Main Catalogue

Edition 2025



Design the future of energy



Main Catalogue Edition 2025

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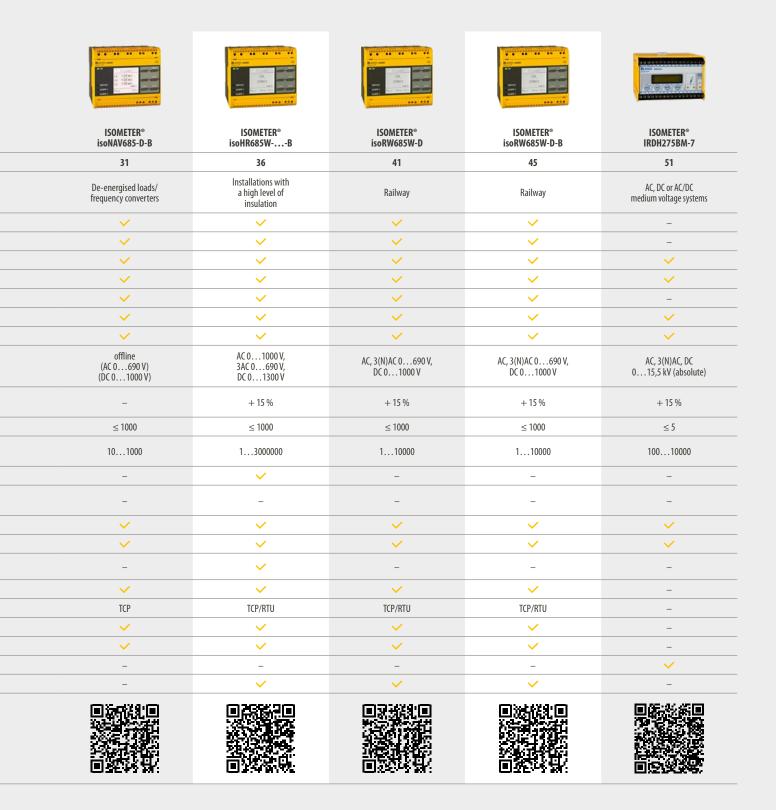
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Device overview insulation monitoring devices ISOMETER®

		The state of the s	Total Control	00 00 00 00 00 00 00 00 00 00 00 00 00	Total State of the		
		ISOMETER® iso685	ISOMETER® iso685B	ISOMETER® iso685P	ISOMETER® isoNAV685-D		
	Catalogue page	12	16	20	26		
S	Special applications	-	-	-	Quick response to combined resistance and offset voltage measurement		
- S2	Control circuits	~	~	~	~		
Circuits	Auxiliary circuits	~	~	~	~		
	Main circuits	~	~	~	~		
E.	3(N)AC	~	~	~	~		
Voltage system	AC	~	~	~	~		
Itage	AC/DC	✓	✓	~	✓		
% 	DC	~	~	~	-		
Nom	ninal system voltage Un	AC, 3(N)AC 0690 V, DC 01000 V	AC, 3(N)AC 0690 V, DC 01000 V	AC, 3(N)AC 0690 V, DC 01000 V	AC, 3(N)AC 0690 V (60 Hz)		
	Tolerance of Un	+ 15 %	+ 15 %	+ 15 %	+ 15 %		
System	leakage capacitance C _e μF	≤ 1000	≤ 1000	≤ 1000	≤ 1000		
Re	esponse value R _{an} kΩ	110000	110000	110000	110000		
	Coupled systems	-	~	~	-		
Loc for in	rating current injector nsulation fault location	-	-	~	-		
E .	DIN rail	~	~	~	✓		
Installation	Screw mounting	~	~	~	~		
Inst	Panel mounting/ wall fastening	~	~	~	-		
	Web server	~	~	~	✓		
	Modbus	TCP/RTU	TCP/RTU	TCP/RTU	TCP		
erfaces	ВСОМ	~	~	~	✓		
Interi	BS	✓	✓	~	✓		
	BMS	_	-	-	-		
	isoData	✓	✓	~	-		
	Product details (Products on www.bender.de/en)						
	Type C. p.	Type C. p. Suitable system components					

	1,100	с. р.		Suitable System components						
	FP200	49	~	~	~	-				
S	AGH150W-4	382	✓	~	-	-				
evice	AGH204S-4	384	~	~	-	-				
ing d	AGH520S	385	~	~	-	-				
Coupli	AGH675S-7	386	-	-	-	_				
	AGH676S-4	388	✓	✓	-	-				



Suitable system components

-	~	-	-	-
-	~	~	~	+
_	✓	~	~	-
_	✓	✓	~	-
_	-	+	-	✓
_	✓	✓	✓	_

Device overview insulation monitoring devices ISOMETER®

		ISOMETER® iso415R	ISOMETER® IR420-D4	ISOMETER® IR425	ISOMETER® iso1685DP
	Catalogue page	55	58	61	64
	Special applications	-	-	-	-
83	Control circuits	~	~	~	-
Circuits	Auxiliary circuits	~	~	~	-
	Main circuits	-	-	_	~
E	3(N)AC	-	-	_	-
syst	AC	~	~	~	~
Voltage system	AC/DC	~	-	~	~
۸	DC	~	-	~	~
Nor	ninal system voltage <i>U</i> n	Depending on variant	AC 0250 V	AC/DC 0300 V	AC 01000 V, DC 01500 V
	Tolerance of <i>U</i> _n	-30 %+15 %	+ 20 %	+ 20 %	+10 %, +5%
System	leakage capacitance C _e μF	≤ 25	≤ 20	≤ 20	≤ 2000
R	esponse value R _{an} kΩ	51000	1200	1200	0.21000
	Coupled systems	-	-	-	~
Lo for i	cating current injector insulation fault location	-	-	-	-
E	DIN rail	~	~	~	-
Installation	Screw mounting	~	~	~	~
Insta	Panel mounting/ wall fastening	-	-	-	-
	Web server	_	-	-	-
10	Modbus	RTU	-	-	RTU
Interfaces	ВСОМ	_	-	-	-
Inte	BS	-	-	-	-
	BMS	-	-	-	<u> </u>
	isoData	-	-	-	-
	Product details (Products on www.bender.de/en)				
	Type C. p.		Suitable syster	m components	
	FP200 49	_	-	-	-
S	AGH150W-4 382	-	-	_	-
devices	AGH204S-4 384	-	-	-	-
77					

385

386

388

AGH520S

AGH675S-7

AGH676S-4



Suitable system components

-	-	-	_	-	-
-	-	+	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	+	-	-	-
_	_	-	_	_	-

Device overview insulation monitoring devices ISOMETER®

		ISOMETER® isoLR275	ISOMETER® isoPV	ISOMETER® isoPV425	ISOMETER® isoPV1685RTU
	Catalogue page	86	89	93	97
	Special applications	Installations with a low level of insulation	Photovoltaic	Photovoltaic	Photovoltaic
×	Control circuits	-	+	-	-
Circuits	Auxiliary circuits	-	+	-	-
J	Main circuits	✓	~	~	✓
Ę	3(N)AC	✓	~	~	✓
syste	AC	✓	✓	✓	✓
Voltage system	AC/DC	✓	✓	✓	✓
Vo	DC	~	✓	✓	✓
No	minal system voltage <i>U</i> n	via AGH-LR 3(N)AC 0690 V DC 01000 V	via AGH-PV 3(N)AC 0793 V DC 01000 V	DC 01000 V, AC 0690 V , 15460 Hz	AC 01000 V DC 01500 V
	Tolerance of <i>U</i> _n	+ 15 % + 10 %	+ 10 %	+ 15 %	+6%
Systen	n leakage capacitance Ce μF	≤ 500	≤ 2000	≤ 500	≤ 2000
R	esponse value $R_{ m an}$ k Ω	0.2100	0.2100	1990	0.2990
	Coupled systems	-	~	-	-
Lo for	ocating current injector insulation fault location	-	-	-	-
E	DIN rail	~	✓	✓	-
Installation	Screw mounting	~	✓	~	✓
Insta	Panel mounting/ wall fastening	-	-	_	-
	Web server	-	-	_	-
10	Modbus	-	-	RTU	RTU
Interfaces	ВСОМ	-	-	_	-
Intel	BS	-	-	_	-
	BMS	✓	✓	~	~
	isoData	-	-	~	-
	Product details (Products on www.bender.de/en)				
	Type C. p.		Suitable syster	n components	
	FP200 49	-	-	_	-
v	AGH150W-4 382	-	-	_	-
evice	AGH204S-4 384	-	+	-	-
ng de	AGH520S 385	-	-	-	+
Coupling devices	AGH675S-7 386	-	-	-	-
	AGH676S-4 388	-	-	-	-













ISOMETER® isoPV1685P	ISOMETER® isoPV1685DP	ISOMETER® IR420-D6	ISOMETER® IR423	ISOMETER® IR123	ISOMETER® isoGEN423
100	103	106	109	112	115
Photovoltaic	Photovoltaic	Disconnected loads	Mobile generators	Mobile generators	Generators acc. to standard DIN VDE 0100-551
-	-	-	-	_	-
-	-	-	-	-	-
✓	✓	~	✓	~	✓
-	~	~	-	-	✓
-	~	~	~	~	✓
-	~	-	-	-	✓
~	✓	~	-	-	✓
DC 01500 V	AC 01000 V DC 01500 V	offline (AC 0 400 V)	AC 0250 V	AC 100250 V	3(N)AC, AC 0400 V, DC 0400 V
+6%	+10 %, +5%	-	+ 20 %	+ 20 %	+25 %
≤ 2000	≤ 4000	≤ 10	≤ 5	≤1	≤ 5
0.2990	0.2200	10010000	1200	46/23	5200
-	✓	-	-	-	-
~	~	-	-	-	-
-	-	~	~	-	✓
~	✓	~	✓	~	✓
-	-	-	-	-	-
-	-	-	-	-	-
-	RTU	-	-	-	RTU
-	-	-	-	-	-
-	-	-	-	-	-
~	✓	-	-	-	✓
_	-	-	-	-	✓













Suitable system components

_	-	-	-	-	-
-	-	~	-	-	-
-	-	~	-	-	-
_	-	~	-	-	-
-	-	-	-	-	-
_	_	-	-	-	-

Device overview insulation monitoring devices ISOMETER®

			ISOMETER® isoRW425	ISOMETER® isoUG425	ISOMETER® isoES425	ISOMETER® isoHV425	
		Catalogue page	118	121	124	127	
-		Special applications	Railway	Unearthed DC systems	Energy storage VDE-AR-E 2510-2	-	
		Control circuits	-	-	_	-	
	Circuits	Auxiliary circuits	-	-	-	-	
	J	Main circuits	<u> </u>	✓	✓	✓	
-		3(N)AC	✓	<u> </u>		<u>✓</u>	
	Voltage system	AC	· · · · · · · · · · · · · · · · · · ·		✓	<u> </u>	
	ge sy			-			
	olta	AC/DC	~	-	~	~	
-		DC	<u> </u>	<u> </u>	✓	✓	
_	Nor	ninal system voltage <i>U</i> n	AC/DC 0400 V	DC 12120 V	3 (N)AC, AC 0400 V, DC 0400 V	with AGH422 AC 01000 V, DC 01000 V	
		Tolerance of <i>U</i> _n	+ 25 %	+20 %	+25 %	+10 %	
	Systen	ı leakage capacitance Ce μF	≤ 300	≤ 50	≤ 100	≤ 150	
_	R	esponse value $R_{an}k\Omega$	1990	2100	2990	11500	
		Coupled systems	-	-	-	-	
	Lo for	cating current injector insulation fault location	-	-	-	-	
	Ē	DIN rail	✓	✓	✓	✓	
	latio	Screw mounting	✓	✓	~	✓	
	Installation	Panel mounting/ wall fastening	-	-	-	-	
		Web server	-	-	-	-	
		Modbus	RTU	RTU	-	RTU	
	aces	ВСОМ	_	_	_	_	
	Interfaces	BS	_	_	_	_	
	트	BMS	✓	~	~	~	
		isoData	<u> </u>	<u> </u>			
-		Product details (Products on www.bender.de/en)					
		Type C. p.		Suitable syster	m components		
		FP200 49	-	-	-	-	
		AGH150W-4 382	_	-	_	_	
	ices	AGH204S-4 384	_	_	_	_	
	Coupling devices	AGH520S 385		_	_	_	
	ild						
	ē			_	_	-	
		AGH676S-4 388	_	-	_	-	











Suitable system components

-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
_	-	-	-
_	-	-	_

ISOMETER® iso685-...

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





Typical applications

- · AC, DC or AC/DC main circuits
- · AC/DC main circuits with directly connected DC components, such as rectifiers, converters, variablespeed drives
- UPS systems, battery systems
- · Heaters with phase control
- · Systems including switchedmode power supplies
- IT systems with high leakage capacitances

Approvals







Device features

- ISOMETER® for IT AC systems with galvanically connected rectifiers or inverters and for IT DC systems (IT = unearthed systems)
- · Automatic adaptation to the existing system leakage capacitance
- Combination of AMPPlus and other profile-specific measurement methods
- Two separately adjustable response value ranges of 1 k Ω ...10 M Ω
- · High-resolution graphical LC display
- · Connection monitoring (monitoring of the measuring lines)
- · Automatic device self test
- Graphical representation of the insulation resistance over time (isoGraph)
- · History memory with real-time clock (buffer for three days) for storing 1023 alarm messages with date and time
- Current or voltage output 0(4)...20 mA, 0...400 μA, 0...10 V, 2...10 V (galvanically separated), which is analogous to the measured insulation value of the system
- Freely programmable digital inputs and outputs
- · Remote setting via the Internet or Intranet (Webserver/Option: COMTRAXX® gateway)
- Worldwide remote diagnosis via the Internet (made available by Bender Service only)
- RS-485/BS (Bender sensor bus) for data exchange with other Bender devices
- BCOM, Modbus TCP/RTU and web server
- · Voltage expandable via coupling devices

Device variants

iso685-D

The device version iso685-D features a high-resolution graphic LC display and control elements for direct operating of the device functions.

iso685-S

The device version iso685-S neither features a display nor a control unit. It can only be used in combination with FP200 and is indirectly operated via this front panel.

Option "W"

Device variants with Option "W" are available for extreme climatic and mechanical conditions.

The ISOMETER® has been developed in compliance with the following standards::

- DIN EN 61557-8 (VDE 0413-8)
- IEC 61557-8

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре		Nominal system voltage range <i>U</i> _n Supply voltage <i>U</i> _s		Display	Option W	Art. No.
iso685-D				integrated	-	B91067010
iso685W-D		AC 0690 V; 0.1460 Hz	Hz AC 24240 V; 50400 Hz		-40+70°C, 3K23,3M12	B91067010W
iso685-S + FP200		DC 01000 V	DC 24240 V	data dha d	-	B91067210
iso685W-S + FP200W				detached	-40+70°C, 3K23,3M12	B91067210W

Description	Art. No.
A set of screw terminals ¹⁾	B91067901
A set of push-wire terminals	B91067902
Enclosure accessories (terminal cover, 2 mounting clips) 1)	B91067903

¹⁾ included in the scope of delivery

Suitable system components

Description	Туре	Art. No.	Page
Device version	iso685-S	B91067110	-
without display	iso685W-S	B91067110W	-
Display for front	FP200	B91067904	49
panel mounting	FP200W	B91067904W	49
	AGH150W-4	B98018006	382
Coupling devices	AGH204S-4	B914013	384
	AGH520S	B913033	385
	AGH676S-4	B913055	388

Suitable measuring instruments on request!

Technical data

Rated voltage	1000 V
Overvoltage category	III
Definitions:	
Measuring circuit (IC1)	L1/+, L2, L3/-
Supply circuit (IC2)	A1, A2
Output circuit 1 (IC3)	11, 12, 14
Output circuit 2 (IC4)	21, 22, 24
Control circuit (IC5)	E, KE, X1, ETH, X3, X4
Rated impulse voltage:	
IC1/(IC2-5)	8 kV
IC2/(IC3-5)	4 kV
IC3/(IC4-5)	4 kV
IC4/IC5	4 kV
Rated insulation voltage:	
IC1/(IC2-5)	1000 V
IC2/(IC3-5)	250 V
IC3/(IC4-5)	250 V
IC4/IC5	250 V
Pollution degree outside ($U_n < 690 \text{ V}$)	3
Pollution degree outside ($U_n > 690 < 1000 \text{ V}$)	2
Protective separation (reinforced insulation) between:	
IC1/(IC2-5)	Overvoltage category III, 1000 V
IC2/(IC3-5)	Overvoltage category III, 300 V
IC3/(IC4-5)	Overvoltage categorylll, 300 V
IC4/IC5	Overvoltage category III, 300 V
Voltage test (routine test) according to IEC 61010-1:	
IC2/(IC3-5)	AC 2.2 kV
IC3/(IC4-5)	AC 2.2 kV
IC4/IC5	AC 2.2 kV

Supply voltage

AC/DC 24240 \
-30+15%
650 mA
DC, 50400 Hz*
-5+15 %
≤ 12 W
≤ 12 W/21 V/
≤ 12 W/45 VA

^{*} At frequencies > 200 Hz, the connection of X1 and remote must be shockproof. Only permanently installed devices which at least have overvoltage category II (300 V) may be connected.

Supply via X1: Supply voltage U_s Tolerance of U_s

supply voltage of	DCZIV
Tolerance of U _s	DC -20+25 %
IT system being monitored	
Nominal system voltage range U_n	AC 0690 V, DC 01000 V
for UL applications	AC/DC 0600 V
Tolerance of $U_{\rm n}$	AC/DC +15 %

Response values

Frequency range of U_n

Max. alternating voltage $U \sim (\text{for } f_{\text{n}} < 4 \text{ Hz})$

nesponse values	
Response value R _{an1} (ALARM 1)	1 kΩ10 MΩ
Response value R _{an2} (ALARM 2)	1 kΩ10 MΩ
Relative uncertainty (acc. to IEC 61557-8)	profile dependent, ± 15 %, at least ± 1 k Ω
Hysteresis	25 %, at least 1 kO

Time response

Response time $t_{\rm an}$ at $R_{\rm F}=0.5$ x $R_{\rm an}$ (10 k Ω) and $C_{\rm e}$ (1 $\mu{\rm F}$) acc. to IE	C 61557-8
	profile dependent, typ. 4 s
Response time DC alarm at $C_e = 1 \mu F$	profile dependent, typ. 2 s
Start-up delay T _{start-up}	0 s10 min

Measuring circuit

Measuring voltage U _m	profile dependent, ±10	V , $\pm 50 V$ (see profile overview in the manual)
Measuring current I _m		≤ 403 µA
Internal resistance R _i , Z _i		≥ 124 kΩ
Permissible extraneous DC v	oltage U _{fg}	≤ 1200 V
Permissible system leakage	capacitance C _e	profile dependent, 01000 μF

Measuring ranges

0.1460 Hz
±1 % ±0.1 Hz
AC 25690 V
AC 25690 V, DC 01000 V
AC/DC > 10 V
±5 % ±5 V
01000 μF
±10 % ±10 μF
DC, 30460 Hz
typ. > 10 kΩ

Display

Indication	graphic display 127 x 127 pixels, 40 x 40 mm*
Display range measured value	0.1 kΩ20 MΩ
Operating uncertainty (acc. to IEC 61557-8)	±15 %, min. ±1 kΩ

^{*} Indication is limited outside the temperature range -25 \ldots +55 °C.

LEDs

DC 24 V

DC, 0.1...460 Hz

 $U \sim \text{max} = 50 \text{ V x } (1 + f_n^2)$

ON (operation LED)	green
SERVICE	yellow
ALARM 1	yellow
ALARM 2	yellow
In-/Outputs (X1)	
Cable length X1 (unshielded cable)	≤ 10 m

Cable length X1 (unshielded cable)	≤ 10 m
Cable length X1 (shielded cable, shield connected to PE on one side)	recommended:
J-Y(St)Y min. 2x0,8	≤ 100 m
Max output current for supply via X1+/X1GND per output	1 A
Max output current for supply via A1/A2 in total on X1	200 mA
Max output current for supply via A1/A2 in total on X1 between 16.8	3 V and 40 V
	$I_{LmaxX1} = 10 \text{ mA} + 7 \text{ mA/V } U_s *$

* $U_{\rm S}$ is the supply voltage of the ISOMETER®. Negative values for $I_{\rm LmaxX1}$ are not permissible.

Digital Inputs (I1, I2, I3)

· J · · · · · · · · · · · · · ·	
Number	3
Operating mode, adjustable	high-active, low-active
Functions	off, test, reset, deactivate device, start initial measurement
Voltage	Low DC -35 V, High DC 1132 V
Tolerance Voltage	±10 %

Digital Outputs (Q1, Q2)

Number	2
Operating mode, adjustable	active, passive
Functions	off, Ins. alarm 1, Ins. alarm 2, connection fault, DC- alarm*,
	DC+ alarm*, symmetrical alarm, device fault, common alarm,
	measurement complete, device inactive, DC offset alarm
Voltage	passive DC 032 V, active DC 0/19.232 V

^{*} Only for $U_n \ge 50 \text{ V}$



Analogue Output (M+)	
Number	,
Operating mode	linear, midscale point 28 kΩ/120 kΩ
Functions	insulation value, DC offse
	.20 mA (< 600 Ω), 420 mA (< 600 Ω), 0400 μA (< 4 k Ω
Voltage	$010 \text{ V} (> 1 \text{ k}\Omega), 210 \text{ V} (> 1 \text{ k}\Omega)$
Tolerance related to the current/volta	
Interfaces	
Field bus:	
Interface/protocol	web server/Modbus TCP/BCON
Data rate	10/100 Mbit/s, autodetec
Max. amount Modbus requests	< 100/
Cable	min. CAT 6
Cable length	≤ 100 m
Connection	RJ45
IP address	DHCP/manual 192.168.0.5
Network mask	255.255.255.0
BCOM address	system-1-0
Function	communication interface
Sensor bus:	
Interface/protocol	RS-485 / isoData, BS bus, Modbus RTU
Data rate	9.6 kBaud/
Cable: twisted pair, one end of shield	
Cable length (depending on the baud	I rate) ≤ 1200 m
Connection	terminals X1A, X1B
Terminating resistor	120 Ω , can be connected internally
Device address, BS bus	190
Switching elements	
Number of switching elements	2 changeover contact:
Operating mode	N/C operation/N/O operation
Contact 11-12-14/21-22-24	off, Ins. alarm 1, Ins. alarm 2, connection fault, DC- alarm*
	DC+ alarm*, symmetrical alarm, device fault, common alarm
	measurement complete, device inactive, DC offset alarn
Electrical endurance at rated operating	ng conditions 10.000 operating cycles
* Only for $U_n \ge 50 \text{ V}$	
Contact data acc. to IEC 60947-5-	1:
Utilisation category	AC-13 / AC-14 / DC-12 / DC-12 / DC-12 / DC-1.
Rated operational voltage	230 V / 230 V / 24 V / 48 V / 110 V / 220 V
Rated operational current	5 A / 3 A / 1 A / 1 A / 0.2 A / 0.1 /
Rated insulation voltage ≤ 2000 m N	
Rated insulation voltage ≤ 3000 m N	
Minimum contact rating	1 mA at AC/DC \geq 10 \

natca operational voltage	230 1 / 230 1 / 27 1 / 70 1 / 110 1 / 220 1
Rated operational current	5 A / 3 A / 1 A / 1 A / 0.2 A / 0.1 A
Rated insulation voltage ≤ 2000 m NN	250 V
Rated insulation voltage ≤ 3000 m NN	160 V
Minimum contact rating	1 mA at AC/DC \geq 10 V
Environment & EMC	
EMC	IEC 61326-2-4
Ambient temperatures:	
Operating temperature	-25+55 ℃

Long-term storage	-40+/0 (
Classification of climatic conditions acc. to IEC 60721 (rela	nted to temperature and relative humidity)
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K1°
Long-term storage (IEC 60721-3-1)	1K22
Character and an advantage and delication and a second	7774

Classification of mechanical conditions acc. to IEC 60	721
Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12
Area of application	≤ 3000 m AMSL

Connection

Connection type	crew-type terminal or push-wire terminal, pluggable
Screw-type terminals:	
Nominal current	≤ 10 A
Tightening torque	0.50.6 Nm (57 lb-in)
Conductor sizes	AWG 24-12
Stripping length	7 mm
Wire cross-section	
rigid/flexible	0.22.5 mm ²
flexible with ferrules, with/without plastic	sleeve 0.252.5 mm ²
Multiple conductor, rigid	0.21 mm ²
Multiple conductor, flexible	0.21.5 mm ²
Multiple conductor, flexible with ferrule w	ithout plastic sleeve 0.251 mm ²
Multiple conductor, flexible with TWIN fer	rule with plastic sleeve 0.51.5 mm ²

Push-wire terminals:

Nominal current	≤ 10 A
Conductor sizes	AWG 24-12
Stripping length	10 mm
Wire cross-section	
rigid/flexible	0.22.5 mm ²
flexible with ferrules, with/without plastic sleeve	0.252.5 mm ²
Multiple conductor, flexible with TWIN ferrule with plastic sleeve	0.51.5 mm ²

Push-wire terminals X1:

Nominal current	≤ 8 A
Conductor sizes	AWG 24-16
Stripping length	10 mm
Wire cross-section	
rigid/flexible	0.21.5 mm ²
flexible with ferrule without plastic sleeve	0.251.5 mm ²
flexible with TWIN ferrule with plastic sleeve	0.250.75 mm ²

-40...+85 °C

Other	
Operating mode	continuous operation
Mounting (0°)	display oriented*
Degree of protection internal components	IP40
Degree of protection terminals	IP20
DIN rail mounting acc. to	IEC 60715
Screw fixing	3 x M4 with mounting clip
Enclosure material	polycarbonate
Flammability class	V-0
ANSI code	64
Dimensions (W x H x D)	108 x 93 x 110 mm
Documentation number	D00022
Weight	< 390 g

^{*} For best ventilation, align cooling slots vertically (0°). At an alignment of 45° the max. operating temperature is reduced by 10 °C. At an alignment fo 90° the max. operating temperature is reduced by 20 °C.

Option "W" data different from the standard version

Devices with the suffix **W** feature increased shock and vibration resistance. The electronics is covered with a special varnish to provide increased protection against mechanical stress and moisture.

Rated operational current of switching elements	max. 3 A (for UL applications)
Ambient temperatures:	
Operating temperature	-40+70 ℃
Operating temperature for UL applications	-40+65 ℃
Transport	-40+85 ℃
Long-term storage	-40+70 ℃

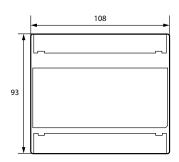
Classification of climatic conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3K23

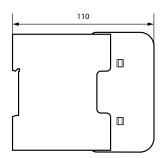
Classification of mechanical conditions acc. to IEC 60721:

Stationary use (IEC 60721-3-3)	3M12

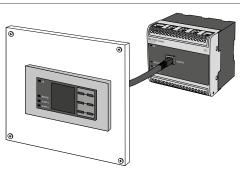
Combination of ISOMETER® sensor variant with an FP200W: The requirements of option **W** will only be fulfilled when the ISOMETER® sensor variant is mounted on a DIN rail and connected to the FP200W via the patch cable.

Dimension diagram (dimensions in mm)

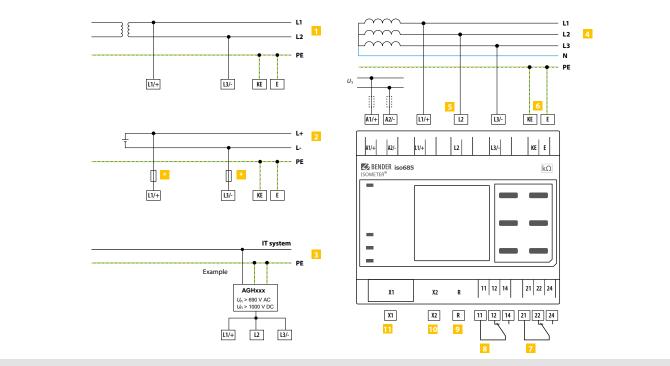




Connection to FP200



Transport



- Connection to an AC system Un
- 2 Connection to a DC system U_n
- 3 Connection to an IT system with coupling device
- Connection to a 3(N)AC system
- Connection to the IT system to be monitored (L1/+, L2, L3/-)
- 6 Separate connection of KE, E to PE
- (K1) Alarm relay 1, available changeover contacts

- 8 (K2) Alarm relay 2, available changeover contacts
- Switchable resistor R for RS-485 bus termination
- 10 Ethernet interface
- 11 Digital interface
- For systems > 690 V and with overvoltage category III a fuse for the connection to the system to be monitored must be provided. Recommendation: 2A screw-in fuses.

Provide line protection!

According to DIN VDE 0100-430, a line protection shall be provided for the supply voltage.

NOTE:

According to DIN VDE 0100-430, devices for protection against a short circuit can be omitted for the coupling of terminals L1/+ and L3/- to the IT system \leq 690 V to be monitored if the wiring is carried out in such a manner as to reduce the risk of a short circuit to a minimum. (Recommendation: Ensure short-circuit-proof and earth-fault-proof wiring).

The connecting lines L1/+, L2, L3/- to the system to be monitored must be carried out as spur lines. No load current may be conducted through the terminals.

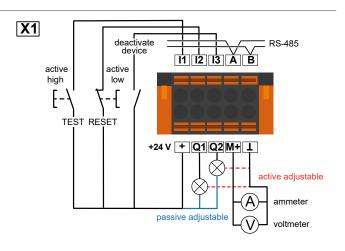
For UL applications:

Use 60/70°C copper lines only!

UL and CSA application require the supply voltage to be protected via 5 A fuses.

Digital interface X1

Digital interface	Terminal	Colour
	I1	Input 1
	12	Input 2
	13	Input 3
11 12 13 A B + Q1 Q2 M+ L	A	RS-485 A
	В	RS-485 B
	+	+24 V
	Q1	Output 1
	Q2	Output 2
	M+	Analogue output
	1	Ground



ISOMETER® iso685-...-B

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





Typical applications

- · AC, DC or AC/DC main circuits
- · AC/DC main circuits with directly connected DC components, such as rectifiers, converters, variablespeed drives
- UPS systems, battery systems
- · Heaters with phase control
- · Systems including switchedmode power supplies
- IT systems with high leakage capacitances

Approvals







Device features

- · ISOMETER® for IT AC systems with galvanically connected rectifiers or inverters and for IT DC systems (IT = unearthed systems)
- Automatic adaptation to the existing system leakage capacitance
- Combination of AMPPlus and other profile-specific measurement methods
- Two separately adjustable response value ranges of 1 k Ω ...10 M Ω
- · High-resolution graphic LC display for excellent readability and recording of the device status
- Connection monitoring (monitoring of the measuring lines)
- Automatic device self test
- Graphical representation of the insulation resistance over time (isoGraph)
- · History memory with real-time clock (buffer for three days) for storing 1023 alarm messages with date and time
- Current or voltage output 0(4)...20 mA, 0...400 μA, 0...10 V, 2...10 V (galvanically separated), which is analogous to the measured insulation value of the system
- Freely programmable digital inputs and outputs
- Remote setting via the Internet or Intranet (Webserver/Option: COMTRAXX® Gateway).
- Worldwide remote diagnosis via the Internet
- RS-485/BS (Bender sensor bus) for communication with other Bender devices
- ISOnet: Internal separation of the ISOMETER® from the IT system to be monitored (e.g. if several IT systems are interconnected)
- · BCOM, Modbus TCP/RTU and web server
- · Voltage expandable via coupling devices

Device variants

iso685-D-B

This device variant features a high-resolution graphic LC display and operating controls for direct operation of the device functions. It cannot be combined with an FP200.

This device variant features neither a display nor operating controls. It can only be used in combination with the FP200 and it is operated via this front panel.

Option "W"

The ISOMETER®s with and without integrated display are available with option "W" for extreme climatic and mechanical conditions (ISOMETER® iso685W-D-B and iso685W-S-B).

Standards

The ISOMETER® has been developed in compliance with the following standards:

- DIN EN 61557-8 (VDE 0413-8)
- IEC 61557-8

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Тур	e	Nominal system voltage range <i>U</i> n	Supply voltage <i>U</i> ₅	Display	Option W	Art. No.
iso685-D-B	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1				-	B91067020
iso685W-D-B	AC 0690 V; 0.1460 Hz DC 01000 V	AC 0690 V; 0.1460 Hz	AC 24240 V; 50400 Hz	integrated	-40+70°C, 3K23, 3M12	B91067020W
iso685-S-B + FP200		DC 24240 V	data dha d	-	B91067220	
iso685W-S-B + FP200W	To be			detached	-40+70°C, 3K23, 3M12	B91067220W

Description	Art. No.
A set of screw terminals ¹⁾	B91067901
A set of push-wire terminals	B91067902
Enclosure accessories (terminal cover, 2 mounting clips) 1)	B91067903

¹⁾ included in the scope of delivery

Description	Туре	Art. No.	Page
Device version	iso685-S-B	B91067120	_
without display	iso685W-S-B	B91067120W	_
Display for front panel mounting	FP200	B91067904	49
	FP200W	B91067904W	49
Coupling devices	AGH150W-4	B98018006	382
	AGH204S-4	B914013	384
	AGH520S	B913033	385
	AGH676S-4	B913055	388

Suitable measuring instruments on request!

Insulation coordination according to IEC 60664-1/IEC 6	60664-3
Rated voltage	1000 V
Overvoltage category	III
Definitions:	
Measuring circuit (IC1)	L1/+, L2, L3/-
Supply circuit (IC2)	A1, A2
Output circuit 1 (IC3)	11, 12, 14
Output circuit 2 (IC4)	21, 22, 24
Control circuit (IC5)	E, KE, X1, ETH, X3, X4
Rated impulse voltage:	
IC1/(IC2-5)	8 kV
IC2/(IC3-5)	4 kV
IC3/(IC4-5)	4 kV
IC4/IC5	4 kV
Rated insulation voltage:	
IC1/(IC2-5)	1000 V
IC2/(IC3-5)	250 V
IC3/(IC4-5)	250 V
IC4/IC5	250 V
Pollution degree outside ($U_{\rm n}$ < 690 V)	3
Pollution degree outside ($U_n > 690 < 1000 \text{ V}$)	2
Protective separation (reinforced insulation) between:	
IC1/(IC2-5)	Overvoltage category III, 1000 V
IC2/(IC3-5)	Overvoltage category III, 300 V
IC3/(IC4-5)	Overvoltage categorylll, 300 V
IC4/IC5	Overvoltage category III, 300 V
Voltage test (routine test) according to IEC 61010-1:	
IC2/(IC3-5)	AC 2,2 kV
IC3/(IC4-5)	AC 2,2 kV
IC4/IC5	AC 2,2 kV
Supply voltage	
Supply via A1/+, A2/-:	
Supply voltage range $U_{\rm S}$	AC/DC 24240 V

Supply voltage range $U_{\rm S}$	AC/DC 24240 \
Tolerance of U _s	-30+15%
Maximum permissible input current of U_s	650 mA
Frequency range of U _S	DC, 50400 Hz*
Tolerance of the frequency range of $U_{\rm S}$	-5+15 %
Power consumption, typically at DC	≤ 12 W
Power consumption, typically at 50/60 Hz	≤ 12 W/21 VA
Power consumption, typically at 400 Hz	≤ 12 W/45 VA

 $^{^{\}ast}~$ At frequencies > 200 Hz, the connection of X1 and remote must be shockproof. Only permanently installed devices which at least have overvoltage category II (300 V) may be connected.

Su	pp	ly	via	X1	:

Supply voltage U_{S}	DC 24 V		
Tolerance of $U_{\rm S}$	DC -20+25 %		

IT system being monitored

Nominal system voltage range U _n	AC 0690 V, DC 01000 V
for UL applications	AC/DC 0600 V
Tolerance of U _n	AC/DC +15 %
Frequency range of U_n	DC, 0.1460 Hz
Max. alternating voltage $U\sim$ (for $f_{\rm n}<4$ Hz)	$U \sim \text{max} = 50 \text{ V x } (1 + f_n^2)$

Response values

nesponse values	
Response value R _{an1} (ALARM 1)	1 kΩ10 MΩ
Response value R _{an2} (ALARM 2)	1 kΩ10 MΩ
Relative uncertainty (acc. to IEC 61557-8)	profile dependent, ± 15 %, at least ± 1 k Ω
Hysteresis	25 %, at least 1 kΩ

Time response

Response time $t_{\rm an}$ at $R_{\rm F}=0.5$ x $R_{\rm an}$ (10 k Ω) and $C_{\rm e}$ (1 $\mu{\rm F}$) acc. to IEC 61557-8

	profile dependent, typ. 4 s
Response time DC alarm at $C_e = 1 \mu F$	profile dependent, typ. 2 s
Start-up delay T _{start-up}	0 s10 min

Measuring circuit

Measuring voltage $U_{\rm m}$	profile dependent,	$\pm 10 \text{ V}$, $\pm 50 \text{ V}$ (see profile overview in the manual)
Measuring current I _m		≤ 403 μA
Internal resistance R _i , Z _i		≥ 124 kΩ
Permissible extraneous DC vol	tage U _{fg}	≤ 1200 V
Permissible system leakage ca	ipacitance Ce	profile dependent, 01000 μF

Measuring ranges

Measuring range f_n	0,1460 Hz
Tolerance measurement of f_n	±1 % ±0.1 Hz
Voltage range measurement of f_n	AC 25690 V
Measuring range U_n	AC 25690 V, DC 01000 V
Voltage range measurement of U_n	AC/DC > 10 V
Tolerance measurement of U_n	±5 % ±5 V
Measuring range Ce	01000 μF
Tolerance measurement of Ce	±10 % ±10 μF
Frequency range measurement of Ce	DC, 30460 Hz
Min. insulation resistance measurement of C_e	typ. $> 10 \text{ k}\Omega$
depending on the profile and coupling mode	

Display

Indication	graphic display 127 x 127 pixels, 40 x 40 mm*
Display range measured value	0.1 kΩ20 MΩ
Operating uncertainty (acc. to IEC 61557-8)	±15 %, min. ±1 kΩ

^{*} Indication is limited outside the temperature range -25 . . . +55 °C.

LEDs

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

In-/Outputs (X1)

Cable length X1 (unshielded cable)	≤ 10 m
Cable length X1 (shielded cable, shield connected to PE on one side)	recommended:
J-Y(St)Y min. 2x0,8	≤ 100 m
Max output current for supply via X1+/X1GND per output	max. 1 A
Max output current for supply via A1/A2 in total on X1	max. 200 mA
Max output current for supply via A1/A2 in total on X1 between 16.8	3 V and 40 V
	$I_{LmaxX1} = 10 \text{ mA} + 7 \text{ mA/V } U_s *$

^{*} $U_{\rm S}$ is the supply voltage of the ISOMETER®. Negative values for $I_{\rm LmaxX1}$ are not permissible.

Digital Inputs (I1, I2, I3)

Number	3
Operating mode, adjustable	high-active, low-active
Functions	off, test, reset, deactivate device, start initial measurement
Voltage	Low DC -35 V, High DC 1132 V
Tolerance Voltage	±10 %

Digital Outputs (Q1, Q2)

Number	2
Operating mode, adjustable	active, passive
Functions	off, Ins. alarm 1, Ins. alarm 2, connection fault, DC- alarm*,
	DC+ alarm*, symmetrical alarm, device fault, common alarm,
	measurement complete, device inactive, DC offset alarm
Voltage	passive DC 032 V, active DC 0/19.232 V

* Only for $U_n \ge 50 \text{ V}$

Analogue Output (M+)

Number		1
Operating mode	li	inear, midscale point 28 k Ω /120 k Ω
Functions		insulation value, DC offset
Current	020 mA (< 600 Ω), 420 n	$nA (< 600 \Omega), 0400 μA (< 4 kΩ)$
Voltage	0.	10 V (> 1 k Ω), 210 V (> 1 k Ω)
Tolerance related to th	e current/voltage final value	±20 %

Interfaces	
Field bus:	
Interface/protocol	web server/Modbus TCP/BCON
Data rate	10/100 Mbit/s, autodetect
Max. amount Modbus requests	< 100/9
Cable	min. CAT 6
Cable length	≤ 100 m
Connection	RJ45
IP address	DHCP/manual 192.168.0.5
Network mask	255.255.255.0
BCOM address	system-1-0
Function	communication interface
ISOnet	
ISOnet number of devices	220
Maximum nominal system voltage ISOnet	AC, 690 V/DC, 1000 \
ISOloop	, ,
ISOloop number of devices	210
Sensor bus:	210
Sensor bus: Interface/protocol	DC 40C / icaData DC hua Madhua DTI
Data rate	RS-485 / isoData, BS bus, Modbus RTU 9.6 kBaud/s
Data rate Cable: twisted pair, one end of shield connected to F	
Cable length (depending on the baud rate)	≤ 1200 m
Connection	terminals X1A, X1E
Terminating resistor	120 Ω , can be connected internally
Device address, BS bus	120 22, can be connected internally
Device address, by bus	1,70
Switching elements	
Number of switching elements	2 changeover contacts
Operating mode	N/C operation/N/O operation
Contact 11-12-14/21-22-24 off, Ins. al	larm 1, lns. alarm 2, connection fault, DC- alarm*
	, symmetrical alarm, device fault, common alarm
	rement complete, device inactive, DC offset alarm
Electrical endurance at rated operating conditions	10.000 operating cycles
* Only for $U_n \ge 50 \text{ V}$	
Contact data are to IEC COOAT E 1.	
Contact data acc. to IEC 60947-5-1:	AC 12 / AC 14 / DC 12 / DC 12 / DC 12 / DC 12
Utilisation category	AC-13 / AC-14 / DC-12 / DC-12 / DC-12 / DC-12
Rated operational voltage	230 V / 230 V / 24 V / 48 V / 110 V / 220 V
Rated operational current	5 A / 3 A / 1 A / 1 A / 0.2 A / 0.1 A
Rated insulation voltage ≤ 2000 m NN	250 \
Data di mandati an malta na - 2000 na MM	
Rated insulation voltage ≤ 3000 m NN Minimum contact rating	160 V 1 mA at AC/DC > 10 V

Rated insulation voltage ≤ 3000 m NN	160 V
Minimum contact rating	1 mA at AC/DC \geq 10 V
Environment & EMC	
EMC	IEC 61326-2-4
Ambient temperatures:	
Operating temperature	-25+55 ℃
Transport	-40+85 ℃
Long-term storage	-40+70 ℃
Classification of climatic conditions acc. to IEC 60721 (relate	d to temperature and relative humidity)
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 607	21
Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M4

Connection		
Connection type	screw-type terminal or push-wir	e terminal, pluggable
Screw-type terminals:		
Nominal current		≤ 10 A
Tightening torque	0.5	.0.6 Nm (57 lb-in)
Conductor sizes		AWG 24-12
Stripping length		7 mm
Wire cross-section		
rigid/flexible		0.22.5 mm ²
flexible with ferrules, with/without pl	astic sleeve	0.252.5 mm ²
Multiple conductor, rigid		0.21 mm ²
Multiple conductor, flexible		0.21.5 mm ²
Multiple conductor, flexible with ferru	le without plastic sleeve	0.251 mm ²
Multiple conductor, flexible with TWIN	I ferrule with plastic sleeve	0.51.5 mm ²
Push-wire terminals:		
Nominal current		≤ 10 A
Conductor sizes		AWG 24-12
Stripping length		10 mm
Wire cross-section		

Conductor sizes	AWG 24-12
Stripping length	10 mm
Wire cross-section	
rigid/flexible	0.22.5 mm ²
flexible with ferrules, with/without plastic sleeve	0.252.5 mm ²
Multiple conductor, flexible with TWIN ferrule with plastic sleeve	0.51.5 mm ²
Push-wire terminals X1:	
Nominal current	≤ 8 A
Conductor sizes	AWG 24-16
Stripping length	10 mm
Wire cross-section	
rigid/flexible	0.21.5 mm ²

Other	
Operating mode	continuous operation
Mounting (0°)	display oriented*
Degree of protection internal components	IP40
Degree of protection terminals	IP20
DIN rail mounting acc. to	IEC 60715
Screw fixing	3 x M4 with mounting clip
Enclosure material	polycarbonate
Flammability class	V-0
ANSI code	64
Dimensions (W x H x D)	108 x 93 x 110 mm
Documentation number	D00177
Weight	< 390 g

* For best ventilation, align cooling slots vertically (0°). At an alignment of 45° the max. operating temperature is reduced by 10 °C. At an alignment fo 90° the max. operating temperature is reduced by 20 °C.

Option "W" data different from the standard version

flexible with ferrule without plastic sleeve flexible with TWIN ferrule with plastic sleeve

Devices with the suffix ${\bf W}$ feature increased shock and vibration resistance. The electronics is covered with a special varnish to provide increased protection against mechanical stress and moisture. \\ Rated operational current of switching elements

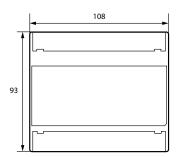
Ambient temperatures:	
Operating temperature	-40+70 °C
Operating temperature for UL applications	-40+65 °C
Transport	-40+85 °C
Long-term storage	-40+70 °C
Classification of climatic conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3K23
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3M12

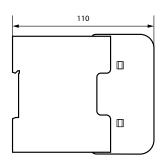
Combination of ISOMETER® sensor variant with an FP200W: The requirements of option **W** will only be fulfilled when the ISOMETER $^{\circ}$ sensor variant is mounted on a DIN rail and connected to the FP200W via the patch cable.

Dimension diagram (dimensions in mm)

Long-term storage (IEC 60721-3-1)

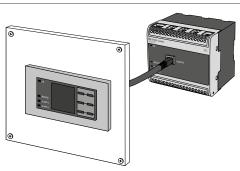
Area of application





Connection to FP200

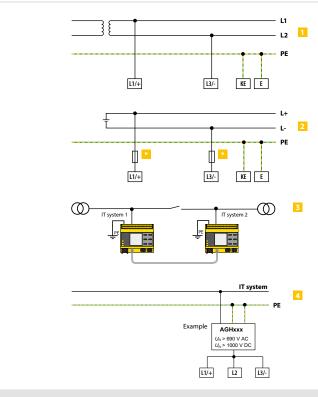
1M12 ≤ 3000 m NN

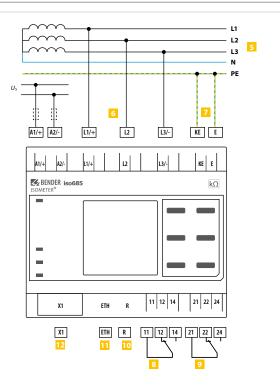


0.25...1.5 mm²

0.25...0.75 mm²

max. 3 A (for UL applications)





- 1 Connection to an AC system Un
- 2 Connection to a DC system U_n
- Linked with two IT systems which can be interconnected via a coupling switch. Information regarding the state of the coupling switch is not necessary.
- Connection to an IT system with coupling device
- Connection to a 3(N)AC system
- 6 Connection to the IT system to be monitored (L1/+, L2, L3/-)
- Separate connection of KE, E to PE

- 8 (K1) Alarm relay 1, available changeover contacts
- (K2) Alarm relay 2, available changeover contacts
- 10 Switchable resistor R for RS-485 bus termination
- 11 Ethernet interface
- 12 Digital interface
- For systems > 690 V and with overvoltage category III a fuse for the connection to the system to be monitored must be provided. Recommendation: 2A screw-in fuses.

Provide line protection!

According to DIN VDE 0100-430, a line protection shall be provided for the supply voltage.

NOTE

According to DIN VDE 0100-430, devices for protection against a short circuit can be omitted for the coupling of terminals L1/+ and L3/- to the IT system \leq 690 V to be monitored if the wiring is carried out in such a manner as to reduce the risk of a short circuit to a minimum. Ensure short-circuit-proof and earthfault-proof wiring.

The connecting lines L1/+, L2, L3/- to the system to be monitored must be carried out as spur lines. No load current may be conducted through the terminals.

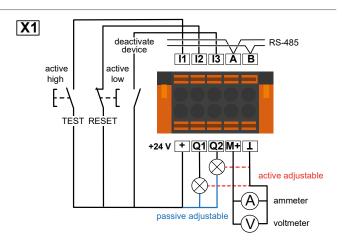
For UL applications:

Use 60/70°C copper lines only!

 ${\it UL and CSA application require the supply voltage to be protected via 5~A~fuses.}$

Digital interface X1

Digital interface	Terminal	Colour
	l1	Input 1
	I2	Input 2
	13	Input 3
_=====	А	RS-485 A
I1 I2 I3 A B	В	RS-485 B
+ Q1 Q2 M+ _	+	+24 V
	Q1	Output 1
X1	Q2	Output 2
	M+	Analogue output
	上	Ground



ISOMETER® iso685-...-P

Insulation monitoring device with integrated locating current injector for IT AC systems with galvanically connected rectifiers or converters and for IT DC systems





Typical applications

- · AC, DC or AC/DC main circuits
- · AC/DC main circuits with directly connected DC components, such as rectifiers, converters, variablespeed drives
- UPS systems, battery systems
- · Heaters with phase control
- Systems including switch-mode power supplies
- · IT systems with high leakage capacitances
- · Installations with insulation fault location

Approvals





Device features

iso685-...-P

- ISOMETER® for IT AC systems with galvanically connected rectifiers or inverters and for IT DC systems (IT = unearthed systems)
- Automatic adaptation to the existing system leakage capacitance
- · Combination of and other profile-specific measurement methods
- Two separately adjustable response value ranges of 1 k Ω ...10 M Ω for Alarm 1 and Alarm 2
- · High-resolution graphical LC display
- Connection monitoring (monitoring of the measuring lines)
- · Automatic device self test
- Graphical representation of the insulation resistance over time (isoGraph)
- · History memory with real-time clock (buffer for three days) for storing 1023 alarm messages with date and time
- Current or voltage output 0(4)...20 mA, 0...400 μA, 0...10 V, 2...10 V (galvanically separated), which is analogous to the measured insulation value of the system
- · Freely programmable digital inputs and outputs
- Remote setting via the Internet or Intranet (Webserver/Option: COMTRAXX® gateway)
- Worldwide remote diagnosis via the Internet (made available by Bender Service only)
- RS-485/BS (Bender sensor bus) for data exchange with other Bender devices
- ISOnet: Internal separation of the ISOMETER® from the IT system to be monitored (e.g. if several IT systems are interconnected)
- · BCOM, Modbus TCP and web server
- Locating current injection for selective insulation fault location
- Indication of the insulation faults selectively located by the EDS system
- · Parameter setting of EDS systems
- · Customer-specific texts for each measuring channel

- · Insulation fault location in AC, 3AC and DC IT systems
- Up to 12 measuring current transformers of the CTAC..., WR..., WS... measuring current transformer series can be connected
- Response sensitivity insulation fault location: EDS440 2...10 mA, EDS441 0.2...1 mA
- Response sensitivity residual current measurement: EDS440 100 mA...10 A, EDS441 100 mA...1 A
- · Communication of the components via BS bus (RS-485) or BB bus

Device variants

iso685-D-P

The device variant ISOMETER® iso685-D-P features a high-resolution graphic LC display and operating controls for direct operation of the device functions. It cannot be combined with an FP200.

The device variant ISOMETER® iso685-S-P features neither a display nor operating controls. It can only be used in combination with the FP200 and it is operated via this front panel.

Option "W"

The ISOMETER®s with and without integrated display are available with option "W" for extreme climatic and mechanical conditions (ISOMETER® iso685W-D-P and iso685W-S-P).

Standards

The ISOMETER® has been developed in compliance with the following standards:

- DIN EN 61557-8 (VDE 0413-8)
- IEC 61557-8

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туро	e	Nominal system voltage range <i>U</i> n	Supply voltage <i>U</i> ₅	Display	Option W	Art. No.
iso685-D-P	Garage and Control of the Control of				-	B91067030
iso685W-D-P	791	AC 0690 V; 0,1460 Hz		integrated	-40+70°C, 3K23,3M12	B91067030W
iso685-S-P + FP200		DC 01000 V	DC 24240 V	data dha d	-	B91067230
iso685W-S-P + FP200W				detached	-40+70 °C, 3K23, 3M12	B91067230W

Insulation fault locators

Description	Supply voltage <i>U</i> s 1)	Response value	Туре	Art. No.	Page					
	210 AC/DC 24240V 0.21							EDS440-S-1	B91080201	148
		2 10 1	EDS440W-S-1	B91080201W	148					
		210 mA	EDS440-L-4	B91080202	148					
			EDS440W-L-4	B91080202W	148					
la collegio e foodale con con			EDS441-S-1	B91080204	148					
Insulation fault locators		AC/DC 24240V	AC/DC 24240V	AC/DC 24240V	AC/DC 24240V		EDS441W-S-1	B91080204W	148	
		0.2 1 4	EDS441-L-4	B91080205	148					
		0.21 mA	EDS441W-L-4	B91080205W	148					
			EDS441-LAB-4	B91080207	148					
			EDS441W-LAB-4	B91080207W	148					
Delevens dele	DC 24V		I0M441-S	B95012057	411					
Relay module	UC 24 V —	DC 24 V	-	I0M441W-S	B95012057W	411				

¹⁾ Absolute values

Accessories

Description	Art. No.
A set of screw-type terminals ¹⁾	B91067901
A set of push-wire terminals	B91067902
Enclosure accessories (terminal cover, 2 mounting clips) 1)	B91067903
BB bus 6TE connector ²⁾	B98110001

included in the scope of delivery

Suitable system components

Description	Туре	Art. No.	Page
Device version	iso685-S-P	B91067130	-
without display	iso685W-S-P	B91067130W	-
Display for front	FP200	B91067904	49
panel mounting	FP200W	B91067904W	49

Suitable measuring instruments on request!

 $^{^{\}mbox{\tiny 2)}}$ Necessary for the connection of the ISOMETER®s with an EDS44 \ldots -S

Insulation coordination according to IEC 60664-1		Measuring ranges
Rated voltage	1000 V	Measuring range f_n 0.1460 Hz
Overvoltage category	III	Tolerance measurement of $f_{\rm n}$ $\pm 1 \% \pm 0.1 {\rm Hz}$
Definitions:		Voltage range measurement of $f_{\rm D}$ AC 25690 V
Measuring circuit (IC1)	L1/+, L2, L3/-	Measuring range $U_{\rm D}$ AC 25690 V, DC 251000 V
Supply circuit (IC2)		
***	A1, A2	
Output circuit 1 (IC3)	11, 12, 14	Tolerance measurement of $U_{\rm n}$ $\pm 5 \% \pm 5 \text{ V}$
Output circuit 2 (IC4)	21, 22, 24	Measuring range C _e 01000 μF
Control circuit (IC5)	(E, KE), X1, ETH, X3, X4	Tolerance measurement of $C_{\rm e}$ $\pm 10 \% \pm 10 \mu F$
Rated impulse voltage:	(2) 112) 111 2111 112 111	Frequency range measurement of C _e DC, 30460 Hz
		_ , , , , ,
IC1/(IC2-5)	8 kV	Min. insulation resistance measurement of C_e typ. $> 10 \text{ k}\Omega$
IC2/(IC3-5)	4 kV	depending on the profile and coupling mode
IC3/(IC4-5)	4 kV	
IC4/IC5	4 kV	Display
	4 KV	Indication graphic display 127 x 127 pixels, 40 x 40 mm*
Rated insulation voltage:		
IC1/(IC2-5)	1000 V	Display range measured value $0.1 \mathrm{k}\Omega20 \mathrm{M}\Omega$
IC2/(IC3-5)	250 V	Operating uncertainty (acc. to IEC 61557-8) \pm 15 %, min. \pm 1 k Ω
IC3/(IC4-5)	250 V	* Indication is limited outside the temperature range -25+55 °C.
		materior is minical outside the temperature range 25 155 C.
IC4/IC5	250 V	LED.
Pollution degree outside ($U_{\rm n}$ < 690 V)	3	LEDs
Pollution degree outside ($U_n > 690 < 1000 \text{ V}$)	2	ON (operation LED) green
Protective separation (reinforced insulation) between:		PGH ON yellow
·		· · · · · · · · · · · · · · · · · · ·
IC1/(IC2-5)	Overvoltage category III, 1000 V	SERVICE yellow
IC2/(IC3-5)	Overvoltage category III, 300 V	ALARM 1 yellow
IC3/(IC4-5)	Overvoltage categorylll, 300 V	ALARM 2 yellow
IC4/IC5	Overvoltage category III, 300 V	•
Voltage test (routine test) according to IEC 61010-1:	270. Total ge tategory my 500 V	In-/Outputs (X1)
	463.519	Cable length X1 (unshielded cable) ≤ 10 m
IC2/(IC3-5)	AC 2.2 kV	•
IC3/(IC4-5)	AC 2.2 kV	Cable length X1 (shielded cable, shield connected to PE on one side) recommended:
IC4/IC5	AC 2.2 kV	J-Y(St)Y min. 2x0,8 \leq 100 m
		Max output current for supply via X1+/X1GND per output max. 1 A
Supply voltage		Max output current for supply via A1/A2 in total on X1 max. 200 mA
		Max output current for supply via A1/A2 in total on X1 between 16.8 V and 40 V
Supply via A1/+, A2/-:		
Supply voltage range U_S	AC/DC 24240 V	$I_{\text{LmaxX1}} = 10 \text{ mA} + 7 \text{ mA/V } U_{\text{S}} *$
Tolerance of $U_{\rm S}$	-30+15%	* $U_{\rm S}$ is the supply voltage of the ISOMETER®. Negative values for $I_{\rm LmaxX1}$ are not permissible.
Maximum permissible input current of U_S	650 mA	of is the supply rottage of the isometer in regulate raises for filliant are not permissione.
		Di-it-1 (t-/14 12 12)
Frequency range of U_s	DC, 50400 Hz*	Digital Inputs (11, 12, 13)
Tolerance of the frequency range of U_s	-5+15 %	Number 3
Power consumption, typically at DC	≤ 12 W	Operating mode, adjustable high-active, low-active
Power consumption, typically at 50/60 Hz	≤ 12 W/21 VA	Functions off, test, reset, deactivate device, start initial measurement
Power consumption, typically at 400 Hz	≤ 12 W/45 VA	Voltage Low DC -35 V, High DC 1132 V
 At frequencies > 200 Hz, the connection of X1 and re installed devices which at least have overvoltage ca 	. ,. ,	Tolerance Voltage ±10 % Digital Outputs (Q1, Q2)
Supply via X1:		Number 2
Supply voltage $U_{\rm S}$	DC 24 V	Operating mode, adjustable active, passive
Tolerance of $U_{\rm S}$	DC -20+25 %	Functions off, Ins. alarm 1, Ins. alarm 2, connection fault, DC- alarm*,
Tolerance of 03	DC 20123 /0	DC+ alarm*, symmetrical alarm, device fault, common alarm,
IT system being monitored		• • • • • • • • • • • • • • • • • • • •
· ·	160 600 V DC0 4000 V	measurement complete, device inactive, DC offset alarm
Nominal system voltage range $U_{\rm n}$	AC 0690 V, DC 01000 V	Voltage passive DC 032 V, active DC 0/19.232 V
for UL applications	AC/DC 0600 V	* Only for $U_0 \ge 50 \text{ V}$
Tolerance of U_n	AC/DC +15 %	uiiy iui u∏ ≥ Ju v
Frequency range of $U_{\rm D}$	DC, 0.1460 Hz	
. , ,		Analogue Output (M+)
Max. alternating voltage $U \sim (\text{for } f_{\text{n}} < 4 \text{ Hz})$	$U \sim \text{max} = 50 \text{ V x } (1 + f_n^2)$	Number 1
Response values		Operating mode linear, midscale point 28 k Ω /120 k Ω
<u> </u>		· •
Response value R _{an1} (ALARM 1)	1 kΩ10 MΩ	Functions insulation value, DC offset
Response value R _{an2} (ALARM 2)	1 kΩ10 MΩ	Current $020 \text{ mA} (< 600 \Omega), 420 \text{ mA} (< 600 \Omega), 0400 \mu A (< 4 k\Omega)$
Relative uncertainty (acc. to IEC 61557-8)	profile dependent, ± 15 %, at least ± 1 k Ω	Voltage $010 \text{ V} (> 1 \text{ k}\Omega), 210 \text{ V} (> 1 \text{ k}\Omega)$
	25% , at least 1 k Ω	Tolerance related to the current/voltage final value ±20 %
Hysteresis	25 %, dt ledst 1 KL2	
·	25 %, dt ledst 1 K12	Interfaces
Time response		
·	μF) acc. to IEC 61557-8	Field bus:
Time response		Field bus: Interface/protocol web server/Modbus TCP/BCOM
Time response Response time t_{an} at $R_F = 0.5 \times R_{an}$ (10 k Ω) and C_e (1	μF) acc. to IEC 61557-8 profile dependent, typ. 4 s	Field bus: Interface/protocol web server/Modbus TCP/BCOM
Time response Response time t_{an} at $R_F=0.5$ x R_{an} (10 k Ω) and C_e (1 Response time DC alarm at $C_e=1$ μF	μF) acc. to IEC 61557-8 profile dependent, typ. 4 s profile dependent, typ. 2 s	Field bus: Interface/protocol web server/Modbus TCP/BCOM Data rate 10/100 Mbit/s, autodetect
Time response Response time t_{an} at $R_F = 0.5 \times R_{an}$ (10 k Ω) and C_e (1	μF) acc. to IEC 61557-8 profile dependent, typ. 4 s	Field bus: Interface/protocol web server/Modbus TCP/BCOM Data rate 10/100 Mbit/s, autodetect Max. amount Modbus requests < 100/s
Time response Response time t_{an} at $R_F=0.5$ x R_{an} (10 kΩ) and C_e (1 Response time DC alarm at $C_e=1$ μF Start-up delay $T_{start-up}$	μF) acc. to IEC 61557-8 profile dependent, typ. 4 s profile dependent, typ. 2 s	Field bus: Interface/protocol web server/Modbus TCP/BCOM Data rate 10/100 Mbit/s, autodetect Max. amount Modbus requests < 100/s Cable min. CAT 6
Time response Response time t_{an} at $R_F=0.5$ x R_{an} (10 kΩ) and C_e (1 Response time DC alarm at $C_e=1$ μF Start-up delay $T_{start-up}$	μF) acc. to IEC 61557-8 profile dependent, typ. 4 s profile dependent, typ. 2 s 0 s 10 min	Field bus: Interface/protocol web server/Modbus TCP/BCOM Data rate 10/100 Mbit/s, autodetect Max. amount Modbus requests < 100/s Cable min. CAT 6 Cable length ≤ 100 m
Time response Response time t_{an} at $R_F=0.5$ x R_{an} (10 k Ω) and C_e (1 Response time DC alarm at $C_e=1$ μF Start-up delay $T_{start-up}$ Measuring circuit	μF) acc. to IEC 61557-8 profile dependent, typ. 4 s profile dependent, typ. 2 s	Field bus: Interface/protocol web server/Modbus TCP/BCOM Data rate 10/100 Mbit/s, autodetect Max. amount Modbus requests < 100/s Cable min. CAT 6 Cable length ≤ 100 m Connection RJ45
Time response Response time t_{an} at $R_F=0.5$ x R_{an} (10 kΩ) and C_e (1 Response time DC alarm at $C_e=1$ μF Start-up delay $T_{start-up}$	μF) acc. to IEC 61557-8 profile dependent, typ. 4 s profile dependent, typ. 2 s 0 s 10 min	Field bus: Interface/protocol web server/Modbus TCP/BCOM Data rate 10/100 Mbit/s, autodetect Max. amount Modbus requests < 100/s Cable min. CAT 6 Cable length ≤ 100 m Connection RJ45
Time response Response time $t_{\rm an}$ at $R_{\rm F}=0.5$ x $R_{\rm an}$ (10 kΩ) and $C_{\rm e}$ (1 Response time DC alarm at $C_{\rm e}=1$ μF Start-up delay $T_{\rm start-up}$ Measuring circuit Measuring voltage $U_{\rm m}$ profile dependent, ± 1 Measuring current $I_{\rm m}$	μF) acc. to IEC 61557-8 profile dependent, typ. 4 s profile dependent, typ. 2 s 0 s10 min 0 V, ±50 V (see profile overview in the manual) ≤ 403 μA	Field bus: Interface/protocol web server/Modbus TCP/BCOM Data rate 10/100 Mbit/s, autodetect Max. amount Modbus requests < 100/s Cable min. CAT € Cable length ≤ 100 m Connection RJ45 IP address DHCP/manual 192.168.0.5
Time response Response time t_{an} at $R_F = 0.5$ x R_{an} (10 kΩ) and C_e (1 Response time DC alarm at $C_e = 1$ μF Start-up delay $T_{start-up}$ Measuring circuit Measuring voltage U_m profile dependent, ± 1 Measuring current I_m Internal resistance R_i , Z_i	μ F) acc. to IEC 61557-8 profile dependent, typ. 4 s profile dependent, typ. 2 s 0 s10 min 0 V, \pm 50 V (see profile overview in the manual) \leq 403 μ A \geq 124 k Ω	Field bus: Interface/protocol web server/Modbus TCP/BCOM Data rate 10/100 Mbit/s, autodetect Max. amount Modbus requests < 100/s Cable min. CAT € Cable length ≤ 100 m Connection RJ45 IP address DHCP/manual 192.168.0.5 Network mask 255.255.255.0
Time response Response time t_{an} at $R_F = 0.5$ x R_{an} (10 kΩ) and C_e (1 Response time DC alarm at $C_e = 1$ μF Start-up delay $T_{start-up}$ Measuring circuit Measuring voltage U_m profile dependent, ± 1 : Measuring current I_m Internal resistance R_i , Z_i Permissible extraneous DC voltage U_{fg}	μ F) acc. to IEC 61557-8 profile dependent, typ. 4 s profile dependent, typ. 2 s 0 s10 min 0 V, \pm 50 V (see profile overview in the manual) \leq 403 μ A \geq 124 kΩ \leq 1200 V	Field bus: Interface/protocol web server/Modbus TCP/BCOM Data rate 10/100 Mbit/s, autodetect Max. amount Modbus requests < 100/s Cable min. CAT € Cable length ≤ 100 m Connection RJ45 IP address DHCP/manual 192.168.0.5 Network mask 255.255.255.0 BCOM address system-1-0
Time response Response time t_{an} at $R_F = 0.5$ x R_{an} (10 kΩ) and C_e (1 Response time DC alarm at $C_e = 1$ μF Start-up delay $T_{start-up}$ Measuring circuit Measuring voltage U_m profile dependent, ± 1 Measuring current I_m Internal resistance R_i , Z_i	μ F) acc. to IEC 61557-8 profile dependent, typ. 4 s profile dependent, typ. 2 s 0 s10 min 0 V, \pm 50 V (see profile overview in the manual) \leq 403 μ A \geq 124 k Ω	Field bus: Interface/protocol web server/Modbus TCP/BCOM Data rate 10/100 Mbit/s, autodetect Max. amount Modbus requests < 100/s Cable min. CAT 6 Cable length ≤ 100 m Connection RJ45 IP address DHCP/manual 192.168.0.5 Network mask 255.255.255.0 BCOM address system-1-0
Time response Response time t_{an} at $R_F = 0.5$ x R_{an} (10 kΩ) and C_e (1 Response time DC alarm at $C_e = 1$ μF Start-up delay $T_{start-up}$ Measuring circuit Measuring voltage U_m profile dependent, ± 1 : Measuring current I_m Internal resistance R_i , Z_i Permissible extraneous DC voltage U_{fg}	μ F) acc. to IEC 61557-8 profile dependent, typ. 4 s profile dependent, typ. 2 s 0 s10 min 0 V, \pm 50 V (see profile overview in the manual) \leq 403 μ A \geq 124 kΩ \leq 1200 V	Field bus: Interface/protocol web server/Modbus TCP/BCOM Data rate 10/100 Mbit/s, autodetect Max. amount Modbus requests < 100/s
Time response Response time t_{an} at $R_F = 0.5$ x R_{an} (10 kΩ) and C_e (1 Response time DC alarm at $C_e = 1$ μF Start-up delay $T_{start-up}$ Measuring circuit Measuring voltage U_m profile dependent, ± 1 Measuring current I_m Internal resistance R_i , Z_i Permissible extraneous DC voltage U_{fg} Permissible system leakage capacitance C_e	μ F) acc. to IEC 61557-8 profile dependent, typ. 4 s profile dependent, typ. 2 s 0 s10 min 0 V, \pm 50 V (see profile overview in the manual) \leq 403 μ A \geq 124 kΩ \leq 1200 V profile dependent, 01000 μ F	Field bus: Interface/protocol web server/Modbus TCP/BCOM Data rate 10/100 Mbit/s, autodetect Max. amount Modbus requests < 100/s
Time response Response time t_{an} at $R_F = 0.5$ x R_{an} (10 kΩ) and C_e (1 Response time DC alarm at $C_e = 1$ μF Start-up delay $T_{start-up}$ Measuring circuit Measuring voltage U_m profile dependent, ± 1 Measuring current I_m Internal resistance R_i , Z_i Permissible extraneous DC voltage U_{fg} Permissible system leakage capacitance C_e	μ F) acc. to IEC 61557-8 profile dependent, typ. 4 s profile dependent, typ. 2 s 0 s10 min 0 V, \pm 50 V (see profile overview in the manual) \leq 403 μ A \geq 124 kΩ \leq 1200 V profile dependent, 01000 μ F	Field bus: Interface/protocol web server/Modbus TCP/BCOM Data rate 10/100 Mbit/s, autodetect Max. amount Modbus requests < 100/s Cable min. CAT 6 Cable length ≤ 100 m Connection RJ45 IP address DHCP/manual 192.168.0.5 Network mask 255.255.255.0 BCOM address system-1-0 Function communication interface ISOnet
Time response Response time t_{an} at $R_F = 0.5$ x R_{an} (10 kΩ) and C_e (1 Response time DC alarm at $C_e = 1$ μF Start-up delay $T_{start-up}$ Measuring circuit Measuring voltage U_m profile dependent, ± 1 Measuring current I_m Internal resistance R_i , Z_i Permissible extraneous DC voltage U_{fg} Permissible system leakage capacitance C_e	μ F) acc. to IEC 61557-8 profile dependent, typ. 4 s profile dependent, typ. 2 s 0 s10 min 0 V, \pm 50 V (see profile overview in the manual) \leq 403 μ A \geq 124 kΩ \leq 1200 V profile dependent, 01000 μ F	Field bus: Interface/protocol Data rate Max. amount Modbus requests Cable Cable length Connection Paddress Network mask Performance BCOM address BCOM address Field bus: Interface/protocol Web server/Modbus TCP/BCOM 10/100 Mbit/s, autodetect 10/100 Mbi
Time response Response time t_{an} at $R_F = 0.5$ x R_{an} (10 kΩ) and C_e (1 Response time DC alarm at $C_e = 1$ μF Start-up delay $T_{start-up}$ Measuring circuit Measuring voltage U_m profile dependent, ± 1 Measuring current I_m Internal resistance R_i , Z_i Permissible extraneous DC voltage U_{fg} Permissible system leakage capacitance C_e	μ F) acc. to IEC 61557-8 profile dependent, typ. 4 s profile dependent, typ. 2 s 0 s10 min 0 V, \pm 50 V (see profile overview in the manual) \leq 403 μ A \geq 124 kΩ \leq 1200 V profile dependent, 01000 μ F	Field bus: Interface/protocol web server/Modbus TCP/BCOM Data rate 10/100 Mbit/s, autodetect Max. amount Modbus requests < 100/s Cable min. CAT 6 Cable length ≤ 100 m Connection RJ45 IP address DHCP/manual 192.168.0.5 Network mask 255.255.255.0 BCOM address system-1-0 Function communication interface ISOnet ISOnet number of devices 220 Maximum nominal system voltage ISOnet 4.00 meb server/Modbus TCP/BCOM
Time response Response time t_{an} at $R_F = 0.5$ x R_{an} (10 kΩ) and C_e (1 Response time DC alarm at $C_e = 1$ μF Start-up delay $T_{start-up}$ Measuring circuit Measuring voltage U_m profile dependent, ± 1 Measuring current I_m Internal resistance R_i , Z_i Permissible extraneous DC voltage U_{fg} Permissible system leakage capacitance C_e	μ F) acc. to IEC 61557-8 profile dependent, typ. 4 s profile dependent, typ. 2 s 0 s10 min 0 V, \pm 50 V (see profile overview in the manual) \leq 403 μ A \geq 124 kΩ \leq 1200 V profile dependent, 01000 μ F	Field bus: Interface/protocol web server/Modbus TCP/BCOM Data rate 10/100 Mbit/s, autodetect Max. amount Modbus requests < 100/s Cable min. CAT 6 Cable length ≤ 100 m Connection RJ45 IP address DHCP/manual 192.168.0.5 Network mask 255.255.255.0 BCOM address system-1-0 Function communication interface ISOnet

ISOloop	
ISOloop number of devices	210
Sensor bus:	
Interface/protocol	RS-485 / isoData, BS bus, Modbus RTU
Data rate	9.6 kBaud/s
Cable: twisted pair, one end of shield co	onnected to PE recommended: J-Y(St)Y min. 2x0.8
Cable length (depending on the baud r	ate) ≤ 1200 m
Connection	terminals X1A, X1B
Terminating resistor	120 Ω , can be connected internally
Device address, BS bus	190
Switching elements	
Number of switching elements	2 changeover contacts
Operating mode	N/C operation/N/O operation
Contact 11-12-14/21-22-24	off, Ins. alarm 1, Ins. alarm 2, connection fault, DC- alarm*,
	DC+ alarm*, symmetrical alarm, device fault, common alarm,
	measurement complete, device inactive, DC offset alarm
Electrical endurance at rated operating	conditions 10.000 operating cycles
* Only for $U_n \ge 50 \text{ V}$	
Contact data acc. to IEC 60947-5-1:	
Utilisation category	AC-13 / AC-14 / DC-12 / DC-12 / DC-12 / DC-12
Rated operational voltage	230 V / 230 V / 24 V / 48 V / 110 V / 220 V
Rated operational current	5 A / 3 A / 1 A / 1 A / 0.2 A / 0.1 A
Rated insulation voltage ≤ 2000 m NN	250 V
Rated insulation voltage ≤ 3000 m NN	160 V
Minimum contact rating	1 mA at AC/DC ≥ 10 V
Environment & EMC	
EMC	IEC 61326-2-4
Ambient temperatures:	
Operating temperature	-25+55 °C
Transport	-40+85 °C
Long-term storage	-40+70 °C
	c. to IEC 60721 (related to temperature and relative humidity)
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11
(IEC 60721 3 2)	4//22

Cable: twisted pair, one end of shield conr	nected to PE recommended: J-Y(St)Y min. 2x0.8
Cable length (depending on the baud rate	e) ≤ 1200 m
Connection	terminals X1A, X1B
Terminating resistor	120 Ω , can be connected internally
Device address, BS bus	190
Switching elements	
Number of switching elements	2 changeover contacts
Operating mode	N/C operation/N/O operation
Contact 11-12-14/21-22-24	off, Ins. alarm 1, Ins. alarm 2, connection fault, DC- alarm*,
DC	alarm*, symmetrical alarm, device fault, common alarm,
	measurement complete, device inactive, DC offset alarm
Electrical endurance at rated operating co	nditions 10.000 operating cycles
* Only for $U_n \ge 50 \text{ V}$	
Contact data acc. to IEC 60947-5-1:	
Utilisation category	AC-13 / AC-14 / DC-12 / DC-12 / DC-12 / DC-12
Rated operational voltage	230 V / 230 V / 24 V / 48 V / 110 V / 220 V
Rated operational current	5 A / 3 A / 1 A / 1 A / 0.2 A / 0.1 A
Rated insulation voltage \leq 2000 m NN	250 V
Rated insulation voltage \leq 3000 m NN	160 V
Minimum contact rating	1 mA at AC/DC ≥ 10 V
Environment & EMC	
EMC	IEC 61326-2-4
Ambient temperatures:	
Operating temperature	-25+55 ℃
Transport	-40+85 °C
Long-term storage	-40+70 ℃
Classification of climatic conditions acc. t	o IEC 60721 (related to temperature and relative humidity)
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22
Classification of mechanical condition	is 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
Area of application	≤ 3000 m NN
Connection	
Connection type	screw-type terminal or push-wire terminal, pluggable
Screw-type terminals:	
Nominal current	≤ 10 Å

Push-wire terminals:	
Nominal current	≤ 10 A
Conductor sizes	AWG 24-12
Stripping length	10 mm
rigid/flexible	0.22.5 mm ²
flexible with ferrules, with/without plastic sleeve	0.252.5 mm ²
Multiple conductor, flexible with TWIN ferrule with plastic sleeve	0.51.5 mm ²
Push-wire terminals X1:	
Nominal current	≤ 8 A
Conductor sizes	AWG 24-16

Nominal current	≤ 8 A
Conductor sizes	AWG 24-16
Stripping length	10 mm
riqid/flexible	0.21.5 mm ²
flexible with ferrule without plastic sleeve	0.251.5 mm ²
flexible with TWIN ferrule with plastic sleeve	0.250.75 mm ²

Operating mode	continuous operation
Mounting (0°)	display oriented*
Degree of protection internal components	IP40
Degree of protection terminals	IP20
DIN rail mounting acc. to	IEC 60715
Screw fixing	3 x M4 with mounting clip
Enclosure material	polycarbonate
Flammability class	V-0
ANSI code	64
Dimensions (W x H x D)	108 x 93 x 110 mm
Documentation number	D00170
Weight	< 390 g

r best ventilation, align cooling slots vertically (0°). an alignment of 45° the max. operating temperature is reduced by 10 °C. an alignment fo 90° the max. operating temperature is reduced by 20 °C.

on "W" data different from the standard version

es with the suffix \mathbf{W} feature increased shock and vibration resistance. The electronics is covered a special varnish to provide increased protection against mechanical stress and moisture.

Rated operational current of switching elements	max. 3 A (for UL applications)
Ambient temperatures:	
Operating temperature	-40+70°C
Operating temperature for UL applications	-40+65 °C
Transport	-40+85°C
Long-term storage	-40+70 °C
Classification of climatic conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3K23
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3M12

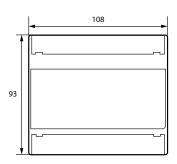
Combination of ISOMETER® sensor variant with an FP200W: The requirements of option **W** will only be fulfilled when the ISOMETER® sensor variant is mounted on a DIN rail and connected to the FP200W via the patch cable.

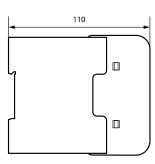
Dimension diagram (dimensions in mm)

flexible with ferrule without plastic sleeve

flexible with TWIN ferrule with plastic sleeve

flexible with ferrules, with/without plastic sleeve





0.5...0.6 Nm (5...7 lb-in)

AWG 24-12

0.2...2.5 mm²

 $0.25\dots 2.5~\text{mm}^2$

 $0.2...1 \, mm^2$

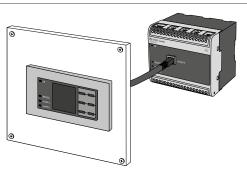
0.2...1.5 mm²

 $0.25...1 \, mm^2$

 $0.5\dots 1.5\ mm^2$

7 mm

Connection to FP200



Tightening torque

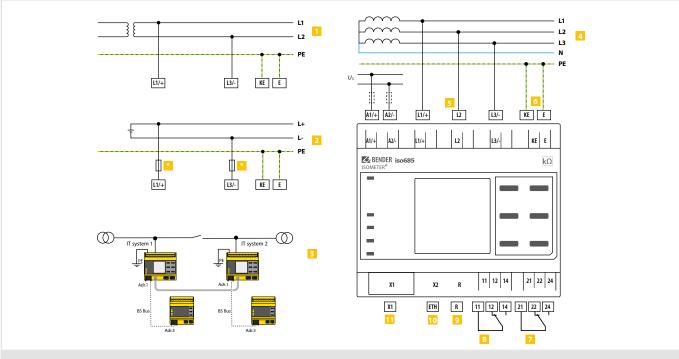
Conductor sizes

Stripping length

Multiple conductor

rigid flexible

rigid/flexible



- 1 Connection to an AC system U_n
- 2 Connection to a DC system U_n
- Inked with two IT systems which can be interconnected via a coupling switch. Information regarding the state of the coupling switch is not necessary.
- Connection to a 3(N)AC system
- Connection to the IT system to be monitored (L1/+, L2, L3/-)
- 6 Separate connection of KE, E to PE

- (K1) Alarm relay 1, available changeover contacts
- (K2) Alarm relay 2, available changeover contacts
- Switchable resistor R for RS-485 bus termination
- Ethernet interface
- Digital interface
- For systems > 690 V and with overvoltage category III a fuse for the connection to the system to be monitored must be provided. Recommendation: 2A screw-in fuses.

Provide line protection!

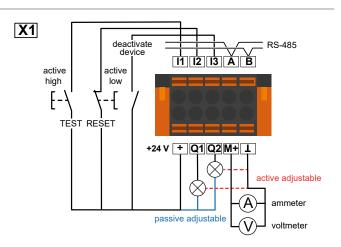
According to DIN VDE 0100-430, a line protection shall be provided for the supply voltage.

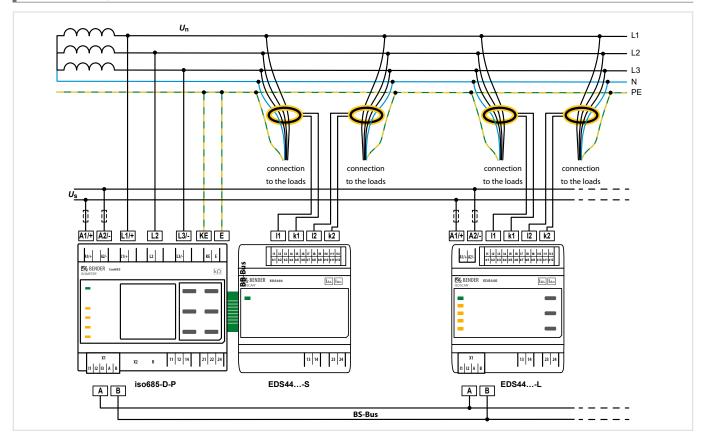
According to DIN VDE 0100-430, devices for protection against a short circuit can be omitted for the coupling of terminals L1/+ and L3/- to the IT system ≤ 690 V to be monitored if the wiring is carried out in such a manner as to reduce the risk of a short circuit to a minimum. (A short-circuit-proof and earth-fault-proof wiring is recommended).

The connecting lines L1/+, L2, L3/- to the system to be monitored must be carried out as spur lines. No load current may be conducted through the terminals.

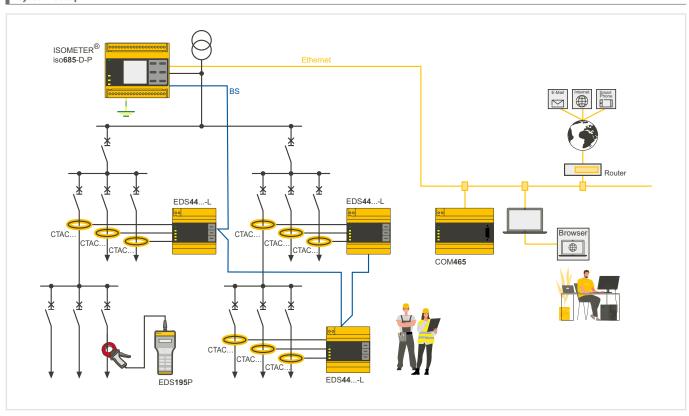
Digital interface X1

Digital interface	Terminal	Colour
	l1	Input 1
	I2	Input 2
	13	Input 3
11 12 13 A B + Q1 Q2 M+ L	А	RS-485 A
	В	RS-485 B
	+	+24 V
	Q1	Output 1
	Q2	Output 2
	M+	Analogue output
	工	Ground





System setup



ISOMETER® isoNAV685-D

Insulation monitoring device for IT AC systems with galvanically connected rectifiers and converters





Typical applications

- AC/DC main circuits with directly connected DC components, such as rectifiers, converters, variable-speed drives
- Systems including switch mode power supplies
- · Systems including frequency inverters

Approvals







Device features

- · ISOMETER® for IT AC systems with galvanically connected rectifiers or inverters and for IT DC systems (IT = unearthed systems)
- Automatic adaptation to the existing system leakage capacitance
- Combination of AMP^{Plus} and other profile-dependent measurement methods
- An adjustable response value for insulation monitoring in the range of 1 k Ω ...10 M Ω (factory setting = 5 k Ω) and a response value of 150 V for the DC offset voltage
- · High-resolution graphic LC display for excellent readability and recording of the device status
- · Connection monitoring (monitoring of the measuring lines)
- · Automatic device self test
- Graphical representation of the insulation resistance over time (isoGraph)
- · History memory with real-time clock (buffer for three days) for storing 1023 alarm messages with date and time
- Current or voltage output 0(4)...20 mA, 0...400 μA, 0...10 V, 2...10 V (galvanically separated) which is analogous to the measured insulation value of the system
- Freely programmable digital inputs and outputs
- Remote setting via the Internet or Intranet (Webserver/Option: COMTRAXX® gateway)
- Worldwide remote diagnosis via the Internet (made available by Bender Service only)
- BCOM, Modbus TCP and web server.

Standards

The ISOMETER® has been developed in compliance with the following standards:

- DIN EN 61557-8 (VDE 0413-8)
- IEC 61557-8

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Ту	Type Nominal system voltage range <i>U</i> n		Supply voltage <i>U</i> ₅	Art. No.
isoNAV685-D		AC 0690 V; 1460 Hz DC 01000 V	AC 24240 V; 50400 Hz DC 24240 V	B91067014

Accessories

Description	Art. No.
A set of screw-type terminals ¹⁾	B91067901
A set of push-wire terminals	B91067902
Enclosure accessories (terminal cover, 2 mounting clips) 1)	B91067903

¹⁾ included in the scope of delivery

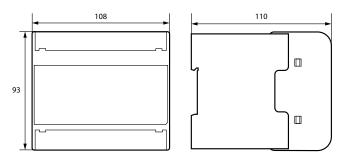
Suitable measuring instruments on request!

Insulation coordination according to IEC 60664-1/IEC 6066	64-3	Measuring ranges	
Rated voltage	1000 V	Measuring range f_n	10460 Hz
Overvoltage category	III	Tolerance measurement of f_n	±1 % ±0.1 Hz
Definitions:		Voltage range measurement of	
Measuring circuit (IC1)	L1/+, L2, L3/-	Measuring range U_n	AC 25690 \
Supply circuit (IC2)	A1, A2	Voltage range measurement of	
Output circuit 1 (IC3)	11, 12, 14	Tolerance measurement of U_n	±5 % ±5 \
Output circuit 2 (IC4)	21, 22, 24	Measuring range C_e	01000 μ
Control circuit (IC5)	(E, KE), (X1, ETH, X3, X4)	Tolerance measurement of Ce	±10 % ±10 μl
Rated impulse voltage:		Min. insulation resistance meas	
IC1/(IC2-5)	8 kV	depending on the profile and co	
		depending on the profile and to	oupling mode
IC2/(IC3-5)	4 kV	Display	
IC3/(IC4-5)	4 kV	,	
IC4/IC5	4 kV	Indication	graphic display 127 x 127 pixels, 40 x 40 mm ³
Rated insulation voltage:		Display range measured value	0.1 kΩ20 MΩ
IC1/(IC2-5)	1000 V	Operating uncertainty (acc. to I	$(EC 61557-8)$ $\pm 15 \%$, min. $\pm 1 \text{ k}\Omega$
IC2/(IC3-5)	250 V	* Indication is limited outside	the temperature range -25+55 °C.
	250 V 250 V	iliaication is illilited outside	the temperature range 25 135 C.
IC3/(IC4-5)		LED.	
IC4/IC5	250 V	LEDs	
Pollution degree outside ($U_{\rm n}$ < 690 V)	3	ON (operation LED)	greer
Pollution degree outside ($U_{\rm D} > 690 < 1000 \text{ V}$)	2	SERVICE	yellow
Protective separation (reinforced insulation) between:		ALARM 1	yellow
IC1/(IC2-5)	Overvoltage category III, 1000 V	ALARM 2	yellow
	3 3 , ,	ALAINIVI 4	yellow
IC2/(IC3-5)	Overvoltage category III, 300 V	In-/Outputs (X1)	
IC3/(IC4-5)	Overvoltage categoryIII, 300 V		hla)
IC4/IC5	Overvoltage category III, 300 V	Cable length X1 (unshielded ca	
Voltage test (routine test) according to IEC 61010-1:		3	e, shield connected to PE on one side) recommended:
IC2/(IC3-5)	AC 2,2 kV	J-Y(St)Y min. 2x0,8	≤ 100 m
IC3/(IC4-5)	AC 2,2 kV	Max output current for supply v	via X1+/X1GND per output max. 1 A
IC4/IC5	AC 2,2 kV	Max output current for supply v	via A1/A2 in total on X1 max. 200 mA
104/103	AC Z,Z KV		via A1/A2 in total on X1 between 16.8 V and 40 V
Supply voltage		max output current for suppry t	
			$I_{\text{LmaxX1}} = 10 \text{ mA} + 7 \text{ mA/V } U_{\text{S}}^*$
Supply via A1/+, A2/-:		* $U_{\rm S}$ is the supply voltage of th	ne ISOMETER®. Negative values for I _{LmaxX1} are not permissible.
Supply voltage range $U_{\rm S}$	AC/DC 24240 V		
Tolerance of U _S	-30+15%	Digital Inputs (I1, I2, I3)	
Maximum permissible input current of U_s	650 mA	Number	3
			-
Frequency range of U _s	DC, 50400 Hz*	Operating mode, adjustable	high-active, low-active
Tolerance of the frequency range of $U_{\rm S}$	-5+15 %	Functions	none, test, reset, device deactivated, initial measurement
Power consumption, typically at 50/60 Hz	≤ 12 W/21 VA	Voltage	Low DC -35 V, High DC 1132 V
Power consumption, typically at 400 Hz	≤ 12 W/45 VA	Tolerance Voltage	±10 %
* At frequencies > 200 Hz, the connection of X1 and remote must	t he shockproof. Only permanently		
installed devices which at least have overvoltage category II (' '' '	Digital Outputs (Q1, Q2)	
installed devices which at least have overvoltage category if (300 V) may be connected.	Number	
Supply via X1:		Operating mode, adjustable	active, passive
	DC 24 V	Functions	none, insulation Alarm 1, insulation fault + DC residual voltage
Supply voltage $U_{\rm S}$	DC 24 V		
Tolerance of U_{s}	DC -20+25 %		ult, device fault, collective alarm, measurement ended, device inactive
IT austam hainn manitanad		Voltage	passive DC 032 V, active DC 0/19.232 V
IT system being monitored			
Nominal system voltage range U_{n}	AC 0690 V, DC 01000 V	Analogue Output (M+)	
for UL applications	AC/DC 0600 V	Number	1
Tolerance of Un	AC/DC +15 %	Operating mode	linear, midscale point 28 kΩ/120 kΩ
Frequency range of $U_{\rm D}$	60 Hz	Functions	insulation value, DC offset
Trequency range of on	00 HZ		
Response values		Current	020 mA (< 600 Ω), 420 mA (< 600 Ω), 0400 μ A (< 4 kΩ
•	410 40.10	Voltage	$010 \text{ V} (> 1 \text{ k}\Omega), 210 \text{ V} (> 1 \text{ k}\Omega)$
Response value R _{an1} (ALARM 1)	1 kΩ10 MΩ	Tolerance related to the current	t/voltage final value ± 20 %
Response value R _{an2} (ALARM 2)	1 kΩ10 MΩ		
Relative uncertainty (acc. to IEC 61557-8) profil	e dependent, ± 15 %, at least ± 1 k Ω	Interfaces	
Hysteresis	25 %, at least 1 kΩ	Field bus:	
,	,	Interface/protocol	web server/Modbus TCP/BCOM
Time response		Data rate	10/100 Mbit/s, autodetect
Response time t_{an} for DC residual voltage $> 1.1 \times U_{DC}$ and Alarm 1	max. 150 s*	Max. amount Modbus requests	
Response time t_{an} at $R_F = 0.5 \times R_{an}$ (10 k Ω) and C_e (1 μ F) acc. to		•	
nesponse time tan at nt — σ.5 x nan (10 κz z) and ce (1 μr) dec. to		Cable	min. CAT 6
C	profile dependent, typ. 4 s	Cable length	≤ 100 m
Start-up delay T _{start-up}	0120 s	Connection	RJ45
* Fast tripping only works in IT networks with a mains frequence	cv of 60 Hz.	IP address	DHCP/manual 192.168.0.5
	-,	Network mask	255.255.255.05
Maacuring circuit			
Measuring circuit		BCOM address	system-1-(
Measuring voltage U _m	±50 V	Function	communication interface
Measuring current I _m	≤ 403 µA		
•	≥ 124 kΩ		
Internal resistance R_i , Z_i			
•	\geq 124 kΩ ≤ 1200 V profile dependent, 0150 μF		

Technical data (continued)

, ,	
Switching elements	
Number of switching elements	2 changeover contacts
Operating mode	N/C operation/N/O operation
Contact 11-12-14/21-22-24 none, ii	$\frac{1}{2}$ nsulation Alarm 1, insulation fault + DC residual voltage,
connection fault, device fau	lt, collective alarm, measurement ended, device inactive
Electrical endurance at rated operating condi	tions 10.000 operating cycles
Contact data acc. to IEC 60947-5-1:	
Utilisation category	AC-13 / AC-14 / DC-12 / DC-12 / DC-12 / DC-12
Rated operational voltage	230 V / 230 V / 24 V / 48 V / 110 V / 220 V
Rated operational current	5 A / 3 A / 1 A / 1 A / 0.2 A / 0.1 A
Rated insulation voltage ≤ 2000 m NN	250 V
Rated insulation voltage ≤ 3000 m NN	160 V
Minimum contact rating	1 mA at AC/DC \geq 10 V
Environment & EMC	
EMC	IEC 61326-2-4
Ambient temperatures:	
Operating temperature	-25…+55℃
Transport	-40+85 ℃
Long-term storage	-40+70 °C
	EC 60721 (related to temperature and relative humidity)
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 a	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
Area of application	≤ 3000 m NN
	_ 5000
Connection Connection type	screw-type terminal or push-wire terminal, pluggable
··	screw-type terminal or push-wife terminal, pluggable
Screw-type terminals:	- 10.4
Nominal current	≤ 10 A 0.50.6 Nm (57 lb-in)
Tightening torque	
Conductor sizes	AWG 24-12
Stripping length	7 mm
rigid/flexible	0.22.5 mm ²
flexible with ferrules, with/without plastic sle	eeve 0.252.5 mm ²
Multiple conductor	
rigid	0.21 mm ²
flexible	0.21.5 mm ²
flexible with ferrule without plastic slee	
flexible with TWIN ferrule with plastic s	leeve 0.51.5 mm ²

Dimension diagram (dimensions in mm)



Push-wire terminals:	
Nominal current	≤ 10 A
Conductor sizes	AWG 24-12
Stripping length	10 mm
rigid/flexible	0.22.5 mm ²
flexible with ferrules, with/without plastic sleeve	0.252.5 mm ²
Multiple conductor, flexible with TWIN ferrule with plastic sleeve	0.51.5 mm ²
Push-wire terminals X1:	
Nominal current	≤ 8 A
Conductor sizes	AWG 24-16
Stripping length	10 mm
rigid/flexible	0.21.5 mm ²
flexible with ferrule without plastic sleeve	0.251.5 mm ²
flexible with TWIN ferrule with plastic sleeve	0.250.75 mm ²
Other	
Operating mode	continuous operation
Mounting (0°)	display oriented*
Degree of protection internal components	IP40
Degree of protection terminals	IP20
DIN rail mounting acc. to	IEC 60715
Screw fixing	3 x M4 with mounting clip
Enclosure material	polycarbonate

* For best ventilation, align cooling slots vertically (0°). At an alignment of 45° the max. operating temperature is reduced by 10 °C. At an alignment fo 90° the max. operating temperature is reduced by 20 °C.

Flammability class

Dimensions (W x H x D)

Documentation number

ANSI code

Weight

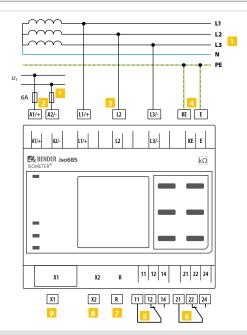
V-0

64

D00215

< 390 g

108 x 93 x 110 mm



- Connection to a 3(N)AC system
- Supply voltage U_s (see nameplate) via 6 A fuse
- Connection to the IT system to be monitored (L1/+, L2, L3/-)
- Separate connection of KE, E to PE
- 5 (K1) Alarm relay 1, available changeover contacts

- (K2) Alarm relay 2, available changeover contacts
- Switchable resistor R for RS-485 bus termination
- 8 Ethernet interface
- Oigital interface
- 6 A fuse for systems > 690 V

NOTE:

According to DIN VDE 0100-430, devices for protection against a short circuit can be omitted for the coupling of terminals L1/+ and L3/- to the IT system \leq 690 V to be monitored if the wiring is carried out in such a manner as to reduce the risk of a short circuit to a minimum. (Recommendation: Ensure short-circuit-proof and earth-fault-proof wiring).

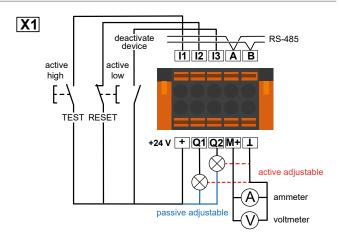
 $The connecting \ lines \ L1/+, L2, L3/- \ to \ the system \ to \ be \ monitored \ must \ be \ carried \ out \ as \ spur \ lines. \ No \ load \ current \ may \ be \ conducted \ through \ the \ terminals.$

For UL applications:

Use 60/70 °C copper lines only!

UL and CSA application require the supply voltage to be protected via 5 A fuses.

Digital interface	Terminal	Colour
	I1	Input 1
	12	Input 2
11 12 13 A B + Q1 Q2 M+ L	13	Input 3
	A	RS-485 A
	В	RS-485 B
	+	+24 V
	Q1	Output 1
	Q2	Output 2
	M+	Analogue output
	Т	Ground



Connection to X1



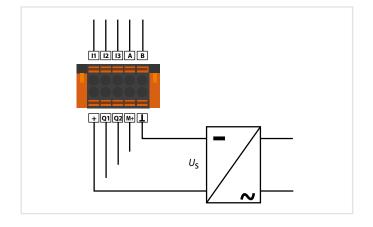
Danger of damage to property due to faulty connections!

The device can be damaged if the unit is simultaneously connected to the supply voltage via the X1 interface, and A1/+ and A2/- terminals. Do not connect the device simultaneously via X1, and A1/+ and A2/- to different supply voltages.



Danger of damage to property due to incorrect nominal voltage!

When the device is powered via the X1 interface, the nominal voltage must be 24 V otherwise the unit may be damaged. Only connect a nominal voltage of 24 V to the X1 interface.



ISOMETER® isoNAV685-D-B

Insulation monitoring device for offline monitoring of de-energised loads





Typical applications

 Monitoring of de-energised loads and systems

Approvals





Device features

- ISOMETER® to monitor the insulation resistance in de-energised systems
- Automatic adaptation to the existing system leakage capacitance
- AMP^{Plus} measurement method
- An adjustable response value in the range 10 k Ω ...1 M Ω (factory setting = 50 k Ω)
- High-resolution graphic LC display for excellent readability and recording of the device status
- · Earth connection monitoring
- · Automatic device self test
- Graphical representation of the insulation resistance over time (isoGraph)
- History memory with real-time clock (buffer for three days) for storing 1023 alarm messages with date and time
- · Freely programmable digital inputs and outputs.
- Remote setting via the Internet or Intranet (Webserver/Option: COMTRAXX® Gateway).
- Worldwide remote diagnosis via the Internet.
- BCOM, Modbus TCP and web server.

Standards

The ISOMETER® has been developed in compliance with the following standards:

- DIN EN 61557-8 (VDE 0413-8)
- IEC 61557-8

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Type Nominal system voltage range <i>U</i> n		Supply voltage <i>U</i> ₅	Art. No.	
isoNAV685-D-B	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	offline	AC 24240 V; 50400 Hz DC 24240 V	B91067024

Accessories

Description	Art. No.
A set of screw-type terminals ¹⁾	B91067901
A set of push-wire terminals	B91067902
Enclosure accessories (terminal cover, 2 mounting clips) 1)	B91067903

¹⁾ included in the scope of delivery

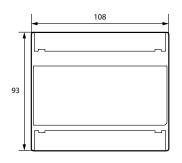
Suitable measuring instruments on request!

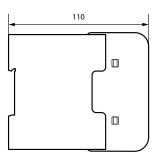
Insulation coordination according to IEC 60664-1/IEC 60664-3	In-/Outputs (X1)
Rated voltage 1000 V	Cable length X1 (unshielded cable) ≤ 10 n
Overvoltage category III	Cable length X1 (shielded cable, shield connected to PE on one side) recommended:
Definitions:	$J-Y(St)Y min. 2x0,8 \leq 100 r$
Measuring circuit (IC1) (L1/+, L2, L3/-)	Max output current for supply via X1+/X1GND per output max. 1.
Supply circuit (IC2) A1, A2	Max output current for supply via A1/A2 in total on X1 max. 200 m.
Output circuit 1 (IC3) 11, 12, 14	Max output current for supply via A1/A2 in total on X1 between 16.8 V and 40 V
Output circuit 2 (IC4) 21, 22, 24	$I_{\text{LmaxX1}} = 10 \text{ mA} + 7 \text{ mA/V } U_{\text{S}}$
Control circuit (ICS) (E, KE), (X1, ETH, X3, X4)	
Rated impulse voltage:	* $U_{\rm S}$ is the supply voltage of the ISOMETER*. Negative values for $I_{\rm LmaxX1}$ are not permissible.
IC1/(IC2-5) 8 kV	Di-la-Li
IC2/(IC3-5) 4 kV	Digital Inputs (I1, I2, I3)
IC3/(IC4-5) 4 kV	Number
1C4/IC5 4 kV	Operating mode, adjustable high-active, low-active
Rated insulation voltage:	Functions none, test, reset, device deactivated
	Voltage Low DC -35 V, High DC 1132 V
•	Tolerance Voltage ±10 9
IC2/(IC3-5) 250 V	Di-it-1 (0.4
IC3/(IC4-5) 250 V	Digital Outputs (Q1, Q2)
IC4/IC5 250 V	Number 2
Pollution degree outside ($U_{\rm n}$ < 690 V) 3	Operating mode, adjustable active, passive
Pollution degree outside ($U_{\rm n} > 690 < 1000 \text{ V}$)	Functions off, connection fault, Alarm L1, Alarm L2, Alarm L3, device fault, common alarn
Protective separation (reinforced insulation) between:	Voltage passive DC 032 V, active DC 0/19.232 V
IC1/(IC2-5) Overvoltage category III, 1000 V	* Only for Un ≥ 50 V
IC2/(IC3-5) Overvoltage category III, 300 V	Viii) 101 011 € 30 1
IC3/(IC4-5) Overvoltage categoryIII, 300 V	Interfaces
IC4/IC5 Overvoltage category III, 300 V	
Voltage test (routine test) according to IEC 61010-1:	Field bus:
IC2/(IC3-5) AC 2,2 kV	Interface/protocol web server/Modbus TCP/BCON
IC3/(IC4-5) AC 2,2 kV	Data rate 10/100 Mbit/s, autodeted
1C4/IC5 AC 2,2 kV	Max. amount Modbus requests < 100/s
TO THE PLANT	Cable min. CAT 6
Supply voltage	Cable length ≤ 100 m
Supply via A1/+, A2/-:	Connection RJ45
•••	IP address DHCP/manual 192.168.0.5
Supply voltage range U_S AC/DC 24240 V	Network mask 255.255.255.0
Tolerance of U_S -30+15%	BCOM address system-1-0
Maximum permissible input current of U_s 650 mA	Function communication interface
Frequency range of $U_{\rm S}$ DC, 50400 Hz*	
Tolerance of the frequency range of U_s $-5+15\%$	Switching elements
Power consumption, typically at DC \leq 12 W	Number of switching elements 2 changeover contacts
Power consumption, typically at 50/60 Hz \leq 12 W/21 VA	Operating mode N/C operation/N/O operation
Power consumption, typically at 400 Hz \leq 12 W/45 VA	Contact 11-12-14/21-22-24 off, connection fault, Alarm L1, Alarm L2, Alarm L3
* At frequencies > 200 Hz, the connection of X1 and remote must be shockproof. Only permanently	device fault, common alarm
installed devices which at least have overvoltage category II (300 V) may be connected.	Electrical endurance at rated operating conditions 10.000 operating cycles
instance devices miles de least have over ortage eacegoly in (500 1, may be connected	Contact data acc. to IEC 60947-5-1:
Supply via X1:	
Supply voltage $U_{\rm S}$ DC 24 V	
Tolerance of $U_{\rm S}$ DC -20+25 %	Rated operational voltage 230 V / 230 V / 24 V / 48 V / 110 V / 220 V
	Rated operational current 5 A / 3 A / 1 A / 1 A / 0,2 A / 0,1 A
IT system being monitored	Rated insulation voltage \leq 2000 m NN 250 V
Nominal system voltage range $U_{\rm n}$ offline	Rated insulation voltage \leq 3000 m NN 160 V
Circuit capacity internal mains switch AC 0690 V, DC 01000 V	Minimum contact rating 1 mA at AC/DC \geq 10 V
for UL applications AC/DC 0600 V	Familian mand 0 FMC
	Environment & EMC
Response values	EMC IEC 61326-2-4
Response value R_{an1} (ALARM 1) 1 k Ω 10 M Ω	Ambient temperatures:
Response value R_{an2} (ALARM 2) 1 k Ω 10 M Ω	Operating temperature -25+55 °C
Hysteresis 25% , at least $1 \text{ k}\Omega$	Transport -40+85 °C
	Long-term storage -40+70 °C
Time response	
Response time t_{an} at $R_F = 0.5$ x R_{an} (10 k Ω) and C_e (1 μF) acc. to IEC 61557-8 30 s	Classification of dimatic conditions acc. to IEC 60721 (related to temperature and relative humidity)
Start-up delay T _{start-up} 0120 s	Stationary use (IEC 60721-3-3) 3K22
	Transport (IEC 60721-3-2) 2K11
Measuring circuit	Long-term storage (IEC 60721-3-1) 1K22
Measuring voltage $U_{\rm m}$ ± 5 V	Classification of mechanical conditions acc. to IEC 60721
Measuring current $I_{\rm m}$ \leq 13,4 μ A	Stationary use (IEC 60721-3-3) 3M11
Internal resistance R_i , Z_i $\geq 372 \text{ k}\Omega$	Transport (IEC 60721-3-2) 2M4
Permissible extraneous DC voltage $U_{\rm fq}$ \leq 1200 V	Long-term storage (IEC 60721-3-1) 1M12
Permissible system leakage capacitance C _e 150 μF	Area of application ≤ 3000 m NN
, , , , , , , , , , , , , , , , , , , ,	<u>νιτα οι αμφιιτατίστι</u> ≤ 3000 III NI
Display	
Indication graphic display 127 x 127 pixels, 40 x 40 mm*	
Display range measured value $0.1 \text{k}\Omega \dots 20 \text{M}\Omega$	
Operating uncertainty (acc. to IEC 61557-8) ± 15 %, min. ± 1 k Ω	
* Indication is limited outside the temperature range -25+55 °C.	
· · · ·	
LEDs Control (FR)	
ON (operation LED) green	
SERVICE yellow	
ALARM 1 yellow	
ALARM 2 yellow	

Technical data (continued)

Connection			
Connection type scre	screw-type terminal or push-wire terminal, pluggable		
Screw-type terminals:			
Nominal current	≤ 10 A		
Tightening torque	0.50.6 Nm (57 lb-in)		
Conductor sizes	AWG 24-12		
Stripping length	7 mm		
rigid/flexible	0.22.5 mm ²		
flexible with ferrules, with/without plastic sleeve	0.252.5 mm ²		
Multiple conductor			
rigid	0.21 mm ²		
flexible	0.21.5 mm ²		
flexible with ferrule without plastic sleeve	0.251 mm ²		
flexible with TWIN ferrule with plastic sleeve	0.51.5 mm ²		
Push-wire terminals:			
Nominal current	≤ 10 A		
Conductor sizes	AWG 24-12		
Stripping length	10 mm		
rigid/flexible	0.22.5 mm ²		
flexible with ferrules, with/without plastic sleeve	0.252.5 mm ²		
Multiple conductor, flexible with TWIN ferrule with	plastic sleeve 0.51.5 mm ²		
Push-wire terminals X1:			
Nominal current	≤ 8 A		
Conductor sizes	AWG 24-16		
Stripping length	10 mm		
rigid/flexible	0.21.5 mm ²		
flexible with ferrule without plastic sleeve	0.251.5 mm ²		
flexible with TWIN ferrule with plastic sleeve	0.250.75 mm ²		

Dimension diagram (dimensions in mm)





Other Operating mode continuous operation Mounting (0°) display oriented* Degree of protection internal components IP40 Degree of protection terminals IP20 DIN rail mounting acc. to IEC 60715 Screw fixing 3 x M4 with mounting clip Enclosure material polycarbonate

64

D00264

< 390 g

108 x 93 x 110 mm

Weight

* For best ventilation, align cooling slots vertically (0°).

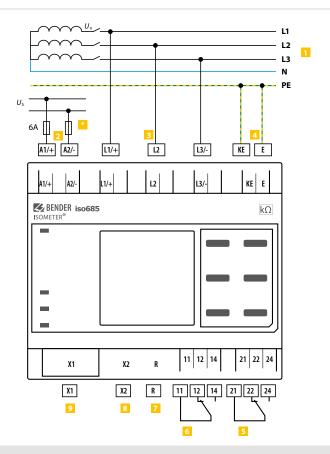
At an alignment of 45° the max. operating temperature is reduced by 10 °C.

At an alignment fo 90° the max. operating temperature is reduced by 20 °C.

Flammability class ANSI code

Dimensions (W x H x D)

Documentation number



- 1 Connection to a 3(N)AC system
- 2 Supply voltage U_s (see nameplate) via 6 A fuse
- Connection to the IT system to be monitored (L1/+, L2, L3/-)
- 4 Separate connection of KE, E to PE
- 5 (K1) Alarm relay 1, available changeover contacts

- 6 (K2) Alarm relay 2, available changeover contacts
- Switchable resistor R for RS-485 bus termination
- Ethernet interface
- Digital interface
- 6 A fuse for systems > 690 V

NOTE:

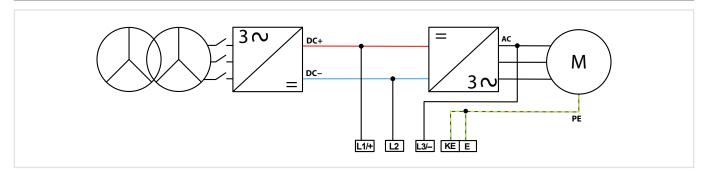
According to DIN VDE 0100-430, devices for protection against a short circuit can be omitted for the coupling of terminals L1/+ and L3/- to the IT system \leq 690 V to be monitored if the wiring is carried out in such a manner as to reduce the risk of a short circuit to a minimum. (Recommendation: Ensure short-circuit-proof and earth-fault-proof wiring).

The connecting lines L1/+, L2, L3/- to the system to be monitored must be carried out as spur lines. No load current may be conducted through the terminals.

For UL applications:

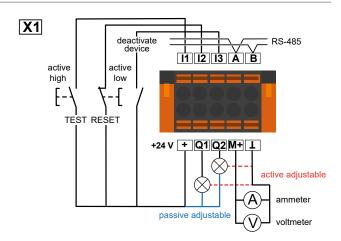
Use 60/70 °C copper lines only!

 ${\it UL\ and\ CSA\ application\ require\ the\ supply\ voltage\ to\ be\ protected\ via\ 5\ A\ fuses.}$



Digital interface X1

Digital interface	Terminal	Colour
11 12 13 A B + Q1 Q2 M+ L	l1	Input 1
	12	Input 2
	13	Input 3
	A	RS-485 A
	В	RS-485 B
	+	+24 V
	Q1	Output 1
	Q2	Output 2
	M+	Analogue output
	Т	Ground



Connection to X1



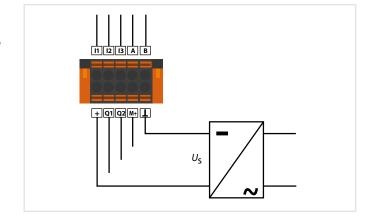
Danger of damage to property due to faulty connections!

The device can be damaged if the unit is simultaneously connected to the supply voltage via the X1 interface, and A1/+ and A2/- terminals. Do not connect the device simultaneously via X1, and A1/+ and A2/- to different supply voltages.



Danger of damage to property due to incorrect nominal voltage!

When the device is powered via the X1 interface, the nominal voltage must be 24 V otherwise the unit may be damaged. Only connect a nominal voltage of 24 V to the X1 interface.



ISOMETER® isoHR685W-x-I-B

Insulation monitoring device for IT AC systems with galvanically connected rectifiers and inverters and for IT DC systems





Typical applications

- · AC, DC or AC/DC main circuits
- · AC/DC main circuits with directly connected DC components, such as rectifiers, converters, variable-speed drives
- · UPS systems, battery systems
- · Heaters with phase control
- Systems including switch-mode power supplies
- · coupled IT systems with high leakage capacitances
- · Monitoring of long capacitive coupled lines

Device features

- ISOMETER® for IT AC systems with galvanically connected rectifiers or inverters and for IT DC systems (IT = unearthed systems)
- · Automatic adaptation to the existing system leakage capacitance
- Combination of AMPPlus and other profile-specific measurement methods
- Two separately adjustable response value ranges of 1 k Ω ...3 G Ω
- · High-resolution graphic LC display
- · Connection monitoring (monitoring of the measuring lines)
- · Automatic device self test
- Graphical representation of the insulation resistance over time (isoGraph)
- · History memory with real-time clock (buffer for three days) for storing 1023 alarm messages with date and time
- Current or voltage output 0(4)...20 mA, 0...400 μA, 0...10 V, 2...10 V (galvanically separated), which is analogous to the measured insulation value of the system
- Freely programmable digital inputs and outputs
- Remote setting via the Internet or Intranet (Webserver/Option: COMTRAXX® gateway).
- Remote diagnosis via the Internet (made available by Bender Service only)
- isoData: Continuous uninterrupted data transmission
- · isoSync: Timely synchronization of measurement processes
- RS-485/BS (Bender sensor bus) for data exchange with other Bender devices via Modbus RTU protocol
- BCOM, Modbus TCP und web server
- ISOnet: Internal separation of the ISOMETER® from the IT system to be monitored (e.g. if several IT systems are interconnected)
- ISOnet priority: Permanent priority of a device within the network
- ISOloop: Special function for ring systems (all systems are coupled)

Approvals





Device variants · isoHR685W-D-I-B

The device version isoHR685W-D-I-B features a high-resolution graphical LC display and control elements for direct operation of the device functions. It cannot be combined with an FP200.

· isoHR685W-S-I-B

The isoHR685W-S-I-B device contains no display and no operating unit. It can only be used in combination with FP200W and is indirectly operated via this front panel.

Standards

The ISOMETER® has been developed in compliance with the following standards:

- DIN EN 61557-8 (VDE 0413-8)
- IEC 61557-8

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре		Nominal system voltage range <i>U</i> n	Supply voltage <i>U</i> s	Display	Art. No.
isoHR685W—D—I—B	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	AC 01000 V; 0.1460 Hz DC 01300 V	AC 24240 V; 50400 Hz	integrated	B91067025W
isoHR685W-S-I-B + FP200W ¹⁾			DC 24240 V	detached	B91067225W

¹⁾ nur in Kombination erhältlich

Suitable system components

Description	Art. No.
A set of screw terminals ¹⁾	B91067901
A set of push-wire terminals	B91067902
Enclosure accessories (terminal cover, 2 mounting clips) 1)	B91067903
BB bus 6TE connector	B98110001

included in the scope of deliverage	ivery
-------------------------------------	-------

Description	Туре	Art. No.	Page
Device version without display	isoHR685W-S-I-B	B91067125W	_
Display for front panel mounting	FP200W	B91067904W	49
Coupling devices	AGH150W-4	B98018006	382
	AGH204S-4	B914013	384
	AGH520S	B913033	385
	AGH676S-4	B913055	388

Suitable measuring instruments on request!

Technical data

Rated voltage	1300 \
Overvoltage category	
Definitions:	
Measuring circuit (IC1)	(L1/+, L2, L3/-)
Supply circuit (IC2)	A1, A2
Output circuit 1 (IC3)	11, 12, 14
Output circuit 2 (IC4)	21, 22, 24
Control circuit (IC5)	(E, KE), (X1, ETH, X3, X4
Rated impulse voltage:	(L, KL), (X1, L111, X3, X4
IC1/(IC2-5)	8 k'
IC2/(IC3-5)	4 k'
IC3/(IC4-5)	4 k'
IC4/IC5	4 k\
Rated insulation voltage:	10001
IC1/(IC2-5)	1000 \
IC2/(IC3-5)	300
IC3/(IC4-5)	300
IC4/IC5	300
Pollution degree outside ($U_{\rm n}$ < 690 V)	
Pollution degree outside ($U_n > 690 < 1000 \text{ V}$)	
Protective separation (reinforced insulation) between:	
IC1/(IC2-5)	Overvoltage category III, 1000
	Overvoltage category II, 1300 '
IC2/(IC3-5)	Overvoltage category III, 300 '
IC3/(IC4-5)	Overvoltage categoryIII, 300 V
IC4/IC5	Overvoltage category III, 300
Voltage test (routine test) according to IEC 61010-1:	
IC2/(IC3-5)	AC 2.2 k
IC3/(IC4-5)	AC 2.2 k
IC4/IC5	AC 2.2 k
Supply voltage	
Supply via A1/+, A2/-:	
Supply voltage range $U_{\rm S}$	AC/DC 24240
Tolerance of U _s	-30+15%
Maximum permissible input current of U_s	650 m
Frequency range of U _S	DC, 50400 Hz
Tolerance of the frequency range of $U_{\rm S}$	-5+15 9
Power consumption, typically at DC	≤ 12 V
Power consumption, typically at 50/60 Hz	≤ 12 W/21 V
Power consumption, typically at 400 Hz	≤ 12 W/45 V/
* At frequencies > 200 Hz, the connection of X1 and ren installed devices which at least have overvoltage cat	
Supply via X1:	
Supply voltage $U_{\rm S}$	DC 24 \
Tolerance of Us	DC -20+25 %

AC 01000 V, 3AC 0690 V, DC 01300 V
AC/DC 01000 V
AC/DC +15 %
DC, 0.1460 Hz
$U \sim \text{max} = 50 \text{ V x } (1 + f_n^2 / \text{Hz}^2)$

Response values	
Response value R _{an1} (ALARM 1)	1 kΩ3 GΩ
Response value R _{an2} (ALARM 2)	1 kΩ3 GΩ
Relative uncertainty (acc. to IEC 61557-8)	profile dependent, ± 15 %, at least ± 1 k Ω
Hysteresis	25 %, at least 1 kΩ

Time response

Response time t_{an} at $R_{F \text{ (without faults)}} = 1 \text{ M}\Omega -> R_{F \text{ (with faults)}} = 0.5 \text{ x } R_{an} (R_{an} = 20 \text{ k}\Omega)$			
and $C_e = 1 \mu\text{F}$ acc. to IEC 61557-8	profile dependent, typ. 10 s		
Response time DC alarm at $C_e = 1 \mu F$	profile dependent, typ. 5 s		
Start-un delay Tetart un	0 120 s		

Measuring circuit

Measuring voltage $U_{\rm m}$	profile dependent,	± 10 V, ± 50 V (see profile overview in	the manual)
Measuring current I _m			≤ 403 µA
Internal resistance R _i , Z _i			\geq 124 k Ω
Internal resistance on decoup	opled systems (inactiv	e by I/O, inactive by ISOnet or cut-off)	typ. 50 M Ω
Permissible extraneous DC vo	oltage U _{fq}		≤ 1500 V
Permissible system leakage of	apacitance Ce	profile dependent,	01000 μF

Measuring ranges

Measuring range f_n	0.1460 Hz
Tolerance measurement of f_n	±1 % ±0.1 Hz
Voltage range measurement of f _n	AC 25690 V
Measuring range U _n	AC 251000 V, 3AC 25690 V, DC 01300 V
Voltage range measurement of Un	AC/DC 101000 V*
Tolerance measurement of U_n	±5 % ±5 V
Measuring range Ce	01000 μF
Tolerance measurement of Ce	±10 % ±10 μF
Frequency range measurement of Ce	DC, 30460 Hz
Min. insulation resistance measurement of C_e	typ. $> 10 \text{ k}\Omega$
depending on the profile and coupling mode	

^{*} Deactivation of voltage metering in a DC system at $U_n >$ DC 1000 V and asymmetric insulation fault at $R_f < 500 \text{ k}\Omega$. Reactivation of voltage metering if $R_f > 500 \text{ k}\Omega$

Display

Indication	graphic display 127 x 127 pixels, 40 x 40 mm*
Display range measured value	0.1 kΩ20 MΩ
Operating uncertainty (acc. to IEC 61557-8)	\pm 15 %, min. \pm 1 k Ω

^{*} Indication is limited outside the temperature range -25 \ldots +55 °C.

LEDs

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

In-/Outputs (X1)

Cable length X1 (unshielded cable)	≤ 10 m
Cable length X1 (shielded cable, shield connected to PE on one side) recommended:	
J-Y(St)Y min. 2x0,8	≤ 100 m
Max output current for supply via X1+/X1GND per output	max. 1 A
Max output current for supply via A1/A2 in total on X1	max. 200 mA
Max output current for supply via A1/A2 in total on X1 between 16.8 V and 40 V	

Max output current for supply via A 1/A2 in total on A1 between 10.0 v and 40 v

 $I_{LmaxX1} = 10 \text{ mA} + 7 \text{ mA/V } U_s *$

Digital Inputs (I1, I2, I3)

Number	3
Operating mode, adjustable	high-active, low-active
Functions	off, test, reset, deactivate device, start initial measurement
Voltage	Low DC -35 V, High DC 1132 V
Tolerance Voltage	±10 %

Digital Outputs (Q1, Q2)

2.3 varpas (4., 42)	
Number	2
Operating mode, adjustable	active, passive
Functions	off, Ins. alarm 1, Ins. alarm 2, connection fault, DC- alarm*,
	DC+ alarm*, symmetrical alarm, device fault, common alarm,
	measurement complete, device inactive, DC offset alarm
Voltage	passive DC 032 V, active DC 0/19.232 V
* Only for $U_n \ge 50 \text{ V}$	

^{*} $U_{\rm S}$ is the supply voltage of the ISOMETER*. Negative values for $I_{\rm LmaxX1}$ are not permissible.

Analogue Output (M+)	
Number	1
Operating mode	linear, midscale point 28 kΩ/120 kΩ
Functions	insulation value, DC offse
Current 0	20 mA (< 600 Ω), 420 mA (< 600 Ω), 0400 μ A (< 4 k Ω)
Voltage	010 V (> 1 kΩ), 210 V (> 1 kΩ
Tolerance related to the current/v	Itage final value $\pm 20\%$
Interfaces	
Field bus:	
Interface/protocol	web server/Modbus TCP/BCON
Data rate	10/100 Mbit/s, autodetect
Max. amount Modbus requests	< 100/9
Cable	min. CAT 6
Cable length	≤ 100 m
Connection	RJ45
IP address	DHCP/manual 192.168.0.5
Network mask	255.255.255.0
BCOM address	system-1-0
Function	communication interface
ISOnet	
ISOnet number of devices	220
Maximum nominal system voltage	ISOnet AC, 690 V/DC, 1000 V
ISOloop	
ISOloop number of devices	210
•	21111
ISOsync	~ F0
Number of ISOsync devices	≤ 50
Sensor bus	DC 405 /: D . DC L M II DTI
Interface/protocol	RS-485 / isoData, BS bus, Modbus RTU
Data rate Mode 1	9.6 kBaud/s
Data rate Mode 2	115.2 kBaud/s
Data rate Mode 3	115.2 kBaud/s
Cable: twisted pair, one end of shi	
Cable length (depending on the background)	ud rate) \leq 1200 m terminals X1A, X1E
	,
Terminating resistor	120 Ω , can be connected internally 190
Device address, BS bus	190
Switching elements	
Number of switching elements	2 changeover contacts
Operating mode	N/C operation/N/O operation
Contact 11-12-14/21-22-24	off, Ins. alarm 1, Ins. alarm 2, connection fault, DC- alarm*,
	DC+ alarm*, symmetrical alarm, device fault, common alarm
	measurement complete, device inactive, DC offset alarm
Electrical endurance at rated opera	ting conditions 10.000 operating cycles
* Only for $U_n \ge 50 \text{ V}$	
Contact data acc. to IEC 60947	5-1:
Utilisation category	AC-13 / AC-14 / DC-12 / DC-12 / DC-12 / DC-12
Rated operational voltage	230 V / 230 V / 24 V / 48 V / 110 V / 220 V

AC-13 / AC-14 / DC-12 / DC-12 / DC-12 / DC-12
230 V / 230 V / 24 V / 48 V / 110 V / 220 V
5 A / 3 A / 1 A / 0.2 A / 0.1 A
250 V
160 V
1 mA at AC/DC \geq 10 V

Environment & EMC	
EMC	IEC 61326-2-4
Ambient temperatures:	
Operating temperature	-25+55 ℃
Transport	-40+85 °C
Long-term storage	-40+70 ℃

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 6072	21
Stationary use (IEC 60721-3-3)	3M12
Transport (IEC 60721-3-2)	2M ²
Long-term storage (IEC 60721-3-1)	1M12
Area of application	< 3000 m NN

Connection type screw-type terminal of	or push-wire terminal, pluggable
Screw-type terminals:	
Nominal current	≤ 10 A
Tightening torque	0.50.6 Nm (57 lb-in)
Conductor sizes	AWG 24-12
Stripping length	7 mm
rigid/flexible	0.22.5 mm ²
flexible with ferrules, with/without plastic sleeve	0.252.5 mm ²
Multiple conductor	
rigid	0.21 mm ²
flexible	0.21.5 mm ²
flexible with ferrule without plastic sleeve	0.251 mm ²
flexible with TWIN ferrule with plastic sleeve	0.51.5 mm ²
Push-wire terminals:	
Nominal current	≤ 10 A
Conductor sizes	AWG 24-12
Stripping length	10 mm
rigid/flexible	0.22.5 mm ²
flexible with ferrules, with/without plastic sleeve	0.252.5 mm ²
Multiple conductor, flexible with TWIN ferrule with plastic sleeve	0.51.5 mm ²
Push-wire terminals X1:	
Nominal current	≤ 8 A
Conductor sizes	AWG 24-16
Stripping length	10 mm
rigid/flexible	0.21.5 mm ²
flexible with ferrule without plastic sleeve	0.251.5 mm ²
flexible with TWIN ferrule with plastic sleeve	0.250.75 mm ²
Other	
Operating mode	continuous operation
Mounting (0°)	display oriented*
Degree of protection internal components	IP40
Degree of protection terminals	IP20
NIII II II II	IFC 4074

Documentation number Weight * For best ventilation, align cooling slots vertically (0°). At an alignment of 45° the max. operating temperature is reduced by 10 °C. At an alignment fo 90° the max. operating temperature is reduced by 20 °C.

Option "W" data different from the standard version

DIN rail mounting acc. to

Screw fixing **Enclosure material**

ANSI code

Flammability class

Dimensions (W x H x D)

Devices with the suffix **W** feature increased shock and vibration resistance. The electronics is covered with a special varnish to provide increased protection against mechanical stress and moisture.

Rated operational current of switching elements max. 3 A (for UL applications)

Combination of ISOMETER* sensor variant with an FP200W: The requirements of option \boldsymbol{W} will only be fulfilled when the ISOMETER® sensor variant is mounted on a DIN rail and connected to the FP200W via the patch cable.

IEC 60715

V-0

64

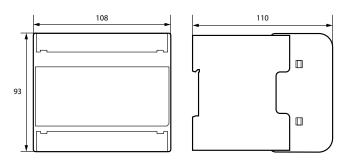
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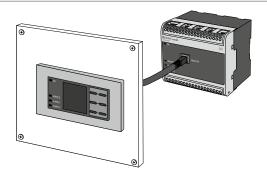
< 390 g

polycarbonate

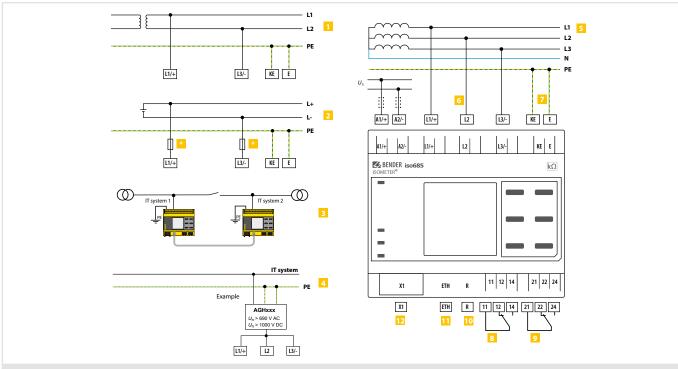
108 x 93 x 110 mm

3 x M4 with mounting clip





Wiring diagram



- 1 Connection to an AC system Un
- 2 Connection to a DC system U_n
- Linked with two IT systems which can be interconnected via a coupling switch. Information regarding the state of the coupling switch is not necessary.
- Connection to an IT system with coupling device
- 5 Connection to a 3(N)AC system
- 6 Connection to the IT system to be monitored (L1/+, L2, L3/-)
- Separate connection of KE, E to PE

- 8 (K1) Alarm relay 1, available changeover contacts
- (K2) Alarm relay 2, available changeover contacts
- Switchable resistor R for RS-485 bus termination
- 11 Ethernet interface
- Digital interface
- For systems > 690 V and with overvoltage category III a fuse for the connection to the system to be monitored must be provided.

Recommendation: 2A screw-in fuses.

Provide line protection!

According to DIN VDE 0100-430, a line protection shall be provided for the supply voltage.

NOTE

According to DIN VDE 0100-430, devices for protection against a short-circuit can be omitted for the coupling of terminals L1/+, L2 and L3/- to the IT system \leq 690 V to be monitored if the wiring is carried out in such a manner as to reduce the risk of a short-circuit to a minimum. Ensure short-circuit-proof and earth-fault-proof wiring.

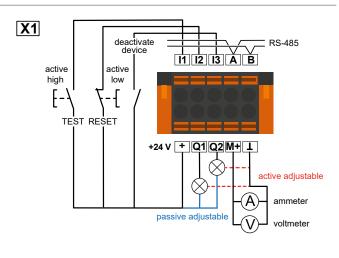
 $The connecting \ lines \ L1/+, L2, L3/-\ to\ the\ system\ to\ be\ monitored\ must\ be\ carried\ out\ as\ spur\ lines.\ No\ load\ current\ may\ be\ conducted\ through\ the\ terminals.$

For UL applications:

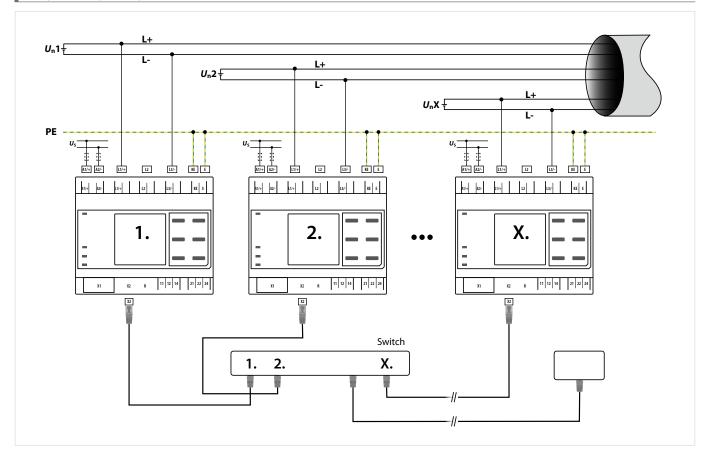
Use 60/70°C copper lines only!

UL and CSA application require the supply voltage to be protected via 5 A fuses.

Digital interface	Terminal Description	
	l1l3	Configurable digital inputs (e.g. test, reset,)
	А, В	Serial interface RS-485, termination by means of a DIP switch R.
11 12 13 A B + Q1 Q2 M+ L	+	Supply voltage of the inputs and outputs I, Q and M. Electrical overload protection. Automatic shutdown in the event of short circuits and transients (resettable). When supplied via an external 24 V source, A1/+, A2/- must not be connected.
	Q1, Q2	Configurable digital output
	M+	Configurable analogue output (e.g. measuring instrument)
	<u> </u>	Reference potential ground



ISOsync for coupled IT systems



ISOMETER® isoRW685W-D

Insulation monitoring device for IT AC systems with galvanically connected rectifiers and converters and for IT systems especially for railway applications





Typical applications

- AC, DC or AC/DC main circuits
- · AC/DC main circuits with directly connected DC components, such as rectifiers, converters, variablespeed drives
- UPS systems, battery systems
- · Heaters with phase control
- Systems with switch-mode power supplies
- IT systems with high leakage capacitances

Approvals









Device features

- ISOMETER® for IT AC systems with galvanically connected rectifiers or inverters and for IT DC systems (IT = unearthed systems)
- Automatic adaptation to the existing system leakage capacitance
- Combination of AMPPlus and other profile-specific measurement methods
- Two separately adjustable response value ranges of 1 k Ω ...10 M Ω for alarm 1 and alarm 2
- · High-resolution graphic LC display
- Connection monitoring (monitoring of the measuring lines)
- · Automatic device self test
- Graphical representation of the insulation resistance over time (isoGraph)
- · History memory with real-time clock (buffer for three days) for storing 1023 alarm messages with date and time
- Current and voltage output 0(4)...20 mA, 0...400 μA, 0...10 V, 2...10 V (galvanically separated) which is analogous to the measured insulation value of the system
- Freely programmable digital inputs and outputs
- Remote setting via the Internet or Intranet (Webserver / Option: COMTRAXX® Gateway)
- Remote diagnosis via the Internet (made available by Bender Service only)
- isoData: Continuous uninterrupted data transmission
- RS-485/BS (Bender sensor bus) for communication with other Bender devices
- BCOM, Modbus TCP and web server

Standards

The ISOMETER® has been developed in compliance with the following standards:

- DIN EN 61557-8 (VDE 0413-8)
- IEC 61557-8
- DIN EN 50155
- DIN EN 45545-2

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Ту	<i>r</i> pe	Nominal system voltage range <i>U</i> n	Supply voltage U₅	Art. No.
isoRW685W-D		AC 0690 V; 1460 Hz DC 01000 V	AC 24240 V; 50400 Hz DC 24240 V	B91067012W

Accessories

Description	Art. No.
A set of screw terminals ¹⁾	B91067901
A set of push-wire terminals	B91067902
Enclosure accessories (terminal cover, 2 mounting clips) 1)	B91067903

¹⁾ included in the scope of delivery

Suitable system components

Description	Туре	Art. No.	Page
	AGH150W-4	B98018006	382
Coupling devices	AGH204S-4	B914013	384
	AGH520S	B913033	385
	AGH676S-4	B913055	388

Suitable measuring instruments on request!

Mascuring parage	Insulation coordination according to IEC 60664-1/IEC	C 60664-3	Measuring ranges
Definition of the state of protein (CO)	Rated voltage	1000 V	Measuring range f_n 0,1460 k
Meaning grown (ICC)	Overvoltage category	III	Tolerance measurement of $f_{\rm n}$ $\pm 1\% \pm 0.1$ k
Meaning grown (ICC)	Definitions:		Voltage range measurement of f_0 AC 25690
Supply close CP CP CP CP CP CP CP C	Measuring circuit (IC1)	L1/+, L2, L3/-	Measuring range U_0 AC 25690 V. DC 251000
Output cincus 1.0.1 1.1	3		
Obogen charm 2 (MC) (E, KY, KY, KY, KY, KY, KY, KY, KY, KY, KY			
Control control City Control contr	•		
Rade imports without company in the CI (1702-5)	•		
CK/II/C4-5		(L, KL), K1, L111, K3, K4	·
COUNTS 14 M 14 M 15 M	· · · · · ·	O LAV	
Might Migh			
Marie Insulation Surges			depending on the profile and coupling mode
Michael model and model			Display
1000 1000		4 kV	
Color Col	_		
Mary			
Particution degree motiside (Ma - 6900 v.) 1000 v. 1	IC2/(IC3-5)	250 V	
Pollution degree autistic (lb., ≤609 \ 0)	IC3/(IC4-5)	250 V	* Indication is limited outside the temperature range -25+55 $^{\circ}$ C.
Pollution (eight on classifier (ii)	IC4/IC5	250 V	
Productive sparation freinforced inculation) between (1/16/16/15 Overrollage category 1,000 Overr	Pollution degree outside ($U_{\rm n}$ < 690 V)	3	LEDs
Productive sparation freinforced inculation) between (1/16/16/15 Overrollage category 1,000 Overr		2	ON (operation LED)
AlcAMC Memory		Overvoltage category III 1000 V	·
Mode		3 3 , ,	· · · · · · · · · · · · · · · · · · ·
Valigate set fruidme test) according to EC 61010-1: (2/(C)C-5) (A/C, 2, M) (A			ALANIWI Z YEIIO
Voltage feet (routine test) according to EC 61010-1:		3 3 , ,	In-/Outputs (X1)
C2/IC5-5 C3/IC5-5 C3/I		Overvoitage category III, 300 V	·
	· · · · · ·		
No.	• ,	,	.
Supply voltage Sup	IC3/(IC4-5)	AC 2,2 kV	
Supply vialage AC/DC 24 240V 50ppt viala A1/+ A2/-: Make output current for supply via A1/A2 in total on X1 between 16.8 V and 40 V 50ppt vialage of the ISOMETER". Negative values for I _{max} x1 are not permissible. To Maximum permissible input current of U _b AC/DC 24 240V 50ppt vialage of the ISOMETER". Negative values for I _{max} x1 are not permissible. To Maximum permissible input current of U _b So METER". Negative values for I _{max} x1 are not permissible. So Maximum permissible input current of U _b	IC4/IC5	AC 2,2 kV	
Supply via A1/+, A2/-: /// (max) = 10 mA + 7 mA/V Us //	Complessed to an		
Supply violage gerange β	Supply voltage		
Tolerance of U,	Supply via A1/+, A2/-:		$I_{\text{LmaxX1}} = 10 \text{ mA} + 7 \text{ mA/V } U_{\text{S}}$
Tolerance of U,	Supply voltage range $U_{\rm S}$	AC/DC 24240 V	* $U_{\rm S}$ is the supply voltage of the ISOMETER®. Negative values for $I_{\rm I, maxX1}$ are not permissible.
Maximum permissible input current of U ₂ S0, MA Frequency range of U ₂ S0, S0, MA Frequency range of U ₃ S0, S0, MA Frequency range of U ₄ S0, S0, MA Frequency range of U ₇ S0, S0, MA Frequency range of U ₈ S0, S0, MA Frequency range of U ₈ S0, MA Frequency range of U ₈ S0, MA Frequency range of U ₈ S0, MA Frequencies > 2004 tx, the connection of X1 and remote must be shockproof. Only permanently rastalled devices which at least have overolotage category II (300 V) may be connected. Supply valtage U ₈ S0, S0, MA Frequency range of U ₈ S0, S0, MA Frequency range of U ₈ AC 0690 V, DC 01000 V or max = 50 V x (1 + K ₆) Frequency range of U ₈ S0, MA Frequency range of U ₈ S0, MA Frequency range of U ₈ AC 0690 V, DC 01000 V or max = 50 V x (1 + K ₆) Frequency range of U ₉ S0, S0, MA Frequency range of U ₈ S0, MA Frequency range of U ₉ S0, S0, MA		-30+15%	· 11, 3
Frequency range of U ₃			Digital Inputs (11, 12, 13)
Operating mode, adjustable high-active, low-active power consumption, typically at DGC			• • • • • •
Founctions maption, typically at DC		· · · · · · · · · · · · · · · · · · ·	
Power consumption, typically at 50/60 Hz ≤ 12 W/Z1 VA Voltage Low DC -3 5 V, High DC 1132 ± 10 V Power consumption, typically at 400 Hz ≤ 12 W/45 VA Foliance Voltage 10 leance Voltage 10 leance Voltage 10 leance Voltage 10 leance Voltage Voltage Vs 0 perating mode, adjustable active, passive Voltage Vs 0 perating mode, adjustable active passive DC 032 V, active DC 0/19.232 Vs 0 per			
Fower consumption, typically at 400 Hz * At frequencies > 200 Hz, the connection of X1 and remote must be shockproof. Only permanently installed devices which at least have overvoltage category II (300 V) may be connected. * Supply via X1: Supply via X1: Supply via X1: Supply voltage Us Tolerance of Us			
* At frequencies > 200 Hz, the connection of X1 and remote must be shockproof. Only permanently in stalled devices which at least have overvoltage category II (300 V) may be connected. **Supply via X1:** Supply via X1:** Sup	, , ,		_ , ,
Stalled devices which at least have overvoltage category II (300 V) may be connected. Supply via X1: Operating mode, adjustable Operating mode palasym passive DCO32 V, active DCO/19.232 V			$\pm 10^{\circ}$
Supply via X1: Number Supply via X1: Operating mode, adjustable Actions	•	. ,. ,	Digital Outputs (Q1, Q2)
Supply via X1: Operating mode, adjustable active, passing to profite dependent, ±10 %, ±20 % testing mode, adjustable active, passing to profite dependent, ±10 %, ±20 % testing or wind to profite dependent, ±10 %, ±20 % testing or wind to profite dependent, ±10 %, ±20 % testing or wind to profite dependent, ±10 %, ±20 % testing or wind to profite dependent, ±10 %, ±20 % testing or wind to profite dependent, ±10 %, ±20 % testing or wind to profite dependent, ±10 %, ±20 % testing or wind to profite dependent, ±10 %, ±20 % testing or wind to profite dependent, ±10 %, ±20 % testing or wind to profite dependent, ±10 %, ±20 % testing or wind to profite dependent, ±10 %, ±20 % testing or wind to profite dependent, ±10 %, ±20 % testing or wind to profite dependent, ±10 %, ±20 % testing or wind to wi	stalled devices which at least have overvoltage category	/ II (300 V) may be connected.	
Supply voltage Us DC 24V Dolerance of Us DC 26V D	Cumply via V1.		
Tolerance of U_s Nominal system voltage range U_n AC $0690 \text{ V}, DC 0600 \text{ V}$ Tolerance of U_n Nominal system voltage range U_n AC $0690 \text{ V}, DC 0600 \text{ V}$ Tolerance of U_n Nominal system voltage range U_n AC $0690 \text{ V}, DC 0600 \text{ V}$ Tolerance of U_n AC $0690 \text{ V}, DC 0600 \text{ V}$ Tolerance of U_n AC $0690 \text{ V}, DC 0600 \text{ V}$ Tolerance of U_n AC $0690 \text{ V}, DC 0600 \text{ V}$ AC 0600 V Tolerance of U_n AC $0690 \text{ V}, DC 0600 \text{ V}$ AC 0600 V Analogue Output $(M+)$ Analogue Output $(M$	•••	DC 24 V	
Trysytem being monitored Mominal system voltage range U_0 (and polications and C/DC 0600 v for U_1 applications and AC/DC 0600 v for U_1 applications and AC/DC 0600 v for U_0 (and U_0 and U_0 (but U_0 and U_0 and U_0 and U_0 and U_0 and U_0 (but U_0 and			. , , ,
Tf system being monitored Voltage passive DC 032 V, active DC 0/19.232 V Nominal system voltage range U_n for UL applications AC /DC 0600 V * only for U_n ≥ 50 V Tolerance of U_n AC /DC +15 % Frequency range of U_n DC , 0.1460 Hz Max. alternating voltage U_n (for f_n < 4 Hz)	Tolerance of U _S	DC -20+25 %	· · · · · · · · · · · · · · · · · · ·
Nominal system voltage range $U_{\rm n}$ AC 0690 V, DC 01000 V for UL applications AC/DC 0600 V Tolerance of $U_{\rm n}$ DC, 0.1460 Hz Max. alternating voltage $U_{\rm m}$ (for $f_{\rm n} < 4$ Hz) $U_{\rm max} = 50$ Vx $(1+f_{\rm n}^2)$ Analogue Output $(M+)$ Sumber Seponse value $R_{\rm ant}$ (ALARM 1) 1 1 1 1 1 1 1 1 1 1	IT system being monitored		
Tolerance of Un		ACO COOM DCO 1000 W	Voltage passive DC 032 V, active DC 0/19.232
Tolerance of Un AC/DC + 15% Prequency range of Un AC/DC + 15% DC, 0.1460 Hz Amalogue Output (M+) Number Max. alternating voltage U~ (for f _n < 4 Hz)	, , ,		* Only for $U_n \ge 50 \text{ V}$
Frequency range of U_n Max. alternating voltage U^\sim (for $f_n < 4$ Hz) U^\sim max $= 50$ V x $(1 + f_n)^2$ Gesponse values Response value R_{an1} (ALARM 1) Response value R_{an1} (ALARM 2) Reposse value R_{an2} (ALARM 2) Re			
Frequency range of U_n Max. alternating voltage U^\sim (for $f_n < 4\mathrm{Hz}$) U^\sim max = 50 V x (1+ f_n^2) Response values Response value R_{an1} (ALARM 1) $1\mathrm{k}\Omega\ldots10\mathrm{M}\Omega$ Response value R_{an2} (ALARM 2) $1\mathrm{k}\Omega\ldots10\mathrm{M}\Omega$ Relative uncertainty (acc. to IEC 61557-8) Profile dependent, $\pm 15\mathrm{W}$, at least $\pm 1\mathrm{k}\Omega$ Hysteresis $25\mathrm{W}$, at least $\pm 1\mathrm{k}\Omega$ Tolerance related to the current/voltage final value $\pm 20\mathrm{W}$ Tolerance related to the current/voltage final value $\pm 20\mathrm{W}$ Tolerance related to the current/voltage final value $\pm 20\mathrm{W}$ Tolerance related to the current/voltage final value $\pm 20\mathrm{W}$ Tolerance related to the current/voltage final value $\pm 20\mathrm{W}$ Tolerance related to the current/voltage final value $\pm 20\mathrm{W}$ Tolerance related to the current/voltage final value $\pm 20\mathrm{W}$ Tolerance related to the current/voltage final value $\pm 20\mathrm{W}$ Tolerance related to the current/voltage final value $\pm 20\mathrm{W}$ Tolerance related to the current/voltage final value $\pm 20\mathrm{W}$ Tolerance related to the current/voltage final value $\pm 20\mathrm{W}$ Tolerance related to the current/voltage final value $\pm 20\mathrm{W}$ Tolerance related to the current/voltage final value $\pm 20\mathrm{W}$ Tolerance related to the current/voltage final value $\pm 20\mathrm{W}$ Tolerance related to the current/voltage final value $\pm 20\mathrm{W}$ Tolerance related to the current/voltage final value $\pm 20\mathrm{W}$ Tolerance related to the current/voltage final value $\pm 20\mathrm{W}$ Tolerance related to the current/voltage final value $\pm 20\mathrm{W}$ Tolerance related to the current/voltage final value $\pm 20\mathrm{W}$ Tolerance related to the current/voltage final value $\pm 20\mathrm{W}$ Tolerance related to the current/voltage final value $\pm 20\mathrm{W}$ Tolerance related to the current/voltage final value $\pm 20\mathrm{W}$ Tolerance related to the current/voltage final value $\pm 20\mathrm{W}$ Tolerance related to the current/voltage final value $\pm 20\mathrm{W}$			Analogue Output (M+)
Max. alternating voltage \$\mathcal{U} \cap (\text{fin} \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \			
Response values Functions insulation value, DC offss Response value Ran1 (ALARM 1) 1 kΩ10 MΩ Current 020 mA (< 600 Ω), 420 mA (< 600 Ω), 0400 μA (< 4kΩ	Max. alternating voltage $U\sim$ (for $f_{\rm n}<4$ Hz)	$U \sim \text{max} = 50 \text{ V x } (1 + f_n^2)$	
Response value R_{an1} (ALARM 1)	Posmoneo valuos		
Response value R_{an2} (ALARM 2) $1 k\Omega 10 M\Omega$ Relative uncertainty (acc. to IEC 61557-8) profile dependent, ± 15 %, at least ± 1 k\O Hysteresis 25 %, at least ± 1 k\O Response time t_{an} at $R_F = 0.5$ x R_{an} (10 k\O) and C_e (1 μ F) acc. to IEC 61557-8 profile dependent, typ. 4 seponse time D calarm at $C_e = 1 \mu$ F profile dependent, typ. 2 start-up delay $T_{start-up}$ possible evertine t_{an} profile dependent,	_ •		
Relative uncertainty (acc. to IEC 61557-8) profile dependent, $\pm 15\%$, at least $\pm 1 \text{ k}\Omega$ Hysteresis 25\%, at least $\pm 1 \text{ k}\Omega$ Time response Response time t_{an} at $R_F = 0.5 \times R_{an}$ (10 k Ω) and C_e (1 μ F) acc. to IEC 61557-8 Profile dependent, typ. 4s profile dependent, typ. 2s Start-up delay $T_{start-up}$ profile dependent, $T_{start-up}$ 0 s10 min Measuring circuit Measuring voltage U_m profile dependent, $\pm 10 \text{ V}$, $\pm 50 \text{ V}$ (see profile overview in the manual) Measuring current I_m profile dependent, T_m	Response value R _{an1} (ALARM 1)	1 kΩ10 MΩ	
Hysteresis 25%, at least 1 kΩ Fine response Response time t_{an} at $R_F = 0.5 \times R_{an}$ (10 kΩ) and C_e (1 μF) acc. to IEC 61557-8 Response time D calarm at $C_e = 1$ μF Response time DC alarm at $C_e = 1$ μF Response time DC alarm at $C_e = 1$ μF Response time DC alarm at $C_e = 1$ μF Response time DC alarm at $C_e = 1$ μF Response time DC alarm at $C_e = 1$ μF Response time DC alarm at $C_e = 1$ μF Response time DC alarm at $C_e = 1$ μF Response time DC alarm at $C_e = 1$ μF Response time DC alarm at $C_e = 1$ μF Response time DC alarm at $C_e = 1$ μF Response time DC alarm at $C_e = 1$ μF Response time DC alarm at $C_e = 1$ μF Response time DC alarm at $C_e = 1$ μF Response time DC alarm at $C_e = 1$ μF Response time DC alarm at $C_e = 1$ μF Response time $C_e = 1$ μF Resp	Response value R _{an2} (ALARM 2)	1 kΩ10 MΩ	
Hysteresis25 %, at least 1 kΩTime responseField bus:Field bus:Interface/protocolweb server/Modbus TCP/BCOIResponse time tan at RF = 0.5 x Ran (10 kΩ) and Ce (1 μF) acc. to IEC 61557-8Interface/protocolweb server/Modbus TCP/BCOIResponse time DC alarm at Ce = 1 μFprofile dependent, typ. 2 sData rate10/100 Mbit/s, autodeteStart-up delay Tstart-up0 s 10 minCablemin. CATCable lengthCable length\$ 100ConnectionR/4Measuring current Im\$ 403 μANetwork maskDHCP/manual 192.168.00Measuring current Im\$ 403 μANetwork mask255.255.255.Internal resistance Ri, Zi\$ 124 kΩBCOM addressSystem-1-Permissible extraneous DC voltage Ufg\$ 1200 VFunctioncommunication interface	Relative uncertainty (acc. to IEC 61557-8)	profile dependent, ± 15 %, at least ± 1 k Ω	Iolerance related to the current/voltage final value $\pm 20^{\circ}$
IntertactsTime responseField bus:Response time t_{an} at $R_F = 0.5$ x R_{an} (10 kΩ) and C_e (1 μF) acc. to IEC 61557-8Interface/protocolweb server/Modbus TCP/BCOIResponse time DC alarm at $C_e = 1$ μFprofile dependent, typ. 2 sData rate10/100 Mbit/s, autodeteStart-up delay $T_{start-up}$ 0 s10 minCablemin. CATMeasuring circuitConnectionR/4Measuring voltage U_m profile dependent, ±10 V, ±50 V (see profile overview in the manual)IP addressDHCP/manual 192.168.0Measuring current I_m ≤ 403 μANetwork mask255.255.255.Internal resistance $R_{I_c}Z_i$ ≥ 124 kΩBCOM addresssystem-1-Permissible extraneous DC voltage U_{fg} ≤ 1200 VFunctioncommunication interface			Interfaces
Response time t_{an} at $R_F = 0.5 \times R_{an}$ ($10 \text{ k}\Omega$) and C_e (1 µF) acc. to IEC 61557-8 Response time t_{an} at $R_F = 0.5 \times R_{an}$ ($10 \text{ k}\Omega$) and C_e (1 µF) acc. to IEC 61557-8 Response time t_{an} at $R_F = 0.5 \times R_{an}$ ($10 \text{ k}\Omega$) and C_e (1 µF) acc. to IEC 61557-8 Response time t_{an} at $R_F = 0.5 \times R_{an}$ ($10 \text{ k}\Omega$) and C_e (1 µF) acc. to IEC 61557-8 Response time t_{an} at $R_F = 0.5 \times R_{an}$ ($10 \text{ k}\Omega$) and C_e (1 µF) acc. to IEC 61557-8 Response time t_{an} at $R_F = 0.5 \times R_{an}$ ($10 \text{ k}\Omega$) and C_e (1 µF) acc. to IEC 61557-8 Response time t_{an} at $R_F = 0.5 \times R_{an}$ ($10 \text{ k}\Omega$) and C_e (1 µF) acc. to IEC 61557-8 Response time t_{an} at $R_F = 0.5 \times R_{an}$ ($10 \text{ k}\Omega$) and C_e (1 µF) acc. to IEC 61557-8 Response time t_{an} at $R_F = 0.5 \times R_{an}$ ($10 \text{ k}\Omega$) and C_e (1 µF) acc. to IEC 61557-8 Response time t_{an} at $R_F = 0.5 \times R_{an}$ ($10 \text{ k}\Omega$) and C_e (10 µF) and C_e (10 µF) and C_e (10 µF) acc. to IEC 61557-8 Response time t_{an} at t_{an} and t_{an} and t_{an} at t_{an} and t_{an}		,	
profile dependent, typ. 4 s profile dependent, typ. 4 s Response time DC alarm at $C_e = 1 \mu F$ profile dependent, typ. 2 s profile dependent, typ. 2 sData rate10/100 Mbit/s, autodeteStart-up delay $T_{start-up}$ 0 s 10 min CableCablemin. CATMeasuring circuitConnectionRJ4Measuring voltage U_m profile dependent, ±10 V, ±50 V (see profile overview in the manual)IP addressDHCP/manual 192.168.0Measuring current I_m ≤ 403 μANetwork mask255.255.255.Internal resistance R_i, Z_i ≥ 124 kΩBCOM addresssystem-1-Permissible extraneous DC voltage U_{fg} ≤ 1200 VFunctioncommunication interface	Time response		
Response time DC alarm at $C_e = 1 \mu F$ profile dependent, typ. 2 s Start-up delay $\overline{I}_{Start-up}$ 0 s 10 min Measuring circuit Cable length $C_e = 1 \mu F$ Start-up delay $\overline{I}_{Start-up}$ 0 s 10 min Measuring circuit Cable length $C_e = 1 \mu F$ Connection RJ4 Measuring voltage U_m profile dependent, $\pm 10 V$, $\pm 50 V$ (see profile overview in the manual) Measuring current I_m $C_e = 1 \mu F$ Measuring current I_m $C_e = 1 \mu F$ Measuring voltage U_m profile dependent, $\pm 10 V$, $\pm 50 V$ (see profile overview in the manual) Measuring current I_m $C_e = 1 \mu F$ Meas	Response time $t_{\rm an}$ at $R_{\rm F}=0.5$ x $R_{\rm an}$ (10 k Ω) and $C_{\rm e}$ (1 $\mu{\rm F}$) a	acc. to IEC 61557-8	·
Start-up delay $\overline{I}_{\text{Start-up}}$ 0 s10 min Measuring circuit Cable length 0 connection RJ4 Measuring voltage U_{m} profile dependent, $\pm 10 \text{V}$, $\pm 50 \text{V}$ (see profile overview in the manual) Measuring current I_{m} $\pm 403 \mu\text{A}$ Network mask DC voltage U_{fg} $\pm 2124 \text{k}\Omega$ BCOM address Permissible extraneous DC voltage U_{fg} $\pm 2120 \text{V}$ Function communication interface		profile dependent, typ. 4 s	
Start-up delay $T_{\text{start-up}}$ 0 s10 min Cable lengthCable length≤ 100 min. CAT Cable lengthMeasuring circuitConnectionRJ4Measuring voltage U_m profile dependent, ±10 V, ±50 V (see profile overview in the manual)IP addressDHCP/manual 192.168.0Measuring current I_m ≤ 403 μANetwork mask255.255.255Internal resistance R_i , Z_i ≥ 124 kΩBCOM addresssystem-1-Permissible extraneous DC voltage U_{fg} ≤ 1200 VFunctioncommunication interface	Response time DC alarm at $C_e = 1 \mu F$	profile dependent, typ. 2 s	·
Measuring circuitCable length \leq 100 mMeasuring voltage U_m profile dependent, \pm 10 V, \pm 50 V (see profile overview in the manual)IP addressDHCP/manual 192.168.00Measuring current I_m \leq 403 μ ANetwork mask255.255.255.Internal resistance R_i , Z_i \geq 124 k Ω BCOM addresssystem-1-Permissible extraneous DC voltage U_{fg} \leq 1200 VFunctioncommunication interface	- · · · · · · · · · · · · · · · · · · ·		Cable min. CAT
Measuring circuitConnectionRJ4Measuring voltage U_m profile dependent, $\pm 10 \text{ V}$, $\pm 50 \text{ V}$ (see profile overview in the manual)IP addressDHCP/manual 192.168.00Measuring current I_m $\leq 403 \mu \text{M}$ Network mask255.255.255.Internal resistance R_i, Z_i $\geq 124 k\Omega$ BCOM addresssystem-1-Permissible extraneous DC voltage U_{fg} $\leq 1200 \text{V}$ Functioncommunication interface	<u> </u>		Cable length ≤ 100
Measuring voltage U_m profile dependent, $\pm 10 \text{ V}$, $\pm 50 \text{ V}$ (see profile overview in the manual)IP addressDHCP/manual 192.168.0Measuring current I_m $\leq 403 \mu\text{A}$ Network mask255.255.255.Internal resistance R_i , Z_i $\geq 124 k\Omega$ BCOM addresssystem-1-Permissible extraneous DC voltage U_{fg} $\leq 1200 \text{ V}$ Functioncommunication interface	Measuring circuit		
Measuring current I_m $\leq 403 \mu \text{M}$ Network mask255.255.255.Internal resistance R_i , Z_i $\geq 124 k \Omega$ BCOM addresssystem-1-Permissible extraneous DC voltage U_{fg} $\leq 1200 \text{V}$ Functioncommunication interface	Measuring voltage $U_{\rm m}$ profile dependent, $\pm 10 {\rm V}$	±50 V (see profile overview in the manual)	
Internal resistance R_i, Z_i $\geq 124 k\Omega$ BCOM address system-1- Permissible extraneous DC voltage U_{fg} $\leq 1200 V$ Function communication interface			
Permissible extraneous DC voltage U_{fg} $\leq 1200 \text{ V}$ Function communication interface		•	
			,
retrilissible system leakage capacitance c _e profile dependent, U I WUU µ I			runction communication interfa
	remnissible system leakage capacitance C _e	prome dependent, 01000 μF	

Technical data (continued)

Sensor bus:		
Interface/protocol		RS-485 / isoData, BS bus, Modbus RTU
Data rate		9.6 kBaud/s
Cable: twisted pair, one end of shie	ld connected to PE	recommended: J-Y(St)Y min. 2x0.8
Cable length (depending on the ba	ud rate)	≤ 1200 m
Connection		terminals X1A, X1B
Terminating resistor		120 Ω , can be connected internally
Device address, BS bus		190
Switching elements		2 do 2000 000 000 000
Number of switching elements		2 changeover contacts
Operating mode		N/C operation/N/O operation
Contact 11-12-14/21-22-24	DC+ alarm*, symn	, Ins. alarm 2, connection fault, DC- alarm*, netrical alarm, device fault, common alarm, t complete, device inactive, DC offset alarm
Electrical endurance at rated opera	ting conditions	10.000 operating cycles
* Only for $U_n \ge 50 \text{ V}$		
Contact data acc. to IEC 60947-	5-1:	
Utilisation category	AC-	13 / AC-14 / DC-12 / DC-12 / DC-12 / DC-12
Pated operational voltage		230 V / 230 V / 24 V / 48 V / 110 V / 220 V

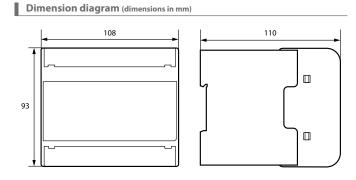
Utilisation category	AC-13 / AC-14 / DC-12 / DC-12 / DC-12 / DC-12
Rated operational voltage	230 V / 230 V / 24 V / 48 V / 110 V / 220 V
Rated operational current	5 A / 3 A / 1 A / 1 A / 0.2 A / 0.1 A
Rated insulation voltage ≤ 2000 m NN	250 V
Rated insulation voltage ≤ 3000 m NN	160 V
Minimum contact rating	1 mA at AC/DC \geq 10 V
Environment & EMC	
EMC	IEC 61326-2-4
Ambient temperatures:	
Operating temperature	-40+70°C
Transport	-40+85 ℃
Transport Long-term storage	-40+85 °C -40+70 °C

Classification of climatic conditions acc. to IEC 60721 (related to temperat	ture and relative humidity)
Stationary use (IEC 60721-3-3)	3K24
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions acc. to IEC 60721	
Stationary use (IFC 60721-3-3)	3M12

Transport (IEC 60721-3-2)

Area of application

Long-term storage (IEC 60721-3-1)

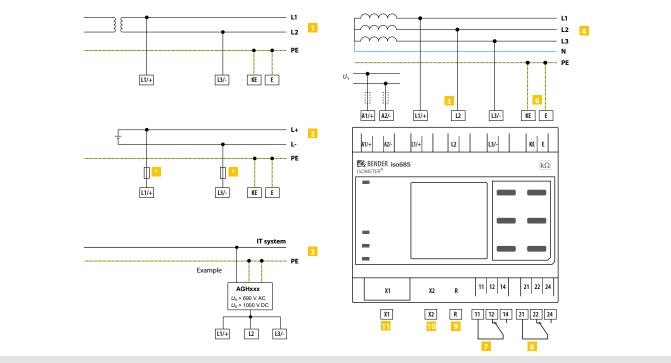


Connection	
Connection type screw-type terminal	or push-wire terminal, pluggabl
Screw-type terminals:	
Nominal current	≤ 10 /
Tightening torque	0.50.6 Nm (57 lb-in
Conductor sizes	AWG 24-12
Stripping length	7 mn
rigid/flexible	0.22.5 mm
flexible with ferrules, with/without plastic sleeve	0.252.5 mm
Multiple conductor	
rigid	0.21 mm
flexible	0.21.5 mm
flexible with ferrule without plastic sleeve	0.251 mm
flexible with TWIN ferrule with plastic sleeve	0.51.5 mm
Push-wire terminals:	
Nominal current	≤ 10 /
Conductor sizes	AWG 24-12
Stripping length	10 mn
rigid/flexible	0.22.5 mm
flexible with ferrules, with/without plastic sleeve	0.252.5 mm
Multiple conductor, flexible with TWIN ferrule with plastic sleeve	0.51.5 mm
Push-wire terminals X1:	
Nominal current	≤ 8 /
Conductor sizes	AWG 24-10
Stripping length	10 mn
rigid/flexible	0.21.5 mm
flexible with ferrule without plastic sleeve	0.251.5 mm
flexible with TWIN ferrule with plastic sleeve	0.250.75 mm
Other	
Operating mode	continuous operation
Mounting (0°)	display oriented
Degree of protection internal components	IP40
Degree of protection terminals	IP2
DIN rail mounting acc. to	IEC 6071:
Screw fixing	3 x M4 with mounting clip
Enclosure material	polycarbonat
Flammability class	V-(
ANSI code	6
Dimensions (W x H x D)	108 x 93 x 110 mn
Documentation number	D00178
Weight	< 390 (

* For best ventilation, align cooling slots vertically (0°). At an alignment of 45° the max. operating temperature is reduced by 10 °C. At an alignment fo 90° the max. operating temperature is reduced by 20 °C.

2M4 1M12

≤ 3000 m NN



- Connection to an AC system Un
- 2 Connection to a DC system U_n
- 3 Connection to an IT system with coupling device
- Connection to a 3(N)AC system
- Connection to the IT system to be monitored (L1/+, L2, L3/-)
- 6 Separate connection of KE, E to PE
- (K1) Alarm relay 1, available changeover contacts

- 8 (K2) Alarm relay 2, available changeover contacts
- Switchable resistor R for RS-485 bus termination
- Ethernet interface
- Digital interface
- For systems > 690 V and with overvoltage category III a fuse for the connection to the system to be monitored must be provided. Recommendation: 2A screw-in fuses.

Provide line protection!

According to DIN VDE 0100-430, a line protection shall be provided for the supply voltage.

NOTE:

According to DIN VDE 0100-430, devices for protection against a short circuit can be omitted for the coupling of terminals L1/+ and L3/- to the IT system ≤ 690 V to be monitored if the wiring is carried out in such a manner as to reduce the risk of a short circuit to a minimum. (Recommendation: Ensure shortcircuit-proof and earth-fault-proof wiring).

The connecting lines L1/+, L2, L3/- to the system to be monitored must be carried out as spur lines. No load current may be conducted through the terminals.

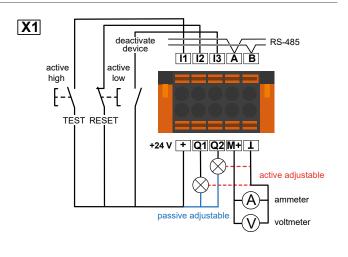
For UL applications:

Use 60/70°C copper lines only!

UL and CSA application require the supply voltage to be protected via 5 A fuses.

Digital interface X1

Digital interface	Terminal	Description
	l1l3	Configurable digital inputs (e.g. test, reset,)
	A, B	Serial interface RS-485, termination by means of a DIP switch R.
11 12 13 A B + Q1 Q2 M+ L	+	Supply voltage of the inputs and outputs I, Q and M. Electrical overload protection. Automatic shutdown in the event of short circuits and transients (resettable). When supplied via an external 24V source, A1/+, A2/- must not be connected.
	Q1, Q2	Configurable digital output
	M+	Configurable analogue output (e.g. measuring instrument)
	上	Reference potential ground



ISOMETER® isoRW685W-D-B

Insulation monitoring device for IT AC systems with galvanically connected rectifiers and converters and for IT DC systems especially for railway applications





Typical applications

- AC, DC or AC/DC main circuits
- AC/DC main circuits with directly connected DC components, such as rectifiers, converters, variablespeed drives
- · UPS systems, battery systems
- Heaters with phase control
- Systems with switch-mode power supplies
- IT systems with high leakage capacitances

Approvals





Device features

- ISOMETER® for AC IT systems with galvanically connected rectifiers or converters and for DC IT systems (IT = unearthed systems)
- · Automatic adaptation to the existing system leakage capacitance
- Combination of AMPPlus and other profile-dependent measurement methods
- Two separately adjustable response value ranges of 1 k Ω ...10 M Ω
- · High-resolution graphic LC display
- · Connection monitoring (monitoring of the measuring lines)
- · Automatic device self test
- Graphical representation of the insulation resistance over time (isoGraph)
- History memory with real-time clock (buffer for 13 days) for storing a maximum of 1023 alarm messages with date and time
- Current or voltage output 0(4)...20 mA, 0...400 μ A, 0...10 V, 2...10 V (galvanically separated) which is analogous to the measured insulation value of the system
- · Freely programmable digital inputs and outputs
- Remote setting via the Internet or Intranet (web server/option: COMTRAXX® gateway)
- Remote diagnosis via the Internet (made available by Bender Service only)
- isoData: Continuous uninterrupted data transmission
- RS-485/BS (Bender sensor bus) for data exchange with other Bender devices via Modbus RTU protocol
- BCOM, Modbus TCP und web server
- ISOnet: Internal separation of the ISOMETER® from the IT system to be monitored (e.g. if several IT systems are interconnected)
- · ISOnet priority: Permanent priority of a device within the network
- ISOloop: Special function for ring systems (all systems are coupled)

Standards

The ISOMETER® has been developed in compliance with the following standards:

- DIN EN 61557-8 (VDE 0413-8)
- IEC 61557-8
- DIN EN 50155
- DIN EN 45545-2

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Nominal system volta	age range $U_{\rm n}$ Supply voltage $U_{\rm S}$	Art. No.
isoRW685W-D-B	AC 0690 V; 0,1. DC 0100		0 Hz B91067022W

Accessories

Description	Art. No.
A set of screw terminals ¹⁾	B91067901
A set of push-wire terminals	B91067902
Enclosure accessories (terminal cover, 2 mounting clips) 1)	B91067903

included in the scope of delivery

Suitable system components

Description	Туре	Art. No.	Page
	AGH150W-4	B98018006	382
Caumlin m davisas	AGH204S-4	B914013	384
Coupling devices	AGH520S	B913033	385
	AGH676S-4	B913055	388

Suitable measuring instruments on request!



	60664-3	Measuring ranges	
Rated voltage	1000 V	Measuring range f _n	0,1460 Hz
Overvoltage category	III	Tolerance measurement of f_n	±1% ±0.1 Hz
Definitions:		Voltage range measurement of f _n	AC 25690 \
Measuring circuit (IC1)	L1/+, L2, L3/-	Measuring range U_{n}	AC 25690 V, DC 251000 V
Supply circuit (IC2)	A1, A2	Voltage range measurement of $U_{\rm n}$	AC/DC > 10 \
Output circuit 1 (IC3)	11, 12, 14	Tolerance measurement of U_n	±5 % ±5 \
Output circuit 2 (IC4)	21, 22, 24	Measuring range C _e	01000 μl
Control circuit (IC5)	(E, KE), X1, ETH, X3, X4	Tolerance measurement of C_e	±10 % ±10 μF
Rated impulse voltage:		Frequency range measurement of C _e	DC, 30460 Hz
IC1/(IC2-5)	8 kV	Min. insulation resistance measurement of C_e	typ. $> 10 \text{ k}\Omega$
IC2/(IC3-5)	4 kV	depending on the profile and coupling mode	71
IC3/(IC4-5)	4 kV		
IC4/IC5	4 kV	Display	
Rated insulation voltage:	TRV	Indication graphic	display 127 x 127 pixels, 40 x 40 mm ³
3	1000 V	Display range measured value	0.1 kΩ20 MΩ
IC1/(IC2-5)	250 V	Operating uncertainty (acc. to IEC 61557-8)	±15 %, min. ±1 kΩ
IC2/(IC3-5)		· · · · · · · · · · · · · · · · · · ·	
IC3/(IC4-5)	250 V	* Indication is limited outside the temperature range -25+:	55 °C.
IC4/IC5	250 V	LED-	
Pollution degree outside ($U_{\rm n}$ < 690 V)	3	LEDs	
Pollution degree outside ($U_n > 690 < 1000 \text{ V}$)	2	ON (operation LED)	greer
Protective separation (reinforced insulation) between:		SERVICE	yellow
IC1/(IC2-5)	Overvoltage category III, 1000 V	ALARM 1	yellow
IC2/(IC3-5)	Overvoltage category III, 300 V	ALARM 2	yellow
IC3/(IC4-5)	Overvoltage categoryIII, 300 V	I. (0	·
IC4/IC5	Overvoltage category III, 300 V	In-/Outputs (X1)	
Voltage test (routine test) according to IEC 61010-1:	<u> </u>	Cable length X1 (unshielded cable)	≤ 10 m
IC2/(IC3-5)	AC 2,2 kV	Cable length X1 (shielded cable, shield connected to PE on one s	side) recommended:
IC3/(IC4-5)	AC 2,2 kV	J-Y(St)Y min. 2x0,8	≤ 100 m
IC4/IC5	AC 2,2 kV	Max output current for supply via X1+/X1GND per output	max. 1 A
16,7165	71C 2/2 111	Max output current for supply via A1/A2 in total on X1	max. 200 mA
Supply voltage		Max output current for supply via A1/A2 in total on X1 between	16.8 V and 40 V
Supply via A1/+, A2/-:			$I_{LmaxX1} = 10 \text{ mA} + 7 \text{ mA/V } U_s *$
Supply voltage range U_S	AC/DC 24240 V	* // is the supply voltage of the ISOMETED® Negative values for	
,		* $U_{\rm S}$ is the supply voltage of the ISOMETER®. Negative values for	or /LmaxX1 are not permissible.
Tolerance of U _S	-30+15%	Dinital Innuta (II I2 I2)	
Maximum permissible input current of U _s	650 mA	Digital Inputs (I1, I2, I3)	
Frequency range of $U_{\rm S}$	DC, 50400 Hz*	Number	3
Tolerance of the frequency range of U_S	-5+15 %	Operating mode, adjustable	high-active, low-active
		Operating mode, adjustable	
Power consumption, typically at DC	≤ 12 W	Functions off, test, reset, deacti	vate device, start initial measurement
Power consumption, typically at DC Power consumption, typically at 50/60 Hz	≤ 12 W ≤ 12 W/21 VA	Functions off, test, reset, deacti Voltage	
Power consumption, typically at DC	≤ 12 W	Functions off, test, reset, deacti	vate device, start initial measurement
Power consumption, typically at DC Power consumption, typically at 50/60 Hz	≤ 12 W ≤ 12 W/21 VA ≤ 12 W/45 VA	Functions off, test, reset, deacti Voltage Tolerance Voltage	vate device, start initial measurement Low DC -35 V, High DC 1132 V
Power consumption, typically at DC Power consumption, typically at 50/60 Hz Power consumption, typically at 400 Hz	\leq 12 W \leq 12 W/21 VA \leq 12 W/45 VA \leq must be shockproof. Only permanently	Functions off, test, reset, deacti Voltage Tolerance Voltage Digital Outputs (Q1, Q2)	vate device, start initial measurement Low DC -35 V, High DC 1132 V ±10 %
Power consumption, typically at DC Power consumption, typically at 50/60 Hz Power consumption, typically at 400 Hz * At frequencies > 200 Hz, the connection of X1 and remote installed devices which at least have overvoltage categor	\leq 12 W \leq 12 W/21 VA \leq 12 W/45 VA \leq must be shockproof. Only permanently	Functions off, test, reset, deacti Voltage Tolerance Voltage Digital Outputs (Q1, Q2) Number	vate device, start initial measurement Low DC -35 V, High DC 1132 V ±10 %
Power consumption, typically at DC Power consumption, typically at 50/60 Hz Power consumption, typically at 400 Hz * At frequencies > 200 Hz, the connection of X1 and remote installed devices which at least have overvoltage categor Supply via X1:	≤ 12 W ≤ 12 W/21 VA ≤ 12 W/45 VA e must be shockproof. Only permanently ry II (300 V) may be connected.	Functions off, test, reset, deacti Voltage Tolerance Voltage Digital Outputs (Q1, Q2) Number Operating mode, adjustable	vate device, start initial measurement Low DC -35 V, High DC 1132 V ±10 %
Power consumption, typically at DC Power consumption, typically at 50/60 Hz Power consumption, typically at 400 Hz * At frequencies > 200 Hz, the connection of X1 and remote installed devices which at least have overvoltage categor Supply via X1: Supply voltage U _S	≤ 12 W ≤ 12 W/21 VA ≤ 12 W/45 VA e must be shockproof. Only permanently ry II (300 V) may be connected.	Functions off, test, reset, deactive Voltage Tolerance Voltage Digital Outputs (Q1, Q2) Number Operating mode, adjustable Functions off, Ins. alarm 1, Ins	vate device, start initial measurement Low DC -35 V, High DC 1132 V ±10 % 2 active, passive alarm 2, connection fault, DC- alarm*,
Power consumption, typically at DC Power consumption, typically at 50/60 Hz Power consumption, typically at 400 Hz * At frequencies > 200 Hz, the connection of X1 and remote installed devices which at least have overvoltage categor Supply via X1:	≤ 12 W ≤ 12 W/21 VA ≤ 12 W/45 VA e must be shockproof. Only permanently ry II (300 V) may be connected.	Functions off, test, reset, deactive Voltage Tolerance Voltage Digital Outputs (Q1, Q2) Number Operating mode, adjustable Functions off, Ins. alarm 1, Ins. alarm 1, Ins. alarm 2, Ins. alarm 3, Ins. alarm 4, Ins. alarm 5, Ins. alarm 5, Ins. alarm 6, Ins. alarm 7, Ins	vate device, start initial measurement Low DC -35 V, High DC 1132 V ±10 % 2 active, passive alarm 2, connection fault, DC- alarm*, al alarm, device fault, common alarm,
Power consumption, typically at DC Power consumption, typically at 50/60 Hz Power consumption, typically at 400 Hz * At frequencies > 200 Hz, the connection of X1 and remote installed devices which at least have overvoltage categor Supply via X1: Supply voltage U ₅ Tolerance of U ₅	≤ 12 W ≤ 12 W/21 VA ≤ 12 W/45 VA e must be shockproof. Only permanently ry II (300 V) may be connected.	Functions off, test, reset, deactive Voltage Tolerance Voltage Digital Outputs (Q1, Q2) Number Operating mode, adjustable Functions off, Ins. alarm 1, Ins. alarm 1, Ins. alarm 2, Ins. alarm 3, Ins. alarm 4, Ins. alarm 5, Ins. alarm 6, Ins. alarm 7, Ins. alarm 7, Ins. alarm 7, Ins. alarm 7, Ins. alarm 8, Ins. alarm 1, Ins	vate device, start initial measurement Low DC -35 V, High DC 1132 V ±10 % 2 active, passive alarm 2, connection fault, DC- alarm*, al alarm, device fault, common alarm, uplete, device inactive, DC offset alarm
Power consumption, typically at DC Power consumption, typically at 50/60 Hz Power consumption, typically at 400 Hz * At frequencies > 200 Hz, the connection of X1 and remote installed devices which at least have overvoltage categor Supply via X1: Supply voltage U _S Tolerance of U _S IT system being monitored	≤ 12 W ≤ 12 W/21 VA ≤ 12 W/45 VA s must be shockproof. Only permanently ry II (300 V) may be connected. DC 24 V DC -20+25 %	Functions off, test, reset, deactive Voltage Tolerance Voltage Digital Outputs (Q1, Q2) Number Operating mode, adjustable Functions off, Ins. alarm 1, Ins. alarm 1, Ins. alarm 2, Ins. alarm 3, Ins. alarm 4, Ins. alarm 5, Ins. alarm 5, Ins. alarm 6, Ins. alarm 7, Ins. alarm 7, Ins. alarm 7, Ins. alarm 7, Ins. alarm 8, Ins. alarm 9, Ins. alarm 9, Ins. alarm 1, Ins. alarm 9, Ins. alarm 1, Ins	vate device, start initial measurement Low DC -35 V, High DC 1132 V ±10 % 2 active, passive alarm 2, connection fault, DC- alarm*, al alarm, device fault, common alarm,
Power consumption, typically at DC Power consumption, typically at 50/60 Hz Power consumption, typically at 400 Hz * At frequencies > 200 Hz, the connection of X1 and remote installed devices which at least have overvoltage categor Supply via X1: Supply voltage U _S Tolerance of U _S IT system being monitored Nominal system voltage range U _n	≤ 12 W ≤ 12 W/21 VA ≤ 12 W/45 VA emust be shockproof. Only permanently ry II (300 V) may be connected. DC 24 V DC -20+25 % AC 0690 V, DC 01000 V	Functions off, test, reset, deactive Voltage Tolerance Voltage Digital Outputs (Q1, Q2) Number Operating mode, adjustable Functions off, Ins. alarm 1, Ins. alarm 1, Ins. alarm 2, Ins. alarm 3, Ins. alarm 4, Ins. alarm 5, Ins. alarm 5, Ins. alarm 6, Ins. alarm 7, Ins. alarm 7, Ins. alarm 7, Ins. alarm 7, Ins. alarm 8, Ins. alarm 9, Ins. alarm 9, Ins. alarm 1, Ins. alarm 9, Ins. alarm 1, Ins	vate device, start initial measurement Low DC -35 V, High DC 1132 V ±10 % 2 active, passive alarm 2, connection fault, DC- alarm*, al alarm, device fault, common alarm, uplete, device inactive, DC offset alarm
Power consumption, typically at DC Power consumption, typically at 50/60 Hz Power consumption, typically at 400 Hz * At frequencies > 200 Hz, the connection of X1 and remote installed devices which at least have overvoltage categor * Supply via X1: Supply voltage U _S Tolerance of U _S IT system being monitored Nominal system voltage range U _n for UL applications	≤ 12 W ≤ 12 W/21 VA ≤ 12 W/45 VA struct be shockproof. Only permanently by II (300 V) may be connected. DC 24 V DC -20+25 % AC 0690 V, DC 01000 V AC/DC 0600 V	Functions off, test, reset, deactive Voltage Tolerance Voltage Digital Outputs (Q1, Q2) Number Operating mode, adjustable Functions off, Ins. alarm 1, Ins. alarm 1, Ins. alarm 2, Ins. alarm 3, Ins. alarm 4, Ins. alarm 5, Ins. alarm 6, Ins. alarm 7, Ins. alarm 7, Ins. alarm 7, Ins. alarm 7, Ins. alarm 8, Ins. alarm 1, Ins	vate device, start initial measurement Low DC -35 V, High DC 1132 V ±10 % 2 active, passive alarm 2, connection fault, DC- alarm*, al alarm, device fault, common alarm, uplete, device inactive, DC offset alarm
Power consumption, typically at DC Power consumption, typically at 50/60 Hz Power consumption, typically at 400 Hz * At frequencies > 200 Hz, the connection of X1 and remote installed devices which at least have overvoltage categor * Supply via X1: Supply voltage U _S Tolerance of U _S IT system being monitored Nominal system voltage range U _n for UL applications Tolerance of U _n	≤ 12 W ≤ 12 W/21 VA ≤ 12 W/25 VA e must be shockproof. Only permanently ry II (300 V) may be connected. DC 24 V DC -20+25 % AC 0690 V, DC 01000 V AC/DC -15 %	Functions off, test, reset, deactive Voltage Tolerance Voltage Digital Outputs (Q1, Q2) Number Operating mode, adjustable Functions off, Ins. alarm 1, Ins. alarm 1, Ins. alarm 2, Ins. alarm 3, Ins. alarm 4, Ins. alarm 5, Ins. alarm 5, Ins. alarm 6, Ins. alarm 7, Ins. alarm 7, Ins. alarm 7, Ins. alarm 7, Ins. alarm 8, Ins. alarm 9, Ins. alarm 9, Ins. alarm 1, Ins. alarm 9, Ins. alarm 1, Ins	vate device, start initial measurement Low DC -35 V, High DC 1132 V ±10 % 2 active, passive alarm 2, connection fault, DC- alarm*, al alarm, device fault, common alarm, uplete, device inactive, DC offset alarm
Power consumption, typically at DC Power consumption, typically at 50/60 Hz Power consumption, typically at 400 Hz * At frequencies > 200 Hz, the connection of X1 and remote installed devices which at least have overvoltage categor * Supply via X1: Supply voltage U _S Tolerance of U _S IT system being monitored Nominal system voltage range U _n for UL applications Tolerance of U _n Frequency range of U _n	≤ 12 W ≤ 12 W/21 VA ≤ 12 W/21 VA ≤ 12 W/45 VA e must be shockproof. Only permanently ry II (300 V) may be connected. DC 24 V DC -20+25 % AC 0690 V, DC 01000 V AC/DC 0600 V AC/DC +15 % DC, 0.1460 Hz	Functions off, test, reset, deactive Voltage Tolerance Voltage Digital Outputs (Q1, Q2) Number Operating mode, adjustable Functions off, Ins. alarm 1, Ins. a DC+ alarm*, symmetric measurement com Voltage passive * Only for $U_n \ge 50 \text{ V}$ Analogue Output (M+)	vate device, start initial measurement Low DC -35 V, High DC 1132 V ±10 % 2 active, passive alarm 2, connection fault, DC- alarm*, al alarm, device fault, common alarm, uplete, device inactive, DC offset alarm
Power consumption, typically at DC Power consumption, typically at 50/60 Hz Power consumption, typically at 400 Hz * At frequencies > 200 Hz, the connection of X1 and remote installed devices which at least have overvoltage categor * Supply via X1: Supply voltage U _S Tolerance of U _S IT system being monitored Nominal system voltage range U _n for UL applications Tolerance of U _n	≤ 12 W ≤ 12 W/21 VA ≤ 12 W/25 VA e must be shockproof. Only permanently ry II (300 V) may be connected. DC 24 V DC -20+25 % AC 0690 V, DC 01000 V AC/DC -15 %	Functions off, test, reset, deactive Voltage Tolerance Voltage Digital Outputs (Q1, Q2) Number Operating mode, adjustable Functions off, Ins. alarm 1, Ins. and DC+ alarm*, symmetric measurement com Voltage passive * Only for $U_n \geq 50 \text{ V}$ Analogue Output (M+) Number	vate device, start initial measurement Low DC -35 V, High DC 1132 V ±10 % 2 active, passive alarm 2, connection fault, DC- alarm*, al alarm, device fault, common alarm, uplete, device inactive, DC offset alarm DC 032 V, active DC 0/19.232 V
Power consumption, typically at DC Power consumption, typically at 50/60 Hz Power consumption, typically at 400 Hz * At frequencies > 200 Hz, the connection of X1 and remote installed devices which at least have overvoltage categor * Supply via X1: * Supply via X1: * Supply voltage \$U_5\$ * Tolerance of \$U_5\$ * IT system being monitored * Nominal system voltage range \$U_n\$ * for UL applications * Tolerance of \$U_n\$ * Frequency range of \$U_n\$ * Max. alternating voltage \$U^{\sim}\$ (for \$f_n < 4\$ Hz)	≤ 12 W ≤ 12 W/21 VA ≤ 12 W/21 VA ≤ 12 W/45 VA e must be shockproof. Only permanently ry II (300 V) may be connected. DC 24 V DC -20+25 % AC 0690 V, DC 01000 V AC/DC 0600 V AC/DC +15 % DC, 0.1460 Hz	Functions off, test, reset, deactive Voltage Tolerance Voltage Digital Outputs (Q1, Q2) Number Operating mode, adjustable Functions off, Ins. alarm 1, Ins. and DC+ alarm*, symmetric measurement com Voltage passive * Only for $U_n \ge 50 \text{ V}$ Analogue Output (M+) Number Operating mode	vate device, start initial measurement Low DC -35 V, High DC 1132 V ±10 % 2 active, passive alarm 2, connection fault, DC- alarm*, al alarm, device fault, common alarm, uplete, device inactive, DC offset alarm DC 032 V, active DC 0/19.232 V
Power consumption, typically at DC Power consumption, typically at 50/60 Hz Power consumption, typically at 400 Hz * At frequencies > 200 Hz, the connection of X1 and remote installed devices which at least have overvoltage categor * Supply via X1: * Supply voltage \$U_5\$ * Tolerance of \$U_5\$ * IT system being monitored * Nominal system voltage range \$U_n\$ * for UL applications * Tolerance of \$U_n\$ * Frequency range of \$U_n\$ * Max. alternating voltage \$U^{\sim}\$ (for \$f_n < 4\$ Hz) * Response values	\leq 12 W \leq 12 W/21 VA \leq 12 W/25 VA \leq 12 W/45 VA \leq 12 W/45 VA \leq 10 W/45	Functions off, test, reset, deactive Voltage Tolerance Voltage Digital Outputs (Q1, Q2) Number Operating mode, adjustable Functions off, Ins. alarm 1,	vate device, start initial measurement Low DC -35 V, High DC 1132 V ±10 % 2 active, passive alarm 2, connection fault, DC- alarm*, al alarm, device fault, common alarm, plete, device inactive, DC offset alarm DC 032 V, active DC 0/19.232 V
Power consumption, typically at DC Power consumption, typically at 50/60 Hz Power consumption, typically at 400 Hz * At frequencies > 200 Hz, the connection of X1 and remote installed devices which at least have overvoltage categor * Supply via X1: * Supply via X1: * Supply voltage \$U_5\$ * Tolerance of \$U_5\$ * IT system being monitored * Nominal system voltage range \$U_n\$ * for UL applications * Tolerance of \$U_n\$ * Frequency range of \$U_n\$ * Max. alternating voltage \$U^{\sim}\$ (for \$f_n < 4\$ Hz) * Response value \$R_{an1}\$ (ALARM 1)	$\leq 12 \text{ W}$ $\leq 12 \text{ W/21 VA}$ $\leq 12 \text{ W/45 VA}$ The must be shockproof. Only permanently rry II (300 V) may be connected. $DC 24 \text{ V}$ $DC -20+25 \%$ $AC 0690 \text{ V, DC } 01000 \text{ V}$ $AC/DC 0600 \text{ V}$ $AC/DC +15 \%$ $DC, 0.1460 \text{ Hz}$ $U \sim_{\text{max}} = 50 \text{ V x } (1+f_n^2)$ $1 \text{ k}\Omega10 \text{ M}\Omega$	Functions off, test, reset, deactively located voltage Digital Outputs (Q1, Q2) Number Operating mode, adjustable Functions off, Ins. alarm 1, Ins. alarm 1, Ins. alarm 1, Ins. alarm 2, Ins. alarm 3, Ins. alarm 4, Ins. alarm 4, Ins. alarm 5, Ins. alarm 6, Ins. alarm 1, Ins. alarm	vate device, start initial measurement Low DC -35 V, High DC 1132 V ±10 % active, passive alarm 2, connection fault, DC- alarm*, al alarm, device fault, common alarm, plete, device inactive, DC offset alarm DC 032 V, active DC 0/19.232 V linear, midscale point 28 kΩ/120 kΩ insulation value, DC offset mA (< 600 Ω), 0400 μA (< 4 kΩ)
Power consumption, typically at DC Power consumption, typically at 50/60 Hz Power consumption, typically at 400 Hz * At frequencies > 200 Hz, the connection of X1 and remote installed devices which at least have overvoltage categor * Supply via X1: * Supply via X1: * Supply voltage Us Tolerance of Us * IT system being monitored * Nominal system voltage range Un for UL applications * Tolerance of Un * Max. alternating voltage U~ (for fn < 4 Hz) * Response value Ran1 (ALARM 1) * Response value Ran2 (ALARM 2)	$\leq 12 \text{ W}$ $\leq 12 \text{ W/21 VA}$ $\leq 12 \text{ W/45 VA}$ The must be shockproof. Only permanently rry II (300 V) may be connected. $DC 24 \text{ V}$ $DC -20+25 \%$ $AC 0690 \text{ V, DC } 01000 \text{ V}$ $AC/DC 0600 \text{ V}$ $AC/DC +15 \%$ $DC, 0.1460 \text{ Hz}$ $U \sim_{\text{max}} = 50 \text{ V x } (1+f_n^2)$ $1 \text{ k}\Omega10 \text{ M}\Omega$ $1 \text{ k}\Omega10 \text{ M}\Omega$	Functions off, test, reset, deactively lost of the set	vate device, start initial measurement Low DC -3 5 V, High DC 11 32 V ± 10 % ± 10
Power consumption, typically at DC Power consumption, typically at 50/60 Hz Power consumption, typically at 400 Hz * At frequencies > 200 Hz, the connection of X1 and remote installed devices which at least have overvoltage categor * Supply via X1: Supply voltage Us Tolerance of Us IT system being monitored Nominal system voltage range Unfor UL applications Tolerance of Un Frequency range of Un Max. alternating voltage U~ (for fn < 4 Hz) * Response value Ran1 (ALARM 1) Response value Ran2 (ALARM 2) Relative uncertainty (acc. to IEC 61557-8)	$\leq 12 \text{ W}$ $\leq 12 \text{ W/21 VA}$ $\leq 12 \text{ W/45 VA}$ The must be shockproof. Only permanently ray II (300 V) may be connected. $DC 24 \text{ V}$ $DC -20+25 \%$ $AC 0690 \text{ V, DC } 01000 \text{ V}$ $AC/DC 0600 \text{ V}$ $AC/DC +15 \%$ $DC, 0.1460 \text{ Hz}$ $U \sim_{\text{max}} = 50 \text{ V x } (1+f_n^2)$ $1 \text{ k}\Omega10 \text{ M}\Omega$ $1 \text{ k}\Omega10 \text{ M}\Omega$ profile dependent, $\pm 15 \%$, at least $\pm 1 \text{ k}\Omega$	Functions off, test, reset, deactively located voltage Digital Outputs (Q1, Q2) Number Operating mode, adjustable Functions off, Ins. alarm 1, Ins. alarm 1, Ins. alarm 1, Ins. alarm 2, Ins. alarm 3, Ins. alarm 4, Ins. alarm 4, Ins. alarm 5, Ins. alarm 6, Ins. alarm 1, Ins. alarm	vate device, start initial measurement Low DC -3 5 V, High DC 11 32 V ± 10 % ± 10
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Power consumption, typically at DC Power consumption, typically at 50/60 Hz Power consumption, typically at 50/60 Hz * At frequencies > 200 Hz, the connection of X1 and remote installed devices which at least have overvoltage categor * Supply via X1: Supply via X1: Supply voltage U _S Tolerance of U _S IT system being monitored Nominal system voltage range U _n for UL applications Tolerance of U _n Frequency range of U _n Max. alternating voltage U~ (for f _n < 4 Hz) * Response value R _{an1} (ALARM 1) Response value R _{an2} (ALARM 2) Relative uncertainty (acc. to IEC 61557-8) Hysteresis * Time response	$\leq 12 \text{ W}$ $\leq 12 \text{ W/21 VA}$ $\leq 12 \text{ W/45 VA}$ e must be shockproof. Only permanently ry II (300 V) may be connected. $DC 24 \text{ V}$ $DC -20 + 25 \%$ $AC 0690 \text{ V, DC } 01000 \text{ V}$ $AC/DC 0600 \text{ V}$ $AC/DC 0600 \text{ V}$ $AC/DC -15 \%$ $DC, 0.1460 \text{ Hz}$ $U \sim \text{max} = 50 \text{ V x } (1 + f_n^2)$ $1 \text{ k}\Omega10 \text{ M}\Omega$ $1 \text{ k}\Omega10 \text{ M}\Omega$ profile dependent, $\pm 15 \%$, at least $\pm 1 \text{ k}\Omega$ 25% , at least $1 \text{ k}\Omega$	Functions off, test, reset, deactively lotage Tolerance Voltage Digital Outputs (Q1, Q2) Number Operating mode, adjustable Functions off, Ins. alarm 1, Ins. alarm 1, Ins. alarm 2, Ins. alarm 3, Ins. alarm 4, Ins. alarm 5, Ins. alarm 6, Ins. alarm 7, Ins. alarm 7, Ins. alarm 7, Ins. alarm 8, Ins. alarm 1,	vate device, start initial measurement Low DC -3 5 V, High DC 11 32 V ± 10 % ± 10 % ± 10 % ± 10 % active, passive alarm 2, connection fault, DC- alarm*, all alarm, device fault, common alarm, uplete, device inactive, DC offset alarm DC 0 32 V, active DC 0/19.2 32 V ± 10 linear, midscale point 28 k ± 10 k (± 10 k ± 10 k (± 10 k) ± 10 k) ± 10 k (± 10 k) ± 10 k) ± 10 k (± 10 k) ± 10 k
Power consumption, typically at DC Power consumption, typically at 50/60 Hz Power consumption, typically at 50/60 Hz * At frequencies > 200 Hz, the connection of X1 and remote installed devices which at least have overvoltage categor * Supply via X1: Supply via X1: Supply voltage \$U_S\$ Tolerance of \$U_S\$ IT system being monitored Nominal system voltage range \$U_N\$ for UL applications Tolerance of \$U_N\$ Frequency range of \$U_N\$ Max. alternating voltage \$U_N\$ (for \$f_N < 4\$ Hz) Response values Response value \$R_{an1}\$ (ALARM 1) Response value \$R_{an2}\$ (ALARM 2) Relative uncertainty (acc. to IEC 61557-8) Hysteresis	$\leq 12 \text{ W}$ $\leq 12 \text{ W/21 VA}$ $\leq 12 \text{ W/45 VA}$ emust be shockproof. Only permanently ry II (300 V) may be connected. $DC 24 \text{ V}$ $DC -20 + 25 \%$ $AC 0690 \text{ V, DC } 01000 \text{ V}$ $AC/DC 0600 \text{ V}$ $AC/DC 0600 \text{ V}$ $AC/DC +15 \%$ $DC, 0.1460 \text{ Hz}$ $U \sim_{\text{max}} = 50 \text{ V x } (1 + f_n^2)$ $1 \text{ k}\Omega10 \text{ M}\Omega$ $1 \text{ k}\Omega10 \text{ M}\Omega$ profile dependent, $\pm 15 \%$, at least $\pm 1 \text{ k}\Omega$ 25% , at least $1 \text{ k}\Omega$	Functions off, test, reset, deactively located voltage Tolerance Voltage Digital Outputs (Q1, Q2) Number Operating mode, adjustable Functions off, Ins. alarm 1, Ins. alarm 1, Ins. alarm 2, Ins. alarm 3, Ins. alarm 4, Ins. alarm 5, Ins. alarm 6, Ins. alarm 7, Ins. alarm 7, Ins. alarm 7, Ins. alarm 8, Ins. alarm 9, Ins. alarm 1, Ins. alarm 1	vate device, start initial measurement Low DC -3 5 V, High DC 11 32 V ± 10 % ± 10 % ± 10 % ± 10 % active, passive alarm 2, connection fault, DC- alarm*, all alarm, device fault, common alarm, plete, device inactive, DC offset alarm DC 0 32 V, active DC 0/19.2 32 V ± 10 linear, midscale point 28 k ± 10 k (< 4 k ± 10) ± 10 k (< 4 k ± 10) ± 10 V (> 1 k ± 10) ± 10 W (> 1 k ± 10) ± 10 W web server/Modbus TCP/BCOM
Power consumption, typically at DC Power consumption, typically at 50/60 Hz Power consumption, typically at 50/60 Hz Power consumption, typically at 400 Hz * At frequencies > 200 Hz, the connection of X1 and remote installed devices which at least have overvoltage categor * Supply via X1: * Supply via X1: * Supply voltage U _S Tolerance of U _S * IT system being monitored * Nominal system voltage range U _n for UL applications * Tolerance of U _n Frequency range of U _n Max. alternating voltage U~ (for f _n < 4 Hz) * Response value R _{an1} (ALARM 1) Response value R _{an2} (ALARM 2) Relative uncertainty (acc. to IEC 61557-8) * Hysteresis * Time response * Response time t _{an} at R _F = 0.5 x R _{an} (10 kΩ) and C _e (1 μF) and the constraints of the con	$\leq 12 \text{ W}$ $\leq 12 \text{ W/21 VA}$ $\leq 12 \text{ W/45 VA}$ The must be shockproof. Only permanently by the shockproof of the sh	Functions off, test, reset, deactive Voltage Tolerance Voltage Digital Outputs (Q1, Q2) Number Operating mode, adjustable Functions off, Ins. alarm 1, Ins. and DC+ alarm*, symmetric measurement com Voltage passive * Only for $U_n \ge 50 \text{ V}$ Analogue Output (M+) Number Operating mode Functions Current 020 mA ($< 600 \Omega$), 420 Voltage 0 Tolerance related to the current/voltage final value Interfaces Field bus: Interface/protocol Data rate	vate device, start initial measurement Low DC -3 5 V, High DC 11 32 V ± 10 % 2 active, passive alarm 2, connection fault, DC- alarm*, all alarm, device fault, common alarm, plete, device inactive, DC offset alarm DC 0 32 V, active DC 0/19.2 32 V 1 linear, midscale point 28 k Ω /120 k Ω insulation value, DC offset mA (< 600 Ω), 0 400 μ A (< 4 k Ω) 10 V (> 1 k Ω), 2 10 V (> 1 k Ω) ± 20 % web server/Modbus TCP/BCOM 10/100 Mbit/s, autodetect
Power consumption, typically at DC Power consumption, typically at 50/60 Hz Power consumption, typically at 50/60 Hz * At frequencies > 200 Hz, the connection of X1 and remote installed devices which at least have overvoltage categor * Supply via X1: Supply via X1: Supply voltage U _S Tolerance of U _S IT system being monitored Nominal system voltage range U _n for UL applications Tolerance of U _n Frequency range of U _n Max. alternating voltage U~ (for f _n < 4 Hz) * Response value R _{an1} (ALARM 1) Response value R _{an2} (ALARM 2) Relative uncertainty (acc. to IEC 61557-8) Hysteresis * Time response	$\leq 12 \text{ W}$ $\leq 12 \text{ W/21 VA}$ $\leq 12 \text{ W/45 VA}$ The must be shockproof. Only permanently by the shockproof of the sh	Functions off, test, reset, deactive Voltage Tolerance Voltage Digital Outputs (Q1, Q2) Number Operating mode, adjustable Functions off, Ins. alarm 1, Ins. and DC+ alarm*, symmetric measurement com Voltage passive * Only for $U_n \ge 50 \text{ V}$ Analogue Output (M+) Number Operating mode Functions Current 020 mA ($< 600 \Omega$), 420 Voltage 0 Tolerance related to the current/voltage final value Interfaces Field bus: Interface/protocol Data rate Max. amount Modbus requests	vate device, start initial measurement Low DC -3 5 V, High DC 11 32 V ± 10 % ± 10 % ± 10 % active, passive alarm 2, connection fault, DC- alarm*, al alarm device fault, common alarm, plete, device inactive, DC offset alarm DC 0 32 V, active DC 0/19.2 32 V ± 10 insulation value, DC offset mA (< ± 10 600 ± 10), 0 400 ± 10 M (< ± 10 4 k ± 10) ± 10 % ± 10 % web server/Modbus TCP/BCOM 10/100 Mbit/s, autodetect < ± 100 /s.
Power consumption, typically at DC Power consumption, typically at 50/60 Hz Power consumption, typically at 50/60 Hz * At frequencies > 200 Hz, the connection of X1 and remote installed devices which at least have overvoltage categor * Supply via X1: Supply via X1: Supply voltage U _S Tolerance of U _S IT system being monitored Nominal system voltage range U _n for UL applications Tolerance of U _n Frequency range of U _n Max. alternating voltage U ~ (for f _n < 4 Hz) * Response value R _{an1} (ALARM 1) Response value R _{an2} (ALARM 2) Relative uncertainty (acc. to IEC 61557-8) Hysteresis * Time response Response time t _{an} at R _F = 0.5 x R _{an} (10 kΩ) and C _e (1 μF) and Response time DC alarm at C _e = 1 μF	$\leq 12 \text{ W}$ $\leq 12 \text{ W/21 VA}$ $\leq 12 \text{ W/45 VA}$ The must be shockproof. Only permanently by the shockproof of the sh	Functions off, test, reset, deactive Voltage Tolerance Voltage Digital Outputs (Q1, Q2) Number Operating mode, adjustable Functions off, Ins. alarm 1, Ins. and DC+ alarm*, symmetric measurement com Voltage passive * Only for $U_n \ge 50 \text{ V}$ Analogue Output (M+) Number Operating mode Functions Current 020 mA ($< 600 \Omega$), 420 Voltage 0 Tolerance related to the current/voltage final value Interfaces Field bus: Interface/protocol Data rate Max. amount Modbus requests Cable	vate device, start initial measurement Low DC -3 5 V, High DC 11 32 V ± 10 % 2 active, passive alarm 2, connection fault, DC- alarm*, all alarm, device fault, common alarm, plete, device inactive, DC offset alarm DC 0 32 V, active DC 0/19.2 32 V ± 10 linear, midscale point 28 k ± 10 /120 k ± 10 insulation value, DC offset mA (< 600 ± 10), 0 400 ± 10 k ± 10 % ± 10 Web server/Modbus TCP/BCOM ± 10 web server/Modbus TCP/BCOM 10/100 Mbit/s, autodetect < 100/s min. CAT 6
Power consumption, typically at DC Power consumption, typically at 50/60 Hz Power consumption, typically at 50/60 Hz * At frequencies > 200 Hz, the connection of X1 and remote installed devices which at least have overvoltage categor * Supply via X1: Supply voltage U _S Tolerance of U _S IT system being monitored Nominal system voltage range U _n for UL applications Tolerance of U _n Frequency range of U _n Max. alternating voltage U~ (for f _n < 4 Hz) Response values Response value R _{an1} (ALARM 1) Response value R _{an2} (ALARM 2) Relative uncertainty (acc. to IEC 61557-8) Hysteresis Time response Response time t _{an} at R _F = 0.5 x R _{an} (10 kΩ) and C _e (1 μF) and Response time DC alarm at C _e = 1 μF Start-up delay T _{start-up}	$\leq 12 \text{ W}$ $\leq 12 \text{ W/21 VA}$ $\leq 12 \text{ W/45 VA}$ The must be shockproof. Only permanently by the shockproof of the sh	Functions off, test, reset, deactive Voltage Tolerance Voltage Digital Outputs (Q1, Q2) Number Operating mode, adjustable Functions off, Ins. alarm 1, Ins. and DC+ alarm*, symmetric measurement com Voltage passive * Only for Un ≥ 50 V Analogue Output (M+) Number Operating mode Functions Current 020 mA (< 600 Ω), 420 Voltage 0 Tolerance related to the current/voltage final value Interfaces Field bus: Interface/protocol Data rate Max. amount Modbus requests Cable Cable length	vate device, start initial measurement Low DC -35 V, High DC 1132 V ± 10 % active, passive alarm 2, connection fault, DC- alarm* al alarm, device fault, common alarm, plete, device inactive, DC offset alarm DC 032 V, active DC 0/19.232 V insulation value, DC offset mA (< 600Ω), 0400 μ A (< $4 k\Omega$) ± 20 % web server/Modbus TCP/BCOM 10/100 Mbit/s, autodetect < $100/5$ min. CAT 6 ≤ 100 min. CAT 6
Power consumption, typically at DC Power consumption, typically at 50/60 Hz Power consumption, typically at 50/60 Hz * At frequencies > 200 Hz, the connection of X1 and remote installed devices which at least have overvoltage categor * Supply via X1: Supply voltage U _S Tolerance of U _S IT system being monitored Nominal system voltage range U _n for UL applications Tolerance of U _n Frequency range of U _n Max. alternating voltage U~ (for f _n < 4 Hz) Response values Response value R _{an1} (ALARM 1) Response value R _{an2} (ALARM 2) Relative uncertainty (acc. to IEC 61557-8) Hysteresis Time response Response time t _{an} at R _F = 0.5 x R _{an} (10 kΩ) and C _e (1 μF) and Response time DC alarm at C _e = 1 μF Start-up delay T _{Start-up} Measuring circuit	$\leq 12 \text{ W}$ $\leq 12 \text{ W/21 VA}$ $\leq 12 \text{ W/45 VA}$ e must be shockproof. Only permanently ry II (300 V) may be connected. $DC 24 \text{ V}$ $DC -20 + 25 \%$ $AC 0 690 \text{ V}, DC 0 1000 \text{ V}$ $AC/DC 0 600 \text{ V}$ $AC/DC +15 \%$ $DC, 0.1 460 \text{ Hz}$ $U \sim_{\text{max}} = 50 \text{ V x } (1+f_n^2)$ $1 \text{ k}\Omega 10 \text{ M}\Omega$ $1 \text{ k}\Omega 10 \text{ M}\Omega$ profile dependent, ±15 %, at least ±1 k Ω $25 \%, \text{ at least } 1 \text{ k}\Omega$ $cc. \text{ to IEC 61557-8}$ $profile dependent, \text{ typ. 2 s}$ 0 s 10 min	Functions off, test, reset, deactive Voltage Tolerance Voltage Digital Outputs (Q1, Q2) Number Operating mode, adjustable Functions off, Ins. alarm 1, Ins. alarm 1, Ins. alarm 1, Ins. alarm 2, Ins. alarm 3, Ins. alarm 4, Ins. alarm 4, Ins. alarm 5, Ins. alarm 6, Ins. alarm 1, I	vate device, start initial measurement Low DC -3 5 V, High DC 11 32 V ± 10 % ± 10
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Power consumption, typically at DC Power consumption, typically at 50/60 Hz Power consumption, typically at 50/60 Hz * At frequencies > 200 Hz, the connection of X1 and remote installed devices which at least have overvoltage categor * Supply via X1: Supply voltage U _S Tolerance of U _S IT system being monitored Nominal system voltage range U _n for UL applications Tolerance of U _n Frequency range of U _n Max. alternating voltage U~ (for f _n < 4 Hz) Response values Response value R _{an1} (ALARM 1) Response value R _{an2} (ALARM 2) Relative uncertainty (acc. to IEC 61557-8) Hysteresis Time response Response time DC alarm at C _e = 1 μF Start-up delay T _{start-up} Measuring circuit Measuring circuit Measuring voltage U _m profile dependent, ±10 V, ± Measuring current I _m	$\leq 12 \text{ W}$ $\leq 12 \text{ W/21 VA}$ $\leq 12 \text{ W/45 VA}$ e must be shockproof. Only permanently by II (300 V) may be connected. $DC 24 \text{ V}$ $DC -20 + 25 \%$ $AC 0 690 \text{ V}, DC 0 1000 \text{ V}$ $AC/DC 0 600 \text{ V}$ $AC/DC +15 \%$ $DC, 0.1 460 \text{ Hz}$ $U \sim_{\text{max}} = 50 \text{ V x } (1+f_n^2)$ $1 \text{ k}\Omega 10 \text{ M}\Omega$ $1 \text{ k}\Omega 10 \text{ M}\Omega$ $1 \text{ k}\Omega 10 \text{ M}\Omega$ $25 \%, \text{ at least } 1 \text{ k}\Omega$ $25 \%, \text{ at least } 1 \text{ k}\Omega$ $cc. \text{ to IEC } 61557-8$ $profile \text{ dependent, typ. } 2 \text{ s}$ $0 \text{ s } 10 \text{ min}$ $\pm 50 \text{ V (see profile overview in the manual)}$ $\leq 403 \text{ µA}$	Functions off, test, reset, deactive Voltage Tolerance Voltage Digital Outputs (Q1, Q2) Number Operating mode, adjustable Functions off, Ins. alarm 1, Ins. alarm 1, Ins. alarm 2, Ins. alarm 3, Ins. alarm 4, Ins. alarm 5, Ins. alarm 6, Ins. alarm 7, Ins. alarm 7, Ins. alarm 1,	vate device, start initial measurement Low DC -3 5 V, High DC 11 32 V ± 10 % ± 10
Power consumption, typically at DC Power consumption, typically at DC Power consumption, typically at 50/60 Hz Power consumption, typically at 400 Hz * At frequencies > 200 Hz, the connection of X1 and remote installed devices which at least have overvoltage categor * Supply via X1: Supply voltage U _S Tolerance of U _S IT system being monitored Nominal system voltage range U _n for UL applications Tolerance of U _n Frequency range of U _n Max. alternating voltage U~ (for f _n < 4 Hz) Response value R _{an1} (ALARM 1) Response value R _{an2} (ALARM 2) Relative uncertainty (acc. to IEC 61557-8) Hysteresis Time response Response time t _{an} at R _F = 0.5 x R _{an} (10 kΩ) and C _e (1 μF) and Response time DC alarm at C _e = 1 μF Start-up delay T _{start-up} Measuring circuit Measuring circuit Measuring voltage U _m profile dependent, ±10 V, ± Measuring current I _m Internal resistance R _i , Z _i	$\leq 12 \text{ W}$ $\leq 12 \text{ W/21 VA}$ $\leq 12 \text{ W/45 VA}$ e must be shockproof. Only permanently by II (300 V) may be connected. $DC 24 \text{ V}$ $DC -20 + 25 \%$ $AC 0 690 \text{ V}, DC 0 1000 \text{ V}$ $AC/DC 0 600 \text{ V}$ $AC/DC +15 \%$ $DC, 0.1 460 \text{ Hz}$ $U \sim_{\text{max}} = 50 \text{ V x } (1+f_n^2)$ $1 \text{ k}\Omega 10 \text{ M}\Omega$ $1 \text{ k}\Omega 10 \text{ M}\Omega$ $1 \text{ k}\Omega 10 \text{ M}\Omega$ $25 \%, \text{ at least } 1 \text{ k}\Omega$ $25 \%, \text{ at least } 1 \text{ k}\Omega$ $cc. \text{ to IEC 61557-8}$ $profile dependent, \text{ typ. 2 s}$ 0 s 10 min $\pm 50 \text{ V (see profile overview in the manual)}$	Functions off, test, reset, deactive Voltage Tolerance Voltage Digital Outputs (Q1, Q2) Number Operating mode, adjustable Functions off, Ins. alarm 1, Ins. alarm 1, Ins. alarm 1, Ins. alarm 2, Ins. alarm 3, Ins. alarm 4, Ins. alarm 4, Ins. alarm 5, Ins. alarm 1,	vate device, start initial measurement Low DC -3 5 V, High DC 11 32 V ± 10 % ± 10
Power consumption, typically at DC Power consumption, typically at DC Power consumption, typically at 50/60 Hz Power consumption, typically at 400 Hz * At frequencies > 200 Hz, the connection of X1 and remote installed devices which at least have overvoltage categor * Supply via X1: Supply voltage U _S Tolerance of U _S IT system being monitored Nominal system voltage range U _n for UL applications Tolerance of U _n Frequency range of U _n Max. alternating voltage U~ (for f _n < 4 Hz) Response values Response value R _{an1} (ALARM 1) Response value R _{an2} (ALARM 2) Relative uncertainty (acc. to IEC 61557-8) Hysteresis Time response Response time t _{an} at R _F = 0.5 x R _{an} (10 kΩ) and C _e (1 μF) and Response time DC alarm at C _e = 1 μF Start-up delay T _{start-up} Measuring circuit Measuring circuit Measuring voltage U _m profile dependent, ±10 V, ±	$\leq 12 \text{ W}$ $\leq 12 \text{ W/21 VA}$ $\leq 12 \text{ W/45 VA}$ e must be shockproof. Only permanently by II (300 V) may be connected. $DC 24 \text{ V}$ $DC -20 + 25 \%$ $AC 0 690 \text{ V}, DC 0 1000 \text{ V}$ $AC/DC 0 600 \text{ V}$ $AC/DC +15 \%$ $DC, 0.1 460 \text{ Hz}$ $U \sim_{\text{max}} = 50 \text{ V x } (1+f_n^2)$ $1 \text{ k}\Omega 10 \text{ M}\Omega$ $1 \text{ k}\Omega 10 \text{ M}\Omega$ $1 \text{ k}\Omega 10 \text{ M}\Omega$ $25 \%, \text{ at least } 1 \text{ k}\Omega$ $25 \%, \text{ at least } 1 \text{ k}\Omega$ $cc. \text{ to IEC } 61557-8$ $profile \text{ dependent, typ. } 2 \text{ s}$ $0 \text{ s } 10 \text{ min}$ $\pm 50 \text{ V (see profile overview in the manual)}$ $\leq 403 \text{ µA}$	Functions off, test, reset, deactive Voltage Tolerance Voltage Digital Outputs (Q1, Q2) Number Operating mode, adjustable Functions off, Ins. alarm 1, Ins. alarm 1, Ins. alarm 2, Ins. alarm 3, Ins. alarm 4, Ins. alarm 5, Ins. alarm 6, Ins. alarm 7, Ins. alarm 7, Ins. alarm 1,	vate device, start initial measurement Low DC -3 5 V, High DC 11 32 V ± 10 % 2 active, passive alarm 2, connection fault, DC- alarm*, all alarm, device fault, common alarm, plete, device inactive, DC offset alarm DC 0 32 V, active DC 0/19.2 32 V 1 linear, midscale point 28 k Ω /120 k Ω insulation value, DC offset mA (< 600 Ω), 0 400 μ A (< 4 k Ω) 10 V (> 1 k Ω), 2 10 V (> 1 k Ω) ± 20 % web server/Modbus TCP/BCOM 10/100 Mbit/s, autodetect
Power consumption, typically at DC Power consumption, typically at DC Power consumption, typically at 50/60 Hz Power consumption, typically at 400 Hz * At frequencies > 200 Hz, the connection of X1 and remote installed devices which at least have overvoltage categor * Supply via X1: Supply voltage U _S Tolerance of U _S IT system being monitored Nominal system voltage range U _n for UL applications Tolerance of U _n Frequency range of U _n Max. alternating voltage U~ (for f _n < 4 Hz) Response value R _{an1} (ALARM 1) Response value R _{an2} (ALARM 2) Relative uncertainty (acc. to IEC 61557-8) Hysteresis Time response Response time t _{an} at R _F = 0.5 x R _{an} (10 kΩ) and C _e (1 μF) and Response time DC alarm at C _e = 1 μF Start-up delay T _{start-up} Measuring circuit Measuring circuit Measuring voltage U _m profile dependent, ±10 V, ± Measuring current I _m Internal resistance R _i , Z _i	$\leq 12 \text{ W}$ $\leq 12 \text{ W/21 VA}$ $\leq 12 \text{ W/45 VA}$ e must be shockproof. Only permanently ry II (300 V) may be connected. $DC 24 \text{ V}$ $DC -20 + 25 \%$ $AC 0 690 \text{ V, DC } 0 1000 \text{ V}$ $AC/DC 0 600 \text{ V}$ $AC/DC +15 \%$ $DC, 0.1 460 \text{ Hz}$ $U \sim_{\text{max}} = 50 \text{ V x } (1+f_n^2)$ $1 \text{ k}\Omega 10 \text{ M}\Omega$ $1 \text{ k}\Omega 10 \text{ M}\Omega$ $25 \%, \text{ at least } 1 \text{ k}\Omega$ $25 \%, \text{ at least } 1 \text{ k}\Omega$ $cc. \text{ to IEC } 61557-8$ $profile \text{ dependent, typ. 2 s}$ $0 \text{ s } 10 \text{ min}$ $\pm 50 \text{ V (see profile overview in the manual)}$ $\leq 403 \text{ µA}$ $\geq 124 \text{ k}\Omega$	Functions Voltage Tolerance Voltage Digital Outputs (Q1, Q2) Number Operating mode, adjustable Functions Off, Ins. alarm 1,	vate device, start initial measurement Low DC -35 V, High DC 1132 V ±10 % 2 active, passive alarm 2, connection fault, DC- alarm*, al alarm, device fault, common alarm, uplete, device inactive, DC offset alarm DC 032 V, active DC 0/19.232 V linear, midscale point 28 kΩ/120 kΩ insulation value, DC offset mA (< 600 Ω), 0400 μA (< 4 kΩ)10 V (> 1 kΩ), 210 V (> 1 kΩ) ±20 % web server/Modbus TCP/BCOM 10/100 Mbit/s, autodetect < 100/s min. CAT 6 ≤ 100 m RJ45 DHCP/manual 192.168.0.5 255.255.255.255.0 system-1-0
Power consumption, typically at DC Power consumption, typically at 50/60 Hz Power consumption, typically at 50/60 Hz * At frequencies > 200 Hz, the connection of X1 and remote installed devices which at least have overvoltage categor * Supply via X1: Supply voltage U _S Tolerance of U _S IT system being monitored Nominal system voltage range U _n for UL applications Tolerance of U _n Frequency range of U _n Max. alternating voltage U~ (for f _n < 4 Hz) Response value R _{an1} (ALARM 1) Response value R _{an2} (ALARM 2) Relative uncertainty (acc. to IEC 61557-8) Hysteresis Time response Response time DC alarm at C _e = 1 μF Start-up delay T _{start-up} Measuring circuit Measuring circuit Measuring current I _m Internal resistance R _i , Z _i Permissible extraneous DC voltage U _{fg}	$\leq 12 \text{ W}$ $\leq 12 \text{ W/21 VA}$ $\leq 12 \text{ W/45 VA}$ e must be shockproof. Only permanently ry II (300 V) may be connected. $DC 24 \text{ V}$ $DC -20 + 25 \%$ $AC 0 690 \text{ V, DC } 0 1000 \text{ V}$ $AC/DC 0 600 \text{ V}$ $AC/DC +15 \%$ $DC, 0.1 460 \text{ Hz}$ $U \sim_{\text{max}} = 50 \text{ V x } (1+f_n^2)$ $1 \text{ k}\Omega 10 \text{ M}\Omega$ $1 \text{ k}\Omega 10 \text{ M}\Omega$ $25 \%, \text{ at least } 1 \text{ k}\Omega$ $25 \%, \text{ at least } 1 \text{ k}\Omega$ $cc. \text{ to IEC } 61557-8$ $profile \text{ dependent, typ. 4 s}} profile \text{ dependent, typ. 2 s} 0 \text{ s 10 min} 1 \text{ min} 1 \text{ dependent, typ. 2 s} 1 \text{ dependent, typ. 2 s}$	Functions off, test, reset, deactive Voltage Tolerance Voltage Digital Outputs (Q1, Q2) Number Operating mode, adjustable Functions off, Ins. alarm 1, Ins. alarm 1, Ins. alarm 2, Ins. alarm 3, Ins. alarm 4, Ins. alarm 5, Ins. alarm 6, Ins. alarm 7, Ins. alarm 7, Ins. alarm 1,	vate device, start initial measurement Low DC -35 V, High DC 1132 V ± 10 %
Power consumption, typically at DC Power consumption, typically at 50/60 Hz Power consumption, typically at 50/60 Hz * At frequencies > 200 Hz, the connection of X1 and remote installed devices which at least have overvoltage categor * Supply via X1: Supply voltage U _S Tolerance of U _S IT system being monitored Nominal system voltage range U _n for UL applications Tolerance of U _n Frequency range of U _n Max. alternating voltage U~ (for f _n < 4 Hz) Response value R _{an1} (ALARM 1) Response value R _{an2} (ALARM 2) Relative uncertainty (acc. to IEC 61557-8) Hysteresis Time response Response time DC alarm at C _e = 1 μF Start-up delay T _{start-up} Measuring circuit Measuring circuit Measuring current I _m Internal resistance R _i , Z _i Permissible extraneous DC voltage U _{fg}	$\leq 12 \text{ W}$ $\leq 12 \text{ W/21 VA}$ $\leq 12 \text{ W/45 VA}$ e must be shockproof. Only permanently ry II (300 V) may be connected. $DC 24 \text{ V}$ $DC -20 + 25 \%$ $AC 0 690 \text{ V, DC } 0 1000 \text{ V}$ $AC/DC 0 600 \text{ V}$ $AC/DC +15 \%$ $DC, 0.1 460 \text{ Hz}$ $U \sim_{\text{max}} = 50 \text{ V x } (1+f_n^2)$ $1 \text{ k}\Omega 10 \text{ M}\Omega$ $1 \text{ k}\Omega 10 \text{ M}\Omega$ $25 \%, \text{ at least } 1 \text{ k}\Omega$ $25 \%, \text{ at least } 1 \text{ k}\Omega$ $cc. \text{ to IEC } 61557-8$ $profile \text{ dependent, typ. 4 s}} profile \text{ dependent, typ. 2 s} 0 \text{ s 10 min} 1 \text{ min} 1 \text{ dependent, typ. 2 s} 1 \text{ dependent, typ. 2 s}$	Functions Voltage Tolerance Voltage Digital Outputs (Q1, Q2) Number Operating mode, adjustable Functions Off, Ins. alarm 1,	vate device, start initial measurement Low DC -35 V, High DC 1132 V ± 10 %
Power consumption, typically at DC Power consumption, typically at 50/60 Hz Power consumption, typically at 50/60 Hz * At frequencies > 200 Hz, the connection of X1 and remote installed devices which at least have overvoltage categor * Supply via X1: Supply voltage U _S Tolerance of U _S IT system being monitored Nominal system voltage range U _n for UL applications Tolerance of U _n Frequency range of U _n Max. alternating voltage U~ (for f _n < 4 Hz) Response value R _{an1} (ALARM 1) Response value R _{an2} (ALARM 2) Relative uncertainty (acc. to IEC 61557-8) Hysteresis Time response Response time DC alarm at C _e = 1 μF Start-up delay T _{start-up} Measuring circuit Measuring circuit Measuring current I _m Internal resistance R _i , Z _i Permissible extraneous DC voltage U _{fg}	$\leq 12 \text{ W}$ $\leq 12 \text{ W/21 VA}$ $\leq 12 \text{ W/45 VA}$ e must be shockproof. Only permanently ry II (300 V) may be connected. $DC 24 \text{ V}$ $DC -20 + 25 \%$ $AC 0 690 \text{ V, DC } 0 1000 \text{ V}$ $AC/DC 0 600 \text{ V}$ $AC/DC +15 \%$ $DC, 0.1 460 \text{ Hz}$ $U \sim_{\text{max}} = 50 \text{ V x } (1+f_n^2)$ $1 \text{ k}\Omega 10 \text{ M}\Omega$ $1 \text{ k}\Omega 10 \text{ M}\Omega$ $25 \%, \text{ at least } 1 \text{ k}\Omega$ $25 \%, \text{ at least } 1 \text{ k}\Omega$ $cc. \text{ to IEC } 61557-8$ $profile \text{ dependent, typ. 4 s}} profile \text{ dependent, typ. 2 s} 0 \text{ s 10 min} 1 \text{ min} 1 \text{ dependent, typ. 2 s} 1 \text{ dependent, typ. 2 s}$	Functions off, test, reset, deactive Voltage Tolerance Voltage Digital Outputs (Q1, Q2) Number Operating mode, adjustable Functions off, Ins. alarm 1, Ins. alarm 1, Ins. alarm 2, Ins. alarm 3, Ins. alarm 4, Ins. alarm 5, Ins. alarm 6, Ins. alarm 7, Ins. alarm 7, Ins. alarm 1,	vate device, start initial measurement Low DC -35 V, High DC 1132 V ± 10 %
Power consumption, typically at DC Power consumption, typically at DC Power consumption, typically at 50/60 Hz Power consumption, typically at 400 Hz * At frequencies > 200 Hz, the connection of X1 and remote installed devices which at least have overvoltage categor * Supply via X1: Supply voltage U_S Tolerance of U_S * IT system being monitored Nominal system voltage range U_N for UL applications Tolerance of U_N Frequency range of U_N Max. alternating voltage U_N (for I_N < 4 Hz) * Response value I_N Response time $I_$	$\leq 12 \text{ W}$ $\leq 12 \text{ W/21 VA}$ $\leq 12 \text{ W/45 VA}$ e must be shockproof. Only permanently ry II (300 V) may be connected. $DC 24 \text{ V}$ $DC -20 + 25 \%$ $AC 0 690 \text{ V, DC } 0 1000 \text{ V}$ $AC/DC 0 600 \text{ V}$ $AC/DC +15 \%$ $DC, 0.1 460 \text{ Hz}$ $U \sim_{\text{max}} = 50 \text{ V x } (1+f_n^2)$ $1 \text{ k}\Omega 10 \text{ M}\Omega$ $1 \text{ k}\Omega 10 \text{ M}\Omega$ $25 \%, \text{ at least } 1 \text{ k}\Omega$ $25 \%, \text{ at least } 1 \text{ k}\Omega$ $cc. \text{ to IEC } 61557-8$ $profile \text{ dependent, typ. 4 s}} profile \text{ dependent, typ. 2 s} 0 \text{ s 10 min} 1 \text{ min} 1 \text{ dependent, typ. 2 s} 1 \text{ dependent, typ. 2 s}$	Functions Voltage Tolerance Voltage Digital Outputs (Q1, Q2) Number Operating mode, adjustable Functions Off, Ins. alarm 1,	vate device, start initial measurement Low DC -35 V, High DC 1132 V ± 10 %

