

The Power in Electrical Safety Main Catalogue Edition 02/2022

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Insulation monitoring devices

ISOMETER®







Equipment for insulation fault location ISOSCAN®







Residual current monitoring systems

LINETRAXX®





Neutral Grounding Resistor Monitor (NGR) LINETRAXX®





Charge Controller





Power Quality and Energy Measurement

LINETRAXX®



LINETRAXX®





System components

Coupling devices

Measuring current transformers Transformers

Relay modules

Power supply units **Measuring instruments Interface converters** Interface repeaters

COMTRAXX® Gateways

COMTRAXX® Alarm indicator and test combinations

COMTRAXX® condition monitors

Visualisation





Switching equipment

ATICS® transfer switching and monitoring devices

Test systems

UNIMET® Safety analyser





Annex

Technical terms Alphabetical list of devices Service







The Power in Electrical Safety



In the past 75 years we have learnt thinking ahead in a strategic and forward-looking way and to consider today what customers are going to need tomorrow. Innovative solutions and service activities, excellent know-how global expertise when it comes to electrical safety provide answers to the challenges of various application areas.

With over 1160 employees we are globally present in over 70 countries.

Insulation monitoring devicesISOMETER®







Equipment for insulation fault location







Residual current monitoring systems







Neutral Grounding Resistor Monitor (NGR)







Charge Controller



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Power Quality and Energy Measurement

Measuring and monitoring relays LINETRAXX®



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System components

Coupling devices Measuring current transformers Transformers Relay modules Power supply units Measuring instruments Interface converters Interface repeaters

COMTRAXX® Gateways
COMTRAXX® Alarm indicator and test combination
COMTRAXX® condition monitors
Visualisation



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Switching equipment

ATICS® transfer switching and monitoring devices

Test systems

UNIMET® Safety analyser



429 440



Anney

Technical terms Alphabetical list of device: Service



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Device overview insulation monitoring devices ISOMETER®



	Catalogue page	16	20	24	30
Special applications		-	-	-	Quick response to combined resistance and offset voltage measurement
Circuits	Control circuits				
	Auxiliary circuits				
	Main circuits				
E	3(N)AC				
Voltage system	AC	=			
ltage	AC/DC	=			
δ	DC				-
Nom	inal system voltage <i>U</i> n	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 <i>U</i> _n	+ 15 %	+ 15 %	+ 15 %	+ 15 %
System	leakage capacitance Ce μF	≤ 1000	≤ 1000	≤ 1000	≤ 1000
Re	sponse value R _{an} kΩ	110000	110000	110000	110000
	Coupled systems	-			-
Loca for in	ating current injector Isulation fault location	-	+		-
5	DIN rail				
Installation	Screw mounting				
Inst	Panel mounting/ wall fastening				-
	Web server				
	Modbus	TCP/RTU	TCP/RTU	TCP/RTU	TCP
Interfaces	всом	=			
Inter	BS				
	BMS	-	-	-	-
	isoData				-
Product details (Products on www.bender.de/en)					

	Туре	С. р.		Suitable system components				
	FP200	53				-		
	AGH150W-4	348			-	-		
vices	AGH204S-4	350			-	-		
Coupling devices	AGH520S	351			-	-		
Coupl	AGH675S-7	352	-	-	=	-		
	AGH676S-4	354			-	-		







ISOMETER® isoHR685W-...-B



ISOMETER® isoRW685W-D



ISOMETER® isoRW685W-D-B

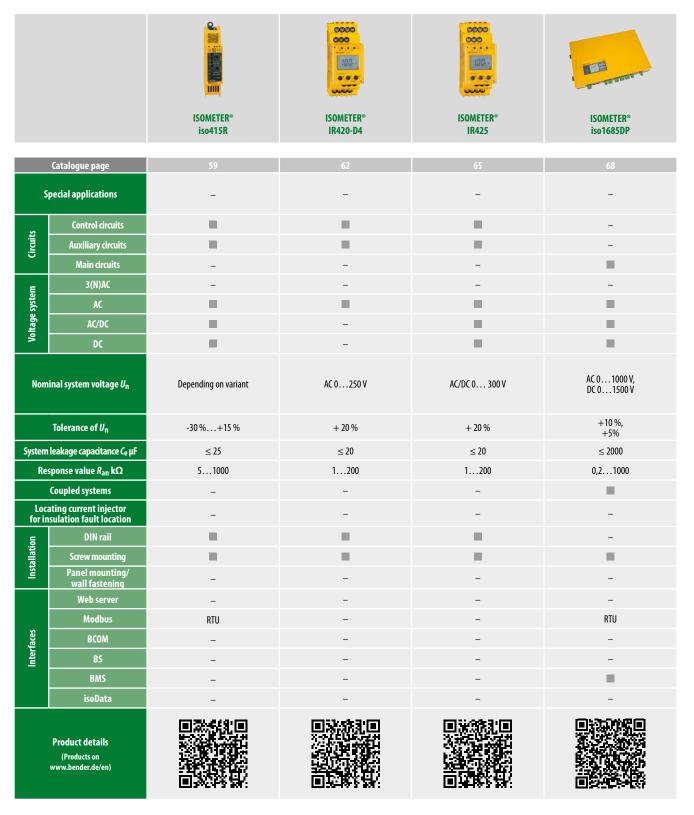


ISOMETER® IRDH275BM-7

35	40	45	49	55
De-energised loads/ frequency converters	Installations with a high level of insulation	Railway	Railway	AC, DC or AC/DC medium voltage systems
				-
				-
				-
offline (AC 0 690 V) (DC 0 1000 V)	AC 01000 V, 3AC 0690 V, DC 01300 V	AC, 3(N)AC 0690 V, DC 01000 V	AC, 3(N)AC 0690 V, DC 01000 V	AC, 3(N)AC, DC 015,5 kV (absolute)
-	+ 15 %	+ 15 %	+ 15 %	+ 15 %
≤ 1000	≤ 1000	≤ 1000	≤ 1000	≤5
101000	13000000	110000	110000	10010000
-		-	-	-
-	-	-	-	-
-		+	+	-
				-
TCP	TCP/RTU	TCP/RTU	TCP/RTU	-
				-
				-
-	-	+	Ŧ	
-				-

Suitable system components								
-		-	-	+				
-				-				
-				-				
-				-				
-	-	-	-					
-				-				

Device overview insulation monitoring devices ISOMETER®



	Туре	С. р.		Suitable system components				
	FP200	53	-	-	-	+		
	AGH150W-4	348	-	-	_	-		
vices	AGH204S-4	350	-	-	-	-		
Coupling devices	AGH520S	351	-	-	-	-		
Coupl	AGH675S-7	352	-	-	-	-		
	AGH676S-4	354	-	-	=	-		













ISOMETER® isoHV1685D

ISOMETER® isoLR1685DP

ISOMETER® isoHR1685DW **ISOMETER®** IR1575

ISOMETER® IR427

ISOMETER® isoMED427x-(PT)

68	68	72	75	78	82
-	Induction furnace	insulated elevating work platforms	-	Medical locations	Medical locations
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-		-	-
				-	-
				-	÷.
AC 02000 V, DC 03000 V	AC 0690 V, DC 0690 V	AC 01000 V, DC 01500 V	AC, 3(N) AC 0400 V DC 0400 V	AC 70330 V	AC 70230 V
+10 %, +5%	+10 % +5%	+10 %, +5%	+ 20 %	+ 15 %	+ 15 %
≤ 2000	≤ 2000	≤1	≤ 60	≤5	≤5
0,21000	0,02100	1001000	21000	50500	50500 kΩ
			-	-	-
-	-	+	+	+	
-	-	-	-		
			-		
-	-	-		-	-
-	-	-	-	-	-
RTU	RTU	RTU	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
				-	
-	-	-	-	-	-













Suitable system components								
-	-	-	-	-	-			
-	-	-	-	-	-			
-	-	-	-	-	-			
-	-	-	-	-	-			
-	-	-	-	-	-			
-	-	-	-	-	-			

Device overview insulation monitoring devices ISOMETER®



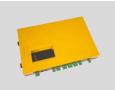




ISOMETER® isoPV



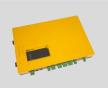
ISOMETER® isoPV425



ISOMETER® isoPV1685RTU

Catalogue page		85	88	92	96
S	pecial applications	Installations with a low level of insulation	Photovoltaic	Photovoltaic	Photovoltaic
: 5	Control circuits	-	-	-	-
Circuits	Auxiliary circuits	-	-	-	-
<u> </u>	Main circuits				
E	3(N)AC			-	-
Voltage system	AC				-
ltage	AC/DC				-
ž	DC				
Nom	inal 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	ACO1000V DCO1500V
	Tolerance of U _n	+ 15 % + 10 %	+ 10 %	+ 15 %	+6%
System	leakage capacitance C _e μF	≤ 500	≤ 2000	≤ 500	≤ 2000
Re	sponse value R _{an} kΩ	0.2100	0.2100	1990	0.2990
	Coupled systems	-	-	-	-
Loca for in	ating current injector Isulation fault location	-	-	-	-
8	DIN rail				-
Installation	Screw mounting				
Inst	Panel mounting/ wall fastening	-	-	-	-
	Web server	-	-	-	-
	Modbus	-	-	RTU	RTU
Interfaces	ВСОМ	-	-	-	-
Inter	BS	-	-	-	-
	BMS				
	isoData	-	-		-
Product details (Products on www.bender.de/en)					

	Туре	С. р.	Suitable system components				
	FP200	53	-	-	-	-	
	AGH150W-4	348	-	-	-	-	
devices	AGH204S-4	350	-	-	-	-	
ing de	AGH520S	351	-	-	-	-	
Coupling	AGH675S-7	352	-	-	-	-	
	AGH676S-4	354	-	-	-	-	







ISOMETER® IR420-D6



ISOMETER® IR423



ISOMETER® IR123



ISOMETER® isoGEN423

96	99	102	105	108
Photovoltaic	Disconnected loads	Mobile generators	Mobile generators	Generators acc. to standard DIN VDE 0100-551
-	-	-	-	-
-	-	-	-	-
-				-
-		-	-	
-				
-	-	-	-	-
		-	-	
DC 01500 V	offline (AC 0400 V)	AC 0250 V	AC 100250 V	3(N)AC, AC 0400 V, DC 0400 V
+6%	-	+ 20 %	+ 20 %	+25 %
≤ 2000	≤ 10	≤5	≤1	≤5
0.2990	10010000	1200	46/23	5200
-	-	-	-	-
-	-	+	-	-
-			-	
-	-	Ψ.	-	-
-	-	-	-	-
-	-	-	-	RTU
-	-	-	-	-
-	-	-	-	-
	-	-	-	
-	-	-	-	

Suitable system components								
-	-	-	-	÷				
-	-	-	-	-				
-	-	-	-	-				
-		-	-	-				
-	-	-	-	-				
-		-	-	-				



Device overview insulation monitoring devices ISOMETER®



		isoRW425	isoUG425	isoES425	isoHV425
	Catalogue page	111	114	117	120
S	pecial applications	Railway	Unearthed DC systems	Energy storage VDE-AR-E 2510-2	-
v	Control circuits	-	-	-	-
Circuits	Auxiliary circuits	-	-	-	-
Ŭ	Main circuits				
Ę	3(N)AC		-	-	
Voltage system	AC		-		
oltage	AC/DC		-		
ž	DC				
Nominal system voltage <i>U</i> n		AC/DC 0400 V	DC 12120 V	3 (N)AC, AC 0 400 V, DC 0 400 V	with AGH422 AC 01000 V, DC 01000 V
	Tolerance of U _n	+ 25 %	+20 %	+25 %	+10 %
System	leakage capacitance C _e μF	≤ 300	≤ 50	≤ 100	≤ 150
Re	sponse value R _{an} kΩ	1990	2100	2990	11500
	Coupled systems	-	-	-	÷
Loca for in	ating current injector Isulation fault location	-	-	-	Ŧ
5	DIN rail				
Installation	Screw mounting				
lnst	Panel mounting/ wall fastening	-	-	-	+
	Web server	-	-	-	-
	Modbus	RTU	RTU	-	RTU
Interfaces	ВСОМ	-	-	-	-
Inter	BS	-	-	-	-
	BMS				
	isoData				
Product details (Products on www.bender.de/en)					
		_			

	Туре	С. р.	Suitable system components						
	FP200	53	-	-	-	-			
	AGH150W-4	348	-	-	-	-			
vices	AGH204S-4	350	-	-	-	-			
Coupling devices	AGH520S	351	-	-	-	-			
	AGH675S-7	352	-	-	-	-			
	AGH676S-4	354	-	-	-	-			







ISOMETER® isoEV425



ISOMETER® isoCHA425



ISOMETER® isoCHA425HV



ISOMETER® iso165C-1

124	128	132	135	139
Electric mobility	Electric mobility	Electric mobility	Electric mobility	Electric mobility
-	-	-	-	-
-	-	-	+	-
-	-	-	-	-
-	-	-	Ψ.	-
-	-	-	-	-
DC 01000 V	DC 01000 V AC 0690 V, 15460 Hz	DC 0400 V	DC 01000 V with AGH420-1	DC 0600 V
+0%	+ 10 % + 15 %	-	+10 %	+ 15 %
≤1	≤5	≤2	≤5	≤1
10010000	10990	23 kΩ 46 kΩ	120 kΩ 600 kΩ	30 kΩ1 MΩ; 40 kΩ2 MΩ
-	-	-	Ψ.	-
-	-	-	+	-
-				-
		-	Ψ.	
-	-	-	+	-
-	-	-	-	-
-	RTU	RTU	RTU	-
-	-	-	-	-
-	-	-	-	-
-				-
-				-

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 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 (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.

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

Nominal system voltage range <i>U</i> n		Supply voltage <i>U</i> ₅		Display	Option "W"	Туре		Art. No.
AC	DC	AC	DC	J,	Sp. 3.	.,,,,		
0690 V; 0.1460 Hz				:	Ψ	iso685-D	Many out	B91067010
	0 1000V	24240 V;	24 240 V	integrated	-40+70°C, 3K23, 3M12	iso685W-D	Trining and the state of the st	B91067010 B91067010W B91067210 B91067210W
	01000 V	50400 Hz	24240 V	don't de	Ψ.	iso685-S + FP200		B91067210
				detached	-40+70 °C, 3K23, 3M12	iso685W-S + FP200W		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
Transparent cover 144x72 (IP65) for FP200 ²⁾	B98060005

 $^{^{\}mbox{\tiny 1)}}$ included in the scope of delivery

 $^{^{2)}}$ If the "transparent front cover 144x72 (IP65)" is used, the cutout in the control cabinet must be increased in height from 66 mm to 68 mm (+ 0.7 / -0 mm).

Туре	Art. No.	Page
iso685-S	B91067110	-
iso685W-S	B91067110W	-
FP200	B91067904	53
FP200W	B91067904W	53
AGH150W-4	B98018006	350
AGH204S-4	B914013	352
AGH520S	B913033	353
AGH676S-4	B913055	356
	iso685-S iso685W-S FP200 FP200W AGH150W-4 AGH204S-4 AGH520S	iso685-S B91067110 iso685W-S B91067110W FP200 B91067904 FP200W B91067904W AGH150W-4 B98018006 AGH204S-4 B914013 AGH520S B913033

Suitable measuring instruments on request!