Technical data (continued)

Sensor bus:		
Interface/protocol		RS-485 / isoData, BS bus, Modbus RTU
Data rate		9.6 kBaud/s
Cable: twisted pair, one end of shield c	onnected to PE	recommended: J-Y(St)Y min. 2x0.8
Cable length (depending on the baud r	ate)	≤ 1200 m
Connection		terminals X1A, X1B
Terminating resistor		120 Ω , can be connected internally
Device address, BS bus		190
Switching elements		
Number of switching elements		2 changeover contacts
Operating mode		N/C operation/N/O operation
Contact 11-12-14/21-22-24	off, Ins. alarn	n 1, Ins. alarm 2, connection fault, DC- alarm*,
	DC+ alarm*, sy	mmetrical alarm, device fault, common alarm,
	measurem	ent complete, device inactive, DC offset alarm
Electrical endurance at rated operating	conditions	10.000 operating cycles
* Only for $U_n \ge 50 \text{ V}$		
Contact data acc. to IEC 60947-5-1:		
Utilisation category		AC-13 / AC-14 / DC-12 / DC-12 / DC-12 / DC-12
Rated operational voltage		230 V / 230 V / 24 V / 48 V / 110 V / 220 V
Rated operational current		5 A / 3 A / 1 A / 1 A / 0.2 A / 0.1 A
D . II I D. DODO 1111		

Ambient temperatures:	
EMC	DIN EN 50121-3-2, IEC 61326-2-4
Environment & EMC	
Minimum contact rating	1 mA at AC/DC ≥ 10 V
Rated insulation voltage \leq 3000 m NN	160 V
Rated insulation voltage \leq 2000 m NN	250 V
Rated operational current	5 A / 3 A / 1 A / 1 A / 0.2 A / 0.1 A
nateu operational voltage	230 V / 230 V / 24 V / 46 V / 110 V / 220 V

Long-term storage	-40+70 °C
Classification of climatic conditions acc. to IEC 60721 (related to ten	nperature and relative humidity)
Stationary use (IEC 60721-3-3)	3K24
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22

Long-term storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions acc. to IEC 60721	
Stationary use (IEC 60721-3-3)	3M12
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12
Area of application	< 3000 m NN

Connection

Connection type	screw-type terminal or push-wire terminal, pluggable
Screw-type terminals:	
Nominal current	≤ 10 A
Tightening torque	0.50.6 Nm (57 lb-in)
Conductor sizes	AWG 24-12
Stripping length	7 mm
rigid/flexible	0.22.5 mm ²
flexible with ferrules, with/without plastic sleev	ve 0.252.5 mm ²
Multiple conductor	
rigid	0.21 mm ²
flexible	0.21.5 mm ²
flexible with ferrule without plastic sleeve	0.251 mm ²
flexible with TWIN ferrule with plastic slee	eve 0.51.5 mm ²

Push-wire terminals:

Nominal current	≤ 10 A
Conductor sizes	AWG 24-12
Stripping length	10 mm
rigid/flexible	0.22.5 mm ²
flexible with ferrules, with/without plastic sleeve	0.252.5 mm ²
Multiple conductor, flexible with TWIN ferrule with plastic sleeve	0.51.5 mm ²

Push-wire terminals X1:

Nominal current	≤ 8 A
Conductor sizes	AWG 24-16
Stripping length	10 mm
rigid/flexible	0.21.5 mm ²
flexible with ferrule without plastic sleeve	0.251.5 mm ²
flexible with TWIN ferrule with plastic sleeve	0.250.75 mm ²

Other

-40...+70 °C

-40...+85 °C

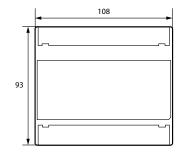
Operating mode	continuous operation
Mounting (0°)	display oriented*
Degree of protection internal components	IP40
Degree of protection terminals	IP20
DIN rail mounting acc. to	IEC 60715
Screw fixing	3 x M4 with mounting clip
Enclosure material	polycarbonate
Flammability class	V-0
ANSI code	64
Dimensions (W x H x D)	108 x 93 x 110 mm
Documentation number	D00419
Weight	< 390 q

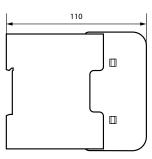
* For best ventilation, align cooling slots vertically (0°). At an alignment of 45° the max. operating temperature is reduced by 10 °C. At an alignment fo 90° the max. operating temperature is reduced by 20 $^\circ\text{C}.$

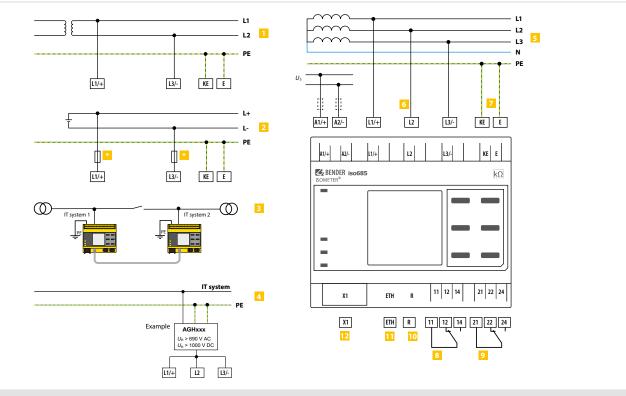
Dimension diagram (dimensions in mm)

Operating temperature

Transport







- 1 Connection to an AC system Un
- 2 Connection to a DC system U_n
- Connection to two IT systems that can be coupled with a coupling switch. Information about the state of the coupling switch is not necessary.
- Connection to an IT system using coupling device
- Connection to a 3(N)AC system
- Connection to the IT system to be monitored (L1/+, L2, L3/-)
- Separate connection of KE, E to PE

- 8 (K1) Alarm relay 1, available changeover contacts
- (K2) Alarm relay 2, available changeover contacts
- Switchable resistor R for RS-485 bus termination
- Ethernet interface
- 12 Digital interface
- In systems > 690 V and with overvoltage category III, a fuse for the connection to the system to be monitored must be provided.
 Recommendation: 2A screw-type fuses

Provide line protection!

According to DIN VDE 0100-430, line protection shall be provided for the supply voltage.

Note

According to DIN VDE 0100-430, devices for protection against a short circuit can be omitted for the coupling of terminals L1/+, L2 and L3/- to the IT system \leq 690 V to be monitored if the wiring is carried out in such a manner as to reduce the risk of a short circuit to a minimum (recommendation: Ensure short-circuit-proof and earth-fault-proof wiring).

 $The connecting \ lines \ L1/+, L2, L3/-\ to \ the system \ to \ be \ monitored \ must \ be \ carried \ out \ as \ spur \ lines. \ No \ load \ current \ may \ be \ conducted \ through \ the \ terminals.$

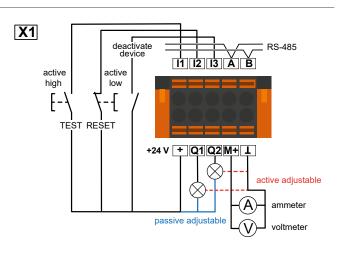
For UL applications:

Use 60/70 °C copper lines only!

UL and CSA applications require the supply voltage to be protected via 5 A fuses.

Digital interface X1

Digital interface	Terminal	Description
	I1I3	Configurable digital inputs (e.g. test, reset,)
	A, B	Serial interface RS-485, termination by means of a DIP switch R.
11 12 13 A B + Q1 Q2 M+ L	+	Supply voltage of the inputs and outputs I, Q and M. Electrical overload protection. Automatic shutdown in the event of short circuits and transients (resettable). When supplied via an external 24V source, A1/+, A2/- must not be connected.
	Q1, Q2	Configurable digital output
	M+	Configurable analogue output (e.g. measuring instrument)
	上	Reference potential ground



Display FP200

Display and operator unit for devices of the iso685 series without display



Device features

- Display for front panel mounting of series iso685
- · Various mounting options
- Uniform operation
- Backlit buttons

Further information

For further information refer to our product range on www.bender.de.

Typical applications

• Display and operator unit for devices of the iso685 series without display

Approvals







Ordering information

Туре	Supply voltage/frequency range U _s	Power consumption	Art. No.	
FP200	DC 24 W/ 20 1 25 0/	tun 2 W	B91067904	
FP200W ¹⁾	DC 24 V/-20+25 %	typ. 3 W	B91067904W	

¹⁾ Device version Option "W" with increased shock and vibration resistance

Accessories

Description	Art. No.
FP200 mechanical accessories comprising: 2 screw attachments	B91067907
Patch cable CAT5e (without UL, temperature range 0+60 °C) Included in the scope of delivery	B91067906
FP200 adapter for front panel mounting IRDH575	B91067905



Technical data

recinical data	
Insulation co-ordination (IEC 60664-1/IEC 6	60664-3)
Rated voltage	50 V
Overvoltage category (OVC)	III
Rated impulse voltage	800 V
Rated insulation voltage	50 V
Pollution degree for accessible parts on the outs	side of the device housing 3
Supply voltage	
Supply voltage $U_{\rm S}$	DC 24 V (via iso685-S variant)
Power consumption	1.2 W
Display	
Graphic display	127 x 127 pixel, 40 x 40 mm
LEDs	
ON (operation LED)	green
SERVICE	yellow
ALARM 1	yellow
ALARM 2	yellow
Interfaces	
Interface/protocol	Internal Bender
Cable length	≤ 5 m
REMOTE Cable	Patch cable at least CAT5e
Environment/EMC	
EMC	IEC 61326-2-4; EN 50121-3-2; EN 50121-4
Ambient temperatures	
Operating temperature	-25+55 °C
Transport	-40+85 °C
Long-term storage	-40+70 °C
Classification of climatic conditions acc. to IE	C 60721 (related to temperature and relative humidity):
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11
Long-time storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions acc	c. to IEC 60721:
Stationary use (IEC 60721-3-3)	3M11
Transportation (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12
Area of application	≤3000 m NN

Connection	
Connection type	plug connectors
Other	
Operating mode	continuous operation
Mounting (0°)	display oriented,
	cooling slots must be ventilated vertically*
Degree of protection, built-in components (DIN EN 60529)	IP40
Degree of protection, terminals (DIN EN 60529)	IP20
Panel cut-out	138x66 mm
Permissible tolerance of panel cut-out	+0.5 /-0
Screw mounting	with mounting brackets
Torque screw mounting	0,3 Nm ±10%
Enclosure material	polycarbonate
Flammability class	UL94V-0
Dimensions (W x H x D)	144 x 72 x 35.6 mm
Documentation number	D00169
Weight	< 180 g

cally). For devices mounted at an angle \neq 0°, the max. working temperature is reduced by 10 °C for devices with a "W" in the device name.

Option "W" data different from the standard version

(Only for remote mounting)	
Ambient temperatures:	
Operating temperature	-40+70°C
Transport	-40+85°C
Long-term storage	-40+70°C
Classification of climatic conditions acc. to IEC 6072	21:

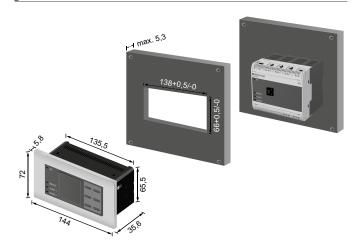
3K23 (condensation and formation of ice possible) Stationary use (IEC 60721-3-3)

Classification of mechanical conditions acc. to IEC 60721:

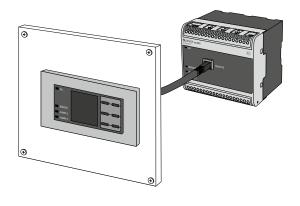
Stationary use (IEC 60721-3-3) 3M12

()* = factory setting

Dimension diagram (dimensions in mm)



Connection to iso685



ISOMETER® IRDH275BM-7 with coupling device AGH675-7 and AGH675-7MV15

Device combination for insulation monitoring in unearthed AC, AC/DC and DC power systems (IT systems)





Typical applications

- AC, DC or AC/DC medium voltage systems
- AC/DC medium voltage systems with directly connected DC components, such as rectifiers, converters, and thyristor-controlled DC drives

Approvals



IRDH275BM-7



Device feature

- · Insulation monitoring for drives including medium voltage converters up to 15.5 kV
- Two separately adjustable response values 100 k Ω ...10 M Ω
- AMP^{Plus} measurement method (European patent: EP 0 654 673 B1)
- · Automatic adaptation to the system leakage capacitance
- Info button to display device settings and the system leakage capacitance
- History memory with real-time clock to store alarm messages with date and time stamp
- BMS interface (Bender Measuring Device Interface) for communication with other Bender devices (RS-485 electrically isolated)
- Current output 0(4)...20mA (electrically isolated) analogously to the measured insulation value
- · Self monitoring with automatic alarm
- · Automatic self test, selectable
- Connection for external $k\Omega$ indication
- Test and reset button
- · Connection external test and reset button
- Two separate alarm relays with two potential-free changeover contacts
- N/O or N/C operation, selectable
- · Backlit two-line plain text display
- Remote setting of specific parameters via Internet (option; COM460IP with at least Option C required)

Standards

The ISOMETER® has been developed in compliance with the following standards:

- DIN EN 61557-8 (VDE 0413-8)
- EN 61557-8
- IEC 61557-8
- IFC 61326-2-4
- DIN EN 60664-1 (VDE 0110-1)
- DIN EN 60664-3 (VDE 0110-3)
- ASTM F1669M-96
- ASTM F1207M-96

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Nominal system voltage <i>U</i> n	Supply voltage <i>U</i> ₅	Cable length	Art. No.	Page
IRDH275BM-727	-	AC 19.255 V; 42460 Hz, DC 19.272 V	-	B91065120	-
AGH675S-7-2000	- AC/DC 07.2 kV; 0460 Hz		2000 mm	B913061	386
AGH675S-7-500		_	500 mm	B913060	386
AGH675S-7MV15-500	AC/DC 015.5 kV, 0460 Hz	-	500 mm	B913058	386

Suitable system components

Description	Туре	Art. No.	Page
External kΩ measuring instruments	9620-1421	B986849	407



Data duralta na	AC 000 V
Rated voltage	AC 800 \ 8 kV/3
Rated impulse voltage/pollution degree	O KV/3
Voltage ranges	
Nominal voltage range $U_{\rm n}$	via AGH675S-7
Supply voltage $U_{\rm S}$ (also see nameplate)	AC 19.255 V
Frequency range U _s	42460 H
Supply voltage $U_{\rm S}$ (also see nameplate)	DC 19.272 V
Power consumption	≤14 V/
Response values	
Response value Ran1 (Alarm 1)	100 kΩ10 MΩ
Response value Ran2 (Alarm 2)	100 kΩ10 MΩ
Relative percentage error $100500 \mathrm{k}\Omega$	±100 kC
Relative percentage error 500 k Ω 10 M Ω	0 %+20 %
Response time tan	≤ 5 mii
Hysteresis	25 %
Measuring circuit	
Measuring voltage Um	≤ 50 \
Measuring current Im (at RF = 0 Ω)	≤ 21 µ/
Internal DC resistance Ri	≥ 2.4 MΩ
Internal impedance Zi, at 50 Hz	≥ 2.4 MΩ
Permissible extraneous DC voltage Ufg	with AGH675S-7
Permissible system leakage capacitance Ce	≤ 5 µ
Factory setting	2 μ
Displays	
Display, illuminated	two-line displa
Characters (number of characters)	2 x 10
Display range, measuring value	50 kΩ10 MΩ
Relative percentage error $50500 \mathrm{k}\Omega$	±50 kΩ
Relative percentage error 500 k Ω 10 M Ω	±10 %
Outputs/inputs	
TEST/ RESET button	internal/externa
Cable length TEST/RESET button external	≤ 10 n
Current output for measuring instrument SKMP (scale centre	e point = 1.2 MΩ):
Current output (load)	20 mA (≤ 500 Ω
Accuracy current output (100 k Ω 10 M Ω)	±10 %, ±100 kΩ
Serial interface	
Interface/Protocol	RS-485/BM:
Connection	terminals A/
Cable length	≤ 1200 n
Recommended cable (screened, screen on one side connected to PE)	J-Y(St)Y 2x0.
Terminating resistor	120 Ω (0.5 W
Device address, BMS bus	130 (factory setting = 3

Switching components 2 changeover of	ontacts: K1 (Alarm 1), K2 (Alarm 2, system fault
Operating principle K1, K2 (Alarm 1, Alarm 2)	N/O or N/C operation
Factory setting (Alarm 1/Alarm 2)	N/O operation
Electrical endurance	12 000 switching operation
Contact class	IIB (IEC 60255-23
Rated contact voltage	AC 250 V/DC 300 \
Making capacity	AC/DC 5 A
Breaking capacity	2 A, AC 230 V, cos phi = 0.4
	0,2 A, DC 220 V, L/R = 0.04 s
Minimum contact current at DC 24 V	≥ 2 mA (50 mW)
Environment/EMC	
EMC immunity	acc. to EN 61326
EMC emission	acc. to EN 61326
Shock resistance IEC 60068-2-27 (device in operation)	15 g/11 m:
Bumping IEC 60068-2-29 (during transport)	40 g/6 m:
Vibration resistance IEC 60068-2-6 (device in operation)	1 g/10150 H
Vibration resistance IEC 60068-2-6 (during transport)	2 g/10150 H
Ambient temperature (during operation)	-10+55 °C
Storage temperature range	-40+70 °C
Climatic class acc. to IEC 60721-3-3	3K22
Connection	
Connection	screw terminals
Connection	
rigid, flexible	0.24 mm ² /0.22.5 mm
flexible with connector sleeve, without/with plastic sle	eve 0.252.5 mm
Conductor sizes	AWG 24-12
Other	
Operating mode	continuous operation
Mounting	as indicated on the display
Protection class, internal components (DIN EN 60529)	IP30
Protection class, terminals (DIN EN 60529)	IP20
Type of enclosure	X112, free from haloger
DIN rail mounting	IEC 60715
Flammability class	UL94 V-0
Tightening torque	0.5 Nm
Documentation number	D00123
Weight approx.	510 c

Insulation coordination acc. to DIN EN 61800-5-1	
AGH675S-7	
Rated insulation voltage	AC 7.2 k V
AGH675S-7MV15	
Rated insulation voltage	AC 15.5 k V
Voltage test acc. to DIN EN 61800-5-1	
Type test:	
AGH675S-7	
Voltage impulse test (basic insulation)	40 kV
AC voltage test (basic insulation)	20 kV
Partial discharge test	14 kV
AGH675S-7MV15	
Voltage impulse test (basic insulation)	111 kV
AC voltage test (basic insulation)	70 kV
Partial discharge test	29 kV
Routine test:	
AC voltage test	40 kV
Voltage ranges	
AGH675S-7	
Nominal system voltage U _n	AC, 3(N)AC, DC 07.2 kV
Nominal frequency f _n	0460 Hz
Internal DC resistance R _i	≥ 2.39 MΩ
AGH675S-7MV15	
Nominal system voltage $U_{\rm n}$	AC, 3(N)AC, DC 015.5 kV
Nominal frequency f _n	0460 Hz
Internal DC resistance R _i	≥ 4.7 MΩ

Environment	
Operating temperature (normal operation)	- 10+ 60 ℃
Operating temperature (continuous operation with asymetrical earth fault	- 10+ 55 ℃
Classification of climatic conditions acc. to IEC 60721 (no condensati	on, no formation of ice)
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 (3M12 Y shaft)
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12

	ec	

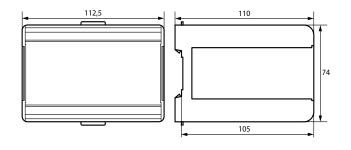
Connection terminal 2 (medium voltage)	high-voltage cable (encapsulated on the device side)
Connection, flexible with ring terminal	M4
Connection 3, 4, 5	screw-type terminals
Connection	
rigid, flexible	0.24 mm ² /0.22.5 mm ²
flexible with connector sleeve	0.252.5 mm ²

Other

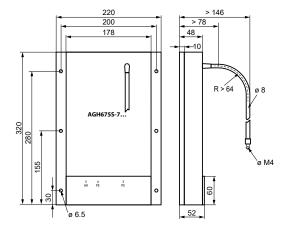
Operating mode	continuous operation
Mounting	any position
Protection class, internal components (DIN EN 60529)	IP64
Protection class, terminals (DIN EN 60529)	IP20
Type of enclosure	resin-encapsulated block
Screw mounting	M5
Flammability class	UL94 HB
Documentation number	D00095
Weight approx.	≤ 5100 q

Dimension diagrams (dimensions in mm)

IRDH275BM-7

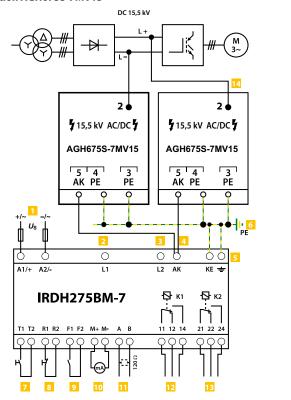


AGH675S-7...



Connection AGH675S-7 DC +7,2 k V DC -7,2k V 7,2 kV AC/DC 5 AGH675S-7 5 4 0 0 IRDH275BM-7 ₽кı **₽** K2

Connection AGH675S-7MV15



- Supply voltage $U_{\rm S}$ (see ordering information) via 6 A fuse
- 2 3 Terminals L1, L2 are not connected!
- Connection to the coupling device AGH675S-7 or the two coupling devices AGH675S-7MV15:
 - Connect terminal AK to terminal(s) 5 of the coupling device AGH675S-7 (or the two coupling devices AGH675S-7MV15), Connection with standard low-voltage cable, maximum voltage at terminal 5: 200 V
- Separate connection of the terminals 3 and 4 of the AGH675S-7 or AGH675S-7MV15 to PE
- External TEST button (NO contact)
- External RESET button (NC contact or wire jumper), when the terminals are open, the fault message will not be stored

- STANDBY by means of the function input F1, F2: When the contact is closed, insulation measurement does not take place.
- Current output, galvanically separated: 0...20 mA or 4...20 mA
- Serial interface RS-485 (termination 120 Ω resistor)
- Alarm relay 1; changeover contacts provided
- Alarm relay 2 (system fault relay); changeover contacts provided
- Connection of the coupling device AGH675S-7 to the converter: connect the high voltage cable encapsulated on one end to the mid-point of the DC intermediate circuit.

Connection of the two coupling devices AGH675S-7MV15 to the converter: connect the high voltage cable encapsulated on L+and L-.

ISOMETER® iso415R-x

Insulation monitoring device for unearthed 3(N)AC, AC and DC systems (IT systems)







Typical applications

• Unearthed 3(N)AC, AC and DC main and control circuits (IT systems)

Approvals



Device features

- Monitoring of the insulation resistance for unearthed 3(N)AC, AC and DC systems with galvanically connected rectifiers
- Automatic adaptation to the system leakage capacitance up to 25 μF
- Response time \leq 6 s at $C_e = 1 \mu F$ and $R_f = R_{an/2}$
- Automatic device self test with connection monitoring
- Two separately adjustable response value ranges from 5...1000 k Ω
- · Alarms are output via LEDs (AL1, AL2) and an alarm relay
- Selectable N/C or N/O relay operation ¹
- $\bullet\,$ Selectable start-up delay, response delay and delay on release 1
- Fault memory 1
- RS-485 interface with Modbus RTU protocol
- NFC interface
- ¹ Only adjustable via Modbus RTU or Bender App

Bender Connect App









Licences

For a list of the open-source software used see our homepage.

Standards

Devices of the iso415R series have been developed according to the following standards:

• IEC 61557-8

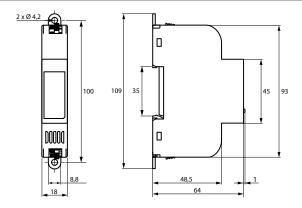
Further information

For further information refer to our product range on www.bender.de.

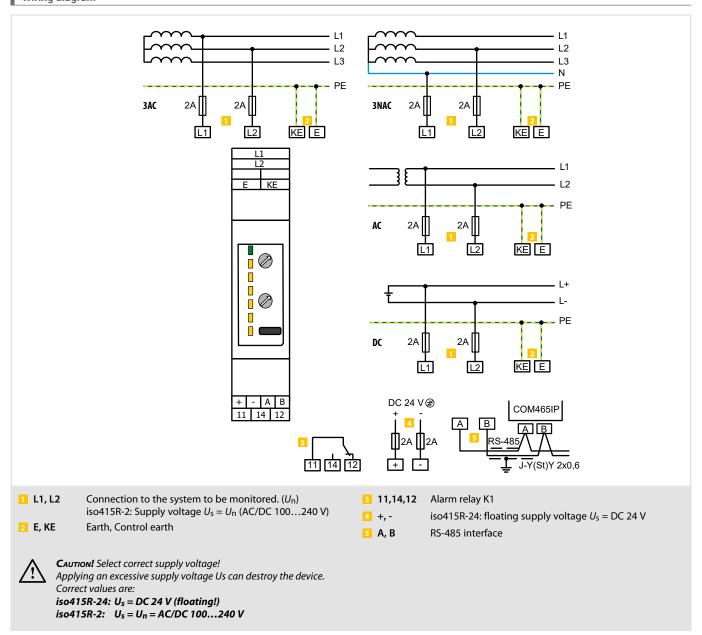
Ordering information

Туре	Supply voltage U₅	Nominal system voltage <i>U</i> n	Art. No.
iso415R-24	DC 24 V	AC 0415 V / DC 0400 V	B71602000
iso415R-2	AC/DC 100240 V	(3)AC 100240 V / 3NAC 100415 V / DC 100240 V	B71603000

Insulation coordination acc. to IEC 60664-1/IEC 60664	3	RS-485 interface	
Definitions:		Protocol	Modbus RTU
Measuring circuit (IC1)	L1, L2	Baud rate 1)	max. 115.2 kbits/s (19.2 kbits/s)*
Control circuit (IC2)	E, KE, +, -, A, B	Parity 1)	even, no, odd (even)*
Output circuit (IC3)	11, 14, 12	Stop bits 1)	1/ 2/ auto (auto)*
Rated voltage	400 V	Cable length (9.6 kbits/s)	≤ 1200 m
Overvoltage category	III	Cable: twisted pair 2)	min. J-Y(St)Y 2x0.6
Operating altitude	2000 m AMSL	Terminating resistor (external)	120 Ω (0.25 W)
Rated impulse voltage:		Device address, Modbus RTU 5)	1247 (100 + SN)*
IC1/(IC2-3)	6 kV	Conit de in manda	
IC2/IC3	4 kV	Switching elements	
Rated insulation voltage:		Switching elements	1 changeover contact
IC1/(IC2-3)	400 V	Operating principle 1)	NC operation/NO operation (NO operation)*
IC2/IC3	250 V	Electrical endurance, number of cycles	10000
Pollution degree	2	Contact data acc. to IEC 60947-5-1:	
Protective separation between:		Utilisation category	AC-12 / AC-14 / DC-12 / DC-12 / DC-12
IC1/(IC2-3)	Overvoltage category III, 600 V	Rated operational voltage	230 V / 230 V / 24 V / 110 V / 220 V
IC2/(IC3)	Overvoltage category III, 300 V	Rated operational current	5 A / 3 A / 1 A / 0.2 A / 0.1 A
Voltage tests (routine test) acc. to IEC 61010-1		Minimum contact rating 3)	1 mA at AC/DC \geq 10 V
IC3/(IC1-2)	AC 2.2 kV	Connection	
Supply voltage			Dunk in
		Connection type	Push-in
iso415R-24: Only via galvanically separated power supply (-		Nominal current	≤ 10 A
Supply voltage $U_{\rm S}$	DC 24 V	Connection properties	0.2 15 (AMC 24.16)
Tolerance of U _s	-20+25 %	rigid	0.21.5 mm ² (AWG 24-16)
Power consumption	≤ 2 W	flexible	0.21.5 mm² (AWG 24-16)
Inrush current (< 5 ms)	< 10 A	with ferrule with plastic sleeve	0.250.75 mm ²
iso415R-2: Only via the system to be monitored $U_S = U_n$ (L1/	L2))	with ferrule without plastic sleeve 4)	0.751.5 mm ²
Monitored IT system iso415R-24		Environment/EMC	
Nominal system voltage $U_{\rm II}$	3(N)AC, AC 0415 V/DC 0400 V	EMC	IEC 61326-2-4
Tolerance of U _n	AC +15 %, DC +25 %	Ambient temperatures	
Frequency range of $U_{\rm D}$	DC 42460 Hz	Operation	-25+55 ℃
Trequency runge of on	DC 12100 Hz	Transport	-40+85 °C
Monitored IT system iso415R-2		Storage	-40+70 °C
Nominal system voltage $U_n = U_s$		Classification of climatic conditions acc. to IEC 60	1721 (related to temperature and relative humidity)
3(N)AC, AC, DC	100240 V	Stationary use (IEC 60721-3-3)	3K22
Tolerance of $U_{\rm n}$	-30 %+15 %	Transport (IEC 60721-3-2)	2K11
Frequency range of U _n	DC 42460 Hz	Long-term storage (IEC 60721-3-1)	1K22
Power consumption (at 50 Hz)	\leq 2 W / \leq 3.5 VA		
Inrush current (< 2 ms)	< 1.8 A	Classification of mechanical conditions acc. to	
Management and the second and the se		Stationary use (IEC 60721-3-3)	3M11
Measuring circuit		Transport (IEC 60721-3-2)	2M4
Measuring voltage U _m	±16 V	Long-term storage (IEC 60721-3-1)	1M12
Measuring voltage $I_{\rm m}$ at $R_{\rm F}$, $Z_{\rm F}=0~\Omega$	≤ 90 µA	Other	
Internal resistance R_i , Z_i	≥ 180 kΩ	Operating mode	continuous operation
Permissible system leakage capacitance Ce	≤ 25 µF	Mounting	cooling slots must be ventilated vertically
Permissible extraneous DC voltage U_{fg}	≤ 500 V	Degree of protection, internal components (DIN EN	
Response values		Degree of protection, terminals (DIN EN 60529)	IP20
Response value R _{an1}	101000 kΩ (40 kΩ)*	Enclosure material	polycarbonate
Response value R _{an2}	5700 kΩ (10 kΩ)*	DIN rail mounting acc. to	IEC 60715
Relative uncertainty R_{an}	$\pm 15\% \pm 2 \text{ k}\Omega$	Flammability class	UL94 V-0
Hysteresis R _{an}	$\pm 13\% \pm 2 \text{ k}\Omega$ 25 %, minimum 1 k Ω	Documentation number	D00401
·	25 /0, 11111111111111 1 1 1 2 2	Weight	≤ 100 g
Time response		()* Factory setting	
Response time t_{an} at $R_F = 0.5$ x R_{an} and $C_e = 1$ μF acc. to IEC ϵ		• •	
Start-up delay t 1)	01800 s (0 s)*	1) Configurable via App and Modbus	
Response delay t_{on} 1)	01800 s (0 s)*	2) When supplied by or when monitoring systems	' '
Delay on release $t_{\rm off}$ ¹⁾	01800 s (0 s)*	\geq 200 Hz, the cable must be laid in a shockproof	f manner.
Recovery time	< 0.4 s	3) Refers to relays that have not been operated with	th high contact currents
Displays, memory		4) Use crimping pliers similar to CRIMPFOX 6 / Wei	dmüller PZ6/PZ6/5 only.
Displays, memory Display	status LED incl. LED bar graph (7 LEDs)		•
	status LED incl. LED bar graph (7 LEDs) $11000 \ k\Omega$	5) Factory setting: 100 + last two digits of serial no	•
Display			•
Display Display range insulation resistance ($R_{\rm F}$)	11000 kΩ	5) Factory setting: 100 + last two digits of serial no	•



Wiring diagram



Insulation monitoring device for unearthed AC control circuits (IT systems)



Typical applications

- AC control circuits in the industrial sector, mechanical engineering, power plants, elevators, automation systems etc.
- · AC control and auxiliary circuits in accordance with DIN EN 60204-1 "Electrical equipment of machines", IEC 60204-1, EN 60204-1
- AC auxiliary circuits in accordance with DIN VDE 0100-725
- Smaller AC IT systems such as $lighting\ systems, mobile\ generators$

Approvals







Device features

- Insulation monitoring for IT control circuits AC 0...300 V
- · Two separately adjustable response values
- Preset function (automatic setting of basic parameters)
- · Connection monitoring system/earth
- LEDs: Power On, Alarm 1, Alarm 2
- · Internal/external test/reset button
- Two separate alarm relays (one changeover contact each)
- N/O or N/C operation, selectable
- · Fault memory behaviour, selectable
- Self monitoring with automatic alarm
- · Multi-functional LC display
- · Adjustable response delay
- Two-module enclosure (36 mm)
- · RoHS compliant
- Push-wire terminal (two terminals per connection)

Standards

The ISOMETER® has been developed in compliance with the following standards:

- DIN EN 61557-8 (VDE 0413-8)
- EN 61557-8
- IEC 61557-8
- ASTM F 1207M-96 (2007)

Further information

For further information refer to our product range on www.bender.de.



Ordering information

Туре	Supply voltage ¹⁾ <i>U</i> s	Art. No. Screw-type terminal Push-wire terminal	
IR420-D4-1	DC 9,694 V / AC 1672 V, 42460 Hz	B91016409	B71016409
IR420-D4-2	DC 70300 V / AC 70300 V, 42460 Hz	B91016405	B71016405

¹⁾ Absolute values

Accessories

Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B98060008
XM420 mounting frame	B990994

Insulation coordination acc. to IEC 60664-1/IEC	60664-3
Rated insulation voltage	250 V
Rated impulse voltage/pollution degree	4 kV/3
Protective separation (reinforced insulation) betweer	
	2) - (L1, L2, E, KE, T/R) - (11, 12, 14) - (21, 22, 24)
Voltage test acc. to IEC 61010-1	2.21 kV
Supply voltage	
IR420-D4-1:	
Supply voltage $U_{\rm S}$	AC 1672 V / DC 9.694 V
Frequency range $U_{\rm S}$	42460 Hz / DC
IR420-D4-2:	
Supply voltage $U_{\rm S}$	AC/DC 70300 V
Frequency range $U_{\rm S}$	42460 Hz, DC
Power consumption	≤ 4 VA
IT system being monitored	
Nominal system voltage U _n	AC 0300 V
Nominal frequency f_0	42460 Hz
	.2.11.100.112
Response values	1 200 kG
Response value R _{an1} (Alarm 1) Response value R _{an2} (Alarm 2)	1200 kΩ 1200 kΩ
PreSet mode	1200 K22
	20 kΩ/10 kΩ
$U_{\rm n} \le 72 \text{ V } R_{\rm an1} \text{ (Alarm 1)} / R_{\rm an2} \text{ (Alarm 2)}$ $U_{\rm n} > 72 \text{ V } R_{\rm an1} \text{ (Alarm 1)} / R_{\rm an2} \text{ (Alarm 2)}$	20 kΩ/ 10 kΩ 46 kΩ/23 kΩ
Relative uncertainty $15 \text{ k}\Omega/5200 \text{ k}\Omega$	$\pm 0.5 \mathrm{k}\Omega/\pm 15 \%$
Hysteresis 15 k Ω /5200 k Ω	$\pm 0.3 \text{ ks} 2/\pm 13 \%$ + 1 k Ω /+25 %
•	
Time response	≤1s
Response time t_{an} at $R_F = 0.5$ x R_{an} and $C_e = 1 \mu F$ Start-up delay (start time) t	010 s (0 s)*
Response delay t _{on}	099 s (0 s)*
	0993 (03)
Measuring circuit	
Measuring voltage U _m	±12 V
Measuring current $I_{\rm m}$ (at $R_{\rm F} = 0 \Omega$)	≤ 200 μA
Internal DC resistance R _i	≥ 62 kΩ
Impedance Z _i at 50 Hz	≥ 60 kΩ
Permissible extraneous DC voltage <i>U</i> fg Permissible system leakage capacitance <i>C</i> e	≤ DC 300 V ≤ 20 μF
remissible system leakage capacitance ce	≤ 20 μr
Displays, memory	
Display	LC display, multi-functional, non-illuminated
Display range, measured value	1 kΩ1 MΩ
Operating uncertainty $15 \mathrm{k}\Omega$	10540
15 KΩ 5 kΩ1 MΩ	± 0.5 kΩ
5 KL21 ML2 Password	± 15 %
	off/0999 (off)*
Fault memory, alarm relay	on/off*

 \leq 10 m

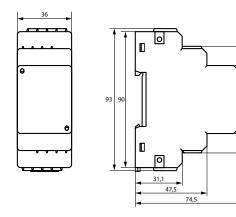
Weight

()* = factory setting

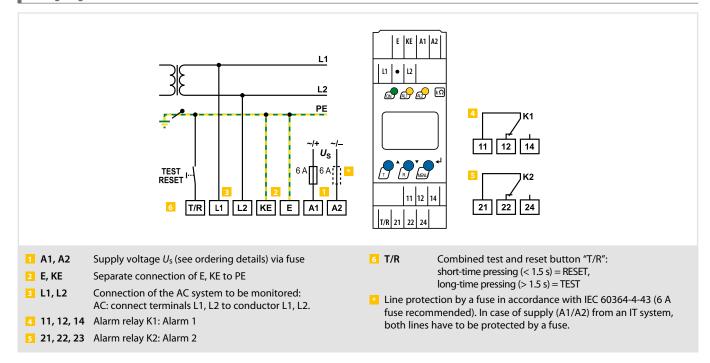
Switching elements	
Number of switching elements	2 (changeover contact K1, K2)
Operating principle	N/C / N/O operation (N/O operation)*
Electrical service life, number of cycles	10000
Contact data acc. to IEC 60947-5-1	
Utilisation category	AC-13 / AC-14 / DC-12 / DC-12 / DC-12
Rated operational voltage	230 V / 230 V / 220 V / 110 V / 24 V
Rated operational current	5 A / 3 A / 0.1 A / 0.2 A / 1 A
Minimum contact rating	1 mA at AC/DC ≥ 10 V
Environment/EMC	
EMC	IEC 61326-2-4
Operating temperature	-25+55 ℃
Classification of climatic conditions acc. to IEC 60721 (r	elated to temperature and relative humidity):
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11
Long-time storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions IEC 60721	
Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M4
Long-time storage (IEC 60721-3-1)	1M12
Connection	
Connection type	screw-type terminal or push-wire terminal
Connection	screw terminals
Connection properties	
rigid	0.2 4 mm ² (AWG 24-12)
flexible	0.22.5 mm ² (AWG 24-14)
Two conductors with the same cross section	,
rigid/flexible	0.21.5 mm ² (AWG 24-16)
Stripping length	89 mm
Tightening torque, terminal screws	0.50.6 Nm
Connection	push-wire terminals
Connection properties	pusii-wire teriiiiiais
rigid	0.22.5 mm ² (AWG 24-14)
flexible	0.22.3 IIIII (AWG 24-14)
without ferrules	0.75 2.5 mm ² (AWC 10.14)
with ferrules	0.752.5 mm² (AWG 19-14) 0.21.5 mm² (AWG 24-16)
Stripping length	10 mm
Opening force	50 N
Test opening, diameter	2.1 mm
Other	
Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (DIN EN 60529	
Degree of protection, terminals (DIN EN 60529)	IP20
Enclosure material	polycarbonate
Flammability class	UL94 V-0
DIN rail mounting acc. to	IEC 60715
Screw mounting	2 x M4 with mounting clip

Dimension diagram (dimensions in mm)

Cable length test and reset button



≤ 150 g







Typical applications

- · AC/DC control circuits in the industrial sector, mechanical engineering, power plants, elevators, automation systems etc.
- AC/DC control and auxiliary circuits in accordance with DIN EN 60204-1 "Electrical equipment of machines", IEC 60204-1, EN 60204-1
- · AC/DC auxiliary circuits in accordance with DIN VDE 0100-725 (VDE 0100-725)
- Smaller AC/DC IT systems such as lighting systems

Approvals





Device features

- Insulation monitoring for AC/DC control circuits 0...300 V
- · Two separately adjustable response values
- Preset function (automatic setting of basic parameters)
- · Connection monitoring system/earth
- LEDs: Power On, Alarm 1, Alarm 2
- · Information about the point of fault L+/L-via display
- Internal/external test/reset button
- Two separate alarm relays (one changeover contact each)
- N/O or N/C operation, selectable
- · Fault memory behaviour, selectable
- · Self monitoring with automatic alarm
- · Multi-functional LC display
- · Adjustable response delay
- Two-module enclosure (36 mm)
- Push-wire terminal (two terminals per connection)

Standards

The ISOMETER® has been developed in compliance with the following standards:

- DIN EN 61557-8 (VDE 0413-8)
- IEC 61557-8
- ASTM F 1669M-96

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Supply voltage ¹⁾ <i>U</i> s	Supply voltage ¹⁾ <i>U</i> _S	
		Screw-type terminal	Push-wire terminal
IR425-D4-1	DC 9.694 V	B91036403	B71036403
IR425-D4W-1	AC 1672 V, 15460 Hz	B91036403W	B71036403W
IR425-D4-2	DC 70300 V	B91036402	B71036402
IR425-D4W-2	AC 70300 V, 15460 Hz	B91036402W	B71036402W

¹⁾ Absolute values

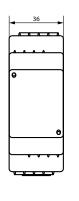
Accessories

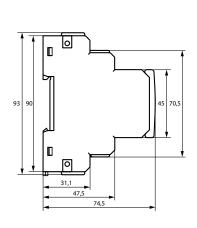
Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B98060008
XM420 mounting frame	B990994

Insulation coordination acc. to IEC 60664-1/IEC	60664-3	Switching elements	
Rated insulation voltage	250 V	Number of	2 (changeover contacts K1, K2)
Rated impulse voltage/Pollution degree	4 kV/3	Operating principle	(N/O operation)(N/C operation)
Protective separation (reinforced insulation) between	1:	Electrical endurance	10000 switching operations
(A1, A2) - (L1, L2, E, KE, T/R) - (11, 12, 14) - (21, 22, 24)	Contact data according IEC 60947-5-1	
Voltage test acc. IEC 61010-1	2.2 kV	Utilization category	AC-13 / AC-14 / DC-12 / DC-12 / DC-12
Supply voltage		Rated operational voltage	230 V / 230 V / 220 V / 110 V / 24 V
		Rated operational current	5 A / 3 A / 0.1 A / 0.2 A / 1 A
IR425-D4-1, IR425-D4W-1:	1616 72 WD60 6 04 W	Minimum current	1 mA at AC/DC \geq 10 V
Supply voltage U _S	AC 1672 V/DC 9.694 V	Environment/EMC	
Frequency range U _s	15460 Hz/DC	EMC	acc. to IEC 61326
IR425-D4-2, IR425-D4W-2:		Operating temperature	-25+55°C
Supply voltage $U_{\rm S}$	AC/DC 70300 V	•	
Frequency range <i>U</i> s	15460 Hz, DC	Classification of climatic conditions acc. to IEC 60721	
Power consumption	≤ 4 VA	Stationary use (IEC 60721-3-3)	3K22
IT System being monitored		for W variant	3K24
Nominal system voltage U_n	AC/DC 0 300 V	Transport (IEC 60721-3-2)	2K11 1K22
Nominal frequency f_n	15460 Hz	Storage (IEC 60721-3-1)	
		Classification of mechanical conditions acc. to IEC	
Response values		Stationary use (IEC 60721-3-3)	3M11
Response value R _{an1} (ALARM 1)	1200 kΩ	Transport (IEC 60721-3-2)	2M4
Response value R _{an1} (ALARM 2)	1200 kΩ	Storage (IEC 60721-3-1)	1M12
Preset function:	2010/4010	Connection	
$U_{\rm n} \le 72 \text{ V: } R_{\rm an1} \text{ (ALARM 1)} / R_{\rm an2} \text{ (ALARM 2)}$	20 kΩ/10 kΩ	Connection type	screw-type terminal or push-wire terminal
$U_{\rm n} > 72 \text{ V: } R_{\rm an1} \text{ (ALARM 1)} / R_{\rm an2} \text{ (ALARM 2)}$	46 kΩ/23 kΩ	· · · · · · · · · · · · · · · · · · ·	screw terminals
Operating error $(15 \text{ k}\Omega)/(5200 \text{ k}\Omega)$	±0.5 kΩ/±15 %	Connection	screw terminals
Hysteresis $(15 \text{ k}\Omega)/(5200 \text{ k}\Omega)$	+1 kΩ/+25 %	Connection properties	0.2 4 (ANIC 24.12)
Time response		rigid	0.24 mm² (AWG 24-12)
Response time t_{an} at $R_F = 0.5$ x R_{an} and $C_e = 1 \mu F$	≤2s	flexible	0.22.5 mm ² (AWG 24-14)
Starting delay t	010 s	Two conductors with the same cross section	0.2 4.5 3/00/6.24.46)
Response delay ton	099 s	rigid/flexible	0.21.5 mm² (AWG 24-16)
Management at a six and t		Stripping length	89 mm
Measuring circuit	, 12 V	Tightening torque, terminal screws	0.50.6 Nm
Measuring voltage $U_{\rm m}$ Measuring current $I_{\rm m}$ ($R_{\rm F}=0~\Omega$)	±12 V	Connection	push-wire terminals
Internal d.c. resistance R_i	\leq 200 µA \geq 62 k Ω	Connection properties	
Internal impedance Z _i (50 Hz)	≥ 62 KΩ ≥ 60 kΩ	rigid	0.22.5 mm ² (AWG 24-14)
Admissible extraneous d.c. voltage U_{fq}	≤ DC 300 V	flexible	
System leakage capacitance C_e	≤ DC 300 V ≤ 20 μF	without ferrules	0.752.5 mm ² (AWG 19-14)
system reakage capacitance ce	⊒ 20 μι	with ferrules	0.21.5 mm ² (AWG 24-16)
Displays, memory		Stripping length	10 mm
Display	LC display, multi-functional, non-illuminated	Opening force	50 N
Display range, measuring value	1 kΩ1 MΩ	Test opening, diameter	2.1 mm
Operating error		Other details	
15 kΩ	\pm 0.5 k Ω		
5 kΩ1 MΩ	± 15 %	Operating mode	continuous
Password	off/0999	Position Degree of protection internal components (EN 60529)	any position IP30
Fault memory (alarm relay)	on/off	Degree of protection internal components (EN 60529) Degree of protection terminals (EN 60529)	IP30 IP20
Inputs		Enclosure material	polycarbonat
Cable length external test/reset button	≤ 10 m	Flammability class	UL94 V-0
		DIN rail mounting acc. to	IEC 60715
		Screw fixing	2 x M4 with mounting clip
		Weight	2 X M-1 With mounting clip

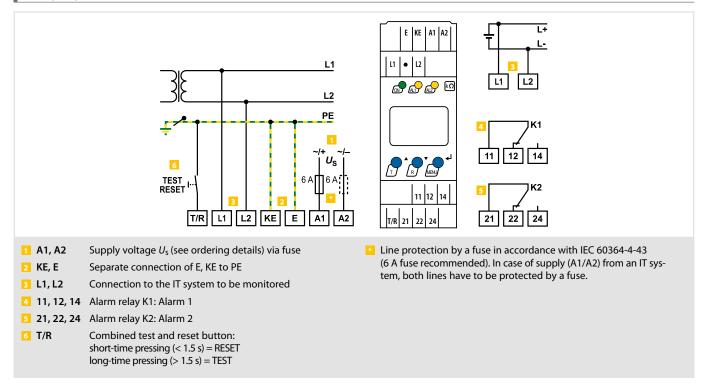
Weight

Dimension diagram (dimensions in mm)





approx. 150 g



ISOMETER® iso1685DP

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





Typical applications

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

Approvals



Device features

- · Isolation monitoring of IT systems
- Measurement of insulation faults 200 $\Omega...1~M\Omega$
- · Automatic adjustment to high system leakage capacitances
- Combination of $\textit{AMP}^\textit{PLUS}$ 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
- · History memory with real-time clock (buffer for 30 days) for storing 1023 alarm messages with date and time
- Freely programmable digital inputs/outputs
- · Separate relays for insulation fault 1, insulation fault 2 and device error

- · High-resolution graphic LC display for excellent readability and recording of the device status
- Graphical representation of the insulation resistance over time (isoGraph) Interfaces

- · RS-485 interface for data exchange with other Bender devices
- Remote setting of certain parameters via the Internet (COMTRAXX® gateway)
- Remote diagnosis by the Bender service via the Internet

Insulation fault monitoring

- 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

Standards

The ISOMETER® iso1685DP device were designed according to the following standards:

- DIN EN 61557-8 (VDE 0413-8)
- DIN EN 61557-9 (VDE 0413-9)
- IEC 61557-8
- IEC 61557-9

Further information

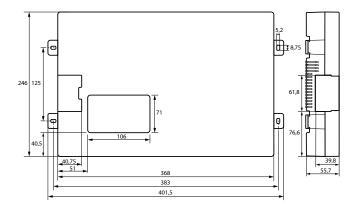
For further information refer to our product range on www.bender.de.

Ordering information

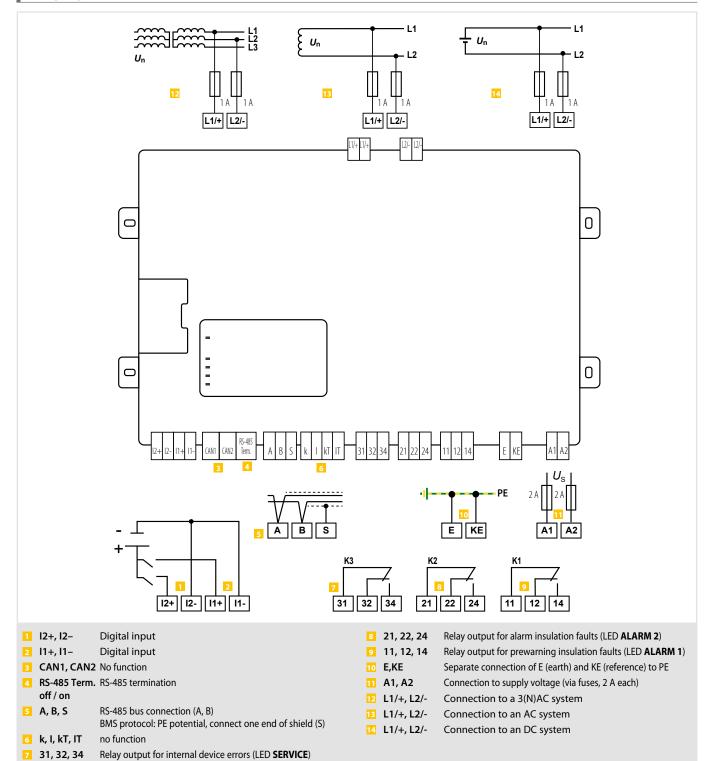
Туре	Supply voltage	Response value range	Nominal voltage	Art. No.
iso1685DP-425	DC 24 V ±25%	200 Ω…1 ΜΩ	AC 01000 V / DC 01500 V	B91065802

Montange in marter 11	Insulation coordination acc. to IEC 60664-1/IEC 60664-3		Inputs	
September 12 (10) 1,17,17 1,10	Definitions:		Operating mode, adjustable	active high, active low
Second control 15(1)	Measuring circuit (IC1)	(L1/+, L2/-), (E, KE)	Functions off, test, reset, de	activate device, insulation fault location
Part	Supply circuit (IC2)	A1, A2	High level	1030 V
March control (1)	Output circuit 1 (IC3)	11, 12, 14	Low level	00.5 V
Part	•			
Memority or and 100 Memory or 100 Memory			Serial interface	
Patent compropring			Interface	RS-485
Service injustice strategy Service in the strategy Service in th			Protocol	BMS; Modbus RTU
Refer 1997 1998	•		Connection	Terminals A/B
Section Sect		III		Shield: terminals S
C		0.147	Cable length	≤ 1200 m
CA CA CA CA CA CA CA CA				
A	, ,			$120 \Omega (0.5 W)$
Continue				290
Martie modulation witaby:			,	
Auto 1.00	IC4 / (IC5-6)	4 kV		1247
Specimen	IC5 / IC6	4 kV		
With Common Com	Rated insulation voltage:			even / odd
March Mar	IC1 / (IC2-5)	1500 V	Stop bits	1 / 2 / auto
March Marc	IC2 / (IC3-5)	250 V	Switching alamants	
Marting Mart	IC2 / IC1+IC6	50 V		2.1
			<u> </u>	3 changeover contacts:
Material Post Material Pos				insulation fault alarm 1
Pollution degree Sabe is location of referenced insubation) between: Operating perindipe R1, R2 n / operating principe R3 R1, R2 n / operating pri	• •			insulation fault alarm 2
Sele bealand reinforced insulation between:				device error
			Operating principle K1, K2	n/coperation or n/o operation
		Ourmelton III 45001		n/c operation, non-adjustable
C(2 / KG	• •			100,000 cycles
Class Cl		3 3 ,		, ,
		3 3 ,		AC 12 / AC 14 / DC 12 / DC 12 / DC 12
S	IC3 / (IC4-6)	Overvoltage category III, 300 V		
Value Control Contr	IC4 / (IC5-6)	Overvoltage category III, 300 V		
RCZ / RCS SC	IC5 / IC6	Overvoltage category III, 300 V	•	5 A / 3 A / 1 A / 0.2 A / 0.1 A
MC MC MC MC MC MC MC MC	Voltage test (routine test) acc. to IEC 61010-1:		Minimum contact rating	1 mA at AC/DC \geq 10 V
Connection Co		AC 2.2 kV	Connection (except mains connection)	
Connection of the connectio		DC $\pm 0.50 \text{ kV}$		
			,,	pluggable push-wire terminals
Macauring urrent In at Ri = 0 Ω (profile dependent) Condition season value Ran and Ray Condition season value Ran Groffile dependent) Condition season value Ran and Ray Condition season value Ra	, ,			
Supply voltage Us			rigid/flexible	0.22.5 mm ² /0.22.5 mm ²
Supply voltage \(\)	107/100	AC 2.2 KV	flexible with ferrule, without/with plastic sleeve	0.252.5 mm ²
Power consumption Septe More and system to be monitored More and system with the system to be monitored More and system with the surface of ln	Supply voltage		Conductor sizes (AWG)	2412
Power consumption Septe More and system to be monitored Nominal system voltage range of the system to be monitored Nominal system voltage range for No Co.1	Supply voltage Us	DC 1830 V	Maine commention	
Contention type Diggane push-witer to				
Nominal system voltage range U_n A C 01000 V; D C 01500 V; P C 01500 V; P C 1460 lk².		= 7	,,	pluggable push-wire terminals
Frequency range Γ _n	Voltage range of the system to be monitored			
Frequency range fn DC 0.1460 Hz AC +10 %/DC +50 Hz Conductor sizes (AWG)	Nominal system voltage range $U_{\rm D}$	AC 01000 V; DC 01500 V	rigid/flexible	0.210 mm ² /0.26 mm ²
Conductor sizes (AWG) Stripping length Stri	, , ,			0.256 mm ² /0.254 mm ²
Measuring circuit for insulation monitoringStripping lengthMeasuring voltage U_m (peak value)±50 VGMeasuring current I_m (at $R_F = 0.\Omega$)≤1.5 mAInternal DC resistance R_i ≥70 kCGPermissible extraneous DC voltage U_{10} ≤DC 1600VPermissible extraneous DC voltage U_{10} ≤DC 1600VPermissible system leakage capacitance C_e (profile-dependent)02000 µFResponse values R_{int} (profile-dependent)200 Ω1 MΩResponse values R_{int} (profile-dependent)200 Ω1 MΩUpper limit of the measuring range for setting $C_{max} = 500 \mu$ F200 kCQUpper limit of the measuring range for setting $C_{max} = 500 \mu$ F200 kCQ 0.2 kΩ 1.0 kΩ 1.0 kΩ±10 kQ 0.2 kΩ 1.0 kΩ±10 kQ 0.2 kΩ 1.0 kΩ±10 kQ 0.2 kΩ 1.0 kΩ±200 kCq 0.2 kΩ 1.0 kΩ±10 kQ 0.2 kΩ 1.0 kΩ±20 kQ 0.2 kΩ 1.0 kΩ±10 kQ 0.2 kΩ 1.0 kΩ±20 kQ 0.2 kΩ 1.0 kΩ±20 kQ 0.2 kΩ 1.0 kQ±10 kQ 0.2 kQ 1.0 kQ±10 kQ 0.2 kQ 1.0 kQ±10 kQ 0.2 kQ 1.0			Conductor sizes (AWG)	248
Measuring vortage \$U_m\$ (peak value)	Totalite of on	110 1 10 70,000 1370	Stripping length	15 mm
Measuring current Im (at R _F = 0 Ω)	Measuring circuit for insulation monitoring		Opening force	90120 N
Measuring current Im (at R _F = 0 Ω)	Measuring voltage $U_{\rm m}$ (peak value)	±50 V		
Mode and and a Reposite Aria (Rane 10 K resistance Ri (Rane 10 K re			Environment/EMC	
Impedance Z₁ at 50 Hz ≤ 70 kΩ Rel. humidity Rel. humidity 4 no. 4 no. <td></td> <td></td> <th>EMC</th> <td>IEC 61326-2-4</td>			EMC	IEC 61326-2-4
Permissible extraneous DC voltage U_{fg} ≤ DC 1600 V Permissible extraneous DC voltage U_{fg} ≤ DC 1600 V Permissible system leakage capacitance C_{fc} (profile-dependent) 02000 μF Response values for insulation monitoring Response value R_{an} (profile-dependent) 200 Ω1 MΩ 1 Condition response value R_{an} and R_{an2} $R_{\text{an1}} \ge R_{\text{an2}}$ $R_{\text{an2}} \ge R_{\text{an2}}$ $R_{\text{an2}} \ge R_{\text{an2}} \ge R_{\text{an2}} \ge R_{\text{an2}}$ $R_{\text{an2}} \ge R_{\text{an2}} \ge R_{\text{an2}} \ge R_{\text{an2}}$ $R_{\text{an2}} \ge R_{\text{an2}} \ge R_{an$			Rel. humidity	10100 %
Permissible system leakage capacitance € (profile-dependent) 02000 μF Permissible system leakage capacitance € (profile-dependent) 02000 μF Permissible system leakage capacitance € (profile-dependent) 200 Ω1 MΩ 1 capsonse value \$A_{an}\$ (profile-dependent) 200 Ω1 MΩ 2 capsonse value \$A_{an}\$ (profile-dependent) 200 Ω2 M	·		•	≤ 3000 m AMSL
Response values for insulation monitoring During operation 40.0. Response value Ran (profile-dependent) 200 Ω1 MΩ fransport 40.0. Condition response value Ran and Ran2 Ran1 ≥ Ran2 Cassification of climatic conditions acc. to IEC 60721-3. 20.0 Upper limit of the measuring range for setting Cemax = 2000 μF 200 ΩCM 40.0 40.0 Relative uncertainty (acc. to IEC 61557-8) 10 kΩ1 MΩ ±15 % 40.0 10.0 10.0 ±15 % 10.0 40.0 10.0 10.0 ±15 % 10.0 40.0 10.0 ±15 % 10.0 10.0 ±15 % 10.0 40.0 10.0 ±15 % 10.0 10.0 ±15 % 10.0 10.0 ±15 % 10.0 10.0 ±15 % 10.0 10.0 ±15 % 10.0 10.0 ±15 % 10.0 10.0 ±15 % 10.0 10.0 ±10.0 10.0 ±10.0 ±10.0 10.0 ±10.0 ±10.0 ±10.0 ±10.0 ±10.0 ±10.0 ±10.0 ±10.0 ±10.0 ±10.0 ±				
Response value R_{an} (profile-dependent) 200 Ω1 MΩ (condition response value R_{an}) (profile-dependent) Transport 401 cong-term storage -251 cong-term storage <th< td=""><td>i crimissibie system reakage capacitance ce (prome-dependent)</td><td>υ2000 μτ</td><th></th><td>40 . 70.00</td></th<>	i crimissibie system reakage capacitance ce (prome-dependent)	υ2000 μτ		40 . 70.00
Response value $R_{\rm an}$ (profile-dependent) 200 Ω 1 M Ω Condition response value $R_{\rm an1}$ and $R_{\rm an2}$ $R_{\rm an1} \ge R_{\rm an2}$ 200 k Ω Upper limit of the measuring range for setting $C_{\rm emax} = 500~\mu {\rm F}$ 200 k Ω Upper limit of the measuring range for setting $C_{\rm emax} = 2000~\mu {\rm F}$ 50 k Ω Relative uncertainty (acc. to IEC 61557-8) 10 k Ω 1 M Ω 215 % 0.2 k Ω < 10 k Ω 2 to Ω 2 k Ω < 10 k Ω 2 to	Response values for insulation monitoring		_ · ·	-40+70°C
Condition response value R_{an1} and R_{an2} $R_{an1} \ge R_{an}$ Upper limit of the measuring range for setting $C_{emax} = 500 \mu F$ $200 k \Omega$ Upper limit of the measuring range for setting $C_{emax} = 2000 \mu F$ $50 k \Omega$ Relative uncertainty (acc. to IEC 61557-8) 10 k Ω 1 M Ω $\pm 15\%$ 0.2 k Ω < 10 k Ω $\pm 200 \Omega \pm 15\%$ Response time t_{an} at $R_F = 0.5 x R_{an}$ ($R_{an} = 10 k \Omega$) and $C_e = 1 \mu F$ acc. to IEC 61557-8 Profile-dependent, typ. $10 s$ Hysteresis 25% , $+ 1 k \Omega$ Locating current t_L $0.0 \pm 200 \Omega$ $0.0 \pm 200 \Omega$ Resouring circuit for insulation fault location (EDS) Locating current t_L $0.0 \pm 200 \Omega$ Test cycle/pause $25 / 4 s$ Display Grafic display $127 x 127 Pixel$, $40 x 40 mm$ Display range measured value 200Ω $500 k \Omega$ Display range measured value 200Ω $500 k \Omega$ Documentation number	•	200 ○ 1 М○		-40+80°C
Upper limit of the measuring range for setting $C_{emax} = 500 μF$ Upper limit of the measuring range for setting $C_{emax} = 2000 μF$ Relative uncertainty (acc. to IEC 61557-8) $10 k\Omega \dots 1 M\Omega$ $2 k\Omega \dots 4 10 k\Omega$ Response time t_{an} at $R_F = 0.5 x R_{an} (R_{an} = 10 k\Omega)$ and $C_e = 1 μF$ acc. to IEC 61557-8 Hysteresis Profile-dependent, typ. 10s Postaging circuit for insulation fault location (EDS) Locating current t_L Display Display Display Grafic Display range measured value Display range measuring range for setting $C_{emax} = 200 μF$ Display Company (IEC 60721-3-1) Classification of climatic conditions acc. to IEC 60721-3-1) Transport (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 60721-3-10 Classification of mechanical co			Long-term storage	-25+80 °C
Upper limit of the measuring range for setting (emax = 500 μF 50 kΩ Relative uncertainty (acc. to IEC 61557-8) 10 kΩ1 MΩ ±15 % 0.2 kΩ<10 kΩ ±200 Ω±15 % 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 Hysteresis 25 %, +1 kΩ Locating current I _L DC ≤ 50 mA Test cycle/pause 2 5 / 4 s Display Display Display Display Grafic display 127 x 127 Pixel, 40 x 40 mm Display range measured value 200 Ω50 MΩ Display range measured value 5 stationary use (IEC 60721-3-3) Stationary use (IEC 60721-3-3) Classification of mechanical conditions acc. to IEC 60721. Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-3) Transport (IEC 60721-3-3) Transport (IEC 60721-3-3) Transport (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 60721. Stationary use (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 60721. Stationary use (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 60721. Stationary use (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 60721. Stationary use (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 60721. Stationary use (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 60721. Stationary use (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 60721. Stationary use (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 60721. Stationary use (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 60721. Stationary use (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 60721. Stationary use (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 60721. Stationary use (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 60721. Transport (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 60721. Transport (IEC 60721-3-1) Classification of mechanical conditions acc. t	•		Classification of climatic conditions acc. to IEC 60721:	
Relative uncertainty (acc. to IEC 61557-8) $10 \ k\Omega \dots 10 \ k\Omega$ $2 \ k\Omega \dots < 10 \ k\Omega$ $2 \ k\Omega \dots < 10 \ k\Omega$ Response time t_{an} at $R_F = 0.5 \times R_{an}$ ($R_{an} = 10 \ k\Omega$) and $C_e = 1 \ \mu F$ acc. to IEC 61557-8 Profile-dependent, typ. $10 \ k\Omega$ Hysteresis $25 \ kO_c + 1 \ k\Omega$ Transport (IEC 60721-3-2) Classification of mechanical conditions acc. to IEC 60721: Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Ung-term storage (IEC 60721-3-1) Transport (IEC 60721-3-2) Transport (IEC 60721-3-1) Transpo				3K23
Reason we intertainly (act. to IEC 61557-8) 10 kΩ 1 MΩ Response time t_{an} at $R_F = 0.5 \times R_{an}$ ($R_{an} = 10 \text{ k}\Omega$) and $C_e = 1 \text{ μF}$ acc. to IEC 61557-8 Profile-dependent, typ. 10 s Hysteresis Display Display Display Display Grafic Display Long-term storage (IEC 60721-3-1) Long-term storage (IEC 60721-3-2) Stationary use (IEC 60721-3-2) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Display Other Other Operating mode Continuous of Position of normal use Position of normal use Continuous of Position of normal use Tightening torque of the screws (4x M5) for enclosure mounting page of protection, internal components Degree of protection, internal components Degree of protection, internal components Degree of protection, terminals Enclosure material Display Grafic Flammability class Software version Documentation number		50 kΩ		2K11
0.2 kΩ<10 kΩ Response time t_{an} at $R_F = 0.5 \times R_{an}$ ($R_{an} = 10$ kΩ) and $C_e = 1$ μF acc. to IEC 61557-8 profile-dependent, typ. 10 s Hysteresis $25\%, +1 kΩ$ Classification of mechanical conditions acc. to IEC 60721: Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Measuring circuit for insulation fault location (EDS) Locating current I_L DC ≤ 50 mA Test cycle/pause $25 / 45$ Display Indicator LEDs for alarms and operating states $2 \times green, 4 \times gellow$ Display Grafic display 127 x 127 Pixel, 40 x 40 mm Display range measured value $200 \Omega50 MΩ$ Fellow and the screws (4x M5) for enclosure mounting and internal components Degree of protection, internal components Degree of protection, terminals Enclosure material Find mability class Software version Documentation number	•			1K22
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 Hysteresis 25 %, +1 kΩ 25			_ ·	
profile-dependent, typ. 10 s Transport (IEC 60721-3-2) Hysteresis 25 %, +1 kΩ Measuring circuit for insulation fault location (EDS) Other Locating current I _L DC ≤ 50 mA Operating mode Continuous of Position of normal use vertical, mains connection Tightening torque of the screws (4x M5) for enclosure mounting 1.0 Display Indicator LEDs for alarms and operating states 2 x green, 4 x y yellow display 127 x 127 Pixel, 40 x 40 mm of Display range measured value 200 Ω50 MΩ Enclosure material polycomentation number Software version Documentation number				
Hysteresis 25 %, +1 kΩ Measuring circuit for insulation fault location (EDS) Locating current /L Display Display Indicator LEDs for alarms and operating states Display Grafic Display range measured value Display range measured value Display Carbon display 127 x 127 Pixel, 40 x 40 mm Display range measured value Display Carbon display 127 x 127 Pixel, 40 x 40 mm Documentation number Display Carbon display 127 x 127 Pixel, 40 x 40 mm Documentation number Display Carbon display 127 x 127 Pixel, 40 x 40 mm Documentation number Display Carbon display 127 x 127 Pixel, 40 x 40 mm Documentation number Display Carbon display 127 x 127 Pixel, 40 x 40 mm Documentation number Display Carbon display 127 x 127 Pixel, 40 x 40 mm Documentation number Display Carbon display 127 x 127 Pixel, 40 x 40 mm Documentation number Display Carbon display 127 x 127 Pixel, 40 x 40 mm Documentation number Display Carbon display 127 x 127 Pixel, 40 x 40 mm Documentation number Display Carbon display 127 x 127 Pixel, 40 x 40 mm Documentation number Display Carbon display 127 x 127 Pixel, 40 x 40 mm Documentation number Display Carbon display 127 x 127 Pixel, 40 x 40 mm Documentation number Display Carbon display 127 x 127 Pixel, 40 x 40 mm Documentation number	Response time t_{an} at $R_F = 0.5$ x R_{an} ($R_{an} = 10$ k Ω) and $C_e = 1$ μF ac	c. to IEC 61557-8		3M11
Measuring circuit for insulation fault location (EDS)Locating current I₂DC ≤ 50 mAOperating modeContinuous of Position of normal useTest cycle/pause2 s / 4 sPosition of normal usevertical, mains connection Tightening torque of the screws (4x M5) for enclosure mounting Degree of protection, internal componentsDisplayDisplay GraficDegree of protection, internal componentsDisplay range measured value200 Ω50 MΩEnclosure materialpolycate polycate p		profile-dependent, typ. 10 s		2M4
Measuring circuit for insulation fault location (EDS)OtherLocating current I₂DC ≤ 50 mA 2 s / 4 sOperating modeContinuous of Position of normal useDisplayTightening torque of the screws (4x M5) for enclosure mounting Display GraficDegree of protection, internal componentsDisplay Graficdisplay 127 x 127 Pixel, 40 x 40 mm Display range measured valueDegree of protection, terminalsEnclosure materialpolycaFlammability classSoftware versionDocumentation number	Hysteresis	25 %, +1 kΩ	Long-term storage (IEC 60721-3-1)	1M12
Locating current I₁DC ≤ 50 mAOperating modeContinuous of Position of normal useContinuous of Position	·		Othor	
Test cycle/pause 2 s / 4 s Display Indicator LEDs for alarms and operating states 2 x green, 4 x yellow Display Grafic display 127 x 127 Pixel, 40 x 40 mm Display range measured value 200 Ω50 MΩ Flammability class Software version Documentation number Position of normal use vertical, mains connection Tightening torque of the screws (4x M5) for enclosure mounting 1.0 Degree of protection, internal components Persition of normal use vertical, mains connection Tightening torque of the screws (4x M5) for enclosure mounting 1.0 Position of normal use vertical, mains connection Tightening torque of the screws (4x M5) for enclosure mounting 1.0 Persit or of normal use vertical, mains connection Tightening torque of the screws (4x M5) for enclosure mounting 1.0 Persit or of normal use vertical, mains connection Tightening torque of the screws (4x M5) for enclosure mounting 1.0 Persit or of normal use vertical, mains connection Tightening torque of the screws (4x M5) for enclosure mounting 1.0 Persit or of normal use vertical, mains connection Tightening torque of the screws (4x M5) for enclosure mounting 1.0 Persit or of normal use vertical, mains connection Tightening torque of the screws (4x M5) for enclosure mounting 1.0 Persit or of normal use vertical, mains connection Tightening torque of the screws (4x M5) for enclosure mounting 1.0 Persit or of normal use vertical, mains connection Tightening torque of the screws (4x M5) for enclosure mounting 1.0 Persit or of normal use vertical, mains connection Tightening torque of the screws (4x M5) for enclosure mounting 1.0				
Tightening torque of the screws (4x M5) for enclosure mounting1.0DisplayIndicator LEDs for alarms and operating states2 x green, 4 x yellow display 127 x 127 Pixel, 40 x 40 mm Display range measured value200 Ω50 MΩ Flammability classEnclosure material Flammability classpolyca Flammability classSoftware version Documentation numberDocumentation number	Locating current I _L	DC ≤ 50 mA		continuous operation
Display Degree of protection, internal components Indicator LEDs for alarms and operating states 2 x green, 4 x yellow display 127 x 127 Pixel, 40 x 40 mm and 200 Ω50 MΩ Display range measured value display 127 x 127 Pixel, 40 x 40 mm and 200 Ω50 MΩ Enclosure material Enclosure material polyca Flammability class Software version Documentation number	Test cycle/pause	2s/4s		vertical, mains connection on top
Indicator LEDs for alarms and operating states 2 x green, 4 x yellow Display Grafic display 127 x 127 Pixel, 40 x 40 mm 200 Ω50 MΩ Flammability class Degree of protection, terminals Degree of protection, terminals Display range measured value 200 Ω50 MΩ Software version Flammability class Software version Documentation number	B: 1		Tightening torque of the screws (4x M5) for enclosure mounti	ng 1.01.5 Nm
Indicator LEDs for alarms and operating states2 x green, 4 x yellow display 127 x 127 Pixel, 40 x 40 mm Display range measured valueDegree of protection, terminals Enclosure materialpolycoEnclosure materialpolycoFlammability classFlammability classSoftware versionDocumentation number	• •		Degree of protection, internal components	IP30
Display Graficdisplay 127 x 127 Pixel, 40 x 40 mmEnclosure materialpolycaDisplay range measured value200 Ω50 MΩFlammability classSoftware versionD0484Documentation number	Indicator LEDs for alarms and operating states	2 x green, 4 x yellow		IP30
Display range measured value $200 \Omega50 M\Omega$ Flammability class Software version D0484 Documentation number	Display Grafic	display 127 x 127 Pixel, 40 x 40 mm	•	polycarbonate
Software version D0484 Documentation number				V-0
Documentation number	•			D0484 D0485
				D0464 D0463 D00272
VVPI(III)				
incigit.			Weight	≤ 1600 g





Wiring diagram



ISOMETER® isoHV1685D







Typical applications

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

Approvals



Device features

- Isolation monitoring of IT systems
- Measurement of insulation faults 200 $\Omega...1$ M Ω in systems with mains voltages of AC 2000 V and DC 3000 V
- · Automatic adjustment to high system leakage capacitances
- Combination of $\textit{AMP}^\textit{PLUS}$ 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
- Device self test with automatic alarm message in the event of a fault
- · History memory with real-time clock (buffer for 30 days) for storing 1023 alarm messages with date and time
- µSD card optional
- Freely programmable digital inputs/outputs
- · Separate relays for insulation fault 1, insulation fault 2 and device error

Display

- · High-resolution graphic LC display for excellent readability and recording of the device status
- Graphical representation of the insulation resistance over time (isoGraph)

Interfaces

- RS-485 interface for data exchange with other Bender devices
- Remote setting of certain parameters via the Internet (COMTRAXX® gateway)
- · Remote diagnosis by the Bender service via the Internet

Standards

The ISOMETER® isoHV1685D was developed in compliance with the following standards:

- IEC 61557-8
- IEC 61557-8 Appendix C (for Profile Fast 2000 μF only)

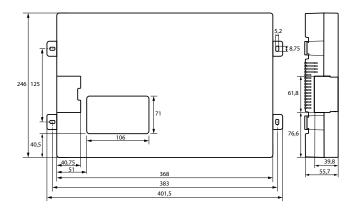
Further information

For further information refer to our product range on www.bender.de.

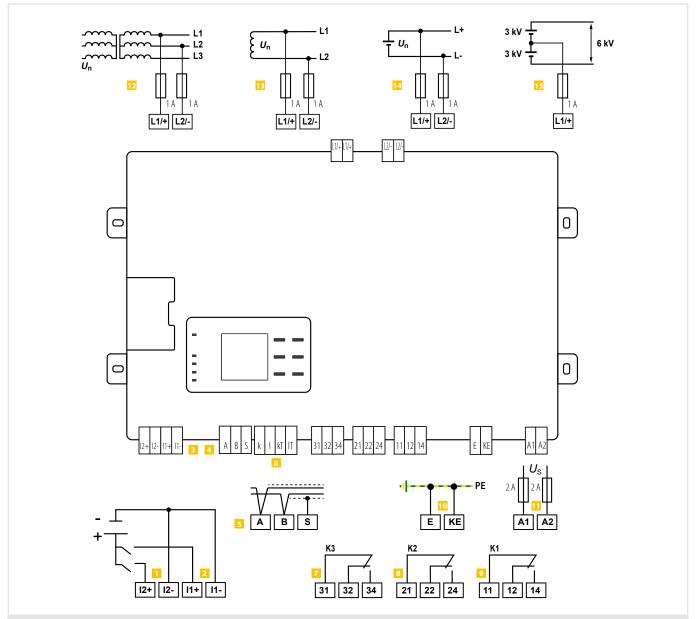
Ordering information

Туре	Supply voltage	Response value range	Nominal voltage	Art. No.
isoHV1685D-425	DC 24 V ±25%	200 Ω…1 ΜΩ	AC 02000 V / DC 03000 V	B91065805

Insulation coordination acc. to IEC 60664-1/IEC 60664-3	,	Digital inputs	
Definitions:		Operating mode, adjustable	active high, active low
Measuring circuit (IC1)	(L1/+, L2/-), (E, KE)	Functions off, test, reset, o	deactivate device, insulation fault location
Supply circuit (IC2)	A1, A2	High level	1030 V
Output circuit 1 (IC3)	11, 12, 14	Low level	00.5 V
Output circuit 2 (IC4)	21, 22, 24		
Output circuit 3 (IC4)	31, 32, 34	Serial interface	
Control circuit (IC6)	(A, B), (I1+, I1-, I2+, I2-)	Interface/protocol	RS-485
Rated voltage	DC 3000 V	Protocol	BMS; Modbus RTU
Overvoltage category	DC 3000 V	Connection	terminals A/B
			Shield: terminal S
Rated impulse voltage:	16 67 14	Cable length	≤ 1200 m
IC1 / (IC2-5)	16.67 kV	Shielded cable (shield to functional earth on one end)	2-core, \geq 0.6 mm2, e.g. J-Y(St)Y 2x0.6
IC2 / (IC3-5)	4 kV	Terminating resistor, can be connected (Term. RS-485)	$120 \Omega (0.5 W)$
IC2 / IC1+IC6	0.8 kV	Device address, BMS bus	290
IC3 / (IC4-6)	4 kV	Device address, Modbus RTU	1247
IC4 / (IC5-6)	4 kV		9.6 / 19.2 / 38.4 / 57.6 / 115 kB
IC5 / IC6	4 kV	Baud rate	
Rated insulation voltage:		Parity	even / odd
IC1 / (IC2-6)	3000 V	Stop bits	1 / 2 / auto
IC2 / (IC3-5)	250 V	Switching elements	
IC2 / IC1+IC6	50 V	Switching elements	2 changeover contacts
IC3 / (IC4-6)	250 V	•	3 changeover contacts:
IC4 / (IC5-6)	250 V	K1	insulation fault alarm 1
IC5 / IC6	250 V	K2	insulation fault alarm 2
Pollution degree	3	K3	device error
Safe isolation (reinforced insulation) between:		Operating principle K1, K2	N/C operation or N/O operation
IC1 / (IC2-5)	Overvoltage category III, 3000 V	Operating principle K3	N/C operation
	3 3,	Electrical endurance under rated operating conditions, num	ber of cycles 100,000
IC2 / (IC3-5)	Overvoltage category III, 300 V	Contact data acc. to IEC 60947-5-1:	
IC2 / IC1+IC6	Overvoltage category III, 50 V	Utilisation category	AC-13 / AC-14 / DC-12 / DC-12 / DC-12
IC3 / (IC4-6)	Overvoltage category III, 300 V	- ,	230 V / 230 V / 24 V / 110 V / 220 V
IC4 / (IC5-6)	Overvoltage category III, 300 V	Rated operational voltage	
IC5 / IC6	Overvoltage category III, 300 V	Rated operational current	5 A / 3 A / 1 A / 0.2 A / 0.1 A
Voltage test (routine test) acc. to IEC 61010-1:		Minimum contact rating	1 mA at AC/DC ≥ 10 V
IC2 / (IC3-5)	AC 2.2 kV	Connection (except mains connection)	
IC2 / IC6	DC ± 0.50 kV		
IC3 / (IC4-6)	AC 2.2 kV	Connection type	pluggable push-wire terminals
IC4 / (IC5-6)	AC 2.2 kV	Connection	22 25 3/22 25 3
IC5 / IC6	AC 2.2 kV	rigid/flexible	0.22.5 mm ² /0.22.5 mm ²
165 / 166	, , , , , , , , , , , , , , , , , , ,	flexible with ferrule, without/with plastic sleeve	0.252.5 mm ²
Supply voltage		Conductor sizes (AWG)	2412
Supply voltage $U_{\rm S}$	DC 1830 V	Mains connection	
Power consumption	≤ 9 W		
·		Connection type	pluggable push-wire terminals
Voltage ranges		Connection	20 10 2/00 1
Nominal system voltage range U_n	AC 02000 V; DC 03000 V	rigid/flexible	0.210 mm ² /0.26 mm ²
Frequency range f_n	DC 0,1460 Hz	flexible with ferrule, without/with plastic sleeve	0.256 mm ² /0.254 mm ²
Tolerance of Un	AC +10 %; DC + 5 %	Conductor sizes (AWG)	248
		Stripping length	15 mm
Measuring circuit for insulation monitoring		Opening force	90120 N
Measuring voltage $U_{\rm m}$ (peak value)	±50 V	Fundamental /FMC	
Measuring current $I_{\rm m}$ (at $R_{\rm F}=0~\Omega$)	≤ 1.5 mA	Environment/EMC	
Internal DC resistance R _i		EMC	IEC 61326-2-4
two-pole coupling	≥ 210 kΩ	Rel. humidity	10100 %
single-pole coupling	≥ 420 kΩ	Area of application	≤ 3000 m AMSL
Impedance Z_i at 50 Hz	20 M22	Ambient temperature	
two-pole coupling	≥ 210 kΩ	during operation	-40+70°C
single-pole coupling	$\geq 210 \text{ k}\Omega$ $\geq 420 \text{ k}\Omega$	Ambient temperature transport	-40+80°C
Permissible extraneous DC voltage U_{fq}	≥ 420 K12 ≤ DC 3150 V		
		Ambient temperature long-term storage	-25+80 ℃
Permissible system leakage capacitance C_{e}	profile-dependent, 02000 μF	Classification of climatic conditions acc. to IEC 60721:	
Response values for insulation monitoring		Stationary use (IEC 60721-3-3)	3K23
Response value R _{an1} (Alarm 1)	200 Ω…1 ΜΩ	Transport (IEC 60721-3-2)	2K11
Response value R _{an2} (Alarm 2)	200 Ω1 ΜΩ	Long-term storage (IEC 60721-3-1)	1K22
		Classification of mechanical conditions acc. to IEC 607	721.
Condition response value	$R_{an1} \ge R_{an2}$		21: 3M11
Upper limit of the measuring range for setting		Stationary use (IEC 60721-3-3)	
	200 kΩ	Transport (IEC 60721-3-2)	2M4
C _{emax} = 500 µF (Profil High capacitance)			1M12
$C_{\text{emax}} = 500 \mu\text{F} (\text{Profile Fast 2000 } \mu\text{F})$	50 kΩ	Long-term storage (IEC 60721-3-1)	
$C_{\text{emax}} = 500 \mu\text{F} \text{ (Profile Fast 2000 } \mu\text{F)}$ Relative uncertainty (acc. to IEC 61557-8)	50 kΩ		
C_{emax} = 500 μF (Profile Fast 2000 μF) Relative uncertainty (acc. to IEC 61557-8) 10 kΩ1 MΩ		Other	continuous anaretica
$C_{\text{emax}} = 500 \mu\text{F} \text{ (Profile Fast 2000 } \mu\text{F)}$ Relative uncertainty (acc. to IEC 61557-8)	50 kΩ	Other Operating mode	•
C_{emax} = 500 μF (Profile Fast 2000 μF) Relative uncertainty (acc. to IEC 61557-8) 10 kΩ1 MΩ	50 kΩ ±15 % 1 kΩ ± 15 %	Other Operating mode Position of normal use	vertical, mains connection on top
C_{emax} = 500 μF (Profile Fast 2000 μF) Relative uncertainty (acc. to IEC 61557-8) 10 kΩ1 MΩ 0.2 kΩ< 10 kΩ	50 kΩ ±15 % 1 kΩ ± 15 %	Other Operating mode Position of normal use Tightening torque of the screws (4x M5) for enclosure moun	vertical, mains connection on top ting 1.01.5 Nm
$C_{\rm emax} = 500$ μF (Profile Fast 2000 μF) Relative uncertainty (acc. to IEC 61557-8) 10 kΩ1 MΩ 0.2 kΩ< 10 kΩ Response time $t_{\rm an}$ at $R_{\rm F} = 0.5$ x $R_{\rm an}$ ($R_{\rm an} = 10$ kΩ) and $C_{\rm e} = 1$ μ	$50~k\Omega$ $$\pm 15~\%$ $1~k\Omega \pm 15~\%$ IF acc. to IEC 61557-8	Other Operating mode Position of normal use Tightening torque of the screws (4x M5) for enclosure moun Degree of protection, internal components	vertical, mains connection on top ting 1.01.5 Nm IP30
$C_{\rm emax}=500$ μF (Profile Fast 2000 μF) Relative uncertainty (acc. to IEC 61557-8) 10 kΩ1 MΩ 0.2 kΩ< 10 kΩ Response time $t_{\rm an}$ at $R_{\rm F}=0.5$ x $R_{\rm an}$ ($R_{\rm an}=10$ kΩ) and $C_{\rm e}=1$ μ Hysteresis	$50~\text{k}\Omega$ $$\pm 15~\%$ $1~\text{k}\Omega \pm 15~\%$ IF acc. to IEC 61557-8 profile-dependent, typ. $10~\text{s}$	Other Operating mode Position of normal use Tightening torque of the screws (4x M5) for enclosure mound Degree of protection, internal components Degree of protection, terminals	vertical, mains connection on top ting 1.01.5 Nm IP30 IP30
$C_{\rm emax} = 500$ μF (Profile Fast 2000 μF) Relative uncertainty (acc. to IEC 61557-8) 10 kΩ1 MΩ 0.2 kΩ< 10 kΩ Response time $t_{\rm an}$ at $R_{\rm F} = 0.5$ x $R_{\rm an}$ ($R_{\rm an} = 10$ kΩ) and $C_{\rm e} = 1$ μ	$50~\text{k}\Omega$ $$\pm 15~\%$ $1~\text{k}\Omega \pm 15~\%$ IF acc. to IEC 61557-8 profile-dependent, typ. $10~\text{s}$	Other Operating mode Position of normal use Tightening torque of the screws (4x M5) for enclosure moun Degree of protection, internal components	continuous operation vertical, mains connection on top ting 1.01.5 Nm IP30 IP30 polycarbonate
$C_{\rm emax}=500$ μF (Profile Fast 2000 μF) Relative uncertainty (acc. to IEC 61557-8) 10 kΩ1 MΩ 0.2 kΩ< 10 kΩ Response time $t_{\rm an}$ at $R_{\rm F}=0.5$ x $R_{\rm an}$ ($R_{\rm an}=10$ kΩ) and $C_{\rm e}=1$ μ Hysteresis	$50~\text{k}\Omega$ $$\pm 15~\%$ $1~\text{k}\Omega \pm 15~\%$ IF acc. to IEC 61557-8 profile-dependent, typ. $10~\text{s}$	Other Operating mode Position of normal use Tightening torque of the screws (4x M5) for enclosure mound Degree of protection, internal components Degree of protection, terminals	vertical, mains connection on top ting 1.01.5 Nm IP30 IP30
$C_{\rm emax} = 500$ μF (Profile Fast 2000 μF) Relative uncertainty (acc. to IEC 61557-8) 10 kΩ 1 MΩ 0.2 kΩ < 10 kΩ Response time $t_{\rm an}$ at $R_{\rm F} = 0.5$ x $R_{\rm an}$ ($R_{\rm an} = 10$ kΩ) and $C_{\rm e} = 1$ μ Hysteresis Display Indicator LEDs for alarms and operating states	$50 \text{ k}\Omega$ $\pm 15 \%$ $1 \text{ k}\Omega \pm 15 \%$ if acc. to IEC 61557-8 profile-dependent, typ. 10 s $25 \%, +1 \text{ k}\Omega$	Other Operating mode Position of normal use Tightening torque of the screws (4x M5) for enclosure moun Degree of protection, internal components Degree of protection, terminals Enclosure material	vertical, mains connection on top ting 1.01.5 Nm IP30 IP30 polycarbonate
$C_{\rm emax} = 500$ μF (Profile Fast 2000 μF) Relative uncertainty (acc. to IEC 61557-8) 10 kΩ 1 MΩ 0.2 kΩ < 10 kΩ Response time $t_{\rm an}$ at $R_{\rm F} = 0.5$ x $R_{\rm an}$ ($R_{\rm an} = 10$ kΩ) and $C_{\rm e} = 1$ μ Hysteresis Display Indicator LEDs for alarms and operating states	$50 \text{ k}\Omega$ $\pm 15 \%$ $1 \text{ k}\Omega \pm 15 \%$ If acc. to IEC 61557-8 profile-dependent, typ. 10 s $25 \%, +1 \text{ k}\Omega$ $1 \text{ x green, } 4 \text{ x yellow}$	Other Operating mode Position of normal use Tightening torque of the screws (4x M5) for enclosure mound Degree of protection, internal components Degree of protection, terminals Enclosure material Flammability class	vertical, mains connection on top ting 1.01.5 Nm IP30 IP30 polycarbonate V-0



Wiring diagram



- 12+, 12-Digital input
- l1+, l1-Digital input
- CAN1, CAN2 No function
- RS-485 Term. RS-485 termination off / on
- RS-485 bus connection (A, B) A, B, S
 - BMS protocol: PE potential, connect one end of shield (S)
- k, I, kT, IT no function
- 7 31, 32, 34 Relay output for internal device errors (LED **SERVICE**)

- 8 21, 22, 24
- Relay output for alarm insulation faults (LED ALARM 2)
- Relay output for prewarning insulation faults (LED ALARM 1)
- E,KE
- 11 A1, A2
- 12 L1/+, L2/-
- 13 L1/+, L2/-
- 14 L1/+, L2/-
- 15 L1/+, L2/-
- Separate connection of E (earth) and KE (reference) to PE
- - Connection to supply voltage (via fuses, 2 A each)
- Connection to a 3(N)AC system
- Connection to an AC system
 - Connection to a DC system with center tap

Connection to an DC system

ISOMETER® isoLR1685DP

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







Typical applications

• ISOMETER® for AC IT systems with galvanically connected rectifiers or inverters and for unearthed DC $\,$ IT systems.

Approvals



Device features

- · Isolation monitoring of IT systems
- Measurement of low-resistance insulation faults 20 $\Omega...100~\text{k}\Omega$
- · Automatic adjustment to high system leakage capacitances
- Combination of $\textit{AMP}^\textit{PLUS}$ 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
- · Device self test with automatic alarm message in the event of a fault
- History memory with real-time clock (buffer for 30 days) for storing 1023 alarm messages with date and time
- Freely programmable digital inputs/outputs
- Separate relays for insulation fault 1, insulation fault 2 and device error

- · High-resolution graphic LC display for excellent readability and recording of the device status
- Graphical representation of the insulation resistance over time (isoGraph)

- · RS-485 interface for data exchange with other Bender devices
- Remote setting of certain parameters via the Internet (COMTRAXX® gateway)
- Remote diagnosis by the Bender service via the Internet

Insulation fault monitoring

- 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

Standards

The ISOMETER® isoLR1685DP device were designed according to the following standards:

- DIN EN 61557-8 (VDE 0413-8)
- DIN EN 61557-9 (VDE 0413-9)
- IEC 61557-8
- IEC 61557-8 Annex C (for Fast 2000 μF profile only)
- DIN EN 61557-9 (VDE 0413-9)

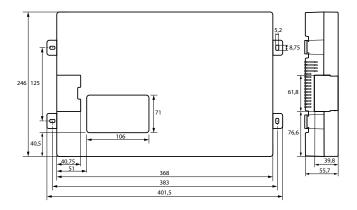
Further information

For further information refer to our product range on www.bender.de.

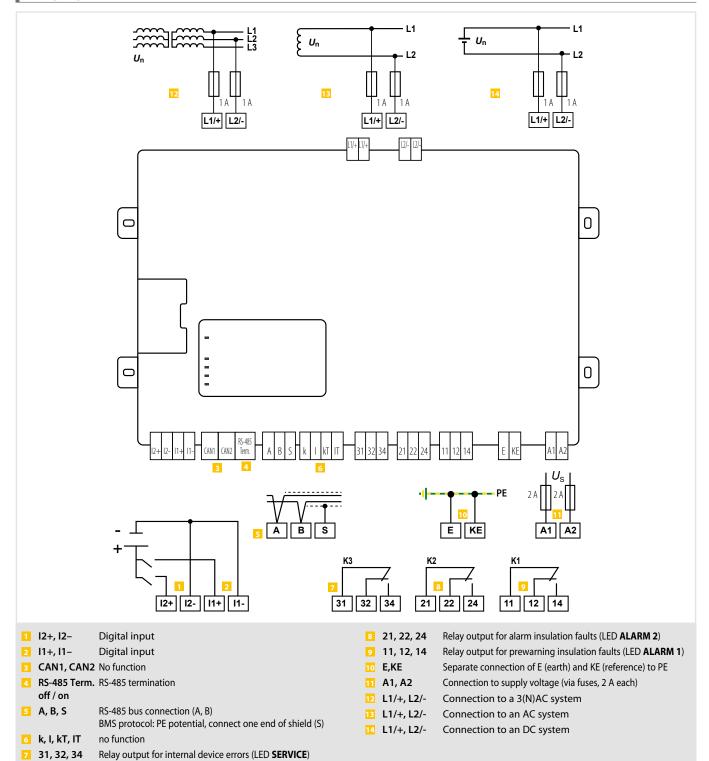
Ordering information

Туре	Supply voltage	Response value range	Nominal voltage	Art. No.
isoLR1685DP-325	DC 24 V ±25%	20 Ω…100 kΩ	AC 0690 V / DC 0690 V	B91065803

Insulation coordination acc. to IEC 60664-1/IEC 60664-3		Digital inputs	
Definitions:		Operating mode, adjustable	active high, active low
Measuring circuit (IC1)	(L1/+, L2/-), (E, KE)	Functions off, test, reset,	deactivate device, insulation fault location
Supply circuit (IC2)	A1, A2	High level	1030 \
Output circuit 1 (IC3)	11, 12, 14	Low level	00.5 \
Output circuit 7 (ICS)	, ,	LOW ICVCI	00.5 ¥
	21, 22, 24	Serial interface	
Output circuit 3 (IC4)	31, 32, 34		RS-485
Control circuit (IC6)	(A, B), (I1+, I1-, I2+, I2-)	Interface/protocol	
Rated voltage	DC 1500 V	Protocol	BMS; Modbus RTU
Overvoltage category	III	Connection	terminals A/B
Rated impulse voltage:			Shield: terminal S
IC1 / (IC2-5)	8 kV	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
IC2 / (IC3-5)	4 kV		120 Ω (0.5 W)
IC2 / IC1+IC6	0.8 kV	Terminating resistor, can be connected (Term. RS-485)	
IC3 / (IC4-6)	4 kV	Device address, BMS bus	290
IC4 / (IC5-6)	4 kV	Device address, Modbus RTU	1247
IC5 / IC6	4 kV	Baud rate	9.6 / 19.2 / 38.4 / 57.6 / 115 kB
Rated insulation voltage:		Parity	even / odd
	1500 V	Stop bits	1 / 2 / auto
IC1 / (IC2-6)	1500 V	Stop bits	1 / 2 / uuto
IC2 / (IC3-5)	250 V	Switching elements	
IC2 / IC6	50 V	Switching elements	3 changeover contacts:
IC3 / (IC4-6)	250 V	3	
IC4 / (IC5-6)	250 V	K1	insulation fault alarm 1
IC5 / IC6	250 V 250 V	K2	insulation fault alarm 2
		К3	device error
Pollution degree	3	Operating principle K1, K2	N/C operation or N/O operation
Safe isolation (reinforced insulation) between:		Operating principle K3	N/C operation
IC1 / (IC2-5)	Overvoltage category III, 1500 V	Electrical endurance under rated operating conditions	100,000 cycles
IC2 / (IC3-5)	Overvoltage category III, 300 V		Tou,oud cycles
IC2 / IC6	Overvoltage category III, 50 V	Contact data acc. to IEC 60947-5-1:	
IC3 / (IC4-6)	Overvoltage category III, 300 V	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
IC4 / (IC5-6)	Overvoltage category III, 300 V	Rated operational current	5 A / 3 A / 1 A / 0.2 A / 0.1 A
IC5 / IC6	Overvoltage category III, 300 V		
Voltage test (routine test) acc. to IEC 61010-1:		Minimum contact rating	1 mA at AC/DC \geq 10 V
IC2 / (IC3-5)	AC 2.2 kV	Connection (except mains connection)	
IC2 / IC6	DC ± 0.50 kV		
IC3 / (IC4-6)	AC 2.2 kV	Connection type	pluggable push-wire terminals
IC4 / (IC5-6)	AC 2.2 kV	Connection	
		rigid/flexible	0.22.5 mm ² /0.22.5 mm ²
IC5 / IC6	AC 2.2 kV	flexible with ferrule, without/with plastic sleeve	0.252.5 mm ²
Cupply voltage		Conductor sizes (AWG)	2412
Supply voltage		Colladetol 3/263 (AWA)	2712
Supply voltage $U_{\rm S}$	DC 1830 V	Mains connection	
Power consumption	≤ 9 W	Connection type	pluggable push-wire terminals
Voltage ranges		Connection	praggasie pasii wire terminais
		rigid/flexible	0.210 mm ² /0.26 mm ²
Nominal system voltage range U_n	AC 0690 V; DC 0690 V	3	• • • • • • • • • • • • • • • • • • • •
Frequency range f_n	DC 0,1460 Hz	flexible with ferrule, without/with plastic sleeve	0.256 mm ² /0.254 mm ²
Tolerance of U_n	AC +10 %/DC +5%	Conductor sizes (AWG)	248
		Stripping length	15 mm
Measuring circuit for insulation monitoring		Opening force	90120 N
Measuring voltage $U_{\rm m}$ (peak value)	±50 V		
Measuring current $I_{\rm m}$ (at $R_{\rm F}=0~\Omega$)	≤ 3.5 mA	Environment/EMC	
Internal DC resistance $R_{\rm i}$	≥ 15 kΩ	EMC	IEC 61326-2-4
Impedance Z _i at 50 Hz	≥ 15 kΩ	Rel. humidity	10100 %
		Area of application	≤ 3000 m AMSL
Permissible extraneous DC voltage Ufg	≤ DC 720 V		≥ 2000 III AINI3L
Permissible system leakage capacitance C_e (profile-dependent)	02000 μF	Ambient temperature	
Response values for insulation monitoring		During operation	-40+70°C
		Transport	-40+80°C
Response value R _{an} (profile-dependent)	20 Ω100 kΩ	Long-term storage	-25+80 °C
Condition response value	$R_{\rm an1} \ge R_{\rm an2}$		
Upper limit of the measuring range for setting $C_{emax} = 500 \mu F$	200 kΩ	Classification of climatic conditions acc. to IEC 60721:	
Upper limit of the measuring range for setting $C_{\text{emax}} = 2000 \mu\text{F}$	50 kΩ	Stationary use (IEC 60721-3-3)	3K23
Relative uncertainty (acc. to IEC 61557-8)	30.122	Transport (IEC 60721-3-2)	2K11
10 k Ω 1 M Ω	±15 %	Long-term storage (IEC 60721-3-1)	1K22
		•	721.
$0.2 \Omega < 10 k\Omega$	±200 Ω ±15 %	Classification of mechanical conditions acc. to IEC 607	
Response time t_{an} at $R_F = 0.5$ x R_{an} ($R_{an} = 10$ k Ω) and $C_e = 1$ μ F as		Stationary use (IEC 60721-3-3)	3M11
	profile-dependent, typ. 10 s	Transport (IEC 60721-3-2)	2M4
Hysteresis	25 %, +1 kΩ	Long-term storage (IEC 60721-3-1)	1M12
		Deviation from the classification of climatic condition	ns:
Measuring circuit for insulation fault location (EDS)		Demands from the dassification of chillage collabor	
Locating current /L	$DC \le 50 \text{ mA}$	Other	
Test cycle/pause	2 s/4 s	Operating mode	continuous operation
		Position of normal use	vertical, mains connection on top
Display			
Indicator LEDs for alarms and operating states	1 x green, 4 x yellow	Tightening torque of the screws (4x M5) for enclosure mour	
	display 127 x 127 Pixel, 40 x 40 mm	Degree of protection, internal components	IP30
Dienlay Grafic	uispiay 12/ x 12/ rixei, 40 X 40 MM	Degree of protection, terminals	IP30
• /			
• /	20 Ω…1 ΜΩ	Enclosure material	nolycarhonato
Display Grafic Display range measured value	20 Ω…1 ΜΩ	Enclosure material	polycarbonate V o
_ ' '	20 Ω1 ΜΩ	Flammability class	V-0
• /	20 Ω1 ΜΩ	Flammability class Software version	V-0 D0538 D0539
_ ' '	20 Ω1 ΜΩ	Flammability class	V-0



Wiring diagram



ISOMETER® isoHR1685DW-925

Insulation monitoring device for mobile, insulated elevating work platforms





Typical applications

 Isolationsüberwachung von Hubarbeitsbühnen/Oberleitungsfahrzeugen.

Approvals



Device features

ISOMETER® for mobile, insulated elevating work platforms

- · Continuous monitoring of both insulation levels on elevating work platforms, also during operation
- Storage of data for verification of insulation condition. Where necessary, provision of documentary verification following a electrical accident
- Graphical representation of the insulation resistance over time (isoGraph)
- RS-485 interface with BMS protocol and Modbus RTU for forwarding data, alarms and acknowledgements via existing communication to work platform
- · History memory with real-time clock (13-day buffer) for storing 1023 alarm messages with date and timestamp
- Freely programmable digital inputs
- · Automatic device self-test with automatic message in the event of a fault
- · Connection monitoring
- 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
- Measurement of high-resistance insulation faults 100 k $\!\Omega...20\,G\Omega$
- · Automatic adjustment to high system leakage capacitances

Standards

The ISOMETER® has been developed in compliance with the following standards:

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

Further information

For further information refer to our product range on www.bender.de.

Ordering information

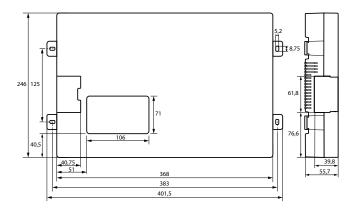
Туре	Supply voltage ¹⁾	Response value range	Nominal system voltage	Art. No.
isoHR1685DW-925	DC 1830 V	100 kΩ100 MΩ	AC 01000 V / DC 01500 V	B91065806W

¹⁾ Absolute values

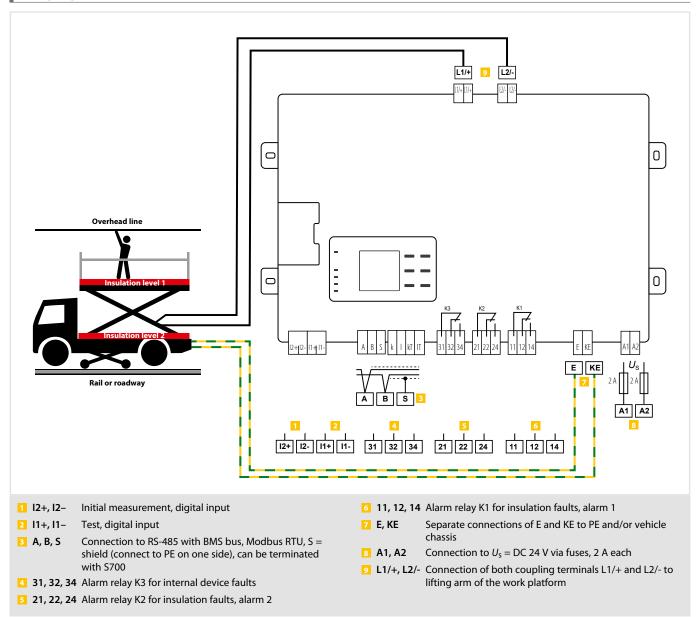
Insulation coordination acc. to IEC 60664-1/IEC 60664-3		Digital inputs	
Definitions:		Operating mode, variable	active high, active lov
Measuring circuit (IC1) (L	1/+, L2/-), (E, KE)	Functions off, test, re	set, disable device, insulation fault location
Supply circuit (IC2)	A1, A2	High level	1030
Output circuit 1 (IC3)	11, 12, 14	Low level	00.5
Output circuit 2 (IC4)	21, 22, 24		
Output circuit 3 (IC4)	31, 32, 34	Serial interface	
Control circuit (IC6) (A, B), (11+, 11-, 12+, 12-)	Interface/Protocol	RS-48
Rated voltage	1500 V	Protocol	BMS; Modbus RT
Overvoltage category	III	Connection	Terminals A/
Rated impulse voltage:			Shield: Terminal
IC1/(IC2-5)	10 kV	Cable length	≤ 1200 ו
IC2/(IC3-5)	4 kV	Shielded cable (shield to functional earth on one side)	2-core, \geq 0.6 mm ² , e.g. J-Y(St)Y 2x0.
IC2/IC1+IC6	800 V	Terminating resistance, engageable (term. RS-485)	120 Ω (0.5 W
IC3/(IC4-6)	4 kV	Device address, BMS bus	(1) 290 (2)
IC4/(IC5-6)	4 kV	Device address, Modbus RTU	124
IC5/IC6	4 kV	Baud rate	9.6 / 19.2 / 38.4 / 57.6 / 115 k
	4 KV	Parity	even / uneve
Rated insulation voltage:	1500 V	Stop bits	1/2/au
IC1/(IC2-6)	1500 V	Stop Dits	1/2/ du
IC2/(IC3-5)	250 V	Switching elements	
IC2/IC6	50 V	Switching elements	3 changeover contact
IC3/(IC4-6)	250 V	Switching cichicits	K1 (insulation fault alarm 1
IC4/(IC5-6)	250 V		K2 (insulation fault alarm 2
IC5/IC6	250 V		K2 (IIISUIALIOII IAUIL AIAIII 2 K3 (device faul
Pollution degree	3	Operating mode V1 V2	•
Protective separation (reinforced insulation) between:		• •	operation / N/O operation (N/C operation)
,	tegory III, 1500 V	Operating mode K3	N/C operation, not modifiab
	category III, 300 V	Electrical endurance under rated operating conditions	100,000 cycle
	category III, 50 V	Contact data acc. to IEC 60947-5-1:	
	category III, 300 V	Utilisation category	AC-13 / AC-14 / DC-12 / DC-12 / DC-1
	category III, 300 V	Rated operational voltage	230 V / 230 V / 24 V / 110 V / 220
	category III, 300 V	Rated operational current	5 A / 3 A / 1 A / 0.2 A / 0.1
Voltage test (routine test) as per IEC 61010-1:	ategory III, 500 v	Rated insulation voltage	250
IC2/(IC3-5)	AC 2.2 kV	Minimum contact rating	1 mA at AC/DC \geq 10
IC2/IC6	DC ±0.50 kV	······································	
IC3/(IC4-6)	AC 2.2 kV	Connection (except mains coupling)	
	AC 2.2 kV	Type of connection	Pluggable push-wire termina
IC4/(IC5-6)		Connection	
IC5/IC6	AC 2.2 kV	rigid/flexible	0.22.5 mm ² /0.22.5 mm
Supply voltage		flexible with ferrule, without/with plastic sleeve	0.252.5 mm
Supply voltage U_{S}	DC 1830 V	Conductor sizes (AWG)	241
, 3 -		conductor sizes (TTTG)	
Power consumption	≤ 9 W	Connection of the mains coupling	
Voltage range		Type of connection	Pluggable push-wire termina
	V; DC 01500 V	Connection	33 1
, , ,	Hz; 60 Hz (±1 Hz)	rigid/flexible	0.210 mm ² /0.26 mm
1 / 3 "	+10 %/DC +5%	flexible with ferrule, without/with plastic sleeve	0.256 mm ² /0.254 mm
Toterance of the second	. + 10 70/DC + 370	Conductor sizes (AWG)	24
Measuring circuit for insulation monitoring		Stripping length	15 mi
Measuring voltage $U_{\rm m}$ (peak value)	± 50 V	Opening force	90120
Measuring current $I_{\rm m}$ (at $R_{\rm f}=0~\Omega$)	± 30 V ≤ 1 μA	opening force	90120
•	≥ 1 μA ≥ 50 MΩ	Environment/EMC	
Internal resistance DC R _i		EMC	IEC 61326-2-
Impedance Z _i at 50 Hz	≥ 50 MΩ	Rel. humidity	10100 9
Permissible extraneous DC voltage <i>U</i> _{fg}	≤ DC 1600 V	Application range	≤ 3000 m AMS
Permissible system leakage capacitance C_e isoHR1685DW-925 profile-de	pendent, 0 1 μF		⊇ 3000 III /IIII3
Response values for insulation monitoring		Ambient temperature	
	00 kΩ100 MΩ	During operation	-40+70°
,		Transport	-40+80°
Response value condition	$R_{an1} \ge R_{an2}$	Long-term storage	-25+80°
Upper limit of the measuring range when setting measuring profile to	a=	Classification of climatic conditions acc. to IEC 60721:	
'high capacity"C _{emax} = 5 μF	24 ΜΩ	Stationary use (IEC 60721-3-3)	3K2
Relative uncertainty (acc. to IEC 61557-8)	±15 %	•	
	±200 kΩ ±15 %	Transport (IEC 60721-3-2)	2K1
Response time t_{an} at R_F $=$ 0.5 x R_{an} (R_{an} $=$ 100 k Ω) and C_e $=$ 1 μF acc. to IEC 61557-8		Long-term storage (IEC 60721-3-1)	1K2
profile-de _l	pendent, typ. 10 s	Mechanical conditions acc. to IEC 60721:	
Hysteresis	25 %	Stationary use (IEC 60721-3-3)	3M1
,		Transport (IEC 60721-3-2)	2M
Display		Long-term storage (IEC 60721-3-1)	1M1
Display graphic display 127 x 127 p			
Display range, measured value	100 kΩ20 GΩ	Other	
		Operating mode	Continuous operatio
LEDs		Position of normal use	Vertical, mains coupling at to
ON (operation LED)	green	Tightening torque for screws (4x M5) to fasten enclosure	1.01.5 Ni
PGH ON (no function)	yellow	Degree of protection, internal components	IP3
SERVICE	yellow	Degree of protection, internal components Degree of protection, terminals	IP3
ALARM 1	yellow	Enclosure material	Polycarbonat
	yellow	Flammability class	V-
ALAKM Z	VEIIIVV		V-
ALARM 2	yellow	•	
ALAKM Z	yellow	Documentation number	D0036
ALANM Z	yellow	•	D0036 ≤ 1600

()* = factory setting





Wiring diagram



ISOMETER® IR1575

Insulation monitoring device for unearthed AC, 3(N)AC systems up to 480 V and DC systems up to 480 V





Typical applications

- AC or AC/DC main circuits
- · AC/DC main circuits with directly connected DC components
- UPS systems, battery systems
- · Heaters with phase control
- Installations including switch mode power supplies

Approvals



Device features

- Insulation monitoring for unearthed AC, AC/DC systems 0...480 V and DC systems 0...480 V
- Two separately adjustable response values 2 k $\Omega...1~M\Omega$
- · AMP measurement method
- Automatic adaptation to the system leakage capacitance
- Injection of the locating current required for selective insulation fault location (only IR1575PG1)
- Alarm LEDs for Alarm 1/Alarm 2
- · Fault memory selectable
- Connection monitoring system conductor/earth
- Test and reset button
- External test/reset button can be connected
- Two separate alarm relays with one potential-free changeover contact each
- N/O or N/C operation, selectable
- · Backlit LC display
- · Self monitoring with automatic alarm
- Plug-in terminals
- Door mounting enclosure 96 x 96 mm

Standards

The ISOMETER® has been developed in compliance with the following standards:

- DIN EN 61557-8 (VDE 0413-8)
- EN 61557-8
- IEC 61557-8

Further information

For further information refer to our product range on www.bender.de.

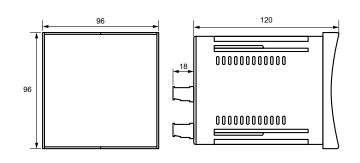
Ordering information

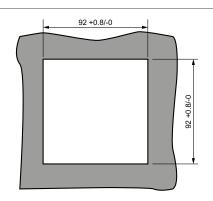
Туре	Supply voltage U s ¹⁾	Design	Art. No.
IR1575-435	AC 88264 V / AC 340460 V		B91064000
IR1575PG1-435	DC 77286 V AC 1672 V	Standard	B91064002
IR1575-434		Standard	B91064003
IR1575PG1-434	DC 10,284 V		B91064004
IR1575W-435	AC 88264 V / AC 340460 V	Increased shock and	B91064000W
IR1575PG1W-435	DC 77286 V	vibration resistance	B91064002W

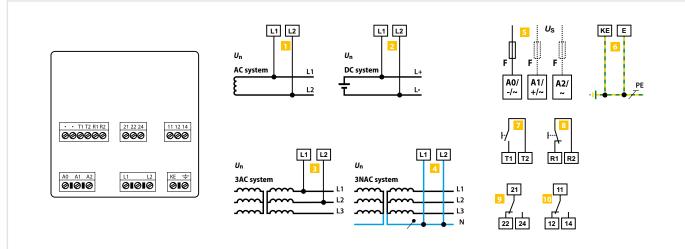
⁾ Absolute values

Insulation coordination acc. to IEC 60664-1		Outputs	
Rated voltage	AC 500 V	Test and reset button internal/external	
Rated impulse voltage/pollution degree	4 kV/3	Switching elements	
Voltage ranges		Switching elements	2 x 1 changeover contact
IR1575:		Operating principle	N/O or N/C operation
Nominal system voltage $U_{\rm D}$	AC, 3(N)AC 0480 V, DC 0480 V	Factory setting (Alarm1/Alarm2)	N/O operation
Nominal frequency f_0	DC, 30420 Hz	Admissible number of operations/h	12 000 cycles
. ,	DC, 30 4 20 Hz	Contact class	IIB (DIN EN 60255-23)
IR1575PG1:	4.C/2.4.C.20 400.V	Rated contact voltage	AC 250 V/DC 300 V
Nominal system voltage U_n	AC/3 AC 20480 V	Making capacity	UC 5 A
Nominal frequency f _n	30460 Hz	Breaking capacity	2 A, AC 230 V, cos φ = 0.4
Nominal system voltage $U_{\rm n}$	DC 20480 V		0.2 A, DC 220 V, L/R = 0.04 s
IR1575x-435:		Minimum contact current at DC 24 V	\geq 2 mA (50 mW)
Supply voltage $U_{\rm S}$ at AO/A1 (see nameplate)	AC 88264 V	Environment	
Frequency range of U _s	42460 Hz		. FN (122)
Supply voltage U_S at AO/A2 (see nameplate)	AC 340460 V	EMC immunity	acc. to EN 61326
Frequency range of U _s	4763 Hz	EMC emission	acc. to EN 61326
Supply voltage $U_{\rm S}$ at AO/A1 (see nameplate)	DC 77286 V	Shock resistance IEC 60068-2-27 (device in operation)	15 g/11 ms
IR1575x-434:		Bumping IEC 60068-2-29 (transport)	40 g/6 ms
Supply voltage <i>U</i> _S at AO/A1 (see nameplate)	AC 1672 V	Vibration resistance acc. to IEC 60068-2-6 (device in operation)	1 g/10150 Hz
Frequency range of U _S	42460 Hz	Vibration resistance acc. to IEC 60068-2-6 (transport)	2 g/10150 Hz
Supply voltage <i>U</i> _S at AO/A1 (see nameplate)	DC 10.284 V	Ambient temperature (during operation)	-10+55 °C
IR1575:		Ambient temperature (during storage)	-40+70 °C
Power consumption	≤ 5 V	Classification of climatic conditions acc. to DIN IEC 60721-3-3	3K23
Response values		Connection	
Response value R _{an1} (Alarm1)	2 kΩ1 MΩ	Connection	plug-in terminals
Response value R _{an2} (Alarm2)	2 kΩ1 MΩ	Connection properties	
Specified response value (2 k Ω 10 k Ω)	$+2 k\Omega$	rigid/flexible	0.24/0.22.5 mm ²
Specified response value ($10 \text{ k}\Omega1 \text{ k}\Omega$)	0 %+20 %	flexible with ferrule with/without plastic sleeve	0.252.5 mm ²
Response time t_{an} at $R_F = 0.5 \times R_{an}$ and $C_e = 1 \mu F$	5 s	Conductor sizes	AWG 2412
Hysteresis (2 k Ω 10 k Ω)	+2 kΩ	Tightening torque	0.50.6 Nm (4.35.3 lb-in)
Hysteresis (10 k Ω 1 M Ω)	25 %	Other	
	25 70	Operating mode	continuous operation
Measuring circuit for insulation measurement		Mounting position	display-oriented
Measuring voltage $U_{\rm m}$	±20 V	Degree of protection, internal components (DIN EN 60529)	IP30
Measuring current $I_{\rm m}$ (bei $R_{\rm F} = 0$ W)	≤ 170 µA	Degree of protection, terminals (DIN EN 60529)	IP20
Internal DC resistance R _i	≥ 119 kΩ	Mounting	panel mounting
Internal impedance Z_i , at 50 Hz		Flammability class	UL94 V-2
IR1575	≥ 14 kΩ	Documentation number	
IR1575PG1	≥ 119 kΩ	IR1575	D00116
Permissible extraneous DC voltage U_{fg}	≤ DC 680 V	IR1575PG1	D00357
Permissible system leakage capacitance C _e	≤ 60 µF	Weight	≤ 400 g
Measuring circuit for insulation fault location (EDS) (Option "W"	
Test current Ip DC	10/25 mA	Shock resistance acc. to IEC 60068-2-27 (during operation)	30 g/11 ms
Test pulse/break	2 s/4 s	Bumping acc. to IEC 60068-2-29 (during transport)	40 g/6 ms
Displays		Vibration resistance acc. to IEC 60068-2-6	1.6 mm/1025 Hz
Display, illuminated	LC display		4 g/25150 Hz
Characters (number of characters, height)	2 x 16 (4.5 mm)	Ambient temperature (during operation)	-10 °C+55 °C
Display range measuring value	1 kΩ5 MΩ	Storage temperature range	-40 °C+85 °C
Absolute error (1 k Ω 10 k Ω)	±1 kΩ		
Relative percentage error $(1 k\Omega10 k\Omega)$	±10 %		

Dimension diagram (dimensions in mm)







- Connection to the AC system to be monitored: connect terminals L1, L2 to conductor L1, L2
- Connection to the DC system to be monitored: Connect terminal L1 to conductor L+, terminal L2 to conductor L-
- Connection to the 3AC system to be monitored:
- Connect terminals L1, L2 to neutral conductor N or terminals L1, L2 to conductor L1, L2
- Supply voltage U_s (see nameplate) via 6 A fuse: A0 - A1 = AC 88...264 V, DC 77...286 V A0 - A2 = AC 340...460 V
- Separate connection of E and KE to PE
- External test button "T1, T2" (N/O contact)
- External reset button "R1, R2" (N/C contact or wire jumper), when the terminals are open, the fault message will not be stored
- Alarm relay: Alarm 2
- 10 Alarm relay: Alarm 1

ISOMETER® IR427 with alarm indicator and test combination MK7

Insulation monitoring device with integrated load and temperature monitoring for medical IT systems in accordance with IEC 60364-7-710, IEC 61557-8 and DIN VDE 0100-710







Typical applications

 Medical IT systems in accordance with IEC 60364-7-710, IEC 61557-8 and DIN VDE 0100-710

Approvals



Device features

ISOMETER® IR427

- · Insulation monitoring for medical IT systems
- · Load and temperature monitoring for IT system transformers
- · Adjustable response value for insulation monitoring
- · Adjustable load current response value
- Integrated voltage monitoring for four alarm and test combinations MK7
- Temperature monitoring with PTC thermistor or bimetal switch
- · Connection monitoring earth
- LEDs: Power On, Alarm 1, Alarm 2
- · Internal/external test button
- Configurable alarm relay: N/O or N/C operation selectable
- Self monitoring with automatic alarm
- Compact two-module enclosure (36 mm)
- Four-wire interface for four alarm indicator and test combinations MK7

Remote alarm indicator and test combination MK7

- · Easy-to-clean front foil surface
- · Label field
- Panel frame alpine white
- · Alarm LEDs: Power On, insulation fault overload, overtemperature
- Test button, mute button
- · Standard flush-mounting enclosure 66 mm

Standards

The ISOMETER® has been developed in compliance with the following standards:

- IEC 60364-7-710
- IEC 61557-8
- DIN VDE 0100-710

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Supply voltage <i>U</i> ₅	Nominal system voltage U n ¹⁾	Art. No.
IR427-2	AC 70264 V, 42460 Hz	AC 70264 V, 42460 Hz	B72075300
MK7 Remote alarm indicator and test combination	DC 1828 V	_	B95100201

¹⁾ Absolute values

Accessories

Description	Art. No.
MK-cavity-wall-box-60mm	B95100203

Suitable system components

Description	Туре	Art. No.	
Measuring current transformers	STW2	B942709	
Mounting frame	XM420	B990994	

Insulation coordination acc. to IEC 60664-1/IEC 60664	3		Interfaces for STW2 measuring current transfo	rmer and temperature sensor
Rated insulation voltage		250 V	Cable lengths:	
ated impulse voltage/pollution degree		4 kV/3	single wire > 0.5 mm ²	≤11
	1, L2, E, KE, 1, 2, 3, 4 Z, Z/k, I) -(11,	, 12, 14)	single wire, twisted > 0.5 mm ²	≤ 10 ι
oltage test acc. to IEC 61010-1		2.21 kV	twisted in pairs, twisted $> 0.5 \text{ mm}^2$	≤ 40 r
Supply voltage			Cable (shield on one side connected to PE)	recommended: J-Y(St)Y min. 2x0.
Supply voltage U_{S}		$=U_{n}$	Switching elements	
Power consumption		= 011 ≤ 4 VA	Number	1 changeover contac
			Operating principle	N/C operation or N/O operation (N/C operation)
T system being monitored			Electrical endurance, number of cycles	1000
lominal system voltage U _n		264 V	Contact data acc. to IEC 60947-5-1	
lominal frequency f _n	47	63 Hz	Utilisation category	AC-13 / AC-14 / DC-12 / DC-12 / DC-1
nsulation monitoring			Rated operational voltage	230 V / 230 V / 24 V / 110 V / 220
Response value R_{an}	50500 kΩ (5	50 kO)*	Rated operational current	5 A / 3 A / 1 A / 0.2 A / 0.1 A
Relative uncertainty		±10 %	Minimum contact rating	1 mA at AC/DC 10
lysteresis		25 %		
Response time t_{an} at $R_F = 0.5 \times R_{an}$ and $C_e = 0.5 \mu F$		≤ 5 s	Environment/EMC	
Permissible system leakage capacitance C _e		5 μF	EMC	IEC 61326-2-
		- µ1	Operating temperature	-25+55°
leasuring circuit			Classification of climatic conditions acc. to IEC 607	721 (except condensation and formation of ice):
leasuring voltage $U_{\rm m}$		±12 V	Stationary use (IEC 60721-3-3)	3K2
leasuring current $I_{\rm m}$ (at $R_{\rm F}=0~\Omega$)		≤ 50 µA	Transport (IEC 69721-3-2)	2K1
nternal DC resistance R _i		240 kΩ	Long-term storage (IEC 60721-3-1)	1K2
mpedance Z _i at 50 Hz		200 kΩ	Classification of mechanical conditions acc. to	IEC 60721
dermissible extraneous DC voltage U_{fg}	≤ D	OC 300 V	Stationary use (IEC 60721-3-3)	3M1
oad current monitoring			Transport (IEC 60721-3-2)	2M
Response value, adjustable	550 A	A (7 A)*	Storage (IEC 60721-3-1)	1M1
Relative uncertainty	2.11507	±5 %	Connection	
lysteresis		4 %	Connection	
etting values load current measurement:		<u> </u>	Connection	push-wire terminal
3	0 VA 6300 VA 8000 VA 10	0000 VA	Connection properties	
alarm 1~ 14 A 18 A	22 A 28 A 35 A	45 A	rigid	0.22.5 mm ² (AWG 2414
esponse time overload, (50 % to 120 %)		< 5 s	flexible	0.75 0.5 3/11/0.5
esponse time for measuring current transformer monitoring	at restart, test or e	every 1 h	without ferrules	0.752.5 mm² (AWG 1914
emperature monitoring:			with ferrules	0.21.5 mm² (AWG 2416
desponse value (fixed value)		4 kΩ	Stripping length Opening force	10 mr
Release value (fixed value)		4 KΩ 1.6 kΩ		
PTC resistors acc. to DIN 44081	max. 6 i		Test opening, diameter	2.1 mr
lesponse time overtemperature	IIIdX. O II	< 2 s	Other	
Response time overtemperature		< 2 s	Operating mode	continuous operatio
esponse anic connection fault FTC (Esistors		~ 4 3	Position of normal use	an
isplays, memory			Degree of protection, internal components (DIN EN 6	
C display	multifunctional, not illun	minated	Degree of protection, terminals (DIN EN 60529)	IP2
Measured value insulation resistance	10 kΩ	1 MΩ	Enclosure material	polycarbonat
perating uncertainty	±10 %,	$,\pm 2\mathrm{k}\Omega$	Flammability class	UL94V-
Measured value load current (as % of the set response value	10	199 %	Screw mounting	2 x M
perating uncertainty		, ±0.2 A	DIN rail mounting acc. to	IEC 6071
assword	on, off/0999 ((off, 0)*	Documentation number	D0011
nterface for MK7			Weight	≤ 150
able length, twisted in pairs, shielded		200 m	()* = Factory setting	
Table (twisted in pairs, one end of shield connected to PE)	recommended: J-Y(St)Y mir			
, , , , , , , , , , , , , , , , , , , ,	10001111101000.5 1(50)1 11111	2.0.0		
Yower supply (terminals 1 and 2):		DC 24 V		
off nax (max. 4 MK7)		80 mA		
		OU IIIA		
Communication (terminal 3 and 4):	DC 405/	D146		
nterface/protocol erminating resistor	RS-485/proprietary, 120 (0.25 W), internal, swi			

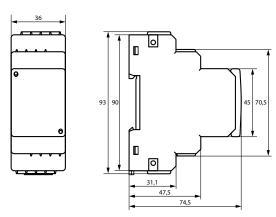
Technical data MK7

Rated insulation voltage	50 V
Rated impulse voltage/pollution degree	500 V/3
Supply voltage	
Supply voltage <i>U</i> s	DC 1828 V
Power consumption	0.5 VA
Environment/EMC	
EMC	IEC 61326
Operating temperature	-10+55°C
Classification of climatic conditions acc. to IEC 60721	
(except condensation and formation of ice):	
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 69721-3-2)	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
Storage (IEC 60721-3-1)	1M12

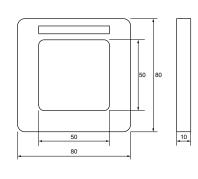
Connection	
Connection	screw-type terminals
Connection properties	
rigid/flexible	0.22.5 mm ² (AWG 2414)
Flexible with ferrule	0.21.5 mm ² (AWG 2416)
Stripping length	8 mm
Other	
Operating mode	continuous operation
Position of normal use	any
Degree of protection, internal components (IEC 60529)	IP30
Degree of protection, terminals (IEC 60529)	IP20
Front plate colour	alpine white
Flush-mounting enclosure, diameter (included in the scope of delivery	r) 66 mm
Weight (including mounting frame)	≤ 80 g

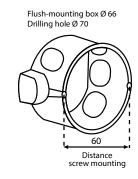
Dimension diagram (dimensions in mm)

IR427



MK7

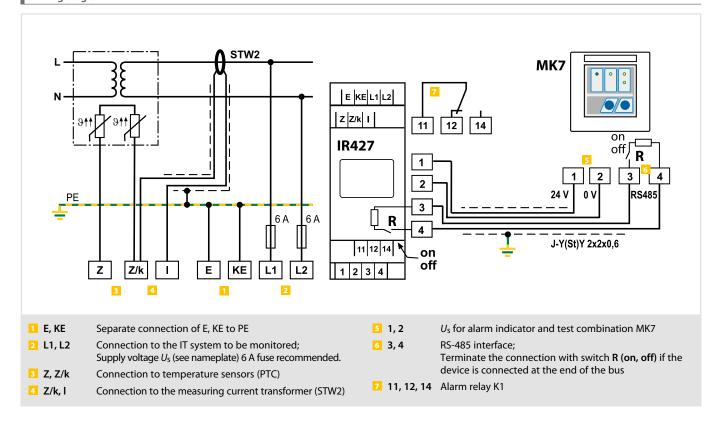




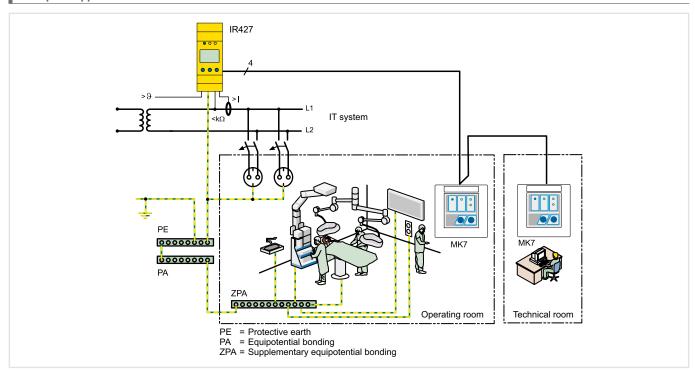
Alarm messages LEDs

	IR427			MK7			
	"ON"	"AL1"	"AL2"	ON	Ins. fault	Overload	Overtemp.
Operation	~	-	-	~	-	-	-
System fault ¹⁾	flashing	flashing	flashing	flashing	flashing	flashing	flashing
Insulation fault	~	~	-	~	~	-	_
Overcurrent	~	-	~	~	-	~	-
Overtemperature	~	-	~	~	-	-	~
No communication betw. IR 427+MK7	-	-	-	flashing	-	-	-

¹⁾ Detailed alarm information on LCD



Example of application



ISOMETER® isoMED427x-(PT)

Insulation monitoring device with integrated load and temperature monitoring and locating current injector and insulation fault location systems for medical IT systems





Typical applications

• Medical IT system in accordance with IEC 60364-7-710, IEC 61557-8, IEC 61557-9 and DIN VDE 0100-710

Device features

- · Insulation monitoring for medical IT systems
- Adjustable response value for insulation monitoring
- · Locating current injector for insulation fault location systems
- · Load and temperature monitoring for IT system transformers
- Adjustable load current response value
- Temperature monitoring with PTC thermistor or bimetal switch
- · Self monitoring with automatic alarm
- · PE connection monitoring
- · Internal/external test button
- LEDs: Power On, Alarm 1, Alarm 2
- Configurable alarm relay: N/O or N/C operation selectable
- Compact two-module enclosure (36 mm)
- BMS interface

Approvals





The Lloyd's Register certification is only valid for the spring-type terminal version of the iso-MED427P-2 (B72075301).

Standards

The ISOMETER® has been developed in compliance with the following standards:

- DIN EN 61557-8 (VDE 0413-8)
- IEC 61557-8
- EN61373 cat I class B

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Supply voltage <i>U</i> ₅	Art. No. Screw-type terminal Push-wire terminal		
		Screw-type terminal	Push-wire terminal	
isoMED427-2	AC 70264 V, 4763 Hz	B92075306	B72075306	
isoMED427P-2 1)		B92075301	B72075301	
isoMED427P-PT		B92075307	B72075307	

¹⁾ Only this device has a Lloyds Register approval

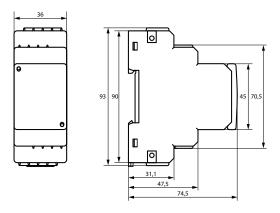
Accessories

Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B98060008
XM420 mounting frame	B990994

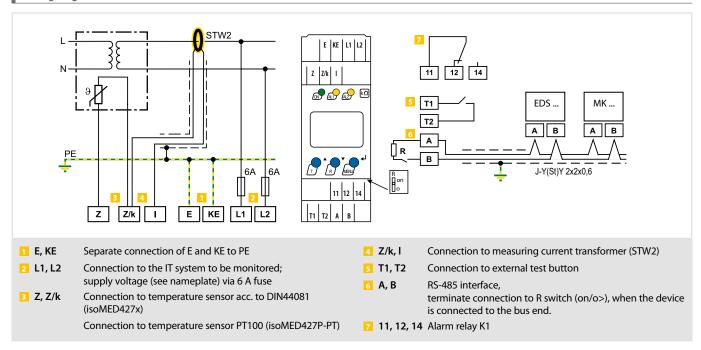
Suitable system components

Description	Туре	Art. No.
Measuring current transformers	STW2	B942709

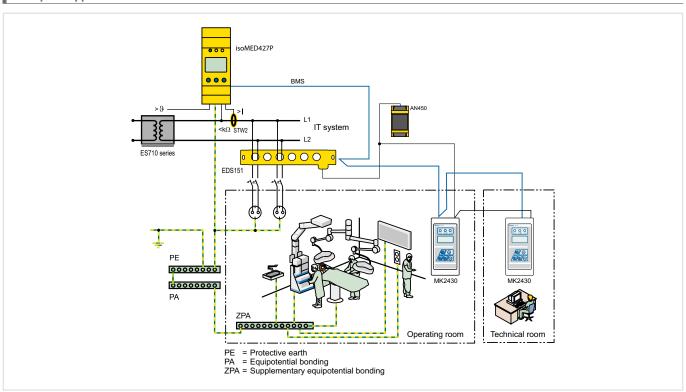
Insulation coordination acc. to IEC 60664-1/-3	Displays, memory
Definitions	Display LC display, multi-functional, not illuminated
Measuring circuit (IC1) L1, L2	Display range measured value insulation resistance (R_F) 10 k $\Omega \dots 1$ M Ω
Control circuit (IC2) E, KE, Z, Z/k, I, T1, T2, A, B	Operating uncertainty $\pm 10 \%, \pm 2 \text{ k}\Omega$
Output circuit (IC3) 11, 12, 14	Measured value load current (as % of the set response value) 10199 %
Rated voltage 250 V	Operating uncertainty $\pm 5\%$, ± 0.2 A
Overvoltage category III	Password off, on [0999]
Operating altitude < 2000 m AMSL	Interface
Rated impulse voltage	
IC1/(IC2-3) 4 kV	Interface/protocol RS-485/BMS Baud rate 9.6 kBit/s
IC2/IC3 4 kV	Cable length ≤ 1200 m
Rated insulation voltage	Cable: twisted pair, one end of shield connected to PE recommended J-Y(St)Y min. n x 2 x 0.8
IC1/(IC2-3) 250 V	Terminating resistor 120 Ω (0.25 W), internal, switchable
IC2/IC3 250 V	Device address, BMS bus 290
Pollution degree 3	Device address, Divis bus 290
Protective separation between	Switching elements
IC1/(IC2-3) Overvoltage category III, 300 V	Number 1 changeover contact
IC2/IC3 Overvoltage category III, 300 V	Operating principle N/C operation / N/O operation
Voltage test (routine test) according to IEC 61010-1	Electrical endurance under rated operating conditions 10 000 cycles
(IC1-2)/IC3 2.2 kV	Contact data acc. to IEC 60947-5-1
Supply voltage	Utilisation category AC-13 / AC-14 / DC-12 / DC-12
Supply voltage $U_{\rm S}$ 100240 V	Rated operational voltage 230 V / 230 V / 24 V / 110 V / 220 V
Tolerance $U_{\rm S}$ $-30+10\%$	Rated operational current 5 A / 3 A / 1 A / 0.2 A / 0.1 A
Power consumption 6.5 VA	Minimum contact load 10 mA/DC 5 V
TOWCI CONSUMPLION	IV MA/VC 3 V
Monitored IT system	Environment/EMC
Nominal system voltage $U_{\rm D}$ 70264 V	EMC IEC 61326-2-4
Nominal frequency f_0 4763 Hz	Operating temperature -25+55 °C
	Classification of climatic conditions acc. to IEC 60721
Insulation monitoring acc. to IEC 61557-8: 2007-01	(related to temperature and relative humidity)
Response value R_{an} 50500 k Ω	Stationary use (IEC 60721-3-3) 3K22
Relative uncertainty $\pm 10 \%$	Transport (IEC 60721-3-2) 2K11
Hysteresis 25 %	Long-term storage (IEC 60721-3-1) 1K22
Response time t_{an} at $R_F = 0.5$ x R_{an} and $C_e = 0.5$ μ F ≤ 5 s	
Response time for connection monitoring PE $\leq 1 \text{ h}$	Classification of mechanical conditions acc. to IEC 60721
Permissible system leakage capacitance $C_{\rm e}$ max. 5 $\mu {\rm F}$	Stationary use (IEC 60721-3-3) 3M11
Locating current injector acc. to IEC61557-9	Transport (IEC 60721-3-2) 2M4
	Long-term storage (IEC 60721-3-1) 1M12
Locating current ≤ 1 mA	Connection
Test pulse/break 2/4 s	
Measuring circuit	Connection type Push-wire terminals
Measuring voltage $U_{\rm m}$ ± 12 V	Nominal current ≤ 10 A
Measuring current $I_{\rm m}$ at $R_{\rm F}=0~\Omega$ $\leq 50~\mu{\rm A}$	Stripping length 10 mm
Internal DC resistance $R_{\rm i}$ $\geq 240 \rm k\Omega$	Opening force 50 N
Impedance Z_i at 50 Hz $\geq 200 \text{ k}\Omega$	Test opening, diameter 2.1 mm
Permissible extraneous DC voltage U_{fg} \leq DC 300 V	Connection properties:
	rigid 0.22.5 mm ² (AWG 2414)
Load current monitoring	flexible without ferrule 0.752.5 mm² (AWG 1914)
Response value adjustable 550 A	flexible with ferrule 0.21.5 mm ² (AWG 2416)
Relative uncertainty $\pm 5\%$	Connection type Screw-type terminals
Hysteresis 4 %	Nominal current ≤ 10 A
Nominal frequency $f_{\rm n}$ 4763 Hz	Tightening torque 0.50.6 Nm (57 lb-in)
Setting values load current measurement	Cross section AWG 24-12
Transformer 3150 VA / 4000 VA / 5000 VA / 6300 VA / 8000 VA / 10000 VA	Stripping length 8 mm
lalarm1 14 A / 18 A / 22 A / 28 A / 35 A / 45 A	Connection properties:
Response time, overload (50 % to 120 %)	rigid / flexible 0.252.5 mm ²
Response time, CT monitoring at restart, test or every 1 h	Flexible with ferrules with/without plastic sleeve 0.252.5 mm ²
nesponse unit, et monitoring at restart, test of every 111	Multi-conductor rigid/flexible 0.21.5 mm ²
Temperature monitoring	Multi-conductor flexible with ferrule without plastic sleeve 0.251.5 mm ²
isoMED427x	Multi-conductor flexible with TWIN ferrule with plastic sleeve 0.251.5 mm ²
	Atlan.
	Other
Sensor PTC resistors acc. to DIN 44081 (max. 6 in series)	
$ \begin{array}{ccc} \text{Sensor} & \text{PTC resistors acc. to DIN 44081 (max. 6 in series)} \\ \text{Response value} & 4 \text{k} \Omega \end{array} $	Operating mode Continuous operation
$\begin{array}{lll} \text{Sensor} & \text{PTC resistors acc. to DIN 44081 (max. 6 in series)} \\ \text{Response value} & 4 \text{k}\Omega \\ \text{Release value} & 1.6 \text{k}\Omega \end{array}$	Position of normal use Any
$ \begin{array}{llllllllllllllllllllllllllllllllllll$	Position of normal use Any Degree of protection, built-in components (DIN EN 60529) IP30
$\begin{array}{llllllllllllllllllllllllllllllllllll$	Position of normal use Any Degree of protection, built-in components (DIN EN 60529) IP30 Degree of protection, built-in components (DIN EN 60529) IP20
$ \begin{array}{llllllllllllllllllllllllllllllllllll$	Position of normal use Any Degree of protection, built-in components (DIN EN 60529) IP30 Degree of protection, built-in components (DIN EN 60529) IP20 Enclosure material Polycarbonate
$ \begin{array}{c} \text{Sensor} & \text{PTC resistors acc. to DIN 44081 (max. 6 in series)} \\ \text{Response value} & 4 \text{k}\Omega \\ \text{Release value} & 1.6 \text{k}\Omega \\ \text{Relative uncertainty} & \pm 10 \text{%} \\ \text{Response time, overtemperature} & < 2 \text{s} \\ \hline \textbf{isoMED427P-PT} \\ \text{Sensor} & \text{PT100 (no series or parallel connections)} \\ \end{aligned} $	Position of normal use Any Degree of protection, built-in components (DIN EN 60529) IP30 Degree of protection, built-in components (DIN EN 60529) IP20 Enclosure material Polycarbonate Flammability class UL94V-0
Sensor PTC resistors acc. to DIN 44081 (max. 6 in series) Response value 4 kΩ Release value 1.6 kΩ Relative uncertainty ± 10 % Response time, overtemperature < 2 s	Position of normal use Any Degree of protection, built-in components (DIN EN 60529) IP30 Degree of protection, built-in components (DIN EN 60529) IP20 Enclosure material Polycarbonate Flammability class UL94V-0 DIN rail mounting IEC 60715
Sensor PTC resistors acc. to DIN 44081 (max. 6 in series) Response value $4 \text{ k}\Omega$ Release value $1.6 \text{ k}\Omega$ Relative uncertainty $\pm 10 \text{ %}$ Response time, overtemperature $< 2 \text{ s}$ isoMED427P-PT Sensor PT100 (no series or parallel connections) Response value $50150 ^{\circ}$ C Hysteresis 10%	Position of normal use Any Degree of protection, built-in components (DIN EN 60529) IP30 Degree of protection, built-in components (DIN EN 60529) IP20 Enclosure material Polycarbonate Flammability class UL94V-0
Sensor PTC resistors acc. to DIN 44081 (max. 6 in series) Response value 4 kΩ Release value 1.6 kΩ Relative uncertainty ± 10 % Response time, overtemperature < 2 s	Position of normal use Any Degree of protection, built-in components (DIN EN 60529) IP30 Degree of protection, built-in components (DIN EN 60529) IP20 Enclosure material Polycarbonate Flammability class UL94V-0 DIN rail mounting IEC 60715



Wiring diagram



Example of application



ISOMETER® isoLR275 with coupling device AGH-LR

Insulation monitoring device for unearthed AC, AC/DC and DC systems (IT systems) for installations with a low level of insulation





Typical applications

- AC, DC or AC/DC main circuits
- IT systems with directly connected inverters
- IT systems with high system capacitances of up to 500 μF
- IT systems with high but slow voltage fluctuations
- Installations including switch mode power supplies
- · Coupled IT systems

Approvals



Device features

isoLR275

- ISOMETER® for IT AC systems with galvanically connected rectifiers or converters and for IT DC systems (IT = unearthed systems)
- Particularly suitable to monitor installations with a low level of insulation
- Use the isoLR275 only combination with the coupling device AGH-LR
- Automatic adaptation to the existing system leakage capacitance
- AMPPlus measurement method (European patent: EP 0 654 673 B1)
- Choice of measurement methods to meet different requirements
- Two separately adjustable response ranges of 0.2...100 k Ω (Alarm 1, Alarm 2)
- · Two-line LC display
- Automatic device self test
- · History memory with real-time clock to store alarm messages with date and time stamp
- BMS interface (Bender Measuring Device Interface) for communication with other Bender devices (RS-485 electrically isolated)
- terminals F1/F2) (e.g. if several ISOMETERs® are interconnected)
- Current output 0(4)...20mA (electrically isolated) analogously to the measured insulation value

- Appropriate coupling device for ISOMETER® isoLR275
- Nominal voltage range AC 0...793 V and DC 0...1100 V
- DIN rail mounting

Standards

The ISOMETER® has been developed in compliance with the following standards:

- DIN EN 61557-8 (VDE 0413-8)
- IEC 61557-8
- IEC 61326-2-4
- DIN EN 60664-1 (VDE 0110-1)
- DIN EN 60664-3 (VDE 0110-3)

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Set con	Set comprising		Supply voltage <i>U</i> ₅	Art. No.
Type	Art. No.	Nominal voltage <i>U</i> n	Supply fortage 03	711 41107
isoLR275-327	B91065700W	3(N)AC 0793 V	AC 19.255 V, 42460 Hz	B91065702W
AGH-LR-3	B98039022W	DC 01100 V	DC 19.272 V	
isoLR275-335	B91065701W	3(N) AC 0793 V	AC 88264 V	B91065703W
AGH-LR-3	B98039022W	DC 01100 V	DC 77286 V	

Devices are available as a set.

Accessories

Description	Art. No.
Screw mounting	B990056

Suitable system components

Description	Туре	Art. No.	Page
External $k\Omega$ measuring instruments	9620-1421	B986841	407

64-3		Outputs/Inputs	
	AC 250 V	"TEST"-/"RESET" button	internal/externa
	6 kV/3	Cable length "TEST"-/"RESET" button, external	≤ 10 n
		Current output (load)	0/420 mA (≤ 500 Ω
, KE, PE, T1, T2, R1, R2, I	-1, F2, M+, M-, A, B)	Accuracy current output,	
	3.536 kV	related to the value indicated (1100 k Ω)	±15 %, ±1 kΩ
	AC 250 V		
	4 kV/3	Serial interface	
(11,	12, 14) - (21, 22, 24)	Interface/protocol	RS-485/BM
	2.21 kV	Connection	terminals A/I
		Cable length	≤ 1200 n
		Shielded cable (shield to PE on one end)	2-core, \ge 0.6 mm ² , e.g. J-Y(St)Y min. 2 x 0.
	via AGH-LR	Terminating resistor	120 Ω (0.5 W
		Device address, BMS bus	130 (3)
	AC 88264 V**	Switching elements	
	42460 Hz		contacts: K1 (Alarm 1), K2 (Alarm 2, device error
	≤ 21.5 VA	Operating mode K1, K2 (Alarm 1/Alarm 2)	N/C operation/N/O operation (N/O operation)
	DC 77286 V**	•	N/C operation/N/O operation (N/O operation)
	≤ 5.5 W	Contact data acc. to IEC 60947-5-1:	
		Utilisation category	AC 13 / AC 14 / DC-12 / DC-12 / DC-1:
	AC 19.255 V**	Rated operational voltage	230 V / 230 V /24 V / 110 V / 220 V
	42460 Hz	Rated operational current	5 A / 3 A / 1 A / 0.2 A / 0.1
	DC 19.272 V**	Minimum contact rating	1 mA at AC/DC \geq 10 $^{\circ}$
	≤ 6 VA	Environment/EMC	
	2011	EMC	
			IEC 61326-2-4 Ed. 1.
	via AGH-LR	not suitable for household and small companies Operating temperature	-25+65°
		. , ,	
	AC 88250 V	Classification of climatic conditions acc. to IEC	
	42460 Hz	Stationary use (IEC 60721-3-3)	3K2
	≤ 21,5 VA	Transport (IEC 60721-3-2)	2K1
	DC 80250 V	Long-term storage (IEC 60721-3-1)	1K2
	≤ 5,5 VA	Classification of mechanical conditions acc. to	IEC 60721:
		Stationary use (IEC 60721-3-3)	
	DC 2465 V	for screw mounting with accessories B990056	3M1:
	≤ 6 VA	for DIN rail mounting	3M1
		Transport (IEC 60721-3-2)	2M-
		Long term storage (IEC 60721-3-1)	1M1:
	0.2100 kΩ	Composition	
	4 kΩ	Connection	
	0.2100 kΩ	Connection	screw-type terminal
	1 kΩ	Connection properties	
	± 15 %	rigid/flexible	0.24 mm ² /0.22.5 mm
	±1kΩ	flexible with ferrules without/with plastic sleeve	0.252.5 mm
see	table in the manual	Tightening torque	0.5 Nn
	25% , $+1$ k Ω	Conductor sizes (AWG)	241
		Cable length between isoLR275 and AGH-LR	≤ 0.5 n
	. 501/	Other	
	± 50 V		continuous aparatio
	≤ 1.5 mA	Operating mode	continuous operation
	≥ 35 kΩ	Mounting Distance to adjacent devices	display-oriente
	≥ 35 kΩ	Distance to adjacent devices	≥ 30 mn
	≤ DC 1100 V	Degree of protection, terminals (DIN EN 60529)	IP3:
	\leq 500 µF (150 µF)*	Degree of protection, terminals (DIN EN 60529)	
		Type of enclosure	X112, free from haloge
ha	klit two-line display	Screw mounting with mounting clip	2 x M-
Da	2 x 16/4/mm	Flammability class	UL94 V-I
	0.2 kΩ1 ΜΩ	Documentation number	D0012
	$\pm 15\%, \pm 1 \text{ k}\Omega$	Weight	≤ 510
	エロがエロス	()* = factory setting	

Insulation coordination acc. to IEC 60664-1	
Rated insulation voltage	AC 800 V
Rated impulse voltage/pollution degree	8 kV/3
Voltage ranges	
Nominal system voltage U_n	AC, 3(N)AC 0793 V, DC 01100 V
Nominal frequency f_n	DC, 10460 Hz
Max. AC voltage $U \sim$ in the frequency range $f_n = 0.110$ Hz	$U_{\sim \text{max}} = 110 \text{ V/Hz} * f_{\text{n}}$
Environment/EMC	
EMC	IEC 61326-2-4 Ed. 1.0
Operating temperature	-25+65°C
Classification of climatic conditions acc. to IEC 60721 (with	h condensation and formation of ice):
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 6072	1:
Stationary use (IEC 60721-3-3)	3M12
Transport (IEC 60721-3-2)	2M4
Storage (IFC 60721-3-1)	1M12

Connection	screw-type terminals
Connection properties	
rigid/flexible	0.24 mm ² /0.22.5 mm ²
flexible with ferrules without/with plastic sleeve	0.252.5 mm ²
Tightening torque	0.5 Nm
Conductor sizes (AWG)	2412
Cable length between isoLR275 and AGH-LR	≤ 0.5 m

Other	
Operating mode	continuous operation
Mounting	cooling slots must be ventilated vertically!
Distance to adjacent devices	≥ 30 mm
Degree of protection, internal components (DIN EN 60529)	IP30
Degree of protection, terminals (DIN EN 60529)	IP20
Type of enclosure	X200, free from halogen
DIN rail mounting	DIN EN 60715/IEC 60715
Screw mounting	2 x M4
Flammability class	UL94 V-0
Weight	≤ 230 g

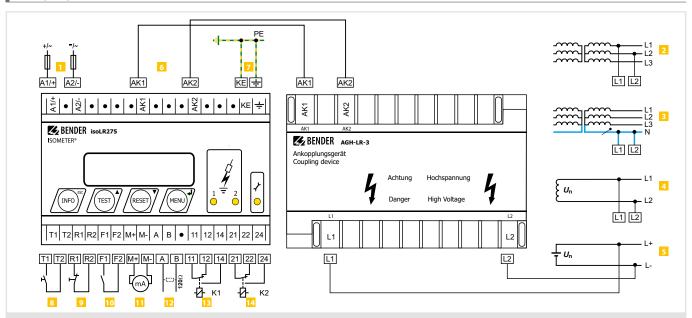
Dimension diagrams (dimensions in mm)

112,5

AGH-LR 111 109 61 71 05.5 91

Wiring diagrams

isoLR275



- Supply voltage $U_{\rm S}$ (see nameplate) via 6 A fuse; For UL and CSA applications, it is mandatory to use 5 A fuses
- Connection to the 3AC system to be monitored: Connect the terminals L1, L2 to neutral conductor N or terminals L1, L2 to conductor L1, L2.
- Connection to the AC system to be monitored: connect terminals L1, L2 to conductor L1, L2.
- Connection to the DC system to be monitored: Connect terminal L1 to conductor L+, terminal L2 to conductor L-
- Connection to the coupling device AGH-PV
- Separate connection of + and KE to PE
- External test button (N/O contact)

- External reset button (N/C contact or wire jumper), when the terminals are open, the fault message will not be stored
- STANDBY by means of the function input F1, F2: when the contact is closed, the insulation resistance is not measured.

Disconnection from the IT system

- Currrent output, electrically isolated: 0...20 mA or 4...20 mA
 - Serial interface RS-485 (termination by means of a 120- Ω resistor)
- Alarm relay "K1"; available changeover contacts
- Alarm relay "K2" (device error relay); available changeover contacts
- * The terminal pairs 7, 8 and 9 have to be wired electrically isolated and do not have to be connected to earth!

ISOMETER® isoPV with coupling device AGH-PV

Insulation monitoring device for unearthed AC, AC/DC and DC systems (IT systems) for photovoltaic systems up to AC 793 V/DC 1100 V







Typical applications

- · AC, DC or AC/DC main circuits
- Solar systems with directly connected inverters
- Solar systems with large system capacitances of up to 2000 μF
- Solar systems with high but slow voltage fluctuations
- Installations including switch mode power supplies
- · Coupled IT systems

Approvals



Device features

isoPV

- ISOMETER® for IT AC systems with galvanically connected rectifiers or converters and for IT DC systems (IT = unearthed systems)
- · Particularly suitable for monitoring photovoltaic systems
- isoPV is always operated in combination with the coupling device AGH-PV
- Automatic adaptation to the existing system leakage capacitance
- AMPPlus-Measurement method (European Patent: EP 0 654 673 B1)
- Choice of measurement methods to meet different requirements
- Two separately adjustable response ranges of 0.2...100 k Ω each (Alarm 1, Alarm 2)
- Two-line LC display
- · Automatic device self test
- Memory with real-time clock to store alarm messages with date and time stamp
- BMS interface (Bender Measuring Device Interface) for communication with other Bender devices (RS-485 galvanically isolated)
- Internal disconnection of the ISOMETER® (via control signal; terminals F1/F2) from the IT system to be monitored (e.g. if several ISOMETER®s are interconnected)
- Current output 0(4)...20mA (electrically isolated) in relation to the measured insulation value

AGH-PV

- Coupling device required for ISOMETER® isoPV, each AGH-PV is specially designed for the corresponding isoPV
- Nominal voltage range AC 0...793 V and DC 0...1100 V
- · DIN rail mounting

Additional functions

- · History memory with real-time clock to store all alarm messages with date and time stamp
- Electrically isolated RS-485 interface (BMS protocol) for communication with other Bender devices
- Isometer disconnecting relays for the operation of several ISOMETER®s in coupled IT systems
- Current output 0(4)...20 mA (electrically isolated)

Standards

The ISOMETER® has been developed in compliance with the following standards:

- DIN EN 61557-8 (VDE 0413-8)
- IEC 61557-8
- IEC 61326-2-4
- DIN EN 60664-1 (VDE 0110-1)
- DIN EN 60664-3 (VDE 0110-3)
- UL 508
- UL 1998 (Software)

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Set comprising		Nominal voltage <i>U</i> n	Supply voltage <i>U</i> s	Art. No.
Туре	Art. No.	Nominal Voltage of	Supply voltage os	AI to No.
isoPV-327 AGH-PV	B91065130W B98039020W	3(N) AC 0793 V	AC 19.255 V, 42460 Hz DC 19,272 V	B91065132W
isoPV-335 AGH-PV	B91065131W B98039020W	DĆ 01100 V	AC 88264 V DC 77286 V	B91065133W

Devices are available as a set.

Accessories

Description	Art. No.
Screw mounting	B990056

Suitable system components

Description	Туре	Art. No.	Page
External $k\Omega$ measuring instruments	9620-1421	B986841	407



Insulation coordination acc. to IEC 60664-1		Displays
Definitions:		Display, illuminated
Supply circuit (IC2)	A1, A2	Characters (number/height)
Output circuit (IC3)	11, 14, 24	Display range measured value
	, T/R, A, B, AK1, GND, AK2	Operating uncertainty
Rated voltage	240 V	Outnuts/Innuts
Overvoltage category	III	Outputs/Inputs
Rated impulse voltage:		Test/reset button
IC2/(IC3-4)	4 kV	Cable length test/reset button, external Current output (load)
IC 3/(IC4)	4 kV	Accuracy current output, related to the value indicated $(1100 \text{ k}\Omega)$
Rated insulated voltage:		Accuracy current output, related to the value indicated (1100 kg2)
IC2/(IC3-4)	250 V	Serial interface
IC 3/(IC4)	250 V	Interface/protocol
Polution degree	3	Connection
Protective separation (reinforced insulation) between:		Cable length
	voltage category III, 300 V	Shielded cable (shield to PE on one end) 2-core, ≥
	voltage category III, 300 V	Terminating resistor
Voltage test (routine test) according to IEC 61010-1:	AC 2 2 IA/	Device address, BMS bus
IC2/(IC3-4) IC 3/(IC4)	AC 2.2 kV	Contaction alamanta
IC 3/(IC4)	AC 2.2 kV	Switching elements
Voltage ranges		Switching elements 2 changeover contacts: K1 (Alarm Operating mode K1, K2 N/C operation n.c./N/O operation
Nominal system voltage U_n	via AGH-PV	<u> </u>
isoPV-335:		Contact data acc. to IEC 60947-5-1:
Supply voltage U_{S} (also see nameplate)	AC 88264 V**	Utilisation category AC 13 /
Frequency range $U_{\rm S}$	42460 Hz	Rated operational voltage 230 V
Power consumption	≤ 21,5 VA	Rated operational current
Supply voltage U_s (also see nameplate)	DC 77286 V**	Minimum contact rating
Power consumption	≤ 5,5 VA	Environment/EMC
isoPV-327:	·	EMC- not suitable for household and small companies
Supply voltage U_{S} (also see nameplate)	AC 19,255 V**	Operating temperature
Frequency range U_S	42460 Hz	Classification of climatic conditions acc. to IEC 60721 (with condens
Supply voltage U_5 (also see nameplate)	DC 19.272 V**	Stationary use (IEC 60721-3-3)
Power consumption	≤ 6 VA	Transport (IEC 60721-3-2)
For UL-application		Long-term storage (IEC 60721-3-1)
Nominal system voltage U _n	via AGH-PV	
	VIG AGIT I V	Classification of mechanical conditions acc. to IEC 60721:
isoPV-335:	1600 0501	Stationary use (IEC 60721-3-3)
Supply voltage U_s (also see nameplate)	AC 88250 V	for screw fixing with accessories B990056 for DIN rail mounting
Frequency range <i>U</i> _S	42460 Hz	Transport (IEC 60721-3-2)
Power consumption AC	≤ 21,5 VA	Long-time storage (IEC 60721-3-1)
Supply voltage U_s (also see nameplate)	DC 80250 V	Long-time storage (IEC 00/21-3-1)
Power consumption DC	≤ 5,5 VA	Connection
isoPV-327:		Connection
Supply voltage $U_{\rm S}$ (also see nameplate)	DC 2465 V	Connection, rigid/flexible
Power consumption	≤ 6 VA	Connection flexible with connector sleeve, without/with plastic sleeve
Response values		Tightening torque
Response value R _{an1}	0.2100 kΩ	Conductor sizes (AWG)
Factory setting R _{an1} (Alarm1)	4 kΩ	Cable length between isoPV and AGH-PV
Response value Ran2	0.2100 kΩ	Odkan
Factory setting R _{an2} (Alarm2)	1 kΩ	Other
Relative uncertainty (7100 k Ω) (in accordance with IEC 61557-8:2007-0		Operating mode
Relative uncertainty (0.27 k Ω)	±1 kΩ	Mounting
Response time t _{an}	see table in manual	Distance to adjacent devices
Hysteresis	25 %, +1 kΩ	Degree of protection, internal components (DIN EN 60529) Degree of protection, terminals (DIN EN 60529)
·		Type of enclosure
Measuring circuit		DIN rail mounting
Measuring voltage $U_{\rm m}$ (peak value)	± 50 V	Screw mounting by means of support (see Seite 67 in manual)
Measuring current $I_{\rm m}$ (at $R_{\rm F}=0~\Omega$)	≤ 1.5 mA	Flammability class
Internal DC resistance DC R _i	≥ 35 kΩ	Software version
Impedance Z _i at 50 Hz	≥ 35 kΩ	Documentation number
Permissible extraneous DC voltage Ufg	≤ DC 1100 V	Weight
Max. system leakage capacitance $C_{\rm e}$	\leq 2000 µF (2000 µF)*	_ ·
		()* = factory setting The values marked with ** are absolute values

Displays	
Display, illuminated	two-line displa
Characters (number/height)	2 x 16/4 mn
Display range measured value	0.2 kΩ1 MΩ
Operating uncertainty	±15%, ±1 kΩ
Outputs/Inputs	
Test/reset button	internal/externa
Cable length test/reset button, external	≤ 10 n
Current output (load)	0/420 mA (≤ 500 Ω
Accuracy current output, related to the value indic	$\pm 15\%, \pm 1 \text{ k}\Omega$
Serial interface	
Interface/protocol	RS-485/BM:
Connection	terminals A/
Cable length	≤ 1200 r
Shielded cable (shield to PE on one end)	2-core, \geq 0.6 mm2, z. B. J-Y(St)Y 2 x 0.
Terminating resistor	120 Ω (0.5 Ω
Device address, BMS bus	130 (3)
Switching elements	
	rer contacts: K1 (Alarm 1), K2 (Alarm 2, device error
Operating mode K1, K2 N/C ope	eration n.c./N/O operation n.o. (N/O operation n.o.)
Contact data acc. to IEC 60947-5-1:	
Utilisation category	AC 13 / AC 14 / DC-12 / DC-12 / DC-1
Rated operational voltage	230 V / 230 V / 24 V / 110 V / 220
Rated operational current	5 A / 3 A / 1 A / 0.2 A / 0.1
Minimum contact rating	1 mA at AC/DC \geq 10
Environment/EMC	
EMC- not suitable for household and small compa	nies IEC 61326-2-
Operating temperature	-25+65°
Classification of climatic conditions acc. to IEC	60721 (with condensation and formation of ice):
Stationary use (IEC 60721-3-3)	3K2
Transport (IEC 60721-3-2)	2K1
Long-term storage (IEC 60721-3-1)	1K2
Classification of mechanical conditions acc. 1	to IEC 60721:
Stationary use (IEC 60721-3-3)	
for screw fixing with accessories B990056	3M1
for DIN rail mounting	3M1
Transport (IEC 60721-3-2)	2M
Long-time storage (IEC 60721-3-1)	1M1
Connection	
Connection	screw-type termina
Connection, rigid/flexible	0.24 mm ² /0.22.5 mm
Connection flexible with connector sleeve, withou	t/with plastic sleeve 0.252.5 mm
Tightening torque	0.60.8 Nr
Conductor sizes (AWG)	241
Cable length between isoPV and AGH-PV	≤ 0.5 r
Other	
Operating mode	continuous operatio
Mounting	display oriente
Distance to adjacent devices	≥ 30 mi
Degree of protection, internal components (DIN E	
Degree of protection, terminals (DIN EN 60529)	IP2
Type of enclosure	X112, free from haloge
DIN rail mounting	DIN EN 60715/IEC 6071
Screw mounting by means of support (see Seite 6	
Flammability class	UL94 V-
i ranninasinity Class	0154 V-

The values marked with** are absolute values



D351 V2.0 D00024 < 510 g

Insulation coordination acc. to IEC 60664-1 Rated insulation voltage	AC 800 V
Rated impulse voltage/pollution degree	8 kV/3
nateu iiipuise voitage/poilution degree	0 KV/3
Voltage ranges	
Nominal system voltage <i>U</i> n	AC, 3(N)AC 0793 V, DC 01100 V
Nominal frequency f _n	DC, 10460 Hz
Max. AC voltage $U\sim$ in the frequency range $f_n=0.110$ Hz:	$U \sim \text{max} = 110 \text{ V/Hz} * f_{\text{n}}$
Environment/EMC	
EMC	IEC61326-2-4
Operating temperature	-25+65 ℃
Classification of climatic conditions acc. to IEC 60721 (with	condensation and formation of ice):
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	l :
Stationary use (IEC 60721-3-3)	3M12
Transport (IEC 60721-3-2)	2M4
Long-time storage (IFC 60721-3-1)	1M12

_			٠.	
Co	nr	ec	tı	on

Connection	screw-type terminal
Connection, rigid/flexible	0.24 mm ² /0.22.5 mm
Connection flexible with connector sleeve, without/with plastic sleeve	0.252.5 mm
Tightening torque	0.5 Nm
Conductor sizes (AWG)	2412
Cable length between isoPV and AGH-PV	≤ 0.5 m

Other

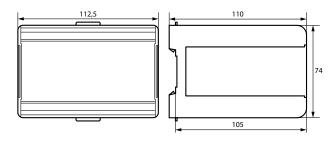
Operating mode	continuous operation
Mounting	cooling slots must be ventilated vertically!
Distance to adjacent devices	≥ 30 mm
Degree of protection, internal components (DIN EN 60529)	IP30
Degree of protection, terminals (DIN EN 60529)	IP20
Type of enclosure	X200, free from halogen
DIN rail mounting	DIN EN 60715/IEC 60715
Screw fixing	2 x M4
Flammability class	UL94 V-0
Weight	< 230 g

()* = factory setting

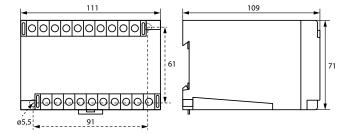
The values marked with** are absolute values

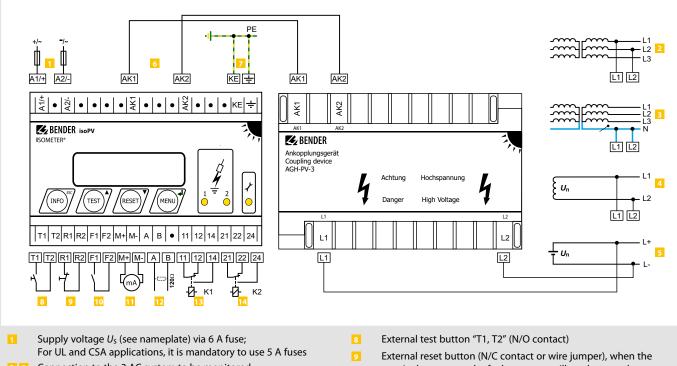
Dimension diagrams (dimensions in mm)

isoPV



AGH-PV

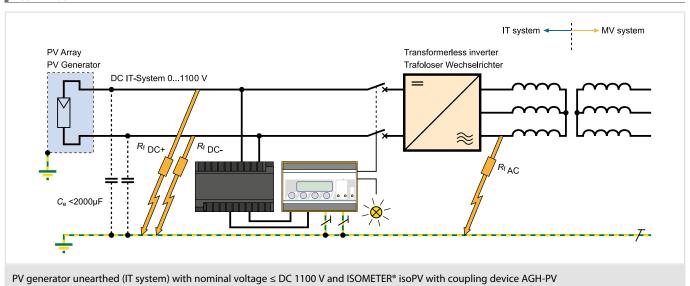




- Connection to the 3 AC system to be monitored: Connect the terminals L1, L2 to neutral conductor N or terminals L1, L2 to conductor L1, L2.
- Connection to the AC system to be monitored: connect terminals L1, L2 to conductor L1, L2.
- Connection to the DC system to be monitored: Connect terminal L1 to conductor L+, terminal L2 to conductor
- Connection to the coupling device AGH-PV
- Separate connection of $\stackrel{}{\leftarrow}$ and KE to PE

- terminals are open, the fault message will not be stored.
- STANDBY by means of the function input "F1, F2": when the contact is closed, the insulation resistance is not measured. Disconnection from the IT system
- Currrent output, electrically isolated: 0...20 mA or 4...20 mA
- Serial interface RS-485 (termination by means of a 120 Ω resistor)
- Alarm relay "K1": available changeover contacts
- Alarm relay "K2" (device error relay); available changeover contacts

Typical application



ISOMETER® isoPV425 with coupling device AGH420

Insulation monitoring device for unearthed DC circuits (IT systems) for photovoltaic installations up to 3(N)AC, AC 690 V/DC 1000 V





Typical applications

- AC, DC or AC/DC main circuits
- Solar systems with directly connected inverters
- Solar systems with high system leakage capacitances
- Solar systems with high but slow voltage fluctuations
- Systems including switched mode power supplies

Approvals



Device features

- Monitoring for unearthed AC and DC systems with galvanically connected rectifiers or inverters
- · Measurement of the nominal system voltage (r.m.s.) with undervoltage and overvoltage detection
- Measurement of DC voltages system to earth (L+/PE and L-/PE)
- Automatic adaptation to the system leakage capacitance up to 1000 μF
- · Automatic device self-test with connection monitoring
- Selectable start-up delay, response delay and delay on release
- Two separately adjustable response value ranges of 1...500 kΩ (Alarm 1, Alarm 2)
- Alarm signalling via LEDs (AL1, AL2), a display and alarm relays (K1, K2)
- N/C operation or N/O operation selectable
- Measured value indication via multi-functional LCD
- Fault memory can be activated
- RS-485 (galvanically isolated) including the following protocols:
- BMS interface (Bender measuring device interface) for data exchange with other Bender components
- Modbus RTI
- isoData (for continuous data output)
- · Password protection to prevent unauthorised parameter changes

Standard

The ISOMETER® has been developed in compliance with the following standards:

- DIN EN 61557-8 (VDE 0413-8)
- IEC 61557-8

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Supply voltage <i>U</i> s	Nominal voltage <i>U</i> n	System leakage	Art.	Art. No.	
.,,,,,	supply loningers;	J		Screw-type terminal	Push-wire terminal	
isoPV425-D4-4 with AGH420	AC 100240 V, 4763 Hz / DC 24240 V	3(N)AC, AC 0690 V / DC 01000 V	≤ 500 µF	B91036303	B71036303	

Accessories

Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B98060008
XM420 mounting frame	B990994



Insulation coordination acc. to IEC 60664-1/IEC 60664-	3
Definitions:	
Supply circuit (IC2)	A1, A2
Output circuit (IC3)	11, 14, 24
Control circuit (IC4)	Up, KE, T/R, A, B, AK1, GND, AK2
Rated voltage	240 V
Overvoltage category	III
Rated impulse voltage:	
IC2/(IC3-4)	4 kV
IC 3/(IC4)	4 kV
Rated insulated voltage:	
IC2/(IC3-4)	250 V
IC 3/(IC4)	250 V
Polution degree	3
Protective separation (reinforced insulation) between:	
IC2/(IC3-4)	Overvoltage category III, 300 V
IC 3/(IC4)	Overvoltage category III, 300 V
Voltage test (routine test) according to IEC 61010-1:	
IC2/(IC3-4)	AC 2.2 kV
IC 3/(IC4)	AC 2.2 kV
Supply voltage	
Supply voltage U _S	AC 100240 V/DC 24240 V
Tolerance of U_{S}	-30+15 %
Frequency range U_5	4763 Hz
Power consumption	$\leq 3 \text{ W}, \leq 9 \text{ VA}$
•	
IT system being monitored	2/11/14 45 0 600 11/15 0 4000 1
Nominal system voltage U _n with AGH420	3(N)AC, AC 0690 V/DC 01000 V
Tolerance of <i>U</i> _n	AC +15 %, DC +10 %
Nominal system voltage range $U_{\rm n}$ with AGH420 (UL508)	AC/DC 0600 V
Frequency range of $U_{\rm n}$	DC 50/60 Hz ±1 Hz
Measuring circuit	
Permissible system leakage capacitance Ce at insulation value	
Permissible system leakage capacitance C_e at insulation value	•
Permissible extraneous DC voltage U_{fg}	≤ 1150 V
Response values	
Response value R _{an1}	2500 kΩ (10 kΩ)*
Response value R _{an2}	1490 kΩ (5 kΩ)*
Relative uncertainty R _{an}	\pm 15 %, at least \pm 1 k Ω
Hysteresis R _{an}	25 %, at least 1 kΩ
Undervoltage detection	301140 V (off)*
Overvoltage detection	311150 V (off)*
Relative uncertainty <i>U</i>	\pm 5 %, at least \pm 5 V
Hysteresis <i>U</i>	5 %, at least 5 V
Time response	
Response time t_{an} at $R_F = 0.5$ x R_{an} and $C_e = 1$ μ F acc. to IEC 61	1557-8 ≤ 10 s
Start-up delay t	010 s (0 s)*
	010 s (0 s)* 099 s (0 s)*

Displays, memory		
Display	<u>'</u>	lay, multi-functional, not illuminated
Display range measured value insu		1 kΩ1 MΩ
Operating uncertainty at $R_F \le 1 \text{ M}\Omega$		\pm 15 %, at least \pm 1 k Ω
Display range measured value nom	inal system voltage (<i>U</i> _n)	301150 V _{RM}
Operating uncertainty		\pm 5 %, at least \pm 5 \
Display range measured value syste	em leakage capacitance at R _F :	> 10 kΩ 0…1000 μl
Operating uncertainty		\pm 15 %, at least \pm 2 μ l
Password		off/0999 (0, off)*
Fault memory alarm messages		on/(off)
Interface		
Interface/protocol	F	RS-485/(BMS)*, Modbus RTU, isoData
Baud rate		U (selectable), isoData (115.2 kBits/s
Cable length (9.6 kBits/s)	ons (sto hote, s), mousus in	≤ 1200 m
Cable: twisted pairs, shield connect	ed to PF on one side	min. J-Y(St)Y 2x0.6
Terminating resistor		(0,25 W), internal, can be connected
Device address, BMS bus, Modbus F		390 (3)*
	110	3,0 (3)
Switching elements	3	1.11/0
Switching elements		1 N/O contacts, common terminal 11
Operating principle	·	ation/N/O operation (N/O operation)*
Electrical endurance, number of cyc	cles	10000
Contact data acc. to IEC 60947-	5-1:	
Utilisation category	A	.C-12 / 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 /2 A /1 A /0.2 A / 0.1 A
Minimum contact rating		1 mA at AC/DC \geq 10 V
Environment/EMC		
EMC		IEC 61326-2-4
Ambient temperatures:		
Operation		-40+70 °C
Transport		-40+85 °C
Storage		-40+70 %
	ns acc. to IEC 60/21 (related t	to temperature and relative humidity):
Stationary use (IEC 60721-3-3)		3K22
Transport (IEC 60721-3-2)		2K11
Long-term storage (IEC 60721-3-1)		1K22
Classification of mechanical cor	nditions acc. to IEC 60721	
Stationary use (IEC 60721-3-3)		3M11
Transport (IEC 60721-3-2)		2M ²
Long-term storage (IEC 60721-3-1)		1M12
Other .		
		continuous operation
Operating mode		
Operating mode Mounting	cooli	
		ing slots must be ventilated vertically
Mounting	onents (DIN EN 60529)	ing slots must be ventilated vertically IP30
Mounting Degree of protection, built-in comp	onents (DIN EN 60529)	ing slots must be ventilated vertically IP30 IP20
Mounting Degree of protection, built-in comp Degree of protection, terminals (DI Enclosure material	onents (DIN EN 60529)	ing slots must be ventilated vertically IP30 IP20 polycarbonate
Mounting Degree of protection, built-in comp Degree of protection, terminals (DI Enclosure material DIN rail mounting acc. to	onents (DIN EN 60529)	ing slots must be ventilated vertically IP3C IP2C polycarbonate IEC 60715
Mounting Degree of protection, built-in comp Degree of protection, terminals (DI Enclosure material	onents (DIN EN 60529)	ing slots must be ventilated vertically IP3C IP2C polycarbonate

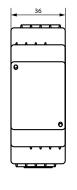
Definitions:	
Measuring circuit (IC1)	L1/+, L2/-
Control circuit (IC2)	AK1, GND, AK2, Up, E
Rated voltage	1000 V
Overvoltage category	III
Rated impulse voltage:	
IC1/(IC2)	8 kV
Rated insulated voltage:	
IC1/(IC2)	1000 V
Polution degree	3
Protective separation (reinforced insulation) between:	
IC1/(IC2)	Overvoltage category III, 1000 V
Monitored IT system	
Nominal system voltage range U_n	AC/DC 01000 V
Tolerance of U _n	AC +15 %, DC +10 %
Nominal system voltage range $U_{\rm n}$ (UL508)	AC/DC 0600 V
Measuring circuit	
Measuring voltage U _m	± 45 V
Measuring current $I_{\rm m}$ at $R_{\rm F}$	≤ 400 μA
Internal resistance DC R _i	≥ 120 kΩ

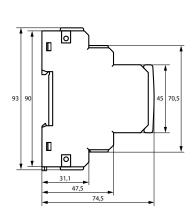
Environment/EMC	
EMC	IEC 61326-2-4
Ambient temperatures:	
Operation	-40+70 ℃
Transport	-40+85 ℃
Storage	-40+70 ℃
Classification of climatic conditions acc. to IEC 60721 (ex	ccept condensation and formation of ice):
Stationary use (IEC 60721-3-3)	3K24
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions acc. to IEC 60	0721:
Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12
Other	
Operating mode	Continuous operation
Mounting	cooling slots must be ventilated vertically
Distance to adjacent devices from $U_{\rm n} > 800 \text{ V}$	≥ 30 mm
Degree of protection internal components (DIN EN 60529)	IP30
Degree of protection terminals (DIN EN 60529)	IP20
Enclosure material	polycarbonate
DIN rail mounting acc. to	IEC 60715
Screw mounting	2 x M4 with mounting clip
Weight	≤ 150 g

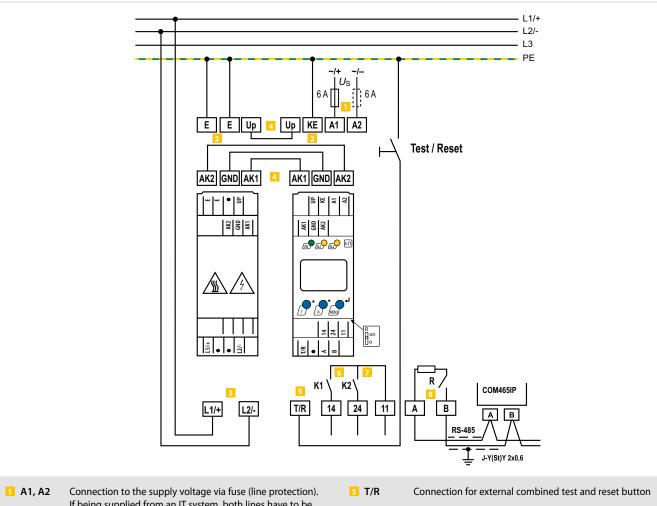
Connection (for ISOMETER® and AGH)

Screw-type terminals:	
Nominal current	≤10 A
Tightening torque	0.50.6 Nm (57 lb-in)
Conductor sizes	AWG 2412
Stripping length	8 mm
Rigid/flexible	0.22.5 mm ²
Flexible with ferrules with/without plastic sleeve	0.252.5 mm ²
Multi-conductor	
rigid / flexible	0.21.5 mm ²
flexible with ferrules without plastic sleeve	0.251.5 mm ²
flexible with TWIN ferrules with plastic sleeve	0.251.5 mm ²
Push-wire terminals:	
Nominal current	≤10 A
Conductor sizes	AWG 2414
Stripping length	10 mm
Rigid	0.22.5 mm ²
Flexible without ferrules	0.752.5 mm ²
Flexible with ferrules with/without plastic sleeve	0.252.5 mm ²
Multi-conductor flexible with TWIN ferrules with plastic sleeve	0.5 1.5 mm ²
Opening force	50 N
Test opening, diameter	2.1 mm
Connection type	terminals Up, AK1, GND, AK2
Single cables for terminals Up, AK1, GND, AK2:	
Cable lengths	≤ 0.5 m
Connection properties	$\geq 0.75 \text{ mm}^2$

Dimension diagram (dimensions in mm)







- If being supplied from an IT system, both lines have to be protected by a fuse.*
- 2 E, KE Connect each terminal separately to PE: The same wire cross section as for A1, A2 must be used.
- Connection to the 3(N)AC, AC or DC system to be monitored. 3 L1/+, L2/-
- 4 Up, AK1, Connect the terminals of the AGH420 to the corresponding GND, AK2 terminals of the isoPV425
- 6 11, 14 Connection to alarm relay K1
- 7 11, 24 Connection to alarm relay K2
- 8 A, B RS-485 communication interface with selectable terminating resistance.

For UL applications:

Only use 60/75°C copper lines! For UL and CSA applications, it is mandatory to use 5 A fuses for the protection of the supply voltage.

Insulation monitoring device for unearthed photovoltaic systems







Typical applications

 Large PV systems designed as IT systems up to DC 1500 V

Approvals







Device features

ISOMETER® for photovoltaic systems.

- · Insulation monitoring of large-scale photovoltaic systems
- Measurement of insulation faults 200 $\Omega...1~\text{M}\Omega$
- Automatic adjustment to high system leakage capacitances
- Combination of AMP^{Plus} 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
- \bullet 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

Interface

- 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

Standards

The ISOMETER® has been 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

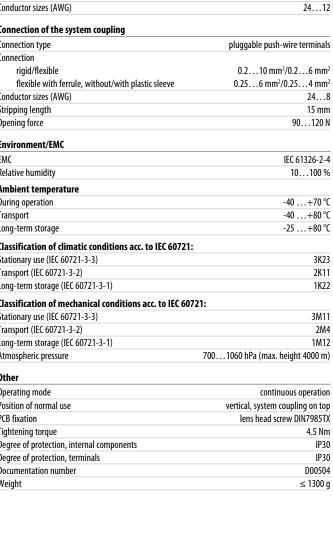
Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Response value range	Supply voltage <i>U</i> ₅	Nominal system voltage <i>U</i> n	Art. No.
isoPV1685RTU-425	200 Ω1 ΜΩ	DC 24 V ±25%	AC 01000 V / DC 01500 V	B91065603

Insulation coordination acc. to IEC 60664-1/IEC 60664-3		Connection (except system coupling)	
Rated voltage	1500 V	Connection type	pluggable push-wire terminals
Rated impulse voltage	10 kV	Connection	. 35 .
Pollution degree	2	rigid/flexible	0.22.5 mm ² /0.22.5 mm ²
		flexible with ferrule, without/with plastic sleeve	0.252.5 mm ²
Voltage ranges		Conductor sizes (AWG)	2412
Nominal system voltage U_{n} RTU	AC 01000 V/DC 01500 V	, ,	
Nominal frequency	DC, $50/60 \text{ HZ} \pm 1 \text{ Hz}$	Connection of the system coupling	
Tolerance of <i>U</i> n	AC +10%/DC +6 %	Connection type	pluggable push-wire terminals
Supply voltage <i>U</i> s	DC 1830 V	Connection	
Power consumption	≤ 7 W	rigid/flexible	0.210 mm ² /0.26 mm ²
		flexible with ferrule, without/with plastic sleeve	0.256 mm ² /0.254 mm ²
Measuring circuit for insulation monitoring		Conductor sizes (AWG)	248
Measuring voltage $U_{\rm m}$ (peak value)	±50 V	Stripping length	15 mm
Measuring current $I_{\rm m}$ (at $R_{\rm F}=0~\Omega$)	≤ 1.5 mA	Opening force	90120 N
Internal DC resistance R _i	≥ 70 kΩ		
Impedance Z _i at 50 Hz	≥ 70 kΩ	Environment/EMC	
Permissible extraneous DC voltage U_{fg}	≤ DC 1500 V	EMC	IEC 61326-2-4
Permissible system leakage capacitance C _e	≤ 2000 µF	Relative humidity	10100 %
Desmance values for insulation we suit and a		Ambient temperature	
Response values for insulation monitoring		During operation	-40 +70 ℃
Response value R _{an1} (Alarm 1)	200 Ω1 ΜΩ	Transport	-40 +80 °C
Response value R _{an2} (Alarm 2)	200 Ω1 ΜΩ	Long-term storage	-25+80 °C
Upper limit of the measuring range when set to $C_{\rm emax}$ = 2000			
Relative uncertainty (10 k Ω 1 M Ω) (acc. to IEC 61557-8)	±15 %	Classification of climatic conditions acc. to IEC 60721:	21/22
Relative uncertainty (0.2 k Ω < 10 k Ω)	±200Ω ±15 %	Stationary use (IEC 60721-3-3)	3K23
Response time t _{an}	see graphic in the manual	Transport (IEC 60721-3-2)	2K11
Hysteresis	25 %, +1 kΩ	Long-term storage (IEC 60721-3-1)	1K22
Displays mamous		Classification of mechanical conditions acc. to IEC 6072	1:
Displays, memory		Stationary use (IEC 60721-3-3)	3M11
LEDs for alarms and operating states	2 x green, 4 x yellow	Transport (IEC 60721-3-2)	2M4
μSD card (Spec. 2.0) for history memory and log files	≤ 32 GByte	Long-term storage (IEC 60721-3-1)	1M12
Inputs		Atmospheric pressure	7001060 hPa (max. height 4000 m)
•			
Digital inputs DigIn1/DigIn2:		Other	
High level	1030 V	Operating mode	continuous operation
Low level	00.5 V	Position of normal use	vertical, system coupling on top
Carial interferes		PCB fixation	lens head screw DIN7985TX
Serial interfaces		Tightening torque	4.5 Nm
Interface	RS-485	Degree of protection, internal components	IP30
	lodbus RTU (Slave); Protocol switchable	Degree of protection, terminals	IP30
Connection	terminals A/B	Documentation number	D00504
	Shield: Terminal S	Weight	≤ 1300 g
Cable length	≤ 1200 m		
Shielded cable (shield to functional earth on one end)	2-core, \geq 0.6 mm ² , 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	217		
6 to 11			
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		
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		
· · · · · · · · · · · · · · · · · · ·	5 A / 3 A / 1 A / 0.2 A / 0.1 A		
Rated operational current Minimum contact rating			
Minimum contact rating	$1 \text{ mA at AC/DC} \ge 10 \text{ V}$		



AC 240 V, 1.5 A in case of a power factor of 0.35

AC 250 V, 8 A in case of a power factor of 0.75 to 0.80

AC 120 V, 3 A in case of a power factor of 0.35

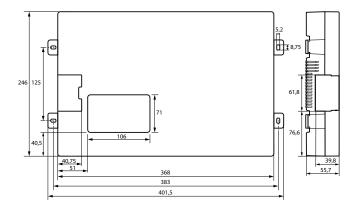
DC 30 V, 8 A in case of ohmic load

Utilisation category for AC control circuits with 50/60 Hz (Pilot duty)

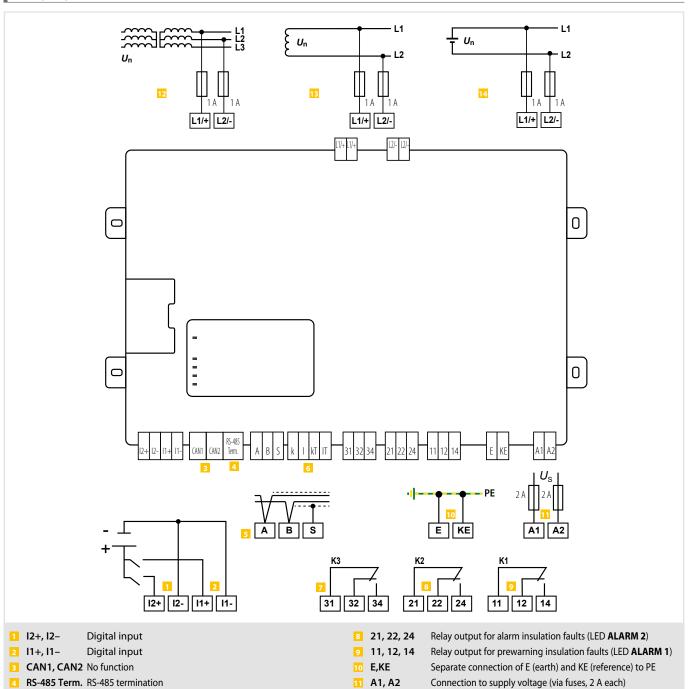
AC load of the alarm relay outputs AC load of the alarm relay outputs

AC load of the alarm relay outputs

DC load of the alarm relay outputs



Wiring diagram



12 L1/+, L2/-

11/+, L2/-

14 L1/+, L2/-

7 31, 32, 34

k, I, kT, IT

off / on

A, B, S

RS-485 bus connection (A, B)

no function

BMS protocol: PE potential, connect one end of shield (S)

Relay output for internal device errors (LED **SERVICE**)

Connection to a 3(N)AC system

Connection to an AC system

Connection to an DC system

ISOMETER® isoPV1685P

Insulation monitoring device for unearthed photovoltaic systems







Typical applications

• Large PV systems designed as IT systems up to DC 1500 V

Approvals





Device features

- Insulation monitoring of large PV systems
- Measurement of insulation faults 200 $\Omega...1~\text{M}\Omega$
- Automatic adjustment to high system leakage capacitances
- Separately adjustable response values Ran1 (Alarm 1) and Ran2 (Alarm 2) for prewarning and alarm
- Connection monitoring of L+, L- for polarity reversal
- Integrated locating current injector up to 50 mA for insulation fault localisation
- Device self test with automatic alarm message in the event of a fault
- \bullet μSD card with data logger and history memory for alarms
- Digital input
- Separate relays for insulation fault 1, insulation fault 2 and device error

- RS-485 interface for data exchange with other Bender devices
- BMS bus via RS-485 interface

Standards

The ISOMETER $\!\!\!^{\circ}$ has been 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
- IEC 61557-9
- UL 508

Further information

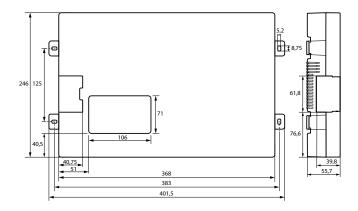
For further information refer to our product range on www.bender.de.

Ordering information

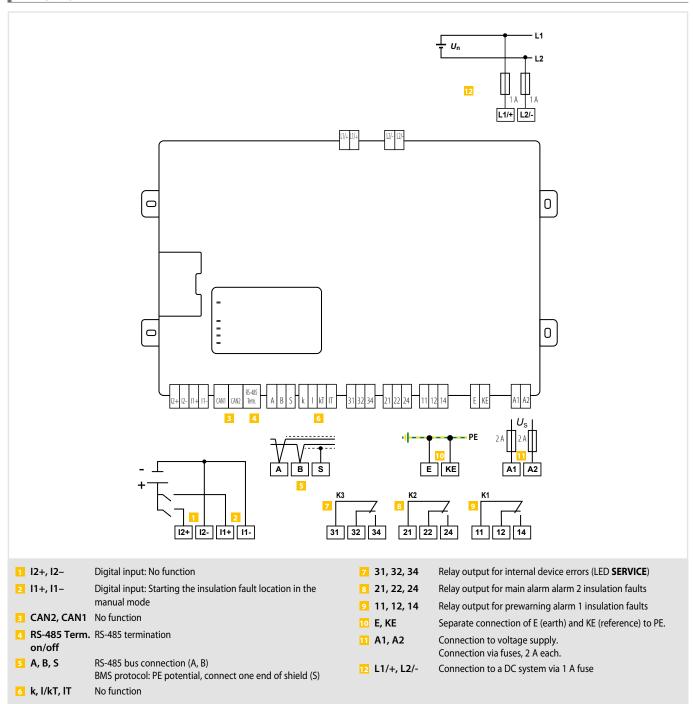
Туре	Response value range	Supply voltage <i>U</i> ₅	Nominal system voltage <i>U</i> n	Art. No.
isoPV1685P-425	200 Ω1 ΜΩ	DC 24 V ±25%	DC 01500 V	B91065604

Rated voltage	1-1/IEC 60664-3 DC 1500 \
Rated impulse voltage	8 k/
Pollution degree	
V-14	
Voltage ranges	DC 0 1500 L
Nominal system voltage U_n Tolerance of U_n	DC 01500 \ DC +6 %
Supply voltage $U_{\rm S}$	DC +0 %
Power consumption	< 7 W
	_
Measuring circuit for insulation monitor	•
Measuring voltage U _m (peak value)	±50 \
Measuring current $I_{\rm m}$ (at $R_{\rm F}=0$ Ω)	≤ 1.5 m/
Internal DC resistance R_i Impedance Z_i at 50 Hz	≥ 70 kΩ ≥ 70 kΩ
Permissible extraneous DC voltage <i>U</i> fq	≥ 70 Ks. ≤ DC 1500 \
Permissible system leakage capacitance C _e	<u>≤</u> 2000 μl
, , , , , , , , , , , , , , , , , , , ,	
Response values for insulation monitoring	-
Response value R _{an1} (Alarm 1)	200 Ω1 ΜΩ
Response value R _{an2} (Alarm 2)	200 Ω1 ΜΩ
Upper limit of the measuring range when set Relative uncertainty (10 k Ω 1 M Ω) (acc. to	
Relative uncertainty (0.2 k Ω < 10 k Ω)	±200 Ω ±15 %
Response time t _{an}	see graphic in the manua
Hysteresis	25 %, +1 kΩ
· D/4 405D	
isoPV1685P only:	(FDC)
Measuring circuit for insulation fault loc	
Locating current /L DC	≤ 50 m/
Test cycle/pause Number of turns of test winding	2/4
Number of turns of test winding	
Displays, memory	
LEDs for alarms and operating states	2 x green, 4 x yellow
μSD card (Spec. 2.0) for history memory and l	og files \leq 32 GByte
Inputs	
•	
Digital inputs Digln1/Digln2:	10 30\
Digital inputs DigIn1/DigIn2: High level	1030 \
Digital inputs DigIn1/DigIn2: High level Low level	1030 \ 00.5 \
Digital inputs DigIn1/DigIn2: High level Low level	
Digital inputs DigIn1/DigIn2: High level Low level Serial interfaces	
High level Low level Serial interfaces BMS Interface/protocol	00.5 \ RS-485 / BMS (Slave
Digital inputs DigIn1/DigIn2: High level Low level Serial interfaces	00.5 \ RS-485 / BMS (Slave terminals A/I
Digital inputs DigIn1/DigIn2: High level Low level Serial interfaces BMS Interface/protocol Connection	00.5 \ RS-485 / BMS (Slave terminals A/I Shield: Terminal
Digital inputs DigIn1/DigIn2: High level Low level Serial interfaces BMS Interface/protocol Connection Cable length	00.5 \ RS-485 / BMS (Slave terminals A// Shield: Terminal : ≤ 1200 n
Digital inputs DigIn1/DigIn2: High level Low level Serial interfaces BMS Interface/protocol Connection Cable length Shielded cable (shield to functional earth on one	00.5 \\ RS-485 / BMS (Slave terminals A/ Shield: Terminal: \leq 1200 n end) 2-core, \geq 0.6 mm², e.g. J-Y(St)Y 2 x 0.0
Digital inputs DigIn1/DigIn2: High level Low level Serial interfaces BMS Interface/protocol Connection Cable length Shielded cable (shield to functional earth on one Terminating resistor, switchable (RS-485 Tern	00.5 N RS-485 / BMS (Slave terminals A/I Shield: Terminal: ≤ 1200 n end) 2-core, ≥ 0.6 mm², e.g. J-Y(St)Y 2 x 0.0 m.) 120 Ω (0.5 W
Digital inputs DigIn1/DigIn2: High level Low level Serial interfaces BMS Interface/protocol Connection Cable length Shielded cable (shield to functional earth on one	00.5 N RS-485 / BMS (Slave terminals A/I Shield: Terminal: ≤ 1200 n end) 2-core, ≥ 0.6 mm², e.g. J-Y(St)Y 2 x 0.0 m.) 120 Ω (0.5 W
Digital inputs DigIn1/DigIn2: High level Low level Serial interfaces BMS Interface/protocol Connection Cable length Shielded cable (shield to functional earth on one Terminating resistor, switchable (RS-485 Tern	00.5 N RS-485 / BMS (Slave terminals A/I Shield: Terminal: ≤ 1200 n end) 2-core, ≥ 0.6 mm², e.g. J-Y(St)Y 2 x 0.0 m.) 120 Ω (0.5 W
Digital inputs DigIn1/DigIn2: High level Low level Serial interfaces BMS Interface/protocol Connection Cable length Shielded cable (shield to functional earth on one Terminating resistor, switchable (RS-485 Terr Device address, BMS bus adjustable (DIP switch) Switching elements	00.5 \\ RS-485 / BMS (Slave terminals A/ Shield: Terminal \\ ≤ 1200 n end) 2-core, ≥ 0.6 mm², e.g. J-Y(St)Y 2 x 0.0 m.) 120 Ω (0.5 W ch) 233 V
Digital inputs DigIn1/DigIn2: High level Low level Serial interfaces BMS Interface/protocol Connection Cable length Shielded cable (shield to functional earth on one Terminating resistor, switchable (RS-485 Tern Device address, BMS bus adjustable (DIP swite) Switching elements K1	00.5 \\ RS-485 / BMS (Slave terminals A/ Shield: Terminal \\ ≤ 1200 n end) 2-core, ≥ 0.6 mm², e.g. J-Y(St)Y 2 x 0.0 m.) 120 Ω (0.5 W ch) 233 V 3 changeover contact insulation fault alarm
Digital inputs DigIn1/DigIn2: High level Low level Serial interfaces BMS Interface/protocol Connection Cable length Shielded cable (shield to functional earth on one Terminating resistor, switchable (RS-485 Term Device address, BMS bus adjustable (DIP switch Switching elements K1 K2	00.5 \\ RS-485 / BMS (Slave terminals A/ Shield: Terminal \\ ≤ 1200 n end) 2-core, ≥ 0.6 mm², e.g. J-Y(St)Y 2 x 0.0 m.) 120 Ω (0.5 W ch) 233 V 3 changeover contact insulation fault alarm insulation fault alarm
Digital inputs DigIn1/DigIn2: High level Low level Serial interfaces BMS Interface/protocol Connection Cable length Shielded cable (shield to functional earth on one Terminating resistor, switchable (RS-485 Term Device address, BMS bus adjustable (DIP switching elements Switching elements K1 K2 K3	RS-485 / BMS (Slave terminals A/I Shield: Terminal : ≤ 1200 n end) 2-core, ≥ 0.6 mm², e.g. J-Y(St)Y 2 x 0.6 m.) 120 Ω (0.5 W ch) 3 changeover contact insulation fault alarm insulation fault alarm.
Digital inputs DigIn1/DigIn2: High level Low level Serial interfaces BMS Interface/protocol Connection Cable length Shielded cable (shield to functional earth on one Terminating resistor, switchable (RS-485 Tern Device address, BMS bus adjustable (DIP switch Switching elements Switching elements K1 K2 K3 Operating principle K1, K2	RS-485 / BMS (Slave terminals A/I Shield: Terminal : ≤ 1200 n end) 2-core, ≥ 0.6 mm², e.g. J-Y(St)Y 2 x 0.0 m.) 120 Ω (0.5 W ch) 3 changeover contact insulation fault alarm insulation fault alarm device erro
Digital inputs DigIn1/DigIn2: High level Low level Serial interfaces BMS Interface/protocol Connection Cable length Shielded cable (shield to functional earth on one Terminating resistor, switchable (RS-485 Tern Device address, BMS bus adjustable (DIP switch) Switching elements K1 K2 K3 Operating principle K1, K2 Operating principle K3	RS-485 / BMS (Slave terminals A/I Shield: Terminal : ≤ 1200 n end) 2-core, ≥ 0.6 mm², e.g. J-Y(St)Y 2 x 0.0 m.) 120 Ω (0.5 W ch) 3 changeover contact insulation fault alarm insulation fault alarm device erro
Digital inputs DigIn1/DigIn2: High level Low level Serial interfaces BMS Interface/protocol Connection Cable length Shielded cable (shield to functional earth on one Terminating resistor, switchable (RS-485 Tern Device address, BMS bus adjustable (DIP switch) Switching elements Switching elements K1 K2 K3 Operating principle K1, K2 Operating principle K3 Contact data acc. to IEC 60947-5-1:	RS-485 / BMS (Slave terminals A/Shield: Terminal) send) 2-core, ≥ 0.6 mm², e.g. J-Y(St)Y 2 x 0.0 m.) 120 Ω (0.5 W ch) 233 V 3 changeover contact insulation fault alarm insulation fault alarm insulation or N/C operation, cannot be changed
Digital inputs DigIn1/DigIn2: High level Low level Serial interfaces BMS Interface/protocol Connection Cable length Shielded cable (shield to functional earth on one Terminating resistor, switchable (RS-485 Tern Device address, BMS bus adjustable (DIP swite) Switching elements K1 K2 K3 Operating principle K1, K2 Operating principle K3 Contact data acc. to IEC 60947-5-1: Utilisation category	RS-485 / BMS (Slave terminals A/I Shield: Terminal): ≤ 1200 n e. end) 2-core, ≥ 0.6 mm², e.g. J-Y(St)Y 2 x 0.0 m.) 120 Ω (0.5 W ch) 233 V 3 changeover contact insulation fault alarm insulation fault alarm insulation or N/C operation, cannot be changed N/C operation, cannot be changed
Digital inputs DigIn1/DigIn2: High level Low level Serial interfaces BMS Interface/protocol Connection Cable length Shielded cable (shield to functional earth on one Terminating resistor, switchable (RS-485 Tern Device address, BMS bus adjustable (DIP swite) Switching elements K1 K2 K3 Operating principle K1, K2 Operating principle K3 Contact data acc. to IEC 60947-5-1: Utilisation category Rated operational voltage	RS-485 / BMS (Slave terminals A/I Shield: Terminal): ≤ 1200 n e end) 2-core, ≥ 0.6 mm², e.g. J-Y(St)Y 2 x 0.0 m.) 120 Ω (0.5 W ch) 233 V 3 changeover contact insulation fault alarm insulation fault alarm insulation or N/O operation N/C operation, cannot be changed AC-13 / AC-14 / DC-12 / DC-12 / DC-12 / 220 V / 230 V / 24 V / 110 V / 220 V
Digital inputs DigIn1/DigIn2: High level Low level Serial interfaces BMS Interface/protocol Connection Cable length Shielded cable (shield to functional earth on one Terminating resistor, switchable (RS-485 Tern Device address, BMS bus adjustable (DIP swite) Switching elements K1 K2 K3 Operating principle K1, K2 Operating principle K3 Contact data acc. to IEC 60947-5-1: Utilisation category Rated operational voltage Rated operational current	RS-485 / BMS (Slave terminals A/I Shield: Terminal): ≤ 1200 n e end) 2-core, ≥ 0.6 mm², e.g. J-Y(St)Y 2 x 0.0 m.) 120 Ω (0.5 W ch) 3 changeover contact insulation fault alarm insulation fault alarm insulation or N/O operation N/C operation or N/O operation N/C operation, cannot be changed AC-13 / AC-14 / DC-12 / DC-12 / DC-12 230 V / 230 V / 24 V / 110 V / 220 V 5 A / 3 A / 1 A / 0.2 A / 0.1 /
Digital inputs DigIn1/DigIn2: High level Low level Serial interfaces BMS Interface/protocol Connection Cable length Shielded cable (shield to functional earth on one Terminating resistor, switchable (RS-485 Tern Device address, BMS bus adjustable (DIP switch) Switching elements K1 K2 K3 Operating principle K1, K2 Operating principle K3 Contact data acc. to IEC 60947-5-1: Utilisation category Rated operational voltage Rated operational current Minimum contact rating	RS-485 / BMS (Slave terminals A/I Shield: Terminal): ≤ 1200 n e end) 2-core, ≥ 0.6 mm², e.g. J-Y(St)Y 2 x 0.0 m.) 120 Ω (0.5 W ch) 3 changeover contact insulation fault alarm insulation fault alarm insulation or N/O operation N/C operation or N/O operation N/C operation, cannot be changed AC-13 / AC-14 / DC-12 / DC-12 / DC-12 230 V / 230 V / 24 V / 110 V / 220 V 5 A / 3 A / 1 A / 0.2 A / 0.1 /
Digital inputs DigIn1/DigIn2: High level Low level Serial interfaces BMS Interface/protocol Connection Cable length Shielded cable (shield to functional earth on one Terminating resistor, switchable (RS-485 Terr Device address, BMS bus adjustable (DIP switch) Switching elements K1 K2 K3 Operating principle K1, K2 Operating principle K3 Contact data acc. to IEC 60947-5-1: Utilisation category Rated operational voltage Rated operational current Minimum contact rating For UL application:	RS-485 / BMS (Slave terminals A/Shield: Terminal): ≤ 1200 n end) 2-core, ≥ 0.6 mm², e.g. J-Y(St)Y 2 x 0.0 m.) 120 Ω (0.5 W ch) 3 changeover contact insulation fault alarm: device erro N/C operation or N/O operation N/C operation, cannot be changed AC-13 / AC-14 / DC-12 / DC-12 / DC-12 230 V / 230 V / 24 V / 110 V / 220 V 5 A / 3 A / 1 A / 0.2 A / 0.1 V 1 mA at AC/DC ≥ 10 V
Digital inputs DigIn1/DigIn2: High level Low level Serial interfaces BMS Interface/protocol Connection Cable length Shielded cable (shield to functional earth on one Terminating resistor, switchable (RS-485 Tern Device address, BMS bus adjustable (DIP swite Switching elements K1 K2 K3 Operating principle K1, K2 Operating principle K3 Contact data acc. to IEC 60947-5-1: Utilisation category Rated operational voltage Rated operational current Minimum contact rating For UL application: Utilisation category for AC control circuits with	RS-485 / BMS (Slave terminals A/I Shield: Terminal): ≤ 1200 n end) 2-core, ≥ 0.6 mm², e.g. J-Y(St)Y 2 x 0.0 m.) 120 Ω (0.5 W ch) 233 V 3 changeover contact insulation fault alarm insulation fault alarm insulation or N/O operation or N/C operation, cannot be changed h/C operation, cannot b/
Digital inputs DigIn1/DigIn2: High level Low level Serial interfaces BMS Interface/protocol Connection Cable length Shielded cable (shield to functional earth on one Terminating resistor, switchable (RS-485 Tern Device address, BMS bus adjustable (DIP swite) Switching elements K1 K2 K3 Operating principle K1, K2 Operating principle K3 Contact data acc. to IEC 60947-5-1: Utilisation category Rated operational voltage Rated operational current Minimum contact rating For UL application: Utilisation category for AC control circuits with AC load of the alarm relay outputs	RS-485 / BMS (Slave terminals A/Shield: Terminal): ≤ 1200 n end) 2-core, ≥ 0.6 mm², e.g. J-Y(St)Y 2 x 0.0 m.) 120 Ω (0.5 W ch) 233 V 3 changeover contact insulation fault alarm insulation fault al
Digital inputs DigIn1/DigIn2: High level Low level Serial interfaces BMS Interface/protocol Connection Cable length Shielded cable (shield to functional earth on one Terminating resistor, switchable (RS-485 Tern Device address, BMS bus adjustable (DIP swite Switching elements K1 K2 K3 Operating principle K1, K2 Operating principle K3 Contact data acc. to IEC 60947-5-1: Utilisation category Rated operational voltage Rated operational current Minimum contact rating For UL application: Utilisation category for AC control circuits with	RS-485 / BMS (Slave terminals A/I Shield: A/I Sh

Connection type	pluggable push-wire terminals
Connection	
rigid/flexible	0.22.5 mm ² /0.22.5 mm ²
flexible with ferrule, without/with plastic sleeve	0.252.5 mm ²
Conductor sizes (AWG)	2412
Connection of the system coupling	
Connection type	pluggable push-wire terminals
Connection	
rigid/flexible	0.210 mm ² /0.26 mm ²
flexible with ferrule, without/with plastic sleeve	0.256 mm ² /0.254 mm ²
Conductor sizes (AWG)	248
Stripping length	15 mm
Opening force	90120 N
Environment/EMC	
EMC	IEC 61326-2-4 Ed. 1.0
Relative humidity	10100 %
Ambient temperature	
During operation	-40+70 °C
Transport	-40+80 °C
Long-term storage	-25+80 °C
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 60	
Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12
Atmospheric pressure	7001060 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



Wiring diagram



ISOMETER® isoPV1685DP

Insulation monitoring device for unearthed systems in photovoltaic systems





Typical applications

 Large PV systems designed as IT systems up to AC 1000 V / DC 1500 V

Approvals



Device features

- Insulation monitoring of large PV systems
- · Automatic adjustment to high system leakage capacitances
- Combination of AMPPLUS 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
- Device self test with automatic alarm message in the event of a fault
- · History memory with real-time clock (buffer for 30 days) for storing 1023 alarm messages with date and time
- Freely programmable digital inputs/outputs
- · Separate relays for insulation fault 1, insulation fault 2 and device error

Display

- High-resolution graphic LC display for excellent readability and recording of the device status
- Graphical representation of the insulation resistance over time (isoGraph)

Interfaces

- RS-485 interface for data exchange with other Bender devices
- Remote setting of certain parameters via the Internet (COMTRAXX® gateway)
- Remote diagnosis by the Bender service via the Internet
- BMS bus via RS-485 interface

Insulation fault monitoring

- 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

Standards

The isoPV1685DP devices were designed according to the following standards:

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

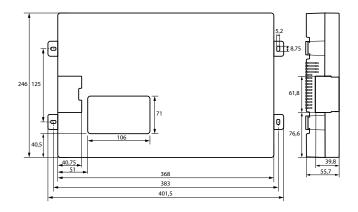
Further information

For further information refer to our product range on www.bender.de.

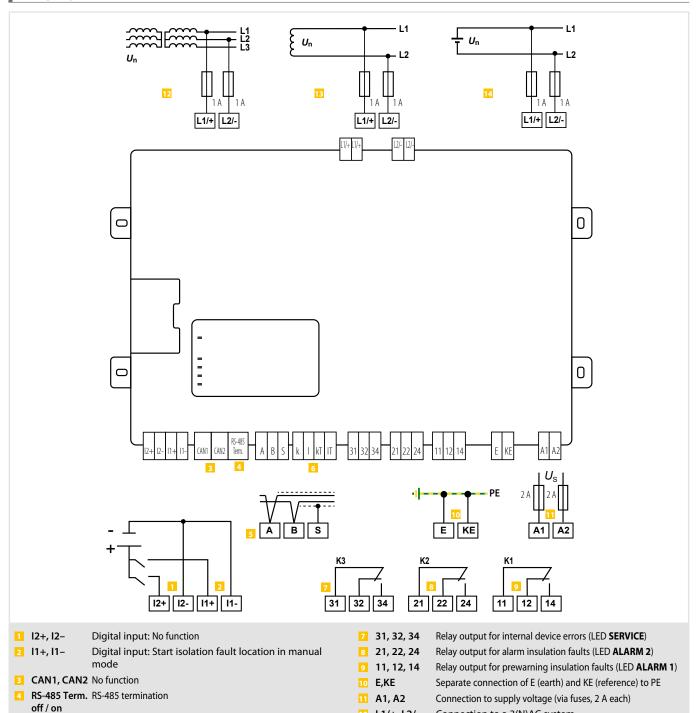
Ordering information

Туре	Response value range	Supply voltage	Nominal voltage	Art. No.
isoPV1685DP	200 Ω200 kΩ	DC 24 V ±25%	AC 01000 V / DC 01500 V	B91065808

	60664-3	Inputs	
Definitions:		Operating mode, adjustable	active high, active lov
Measuring circuit (IC1)	(L1/+, L2/-), (E, KE)		deactivate device, insulation fault location
Supply circuit (IC2)	A1, A2	High level	1030
Output circuit 1 (IC3)	11, 12, 14	Low level	00.5
Output circuit 2 (IC4)	21, 22, 24		
Output circuit 3 (IC4)	31, 32, 34	Serial interface	
Control circuit (IC6)	(A, B), (I1+, I1-, I2+, I2-)	Interface	RS-48
Rated voltage	DC 1500 V		
		Protocol	BMS; Modbus RT
Overvoltage category	III	Connection	Terminals A/
Rated impulse voltage:			Shield: terminals
IC1 / (IC2-5)	10 kV	Cable length	≥ 1200 r
IC2 / (IC3-5)	4 kV	Shielded cable (shield to functional earth on one end)	2-core, \geq 0.6 mm ² , e.g. J-Y(St)Y 2x0.
IC2 / IC1+IC6	0.8 kV	Terminating resistor, can be connected (Term. RS-485)	
IC3 / (IC4-6)	4 kV		120 Ω (0.5 W
	4 kV	Device address, BMS bus	29
IC4 / (IC5-6)		Device address, Modbus RTU	124
IC5 / IC6	4 kV	Baud rate	9.6 / 19.2 / 38.4 / 57.6 / 115 k
Rated insulation voltage:		Parity	even / od
IC1 / (IC2-6)	1500 V		
IC2 / (IC3-5)	250 V	Stop bits	1 / 2 / aut
IC2 / IC6	50 V	Control to an alternative	
IC3 / (IC4-6)	250 V	Switching elements	
		Switching elements	3 changeover contact
IC4 / (IC5-6)	250 V	K1	insulation fault alarm
IC5 / IC6	250 V	K2	insulation fault alarm
Pollution degree	3		
Safe isolation (reinforced insulation) between:		K3	device erro
IC1 / (IC2-5)	Overvoltage category III, 1500 V	Operating principle K1, K2	n/coperation or n/o operatio
IC2 / (IC3-5)	Overvoltage category III, 1900 V	Operating principle K3	n/c operation, non-adjustabl
		Electrical endurance under rated operating conditions	100,000 cycle
IC2 / IC6	Overvoltage category III, 50 V		100,000 Cycle
IC3 / (IC4-6)	Overvoltage category III, 300 V	Contact data acc. to IEC 60947-5-1:	
IC4 / (IC5-6)	Overvoltage category III, 300 V	Utilisation category	AC-13 / AC-14 / DC-12 / DC-12 / DC-1
IC5 / IC6	Overvoltage category III, 300 V	Rated operational voltage	230 V / 230 V / 24 V / 110 V / 220
Voltage test (routine test) acc. to IEC 61010-1:		Rated operational current	
IC2 / (IC3-5)	AC 2.2 kV		5 A / 3 A / 1 A / 0.2 A / 0.1 A
		Minimum contact rating	1 mA at AC/DC \geq 10 $^{\circ}$
102 / 106	DC ±0.5 kV	C di (di	
IC3 / (IC4-6)	AC 2.2 kV	Connection (except mains connection)	
IC4 / (IC5-6)	AC 2.2 kV	Connection type	pluggable push-wire terminal
IC5 / IC6	AC 2.2 kV	Connection	· • • •
		rigid/flexible	0.22.5 mm ² /0.22.5 mm
Supply voltage		3	
Supply voltage $U_{\rm S}$	DC 1830 V	flexible with ferrule, without/with plastic sleeve	0.252.5 mm
Power consumption	≤9W	Conductor sizes (AWG)	241
I ower consumption			
Voltage ranges		Mains connection	
Nominal system voltage range $U_{\rm n}$	AC 01000 V; DC 01500 V	Connection type	pluggable push-wire terminal
		Connection	
Frequency range of U_n	DC; 50 Hz; 60 Hz	rigid/flexible	0.210 mm ² /0.26 mm
Tolerance of U _n	AC +10 %/DC +5%	3	
		flexible with ferrule, without/with plastic sleeve	0.256 mm ² /0.254 mm
Measuring circuit for insulation monitoring		Conductor sizes (AWG)	24
Measuring voltage $U_{\rm m}$ (peak value)	±50 V	Stripping length	15 mr
Measuring current $I_{\rm m}$ (at $R_{\rm F} = 0 \Omega$)	≤ 0.7 mA	Opening force	901201
Internal DC resistance R _i	≥ 70 kΩ	· r · · · · · · · · · · · ·	701201
Impedance Z _i at 50 Hz	$\geq 70 \text{ k}\Omega$ $\geq 70 \text{ k}\Omega$	Environment/EMC	
•			IEC (433) 2
Permissible extraneous DC voltage Ufg	≤ DC 1600 V	EMC	IEC 61326-2-
Permissible system leakage capacitance Ce	profile-dependent, 04000 μF	Rel. humidity	10100 9
		Area of application	≤ 3000 m AMS
Pornanco valuor for inculation manifesia -			
Response values for insulation monitoring		Ambient temperature	
Response value R _{an}	200 Ω200 kΩ	Ambient temperature	4A , 7A 0.
		During operation	
Response value R_{an} Condition response value R_{an1} and R_{an2}	$R_{\text{an1}} \ge R_{\text{an2}}$	•	-40+80°
Response value $R_{\rm an}$ Condition response value $R_{\rm an1}$ and $R_{\rm an2}$ Upper limit of the measuring range for setting for m	$R_{\rm an1} \ge R_{\rm an2}$ easurement profile	During operation	-40+80°
Response value $R_{\rm an}$ Condition response value $R_{\rm an1}$ and $R_{\rm an2}$ Upper limit of the measuring range for setting for me "PV up to 500 µF" $C_{\rm emax} = 500$ µF	$R_{\rm an1} \ge R_{\rm an2}$ easurement profile $200~{\rm k}\Omega$	During operation Transport Long-term storage	-40+80 °(-25+80 °
Response value $R_{\rm an}$ Condition response value $R_{\rm an1}$ and $R_{\rm an2}$ Upper limit of the measuring range for setting for me "PV up to 500 µF" $C_{\rm emax} = 500$ µF Upper limit of the measuring range for setting for me	$R_{\rm an1} \ge R_{\rm an2}$ easurement profile $200 \ \rm k\Omega$ easurement profile	During operation Transport Long-term storage Classification of climatic conditions acc. to IEC 60721	-40+80 °(-25+80 °(
Response value $R_{\rm an}$ Condition response value $R_{\rm an1}$ and $R_{\rm an2}$ Upper limit of the measuring range for setting for me "PV up to 500 µF" $C_{\rm emax} = 500$ µF	$R_{\rm an1} \ge R_{\rm an2}$ easurement profile $200~{\rm k}\Omega$	During operation Transport Long-term storage	-40+80 °(-25+80 °(
Response value $R_{\rm an}$ Condition response value $R_{\rm an1}$ and $R_{\rm an2}$ Upper limit of the measuring range for setting for me "PV up to 500 µF" $C_{\rm emax} = 500$ µF Upper limit of the measuring range for setting for me	$R_{\rm an1} \ge R_{\rm an2}$ easurement profile $200 \ \rm k\Omega$ easurement profile	During operation Transport Long-term storage Classification of climatic conditions acc. to IEC 60721	-40+80° -25+80° :
Response value $R_{\rm an}$ Condition response value $R_{\rm an1}$ and $R_{\rm an2}$ Upper limit of the measuring range for setting for me "PV up to 500 µF" $C_{\rm emax} = 500$ µF Upper limit of the measuring range for setting for me "PV up to 4000 µF" $C_{\rm emax} = 4000$ µF	$R_{\rm an1} \ge R_{\rm an2}$ easurement profile $200 \ \rm k\Omega$ easurement profile	During operation Transport Long-term storage Classification of climatic conditions acc. to IEC 60721: Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2)	-40+80° -25+80° : 3K2 2K1
Response value R_{an} Condition response value R_{an1} and R_{an2} Upper limit of the measuring range for setting for m "PV up to 500 μ F" $C_{emax} = 500 \mu$ F Upper limit of the measuring range for setting for m "PV up to 4000 μ F" $C_{emax} = 4000 \mu$ F Relative uncertainty (acc. to IEC 61557-8) $10 \mathrm{k}\Omega \ldots 1 \mathrm{M}\Omega$	$R_{\rm an1} \ge R_{\rm an2}$ easurement profile $200 \ k\Omega$ easurement profile $50 \ k\Omega$ $\pm 15 \ \%$	During operation Transport Long-term storage Classification of climatic conditions acc. to IEC 60721: Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1)	-40+80° -25+80° : 3K2 2K1 1K2
Response value R_{an} Condition response value R_{an1} and R_{an2} Upper limit of the measuring range for setting for me "PV up to $500~\mu$ F" $C_{emax} = 500~\mu$ F Upper limit of the measuring range for setting for me "PV up to $4000~\mu$ F" $C_{emax} = 4000~\mu$ F Relative uncertainty (acc. to IEC 61557-8) $10~k\Omega\ldots 1~M\Omega$ $0.2~k\Omega\ldots < 10~k\Omega$	$R_{\rm an1} \ge R_{\rm an2}$ easurement profile $200 \ k\Omega$ easurement profile $50 \ k\Omega$ $\pm 15 \ \%$ $\pm 200 \ \Omega \pm 15 \ \%$	During operation Transport Long-term storage Classification of climatic conditions acc. to IEC 60721: Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2)	-40+80° -25+80° : 3K2 2K1 1K2
Response value R_{an} Condition response value R_{an1} and R_{an2} Upper limit of the measuring range for setting for m "PV up to 500 μ F" $C_{emax} = 500 \mu$ F Upper limit of the measuring range for setting for m "PV up to 4000 μ F" $C_{emax} = 4000 \mu$ F Relative uncertainty (acc. to IEC 61557-8) $10 \mathrm{k}\Omega \ldots 1 \mathrm{M}\Omega$	easurement profile $200 \text{ k}\Omega$ easurement profile $50 \text{ k}\Omega$ $\pm 15 \%$ $\pm 200 \Omega \pm 15 \%$ and $C_e = 1 \text{ µF} \text{ acc. to IEC 61557-8}$	During operation Transport Long-term storage Classification of climatic conditions acc. to IEC 60721: Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 607	-40+80° -25+80° : 3K2 2K1 1K2
Response value R_{an} Condition response value R_{an1} and R_{an2} Upper limit of the measuring range for setting for m "PV up to $500~\mu$ F" $C_{emax} = 500~\mu$ F Upper limit of the measuring range for setting for m "PV up to $4000~\mu$ F" $C_{emax} = 4000~\mu$ F Relative uncertainty (acc. to IEC 61557-8) $10~k\Omega\ldots 1~M\Omega$ $0.2~k\Omega\ldots < 10~k\Omega$ Response time t_{an} at $R_F = 0.5~x~R_{an}$ $(R_{an} = 10~k\Omega)$ and	easurement profile $200 \text{ k}\Omega$ easurement profile $50 \text{ k}\Omega$ $\pm 15 \%$ $\pm 200 \Omega \pm 15 \%$ and $C_e = 1 \text{ µF}$ acc. to IEC 61557-8 profile-dependent, typ. 10 s	During operation Transport Long-term storage Classification of climatic conditions acc. to IEC 60721: Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 607 Stationary use (IEC 60721-3-3)	-40+80° -25+80° : 3K2 2K1 1K2 721:
Response value R_{an} Condition response value R_{an1} and R_{an2} Upper limit of the measuring range for setting for m "PV up to $500~\mu$ F" $C_{emax} = 500~\mu$ F Upper limit of the measuring range for setting for m "PV up to $4000~\mu$ F" $C_{emax} = 4000~\mu$ F Relative uncertainty (acc. to IEC 61557-8) $10~k\Omega\ldots 1~M\Omega$ $0.2~k\Omega\ldots < 10~k\Omega$	easurement profile $200 \text{ k}\Omega$ easurement profile $50 \text{ k}\Omega$ $\pm 15 \%$ $\pm 200 \Omega \pm 15 \%$ and $C_e = 1 \text{ µF} \text{ acc. to IEC 61557-8}$	During operation Transport Long-term storage Classification of climatic conditions acc. to IEC 60721: Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 607 Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2)	-40+80° -25+80° : 3K2 2K1 1K2 721: 3M1
Response value R_{an} Condition response value R_{an1} and R_{an2} Upper limit of the measuring range for setting for measuring to the measuring range for setting for measuring to the setting for measuring range for setting for measuring to the setting for measuring	easurement profile $200 \text{ k}\Omega$ easurement profile $50 \text{ k}\Omega$ $\pm 15 \%$ $\pm 200 \Omega \pm 15 \%$ and C_e = 1 μ F acc. to IEC 61557-8 profile-dependent, typ. 10 s $25 \%, +1 \text{ k}\Omega$	During operation Transport Long-term storage Classification of climatic conditions acc. to IEC 60721: Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 607 Stationary use (IEC 60721-3-3)	-40+80° -25+80° : 3K2 2K1 1K2 721: 3M1
Response value R_{an} Condition response value R_{an1} and R_{an2} Upper limit of the measuring range for setting for me "PV up to $500~\mu\text{F}$ " $C_{emax} = 500~\mu\text{F}$ Upper limit of the measuring range for setting for me "PV up to $4000~\mu\text{F}$ " $C_{emax} = 4000~\mu\text{F}$ Relative uncertainty (acc. to IEC 61557-8) $10~k\Omega\ldots1~k\Omega$ $0.2~k\Omega\ldots<10~k\Omega$ Response time t_{an} at $R_F = 0.5~x~R_{an}$ ($R_{an} = 10~k\Omega$) and Hysteresis	easurement profile $200 \text{ k}\Omega$ easurement profile $50 \text{ k}\Omega$ $\pm 15 \%$ $\pm 200 \Omega \pm 15 \%$ and C_e = 1 μ F acc. to IEC 61557-8 profile-dependent, typ. 10 s $25 \%, +1 \text{ k}\Omega$ (EDS)	During operation Transport Long-term storage Classification of climatic conditions acc. to IEC 60721: Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 607 Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2)	-40+80° -25+80° : : : : : : : : : : : : : : : : : : :
Response value R_{an} Condition response value R_{an1} and R_{an2} Upper limit of the measuring range for setting for me "PV up to $500~\mu\text{F}$ " $C_{emax} = 500~\mu\text{F}$ Upper limit of the measuring range for setting for me "PV up to $4000~\mu\text{F}$ " $C_{emax} = 4000~\mu\text{F}$ Relative uncertainty (acc. to IEC 61557-8) $10~k\Omega\ldots 1~M\Omega$ $0.2~k\Omega\ldots < 10~k\Omega$ Response time t_{an} at $R_{F} = 0.5~x~R_{an}$ ($R_{an} = 10~k\Omega$) and Hysteresis Measuring circuit for insulation fault location (Locating current I_{L}	easurement profile $200 \text{ k}\Omega$ easurement profile $50 \text{ k}\Omega$ $\pm 15 \%$ $\pm 200 \Omega \pm 15 \%$ and C_{e} = 1 μ F acc. to IEC 61557-8 profile-dependent, typ. 10 s $25 \%, +1 \text{ k}\Omega$ (EDS)	During operation Transport Long-term storage Classification of climatic conditions acc. to IEC 60721: Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 60: Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Other	-40+80° -25+80° : : : : : : : : : : : : : : : : : : :
Response value R_{an} Condition response value R_{an1} and R_{an2} Upper limit of the measuring range for setting for me "PV up to $500~\mu\text{F}$ " $C_{emax} = 500~\mu\text{F}$ Upper limit of the measuring range for setting for me "PV up to $4000~\mu\text{F}$ " $C_{emax} = 4000~\mu\text{F}$ Relative uncertainty (acc. to IEC 61557-8) $10~k\Omega\ldots 1~M\Omega$ $0.2~k\Omega\ldots < 10~k\Omega$ Response time t_{an} at $R_{F} = 0.5~x~R_{an}$ ($R_{an} = 10~k\Omega$) and Hysteresis Measuring circuit for insulation fault location (Locating current I_{L}	easurement profile $200 \text{ k}\Omega$ easurement profile $50 \text{ k}\Omega$ $\pm 15 \%$ $\pm 200 \Omega \pm 15 \%$ and C_e = 1 μ F acc. to IEC 61557-8 profile-dependent, typ. 10 s $25 \%, +1 \text{ k}\Omega$ (EDS)	During operation Transport Long-term storage Classification of climatic conditions acc. to IEC 60721: Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 60: Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Other Operating mode	-40+80° -25+80° : 3K2 2K1 1K2 721: 3M1 2M 1M1
Response value $R_{\rm an}$ Condition response value $R_{\rm an1}$ and $R_{\rm an2}$ Upper limit of the measuring range for setting for me "PV up to $500~\mu{\rm F}"$ $C_{\rm emax} = 500~\mu{\rm F}$ Upper limit of the measuring range for setting for me "PV up to $4000~\mu{\rm F}"$ $C_{\rm emax} = 4000~\mu{\rm F}$ Relative uncertainty (acc. to IEC 61557-8) $10~{\rm k}\Omega\ldots 1~{\rm k}\Omega$ $0.2~{\rm k}\Omega\ldots < 10~{\rm k}\Omega$ Response time $t_{\rm an}$ at $R_{\rm F} = 0.5~{\rm x}~R_{\rm an}~(R_{\rm an} = 10~{\rm k}\Omega)$ and Hysteresis Measuring circuit for insulation fault location (Locating current $t_{\rm L}$ Test cycle/pause	easurement profile $200 \text{ k}\Omega$ easurement profile $50 \text{ k}\Omega$ $\pm 15 \%$ $\pm 200 \Omega \pm 15 \%$ and C_{e} = 1 μ F acc. to IEC 61557-8 profile-dependent, typ. 10 s $25 \%, +1 \text{ k}\Omega$ (EDS)	During operation Transport Long-term storage Classification of climatic conditions acc. to IEC 60721: Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 60: Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Other Operating mode Position of normal use	-40+80° -25+80° : : : : : : : : : : : : : : : : : : :
Response value R_{an} Condition response value R_{an1} and R_{an2} Upper limit of the measuring range for setting for me "PV up to $500 \mu F'' C_{emax} = 500 \mu F$ Upper limit of the measuring range for setting for me "PV up to $4000 \mu F'' C_{emax} = 4000 \mu F$ Relative uncertainty (acc. to IEC 61557-8) $10 k\Omega \ldots 1 M\Omega$ $0.2 k\Omega \ldots < 10 k\Omega$ Response time t_{an} at $t_{an} = 10 k\Omega$ and Hysteresis Measuring circuit for insulation fault location (Locating current t_{L}	easurement profile $200 \text{ k}\Omega$ easurement profile $50 \text{ k}\Omega$ $\pm 15 \%$ $\pm 200 \Omega \pm 15 \%$ and C_{e} = 1 μ F acc. to IEC 61557-8 profile-dependent, typ. 10 s $25 \%, +1 \text{ k}\Omega$ (EDS)	During operation Transport Long-term storage Classification of climatic conditions acc. to IEC 60721: Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 60: Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Other Operating mode Position of normal use Tightening torque of the screws (4x M5) for enclosure mounty	-40+80° -25+80° : 3K2 2K1 1K2 721: 3M1 2M 1M1 continuous operatio vertical, mains connection on to
Response value $R_{\rm an}$ Condition response value $R_{\rm an1}$ and $R_{\rm an2}$ Upper limit of the measuring range for setting for me "PV up to $500~\mu{\rm F}"$ $C_{\rm emax} = 500~\mu{\rm F}$ Upper limit of the measuring range for setting for me "PV up to $4000~\mu{\rm F}"$ $C_{\rm emax} = 4000~\mu{\rm F}$ Relative uncertainty (acc. to IEC 61557-8) $10~k\Omega\ldots 1~k\Omega$ $0.2~k\Omega\ldots < 10~k\Omega$ Response time $t_{\rm an}$ at $t_{\rm F} = 0.5~x$ $t_{\rm an}$ $t_{\rm an} = 10~k\Omega$) and Hysteresis Measuring circuit for insulation fault location (Locating current $t_{\rm L}$ Test cycle/pause	easurement profile $200 \text{ k}\Omega$ easurement profile $50 \text{ k}\Omega$ $\pm 15 \%$ $\pm 200 \Omega \pm 15 \%$ and C_{e} = 1 μ F acc. to IEC 61557-8 profile-dependent, typ. 10 s $25 \%, +1 \text{ k}\Omega$ (EDS)	During operation Transport Long-term storage Classification of climatic conditions acc. to IEC 60721: Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 60: Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Other Operating mode Position of normal use	-40+80° -25+80° : 3K2 2K1 1K2 721: 3M1 2M 1M1 continuous operatio vertical, mains connection on to
Response value R_{an} Condition response value R_{an1} and R_{an2} Upper limit of the measuring range for setting for me "PV up to $500~\mu$ F" $C_{emax} = 500~\mu$ F Upper limit of the measuring range for setting for me "PV up to $4000~\mu$ F" $C_{emax} = 4000~\mu$ F Relative uncertainty (acc. to IEC 61557-8) $10~k\Omega\ldots 1~k\Omega$ $0.2~k\Omega\ldots < 10~k\Omega$ Response time C_{an} at C_{an} at C_{an} at C_{an} Response time C_{an} at C_{an} at C_{an} at C_{an} and C_{an} Hysteresis Measuring circuit for insulation fault location (Locating current C_{an} Test cycle/pause Display Indicator LEDs for alarms and operating states	easurement profile $200 \text{ k}\Omega$ easurement profile $50 \text{ k}\Omega$ $\pm 15 \%$ $\pm 200 \Omega \pm 15 \%$ at $C_e = 1 \mu\text{F acc. to IEC 61557-8}$ profile-dependent, typ. $\pm 10 \text{ s}$ $\pm 25 \%$, $\pm 1 \text{ k}\Omega$ (EDS) $DC \leq 50 \text{ mA}$ $2 \text{ s } \text{ y } \text{ seconds}$	During operation Transport Long-term storage Classification of climatic conditions acc. to IEC 60721: Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 60: Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Other Operating mode Position of normal use Tightening torque of the screws (4x M5) for enclosure mounty	-40+80 ° -25+80 ° · 3K2 2K1 1K2 721: 3M1 2M- 1M1. continuous operation vertical, mains connection on to thing 1.01.5 Nn
Response value R_{an} Condition response value R_{an1} and R_{an2} Upper limit of the measuring range for setting for me "PV up to 500μ F" $C_{emax} = 500 \mu$ F Upper limit of the measuring range for setting for me "PV up to 4000μ F" $C_{emax} = 4000 \mu$ F Relative uncertainty (acc. to IEC 61557-8) $10 k\Omega \dots 1 M\Omega$ $0.2 k\Omega \dots < 10 k\Omega$ Response time t_{an} at $R_F = 0.5 x R_{an} (R_{an} = 10 k\Omega)$ and Hysteresis Measuring circuit for insulation fault location (Locating current I_L Test cycle/pause Display Indicator LEDs for alarms and operating states Display Grafic	easurement profile $200 \text{ k}\Omega$ easurement profile $50 \text{ k}\Omega$ $\pm 15 \%$ $\pm 200 \Omega \pm 15 \%$ at $C_e = 1 \mu\text{F} \text{ acc. to IEC } 61557-8 \text{ profile-dependent, typ. } 10 \text{ s} 25 \%, +1 \text{ k}\Omega$ (EDS) $DC \leq 50 \text{ mA}$ 2 s / 4 s $2 \text{ x green, 4 x yellow}$ display 127 x 127 Pixel, 40 x 40 mm	During operation Transport Long-term storage Classification of climatic conditions acc. to IEC 60721: Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 60: Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Other Operating mode Position of normal use Tightening torque of the screws (4x M5) for enclosure mounding person of protection, internal components Degree of protection, terminals	-40+80 % -25+80 % 3K2 2K1 1K2 721: 3M1 2M: 1M1. continuous operation vertical, mains connection on to thing 1.01.5 Nn 1P36 1P36
Response value R_{an} Condition response value R_{an1} and R_{an2} Upper limit of the measuring range for setting for me "PV up to $500~\mu$ F" $C_{emax} = 500~\mu$ F Upper limit of the measuring range for setting for me "PV up to $4000~\mu$ F" $C_{emax} = 4000~\mu$ F Relative uncertainty (acc. to IEC 61557-8) $10~k\Omega\ldots 1~k\Omega$ $0.2~k\Omega\ldots < 10~k\Omega$ Response time C_{an} at C_{an} at C_{an} at C_{an} Response time C_{an} at C_{an} at C_{an} at C_{an} and C_{an} Hysteresis Measuring circuit for insulation fault location (Locating current C_{an} Test cycle/pause Display Indicator LEDs for alarms and operating states	easurement profile $200 \text{ k}\Omega$ easurement profile $50 \text{ k}\Omega$ $\pm 15 \%$ $\pm 200 \Omega \pm 15 \%$ at $C_e = 1 \mu\text{F acc. to IEC 61557-8}$ profile-dependent, typ. $\pm 10 \text{ s}$ $\pm 25 \%$, $\pm 1 \text{ k}\Omega$ (EDS) $DC \leq 50 \text{ mA}$ $2 \text{ s } \text{ y } \text{ seconds}$	During operation Transport Long-term storage Classification of climatic conditions acc. to IEC 60721: Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 60: Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Other Operating mode Position of normal use Tightening torque of the screws (4x M5) for enclosure mour Degree of protection, internal components Degree of protection, terminals Enclosure material	-40+80 °C -25+80 °C 3K2 2K1 1K2 7Z1: 3M1 2M 1M1 continuous operation vertical, mains connection on top hting 1.01.5 Nn 1P3C 1P3C
Response value R_{an} Condition response value R_{an1} and R_{an2} Upper limit of the measuring range for setting for me "PV up to 500μ F" $C_{emax} = 500 \mu$ F Upper limit of the measuring range for setting for me "PV up to 4000μ F" $C_{emax} = 4000 \mu$ F Relative uncertainty (acc. to IEC 61557-8) $10 k\Omega \dots 1 M\Omega$ $0.2 k\Omega \dots < 10 k\Omega$ Response time t_{an} at $R_F = 0.5 x R_{an} (R_{an} = 10 k\Omega)$ and Hysteresis Measuring circuit for insulation fault location (Locating current I_L Test cycle/pause Display Indicator LEDs for alarms and operating states Display Grafic	easurement profile $200 \text{ k}\Omega$ easurement profile $50 \text{ k}\Omega$ $\pm 15 \%$ $\pm 200 \Omega \pm 15 \%$ at $C_e = 1 \mu\text{F} \text{ acc. to IEC } 61557-8 \text{ profile-dependent, typ. } 10 \text{ s} 25 \%, +1 \text{ k}\Omega$ (EDS) $DC \leq 50 \text{ mA}$ 2 s / 4 s $2 \text{ x green, 4 x yellow}$ display 127 x 127 Pixel, 40 x 40 mm	During operation Transport Long-term storage Classification of climatic conditions acc. to IEC 60721: Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 60: Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Other Operating mode Position of normal use Tightening torque of the screws (4x M5) for enclosure mound Degree of protection, internal components Degree of protection, terminals Enclosure material Flammability class	-40+80 ° -25
Response value R_{an} Condition response value R_{an1} and R_{an2} Upper limit of the measuring range for setting for me "PV up to 500μ F" $C_{emax} = 500 \mu$ F Upper limit of the measuring range for setting for me "PV up to 4000μ F" $C_{emax} = 4000 \mu$ F Relative uncertainty (acc. to IEC 61557-8) $10 k\Omega \dots 1 M\Omega$ $0.2 k\Omega \dots < 10 k\Omega$ Response time t_{an} at $R_F = 0.5 x R_{an} (R_{an} = 10 k\Omega)$ and Hysteresis Measuring circuit for insulation fault location (Locating current I_L Test cycle/pause Display Indicator LEDs for alarms and operating states Display Grafic	easurement profile $200 \text{ k}\Omega$ easurement profile $50 \text{ k}\Omega$ $\pm 15 \%$ $\pm 200 \Omega \pm 15 \%$ at $C_e = 1 \mu\text{F} \text{ acc. to IEC } 61557-8 \text{ profile-dependent, typ. } 10 \text{ s} 25 \%, +1 \text{ k}\Omega$ (EDS) $DC \leq 50 \text{ mA}$ 2 s / 4 s $2 \text{ x green, 4 x yellow}$ display 127 x 127 Pixel, 40 x 40 mm	During operation Transport Long-term storage Classification of climatic conditions acc. to IEC 60721: Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 60: Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Other Operating mode Position of normal use Tightening torque of the screws (4x M5) for enclosure mour Degree of protection, internal components Degree of protection, terminals Enclosure material	3K2: 2K1: 1K2: 721: 3M1 2M- 1M12 continuous operation vertical, mains connection on to



Wiring diagram



12 L1/+, L2/-

13 L1/+, L2/-

14 L1/+, L2/-

6 k, l, kT, IT

5 A, B, S

RS-485 bus connection (A, B)

No function

BMS protocol: PE potential, connect one end of shield (S)

Connection to a 3(N)AC system

Connection to an AC system

Connection to an DC system

ISOMETER® IR420-D6

AC

Offline monitor for de-energised AC, DC and 3(N)AC loads in TN,TT and IT systems



Typical applications

· De-energised loads such as emergency drives, ship cranes, slide-valve drives in supply lines (gas, water, oil), motor-driven closing systems, diving pumps, drives for anchors, elevators, flue-gas valves and emergency power generators

automatic fire extinguisher pumps,

Device features

- Insulation monitoring for de-energised TN, TT and unearthed systems AC, 3(N)AC and DC
- · Nominal voltage extendable via coupling device
- Two separately adjustable response values 100 k $\Omega...10~M\Omega$
- LEDs: Power On LED, LEDs Alarm 1, Alarm 2 for signalling insulation faults
- · Combined test/reset button
- · Two separate alarm relays with one changeover contact each
- · Fault memory behaviour, selectable
- · Push-wire terminal (two terminals per connection)

Standards

The ISOMETER® has been developed in compliance with the following standards:

- DIN EN 61557-8 (VDE 0413-8)
- EN 61557-8
- IEC 61557-8
- IEC 61326-2-4
- DIN EN 60664-1 (VDE 0110-1)
- DIN EN 60664-3 (VDE 0110-3)

Further information

For further information refer to our product range on www.bender.de.







Ordering information

Туре	Supply voltage ¹⁾ <i>U</i> s	Art. No.	
	Supply rollage of	Screw-type terminal	Push-wire terminal
IR420-D6-1	DC 9,694 V / AC 1672 V, 42460 Hz	B91016415	B71016415
IR420-D6-2	DC 70 200W/AC 70 200W 42 4C0 U-	B91016407	B71016407
IR420-D64-2	DC 70300 V / AC 70300 V, 42460 Hz	B91016408	B71016408

¹⁾ Absolute values

Accessories

Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B98060008
XM420 mounting frame	B990994

Suitable system components

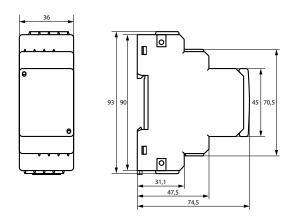
Description	Туре	Nominal voltage <i>U</i> n ¹⁾	Art. No.	Page
	AGH150W	AC 01150 V, DC 01100 V	B915576	382
	AGH204S-4	AC 01650 V AC + DC 01300 V	B914013	384
Coupling device	AGH520S	AC 50400 Hz, 07200 V	B913033	385
	AG70	AC 230 V; 50 Hz	B984718	-
	DS2-31	3 AC 50400 Hz, 0500 V	B984092	-

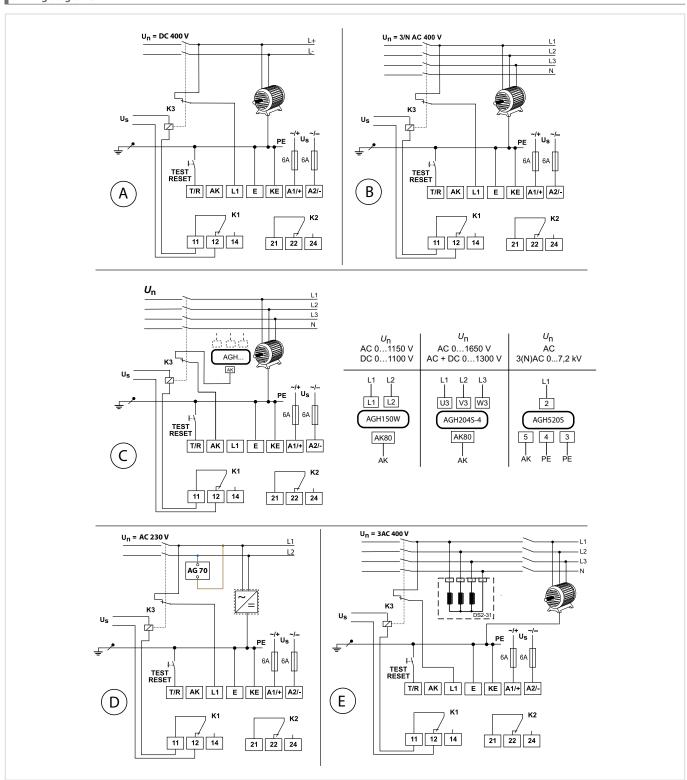
¹⁾ Absolute values

lechnical data	
Insulation coordination acc. to IEC 60664-1/IEC 60664-3	Inputs
Rated insulation voltage	Cable length external test/reset button $\leq 10 \text{ m}$
(A1, A2) - (11, 12, 14) - (21, 22, 24)	Switching alamante
(L1, AK, E, KE, T/R) 500	V 2/1 1 1/4 K2
Rated impulse voltage 6	= 0
Overvoltage category	Operating principle N/O operation, N/C operation (N/O operation n.o.)*
Pollution degree	3 Electrical endurance 10000 switching operations
Protective separation (reinforced insulation) between:	Contact data according IEC 60947-5-1
(A1, A2) - (L1, AK, E, KE, T/R) - (11, 12, 14) - (21, 22, 2	
Voltage test acc. IEC 61010-1 2.2	
Supply voltage	Rated operational current $5 \text{ A}/3 \text{ A}/0.1 \text{ A}/0.2 \text{ A}/1 \text{ A}$ Minimum current 1 mA at AC/DC $\geq 10 \text{ V}$
IR420-D6-1:	
Supply voltage U_5 AC 1672 V/DC 9.694	
Frequency range U_s 42460 Hz/	
IR420-D6-2:	Operating temperature -25+55 °C
Supply voltage U_5 AC/DC 70300	Climatic classes acc. to IEC 60721 (without condensation and formation of ice)
Frequency range U_5 42460 Hz,	- Ctationary use (IEC 60721-2-2)
Power consumption ≤ 3 ³	Transport (IEC 60721.2.2)
Tower consumption 2.3	Storage (IEC 60721-3-1) 1K22
System being monitored	Classification of mechanical conditions acc. to IEC 60721:
Nominal system voltage $U_{\rm n}$ AC 0400	
Tolerance of $U_{\rm n}$ 25	Transport (IEC 60721-3-2) 2M4
Frequency range of U_n 42460	Z Storage (IEC 60721-3-1) 1M12
without AGH nominal contact voltage of the N/C. contact K3 (switch-on contact	r)
with AGH520S AC 50400 Hz, 07200	V Connection
with AGH150W AC 01150	V Connection screw terminals
DC 01100	V Connection properties
with AGH204S-4 AC 01650	V rigid 0.24 mm² (AWG 24 12)
including DC components 01300	V flexible 0.22.5 mm ² (AWG 2414)
Response values	Two conductors with the same cross section
Response value R_{an1} (AL 1) 100 k Ω 10 M Ω (1 M Ω	$_{*}$ rigid/flexible 0.21.5 mm ² (AWG 2416)
Response value R_{an2} (AL 2) $100 \text{ k}\Omega \dots 10 \text{ M}\Omega$ (100 k Ω	- Strinning langth 9 mm
Operating error ($\leq 1 \text{ M}\Omega$) ± 15	Tightaning torqual tarminal scraws 0.5 0.6 Nm
Hysteresis +25	
	Connection properties
Time response	rigid 0.22.5 mm² (AWG 2414)
Response time t_{an} at $R_F = 0.5$ x R_{an} and $C_e = 1 \mu\text{F}$ ≤ 4	5 flexible
Start-up delay <i>t</i> 010 s (0 s	* without ferrules 0.752.5 mm² (AWG 1914)
Response delay t_{on} 099 s (0 s	* with ferrules $0.21.5 \text{ mm}^2$ (AWG 2416)
Measuring circuit	Stripping length 10 mm
Measuring voltage $U_{\rm m}$ +12	Opening force 50 N
Measuring current I_m ($R_F = 0 \Omega$) ≤ 10	= Test opening, giameter 2.1 mm
Internal d.c. resistance R_i $\geq 1.2 \text{ M}$	
Internal impedance Z_i (50 Hz) \geq 1.1 M	
Admissible extraneous d.c. voltage U_{fq} \leq DC 300	_ operating mode
System leakage capacitance $C_e \le 10$	
	Degree of protection terminals (EN 60529) IP20
Displays, memory	– Enclosure material polycarbonat
Display LC display, multi-functional, non-illuminat	d Flammability class UL94 V-C
Display range, measuring value $10 \text{ k}\Omega20 \text{ M}$	DIN rail mounting acc. to IEC 60715
	/ ₆
Percentage operating error ($\leq 1 \text{ M}\Omega$) ± 15	_ SCIEW MOUNTING / X M4 WITH MOUNTING CHE
Password off/0999 (off Fault memory (alarm relay) on/off (off	Screw mounting 2 x M4 with mounting cits Documentation number D00117

()* = Factory setting

Dimension diagram (dimensions in mm)





Description			Terminal	Connection
$\overline{(A)}$	Monitoring of disconnected DC loads up to 400 V with is a low-resistance connection between L + and L- via the load.	Ε,	E, KE	Connect the leads E and KE separately to PE
\subseteq			A1, A2	Supply voltage U_{S} (see nameplate) via 6 A fuse
B	Monitoring of disconnected 3-phase AC loads up to 400 V with a low-resistance connection between L1, L2 and L3 via the load.		11, 12, 14	Alarm relay K1
$\overline{\mathbf{C}}$	Monitoring of disconnected AC loads up to $U_{\rm n}$ with a low-resistance connection between		21, 22, 23	Alarm relay K2 (system fault relay)
$\underline{\mathbf{U}}$	L1, L2, and L3 via the load.	К3	relay for isolating the ISOMETER®	
(D)	Monitoring of disconnected lines or disconnected loads with high resistance between the active conductors L1 and L2. The inductive load AG70 connects the lines L1 and L2 via an inductance so that both lines can be monitored.	İ	AGH	Coupling device for the monitoring of loads up to $U_{\rm n}$
			AG70	For the monitoring of loads with an undefined internal resistance or an open
	Monitoring of disconnected lines or disconnected loads with high resistance between the active conductors L1, L2 and L3. The inductive star-point coupling device D52-31 connects lines L1, L2 and L3 via an inductance so that four lines can be monitored.		DS2-31	single conductor in cables
			T/R	for combined external test/reset button
			L1, AK	Connection to the system being monitored

Insulation monitoring device for mobile generators



Typical applications

- IEC 60364-7-717, DIN VDE 0100-717 (2005) Electrical installations in mobile or transportable units
- DIN VDE 0100-551 (VDE 0100-551), IEC 60364-5-551 Low-voltage generating sets (mobile generators)
- GW 308 "Mobile Stromerzeuger für Rohrleitungsbaustellen 8/00" (Mobile auxiliary power generators on pipeline site") (DVGW)
- · BGI 867 (German Berufsgenossenschaft Information) Auswahl und Betrieb von Ersatzstromerzeugern auf Bau-und Montagestellen (Selecting and operating standby generators on construction and installation sites)

Approvals



Device features

- Insulation monitoring for mobile generators AC 0...300 V
- Protection by electrical separation with insulation monitoring and disconnection
- Version "W" for protection against high mechanical stress
- Two separately adjustable response values
- · Connection monitoring system/earth
- Power On LED, alarm LEDs: Alarm 1, Alarm 2
- Internal/external test/reset button
- Two separate alarm relays (one changeover contact each)
- N/O or N/C operation, selectable
- · Fault memory behaviour, selectable
- Self monitoring with automatic alarm
- · Multi-functional LC display
- · Adjustable response delay
- Two-module enclosure (36 mm)
- Push-wire terminal (two terminals per connection)

Standards

The ISOMETER® has been developed in compliance with the following standards:

- DIN EN 61557-8 (VDE 0413-8)
- EN 61557-8
- IEC 61557-8
- · IEC 61326-2-4
- DIN EN 60664-1 (VDE 0110-1)
- DIN EN 60664-3 (VDE 0110-3)
- ASTM F1669M-96
- ASTM F1207M-96

Further information

For further information refer to our product range on www.bender.de.



Ordering information

Туре	Supply voltage ¹⁾ <i>U</i> s	Version Art.		No.	
1,790	Supply voluge 05	Version	Screw-type terminal	Push-wire terminal	
IR423-D4-1	AC 1672 V, 30460 Hz / DC 9,694 V	Chamdond	B91016304	B71016304	
IR423-D4-2	AC/DC 70300 V, 30460 Hz	Standard	B91016305	B71016305	
IR423-D4W-1	AC 1672 V, 30460 Hz / DC 9,694 V	High manks with laters a	B91016304W	B71016304W	
IR423-D4W-2	AC/DC 70300 V, 30460 Hz	High mechanical stress	B91016305W	B71016305W	

¹⁾ Absolute values

Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B98060008
XM420 mounting frame	B990994

2.21 kV AC 1672 V / DC 9.694 V 30460 Hz / DC AC/DC 70300 V 30460 Hz, DC \leq 4 VA AC 0300 V 30460 Hz 1200 kΩ (46 kΩ)* 1200 kΩ (23 kΩ)* \pm 0.5 kΩ/ \pm 15 %
AC 1672 V / DC 9.694 V 30460 Hz / DC 4 VA 30460 Hz / DC 4 VA 30460 Hz / DC 4 VA $1200 \text{ kΩ } (46 \text{ kΩ})^*$ $1200 \text{ kΩ } (23 \text{ kΩ})^*$ $\pm 0.5 \text{ kΩ}/\pm 15 \%$
AC 1672 V / DC 9.694 V 30460 Hz / DC AC/DC 70300 V 30460 Hz, DC \leq 4 VA AC 0300 V 30460 Hz 1200 kΩ (46 kΩ)* 1200 kΩ (23 kΩ)* \pm 0.5 kΩ/ \pm 15 %
2.21 kV AC 1672 V / DC 9.694 V 30460 Hz / DC AC/DC 70300 V 30460 Hz, DC ≤ 4 VA AC 0300 V
30460 Hz / DC AC/DC 70300 V 30460 Hz, DC $\leq 4 \text{ VA}$ AC 0300 V 30460 Hz 1200 kΩ (46 kΩ)* 1200 kΩ (23 kΩ)* $\pm 0.5 \text{ kΩ/± 15}\%$
30460 Hz / DC AC/DC 70300 V 30460 Hz, DC ≤ 4 VA AC 0300 V 30460 Hz 1200 k Ω (46 k Ω)* 1200 k Ω (23 k Ω)* ± 0.5 k Ω /± 15%
30460 Hz / DC AC/DC 70300 V 30460 Hz, DC $\leq 4 \text{ VA}$ AC 0300 V 30460 Hz 1200 kΩ (46 kΩ)* 1200 kΩ (23 kΩ)* $\pm 0.5 \text{ kΩ/± 15}\%$
AC/DC 70300 V 30460 Hz, DC ≤ 4 VA AC 0300 V 30460 Hz 1200 kΩ (46 kΩ)* 1200 kΩ (23 kΩ)* ± 0.5 kΩ/± 15%
30460 Hz, DC ≤ 4 VA AC 0300 V 30460 Hz 1200 k Ω (46 k Ω)* 1200 k Ω (23 k Ω)* ± 0.5 k Ω /± 15%
30460 Hz, DC ≤ 4 VA AC 0300 V 30460 Hz 1200 k Ω (46 k Ω)* 1200 k Ω (23 k Ω)* ± 0.5 k Ω /± 15%
\leq 4 VA AC 0300 V 30460 Hz 1200 kΩ (46 kΩ)* 1200 kΩ (23 kΩ)* ± 0.5 kΩ/± 15%
AC 0300 V 30460 Hz 1200 kΩ (46 kΩ)* 1200 kΩ (23 kΩ)* \pm 0.5 kΩ/ \pm 15%
30460 Hz $1200 \text{ k}\Omega (46 \text{ k}\Omega)^*$ $1200 \text{ k}\Omega (23 \text{ k}\Omega)^*$ $\pm 0.5 \text{ k}\Omega/\pm 15\%$
30460 Hz $1200 \text{ k}\Omega (46 \text{ k}\Omega)^*$ $1200 \text{ k}\Omega (23 \text{ k}\Omega)^*$ $\pm 0.5 \text{ k}\Omega/\pm 15\%$
1200 k Ω (46 k Ω)* 1200 k Ω (23 k Ω)* ± 0.5 k Ω /± 15%
1200 kΩ (23 kΩ)* ± 0.5 kΩ/± 15 %
1200 kΩ (23 kΩ)* ± 0.5 kΩ/± 15 %
± 0.5 kΩ/± 15 %
+ 1 kΩ/+ 25 %
≤1s
010 s (0 s)*
099 s (0 s)*
± 12 V
≤ 200 µA
≥ 62 kΩ
≥ 60 kΩ
≤ DC 300 V ≤ 5 μF
≥ υμΓ
let e l'eller i
nulti-functional, non-illuminated $1\mathrm{k}\Omega\ldots 1\mathrm{M}\Omega$
± 0.5 kΩ/± 15 %
off/0999 (off)*
on/off*
≤ 10 m
2 (changeover contact K1, K2)
r N/O operation (N/O operation)*
10000
/ AC-14 / DC-12 / DC-12 / DC-12 0 V / 230 V / 220 V / 110 V / 24 V 5 A / 3 A / 0.1 A / 0.2 A / 1 A

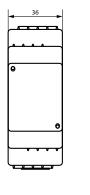
Environment/EMC	
EMC	acc. to IEC 61326-2-4
Operating temperature	-25+55 ℃
Option "W"	-40+70 °C
Climatic class acc. to IEC 60721	
Stationary use (IEC 60721-3-3)	3K22
Option "W"	3K23
Transport (IEC 60721-3-2)	2K11
Long-time storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions IEC	60721
Stationary use (IEC 60721-3-3)	3M11
Option "W"	3M12
Transport (IEC 60721-3-2)	2M4
Long-time storage (IEC 60721-3-1)	1M12
Connection	
Connection type	screw-type terminal or push-wire terminal
Connection	screw terminals
Connection properties	
rigid .	0.24 mm ² (AWG 2412)
flexible	0.22.5 mm ² (AWG 2414)
T I A SILA SI	

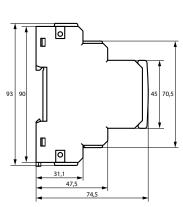
rigid	0.24 mm ² (AWG 2412)
flexible	0.22.5 mm ² (AWG 2414)
Two conductors with the same cross section	
rigid/flexible	0.21.5 mm ² (AWG 2416)
Stripping length	89 mm
Tightening torque, terminal screws	0.50.6 Nm
Connection	push-wire terminals
Connection properties	
rigid	0.22.5 mm ² (AWG 2414)
flexible	
without ferrules	0.752.5 mm ² (AWG 1914)
with ferrules	0.21.5 mm ² (AWG 2416)
Stripping length	10 mm
Opening force	50 N
Test opening, diameter	2.1 mm
Other	

Other	
Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (DIN EN 60529)	IP30
Degree of protection, terminals (DIN EN 60529)	IP20
Enclosure material	polycarbonate
Flammability class	UL94 V-0
DIN rail mounting acc. to	IEC 60715
Screw mounting	2 x M4 with mounting clip
Documentation number	D00038

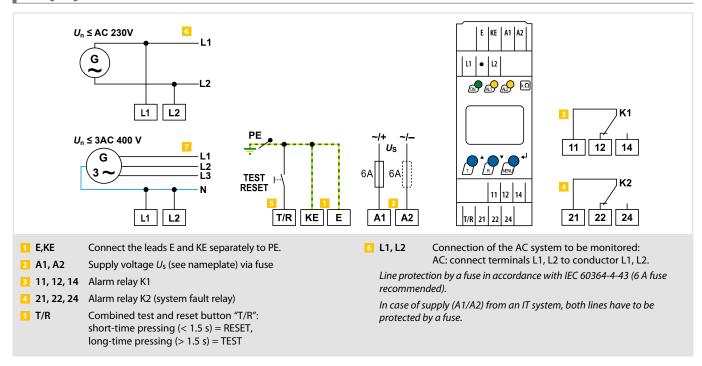
* = factory setting

Dimension diagram (dimensions in mm)

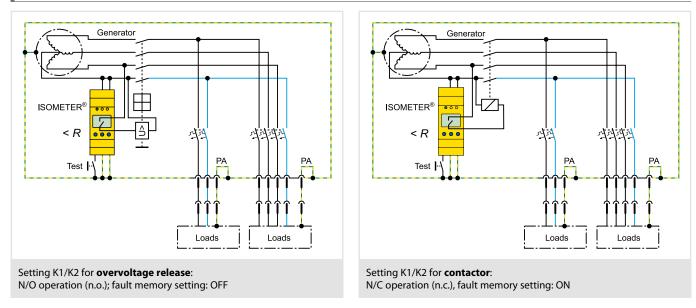




≤ 150 g



Protective measure for mobile generators: "Protection by electrical separation with insulation monitoring and disconnection"



ISOMETER® IR123P

Insulation monitoring device for mobile generators





Typical applications

• Monitoring of unearthed AC systems (IT systems) in mobile generators

Approvals

C € ĽK

Device features

- Insulation monitoring for unearthed DC systems (IT systems) 100...300 V
- Automatic adaptation to the existing system leakage capacitance
- Optimised measurement technique for low-frequency control processes
- Electrically isolated PWM output for the $k\Omega$ measuring value
- Optocoupler output for signalling the device status
- Automatic device self test
- · Certonal coating
- Permanently set response value for the insulation resistance 23/46 $k\Omega$
- Second response range 40/80 $k\Omega$ selectable via a jumper

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Connection	Nominal system voltage <i>U</i> n	Supply voltage U s ¹⁾	Art. No.
IR123P-4-2	Connectors	AC 100300 V, 22460 Hz	$U_{\rm S} = U_{\rm n}$	B91016308

¹⁾ Absolute values

Technical data	
Insulation coordination acc. to IEC 60664-1	
Rated insulation voltage	250 \
Rated impulse voltage/pollution degree	2.5 kV/3
Protective separation (reinforced insulation) between:	
(A1/L1, A2/L2, E, KE, T/R, T, R	, M+, M-/0K-, OK+) -(11-12-14) -(21-22-24)
Voltage test acc. to IEC 61010-1	2.21 k\
Supply voltage	
Supply voltage $U_{\rm S}$	$=U_{\mathbf{I}}$
Power consumption	≤ 3 VA
IT system being monitored	
Nominal system voltage U_n	AC 100300 \
Nominal frequency f _n	22460 Hz
Response values	
Response value R _{an2} (Alarm 2)	(46 kΩ)*
Response value R _{an1} (Alarm 1)	(23 kΩ) ³
Second response range, adjustable via jumper JP1	80/40 kC
Relative percentage error	±15 %
Hysteresis	+25 %
Time response	
Response time t_{an} at $R_F = 0.5$ x R_{an} and $C_e = 1$ μF	≤1:
Measuring circuit	
Measuring voltage $U_{\rm m}$	±12\
Measuring current $I_{\rm m}$ (at $R_{\rm F} = 0 \Omega$	≤ 200 µ <i>l</i>
Internal DC resistance R_i	≥ 62 kΩ
Impedance Z _i at 50 Hz	≥ 60 kΩ
Permissible extraneous DC voltage U_{fg}	≤ DC 300 \
Permissible system leakage capacitance C _e	≤ 5 µl
Memory	
Fault memory (alarm relay)	on / off (on)*
Inputs	
Reset button	N/O contact
Test button	N/O contact
Cable length external test/reset button	3 m
Switching elements	
Number of switching elements	2 (changeover contacts K1, K2)
Operating principle K1/K2	N/C or N/O operation (N/O operation)*

Interfaces	
Optocoupler, alarm	<i>U</i> _{CE} 24 V, I _C 10 mA
Optocoupler, measured value	$U_{CE} \leq DC 24 \text{ V}, I_C \leq 10 \text{ m/s}$
	PWM signal, duty cycle $0 \% = \infty k\Omega$
	PWM signal, duty cycle 50 % = 120 k Ω
	PWM signal, duty cycle $100 \% = 0 \text{ k}\Omega$
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 / 220 V / 110 V / 24 V
Rated operational current	5 A / 3 A / 0.1 A / 0.2 A / 1 A
Minimum current	1 mA at AC/DC \geq 10 V
Environment/EMC	
EMC	acc. to IEC 61326-2-4
Operating temperature	-25+60°
Climatic categories acc. to IEC 60721, valid fo	or one encapsulated p.c.b.:
(related to temperature and relative humidity)	
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K1
Storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions acc. to	IEC 60721, valid for one encapsulated p.c.b:
Stationary use (IEC 60721-3-3)	3M1:
Transport (IEC 60721-3-2)	2M-
Storage (IEC 60721-3-1)	1M12
Connection	
Connection	connectors Universal MATE-N-LOI
	3-pole TE Connectivity Nr. 350789-
	6-pole TE Connectivity Nr. 641831-
	8-pole TE Connectivity Nr. 641828-
Other	
Operating mode	continuous operation
Mounting	any position
Dimensions of the p.c.b., L x W x H	
without connectors	107.5 x 76.5 x 20 mm
with connectors	107.5 x 76.5 x 35 mm
Γα. al. aa	

Enclosure

Weight

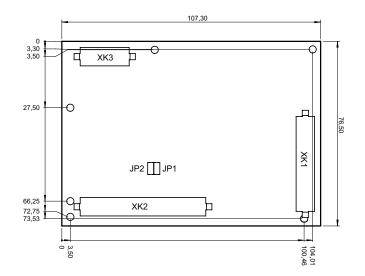
10,000

Documentation number

()* = factory setting

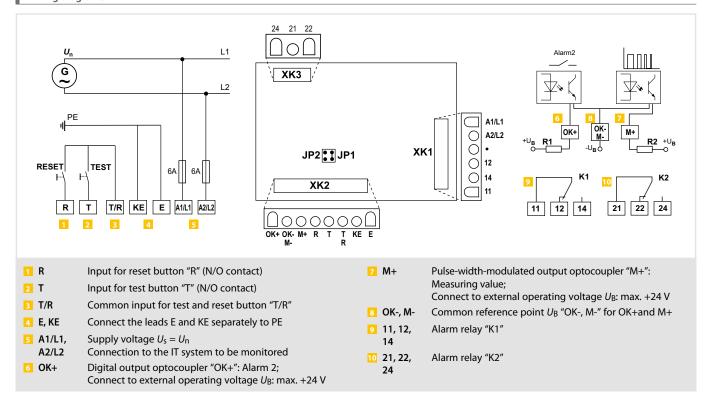
Dimension diagrams (dimensions in mm)

Electrical endurance, number of cycles

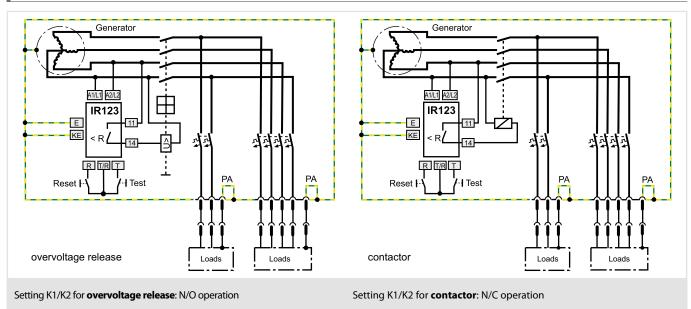


without D00113

≤ 150 g



Application example with overvoltage release or contactor



ISOMETER® isoGEN423

Insulation monitoring device for unearthed AC, AC/DC and DC systems (IT systems) up to 3(N)AC, AC 400 V, DC 400 V, suitable for the application of generators acc. to standard DIN VDE 0100-551





Typical applications

- AC main circuits up to 400 V
- DC main circuits up to 400 V
- · Generators according to DIN VDE 0100-551

Approvals





Device features

- Monitoring the insulation resistance RF for unearthed AC/DC systems
- Measurement of the system voltage U_n (true RMS.) with undervoltage and overvoltage detection
- Measuring the DC residual voltages U_{L1e} (L1/+ to PE) and U_{L2e} (L2/- to PE)
- Selectable start-up delay, response delay and delay on release
- Alarm output via LEDs (AL1, AL2), display and alarm relays (K1, K2)
- · Automatic self test with connection monitoring
- Selectable N/C or N/O relay operation
- · Measured value indication via multifunctional LC display
- Activatable fault memory
- Two operating modes: GEn and DC
- Automatic adjustment to the system leakage capacitance C_e up to 5 μF
- Two separately adjustable response value ranges of 5...200 kΩ (prewarning, alarm)
- · Password protection against unauthorised changing of parameters
- RS-485 (galvanically isolated) including the following protocols:
- BMS interface (Bender measuring device interface) for data exchange with other Bender components
- Modbus RTU
- IsoData (for continuous data output)

Standards

The ISOMETER® has been developed in compliance with the following standards:

- DIN EN 61557-8 (VDE 0413-8)/Cor1
- IEC 61557-8/COR1
- DIN VDE 0100-551

Further information

For further information refer to our product range on www.bender.de.

Ordering information

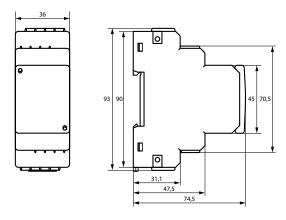
Туре	Nominal voltage <i>U</i> n	Art. No.	
-77-		Screw-type terminal	Push-wire terminal
isoGEN423-D4-4	3(N)AC, AC 0400 V	B91036325	B71036325
isoGEN423-D4W-4 ¹⁾	DC 0400 V	_	B71036325W

¹⁾ Option W: Increased shock and vibration resistance 3K23; 3M12; -40...+70 °C

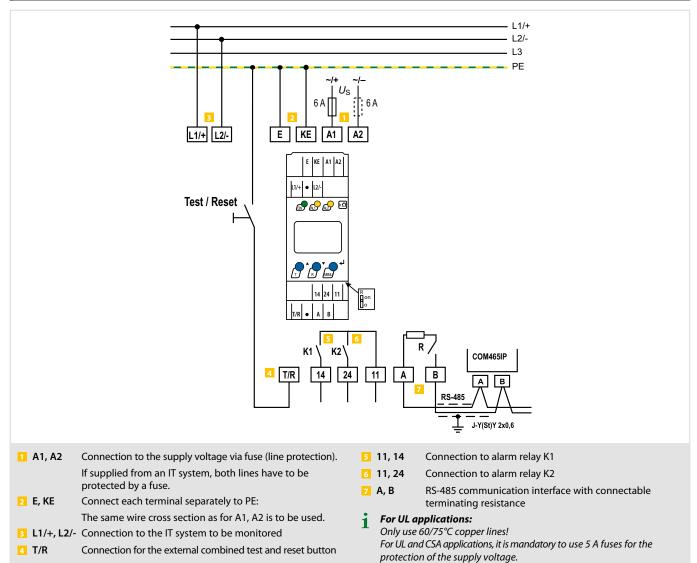
Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B98060008
XM420 mounting frame	B990994



Insulation coordination acc. to IEC 60664-1/IEC 60664-3		Interface	
Definitions:		Interface/protocol R	S-485/BMS, Modbus RTU, isoData
Measuring circuit (IC1)	L1/+, L2/-	Baud rate BMS (9.6 kBit/s), Modbus RTU (s	electable), isoData (115.2 kBits/s
Supply circuit (IC2)	A1, A2	Cable length (9.6 kBits/s)	≤ 1200 r
Output circuit (IC3)	11, 14, 24	Cable: Shield on one end to PE recom	mended: CAT6/CAT7 min. AWG2
Control circuit (IC4)	E, KE, T/R, A, B	alternatively: twisted pairs, shield on one end to PE	J-Y(St)Y min. 2×0 .
Rated voltage	400 V	·	25 W), internal, can be connecte
	III	Device address, BMS bus, Modbus RTU	., .
Overvoltage category	III	Device address, DMS Dus, Modbus KTO	390 (3)
Rated impulse voltage:		Switching elements	
IC1/(IC2-4)	6 kV		
IC2/(IC3-4)	4 kV		c 1 contacts, common terminal 1
IC3/IC4	4 kV	Operating principle N/C operation	n/N/O operation (N/O operation)
Rated insulation voltage:		Electrical endurance, number of cycles	10 00
3	400 V	Contact data acc to IEC 60047 E 1.	
IC1/(IC2-4)	400 V	Contact data acc. to IEC 60947-5-1:	
IC2/(IC3-4)	250 V	······································	2 / AC-14 / DC-12 / DC-12 / DC-1
IC3/IC4	250 V	Rated operational voltage 23	30 V / 230 V / 24 V / 110 V / 220
Polution degree	3	Rated operational current	5 A / 2 A / 1 A / 0.2 A / 0,1
Protective separation (reinforced insulation) between:		Minimum contact rating	1 mA at AC/DC ≥ 10
•	Overvelters seteman III (00 V	Millimum contact ruting	THIN de Ney De 2 To
IC1/(IC2-4)	Overvoltage category III, 600 V	Environment/EMC	
IC2/(IC3-4)	Overvoltage category III, 300 V		IFC (1224.2
IC 3/IC4	Overvoltage category III, 300 V	EMC	IEC 61326-2-
Voltage test (routine test) according to IEC 61010-1:		Ambient temperatures:	
IC2/(IC3-4)	AC 2,2 kV	Operation	-40+70 °
IC 3/IC4	AC 2,2 kV	Transport	-40+85°
IC J/ICT	AC Z,Z KV	•	
Supply voltage		Storage	-40+70°
	AC 100 340 W/DC 34 346 W	Climatic classes acc. to IEC 60721:	
Supply voltage U _s	AC 100240 V/DC 24240 V	Stationary use (IEC 60721-3-3)	3K2
Tolerance of U _s	-30+15 %	Transport (IEC 60721-3-2)	2K1
Frequency range $U_{\rm S}$	4763 Hz		
Power consumption	≤ 3 W, ≤ 9 VA	Long-time storage (IEC 60721-3-1)	1K2:
	,	Classification of mechanical conditions acc. to IEC 60721:	
IT system being monitored		Stationary use (IEC 60721-3-3)	3M1 ⁻
Nominal system voltage U_n	3(N)AC, AC, DC 0400 V	for option W	3M1:
Tolerance of Un	+25 %	•	
		Transport (IEC 60721-3-2)	2M4
Frequency range of U _n	DC, 35460 Hz	Long-term storage (IEC 60721-3-1)	1M1
Measuring circuit Measuring voltage $U_{\rm m}$	±12 V	Connection Screw-type terminals:	
Measuring current $I_{\rm m}$ at $R_{\rm F}$, $Z_{\rm F}=0$	≤ 110 µA		≤10 /
Internal resistance R_i , Z_i	≥ 115 kΩ	Nominal current	
Permissible system leakage capacitance C _e	≤ 5 μF	Tightening torque	0.50.6 Nm (57 lb-in
Permissible extraneous DC voltage U_{fg}	≤ 700 V	Conductor sizes	AWG 241
		Stripping length	8 mr
Response values		Rigid/flexible	0.22.5 mm
Response value R _{an1}	$R_{an2}200 \text{ k}\Omega \text{ (46 k}\Omega)^*$	3	
Response value R _{an2}		Flexible with ferrules with/without plastic sleeve	0.252.5 mm
	5 kΩR _{an1} (23 kΩ)*	Multi-conductor	
Relative uncertainty R _{an}	± 15 %, at least ± 2 k Ω	rigid /flexible	0.21.5 mm
Hysteresis R _{an}	25 %, at least 1 kΩ	flexible with ferrules without plastic sleeve	0.251.5 mm
Undervoltage detection U <	10 V <i>U</i> > (off/10 V)*		
Overvoltage detection <i>U</i> >	U<500 V (off/500 V)*	flexible with TWIN ferrules with plastic sleeve	0.51.5 mm
Relative uncertainty <i>U</i>	\pm 5 %, at least \pm 5 V	Push-wire terminals:	
Relative uncertainty of Relative uncertainty depending on the frequency ≥ 400 Hz	-0,015 %/Hz	Nominal current	-10
	·		≤10.
Hysteresis <i>U</i>	5 %, at least 5 V	Conductor sizes	AWG 241
		Stripping length	10 mn
Time resnance		2	0.22.5 mm
Time response			
Response time t_{an} of $R_F = 0.5 \times R_{an}$ and $C_e = 1 \mu F$ according to IEC 61.		Rigid	
	557-8 ≤ 1 s 010 s (0 s)*	Rigid Flexible without ferrules	0.752.5 mm
Response time t_{an} of $R_F = 0.5 \times R_{an}$ and $C_e = 1 \mu F$ according to IEC 61.		Rigid	0.752.5 mm
Response time $t_{\rm an}$ of $R_{\rm F}=0.5$ x $R_{\rm an}$ and $C_{\rm e}=1$ $\mu{\rm F}$ according to IEC 61. Start-up delay t Response delay $t_{\rm on}$	010 s (0 s)* 099 s (0 s)*	Rigid Flexible without ferrules	0.752.5 mm 0.252.5 mm 0.51.5 mm
Response time $t_{\rm an}$ of $R_{\rm F}=0.5$ x $R_{\rm an}$ and $C_{\rm e}=1$ $\mu{\rm F}$ according to IEC 61. Start-up delay t	010 s (0 s)*	Rigid Flexible without ferrules Flexible with ferrules with/without plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve	0.752.5 mm 0.252.5 mm 0.51.5 mm
Response time $t_{\rm an}$ of $R_{\rm F}=0.5$ x $R_{\rm an}$ and $C_{\rm e}=1$ $\mu{\rm F}$ according to IEC 61. Start-up delay t Response delay $t_{\rm on}$	010 s (0 s)* 099 s (0 s)*	Rigid Flexible without ferrules Flexible with ferrules with/without plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve Opening force	0.752.5 mm 0.252.5 mm 0.51.5 mm 50 N
Response time $t_{\rm an}$ of $R_{\rm F}=0.5$ x $R_{\rm an}$ and $C_{\rm e}=1$ μF according to IEC 61. Start-up delay t Response delay $t_{\rm on}$ Delay on release $t_{\rm off}$	010 s (0 s)* 099 s (0 s)* 099 s (0 s)*	Rigid Flexible without ferrules Flexible with ferrules with/without plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve	0.752.5 mm 0.252.5 mm 0.51.5 mm
Response time $t_{\rm an}$ of $R_{\rm F}=0.5$ x $R_{\rm an}$ and $C_{\rm e}=1$ $\mu{\rm F}$ according to IEC 61. Start-up delay t Response delay $t_{\rm on}$ Delay on release $t_{\rm off}$ Displays, memory Display LC display,	010 s (0 s)* 099 s (0 s)* 099 s (0 s)* multi-functional, not illuminated	Rigid Flexible without ferrules Flexible with ferrules with/without plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve Opening force Test opening, diameter	0.752.5 mm 0.252.5 mm 0.51.5 mm 50 N
Response time $t_{\rm an}$ of $R_{\rm F}=0.5$ x $R_{\rm an}$ and $C_{\rm e}=1$ $\mu{\rm F}$ according to IEC 61 Start-up delay t Response delay $t_{\rm on}$ Delay on release $t_{\rm off}$ Displays, memory Display LC display, Display range measured value insulation resistance ($R_{\rm F}$)	$0\dots 10 \ s \ (0 \ s)^*$ $0\dots 99 \ s \ (0 \ s)^*$ $0\dots 99 \ s \ (0 \ s)^*$ multi-functional, not illuminated $1 \ k\Omega\dots 2 \ M\Omega$	Rigid Flexible without ferrules Flexible with ferrules with/without plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve Opening force Test opening, diameter Other	0.752.5 mm 0.252.5 mm 0.51.5 mm 50 t 2.1 mn
Response time $t_{\rm an}$ of $R_{\rm F}=0.5$ x $R_{\rm an}$ and $C_{\rm e}=1$ $\mu{\rm F}$ according to IEC 61 Start-up delay t Response delay $t_{\rm on}$ Delay on release $t_{\rm off}$ Displays, memory Display LC display, Display range measured value insulation resistance $(R_{\rm F})$ Operating uncertainty	$\begin{array}{c} 0\dots 10~s~(0~s)^*\\ 0\dots 99~s~(0~s)^*\\ 0\dots 99~s~(0~s)^*\\ \end{array}$ multi-functional, not illuminated $1~k\Omega\dots 2~M\Omega\\ \pm 15~\%,~at~least~\pm 2~k\Omega\\ \end{array}$	Rigid Flexible without ferrules Flexible with ferrules with/without plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve Opening force Test opening, diameter Other Operating mode	0.752.5 mm 0.252.5 mm 0.51.5 mm 50 N 2.1 mn
Response time $t_{\rm an}$ of $R_{\rm F}=0.5$ x $R_{\rm an}$ and $C_{\rm e}=1$ $\mu{\rm F}$ according to IEC 61 Start-up delay t Response delay $t_{\rm on}$ Delay on release $t_{\rm off}$ Displays, memory Display LC display, Display range measured value insulation resistance ($R_{\rm F}$)	$0\dots 10 \ s \ (0 \ s)^*$ $0\dots 99 \ s \ (0 \ s)^*$ $0\dots 99 \ s \ (0 \ s)^*$ multi-functional, not illuminated $1 \ k\Omega\dots 2 \ M\Omega$	Rigid Flexible without ferrules Flexible with ferrules with/without plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve Opening force Test opening, diameter Other Operating mode	0.752.5 mm 0.252.5 mm 0.51.5 mm 501 2.1 mn
Response time $t_{\rm an}$ of $R_{\rm F}=0.5$ x $R_{\rm an}$ and $C_{\rm e}=1$ $\mu{\rm F}$ according to IEC 61 Start-up delay t Response delay $t_{\rm on}$ Delay on release $t_{\rm off}$ Displays, memory Display LC display, Display range measured value insulation resistance $(R_{\rm F})$ Operating uncertainty	$\begin{array}{c} 0\dots 10~s~(0~s)^*\\ 0\dots 99~s~(0~s)^*\\ 0\dots 99~s~(0~s)^*\\ \end{array}$ multi-functional, not illuminated $1~k\Omega\dots 2~M\Omega\\ \pm 15~\%,~at~least~\pm 2~k\Omega\\ \end{array}$	Rigid Flexible without ferrules Flexible with ferrules with/without plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve Opening force Test opening, diameter Other Operating mode	0.752.5 mm 0.252.5 mm 0.51.5 mm 50 I 2.1 mn continuous operation
Response time $t_{\rm an}$ of $R_{\rm F}=0.5$ x $R_{\rm an}$ and $C_{\rm e}=1$ $\mu{\rm F}$ according to IEC 61 Start-up delay t Response delay $t_{\rm on}$ Delay on release $t_{\rm off}$ Displays, memory Display LC display, Display ange measured value insulation resistance $(R_{\rm F})$ Operating uncertainty Display range measured value nominal system voltage $(U_{\rm n})$ Operating uncertainty	$\begin{array}{c} 0\dots 10 \text{ s } (0 \text{ s})^*\\ 0\dots 99 \text{ s } (0 \text{ s})^*\\ 0\dots 99 \text{ s } (0 \text{ s})^*\\ \end{array}$ multi-functional, not illuminated $1 \text{ k}\Omega\dots 2 \text{ M}\Omega\\ \pm 15 \text{ \%, at least } \pm 2 \text{ k}\Omega\\ 0\dots 500 \text{ V}_{\text{RMS}}\\ \pm 5 \text{ \%, at least } \pm 5 \text{ V} \end{array}$	Rigid Flexible without ferrules Flexible with ferrules with/without plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve Opening force Test opening, diameter Other Operating mode Mounting cooling Degree of protection, built-in components (DIN EN 60529)	0.752.5 mm 0.252.5 mm 0.51.5 mm 50 l 2.1 mr continuous operatio
Response time $t_{\rm an}$ of $R_{\rm F}=0.5$ x $R_{\rm an}$ and $C_{\rm e}=1$ $\mu{\rm F}$ according to IEC 61 Start-up delay t Response delay $t_{\rm on}$ Delay on release $t_{\rm off}$ Displays, memory Displays, memory LC display, Display LC display, Display range measured value insulation resistance ($R_{\rm F}$) Operating uncertainty Display range measured value nominal system voltage ($U_{\rm n}$) Operating uncertainty	$\begin{array}{c} 0\dots 10 \text{ s } (0 \text{ s})^*\\ 0\dots 99 \text{ s } (0 \text{ s})^*\\ 0\dots 99 \text{ s } (0 \text{ s})^*\\ \end{array}$ multi-functional, not illuminated $1 \text{ k}\Omega\dots 2 \text{ M}\Omega\\ \pm 15 \text{ \%, at least } \pm 2 \text{ k}\Omega\\ 0\dots 500 \text{ V}_{\text{RMS}}\\ \pm 5 \text{ \%, at least } \pm 5 \text{ V}\\ 0 \text{ k}\Omega \text{ (only "de" mode)}\\ \end{array}$	Rigid Flexible without ferrules Flexible with ferrules with/without plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve Opening force Test opening, diameter Other Operating mode Mounting cooling Degree of protection, built-in components (DIN EN 60529) Degree of protection, terminals (DIN EN 60529)	0.752.5 mm 0.252.5 mm 0.51.5 mm 50/ 2.1 mr continuous operatio slots must be ventilated verticall IP3 IP2
Response time $t_{\rm an}$ of $R_{\rm F}=0.5$ x $R_{\rm an}$ and $C_{\rm e}=1$ µF according to IEC 61 Start-up delay t Response delay $t_{\rm on}$ Delay on release $t_{\rm off}$ Displays, memory Display LC display, Display arange measured value insulation resistance ($R_{\rm F}$) Operating uncertainty Display range measured value nominal system voltage ($U_{\rm n}$) Operating uncertainty Display range measured value system leakage capacitance of $R_{\rm F}>1$	$\begin{array}{c} 0\dots 10 \ s \ (0 \ s)^* \\ 0\dots 99 \ s \ (0 \ s)^* \\ 0\dots 99 \ s \ (0 \ s)^* \end{array}$ multi-functional, not illuminated $1 \ k\Omega\dots 2 \ M\Omega \\ \pm 15 \ \%, \ at \ least \pm 2 \ k\Omega \\ 0\dots 500 \ V_{RMS} \\ \pm 5 \ \%, \ at \ least \pm 5 \ V \\ 0 \ k\Omega \ (only "dc" \ mode) \\ 0\dots 17 \ \mu F \end{array}$	Rigid Flexible without ferrules Flexible with ferrules with/without plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve Opening force Test opening, diameter Other Operating mode Mounting cooling Degree of protection, built-in components (DIN EN 60529) Degree of protection, terminals (DIN EN 60529) Enclosure material	0.752.5 mm 0.252.5 mm 0.51.5 mm 50 l 2.1 mr continuous operatio slots must be ventilated verticall IP3 IP2 polycarbonat
Response time $t_{\rm an}$ of $R_{\rm F}=0.5$ x $R_{\rm an}$ and $C_{\rm e}=1$ $\mu{\rm F}$ according to IEC 61 Start-up delay t Response delay $t_{\rm on}$ Delay on release $t_{\rm off}$ Displays, memory Displays, memory LC display, Display LC display, Display range measured value insulation resistance ($R_{\rm F}$) Operating uncertainty Display range measured value nominal system voltage ($U_{\rm n}$) Operating uncertainty Display range measured value system leakage capacitance of $R_{\rm F}>1$ Operating uncertainty of RF \geq 20 k Ω and $C_{\rm e}\leq$ 5 $\mu{\rm F}$	$\begin{array}{c} 0\dots 10 \text{ s } (0 \text{ s})^*\\ 0\dots 99 \text{ s } (0 \text{ s})^*\\ 0\dots 99 \text{ s } (0 \text{ s})^*\\ \end{array}$ multi-functional, not illuminated $1 \text{ k}\Omega\dots 2 \text{ M}\Omega\\ \pm 15 \text{ W, at least } \pm 2 \text{ k}\Omega\\ 0\dots 500 \text{ V}_{\text{RMS}}\\ \pm 5 \text{ W, at least } \pm 5 \text{ V}\\ 0 \text{ k}\Omega \text{ (only "dc" mode)}\\ 0\dots 17 \mu\text{F}\\ \pm 15 \text{ W, at least } \pm 0.1 \mu\text{F}\\ \end{array}$	Rigid Flexible without ferrules Flexible with ferrules with/without plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve Opening force Test opening, diameter Other Operating mode Mounting cooling Degree of protection, built-in components (DIN EN 60529) Degree of protection, terminals (DIN EN 60529) Enclosure material DIN rail mounting acc. to	0.752.5 mm 0.252.5 mm 0.51.5 mm 50 I 2.1 mn continuous operation slots must be ventilated verticall IP30 IP20 polycarbonat IEC 6071.
Response time $t_{\rm an}$ of $R_{\rm F}=0.5$ x $R_{\rm an}$ and $C_{\rm e}=1$ $\mu{\rm F}$ according to IEC 61 Start-up delay t Response delay $t_{\rm on}$ Delay on release $t_{\rm off}$ Displays, memory Display LC display, Display ange measured value insulation resistance $(R_{\rm F})$ Operating uncertainty Display range measured value nominal system voltage $(U_{\rm n})$ Operating uncertainty Display range measured value system leakage capacitance of $R_{\rm F}>1$	$\begin{array}{c} 0\dots 10 \ s \ (0 \ s)^* \\ 0\dots 99 \ s \ (0 \ s)^* \\ 0\dots 99 \ s \ (0 \ s)^* \end{array}$ multi-functional, not illuminated $1 \ k\Omega\dots 2 \ M\Omega \\ \pm 15 \ \%, \ at \ least \pm 2 \ k\Omega \\ 0\dots 500 \ V_{RMS} \\ \pm 5 \ \%, \ at \ least \pm 5 \ V \\ 0 \ k\Omega \ (only "dc" \ mode) \\ 0\dots 17 \ \mu F \end{array}$	Rigid Flexible without ferrules Flexible with ferrules with/without plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve Opening force Test opening, diameter Other Operating mode Mounting cooling Degree of protection, built-in components (DIN EN 60529) Degree of protection, terminals (DIN EN 60529) Enclosure material	0.752.5 mm 0.252.5 mm 0.51.5 mm 50 N
Response time $t_{\rm an}$ of $R_{\rm F}=0.5$ x $R_{\rm an}$ and $C_{\rm e}=1$ $\mu{\rm F}$ according to IEC 61 Start-up delay t Response delay $t_{\rm on}$ Delay on release $t_{\rm off}$ Displays, memory Display LC display, Display ange measured value insulation resistance $(R_{\rm F})$ Operating uncertainty Display range measured value nominal system voltage $(U_{\rm n})$ Operating uncertainty Display range measured value system leakage capacitance of $R_{\rm F}>1$ Operating uncertainty of RF ≥ 20 k Ω and $C_{\rm e} \leq 5$ $\mu{\rm F}$	$\begin{array}{c} 0\dots 10 \text{ s } (0 \text{ s})^*\\ 0\dots 99 \text{ s } (0 \text{ s})^*\\ 0\dots 99 \text{ s } (0 \text{ s})^*\\ \end{array}$ multi-functional, not illuminated $1 \text{ k}\Omega\dots 2 \text{ M}\Omega\\ \pm 15 \text{ W, at least } \pm 2 \text{ k}\Omega\\ 0\dots 500 \text{ V}_{\text{RMS}}\\ \pm 5 \text{ W, at least } \pm 5 \text{ V}\\ 0 \text{ k}\Omega \text{ (only "dc" mode)}\\ 0\dots 17 \mu\text{F}\\ \pm 15 \text{ W, at least } \pm 0.1 \mu\text{F}\\ \end{array}$	Rigid Flexible without ferrules Flexible with ferrules with/without plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve Opening force Test opening, diameter Other Operating mode Mounting cooling Degree of protection, built-in components (DIN EN 60529) Degree of protection, terminals (DIN EN 60529) Enclosure material DIN rail mounting acc. to	0.752.5 mm 0.252.5 mm 0.51.5 mm 50 N 2.1 mn continuous operation slots must be ventilated vertically IP30 IP20 polycarbonate IEC 6071:
Response time $t_{\rm an}$ of $R_{\rm F}=0.5$ x $R_{\rm an}$ and $C_{\rm e}=1$ $\mu{\rm F}$ according to IEC 61 Start-up delay t Response delay $t_{\rm on}$ Delay on release $t_{\rm off}$ Displays, memory Display LC display, Display ange measured value insulation resistance $(R_{\rm F})$ Operating uncertainty Display range measured value nominal system voltage $(U_{\rm n})$ Operating uncertainty Display range measured value system leakage capacitance of $R_{\rm F}>1$ Operating uncertainty of RF \geq 20 k Ω and $C_{\rm e}\leq$ 5 $\mu{\rm F}$ Password	$\begin{array}{c} 0\dots 10 \text{ s } (0 \text{ s})^*\\ 0\dots 99 \text{ s } (0 \text{ s})^*\\ 0\dots 99 \text{ s } (0 \text{ s})^*\\ \end{array}$ $\begin{array}{c} \text{multi-functional, not illuminated}\\ 1 \text{ k}\Omega\dots 2 \text{ M}\Omega\\ \pm 15 \text{ %, at least} \pm 2 \text{ k}\Omega\\ 0\dots 500 \text{ V}_{\text{RMS}}\\ \pm 5 \text{ %, at least} \pm 5 \text{ V}\\ 0 \text{ k}\Omega \text{ (only "dc" mode)}\\ 0\dots 17 \text{ µF}\\ \pm 15 \text{ %, at least} \pm 0.1 \text{ µF}\\ \text{off}/0\dots 999 \text{ (0, off)}^*\\ \end{array}$	Rigid Flexible without ferrules Flexible with ferrules with/without plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve Opening force Test opening, diameter Other Operating mode Mounting cooling Degree of protection, built-in components (DIN EN 60529) Degree of protection, terminals (DIN EN 60529) Enclosure material DIN rail mounting acc. to Screw fixing	0.752.5 mm 0.252.5 mm 0.51.5 mm 50 N 2.1 mn continuous operation slots must be ventilated vertically IP30 IP20 polycarbonate IEC 6071: 2 x M4 with mounting clip



Wiring diagram



ISOMETER® isoRW425

Insulation monitoring device for unearthed AC, AC/DC and DC systems (IT systems) for railway applications up to 3(N)AC, AC/DC 440 V





Typical applications

- AC control circuits in rolling stock according to EN 50155
- · AC, DC or AC/DC circuits
- · Systems including switchedmode power supplies
- Small AC-IT systems e. g. lighting systems

Approvals



Device features

- Monitoring of the insulation resistance R_F (R mode) or the insulation impedance Z_F (Z mode) of unearthed 3(N) AC, AC and DC systems (IT systems) with galvanically connected rectifiers or inverters
- Insulation impedance Z_F (Z mode) for 50 Hz or 60 Hz
- Measurement of the nominal system voltage U_n (True-RMS) with undervoltage and overvoltage detection
- Measuring the DC residual voltages U_{L1e} (L1/+ to PE) and U_{L2e} (L2/- to PE)
- · Selectable start-up delay, response delay and delay on release
- Alarm signalling via LEDs (AL1, AL2), a display and alarm relays (K1, K2)
- · Automatic device self test with connection monitoring
- N/C operation or N/O operation selectable
- · Measured value indication via multi-functional LCD
- · Fault memory can be activated
- Automatic adaptation to the system leakage capacitance C_e up to 300 μF in R mode and $1\mu F$ in Z mode
- Two separately adjustable response ranges of 1...990 k Ω (prewarning, alarm)
- Password protection to prevent unauthorised changes of parameters
- RS-485 (galvanically isolated) interface including the following protocols:
- BMS interface (Bender measuring device interface) for data exchange with other Bender components
- Modbus RTU
- isoData (for continuous data output)

Standards

The ISOMETER® has been developed in compliance with the following standards:

- DIN EN 61557-8 (VDE 0413-8)
- DIN EN 50155
- EN 45545-2
- IEC 61557-8

Further information

For further information refer to our product range on www.bender.de.

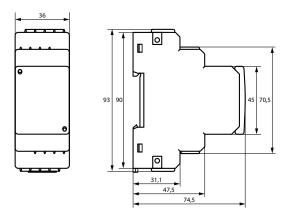
Ordering information

Туре	Supply voltage <i>U</i> s	Art. No.	
1,752	Supply foliage of	Screw-type terminal	Push-wire terminal
isoRW425-D4W-4	AC 100240 V, DC 24240 V	B91037000W	B71037000W

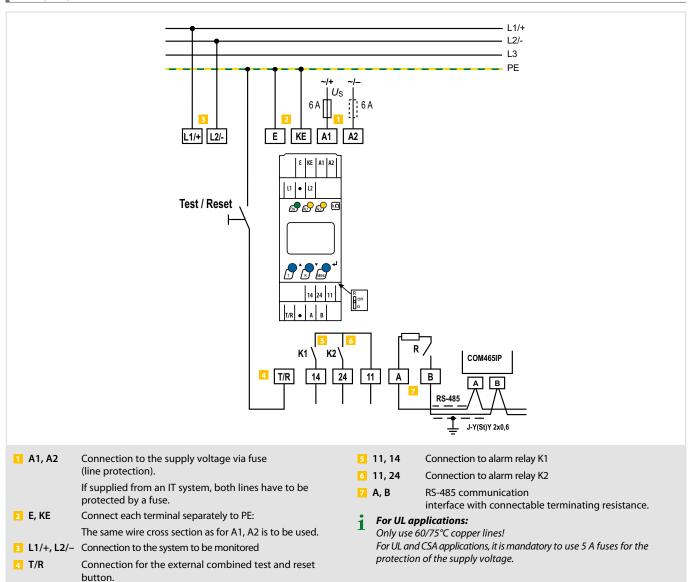
¹⁾ Option W: Increased shock and vibration resistance 3K23; 3M12; -40...+70 °C

Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B98060008
XM420 mounting frame	B990994

Insulation coordination acc. to IEC 60664-1/IEC 60664-3		Interface	
Definitions:		Interface/protocol	RS-485/BMS, Modbus RTU, isoData
Measuring circuit (IC1)	L1/+, L2/-	Baud rate BMS (9.6 kbit/s), Modbus RTU	selectable), isoData (115.2 kbits/s)
Supply circuit (IC2)	A1, A2	Cable length (9.6 kbits/s)	≤ 1200 m
Output circuit (IC3)	11, 14, 24	Cable: Shield on one end to PE recommended:	CAT6/CAT7 min. AWG23
Control circuit (IC4)	E, KE, T/R, A, B	alternatively: twisted pairs, shield on one end to PE	$J-Y(St)Y$ min. 2×0.8
Rated voltage	440 V	, , ,),25 W), internal, can be connected
Overvoltage category			
	III	Device address, BMS bus, Modbus RTU	390 (3)*
Rated impulse voltage:	6114	Switching elements	
IC1/(IC2-4)	6 kV		
IC2/(IC3-4)	4 kV		N/O contacts, common terminal 11
IC 3/(IC4)	4 kV		on/N/O operation (N/O operation)*
Rated insulated voltage:		Electrical endurance, number of cycles	10000
IC1/(IC2-4)	500 V	Contact data acc. to IEC 60947-5-1:	
IC2/(IC3-4)	250 V		12 / AC-14 / DC-12 / DC-12 / DC-12
IC 3/(IC4)	250 V		
Polution degree	3		230 V / 230 V / 24 V / 110 V / 220 V
	<u> </u>	Rated operational current	5 A / 2 A / 1 A / 0.2 A / 0.1 A
Protective separation (reinforced insulation) between:		Minimum contact rating	1 mA at AC/DC \geq 10 V
	rvoltage category III, 500 V		
	rvoltage category III, 300 V	Environment/EMC	
IC 3/(IC4) Ove	rvoltage category III, 300 V	EMC	IEC 61326-2-4, DIN EN50121-3-2
Voltage test (routine test) according to IEC 61010-1:		Ambiant tamparaturas	
IC2/(IC3-4)	AC 2,2 kV	Ambient temperatures:	40 . 70.00
IC 3/(IC4)	AC 2,2 kV	Operation	-40+70 °C
	11C 2,2 1(V	Transport	-50…+85 ℃
Supply voltage		Storage	-55…+80 ℃
	00240 V/DC 24240 V	Classification of climatic conditions acc. to IEC 60721	
117			21/24
Tolerance of U _S	-30+15 %	Stationary use (IEC 60721-3-3)	3K24
Frequency range <i>U</i> _s	4763 Hz	Transport (IEC 60721-3-2)	2K11
Power consumption	≤ 3 W, ≤ 9 VA	Long-time storage (IEC 60721-3-1)	1K23
IT custom being manitored		Classification of mechanical conditions acc. to IEC 60721	
IT system being monitored		Stationary use (IEC 60721-3-3)	3M12
	AC 0440V/DC 0440 V		
Nominal system voltage range U_n (UL508)	AC/DC 0400 V	Transport (IEC 60721-3-2)	2M4
Tolerance of U _n	+15 %	Long-term storage (IEC 60721-3-1)	1M12
Frequency range of U _n	DC, 15460 Hz	Comment on	
	,	Connection	
Measuring circuit		Screw-type terminals:	
Measuring voltage $U_{\rm m}$	± 12 V	Nominal current	≤10 A
Measuring current $I_{\rm m}$ at $R_{\rm F}$, $Z_{\rm F}=0$ Ω	≤ 110 µA		
Internal resistance R_i , Z_i	≥ 115 kΩ	Tightening torque	0.50.6 Nm (57 lb-in)
	≥ 113 KZ2	Conductor sizes	AWG 2412
Permissible system leakage capacitance Ce	200 5	Stripping length	8 mm
R mode	≤ 300 µF	Rigid/flexible	0.22.5 mm ²
Z mode	≤ 1 µF	-	
Permissible extraneous DC voltage U_{fg}	≤ 700 V	Flexible with ferrules with/without plastic sleeve	0.252.5 mm ²
_		Multi-conductor	
Response values		rigid /flexible	0.21.5 mm ²
Response value R _{an1}	2990 kΩ (40 kΩ)*	flexible with ferrules without plastic sleeve	0.251.5 mm ²
Response value R _{an2}	1980 kΩ (10 kΩ)*	•	
Relative uncertainty R_{an} (R mode or $Z_F \approx R_F$)	\pm 15 %, at least \pm 1 k Ω	flexible with TWIN ferrules with plastic sleeve	0.51.5 mm ²
Hysteresis R _{an}	25 %, at least 1 kΩ	Push-wire terminals:	
Response value Z _{an1}	11500 kΩ (off)*	Nominal current	≤10 A
Response value Z _{an2}	10490 kΩ (off)*		
<u> </u>		Conductor sizes	AWG 2414
Relative uncertainty Z _{an}	\pm 15 %, at least \pm 1 k Ω	Stripping length	10 mm
Hysteresis Z _{an}	25 %, at least 1 kΩ	Rigid	0.22.5 mm ²
Undervoltage detection	10499 V (off)*	Flexible without ferrules	0.752.5 mm ²
Overvoltage detection	11500 V (off)*		
Relative uncertainty <i>U</i>	\pm 5 %, at least \pm 5 V	Flexible with ferrules with/without plastic sleeve	0.252.5 mm ²
Relative uncertainty depending on the frequency ≥ 400 Hz	-0.015 %/Hz	Multi-conductor flexible with TWIN ferrules with plastic sleeve	0.51.5 mm ²
Hysteresis U	5 %, at least 5 V	Opening force	50 N
.,,550,550	J /0, at ICa3t J V	Test opening, diameter	2.1 mm
Time response		. est opening, diameter	2.1 111111
Response time t_{an} of $R_F = 0.5 \times R_{an}$ and $C_e = 1 \mu F$ according to IEC 61557-8	≤ 10 s	Other	
		Operating mode	continuous operation
Response time t_{an} of $Z_F = 0.5 \times Z_{an}$	≤5s	. ,	· · · · · · · · · · · · · · · · · · ·
Start-up delay t	010 s (0 s)*		slots must be ventilated vertically
Response delay ton	099 s (0 s)*	Degree of protection, built-in components (DIN EN 60529)	IP30
Delay on release toff	099 s (0 s)*	Degree of protection, terminals (DIN EN 60529)	IP20
Di-ul-u-		Enclosure material	polycarbonate
Displays, memory		DIN rail mounting acc. to	IEC 60715
_ · ·	functional, not illuminated	Screw fixing	2 x M4 with mounting clip
Display range measured value insulation resistance (R _F)	1 kΩ4 MΩ	Flammability class	UL94 V-0
Display range measured value impedance (Z_F) with $f_n = 50/60$ Hz	1 kΩ1 MΩ	Documentation number	D00052
Operating uncertainty ($R_{\rm F}$ in R mode, $Z_{\rm F}$ in Z mode)	\pm 15 %, at least \pm 1 k Ω		
Display range measured value nominal system voltage (U_n)	0500 V _{RMS}	Weight	≤ 150 g
bispier range incusared value nominal system voltage (Off)	\pm 5 %, at least \pm 5 V	()* = factory setting	
Operating uncertainty	·	· -	
Operating uncertainty	A 300 -		
Display range measured value system leakage capacitance of $R_{F} > 10~\text{k}\Omega$	0300 μF		
Display range measured value system leakage capacitance of $\mbox{\it R}_F > 10~\mbox{k}\Omega$ Operating uncertainty	\pm 15 %, at least \pm 2 μ F		
Display range measured value system leakage capacitance of $R_{F} > 10~\text{k}\Omega$			
Display range measured value system leakage capacitance of $\mbox{\it R}_F > 10~\mbox{k}\Omega$ Operating uncertainty	\pm 15 %, at least \pm 2 μ F		
Display range measured value system leakage capacitance of $R_F>10~k\Omega$ Operating uncertainty Display range measured value system leakage capacitance of $Z_F>10~k\Omega$	± 15 %, at least ± 2 μF 1 nF1 μF		



Wiring diagram



Insulation monitoring device for unearthed DC systems (IT systems) up to 120 V



Typical applications

- Simple battery systems
- · Conveniently sized DC control voltage systems
- DC lamp circuits

Approvals





Device features

- Monitoring of asymmetrical insulation resistance RF for unearthed DC systems
- Measurement of the system voltage U_n (r.m.s. and DC) with undervoltage and overvoltage detection
- Measuring the DC residual voltages U_{L+e} (L+ to PE) and U_{L-e} (L- to PE)
- Selectable start-up delay, response delay and delay on release
- Alarm signalling via LEDs (AL1, AL2), a display and alarm relays (K1, K2)
- N/C operation or N/O operation of the relays selectable
- · Measured value indication via multi-functional LCD
- Fault memory can be activated
- Configurable adaptation to the system leakage capacitance C_e up to 5 μF
- Two separately adjustable response value ranges of 1...100 k Ω (prewarning, alarm)
- Password protection to prevent unauthorised parameter changes
- RS-485 (galvanically isolated) including the following protocols:
- BMS interface (Bender measuring device interface) for data exchange with other Bender components
- Modbus RTU
- IsoData (for continuous data output)

Standards

The ISOMETER® has been developed in compliance with the following standards:

• DIN EN 50155

Further information

For further information refer to our product range on www.bender.de.

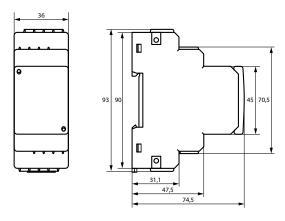
Ordering information

Туре	Supply voltage <i>U</i> s	Nominal voltage <i>U</i> n	System leakage	Art. No.	
.,,,,	Supply foliage 05	Hommar vortage of	capacitance	push-wire terminal	
isoUG425-D4-4	AC 100240 V, 4763 Hz / DC 24240 V	DC 12120 V	≤ 50 µF	B71036320	

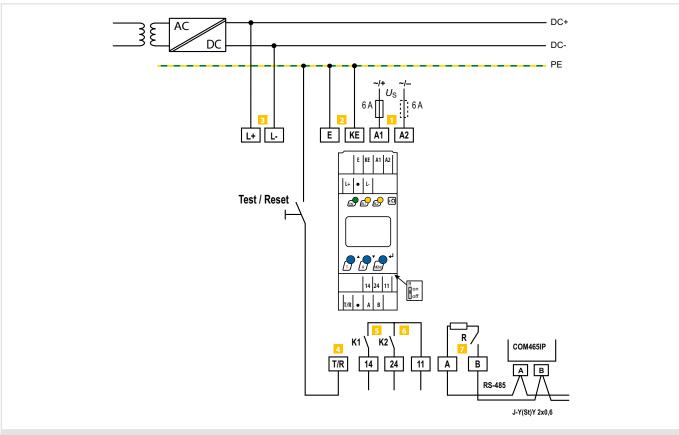
Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B98060008
XM420 mounting frame	B990994

Insulation coordination acc. to IEC 60664-1/IEC 60664-3		Interface
Definitions:		Interface/protocol
Measuring circuit (IC1)	L+, L-	Baud rate BMS (9.6 kbit/s
Supply circuit (IC2)	A1, A2	Cable length (9.6 kbits/s)
Output circuit(IC3)	11, 14, 24	Cable: twisted pairs, shield connected to PE on one
Control circuit (IC4)	E, KE, T/R, A, B	Terminating resistor
Rated voltage	400 V	Device address, BMS bus, Modbus RTU
Overvoltage category	III	Switching elements
Rated impulse voltage:		
IC1/(IC2-4)	6 kV	Switching elements
IC2/(IC3-4)	4 kV	Operating principle
IC 3/IC4	4 kV	Electrical endurance, number of cycles
Rated insulated voltage:		Contact data acc. to IEC 60947-5-1:
IC1/(IC2-4)	400 V	Utilisation category
IC2/(IC3-4)	250 V	Rated operational voltage
IC 3/IC4	250 V	Rated operational current
Pollution	3	Minimum contact rating (reference information fro
Protective separation (reinforced insulation) between:		F
IC1/(IC2-4)	Overvoltage category III, 600 V	Environment/EMC
IC2/(IC3-4)	Overvoltage category III, 300 V	EMC
IC 3/IC4	Overvoltage category III, 300 V	Ambient temperatures:
Voltage test (routine test) according to IEC 61010-1:		Operation
IC2/(IC3-4)	AC 2.2 kV	Transport
IC 3/IC4	AC 2.2 kV	Storage
		Classification of climatic conditions acc. to IEC 60
Supply voltage		Stationary use (IEC 60721-3-3)
Supply voltage U_{S}	AC 100240 V/DC 24240 V	
Tolerance of $U_{\rm S}$	-30+15 %	Transport (IEC 60721-3-2)
Frequency range <i>U</i> _S	4763 Hz	Long-term storage (IEC 60721-3-1)
Power consumption	\leq 3 W, \leq 9 VA	Classification of mechanical conditions acc. to
IT		Stationary use (IEC 60721-3-3)
IT system being monitored		Transport (IEC 60721-3-2)
Nominal system voltage $U_{\rm n}$	DC 12120 V	Long-term storage (IEC 60721-3-1)
Tolerance of U _n	+20 %	Connection
Measuring circuit		
Internal resistance R _i	≥ 115 kΩ	Connection type
Permissible system leakage capacitance C _e	≥ 113 kΩ2 ≤ 50 μF	Nominal current
reminssible system leakage capacitance ce	≤ 30 μr	Conductor sizes
Response values		Stripping length
Response value R _{an1}	1100 kΩ (50 kΩ)*	Rigid
Response value R _{an2}	195 kΩ (25 kΩ)*	Flexible without ferrules
Relative uncertainty R _{an}	± 15 %, at least ± 2 k Ω	Flexible with ferrules with/without plastic sleeve
Hysteresis R _{an}	25% , at least $1 \text{ k}\Omega$	Multi-conductor flexible with TWIN ferrules with p
Undervoltage detection $U_{\rm DC}$	8143 V (off)*	Opening force
Overvoltage detection U_{DC}	8.1144 V (off)*	Test opening, diameter
Relative uncertainty U_{DC}	±5 %, at least ±0.5 V	rest opening, diameter
Hysteresis U _{DC}	5 %, at least 1 V	Other
nysteresis o ge	3 70, 40 10430 1 7	Operating mode
Time response		Mounting
Response time t_{an} at $R_F = 0.5$ x R_{an} and $C_e = 1$ μ F acc. to IEC 61557-	8 ≤1s	Degree of protection, built-in components (DIN EN
Start-up delay t	010 s (0 s)*	Degree of protection, terminals (DIN EN 60529)
Response delay ton	099 s (0 s)*	Enclosure material
Delay on release $t_{\rm off}$	099 s (0 s)*	DIN rail mounting acc. to
	233372 (4.2)	Screw fixing
Displays, memory		Documentaion number
Display LC display	, multi-functional, not illuminated	Weight
Display range measured value insulation resistance (RF)	1 kΩ1 MΩ	
Operating uncertainty	± 15 %, at least ± 2 k Ω	()* = Factory setting
Display range measured value nominal system voltage (U_n)		
	$= \infty$: 300 V _P ; R _F = 0 kΩ: 150 V _P)	
Operating uncertainty U _{DC}	\pm 5 %, at least \pm 0.5 V	
Operating uncertainty U _{RMS}	±5 %, at least ±1.5 V	
Password	off/0999 (0, off)*	
Fault memory alarm messages	on/(off)*	

Interface		
Interface/protocol	RS-485; BM	S, Modbus RTU, isoData
Baud rate	BMS (9.6 kbit/s), Modbus RTU (selectable)	, isoData (115.2 kbits/s)
Cable length (9.6 kbits/s)		≤ 1200 m
Cable: twisted pairs, shield conr	nected to PE on one side	min. J-Y(St)Y 2x0.6
Terminating resistor	120 Ω (0.25 W), into	ernal, can be connected
Device address, BMS bus, Modb	us RTU	390 (3)*
Switching elements		
Switching elements	2 x 1 N/O contact	ts, common terminal 11
Operating principle	N/C operation/N/O ope	ration (N/O operation)*
Electrical endurance, number of	f cycles	10,000
Contact data acc. to IEC 6094	47-5-1:	
Utilisation category	AC-12 / 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 /	2 A / 1 A / 0.2 A / 0.1 A
Minimum contact rating (refere	ence information from the relay manufacturer)	10 mA / DC 5 V
Environment/EMC		
EMC		IEC 61326-2-4
Ambient temperatures:		
Operation		-40+70 °C
Transport		-40+85 °C
Storage		-40+70 °C
Classification of climatic cond	itions acc. to IEC 60721	
Stationary use (IEC 60721-3-3)		3K22
Transport (IEC 60721-3-2)		2K11
Long-term storage (IEC 60721-3	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
Connection		
Connection type		push-wire terminal
Nominal current		≤10 A
Conductor sizes		AWG 2414
Stripping length		10 mm
Rigid		0.22.5 mm ²
Flexible without ferrules		0.752.5 mm ²
Flexible with ferrules with/with	nout plactic cleave	0.252.5 mm ²
Multi-conductor flexible with T		0.51.5 mm ²
	will leffules with plastic sleeve	50 N
Opening force		2.1 mm
Test opening, diameter		2.1 mm
Other		
Operating mode		continuous operation
Mounting		be ventilated vertically
Degree of protection, built-in co		IP30
Degree of protection, terminals	(DIN EN 60529)	IP20
Enclosure material		polycarbonate
DIN rail mounting acc. to		IEC 60715
Screw fixing	2 x	M4 with mounting clip
Documentaion number		D00220
Weight		≤ 150 g



Wiring diagram



- 1 A1, A2 Connection to the supply voltage via fuse (line protection). If being supplied from an IT system, both lines have to be protected by a fuse.
- 2 E, KE Connect each terminal separately to PE: The same wire cross section as for A1, A2 is to be used
- 3 L+, L-Connection to the DC system to be monitored 4 T/R Connection for the external combined test and reset button
- 5 11, 14 Connection to alarm relay K1
- 6 11, 24 Connection to alarm relay K2
- 7 A, B RS-485 communication interface with connectable terminating resistor

For UL applications:

Only use 60/75°C copper lines! For UL and CSA applications, it is mandatory to use 5 A fuses for the protection of the supply voltage.

The supply voltage U_s applied to A1/A2 can be provided by the system voltage (L + /L -) when the system voltage is 24V DC. Otherwise a separate power supply is needed.

ISOMETER® isoES425

Insulation monitoring device for unearthed AC, AC/DC and DC systems (IT systems) for energy storage devices up to AC/DC 400 V





Typical applications

• Monitoring the earth connection during network operation and monitoring the electrical installation during isolated operation.

Approvals



Device features

- Monitoring of the insulation resistance RF for unearthed AC/DC systems
- Measuring the system voltage Un (True-RMS) with undervoltage/overvoltage detection
- Measuring the DC residual voltages U_{L1e} (L1/+ to PE) and U_{L2e} (L2/- to PE)
- Selectable start-up delay, response delay and delay on release
- Alarm output via LEDs (AL1, AL2), display, and alarm relays (K1, K2)
- · Automatic device self test with connection monitoring
- Selectable n/c or n/o relay operation
- · Measured value indication via multifunctional LC display
- Activatable fault memory
- Automatic adjustment to the system leakage capacitance C_e up to 100 μF
- Two separately adjustable response value ranges 1...990 kΩ (prewarning, alarm)
- Password protection against unauthorised changing of parameters
- RS-485 (galvanically isolated) including the following protocols:
- BMS (Bender measuring device interface) for the data exchange with other Bender devices
- IsoData (for continuous data output)

Standards

The ISOMETER® has been developed in compliance with the following standards:

- DIN EN 61557-8 (VDE 0413-8)
- IEC 61557-8

Further information

For further information refer to our product range on www.bender.de.

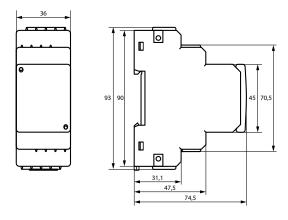
Ordering information

Туре	Nominal system voltage <i>U</i> n	inal system voltage U_n Supply voltage U_S System leakage capacitance Co		Art. No.
			tapatitanee te	Push-wire terminal
isoES425-D4-4	3 (N)AC, AC 0400 V/DC 0400 V	AC 100240 V, 4763 Hz / DC 24240 V	< 100 μF	B71037020

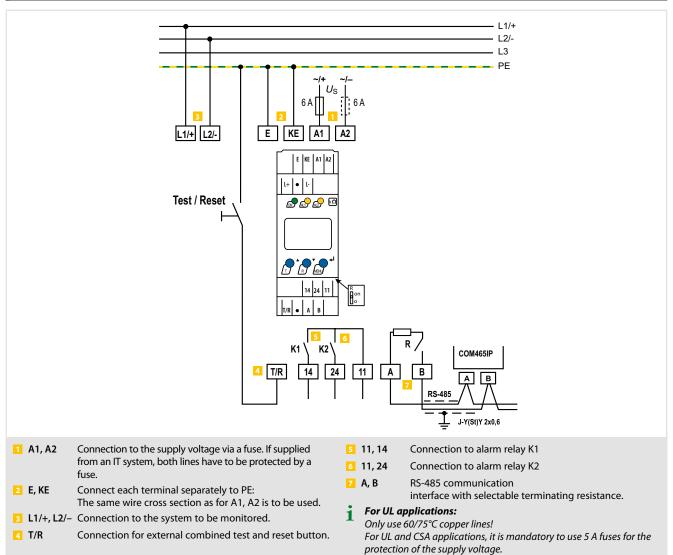
Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B98060008
XM420 mounting frame	B990994

Insulation coordination acc. to IEC 60664-1/IEC 60664-3		Displays, memory
Definitions:		Display LC display, multi-functional, not illuminated
Measuring circuit (IC1)	L1/+, L2/-	Display range measured value insulation resistance (R_F) 1 k Ω 4 M Ω
Supply circuit (IC2)	A1, A2	Operating uncertainty \pm 15 %, at least \pm 1 k Ω
Output circuit (IC3)	11, 14, 24	Display range measured nominal system voltage value (U_n) 0500 V_{RMS}
Control circuit (IC4)	E, KE, T/R, A, B	Operating uncertainty U \pm 5 %, at least \pm 5 V
Rated voltage	400 V	Display range measured leakage capacitance value for $R_{\rm F} > 10 \rm k\Omega$ 0105 $\mu \rm F$
Overvoltage category	III	Operating uncertainty \pm 15 %, mindestens \pm 2 μ F
Rated impulse withstand voltage:		Password off/0999 (0, off)*
IC1/(IC2-4)	6 kV	Fault memory alarm message on/(off)*
IC2/(IC3-4)	4 kV	
IC 3/(IC4)	4 kV	Interface
Rated insulation voltage:	T KY	Interface/protocol RS-485; BMS, isoData
IC1/(IC2-4)	400 V	Baud rate BMS (9.6 kBit/s), isoData (115.2 kBits/s)
IC2/(IC3-4)	250 V	Cable length (9.6 kBits/s ≤ 1200 m
IC 3/IC4	250 V	Cable: twisted pair, shield connected to PE min. J-Y(St)Y 2x0.6
Pollution degree	3	Terminating resistor 120 Ω (0.25 W), internal, can be connected
Protective separation (reinforced insulation) between:		Device address, BMS bus 390 (3)*
•	Overvoltage category III, 600 V	
IC1/(IC2-4)	Overvoltage category III, 600 V Overvoltage category III, 300 V	Switching elements
IC2/(IC3-4)		Switching elements 2 x 1 NO contacts, common terminal 11
IC 3/(IC4)	Overvoltage category III, 300 V	Operating principle N/C operation/N/O operation (N/C operation)*
Voltage tests (routine test) acc. to IEC 61010-1:	062214	Electrical endurance, number of cycles 10000
IC2/(IC3-4)	DC 2.2 kV	Contact data acc. to IEC 60947-5-1:
IC 3/(IC4)	AC 2.2 kV	Utilisation category AC-12 / AC-14 / DC-12 / DC-12 / DC-12
Supply voltage		Rated operational voltage 230 V / 230 V / 24 V / 110 V / 220 V
Supply voltage U_5	AC 100240 V/DC 24240 V	Rated operational current 5 A / 2 A / 1 A / 0.2 A / 0.1 A
Tolerance of U_5	-30+15 %	Minimum contact rating $3 \text{ A}/2 \text{ A}/1 \text{ A}/6.2 \text{ A}/6.1 \text{ A}$
	4763 Hz	Millimon Contact rating
Frequency range U _s		Environment/EMC
Power consumption	≤ 3 W, ≤ 9 VA	EMC IEC 61326-2-4
IT system being monitored		
Nominal system voltage $U_{\rm n}$	3(N)AC, AC/DC 0400 V	Ambient temperatures:
Tolerance of $U_{\rm B}$	25%	Operation -25+70 °C
Frequency range of $U_{\rm n}$	DC, 15460 Hz	Transport -40+85 °C
Trequency runge of on	00, 13.1.100112	Storage -25+70 °C
Measuring circuit		Classification of climatic conditions acc. to IEC 60721
Measuring voltage $U_{\rm m}$	± 12 V	Stationary use (IEC 60721-3-3) 3K24
Measuring current $I_{\rm m}$ at $R_{\rm F}$	≤ 110 µA	Transport (IEC 60721-3-2) 2K11
Internal resistance R _i	≥ 115 kΩ	Long-time storage (IEC 60721-3-1) 1K23
Permissible leakage capacitance C _e	≤ 100 µF	Classification of mechanical conditions acc. to IEC 60721:
Permissible external DC voltage U_{fq}	≤ 700 V	Stationary use (IEC 60721-3-3) 3M12
		Transport (IEC 60721-3-2) 2M4
Response values		Long-term storage (IEC 60721-3-1) 1M12
Response value R _{an1}	2990 kΩ (69 kΩ)*	
Response value R _{an2}	1980 kΩ (23 kΩ)*	Connection
Operating uncertainty R_{an}	\pm 15 %, at least \pm 1 k Ω	Connection type Push-wire terminal
Hysteresis Ran	25 %, at least 1 k Ω	Nominal current ≤ 10 A
Undervoltage detection <i>U</i>	10499 V (off)*	Conductor sizes AWG 2414
Overvoltage detection <i>U</i>	11500 V (off)*	Stripping length 10 mm
Operating uncertainty <i>U</i>	\pm 5 %, at least \pm 5 V	rigid 0.22.5 mm ²
Frequency dependent operating uncertainty ≥ 400 Hz	-0.015 %/Hz	flexible without ferrules 0.752.5 mm ²
Hysteresis <i>U</i>	5 %, at least 5 V	flexible with ferrules, with/without plastic collar 0.252.5 mm ²
•		Multiple conductor, flexible with TWIN ferrule with plastic sleeve 0.51.5 mm ²
Time response		Opening force 50 N
Response time $t_{\rm an}$ at $R_{\rm F}{=}~0.5$ x $R_{\rm an}$ and $C_{\rm e}{=}1~\mu{\rm F}$ acc. to IEC 61557-8	≤ 10 s	Test opening, diameter 2.1 mm
Start-up delay t	010 s (0 s)*	
Response delay ton	099 s (0 s)*	Other
Delay on release $t_{ m off}$	099 s (0 s)*	Operating mode Continuous operation
		Mounting Cooling slots must be ventilated vertically
		Degree of protection, built-in components (DIN EN 60529) IP30
		Degree of protection, terminals (DIN EN 60529)
		Enclosure material Polycarbonate
		DIN rail mounting acc. to IEC 60715
		Screw fixing 2 x M4 with mounting clip
		Weight ≤ 150 g

()* = Factory setting



Wiring diagram



ISOMETER® isoHV425... with coupling device AGH422

Insulation monitoring device for unearthed AC, AC/DC and DC systems (IT system) up to 3(N)AC, AC 1000 V, DC 1000 V





Typical applications

- AC main circuits up to 1000 V
- DC main circuits up to 1000 V
- · Systems including switchedmode power supplies

Approvals





Device features

- Monitoring the insulation resistance RF for unearthed AC/DC systems
- Measurement of the system voltage U_n (true RMS) with undervoltage and overvoltage detection
- Measuring the DC residual voltages U_{L1e} (L1/+ to PE) and U_{L2e} (L2/- to PE)
- Selectable start-up delay, response delay and delay on release
- Alarm signalling via LEDs (AL1, AL2), a display and alarm relays (K1, K2)
- · Automatic device self test with connection monitoring
- Selectable N/C or N/O relay operation
- · Measured value indication via a multifunctional LC display
- · Fault memory can be activated
- Automatic adaptation to the system leakage capacitance C_e up to 150 μF
- Two separately adjustable response value ranges of 10...500 kΩ (prewarning, alarm)
- Password protection to prevent unauthorised parameter changes

isoHV425-D4-4

- RS-485 (galvanically separated) including the following protocols:
- BMS interface (Bender measuring device interface) for data exchange with other Bender components
- IsoData (for continuous data output)

isoHV425-D4M-4

· Analogue output (galvanically separated)

Standards

The ISOMETER® has been developed in compliance with the following standards:

- DIN EN 61557-8 (VDE 0413-8)
- DIN EN 50155
- EN 45545-2
- IEC 61557-8
- EN 61373 cat I class B

Application in rail vehicles / DIN EN 45545-2:2016!

If the distance to neighbouring components that do not meet the requirements of the DIN EN 45545-2 Table 2 standard is < 20 mm horizontally or < 200 mm vertically, these are to be regarded as grouped. See DIN EN 45545-2 Chapter 4.3 Grouping rules.

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Supply voltage <i>U</i> s	Nominal voltage <i>U</i> _n Version Art. No.		No.	
				Screw-type terminal	Push-wire terminal
isoHV425-D4-4 with AGH422	AC 100240 V, 4763 Hz DC 24240 V		6 . 1 6	B91036501S	B71036501
isoHV425W-D4-4 with AGH422W ¹⁾		AC 01000 V	Serial interface	B91036501W	B71036501W
isoHV425-D4M-4 with AGH422		DC 01000 V	Analamaaaa	-	B71036503
isoHV425W-D4M-4 with AGH422W ¹⁾			Analogue output	B91036503W	B71036503W

¹⁾ Option W: Increased shock and vibration resistance 3K23; 3M12; -40...+70 °C

Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B98060008
XM420 mounting frame	B990994

Insulation coordination acc. to IEC 60664-1/IEC 60664-3		Interface (valid for isoHV4	125-D4-4 only)		
Definitions:		Interface/protocol		RS-485/(BMS)*, Modbu	us RTU, isoData
Supply circuit (IC2)	A1, A2	Baud rate	BMS (9.6 kbit/s), Modbu	us RTU (selectable), isoData	(115.2 kbits/s
Output circuit (IC3)	11, 14, 24	Cable length (9.6 kbits/s)			≤ 1200 m
Control circuit (IC4) Up, KE, T/R, A, B	, AK1, GND, AK2, M+, M-	Cable: twisted pairs, shield co	onnected to PE on one side	min.	J-Y(St)Y 2x0.6
Rated voltage	240 V	Terminating resistor	1.	20 Ω (0.25 W), internal, car	n be connected
Overvoltage category	III	Device address, BMS bus, Mo	dbus RTU		390 (3)*
Rated impulse voltage:					
IC2/(IC3-4)	4 kV	Analogue output (valid fo	r isoHV425-D4M-4 only)		
IC 3/IC4	4 kV	Operating mode			$(R = 120 \text{ k}\Omega)^*$
Rated insulation voltage:		Functions		(insula	tion value R _F)*
IC2/(IC3-4)	250 V	Max. no load voltage (open t	erminals)		DC 12 V
IC 3/IC4	250 V	Max. short-circuit current			ort-circuit proo
Pollution degree	3	Voltage output		DC 010 V, lo	
Protective separation (reinforced insulation) between:		Current output		DC 0/420 mA,	
IC2/(IC3-4) overv	oltage category III, 300 V	Current output		DC 0400 μΑ	
IC 3/IC4 overv	oltage category III, 300 V	Tolerance		±10 %, +2 %	% of final value
Voltage tests (routine test) acc. to IEC 61010-1:		Switching elements			
IC2/(IC3-4)	AC 2.2 kV	Switching elements		2 x 1 N/O contact, comm	on tarminal 11
IC 3/IC4	AC 2.2 kV	Operating principle	N/C	operation/N/O operation (N	
			ted operating conditions, num	· · · ·	10,000
Supply voltage				iber of cycles	10,000
)240 V/DC 24240 V	Contact data acc. to IEC 60)947-5-1		
Tolerance of U _s	-30+15 %	Utilisation category		AC-12 / AC-14 / DC-12 /	
Frequency range U _s	4763 Hz	Rated operational voltage		230 V / 230 V / 24 V /	
Power consumption	\leq 3 W, \leq 9 VA	Rated operational current			A / 0,2 A / 0,1 A
IT system being monitored		Minimum contact rating		1 mA at	$t AC/DC \ge 10 V$
- · -	1000 V/DC 01000 V	Environment/EMC			
Tolerance of $U_{\rm n}$	AC +10 %, DC +10 %	EMC		IEC 61326-2-4,	EN 50121 2 2
Nominal system voltage range U_n with AGH422 (UL508)	AC/DC 0600 V			IEC 01320-2-4,	, EN JUIZ 1-3-2
Frequency range of U _n	DC, 15460 Hz	Ambient temperatures			
rrequency range or on	DC, 13400 HZ	Operation			-40+70°C
Measuring circuit		Transport			-40+85°C
Permissible system leakage capacitance C _e	≤ 150 μF	Storage			-40+70°C
Permissible extraneous DC voltage U_{fq}	≤ 1600 V	Classification of climatic cor	nditions acc. to IEC 60721		
		Stationary use (IEC 60721-3-3	3)		3K22
Response values		for W variant			3K24
Response value R _{an1}	11500 kΩ (50 kΩ)*	Transport (IEC 60721-3-2)			2K11
Response value R _{an2}	10490 kΩ (25 kΩ)*	Long-term storage (IEC 6072	1-3-1)		1K22
Relative uncertainty $R_{\rm an}$	± 15 %, at least ± 3 k Ω	Classification of mechanic	al conditions acc. to IEC 607	721	
Hysteresis R _{an}	25 %, at least 1 kΩ	Stationary use (IEC 60721-3-			3M11
Undervoltage detection	301.09 kV (off)*	for W variant	-,		3M12
Overvoltage detection	311.10 kV (off)*	Transport (IEC 60721-3-2)			2M4
Relative uncertainty U	\pm 5 %, at least \pm 5 V	Long-term storage (IEC 6072	1-3-1)		1M12
Relative uncertainty depending on the frequency \geq 200 Hz	-0.075 %/Hz		,		
Hysteresis <i>U</i>	5 %, at least 5 V	Other			
Time response		Operating mode		continu	uous operation
Response time t_{an} at $R_F = 0.5 \times R_{an}$ and $C_e = 1 \mu F$ acc. to IEC 61557-8	≤ 20 s	Mounting		cooling slots must be venti	lated vertically
Start-up delay t		Degree of protection, built-in			IP30
Response delay t _{on}	010 s (0 s)* 099 s (0 s)*	Degree of protection, termina	als (DIN EN 60529)		IP20
Delay on release t _{off}	099 s (0 s)*	Enclosure material			polycarbonate
Delay on release 10ff	U77 3 (U 3)	DIN rail mounting acc. to			IEC 60715
Displays, memory		Screw mounting		2 x M4 with	mounting clip
- , , ,	nctional, not illuminated	Documentation number			D00082
Display range measured value insulation resistance $(R_{\rm F})$	1 kΩ4 MΩ	Weight			≤ 150 g
Operating uncertainty	± 15 %, at least ± 3 k Ω	()* = Factory setting			
Display range measured value nominal system voltage $(U_{\rm D})$	301.15 kV _{RMS}	, , , , , , ,			
. , , , , , , , , , , , , , , , , , , ,	± 5 %, at least ± 5 V				
Operating uncertainty					
Operating uncertainty Display range measured value system leakage capacitance for $R_F > 20~k\Omega$	0200 μF				
Operating uncertainty Display range measured value system leakage capacitance for $R_{\rm F} > 20~{\rm k}\Omega$ Operating uncertainty Password					

Definitions:	
Measuring circuit (IC1)	L1/+, L2/-
Control circuit (IC2)	AK1, GND, AK2, Up, E
Rated voltage	1000 V
Overvoltage category	III
Rated impulse voltage:	
IC1/IC2	8 kV
Rated insulation voltage:	
IC1/IC2	1000 V
Pollution degree	3
Protective separation (reinforced insulation) betwee	n:
IC1/IC2	Overvoltage category III, 1000 V
IT system being monitored	
Nominal system voltage range <i>U</i> _n	AC 01000 V/DC 01000 V
Tolerance of U _n	AC +10 %/DC +10 %
Measuring circuit	
Measuring voltage U _m	±45 V
Measuring current $I_{\rm m}$ for $R_{\rm F}$	≤ 120 µA
Internal resistance R _i	≥ 390 kΩ

Environment/EMC	IFC (122(2 4 FN 50121 2 2
EMC	IEC 61326-2-4, EN 50121-3-2
Ambient temperatures	
Operation	
$U_{\rm n} < 700$	-40+70°C
$U_{\rm n} > 700$	-40+55 °C
Transport	-40+85 °C
Storage	-40+70 °C
Classification of climatic conditions acc. to IEC 60721 (related to temperature and relative humidity)
Stationary use (IEC 60721-3-3)	3K22
for W variant	3K24
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions acc. to IEC 6	60721
Stationary use (IEC 60721-3-3)	3M11
for W variant	3M12
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12
Other	
Operating mode	continuous operation
Mounting	cooling slots must be ventilated vertically
Distance to adjacent devices from $U_{\rm n} > 800 \rm V$	≥ 30 mm
Degree of protection, built-in components (DIN EN 60529	9) IP30
Degree of protection, terminals (DIN EN 60529)	IP20
F 1	1 1 4

Connection (for ISOMETER® and AGH)

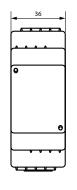
Single cables for terminals Up, AK1, GND, AK2:

Cable lengths

Connection properties

Screw-type terminals:	
Nominal current	≤10 A
Tightening torque	0.50.6 Nm (57 lb-in)
Conductor sizes	AWG 2412
Stripping length	8 mm
Rigid/flexible	0.22.5 mm ²
Flexible with ferrules with/without plastic sleeve	0.252.5 mm ²
Multi-conductor	
rigid / flexible	0.21.5 mm ²
flexible with ferrules without plastic sleeve	0.251.5 mm ²
flexible with TWIN ferrules with plastic sleeve	0.251.5 mm ²
Push-wire terminals:	
Nominal current	≤10 A
Conductor sizes	AWG 2414
Stripping length	10 mm
Rigid	0.22.5 mm ²
Flexible without ferrules	0.752.5 mm ²
Flexible with ferrules with/without plastic sleeve	0.25 2.5 mm ²
Multi-conductor flexible with TWIN ferrules with plastic sleeve	0.5 1.5 mm ²
Opening force	50 N
Test opening, diameter	2.1 mm
Connection type	terminals Up, AK1, GND, AK2

Dimension diagram (dimensions in mm)

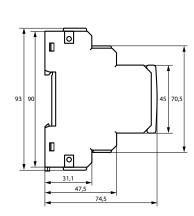


Enclosure material DIN rail mounting acc. to

Screw mounting Weight

≤ 0.5 m

≥ 0.75 mm²

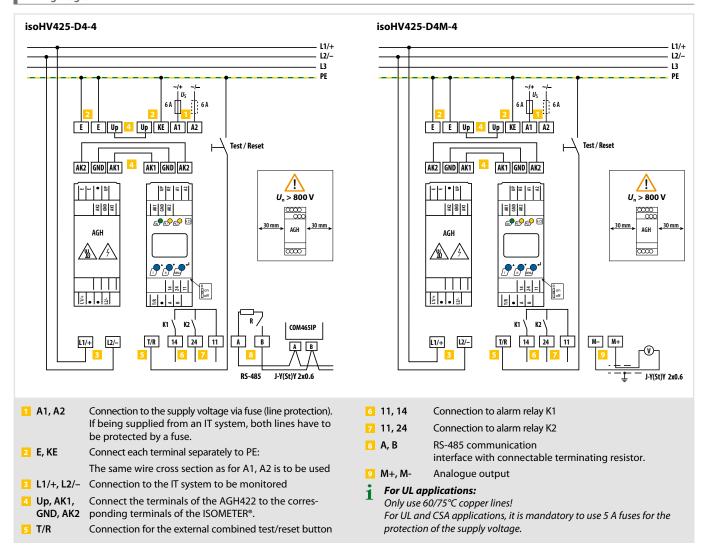


polycarbonate

2 x M4 with mounting clip

IEC 60715

150 g



ISOMETER® IR155-3203/IR155-3204

Insulation monitoring device for unearthed DC drive systems (IT systems) in electric vehicles





Typical applications

 Monitoring for unearthed DC drive systems (IT systems) in electric vehicles

Approvals



Device features

- Suitable for 12 V and 24 V systems
- · Automatic device self test
- Continuous measurement of the insulation resistance 0...10 $M\Omega$
- Response time for the first measurement of the system state (SST) is < 2 s after switching the supply voltage on
- Response time < 20 s for insulation resistance measurement (DCP)
- Automatic adaptation to the existing system leakage capacitance ($\leq 1~\mu F)$
- · Detection of earth faults and interruption of the earth connection
- Insulation monitoring of AC and DC insulation faults for unearthed systems (IT systems) 0...1000 V
- Undervoltage detection for voltages below 500 V (adjustable at factory by Bender)
- Short circuit proof outputs for:
 - Fault detection (high-side output)
 - Measured value (PWM 5...95 %) and status (f = 10...50 Hz) at high or inverted low-side driver (M_{HS}/M_{LS} output)
- Protective coating (SL 1307 FLZ)

Standards

- IEC 61557-8
- IEC 61010-1
- IEC 60664-1
- · ISO 6469-3
- ISO 23273-3
- ISO 16750-1
- ISO 16750-2
- · ISO 16750-4
- E1 (ECE regulation No. 10 version 5) acc. 72/245/EWG/EEC
- DIN EN 60068-2-38
- DIN EN 60068-2-30
- DIN EN 60068-2-14
- DIN EN 60068-2-64
- DIN EN 60068-2-27

Normative exclusion

The device went through an automotive test procedure in combination with multi customer requirements reg. ISO16750-x.

The standard IEC61557-8 will be fulfilled by creating the function for LED warning and test button at the customer site if necessary.

The device includes no surge and load dump protection above 50 V. An additional central protection is necessary.

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Parameters	Response value R _{an}	F _{ave}	Undervoltage detection	Measured value output	Art. No.
IR155-3203	Continuously set usly s	100 kO	10	300 V	Low-side	B91068138V4
IR155-3204	Continuously set value	100 kΩ	100 kΩ 10	0 V (inactive)	High-side	B91068139V4
IR155-3203		1001-0 1140	1 10	0 500 //	Low-side	B91068138CV4
IR155-3204	Customer-specific setting $100 \text{ k}\Omega1 \text{ M}\Omega$	110	0500 V	High-side	B91068139CV4	

Description	Art. No.
Fastening set	B91068500
Connector set IR155-32xx	B91068501

Voltage test

Insulation coordination acc. to IEC 60664-1

Protective separation (reinforced insulation)

between (L+/L-) - (Kl. 31, Kl. 15, E, KE, M_{HS}, M_{LS}, OK_{HS}) AC 3500 V/1 min

Supply/IT system being monitored	
Supply voltage $U_{\rm S}$	DC 1036 V
Max. operating current Is	150 mA
Max. current I_k	2 A
	6 A/2 ms inrush current
HV voltage range (L+/L-) U _n	AC 01000 V (peak value)
	0660 V r.m.s. (10 Hz1 kHz)
	DC 01000 V
Power consumption	< 2 W

Response values

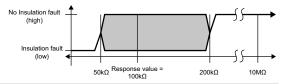
Response value hysteresis (DCP)	25 %
Response value Ran	100 kΩ1 ΜΩ
Undervoltage detection	0500 V

Measuring range

Measuring range	010 MΩ
Undervoltage detection	0500 V default setting: 0 V (inactive)
Relative uncertainty	
SST (≤ 2 s)	$good > 2* R_{an}$; $bad < 0.5* R_{an}$
Relative uncertainty DCP	085 kΩ ▶ ±20 kΩ
(default setting 100 k Ω)	100 kΩ10 MΩ ▶ ±15%
Relative uncertainty output M (fundamental frequency)	±5 % at each frequency
	(10 Hz: 20 Hz: 30 Hz: 40 Hz: 50 Hz)

Relative uncertainty

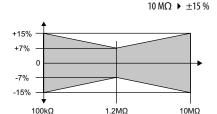
undervoltage detection $U_{\text{n}} \ge 100 \,\text{V} \quad \blacktriangleright \quad \pm 10 \,\%$; at $U_{\text{n}} \ge 300 \,\text{V} \quad \blacktriangleright \quad \pm 5 \,\%$ Relative uncertainty (SST) "Good condition" $\geq 2 R_{an}$ "Bad condition" ≤ 0.5 * R_{an}



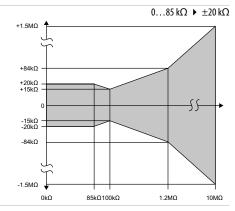
Relative uncertainty DCP

100 kΩ...10 MΩ ±15 %100 k Ω ...1.2 M Ω \blacktriangleright ±15 % to ±7 %

> 1.2 MΩ ▶ ±7 % 1.2...10 M Ω \blacktriangleright ±7 % to ±15 %



Absolute uncertainty



Time response

Response time t _{an} (OK _{HS} ; SST)	$t_{\rm an} \le 2 {\rm s} ({\rm typ.} < 1 {\rm s} {\rm at} U_{\rm n} > 100 {\rm V})$

Response time t_{an} (OKHS; DCP)

. (when changing over from $R_F=10~\text{M}\Omega$ to $R_{an}/2$; at $C_e=1~\mu\text{F}$; $U_n=\text{DC}~1000~\text{V}$)

 $t_{an} \le 20 \text{ s (at } F_{ave} = 10^*)$ $t_{an} \le 17.5 \text{ s (at } F_{ave} = 9)$ $t_{an} \le 17.5 \text{ s (at } F_{ave} = 8)$ $t_{an} \le 15 \text{ s (at } F_{ave} = 7)$ $t_{an} \le 12.5 \text{ s (at } F_{ave} = 6)$ $t_{an} \le 12.5 \text{ s (at } F_{ave} = 5)$ $t_{an} \leq 10 \text{ s (at } F_{ave} = 4)$ $t_{an} \le 7.5 \text{ s (at } F_{ave} = 3)$ $t_{an} \le 7.5 \text{ s (at } F_{ave} = 2)$

 $t_{an} \le 5 \text{ s (at } F_{ave} = 1)$ during the self test $t_{an} + 10 s$

 $t_{ab} \le 40 \text{ s (at } F_{ave} = 10)$

Switch-off time tab (OKHS; DCP)

(when changing over from $\textit{R}_{an/2}$ = 10 $\text{M}\Omega$ to \textit{R}_F ; at \textit{C}_e = 1 μF ; \textit{U}_n = DC 1000 V

 $t_{ab} \le 40 \text{ s (at } F_{ave} = 9)$ $t_{ab} \leq 33 \text{ s (at } F_{ave} = 8)$ $t_{ab} \le 33 \text{ s (at } F_{ave} = 7)$ $t_{ab} \le 33 \text{ s (at } F_{ave} = 6)$ $t_{ab} \le 26 \text{ s (at } F_{ave} = 5)$ $t_{ab} \le 26 \text{ s (at } F_{ave} = 4)$ $t_{ab} \le 26 \text{ s (at } F_{ave} = 3)$ $t_{ab} \le 20 \text{ s (at } F_{ave} = 2)$ $t_{ab} \le 20 \text{ s (at } F_{ave} = 1)$ during a self test $t_{ab} + 10 s$ 10 s

Duration of the self test (every five minutes; should be added to t_{an}/t_{ab})

Measuring circuit

System leakage capacitance Ce	≤ 1 μF
Smaller measurement range and increased measuring time at Ce	> 1 μF
	(e.g. max. range 1 MΩ @ 3 μF,

 $t_{an} = 68$ s when changing over from $R_F 1 M\Omega$ to $R_{an}/2$)

·	, and ,
	±40 V
	±33 μA
	\geq 1.2 M Ω
	\geq 1.2 M Ω

Output

Measurement output (M)

$M_{\rm HS}$ switches to $U_{\rm S}-2$ V (3204)

(external pull-down resistor to Kl. 31 necessary 2.2 k Ω)

M_{LS} switches to KI. 31 +2 V (3203)

(external pull-up resistor to KI. 15 reqired 2.2 $k\Omega$

0 Hz ► Hi > short circuit to $U_{\rm b}$ +(Kl. 15); Low > IMD off or short circuit to Kl. 31

10 Hz ▶ Normal condition

Insulation measurement DCP;

starts two seconds after power on;

First successful insulation measurement at ≤ 17.5 s

PWM active 5...95 %

20 Hz ▶ undervoltage condition

Insulation measurement DCP (continuous measurement);

starts two seconds after power on;

PWM active 5...95 %

First successful insulation measurement at \leq 17.5 s

Undervoltage detection 0...500 V

(Bender configurable)

30 Hz ▶ Speed start measurement Insulation measurement (only good/bad evaluation)

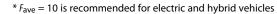
starts directly after power on $\leq 2 s$; PWM 5...10 % (good) and 90...95 % (bad)

40 Hz ▶ Device error

Device error detected; PWM 47.5...52.5 %

50 Hz ▶ Connection fault earth Fault detected on the earth connection (Kl. 31)

PWM 47.5...52.5 %



Status output (OKHS)

 OK_{HS} switches to $U_S - 2 \text{ V}$

(external pull-down resistor to Kl. 31 required 2.2 k Ω)

High ▶ No fault; R_F > response value Low ▶ Insulation resistance ≤ response value detected; Device error; Fault in the earth connection Undervoltage detected or device switched off

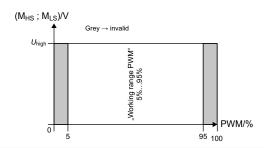
Operating principle PWM driver

• Condition "Normal" and "Undervoltage detected" (10 Hz; 20 Hz)

Duty cycle 5 % = > 50 M Ω (∞) Duty cycle 50 $\% = 1200 \text{ k}\Omega$ Duty cycle 95 % = 0 k Ω

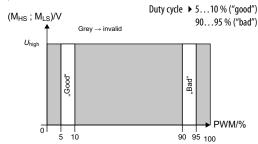
$$R_{\rm F} = \frac{90 \% \text{ x } 1200 \text{ k}\Omega}{dc_{\rm meas} - 5\%} -1200 \text{ k}\Omega$$

 $dc_{\text{meas}} = \text{measured duty cycle } (5 \% ... 95 \%)$



Operating principle PWM driver

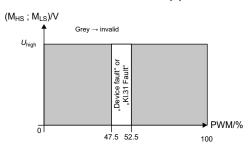
• Condition "SST" (30 Hz)



Operating principle PWM driver

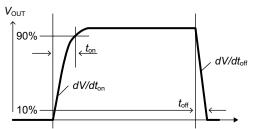
• Condition "Device error" and "KI.31 fault" (40 Hz; 50 Hz;)

Duty cycle ▶ 47.5...52.5 %



Load current /L	80 mA
Turn-on time ▶ to 90 % V _{out}	max. 125 μs
Turn-off time ▶ to 10 % V _{out}	max. 175 μs
Slew rate on ▶ 1030 % V _{out}	max. 6 V/μs
Slew rate off ▶ 7040 % V _{out}	max. 8 V/μs

Timing 3204 (inverse to 3203)



Load dump protection	< 50 V
Measurement method	Bender-DCP technology
Factor averaging	
F _{ave} (output M)	110 (factory set: 10)
ESD protection	
Contact discharge — directly to terminals	≤ 10 k\
Contact discharge — indirectly to environment	≤ 25 k\
Air discharge — handling of the PCB	≤ 6 kV

TYCO-MICRO MATE-N-LOK On-board connectors 1 x 2-1445088-8

KI. 31, KI.15, E, KE, M_{HS}, M_{LS}, OK_{HS}

2 x 2-1445088-2 (L+, L-); The connection between the respective connecting pins at L+or L-may only be used as redundancy. Cannot be used for looping through!

Crimp contacts TYCO-MICRO MATE-N-LOK Gold

14 x 1-794606-1 Conductor cross section: AWG 20...24

Enclosure for crimp contacts TYCO-MICRO MATE-N-LOK receptor HSG single R -1445022-8 TYCO-MICRO MATE-N-LOK receptor HSG single R -1445022-2

General data

Necessary crimp tongs (TYCO)	91501-1
Operating mode/mounting	continuous operation/any position
Temperature range	-40+105 °C
Voltage failure	≤ 2 ms
Flammability class acc. to	UL 94 V-0

Mounting

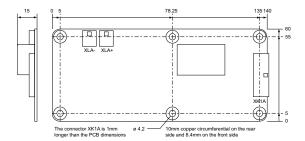
M4 metal screws with locking washers between screw head and PCB. Torx, T20 with a maximum tightening torque of 4 Nm for the screws. Furthermore, a maximum of 10 Nm tightening torque to the PCB at the mounting points.

Mounting and connector kits are not included in delivery, but are available as accessories. The maximum diameter of the mounting points is 10 mm.

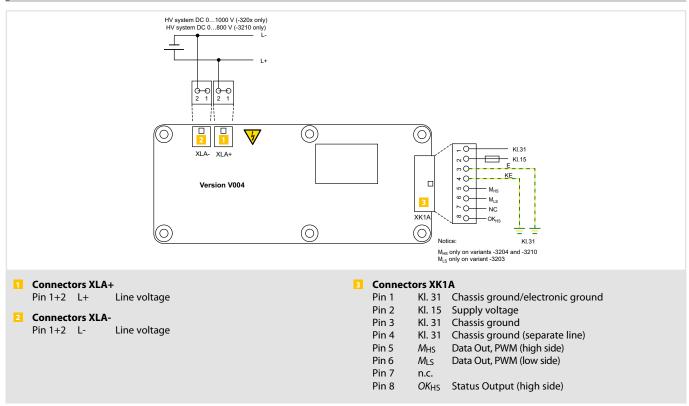
Before mounting the device, ensure sufficient insulation between the device and the vehicle or the mounting points (min. 11.4 mm to other parts). If the device is mounted on a metal or conductive subsurface, this subsurface has to be at earth potential (Kl.31; vehicle mass).

surface, this subsurface has to be at carri potential (this i, remere mass).	
Deflection	max. 1 % of the length or width of the PCB
Coating	thick-film lacquer
Documentation number	D00115
Weight	52 q ±2 q

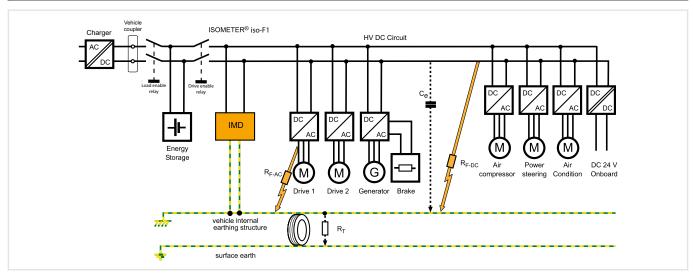
Dimension diagrams (dimensions in mm)



Wiring diagram



Example of application



ISOMETER® isoCHA425

Insulation monitoring device for unearthed DC systems (IT systems) DC 0 V to 400 V. Suitable for DC charging stations according to CCS or CHAdeMO





Typical applications

 DC charging stations for electric vehicles according to CSS or CHAdeMO

Approvals





Device features

- Monitoring of the insulation resistance R_F of DC charging stations in accordance with the CHAdeMO standard or Combined Charging System (CCS).
- · CHAdeMO (Mode CHd):
- Maximum system leakage capacitance 1.6 μF per conductor
- Detection of insulation faults in the system voltage range from 50 V to 400 V
- Response for time one-pole insulation faults RFU:
 - $R_{FU} \le 100 \text{ k}\Omega$: max. 1 s
 - $100 \text{ k}\Omega < R_{\text{FU}} \le 2 \text{ M}\Omega$: max. 10 s
- Response time for two-pole insulation faults R_{FS} : max. 10 s
- CCS (Mode dc):
- Detection of insulation faults up to 2 $M\Omega$
- Maximum system leakage capacitance Ce: 5 μF
- Response time t_{an} at $C_e \le 5$ μF or $R_F \le 100$ kΩ: max. 10 s
- Measuring the system leakage capacitance Ce
- Measuring the nominal system voltage U_n (true RMS) with undervoltage/overvoltage detection
- Measuring the residual voltages U_{L1e} (between L+ and earth) and U_{L2e} (between L- and earth)
- · Selectable start-up delay, response delay and delay on release
- Two separately adjustable response value ranges from 5...250 kΩ (prewarning, alarm)
- Alarm output via LEDs ('AL1', 'AL2'), display, and alarm relays ('K1', 'K2')
- · Automatic device self test with connection monitoring
- Selectable N/C or N/O relay operation
- · Measured value indication via multi-functional LC display
- · Activatable fault memory
- RS-485 (galvanically isolated) including the following protocols:
- BMS (Bender measuring device interface) for the data exchange with other Bender devices
- Modbus RTU
- IsoData (for continuous data output)
- · Password protection against unauthorised changing of parameters
- Stop mode to disable the measuring pulse generator

Standards

The ISOMETER® was developed in compliance with the standards specified in the Declaration of Conformity.

EU Declaration of Conformity

Hereby, Bender GmbH & Co. KG declares that the device covered by the Radio Directive complies with Directive 2014/53/EU. The full text of the EU Declaration of Conformity is available at the following Internet address: https://www.bender.de/fileadmin/content/Products/CE/CEKO_isoXX425.pdf

UKCA Declaration of Conformity

Hereby, Bender GmbH & Co. KG declares that this device is in compliance with Radio Equipment Regulations 2017 (S.I. 2017/1206). The full text of the UK declaration of conformity is available at the following internet address: https://www.bender.de/fileadmin/content/Products/UKCA/UKCA_isoXX425.pdf

Further information

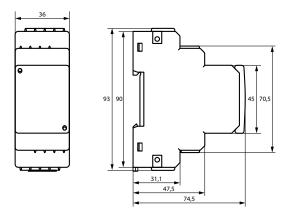
For further information refer to our product range on www.bender.de.

Ordering information

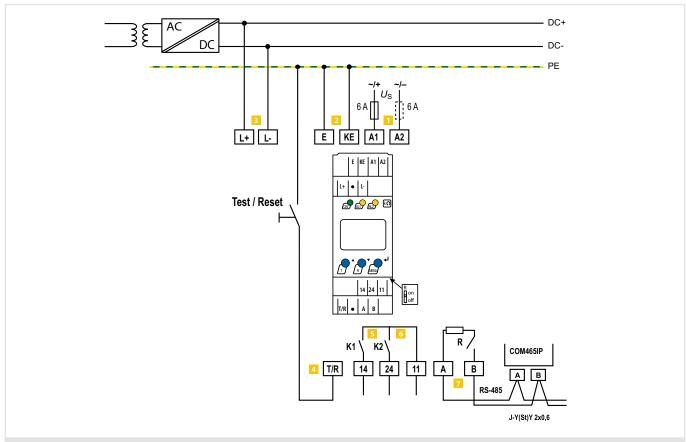
Туре	Nominal voltage <i>U</i> n	Art	. No
.,,,,		Screw terminal	Push-wire terminal
isoCHA425-D4-4	CCS: DC 0400 V CHAdeM0: DC 50400 V	B91036395	B71036395

Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B98060008
XM420 mounting frame	B990994

Insulation coordination acc. to IEC 60664-1/-3		Interface	
Definitions		Interface / protocol	RS-485 / BMS, Modbus RTU, isoData
Measuring circuit (IC1)	L+,L	Baud rate	BMS (9.6 kbit/s), Modbus RTU (selectable),
Supply circuit (IC2)	A1, A2		isoData (115.2 kbit/s)
Output circuit (IC3)	11, 14, 24	Cable length (9.6 kbit/s)	≤ 1200 m
Control circuit (IC4)	E, KE, T/R, A, B	Cable: twisted pairs	min. J-Y(St)Y 2 x 0.6
Rated impulse voltage		Terminating resistor	120 Ω (0.25 W), internal, can be connected
IC1/(IC2-4)	6 kV	Device address, BMS bus, Modbus RTU	390 (3)*
IC2/(IC3-4)	4 kV		
IC3/IC4	4 kV	Switching elements	
Rated insulation voltage		Switching elements	2 x 1 N/O contact, common terminal 11
IC1/(IC2-4)	400 V	Operating principle	N/C operation, N/O operation (N/C operation)*
IC2/(IC3-4)	250 V	Electrical endurance under rated operating conditions	10,000 cycles
IC3/IC4	250 V	Contact data acc. to IEC 60947-5-1	• •
Pollution degree	3	Utilisation category	AC-12 / AC-14 / DC-12 / DC-12 / DC-12
		3 /	
Protective separation (reinforced insulation) between	O	Rated operational voltage	230 V / 230 V / 24 V / 110 V / 220 V
IC1/(IC2-4)	Overvoltage category III, 600 V	Rated operational current	5 A / 2 A / 1 A / 0.2 A / 0.1 A
IC2/(IC3-4)	Overvoltage category III, 300 V	Minimum contact load	1 mA at DC ≥ 5 V
IC3/IC4	Overvoltage category III, 300 V	Contact data acc. to UL 508	
Voltage test (routine test) according to IEC 61010-1		Rated operational voltage	AC 250 V
IC2/(IC3-4)	AC 2.2 kV	Rated operational current	2 A
IC3/IC4	AC 2.2 kV		
Supply voltage		Environment/EMC	
Supply voltage	16400 0101112555 5 11	EMC I	EC 61326-2-4; IEC 61851-21-2:2018-04 Ed. 1.0
Supply voltage $U_{\rm S}$	AC 100240 V / DC 24240 V	Ambient temperatures	
Tolerance of U _s	-30+15 %	•	-40+70 °C*
Frequency range $U_{\rm S}$	4763 Hz	Operation	
Power consumption	\leq 3 W, \leq 9 VA	Transport	-40+85 °C
IT eyetom boing monitored		Storage	-40+70 °C
IT system being monitored		* Below –25 °C the readability of the display is limited	l.
Nominal system voltage $U_{\rm n}$	DC 0400 V	Classification of dimentic conditions are to IEC CO	734
Tolerance of U _n	+25 %	Classification of climatic conditions acc. to IEC 60	/21
Response values		(related to temperature and relative humidity)	21/22
<u> </u>	0 25010 (22010)*	Stationary use (IEC 60721-3-3)	3K22
Response value R _{an1}	$R_{an2}250 \text{ k}\Omega (230 \text{ k}\Omega)^*$	Transport (IEC 60721-3-2)	2K11
Response value R _{an2}	5 kΩR _{an1} (48 kΩ)*	Long-term storage (IEC 60721-3-1)	1K22
Hysteresis R _{an}	25% , $> 1 k\Omega$	Classification of mechanical conditions acc. to IEC	60721
Undervoltage detection U	< 10499 V (off)*	Stationary use (IEC 60721-3-3)	3M11
Overvoltage detection U	> 11500 V (off)*	Transport (IEC 60721-3-2)	2M4
Overload detection <i>U</i>	> 510 V (cannot be deactivated)	Long-term storage (IEC 60721-3-1)	1M12
Hysteresis <i>U</i>	5 %, > 5 V		
Custom voltoro		Connection	
System voltage		Screw terminals	
Measuring range	500 V _{RMS}	Nominal current	≤ 10 A
Display range	0500 V (measurement True-RMS)	Tightening torque	0.50.6 Nm (57 lb-in)
Measurement and relative uncertainty	$\pm 5\%, > \pm 5 \text{ V}$	Conductor sizes	AWG 2412
Mode CCS (dc)			
		Stripping length	8 mm
Permissible system leakage capacitance C	≤ 5 μF	Rigid/flexible	0.22.5 mm ²
Measuring and display range R _F	1 kΩ2 MΩ	Flexible with ferrules with/without plastic sleeve	0.252.5 mm ²
Measurement uncertainty R_F / relative uncertainty R_{an}	±15 %, ±2 kΩ	Multiple conductor	
Measuring and display range C_e	017 μF	rigid/flexible	0.21.5 mm ²
Measurement uncertainty C_e :		with ferrules without plastic sleeve	0.251.5 mm ²
$R_{\rm F}$ < 10 k Ω	no measurement	with TWIN ferrules with plastic sleeve	0.251.5 mm ²
$R_{\rm F} \ge 10 \rm k\Omega$	±15 %, ±0.1 μF	Push-wire terminals	
Response time t _{an} :		Nominal current	≤ 10 A
$R_{\rm an} = 2.0$ x $R_{\rm F}$ and $C_{\rm e} = 1$ μF acc. to IEC 61557-8	≤ 10 s	Cross section	AWG 2414
$R_{\rm an} = 2.0 \text{ x } R_{\rm F} \text{ and } R_{\rm F} \le 100 \text{ k}\Omega$	≤ 10 s	Stripping length	10 mm
		Rigid	0.22.5 mm
Mode CHAdeMO (CHd)		Flexible	0.22.3
System voltage $U_{\rm n}$	measurement from $U_n \ge DC 50 \text{ V}$	without ferrules	0.752.5 mm ²
Permissible system leakage capacitance C _e	per conductor ≤ 1.6 μF		
Measuring and display range RF & RFU	1 kΩ2 MΩ	with ferrules with/without plastic sleeve	0.252.5 mm ²
Measurement uncertainty $R_{\rm F}$ / relative uncertainty $R_{\rm an}$	$\pm 15\%$, $\pm 2 \text{ k}\Omega$	Multi-conductor flexible with TWIN ferrules with plastic	
Measuring and display range C _e	017 μF	Opening force	50 N
Measurement uncertainty C _e :	υ μι	Test opening	Ø 2.1 mm
$R_{\rm F}$ < 10 k Ω	no measurement	Other	
$R_{\rm F} \ge 10 \text{ k}\Omega$	±15 %, ±0.1 μF		
Response time t_{an} :	±13 /0, ±0.1 μΓ	Operating mode	continuous operation
$R_{\text{an}} = 2.0 \text{ x } R_{\text{FU}} \text{ and } R_{\text{FU}} \leq 100 \text{ k}\Omega$	≤ 10 s	Mounting	cooling slots must be ventilated vertically
		Degree of protection, built-in components (DIN EN 605.	
$R_{\rm an} = 2.0 \text{ x } R_{\rm F}$	≤ 10 s	Degree of protection, terminals (DIN EN 60529)	IP20
Displays, memory		Enclosure material	polycarbonate
Password	off / 0999 (off / 0)*	DIN rail mounting acc. to	IEC 60715
		Screw mounting	2 x M4 with mounting clip
Fault memory alarm messages	0n/(off)*	Documentation number	D00352
Display	LC display, multifunctional, not illuminated	Weight	≤ 150 g
Time response		()* = factory setting	
Start-up delay t	010 s (0 s)*	(, lactory setting	
Juli up uciay i	UIUS(US)"		
Pacpanca dalay to	0 00 c /0 =*		
Response delay $t_{ m on}$ Delay on release $t_{ m off}$	099 s (0 s)* 099 s (0 s)*		



Wiring diagram



- **11** A1, A2 Connection to the supply voltage U_s via fuse (line protection): If supplied from an IT system, protect both lines by a fuse.
- E, KE Connect each terminal separately to PE: Use same wire cross section as for ,A1', ,A2'.
- L+, L- Connection to the system to be monitored Indication in display: ,L1' for L+; ,L2' for L
- T/R Connection for the external combined test and reset button
- 11, 14 Connection to alarm relay ,K1'

- 11, 24 Connection to alarm relay ,K2'
- A, B RS-485 communication interface with connectable terminating resistor
 - Example: Connection of a BMS Ethernet gateway COM465IP
- For UL applications:

Use 60/70 °C copper lines only!

For UL and CSA applications, using 5 A fuses for the protection of the supply voltage U_s is mandatory.

ISOMETER® isoCHA425HV with AGH420-1/AGH421-1

Insulation monitoring device with coupling device for unearthed DC systems (IT systems) DC 0 V to 1000 V. Suitable for DC charging stations according to CCS or CHAdeMO





Typical applications

- DC charging stations for electric vehicles in accordance with the Japanese charging standard CHAdeMO
- DC charging stations for electric vehicles according to CCS (Combined Charging System) in compliance with IEC 61851-23

Approvals









Device features

- Monitoring of the insulation resistance RF of DC charging stations according to CHAdeMO standard or Combined Charging System (CCS).
- Measurement of the system leakage capacitance $C_{\rm e}$
- Measurement of the system voltage U_n (True RMS) with undervoltage/overvoltage
- Measurement of the DC residual voltages U_{L1e} (L1/+ to PE) and U_{L2e} (L2/- to PE)
- · Selectable start-up delay, response delay and delay on release
- Two separately adjustable response value ranges of 5...600 k Ω (prewarning, alarm)
- Alarm output via LEDs ("AL1", "AL2"), a display and alarm relays ("K1", "K2")
- · Automatic device self test with connection monitoring
- Selectable N/C or N/O relay operation
- · Measured value indication via a multi-functional LC display
- · Activatable fault memory
- RS-485 (galvanically isolated) including the following protocols:
- BMS (Bender measuring device interface) for data exchange with other Bender devices
- Modbus RTU
- IsoData (for continuous data output)
- · Password protection to prevent unauthorised parameter changes
- · Stop mode for disabling the measuring pulse generator and in combination with AGH421-1 disconnection from the monitored system

Standards

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

- IEC 61851-23:2023 ED2
- IEC 61851-21-2: 2018-04 Version 1.0
- IEC 61557-8 Edition 3.0 2014-12
- DIN EN 61557-8:2015
- UI 2231-1 Edition 2 2012-09 Rev 2021-09
- UL 2231-2 Edition 2 2012-09 Rev 2020-12

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Nominal system voltage <i>U</i> n	Art.	No.
1,750	Nonman system vortage on	Set	Contents
isoCHA425HV-D4-4 + AGH420-1	CCS: DC 01000 V CHAdeMO: DC 501000 V	B91036396	B71036394 B78039033
isoCHA425HV-D4-4 + AGH421-1	CCS: DC 01000 V CHAdeMO: DC 501000 V	B71036399	B71036394 B78039034

Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B98060008
XM420 mounting frame	B990994

Insulation coordination acc. to IEC 60664-1/IEC 60664-	3	Two-pole fault RFS (only CHd Mode)	
Definitions:		Measuring and display range RFS	1160 kΩ
Supply circuit (IC2)	A1, A2	Measurement uncertainty R_{FS} / Relative uncertainty R_{ar}	n:
Output circuit (IC3)	11, 14, 24	< 160 kΩ	±15 %, ±2 kC
Control circuit (IC4)	Up, KE, T/R, A, B, AK1, GND, AK2	Measuring and display range $C_{\rm e}$	035 μ
Rated voltage	240 V	Measurement uncertainty C _e :	
Overvoltage category		$R_{\rm F} < 10 \rm k\Omega$	no measuremen
	III	$R_{\rm F} \ge 10 \mathrm{k}\Omega$	±15 %, ±0.1 μ
Rated impulse voltage:			± 13 %, ±0.1 μ
IC2/(IC3-4)	4 kV	Response time t _{an} :	.,
IC3/IC4	4 kV	$R_{\rm an} = 1.2 \text{ x } R_{\rm FU} \text{ and } R_{\rm FU} \leq 100 \text{ k}\Omega \text{ and } U_{\rm n} > 100 \text{ m}$	
Rated insulation voltage:		$R_{\rm an} = 1.2 \mathrm{x}R_{\rm F}$	≤ 10
IC2/(IC3-4)	250 V	Displays, memory	
IC3/IC4	250 V	_ • • • •	#/A 000 / #/A
Pollution degree	3	Password	off/0999 (off/0)
Protective separation (reinforced insulation) between:		Fault memory alarm messages	on/(off)
IC2/(IC3-4)	overvoltage category III, 300 V	Display	LC display, multifunctional, not illuminate
IC3/IC4	overvoltage category III, 300 V	Time vernence	
Voltage tests (routine test) acc. to IEC 61010-1:	overvoltage category III, 500 v	Time response	
	DC ±3.1 kV	Start-up delay t	010 s (0 s)
IC2/(IC3-4)		Response delay ton	099 s (0 s)
IC3/IC4	AC 2.2 kV	Delay on release toff	099 s (0 s)
Supply voltage			
	AC 100 340 W/DC 34 340 W	Interface	
Supply voltage $U_{\rm S}$	AC 100240 V/DC 24240 V	Interface/protocol	RS-485/BMS, Modbus RTU, isoData
Tolerance of U _s	-30+15 %	Baud rate BMS (9.6 kbit/s), M	odbus RTU (selectable), isoData (115.2 kbits/s
Frequency range U _s	4763 Hz	Cable length (9.6 kBits/s)	≤ 1 200 n
Power consumption	\leq 3 W, \leq 9 VA	Cable: twisted pairs	min. J-Y(St)Y 2 x 0.
IT		Terminating resistor	120 Ω (0.25 W), internal, can be connected
IT system being monitored		Device address, BMS bus, Modbus RTU	390 (3)
Nominal system voltage $U_{\rm n}$ with AGH420-1/AGH421-1	DC 01000 V	DEVICE AUDICSS, DIVIS DUS, IVIDUDUS KTU	390 (3)
Tolerance of U _n	DC +10 %	Switching elements	
Nominal system voltage range U_n with AGH420-1/AGH421-1	(UL508) DC 0600 V	Switching elements	2 x 1 N/O contact, common terminal 1
	-		•
Response values			N/C operation, N/O operation (N/C operation)
Response value R _{an1}	$R_{an2}600 \text{ k}\Omega (600 \text{ k}\Omega)^*$	Electrical endurance under rated operating conditions,	number of cycles 10000
Response value R _{an2}	$5 \text{ k}\Omega \dots R_{\text{an1}} (120 \text{ k}\Omega)^*$	Contact data acc. to IEC 60947-5-1:	
Hysteresis R _{an}	25% , $> 1 k\Omega$	Utilisation category	AC-12 / AC-14 / DC-12 / DC-12 / DC-12
Undervoltage detection U_n <	101090 V (off)*	Rated operational voltage	230 V / 230 V / 24 V / 110 V / 220 V
Overvoltage detection $U_n >$	111100 V (off)*	Rated operational current	5 A / 2 A / 1 A / 0,2 A / 0,1 A
Overload detection U_n	1200 V (cannot be deactivated)	Minimum contact load	$1 \text{ mA at DC} \ge 5 \text{ N}$
			TillA dt DC 2 3
Hysteresis U _n	5 %, > 5 V	Contact data acc. to UL508	
System voltage		Rated operational voltage	AC 250 \
, -	DC + 1200 V	Rated operational current	21
Measuring range	DC ±1200 V		
Display range	0 V1.2 kV (measurement True RMS)	Environment/EMC	
Measurement and relative uncertainty	$\pm 5\%, > \pm 5 \text{ V}$	EMC I	EC 61326-2-4, IEC 61851-21-2:2018-04 Ed. 1.0
Mode CCS (dc)		Ambient temperatures	
	- 20 5	Operation	-40+70 °C
Permissible system leakage capacitance Ce	≤ 20 µF	Transport	-40+85 %
Permissible system leakage capacitance C_e (acc. to UL2231-1		Storage	-40+70 °(
Measuring and display range $R_{\rm F}$	1 kΩ2 MΩ		
Measurement uncertainty R_F / relative uncertainty R_{an} :		* The readability of the display below the temperature	e of -25 °C is limited.
$C_{\rm e} \leq 5 \mu \rm F$	$\pm 15 \%$, $\pm 2 k\Omega$	Classification of climatic conditions acc. to IEC 60	734
$C_{\rm e} > 5 \mu \text{F} \text{ and } R_{\rm F} > 100 \text{k}\Omega$	$\pm (5 \% \text{ x } R_{an}/100 \text{ k}\Omega + 10\%)$		721
Measuring and display range C_e	035 μF	(related to temperature and relative humidity)	
Measurement uncertainty C_e :		Stationary use (IEC 60721-3-3)	3K2
$R_{\rm F} < 10 \ {\rm k}\Omega$	no measurement	Transport (IEC 60721-3-2)	2K1
$R_{\rm F} \ge 10 \mathrm{k}\Omega$	±15 %, ±0.1 μF	Long-term storage (IEC 60721-3-1)	1K2
	±13 70, ±0.1 μΓ	Classification of mechanical conditions acc. to IEC	60721
Response time t_{an} :	- 40		. 60721 3M1
$R_{\text{an}} = 2.0 \text{ x } R_{\text{F}} \text{ and } C_{\text{e}} = 1 \text{ µF acc. to IEC 61557-8}$	≤ 10 s	Stationary use (IEC 60721-3-3)	
$R_{\rm an} = 2.0 \text{ x } R_{\rm F} \text{ and } C_{\rm e} \le 5 \mu\text{F or } R_{\rm F} \le 100 k\Omega$	≤ 10 s	Transport (IEC 60721-3-2)	2M-
Mode CHAdeMO (CHd an CHA)		Long-term storage (IEC 60721-3-1)	1M1:
		Other	
System voltage <i>U</i> _n	measurement only from $U_n \ge DC 50 \text{ V}$		
Permissible system leakage capacitance C _e	per conductor ≤ 1.6 μF	Operating mode	continuous operation
One-pole fault R _{FU}		Mounting	cooling slots must be ventilated vertically
Measuring and display range R _{FU}	1 kΩ2 MΩ	Degree of protection built-in components (DIN EN 6052	
Measurement uncertainty R_{FU} / relative uncertainty R_{an} :	1 11222 14122	Degree of protection terminals (DIN EN 60529)	IP20
measurement uncertainty neu / relative uncertainty han.	±15 0/ ±2 l.O	Enclosure material	polycarbonate
11. > 100 V and Pru < 200 LO	$\pm 15 \%$, $\pm 2 \text{ k}\Omega$	DIN rail mounting acc. to	IEC 60715
$U_{\rm n} \ge 100 \text{ V}$ and $R_{\rm FU} \le 200 \text{ k}\Omega$	1450/ .310		
$U_{\rm n} \ge 100 \text{ V}$ and $R_{\rm FU} \le 200 \text{ k}\Omega$ $U_{\rm n} > 200 \text{ V}$	±15 %, ±2 kΩ	-	2 x M4 with mounting clip
	±15 %, ±2 kΩ	Screw mounting	2 x M4 with mounting clip
	±15 %, ±2 kΩ	Screw mounting Documentation number	D00404
	±15 %, ±2 kΩ	Screw mounting	•

Insulation coordination acc. to IEC 60664-1/IEC 606	664-3
Definitions:	
Measuring circuit (IC1)	L1/+, L2/-
Control circuit (IC2)	AK1, GND, AK2, Up, E
Rated voltage	1000 V
Overvoltage category	III
Rated impulse voltage:	
IC1/IC2	8 kV
Rated insulation voltage:	
IC1/IC2	1 000 V
Pollution degree	3
Protective separation (protective impedance) between:	
IC1/IC2	overvoltage category III, 1000 V
IT system being monitored	
Nominal system voltage range U _n	DC 01 000 V
Tolerance of U _n	DC +10 %
Nominal system voltage range $U_{\rm n}$ (UL508)	DC 0600 V
Measuring circuit	
Measuring voltage $U_{\rm m}$	±45 V
Measuring current $I_{\rm m}$ at $R_{\rm F}$	≤ 400 μA
Internal DC resistance R _i	≥ 120 kΩ

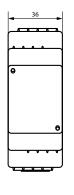
EMC	IEC 61326-2-4
Ambient temperatures	
Operation •	-40+70°C
Transport	-40+85°C
Storage Storage	-40+70°C
Classification of climatic conditions acc. to IEC 607. (related to temperature and relative humidity)	21
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	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
Other	
Operating mode	continuous operation
Mounting	cooling slots must be ventilated vertically
Distance to adjacent devices from $U_{\rm n}$ $>$ 800 V	≥ 30 mm
Degree of protection built-in components (DIN EN 60529) IP30
Degree of protection terminals (DIN EN 60529)	IP20
Enclosure material	polycarbonate
DIN rail mounting acc. to	IEC 60715
Screw mounting	2 x M4 with mounting clip
Weight	≤ 150 g

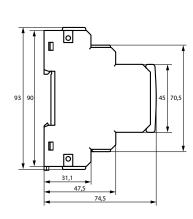
Connection (for isoCHA425HV and AGH)

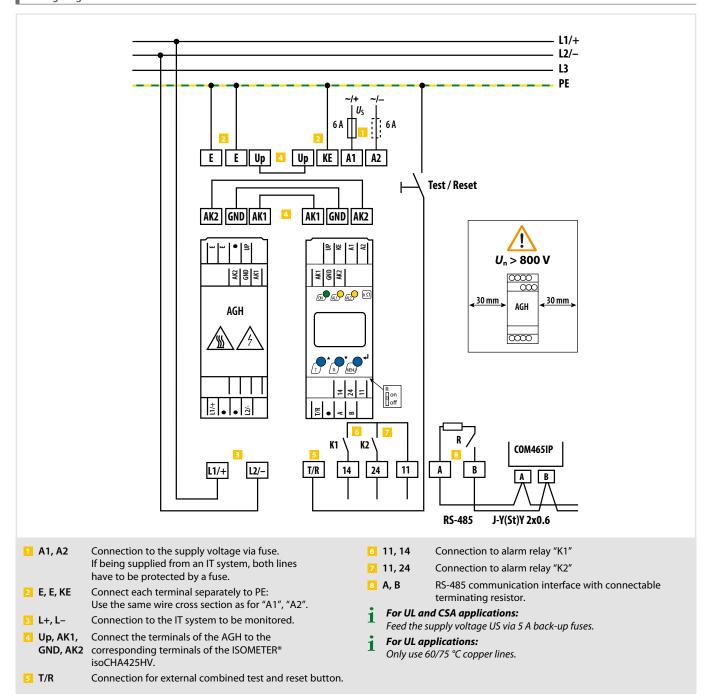
Push-wire terminals	
Nominal current	≤ 10 A
Cross section	AWG 2414
Stripping length	10 mm
Rigid	0.22.5 mm ²
Flexible	
without ferrules	0.752.5 mm ²
with ferrules with/without plastic sleeve	0.252.5 mm ²
Multi-conductor flexible with TWIN ferrules with plastic sleeve	0.5 1.5 mm ²
Opening force	50 N
Test opening	Ø 2.1 mm

Single cables for terminals Up, AK1, GND, AK2 Requirement for connecting cables between ISOMETER® and AGH Cable lengths ≤ 0.5 m $\geq 0.75 \text{ mm}^2$ Connection properties

Dimension diagram (dimensions in mm)







ISOMETER® iso175

Insulation monitoring device for unearthed drive systems (IT systems) in road vehicles





Typical applications

• Monitoring for unearthed drive systems (IT systems) in road vehicles

Approvals



Device features

- Suitable for 12 V and 24 V DC systems (supply voltage)
- Insulation monitoring of DC insulation faults for unearthed systems (IT systems)
- Insulation monitoring of AC insulation faults for unearthed systems (IT systems) (from firmware version D720V1.01)
- Continuous insulation resistance measurement $R_{\rm iso_corrected}$ and $R_{\rm iso_original}$
- Response time \leq 30 s for insulation resistances \leq 500 Ω /Volt and system leakage capacitances \leq 2 μ F
- · Insulation measurement of larger leakage capacities possible through parameterisation (Profile High Capacity) .
- Insulation measurement also when the vehicle's HV electric system is not energised
- Intetrated self diagnosis (online self test)
- HV connection monitoring (offline self test)
- · Continuous monitoring of the earth connection
- Undervoltage detection
- · Earth connection can be disconnected (Earthlift)
- · Interfaces:
 - Digital output for device error message (OKHS)
 - HS-CAN interface with the following protocols
 - Bender-Standard
 - CAN-SAE J1939
 - All outputs short-circuit proof
- · Load-dump protection

Standards

The ISOMETER® iso175 has been developed in accordance with the following standards and approvals:

- IFC 61010-1
- IEC 60664-1
- IEC 60068-2-6
- IEC 60068-2-14
- IEC 60068-2-27
- · IEC 60068-2-64
- ISO 6469-3
- ISO 16750-2
- · ISO 16750-3
- · ISO 16750-4 • (UN)ECE R10 Rev.6
- SAF J1939-82
- Insulation measurement functions based on: IEC 61557-8

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Connector type (connection)	Interfaces	Standardconfiguration	Art. No.
iso175C-32-SS	TYCO ¹	HS-CAN	Baud rate:	B91068201
iso175C-42-SS	Samtec/Molex ²	SAE J1939	500 kBaud	B91068202
iso175C-32-SB	TYCO ¹	HS-CAN	Response value: 100 kΩ (error)	B91068203
iso175C-42-SB	Samtec/Molex ²	Bender	500 kΩ (warning)	B91068204

- HV+ / HV connections
 - · Connector: TE Connectivity / AMP
- Tyco-Micro Mate-N-Lok™, 1445022-2

LV connection

- · Connector: TE Connectivity / AMP
- Tyco-Micro Mate-N-Lok™, 1445022-8

Crimp contacts, suitable for both connections

- Connector: TE Connectivity / AMP
- Tyco-Micro Mate-N-Lok™ gold, plating B (38 μm), 1-794606-1
- Crimping tool (Tyco): 91501-1 (AWG 20...24)

- ² HV+ / HV connections
 - Connector: Molex Mini Fit Jr. Housing, 39-01-2025
 - · Crimp contact: Mini Fit Jr. Gold Kontakt, 39-00-0089, AWG 16
 - Crimping tool (Molex): 2002182200

LV connection

- · Connector: Samtec Mini Mate Housing, IPD1-08-S-K
- Crimpkontakt: Samtec Mini Mate Gold, CC79R2024-01-L, AWG 20...24
- Crimping tool 20-30 AWG (Samtec): CAT-HT-179-2030-13

Cable recommendation for proper functioning of the offline self test: AlphaWire (Art. No. 5875)

CAN configurations (e.g. baud rate and addressing) cannot be changed later.