Technical data

nsulation coordination according to IEC 60664-1/IEC 606	564-3	Measuring circuit
Definitions:		Measuring voltage U _m
Measuring circuit (IC1)	(L1/+, L2, L3/-)	Measuring current I _m
Supply circuit (IC2)	A1, A2	Internal resistance R_i , Z_i
Output circuit 1 (IC3)	11, 12, 14	Permissible extraneous DC volta
Output circuit 2 (IC4)	21, 22, 24	Permissible system leakage capa
Control circuit (IC5)	(E, KE), (X1, ETH, X3, X4)	
Rated voltage	1000 V	Measuring ranges
Overvoltage category	III	Measuring range f _n
Rated impulse voltage:		Tolerance measurement of f_n
IC1/(IC2-5)	8 kV	Voltage range measurement of i
IC2/(IC3-5)	4 kV	Measuring range U_n
IC3/(IC4-5)	4 kV	
IC4/IC5	4 kV	Voltage range measurement of the
Rated insulation voltage:		Tolerance measurement of U_n
IC1/(IC2-5)	1000 V	Measuring range $C_{\rm e}$
IC2/(IC3-5)	250 V	Tolerance measurement of C_e
IC3/(IC4-5)	250 V	Frequency range measurement
IC4/IC5	250 V	Min. insulation resistance measu
Pollution degree for accessible parts on the outside of the device	e housing ($U_{\rm n}$ < 690 V)	
Pollution degree for accessible parts on the outside of the device	e housing $(U_{\rm n} > 690 < 1000 \text{ V})$ 2	Display
Protective separation (reinforced insulation) between:		<u> </u>
IC1/(IC2-5)	Overvoltage category III, 1000 V	Indication
IC2/(IC3-5)	Overvoltage category III, 300 V	Display range measured value
IC3/(IC4-5)	Overvoltage categoryIII, 300 V	Operating uncertainty (according
IC4/IC5	Overvoltage category III, 300 V	LEDs
Voltage test (routine test) according to IEC 61010-1:		ON (operation LED)
IC2/(IC3-5)	AC 2,2 kV	SERVICE
IC3/(IC4-5)	AC 2,2 kV	ALARM 1
IC4/IC5	AC 2,2 kV	ALARM 2
Supply voltage		In-/Outputs (X1-Interface)
Supply via A1/+, A2/-:		Cable length X1 (unshielded cab
Supply voltage range $U_{\rm S}$	AC/DC 24240 V	Cable length X1 (shielded cable,
Folerance of U_S	-30+15%	J-Y(St)Y min. 2x0,8)
Maximum permissible input current of $U_{\rm S}$	650 mA	Total max. supply output curren
Frequency range of U _S	DC, 50400 Hz ¹⁾	Total max. supply output curren
Folgrance of the frequency range of $U_{\rm S}$	-5+15 %	Total max. supply output curren
Power consumption, typically DC	≤ 12 W	Total max. supply output curren
Power consumption, typically 50/60 Hz	≤ 12 W/21 VA	
Power consumption, typically 400 Hz	≤ 12 W/45 VA	
, ,,, ,	≤ 12 W/43 VA	Digital Inputs (I1, I2, I3)
Supply via X1:	25011	Number
Supply voltage <i>U</i> s	DC 24 V	Operating mode, adjustable
Tolerance of $U_{\rm S}$	DC -20+25 %	Functions
T system being monitored		Voltage
Nominal system voltage range U _n	AC 0690 V	Tolerance Voltage
, , , , , , , , , , , , , , , , , , , ,	DC 01000 V	Digital Outputs (Q1, Q2)
A	C/DC 0600 V (for UL applications)	Number
Tolerance of Un	AC/DC +15 %	Operating mode, adjustable
Frequency range of Un	DC, 0.1460 Hz	1 3 , ,
Max. AC voltage U_{\sim} in the frequency range $f_{\rm n}=0.14$ Hz	$U_{\sim \text{max}} = 50 \text{ V/Hz}^2 * (1 + f_n^2)$	Functions
Response values		w. b.
Response value R _{an1} (alarm 1)	1 kΩ10 MΩ	Voltage
Response value R _{an2} (alarm 2)	1 kΩ10 MΩ	Analogue Output (M+)
Relative uncertainty (acc. to IEC 61557-8) profile	dependent, ± 15 %, at least ± 1 k Ω	Number
Hysteresis	25 %, at least 1 kΩ	Operating mode
Time response		Functions
Time response	F 10 . 156	Current 0

Current

Voltage

0...600 s

Tolerance related to the current/voltage final value

Measuring circuit	
Measuring voltage U _m	profile dependent, $\pm 10 \text{ V}$, $\pm 50 \text{ V}$ (see profile overview)
Measuring current I _m	≤ 403 µA
Internal resistance R_i , Z_i	≥ 124 kΩ
Permissible extraneous DC voltage	
Permissible system leakage capacit	ance C _e 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 251000 V
Voltage range measurement of U_n	AC/DC > 10 V
Tolerance measurement of U_n	±5 % ±5 V
Measuring range C _e	01000 μF
Tolerance measurement of Ce	±10 % ±10 μF
Frequency range measurement of C	
Min. insulation resistance measurer	nent of $C_{ m e}$ depending on the profile and coupling mode, typ. $>$ 10 k Ω
Display	acpending on the prome and coupling mode, typ. > 10 ks2
Display Indication	graphic display 127 x 127 pixels, 40 x 40 mm ²
Display range measured value	0.1 kΩ20 MΩ
Operating uncertainty (according to	
LEDs	
ON (operation LED)	green
SERVICE	yellow
ALARM 1	yellow
ALARM 2	yellow
In-/Outputs (X1-Interface)	,
Cable length X1 (unshielded cable)	\leq 10 m eld connected to earth (PE) on one end, recommended:
J-Y(St)Y min. 2x0,8)	eta connectea to earth (PE) on one ena, recommendea: ≤ 100 m
	r each output (device supplied by X1.+/X1.GND) max. 1 A
Total max. supply output current or	
	1 X1 (device supplied by A1+/A2- between 16,8 V and 40 V)
Total max. supply output current of	$I_{\text{Lmax}X1} = 10 \text{ mA} + 7 \text{ mA/V} * U_s^{3}$
	(negative values are not allowed for /LmaxX1)
D: 1: 11 (/a 12 12)	(itegative values are not allowed to religion)
Digital Inputs (I1, I2, I3)	
Number	3
Operating mode, adjustable	active high, active low
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 4
	DC+ alarm 4, symmetrical alarm, device fault, common alarm,
Valtaria	measurement complete, device inactive, DC offset alarm
Voltage	passive DC 032 V, active DC 0/19.232 V
Analogue Output (M+)	
Number	1



Start-up delay T_{start-up}

Response time DC alarm at $C_e = 1 \mu F$

Response time t_{an} at $R_F=0.5$ x R_{an} ($R_{an}=10$ k Ω) and $C_e=1$ μF according to IEC 61557-8

profile dependent, typ. 4 s (see diagrams in manual)

profile dependent, typ. 2 s (see diagram in manual)

0...20 mA (< 600 Ω), 4...20 mA (< 600 Ω), 0...400 μA (< 4 kΩ)

linear, midscale point 28 k Ω /120 k Ω insulation value, DC offset

 $0...10 \text{ V } (> 1 \text{ k}\Omega), 2...10 \text{ V } (> 1 \text{ k}\Omega)$

 $\pm 20 \%$

Interfaces	
Field bus:	
Interface/protocol	web server/Modbus TCP/BCOM
Data rate	10/100 Mbit/s, autodetect
Max. amount Modbus requests	< 100/s
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/BS/Modbus RTU
Data rate	9.6 kBaud/s
Cable length	≤ 1200 m
Cable: twisted pair, one end of shield connected to PE	recommended: J-Y(St)Y min. 2x0.8
Connection	terminals X1.A, X1.B
Terminating resistor at the beginning and at the end of the	e transmission path
	120 Ω , can be connected internally
Device address, BS bus	190
Switching elements	
Number of cuitching elements	2 changeover contacts

Number of switching elements	2 chan	geover contacts
Operating mode	N/C operation	n/N/O operation
Contact 11-12-14/21-22-24	off, Ins. alarm 1, Ins. alarm 2, connection fa	ult, DC- alarm 4),
	DC+ alarm 4), symmetrical alarm, device fault,	common alarm,
	measurement complete, device inactive,	DC offset alarm
Electrical endurance under rated o	perating conditions, number of cycles	10.000

Electrical endurance under rated operating conditions, number of 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 \leq 3000 m NN						160 V
Minimum contact rating				1 n	nA at AC/D	C ≥ 10 V

Condiciones Ambientales/Compatibilidad electromagnética

CEM	IEC 61326-2-4 ⁵⁾
Ambient temperatures:	
Operating temperature	-25+55 ℃
Transport	-40+85 °C
Long-term storage	-40+70 ℃

Classification	of c	limati	c conditions	acc. to	IEC	607	21	:

Area of application

Classification of Chinatic Conditions a	ICC. 10 IEC 00/21.
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 conditio	ns 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

Screw-type terminals:	
Nominal current	≤ 10 A
Tightening torque	0.50.6 Nm (57 lb-in)
Conductor sizes	AWG 2412
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
Multiple conductor, flexible	0.21.5 mm ²
Multiple conductor, flexible with ferrule without plastic sleeve	0.251 mm ²
Multiple conductor, flexible with TWIN ferrule with plastic sleeve	0.51.5 mm ²

pluggable screw-type terminal or push-wire terminal

Push-wire terminals:	
Nominal current	≤ 10 A
Conductor sizes	AWG 2412
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:

i usii wiic teriiiiiuis xii	
Nominal current	≤ 8 A
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 TWIN ferrule with plastic sleeve	0.250.75 mm ²

Other

Operating mode	continuous operation
Mounting (0°)	display oriented, cooling slots must be ventilated vertically 6)
Degree of protection internal compo	onents 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

Option "W" data different from the standard version

Rated operational current of switching elements

Ambient temperatures:	
Operating temperature	-40+70 ℃
	-40+65 °C (for UL applications)
Transport	-40+85 ℃
Long-term storage	-40+70 ℃

Classification of climatic conditions acc. to IEC 60721:

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

Classification of mechanical conditions acc. to IEC 60721:

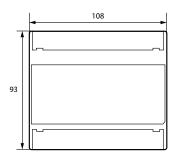
3M12 Stationary use (IEC 60721-3-3)

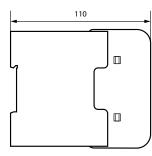
- $^{\rm 1)}$ At a frequency > 200 Hz, the connection of X1 must be insulated. Only permanently installed devices which at least have overvoltage category CAT2 (300V) may be connected.
- $^{2)}$ Indication limited outside the temperature range -25 \ldots +55 °C.
- $^{\scriptscriptstyle (3)}$ $U_{\scriptscriptstyle S}$ [Volt] = supply voltage ISOMETER $^{\scriptscriptstyle (0)}$
- $^{\scriptscriptstyle 4)}$ For $\textit{U}_{n} \geq 50 \text{ V}$ only.

≤ 3000 m NN

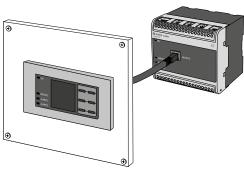
- ⁵⁾ This is a class A product. In a domestic environment, this product may cause radio interference. In this case, the user may be required to take corrective actions.
- $^{\rm 61}$ Recommendation: Devices mounted at 0 $^{\circ}$ (display-oriented, cooling slots must be ventilated vertically). For devices mounted at an angle of 45°, the max. working temperature is reduced by 10 °C. For devices mounted at an angle of 90°, the max. working temperature is reduced by 20 °C.

Dimension diagram (dimensions in mm)



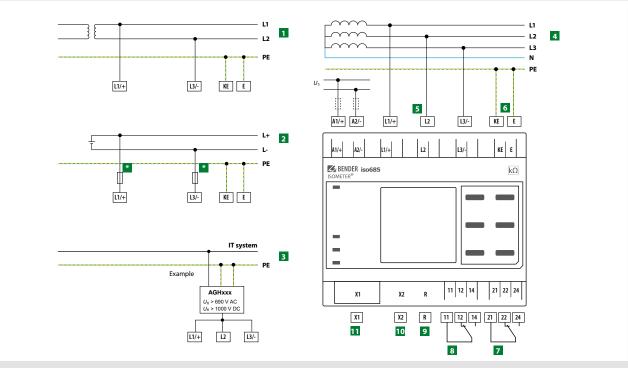


Connection to FP200





max. 3 A (for UL applications)



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

- 8 (K2) Alarm relay 2, available changeover contacts
- 9 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.

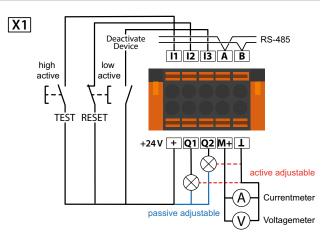
For UL applications:

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
	A	RS-485 A
11 12 13 A B + Q1 Q2 M+ 1 X1	В	RS-485 B
	+	+24 V
	Q1	Output 1
	Q2	Output 2
	M+	Analogue output
	Т	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 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 (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.

iso685-S-B

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

Nominal system voltage range <i>U</i> n		Supply voltage <i>U</i> ₅		Display	Option "W"	Туре		Art. No.	
AC	DC	AC	DC Type			AIL NO.			
				_	-	iso685-D-B	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	B91067020	
0690V;		24240 V;	24 2424		•	-40+70 °C, 3K23, 3M12	iso685W-D-B ¹⁾	Treat and the second	B91067020W
1460 Hz	01000 V	50400 Hz	24240 V		-	iso685-S-B +FP200		B91067220	
				_	-40+70 °C, 3K23, 3M12	iso685W-S-B +FP200W ¹⁾		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
Transparent cover 144x72 (IP65) for FP200 ²⁾	B98060005

¹⁾ included in the scope of delivery

 $^{^{2)}}$ If the "transparent front cover 144x72 (IP65)" is used, the cutout in the control cabinet must be increased in height from 66 mm to 68 mm (+ 0.7 / -0 mm).

Description	Туре	Art. No.	Page
Device version	iso685-S-B	B91067120	-
without display	iso685W-S-B	B91067120W	-
Display for front panel mounting	FP200	B91067904	53
	FP200W	B91067904W	53
Coupling devices	AGH150W-4	B98018006	350
	AGH204S-4	B914013	352
	AGH520S	B913033	353
	AGH676S-4	B913055	356

Suitable measuring instruments on request!

Technical data

Definitions:	1/IEC 60664-3
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 voltage	1000 \
Overvoltage category	
Rated impulse voltage:	
IC1/(IC2-5)	8 k\
IC2/(IC3-5)	4 k\
IC3/(IC4-5)	4 k\
IC4/IC5	4 k\
Rated insulation voltage:	
IC1/(IC2-5)	1000 V
IC2/(IC3-5)	250 V
IC3/(IC4-5)	250 V
IC4/IC5	250 V
Pollution degree for accessible parts on the outside of the de	evice housing ($U_{\rm n}$ < 690 V)
Pollution degree for accessible parts on the outside of the de	
Protective separation (reinforced insulation) between:	
IC1/(IC2-5)	Overvoltage category III, 1000 \
IC2/(IC3-5)	Overvoltage category III, 300 \
IC3/(IC4-5)	Overvoltage category III, 300 \
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 k\
IC4/IC5	AC 2,2 kV
Supply voltage	
Supply via A1/+, A2/-:	
Supply voltage range $U_{\rm S}$	AC/DC 24240 V
Tolerance of U_{S}	-30+15%
Maximum permissible input current of U_s	650 m <i>l</i>
Frequency range of $U_{\rm S}$	DC, 50400 Hz ¹
	-5+15 %
Tolerance of the frequency range of U_s	3 13 /
Tolerance of the frequency range of <i>U</i> s Power consumption, typically DC	
	≤ 12 W
Power consumption, typically DC	≤ 12 W ≤ 12 W/21 VA
Power consumption, typically DC Power consumption, typically 50/60 Hz Power consumption, typically 400 Hz	≤ 12 W ≤ 12 W/21 VA
Power consumption, typically DC Power consumption, typically 50/60 Hz Power consumption, typically 400 Hz Supply via X1:	≤ 12 W/21 VA ≤ 12 W/21 VA ≤ 12 W/45 VA
Power consumption, typically DC Power consumption, typically 50/60 Hz Power consumption, typically 400 Hz	≤ 12 W/21 VA ≤ 12 W/21 VA ≤ 12 W/45 VA DC 24 V
Power consumption, typically DC Power consumption, typically 50/60 Hz Power consumption, typically 400 Hz Supply via X1: Supply voltage <i>U</i> _S Tolerance of <i>U</i> _S	≤ 12 W/21 VA ≤ 12 W/21 VA ≤ 12 W/45 VA
Power consumption, typically DC Power consumption, typically 50/60 Hz Power consumption, typically 400 Hz Supply via X1: Supply voltage $U_{\rm S}$ Tolerance of $U_{\rm S}$	≤ 12 W/21 VA ≤ 12 W/21 VA ≤ 12 W/45 VA DC -20+25 %
Power consumption, typically DC Power consumption, typically 50/60 Hz Power consumption, typically 400 Hz Supply via X1: Supply voltage <i>U</i> _S Tolerance of <i>U</i> _S	≤ 12 W/21 V/ ≤ 12 W/21 V/ ≤ 12 W/45 V/ DC -20+25 % AC 0690 \
Power consumption, typically DC Power consumption, typically 50/60 Hz Power consumption, typically 400 Hz Supply via X1: Supply voltage $U_{\rm S}$ Tolerance of $U_{\rm S}$	≤ 12 W/21 V/4 ≤ 12 W/45 V/4 DC 24 \ DC -20+25 % AC 0690 \ DC 01000 \
Power consumption, typically DC Power consumption, typically 50/60 Hz Power consumption, typically 400 Hz Supply via X1: Supply voltage U_S Tolerance of U_S IT system being monitored Nominal system voltage range U_n	≤ 12 W/21 V/ ≤ 12 W/45 V/ ≤ 12 W/45 V/ DC -24 \ DC -20+25 % AC 0690 \ DC 01000 \ AC/DC 0600 V (for UL applications
Power consumption, typically DC Power consumption, typically 50/60 Hz Power consumption, typically 400 Hz Supply via X1: Supply voltage U_S Tolerance of U_S IT system being monitored Nominal system voltage range U_n	≤ 12 W/21 V/4 ≤ 12 W/45 V/ DC 24 \ DC -20+25 % AC 0690 \ DC 01000 \ AC/DC 0600 V (for UL applications AC/DC+15 %)
Power consumption, typically DC Power consumption, typically 50/60 Hz Power consumption, typically 400 Hz Supply via X1: Supply voltage U _S Tolerance of U _S IT system being monitored Nominal system voltage range U _n Tolerance of U _n Frequency range of U _n	≤ 12 W/21 VA ≤ 12 W/21 VA ≤ 12 W/45 VA DC -20+25 % AC 0690 V DC 01000 V AC/DC 0600 V (for UL applications) AC/DC +15 % DC, 0.1460 Hz
Power consumption, typically DC Power consumption, typically 50/60 Hz Power consumption, typically 400 Hz Supply via X1: Supply voltage U_S Tolerance of U_S IT system being monitored Nominal system voltage range U_n	≤ 12 W/21 V/4 ≤ 12 W/45 V/4 ≤ 12 W/45 V/4 DC 24 \ DC -20+25 % AC 0690 \ DC 01000 \ AC/DC 0600 V (for UL applications AC/DC +15 % DC, 0.1460 H;
Power consumption, typically DC Power consumption, typically 50/60 Hz Power consumption, typically 400 Hz Supply via X1: Supply voltage U_S Tolerance of U_S IT system being monitored Nominal system voltage range U_N Tolerance of U_N Frequency range of U_N Max. AC voltage U_N in the frequency range U_N Response values	≤ 12 W $ ≤ 12 W/21 VA $ $ ≤ 12 W/45 VA $ $ ≤ 12 W/45 VA $ DC 24 V DC -20+25 % AC 0690 V DC 01000 V AC/DC 0600 V (for UL applications AC/DC +15 % DC, 0.1460 Hi $ DC, 0.1460 Hi $ $ DC, 0.1460 Hi $ $ DC, 0.1460 Hi $ $ DC, 0.1461 Hi$
Power consumption, typically DC Power consumption, typically 50/60 Hz Power consumption, typically 400 Hz Supply via X1: Supply voltage U_S Tolerance of U_S IT system being monitored Nominal system voltage range U_n Tolerance of U_n Frequency range of U_n Max. AC voltage U_{\sim} in the frequency range $f_n = 0.1$ Response value S_n (alarm 1)	≤ 12 W / 21 V/4 ≤ 12 W / 21 V/4 ≤ 12 W / 45 V/4 DC -20+25 % AC 0690 \(\text{ DC } 0 \times \text{ 1000 V} \) AC/DC 0600 V (for UL applications AC/DC + 15 % DC, 0.1460 H; 4 Hz $U \sim \max = 50 \text{ V/Hz}^2 * (1 + f_n^2) $
Power consumption, typically DC Power consumption, typically 50/60 Hz Power consumption, typically 400 Hz Supply via X1: Supply voltage U_S Tolerance of U_S IT system being monitored Nominal system voltage range U_n Tolerance of U_n Frequency range of U_n Max. AC voltage U_\sim in the frequency range $f_n = 0.1$ Response values Response value R_{an1} (alarm 1) Response value R_{an2} (alarm 2)	\leq 12 W / 45 V / 8 \leq 12 W / 45 V / 9 DC -24 V / 9 DC -20+25 % AC 0690 V DC 01000 V / 9 DC 01000 V / 9 C / 9 DC +15 % DC, 0.1460 H; DC, 0.1460 H; 4 Hz $U_{\sim \text{max}} = 50 \text{ V/Hz}^2 * (1 + f_n^2)$ 1 kΩ10 MΩ 1 kΩ10 MΩ 1 kΩ10 MΩ
Power consumption, typically DC Power consumption, typically 50/60 Hz Power consumption, typically 400 Hz Supply via X1: Supply voltage U_S Tolerance of U_S IT system being monitored Nominal system voltage range U_n Tolerance of U_n Frequency range of U_n Max. AC voltage U_{\sim} in the frequency range $f_n = 0.1$ Response value S_n (alarm 1)	≤ 12 W/21 VA ≤ 12 W/21 VA ≤ 12 W/45 VA DC -20+25 % AC 0690 V DC 01000 V AC/DC 0600 V (for UL applications) AC/DC +15 % DC, 0.1460 Hz

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

profile dependent, typ. 4 s (see diagrams in manual)

profile dependent, typ. 2 s (see diagram in manual)

0...600 s

Measuring circuit	
Measuring voltage $U_{\rm m}$	profile dependent, ±10 V, ±50 V (see profile overview)
Measuring current I _m	≤ 403 μA
Internal resistance R_i , Z_i	≥ 124 kΩ
Internal resistance on decouppled systems (
Permissible extraneous DC voltage U_{fg}	≤ 1200 V
Permissible system leakage capacitance C_e	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 $f_{\rm n}$	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 $U_{\rm n}$	±5 % ±5 V
Measuring range C _e	01000 μF
Tolerance measurement of Ce	±10 % ±10 μF
Frequency range measurement of C_e	DC, 30460 Hz
Min. insulation resistance measurement of de	$C_{\rm e}$ Dending on the profile and coupling mode, typ. $>$ 10 k Ω
Display	3,
Indication	graphic display 127 x 127 pixels, 40 x 40 mm ²⁾
Display range measured value	0.1 kΩ20 MΩ
Operating uncertainty (according to IEC 61.	
operating uncertainty (according to lee or	257 0) ±15 /0, ut least ±1 k22
LEDs	
ON (operation LED)	green
SERVICE	yellow
ALARM 1	yellow
ALARM 2	yellow
In-/Outputs (X1-Interface)	
Cable length X1 (unshielded cable)	≤ 10 m
Cable length X1 (shielded cable, shield connect	
J-Y(St)Y min. 2x0,8)	≤ 100 m
Total max. supply output current for each output	ut (device supplied by X1.+/X1.GND) max. 1 A
Total max. supply output current on X1 (device	supplied by A1+/A2-) max. 200 mA
Total max. supply output current on X1 (device	supplied by A1+/A2- between 16,8 V and 40 V)
	$I_{\text{LmaxX1}} = 10 \text{ mA} + 7 \text{ mA/V} * U_5^{3}$
	(negative values are not allowed for I _{LmaxX1})
Digital Inputs (I1, I2, I3)	
Number	3
Operating mode, adjustable	active high, active low
	t, 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
	Ins. alarm 1, Ins. alarm 2, connection fault, DC- alarm 4),
	llarm ⁴⁾ , symmetrical alarm, device fault, common alarm,
<i>DC1</i> C	measurement complete, device inactive, DC offset alarm
Voltage	passive DC 032 V, active DC 0/19.232 V
Analogue Output (M+)	· ·
Number	1
Operating mode	linear, midscale point 28 k Ω /120 k Ω
Functions	insulation value, DC offset
	$(< 600 \Omega)$, 420 mA $(< 600 \Omega)$, 0400 μA $(< 4 k\Omega)$
Voltage	$010 \text{ V} (> 1 \text{ k}\Omega), 210 \text{ V} (> 1 \text{ k}\Omega)$
Tolerance related to the current/voltage fir	

Response time DC alarm at $C_{e}=1\,\mu F$

Start-up delay T_{start-up}

Tolerance related to the current/voltage final value

Interfaces						
Field bus:						
Interface/protocol			W	eb server/	Modbus TO	P/BCON
Data rate				10/100	Mbit/s, au	todetec
Max. amount Modbus requests						< 100/
Cable length						≤ 100 n
Connection						RJ4.
IP address				DHCP/n	nanual 192	.168.0.
Network mask					255.2	55.255.
BCOM address					sys	tem-1-0
Function		communication inter			interfac	
ISOnet:						
Number ISOnet devices						≤ 20
Max. nominal system voltage rang	e ISOnet			А	C 690 V; D	C 1000 '
Sensor bus:						
Interface/protocol				RS-4	85/BS/Mod	lbus RTI
Data rate						kBaud/
Cable length						1200 n
Cable: twisted pair, one end of shie	eld connected t	to PE	recon	nmended:	J-Y(St)Y m	
Connection					erminals X	
Terminating resistor at the beginni	ing and at the	end of the	transmissi			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
· · · · , · · · · · · · · · ,	J				onnected in	nternally
Device address, BS bus						190
Switching elements						
				2 -		
Number of switching elements Operating mode					nangeover	
Operating mode Contact 11-12-14/21-22-24	off Inc. a	larm 1 Inc	alarm 2		tion/N/O o fault, DC-	
Contact 11-12-14/21-22-24	DC+ alarm 4					
					ive, DC offs	
Electrical endurance under rated o					ve, De ons	10.000
		tions, num	bei oi cyci			10.000
Contact data acc. to IEC 60947-		16.11	DC 12	DC 12	DC 12	DC 41
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 \
Rated operational current	5 A	3 A	1 A	1 A	0.2 A	0.1
Rated insulation voltage ≤ 2000 m						250 \
Rated insulation voltage ≤ 3000 m	1 NN					160 \
Minimum contact rating				1 n	nA at AC/D	C ≥ 10 \
Environment/EMC						
EMC					IEC 613	26-2-4
Ambient temperatures:					.200.5	
Operating temperature					25	.+55 °(
Transport						.+85 °
Long-term storage						.+70°
					-40	. + / 0
Classification of climatic condit	tions acc. to I				.1.6	
Stationary use (IEC 60721-3-3)		3K23 (ex	cept conde	ensation ar	d formation	
Transport (IEC 60721-3-2)						2K1
Long-term storage (IEC 60721-3-1)						1K2
Classification of mechanical co	nditions acc.	to IEC 607	721:			
Stationary use (IEC 60721-3-3)						3M1
Transport (IEC 60721-3-2)						2M4
Long-term storage (IEC 60721-3-1))					1M12
Area of application					≤ 30	00 m NN

Connection		
Connection type	pluggable screw-type	terminal or push-wire terminal
Screw-type terminals:		
Nominal current		≤ 10 A
Tightening torque		0.50.6 Nm (57 lb-in)
Conductor sizes		AWG 2412
Stripping length		7 mm
rigid/flexible		0.22.5 mm ²
flexible with ferrules, witl	h/without plastic sleeve	0.252.5 mm ²
Multiple conductor, rigid		0.21 mm ²
Multiple conductor, flexib	le	0.21.5 mm ²
Multiple conductor, flexib	le with ferrule without plastic sleeve	0.251 mm ²
Multiple conductor, flexib	le with TWIN ferrule with plastic sleeve	0.51.5 mm ²
Push-wire terminals:		
Nominal current		≤ 10 A
Conductor sizes		AWG 2412
Stripping length		10 mm
rigid/flexible		0.22.5 mm ²
flexible with ferrules, witl	h/without plastic sleeve	0.252.5 mm ²
Multiple conductor, flexib	le with TWIN ferrule with plastic sleeve	0.51.5 mm ²
Push-wire terminals X1	l :	
Nominal current		≤ 8 A
Conductor sizes		AWG 2416
Stripping length		10 mm
rigid/flexible		0.21.5 mm ²
flexible with ferrule withou	out 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, cooling slots	must be ventilated vertically 6)
Degree of protection inter		IP40
Degree of protection term	ninals	IP20
DIN rail mounting acc. to		IEC 60715
Screw fixing		3 x M4 with mounting clip
Enclosure material		polycarbonate

Option "W" data different from the standard version Rated operational current of switching elements

Ambient temperatures:	
Operating temperature	-40+70 ℃
	-40+65 °C (for UL applications)
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 (condensation and formation of ice possible)

Classification of mechanical conditions acc. to IEC 60721:

Stationary use (IEC 60721-3-3)

- $^{\rm 1)}$ At a frequency > 200 Hz, the connection of X1 must be insulated. Only permanently installed devices which at least have overvoltage category CAT2 (300V) may be connected.
- $^{2)}$ Indication limited outside the temperature range -25 \ldots +55 °C.
- $^{\scriptscriptstyle (3)}$ $U_{\scriptscriptstyle S}$ [Volt] = supply voltage ISOMETER $^{\scriptscriptstyle (0)}$
- $^{4)}$ For $U_{n} \ge 50 \text{ V}$ only.

Flammability class ANSI code Dimensions (W x H x D

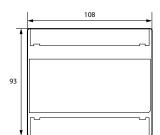
Weight

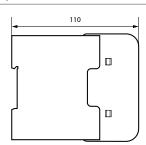
Documentation number

- $^{\rm 5)}$ This is a class A product. In a domestic environment, this product may cause radio interference. In this case, the user may be required to take corrective actions.
- $^{\rm 6)}$ Recommendation: Devices mounted at 0 $^{\circ}$ (display-oriented, cooling slots must be ventilated

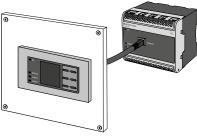
For devices mounted at an angle of 45°, the max. working temperature is reduced by 10 °C. For devices mounted at an angle of 90°, the max. working temperature is reduced by 20 °C.

Dimension diagram (dimensions in mm)





Connection to FP200

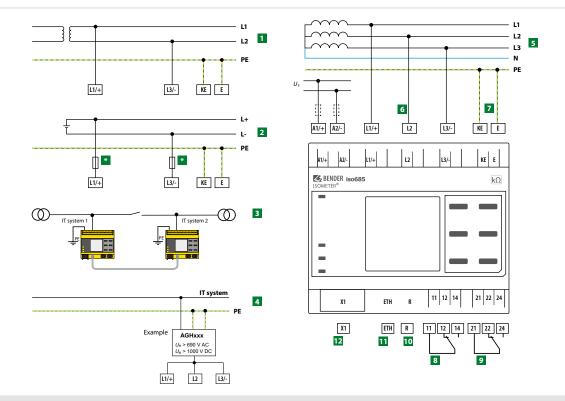


V-0

< 390 g

108 x 93 x 110 mm D00177

max. 3 A (for UL applications)



- 1 Connection to an AC system U_n
- 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.
- 4 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/-)
- **7** Separate connection of KE, E to PE

- 8 (K1) Alarm relay 1, available changeover contacts
- 9 (K2) Alarm relay 2, available changeover contacts
- 5 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 earth-fault-proof wiring.

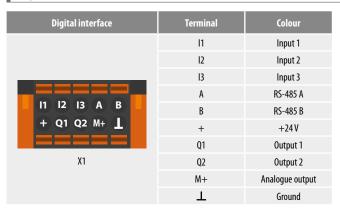
The connecting lines L1/+, L2, L3/- to the system to be monitored must be carried out as spur lines. No load current may be conducted through the terminals.

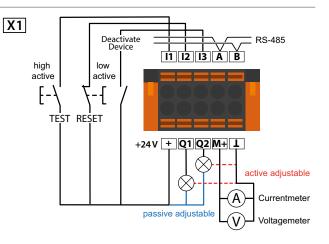
For UL applications:

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





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

EDS44x

- 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.