Туре	Connector type (connection)	Interfaces	Customerconfiguration	Art. No.
See Standard variants	TYCO (side) or Samtec/Molex (top)	HS-CAN (SAE J1939 or Bender)	According to customer specifications	B91068200

^{*} For sales contact data and further information see "https://www.bender.de/en/solutions/emobility/".

Accessories

Description	Suitable for type	Art. No.
IR155/iso175 fastening kit	All	B91068500
IR155/iso175 connection kit (TYCO)	iso175X-32-XX	B91068501
IR155/iso175 connection kit (Samtec/Molex)	iso175X-42-XX	B91068502

Technical Data

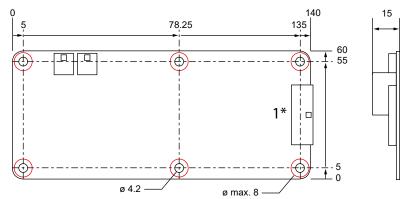
Insulation coordination acc. to		
Protective separation (reinforced i	nsulation) b	etween (L+/L-) – (terminal 31, terminal 15, E,
Rated impulse voltage		CAN _H , CAN _L , OK _{HS}) 6000 V
Overvoltage category		
Voltage test		DC 4200 V/1 min
Pollution degree		2
Supply / monitored IT system		
Supply voltage U_{S}		DC 1224 V
Tolerance Supply voltage <i>U</i> s		-17+50 %
Self consumption, no load at outp	ut	≤ 0.55 W
Max. operating current Is	ut	300 mA
HV voltage range (L+/L-) <i>U</i> _n		DC 01000 V
TIV Voltage fallige (ET/E / Off		AC 0480 V _{RMS} (f=50/60Hz)
Tolerance of Un		+10 %
Recommended back-up-fuse		M 630 mA
•		M 030 HIM
Response values Response value Ran		30 k25MΩ
Response value hysteresis (DCP)		25 %
Undervoltage detection		01000 V
ondervoltage detection		Default setting: 0 V (inactive)
Undervoltage detection hysteresis	<u> </u>	5 %
Measuring range		
R iso corrected		040,5 MΩ
R iso original		050 ΜΩ
Isolation: R iso neg*		050 ΜΩ
Isolation: R iso pos*		050 ΜΩ
Voltage: HV system voltage measi	irement	DC 01000 V
voluge. IIV system voluge meast	arement	AC 0480 V _{RMS} (f=50/60Hz)
Tolerance Voltage: HV system volt	age measurement	±5 % ±2 V
Capacity: (capacitance) Measured		010 µF
Unbalance U_n (Prerequisite: DC \geq		
Tolerance Unbalance		±5 %
Relative uncertainty of the estima	ted measured values	
R iso status = 0xFC)		0100 %
Tolerance "R iso corrected"	Measuring ra	
(R iso status = 0xFD)	050 kΩ	050 kΩ
· _ · · _ · · /		Rel. fault
	50 kΩ1.2 N	MΩ 0120 % to 048 %
	1.25 MΩ	048 % to 076 %
	510 MΩ	076 %
	$> 10 \text{M}\Omega$	not specified
Tolerance 'R iso corrected'	Measuring ra	inge Abs. fault
(R iso status = 0xFE)	050 kΩ	050 kΩ
,		Rel. fault
		MΩ 060 % to 024 %
	50 kΩ1.2 N	/11.2
	50 kΩ1.2 N 1.25 MΩ	
		024 % to 038 % 038 %

* Available from an H\	/ voltage > 100)V
------------------------	-------------------

Time response		
Enabling time t _{start} (OK _{HS} ; fast start me	easurement	≤ 5 s (C _e ≤ 2 µ
Response time t_{an} (OK_{HS})		≤ 30
as per LV 123 (100500 Ω / V, 2 μ F (profiles: Standard/ Sta	ndard with fast startup)
Switch-off time t_{ab} (OK _{HS} ; DCP)/ insula		Standard profile ≤ 5.
$(100500 \Omega/Volt)$ until R_iso ≥ 10	$M\Omega$, $C_e \le 1 \mu F$ H	igh Capacity (capacitance) profile ≤ 60
		Disturbed profile ≤ 11.
		Service profile ≤ 36
Offline self test		≤ `
Offline self test with output test (OKHS)	≤!
Measuring circuit		
System leakage capacitance C_e max.	Standard profile	≤ 5
,	High Capacity (capac	itance) profile ≤ 10
	Disturbed profile	≤ 10
Measuring voltage U _M	•	±35 V ±2
Measuring current $I_{\rm M}$ at $R_{\rm F}=0~{\rm k}\Omega$		≤ ±30
DC internal resistance R _i		$1.2\mathrm{M}\Omega\pm2$
Status output OK _{HS}		
OK_{HS} (High-Side Treiber) high U_{S}^*		≥ U _s -2
OK _{HS} (High-Side Treiber) low U _S *		≤ 0,2
Permissible output current max.		80 n
•	racistar (2k2 A)	001
* With correctly connected pull-down	ICSISTUI (ZKZ 11)	
CAN interface		
Data transmission rate		125, 250, 500, 666, 800, 1000 kBa
Terminating resistor		120 🕻
* via jumper: Recommended: Weitronic	tw Jumper series 165. M	anufacturer ordering no.: 165-101-10-1
EMC		
Load-dump protection		≤ 58
ESD protection		
Contact discharge — directly at the teri	minals	≤ 4
Contact discharge — indirectly via the		≤4
Air discharge — handling of printed cir		 ≤8
HV connection		
Cable length, max.		25
Cable cross section AWG		20
Validated cable type		AlphaWire 58
Environment		/ inpilativité 30
Operating temperature		-40+105
Temperature cycle (ISO 16750-4)		-40+103
Air humidity (rH)		0100
Altitude		≤ 3000
		≥ 3000
Classification of climatic condition	s acc. to IEC 60721	
Transport (IEC 60721-3-2)		2K
Long-time storage (IEC 60721-3-1)		1K
Classification of mechanical condi	tions acc. to IEC 6072	
Transport (IEC 60721-3-2)		21
		1M
Long-time storage (IEC 60721-3-1)		
Other Operating mode		Continuous operati
Other Operating mode		·
Long-time storage (IEC 60721-3-1) Other Operating mode Flammability class as per Deflection		Continuous operati UL 94 V ax. 1 % of the length or width of the Po
Other Operating mode Flammability class as per		UL 94 V
Other Operating mode Flammability class as per Deflection		UL 94 V ax. 1 % of the length or width of the P

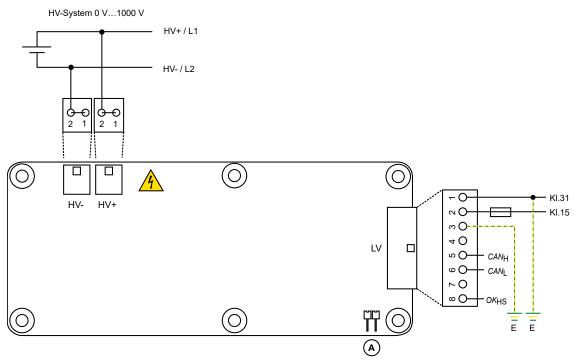
Dimension diagram

Dimensions in mm (L x W x H) 140 x 60 x 15 mm



- 1* LV: protrudes 1 mm from the printed circuit board edge
- 1 Red markings: fastening positions

Wiring diagram



Connector*	Pin no.	Description	
HV+	1	Maine valle see (L.)	
nv+	2	Mains voltage (L+)	
HV-	1	Maine vallege (L.)	
HV-	2	Mains voltage (L-)	
	1	Supply voltage - (terminal 31)	
	2	Supply voltage - (terminal 15)	
	3	Earth connection (E) ¹	
LV	4	n.c.	
LV	5	CAN-High	
	6	CAN-Low	
	7	n.c.	
	8	Status output (high side) (OK _{HS}) ²	
Α		Jumper CAN terminating resistor 120 Ω^3	

¹ Pins 1 and 3 must be on the same potential for fault-free operation.

For a functioning connection detection of LV pin 3 to chassis ground, the connection of LV pin 1 must also be connected to chassis ground.



² The electrical design of the status output is an open-collector topology, which requires a pull-down resistor against terminal 31 for a defined output signal. Here a 2k2 resistor with a power rating of at least 1 W is recommended.

³ The ISOMETER® furnished with an onboard CAN-bus termination with 120)2, which can be activated by plugging a jumper (for a recommendation see chapter "Technical data") to plug connector A.

^{*} For details on the connectors required to connect to the HV system as well as to the supply voltage refer to "Ordering information".



Device overview Equipment for insulation fault location ISOSCAN®

				* Signature Sign	* Section Sect
		ISOSCAN® EDS440	ISOSCAN® EDS441	ISOSCAN® EDS441-LAB	ISOSCAN® EDS440-LAF
	Catalogue page	148	148	148	148
	Special applications	-	-	High-resistance insulation faults in case of high system leakage capacitances and low test current value	Use with flexible strap transformers CTAF
	Application	stationary	stationary	stationary	stationary
Gircuits	Control circuits	-	~	✓	-
Gir	Main circuits	✓	-	-	~
E	3(N)AC	✓	-	-	✓
syste	AC	✓	~	✓	✓
Voltage system	AC/DC	✓	~	✓	✓
%	DC	✓	~	~	✓
No	minal voltage <i>U</i> n max	see Locating current injector (e. g. ISOMETER® iso685-D-P)	AC 20276 V, DC 20308 V	AC 20276 V, DC 20308 V	see Locating current injector (e. g. ISOMETER® iso685-D-P)
System	leakage capacitance Ce μF	acc. to characteristic curve	acc. to characteristic curve	acc. to characteristic curve	acc. to characteristic curve
	sponse value R _{an} kΩ	acc. to characteristic curve	acc. to characteristic curve	acc. to characteristic curve	acc. to characteristic curve
Installa- tion	DIN rail	~	~	✓	✓
Inst	Screw mounting	~	~	✓	~
ces	ВВ	EDS440-S	EDS441-S	-	-
Interfaces	BS	EDS440-L	EDS441-L	✓	~
_ <u>=</u>	BMS	-	-	-	-
	Product details (Products on www.bender.de/en)				
	Type C. p		· · · · · · · · · · · · · · · · · · ·	m components	
d PGF	iso685-D-P 20		<u> </u>	✓	-
Suitable ISOMETER®s with integrated PGH	isoMED427P 83		~	-	-
table th inte	isoPV1685P 100		-	-	-
Su	iso1685DP 64		-	-	-
	CTAC 359		<u> </u>	-	-
_	CTAS 362		~	-	
Measuring current transformers	W 365		-	✓	-
'ing c Sform	WS 367		~	_	-
easul	WSS 369		-	-	-
≥	WRS(P) 371		-	~	
	CTUB100 376		-	~	-
	CTAF		-	-	<u> </u>
suppl iit	AN410 403		-	Y	
wer	AN450 405		-	Y	-
Relay Power supply module unit	STEP-PS 400 IOM441 411		- ~	· ·	- ~

The second second	Ni di	
ISOSCAN® EDS150	ISOSCAN° EDS151	ISOSCAN® EDS30
155	158	161
-	Medical locations	EDS3096PG for de-energised systems
stationary	stationary	portable
-	~	<u> </u>
~	-	~
~	-	~
~	~	~
~	~	~
~	~	~
see Locating current injector (e. g. ISOMETER® iso685-D-P)	AC 20276 V, DC 20308 V	dependent on type
acc. to characteristic curve	acc. to characteristic curve	acc. to characteristic curve
acc. to characteristic curve	acc. to characteristic curve	acc. to characteristic curve
-	-	_
~	~	_
-	-	_
-	-	-
✓	~	_







Suitable system components

-	-	~
	✓	~
~	-	✓
~	-	✓
-	-	_
_	-	_
	-	-
	-	-
-	-	_
-	-	_
-	-	_
-	-	_
~	~	-
~	~	-
-	-	-
-	_	-

ISOSCAN® EDS440/441

Insulation fault locators for localisation of insulation faults in unearthed DC, AC and three-phase power supply systems (IT systems)





Typical applications

- · Insulation fault location in AC, 3AC and DC IT systems
- · Main circuits and control circuits in industrial plants and ships
- · Diode-decoupled DC IT systems in power plants
- Systems for medical locations

Approvals







Device features

- · Universal system concept
- · Modular design, therefore easily adjustable to the given circumstances
- · Measuring current transformers available in various sizes and versions
- · CT connection monitoring
- 12 measuring channels for measuring current transformer series CTAC..., W..., WR..., WS...
- · Optional extension by 12 relay channels
- · Fault memory behaviour selectable
- Up to 50 EDS insulation fault locators in the system, 600 measuring channels
- Response sensitivity: EDS440 2...10 mA, EDS441 0.2...1 mA
- AC residual current measurement with configurable response value
- Two alarm relays with one N/O contact each
- N/O or N/C operation selectable
- · External test/reset
- · Central display of faulty outgoing circuits
- Serial interface RS-485, BS bus address range 2...79
- Connection to higher-level control and visualisation systems possible

Standards

Observe the applicable national and international standards. The EDS44x series meets the device standards:

- DIN VDE 0100-410 (VDE 0100-410)
- DIN EN 61557-9 (VDE 0413-9)
- IEC 61557-9
- DIN EN 50155 (VDE 0115-200)
- DIN EN 45545-2

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Type	Type Response value Supply voltage <i>U</i> s ¹⁾ LED display	Supply voltage (L.1)	LED display	Option "W"	Art. No.
туре		-40+70 °C, 3K23, 3M12	AI t. No.		
EDS440-S-1		DC 24 V		-	B91080201
EDS440W-S-1	2 10 4			~	B91080201W
EDS440-L-4	210 mA	AC/DC 24240 V	~	-	B91080202
EDS440W-L-4				~	B91080202W
EDS441-S-1		DC 24 V –	-	B91080204	
EDS441W-S-1			_	~	B91080204W
EDS441-L-4				-	B91080205
EDS441W-L-4	- 0,21 mA	AC/DC 24 240V		~	B91080205W
EDS441-LAB-4		AC/DC 24240 V	~	-	B91080207
EDS441W-LAB-4				~	B91080207W
EDS440-LAF-4	10 mA	AC/DC 24240 V	~	-	B91080209

⁾ Absolute values

Accessories

Description	Art. No.
Plug kit, screw terminals ¹⁾	B91080901
Plug kit, push-wire terminals	B91080902
Mechanical accessories (terminal cover, 2 mounting clips) 1)	B91080903
BB bus 4TE Connector ²⁾	B98110002

¹⁾ included in the scope of delivery

 $^{^{\}rm 2)}~$ included in the scope of delivery of EDS44x-S-4

Description	Design	Type of construction	Туре	Art. No.	Page
DC 405 remeater	Bus repeater	-	DI-1PSM	B95012044	-
RS-485 repeater	Supplied by the USB port	-	DI-2USB	B95012045	410
Relay module	12-fold relay module (input/output mudule)	-	I0M441(W)-S	B95012057(W)	411
	pulsed DC sensitive	circular	CTAC	B981100	359
			CTUB102-CTBC	B781200	376
			WS	B9117	365
Measuring current transformers		rectangular	WRS(P)	B9117	371
		split-core flexible	CTAS	B981100	362
			WS	B980806	367
			CTAF	B981100	-

Technical data

Insulation coordination acc. to IEC 60664-1/IEC 6066	14-3
Definitions	A1 A2
Supply circuit (IC1)	A1, A2
Output circuit 1 (IC2)	13, 14
Output circuit 2 (IC3)	23, 24
Control circuit (IC4)	(A1, A2), (13,14)-(23,24)-(X1, X3)
Rated voltage	1000 V
Overvoltage category	III
Range of use	≤ 2000 m AMSL
Rated impulse voltage	
IC1/(IC2-4)	4 kV
IC2/(IC3-4)	4 kV
IC3/(IC4)	4 kV
Rated insulation voltage	
IC1/(IC2-4)	AC 250 V
IC2/(IC3-4)	250 V
IC3/IC4	250 V
Pollution degree outside ($U_{\rm n}$ < 690 V)	3
Pollution degree outside ($U_n > 690 < 1000 \text{ V}$)	2
Protective separation (reinforced insulation) between	
IC1/(IC2-4)	Overvoltage category III, 1000 V
IC2/(IC3-4)	Overvoltage category III, 300 V
IC3/IC4	Overvoltage category III, 300 V
Voltage tests (routine test) acc. to IEC 61010-1	
IC2/(IC3-4)	AC 2.2 kV
IC3/IC4	AC 2.2 kV
Supply voltage	

Supply voltage range U_S EDS44...-L (...-LAB, ...-LAF) Supply voltage range U_S EDS44...-S

DC 24 V Tolerance of U_s -20...+15% Frequency range of $U_{\rm S}$ DC, 50...400 Hz^{1) 2)} Tolerance: -5...+15 % Power consumption, typically 50 Hz (400 Hz) EDS44 . . . - L \leq 4 W/7 VA (\leq 4 W, 28 VA) Power consumption, typically (DC via BB bus) EDS44...-S $\leq 1 \, W$

 $^{1)}\,$ At a frequency > 200 Hz, the connection of X1 and k1-12/l1-12 must be insulated. Only permanently installed devices which at least have overvoltage category CAT2 (300 V) may be connected.

 $^{2)}\,$ Only 50/60 Hz are permitted for UL applications.

Scanning time for all channels insulation fault location ($I_{\Delta L}$)

 $Response\ time\ for\ measuring\ current\ transformer\ monitoring$

Response time residual current measurement ($I_{\Delta n}$)

Response values

	EDS440	EDS441
Response value insulation fault location (I _{AL})	210 mA	0.21 mA
Relative uncertainty ($I_{\Delta L}$)	±30 %, min. ±2 mA ³⁾	±30 %, min. ±0.2 mA ³⁾
Response value residual current measurement ($I_{\Delta n}$)	0,110 A	0,11 A
Relative uncertainty $(I_{\Delta n})$ (4260 Hz)	±5 %	±5 %
Relative uncertainty ($I_{\Delta n}$) (611000 Hz)	-200 %	-200 %
Hysteresis	20 %	20 %
Time response		

Measuring circuit

Nominal system voltage U_n EDS440	refer to locating	current injector (e.g. ISOMETER® iso685-D-P)
Nominal system voltage <i>U</i> _n EDS441		AC 230 V ±15 %
		DC 220 V \pm 40 %
Measuring current transformers external for	or EDS440 type	CTAC, CTAS, W, WR, WS
Measuring current transformers external for	or EDS441type	CTAC, CTAS, W/8000, WS/8000
Measuring current transformers external for	or EDS441-LAB	CTUB102-CTBC
Measuring current transformers external for	or EDS440-LAF	CTAF
Load EDS440		47 Ω
Load EDS441, EDS440-LAF		1.5 kΩ
Rated insulation voltage measuring curr	ent transformers	800 V

Connection EDS measuring current transformers

Single wire ≥ 0.75 mm ²	01 m
Single wire, twisted ≥ 0.75 mm ²	110 m
Shielded cable ≥ 0.5 mm ²	1040 m
Recommended cable (shielded, shield connected to PE on one side)	J-Y (St) Y min. 2 x 0.8

Measuring ranges insulation fault location $I_{\Delta L}$

Rated frequency range	DC, 16.71000 Hz
Measuring range insulation fault location (IAL) EDS440	1.550 mA
Measuring range insulation fault location (IAL) EDS441	0.155 mA
Maximum permissible residual current	refer to "Diagrams" in the manua

Measuring range residual current measurement $I_{\Delta n}$

Measuring range residual current measurement ($I_{\Delta n}$) EDS440	0.120 A
Rated frequency range EDS440-x	501000 Hz
Measuring range residual current measurement ($I_{\Delta n}$) EDS441	0.12 A
Rated frequency range EDS441-x	5060 Hz

LEDs

AC/DC 24...240 V

ON (operation LED)	green
COM	yellow
SERVICE	yellow
IΔL ALARM	yellow
IΔn ALARM	yellow
112 channel indication	vellow

Digital inputs

Number	2
Operating mode, adjustable	active high, active low
Function	none, test, reset
Voltage level	Low DC -55 V, High DC 1132 V

Digital current output

none, $I_{\Delta L}$ alarm, $I_{\Delta n}$ alarm, device error,
onnection fault, common alarm, BS bus malfunction
0 mA DC inactive, 20 mA DC active
±10 %
$R \le 500 \ \Omega/P_{\rm R} \ge 0.25 {\rm W}$

Buzzer

profile-dependent, min. 6 s

≤ 400 ms

max. 18 min

Number	1
Function	none, $I_{\Delta L}$ alarm, $I_{\Delta n}$ alarm, device error,
	transformer connection fault, insulation fault location active, common alarm

Technical data (continued)

Interfaces	
Interface/protocol	RS-485 BS bus Modbus RTU
Data rate BS bus	9.6 kBaud/s
Data rate Modbus RTU	9.6 19.2 37.4 57.6 115 kBaud/s
Cable length	≤ 1200 m
Cable: twisted pair, one end of shield conn	ected to PE recommended: J-Y (St) Y min. 2 x 0.8
Connection	X1.A, X1.B
Terminating resistor	120 Ω , can be activated internally
Device address, BS bus	0, 279 (optional 0, 2159)
Switching elements	
Number	2 N/O contacts
Operating mode	N/C operation / N/O operation
Function contact 13,14	none, $I_{\Delta L}$ alarm, $I_{\Delta n}$ alarm, device error,
	CT connection fault, common alarm, BS bus malfunction
Function contact 23,24	none, $I_{\Delta L}$ alarm, $I_{\Delta n}$ alarm, device error,
	CT connection fault, common alarm, BS bus malfunction
Electrical endurance under rated operating	conditions 30000 hrs.
Rated operational voltage	AC 250 V
Rated operational current	7 A
Rated insulation voltage	4 kV
Contact data acc. to IEC 60947-5-1	
Utilisation category	AC-13 / AC-14 / DC-12 / DC-12 / DC-12 / DC-12
Rated operational voltage	230 V / 230 V / 24 V / 48 V / 110 V / 220 V
Rated operational current	5 A / 3 A / 1 A / 1 A / 0.2 A / 0.1 A
Max. switching capacity	300 W / 2770 VA
Max. switching voltage	DC 30 V / AC 277 V
Minimum contact rating	1 mA at AC/DC \geq 10 V
Environment/EMC	
EMC	IEC 61326-2-4
Ambient temperatures	
Operating temperature	-25 ℃ +55 ℃
Transport	-40 °C +85 °C
Storage	-25 °C+70 °C
Classification of climatic conditions ac	cc. 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 condition	
Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12

Screw-type terminals:	
Tightening torque	0.50.6 Nm (57 lb-in)
Conductor sizes	AWG 2412
Stripping length	7 mm
rigid/flexible	0.22.5 mm
flexible with ferrule, with/without plastic sleeve	0.252.5 mm
Multiple conductor	
rigid	0.21 mm
flexible	0.21.5 mm
flexible with ferrule without plastic sleeve	0.251 mm
flexible with TWIN ferrule with plastic sleeve	0.51.5 mm
Push-wire terminals:	
Conductor sizes	AWG 2412
Stripping length	10 mm
rigid/flexible	0.22.5 mm
flexible with ferrule, with/without plastic sleeve	0.252.5 mm
Multiple conductor, flexible with TWIN ferrule with plastic sleeve	0.51.5 mm
Push-wire terminals X1, X2:	
Conductor sizes	AWG 2416
Stripping length	10 mm
rigid/flexible	0.21.5 mm
flexible with ferrule without plastic sleeve	0.251.5 mm
flexible with ferrule with plastic sleeve	0.250.75 mm
Other	
Operating mode	continuous operation
Mounting	
at an ambient temperature > 55 °C	vertica
at an ambient temperature $<$ 55 $^{\circ}$ C	optiona
Degree of protection internal components	IP40
Degree of protection terminals	IP20
DIN rail mounting acc. to	IEC 60715
Screw fixing	2 x M4 with mounting clip
Enclosure material	polycarbonate
Flammability class	UL 94V-0
Dimensions (W x H x D)	72 x 93 x 63
Documentation number	D00201
Documentation number	

$\mbox{\em "W"}$ option data deviating from the standard version

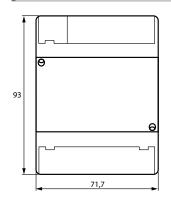
EDS44...-S

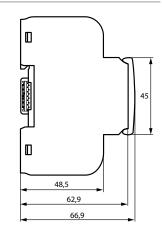
 $\mathsf{EDS44x\text{-}L}, \ldots \text{-}\mathsf{LAB}, \ldots \text{-}\mathsf{LAF}$

Devices with the suffix "W" feature increased shock and vibration resistance. The electronics is cov $ered\ with\ a\ special\ varnish\ to\ provide\ increased\ protection\ against\ mechanical\ stress\ and\ moisture.$

Ambient temperatures:	
Operating temperature	-40+70 ℃
Transport	-40+85 ℃
Long-term storage	-25+70 ℃
Classification of climatic conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3K23
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3M11

Dimension diagram (dimensions in mm)

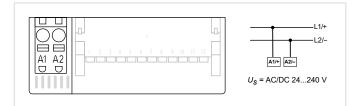




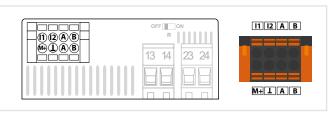
ca. 122 g

ca. 242 g

Connection to the voltage supply

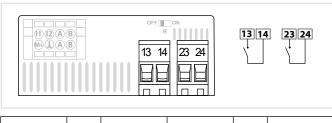


Connection to the X1 interface



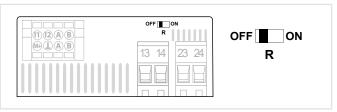
l1	Input 1	M+	Dig. current output
12	Input 2	1	Ground
Α	RS-485 A (input)	Α	RS-485 A (output)
В	RS-485 B (input)	В	RS-485 B (output)

Connection of relays



Alassa valas 1	13	N/O contact	Alauma malau 2	23	N/O someost
Alarm relay 1	14	N/O CONTACT	Alarm relay 2	24	N/O contact

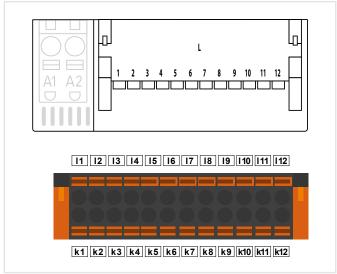
BS bus termination



Activating a terminating resistor to define the first and the last device in the bus system.

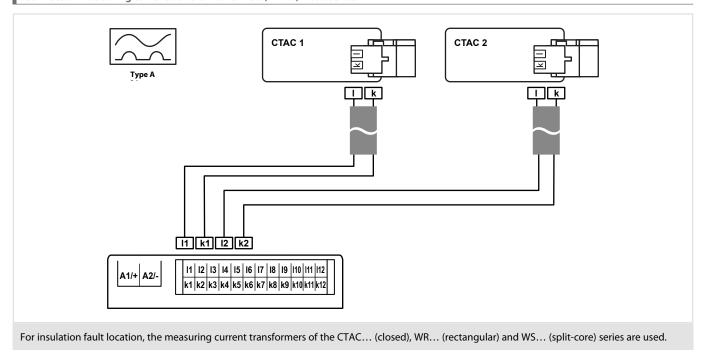
ON	First and last device in a bus	OFF	All devices between the first and the last device in the bus
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Connection to the k1-12/l1-12 interface

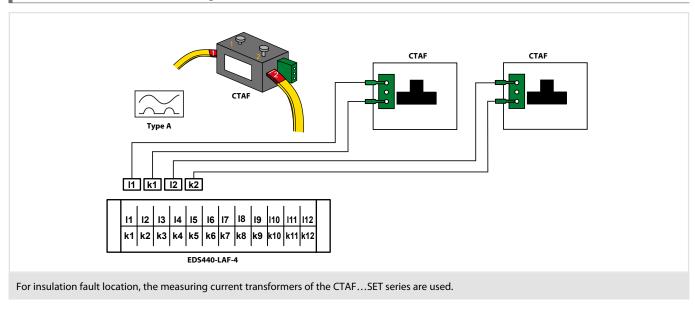


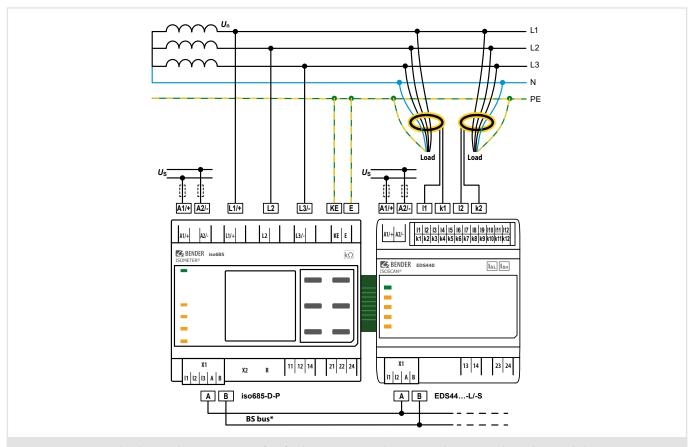
l1	Measuring CT 1	k1
12	Measuring CT 2	k2
13	Measuring CT 3	k3

14	Measuring CT 4	k4
l12	Measuring CT 12	k12



Connection of CTAF...SET series measuring current transformers to EDS440-LAF-4

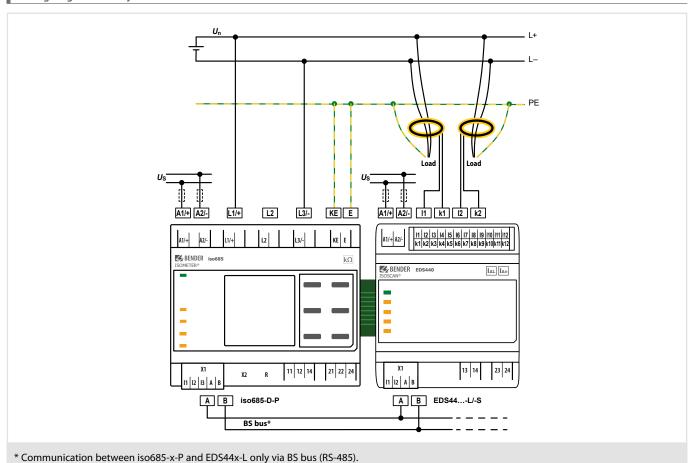


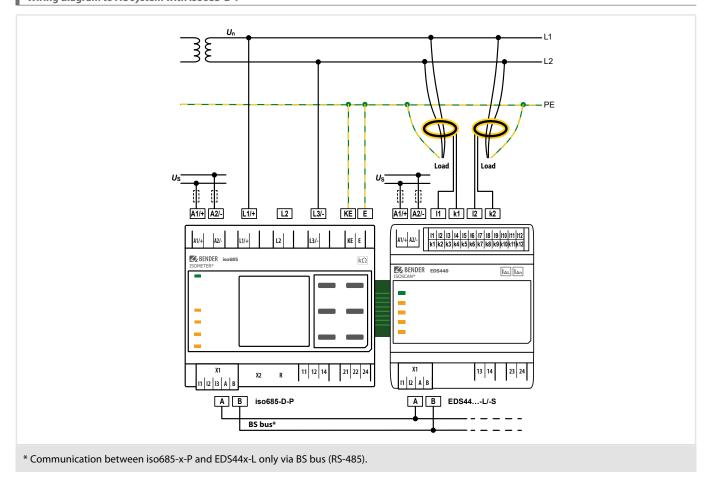


For systems > 690 V and with overvoltage category III a fuse for the connection to the system to be monitored must be provided. Recommendation: 2A fuses.

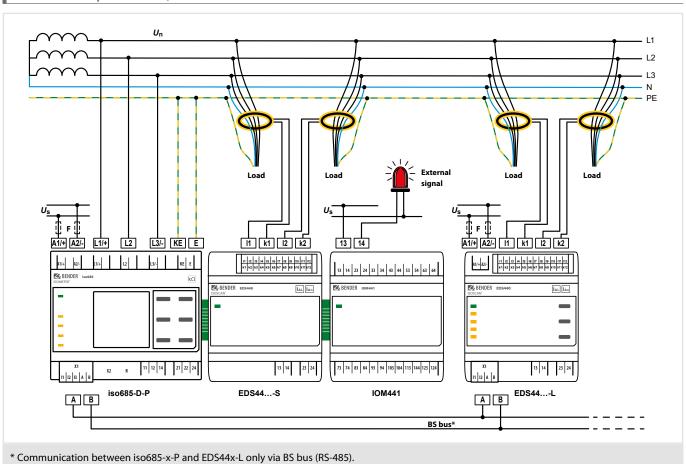
* Communication between iso685-x-P and EDS44x-L only via BS bus (RS-485).

Wiring diagram to DC system with iso685-D-P





Connection example: iso685-D-P, EDS440-S and EDS440-L



ISOSCAN® EDS150

Insulation fault locator with integrated measuring current transformers for EDS systems



Device features

- Insulation fault location in AC, AC/DC and DC IT systems
- 6 measuring channels with measuring current transformer per EDS150
- Up to 528 measuring channels can be combined by the BMS bus in the IT system being monitored: 88 x 6 measuring channels
- Response sensitivity 5 mA
- A response time of up to 8 s in the AC system acc. to IEC 61557-9
- · RS-485 interface with BMS protocol
- BMS address range 3...90
- · Cyclical self test

• Insulation fault location in AC, AC/ DC and DC IT systems

Typical applications

· DC main circuits in industrial plants, power stations and ships

Approvals





Standards

The ISOSCAN® complies with the requirements of the device standards:

- IEC 61557-9
- EN 61557-9
- DIN EN 61557-9
- IEC 61326-2-4

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Measuring range	Respons	se value	Supply voltage ¹¹ U₅	Art. No.	
		EDS function	RCM function			
EDS150	525 mA	5 mA	10 A	AC 1724 V, 5060 Hz / DC 1428 V	B91080103	

¹⁾ Absolutwerte

Accessories

Type designation	Art. No.
Mounting clip for DIN rail mounting	B91080110

Suitable system components

Description	Voltage supply	Output voltage	Explanation	Туре	Art. No.	Page
	AC 90264 V/DC 120370 V/4763 Hz	DC 24 V, 420 mA	For the supply of max. 6 EDS15	AN410	B924209	403
Power supply unit	AC 230 V/5060 Hz	AC 20 V, 500 mA	For the supply of max. 6 EDS15	AN450	B924201	405
	AC 127 V/5060 Hz	AC 20 V, 500 mA	For the supply of max. 6 EDS15	AN450-133	B924203	405



CAUTION! Only use power supply units according to IEC 60364-7-710!

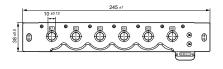
When using power supply units for the supply of EDS devices, only use power supply units providing protective separation (reinforced insulation) between the primary and secondary voltage, as stipulated in the IEC 60364-7-710 standard.

All power supply units listed in the table above comply with the requirements of this standard!

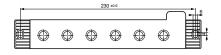
Technical data

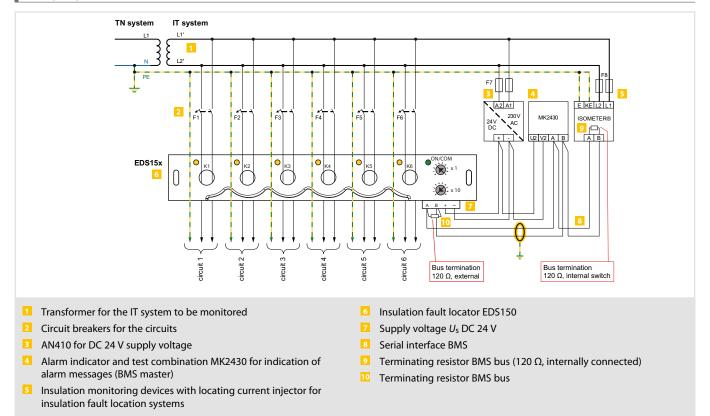
Environment/EMC	
EMC	IEC 61326-2-4
Operating temperature	-25+55 ℃
For UL application:	
Maximum ambient temperature 55 °C	
Classification of climatic conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions acc. to IEC 60721:	
	3M11
	2M4
Storage (IEC 60721-3-1)	1M12
Connection	
	pluggable push-wire terminal
	praggable pash while terminal
	0.21.5 mm ² (AWG 2416)
Multi-conductor connection (2 conductors of the same cross section)	
rigid / flexible	0.21.5 mm ²
flexible with ferrule without plastic sleeve	0.251.5 mm ²
flexible with ferrule with plastic sleeve	0.250.75 mm ²
Stripping length	10 mm
1 3	continuous operation
	any
	polycarbonate UL94 V-0
	2 x M6
	1.5 Nm
Documentation number	D00106
Weight	≤ 340 g
()* = factory setting	
. ,	
	EMC Operating temperature For UL application: Maximum ambient temperature 55 °C Classification of climatic conditions acc. to IEC 60721: Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 60721: Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type For UL application: Only use 60/75°C copper conductors! Connection rigid /flexible Multi-conductor connection (2 conductors of the same cross section) rigid / flexible flexible with ferrule without plastic sleeve flexible with ferrule with plastic sleeve Stripping length Other Operating mode Position of normal use Enclosure material Flammability class Screw mounting Tightening torque Documentation number Weight ()* = factory setting

Dimension diagrams (dimensions in mm)









ISOSCAN® EDS151

Insulation fault locator with integrated measuring current transformers for EDS systems



Device features

- · Insulation fault location in AC, AC/DC and DC IT systems
- 6 measuring channels with measuring current transformer per EDS151
- Up to 528 measuring channels can be combined by the BMS bus in the IT system being monitored: 88 x 6 measuring channels
- · Response sensitivity 0.5 mA
- A response time of up to 8 s in the AC system acc. to IEC 61557-9
- · RS-485 interface with BMS protocol
- BMS address range 3...90
- · Cyclical self test

Typical applications

- Insulation fault location in AC, AC/ DC and DC IT systems
- · DC main circuits in industrial plants, power stations and ships
- IT systems for medical locations and control circuits

Standards

The ISOSCAN® complies with the requirements of the device standards:

- IEC 61557-9
- EN 61557-9
- DIN EN 61557-9
- · IEC 61326-2-4

Approvals





Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Measuring range	Respons	se value	Supply voltage ¹¹ U₅	Art. No.	
		EDS function	RCM function			
EDS151	0,52,5 mA	0,5 mA	1 A	AC 1724 V, 5060 Hz / DC 1428 V	B91080101	

¹⁾ Absolutwerte

Accessories

Type designation	Art. No.
Mounting clip for DIN rail mounting	B91080110

Suitable system components

Description	Туре	Voltage supply	Output voltage	Explanation	Art. No.	Page
	AN410	AC 90264 V/DC 120370 V/4763 Hz	DC 24 V, 420 mA	For the supply of max. 6 EDS15	B924209	403
Power supply unit	AN450	AC 230 V/5060 Hz	AC 20 V, 500 mA	For the supply of max. 3 EDS15	B924201	405



CAUTION! Only use power supply units according to IEC 60364-7-710!

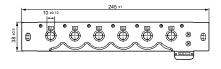
When using power supply units for the supply of EDS devices, only use power supply units providing protective separation (reinforced insulation) between the primary and secondary voltage, as stipulated in the IEC 60364-7-710 standard.

All power supply units listed in the table above comply with the requirements of this standard!

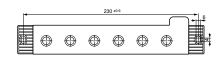
Technical data

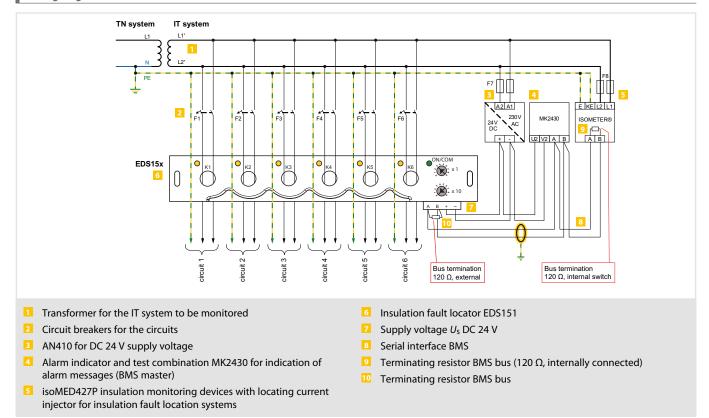
Rated insulation voltage	AC 250 V	EMC	IEC 61326-2-4
Rated impulse voltage	6 kV	Operating temperature	-25+55 °C
Pollution degree	3	For UL application:	
Voltage ranges		Maximum ambient temperature 55 °C	
		Classification of climatic conditions acc. to IEC 60721:	
IT system being monitored:	AC 20 27CV DC 20 200V	Stationary use (IEC 60721-3-3)	3K22
Nominal system voltage U _n	AC 20276 V, DC 20308 V	Transport (IEC 60721-3-2)	2K11
Nominal frequency f _n	42460 Hz	Long-term storage (IEC 60721-3-1)	1K22
Supply voltage:		Classification of mechanical conditions acc. to IEC 60721:	
Supply voltage $U_{\rm S}$	AC 1724 V, DC 1428 V	Stationary use (IEC 60721-3-3)	3M1°
Frequency range of the supply voltage	5060 Hz	Transport (IEC 60721-3-2)	2M ⁴
Power consumption		Storage (IEC 60721-3-1)	1M12
AC	≤ 3 VA		
DC	≤ 1.5 VA	Connection	
Measuring circuit		Connection type	pluggable push-wire termina
Number of measuring channels (per device/system)	6/528	For UL application:	
	0/328	Only use 60/75°C copper conductors!	
EDS function:		Connection	2
Response value	0.5 mA	rigid / flexible	0.21.5 mm ² (AWG 2416)
Relative uncertainty	±30 %	Multi-conductor connection (2 conductors of the same cross section)	
Rated frequency	42460 Hz	rigid / flexible	0.21.5 mm
Measuring range EDS function	0.52.5 mA	flexible with ferrule without plastic sleeve	0.251.5 mm
Response time in the AC system acc. to IEC 61557-9	≤ 8 s	flexible with ferrule with plastic sleeve	0.250.75 mm
Scanning time for all channels	approx. 72 s	Stripping length	10 mm
RCM function:		Other	
Response value	1 A	Operating mode	continuous operation
Relative uncertainty	±30 %	Position of normal use	any
Frequency range	4268 Hz	Enclosure material	polycarbonate
Displays		Degree of protection	polycarbonate
Displays		internal components	IP30
LEDs:		terminals	IP20
ON/COM, green	operation indicator/bus activity	Flammability class	UL94 V-0
Alarm K1K6, yellow	EDS and RCM function	Screw mounting	2 x M6
Interface		Tightening torque	1.5 Nm
Interface/protocol	RS-485/BMS	Documentation number	D00107
Connection	terminals A/B	Weight	≤ 340 c
Cable (twisted pair, one end of shield connected to PE)	two-core, recommended: J-Y(St)Y min. 2x0.8	()* = factory setting	
Cable length	two-core, recommended. 3-1(3t)1 min. 2x0.8 ≤ 1200 m	() — lactory setting	
Terminating resistor	120 Ω (0.25 W)		
Device address, BMS bus	390 (3)*		

Dimension diagrams (dimensions in mm)









ISOSCAN® EDS30...

Portable equipment for insulation fault location for unearthed and earthed systems (IT and TN systems) to be used in conjunction with or without equipment for insulation fault location



Typical applications

· IT systems with or without an incorporated equipment for insulation fault location (EDS)

Approvals



Device features

- Portable insulation fault location systems for IT systems AC 0...790 V/DC 0...960 V/42...460 Hz or de-energised systems
- Residual current measurement in TN/TT systems
- Use in main and control circuits, photovoltaic systems
- Measuring clamps 20/52 mm (115 mm optional)
- · Robust aluminium case, convenient to carry
- · Locating current injectors PGH18... with variable locating current 1...25 mA
- Integrated locating voltage for de-energised systems (PGH186)

Insulation fault locator EDS195P(M)

- Backlit LC display, 3 x 16 characters
- · Measuring clamps 20/52 mm included in the scope of delivery
- · Accumulator (delivered with a power supply unit)
- Response value insulation fault location 2...10 mA for main circuits
- Response value insulation fault location 0.2...1 mA for control circuits
- Response value residual current measurement 10 mA...10 A
- · Selectable operating mode insulation fault location/residual current measurement

Standards

Observe the applicable national and international standards. The series EDS309... complies with the standards:

- DIN VDE 0100-410 (VDE 0100-410) Low-voltage electrical installations - Part 4-41: Protection for safety - Protection against electric shock (IEC 60364-4-41, modified); German version HD 60364-4-41

Electrical safety in low voltage distribution systems up to 1000 V a.c. and 1500 V d.c. - Equipment for testing, measuring or monitoring of protective measures - Part 9: Equipment for insulation fault location in IT systems (IEC 61557-9); German version EN 61557-9

DIN EN 61010-1; VDE 0411-1 Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements (IEC 61010-1); German version EN 61010-1

Further information

For further information refer to our product range on www.bender.de.

Ordering information

		Scope of	delivery					
Туре	Insulation fault locator	Locating current injector	Measuring clamps 20 mm	Measuring clamps 52 mm	Supply voltage <i>U</i> s	Nominal voltage <i>U</i> n	Art. No.	
EDS3090	EDS195PM	-	PSA3020	PSA3052	-	AC 20575 V, 42460 Hz / DC 20504 V	B91082026	
EDS3090PG	EDS195PM	PGH185	PSA3020	PSA3052	AC 230 V, 5060 Hz	AC 20575 V, 42460 Hz / DC 20504 V	B91082021	
EDS3090PG-13	EDS195PM	PGH185-13	PSA3020	PSA3052	AC 90132 V, 5060 Hz	AC 20575 V, 42460 Hz / DC 20504 V	B91082022	
EDS3091	EDS195PM	-	PSA3320	PSA3352	-	AC 20265 V, 42460 Hz / DC 20308 V	B91082027	
EDS3091PG	EDS195PM	PGH185	PSA3320	PSA3352	AC 230 V, 50 60 Hz	AC 20265 V, 42460 Hz / DC 20308 V	B91082023	
EDS3091PG-13	EDS195PM	PGH185-13	PSA3320	PSA3352	AC 90132 V, 5060 Hz	AC 20265 V, 42460 Hz / DC 20308 V	B91082024	
EDS3092PG	EDS195PM	PGH183	PSA3320	PSA3352	AC 230 V, 50 60 Hz	AC 20265 V, 42460 Hz / DC 20308 V	D01002020	
ED33092PG	EDSTASEM	PGH185	PSA3020	PSA3052	AC 230 V, 50 60 Hz	AC 20575 V, 42460 Hz / DC 20504 V	B91082030	
EDS3096PG	EDS195PM	PGH186	PSA3020	PSA3052	AC 230 V, 5060 Hz	AC 0575 V, 42460 Hz / DC 0504 V	B91082025	
EDS3096PG-13	EDS195PM	PGH186-13	PSA3020	PSA3052	AC 90132 V, 5060 Hz	AC 0575 V, 42460 Hz / DC 0504 V	B91082029	
EDS3096PV	EDS195PM	PGH186	-	2 x PSA3052	AC 230 V, 5060 Hz	AC 0575 V, 42460 Hz / DC 0504 V	B91082031	

Туре	Designation	Nominal voltage <i>U</i> n	Art. No.
AGE185	Coupling device for increasing the voltage range of the PGH185/186	AC 42460 Hz, 500790 V; DC 400960 V	B980305
Adapter cable BNCPS2	Adapter cable for operating a WF current transformer on the EDS195PM	=	B91082045
EDS-SET	BNC T-connector and 2 BNC cables for fault location in diode-decoupled systems	=	B91082007
Plug power supply with USB connector	DC 5 V for external supply of the EDS195PM via µUSB connector	=	A167054
PSA3165	Clamp 115 mm for EDS3090 and EDS3096	=	B980852
CTAF	Clamp flexible for insulation fault location and differential method, with CTAF GEHÄUSE, CTAF500 BAND, CTAF1000 BAND, BNC cable, terminal, 2 × spare screws, case Only in combination with EDS195PM	1	B98080220
CTAF GEHÄUSE	CTAF enclosure as spare part for CTAF SET without BNC cable, with terminal and $2\times$ spare screws	=	B98110026
CTAF500 BAND	Band 500 mm as spare part for CTAF SET		B98110027
CTAF1000 BAND	Band 1000 mm as spare part for CTAF SET	_	B98110028

Technical data

Technical	data	EDS309:	svstem
· cciiiicai			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,

Valid for PGH18..., EDS195P(M), AGE185

nviro			

EMC	IEC 61326-2-4
Operating temperature	-10+55 ℃
Classification of climatic conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11
Storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions acc. to IEC 6072	1
Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M4
Long-time storage (IEC 60721-3-1)	1M12

otner	
Operating mode	continuous operation
Position of normal use	any
Weight EDS309	≤ 7000 g
Weight EDS309 with PSA3165	≤ 8500 g
Weight EDS3092	≤ 9000 g
Dimensions WxHxD	430 x 340 x 155 mm
Documentation number	D00012

PGH18...

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

Rated insulation voltage	AC 500 V
Rated impulse withstand voltage	4 kV
Pollution degree	3
Nominal system voltage <i>U</i> n	
PGH183	AC 20265 V 42460 Hz, DC 20308 V

(3)AC 20...575 V 42...460 Hz, DC 20...504 V

PGH186

PGH185

GH186 (3)AC 0575 V 42460 Hz, DC 0.	
Voltage supply	
Supply voltage $U_{\rm S}$	AC 230 V/5060 Hz
Operating range of $U_{\rm S}$	0.851.15 x <i>U</i> _s
Supply voltage $U_{\rm S}$ version -13	AC 90132 V/5060 Hz
Power consumption	
PGH183, PGH185	≤ 3 VA

PGH186 **Locating current**

PGH183	selectable: 1 / 2.5 mA
PGH185/186	selectable: 10 / 25 mA
Clock pulse	2 s
Idle time	4 s
Measuring voltage $U_{\rm m}$	

PGH186 Othor.

other	
Degree of protection, internal components DIN EN 60529 (VDE 0470-1)	IP40
Enclosure material	ABS plastic
Flammability class	UL94 V-0
Weight	≤ 700 g
Dimensions WxHxD	160 x 148 x 81 mm

EDS195P(M)

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

Voltage supply	
Pollution degree	3
Rated impulse withstand voltage	0.8 kV
Rated insulation voltage	50 V

Supply voltage $U_{\rm S}$	Rechargeable batteries, batteries or USB power supply unit
Accumulators	3 x NiMH R6 AA - 1.2 V - min. 2000 mAh
Hours of operation (without display illumin	nation) $\geq 150 \text{h}$
Charging time	≤ 5 h
Batteries	3 x LR6 AA — 1.5 V
USB power supply unit:	
Primary	100240 V, 5060 Hz

Secondary

Power consumption	≤ 0.5 W
Measuring circuit insulation	n fault location
Nominal system voltage	conductors uninsulated, including measuring clamp up to 600 V
Rated frequency	DC, 422000 Hz

Main circuit ($I_{Lmax} = 50 \text{ mA}$) Measuring range 2 mA...50 mA Measuring clamps PSA3020, PSA3052, PSA3165 Response value I_{AL}, adjustable 2...10 mA (5 mA)* Relative uncertainty $\pm 30 \%/\pm 2$ mA of the reference value

IILIOI CITCUIL (/Lmax = 3 IIIA)	
Measuring range	0.2 mA5 mA
Measuring clamps	PSA3320, PSA3352
Response value $I_{\Delta L}$, adjustable	0.21.0 mA (0.5 mA)*
Relative uncertainty 0.20.9 mA	± 30 %/ ± 0.2 mA of the reference value
Relative uncertainty 15 mA	± 30 %/ ± 2 mA of the reference value

Measuring circuit residual current

Measuring clamps PSA3020, PSA3052, PSA3165	
Measuring range	5 mA10 A (crest factor up to 3)
Response value I _{ΔL} , adjustable	10 mA10 A (100 mA)*
Measuring clamps PSA3320, PSA3352	
Measuring range	2 mA2 A (crest factor up to 3)
Response value $I_{\Delta L}$, adjustable	5 mA1 A (100 mA)*
Frequency range	421000 Hz
Relative uncertainty, 4260 Hz	±5 %
Relative uncertainty, 611000 Hz	±20 %

Harmonics, adjustable Inputs

 \leq 6 VA

DC 50 V

Hysteresis

Connection for measuring clamp	BNC plug
Connection for power supply unit (DC 5 V)	μUSB plug

Display

3×16 characters, switchable backlight	LCD
Alarm	LED

Other

Degree of protection, internal components DIN EN 60529 (VDE 0470-1)	IP40
Protection class acc. to IEC 60947-1, DIN EN 60947-1 (VDE 0660-100)	III
Enclosure material	ABS plastic
Flammability class	UL94 V-0
Weight	≤ 350 g
Software version	D399 V2.1
Dimensions WxHxD	84 x 197 x 30 mm

()* = Factory settings



DC 5 V, ±10 %

20 %

1st to 8th harmonic component

Measuring clamps

Note: The technical data for the CTA-F-set can be found at: https://www.bender.de/en/service-support/download-area/

Electrical safety

IEC 61010-2-030
2
III
600 V
AC 600 V CAT III resp. AC 300 V CAT IV
10 A / 10 mA
1 A / 0.1 mA
10 A / 10 mA
DE 0470-1) IP40
660-100) Class III
BNC plug
216 x 111 x 45 mm
135 x 65 x 30 mm
285 x 179 x 45 mm
52 mm
20 mm
115 mm
≤ 700 g
≤ 300 g
≤ 1300 g

AGE185

Insulation coordination acc. to IEC 60664-1

Rated insulation voltage	AC 1000 V
Rated impulse voltage	4 kV
Pollution degree	3
Nominal system voltage Un	(3)AC 500790 V, 42460 Hz; DC 400960 V

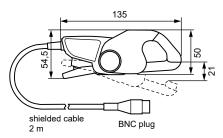
Other

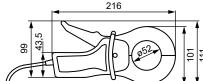
IP30	egree of protection, internal components DI
necting wire 1 mm ²	/pe of connection/cable:
≤ 200 g	/eight
88.5 x 42 x 21 mm	imensions W x H x D
88.5 x 42	· J ·

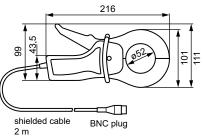
PSA3165

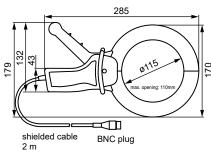
Dimension diagram (dimensions in mm)

PSA3020/3320

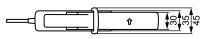


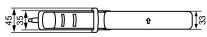




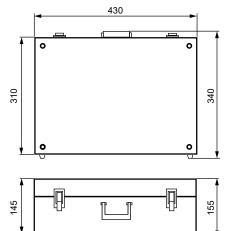






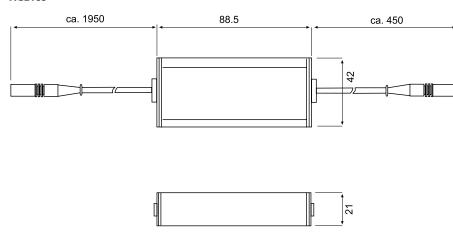


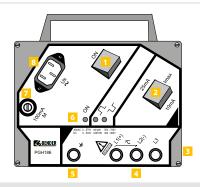
Alukoffer



AGE185

PSA3052/3352





- ON/OFF switch, switch test current on or off
- Selector switch for the maximum locating current 25/10 mA or 2.5/1 mA
- Not visible: Magnetic adhesive strip at the back of the enclosure for fixing to metal parts (e.g. switchboard cabinet)
- 3 sockets for system coupling
- Socket for PE connection

- 6 LED indicators:
 - "ON" Power On LED
- Indication of the positive clock pulse of the locating current T Indication of the negative clock pulse of the locating current
- Microfuse 100 mA
- Panel plug for supply voltage

Operating elements EDS195P(M)



- BNC connection for measuring clamp
- Measuring signal output for connecting to an oscilloscope (EDS195PM only)
- Micro USB connection for charging the device's rechargeable batteries
- LC display, illuminated, 3 lines of 16 characters
- **S ALARM** LED
 - · flashes if the response value is exceeded
 - · lights up continuously when the fault is cleared and the fault memory is activated
- 6 Control buttons

Control buttons

Select the operating mode:

Insulation fault location in IT systems (EDS mode) $I_{\Delta L}$

Residual current measurement in TN-S systems $I_{\Delta n}$ (RCM mode)

HOLD Save the measured value. HOLD

Move up in the menu, increase parameter values.

RESET Delete fault memory. RESET

Move down in the menu, reduce parameter values.

Switch display lighting on/off.

Select current transformer: 8

Display	Device	suitable for		
PSA30xx	PSA30/PSA3165	$I_{Lmax} = 50 \text{ mA}$		
CTAF		$I_{Lmax} = 50 \text{ mA}$ $I_{Lmin} = 25 \text{ mA}$		
W/WR/WS	W/WR/WS	$I_{Lmax} = 50 \text{ mA}$		
PSA33xx	PSA33	$I_{Lmax} = 5 \text{ mA}$		
W/WS-8000	W8000 / WS8000	$I_{Lmax} = 5 \text{ mA}$		
WF	WF	/An		

INFO

-\c\;-

INFO Display device info:

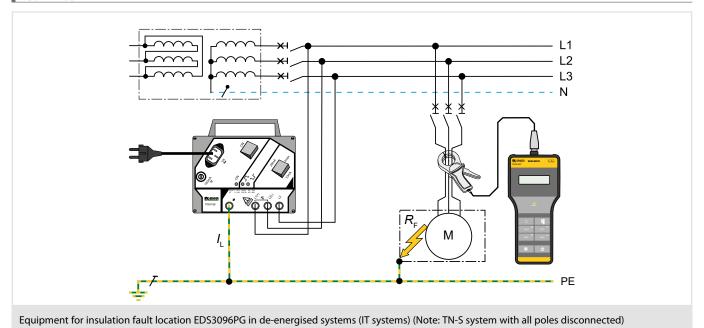
- · device type, date, time, manufacturer
- · software version
- Actual response values $I_{\Delta L}$ and $I_{\Delta n}$
- status word (setup status)

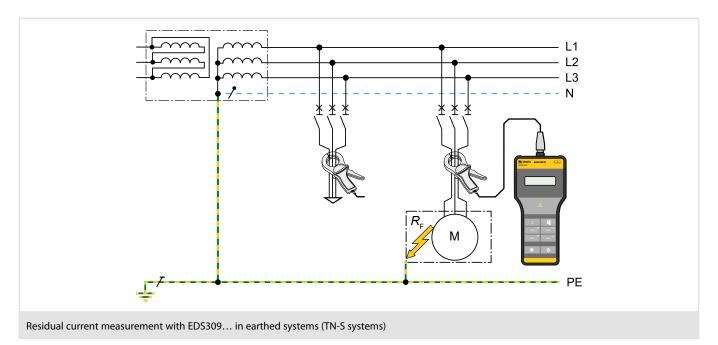
ESC Leave a menu function without changing parameters.

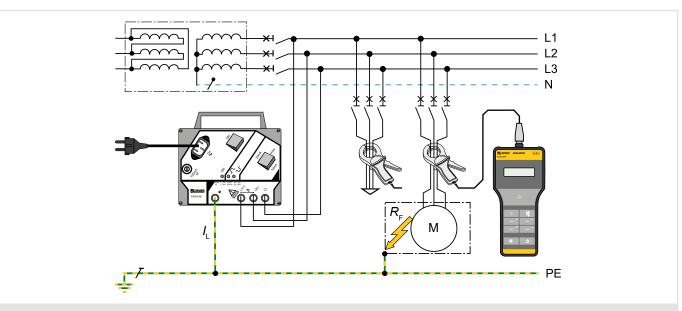
MENU Open the menu MENU

Accept modified parameter values or selected menu items.

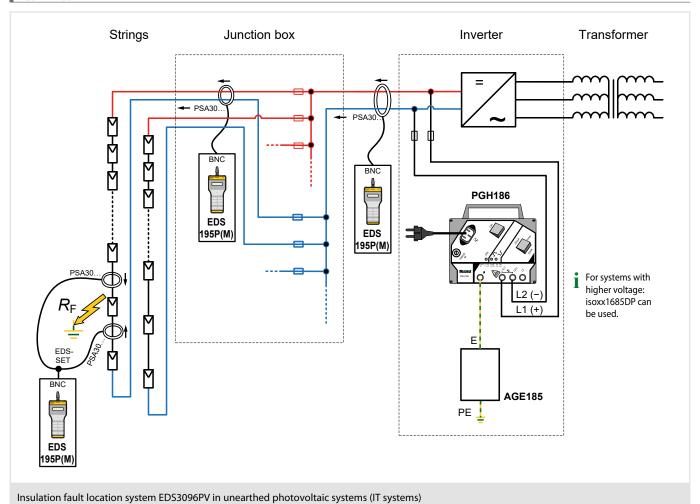
Switch device on/off. \bigcirc

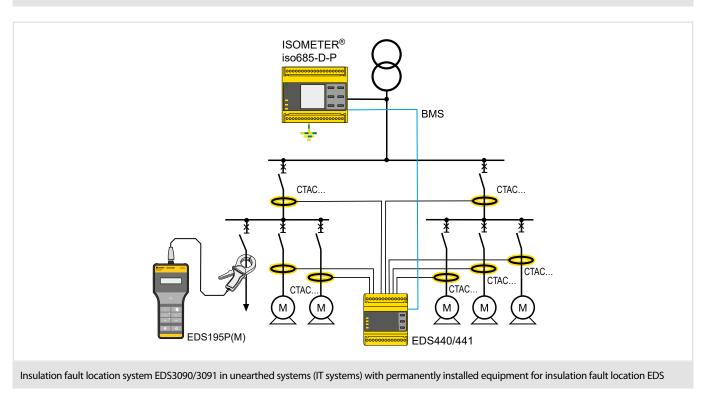






Equipment for insulation fault location EDS3090/3091PG for use in unearthed systems (IT systems) without a permanently installed equipment for insulation fault location





Device selection for IT systems with integrated equipment for insulation fault location

Type of distribution system	AC, DC, AC/DC (mixed systems)
Application range	Main circuits or Control circuits

Insulation monitoring device ISOMETER®/Locating current injector PGH

	The state of the s	
Туре	iso685-x-P	isoxx1685xP
Nominal system voltage <i>U</i> _n	AC 0690 V, DC 01000 V	isoLR1685DP: AC 0690, DC 0690 V iso1685DP: AC 01000 V, DC 01500 V
Locating current IL	1/1.8/2.5/5/10/25/50 mA	1/2.5/5/10/25/50 mA
Response values	1 kΩ…10 MΩ	iso1685DP: $20~\Omega\dots100~k\Omega$ iso1685DP: $200~\Omega\dots1~M\Omega$
LC display	graphic display	graphic display
Alarm relay	2 changeover contacts	3 changeover contacts
Interface/protocol	RS-485 (BS)	RS-485 (BS)
Address range	190	190

Insulation fault locator

Туре	EDS195P(M)	
LC display	3 x 16 characters	
Evaluating current I _{ΔL}	0.250 mA	
Response value	0.21/210 mA selectable	

Messzangen

Application range	Main circuits		Control circuits		
	O	Q <u>>0</u>	6 ₹0	O	Q <u>>0</u>
Туре	PSA3020	PSA3052	PSA3165 (optional)	PSA3320	PSA3352
20 mm	~			~	
52 mm		~			~
115 mm			~		

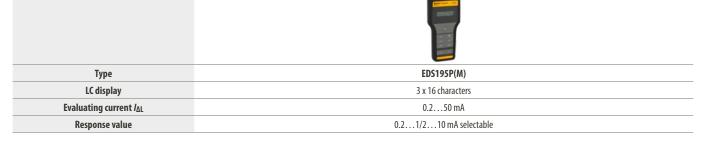
Complete systems

Туре	EDS3090		EDS3091
Comprising	Aluminium case, EDS195P(M), PSA3020, PSA3052, power supply unit	Aluminium case, EDS195P(M), PSA3020, PSA3052, power supply unit	Aluminium case, EDS195P(M), PSA3320, PSA3352, power supply unit

Device selection for IT systems without a permanently installed equipment for insulation fault location

Application	Main	circuit	Control circuit				
	energised	offline	energised				
	Locating current injector PGH						
Nominal system voltage \emph{U}_n	3AC, AC 20575 V DC 20504 V	3AC, AC 0575 V DC 0504 V	AC 20265 V, DC 20308 V				
<i>U</i> _s AC 230 V	PGH185 PGH186		PGH183				
<i>U</i> ₅ AC 90132 V	PGH185-13	PGH186-13	PGH183-13				
Locating current /L max.	10/25 mA	10/25 mA	1/2.5 mA				

Insulation fault locator



Measuring clamps

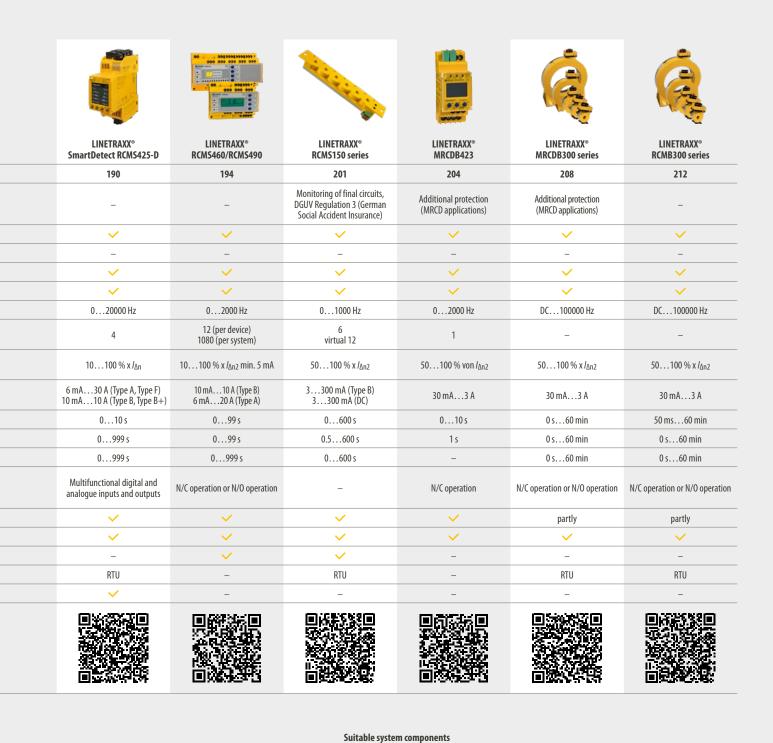


	Components EDS309																	
EDS195PM with Accessories							PGH18 with accessories for				Measuring clamps							
Device type	Aluminium case with carrying handle	Operating manual	Insulation fault locator	Clamping connector on 4 mm	Adapter BNC/4mm connector for curr. transform	Adapter BNC-PS2 for WF-CT, optional	Plug power supply for EDS195PM	Locating current injector	Supply cable for PGH18	Safety measuring cable, black	Safety measuring cable, green/yellow	Safety claw grip, black	Safety claw grip, green/yellow	Coupling device, optional (EDS3096PV only: in the scope of delivery)	Measuring clamps 20 mm	Measuring damps 52 mm	Measuring damps 115 mm, optional	EDS-Set, optional
EDS3090	1	1	EDS195PM	1	1	1	1								PSA3020	PSA3052	PSA3165	1
EDS3090PG	1	1	EDS195PM	1	1	1	1	PGH185	1	3	1	3	1	AGE185	PSA3020	PSA3052	PSA3165	1
EDS3090PG-13	1	1	EDS195PM	1	1	1	1	PGH185-13	1	3	1	3	1	AGE185	PSA3020	PSA3052	PSA3165	1
EDS3091	1	1	EDS195PM	1	1	1	1								PSA3320	PSA3352		1
EDS3091PG	1	1	EDS195PM	1	1	1	1	PGH183	1	3	1	3	1		PSA3320	PSA3352		1
EDS3091PG-13	1	1	EDS195PM	1	1	1	1	PGH183-13	1	3	1	3	1		PSA3320	PSA3352		1
EDS3092PG	1	1	EDS195PM	1	1	1	1	PGH183 PGH185	2	6	2	6	2		PSA3320 PSA3020	PSA3352 PSA3052		1
EDS3096PG	1	1	EDS195PM	1	1	1	1	PGH186	1	3	1	3	1	AGE185	PSA3020	PSA3052	PSA3165	1
EDS3096PG-13	1	1	EDS195PM	1	1	1	1	PGH186-13	1	3	1	3	1	AGE185	PSA3020	PSA3052	PSA3165	1
EDS3096PV	1	1	EDS195PM	-	-	-	1	PGH186	1	3	1	3	1	AGE185		2 x PSA3052		



Device overview residual current monitors LINETRAXX®

		180.	100.	100.		un un	
		LINETRAXX [®] RCM420	LINETRAXX [®] RCMA420	LINETRAXX [®] RCMA423	LINETRAXX® SmartDetect RCMS410	LINETRAXX® SmartDetect RCMS425-L	
Cat	talogue page	174	177	180	183	186	
	ial applications	-	-	-	-	-	
Type of distribution system	TN/TT	~	~	~	~	✓	
Typ distril sys	IT	-	-	_	-	-	
Residual	\cong	~	~	~	~	~	
Resi		-	~	~	~	~	
Rated	frequency range	422000 Hz	02000 Hz	02000 Hz	020000 Hz	020000 Hz	
Numb	er of measuring channels	1	1	1	4	4	
Response value	J _{Δn1}	50100 % x /∆n2	50100 % x /∆n2	50100 % x /∆n2	10100 % x /∆n	10100 % x /Δn	
Res	I _{Δn2}	10 mA10 A	10500 mA	30 mA3 A	6 mA30 A (Type A, Type F) 10 mA10 A (Type B, Type B+)	6 mA30 A (Type A, Type F) 10 mA10 A (Type B, Type B+)	
Resp	onse delay t _{on}	010 s	010 s	010 s	010 s	010 s	
Sta	rt-up delay t	010 s	010 s	010 s	0999 s	0999 s	
Delay	on release t _{off}	0300 s	099 s	099 s	0999 s	0999 s	
Opera a	ating principle, larm relays	N/C operation or N/O operation	N/C operation or N/O operation	N/C operation or N/O operation	N/C operation or N/O operation + Multifunctional digital and analogue inputs and outputs	N/C operation or N/O operation + Multifunctional digital and analogue inputs and outputs	
stalla- tion	DIN rail	~	~	~	~	~	
Installa- tion	Screw mounting	~	~	~	~	~	
S	BMS	-	-	-	-	-	
Interfaces	Modbus	-	-	-	RTU	RTU	
Ξ	NFC	-	-	-	~	~	
(oduct details (Products on w.bender.de/en)						
	Type C. p.			Suitable system components			
	CTAC 359	~	-	-	~	~	
	CTAS 362	~	-	_	~	~	
ŧ	W 365	✓	-	-	~	~	
Measuring current transformers	WS 367	~	-	-	~	~	
uring	WSS 369	~	-	_	~	~	
Meast	WRS(P) 371	~	-	-	~	~	
~	WF 373	-	-	-	-	-	
	CTUB100 376	-	~	~	~	~	
	CTBS25 380	-	-	_	~	~	
RS-485 repeater	, DI-1DL 408	-	-	-	-	-	
Power suppunits	Ply STEP-PS 400	-	-	-	~	~	

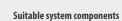


Device overview residual current monitors LINETRAXX®

			The state of the s		D T Table 19 Control 1
		LINETRAXX [®] RCMB330	LINETRAXX° CEP410R-2	LINETRAXX® RCM410R	RCMB131-01
Ca	talogue page	216	219	222	225
	cial applications	-	Monitoring at central earthing point (CEP)	-	Monitoring of final circuits, integration in power distribution units (PDUs)
Type of distribution system	TN/TT	✓	~	~	~
Typ distr on sy	IT	-	-	_	-
Residual	\cong	✓	~	✓	~
Resi	===	~	-	~	~
Rated	frequency range	DC100000 Hz	4270 Hz	4270 Hz	DC2000 Hz
Numl	ber of measuring channels	-	1	-	-
Response value	<i>I</i> Δn1	50100 % x / _{Δn2}	50100 % x /Δn	50100 % x /Δn	3,5100 mA (DC)
Resp	I _{Δn2}	30500 mA	10 mA30 A	10 mA30 A	3,5100 mA (r.m.s.)
Res	ponse delay t _{on}	50 ms60 min	010 s	010 s	-
St	art-up delay t	0 s60 min	0900 s	0900 s	-
Dela	y on release t _{off}	0 s60 min	0900 s	0900 s	-
Opei	rating principle, alarm relays	-	N/C operation or N/O operation	N/C operation or N/O operation	-
alla-	DIN rail	✓	~	✓	~
Inst	Screw mounting	✓	~	✓	~
S	BMS	-	-	-	-
alarn	Modbus	RTU	RTU	RTU	RTU
<u>=</u>	NFC	-	~	~	-
	roduct details (Products on rw.bender.de/en)				

	Type	С. р.		Suitable system	m components	
	CTAC	359	-	~	✓	-
	CTAS	362	_	~	~	-
=	W	365	_	~	~	_
Measuring current transformers	WS	367	-	~	~	-
ring c	WSS	369	-	~	✓	_
easu	WRS(P)	371	-	~	✓	_
≥	WF	373	-	+	-	-
	CTUB100	376	_	+	-	_
	CTBS25	380	-	+	-	-
RS-485 repeater	DI-1DL	408	-	-	-	-
Power supply units	STEP-PS	400	~	~	~	~





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-	-	-	-
_	-	-	-
_	-	-	-
_	-	-	-
-	-	-	-
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-	-	-	-
-	-	-	-
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LINETRAXX® RCM420

Residual current monitor for AC current monitoring in TN and TT systems





Typical applications

- · Residual current monitoring in earthed 2, 3 or 4-conductor systems
- · Current monitoring of, in the normal case, de-energised single conductors
- · Socket-outlet circuits for devices which are operated unattended for a long time and which may not fail
- · Alarm systems, safety devices
- Air conditioning systems, EDP systems
- Cooling equipment with valuable frozen goods
- · Canteen kitchens
- · Monitoring of earthed power supplies for stray currents
- · Impact on N conductors
- · Trace heating systems

Device features

- AC and pulsed DC sensitive residual current monitor Type A according to DIN EN 62020
- · Adjustable switching hysteresis
- RMS value measurement
- Starting delay, response delay and delay on release
- · Measured value display via multifunctional LC display
- Alarm indication via LEDs (AL1, AL2) and changeover contacts (K1, K2)
- N/C operation or N/O operation selectable
- Password protection against unauthorized parameter changing
- · Fault memory function can be switched off
- CT connection monitoring

Approvals







UL508 - Standard for Industrial Control Equipment CSA C22.2 No. 14-13 - Industrial Control Equipment UL File number E173157 (for all RCM420)

UL1053 – Standard for Safety Ground-Fault Sensing and Relaying Equipment UL File number E478610

(Only for B74014002 and B94014002 and solely in combination with Marina Guard MG-1.3 and MG-T.3. If necessary, other applications are to be evaluated separately after consulting the manufacturer.)

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Supply voltage ¹⁾ U _S	Art. No.		
.,,,,,	5pp., 101gu 05	Screw-type terminal	Push-wire terminal	
RCM420-D-1	AC 1672 V, 40460 Hz / DC 9,694 V	B94014001	B74014001	
RCM420-D-2	AC 70300 V, 40460 Hz / DC 70300 V	B94014002	B74014002	

¹⁾ Absolute values

Accessories

Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B 9806 0008

Suitable system components

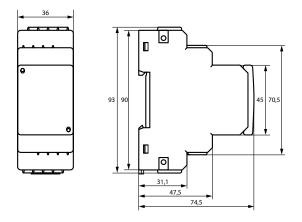
Description	Type of construction	Туре	Art. No.	Page
	circular	CTAC	B981100	359
Measuring current transformers	rectangular	WRS(P)	B9117	371
	split-core	WS	B980806	367

Insulation coordination acc. to IEC 60664-1/IEC 60664-3		Switching elements	
RCM420-D-1		Number of switching elements	2 x 1 changeover contact
Rated insulation voltage	100 V	Operating principle N/C	operation/ N/O operation (N/O operation)*
Overvoltage category/pollution degree	III/3	Electrical service life under rated operating conditions	10000 switching operations
Rated impulse voltage	2,5 kV	Minimum contact load (relay manufacturer's reference)	10 mA/5 V DC
RCM420-D-2	,	Contact data acc. to IEC 60947-5-1:	
Rated insulation voltage	250 V	Utilization category	AC-13 / AC-14 / DC-12 / DC-12 / DC-12
Overvoltage category/pollution degree	III/3	Rated operational voltage	230 V / 230 V / 24 V / 110 V / 220 V
Rated impulse voltage	4 kV	Rated operational voltage UL	200 V / 200 V / 24 V / 110 V / 200 V
nated impuise voitage	TRV	Rated operational current	5 A / 3 A / 1 A / 0.2 A / 0.1 A
Supply voltage		Environment/EMC	
RCM420-D-1		EMC	DIN EN 62020
Supply voltage range $U_{\rm S}$	AC 2460 V/DC 2478 V	Operating temperature	-25+55 °C
Operating range $U_{\rm S}$	AC 1672 V/DC 9.694 V	. , ,	
Frequency range <i>U</i> _S	DC, 42460 Hz	Classification of climatic conditions acc. to IEC 6072	1
RCM420-D-2		(related to temperature and relative humidity)	21/22
Supply voltage range $U_{\rm S}$	AC/DC 100250 V	Stationary use (IEC 60721-3-3)	3K22
Operating range $U_{\rm S}$	AC/DC 70300 V	Option W	3K23
Frequency range U_s	42460 Hz	Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1)	2K11 1K22
Protective separation (reinforced insulation) between			
·	(k/l, T/R) - (11, 12, 14) - (21, 22, 24)	Classification of mechanical conditions acc. to IEC 6	
Voltage test according to IEC 61010-1	2.21 kV	Stationary use (IEC 60721-3-3)	3M11
Power consumption	≤ 6.5 VA	Option W Transportation (IEC 60721-3-2)	3M12
·		Storage (IEC 60721-3-1)	2M4 1M12
Measuring circuit		Storage (IEC 60721-3-1)	IMIZ
External measuring current transformer type	CTAC, WR, WS	Connection	
Load	68 Ω	For UL application:	
Rated insulation voltage (measuring current transformer)	800 V	Use copper conductors only!	
Operating characteristic acc. to DIN EN 62020	type A 422000 Hz	Use 60/70 °C copper conductors only!	
Frequency range Measuring range	3 mA16 A	Screw-type terminal	
Relative uncertainty	020 %	Connection properties:	
Operating uncertainty	030 %	rigid/flexible	0.24/0.22.5 mm ² (AWG 2412)
· · · · ·	030 /0	Two conductors with the same cross section:	0.2 170.22.3 11111 (11110 2 1 12)
Response values		rigid/flexible	0.21.5/0.21.5 mm ²
Rated residual operating current $I_{\Delta n1}$ (prewarning, AL1)	50100 % x /Δn2, (50 %)*	Stripping length	89 mm
Rated residual operating current $I_{\Delta n2}$ (Alarm, AL2)	10 mA10 A (30 mA)*	Tightening torque, terminal screws	0.50.6 Nm
Hysteresis	1025 % (15%)*	Push-wire terminals	
Specified time		Connection properties:	
Starting delay t	010 s (0.5 s)*	rigid	0.22.5 mm ² (AWG 2414)
Response delay t _{on2} (Alarm)	010 s (0 s)*	flexible without ferrules	0.752.5 mm ² (AWG 1914)
Response delay $t_{0,1}$ (prewarning)	010 s (1 s)*	flexible with ferrules	0.21.5 mm ² (AWG 2416)
Delay on release t_{off}	0300 s (1 s)*	Stripping length	10 mm
Operating time t_{ae} at $I_{\Delta n} = 1$ x $I_{\Delta n1/2}$	≤ 180 ms	Opening force	50 N
Operating time t_{ae} at $I_{\Delta n} = 5 \times I_{\Delta n 1/2}$	≤ 30 ms	Test opening, diameter	2.1 mm
Response time t_{an}	$t_{\rm an} = t_{\rm ae} + t_{\rm on1/2}$	Other	
Recovery time t _b	≤ 300 ms	- · · · · ·	continuous aparation
Number of reload cycles	0100 (0)*	Operating mode Position of normal use	continuous operation
Displays, memory		Protection class, internal components (DIN EN 60529)	any IP30
• • •	2 m Å 1 / Å	Degree of protection, terminals (DIN EN 60529)	IP20
Display range, measured value Error of indication	3 mA16 A ± 15 %/± 2 digit	Enclosure material	polycarbonate
Measured-value memory for alarm value	data record measured values	Flammability class	UL94V-0
Password	off/0999 (OFF)*	DIN rail mounting acc. to	IEC 60715
Fault memory alarm relay	on/off (off)*	Screw mounting	2 x M4 with mounting clip
, ,	011/011 (011)	Documentation number	D00057
Inputs/outputs		Weight	≤ 150 g
Cable length for external test/reset button	010 m	()* = factory setting	
Cable lengths for measuring current transformers		,,	
Single wire $\geq 0.75 \text{ mm}^2$	01 m		
Single wire, twisted $\geq 0.75 \text{ mm}^2$	010 m		
Shielded cable ≥ 0.75 mm ²	040 m		
Cable (shielded, shield on one side connected to terminal I of the			
recommended	CAT6/CAT7 min. AWG23		
alternatively	J-Y(St)Y min. 2x0.8		

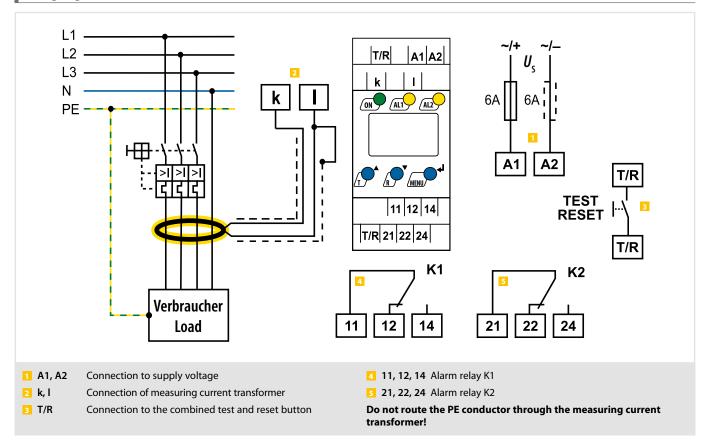
screw terminals



Connection



Wiring diagram



LINETRAXX® RCMA420

Residual current monitor for monitoring AC, DC and pulsed DC currents in TN and TT systems





Typical applications

- AC/DC sensitive residual current monitoring in earthed two, three or four conductor systems (TN and TT systems)
- · Monitoring of variable-speed drives, UPS systems, construction site equipment, printing machines, battery systems, laboratory equipment, wood working machines, MF welding systems, furniture industry, medical electrical equipment, etc.
- · AC/DC sensitive current monitoring of, in the normal case, de-energised single conductors (e.g. N and PE conductors)

Approvals







Ordering information

Art. No.		
Push-wire terminal	Screw-type terminal	
B74043001	B94043001	
B74043002	B94043002	

¹⁾ Absolute values

Accessories

Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B 9806 0008

Device features

- AC/DC sensitive residual current monitor Type B according to IEC 62020 and IEC 60755
- Two separately adjustable response ranges (prewarning, alarm)
- Adjustable switching hysteresis
- RMS value measurement
- · Starting delay, response delay and delay on release
- Measured value display via multifunctional LC display
- Alarm indication via LEDs (AL1, AL2) and changeover contacts (K1, K2)
- N/C operation or N/O operation selectable
- · Password protection against unauthorized parameter changing
- Fault memory function can be switched off
- · CT connection monitoring

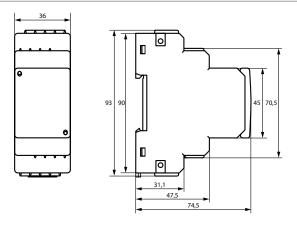
Further information

For further information refer to our product range on www.bender.de.

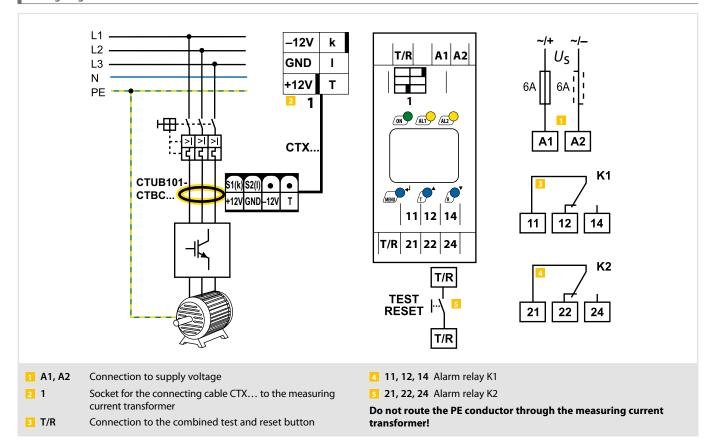
Suitable system components

Description	Type of construction	Туре	Art. No.	Page
Measuring current transformers	circular	CTUB100	B781200	376
Connecting cables for Measunging current transformers	-	СТХ	B9811008	376

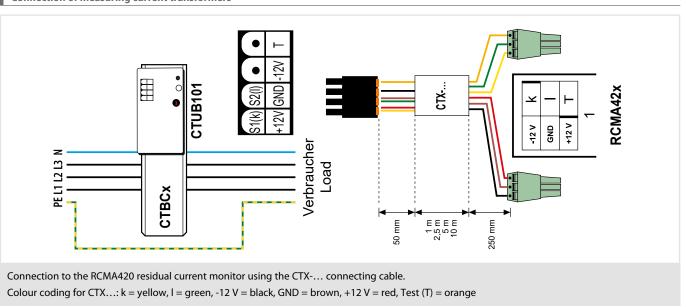
Insulation coordination acc. to IEC 60664-1/IEC 606	664-3	Inputs/outputs	
RCMA420-D-1:		Cable length for external test/reset button	010 m
Rated insulation voltage	100 V		
Overvoltage category/pollution degree	III/3	Cable lengths for measuring current transformers	
Rated impulse voltage	2.5 kV/3	Connection CTX	1 m/2.5 m/5 m/10 m
	2.5 KV/5	or alternatively: single wire 6 x 0.75 mm ²	010 m
RCMA420-D-2:	250 V	Switching elements	
Rated insulation voltage Overvoltage category/pollution degree	Z50 V III/3	Number of switching elements	2 x 1 changeover contact
Rated impulse voltage	4 kV		I/C operation/N/O operation (N/C operation)*
nateu impuise voitage	4 KV	Electrical service life under rated operating conditions	10000 switching operations
Supply voltage		Contact data acc. to IEC 60947-5-1	
RCMA420-D-1:		Utilization category	AC-13 / AC-14 / DC-12 / DC-12 / DC-12
Supply voltage range $U_{\rm S}$	AC 2460 V/DC 2478 V	Rated operational voltage	230 V / 230 V / 24 V / 110 V / 220 V
Operating range $U_{\rm S}$	AC 1672 V/DC 9.694 V	Rated operational voltage UL	200 V / 200 V / 24 V / 110 V / 200 V
Frequency range $U_{\rm S}$	DC, 42460 Hz	Rated operational current	5 A / 3 A / 1 A / 0.2 A / 0.1 A
RCMA420-D-2:		Minimum contact load (relay manufacturer's reference)	10 mA/5 V DC
Supply voltage range $U_{\rm S}$	AC/DC 100250 V		
Operating range U_S	AC/DC 70300 V	Environment/EMC	
Frequency range $U_{\rm S}$	DC, 42460 Hz	EMC	DIN EN 62020
· · ·	(A1, A2) - (k/l, T/R) - (11, 12, 14) - (21, 22, 24)	Operating temperature	-25+55 ℃
Voltage test according to IEC 61010-1	2.21 kV	Classification of climatic conditions acc. to IEC 60721	related to temperature and relative humidity):
Power consumption	≤ 6.5 VA	Stationary use (IEC 60721-3-3)	3K22
·	<u> </u>	Transportation (IEC 60721-3-2)	2K11
Measuring circuit		Storage (IEC 60721-3-1)	1K22
External measuring current transformer	CTUB101-CTBC2060	Classification of mechanical conditions acc. to IEC	60721:
Rated insulation voltage (measuring current transforme	r) 800 V	Stationary use (IEC 60721-3-3)	3M11
Operating characteristic acc. to DIN EN 62020	type B	Transportation (IEC 60721-3-2)	2M4
Frequency range	02000 Hz	Storage (IEC 60721-3-1)	1M12
Measuring range AC	01.5 A	Connection	
Measuring range DC	0600 mA		
Relative uncertainty for f	0 35.0/	For UL applications: use 60°C/70°C copper conductors only	
≤ 2 Hz > 2<16 Hz	035 % -35+100 %		
> 2 < 10 Hz ≥ 16 ≤ 1000 Hz	-55+100 % 035 %	Screw-type terminal	
≥ 10 ≤ 1000 Hz > 1000 ≤ 2000Hz	± 35 %	Connection properties:	0.2 4/0.2 2.5 (ANNC 24 12)
Operating uncertainty	±17.5 %	rigid/flexible Two conductors with the same cross section:	0.24/0.22.5 mm ² (AWG 2412)
operating uncertainty	±17.5 70	rigid/flexible	0.21.5/0.21.5 mm ²
Response values		Stripping length	89 mm
Rated residual operating current $I_{\Delta n1}$ (prewarning, AL1)	50100 % x / _{Δn2} , (50 %)*	Tightening torque, terminal screws	0.50.6 Nm
Rated residual operating current $I_{\Delta n2}$ (Alarm, AL2)	10500 mA (30 mA)*	<u> </u>	0.50.0 11111
Hysteresis	1025 % (15%)*	Push-wire terminals Connection properties:	
Specified times		rigid	0.22.5 mm ² (AWG 2414)
Starting delay t	010 s (0.5 s)*	flexible without ferrules	0.752.5 mm² (AWG 2414)
Response delay t _{on1} (prewarning)	010 s (1 s)*	flexible with ferrules	0.21.5 mm² (AWG 2416)
Response delay t _{on2} (alarm)	010 s (0 s)*	Stripping length	10 mm
Delay on release toff	099 s (1 s)*	Opening force	50 N
Operating time t_{ae} at $I_{\Delta n} = 1 \times I_{\Delta n1/2}$	≤ 180 ms	Test opening, diameter	2.1 mm
Operating time t_{ae} at $l_{\Delta n} = 5 \times l_{\Delta n 1/2}$	≤ 30 ms		
Response time t _{an}	$t_{\rm an} = t_{\rm ae} + t_{\rm on1/2}$	Other	
Recovery time t _b	≤ 300 ms	Operating mode	continuous operation
Number of reload cycles	0100 (0)*	Position of normal use	display-oriented
Dienlave moment		Degree of protection, internal components (IEC 60529)	IP30
Displays, memory	0 154	Degree of protection, terminals (IEC 60529)	IP20
Display range, measured value AC	01.5 A	Enclosure material	polycarbonate
Display range, measured value DC	0600 mA	Flammability class	UL94V-0
Error of indication	±17.5 %/± 2 digit	DIN rail mounting acc. to	IEC 60715
Measured-value memory for alarm value Password	data record measured values off/0999 (off)*	Screw fixing Documentation number	2 x M4 with mounting clip D00059
Fault memory alarm relay	on/off (on)*	Weight	≤ 150 q
i aut memory alami relay	011/011 (011)		≥ 130 g
		()* = factory setting	



Wiring diagram



Connection of measuring current transformers



LINETRAXX® RCMA423

Residual current monitor for monitoring AC, DC and pulsed DC currents in TN-and TT systems







Typical applications

- AC/DC sensitive residual current monitoring in earthed two, three or four conductor systems (TN and TT systems)
- Monitoring of variable-speed drives, UPS systems, construction site equipment, printing machines, battery systems, laboratory equipment, wood working machines, MF welding systems, furniture industry, medical electrical equipment, etc.
- · AC/DC sensitive current monitoring of, in the normal case, de-energised single conductors (e.g. N conductors)

Device features

- AC/DC sensitive residual current monitor Type B according to IEC 62020 and IEC 60755
- Two separately adjustable response ranges (prewarning, alarm)
- Adjustable switching hysteresis
- RMS value measurement
- · Starting delay, response delay and delay on release
- Measured value display via multifunctional LC display
- Alarm indication via LEDs (AL1, AL2) and changeover contacts (K1, K2)
- N/C operation or N/O operation selectable
- · Password protection against unauthorized parameter changing
- Fault memory function can be switched off
- · CT connection monitoring

Further information

For further information refer to our product range on www.bender.de.

Approvals







Ordering information

Type	Supply voltage¹ <i>U</i> s	Art. No.	
1762	Supply to lage 05	Screw-type terminal	Push-wire terminal
RCMA423-D-1	AC 1672 V, 42460 Hz / DC 9.694 V	B94043023	B74043023
RCMA423-D-2	AC 70300 V, 42460 Hz / DC 70300 V	B94043025	B74043025

¹⁾ Absolute values

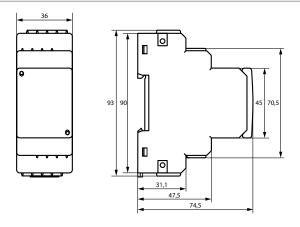
Accessories

Description	Art. No.	
Mounting clip for screw mounting (1 piece per device)	B 9806 0008	

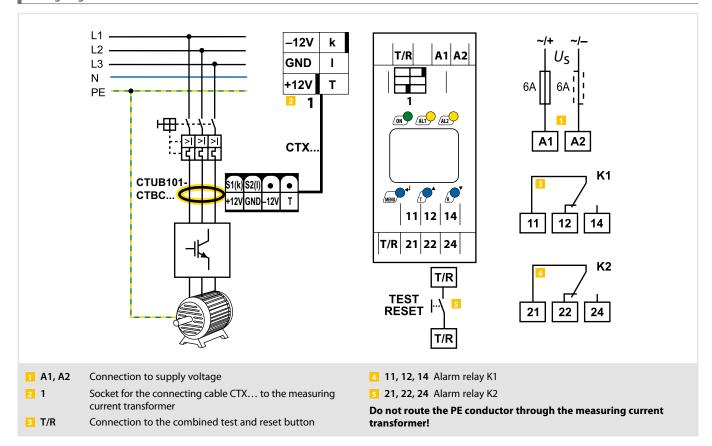
Suitable system components

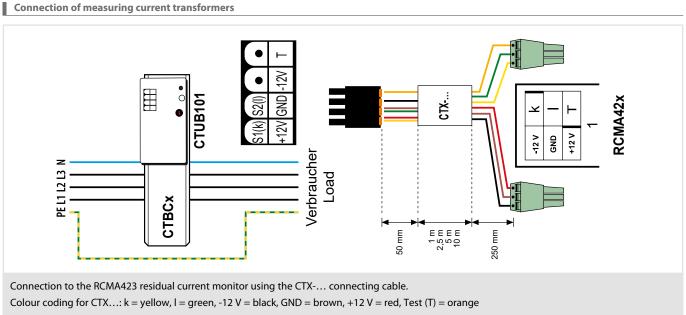
Description	Type of construction	Туре	Art. No.	Page
Measuring current transformers	circular	CTUB100	B781200	376
Connecting cables for Measunging current transformers	_	СТХ	B9811008	376

Sealed insolution voltage 1909	Insulation coordination acc. to IEC 60664-1/IEC 60664-3	Cable lengths for measuring current transformers
Alternatives Supply work Alternatives Alternatives Supply work	RCMA423-D-1:	Connection CTX 1 m/2.5 m/5 m/10 m
Rate displace voltage 9.5		or alternatively: single wire 6 x 0.75 mm ² 010 m
Rated injustive voltage (Overvoltage category/pollution degree III/3	Switching elements
Partical final final found to ording acting prolypollution degree 1808	Rated impulse voltage 2.5 kV	
Rized insigation voltage Series S	RCMA423-D-2:	
Marted imagine with optimished integers	Rated insulation voltage 250 V	1 31 1
Supply workage Supply wor	Overvoltage category/pollution degree III/3	
Supply voltage	Rated impulse voltage/pollution degree 4 kV	
RAMA23-D-1: Supply voltage range Us AC 24., 60 V/D 24., 78 V/D 26., 50 V/D 26., 5	Sunnly voltage	
Supply vallage range \(\)		
Supply voltage range us		
Frequency range ls		
Supply values range Us		F
Supply wildage range U5		
Protective sparation (reinforced insulation) between	117 3 3 -	1 3 1
Protective separation (reinforced insulation) between (A1, A2) -(I/I, T/R) -(II, 12, 14) -(12, 12, 24) Value gets a cording to IEC (61016-1	1 7 7 -	
Variage test according to IEC 6101-01 2.21 km 6.5 km 5.5	<u> </u>	
Power consumption	•	·
Classification of mechanical conditions act. to IRC 60721-3-1 Stationary use (IRC 60721-3-2)		Storage (IEC 60721-3-1) 1K22
External measuring current transformer CTUB101-CTBC20210(p) Rate dinsulation voltage (measuring current transformer) 800 V 800 perating characteristic act. to IDN EN 62020 and IE 60755 5 Usp B Rate direquency 02000 ht	Tower consumption 5 0.5 VA	Classification of mechanical conditions acc. to IEC 60721:
Storage (IEC 60721-3-1) MM.	Measuring circuit	•
Operating daracteristic acc. to DIN EN 62020 and IEC 60755 type B Connection Rated frequency 02000 hz TU Lapplications: ≤ 2 Hz 035 mg See" CVTOPC copper conductors only ≤ 2 Hz 035 mg See" CVTOPC copper conductors only ≤ 16 ≤ 1000 Hz 035 mg See" Value 0 perating uncertainty ±17,5 mg Connection properties: 0 perating uncertal function prewarning, AL1) 50100 % of fana (50 mg)* figid/flexible 0.24/0225 mm² (AWG 2412 1 pytesfield time 102 5 (%) % (15 mg)* figid/flexible 0.24/0225 mm² (AWG 2412 5 pecified time 102 5 (%) % (15 mg)* figid/flexible 0.24/0225 mm² (AWG 2412 5 pecified time 5 mg 5 mg		
Relate frequency 02000 Hz Connection report in case bet lan = 1 x lan1/2 Connection report in case bet lan = 1 x lan1/2 Connection report in case bet lan = 1 x lan1/2 Connection report in case bet lan = 1 x lan1/2 Connection report in case bet lan = 5		Storage (IEC 60721-3-1) 1M12
Relative uncertainty for f		Connection
Second tenter lateral tentere la tenter lateral tenter lateral tenter lateral tenter lateral		
Screw-type terminal	,	
≥ 1.6 ≤ 1000 Hz 5.1000 ≤ 2000 Hz 5.35		
\$\ Position processing to preating uncreating to preating uncreating to \$\ \text{Position processing uncreating to \$\ \text{Position processing uncreating to \$\ \text{Position processing uncreating un		
Response values Invocanductors with the same cross sections: rigid/flexible rigid flexible rigid flexible rigid fle		• •
Response values rigid/flexible 0.21.5/0.21.5 mm Rated residual operating current /an2 (alarm, AL2) 30 mA3 A (30 mA)* A (30 mA)* Hysteresis 1025 % (15%)** Tightening torque, terminal screws 0.506 Nm Specified time 1025 % (15%)** Push-wire terminals Start-up delay t 010 s (0.5)* flexible without ferrules 0.752.5 mm² (AWG 2414 Response delay tan2 (alarm) 010 s (0.5)* flexible with terrules 0.752.5 mm² (AWG 2414 Response delay tan2 (alarm) 010 s (0.5)* flexible with terrules 0.21.5 mm² (AWG 2414 Response delay tan2 (alarm) 010 s (0.5)* flexible with terrules 0.21.5 mm² (AWG 2414 Delay on release tarf 099 s (1.5)* Openating time tase bei i/lan = 1 x i/lan1/2 ≤ 180 ms Response time tan 1an + tan +		
Response values Stripping length 89 mm Rated residual operating current lan2 (alarm, AL2) 3.0 mA 3.4 (30 mA) 4 (30 mA)		
Rated residual operating current I _{An1} (prewarning, AL1) 50100 % of I _{An2} (50 %)* and A3 A (30 mA)* hysteresis Tightening torque, terminal screws 0.506 Nm Specified time Push-wire terminals Specified time Connection properties: Start-up delay t 010 s (0.5 s)* Response delay t _{on1} (prewarning) 010 s (0.5 s)* Flexible with terrules 0.7525 mm² (AWG 2414 Push-wire terminals Nesponse delay t _{on2} (alarm) 010 s (0.5 s)* Push-wire terminals Response delay t _{on2} (alarm) 010 s (0.5 s)* Flexible with ferrules 0.7525 mm² (AWG 2414 Push-wire terminals Operating time t _{ae} bei l _{An} = 1 x l _{An1/2} ≤ 30 ms Coloping force Stopping length Other Number of reload cycles 5 y t _{an} = t _{an} t _{an} = t _{an} + t _{an} + t _{an} = t _{an} + t _{an} + t _{an} = t _{an} + t _{an} + t _{an} = t _{an} + t _{an} +		
Rated residual operating current I₂n₂ (alarm, AL2) 30 mA3 A (30 mA)* Push-wire terminals Hysteresis 1025 % (155%)* Push-wire terminals Specified time		11 3 3
Specified time Specified time Specified time Specified time Specified time Start-up delay t		<u> </u>
Specified time rigid 0.22.5 mm² (AWG 2414 Start-up delay t 010 s (0.5 s)* flexible without ferrules 0.752.5 mm² (AWG 2414 Response delay t₀n₁ (prewarning) 010 s (0.5)* flexible without ferrules 0.752.5 mm² (AWG 2414 Response delay t₀n₂ (alarm) 010 s (0.5)* flexible with ferrules 0.21.5 mm² (AWG 2414 Delay on release t₀nf 099 s (1.5)* 5tripping length 010 mm² Operating time t₂e bei l₄n = 1 x l₄n₁/2 ≤ 180 m 5tripping length 10 mm² Operating time t₂e bei l₄n = 5 x l₄n₁/2 ≤ 30 ms tan = t₂e + t₀n₁/2 ≤ 180 m Recovery time t₂ ≤ 300 ms tan = t₂e + t₀n₁/2 Operating mode Continuous operation Number of reload cycles 0100 (0)* Postion of normal use display-orienter Displays, memory Displays, memory Degree of protection, internal components (IEC 60529) Postion of normal use Error of indication ±17.5 %/±2 digit Hammability class UL94V-4 Measured-value memory for alarm value data record measured values Numeration in unumber Ocoumentation number Ocoumentati	Hysteresis 1025 % (15%)*	
Start-up delay t 010 s (0.5 s)* Response delay ton1 (prewarning) 010 s (0.5 s)* Response delay ton2 (alarm) 010 s (0.5 s)* Delay on release toff 099 s (1.5)* Operating time tae bei lon = 1 x lon1/2 22 s and poperating time tae bei lon = 5 x lon1/2 23 on s Response time tan bei lon = 5 x lon1/2 23 on s Number of reload cycles 0100 (0)* Displays, memory Displays, memory Displays range, measured value AC/DC 06 A Error of indication ±17.5 %/±2 digit Measured-value memory for alarm value data record measured values Password 0100 (0)* Displays full memory alarm relay 0100 (0)* Displays full memory alarm femaly 0100 (0)* Displays full memory alarm relay 0100 (0)* Displays full memory alarm femal of full female ferrules 0100 (0)* Display full memory alarm female flex bein ferrules 0100 (0)* Display full memory alarm female flex bein female fle	Specified time	• •
Response delay ton1 (prewarning) Response delay ton2 (alarm) Delay on release toff Operating time tae bei lan = 1 x lan1/2 Operating time tae bei lan = 5 x lan1/2 Recovery time tb Number of reload cycles Displays range, measured value AC/DC Displays range, measured value memory for alarm value Password Death of the memory alarm relay Displays range, measured value memory for alarm value Response delay ton2 (alarm) Onumber of reload cycles Display range, measured value memory for alarm value Display range, measured value memory for alarm value Displays range, measured value memory for alarm value Displays range, measured value memory for alarm value Displays range, measured value memory for alarm value Display range, measured value exciption of normal use Degree of protection, internal components (IEC 60529) Display range, measured value exciption of normal use Dis	Start-up delay <i>t</i> 010 s (0.5 s)*	,
Delay on release t_{off} 099 s (1 s)* Operating time t_{ae} be il $t_{An} = 1 \times t_{An1/2}$ 2 s 180 ms Operating time t_{ae} be il $t_{An} = 5 \times t_{An1/2}$ 2 s 30 ms Response time t_{An} 1 $t_{An} = t_{ae} + t_{on1/2}$ 2 s 30 ms Number of reload cycles 0100 (0)* Displays, memory Display range, measured value AC/DC 06 Error of indication 1 $t_{An} = t_{An} = t_{A$		
Operating time t_{ae} be i $l_{\Delta n} = 1 \times l_{\Delta n/1/2}$ $\leq 180 \text{ ms}$ Operating time t_{ae} be i $l_{\Delta n} = 5 \times l_{\Delta n/1/2}$ $\leq 30 \text{ ms}$ Response time t_{an} $t_{an} = t_{ae} + t_{on1/2}$ Recovery time t_b $\leq 300 \text{ ms}$ Number of reload cycles $0100 (0)^*$ Displays, memoryOperating modecontinuous operationDisplay range, measured value AC/DC 06 A Degree of protection, internal components (IEC 60529)IP2Enclosure materialpolycarbonateMeasured-value memory for alarm valuedata record measured valuesTemmability classUL94V-1Passwordoff/0999 (off)*DIN rail mounting acc. to $2 \times M4$ with mounting acc. toFault memory alarm relayon/off (on)* $2 \times M4$ with mounting acc. to $2 \times M4$ with mounting acc. toInputs/outputs $4 \times M$ $4 \times M$ $4 \times M$	Response delay t_{on2} (alarm) 010 s (0 s)*	
Operating time t_{ae} be i $l_{\Delta n} = 5 \times l_{\Delta n 1/2}$ $\leq 30 \text{ ms}$ Response time t_{an} $t_{an} = t_{ae} + t_{on1/2}$ OtherRecovery time t_b $\leq 300 \text{ ms}$ Operating modecontinuous operationNumber of reload cycles $0100 (0)^*$ Position of normal usedisplay-orientedDisplays, memoryDisplay range, measured value AC/DC 06 A Degree of protection, internal components (IEC 60529)IP3Error of indication $\pm 17.5 \% / \pm 2 \text{ dign}$ Enclosure materialpolycarbonateMeasured-value memory for alarm valuedata record measured valuesFlammability classUL94V-1Passwordoff/0999 (off)*Screw mounting $2 \times M4$ with mounting acc. toFault memory alarm relayon/off (on)*Documentation numberDocumentation numberWeight $\leq 150 \text{ dign}$	Delay on release $t_{\rm off}$ 099 s (1 s)*	Opening force 50 N
Response time t_{an} $t_{an} = t_{ae} + t_{on1/2}$ Recovery time t_b $\leq 300 \text{ ms}$ Number of reload cycles $0100 (0)^*$ Displays, memory Display range, measured value AC/DC 064 Error of indication $\pm 17.5 \% / \pm 2 $ displayed at a record measured value Acycle memory for alarm value 0064 Password 0064 Fault memory alarm relay 0064 For the contraction 0064 Position of normal use 0064 Degree of protection, internal components (IEC 60529) 064 Find material 0064 Find material		Test opening, diameter 2.1 mm
Recovery time t _b ≤ 300 ms Number of reload cycles 0100 (0)* Displays, memory Display range, measured value AC/DC 06 A Error of indication 4 ±17.5 %/±2 digit Measured-value memory for alarm value data record measured value Password off/0999 (off)* Fault memory alarm relay 0.0.06 mperating mode 7 continuous operation of normal use 7 display-oriented 7 begree of protection, internal components (IEC 60529) 1P30 pegree of protection, terminals (IEC 60529) 1P30 peg	• •	Othor
Number of reload cycles Displays, memory Display range, measured value AC/DC Error of indication Measured-value memory for alarm value Password Fault memory alarm relay Displays memory Displays range, measured value AC/DC O6 A Error of indication ±17.5 %/±2 digit follows a condition the minds (IEC 60529) Error of indication ±17.5 %/±2 digit follows material Fault memory alarm value On/off (on) Displays, memory Degree of protection, internal components (IEC 60529) Error of indication, terminals (IEC 60529) Error of indication, terminals (IEC 60529) Error of indication, terminals (IEC 60529) Error of indication, internal components (IEC 60529) Degree of protection, internal components (IEC 60529) Error of indication, terminals (IEC 60529) Displays range, measured value AC/DC Error of indication, terminals (IEC 60529) Error of indication, terminals (IEC 60529) Displays range, measured value AC/DC Error of indication, terminals (IEC 60529) Error of indication, terminals (IEC 60529) Displays range, measured value AC/DC Error of indication, terminals (IEC 60529) Error of indication, terminals (IEC 60529) Displays range, measured value AC/DC Error of indication, terminals (IEC 60529) Displays range, measured value AC/DC Error of indication, terminals (IEC 60529) Displays range, measured value and terminals (IEC 60529) Error of indication, terminals (IEC 60529) Displays range, measured value and terminals (IEC 60529) Error of indication, terminals (IEC 60529) Displays range, measured value and terminals (IEC 60529) Error of indication, terminals (IEC 60529) Displays range rang		
Displays, memory Degree of protection, internal components (IEC 60529) IP3 Display range, measured value AC/DC 06 A Error of indication ±17.5 %/±2 digit Enclosure material polycarbonate Measured-value memory for alarm value data record measured values DIN rail mounting acc. to IEC 6071 Password off/0999 (off)* Screw mounting 2 x M4 with mounting clip Fault memory alarm relay on/off (on)* Documentation number Documentation number Inputs/outputs Weight ≤ 150		
Displays, memory Degree of protection, terminals (IEC 60529) IP2 Display range, measured value AC/DC 06 A Enclosure material polycarbonate Error of indication ±17.5 %/±2 digit Flammability class UL94V-I Measured-value memory for alarm value data record measured values DIN rail mounting acc. to IEC 6071 Password off/0999 (off)* Screw mounting 2 x M4 with mounting clip Fault memory alarm relay on/off (on)* Documentation number Documentation number Inputs/outputs Weight ≤ 150	Number of reload cycles U100 (U)**	
Display range, measured value AC/DC Error of indication ±17.5 %/±2 digit Measured-value memory for alarm value data record measured values off/0999 (off)* Fault memory alarm relay Inputs/outputs Concept to the concept t	Displays, memory	
Error of indication ±17.5 %/±2 digit Measured-value memory for alarm value Password off/0999 (off)* Fault memory alarm relay on/off (on)* Inputs/outputs Flammability class DIN rail mounting acc. to Screw mounting Occumentation number Documentation number Weight Flammability class UL94V- DIN rail mounting acc. to Screw mounting Occumentation number Weight C \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		<u> </u>
Password off/0999 (off)* Fault memory alarm relay on/off (on)* Inputs/outputs Off/0999 (off)* On/off (on)* On/off (on)* Weight 2 x M4 with mounting clip to bound the company of t		
Fault memory alarm relay on/off (on)* Inputs/outputs On/off (on)* Weight Ocumentation number Weight () * 6 th so which () * 6 th		•
Inputs/outputs Weight ≤ 150		Screw mounting 2 x M4 with mounting clip
inputs/outputs	Fault memory alarm relay on/off (on)*	
()* fortune of the control of the c	Inputs/outputs	Weight \leq 150 g
CADIC ICHIULI IVI CALCINAL LESVI (CSEL DULLUII	Cable length for external test/reset button 010 m	()* = factory setting



Wiring diagram









Typical applications

- · Measuring and analysing residual currents, fault currents, and nominal currents of loads and installations
- · Monitoring of residual currents of stationary electrical installations and equipment as an alternative to the periodic verification
- · Recognition of gradual insulation deteriorations to support preventive maintenance
- Monitoring of currents constituting a fire hazard at locations exposed to fire hazards
- EMC monitoring of TN-S systems for stray currents and additional N-PE-bridges
- · Monitoring of PE and protectivebonding conductors for the absence of a current flow
- · Monitoring of N-conductors for overload due to harmonics
- · Monitoring of digital input

Standards

The RCMS410 device has been developed in accordance with the following standards:

- DIN EN IEC 62020-1
- UL508

Approvals





Device features

Special features

- Four channels for AC, pulsed DC, or AC/DC sensitive measuring
- · Configurable frequency response
- Space savings due to a compact housing (1 module)
- · Expansion/retrofit or change of functions in the event of changed monitoring requirements
- Simple configuration with Bender Connect App via NFC interface
- Customer-specific factory settings possible

Residual current measurement

- Residual current measurement device (RCM) in accordance with DIN EN 62020-1 (IEC 62020-1)
- Four channels for residual current measurement
- · Every channel can alternatively also be configured as digital input
- Either AC, pulsed DC, or AC/DC sensitive measuring for every channel
- Type A, type F, type B and type B+ characteristics can be set in accordance with IEC 60755 (or VDE 0664-400)
- Measurement of AC/DC (r.m.s. value) and AC and DC components
- Frequency range: DC, 15 Hz...20 kHz
- Frequency analysis up to the 400th harmonic, calculation of the THD value

Response value monitoring

- Main alarm with adjustable residual response value I∆n
- Prewarning: 10...100 % of the residual response value $I_{\Delta n}$
- Separate evaluation of AC/DC (RMS) or AC and DC components
- · Response value:
- Type A: 6 mA...30 A
- Type F: 6 mA...30 A (15 Hz...20 kHz)
- Type B/Type B+: 10 mA...10 A (only with function module B "AC/DC sensitive measuring and evaluation of values")
- Configurable frequency response
- · Measurement modes for each channel: overcurrent (standard), undercurrent, or window mode (out-of-range-values)
- · Adjustable time delays (response delay and delay on release)
- · Fault-memory behaviour per channel selectable
- Preset function
- Reload function
- · Starts in alarm status and start-up delay configurable
- · Continuous CT-connection monitoring

Display and operation

- NFC interface for parameter setting with the Bender Connect App
- · LED bargraph with
- Device status LED
- LEDs for pre-warning and main alarm
- Alarm-LED for each channel
- Integrated combined test/reset button, connection for external buttons
- · Sealable transparent cover (optional)

- · One digital input, one digital input/output, and one multifunctional digital/analogue output
- · RS-485 with Modbus
- · NFC interface for device parameter setting via Bender Connect App with the device engerised or de-energised

Supply voltage

Supply voltage 24 V DC

Bender Connect App









For a list of the open-source software used see our homepage.

Further information

For further information refer to our product range on www.bender.de.



_	Measuring current transformers that can be used Configurable		Configurable	Enabled function		
Type	Supply voltage <i>U</i> _S	Type A Type F			modules *	Art. No.
RCMS410-24	DC 24 V	Х	(X) with function module B	In preparation	In preparation: Customised ex factory (A, B, C can be bought later)	B84604040
NCW3410-24	DC 24 V	Х	Х	-	B (A and C can be bought later)	B84604041
		Х	Х	-	A, B, C	B84604042

Function modules

Accessories

Description	Art. No.
Sealable transparent cover	B80609199

Technical data

Insulation coordination (IEC 60664-1/IEC 60664-3)		Connecting wires
Rated voltage	50 V	Conductor length
Overvoltage category	III	Type B transform
Rated impulse voltage	800 V	Type A transforn
Rated insulation voltage	50 V	Type A transforn
Pollution degree	2	For UL applications
		External transformers
Supply voltage (+, -)		permissible continuou
Connection	+,-	single-channel u
Supply voltage $U_{\rm S}$	DC 24 V	dual-channel us
Protection class of power supply unit	2 or 3	use of three char
Permissible tolerance	-30+25 %	use of four chan
Permissible ripple	5 %	Permissible number of wind
Power consumption	≤ 2 W	
Inrush current (5 ms)	< 10 A	Time response
Moreuring circuit		Start-up delay t
Measuring circuit		Response delay ton
Burden (internal)	33 Ω	Delay on release $t_{\rm off}$
Frequency range	DC, 15 Hz20 kHz	Operating time tae
Measuring range (peak)	3 mA100 A	with 1 x I∆n
Measuring range rms	2 mA70 A	with 5 x I _{∆n}
Rated residual operating current		Response time t _{an}
Type A, type F	30 A	Recovery time tb
Type B, type B+	10 A	Response time for CT conne
Residual operating current $I_{\Delta n}$ (main alarm, AL2) 1)		Operation
Type A, type F	6 mA30 A (30 mA)*	<u> </u>
Type B, type B+	10 mA10 A (30 mA)*	Display
Prewarning (AL1)	10100 % x /∆n (70 %)*	Buttons
Operating uncertainty	$\pm 10 \%$ (at 0.55 x $I_{\Delta n}$)	Terminating resistor DIP swi
Relative response uncertainty		RS-485 interface
Type A, type F	6 mA20 A: -200 %	Connection
	2030 A: -500 %	Protocol
Type B, type B+	-200 %	Baud rate
Hysteresis	1025 % (15 %)*	Parity
Fault-memory alarm messages	on/off (off)*	
permissible continuous residual current with		Stop bits
single-channel use	85 A	Cable length (at 9.6 kbits/s)
dual-channel use	60 A	Recommended lines, shield
use of three channels	49 A	CAT6/CAT7
use of four channels	42 A	min. J-Y(St)Y 2 x 0.6 m
The requirements of the respective standards are only met with a	response value from 30 mA to 9.9 A	Device address
,		NFC interface
Measuring-current transformers		Frequency
Connection	CT14 (S1, S2)	Transmitting power ²⁾
Measuring-current transformer series		

Connection	CT14 (S1, S2)
Measuring-current transformer series	
Type A	CTAC, CTAS, W, WR, WS
Type F	CTAC
Type B, type B+	CTUB-CTBC, CTBS
Typ A für UL1053 applications	CTAC
Typ B, Typ B+ for UL1053 applications	CTUB-CTBC
CT connection monitoring	yes
Rated voltage U_{n}	see measuring-current-transformer manual

Connecting wires	see measuring-current-transformer manual
Conductor length	
Type B transformer	≤ 10 m
Type A transformer (single wire $\geq 0.75 \text{ mm}^2$)	≤ 10 m
Type A transformer (shielded cable ≥ 0.75 mr	,
For UL applications	60/75 °C copper conductors
External transformers	
permissible continuous secondary current with	
single-channel use	140 mA
dual-channel use	100 mA
use of three channels	80 mA
use of four channels	70 mA 1002000
Permissible number of windings	1002000
Time response	
Start-up delay t	0999 s (0 s)*
Response delay ton	010 s (0 s)*
Delay on release t _{off}	0999 s (1 s)*
Operating time tae	.260
with 1 x /∆n	≤ 260 ms
with 5 x I _{\Delta n}	40100 ms
Response time t _{an}	$t_{\rm an} = t_{\rm ae} + t_{\rm on}$
Recovery time tb	≤ 500 ms
Response time for CT connection monitoring	≤ 10 s
Operation	
Display	status LED, alarm LEDs, channel LEDs
Buttons	reset / test / NFC / address setting / protect
Terminating resistor DIP switches	on/off (off)*
RS-485 interface	
Connection	A, B
Protocol	Modbus RTU
Baud rate	max 115.2 kbits/s (19.2 kbits/s)*
Parity	even, no, odd (even)*
Stop bits	1/2/auto (auto)*
Cable length (at 9.6 kbits/s)	≤ 1200 m
Recommended lines, shield on one side connected to PE	
CAT6/CAT7	min. AWG23
min. J-Y(St)Y 2 x 0.6 mm ²	twisted pair
Device address 1	247 (100+ last two digits of serial number)*
NFC interface	
Frequency	13.56 MHz
Transmitting power ²⁾	0 W
²⁾ EMC influences may lead to communication interruption	ons at the NFC interface
Input I	
Connection	l, 1
	10

potential-free contact

10 m

max. cable length (recommended)

external connections

A: Harmonic analysis (FFT)

B: AC/DC sensitive measuring and evaluation of values

C: Connection of type A external current transformers

Technical data (continuation)

Input/output Q	
Connection	Q, 1
max. cable length (recommended)	10 m
max. load	20 mA
Low voltage level (output)	02 V
High voltage level (output)	10 V <i>U</i> s
External voltage (passive mode)	DC 0(<i>U</i> _s - 1 V)
Output M+	
Connection	M+, L
max. cable length (recommended)	10 m
max. load	20 mA
Burden	
current output	≤ 600 Ω
voltage output	\geq 10 k Ω
Tolerance with respect to final current/voltage value	±20 %
External voltage (passive mode)	DC 0U _s

Connection	

Connections	
Terminals	plug-in screw-type terminals
Terminal series	Phoenix Contact MC 1,5/ -ST-3,5 BK
Connection properties	
rigid	0.141.5 mm ²
flexible, without plastic sleeve	0.251.5 mm ²
flexible, with plastic sleeve	0.250.5 mm ²
Stripping length	7 mm
Tightening torque	0.220.25 Nm
Conductor cross section AWG	2816

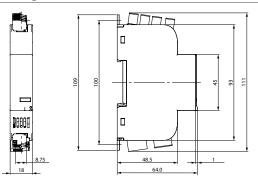
EMC/Environment DIN EN IEC 62020-1 Operating temperature -40...+70 ℃ -40...+85 °C Transport -40...+70 °C Long-time storage Classification of climatic conditions acc. to IEC 60721 (except condensation and formation of ice): 3K22 Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) 2K11 Long-term storage (IEC 60721-3-1) 1K22 Classification of mechanical conditions acc. to IEC 60721 3M11 Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) 2M4 Long-term storage (IEC 60721-3-1) 1M12 Operating mode continuous operation

0	t	h	e

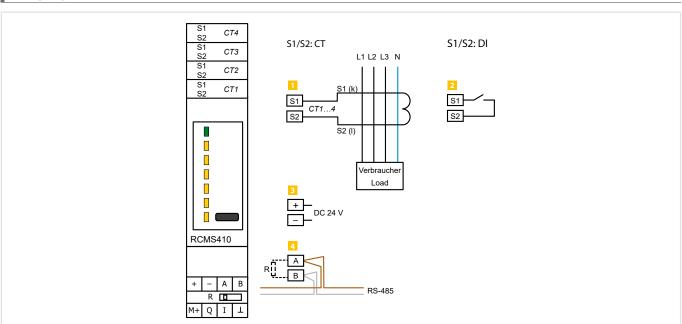
operating mode	continuous operation
Mounting	vertical
Degree of protection (DIN EN 60529)	
terminals	IP20
internal components	IP30
Enclosure material	polycarbonate
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Documentation number	D00424
Weight	≤ 55 g

()* = Factory setting

Dimension diagram (dimensions in mm)



Wiring diagram



3 +/-

4 A, B

1 S1/S2 CT Measuring-current-transformer connection

Connection for supply voltage

2 S1/S2 DI CT1...4 as digital input

RS-485

supplied from the same mains part.

RCMS410 can be destroyed!

The RCMS410 and all connected CTUB102-CTBCxx devices must be

Ensure that the 24-V-DC supply is connected correctly. Otherwise the

For UL applications: Use 60/75 °C copper conductors only! Cable lengths to the measuring current transformer: See technical data.

LINETRAXX® SmartDetect RCMS425-L

Four-channel residual current monitor sensitive to AC, pulsed DC, and smooth DC





Typical applications

- · Measuring and analysing residual currents, fault currents, and nominal currents of loads and installations
- · Monitoring of residual currents of stationary electrical installations and equipment as an alternative to the periodic verification
- · Recognition of gradual insulation deteriorations to support preventive maintenance
- Monitoring of currents constituting a fire hazard at locations exposed to fire hazards
- EMC monitoring of TN-S systems for stray currents and additional N-PE-bridges
- · Monitoring of PE and protectivebonding conductors for the absence of a current flow
- · Monitoring of N-conductors for overload due to harmonics
- · Monitoring of digital input

Standards

Das Gerät RCMS425-L wurde nach folgenden Normen entwickelt:

- DIN EN IEC 62020-1
- UL508

Approvals



Device features

Special features

- · Four channels for AC, pulsed DC, or AC/DC sensitive measuring
- · Configurable frequency response
- · Expansion/retrofit or change of functions in the event of changed monitoring requirements
- · Simple configuration with Bender Connect App via NFC interface
- · Customer-specific factory settings possible

Residual current measurement

- · Residual current measurement device (RCM) in accordance with DIN EN 62020-1 (IEC 62020-1)
- · Four channels for residual current measurement
- Every channel can alternatively also be configured as digital input
- Either AC, pulsed DC, or AC/DC sensitive measuring for every channel
- Type A, type F, type B and type B+ characteristics can be set in accordance with IEC 60755 (or VDE 0664-400)
- Measurement of AC/DC (r.m.s. value) and AC and DC components
- Frequency range: DC, 15 Hz...20 kHz
- Frequency analysis up to the 400th harmonic, calculation of the THD value

Response value monitoring

- Main alarm with adjustable residual response value $I_{\Delta n}$
- Prewarning: 10...100 % of the residual response value $I_{\Delta n}$
- Separate evaluation of AC/DC (RMS) or AC and DC components
- Response value:
- Type A: 6 mA...30 A
- Type F: 6 mA...30 A (15 Hz...20 kHz)
- Type B/Type B+: $10\,\mathrm{mA...}10\,\mathrm{A}$ (only with function module B "AC/DC sensitive measuring and evaluation of values")
- Configurable frequency response
- · Measurement modes for each channel: overcurrent (standard), undercurrent, or window mode (out-of-range-values)
- Adjustable time delays (response delay and delay on release)
- · Fault-memory behaviour per channel selectable
- · Preset function
- Reload function
- · Starts in alarm status and start-up delay configurable
- Continuous CT-connection monitoring

Display and operation

- NFC interface for parameter setting with the Bender Connect App
- LED bargraph with
 - Device status LED
- LEDs for pre-warning and main alarm
- Alarm-LED for each channel
- Integrated combined test/reset button, connection for external buttons
- · Sealable transparent cover (optional)

- One digital input, one digital input/output, and one multifunctional digital/analogue output
- Alarm relays K1 and K2
- · RS-485 with Modbus
- NFC interface for device parameter setting via Bender Connect App with the device engerised or de-energised

Supply voltage

- Supply voltage DC 24 V
- Wide range power supply AC/DC 100...240 V

Bender Connect App









Licences

For a list of the open-source software used see our homepage.

Further information

For further information refer to our product range on www.bender.de.

_	Measuring current transformers that can be used			Configurable	Enabled function	
Туре	Supply voltage <i>U</i> S	Type A Type F		at the factory	modules *	Art. No.
RCMS425-L-2	DC 24 V	Х	(X) with function module B	In preparation	In preparation: Customised ex factory (A, B, C can be bought later)	B84605040
NCW3423-L-2	AC/DC 100240 V	Х	Х	-	B (A and C can be bought later)	B84605041
		Х	Х	-	A, B, C	B84605042

Function modules

Accessories

Description	Art. No.	
Sealable transparent cover	B80609299	

Technical data

Definitions	
Supply circuit (IC1)	A1, A
Measuring circuit (IC2)	+, -, A, B, M+, Q, I, GND, CT1
Control circuit 1 (IC3)	11, 14, 1
Control circuit 2	21, 24, 2
Rated voltage	250
Overvoltage category	I
Operating altitude	≤ 2000 m above sea leve
Rated impulse voltage	
IC1/(IC2-4)	6 k
IC2/(IC3-4)	6 k¹
IC3/IC4	6 k
Rated insulation voltage	
IC1/(IC2-3)	250
IC2/(IC3- 4)	250
IC3/IC4 2	250
Pollution degree	
Safe isolation (reinforced insulation) between	
IC1/(IC2-4)	300
IC2/(IC3-4)	300
IC3/IC4	300
Voltage test (routine test) according to IEC 61010-1	
IC1/(IC2-4)	AC 2.2 k
IC2/(IC3-4)	AC 2.2 k
IC3/IC4	AC 2.2 k
Supply voltage (+, -)	
Connection	+,-
Supply voltage U₅	DC 24
Protection class of power supply unit	2 or
Permissible tolerance	-30+25 %
Permissible ripple	5 %
Power consumption	≤ 2 V
Inrush current (5 ms)	< 10
Supply voltage (A1, A2)	
Connection	A1, A
Supply voltage U₅	AC/DC 100240
Tolerance of $U_{\rm S}$	-30+15 9
Frequency range $U_{\rm S}$	DC/47460 H
Power consumption	≤ 15 VA bei 50 H
Inrush current (5 ms)	< 25

Measuring circuit	
Burden (internal)	33 🕻
Frequency range	DC, 15 Hz20 kH
Measuring range (peak)	3 mA100 /
Measuring range rms	2 mA70 i
Rated residual operating current	
Type A, type F	30 /
Type B, type B+	10 /
Residual operating current $I_{\Delta n}$ (main alarm, AL2) 1)	
Type A, type F	6 mA30 A (30 mA)
Type B, type B+	10 mA10 A (30 mA)
Prewarning (AL1)	10100 % x / _{Δn} (70 %)
Operating uncertainty	±10 % (at 0.55 x <i>l</i> Δn
Relative response uncertainty	
Type A, type F	6 mA20 A: -200 9
	2030 A: -500 9
Type B, type B+	-200 9
Hysteresis	1025 % (15 %)
Fault-memory alarm messages	on/off (off)
permissible continuous residual current with	
single-channel use	85
dual-channel use	60
use of three channels	49
use of four channels	42
1) The requirements of the respective standards are only I	met with a response value from 30 mA to 9.9 <i>I</i>
Measuring-current transformers	
Connection	CT14 (S1, S2
Connection Measuring-current transformer series	CT14 (S1, S2
Measuring-current transformer series	CTAC, CTAS, W, WR, W
Measuring-current transformer series Type A	CTAC, CTAS, W, WR, W
Measuring-current transformer series Type A Type F Type B, type B+	CTAC, CTAS, W, WR, W CTA CTUB-CTBC, CTB
Measuring-current transformer series Type A Type F Type B, type B+ CT connection monitoring	CTAC, CTAS, W, WR, W CTA CTUB-CTBC, CTB ye
Measuring-current transformer series Type A Type F Type B, type B+ CT connection monitoring Rated voltage Un	CTAC, CTAS, W, WR, W CTA CTUB-CTBC, CTB ye see measuring-current-transformer manua
Measuring-current transformer series Type A Type F Type B, type B+ CT connection monitoring Rated voltage Un	CTAC, CTAS, W, WR, W CTA CTUB-CTBC, CTB ye see measuring-current-transformer manua
Measuring-current transformer series Type A Type F Type B, type B+ CT connection monitoring Rated voltage <i>U</i> _n Connecting wires	CTAC, CTAS, W, WR, W CTA CTUB-CTBC, CTB ye see measuring-current-transformer manua
Measuring-current transformer series Type A Type F Type B, type B+ CT connection monitoring Rated voltage <i>U</i> _n Connecting wires Conductor length	CTAC, CTAS, W, WR, W CTA CTUB-CTBC, CTB ye see measuring-current-transformer manual see measuring-current-transformer manual
Measuring-current transformer series Type A Type F Type B, type B+ CT connection monitoring Rated voltage Un Connecting wires Conductor length Type B transformer	CTAC, CTAS, W, WR, W CTA CTUB-CTBC, CTB ye see measuring-current-transformer manua see measuring-current-transformer manua ≤ 10 1 ≤ 10 1
Measuring-current transformer series Type A Type F Type B, type B+ CT connection monitoring Rated voltage Un Connecting wires Conductor length Type B transformer Type A transformer (single wire ≥ 0.75 mm²	CTAC, CTAS, W, WR, W CTA CTUB-CTBC, CTB ye see measuring-current-transformer manua see measuring-current-transformer manua ≤ 10 r) ≤ 10 r m²) ≤ 40 r
Measuring-current transformer series Type A Type F Type B, type B+ CT connection monitoring Rated voltage Un Connecting wires Conductor length Type B transformer Type A transformer (shielded cable ≥ 0.75 m For UL applications	CTAC, CTAS, W, WR, W CTA CTUB-CTBC, CTB ye see measuring-current-transformer manua see measuring-current-transformer manua ≤ 10 r) ≤ 10 r m²) ≤ 40 r
Measuring-current transformer series Type A Type F Type B, type B+ CT connection monitoring Rated voltage Un Connecting wires Conductor length Type B transformer Type A transformer (shielded cable ≥ 0.75 m For UL applications	CTAC, CTAS, W, WR, W CTA CTUB-CTBC, CTB ye see measuring-current-transformer manua see measuring-current-transformer manua ≤ 10 r) ≤ 10 r m²) ≤ 40 r
Measuring-current transformer series Type A Type F Type B, type B+ CT connection monitoring Rated voltage Un Connecting wires Conductor length Type B transformer Type A transformer (single wire ≥ 0.75 mm² Type A transformer (shielded cable ≥ 0.75 m For UL applications External transformers	CTAC, CTAS, W, WR, W CTA CTUB-CTBC, CTB ye see measuring-current-transformer manua see measuring-current-transformer manua ≤ 10 n) ≤ 10 n 10 m²) ≤ 40 n 60/75 °C copper conductor
Measuring-current transformer series Type A Type F Type B, type B+ CT connection monitoring Rated voltage Un Connecting wires Conductor length Type B transformer Type A transformer (single wire ≥ 0.75 mm² Type A transformer (shielded cable ≥ 0.75 m For UL applications External transformers permissible continuous secondary current with	CTAC, CTAS, W, WR, W CTA CTUB-CTBC, CTB ye see measuring-current-transformer manua see measuring-current-transformer manua ≤ 10 m) ≤ 10 m 60/75 °C copper conductor 140 m
Measuring-current transformer series Type A Type F Type B, type B+ CT connection monitoring Rated voltage Un Connecting wires Conductor length Type B transformer Type A transformer (single wire ≥ 0.75 mm² Type A transformer (shielded cable ≥ 0.75 m For UL applications External transformers permissible continuous secondary current with single-channel use	
Measuring-current transformer series Type A Type F Type B, type B+ CT connection monitoring Rated voltage Un Connecting wires Conductor length Type B transformer Type A transformer (single wire ≥ 0.75 mm² Type A transformer (shielded cable ≥ 0.75 m For UL applications External transformers permissible continuous secondary current with single-channel use dual-channel use	CTAC, CTAS, W, WR, W CTA CTUB-CTBC, CTB ye see measuring-current-transformer manual see measuring-current-transformer manual ≤ 10 r) ≤ 10 r nm²) ≤ 40 r 60/75 °C copper conductor

A: Harmonic analysis (FFT)

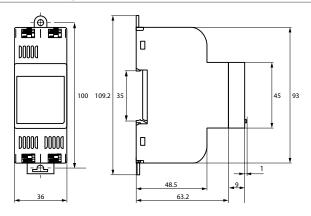
B: AC/DC sensitive measuring and evaluation of values

C: Connection of type A external current transformers

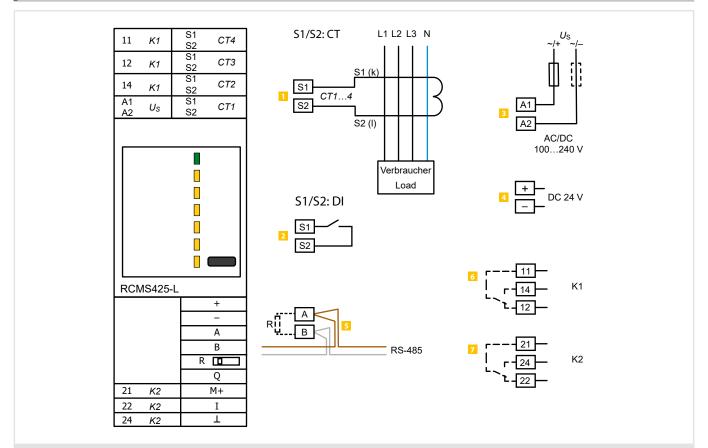
Time response		Switching elements	
Start-up delay <i>t</i>	0999 s (0 s)*	Number of switching elements	2 changeover contac
Response delay $t_{ m on}$	010 s (0 s)*	Connection	11, 14,
Delay on release toff	0999 s (1 s)*		21, 24, 2
Operating time t _{ae}		Operating mode	N/C operation/N/O operation (N/C operation
with $1 \times I_{\Lambda n}$	≤ 260 ms	Maximum permissible voltage	AC 380 V / DC 30
with 5 x $I_{\Delta n}$	40100 ms	Switching capacity	1250 VA / 150
Response time t _{an}	$t_{\rm an} = t_{\rm ae} + t_{\rm on}$	Minimum current	10 mA at DC 10
Recovery time t _b	≤ 500 ms	Electrical endurance under rated operating conditions	10000 switching operation
Response time for CT connection monitoring	≤ 10 s		
·		Connections (A1, A2, relays)	
Operation		Terminals	plug-in screw-type termina
· · ·	, alarm LEDs, channel LEDs	Terminal series	Phoenix Contact MSTBT 2,5/ST-5,08 E
	/ address setting / protect	Connection properties	
Ferminating resistor DIP switches	on/off (off)*	rigid	0.22.5 mr
OC 405 intenfere		flexible, without plastic sleeve	0.252.5 mr
RS-485 interface		flexible, with plastic sleeve	0.252.5 mr
Connection	A, B	Stripping length	7 mi
Protocol	Modbus RTU	Tightening torque	0.50.6 N
	15.2 kbits/s (19.2 kbits/s)*	Conductor cross section	AWG 241
Parity	even, no, odd (even)*		
Stop bits	1/2/auto (auto)*	Connections (others)	
Cable length (at 9.6 kbits/s)	≤ 1200 m	Terminals	plug-in screw-type termina
Recommended lines, shield on one side connected to PE		Terminal series	Phoenix Contact MC 1,5/ -ST-3,5 E
CAT6/CAT7	min AWG23	Connection properties	
min. J-Y(St)Y 2 x 0.6 mm ²	twisted pair	rigid	0.141.5 mn
Device address 1247 (100+ last tw	o digits of serial number)*	flexible, without plastic sleeve	0.251.5 mn
NFC interface		flexible, with plastic sleeve	0.250.5 mn
	40.54111	Stripping length	7 mi
requency	13.56 MHz	Tightening torque	0.220.25 Ni
Transmitting power ²⁾	0 W	Conductor cross section AWG	281
2) EMC influences may lead to communication interruptions at the NFC int	erface	EMC/Environment	
		EMC	DIN EN IEC 62020-
Input I			DIN EN IEC 02020-
Connection	Ι, ⊥	Operating temperature for $U_S = DC 24 \text{ V}$	-25+70°
max. cable length (recommended)	10 m	for $U_S = DC 24 \text{ V}$ for $U_S = AC/DC 100240 \text{ V}$	-25+70 -25+55°
external connections	potential-free contact		-23+35°
Input/output Q		Transport	-40+70°
· · ·	Q, 1	Long-time storage	
Connection		Classification of climatic conditions acc. to IEC 607	721
max. cable length (recommended)	10 m	(except condensation and formation of ice):	
max. load	20 mA	Stationary use (IEC 60721-3-3)	3K2
Low voltage level (output) High voltage level (output)	02 V	Transport (IEC 60721-3-2)	2K1
3 3 1 7	10 VU _s	Long-term storage (IEC 60721-3-1)	1K2
External voltage (passive mode)	DC 0(<i>U</i> _s - 1 V)	Classification of mechanical conditions acc. to IEC	60721
Output M+		Stationary use (IEC 60721-3-3)	3M1
Connection	M+, 1	Transport (IEC 60721-3-2)	2M
max. cable length (recommended)		Long-term storage (IEC 60721-3-1)	1M1
max. load	20 mA		
Burden	ZUIIIA	Other	
current output	≤ 600 Ω	Operating mode	continuous operatio
voltage output	≤ 000 Ω ≥ 10 kΩ	Mounting	vertic
Tolerance with respect to final current/voltage value	±20 %	Degree of protection (DIN EN 60529)	
, ,	DC 0 <i>U</i> s	terminals	IP2
external voltage (passive mode)	νC U <i>U</i> _S	internal components	IP3
		Enclosure material	polycarbona
		DIN rail mounting acc. to	IEC 6071
		Flammability class	UL94 V-
		Documentation number	D0048
		Weight	≤ 110
			⇒ 110

()* = Factory setting





Wiring diagram



1 S1/S2 CT Current transformer CT

2 S1/S2 DI CT1...4 as digital input

3 A1, A2 Supply voltage AC/DC

Supply voltage DC

5 A, B RS-485 interface: Modbus RTU

6 11, 14, 12 Relay K1

7 21, 24, 22 Relay K2

AC/DC 100...240 V

back-up fuses for U_s: 6 A

RCMS425-L and all connected CTUB102-CTBCxx must be supplied from the same power supply unit.

For UL applications:

The measuring current transformers must be connected before

 $\label{lem:cable} \textbf{Cable lengths to the measuring current transformer: See technical data.}$

LINETRAXX® SmartDetect RCMS425-D

Four-channel residual current monitor sensitive to AC, pulsed DC, and smooth DC





Typical applications

- · Measuring and analysing residual currents, fault currents, and nominal currents of loads and installations
- · Monitoring of residual currents of stationary electrical installations and equipment as an alternative to the periodic verification
- · Recognition of gradual insulation deteriorations to support preventive maintenance
- Monitoring of currents constituting a fire hazard at locations exposed to fire hazards
- EMC monitoring of TN-S systems for stray currents and additional N-PE-bridges
- · Monitoring of PE and protectivebonding conductors for the absence of a current flow
- · Monitoring of N-conductors for overload due to harmonics
- · Monitoring of digital input

Standards

Das Gerät RCMS425-D wurde nach folgenden Normen entwickelt:

- DIN EN IEC 62020-1
- DIN EN 50155
- UI 508

Approvals





Device features

Special features

- · Four channels for AC, pulsed DC, or AC/DC sensitive measuring
- · Configurable frequency response
- TFT display for convenient operation and configuration
- · Expansion/retrofit or change of functions in the event of changed monitoring requirements
- Simple configuration with Bender Connect App via NFC interface
- · Customer-specific factory settings possible

Residual current measurement

- Residual current measurement device (RCM) in accordance with DIN EN 62020-1 (IEC 62020-1)
- · Four channels for residual current measurement
- · Every channel can alternatively also be configured as digital input
- Either AC, pulsed DC, or AC/DC sensitive measuring for every channel
- Type A, type F, type B and type B+ characteristics can be set in accordance with IEC 60755 (or VDE 0664-400)
- Measurement of AC/DC (r.m.s. value) and AC and DC components
- Frequency range: DC, 15 Hz...20 kHz
- Frequency analysis up to the 400th harmonic, calculation of the THD value

Response value monitoring

- Main alarm with adjustable residual response value I_{Δn}
- Prewarning: 10...100 % of the residual response value $I_{\Delta n}$
- Separate evaluation of AC/DC (RMS) or AC and DC components
- · Response value:
- Type A: 6 mA...30 A
- Type F: 6 mA...30 A (15 Hz...20 kHz)
- Type B/Type B+: 10 mA...10 A (only with function module B "AC/DC sensitive measuring and evaluation of values")
- · Configurable frequency response
- · Measurement modes for each channel: overcurrent (standard), undercurrent, or window mode (out-of-range-values)
- Adjustable time delays (response delay and delay on release)
- Fault-memory behaviour per channel selectable
- · Preset function
- · Reload function
- · Starts in alarm status and start-up delay configurable
- · Continuous CT-connection monitoring

Display and operation

- · NFC interface for parameter setting with the Bender Connect App
- · LCD display
- Device status LED
- Alarm LED
- Full text menu
- 4-button navigation
- · Integrated combined test/reset button, connection for external buttons
- · Sealable transparent cover (optional)

Interfaces

- · One digital input, one digital input/output, and one multifunctional digital/analogue output
- Alarm relays K1 and K2
- RS-485 with Modbus
- NFC interface for device parameter setting via Bender Connect App with the device engerised or de-energised

Supply voltage

- Supply voltage DC 24 V
- Wide range power supply AC/DC 100...240 V

Bender Connect App









Licences

For a list of the open-source software used see our homepage.

Further information

For further information refer to our product range on www.bender.de.



		Measuring current transformers that can be used		Configurable	Enabled function		
Туре	Supply voltage <i>U</i> s	Type A Type F	Type B Type B+	at the factory	modules *	Art. No.	
RCMS425-D-2	DC 24 V		(X) with function module B	In preparation	In preparation: Customised ex factory (A, B, C can be bought later)	B84606040	
NCNI3423-D-2	AC/DC 100240 V X		Х	_	B (A and C can be bought later)	B84606041	
		Х	X	-	A, B, C	B84606042	

^{*} Function modules

Accessories

Description	Art. No.
Sealable transparent cover	B80609299

Technical data

Definitions	
Supply circuit (IC1)	A1, A2
Measuring circuit (IC2)	+, -, A, B, M+, Q, I, GND, CT14
Control circuit 1 (IC3)	11, 14, 12
Control circuit 2	21, 24, 22
Rated voltage	250 \
Overvoltage category	II
Operating altitude	≤ 2000 m above sea leve
Rated impulse voltage	
IC1/(IC2-4)	6 k\
IC2/(IC3-4)	6 k\
IC3/IC4	6 k\
Rated insulation voltage	
IC1/(IC2-3)	250 \
IC2/(IC3- 4)	250 \
IC3/IC4 2	250 \
Pollution degree	
Safe isolation (reinforced insulation) between	
IC1/(IC2-4)	300 \
IC2/(IC3-4)	300 \
IC3/IC4	300 \
Voltage test (routine test) according to IEC 61010-1	
IC1/(IC2-4)	AC 2.2 k\
IC2/(IC3-4)	AC 2.2 k\
IC3/IC4	AC 2.2 k\
Supply voltage (+, -)	
Connection	+,-
Supply voltage $U_{\rm S}$	DC 24 \
Protection class of power supply unit	2 or 3
Permissible tolerance	-30+25 %
Permissible ripple	5 %
Power consumption	≤ 2 W
Inrush current (5 ms)	< 10 Å
Supply voltage (A1, A2)	
Connection	A1, A2
Supply voltage <i>U</i> s	AC/DC 100240 \
Tolerance of U _s	-30+15 %
Frequency range $U_{\rm S}$	DC/47460 H
Power consumption	≤ 15 VA bei 50 H
Inrush current (5 ms)	< 25 /

Burden (internal)	33 🕻
Frequency range	DC, 15 Hz20 kH
Measuring range (peak)	3 mA100
Measuring range rms	2 mA70
Rated residual operating current	
Type A, type F	30
Type B, type B+	10
Residual operating current $I_{\Delta n}$ (main alarm, AL2) 1)	
Type A, type F	6 mA30 A (30 mA)
Type B, type B+	10 mA10 A (30 mA)
Prewarning (AL1)	10100 % x /Δn (70 %)
Operating uncertainty	±10 % (at 0.55 x /дп
Relative response uncertainty	
Type A, type F	6 mA20 A: -200 9
	2030 A: -500 9
Type B, type B+	-2009
Hysteresis	1025 % (15 %)
Fault-memory alarm messages	on/off (off)
permissible continuous residual current with	
single-channel use	85
dual-channel use	60
use of three channels	49
use of four channels The requirements of the respective standards are only to	
The requirements of the respective standards are only of Measuring-current transformers	met with a response value from 30 mA to 9.9
The requirements of the respective standards are only of Measuring-current transformers Connection	met with a response value from 30 mA to 9.9
The requirements of the respective standards are only of Measuring-current transformers Connection	met with a response value from 30 mA to 9.9 CT14 (S1, S2
The requirements of the respective standards are only in the standards.	met with a response value from 30 mA to 9.9. CT14 (S1, S2 CTAC, CTAS, W, WR, W
The requirements of the respective standards are only in the sequirement transformers Connection Measuring-current transformer series Type A Type F	met with a response value from 30 mA to 9.9 CT14 (S1, S2 CTAC, CTAS, W, WR, W
The requirements of the respective standards are only in the same of the respective standards are only in the same of the s	met with a response value from 30 mA to 9.9 CT14 (S1, S2 CTAC, CTAS, W, WR, W CTA CTUB-CTBC, CTB
The requirements of the respective standards are only in the sequirement transformers Connection Measuring-current transformer series Type A Type F Type B, type B+ CT connection monitoring	met with a response value from 30 mA to 9.9. CT14 (S1, S2 CTAC, CTAS, W, WR, W CTA CTUB-CTBC, CTB
The requirements of the respective standards are only in the sequirement transformers Connection Measuring-current transformer series Type A Type F Type B, type B+ CT connection monitoring Rated voltage Un	CTAC, CTAS, W, WR, W CTAC CTBC-CTBC, CTBC CTBC-CTBC, CTB CTBC-CTBC, CTB ye see measuring-current-transformer manua
The requirements of the respective standards are only in the sequirement transformers Connection Measuring-current transformer series Type A Type F Type B, type B+ CT connection monitoring Rated voltage Un Connecting wires	CTAC, CTAS, W, WR, W CTAC CTBC-CTBC, CTBC CTBC-CTBC, CTB CTBC-CTBC, CTB ye see measuring-current-transformer manua
The requirements of the respective standards are only in the sequirement transformers Connection Measuring-current transformer series Type A Type F Type B, type B+ CT connection monitoring Rated voltage Un Connecting wires Conductor length	CTAC, CTAS, W, WR, W CTAC CTUB-CTBC, CTB ye see measuring-current-transformer manual
The requirements of the respective standards are only in the seasuring-current transformers Connection Measuring-current transformer series Type A Type F Type B, type B+ CT connection monitoring Rated voltage Un Connecting wires	CTAC, CTAS, W, WR, W CTAC CTUB-CTBC, CTB see measuring-current-transformer manualsee measuring-current-transformer manualsee.
The requirements of the respective standards are only in the Measuring-current transformers Connection Measuring-current transformer series Type A Type F Type B, type B+ CT connection monitoring Rated voltage Un Connecting wires Conductor length Type B transformer Type A transformer (single wire ≥ 0.75 mm²	CTAC, CTAS, W, WR, W CTAC CTUB-CTBC, CTB see measuring-current-transformer manual see measuring-current-transformer manual ≤ 10 I ≤ 10 I
The requirements of the respective standards are only in the sequirement transformers Connection Measuring-current transformer series Type A Type F Type B, type B+ CT connection monitoring Rated voltage Un Connecting wires Conductor length Type B transformer	CTAC, CTAS, W, WR, W CTAC CTUB-CTBC, CTE see measuring-current-transformer manusee measuring-current-transf
The requirements of the respective standards are only in Measuring-current transformers Connection Measuring-current transformer series Type A Type B Type B, type B+ CT connection monitoring Rated voltage Un Connecting wires Conductor length Type B transformer Type A transformer (single wire ≥ 0.75 mm² Type A transformer (shielded cable ≥ 0.75 m For UL applications	CTAC, CTAS, W, WR, W CTAC CTUB-CTBC, CTE see measuring-current-transformer manusee measuring-current-transf
The requirements of the respective standards are only in Measuring-current transformers Connection Measuring-current transformer series Type A Type B Type B, type B+ CT connection monitoring Rated voltage Un Connecting wires Conductor length Type B transformer Type A transformer (single wire ≥ 0.75 mm² Type A transformer (shielded cable ≥ 0.75 m For UL applications External transformers	CTAC, CTAS, W, WR, W CTAC CTUB-CTBC, CTE see measuring-current-transformer manusee measuring-current-transf
The requirements of the respective standards are only in Measuring-current transformers Connection Measuring-current transformer series Type A Type B Type B, type B+ CT connection monitoring Rated voltage Un Connecting wires Conductor length Type B transformer Type A transformer (single wire ≥ 0.75 mm² Type A transformer (shielded cable ≥ 0.75 m For UL applications	CT14 (\$1, \$2 CTAC, CTAS, W, WR, W CTAC CTUB-CTBC, CTB ye see measuring-current-transformer manual see measuring-current-transformer manual 10 10 10 10 10 10 10 10 10 10
The requirements of the respective standards are only in Measuring-current transformers Connection Measuring-current transformer series Type A Type F Type B, type B+ CT connection monitoring Rated voltage Un Connecting wires Conductor length Type B transformer Type A transformer (single wire ≥ 0.75 mm² Type A transformer (shielded cable ≥ 0.75 m² For UL applications External transformers permissible continuous secondary current with	CT14 (\$1, \$2 CTAC, CTAS, W, WR, W CTAC CTUB-CTBC, CTB ye see measuring-current-transformer manual see measuring-current-transformer manual 10 10 60/75 °C copper conductor
The requirements of the respective standards are only in Measuring-current transformers Connection Measuring-current transformer series Type A Type F Type B, type B+ CT connection monitoring Rated voltage Un Connecting wires Conductor length Type B transformer Type A transformer (single wire ≥ 0.75 mm² Type A transformer (shielded cable ≥ 0.75 m For UL applications External transformers permissible continuous secondary current with single-channel use	CT14 (S1, S2 CTAC, CTAS, W, WR, W. CTAC CTUB-CTBC, CTB. ye see measuring-current-transformer manua see measuring-current-transformer manua ≤ 10 m ≤ 10 m
The requirements of the respective standards are only in Measuring-current transformers Connection Measuring-current transformer series Type A Type F Type B, type B+ CT connection monitoring Rated voltage Un Connecting wires Conductor length Type B transformer Type A transformer (single wire ≥ 0.75 mm² Type A transformer (shielded cable ≥ 0.75 m For UL applications External transformers permissible continuous secondary current with single-channel use dual-channel use	CT14 (\$1, \$2 CTAC, CTAS, W, WR, W CTA CTUB-CTBC, CTB ye see measuring-current-transformer manual see measuring-current-transformer manual \$\leq\$ 10 \text{ n} \$\leq\$ 10 \text{ n} \$\leq\$ 40 \text{ n} 60/75 °C copper conductor 140 \text{ m.} 100 \text{ m.}

A: Harmonic analysis (FFT)

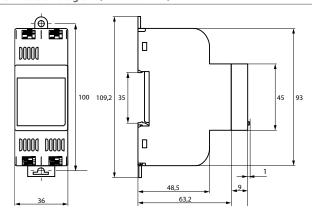
B: AC/DC sensitive measuring and evaluation of values

C: Connection of type A external current transformers

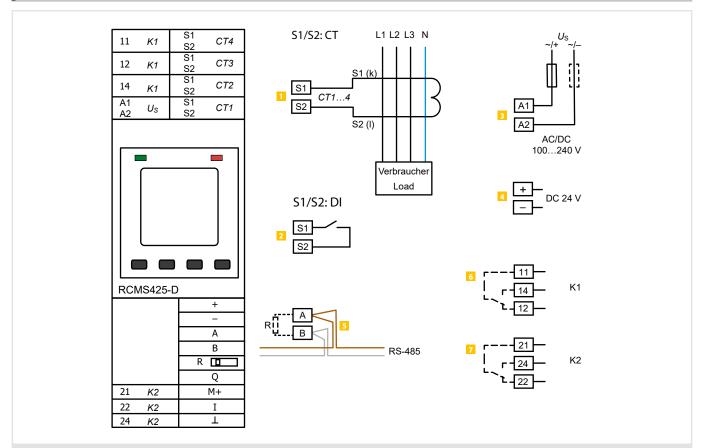
Technical data (continuation)	
'ime response	
tart-up delay t	0999 s (0 s)*
Response delay $t_{ m on}$	010 s (0 s)*
Oelay on release t _{off}	0999 s (1 s)*
Operating time t _{ae}	
with 1 x I∆n	≤ 260 ms
with 5 x $I_{\Delta n}$	40100 ms
Response time t _{an}	$t_{an} = t_{ae} + t_{or}$
Recovery time t _b	≤ 500 ms
Response time for CT connection monitoring	≤ 10 :
RS-485 interface	
onnection	A, E
Protocol	Modbus RTU
Baud rate	max 115.2 kbits/s (19.2 kbits/s) ³
rarity	even, no, odd (even)*
top bits	1/2/auto (auto)*
Table length (at 9.6 kbits/s)	1/2/auto (auto) ≤ 1200 m
Recommended lines, shield on one side connec	
CAT6/CAT7	min AWG2
min. J-Y(St)Y 2 x 0.6 mm ²	twisted pair
Device address	1247 (100+ last two digits of serial number)*
IFC interface	
requency	13.56 MHz
ransmitting power ²⁾ EMC influences may lead to communication	0 W
LINC IIII delices illay lead to communication	interruptions at the W.C. interrace
nput I	
nput I Connection	
•	
onnection	10 m
connection nax. cable length (recommended)	10 m
onnection nax. cable length (recommended) external connections	10 n potential-free contac
connection nax. cable length (recommended) external connections external connections external connections external connection	10 n potential-free contac Q, J
connection nax. cable length (recommended) external connections nput/output Q connection nax. cable length (recommended)	10 m potential-free contac Q, J 10 m
connection nax. cable length (recommended) external connections nput/output Q connection nax. cable length (recommended) nax. load	10 m potential-free contac Q, J 10 m 20 m
connection nax. cable length (recommended) external connections nput/output Q connection nax. cable length (recommended) nax. load ow voltage level (output)	10 m potential-free contac Q, J 10 m 20 m/ 02 \
connection nax. cable length (recommended) external connections nput/output Q connection nax. cable length (recommended) nax. load ow voltage level (output) ligh voltage level (output)	10 m potential-free contac Q, J 10 m 20 m 0 2 V 10 V
connection nax. cable length (recommended) external connections nput/output Q connection nax. cable length (recommended) nax. load now voltage level (output) ligh voltage level (output) external voltage (passive mode)	10 m potential-free contac Q, J 10 m 20 m/ 02 \ 10 V <i>U</i>
connection nax. cable length (recommended) external connections nput/output Q connection nax. cable length (recommended) nax. cable length (recommended) now voltage level (output) ligh voltage level (output) external voltage (passive mode)	10 m potential-free contac Q, J 10 m 20 m/ 0 2 \ 10 V
connection nax. cable length (recommended) external connections nput/output Q connection nax. cable length (recommended) nax. load oow voltage level (output) ligh voltage level (output) external voltage (passive mode) Output M+ connection	10 m potential-free contac Q, J 10 m 20 m/ 02/ 10 VU DC 0(U _S - 1 V
connection nax. cable length (recommended) external connections nput/output Q connection nax. cable length (recommended) nax. load oow voltage level (output) ligh voltage level (output) external voltage (passive mode) Output M+ connection nax. cable length (recommended)	10 m potential-free contac Q, J 10 m 20 m/. 0 2 v 10 V
connection nax. cable length (recommended) external connections nput/output Q connection nax. cable length (recommended) nax. load oow voltage level (output) ligh voltage level (output) external voltage (passive mode) Dutput M+ connection nax. cable length (recommended) nax. load	10 m potential-free contac Q, J 10 m 20 m/. 0 2 v 10 V
connection nax. cable length (recommended) external connections nput/output Q connection nax. cable length (recommended) nax. load ow voltage level (output) ligh voltage level (output) external voltage (passive mode) Dutput M+ connection nax. cable length (recommended) nax. load Burden	10 m potential-free contact Q, J 10 m 20 m/ 10 V U 50 m/ 20 m/
connection nax. cable length (recommended) external connections nput/output Q connection nax. cable length (recommended) nax. load ow voltage level (output) ligh voltage level (output) external voltage (passive mode) Dutput M+ connection nax. cable length (recommended) nax. load Burden current output	10 m potential-free contact Q, J 10 m 20 m/ 10 V U 50 m/ 20 m/
connection nax. cable length (recommended) external connections nput/output Q connection nax. cable length (recommended) nax. load ow voltage level (output) ligh voltage level (output) external voltage (passive mode) Dutput M+ connection nax. cable length (recommended) nax. load Burden	10 m potential-free contac Q, J 10 m 20 m/ 02 V 10 VU DC 0(U ₅ - 1 V M+, J 10 m 20 m/ ≤ 600 C
connection nax. cable length (recommended) external connections nput/output Q connection nax. cable length (recommended) nax. load ow voltage level (output) ligh voltage level (output) external voltage (passive mode) Dutput M+ connection nax. cable length (recommended) nax. load Burden current output	10 m potential-free contact Q, J 10 m Q, J 10 m Q 20 m/Q 10 V
connection nax. cable length (recommended) external connections nput/output Q connection nax. cable length (recommended) nax. load ow voltage level (output) ligh voltage level (output) external voltage (passive mode) Dutput M+ connection nax. cable length (recommended) nax. load Burden current output voltage output	10 m potential-free contact Q, J 10 m Q, J 10 m Q 10 m Q 10 V
connection nax. cable length (recommended) external connections nput/output Q connection nax. cable length (recommended) nax. cable length (recommended) nax. load oow voltage level (output) liigh voltage level (output) external voltage (passive mode) Output M+ connection nax. cable length (recommended) nax. load current output voltage output voltage output iderance with respect to final current/voltage external voltage (passive mode)	10 m potential-free contact Q, J 10 m Q, J 10 m Q
connection nax. cable length (recommended) external connections nput/output Q connection nax. cable length (recommended) nax. cable length (recommended) nax. load ow voltage level (output) liigh voltage level (output) external voltage (passive mode) Output M+ connection nax. cable length (recommended) nax. load Burden current output voltage output colerance with respect to final current/voltage external voltage (passive mode)	10 m potential-free contact Q, J
connection nax. cable length (recommended) external connections nput/output Q connection nax. cable length (recommended) nax. cable length (recommended) nax. load oow voltage level (output) liigh voltage level (output) external voltage (passive mode) Output M+ connection nax. cable length (recommended) nax. load current output voltage output iverance with respect to final current/voltage external voltage (passive mode) iverance with respect to final current/voltage external voltage (passive mode) iverance with respect to final current/voltage external voltage (passive mode)	10 m potential-free contac Q, J 10 m 20 m/ 02\ 10 VU DC 0(U _s - 1 V M+, J 10 m 20 m/ ≤ 600 C ≥ 10 kC value ±20 % DC 0U
connection nax. cable length (recommended) external connections nput/output Q connection nax. cable length (recommended) nax. cable length (recommended) nax. load ow voltage level (output) liigh voltage level (output) external voltage (passive mode) Output M+ connection nax. cable length (recommended) nax. load Burden current output voltage output colerance with respect to final current/voltage external voltage (passive mode)	10 m potential-free contac Q, J 10 m 20 m/ 02\ 10 VU DC 0(U _S - 1 V M+, J 10 m 20 m/ ≤ 600 C ≥ 10 kC value ±20 % DC 0U
connection nax. cable length (recommended) external connections nput/output Q connection nax. cable length (recommended) nax. load oow voltage level (output) ligh voltage level (output) external voltage (passive mode) Output M+ connection nax. cable length (recommended) nax. load burden	10 m potential-free contac Q, J 10 m 20 m/ 02\ 10 VU DC 0(U ₅ - 1 V M+, J 10 m 20 m/
connection nax. cable length (recommended) external connections nput/output Q connection nax. cable length (recommended) nax. load oow voltage level (output) ligh voltage level (output) external voltage (passive mode) Output M+ connection nax. cable length (recommended) nax. load burden	10 m potential-free contact Q, J 10 m 20 m/ 02 \ 10 VU DC 0(U ₅ - 1 V M+, J 10 m 20 m/ ≤ 600 C ≥ 10 kC ≥ 10 kC 11, 14, 12 21, 24, 22 N/C operation/N/O operation (N/C operation)
connection nax. cable length (recommended) external connections nput/output Q connection nax. cable length (recommended) nax. load oow voltage level (output) ligh voltage level (output) external voltage (passive mode) Dutput M+ connection nax. cable length (recommended) nax. load Burden	10 m potential-free contact Q, J 10 m 20 m/ 02\ 10 VU DC 0(U ₅ - 1 V M+, J 10 n 20 m/ S = 600 C ≥ 10 kC ≥ 10 kC 20 m/ 2 changeover contact 11, 14, 12 21, 24, 22 N/C operation/N/O operation (N/C operation) AC 380 V / DC 30 N
connection nax. cable length (recommended) external connections nput/output Q connection nax. cable length (recommended) nax. load oow voltage level (output) ligh voltage level (output) external voltage (passive mode) Dutput M+ connection nax. cable length (recommended) nax. load Burden current output voltage output colerance with respect to final current/voltage external voltage (passive mode) switching elements lumber of switching elements connection Operating mode Aaximum permissible voltage witching capacity	10 m potential-free contact Q, J 10 m 20 m/ 02\ 10 VU DC 0(U ₅ - 1 V M+, J 10 m 20 m/ M+, J 20 m/ ≥ 600 Ω ≥ 10 kΩ ≥ 10 kΩ 11, 14, 12 21, 24, 22 N/C operation/N/O operation (N/C operation) AC 380 V / DC 30 \ 1250 VA / 150 W
connection nax. cable length (recommended) external connections nput/output Q connection nax. cable length (recommended) nax. load oow voltage level (output) ligh voltage level (output) external voltage (passive mode) Dutput M+ connection nax. cable length (recommended) nax. load Burden	10 m potential-free contact Q, J 10 m 20 m/ 02 \ 10 VU DC 0(U ₅ - 1 V M+, J 10 m 20 m/ M+, J 20 m/ ≥ 600 C ≥ 10 kC ≥ 10 kC 11, 14, 12 21, 24, 22 N/C operation/N/O operation (N/C operation) AC 380 V / DC 30 \ 1250 VA / 150 W 10 mA at DC 10 \

Connections (A1, A2, relays)	
Terminals	plug-in screw-type terminals
Terminal series	Phoenix Contact MSTBT 2,5/ST-5,08 BK
Connection properties	
rigid	0.22.5 mm ²
flexible, without plastic sleeve	0.252.5 mm ²
flexible, with plastic sleeve	0.252.5 mm ²
Stripping length	7 mm
Tightening torque	0.50.6 Nm
Conductor cross section	AWG 2412
Connections (others)	
Terminals	plug-in screw-type terminals
Terminal series	Phoenix Contact MC 1,5/ -ST-3,5 BK
Connection properties	
rigid	0.141.5 mm ²
flexible, without plastic sleeve	0.251.5 mm ²
flexible, with plastic sleeve	0.250.5 mm ²
Stripping length	7 mm
Tightening torque	0.220.25 Nm
Conductor cross section AWG	2816
EMC/Environment	
EMC	DIN EN IEC 62020-1
Operating temperature	-25+55℃
Transport	-40+85 °C
Long-time storage	-40+70 °C
Classification of climatic conditions acc. to IEC	60721
(except condensation and formation of ice):	21/22
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	
Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12
Other	
Operating mode	continuous operation
Mounting	vertical
Degree of protection (DIN EN 60529)	
terminals	IP20
internal components	IP30
Enclosure material	polycarbonate
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Documentation number	D00488
Weight	≤ 125 g
0.8	

* = Factory setting



Wiring diagram



1 S1/S2 CT Current transformer CT

2 S1/S2 DI CT1...4 as digital input

3 A1, A2 Supply voltage AC/DC

Supply voltage DC

5 A, B RS-485 interface: Modbus RTU

6 11, 14, 12 Relay K1

7 21, 24, 22 Relay K2

AC/DC 100...240 V

back-up fuses for U_s: 6 A

RCMS425-L and all connected CTUB102-CTBCxx must be supplied from the same power supply unit.

For UL applications:

The measuring current transformers must be connected before

 $\label{lem:cable} \textbf{Cable lengths to the measuring current transformer: See technical data.}$

LINETRAXX® RCMS460-D/-L - RCMS490-D/-L

Multi-channel AC, pulsed DC and AC/DC sensitive residual current monitors for earthed AC, DC and AC/DC systems (TN and TT systems)



Typical applications

- · Measuring and evaluating residual, fault and rated currents of loads and installations in the frequency range of
- 0...2000 Hz (CTUB100 or CTBS25 series measuring current transformers),
- 42...2000 Hz (CTAC..., WR.... WS..., WF... series measuring current transformers)
- · Monitoring of currents regarded as fire hazards in flammable atmospheres
- EMC monitoring of TN-S systems for "stray currents" and additional N-PE connections
- · Monitoring of N conductors for overload caused by harmonics
- · Monitoring of PE and equipotential bonding conductors to ensure they are free of current
- · Residual current monitoring of stationary electrical equipment and systems to determine test intervals which meet practical requirements in compliance with the DGUV regulation 3 (German Social Accident Insurance).
- · Personnel and fire protection due to rapid disconnection
- · Monitoring of digital inputs

Device features

- Optional AC, pulsed DC or AC/DC sensitive measurement by selecting the respective measuring current transformer for each channel
- True r.m.s. value measurement
- 12 measuring channels per device for residual current measurement or digital input
- Up to 90 RCMS... monitors, up to 1080 measuring channels in the system
- · Fast parallel scanning for all channels
- · Response ranges: 10 mA...10 A (0...2000 Hz), 6 mA...20 A (42...2000 Hz), 100 mA...125 A (42...2000 Hz) RCMS...-D4
- · Preset function
- Adjustable time delays
- The frequency response characteristics can be set for the protection of persons, fire and plant protection
- History memory with date and time stamp for 300 data records
- Data logger for 300 data records/channel
- · Analysis of the harmonics, DC, THF
- Two alarm relays with one changeover contact each
- Device version RCMS490 with one alarm contact per channel
- N/O or N/C operation and fault memory selectable
- Connection external test/reset button
- Backlit graphical display (7-segment display) and alarm LEDs
- · Data exchange via BMS bus
- Password protection for device setting
- · Continuous CT connection monitoring
- · RoHS compliant

Standards

The LINETRAXX® RCMS460/490 series complies with the requirements of the device standards:

• DIN EN 62020 (VDE 0663)

Approvals







UL508 - Standard for Industrial Control Equipment CSA C22.2 No. 14-13 - Industrial Control Equipment UL File number E173157 (for all RCMS460/RCMS490)

UL1053 - Standard for Safety Ground-Fault Sensing and Relaying Equipment

UL File number E478610

(Only for B94053006 and solely in combination with Marina Guard MG-1.3 and MG-T.3.

If necessary, other applications are to be evaluated separately after consulting the manufacturer.)

Further information

For further information refer to our product range on www.bender.de.



Ordering information RCMS460/490-D

Type Supply voltage <i>U</i> ₅	Differential measurement method		Common alarm relay for all	Alarm relay per	4 channels for load current	Art. No.											
Турс	Supply voltage 03	pulsed DC sensitive	AC/DC sensitive	channels	channel	measurement	AI C. HO.										
RCMS460-D-1	AC 1672 V, 50/60 Hz / DC 1694 V	- 6 mA20 A						B94053001									
RCMS460-D-2	AC 70276 V, 50/60 Hz / DC 70276 V					_	B94053002										
RCMS460-D4-1	AC 1672 V, 50/60 Hz / DC 1694 V		- 6 mA20 A	- 6 mA20 A] (mA 20A 10 mA			_	100 4 135 4	B94053009							
RCMS460-D4-2	AC 70276 V, 50/60 Hz / DC 70276 V					6 A - 20 A	C 4 20.4			C A 20 A	C A 20 A	CA 20.4	C A . 20 A	10 4 10 4	2 x 1		100 mA125 A
RCMS490-D-1	AC 1672 V, 50/60 Hz / DC 1694 V				10 mA10 A	changeover contact			B94053005								
RCMS490-D-2	AC 70276 V, 50/60 Hz / DC 70276 V				12 x 1	_	B94053006										
RCMS490-D4-1	AC 1672 V, 50/60 Hz / DC 1694 V				N/O contact	100 4 135 4	B94053011										
RCMS490-D4-2	AC 70276 V, 50/60 Hz / DC 70276 V]				100 mA125 A	B94053012										

Ordering information RCMS460/490-L

Type Supply voltage U _s	Current measurement		Common alarm relay	Alarm relay per	Art. No.			
	pulsed DC sensitive	AC/DC sensitive	for all channels	channel	711 1101			
RCMS460-L-1	AC 1672 V, 50/60 Hz / DC 1694 V	- 6 mA20 A	C A . 20 A				B94053003	
RCMS460-L-2	AC 70276 V, 50/60 Hz / DC 70276 V			C A 20 A	C A - 20 A	10 mA10 A	2 x 1	_
RCMS490-L-1	AC 1672 V, 50/60 Hz / DC 1694 V		10 MA 10 A	changeover contact	12 1 N/O contact	B94053007		
RCMS490-L-2	AC 70276 V, 50/60 Hz / DC 70276 V				12 x 1 N/O contact	B94053008		

Accessories

Description	Art. No.
XM460 mounting frame, 144 x 72 mm	B990995
XM490 mounting frame, 198 x 72 mm	B990996

Suitable system components

Description	Version	Type of construction	Туре	Art. No.	Page
		circular	CTAC	B981100	359
	pulsed DC sensitive	rectangular	WRS(P)	B9117	371
Massuring surrent transformers	puiseu DC sensitive	split-core	WS	B980806	367
Measuring current transformers		flexible	WF	B780802	373
	AC/DC appointing	circular -	CTUB100	B781200	376
	AC/DC sensitive		CTBS25	B98120060	380
Connecting cables for Measunging current transformers CTUB100 series	-	-	CTXS	B9811009	376
Condition Monitor	with integrated gateway: Bender system/Ethernet		COM465IP	B950610	417
Condition Monitor	with display and an integrated gateway	-	CP9I	B9506103	431
RS-485 repeater	-	_	DI-1DL	B95012047	408
Power supply unit	for supplying up to six CTUB100 series measuring current transformers	-	STEP-PS	B940531	400
Alarm indicator and test combination	acc. DIN VDE 0100-710	_	MK2430	B951000	441

	Device features/d	istinguishing features	RCMS460-D	RCMS460-L	RCMS490 -D	RCMS490-L
	Paran	neter setting function	~	-	~	-
		Master/Slave	~	~	~	~
		Address range	190	190	190	190
	Measur	ing channels per device	12	12	12	12
		VS, CTUB100, CTBS25, WF series ing current transformers	>	~	~	~
		CT monitoring	>	~	~	~
		AC/DC sensitive 02000 Hz (Type B)	10 mA10 A	10 mA10 A	10 mA10 A	10 mA10 A
	Rated residual operating	pulsed DC sensitive 422000 Hz (Type A)	6 mA20 A	6 mA20 A	6 mA20 A	6 mA20 A
Measuring circuit	current / _{An2} (Alarm)	pulsed DC sensitive 422000 Hz (Type A) for the channels 912 (RCMS4x0-D4/-L4)	100 mA125 A	100 mA125 A	100 mA125 A	100 mA125 A
	Rated residual op	erating current /Δn1 (prewarning)	10100 %, min. 5 mA			
	Function selec	table per channel off, <, >, I/O	>	>	~	~
	Cut-off frequency adjustable for personnel, plant and fire protection		>	*	~	*
	Preset f	function for /Δn2 and I/O	>	>	~	~
		Hysteresis	240 %	240 %	240 %	240 %
	Fact	tor for additional CT	>	>	~	~
Switching	Common a	larm relay for all channels	2 x 1 changeover contact			
elements	Alar	rm relay per channel	-	_	12 x 1 N/O contact	12 x 1 N/O contact
	Sta	rt-up delay 099 s	>	~	~	~
Time	Response de	elay tv, adjustable 0999 s	>	~	~	~
response	Operating time at	$I_{\Delta n} = 1 \times I_{\Delta n2} \le 180 \text{ ms}$	>	~	~	~
	operating time at	/ _{Δn} = 5 x / _{Δn2} : ≤ 30ms	>	~	~	~
	Analysis of	the harmonics (/a, DC, THF)	>	*	~	*
	History n	nemory 300 data records	~	-	~	-
	Data logger 1	for 300 data records/ channel	>	-	~	_
Displays,		Internal clock	~	-	~	_
memory		Password	~	-	~	_
	Language Eng	lish, German, French, Swedish	>	_	~	_
	Backi	lit graphics LC display	>	-	~	_
	7-segm	ent display and LED line	-	~	-	~

 $[\]ensuremath{^*}$ only in conjunction with RCMS4xx-D, MK2430 or COM465IP

Technical data

a) RCMS4x0-D1	
Supply voltage $U_{\rm S}$	DC 2475 V/AC 2460 V (AC/DC ±20 %)
Supply voltage frequency	DC, 50/60 Hz
Rated insulation voltage	100 V
Overvoltage category	III
Pollution degree	3
Rated impulse voltage	2.5 kV
Protective separation (reinforced insulation) between	(A1, A2) - (k1, Ik12, R, T/R, T, A, B)
Voltage test acc. to IEC 61010-1	1.344 kV
Rated insulation voltage	250 V
Overvoltage category	III
Pollution degree	3
Rated impulse voltage	4 kV
Basic insulation between	(A1, A2), (k1, Ik12, R, T/R, T, A, B) -
	21, C22, C24), (11,14), (21,24), (31,34), (41,44),
	81,84), (91,94),(101,104), (111,114), (121,124)
Basic insulation between: (11, 14) -	(21, 24) - (31, 34) - (41, 44) - (51, 54) - (61, 64)
Voltage test acc. to IEC 61010-1	2.21 kV
Rated insulation voltage	250 V
Overvoltage category	III
Pollution degree	3
Rated impulse voltage	6 kV
Protective separation (reinforced insulation) between	(C11, C12, C14) - (C21, C22, C24) -
(11, 14, 21, 24, 31, 3	34) - (41, 44, 51, 54, 61, 64) - (71,74) - (81,84) -
	(91,94) - (101,104) - (111,114) - (121,124)
Voltage test acc. to IEC 61010-1	3.536 kV

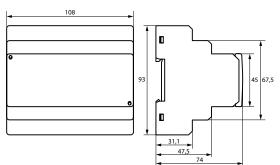
1) 2000 - 22	
b) RCMS4x0-D2	
Supply voltage $U_{\rm S}$	AC/DC 100240 V (-20+15 %)
Supply voltage frequency	DC, 50/60 Hz
Rated insulation voltage	250 V
Overvoltage category	III
Pollution degree	3
Rated impulse voltage	6 kV
Protective separation (reinforced insulation) between	en (A1, A2) - (k1, Ik12, R, T/R, T, A, B),
(C11, C12, C14),	(C21, C22, C24), (11,14), (21,24), (31,34), (41,44),
(51,54), (61,64), (71,74), (81,84), (91,94),(101,104), (111,114), (121,124)
Protective separation (reinforced insulation) between	en (C11, C12, C14) - (C21, C22, C24) -
(11, 14,	21, 24, 31, 34) - (41, 44, 51, 54, 61, 64) - (71,74) -
(8	1,84) - (91,94) - (101,104) - (111,114) - (121,124)
Voltage test acc. to IEC 61010-1	3.536 kV
Rated insulation voltage	250 V
Overvoltage category	III
Pollution degree	3
Rated impulse voltage	4 kV
Basic insulation between: k1, lk1	2, R, T/R, T, A, B) - (C11, C12, C14), (C21, C22, C24)
Basic insulation between: (11, 14) - (21, 24) - (31, 34) - (41, 44) - (51, 54) - (61, 64)
Voltage test acc. to IEC 61010-1	2.21 kV

Measuring circuit	Cable lengths for CTAC, WR, WS, WF series measuring current transformers
External measuring current transformers CTAC, WR, WS, WF series (Type A),	Single wire $\geq 0.75 \text{ mm}^2$ 01 m
CTUB100, CTBS25 series (Type B)	Single wire, twisted $\geq 0.75 \text{ mm}^2$ 010 m
CT monitoring on/off (on)*	Shielded cable $\geq 0.5 \text{ mm}^2$ 040 m
Rated burden RCMSD/-L 68Ω	Cable (shielded, shield connected to terminal I at one end, must not be earthed)
Rated burden RCMSD4/-L4 (channels 912 only) 1Ω	recommended: J-Y(St)Y min. 2 x 0.8
Rated insulation voltage (measuring current transformer) 800 V	Cable lengths for CTIIP100 and CTPS25 series measuring surrent transformers
Operating characteristics acc. to IEC/TR 60755 type A and type B	Cable lengths for CTUB100 and CTBS25 series measuring current transformers
depending on measuring current transformer series (type A)*	Single wire $\ge 0.75 \text{ mm}^2$ 010 m
Rated frequency 02000 Hz (Type B) / 422000 Hz (type A)	Connection plug-in connector, recommended CTXS
Cut-off frequency none, IEC, 50 Hz, 60 Hz (none)*	Switching elements
Measuring range RCMSD/-L 030 A (measuring current transformer type A)	Number 2 x 1 changeover contact (RCMS460)
020 A (measuring current transformer type B)	2 x 1 changeover contact, 12 x 1 N/O contact (RCMS490)
Crest factor up to 10 A = 4, up to 20 A = 2	Operating principle NC or N/O operation (N/O operation)*
Measuring range RCMSD4/-L4 (channels 912 only) 100 mA125 A	Electrical endurance under rated operating conditions, number of cycles 10.000
Rated residual operating current I∆n2 (alarm) 10 mA10 A (type B)	Contact data acc. to IEC 60947-5-1
6 mA20 A (type A)	Utilisation category AC-13 / AC-14 / DC-12 / DC-12 / DC-12
(100 mA overcurrent)*	Rated operational voltage 230 V / 230 V / 24 V / 110 V / 220 V
Rated residual operating current $I_{\Delta n2}$ (alarm) for RCMSD4/-L4 (channels 912 only)	Rated operational current (common alarm relay) 5 A / 3 A / 1 A / 0,2 A / 0,1 A
100 mA125 A (16 A overcurrent)*	Rated operational current (alarm relay) 2 A / 0.5 A / 5 A / 0.2 A / 0.1 A
Rated residual operating current $I_{\Delta n1}$ (prewarning) 10100 % x $I_{\Delta n2}^*$ Digital input 1: < 100 Ω	Minimum contact rating 10 mA/5 V DC
Digital input $ \begin{array}{c} 1: < 100 \ \Omega \\ 0: > 250 \ \Omega \\ \end{array} $	
0: > 250 Ω Preset for alarm /Δ x factor 199 (3)*	Environment/EMC EMC DIN EN 62020
Preset for alarm 7∆ x factor 199 (3)* Offset 020 A (30 mA)*	
Preset for digital input 0.1.20 A (30 ma)*	Operating temperature -25+ 55 °C
Relative uncertainty RCMSD/-L 020 % ¹⁾	Classification of climatic conditions acc. to IEC 60721
Relative uncertainty RCMS0/-L Relative uncertainty RCMS04/-L4 (channels 912 only) +1020 % ¹	(related to temperature and relative humidity)
Hysteresis 240% (20 %)*	Stationary use (IEC 60721-3-3 3K22
Factor for additional CT /110; x 1250 (x 1)*	Transport (IEC 60721-3-2) 2K11
Number of measuring channels (per device/system) 12/1080	Long-term storage (IEC 60721-3-1) 1K22
	Classification of mechanical conditions acc. to IEC 60721
¹⁾ In the frequency range of < 15 Hz, the relative uncertainty is between -35 $\%+100$ $\%$.	Stationary use (IEC 60721-3-3) 3M11
Time records	Transport (IEC 60721-3-2) 2M4
Time response	Long-term storage (IEC 60721-3-1) 1M12
Start-up delay t (start-up) per device 099 s (0 ms)*	Connection
Response delay t_{00} per channel 0999 s (200 ms)*	
Delay on release t _{off} per channel 0999 s (200 ms)*	For UL applications:
Operating time t_{ae} at $l_{\Delta n} = 1 \times l_{\Delta n 1/2}$ $\leq 180 \text{ ms}$ Operating time t_{ae} at $l_{\Delta n} = 5 \times l_{\Delta n 1/2}$ $\leq 30 \text{ ms}$	Use 60/70 °C copper conductors only! Connection screw terminals
Response time t_{an} for residual current measurement $t_{an} = t_{ae} + t_{on1/2}$	Connection screw terminals Connection properties:
Operating time t_{ae} digital inputs $ \leq 3.5 \text{ s} $	Rigid/flexible/conductor sizes 0.24/0.22.5 mm²/AWG 2412
Scanning time for all measuring channels (residual current measurement) ≤ 180 ms	Multi-conductor connection (2 conductors with the same cross section):
Recovery time t _b 500600 ms	Rigid/flexible 0.21.5/0.21.5 mm2
incovery unitely	Stripping length 89 mm
Displays, memory	Tightening torque 0.50.6 Nm
Measured value display range RCMSD / -L 030 A (CT Type A)	19 to
020 A (CT type B)	Other Other
Display range, measured value RCMSD4/-L4 (channels 912) 0125 A (CT type A)	Operating mode continuous operation
Error of indication $000000000000000000000000000000000000$	Mounting display-oriented
LEDs ON/ALARM	Degree of protection, internal components (IEC 60529)
measuring channel 112 (RCMSL)	Degree of protection, terminals (IEC 60529)
LC display backlit graphical display (RCMSD)	Enclosure material polycarbonate
7-segment display 2 x 7.62 mm (RCMS4L)	Flammability class UL94V-0
History memory 300 data records (RCMSD)	Screw mounting 2 x M4
Data logger 300 data records per measuring channel (RCMSD)	DIN rail mounting acc. to IEC 60715
Password off / 0999 (off)*	Software version measurement technique D233 V2.60
Language	Software version display
German, English, French D256 V2.3x	RCMS4L D216 V2.3x
German, English, Swedish D339 V2.3x	German, English, French D256 V2.3x
German, English, Italian D403 V2.3x	German, English, Swedish D339 V2.3x
Fault memory alarm relay on/off (off)*	German, English, Italian D403 V2.3x
Inputs/outputs	Power consumption ≤10 VA (RCMS460)
Test/reset button internal/external	≤12 VA (RCMS490)
Cable length for external test/reset button 010 m	Documentation number D00067
-	Weight ≤ 300 g (RCMS460),
Interface	≤ 510 g (RCMS490)
Interface/protocol RS-485/BMS	()* factory setting
Baud rate 9.6 kbit/s	
Cable length 01200 m	
Cable (shielded, shield connected to PE on one side) recommended: min. J-Y(St)Y min. 2x0.8	
Terminating resistor 120 Ω (0.25 W) connectable via DIP switch	
Device address. BMS hus 190 (2)*	

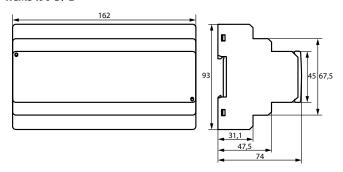
1...90 (2)*

Device address, BMS bus

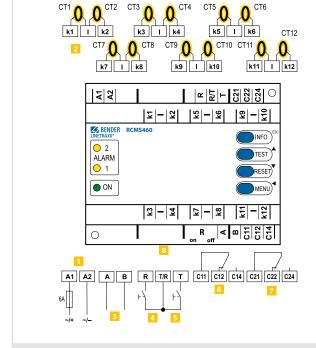
RCMS460-D/-L



RCMS490-D/-L

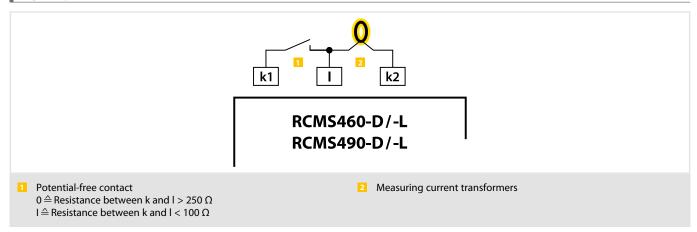


Wiring diagrams

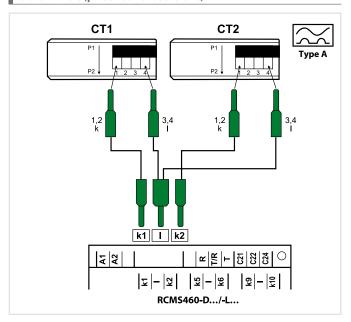


k1 | k2 k3 | k4 k5 I k6 11 14 21 24 31 34 41 44 51 54 61 64 k7 | k8 k9 I k10 k11 | I | k12 71 74 81 84 91 94 101 104 111 114 121 124 **₩** BENDER O 2 ALARM TEST RESET ON MENU) 0 A1 A2 A B R T/R T C11 C12 C14 C21 C22 C24

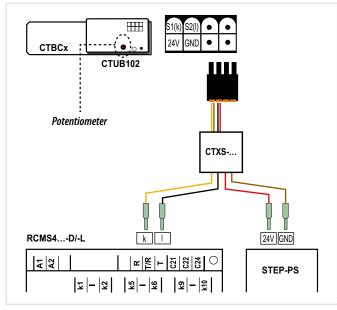
- 1 A1, A2 Connection of supply voltage U_s (see ordering information): we recommend the use of 6 A fuses.
- 2 k1, l... CT1...CT12. Either Type A or Type B measuring current k12, l transformers can be selected for each measuring channel. Six CTUB100 series measuring current transformers require one STEP-PS power supply unit. The channels k9...k12 of the device versions RCMS460-D4/-L4 require the connection of Type A measuring current transformers.
- BMS bus (RS-485 interface with BMS protocol) 3 A, B
- External reset button (N/O contact). The external reset 4 R, T/R buttons of several devices must not be connected to one another.
- 5 T, T/R External test button (N/O contact). The external test buttons of several devices must not be connected to one
- 6 C11, C12, Common alarm relay K1: Alarm 1, common message for C14 alarm, prewarning, device error.
- C21, C22, Common alarm relay K2: ALARM 2, common message for C24 alarm, prewarning, device error.
- Activate or deactivate the terminating resistor of the BMS 8 Ron/off bus (120 Ω).
- 9 CT Measuring current transformers (CTAC..., CTBS25, CTUB100, WR..., WS..., WF... series)



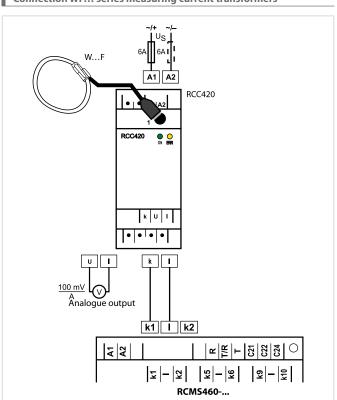
Connection CTAC..., WR...S(P), WS... series measuring current transformers (pulsed current sensitive)



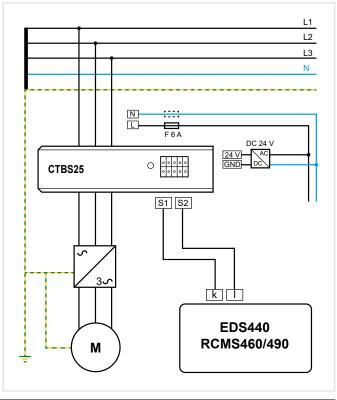
Connection CTUB100 series measuring current transformer (AC/DC current sensitive)

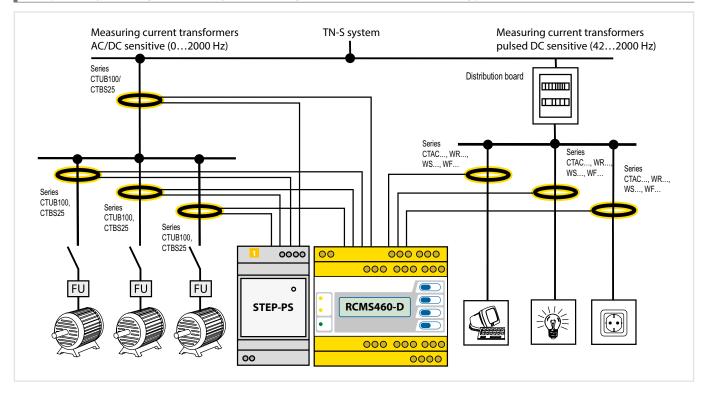


Connection WF... series measuring current transformers

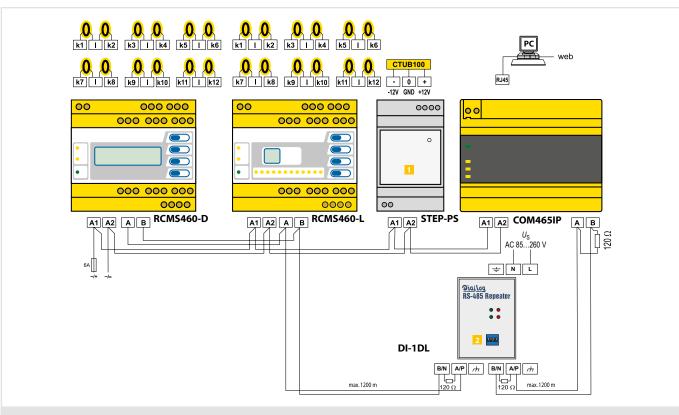


Connection CTUB100 series measuring current transformer (AC/DC current sensitive)





Example for a system design of – standard system consisting of an RCMS460-D and RCMS460-L and a protocol converter COM460IP



Note:

- When using AC/DC current sensitive measuring current transformers of the CTUB100 and CTBS25 series , a DC 24 V power supply unit (e.g. STEP-PS series) is required to supply the measuring current transformers with voltage. For this purpose, the technical data of the respective measuring current transformer series must be observed.
- The DI-1DL repeater only is required when the length of the cable exceeds 1200 m.

LINETRAXX® RCMS150 series

Residual current monitor type B with integrated measuring current transformers for unearthed AC/DC systems (TN and TT systems)



Typical applications

- · Residual current monitoring system for current outlets and final circuits
- · Monitoring residual currents of stationary electrical installations and equipment to determine practice-oriented test intervals in accordance with DGUV Regulation 3 (German Social Accident Insurance) and BetrSichV (Occupational Safety and Health Regulation)
- EMC monitoring of TN-S systems for "stray" currents and additional unwanted N-PE bridges
- · Monitoring currents regarded as fire hazards in flammable atmospheres
- Monitoring the PE to ensure that there is no current flow

Device features

- · Continuous residual current monitoring in compliance with DGUV Vorschrift 3 (German Social Accident Insurance Regulation 3)
- AC/DC sensitive residual current monitor type B with 6 channels K1...6 (each channel features 2 measuring channels: 1 x r.m.s., 1 x DC)
- · Ideal for applications with space limitations
- · Easy DIN rail or screw mounting to standard distribution panels
- 2 separately adjustable response values (RMS or DC) per channel
- · Continuous self monitoring
- Fully shielded measuring current transformers to avoid external influences due to magnetic fields that may cause disturbances
- Compatible with Bender gateways of type COM465IP, CP9...
- RCMS150 (RS-485 interface with BMS protocol)
 - In the system network compatible with RCMS460/490
 - Address range 2...90, can be set directly on the unit
- Up to 89 RCMS150 can be used on the bus
- RCMS150-01 (RS-485 interface with Modbus RTU protocol)
 - In the system network, compatible with other Modbus RTU-capable device series from Bender, including the RCMB300 series and RCMB13...-01
- Address range1...99 can be set directly on the unit by means of a detent potentiometer
- Address range1...247 adjustable via the bus
- Up to 247 RCMS150-01 can be used on the bus

Further information

For further information refer to our product range on www.bender.de.