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.



Nominal system voltage range <i>U</i> n		stem voltage range <i>U</i> n Supply voltage <i>U</i> s		oltage <i>U</i> s Display		Туре		Art. No.	
AC	DC	AC	DC	Display	Option "W" 1)	,,,,,		THE COLOR	
	01000 V 24240 V; 50400 Hz	24240V:				-	iso685-D-P	National Control of the Control of t	B91067030
0690 V;						integrated	-40+70 °C, 3K23, 3M12	iso685W-D-P	419.00
0.1460 Hz		50400 Hz —					-	iso685-S-P +FP200	
			detached		detached	-40+70 °C, 3K23, 3M12	iso685W-S-P +FP200W		B91067230W

Insulation fault locators

Description	Supply voltage U ₅ ¹¹	Response value	Туре	Art. No.	Page
			EDS440-S-1	B91080201	146
		2 10 ··· A	EDS440W-S-1	B91080201W	146
	45/0524 24014	210 mA	EDS440-L-4	B91080202	146
			EDS440W-L-4	B91080202W	146
Insulation fault locators			EDS441-S-1	B91080204	146
insulation lault locators	AC/DC 24240V		EDS441W-S-1	B91080204W	146
	0.21 mA	EDS441-L-4	B91080205	146	
		0.21 MA	EDS441W-L-4	B91080205W	146
			EDS441-LAB-4	B91080207	146
			EDS441W-LAB-4	B91080207W	146
Dalass mandula	DC 24V		IOM441-S	B95012057	402
Kelay module	Relay module DC 24 V	_	IOM441W-S	B95012057W	402

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
Transparent cover 144x72 (IP65) for FP200 ²⁾	B98060005
BB bus 6TE connector 3)	B98110001

¹⁾ 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	53
panel mounting	FP200W	B91067904W	53

Suitable measuring instruments on request!

 $^{^{2)}}$ If the "transparent front cover 144x72 (IP65)" is used, the cutout in the control cabinet must be increased in height from 66 mm to 68 mm (+ 0.7/-0 mm).

 $^{^{\}rm 3)}$ Necessary for the connection of the ISOMETER $^{\rm o}$ s with an EDS44 \ldots -S

Insulation coordination according to IEC 6	0664-1/IEC 60664-3	Measuring ranges	
Definitions:		Measuring range f _n	0.1460 Hz
Measuring circuit (IC1)	(L1/+, L2, L3/-)	Tolerance measurement of f_n	±1 % ±0.1 Hz
Supply circuit (IC2)	A1, A2	Voltage range measurement of f_n	AC 25690 V
Output circuit 1 (IC3)	11, 12, 14	Measuring range U_{n}	AC 25690 V
Output circuit 2 (IC4)	21, 22, 24		DC 01000 V
Control circuit (IC5)	(E, KE), (X1, ETH, X3, X4)	Voltage range measurement of $U_{\rm n}$	AC/DC > 10 V
Rated voltage	1000 V	Tolerance measurement of U_n	±5 % ±5 V
Overvoltage category		Measuring range C _e	01000 μF
Rated impulse voltage:		Tolerance measurement of C _P	±10 % ±10 μF
IC1/(IC2-5)	8 kV	Frequency range measurement of C _e	DC, 30460 Hz
, ,	4 kV	Min. insulation resistance measurement of C _e	DC, 30400 Hz
IC2/(IC3-5)			d line d 10 lo
IC3/(IC4-5)	4 kV	depending on the profile	e and coupling mode, typ. $> 10 \mathrm{k}\Omega$
IC4/IC5	4 kV	Display	
Rated insulation voltage:		/	play 127 x 127 pixels, 40 x 40 mm ²
IC1/(IC2-5)	1000 V	Display range measured value	0.1 kΩ20 MΩ
IC2/(IC3-5)	250 V	Operating uncertainty (according to IEC 61557-8)	± 15 %, at least ± 1 k Ω
IC3/(IC4-5)	250 V	operating uncertainty (according to IEC 01337-8)	±13 %, at least ±1 k22
IC4/IC5	250 V	LEDs	
Pollution degree for accessible parts on the out	side of the device housing ($U_{\rm n}$ < 690 V) 3	ON (operation LED)	green
Pollution degree for accessible parts on the out	side of the device housing ($U_n > 690 < 1000 \text{ V}$) 2	PGH ON	yellow
Protective separation (reinforced insulation) be	tween:		· · · · · · · · · · · · · · · · · · ·
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 category III, 300 V	ALARM 2	yellow
IC4/IC5	Overvoltage category III, 300 V	In-/Outputs (X1-Interface)	
Voltage test (routine test) according to IEC 610	, , , , , , , , , , , , , , , , , , ,		
Voltage test (routine test) according to IEC 610 IC2/(IC3-5)		Cable length X1 (unshielded cable)	≤ 10 m
IC2/(IC3-5) IC3/(IC4-5)	AC 2,2 kV AC 2,2 kV	Cable length X1 (shielded cable, shield connected to earth (PE) on one	end, recommended:
		J-Y(St)Y min. 2x0,8)	≤ 100 m
IC4/IC5	AC 2,2 kV	Total max. supply output current for each output (device supplied by X	1.+/X1.GND) max. 1 A
Supply voltage		Total max. supply output current on X1 (device supplied by A1+/A2-)	max. 200 mA
supply rollage		Total max. supply output current on X1 (device supplied by A1+/A2-b	
Supply via A1/+, A2/-:		Total max. supply output current of AT (device supplied by ATT)/AZ b	$I_{\text{LmaxX1}} = 10 \text{ mA} + 7 \text{ mA/V} * U_5^{3}$
Supply voltage range $U_{\rm S}$	AC/DC 24240 V	(
Tolerance of $U_{\rm S}$	-30+15%	(nega	ative values are not allowed for I_{LmaxX1})
Maximum permissible input current of U_{S}	650 mA	Digital Inputs (I1, I2, I3)	
Frequency range of $U_{\rm S}$	DC, 50400 Hz 1)	Number	3
Folerance of the frequency range of $U_{\rm S}$	-5+15 %		
Power consumption, typically DC	≤ 12 W	Operating mode, adjustable	active high, active low
Power consumption, typically 50/60 Hz	≤ 12 W/21 VA	Functions off, test, reset, deactivate device, start initial mea	
Power consumption, typically 400 Hz	≤ 12 W/45 VA		ow DC -35 V, High DC 1132 V
, , ,	3 12 W/13 W	Tolerance Voltage	±10 %
Supply via X1:		Digital Outputs (Q1, Q2)	
Supply voltage $U_{\rm S}$	DC 24 V		
Tolerance of <i>U</i> s	DC -20+25 %	Number	2
IT system being monitored		Operating mode, adjustable	active, passive
<u> </u>	ACO (00 V		rm 2, connection fault, DC- alarm ⁴⁾ ,
Nominal system voltage range U_{n}	AC 0690 V	• •	alarm, device fault, common alarm,
	DC 01000 V		ete, device inactive, DC offset alarm
	AC/DC 0600 V (for UL applications)	Voltage passive DO	C 032 V, active DC 0/19.232 V
Tolerance of <i>U</i> n	AC/DC +15 %	Analogue Output (M +)	
Frequency range of U_{n}	DC 0.1460 Hz	Analogue Output (M+)	
Max. AC voltage U_{\sim} in the frequency range $f_{\rm n}$ =	= 0.14 Hz $U_{\sim \text{max}} = 50 \text{ V/Hz}^2 * (1 + f_n^2)$	Number	1
			near, midscale point 28 k Ω /120 k Ω
Response values		Functions	insulation value, DC offset
Response value R _{an1} (alarm 1)	1 kΩ10 MΩ		A (< 600 Ω), 0400 μ A (< 4 k Ω)
Response value R _{an2} (alarm 2)	1 kΩ10 MΩ	Voltage 0	. 10 V (> 1 kΩ), 210 V (> 1 kΩ)
Relative uncertainty (acc. to IEC 61557-8)	dependent on the profile, ± 15 %, at least ± 1 k Ω	Tolerance related to the current/voltage final value	±20 %
lysteresis	25 %, at least 1 kΩ		
•	,	Interfaces	
Time response		Field bus:	
Response time t_{an} at $R_F = 0.5 \text{ x } R_{an}$ ($R_{an} = 10 \text{ k}$	Ω) and $C_e = 1$ μF according to IEC 61557-8		woh conver/Modhus TCD/DCOM
	profile dependent, typ. 4 s (see diagrams in manual)	Interface/protocol	web server/Modbus TCP/BCOM
	profile dependent, typ. 2 s (see diagram in manual)	Data rate	10/100 Mbit/s, autodetect
Start-up delay $T_{\text{start-up}}$	0600 s	Max. amount Modbus requests	< 100/s
ap acia) · sidit-up	00003	Cable length	≤ 100 m
Measuring circuit		Connection	RJ45
-	ofile dependent, $\pm 10 \text{ V}$, $\pm 50 \text{ V}$ (see profile overview)	IP address	DHCP/manual* 192.168.0.5*
Measuring current Im	$\leq 403 \mu\text{A}$	Network mask	255.255.255.0*
nternal resistance R _i , Z _i	≥ 124 kΩ	BCOM address	system-1-0
nternal resistance κ_i, z_i nternal resistance on decouppled systems (inact		Function	communication interface
Permissible extraneous DC voltage U_{fg}	≤ 1200 V	ISOnet:	0 00 1 :
Permissible system leakage capacitance $C_{\rm e}$	profile dependent, 01000 μF	Number ISOnet devices	020 devices
		Max. nominal system voltage range ISOnet	AC 690 V/DC 1000 V
		EDSsync:	
		Number EDSsync devices	210 devices
		•	
		ISOloop	
		•	210 device:



Sensor bus:	
Interface/protocol	RS-485/BB-Bus/Modbus RTU
Data rate	9.6 kBaud/s
Cable length	≤ 1200 m
Cable: twisted pair, one end of shield connected to PE	recommended: J-Y(St)Y min. 2x0.8
Connection	terminals X1.A, X1.B
Terminating resistor	120 Ω , can be connected internally
Device address	190
Switching elements	
Number of switching elements	2 changeover contacts

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 4),
	DC+ alarm 4), symmetrical alarm, device fault, common alarm,
	mascurament complete device inactive DC offcet alarm

Electrical endurance under rated operating conditions, number of cycles	10.000

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 n	nA at AC/D	C > 10 V

Environment/EMC
EMC

EMC	IEC 61326-2-4 ⁵⁾
Ambient temperatures:	
Operating temperature	-25+55 ℃
Transport	-40+85 ℃
Long-term storage	-40+70 ℃

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)	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	≤ 3000 m NN

Connection

Connection type	pluggable screw-type terminal or push-wire terminal

Screw-type	terminals
------------	-----------

Nominal current	≤ 10 A
Tightening torque	0.50.6 Nm (57 lb-in)
Conductor sizes	AWG 2412
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
Multiple conductor, flexible	0.21.5 mm ²
Multiple conductor, flexible with ferrule without plastic sleeve	0.251 mm ²
Multiple conductor, flexible with TWIN ferrule with plastic sleeve	0.51.5 mm ²

Push-wire terminals:

Nominal current	≤ 10 A
Conductor sizes	AWG 2412
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 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 TWIN ferrule with plastic sleeve	0.250.75 mm ²

Operating mode	continuous operation
Mounting (0°)	display oriented, cooling slots must be ventilated vertically 6)
Degree of protection internal comp	oonents 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	< 510 g

Option "W" data different from the standard version

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

Operating temperature	-40+70 ℃
	-40+65 °C (for UL applications)
Transport	-40+85 °C
Long-term storage	-40+70 ℃

Classification of climatic conditions acc. to IEC 60721:

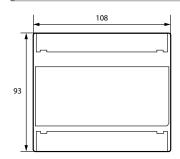
Stationary use (IEC 60721-3-3)	3K23 (condensation and formation of ice possible)
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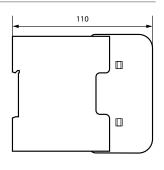
Classification of mechanical conditions acc. to IEC 60721:

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

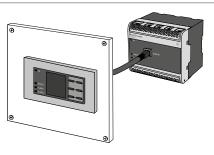
- 1) At a frequency > 200 Hz, the connection of X1 ande Remote must be insulated. Only permanently installed devices which at least have overvoltage category CAT2 (300V) may be connected.
- $^{2)}\,$ Indication limited outside the temperature range -25 \ldots +55 °C.
- $^{3)}$ U_{S} [Volt] = ISOMETER $^{\circ}$ supply voltage
- $^{\scriptscriptstyle (4)}$ For $\textit{U}_n \geq 50\,\text{V}$ only.
- $^{\rm 5)}$ This is a class A product. This product may cause radio interference in residential areas. In this case, the user may be required to take corrective actions.
- $^{\rm 6)}$ Recommendation: Devices mounted at 0° (display oriented, cooling slots must be ventilated vertically) For devices mounted at an angle of 45°, the max. working temperature is reduced by 10 °C. For devices mounted at an angle of 90° , the max. working temperature is reduced by $20^\circ C$.

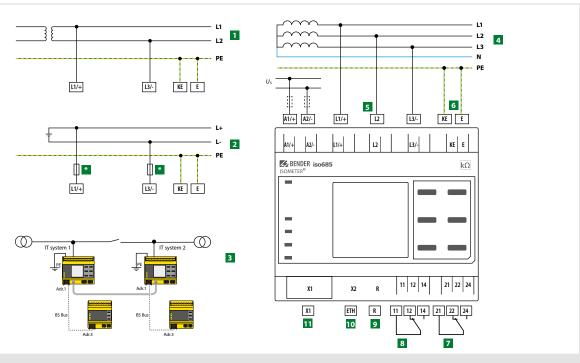
Dimension diagram (dimensions in mm)





Connection to FP200





- 1 Connection to an AC system U_n
- 2 Connection to a DC system Un
- 3 Linked with two IT systems which can be interconnected via a coupling switch. Information regarding the state of the coupling switch is not necessary.
- 4 Connection to a 3(N)AC system
- 5 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
- 9 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.

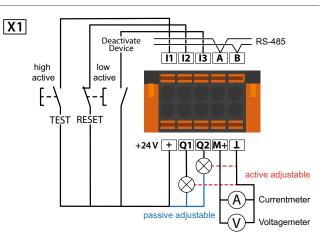
Note

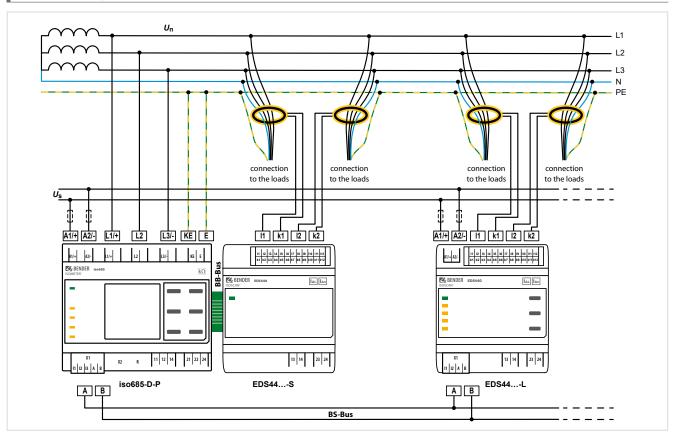
According to DIN VDE 0100-430, devices for protection against a short circuit can be omitted for the coupling of terminals L1/+ and L3/- to the IT system≤ 690 V to be monitored if the wiring is carried out in such a manner as to reduce the risk of a short circuit to a minimum. (A short-circuit-proof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

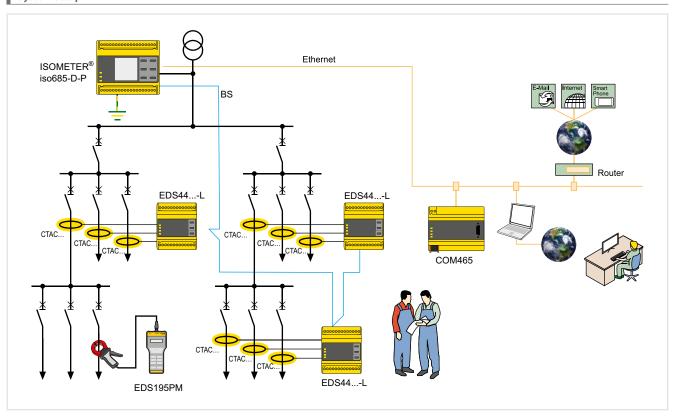
Digital interface X1

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











- 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 $\emph{AMP}^\textit{Plus}$ 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

Nominal system	voltage range <i>U</i> n	Supply voltage <i>U</i> s Type		Type		Art. No.
AC	DC	AC	DC	176	ic .	AI t. No.
0690 V; 1460 Hz	01000 V	24240 V; 50400 Hz	24240 V	isoNAV685-D	TO THE PARTY OF TH	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 60664-3	Display
Definitions:		Indication graphic display 127 x 127 pixels, 40 x 40 mm ³
Measuring circuit (IC1)	(L1/+, L2, L3/-)	Display range measured value 0.1 kΩ20 MΩ
Supply circuit (IC2)	A1, A2	Operating uncertainty (according to IEC 61557-8) ± 15 %, at least ± 1 kC
Output circuit 1 (IC3)	11, 12, 14	
Output circuit 2 (IC4)	21, 22, 24	LEDs
Control circuit (IC5)	(E, KE), (X1, ETH, X3)	ON (operation LED) green
Rated voltage	1000 V	SERVICE yellow
Overvoltage category	1000 V	ALARM 1 (Iso. Alarm 1) yellow
Rated impulse voltage:		ALARM 2 (Insulation fault + DC offset fault) yellow
IC1/(IC2-5)	8 kV	
* *		In-/Outputs (X1-Interface)
IC2/(IC3-5)	4 kV	Cable length X1 (unshielded cable) $\leq 10 \mathrm{m}$
IC3/(IC4-5)	4 kV	Cable length X1 (shielded cable, shield connected to earth (PE) on one end, recommended:
IC4/IC5	4 kV	$J-Y(St)Y min. 2x0,8)$ $\leq 100 m$
Rated insulation voltage:		Total max. supply output current for each output (device supplied by X1.+/X1.GND) max. 1 A
IC1/(IC2-5)	1000 V	Total max. supply output current on X1 (device supplied by A1+/A2-) max. 200 m/
IC2/(IC3-5)	250 V	Total max. supply output current on X1 (device supplied by A1+/A2- between 16,8 V and 40 V)
IC3/(IC4-5)	250 V	$I_{\text{Lmax}X1} = 10 \text{mA} + 7 \text{mA}V * U_s^2$
IC4/IC5	250 V	
Pollution degree for accessible parts on the outside of th	e device housing ($U_{\rm n}$ < 690 V)	(negative values are not allowed for I _{Lmax} X1)
Pollution degree for accessible parts on the outside of th		Digital Inputs (11, 12, 13)
Protective separation (reinforced insulation) between:		Number
IC1/(IC2-5)	Overvoltage category III, 1000 V	
IC2/(IC3-5)	Overvoltage category III, 300 V	
IC3/(IC4-5)	Overvoltage category III, 300 V	
IC3/(IC4-3) IC4/IC5	Overvoltage category III, 300 V	Voltage: Low DC -35 V, High DC 1132 \
Voltage test (routine test) according to IEC 61010-1:	overvoitage category III, 500 V	Tolerance Voltage ±10 %
	AC 2 2 14	Digital Outputs (Q1, Q2)
IC2/(IC3-5)	AC 2,2 kV	· ·
IC3/(IC4-5)	AC 2,2 kV	Number 2
IC4/IC5	AC 2,2 kV	Operating mode, adjustable active, passive
Supply voltage		Functions none, insulation Alarm 1, insulation fault + DC residual voltage
Supply voltage		connection fault, device fault, collective alarm, measurement ended, device inactive
Supply via A1/+, A2/-:		Voltage passive DC 032 V, active DC 0/19.232 V
Supply voltage range U _S	AC/DC 24240 V	Andrew Octob (N.)
Tolerance of $U_{\rm S}$	-30+15 %	Analogue Output (M+)
Maximum permissible input current of U_s	650 mA	Number
Frequency range of U _s	DC, 50400 Hz 1)	Operating mode linear, midscale point 28 k Ω /120 k Ω
Tolerance of the frequency range of U_s	-5+15 %	Functions insulation value, DC offse
Power consumption, typically 50/60 Hz	≤ 12 W/21 VA	Current $020 \text{ mA} (< 600 \Omega), 420 \text{ mA} (< 600 \Omega), 0400 \mu A (< 4 k\Omega)$
Power consumption, typically 400 Hz	≤ 12 W/45 VA	Voltage $010 \text{ V } (> 1 \text{ k}\Omega), 210 \text{ V } (> 1 \text{ k}\Omega)$
. ,, ,	≥ 12 W/ 13 W	Tolerance related to the current/voltage final value ±20 %
Supply via X1:		
Supply voltage $U_{\rm S}$	DC 24 V	Interfaces
Tolerance of <i>U</i> _s	DC -20+25 %	Field bus:
IT system being monitored		Interface/protocol web server/Modbus TCP/BCON
		Data rate 10/100 Mbit/s, autodetec
Nominal system voltage range U_n	AC 0690 V; DC 01000 V	Max. amount Modbus requests < 100/100 mbit/s, autoacted
	AC/DC 0600 V (for UL applications)	·
Tolerance of U _n	AC/DC +15 %	Cable length ≤ 100 m
Frequency range of U_n	60 Hz	Connection RJ4:
D		IP address DHCP/manual 192.168.0.5
Response values		Network mask 255.255.255.
Response value R _{an1} (alarm 1)	1 kΩ10 MΩ	BCOM address system-1-0
Response value DC residual voltage (Alarm 2) (U_{DC})	20 V1 k V	Function communication interface
Relative uncertainty (acc. to IEC 61557-8)	profile dependent, ± 15 %, at least ± 1 k Ω	Switzhing alamants
Hysteresis	25 %, at least 1 kΩ	Switching elements
•	·	Number of switching elements 2 changeover contacts
Time response		Operating mode N/C operation/N/O operation
Response time t_{an} for DC residual voltage $> 1,1xU_{DC}$ as	nd Alarm 1 max. 150 ms ²⁾	Contact 11-12-14 none, insulation Alarm 1, insulation fault + DC residual voltage
Response time t_{an} at $R_F = 0.5 \times R_{an} (R_{an} = 10 \text{ k}\Omega)$ and	$C_{\rm e} = 1 \mu \text{F} \text{acc. to IEC } 61557-8$	connection fault, device fault, collective alarm, measurement ended, device inactive
•	dependent, typ. 4 s (see diagrams in manual)	Contact 21-22-24 none, insulation Alarm 1, insulation fault + DC residual voltage
Startup delay T _{startup}	0120 s	connection fault, device fault, collective alarm, measurement ended, device inactive
	5203	Electrical endurance under rated operating conditions, number of cycles 10.000
Measuring circuit		
	±50 V	Contact data acc. to IEC 60947-5-1:
Measuring voltage $U_{\rm m}$		Utilisation category AC-13 AC-14 DC-12 DC-12 DC-12 DC-12
	< 403 IIA	
Measuring current /m	≤ 403 μA > 124 kO	Rated operational voltage 230 V 230 V 24 V 48 V 110 V 220 V
Measuring current I _m Internal resistance R _i , Z _i	≥ 124 kΩ	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 P
Measuring current I _m Internal resistance R _i , Z _i Permissible extraneous DC voltage U _{fg}	≥ 124 kΩ ≤ 1200 V	
Measuring current I _m Internal resistance R _i , Z _i Permissible extraneous DC voltage U _{fg}	≥ 124 kΩ	Rated operational current 5 A 3 A 1 A 1 A 0.2 A 0.1 A
Measuring current I _m Internal resistance R _i , Z _i Permissible extraneous DC voltage U _{fg} Permissible system leakage capacitance C _e	≥ 124 kΩ ≤ 1200 V	Rated operational current 5 A 3 A 1 A 1 A 0.2 A 0.1 μ Rated insulation voltage \leq 2000 m NN 250 \text{ Rated insulation voltage } \leq 3000 m NN 160 N
Measuring current I _m Internal resistance R _i , Z _i Permissible extraneous DC voltage Ufg Permissible system leakage capacitance C _e Measuring ranges	≥ 124 k Ω ≤ 1200 V profile dependent, 0150 μF	Rated operational current 5 A 3 A 1 A 1 A 0.2 A 0.1 μ Rated insulation voltage \leq 2000 m NN 250 \text{ Rated insulation voltage } \leq 3000 m NN 160 N
Measuring current I _m Internal resistance R _i , Z _i Permissible extraneous DC voltage Ufg Permissible system leakage capacitance C _e Measuring ranges Measuring range f _n	$\geq 124 \text{ k}\Omega$ $\leq 1200 \text{ V}$ profile dependent, $0150 \text{ \mu}F$ 10460 Hz	Rated operational current 5 A 3 A 1 A 1 A 0.2 A 0.1 μ Rated insulation voltage \leq 2000 m NN 250 \text{ Rated insulation voltage } \leq 3000 m NN 160 N
Measuring voltage $U_{\rm m}$ Measuring current $I_{\rm m}$ Internal resistance $R_{\rm i}$, $Z_{\rm i}$ Permissible extraneous DC voltage $U_{\rm fg}$ Permissible system leakage capacitance $C_{\rm e}$ Measuring ranges Measuring range $f_{\rm n}$ Tolerance measurement of $f_{\rm n}$	$\geq 124 \text{ k}\Omega$ $\leq 1200 \text{ V}$ profile dependent, $0\dots150 \text{ µF}$ $10\dots460 \text{ Hz}$ $\pm 1 \% \pm 0.1 \text{ Hz}$	Rated operational current 5 A 3 A 1 A 1 A 0.2 A 0.1 μ Rated insulation voltage \leq 2000 m NN 250 \text{ Rated insulation voltage } \leq 3000 m NN 160 N
Measuring current I _m Internal resistance R _i , Z _i Permissible extraneous DC voltage Ufg Permissible system leakage capacitance C _e Measuring ranges Measuring range f _n	$\geq 124 \text{ k}\Omega$ $\leq 1200 \text{ V}$ profile dependent, $0150 \text{ \mu}F$ 10460 Hz	Rated operational current 5 A 3 A 1 A 1 A 0.2 A 0.1 μ Rated insulation voltage \leq 2000 m NN 250 \text{ Rated insulation voltage } \leq 3000 m NN 160 N

AC 25...690 V

AC/DC > 10 V

±10 % ±10 μF

depending on the profile and coupling mode, typ. > 10 $k\Omega$

±5 % ±5 V 0...1000 μF



Min. insulation resistance measurement of \emph{C}_{e}

Measuring range U_n Voltage range measurement of U_n

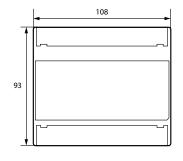
Measuring range Ce

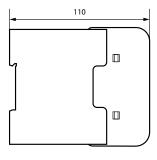
Tolerance measurement of U_n

Tolerance measurement of Ce

Environment/EMC	
EMC	IEC 61326-2-4 ⁵⁾
Ambient temperatures:	
Operating temperature	-25+55 ℃
Transport	-40+85 ℃
Long-term storage	-40+70 °C
Classification of climatic conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3) 3K23 (except cond-	ensation 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
Area of application	≤ 3000 m NN
Connection	
Connection type pluggable screw-type to	erminal or push-wire terminal
Screw-type terminals:	
Nominal current	≤ 10 A
Tightening torque	0.50.6 Nm (57 lb-in)
Conductor sizes	AWG 2412
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
Multiple conductor, flexible	0.21.5 mm ²
Multiple conductor, flexible with ferrule without plastic sleeve	0.251 mm ²
Multiple conductor, flexible with TWIN ferrule with plastic sleeve	0.51.5 mm ²
Push-wire terminals:	
Nominal current	≤ 10 A
Conductor sizes	AWG 2412
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

Dimension diagram (dimensions in mm)



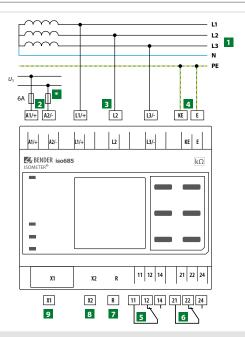


Push-wire terminals X1:	
Nominal current	≤ 8 A
Conductor sizes	AWG 2416
Stripping length	10 mm
rigid/flexible	0.21.5 mm ²
flexible with ferrule without plastic sleeve	0.251.5 mm ²
flexible with TWIN ferrule with plastic sleeve	0.250.75 mm ²

Operating mode	continuous operation
Mounting (0°)	display oriented, cooling slots must be ventilated vertically 6
Degree of protection internal compone	nts 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	D00215
Weight	< 390 q

- $^{\rm 1)}\,$ At a frequency > 200 Hz, the connection of X1 must be insulated. Only permanently installed devices which at least have overvoltage category CAT2 (300V) may be connected.
- $^{\rm 2)}$ Fast tripping only works in IT networks with a mains frequency of 60 Hz.
- $^{\mbox{\scriptsize 3)}}$ Indication limited outside the temperature range -25 \ldots +55 °C.
- ⁴⁾ U_{S} [Volt] = supply voltage ISOMETER®
- $^{\rm 5)}$ This is a class A product. In a domestic environment, this product may cause radio interference. In this case, the user may be required to take corrective actions.
- $^{\rm 6)}$ Recommendation: Devices mounted at 0 $^{\rm o}$ (display-oriented, cooling slots must be ventilated vertically).

For devices mounted at an angle of 45°, the max. working temperature is reduced by 10 °C. For devices mounted at an angle of 90°, the max. working temperature is reduced by 20 °C.



- 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
- 8 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).

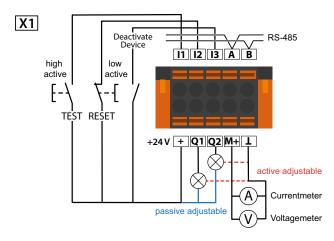
The connecting lines L1/+, L2, L3/- to the system to be monitored must be carried out as spur lines. No load current may be conducted through the terminals.

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



Connection to X1



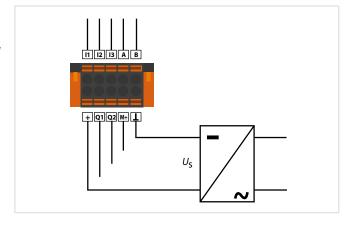
Danger of damage to property due to faulty connections!