Approvals





LR in preparation

Ordering information

Туре	Supply voltage <i>U</i> s	Protocol	Art. No.
RCMS150	DC 24V	BMS	B94053025
RCMS150-01	DC 24 V	Modbus RTU	B94053026

Accessories

Description	Art. No.
Mounting clip for DIN rail mounting	B91080110

Suitable system components

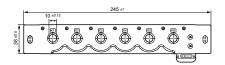
Description	RCMS 150	RCMS 150-01	Туре	Art. No.	Page
Power supply	>	~	STEP-PS	B940531	400
Condition Monitor with integrated gateway	>	>	COM465IP ¹⁾	B95061065	417
Condition Monitor	~	~	CP9I	B9506103	431
RS-485 repeater	>	>	DI-1DL	B95012047	408
Residual current monitor ²⁾	<		RCMS460-D	B940530	194
	~	_	RCMS490-D	B940530	194

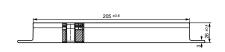
¹⁾ from function module C

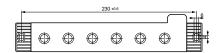
²⁾ In this case no Condition Monitor/Gateway necessary. Suitable for measured value and alarm indication only, not suitable for parameter setting

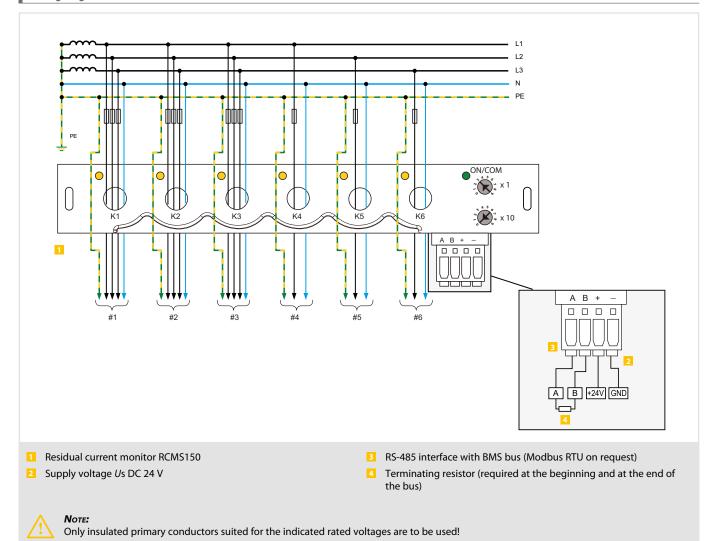
Insulation coordination according to IEC 6	50664-1	Environment/EMC	
The data are valid for the monitored primary circ	cuit to the output circuit	EMC	
Primary circuit	Primary conductors routed through the transformer	Immunity	IEC 62020-
Output circuit	(+, -, A, B)	Emission	IEC 62020-
Rated insulation voltage	300 V	Operating temperature	-25+70°
Overvoltage category	III	for UL applications	-25+65°
Rated impulse withstand voltage monitored cir	rcuit/output circuit 4 kV	•	
Range of use	≤ 2000 m AMSL	Classification of climatic conditions acc. to IEC 60721 (rela	· · · · · · · · · · · · · · · · · · ·
Rated insulation voltage	250 V	Stationary use (IEC 60721-3-3)	3K2
Pollution degree	3	Transport (IEC 60721-3-2)	2K1
Insulation	<u> </u>	Long-term storage (IEC 60721-3-1)	1K2
To achieve double insulation (DI) for over	rvoltage category III. insulated primary	Classification of mechanical conditions acc. to IEC 607	21:
conductors with sufficient rated voltage i		Stationary use (IEC 60721-3-3)	3M1 ⁻
BI	Overvoltage category III	Transport (IEC 60721-3-2)	2M-
DI	Overvoltage category II	Long-term storage (IEC 60721-3-1)	1M1:
Voltage test acc. to IEC 61010-1	AC 2.2 kV		
Totage test acc to lee of the f	TIC Z.I.Z. KV	Connection	
Power supply		Connection type	pluggable double push-wire termina
Nominal supply voltage U_S with galvanic separate	ation DC 24 V	Connection properties:	•
Operating range $U_{\rm S}$	±20 %	rigid, flexible/conductor sizes	0.21.5 mm ² (AWG 2416)
Power consumption	< 4 W	Multi-conductor connection (2 conductors with the san	•
		rigid	0.21.5 mm
Residual current measuring range		flexible	0.21.5 mm
Frequency range	02000 Hz	flexible with ferrule without plastic sleeve	0.251.5 mm
Measuring range	±500 mA	flexible with ferrule with plastic sleeve	0.250.75 mm
Resolution measured value	1 % of the set response value	Stripping length	10 mm
Response values		Other	
Residual current /AN2	RMS 0300 mA (30 mA)*	Operating mode	continuous operation
for LR applications	RMS 10300 mA (30 mA)*	Position of normal use	an
Residual current /AN2	DC 3 300 mA (6 mA)*	Enclosure material	polycarbonate
for LR applications	DC 10300 mA (6 mA)*	Flammability class	UL94 V-(
Ratio / _{AN2} RMS// _{AN2} DC	0.25	Screw mounting to standard distribution panels with 12 TE	2 x M6
Prewarning $I_{\Delta N1}$ RMS/DC	50100 % of I _{ΔN2} (50 %)*	DIN rail mounting	mounting clip (accessories
Response tolerance I _{AN2}	30100 /0 011ΔΝΣ (30 /0)	Tightening torque	1.5 Nn
DC 10500 Hz	-200%	Documentation number	D00259
500 Hz1 kHz	-20+100 %	Weight	170 (
Hysteresis	1025 % (15 %)	weight	170 (
•		Measuring current transformer	
¹⁾ For LR applications, $I_{\Delta n2}$ DC must be change	d to a value ≥ 10 mA.	Diameter cable gland	10 mm
Time was now		Load current	32 A
Time response		_	
Start-up delay t _{start-up}	0.5600 s (0.5 s)*	Bus parameter	
Response delay		Alarm	threshold value exceeded, system faul
t _{on1} RMS/DC	0600 s (0 s)*		DC component, RMS (resolution 0.1 mA
t _{on2} RMS/DC	0600 s (0 s)*	Times respon	se delay, delay on release, start-up dela
Delay on release		()* = factory settings	
t _{off} DC	0600 s (1 s)*	(, seconds	
Indication (LEDs)			
ON	green		
ALARM K16	yellow		
Interface			
	DC AOF		
Interface/protocol	RS-485		
Connection	terminals A/B		
Cable	Shield on one side connected to PE		
recommended:	CAT6/CAT7 min. AWG 23		
alternative:	twisted pair, J-Y(St)Y min. 2x0,8		
Bus terminating resistor external	(2x) 120 Ω (0.25 W)		
Protocol	BMS		
Cable langth	≤ 1200 m		
Cable length			
Device address	290 (2)*		
3			
Device address	290 (2)*		

Dimension diagrams (dimensions in mm)









LINETRAXX® MRCDB423

Modular residual current device type B for additional protection (protection against indirect contact) in earthed systems (TN and TT systems)



Typical applications

• Additional protection (protection against indirect contact) in earthed systems (TN and TT systems)

Device features

- · AC/DC sensitive MRCD type B in accordance with IEC 60947-2 Annex M
- Use as modular residual current protective device for additional protection in earthed systems
- Operating characteristic type B in accordance with IEC 60755
- · RMS value measurement of the residual current
- · Alarm and prewarning indication via display and LEDs
- Alarm and prewarning output via relays (K1/K2)
- Control of a switching element with isolating properties via relay K2
- Measuring current transformer connection monitoring
- Fault memory

Further information

For further information refer to our product range on www.bender.de.

Approvals



Ordering information

MRCDB423

Туре	Supply voltage U s ¹⁾	Response range I∆n	Rated frequency	Art. No.
MRCDB423-D-1	DC 9.694 V / AC 42460 Hz, 1672 V	20 4 2.4	0 2000 H-	B94043055
MRCDB423-D-2	DC 70300 V / AC 42460 Hz, 70300 V	30 mA3 A	02000 Hz	B94043056

¹⁾ Absolute values of the voltage range

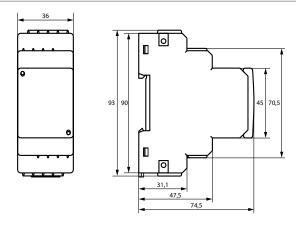
External measuring current transformers

Туре	CT diameter	Shield	Art. No.	Page
CTUB101-CTBC20	a 20	-	B78120010	376
CTUB101-CTBC20P	ø 20	~	B78120020	376
CTUB101-CTBC35	ø 35	-	B78120012	376
CTUB101-CTBC35P		~	B78120022	376
CTUB101-CTBC60	(0	-	B78120014	376
CTUB101-CTBC60P	ø 60	~	B78120024	376

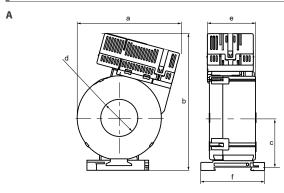
Туре	CT diameter	Shield	Art. No.	Page
CTUB101-CTBC120	~ 120	-	B78120016	376
CTUB101-CTBC120P	ø 120	>	B78120026	376
CTUB101-CTBC210	~ 210	-	B78120018	376
CTUB101-CTBC210P	ø 210	~	B78120028	376

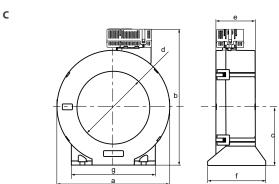
Insulation coordination acc. to IEC 60664-1/IEC 60	664-3
MRCDB423-D-1:	
Rated voltage	100 \
Overvoltage category/pollution degree	III/2
Rated impulse voltage	2.5 k
MRCDB423-D-2:	
Rated voltage	250
Overvoltage category/pollution degree	III/2
Rated impulse voltage	4 k'
Protective separation (reinforced insulation) between	(A1, A2) - (k, I, T/R) - (11, 12, 14) - (21, 22, 24
Voltage tests acc. to IEC 61010-1	2.21 k
Supply voltage	
MRCDB42-D-1:	
Supply voltage range U _S	AC 2460 V/DC 2478 V
Operating range supply voltage $U_{\rm S}$	AC 1672 V/DC 9.694 V
Frequency range $U_{\rm S}$	DC, 42460 H
MRCDB423-D-2:	
Supply voltage range $U_{\rm S}$	AC/DC 100250
Operating range supply voltage $U_{\rm S}$	AC/DC 70300
Frequency range $U_{\rm S}$	DC, 42460 H
Power consumption	≤ 6.5 V
Measuring circuit	
External measuring current transformer type	CTUB101-CTBCxx(P); CTUB101-CTBCxxx(P
Rated voltage (measuring current transformer)	800
Operating characteristic type B in accordance with IEC 60	0755 type
Rated frequency	02000 H
Operating uncertainty	035 %
Response values	
Rated residual operating current I∆n1	50100 % of I _{Δn2} (50 %)
Rated residual operating current $I_{\Delta n2}$	30 mA3 A (30 mA)
Time response	
Start-up delay <i>t</i>	(1 s)
Response delay ton1	010 s (1 s)
Response delay ton2	010 s (0 s)
Operating time t_{ae} at $I_{\Delta n} = 1 \times I_{\Delta n 1/2}$	≤ 180 m
Operating time t_{ae} at $I_{\Delta n} = 5 \times I_{\Delta n 1/2}$	≤ 23 m
Response time t _{an}	$t_{\rm an} = t_{\rm ae} + t_{\rm on1/}$
Recovery time $t_{\rm b}$	≤ 300 m
Displays, memory	
Display range measured value AC/DC	06
Error of measured value indication	±17.5 %/±2 digit
Measured-value memory for alarm value	Data record measured value
Password	off/0999 (on)
Fault memory output relay	ye

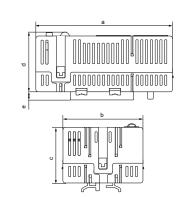
Cable length for external test/reset button			03 r
Cable length for measuring current transformer conn	nection		03 r
Switching elements			
Number of switching elements			2 v 1 changeover centar
Operating principle			2 x 1 changeover contact N/C operation
Electrical endurance, number of cycles			1000
			1000
Contact data acc. to IEC 60947-5-1:		16 12 / 14	C 4.4 / DC 42 / DC 42 / DC 4
Utilisation category			C-14 / DC-12 / DC-12 / DC-1
Rated operational voltage			/ 230 V / 24 V / 110 V / 220
Rated operational voltage UL Rated operational current	5 A		² 200 V / 24 V / 110 V / 200 1 A 0.2 A 0.1
	5 A	3 A	1 A 0.2 A 0.1 1 mA at AC/DC > 10
Minimum contact rating			I MA al AC/DC ≥ 10
Environment/EMC			
EMC IEC 60947-2 a	nnex M (lir	nit value o	class A according to CISPR11
Operating temperature	•		-25+55 °
Transport			-25+70°
Long-term storage			-25+55°
Classification of climatic conditions acc. to IEC 607	' 21 (related	to temner	rature and relative humidity)
Stationary use (IEC 60721-3-3)	ZI (iciatea	to temper	3K2
Transport (IEC 60721-3-2)			2K1
Long-term storage (IEC 60721-3-1)			1K2
Classification of mechanical conditions acc. to	IE <i>C 6</i> 0721		
Stationary use (IEC 60721-3-3)	IEC 00/21		3M1
Transport (IEC 60721-3-2)			2M
Long-term storage (IEC 60721-3-1)			1M1
Long term storage (ice 00/21 3 1)			TIWI I
Connection			
Connection type			screw-type termina
Connection properties:			
Rigid/flexible			22.5 mm² (AWG 2412
Multi-conductor connection (2 conductors with the s	ame cross	section):	
Rigid/flexible			0.21.5/0.21.5 mn
Stripping length			89 mr
Tightening torque			0.50.6 Ni
Other			
Operating mode			continuous operatio
Position of normal use			display-oriente
Degree of protection, internal components (IEC 6052	9)		IP3
Degree of protection, terminals (IEC 60529)	,		IP2
Enclosure material			polycarbonat
Flammability class			UL94V-
DIN rail mounting acc. to			IEC 6071
Screw fixing			2 x M4 with mounting cli
Documentation number			D0039
DOCUMENTATION NUMBER			



Dimension diagram CTUB10...-CTBC...





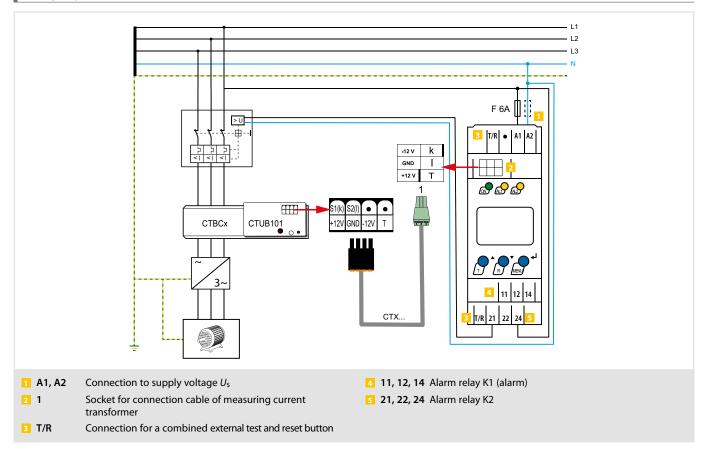


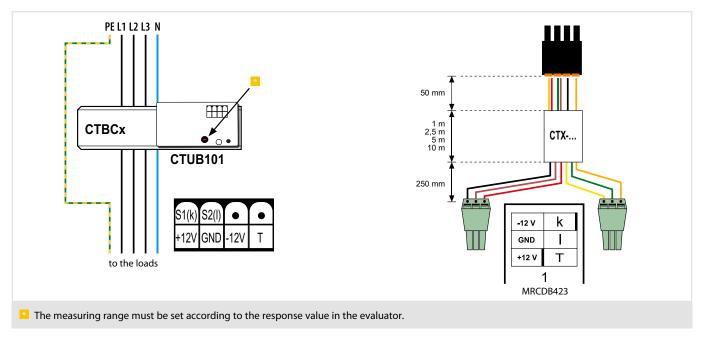
	Dimensions (mm)							
	Туре	a	b	c	d	e	f	g
	CTUB10CTBC20(P)	75	83	37	ø 20	46	60,5	-
Α	CTUB10CTBC35(P)	97	130	47	ø 35	46	61	_
В	CTUB10CTBC60(P)	126	151	57	ø 60	56	78	_
	CTUB10CTBC120(P)	188	225	96	ø 120	65	96	139
	CTUB10CTBC210(P)	302	339	153	ø 210	67	113	277
D	CTUB10	74	44	30	32	4,6	-	_

В

D

Tolerance:: ±0,5 mm





LINETRAXX® MRCDB300 series

AC/DC sensitive residual current monitoring modules for MRCD applications



Typical applications

• for MRCD applications

Approvals





Device features

- Structure of a protective device in accordance with IEC 60947-2 Annex M in combination with a circuit breaker providing isolating properties
- · Monitoring of the connected circuit breaker by means of contact feedback
- RS-485 interface with Modbus RTU (reading out measured values/setting parameters)
- Integrated switching outputs with two changeover contacts K1 and K2 (galvanically isolated)
- · Fulfils the protection goals protection of persons, fire protection and plant protection (depending on the variant)
- Frequency range DC...100 kHz
- · Combined test and reset button
- · Multicolour LED indicating operation, exceeded response value, disturbances and status messages
- AC/DC sensitive type B measured value acquisition acc. to IEC 60755
- AC/DC sensitive type B+ measured value acquisition acc. to VDE 0664-400
- Exchangeable electronic enclosure without mechanical separation of the primary conductors
- · Extension/retrofitting or modification of functionalities in case of changed monitoring requirements
- Insensitive to load currents due to full magnetic shield (CTBC...P only)
- · Connection monitoring of the measuring current transformer with cyclical test current
- Use of all MRCDB30... for all CTBC... measuring current transformer sizes
- · Supply voltage DC 24

Standards

The variants B74043120, B74043121 and B74043122 of the MRCDB300 series comply with the requirements of the standard:

• DIN EN 45545-2.

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Electronic modules

Туре	Supply voltage <i>U</i> ₅	Variant	Art. No.
MRCDB301		Protection of persons	B74043120
MRCDB302		Fire protection	B74043121
MRCDB303		Protection of persons, fire protection and plant protection (freely configurable)	B74043122
MRCDB304	DC 24V (19.228.8V)	Plant protection	on request
MRCDB305		Protection of persons for applications with pulsed, very high peak load currents (> 1 kA for < 1 s), e.g. welding applications	B74043125

Required terminals are included in the scope of delivery.

Measuring current transformers

Туре	Internal diameter	Art. No.
CTBC20	20	B98120001
CTBC20P	20 mm	B98120002
CTBC35	35 mm	B98120003
CTBC35P		B98120004
CTBC60	60 mm	B98120005
CTBC60P		B98120006
CTBC120	120 mm	B98120007
CTBC120P	120 mm	B98120020
CTBC210	210 mm	B98120008
CTBC210P	Z IV MM	B98120021

P = full magnetic shield

Accessories

Description	Art. No.
Interface converter USB to RS-485	B95012045
Terminal block for MRCD module ¹⁾	B74043124
Snap-on mounting for CTBC20 and CTBC20P1)	B91080111
Snap-on mounting for CTBC35 and CTBC35P1)	B91080112

¹⁾ Included in scope of delivery

Suitable system components

Description	max. connected current transformers	Туре	Art. No.	Page
Voltage	14	STEP-PS/1 AC/24 DC/1.75	B94053111	400
supply	34	STEP-PS/1 AC/24 DC/4.2	B94053112	400

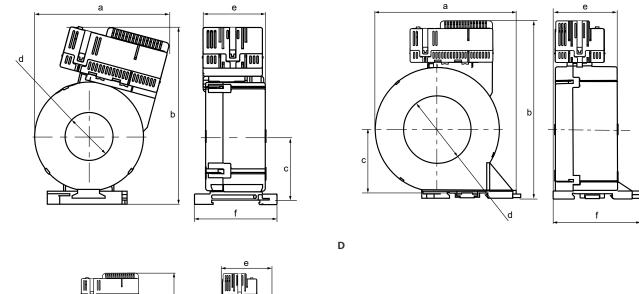


Insulation coordination acc. to IEC 60664-1 Definitions:	, i.e. 0000T J	Inputs Lable	T/R, GND, D1, D0
Measuring circuit (IC1)	Primary conductors routed through the current transformer	Maximum length connecting cable	10 m
Secondary (IC2)	Terminal block 1 (24 V, GND, D1, DG, T/R, GND, A, B, X1, X2)	Outputs	
Control circuit 1 (IC3)	Terminal block 2 (11,12,14)	Number of changeover contacts	
Control circuit 2 (IC4) Rated insulation voltage	Terminal block 3 (21,22,24) 800 V	Operating principle	
Overvoltage category		MRCDB301, MRCDB302, MRCDB305	N/C principle
Area of application	≤ 2000 m AMSL		or N/O principle, (freely configurable), (N/C principle) [†]
Rated impulse voltage:		Switching outputs (K1, K2)	250 V, 5 A
IC1((IC2-IC4)	8 kV	Switching capacity	1500 VA/144 W
IC2/(IC3-IC4) IC3/IC4	4 kV 4 kV	Contact data acc. to IEC 60947-5-1	AC 12 / AC 14 / DC 12 / DC 12 / DC 13
Rated insulation voltage:	4 80	Utilisation category Rated operational voltage	AC-13 / AC-14 / DC-12 / DC-12 / DC-12 250 V / 250 V / 24 V / 110 V / 220 V
IC1/(IC2-IC4)	800 V	Rated operational current	5 A / 3 A / 1 A / 0,2 A / 0,1 A
IC2/(IC3-IC4)	250 V	(for UL applications)	3 A / 3 A
IC3/IC4	250 V	Minimum current	10 mA at DC 5 \
Pollution degree Safe isolation (reinforced insulation) between:	2	Electrical endurance, number of cycles	10,000
IC2/(IC3-IC4)	300 V	Environment/EMC	
Basic insulation between:	3001	EMC	IEC 60947-2 Annex N
IC1/(I2-IC4)	800 V	Operating temperature	-2570°C
IC3/IC4	300 V	Classification of climatic conditions acc. to IEC 60	0721
Voltage test (routine test) acc. to IEC 61010-1:	462214	Stationary use (IEC 60721-3-3)	3K23
IC2/(IC3-IC4) IC3/IC4	AC 2.2 kV AC 2.2 kV	Transport (IEC 60721-3-2)	2K1*
IC3/IC4	AC 2.2 KV	Long-term storage (IEC 60721-3-1)	1K22
Supply voltage		Classification of mechanical conditions acc. to IE	
Supply voltage U _s	DC 24 V	Stationary use (IEC 60721-3-3)	3M1
Operating range of U_S Ripple U_S	±20 % ≤ 1 %	Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1)	2M4 1M12
Power consumption	≤ 1 7% ≤ 2.5 W	Long-term storage (IEC 60721-3-1)	IMIZ
Inrush current	1.7 A for 1 ms	Connection	
		Required terminals are included in the scope of delivery.	
Measuring circuit		Terminal block 1	
Internal diameter measuring current transforme Characteristics according to IEC 62020 and IEC/T		Manufacturer	Phoenix Contac
Measuring range	5 mA20 A	Type	DFMC 1.5/5-ST-3.5 Bł
Response value /∆n	see frequency responses in manual	The connection conditions of the manufacturer apply. Connection properties	
MRCDB301 (protection of persons)	30 mA	rigid	0.21.5 mm ² (AWG 2416
MRCDB302 (fire protection)	300 mA	flexible	0.21.5 mm² (AWG 2416
MRCDB303 (plant protection)	30 mA3 A (freely configurable), (30 mA)*	with ferrule	0.250.75 mm ² (AWG 2419
MRCDB305 (protection of persons) Prewarning	30 mA 50 %100 % I∆n (freely configurable), (60 %)*	Terminal block 2, 3	
Rated current In	30 %100 % /Δn (freely configurable), (60 %)	Manufacturer	Phoenix Contac
CTBC20 at $I_{\Delta n} = 30 \text{ mA}$	40 A	Туре	FKCVW 2.5/ 3-ST-5.08
CTBC20 at $I_{\Delta n} = 300 \text{ mA}$	63 A	The connection conditions of the manufacturer apply.	
CTBC20P	80 A	Connection capacity rigid	0.22.5 mm² (AWG 2413
CTBC35 at $I_{\Delta n} = 30 \text{ mA}$	80 A	flexible	0.22.5 mm² (AWG 2413
CTBC35 at $I_{\Delta n} = 300 \text{ mA}$ CTBC35P	125 A 160 A	with ferrule	0.252.5 mm² (AWG 2413
CTBC637 CTBC60 at $I_{\Delta n} = 30 \text{ mA}$	160 A	Harris CTRC	
CTBC60 at $I_{\Delta n} = 300 \text{ mA}$	250 A	Mounting CTBC	
CTBC60P	320 A	Screw type CTBC2060(P)	DIN EN ISO 7045 - M
CTBC120 at $I_{\Delta n} = 100 \text{ mA}$	330 A	CTCB120210(P)	DIN EN ISO 7045 - ME
CTBC120P at $I_{\Delta n} = 100 \text{ mA}$	630 A	Washer type	
CTBC210 at $I_{\Delta n}$ = 300 mA CTBC210P at $I_{\Delta n}$ = 100 mA	630 A 630 A	CTBC2060(P)	DIN EN ISO 7089/7090 - 5
CTBC210F at $I_{\Delta n} = 100 \text{ mA}$	1000 A	CTCB120210(P)	DIN EN ISO 7089/7090 - 6
Operating uncertainty	±17.5 %	Tightening torque	2.71
Relative uncertainty	035 %	CTBC2035 (P) CTCB60210(P)	0.6 Nm 1 Nm
Test winding	yes		I NII
Possible response values (to be set on the	evaluator)	Other	
CTBC20, CTBC20P	10500 mA	Operating mode	continuous operation
CTBC35, CTBC35P, CTUBC60, CTBC60P	30 mA10 A	Mounting Doggeo of protection, internal components (DIN EN 60)	any position
CTBC120P, CTBC210P	100 mA10 A	Degree of protection, internal components (DIN EN 60: Degree of protection, terminals (DIN EN 60529)	529) IP40 IP20
CTBC120, CTBC210	300 mA10 A	Flammability class	UL94 V-(
Time response		Software	D0579
Response delay ton		Documentation number	D0034
MRCDB301, MRCDB302, MRCDB305	0 s	Weight	
MRCDB303	0 s60 min (freely configurable), (0 s)*	MRCDB30	≤ 100 <u>c</u>
Start-up delay t _{an}	0 s60 min (freely configurable), (0 s)*	CTBC20 CTBC20P	≤ 160 g ≤ 220 g
Delay on release t _{off}	2 s after reset	CTBC207 CTBC35	≤ 220 Q ≤ 240 Q
Operating time t_{ae} at 1 x $I_{\Delta n}$	≤ 180 ms	CTBC35P	≤ 320 g
at 2 x /Δn	≤ 130 ms	CTBC60	≤ 460 €
at 5 x /∆n	≤ 20 ms	CTBC60P	≤ 620 €
Response time	$t_{\rm an} = t_{\rm ae} + t_{\rm on}$	CTBC120	≤ 1390 c
Recovery time t _b	≤1s	CTBC120P CTBC210	≤ 1750 g ≤ 4220 g
Indication		CTBC210P	≤ 4220 g ≤ 4870 g
			⊒ 10/0 €
Multicolour LED red/green, s	ee table "System states: LED and output relays" on page 210	()* Factory setting	
Multicolour LED red/green, s	ee table "System states: LED and output relays" on page 210	()* Factory setting The use of the power supply units listed at "Accessorie	s" is recommended

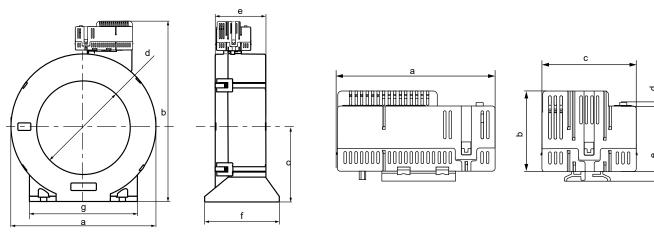


Α

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В



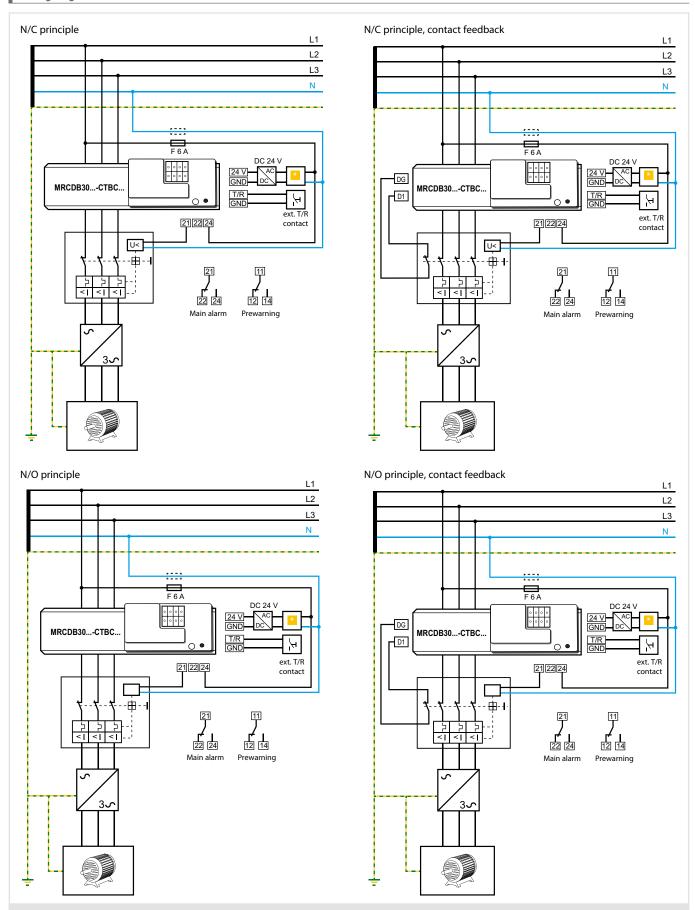
	Dimensions (mm)							
	Туре	a	b	c	d	e	f	g
	MRCDB30CTBC20(P)	81	112	37	ø 20	46	60	-
A	MRCDB30CTBC35(P)	97	130	47	ø 35	49	61	-
В	MRCDB30CTBC60(P)	126	158	57	ø 60	56	78	-
(MRCDB30CTBC120(P)	188	232	96	ø 120	65	96	139
	MRCDB30CTBC210(P)	302	346	153	ø 210	67	113	277
D	MRCDB30	74	37	44	2	4,6	-	-

Tolerance: ±0.5 mm

System states: LED and output relays

The LED indicates the system state by means of colours and lighting/flashing. The N/O contacts of relay outputs K1 and K2 have defined switching positions for each system state.

Custom state	LED		Notes	Changeov	er contact
System state	ON (green)	Alarm (red)	Notes	K1	K2
Device switched off	off	off	Device is de-energised, no monitoring, no monitoring function	de-energised	de-energised
Normal operating state	lights	off	The device is supplied with the specified voltage and monitors the primary circuit. No residual current flows which would lead to tripping.	energised	energised
Prewarning	lights	flashes briefly	The device is supplied with the specified voltage and monitors the primary circuit. A fault current flows which exceeds the set limit of the prewarning.	de-energised	energised
Main alarm	off	lights	The device is supplied with the specified voltage and monitors the primary circuit. A fault current flows which exceeds the set limit of the alarm.	de-energised	de-energised
Device error	off	flashes slowly	The device is supplied with the specified voltage and monitors the primary circuit. An error is detected by the periodic self tests.	de-energised	de-energised



- The use of a type 2 surge protection device (SPD) is mandatory due to possible impulse voltages and in order to comply
 with normative requirements.
 - The surge protection device must be connected upstream of the power supply unit on the supply side.
 - Features of the surge protection device: Nominal discharge current $I_{\rm n}$ (8/20 μ s): 20 kA Response time: 25 ns

two-stage: 1 varistor + 1 spark gab

Alternatively, the power supply unit must be connected to a CAT II supply without a surge protection device.

LINETRAXX® RCMB300 series

AC/DC sensitive residual current monitoring modules with an integrated measuring current transformer



Typical applications

• AC and DC fault currents in earthed systems (TN and TT systems).

Approvals





Device features

- Continuous residual current monitoring in compliance with DGUV Vorschrift 3 (German Social Accident Insurance Regulation 3)
- · Easy DIN rail or screw mounting
- RS-485 interface with Modbus RTU (reading out measured values/setting parameters)
- Integrated switching outputs with two changeover contacts K1 and K2 (galvanically isolated)
- Frequency range DC...100 kHz
- · Combined test and reset button
- Multicolour LED indicating operation, exceeded response value, disturbances and status messages
- AC/DC sensitive type B measured value acquisition acc. to IEC 60755
- AC/DC sensitive type B+ measured value acquisition acc. to VDE 0664-400
- The AC and DC components as well as the r.m.s. value of the residual current can be evaluated separately
- Exchangeable electronic enclosure without mechanical separation of the primary conductors
- · Extension/retrofitting or modification of functionalities in case of changed monitoring requirements
- Insensitive to load currents due to full magnetic shield (CTBC...P only)
- · Connection monitoring of the measuring current transformer with cyclical test current
- Use of the RCMB301 for all CTBC... measuring current transformer sizes
- Supply voltage DC 24 V

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Evaluation electronics

Туре	Supply voltage <i>U</i> ₅	Variant	Art. No.	
RCMB301	DC 24 V (19.228.8 V)	Modbus RTU	B74043100	

Required terminals are included in the scope of delivery.

Measuring current transformers

Туре	Internal diameter	Art. No.	
CTBC20	20	B98120001	
CTBC20P	20 mm	B98120002	
CTBC35	35 mm	B98120003	
CTBC35P	35 mm	B98120004	
CTBC60	(0,	B98120005	
CTBC60P	60 mm	B98120006	
CTBC120	120 mm	B98120007	
CTBC120P	120 111111	B98120020	
CTBC210	210 mm	B98120008	
CTBC210P	Z IV MM	B98120021	

 $P = full\ magnetic\ shield$

Accessories

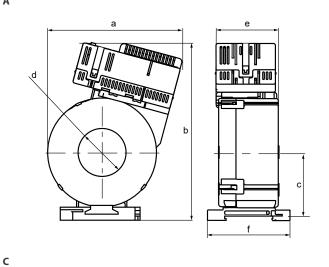
Description	Art. No.
Interface converter USB to RS-485	B95012045
Terminal block for RCMB301 module ¹⁾	B74043124
Snap-on mounting for CTBC20 and CTBC20P1)	B91080111
Snap-on mounting for CTBC35 and CTBC35P1)	B91080112

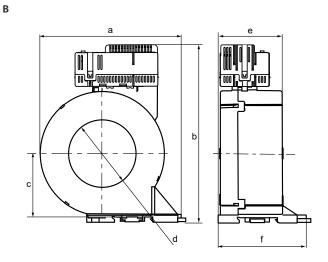
¹⁾ Included in scope of delivery

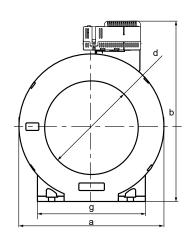
Suitable system components

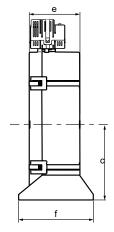
Description	max. connected current transformers	Туре	Art. No.	Page
	4	STEP-PS/1 AC/24 DC/0.5	B94053110	400
Voltage supply	14	STEP-PS/1 AC/24 DC/1.75	B94053111	400
3466.)	34	STEP-PS/1 AC/24 DC/4.2	B94053112	400

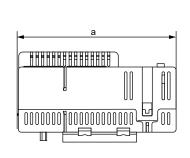
Insulation coordination acc. to IEC	60664-1/IEC 60664-3	Outputs	
Definitions:		Number of changeover contacts	2
Measuring circuit (IC1)	Primary conductors routed through the current transformer		le (freely configurable), (N/C principle)*
Secondary (IC2)	Terminal block 1 (24 V, GND, T/R, GND, A, B, X1, X2)	Switching outputs (K1, K2)	250 V, 5 A
Control circuit 1 (IC3)	Terminal block 2 (11,12,14)	Switching capacity	1500 VA/144 W
Control circuit 2 (IC4)	Terminal block 3 (21,22,24)	Contact data acc. to IEC 60947-5-1	
Rated insulation voltage	800 V	Utilisation category	AC-13 / AC-14 / DC-12 / DC-12 / DC-12
Overvoltage category	<u> </u>	Rated operational voltage	250 V / 250 V / 24 V / 110 V / 220 V
Pollution degree	2 2000 m AMSI	Rated operational current	5 A / 3 A / 1 A / 0,2 A / 0,1 A
Area of application	≤ 2000 m AMSL	(for UL applications) Minimum current	3 A / 3 A 10 mA at DC 5 V
Rated impulse voltage:	8 kV	Electrical endurance, number of cycles	
IC1((IC2-IC4)	8 KV 4 kV	Electrical endurance, number of cycles	10,000
IC2/(IC3-IC4) IC3/IC4	4 kV	Environment/EMC	
Rated insulation voltage:	4 KV	EMC	IEC 62020-1
IC1/(IC2-IC4)	800 V	Operating temperature	-2570 ℃
IC2/(IC3-IC4)	250 V	Classification of climatic conditions acc. to IEC 60721	
IC3/IC4	250 V 250 V	Stationary use (IEC 60721-3-3)	3K23
Safe isolation (reinforced insulation) be		Transport (IEC 60721-3-2)	2K11
IC2/(IC3-IC4)	300 V	Long-term storage (IEC 60721-3-1)	1K22
Basic insulation between:	300 1		
IC1/(I2-IC4)	800 V	Classification of mechanical conditions acc. to IEC 6072	
IC3/IC4	300 V	Stationary use (IEC 60721-3-3)	3M11
Voltage test (routine test) acc. to IEC 61		Transport (IEC 60721-3-2)	2M4
IC2/(IC3-IC4)	AC 2.2 kV	Long-term storage (IEC 60721-3-1)	1M12
IC3/IC4	AC 2.2 kV	Connection	
	LiL IV	Required terminals are included in the scope of delivery.	
Supply voltage			
Supply voltage $U_{\rm S}$	DC 24 V	Terminal block 1	Dhaaniy Cantast
Operating range of $U_{\rm S}$	±20 %	Manufacturer Type	Phoenix Contact DFMC 1.5/5-ST-3.5 BK
Ripple <i>U</i> s	≤ 1 %	The connection conditions of the manufacturer apply.	DEMIC 1.5/5-51-3.3 DK
Power consumption	≤ 2.5 W	Connection properties	
Inrush current	1.7 A for 1 ms	rigid	0.21.5 mm ² (AWG 2416)
Measuring circuit		flexible	0.21.5 mm ² (AWG 2416)
Internal diameter measuring current tra	ansformer see dimension diagrams on page 214	with ferrule	0.250.75 mm ² (AWG 2419)
Characteristics according to IEC 62020-	, , , , , , , , , , , , , , , , , , ,		0.250.75 IIIII (AWG 2417)
Response value $I_{\Delta n}$	30 mA3 A (freely configurable), (30 mA)*	Terminal block 2, 3	N C
Prewarning	50100 % $I_{\Delta n}$ (freely configurable), (60 %)*	Manufacturer	Phoenix Contact
Rated current In	30100 /01 <u>M</u> Π (freely configurable), (00 /0)	Type	FKCVW 2.5/ 3-ST-5.08
CTBC20 at $I_{\Delta n} = 30 \text{ mA}$	40 A	The connection conditions of the manufacturer apply.	
CTBC20 at $I_{\Delta n} = 300 \text{ mA}$	63 A	Connection capacity	0.2 2.5 2 (ANIC 24 12)
CTBC20P	80 A	rigid	0.22.5 mm ² (AWG 2413)
CTBC35 at $I_{\Delta n} = 30 \text{ mA}$	80 A	flexible	0.22.5 mm ² (AWG 2413)
CTBC35 at $I_{\Delta n} = 300 \text{ mA}$	125 A	with ferrule	0.252.5 mm ² (AWG 2413)
CTBC35P	160 A	Mounting CTBC	
CTBC60 at $I_{\Delta n} = 30 \text{ mA}$	160 A	Screw type	
CTBC60 at $I_{\Delta n} = 300 \text{ mA}$	250 A	CTBC2060(P)	DIN EN ISO 7045 - M5
CTBC60P	320 A	CTCB120210(P)	DIN EN ISO 7045 - M6
CTBC120 at $I_{\Delta n} = 100 \text{ mA}$	330 A	Washer type	
CTBC120P at $I_{\Delta n} = 100 \text{ mA}$	630 A	CTBC2060(P)	DIN EN ISO 7089/7090 - 5
CTBC210 at $I_{\Delta n} = 300 \text{ mA}$	630 A	CTCB120210(P)	DIN EN ISO 7089/7090 - 6
CTBC210P at $I_{\Delta n} = 100 \text{ mA}$	630 A	Tightening torque	
CTBC210P at $I_{\Delta n} = 300 \text{ mA}$	1000 A	CTBC2035 (P)	0.6 Nm
Operating uncertainty	±17.5 %	CTCB60210(P)	1 Nm
Relative uncertainty	035 %	Out	
Test winding	yes	Other	
Possible response values (to be set	on the evaluator)	Operating mode	continuous operation
		Mounting Dagrag of protection, internal components (DIN EN 60530)	any position
CTBC20, CTBC20P	10 mA500 mA	Degree of protection, internal components (DIN EN 60529)	IP40
CTBC35, CTBC35P, CTUBC60, CTBC60P	30 mA10 A	Degree of protection, terminals (DIN EN 60529)	IP20
CTBC120P, CTBC210P	100 mA10 A	Flammability class	UL94 V-0
CTBC120, CTBC210	300 mA10 A	Software Documentation number	D0579
Time response		Documentation number Weight	D00372
Response delay ton	50 ms60 min (freely configurable), (0 s)*	·	~ 100 ~
Start-up delay t _{an}	0 s60 min (freely configurable), (0 s)*	RCMB301 CTBC20	≤ 100 g ≤ 160 g
Delay on release toff	0 s60 min (freely configurable)	CTBC20P	≤ 100 g ≤ 220 g
Operating time tae		CTBC35	≤ 220 g ≤ 240 g
at 1 x /∆n	≤ 230 ms	CTBC35P	≤ 240 g ≤ 320 g
at 2 x l∆n	≤ 180 ms	CTBC60	≤ 320 g ≤ 460 g
at 5 x l∆n	≤ 70 ms	CTBC60P	≤ 400 g ≤ 620 g
Response time	$t_{an} = t_{ae} + t_{on}$	CTBC120	≤ 020 g ≤ 1390 g
Recovery time t _b	<u>s</u> ≤1s	CTBC120P	≤ 1750 g
		CTBC1201	≤ 4220 g
Indication		CTBC210P	≤ 4220 g ≤ 4870 g
Multicolour LED	Refer to "System states: LED and output relays" on page214		5/09
Inputs		()* Factory setting	
Lable	T/R, GND	The use of the power supply units listed at "Accessories" is rec	
Maximum length connecting cable	17R, GND	The use of a surge protection device is mandatory for these po	wer supply units.
	10111		

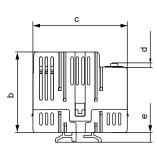












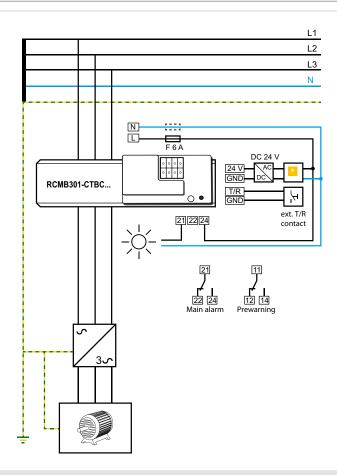
	Dimensions (mm)							
	Туре	a	b	c	d	e	f	g
Α	RCMB301-CTBC20(P)	81	112	37	ø 20	46	60	-
A	RCMB301-CTBC35(P)	97	130	47	ø 35	46	61	-
В	RCMB301-CTBC60(P)	126	158	57	ø 60	56	78	-
	RCMB301-CTBC120(P)	188	232	96	ø 120	65	96	139
	RCMB301-CTBC210(P)	302	346	153	ø 210	67	113	277
D	RCMB301	74	37	44	2	4.6	-	_

Tolerance: ±0.5 mm

System states: LED and output relays

The LED indicates the system state by means of colours and lighting/flashing. The N/O contacts of relay outputs K1 and K2 have defined switching positions for each system state.

Custom state	LED		Notes	Changeover contact	
System state	ON (green)	Alarm (red)	Notes	K1	K2
Device switched off	off	off	Device is de-energised, no monitoring, no monitoring function	de-energised	de-energised
Normal operating state	lights	off	The device is supplied with the specified voltage and monitors the primary circuit. No residual current flows which would lead to tripping.	energised	energised
Prewarning	lights	flashes briefly	The device is supplied with the specified voltage and monitors the primary circuit. A fault current flows which exceeds the set limit of the prewarning.	de-energised	energised
Main alarm	off	lights	The device is supplied with the specified voltage and monitors the primary circuit. A fault current flows which exceeds the set limit of the alarm.	de-energised	de-energised
Device error	off	flashes slowly	The device is supplied with the specified voltage and monitors the primary circuit. An error is detected by the periodic self tests.	de-energised	de-energised



- The use of a type 2 surge protection device (SPD) is mandatory due to possible impulse voltages and in order to comply with normative requirements.
 - The surge protection device must be connected upstream of the power supply unit on the supply side.
 - Features of the surge protection device: Nominal discharge current I_n (8/20 μ s): 20 kA

Response time: 25 ns

two-stage: 1 varistor + 1 spark gab

Alternatively, the power supply unit must be connected to a CAT II supply without a surge protection device.

LINETRAXX® RCMB330

AC/DC sensitive residual current monitoring module with integrated split-core measuring current transformer



Typical applications

· Measuring AC and DC fault currents in earthed systems (TN and TT systems)

Approvals



Device features

- · Continuous residual current monitoring in compliance with DGUV Vorschrift 3 (German Accident Prevention Regulation 3)
- · Easy DIN rail or screw mounting
- RS-485 interface with Modbus RTU (reading out measured values/setting parameters)
- Frequency range DC...100 kHz
- · Multicolour LED for operation and status messages
- Digitally adjustable filters for AC/DC sensitive measured value acquisition (lowpass filters, type B acc. to IEC 60755, type B+ acc. to VDE 0664-400)
- Separate evaluation of the AC and DC components as well as the RMS value of the residual current possible
- Installation without mechanical separation of the primary conductors
- Extension or modification of functionalities through software updates via Modbus
- Insensitive to load currents due to magnetic screen
- Supply voltage DC 24 V

Normen

The RCMB330 residual current monitoring modules comply with the device standard:

• IEC 62020-1

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Type Supply voltage <i>U</i> s		Variant	Art. No.
RCMB330 DC 24 V (19,228,8 V)		Modbus RTU	B74043160

Accessories

Description	Art. No.	
RS-485/USB interface converter	B95012045	

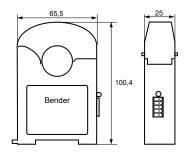
Suitable system components

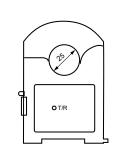
The use of the listed power supply units is recommended. The use of a surge protection device is mandatory for these power supply units.

Description	max. connected current transformers	Туре	Art. No.	Page
	4	STEP-PS/1 AC/24 DC/0.5	B94053110	400
Voltage supply	14	STEP-PS/1 AC/24 DC/1.75	B94053111	400
зирріу	34	STEP-PS/1 AC/24 DC/4.2	B94053112	400

Definitions	
Measuring circuit (IC1)	Primary conductors routed through the current transformer
Secondary (IC2)	terminal block (24 V, GND, A, B, X1, X2)
Rated voltage	300 \
Overvoltage category	
Operating altitude	≤ 2000 m AMSI
Rated impulse voltage	
IC1/IC2	4 k\
Rated insulation voltage	
IC1/IC2	300 \
Pollution degree	2
Basic insulation between	
IC1/IC2	300 \
Supply voltage	
Supply voltage $U_{\rm S}$	DC 24 \
Operating range of U_s	±5 %
Ripple U _s	≤ 2 %
Power consumption	≤ 0.5 W typ. (2.5 W max.
Inrush current	10 A for 25 μ
Measuring circuit	
Measuring current transformer, internal o	diameter 25 mm
Characteristics according to IEC 62020-1	AC/DC sensitive, type I
Measuring range	10500 m/
Residual operating current I	30500 mA (freely configurable), (30 mA)
Prewarning	50100 % $I_{\Delta n}$ (freely configurable), (60 %)
Rated current In	100/
Operating uncertainty	
DC50 kHz	±17.5 %
50100 kHz	0+55 %
Relative uncertainty	01111337
DC50 kHz	035 %
50100 kHz	-15+35 %
Time response	
Response delay ton (prewarning)	50 ms60 min (1 s)
Response delay t_{on} (main alarm)	50 ms60 min (50 ms)
Start-up delay t _{an}	0 s60 min (freely configurable), (0 s)
Delay on release t _{off}	0 s60 min (freely configurable), (1 s)
Operating time t _{ae}	0 3100 (cc.) coiguidbic/, (1 3/
at 1 x /An	≤ 500 m
at 2 x /n	≤ 230 m
at $5 \times I_{\Delta n}$	≤ 230 m
Response time	$t_{\rm an} = t_{\rm ae} + t_0$
nesponse unic	raii — rae — ro

Dimension diagram (dimensions in mm, tolerance ±0.5 mm)





Displays	
Multicolour LED	Refer to chapter "LED" in the manua
Interface	
Interface/protocol	RS-485/Modbus RT
Baud rate	1.257.6 kbit/
Cable length	01200 r
Environment/EMC	
EMC	IEC 62020-
Operating temperature	-2570°
Classification of climatic conditions acc. to IEC 60721 (related to temperature and relative humidity):
Stationary use (IEC 60721-3-3)	3K2
Transport (IEC 60721-3-2)	2K1
Long-term storage (IEC 60721-3-1)	1K2
Classification of mechanical conditions acc. to IEC 6	60721
Stationary use (IEC 60721-3-3)	3M1
Transport (IEC 60721-3-2)	2M
Long-term storage (IEC 60721-3-1)	1M1
Connection	
Required terminals are included in the scope of delivery	
Terminal block	
Manufacturer	Phoenix Contac
Туре	PCB plug-in connector - DFMC 0.5/ 8-ST-2.5
The connection conditions of the manufacturer apply.	
Connection properties	
rigid	0.140.5 mm ² (AWG 26-20
flexible	0.140.5 mm ² (AWG 26-20
with ferrules	0.250.34 mm² (AWG 24-22
Other	
Operating mode	continuous operatio
Mounting	any positio
Degree of protection, internal components (DIN EN 6052)	9) IP4
Degree of protection, terminals (DIN EN 60529)	IP2
Flammability class	UL94 V-

()* factory setting

Documentation number

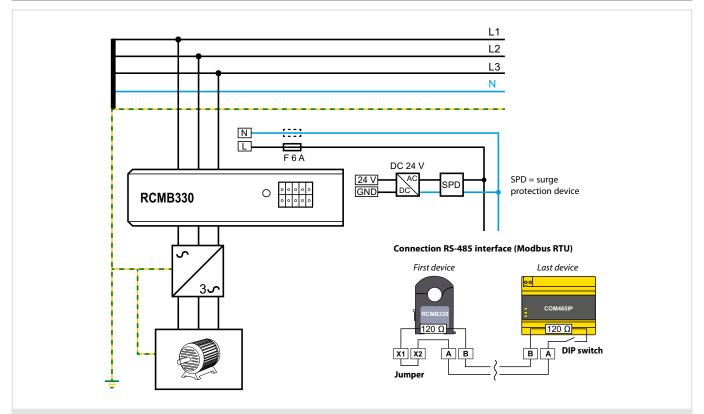
Software

Weight

D0609

D00389

≤ 170 g



By using the jumper, the internal 120 Ω terminating resistor can be connected.

COM465IP

By means of the $\mbox{\bf DIP}$ switch, the internal 120 Ω terminating resistor can be connected.

The connections for the power supply (X1, X2) and the RS-485 interface (A, B) are doubled, so that the wiring can be carried out directly on the device according to the **daisy-chain** principle required for **Modbus**.

LINETRAXX® CEP410R-2

AC and pulsed DC sensitive residual current monitor at the central earthing point (CEP)





Typical applications

 Monitoring of the central earthing point for the detection of PEN bridges and connections between two neutral conductors of two separate TN systems, whereby the measured value is recorded in accordance with its intended use in a range of f = 42...70 Hz.

Approvals



Device features

- Alternating and pulsing current sensitive residual current monitoring device according to DIN EN IEC 62020-1,
 Type A
- Root mean square measurement (RMS)
- Measuring range: 10 mA...30 A (42...70 Hz)
- Prewarning: 50...100 % of residual operating current
- Supply voltage DC 24 V or AC/DC 100...240 V
- LED-strip measured value display
- · Adjustable response delay
- · Alarm relay (designed as changeover contact)
- N/C or N/O operation and fault memory behaviour selectable
- RS-485 with Modbus RTU
- Continuous CT-connection monitoring
- NFC interface for device parameter setting with the device energised or deenergised

Bender Connect App









Licences

For a list of the open-source software used see our homepage.

Standards

Devices of the CEP410R-2 series have been developed according to the following standards:

• DIN EN IEC 62020-1

Further information

For further information refer to our product range on www.bender.de.

Ordering information

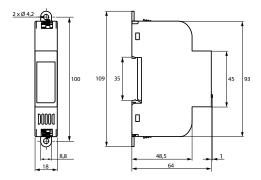
Туре	Supply voltage U _s	Art. No.
CEP410R-2	DC 24 V AC/DC 100240 V	B74603008

Accessories

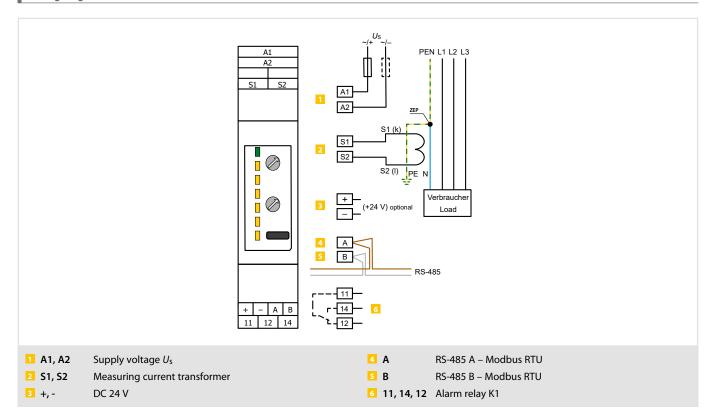
Description	Art. No.
Sealable transparent cover	B80609199

Insulation coordination acc. to IEC 60664-1/IEC 6	60664-3	Operation	
Definitions:		Display	Status LED incl. LED bar grapl
Supply circuit (IC1)	A1, A2	Display range, measured value	25 / 50 / 75 / 100 9
Output circuit (IC2)	11, 12, 14	· · ·	et / test / NFC / address settin
Measuring & control circuit (IC3)	S1, S2, +, -, A, B	Dutton 1/11	et / test / til e / uduless settill
		RS-485 interface	
Rated voltage	250 V	Connection	A,
Overvoltage category	<u> </u>	Protocol	Modbus RT
Operating altitude	≤ 2000 m AMSL		
Rated impulse voltage:			ax 115.2 kbits/s (19.2 kbits/s)
IC1/(IC2-3)	4 kV	Parity	even, no, odd (even)
IC2/IC3	4 kV	Stop bits	1/2/auto (auto)
Rated insulation voltage:	110	Cable length (at 9.6 kbits/s)	≤ 1200 r
3	350 //	Recommended lines, shield on one side connected to PE min. J-Y	(St)Y 2 x 0.6 mm ² , twisted pai
IC1/(IC2-3)	250 V	Required terminating resistor	120 Ω (> 0.25 W
IC2/IC3	250 V	· •	
Pollution degree	2	Device address 1247 (100+ la:	st two digits of serial number)
Protective separation (reinforced insulation) between:	:	NFC interface	
IC1/(IC2-3)	300 V		45.54111
IC2/IC3	300 V	Frequency	13.56 MH
	300 ¥	Transmitting power ³⁾	0 V
Voltage test (routine test) acc. to IEC 61010-1:	460011	3) EMC influences may lead to communication interruptions at the NF	C interface
IC1/(IC2-3)	AC 2.2 kV	Line influences may lead to communication interruptions at the Ni	Ciliteriace
IC2/IC3	AC 2.2 kV	Switching elements	
			4.1
Supply voltage		Switching elements	1 changeover contac
Connection	+,-	Connection	11, 12, 1
Supply voltage $U_{\rm S}$	DC 24 V	Operating principle N/C or I	N/O operation (N/C operation)
,		Electrical endurance, number of cycles	1000
Tolerance of U _s	-30+25 %		1000
Power consumption	≤ 2 W	Contact data acc. to IEC 60947-5-1:	
Inrush current (< 5 ms)	< 10 A	Utilisation category AC-13 /	AC-14 / DC-12 / DC-12 / DC-1
		Rated operational voltage 230	V / 230 V / 24 V / 110 V / 220 V
Supply voltage		Rated operational current	5 A / 3 A / 1 A / 0.2 A / 0.1 /
Connection	A1, A2	•	
Supply voltage U_S	AC/DC 100240 V (4763 Hz)	Minimum contact load relay manufacturer's reference	1 mA at AC/DC \geq 10 \
Tolerance of U_s	±15 %	(Refers to relays that have not been operated with high contact currents.,)
-		Fundament (FMC	
Power consumption	\leq 2 W / \leq 3.5 VA	Environment/EMC	
Inrush current (< 2 ms)	< 1.8 A	EMC	DIN EN IEC 62020-
		Operation	-25+55°(
Measuring circuit		Transport	-40+85 °C
Burden (internal)	33 Ω	Storage	-40+70°
Frequency range	4270 Hz	Storage	-40+70
Measuring current transformer monitoring ¹⁾	On/off (on)*	Classification of climatic conditions acc. to IEC 60721	
•	` '	(except condensation and formation of ice)	
Measuring range (peak)	2 mA70 A	Stationary use (IEC 60721-3-3)	3K2
Measuring range rms	2 mA50 A		
Rated residual operating current (Type A)	30 A	Transport (IEC 60721-3-2)	2K1
Residual operating current $I_{\Delta n}$ (Type A) 1)	10 mA30 A (30 mA)*	Long-term storage (IEC 60721-3-1)	1K2
Prewarning 1)	50100 % x /Δn (70 %)*	Classification of mechanical conditions acc. to IEC 60721	
		Stationary use (IEC 60721-3-3)	3M1
Operating uncertainty	$\pm 10 \% (at 0.55 x I_{\Delta n})$	•	
Relative response uncertainty	6 mA20 A: -200 %	Transport (IEC 60721-3-2)	2M-
	2030 A: -500 %	Long-term storage (IEC 60721-3-1)	1M1
Rated thermal short-term current	2.4 kA/1 s		
Hysteresis	1025 % (15 %)*	Connection	
•	on/off (off)*	Connection type	push-ir
Fault-memory alarm messages	011/011 (011)	Connection properties	
1) Can only be configured via RS-485		• •	0.21.5 mm ² (AWG 2416
, ,		,	,
Measuring-current transformers			0.21.5 mm ² (AWG 2416
	CT (C1 C2)	with ferrule without plastic sleeve	0.250.75 mm
Connection	CT (\$1, \$2)	with ferrule with plastic sleeve	0,751,5 mm
Measuring-current transformer series, Type A 2)	CTAC, CTAS, W, WR, WS	(Use crimping pliers similar to CRIMPFOX 6 / Weidmüller PZ6/PZ6/S	5 only)
CT connection monitoring	yes	Stripping length	8 mn
Rated voltage $U_{\rm n}$	see measuring-current-transformer manual		V IIIII
Rated surge current	6.0 kA/40 ms	Other	
Connecting cables	see measuring-current-transformer manual		continuous anaration
	See measuring current transformer mailual	Operating mode	continuous operation
Cable lengths		Mounting	vertica
Single wire $\geq 0.75 \text{ mm}^2$	01 m	Degree of protection (DIN EN 60529)	
Single wire, twisted $\geq 0.75 \text{ mm}^2$	010 m	terminals (DIN EN 60529)	IP20
Shielded cable $\geq 0.75 \text{ mm}^2$	040 m	internal components	IP30
		Enclosure material	polycarbonate
2) For a selection of suitable measuring current transf	ormers, see chapter "Measuring current		. ,
transformer connection" in the manual		DIN rail mounting acc. to	IEC 6071:
		Flammability class	UL94 V-0
Time response		Documentation number	D0052
	0 000 - (0 -)*	Weight	≤ 100 €
	II MILLEUM		-
Start-up delay t	0900 s (0 s)*	* Factory cotting	
Start-up delay <i>t</i> Response delay <i>t</i> _{on}	010 s (0 s)*	* Factory setting	
Start-up delay <i>t</i> Response delay <i>t</i> _{on} Delay on release <i>t</i> _{off}		* Factory setting	
Start-up delay <i>t</i> Response delay <i>t</i> _{on} Delay on release <i>t</i> _{off}	010 s (0 s)*	* Factory setting	
Start-up delay <i>t</i> Response delay <i>t</i> Delay on release <i>t</i> _{off} Operating time <i>t</i> _{ae}	010 s (0 s)*	* Factory setting	
Start-up delay t Response delay $t_{\rm on}$ Delay on release $t_{\rm off}$ Operating time $t_{\rm ae}$ at $l_{\Delta n} = 1 \times l_{\Delta n}$	010 s (0 s)* 0900 s (0 s)* ≤ 260 ms	* Factory setting	
Start-up delay t Response delay $t_{\rm On}$ Delay on release $t_{\rm Off}$ Operating time $t_{\rm ae}$ at $l_{\Delta n}=1$ x $l_{\Delta n}$ at $l_{\Delta n}=5$ x $l_{\Delta n}$	010 s (0 s)* 0900 s (0 s)* ≤ 260 ms 40120 ms	* Factory setting	
Start-up delay t Response delay $t_{\rm on}$ Delay on release $t_{\rm off}$ Operating time $t_{\rm ae}$ at $l_{\Delta n} = 1 \times l_{\Delta n}$ at $l_{\Delta n} = 5 \times l_{\Delta n}$ Response time t	$010 \text{ s } (0 \text{ s})^*$ $0900 \text{ s } (0 \text{ s})^*$ $\leq 260 \text{ ms}$ 40120 ms $t_{an} = t_{ae} + t_{on}$	* Factory setting	
Start-up delay t Response delay t_{on} Delay on release t_{off} Operating time t_{ae} at $I_{\Delta n} = 1 \times I_{\Delta n}$ at $I_{\Delta n} = 5 \times I_{\Delta n}$	$010 s (0 s)^*$ $0900 s (0 s)^*$ $\leq 260 \text{ ms}$ 40120 ms $t_{an} = t_{ae} + t_{on}$ $\leq 500 s$	* Factory setting	

Dimension diagram (dimensions in mm)



Wiring diagram



LINETRAXX® RCM410R

Single-channel AC and pulsed DC sensitive residual current monitor for AC systems (Earth leakage relay/monitor (ELR/ELM) / Ground fault relay)





Typical applications

· Fault or residual current monitoring in earthed systems (TN/TT)

Approvals



Device features

- AC and pulsed DC sensitive residual current monitor according to DIN EN IEC 62020-1, Type A
- · Root mean square measurement (RMS)
- Residual operating current $I_{\Delta n}$ adjustable: 10 mA...30 A (42...70 Hz)
- Prewarning: 50...100 % of residual operating current
- Supply voltage DC 24 V, optional AC/DC 100...240 V (RCM410R-2 only)
- · LED strip measured value display
- · Adjustable response delay
- Alarm relay (designed as changeover contact)
- N/C or N/O operation and fault memory behaviour selectable
- RS-485 with Modbus RTU
- Continuous CT-connection monitoring
- NFC interface for configuration of the unit in energised and de-energised state

Bender Connect App









Licences

For a list of the open-source software used see our homepage.

Standards

Devices of the RCM410R series have been developed according to the following standards:

- DIN EN IEC 62020-1
- UL508
- UL1053

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Supply voltage U₅	Art. No.
RCM410R-24 DC 24 V		B74602000
RCM410R-2	AC/DC 100240 V / DC 24 V	B74603000

Accessories

	Description	Art. No.
ſ	Sealable transparent cover	B80609199

Insulation coordination acc. to IEC 60664-1/IEC 60664-3		Measuring-current transformers
RCM410R-24:		Connection CT (S1, S2)
Definitions:		Measuring-current transformer series, Type A ²⁾ CTAC, CTAS, W, WR, WS
Measuring & control circuit (IC1)	S1, S2, +, -, A, B	CT connection monitoring yes
Output circuit (IC2)		Rated voltage $U_{\rm D}$ see measuring-current-transformer manual
• • • • • • • • • • • • • • • • • • • •	11, 14, 12	Rated surge current 6.0 kA/40 ms
Rated voltage	250 V	Connecting cables see measuring-current-transformer manual
Overvoltage category	III	Cable lengths
Operating altitude	≤ 2000 m AMSL	
Rated impulse voltage:		Single wire $\geq 0.75 \text{ mm}^2$ 01 m
IC1/IC2	4 kV	Single wire, twisted $\geq 0.75 \text{ mm}^2$ 010 m
Rated insulation voltage:		Shielded cable $\geq 0.75 \text{ mm}^2$ 040 m
IC1/IC2	250 V	2) For a selection of suitable measuring current transformers, see chapter "Measuring current
Pollution degree	250 7	transformer connection" in the manual
		transformer connection in the manual
Protective separation (reinforced insulation) between:	200 1/	Time vernence
IC1/IC2	300 V	Time response
Voltage test (routine test) acc. to IEC 61010-1:		Start-up delay <i>t</i> 0900 s (0 s)*
IC1/IC2	AC 2.2 kV	Response delay t_{on} 010 s (0 s)*
RCM410R-2:		Delay on release $t_{\rm off}$ 0900 s (0 s)*
Definitions:		Operating time t _{ae}
	41.42	$at I_{\Delta n} = 1 \times I_{\Delta n} $ $\leq 260 \text{ ms}$
Supply circuit (IC1)	A1, A2	at $I_{\Delta n} = 5 \times I_{\Delta n}$ 40120 ms
Output circuit (IC2)	11, 12, 14	
Measuring & control circuit (IC3)	S1, S2, +, -, A, B	Response time t $t_{an} = t_{ae} + t_{on}$
Rated voltage	250 V	Recovery time t_b $\leq 500 \text{ s}$
Overvoltage category	III	Response time for measuring current transformer monitoring $\leq 10 \text{ s}$
Operating altitude	≤ 2000 m AMSL	Onaustian
Rated impulse voltage:	_ 2000 111 711113E	Operation
IC1/(IC2-3)	4 kV	Display Status LED incl. LED bar graph
		Display range, measured value 25 / 50 / 75 / 100 %
IC2/IC3	4 kV	Button T/R Reset / test / NFC / address setting
Rated insulation voltage:		·
IC1/(IC2-3)	250 V	RS-485 interface
IC2/IC3	250 V	Connection A, B
Pollution degree	2	Protocol Modbus RTU
Protective separation (reinforced insulation) between:	-	
IC1/(IC2-3)	300 V	
		Parity even, no, odd (even)*
102/103	300 V	Stop bits 1/2/auto (auto)*
Voltage test (routine test) acc. to IEC 61010-1:		Cable length (at 9.6 kbits/s) \leq 1200 m
IC1/(IC2-3)	AC 2.2 kV	Recommended lines, shield on one side connected to PE
IC2/IC3	AC 2.2 kV	CAT6/CAT7 min. AWG23
		min. J-Y(St)Y 2 x 0.6 mm ² twisted pair
Supply voltage		Required terminating resistor $120 \Omega (> 0.25 W)$
RCM410R-2, RCM410R-24		Device address 1247 (100+ last two digits of serial number)*
Connection		Device address 1247 (100+ last two digits of serial number)
	+, - DC 24 V	NFC interface
Supply voltage U _S		
Tolerance of U _s	-30+25 %	Frequency 13.56 MHz
Power consumption	≤ 2 W	Transmitting power ³⁾ 0 W
Inrush current (< 5 ms)	< 10 A	3) EMC influences may lead to communication interruptions at the NFC interface
RCM410R-2		
Connection	A1, A2	Switching elements
Supply voltage U_S	·	Switching elements 1 changeover contact
117 3 -	AC/DC 100240 V (4763 Hz)	Connection 11, 12, 14
Tolerance of U _s	±15 %	Operating principle N/C or N/O operation (N/C operation)*
Power consumption	\leq 2 W / \leq 3.5 VA	Electrical endurance, number of cycles 10000
Inrush current (< 2 ms)	< 1.8 A	·
		Contact data acc. to IEC 60947-5-1:
Measuring circuit		Utilisation category AC-13 / AC-14 / DC-12 / DC-12
Burden (internal)	33 Ω	Rated operational voltage 230 V / 230 V / 24 V / 110 V / 220 V
Frequency range	4270 Hz	Rated operational current 5 A / 3 A / 1 A / 0.2 A / 0.1 A
Measuring current transformer monitoring ¹⁾	On/off (on)*	Minimum contact load relay manufacturer's reference 10 mA/5 V DC
Measuring range (peak)	2 mA70 A	(Refers to relays that have not been operated with high contact currents.)
Measuring range rms	2 mA50 A	(петегэ to retays that have not veen operated with high contact currents.)
		Environment/EMC
Rated residual operating current (Type A)	30 A	
Residual operating current $I_{\Delta n}$ (Type A) 1)	10 mA30 A (30 mA)*	EMC DIN EN IEC 62020-1
Prewarning 1)	50100 % x /Δn (70 %)*	Ambient temperatures
Operating uncertainty	$\pm 10 \%$ (at 0.55 x $I_{\Delta n}$)	Operation -25+55 ℃
Relative response uncertainty	6 mA20 A: -200 %	Transport -40+85 ℃
,	2030 A: -500 %	Storage -40+70°C
Rated thermal short-term current	2.4 kA/1 s	
Hysteresis		Classification of climatic conditions acc. to IEC 60721
•	1025 % (15 %)*	(except condensation and formation of ice)
Fault-memory alarm messages	on/off (off)*	Stationary use (IEC 60721-3-3) 3K22
1) Can only be configured via RS-485		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

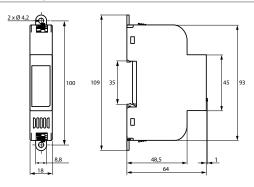
Technical data (continuation)

Connection	
Connection type	push-in
Connection properties	
rigid	0.21.5 mm ² (AWG 2416)
flexible	0.21.5 mm ² (AWG 2416)
with ferrule without plastic sleeve	0.250.75 mm ²
with ferrule with plastic sleeve	0,751,5 mm ²
(Use crimping pliers similar to CRIMPFOX 6 / Weid	müller PZ6/PZ6/5 only)
Stripping length	8 mm

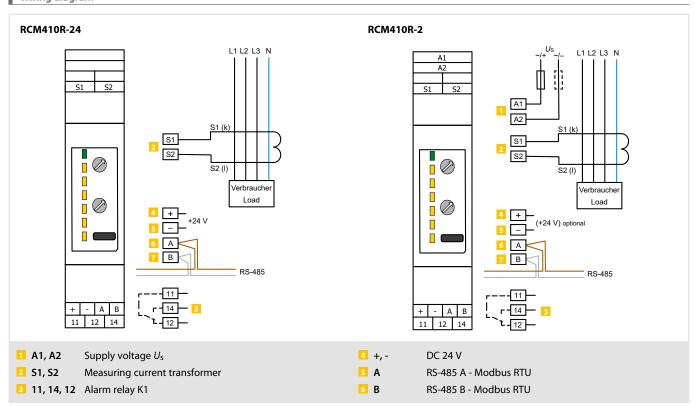
Operating mode	continuous operation
Mounting	vertical
Degree of protection (DIN EN 60529)	
terminals (DIN EN 60529)	IP20
internal components	IP30
Enclosure material	polycarbonate
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Documentation number	D00403
Weight	
RCM410R-24	≤ 60 g
RCM410R-2	≤70 g

^{*} Factory setting

Dimension diagram (dimensions in mm)



Wiring diagram



RCMB131-01

AC/DC sensitive residual current monitoring module for measuring AC and DC currents up to ±100 mA



Typical applications

- Designed for installation in PDUs and outlet boxes
- Communication with a master via an RS-485 interface via Modbus RTU

Device features

- AC/DC sensitive leakage and fault current monitoring for preventive maintenance
- · Suitable for PCB mounting
- High resolution for implementing equipment leakage current monitoring
- Measured value and alarm transmission via Modbus RTU (RS-485)
- Frequency range DC...2 kHz
- Compact design for monitoring nominal loads up to $I_n = 32 \text{ A}$
- · Low load current sensitivity due to fully shielded measuring current transformer
- Continuous monitoring of the connection to the measuring current transformer
- · Integrated test function
- Supply voltage DC 12...24 V

Further information

For further information refer to our product range on www.bender.de.

Approvals



Ordering information

Туре	Output range	Supply voltage <i>U</i> ₅	Art. No.
RCMB131-01	0100 mA (RMS)	DC 1224 V	B94042131

Technical data

Primary circuit	monitored primary conductors	
Secondary circuit	Connections Vcc, GND, A, B, S1, S2	
All following specifications apply to the insulation be	etween the primary and secondary circuit	
Rated voltage	300 V	
Overvoltage category	III	
Rated impulse voltage	4 kV	
Operating altitude	up to 3000 m AMSL	
Rated insulation voltage	320 V	
Pollution degree	2	
Safe separation (reinforced insulation)	between primary and secondary circuit	
Voltage test acc. to IEC 61010-1	AC 2.2 kV	
Voltage supply		
Supply voltage $U_{\rm S}$	DC 1224 V	
Operating range of the supply voltage	±20 %	
Ripple	100 mV	
Power consumption	< 0.75 W	
Measuring circuit		
Internal diameter primary conductor opening	15 mm	
Measured value evaluation	DC, RMS	
Measuring range	AC/DC ±300 mA	
Characteristics according to IEC 60755	AC/DC sensitive, type B	
$I_{\Delta n1}$		
Response value	DC 3.5100 mA (* 6 mA)	
Response tolerance	0.71.0 x <i>I</i> _{Δn1}	
$I_{\Delta n2}$		
Response value	RMS 3.5100 mA (* 30 mA)	
Response tolerance		
DC1 kHz	0.71.0 x <i>I</i> _{Δn2}	
12 kHz	1.02.0 x / _{Δn2}	
Output range	0100 mA (RMS)	
Resolution	< 0.2 mA	
Frequency range	DC2 kHz	

Operating uncertainty	
DC500 Hz	$\pm (5 \% +0.5 \text{ mA})$
5011000 Hz	±(15 % +0.5 mA)
12 kHz	-(50 % ±0.5 mA)
Time response	
Response time tae (relay switching time of 10 ms considered)	
for 1 x I∆n	≤ 290 ms
for 2 x I∆n	≤ 140 ms
for 5 x I∆n	≤ 30 ms
Recovery time t _b	≤ 29
Disturbances	
Load current /n	32 A
Response value assignment	
/ _{Δn1} (DC)	S 1
/ _{Δn2} (RMS)	SZ
Connection	
Max. Cable length	≤ 10 m
Outputs	
Interface	RS-485
Protocol	Modbus RTL
Switching outputs	Open Collector, not short-circuit-proo
Switching capacity	40 V / 50 mA
Output voltage LOW level	00.6 \
Output voltage HIGH level	3.13.6 \
Hysteresis	≤ 30 %

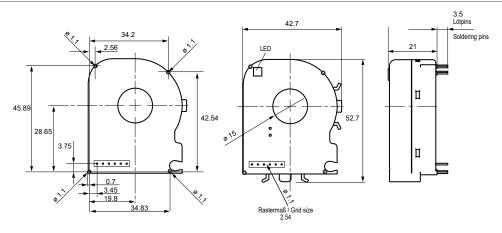
Technical data (continued)

Environment/EM	C	
EMC	DIN EN IEC 62020-1:2021-10 (IEC 62020-1:2020-04 Ed.	1.0), where applicable
Ambient temperati	ure (incl. primary conductors routed through module)	-25+70 °C
Classification of cl	imatic conditions acc. to IEC 60721 (related to temperature a	and relative humidity):
Stationary use (IEC	60721-3-3)	3K22
Transport (IEC 6072	21-3-2)	2K11
Long-term storage	(IEC 60271-3-1)	1K22
Classification of I	nechanical conditions acc. to IEC 60271	
Stationary use (IEC	60721-3-3)	3M11
Transport (IEC 6072	21-3-2)	2M4
Long-term storage	(IEC 60271-3-1)	1M12

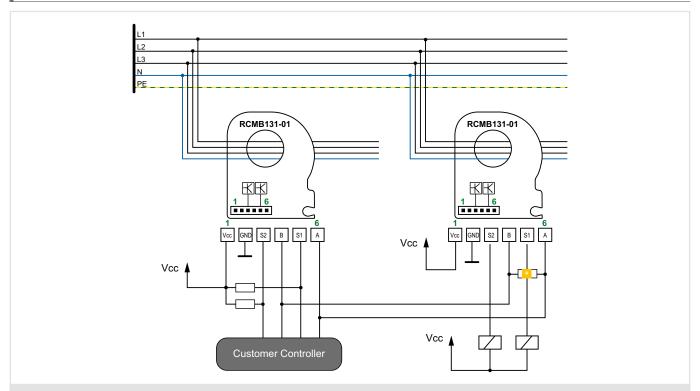
Operating mode	continuous operation
Mounting	any position
Protection class	IP 30
Flammability rating	UL94 V-0
Service life at 40 °C	10 years
Software	D0604
Documentation number	D00358

^{* =} factory settings

Dimension diagram (dimensions in mm)



Wiring diagram



 ${\color{red} {
m \square}}$ Terminating resistor 120 ${\color{red} {\Omega}}$ must only be set on the last device in the RS-485 bus chain.



The maximum cable length must be limited to ≤ 10 m.

RCMB131-02

AC/DC sensitive residual current monitoring module for measuring AC and DC currents up to ± 100 mA



Typical applications

- Designed for installation in PDUs and outlet boxes
- Outputs the RMS value of the residual current via a PWM output, which is read out and evaluated by a higher-level circuit

Device features

- AC/DC sensitive leakage and fault current monitoring for preventive maintenance
- · Suitable for PCB mounting
- High resolution for implementing equipment leakage current monitoring
- Measurement signal output via PWM output
- Frequency range DC...2 kHz
- Compact design for monitoring nominal loads up to $I_n = 32 \text{ A}$
- · Low load current sensitivity due to fully shielded measuring current transformer
- Continuous monitoring of the connection to the measuring current transformer
- Integrated test function
- Supply voltage DC 12...24 \mbox{V}

Further information

For further information refer to our product range on www.bender.de.

Approvals



Ordering information

Туре	Output range	Supply voltage <i>U</i> ₅	Art. No.
RCMB131-02	0100 mA (RMS)	DC 1224 V	B94042132

Technical data

Insulation coordination according to IEC 6066	4-1	
Primary circuit	monitored primary conductors	
Secondary circuit	Connections Vcc, GND, T, PWM, S1, ERR	
All following specifications apply to the insulation be	tween the primary and secondary circuit	
Rated voltage	300 V	
Overvoltage category	III	
Rated impulse voltage	4 kV	
Operating altitude	up to 3000 m AMSL	
Rated insulation voltage	320 V	
Pollution degree	2	
Safe separation (reinforced insulation)	between primary and secondary circuit	
Voltage test acc. to IEC 61010-1	AC 2.2 kV	
Voltage supply		
Supply voltage U_{S}	DC 1224 V	
Operating range of the supply voltage	±20 %	
Ripple	100 mV	
Power consumption	< 0.75 W	
Measuring circuit		
Internal diameter primary conductor opening	15 mm	
Measured value evaluation	DC, RMS	
Characteristics according to IEC 60755	AC/DC sensitive, type B	
Response value I∆n1	DC 6 mA	
Response tolerance $I_{\Delta n1}$	0.71.0 x <i>I</i> _{Δn1}	
Measuring range	AC/DC \pm 300 mA	
Resolution	< 0.2 mA	
Frequency range	DC2 kHz	
Measuring time	180 ms	
Operating uncertainty		
DC500 Hz	$\pm (5 \% + 0.5 \text{ mA})$	
5011000 Hz	\pm (15 % + 0.5 mA)	
10012000 Hz	$\pm (50 \% + 0.5 \text{ mA})$	

Response time t_{ae} (relay switching time of 10 ms considered)		
for 1 x / _{An}	≤ 290 m:	
for 2 x I _{An}	≤ 140 m:	
for 5 x I _{Δn}	≤ 30 m:	
Recovery time t _b	≤ 2:	
Disturbances		
Load current In	32 A	
Connection		
Max. Cable length	≤ 10 m	
Outputs		
Switching outputs S1, ERR	Open Collector, not short-circuit-proo	
Switching capacity	40 V / 50 mA	
Hysteresis	≤ 30 %	
PWM	PWM signal, push pul	
Internal resistance PWM signal	4.7 kΩ	
Voltage HIGH level	3.13.6\	
Voltage LOW level	00.6 \	
Frequency PWM signal	8 kH:	
Specification of the PWM signal	(0100) % = (0100) mA	
Output resistance	not short-circuit-proof	
Response value assignment		
$I_{\Delta n1}$ (DC)	S	
Internal error	ERF	

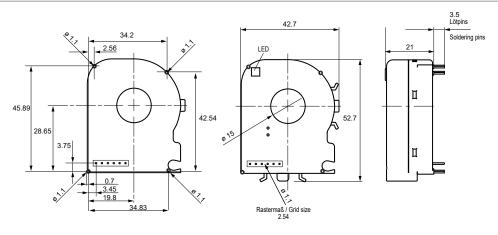
Technical data (continued)

Environmen	t/EMC	
EMC	DIN EN IEC 62020-1:2021-10 (IEC 62020-1:2020-04 Ed.	1.0), where applicable
Ambient temp	perature (incl. primary conductors routed through module)	-25+70 °C
Classification	of climatic conditions acc. to IEC 60721 (related to temperature a	nd relative humidity):
Stationary use	e (IEC 60721-3-3)	3K22
Transport (IEC	60721-3-2)	2K11
Long-term sto	orage (IEC 60271-3-1)	1K22
Classification	n of mechanical conditions acc. to IEC 60271	
Stationary use	e (IEC 60721-3-3)	3M11
Transport (IEC	60721-3-2)	2M4
Long-term sto	orage (IEC 60271-3-1)	1M12

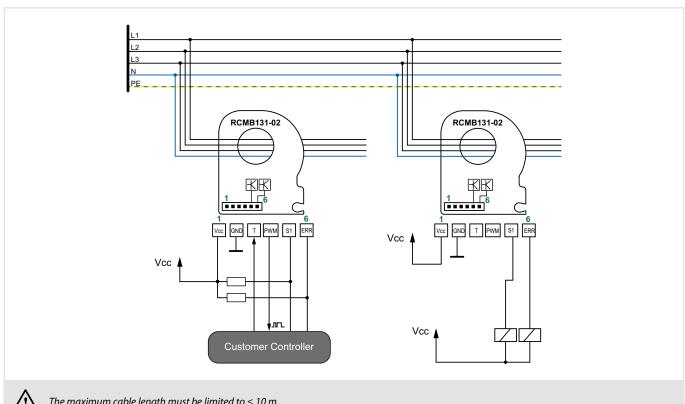
Operating mode	continuous operation
Mounting	any position
Protection class	IP 30
Flammability rating	UL94 V-0
Service life at 40 °C	10 years
Software	D0604
Documentation number	D00354

^{* =} factory settings

Dimension diagram (dimensions in mm)



Wiring diagram



The maximum cable length must be limited to ≤ 10 m.

RCMB132-01

AC/DC sensitive residual current monitoring module for measuring AC and DC currents up to ± 100 mA



Typical applications

- Designed for installation in PDUs and outlet boxes
- Communication with a master via an RS-485 interface via Modbus RTU
- Connection of several devices in a daisy chain. For this purpose, the RCMB132-01 provides two identical connectors for RS-485 (incl. power supply)

Device features

- AC/DC sensitive leakage and fault current monitoring for preventive maintenance
- · High resolution for implementing equipment leakage current monitoring
- Measured value and alarm transmission via Modbus RTU (RS-485)
- Frequency range DC...2 kHz
- Compact design for monitoring nominal loads up to $I_n = 32 \text{ A}$
- Low load current sensitivity due to fully shielded measuring current transformer
- Continuous monitoring of the connection to the measuring current transformer
- Integrated test function
- Supply voltage DC 12...24 V

Further information

For further information refer to our product range on www.bender.de.

Approvals



Ordering information

Туре	Measuring range	Supply voltage <i>U</i> s	Art. No.
RCMB132-01	AC/DC ±100 mA	DC1224 V	B94042136
Mounting foot MCCT20			B91080111

Technical data

Primary circuit	monitored primary conductors
Secondary circuit	Connections Vcc, GND, A, B, S1, S2
All following specifications apply to the insulation be	etween the primary and secondary circuit
Rated voltage	300 V
Overvoltage category	III
Rated impulse voltage	4 kV
Operating altitude	up to 3000 m AMSL
Rated insulation voltage	320 V
Pollution degree	2
Safe separation (reinforced insulation)	between primary and secondary circuit
Voltage test acc. to IEC 61010-1	AC 2.2 kV
Voltage supply	
Supply voltage $U_{\rm S}$	DC 1224 V
Operating range of the supply voltage	±20 %
Ripple	100 mV
Power consumption	< 0.75 W

Measuring circuit	
Internal diameter primary conductor opening	15 mm
Measured value evaluation	DC, RMS
Measuring range	AC/DC ±300 mA
Characteristics according to IEC 60755	AC/DC sensitive, type B
$I_{\Delta n1}$	
Response value	DC 3.5100 mA (* 6 mA)
Response tolerance	0.71.0 x <i>l</i> ∆n1
$I_{\Delta n2}$	
Response value	RMS 3.5100 mA (* 30 mA)
Response tolerance	
DC1 kHz	0.71.0 x /∆n2
12 kHz	1.02.0 x /∆n2
Output range	0100 mA (RMS)
Resolution	< 0.2 mA
Frequency range	DC2 kHz
Measuring time	180 ms
Operating uncertainty	
DC500 Hz	±(5 % + 0.5 mA)
5011000 Hz	±(15 % + 0.5 mA)
12 kHz	$-(50 \% \pm 0.5 \text{ mA})$
Time response	
Response time t_{ae} (relay switching time of 10 ms considered)	
for 1 x IΔn	≤ 290 ms
for 2 x I∆n	≤ 140 ms
for 5 x IΔn	≤ 30 ms
Recovery time t _b	≤ 2 s

Technical data (continued)

Disturbances	
Load current In	32 A
Response value assignment	
I _{Δn1} (DC)	S1
$I_{\Delta n2}$ (RMS)	S2
Connection	
Max. Cable length	≤ 10 m
Outputs	
Interface	RS-485
Protocol	Modbus RTU
Switching outputs	Open Collector, not short-circuit-proof
Switching capacity	40 V / 50 mA
Output voltage LOW level	00.6 V
Output voltage HIGH level	3.13.6 V
Hysteresis	≤ 30 %

Environment/EMC

DIN EN IEC 62020-1:2021-10 (IEC 62020-1:2020-04 Ed. 1.0), where applicable EMC Ambient temperature (incl. primary conductors routed through module)

Classification of climatic conditions acc. to IEC 60721 (related to temperature and relative humidity): Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60271-3-1) 1K22

Classification of mechanical conditions acc. to IEC 60271

Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60271-3-1)	1M12

Other

Operating mode	continuous operation
Mounting	any position
Protection class	IP 30
Flammability rating	UL94 V-0
Service life at 70 °C acc. to IEC 61709	20 years
Software	D0604
Plug (included in scope of delivery)	Phoenix Contact, PTSM 0.5/4-P-2.5
Documentation number	D00356

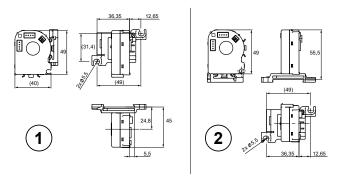
^{* =} factory settings

Dimension diagram (dimensions in mm)

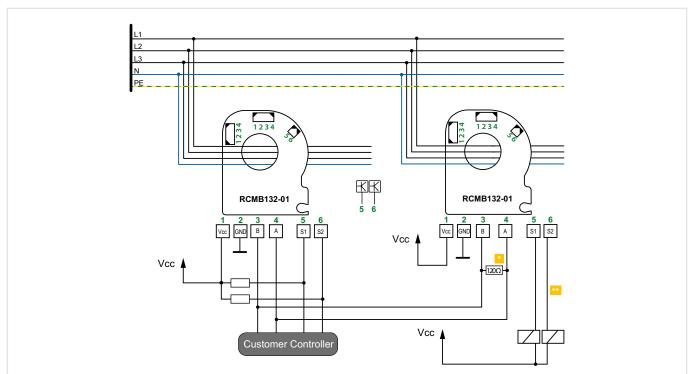
31.75 28.65 П

Rail mounting

with mounting foot MCCT20 (accessories, see ordering data)



Wiring diagram



- \square Terminating resistor 120 Ω must only be set on the last device in the RS-485 bus chain.
- An external protective circuit is especially required for inductive loads.



The maximum cable length must be limited to ≤ 10 m.

RCMB104

AC/DC sensitive residual current monitoring module for electric vehicle charging systems



Typical applications

AC charging systems for electric vehicles

Approvals





Device features

- Four outputs (Switch1, Switch2, Error, PWM)
- · Measuring range ±300 mA
- Residual current resolution < 0.2 mA
- · Patented measurement technology
- Load current up to 32 A or 80 A* RMS (singlephase) or 3 x 32 A RMS (three-phase)
- Fault output (integrated self monitoring and test functions)
- · High insensitivity to external interferences
- Available variants for application according to IEC 62752 and UL 2231-2
- Wide range of use even in severe environments (e.g. in the event of external fields)
- In applications according to IEC 62752, the device can replace a type B RCD when combined with a type A RCD and a suitable switching device (e.g. a power relay)
- * Only in case of use according to UL2231-2

Standards

The monitoring modules compliens, depending on the variant, with the following device standards:

RCMB104-1

IEC 62752 In-cable control and protection device for mode 2 charging of electric road vehicles (IC-CPD)

RCMB104-2:

CCID20 acc. to UL 2231-2 (Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits: Particular Requirements for Protection Devices for Use in Charging Systems)

RCMB104-2

CCID5 acc. to UL 2231-2 (Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits: Particular Requirements for Protection Devices for Use in Charging Systems)

Patents

EP 2 571 128 / US 9,397,494 / ZL 201210157968.6 / CN 103001175, EP 2 813 856

Further information

For further information refer to our product range on www.bender.de.

Ordering information RCMB104

Туре	Description	Art. No.
RCMB104-1	02000 Hz IEC 6/30 mA	B94042480
RCMB104-2	02000 Hz UL 2231 5/20 mA	B94042481

Ordering information Measuring current transformer

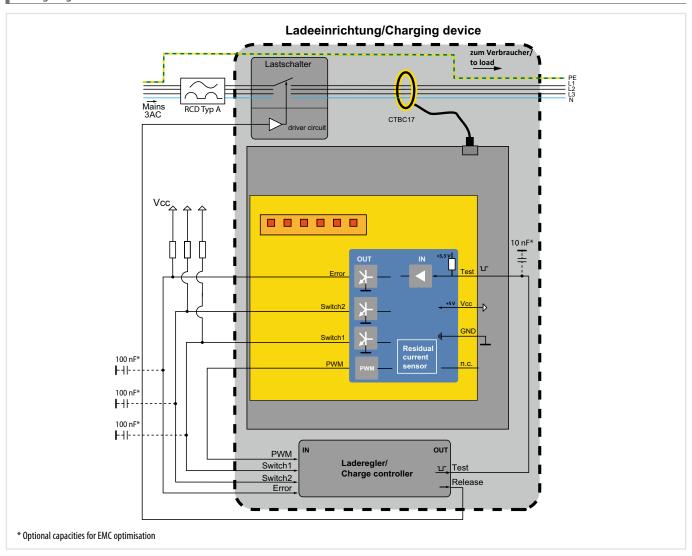
Description	Diameter/ Connection cable	Туре	Art. No.	Page
Measuring current transformer	17 mm/–	CTBC17	B98080070	281
Connection cable CTBC17	−/180 ± 30 mm	CTBC17-Kabel180MM	B98080540	281
	−/325 ± 25 mm	CTBC17-Kabel325MM	B98080541	281
	−/600 ± 30 mm	CTBC17- Kabel600MM	B98080543	281
	-/1470 ± 30 mm	CTBC17-Kabel1470MM	B98080542	281

Main circuit (current paths trough CT)	220/400 V	RCMB104-2 (Switch2, CCID5 acc. to UL 2 Ground fault threshold /2	25 1-2)
Rated operational voltage $U_{\rm e}$ Rated current $I_{\rm n}$	230/400 V single-phase: 32 A (80 A)	60 Hz	RMS 5 mA
nated current 1 ₀	three-phase: 32 A	DC	30 mA
Insulation coordination according to IEC 60664-1/IEC 60664	•	Response tolerance I ₂	
Definitions:	· 5	for $f = \ge 60 \le 500 \text{ Hz}$	0.941.1 x / ₂
Main circuit IC1	(L1, L2, L3, N)	for $f = > 500 \le 2000 \text{ Hz}$	0.82 x /
	Switch2, Switch1, Vcc, GND, PWM)	Restart value /2	< 2 m/
Rated voltage	250 V	Operating time t_{ae} (DC \leq 100 Hz)	· (20/I)143 10 m
Overvoltage category (ÜK)	III	All fault current except pure DC DC $> 30 \le 100.6$ mA	$< (20/I)^{1.43} - 10 \text{ m}$ $< (40 \times 1.414/I)^4 - 10 \text{ m}$
Rated impulse voltage:		DC > 30≤ 100.6 mA DC > 100.6 mA	< (40 x 1.4 14/1) - 10 m: < (20/1) ^{1.43} - 10 m:
IC1/IC2	4 kV	Release time t _{off}	< 2.5:
Rated insulation voltage U_1 :	25214		(2.3.
IC1/IC2	250 V	Outputs Switch1, Switch2, Error	
Pollution degree Protective separation (reinforced insulation) between:	2	Type	Open Collector (NPN)
IC/IC2	ÜK III, 250 V	Switching capacity	DC 40 V/20 mA ³
	OK III, 230 V	Signalling times in the event of module and Error	nardware errors ≤ 1.5 s
The data are valid from the main circuit to the control circuit.		Switch1	≤ 1.5 · ≤ 2.5 ·
Power supply		Switch2	≤ 2.5 €
Nominal supply voltage $V_{\rm CC}$	DC 5 V		
Tolerance of the supply voltage $V_{\rm CC}$	±5 %	PMW output	0.101
Voltage ripple V _{cc}	< 100 mV	Type	PushPul
Absolute maximum supply voltage V_{cc}	DC 5.5 V	HIGH level LOW level	3.13.5 V ³
Supply current I_{cc}	45 mA	PWM frequency	8000 Hz
Residual current measuring range		Scaling	3000 112
Rated frequency /Δn	02000 Hz	RCMB104-1	0100 % = DC 030 mA
Measuring range $I_{\Delta n}$	±300 mA	RCMB104-2	0100% = RMS 050 mA
Resolution I _{An}	< 0.2 mA	Maximum current-carrying ability	10 mA
Response values		* The overvoltage protection must be ensure	ed by the customer.
<u> </u>		Control input (TEST)	,
RCMB104-1 (Switch1)	DMC 20 4		LOWI activisted state
Rated residual operating current $I_{\Delta rms1}$ Response tolerance $I_{\Delta rms1}$	RMS 30 mA	Туре	LOW: activated state HIGH: deactivated state
for $f = DC \dots \le 100 \text{ Hz}$	0.71 x / _{Δrms1}	Switching thresholds	HIGH: 3.1 5.5 V
for $f = 100 \le 100 \text{ Hz}$	0.82.5 x /Δrms1	5 Witching the Shorts	LOW: 0 0.6 N
for $f = 4002000 \text{ Hz}$	1.56 x / _{Δrms1}	FMV/IFC (27F2 III 2224 2)	
Restart value I∆rms1	< 10 mA	EMV (IEC 62752, UL 2231-2)	· I da Palal e la II
Operating time t_{ae} (DC \leq 100 Hz)			in an enclosure that complies with the mentioned standards.
1x <i>I</i> ∆n1	< 270 ms	Restrictions line-conducted interference	
2x <i>I</i> ∆n1	< 80 ms	Maximum connection length:	100 mm
5x / _{Δn1}	< 20 ms	ESD immunity acc. to Human Body Model JE	
RCMB104-1 (Switch2, IEC 62752)		On avating tampayatura	±2 kV (contact) -3080 °C
Rated residual operating current $I_{\Delta dc2}$	DC 6 mA	Operating temperature Storage temperature	_3085 °C
Response tolerance $I_{\Delta dc2}$	> 0.51 x / _{Δdc2}		-4005
Rated residual operating current I∆rms2	RMS 30 mA	Climatic class Stationary use (IEC 60721-3-3)	3K24 (except condensation, water and formation of ice
Response tolerance /Δrms2	0.7 1 1 1	Transport (IEC 60721-3-2)	2K11
for $f = DC \dots \le 100 \text{ Hz}$ for $f = 100 \dots \le 400 \text{ Hz}$	0.71 x /Δrms2	Long-term storage (IEC 60721-3-1)	1K21
for $f = 4002000 \text{ Hz}$	0.82.5 x / _{Δrms2} 1.56 x / _{Δrms2}	Classification of mechanical conditions	
Restart value	1.50 λ /ΔΠΠΩΖ	Stationary use (IEC 60721-3-3)	3M11
/Δdc2	< 2.5 mA	Transport (IEC 60721-3-3)	2M4
I _{Δrms2}	< 10 mA	Long-term storage (IEC 60721-3-1)	1M12
Operating time tae		Range of use	< 4000 m
DC 6 mA	< 700 ms	Degree of protection	
DC 60 mA	< 240 ms		IDO
DC 300 mA	< 20 ms	RCMB104	inector plug) IPOC
Operating time t_{ae} (DC \leq 100 Hz)	. 370	Measuring current transformer (without con	incctor prug/ IP55
1x /∆rms2	< 270 ms < 80 ms	Connections	
2x Ι _{Δrms2} 5x Ι _{Δrms2}	< 80 ms < 20 ms	Measuring current transformer	
	< 20 IIIS	Connection type	PCB plug-in connector 0.65 x 0.65 mm
RCMB104-2 (Switch1, CCID20 acc. to UL 2231-2)		Modular dimensions	single row 6 x 2.54 mm
Ground fault threshold I ₁ 60 Hz	RMS 20 mA	Contact surface	tinnec
DC	40 mA x 1.141	Pin length	2.5 mm
Response tolerance I ₁	TV III/1 X 1.141	Inputs/outputs	
for $f = 60 \text{ Hz}$	0.751 x l1	Connection type	PCB plug-in connector 0.5 x 0.5 mm
for $f = > 60 \le 2000 \text{ Hz}$	0.83.5 x l1	Arrangement of connections	double row 2 x 4 pins
Restart value /1	< 10 mA	Modular dimensions	2.00 mm
Operating time t_{ae} (DC \leq 100 Hz)		Contact surface Pin length	tinnec 2.5 mm
All fault current except pure DC	$< (20/I)^{1.43} - 10 \text{ ms}$	Soldering process for PCB	recommended: selective soldering
DC > 30≤ 100.6 mA	$< (40 \times 1.414/I)^4 - 10 \text{ ms}$		•
DC > 100.6 mA	< (20/I) ^{1.43} –10 ms	Connection measuring current transfor Maximum distance to connector	mer CIBC17 100 mm
Release time t _{off}	< 2.5 s	Connection type	PCB plug-in connector
		Number of poles	6 (2x3 poles)
		Modular dimensions	3.0 mm
		Number of mating cycles	30
		Number of mating cycles Manufacturer type designation	30 Molex MicroFit 3.0 Header
		9 /	
		Manufacturer type designation	Molex MicroFit 3.0 Header 43045-0607

Side view; Front view Recommended drilling diameter: Ø 1,1mm 20,35³ -|2,54³ 1,6² Φ ф 2,5³ ф ф 0 17,41⁴ 14,23³ 15 _ _ $7,59^{3}$ φ 2,57² 23,99³ Ø 1,5² 1,63 26,5² ■ 0,5 x 28⁴ **0**,64

Tolerances dimensions				
x^1 ± 0,05				
x ² ± 0,1				
χ ³	± 0,2			
х4	± 0,3			

Wiring diagram



RDC104-4

DC sensitive residual current monitoring module for electric vehicle charging systems



Typical applications

· DC fault current monitoring of AC charging systems for electric vehicles

Approvals



Device features

- Four outputs (Switch1, Switch2, Error, PWM)
- Measuring range ±300 mA
- Residual current resolution < 0.2 mA
- Patented measurement technology
- Rated current up to 32 A (singlephase) or 3 x 32 A RMS (three-phase)
- Fault output (integrated self monitoring and test functions)
- · High insensitivity to external interferences
- Available variants for application according to IEC 62955
- Wide range of use even in severe environments (e.g. in the event of external fields)
- In applications according to IEC 62955, the device can replace a type B RCD when combined with a type A RCD and a suitable switching device (e.g. a power relay)

Standards

The monitoring modules compliens, depending on the variant, with the following device standards:

RDC104-4:

IEC 62955 Residual direct current detecting device (RDC-DD) to be used for mode 3 charging of electric vehicles)

Patents

EP 2 571 128 / US 9,397,494 / ZL 201210157968.6 / CN 103001175, EP 2 813 856.

Further information

For further information refer to our product range on www.bender.de.

Ordering information RDC104-4

Туре	Description	Art. No.
RDC104-4	RDC-M module acc. to IEC 62955	B94042483

Ordering information Measuring current transformer

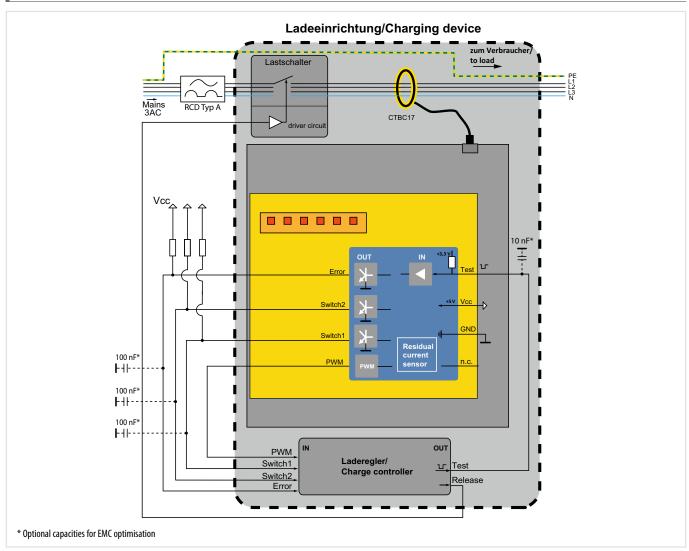
Description	Diameter/ Connection cable	Туре	Art. No.	Page
Measuring current transformer	17 mm/–	CTBC17	B98080070	281
	$-/180 \pm 30 \text{mm}$	CTBC17-Kabel180MM	B98080540	281
Composition cobbs CTDC17	−/325 ± 25 mm	CTBC17-Kabel325MM	B98080541	281
Connection cable CTBC17	$-/600 \pm 30 \text{mm}$	CTBC17- Kabel600MM	B98080543	281
	-/1470 ± 30 mm	CTBC17-Kabel1470MM	B98080542	281

Main circuit (current paths trough CT)	***************************************	PMW output	0 10 11
Rated operational voltage U_e	230/400 V	Type	PushPull
Rated current In	single-phase: 32 A (80 A)	HIGH level	3.13.5 V*
	three-phase: 32 A	LOW level	00.5 V*
Insulation coordination according to IEC 60	0664-1/IEC 60664-3	PWM frequency	8000 Hz
Definitions:		Scaling RDC104-4	0100 % = DC 030 mA
Main circuit IC1	(L1, L2, L3, N)	Maximum current-carrying ability	0100 % = DC 030 IIIA 10 mA
Control circuit IC2	(af, Test, Error, Switch2, Switch1, Vcc, GND, PWM)	, , ,	
Rated voltage	250 V	* The overvoltage protection must be ensured by the c	ustomer.
Overvoltage category (ÜK)		4	
Rated impulse voltage:		Control input (TEST)	
IC1/IC2	4 kV	Туре	LOW: activated state
Rated insulation voltage U_1 :	TRV	C to It al. II II	HIGH: deactivated state
IC1/IC2	250 V	Switching thresholds	HIGH: 3.1 5.5 V
Pollution degree	250 V		LOW: 0 0.6 V
		EMV (IEC 62955)	
Protective separation (reinforced insulation) bet		ESD restrictions : The device must be mounted in an e	nclosure that complies with the mentioned
IC/IC2	ÜK III, 250 V	standards.	nelosare that compries that the mentioned
The data are valid from the main circuit to the o	ontrol circuit.		
_		Restrictions line-conducted interferences:	100
Power supply		Maximum connection length: ESD immunity acc. to Human Body Model JESD22-A114	100 mm 4 ±2 kV (air)
Nominal supply voltage $V_{\rm cc}$	DC 5 V	בשט ווווווועווונץ מככ. נט חעווומוו Body Model JesDZZ-A 114	±2 kV (air) ±2 kV (contact)
Tolerance of the supply voltage $V_{\rm cc}$	±5 %	Operating temperature	±2 kV (contact) -3080 °C
Voltage ripple V_{cc}	< 100 mV	Storage temperature	-3085 °C
Absolute maximum supply voltage V_{cc}	DC 5.5 V		-₩65 €
Supply current I _{cc}	45 mA	Climatic class	
			cept condensation, water and formation of ice)
Residual current measuring range		Transport (IEC 60721-3-2)	2K11
Rated frequency I∆n	02000 Hz	Long-term storage (IEC 60721-3-1)	1K21
Measuring range $I_{\Delta n}$	100 mA	Classification of mechanical conditions	
Resolution $I_{\Delta n}$	< 0.2 mA	Stationary use (IEC 60721-3-3)	3M11
Response values		Transport (IEC 60721-3-2)	2M4
nesponse values		Long-term storage (IEC 60721-3-1)	1M12
RDC104-4 (Switch1)		Range of use	< 4000 m
Rated residual operating current I _{dc1}	DC 6 mA	Degree of protection	
Response tolerance I _{Δdc1}	0.51 x / _{Δdc1}	RDC104-4	IP00
Restart value I∆dc1	< 2.5 mA	NDC104-4	11 00
Operating time t_{ae}		Connections	
DC 6 mA	< 480 ms	Inputs/outputs	
DC 12 mA	< 240 ms	Connection type	PCB plug-in connector 0.5 x 0.5 mm
DC 30 mA	< 120 ms	Arrangement of connections	double row 2 x 4 pins
DC 60 mA	< 70 ms	Modular dimensions	2.00 mm
DC 200 mA	< 30 ms	Contact surface	tinned
DC 300 mA	< 30 ms	Pin length	2.5 mm
		Soldering process for PCB	recommended: selective soldering
RDC104-4 (Switch2, IEC 62955)	DC 2 4		
Rated residual operating current $I_{\Delta dc2}$ Response tolerance $I_{\Delta dc2}$	DC 6 mA > 0.51 x / _{Δdc2}	Connection measuring current transformer CTBC	
		Maximum distance to connector	100 mm
Restart value I _{Adc2}	< 2.5 mA	Manufacturer type designation	Molex MicroFit 3.0 Header
Operating time t_{ae}		Article number	43045-0607
DC 6 mA	< 480 ms	The connector is not included in the scope of delivery.	
DC 12 mA	< 240 ms	For further information, refer to the original data sheet	t created by Molex.
DC 30 mA	< 120 ms		
DC 60 mA	< 70 ms		
DC 200 mA	< 30 ms		
DC 300 mA	< 30 ms		
Outputs Switch1, Switch2, Error			
Type	Open Collector (NPN)		
Switching capacity	DC 40 V/20 mA*		
Signalling times in the event of module and har			
Error	dware errors ≤ 1.5 s		
Switch1	≤ 1.5 s		
Switch2	≤ 1.5 s		
	= 1.53		

Side view; Front view Recommended drilling diameter: Ø 1,1mm 20,35³ -|2,54³ 1,6² Φ ф 2,5³ ф ф 0 17,41⁴ 14,23³ 15 _ _ $7,59^{3}$ φ 2,57² 23,99³ Ø 1,5² 26,5² 1,63 ■ 0,5 x 28⁴ **0**,64

Tolerances dimensions				
x ¹ ± 0,05				
x ²	± 0,1			
χ ³	± 0,2			
x4	± 0,3			

Wiring diagram





Device overview neutral grounding resistance monitoring (NGR) LINETRAXX®

		The state of the s	The state of the s	And were	A LANGTON AVAILABLE OF THE PARTY OF THE PART
		LINETRAXX® NGRM500	LINETRAXX° NGRM550	LINETRAXX° NGRM700	LINETRAXX° NGRM750
	Catalogue page	240	240	245	245
	Special applications	Neutral grounding resistance monitoring (NGR monitoring)	Neutral grounding resistance monitoring (NGR monitoring)	Neutral grounding resistance monitoring (NGR monitoring)	Neutral grounding resistance monitoring (NGR monitoring)
System	HRG	✓	+	~	-
	LRG	-	~	-	✓
Fault	\cong	~	~	✓	✓
Fa		✓	~	✓	<u> </u>
Ph	ase monitoring L1, L2, L3	-	-	✓	<u> </u>
	System voltage L-L*	60025000 V	60025000 V	60025000 V	60025000 V
Harmonic analysis	RMS 032	~	~	~	<u> </u>
Harn	Analysis range	~	~	✓	~
	Relay operating mode	Configurable fail-safe or non-fail-safe	Configurable fail-safe or non-fail-safe	Configurable fail-safe or non-fail-safe	Configurable fail-safe or non-fail-safe
	Communication	Webserver, BCOM, Modbus RTU, Modbus TCP	Webserver, BCOM, Modbus RTU, Modbus TCP	Webserver, BCOM, Modbus RTU, Modbus TCP	Webserver, BCOM, Modbus RTU, Modbus TCP
	Maximum altitude	2000 m	2000 m	5000 m	5000 m
ing	Detachable HMI for front panel mounting	-	+	~	~
Mounting	DIN rail	✓	~	-	-
	Screw mounting	-	+	~	~
	Product details (Products on www.bender.de/en)				

^{*} Freely configurable in the device, taking suitable coupling devices into account.

Device overview coupling devices for NGR monitoring



Recommended minimum value R_{NGR} (tripping level 50 %)

			CD1000			CD10	00-2		CD5	000			CD14400			CD25000
	Usys	400 V	600 V	690 V	400 V	600 V	690 V	1000 V	2400 V	4200 V	6 kV	6.6 V	7.2 kV	11 kV	14.4 kV	25 kV
	1 A	231 Ω	346 Ω	398 Ω	231 Ω	346 Ω	398 Ω	577 Ω	1386 Ω	-	-	-	-	-	-	-
	5 A	46 Ω	69 Ω	80 Ω	46 Ω	69 Ω	80 Ω	115 Ω	277 Ω	485 Ω	693 Ω	762 Ω	831 Ω	1270 Ω	1663 Ω	-
	10 A	(23 Ω)	35 Ω	40 Ω	(23 Ω)	35 Ω	40 Ω	58 Ω	139 Ω	242 Ω	346 Ω	381Ω	416 Ω	635 Ω	831 Ω	1443 Ω
	15 A	(15 Ω)	(23 Ω)	<i>(27 Ω)</i>	(15 Ω)	(23 Ω)	(27 Ω)	38 Ω	92 Ω	162 Ω	231 Ω	254 Ω	277 Ω	423 Ω	554Ω	962 Ω
/NGR	20 A	-	<i>(17 Ω)</i>	<i>(20 Ω)</i>	-	(17 Ω)	(20 Ω)	29 Ω	69 Ω	121 Ω	(173 Ω)	191 Ω	208 Ω	318 Ω	416 Ω	722 Ω
2	25 A	-	-	(16Ω)	-	-	(16Ω)	(23 Ω)	55 Ω	97 Ω	(139 Ω)	(152Ω)	(166Ω)	254Ω	333 Ω	577 Ω
	30 A	-	-	-	-	-	-	(19 Ω)	(46 Ω)	81 Ω	(115 Ω)	(127 Ω)	(139Ω)	212 Ω	277 Ω	481 Ω
	40 A	-	-	-	-	-	-	-	(35 Ω)	61 Ω	<i>(87 Ω)</i>	<i>(95 Ω)</i>	(104Ω)	(159Ω)	208 Ω	361 Ω
	50 A	-	-	-	-	-	-	-	(28 Ω)	(48 Ω)	-	(76 Ω)	<i>(83 Ω)</i>	(127 Ω)	(166 Ω)	289 Ω
	100 A	-	_	-	-	-	-	-	-	(24 Ω)	-	-	-	-	(83 Ω)	(144 Ω)

Temperature range -40...+70 °C, field calibration at 25 °C

(Limited temperature range 0...+40 °C, field calibration at 25 °C)

LINETRAXX® NGRM500 (HRG)/NGRM550 (LRG)

Neutral Grounding Resistor Monitor



Typical applications

- · For use in high-resistance grounded systems (NGRM500)
- For use in low-resistance grounded systems (NGRM550)

Approvals



UL File Number: E493737, E173157

Device features

- Determination of R_{NGR} with passive and active measurement methods
- Continuous monitoring of the RNGR even if the installation is de-energized;
- · Alarm or trip on ground fault
- Monitoring of the current INGR
- Monitoring of the voltage UNGR
- · Ethernet communication
- · Web server
- Language selection (German, English GB and US, Spanish, French)
- · Test button (internal, external) with/without tripping
- · FFT analysis of neutral current and voltage
- Pulser control for manual ground fault location
- Relay outputs for detection of ground faults and resistor faults
- Relay output for shutdown of the installation after a configurable time
- Can be combined with RCMS... for automatic shutdown of feeders
- · Graphical user interface
- Wide supply voltage range for operating the NGR monitor
- Range of use up to 2000 m AMSL
- · Fault/History memory
- Analogue output of measured values (0...10 V, 4...20 mA, etc., selectable parameters)
- Password protection
- Tripping on RMS, fundamental component signal or harmonics
- · Detection of AC and DC ground faults
- Variants High Resistance Grounded (HRG), Low Resistance Grounded (LRG)

	Н	RG	LRG		
	NGRM500 NGRM700		NGRM550	NGRM750	
U _{sys} LL	40025000V				
/NGR nom	0,5	.100 A	102000 A		
R _{NGR nom}	R _{NGR nom} 155000 Ω		0,1200 Ω		

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	System type	Supply voltage U₅/ Frequency range Hz	Art. No.
NGRM500	HRG	AC 48240 V, 4070 Hz	B94013500
NGRM550	LRG	DC 48240 V	B94013550

Suitable system components

Description	Туре	Art. No.	Page
Coupling device	CD	B980390	257
	CTAC	B981100	359
Manageria a suggestation of common	CTAS	B981100	362
Measuring current transformer	CTB31CTB51	B980860	301
	CTUB103	B781200	251
Voltage supply for measuring current transformers	STEP-PS	B940531	400

Insulation coordination according to IEC 60664-1/IEC 6066	4-3/DIN EN 50178	Tolerance t _{trip} when set to	20.
Definitions		RMS	-200 ms
Supply circuit (IC1)	(A1, A2)	Fundamental	0+150 ms (filter time)
Measuring circuit/Control circuit (IC2)	(RS, E, CT), (X1, ETH)	Harmonics	0+150 ms (filter time)
Output circuit 1 (IC3)	(11, 12, 14)	Measuring current transformer ratio primary	110,000
Output circuit 2 (IC4)	(21, 22, 24)	Measuring current transformer ratio secondary	110,000
Output circuit 3 (IC5)	(31, 32, 34)	Measuring range	2 x / _{NGR nom}
Rated voltage	250 V	Monitoring U _{NGR}	
Overvoltage category	III	Frequency ranges	DC / 50/60 Hz / 103200 Hz
Rated impulse voltage		U_{NGR} with $R_{\text{S}} = 20 \text{ k}\Omega$	$(400/\sqrt{3}) \dots \le (4300/\sqrt{3}) \text{ V}$
IC1/(IC25)	4 kV	U_{NGR} with $R_{\text{S}} = 100 \text{ k}\Omega$	$(400/\sqrt{3}) \dots \le (4300/\sqrt{3}) \text{ kV}$ > $(4.3/\sqrt{3}) \dots (25/\sqrt{3}) \text{ kV}$
IC2/(IC35)	4 kV		1.2 x U _{NGR nom}
IC3/(IC45)	4 kV	Measuring range Overload capacity	2 x <i>U</i> _{NGR} for 10 s
IC4/(IC5)	4 kV		
Rated insulation voltage		Measurement accuracy	2 % of $U_{NGR \text{ nom}}$ with $U_{NGR \text{ nom}} = (U_{sys} (L-L)/\sqrt{3})$
IC1/(IC25)	250 V	Voltage response value	1090 % U _{NGR nom}
IC2/(IC35)	250 V	Response delay, ground-fault relay	≤ 40 ms (±10 ms)
IC3/(IC45)	250 V	Response delay, trip relay (configurable)	100 ms48 h, ∞
IC4/(IC5)	250 V	Tolerance ttrip when set to	
Pollution degree exterior	3	RMS	–200 ms
Safe isolation (reinforced insulation) between		Fundamental	0+150 ms (filter time)
IC1/(IC25)	300 V	Harmonics	0+150 ms (filter time)
IC2/(IC35)	300 V	DC immunity in case of active R_{NGR} measurement	
IC3/(IC45)	300 V	with $R_S = 20 \text{ k}\Omega$	DC ±12 V
IC4/(IC5)	300 V	with RS = $100 \text{ k}\Omega$	DC ±60 V
Voltage tests (routine test) acc. to IEC 61010-1	JUU V	District in water	
3 , ,	AC 2 2 IV	Digital inputs	
IC1/(IC25) IC2/(IC35)	AC 2.2 kV	Galvanic separation	no
,	AC 2.2 kV	Length connecting cables	max. 10 m
IC3/(IC45)	AC 2.2 kV	U _{in}	24 V
IC4/(IC5)	AC 2.2 kV	Overload capacity	−532 V
Supply voltage		Digital autoute	
Nominal supply voltage $U_{\rm S}$	AC/DC, 48240 V	Digital outputs	
for UL applications	AC/DC, 48240 V	Galvanic separation	no
for AS/NZS 2081 applications	AC/DC, 48230 V	Length connecting cables	max. 10 m
Tolerance U _S	±15 %	Currents (sink) for each output	max. 300 mA
Tolerance U_S (for UL applications)		Voltage	24 V
•••	-50+15 %	Overload capacity	−532 V
Tolerance U _s (for AS/NZS 2081 applications)	-25+20 %	Analogue output (M+)	
Frequency range <i>U</i> _s	DC, 4070 Hz		
Power consumption (max.)	≤ 7 W / 16 VA	Operating principle	linear
Monitoring R _{NGR}		Functions	/NGR, RNGR
Measuring input Rs	< 33 V RMS		0 Ω), 4 20 mA (\leq 600 Ω), 0 400 μA (\leq 4 kΩ)
Measuring input r_3 Measuring range NGR (with $R_5 = 20 \text{ k}\Omega$) active	010 kΩ	Voltage	$010 \text{ V} (\geq 1 \text{ k}\Omega), 210 \text{ V} (\geq 1 \text{ k}\Omega)$
Measurement uncertainty for $T = 0+40$ °C	±20 Ω	Tolerance related to the current/voltage end value	±20 %
Measurement uncertainty for $T = -40+70$ °C	±40 Ω	Ground-fault, NGR, trip relay	
Measuring range NGR (with $R_S = 100 \text{ k}\Omega$) active	010 kΩ	Switching elements	changeover contacts
Measurement uncertainty for T = 0+40 °C	±30 Ω	Operating mode	changeover contacts configurable fail-safe/non-fail-safe
Measurement uncertainty for $T = 0+40^{\circ}$ C		Electrical endurance, number of cycles	3
,	±80 Ω		10,000
HRG	15.0 51.0	Switching capacity	2000 VA / 150 W
Setting range R _{NGR nom}	15 Ω5 kΩ	Contact data acc. to IEC 60947-5-1	
Response value $< R_{NGR nom}$	1090 % RNGR nom	Utilisation category	AC-13 / AC-14 / DC12 / DC12 / DC12
Response value >R _{NGR nom}	110200 % R _{NGR nom}	Rated operational voltage	250 V / 250 V / 220 / 110 / 24 V
LRG		Rated operational current	5 A*/3 A/0,1 A/0,2 A/1 A
Setting range R _{NGR nom}	0.1200 Ω	Minimum current	1 mA at AC/DC > 10 V
Response value >R _{NGR nom}	200500 Ω	* 2 A for III applications	
Response delay, NGR-fault relay	7 s (±2.5 s)	* 3 A for UL applications	
Response delay, trip relay	048 h	Environment/EMC	
Manitarina I			DIN EN (1000 (2 IEC (02EE 2(E.L. 2 0
Monitoring /NGR		EMC immunity	DIN EN 61000-6-2, IEC 60255-26 Ed. 3.0
Measuring circuit 5 A		EMC emission	DIN EN 61000-6-4, IEC 60255-26 Ed. 3.0
Frequency ranges	DC / 50/60 Hz / 103200 Hz	Operating temperature	-40+60 °C
Nominal measuring current I_n	5 A	Operating temperature for UL applications	-40+60 °C
Maximum continuous current	2 x / _n	Transport	−40+85 °C
Overload capacity	10 x In for 0.03 s	Long-term storage	−40+70°C
Measurement accuracy	$\pm 2\%$ of $I_{\rm n}$	Humidity	≤ 98 %
Load	10 mΩ	Operating altitude	≤ 2000 m AMSL
Measuring circuit 50 mA		Classification of climatic conditions acc. to IEC 6	0721 (related to temperature and relative humidity)
Frequency ranges	DC / 50/60 Hz / 103200 Hz	Stationary use (IEC 60721-3-3)	3K22
Nominal measuring current In	50 mA	Transport (IEC 60721-3-2)	2K11
Maximum continuous current	2 x I _n	Long-term storage (IEC 60721-3-1)	1K22
Overload capacity	10 x <i>I</i> _n for 2 s	_ ·	
Measurement accuracy	$\pm 2\%$ of $I_{\rm n}$		o IEC 60721 / IEC 60255-21 / DIN EN 60068-2-6
	68 Ω	Stationary use	3M12
· · · · · · · · · · · · · · · · · · ·		T .	2114
Load	22 00	Transport	2M4
Load Measuring circuits 5 A and 50 mA		Transport Long-term storage	2M4 1M12
Load Measuring circuits 5 A and 50 mA Response value I _{NGR}	1090 % /NGR nom		
Load Measuring circuits 5 A and 50 mA			

Technical data (continued)

Connection	
Screw-type terminals	
Tightening torque	0.50.6 Nm (57 lb-in)
Stripping length	7 mm
Recommended connecting cables	
rigid/flexible	0.22.5 mm ² (AWG 2413)
flexible with ferrule with/without plastic sleeve	0.252.5 mm ² (AWG 2413)
Multiple conductor rigid	0.21 mm ² (AWG 2418)
Multiple conductor flexible	0.21.5 mm ² (AWG 2416)
Multiple conductor, flexible with ferrule without plastic sleeve	0.251 mm ² (AWG 2418)
Multiple conductor, flexible with TWIN ferrule with plastic sleeve	0.51,5 mm ² (AWG 2116)
Push-wire terminal X1	
Stripping length	10 mm

 $0.2...1.5~\text{mm}^2~\text{(AWG 24...16)}$ 0.25...1.5 mm² (AWG 24...16)

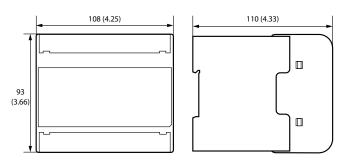
0.25...0.75 mm² (AWG 24...18)

Other	
Operating mode	continuous operation
Mounting	display-oriented
Degree of protection, internal components (DIN EN 60529)	IP30
Flammability class	UL 94V-0
Protective coating measurement equipment	SL1307, UL file E80315
Documentation number	D00373
Weight	< 500 q

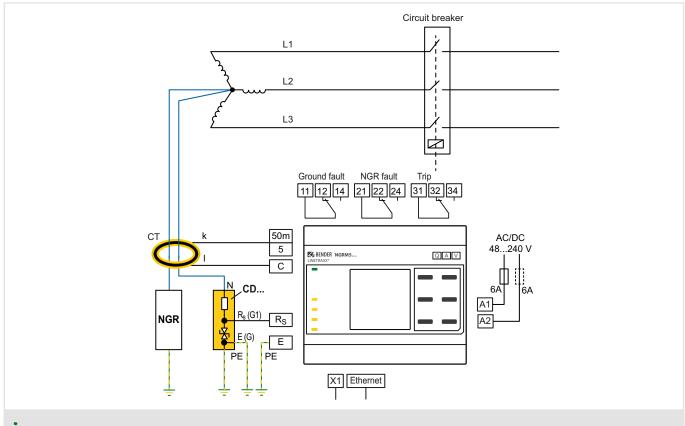
Dimension diagram (dimensions in mm)

flexible with ferrule without plastic sleeve flexible with ferrule with plastic sleeve

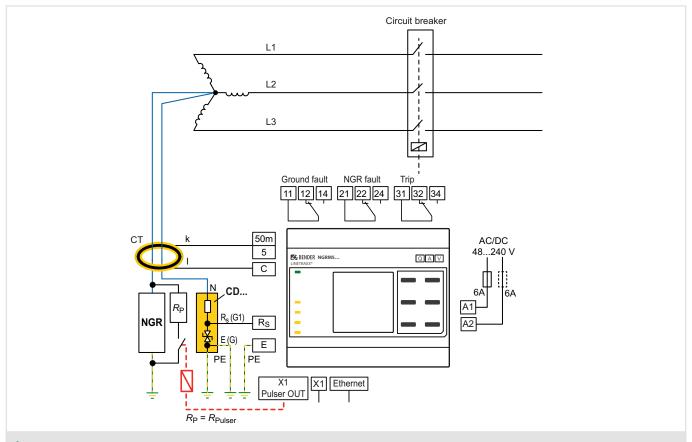
Recommended connecting cables rigid/flexible



Connection star connection

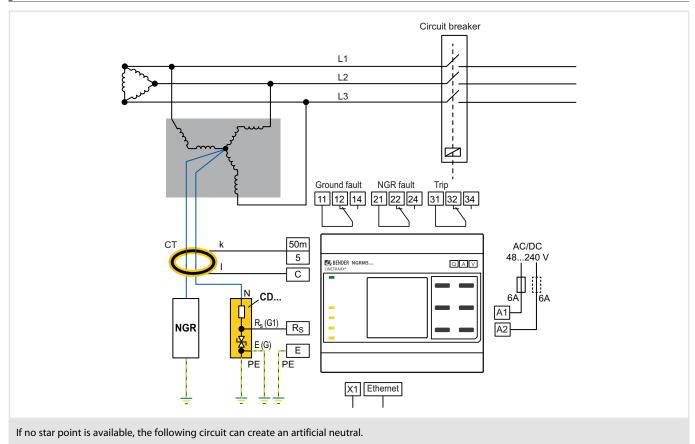


ightharpoonup The "N" connection of the CD-series coupling device should be as close to the transformer star point as possible.



The "N" connection of the CD-series coupling device should be as close to the transformer star point as possible. An intermediate relay may be required between the power contactor of the pulser and the digital output at X1 of the FP200-NGRM.

Connection artificial neutral (delta connection): zigzag transformer



Depending on the system to be monitored, a suitable measuring current transformer has to be chosen. All common measuring current transformers (50 mA or 5 A on the secondary side) can be used. The following table helps you with the choice:

System type	AC + DC	AC	AC	AC
I _{NGR}	0,525 A	525 A	51000 A	102000 A
f	f 03800 Hz		50/60 Hz	50/60 Hz
Transformation ratio Bender measuring current transformer	Measuring range (see CTUB103 manual) 5 A 100:1 10 A 200:1 25 A 500:1	600:1		
Connecting cable	max. 30 m	max. 40 m		mm²/AWG12
Connecting Cable	provided cable or 0.75.	. 1.5 mm²/AWG18 16	max. 40 m: 6	mm²/AWG10
IΔn	\(\)	\(\)		\sim
Туре	CTUB103 CTUB103 S1(k) S2(l)	CTAC CTAS CTAC k 1	CTB3151	Any standard current transformer can be used.
CT: Terminal k	NGRM5: 50 mA	NGRM5: 50 mA	NGRM5: 5 A	NGRM5: 5 A
CT: Terminal I	NGRM5: C	NGRM5: C	NGRM5: C	NGRM5: C

LINETRAXX® NGRM700 (HRG)/NGRM750 (LRG)

Neutral Grounding Resistor Monitor



Typical applications

- For use in high-resistance grounded systems (NGRM700)
- For use in low-resistance grounded systems (NGRM750)

Approvals



UL File number: E493737, E173157

Device features

- Determination of RNGR with passive and active measurement methods
- Continuous monitoring of the RNGR even if the installation is de-energized;
- · Alarm or trip on ground fault
- Monitoring of the current INGR
- Monitoring of the voltage U_{NGR}
- Faulted phase indication (optional; up to 690 V direct coupling, otherwise via potential transformers)
- Ethernet communication
- Web server
- · Language selection (German, English GB and US, Spanish, French)
- Test button (internal, external) with/without tripping
- FFT analysis of neutral current and voltage
- Pulser control for manual ground fault location
- · Relay outputs for detection of ground faults and resistor faults
- Relay output for shutdown of the installation after a configurable time
- Can be combined with RCMS... for automatic shutdown of feeders
- Graphical user interface
- Integrated wide-range power supply unit for operating the NGR monitor (AC/DC 24...240 V)
- Range of use up to 5000 m AMSL
- · Fault/History memory
- Analogue output of measured values (0...10 V, 4...20 mA, etc., selectable parameter)
- · Detachable HMI for door mounting
- · Password protection
- Tripping on RMS, fundamental component signal or harmonics
- · Detection of AC and DC ground faults
- Variants High Resistance Grounded (HRG), Low Resistance Grounded (LRG)

	Н	RG	LRG			
	NGRM500 NGRM700		NGRM550	NGRM750		
U _{sys LL}		400	25000V			
/NGR nom	0.5100 A		102000 A			
R _{NGR nom}	155	155000 Ω		0,1200 Ω		

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	System type	Supply voltage U₅/ Frequency range Hz	Art. No.
NGRM700	HRG	AC 24240 V, 4070 Hz	B94013700
NGRM750	LRG	DC 24240 V	B94013750

Suitable system components

Description	Туре	Art. No.	Page
Coupling device	CD	B980390	257
	CTAC	B981100	359
Measuring current transformer	CTAS	B981100	362
measuring current transformer	CTB31CTB51	B980860	301
	CTUB103	B781200	251
Voltage supply for measuring current transformers	STEP-PS	B940531	400

Insulation coordination according to IEC 60664-1/IEC 60664-3/	DIN EN 50178	Monitoring I _{NGR}	
Definitions Massiving circuit 1 (IC1)	(1 2 2)	Measuring circuit 5 A	DC / 50/60 Hz / 103200 Hz
Measuring circuit 1 (IC1) Supply circuit (IC2)	(L1, L2, L3) (A1, A2)	Frequency ranges Nominal measuring current / _n	5 /
***		~	
Measuring circuit/Control circuit (IC3)	(RS, E, CT), (X1, Ethernet)	Maximum continuous current	2x1
Output circuit 1 (IC4)	(11, 12, 14)	Overload capacity	10 x / _n for 0.03
Output circuit 2 (IC5)	(21, 22, 24)	Measurement accuracy	±2 % of <i>i</i>
Output circuit 3 (IC6)	(31, 32, 34)	Load	10 mg
Rated voltage	690 V	Measuring circuit 50 mA	
Overvoltage category	III	Frequency ranges	DC / 50/60 Hz / 103200 H
Rated impulse voltage		Nominal measuring current I_n	50 m.
IC1 / (IC26)	8 kV	Maximum continuous current	2 x .
IC2 / (IC36)	4 kV	Overload capacity	10 x In for 2
IC3 / (IC46)	4 kV	Measurement accuracy	±2 % of
IC4 / (IC56)	4 kV	Load	68 9
IC5 / (IC6)	4 kV	Measuring circuits 5 A and 50 mA	
Rated insulation voltage		Response value I _{NGR}	1090 % /NGR no
IC1 / (IC26)	800 V	Response delay, ground-fault relay	\leq 40 ms (±10 m
IC2 / (IC36)	250 V	Response delay, trip relay (configurable)	100 ms48 h,
IC3 / (IC46)	250 V	Tolerance t_{trip} when set to	100 11340 11,
IC4 / (IC56)	250 V 250 V	RMS	−200 n
IC5 / (IC6)	250 V 250 V	Fundamental	0+150 ms (filter time
			•
Pollution degree exterior	3	Harmonics	0+150 ms (filter time
Safe isolation (reinforced insulation) between	2001	Measuring current transformer ratio primary	110,00
IC1 / (IC26)	800 V	Measuring current transformer ratio secondary	110,00
IC2 / (IC36)	300 V	Measuring range	2 x I _{NGR nor}
IC3 / (IC46)	300 V	Counling	
IC4 / (IC56)	300 V	Coupling	
IC5 / (IC6)	300 V	$R_{\rm S}$ for $U_{\rm Sys} \le 4.3$ kV	CD1000, CD1000-2, CD5000 (20 kΩ
Voltage tests (routine test) acc. to IEC 61010-1		$R_{\rm S}$ for $U_{\rm sys} > 4.3$ kV	CD14400, CD25000 (100 kΩ
IC2 / (IC36)	AC 2.2 kV	Monitoring U _{NGR}	
IC3 / (IC46)	AC 2.2 kV		DC / FO / CO ! ! / CO
IC4 / (IC56)	AC 2.2 kV	Frequency ranges	DC / 50/60 Hz / 103200 H
IC5 / (IC6)	AC 2.2 kV	$U_{\rm NGR}$ with $R_{\rm S}=20~{\rm k}\Omega$	$(400/\sqrt{3}) \dots \le (4300/\sqrt{3})$
1657 (166)	7.0 2.12	$U_{\rm NGR}$ with $R_{\rm S}=100~{\rm k}\Omega$	$> (4.3 / \sqrt{3}) \dots (25 / \sqrt{3}) k$
Supply voltage		Measuring range	1.2 x <i>U</i> NGR nor
Nominal supply voltage U _s		Overload capacity	2 x <i>U</i> NGR for 10
≤ 2000 m	AC/DC, 24240 V	Measurement accuracy	2 % of $U_{NGR nom}$ with $U_{NGR nom} = (U_{sys (L-L)}/\sqrt{3})$
≤ 2000 m (for UL applications)	AC/DC, 48240 V	Voltage response value	1090 % <i>U</i> NGR nor
≤ 2000 m (for AS/NZS 2081 applications)	AC/DC, 48230 V	Response delay, ground-fault relay	≤ 40 ms (±10 ms
≥ 2000 m (101 A5/N25 2001 applications)	AC/DC, 46230 V	Response delay, trip relay (configurable)	100 ms48 h, ∝
	'	Tolerance t _{trip} when set to	,
> 2000 ≤ 5000 m (for UL and AS/NZS 2081 applications)	AC/DC, 48120 V	RMS	−200 m
Tolerance U _s	±15 %	Fundamental	0+150 ms (filter time
Tolerance U _S (for UL applications)	-50+15 %	Harmonics	0+150 ms (filter time
Tolerance $U_{\rm S}$ (for AS/NZS 2081 applications)	-25+20 %	DC immunity in case of active R _{NGR} measurement	
Frequency range U _s	DC, 4070 Hz	-	
Power consumption (typ. 50/60 Hz)	\leq 6.5 W / 13 VA	with $R_S = 20 \text{ k}\Omega$	DC ±12 \
Phase monitoring		with $R_S = 100 \text{ k}\Omega$	DC ±60 \
Nominal measuring voltage $U_{\rm D}$	3 AC 100690 V, CAT III	Digital inputs	
Measuring range	1.2 x U _n	Galvanic separation	no
		Length connecting cables	max. 10 n
Measurement accuracy	±1% of U _n	U _{in}	241
Power consumption per phase	≤ 0.5 W	Overload capacity	-532
Overload capacity	2 x U _n continuous	overload capacity	332
Input resistance	1.76 ΜΩ	Digital outputs	
PT ratio primary	110,000	Galvanic separation	n
PT ratio secondary	110,000	Length connecting cables	max. 10 n
Measuring range with PT	100 V25 kV	Currents (sink) for each output	max. 300 m/
Monitoring Dura		Voltage	111ax. 500 1117
Monitoring R _{NGR}			
Measuring input R _S	< 33 V RMS	Overload capacity	-532
Measuring range NGR (with $R_S = 20 \text{ k}\Omega$) active	010 kΩ	Analogue output (M+)	
	±20 Ω	Operating principle	linea
Measurement uncertainty for $T = 0+40$ °C			
Measurement uncertainty for $T = 0+40$ °C Measurement uncertainty for $T = -40+70$ °C	±40 Ω		INGR, RNG
•	±40 Ω 0…10 kΩ	Functions 0 20 mA / < 60	10 O) 1 20 ml (- (00 O) 0 400 1 - 410
Measurement uncertainty for $T = -40+70$ °C		Current 020 mA (≤ 60	
Measurement uncertainty for T = $-40+70$ °C Measuring range NGR (with $R_S = 100 \text{ k}\Omega$) active	010 kΩ	Current $020 \text{ mA} (\leq 60 \text{ Voltage})$	$010 \text{ V} (\geq 1 \text{ k}\Omega), 210 \text{ V} (\geq 1 \text{ k}\Omega)$
Measurement uncertainty for $T=-40\ldots+70$ °C Measuring range NGR (with $R_S=100$ k Ω) active Measurement uncertainty for $T=0\ldots+40$ °C Measurement uncertainty for $T=-40\ldots+70$ °C HRG	010 kΩ ±30 Ω	Current 020 mA (≤ 60	$010 \text{ V} (\geq 1 \text{ k}\Omega), 210 \text{ V} (\geq 1 \text{ k}\Omega)$
Measurement uncertainty for $T=-40\ldots+70$ °C Measuring range NGR (with $R_S=100$ k Ω) active Measurement uncertainty for $T=0\ldots+40$ °C Measurement uncertainty for $T=-40\ldots+70$ °C HRG Setting range $R_{NGR\ nom}$	010 kΩ ±30 Ω	Current $020 \text{ mA} (\leq 60 \text{ Voltage})$	$010 \text{ V} (\geq 1 \text{ k}\Omega), 210 \text{ V} (\geq 1 \text{ k}\Omega)$
Measurement uncertainty for $T=-40\ldots+70$ °C Measuring range NGR (with $R_S=100$ k Ω) active Measurement uncertainty for $T=0\ldots+40$ °C Measurement uncertainty for $T=-40\ldots+70$ °C HRG Setting range $R_{NGR\ nom}$ Response value $< R_{NGR\ nom}$	010 kΩ ±30 Ω ±80 Ω	Current 020 mA (≤ 60 Voltage Tolerance related to the current/voltage end value Ground-fault, NGR, trip relay	010 V (≥ 1 kΩ), 210 V (≥ 1 kΩ ±20 9
Measurement uncertainty for $T=-40\ldots+70$ °C Measuring range NGR (with $R_S=100$ k Ω) active Measurement uncertainty for $T=0\ldots+40$ °C Measurement uncertainty for $T=-40\ldots+70$ °C HRG Setting range $R_{NGR\ nom}$ Response value $< R_{NGR\ nom}$	010 kΩ ±30 Ω ±80 Ω	Current 020 mA (≤ 60 Voltage Tolerance related to the current/voltage end value Ground-fault, NGR, trip relay Switching elements	$0\dots 10\ V\ (\ge 1\ k\Omega), 2\dots 10\ V\ (\ge 1\ k\Omega)$ e $\pm 20\ \%$ changeover contact
Measurement uncertainty for $T=-40\ldots+70$ °C Measuring range NGR (with $R_S=100$ k Ω) active Measurement uncertainty for $T=0\ldots+40$ °C Measurement uncertainty for $T=-40\ldots+70$ °C HRG Setting range $R_{NGR\ nom}$	010 kΩ ±30 Ω ±80 Ω 15 Ω5 kΩ 1090 % RNGR nom	Current 020 mA (≤ 60 Voltage Tolerance related to the current/voltage end value Ground-fault, NGR, trip relay Switching elements Operating mode	$0\dots 10\ V\ (\ge 1\ k\Omega), 2\dots 10\ V\ (\ge 1\ k\Omega)$ e $\pm 20\ \%$ changeover contact configurable fail-safe/non-fail-saf
Measurement uncertainty for $T=-40\ldots+70$ °C Measuring range NGR (with $R_S=100$ k Ω) active Measurement uncertainty for $T=0\ldots+40$ °C Measurement uncertainty for $T=-40\ldots+70$ °C HRG Setting range $R_{NGR\ nom}$ Response value $< R_{NGR\ nom}$ Response value $> R_{NGR\ nom}$ LRG	010 kΩ ±30 Ω ±80 Ω 15 Ω5 kΩ 1090 % RNGR nom 110200 % RNGR nom	Current 020 mA (≤ 60 Voltage Tolerance related to the current/voltage end value Ground-fault, NGR, trip relay Switching elements Operating mode Electrical endurance, number of cycles	$0\dots 10 \ V\ (\ge 1 \ k\Omega), 2\dots 10 \ V\ (\ge 1 \ k\Omega)$ e $\pm 20 \ \%$ changeover contact $ \text{configurable fail-safe/non-fail-safe} $
Measurement uncertainty for $T = -40+70 ^{\circ}\text{C}$ Measuring range NGR (with $R_S = 100 \mathrm{k}\Omega$) active Measurement uncertainty for $T = 0+40 ^{\circ}\text{C}$ Measurement uncertainty for $T = -40+70 ^{\circ}\text{C}$ HRG Setting range $R_{NGR nom}$ Response value $< R_{NGR nom}$ Response value $> R_{NGR nom}$ LRG Setting range $R_{NGR nom}$	010 kΩ ±30 Ω ±80 Ω 15 Ω5 kΩ 1090 % RNGR nom 110200 % RNGR nom	Current 020 mA (≤ 60 Voltage Tolerance related to the current/voltage end value Ground-fault, NGR, trip relay Switching elements Operating mode Electrical endurance, number of cycles Switching capacity	$0\dots 10 \ V\ (\ge 1 \ k\Omega), 2\dots 10 \ V\ (\ge 1 \ k\Omega)$ e $\pm 20 \ \%$ changeover contact $ \text{configurable fail-safe/non-fail-safe} $
Measurement uncertainty for $T = -40+70 ^{\circ}\text{C}$ Measuring range NGR (with $R_S = 100 \text{k}\Omega$) active Measurement uncertainty for $T = 0+40 ^{\circ}\text{C}$ Measurement uncertainty for $T = -40+70 ^{\circ}\text{C}$ HRG Setting range $R_{\text{NGR nom}}$ Response value $< R_{\text{NGR nom}}$ Response value $> R_{\text{NGR nom}}$ LRG Setting range $R_{\text{NGR nom}}$ Response value $> R_{\text{NGR nom}}$ Response value $> R_{\text{NGR nom}}$ Response value $> R_{\text{NGR nom}}$	$\begin{array}{c} 010 \mathrm{k}\Omega \\ \pm 30 \Omega \\ \pm 80 \Omega \\ \end{array}$ $\begin{array}{c} 15 \Omega5 \mathrm{k}\Omega \\ 1090 \% R_{\mathrm{NGR \ nom}} \\ 110200 \% R_{\mathrm{NGR \ nom}} \\ \end{array}$ $\begin{array}{c} 0.1200 \Omega \\ 200500 \Omega \end{array}$	Current 020 mA (≤ 60 Voltage Tolerance related to the current/voltage end value Ground-fault, NGR, trip relay Switching elements Operating mode Electrical endurance, number of cycles	$0\dots 10 \ V \ (\ge 1 \ k\Omega), 2\dots 10 \ V \ (\ge 1 \ k\Omega)$ e $\pm 20 \ \%$ changeover contact $ configurable \ fail-safe/non-fail-safe \\ 10,00$
Measurement uncertainty for $T = -40+70 ^{\circ}\text{C}$ Measuring range NGR (with $R_S = 100 \mathrm{k}\Omega$) active Measurement uncertainty for $T = 0+40 ^{\circ}\text{C}$ Measurement uncertainty for $T = -40+70 ^{\circ}\text{C}$ HRG Setting range $R_{NGR nom}$ Response value $< R_{NGR nom}$ Response value $> R_{NGR nom}$ LRG Setting range $R_{NGR nom}$ Response value $> R_{NGR nom}$	$\begin{array}{c} 010 \mathrm{k}\Omega \\ \pm 30 \Omega \\ \pm 80 \Omega \\ \end{array}$ $\begin{array}{c} \pm 80 \Omega \\ \end{array}$ $15 \Omega5 \mathrm{k}\Omega \\ 1090 \% R_{\mathrm{NGR \ nom}} \\ 110200 \% R_{\mathrm{NGR \ nom}} \\ 0.1200 \Omega \\ 200500 \Omega \\ \end{array}$ ${c} 75 (\pm 2.5 \mathrm{s})} \end{array}$	Current 020 mA (≤ 60 Voltage Tolerance related to the current/voltage end value Ground-fault, NGR, trip relay Switching elements Operating mode Electrical endurance, number of cycles Switching capacity	$0\dots 10 \text{ V } (\ge 1 \text{ k}\Omega), 2\dots 10 \text{ V } (\ge 1 \text{ k}\Omega)$ e $\pm 20 \text{ \%}$ changeover contact configurable fail-safe/non-fail-safe } 10,000
Measurement uncertainty for $T = -40+70 ^{\circ}\text{C}$ Measuring range NGR (with $R_S = 100 \mathrm{k}\Omega$) active Measurement uncertainty for $T = 0+40 ^{\circ}\text{C}$ Measurement uncertainty for $T = -40+70 ^{\circ}\text{C}$ HRG Setting range $R_{NGR nom}$ Response value $< R_{NGR nom}$ Response value $> R_{NGR nom}$ LRG Setting range $R_{NGR nom}$ Response value $> R_{NGR nom}$	$\begin{array}{c} 010 \mathrm{k}\Omega \\ \pm 30 \Omega \\ \pm 80 \Omega \\ \end{array}$ $\begin{array}{c} 15 \Omega5 \mathrm{k}\Omega \\ 1090 \% R_{\mathrm{NGR \ nom}} \\ 110200 \% R_{\mathrm{NGR \ nom}} \\ \end{array}$ $\begin{array}{c} 0.1200 \Omega \\ 200500 \Omega \end{array}$	Current 020 mA (≤ 60 Voltage Tolerance related to the current/voltage end value Ground-fault, NGR, trip relay Switching elements Operating mode Electrical endurance, number of cycles Switching capacity Contact data acc. to IEC 60947-5-1	010 V (≥ 1 kΩ), 210 V (≥ 1 kΩ ±20 % changeover contact configurable fail-safe/non-fail-safe 10,000 2000 VA / 150 W
Measurement uncertainty for $T = -40+70 ^{\circ}\text{C}$ Measuring range NGR (with $R_S = 100 \text{k}\Omega$) active Measurement uncertainty for $T = 0+40 ^{\circ}\text{C}$ Measurement uncertainty for $T = -40+70 ^{\circ}\text{C}$ HRG Setting range $R_{NGR nom}$ Response value $< R_{NGR nom}$ Response value $> R_{NGR nom}$ LRG Setting range $R_{NGR nom}$	$\begin{array}{c} 010 \mathrm{k}\Omega \\ \pm 30 \Omega \\ \pm 80 \Omega \\ \end{array}$ $\begin{array}{c} \pm 80 \Omega \\ \end{array}$ $15 \Omega5 \mathrm{k}\Omega \\ 1090 \% R_{\mathrm{NGR \ nom}} \\ 110200 \% R_{\mathrm{NGR \ nom}} \\ 0.1200 \Omega \\ 200500 \Omega \\ \end{array}$ ${c} 75 (\pm 2.5 \mathrm{s})} \end{array}$	Current 020 mA (≤ 60 Voltage Tolerance related to the current/voltage end value Ground-fault, NGR, trip relay Switching elements Operating mode Electrical endurance, number of cycles Switching capacity Contact data acc. to IEC 60947-5-1 Utilisation category Rated operational voltage	changeover contact configurable fail-safe/non-fail-safe 10,000 2000 VA / 150 V AC-13 / AC-14 / DC12 / DC12 / DC12 250 V / 250 V / 220 / 110 / 24 V
Measurement uncertainty for $T = -40+70 ^{\circ}\text{C}$ Measuring range NGR (with $R_S = 100 \mathrm{k}\Omega$) active Measurement uncertainty for $T = 0+40 ^{\circ}\text{C}$ Measurement uncertainty for $T = -40+70 ^{\circ}\text{C}$ HRG Setting range $R_{NGR nom}$ Response value $< R_{NGR nom}$ Response value $> R_{NGR nom}$ LRG Setting range $R_{NGR nom}$ Response value $> R_{NGR nom}$	$\begin{array}{c} 010 \mathrm{k}\Omega \\ \pm 30 \Omega \\ \pm 80 \Omega \\ \end{array}$ $\begin{array}{c} \pm 80 \Omega \\ \end{array}$ $15 \Omega5 \mathrm{k}\Omega \\ 1090 \% R_{\mathrm{NGR \ nom}} \\ 110200 \% R_{\mathrm{NGR \ nom}} \\ 0.1200 \Omega \\ 200500 \Omega \\ \end{array}$ ${c} 75 (\pm 2.5 \mathrm{s})} \end{array}$	Current 020 mA (≤ 60 Voltage Tolerance related to the current/voltage end value Ground-fault, NGR, trip relay Switching elements Operating mode Electrical endurance, number of cycles Switching capacity Contact data acc. to IEC 60947-5-1 Utilisation category	010 V (≥ 1 kΩ), 210 V (≥ 1 kΩ ±20 % changeover contact configurable fail-safe/non-fail-safe 10,000 2000 VA / 150 W

Environment/EMC	
EMC immunity	DIN EN 61000-6-2, IEC 60255-26 Ed. 3.0
EMC emission	DIN EN 61000-6-4, IEC 60255-26 Ed. 3.0
Operating temperature	-40+70°C
Operating temperature for UL applications	-40+60°C
Transport	-40+85 °C
Long-term storage	−40+70 °C
Humidity	≤ 98 %
Operating altitude	≤ 5000 m AMSI
Classification of climatic conditions acc. to IEC 6072	21 (related to temperature and relative humidity)
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11

Classification of climatic conditions acc. to IEC 60721 (related to temperature and relative humidity)	
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 / IE	EC 60255-21 / DIN EN 60068-2-6

Stationary use	3M12
Transport	2M4
Long-term storage	1M12

Connection	

Screw-type terminals	
Tightening torque	0.50.6 Nm (57 lb-in)
Stripping length	7 mm
Recommended connecting cables	
rigid/flexible	0.22.5 mm ² (AWG 2413)
flexible with ferrule with/without plastic sleeve	0.252.5 mm ² (AWG 2413)
Multiple conductor rigid	0.21 mm ² (AWG 2418)
Multiple conductor flexible	0.21.5 mm ² (AWG 2416)
Multiple conductor, flexible with ferrule without plastic sleeve	0.251 mm ² (AWG 2418)
Multiple conductor, flexible with TWIN ferrule with plastic sleeve	0.51.5 mm ² (AWG 2116)

Push-wire terminal X1 Stripping length 10 mm Recommended connecting cables rigid/flexible 0.2...1.5 mm² (AWG 24...16) flexible with ferrule without plastic sleeve $0.25...1.5 \text{ mm}^2 \text{ (AWG 24...16)}$ flexible with ferrule with plastic sleeve 0.25...0.75 mm² (AWG 24...18)

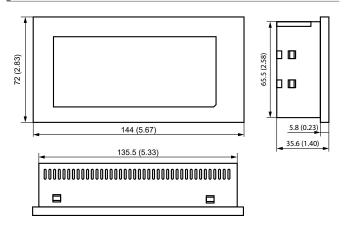
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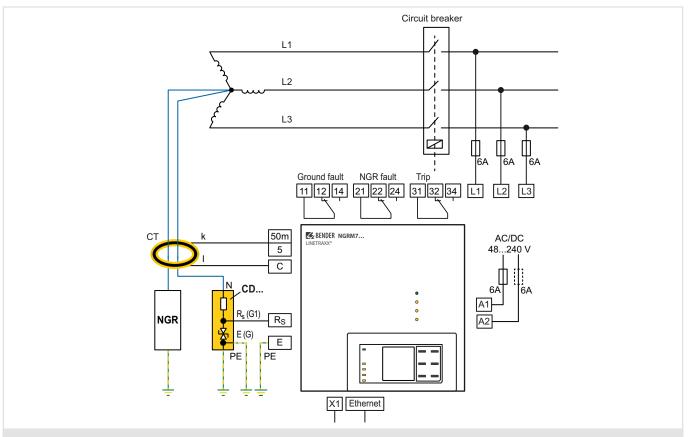
Operating mode	continuous operation
Mounting	display-oriented
Degree of protection, internal components (DIN EN 60529)	IP30
Flammability class	UL 94V-0
Protective coating measurement equipment	SL1307, UL file E80315
Documentation number	D00292
Weight	1050 q

Dimension diagram NGRM7... (dimensions in mm (in))

61.40 (2.42) 3 (0.12) 223.50 (8.80) 125 (4.92) 0 00 _ _ 205 (8.07) 211 (8.31) 230 (9.06) 245 (9.65)

Dimension diagram FP200-NGRM (dimensions in mm (in))

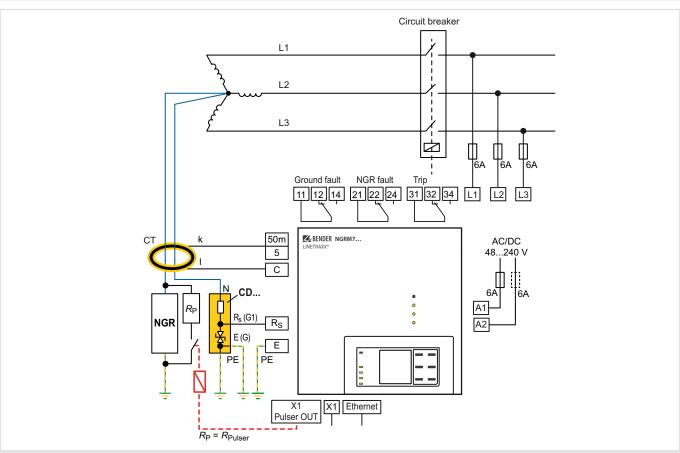




 $For these \ voltages, the \ phase \ monitor \ of \ the \ NGRM7... \ can be connected \ directly \ to \ the \ conductors \ to \ be \ monitored.$

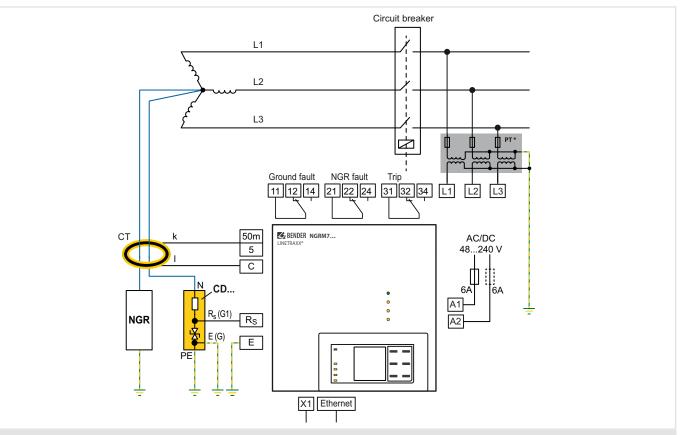
1 The "N" connection of the CD-series coupling device should be as close to the transformer star point as possible.

Connection Star connection: $U_{sys} \le 690 \text{ V}$ with pulser



The "N" connection of the CD-series coupling device should be as close to the transformer star point as possible. An intermediate relay may be required between the power contactor of the pulser and the digital output at X1 of the FP200-NGRM.

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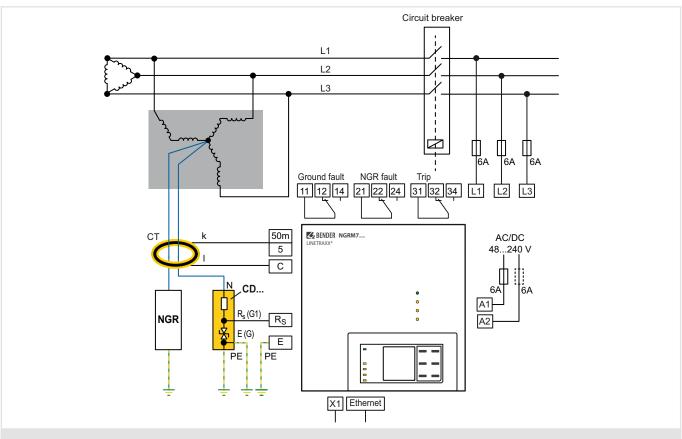


 $For these \ voltages, the \ phase \ monitor \ of \ the \ NGRM7... \ can \ only \ be \ connected \ to \ the \ conductors \ to \ be \ monitored \ via \ potential$ transformers (PT).

Note: * PT ratio "primary: secondary" can be adjusted in the NGRM7....

1 The "N" connection of the CD-series coupling device should be as close to the transformer star point as possible.

Connection artificial neutral (delta connection): zigzag transformer



If no star point is available, the following circuit can create an artificial neutral.

Depending on the system to be monitored, a suitable measuring current transformer has to be chosen. All common measuring current transformers (50 mA or 5 A on the secondary side) can be used. The following table helps you with the choice:

System type	AC + DC	AC	AC	AC
/ _{NGR}	0.525 A	525 A	51000 A	102000 A
f	03800 Hz	423800 Hz	50/60 Hz	50/60 Hz
Transformation ratio Bender measuring current transformer	Measuring range (see CTUB103 manual) 5 A 100:1 10 A 200:1 25 A 500:1	600:1		
Connecting cable	max. 30 m	max. 40 m	max. 25 m: 4	mm²/AWG12
Connecting cable	provided cable or 0.75	.1.5 mm²/AWG1816	max. 40 m: 6	mm ² /AWG10
IΔn	\text{\tin}\\ \text{\tert{\text{\text{\text{\text{\text{\text{\text{\text{\texi}\text{\tin}\text{\text{\texi}\tint{\text{\texi}\text{\text{\texi}\ti}\titt{\text{\texi}\text{\text{\text{\texi}\text{\text{\text{\	}	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	\sim
	CTUB103	CTAC/ CTAS	CTB3151	Any standard current transformer can be used.
Туре	24 V	CTAC	СТВ	
	S1(k) S2(l)	CTAS	<u> k l </u>	
CT: Terminal k	NGRM7: 50 mA	NGRM7: 50 mA	NGRM7: 5 A	NGRM7: 5 A
CT: Terminal I	NGRM7: C	NGRM7: C	NGRM7: C	NGRM7: C

LINETRAXX® CTUB103

AC/DC sensitive measuring current transformer (Type B)



Device features

- Multicolour LED for operation, fault and status messages
- · Electronic module can be exchanged without mechanical separation of the primary conductors
- Monitoring of the connection to the measuring current transformer
- Evaluator: NGRM500, NGRM700

Further information

For further information refer to our product range on www.bender.de.

Typical applications

• Convert system leakage and fault currents into an evaluable measurement signal.

Approvals







Ordering details

CTUB103 set

Set	ø current transformers	Permissible measuring range	Art. No.
CTUB103-CTBC35	35	5 A, 10 A	B78120030
CTUB103-CTBC60	60	5 A, 10 A, 25 A	B78120031
CTUB103-CTBC120	120	5 A, 10 A, 25 A	B78120032

Ordering details for spare parts and accessories

Electronic modules

Туре	Supply voltage <i>U</i> ₅	Art. No.
CTUB103	DC 24 V	B78120052

Required terminals or connecting cables are optionally available.

Suitable system components

Description	max. connected current transformers	Туре	Art. No.	Page
	4	STEP-PS/1 AC/24 DC/0.5	B94053110	400
Voltage supply	14	STEP-PS/1 AC/24 DC/1.75	B94053111	400
заррі)	34	STEP-PS/1 AC/24 DC/4.2	B94053112	400

Measuring current transformer cores

Туре	ø current transformers	Art. No.
CTBC35	35 mm	B98120003
CTBC60	60 mm	B98120005
CTBC120	120 mm	B98120007

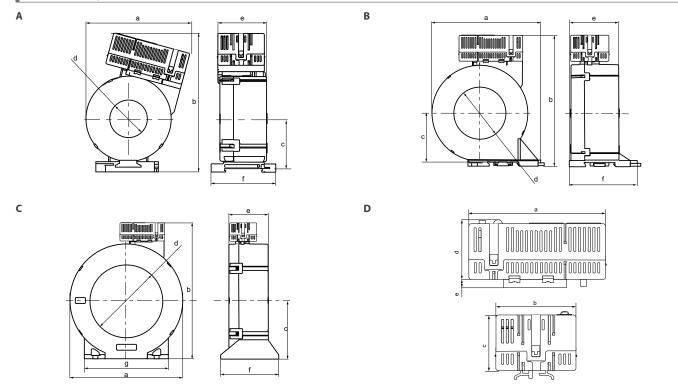
Accessories

Description	Art. No.
DIN rail mounting clip for CTBC35	B91080112

Included in the scope of delivery

Definitions	
Measuring circuit (IC1)	primary conductors routed through thecurrent transforme
Secondary (IC2)	connections X pluc
Rated voltage	800 V
Overvoltage category	
Area of application	 ≤ 2000 m AMSI
Rated impulse voltage (IC1/IC2)	= 2000 III / III / I
Rated insulation voltage (reinforced ins	
Pollution degree	2
Supply voltage CTUB103	
Description	24 V, GND
Supply voltage $U_{\rm S}$	DC 24 V
Operating range of $U_{\rm S}$	±20 %
Ripple $U_{\rm S}$	< 1 %
Power consumption	≤ 5.3 W
Inrush current	1 A for 1 ms
Measuring circuit	
Internal diameter measuring current tra	ansformer see dimension diagrams on page 4
Measurement accuracy	+2 %
Rated continuous thermal current I _{cth}	42 A
Rated short-time thermal current Ith	2.4 kA/1 s
Rated dynamic current I _{dyn}	6 kA/40 ms
nateu dynamic current rayn	0 kA/40 III3
Measuring ranges	
Measuring range 1	5 A rms
Permanent overload capacity	10.5 A rms
	14.5 A peak
Scaling	5 A/50 mA, 100:1
Measuring range 2	10 A rms
Permanent overload capacity	21 A rms
. ,	29.5 A peak
Scaling	10 A/50 mA, 200:1
Measuring range 3	25 A rms
Permanent overload capacity	42 A rms
	59 A peak
Scaling	25 A/50 mA, 500:1
Displays	
Multicolour LED	red, green
Output	
Name	S1 (k), S2 (I)
Max. voltage	±10 V
Max. current	±100 mA
Max. cable length	30 m
Load	68 O

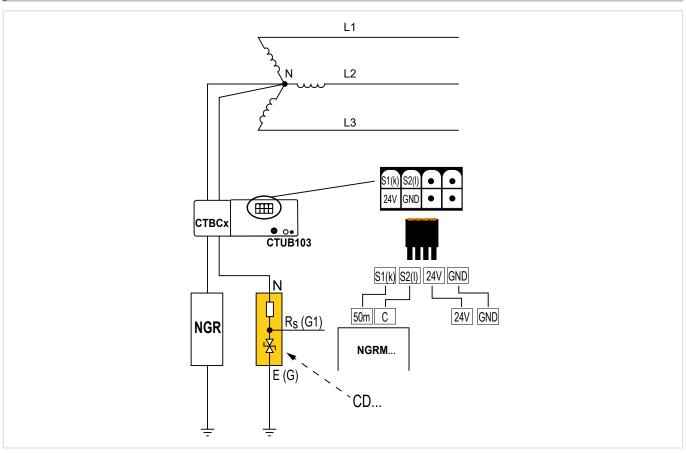
Environment/EMC	
EMC	IEC 61000-6
Operating temperature	-2555 °C
Classification of climatic conditions acc. to IEC 60721 (related	to temperature and relative humidity):
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions acc. to IEC 60721	
Stationary use (IEC 60721-3-3)	3M1°
Transport (IEC 60721-3-2)	2M ²
Long-term storage (IEC 60721-3-1)	1M12
Connection	
Use 60 °C/75 °C copper lines only.	
X plug	
Manufacturer	Phoenix Contact
Туре	DFMC 1.5/4-ST-3.5 BH
The connection conditions of the manufacturer apply.	
Connection properties	
rigid	0.21.5 mm ² (AWG 2416)
flexible	0.21.5 mm ² (AWG 2416
with ferrule	0.250.75 mm
Mounting CTBC	
Screw type	
CTBC35, CTBC60	DIN EN ISO 7045 - M5
CTBC120	DIN EN ISO 7045 - Me
Washer type	
CTBC35, CTBC60	DIN EN ISO 7089/7090 - 5
CTBC120	DIN EN ISO 7089/7090 - 6
Tightening torque	
CTBC35	0.6 Nn
CTBC60, CTBC120	1 Nn
Other	
Operating mode	continuous operation
Mounting	any position
Degree of protection, built-in components (DIN EN 60529)	IP40
Degree of protection, terminals (DIN EN 60529)	IP20
Flammability class	UL94 V-(
Software	D59°
Documentation number	D00410
Weight CTURAGE CTRCAE	***
CTUB103 - CTBC35	≤ 310 €
CTUB103- CTBC60	≤ 530 €
CTUB103- CTBC120	≤ 1460 (



	Dimensions in mm							
	Туре	a	b	c	d	e	f	g
Α	CTUB10CTBC35	97	130	47	ø 35	46	61	
В	CTUB10CTBC60	126	151	57	ø 60	56	78	_
C	CTUB10CTBC120	188	225	96	ø 120	65	96	139
D	CTUB103	74	44	30	32	4,6	-	-

Tolerance: ±0,5 mm

Wiring diagram



RC48N

Ground-fault neutral-grounding monitor



Device features

- Ground-fault monitor for high-resistance grounded installations with a limited fault current of 5...25 A
- Three-in-one functionality: Residual current, voltage and grounding resistor continuity
- Measures the residual current by means of a Bender residual current transformer
- Alarm easily recognizable by LED lights
- · Alarm relay with adjustable trip time
- Measures resistance value and voltage drop of the NGR via coupling devices
- · Alarm easily recognizable by LED lights
- The alarm relay can be used for the tripping of a load switch
- Depending on the type of load switch the operating mode of the alarm relay can be set to N/O operation or N/C operation

Typical applications

• High-resistance grounded installations with a limited fault current of 5...25 A

Standards

• CSA M421-00: Use of electricity in mines

Approvals



Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Supply voltage Us	Response value, residual current	Art. No.
RC48N-935	AC/DC 60264 V, 5060 Hz	adjustable 0,11 A respectively 110 A	B94013005

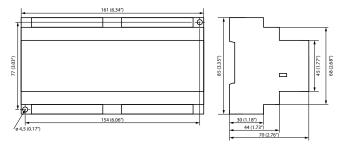
Suitable system components

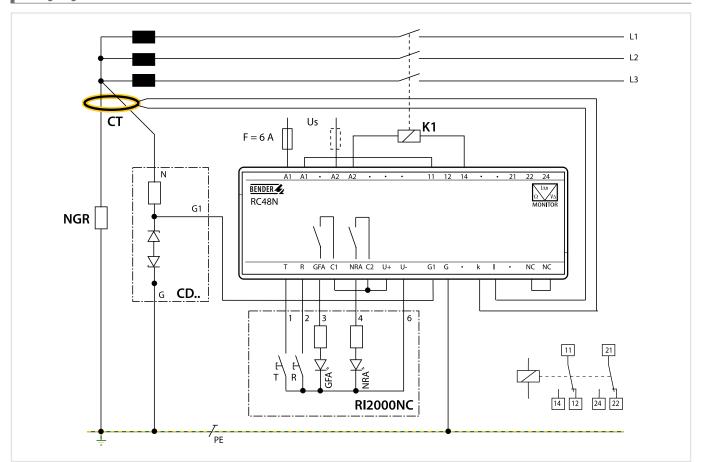
Description	Innendurchmesser	Туре	Art. No.	Page
Coupling device	-	CD	B980390	255
Remote alarm indicator and operator panel	-	RI2000NC	B94071001	-
Desidual summent two metawas as	70 mm	W2-S70	B911732	361
Residual current transformer	105 mm	W3-S105	B911733	361

Rated insulation voltage	AC 250 V
Rated impulse withstand voltage/pollution degree	2.5 kV/3
Voltage ranges	
Supply voltage $U_{\rm S}$	AC/DC 60264 V, 5060 Hz
For UL:	
Supply voltage $U_{\rm S}$	AC/DC 110240 V, 50/60 Hz
Fuse	recommended: 6 A slow fuse
Power consumption	approx. 5.8 VA at AC 60 V
	approx. 8.5 VA at AC 264 V
Residual current monitoring	
Response value, residual current ac	djustable 0.11 A respectively 110 A
Accuracy	+025 %
Response delay	adjustable 0.12 s
Accuracy of response delay	±20 %
Continuous short circuit current	200 A
	2500 A for 2 s
Operating mode	latching
Ground conductor monitoring	
Response value, voltage measurement	adjustable 20400 V
Accuracy	± 10 %
Response value, neutral grounding resistor at $U_n = 0 \text{ V}$	2 kΩ
Accuracy	+52 % of the coupling resistance
Response time	5 s ±20 %
Operating mode	latching
Inputs	
Connection to the residual current transformer:	
Single wire 0.75 mm ² (AWG 18)	up to 1 m (3')
Single wire, twisted 0.75 mm ² (AWG 18)	110 m (330')
Shielded cable 0.75 mm ² (AWG 18) (shield to Ground)	1025 m (3075′)
Connection to the remote alarm indicator and operator pane	I RI2000NC:
Single wire 0.75 mm ² (AWG 18)	010 m (030')

Outputs	
Switching elements (alarm relay)	2 changeover contacts
Rated contact voltage	AC 250 V/DC 300 V
Limited making capacity	AC/DC 5 A
Limited breaking capacity	AC/DC 2/0.2 A
Permissible number of operations	12 000 cycles
Operating mode, alarm relay, selectable	N/O operation/N/C operation
Switching elements (GFA, NRA)	2 NO contacts
Rated contact voltage	AC 250 V/DC 300 V
Limited making capacity	AC/DC 5 A
Limited breaking capacity	AC/DC 2/0.2 A
Permissible number of operations	12 000 cycles
Type tests	
Test of the electromagnetic compatibility (EMC)	
Immunity	according to IEC 62020
Emissions	according to EN 50081
Emissions according to EN 55011/CISPR11	Class A
Environment	
Operating temperature	-40+60 °C (233333 K)
Storage temperature	-55+80 °C (218353 K)
Climatic class according to IEC 60721	3K22
Connection	
Connection type	screw terminals
Wire cross section, single wire	0.24 mm ² (AWG 2412)
Wire cross section, flexible	0.22,5 mm ² (AWG 2414)
Other	
Operating mode	continuous operation
Mounting	any position
Protection class	according to DIN EN 60529
Built-in components	IP30
Terminals	IP20
Flammability class	UL94V-0
Documentation number	D00426
Weight	approx. 350 g

Dimension diagram (dimensions in mm (inch))





_					- 1		_
•	or	۱n	ю	41	n	n	ıs

A1, A2 Connection supply voltage U_s . 11, 12, 14 Two voltage free changeover contacts, trip in case 21, 22, 24 of alarm. N/C or N/O operation selectable. G, G1 Connection, coupling devices CD1000 or CD5000 k, I Connection, residual current transformer NC, NC Select N/O operation or N/C operation for the free changeover contacts: Bridge open: N/O operation

Bridge closed: N/C operation (factory setting)

Connection of the remote alarm indicator and operator panel RI2000NC

Т Connection external TEST button R Connection external RESET button GFA Connection external "Alarm Ground Fault" LED NRA Connection external "Alarm Resistor Fault" LED U+, U-Output DC 12 V, for the supply of the remote alarm indicator and operator panel RI2000NC. C1, C2, U+ Bridge supplies the remote alarm indicator and operator panel RI2000NC with supply voltage from the RC48N.

Coupling device



Typical applications

• The coupling device is suitable for HRG applications up to AC 690 V $\,$ and/or DC 400 V.

Device features

- Coupling device for NGRM
- Range of use up to AC 690 V/DC 400 V system voltage
- Range of use up to 2000 m

Approvals



Further information

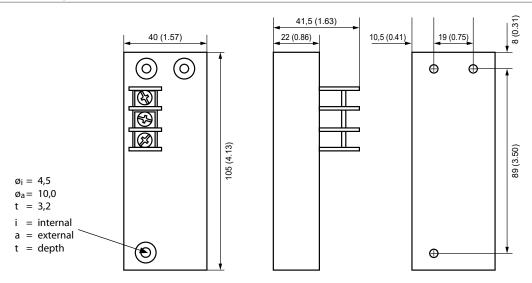
For further information refer to our product range on www.bender.de.

Ordering information

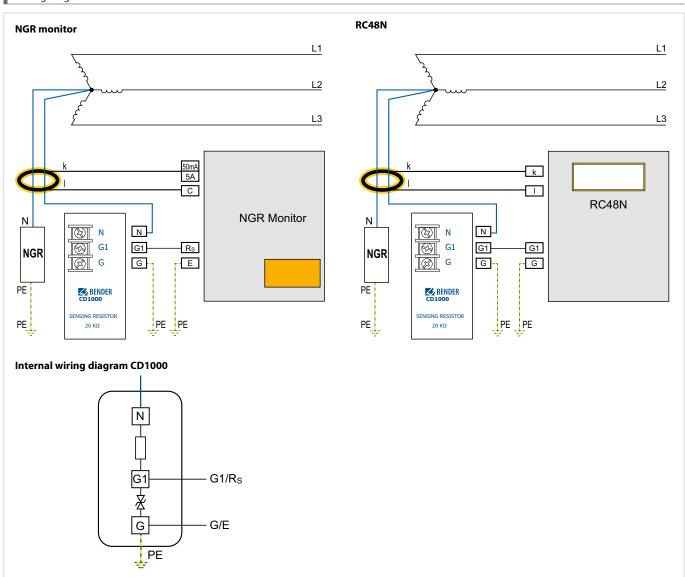
Туре	$u_{ m LL}$	Ungr	Art. No.
CD1000	up to 690 V	400 V	B98039010

Insulation coordination DIN EN 50178:1997	
Definition	
Measuring circuit (IC1)	N
Output circuit (IC2)	G1
Protective circuit (IC3)	G, PE
Rated voltage	400 V
Overvoltage category	III
Pollution degree	2
Rated insulation voltage	
no galvanic separation between the circuits!	
IC1/(IC2 – IC3)	400 V
IC2/IC3	50 V
Voltage range	
- Un	DC, 50/60 Hz, 103200 Hz 400 V
In	30 mA
Overload capacity	1.15 x $U_{\rm n}$ for $<$ 30 minutes
Resistance	
20 kΩ	±5 %
Temperature coefficient	25 ppm/K
Environment	
Ambient temperature	-40+70°C
Ambient temperature for UL	-40+60 °C
Humidity	≤ 98 %
Classification of climatic conditions acc. to IEC 60721	
(related to temperature and relative humidity)	
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22

Stationary use	3M12
Transport	2M4
Long-term storage	1M12
Connection	
Tightening torque	0.50.6 Nm (4,45,3 lb-in)
Conductor sizes	AWG 2412
Stripping length	7 mm
Conductor, rigid	0.24 mm ²
Conductor, flexible	0.22.5 mm ²
Multiple conductor, flexible with ring cable lug	
without plastic sleeve	0.251.5 mm ²
with plastic sleeve	0.252.5 mm ²
Other	
Operating mode	continuous operation
Mounting	any position
Screw type mounting screws	M4x30
Tightening torque mounting screws	2.5 Nm (22.1 lb-in)
Operating altitude	up to 2000 m AMSL
Degree of protection, internal components (DIN EN 60529)	IP30
Flammability class	UL94 HB
Documentation number	D00397
Weight	< 190 g



Wiring diagram



Terminal	Use	Connecting cable	
	•	Metrical	Imperial
N	Connection to the star point of the HRG system		
G1	Connection to R _S of the NGRM	1.5 mm ²	AWG16
G	Connection to E of the NGRM; internally connected to PE		
PE	Connection to enclosure	≥ 1.5 mm ²	≥ AWG16

Coupling device



Typical applications

• The coupling device is suitable for HRG applications up to AC 1000 V and/or DC 690 V.

Insulation coordination DIN EN 50178:1997

Device features

- Coupling device for NGRM
- Range of use up to AC 1000 V/DC 600 V system voltage
- Application up to 5000 m

Approvals



Further information

For further information refer to our product range on www.bender.de.

Ordering information

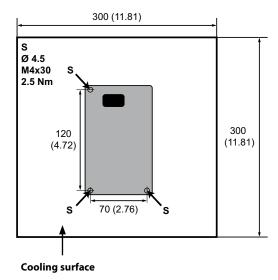
Туре	$v_{ m LL}$	U _{NGR}	Art. No.
CD1000-2	up to 1000 V	600 V	B98039053

Definition	
Measuring circuit (IC1)	N
Output circuit (IC2)	Rs
Protective circuit (IC3)	E, PE
Rated voltage	600 V
Overvoltage category	III
Pollution degree	2
Rated insulation voltage	
No galvanic separation between the circuits!	
IC1/(IC2 – IC3)	600 V
IC2/IC3	50 V
Voltage range	
<i>U</i> n	DC, 50/60 Hz, 103200 Hz 600 V
I _n	30 mA
Overload capacity	1.15 x U_n for $<$ 30 minutes
Resistance	
20 kΩ	±0.5 %
Temperature coefficient	20 ppm/K
Environment	
Ambient temperature	-40+70 ℃
Ambient temperature for U _L	-40+60°C
Humidity	≤ 98 %
Classification of climatic conditions acc. to IEC 60721	
(related to temperature and relative humidity)	
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22

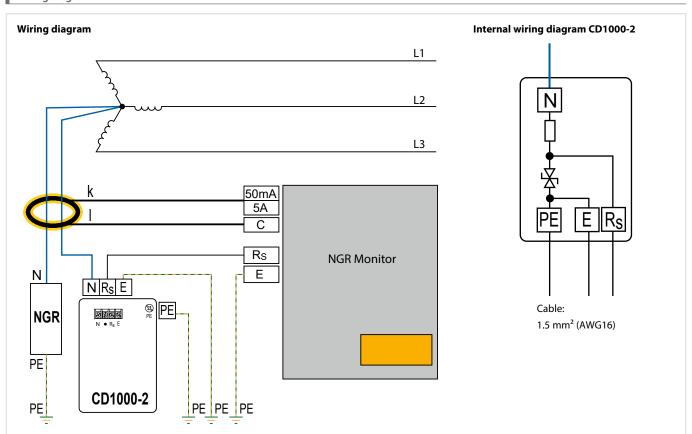
Classification of mechanical conditions acc. to IEC 60721	
Stationary use	3M12
Transport	2M ²
Long-term storage	1M12
Connection	
Tightening torque	0.50.6 Nm (4.45.3 lb-in
Conductor sizes	AWG 2412
Stripping length	7 mm
Conductor, rigid	0.24 mm
Conductor, flexible	0.22.5 mm
Multiple conductor, flexible with ferrule	
without plastic sleeve	0.251.5 mm
with plastic sleeve	0.252.5 mm
Multiple conductor, flexible with TWIN ferrule	
with plastic sleeve	0.51.5 mm
Other	
Operating mode	continuous operation
Mounting	any positior
Screw type mounting screws	M4x30
Tightening torque mounting screws	2.5 Nm (22.1 lb-in
Operating altitude	up to 5000 m AMSI
Degree of protection, internal components (DIN EN 60529)	IP30
Flammability class	UL 94V-(
Documentation number	D00345
Weight	< 700 g

24 (0.94) 27 (1.06) 80 (3.15) 130 (5.12)

The device is suitable for screw mounting. For $U_{LL} > 690 \text{ V}$, a cooling surface of 300 x 300 mm (11.81 in²) must be provided.



Wiring diagram



So that the connection between NGR and star point is also monitored, the "N" terminal of the CD1000-2 should be connected directly to the star point of the transformer.

A direct connection between the "N" connections of the CD1000-2 and the NGR is not recommended, as in this case a line interruption between the star point and the NGR connection ${}_{\textit{u}}N^{\textit{u}}$ would not be monitored.

Terminal	Terminal Use		Connecting cable	
ICIIIIII	•	Metrical	Imperial	
N	Connection to the star point of the HRG system			
Rs	Connection to R _S of the NGRM	1.5 mm ²	AWG16	
E	Connection to protective earth conductor (internally connected to PE)			
PE	Connection to the protective conductor (internally connected to E), cable lug M4	≥ 1,5 mm ²	≥ AWG16	

Coupling device



Typical applications

• The coupling device is suitable for HRG applications up to AC 4300 V and/or DC 2500 V.

Insulation coordination DIN EN 50178:1997

Device features

- Coupling device for NGRM
- Range of use up to AC 4300 V/DC 2500 V system voltage
- Range of use up to 5000 m

Approvals



Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	U LL	Ungr	Art. No.
CD5000	up to 4300 V	2500 V	B98039011

Technical data

Definition	
Measuring circuit (IC1)	N
Output circuit (IC2)	G1
Protective circuit (IC3)	G, Pf
Rated voltage	3 k\
Overvoltage category	!!
Pollution degree	2
Rated insulation voltage	
no galvanic separation between the circuits!	
IC1/(IC2 – IC3)	3 k\
IC2/IC3	50 \
Voltage range	
$\overline{U_{n}}$	DC, 50/60 Hz, 103200 Hz 2500 \
I _n	125 m <i>A</i>
Overload capacity	1.15 x $U_{\rm n}$ for $<$ 5 minutes
Resistance	
20 kΩ	±1 %
Temperature coefficient	20 ppm/k
Environment	
Ambient temperature	-40+70°C
Ambient temperature for U _L	-40+60°C
Humidity	≤ 98 %
Classification of climatic conditions acc. to IEC 60721	
(related to temperature and relative humidity)	
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22

Stationary use	3M12	
Transport	2M ²	
Long-term storage	1M12	
Connection		
Tightening torque G1 and G	0.50.6 Nm (4,45,3 lb-in)	
Conductor sizes	AWG 2412	
Connection G1 and G	cable lug	
Conductor	≥ 1.5 mm ²	
Connection PE	cable lug M6	
Conductor	≥ 2.5 mm	
Connection N (use minimum 110 °C conductor)	cable lug M6, M10	
Other		
Operating mode	continuous operation	
Mounting	any position	
Operating altitude	up to 5000 m AMS	

Degree of protection, internal components (DIN EN 60529)

Flammability class

Weight

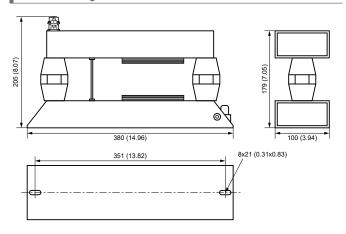
Documentation number

IP0

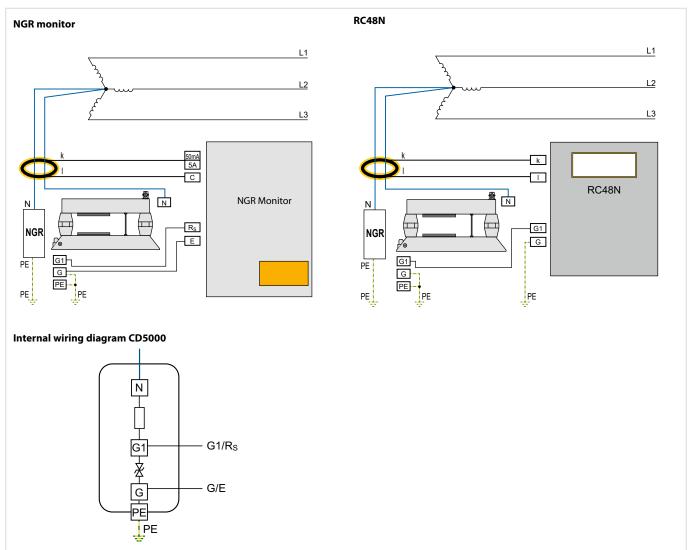
UL 94V-0

D00398

< 3800 g



Wiring diagram



Terminal	Use	Connecting cable	
Terminal	•	Metrical	Imperial
N	Connection to the star point of the HRG system	via cable lug M6 or M10	
G1	Connection to R _S of the NGRM	1.5? AMC10	
G	Connection to E of the NGRM (internally connected to PE, see internal wiring diagram)	- 1.5 mm ² AWG16	
PE to enclosure	Connection to the protective conductor (internally connected to E, see internal wiring diagram)	≥ 1.5 mm ²	≥ AWG16

Coupling device



Device features

- Coupling device for NGRM
- Range of use up to 14400 V system voltage
- Application up to 5000 m
- IP54

Approvals





Typical applications

• The coupling device is suitable for HRG applications up to a system voltage of 14400 V.

Further information

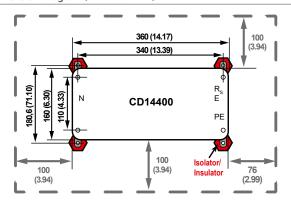
For further information refer to our product range on www.bender.de.

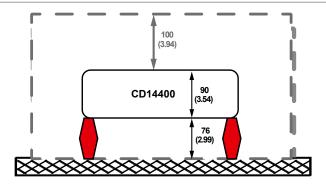
Ordering information

Туре	U LL	Ungr	Art. No.
CD14400	up to 14400 V	8400 V	B98039054

Definitions	
Definitions Macausian district (IC1)	A.
Measuring circuit (IC1)	N
Output circuit (IC2)	Rg
Protective circuit (IC3)	E, PE 8400 V
Rated voltage	8400 V
Overvoltage category Pollution degree	
Rated insulation voltage	
no galvanic separation between the circuits!	
IC1/(IC2 – IC3)	8400 V
IC/(IC2 = IC3)	50 V
ICZ/IC3	J0 V
Voltage range	
Un	DC, 50/60 Hz, 103200 Hz 8400 V
I _n	84 mA
Operating time	
without ground fault (1900 V)	unlimited
with ground fault (4200 V)	90 seconds
with ground fault (8400 V)	60 seconds
Cool-down period	120 minutes
Overload capacity	1.15 x <i>U</i> _n for < 30 seconds
Resistance	
100 kΩ	±0.5 %
Temperature coefficient	20 ppm/k
Environment	
Ambient temperature	-40+70°C
Ambient temperature for $U_{\rm L}$	-40+60°C
Humidity	≤ 98 %
Classification of climatic conditions acc. to IEC 60721	
(related to temperature and relative humidity)	
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22

Stationary use	3M12
Transport	2M4
Long-term storage	1M12
Connection	
Connection R _S and E	
Tightening torque	0.50.6 Nm (4.45.3 lb-in
Conductor sizes	AWG 2412
Stripping length	7 mm
Conductor, rigid	0.24 mm
Conductor, flexible	0.22.5 mm
Multiple conductor, flexible with ferrule	
without plastic sleeve	0.251.5 mm
with plastic sleeve	0.252.5 mm
Multiple conductor, flexible with TWIN ferrule	
with plastic sleeve	0.51.5 mm
Connection N and PE	
Tightening torque cable lug M10	17 Nm (150 lb-in
Tightening torque cable lug M5	2.2 Nm (19.5 lb-in
Other	
Tightening torque	
cover screws	2.5 Nm (22.1 lb-in
mounting screws	21 Nm (186 lb-in
Operating mode	in case of a ground fault maximum 60
Mounting	any positior
Operating altitude	up to 5000 m AMSI
Degree of protection, internal components (DIN EN 60529)	IP54
Flammability class	UL 94V-(
Documentation number	D00346
Weight	< 4.4 kg

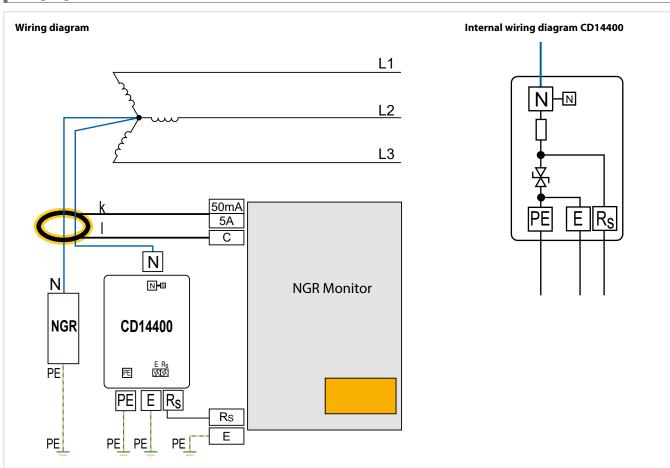




Tightening torque cover screws: 2.5 Nm (22.1 lb-in)

Minimum distance to adjacent devices

Wiring diagram



The "N" terminal of the CD14400 should be connected directly to the star point of the transformer, so that the connection between NGR and star point is also monitored.

A direct connection between the "N" connections of the CD14400 and the NGR is not recommended, as in this case a line interruption between the star point and the NGR connection "N" would not be monitored.

Terminal	Use	Connecting cable	
Termina	use use	Metrical	Imperial
Rs	Connection to R _S of the NGRM	1.5 mm ² AWC16	
E	Connection to E of the NGRM; internally connected to PE	1.5 mm ²	AWG16
N	Connection to the star point of the HRG system; via cable lug M5 or M10	AWC1C or greater	
PE	Connection to protective earth conductor; internally connected to E, cable lug M5	≥ 1.5 mm ² AWG16 or greater	

Coupling device



Typical applications

 The coupling device is suitable for HRG applications up to AC 25 kV and/or DC 14.5 kV

Device features

- Coupling device for NGRM
- Range of use up to AC 25 kV/DC 14.5 kV system voltage
- Application up to 5000 m

Approvals



Further information

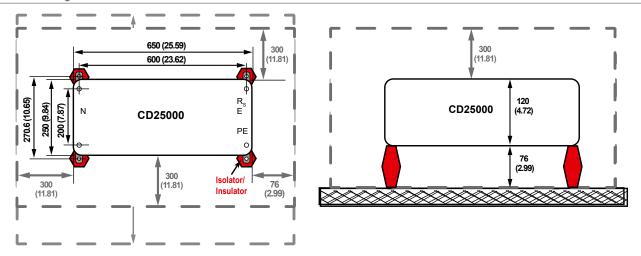
For further information refer to our product range on www.bender.de.

Ordering information

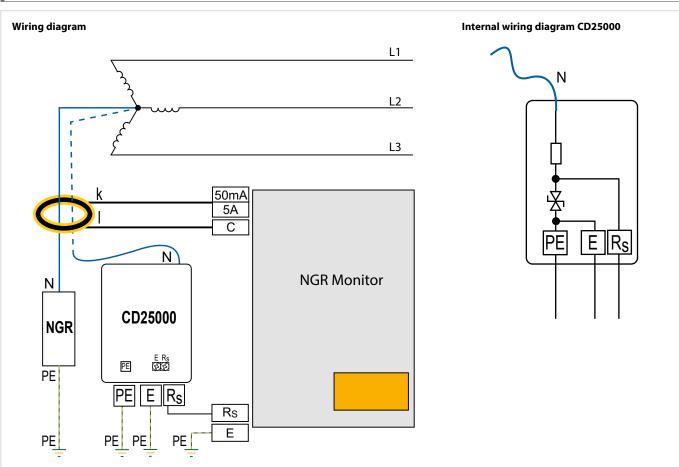
Туре	U LL	Ungr	Art. No.
CD25000	up to 25000 V	14500 V	B98039055

Definition	
Measuring circuit (IC1)	
Output circuit (IC2)	R
Protective circuit (IC3)	E, PI
Rated voltage	14500 \
Overvoltage category	
Pollution degree	2
Rated insulation voltage	
no galvanic separation between the circuits!	
IC1/(IC2 – IC3)	14500 V
IC2/IC3	50 V
Voltage range	
U _n	DC, 50/60 Hz, 103200 Hz 14500 V
I _n	145 mA
Operating time	
without ground fault (2800 V)	unlimited
with ground fault (14500 V)	10 seconds
Cool-down period	120 minutes
Overload capacity	1.15 x <i>U</i> _n for < 10 seconds
Resistance	
100 kΩ	±0.5 %
Temperature coefficient	20 ppm/k
Environment	
Ambient temperature	-40+70°C
Ambient temperature for U_{L}	-40+60°C
Humidity	≤ 98 %
Classification of climatic conditions acc. to IEC 60721	
(related to temperature and relative humidity)	
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22

Stationary use	3M12
Transport	2M4
Long-term storage	1M12
Connection	
Connection R _S and E	
Tightening torque	0.50.6 Nm (4.45.3 lb-in)
Conductor sizes	AWG 2412
Stripping length	7 mm
Conductor, rigid	0.24 mm
Conductor, flexible	0.22.5 mm
Multiple conductor, flexible with ferrule	
without plastic sleeve	0.251.5 mm
with ferrule with plastic sleeve	0.252.5 mm
Multiple conductor, flexible with TWIN ferrule	
with plastic sleeve	0.51.5 mm
Connection PE for cable lug	
Tightening torque cable lug M5	2.2 Nm (19.5 lb-in
Connection N	
Connection via HV line with open end	cable lug provided by the custome
Other	
Operating mode	in case of a ground fault maximum 10 s
Mounting	any position
Tightening torque cover screws	2.5 Nm (22.1 lb-in
Operating altitude (when mounted on insulators)	up to 5000 m AMSI
Degree of protection, internal components (DIN EN 60529)	IP54
Flammability class	UL 94V-(
Documentation number	D0034
Weight	< 11 kg



Wiring diagram



 $The {\tt ,N''} terminal of the {\tt CD25000} should be connected directly to the star point of the transformer, so that the connection between NGR and star point of the transformer. The {\tt ,N''} terminal of the {\tt CD25000} should be connected directly to the star point of the transformer, so that the connection between NGR and star point of the transformer. The {\tt ,N''} terminal of {\tt ,N''} terminal$ is also monitored.

A direct connection between the "N" connections of the CD25000 and the NGR is not recommended, as in this case a line interruption between the star point and the NGR connection "N" would not be monitored.

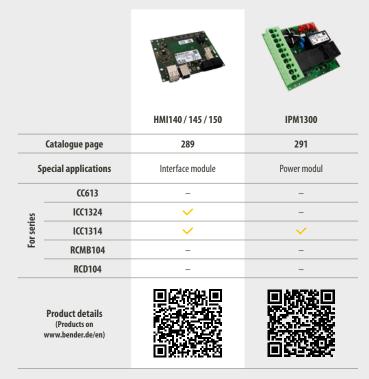
Terminal	Use	Connecting cable			
lenima	650	Metrical	Imperial		
N	Connection to the star point of the HRG system: permanently connected cable (1.8 m), cable lug provided by the customer	0.36	mm²		
Rs	Connection to R _S of the NGRM	1.5 mm ²	AWG16		
E	Connection to E of the NGRM; Internally connected to PE	1.5 mm ²	AWG16		
PE	Connection to the protective conductor, internally connected to E, M5 cable lug	≥ 1.5 mm ²	AWG16 or greater		

Device overview charge controller

		CC613	ICC1324	ICC1314
	Catalogue page	270	274	278
	Modem	4G modem (optional)	4G modem (optional)	2G/4G modem (optional)
6 mA D	ntegrated patented OC fault current detection	~	~	~
lr C	ntegrated Powerline ommunication (PLC)	~	~	~
	Emergency Opener	~	~	~
	WiFi module	-	(optional)	✓ (optional)
Integ	rated power supply unit	_	~	~
Interface	Ethernet	~	~	~
Intel	Modbus	~	✓	~
Variant	Enclosure for DIN rail mounting	~	-	-
	PCB version	-	~	~
	Product details (Products on www.bender.de/en)			

Device overview accessories charge controller





Charge controller CC613

Charge controller for use in electric vehicle charging stations, wallboxes or street light charging points



Typical applications

 Electric vehicle charging stations, wallboxes or street light charging points

Approvals



Device features

- Charge controller in accordance with IEC 61851-1 (charging mode 3)
- Configurable master and slave operation

Setting up charging stations with two charging points:

- 1 charge controller as data gateway with 4G modem
- 1 charge controller as slave without 4G modem
- Dynamic load management to optimally distribute the available power among all charging points and signal the maximum power available in each case to the vehicle
- Residual direct current monitoring module (external RCD type A required), different cable lengths can be selected
- $\bullet \ \ Integrated\ emergency\ opener\ for\ actuator\ control\ (locking/unlocking)\ and\ monitoring\ of\ the\ 12\ V\ supply\ voltage$
- Can be integrated in single- or three-phase systems up to 80 A
- OCPP 1.5 and OCPP 1.6 compliant with JSON, SOAP
- Supported mobile networks: 4G (LTE), 3G (UMTS) and 2G (GSM) with an integrated 4G modem
- 3 USB interfaces:
- 1 CONFIG interface for local configuration and installation of software updates
- 2 USB host interfaces
- Control Pilot and Proximity Pilot communication
- Configurable support for additional SCHUKO socket-outlets
- Meter interface: Modbus TCP and RTU
- External Modbus interface (second meter for dynamic load management)
- User interface modules for customer-specific applications (e.g. RFID, LED, antenna)
- · Configurable 2-channel input/output extension interface for additional functionality
- Internal temperature sensor to reduce the charging current depending on the ambient temperature
- ISO 15118 Powerline Communication (PLC) for plug & charge and load management systems
- ISO 15118 Powerline Communication (PLC) for plug & charge or autocharge
- · Ethernet interface

Standards

The charge controller has been developed in compliance with the following standards:

- EN IEC 63000
- EN IEC 62311
- EN IEC 61851-1
- IEC 61851-21-2
- EN 61851-22
- EN 301 489-1
- EN 301 511
- EN 301 908-1
 EN 301 908-13
- EN 301 908-2
- EN ISO 15118-2
- EN ISO 15118-3
- IEC 62955
- EN 301 489-52 Draft

Patents

EP 2 571 128 / US 9,397,494 / ZL 201210157968.6 / CN 103001175, EP 2 813 856.

Further information

For further information refer to our product range on www.bender.de.



Туре	Modem	Interface	RDC-M	External Modbus	OCPP-capable	PLC*	User interface	I/O extension	Art. No.
CC613-ELM4PR-M	4G			~	~		~	~	B94060020
CC613-ELPR-M	-			~	~		~	~	B94060021
CC613-ELM4PR	4G	Modbus, Ethernet	~	-	~	~	~	~	B94060026
CC613-ELPR	-	Lancinet		-	~		~	~	B94060027
CC613-HEM-X2	-			-	-		-	-	B94060028

^{*} Powerline Communication acc. to ISO/IEC 15118

1 The charge controller with residual direct current monitoring module (RDC-M) only works in combination with a measuring current transformer (to be ordered separately). Different cable lengths are available.

Accessory

Description	Art. No.	Page
RFID105-L1 with RJ45 cable (length 500 mm)	B94060105	286
RFID114 with RJ45 cable (length 500 mm)	B94060114	287
Current transformer CTBC17 (cable variant, cable length 325 mm) ¹⁾	B98080071	281
Current transformer CTBC17 (PCB variant) 1), 2)	B98080070	281
Connection cable CTBC17-Cable incl. clip housing	B980805	281
DPM2x16FP (display module)	B94060120	285

Plug kit	Content / Quantity	Art. No.
Plug kit (can be ordered separately)	3-pole (1 x), 4-pole (1 x), 8-pole (2 x)	B94060129
Plug kit bulk pack, ELM4PR-M, ELPR-M	3-pole (50 x), 4-pole (50 x), 8-pole (100 x)	B94060128
Plug kit bulk pack, ELM4PR, ELPR, HEM-X2	4-pole (50 x), 8-pole (100 x)	B94060126

Technical data

Insulation coordination acc. to IEC 60664-1/IEC 60664-3	
Rated voltage	250 V
Pollution degree	2
Overvoltage category within terminal H	ļ
Overvoltage category, terminal H and all other terminals	II
Rated impulse voltage, terminal H and all other terminals	6 k\
Rated impulse voltage within terminal H	2.5 k\
Double insulation between terminal H and all other terminals	OCV II
Basic insulation within terminal H	OCV I
Operating altitude AMSL	≤ 2000 m
Supply voltage (terminal B (OCV, +12CV))	
Nominal voltage	DC 12 V
Operating range of the nominal voltage	DC 11.412.6 V
Max. nominal current	750 m <i>A</i>
Max. nominal current without USB load	400 mA
Max. nominal current with USB load	750 m <i>A</i>
Residual direct current monitoring module* (RDC-M, terminal A)	
Measuring range	100 m <i>A</i>
Response values:	
Residual current I∆n	DC 6 mA
Response tolerance $I_{\Delta n}$	-500 %
Measuring current transformers	
Max. connection cable length	≤ 1.47 m
Restart sequence value:	
DC 6 mA	< 3 mA
* Patented 6 mA DC residual current trip (Patent: EP 2 571 128/US 9,397,494/ZL 201210157968.6/CN 103001175, EP 2	813 856)
SMA plug connector* for 4G antenna (optionally with 4G modem, termir	.al E)

SWA plug connector for 40	antenna (optionally with 40 modelli, terminal E)
Frequency bands	800 MHz/850 MHz/900 MHz/1800 MHz/2100 MHz/2600 MHz
Impedance	50 Ω
Data rate	GSM:
	GPRS: UL 85.6 kBit/s; DL 107 kBit/s
	EDGE: UL 236.8 kBit/s; DL 296 kBit/s
	UMTS:
	WCDMA: UL 384 kBit/s; DL 384 kBit/s
	DC-HSDPA: DL 42 MBit/s
	HSUPA: UL 5.76 MBit/s
	LTE:
	LTE FDD: UL 5 MBit/s; DL 10 MBit/s
	LTE TDD: UL 3.1 MBit/s; DL 8.96 MBit/s
Specified antenna	PSI-GSM/UMTS-QB-ANT

* SMA plug connector must be safeguarded against ESD discharges by the customer

N-4-	:	e.	