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







- 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

Nominal system voltage range <i>U</i> n	Supply v	oltage <i>U</i> s	Tv	Art. No.	
	AC	Type DC			ALC NO.
offline	100240 V; 47460 Hz	24 V, 100 240 V	isoNAV685-D-B	**************************************	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-Interface)						
Definitions:			Cable length X1 (unshielded cable)						≤ 10 m
Measuring circuit (IC1)	(L1/	'+, L2, L3/-)	Cable length X1 (shielded cable, shield conr	nected to ea	arth (PE) on	one end, re	ecommende	ed:	
Supply circuit (IC2)		A1, A2	J-Y(St)Y min. 2x0,8)						≤ 100 m
Output circuit 1 (IC3)		11, 12, 14	Total max. supply output current for each o	utput (devi	ce supplied	by X1.+/X	1.GND)		max. 1 A
Output circuit 2 (IC4)		21, 22, 24	Total max. supply output current on X1 (de	vice supplie	ed by A1+/A	2-)		max	k. 200 mA
Control circuit (IC5)	(E, KE), (X1, I	ETH, X3, X4)	Total max. supply output current on X1 (de				n 16,8 V an	d 40 V)	
Rated voltage	(1 // (1	1000 V) mA + 7 m/	A/V * Us 3)
Overvoltage category		III			(-		t allowed fo	-
Rated impulse voltage:					,	.eguare re	and Co di C 110		··Linaxxi
IC1/(IC2-5)		8 kV	Digital Inputs (I1, I2, I3)						
IC2/(IC3-5)		4 kV	Number						3
		4 kV	Operating mode, adjustable				act	ive high, a	ctive low
IC3/(IC4-5)		4 kV	Functions			none.		device dea	
IC4/IC5		4 KV	Voltage:					High DC 1	
Rated insulation voltage:		400011	Tolerance Voltage			LOW D	. 33 1,	ingii be i	±10 %
IC1/(IC2-5)		1000 V	Tolerance voltage						±10 70
IC2/(IC3-5)		250 V	Digital Outputs (Q1, Q2)						
IC3/(IC4-5)		250 V	Number						2
IC4/IC5		250 V	Operating mode, adjustable					activo	, passive
Pollution degree for accessible parts on the outside of the d	evice housing (<i>U</i> _n < 690 V)	3	1 7 ,	· Alarm I '	l Alarm I a	Alarm I 2	dovice fo		· •
Pollution degree for accessible parts on the outside of the d	evice housing ($U_{\rm n}$ >690 < 1000 V) 2	Functions off, connection fault	, MIAIIII L					
Protective separation (reinforced insulation) between:			Voltage		passiv	e DC U	oz v, activ	e DC 0/19.	232 V
IC1/(IC2-5)	Overvoltage categor	y III, 1000 V	Interfaces						
IC2/(IC3-5)	Overvoltage categor								
IC3/(IC4-5)	Overvoltage catego		Field bus:						
IC4/IC5	Overvoltage catego		Interface/protocol			W	eb server/	'Modbus TO	P/BCOM
Voltage test (routine test) according to IEC 61010-1:	Overvoitage tatego) i j i i i , 300 v	Data rate				10/100	Mbit/s, au	todetect
		AC 2 2 LV	Max. amount Modbus requests						< 100/s
IC2/(IC3-5)		AC 2,2 kV	Cable length						≤ 100 m
IC3/(IC4-5)		AC 2,2 kV	Connection						RJ45
IC4/IC5		AC 2,2 kV	IP address				DHCP/r	nanual 192	
Supply voltage			Network mask				Jc.,.		55.255.0
Supply voltage			BCOM address						stem-1-0
Supply via A1/+, A2/-:			Function				comm	nunication	
Supply voltage range $U_{\rm S}$	AC/DC	24240 V	runction				COIIIII	iuiiicatioii	illellace
Tolerance of <i>U</i> _S	-:	30+15%	Switching elements						
Maximum permissible input current of U_s		650 mA	Number of switching elements				2 c	hangeover	contacts
Frequency range of $U_{\rm S}$	DC. 50	400 Hz ¹⁾	Operating mode					ition/N/O o	
Tolerance of the frequency range of $U_{\rm S}$		5+15 %	_ · ·		£				
Power consumption, DC		≤ 12 W	Contact 11-12-14/21-22-24	0	ii, connect	on iauit, i		Alarm L2, A	
Power consumption, typically 50/60 Hz		12 W/21 VA						ult, comm	
			Electrical endurance under rated operat	ing condi	tions, num	per of cycl	es		10.000
Power consumption, typically 400 Hz		12 W/45 VA	Contact data acc. to IEC 60947-5-1:						
Supply via X1:			Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-12	DC-12
Supply voltage $U_{\rm S}$		DC 24 V	Rated operational voltage	230 V	230 V	24 V	48 V	110 V	220 V
Tolerance of <i>U</i> s	DC -2	20+25 %	Rated operational current	5 A	3 A	1 A	1 A	0.2 A	0.1 A
			Rated insulation voltage ≤ 2000 m NN	371	371			0.271	250 V
IT system being monitored			Rated insulation voltage ≤ 3000 m NN						160 V
Nominal system voltage range U_{n}		offline					1	- A -+ AC/D	
Circuit capacity internal mains switch	AC 0690 V; DC	01000 V	Minimum contact rating				ır	nA at AC/D	C ≥ 10 V
. ,	AC/DC 0600 V (for UL a		Environment/EMC						
			EMC					IEC 612	26-2-4 ⁴⁾
Response values								ILC 013	20-2-4
Response value R _{an1} (alarm 1)	1 kC	Ω10 ΜΩ	Ambient temperatures:						
Response value R_{an2} (alarm 2)		Ω10 ΜΩ	Operating temperature						+55 ℃
Hysteresis		t least 1 kΩ	Transport					-40	+85 ℃
•			Long-term storage					-40	+70 ℃
Time response			Classification of climatic conditions	acc +a 1	FC 60721.				
Response time t_{an} at $R_F = 0.5 \times R_{an}$ ($R_{an} = 10 \times \Omega$) and $C_e = 10 \times \Omega$	μF according to IEC 61557-8	30 s	Stationary use (IEC 60721-3-3)	acc. (0 I			ncation -	ad former	on of:\
Start-up delay T _{start-up}		0120 s			SNZ3 (eXC	ept conde	ensauton al	nd formatio	
			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 condit	ions acc.	to IEC 607	21:			
Measuring current /m		≤ 13,4 μA	Stationary use (IEC 60721-3-3)						3M11
Internal resistance R_{i} , Z_{i}		≥ 372 kΩ	Transport (IEC 60721-3-2)						2M4
Permissible extraneous DC voltage <i>U</i> fq		≥ 372 KΩ2 ≤ 1200 V	Long-term storage (IEC 60721-3-1)						1M12
Permissible system leakage capacitance <i>C</i> e		≤ 1200 V 150 μF	Area of application					< 30	00 m NN
стинээние зухтени теакауе сараспапсе Се		130 μτ	πιτα σι αρμιτατίσει					≥ 30	OU III IVIN
Display									
	aphic display 127 x 127 pixels, 40) x 40 mm ²⁾							
Display range measured value		Ω20 ΜΩ							
Operating uncertainty (according to IEC 61557-8)	± 15 %, at 1	east ±1 kΩ							
LEDs									
ON (operation LED)		green							
SERVICE		yellow							

yellow yellow



ALARM 1 (L1 and L2) ALARM 2 (L3)

64

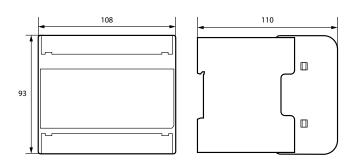
D00264

< 390 g

108 x 93 x 110 mm

Connection	
Connection type pluggable screw-type	terminal or push-wire terminal
Screw-type terminals:	
Nominal current	≤ 10 A
Tightening torque	0.50.6 Nm (57 lb-in)
Conductor sizes	AWG 2412
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
Multiple conductor, flexible	0.21.5 mm ²
Multiple conductor, flexible with ferrule without plastic sleeve	0.251 mm ²
Multiple conductor, flexible with TWIN ferrule with plastic sleeve	0.51.5 mm ²
Push-wire terminals:	
Nominal current	≤ 10 A
Conductor sizes	AWG 2412
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 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 TWIN ferrule with plastic sleeve	0.250.75 mm ²

Dimension diagram (dimensions in mm)



Other Operating mode continuous operation display oriented, cooling slots must be ventilated vertically 5) Mounting (0°) Degree of protection internal components Degree of protection terminals IP20 DIN rail mounting acc. to IEC 60715 3 x M4 with mounting clip Screw fixing polycarbonate **Enclosure material** Flammability class V-0 ANSI code

- $^{1)}$ At a frequency > 200 Hz, the connection of X1 must be insulated. Only permanently installed devices which at least have overvoltage category CAT2 (300V) may be connected.
- $^{2)}$ Indication limited outside the temperature range -25 \ldots +55 °C.
- $^{3)}$ U_{S} [Volt] = supply voltage ISOMETER $^{\circ}$

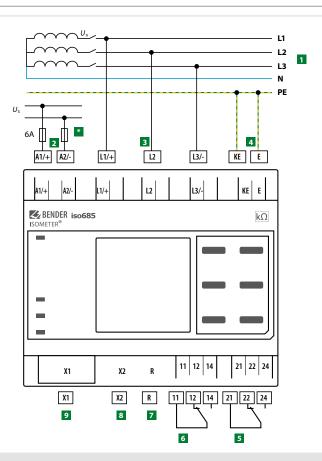
Dimensions (W x H x D)

Documentation number

Weight

- $^{\rm 4)}$ This is a class A product. In a domestic environment, this product may cause radio interference. In this case, the user may be required to take corrective actions.
- $^{5)}$ Recommendation: Devices mounted at 0 $^{\circ}$ (display-oriented, cooling slots must be ventilated vertically).

For devices mounted at an angle of 45°, the max. working temperature is reduced by 10 °C. For devices mounted at an angle of 90°, the max. working temperature is reduced by 20 °C.



- 1 Connection to a 3(N)AC system
- 2 Supply voltage U_s (see nameplate) via 6 A fuse
- 3 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
- 7 Switchable resistor R for RS-485 bus termination
- 8 Ethernet interface
- 9 Digital interface
- 6 A fuse for systems > 690 V

NOTE:

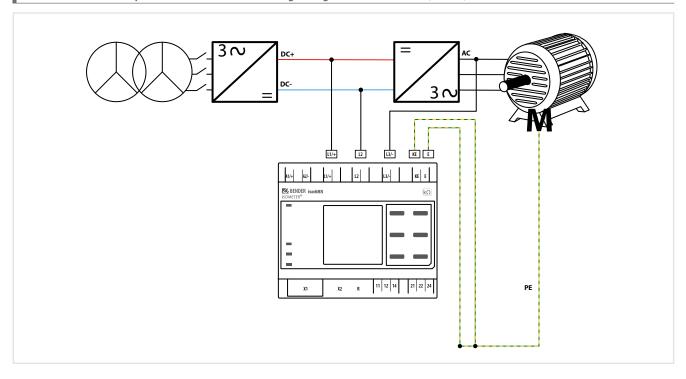
According to DIN VDE 0100-430, devices for protection against a short circuit can be omitted for the coupling of terminals L1/+ and L3/- to the IT system \leq 690 V to be monitored if the wiring is carried out in such a manner as to reduce the risk of a short circuit to a minimum. (Recommendation: Ensure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

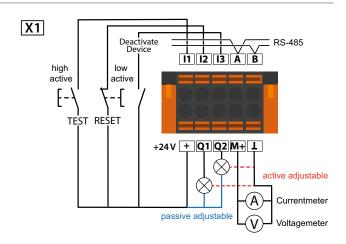
Use 60/70 °C copper lines only!

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



Digital interface X1

Digital interface	Terminal	Colour
I1 I2 I3 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



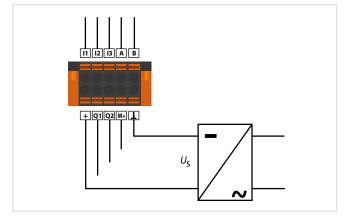
Danger of damage to property due to faulty connections!

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 AMP^{Plus} 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

Nominal system	voltage range <i>U</i> n	Supply v	oltage Us	. Display	Display Type		Art. No.
AC	DC	AC	DC		Display	1,74.5	
01000 V		24240V;	24 2404	integrated	isoHR685W-D-I-B	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	B91067025W
0,1460 Hz	01300 V	50400 Hz	24240 V	detached	isoHR685W-S-I-B + FP200W ¹⁾		B91067225W

¹⁾ Only available in combination

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
Transparent cover 144x72 (IP65) for FP200 ²⁾	B98060005
BB bus 6TE connector	B98110001

 $^{^{\}mbox{\tiny 1)}}$ included in the scope of delivery

²⁾ If the "transparent front cover 144x72 (IP65)" is used, the cutout in the control cabinet must be increased in height from 66 mm to 68 mm (+ 0.7 / -0 mm).

Description	Туре	Art. No.	Page
Device version without display	isoHR685W-S-I-B	B91067125W	-
Display for front panel mounting	FP200W	B91067904W	53
Coupling devices	AGH150W-4	B98018006	348
	AGH204S-4	B914013	350
	AGH520S	B913033	351
	AGH676S-4	B913055	354

Suitable measuring instruments on request!

Technical data	
Insulation coordination acc. to IEC 60664-1/IEC	60664-3
Definitions:	
Measuring circuit (IC1)	L1/+, L2, L3/
Supply circuit (IC2)	A1, A
Output circuit 1 (IC3)	11, 12, 1
Output circuit 2 (IC4)	21, 22, 2
Control circuit (IC5)	(E, KE), (X1, ETH, X3, X4
Rated voltage	1300
Overvoltage category	
Rated impulse voltage:	
IC1/(IC2-5)	8 k
IC2/(IC3-5)	4 k'
IC3/(IC4-5)	4 k'
IC4/IC5	4 k'
Rated insulation voltage:	1000
IC1/(IC2-5)	1000
IC2/(IC3-5)	300
IC3/(IC4-5)	300
IC4/IC5	300
Pollution degree outside (U_n < 690 V) Pollution degree outside (U_n >690 < 1000 V)	
Safe isolation (reinforced insulation) between:	
, , , , , , , , , , , , , , , , , , , ,	Oceanical to the content of the cont
IC1/(IC2-5)	Overvoltage category III, 1000
IC2//IC2 E\	Overvoltage category II, 1300 Overvoltage category III, 300
IC2/(IC3-5) IC3/(IC4-5)	Overvoltage category III, 300 V
IC3/(IC4-3) IC4/IC5	overvoltage category III, 300 v
Voltage tests (routine test) acc. to IEC 61010-1	overvoltage category III, 500
IC2/(IC3-5)	AC 2.2 k
IC3/(IC4-5)	AC 2.2 k
IC4/IC5	AC 2.2 k
	AC 2.2 K
Supply voltage	
Supply via A1/+, A2/-:	
Supply voltage range U _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_s	-5+15 %
Power consumption, typically DC	≤ 12 V
Power consumption, typically 50/60 Hz	≤ 12 W/21 V/
Power consumption, typically 400 Hz	≤ 12 W/45 V/
Supply via X1:	
Supply voltage <i>U</i> ₅	DC 24 '
Tolerance of $U_{\rm S}$	DC -20+25 %
IT system being monitored	
Nominal system voltage range U _n	AC 01000 V, 3AC 0690 V, DC 01300 V
,	AC/DC 01000 V (for UL applications
Tolerance of U _n	AC/DC +15 %
Frequency range of U _n	DC 0.1460 H
Max. AC voltage U_{\sim} in the frequency range $f_{\rm n} = 0.1$	4 Hz $U_{\sim \text{max}} = 50 \text{ V/Hz}^2 * (1 + f_n^2)$
Response values	
Response value R _{an1} (Alarm 1)	1 kΩ3 GΩ
Response value R _{an2} (Alarm 2)	1 kΩ3 GC
Response value R _{an2} (Alarm 2)	1 k Ω 3 G Ω dependent on the profile, \pm 15 %, at least \pm 1 k Ω

Time response	
Response time t_{an} at $R_F = 0.5 \times R_{an}$ (R_{ar}	$_{\rm 1}$ = 10 kΩ) and $C_{\rm e}$ = 1 μF according to IEC 61557-8
	profile dependent, typ. 10 s (see diagrams in manual
Response time DC Alarm at $C_e = 1 \mu F$	profile dependent, typ. 5 s (see diagram in manual
Start-up delay T _{start-up}	0120
Measuring circuit	
Measuring voltage U _m	profile dependent, ±10 V, ±50 V (see profile overview
Measuring current I _m	profile dependent, ± 10 v, ±30 v (see profile overview ≤ 403 μ/
Internal resistance R _i , Z _i	≥ 124 kC
* *	ns (inactive by I/O, inactive by ISOnet or cut-off) typ. 50 MC
Permissible extraneous DC voltage U_{fg}	≤ 1500 \
Permissible system leakage capacitance	e C _e profile dependent, 01000 μ
Measuring ranges	
Measuring range f _n	0.1460 H
Tolerance measurement of f _n	±1% ±0.1 H
Voltage range measurement of f_n	AC 25690 \
Measuring range U_n (without an external of	
Valta na nama na masanina na af II	AC 251000 V; 3AC 25690 V; DC 01300 V
Voltage range measurement of U_n Tolerance measurement of U_n	AC/DC 101000 V ³ ±5 % ±5 V
Measuring range C_e	01000 μ
Tolerance measurement of C _e	±10 % ±10 µl
Frequency range measurement of Ce	DC, 30460 H
Min. insulation resistance measuremen	
	depending on the profile and coupling mode, typ. $> 10 \text{ k}\Omega$
	acpenancy on the prome and coupling mode, typis to ha
Display	
Indication	graphic display 127 x 127 pixels, 40 x 40 mm ²
Display range measured value	0.1 kΩ20 MΩ
Operating uncertainty (according to IEC	$(61557-8)$ $\pm 15\%$, at least $\pm 1 \text{ k}\Omega$
LEDs	
ON (operation LED)	aron
SERVICE	greei yellov
ALARM 1	yellov
ALARM 2	yellov
71.071.2	yellov
In-/Outputs (X1-Interface)	
Cable length X1 (unshielded cable)	≤ 10 n
Cable length X1 (shielded cable, shield co	onnected to earth PE on one side J-Y(St)Y min. $2x0.8$) ≤ 100
m	
Total max. supply output current via X1	
Total max. supply output current via X1 Total max. supply output current via A1	/A2 in total on X1 max. 200 m/ /A2 in total on X1 between 16.8 V and 40 V
Total max. supply output current via X1 Total max. supply output current via A1	//A2 in total on X1 max. 200 m/ //A2 in total on X1 between 16.8 V and 40 V $I_{LmaxX1} = 10 \text{ mA} + 7 \text{ mA/V} * U_s$
Total max. supply output current via X1 Total max. supply output current via A1	//A2 in total on X1 max. 200 m/ //A2 in total on X1 between 16.8 V and 40 V $I_{LmaxX1} = 10 \text{ mA} + 7 \text{ mA/V} * U_s$
Total max. supply output current via X1 Total max. supply output current via A1 Total max. supply output current via A1	/A2 in total on X1 max. 200 m/
Total max. supply output current via X1 Total max. supply output current via A1 Total max. supply output current via A1 Digital inputs (11, 12, 13)	$I/A2$ in total on X1 max. 200 m/ $I/A2$ in total on X1 between 16.8 V and 40 V $I_{LmaxX1} = 10$ mA $+$ 7 mA/V * U_{S} (negative values are not allowed for I_{LmaxX1}
Total max. supply output current via X1 Total max. supply output current via A1 Total max. supply output current via A1 Digital inputs (I1, I2, I3) Number	$I/A2$ in total on X1 max. 200 m/ $I/A2$ in total on X1 between 16.8 V and 40 V $I_{LmaxX1} = 10$ mA $+$ 7 mA/V * U_{S} (negative values are not allowed for I_{LmaxX1}
Total max. supply output current via X1 Total max. supply output current via A1 Total max. supply output current via A1 Digital inputs (I1, I2, I3) Number Operating mode, adjustable	$I/A2$ in total on X1 max. 200 m/ $I/A2$ in total on X1 between 16.8 V and 40 V $I_{LmaxX1} = 10 mA + 7 mA/V * U_{S}$ (negative values are not allowed for I_{LmaxX1} active high, active lov
Total max. supply output current via X1 Total max. supply output current via A1 Total max. supply output current via A1 Digital inputs (I1, I2, I3) Number Operating mode, adjustable Functions	$I/A2$ in total on X1 max. 200 m/ $I/A2$ in total on X1 between 16.8 V and 40 V $I_{LmaxX1} = 10 mA + 7 mA/V * U_{S}$ (negative values are not allowed for I_{LmaxX1} active high, active low off, test, reset, deactivate device, start initial measuremen
Total max. supply output current via X1 Total max. supply output current via A1 Total max. supply output current via A1 Digital inputs (I1, I2, I3) Number Operating mode, adjustable Functions Voltage	$I/A2$ in total on X1 max. 200 m/ $I/A2$ in total on X1 between 16.8 V and 40 V $I_{LmaxX1} = 10$ mA + 7 mA/V * I_{S} (negative values are not allowed for I_{LmaxX1} active high, active low off, test, reset, deactivate device, start initial measuremen Low DC -35 V, High DC 1132 V
Total max. supply output current via X1 Total max. supply output current via A1 Total max. supply output current via A1 Digital inputs (I1, I2, I3) Number Operating mode, adjustable Functions	//A2 in total on X1 max. 200 m/ //A2 in total on X1 between 16.8 V and 40 V $I_{LmaxX1} = 10 \text{ mA} + 7 \text{ mA/V} * U_s$
Total max. supply output current via X1 Total max. supply output current via A1 Total max. supply output current via A1 Digital inputs (I1, I2, I3) Number Operating mode, adjustable Functions Voltage	$I/A2$ in total on X1 max. 200 m/ $I/A2$ in total on X1 between 16.8 V and 40 V $I_{LmaxX1} = 10$ mA + 7 mA/V * I_{S} (negative values are not allowed for I_{LmaxX1} active high, active low off, test, reset, deactivate device, start initial measuremen Low DC -35 V, High DC 1132 V
Total max. supply output current via X1 Total max. supply output current via A1 Total max. supply output current via A1 Digital inputs (I1, I2, I3) Number Operating mode, adjustable Functions Voltage Voltage tolerance	$I/A2$ in total on X1 max. 200 m/ $I/A2$ in total on X1 between 16.8 V and 40 V $I_{LmaxX1} = 10$ mA + 7 mA/V * I_{S} (negative values are not allowed for I_{LmaxX1} active high, active low off, test, reset, deactivate device, start initial measuremen Low DC -35 V, High DC 1132 V
Total max. supply output current via X1 Total max. supply output current via A1 Total max. supply output current via A1 Digital inputs (I1, I2, I3) Number Operating mode, adjustable Functions Voltage Voltage tolerance Digital outputs (Q1, Q2)	//A2 in total on X1 max. 200 m/ //A2 in total on X1 between 16.8 V and 40 V //LmaxX1 = 10 mA + 7 mA/V * Us (negative values are not allowed for /LmaxX1 active high, active low off, test, reset, deactivate device, start initial measuremen Low DC -35 V, High DC 1132 V

DC 0...32 V, active DC 0/19.2...32 V

DC+ alarm 4), symmetrical alarm, device fault, common alarm, measurement complete, device inactive, DC offset alarm

Voltage passive

Analogue output (M Number	+)	
Operating mode	linear	midscale point 28 kΩ/120 kΩ
Functions	illiculy	insulation value, DC shift
Current	020 mA (< 600 Ω), 420 mA (<	· · · · · · · · · · · · · · · · · · ·
Voltage	010	V (>1 kΩ), 210 V (>1 kΩ)
Tolerance related to the	e current/voltage final value	± 20 %

Eia	ы	bus:

Interface/protocol	web server/Modbus TCP/BCOM
Data rate	10/100 Mbit/s, autodetect
Max. number of Modbus requests	<100/s
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
ICO	

ISOnet

Number of ISOnet devices	220 dev
Max. nominal system voltage ISOnet	AC, 690 V/DC, 1000V

ISOloop

Number of ISOloop devices 2...20 dev ISOsync:

Number of ISOsync devices

,	
Sensor bus:	
Interface/Protocol	RS-485/RR hus

Data rate mode 1	9.6 kBaud/s
Cable length (depending on the baud rate)	≤1200 m
Cable: twisted pair, one end of shield connected to PE	recommended: J-Y(St)Y min. 2x0.8
Connection	terminals X1.A, X1.B
Terminating resistor	120 Ω , can be connected internally
Device address	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 4)
	DC+ alarm 4), symmetrical alarm, device fault, common alarm,
	measurement complete, device inactive, DC offset alarm

Electrical endurance under rated operating conditions, number of cycles Contact data acc. to IEC 60947-5-1:

Contact data acc. to ILC 00747-7-1.	
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 and temperature range

EMC IEC 60533, IEC 613	
Operating temperature	-25+55 ℃
Transport	-40+85 °C
Long-term storage	-40+70 °C

Classification of climatic conditions acc. to IEC 60721 (related to temperature and relative humidi-

ty)	
Staionary use (IEC 60721-3-3)	3K23
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22

Classification of mechanical conditions acc. to IEC 60721:

Stationary use (IEC 60721-3-3)	3M12
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12
Area of application	≤3000 m NN

Connection

Connection type pluggable screw terminal or push-wire terminal

Screw-type terminals:

Nominal current	≤ 10 A
Tightening torque	0.50.6 Nm (57 lb-in)
Conductor sizes	AWG 2412
Stripping length	7 mm
rigid/flexible	0.22.5 mm ²
flexible with ferrules, with/without plastic collar	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 without plastic sleeve	0.251 mm ²
Multiple conductor, flexible with TWIN ferrule with plastic sleeve	0.51.5 mm ²

Push-wire terminals:

rush whe terminus.	
Nominal current	≤ 10 A
Conductor sizes	AWG 2412
Stripping length	10 mm
rigid/flexible	0.22.5 mm ²
flexible with ferrules, with/without plastic collar	0.252.5 mm ²
Multiple conductor, flexible with TWIN ferrule with plastic sleeve	0.5 1.5 mm ²

Push-wire terminals X1:

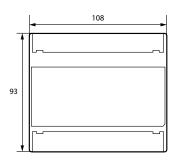
Nominal current	≤ 8 A
Conductor sizes	AWG 2416
Stripping length	10 mm
rigid/flexible	0.21.5 mm ²
flexible with ferrule without plastic sleeve	0.251.5 mm ²
flexible with ferrule with plastic sleeve	0.250.75 mm ²

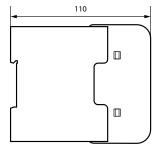
10,000

Other	
Operating mode	continuous operation
Mounting (0°)	display oriented, cooling slots must be ventilated vertically ⁶
Degree of protection internal comp	ponents 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-C
ANSI code	64
Dimensions (W x H x D)	108 x 93 x 110 mm
Documentation number	D00261
Weight	< 390 g

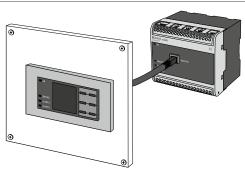
- $^{1)}\,$ At a frequency > 200 Hz, the connection of X1 and remote must be insulated. Only permanently installed devices which at least have overvoltage category CAT2 (300 V) may be connected.
- $^{2)}$ Indication limited outside the temperature range -25 \ldots +55 °C.
- $^{3)}$ $U_{\rm S}$ [Volt] = supply voltage ISOMETER $^{\circ}$
- ⁴⁾ Only for $U_{\rm n} \ge 50$ V.
- 5) This is a class A product. In a domestic environment, this product may cause radio interference. In this case, the user may be required to take corrective actions.
- $^{6)}$ Recommendation: Mounting position 0° (display-oriented, cooling slots must be ventilated vertically). At mounting position 45°, the max. operating temperature is reduced by 10 °C. At mounting position 90°, the max. operating temperature is reduced by 20 °C.

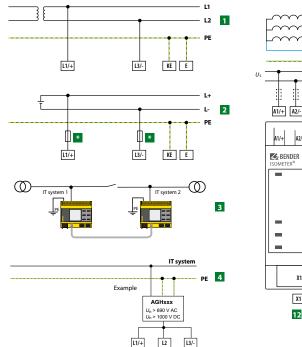
Dimension diagram (dimensions in mm)

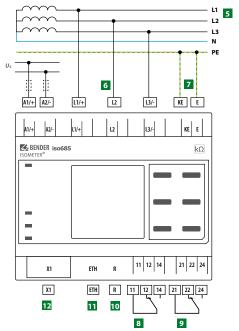




Connection to FP200







- 1 Connection to an AC system Un
- 2 Connection to a DC system U_n
- 3 Linked with two IT systems which can be interconnected via a coupling switch. Information regarding the state of the coupling switch is not necessary.
- 4 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/-)
- **7** Separate connection of KE, E to PE

- 8 (K1) Alarm relay 1, available changeover contacts
- 9 (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/+, L2 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. 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.

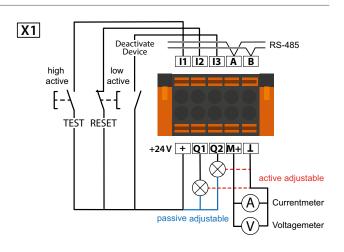
For UL applications:

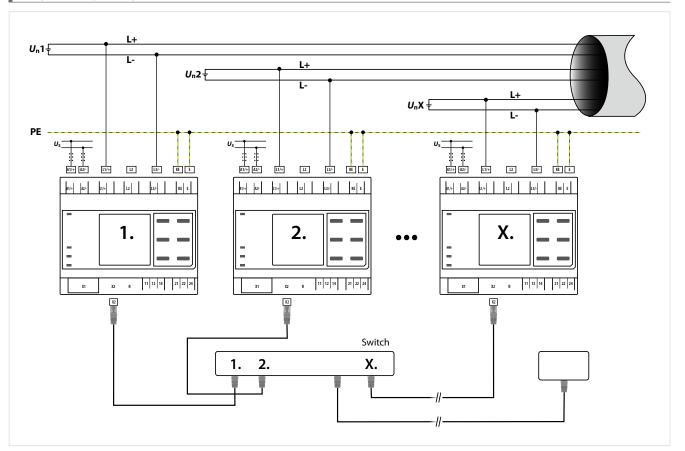
Use 60/70°C copper lines only!

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

Digital interface X1

Digital interface	Terminal	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+ 1	+	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)
	Т	Reference potential ground





ISOMETER® isoRW685W-D







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 AMP^{Plus} 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
- 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

Nominal system voltage range <i>U</i> n		Supply voltage <i>U</i> ₅		Type		Art. No.
AC	DC	AC	DC	туре		AI C. NO.
0690 V; 1460 Hz	01000 V	24240 V; 50400 Hz	24240 V	isoRW685W-D	Total Control	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	350
Coupling devices	AGH204S-4	B914013	352
	AGH520S	B913033	353
	AGH676S-4	B913055	356

Suitable measuring instruments on request!