USB port type A; USB 2.0 max. 250 mA
USB port type A; USB 2.0 max. 250 mA
10/100 Mbit
micro USB port type AB
micro SIM
interna
9.6 kBit
9.6 kBit
acc. to IEC 61851
acc. to IEC 61851

^{*} USB host 1 and USB host 2: in total 500 mA

Inputs (depending on the variant)

DC 11.4 V25.2 V
2.36.4 mA

Weld check (terminal H (WB, WA))

Input voltage	// // // /
Input current	0.61.3 mA

Input PE (terminal B (PE, PE))

Outputs (depending on the variant)

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

Relays (12 V) (terminal J (relay 13, relay 14))

kated operational voltage $U_{\rm e}$	DC 24 V
Rated operational current /e	DC 1 A
Minimum contact rating	DC 1 mA at \geq 10 V

witching contact for contactor (terminal H (relay 23, relay 24))

Rated operational voltage $U_{\rm e}$	AC 230 V
Rated operational current Ie	AC 4 A
Minimum contact rating	AC 50 mA at \geq 10 V

Environment/EMC

EMC	see CE declaration
Operating temperature	-3070 °C

Classification of climatic conditions acc. to IEC 60721:

3K23 (except condensation and formation of ice)
2K11
1K21
EC 60721:
3M11
2M4
1M12

¹⁾ Internal diameter: 17 mm

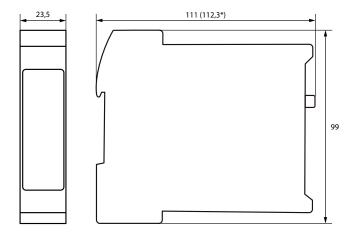
²⁾ The PCB-variant can be combined with the connection cables of different lengths

Technical data (continued)

Cable lengths/cable types	
Cable	Shielded, one end of shield connected to PE
HMI (user interface, terminal K) (depending on	the variant)
Connection cable RJ45, shielded	
Max. connection cable length	internal 2 m
Ethernet (terminal D)	
Connection cable	CAT 6
Max. connection cable length	100 m
Connection type (terminal blocks B and J)	push-wire terminal
Connection specifications:	
Rigid/flexible	0.21.5 mm ² (AWG 2416)
Flexible with ferrule without plastic sleeve	0.251.5 mm ² (AWG 2416)
Flexible with ferrule with plastic sleeve	0.140.75 mm ² (AWG 2618)
Stripping length	10 mm
Max. connection cable length	2 m
Cross-section	≥ 0.5 mm ²
Max. connection cable length (PE)	4 m
Cross-section (PE)	≥ 1 mm ²

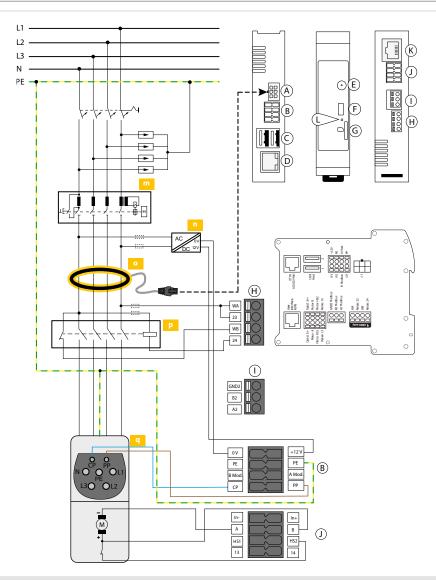
Connection specification	S:	
Rigid/flexible		0.21.5 mm ² (AWG 2416)
Flexible with ferru	le without plastic sleeve	0.251.5 mm ² (AWG 2416)
Flexible with ferru	le with plastic sleeve	0.140.75 mm ² (AWG 2618)
Stripping length		10 mm
Max. connection cable le	ength	2 m
Cross-section		$\geq 0.5 \text{ mm}^2$
Max. connection cable le	ength (PE)	4 m
Cross-section (PE)		≥ 1 mm ²
Other		
Operating mode		Continuous operation
Mounting position	Orientated to front panel; a	ir must pass through cooling slots vertically
Degree of protection		IP20
DIN rail		IEC 60715
Documentation number		D00381
	variant)	max. 500 g

Dimension diagram



Dimensions in mm acc. to ISO 2768 - $\mbox{\ensuremath{\text{m}}}$

 $^{{\}it *Dimensions with antenna socket}$



- **A** Connection measuring current transformer (CT)
- **B** 12 V supply, PE, Modbus meter, CP, PP
- © 2x USB type A (1, 2)
- (ETH1)
- **(E)** Antenna socket 4G (only available for variants with 4G modem¹)
- ${\Large \Large {\mathbb F}} \ \ {\it Configuration interface}$
- **©** Micro SIM card slot (only available for variants with 4G modem¹)
- (H) Weld check, relay for contactor control rated for 230 V/4 A
- ① External Modbus (galvanic separation)
- ① Locking, control relay GPIO, optocoupler input
- (K) Connection user interface (HMI) (not available with HEM-X2 variant)
- **©** STATUS LED
- m RCD type A
- Voltage supply DC 12 V
- Measuring current transformer (CT) with plug
- Contactor
- Type 2 socket-outlet
- Data gateways with 4G modem: CC613-ELM4PR-M and CC613-ELM4PR

Terminal assignment

	0V	Input 0 V
	+ 12 V	Supply voltage +12 V
	PE	Input PE
В	PE	Input PE
D	B Mod.	Modbus meter B
	A Mod.	Modbus meter A
	СР	Control Pilot
	PP	Proximity Pilot

	WA	Weld check input L1
Н	23	Relais 23: Switching contact contactor
П	WB	Weld check input N
	24	Relais 24: Switching contact contactor

	GND2	External Modbus GND (shield connected on one side)
I	B2	External Modbus B (galvanic separation)
	A2	External Modbus A (galvanic separation)

	ln-	Opto 1 In-: Optocoupler input 12 V negative			
] - -	ln+	Opto 1 In-: Optocoupler input 12 V positive			
	A	Actuator A: Locking actuator output negative			
	В	Actuator B: Locking actuator output positive			
	HS2	Actuator HS2: Locking input actuator switch			
	HS1	Actuator HS1: Locking 12 V output actuator switch			
	14	Relay 14: Relay contacts GPIO (12 V)			
	13	Relay 13: Relay contacts GPIO (12 V)			



CAUTION! Switching contact contactor and weld check at terminal H are only suitable for mains voltage (230 V)! Not permitted for SELV/PELV voltages.



ICC1324 charge controller

Charge controller for charging systems for electric vehicle charging



Image similar

Typical applications

• AC charging stations for electric vehicles, wallboxes

Approvals



Device features

- Charge controller in accordance with IEC 61851-1 (mode 3 charging)
- · Master and slave operation configurable
- Setting up charging ssystems with two charging points: 1 charge controller as data gateway with 4G modem and 1 charge controller as slave without 4G modem
- Dynamic load management to optimally distribute the available power among all charging points and signal the maximum power to the vehicle
- Patented residual direct current monitoring module (external RCD type A required), different cable lengths can be selected
- Integrated emergency opener for actuator control (locking/unlocking)
- Can be integrated in single- or three-phase systems up to 3x 32 A
- · OCPP 1.5 and OCPP 1.6 compliant with JSON, SOAP
- Integrated 4G modem
- · 3 USB interfaces:
 - 1 CONFIG interface (type B) for local configuration and installation of software updates
- 2 USB host interfaces (type A)
- Control Pilot and Proximity Pilot communication (acc. to IEC 61851-1)
- · Additional SCHUKO socket-outlet control
- · Meter interface: Modbus TCP and RTU
- External Modbus interface for remote control via energy management systems
- Additional inputs and outputs for extended control of the charge controller
- · Internal temperature sensor to reduce the charging current depending on the ambient temperature
- ISO 15118 Powerline Communication (PLC) for plug & charge, autocharge and load management systems
- Integrated WiFi module and two Ethernet interfaces
- Integrated DC 15 V voltage source for customer-specific applications
- Supply voltage AC 230 V

Standards

The charge controller has been developed in compliance with the following standards:

• EN 61851-22

• EN IEC 63000

• EN 301 489-52

• EN IEC 61439-1

• EN ISO 15118-2 • EN ISO 15118-3 • EN 301 511

• EN IEC 61439-7 • EN IEC 61851-1

• FN 300 328

• FN 301 908-1 • FN 301 908-13

• EN IEC 61851-21-2

• EN 301 489-1

• EN 301 908-2

• EN IEC 62311

• EN 301 489-17

• IEC 62955

Patents

EP 2 571 128 / US 9,397,494 / ZL 201210157968.6 / CN 103001175, EP 2 813 856.

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	4G modem	WiFi	PLC 1)	Insulated input	12 V relay output	Interface	Art. No.
ICC1324-Connect Plus	(Cat 1)	~	~	2x	2x	USB, Modbus meter, Ethernet, RFID	B94060080
ICC1324-Connect	(Cat M1/NB1)	-	~	1x	-		B94060079
ICC1324-Connect SP	-	~	~	1x	1x		B94060074
ICC1324-Home Plus	-	~	~	1x	-		B94060078
ICC1324-Home	-	-	-	1x	-	USB	B94060077

¹⁾ Powerline Communication acc. ISO/IEC 15118

The charge controller with residual direct current monitoring module (RDC-M) only works in combination with the measuring current transformer (to be ordered separately). Different cable lengths are available.

Description	Art. No.	Page
HMI150 (Interface module)	B94060150	289
HMI145 (Interface module)	B94060151	289
HMI140 (Interface module)	B94060152	289
Current transformer CTBC17 (cable variant, cable length 325 mm) ¹⁾	B98080071	281
Current transformer CTBC17 (PCB variant) ^{1), 2)}	B98080070	281
Connection cable CTBC17-Cable incl. clip housing	B980805	281

Plug kit	Content / Quantity	Art. No.
Plug kit (can be ordered separately)	2-pole (1 x), 4-pole (1 x), 8-pole (3 x)	B94060125
Plug kit bulk pack Connect Plus, Connect, Home Plus	2-pole (50 x), 4-pole (50 x), 8-pole (150 x)	B94060124
Plug kit bulk pack Home	2-pole (50 x), 4-pole (50 x), 8-pole (100 x)	B94060123

Technical data

Insulation coordination acc. to IEC 60664-1/IE	C 60664-3	
Rated voltage / Pollution degree	250 V / 2	
Overvoltage category	II (within terminal M)	
Overvoltage category	III (terminal M and all other terminals)	
Rated impulse voltage	6 kV (terminal M and all other terminals)	
Rated impulse voltage	2.5 kV (within terminal M)	
Double insulation acc. to OVC III between	terminal M and all other terminals	
Basic insulation acc. to OVC II	within terminal M	
Operating altitude	≤ 2000 m AMSL	
Supply voltage AC 230 V (terminal N (L1, N))		
Supply voltage range $U_{\rm S}$	184 264 V	
Frequency of U _s	50 Hz	
maximum Power consumption	12 W	
average Power consumption	6 W	
External circuit breaker recommended	B6A	
Residual direct current monitoring module* (l	RDC-M, terminal J)	
Measuring range	100 mA	
Response values:		
Residual current I _{dc}	DC 6 mA	
Response tolerance I _{dc}	-500 %	
Measuring current transformer:		
Max. Length of the connection cable	≤1,47 m	
Restart sequence value:		
DC 6 mA	< 3 mA	
* patented 6 mA DC fault current tripping		
(Patents: EP 2 571 128 / US 9,397,494 / ZL 2012101	57968.6 / CN 103001175, EP 2 813 856)	
SMA connector for 4G antenna (for ICC1324-Con	nect Plus variant only, terminal G)	
Modem LTF Cat 1 & GSM		

Frequency bands	800 MHz/850 MHz/900 MHz/1800 MHz/2100 MHz/2600 MHz
	LTE-FDD: B1/B3/B7/B8/B20/B28; WCDMA: B1/B8; GSM: B3/B8
Impedance	50 Ω
Data rate	GSM:
	GPRS: UL 85.6 kBit/s; DL 107 kBit/s
	EDGE: UL 236.8 kBit/s; DL 296 kBit/s
	UMTS:
	WCDMA: UL 384 kBit/s; DL 384 kBit/s
	DC-HSDPA: DL 42 MBit/s
	HSUPA: UL 5.76 MBit/s
	LTE:
	LTE FDD: UL 5 MBit/s; DL 10 MBit/s
	LTE TDD: UL 3.1 MBit/s; DL 8.96 MBit/s
Recommended antenna	TC ANT MOBILE WALL 0.5M - 2702274
Max. length of the antenna cable	< 3 m
Max. output power	GSM850/EGSM900: 33dBm
	DCS1800/PCS1900: 30dBm
	WDMA: 24dBm
	LTE: 23dBm

SMA connector for LTE-M1 antenna & LTM-NB1/2 antenna (for ICC1324-Connect variant only, terminal G)

Modem LTE CAT M1/NB1 & GSM	
Frequency bands (Cat M1/Cat NB1: LTE FDD: B1/B2/B3/B4/B5/B8/B12/B13/B18 B19/B20/B25/B26*/B28 LTE TDD: B39 (For Cat M1 Only
Impedance	50 C
Data rate	GSM
	850/900/1800/1900MH
	GPRS
	UL 85,6 kBit/s; DL 107 kBit/
	GSN
	UL 236,8 kBit/s; DL 296 kBit
	LTE-M1
	Max. 375Kbps (DL), max. 375Kbps (UL
	LTE-NB
	Max. 32Kbps (DL), max. 70Kbps (UL
Recommended antenna	TC ANT MOBILE WALL 0.5M - 2702274
Max. length of the antenna cable	< 3 n
Max. output power	GSM850/EGSM900: 33dBn
	DCS1800/PCS1900: 30dBn
	LTE: 23dBn
WiFi	
Standards	IEEE 802.11b/g/i
Frequency bands	2.4 GHz Kanäle 1-13 (2.412 GHz - 2.472
Channel band width	20 MH
Data rate	802.11b1, 2, 5.5 and 11 Mbp
	802.11g 6, 9, 12, 18, 24, 36, 48 and 54 Mbp
	802.11n MCS0-MCS7 (max 72.2Mbps
max. output power:	19 dBm Ell
LED indications	
Service	blue: system is starting
	green: system started, not ready for operation ye
	flashing green: system running, system ready for operation
	red: system erro
Ethernet (terminals B, C)	off: no Ethernet connection
	steady green: active Ethernet connection
	flashing green: data exchang
	steady yellow: transmission rate 100 Mbit/
	yellow off: transmission rate 10 Mbit/
Data interface	
USB host 1 (terminal D1)	USB port type A; USB 2.0 max. 250 m/
USB host 2 (terminal D2)	USB port type A; USB 2.0 max. 250 max
Ethernet (terminal B, C)	10/100 Mbi
CONFIG (configuration interface, termina	• • • • • • • • • • • • • • • • • • • •
SIM card (only with 4G modem, terminal	•
Modbus meter (terminal A)	9.6 kBi
Control Pilot (terminal A (CP))	acc. to IEC 6185
Proximity Pilot (terminal A (PP))	acc. to IEC 6185

¹⁾ Internal diameter: 17 mm

 $^{^{\}rm 2)}~{\rm The}~{\rm PCB-variant}$ can be combined with the connection cables of different lengths

Optocoupler 1 (terminal L (Opto 1 In+, Opto 1 In-))	
Input voltage (HIGH)	DC 11.425.2 \
Input voltage (LOW)	DC 0 \
Input current	2.3 6.4 mA
Optocoupler 2 (terminal L (Opto 2 In+, Opto 2 In-))	
Input voltage (HIGH)	DC 11.425.2 \
Input voltage (LOW)	DC 0 \
Input current	2.36.4 mA
Potential difference to PE/GND	max. 100 V*
Weld check (terminal M (WB, WA))	
Input voltage	AC 184264 \
Input current	0.61.3 mA
Potential difference to PE/GND	max. 100 V*

*	The potential difference between the optocoupler inputs and other inputs/outputs must be less
	than 100 V.

Input PE (terminal A (PE, PE))

Rated operational current le

0	ut	pu	ts

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

DC 15 V voltage source (terminal A (15 V, 0 V))	
Output voltage	

maximum load capacity	0,4 A / 4,8 VA
Tolerance	DC ± 0,75 V
Relay 1 (12 V) (terminal K (relay 13, relay 14))	
Rated operational voltage U_e	DC 24 V

Minimum contact ra	iting	

nelay 2 (12 V) (terillillar k (relay 23, relay 24))	
Rated operational voltage U_e	DC 24 V
Rated operational current /e	DC 1 A
Minimum contact rating	1 mA at ≥ 10 V

Switching contact for contactor (terminal M (relay 33, relay 34))

Rated operational voltage $U_{\rm e}$	AC 230 V
Rated operational current I _e	AC 4 A
Minimum contact rating	50 mA at ≥ 10 V (AC)

Environment/EMC

EMC	see CE declaration
Operating temperature	-25+65 ℃

Classification of climatic conditions acc. to IEC 60721:

Stationary use (IEC 60721-3-3)	3K23 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K21

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

Cable lengths/cable types

Ethernet	(terminals	B. C)

Cross-section (PE)

DC 15 V

DC 1 A 1 mA at \geq 10 V

Cable	shielded on one side, shield on charge controller side to PE
Connection cable	
Max. connection cable length	100 m

Connection type (terminal blocks A, K and L)	push-wire terminal	
Connection specifications:		
rigid /flexible	0.21.5 mm ² (AWG 2416)	
flexible with ferrule without plastic sleeve	0.251.5 mm² (AWG 2416)	

flexible with ferrule with plastic sleeve	0.14 0.75 mm ² (AWG 2618)
Stripping length	10 mm
Max. connection cable length	< 3 m
Cable (Modbus)	shielded and twisted in pairs, shield on both sides to PE
Max. connection cable length (Modbus)	250 m
Cross section (Modbus)	$\geq 0.5 \text{ mm}^2$
Max. connection cable length (PE)	< 3 m

Connection type (terminal block M)	push-wire terminal	
Connection specifications:		
rigid /flexible	0.752.5 mm ² (AWG 2416)	
flexible with ferrule without plastic sleeve	0.752.5 mm ² (AWG 2416)	
flexible with ferrule with plastic sleeve	0.752.5 mm ² (AWG 2418)	
Stripping length	10 mm	
Max connection cable length	< 3 m	

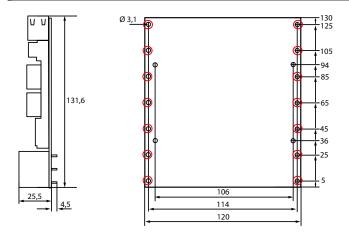
 $\geq 1 \, mm^2$

Connection type (terminal block N)	push-wire terminal	
Connection specifications:		
rigid /flexible	0.22.5 mm ² (AWG 2412)	
flexible with ferrule without plastic sleeve	0.252.5 mm ² (AWG 2412)	
flexible with ferrule with plastic sleeve	0.252.5 mm ² (AWG 2412)	
Stripping length	10 mm	

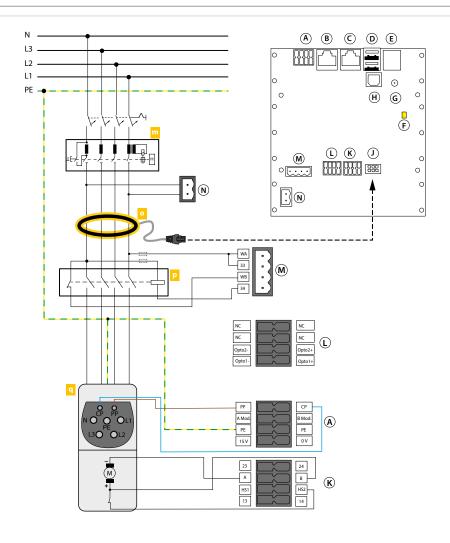
Other

Operating mode	continuous operation
Mounting position	standing
Degree of protection	IP20
Documentation number	D00436
Weight	max. 500 g (depends on variant)

Dimension diagram (dimensions in mm)



- Red marks: Possible fastening points
- Fastening recommendation:
 - Fillister head screws: 4 x M 2.5
 - Torque specification: 0.36 Nm



- A PE, Modbus meter, CP, PP
- **B** Connection Ethernet (ETH2)
- © Connection Ethernet (ETH1)
- ① 2x USB type A (1, 2)
- € Micro SIM card slot (only available for variants with 4G modem)¹
- **F** LED service
- **6** Antenna socket 4G (only available for variants with 4G modem¹)
- (H) Configuration interface USB type B
- ① Connection measuring current transformer (CT)
- **K** Locking, control relay GPIO
- C Optocoupler input
- M Weld check, relay for contactor control rated for 230 V/4 A
- N Power supply AC 230 V
- RCD type A
- Measuring current transformer (CT) with plug
- Contactor
- Type 2 socket-outlet
- Data gateways with 4G modem: ICC1324-Connect Plus and ICC1324-Connect

Terminal assignment

15 V customer-specific	0 V	DC 15 V voltage source for
	15 V	customer-specific application
	Input PE	
	PE	Input PE
Α	B Mod.	Modbus meter B
	A Mod.	Modbus meter A
	СР	Control Pilot
	PP	Proximity Pilot

м	WA	Weld check input L1
	33	Relay 33: Switching contact contactor
	WB	Weld check input N
	34	Relay 34: Switching contact contactor

	23	Relay 23: Relay contacts GPIO (12 V)		
	24	Relay 24: Relay contacts GPIO (12 V)		
	A	Actuator A: Locking actuator output negative		
	В	Actuator B: Locking actuator output positiv		
K	HS2	Actuator HS2: Locking input actuator switch		
	HS1	Actuator HS1: Locking 12 V output actuator switch		
	14	Relay 14: Relay contacts GPIO (12 V)		
	13	Relay 13: Relay contacts GPIO (12 V)		

_		
	Opto1-	Optocoupler input 1 12 V negative
	Opto1+	Optocoupler input 1 12 V positive
L	Opto2-	Optocoupler input 2 12 V negative
	0pto2+	Optocoupler input 2 12 V positive

М	N	Neutral conductor
IN	L1	230 V supply (phase 1)

The 230 V supply (terminal N), the weld check input (terminal M, WA) and the switching contact contactor (terminal M, 33) must be connected to the same phase (L1) to ensure protection against overvoltage!

ICC1314 charge controller

Charge controller for charging systems for electric vehicle charging



Image similar

Typical applications

 AC charging stations for electric vehicles, wallboxes, single and double charging stations

Approvals



Device features

- Charge controller in accordance with IEC 61851-1 (charging mode 3)
- · Integrated WiFi module for configuration and connection with other charging systems
- Suitable for single-phase or three-phase charging of electric vehicles up to 80 A, depending on the current carrying capacity of the integrated power module which is used
- integrated residual direct current monitoring module with residual current transformer for DC residual current monitoring (external RCD type A required)
- USB interfaces
 - 1 CONFIG interface (type B) for configuration and maintenance as well as for connecting two charge controllers for dual charging systems
 - 2 USB host interfaces (type A), one of them can be used as an alternative to the CONFIG interface
- · Meter interface
 - Modbus RTU for internal energy meters, suitable for Eichrecht-compliant billing
- Modbus TCP for connecting meters for load management
- Up to two Ethernet interfaces
- · Suitable for the installation of dual charging systems using two charge controllers
- Suitable for the installation of charging systems with two alternatively usable plug systems (e.g. type 2 and protective contact sockets)
- Integrated emergency opener of the charging socket actuator in the case of a power blackout
- Integrated 2G / 4G modem with router function
- 2 optocoupler inputs and 2 relay outputs for additional functions
- · Integrated DC 12 V voltage supply with a maximum current carrying capacity of 400 mA for customised applications
- · Support for RFID reader
- Support for OCPP 1.6-J
- · ISO 15118 Powerline Communication (PLC) with support of plug & charge authorisation, load management and
- · Dynamic load management for optimised distribution of the available power to connected vehicles, including PV charging optimisation and prioritisation function
- · Support for the EEBUS profiles overload protection, optimisation of PV charging, cost-optimised charging and load specification by electricity grid operators
- Support for the Bender app for home loading and API for customer-specific apps
- Tool support for configuring and testing charging systems in production
- Configurable support for additional SCHUKO socket-outlet
- · Control Pilot and Proximity Pilot communication
- · Internal temperature sensor to reduce the charging current depending on the ambient temperature

Standards

The charge controller has been developed in compliance with the following standards:

- EN 61851-22
- EN IEC 63000
- EN 301 489-52

- EN IEC 61439-1
- EN ISO 15118-2
- EN 301 511

- EN IEC 61439-7 • EN IEC 61851-1
- EN ISO 15118-3
- EN 301 908-1

- EN IEC 61851-21-2
- EN 300 328
- EN 301 908-13

- EN IEC 62311
- EN 301 489-1 • EN 301 489-17
- EN 301 908-2 • IEC 62955

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	4G modem	WiFi	PLC 1)	Insulated input	12 V relay output	Interface	Art. No.
ICC1314-Connect-Plus	(Cat 1)	~	~	2x	2x	USB, Modbus meter, Ethernet, IPM	B94060073
ICC1314-Connect-Plus-G1	(Cat 1)	~	~	2x	2x	USB, Modbus meter, Ethernet, IPM	B94060030
ICC1314-Companion-G1	-	-	~	2x	2x	USB, Modbus meter, IPM	B94060031

¹⁾ Powerline Communication acc. ISO/IEC 15118

Description	Art. No.	Page
IPM1300 (Power module)	B94060198	291
HMI150 (Interface module)	B94060150	289
HMI145 (Interface module)	B94060151	289
HMI140 (Interface module)	B94060152	289

Connection kit	Content / Quantity	Art. No.	
Flat band cable for connecting the IPM	Lenght 0.3 m, 20-pole (1 x)	on request	
Cable set Connect Plus and Companion	8-pole, 0.5 m (3 x)	on request	

Technical data

Insulation coordination acc. to I	EC 60664-1 / IEC 60664-3
Rated voltage	12.5 V / 24 V
Overvoltage category (terminal e)	III
Pollution degree	2
Rated impulse voltage	800 V
Operating altitude AMSL	≤ 2000 m
Supply voltage DC 12 V (Termina	al P (L1, N))
Supply voltage range $U_{\rm S}$	DC 11.4 V12.6 V
Max. power consumption	12 W
Average power consumption	6 W
SMA plug connector (terminal G) or U.FL plug connector (terminal T) for 4G antenna
Modem LTE Cat 1 & GSM	
Frequency bands	800 MHz/850 MHz/900 MHz/1800 MHz/2100 MHz/2600 MHz
, , , , , ,	LTE-FDD: B1/B3/B7/B8/B20/B28; WCDMA: B1/B8; GSM: B3/B8
Impedance	50 Ω
Data rate	GSM:
	GPRS: UL 85.6 kBit/s; DL 107 kBit/s
	EDGE: UL 236.8 kBit/s; DL 296 kBit/s
	UMTS:
	WCDMA: UL 384 kBit/s; DL 384 kBit/s
	DC-HSDPA: DL 42 MBit/s
	HSUPA: UL 5.76 MBit/s
	LTE:
	LTE FDD: UL 5 MBit/s; DL 10 MBit/s
	LTE TDD: UL 3.1 MBit/s; DL 8.96 MBit/s
Recommended antenna	TC ANT MOBILE WALL 0,5M - 2702274
Max. length of the antenna cable	< 3 m
Max. output power	GSM850/EGSM900: 33 dBm
	DCS1800/PCS1900: 30 dBm
	WDMA: 24 dBm
	LTE: 23 dBm
Recommended torque*	1 Nm
* for SMA plug connector	
Data interface	
USB-Host 1 (terminal D1)	USB port type A; USB 2.0 max. 250 mA
USB-Host 2 (terminal D2)	USB port type A; USB 2.0 max. 250 mA
Ethernet (terminal B, C)	10/100 Mbit
CONFIG (configuration interface, terr	minal H) USB port type B
SIM card (only with 4G modem, tern	ninal E) micro SIM
Modbus meter	9.6 kBit
Control Pilot (terminal (CP))	acc. to IEC 61851
Proximity Pilot (terminal (PP))	acc. to IEC 61851

Inputs	
Input voltage (HIGH)	DC 11.4 V25.2 V
Input voltage (LOW)	DC 0 V
Input current	2.36.4 mA
max. potential difference to PE/GND	50 V*

Outputs	
Contact data acc. to IEC 60947-5-1:	
DC 12 V voltage source (Terminal A (12	V, 0 V))
Output voltage	DC 12 \
Max. load capacity	400 m/
Tolerance	DC ± 0.75 \
Relay 1 and 2 (12 V) (Terminal K: Relay	13/14 and Relay 23/24)
Rated operational voltage U_e	DC 24 \
Rated operational current I _e	DC 1 /
Minimum contact rating	DC 1 mA at \geq 10
Environment / EMC	
EMC see	CE declaration
Operating temperature	-25+65°
Classification of climatic conditions acc	. to IEC 60721:
Stationary use (IEC 60721-3-3)	3K23 (except condensation and formation of ice
Transport (IEC 60721-3-2)	2K1
Long-term storage (IEC 60721-3-1)	1K2
Classification of mechanical conditions	acc. to IEC 60721:
Stationary use (IEC 60721-3-3)	3M1
Transport (IEC 60721-3-2)	2M-
Long-term storage (IEC 60721-3-1)	1M1.
Cable lengths /cable types	
Cable shielded	on one side, shield to P
Ethernet (Terminal B, C)*	
Connection cable	CAT 6 or higher, shielde

Connection cable
Max. connection cable length

- * Integrated surge protection for indoor applications
 - An additional surge protection device (SPD) is required for outdoor applications.

Flat band cable connection P

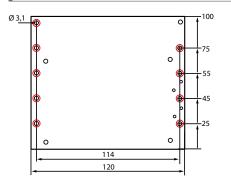
Input PE (Terminal A (PE, PE))

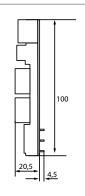
Permissible connection plug/connector system	Micromatch W+P 6990-5-20-1-PPTR
Flat band cable length	< 0.3 m

- * can be ordered separately (see "Ordering information")
 - The plug-in system on the IPM board and on the charge controller can withstand 5 plugging cycles.
- The plug on the flat band cable is intended for single insertion.

·	
Operating mode	continuous operation
Mounting position	standing
Degree of protection	IP20
Documentation number	D00520
Weight (depends on the variant)	max. 110 g

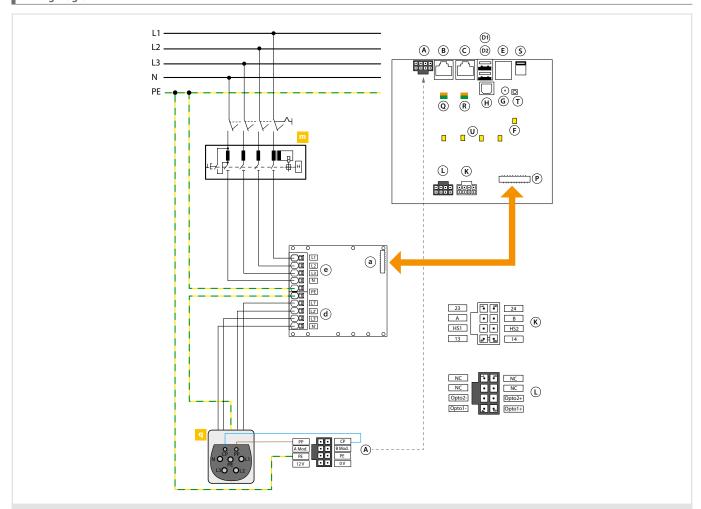
100 m





- Red marks: Possible fastening points
- Fastening recommendation:
- Fillister head screws: 4 x M 2.5
- Torque specification: 0.36 Nm

Wiring diagram



- A 12 V, PE, Modbus meter, CP, PP (Molex Nano-Fit 105310-3508)
- B Connection Ethernet (ETH2)
- C Connection Ethernet (ETH1)
- D1, D2 2x extension connection (USB type A)
 - E SIM card holder (3FF, micro)
 - F LED status charge controller
 - G Antenna socket 4G modem (SMA)
 - H Configuration interface (USB type B)
 - K Connector locking device, control relay (Molex Nano-Fit 105310-4508)
 - L Optocoupler input (Molex Nano-Fit 105310-3508)
 - P Connection integrated power module (IPM) 20-pole
 - Q LED activity Ethernet 2
 - R LED activity Ethernet 1
 - S integrated WiFi antenna
 - T Antenna socket 4G modem (U.FL)
 - U 4x RGB LED (status charging system)

- RCD type A
- Type 2 socket-outlet

Klemmenzuordnung

A4	12 V	DC 12 V voltage source for
A8	0 V	customer-specific application
А3	PE	Input PE
Α7	PE	Input PE
A2	A Mod.	Modbus meter A
A6	B Mod.	Modbus meter B
A1	PP	Proximity Pilot
A5	СР	Control Pilot

K4	13	Relay 13: relay output 1 (12 V)
K8	14	Relay 14: relay output 1 (12 V)
К3	HS2	Actuator HS2: Locking input actuator switch

K2 A Actuator A: Locking actuator output negative K6 B Actuator B: Locking actuator output positive K1 23 Relay 23: relay output 2 (12V)	K7	HS1	Actuator HS1: Locking 12 V output actuator switch
K6 B Locking actuator output positive K1 23 Relay 23: relay output 2 (12 V)	K2	Α	710144101711
iii 25 iiiii) 2511ciu) output 2 (12 17	K6	В	/ ictuator bi
V5 34 D 1 34 1 4 43/4310	K1	23	Relay 23: relay output 2 (12 V)
K5 24 Kelay 24: relay output 2 (12 V)	K5	24	Relay 24: relay output 2 (12 V)

		Optocoupler input 1 (12 V negativ)
L8	Opto1+	Optocoupler input 1 (12 V positiv)
L3	Opto2-	Optocoupler input 2 (12 V negativ)
L7	Opto2+	Optocoupler input 2 (12 V positiv)

CTBC17 series

AC/DC sensitive measuring current transformers



Typical applications

 Electric vehicle charging stations, wallboxes or street light charging points

Approvals



(conformity for cable variant only)



UL File E173157

Device features

- Suitable for AC/DC sensitive residual current measurement according to IEC 62752 and IEC 60755
- · Suitable for DC fault current monitoring to protect type A RCDs in conjunction with the listed evaluators
- Shield to prevent interferences caused by high load currents and external magnetic fields
- PCB mounting
- Connection cable for direct mounting available
- · Can be used in applications according to
 - IEC 62020
 - IEC 62752
 - IEC 61851-1
 - IEC 62955
 - UL2231

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Sensor	Version	Art. No.
CTBC17P-03	DCD	B98080070
CTBC17P-04	PCB mounting	B98080074
CTBC17P-03-K0325	Cable variant (length 325 ±25 mm)	B98080071

Cable incl. clip enclosure	Connector length (mm)	Art. No.
CTBC17 cabel1470	1470 ±30	B98080542
CTBC17 cabel600	600 ±25	B98080543
CTBC17 cabel325	325 ±25	B98080541
CTBC17 cabel180	180 ±25	B98080540

Accessories

Description	Recommended mounting screws
Mounting screws M3	2 x Würth-WüPlast 2.5 x 8 mm

Suitable system components

CTBC17P-03

Description	Cable	РСВ	Туре	Art. No.	Page
Chausa santuallau	>	-	CC613	B940600	270
Charge controller	~	1	ICC1324	B940600	274
Residual current	V 1)	~	RCMB104	B940424	231
monitoring modules	V 1)	>	RDC104	B94042483	234

¹⁾ Molex adapter connector required by customer

CTBC17P-04²⁾

Description	Cable	PCB
Residual current monitoring modules	√ 1)	~

¹⁾ Molex adapter connector required by customer

²⁾ Various residual current monitoring modules for charge controllers in combination with the CTBC17P-04 are available on request.

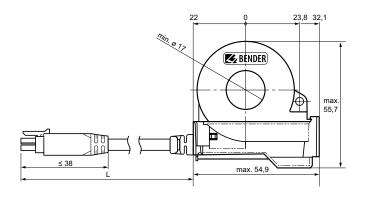
Technical data

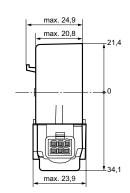
Insulation coordination according to IEC 60664-1	
Definitions	
CT cable feed-through opening on primary side	(IC1)
Measuring circuit; CT on secondary side	(IC2)
Connection cable measuring circuit	(IC3)
Operating altitude	
Basic insulation	≤ 4000 m AMSL
Double insulation	≤ 2000 m AMSL
Rated voltage	600 \
Overvoltage category	
Rated impulse voltage	
IC1/IC2	8 kV
IG .	4 kV
Rated insulation voltage	***
IC1/IC2	600 V
IG	300 \
Pollution degree	
Safe separation (double insulation) between	01/6 111/600 1
IC1/IC2	OVC III/600 \
Insulation coordination according to IEC 62955	0 (400.1
IC1/IC2	8 mm/400 V
Measuring current transformer circuit	
Diameter cable feed-through opening	17 mm
Rated load current	80 A
Rated primary residual current	1000 mA
Rated DC residual operating current $I_{\Delta dc}$ acc. to IEC 62955	6 mA
Rated continuous thermal current I _{cth}	80 A
Rated short-time thermal current I _{th}	2400 A
Rated dynamic current I _{dyn}	6000 A
Environment	
Operating temperature with cable	-30+80°C
Operating temperature sensor	-35+85°0
Temperature in the cable feed-through opening	max. 100 °C
Environment (UL applications)	
Operating temperature with cable	-30+75 °C
Operating temperature sensor	-35+85 °C
Temperature in the cable feed-through opening	max. 100 °C
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)	3M12
Transport (IEC 60721-3-2)	2M ²
Long-term storage (IEC 60721-3-1)	1M12
	111112

Fastening solderable fixing pins Pin length from top edge of PCB 3.9 ±0.3 mm Connection windings solderable contact pins Pin length from top edge of PCB min. 3 mm Enclosure retaining pin pull-out forces 50N/PIN Soldering profile 260 °C for 10 s Recommended PCB thickness 1.62.4 mm Connection Connection Tightening torque mounting screw 0.5 Nm Pilling diameter 3 mm Connection cable with plug connector 6 poles cable length see ordering information Suitable PCB connector Molex Micro Fit 3.0 Header Art No. 43045-0607 Connection cable UL Style 2464 External diameter of the cable (Da) typ. 5.4 mm Bending radius of the connection cable
Connection windings Pin length from top edge of PCB Pin length PCB thickness Pin length PCB connector Pightening torque mounting screw Pilling diameter Pin length See ordering information Pilling diameter Pin length PCB connector Pilling diameter Pilling d
Pin length from top edge of PCB min. 3 mm Enclosure retaining pin pull-out forces 50N/PIN Soldering profile 260 °C for 10 s Recommended PCB thickness 1.62.4 mm Connection Tightening torque mounting screw 0.5 Nm Drilling diameter 3 mm Connection cable with plug connector 6 poles Cable length see ordering information Suitable PCB connector Molex Micro Fit 3.0 Header Art No. 43045-0607 Connection cable UL Style 2464 External diameter of the cable (Da) typ. 5.4 mm
Enclosure retaining pin pull-out forces 50N/PIN Soldering profile 260 °C for 10 s Recommended PCB thickness 1.62.4 mm Connection Tightening torque mounting screw 0.5 Nm Drilling diameter 3 mm Connection cable with plug connector 6 poles Cable length see ordering information Suitable PCB connector Molex Micro Fit 3.0 Header Art No. 43045-0607 Connection cable UL Style 2464 External diameter of the cable (Da) typ. 5.4 mm
Soldering profile 260 °C for 10 s Recommended PCB thickness 1.62.4 mm Connection Tightening torque mounting screw 0.5 Nm Drilling diameter 3 mm Connection cable with plug connector 6 poles Cable length see ordering information Suitable PCB connector Molex Micro Fit 3.0 Header Art No. 43045-0607 Connection cable UL Style 2464 External diameter of the cable (Da) typ. 5.4 mm
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Cable length see ordering information Suitable PCB connector Suitable PCB connector Molex Micro Fit 3.0 Header Art No. 43045-0607 Connection cable UL Style 2464 External diameter of the cable (Da) typ. 5.4 mm
Suitable PCB connector Molex Micro Fit 3.0 Header Art No. 43045-0607 Connection cable UL Style 2464 External diameter of the cable (Da) typ. 5.4 mm
Molex Micro Fit 3.0 Header Art No. 43045-0607 Connection cable External diameter of the cable (Da) typ. 5.4 mm
Connection cable UL Style 2464 External diameter of the cable (Da) typ. 5.4 mm
External diameter of the cable (Da) typ. 5.4 mm
Bending radius of the connection cable
Once 8 x Da
Several times 15 x Da
Other
Degree of protection (DIN EN 60529) IP40
Degree of protection, connection (DIN EN 60529) IP30
Fastening cable connection variant cable ties
Enclosure sensor black
Flammability class according to UL94V-0
Weight
CTBC17 cable1470 < 75 g
CTBC17 cable600 < 40 g
CTBC17 cable325 < 30 g
CTBC17 cable180 < 25 g
CTBC17P-03 < 40 g
CTBC17P-03-K0325 < 70 g
CTBC17P-04 < 40 g

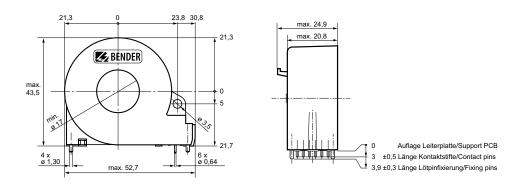
Dimension diagram (dimensions in mm)

Cable variant



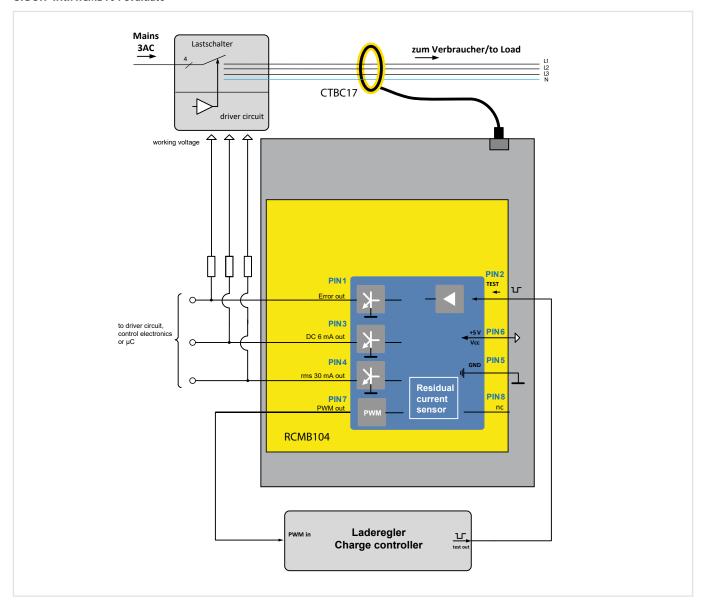


PCB variant

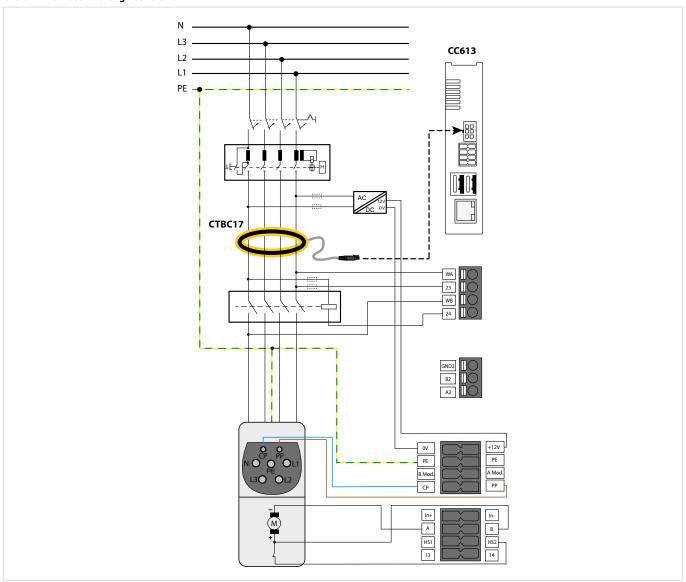


Wiring diagram – PCB variant

CTBC17 with RCMB104 evaluato



CTBC17 with CC613 charge controller



DPM2x16FP Display Module

To visualize the status of the charge controller or charging station/wallbox



Typical applications

• For use in electric vehicle (EV) charging stations, wall boxes and street light charging points

Approvals

Device features

- LED display with 2 x 16 characters
- Two RJ45 interface sockets

Standards

The display module has been developed in compliance with:

- EN 61851-1
- EN 61851-22
- EN 61439-1
- DIN IEC/TS 61439-7

Further information

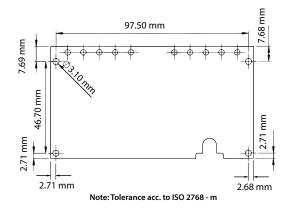
For further information refer to our product range on www.bender.de.

C€ KK

Ordering information

Туре	Art. NO.
DPM2x16FP	B94060120

Dimension diagram (dimensions in mm)



Insulation coordination acc. to IEC 6066	64-1/IEC 60664-3
Rated voltage	12.5 V
Overvoltage category	III
Pollution degree	2
Rated impulse withstand voltage	800 V
Rated insulation voltage	12.5 V
Altitude	≤ 2000 m above sea level
Nominal voltage/nominal current	
Nominal voltage	DC 3.3/5 V
Nominal voltage tolerance	±5%
Nominal current	< 100 mA
Environment/EMC	
EMC	EN 61851-22
Operating temperature	-25…+75 ℃
Classification of climatic conditions acc	a. to IEC 60721:
Stationary use (IEC 60721-3-3)	3K23 (except condensation and formation of ice)
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
Connection	
Connection to charge controller	via RJ45 cable
Connection to RFID module	via RJ45 cable
Cable length	< 1 m
Other	
Brightness of display background illuminati	on to 0100 %
Bus	120
Protection class	IP00
Documentation number	D00296
Weight	150 g

RFID105-L1

RFID module with integrated status LEDs for use in combination with charge controllers used in electric vehicle charging stations, wall boxes and street light charging points



Approvals



Typical applications

• For use in combination with charge controllers used in electric vehicle charging stations, wall boxes and street light charging points

Standards

The RFID has been developed in compliance with:

- ISO 14443A/MIFARE
- EN 50364
- EN IEC 61851-21-2
- EN IEC 62368-1
- EN IEC 63000
- ETSI EN 300 330
- ETSI EN 301 489-1
- ETSI EN 301 489-3

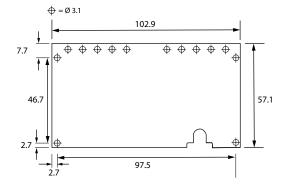
Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Art. No.
RFID105-L1	B94060105

Dimension diagram (dimensions in mm)



nsulation coordination acc. to IEC 60664-1/IEC 60664-3	
Rated voltage	12.5 V
Pollution degree	2
Rated impulse withstand voltage	800 V
Rated insulation voltage	12.5 V
Altitude	≤ 2,000 m AMSL

nateu voitage/fateu turrent	
Rated voltage	DC 3.3/5 V
Rated voltage tolerance	±5%
Rated current	140/64 mA

Frequency	
Radio frequency	13.56 MHz
Max. transmitting power* 42 dBµA/m	

^{*} at a distance of 10Lm

Environment/EMC		
Operating temperature	-30	+70 °C

Climatic conditions acc. to IEC 6072	1:
Stationary use (IEC 60721-3-3)	3K23 (except condensation, water and formation of ice)
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K21
Mechanical conditions acc. toIEC 60	721:
Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12

Long-term storage (IEC 60721-3-1)	1M12
Connection	
Charge controller connection	RJ45 cable*
Maximum cable length	< 2 m

Other	
Protection class	IP00
Maximum read distance	100 mm
Documentation number	D00453
Weight	25 g

RFID114

RFID module without integrated status LEDs for use in combination with charge controllers used in electric vehicle charging stations, wall boxes or street light charging points



Approvals



Typical applications

• For use in combination with charge controllers used in electric vehicle charging stations, wall boxes and street light charging points

Standards

The RFID module has been developed in compliance with:

- ISO 14443A/MIFARE
- EN 50364
- EN 60950-1
- EN 61851-1
- EN 61851-22
- ETSI EN 301 489-1 V2.1.1
- ETSI EN 301 489-3 V2.1.1
- EN 300 330 V2.1.1

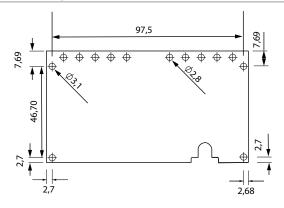
Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Art. No.
RFID114 (RJ45 cable (length 500 mm) included)	B94060114

Dimension diagram (dimensions in mm)



Insulation coordination acc. to IEC 6	0664-1/IEC 60664-3
Rated voltage	12.5 V
Overvoltage category	III
Pollution degree	3
Rated impulse withstand voltage	800 V
Rated insulation voltage	12.5 V
Altitude	≤ 2000 m AMSL
Nominal voltage/nominal current	
Nominal voltage	DC 3.3 V
Nominal voltage tolerance	±5 %
Nominal current	80 mA
Frequency	
Radio frequency	13.56 MHz
Environment	
Operating temperature	-30+70°C
Climatic conditions acc. to IEC 60721	:
Stationary use (IEC 60721-3-3)	3K23 (except condensation, water and formation of ice)
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K21
Mechanical conditions acc. to IEC 603	721:
Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12
Connection	
Connection to charge controller	via RJ45 cable
Maximum cable length	3 m
Other	
Degree of protection	IPOC
Maximum reading distance	100 mm
Documentation number	D00328
Weight	25 g

RFID117-L1

RFID module with integrated status LEDs and reinforced antenna power, for use in combination with charge controllers used in electric vehicle charging stations, wall boxes and street light charging points



Approvals



Typical applications

- · For use in combination with charge controllers used in electric vehicle charging stations, wall boxes and street light charging points
- · For e.g. Giro-e applications

Standards

The RFID has been developed in compliance with:

- ISO 14443A/MIFARE
- EN 50364
- EN IEC 61851-21-2
- EN IEC 62368-1
- EN IEC 63000
- ETSI EN 300 330 V2.1.1
- ETSI EN 301 489-1 V2.2.3
- ETSI EN 301 489-3

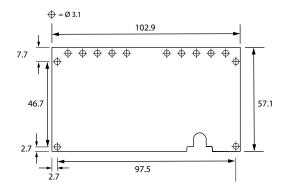
Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Art. No.
RFID117-L1 (RJ45 cable (length 500 mm) included)	B94060117

Dimension diagram (dimensions in mm)



Technical data

Rated voltage	12.5 V
Pollution degree	2
Rated impulse withstand voltage	800 V
Rated insulation voltage	12.5 V
Altitude	≤ 2,000 m AMSL
Rated voltage/rated current	
Rated voltage	DC 3.3/5 V
Rated voltage tolerance	±5%
Rated current	140/64 mA
Frequency	
Radio frequency	13.56 MHz
Max. transmitting power*	42 dBμA/m
* at a distance of 10Lm	
Environment/EMC	
Operating temperature	-30+70°C
Climatic conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3K23 (except condensation, water and formation of ice)
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K21
Mechanical conditions acc. toIEC 6072	1:
Stationary use (IEC 60721-3-3)	3M11
_	2M4
Transport (IEC 60721-3-2)	

* Type: CAT 5e Class D, RF/UTP,	twisted pair patch cable, AWG 26/7
---------------------------------	------------------------------------

Charge controller connection

Maximum cable length

Other	
Protection class	IP00
Maximum read distance	100 mm
Documentation number	D00422
Weight	25 g

RJ45 cable*

< 2 m

HMI140 / HMI145 / HMI150

Interface module for Bender charge controllers



Typical applications

- · Charging stations for electric vehicles
- · For public, semi-public, commercial or private use

Approvals



Device features (depending on the variant)

- · Control via USB
- Power supply via USB or external DC power supply
- RFID reader for authorization of the charging process
- 11 full-colour RGB LEDs for static or animated visualization of different operating states
- · Buzzer for acoustic signalling of states or for confirming user input
- Relay output (single-pole changeover contact)
- Integrated WiFi module (front-end module)
- Two USB host outputs
- Controllable full-colour RGB LED outputs
- · Digital control input
- · Ambient light sensor
- Temperature sensor

Standards

The HMI1xx has been developed in compliance with:

- EN 50364
- EN 61000-6-2
- EN IEC 62311
- EN IEC 63000
- ETSI EN 300 328
- ETSI EN 301 489-1
- ETSI EN 301 489-3

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	RFID reader	RGB LEDs	Digital control input	USB host connection	WiFi	RGB LED output	Relay output	Sensors (light, temperature)	Buzzer	Art. No.
HMI150	✓	✓	✓	✓	✓	✓	✓	✓	✓	B94060150
HMI145	✓	✓	✓	✓	-	√	✓	-	-	B94060151
HMI140	✓	✓	✓	-	-	-	✓	-	-	B94060152

Technical data

Insulation coordination according to IEC 60664-1 / IEC 6066 Rated voltage	15.8 V
Pollution degree	2
Operating altitude AMSL	≤ 2000 m
Supply voltage	
External DC (terminal C: +DC / GND)	
Nominal voltage	DC 12V
Voltage range	11.415.8 V
Max. power consumption without USB load HMI140 / 145 / 150	3.5 / 7.5 / 9.5 W
Max. power consumption with USB load HMI145 / 150	14.0 / 16.0 W
DC 5 V from charge controller (terminal B)	
Nominal voltage	DC 5V
Nominal voltage tolerance	±5%
Max. nominal current	500 mA
Interface data	
USB	
Charge controller connection	USB port type B; USB 2.0,
	current requirement max. 500mA
USB host 1 (terminal A1)	USB port type A; USB 2.0,
	load up to max. 500mA
USB host 2 (terminal A2)	USB port type A; USB 2.0,
	load up to max. 500mA

RFID reader Frequency 13.56 MHz Max. field strength (distance of 10 m) 42 dBµA/m ISO/IEC 14443 type A, MIFARE Standard WiFi IEEE 802.11b/g/n Standard Frequency bands 2.4 GHz 2.412 GHz - 2.472 GHz Channels 1-13 Channel bandwidth 20 MHz 802.11b 1, 2, 5.5, 11 Mbps Data rates 802.11g 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11n MCS0-MCS7 (max. 72.2 Mbps) Max. output power 19 dBm EIRP Inputs

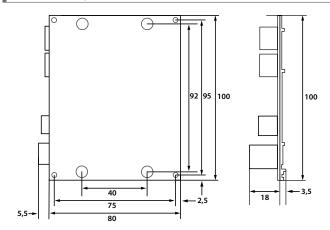
Control input (terminal C: IN)	
Input voltage	DC 015.8 V
Input current max.	1.5 mA
Max. switching frequency	5 Hz
EMC functional earthing (terminal C: FE) ²	

- low: E 1.2 V; high: G 2.0 V (or not connected)
- as needed, for connection to metallic chassis or housing parts connected to PE for improved EMC performance.

Technical data (continued)

Outputs	
Relay (terminal C: 11 / 12 / 14)	
Contact layout	Changeover contact (design C)
Rated operational voltage (to GND and betwee	n open contacts) DC 15V
Rated operational current	DC 1 A
External LED connection (terminal D)	
Rated voltage	DC 15V
LED current per output (constant current, contr	rolled) 060 mA
Voltage, shared anode (terminal D, +DC LED)	pprox external DC - 0.3 V
Voltage, shared cathode (terminal D, GND)	0 V
Environment / EMC	
Operating temperature	-30+70°C
Classification of climatic conditions accord	ling to IEC 60721
Stationary use (IEC 60721-3-3)	K23 (except condensation, water and formation of ice)
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K21
Classification of mechanical conditions ac	cording to IEC 60721
Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12
EMC environmental classes	
Emitted interference	B (residential, business or commercial areas)
Interference immunity	A (industrial environment)

Dimension diagram (dimensions in mm)



Connection lengths / cable types USB host A1 and A2 Max. cable length 1.8 m Double shielded Cable type Charge controller connection (terminal B) Max. cable length 1.8 m Double shielded Cable type Recommended connection cables hama: 00200602 Delock: 83892, 83893 Good Connection: GC2510-2TQ

	dood connection. dc2510 210	
External DC supply, FE, relay, control input, external LEDs (terminals C and D)¹		
Connection data		
Rigid / flexible	0.2 1.5 mm ² (AWG 24 16)	
Flexible with ferrule without plastic sleeve	0.25 1.5 mm ² (AWG 24 16)	
Flexible with ferrule with plastic sleeve	0.14 0.75 mm ² (AWG 2618)	
Stripping length	10 mm	
Max. cable length	1.8 m	

 $^{^{\}rm 1}~$ FE connection as required with the lowest possible impedance, at the remaining connections, cables of the respective function groups in twisted pairs or equivalent

Integrated power module for charge controllers



Device features

- · 22 kW power relay
- · Integrated residual current transformer for DC fault current monitoring
- Surge Protection Device (SPD)
- Integrated DC voltage supply
- integrated temperature sensors
- 20-pole flat band cable connector for connection to the charge controller by using a flat band cable
- · PE monitoring

Typical applications

 AC charging stations for electric vehicles, wallboxes, single and double charging stations

Approvals



Standards

The IPM1300 has been developed in compliance with the following standards:

- IEC 62955
- DIN EN IEC 61851-1
- DIN EN IEC 61851-21-2
- IEC 61439-1
- DIN EN 61439-7
- IEC 61439-7

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Art. No.		
IPM1300	B94060198		

Only for use with the following ICC1314 charge controller variants:

Туре	USB	4G modem	Ethernet	Wifi	PCL ¹⁾	Isolated entrance	12 V relay output	Art. No.	Page
ICC1314-Connect-Plus-G1	2x (Typ-A) / 1x (Typ-B)	✓ (Cat 1)	2	~	~	2	2	B94060030	278
ICC1314-Companion-G1	1x (Typ-A) / 1x (Typ-B)	-	-	-	~	2	2	B94060031	278

5.5 W

Weight

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

Technical data

rateu voitage	230 V
Overvoltage category (terminal e)	III
Pollution degree	2
Rated impulse voltage	4 kV
Operating altitude	\leq 2000 m above mean sea level
AC network connection, single-phase / three-	phase (terminal block e (L1, L2, L3, N, PE))
Nominal voltage	220230 V / 400 V
Nominal voltage tolerance	198253 V / 343438 V
Nominal voltage tolerance*	208253 V / 361440 V
Charging current max.	1 x 32 A / 3 x 32 A
Charging power max.	7.3 kW / 22 kW
Frequency	50 Hz

^{*} when using PE monitoring

Self-consumption max.

Connection, type 2-socket AC single-phase / three-phase (terminal block d (L1, L2, L3, N, Pl		
Nominal voltage	230 V / 400 V	
Charging current max.	1 x 32 A / 3 x 32 A	
Charging power max.	7.3 kW / 22 kW	
Frequency	50 Hz	

Cable lengths/ cable types

Terminal blocks e and d			
Connection type	Push-wire terminal		
Connection data*			
Rigid/ flexible	2.516 mm ²		
Flexible with ferrule without plastic sleeve	2.516 mm ²		
Flexible with ferrule with plastic sleeve	2.510 mm ²		
Stripping length	18 mm		
Charging cable length max. (terminal "d")	< 10 m		

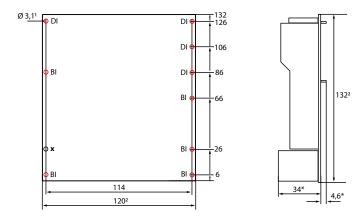
^{*} Depends on the power capacity connected to the power module

Permissible connection plug/ connector system	Micromatch W+P 6990-5-20-1-PPTR
Flat band cable length	< 0.3 m
Environment	
Operating temperature	-25+65 °C
Classification of climatic conditions acc. to IEC 607	721
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K21
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)	1M2
Other	
Protection class	IPOC
Documentation number	D00462

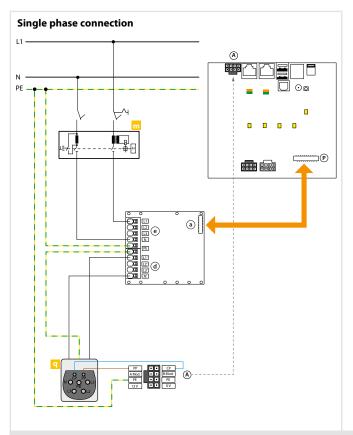
ca. 470 g

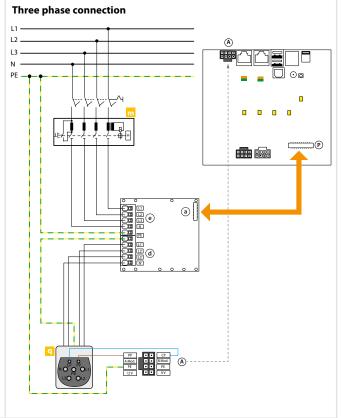
 $^{^{\}rm 1)}~$ Powerline Communication according to ISO/ IEC1511

Dimension diagram (dimensions in mm)



Wiring diagram





- (A)* 12 V, PE, Modbus meter, CP, PP (Molex Nano-Fit 105310-3508)
- ${\Bbb P}^*$ Connection integrated power module (IPM) 20-pole
- a Charge controller connection 20 pole
- **d** Connection type 2 connector
- AC network connection

- RCD Type A
- Type 2 socket or fixed charging cable
- * Refers to ICC1314



Device overview Universal Devices for Power Quality and Energy Measurement PEM

		LINETRAXX® PEM353
	Catalogue page	296
	Accuracy class according to IEC 62053-22	0.5 s
ive lents	DIN EN 50160 (report)	-
Normative requirements	DIN EN 61000-4-7 (harmonic)	Class II
regi	DIN EN 61000-4-15 (flicker) DIN EN 61000-4-30 (PQ measurement method)	-
	Phase voltages/Line voltages	✓
_	Phase currents	✓
	Neutral current 14	✓ (PEM353-N only)
	Neutral current I4 (calculated)	✓
	Frequency / phase angle	✓
	Reactive and active power import/ Reactive and active power export	~
25	Voltage unbalance/current unbalance	✓
Parameters 	Power	per phase and total S in kVA, P in kW, Q in kvar
Para	Displacement factor cos (ϕ)/power factor λ	∨
_	Total harmonic distortion (THD _U /THD _I)	up to the 31 rd
_	Harmonic components voltage	up to the 31 rd
_	Harmonic components current	up to the 31 rd
_	Transient detection	-
_	Overvoltage (swell)	-
	Undervoltage (sag)	-
	Flicker severity P _{ST}	-
	Data recorder / HighSpeed data recorder	5/0
es	Waveform recorder	-
Features	Digital inputs	4
<u></u>	Digital outputs	2 (PEM353-P only)
	Relay outputs (RO)	2 (PEM353, PEM353-N only)
ects	Voltage supply	AC/DC 95250 V (47440 Hz)
al asp	Sampling rate	3,2 kHz
Technical aspects	Temperature	-25+55 ℃
	Communication	Modbus RTU
	Product details (Products on www.bender.de/en)	

Energy meter and Measuring current transformer for universal measuring devices





	CTB31/CTB41/CTB51	KBR18/KBR32
Catalogue page	301	301
Туре	Measuring current transformer	Measuring current transformer
Product details (Products on www.bender.de/en)		

Power Quality and Energy Measurement LINETRAXX® PEM353



Typical applications

- Modern indicating instrument for electrical quantities, e.g. as a replacement for analogue indicating instruments
- · Power quality monitoring
- Limit value monitoring (setpoints) with alarm forwarding
- Measurement and monitoring of the N conductor
- Energy and power measurement, e.g. as part of energy data monitoring

Approvals



Device features

- Accuracy class according to IEC 62053-22: 0,5
- · Measured quantities
- Phase voltages U_{L1}, U_{L2}, U_{L3} in V
- Line voltages U_{L1L2}, U_{L2L3}, U_{L3L1} in V
- Phase currents I1, I2, I3 in A
- Neutral current (calculated) I4 in A
- Frequency f in Hz
- Phase angle for U and I in °
- Power per phase conductor S in kVA, P in kW, Q in kvar
- Total power S in kVA, P in kW, Q in kvar
- Displacement factor cos (φ)
- Power factor λ
- Active and reactive energy import in kWh, kvarh
- Active and reactive energy export in kWh, kvarh
- Voltage unbalance in %
- Current unbalance in %
- Harmonic distortion (THD) for U and I
- k-factor for
- · Limit value monitoring (setpoints) with alarm forwarding
- Energy and power measurement with log and tariff system
- · Configurable start page with 4 measured quantities
- Measurement and monitoring of the N conductor (PEM353-N only)

Standards

PEM353 was designed in accordance with the following standards:

• DIN EN 62053-22 (VDE 0418 Part 3-22)

Electricity metering equipment (a.c.) - Particular requirements - Part 22: Static meters for active energy (classes 0.2 and 0.5) (IEC 62053);

• DIN EN 61557-12 (VDE 0413-12)

Electrical safety in low voltage distribution systems up to 1000 V a.c. and 1500 V d.c. – Equipment for testing, measuring or monitoring of protective measures – Part 12: Performance measuring and monitoring devices (PMD)

• DIN IEC 61554:2002-08

Panel mounted equipment – Electrical measuring instruments – Dimensions for panel mounting (IEC 61554:1999)

Further information

For further information refer to our product range on www.bender.de.



			PEM353	PEM353-P	PEM353-N	
		Ordering details	B93100355	B93100354	B93100353	
Accuracy class of the active energy (acc. to IEC 62053-22) Current transformer 5 A: Class 0,5 Current transformer 1 A: Class 1,0 4565 Hz Volatage inputs (L1, L2, L3) TN and TT system (earthed): AC 230/400400/690 V, CAT III 600 V IT system (unearthed): AC 400480 V, CAT III 300 V / AC 500690 V, CAT II 1000 V Current inputs (I1, I2, I3) 5 A / 1 A 14 - 5						
		III 600 V O V, CAT II 1000 V				
emen		Current inputs (I1, I2, I3)		5 A / 1 A		
leasur		I 4	5A			
2		Harmonic / Distortion U/I	up to the 31st			
		Sampling rate	3,2 kHz			
Setpoints limit value monitoring 9						
Data logger		Logs	Event log (SOE log), Max./Min. log Peak demand log, Energy meter log (monthly values)			
Data		Data recorder	-	-	5	
	4 MB	Load data log (daily and monthly values)	-	-	~	
		Digital inputs		4		
প্ত		Digital outputs	2 x relay	2 x pulse	2 x relay	
Properties		Supply voltage		95250 V; DC, AC 47440 Hz		
E		Communication interface		RS-485 (Modbus RTU, BACnet MS/TP, DNP)		
		Language	English			

Technical data

Pollution degree	2
Climate category operation	3K2 ²
Max. installation altitude above NN:	2000 m
Definitionen	
Measuring circuit 1 (IC1)	(L1, L2, L3, N
TN and TT system	
Nominal voltage	400/690 \
Overvoltage category/Rated insulation voltage	III/600 \
IT system	
Nominal voltage	480 \
Overvoltage category/Rated insulation voltage	III/300 \
Nominal voltage	690 \
Overvoltage category/Rated insulation voltage	II/1000 \
Measuring circuit 2 (IC2)	(•111, 112, •121, 122, •131, 132)
Overvoltage category/Rated insulation voltage	III/300 \
Supply circuit (IC3)	(A1/+, A2/-)
Overvoltage category/Rated insulation voltage	III/300 \
Output circuit 1 (IC4) at PEM353-N and PEM353	(D013, D014)
Overvoltage category/Rated insulation voltage	III/300 \
Output circuit 1 (IC4) at PEM353-P	(E1+, E1-)
Overvoltage category/Rated insulation voltage	III/50 \
Output circuit 2 (IC5) at PEM353-N and PEM353	(D023, D024)
Overvoltage category/Rated insulation voltage	III/300 \
Output circuit 2 (IC5) at PEM353-P	(E2+, E2-
Overvoltage category/Rated insulation voltage	III/50 \
Control circuit 1 (IC6)	(DIC, DI1, DI2, DI3, DI4)
Overvoltage category/Rated insulation voltage	III/50 \
Control circuit 2 -RS-485 (IC7)	(D+, D-
Overvoltage category/Rated insulation voltage	III/50 \
Rated impulse voltage	
IC1/(IC27)	6 k\
IC2/(IC37)	4 k\
IC3/(IC47)	4 k\
IC4/(IC57)	4 k\
IC5/(IC67)	4 k\
IC6/IC7	800 \

Rated insulation voltage	
IC1/(IC27)	1000 V
IC2/(IC35)	250 \
IC2/(IC67)	250 N
IC3/(IC47)	250 V
IC4/(IC57)	250 N
IC5/(IC67)	250 V
IC6/IC7	32 V
Safe separation (reinforced insulation) between	
IC1/(IC27)	overvoltage category III, 600 V
IC2/(IC37)	overvoltage category III, 300 V
IC3/(IC47)	overvoltage category III, 300 V
IC4/(IC57)	overvoltage category III, 300 V
IC5/(IC67)	overvoltage category III, 300 V
Voltage test (routine test) acc. to IEC 61010-1:	
IC1/(IC27)	AC 2.0 kV, 1 minute
IC2/(IC37)	AC 2.0 kV, 1 minute
IC3/(IC47)	AC 2.0 kV, 1 minute
IC4/(IC57)	AC 2.0 kV, 1 minute
IC5/(IC67)	AC 2.0 kV, 1 minute
Supply voltage	
Supply voltage	AC/DC 95250 V (±10 %)
Frequency range	DC, 47 440 Hz
Power consumption	< 5 VA
Measuring voltage inputs	
see insulation coordination	
Measuring range	10 828 V (120 % <i>U</i> n, max)
Rated frequency	4565 Hz
Internal resistance U _{L1-N,L2-N,L3-N}	> 12 MΩ
Transformation ratio of the measuring voltage transfor	mer
Primary	1 1,000,000 \
Secondary	1690 \
Max. transformation ratio	10,000
Measuring current transformer inputs	
/nom	5 A
Measuring range	0.1 200 % / _{non}
Load	< 0.15 VA
Luau	
Overload range	2 x I _{nom} permanent

Technical data (continued)

Transformation ratio of the measuring current transformer		
Primary	1 30000 A	
Secondary	15 A	

$\label{eq:accuracies} \textbf{Accuracies (OMV = of measured value/OFS = of full-scale value)}$

II DINTH COOKS	00 (105 0110 000)
Power factor λ	±0.5 %
Active power, reactive power	$\pm 0.5 \%$ OMV, $+0.05 \%$ OFS
Phasing	±1°
Frequency f	±0.02 Hz
Neutral current I4 (PEM353-N)	±0.2 % 0MV
Current <i>I</i> _{1, 2, 3}	$\pm 0.2 \%$ OMV, $+0.05 \%$ OFS
Phase voltage <i>U</i> _{L1-N,L2-N,L3-N}	±0.2 % 0MV, +0.05 % 0FS

Measurement of the active energy acc. to DIN EN 62053-22 (VDE 0418 part 3-22)

Accuracy class with 5 A measuring current	transformers	0.5
Accuracy class with 1 A measuring current	transformers	1
assurament of the voltage rms values	acc. to DIN EN 61557-12 (VDE 0413-12)	chanter 4.7.6

Measurement of the voltage rms values Measurement of the phase current rms values acc. to DIN EN 61557-12 (VDE 0413-12), chapter 4.7.5 Frequency measurement acc. to DIN EN 61557-12 (VDE 0413-12), chapter 4.7.4

Interface

Interface: Protocol	RS-485: Modbus RTU, BACnet MS/TP, DNP	
Baud rate	1.238.4 kbit/s	
Cable length	01200 m	
Recommended cable (shielded)	J-Y(St)Y min. 2 x 0.8	

Switching elements

Outputs	2 N/O contacts
Operating principle	N/O operation
PEM353-N, PEM353	
Relay contacts, N/O operation, AC 250 V or DC 30 V	5 A
Minimum current I _{min}	1 mA at AC/DC \geq 10 V
PEM353-P	
Pulse output	max. DC 30 V, max. 30 mA
Cable length	≤ 30 m
Inputs	4 common galv. isolated digital inputs

1 mA

DC 24 V

$U_{\rm DI}$ Environment/EMC

EMC	IEC 61326-1
Operating temperature	-25+55 °C
Classification of climatic conditions acc. to IEC 60721 (stationary use)	3K24
Classification of mechanical conditions acc. to IEC 60721 (stationary use)	3M11
Range of use	< 2000 m

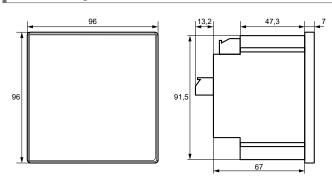
Connection

Connection type	screw-type terminals, plug-in connector
	,,,

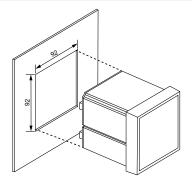
Other

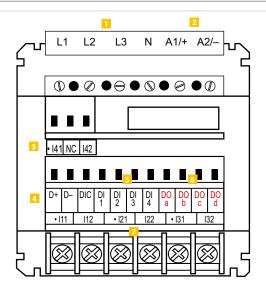
Degree of protection, installation	IP20
Degree of protection, front (with rubber seal)	IP54
Documentation number	D00335
Weight	≤ 350 g

Dimension diagram (dimensions in mm)



Panel cutout (dimensions in mm)

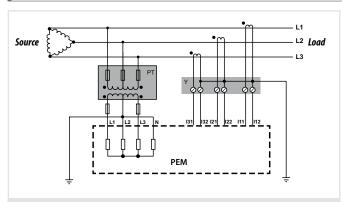




- Measuring voltage inputs:
 - The measuring leads should be protected with appropriate fuses.
- Supply voltage: Power protection by a 6 A fuse, quick response. If being supplied from an IT system, both lines have to be protected by a fuse.
- Measuring current inputs I4 (only PEM353-N)
- RS-485 bus connection
- 5 Digital inputs
- Digital outputs (N/O contacts)
- Measuring current inputs I1...3

	DO a	DO b	DO c	DO d
PEM353(-N)	D013	D014	D023	D024
PEM353-P	E1+	E1-	E2+	E2-

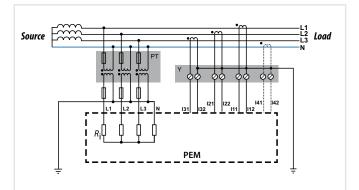
Wiring diagrams with voltage transformers (medium and high voltage)



Three-phase 3-wire system 3P3W with 3 measuring current transformers

When used in a 3-wire system, the connection type (Setup > Basic > Wiring Mode) must be set to **3P3W**.

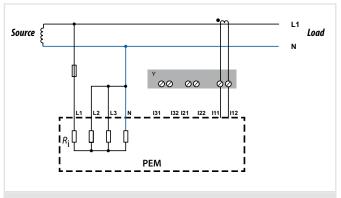
- Y Isolating terminal of the measuring current transformers
- PT The transformation ratio in the PEM353 can be set by specifying the primary and secondary transformation ratio. Odd ratios can also be configured.



Three-phase 4-wire system (example TN-S system) 3P4W with 3 voltage transformers

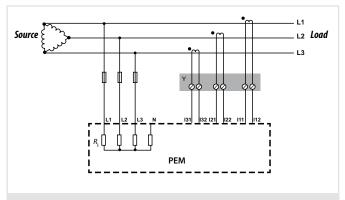
When using this wiring, the connection type (Setup > Basic > Wiring Mode) must be set to **3P4W**.

- Y Isolating terminal of the measuring current transformers
- 14 Measurement 14 for PEM353-N only
- PT The transformation ratio in the PEM353 can be set by specifying the primary and secondary transformation ratio. Odd ratios can also be configured.



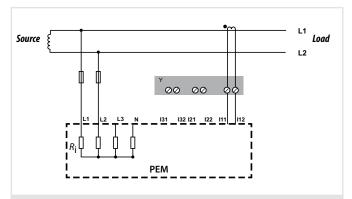
Single-phase 2-wire system 1P2W L-N

When using this wiring, the connection type (Setup > Basic > Wiring Mode) must be set to 1P2W L-N.



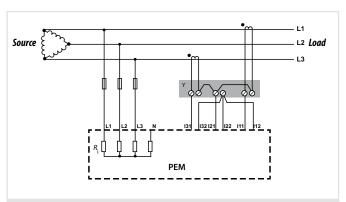
3P3W with 3 measuring current transformers

When used in a 3-wire system, the connection type (Setup > Basic > Wiring Mode) must be set to **3P3W**.

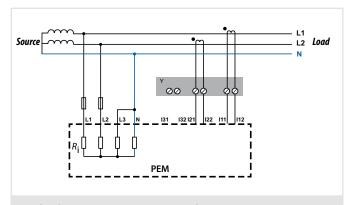


Single-phase 2-wire system 1P2W L-L

When using this wiring, the connection type (Setup > Basic > Wiring Mode) must be set to 1P2W L-L.



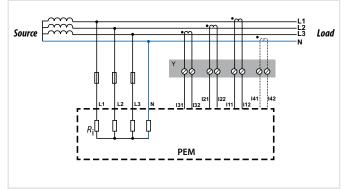
3P3W with 2 measuring current transformers (Aron circuit)



Single-phase 3-wire system 1P3W with 2 measuring current transformers

When used in a 3-wire system, the connection type $(Setup > Basic > Wiring\ Mode)\ must\ be\ set\ to\ \textbf{1P3W}.$

Isolating terminal of the measuring current transformers



3P4W with 3 (4) measuring current transformers

When using this wiring, the connection type (Setup > Basic > Wiring Mode) must be set to 3P4W.

- Isolating terminal of the measuring current transformers
- Measurement I4 for PEM353-N only

Measuring current transformer for universal measuring devices

Window-type/Split-core current transformer



Approvals



Device features

CTB41/CTB51

- Window-type current transformer
- Screwless connection technique
- Maintenance-free, gas-tight connection
- Max. operating voltages up to 1.2 kV
- Can also be used in 690 V systems
- $\bullet \ \ Unbreakable \ plastic \ enclosure, self-extinguishing, UL94-V0, flame-resistant$

KBR18/KBR32

- Split-core current transformer (mounting without disconnecting the primary conductor)
- Incl. connecting cable (2.5 m)
- Max. operating voltages up to 0.72 kV

Standards

The measuring current transformers were designed in accordance with the following standards:

- IEC 61869-1
- IEC 61869-2
- IEC 61010-1

Further information

For further information refer to our product range on www.bender.de.

Ordering details window-type current transformer

Model	Туре	Accuracy	Secondary current	Primary current	Art. No.
CTB31	WL605 CL. 1	1	5	60	B98086001
CTB31	WL601 CL. 1	1	1	60	B98086002
CTB31	WL755 CL. 1	1	5	7.5	B98086003
CTB31	WL751 CL. 1	1	1	75	B98086004
CTB31	WL1255 CL. 0.5	0.5	-		B98086005
CTB31	WL1255 CL. 1	1	5	125	B98086007
CTB31	WL1251 CL. 0.5	0.5	1	125	B98086006
CTB31	WL1251 CL. 1	1	1		B98086008
CTB31	WL1505 CL. 0.5	0.5	_		B98086009
CTB31	WL1505 CL. 1	1	5	450	B98086011
CTB31	WL1501 CL. 0.5	0.5		150	B98086010
CTB31	WL1501 CL. 1	1	1		B98086012
CTB31	WL2005 CL. 0.5	0.5			B98086013
CTB31	WL2005 CL. 1	1			B98086015
CTB31	WL2001 CL. 0.5	0.5		1 200	B98086014
CTB31	WL2001 CL. 1	1	1		B98086016
CTB41	WL2505 CL. 0.5	0.5	_		B98086017
CTB41	WL2505 CL. 1	1	5	250	B98086019
CTB41	WL2501 CL. 0.5	0.5		250	B98086018
CTB41	WL2501 CL. 1	1	1		B98086020
CTB41	WL3005 CL. 0.5	0.5	_		B98086021
CTB41	WL3005 CL. 1	1	5	200	B98086023
CTB41	WL3001 CL. 0.5	0.5	_	300	B98086022
CTB41	WL3001 CL. 1	1	1		B98086024
CTB41	WL4005 CL. 1	1	-		B98086026
CTB41	WL4005 CL. 0.5	0.5	5	400	B98086027
CTB41	WL4001 CL. 1	1	1	400	B98086028
CTB41	WL4001 CL. 0.5	0.5	1		B98086025
CTB41	WL5005 CL. 1	1	-		B98086029
CTB41	WL5005 CL. 0.5	0.5	5		B98086031
CTB41	WL5001 CL. 1	1		500	B98086032
CTB41	WI 5001 CL. 0.5	0.5	1	1	B98086033

Model	Туре	Accuracy	Secondary current	Primary current	Art. No.
CTB51	WL6005 CL. 1	1	5		B98086034
CTB51	WL6005 CL. 0.5	0.5)	600	B98086035
CTB51	WL6001 CL. 1	1	1	600	B98086036
CTB51	WL6001 CL. 0.5	0.5] '		B98086037
CTB51	WL8005 CL. 1	1	. 5		B98086038
CTB51	WL8005 CL. 0.5	0.5	,	800	B98086039
CTB51	WL8001 CL. 1	1	1	800	B98086040
CTB51	WL8001 CL. 0.5	0.5] '		B98086041
CTB51	WL10005 CL. 1	1	_		B98086042
CTB51	WL10005 CL. 0.5	0.5	5	1000	B98086043
CTB51	WL10001 CL. 1	1	1	1000	B98086044
CTB51	WL10001 CL. 0.5	0.5	1 '		B98086045

Ordering details split-core current transformer

Model	Туре	Accuracy	Secondary current	Primary current	Art. No.
KBR18	WLS501 KL. 3FS5	3FS5	1	50	B98086046
KBR18	WLS1001 KL. 3FS5	3FS5	1	100	B98086047
KBR18	WLS1501 KL. 3FS5	3FS5	1	150	B98086048

Model	Туре	Accuracy	Secondary current	Primary current	Art. No.
KBR32	WLS2501 KL. 3FS5	3FS5	1	250	B98086049
KBR32	WLS5001 KL. 1FS5	3FS5	1	500	B98086050

Selection guide current transformer/PEM

Design specifications of the measuring ranges current transformer/PEM

The secondary current of the current transformer has to be adjusted to the current input of the measuring device. The following table will help you to select the device type.

Current transformer secondary current	PEM353(-x) (5 A)	PEMxxx(-xx5) (5 A)	PEMxxx-xx1 (1 A)
5 A	~	~	-
1 A	_1)	_1)	>

¹⁾ Note: In principle, measuring current transformers can also be operated with 1 A secondary current on $measuring\ devices\ with\ 5\ A\ current\ input.\ In\ this\ case,\ the\ accuracy\ class\ is\ expected\ to\ be\ reduced\ by$ one class (e.g. 0.5 to 1).

The measurement accuracy classes of the system

The measurement accuracy class of the system is influenced by both the accuracy classes of the measuring current transformers und the measuring device. Refer to DIN EN 61557-12, Annex E.2.

Accuracy classes of measuring current transformers	PEM3xx (0.5 S)	PEM5xx (0.5 S)
1	1	1
0.5	1	1

Technical Data

Rated continuous thermal current I _{cth}	1.2 x / _N
Rated short-time thermal current Ith	60 x / _N , 1 s
Max. operating voltage $U_{\rm m}$	1.2 kV, <i>U</i> eff
Insulation test voltage	6 kV, U _{eff} , 50 Hz, 1 min
Nominal frequency	50/60 Hz
Insulation class	E
Operating temperature	-550 ℃

CTB41

Rated continuous thermal current Icth	1.2 x / _N
Rated short-time thermal current Ith	60 x / _N , 1 s
Max. operating voltage $U_{\rm m}$	1.2 kV, <i>U</i> _{eff}
Insulation test voltage	6 kV, <i>U</i> eff, 50 Hz, 1 min
Nominal frequency	50/60 Hz
Insulation class	E
Operating temperature	-550 ℃

CTB51

Rated continuous thermal current I _{cth}	1.2 x / _N
Rated short-time thermal current Ith	60 x / _N , 1 s
Max. operating voltage $U_{\rm m}$	1.2 kV, <i>U</i> eff
Insulation test voltage	6 kV, U _{eff} , 50 Hz, 1 min
Nominal frequency	50/60 Hz
Insulation class	E
Operating temperature	-550 °C
Documentation number	D00231

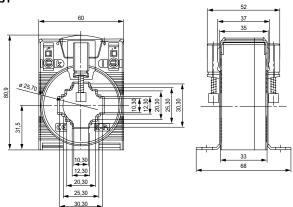
KBR18

Rated continuous thermal current I _{cth}	1.2 x / _N
Rated short-time thermal current Ith	60 x / _N , 1 s
Max. operating voltage $U_{\rm m}$	0.72 kV, <i>U</i> _{eff}
Insulation test voltage	3 kV, <i>U</i> _{eff} , 50 Hz, 1 min
Nominal frequency	50 Hz
Insulation class	E
Operating temperature	-550°C

KBR32

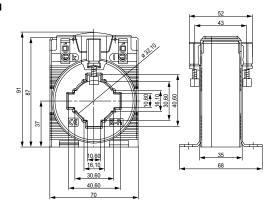
Rated continuous thermal current I _{cth}	1.2 x / _N
Rated short-time thermal current Ith	60 x / _N , 1 s
Max. operating voltage $U_{\rm m}$	0.72 kV, <i>U</i> efl
Insulation test voltage	3 kV, <i>U</i> _{eff} , 50 Hz, 1 min
Nominal frequency	50 Hz
Insulation class	E
Operating temperature	-550 ℃
operating temperature	

CTB31



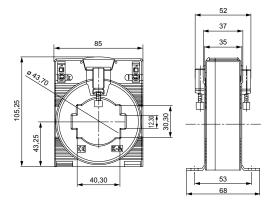
Dimensi	ions (mm)
Busbar 1	30 x 10
Busbar 2	25 x 12
Busbar 3	20 x 20
Circular conductor	25,7
Installation width	60
Installation height	80,9
Overall depth	52

CTB41



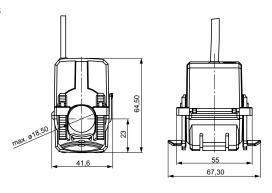
Dimensions	(mm)
Busbar 1	40 x 10
Busbar 2	30 x 15
Circular conductor	32
Installation width	70
Installation height	91
Overall depth	52

CTB51



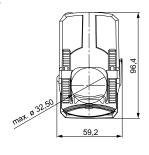
Dimension	s (mm)
Busbar 1	50 x 12
Busbar 2	40 x 30
Circular conductor	44
Installation width	85
Installation height	105.25
Overall depth	52

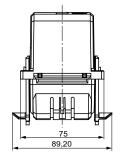
KBR18



Dimension	ons (mm)
Circular conductor	18
Installation width	41.6
Installation height	64.5
Installation depth incl. fixation clips	67.3

KBR32





Dimensi	ons (mm)
Circular conductor	32.5
Installation width	59.2
Installation height	96.4
Installation depth incl. fixation clips	89.2

Device overview measuring and monitoring relays LINETRAXX®

		LINETRAXX®	LINETRAXX®	LINETRAXX®	Russ sus	LINETRAXX®	LINETRAXX®	
		VME420	VME421H	VMD258	ES258	VMD420	VMD421H	
	Catalogue page	306	309	312	315	316	319	
	pecial applications	-	-	Power plant	Energy backup for device series VMD258	-	-	
Application	Voltage monitoring	~	~	~	-	~	~	
Appli	Current monitoring	_	-	_	-	_	-	
ing	AC	U<,U>	U<,U>	-	-	-	-	
monitor	ЗАС	-	-	U<, U>	-	U<, U>	U<, U>	
Voltage monitoring	3(N)AC	-	-	-	-	U<, U>	U<, U>	
	DC	U<,U>	U<, U>	_	_	_	-	
nom	Measuring range/ inal system voltage <i>U</i> n	AC/DC systems 0300 V	VME421H-D-1 AC/DC systems 9,6150 V VMD421H-D-2 70300 V	3AC 690/500/480/440/ 400/230/110/100 V	-	(L-N) 0288 V (L-L) 0500 V	(L-N) 0288 V (L-L) 0500 V	
	Frequency	f<,f>	f<,f>	-	-	f<,f>	f<,f>	
	Phase sequence	-	-	-	-	~	~	
	Phase failure	_	-	_	-	~	~	
	Asymmetry	_	-		-	~	~	
	Supply voltage <i>U</i> s	external	system	system	-	external	system	
Current monito-	1 AC with <i>U</i> s	_	-	-	-	-	-	
3 8	3 AC with <i>U</i> s	_	-	_	-	_	+	
	Special function	-	-	-	-	-	-	
Installa- tion	DIN rail	~	~	~	~	~	~	
Inst	Screw mounting	~	~	~	~	~	~	
	Product details (Products on www.bender.de/en)							

















LINETRAXX® VMD423/VMD423H	LINETRAXX® VMD460-NA	LINETRAXX® VMD461	LINETRAXX® CME420	LINETRAXX® CMD420/CMD421	LINETRAXX® CMS460	LINETRAXX® GM420	RC48C
322	325	330	336	339	342	345	348
Interface Protection System/Decoupling protection relay	Interface Protection System/Decoupling protection relay	Interface Protection System/Decoupling protection relay	-	-	-	Loop monitoring	Residual current/loop monitoring
~	✓	~	-	-	-	-	-
-	-	-	~	~	~	_	~
-	U<, U<<, U>, U>>, U _{10min} >	U<, U<<, U<<<, U>, U>>, U>>>	-	-	-	-	-
-	U<, U<<, U>, U>>, U _{10min} >	U<,U<<,U<<<, U>,U>>,U>>>	-	-	-	-	-
<i>U</i> <, <i>U</i> >, <i>U</i> _{10min} >	U<, U<<, U>, U>>, U _{10min} >	U<,U<<,U<<<, U>,U>>,U>>>	-	-	-	-	-
-	-	-		-	-	-	-
(L-N) 0288 V (L-L) 0500 V	(L-N) 0300 V (L-L) 0520 V	VMD461 (L-N) AC 50260 V (L-L) AC 87450 V (DC+-/DC-) DC 50450 V VMD461 +CD440 (L-N) AC 250690 V (L-L) AC 4401200 V (DC+/DC-) DC 2501200 V	-	-	-	-	-
f<,f>	f<,f<<,f>,f>>	f<, f<<, f<<, f>, f>>, f>>>	-	+	-	-	-
~	~	~	-	-	-	-	-
~	~	~	-	-	-	-	-
~	~	~	-	-	-	_	-
external (VMD423) system (VMD423H)	external	external	-	-	-	extern	extern
-	-	-	<i>l</i> <, <i>l</i> >	-	<i>I</i> <, <i>I</i> >	_	-
_	-	-	-	<i>I</i> <, <i>I</i> >	<i>l</i> <, <i>l</i> >	_	-
-	RS-485 interface, Islanding detection: -ROCOF (df/dt) -Vector shift	RS-485 interface, Islanding detection: -ROCOF (df/dt) -Vector shift	-	-	RS-485 interface	Monitoring of conductor loops for interruption	Monitoring of conductor loops for interruption and short circuit by using an termination device
~	~	~	~	~	~	~	~
~	~	~	~	~	~	~	~

















LINETRAXX® VME420

Multi-functional monitoring relay for undervoltage, overvoltage and frequency monitoring in AC/DC systems with separate supply voltage



Typical applications

- Voltage and frequency monitoring of single-phase machines and electrical installations
- Earth fault monitoring in mediumvoltage systems via voltage transformers
- · Monitoring of battery systems
- Switching machinery and equipment on and off at a certain voltage level

Approvals











Device features

- Monitoring AC/DC systems for undervoltage, overvoltage and frequency in the voltage range of 0...300 V
- Various monitoring functions selectable *U* <, *U* >, *f* <, *f* >
- Start-up delay, response delay and delay on release
- Adjustable switching hysteresis
- r.m.s. value measurement (AC+DC)
- Digital measured value display via multi-functional LC display
- Preset function (automatic setting of basic parameters)
- LEDs: Power On, Alarm 1, Alarm 2
- · Measured value memory for operating value
- · Continuous self monitoring
- Internal test/reset button
- Two separate alarm relays (one changeover contact each)
- N/C or N/O operation and fault memory behaviour selectable
- · Password protection for device setting
- · Sealable transparent cover
- Two-module enclosure (36 mm)
- Push-wire terminal (two terminals per connection)
- · RoHS compliant

Standards

The VME420 complies with the requirements of

• DIN EN 45545-2.

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Supply voltage ¹⁾ U _S	Art. No.		
.,,,-	5pp., 101gu 03	Screw-type terminal	Push-wire terminal	
VME420-D-1	AC 1672 V, 15460 Hz / DC 9,694 V	B93010001	B73010001	
VME420-D-2	AC 70300 V, 15460 Hz / DC 70300 V	B93010002	B73010002	

¹⁾ Absolute values

Accessories

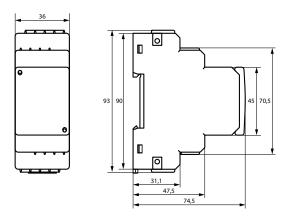
Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B98060008

Insulation coordination acc. to IEC 60664-1/IEC 60664-	-3	Switching elements
Rated insulation voltage	250 V	Number
Rated impulse voltage/pollution degree	4 kV/3	Operating principle
Overvoltage category	III	K2: Err, <i>U</i> <, <i>U</i> >, H
Protective separation (reinforced insulation) between: (A1	, A2) -(U1/+, U2/-) -(11-12-14) -(21-22-24)	K1: Err, $U <$, $U >$, I
Cumulu valta na		Electrical endurance, number of cycles
Supply voltage		Contact data acc. to IEC 60947-5-1
VME420-D-1:		Utilisation category
Supply voltage $U_{\rm S}$	AC 1672 V/DC 9.694 V	Rated operational voltage
Frequency range U _S	15460 Hz	Rated operational current
VME420-D-2:		Minimum contact rating
Supply voltage $U_{\rm S}$	AC/DC 70300 V	
Frequency range U _S	15460 Hz	Environment/EMC
Power consumption	≤ 4 VA	EMC
Tower consumption	2 7 7 7	Operating temperature
Measuring circuit		Classification of climatic conditions acc. to I
Measuring range (r.m.s. value)	AC/DC 0300 V	Stationary use (IEC 60721-3-3)
Rated frequency $f_{\rm D}$	DC, 15460 Hz	Transport (IEC 60721-3-2)
Frequency display range	10500 Hz	Long-term storage (IEC 60721-3-1)
		Classification of mechanical conditions a
Response values		Stationary use (IEC 60721-3-3)
Undervoltage U < (Alarm 2)	AC/DC 6300 V	Transport (IEC 60721-3-2)
Overvoltage U > (Alarm 1)	AC/DC 6300 V	Long-term storage (IEC 60721-3-1)
Resolution of setting U 6.049.9 V	0.1 V	
Resolution of setting <i>U</i> 50300 V	1 V	Connection
Preset function:		Connection type
Undervoltage $U < = (0.85 U_n)$:*		Connection
for $U_{\rm n} = 230/120/60/24 \rm V$	196/102/51/20.4 V	Connection properties
Overvoltage $U > = (1.1 U_n)$:*		rigid
for <i>U</i> _n = 230/120/60/24 V	253/132/66/26.4 V	flexible
Relative uncertainty voltage at DC, 50/60 Hz	±1.5 %, ±2 digits	two conductors with the same cross sect
Relative uncertainty, voltage in the range of 15460 Hz	±3 %, ±2 digit	rigid/flexible
Hysteresis <i>U</i>	140 % (5 %)*	Stripping length
Underfrequency Hz <	10500 Hz**	Tightening torque, terminal screws
Overfrequency Hz >	10500 Hz**	Connection
Resolution of setting f 10.099.9 Hz	0.1 Hz	
Resolution of setting f 100500 Hz	1 Hz	Connection properties rigid
Preset function:		flexible
Underfrequency for $f_n = 16,7/50/60/400 \text{ Hz}$	15,7/49/59/399 Hz	without ferrules
Overfrequency for f _n = 16,7/50/60/400 Hz	17,7/51/61/401 Hz	with ferrules
Hysteresis frequency Hys Hz	0.12 Hz (0.2 Hz)*	Stripping length
Relative uncertainty, frequency range 15460 Hz	±0.2 %, ±1 digit	Opening force
	,	Test opening, diameter
Time response		rest opening, diameter
Start-up delay <i>t</i>	0300 s (0 s)*	Other
Response delay t _{on1/2}	0300 s (0 s)*	Operating mode
Delay on release t _{off}	0300 s (0.5 s)*	Mounting
Resolution of setting t , $t_{on1/2}$, t_{off} (010 s)	0.1 s	Degree of protection, internal components (DI
Resolution of setting t , $t_{on 1/2}$, t_{off} (1099 s)	1 s	Degree of protection, terminals (DIN EN 60529
Resolution of setting t , $t_{on1/2}$, t_{off} (100300 s)	10 s	Enclosure material
Operating time, voltage t_{ae} DC/AC 16.7	Hz: \leq 130 ms, AC 42460 Hz: \leq 70 ms	Screw mounting
Operating time frequency tae	AC 15460 Hz: \leq 310 ms	DIN rail mounting acc. to
Response time t _{an}	$t_{\rm an}=t_{\rm ae}+t_{\rm on1/2}$	Flammability class
Recovery time t _b	≤ 300 ms	Documentation number
Displays, memory		Weight
<u> </u>	diamlass manifettion sets and a settle of the	()* = factory setting
	display, multifunctional, not illuminated	, ,
Display range measured value	AC/DC 0300 V	** = The technical data applies to the operation $**$
Operating uncertainty at 50/60 Hz	±1.5 %, ±2 digits	
Operating uncertainty, voltage in the range of 15460 Hz	±3 %, ±2 digits	
Operating uncertainty, frequency in the range of 15460 H		
History memory (HiS) for the first alarm value	data record measured values	
Password Fault memory (M) alarm relay	off/0999 (off)* on/off/con (on)*	

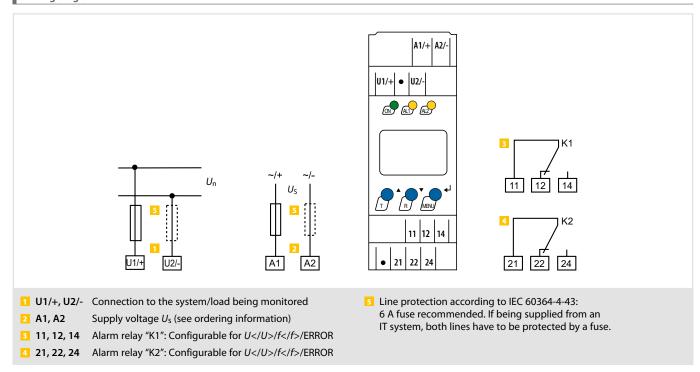
Switching elements	
Number	2 x 1 changeover contacts (K1, K2
Operating principle	N/C operation/N/O operation
	.AL (undervoltage $U <: N/C$ operation n.c.)
	S.AL (overvoltage $U >: N/O$ operation n.o.)
Electrical endurance, number of cycles	10,000
Contact data acc. to IEC 60947-5-1	
Utilisation category	AC-13 / AC-14 / DC-12 / DC-12 / DC-1
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 \geq 10 V
Environment/EMC	
EMC	IEC 61326-
Operating temperature	-25+55 °C
Classification of climatic conditions acc. to IEC 60721 (re	elated to temperature and relative humidity):
Stationary use (IEC 60721-3-3)	3K2
Transport (IEC 60721-3-2)	2K1
Long-term storage (IEC 60721-3-1)	1K2
Classification of mechanical conditions acc. to IEC 60	0721
Stationary use (IEC 60721-3-3)	3M1
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M1.
Connection	
Connection type	screw-type terminal or push-wire termina
Connection	screw terminal
Connection properties	Screw termina:
rigid	0.24 mm² (AWG 2412
flexible	0.22.5 mm ² (AWG 2414
two conductors with the same cross section	0.22.5 IIIII (AWG 2414
rigid/flexible	0.21.5 mm ² (AWG 2416
Stripping length	89 mn
Tightening torque, terminal screws	0.50.6 Nn
Connection	push-wire terminal
Connection properties	push tine termina
rigid	0.22.5 mm ² (AWG 2414
flexible	0.21112.3 11.111 (1.11.02 11.1111
without ferrules	0.752.5 mm ² (AWG 1914
with ferrules	0.21.5 mm ² (AWG 2416
Stripping length	10 mn
Opening force	501
Test opening, diameter	2.1 mn
Other	
	continuous operation
Uperating mode	any position
Operating mode Mounting Degree of protection, internal components (DIN EN 60529	
Mounting Degree of protection, internal components (DIN EN 60529)) IP3
Mounting Degree of protection, internal components (DIN EN 60529) Degree of protection, terminals (DIN EN 60529)) IP30 IP20
Mounting Degree of protection, internal components (DIN EN 60529) Degree of protection, terminals (DIN EN 60529 Enclosure material) IP30 IP20 polycarbonato
Mounting Degree of protection, internal components (DIN EN 60529) Degree of protection, terminals (DIN EN 60529 Enclosure material Screw mounting) IP3 IP2i polycarbonat 2 x M4 with mounting cli
Mounting Degree of protection, internal components (DIN EN 60529 Degree of protection, terminals (DIN EN 60529 Enclosure material) IP30

ating range of the rated frequency 15...460 Hz only

D00026 ≤ 150 g



Wiring diagram



LINETRAXX® VME421H

Multi-functional monitoring relay for undervoltage, overvoltage and frequency monitoring in AC/DC systems without separate supply voltage



Typical applications

- Voltage and frequency monitoring of single-phase machines and electrical installations
- Earth fault monitoring in mediumvoltage systems via voltage transformers
- · Monitoring of battery systems
- Switching machinery and equipment on and off at a certain voltage level

Device features

- Undervoltage and overvoltage monitoring of AC/DC systems in the frequency range DC/15...460 Hz device variant -1: 9,6...150 V device variant -2: 70...300 V
- Preset function: Automatic response value setting for undervoltage and overvoltage, < U and > U as well as for
 underfrequency and overfrequency < f and > f
- Voltage and frequency monitoring with window discriminator function, < U and > U as well as < f and > f
- · Without external supply voltage
- Integrated energy backup
- Indication of the system frequency f
- · Starting delay, response delay and release delay
- Adjustable switching hysteresis for *U* and *f*
- r.m.s. value measurement AC + DC
- Measured value display via multi-functional LC display
- Alarm indication via LEDs (AL1, AL2) and changeover contacts (K1, K2)
- N/C operation or N/O operation selectable
- Password protection against unauthorised parameter changing
- The fault memory can be activated or deactivated. In the "con" mode, all alarm parameters remain stored on failure of the nominal voltage being monitored ($U_n = U_S$)
- Start-up of the device with or without simulated alarm message
- Frequency alarm behaviour in case of measuring voltage failure can be parameterised

Approvals



Further information

For further information refer to our product range on www.bender.de.



Ordering information

Туре	Nominal system voltage ¹⁾ <i>U</i> n	Art.	No.
1,7,80	nommar system vortage on	Screw-type terminal	Push-wire terminal
VME421H-D-1	AC 9.6150 V, 15460 Hz / DC 9.6150 V	B93010003	B73010003
VME421H-D-2	AC 70300 V, 15460 Hz / DC 70300 V	B93010004	B73010004

¹⁾ Absolute values

Accessories

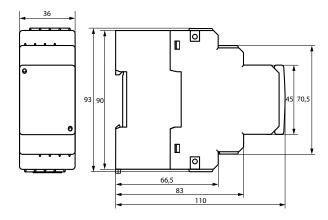
Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B 9806 0008



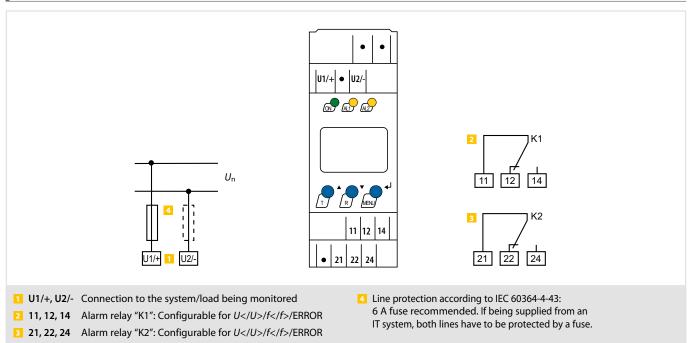
Insulation coordination acc. to IEC 60664-1/IEC 60		Displays, memory
Rated insulation voltage	250 V	Display Display range measured value
Rated impulse voltage/overvoltage category	4 kV/III	Display range measured value
Pollution degree		VME421H-D- 1
Protective separation (reinforced insulation) between:	(U1/+, U2/-) -(11-12-14) -(21-22-24)	VME421H-D- 2
Voltage test acc. to IEC 61010-1	2.21 kV	Operating uncertainty at 50/60 Hz
Supply voltage		Operating uncertainty voltage in the range of 15
VME421H-D-1:		Operating uncertainty in the frequency range 15
	none (internally supplied by U_n : 9,6150 V)	History memory (HiS) for the first alarm value
VME421H-D-2:	mone (internally supplied by oil: 5,6150 v)	Password
	none (internally supplied by U_n : 70300 V)	Fault memory (M) alarm relay
Supply voltage $U_{\rm S}$ Power consumption	$\frac{\text{Holle (Internally supplied by } o_0. 70500 \text{ V})}{\leq 6 \text{ VA}}$	Switching elements
rower consumption	<u>≤ 0 VA</u>	Number
Measuring circuit		Operating principle
Measuring range (rms value) (VME421H-D-1)	AC/DC 0150 V	K2: Err, $U < , U > $, Hz $<$
Measuring range (rms value) (VME421H-D-2)	AC/DC 0300 V	K1: Err, $U < V > Hz$
Rated frequency f_n	DC, 15460 Hz	Electrical endurance, number of cycles
Frequency display range	10500 Hz**	
		Contact data acc. to IEC 60947-5-1
Response values		Utilisation category
VME421H-D-1:		Rated operational voltage
Undervoltage $U < (Alarm 2)$	AC/DC 9.6150 V	Rated operational current
Overvoltage U > (Alarm 1)	AC/DC 9.6150 V	Minimum contact rating
Preset function:		Environment/EMC
Undervoltage $U < (0.85 U_{\rm n})^*$ for $U_{\rm n} = 120/60/24 \text{ V}$	102/51/20.4 V	EMC
Overvoltage $U > (1.1 U_{\rm n})^*$ for $U_{\rm n} = 120/60/24 {\rm V}$	132/66/26.4 V	Operating temperature
Resolution of setting <i>U</i> 9.649.9 V	0.1 V	· · · · · · · · · · · · · · · · · · ·
Resolution of setting <i>U</i> 50150 V	1 V	Classification of climatic conditions acc. to IEC
VME421H-D-2:		Stationary use (IEC 60721-3-3)
Undervoltage <i>U</i> < (ALARM 2)	AC/DC 70300 V	Transport (IEC 60721-3-2)
Overvoltage $U > (ALARM 1)$	AC/DC 70300 V	Long-term storage (IEC 60721-3-1)
Resolution of setting U 70300 V	1 V	Classification of mechanical conditions acc
Preset function:		Stationary use (IEC 60721-3-3)
Undervoltage $U < (0.85 U_n)^*$ for $U_n = 230/120 \text{ V}$	196/102 V	Transport (IEC 60721-3-2)
Overvoltage $U > (1.1 U_{\rm n})^*$ for $U_{\rm n} = 230/120 {\rm V}$	253/132 V	Long-term storage (IEC 60721-3-1)
VME421H:		Connection
Relative uncertainty voltage at DC, 50/60 Hz	±1.5 %, ±2 digits	
Relative uncertainty voltage in the range 15460 Hz	±3 %, ±2 digit	Connection type
Hysteresis <i>U</i>	140 % (5 %)*	Connection
Underfrequency Hz <	10500 Hz**	Connection properties
Overfrequency Hz >	10500 Hz**	rigid
Resolution of setting f 10.099.9 Hz	0.1 Hz	flexible
Resolution of setting f 100500 Hz	1 Hz	two conductors with the same cross sectio
Preset function:		rigid/flexible
Underfrequency for $f_n = 16.7 \text{ Hz} / 50 \text{ Hz} / 60 \text{ Hz} / 400 \text{ Hz}$	2 15.7 Hz / 49 Hz / 59 Hz / 399 Hz	Stripping length
Overfrequency for $f_n = 16.7 \text{ Hz} / 50 \text{ Hz} / 60 \text{ Hz} / 400 \text{ Hz}$	17.7 Hz / 51 Hz / 61 Hz / 401 Hz	Tightening torque, terminal screws
Hysteresis frequency Hys Hz	0.12 Hz (0.2 Hz)*	Connection
Relative uncertainty, frequency in the range of 15460	Hz ±0.2 %, ±1 digit	Connection properties
Time response		rigid
<u> </u>	0 200 - (0 -)*	flexible
Start-up delay t	0300 s (0 s)*	without ferrules
Response delay t _{on1/2}	0300 s (0 s)*	with ferrules
Delay on release toff	0300 s (0.5 s)*	Stripping length
Resolution of setting t, t _{on1/2} , t _{off} (010 s)	0.1 s	Opening force
Resolution of setting t, t _{on1/2} , t _{off} (1099 s)	1s	Test opening, diameter
Resolution of setting t , $t_{on1/2}$, t_{off} (100300 s)	10 s	
	16.7 Hz: ≤ 130 ms, AC 42460 Hz: ≤ 70 ms	Other
Operating time frequency tae	AC 15460 Hz: ≤ 310 ms	Operating mode
Response time t _{an}	$t_{\rm an} = t_{\rm ae} + t_{\rm on1/2}$	Mounting
Discharging time energy backup on power failure		Degree of protection, internal components (DIN
VME421H-D- 1	35	Degree of protection, terminals (DIN EN 60529
WATERCALL D. D.	2.5 s at $f_{\rm n}$ < 42 Hz	Enclosure material
VME421H-D- 2	\geq 4 s at DC 70 V	Screw mounting
	\geq 6 s at DC 80 V/AC 70 V	DIN rail mounting acc. to
Charging time energy backup		Flammability class
VME421H-D- 1	60 s	Documentation number
	60 s 120 s ≤ 300 ms	Documentation number Weight

VME421H-D-1	AC/DC 0150 \
VME421H-D- 2	AC/DC 0300 \
Operating uncertainty at 50/60 Hz Operating uncertainty voltage in the range of 15460 Hz	$\pm 1.5 \%$, $\pm 2 \text{ digit}$ $\pm 3 \%$, $\pm 2 \text{ digit}$
Operating uncertainty voltage in the lange of 13400 Hz Operating uncertainty in the frequency range 15460 Hz	
History memory (HiS) for the first alarm value	data record measured value
Password	off/0999 (off)
Fault memory (M) alarm relay	on/off/con (on)
	on, on, con (on)
Switching elements	2 4 1
Number	2 x 1 changeover contacts (K1, K2
Operating principle	N/C operation/N/O operation
	AL (undervoltage $U <: N/C$ operation n.c.)
KI: Err, $U < , U > , HZ < , HZ > , S$ Electrical endurance, number of cycles	S.AL (overvoltage $U >: N/O$ operation n.o.) 10,00
Contact data acc. to IEC 60947-5-1	10,000
Utilisation category	AC-13 / AC-14 / DC-12 / DC-12 / DC-1.
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	$1 \text{ mA at AC/DC} \ge 10^{\circ}$
	Time de Nejoc = 10
Environment/EMC	
EMC	IEC 61326-
Operating temperature	-25+55°
Classification of climatic conditions acc. to IEC 60721 (re	lated to temperature and relative humidity):
Stationary use (IEC 60721-3-3)	3K2
Transport (IEC 60721-3-2)	2K1
Long-term storage (IEC 60721-3-1)	1K2
Classification of mechanical conditions acc. to IEC 60	721
Stationary use (IEC 60721-3-3)	3M1
Transport (IEC 60721-3-2)	2M-
Long-term storage (IEC 60721-3-1)	1M1:
Connection	
Connection type	screw-type terminal or push-wire termina
Connection	screw terminal
Connection properties	
rigid .	0.24 mm ² (AWG 2412
flexible	0.22.5 mm ² (AWG 2414
two conductors with the same cross section	
rigid/flexible	0.21.5 mm ² (AWG 2416
Stripping length	89 mn
Tightening torque, terminal screws	0.50.6 Nn
Connection	push-wire terminal
Connection properties	
rigid	0.22.5 mm ² (AWG 2414
flexible	
without ferrules	0.752.5 mm ² (AWG 1914
with ferrules	0.21.5 mm ² (AWG 2416
Stripping length	10 mn
Opening force	501
Test opening, diameter	2.1 mn
Other	
Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (DIN EN 60529)	IP3
7 1	IP2
7 1	polycarbonat
Degree of protection, terminals (DIN EN 60529	
Degree of protection, terminals (DIN EN 60529 Enclosure material Screw mounting	
Degree of protection, terminals (DIN EN 60529 Enclosure material Screw mounting DIN rail mounting acc. to	IEC 6071
Degree of protection, terminals (DIN EN 60529 Enclosure material Screw mounting DIN rail mounting acc. to Flammability class	IEC 6071
Degree of protection, terminals (DIN EN 60529 Enclosure material Screw mounting DIN rail mounting acc. to	2 x M4 with mounting cli IEC 6071: UL94 V-I D0014' ≤ 240 (

LC display, multifunctional, not illuminated



Wiring diagram



LINETRAXX® VMD258

Undervoltage/overvoltage relay for monitoring three-phase AC systems (window function) for power plant applications



Typical applications

- Monitoring of the power supply of machines and electrical installations
- · Monitoring of loads
- Switching electrical systems on and off at a certain voltage level
- · Monitoring of stand-by and emergency supply systems

Approvals

CE LK

Device features

- · High availability due to purely analogue technology
- · Undervoltage and overvoltage monitoring for 3AC systems
- · No separate supply voltage required
- Separate alarm relays for undervoltage and overvoltage with two potential-free changeover contacts
- Adjustable response value: 0.7...0.95 x U_n / 1.05...1.3 x U_n
- Nominal system voltages: 3AC 690/500/480/440/400/230/110/100 V
- Adjustable response delay: 0...5 s
- LEDs for operation, overvoltage, undervoltage

Standards

The LINETRAXX® VMD258 series complies with the requirements of the device standards:

- DIN EN 60255-1 VDE 0435-300 (Measuring relays and protection equipment - Part 1: Common requirements (IEC 60255-1:2009)
- IEC 60255-127 Measuring relays and protection equipment - Part 127: Functional requirements for over/under voltage protection.

Further information

For further information refer to our product range on www.bender.de.

Ordering details

Туре	Connection	Art. No.
VMD258 3AC 100 V	3AC, 100 V	B93010060
VMD258 3AC 110 V	3AC, 110 V	B93010061
VMD258 3AC 230 V	3AC, 230 V	B93010062
VMD258 3AC 400 V	3AC, 400 V	B93010063
VMD258 3AC 440 V	3AC, 440 V	B93010064
VMD258 3AC 480 V	3AC, 480 V	B93010065
VMD258 3AC 500 V	3AC, 500 V	B93010066
VMD258 3AC 690 V	3AC, 690 V	B93010067

Accessories

Description	Art. No.
Additional mounting clips (screw mounting)	B98060008

Suitable system components

Description	Туре	Art. No.	Page
Energy backup	ES258	B93010068	315

Supply voltage U_S AC (V)	690	48	30/500	40	0/440	230	100	/110
Rated voltage AC (V)	1000			600		300		150
Rated impulse voltage (kV)	12		12		8	6		
Pollution degree								
Overvoltage category								II
Voltage ranges								
Frequency range of U_S						4	156	66 H
Operating range						0.5	1.3	x U
Short-time overload capability						1.5	x Us ⋅	< 1
Power consumption							≤ 1	0 V
Nominal supply voltage <i>U</i> _S 3AC (V)	690	500	480	440	400	230	110	100
Power consumption at 50 Hz, 1.3 x U_S (VA)	19	15	12	14	9	16	15	10
Power consumption at 60 Hz, 1.3 x U_S (VA)	11	9	8	8	6	9	9	7
Measuring circuit								
Nominal system voltage <i>U</i> _n		3AC	690/50	0/480	/440/4	00/230/		
Setting range							1.3	
Short-time overload capability							x Un ⋅	
Frequency range of <i>U</i> _n							156	
	3 3				хU			
Response value <i>U</i> _n adjustable							>U	l, <l< td=""></l<>
Response values								
Undervoltage < U (alarm)							.0.95	
Overvoltage >U (alarm)							1.3	
Relative uncertainty at the setting limits		4566 Hz: ±3 47.563 Hz: ±2						
Hysteresis					4,	.563		E2 % ∶3 %
Repetition accuracy								. 3 % ⊵1 %
LED ON								reen
Alarm for < U						I F	D (yel	
Alarm for >U							D (yel	
						LL	.D (yei	ilow
Time response Start-up delay t						500	ms ±2	20.0
Response delay t_{on}							5 s ±	
Delay on release t _{off}							ms ±2	
Operating time tae at overvoltage							1115 ±2 15* ±2	
Operating time t_{ae} at undervoltage						100 ms		
Response time t _{an}							= t _{ae} -	
Long-term influence						٠an -		+ ≀₀ 10 %
Overshooting time tov								0 m
	auisa						- 10	
Connection for external energy storage do U_{\min}	evice						DC	24 \
U _{max}								68 \
U_{typ} at 1.0 x U_{n}						424		
Short-circuit proof (Z+, Z-)							, v <u>→</u> rt tim	

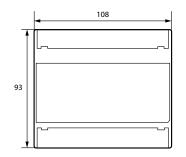
Switching elements	
Number of switching elements	2 x 2 changeover contacts
Operating mode	N/C operation (undervoltage
	N/O operation (overvoltage
Electrical endurance, number of cycles	10000
Contact data acc. to IEC 60947-5-1	
Utilisation category	AC-13 / AC-14 / DC-12 / DC-12 / DC 12
Rated operational voltage	230 V / 230 V / 220 / 110 / 24 \
Rated operational current	5 A / 3 A / 0,1 / 0,2 / 1 A
Minimum current	1 mA at AC/DC > 10 \
Environment/EMC	
EMC immunity	acc. to IEC 60255-26
EMC emission	acc. to IEC 60255-25
Operating temperature	-20+70°C
Climatic class acc. to DIN IEC 60721-3-3 (related to temp	perature and relative humidity)
Stationary use, except condensation	3K22
Transport	2K1°
Long-term storage	1K22
Classification of mechanical conditions acc. to IEC 60	721
Stationary use	3M1°
Transport	2M ⁴
Long-term storage	1M12
Requirements acc. to IEC 60255	Class 2
Connection	
Connection	screw terminal:
Connection properties	
rigid/flexible	0.22.5 mm
flexible with ferrule	0.252.5 mm
without/with plastic sleeve	0.252.5 mm
Conductor sizes (AWG)	2413
Tightening torque	0.50.6 Nm
Current through L1L1, L2L2 or L3L3	each max. 3 A

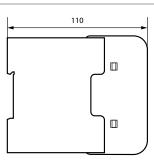
Operating mode

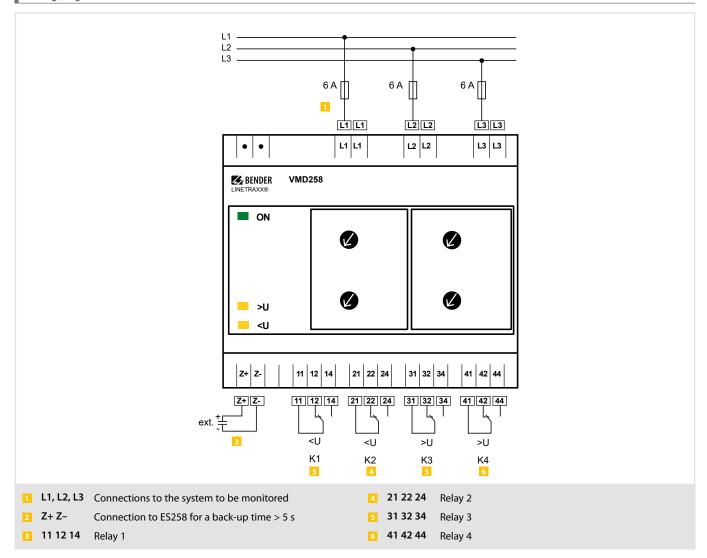
Operating mode	continuous operation
Position	any position
Degree of protection, internal components (DIN EN 60529)	IP30
Degree of protection, terminals (DIN EN 60529)	IP20
Enclosure material	polycarbonate
Flammability class	UL94 V-0
DIN rail mounting acc. to	IEC 60715
Screw mounting	4 x M4
Weight	825 g

- * Operating time \emph{t}_{ae} overvoltage increase from 100 % to 130 %, switching threshold
- ** Operating time \textit{t}_{ae} undervoltage decrease from 100 % to 0 %, switching threshold at 95 %

Dimension diagram (dimensions in mm)









Typical applications

• Supplementary device for the undervoltage/overvoltage relay VMD258.

Further information

For further information refer to our product range on www.bender.de.

Approvals



Ordering information

Туре	Art. No.
ES258	B93010068

Technical data

Insulation coordination according to IEC 60664-1

Rated insulation voltage	DC 100 V
Rated impulse voltage/pollution degree	800 V/3
Overvoltage category	II

Output Z1/Z2

Supply voltage	DC 4147 V (±30 %)
Storage capacity to supply the undervoltage and overvoltage relays	min. 5 s (±0.5 s)
Recovery time	≤ 60 s
Internal fuse, triggered in case of incorrect connection	yes

Environment/EMC

EMC immunity EMC emission	acc. to IEC 61000-6-2 acc. to IEC 61000-6-4
EMC GIIISSIOII	acc. to IEC 01000-0-4

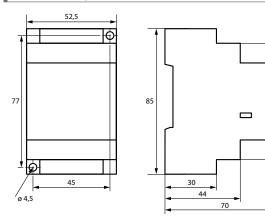
Connection

Connection	screw -type terminal
Connection properties	
single wire	2 x (0.54) mm ²
flexible with end ferrule	2 x (0.52.5) mm ²

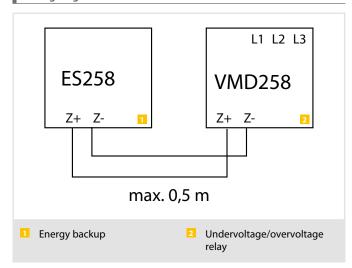
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Vulei	
Operating mode	continuous operation
Mounting	any position
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94V-0
Documentation number	D00086
Weight	≤ 160 g

Dimension diagram (dimensions in mm)



Wiring diagram



LINETRAXX® VMD420

Multi-functional voltage relay for 3(N)AC systems, frequency/overvoltage/undervoltage, phase, phase failure, asymmetry



Typical applications

- · Monitoring of voltage-sensitive machines and electrical installations
- · Switching machinery and equipment on and off at a certain voltage level
- · Monitoring of stand-by and emergency supply systems
- Supply voltage monitoring of portable loads
- Protection of three-phase motors against phase failure and phase open-circuit
- Transformer protection, asymmetrical load can be recognised

Device features

- Undervoltage, overvoltage and frequency monitoring in 3(N)AC systems 0...500 V
- · Asymmetry, phase failure and phase sequence monitoring
- Various monitoring functions selectable U <, U >, f <, f >
- Start-up delay, response delay and delay on release
- · Adjustable switching hysteresis
- rms value measurement (AC+DC)
- Digital measured value display via multi-functional LC display
- Preset function (automatic setting of basic parameters)
- LEDs: Power On, Alarm 1, Alarm 2
- Measured value memory for operating value
- · Continuous self monitoring
- · Internal test/reset button
- Two separate alarm relays (one changeover contact each)
- N/C or N/O operation and fault memory behaviour selectable
- · Password protection for device setting
- · Sealable transparent cover
- Two-module enclosure (36 mm)
- Push-wire terminal (two terminals per connection)
- · RoHS compliant

Standards

The VMD420 complies with the requirements of

• DIN EN 45545-2.

Further information

For further information refer to our product range on www.bender.de.









Ordering information

Туре	Supply voltage ¹⁾ U s	Art.	No.
1,750	Supply foliage 03	Screw-type terminal	Push-wire terminal
VMD420-D-1	AC 1672 V, 15460 Hz / DC 9,694 V	B93010005	B73010005
VMD420-D-2	AC/DC 70300 V, 15460 Hz	B93010006	B73010006

¹⁾ Absolute values

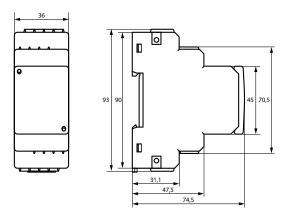
Accessories

Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B98060008

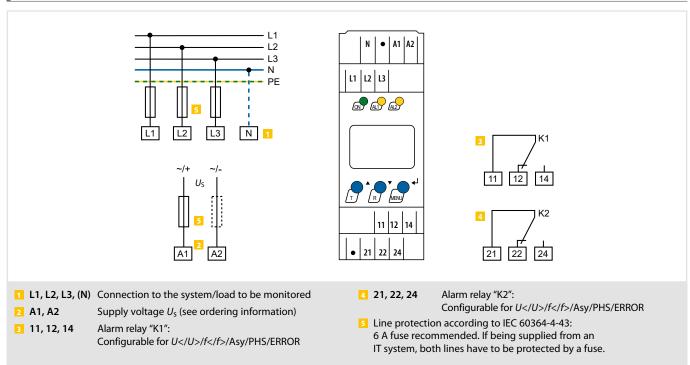
Insulation coordination acc. to IEC 60664-1/IEC 60664-3		Switching elements	
Rated insulation voltage	400 V	Number	2 x 1 changeover contacts (K1, K2)
Rated impulse voltage/pollution degree	4 kV/III	Operating principle	N/C operation n.c. or N/O operation n.c
Protective separation (reinforced insulation) between			S.AL (undervoltage $U <$, asymmetry Asy, N/C operation n.c.)
	L2, L3) -(11, 12, 14) -(21, 22, 24)		S.AL (overvoltage $U >$, asymmetry Asy, N/O operation n.o.)
Voltage test acc. to IEC 61010-1:	2 22 14/	Electrical endurance, number of cycles	10,000
(N, L1, L2, L3) -(A1, A2), (11, 12, 14) (N, L1, L2, L3) -(21, 22, 24)	3.32 kV 2.21 kV	Contact data acc. to IEC 60947-5-1:	
(N, L1, L2, L3) -(21, 22, 24) (A1, A2) -(11, 12, 14) -(21, 22, 24)	2.21 kV	Utilisation category	AC-13 / AC-14 / DC-12 / DC-12 / DC-13
(11,12) (11,12,14) (21,22,24)	Z.Z I KV	Rated operational voltage	230 V / 230 V / 24 V / 110 V / 220 V
Supply voltage		Rated operational current Minimum contact load (relay manufacturer's refe	5 A / 3 A / 1 A / 0.2 A / 0.1 A rence) 1 mA at AC/DC ≥ 10 \
VMD420-D-1:		Millillialli collact load (lelay mandiactulei s lele	TillA at AC/DC ≥ 10 t
Supply voltage $U_{\rm S}$	AC 1672 V/DC 9.694 V	Environment/EMC	
Frequency range $U_{\rm S}$	15460 Hz	EMC	EN 61326-1
VMD420-D-2:		Ambient temperatures:	
Supply voltage U _s	AC/DC 70300 V	Operation	-25+55°C
Frequency range U_{S}	15460 Hz	Transport	-25+70°C
Power consumption	≤ 4 VA	Storage	-25+55 °C
Management district			60721 (related to temperature and relative humidity):
Measuring circuit	ACO 200 V	Stationary use (IEC 60721-3-3)	3K22
Measuring range (rms value) (L-N) Measuring range (rms value) (L-L)	AC 0288 V AC 0500 V	Transport (IEC 60721-3-2)	2K11
Input impedance (burden) L1-N, L2-N, L3-N	AC 0500 V 1 MΩ	Long-term storage (IEC 60721-3-1)	1K22
Input impedance (burden) N	n.a.	Classification of mechanical conditions acc.	to IEC 60721
Rated frequency f _n	15460 Hz	Stationary use (IEC 60721-3-3)	3M1°
Frequency display range	10500 Hz	Transport (IEC 60721-3-2)	2M4
rrequericy display range	10500112	Long-term storage (IEC 60721-3-1)	1M12
Response values		Option "W" data different from the standar	d version
Type of distribution system	3(N)AC/3AC (3AC)*	Classification of climatic conditions acc. to IEC 607	721:
Undervoltage $U < (Alarm 2)$ (measurement method: $3Ph/3n$)	AC 6500/6288 V	Stationary use (IEC 60721-3-3)	3K23 (condensation and formation of ice is possible)
Overvoltage $U > (Alarm 1)$ (measurement method: $3Ph/3n$)	AC 6500/6288 V	Classification of mechanical conditions acc. to IEC	60721:
Resolution of setting <i>U</i>	1 V	Stationary use (IEC 60721-3-3)	3M12
Preset function for 3AC measurement:		Connection	
Undervoltage U < (0.85 Un)* for $U_n = 400/208 \text{ V}$	340/177 V		
Overvoltage U > $(1.1 \text{ Un})^*$ for $U_n = 400/208 \text{ V}$	440/229 V	Connection type	screw-type terminal or push-wire terminal
Preset function for 3(N)AC measurement:	10C/102 V	Connection	screw terminals
Undervoltage $U < (0.85 U_{\rm n})^*$ for $U_{\rm n} = 230/120 \text{ V}$	196/102 V	Connection properties	
Overvoltage $U > (1.1 U_{\rm n})^*$ for $U_{\rm n} = 230/120 \text{ V}$	253/132 V 530 % (30 %)*	rigid	0.24 mm ² (AWG 2412)
Asymmetry Phase failure	by setting the asymmetry	flexible	0.22.5 mm ² (AWG 2414)
	vise/anticlockwise rotation (off)*	two conductors with the same cross section	
Relative uncertainty, voltage at 50/60 Hz	±1.5 %, ±2 digits	rigid/flexible	0.21.5 mm² (AWG 2416) 89 mm
Relative uncertainty, voltage in the range 15460 Hz	±3 %, ±2 digits	Stripping length Tightening torque, terminal screws	0.50.6 Nm
Hysteresis <i>U</i>	140 % (5 %)*		
Underfrequency Hz <	10500 Hz**	Connection	push-wire terminals
Overfrequency Hz >	10500 Hz**	Connection properties	0.2 2.5 mm ² /AMC 24 14
Resolution of setting $f(10.099.9 \text{ Hz})$	0.1 Hz	rigid	0.22.5 mm ² (AWG 2414)
Resolution of setting $f(100500 \text{ Hz})$	1 Hz	flexible without ferrules	0.7E 2.5 mm ² (AWC 10 14)
Preset function:		with ferrules	0.752.5 mm² (AWG 1914) 0.21.5 mm² (AWG 2416)
Underfrequency for $f_0 = 16,7/50/60/400 \text{ Hz}$	15.7/49/59/399 Hz	Stripping length	0.21.3 IIIII (AWG 2410)
Overfrequency for $f_n = 16,7/50/60/400 \text{ Hz}$	17.7/51/61/401 Hz	Opening force	50 N
Hysteresis, frequency Hys Hz	0.12 Hz (0.2 Hz)*	Test opening, diameter	2.1 mm
Relative uncertainty, frequency range 15460 Hz	±0.2 %, ±1 digit		2.1 11111
C		Other	
Specified time		Operating mode	continuous operation
Start-up delay t	0300 s (0 s)*	Mounting	any position
Response delay t _{on1/2}	0300 s (0 s)*	Degree of protection, internal components (DIN E	
Delay on release t _{off}	0300 s (0.5 s)*	Degree of protection, terminals (DIN EN 60529	IP20
Resolution of setting t , $t_{on1/2}$, $t_{off}(010 s)$	0.1 s	Enclosure material	polycarbonate
Resolution of setting t , $t_{on1/2}$, t_{off} (1099 s)	1 s	Flammability class	UL94 V-0
Resolution of setting t, t _{on1/2} , t _{off} (100300 s)	10 s	DIN rail mounting acc. to	IEC 60715
Operating time, voltage t _{ae} Operating time, frequency t _{ae}	≤ 140 ms ≤ 335 ms	Screw mounting	2 x M4 with mounting clip
Response time t _{an}		Documentation number	D00137
Recovery time t _b	$t_{an} = t_{ae} + t_{on1/2}$ $\leq 300 \text{ ms}$	Weight	≤ 150 g
necorety unite ty	≥ 700 III2	()* = factory setting	
Displays, memory		** $=$ The technical data can only be ensured in	the operating range of the nominal
	multifunctional, not illuminated	frequency 15460 Hz.	
Display range measured value	AC/DC 0500 V		
Operating uncertainty, voltage at 50 Hz/60 Hz	±1.5 %, 2 digits		
Operating uncertainty voltage in the range of 15460 Hz	±3 %, ±2 digits		
Operating uncertainty, frequency in the range of 15460 Hz	±0.2 %, ±1 digit		
History memory (HiS) for the first alarm value	data record measured values		
Password	off/0999 (off/ 0)*		
Fault memory (M) alarm relay	on/off/con (on)*		

on/off/con (on)*

Fault memory (M) alarm relay



Wiring diagram



LINETRAXX® VMD421H

Multi-functional voltage relay for 3(N)AC systems, frequency/overvoltage/undervoltage, phase, phase failure, asymmetry



Typical applications

- Monitoring of voltage-sensitive machines and electrical installations
- Switching machinery and equipment on and off at a certain voltage level
- Monitoring of stand-by and emergency supply systems
- Supply voltage monitoring of portable loads
- Protection of three-phase motors against phase failure and phase open-circuit
- Transformer protection, asymmetrical load can be recognised

Device features

- Undervoltage, overvoltage and frequency monitoring in 3(N)AC systems 70...500/288 V
- · Without external supply voltage
- Integrated energy backup
- · Asymmetry, phase failure and phase sequence monitoring
- Various monitoring functions selectable U < U > f < f >
- · Start-up delay, response delay, delay on release
- · Adjustable switching hysteresis
- rms value measurement (AC+DC)
- · Digital measured value display via multi-functional LC display
- Preset function (automatic setting of basic parameters)
- LEDs: Power On, Alarm 1, Alarm 2
- Measured value memory for operating value
- · Continuous self monitoring
- · Internal test/reset button
- Two separate alarm relays (one changeover contact each)
- N/C or N/O operation and fault memory behaviour selectable
- · Password protection for device setting
- · Sealable transparent cover
- Two-module enclosure (36 mm)
- Push-wire terminal (two terminals per connection)
- RoHS compliant

Standards

The LINETRAXX® VMD421H series complies with the requirements of the device standards:

• IEC 61010-1

Approvals



Further information

For further information refer to our product range on www.bender.de.



Ordering information

Type Nominal system voltage 1) Un Art. No.		No.	
,,,,,,	nommar system to tage on	Screw-type terminal	Push-wire terminal
VMD421H-D-3	3(N)AC 70500 V, 15460 Hz	B93010007	B73010007

¹⁾ Absolute values

Accessories

Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B98060008

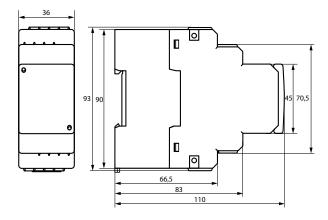
Insulation coordination acc. to IEC 60664-1/IEC 60664-3		Switching elements	
Rated insulation voltage	400 V	Number of changeover contacts	2 x 1 (K1, K2
Rated impulse voltage/Pollution degree	4 kV/III	Operating principle	N/C operation / N/O operation
Protective separation (reinforced insulation) between (N, L1, L2, L3) - (11, 12, 14) - (21, 22, 24)	K2: Err, $<$ U, $>$ U, Asy, $<$ Hz, $>$ Hz, PHS (und	ervoltage $<$ U, asymmetry Asy, N/C operation)
Voltage test acc. to IEC 61010-1:		K1: Err, $<$ U, $>$ U, Asy, $<$ Hz, $>$ Hz, PHS (over	ervoltage $>$ U, asymmetry Asy, N/O operation) $^{\circ}$
(N, L1, L2, L3) - (11, 12, 14)	3.32 kV	Electrical endurance, number of cycles	10000
N, L1, L2, L3) - (21, 22, 24)	2.21 kV	Contact data acc. to IEC 60947-5-1	
unnly voltage		Utilisation category	AC-13 / AC-14 / DC-12 / DC-12 / DC-12
Supply voltage	nana (intermally symple d by 11)	Rated operational voltage	230 V / 230 V /24 V / 110 V / 220 V
Supply voltage Us	none (internally supplied by U_n)	Rated operational current	5 A / 3 A / 1 A /0.2 A /0.1 A
Power consumption	≤ 6 VA	Minimum contact rating	1 mA at AC/DC ≥ 10 \
Measuring circuit		F	
Measuring range (r.m.s. value) (L-N)	AC 0288 V	Environment/EMC	
Measuring range (r.m.s. value) (L-L)	AC 0500 V	EMC	IEC 6132
Rated frequency $f_{\rm D}$	15460 Hz	Operating temperature	-25+55 °C
requency display range	10500 Hz	Classification of climatic conditions acc. to IEC 6072	1 (related to temperature and relative humidity):
		Stationary use (IEC 60721-3-3)	3K22
Response values		Transport (IEC 60721-3-2)	2K1
Type of distribution system	3(N)AC/3AC (3AC)*	Long-term storage (IEC 60721-3-1)	1K22
Jndervoltage $<$ U (Alarm 2) (measurement method: 3Ph/3n)		Classification of mechanical conditions acc. to IE	C 60721
Overvoltage > U (Alarm 1) (measurement method: 3Ph/3n)	AC 70500 V/70288 V	Stationary use (IEC 60721-3-3)	3M1
Resolution of setting <i>U</i>	1 V	Transport (IEC 60721-3-2)	2M4
Preset function for 3AC measurement:		Long-term storage (IEC 60721-3-1)	1M1
Jndervoltage $< U (0.85 U_n)^*$ for $U_n = 400/208 V$	340/177 V	-	
Overvoltage > U (1.1 $U_{\rm n}$)* for $U_{\rm n}$ = 400/208 V	440/229 V	Connection	
Preset function for 3(N)AC measurement:		Connection type	screw-type terminal or push-wire termina
Jndervoltage $< U (0.85 U_{\rm n})^*$ for $U_{\rm n} = 230/120 \text{ V}$	196/102 V	Connection	screw terminal
Overvoltage > $U (1.1 U_{\rm n})^*$ for $U_{\rm n} = 230/120 \text{ V}$	253/132 V	Connection properties	
Hysteresis <i>U</i>	140 % (5 %)*	rigid	0.24 mm ² (AWG 2412
Asymmetry	530 % (30 %)*	flexible	0.22.5 mm² (AWG 2414
Phase failure	by setting the asymmetry	Two conductors with the same cross section	,
Phase sequence	clockwise/anticlockwise rotation (off)*	rigid/flexible	0.21.5 mm ² (AWG 2416
Relative uncertainty, voltage at 50/60 Hz	± 1.5 %, ± 2 digits	Stripping length	89 mn
Relative uncertainty voltage in the range 15460 Hz	±3 %, ±2 digits	Tightening torque, terminal screws	0.50.6 Nn
Underfrequency < Hz	10500 Hz**	Connection	push-wire terminal
Overfrequency > Hz	10500 Hz**	Connection properties	pusii-wire teriliiliai
Resolution of setting f 10.099.9 Hz	0.1 Hz	rigid	0.22.5 mm ² (AWG 2414
Resolution of setting f 100500 Hz	1 Hz	flexible	0.22.5 mm (AWG 2414
By preset function :	45 7 (40 /50 /200)	without ferrules	0.752.5 mm² (AWG 1914
Underfrequency for $f_0 = 16.7/50/60/400 \text{ Hz}$	15.7/49/59/399 Hz	with ferrules	0.21.5 mm² (AWG 2416
Overfrequency for $f_n = 16.7/50/60/400 \text{ Hz}$	17.7/51/61/401 Hz	Stripping length	10 mn
Hysteresis frequency Hys Hz	0.12 Hz (0.2 Hz)*	Opening force	501
Relative uncertainty, frequency in the range of 15460 Hz	±0.2 %, ±1 digit	Test opening, diameter	2.1 mn
Time response		rest opening, diameter	2.1 11111
Start-up delay <i>t</i>	0300 s (0 s)*	Other	
Response delay $t_{\text{on1/2}}$	0300 s (0 s)*	Operating mode	continuous operation
Delay on release $t_{\rm off}$	0300 s (0.5 s)*	Mounting position	vertically, see dimension diagran
Resolution of setting t , $t_{on1/2}$, t_{off} (010 s)	0.1 s	Degree of protection, internal components (IEC 60529) IP3
Resolution of setting t , $t_{\text{on1/2}}$, t_{off} (1099 s)	1s	Degree of protection, terminals (IEC 60529)	IP3
Resolution of setting t , $t_{on1/2}$, t_{off} (100300 s)	10 s	Enclosure material	polycarbonat
Operating time, voltage t_{ae}	≤ 140 ms	Flammability class	UL94 V-
Operating time, frequency tae	≤ 335 ms	DIN rail mounting acc. to	IEC 60715
Response time t _{an}	$t_{\rm an} = t_{\rm ae} + t_{\rm on1/2}$	Screw mounting	2 x M4 with mounting cli
Discharging time energy backup on power failure	≥ 2.5 s	Documentation number	D0013
Charging time energy storage	≤ 60 s	Weight	≤ 240
3 3 3/ 3	≤ 300 ms	()* = factory setting	
Recovery time $t_{\rm b}$		• •	
•		** The technical data are only guaranteed within the	operating range of the rated
Displays, memory	Signlay multifunctional not illuminated	** The technical data are only guaranteed within the frequency (15460 Hz).	operating range of the rated
Displays, memory Display LC	display, multifunctional, not illuminated	, ,	operating range of the rated
Displays, memory Display LC Display LC Display LC	AC/DC 0500 V	, ,	operating range of the rated
Displays, memory Display LC Display range measured value Operating uncertainty, voltage at 50/60 Hz	AC/DC 0500 V ±1.5 %, ±2 digits	, ,	operating range of the rated
Display range measured value Operating uncertainty, voltage at 50/60 Hz Operating uncertainty voltage in the range of 15460 Hz	AC/DC 0500 V ±1.5 %, ±2 digits ±3 %, ±2 digits	, ,	operating range of the rated
Displays, memory Display LC or Display arange measured value Operating uncertainty, voltage at 50/60 Hz Operating uncertainty voltage in the range of 15460 Hz Operating uncertainty, frequency in the range of 15460 Hz	AC/DC 0500 V ±1.5 %, ±2 digits ±3 %, ±2 digits ±0.2 %, ±1 digit	, ,	operating range of the rated
Displays, memory Display LC Display range measured value Deperating uncertainty, voltage at 50/60 Hz Deperating uncertainty voltage in the range of 15460 Hz	AC/DC 0500 V ±1.5 %, ±2 digits ±3 %, ±2 digits	, ,	operating range of the rated

Off/0...999 (OFF)*

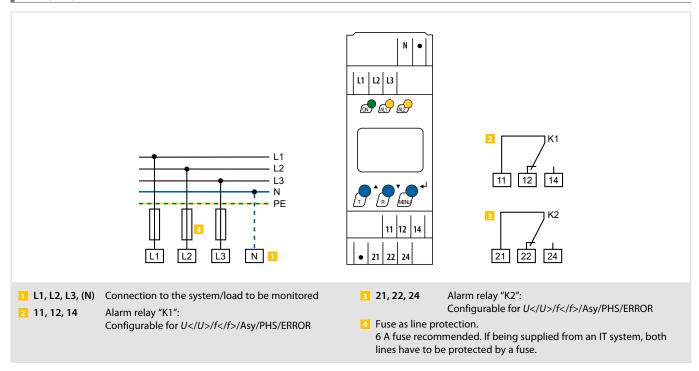
on/off/con (on)*

Password

Fault memory (M) alarm relay



Wiring diagram



LINETRAXX® VMD423/VMD423H

Three-phase voltage and frequency monitoring relay for CHPs (Combined Heat and Power plants), wind power stations, hydroelectric power plants and photovoltaic systems in accordance with DIN V VDE V 0126-1-1





Typical applications

- Monitoring of automatic switching points between private electricity generation power system in parallel operation with the public low voltage grid
- Applications according to DIN V VDE V 0126-1-1 (VDE V 0126-1-1), C 10/11, EN 50438
- Universally applicable for photovoltaic systems, CHPs (Combined Heat and Power plants), wind power and hydro power plants

· VMD423 with separate supply voltage

Device features

- VMD423H is supplied by the system being monitored
- Undervoltage, overvoltage and underfrequency and overfrequency monitoring in 3(N)AC systems AC 0...500 V
- · Monitoring of overvoltage by average determination of the latest 10-minute measuring interval
- · Asymmetry, phase failure and phase sequence monitoring
- · Start-up delay, response delay and delay on release
- · Adjustable switching hysteresis
- rms value measurement (AC+DC)
- Digital measured value display via multi-functional LC display
- LEDs: Power On, Alarm 1, Alarm 2
- Measured value memory for operating value
- · Continuous self monitoring
- · Internal test/reset button
- Two separate alarm relays (one changeover contact each)
- N/C or N/O operation and fault memory behaviour selectable
- Password protection for device settings
- · Sealable transparent cover
- Push-wire terminal (two terminals per connection)
- Two-module enclosure (36 mm)
- RoHS compliant





Certificates of non-objection

- DIN V VDE V 0126-1-1 (France, Switzerland)
- DIN V VDE V 0126-1-1 and EN 50438 (Czech Republic)
- · C 10/11 (Belgium)

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Supply voltage ¹¹ <i>U</i> ₅	Response value	Art. No.	
-7F-	54pp.y 10.1452 03		Screw-type terminal	Push-wire terminal
VMD423-D-1	AC 1672 V, 15460 Hz / DC 9,694 V	AC 10500 V	B93010020	B73010020
VMD423-D-2	AC 70300 V, 15460 Hz / DC 70300 V	AC 10500 V	B93010021	B73010021
VMD423H-D-3	U _n	AC 70500 V	B93010022	B73010022

¹⁾ Absolute values

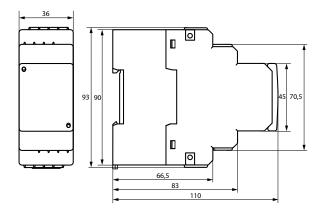
Accessories

Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B98060008

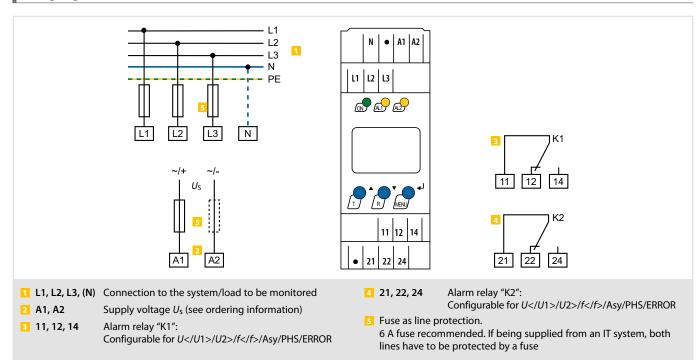
Insulation coordination acc. to IEC 60664-1/IEC		Switching elements	
Rated insulation voltage	400 V	Number	2 x 1 changeover contacts (K1, K2)
Rated impulse voltage/pollution degree	4 kV/III	Operating principle K1/K2	N/O operation n.o/N/C operation n.c
	1 1, A2) - (N, L1, L2, L3) - (11, 12, 14) - (21, 22, 24)	overfrequency > h	$\log > U$ 1, asymmetry Asy, underfrequency < Hz, I 2, alarm when starting SAL, N/C operation n.c.)*
Voltage test according to IEC 61010-1:			rvoltage $< U$, overvoltage $> U$ 1, asymmetry Asy,
(N, L1, L2, L3) - (A1, A2), (11, 12, 14)	3.32 kV	' '	< Hz, overfrequency $>$ Hz, phase sequence PHS ,
(N, L1, L2, L3) - (21, 22, 24)	2.21 kV		/2, alarm when starting SAL, N/C operation n.c.)*
(A1, A2) - (11, 12, 14) - (21, 22, 24)	2.21 kV	Electrical endurance, number of cycles	10000
Supply voltage		Contact data acc. to IEC 60947-5-1: Utilisation category	AC 13 / AC 14 / DC-12 / DC-12 / DC-12
VMD423-D-1:		Rated operational voltage	230 V / 230 V / 24 V / 110 V / 220 V
Supply voltage $U_{\rm S}$	AC 1672 V/DC 9.694 V	Rated operational current	5 A / 3 A / 1 A / 0.2 A / 0.1 A
Frequency range $U_{\rm S}$	15460 Hz	Minimum contact rating	1 mA at AC/DC \geq 10 V
VMD423-D-2:		Fundament /FMC	
Supply voltage $U_{\rm S}$	AC/DC 70300 V	Environment/EMC	IFC 44004
Frequency range U_s	15460 Hz	EMC	IEC 61326
Power consumption	≤ 3.5 VA	Operating temperature	- 25+ 55 °C
VMD423H-D-3:		Classification of climatic conditions acc. to IEC 607	
Supply voltage U_S	none (internally supplied by U_n)	Stationary use (IEC 60721-3-3)	3K22
Power consumption	≤ 5 VA	Transport (IEC 60721-3-2)	2K11
Moasuring circuit		Long-term storage (IEC 60721-3-1)	1K22
Measuring circuit	ACA 2004	Classification of mechanical conditions acc. to I	
Measuring range (r.m.s. value) (L-N) Measuring range (r.m.s. value) (L-L)	AC 0288 V AC 0500 V	Stationary use (IEC 60721-3-3)	3M11
Rated frequency f_0	4065 Hz	Transport (IEC 60721-3-2)	2M4
Frequency display range	25100 Hz	Long-term storage (IEC 60721-3-1)	1M12
	25100112	Connection	
Response values		Connection type	screw-type terminal or push-wire terminal
Type of distribution system	3(N)AC/3AC (3(N)AC)*	Connection	screw terminals
Undervoltage< U (Alarm 2)		Connection properties	Sciew terminals
(measurement method: 3Ph/3n)	AC 10500/10288 V (3n: AC 184 V)*	rigid	0.24 mm ² (AWG 2412)
Overvoltage > U1 (Alarm 1)		flexible	0.22.5 mm ² (AWG 2414)
(measurement method: 3Ph/3n)	AC 10500/10288 V (3n: AC 264 V)*	Two conductors with the same cross section	0.22.3 (
Overvoltage > U2 (Alarm 1)	AC 10	rigid/flexible	0.21.5 mm ² (AWG 2416)
(measurement method: 3Ph/3n)	AC 10500 V/10288 V (3n: AC 253 V)*	Stripping length	89 mm
Overvoltage <i>U</i> 2 Schrittweite <i>U</i>	10-minute average determination	Tightening torque, terminal screws	0.50.6 Nm
Hysteresis <i>U</i>	140 % (5 %)*	Connection	push-wire terminals
Asymmetry	530 % (30 %)*	Connection properties	F
Phase failure	by setting the asymmetry	rigid rigid	0.22.5 mm ² (AWG 2414)
Phase sequence	clockwise R/anticlockwise L (R/on)*	flexible	
Relative uncertainty, voltage at 50/60 Hz	±1.5 %, ±2 digits	without ferrules	0.752.5 mm ² (AWG 1914)
Underfrequency< Hz	4565 Hz (47.5 Hz)*	with ferrules	0.21.5 mm ² (AWG 2416)
Overfrequency > Hz	4565 Hz (50.2 Hz)*	Stripping length	10 mm
Resolution of setting f	0.1 Hz	Opening force	50 N
Hysteresis frequency Hys Hz	0.12 Hz (0.1 Hz)*	Test opening, diameter	2.1 mm
Relative uncertainty, frequency 4065 Hz	±0.1 %, ±1 digit	Other	
Time response		Operating mode	continuous operation
Start-up delay t	0300 s (30 s)*	Mounting	any position
Response delay t _{on1/2}	0300 s (0.1)	Degree of protection, internal components (IEC 6052)	
Delay on release t _{off}	0300 s (30 s)*	Degree of protection, terminals (IEC 60529)	IP30
Resolution of setting t , t_{off} , $t_{on1/2}$ (010 s)	0.1 s	Flammability class	UL94 V-0
Resolution of setting t , t_{off} , $t_{on1/2}$ (1099 s)	1s	DIN rail mounting acc. to	IEC 60715
Resolution of setting t , t_{off} , $t_{on1/2}$ (10.0300 s)	10 s	Enclosure material	polycarbonate
Operating time, voltage tae	≤ 80 ms	Screw mounting	2 x M4 with mounting clip
Operating time, frequency t _{ae}	≤ 80 ms	Documentation number	D00139
Response time t _{an}	$t_{\rm an} = t_{\rm ae} + t_{\rm on1/2}$	Weight	
Recovery time t _b	≤ 300 ms	VMD423	≤ 150 g
Displays, memory		VMD423H	≤ 240 g
	IC display multifunctional not illuminated	()* = Factory setting	
Display Display range measured value	LC display, multifunctional, not illuminated AC 0500 V		
Operating uncertainty, voltage at 50/60 Hz	± 1.5 %, ± 2 digits		
Operating uncertainty, voltage at 30,00 Hz Operating uncertainty, frequency in the range of 40			
History memory (HiS) for the first alarm value	data record measured values		
Password	off/on / 0999 (on/126)*		
Fault memory (M) alarm relay	on/off/con (off)*		
	on, on, con (on)		

VMD423

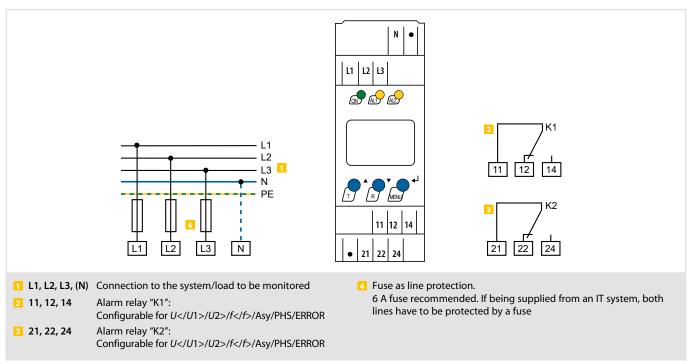
VMD423H



Wiring diagram – VMD423



Wiring diagram – VMD423H



LINETRAXX® VMD460-NA

Network and system protection (NS protection) for monitoring the power feed-in of power generation systems



Typical applications

- · Central NS protection (VDE-AR-N 4105)
- Protective disconnection (VDE-AR-N 4110, BDEW)
- Interface Protection (IP) (Engineering Recommendations; EREC G99, G59, G83, G59)
- · Protezione di interfaccia (CEI 0-21)
- · Automatic disconnection device between a generating plant parallel to the network and the public
- · Universal for generating plants for safe network decoupling

Approvals





Device features

- · Monitoring of different system types: 1AC, 3AC, 3NAC
- · Continuous monitoring of the phase voltage and line-to-line voltage
- (Re)connection and monitoring of the conditions
- Reconnection after
 - short interruptions
 - df/dt detection (ROCOF)
 - vector shift detection
- Voltage protection functions *U*<, *U*<<, *U*>> and *U*>
- Frequency protection functions f<, f<<, f>> and f>
- Islanding detection df/dt (ROCOF), vector shift detection
- · Unbalance detection
- · Monitoring of the tripping circuits and interface switches by means of contact feedback
- Remote trip: remote disconnection via ripple-control receiver
- Test function for checking the tripping circuit, the interface switch and for determining the connection times
- · Automatic self test
- Password protection
- · Reset device to factory settings
- · History memory of the last 300 faults with time stamp (real-time clock)
- Language selection (German, English, Italian)
- Remote configuration and remote maintenance using COM465IP and/or CP9...-I (RS-485)
- · Backlit graphic LC display
- · Sealable enclosure
- · Single-fault tolerance

Standard/application guide

- · VDE-AR-N 4105:2018-09
- VDE-AR-N 4105:2011-08
- VDE-AR-N 4110:2018-11
- BDEW-Richtlinie 2008 einschl. Ergänzungen bis 01.2013
- DIN V VDE V 0126-1-1(:2016-06, /A1:2012-02)
- CEI 0-21 (:2012-06, :V1:2012-12, :V2:2013-12, :2014-09, :V1:2014-12, :2016-07, V1:2017-07)
- · C10/11:2012-06
- · G98/1-4:2019
- · G83/2:2012
- · G99/1-4:2019
- G59/3:2013
- G59/2(:2010, -1:2011
- UL File No. E173157

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Supply voltage <i>U</i> s	Art. No.
VMD460-NA-D-2	AC/DC 100240 V	B93010045

Device version with push-wire terminal on request.

Accessories

Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B98060008

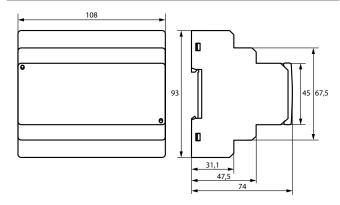


Insulation coordination acc. to IEC 60664-1/IEC 60664-3		Digital inputs	
Rated voltage	400 V	Monitoring of potential-free contacts or voltage inputs:	closed = low; 04 V; I _{in} < -5 mI
Rated impulse voltage/ Overvoltage category	6 kV/III		open = high; $> 6 \le 30$ \
Pollution degree	2	D1	feedback signal contact K
Protective separation (reinforced insulation) between		D2	feedback signal contact K
(A1, A2) - (L1, L2, L3,	N) - (11, 12, 14, 21, 22, 24)	D3	local control (mode
(D1, D2, D3, D4, DG1/2, DG3/4, RTG,	RT1)-(A1, A2, L1, L2, L3, N)	D4	external signal (mode
Voltage test according to IEC 61010-1:		RT1	remote tri
(N, L1, L2, L3) - (A1, A2), (11, 12, 14, 21, 22, 24)	3.32 kV	DG1/2, DG3/4, RTG	GN
Supply voltage		Max. length of the connecting cables of digital inputs	3 n
Nominal supply voltage <i>U</i> s	AC/DC 100240 V	Displays, memory	
Tommar supply votage of	DC/50/60 Hz	Display	LC display, multi-functional, illuminate
Operating range U_{S}	AC/DC 75300 V	Display range, measured value	AC/DC 0520
operating range of	DC/4070 Hz	Operating uncertainty, voltage	$U \le 280 \text{ V:} \le \pm 19$
Power consumption at AC 230 V	< 7.5 VA/< 3.5 W	operating uncertainty, voltage	U > 280 V: ±3 %
maximum	9 VA/3.5 W	Operating uncertainty, frequency	5 > 200 v. ±3 // ≤ ±0.1 %
Bridging time at $U_{\rm S} = 230$ V and dip to 0 V	600 ms	History memory for the last 300 messages	1 data record of measured values each
,	000 1113	Password	off/on/0999 (off)
Measuring circuit			2.1,2.1,2.1.2.2.(2.1,
System type	1AC, 3(N)AC	Switching elements	
Nominal system voltage $U_{\rm n}$ (r.m.s. value) (L-N)	AC 0300 V	Number of changeover contacts	2 x 1 (K1, K2
Nominal system voltage $U_{\rm n}$ (r.m.s. value) (L-L)	AC 0520 V	Operating mode	NC operation/NO operation
Input impedance (Load) L1, L2, N	480 kΩ	Electrical endurance in rated operating conditions	10,000 cycle
Input impedance (Load) L3	680 kΩ	Contact data acc. to IEC 60947-5-1	
Rated frequency f_n ($U_n > 20 \text{ V}$)	4565 Hz	Utilisation category	AC-13 / AC-14 / DC-12 / DC-12 / DC-1.
Response values	1150 %	Rated operational voltage	230 V / 230 V / 24 V / 110 V / 220 V
Relative uncertainty, voltage	$U \le 280 \text{ V}: \le \pm 1 \%$	Rated operational current	5 A** / 3 A / 1 A / 0.2 A / 0.1
	$U > 280 \text{ V: } \pm 3 \%$	Minimum contact rating	10 mA at AC/DC \geq 5 \
Resolution of setting, voltage	1 %		
Nominal frequency	50 Hz	** Rated operational current for UL508 and CSA C22.2 =	: 4 A
Relative uncertainty, frequency	≤ ±0.1 %	Environment/EMC	
Resolution of setting f	0.05 Hz	EMC	DIN EN 60255-26/CEI 0-2
Recording of measured value, switching condition		Operating temperature	-25+55°(
(reconnection and disconnection)		Classification of climatic conditions acc. to IEC 60721	
L-N, L-L	01.5 <i>U</i> _n	Stationary use (IEC 60721-3-3)	3K2
f<,f<<	4560 Hz	Transport (IEC 60721-3-2)	2K1
, f>,f>>	5065 Hz	Long-term storage (IEC 60721-3-1)	1K2
		Classification of mechanical conditions acc. to IEC	
Recording of measurement value, condition for disconnection			60721
	0.05 0.0 Uz/c		
ui/ui	0.059.9 Hz/s	Stationary use (IEC 60721-3-3)	3M1
	0.059.9 Hz/s	Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2)	3M1 2M-
Time response	0.059.9 Hz/s 40 ms60 min	Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1)	3M1 2M4
Time response Delay time for connection <i>t</i> _{on}		Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection	3M1 2M 1M2;
Time response Delay time for connection t _{on}		Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type	3M1 2M 1M2;
Time response Delay time for connection t_{0n} Resolution of setting t_{0n}	40 ms60 min	Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type Connection properties:	3M1 2M- 1M2 screw-type terminals or push-wire terminal
Time response Delay time for connection t_{on} Resolution of setting t_{on} < 50 ms:	40 ms60 min 5 ms	Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type Connection properties: rigid	3M1 2M- 1M2 screw-type terminals or push-wire terminal 0.24 mm² (AWG 2412
50200 ms:	40 ms60 min 5 ms 10 ms	Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type Connection properties: rigid flexible	3M1 2M- 1M2 screw-type terminals or push-wire terminal 0.24 mm ² (AWG 2412 0.22.5 mm ² (AWG 2414
Time response Delay time for connection t_{on} Resolution of setting t_{on} $< 50 \text{ ms}$: $50 \dots 200 \text{ ms}$: $200 \text{ ms} \dots 5 \text{ s}$:	40 ms60 min 5 ms 10 ms 50 ms	Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type Connection properties: rigid flexible Stripping length	3M1 2M- 1M2. screw-type terminals or push-wire terminal 0.24 mm² (AWG 2412 0.22.5 mm² (AWG 2414
Time response Delay time for connection t_{on} Resolution of setting t_{on} $< 50 \text{ ms}$: $50 \dots 200 \text{ ms}$: $200 \text{ ms} \dots 5 \text{ s}$: $5 \dots 10 \text{ s}$	40 ms60 min 5 ms 10 ms 50 ms 0.1 s	Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type Connection properties: rigid flexible	3M1 2M- 1M22 screw-type terminals or push-wire terminal 0.24 mm² (AWG 2412 0.22.5 mm² (AWG 2414 89 mn
Time response Delay time for connection t_{on} Resolution of setting t_{on} $< 50 \text{ ms}$: $50 \dots 200 \text{ ms}$: $200 \text{ ms} \dots 5 \text{ s}$: $5 \dots 10 \text{ s}$ $10 \text{ s} \dots 60 \text{ s}$:	40 ms60 min 5 ms 10 ms 50 ms 0.1s	Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type Connection properties: rigid	3M1 2M- 1M22 screw-type terminals or push-wire terminal 0.24 mm² (AWG 2412 0.22.5 mm² (AWG 2414 89 mn
Time response Delay time for connection ton Resolution of setting ton < 50 ms: 50 200 ms: 200 ms 5 s: 5 10 s 10 s 60 s: 60 300 s: 300 s 60 min:	40 ms60 min 5 ms 10 ms 50 ms 0.1 s 1 s	Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type Connection properties: rigid	3M1 2M- 2M- 1M2 screw-type terminals or push-wire terminal 0.24 mm² (AWG 2412 0.22.5 mm² (AWG 2414 89 mm 0.50.6 Nm (57 lb-in
Time response Delay time for connection t_{on} Resolution of setting t_{on} $< 50 \text{ ms}$: $50 \dots 200 \text{ ms}$: $200 \text{ ms} \dots 5 \text{ s}$: $5 \dots 10 \text{ s}$ $10 \text{ s} \dots 60 \text{ s}$: $60 \dots 300 \text{ s}$: $300 \text{ s} \dots 60 \text{ min}$: Operating time voltage t_{ae}	40 ms60 min 5 ms 10 ms 50 ms 0.1 s 1 s 10 s 1 min	Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type Connection properties: rigid	3M1 2M- 2M- 1M2 screw-type terminals or push-wire terminal 0.24 mm² (AWG 2412 0.22.5 mm² (AWG 2414 89 mn 0.50.6 Nm (57 lb-in
Time response Delay time for connection t_{on} Resolution of setting t_{on} < 50 ms: 50 200 ms: 200 ms 5 s: 5 10 s 10 s 60 s: 60 300 s: 300 s 60 min: Operating time voltage t_{ae} Operating time, frequency t_{ae}	40 ms60 min 5 ms 10 ms 50 ms 0.1 s 1 s 10 s 1 min half a supply period ≤ 40 ms	Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type Connection properties: rigid flexible Stripping length Tightening torque Other Operating mode Mounting	3M1 2M 1M2 screw-type terminals or push-wire terminal 0.24 mm² (AWG 2412 0.22.5 mm² (AWG 2414 89 mr 0.50.6 Nm (57 lb-in
Time response Delay time for connection t_{on} Resolution of setting t_{on} < 50 ms: 50 200 ms: 200 ms 5 s: 5 10 s 10 s 60 s: 60 300 s: 300 s 60 min: Operating time voltage t_{ae} Operating time, frequency t_{ae}	40 ms60 min 5 ms 10 ms 50 ms 0.1 s 1 s 10 s 1 min half a supply period	Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type Connection properties: rigid flexible Stripping length Tightening torque Other Operating mode Mounting Degree of protection, internal components (DIN EN 6052	3M1 2M 1M2 screw-type terminals or push-wire terminal 0.24 mm² (AWG 2412 0.22.5 mm² (AWG 2414 89 mr 0.50.6 Nm (57 lb-in continuous operatio any positio
Time response Delay time for connection t_{on} Resolution of setting t_{on} < 50 ms: 50 200 ms: 200 ms 5 s: 5 10 s 10 s 60 s: 60 300 s: 300 s 60 min: Operating time voltage t_{ae} Operating time, frequency t_{ae}	40 ms60 min 5 ms 10 ms 50 ms 0.1 s 1 s 10 s 1 min half a supply period ≤ 40 ms	Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type Connection properties: rigid flexible Stripping length Tightening torque Other Operating mode Mounting Degree of protection, internal components (DIN EN 6052) Degree of protection, terminals (DIN EN 60529)	3M1 2M- 2M- 1M2 screw-type terminals or push-wire terminal 0.24 mm² (AWG 2412 0.22.5 mm² (AWG 2414 89 mn 0.50.6 Nm (57 lb-in continuous operation any position (9) IP36
Time response Delay time for connection t_{on} Resolution of setting t_{on} < 50 ms: 50 200 ms: 200 ms 5 s: 5 10 s 10 s 60 s: 60 300 s: 300 s 60 min: Operating time voltage t_{ae} Operating time, frequency t_{ae}	40 ms60 min 5 ms 10 ms 50 ms 0.1 s 1 s 10 s 1 min half a supply period ≤ 40 ms	Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type Connection properties: rigid	3M1 2M4 1M22 screw-type terminals or push-wire terminals 0.24 mm² (AWG 2412 0.22.5 mm² (AWG 2414 89 mm 0.50.6 Nm (57 lb-in continuous operatior any positior any positior (9) IP30 polycarbonate
Time response Delay time for connection t_{on} Resolution of setting t_{on} < 50 ms: 50 200 ms: 200 ms 5 s: 5 10 s 10 s 60 s: 60 300 s: 300 s 60 min: Operating time voltage t_{ae} Operating time, frequency t_{ae}	40 ms60 min 5 ms 10 ms 50 ms 0.1 s 1 s 10 s 1 min half a supply period ≤ 40 ms	Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type Connection properties: rigid flexible Stripping length Tightening torque Other Operating mode Mounting Degree of protection, internal components (DIN EN 6052) Enclosure material Flammability class	screw-type terminals or push-wire terminals 0.24 mm² (AWG 2412 0.22.5 mm² (AWG 2414 89 mm 0.50.6 Nm (57 lb-in) continuous operatior any positior any positior (9) IP30 polycarbonate UL94 V-C
Time response Delay time for connection t_{on} Resolution of setting t_{on} $< 50 \text{ ms}$: $50 \dots 200 \text{ ms}$: $200 \text{ ms} \dots 5 \text{ s}$: $5 \dots 10 \text{ s}$ $10 \text{ s} \dots 60 \text{ s}$: $60 \dots 300 \text{ s}$:	40 ms60 min 5 ms 10 ms 50 ms 0.1 s 1 s 10 s 1 min half a supply period ≤ 40 ms	Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type Connection properties: rigid flexible Stripping length Tightening torque Other Operating mode Mounting Degree of protection, internal components (DIN EN 60529) Enclosure material Flammability class DIN rail mounting acc. to	3M1 2M4 1M22 screw-type terminals or push-wire terminals 0.24 mm² (AWG 2412 0.22.5 mm² (AWG 2414 89 mm 0.50.6 Nm (57 lb-in continuous operatior any positior any positior (9) IP30 polycarbonate UL94 V-C IEC 60715
Time response Delay time for connection t_{on} Resolution of setting t_{on} < 50 ms: 50 200 ms: 200 ms 5 s: 5 10 s 10 s 60 s: 60 300 s: 300 s 60 min: Operating time voltage t_{ae} Operating time, frequency t_{ae}	40 ms60 min 5 ms 10 ms 50 ms 0.1 s 1 s 10 s 1 min half a supply period ≤ 40 ms	Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type Connection properties: rigid flexible Stripping length Tightening torque Other Operating mode Mounting Degree of protection, internal components (DIN EN 6052) Enclosure material Flammability class	screw-type terminals or push-wire terminals 0.24 mm² (AWG 2412 0.22.5 mm² (AWG 2414 89 mm 0.50.6 Nm (57 lb-in) continuous operatior any positior any positior (9) IP30 polycarbonate

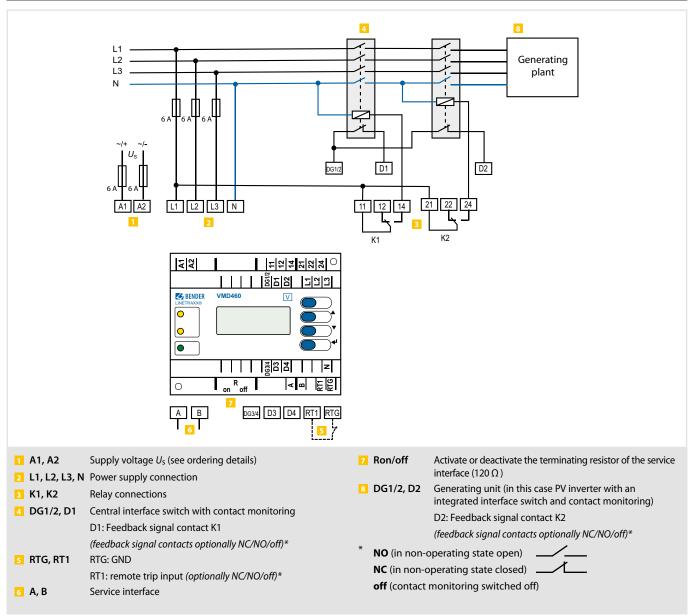
Weight

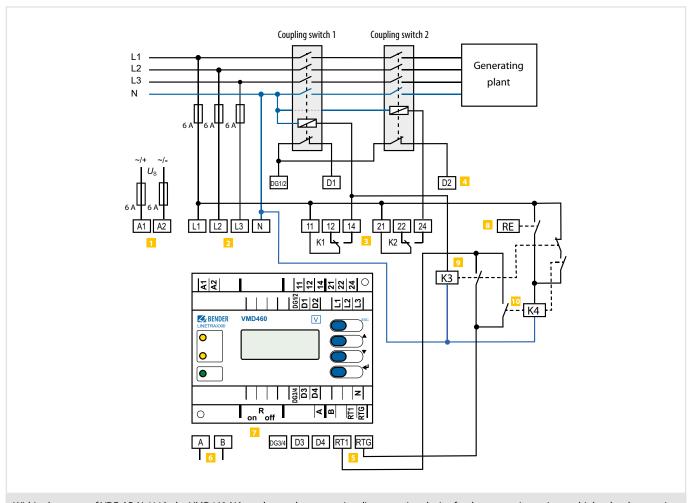
()* = Factory setting

≤ 360 g



Wiring diagram VMD460 (VDE-AR-N 4105:2018 – basic program 4105_2)



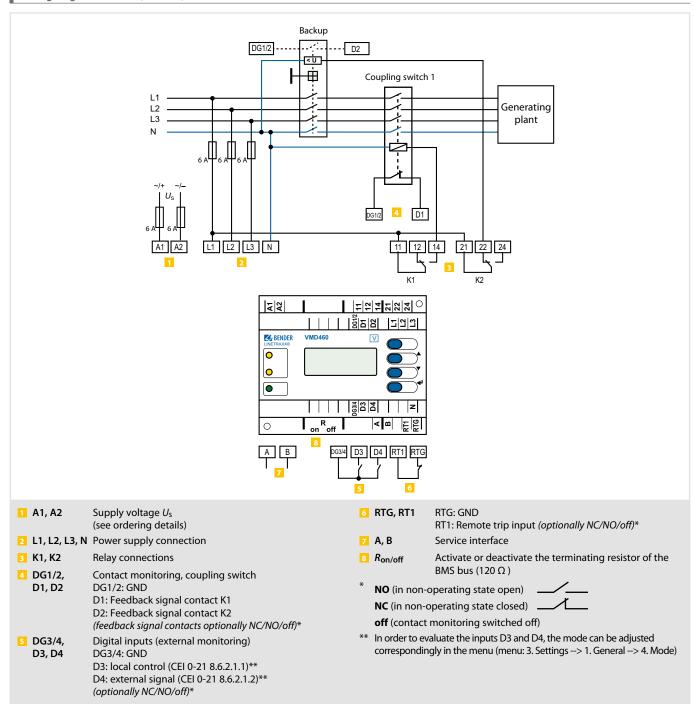


Within the scope of VDE-AR-N 4110, the VMD460-NA can be used as protective disconnection device for the generating unit or as higher-level protective disconnection, the latter, however, only if the Q-U protection function may be dispensed with. According to VDE-AR-N 4110 chapter 10.3.3.4 par. 5, this is possible after consultation with the network operator and under the following conditions:

- · Generating plants with limited dynamic network support or
- Generating plants < 1 MVA

Both types of application are possible when the generating plant is connected to the busbar of a substation (MV-busbar) or when the generating plant is connected to the medium-voltage network (MV-network).

1 A1, A2 2 L1, L2, L3, N 3 K1, K2	Supply voltage U_s (see ordering details) Power supply connection Relay connections	7 R _{on/off}	Activate or deactivate the terminating resistor of the service interface (120 Ω) Ripple-control receiver
DG1/2, D1, D2	Contact monitoring coupling switchDG1/2: GND D1: Feedback signal contact K1 D2: Feedback signal contact K2 (feedback signal contacts optionally NC/NO/off)*		External relay with an N/C contact and an N/O contact External relay with two N/O contacts D4 Not used for the standard mentioned before
5 RTG, RT1 6 A, B	RTG: GND RT1: remote trip input (optionally NC/NO/off)* Service interface	* NO (in non-operating state open) NC (in non-operating state closed) off (contact monitoring switched off)	



LINETRAXX® VMD461 with CD440 coupling device

Multifunctional voltage relay for AC, DC, 3(N)AC systems



Typical applications

- · Monitoring of voltage-sensitive machines and installations
- · Switching installations on and off at a certain voltage level
- Protection of three-phase motors against phase failure and phase open-circuit
- Vector shift detection for protection of electrical machines
- Islanding detection ROCOF (rate of change of frequency)
- Transformer protection by recognising asymmetrical load

Approvals





Device features

- When combined with a CD440 coupling device, DC systems up to 1200 V, 1AC systems up to 690 V, 3AC systems up to 1200 V and 3NAC systems up to 690 V can be monitored
- · All functions are represented in ANSI codes
- Monitoring of DC, 1AC, 3(N)AC systems DIN EN 60255-1:2010-9
- · Single-fault safety
- · Unbalance, phase failure and phase sequence monitoring
- Monitoring of the connected switches and/or disconnectors (configurable: NC/NO/off)
- Islanding detection df/dt (ROCOF)
- Vector shift function
- RS-485 interface (data exchange/parameter setting/software update)
- Test function to determine the switch-off time
- Test button for the trigger circuit
- The last 300 network faults can be recalled with time stamp/real-time clock
- · Continuous monitoring of the phase voltage and line-to-line voltage
- Special switch-on conditions after an infringement of a response value
- Language selection (German, English, French)
- · Backlit graphic LC display
- · Password protection for device setting
- · Remote shutdown via ripple control signal receiver
- · Sealable enclosure

Standards

The device fulfils the requirements of the following standards:

- DIN EN 60255-127 (IEC 60255-127)
- · VDE 0435-3127
- UL File: E173157

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Description	Supply voltage <i>U</i> ₅	Art. No.
VMD461-D-2	Multifunctional voltage relay	AC/DC 100240 V	B93010047
CD440	Coupling device	=	B73010046

Accessories

Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B98060008

Suitable system components

Description	Device variants / Supply voltage <i>U</i> s	Туре	Art. No.	Page
Candition Maniton	with an interweted materials Dander system (Tables and	COM465IP	B950610	417
Condition Monitor	with an integrated gateway: Bender system/Ethernet	CP9I	B9506103	431
RS-485 repeater	AC/DC 24 V ± 20 %	DI-1PSM	B95012044	-

C2/(IC36) 300 V C3/(IC46) 300 V C4/(IC56) 300 V C5/(IC6) 300 V	DC, 1AC, 3AC, 3NAC AC 250690 V AC 4401200 V DC 2501200 V AC 250600 V AC 440600 V DC 250600 V 01.15 \times Un 1.5 \times Un max for 5 s 1150 % $\leq \pm 2\%$ DC, 50/60 Hz DC, 4565 Hz 0.05 Hz $\leq \pm 0.1\%$
CF-NOT- CF-	AC 4401200 V DC 2501200 V AC 250600 V AC 440600 V DC 250600 V 01.15 $\times U_n$ 1.5 $\times U_n$ max for 5 s 1150 % $\leq \pm 2$ % DC, 50/60 Hz DC, 4565 Hz 0.05 Hz
C C C C C C C C	AC 4401200 V DC 2501200 V AC 250600 V AC 440600 V DC 250600 V 01.15 $\times U_n$ 1.5 $\times U_n$ max for 5 s 1150 % $\leq \pm 2$ % DC, 50/60 Hz DC, 4565 Hz 0.05 Hz
Measuring drout (IC)	DC 2501200 V AC 250600 V AC 440600 V DC 250600 V 01.15 \times U_n 1.5 \times U_n max for 5 s 1150 % $\leq \pm 2$ % DC, 50/60 Hz DC, 4565 Hz 0.05 Hz
Measuring circuit (ICQ)	AC 250600 V AC 440600 V DC 250600 V 01.15 \times U_n 1.5 \times U_n max for 5 s 1150 % $\leq \pm 2$ % DC, 50/60 Hz DC, 4565 Hz
Supply critait (IG) VMAH61 (IAI, AZ) (IC) Control circuit (IC4) VMAH61 (ID, AZ) EATZ, RIT, RIT ID, and the circuit (IC4) Control circuit (IC4) VMAH61 (ID, AZ) EATZ, RIT, RIT ID, and the circuit (IC4) Control circuit (IC4) VMAH61 (ID, AZ) EATZ, RIT, RIT ID, and the circuit (IC4) COL (IC+/IC-) COL (IC+/IC-) COL (IC+/IC-) Collection (IC4)	AC 440600 V DC 250600 V $01.15 \times U_n$ $1.5 \times U_n$ max for 5 s 1150 % $\leq \pm 2 \%$ 1 % DC, 50/60 Hz DC, 4565 Hz
Control (Circil (Circil (Circil (Circ) (C	AC 440600 V DC 250600 V $01.15 \times U_n$ $1.5 \times U_n$ max for 5 s 1150 % $\leq \pm 2 \%$ 1 % DC, 50/60 Hz DC, 4565 Hz
CL + CD -	DC 250600 V 01.15 x U_n max for 5 s 1150 % $\leq \pm 2$ % DC, 50/60 Hz DC, 4565 Hz 0.05 Hz
Measuring range Measuring	$01.15 \times U_n$ $1.5 \times U_n$ max for $5 \times U_n$ max for $5 \times U_n$ max for $5 \times U_n$ 1150% 11
New North College	1.5 x U_n max for 5 s 1150 % $\leq \pm 2$ % 1 % DC, 50/60 Hz DC, 4565 Hz 0.05 Hz
Reposite voltage	$\begin{array}{c} 1 \dots 150 \% \\ \leq \pm 2 \% \\ 1 \% \\ \text{DC, 50/60 Hz} \\ \text{DC, 45} \dots 65 \text{Hz} \\ 0.05 \text{Hz} \end{array}$
C	≤ ±2 % 1 % DC, 50/60 Hz DC, 4565 Hz 0.05 Hz
C2	1 % DC, 50/60 Hz DC, 4565 Hz 0.05 Hz
C	DC, 50/60 Hz DC, 45 65 Hz 0.05 Hz
CS CS CS CS CS CS CS CS	DC, 4565 Hz 0.05 Hz
Overvoltage category IIII Max. alittude Recording of measurement values, switch-on condition (1C/I/C2	≤ ±0.1 %
Max. altitude	
MAX. attitude	
CZ/ CZ6	
C C C C C C C C	1100 %
(4/(ICS6)	100150 % 4560 Hz
Color Colo	4560 HZ 5065 Hz
Recording of measurement value, switch-off condition	right, left
Pollution degree 3 U, U < \ U < \ U \ U \ U \ U \ U \ U \ U \	rigitt, icit
CZ/(IC36)	
C2/(IC36)	1100 %
CZ/(IC36)	100150 %
C3/(IC46)	4560 Hz
Cd-/(ICS6)	5065 Hz
C5/IC6	0.059.95 Hz/s
Protective separation (reinforced insulation): Time response IC1/(IC36) DC, 3AC: Overvoltage category III, 1250 V 1AC, 3NAC: Overvoltage category III, 1000 V 1AC, 3N	125 %
CZ/(IC36) DC, 3AC: Overvoltage category III, 1250 V 1AC, 3NAC: Overvoltage category III, 1250 V 1AC, 3NAC: Overvoltage category III, 1000 V CZ/(IC36) 300 V CZ/(IC36) 300 V CZ/(IC56) 300 V CZ/(IC56) 300 V CZ/(IC56) 300 V CZ/(IC36) 300 V	150 %
CZ/(IC36) CZ/(
C2/(IC36) 300 V	ms60 min (200 ms)*
C3/(IC46) 300 V C3/(IC46) 300 V C3/(IC46) 300 V C5/(C6 300 V C2/(IC36) 300 V C2/(IC36) 300 V C3/(IC46) 300 V C3	ms60 min (100 ms)*
C4/(IC56) 300 V C5/IC6 300 V	ms60 min (100 ms)*
IC5/IC6 300 V Operating time, frequency t_{ae} Voltage test (routine test) acc. to IEC 60255-27/DIN EN 50178:1998 EC2/IC36) 2.21 kV Digital inputs IG3/IC46) 2.21 kV Monitoring of potential-free contacts or voltage inputs: closed = IC4/IC56) 2.21 kV D1 Feedback signal IC5/IC6 2.21 kV D2 Feedback signal	half a supply period
Recovery time t_b Recovery time t_b IC2/(IC36)2.21 kVDigital inputsIC3/(IC46)2.21 kVMonitoring of potential-free contacts or voltage inputs:closed =IC4/(IC56)2.21 kV0IC5/IC62.21 kVD1Feedback signalD2Feedback signal	≤ 40 ms
C2/(IC36) 2.21 kV Digital inputs C2/(IC36) 2.21 kV Monitoring of potential-free contacts or voltage inputs: C2/(IC56)	300 ms
C3/(IC46) 2.21 kV Monitoring of potential-free contacts or voltage inputs: closed = IC4/(IC56) 2.21 kV IC5/IC6 2.21 kV D1 Feedback signal D2 Feedback signal D3 Feedback signal D4 Feedback signal D5 Feedback signal D5 Feedback signal D6 Feedback signal D7 Feedback sig	
IC4/(IC56) 2.21 kV 0 IC5/IC6 2.21 kV D1 Feedback signal D2 Feedback signal	ow; 04 V; lin < -5 mA
IC5/IC6 2.21 kV D1 Feedback signal D2 Feedback signal	oen = high; > 6 ≤ 30 V
D2 Feedback signal	contact of alarm relay K1
	contact of alarm relay K2
Supply voltage RT1	remote trip
Nominal supply voltage U_5 100240 V DG1/2, RTG	GND
Tolerance U_s $\pm 25\%$ max, length of the connecting cables of the digital inputs	
Nominal frequency range <i>U</i> _s DC, 50/60 Hz (shielded cable recommended)	10 m
Power consumption at AC 230 V < 3.5 W/ < 7.5 VA	
maximum 3.5 W/9 VA Displays, memory	: Employ - 1 :00 - 1 - 1
Moscuring circuit	i-functional, illuminated
Display range, measured value	09.99 kV record measured values
System type DC, 1AC, 3AC, 3NAC Password	on/off/0999 (off*)
Nominal voltage // ₅	011/011/0277 (UII")
L-N) AC 50260 V Interface	
(L-L) AC 87450 V Interface/protocol	RS-485/BMS
(DC+/DC-) DC 50450 V Baud rate	9.6 kBit/s
Measuring range $01.15 \times U_n$ Cable length	01200 m
Overload capacity 1.5 x $U_{\rm n}$ max for 5 s Recommended cable (shielded, shield connected to PE on one side)	
Response values 1150% Terminating resistor $120 \Omega (0.25 \text{ W}) \text{ cc}$	
Operating uncertainty U_n $\leq \pm 1\%$ Device address, BMS bus	nnectable via DIP switch
Resolution of setting $U_{\rm n}$ 1%	
Rated frequency DC, 50/60 Hz	nin. J-Y(St)Y min. 2 x 0.8 nnectable via DIP switch 190 (2)*
Frequency range U_n DC, 4565 Hz	nnectable via DIP switch
Resolution of setting f 0.05 Hz	nnectable via DIP switch
Relative uncertainty $f \le \pm 0.1 \%$	nnectable via DIP switch

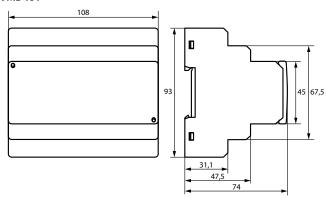
Technical data (continued))

Number of changeover contacts		2 x 1 (K1, K2)
Operating principle K1, K2	N/C operation or N/O	operation (N/C)*
Electrical endurance under rated operating con-	ditions, number of cycles	10,000
Contact data acc. to IEC 60947-5-1:		
Utilisation category	AC-13 / AC-14 / DC-1	2 / 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 m <i>A</i>	at AC/DC \geq 10 V
Environment/EMC		
EMC		DIN EN 60255-26
Operating temperature		−25…+55 °C
Classification of climatic conditions acc. to IE	C 60721 (related to temperature and re	elative humidity):
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	c. to IEC 60721:	
Stationary use (IEC 60721-3-3)		3M11
Transport (IEC 60721-3-2)		2M4
Hallsport (IEC 00/21-3-2)		ZIVIT

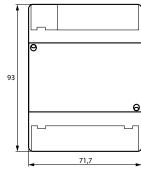
Connection VMD461	
Connection	screw-type terminal
Connection properties:	
rigid	0.24 mm ² (AWG 2412
flexible with ferrule	0.22.5 mm ² (AWG 2414
Stripping length	89 mn
Tightening torque	0.50.6 Nm (57 lb-in
Connection CD440	
Connection	push-wire terminal
Connection properties	
rigid	0.22.5 mm ² (AWG 2414
flexible without ferrule	0.752.5 mm ² (AWG 1914
flexible with ferrule	0.21.5 mm ² (AWG 2416
Stripping length	10 mn
Opening force	50 N
Test opening, diameter	2.1 mn
Other	
Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (DIN EN 60529)	IP30
Degree of protection, terminals (DIN EN 60529)	IP20
Enclosure material	polycarbonate
Flammability class	UL94 V-(
DIN rail mounting acc. to	IEC 6071:
Screw mounting CD440	2 x M4 with mounting clip
Screw mounting VMD461	2 x M
Software version, measurement technology	D570 V1.2
Software version, display	D256 V2.3:
Weight	
VMD461	≤ 360
CD440	≤ 125 0

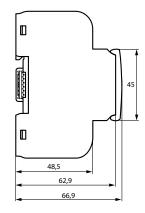
Dimension diagram (dimensions in mm)

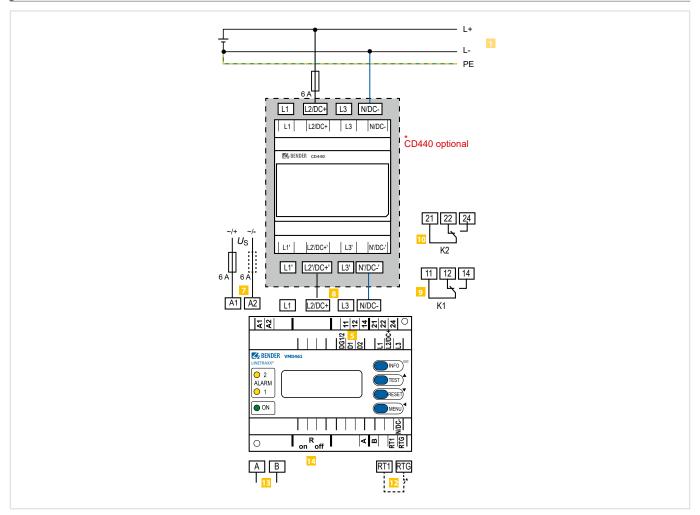


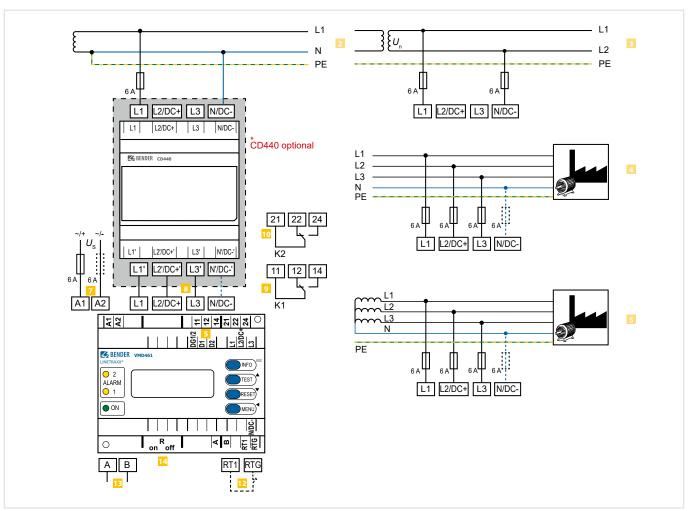


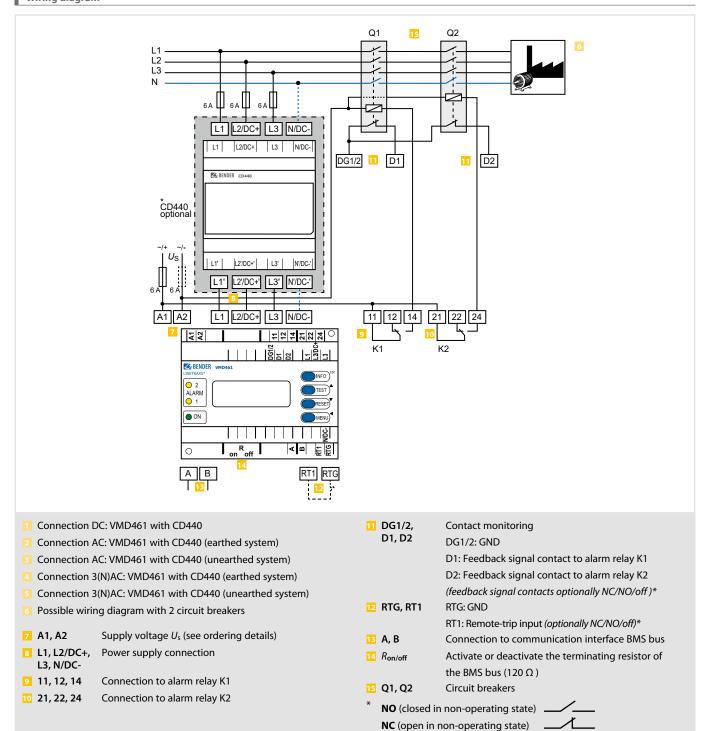
CD440



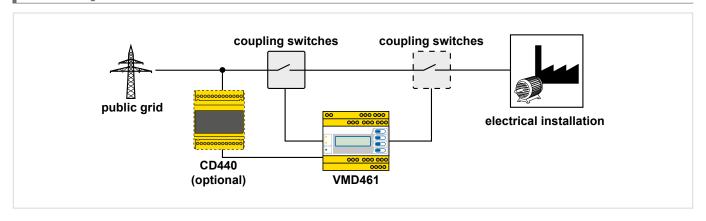




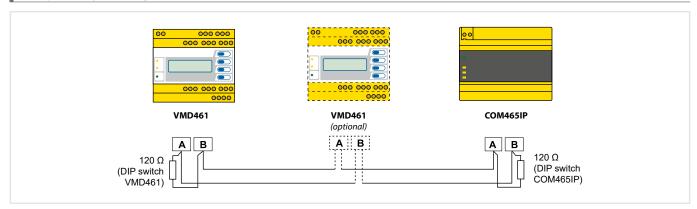




aus (switched off)



Example for a system design



LINETRAXX® CME420

Multi-functional current relay, AC, overcurrent/undercurrent/window discriminator function



Typical applications

- · Current consumption of motors, such as pumps, elevators, cranes
- Monitoring of lighting circuits, heating circuits, charging stations
- Monitoring of emergency lighting
- · Monitoring of screw conveyors, e.g. in sewage plants
- · Dust removal in wood working

Approvals







Device features

- Undercurrent and overcurrent monitoring in AC systems 0.1...16 A without measuring current transformer
- Indirect current monitoring with standard current transformers x/1 A, x/5 A, x/10 A
- Transformation ratio n allows adaptation to all standard current transformers x/1 A, x/5 A, x/10 A
- Different monitoring functions selectable I <, I > or I </I >
- Start-up delay, response delay, delay on release
- · Adjustable switching hysteresis
- r.m.s. value measurement (AC)
- Digital measured value display via multi-functional LC display
- LEDs: Power On, Alarm 1, Alarm 2
- · Measured value memory for operating value
- · Continuous self monitoring
- Internal test/reset button
- Two separate alarm relays (one changeover contact each)
- N/C or N/O operation and fault memory behaviour selectable
- · Password protection for device setting
- · Sealable transparent cover
- Two-module enclosure (36 mm)
- Push-wire terminal (two terminals per connection)
- · RoHS compliant

Standards

The LINETRAXX® CME420 series complies with the requirements of the device standards:

• IEC 60255-6.

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Type	Supply voltage ¹⁾ U _S	Art.	No.
1,7,60	Supply voltage 05	Screw-type terminal	Push-wire terminal
CME420-D-1	AC 1672 V, 42460 Hz / DC 9.694 V	B93060001	B73060001
CME420-D-2	AC 70300 V, 42460 Hz / DC 70300 V	B93060002	B73060002

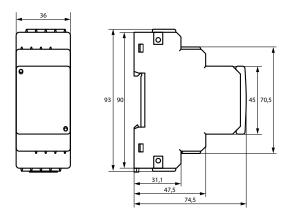
¹⁾ Absolute values

Accessories

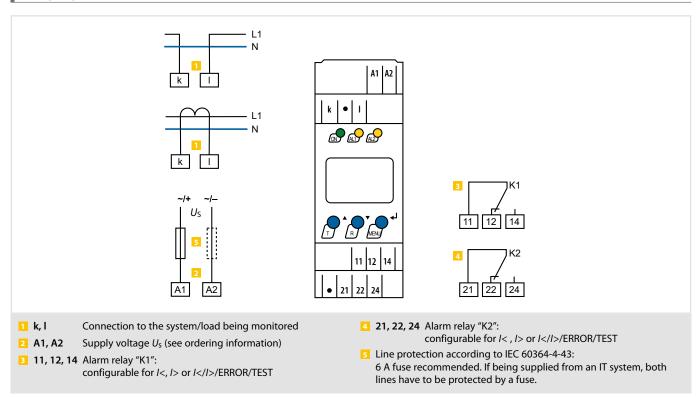
Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B98060008

Insulation coordination acc. to IEC 60664-1/IEC 60664	
Rated insulation voltage	250 V
Rated impulse voltage/overvoltage category	4 kV/III
pollution degree	3
Protective separation (reinforced insulation) between	(A1, A2) -(k, I) -(11, 12, 14) -(21, 22, 24)
Maximum nominal voltage of the system being monitored	
when the conductor being monitored is directly connected:	
With protective separation	AC 230 V
Without protective separation	AC 400 V
Supply voltage	
CME420-D-1:	
Supply voltage $U_{\rm S}$	AC 1672 V/DC 9.694 V
Frequency range U _s	42460 Hz
CME420-D-2:	
Supply voltage U _s	AC/DC 70300 V
Frequency range $U_{\rm S}$	42460 Hz
Power consumption	≤ 4 VA
Measuring circuit	
Measuring range (r.m.s. value, screw-type terminal)	AC 0.0516 A
Measuring range (r.m.s. value, push-wire terminal)	AC 0.0512 A
Overload capability < 1 s	40 A
Rated frequency f _n	422000 Hz
Burden	n.A., due to internal current transformers
Response values	
Undercurrent	
Undercurrent $I <$ (alarm I_2), direct connection:	
Push-wire terminal	AC 0.112 A (1 A)*
Screw-type terminal	AC 0.116 A (1 A)*
or external current transformer	
Undercurrent $I <$ (prewarning I_1)	100200 % (150 %)*
Overcurrent	
Overcurrent $l>$ (alarm l_2), direct connection:	
Push-wire terminal	AC 0.112 A (1 A)*
Screw-type terminal	AC 0.116 A (1 A)*
or external current transformer	
Overcurrent $l>$ (prewarning l_1)	10100 % (50 %)*
Others	
External current transformer	x/1 A, x/5 A, x/10 A
Transformation ratio factor n	12000 (1)*
Relative percentage error at 50/60 Hz	±3 %, ±2 digits
Relative percentage error in the range of 422000 Hz	±5 %, ±2 digits
	1040 % (15 %)*
Hysteresis	
Hysteresis Specified time	0300 s (0.5 s)*
Hysteresis Specified time Starting delay	
Hysteresis Specified time Starting delay Response delay t _{on1}	0300 s (1 s)*
Hysteresis Specified time Starting delay Response delay ton1 Response delay ton2 Delay on release toff	0300 s (1 s)* 0300 s (0 s)*
Hysteresis Specified time Starting delay Response delay ton1 Response delay ton2 Delay on release toff Operating time tae	0300 s (1 s)* 0300 s (0 s)* 0300 s (1 s)*
Hysteresis Specified time Starting delay Response delay ton1 Response delay ton2 Delay on release toff	0300 s (0.5 s)* 0300 s (1 s)* 0300 s (0 s)* 0300 s (1 s)*

Displays, memory	
Display	LC display, multi-functional, not illuminated
Measuring range measured value x transformation ratio	
Operating error at 50/60 Hz	±3 %, ±2 digit:
Operating error in the range of 422000 Hz	±5 %, ±2 digit:
Measured-value memory (HiS) for the first alarm value	data record measured value
Password	Off/0999 (Off)*
Fault memory (M) alarm relay	on/off (on)
radic memory (w) alam relay	on on ton
Switching elements	
	s, with one changeover contact each (K1, K2
	n.c./N/O operation n.o. (N/C operation n.c.)
Electrical service life under rated operating conditions	10,000 switching operations
Contact data acc. to IEC 60947-5-1	
Utilization 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 load	1 mA at AC/DC \geq 10 \
- · · · · · · · · · · · · · · · · · · ·	
Environment/EMC	IFC 4400
EMC	IEC 61326
Operating temperature	-25+55 °C
Classification of climatic conditions acc. to IEC 60721 ((related to temperature and relative humidity):
Stationary use (IEC 60721-3-3)	3K22
Transportation (IEC 60721-3-2)	2K1
Storage (IEC 60721-3-1)	1K2
Classification of mechanical conditions acc. to IEC	60721
	3M1
Stationary use (IEC 60721-3-3)	
Transportation (IEC 60721-3-2)	2M-
	2M4
Transportation (IEC 60721-3-2)	2M4
Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection	2M 1M12
Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type	2M-2 1M12 screw-type terminal or push-wire termina
Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type Connection	2M- 1M12 screw-type terminal or push-wire termina
Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type Connection Connection properties	2M- 1M12 screw-type terminal or push-wire terminal screw terminal
Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type Connection Connection properties rigid	2M. 1M1. screw-type terminal or push-wire terminal screw terminal. 0.24 mm² (AWG 2412
Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type Connection Connection properties rigid flexible	2M. 1M1. screw-type terminal or push-wire terminal screw terminal. 0.24 mm² (AWG 2412
Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type Connection Connection properties rigid flexible Two conductors with the same cross section	screw-type terminal or push-wire terminal screw terminals 0.24 mm² (AWG 2414
Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type Connection properties rigid flexible Two conductors with the same cross section rigid/flexible	screw-type terminal or push-wire terminal screw terminals 0.24 mm² (AWG 2412 0.22.5 mm² (AWG 2414
Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection Connection Connection properties rigid flexible Two conductors with the same cross section rigid/flexible Stripping length	2M. 1M1. screw-type terminal or push-wire terminal screw terminal: 0.24 mm² (AWG 2412 0.22.5 mm² (AWG 2414 0.21.5 mm² (AWG 2416 8 mm²
Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type Connection properties rigid	2M. 1M1. screw-type terminal or push-wire terminal screw terminal: 0.24 mm² (AWG 2412 0.22.5 mm² (AWG 2414 0.21.5 mm² (AWG 2416 8 mn 0.50.6 Nn
Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection Connection Connection Connection properties rigid flexible Two conductors with the same cross section rigid/flexible Stripping length Tightening torque, terminal screws Connection	2M. 1M1. screw-type terminal or push-wire terminal screw terminal 0.24 mm² (AWG 2412 0.22.5 mm² (AWG 2414 0.21.5 mm² (AWG 2416 8 mm 0.50.6 Nm²
Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type Connection properties rigid	2M. 1M1. screw-type terminal or push-wire terminal screw terminal: 0.24 mm² (AWG 2412 0.22.5 mm² (AWG 2414 0.21.5 mm² (AWG 2416 8 mn 0.50.6 Nn
Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection Connection Connection properties rigid	screw-type terminal or push-wire terminal screw terminal: 0.24 mm² (AWG 2412 0.22.5 mm² (AWG 2414 0.21.5 mm² (AWG 2416 8 mn 0.50.6 Nn push-wire terminal:
Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type Connection properties rigid	2M. 1M1. 1M1. 1M1. 1M1. 1M1. 1M1. 1M1. 1
Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection Connection Connection properties rigid	2M-1M12 screw-type terminal or push-wire terminal screw terminals 0.24 mm² (AWG 2412 0.22.5 mm² (AWG 2414 0.21.5 mm² (AWG 2416 8 mm 0.50.6 Nm push-wire terminals
Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type Connection properties rigid	2M. 1M1. screw-type terminal or push-wire terminal screw terminal: 0.24 mm² (AWG 2412 0.22.5 mm² (AWG 2414 0.21.5 mm² (AWG 2416 8 mn 0.50.6 Nn push-wire terminal: 0.22.5 mm² (AWG 2414
Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection Connection Connection Connection Connection Connection properties rigid flexible Two conductors with the same cross section rigid/flexible Stripping length Tightening torque, terminal screws Connection Connection Connection properties rigid flexible without ferrules	2M. 1M1. screw-type terminal or push-wire terminal screw terminal: 0.24 mm² (AWG 2412 0.22.5 mm² (AWG 2414 0.21.5 mm² (AWG 2416 8 mn 0.50.6 Nn push-wire terminal: 0.22.5 mm² (AWG 2414 0.752.5 mm² (AWG 1914 0.21.5 mm² (AWG 1914 0.21.5 mm² (AWG 2416
Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection Connection Connection Connection Connection Connection properties rigid flexible Two conductors with the same cross section rigid/flexible Stripping length Tightening torque, terminal screws Connection Connection Connection properties rigid flexible without ferrules with ferrules	2M-1M12 screw-type terminal or push-wire terminal screw terminals 0.24 mm² (AWG 2412 0.22.5 mm² (AWG 2414 0.21.5 mm² (AWG 2416 8 mm 0.50.6 Nm push-wire terminals 0.22.5 mm² (AWG 2414 0.752.5 mm² (AWG 2414 0.752.5 mm² (AWG 1914 0.21.5 mm² (AWG 1914 0.21.5 mm² (AWG 2416
Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection Connection Properties rigid flexible Two conductors with the same cross section rigid/flexible Stripping length Tightening torque, terminal screws Connection Connection properties rigid flexible without ferrules with ferrules Stripping length	2M-1M12 screw-type terminal or push-wire terminal screw terminals 0.24 mm² (AWG 2412 0.22.5 mm² (AWG 2414 0.21.5 mm² (AWG 2416 8 mm 0.50.6 Nm push-wire terminals 0.22.5 mm² (AWG 2414 0.752.5 mm² (AWG 2414 0.752.5 mm² (AWG 1914 0.21.5 mm² (AWG 2416 10 mm 50 N
Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection Connection Connection Connection properties rigid flexible Two conductors with the same cross section rigid/flexible Stripping length Tightening torque, terminal screws Connection Connection Connection properties rigid flexible without ferrules with ferrules with ferrules Stripping length Opening force Test opening, diameter	2M-1M12 screw-type terminal or push-wire terminal screw terminals 0.24 mm² (AWG 2412 0.22.5 mm² (AWG 2414 0.21.5 mm² (AWG 2416 8 mm 0.50.6 Nm push-wire terminals 0.22.5 mm² (AWG 2414 0.752.5 mm² (AWG 2414 0.752.5 mm² (AWG 1914 0.21.5 mm² (AWG 2416 10 mm 50 N
Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection Connection Connection Connection properties rigid flexible Two conductors with the same cross section rigid/flexible Stripping length Tightening torque, terminal screws Connection Connection properties rigid flexible without ferrules with ferrules with ferrules Stripping length Opening length Opening force Test opening, diameter	2M. 1M1. screw-type terminal or push-wire terminal screw terminal. 0.24 mm² (AWG 2412 0.22.5 mm² (AWG 2414 0.21.5 mm² (AWG 2416 8 mn 0.50.6 Nn push-wire terminal. 0.22.5 mm² (AWG 2414 0.752.5 mm² (AWG 1914 0.21.5 mm² (AWG 1914
Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection Connection Connection Connection properties rigid flexible Two conductors with the same cross section rigid/flexible Stripping length Tightening torque, terminal screws Connection Connection Properties rigid flexible without ferrules with ferrules with ferrules Stripping length Opening force Test opening, diameter Other Operating mode	2M. 1M1. screw-type terminal or push-wire terminal screw terminal. 0.24 mm² (AWG 2412 0.22.5 mm² (AWG 2414 0.21.5 mm² (AWG 2416 8 mn 0.50.6 Nn push-wire terminal. 0.22.5 mm² (AWG 2414 0.752.5 mm² (AWG 1914 0.21.5 mm² (AWG 1914)
Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection Connection Connection Connection Properties rigid flexible Two conductors with the same cross section rigid/flexible Stripping length Tightening torque, terminal screws Connection Connection Properties rigid flexible with out ferrules with ferrules with ferrules Stripping length Opening force Test opening, diameter Other Operating mode Position	2M. 1M1. screw-type terminal or push-wire terminal screw terminal. 0.24 mm² (AWG 2412 0.22.5 mm² (AWG 2414 0.21.5 mm² (AWG 2414 0.21.5 mm² (AWG 2414 0.22.5 mm² (AWG 2414 0.22.5 mm² (AWG 2414 0.752.5 mm² (AWG 2414 0.752.5 mm² (AWG 2416 10 mm 50 1 2.1 mm
Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection Connection Connection Connection Properties rigid flexible Two conductors with the same cross section rigid/flexible Stripping length Tightening torque, terminal screws Connection Connection Properties rigid flexible without ferrules with ferrules with ferrules Stripping length Opening length Opening force Test opening, diameter Other Operating mode Position Degree of protection DIN EN 60529, internal components	2M. 1M1. screw-type terminal or push-wire terminal screw terminal: 0.24 mm² (AWG 2412 0.22.5 mm² (AWG 2414 0.21.5 mm² (AWG 2414 0.21.5 mm² (AWG 2414 0.22.5 mm² (AWG 2414 0.22.5 mm² (AWG 2414 0.21.5 mm² (AWG 2414 0.21.5 mm² (AWG 2414 0.21.5 mm² (AWG 2416 10 mm 50 1 2.1 mm continuous operation any position any position
Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection Connection Connection Connection properties rigid flexible Two conductors with the same cross section rigid/flexible Stripping length Tightening torque, terminal screws Connection Connection properties rigid flexible without ferrules with ferrules with ferrules Opening force Test opening, diameter Other Operating mode Position Degree of protection DIN EN 60529, internal components Degree of protection DIN EN 60529, terminals	2M. 1M1. screw-type terminal or push-wire terminal screw terminal: 0.24 mm² (AWG 2412 0.22.5 mm² (AWG 2414 0.21.5 mm² (AWG 2414 0.21.5 mm² (AWG 2414 0.22.5 mm² (AWG 2414 0.22.5 mm² (AWG 2414 0.21.5 mm² (AWG 2414 0.21.5 mm² (AWG 2416 10 mn 50 1 2.1 mn continuous operation any position in P36 in
Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection Connection Connection type Connection Properties rigid flexible Two conductors with the same cross section rigid/flexible Stripping length Tightening torque, terminal screws Connection Connection properties rigid flexible without ferrules with ferrules with ferrules Opening length Opening force Test opening, diameter Other Operating mode Position Degree of protection DIN EN 60529, internal components Degree of protection DIN EN 60529, terminals Enclosure material	2M. 1M1. screw-type terminal or push-wire terminal screw terminal 0.24 mm² (AWG 2412 0.22.5 mm² (AWG 2414 0.21.5 mm² (AWG 2416 8 mm 0.50.6 Nn push-wire terminal 0.22.5 mm² (AWG 2414 0.752.5 mm² (AWG 2414 0.752.5 mm² (AWG 2414 0.752.5 mm² (AWG 2416 10 mm 50 I 2.1 mm² continuous operation any position any position in IP30 IP20 polycarbonate
Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection Connection Connection type Connection Properties rigid flexible Two conductors with the same cross section rigid/flexible Stripping length Tightening torque, terminal screws Connection Connection Properties rigid flexible without ferrules with ferrules with ferrules Stripping length Opening force Test opening, diameter Other Operating mode Position Degree of protection DIN EN 60529, internal components Degree of protection DIN EN 60529, terminals Enclosure material Flammability class	2M. 1M1: screw-type terminal or push-wire terminal screw terminal: 0.24 mm² (AWG 2412 0.22.5 mm² (AWG 2414 0.21.5 mm² (AWG 2414 0.21.5 mm² (AWG 2414 0.22.5 mm² (AWG 2414 0.22.5 mm² (AWG 2414 0.752.5 mm² (AWG 2414 0.752.5 mm² (AWG 2414 0.752.5 mm² (AWG 2416 10 mn 50 N 2.1 mn continuous operation any position any position in P36 in P26 polycarbonate UL94 V-6
Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection Connection type Connection Connection properties rigid flexible Two conductors with the same cross section rigid/flexible Stripping length Tightening torque, terminal screws Connection Connection properties rigid flexible without ferrules with ferrules Stripping length Opening force Test opening, diameter Other Operating mode Position Degree of protection DIN EN 60529, internal components Degree of protection DIN EN 60529, terminals Enclosure material Flammability class DIN rail mounting acc. to	2M. 1M1: screw-type terminal or push-wire terminal screw terminal: 0.24 mm² (AWG 2412 0.22.5 mm² (AWG 2414 0.21.5 mm² (AWG 2416 8 mn 0.50.6 Nn push-wire terminal: 0.22.5 mm² (AWG 2414 0.752.5 mm² (AWG 2414 0.752.5 mm² (AWG 2414 0.752.5 mm² (AWG 2416 10 mn 50 N 2.1 mn continuous operation any position any position in P30 in P20 polycarbonate UL94 V-6 IEC 6071:
Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection Connection Connection Connection Properties rigid flexible Two conductors with the same cross section rigid/flexible Stripping length Tightening torque, terminal screws Connection Connection properties rigid flexible without ferrules with ferrules Stripping length Opening force Test opening, diameter Other Operating mode Position Degree of protection DIN EN 60529, internal components Degree of protection DIN EN 60529, terminals Enclosure material Flammability class DIN rail mounting acc. to Screw mounting	2M- 1M12 screw-type terminal or push-wire terminal screw terminal: 0.24 mm² (AWG 2412 0.22.5 mm² (AWG 2414 0.21.5 mm² (AWG 2416 8 mm 0.50.6 Nm push-wire terminal: 0.22.5 mm² (AWG 2414 0.752.5 mm² (AWG 2414 0.752.5 mm² (AWG 2414 0.752.5 mm² (AWG 2416 10 mm 50 N 2.1 mm continuous operation any position any position in P30 in P30 in P30 in P30 in P40 i
Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection Connection type Connection Connection properties rigid flexible Two conductors with the same cross section rigid/flexible Stripping length Tightening torque, terminal screws Connection Connection properties rigid flexible without ferrules with ferrules Stripping length Opening force Test opening, diameter Other Operating mode Position Degree of protection DIN EN 60529, internal components Degree of protection DIN EN 60529, terminals Enclosure material Flammability class DIN rail mounting acc. to	2M/2 1M12 screw-type terminal or push-wire terminal screw terminals 0.24 mm² (AWG 2412) 0.22.5 mm² (AWG 2414) 0.21.5 mm² (AWG 2416) 8 mm 0.50.6 Nm push-wire terminals 0.22.5 mm² (AWG 2414) 0.752.5 mm² (AWG 2414) 10.752.5 mm² (AWG 2414) 10.752.5 mm² (AWG 2416) 10 mm 50 N 2.1 mm continuous operation any position



Wiring diagram



LINETRAXX® CMD420/CMD421

Current monitoring relays for monitoring 3AC currents for overcurrent and undercurrent using measuring current transformers or current monitoring with window discriminator function



Typical applications

- Current consumption of motors, such as pumps, elevators, cranes
- Monitoring of lighting circuits, heating circuits, charging stations
- Monitoring of emergency lighting
- Monitoring of screw conveyors, e.g. in sewage plants
- Dust removal in wood working

Device features

- Undercurrent and overcurrent monitoring in AC systems, current monitoring with window discriminator function
- Current monitoring using standard current transformers: x/ 1A (CMD420), x/ 5A (CMD421)
- Two separately adjustable alarm relays with one changeover contact each (K1, K2)
- Fault memory behaviour for the alarm relays selectable
- N/C or N/O operation selectable for K1, K2
- Digital measured value display via multi-functional LC display
- LEDs: Power On (ON), Alarm 1 (AL1) and Alarm 2 (AL2)
- · Start-up delay, response delay and delay on release
- Adjustable switching hysteresis
- r.m.s. value measurement AC
- · History memory for the operating value
- Cyclical self test
- Test and reset button
- Password protection to prevent unauthorised changes being made to device settings
- · Sealable transparent cover
- Available with screw-type or push-wire terminals

Further information

For further information refer to our product range on www.bender.de.

Approvals



Ordering information

Type Suitable for current	Response value	Supply voltage ¹¹ <i>U</i> ₅	Art. No.			
Турс	transformer types	nesponse value	Supply voltage os	Screw-type terminal	Push-wire terminal	
CMD420-D-1	/1 A	0.1 1.4	AC 1672 V, 15460 Hz / DC 9.6 V94 V	B93060006	B73060006	
CMD420-D-2	x/1A	0.11 A x n	U.II A X II	AC/DC 70300 V, 15460 Hz	B93060007	B73060007
CMD421-D-1	/FA	0.5 5.4	AC 1672 V, 15460 Hz / DC 9.6 V94 V	B93060008	B73060008	
CMD421-D-2	x/5A	0.55 A x n	AC/DC 70300 V, 15460 Hz	B93060009	B73060009	

¹⁾ Absolute values

Accessories

Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B98060008

Insulation coordination acc. to IEC 60664-1/IEC 6	50664-3	Displays, memory	
CMD420		Display LC display,	multifunctional, not illuminated
	AC 250 V	Display range, measured value (r.m.s. value) x transformation ratio n	CMD420: AC 01 A x n
Rated insulation voltage	AC 250 V	Display range, measured value (i.i.i.s. value) x ransormation ratio	CMD421: AC 05 A x n
Rated impulse voltage/pollution degree	6 kV/3	Operating uncertainty in the range of 42460 Hz	±5 %, ±2 digit
Protective separation (reinforced insulation) between	(A1, A2) -(k, I) -(11, 12, 14) -(21, 22, 24)	Measured-value memory (HiS) for the first alarm value	data record measured values
Protective separation (reinforced insulation) between	(k1, l1, k2, l2, k3, l3) -(11, 12, 14)	Password	on/off/0999 (OFF)*
Voltage test acc. to IEC 61010-1	3.536 kV	Fault memory (M) alarm relay	on/off/con (on)*
CMD421		rault memory (w) alami relay	UII/UII/CUII (UII)
Rated insulation voltage	AC 250 V	Switching elements	
Rated impulse voltage/pollution degree	4 kV/3		x 1 changeover contacts (K1, K2)
Basic insulation between:	(k1, l1, k2, l2, k3, l3) -(A1, A2), (21, 22, 24)	Operating principle	N/C operation/N/O operation
Basic insulation between:	(11, 12, 14) -(21, 22, 24)	K1: Err, I1, I2, tES (device error Err, overcurrent pre	
Voltage test acc. to IEC 61010-1	2.21 kV		
voltage test acc. to IEC 01010-1	Z.21 KV	, , , , , , , , , , , , , , , , , , , ,	
Supply voltage		Electrical endurance, number of cycles	10,000
CMD420 D 1 CMD421 D 1.		Contact data acc. to IEC 60947-5-1	
CMD420-D-1, CMD421-D-1:	AC 16 72 V/DC 0.6 04 V	Utilisation category AC-13	/ AC-14 / DC-12 / DC-12 / DC-12
Supply voltage $U_{\rm S}$	AC 1672 V/DC 9.694 V	Rated operational voltage 230) V / 230 V / 24 V / 110 V / 220 V
Frequency range U _S	15460 Hz	Rated operational current	5 A / 3 A / 1 A / 0.2 A / 0.1 A
CMD420-D-2, CMD421-D-2:		Minimum contact rating	1 mA at AC/DC \ge 10 V
Supply voltage $U_{\rm S}$	AC/DC 70300 V		
Frequency range U_S	15460 Hz	Environment/EMC	
Power consumption	≤ 4 VA	EMC	IEC 61326-1
		Operating temperature	-25+55 °C
Measuring circuit CMD420			
Nominal measuring range (r.m.s. value) n = 1	AC 01 A	Classification of climatic conditions acc. to IEC 60721 (related to tem	
Overload capability, continuous	2 A	Stationary use (IEC 60721-3-3)	3K22
Overload capability < 5 s	5 A	Transport (IEC 60721-3-2)	2K11
Load per measuring input	50 mΩ	Storage (IEC 60721-3-1)	1K22
Rated frequency f _n	422000 Hz	Classification of mechanical conditions acc. to IEC 60721	
nateu frequency /n	4Z2000 fiZ	Stationary use (IEC 60721-3-3)	3M11
Response values CMD420		Transport (IEC 60721-3-2)	2M4
Undercurrent Lo /< (Alarm 2) n = 1	AC 0.11 A (0.3 A)*	Storage (IEC 60721-3-1)	1M12
Undercurrent Lo $I < (Alarm 1) n = 1$	100200 % (150 %)*	5101uge (120 007 2 1 5 1 7	2
	imum nominal current of 1 A into consideration!	Connection	
		Connection type screw-type	terminal or push-wire terminal
Overcurrent Hi /> (Alarm 2) n = 1	AC 0.11 A (0.3 A)* (Hi)*		·
Overcurrent Hi /> (Alarm 1) n = 1	50100 % (50 %)* (Hi)*	Connection	screw terminals
Window $I_n I > (Alarm 2) n = 1$	AC 0.11 A (0.3 A)*	Connection properties	
Window $I_n I <$ (Alarm 1) $n = 1$	50100 % (50 %)*	rigid	0.24 mm ² (AWG 2412)
External current transformer	x/1 A	flexible	0.22.5 mm ² (AWG 2414)
Transformation ratio n	12000 (1)*	two conductors with the same cross section	
Relative uncertainty in the range of 42460 Hz	\pm 5 %, \pm 2 digits	rigid/flexible	0.21.5 mm ² (AWG 2416)
Hysteresis	340% (15 %)*	Stripping length	8 mm
H : : : : : : : : : : : : : : : : : : :		Tightening torque, terminal screws	0.50.6 Nm
Measuring circuit CMD421		Connection	push-wire terminals
Nominal measuring range (r.m.s. value)	AC 05 A	Connection properties	Pasii
Overload capability, continuous	7.5 A	rigid	0.22.5 mm ² (AWG 2414)
Overload capability < 5 s	with screw-type terminal connection: 20 A	flexible	0.22.3 IIIIII (AWG 2414)
	with push-wire terminals: 12 A		0.75 2.5 mm ² /ANNC 10 14\
Load per measuring input	3 mΩ		0.752.5 mm ² (AWG 1914)
Rated frequency fn	42460 Hz	with ferrules	0.21.5 mm ² (AWG 2416)
,		Stripping length	10 mm
Response values CMD421		Opening force	50 N
Undercurrent Lo $I <$ (Alarm 2) $n = 1$	AC 0.55 A (1.5 A)*	Test opening, diameter	2.1 mm
Undercurrent Lo / < (Alarm 1) n = 1	100200 % (150 %)*	Other	
Take a max	imum nominal current of 5 A into consideration!		
Overcurrent Hi / > (Alarm 2) n = 1	AC 0.55 A (1.5 A)* (Hi)*	Operating mode	continuous operation
Overcurrent Hi $I > (Alarm 1)$ $n = 1$	50100 % (50 %)* (Hi)*	Mounting	any position
Window $I_n I > \text{(Alarm 2) } n = 1$	AC 0.55 A (1.5 A)*	Degree of protection, internal components (IEC 60529)	IP30
Window $I_n I > \text{(Alarm 1) } I = I$ Window $I_n I < \text{(Alarm 1) } n = 1$	50100 % (50 %)*	Degree of protection, terminals (IEC 60529)	IP20
External current transformer		Enclosure material	polycarbonate
	x/5 A 1 2000 (1)*	Flammability class	UL94 V-0
Transformation ratio n	12000 (1)*	DIN rail mounting acc. to	IEC 60715
Relative uncertainty in the range of 42460 Hz	±5 %, ±2 digits	Screw mounting	2 x M4 with mounting clip
Hysteresis	340% (15 %)*	Documentation number	D00101
Time response		Weight	≤ 150 g
Start-up delay t	0300 s (0.5 s)*	_ •	,
. ,		()* = factory setting	
Response delay ton1	0300 s (1 s)*		
Response delay t _{on2}	0300 s (0 s)*		
Delay on release t_{off}	0300 s (1 s)*		
Resolution of setting t , $t_{on1/2}$, t_{off} (010 s)	0.1 s		
Resolution of setting t , $t_{on1/2}$, t_{off} (1099 s)	1 s		
Resolution of setting t , $t_{on1/2}$, t_{off} (100300 s)	10 s		
Operating time tae	≤ 130 ms		
Response time t _{an}	$t_{\rm an} = t_{\rm ae} + t_{\rm on1/2}$		
Douice releace time t	∠ 125 mc		

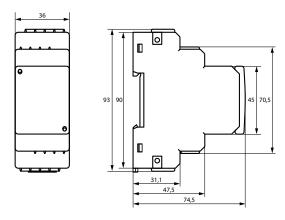
≤ 135 ms

 $t_{\text{off}} = t_{\text{re}} + t_{\text{off}}$ ≤ 300 ms

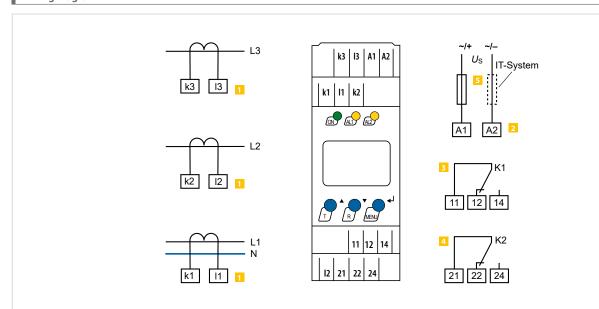
Device release time $t_{\rm re}$

Release time $t_{\rm off}$

Recovery time $t_{\rm b}$



Wiring diagram



- 🚺 k, l Connection to the conductors to be monitored; using current transformers
- Supply voltage $U_{\rm S}$ (see ordering information) 2 A1, A2
- 3 11, 12, 14 Alarm relay "K1": configurable for I <, I > or I < I > /ERROR/TEST
- 4 21, 22, 24 Alarm relay "K2": configurable for alarm I <, I > or I < /I > /ERROR/TEST
- 5 Line protection according to IEC 60364-4-43: 6 A fuse recommended. If being supplied from an IT system, both lines have to be protected by a fuse.

LINETRAXX® CMS460-D

Multi-channel AC, pulsed DC sensitive load current evaluator for AC systems (TN, TT and IT systems)



Typical applications

- · Monitoring of loads and installations for load currents in the frequency range of 42...2000 Hz (measuring current transformers CTAC..., WR...S(P), WS..., WF...)
- · Monitoring of currents regarded as fire hazards in flammable atmospheres
- EMC monitoring of TN systems for "stray currents" and additional N-PE connections
- Monitoring of N conductors for overload caused by harmonics
- · Monitoring of PE and equipotential bonding conductors to ensure they are free of current

Device features

- Optional AC or pulsed DC sensitive measurements for each channel
- · rms value measurement
- 12 measuring channels per individual device for load current
- Up to 90 evaluators CMS460-D in the system (1080 measuring channels)
- Fast parallel scanning for all channels
- Response ranges 100 mA...125 A (42...2000 Hz)
- · Preset function
- · Adjustable time delays
- · Adjustable frequency behaviour (e.g. fire and plant protection)
- History memory with date and time stamp for 300 data records/channel
- Data logger for 300 data records/channel
- · Analysis of the harmonics, THD
- Two alarm relays with one changeover contact each
- N/O or N/C operation and fault memory selectable
- · Connection external test and reset button
- · Backlit graphical display (7-segment display) and alarm LEDs
- · Data exchange via BMS bus
- · Password protection for device setting
- · RoHS compliant

Further information

For further information refer to our product range on www.bender.de.

Approvals



Ordering information

Туре	Supply voltage ¹¹ U₅	Art. No.
CMS460-D-1	AC 1672 V, 42460 Hz / DC 1694 V	B94053017
CMS460-D-2	AC 70276 V, 42460 Hz / DC 70276 V	B94053018

¹⁾ Absolute values

Accessories

Description	Art. No.	
XM460 mounting frame, 144 x 82 mm	B990995	

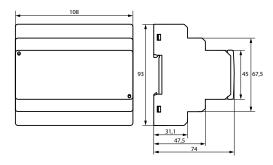
Suitable system components

Description	Version	Type of construction	Туре	Art. No.	Page
Measuring current transformers pulsed DC sensitive	circular	CTAC	B981100	359	
	muland DC compiting	rectangular	WRS(P)	B9117	371
	puised DC sensitive	split-core	WS	B980806	367
		flexible	WF	B780802	373
Condition Monitor with integrated gateway:		-	COM465IP	B950610	417
Condition Monitor	Bender system/Ethernet	-	CP9I	B9506103	431
RS-485 repeater	_	-	DI-1DL	B95012047	408

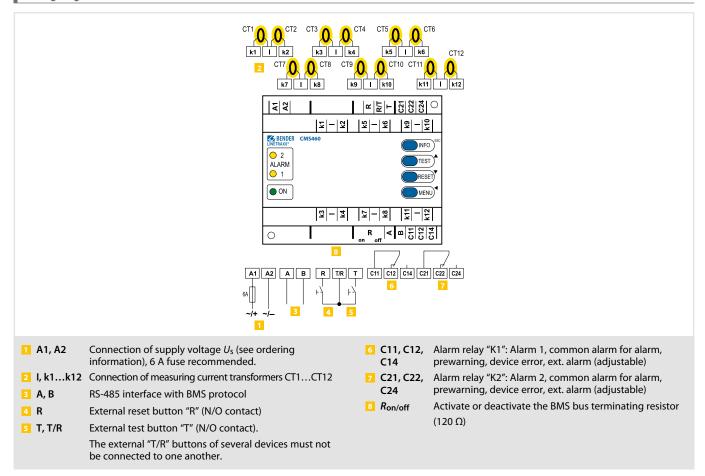
Insulation coordination acc. to IEC 60664-1/IEC 60664-3 for the versions:	Displays, memory
a) CMS460-D1	Display range, measuring value < 10 mA125 A (CT type A)
Supply voltage U_s DC 2475V/AC 2460 V (AC/DC \pm 20 %)	< 10 mA30 A (measuring current transformer Flex)
Supply voltage frequency DC, 50/60 Hz	Operating uncertainty \pm 10 %
Rated insulation voltage 100 V	LEDs ON/ALARM
Overvoltage category/pollution degree III/3	LC display backlit graphical display
	History memory 300 data records
-	Data logger 300 data records per measuring channel
Protective separation (reinforced insulation) between (A1, A2) - (k1, Ik12, R, T/R, T, A, B)	Password off/0999 (off)*
Voltage test acc. to IEC 61010-1 1.344 kV	
Rated insulation voltage 250 V	Language D, GB, F (GB)*
Overvoltage category/pollution degree III/3	Fault memory alarm relay on/off (off)*
Rated impulse voltage 4 kV	Inputs/outputs
Basic insulation between: (A1, A2), (k1, Ik12, R, T/R, T, A, B) -	
(C11, C12, C14), (C21, C22, C24), (11,14), (21,24), (31,34), (41,44),	Test/reset button internal/external
(51,54), (61,64), (71,74), (81,84), (91,94),(101,104), (111,114), (121,124)	Cable length for external test/reset button 010 m
	luturf
Basic insulation between: (11, 14) - (21, 24) - (31, 34) - (41, 44) - (51, 54) - (61, 64)	Interface
/oltage test acc. to IEC 61010-1 2.21 kV	Interface/protocol RS-485/BMS
Rated insulation voltage 250 V	Baud rate 9.6 kbit/s
Overvoltage category/pollution degree III/3	Cable length 01200 m
Rated impulse voltage 6 kV	Recommended cable (shielded, shield connected to PE on one side)
Protective separation (reinforced insulation) between (C11, C12, C14) - (C21, C22, C24) -	min. J-Y(St) min. 2x0.8
(11, 14, 21, 24, 31, 34) - (41, 44, 51, 54, 61, 64) - (71,74) - (81,84) -	For UL applications: Copper lines at least 60/70 °C
(91,94) - (101,104) - (111,114) - (121,124)	
	Terminating resistor 120 Ω (0.25 W) connectable via DIP switch
Voltage test acc. to IEC 61010-1 3.536 kV	Device address, BMS bus 190 (2)*
b) CMS460-D2	Cable lengths for CTAC, WR, WS, WF series measuring current transformers
Supply voltage U_s AC/DC 100240 V (-20+15 %)	
Supply voltage frequency DC, 50/60 Hz	Single wire $\geq 0.75 \text{ mm}^2$ 01 m
Rated insulation voltage 250 V	Single wire, twisted $\geq 0.75 \text{ mm}^2$ 010 m
Overvoltage category/pollution degree III/3	Shielded cable $\geq 0.5 \text{ mm}^2$ 040 m
Rated impulse voltage 6 kV	Recommended cable (shielded, shield connected to terminal I at one end, must not be earthed)
· · · · · · · · · · · · · · · · · · ·	J-Y(St)Y min. 2x0.8
Protective separation (reinforced insulation) between (A1, A2) - (k1, I k12, R, T/R, T, A, B),	
(C11, C12, C14), (C21, C22, C24), (11,14), (21,24), (31,34), (41,44),	Switching elements
(51,54), (61,64), (71,74), (81,84), (91,94), (101,104), (111,114), (121,124)	Number of changeover contacts 2 x 1 changeover contacts
rotective separation (reinforced insulation) between (C11, C12, C14) - (C21, C22, C24) -	Operating principle N/C or N/O operation (N/O operation)*
(11, 14, 21, 24, 31, 34) - (41, 44, 51, 54, 61, 64) - (71,74) - (81,84) -	Electrical endurance, number of cycles 10,000
(91,94) - (101,104) - (111,114) - (121,124)	·
Voltage test acc. to IEC 61010-1 3.536 kV	Contact data acc. to IEC 60947-5-1
Rated insulation voltage 250 V	Utilisation category AC-13 / AC-14 / DC-12 / DC-12 / DC-12
Overvoltage category/pollution degree III/3	Rated operational voltage 230 V / 230 V / 24 V / 110 V / 220 V
Rated impulse voltage 4 kV	Rated operational current (common alarm relay) 5 A / 3 A / 1 A / 0.2 A / 0.1 A
1 2	Rated operational current (alarm relay) 2 A / 0.5 A / 5 A / 0.2 A / 0.1 A
Basic insulation between: k1, Ik12, R, T/R, T, A, B) - (C11, C12, C14), (C21, C22, C24)	Minimum contact rating 1 mA at AC/DC \geq 10 V
Basic insulation between: (11, 14) - (21, 24) - (31, 34) - (41, 44) - (51, 54) - (61, 64)	······································
/oltage test acc. to IEC 61010-1 2.21 kV	Environment/EMC
Measuring circuit	EMC IEC 61326-1
•	Operating temperature -25 °C
External measuring current transformers CTAC, WR, WS, WF series (type A)	• • •
Load 1Ω	Classification of climatic conditions acc. to IEC 60721 (related to temperature and relative humidity):
Rated insulation voltage (measuring current transformer) 800 V	Stationary use (IEC 60721-3-3) 3K22
Operating characteristics acc. to IEC 60755 type A	Transport (IEC 60721-3-2) 2K11
depending on measuring current transformer series (type A)*	Long-term storage (IEC 60721-3-1) 1K22
Rated frequency 422000 Hz (type A)	Classification of mechanical conditions acc. to IEC 60721
Cut-off frequency none, IEC, 50 Hz, 60 Hz (none)*	Stationary use (IEC 60721-3-3) 3M11
Measuring range 100 mA125 A (measuring current transformer type A)	• • • • • • • • • • • • • • • • • • • •
100 mA30 A (measuring current transformer Flex)	Transport (IEC 60721-3-2) 2M4
, ,	Long-term storage (IEC 60721-3-1) 1M12
Crest factor up to 10 A = 4, up to 125 A = 2	Connection
Rated operating current In2 (alarm) 100 mA125 A (16 A overcurrent)*	Connection
Rated operating current In1 (prewarning) 10100 % x In2*	Connection screw-type terminals
Preset for alarm offset: 020 A (1 A)* and I x factor 199 (3)*	Connection properties:
Relative uncertainty +1020 %	rigid/flexible/conductor sizes 0.24/0.22.5 mm ² /AWG 2412
,	multi-conductor connection (2 conductors with the same cross section):
Hysteresis 240% (20 %)*	rigid/flexible 0.21.5/0.21.5 mm ²
•	11qtu/11cxibic 0.21.3/0.21.3/11111
Factor for additional CT /210; x 110 (x 1)*	•
Factor for additional CT /210; x 110 (x 1)*	Stripping length 89 mm
-actor for additional CT /210; x 110 (x 1)* Number of measuring channels (per device/system) 12/1080	Stripping length 89 mm
Actor for additional CT /210; x 110 (x 1)* Number of measuring channels (per device/system) 12/1080 Time response	Stripping length 89 mm
Actor for additional CT /210; x 110 (x 1)* Number of measuring channels (per device/system) 12/1080 Time response Start-up delay t(start-up) per device 099 s (0 ms)*	Stripping length 89 mm Tightening torque 0.50.6 Nm Other
Factor for additional CT /210; x 110 (x 1)* Number of measuring channels (per device/system) 12/1080 Filme response Start-up delay t (start-up) per device 099 s (0 ms)* Response delay t 099 s (200 ms)*	Stripping length 89 mm Tightening torque 0.50.6 Nm Other Operating mode continuous operation
Factor for additional CT Number of measuring channels (per device/system) Time response Start-up delay t(start-up) per device Response delay ton per channel Delay on release toff per channel 099 s (200 ms)* 099 s (200 ms)*	Stripping length 89 mm Tightening torque 0.50.6 Nm Other Operating mode continuous operation Mounting display-oriented
Factor for additional CT /210; x 110 (x 1)* Number of measuring channels (per device/system) 12/1080 Filme response Start-up delay t (start-up) per device 099 s (0 ms)* Response delay t_{0n} per channel 0999 s (200 ms)* Delay on release t_{off} per channel 0999 s (200 ms)* Operating time t_{ae} at $t_{n} = 1$ x $t_{n1/2}$ ≤ 180 ms	Stripping length 89 mm Tightening torque 0.50.6 Nm Other Operating mode continuous operation Mounting display-oriented Degree of protection, internal components (IEC 60529) IP30
Finder response Start-up delay t (start-up) per device Response delay t_0 per channel Delay on release t_0 ff per channel Our perating time t_0 at t_0 at t_0 and t_0 be perating time t_0 at t_0 and t_0 be perating time t_0 at t_0 and t_0 be perating time t_0 at t_0 and t_0 are t_0 are t_0 and t_0 are t_0 and t_0 are t_0 and t_0 are $t_$	Stripping length 89 mm Tightening torque 0.50.6 Nm Other Operating mode continuous operation Mounting display-oriented Degree of protection, internal components (IEC 60529) IP30 Degree of protection, terminals (IEC 60529) IP20
Finder response Start-up delay t (start-up) per device Response delay t_0 per channel Delay on release t_0 ff per channel Occupant of the action of	Stripping length 89 mm Tightening torque 0.50.6 Nm Other Operating mode continuous operation Mounting display-oriented Degree of protection, internal components (IEC 60529) IP30 Degree of protection, terminals (IEC 60529) IP20 Enclosure material polycarbonate
Factor for additional CT /210; x 110 (x 1)* Number of measuring channels (per device/system) 12/1080 Time response Start-up delay t (start-up) per device 099 s (0 ms)* Response delay t 0999 s (200 ms)* Delay on release t 0999 s (200 ms)* Operating time t 1 ae at t 1 n = 1 x t 1 n1/2 \leq 180 ms Operating time t 2 ae at t 3 n = 5 x t 1 n1/2 \leq 30 ms	Stripping length 89 mm Tightening torque 0.50.6 Nm Other Operating mode continuous operation Mounting display-oriented Degree of protection, internal components (IEC 60529) IP30 Degree of protection, terminals (IEC 60529) IP20 Enclosure material polycarbonate
Factor for additional CT /210; x 110 (x 1)* Number of measuring channels (per device/system) 12/1080 Time response Start-up delay t (start-up) per device 099 s (0 ms)* Response delay t_{0n} per channel 0999 s (200 ms)* Delay on release t_{off} per channel 0999 s (200 ms)* Operating time t_{ae} at $I_{n} = 1$ x $I_{n1/2}$ ≤ 180 ms Operating time t_{ae} at $I_{n} = 5$ x $I_{n1/2}$ ≤ 30 ms Response time t_{an} for current measurement $t_{an} = t_{ae} + t_{on1/2}$ Scanning time for all measuring channels (current measurement) ≤ 180 ms	Stripping length 89 mm Tightening torque 0.50.6 Nm Other Operating mode continuous operation Mounting display-oriented Degree of protection, internal components (IEC 60529) IP30 Degree of protection, terminals (IEC 60529) IP20 Enclosure material polycarbonate Flammability class UL94V-0
Factor for additional CT /210; x 110 (x 1)* Number of measuring channels (per device/system) 12/1080 Time response Start-up delay t (start-up) per device 099 s (0 ms)* Response delay t 099 s (0 ms)* Delay on release t 099 s (200 ms)* Operating time t 1 ae at t 1 n = 1 x t 1/1/2 ≤ 180 ms Operating time t 2 ae at t 3 n = 5 x t 1/1/2 ≤ 30 ms Response time t 3 n for current measurement t 4 an t 4 ae t 6 n s s	Stripping length 89 mm Tightening torque 0.50.6 Nm Other Operating mode continuous operation Mounting display-oriented Degree of protection, internal components (IEC 60529) IP30 Degree of protection, terminals (IEC 60529) IP20 Enclosure material polycarbonate Flammability class UL94V-0 Screw fixing 2 x M4
Factor for additional CT /210; x 110 (x 1)* Number of measuring channels (per device/system) 12/1080 Filme response Start-up delay t (start-up) per device 099 s (0 ms)* Response delay t_{0n} per channel 0999 s (200 ms)* Delay on release t_{0ff} per channel 0999 s (200 ms)* Operating time t_{ae} at $I_{n} = 1$ x $I_{n1/2}$ ≤ 180 ms Operating time t_{ae} at $I_{n} = 5$ x $I_{n1/2}$ ≤ 30 ms Response time t_{an} for current measurement $t_{an} = t_{ae} + t_{on1/2}$ Scanning time for all measuring channels (current measurement) ≤ 180 ms	Stripping length 89 mm Tightening torque 0.50.6 Nm Other Operating mode continuous operation Mounting display-oriented Degree of protection, internal components (IEC 60529) IP30 Degree of protection, terminals (IEC 60529) IP20 Enclosure material polycarbonate Flammability class UL94V-0 Screw fixing 2 x M4 DIN rail mounting acc. to IEC 60715
Factor for additional CT /210; x 110 (x 1)* Number of measuring channels (per device/system) 12/1080 Time response Start-up delay t (start-up) per device 099 s (0 ms)* Response delay t_{0n} per channel 0999 s (200 ms)* Delay on release t_{off} per channel 0999 s (200 ms)* Operating time t_{ae} at $I_{n} = 1$ x $I_{n1/2}$ ≤ 180 ms Operating time t_{ae} at $I_{n} = 5$ x $I_{n1/2}$ ≤ 30 ms Response time t_{an} for current measurement $t_{an} = t_{ae} + t_{on1/2}$ Scanning time for all measuring channels (current measurement) ≤ 180 ms	Stripping length 89 mm Tightening torque 0.50.6 Nm Other Operating mode continuous operation Mounting display-oriented Degree of protection, internal components (IEC 60529) IP30 Degree of protection, terminals (IEC 60529) IP20 Enclosure material polycarbonate Flammability class UL94V-0 Screw fixing 2 x M4

()* Factory setting

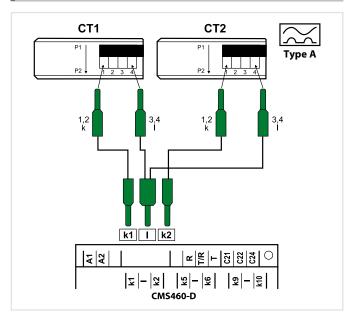




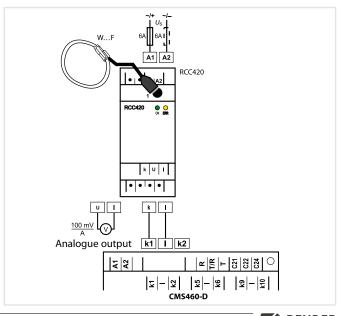
Wiring diagrams



Connection CTAC..., WR...S(P), WS... series measuring current transformers (pulsed DC sensitive)



Connection WF... series measuring current transformer (pulsed DC sensitive)



LINETRAXX® GM420

Loop monitoring relay to monitor loop resistances or PE conductor connections



Typical applications

- Loop monitoring of motors
- Loop monitoring of PE conductor connections for wire interruptions in electrical installations
- Monitoring of earthing systems

Approvals







Device features

- Loop monitoring of the PE conductor in AC systems
- · Measuring circuit providing a high resistance against extraneous voltages and indication of extraneous voltages
- Adjustable start-up delay, response delay and delay on release
- Adjustable switching hysteresis
- Digital measured value display via multi-functional LC display
- Preset function (automatic setting of basic parameters)
- LEDs: Power On, Alarm 1, Alarm 2
- Measured value memory for operating value
- · Continuous self monitoring
- Internal test/reset button
- Two separate alarm relays with one changeover contact each
- N/C or N/O operation and fault memory behaviour selectable
- · Password protection for device setting
- · Sealable transparent cover
- Two-module enclosure (36 mm)
- Push-wire terminal (two terminals per connection)
- RoHS compliant

Further information

For further information refer to our product range on www.bender.de.

Ordering information

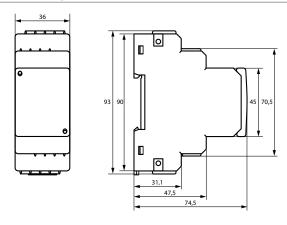
Type	Supply voltage 1) Us	Art	Art. No.	
,,,,,	Supply issuage in or	Screw-type terminal	Push-wire terminal	
GM420-D-1	AC 1672 V, 15460 Hz / DC 9.694 V	B93082001	B73082001	
GM420-D-2	AC 70300 V, 15460 Hz / DC 70300 V	B93082002	B73082002	

¹⁾ Absolute values

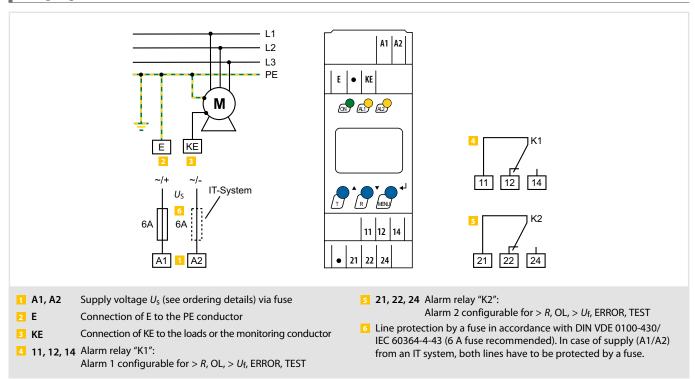
Accessories

Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B98060008

Insulation coordination acc. to IEC 60664-1/IEC 60664-3		Switching elements	
Rated insulation voltage	400 V	Number	2 x 1 changeover contacts (K1, K2
Rated impulse voltage/pollution degree	4 kV/III	Operating principle	N/C operation or N/O operation
	(E, KE) - (11-12-14) - (21-22-24)	K1: Err, $> R$, OL, $> U$, tES	
Voltage test acc. to IEC 61010-1:		(device error, loop resistance, measuring current di	sconnection) N/O operation (n.o.)
(E, KE) - [(A1-A2), (11-12-14)]	3.32 kV	K2: Err, $> R$, OL, $> U$, tES (overvoltage)	N/O operation (n.o.)
(E, KE) - (21-22-24)	2.21 kV	Electrical endurance, number of cycles	1000
(A1- A2) - (11-12-14) - (21-22-24)	2.21 kV	Contact data acc. to IEC 60947-5-1	
		Utilisation category	AC 13 / AC 14 / DC-12 / DC-12 / DC-1
Supply voltage		Rated operational voltage	230 V / 230 V / 24 V / 110 V / 220
GM420-D-1		Rated operational current	
Supply voltage $U_{\rm S}$	AC 1672 V / DC 9.694 V	•	5 A/3 A/1 A/0.2 A/0.1 $1 \text{ mA at AC/DC} \ge 10$
Frequency range $U_{\rm S}$	DC, 15460 Hz	Minimum contact rating	I MA at AC/DC ≥ 10
. , , , , , , , , , , , , , , , , , , ,	DC, 13400 Hz	Environment/EMC	
GM420-D-2:		EMC	IEC 6132
Supply voltage <i>U</i> s	AC/DC 70300 V		ILC 0132
Frequency range U _s	DC, 15460 Hz	Ambient temperature	
Power consumption	≤ 3.5 VA	Operating temperature	-25+55°
Manageria e diverit		Transport	-25+70°
Measuring circuit		Long-term storage	-25+55 °
Loop resistance R _m :		Classification of climatic conditions acc. to IEC 60721	
Measuring range R _m	0100 Ω	Stationary use (IEC 60721-3-3)	3K2
Measuring current I _m	DC 20 mA	Transport (IEC 60721-3-2)	
Measuring voltage $U_{\rm m}$	≤ DC 24 V		
	300211	Long time storage (IEC 60721-3-1)	1K2
Extraneous voltage U _f :		Climatic class acc. to IEC 60721	
Measuring range U _f	AC 050 V	Stationary use (IEC 60721-3-3)	3M1
Rated frequency f _n	42460 Hz	Transport (IEC 60721-3-2)	2M
Disconnection of the measuring loop at $U_{ m f}$	≥ 12 V	Long-time storage (IEC 60721-3-1)	1M1
Reconnection of the measuring loop	≤ 10 V	zong ume storage (ize oor z. v. v.)	
Permissible extraneous voltage <i>U</i> f	≤ 440 V	Connection	
Permissible extraneous DC voltage, without influence on the measur	ement DC 0 V	Connection type	screw-type terminal or push-wire termina
·		Connection	screw termina
Response values			Screw termina
Loop resistance		Connection properties	2/11/2/11
> R (Alarm 1)	0.1100 Ω	rigid	0.24 mm ² (AWG 2412
Resolution of setting R = 010 Ω	0.1100 Ω2	flexible	0.22.5 mm ² (AWG 241 ⁴
<u> </u>		two conductors with the same cross section	
Resolution of setting R = 10100Ω	1Ω	rigid/flexible	0.21.5 mm ² (AWG 2416
Preset function: Loop resistance (> R)	$= ((R_{\rm m} + 0.5 \Omega) \times 1.5)^*$	Stripping length	89 mi
Relative uncertainty 01Ω	±20 %, ±1 digit	Tightening torque, terminal screws	0.50.6 Ni
Relative uncertainty 110Ω	±5 %, ±1 digit	Connection	nuch wire termine
Relative uncertainty 10100 Ω	±5 %, ±1 digit		push-wire termina
Hysteresis > R	140 % (25 %)*	Connection properties	2.2.2.3/49/624
Extraneous voltage		rigid	0.22.5 mm ² (AWG 241 ⁴
	1 FOV (25 V)*	flexible	
<i>U_f</i> (> <i>U</i>) (Alarm 2)	150 V (25 V)*	without ferrules	0.752.5 mm ² (AWG 1914
Resolution of setting <i>U</i> _f 150 V	0.5 V	with ferrules	0.21.5 mm ² (AWG 2416
Relative uncertainty $U_{\rm f}$ (> U) in the range of 50/60 Hz	±2 %, ±1 digit	Stripping length	10 mi
Relative uncertainty U_f (> U) in the range of 42460 Hz	±10 %, ±1 digit	Opening force	50
Hysteresis > U	140 % (5 %)*	Test opening, diameter	2.1 mi
T		opening, warneter	2.1 1111
Time response		Other	
Start-up delay t	099 s (0 s)*	Operating mode	continuous operatio
Response delay ton1/2	099 s (0 s)*	Mounting	any positio
Delay on release t _{off}	099 s (0.5 s)*	Degree of protection, internal components (IEC 60529)	IP3
Operating time t _{ae}	. ,	Degree of protection, internal components (IEC 60529)	
in the case of loop interruption ($R > 50 \text{ k}\Omega$)	≤ 40 ms	9	
in the case of closed loop $(>R)$ t_{ae}	≤ 500 ms	Enclosure material	polycarbona
in case of extraneous voltage (> U) and overload (OL) t_{ae}	≤ 100 ms	Screw mounting	2 x M4 with mounting cl
3 i i i i i i i i i i i i i i i i i i i		DIN rail mounting acc. to	IEC 6071
Response time t _{an}	$t_{\rm an} = t_{\rm ae} + t_{\rm on1/2}$	Flammability class	UL94 V-
Recovery time t _b	≤ 300 ms	Software version	D268 V1.0
Recovery time $t_{\rm b}$ after safety shutdown	≤1s	Documentation number	D0011
Displays, memory		Weight	≤ 150
	multifunctional not illuminated	()* = factory setting	
. ,	multifunctional, not illuminated	() — factory setting	
Display range, measuring value R _m	0100 Ω		
Display range, measuring value U _f	AC 050 V		
Operating uncertainty			
loop resistance 01Ω	±20 %, ±1 digit		
operating uncertainty loop resistance 1100 Ω	±5 %, ±1 digit		
operating uncertainty voltage in the range of 50/60 Hz	±2 %, ±1 digit		
operating uncertainty voltage in the range of 42460 Hz	$\pm 10\%$, ± 1 digits		
History memory (HiS) for the first alarm value	data record measured values		
Password	off/0999 (off)*		
Fault memory (M) alarm relay	on/off (on)*		



Wiring diagram



RC48C

Residual current/loop monitoring device



Device features

- · Earth fault monitor with integrated loop monitoring
- · Measurement of the fault current by means of a Bender measuring current transformer
- Alarm easily recognisable by LED lights
- Alarm relay with two voltage-free changeover contacts
- · Alarm contact can be delayed by a selectable time
- Detection of series and transverse resistance faults
- The alarm relay can be used to trigger a load switch
- · Depending on the type of load switch, the operating mode of the alarm relay can be set to normally open or normally closed operation

Standard

- CSA M421-16
- NEC 250.188(D)

Approvals

pilot wire

Typical applications



• Monitoring cables that feature a

• Monitoring of earthing systems

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Supply voltage <i>U</i> s	Supply voltage <i>U</i> ₅ für UL	Art. No.
RC48C-935			B94013002
RC48C-9935	AC/DC 60264 V, 5060 Hz	AC/DC 110240 V, 50/60 Hz	B94013012
RC48C-9936			B94013013

Accessories

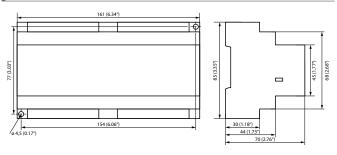
Description	Art. No.
Termination device for RC48C, P = 5 W (without an enclosure)	B94013008
Termination device for RC48C, P = 50 W (without an enclosure)	B94013009
Termination device for RC48C, P = 50 W	B94013006
Termination device for RC48C with an integrated resistor for remote disconnection, P = 50 W	B94013007

Suitable system components

Description	Inside diameter	Туре	Art. No.	Page	
Remote alarm indicator and test combination	_	RI2000GC	B94071000	-	
Residual current transformer	70 mm	W2-S70	B911732	365	
	105 mm	W3-S105	B911733	365	

Rated insulation voltage	AC 250 \
Rated impulse voltage/pollution degree	2.5 kV/
Voltage ranges	
Supply voltage U _S	AC/DC 60264 V, 5060 H
For UL:	
Supply voltage U_s	AC/DC 110240 V, 50/60 H
Fuse	recommended: 6 A slow fus
Power consumption	approx. 5 VA at AC 60 V
	approx. 8.5 VA at AC 264 \
Residual current monitoring	
Response value, residual current	adjustable 0.11 A or 110 A
Accuracy of $I_{\Delta n}$ / A, (valid for setting ranges x1 and x10)	·
at position "0.1" and "1"	025 %
at position "0.3", "0.5" and "0.7"	±20 %
Response delay	selectable 0.12
Accuracy of the response delay	±20 %
Continuous short-circuit current	200 A
	2500 A for 2 second
Operating mode	latching
Ground conductor monitoring	
Response value	
RC48C-935	40 Ω
RC48C-9935, RC48C-9936	400 Ω
Accuracy	±10 Ω
Open-circuit voltage	DC 12 V
Output impedance	240 🖸
Rated current of the measuring loop	DC 25 m/
Protection against extraneous voltage	AC 25 V continuous
	AC 120 V for 3
Delay on release	1.5
Response time, series resistance faults	0.2
Response time, cross resistance faults	0.2
Accuracy of the response time	±20 %
Operating mode	
RC48C-935, RC48C-9936	no latching
RC48C-9935	latching
Inputs	
Connection to the residual current transformer	
Single wire 0.75 mm ² (AWG 18)	up to 1 m (3'
Single wire, twisted 0.75 mm ² (AWG 18)	110 m (330'
Shielded cable 0.75 mm ² (AWG 18) (shield to ground)	1025 m (3075'
Connection to the RI2000GC remote alarm indicator and test con	
Single wire 0.75 mm ² (AWG 18)	010 m (030'

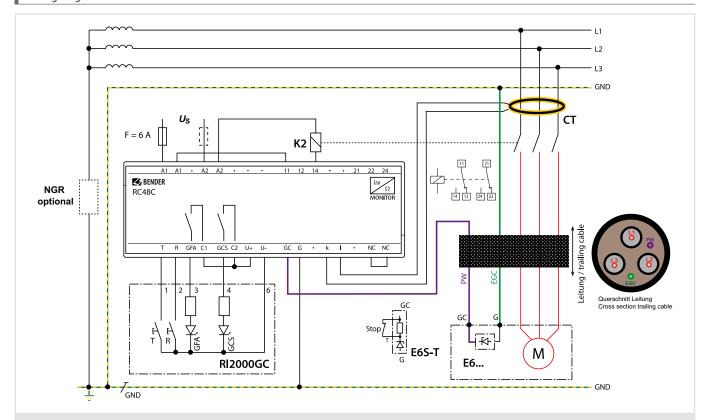
Dimension diagram (dimensions in mm (in))



Outputs	
Switching elements (alarm relay)	2 changeover contacts (N/O and N/C, Form C
Rated contact voltage	AC 250 V/DC 300 \
Making capacity	AC/DC 5 A
Breaking capacity AC/DC	2/0.2 <i>F</i>
Permissible number of operating cycles	12000 cycle
Operating mode, switching elements (alarm relay)	Fail-Safe
Switching elements (GFA, GCS)	2 NO contacts
Rated contact voltage	AC 250 V/DC 300 \
Making capacity	AC/DC 5 A
Breaking capacity AC/DC	2/0.2 A
Permissible number of operating cycles	12000 cycle
Type tests	
Test of the electromagnetic compatibility (EMC)	
Immunity	according to IEC 62020
Emission	according to EN 5008°
Emissions according to EN 55011/CISPR11	class A
Environment	
Ambient temperature, during operation	-40+60 °C (-40140 F
Ambient temperature, for storage	-55+80 °C (-67176 F
Climatic class acc. to IEC 60721 (except condensation	and formation of ice) 3K22
Connection	
Connection type	screw-type terminal:
Connection properties	
rigid	0.24 mm ² (AWG 2412)
flexible	0.22.5 mm ² (AWG 2414
Other	
Operating mode	continuous operation
Mounting	any position
Protection class	according to DIN EN 60529
Built-in components	IP 30
Terminals	IP 20
Flammability class	UL94V-
Documentation number	D00318
W.:.l.4	3/0

Weight

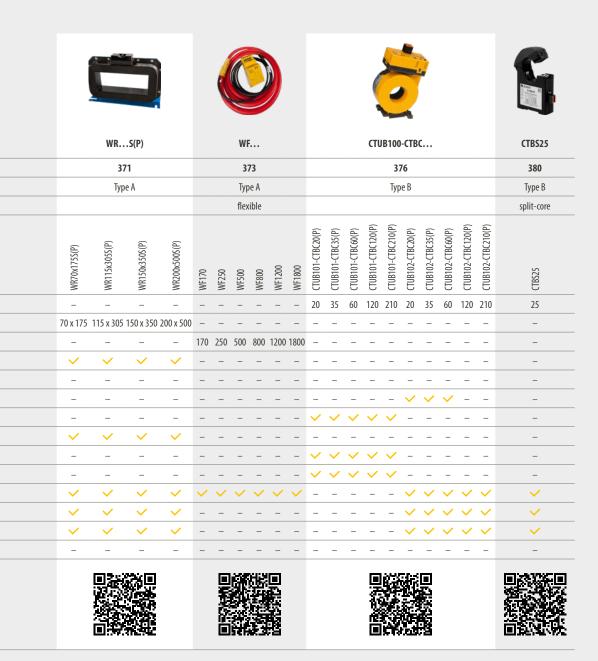
approx. 360 g



Connections	3	Connection	to the RI2000GC remote alarm indicator and test		
A1, A2	Connection supply voltage U_s .	combination	n		
11, 12, 14	Two voltage-free changeover contacts trip in case of	Т	Connection external Test button		
21, 22, 24	an alarm. N/C operation or N/O operation selectable.	R	Connection external Reset button		
NC, NC	Set contact configuration for voltage-free changeover	GFA	Connection external "Alarm Ground Fault" LED		
	contacts:	GCS	Connection external "Ground Check Safe" LED		
	Bridge open: N/O Bridge closed: N/C (factory setting)	U+, U-	Output DC 12 V, e.g. for the supply of the RI2000GC remote alarm indicator and test combination		
k, l	Connection residual current transformer	C1, C2, U+	Bridge supplying the RI2000GC remote alarm indicator		
GC	Connection to the PW (pilot wire) conductor of the cable		and test combination with supply voltage from the		
G	Connection to the EGC (equipment grounding conductor = GND) conductor of the cable.		RC48C.		

Device overview measuring current transformers

		0	7		0												A			L.			
		CTAC			CTAS		W	/0-S2	0W	15-S2 ⁻	10, W	10/60	00		WS.	/WS	-8000			WS	ss		
Ca	ntalogue page	359			362					365						367				3	69		
	Туре	Type A			Type A					Type A	4					Type A				Ту	pe A		
	Eigenschaft				split-cor	re										split-core	2			spli	t-core		
	CT type	CTAC20(/01) CTAC35(/01) CTAC60	CTAC210	CTAS 50 (/01)	CTAS 80 (/01)	CTAS120(/01)	W10/600	W0-520	W1-535	W2-570	W3-S105	W4-S140	W5-5210	WS20x30	WS50x80	WS80x120	WS20x30-8000	WS50x80-8000	WS50x80S	WS80x80S	WS80x120S	W580x160S	
ions	Inside diameter	20 35 60 1.	20 210	50	80	120	10	20	35	70	105	140	210	-	_	_	_	_	-	_	_	_	
Dimensions (mm)	Width x height			-	_	-	-	-	-	_	_	-	_	20 x 30	50 x 80	80 x 120	20 x 30	50 x 80	50 x 80	80 x 80	80 x 120	80 x 160	
<u> </u>	Strip length			_	_	_	_	_	_	-	-	_	_	-	_	-	_	_	-	_	_	_	
	EDS440	~ ~ ~ ~	/	<u> </u>		<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	~	~	<u> </u>			~	<u> </u>	~	<u> </u>	
	EDS441	~ ~		~	<u> </u>		_	_	_	-	-	_	_	-	_	-	<u> </u>	<u> </u>	-	_		_	
	EDS441-LAB						_	_	_	_	_	_	_	_	_			<u> </u>	-			_	
>	MRCDB423						_	_	_	_	_		_	-					-				
Device family	RCM420	V V V					_	_	<u> </u>	_	_	_	<u> </u>						<u> </u>	<u> </u>			
evice	RCMA420						_	_	_	_	_	_	_	_	_				-				
ă	RCMA423						_	_	_	_	_	_	_	_					-				
	RCMS460/490	V V V V	<u> </u>					<u> </u>	<u> </u>	<u> </u>		<u> </u>	<u> </u>						<u> </u>	<u> </u>	<u> </u>		
	RCMS410 RCMS425		<u> </u>					<u> </u>	<u> </u>	<u> </u>		<u> </u>	<u> </u>						<u>~</u>	~		<u> </u>	
		-			<u> </u>		Ť	<u> </u>	_	_	_		<u> </u>										
	NGRM						Ë	_	_	_	_	_	_	_	_	_			_				
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Device overview coupling devices



Device overview isolating transformers, transformers for operating theatre lights



Device overview power supply units



Device overview measuring instruments



Device overview interface converters and repeaters





DI-2USB

(atalogue page	408	410	
	Application	Interface repeater BMS bus	Interface converter BMS/USB	
	Input	RS-485	RS-485	
Connection		screw-type terminal	screw-type terminal	
_	Cable length	≤ 1200 m	≤ 1200 m	
	Output	RS-485	USB	
Ħ	Connection	screw-type terminal	USB Type B	
Output	Cable length	≤ 1200 m	≤ 5 m	
Ū	Expansion of bus devices	≤ 30	-	
Supply voltage <i>U</i> s		AC 85260 V, 5060 Hz	via USB	
Pa	rticular features	-	Driver CD	
			massum	

Product details (Products on www.bender.de/en)





Device overview relay module



I0M441

Catalogue page	411			
Application	for extension of EDS44x applications			
Relay number	12 N/O contacts			
Supply voltage U _s	via BB bus			
Interface	BB bus			
Connection	push-wire terminal / BBbus PCB			
Relay operation	configurable			

Product details (Products on www.bender.de/en)



Device overview condition monitors/gateways

			1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	The state of the s		
		COMTRAXX® EDGE500IP	COMTRAXX® COM465IP	COMTRAXX® COM465DP	COMTRAXX® COM465ID	COMTRAXX® COM463BC	COMTRAXX® CP907-I
	Catalogue page	413	417	421	425	429	431
	Application			Condition monitor with	/ gateway functionality		
	Web server	~	~	~	~	~	~
	System-wide device parameterisation	~	~	~	~	-	~
	Visualisations	~	~	~	~	_	~
	Individual alarms	~	~	~	~	-	~
tion	E-mail notification	~	~	~	~	~	~
erisa	Third-party device integration	~	~	~	~	-	~
Parameterisation	Complex connections	~	~	~	~	-	~
Par	System documentation	~	~	~	~	-	~
	Device/system backup	~	~	~	~	-	~
	Virtual devices	100 per 16 channels	100 per 16 channels	100 per 16 channels	100 per 16 channels	-	100 per 16 channels
	History memory	20,000 data records	20,000 data records	20,000 data records	20,000 data records	-	20,000 data records
	Data logger	30 per 10,000 data records	30 per 10,000 data records	30 per 10,000 data records	30 per 10,000 data records	-	30 per 10,000 data records
	Modbus RTU	~	~	~	_	~	~
	BMS	~	~	~	_	~	~
au -	USB-C	2	-	-	_	-	_
Interface	Ethernet	2	1	1	1	1	1
<u>i</u>	Protocol input	BMS (internal) /BCOM / Modbus RTU/TCP	BMS (internal / external) / BCOM / Modbus RTU/TCP	BMS (internal / external) / BCOM / Modbus RTU/TCP	isoData / Modbus TCP	BMS (external) / BCOM	BMS (internal) / BCOM /
	Protocol output	Modbus RTU/TCP / SNMP / MQTT	Ethernet / Modbus RTU/TCP / SNMP / PROFINET / MQTT	Ethernet / Modbus RTU/TCP / SNMP / PROFINET / PROFIBUS DP / MQTT	Ethernet / Modbus TCP / OPC-UA5	Ethernet	Ethernet / Modbus RTU/TCP / SNMP / PROFINET / MQTT
outputs/	Digital inputs (potential-free)	8	-	-	-	-	-
	N/C or N/O operation	selectable	-	-	-	-	-
Inputs	Relay outputs	Relay outputs 4 – –		-	-	-	
_	N/C or N/O operation	selectable	-	-	-	-	-
	Installation	DIN rail	DIN rail	DIN rail	DIN rail	DIN rail	Panel mounting, surface mounting, flush mounting
	Supply voltage <i>U</i> s	DC 24 V	AC/DC 24240 V	AC/DC 24240 V	AC/DC 24240 V	AC/DC 24240 V	DC 24 V
	Product details (Products on www.bender.de/en)						

Device overview alarm indicator and test combinations

		AND MANY STATES OF THE PARTY OF	Note:		W
		COMTRAXX [®] CP9xx	COMTRAXX® CP305	COMTRAXX [®] MK2430	Visualisation
	Catalogue page	434	437	441	444
- Ses	MEDICS® systems	~	~	~	~
Messages/ displays	RCMS Residual current monitoring system	~	~	~	~
A di	EDS insulation fault locator	~	~	~	~
	Flush-mounting	~	~	~	~
Installation type	Cavity wall mounting	~	~	~	~
ation	Cable-duct mounting	-	~	~	-
nstall	Panel mounting	~	✓	~	~
_	Surface mounting	~	~	~	-
	Digital inputs (potential free)	12	12	0/12	-
ts	N/O or N/C operation	selectable	selectable	selectable	-
outpo	Relay outputs	1	2	1	-
Inputs/outputs	N/O or N/C operation	programmable	programmable	programmable	-
	Common alarm	programmable	programmable	programmable	-
	System fault alarm	programmable	programmable	programmable	-
	Languages selectable	> 25	> 25	2	programmable
e	Standard display	Graphic LCD (7", 15.6", 24")	5" TFT touch display	4 x 20 characters	-
essag	Additional text display	~	~	3 x 20 characters	-
xt m	Standard texts	~	✓	~	-
ng/te	Freely configurable text messages	~	✓	200	-
Parameter setting/text message	History memory, maximum number of data records	20,000	1000	250	-
rame	Real-time clock	~	~	~	-
R	Parameterisation software	integrated	integriert	TMK-Set V 4.xx (USB, BMS)	-
	Messages/alarms, medical gases	acc. to EN475, EN737-3	acc. to EN475, EN737-3	acc. to EN475, EN737-8	-
	RS-485 (BMS protocol)	~	~	~	-
	BMS address range	1150	190	1150	-
faces	Master redundancy, BMS internal	~	~	~	-
Interfaces	Modbus RTU address range	1247	130	-	-
	USB	~	-	~	-
	Ethernet (TCP/IP)	~	~	-	~
	Supply voltage Us	DC 24 V/AC 250 V	AC 1828 V/DC 1830 V	AC/DC 24 V	-
Stored	l energy time in the event of power failure	≥ 15 s	≥ 2 s	≤ 15 s	-
	Product details (Products on www.bender.de/en)				

LINETRAXX® CTAC...

Measuring current transformers



Device features

Measuring current transformers CTAC...

- For RCMS460/490 residual current monitoring systems
- For RCM420 residual current monitors
- For EDS440 insulation fault locators in AC and DC systems

Measuring current transformers CTAC.../01

• For EDS441 insulation fault locators

Further information

For further information refer to our product range on www.bender.de.

Typical applications

- For residual current monitoring systems of the series RCM or RCMS
- $\bullet \ \ Suitable \ for \ use \ in \ insulation \ fault$ location for IT systems (EDS)

Approvals







Ordering information

Туре	Mounting	Inside diameter	Art. No.²)
CTAC20		20	B98110005
CTAC20/01 ¹⁾	Mounting brackets, DIN rail	20 mm	B98110006
CTAC35		25	B98110007
CTAC35/01 ¹⁾		35 mm	B98110008
CTAC60		60 mm	B98110017
CTAC120	Mounting brackets	120 mm	B98110019
CTAC210	Mounting brackets	210 mm	B98110020

¹⁾ For EDS441 insulation fault locators

Accessories

Type designation	Art. No.
Snap-on mounting for CTAC20 and CTAC20/01	B91080111
Snap-on mounting for CTAC35 and CTAC35/01	B91080112

Includet in scope of delivery

Selection list

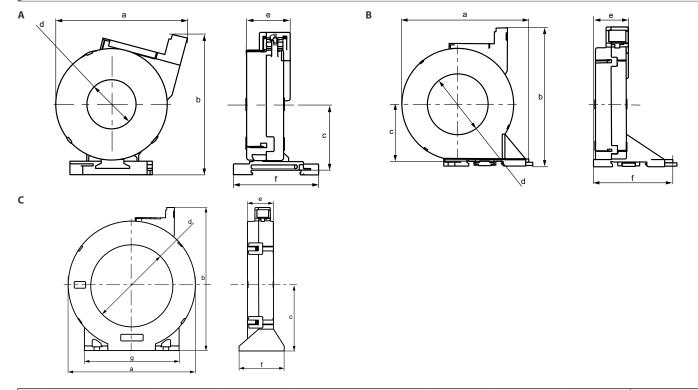
Туре	RCM420	RCMS460 RCMS490	EDS440	EDS441
CTAC20	~	~	~	-
CTAC35	~	~	~	-
CTAC60	~	~	~	-
CTAC120	~	~	~	-
CTAC210	~	~	~	-
CTAC20/01	-	-	-	~
CTAC35/01	-	-	-	~

²⁾ B781100xxMIL variants available on request

Rated insulation voltage	800 \
Overvoltage category	III 8 kV/3
Rated impulse voltage/pollution degree	
Measuring current transformer circuit	
CTAC	
Rated transformation ratio K _r	600/
Rated continuous thermal current* I _{cth}	125
Frequency range	15 Hz100 kH
Rated short-time thermal current* Ith	2.4 kA/1
Rated dynamic current* I _{dyn}	50 kA / 50 m
Rated current /	
CTAC20 at $I_{\Delta n} \ge 30 \text{ mA}$	63 /
CTAC20 at $I_{\Delta n} \ge 300 \text{ mA}$	80 /
CTAC35 at $I_{\Delta n} \ge 30 \text{ mA}$	125 /
CTAC35 at $I_{\Delta n} \ge 300 \text{ mA}$	160 /
CTAC60 at $I_{\Delta n} \ge 30 \text{ mA}$	200 /
CTAC60 at $I_{\Delta n} \ge 300 \text{ mA}$	400 /
CTAC120 at $I_{\Delta n} \ge 100 \text{ mA}$	400 /
CTAC210 at $I_{\Delta n} \ge 300 \text{ mA}$	630 /
CTAC/01	
Rated transformation ratio $K_{ m r}$	8000/
Rated continuous thermal current* I _{cth}	6.
Rated short-time thermal current* I _{th}	0.36 kA/1
Rated dynamic current* I _{dyn}	0.9 kA / 40 m
Rated current /	
CTAC20/01 at $I_{\Delta n} \ge 30 \text{ mA}$	63 /
CTAC20/01 at $I_{\Delta n} \ge 300 \text{ mA}$	80 /
CTAC35/01 at $I_{\Delta n} \ge 30 \text{ mA}$	125 /
CTAC35/01 at $I_{\Delta n} \ge 300 \text{ mA}$	160
* refers to the residual current	
Environment	
Operating temperature	-25+70°
B781100xxMIL (for applications with EDS)	-40+70°
Climatic class acc. to IEC 60721	
Stationary use (IEC 60721-3-3)	3K2
Transport (IEC 60721-3-2)	2K1
Long-time storage (IEC 60721-3-1)	1K2
Classification of mechanical conditions IEC 60721	
Stationary use (IEC 60721-3-3)	3M1
B781100xxMIL devices ¹⁾	3M1:
Transport (IEC 60721-3-2)	2M4
Long-time storage (IEC 60721-3-1)	1M1:

Connection		
Terminal type	MSTB 2.5/2-ST-5.08	
for B781100xxMIL devices	FKC 2.5/2-ST-5.08	
Manufacturer	Phoenix Contac	
Connection type	screw type termina	
for B781100xxMIL devices	push-wire termina	
The connection conditions of the manufacturer apply.		
Corresponding PCB connectors are included in the scope of delive	ery	
Connection properties		
rigid	0.22.5 mm ² (AWG 2412)	
flexible	0.22.5 mm ² (AWG 2412)	
Stripping length	7 mm	
Connection EDS, RCM(S) measuring current transformer	s	
Single wire ≥ 0.75 mm ²	01 m	
Single wire, twisted ≥ 0.75 mm ²	010 m	
Shielded cable ≥ 0.5 mm²	040 n	
Shielded cable	recommended: J-Y(St)Y min. 2x0.8	
RCM: shield on one side connected to L-conductor, not co	onnected to earth	
EDS: shield on one side connected to PE		
Mounting		
Screw Type		
CTAC20(/01), CTAC35(/01), CTAC60	DIN EN ISO 7045 - M5)	
CTAC120, CTAC210	DIN EN ISO 7045 - M6	
Washer type		
CTAC20(/01), CTAC35(/01), CTAC60	DIN EN ISO 7089/7090 - 5	
CTAC120, CTAC210	DIN EN ISO 7089/7090 - 6	
Tightening torque		
CTAC20(/01), CTAC35(/01)	0.6 Nn	
CTAC60, CTAC120, CTAC210	1 Nm	
Other		
Degree of protection, internal components (DIN EN 60529)	IP40	
Degree of protection, terminals (IEC 60529)	IP20	
_ · · · · · · · · · · · · · · · · · · ·	111.0.434.6	
Flammability class	UL94 V-0	
Flammability class Documentation number	D0038	

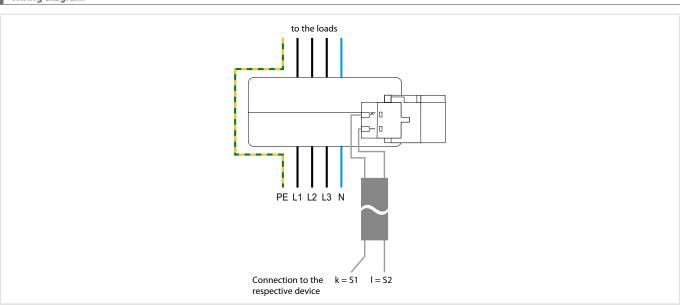
 $^{^{1)}\,\,}$ CTAC120 and CTAC210 must be additionally mounted for the 3M12. (see mountings in the manual)



Dimensions (mm)							Weight in g (gross)		
	Type a b c d e f g							(gross)	
	CTAC20(/01)	75	82	37	ø 20	32	60	_	160
Α	CTAC35(/01)	94	100	47	ø 35	30	61	-	220
В	CTAC60	126	137	57	ø 60	33	78	-	460
	CTAC120	188	211	96	ø 120	38	66	139	1140
	CTAC210	302	324	153	ø 210	40	74	277	2340

Tolerance: ± 0.5 mm

Wiring diagram



Measuring current transformers CTAC...

Connection to the respective residual current monitoring system RCMS, residual current monitors RCM or to insulation fault location systems EDS

Measuring current transformers CTAC.../01

Connection to the respective EDS474(E)-12, EDS461, EDS491 and EDS441 insulation fault locator

LINETRAXX® CTAS series

Split-core type measuring current transformers



Typical applications

CTAS... measuring current transformers

- $\bullet \ \ For \ residual \ current \ monitoring \ systems \ of the \ RCMS460/490 \ series$
- For residual current monitors of the RCM420 series
- For insulation fault locators of the EDS440 series in AC and DC systems

CTAS.../01 measuring current transformers

• For insulation fault locators EDS441

Approvals Further information

CEUK CULUS

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Internal diameter	Mounting	Art. No.
CTAS50	FO		B98110009
CTAS50/01	50 mm	Screw mounting, DIN rail	B98110012
CTAS80			B98110010
CTAS80/01	80 mm		B98110013
CTAS120	120 mm	Corour mounting	B98110011
CTAS120/01	120 ((((()	Screw mounting	B98110014

Accessories

Description	Art. No.
Mounting clip ¹⁾	B98110015
Mounting bracket	B98110016

¹⁾ Included in the scope of delivery of the CTAS50(/01) and CTAS80(/01). For CTAS120(/01) reduced mechanical conditions apply.

Selection list

Туре	RCM420	RCMS460 RCMS490	EDS440	EDS441
CTAS50	~	~	~	-
CTAS80	~	~	~	_
CTAS120	~	~	~	-
CTAS50/01	-	-	-	~
CTAS80/01	-	-	-	~
CTAS120/01	-	-	-	~

Technical data

500 V
630 V
III
8 kV/3
720 V
600/1
125 A
42 Hz3 kHz
2.4 kA / 1 s
50 kA / 50 ms
85 A
160 A
250 A

CTAS.../01

Rated transformation ratio K _r	8000/1
Rated continuous thermal current* I _{cth}	125 A
Rated short-time thermal current* Ith	0.36 kA/1 s
Rated dynamic current* /dyn	0.9 kA/40 ms
Rated current In	
CTAS50/01 at $I_{\Delta n} \ge 30 \text{ mA}$	85 A
CTAS80/01 at $I_{\Delta n} \ge 100 \text{ mA}$	160 A
CTAS120/01 at $I_{\Delta n} \ge 300 \text{ mA}$	250 A

* refers to the residual current

For UL applications:

Sensing voltage	630 V
Working voltage	30 V
Sensing current difference	
CTAS50(/01)	30 mA
CTAS80(/01)	100 mA
CTAS120(/01)	300 mA

Technical data (continued))

Operating temperature	-25+70°C
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 (-40+80 °C)
Classification of mechanical conditions acc. to IEC 60721	
Stationary use (IEC 60721-3-3)	
Mounting clip	3M12
Mounting bracket	3M12
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12
Connection	
Connection type	screw-type terminals
Connection properties	

0.34...2.5 mm² (AWG 22...12)

0.34...2.5 mm² (AWG 22...12)

copper or copper-clad aluminium

8...9 mm

0.5 Nm (4.43lb-in)

Single wire ≥ 0.75 mm ²	01 m
Single wire, twisted ≥ 0.75 mm ²	010 m
Shielded cable $\geq 0.5 \text{ mm}^2$	040 m
Shielded cable	
recommended	CAT6/CAT7 min. AWG 22
alternatively	Cables, twisted pairs, J-Y(St)Y min. 2x0,8
RCM	shield connected to L conductor, must not be earthed
EDS	shield to PE
Other	
Degree of protection	
internal components (DIN EN 60529)	IP40
terminals (DIN EN 60529)	IP20
Flammability class	UL94 V-0
Number of opening cycles	max. 10
Documentation number	D00452

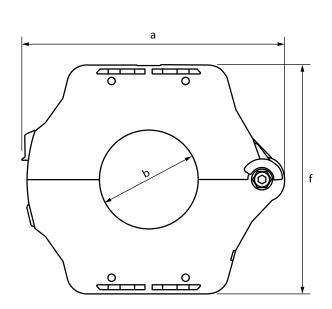
Dimension diagram

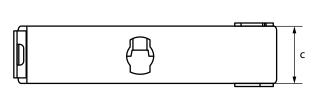
rigid flexible

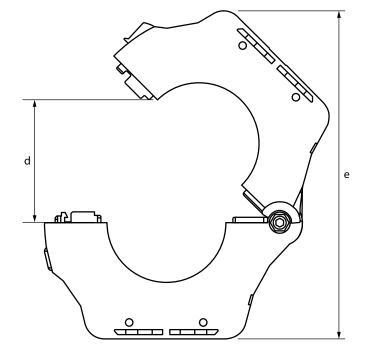
Stripping length

Tightening torque For UL applications

conductors

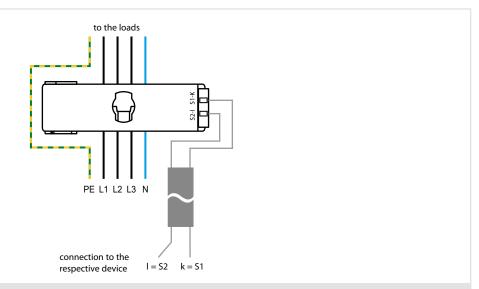






Dimensions (mm)						Weight in g		
Туре	a	b	С	d	e	f	(gross)	
CTAS50	133	ø 50	29	77	175	116	425	
CTAS50/01	133	ø 50	29	77	175	116	460	
CTAS80	177	ø 80	29	108	235	156	875	
CTAS80/01	177	ø 80	29	108	235	156	950	
CTAS120	225	ø 120	50	150	303	205	1500	
CTAS120/01	225	ø 120	50	150	303	205	1550	

Tolerance: ±0.5 mm



CTAS... measuring current transformers

Connection to residual current monitoring systems of the RCMS series, residual current monitors of the RCM series or insulation fault location systems of the EDS series

CTAS.../01 measuring current transformers Connection to an insulation fault locator EDS441

2025 BENDER

Measuring current transformers



Measuring current transformer W10/600

Typical applications

- For residual current monitors (RCM)
- For residual current monitoring systems (RCMS)
- For insulation fault locators with additional EDS in AC and DC systems

Standards

W0-S20...W5-S210 series measuring current transformers comply with the device standard:

• IEC 61869-1.

Approvals





For further information refer to our product range on www.bender.de.



Measuring current transformer W0-S20



Measuring current transformer W1-S35

Ordering information

Туре	Inside diameter		Approvals		Art. No.	
Туре	mside diameter	UL	UL EAC LR		ALC NO.	
W10/600	10 mm	-	-	>	B911761	
W0-S20	20 mm	-	~	>	B911787	
W1-S35	35 mm	~	~	~	B911731	
W2-S70	70 mm	~	~	~	B911732	
W3-S105	105 mm	~	~	~	B911733	
W4-S140	140 mm	~	~	~	B911734	
W5-S210	210 mm	~	~	~	B911735	

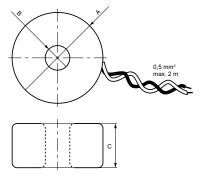
Technical data

Insulation coordination acc. to IEC 60044-1	
Highest system voltage for electrical equipment $U_{\rm m}$	AC 720 V
Rated impulse withstand voltage U_{isol}	3 kV
Measuring circuit	
Rated transformation ratio	600/1
Rated burden	180 Ω (18 Ω at 100 A)
Phase displacement	<4°
Rated primary current	≤10 A (100 A)
Rated primary current	≥10 mA
Nominal power	50 mVA
Rated frequency	15400 Hz
Internal resistance	58Ω
Secondary overvoltage protection	with suppressor diode P6KE6V8CF
Accuracy class	3
Rated continuous thermal current	100 A
Rated short-time thermal current	14 kA 1 s
Rated dynamic current	35 kA 30 ms
Environment	
Shock resistance IEC 60068-2-27 (device in operation)	15 g/11 ms
Bumping IEC 60068-2-29 (transport)	40 g/6 ms
Virbation resistance IEC 60068-2-6 (device in operation)	
W1-S35W3-S105	1 g/10150 Hz
W4-S140, W5-S210	1 g/10150 Hz/0.075 mm
Vibration resistance IEC 60068-2-6 (device not in operation)	2 g/10150 Hz
Ambient temperature (during operation/during storage)	-10+ 50 °C/-40+ 70 °C
Climatic class acc. to DIN IEC 60721-3-3	3K22

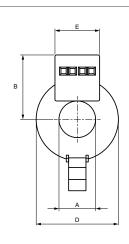
Connection	screw-type terminals
Connection	
rigid/flexible	0.2/4/0.22.5 mm ²
flexible with ferrules with/without plastic sleeve	0.252.5 mm ²
Conductor sizes	AWG 2412
Connection to the evaluator	
single wire $\geq 0.75 \text{ mm}^2$	01 m
single wire, twisted $\geq 0.75 \text{ mm}^2$	010 m
shielded cable $\geq 0.6 \text{ mm}^2$	040 m
Shielded cable (shield connected to PE on one side)	recommended cable J-Y(St)Y min. 2 x 0.6
Other	
Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (DIN EN 60529)	IP40
Degree of protection, terminals (DIN EN 60529)	IP20
Screw mounting	M5
Flammability class	UL94 V-0
Documentation number	D00142 (W(0-5)-S)
	D00143 (W10)

Dimension diagrams

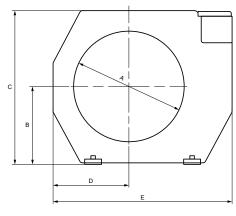
Type W10/600

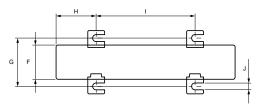


Type W0-S20



Type W1-S35...W5-S210





Dimensions (mm)									Weight		
Туре	A	В	C	D	E	F	G	Н	ı	J	g.i.c
W10/600	ø 37	ø 10	18	-	-	-	-	-	-	-	85 g
W0-S20	ø 20.5	36	69	ø 46	25	32	23	_	-	_	70 g
W1-S35	ø 35	44	79	35	100	32.5	46	26.5	48	6.5	250 g
W2-S70	ø 70	58	110	52	130	32.5	46	32	66	6.5	380 g
W3-S105	ø 150	74	146	72	170	32.5	46	38	94	6.5	700 g
W4-S140	ø 140	99.5	197	97.5	220	32.5	46	48.5	123	6.5	1500 g
W5-S210	ø 210	143	285	150	300	32.5	46	69	161	6.5	2500 g

Split-core type measuring current transformers



Typical applications

WS... measuring current transformers

- For RCMS460/490 residual current monitoring systems
- For RCM420/RCM460 residual current monitors
- For EDS470, EDS460/490 and EDS440 insulation fault locators in AC and DC systems

WS...-8000 measuring current transformer

• For EDS473(E)-12, EDS474(E)-12, EDS461 and EDS491 insulation fault locators

Approvals



Standards

WS... and WS...-8000 measuring current transformers comply with the device standard:

• IEC 61869-1

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Internal dimensions	Mounting	Art. No.
WS20x30	20 v 20 mm		B98080601
WS20x30-8000 ¹⁾	20 x 30 mm		B98080602
WS50x80	5000	Mounting brackets	B98080603
WS50x80-8000 ¹⁾	50 x 80 mm		B98080604
WS80x120	80 x 120 mm		B98080606

 $^{^{\}rm 1)}$ For EDS461/491 and EDS473/474 insulation fault locators

Selection list

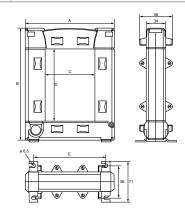
Туре	RCM420	RCMS460 RCMS490	EDS440	EDS441	EDS441-LAB
WS20x30	~	~	~	-	_
WS50x80	~	~	~	-	-
WS80x120	~	~	~	-	-
WS20x30-8000	-	_	-	~	~
WS50x80-8000	-	_	-	~	~



Rated insulation voltage	800 \
Rated impulse voltage/pollution degree	8 kV/3
CT circuit WS	
Rated primary residual current	10 A
Rated secondary residual current	0.0167 A
Rated transformation ratio K _n	10/0.0167 A
Rated burden	max. 180 Ω
Nominal power	0.05 VA
Frequency range	42 Hz3 kHz
Rated continuous thermal current I _{cth}	40 A
Rated short-time thermal current Ith	$60 \text{ x } I_{\text{cth}} = 2.4 \text{ kA/1} \text{ s}$
Rated dynamic current I _{dyn}	$2.5 \text{ x } I_{\text{th}} = 6.0 \text{ kA}/40 \text{ ms}$
CT circuit WS8000	
Rated primary residual current	1 A
Rated secondary residual current	0.125 mA
Rated transformation ratio K _n	1 A/0.125 mA
Frequency range	42 Hz3 kHz
Rated continuous thermal current I _{cth}	6 A
Rated short-time thermal current Ith	$60 \text{ x } I_{\text{cth}} = 0.36 \text{ kA/1}$
Rated dynamic current I _{dyn}	2.5 x I _{th} = 0.9 kA/40 ms

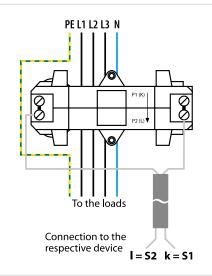
Operating temperature	-25+70°C
Classification of climatic conditions acc. to IEC 60721 (except	condensation and formation of ice)
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K12
Long-time storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions IEC 60721	
Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M4
Long-time storage (IEC 60721-3-1)	1M12
Connection	
Connection	screw-type terminal
Connection	
rigid/flexible/conductor sizes	0.082.5 mm ² (AWG 2812)
Stripping length	89 mm
Connection EDS, RCM(S) measuring current transformers	
Single wire ≥ 0.75 mm ²	01 m
Single wire, twisted $\geq 0.75 \text{ mm}^2$	010 m
Shielded cable $\geq 0.5 \text{ mm}^2$	040 m
Shielded cable (shield on one side connected to L-conductor, not conne	ected to earth)
	recommended: J-Y(St)Y min. 2x0.8
Other	
Degree of protection, internal components (DIN EN 60529)	IP40
Degree of protection, terminals (DIN EN 60529)	IP20
Screw mounting	M5 with mounting brackets
D	D0007

Dimension diagram



	Weight					
Туре	A B C D E				Weight	
WS20x30	93	106.15	23	33	64	≤ 600 g
WS50x80	125	158.15	55	85	96	≤ 1040 g
WS80x120	155	198.15	85	125	126	≤ 1400 g
WS20x30-8000	93	106.15	33	33	64	≤ 630 g
WS50x80-8000	125	158.15	85	85	96	≤ 1080 g

Wiring diagram



Documentation number

WS... series measuring current transformers

Connection to the respective RCMS series residual current monitoring system, RCM series residual current monitors or to EDS series insulation fault location systems

WS...-8000 measuring current transformer

Connection to the respective EDS461 and EDS491 insulation fault locator



D00077

WS50x80S...WS80x160S series

Split-core type measuring current transformers



Measuring current transformer WS50x80S

Typical applications

- For residual current monitors (RCM)
- For residual current monitoring systems (RCMS)
- For insulation fault locators with additional EDS in AC and DC systems

Standards

WS... measuring current transformers comply with the device standard:

• IEC 61869-1.

Approvals



Measuring current transformer WS80x160S

CECH R AL

Further information

For further information refer to our product range on www.bender.de.

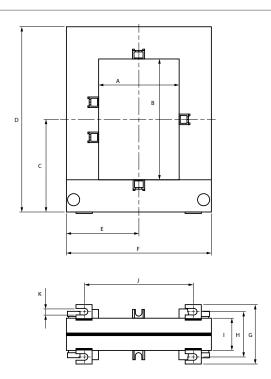
Ordering information

Туре	Internal dimensions		Approvals		Art. No.	
	internal uniterisions	UL	EAC	LR	ALC: NO.	
WS50x80S	50 x 80 mm	~	~	~	B911741	
WS80x80S	80 x 80 mm	~	~	>	B911742	
WS80x120S	80 x 120 mm	~	~	~	B911743	
WS80x160S	80 x 160 mm	-	~	~	B911755	

Technical data

Highest system voltage for electrical equipment $U_{\rm m}$	AC 720 V
Rated impulse withstand voltage <i>U</i> _{isol}	3 kV
Measuring circuit	
Rated transformation ratio	600/1
Rated burden	180 Ω
Rated primary current	≤ 10 A (100 A)
Rated primary current	≥ 10 mA
Nominal power	50 mVA
Rated frequency	50400 Hz
Internal resistance	58Ω
Secondary overvoltage protection	with suppressor diode P6KE6V8CF
Accuracy class	5
Rated continuous thermal current	100 A
Rated short-time thermal current	14 kA/1 s
Rated dynamic current	35 kA/30 ms
Environment	
Standard	IEC 60044-1
Shock resistance IEC 60068-2-27 (device in operation)	15 g/11 ms
Bumping IEC 60068-2-29 (transport)	40 g/6 s
Vibration resistance IEC 60068-2-6	
device in operation	1 g/10150 Hz
transport	2 g/10150 Hz
Ambient temperature	
during operation	-10+50°C
storage temperature range	-40+70°C
Climatic class acc. to DIN IEC 60721-3-3	3K22

Connection	screw-type terminals
Connection	
rigid/flexible	0.24/0.22.5 mm
flexible with ferrules with/without plastic sleeve	0.252.5 mm
Conductor sizes	AWG 2412
Connection to the evaluator	
single wire $\geq 0.75 \text{ mm}^2$	01 m
single wire, twisted $\geq 0.75 \text{ mm}^2$	010 m
shielded cable $\geq 0.6 \text{ mm}^2$	040 m
Shielded cable (shield on one side connected to PE)	recommended: J-Y(St)Y min. 2 x 0.6
Other	
Operating mode	continuous operatior
Mounting	any positior
Degree of protection	
internal components (DIN EN 60529)	IP40
terminals (DIN EN 60529)	IP20
Screw mounting	M5
Flammability class	UL94 V-0
Documentation number	D0014 ^r



Dimensions (mm)								Weight				
Туре	A	В	C	D	E	F	G	Н	I	J	K	- Weight
WS50x80S	50	80	72	145	57	114	59	45	32	78	6.5	900 g
WS80x80S	80	80	72	145	72	144	59	45	32	108	6.5	1050 g
WS80x120S	80	120	92	184	72	144	59	45	32	108	6.5	1250 g
WS80x160S	80	160	113	246	92	184	59	45	32	120	6.5	2550 g

WR70x175S(P)...WR200x500S(P) series

Measuring current transformers



Measuring current transformers WR70x175S(P)



Measuring current transformers WR200x500S(P)

Typical applications

- For RCMS460/490 residual current monitoring systems
- For RCM420 residual current monitors
- \bullet For EDS470, EDS460/490 and EDS440 insulation fault locators in AC and DC systems
- The WR...SP measuring current transformers are particularly suitable for use in busbar systems. This series is to be used for load currents ≥ 500 A.

Standards

 $WR70x175S(P)...WR200x500S(P)\ measuring\ current\ transformers\ comply\ with\ the\ device\ standards:$

- DIN EN 60044-
- IEC 61869

Further information

For further information refer to our product range on www.bender.de.

Approvals



Ordering information

Туре	Internal	Арр	rovals	Screening	Art. No.	
.,,,,,	dimensions UL LR	Jereeming	71111101			
WR70x175S	70 x 175 mm	~	~		B911738	
WR115x305S	115 x 305 mm	~	~		B911739	
WR150x350S	150 x 350 mm	~	~	without screening	B911740	
WR200x500S	200 x 500 mm	~	~		B911763	
WR70x175SP	70 x 175 mm	~	~		B911790	
WR115x305SP	115 x 305 mm	~	~	Camanian intermeted	B911791	
WR150x350SP	150 x 350 mm	~	~	Screening integrated	B911792	
WR200x500SP	200 x 500 mm	~	~		B911793	

Highest system voltage for electrical equipment $U_{\rm m}$	AC 720 V
Rated impulse withstand voltage $U_{ m isol}$	3 kV
Measuring circuit	
Rated transformation ratio	600/1
Rated burden	180 Ω
Rated primary current	≤ 10 A (100 A)
Rated primary current	≥ 10 mA
Nominal power	50 mVA
Rated frequency	50400 Hz
Internal resistance	58Ω
Secondary overvoltage protection	suppressor diode P6KE6V8CF
Accuracy class	5
Rated continuous thermal current	100 A
Rated short-time thermal current	14 kA / 1 s
Rated surge current	50 kA / 50 ms

Connection	
Connection	screw-type terminals
Connection	
rigid/flexible	0.24/0.22.5 mm ²
flexible with ferrules with/without plastic sleeve	0.252.5 mm ²
Conductor sizes	AWG 24-12
Connection to the evaluator	
single wire $\geq 0.75 \text{ mm}^2$	01 m
single wire, twisted $\geq 0.75 \text{ mm}^2$	010 m
shielded cable $\geq 0.6 \text{ mm}^2$	040 m
Shielded cable (shield on one side connected to PE)	recommended: J-Y(St)Y min. 2 x 0.6

Other

15 g/11 ms 40 g/6 s

1 g/10...150 Hz

2 g/10...150 Hz

-10...+50 °C

-40...+70 ℃

3K22

Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (DIN EN 60529)	IP40
Degree of protection, terminals (DIN EN 60529)	IP20
Screw mounting	M5
Flammability class	UL94 V-0
Documentation number	D00144

Dimension diagrams

Ambient temperature (during operation) Ambient temperature (during storage)

Climatic class acc. to DIN IEC 60721-3-3

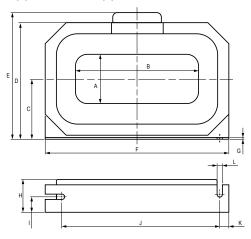
Bumping IEC 60068-2-29 (transport)

WR70x175S(P)...WR150x350S(P)

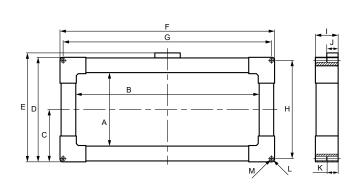
Shock resistance IEC 60068-2-27 (device in operation)

Vibration resistance IEC 60068-2-6 (device in operation)

Vibration resistance IEC 60068-2-6 (transport)

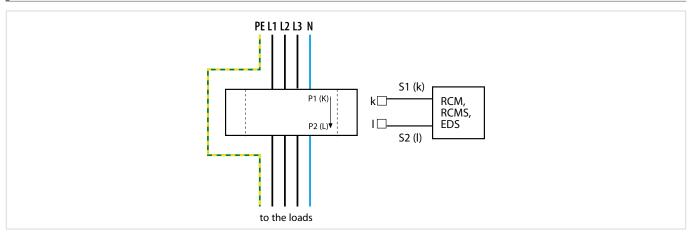


WR200x500S(P)



Dimensions (mm)							Weight							
Туре	A	В	C	D	E	F	G	Н	I	J	K	L	М	g.i.c
WR70x175S(P)	70	175	85	165	180	261	2,5	46	22	225	13	7,5	-	2200 g
WR115x305S(P)	115	305	118	225	240	402	2,5	55	25	360	21	8	-	4500 g
WR150x350S(P)	150	350	140	272	286	460	2,5	55	28	418	21	8	-	5900 g
WR200x500S(P)	200	500	142,5	285	297	585	567,9	267,9	62	31	30	ø12	ø5,5	11500 g

Wiring diagram



LINETRAXX® Series WF...

Consisting of an RCC420 signal converter and a W...F measuring current transformer Flexible WF170, WF250, WF500, WF800, WF1200, WF1800 measuring current transformers



Typical applications

- · Residual, fault and nominal current monitoring of loads and systems which cannot be switched off
- EMC monitoring of TN-S systems for "stray currents" and additional N-PE connections in the central earthing point (CEP)
- · Monitoring of PE and equipotential bonding conductors to ensure they are free of current

Approvals



Device features

- Flexible measuring current transformer in different lengths
- · Space-saving design, quick installation
- · Easy retrofitting into existing installations
- Can be installed without the need to disconnect the conductors
- Connection monitoring WF... measuring current transformers
- For RCMS460/490 series residual current monitoring systems
- For RCM420-D9 series residual current monitors
- Analogue output (U, I) for external measuring devices
- RCC420 with push-wire terminals (two terminals per connection)

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Supply voltage U _s ¹¹)	Length A measuring current transformer	Art. No.
WF170-1	AC 1672 V, 42460 Hz / DC 9.694 V	170 mm	B78080201
WF170-2	AC 70300 V, 42460 Hz / DC 70300 V	170 mm	B78080202
WF250-1	AC 1672 V, 42460 Hz / DC 9.694 V	250	B78080203
WF250-2	AC 70300 V, 42460 Hz / DC 70300 V	250 mm	B78080204
WF500-1	AC 1672 V, 42460 Hz / DC 9.694 V	F00	B78080205
WF500-2	AC 70300 V, 42460 Hz / DC 70300 V	500 mm	B78080206
WF800-1	AC 1672 V, 42460 Hz / DC 9.694 V	000	B78080207
WF800-2	AC 70300 V, 42460 Hz / DC 70300 V	800 mm	B78080208
WF1200-1	AC 1672 V, 42460 Hz / DC 9.694 V	1200	B78080209
WF1200-2	AC 42460 Hz, 70300 V / DC 70300 V	1200 mm	B78080210
WF1800-1	AC 1672 V, 42460 Hz / DC 9.694 V	1000	B78080221
WF1800-2	AC 42460 Hz, 70300 V / DC 70300 V	1800 mm	B78080222

¹⁾ Absolute values

Accessories

Description	Туре	Art. No.
Mounting clip for screw mounting (1 piece per device)	XM420 (RCC420)	B98060008

Technical data

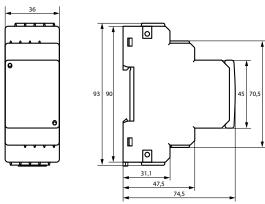
Standard: RCC420	IEC 61010-2-030: 2004-05-01
Pollution degree	3
Rated insulation voltage	250 V
Standard: WF	IEC 61010-1 and IEC 61010-2-032 CAT III
Pollution degree	2
Rated insulation voltage (CAT III)	1000 V _{rms} or DC
Supply voltage	
Supply voltage $U_{\rm S}$	see ordering information
Power consumption	≤ 3 VA
Measuring circuit	
Measuring range	100 mA20 A
Rated transformation ratio	K _n (U -I): 100 mV/A, K _N (k -I): 1.67 mA/A
Rated burden (signal output k, l)	68 Ω
Rated frequency	422000 Hz
Rated continuous thermal current Icth	1 kA
Rated short-time thermal current Ith	60 kA/1 s
Rated dynamic current I _{dyn}	150 kA/40 ms
Environment/EMC	
EMC	IEC 62020
Operating temperature	-25+55 °C
Classification of climatic conditions acc. to IEC	60721 (except condensation and formation of ice)
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11
Long-time 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-time storage (IEC 60721-3-1)	1M12

Connection RCC420		
Connection type		push-wire terminal
Connection properties		
rigid		2.5 mm² (AWG 24-14)
flexible without ferrule		2.5 mm² (AWG 19-14)
flexible with ferrule	0.2	1.5 mm² (AWG 24-16)
Stripping length		10 mm
Opening force		50 N
Test opening, diameter		2.1 mm
Connection measuring current transformer WF		PS/2 plug
Cable length WF		2 m
Cable lengths RCMS-RCC420		
Single wire ≥ 0.75 mm ²		01 m
Single wire, twisted ≥ 0.75 mm ²		010 m
Shielded cable $\geq 0.5 \text{ mm}^2$		040 m
Shielded cable (shield to terminal I, not connected to earth)	recommende	d: J-Y(St)Y min. 2x0.8
Other		
Operating mode		continuous operation
Mounting		any position
Degree of protection, internal components (IEC 60529)		IP30
Degree of protection, terminals (IEC 60529)		IP30
Enclosure material RCC420		polycarbonate
Screw mounting	2 x N	14 with mounting clip
DIN rail mounting acc. to		IEC 60715
Flammability class		UL94V-0
Documentation number		D00072
Weight		RCC $420 \le 160 \text{ g}$
	WF170 \leq 160 g	WF800 \leq 230 g
	WF250 \leq 180 g	WF1200 \leq 310 g
	WF500 ≤ 200 g	WF1800 ≤ 430g

Note: The measuring current transformer is adapted to the associated signal converter RCC420.

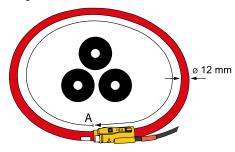
Dimension diagrams (dimensions in mm)

XM420 (RCC420)



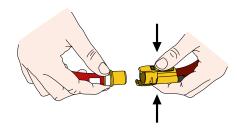
WF... measuring current transformers

A = For details about the length of the measuring current transformer refer to ordering information.

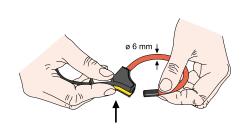


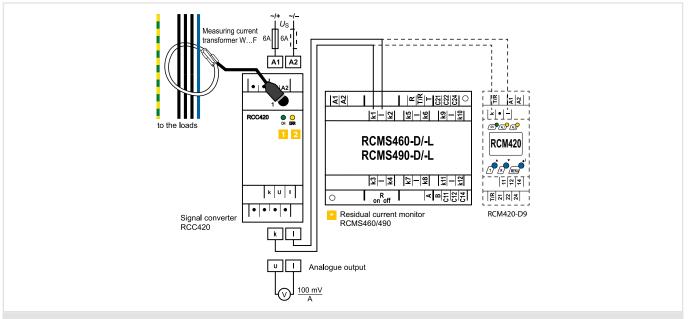
Dimension diagrams (dimensions in mm)

Locking connector measuring current transformer WF500...WF1800 $\,$ Keep the locking connector clean



Locking connector WF170...WF250





Connection to the respective RCMS460/490 residual monitoring system or to an RCM420-D9 residual current monitor.

- Power On LED "ON": lights up when voltage is available and when the device is in operation
- Alarm LED "ERR": Lights in the event of a short circuit and interruption of the WF...
- When using software version D233 V 2.21 or an earlier version, switch off CT monitoring

When using software version D233 V 2.31 or higher, set the CT type to "flex".

LINETRAXX® CTUB100 series

AC/DC sensitive measuring current transformer (Type B)



Typical applications

- For RCMS4... residual current monitoring systems
- For RCM420/423 residual current monitors

Approvals







Device features

- · Combined test and reset button
- · Multicolour LED for operation, fault and status messages
- · Exchangeable electronic module without mechanical separation of the primary conductors
- · Extension/retrofitting or modification of functionalities in case of changed monitoring requirements
- Insensitive to load currents due to full magnetic shield (CTUB10x-CTBC...P only)
- · Monitoring of the connection to the measuring current transformer
- Supply voltage DC ±12 V/DC 24 V
- CTUB10x-CTBC... for residual current monitoring systems of the RCMS4... series as well as for RCMA420/423 residual current monitors
- CTUB10x-CTBC...P for residual current monitoring systems of the RCMS4... series as well as for RCMA420/423 residual current monitors. Can be used for very high system-related peak load currents.

Standards

CTUB10x series measuring current transformers comply with the following device standard:

• IEC 62020-1 for CTUB101, CTUB102 and CTUB105 in combination with a residual current monitor/residual current monitoring system (RCMS4... or RCMA420/423)

CTUB100 series measuring current transformers comply with the requirements of the standard DIN EN 45545-2 for application in railway vehicles.

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Shielding	Current transformer diameter	Supply voltage	Suitable for evaluator	Art. No.
CTUB101-CTBC20	-	ø 20			B78120010
CTUB101-CTBC20P	~	0 20			B78120020
CTUB101-CTBC35	=	ø 35			B78120012
CTUB101-CTBC35P	~	0 33			B78120022
CTUB101-CTBC60	=	ø 60	DC ±12 V	RCMA420	B78120014
CTUB101-CTBC60P	~	Ø 00	DC ±12 V	RCMA423	B78120024
CTUB101-CTBC120	=	ø 120			B78120016
CTUB101-CTBC120P	~	Ø 120			B78120026
CTUB101-CTBC210	=	ø 210			B78120018
CTUB101-CTBC210P	~	0210			B78120028
CTUB102-CTBC20	=	a 20	a 20		B78120011
CTUB102-CTBC20P	~	Ø 20			B78120021
CTUB102-CTBC35	-	ø 35			B78120013
CTUB102-CTBC35P	~	0 33			B78120023
CTUB102-CTBC60	=	ø 60		RCMS410	B78120015
CTUB102-CTBC60P	~	Ø 00	DC 24 V	RCMS425 RCMS460	B78120025
CTUB102-CTBC120	=			RCMS490	B78120017
CTUB102-CTBC120P	~	ø 120			B78120027
CTUB105-CTBC120P	~				B78120041
CTUB102-CTBC210	-	ø 210			B78120019
CTUB102-CTBC210P	~	Ø 2 I U			B78120029
CTUB102-CTBC20P	~	ø 20			B78120021
CTUB102-CTBC35P	~	ø 35	DC 24 V	EDS441-LAB	B78120023
CTUB102-CTBC60P	~	ø 60			B78120025

Electronic modules

Туре	Supply voltage <i>U</i> s	Art. No.
CTUB101	DC ±12 V	B78120050
CTUB102	26244	B78120051
CTUB105	DC 24 V	B78120054

Required terminals are included in the scope of delivery. Connecting cables are optionally available.

Connecting cables

	r		
Name	Length (m)	Connection to	Art. No.
CTX-100	1		B98110080
CTX-250	2.5	DCMAAA	B98110081
CTX-500	5	RCMA42	B98110082
CTX-1000	10		B98110083
CTXS-100	1		B98110090
CTXS-250	2.5	RCMS4 EDS441LAB	B98110091
CTXS-500	5		B98110092
CTXS-1000	10		B98110093

Suitable system components

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

Description	max. connected current transformers	Туре	Art. No.	Page
	4	STEP-PS/1 AC/24 DC/0.5	B94053110	400
Voltage supply	14	STEP-PS/1 AC/24 DC/1.75	B94053111	400
344.)	34	STEP-PS/1 AC/24 DC/4.2	B94053112	400

Measuring current transformer cores

Туре	Internal diameter	Art. No.
CTBC20	20	B98120001
CTBC20P	20 mm	B98120002
CTBC35	3F mm	B98120003
CTBC35P	35 mm	B98120004
CTBC60	- 60 mm	B98120005
CTBC60P		B98120006
CTBC120	120 mm	B98120007
CTBC120P		B98120020
CTBC210	210 mm	B98120008
CTBC210P		B98120021

 $P = full\ magnetic\ shield$

The measuring current transformers of the CTUB10x series comply with the requirements of the standard DIN EN 45545-2.

Accessories

Name	Art. No.
DIN rail mounting clip for CTBC20 and CTBC20P	B91080111
DIN rail mounting clip for CTBC35 and CTBC35P	B91080112

Included in the scope of delivery

Technical data

Definitions:	
Measuring circuit (IC1)	primary conductors routed through the current transformer
Secondary (IC2)	connections terminal block
Rated insulation voltage	800 V
Overvoltage category	III
Area of application	≤ 2000 m AMSL
Rated impulse voltage:	
IC1/IC2	8 kV
Rated insulation voltage (reinforced	d insulation):
IC1/IC2	800 V
Pollution degree	2
Supply voltage	
CTUB101	
Description	+12 V, GND, -12 V
Supply voltage $U_{\rm S}$	DC ±12 V
Operating range of $U_{\rm S}$	±2 %
Ripple U _s	≤1%
Power consumption	≤ 2.5 W
CTUB102 and CTUB105	

Measuring circuit

Internal diameter measuring current transformer	see dimension diagrams
Rated current /	RCM application / MRCD application
CTBC20 at $I_{\Delta n} \ge 30 \text{ mA}$	63 A / 40 A
CTBC20 at $I_{\Delta n} \ge 300 \text{ mA}$	80 A / 63 A
CTBC20P	80 A / 80 A
CTBC35 at $I_{\Delta n} \ge 30 \text{ mA}$	125 A / 80 A
CTBC35 at $I_{\Delta n} \ge 300 \text{ mA}$	160 A / 125 A
CTBC35P	160 A / 160 A
CTBC60 at $I_{\Delta n} \ge 30 \text{ mA}$	200 A / 160 A
CTBC60 at $I_{\Delta n} \ge 300 \text{ mA}$	400 A / 250 A
CTBC60P	400 A / 320 A
CTBC120 at $I_{\Delta n} \ge 100 \text{ mA}$	400 A / 330 A
CTBC120P at $I_{\Delta n} \ge 100 \text{ mA}$	630 A / 630 A
CTBC210 at $I_{\Delta n} \ge 300 \text{ mA}$	630 A / 630 A
CTBC210P at $I_{\Delta n} \ge 100 \text{ mA}$	630 A / 630 A
CTBC210P at $I_{\Delta n} \ge 300 \text{ mA}$	1000 A / 1000 A
Measurement accuracy	$\pm 1\%$ of full scale value
Test winding	yes
Rated continuous thermal current 1) Icth	125 A
at UL applications	30 A
Rated short-time thermal current 1) Ith	2.4 kA/1 s
Rated dynamic current 1) I _{dyn}	6 kA / 40ms
	50 kA / 50ms

 $^{^{1)}\,\,}$ refers to the residual current

24 V, GND

DC 24 V ±20 %

≤1%

≤ 2.5 W

1A for 1 ms

Residual current 6...50 kA: Device defect CTUB1..., message via LED. There is no danger of fire or electric shock

Possible response values (to be set on the evaluator)

CTBC20, CTBC20P	10500 mA
CTBC35, CTBC35P, CTUBC60, CTBC60P	30 mA10 A
CTBC120, CTBC120P, CTBC210P	100 mA10 A
CTBC210	300 mA10 A

Measuring ranges CTUB101, CTUB102

Measuring range 1 ($I_{\Delta n} \le 0.1 \text{ A}$)	0900 mA (peak)
Measuring range 2 (0.1 A $< I_{\Delta n} \le 0.5$ A)	03.5 A (peak)
Measuring range 3 ($I_{\Delta n} > 0.5 \text{ A}$)	020 A (peak)

Description Supply voltage U_S

Ripple Us

Operating range of $U_{\rm S}$

Power consumption

Inrush current

Technical data (continued)

Measuring ranges CTUB1052	
Measuring range 3 ($I_{\Delta n} > 0.5 \text{ A}$)	020 A (peak
Indication	
Multicolour LED	table on page 379
Output	
Name	S1 (k), S2 (l)
Scaling	400 mV/1 A
Max. voltage	±10 V
Output device error	
CTUB101, 102	Max. full scale value
CTUB105	8 A
Max. connector length	10 m
Output resistance	172 Ω
Input	
Name	T (for CTUB101 only)
Current load	< 300 mA
Environment/EMC	
EMC	IEC 62020-1
Operating temperature	-2570°C
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
Connection	
Max. connection length	10 m
Connecting cables are optionally available.	
Use 60/75 °C copper lines only.	

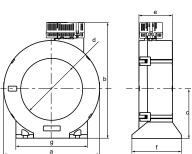
Manufacturer	Phoenix Contact
Туре	DFMC 1.5/4-ST-3.5 Bk
The connection conditions of the manufacturer apply	· .
Connection properties	
rigid	0.21.5 mm ² (AWG 24-16)
flexible	0.21.5 mm ²
with ferrule	0.250.75 mm ²
Mounting CTBC	
Screw type	
CTBC2060(P)	DIN EN ISO 7045 - M5x
CTBC120210(P)	DIN EN ISO 7045 - M6
Washer type	
CTBC2060(P)	DIN EN ISO 7089/7090 - 5
CTBC120210(P)	DIN EN ISO 7089/7090 - 6
Tightening torque	
CTBC2035 (P)	0.6 Nm
CTBC60210(P)	1 Nm

Other	
Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (DIN EN 60529)	IP40
Degree of protection, terminals (DIN EN 60529)	IP20
Flammability class	UL94 V-0
Software	D591
Documentation number	D00362
Weight	
CTUB10x- CTBC20	≤ 230 g
CTUB10x- CTBC20P	≤ 290 g
CTUB10x- CTBC35	≤ 310 g
CTUB10x- CTBC35P	≤ 390 g
CTUB10x- CTBC60	≤ 530 g
CTUB10x- CTBC60P	≤ 690 g
CTUB10x- CTBC120	≤ 1460 g
CTUB10x- CTBC120P	≤ 1820 g
CTUB10x- CTBC210	≤ 4290 g
CTUB10x- CTBC210P	≤ 4940 g

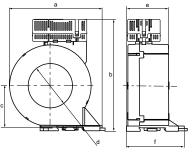
The use of the power supply units listed at "Accessories" is recommended. The use of a surge protection device is mandatory.

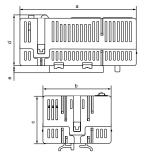
Dimension diagrams

A



В





						6 0 2		
	Dimensions (mm)							
	Туре	a	b	С	d	e	f	g
_	CTUB10CTBC20(P)	75	83	37	ø 20	46	60.5	-
Α	CTUB10CTBC35(P)	97	130	47	ø 35	46	61	-
В	CTUB10CTBC60(P)	126	151	57	ø 60	56	78	-
	CTUB10CTBC120(P)	188	225	96	ø 120	65	96	139
	CTUB10CTBC210(P)	302	339	153	ø 210	67	113	277
D	CTUB10	74	44	30	32	4.6	_	_

D

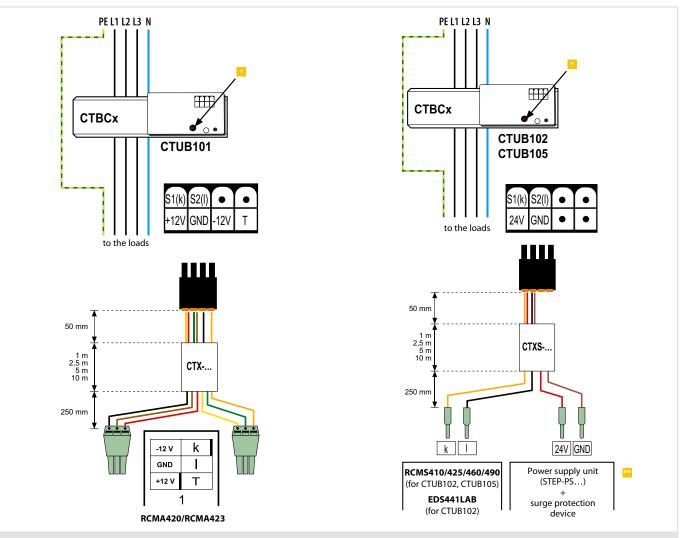
Tolerance: $\pm 0.5 \text{ mm}$

C

The LED indicates the system state by means of colours and lighting/flashing.

System state	Ц	Notes		
System state	green (ON)	red (alarm)	notes	
Device switched off	off	off	Device is deenergised	
Normal operating state	lights	off	The device is supplied with the specified voltage and the measuring current transformer core is connected to the electronic module.	
Device error	off	flashes	The device is supplied with the specified voltage but there is no connection to the measuring current transformer core or some other device error has occurred.	

Wiring diagram



The measuring range must be selected according to the response value l∆N set on the RCM... evaluator. If, however, a larger measuring range is selected, the resolution deteriorates.

CTUB102 with EDS441-LAB: Location current EDS441-LAB max. 25 mA. Adjust the measuring range on the measuring current transformer to this range. **CTUB105**: Measuring range 3 is fixed and cannot be changed..

Setting measuring range (not possible with CTUB105)					
# Potentiometer setting Response value RCMA/RCMS Measuring range rms Measuring range pea					
1	0	<i>I</i> _{Δn} ≤ 0.1 A	0450 mA	0900 mA	
2	①	$0.1 \text{A} < I_{\Delta n} \le 0.5 \text{A}$	00.75 A	03.5 A	
3	(S)	<i>I</i> _{Δn} > 0.5 A	010 A	020 A	

- The use of a type 2 surge protection device (SPD) is mandatory due to possible impulse voltages and in order to comply with normative requirements.
 - The surge protection device must be connected upstream of the power supply unit on the supply side.
 - The surge protection device 7P.22.8.275.1020 from Finder or an equivalent alternative can be used.



CAUTION

When using several CTUB100 measuring current transformers, the power supply (24V, GND) must not be daisy-chained from current transformer to current transformer but should be star-shaped (e.g. using a potential distributor).

LINETRAXX® CTBS25

Split-core AC/DC sensitive measuring current transformer



Typical applications

- For residual current monitoring systems (RCMS)
- For insulation fault locators (EDS)

Approvals

C € ĽK

Device features

- · Split-core measuring current transformer for easy retrofitting without disconnecting the primary conductors
- Suitable for AC/DC sensitive type B residual current measurement
- $\bullet \ \ Can \ be \ combined \ with \ RCMS460/490 \ residual \ current \ monitoring \ systems$
- Can be combined with EDS440 insulation fault locators
- Supply voltage DC 24 V

Standards

The CTBS25 measuring current transformer complies with the device standard:

- IEC 62020:2003-11 in combination with a residual current monitor/monitoring system (RCMS460/490 or RCMA420/423)
- IEC 61557-9 in combination with an insulation fault locator (EDS440)

Further information

For further information refer to our product range on www.bender.de.

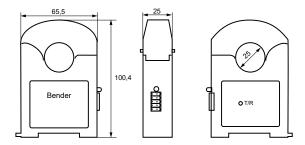
Ordering information

Туре	Supply voltage U₅	Art. No.
CTBS25	DC 24 V	B98120060

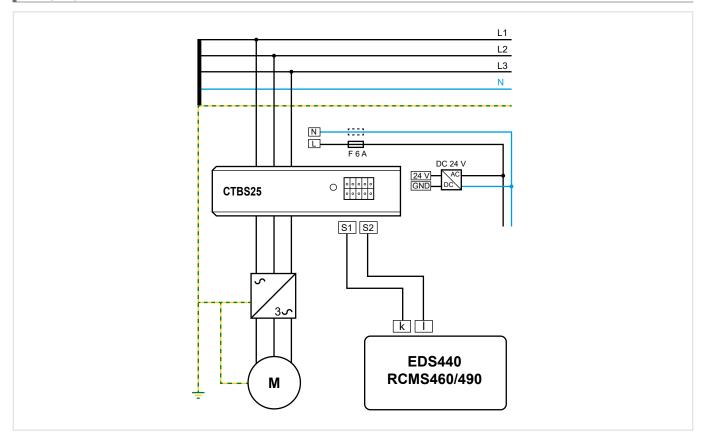
Technical data

Values only apply to closed measur	ing current transformer.	
Insulation coordination acc. to	IEC 60664-1/IEC 60664-3	
Definitions		
Measuring circuit (IC1)	Primary conductors routed through the	e current transformer
Secondary (IC2)	Terminal block	1 (24 V, GND, S1, S2)
Rated voltage		300 V
Overvoltage category		III
Operating altitude		≤ 2000 m AMSL
Rated impulse voltage IC1/IC2		4 kV
Rated insulation voltage IC1/IC2		300 V
Pollution degree		2
Basic insulation between IC1/IC2		300 V
Supply voltage		
Supply voltage U _s		DC 24 V
Operating range of U _s		±5 %
Ripple U _s		≤ 2 %
Inrush current		10 A for 25 μs
Power consumption	≤ 0.25	W typ. (2.5 W max.)
Measuring circuit		
Measuring current transformer, into	ernal diameter	25 mm
Characteristics according to IEC 620	20 and IEC/TR 60755 AC	C/DC sensitive, type B
Frequency bandwidth		DC 100 kHz
Measuring range I∆n		
DC/AC (< 100 kHz)		10500 mA
Rated current In		100 A
Rated continuous thermal current I	cth	68 A
Operating uncertainty		$\pm 1\%\pm 1\mathrm{mA}$
Cable length between (S1, S2) and	(k, l)	10 m
Displays		
Multicolour LED		red, green

Environment/EMC	
EMC	IEC 62020:1998+A1:2003
Operating temperature	-2575 ℃
Classification of climatic conditions acc. to IEC 6	0721
(except condensation and formation of ice)	
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 II	EC 60721
Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12
Terminal block 1, reverse polarity protection	
Required terminals are included in the scope of delivery	<u> </u>
The connection conditions of the manufacturer apply.	
Manufacturer	Phoenix Contact
Туре	PCB plug-in connector - DFMC 0.5/ 5-ST-2.54
Connection properties	
rigid	0.140.5 mm ² (AWG 2620)
flexible	0.140.5 mm ² (AWG 2620)
with ferrule	0.250.34 mm ² (AWG 2422)
Other	
Operating mode	continuous operation
Mounting	any position
Degree of protection (DIN EN 60529)	IP30
Flammability class	UL94 V-0
Documentation number	D00388
Weight	≤ 165 g



Wiring diagram







Typical applications

• Extension of the nominal voltage range for the ISOMETER®s iso685... series to AC 0...1150 V, DC 0...1760 V

Standards

The AGH150W(-4) complies with the requirements of

- DIN EN 45545-2.
- DIN EN 50155.

Approvals



AGH150W-4



Further information

For further information refer to our product range on www.bender.de.

Ordering information

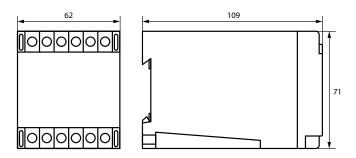
Туре	Nominal system voltage <i>U</i> s	Art. No.
AGH150W	AC 01150 V / DC 01100 V	B915576
AGH150W-4	AC 01150 V / DC 01760 V	B98018006

AGH150W	
Rated insulation voltage	AC 1000 V
Voltage test acc. to IEC 60255	12 kV
Pollution degree	2
AGH150W-4	
Rated insulation voltage	AC 1600 V
Voltage test acc. to IEC 60255	17 kV
Pollution degree	2
Voltage test acc. to DIN EN 61800-5-1 (VDE 0160-1	05-1)
AGH150W	
Voltage impulse test (basic insulation)	≥ AC 8 kV
AC voltage test (basic insulation)	≥ AC 4.3 kV
AGH150W-4	
Voltage impulse test (basic insulation)	≥ AC 11 kV
AC voltage test (basic insulation)	≥ AC 6.6 kV
Voltage ranges	
AGH150W	
Nominal system voltage U _n	AC 01150 V, DC 01100 V
Frequency range of Un (sinus)	DC 1460 Hz
Overvoltage category	CAT III
Rated impulse voltage	≥8 kV
Internal DC resistance R_i	80 kΩ
Tolerance of internal DC resistance R _i	±2 kΩ*
AGH150W-4	
Nominal system voltage <i>U</i> _n	AC 01150 V, DC 01760 V
for UL applications	DC 01600 V
Frequency range of $U_{n (sinus)}$	DC 1460 Hz
Overvoltage category	CAT III
Rated impulse voltage	≥11 kV
Internal DC resistance Ri	≥160 kΩ
Tolerance of internal DC resistance R_i	±4 kΩ*

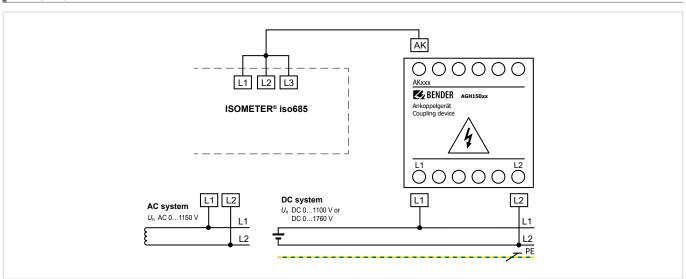
Class of extended operating temperature at switch-on	Class ST1
Operating altitude	≤ 2000 m AMSI
Ambient temperatures	
Operation	-40+70°C
for UL applications	-10+55 °C
Storage	-40+70 °C
Classification of climatic conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3K22 (max. 98 % humidity)
Transport (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)	2M ⁴
Long-term storage (IEC 60721-3-1)	1M12
Connection	
Connection	flat terminals
Connection properties	
rigid/flexible	0.24/0.22.5 mm
Other	
Operating mode	continuous operation
Mounting	any position
Nominal power consumption	≤ 10 W at DC 1760 V
Degree of protection	
internal components (DIN EN 60529)	IP30
terminals (DIN EN 60529)	IP20
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-(
Documentation number	D00093
Weight	≤ 900 c

be taken into account accordingly

Dimension diagram (dimensions in mm)



Wiring diagram







Typical applications

• Extension of the nominal voltage range for ISOMETER® to the voltages specified in the technical data.

Approvals







Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Nominal system voltage <i>U</i> s	Art. No.
AGH204S-4	3(N)AC 01650 V / DC 01300 V	B914013

Technical data

Insulation coordination acc. to DIN EN 61800-5-1 (VDE 0160-105-1)	
Rated insulation voltage	AC 1500 V
Rated impulse voltage	≥10.4 kV
Overvoltage category	III
Voltage test acc. to DIN EN 61800-5-1 (VDE 0160-105-1)	
Impulse voltage test (basic insulation)	≥ AC 10.4 kV
AC voltage test (basic insulation)	≥ AC 5 kV
Partial discharge test	≥ 3 kV
Voltage ranges	

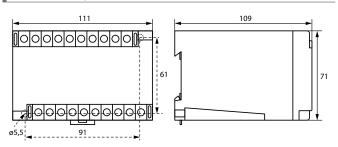
Nominal system voltage U_n	
including DC components	01300 V
AK80	3(N)AC 01300 V, 50400 Hz
AK160	3(N)AC 01650 V, 50400 Hz, DC 01840 V
for UL applications	01500 V
Frequency range of U _n	DC 50440 Hz
Internal DC resistance R _i coupling to	
AK80	80 kΩ
AK160	160 kΩ
Environment	

AK80	80 kΩ
AK160	160 kΩ
Environment	
Ambient temperature	
Operation	-10+55 °C
Storage	-40+70°C
Classification of climatic conditions acc. to IEC 60721	3K23
Shock resistance	
Operation (IEC 60068-2-27)	15 g / 11 ms
Transport (IEC 60068-2-29)	40 g / 6 ms
Vibration resistance acc to IEC 60068-2-6	
Operation	1 g / 10150 Hz
Transport	2 g / 10150 Hz
Connection	

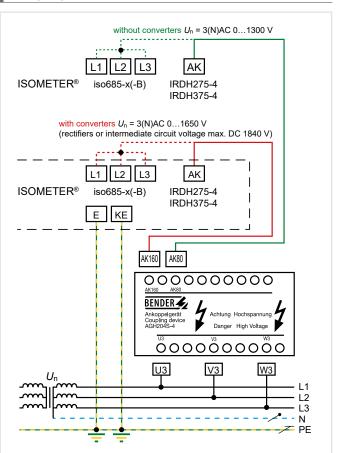
Connection	
Connection	screw-type terminals
Connection properties, rigid/flexible	0.24 mm ² /0.22.5 mm ²
Tightening torque	0.5 Nm
Conductor sizes	AWG 2412
Length of the connecting lead (ISOMETER® to AGH)	≤ 0.5 m
Other	

Operating mode	continuous operation
Mounting	any position
Degree of protection	
internal components (DIN EN 60529)	IP30
terminals (DIN EN 60529)	IP20
Type of enclosure	X112, free from halogen
Screw mounting	2 x M4
DIN rail mounting	IEC 60715

Dimension diagram (dimensions in mm)



Wiring diagram



UL94 V-0

D00094

≤ 1350 g

Weight

Flammability class

Documentation number

Coupling device



Typical applications

• Extension of the nominal voltage range to 3(N)AC 50...400 Hz, 0...7,2 kV for the ISOMETER*s iso685... series.

Approvals







Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Nominal system voltage <i>U</i> n	Art. No.		
AGH520S 3(N)AC 07,2 kV, 50400 Hz		B913033		

 \geq 6 M Ω

Technical data

Insulation coordination acc. to IEC 61800-5-1	
Operating voltage	AC 6.3 kV
Voltage test according to IEC 61800-5-1	
Impulse voltage test (basic insulation)	AC 35 kV
Overvoltage category	III
AC voltage test (basic insulation)	AC 17.5 kV
Partial discharge test	12 kV
Voltage ranges	
Nominal system voltage U_n	AC 07.2 kV
for UL applications	AC 06.0 kV
Frequency range of U _n	50400 Hz
Internal DC resistance R _i	≥ 80 kΩ

Impedance Z_i at 7.2 kV and 50 Hz **Environmental conditions**

Ambient temperatures	
Operation	-10+55 °C
Operation UL-Applications	-10+45 ℃
Storage	-40+70 °C
Classification of climatic conditions acc. to IEC 60721	3K23
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3	3M11
Transport (IEC 60721-3-2)	2M4
Storage (IEC 60721-3-1)	1M12

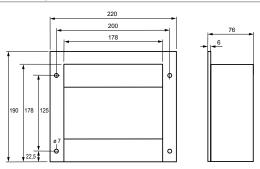
Connection

Connection terminal 2 (medium voltage)	screw-type terminals
Connection terminals 3-5	screw-type terminals
Connection properties, rigid/flexible	0.24 mm ² / 0.22.5 mm ²
Conductor sizes	AWG 2412
Tightening torque	2.9 Nm

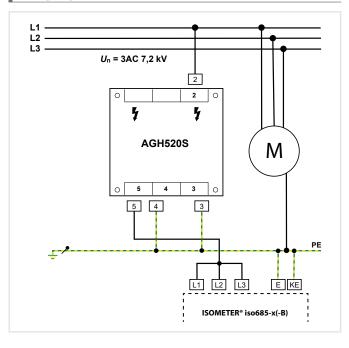
General data

Operating mode	continuous operation
Position	any position
Degree of protection	
internal components (DIN EN 60529)	IP64
terminals (DIN EN 60529)	IP20
Type of enclosure	resin-encapsulated block in housing
Screw mounting	4 x M5
Flammability class	UL94 V-HB
Documentation number	D00073
Weight	4500 g

Dimension diagram (dimensions in mm)



Wiring diagram online mode







Typical applications

• Extension of the nominal voltage range to AC/DC 0...15.5 kV for the ISOMETER® IRDH275BM-7

Approvals



Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Nominal system voltage <i>U</i> n	Cable length	Art. No.	
AGH675S-7-500	AC/DCO 7.2141.0 ACOUL	500 mm	B913060	
AGH675S-7-2000	AC/DC 07.2 kV, 0460 Hz	2000 mm	B913061	
AGH675S-7-MV15-500	AC/DC 0 15.5 kV, 0460 Hz	500 mm	B913058	

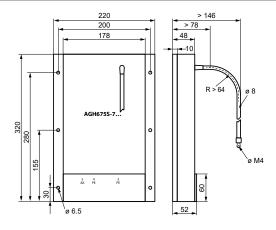
Weight

Technical data

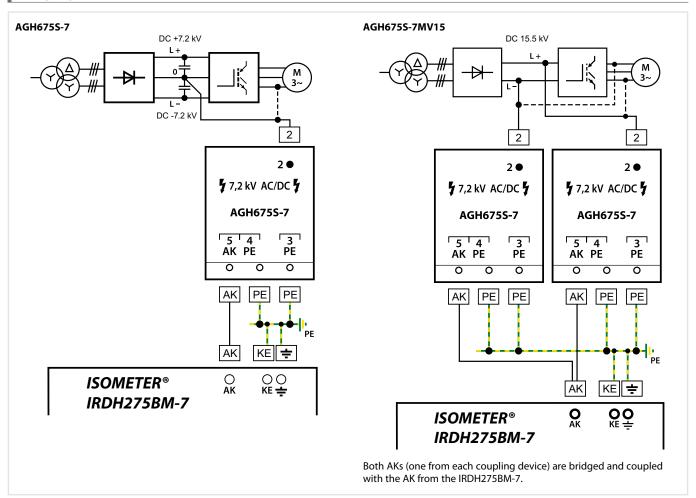
AGH675S-7	
Rated insulation voltage	AC 7.2 k\
AGH675S-7MV15	
Rated insulation voltage	AC 15.5 k\
Voltage test according to DIN EN 61800-5-1 (VDE 0	160-105-1)
AGH675S-7	
AC voltage test (basic insulation)	≥ AC 40 k\
AC voltage test (basic insulation)	≥ AC 20 k\
Partial discharge test	≥ 14 k\
AGH675S-7MV15	
Impulse voltage test (basic insulation)	≥ AC 111 k\
AC voltage test (basic insulation)	≥ AC 70 k\
Partial discharge test	≥ 29 kV
Voltage ranges	
AGH675S-7	
Nominal system voltage <i>U</i> _n	AC, 3(N)AC, DC 07.2 kV
Nominal frequency f _n	0460 H
Frequency range of U_n (sinus)	DC 1460 Hz
Internal DC resistance R _i	≥ 2.39 MΩ
AGH675S-7MV15	
Nominal system voltage <i>U</i> _n	AC, 3(N)AC, DC 015.5 k\
Nominal frequency f _n	0460 Hz
Frequency range of U_n (sinus)	DC 1460 Hz
Internal DC resistance R _i	≥ 4.7 MΩ

Ambient temperature	
Operation	-10+55 °C
Storage	-40+70°C
Classification of climatic conditions acc. to	IEC 60721:
Stationary use (IEC 60721-3-3)	3K22 (max. 98 % humidity)
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions ac	c. to IEC 60721:
Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12
Connection	
Connection terminal 2 (medium voltage)	high-voltage cable (encapsulated on the device side)
Connection, flexible with ring eyelet	M4
Connection type terminals 3, 4, 5	screw-type terminals
Connection, rigid/flexible	0.24 mm ² / 0.22.5 mm ²
Tightening torque	0.5 Nm
Other	
Operating mode	continuous operation
Mounting	any position
Degree of protection	
internal components (DIN EN 60529)	IP64
terminals (DIN EN 60529)	IP20
Type of enclosure	resin-encapsulated block
Screw mounting	6 x M5
Flammability class	UL94 V-HB
Documentation number	D00095

≤ 5100 g



Wiring diagram



Coupling device



Typical applications

• Extension of the nominal voltage range to AC, 3(N)AC 0...12 kV, 50...460 Hz for the ISOMETER®s iso685... series and IR420-D64

Approvals



Further information

For further information refer to our product range on www.bender.de.

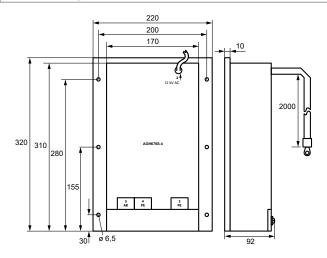
Ordering information

Туре	Nominal system voltage <i>U</i> s	Cable length	Art. No.
AGH676S-4	AC, 3(N)AC 012 kV, 50460 Hz	2000 mm	B913055

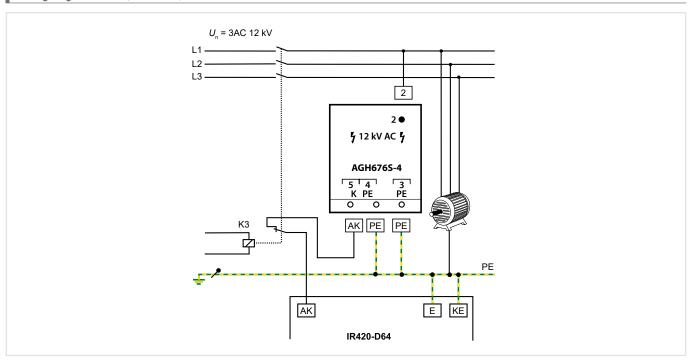
Technical data

Rated insulation voltage	AC 12 kV
Voltage test acc. to IEC 61800-5-1	
Voltage impulse test (basic insulation)	≥ AC 75 kV
AC voltage test (basic insulation)	≥ AC 45 kV
Partial discharge test	≥ 16.5 kV _{eff}
AC voltage test, rate of increase < 2 kV/s	AC 25 kV
Voltage ranges	
Nominal system voltage <i>U</i> _n	AC / 3(N)AC 012 kV
Nominal frequency f _n	50460 Hz
Internal DC resistance R _i	≥ 160 kΩ
Impedance Z _i at 12 kV and 50 Hz	≥ 12 MΩ
Environment EMC	
Ambient temperature	
during operation	-10+55°C
Storage temperature range	-40+70°C
Climatic class acc. to IEC 60721-3-3	3K23
Shock resistance IEC 60068-2-27	
Operation	15 g/11 ms
Transport	40 g/6 ms
Vibration resistance IEC 60068-2-6	
Operation	1 g / 10150 Hz
Transport	2 g / 10150 Hz

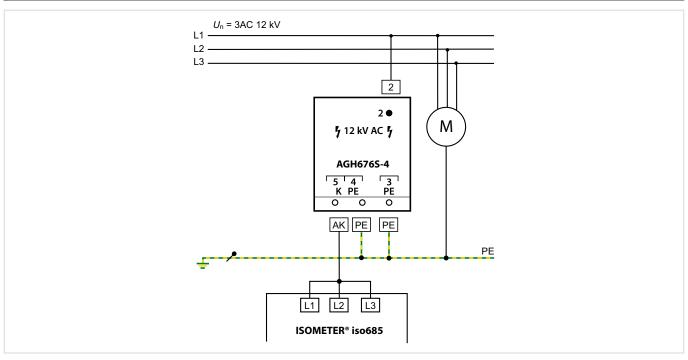
Connection	
Connection medium voltage	high-voltage cable (encapsulated on the device side)
Connection, flexible with ring terminal	M8
Connection terminals 3, 4, 5	screw terminals
Connection properties, rigid/flexible	0.24 mm ² /0.22.5 mm ²
Tightening torque	0.5 Nm
Other	
Operating mode	continuous operation
Position	any position
Degree of protection	
internal components (DIN EN 60529)	IP64
terminals (DIN EN 60529)	IP20
Type of enclosure	resin-encapsulated block
Screw fixing	M5
Flammability class	UL94 HB
Documentation number	D00096
Weight	≤ 8400 g



Wiring diagram offline (IR420-D64)



Wiring diagram online (iso685)



Isolating transformer ES710

Single-phase isolating transformers for the design of medical IT systems







Typical applications

• For IT systems in medical locations

Approvals



VDE test mark for all types:

- ES710/3150 ES710/10000
- ES710/3150S ES710/10000S
- ES710/3150SN ES710/10000SN
- ES710/3150-GL ES710/10000-GL
- ES710/3150S-GL ES710/10000S-GL
- ES710/3150SN-GL ES710/10000SN-GL



Device features

- Built-in temperature sensors acc. to DIN 44081 (120 °C)
- Screen winding with brought-out insulated connection terminal
- · Insulated mounting angles
- Degree of protection, IP00 (open design)
- Degree of protection, IP23 (with enclosure)
- · Protection class I
- Protection class II (option: encapsulated version)
- · Reinforced insulation
- Classification of insulation: ta40/B
- Connections: screw terminals
- Noise level < 35 dB (A)(no-load and nominal load)
- · Vector group: IiO
- Inrush current I_E GL version $< 6 \times \hat{I}_n$

Standards

ES710 isolating transformers comply with the device standards and the regulations for installation:

- DIN EN 61558-1 (VDE 570-1)
- IEC 61558-1
- DIN VDE 0100-710 (VDE 0100-710)
- DIN EN 61558-2-15 (VDE 0570-2-15)
- IEC 61558-2-15
- IEC 60364-7-710

Extension of VDE certification for GL version tested and certified in accordance with:

- DIN EN 61558-1 (VDE 0570 Part 1); EN 61558-1
- DIN EN 61558-1/A1 (VDE 0570 Part 1/A1); EN 61558-1/A1
- DIN EN 61558-2-15 (VDE 0570 Part 2-15); EN 61588-2-15

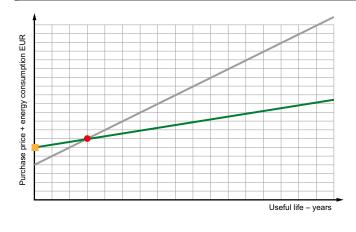
Further information

For further information refer to our product range on www.bender.de.

Туре	ES710/3150	ES710/4000	ES710/5000	ES710/6300	ES710/8000	ES710/10000
Power/voltages/currents						
Rated power	3150 VA	4000 VA	5000 VA	6300 VA	8000 VA	10000 VA
Rated frequency	5060 Hz	5060 Hz	5060 Hz	5060 Hz	5060 Hz	5060 Hz
Rated input voltage	AC 230 V	AC 230 V	AC 230 V	AC 230 V	AC 230 V	AC 230 V
Rated input current	14.2 A	18 A	22.5 A	28.5 A	36 A	45.3 A
Rated output voltage	AC 230/115 V	AC 230/115 V	AC 230/115 V	AC 230/115 V	AC 230/115 V	AC 230/115 V
Rated output current	13.7 A	17.4 A	21.7 A	27.4 A	34.7 A	43.5 A
Inrush current /E	< 12 x Î _n	$<$ 12 x \hat{l}_{n}	$< 12 x \hat{l}_{n}$	< 12 x Î _n	$< 12 x \hat{I}_{n}$	$<$ 12 x \hat{I}_{n}
Inrush current /E GL version	$< 6 x \hat{l}_n$	$< 6 x \hat{I}_n$	$< 6 x \hat{I}_n$	$< 6 x \hat{I}_n$	$< 6 x \hat{I}_n$	$< 6 x \hat{l}_n$
Leakage current	≤ 0.5 mA	≤ 0.5 mA	≤ 0.5 mA	≤ 0.5 mA	≤ 0.5 mA	≤ 0.5 mA
No-load input current <i>i</i> 0	≤ 3 %	≤ 3 %	≤ 3 %	≤ 3 %	≤ 3 %	≤ 3 %
No-load input current io GL version	≤ 2 %	≤ 2 %	≤ 2 %	≤ 2 %	≤ 2%	≤ 2%
No-load output voltage U_0	≤ 236 V	≤ 234 V	≤ 234 V	≤ 235 V	≤ 233 V	≤ 233 V
Short-circuit voltage U _k	≤ 3 %	≤ 3 %	≤ 3 %	≤ 3 %	≤ 3 %	≤ 3 %
Environmental conditions						
Ambient temperature	≤ 40 °C	≤ 40 °C	≤ 40 °C	≤ 40 °C	≤ 40 °C	≤ 40 °C
No-load temperature rise	≤ 20 °C	≤ 23 °C	≤ 26 °C	≤ 23 °C	≤ 35 °C	≤ 37 °C
Full-load temperature rise	≤ 69 °C	≤ 48 °C	≤ 62 °C	≤ 65 °C	≤ 70 °C	≤ 70 °C
Noise level (under no-load conditions and nominal load)	≤ 35 dB(A)	≤ 35 dB(A)	≤ 35 dB(A)	≤ 35 dB(A)	≤ 35 dB(A)	≤ 35 dB(A)
Other						
Insulation classification	t _a 40/B	t _a 40/B	t _a 40/B	<i>ta</i> 40/B	t _a 40/B	t _a 40/B
Degree of protection	IP00	IP00	IP00	IP00	IP00	IP00
Protection class	I/II*	I/II*	I/II*	I/II*	I/II*	I/II*
Core U/I	180/93	210/63	210/73	210/88	210/103	240/83
Core U/I GL version	180/93	210/63	210/73	210/88	210/103	210/120
Recommended use when						
used in accordance with DIN VDE 0100-710	25 A gL/gG	35 A gL/gG	50 A gL/gG	50 A gL/gG	63 A gL/gG	80 A gL/gG
Recommended use when used in accordance						
with DIN VDE 0100-710 GL version	25 A gL/gG	25 A gL/gG	35 A gL/gG	50 A gL/gG	50 A gL/gG	63 A gL/gG
Induction	0.86 T	0.94 T	1.00 T	1.05 T	1.05 T	1.05 T
R _{primary} ±5 %	0.255 Ω	0.135 Ω	0.100 Ω	Ω 080.0	0.064Ω	0.050 Ω (-GL 0,054
R _{secondary} ±5 %	0.230 Ω	0.110 Ω	0.095 Ω	0.070 Ω	0.056Ω	0.036 Ω (-GL 0,045
Efficiency	95 %	96 %	96 %	96 %	96 %	96 %
Documentatin number: D00109						
Loss at 2022 ° C ambient temperature						
Fe loss (iron loss)	< 55 W	< 60 W	< 80 W	< 105 W	< 110 W	< 150 W
Fe loss (iron loss) GL version	< 18 W	< 20 W	< 26 W	< 33 W	< 38 W	< 42 W
Cu loss (copper loss)	< 90 W	< 80 W	< 100 W	< 125 W	< 165 W	< 190 W
Cu loss (copper loss) GL version	< 90 W	< 80 W	< 100 W	< 125 W	< 165 W	< 205 W
Heat dissipation loss at 40 $^\circ$ C ambient temperature and	100 % continuous load	d				
Heat dissipation loss	< 165 W	< 160 W	< 202 W	< 265 W	< 320 W	< 380 W
Heat dissipation loss GL version	< 125 W	< 115 W	< 140 W	< 185 W	< 230 W	< 270 W

^{*} Option: completely encapsulated version Energy efficient version GL = Green Line

Green Line transformer (energy efficient version) – High degree of energy saving over the life time (16 years AfA) (German AfA table for depreciation of wear and tear)



This general illustration is based on calculations of the transformer's energy consumption while energy costs remained constant at 13.4 ct/kWh (source: first energy) for 16 years. The wide variety of bandwidths result from the different transformer capacities.

Afa = Deprecation of wear and tear

= Standard version

= GL version (Green Line)

= A higher purchase price of approx. 15-20%

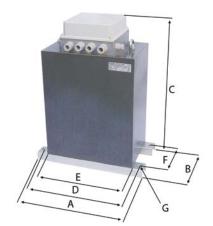
= ROI (Return on Investment) after about 1-3 years

Standard

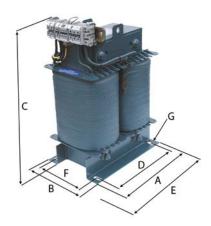
Dimension B is the depth incl. terminals



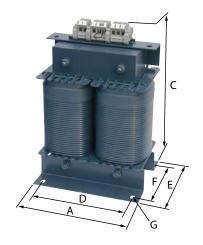
SK2 series



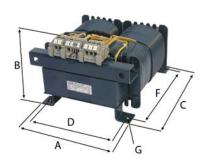
S series Dimension E is the depth incl. terminals



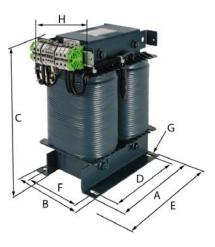
K series



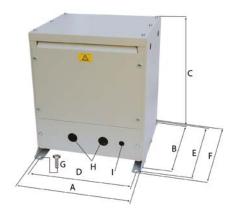
LG series



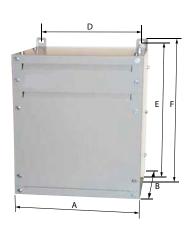
SN-GL series



Enclosure ESDS0107-1



Enclosure ESDS710

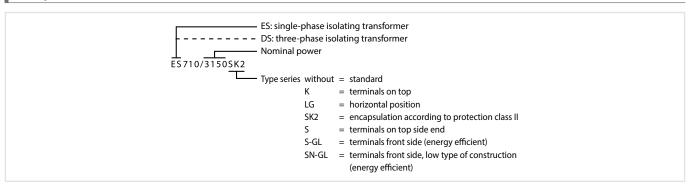


	Dimensions (mm)							Cu weight	Weight	Tuna	Art. No.
	A	В	C	D	E	F	G	(kg)	(kg)	Туре	Art. No.
	240	230	325	200	180	145	11 x 28	15	49	ES710/3150-GL	B92090001
	280	200	370	240	150	115	11 x 28	24	59	ES710/4000-GL	B92090002
series	280	210	370	240	160	125	11 x 28	25	61	ES710/5000-GL	B92090003
ਤੂ [280	225	370	240	175	140	11 x 28	26	65	ES710/6300-GL	B92090004
ĺ	280	240	370	240	190	155	11 x 28	27	74	ES710/8000-GL	B92090005
ĺ	280	255	370	240	205	170	11 x 28	33	85	ES710/10000-GL	B92090006
	280	180	370	240	290	145	11 x 28	15	49	ES710/3150S-GL	B92090061
ĺ	280	150	420	240	290	115	11 x 28	24	59	ES710/4000S-GL	B92090062
eries	280	160	420	240	290	125	11 x 28	25	61	ES710/5000S-GL	B92090063
S-GL series	280	175	420	240	290	140	11 x 28	26	65	ES710/6300S-GL	B92090064
۱	280	190	420	240	290	155	11 x 28	27	74	ES710/8000S-GL	B92090065
Ì	280	205	420	240	290	170	11 x 28	33	85	ES710/10000S-GL	B92090066
\dashv	280	180	370	240	290	145	11 x 28	15	49	ES710/3150SN-GL	B92090121
Ì	280	150	370	240	320	115	11 x 28	24	59	ES710/4000SN-GL	B92090122
SN-GL series	280	160	370	240	320	125	11 x 28	25	61	ES710/5000SN-GL	B92090123
-GLs	280	175	370	240	320	140	11 x 28	26	65	ES710/6300SN-GL	B92090124
8	280	190	370	240	320	155	11 x 28	27	74	ES710/8000SN-GL	B92090125
ŀ	280	205	375	240	325	170	11 x 28	33	85	ES710/10000SN-GL	B92090126
\dashv	240	230	325	200	180	145	11 x 28	15	49	ES710/3150	B924211
ŀ	280	200	370	240	150	115	11 x 28	24	59	ES710/4000	B924212
Standard	280	210	370	240	160	125	11 x 28	25	61	ES710/5000	B924213
	280	225	370	240	175	140	11 x 28	26	65	ES710/6300	B924214
	280	240	370	240	190	155	11 x 28	27	74	ES710/8000	B924215
	320	260	420	270	200	160	13 x 35	39	85	ES710/10000	B924216
\dashv	240	_	360	200	180	145	11 x 28	15	49	ES710/3150K	B924221
	280		420	240	150	115	11 x 28	24	59	ES710/4000K	B924221
اي	280		420	240	160	125	11 x 28	25	61	ES710/5000K	B924222 B924223
Kseries		_			175			26	65		B924224
~	280		420	240		140	11 x 28			ES710/6300K	B924224 B924225
ŀ	280	_	420	240	190	155	11 x 28	27	74	ES710/8000K	
\dashv	320		480	270	200	160	13 x 35	39	85	ES710/10000K	B924226
ŀ	230	235	320	204	_	240	9 x 14	15	49	ES710/3150LG	B924231
2	260	210	365	234	_	280	9 x 14	24	59	ES710/4000LG	B924232
LG series	260	220	365	234	-	280	9 x 14	25	61	ES710/5000LG	B924233
의	260	235	365	234	-	280	9 x 14	26	65	ES710/6300LG	B924234
}	260	250	365	234	-	280	9 x 14	27	74	ES710/8000LG	B924235
\dashv	294	240	410	264	-	320	13 x 20	39	85	ES710/10000LG	B924236
}	380	200	450	350	270	150	11 x 16	15	69	ES710/3150SK2	B924241
ا ا	380	190	500	350	310	150	11 x 16	24	75	ES710/4000SK2	B924242
SK2 series	380	200	500	350	310	160	11 x 16	25	77	ES710/5000SK2	B924243
SS	380	215	500	350	310	175	11 x 16	26	86	ES710/6300SK2	B924244
}	380	230	500	350	310	190	11 x 16	27	90	ES710/8000SK2	B924245
_	410	240	560	380	350	200	11 x 16	39	105	ES710/10000SK2	B924246
}	280	180	370	240	290	145	11 x 28	15	49	ES710/3150S	B924261
اي	280	150	420	240	290	115	11 x 28	24	59	ES710/4000S	B924262
Sseries	280	160	420	240	290	125	11 x 28	25	61	ES710/5000S	B924263
~	280 280	175 190	420 420	240	290 290	140 155	11 x 28 11 x 28	26 27	65 74	ES710/6300S ES710/8000S	B924264 B924265
ŀ	320	200	440	240 270	330	160	13 x 35	39	85	ES710/8000S ES710/10000S	B924265 B924266

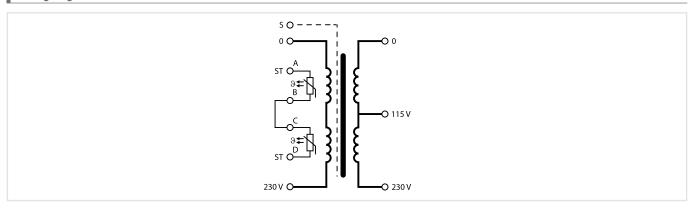
Ordering information enclosure

Dimensions (mm)								Weight (kg)	Version	Туре	Art. No.	
A	В	C	D	E	F	G	Н	I	Weight (kg)	Tersion	.,,,,,	711 1101
430	380	500	385	420	450	M10	ø 37,5	ø 20,5	16	floor mounting	ESDS0107-1	B924673
350	300		315	550	580				18	hanging mounting	ESDS710	B924741

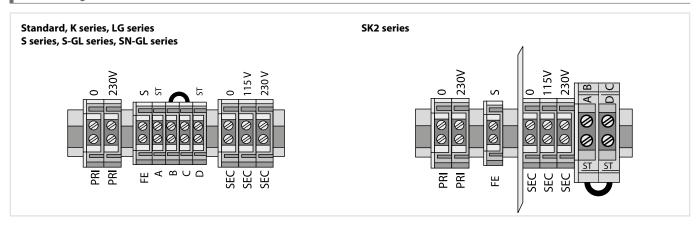
Nameplate



Wiring diagram



Terminal diagram



Connection properties

Туре	Input terminals flexible/rigid	Screen winding flexible/rigid	Control terminals flexible/rigid	Control terminals for protection class II flexible/rigid	Output terminals flexible/rigid
ES710/3150	16/25 mm ²	16/25 mm ²	4/6 mm ²	2.5/4 mm ²	16/25 mm ²
ES710/4000	16/25 mm ²	16/25 mm ²	4/6 mm ²	2.5/4 mm ²	16/25 mm ²
ES710/5000	16/25 mm ²	16/25 mm ²	4/6 mm ²	2.5/4 mm ²	16/25 mm ²
ES710/6300	16/25 mm ²	16/25 mm ²	4/6 mm ²	2.5/4 mm ²	16/25 mm ²
ES710/8000	16/25 mm ²	16/25 mm ²	4/6 mm ²	2.5/4 mm ²	16/25 mm ²
ES710/10000	35/35 mm ²	35/35 mm ²	4/6 mm ²	2.5/4 mm ²	35/35 mm ²

Isolating transformers DS0107

Three-phase isolating transformers for the supply of three-phase loads in medical locations



Typical applications

• For IT systems in medical locations

Approvals



Device features

- Built-in temperature sensors acc. to DIN 44081 (120 $^{\circ}$ C)
- Screen winding with brought-out insulated connection terminal
- · Insulated mounting angles
- Degree of protection, IP00 (open design)
- Degree of protection, IP23 (with enclosure)
- · Protection class I
- Protection class II (option: encapsulated version)
- Reinforced insulation
- Classification of insulation ta40/B
- Connections: screw terminals
- Noise level < 35 dB (A)(no-load and nominal load)
- · Vector group: Yyn O

Standards

DS0107 isolating transformers comply with the device standards and the regulations for installation:

- DIN EN 61558-1 (VDE 570-1)
- IEC 61558-1
- DIN VDE 0100-710 (VDE 0100-710)
- DIN EN 61558-2-15 (VDE 0570-2-15)
- IEC 61558-2-15
- IEC 60364-7-710

Note:

- According to DIN VDE 0100-710 (VDE 0100-710), para. 710.512.1.6.2, single -phase transformers shall be used for the erection of medical IT systems.
- The transformers of the DS0107 series are not suitable for the erection and installation of medical IT systems.

Further information

For further information refer to our product range on www.bender.de.

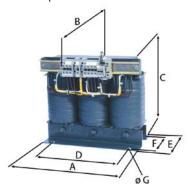
Technical data

Туре	DS0107/2000	DS0107/3150	DS0107/4000	DS0107/5000	DS0107/6300	DS0107/8000	DS0107/10000
Insulation classification	ta 40/B	t _a 40/B	t _a 40/B	t _a 40/B	t _a 40/B	t _a 40/B	t _a 40/B
Degree of protection	IP00	IP00	IP00	IP00	IP00	IP00	IP00
Protection class	I/II*	I/II*	I/II*	I/II*	I/II*	I/II*	I/II*
Power/voltages/currents							
Rated power	2000 VA	3150 VA	4000 VA	5000 VA	6300 VA	8000 VA	10000 VA
Rated frequency	5060 Hz	5060 Hz	5060 Hz	5060 Hz	5060 Hz	5060 Hz	5060 Hz
Rated input voltage	3AC 400 V	3AC 400 V	3AC 400 V	3AC 400 V	3AC 400 V	3AC 400 V	3AC 400 V
Rated input current	3 A	4.9 A	6.1 A	7.7 A	9.8 A	12.2 A	15.6 A
Rated output voltage	3NAC 230 V	3NAC 230 V	3NAC 230 V	3NAC 230 V	3NAC 230 V	3NAC 230 V	3NAC 230 V
Rated output current	5 A	7.9 A	10 A	12.6 A	15.8 A	20.1 A	25.2 A
Inrush current I _E	< 12 x <i>Î</i> n	< 12 x <i>Î</i> n	< 12 x <i>Î</i> n	< 12 x În	< 12 x În	< 12 x În	< 12 x <i>Î</i> n
Leakage current	≤ 0.5 mA	≤ 0.5 mA	≤ 0.5 mA	\leq 0.5 mA	≤ 0.5 mA	≤ 0.5 mA	≤ 0.5 mA
No-load input current io	≤ 3.0 %	≤ 3.0 %	≤ 3.0 %	≤ 3.0 %	≤ 3.0 %	≤ 3.0 %	≤ 3.0 %
No-load output voltage u ₀	≤ 232 V	≤ 235 V	≤ 234 V	≤ 236 V	≤ 236 V	≤ 235 V	≤ 235 V
Short-circuit voltage <i>u</i> _k	≤ 2.9 %	≤ 2.9 %	≤ 2.8 %	≤ 3 %	≤ 2.8 %	≤ 2.8 %	≤ 2.5 %
Environmental conditions							
Ambient temperature	≤ 40 °C	≤ 40 °C	≤ 40 °C	≤ 40 °C	≤ 40 °C	≤ 40 °C	≤ 40 °C
No-load temperature rise	≤ 25 °C	≤ 21 °C	≤ 24 °C	≤ 28 °C	≤ 24 °C	≤ 27 °C	≤ 32 °C
Full-load temperature rise	≤ 50 °C	≤ 50 °C	≤ 53 °C	≤ 67 °C	≤ 60 °C	≤ 72 °C	≤ 75 °C
Noise level (no load and full load)	\leq 35 dB(A)	\leq 35 dB(A)	\leq 35 dB(A)	\leq 35 dB(A)	\leq 35 dB(A)	\leq 35 dB(A)	\leq 35 dB(A)
Other							
Recommended fuse when used in accordance							
with DIN VDE 0100-710	10 A gL/gG	16 A gL/gG	20 A gL/gG	20 A gL/gG	25 A gL/gG	35 A gL/gG	35 A gL/gG
Induction	1.0 T	0.8 T	0.86 T	0.8 T	0.8 T	0.8 T	0.82 T
R _{primary}	1.12 Ω	0.7 Ω	0.42 Ω	0.38 Ω	0.33 Ω	0.26 Ω	0.13 Ω
Rsecondary	0.27 Ω	0.17 Ω	0.13 Ω	0.12 Ω	0.07 Ω	0.055 Ω	0.05 Ω
FE loss (iron loss)	45 W	51 W	70 W	75 W	80 W	96 W	120 W
Cu loss (copper loss)	60 W	105 W	115 W	170 W	200 W	255 W	270 W
Efficiency	95 %	96 %	95 %	95 %	96 %	96 %	96 %
Documentation number: D00105							

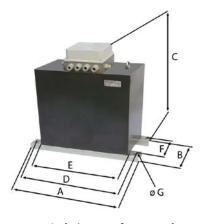
^{*} Option: completely encapsulated version



Standard – Dimension B: depth incl. terminals



SK2 series

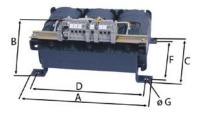


K series

All other dimensions correspond to the standard dimensions.







Isolating transformer enclosure



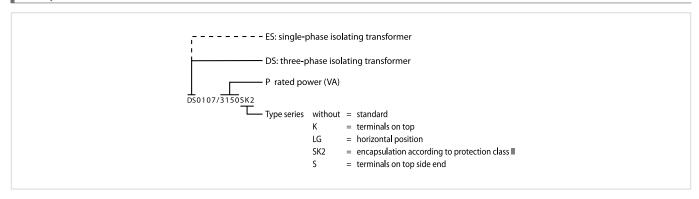
Ordering information

			Di	mensions (mi	m)		Cu weight	Weight	Туре	Art. No.	
	A	В	C	D	E	F	G	(kg)	(kg)	Туре	Art. No.
	300	200	270	240	160	130	11	16	34	DS0107/2000	B924694
	360	210	325	310	170	135	11	28	63	DS0107/3150	B924106
þ	360	225	325	310	185	150	11	29	70	DS0107/4000	B924121
Standard	360	240	325	310	200	165	11	31	77	DS0107/5000	B924112
152	420	230	370	370	200	160	11	48	97	DS0107/6300	B924107
	420	245	370	370	215	175	11	51	107	DS0107/8000	B924628
	420	260	370	370	230	190	11	59	130	DS0107/10000	B924672
	300	-	310	240	162	130	11	16	34	DS0107/2000K	B924687
	360	-	360	310	170	135	11	28	63	DS0107/3150K	B924688
	360	-	360	310	185	150	11	29	70	DS0107/4000K	B924689
K series	360	-	360	310	200	165	11	31	77	DS0107/5000K	B924690
	420	-	420	370	200	160	11	48	97	DS0107/6300K	B924691
	420	-	420	370	215	175	11	51	107	DS0107/8000K	B924692
	420	-	420	370	230	190	11	59	130	DS0107/10000K	B924693
	330	195	265	298	-	200	7	16	34	DS0107/2000LG	B924695
	394	198	310	358	-	240	9	28	63	DS0107/3150LG	B924658
S	394	214	310	358	-	240	9	29	70	DS0107/4000LG	B924659
LG series	394	228	310	358	-	240	9	31	77	DS0107/5000LG	B924660
	452	212	360	408	-	280	12	48	97	DS0107/6300LG	B924661
	452	227	360	408	-	280	12	51	107	DS0107/8000LG	B924662
	452	250	360	408	-	280	12	59	130	DS0107/10000LG	B924679
	410	190	400	380	330	125	11	16	49	DS0107/2000SK2	B924696
	520	190	450	490	390	135	11	28	75	DS0107/3150SK2	B924122
8	520	190	450	490	390	135	11	29	80	DS0107/4000SK2	B924123
SK2 series	520	200	450	490	390	150	11	31	86	DS0107/5000SK2	B924124
	520	200	500	490	450	150	11	48	107	DS0107/6300SK2	B924125
	520	215	500	490	450	175	11	51	130	DS0107/8000SK2	B924126
	520	230	500	490	450	175	11	59	155	DS0107/10000SK2	B924678

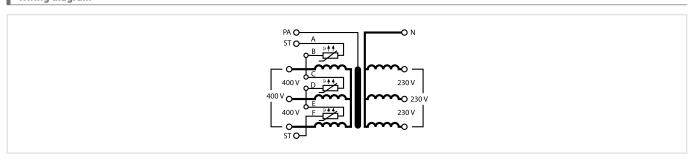
Ordering information enclosure

			Dime	ensions (mm)				Suitable for the following	Weight (kg)	Туре	Art. No.
A	В	C	D	E	F	G	Н	I	device types		-77-	
430	380	490	385	420	450	M10	ø 29	ø 21	DS0107/2000 bis DS0107/5000	16	ESDS0107-1	B924673
600	420	490	555	460	490	M10	ø 36	ø 16	DS0107/6300 bis DS0107/10000	23	ESDS0107-2	B924674

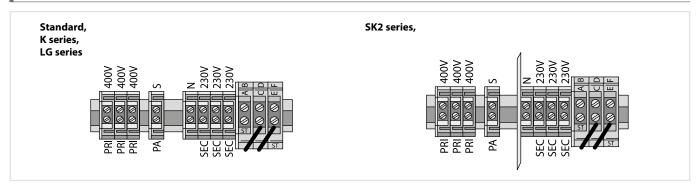
Nameplate



Wiring diagram



Terminal diagram



Connection properties

Туре	Input terminals flexible/rigid	Screen winding flexible/rigid	Control terminals flexible/rigid	Output terminals flexible/rigid
DS0107/2000	10/16 mm ²	10/16 mm ²	2.5/4 mm ²	10/16 mm ²
DS0107/3150	10/16 mm ²	10/16 mm ²	2.5/4 mm ²	10/16 mm ²
DS0107/4000	10/16 mm ²	10/16 mm ²	2.5/4 mm ²	10/16 mm ²
DS0107/5000	10/16 mm ²	10/16 mm ²	2.5/4 mm ²	10/16 mm ²
DS0107/6300	10/16 mm ²	10/16 mm ²	2.5/4 mm ²	16/25 mm ²
DS0107/8000	10/16 mm ²	10/16 mm ²	2.5/4 mm ²	16/25 mm ²
DS0107/10000	16/25 mm ²	16/25 mm ²	2.5/4 mm ²	16/25 mm ²

ESL0107 transformers for operating theatre lights

Single-phase isolating transformers for the supply of operating theatre lights



Device features

- Screen winding lead out for external connection
- · Insulated mounting angles
- Degree of protection, IP00 (open design)
- Reinforced insulation
- Classification of insulation ta 40/E
- Connections: screw terminals
- Vector group: IiO

Typical applications

• For the supply of operating theatre lights in group 2 medical locations

Approvals



Standards

ESL0107 isolating transformers comply with the device standards and the regulations for installation:

- DIN EN 61558-1 (VDE 0570-1)
- IEC 61558-1
- DIN EN 61558-2-6 (VDE 0570-2-6)
- IEC 61558-2-6

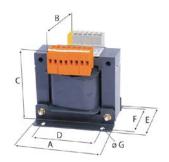
Further information

For further information refer to our product range on www.bender.de.

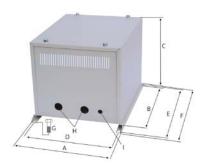
Technical data

Туре	ESL0107/120	ESL0107/160	ESL0107/280	ESL0107/400	ESL0107/630	ESL0107/1000
Insulation classification	t _a 40/E	t _a 40/E	t _a 40/E	t _a 40/E	t _a 40/E	t _a 40/E
Degree of protection/protection class	IP00/I	IP00/I	IP00/I	IP00/I	IP00/I	IP00/I
Power/voltages/currents						
Rated power	120 VA	160 VA	280 VA	400 VA	630 VA	1000 VA
Rated frequency	5060 Hz	5060 Hz	5060 Hz	5060 Hz	5060 Hz	5060 Hz
Rated input voltage	230 V	230 V	230 V	230 V	230 V	230 V
Rated input current	0.6 A	0.8 A	1.4 A	1.9 A	3 A	4.6 A
Rated output voltage	2328 V	2328 V	2328 V	2328 V	2328 V	2328 V
Rated output current	4.3 A	5.7 A	10 A	14.3 A	22.5 A	35.7 A
Inrush current I _E	< 15 x Î _n	$<$ 15 x \hat{l}_{n}	< 15 x Î _n	$< 15 x \hat{I}_{n}$	< 15 x Î _n	$<$ 15 x \hat{I}_{n}
Leakage current	≤ 5 µA	≤ 5 µA	≤ 5 µA	≤ 5 µA	≤ 5 µA	≤ 5 µA
No-load input current io	≤ 95 mA	≤ 120 mA	≤ 140 mA	≤ 237 mA	≤ 270 mA	≤ 320 mA
No-load output voltage u ₀	≤ 31.7 V	≤ 30.7 V	≤ 30.6 V	≤ 29.7 V	≤ 30 V	≤ 30 V
Short-circuit voltage u _k	≤ 11 %	≤ 8.8 %	≤ 7.9 %	≤ 5.3 %	≤ 5 %	≤ 4.3 %
Environmental conditions						
Ambient temperature	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C
No-load temperature rise	≤ 17 °C	≤ 20 °C	≤ 18 °C	≤ 26 °C	≤ 23 °C	≤ 26 °C
No-load temperature rise	≤ 66 °C	≤ 64 °C	≤ 71 °C	≤ 62 °C	≤ 64 °C	≤ 65 °C
Noise level (no load and full load)	≤ 35 dB(A)	≤ 35 dB(A)	≤ 35 dB(A)	≤ 35 dB(A)	≤ 35 dB(A)	≤ 35 dB(A)
Other						
Recommended fuse when used in accordance						
with DIN VDE 0100-710	6 A gL/gG	6 A gL/gG	6 A gL/gG	10 A gL/gG	16 A gL/gG	16 A gL/gG
Induction	1.23 T	1.17 T	1.14 T	1.14 T	1.06 T	1T
R _{primary}	15.3 Ω	8.9 Ω	4.7 Ω	2Ω	1.2 Ω	0.6 Ω
R _{secondary}	0.32 Ω	0.2 Ω	0.095 Ω	0.05 Ω	0.028 Ω	0.016 Ω
FE loss (iron loss)	5.5 W	6.3 W	9 W	15 W	18 W	26 W
Cu loss (copper loss)	15.8 W	16 W	25 W	23 W	33 W	44 W
Efficiency	85 %	88 %	89 %	91 %	92 %	94 %
Documentation number: D00110						

Isolating transformer



Isolating transformer enclosure



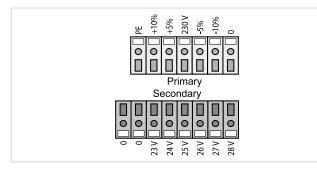
Ordering information

		Di	mensions (mı	m)		Cu weight	Weight	Туре	Art. No.	
Α	В	C	D	E	F	G	(kg)	(kg)	1,700	Art. No.
96	96	105	84	82	65	5.5	0.5	2.3	ESL0107/120	B924632
96	106	105	84	92	75	5.5	0.8	2.8	ESL0107/160	B924633
120	102	125	90	92	74	5.5	1	4	ESL0107/280	B924634
120	134	125	90	128	110	5.5	1.6	6.7	ESL0107/400	B924637
150	135	150	122	130	108	6.5	3	10.2	ESL0107/630	B924638
174	145	175	135	150	120	6.5	5.8	16.5	ESL0107/1000	B924639

Ordering information enclosure

	Dimensions (mm)								Weight (kg)	Туре	Art. No.
Α	В	C	D	E	F	G	Н	1	Weight (kg)	1,700	
240	280	220	220	300	320	M6	ø 29	ø 21	3.5	ESL0107-0	B924204

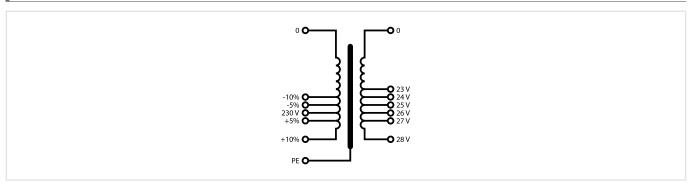
Terminal diagram



Connection properties

Туре	Input terminals flexible/rigid	Screen winding flexible/rigid	Output terminals flexible/rigid
ESL0107/120	4/6 mm ²	4/6 mm²	4/6 mm ²
ESL0107/160 4/6 mm ²		4/6 mm ²	4/6 mm ²
ESL0107/280	4/6 mm ²	4/6 mm ²	4/6 mm ²
ESL0107/400	4/6 mm ²	4/6 mm ²	4/6 mm ²
ESL0107/630	10/16 mm ²	4/6 mm ²	10/16 mm ²
ESL0107/1000	10/16 mm ²	4/6 mm ²	10/16 mm ²

Wiring diagram



STEP-PS

For supply of Bender devices with a supply voltage of DC 24 V



Device features

- · Easy DIN rail and wall mounting
- · Maximum energy efficiency thanks to low idling losses
- Fast commissioning with LED function monitoring
- High operational reliability thanks to long power failure buffering under full load and high MTBF (> 500,000 h)
- · Can be used worldwide in all industrial sectors due to a wide-range input and an international approval package
- Wide temperature range from -25 °C to +70 °C
- · Can be connected in parallel to increase power

Typical applications

- For supply of Bender devices with a supply voltage of DC 24 V
- $\bullet \ \, \text{The compact design makes them}$ especially suitable for installation distributors and flat control panels

Further information

For further information refer to our product range on www.bender.de.

Approvals



Ordering information

Туре	Rated input voltage <i>U</i> _{IN}	Rated voltage	Art. No.
STEP-PS/1 AC/24 DC/0.5			B94053110
STEP-PS/1 AC/24 DC/1.75	AC 85264 V, 4565 Hz DC 95250 V	DC 24 V	B94053111
STEP-PS/1 AC/24 DC/4.2	00732501		B94053112

Input data		STEP-PS/1AC/24DC/4.2 (100 W)	
Nominal input voltage range	AC 100240 V	Setting range of the output voltage	DC 22.529.5 V (> 24 V constant power)
AC input voltage range	AC 85264 V	Output current	4.2 A (-2570 °C)
DC input voltage range	DC 95 V250 V		4.4 A (-25 40 °C permanent)
AC frequency range	4565 Hz		6.5 A (maximum output current)
DC frequency range	0 Hz	Derating	above +55 °C: 2.5 % per kelvin
· · ·		Control deviation	< 1 % (change in load, static 1090 %)
STEP-PS/1AC/24DC/0.5 (12 W)	annuar 0.20 A (AC 120 V)		< 2 % (change in load, dynamic 1090 %)
Current consumption	approx. 0.28 A (AC 120 V)		$< 0.1 \%$ (change in input voltage $\pm 10 \%$)
Innich summe limitestica	approx. 0.13 A (AC 230 V)	Maximum power loss nominal load	13.2 W
Inrush current limitation	< 15 A (typical)	Maximum power dissipation idling	0.7 W
l²t	< 0.1 A ² s	Efficiency	> 88 % (for AC 230 V and nominal values)
Power failure buffering	> 15 ms (AC 120 V)	Ascent time	< 0.5 s (<i>U</i> _{OUT} (1090 %))
	> 90 ms (AC 230 V)	Residual ripple	< 25 mV _{SS} (with nominal values)
Typical turn-on time	< 0.5 s	Peak switching voltages	< 25 mV _{SS} (with nominal values)
Input fuse, integrated	1.25 A (slow acting, internal)	Connection in parallel	yes, for increased power
STEP-PS/1AC/24DC/1.75 (40 W)		Connection in series	yes
Current consumption	approx. 0.6 A (AC 120 V)	Overvoltage protection against internal overvoltages	yes, limited to approx. DC 35 V
·	approx. 0.3 A (AC 230 V)	Resistance to reverse feed	max. DC 35 V
Inrush current limitation	< 15 A (typical)	nesistance to reverse recu	max. DC 33 v
l²t	< 0.6 A ² s	Power consumption	
Power failure buffering	> 25 ms (AC 120 V)	STEP-PS/1AC/24DC/0.5 (12 W)	
	> 150 ms (AC 230 V)		< 0.3 W
Typical turn-on time	< 0.5 s	Maximum power dissipation idling	
Input fuse, integrated	3.15 A (slow acting, internal)	Maximum power loss nominal load	< 2.2 W
Recommended back-up fuse for line protection	6 A	STEP-PS/1AC/24DC/1.75 (40 W)	
necommended back up ruse for fine protection	10 A	Maximum power dissipation idling	5 W
	16 A (characteristic B)	Maximum power loss nominal load	0.7 W
	TO A (characteristic b)	STEP-PS/1AC/24DC/4.2 (100 W)	
STEP-PS/1AC/24DC/4.2 (100 W)		Maximum power dissipation idling	13.2 W
Current consumption	approx. 1.3 A (AC 120 V)	Maximum power loss nominal load	0.7 W
	approx. 0.8 A (AC 230 V)	Maximum power 1035 Hommar Toda	0.7 11
Inrush current limitation	< 15 A (typical)	LED status indicator	
l ² t	< 1 A ² s	Status display	"DC OK" LED green/ U_{OUT} > 21.5 V: LED lights up
Power failure buffering	> 20 ms (AC 120 V)		< 21.5 V: LED off
	> 100 ms (AC 230 V)		
Typical turn-on time	< 0.5 s	Environmental conditions	
Input fuse, integrated	4 A (slow acting, internal)	Ambient temperature (operation)	-2570 °C (> 55 °C derating)
Recommended back-up fuse for line protection	6 A	Ambient temperature (storage/transport)	-4085 °C
	10 A	Max. perm. humidity (operation)	\leq 95 % (at 25 °C, no condensation)
	16 A (characteristic B)	Vibration (operation) <	15 Hz, amplitude \pm 2.5 mm acc. to IEC 60068-2-6
Output data			15 150 Hz, 2.3 g, 90 min.
<u> </u>	DC 2414 + 4.04	Shock	30 g in all directions, acc. to IEC 60068-2-27
Nominal output voltage	DC 24 V ±1 %	Pollution degree acc. to EN 50178	2
STEP-PS/1AC/24DC/0.5 (12 W)		Classification of climatic conditions	3K22 (acc. to EN 60721)
Output current	0.5 A (-25+55 °C)	Commention	
	0.55 A (-2540 °C permanent)	Connection	
	1 A (maximum output current)	Connection type	screw connection
Control deviation	< 1 % (change in load, static 1090 %)	Connection properties	
	< 2 % (change in load, dynamic 1090 %)	Rigid/flexible	0.2 2.5 mm ²
	$<$ 0.1 % (change in input voltage \pm 10 %)	Conductor sizes	AWG 2412
Efficiency	> 84 % (for AC 230 V and nominal values)	Tightening torque	0.6 0.8 Nm
Residual ripple	< 20 mV _{SS} (20 MHz)	Stripping length	6.5 mm
Peak switching voltages	< 30 mV _{SS} (20 MHz)	Other	
Connection in parallel	yes, for increased power		AC 4131/6
Connection in series	yes	Insulation voltage input/output	AC 4 kV (type test)
Protection against internal overvoltages	yes, limited to approx. DC 35 V	Insulation valtages in the APP	AC 2 KV (routine test)
Resistance to reverse feed	≤ DC 35 V	Insulation voltage input/PE	AC 3.5 kV (type test)
STEP-PS/1AC/24DC/1.75 (40 W)		Insulation valtages	AC 2 kV (routine test)
	DC 22.5 V 20.5 V /> 24 V constant novemb	Insulation voltage output/PE	DC 500 V ((routine test)
Setting range of the output voltage	DC 22.5 V29.5 V (> 24 V constant power)	Degree of protection	IP20
Output current	1.75 A (-2570 °C)	Protection class	<u> </u>
	1.9 A (-2540 °C permanent)	MTBF (IEC 61709)	500000 h
Doroting	3.75 A (maximum output current)	Enclosure material	polycarbonate
Derating Control doviction	above +55 °C: 2.5 % per kelvin	Foot latch material	plastic POM
Control deviation	< 1 % (change in load, static 1090 %)	Dimensions W/H/D (state of delivery)	
	< 2 % (change in load, dynamic 1090 %)	STEP-PS/1AC/24DC/0.5 (12 W)	18/90/61 mm
Mandanian annia lancia control lanci	< 0.1 % (change in input voltage ±10 %)	STEP-PS/1AC/24DC/1.75 (40 W)	54/90/61 mm
Maximum power loss nominal load	5 W	STEP-PS/1AC/24DC/4.2 (100 W)	90/90/61 mm
Maximum power dissipation idling	0.7 W	Weight	
Efficiency	> 89 % (for AC 230 V and nominal values)	STEP-PS/1AC/24DC/0.5 (12 W)	100 g
Ascent time	< 0.5 s (<i>U</i> _{OUT} (1090 %))	STEP-PS/1AC/24DC/1.75 (40 W)	200 g
		CTED DC (4.4.C/2.4DC (4.2.(4.00.M))	400
Residual ripple	< 35 mV _{SS} (with nominal values)	STEP-PS/1AC/24DC/4.2 (100 W)	400 g
Switching transients	< 35 mV _{SS} (with nominal values)	S1EP-P5/1AC/24DC/4.2 (100 W)	400 g
Switching transients Connection in parallel	< 35 mV _{SS} (with nominal values) yes, for increased power	S1EP-PS/TAC/24DC/4.2 (100 W)	400 g
Switching transients Connection in parallel Connection in series	< 35 mV _{SS} (with nominal values) yes, for increased power yes	S1EP-PS/1AC/24UC/4.2 (100 W)	400 g
Switching transients Connection in parallel	< 35 mV _{SS} (with nominal values) yes, for increased power	S1EP-PS/1AC/24UC/4.2 (100 W)	400 g



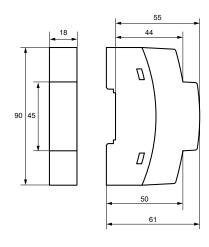
Technische Daten (Fortsetzung)

Standards	
Electrical equipment of machines	EN 60204
Safety isolating transformers for switch mode power supplie	es IEC 61558-2-17
Electrical safety (of information technology equipment)	IEC 60950-1/VDE 0805 (SELV)
Electronic equipment for use in power installations	EN 50178/VDE 0160 (PELV)
Protective extra-low voltage	IEC 60950-1 (SELV) and EN 60204 (PELV)
Protective separation	DIN VDE 0100-410
	DIN VDE 0106-1010
Protection against electric shock	DIN 57100-410
Protection against electric shock, basic requirements for	
protective separation in electrical equipment	DIN VDE 0106-101
Limits for harmonic current emissions	EN 61000-3-2
STEP-PS/1AC/24DC/1.75 (40W) and STEP-PS/1AC/24DC	/4.2 (100 W)
Certificate	CB Scheme

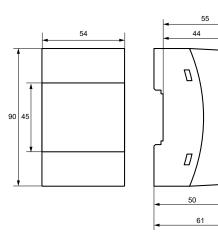
Approvals and certifications	
STEP-PS/1AC/24DC/0.5 (12W)	
UL approvals	UL/C-UL Listed UL 508
	UL/C-UL Recognized UL 60950
	NEC Class 2 as per UL 1310
UL/C-UL	Listed ANSI/ISA-12.12.01 Class I, Division 2, Groups A, B, C, D
STEP-PS/1AC/24DC/1.75 (40W)	
UL approvals	UL/C-UL Listed UL 508
	UL/C-UL Recognized UL 60950
	NEC Class 2 as per UL 1310
Shipbuilding sector	Germanischer Lloyd
STEP-PS/1AC/24DC/4.2 (100W)	
UL approvals	UL/C-UL Listed UL 508
	UL/C-UL Recognized UL 60950
Shipbuilding sector	Germanischer Lloyd

Dimension diagram (dimensions in mm)

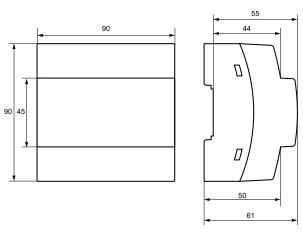
STEP-PS/1AC/24DC/0.5 (12 W)



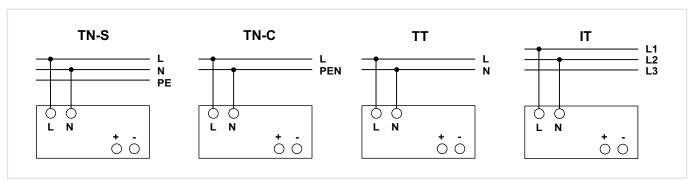
STEP-PS/1AC/24DC/1.75 (40 W)



STEP-PS/1AC/24DC/4.2 (100 W)



Connection to different systems



Power supply unit for DC 24 V supply



Typical applications

• To supply Bender devices with DC 24 V and maximum 10 VA power consumption

- Primary-pulsed power supply unit for the power supply of Bender devices with a supply voltage of DC 24 V and a power consumption of max. 10 VA
- Power supply for max. 3 MK2430 alarm indicator and test combinations
- Protected against idle running, overload and continuous short circuits

Standards

Device features

The AN410 series complies with the requirements of the device standard:

• EN 61204

Further information

For further information refer to our product range on www.bender.de.





*) Approval relating to the rated input voltage U_{IN}

Ordering information

Туре	ABB type	Rated input voltage U _{IN}	Rated output voltage	Art. No.
AN410	CP-D 24/0.42/Art. No. 1SVR 427 041 R0000	AC 90264 V, 4763 Hz / DC 120370 V	DC 24 V	B924209
AN420-R	CP-D RU/Art. No. 1SVR 427 049 R0000	DC 935 V	DC 935 V	B95100250



Technical data	
Insulation coordination acc. to IEC 60664-1	
Rated impulse voltage/pollution degree	3 kV/2
Rated insulation voltage U_i input circuit/output circuit	3 kV
Input circuits	
Rated input voltage U_{IN}	see ordering information
Power consumption	≤ 3 W
Inrush current	≤ 30 A, ≤ 3 ms
Stored energy time in the event of power system failure	≥ 30 ms
Typical current/power consumption at	
AC 110 V	184 mA/11.62 W
AC 230 V	120.6 mA/12 W
Primary fuse (internal device protection, not accessible)	1 A time-lag/AC 250 V
Output circuit	
Rated output voltage	DC 24 V (±1 %)
Rated output current	420 mA
Derating of the output current 60 °C $< T_U \le 70$ °C	2.5 %/K
Parallel connection option	with redundance unit AN420-R
Protection against short circuits/no-load continuous prote	ection against short circuits/no-load
Environment/EMC	
EMC immunity	acc. to EN 61000-6-2
EMC emission	acc. to EN 61000-6-3
Ambient temperature (during operation / during storage)	-25+70 °C / -25+85 °C
Classification of mechanical conditions acc. to IEC/EN 60068-2	
Connection	
Connection	screw-type terminals
Connection	
rigid, flexible (with or without ferrule) / conductor sizes	0.22 mm ² / AWG 2414
Stripping length	6 mm (0.24 inches)
Tightening torque	0.360.56 Nm
<u> </u>	

C Usten	UL 508, CAN/CSA C22.2 No. 14
c 71 0s	UL 1310, CAN/CSA C22.2 No. 223 (Class 2 Power Supply)
c 71 2 us	UL 6090, CAN/CSA C22.2 No. 60950
(10)	000
Mark	
CE	
*) Approval relating to the	rated input voltage $U_{ m IN}$
,	rated input voltage $\mathit{U}_{ ext{IN}}$
Other	2 LEDs: output voltage preser
Other	
Other Status indicators	2 LEDs: output voltage preser
Other Status indicators Operating mode	2 LEDs: output voltage preser output votlage lo
Other Status indicators Operating mode Mounting	2 LEDs: output voltage preser output votlage lo continuous operatio
Other Status indicators Operating mode Mounting Degree of protection	2 LEDs: output voltage preser output votlage lo continuous operatio
Other Status indicators Operating mode Mounting Degree of protection	2 LEDs: output voltage preser output votlage lo continuous operatic vertically (terminals +/– at the to

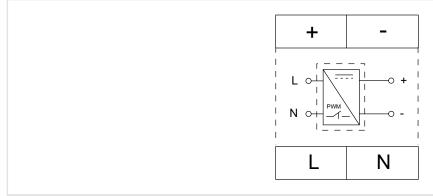
Minimum distance to adjacent devices vertically/horizontally

Enclosure dimensions (W x H x D) DIN rail mounting acc. to

Protective extra low voltage Documentation number

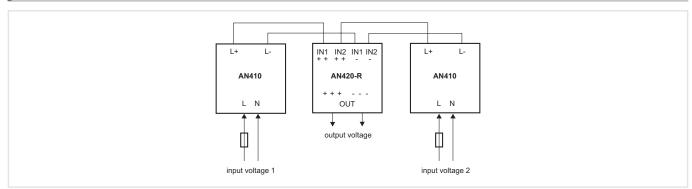
Weight

Wiring diagram



L, N: input voltage +, -: output voltage

Option for redundant power supply



25/25 mm

IEC 60715 SELV (EN 60950-1)

D00099

≤ 70 g

18 x 91 x 57.5 mm (0.71 x 3.58 x 2.26 inches)

Power supply unit



Typical applications

• Supply of Bender devices with AC 20 V and a power consumption of maximum 9 VA

Device features

- Power supply unit for the supply of Bender devices with AC 20 V and a power consumption of maximum 9 VA
- Supply of 3 MK2430 alarm indicator and test combinations (for example)
- Protected secondary circuit

Standards

The AN450 series complies with the requirements of the device standards:

• DIN EN 61558-2-6

Further information

For further information refer to our product range on www.bender.de.

Approvals



Ordering information

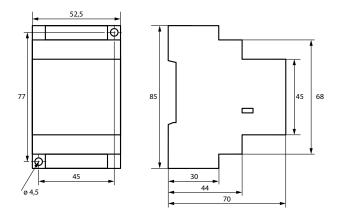
Туре	Output voltage	Supply voltage <i>U</i> ₅	Art. No.
AN450	AC 2011 F0 C0 II-	AC 230 V, 5060 Hz	B924201
AN450-133	AC 20 V, 5060 Hz	AC 127 V, 50 60 Hz	B924203

Technical data

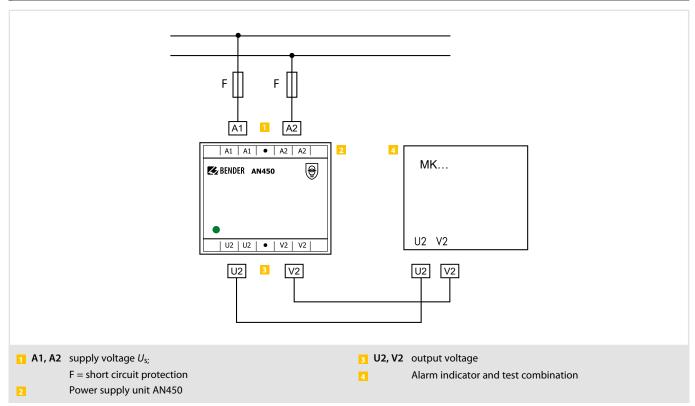
Insulation coordination acc. to IEC 60664-1	
Rated voltage	AC 250 V
Overvoltage category/pollution degree	III/2
Rated impulse voltage	4 kV
Altitude	≤ 2000 m NN
Voltage ranges	
Nominal voltage	see ordering details
Frequency range	see ordering details
Operating range of rated voltage	0.851.1
Output voltage	AC 20 V, 5060 Hz
Rated output Power	≤ 9 VA
Internal secondary protection	PTC resistor
Enviroment/EMC	
EMC immunity	acc. to EN 61000-6-2
EMC emission	acc. to EN 61000-6-4
Classification of climatic conditions acc. to IEC 60721	
Stationary use	3K22
Transport	2K11
Storage	1K21
Operating temperature	- 10+ 55 °C
Classification of mechanical conditions acc. to IEC 60721	
Stationary use	3M11
Transport	2M4
Storage	1M12

Connection	
Connection	screw terminals
Connection properties:	
rigid/flexible / Conductor sizes	0.24/0.22.5 mm ² / AWG 2412
Connection, flexible with connector sleeve	0.252 mm ²
Stripping length	8 mm
Tightening torque, terminal screws	0.5 Nm
Other	
Operating mode	continuous operation
Mounting	any position
Protection class internal	
components (DIN EN 60529)	IP30
terminals (DIN EN 60529)	IP20
Screw fixing	2 x M4
DIN rail mounting acc. to	DIN EN 60715/IEC 60715
Flammability class	UL94V-0
Standards	IEC 61558-2-6
Documentation number	D00100
Weight	≤ 400 g

Dimension diagram (dimensions in mm)



Wiring diagram



Measuring instruments



Device features

- Dimensions: 72 x 72 mm (7204/7220) or 96 x 96 mm (9604/9620)
- Version S for increased shock and vibration resistance
- Scale background: white, imprint: black

Further information

For further information refer to our product range on www.bender.de.

Typical applications

The analogue measuring instruments of the 96.../72... series for indication of measured values from Bender devices utilising an appropriate output

Approvals



Ordering information

Туре	Scale centre point (SKMP)	Dimensions	Input current	Suitable ISOMETER®	Art. No.
7204-1421	1201-0	72 72			B986763
7204S-1421	- 120 kΩ	72 x 72 mm	0 4004		B986804
9604-1421	1201.0		0400 μA 96 x 96 mm		B986764
9604S-1421		96 X 96 MM		96 x 96 mm	B986784
9620-1421	120 kΩ	96 x 96 mm	0 20 4	iso685	B986841
9620S-1421	120 KL 2	90 X 90 IIIIII	020 mA		B986842
9604-1621	1,2 ΜΩ	96 x 96 mm	0400 μΑ		B986782
7220-1421	1201-0	72 72	020 mA		B986844
7220S-1421		72 x 72 mm	020 MA		B986848

Technical data

Test voltage	3 kV
Accuracy class acc. to DIN 43780	1.5
Normal position	vertical +5°
Temperature range	-25+40 °C

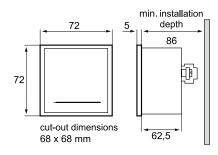
Protection class acc. to DIN 40050 Enclosure

Enclosure	IP52
Terminals	IP00
Terminals with contact protection	

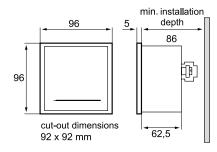
Documentation number D00092

Dimension diagram (dimensions in mm)

7204/7220



9604/9620



DI-1DL

RS-485 interface repeater for RS-485 bus extension



Approvals



Device features

- · Plastic enclosure for DIN rail mounting
- · Dynamic baud rate setting
- Galvanic separation between the input and output circuit and the power supply overvoltage protection
- Supply voltage AC 85...260 V, 50...60 Hz
- Automatic baud rate changeover can therefore be used for the internal BMS bus without limitations

Typical applications

- Extension of the maximum possible bus length by 1200 m in BMS systems (EDS, RCMS, MEDICS® systems)
- Extension of the maximum possible bus nodes by 31*
- Protection against spikes by galvanic separation between the input and output circuit and the power supply
- Implementation of resonant stubs (refer also to BSM instruction leaflet)

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Supply voltage U₅	Art. No.
DI-1DL	AC 85260 V, 5060 Hz	B95012047

Technical data

Supply voltage U_S	AC 85260 V, 5060 Hz
Power consumption	0.1 A/7 W
Interfaces	
BMS	
Interface/protocol	2 x RS-485/BMS
Baud rate	dynamic
Cable length	≤ 1200 m
Cable (twisted in pairs, one end of shield connected to PE)	recommended: J-Y(St)Y min. 2x0.8
Data direction switching	automatic
Cascading option	yes
Number of bus devices:	31 additional bus devices per repeater,
cascading allov	s a virtually unrestricted number of connections
Terminating resistor and bus bias voltage can be active	vated by a switch
Device address, BMS bus	-
Alarm LEDs	activity indication: direction and faults (green)
	internal operating voltage (red)

Environment	
Operating temperature	

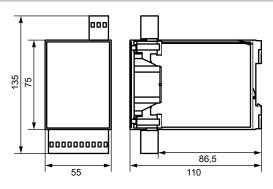
Operating temperature	0+70 ℃

Connection Connection

Other	
Operating mode	continuous operatior
Mounting	any positior
Enclosure	for standard DIN rail 32 mm (approx 110 x 75 x 55)

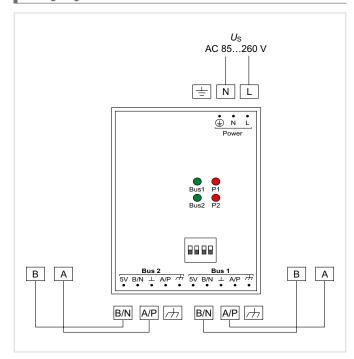
Operating manual DiaLog RS-485 repeater type CN-2-1 Documentation number D00125 Weight approx. 90 g

Dimension diagram (dimensions in mm)



push-wire/plug-in terminals

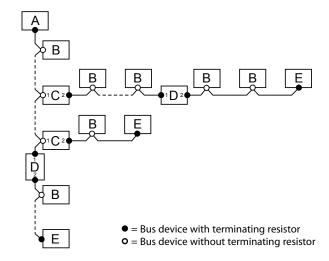
^{*} depending on used transceivers



Settings

- a) When used in the BMS bus, the rotary switch is to be set to position 4 for baud rate/interference suppression. The rotary switch is located at the bottom of the device.
- b) Two DIP switches are available per bus segment to terminate the bus and to generate the required bias voltage. Both DIP switches must be switched on for activation.

The termination is carried out as shown in the following example of a BMS bus system:



Termination/bias voltage		
Α	Master	Terminating resistor activated via switch on device (ON)* or external terminating resistor between terminals A and B
В	Slave	Terminating resistor deactivated via switch on device (OFF)*
C inte	RS-485 interface	Bus 1: Terminating resistor and bias voltage generation deactivated via switch on device (DIP switch 1, 2: OFF)
	repeater DI-1DL	Bus 2: Terminating resistor and bias voltage generation activated via switch on device (DIP switch 3, 4: ON)
D	RS-485 interface	Bus 1: Terminating resistor and bias voltage generation deactivated via switch on device (DIP switch 1, 2: OFF), external terminating resistor between terminals A/P and B/N
	repeater DI-1DL	Bus 2: Terminating resistor and bias voltage generation activated via switch on device (DIP switch 3, 4: ON)*
E	Slave	Terminating resistor activated via switch on device (ON) or external terminating resistor between terminals A and B

^{*} The bias voltage generation is generally activated for the BMS bus master (via software) and deactivated for the BMS slaves.



Device features

- · Plastic enclosure
- · Galvanic separation between the input and output circuit
- Power supply via USB port
- USB cable and driver CD included in the scope of delivery

Approvals



Typical applications

- Conversion of USB interface into RS-485 interface
- · Parameterisation of alarm indicator and operator panels (MK2430) via RS-485 interface by means of software
- Parameterisation of Modbus RTU devices via RS-485 interface by means of software

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Supply voltage	Art. No.
DI-2USB	from USB port, no additonal power supply required	B95012045

Technical data

Insulation coordination acc. to IEC 60664-1	
Rated voltage	
Rated impulse voltage/pollution degree	3 kV/3
Supply voltage	
Supply voltage <i>U</i> s	see ordering details
Power consumption	95 mV <i>A</i>
Interfaces	
RS-485	
Interface/protocol	1 x RS-485/-
Baud rate	9.6115.2 kbit/s
Cable length	≤ 1200 m
Cable (twisted in pairs, one end of shield connected to PE)	recommended: J-Y(St)Y min. 2x0.8
Mode	_
Connection	A, B
Integrated terminating resistors, selectable via jumper, factory setting	terminating resistors included
Device address	-
USB	
Serial interface	1 x USE
Alarm LEDs ON (yello	ow), R x Data (green), T x Data (red)

Environment/EMC

EMC immunity/EMC emission	EN 61000-6-2/EN 61000-6-4
Operating temperature	
Classification of climatic conditions acc. to IEC	60721
Stationary use	3K22
Transport	2K11
Long-term storage	1K22
Classification of machanical conditions are to	IFC (0734

Classification of mechanical conditions acc. to IEC 60721

Stationary use	3M11
Transport	2M4
Long-term storage	1M12

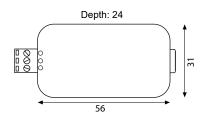
Connection	screw-type terminals/USB plug type B
Connection properties	
rigid/flexible/conductor sizes	0.52.5 mm ² (AWG 2212)

Other

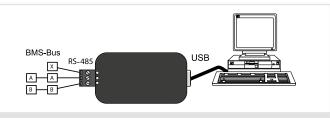
Connection

Operating mode	continuous operation
Mounting	any position
Screw mounting	2 x M3
DIN rail mounting acc. to	IEC 60715
Operating manual	manual of third-party manufacturer
Documentation number	D00103
Weight	≤ 25 g

Dimension diagram (dimensions in mm)



Wiring diagram



DI-2USB to connect a personal computer utilising a USB interface to a BMS network.

Note: Consider BMS bus termination

Relay module



Device features

- Extension of Bender devices by 12 relays
- N/O and N/C selectable

Further information

For further information refer to our product range on www.bender.de.

Typical applications

• Extension of the measuring channels during insulation fault location by potential-free contacts

Approvals



Ordering information

Туре	Supply voltage <i>U</i> ₅	Option "W"	Art. No.
I0M441-S	DC 24 V	-	B95012057
IOM441W-S		~	B95012057W

Accessories

Description	Art. No.
Plug kit screw terminals ¹⁾	B95012901
Plug kit Push-wire terminals	B95012902
Mechanical accessoires 1) (terminal cover + 2 mounting clips)	B95012903
BB bus 4TE Connector 1) (Requires matching PCB on base unit)	B98110002

¹⁾ Within scope of delivery

Technical data

Insulation coordination according to IEC 60664-1

Definitions:	
Supply circuit	BB bus
Output circuits	relay contacts [(13, 14), (23, 24), (33, 34),
(43, 44	4), (53, 54), (63, 64), (73, 74), (83,84), (93, 94)
	(103, 104), (113, 114), (123, 124)]
Protective separation (reinforced insulation) between	(BB bus) — (relay contacts)
Rated voltage	250 V
Overvoltage category	III
Pollution degree	2
Rated impulse voltage	6 kV
Voltage test (routine test) acc. to IEC 61010-1	AC 3.51 kV
Basic insulation between	(relay contact) — (relay contact)
Rated voltage	250 V
Overvoltage category	III
Pollution degree	2
Rated impulse voltage	4 kV
Voltage test (routine test) acc. to IEC 61010-1	AC 2.21 kV
Supply voltage	
Supply voltage $U_{\rm S}$	DC 24 V
Tolerance of U_{S}	5 %
Power consumption	< 1.7 W

LEDs	
ON (operation LED)	green
Switching elements	
Number	12 N/O contacts
Rated operational voltage	AC 250 V/DC 30 V
Rated operational current	5 A
Minimum contact rating	1 mA at \geq DC 5 V
Environment/EMC	
EMC	IEC 61326-2-4
Ambient temperatures:	
Operating temperature	-25+55 ℃
Transport	-40+85 °C
Storage	-25+70 ℃
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
Area of application	≤ 2000 m AMSL

Technical data (continued)

Connection	
Connection type	pluggable push-wire terminal
Conductor sizes	AWG 2412
Stripping length	10 mm
rigid/flexible	0.22.5 mm ²
flexible with ferrule, with/without plastic sleeve	0.252.5 mm ²
Multiple conductor, flexible with TWIN ferrule with plastic sleeve	0.51.5 mm ²

Operating mode	continuous operation
Degree of protection internal components	IP40
Degree of protection terminals	IP20
DIN rail mounting acc. to	IEC 60715
Screw fixing	2 x M4 with mounting clip
Enclosure material	polycarbonate
Flammability class	UL 94V-0
Dimensions (W x H x D)	72 x 93 x 63
Documentation number	D00300
Weight	approx. 180 g

Device version "W"

Devices with the suffix "W" feature increased shock and vibration resistance.

The electronics is covered with a special varnish to provide increased protection against mechanical stress and moisture.

Ambient temperatures:

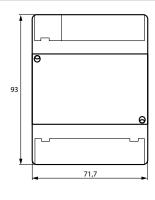
Operating temperature	-40+70 ℃
Transport	-40+85 ℃
Long-term storage	-25+70 ℃

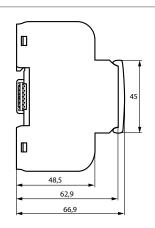
Classification of climatic conditions acc. to IEC 60721:

Stationary use (IEC 60721-3-3)	3K23
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3M12

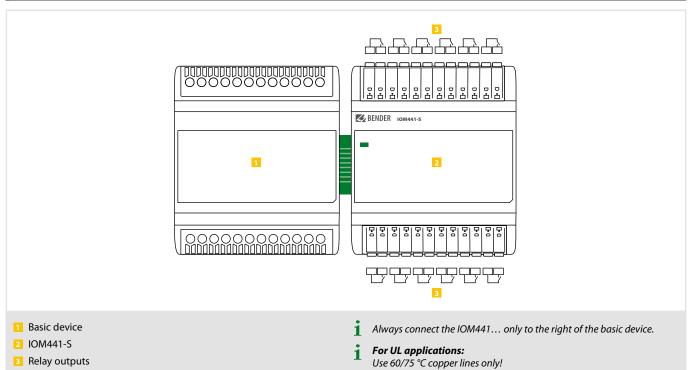
()* = Factory settings

Dimension diagram (dimensions in mm)





Wiring diagram



COMTRAXX® EDGE500IP

Condition Monitor with gateway functionality for the integration and provision of Bender device data



Typical applications

- · Optimum display and visualisation of device and plant statuses
- Monitoring and analysing Bender devices and compatible third-party
- · Customised system overview thanks to a wide range of options
- Selective notification to various users in the event of alarms
- Use of professional visualisation programs through conversion to the Modbus TCP, Modbus RTU, SNMP and MQTT protocols
- · Clear setting of device parameters. It is possible to save, document and restore parameters
- · Commissioning and diagnosis of Bender systems
- · Remote diagnosis, remote maintenance

Data transfer interfaces







Approvals



Device features

- · Condition monitor for Bender systems
- · Integrated modular gateway between Bender systems and TCP/IP enables remote access via LAN, WAN or Internet
- · Range of functions adjustable through function modules
- · Support of devices that are connected to the internal BMS bus, via BCOM, via Modbus RTU or Modbus TCP
- Individual visualisation can be generated, which is displayed via the web browser

Range of functions

Basic device (without function modules)

- · Condition monitor with web interface
- · Interfaces for the integration of devices
- Internal BMS bus (max, 150 devices)
- BCOM (max. 255 devices)
- Modbus RTU and Modbus TCP (max. 247 devices each)
- Gateway to Modbus TCP: Reading the latest measured values, status/alarm messages from addresses 1...5 of the respective interface via Modbus TCP
- · Gateway to Modbus RTU: Reading the latest measured values, status/alarm messages from addresses 1...5 of the internal BMS interface via Modbus RTU
- 2 Ethernet interfacea with 10 Mbit/s | 100 Mbit/s | 1 Gbit/s for remote access via LAN, WAN or Internet
- Parameterisation of the individual EDGE500... device parameters
- Time synchronisation for all assigned devices
- 10 data points from third-party devices (via Modbus RTU or Modbus TCP) can be integrated into the system
- · 8 digital inputs
- · 3 relay outputs!

Function module A: Interfaces

- · Reading the latest measured values, status and alarm messages from all assigned devices. Uniform access to all assigned devices via Modbus TCP over integrated server.
- · Reading the latest measured values, status and alarm messages from all assigned devices via internal BMS. Uniform access to all assigned devices via Modbus RTU.
- · Control commands: From an external application (e.g. visualisation software or PLC), commands can be sent to BMS devices via Modbus TCP or Modbus RTU.
- Access to alarms and measured values via SNMP (V1, V2c or V3). SNMP traps are supported.
- · Alarms and measured values are provided via MQTT.
- 2000 data points from third-party devices (Modbus RTU or Modbus TCP) can be integrated into the system.

Function module B: Basic functions

- · Display of current measured values, operating/alarm messages and parameters in the system overview
- · History memory (20,000 entries)
- Data logger, freely parameterisable (30 x 10,000 entries)
- Creating 100 virtual devices with 16 channels
- Assignment of individual texts for devices, channels (measuring points) and alarms
- · Device failure monitoring
- E-mail notification of alarms and system errors to different users
- · Creation of device documentation for each device in the system including all parameters and measured values associated with the device, as well as device information such as serial number and software version.
- · Creation of system documentation of all devices in the system at once.
- Quick and easy parameterisation of all devices assigned to the gateway using a web browser.
- · Creating and restoring device backups for all devices in the system.

Function module C: Visualisation

- Quick and easy-to-create visualisation of the system. Integrated editor provides access to a variety of widgets and functions.
- $\bullet \ \, \text{Display on up to 50 overview pages, where e.g. room plans can be stored. Navigation within these overview}$ pages is possible.
- · Access to all measured values that are available in the system.
- · Buttons and sliders can be used to send BMS test and reset commands, as well as to control external devices via Modbus TCP.

Further information

For further information refer to our product range on www.bender.de.



Туре	Application	Supply voltage	Power consumption	Art. No.
EDGE500IP	Condition monitor with gateway functionality Integration and provision of Bender device data	DC 24	≤ 3,5 W	B95061250

Function modules

Function module (software licence)	Application	Art. No.
Function module A	Interfaces Modbus TCP / RTU: Full data access Modbus TCP / RTU Control commands BMS SNMP MQTT Integrate Modbus third-party devices (2,000 data points)	B75061030
Function module B	Technical (Engineering) System overview Parameterisation Backups Documentation Customised texts E-mail notification Device failure monitoring History memory Data logger Virtual devices	B75061031
Function module C	Visualisation Visualisation / Editor Alarm addresses / test addresses	B75061032

Technical data

Insulation coordination acc. to IEC 60664-1/IEC 60664-3		
Rated voltage	AC 50 V	
Overvoltage category	II	
Pollution degree	2	
Protective separation (reinforced insulation) between	(A1/+, A2/-) - [(X1), (X2), (X3), (X5)]	

Overvoltage category II and pollution degree 2 are related to the relay contacts. Further insulation coordination takes place based on functional separation.

Supply voltage

Connections	A I/+. A2/-
Supply voltage $U_{\rm S}$	DC 24 V
Range U_{S}	DC 1830 V
Protection class Power supply unit	2 or 3
Permissible ripple	5 %
Typical power consumption	≤ 3.5 W
Maximum power consumption	≤ 10.5 W
Inrush current (< 5 ms)	< 1.5 A
Maximum cable length when supplied via B95061210 (24 V DC power su	pply unit 1.75 A)
0.28 mm ²	75 m
0.5 mm ²	130 m
0.75 mm ²	200 m
1.5 mm ²	400 m
2.5 mm ²	650 m

Indications LEDs:

3.	
ON	operation indicator
ETHERNET 1/2	data traffic ETH12
NFC	In preparation
RS485 1	Data traffic RS-485 interface 1
RS485 2	Data traffic RS-485 interface 2
NFC RS485 1	<i>In preparatio</i> Data traffic RS-485 interface

Memory	
Number of data points for "third-party devices" on the Modbus TCP and N	lodbus RTU 50
Individual texts (function module B) unlimited number of t	exts each with 100 characters
E-mail configuration and device failure monitoring (function module B)	max. 250 entries
Number of data loggers (function module B)	30
Number of data points per data logger (function module B)	10,000
Number of history memory entries (function module B)	20,000

Visualisation (Function module C)

Number of pages	50
Background image size	Max. 3 MB

Interface RJ45 (X6...7)

Ethernet	
Port	2 x RJ45
Cable	Shielded, min. Cat. 5
Cable length	< 100 m
Data rate	10/100 MBit/s, autodetect
HTTP mode	HTTP/HTTPS (HTTP)*
DHCP	on/off (off)*
t _{off} (DHCP)	560 s (30 s)*
IP address	

First IP address: freely configurable nnn.nnn.nnn ETH1 (192.168.0.254)* ETH2 (10.0.0.254)* Second fixed IP address (e.g. for commissioning) ETH1: 169.254.0.1 ETH2: 169.254.0.2

Net mask nnn.nnn.nnn (255.255.0.0)*

Protocols (depending on function module selected) TCP/ IP, Modbus TCP, Modbus RTU, MQTT, DHCP, SMTP, NTP

BCOM

A1/+ A2/

Interface/protocol	ETH1 / BCOM
BCOM system name	(SYSTEM)*
BCOM subsystem address	1255 (1)*
BCOM device address	0255 (0)*

Modbus TCP

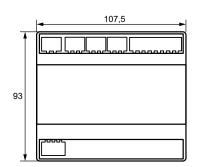
Interface/protocol		ETH12 / Modbus TCP
Operating mode	Client for assigned Bender o	devices and "third-party devices"
Operating mode	Server for access to the process image a	nd for Modbus control commands
Parallel data access from	n different clients	max. 25
Bender Modbus image		V1, V2 (V2)*

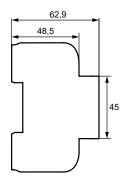
SNMP

Interface/protocol	ETH12 / SNMP
Versions	1, 2c, 3
Supported devices	queries to all devices (channels) possible
Trap support	yes
MQTT	

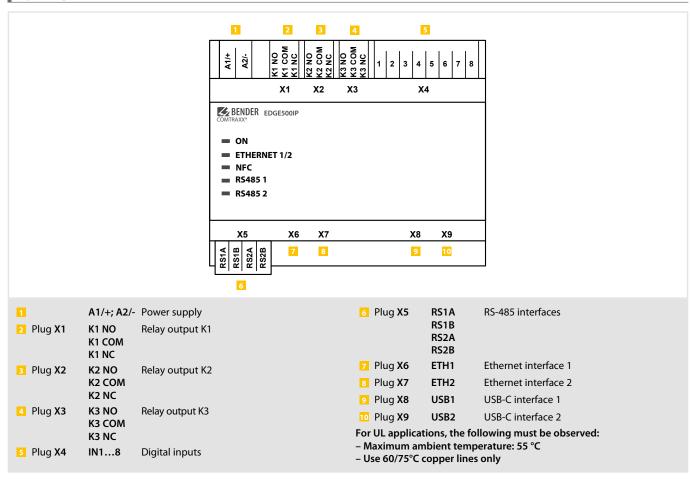
MQII	
Interface/protocol	ETH12 / MQTT
Operating mode	Publisher (provides data for brokers)
Slots for transferring measured values	255

Section Hearts 1900	Interface RS-485 (X5)	Environment/EMC
The principation of Control of	BMS bus (internal)	EMC EN 61326-1 Table 1 - basic electromagnetic environment
Recently mode		EN 61326-1 Table 2 - industrialelectromangnetic environment
Section Sect		IEC 62074 1,2024 00 Ed 2 0 Clause 6 7 7 2 Class 1
Cable Cabl	•	Electromagnetic environment Other than recidential environments
Color to community		CICDD 11.2015 /AMD1.2015 /AMD2.2010
Color distribution		200 III
Consection 12-001 Automatical 12-001	· · · · · · · · · · · · · · · · · · ·	Desidential environments (ICDD
Connection type	Cable recommended CAT6/CAT7 min.	AWU2J
Secretarian presentarian 12 M O (10 / 10 / 10 / 10 / 10 / 10 / 10 / 10	Cable alternatively Twisted pair, J-Y (St) Y mir	. 240.0
Sementing Sementing Sementing Semination Semina		Cuant 1 Class D
Terminating resistors 10 to 0 (10 5 40), and be winthed an via (DMIRDAY subserve before address, trends of the content of	· · · · · · · · · · · · · · · · · · ·	<u> </u>
Section Sect	71	
Section Sect	• • • • • • • • • • • • • • • • • • • •	
The content of the	Device address, internal BMS dus	
Marcine Marc	Modbus RTU	_ , ,
Spent in mode	Interface/protocol RS-485/Mode	us RTU
State S. S. S. S. S. S. S. S		
Cable Irengh Depending on the band rate 9	·	·
9.6 kBour 1.200 m		
1.4.2 Seland \$ \$ \$ \$ \$ \$ \$ \$ \$, ,	
A Salad S		_ ,
\$ 1,48 48 48 48 48 48 48 48 48 48 48 48 48 4	19.2 kBaud <	000 m Mechanical conditions acc. to IEC 60721:
Section Schedule	38.4 kBaud <	000
Cable Shielded, one end of shield connected to Pc (Ad For ART) man, 2018. Cable alternatively Notified by (Ad For ART) man, 2018. Cable alternatively Notified by (St. ST. ST. ST. ST. ST. ST. ST. ST. ST. ST		Stationary use (IEC 00721-3-3)
Cable Activation Activati		Transport (IEC 00721-3-2)
Connection SUSPIA, RS18 Connection type See connection, Pyths-wire terminal by the property of Modus RIU sine addresses 2, 2, 2, 2, 5 mm² (budies using 10 gard) Connection type Suspender Modus RIU sine addresses 2, 2, 2, 2, 5 mm² (budies with femile with fivelial with femile with fivelial with pasts sleeve 0.2, 2, 5 mm² (budies with femile with fivelial with fiv		LUIIQ-LEIIII SLUIAQE (ILC UU/ Z I-J-I)
Since Sin		
Connection type		. LAU.U
Connection type See connection, p-the-wise terminality (Final Estimatisting resistor 2.0 Ω (2.5 W), can be switched on via COMTRAX's offware Supported Modebus RIU slave addresses 225 mm² brusherses 225 mm²		
Terminar presistor 120 Q (10.25 W), can be switched on via COMIRAX's ofwer group presided Mobile (10.30.25 mm) (10.00		inal B" Conductor sizes AWG 24-12
Supported Modes RIU slave addresses	Terminating resistor 120 Ω (0.25 W), can be switched on via COMTRAXX® so	G
Number	Supported Modbus RTU slave addresses 2	347
Number		ilgid/liexible 0.22.5 lillil
Connection type	Interface USB (X89)	
Connection type USH-2.0-Host 15 y 5,000 m/st Conductor sizes AMO 24-16 conductor	Number	Multiple conductor, flexible with TWIN ferrule with plastic sleeve 0.51.5 mm ²
Operating mode US9-2-0-Hots (5 y, 500 max) Identified to a 480 Mbb/Hots (2 mbb/les) 480 Mbb/Hots (2 mbb/les) 10 tripping leght) 0 mm Cable length 8 mbb/ 10		
Data farate		
Table length	• •	
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Digital injurts (K4) 6 with errule with plastic sleeve 0.215 mm² with plastic sleev	Cable length	
Number 88 Galvanic sparation Other Galvanic sparation 4 Yes Check Maximum cable length Selectable for each input: high-active or low-active long participum on the participum of plant and participum on the participum of participum on the participu	Divided immute (VA)	·
Galvanic separation Yes Obter Maximum cable length < 1000m		
Naminum dabe length Selectable for each input: high-active or low-active factory setting Selectable for each input: high-active or low-active factory setting Selectable for each input: high-active or low-active factory setting Selectable for each input: high-active or low-active factory setting Selectable for each input: high-active or low-active factory setting Selectable for each input: high-active or low-active factory setting Selectable for each input: high-active or low-active factory setting Selectable for each input: high-active or low-active factory setting Selectable for each input: high-active or low-active factory setting Selectable for each input: high-active or low-active factory setting Selectable for each input: high-active or low-active factory setting Selectable for each input: high-active or low-active factory setting Selectable for each input: high-active or low-active factory setting Selectable for each input: high-active or low-active factory setting Selectable factory setting Selectable for each input: high-active or low-active factory setting Selectable for each input: high-active or low-active factory setting Selectable for each input: high-active or low-active factory setting Selectable factory setting Sel	Number	
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Operating mode Selectable for each input: high-active or low-active factory setting high-active or low-active for lotage range (low) OC 1.230 v Voltage comection plug-in terminal (1-1) (2-2) (3-3)(8-8) OC 1.2	Maximum cable length <	000 m Operating mode continuous operation
Factory setting high-active Voltage range (high) DC 12304 billing range (hogh) De 12304 billing range (hogh)	Operating mode Selectable for each input: high-active or low	-active Mounting front-oriented, cooling slots must be ventilated vertically
Voltage range (high) DC 1230V internal components IP30 Voltage range (low) DC 020 Internal components IP30 Max. current pre-channel (at AC/DC 30V) 8 mAm Amenor mounting on a DN rail IEC60715 Connection plug-in terminal (1.1) (2.2) (3.3)(8-8) Amenor mounting on a DN rail IEC60715 Switching elements (X13) ————————————————————————————————————		
Voltage range (low) DC 02 V Max. current per channel (at AC/DC 30 V) terminals IP20 Max. current per channel (at AC/DC 30 V) 8 mA Snap-on mounting on an DIN rail IEC 60715 Connection plug-in terminal (1-1) (2-2) (3-3) (8-8) Snap-on mounting on an DIN rail IEC 60715 Switching elements (X13) Screw mounting 3 x Md For UL applications: Intended use General purpose relay Number of changeover contacts 3 x Md Notage connected to the relay 5 EUX AV (2000 per atting yoldsage DC 24V Rated operating outrent 8 A Operating yoldsage DC 24V Relect operating yordige NC operation by Vivo operations of the relay manufacture of Programmable Electrical endurance under rated operating conditions 10,000 operating yold by Vivo (2000 pict No. 1) (200		
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Connection plug-in terminal (1-1) (2-2) (3-3) (8-8) Screw mounting 3 x M4 Switching elements (X13) General purpose relay Inclosure type 1,460 Number of changeover contacts 3 and M2 1,500 1,000 Rated operating voltage DC 24 Y 2,000 1,000 2,000 1,000 1,000 2,000 1,000 1,000 2,000 1,000 1,000 2,000 1,000 1,000 2,000 1,000 <td< td=""><td>• •</td><td>DILL II</td></td<>	• •	DILL II
Switching elements (X13) For UL applications: Intended use General purpose relay Purpose relay Polytace connected to the relay SELV Rated operating outlage DC 24 V Rated operating principle N/C operation / N/O operation Programmable Electrical endurance under rated operating conditions 10,000 operating cycles Minimum contact load (reference specification of the relay manufacturer) 10 mA / 12 V DC Connection plug-in terminal K1 NO K1 COM K1 NC K3 NO K3 COM K3 NO K3 NO K3 NO K3 COM K3 NO K3	·	
Switching elements (X13) Enclosure material polycarbonater For UL applications: Intended use General purpose relay Feature of changes own contacts Endosure material polycarbonater Wortage connected to the relay SELV SELV Documentation number 0000507 Rated operating voltage DC 24V Weight ≤ 240 g Rated operating current 8 A Weight ≤ 240 g Function Programmable Electrical endurance under rated operating conditions 10,000 operating cycles Weight ≤ 8 A (* * * actory settings*) Foreview: Used ports K2 N0 K2 C0M K1 NC K2 N0 K2 C0M K2 NC K2 N0 K2 C0M K3 NC K2 NO K3 NC K3	Connection plug-in terminal (1-1) (2-2) (3-3) .	. (5 -)
For UL applications: Intended use General purpose relay Flammability class Illammability class U1944-0 Number of changeover contacts 3 Microbacconnected to the relay SELV Illammability class 10.944-0 10.955-0 10.954-0 10.954-0 10.954-0 10.954-0 10.954-0 10.954-0 10.954-0 10.954-0 10.954-0 10.954-0 10.954-0 10.954-0 10.954-0 10.955-0 10.954-0 10.955-0 10.954-0 10.954-0 10.954-0 10.955-0 10.954-0 10.955-0 10.954-0 10.955-0 10.954-0 10.955-0 10.955-0 10.955-0 10.955-0 10.955-0 10.955-0 10.955-0 10.955-0 10.955-0 10.955-0 10.955-0 10.9	4 1:11 1 (1/4 2)	Enclosure type J460
For ULA pplications: Intended use General purpose relay Number of changeover contacts If lammability class UL947-00 Number of changeover contacts 3 3 20 Number of changeover contacts SELV Voltage connected to the relay SELV Voltage connected to the relay SELV Voltage connected or the relay SELV Voltage connected or the relay of the relay manufacturer) A 8 A Voltage connected or the relay of the relay of the relay of the relay manufacturer) 10 mA / 12 V DC Connection plug-in terminal K1 NO K1 COM K1 NC K2 COM K2 NC K2 COM	Switching elements (X13)	Enclosure material polycarbonate
Number of changeover contactcs 3 bimensions (W x H x D) 107.5 x 93 x 62.9 mm 2005000 2005000 200500 200	For UL applications: Intended use General purpo	
Voltage connected to the relay Rated operating voltage Rated operating current Sa A Operating principle N/C operation / N/O operation / N/O operation / N/O operating principle Electrical endurance under rated operating conditions Minimum contact load (reference specification of the relay manufacturer) Connection plug-in terminal K1 NO K1 COM K1 NC K2 NO K2 NC K3 NO K3 COM K3 NC K3 NO K3	Number of changeover contacts	•
Rated operating voltage	,	CELLY
Rated operating current Operating principle N/C operation /N/O operation Function Programmable Electrical endurance under rated operating conditions Nimimum contact load (reference specification of the relay manufacturer) Nimimum contact load (reference specification of the relay manufacturer) Nimimum contact load (reference specification of the relay manufacturer) Nimimum contact load (reference specification of the relay manufacturer) Nimimum contact load (reference specification of the relay manufacturer) Nimimum contact load (reference specification of the relay manufacturer) Nimimum contact load (reference specification of the relay manufacturer) Nimimum contact load (reference specification of the relay manufacturer) Nimimum contact load (reference specification of the relay manufacturer) Nimimum contact load (reference specification of the relay manufacturer) Nimimum contact load (reference specification of the relay manufacturer) Nimimum contact load (reference specification of the relay manufacturer) Nimimum contact load (reference specification of the relay manufacturer) Nimimum contact load (reference specification of the relay manufacturer) Nimimum contact load (reference specification of the relay manufacturer) Nimimum contact load (reference specification of the relay manufacturer) Nimimum contact load (reference specification of the relay manufacturer) Nimimum contact load (reference specification of the relay manufacturer) Nimimum contact load (reference specification of the relay manufacturer) Nimimum contact load (reference specification of the relay manufacturer) Nimimum contact load (reference specification of the relay manufacturer) Nimimum contact load (reference specification of the relay manufacturer) Nimimum contact load (reference specification of the relay manufacturer) Nimimum contact load (reference specification of the relay manufacturer) Nimimum contact load (reference specification of the relay manufacturer) Nimimum contact load (reference specification of the relay manufacturer)		
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Uperating principle Function Frogrammable Electrical endurance under rated operating conditions Minimum contact load (reference specification of the relay manufacturer) NI 0 mA / 12 V DC Connection plug-in terminal K1 N0 K1 COM K1 NC K2 N0 K2 COM K2 NC K3 N0 K3 COM K3 NC Overview: Used ports S DNS (UDP/TCP) 67, 68 DHCP (UDP) 80 HTTP (TCP) 123 NTP (UDP) 161 SNMP (UDP) 162 S NMP (UDP) 162 S NMP TRAPS (UDP) 443 HTTPS (TCP) 502 MODBUS (TCP) 4840 OPCUA (TCP) 5353 MDNS (UDP)		
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K2 NO K2 COM K2 NC K3		
K3 NO K3 COM K3 NC Overview: Used ports 53 DNS (UDP/TCP) 67, 68 DHCP (UDP) 80 HTTP (TCP) 123 NTP (UDP) 161 SNMP (UDP) 162 S NMP TRAPS (UDP) 443 HTTPS (TCP) 502 MODBUS (TCP) 4840 OPCUA (TCP) 5353 MDNS (UDP)		
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443 HTTPS (ΤCP) 502 MODBUS (ΤCP) 4840 OPCUA (ΤCP) 5353 MDNS (UDP)		
502 MODBUS (TCP) 4840 OPCUA (TCP) 5353 MDNS (UDP)		
4840 OPCUA (TCP) 5353 MDNS (UDP)	443 HTTP	S (TCP)
4840 OPCUA (TCP) 5353 MDNS (UDP)	502 MODBU	S (TCP)
5353 MDNS (UDP)		
TODUZ DLOMI (UDF)		
	TOUUZ BLUN	(UDI)





Operating controls and connections



COMTRAXX® COM465IP

Condition Monitor with integrated gateway for the connection of Bender devices to Ethernet TCP/IP networks



Typical applications

- Optimum display and visualisation of device and system states in the web browser
- · Monitoring and analysis of compatible Bender products and third-party devices
- · Specific system overview through individual system description
- · Selective notification to various users in the event of alarms
- · Numerous interfaces for data transfer to higher-level systems
- · Clear setting of device parameters. Storing, documenting and restoring parameters is possible
- · Commissioning and diagnosis of Bender systems
- · Remote diagnosis, remote maintenance

Data transfer interfaces







Approvals





Device features

- · Condition monitor for Bender systems
- · Integrated modular gateway between Bender systems and TCP/IP enables remote access via LAN, WAN or Internet
- Range of functions adjustable through function modules
- Ethernet (10/100 MBit/s) for remote access via LAN, WAN or Internet
- · Support of devices that are connected to the internal or external BMS bus, via BCOM, via Modbus RTU or Modbus TCP
- · Individual visualisation can be generated, which is displayed via the web browser

Range of functions

Basic device (without function modules)

- · Condition monitor with web interface
- · Interfaces for the integration of devices
- Internal BMS bus (max. 150 devices) and external* BMS bus (max. 99 x 150 devices)
- BCOM (max. 255 devices)
- Modbus RTU and Modbus TCP (max. 247 devices each)
- Remote display of the latest measured values, status/alarm messages and parameters*
- Gateway to Modbus TCP: Reading the latest measured values, status/alarm messages from addresses 1...10 of each interface via Modbus TCP
- Gateway to Modbus RTU: Reading the latest measured values, status/alarm messages from addresses 1...10 of the internal BMS interface via Modbus RTU
- Ethernet interface with 10/100 MBit/s for remote access via LAN, WAN or Internet
- Setting of internal device parameters and parameters of devices connected via Modbus RTU and Modbus TCP **
- Time synchronisation for all assigned devices
- · History memory (20,000 entries)
- · Data loggers, freely configurable (30 x 10,000 entries)
- · 50 data points from third-party devices (via Modbus RTU or Modbus TCP) can be integrated into the system
- A virtual device with 16 channels can be created
- *) Indicating parameters of BMS bus devices is only possible when the gateway is connected to the internal BMS bus.
- **) Parameters can be set via web application and externally (via BMS/ICOM/BCOM), but not via Modbus. The parameters of assigned devices can only be read; Function module C is necessary for modification of settings!

Function module A

- · Assignment of individual texts for devices, channels (measuring points) and alarms.
- · Device failure monitoring.
- E-mail notification to different users in case of alarms or system errors.
- · Device documentation of any device in the system can be generated.*

It contains all parameters and measured values belonging to the device, as well as device information such as serial number and software version.

- System documentation can be created. It documents all devices in the system at once.
- *) Creating device documentation of BMS bus devices is only possible if the gateway is connected to the internal BMS bus.

Function module B

- · Reading the latest measured values, status and alarms messages from all assigned devices. Uniform access to all assigned devices via Modbus TCP over integrated server.
- · Reading the latest measured values, status and alarm messages from all assigned devices via internal BMS. Uniform access to all assigned devices via Modbus RTU.
- · Control commands: From an external application (e.g. visualisation software or PLC), commands can be sent to BMS devices via Modbus TCP or Modbus RTU.
- Access to alarms and measured values via SNMP (V1, V2c or V3). SNMP traps are supported.
- · Access via PROFINET to alarms and measured values.
- Alarms and measured values provided via MQTT.

Function module C

- Fast and easy parameter setting of all devices* assigned to the gateway via web browser.
- Device backups of all devices in the system can be created and restored.
- *) Parameter setting of BMS bus devices is only possible when the gateway is connected to the internal BMS bus

Function module D

- · Quick and easy-to-create visualisation of the system. Integrated editor provides access to a variety of widgets and functions.
- Display on up to 50 overview pages, where e.g. room plans can be stored. Navigation within these overview pages is possible.
- \bullet Access to all measured values that are available in the system.
- Buttons and sliders can be used to send BMS test and reset commands, as well as to control external devices via Modbus TCP.

Function module E

• 100 virtual devices with 16 channels each can be created.

Function module F

• 1,600 data points from third-party devices (via Modbus RTU or Modbus TCP) can be integrated into the system.

Examples:

- To write parameters via Modbus, function modules B and C are required.
- To read parameters via Modbus, function module B is required.
- Function modules A and D are required to be able to use a visualisation in combination with the individual texts.

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Application	Supply voltage/ frequency range <i>U</i> ₅	Power consumption	Art. No.
COM465IP-230V	Condition monitor with integrated gateway: Bender system/Ethernet	AC/DC 24240 V, 5060 Hz	≤ 6.5 VA/≤ 4 W	B95061065

Function modules

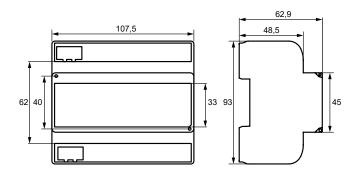
Function module (software licence)	Application	Art. No.
Function module A	Individual text messages for all devices/ channels, device failure monitoring, e-mail in the event of an alarm, device documentation	B75061011
Function module B	Provision of data via Modbus TCP and Modbus RTU, SNMP server with trap function, PROFINET, MQTT	B75061012
Function module C	Parameter setting of all integrated devices, device backups	B75061013
Function module D	Visualisation application	B75061014
Function module E	Virtual devices	B75061015
Function module F	Integration of third-party devices	B75061016

Insulation coordination acc. to IEC 60664-1/IEC 60664-3		Modbus RTU	DC 405/44 II DTU
Rated voltage	AC 250 V	Interface/protocol	RS-485/Modbus RTU
Rated impulse voltage/overvoltage category	4 kV/III	Operating mode	master/slave (master)*
Pollution degree	3	Baud rate	9.657.6 kBit/s
Protective separation (reinforced insulation) between	DD116\ (Va) (Va) (Va)	Cable length	\leq 1,200 m d, one end of shield connected to PE
(A1/+, A2/-) - [(AMB, BMB), (AB	MS, BBMS), (X2), (X3, X4)]	Cable shielde recommended:	a, one end of shield connected to PE CAT6/CAT7 min. AWG23
Supply voltage		alternative:	twisted pair, J-Y(St)Y min. 2x0,8
Supply voltage $U_{\rm S}$	AC/DC 24240 V	Connection	X1 (AMB, BMB)
Frequency range U_s	5060 Hz		connection "push-wire terminal X1"
Power consumption	≤ 6.5 VA / ≤ 4 W	, ·	0.25 W), can be connected internally
·		Supported Modbus RTU slave addresses	2247
Indications		PROFINET	
LEDs:		Interface/protocol	Ethernet/PROFINET
ON	operation indicator	Operating mode	Slave (IO-Device)
ETHERNET IP	data traffic Ethernet	· · ·	State (10 Device)
MODBUS RTU	data traffic Modbus	SNMP	Tab aura at /CNIAD
BMS Ethernet (terminal X2) lights during network connection, f	data traffic BMS	Interface/protocol Versions	Ethernet/SNMP 1, 2c, 3
Ethernet (terminal x2) lights during network connection, i	asiles during data transfer		ries to all devices (channels) possible
Memory		Trap support	yes
Individual texts (function module A only) unlimited number of te	xts each with 100 characters		yes yes
E-mail configuration and device failure monitoring	max. 250 entries	MQTT	Ethernet/MOTT
Number of data points for "third-party devices" to Modbus TCP and Modbu		Interface/protocol Operating mode	Publisher (provides data for brokers)
Number of data loggers	30		animici (hionines agra ini niokels)
Number of data points per data logger	10,000	Overview: used ports	DNC (UDD (TCD)
Number of history memory entries	20,000	53	DNS (UDP/TCP)
Visualisation		67, 68 80	DHCP (UDP) HTTP (TCP)
Number of pages	50	123	NTP (UDP)
Background image size	3 MB	161	SNMP (UDP)
		162	SNMP TRAPS (UDP)
Interfaces		443	HTTPS (TCP)
Ethernet		502	MODBUS (TCP)
Port	RJ45	4840	OPCUA (TCP)
Cable length	< 100 m	5353	MDNS (UDP)
Data rate	10/100 MBit/s, autodetect	48862	BCOM (UDP)
HTTP mode	HTTP/HTTPS (HTTP)*	Environment/EMC	
DHCP	on/off (off)*	EMC	EN 61326-1
t _{off} (DHCP)	560 s (30 s)*		EN 01320 1
IP address nnn.nnn.nnn	(102 160 0 254)*	Ambient temperatures	25 . 55.06
can always be reached via:	(192.168.0.254)* 169.254.0.1	Operating temperature Transport	-25+55 ℃ -40+85 ℃
•	nn.nnn.nnn (255.255.0.0)*	Long-term storage	-40+65 € -25+70 °C
Protocols (depending on function module selected)	(233,233,616)		25170 C
TCP/ IP, Modbus TCP, Mod	bus RTU, DHCP, SMTP, NTP	Classification of climatic conditions acc. to IEC 60721:	3K22
BMS bus (internal/external)		Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2)	2K11
Interface/protocol RS-485/BMS internal or BM	S external (BMS internal)*	Long-term storage (IEC 60721-3-1)	1K22
Operating mode	master/slave (master)*	Mechanical conditions acc. to IEC 60721:	
Baud rate BMS		Stationary use (IEC 60721-3-3)	3M11
internal	9.6 kBit/s	Transport (IEC 60721-3-2)	2M4
external	(19.2 / 38.4 / 57.6) kBit/s	Long-term storage (IEC 60721-3-1)	1M12
Cable length	≤ 1,200 m		
•	d of shield connected to PE	Connection	
recommended:	CAT6/CAT7 min. AWG23	Connection type	pluggable push-wire terminals
	ed pair, J-Y(St)Y min. 2x0,8	Push-wire terminals	
Connection runs refer to connection	X1 (ABMS, BBMS) on "push-wire terminal X1"	Conductor sizes	AWG 2412
,,	an be connected internally	Stripping length	10 mm
Device address, internal/external BMS bus	1150 (1)*/299	rigid/flexible	0.22.5 mm ²
	1150 (1) 7255	flexible with ferrule, with/without plastic sleeve	0.252.5 mm ²
BCOM Interface/protocol	Ethernet/BCOM	Multiple conductor, flexible with TWIN ferrule with plastic sleeve	0.51.5 mm ²
BCOM system name	(SYSTEM)	Push-wire terminal X1	
BCOM subsystem address	1255 (1)*	Conductor sizes	AWG 2416
BCOM device address	0255 (0)*	Stripping length	10 mm
Modbus	.,	rigid/flexible flexible with ferrule without plastic sleeve	0.21.5 mm ² 0.251.5 mm ²
Bender Modbus image	V1, V2 (V2)*	flexible with ferrule with plastic sleeve	0.250.75 mm ²
Modbus TCP	, ** (***)	nearate with retruite with phastic steere	0.230./ 3
Interface/protocol	Ethernet/Modbus TCP		
Operating mode client for Bender Modbus TCP device			
Operating mode server for access to the process image and for			
D 11 1 1 4 C 1900 4 19 4			

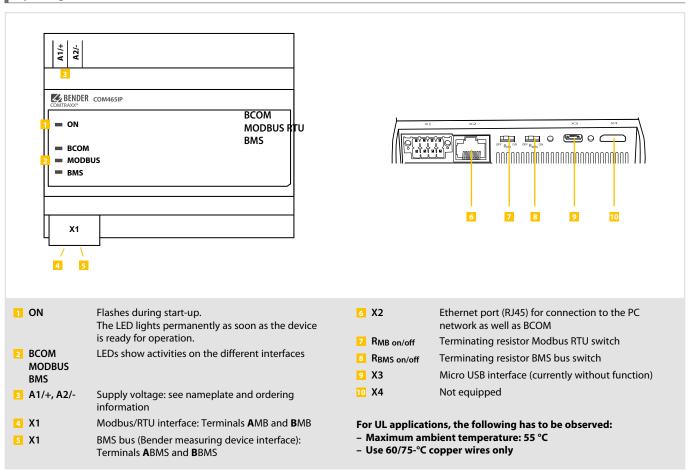
Parallel data access from different clients

Other		
Operating mode	continuous operation	
Mounting	front-oriented, cooling slots must be ventilated vertically	
Degree of protection		
internal components (IEC 60529)	IP30	
terminals (IEC 60529)	IP20	
Quick DIN rail mounting acc. to	IEC 60715	
Screw mounting	3 x M4	
Enclosure type	J460	
Enclosure material	polycarbonate	
Flammability class	UL94V-0	
Dimensions (W x H x D)	107.5 x 93 x 62.9 mm	
Documentation number	D00216	
Weight	< 240 n	





Operating controls and connections



COMTRAXX® COM465DP

Condition Monitor with integrated gateway for the connection of Bender devices to PROFIBUS DP and Ethernet TCP/IP networks



Typical applications

- · Optimum display and visualisation of device and system states in the web browser
- · Monitoring and analysis of compatible Bender products and third-party devices
- · Specific system overview through individual system description
- · Selective notification to various users in the event of alarms
- · Numerous interfaces for data transfer to higher-level systems
- · Clear setting of device parameters. Storing, documenting and restoring parameters is possible
- · Commissioning and diagnosis of Bender systems
- · Remote diagnosis, remote maintenance

Data transfer interfaces







Approvals







Device features

- · Condition monitor for Bender systems
- · Integrated modular gateway between Bender systems and TCP/IP enables remote access via LAN, WAN or Internet
- Range of functions adjustable through function modules
- Ethernet (10/100 MBit/s) for remote access via LAN, WAN or Internet
- · Support of devices that are connected to the internal or external BMS bus, via BCOM, via Modbus RTU or Modbus TCP
- Integrated gateway between Bender system and PROFIBUS DP
- Individual visualisation can be generated, which is displayed via the web browser

Range of functions (V4.9.x and higher)

Basic device (without function modules)

- · Condition monitor with web interface
- · Interfaces for the integration of devices
- Internal BMS bus (max. 150 devices) and external* BMS bus (max. 99 * 150 devices)
- BCOM (max. 255 devices)
- Modbus RTU and Modbus TCP (max. 247 devices each)
- Remote display of the latest measured values, status/alarm messages and parameters*
- Gateway to Modbus TCP: Reading the latest measured values, status/alarm messages from addresses 1...10 of each interface via Modbus TCP
- Gateway to Modbus RTU: Reading the latest measured values, status/alarm messages from addresses 1...10 of the internal BMS interface via Modbus RTU
- Ethernet interface with 10/100 Mbit/s for remote access via LAN, WAN or the Internet
- Setting of internal device parameters and parameters of devices connected via Modbus RTU and Modbus TCP **
- · Time synchronisation for all assigned devices
- · History memory (20,000 entries)
- Data loggers, freely configurable (30 * 10,000 entries)
- · 50 data points from third-party devices (via Modbus RTU or Modbus TCP) can be integrated into the system
- A virtual device with 16 channels can be created
- Support for external applications (e.g. visualisation programs or PLCs) by means of the PROFIBUS DP protocol.
- · Reading the latest measured values, status and alarms messages from all assigned devices. Uniform access to all assigned devices by means of PROFIBUS DP via integrated servers.
- *) Indicating parameters of BMS bus devices is only possible when the gateway is connected to the internal BMS bus.
- **) Parameters can be set via web application and externally (via BMS/ICOM/BCOM), but not via Modbus or PROFIBUS. The parameters of assigned devices can only be read; function module C is necessary for modification of settings!

Function module A

- · Allocation of individual texts for devices, channels (measuring points) and alarms.
- · Device failure monitoring
- E-mail notification in the event of alarms or system faults to different users.
- Device documentation of any device in the system can be generated.* This contains all associated parameters and measured values as well as device information, such as serial number and software version.
- System documentation can be generated. It documents all devices in the system at once.
- *) Generating device documentation of BMS bus devices is only possible if the gateway is connected to the internal BMS bus.

Function module B

- · Reading the latest measured values, status and alarms messages from all assigned devices. Uniform access to all assigned devices via Modbus TCP over integrated server.
- · Reading the latest measured values, status and alarm messages from all assigned devices via internal BMS. Uniform access to all assigned devices via Modbus RTU.
- · Control commands: From an external application (e.g. visualisation software or PLC), commands can be sent to BMS devices via Modbus TCP or Modbus RTU.
- Access to alarms and measured values via SNMP (V1, V2c or V3). SNMP traps are supported.
- · Access via PROFINET to alarms and measured values.
- · Alarms and measured values provided via MQTT.

Function module C

- Fast and easy parameter setting of all devices* assigned to the gateway via web browser.
- Backups of all devices in the system can be created and restored.
- *) Parameter setting of BMS bus devices is only possible when the gateway is connected to the internal BMS bus

Function module D

- · Quick and easy-to-create visualisation of the system. Integrated editor provides access to a variety of widgets and functions.
- Display on up to 50 overview pages, where e.g. room plans can be stored. Navigation within these overview pages is possible.
- Access to all measured values that are available in the system.
- Buttons and sliders can be used to send BMS test and reset commands, as well as to control external devices via Modbus TCP.

Function module E

• 100 virtual devices with 16 channels each can be created.

Function module F

• 1,600 data points from third-party devices (via Modbus RTU or Modbus TCP) can be integrated into the system.

Examples:

- To write parameters via Modbus, function modules B and C are required.
- To read parameters via Modbus, function module B is required.
- Function modules A and D are required to be able to use a visualisation in combination with the individual texts.
- For parameterisation via PROFIBUS, the function module C is

Further information

For further information refer to our product range on www.bender.de.

Ordering information

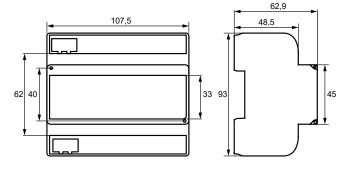
Туре	Application	Supply voltage/ frequency range <i>U</i> ₅	Power consumption	Art. no.
COM465DP-230 V	Condition Monitor with integrated gateway: Bender system/PROFIBUS DP/Ethernet	AC/DC 24240 V, 5060 Hz	≤ 6.5 VA/≤ 4 W	B95061060

Function modules

Function module (software licence)	Application	Art. No.
Function module A	Individual text messages for all devices/ channels, device failure monitoring, e-mail in the event of an alarm, device documentation	B75061011
Function module B	Provision of data via Modbus TCP and Modbus RTU, SNMP server with trap function, PROFINET, MQTT	B75061012
Function module C	Parameter setting of all integrated devices, device backups	B75061013
Function module D	Visualisation application	B75061014
Function module E	Virtual devices	B75061015
Function module F	Integration of third-party devices	B75061016

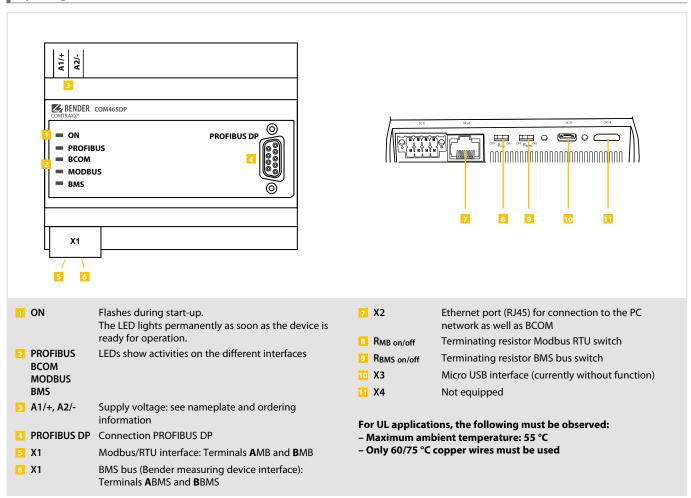
Insulation coordination acc. t	to IEC 60664-1/IEC 60664-3	Modbus RTU	
Rated voltage	AC 250 V	Interface/protocol	RS-485/Modbus RTU
Rated impulse voltage/overvolta		Operating mode	master/slave (master)*
Pollution degree	3	Baud rate	9.657.6 kBit/s
Protective separation (reinforced		Cable length	≤ 1,200 m
•	-, A2/-) - [(AMB, BMB), (ABMS, BBMS), (X2), (X3, X4), (PROFIBUS DP)]		nielded, one end of shield connected to PE
(A1/ +	-, AZ/-) - [(AIMID, DINID), (ADINIS, DDINIS), (AZ), (AS, A4), (1 NOTIDOS DT)]	recommended:	CAT6/CAT7 min. AWG23
Supply voltage		alternative:	twisted pair, J-Y(St)Y min. 2x0,8
Supply voltage $U_{\rm S}$	AC/DC 24240 V	Connection	X1 (AMB, BMB)
Frequency range U_S	5060 Hz		· , , ,
Power consumption	≤ 6.5 VA / ≤ 4 W	· · · · · · · · · · · · · · · · · · ·	fer to connection "push-wire terminal X1"
i owei consumption	≥ 0.3 VA / ≥ 4 W		Ω (0.25 W), can be connected internally
Indications		Supported Modbus RTU slave addresses	2247
LEDs:		PROFINET	
ON	operation indicator	Interface/protocol	Ethernet/PROFINET
PROFIBUS	data traffic PROFIBUS DP	Operating mode	Slave (IO-Device)
ETHERNET IP	data traffic Ethernet	SNMP	
MODBUS RTU	data traffic Modbus	Interface/protocol	Ethernet/SNMP
BMS	data traffic BMS	Versions	1, 2c, 3
		Supported devices	
Ethernet (terminal X2)	lights during network connection, flashes during data transfer	••	queries to all devices (channels) possible
Memory		Trap support	yes
Individual texts (function module	e A only) unlimited number of texts each with 100 characters	MQTT	
E-mail configuration and device	,,	Interface/protocol	Ethernet/MQTT
	-party devices" to Modbus TCP and Modbus RTU 50	Operating mode	Publisher (provides data for brokers)
Number of data loggers	-party devices to moubus ice and moubus kito 50	PROFIBUS DP	
Number of data points per data l			-485 galvanically separated/PROFIBUS DP
	-	Operating mode	slave
Number of history memory entrice	es 20,000	Baud rate	automatic baud rate detection:
Visualisation		Dudu IULC	9.6 kBit/s1.5 MBit/s
Number of pages	50	0.4	6/19.2/93.75/187.5/500 kBit/s, 1.5 MBit/s
Background image size	3 MB	Connection	9-pole sub D
Interfaces	3.110	Device address, PROFIBUS DP	1125 (3)*
		Overview: used ports	
Ethernet		53	DNS (UDP/TCP)
Port	RJ45	67, 68	DHCP (UDP)
Cable length	< 100 m	80	HTTP (TCP)
Data rate	10/100 MBit/s, autodetect	123	NTP (UDP)
HTTP mode	HTTP/HTTPS (HTTP)*	161	SNMP (UDP)
DHCP	on/off (off)*	162	SNMP TRAPS (UDP)
t _{off} (DHCP)	560 s (30 s)*	443	HTTPS (TCP)
IP address		502	MODBUS (TCP)
nnn.nnn.nnn	(192.168.0.254)*	4840	OPCUA (TCP)
can always be reached via	169.254.0.1	5353	MDNS (UDP)
Net mask	nnn.nnn.nnn (255.255.0.0)*	48862	BCOM (UDP)
Protocols (depending on function	n module selected) TCP/ IP, Modbus TCP, Modbus RTU, DHCP, SMTP, NTP	Environment/EMC	
	TCP/ IP, MIOUDUS TCP, MIOUDUS KTO, DITCP, SMITP, NTP		FN (122) 1
BMS bus (internal/external)		EMC	EN 61326-1
Interface/protocol	RS-485/BMS internal or BMS external (BMS internal)*	Ambient temperatures	
Operating mode	master/slave (master)*	Operating temperature	-25+55 ℃
Baud rate BMS		Transport	-40+85 °C
internal	9.6 kBit/s	Long-term storage	-25+70 °C
external	(19.2 / 38,4 / 57.6) kBit/s	Classification of climatic conditions acc. to IEC 60721	
Cable length	≤ 1,200 m	Stationary use (IEC 60721-3-3)	3K22
Cable	shielded, one end of shield connected to PE	Transport (IEC 60721-3-2)	2K11
recommended:	CAT6/CAT7 min. AWG23	Long-term storage (IEC 60721-3-1)	1K22
alternative:	twisted pair, J-Y(St)Y min. 2x0,8		INZZ
Connection	X1 (ABMS, BBMS)	Mechanical conditions acc. to IEC 60721:	
Connection type	refer to connection "push-wire terminal X1"	Stationary use (IEC 60721-3-3)	3M11
Terminating resistor	120 Ω (0.25 W), can be connected internally	Transport (IEC 60721-3-2)	2M4
Device address, internal/external	I BMS bus 1150 (1)*/299	Long-term storage (IEC 60721-3-1)	1M12
BCOM		Connection	
Interface/protocol	Ethernet/BCOM	Connection type	pluggable push-wire terminals
BCOM system name	(SYSTEM)	Push-wire terminals	
BCOM subsystem address	1255 (1)*	Conductor sizes	AWG 2412
BCOM device address	0255 (0)*	Stripping length	10 mm
Modbus		rigid/flexible	0.22.5 mm ²
Bender Modbus image	V1, V2 (V2)*	flexible with ferrule, with/without plastic sleeve	0.252.5 mm ²
•	,(+2)	Multiple conductor, flexible with TWIN ferrule with plastics	
Modbus TCP	Ethernet/Modbus TCP	· · · · · · · · · · · · · · · · · · ·	
Interface/protocol		Push-wire terminal X1	
Operating mode	client for Bender Modbus TCP devices and "third-party devices"	Conductor sizes	AWG 2416
	er for access to the process image and for Modbus control commands	Stripping length	10 mm
Parallel data access from differen	nt clients max. 25	rigid/flexible	0.21.5 mm ²
		flexible with ferrule without plastic sleeve	0.251.5 mm ²
		flexible with ferrule with plastic sleeve	0.250.75 mm ²

Other	
Operating mode	continuous operation
Mounting	front-oriented, cooling slots must be ventilated vertically
Degree of protection	
internal components (IEC 60529)	IP30
terminals (IEC 60529)	IP20
Quick DIN rail mounting acc. to	IEC 60715
Screw mounting	3 x M4
Enclosure type	J460
Enclosure material	polycarbonate
Flammability class	UL94V-0
Dimensions (W x H x D)	107.5 x 93 x 62.9 mm
Documentation number	D00216
Weight	≤ 240 g



()* = factory settings

Operating controls and connections



COMTRAXX® COM465ID

Condition Monitor with an integrated gateway for the connection of Bender isoData devices to Ethernet TCP/IP networks



Typical applications

- Optimum display and visualisation of device and plant statuses in the web browser
- Collecting information from the Bender system and making it available via Modbus TCP and OPC-UA
- Specific system overview through individual installation description
- Selective notification to various users in case of alarms
- Information from the Bender system can be transmitted to POWERSCOUT® for analysis and archiving.
- Commissioning and diagnosis of Bender systems
- Remote diagnosis, remote maintenance

Approvals



Device features

- · Condition Monitor for Bender systems
- Integrated modular gateway between Bender systems and TCP/IP enables remote access via LAN, WAN or the Internet
- Range of functions adjustable through function modules
- Ethernet (10/100 Mbit/s) for remote access via LAN, WAN or the Internet
- · Support for devices that are connected via isoData, BCOM or Modbus TCP

Range of functions

Basic device (without function modules)

- Condition Monitor with a web interface for use with Bender isoData and BCOM as well as universal measuring devices.
- · Support for devices that are connected
- via IsoData (1 device per interface),
- via the BCOM interface (max. 139 devices with one gateway / max. 98 x 139 devices in an interconnection with other gateways),
- via Modbus TCP (max. 247 devices).
- Remote display of present measured values, operating status and alarm messages.
- Gateway to Modbus TCP: Reading the latest subsystem measured values, operating status and alarm messages from addresses 1...10 via Modbus TCP *).
- Ethernet interface with 10/100 Mbit/s for remote access via LAN, WAN or the Internet.
- Time synchronisation for all assigned devices.
- · History memory (1,000 entries).
- Data loggers, freely configurable (30 x 10,000 entries).
- 50 data points from third-party devices (via Modbus TCP) can be integrated into the system.
- · A virtual device with 16 channels can be created.
- *) Individual parameters can be set via a web-based application and externally (via BCOM), but not via Modbus.

 The parameters of assigned devices can only be read. In order to change settings, function module C is required!

Function module A

- · Assigning individual texts for devices, channels (measuring points) and alarms
- Device failure monitoring
- E-mail notification in the event of alarms or system faults to different users
- · Configuration of e-mail notifications
- Device documentation of any device in the system can be generated.
 It contains all parameters and measured values belonging to the device, as well as device information such as serial number and software version.
- System documentation can be created. It documents all devices in the system at once.

Function module B

- Reading the latest measured values, operating status and alarms messages from all assigned devices. Uniform
 access to all assigned devices by means of Modbus TCP via an integrated server.
- Control commands: From an external application (e.g. visualisation software or PLC), commands can be sent to devices by means of Modbus TCP.
- · Access to alarms and measurement values via SNMP protocol (V1, V2c or V3). SNMP traps are supported.
- · Access via PROFINET to alarms and measured values.

Function module C

- Fast and easy parameter setting of all devices assigned to the gateway via a web browser.
- A backup file containing the settings of all devices in the system can be generated and imported.

Function module D

- Quick and easy-to-create visualisation of the system. Integrated editor provides access to a variety of widgets and functions.
- Display on up to 50 overview pages, where e.g. room plans can be stored. Navigation within these overview pages is possible.
- Access to all measured values that are available in the system.
- Buttons and sliders can be used to send BMS test and reset commands, as well as to control external devices via Modbus TCP.



Function module E

• 100 virtual devices with 16 channels each can be created.

Function module F

• 1,600 data points from third-party devices (via Modbus TCP) can be integrated into the system.

Examples:

- To write parameters via Modbus, the function modules B and C are required.
- To read parameters via Modbus, the function module B is required.

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Application	Supply voltage/ Frequency range <i>U</i> ₅	Power consumption	Art. No.	
COM465ID-230V	Condition Monitor with an integrated gateway: Bender system/Ethernet	AC/DC 24240 V, 5060 Hz	≤ 6.5 VA/≤ 4 W	B95061070	

Function modules

Function module (software licence)	Annlication	
Function module A	Individual text messages for all devices/ channels, device failure monitoring, e-mail in the event of an alarm, device documentation	B75061011
Function module B Provision of data via Modbus TCP and Modbus RTU, SNMP server with trap function, PROFINET,		B75061012
Function module C	Parameter setting of all integrated devices, device backups	B75061013
Function module D	Visualisation application	B75061014
Function module E	Virtual devices	B75061015
Function module F	Integration of third-party devices	B75061016

Technical data	
Insulation coordination acc. to IEC 60664-1/IEC 60664-3	Environment/EMC
Rated voltage AC 250 V	EMC EN 61326-1
Rated impulse voltage/Overvoltage category 4 kV/III	Ambient temperatures
Pollution degree 3	Operating temperature -25+55 °C
Protective separation (reinforced insulation) between	Transport -40+85 °C
(A1/+, A2/-) - [(AMB, BMB), (ABMS, BBMS), (X2)]	
(***) * [(****) (****) (****) (****)	Long-term storage $-25+70^{\circ}\text{C}$
Supply voltage	Classification of climatic conditions acc. to IEC 60721
Supply voltage U_5 AC/DC 24240 V	Stationary use (IEC 60721-3-3) 3K22 (except condensation and formation of ice)
Frequency range U_5 5060 Hz	Transport (IEC 60721-3-2) 2K11
Power consumption $\leq 6.5 \text{ VA} / \leq 4 \text{ W}$	Long-term storage (IEC 60721-3-1) 1K22
rower consumption \$\leq 0.5 \text{ VA } \sqrt{\geq 4 \text{ W}}	
Indication	Classification of mechanical conditions acc. to IEC 60721
	Stationary use (IEC 60721-3-3) 3M11
LEDs:	Transport (IEC 60721-3-2) 2M4
ON operation indicator	Long-term storage (IEC 60721-3-1) 1M12
BCOM data traffic BCOM	
ISODATA1 data traffic ISODATA1	Connection
ISODATA2 data traffic ISODATA2	Connection type pluggable push-wire terminals
Ethernet (X2 terminal) lights during network connection, flashes during data transmission	
	Push-wire terminals
Internal memory	Conductor sizes AWG 2412
Individual texts (function module A only) unlimited number of texts with 100 characters each	Stripping length 10 mm
E-mail configuration (function module A only) and device failure monitoring max. 250 entries	riqid/flexible 0.22.5 mm ²
	flexible with ferrule, with/without plastic sleeve 0.252.5 mm ²
Number of data points for "third-party devices" on Modbus TCP 50	Multiple conductor, flexible with TWIN ferrule with plastic sleeve 0.51.5 mm ²
Data loggers 30	
Number of data points per data logger 10,000	Push-wire terminal X1
Number of history memory entries 1,000	Conductor sizes AWG 2416
	Stripping length 10 mm
Visualisation	riqid/flexible 0.21.5 mm ²
Number of pages 50	flexible with ferrule without plastic sleeve 0.251.5 mm ²
Size of the background image 3 MB	
Data points (per page) 50 devices or channels, 150 text elements	flexible with ferrule with plastic sleeve 0.250.75 mm ²
vata points (per page)	Other
Interfaces	
	Operating mode continuous operation
Ethernet	Mounting front-oriented, cooling slots must be ventilated vertically
Port RJ45	Degree of protection
Cable length < 100 m	internal components (IEC 60529) IP30
Data rate 10/100 MBit/s, autodetect	terminals (IEC 60529) IP20
HTTP mode HTTP/HTTPS (HTTP)*	DIN rail mounting acc. to IEC 60715
DHCP on/off (off)*	Screw fixing 3 x M4
t _{off} (DHCP) 560 s (30 s)*	Enclosure type J460
IP address	Enclosure material polycarbonate
nnn.nnn.nnn (192.168.0.254)*	Flammability class UL94V-0
can always be reached via 169.254.0.1	Dimensions (W x H x D) 107.5 x 93 x 62.9 mm
Net mask nnn.nnn.nnn (255.255.0.0)*	Documentation number D00368
Protocols (depending on function module selected)	Weight ≤ 240 g
TCP/ IP, Modbus TCP, DHCP, SMTP, NTP, OPC-UA	
	()* = Factory settings
BCOM	
Interface/protocol Ethernet/BCOM	
BCOM system name (SYSTEM)*	
BCOM subsystem address 1255 (1)*	
BCOM device address 0255 (0)*	
· ·	
Modbus TCP	
Interface/protocol Ethernet/Modbus TCP	
Operating mode client for Bender Modbus TCP devices and "third-party devices"	
Operating mode server for access to the process image and for Modbus control commands	
Parallel data access from different clients max. 25	
SNMP	
Versions 1, 2c, 3	
Devices supported Queries to all devices (channels) possible (no trap functionality)	
isoData	
Interface/protocol RS-485/ISODATA	
Operating mode master	
Baud rate ISODATA 9.6115.2 kbit/s	
Cable length ≤ 1200 m	
Cable shielded, one end of shield connected to PE	
recommended: CAT6/CAT7 min. AWG23	
alternative: twisted pair, J-Y(St)Y min. 2x0,8	
Connection X1 (A-ID1, B-ID1, A-ID2, B-ID2)	
Connection type refer to connection "push-wire terminal X1"	
Terminating resistor 120 Ω (0.25 W), can be connected internally	
Device address ISODATA1 (2); ISODATA2 (3)	
SNMP	
Interface/protocol Ethernet/SNMP	
Various 1 2c 2	

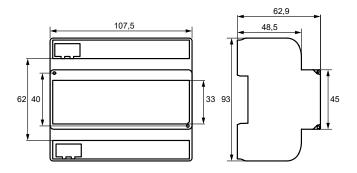
1, 2c, 3

no

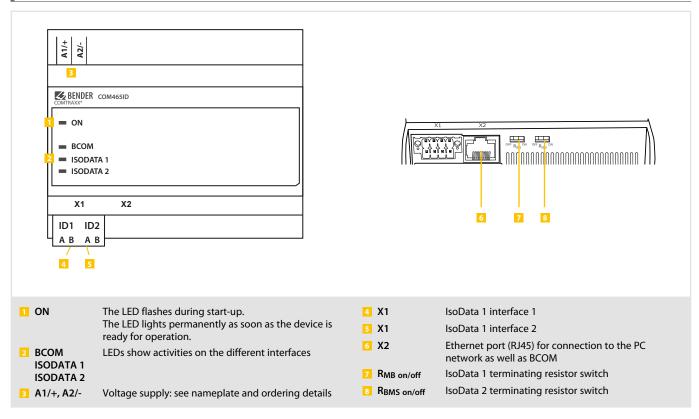
queries to all devices (channels) possible

Supported devices Trap support

Versions



Operating controls and connections



COMTRAXX® COM463BC

Gateway for data exchange between the interfaces BCOM and external BMS



Typical applications

- Information exchange between BCOM and external BMS systems
- Configuration of the information to be transferred from one system to the other
- Several external BMS systems can be displayed together with BCOM systems in one overview
- · Selective notification to different users in case of alarms
- · Remote diagnosis, remote maintenance

Approvals



Device features

- Gateway for data exchange between the interfaces BCOM and external BMS
- · Gateway with web interface
- Data exchange between devices at the following interfaces:
- External BMS bus (max. 99 x 150 devices)
- BCOM (max. 255 devices)
- Remote display of present measured values and operation/alarm messages
- Ethernet interface with 10/100 Mbit/s for remote access via LAN, WAN or the Internet
- Assignment of individual texts for devices, channels (measuring points) and alarms
- Device failure monitoring
- E-mail notifications to various users in the event of alarms and system errors
- 100 virtual devices with 16 channels each can be created. These are used to transfer information from a BCOM system to an external BMS system.

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Application	Supply voltage/ Frequency range <i>U</i> ₅	Power consumption	Art. No.
COM463BC-230 V	Gateway for the connection of systems with BCOM and external BMS	AC/DC 24240 V, 5060 Hz	≤ 6.5 VA / ≤ 4 W	B95061051

max. 250 entries

Technical data

Insulation coordination acc. to IEC	60664-1/IFC 60664	L.?
Rated insulation voltage	00004 1/120 00004	AC 250 V
Rated impulse voltage/Overvoltage car	tegory	4 kV/II
Pollution degree	· ·	3
Protective separation (reinforced insula	ation) between	(A1/+, A2/-) - [(ABMS, BBMS), (X2)]
Supply voltage		
Tension d'alimentation $U_{\rm S}$		AC/DC 24240 V
Gamme de fréquences Us		5060 Hz
Consommation propre		\leq 6,5 VA / \leq 4 W
Indications		
LEDs		
ON		operation indicator
BCOM		data traffic BCON
BMS		data traffic BMS
Ethernet (terminal X2)	lights during netwo	rk connection, flashes during data transfer
Memory		
Individual texts	unlimited	number of texts with 100 characters each

Interfaces	
BMS bus (external)	
Interface/protocol	RS-485/BMS external
Operating mode	master/slave (master)*
Baud rate BMS external	(19.2 / 38.4 / 57.6) kBit/s
Cable length	≤ 1,200 m
Cable	shielded, one end of shield connected to PE
recommended:	CAT6/CAT7 min. AWG23
alternative:	twisted pair, J-Y(St)Y min. 2x0,8
Connection	X1 (ABMS, BBMS)
Connection type	refer to connection "push-wire terminal X1"
Terminating resistor	120 Ω (0.25 W), can be connected internally
Device address, internal/external BMS bus	299 (2)*
BCOM	
Interface/protocol	Ethernet/BCOM
BCOM system name	(SYSTEM)*
BCOM subsystem address	1255 (1)*
BCOM device address	0255 (0)*

E-mail configuration and device failure monitoring

Technical data (continued)

Environment/EMC	
EMC	EN 61326-1
Ambient temperatures	
Operation	-25+55 °C
Transport	-40+85 °C
Long-term storage	-25+70°(
Classification of climatic conditions acc. to IEC 60721	
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K1°
Long-term storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions acc. to IEC 6072	1
Stationary use (IEC 60721-3-3)	3M1°
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12
Connection	

Connection type	pluggable push-wire terminals	
Push-wire terminals		
Conductor sizes	AWG 2412	
Stripping length	10 mm	
rigid/flexible	0.22.5 mm ²	
flexible with ferrule, with/without plastic sleeve	0.252.5 mm ²	
Multiple conductor, flexible with TWIN ferrule with plastic sleeve	0.51.5 mm ²	

Push-wire terminal X1

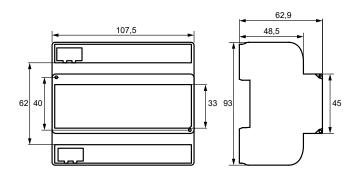
Conductor sizes	AWG 2416
Stripping length	10 mm
rigid/flexible	0.21.5 mm ²
flexible with ferrule without plastic sleeve	0.251.5 mm ²
flexible with ferrule with plastic sleeve	0.250.75 mm ²

Other

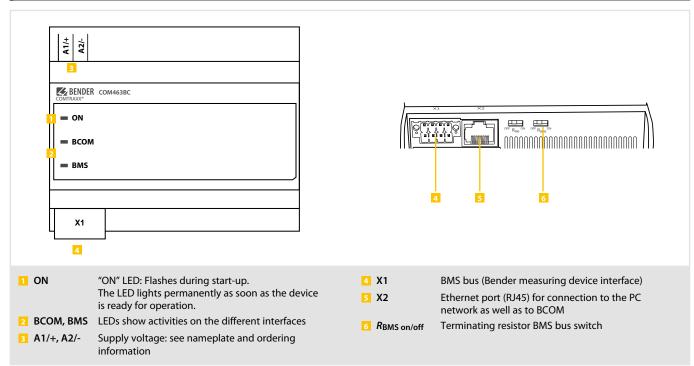
Operating mode		continuous operation
Mounting	front-oriented, cooling slots	must be ventilated vertically
Degree of protection, internal compon-	ents (IEC 60529)	IP30
Degree of protection, terminals (IEC 60	529)	IP20
Quick DIN rail mounting acc. to		IEC 60715
Screw fixing		2 x M4
Enclosure type		J460
Enclosure material		polycarbonate
Flammability class		UL94V-0
Dimensions (W x H x D)		107.5 x 93 x 62.9 mm
Documentation number		D00427
Weight		≤ 240 q

()* = factory settings

Dimension diagram (dimensions in mm)



Operating controls and connections



COMTRAXX® CP9...-I

Alarm indicator and operator panel for medical locations and other areas



Typical applications

- Monitoring and parameter setting of all Bender products that support communication
- Mounting in the control cabinet door so that all information is immediately visible
- Commissioning and diagnosis of Bender systems
- Remote diagnosis and remote maintenance
- Control stations in all areas
- Monitoring and analysis of data centres

Data transfer interfaces





Approvals



Ordering information

Complete devices

Туре	Display size	Supply	Device dimensions (W x H x D)	Weight	Enclosure	Display unit Glass, tempered	Art. No.
CD007 I	CP907-I 7" (17.6 cm) DC 24 V, < 15 W	226 x 144 x 78 mm	1.1 kg	Flush-mounting enclosure	white	B95061031	
CP907-1		226 x 144 x 65 mm	1.0 kg	Control cabinet door mounting	white	B95061032	

Scope of delivery: Display unit, control cabinet door mounting or flush-mounting enclosure incl. mounting plate with electronics, CP9xx connecting cable and plug kit.

Components separately

Device series	Туре	Art. No.
CP907-I	Flush-mounting enclosure	B95100140

Device features

- Display size 7" and 15.6" with tempered and anti-reflective glass
- · Easy to clean and disinfect, degree of protection IP54
- · Screwless mounted front plate
- Condition monitor for Bender systems
- Integrated modular gateway between Bender systems and TCP/IP
- · Remote access via LAN, WAN or Internet
- Support of devices that are connected to the internal BMS bus, via BCOM, Modbus RTU or Modbus TCP
- · Individual visualisation can be generated, which can be viewed via the web browser or on the display
- Silent due to operation without fan
- High-quality representation with excellent contrast, high resolution and a wide viewing angle
- · Possibility of graphical integration of building plans or status display in photo quality
- Visual and acoustic notification in the event of an alarm

Further information

For further information refer to our product range on www.bender.de.



Device series	Description	Art. No.
all	CP9l replacement plug kit	B95061910
CP907-I	CP9I suction lifter	B95061911
CP907-I	CP907-I surface-mounting enclosure	B95061915

Insulation coordination acc. to IEC 60664-1	Modbus TCP
CP907-I	Interface/protocol Ethernet/Modbus TCP
Rated voltage 50 V	Cable length < 100 m
Overvoltage category III	Operating mode client for Bender Modbus TCP devices and "third-party devices"
Pollution degree 2	Operating mode server for access to process image and for Modbus control commands
Rated impulse voltage 800 V	Parallel data access for different clients max. 25
	Modbus RTU
Supply	Interface/protocol RS-485/Modbus RTU
CP907-I via plug-in terminal (A1/+;A2/-)	Cable length < 1200 m
Nominal voltage DC 24 V SELV/PELV	Cable shielded, one end of shield connected to PE
Nominal voltage tolerance $\pm 20 \%$	recommended: CAT6/CAT7 min. AWG23
Typical power consumption at DC 24 V < 15 W	alternative: twisted pair, J-Y(5t)Y min. 2x0,8
Maximum cable length when supplied via B95061210 (24 V DC power supply unit 1.75 A):	Connection "AMB", "BMB" (see plug-in terminal)
0.28 mm ² 75 m	Operating mode master/slave (master)*
0.5 mm ² 130 m	Baud rate $9.657.6$ kBit/s Terminating resistor 120Ω (0.25 W), can be connected internally (see plug-in terminal)
0.75 mm ² 200 m	Supported Modbus RTU slaves addresses 2247
1.5 mm ² 400 m	•
2.5 mm ² 650 m	PROFINET
CP907-I via Power-over-Ethernet (PoE)	Interface/protocol Ethernet/PROFINET
Nominal voltage DC 48 V SELV/PELV	Operating mode slave (10 device)
Nominal voltage tolerance -25+15 %	SNMP
Typical power consumption for PoE < 15 W	Interface/protocol Ethernet/SNMP
Maximum cable length when supplied via AWG 26/7; 0.14 mm ² 100 m	Versions 1, 2c, 3
Stored energy time in the event of voltage failure	Supported devices query of all devices (channels) possible
Time, date min. 3 days	Trap support yes
mine, date	MQTT
Displays, memory	Interface/protocol Ethernet/MQTT
Display	Operating mode Publisher (provides data for brokers)
CP907-I 7" TFT touch display	USB
E-mail configuration and device failure monitoring max. 250 entries	Number 2
Individual texts unlimited number of texts with 100 characters each	Operating mode USB 2.0 host (5 V, 500 mA)
Number of data points for "third-party devices" to Modbus TCP and Modbus RTU 1600	Data rate 480 Mbit/s
Number of data loggers 30	Cable length < 3 m
Number of data points per data logger 10 000	Connection type USB 2 Standard-A
Number of history memory entries 20 000	Used ports
Visualisation	53 DNS (UDP/TCP)
Number of pages 50	67, 68 DHCP (UDP)
Background image size max. 3 MB	80 HTTP (TCP)
	123 NTP (UDP)
Interfaces	161 SNMP (UDP)
Ethernet	162 SNMP TRAPS (UDP)
Connection RJ45	443 HTTPS (TCP)
Cable shielded, both ends of shield connected to PE	502 MODBUS (TCP)
Cable length < 100 m	4840 OPCUA (TCP)
Data rate 10/100 Mbit/s, autodetect	5353 MDNS (UDP)
HTTP mode HTTP/HTTPS (HTTP)*	48862 BCOM (UDP)
DHCP on/off (off)*	Digital inputs (112)
$T_{\text{off}} \text{ (DHCP)}$ 560 s (30 s)*	Number 12
IP address	Galvanic separation yes
nnn.nnn.nnn (192.168.0.254)*	Maximum cable length < 1000 m
can always be reached via 169.254.0.1	Operating mode selectable for each input: active-high or active-low
Net mask nnn.nnn.nnn (255.255.0.0)* Protocolc TCP/ID Modbus TCP Modbus PTIL DPDEINET DHCD SMMD SMTD NTD	Factory setting active-high
Protocols TCP/IP, Modbus TCP, Modbus RTU, PROFINET, DHCP, SNMP, SMTP, NTP	Voltage range (high) AC/DC 1030 V
BMS bus	Voltage range (low) AC/DC 02 V
Interface/protocol RS-485/BMS internal	Max. current per channel (at AC/DC 30 V) 8 mA
Operating mode master/slave (master)*	Connection push-in terminal (1-1) (2-2) (3-3) (12-12)
Baud rate 9.6 kBit/s	Switching elements
Cable length < 1200 m	
Cable shielded, one end of shield connected to PE recommended: CAT6/CAT7 min. AWG23	For UL applications
	Intended use: General purpose relay
alternative: twisted pair, J-Y(St)Y min. 2x0,8 Connection "ABMS", "BBMS" (see pluq-in terminal)	Voltage connected to the relay: SELV
Terminating resistor 120Ω (0.25 W), can be connected internally (see plug-in terminal)	Number 1 relay
Device address 1150 (1)*	Operating mode N/C operation or N/O operation
* * *	Function programmable
BCOM Interface/protocol Ethornot/PCOM	Electrical endurance under rated operating conditions, number of cycles 10,000
Interface/protocol Ethernet/BCOM Cable length < 100 m	Contact data acc. to IEC 60947-5-1:
BCOM system name (SYSTEM)*	Utilisation category AC-13 / AC-14 / DC-12
BCOM subsystem address (STSTEM)" 1255 (1)*	Rated operational voltage 24 V / 24 V / 24 V
BCOM device address 0255 (0)*	Rated operational current 2 A / 2 A / 2 A
	Minimum contact load (relay manufacturer's reference) 10 μA / 10 mV DC
Modbus Pandar Madhur imana V1 V2 //2>*	Connection plug-in terminal (11;12;14)
Bender Modbus image V1, V2 (V2)*	

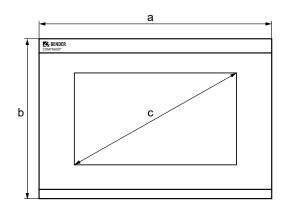
Technical data (continued)

Buzzer			Environment/EMC
Buzzer message ca	n be acknowledged, adoption of characte	ristics of new value	EMC
Buzzer interval		configurable	Operating temperatu
Buzzer frequency		configurable	CP907-I
Buzzer repetition		configurable	CP907-I for UL-
Audio			Operating altitude
Line IN		not used	Rel. humidity
Line OUT	Output to a STEREO playback device vi		Classification of cli
Cable length	Output to a STENEO playback device vi	< 3 m	Stationary use (IEC 6
Cable leligili			Transport (IEC 60721
Device connections			Long-term storage (I
Plug-in terminal (A1/+;A2/-) (11;12;1	14)		Classification of m
Plug-in terminal (A1/+;A2/-PE) (11;1	•		Stationary use (IEC 6
Conductor sizes		AWG 2412	Transport (IEC 60721
Stripping length		10 mm	Long-term storage (I
rigid/flexible		0.22.5 mm ²	Other
flexible with ferrule, with/without plastic	sleeve	0.252.5 mm ²	
Multiple conductor, flexible, with TWIN fe	errule with plastic sleeve	0.51.5 mm ²	Operating mode
Plug-in terminal (l112), (k1k12), (MB), (BMS)		Mounting Degree of protection,
Conductor sizes	,, (,	AWG 2416	Degree of protection
Stripping length		10 mm	Degree of protection
rigid/flexible		0.21.5 mm ²	Flammability class
flexible with ferrule without plastic sleeve	e	0.251.5 mm ²	Device dimensions
flexible with ferrule with plastic sleeve		0.250.75 mm ²	CP907-I (W x H
For UL-applications (only CP907-I)			Documentation num
Use copper conductors only.			Weight
Minimum temperature rating of the cable to	be connected to the field wiring terminals	75 °C	CP907-I
Minimum temperature rating of the cable to	be connected to the PoE plug	2° 08	()* = factory setting

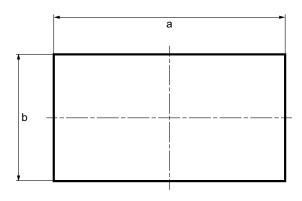
EMC	IEC 61326-1
Operating temperature	
CP907-I	-10+55°C
CP907-I for UL-Applications	-10+50°C
Operating altitude	≤ 2000 m AMSI
Rel. humidity	≤ 98 % at 25 °C
Classification of climatic conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M ²
Long-term storage (IEC 60721-3-1)	1M12
Other	
Operating mode	continuous operation
Mounting	display-oriented
Degree of protection, front	IP54
Degree of protection, front for UL applications	IP50
Degree of protection, enclosure	IP20
Flammability class	UL 94V-0
Device dimensions	
CP907-I (W x H x D)	226 x 144 x 78 mm
Documentation number	D00418
Weight	
CP907-I	< 1.1 kg

Dimensions

External dimensions



Installation dimensions - panel cut-out



Type	Dimensions (mm)		
Турс	a	b	c
CP907-I	226	144	176 (7")

Glass thickness 3 mm

Туре	Enclosure	Dimensio	Required installation	
, iyec	Enclosure	a	b	depth
	Flush-mounting enclosure	212	124	75
CP907-I	Door	215	124	65
	Surface-mounting	299	173	-

COMTRAXX® CP9xx

Alarm indicator and operator panel for medical locations and other areas



Typical applications

Monitoring, operation and display of:

- Medical Isolated Power Systems
- · Supply systems for medical gases
- · Ventilation and air-conditioning systems
- · Room lighting
- · Operating theatre lights
- Special power supply systems (BSV (battery-based safety power supply) or UPS (uninterruptible power supply)
- Further systems from different manufacturers.

Approvals



Device features

- Display size 7", 15" and 24" with tempered and anti-reflective glass
- · Easy to clean and to desinfect, degree of protection IP54
- Screwless mounted front plate
- User-friendly touch-sensitive monitoring system for medical locations and other applications
- · Particularly simple operation
- · Additional information for medical and technical personnel
- · Visual and acoustic notification in the event of an alarm
- · Clear menu structure with self-explanatory interactive images
- · Clearly marked safety functions
- · Silent due to operation without fan
- · High-quality representation with excellent contrast, high resolution and a wide viewing angle
- · Possibility of graphical integration of building plans or status display in photo quality
- · Easy integration of external subsections like charging stations for operating theatre table controls and intercom systems with front foil
- · Simple conversion and expansion with minimal service interruptions

Other project-specific versions with foil surface or with additional internal components available on request:

- · Charging tray for operating theatre table remote controls
- Intercom systems
- · Operating theatre light controls
- · Programmable backlit keypads
- Digital/Analogue inputs/outputs for installation in panel enclosures or control cabinets
- · Data coupling to third-party systems
- · Project-specific built-in enclosures
- Integration of third-party systems
- Matt surface or highly transparent foil options available
- · Exchange of existing control panels (Retrofit)

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Complete devices

Туре	Display size	Supply	Device dimensions (W x H x D)	Weight	Display unit glass, tempered	Art. No.¹)
CP907	7" (17.6 cm)	DC 24 V, < 15 W;	226 v 144 v 70 mm	1.1 kg	white	B95061080
CP907 without Flush-mounting enclosure	7" (17.6 cm)	alternatively PoE possible	226 x 144 x 78 mm	0.9 kg	white	B95061093
CP915 15,6" (39.6	15 (" (20 ()	AC 100 240 V + 20 W	505 250 02	6.1 hm	white	B95061081
	15,6" (39.6 cm) AC 100240 V, < 30 W	505 x 350 x 92 mm	6.1 kg	grey	B95061085	
CP924	24" (61 cm) AC 100240 V, < 55 W	AC 100 - 240 V - FE W	CEA 441 400	0.41	white	B95061083
		654 x 441 x 100 mm	9.1 kg	grey	B95061084	

¹⁾ In the offer phase the Art. No. may differ

Scope of delivery: display unit, flush-mounting enclosure incl. mounting plate with electronics, CP9xx connecting cable and plug connector kit.

Components separately

Device series	Туре	Art. No.¹)
CP907	Flush-mounting enclosure	B95100140
CP915	Display unit white	B95061112
	Display unit grey	B95061110
CP924	Display unit white	B95061115
	Display unit grey	B95061116

¹⁾ In the offer phase the Art. No. may differ

Accessories

Device series	Description	Art. No.
CP907	Surface-mounting enclosure	B95061915
CP915, CP924	CP9xx suction lifter 1)	B95061911
All	CP9xx replacement plug kit	B95061910

¹⁾ The suction lifter is needed to remove the display.



Insulation coordination acc. to IEC 60664-1	BMS bus
CP907	Interface/protocol RS-485/BMS internal
Rated voltage 50 V	Operating mode master/slave (master)*
Overvoltage category III	Baud rate 9.6 kbit/s
Pollution degree 2	Cable length < 1200 m
Rated impulse voltage 800 V	Cable shielded, one end of shield connected to PE
	recommended CAT6/CAT7 min. AWG23
CP915/CP924	alternative twisted pair, J-Y(St)Y min. 2x0,8
Rated insulation voltage AC 250 V	Connection "ABMS", "BBMS" (see plug-in terminal)
Overvoltage category III for UL applications II	Terminating resistor 120Ω (0.25 W), can be switched on internally (see plug-in terminal)
Pollution degree 2	Device address 1150 (1)*
Rated impulse voltage 4 kV	BCOM
nated illipuise voltage 4 kV	Interface/protocol Ethernet/BCOM
Supply	Cable length < 100 m
CP907 via plug-in terminal (A1/+;A2/-)	BCOM system name (SYSTEM)*
Nominal voltage DC 24 V SELV/PELV	BCOM subsystem address 1255 (1)*
Nominal voltage tolerance ±20 %	BCOM device address 1255 (1)*
Typical power consumption at DC 24 V < 15 W	Modbus
Maximum cable length when supplied via B95061210 (DC 24 V power supply unit 1.75 A):	Bender Modbus image V1, V2 (V2)*
0.28 mm ² 75 m	Modbus TCP
0.5 mm ² 130 m	Interface/protocol Ethernet/Modbus TCP
0.75 mm ² 200 m	Cable length < 100 m
1.5 mm ² 400 m	Operating mode Client for Nemder Modbus TCPdevices and "third-party devices"
2.5 mm ² 650 m	Operating mode Server for access to process image and for Modbus control commands
CP907 via Power-over-Ethernet (PoE)	Parallel data access from different clients max. 25
Nominal voltage DC 48 V SELV/PELV	Modbus RTU
Nominal voltage blerance -25+15 %	Interface/protocol RS-485/Modbus RTU
Typical power consumption for PoE < 15 W	Cable length < 1200 m
Maximum cable length when supplied via AWG 26/7; 0.14 mm ² 100 m	Cable shielded, one end of shield connected to PE
	recommended CAT6/CAT7 min. AWG23
CP915 via terminal block (L1; N) Nominal voltage via external power supply unit AC 100 240 V	alternative twisted pair, J-Y(St)Y min. 2x0,8
Nominal voltage via external power supply unit Nominal voltage tolerance -15+10 %	Connection "AMB", "BMB" (see plug-in terminal)
Frequency range U_5 5060 Hz	Operating mode master/slave (master)*
Typical power consumption at AC 230 V < 30 W	Baud rate 9.657.6 kBit/s
	Terminating resistor 120 R (0.25 W), can be connected internally (see plug-in terminal)
CP924 via terminal block (L1; N)	Supported Modbus RTU slave addresses 2247
Nominal voltage via external power supply unit AC 100 240 V	PROFINET
Nominal voltage tolerance -15+10 %	Interface/protocol Ethernet/PROFINET
Frequency range <i>U</i> _S 5060 Hz	Operating mode Slave (IO-Device)
Typical power consumption at AC 230 V < 55 W	·
Stored energy time in the event of voltage failure	SNMP
Time, date min. 3 days	Interface/protocol Ethernet/SNMP Versions 1, 2c, 3
D. 1	Devices supported Queries to all devices (channels) possible
Displays, memory	Trap support No
Display/Resolution	
CP907 7" TFT touch display/800 x 480	MQTT Interface/protocol Ethernet/MQTT
CP915 15.6" TFT touch display/1280 x 720	Interface/protocol Ethernet/MQTT Operating mode Publisher (provides data for brokers)
CP924 24" TFT touch display/1280 x 720 or 1920 x 1080	<u> </u>
E-mail configuration and device failure monitoring max. 250 entries Individual texts unlimited number of texts with 100 characters each	USB
Displayable devices 247	Number 2
Number of data points for "third-party devices" to Modbus TCP and Modbus RTU 1600	Operating mode USB-2.0-Host (5 V, 500 mA)
Number of data loggers 30	Datarate 480 Mbit/s
Number of data points per data logger 10,000	Cable length < 3 m Connection type USB 2 Standard-A
Number of entries in the history memory 20,000	
<u> </u>	Used ports
Visualisation	53 DNS (UDP/TCP)
Number of pages 50	67, 68 DHCP (UDP)
Background image size max. 3 MB	80 HTTP (TCP)
Interfaces	123 NTP (UDP)
	161 SNMP (UDP)
Ethernet	443 HTTPS (TCP)
Connection RJ45	502 MODBUS (TCP)
Cable shielded, shield on both sides to PE	4840 OPCUA (TCP) 5353 MDNS (UDP)
Cable length < 100 m	48862 BCOM (UDP)
Data rate 10/100 Mbit/s, autodetect	DCOM (OUF)
HTTP mode HTTP/HTTPS (HTTP)*	Digital inputs (112)
DHCP on/off (off)*	Number 12
t _{off} (DHCP) 560 s (30 s)*	Galvanic separation yes
IP address (102.168.0.254)*	Maximum cable length < 1000 m
nnn.nnn.nnn (192.168.0.254)* can always be reached via 169.254.0.1	Operating mode selectable for each input: active-high or active-low
can always be reached via 169.254.0.1 Net mask nnn.nnn.nnn (255.255.0.0)*	Factory setting active-high
Protocols TCP/IP, Modbus TCP, Modbus RTU, PROFINET, DHCP, SNMP, SMTP, NTP	Voltage range (high) AC/DC 1030 V
TOTAL STREET, MOUDUS TO , MOUDUS TO , I TO I INC. , STRIPL , SIRIFF, INTE	Voltage range (low) AC/DC 02 V
	Max. Current per channel (at AC/DC 30 V) 8 mA (1.1) (3.2) (3.3) (13.13)



Connection plug-in terminal

(1-1) (2-2) (3-3)...(12-12)

Switching elements

For UL applications

Intended use: General purpose relay

Voltage connected to the relay: SELV

Number	1 relay
Operating mode	N/C operation / N/O operation
Function	programmable
Electrical endurance under rated operating conditions, number of cycle	es 10,000

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

Utilisation category	AC-13 / AC-14 / DC-12
Rated operational voltage	24 V / 24 V / 24 V
Rated operational current	2 A / 2 A / 2 A
Minimum contact load (relay manufacturer's reference)	10 μA / 10 mV DC
Connection	plug-in terminal (11;12;14)

Buzzer

Buzzer message	can be acknowledged, adoption of characteristics of new value
Buzzer interval	configurable
Buzzer frequency	configurable
Buzzer repetition	configurable

Audio

Line IN	not used
Line OUT	Output to a STEREO playback device via 3.5 mm jack plug
Cable length	< 3 m

Device connections

Terminal block	(I 1: N:	PF) (for	CP015 and	(P924 o	nlv)
Terrinina biock	(LI, IV,	1 L/ (101	CI VIJ aliu	1 (1 /27 0	y <i>,</i>

Conductor sizes	AWG 2012
Stripping length	1011 mm
rigid/flexible	0.54 mm ²
flexible with ferrule with/without plastic sleeve	0.54 mm ²
Multiple conductor, flexible with TWIN ferrule with plastic sleeve	0.54 mm ²

Plug-in terminal (A1/+;A2/-) (11;12;14) Plug-in terminal (A1/+;A2/-;PE) (11;12;14)

Conductor sizes	AWG 2412
Stripping length	10 mm
rigid/flexible	0.22.5 mm ²
flexible with ferrule with/without plastic sleeve	0.252.5 mm ²
Multiple conductor, flexible with TWIN ferrule with plastic sleeve	0.51.5 mm ²

Plug-in terminal (I112), (k1k12), (MB), (BMS)
Conductor sizes	AWG 2416
Stripping length	10 mm
rigid/flexible	0.21.5 mm ²
flexible with ferrule without plastic sleeve	0.251.5 mm ²
flexible with ferrule with plastic sleeve	0.250.75 mm ²

For UL-applications (only CP907)

Use copper conductors only.	
Minimum temperature rating of the cable to be connected to the field wiring terminals	75 ℃
Minimum temperature rating of the cable to be connected to the PoE plug	80 °C

Environment/EMC

EMC	IEC 61326-1
Operating temperature	
CP907	-10+55 °C
CP907 for UL-Applications	-10+50 °C
CP915	-5+40 °C
CP924	-5+40 °C
Range of use	≤ 2000 m AMSL
Rel. humidity	W 98 % at 25 °C

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:

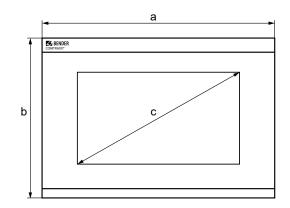
Stationary use (IEC 60721-3-3)	
CP907	3M11
CP915, CP924	3M10
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12

0ther

Operating mode	continuous operation
Mounting	display-oriented
Degree of protection, front	IP54
Degree of protection, front for UL applications	
CP907	IP50
CP915, CP924	IP54
Degree of protection, enclosure	IP20
Flammability class	UL 94V-0
Dimensions	
CP907 (W x H x D)	226 x 144 x 78 mm
CP915 (W x H x D)	505 x 350 x 92 mm
CP924 (W x H x D)	654 x 441 x 100 mm
Documentation number	D00349
Weight	
CP907	< 1.1 kg
CP915	< 7.1 kg
CP924	< 10.5 kg

Dimensions

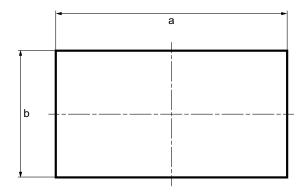
External dimensions



Type		Dimensions (mm)	
1,700	a	b	С
CP907	226	144	176 (7")
CP915	505	350	386 (15,6")
CP924	654	441	610 (24")

Glass thickness 3 mm

Installation dimensions - panel cut-out



Type	Enclosure	Dimensions (mm)		Required installation
.,,,,	Endosare	a	b	depth
CD007	Flush-mounting	212	124	75
CP907	Surface-mounting	299	173	-
CP915	Flush-mounting	464	309	92
CP924	Flush-mounting	613	401	95

COMTRAXX® CP305 – Control Panel

Remote alarm indicator for medical locations and other areas



Typical applications

• For medical locations and other areas

Approvals





Device features

- Display of operating, warning, and alarm messages according to DIN VDE 0100-710, IEC 60364-7-710 and other standards
- · 12 digital inputs
- 2 relay contacts (changeover contacts) that can also be operated using a switch on the display
- Plaintext display with backlit 5" touch display
- · Easy to clean and disinfect, degree of protection IP54 (overall device) and IP66 (front glass panel)
- · Front glass panel mounted without screws
- User-friendly, touch-sensitive monitoring system for medical uses and other applications
- · Exceptionally simple user guidance
- Additional information for medical and technical personnel
- · Visual and acoustic signalling in the event of an alarm
- · Clear menu structure
- Silent due to fanless operation
- High-quality visualization with outstanding contrast, high resolution and a wide viewing angle
- Device testing and modification of the parameter settings with minimal service interruptions
- Standard texts for messages can be selected in the national language
- 2 languages can be configured and switching between them is possible during operation
- 500 freely programmable message texts
- Bus technology for simple installation and low fire load
- · Acoustic alarm can be acknowledged / muted
- · Versions for flush mounting and surface mounting
- Predefined message texts simplify start-up
- History memory with real time clock for storing 1000 warning and alarm messages
- Voltage supply via power supply unit
- Parameter configuration via Ethernet interface
- Replace MK2430 (retrofit); other devices on request

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Description	Art. No.
CP305-I0		B95100051
CP305-C	Customised parameter settings	B22030051

Accessories

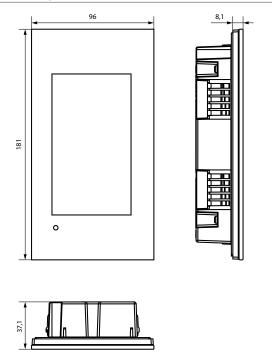
Description	Art. No.
Flush-mounting enclosure	B923710
Cavity-wall installation set for flush-mounting enclosures	B923711
Control panel installation set for flush-mounting enclosure	B95101000
CP305-IO plug kit	B95100151
Ethernet adapter kit (RJ45 socket insert, Cat.6 SLIM patch cable)	B95100152
CP305 surface-mounting enclosure	B95100153
Retrofit kit: MK800 to CP305	BF95100154

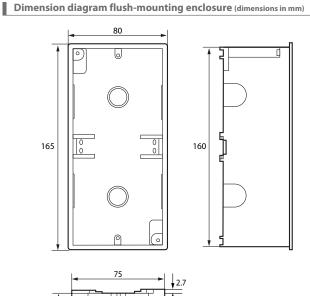
Insulation coordination CP305 acc. to IEC 60664-1	Digital inputs (112)
Rated voltage 50 V	Number 12
Overvoltage category II	Galvanic separation In groups of four
Pollution degree 2	IN 14 / GND 1-4
Overvoltage category II and pollution degree 2 is related to the relay contacts. Further insulation	IN 58 / GND 5-8
coordination takes place after functional separation.	IN 912 / GND 9-12
	Relay mode Can be selected for each input: high-active or low-active
Supply via plug-in terminal (A1/+, A2/-)	Factory setting Off
Rated voltage AC/DC 24 V	Voltage range (high) AC/DC 1030 V
Operating range of the supply voltage AC 1828 V/DC 1830 V	Nominal: 24 V
Nominal frequency 50/60 Hz	Voltage range (low) AC/DC 0 2 V Max. current per channel (at AC/DC 30 V) 8 mA
Typical power consumption < 4.2 W	Connection Plug-in terminals
Maximum cable length with supply via B95061210 (24 V DC power supply unit 1.75 A)	IN 1 4 / GND1-4
0.28 mm ² 75 m 0.5 mm ² 130 m	IN 58 / GND 5-8
0.5 mm ² 130 m 0.75 mm ² 200 m	IN 912 / GND 9-12
1.5 mm ² 400 m	Maximum cable length < 500 m
2.5 mm ² 650 m	
2.5 111111	Switching elements
Stored energy time in the event of voltage failure	Connection Plug-in terminal
Time, date Min. 2 days	K1 NC; K1 NO; K1 COM
Restart after power failure Min. 2 seconds	K2 NC; K2 NO; K2 COM
Displays, memory	Number of changeover contacts 2
Display 5" TFT touch display (720 x 1280 px)	Operating principle (changeover contacts) N/C operation / N/O operation Function Programmable
Displayable devices 5 TEL touch display (720 x 1280 px)	Minimum contact load 100 mA/DC 5 V (0.5 W)
Number of alarm addresses 500	Electrical endurance under rated operating conditions 10,000 operating cycles
Number of test addresses 50	
Number of history memory entries 1000	Contact data acc. to IEC 60947-5-1 Utilisation category AC-13 / AC-14 / DC-12
, ,	Utilisation category AC-13 / AC-14 / DC-12 Rated operational voltage AC 24 V / AC 24 V / DC 24 V
Interfaces	Rated operational current AC 2 A / AC 2 A / AC 2 A / AC 2 A
Ethernet	nated operational current REZN/NEZN/NEZN/NEZN/
Connection RJ45	Buzzer
Data rate 10/100 Mbit/s, autodetect	Buzzer alarm Can be acknowledged, adoption of characteristics of new value, can be muted
DHCP on/off (on)*	Buzzer interval Configurable
IP address (1:1 connection) 169.254.xx.yy (xx and yy are unique for each device)	Buzzer frequency Configurable
Netmask nnn.nnn.nnn (255.255.255.0)*	Buzzer repetition Configurable
Logs TCP/IP, Modbus TCP, DHCP, SNTP	Device connections
Ethernet	
Protocol (for reading the digital inputs and relay outputs only) Modbus TCP	Plug-in terminal (A1/+, A2/-)
Operating mode Slave	Conductor sizes AWG 2412 Stripping length 10 mm
RS-485	Stripping length 10 mm Rigid/flexible 0.22.5 mm ²
Protocol BMS internal	Flexible with ferrules, with/without plastic sleeve 0.252.5 mm ²
Operating mode Master/slave (master)*	Multiple conductor flexible with TWIN ferrule with plastic sleeve 0.51.5 mm ²
Baud rate 9.6 kBit/s	<u> </u>
Cable length < 1200 m	Plug-in terminals
Shielded cable, one end of shield connected to PE Recommended: CAT6/CAT7 min. AWG23	(RS-485 A, RS-485 B), (IN14, GND14, IN912, GND912) (IN58, GND58, K1, K2)
Alternative: J-Y(St)Y min. 2 x 0.8	Conductor sizes AWG 2416
Galvanic separation Yes	Stripping length 10 mm
Connection "RS-485 A", "RS-485 B" (see plug-in terminal)	Riqid/flexible 0.21.5 mm ²
T	
•	-
Device address 190 (1)*	Flexible with ferrule without plastic sleeve 0.2 1.5 mm ²
Device address 190 (1)* Number of supported devices 89	Flexible with ferrule without plastic sleeve 0.21.5 mm ² Flexible with ferrule with plastic sleeve 0.21.5 mm ²
Device address 190 (1)* Number of supported devices 89 RS-485	Flexible with ferrule without plastic sleeve 0.21.5 mm ² Flexible with ferrule with plastic sleeve 0.21.5 mm ² For UL applications
Device address 190 (1)* Number of supported devices 89 RS-485 Protocol Modbus RTU	Flexible with ferrule without plastic sleeve 0.21.5 mm² Flexible with ferrule with plastic sleeve 0.21.5 mm² For UL applications Use copper lines only.
Device address 190 (1)* Number of supported devices 89 RS-485 Protocol Modbus RTU Operating mode Master	Flexible with ferrule without plastic sleeve 0.21.5 mm² Flexible with ferrule with plastic sleeve 0.21.5 mm² For UL applications Use copper lines only. Minimum temperature range of the cable to be connected to the plug-in terminals 75 °C
Device address 190 (1)* Number of supported devices 89 RS-485 Protocol Modbus RTU Operating mode Master Baud rate 19.2 kBit/s	Flexible with ferrule without plastic sleeve 0.21.5 mm ² Flexible with ferrule with plastic sleeve 0.21.5 mm ² For UL applications Use copper lines only.
Device address 190 (1)* Number of supported devices 89 RS-485 Protocol Modbus RTU Operating mode Master Baud rate 19.2 kBit/s Parity even, odd, none (even)*	Flexible with ferrule without plastic sleeve 0.21.5 mm² Flexible with ferrule with plastic sleeve 0.21.5 mm² For UL applications Use copper lines only. Minimum temperature range of the cable to be connected to the plug-in terminals 75 °C
Device address 190 (1)* Number of supported devices 89 RS-485 Protocol Modbus RTU Operating mode Master Baud rate 19.2 kBit/s Parity even, odd, none (even)* Stop bits 1, 2, auto (1)*	Flexible with ferrule without plastic sleeve Flexible with ferrule with plastic sleeve 0.21.5 mm² For UL applications Use copper lines only. Minimum temperature range of the cable to be connected to the plug-in terminals 75 °C Environment/EMC EMC IEC 61000-6-2:2016-08 Ed. 3.0 IEC 61000-6-3:2020-07 Ed. 3.0
Device address 190 (1)* Number of supported devices 89 RS-485 Protocol Modbus RTU Operating mode Master Baud rate 19.2 kBit/s Parity even, odd, none (even)* Stop bits 1, 2, auto (1)* Alarm query interval 030 s (2 s)*	Flexible with ferrule without plastic sleeve Flexible with ferrule with plastic sleeve 0.21.5 mm² For UL applications Use copper lines only. Minimum temperature range of the cable to be connected to the plug-in terminals 75 °C Environment/EMC EMC IEC 61000-6-2:2016-08 Ed. 3.0 IEC 61326-1:2020-10 Ed. 3.0 IEC 61326-1:2020-10 Ed. 3.0
Device address 190 (1)* Number of supported devices 89 RS-485 Protocol Modbus RTU Operating mode Master Baud rate 19.2 kBit/s Parity even, odd, none (even)* Stop bits 1, 2, auto (1)* Alarm query interval 030 s (2 s)* Cable length < 1200 m	Flexible with ferrule without plastic sleeve Flexible with ferrule with plastic sleeve 0.21.5 mm² For UL applications Use copper lines only. Minimum temperature range of the cable to be connected to the plug-in terminals 75 °C Environment/EMC EMC IEC 61000-6-2:2016-08 Ed. 3.0 IEC 61306-6-3:2020-07 Ed. 3.0 IEC 61326-1:2020-10 Ed. 3.0 DIN EN 61326-1:2020-10 Ed. 3.0
Device address 190 (1)* Number of supported devices 89 RS-485 Protocol Modbus RTU Operating mode Master Baud rate 19.2 kBit/s Parity even, odd, none (even)* Stop bits 1, 2, auto (1)* Alarm query interval 030 s (2 s)* Cable length < 1200 m Shielded cable, one end of shield connected to PE Recommended: CAT6/CAT7 min. AWG23	Flexible with ferrule without plastic sleeve Flexible with ferrule with plastic sleeve 0.21.5 mm² For UL applications Use copper lines only. Minimum temperature range of the cable to be connected to the plug-in terminals 75 °C Environment/EMC EMC IEC 61000-6-2:2016-08 Ed. 3.0 IEC 61306-6-3:2020-07 Ed. 3.0 IEC 61326-1:2020-10 Ed. 3.0 DIN EN 61326-1:2013-07
Device address 190 (1)* Number of supported devices 89 RS-485 Protocol Modbus RTU Operating mode Master Baud rate 19.2 kBit/s Parity even, odd, none (even)* Stop bits 1, 2, auto (1)* Alarm query interval 030 s (2 s)* Cable length < 1200 m Shielded cable, one end of shield connected to PE Recommended: CAT6/CAT7 min. AWG23 Alternative: J-Y(St)Y min. 2 x 0.8	Flexible with ferrule without plastic sleeve Flexible with ferrule with plastic sleeve 0.21.5 mm² For UL applications Use copper lines only. Minimum temperature range of the cable to be connected to the plug-in terminals 75 °C Environment/EMC EMC IEC 61000-6-2:2016-08 Ed. 3.0 IEC 61000-6-3:2020-07 Ed. 3.0 IEC 61326-1:2020-10 Ed. 3.0 DIN EN 61326-1:2013-07 DIN EN 61326-1:2019-05
Device address 190 (1)* Number of supported devices 89 RS-485 Protocol Modbus RTU Operating mode Master Baud rate 19.2 kBit/s Parity even, odd, none (even)* Stop bits 1, 2, auto (1)* Alarm query interval 030 s (2 s)* Cable length < 1200 m Shielded cable, one end of shield connected to PE Recommended: CAT6/CAT7 min. AWG23 Alternative: J-Y(St)Y min. 2 x 0.8 Galvanic separation Yes	Flexible with ferrule without plastic sleeve Flexible with ferrule with plastic sleeve 0.21.5 mm² For UL applications Use copper lines only. Minimum temperature range of the cable to be connected to the plug-in terminals 75 °C Environment/EMC EMC IEC 61000-6-2:2016-08 Ed. 3.0 IEC 61000-6-3:2020-07 Ed. 3.0 IEC 61326-1:2020-10 Ed. 3.0 DIN EN 61326-1:2013-07 DIN EN 61326-1:2019-05 EN 300 330 V2.1.1
Device address 190 (1)* Number of supported devices 89 RS-485 Protocol Modbus RTU Operating mode Master Baud rate 19.2 kBit/s Parity even, odd, none (even)* Stop bits 1, 2, auto (1)* Alarm query interval 030 s (2 s)* Cable length < 1200 m Shielded cable, one end of shield connected to PE Recommended: CAT6/CAT7 min. AWG23 Alternative: J-Y(St)Y min. 2 x 0.8 Galvanic separation Yes Connection "RS-485 A", "RS-485 B" (see plug-in terminal)	Flexible with ferrule without plastic sleeve Flexible with ferrule with plastic sleeve 0.21.5 mm² For UL applications Use copper lines only. Minimum temperature range of the cable to be connected to the plug-in terminals 75 °C Environment/EMC EMC IEC 61000-6-2:2016-08 Ed. 3.0 IEC 61000-6-3:2020-07 Ed. 3.0 IEC 61326-1:2020-10 Ed. 3.0 DIN EN 61326-1:2013-07 DIN EN 61326-1:2019-05 EN 300 330 V2.1.1 ETSI EN 301 489-3 V2.3.0
Device address 190 (1)* Number of supported devices 89 RS-485 Protocol Modbus RTU Operating mode Master Baud rate 19.2 kBit/s Parity even, odd, none (even)* Stop bits 1, 2, auto (1)* Alarm query interval 030 s (2 s)* Cable length < 1200 m	Flexible with ferrule without plastic sleeve For UL applications Use copper lines only. Minimum temperature range of the cable to be connected to the plug-in terminals Fror UL applications Use copper lines only. Minimum temperature range of the cable to be connected to the plug-in terminals 75 °C Environment/EMC EMC IEC 61000-6-2:2016-08 Ed. 3.0 IEC 61306-1:2020-10 Ed. 3.0 IEC 61326-1:2020-10 Ed. 3.0 DIN EN 61326-1:2013-07 DIN EN 61326-1:2013-07 DIN EN 50364:2019-05 EN 300 330 V2.1.1 ETSI EN 301 489-3 V2.3.0 Operating temperature
Device address 190 (1)* Number of supported devices 89 RS-485 Protocol Modbus RTU Operating mode Master Baud rate 19.2 kBit/s Parity even, odd, none (even)* Stop bits 1, 2, auto (1)* Alarm query interval 030 s (2 s)* Cable length < 1200 m	Flexible with ferrule without plastic sleeve For UL applications Use copper lines only. Minimum temperature range of the cable to be connected to the plug-in terminals Fror UL applications Use copper lines only. Minimum temperature range of the cable to be connected to the plug-in terminals 75 °C Environment/EMC EMC IEC 61000-6-2:2016-08 Ed. 3.0 IEC 61306-1:2020-07 Ed. 3.0 IEC 61326-1:2020-10 Ed. 3.0 DIN EN 61326-1:2020-10 Ed. 3.0 DIN EN 61326-1:2013-07 DIN EN 6326-1:2013-07 DIN EN 50364:2019-05 EN 300 330 V2.1.1 ETSI EN 301 489-3 V2.3.0 Operating temperature -10+55 °C Operating temperature for UL applications -10+50 °C
Device address 190 (1)* Number of supported devices 89 RS-485 Protocol Modbus RTU Operating mode Master Baud rate 19.2 kBit/s Parity even, odd, none (even)* Stop bits 1, 2, auto (1)* Alarm query interval 030 s (2 s)* Cable length < 1200 m	Flexible with ferrule without plastic sleeve For UL applications Use copper lines only. Minimum temperature range of the cable to be connected to the plug-in terminals Fror UL applications Use copper lines only. Minimum temperature range of the cable to be connected to the plug-in terminals 75 °C Environment/EMC EMC IEC 61000-6-2:2016-08 Ed. 3.0 IEC 61306-6-3:2020-07 Ed. 3.0 IEC 61326-1:2020-10 Ed. 3.0 DIN EN 61326-1:2020-10 Ed. 3.0 DIN EN 61326-1:2013-07 DIN EN 6326-1:2013-07 DIN EN 50364:2019-05 EN 300 330 V2.1.1 ETSI EN 301 489-3 V2.3.0 Operating temperature

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

Operating mode	Continuous operation
Mounting position	Display-oriented
	adjustable horizontal/vertical display orientation
Degree of protection of front glass pane	IP66
Degree of protection of front for UL applications	IP50
Degree of protection of enclosure	IP20
Degree of protection mounted flush with wall	IP54
Flammability class	UL 94V-0
Device dimensions (W x D x H)	181 x 96 x 37.31 mm
Documentation number	D00425
Weight	< 420 c

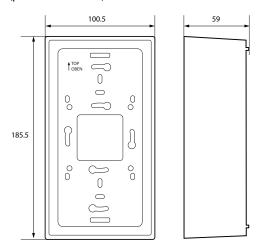
Dimension diagram CP305 (dimensions in mm)





Dimension diagram surface mounting (dimensions in mm)

Surface mounting requires use of the appropriate surfacemounting enclosure (part. no. B95100153).

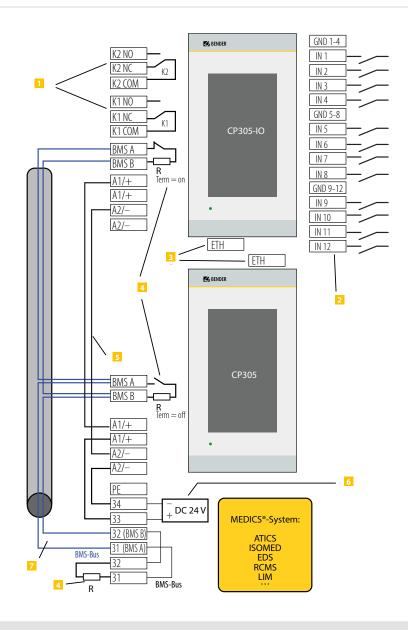


Any clearance between the surface-mounting enclosure and the wall must be compensated using washers. Never tighten the screws with a cordless screwdriver; only do so by hand. If this is disregarded, the surface-mounted housing can become warped.

 $\textbf{Dimension diagram cavity wall and panel mounting} \; (\texttt{dimensions in mm})$

55

Mounting kit required Cavity wall mounting Panel mounting B923711 B95101000 9...50 mm 2...50 mm



1 K...COM 2 Relay outputs

K...NC Parametrisable contacts for device errors, test of assigned de-K...NO vices*, device failure and common alarm message.

2 IN1...12 **Digital inputs** GND...

The digital inputs are divided into three groups of four, which are galvanically separated from each other and from the device. Each group has its own GND terminal for the reference

If the inputs are controlled via an external voltage, the common reference potential is connected to the "GND" terminal and the signal is connected to the respective input IN1...12.

3 ETH Ethernet interface for connection to a PC

The CP305 can be integrated into the Bender/hospital network via the Ethernet interface. Parameters can be set on the PC and data as well as the history memory can be read out. Connected measuring devices can be displayed with their channels.

4 R **Terminating resistor of RS-485 interface**

If two or more devices are connected to each other via RS-485, the bus line must be terminated at both ends with a resistor $(R = 120 \Omega)$ (can be switched on via dip switch on the underside of the CP305).



5 A1+/A2-

Supply voltage (both direct and alternating current) Adhere to the permissible cable lengths and cross sections when supplying the CP305 in the MEDICS® modules.

6 DC 24 V

Power supply unit (both direct and alternating current) in the MEDICS® module, sufficient for supplying power to up to two CP305 devices.

BMS A BMS B

BMS bus connection or Modbus-RTU bus connection Cable: Shielded, one end of shield connected to PE Recommended CAT6/CAT7 min. AWG23 Alternatively Cable, twisted pairs, J-Y(St)Y min. 2x0.8 Connect shield to PE on one side

Various Bender devices with a BMS bus interface. Examples: ATICS, isoMED427P, EDS151, RCMS..., CP9xx, ...

Various Bender devices with a Modbus-RTU bus interface. Examples: iso415, RCMS410, ...

* Devices without BMS bus connection, but with test input (e.g. ISOMETER®)

COMTRAXX® MK2430

Alarm indicator and test combination with LCD



Typical applications

- Visual and acoustic signalling of operating status and alarm messages
- Display of measured values and setting of limit values for monitoring purposes from BMS-capable Bender monitoring systems

Approvals



Device features

- Display of operating status, warning and alarm messages in accordance with DIN VDE 0100-710, IEC 60364-7-710 and other standards
- Backlit clear LC text display (4 x 20 characters)
- Predefined standard texts in 20 languages
- 200 freely programmable message texts
- · Bus technology for easy installation and reduced fire load
- · Acoustic alarm with mute function
- Parameter setting via menu (German/English)
- Suitable for flush and surface mounting
- · Easy commissioning due to predefined message texts
- 12 digital inputs/1 relay output (MK2430-11 only)
 History memory with real-time clock to store 250 warning and alarm messages
- MK2418 can easily be exchanged for MK2430/MK2007

Standards

The MK2430 alarm indicator and test combination meets the requirements for installation:

- DIN VDE 0100-710 (VDE 0100 Part 710)
- IEC 60364-7-710

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Digital inputs/ relay output	Enclosure	Enclosure included in the scope of delivery	Art. No.
MK2430-11	12/1	Flush manustics		B95100001
MK2430-12	-	Flush-mounting	~	B95100002
MK2430H-12	-	Flush-mounting, horizontal mounting	=	B95100024

Accessories

Type designation	Art. No.
Parameterisation software TMK-SET	as Internet download
MK2430-mounting kit, complete	B95101000
Flush-mounting enclosure	B923710
Cavity wall installation set for flushmounting enclosure	B923711
CPx05 surface-mounting enclosure	B95100153

Suitable system components

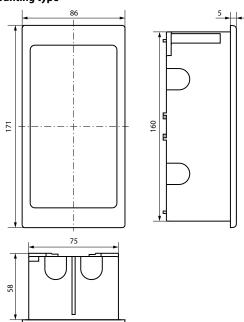
Description	Туре	Art. No.	Page
Dancar annuh mit	AN410	B924209	403
Power supply unit	AN450	B924201	405

Insulation coordination acc. to IEC 60664-1	Max. cable length in case of power supply of 1/2/3 MK24 from one AN410
Rated insulation voltage AC 250 V	0.28 mm² (e.q. J-Y(St)Y nx0.6) 300/150/100 m
Rated impulse withstand voltage/pollution degree 4 kV/3	0.5 mm² (e.g. J-Y(St)Y n x 0.8) 500 /250/150 n
	0.75 mm ² 750/375/250 n
Supply voltage	1.5 mm ² 1500/750/500 m
Supply voltage $U_{\rm S}$ AC/DC 24 V	2.5 mm ² 2500/1200/750 m
requency range $U_{\rm S}$ 0/4060 Hz	2.5 (1111)
perating range <i>U</i> _S AC 1828/DC 1830 V	Colours
Power consumption ≤ 3 VA	Front foil RAL 7035 (light grey); RAL 7040 (basalt grey
/oltage failure without reset ≤ 15 s	Marking RAL 5005 (ultramarine blue
<u> </u>	Front plate RAL 7035 (light grey
Displays and LEDs	
Display, characters four lines, 4 x 20 characters	Switching elements (MK243011 only)
standard message texts in 20 languages	Number 1 changeover contact
larm addresses configurable 150	Function programmable
Programmable text messages 200	Operation mode N/C or N/O operation (programmable
listory memory (messages) 250	Electrical endurance, number of cycles 1000
tandard text message 3 x 20 characters	Contact data acc. to IEC 60947-5-1
additional text message (press button to access) 3 x 20 characters	Utilisation category AC-13 / AC-14 / DC-1
NORMAL (green), WARNING (yellow), ALARM (red)	Rated operational voltage 24 V / 24 V / 24 V
Menu texts German/English	Rated operational current 5 A / 3 A / 1/24 V
Suttons 5 (Isometer test, buzzer mute, additional text, scroll, menu)	·
5 (ISSNEED REST, MALE)	Minimum contact rating 1 mA at AC/DC > 10
Buzzer	Environment/EMC
Buzzer message can be acknowledged, adoption of characteristics of new value operation	EMC immunity DIN EN 61000-6-2
Buzzer interval configurable	EMC emission DIN EN 61000-6-3
Buzzer frequency configurable	Operating temperature -5+55 °C
Buzzer repetition configurable	· • ·
(111/2422 44 1)	Classification of climatic conditions acc. to IEC 60721:
nputs (MK243011 only)	Stationary use 3K22
Digital inputs 12 (IN1IN12)	Transport 2K11
Galvanic separation yes	Long-term storage 1K22
Activation of the digital inputs via potential-free contacts/extraneous voltage	Classification of mechanical conditions acc. to IEC 60721:
Operating principle N/O or N/C operation individually selectable for each input	Stationary use 3M11
Factory setting N/O operation	Transport 2M4
Voltage range (high) AC/DC 1030 V	Long-term storage 1M12
Voltage range (low) AC/DC 02 V	
Cable recommended: J-Y(St)Y min. 2 x 0.8	Connection
Cable length ≤ 500 m	Connection pluggable screw terminal
	Connection properties (supply voltage, BMS bus):
nterfaces	Connection of single conductors
nterfaces RS-485 and USB (V2.0/V1.1)	riqid/flexible/conductor sizes 0.22.5/0.22.5 mm² (AWG 2412
Fechnical data for the RS-485 interface:	flexible with ferrule without/with plastic sleeve 0.252.5/0.252.5 mm
	Multi-conductor connection (2 conductors of the same cross section)
Protocol BMS	rigid/flexible 0.21/0.21.5 mm
Baud rate 9.6 kbit/s	flexible with ferrule without plastic sleeve 0.251 mm
Cable length ≤ 1200 m	flexible with TWIN ferrules with plastic sleeve 0.51.5 mm
Cable (twisted in pairs, one end of shield connected to PE) recommended: J-Y(St)Y min. 2 x 0.8	·
Terminating resistor $120 \Omega (0.25 \text{ W})$ connectable via DIP switch	Connection properties (inputs):
Device address, BMS bus 1150	Connection of single conductors
Factory setting device address 1 (master)	rigid/flexible/conductor sizes 0.081.5/0.081.5 mm² (AWG 2816
Programming	flexible with ferrule without/with plastic sleeve 0.251.5/0.250.5 mm
Programming DC 405 or UCD 7/2 0.0/4 1) UCD cobbs. Time A rive or time D rive	Multi-conductor connection (2 conductors with the same cross section):
nterfaces RS-485 or USB (V2.0/V1.1), USB cable: Type A plug on type B plug	rigid/flexible 0.080.5/0.080.75 mm
oftware TMK-SET V 4.0 or higher	flexible with ferrules without plastic sleeve 0.250.34 mm
actory setting password activated	flexible with TWIN ferrules with plastic sleeve 0.5 mm
Max. cable length in case of power supply of 1/2/3 MK24 from one AN450	Stripping length 7 mm
160/40/- m	Tightening torque 0.50.6 Nn
250/70/- m 250/70/- m	Othor
	Other
0.75 mm ² 400/100/- m	Operating mode continuous operation
.5 mm ² 800/210/10 m	Mounting display-oriented
2.5 mm ² 1300/360/20 m	Degree of protection (DIN EN 60529 IP50 (surface-mounting type: IP54)
	Degree of protection (DIN EN 60529) IP20
	Flammability class UL94V-0
	Documentation number D00129

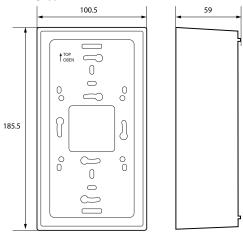
Weight

flush mounting \leq 210 g, surface mounting \leq 400 g

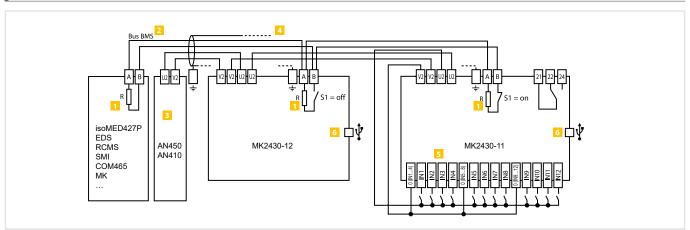
Flush-mounting type



Surface-mounting type



Wiring diagram



- 1 Terminating resistor BMS bus (120 Ω)
- Connection BMS bus
- Power supply unit incorporated in the MEDICS® module, sufficient for supplying power to maximum three MK2430
- Cable between MEDICS® module and MK2430 When the MK2430 is supplied by the AN410 or AN450 power supply unit in the MEDICS® modules, the permissible cable lengths and cable cross sections have to be considered.
- 5 Digital inputs
 - The digital inputs may be controlled either via potential-free contacts or via voltage signals. If you are using potential-free contacts, the voltage can be drawn from the AN410 or AN450 (3).
 - When the inputs are activated via an external voltage, the common 0(-) is connected to terminal 0 and the 1(+)-signal is connected to the respective input IN1...IN12. In this case, the connections between the terminals 0 and V2 and the common connections and U2 $\,$ are not required.
- USB connection for programming purposes

Visualisation



Typical applications

• Visualisation of Bender systems

Device features

- · Graphical representation on a screen showing the design and status of Bender systems, e.g. in the form of an outline view or a circuit diagram
- Localising and identifying faults easier and faster
- Display of operating messages, alarm messages and currently measured values
- Displaying and analysing historical data
- · Viewing and operating from remote computers
- · Display and operation via the gateway COM465IP option D by means of a browser and a personal computer in the network.
- Individually programmed visualisation on a touch panel PC or a PC

Our service range:

Bender offers you the following solution package:

- Bender gateway to connect your Bender system to a computer
- Touch panel computer and/or computer with monitor for displaying the visualisation solution
- $\bullet \ \ Customer-specific \ programming \ of the \ visualisation \ solution \ using \ a \ high-performance \ software$
- $\bullet\,$ On-site setting and testing of the visualisation

Your advantages:

- · Continuous overview of the system at any place
- Faults can be detected easily and hence remedied faster
- Correlations can be recognised and faults can be avoided in the future

Further information

For further information refer to our product range on www.bender.de.

ATICS®, the worldwide safest and most compact all-in-one changeover and monitoring device

for safety-relevant and medical locations

Safe

Functional safety SIL2 according to IEC 61508

guarantees protection against malfunction hazards

Continuous self monitoring

of electronic system and circuit paths with automatic notification

Preventive safety

by automatic reminders for prescribed tests

Maximum reliability during changeover

- Patented changeover system with mechanical and electrical interlock
- Weld-free switching contacts with circuit breaker mechanism
- Insensitive to voltage fluctuations or shocks, for example, due to stable operating position and constant contact pressure
- Monitoring for short circuits

Easy-to-use

Easy to operate and perfect overview

due to clear menu structure and user guidance

Correct information at the correct time

due to clear messages via an illuminated graphic display and via bus

Safe manual changeover during service

due to integrated manual/automatic mode with mechanical restart interlock

Complete documentation of events

- Changeover procedures
- Testing
- Parameter changes

External functional test or replacement without service interruption

by optional bypass switch

Compact

Compact design

of electronic system and switching elements in one enclosure

Changeover, IT system monitoring and locating current injector in one device

Simple wiring

due to integrated design

Completely pluggable

Efficient

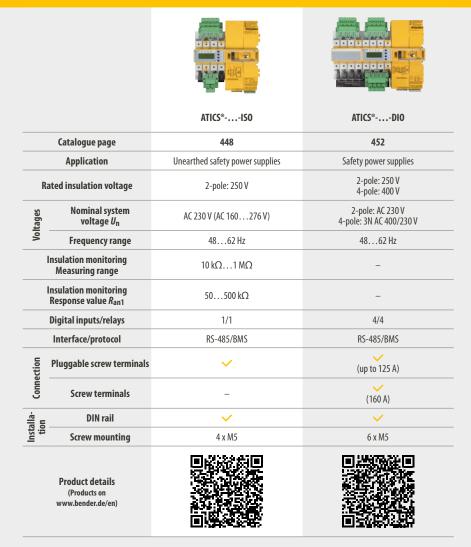
Small space required

Tests according to the regulations without interruption of the po-

Easy integration into existing installations



Device overview ATICS® switchover and monitoring devices



ATICS®-...-ISO

Automatic transfer switching devices with monitoring function for unearthed safety power supplies



Typical applications

- Design of safety power supplies in group 2 medical locations, e.g.
 - intensive care unit
 - operating theatres
- Retrofit

Approvals



Device features

Perfectly suitable for space-saving installation/retrofitting

- · Compact device for easy setup of safety power supplies with functional safety in accordance with DIN EN 61508 (SIL 2) e.g. for group 2 medical locations in compliance with DIN VDE 0100-710 (VDE 0100-710)/IEC 60364-7-710
- · Increased safety and availability by integrating changeover and IT system monitoring in one compact device
- · All-in-one: Integration of switch disconnector, control and monitoring electronics for unearthed safety power supplies
- · Solutions for any application

Convenient installation and commissioning

Saves time and money

Safe operation

- · Robust switch disconnector contacts
- · Mechanical locking
- · Manual operation directly on the device
- Functional safety SIL 2
- Certification by TÜV SÜD in accordance with EN 61508 (VDE 0803) SIL 2 and DIN VDE 0100-710 (VDE 0100-710)

Uninterrupted maintenance

- · Plug connectors and optional bypass switch
- · Excellent communication and parameterisation options

Standards

The transfer switching device conforms to the following standards:

- DIN VDE 0100-710 (VDE 0100-710)*
- DIN VDE 0100-718 (VDE 0100-718)
- ÖVE/ÖNORM E 8007
- IEC 60364-7-710*
- DIN EN 61508-1 (VDE 0803-1)*
- IEC 61508-1 (2010-04) Ed. 2.0*
- DIN EN 61508-2 (VDE 0803-2)*
- IEC 61508-2 (2010-04) Ed. 2.0*
- DIN EN 61508-3 (VDE 0803-3)* • IEC 61508-3 (2010-04) Ed. 2.0*
- DIN EN 60947-6-1 (VDE 0660-114)
- IEC 60947-6-1 (2013-12) Ed. 2.1
- DIN EN 61557-8 (VDE 0413-8)

Standard-compliant isolating transformer monitoring according to:

- DIN EN 61558-1 (VDE 0570-1)
- DIN EN 61558-1/A1 (VDE 0570-1/A1)

The standards marked with * were part of the test conducted by TÜV Süd.

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Rated operational current I _e	Rated operational voltage <i>U</i> e	Art. No.
ATICS-2-63A-ISO		AC 240 V	B92057202
ATICS-2-63A-ISO-ES*	AC 63 A	AC 240 V	B92057206
ATICS-2-63A-ISO-400		AC 415 V	B92057204
ATICS-2-80A-ISO		AC 240 V	B92057203
ATICS-2-80A-ISO-ES*	AC 80 A	AC 240 V	B92057207
ATICS-2-80A-ISO-400		AC 415 V	B92057205

^{*} with connection option for ATICS-ES energy storage device.

Description	Rated operational current /e	Туре	Art. No.
Dungan guritada kita	AC 63 A	ATICS-BP-2-63A-SET	B92057252
Bypass switch kit	AC 80 A	ATICS-BP-2-80A-SET	B92057253
Energy storage for ATICS®	-	ATICS-ES*	B92057255

^{*} ATICS-ES may only be used in combination with the following ATICS® transfer switching devices: B92057206, B92057207.

Suitable system components

Description	Туре	Art. No.	Page
Insulation fault locator	EDS151	B91080101	158
Alarm indicator and operator panel	СР	B950610	434
Alarm indicator and test combination	CP305	В	437
Alariii iliulcator alid test compination	MK2430	B951000	441

Technical data

Insulation coordination acc. to IEC 606	
Overvoltage category	<u> </u>
Pollution degree outside, inside	2701
Rated insulation voltage	250 \
Protective separation between	line 1 – line 2; line 1, 2, 3 – RS-485
Voltage test according to IEC 61010-1 (basic insu	line 1, 2, 3 – digital inputs; line 1, 2, 3 – relay outputs lation/protective separation) 2.21 kV/3.54 kV
voltage lest according to IEC 6 10 10-1 (basic list	ulation/protective separation) 2.21 kV/5.54 kV
Supply voltage	
Supply voltage $U_{\rm S}$	230 V (50/60 Hz
Power consumption at 63 A	≤ 16 W
Power consumption at 80 A	≤ 28 W
Current during changeover process	17 A / < 30 ms
Power section/switching elements	
Nominal system voltage $U_{\rm D}$	refer to ordering detail:
Frequency range f_0	4862 Hz
Crest factor	< 1.2
Number of switching cycles (mechanical)	> 8000
Short circuit currents	refer to the manual, table "Short circuit currents"
Short circuit current I_{cc} and fuses	reter to the manaay table short entart currents
===	e manual, table "Utilisation category acc. to DIN EN 60947"
Voltage monitoring/changeover	
Frequency range f_n	4070 Hz
Undervoltage response value (Alarm 1)	160207 V (1-V steps
Overvoltage response value (Alarm 2)	240275 V (1-V steps
Response delay ton	50 ms100 s (resolution of setting starting 50 ms
Delay on release toff	200 ms100 s (resolution of setting starting 50 ms)
Hysteresis	210 % (1-% steps)
Frequency measurement	4070 Hz (resolution 0.1 Hz)
Display range measured value	20300 \
Operating uncertainty	±1 %
Change over period	t <500 ms100
Current monitoring (output current)	
Measuring current transformers	STW3, STW4
Measuring range In (TRMS)	STW3: 0> 150 A, STW4: 0> 260 A
Response value for short-circuit detection ATICS-	-ISO (versions 63 A and 80 A) with STW3 130 A
Crest factor	min. 2
Hysteresis for short-circuit alarm	5 %
Cable length:	
Single wire ≥ 0.75 mm²	01 m
Single wire, twisted ≥ 0.75 mm²	110 m
Shielded cable	1040 m
Cable: twisted pairs, shield to terminal 1 at	one end, must not be earthed
	recommended: J-Y(St)Y min. n x 2 x 0.8

_		
T	system	monitoring

Nominal system voltage (operating range)	230 V 50/60 Hz (80275 V)
Measuring range	10 kΩ1 MΩ
Measurement method	AMP (adaptive measuring pulse)
Response value R _{an1} (ALARM 1)	50250 kΩ
Relative uncertainty	±15 %
Hysteresis	≤ 25 %
Response time t_{an} at $R_F = 0.5 \text{ x } R_{an}$ and $C_e = 1 \mu F$	≤ 5 s
Measuring voltage U _m	DC 12 V
Measuring current $I_{\rm m}$ (at $R_{\rm F} = 0 \Omega$)	≤ 53 μA
Internal resistance Ri	≥ 240 kΩ
Impedance Z _i	≥ 220 kΩ
Internal resistance/impedance during test	≥ 100 kΩ
Permissible extraneous DC voltage $U_{\rm fg}$	≤ DC 370 V
Permissible system leakage capacitance Ce	≤ 5 µF
Automatic self test	every hour
Response time for loss of earth connection as well as loss of	f network connection maximum 1 hour

Load current monitoring (IT system transformer)

Measuring current transformers	STW2, STW3, SWL-100 A
Measuring range /L (TRMS)	10110 % of the response value
Adjustable response value (STW2, STW3, SWL-100A)	5(50) 100 A (1-A steps)
Relative uncertainty	±5 %
Crest factor	≤ 2
Response time	<1s
Response delay ton	0100 s (step-by-step in 1-s steps)
Delay on release toff	0100 s (step-by-step in 1-s steps)
Hysteresis	530 %
Response time CT connection monitoring approx. 1 h	(or immediately in case of "TEST Isometer")

Cable length:

Single wire ≥ 0.75 mm ²	01 m
Single wire, twisted ≥ 0.75 mm ²	110 m
Shielded cable 0.5 mm ²	1040 m
Cable: twisted pairs, shield to terminal 1 at one end, must not be earthed	

recommended: J-Y(St)Y min. n x 2 x 0.8

Temperature monitoring (IT system transformer)

4 kΩ
±10 %
1.6 kΩ
≤ 2 s
max. 6 in series

Insulation fault location

Test current I _T	< 1 mA
Test cycle/pause	2/4 9

Technical data (continued)

Displays and data memory	
Display: graphic display	languages DE, EN, FR, PL
Alarm LEDs	line 1, line 2, alarm, com
History memory	500 data records
Data logger	500 data records/channe
Config. logger	300 data records
Test logger	100 data records
Service logger	100 data records
Input	
Digital inputs	1
Galvanic separation	yes
Control	via potential-free contacts
Mode of operation	active at 0 V (low) or 24 V (high), adjustable
Voltage range high/low	AC/DC 1030 V/AC/DC 00.5 \
Adjustable function	switching back interlocking function, manual/automatic mode
	bypass operation, function test, changeover of the preferred line
	alarm input for operating theatre lights, alarm input for other device
Output	
Switching element	1 potential-free changeover contact
Mode of operation adjustable N/O or N/C ope	
Adjustable function	refer to the manual, settings menu 5: "Relay'
Electrical endurance under rated of	operating conditions, number of cycles 10 000
Contact data according to IEC	61810
Rated operational current AC (resi	istive load, $\cos \phi$ =1) 5 A / AC 250 V
Rated operational current DC	5 A / DC 30 V
Overvoltage category	II
Minimum contact rating	10 mA at DC > 5 \
BMS interface	
Interface/protocol	RS-485 / BMS
Baud rate	9.6 kbit/
Cable length	≤ 1200 m
Cable: shield connected to PE	recommended: CAT6/CAT7 min. AWG23
alternatively	twisted pairs, shielded, shield connected to PE on one side
	J-Y(St)Y min. n x 2 x 0.8
Terminating resistor	120 Ω (0.25 W
Device address, BMS bus	290
Environment/EMC	
EMC	EN 61326 (see CE declaration)

Dimension diagram (dimensions in mm)

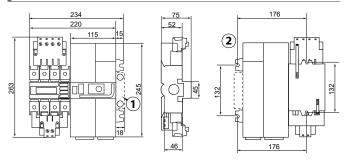
Classification of climatic conditions acc. to IEC 60721:

Operating temperature

Stationary use (IEC 60721-3-3)

Long-term storage (IEC 60721-3-1)

Transport (IEC 60721-3-2)





1	Additional space required for auxiliary contact when using the bypass switch	
2	Rear view (dimensions for screw mounting on mounting plate)	
3	Cutout for terminal cover	

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

Terminals

Power section		
Connection directly on ATICS®, for plug connections	screw-type terminals	
rigid (flexible) / conductor sizes	1070 mm ² (650 m	m ²) / 8 (10) 0 AWG
Stripping length		15 mm
Tightening torque (hexagon socket 4 mm)		5 Nm
Connection type	pluggable	screw-type terminals
Conductor cross section, rigid min/max		1.5 mm ² / 35 mm ²
Conductor cross section, flexible min/max		1.5 mm ² / 25 mm ²
Conductor cross section AWG/min/max		20/2
Stripping length (do not use ferrules)		20 mm
Tightening torque (Torx® screwdriver T20 or slotted screwdriver 6.5 x 1.2 mm)		2.5 Nm (≤ 25 mm ²)
		$4.5 \text{ Nm } (\geq 25 \text{ mm}^2)$
Torque setting for manual operation (Allen 5 mm)		approx. 6 Nm

Electronics

Connection	screw-type terminals	
rigid/flexible / conductor sizes	0.141.5 mm ² / 2816 AWG	
Stripping length	7 mm	
Tightening torque (slotted screws, screwdriver 2.5 x 0.4 mm)	0.220.25 Nm	

Other

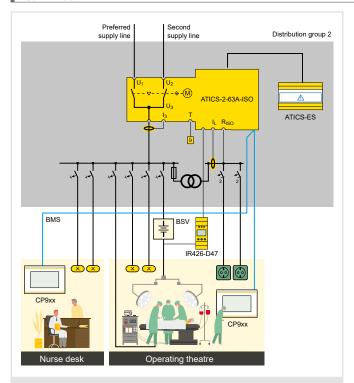
-25...+55 °C

3K22

2K11

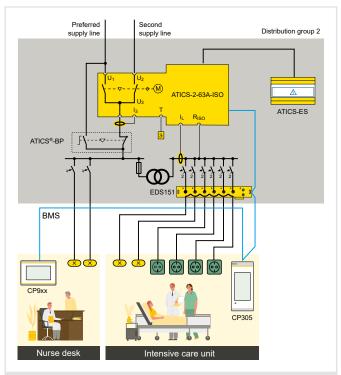
1K22

- Curci	
Operating mode	continuous operation
Mounting	display-oriented
Operating altitude up to a maximum of	2000 m AMSL
Protection class	Class I
Protection class LCD under foil (DIN EN 60529)	IP40
Enclosure material	polycarbonate
Flammability class	UL94V-0
DIN rail mounting	acc. to IEC 60715
Screw mounting	4 x M5
Dimensions incl. terminals (W x H x D)	234 x 270 x 73
Documentation number	D00046
Weight	approx. 3400 g



Application example operating theatre

- ATICS®-2-63A-ISO: Changeover between the preferred and the redundant line while monitoring the medical IT system with transformer load and temperature monitoring
- IR426-D47: Monitoring of the operating theatre light IT system (optional)
- MK.../CP...: Alarm at at least two points with independent power supplies for functional safety
- ATICS-ES: Energy storage (B92057206, B92057207 only)



Example intensive care unit

- ATICS®-2-63A-ISO: Changeover between the preferred and the redundant line while monitoring the medical IT system with transformer load and temperature monitoring
- EDS151: Insulation fault locator or fast insulation fault localisation (recommended)
- ATICS®-BP: Bypass switch for uninterrupted test/maintenance (recommended)
- MK.../CP...: Alarm at at least two points with independent power supplies for functional safety
- ATICS-ES: Energy storage (B92057206, B92057207 only)

Automatic transfer switching devices for safety power supplies



Typical applications

- · Design of safety power supplies, e.g. for
 - main distribution boards
 - computing centres
 - industry
- Retrofit

Approvals



Device features

Perfectly suitable for space-saving installation/retrofitting

- · Compact device for designing safety power supplies with functional safety more easily, in accordance with $DIN\,VDE\,\,61508\,(SIL\,\,2), in computing\,\,centres, industry, or in\,\,group\,\,2\,\,medical\,\,locations\,\,in\,\,accordance\,\,with$ DIN VDE 0100-710 (VDE 0100-710)/IEC 60364-7-710
- · All-in-one: Integration of switch disconnector and control electronics
- Compact design
- · Solutions for any application

Convenient installation and commissioning

· Saves time and money

Safe operation

- · Switch disconnector contacts of robust design
- · Mechanical locking
- · Manual operation directly on the device
- · Functional safety SIL 2
- Certification by TÜV SÜD

Uninterrupted maintenance

- Plug connectors and optional bypass switch
- · Excellent communication and parameterisation options

Standards

The transfer switching device conforms to the following standards:

- DIN VDE 0100-710 (VDE 0100 Part 710)*
- DIN VDE 0100-718 (VDE 0100-718)
- ÖVE/ÖNORM E 8007
- IEC 60364-7-710*
- DIN EN 61508-1 (VDE 0803-1)*
- IEC 61508-1 (2010-04) Ed. 2.0*
- DIN EN 61508-2 (VDE 0803-2)*
- IEC 61508-2 (2010-04) Ed. 2.0*
- DIN EN 61508-3 (VDE 0803-3)*
- IEC 61508-3 (2010-04) Ed. 2.0*
- DIN EN 60947-6-1 (VDE 0660-114) • IEC 60947-6-1 (2013-12) Ed. 2.1

Standard-compliant isolating transformer monitoring according to:

- DIN EN 61558-1 (VDE 0570-1)
- DIN EN 61558-1/A1 (VDE 0570-1/A1)

The standards marked with * were part of the test conducted by TÜV Süd.

Further information

For further information refer to our product range on www.bender.de.

Ordering information ATICS®...-DIO 2-pole

Туре	Version	Rated operational current Ie	Scope of delivery	Art. No.
ATICS-2-63A-DIO	2-pole	AC 63 A	1 x STW3, bridge, connectors, terminal cover	B92057212
ATICS-2-80A-DIO	- 2-poie	AC 80 A	1 x STW3, bridge, connectors, terminal cover	B92057213
ATICS-BP-2-63A-SET	Dumana muitah aat	AC 63 A	Bridge, terminal cover, auxiliary contacts, LEDs green/red	B92057252
ATICS-BP-2-80A-SET	Bypass switch set	AC 80 A	Bridge, terminal cover, auxiliary contacts, LEDs green/red	B92057253

Туре	Version	Rated operational current I _e	Scope of delivery	Art. No.
ATICS-4-80A-DIO		AC 80 A	4 x STW3, bridge, connectors, terminal cover	B92057222
ATICS-4-125A-DIO	4-pole	AC 125 A	4 x STW4, bridge, connectors, terminal cover	B92057223
ATICS-4-160A-DIO		AC 160 A	4 x STW4, bridge, terminal cover	B92057224
ATICS-BP-4-80A-SET		AC 80 A	Bridge, terminal cover, auxiliary contacts, LEDs green/red	B92057260
ATICS-BP-4-125A-SET	Bypass switch set	AC 125 A	Bridge, terminal cover, auxiliary contacts, LEDs green/red	B92057262
ATICS-BP-4-160A-SET		AC 160 A	Bridge, terminal cover, auxiliary contacts, LEDs green/red	B92057264

Suitable system components

Description	Туре	Art. No.	Page
Alarm indicator and operator panel	СР	B950610	431
AL . 1	CP305	В	437
Alarm indicator and test combination	MK2430	B951000	441

Technical data

Overvoltage category	III
Pollution degree outside, inside	2
Rated insulation voltage ATICS-2-DIO/ATICS-	4-DIO 250 V/400 V
Protective separation between	Line 1 – Line 2; Line 1, 2, 3 – RS-485
	Line 1, 2, 3 – digital inputs; Line 1, 2, 3 – relay outputs

Voltage test according to IEC 61010-1 (basic insulation/protective separation)

2.21 kV/3.54 kV

Supply	voltage

Supply voltage	
Supply voltage $U_{\rm S}$	230 V (50/60 Hz)
Power consumption ATICS-2-63A-DIO	≤ 16 W
Power consumption ATICS-2-80A-DIO	≤ 23 W
Power consumption ATICS-4-80A-DIO	≤ 39 W
Power consumption ATICS-4-125A-DIO	≤ 87 W
Power consumption ATICS-4-160A-DIO	≤ 119 W
Current during the changeover process	17 A/< 30 ms

Power section/switching elements

Rated operational voltage Ue ATICS-2-DIO / ATICS-4-DIO	AC 240 V/3NAC 415 V
Frequency range f _n	4862 Hz
Crest factor	≤ 1.2
Number of switching cycles (mechanical)	≥ 8000
Short-circuit currents	see table "Short-circuit currents" in manual
Short-circuit current I_{cc} and fuses	

refer to table "Utilisation category acc. to DIN EN 60947" in manual

Voltage monitoring/changeover

4070 Hz
160207 V (1-V steps)
240275 V (1-V steps)
50 ms100 s (resolution of setting starting 50 ms)
200 ms100 s (resolution of setting starting 50 ms)
210 % (1-% steps)
4070 Hz (resolution 0.1 Hz)
20276 V
20520 V
±1%
t < 500 ms100 s

Current monitoring (output current)

current monitoring (output current)	
Measuring current transformers	STW3, STW4
Measuring range In (TRMS)	STW3: 0> 150 A, STW4: 0> 260 A
Response value for short-circuit detection ATICS-DIO	
(versions 63 A and 80 A) with STW3	130 A
(versions 125 A and 160 A) with STW4	250 A
Crest factor	min. 2
Hysteresis for short-circuit alarm	5 %

Cable length:

Single wire $\geq 0.75 \text{ mm}^2$	01 m
Single wire, twisted $\geq 0.75 \text{ mm}^2$	110 m
Shielded cable	1040 m

Cable: twisted pairs, shield to terminal I at one end, must not be earthed

recommended: J-Y(St)Y min. n x 2 x 0.8

Displays and data memory

Display: graphic display	languages DE, EN, FR, PL	
Alarm LEDs	Line 1, Line 2, Alarm, Cor	
History memory	500 data records	
Data logger	500 data records/channel	
Config. logger	300 data records	
Test data logger	100 data records	
Service logger	100 data records	

Input

Digital inputs	4
Galvanic separation	yes
Control	via potential-free contacts
Mode of operation	active at 0 V (low) or 24 V (high), adjustable
Voltage range high/low	AC/DC 1030 V/AC/DC 00.5 V
Adjustable function	switching back interlocking function, manual/automatic mode,
	bypass mode, functional test, changeover to the preferred line
	alarm input for operating theatre lights, alarm input for other devices

Relay output 1

Switching element	1 potential-free changeover contact
Mode of operation adjustable	N/O or N/C operation
Adjustable function	see "Settings menu 4: Relay" in manual
Electrical endurance under rated operating conditions, num	nber of cycles 10,000

Contact data according to IEC 61810

Rated operational current AC (resistive load, $\cos \phi = 1$)	5 A/AC 250 V
Rated operational current DC	5 A/DC 30 V
Overvoltage category	III
Minimum contact rating	10 mA at DC > 5 V

Relay outputs 2...4

Switching element	1 potential-free N/O contact
Mode of operation adjustable	N/O or N/C operation
Adjustable function	see "Settings menu 4: Relay" in manual
Electrical endurance under rated operating con	ditions, number of cycles 80,000

Contact data according to IEC 61810

Rated operational current AC (resistive load, $\cos \phi = 1$)	5 A/AC 150 V
Rated operational current DC	5 A/DC 30 V
Overvoltage category	III
Minimum switching capacity	120 mW

Technical data (continued)

RS-485/BMS
9.6 kbit/s
≤ 1200 m
CAT6/CAT7 min. AWG23
onnected to PE J-Y(St)Y min. 2x0.8
120 Ω (0.25 W)
290
EN 61326 (see CE declaration)
-25+55 ℃
3K22
2K11
1K22
3M11

T۸	rm	in	٦.	-	

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Da	MAP	section

Transport (IEC 60721-3-2)

Long-term storage (IEC 60721-3-1)

screw-type terminals rigid (flexible)/conductor sizes 10...95 mm² (6...70 mm²)/8 (10)...000 (00) AWG Stripping length 15 mm Tightening torque (hexagon socket 4 mm) 5 Nm Connection type (up to 125 A) pluggable screw terminals Conductor cross section, rigid min /max

 Connection type (up to 125 A)
 pluggable screw terminals

 Conductor cross section, rigid min./max
 1.5/35 mm²

 Conductor cross section, flexible min./max.
 1.5/25 mm²

 Conductor cross section AWG/min./max
 16/2

 Stripping length (without ferrules)
 20 mm

 Tightening torque (Torx* screwdriver T20 or slotted screwdriver 6.5 x 1.2 mm)

2.5 Nm (≤ 25 mm²) 4.5 Nm (≥ 25 mm²)

Torque setting for manual operation (Allen 5 mm)

Connection directly on ATICS®, for plug connections and connection of 160 A version

Electronics

Connection	pluggable screw-type terminalsterminals
rigid/flexible/conductor sizes	0.141.5 mm ² /2816 AWG
Stripping length	7 mm
Tightening torque (slotted screws, screwdriver 2.5 x 0.4 mn	n) 0.220.25 Nm

Other |

2M4

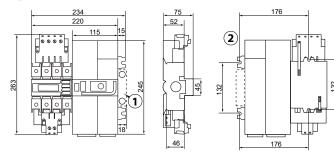
1M12

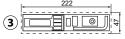
approx. 6 Nm

Other	
Operating mode	continuous operation
Mounting	display-oriented
For use at altitudes	up to 2000 m AMSL
Protection class	Class I
Protection class LCD under foil (DIN EN 60529)	IP40
Enclosure material	polycarbonate
Flammability class	UL94V-0
Mounting	DIN rail acc. to IEC 60715
Screw mounting	4 x M5
Dimensions incl. terminals (W x H x D)	234 x 270 x 73
Documentation number	D00080
Weight	
ATICS-2-DIO	approx. 3400 g
ATICS-4-DIO	approx. 4800 g

Dimension diagrams (dimensions in mm)

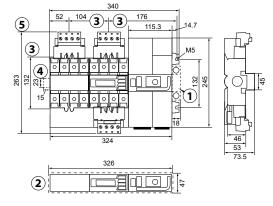
2-pole



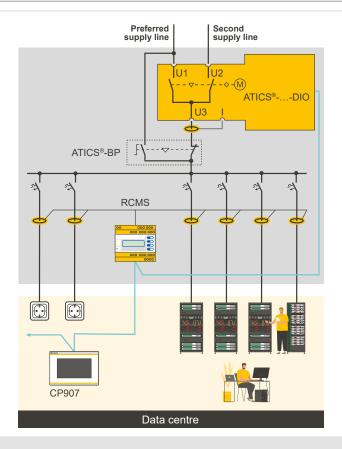


1	Additional space required for auxiliary contact when using the bypass switch
2	Rear view (dimensions for screw mounting on mounting plate)
3	Cutout for terminal cover

4-pole



1	Additional space required for auxiliary contact when using the bypass switch
2	Cutout for terminal cover
3	Dimensions for screw mounting on mounting plate
4	Additional space required for the connector plug of the measuring current transformer
5	80 A / 125 A version; 160 A version without plug connector



Example application data centre

- ATICS-2-63A-DIO: Changeover between preferred and redundant line
 MK.../CP...: Alarm at at least two points with independent power supplies for functional safety
- $\bullet \ RCMS: RCMS460 \ or \ RCMS490 \ residual \ current \ monitors for localising \ residual \ and \ operating \ currents \ in \ TT \ and \ TN-S \ systems$

Safety Analyser

For over 30 years, the "Bender Tester" has been a wellknown term for quality and long service life in the area of fully automated electrical safety testers. "UNIMET®" became the brand name.

UNIMET® – compact design – "Made in Germany", the user-friendly one among the safety analysers.

Device overview UNIMET® test systems



¹⁾ Medical electrical equipment without patient connections

UNIMET® 300ST

Test system for electrical equipment and electric hospital and care beds



Device features

- · Easy operation and handling
- · Automatic and manual test procedure
- Data input via keyboard or barcode scanner
- · Visual inspection, functional testing and electrical testing
- 600 data records can be stored
- Data exchange and storage via UNIData 300
- Compatible with common application programs such as visual FM, MT Data and Fundamed

Typical applications

• Safe tests of electrical equipment, hospital and healthcare beds as well as medical electrical equipment without patient connections.

Standards

The UNIMET® 300ST series tests are carried out in accordance with the requirements of the device standards:

- IEC 62353
- DIN EN 62353 (VDE 0751-1)
- ÖVE/ÖNORM EN 62353
- DIN VDE 0701-0702
- ÖVE E8701-1

Approvals



Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Supply voltage <i>U</i> ₅	Version	Art. No
UNIMET®300ST	AC 220 V	Standard	B96023000
UNIMET®300ST	AC 230 V	СН	B96023001

Suitable system components

Description	Variant	Туре	Art No.	Page
	German Schuko	VK701-6	B96020067	-
Adapter	Non-heating appliances	VK701-7	B96020066	-
	Adapter kit 16 A for DS32A	VK701-8	B96020097	_
Interface cable	-	RS-232/RS-232	B96012012	_
Test probe	-	Testprobe	B928748	-
Test terminal	-	Testterminal	B928741	-
Barcode scanner	-	PS/2	B96020082	-
Converter	-	USB1.1RS-232converter	B96020086	-
Flex keyboard	-	Flexkeyboard	B96020093	_
		DS32A	B96020098	473
Three-phase adapter	-	DS32A (CH/CH)	B96020110	473
		DS32DCT	B96020100	_

Technical data

Supply voltage	AC 230 V ± 10 %)
Frequency range	4565 Hz
Power consumption	max. 50 VA
Maximum load current	16 A
Max. connectable load at 230 V	3700 VA
Protection class	II
Ambient temperature	050°C
Storage temperature	-10+70°C
Degree of protection	IP20

Testina	۸f	DE	rocicta	nco
resuma	oı	rc	resista	nce

Test voltage	approx. 5 V, system frequency
Short-circuit current	> 2 A
Measuring range	0.00129.999 Ω
Measuring accuracy	$0.0011.0~\Omega$: $\pm 2.5~\%$ of MV ± 2 digits
	1.00129.999 Ω : ± 5 % of MV ± 2 digits

Leakage current, differential measurement method

Measuring range	0.0219.99 mA
Measuring accuracy	\pm 5 % of MV \pm 5 digits

Leakage current, direct measurement

Measuring range	0,00119,999 mA
Measuring accuracy	0,00119,999 mA: ±5 % of MV ±2 digits

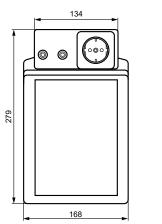
Equipment leakage current -Alternative method

Measuring range	0.00119.999 mA
Measuring accuracy 0,001	0,0019,999 mA: ± 5 % of MV ± 2 digits
	$10,00019,999 \text{ mA: } \pm 7 \% \text{ of MV } \pm 2 \text{ digits}$
Test voltage (Equipment leakage curr	ent meacurement — alternative method)

approx. system voltage, system frequency

max. 3.5 mA Test current

Dimension diagram (dimensions in mm)





Insulation resistance	
Test voltage	approx. DC 500 V
Max. test current	2.5 mA
Measuring range	0.01199.99 MΩ
Measuring accuracy	$0.0199.99~M\Omega$: $\pm 5~\%$ of MV ± 2 digits
	100.00199.99 M Ω : \pm 10 % of MV \pm 2 digits
Load current measurement	
Measuring range	0.01 A to 16 A
Measuring accuracy	± 2.5 % of MV, ± 3 digits
Voltage measurement	
Measuring range	90264 V
Measuring accuracy	±2.5 % of MV, ±2 digits
Apparent power	
Measuring range	53700 VA
Measuring accuracy	\pm 5 % of MV, \pm 5 digits
Other	
Dimensions (without bag)	ca. 168 x 272 x 124 mm (W x D x H)
Weight (without accessories or bag)	approx. 2.2 kg
Calibration interval	36 months
Documentation number	D00135

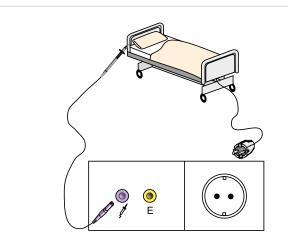
Documentation number of MV = of measured value



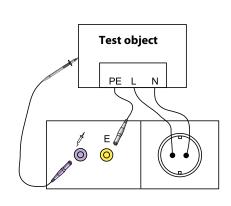


- Function buttons
- Backlit LCD for displaying the user menu and the measurement results. Four lines of 20 characters each.
- Permanently attached power cable for connection to the supply voltage.
- 4 Sockets
 - violet: Connection for test probe for testing exposed parts of the device under test.
 - yellow (E): for a second test lead when the low-resistance continuity of the PE conductor is to be measured between two points (e.g., on single-phase, permanently connected devices or extension cables).
- 5 Test socket: This is where the DUT's power supply cable is plugged in
- Durable plastic enclosure, with pushbuttons for safe storage in the carrying bag.
- Power switch with thermo-magnetic circuit breaker
- 8 Interfaces
 - 9-pole RS-232 interface, galvanically isolated, for connection to a personal computer
 - Centronics interface for connection to a printer
 - PS/2 port for connection to an external standard keyboard and a barcode reading wand or scanner.

Wiring diagrams

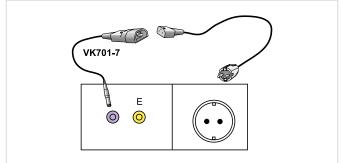


Connection of hospital and care beds and electrical equipment with plug-in connector.



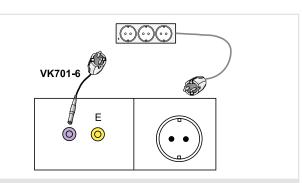
For connecting single-phase permanently installed equipment to the test system

- Disconnect the device
- Disconnect the connection to the supply voltage



Testing of extension cables

- Connection of connecting and extension cords



Testing of extension cables

- Connection of connecting and extension cords

UNIMET® 400ST

Test system for medical electrical equipment, electrical hospital and care beds and electrical equipment



Typical applications

• Safe testing of medical electrical equipment with patient connections, hospital and care beds and electrical equipment.

Approvals



Device features

- · Easy operation and handling
- · Automatic and manual test procedure
- Data input via keyboard or barcode scanner
- · Visual inspection, functional testing and electrical testing
- · 4mm socket for testing applied parts
- 600 data records can be stored
- Data exchange and storage via UNIData 300/400
- Compatible with common application programs such as visual FM, MT Data and Fundamed

Standards

The UNIMET® 400ST series carries out tests in accordance with the requirements of the device standards:

- IEC 62353
- DIN EN 62353 (VDE 0751-1)
- ÖVE/ÖNORM EN 62353
- DIN VDE 0701-0702
- ÖVE E8701-1

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Supply voltage <i>U</i> ₅	Version	Art. No.
UNIMET®400ST	AC 230 V	Standard	B96024000
UNIMET®400ST	AC 230 V	СН	B96024001

Suitable system components

Description	Variant	Туре	Art. No.	Page
PatBox	-	PatBox	B96020096	-
	German Schuko	VK701-6	B96020067	-
Adapter	Non-heating appliances	VK701-7	B96020066	-
	Adapter kit 16 A for DS32A	VK701-8	B96020097	-
Interface cable	-	RS-232/RS-232	B96012012	-
Test probe	-	Testprobe	B928748	-
Test terminal	=	Testterminal	B928741	_
Barcode scanner	-	PS/2	B96020082	_
Converter	-	USB1.1RS-232converter	B96020086	-
Flex keyboard	-	Flexkeyboard	B96020093	_
		DS32A	B96020098	473
Three-phase adapter	-	DS32A (CH/CH)	B96020110	473
		DS32DCT	B96020100	-

Technical data

Supply voltage	AC 230 V \pm 10 %)
Frequency range	4565 Hz
Power consumption	max. 50 VA
Maximum load current	16 A
Max. connectable load at 230 V	3700 VA
Protection class	II
Ambient temperature	050 ℃
Storage temperature	-10+70°C
Degree of protection	IP20

Tactina	of DF	resistanc	0

Test voltage	approx. 5 V, system frequency
Short-circuit current	> 2 A
Measuring range	0.00129.999 Ω
Measuring accuracy	$0.0011.0~\Omega$: $\pm 2.5~\%$ of MV ± 2 digits
	1.00129.999 Ω : ±5 % of MV ±2 digits

Leakage current, differential measuring method

Measuring range	0.02 mA19.99 mA
Measuring accuracy	± 5 % of MV ± 5 digits

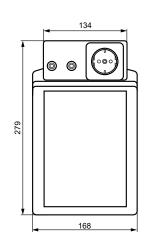
Leakage current, direct measurement

Measuring range	0.00119.999 mA
Measuring accuracy	0.00119.999 mA: ±5 % of MV ±2 digits

Equipment leakage current -alternative method

Equipment leakage current -alternative method	
Measuring range	0,00119,999 mA
Measuring accuracy	0,0019,999 mA: ±5 % of MV ±2 digits
	10,00019,999 mA: ±7 % of MV ±2 digits
Test voltage (Equipment leakage current measuremen	t – alternative method)
	approx. system voltage, system frequency
Test current	max 3.5 mA

Dimension diagram (dimensions in mm)





Insulation resistance	
Test voltage	approx. DC 500 V
Max. test current	2.5 mA
Measuring range	0.01199.99 MΩ
Measuring accuracy	$0.0199.99~M\Omega$: $\pm 5~\%$ of MV ± 2 digits
	100.00199.99 M Ω : ± 10 % of MV ± 2 digits
Load current measurement	
Measuring range	0.0116 A
Measuring accuracy	± 2.5 % of MV, ± 3 digits
Voltage measurement	
Measuring range	90264 V
Measuring accuracy	±2.5 % of MV, ±2 digits
Apparent power	
Measuring range	53700 VA
Measuring accuracy	\pm 5 % of MV, \pm 5 digits
Other	
Dimensions (without bag)	ca. 168 x 272 x 124 mm (W x D x H)
Weight (without accessories or bag)	approx. 2.2 kg
Calibration interval	36 months
Documentation number	D00136

of MV = of measured value

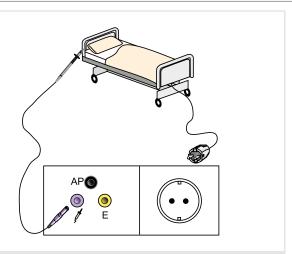




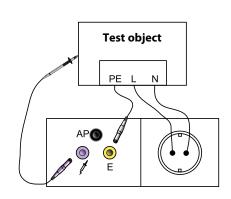
- Function buttons
- Backlit LCD for displaying the user menu and the measurement results. Four lines of 20 characters each.
- Permanently attached power cable for connection to the supply voltage.
- 4 Sockets
 - black(AP): for testing applied parts
 - violet: Connection for test probe for testing exposed parts of the device under test.
 - yellow (E): for a second test lead when the low-resistance continuity of the PE conductor is to be measured between two points (e.g., on single-phase, permanently connected devices or extension cables).

- 5 Test socket: This is where the DUT's power supply cable is plugged in
- Durable plastic enclosure, with pushbuttons for safe storage in the carrying bag.
- Power switch with thermo-magnetic circuit breaker
- 8 Interfaces
 - 9-pole RS-232 interface, galvanically isolated, for connection to a personal computer
 - Centronics interface for connection to a printer
 - PS/2 port for connection to an external standard keyboard and a barcode reading wand or scanner.

Wiring diagrams

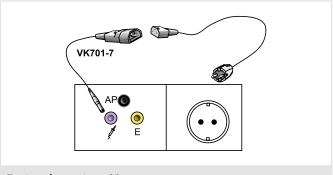


Connection of hospital and care beds and electrical equipment with plug-in connector.



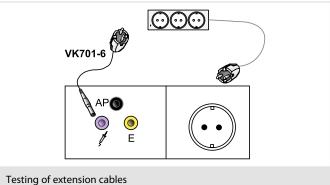
For connecting single-phase permanently installed equipment to the test system

- Disconnect the device
- Disconnect the connection to the supply voltage

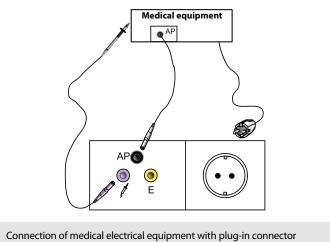


Testing of extension cables

- Connection of connecting and extension cords



- Connection of connecting and extension cords



UNIMET® 610ST

Test system for electrical equipment and machines



Areas of application

- Electrical equipment
 "Inspection after repair, modification of electrical appliances –
 Periodic inspection on electrical
 appliances" acc. to DIN VDE 07010702 (VDE 0701-0702).
- DIN EN 60204-1/VDE 0113 Safety of machinery - Electrical equipment of machines - Part 1: General requirements

Certifications



Device features

- The Windows user interface provides an easy-to-use solution
- · Data exchange and storage via Control Center
- Automatic, semi-automatic or manual test sequences
- Data input via touch screen, keyboard or barcode scanner
- Visual inspection, electrical safety and functional test user-definable
- Test sequences user-definable
- Data storage > 10,000 data records
- Filter function for fast data selection
- · Management of test dates
- Multitenancy
- · Catalogue systems
- Test probe with two switching contacts for semi-automatic testing of parts not connected to PE
- · Compatible with all common application programs

Standards

The UNIMET® 610ST series tests according to the device standards:

- DIN VDE 0701-0702
- DIN VDE 0113/EN 60204-1
- ÖVE/ÖNORM E 8701-1

Further information

For further information, refer to our product area at www.bender.de.

Ordering details

Туре	Nominal voltage range	Maximum output current	Version	Art. No.
UNIMET® 610ST	AC 100120 V and AC 220240 V	16 A	Standard (DE/DE)	B96026020

Suitable system components

Description	Variant	Туре	Art. No.	Page
	Schuko	VK701-6	B96020067	_
Adapter	Non-heating devices	VK701-7	B96020066	_
	Adapter kit 16 A for DS32A	VK701-8	B96020097	475
Cable	For connecting the test system to a PC, 9-pin, female-female (null-modem cable)	RS-232/RS-232 interface cable	B96012012	-
	Measuring lead, 150 cm, 4-mm connector	Cable 150 cm	B928703	_
T	TP800 active test probe (with switch)	TP800	B96020080	_
Test probe	Measuring lead, 3 m, with black test probe	-	B928748	_
Test terminal	Black	-	B928741	_
Touchscreen pen	-	Stylus pen	B928749	_
Barcode scanner	for UNIMET® 610ST (PS/2 port)	-	B96020082	_
Flex keyboard	for UNIMET® 610ST (USB port)	-	B96020093	_
Test kit	various adapters for connecting medical electrical equipment to test systems	PK3	B96020004	_
Three-phase adapter	for testing three-phase devices during operation	DS32A	B96020098	473

Technical data

Nominal voltage range	AC 100120 V/±10 %, AC 220240 V/±10 %
Frequency range	4862 Hz
Power consumption	max. 100 VA
Maximum output current	see ordering details
Protection class	II
Testing of PE resistance	
Measuring range	0.001 29.999 Ω
Measuring current	max. AC 8 A
Measuring voltage	max. AC 8 V
Intrinsic uncertainty	$0.0011.000~\Omega$: $\pm 2.5~\%$ of MV $\pm 5~$ digits
	1.00129.999 Ω : ± 5 % of MV ± 5 digits
Operating uncertainty	$0.0011.000~\Omega$: $\pm 5~\%$ of MV ± 10 digits
	1.00129.999 Ω : \pm 7.5 % of MV \pm 10 digits
Insulation resistance	
Measuring range	0.01199.99 MΩ
Measuring voltage	max. DC 550 V
Measuring current	max. 2.5 mA
Intrinsic uncertainty	$0.0199.99~M\Omega$: $\pm 5~\%$ of MV ± 2 digits
	100.00199.99 M Ω : ±10 % of MV ±2 digits
Operating uncertainty	$0.0199.99 \text{ M}\Omega$: $\pm 7.5 \%$ of MV ± 4 digits
	100.00199.99 M Ω : ± 10 % of MV ± 4 digits
Equipment leakage current - alter	native method
Measuring range	0.00119.999 mA

Measuring range	0.00119.999 mA
Measuring voltage	max. AC 250 V
Measuring current	max. 3 mA
Intrinsic uncertainty	± 5 % of MV ± 5 digits
Operating uncertainty	± 7.5 % MV ± 10 digits

Leakage current, residual current measuring method

Measuring range	0.0219.99 mA
Intrinsic uncertainty	± 5 % of MV ± 2 digits
Operating uncertainty	$\pm 7.5\%$ of MV ± 4 digits
Frequency response	40100 kHz ±3 dB

Leakage current, direct measurement

Measuring range	0.00119.999 mA
Intrinsic uncertainty	± 5 % of MV ± 2 digits
Operating uncertainty	± 7.5 % of MV ± 4 digits
Frequency response	up to 100 kHz ± 3 dB

Voltage measurement

Measuring range	AC 90264 V
Frequency range	4862 Hz
Intrinsic uncertainty	± 2.5 % of MV ± 3 digits

Load current measurement

Measuring range	0.00516 A
Frequency range	4862 Hz
Intrincic uncertainty	+2.5 % of MV +3 digits

Apparent power

Measuring range	53600 VA
Frequency range	4862 Hz
Intrinsic uncertainty	\pm 5 % of MV \pm 3 digits

Environment/EMC

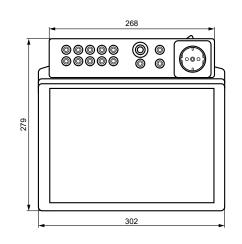
EMC	IEC 61326-1
Ambient temperature	0+40°C
Storage temperature	-10+70 °C
Relative humidity (up to 31 °C)	max. 80 %
Relative humidity (> 3140 °C)	decreasing linearly, max. 50 %
	condensation must be avoided
Height AMSL	max. 2000 m

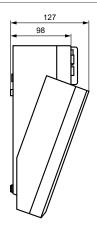
Other

Degree of protection	enclosure: IP40, connections: IP20
	in acc. with DIN VDE 0470 Part 1/EN 60529
Dimensions (without bag)	approx. 300x277x126 mm (W x D x H)
Weight (without accessories or bag)	approx. 3.5 kg
Calibration interval	36 months
Documentation number	D00380

of MV = of measured value

Dimension diagram (dimensions in mm)





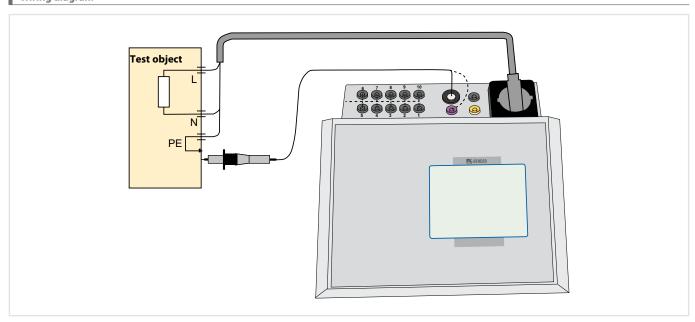




- Touch screen for operation and display. For this purpose, a stylus is included in the scope of delivery.
- Durable plastic enclosure, with push buttons for safe storage in the carrier bag.
- 10 sockets (1...10) for the connection of VK adapters to test extension lines.
- 4 Measuring terminals
 - [B] (violet) for the connection of the single-pole test probe supplied with the product.
 - [A] for active test probe TP800 with push button (optional).
 - Socket [C] for equipotential bonding (e.g. connection for single-pole line extension with clip for the testing of permanently installed equipment).
 - Socket [D] for functional earth

- 5 Test socket: This is where the DUT's power supply cable is plugged in.
- Connection to the supply voltage and power switch with thermo-magnetic circuit breaker.
- Without function.
- 8 Interfaces:
 - PS/2 port for external keyboard
 - RS-485 serial interface for Bender Service
 - RS-232 interface, 9-pin, electrically isolated, for connection to a PC
 - USB interface for connection to a printer, a USB stick, an external keyboard or a barcode scanner (2 x host) and a PC (1 x device, for Bender Service only)
 - Ethernet network connection (optional)

Wiring diagram



UNIMET® 810ST

Test system for medical electrical equipment



Typical applications

- · Tests of medical electrical equipment in accordance with DIN EN 60601-1 3rd edition
- · Recurrent tests of medical electrical equipment in accordance with DIN EN 62353 (VDE 0751-1).
- · Electrical equipment "Prüfung nach Instandsetzung, Änderung elektrischer Geräte (Recurrent test and test after repair and modification of electrical equipment)" in accordance with DIN VDE 0701-0702 (VDE 0701-0702).

Approvals



Device features

- Easy operation by Windows user interface
- · Data exchange and storage via Control Center
- Automatic, semi-automatic or manual test sequence
- · Data input via touch screen, keyboard or barcode scanner
- Visual inspection, electrical tests, functional tests, user-definable
- Test sequences user-definable
- Data memory > 10,000 data records
- · Filter function for fast data selection
- · Management of test dates
- Multitenancy
- · Catalogue systems
- Test probe with two switching contacts –for semi-automatic testing of conductive parts not connected to PE
- Compatible with common application programs such as visual FM, MT Data and Fundamed

Standards

The UNIMET® 810ST series carries out tests in accordance with the requirements of the device standards:

- IEC 60601-1
- IEC 62353
- DIN EN 62353 (VDE 0751-1)
- IEC 61010-1
- ÖVE/ÖNORM EN 62353
- DIN VDE 0701-0702
- ÖVE E8701-1

Further information

For further information refer to our product range on www.bender.de.

Ordering information

Туре	Nominal voltage range	Maximum load current	Version	Art. No.
UNIMET®810ST	AC 100120 V	16 A	Standard (DE/DE)	B96028020
UNIMET®810ST		13 A	GB/GB	B96028024
UNIMET®810ST	and		B/B	B96028027
UNIMET®810ST	AC 220240 V		US/US	B96028028
UNIMET®810ST]	10 A	СН	B96028026

Suitable system components

Description	Variant	Туре	Art No.	Page
	German Schuko	VK701-6	B96020067	-
Adapter	Non-heating appliances	VK701-7	B96020066	_
	Adapter kit 16 A for DS32A	VK701-8	B96020097	475
C-bl-	for connecting the test system with a PC, 9-pole, female-female (Null modem cable)	RS-232/RS-232interfacecable	B96012012	-
Cable	Measuring lead, 150 cm, 4 mm connector	Cable150cm	B928703	-
Testanolis	Test probe active (with switch)		B96020080	-
Test probe	3 m measuring lead with black test probe	-	B928748	-
Test terminal	black	-	B928741	-
Touchscreen pen	-	Styluspen	B928749	-
Barcode scanner	for the UNIMET® 810ST (PS/2 connection)	-	B96020082	-
Flex keyboard	for the UNIMET® 810ST (USB connection)	-	B96020093	-
Test kit	various adapters for connecting medical electrical equipment to test systems	PK3	B96020004	-
Test box	for testing test systems	TB3	B96020025	476
Three-phase adapter for testing three-phase devices during of	fortestion there also and other devices	DS32A	B96020098	473
	tor testing three-phase devices during operation	DS32A (CH/CH)	B96020110	473
External power source 25 A	for standard-compliant protective earth resistance measurements (only in conjunction with UNIMET® 810ST)	EPS800	B96028050	471

Technical data

40 4011	
4862 H	
max. 100 VA	
see ordering information	
SKII	

resumg of PE resistance	
Measuring range	0.001 29.999 Ω
Measuring current	max. AC 8 A
Measuring voltage	max. AC 8 V
Intrinsic uncertainty	$0.0011.000~\Omega$: $\pm 2.5~\%$ v. M. $\pm 5~$ digits
	1.00129.999 Ω: \pm 5 % v. M. \pm 5 digits
Operating uncertainty	$0.0011.000~\Omega$: $\pm 5~\%$ v. M. ± 10 digits

1.001...29.999 Ω : ± 7.5 % v. M. ± 10 digits

Insulation resistance	
Measuring range	

Measuring range	0.01199.99 MΩ
Measuring voltage	max. DC 550 V
Measuring current	max. 2.5 mA
Intrinsic uncertainty	$0.0199.99~M\Omega$: $\pm 5~\%$ v. M. ± 2 digits
	100.00199.99 M Ω : \pm 10 % v. M. \pm 2 digits
Operating uncertainty	$0.0199.99~M\Omega$: $\pm 7,5~\%$ v. M. ± 4 digits
	$100.00199.99 \text{ M}\Omega$: $\pm 10 \% \text{ v. M. } \pm 4 \text{ digits}$

Equipment leakage current -alternative method

Measuring range	0.00119.999 mA
Measuring voltage	max. AC 250 V
Measuring current	max. 3 mA
Intrinsic uncertainty	±5 % v. M. ±5 digits
Operating uncertainty	±7.5 % v. M. ±10 digits

Leakage current, differential measurement method

Measuring range	0.0219.99 mA
Intrinsic uncertainty	±5 % v. M. ±2 digits
Operating uncertainty	±7.5 % v. M. ±4 digits
Frequency response	40100 kHz ±3 dB

Leakage current, direct measurement

measuring range	0.00119.999 MA
Intrinsic uncertainty	±5 % v. M. ±2 digits
Operating uncertainty	±7.5 % v. M. ±4 digits
Frequency response	up to 100 kHz ±3 dB

Voltage measurement

Measuring range	AC 90264 V
Frequency range	4862 Hz
Intrinsic uncertainty	±2.5 % v. M. ±3 digits

Load current measurement

Measuring range	0.00516 A	
Frequency range	4862 Hz	
Intrinsic uncertainty	+2.5 % v. M. +3 digits	

Apparent power

Measuring range	53600 VA
Frequency range	4862 Hz
Intrinsic uncertainty	±5 % v. M. ±3 digits

Environment/EMC

EMC	IEC 61326-1
Ambient temperature	0+40°C
Storage temperature	-10+70°C
Relative humidity (up to 31 °C)	max. 80 %
Relative humidity (> 3140 °C)	decreasing linearily, max. 50 %
	condensation must be avoided
Height above sea level	max. 2000 m

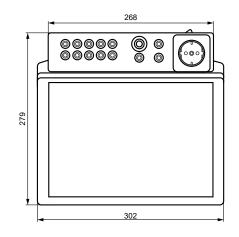
Other

Degree of protection,	enclosure: IP40	connections:	IP20
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	according to DIN VDE 0470 Part 1/EN 60529
Dimensions (without bag)	approx. 300x277x126 mm (W x D x H)
Documentation number	D00008
Weight (without accessories or bag)	approx. 3.5 kg
Calibration interval	36 months
Documentation number	D00008

of MV = of measured value

Dimension diagram (dimensions in mm)









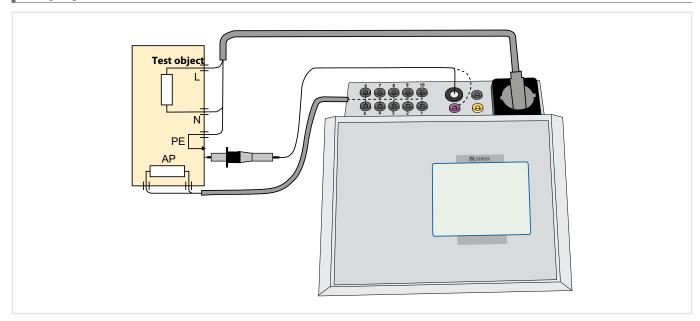
- Touchscreen for operator control and indication. For this purpose, a stylus is included in the scope of supply.
- Durable plastic enclosure, with pushbuttons for safe storage in the carrying bag.
- 10 sockets (1...10) for the connection of patient electrodes.
- Measuring terminals
 - [B] (violet) for the connection of the single-pole test probe supplied with the product.
 - [A] for active test probe TP800 with pushbutton (option).
 - Socket [C] for equipotential bonding (e.g. connection for singlepole line extension with clip for the testing of permanently installed equipment).
 - socket [D] for functional earth
- 5 Test socket: This is where the DUT's power supply cable is plugged in.
- Connection to the supply voltage and power switch with thermomagnetic circuit breaker.

- Connection for the external 25 A power source EPS800.
 - Note: The plug clicks into place and is secured against being pulled out accidentally.

The plug can only be removed after pushing the movable grip back.

- 8 Interfaces:
 - PS/2 connection for external keyboard
 - RS-485 serial interface for Bender Service
 - 9-pole RS-232 interface, galvanically isolated, for connection to a personal computer
 - USB interface for connection to a printer, a USB stick, an external keyboard or a barcode scanner (2 x host) and a PC (1 x device, for Bender Service only)
 - Ethernet network connection (optional)

Wiring diagram



External power source 25 A for UNIMET® 800/810ST



Device features

• To be used in conjunction with the appropriate UNIMET® 800/810ST

Standards

The EPS800 series carries out tests in compliance with the device standard:

- IEC 60601-1
- IEC 61010-1

Typical applications

• External 25 A power source for standard-compliant protective earth resistance measurement acc. to IEC 60601-1 and IEC 61010-1

Further information

For further information refer to our product range on www.bender.de.

Approvals



Ordering information

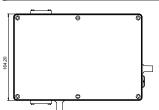
Type Version	for UNIMET®		Art. No.	
	800ST	810ST	Art. No.	
EPS800	Standard (German)	B96028010	B96028020	B96028050
EPS800	GB	B96028014	B96028024	B96028054
EPS800	СН	B96028016	B96028026	B96028056
EPS800	В	B96028017	B96028027	B96028057
EPS800	US	B96028018	B96028028	B96028058

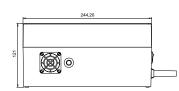
Technical data

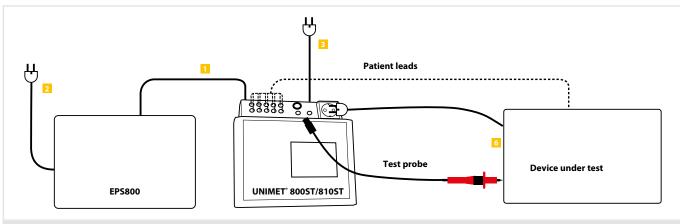
Nominal voltage	AC 207253 V, 48 62 Hz
Power consumption	400 VA
Measuring current	AC 25 A ± 10 % (0 0.3 Ω)
Output power	230 VA
Operating mode	continuous operation
Protection class	-
Micro-fuse	5 x 20 mm, fast 5 A/250 V

IEC 61326-1
0+40°C
-10+70 ℃
max. 80 %
decreasing linearily, max. 50 %
condensation must be avoided
max. 2000 m
IP20
ca. 244 x 164 x 120 mm (W x D x H)
D00146
≤ 4 kg

Dimension diagram (dimensions in mm)







- Insert the control cable of the EPS800 into the "EPS800" connector socket on the rear of the UNIMET® 800ST/810ST.
 - Note: The plug clicks into place and is secured against being pulled out accidentally. The plug can only be removed after sliding back the movable handle piece.
- 2 Connect the supply line of the EPS800 to the power socket.
- 3 Connect the supply line of the UNIMET® 800ST/810ST to the power socket.
- 4 Switch on the power switch of the UNIMET® 800ST/810ST.
- 5 Switch on the power switch of the EPS800. The sound of the internal ventilator can be heard.
- 6 Connect the DUT. Determine the test sequence according to the classification.

3AC three-phase adapter with differential current measurement



Device features

• To be used in conjunction with an UNIMET test system

Standards

The DS32A series carries out tests in compliance with the device standard:

- DIN VDE 0701-0702
- DIN EN 62353

Further information

For further information refer to our product range on www.bender.de.

Typical applications

• Three-phase adapter for testing medical electrical three-phase devices during operation

Approvals



Ordering information

Туре	Art. No.
DS32A	B96020098
DS32A (CH/CH)	B96020110

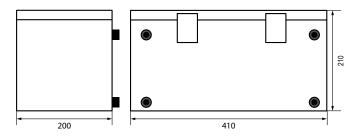
Technical data

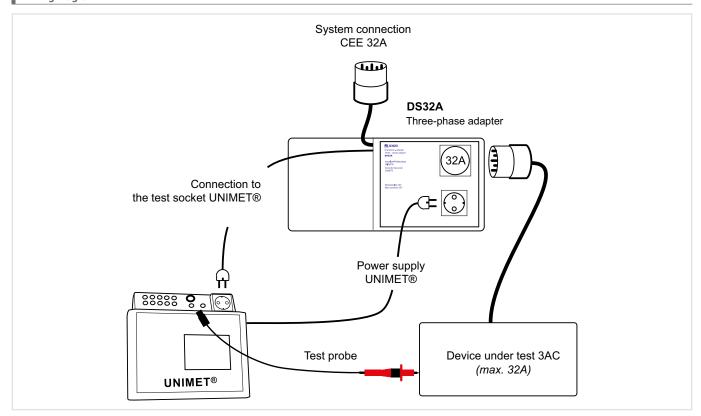
Electrical safety	
Protection class	I acc. to IEC 61010-1/EN 601010-1/VDE 0411-1
Pollution degree	2
Measurement category	CAT II
Test voltage	1.69 kV
Current carrying capacity	32 A/6 h three-phase current
EMC	EN 61326-1
Differential current	
Measuring range	AC 0.0220 mA
Intrinsic uncertainty	5 % v. M. ±50 μA

Supply voltage	
Supply voltage U _S	3AC 400 V ±10 %
Frequency range U _S	5060 Hz
Power consumption	approx. 18 VA
Load current max.	32 A
Environmental conditions	
Storage temperature	-10+70°C

Storage temperature	-10+/0℃
Operating temperature	0+50 ℃
Degree of protection	IP20
Dimensions	405 x 210 x 200 mm (width x height x depth)
Weight	8.9 kg
Height above sea level	max. 2000 m
Operating mode	not suitable for continuous operation
Documentation number	D00147

Dimension diagram (dimensions in mm)







Device features

• To be used in conjunction with the three-phase adapter DS32A

Further information

For further information refer to our product range on www.bender.de.

Typical applications

 for the measurement of 16-Athree-phase devices in conjunction with the three-phase adapter DS32A

Approvals



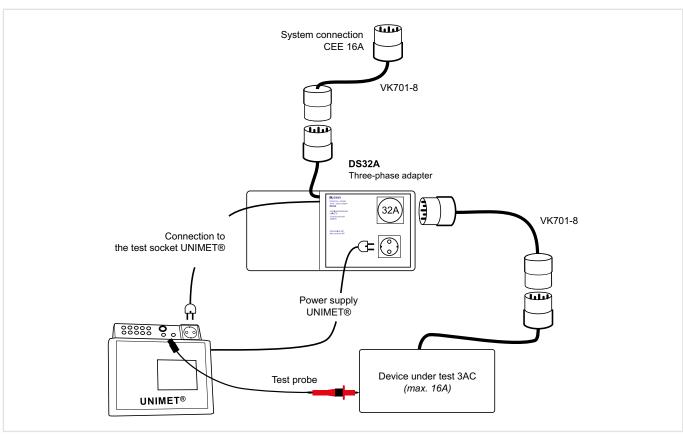
Ordering information

Туре	Art. No.
VK701-8	B96020097

Technical data

Nominal voltage		
Nominal voltage	3-ph 3AC 400 V	
Max. current	16 A	
Documentation number	D00172	

Wiring diagram



Test box



Typical applications

- Testing the measured values of safety testers
- Comprehensive system self test

Approvals



Device features

- Test box for UNIMET® 800/810ST
- Time and cost saving through simple handling
- Simulation of a standardised DUT
- 10 patient sockets for individual calibration
- Magnetic adhesive stripes allow simple fixing to the safety tester

Further information

For further information refer to our product range on www.bender.de.

Ordering information

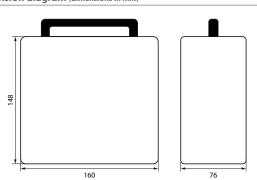
Туре	Version	Art. No.
TB3 test box	Standard (German)	B96020025

Technical data

Insulation coordination acc. to IEC 60664-1

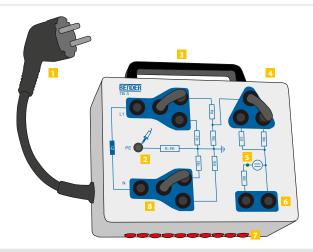
Rated insulation voltage	AC 250 V
Rated impulse voltage/pollution degree	4 kV/3
Voltage ranges	
Nominal system voltage $U_{\rm n}$	100240 V
Rated frequency fn	AC 4862 Hz
Output voltage U12	7.39 V (±2.5 %)
Max. power consumption	35 VA at 50 Hz, 230 V
Evaluation of tolerance values	
Precalculation	110 %
Tolerance	10 %
Built-in resistors	
R -MD (safety tester)	1000 Ω
R -PE	0.233 Ω
R3	25 000 Ω
R4	1 000 000 Ω
R5	1 500 000 Ω
R6	100 000 000 Ω
R7	1 000 000 Ω
R8	100 000 Ω
R9	130 000 Ω

Dimension diagram (dimensions in mm)



Other

Ambient temperature (during operation)	0+50 ℃
Ambient temperature (during storage)	-10+70 ℃
Operating mode	continuous operation
Mounting	any position
Protection class	Class I
Dimensions in mm (H x W x D)	148 x 160 x 76
Weight	≤ 900 g
24-month calibration interval	
Documentation number	D00149



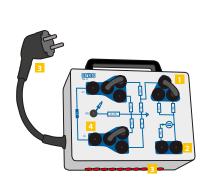
- Mains plug; only to be used for the test socket of the safety tester
- 2 Socket for the connection of the test probe
- Carrying handle
- 4 Enclosure, magnetic adhesive stripes allow simple fixing to the safety tester µP601
- 5 LED lights when voltage is applied at the mains plug
- 6 Sockets for the patient connections 1 and 2 of the safety tester
- 7 The sockets 1 and 2 at the side of the test box TB3 are internally connected to the sockets on the front. The sockets 3...10 can be used to test the patient connections 3...10 at the safety tester (patient auxiliary current measurement). The measured values differ from the values documented in the table "tolerance values".



Sockets on the side

3 Jumpers allow simulation of different test situations

Connections



1 Jumpers. Insert the jumpers in such a way that the following sockets are connected:

UNIMET® 810ST
a-b
d-f
h-i

Connect the patient sockets 1 and 2 of the safety tester (at UNIMET® 810ST socket 2 only) to the respective socket of the test box TB3.



- Insert the mains plug of TB3 into the test socket of the safety tester, as illustrated. Please observe the plug-in direction.
 - at UNIMET® 810ST, insert the supply cable from the top In case of wrong plug-in direction test results will become unusable.
- 4 Contact the test probe of the safety tester with the socket PE of TB3
- 5 UNIMET® 800/810ST test system

Technical terms

	Alarm state indicates that the residual current in the installation monitored has exceeded the preset evel of the RCM.
Direct contact E	Electric contact of persons or animals with live parts.
	Part of the Earth which is in electric contact with an earth electrode and the electric potential of which is not necessarily equal to zero.
	Conductive part or parts which is/are in good contact with earth and form an electrical connection with it.
Earth fault	Occurrence of an accidental conductive path between a live conductor and the Earth.
Earth fault current	Current flowing to earth due to an insulation fault.
Earth leakage current (Current flowing from the live parts of the installation to earth in the absence of an insulation fault.
	Effect influencing the functioning of measuring equipment and, consequently, the measured value produced by it.
Effects of the distribution system voltage	Effect influencing the operation and, consequently, the measured value produced by it.
Electric shock P	Physiological effect resulting from an electric current through a human or animal body.
Т	Device or combination of devices used for insulation fault location in IT systems. The insulation fault location system is used in addition to an insulation monitoring device. It injects a locating current between the electrical system and earth and locates insulation faults.
Equipotential bonding	Provision of electrical connections between conductive parts, intended to achieve equipotentiality.
	Conductive part of equipment which can be touched and which is not normally live, but which can become live when basic insulation fails.
	Conductive part not forming part of the electrical installation and liable to introduce an electric potential, generally the electric potential of a local earth.
Extraneous DC voltage U_{fg}	OC voltage occurring in AC systems between the AC conductors and earth (derived from DC parts).
	oltage to which the measuring equipment can be subjected by external influences. This is not required for the operation of the measuring equipment, but can interfere with its operation.
Fault current I _Δ	Current which flows across a given point of fault resulting from an insulation fault.
	/oltage appearing under fault conditions between exposed conductive and/or extraneous conductive parts and earth.
Fiducial value A	A clearly specified value to which reference is made in order to define the fiducial error.
	Electric contact of persons or animals with exposed-conductive parts which have become live under fault conditions.
	A quantity which is not the subject of the measurement, but which influences the value of the measured quantity, or the indication of measuring equipment.
	A defect in the insulation of an equipment which can result either in an abnormal current through his insulation or in a disruptive discharge.
Insulation fault locator	Device or part of device for the location of the insulation fault.
ir ir	Equipment which permanently monitors and indicate the insulation resistance of an electrical installation or a section of it in unearthed IT AC systems. The equipment is intended to signal a drop in insulation resistance below a minimum limit, so that the cause of the reduction can be found before a second fault occurs resulting in an unwanted disconnection of the electrical installation.
	Resistance in the system being monitored, including the resistance of all the connected appliances to earth.

2025 BENDER

Internal DC resistance R _i	Resistance of the insulation monitoring device between the terminals to the system being monitored and earth.
Internal impedance Zi	Total impedance of the insulation monitoring device between the terminals to the system being monitored and earth, measured at the nominal frequency.
ISOMETER®	Registered trademark of Bender GmbH & Co. KG, Grünberg. An ISOMETER® actively measures the insulation resistance in IT systems with a measuring voltage which is superimposed between the system and the PE conductor.
Leakage current	Electric current in an unwanted conductive path under normal operating conditions.
Live part	Conductor or conductive part intended to be energised in normal operation, including a neutral conductor, but by convention not a PEN conductor or PEM conductor or PEL conductor.
Locating current /L	r.m.s. value of the current that is injected by the locating current injector during the location process. The locating current can be generated by an independent locating voltage source, or an independent locating current source, or it can be driven directly from the system to be monitored.
Locating voltage U _L	r.m.s. value of the voltage present at the measuring terminals of the locating current injector during the measurement when the device has an independent locating voltage or current source.
Measuring current I _m	Maximum current that can flow between the system and earth, limited by the internal resistance from the measuring voltage source of the insulation monitoring device.
Measuring voltage U _m	Voltage present at the measuring terminals during the measurement.
Nominal current I _n	Current of the measuring equipment under nominal conditions.
Nominal frequency (f _n)	Frequency for which the measuring equipment is intended to be used and designed.
Nominal voltage of the distribution system (U_n)	Voltage by which a distribution system or equipment is designated and to which certain operating characteristics are referred.
Nominal voltage of the measuring equipment (<i>U</i> _{me})	Voltage for which the measuring equipment is intended to be used and the value of which is marked on the equipment.
Nominal voltage range	Voltage range for which the measuring and monitoring equipment is intended to be used and for which it has been designed.
Open-circuit voltage (Uq)	Voltage present across unloaded terminals on the measuring equipment.
Operating voltage in a system	The value of the voltage under normal conditions at a given, specific point of the system.
Origin (of the electrical installation)	Point at which electric energy is delivered to the electrical installation.
Output voltage (U _a)	Voltage across the measuring equipment terminals where this equipment does or can output electric power.
Performance characteristic	One of the quantities (described by values, tolerances, ranges) assigned to an equipment in order to define its performance.
Protective conductor PE	Conductor provided for purposes of safety for example protection against electric shock.
Puslating direct current	Current of pulsating waveform which assumes, in each period of the rated power frequency, the value 0 or the value not exceeding 0.006 A d.c. during one single interval of time, expressed in angular measure, of at least 150°.
Rated contact voltage	Voltage for which a relay contact is rated to open and close under specified conditions.
Rated operating conditions	A set of specified measuring ranges for performance characteristics and specified operating ranges for influence quantities, within which the variations of operating errors of an instrument are specified and determined.
Rated residual operating current $I_{\Delta n}$	The value of the residual operating current, assigned to the RCM by the manufacturer, at which the RCM shall operate under specified conditions.
RCM directionally discriminating	RCM used in IT systems, capable of directionally discriminating between supply side and load side residual currents.
RCM type A	RCM for which actuation is ensured for residual sinusoidal alternating currents and residual pulsating direct currents, whether suddenly applied or slowly rising.



RCM type B RCM for which actuation is ensured for residual sinusoidal alternating currents, redirect currents or smooth residual direct currents, whether suddenly applied or significant currents.	
ancer can end of smooth residual affect can end, mether suddenly applica of si	
Residual current I _D Algebraic sum of the values of the electric currents in all live conductors, at the same point of an electric circuit in an electrical installation.	ame time at a given
Residual current monitor Device or association of devices which monitors the residual current in an electrica which activates an alarm when the residual current exceeds the operating value of	
Residual current monitoring system Usually consists of the residual current monitor and measuring current transform localises occurring residual currents and indicates the location of the fault.	ers. The system
Residual operating current Value of the residual current which causes the RCM to operate under specified co	onditions.
Response sensitivity Value of the evaluating current or insulation resistance at which the evaluator resistance at	ponds under
Response time t _{an} Time required by an insulation monitoring device to respond under specified condition	ıs.
Response value R _a Value of the insulation resistance at which the device responds under specified or	onditions.
Short circuit to exposed-conductive part A conductive connection caused by a fault between the exposed-conductive part of electrical equipment.	t and the live parts
Short circuit current (I _k) Current flowing across the short-circuited terminals of the measuring equipment	
Solid short circuit, short circuit to exposed-conductive parts or short-circuit to exposed-conductive parts or	arth exists if
Specified operating range Range of values of a single influence quantity which forms a part of the rated operations.	ating conditions.
Specified response value R _{an} Value of the insulation resistance, permanently set or adjustable, on the device as insulation resistance falls below this limit.	nd monitored if the
Supply voltage (U_s) Voltage at a point where the measuring equipment does or can accept electric energy	rgy as a supply.
System leakage capacitance C _e Total capacitance to earth of the system to be monitored, including any connecte which value the insulation monitoring device can work as specified.	ed appliances, up to
Total earthing resistance R _A The resistance between the main earthing terminal and the earth.	
Touch voltage (<i>U</i> _L) Maximum value of the touch voltage which is permitted to be maintained indefinit ditions of external influences and is usually equal to AC 50 V, r.m.s. or 120 V ripple	
Touch voltage Ut Voltage between conductive parts when touched simultaneously by a person or	an animal.
True value The value which characterises a quantity perfectly defined, under the conditions the quantity is considered.	which exist when
Variation The difference between the indicated values for the same value of the measured indicating or recording instrument, of the (conventional) true value of a supply in single influence quantity assumes successively two different values.	
Voltage against earth (U _o) a) In distribution systems with an earthed neutral point, the voltage between a pand the earthed neutral point.	hase conductor

480 Annex | Technical terms



Short form German term		English term	
MRCD	Gerät oder Anordnung von Geräten, das/die eine Strommesseinrichtung und eine Auswerteeinheit zur Erkennung und Bewertung sowie zur Ansteuerung des Kontaktöffnens einer Abschaltvorrichtung enthält.	device or an association of devices comprising a current sensing means and a processing device designed to detect and to evaluate the residual current and to control the opening of the contacts of a current breaking device	
PRCD	ortsveränderliche FI-bzw. DI-Schutzeinrichtung (auch OVS)	portable residual current protective device	
PRCD-S	OVS mit erweitertem Schutzumfang und Sicherstellung der bestimmungsgemäßen Nutzbarkeit des Schutzleiters	portable residual current protective device-safety	
RCB0	FI-bzw. DI-Schutzeinrichtung mit eingebautem Überstromauslöser (FI/LS-bzw. DI/LS-Schalter)	residual-current-operated circuit breakers with integrated overcurrent protection	
RCCB	FI-bzw. DI-Schutzeinrichtung ohne eingebauten Überstromschutz	residual-current-operated circuit breakers without integrated overcurrent protection	
RCD (generic term)	Fehlerstrom-Schutzeinrichtung (RCD ohne Hilfsspannung, spannungsunabhängig) bzw. Differenzstrom-Schutzeinrichtung) (RCD mit Hilfsspannung, spannungsabhängig)	residual current protective device	
RCM	Differenzstrom-Überwachungsgerät	residual current monitors	
SRCD	ortsfeste FI-bzw-DI-Schutzeinrichtung in Steckdosenausführung	fixed socket-outlets residual current protective device	

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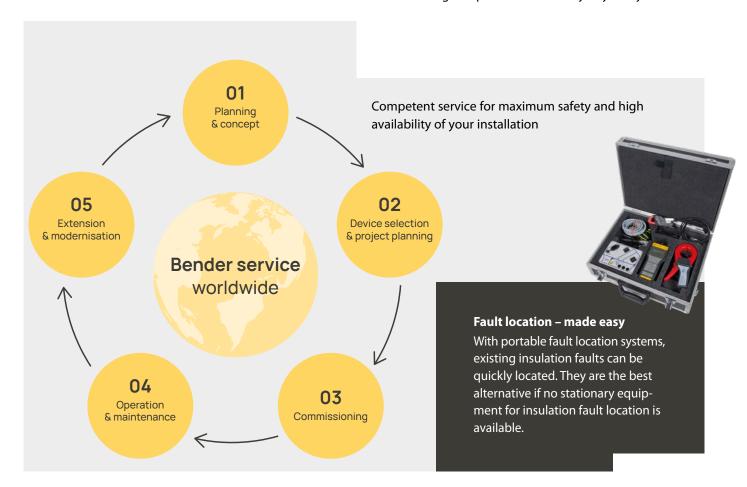
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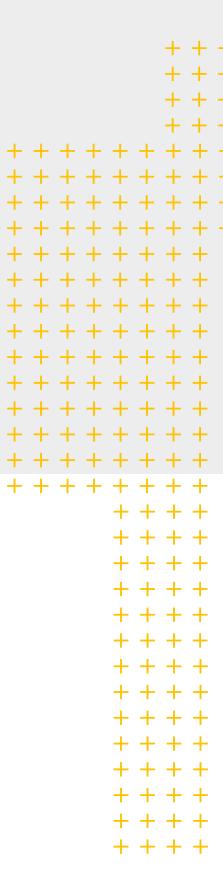
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