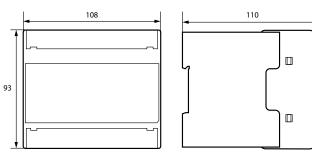
Insulation coordination according to IEC 60664-1/	TEC 60664-3	Measuring ranges	
Definitions:		Measuring range f _n	0.1460 Hz
Measuring circuit (IC1)	(L1/+, L2, L3/-)	Tolerance measurement of f_n	±1 % ±0.1 Hz
Supply circuit (IC2)	A1, A2	Voltage range measurement of f_n	AC 25690 V
Output circuit 1 (IC3)	11, 12, 14	Measuring range $U_{\rm n}$	AC 25690 V, DC 01000 V
Output circuit 2 (IC4)	21, 22, 24	Voltage range measurement of U_n	AC/DC > 10 V
Control circuit (IC5)	(E, KE), (X1, ETH, X3, X4)	Tolerance measurement of U_n	±5 % ±5 V
Rated voltage	1000 V	Measuring range C _e	01000 μF
Overvoltage category	1000 1	Tolerance measurement of $C_{\rm e}$	±10 % ±10 μF
Rated impulse voltage:		Frequency range measurement of C_e	•
	0.114		DC, 30460 Hz
IC1/(IC2-5)	8 kV	Min. insulation resistance measurement of C_e	
IC2/(IC3-5)	4 kV	depending of	n the profile and coupling mode, typ. $>$ 10 k Ω
IC3/(IC4-5)	4 kV	Display	
IC4/IC5	4 kV		1: 1: 1 427 427 : 1 40 40 3
Rated insulation voltage:			graphic display 127 x 127 pixels, 40 x 40 mm ²⁾
IC1/(IC2-5)	1000 V	Display range measured value	0.1 kΩ20 MΩ
IC2/(IC3-5)	250 V	Operating uncertainty (according to IEC 61557-8)	± 15 %, at least ± 1 k Ω
IC3/(IC4-5)	250 V	IFD.	
IC4/IC5	250 V	LEDs	
		ON (operation LED)	green
Pollution degree outside (<i>U</i> _n < 690 V)	3	SERVICE	yellow
Pollution degree outside ($U_n > 690 < 1000 \text{ V}$)	2	ALARM 1	yellow
Safe isolation (reinforced insulation) between:		ALARM 2	yellow
IC1/(IC2-5)	Overvoltage category III, 1000 V	ALEMANTI Z	yellow
IC2/(IC3-5)	Overvoltage category III, 300 V	In-/Outputs (X1-Interface)	
IC3/(IC4-5)	Overvoltage categoryIII, 300 V	Cable length X1 (unshielded cable)	≤ 10 m
IC4/IC5	Overvoltage category III, 300 V	Cable length X1 (unsilieded cable) Cable length X1 (shielded cable, shield connected to	
Voltage test (routine test) according to IEC 61010-1:	Overvoltage category III, 300 v		
	AC 2 2 IV	J-Y(St)Y min. 2x0,8)	≤ 100 m
IC2/(IC3-5)	AC 2.2 kV	Total max. supply output current via X1.+/X1.GND fo	
IC3/(IC4-5)	AC 2.2 kV	Total max. supply output current via A1/A2 in total o	n X1 max. 200 mA
IC4/IC5	AC 2.2 kV	Total max. supply output current via A1/A2 in total o	n X1 between 16.8 V and 40 V
Comples on life and			$I_{\text{LmaxX1}} = 10 \text{ mA} + 7 \text{ mA/V} * U_5^{3}$
Supply voltage			(negative values are not allowed for I _{LmaxX1})
Supply via A1/+, A2/-:			C J Ellianti
Supply voltage range $U_{\rm S}$	AC/DC 24240 V	Digital Inputs (I1, I2, I3)	
Tolerance of $U_{\rm S}$	-30+15%	Number	3
Maximum permissible input current of $U_{\rm S}$	650 mA	Operating mode, adjustable	active high, active low
	DC, 50400 Hz ¹⁾		et, deactivate device, start initial measurement
Frequency range of <i>U</i> _s	·		Low DC -35 V, High DC 1132 V
Tolerance of the frequency range of U_s	-5+15 %	Voltage	• •
Typical power consumption DC	≤ 12 W	Tolerance Voltage	±10 %
Typical power consumption 50/60 Hz	≤ 12 W/21 VA	Digital Outputs (Q1, Q2)	
Typical power consumption 400 Hz	≤ 12 W/45 VA		
Supply via X1:		Number	2
Supply voltage $U_{\rm S}$	DC 24 V	Operating mode, adjustable	active, passive
		Functions off, Ins. alarn	n 1, Ins. alarm 2, connection fault, DC- alarm 4),
Tolerance of <i>U</i> s	DC -20+25 %	DC+ alarm ⁴⁾ , syı	mmetrical alarm, device fault, common alarm,
IT system being monitored		measuren	nent complete, device inactive, DC offset alarm
	ACO COOM DCO 1000 W	Voltage	passive DC 032 V, active DC 0/19.232 V
Nominal system voltage range $U_{\rm n}$	AC 0690 V, DC 01000 V		,
	AC/DC 0600 V (for UL applications)	Analogue Output (M+)	
Tolerance of <i>U</i> _n	AC/DC +15 %	Number	1
Frequency range of U_n	DC, 0.1460 Hz	Operating mode	linear, midscale point 28 k Ω /120 k Ω
Max. AC voltage U_{\sim} in the frequency range $f_{\rm n}=0.14$	Hz $U_{\sim max} = 50 \text{ V *} (1 + f_n^2/\text{Hz}^2)$	Functions	insulation value, DC shift
. , ,			insulation value, DC sinte), 420 mA ($<$ 600 Ω), 0400 μ A ($<$ 4 k Ω)
Response values			
Response value R _{an1} (alarm 1)	1 kΩ10 MΩ	Voltage	$010 \text{ V} (> 1 \text{ k}\Omega), 210 \text{ V} (> 1 \text{ k}\Omega)$
Response value R _{an2} (alarm 2)	1 kΩ10 MΩ	Tolerance related to the current/voltage final value	±20 %
Relative uncertainty (acc. to IEC 61557-8)	profile dependent, ± 15 %, at least ± 1 k Ω	Interfaces	
Hysteresis	25 %, at least 1 k Ω	menaces	
,5	25 /0, at icast 1 K12	Field bus	
Time response		Interface/protocol	web server/Modbus TCP/BCOM
Response time t_{an} at $R_F = 0.5 \times R_{an}$ ($R_{an} = 10 \times \Omega$) and	Co = 1 uE according to IEC 61557-8	Data rate	10/100 Mbit/s, autodetect
•	ependent, typ. 4 s (see diagrams in manual)	Max. amount Modbus requests	< 100/s
•		•	
	ependent, typ. 2 s (see diagrams in manual)	Cable length	≤ 100 m
Start-up delay T _{start-up}	0120 s	Connection	RJ45
Measuring circuit		IP address	DHCP/manual 192.168.0.5
	1	Network mask	255.255.255.0
, , , , , , , , , , , , , , , , , , ,	endent, ±10 V, ±50 V (see profile overview)	BCOM address	system-1-0
Measuring current I _m	≤ 403 µA	Function	communication interface
Internal resistance R_i , Z_i	≥ 124 kΩ		
Permissible extraneous DC voltage Ufg	≤ 1200 V	Sensor bus	DC 405/5 D-4-/DC /44 0711
Permissible system leakage capacitance C _e	profile dependent, 01000 μF	Interface/protocol	RS-485/isoData/BS bus/Modbus RTU
	promo dependenty over 1000 pr	Data rate	9.6 kBaud/s
		Cable length	≤ 1200 m
		Cable: twisted pair, one end of shield connected to P	E recommended: J-Y(St)Y min. 2x0.8
		Connection	terminals X1.A, X1.B
		Terminating resistor at the beginning and at the end	of the transmission path
		Terminating resistor at the beginning and at the end	of the transmission path 120Ω , can be connected internally



recilifical data (continue	ω,					
Switching elements						
Number of switching elements				2 cl	nangeover	contacts
Operating mode					tion/N/O o	
Contact 11-12-14/21-22-24	off, Ins. a	larm 1, Ins	. alarm 2, o	connection	fault, DC-	alarm 4),
DC	+ alarm 4)	, symmetri	ical alarm,	device fau	ılt, commo	n alarm,
	measu	irement co	mplete, de	evice inacti	ve, DC offs	et alarm
Electrical endurance under rated opera	ting condi	tions, num	ber of cycl	es		10.000
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 m	nA at AC/D	C ≥ 10 V
Environment/EMC						
EMC			DIN FI	N 50121-3-	-2, IEC 613	26-2-4 ⁵⁾
Ambient temperatures:			J 2.	.50.2.5	2,120013	
Operating temperature					-40	.+70°C
Transport Transport						.+85 °C
Long-term storage						.+70 °C
Classification of climatic condition	cace to l	EC 60721	(ralated to tor	mnoraturo and		
Stationary use (IEC 60721-3-3)	s acc. to i	LC 00/21	(related to tel	iiperature and	i relative ilulii	3K24
Transport (IEC 60721-3-2)						2K11
Long-term storage (IEC 60721-3-1)						1K22
Classification of mechanical condit	ione see	+0 IEC 60.	771.			
Stationary use (IEC 60721-3-3)	ions acc.	LO IEC OU	/21:			3M12
Transport (IEC 60721-3-3)						2M4
Long-term storage (IEC 60721-3-1)						1M12
Area of application					< 30	00 m NN
•						00 111 1111
Connection						
Connection type	plu	ggable scr	ew-type te	rminal or p	push-wire	terminal
Screw-type terminals:						
Nominal current						\leq 10 A
Tightening torque				0.50	.6 Nm (5	.7 lb-in)
Conductor sizes					AWG	2412
Stripping length						7 mm
rigid/flexible					0.2	2.5 mm ²
flexible with ferrules, with/without pla	istic sleeve				0.25	2.5 mm ²
Multiple conductor						
rigid						1 mm²
flexible						1.5 mm ²
flexible with ferrule without plas	tic sleeve				0.25.	1 mm²

Dimension	diagram	(dimensions in mm)

flexible with TWIN ferrule with plastic sleeve



Push-wire terminals:	
Nominal current	≤ 10 A
Conductor sizes	AWG 2412
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

us	11-	wire	terminais x r.	

Nominal current	≤ 8 A
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 TWIN ferrule with plastic sleeve	0.250.75 mm ²

Other

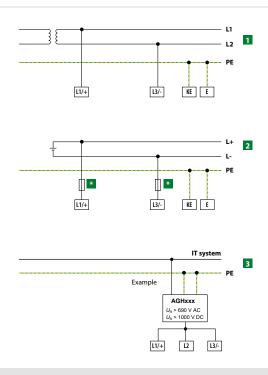
Operating mode	continuous operation
Mounting (0°)	display oriented, cooling slots must be ventilated vertically 6)
Degree of protection internal comp	ponents IP40
Degree of protection terminals	IP20
DIN rail mounting acc. to	IEC 60715
Screw fixing	3 x M4 with mounting clip
Enclosure material	polycarbonate
Flammability class	V-0
ANSI code	64
Dimensions (W x H x D)	108 x 93 x 110 mm
Documentation number	D00178
Weight	< 390 q

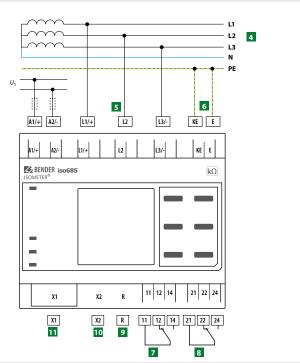
- ¹⁾ At a frequency > 200 Hz, the connection of X1 must be insulated. Only permanently installed devices which at least have overvoltage category CAT2 (300V) may be connected.
- $^{2)}$ Indication limited outside the temperature range -25 \ldots +55 °C.
- $^{3)}$ $U_{\rm S}$ [Volt] = supply voltage ISOMETER $^{\circ}$
- ⁴⁾ For $U_n \ge 50 \text{ V}$ only.

0.5...1.5 mm²

- ⁵⁾ This is a class A product. In a domestic environment, this product may cause radio interference. In this case, the user may be required to take corrective actions.
- $^{6)}$ Recommendation: Devices mounted at 0 $^{\circ}$ (display-oriented, cooling slots must be ventilated vertically).

For devices mounted at an angle of 45°, the max. working temperature is reduced by 10 °C. For devices mounted at an angle of 90°, the max. working temperature is reduced by 20 °C.





- 1 Connection to an AC system Un
- 2 Connection to a DC system U_n
- 3 Connection to an IT system with coupling device
- 4 Connection to a 3(N)AC system
- 5 Connection to the IT system to be monitored (L1/+, L2, L3/-)
- 6 Separate connection of KE, E to PE
- 7 (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.

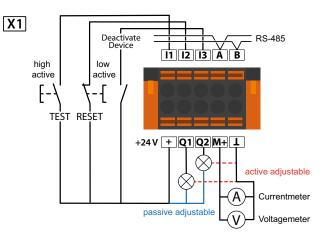
For UL applications:

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	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 24 V source, A1/+, A2/- must not be connected.
	Q1, Q2	Configurable digital output
	M+	Configurable analogue output (e.g. measuring instrument)
	Т	Reference potential ground



ISOMETER® isoRW685W-D-B







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 $\Omega...10~M\Omega$
- 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 (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

Nominal system	voltage range <i>U</i> n	Supply voltage <i>U</i> s		Supply voltage <i>U</i> ₅		Туре		Art. No.
AC	DC	AC	DC	AI C. NO.				
0690 V; 0,1460 Hz	01000 V	24240 V; 50400 Hz	24240 V	isoRW685W-D-B		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

¹⁾ included in the scope of delivery

Suitable system components

Description	Туре	Art. No.	Page
Coupling devices	AGH150W-4	B98018006	350
	AGH204S-4	B914013	352
	AGH520S	B913033	353
	AGH676S-4	B913055	356

Suitable measuring instruments on request!



Insulation coordination acc. to IEC 60664-	1/IEC 60664-3	Measuring ranges
Definitions:		Measuring range $f_{\rm n}$ 0.1460 Hz
Measuring circuit (IC1)	(L1/+, L2, L3/-)	Measurement tolerance of $f_{\rm n}$ $\pm 1 \% \pm 0.1$ Hz
Supply circuit (IC2)	A1, A2	Measurement voltage range of $f_{\rm n}$ AC 25690 V
Output circuit 1 (IC3)	11, 12, 14	Measuring range <i>U</i> _D AC 25690 V, DC 251000 V
Output circuit 2 (IC4)	21, 22, 24	Measurement voltage range of $U_{\rm n}$ AC/DC > 10 V
Control circuit (IC5)	(E, KE), (X1, ETH, X3, X4)	Measurement tolerance of $U_{\rm D}$ $\pm 5 \% \pm 5 \text{ V}$
Rated voltage	1000 V	Measuring range $C_{\rm e}$ 01000 $\mu {\rm F}$
Overvoltage category	1000 V	Measurement tolerance of $C_{\rm e}$ $\pm 10 \% \pm 10 ~\mu$
	III	
Rated impulse voltage:	0.114	Measurement frequency range of C _e DC, 30460 Hz
IC1/(IC2-5)	8 kV	Min. measurement insulation resistance of C_e depending on profile and coupling mode, typ. $> 10 \text{ k}\Omega$
IC2/(IC3-5)	4 kV	Display
IC3/(IC4-5)	4 kV	_ · ·
IC4/IC5	4 kV	Display graphic display 127 x 127 pixels, 40 x 40 mm ²⁾
Rated insulation voltage:		Display range measured value $0.1 \text{ k}\Omega20 \text{ M}\Omega$
IC1/(IC2-5)	1000 V	Operating uncertainty (acc. to IEC 61557-8) \pm 15 %, min. 1 k Ω
IC2/(IC3-5)	250 V	LEDs
IC3/(IC4-5)	250 V	
IC4/IC5	250 V	ON (operation LED) green
Pollution degree outside ($U_{\rm n}$ < 690 V)	3	SERVICE yellow
Pollution degree outside ($U_0 > 690 < 1000 \text{ V}$)	2	ALARM 1 yellow
Protective separation (reinforced insulation) be		ALARM 2 yellow
		had a selection of the
IC1/(IC2-5)	overvoltage category III, 1000 V	Inputs/outputs (X1 interface)
IC2/(IC3-5)	overvoltage category III, 300 V	Cable length X1 (unshielded cable) $\leq 10 \text{ m}$
IC3/(IC4-5)	overvoltage category III, 300 V	Cable length X1 (shielded cable, shield connected to PE on one side, recommended: J-Y(St)Y min. 2x0.8)
IC4/IC5	overvoltage category III, 300 V	≤100 m
Voltage test (routine test) acc. to IEC 61010-1:		Total max. supply output current via X1.+/X1.GND for each output max. 1 A
IC2/(IC3-5)	AC 2.2 kV	Total max. supply output current via A1/A2 in total on X1 max. 200 mA
IC3/(IC4-5)	AC 2.2 kV	Total max. supply output current via A1/A2 in total on X1 between 16.8 V and 40 V
IC4/IC5	AC 2.2 kV	$I_{\text{LmaxX1}} = 10 \text{ mA} + 7 \text{ mA/V} * U_5^{3}$
		(negative values are not allowed for $I_{\text{I max}X1}$)
Supply voltage		(negative raises are not another for Elliaxxi)
Supply via A1/+, A2/-:		Digital inputs (I1, I2, I3)
Supply voltage range U_S	AC/DC 24240 V	Number 3
Tolerance of U_S	-30+15 %	Operating mode, adjustable active high, active low
Maximum permissible input current of U_s	650 mA	Functions off, test, reset, deactivate device, start initial measurement
	DC, 50400 Hz ¹⁾	Voltage Low DC -35 V, High DC 1132 V
Frequency range of U_S	•	Voltage tolerance ±10 %
Tolerance of the frequency range of U_s	-5+15 %	voltage tolerance ± 10 70
Typical power consumption DC	≤ 12 W	Digital outputs (Q1, Q2)
Typical power consumption 50/60 Hz	≤ 12 W/21 VA	Number 2
Typical power consumption 400 Hz	≤ 12 W/45 VA	Operating mode, adjustable active, passive
Supply via X1:		Functions off, ins. alarm 1, ins. alarm 2, connection fault, DC- alarm 4,
Supply voltage U _S	DC 24 V	DC+ alarm ⁴⁾ , symmetrical alarm, device error, common alarm,
Tolerance of U_S	DC -20+25 %	
Total and Co. Co.	DC 20111125 /6	measurement complete, device inactive, DC offset alarm
Monitored IT system		Voltage passive DC 032 V, active DC 0/19.232 V
Nominal system voltage range $U_{\rm D}$	AC 0690 V, DC 01000 V	Analogue output (M+)
, , ,	AC/DC 0600 V (for UL applications)	Number 1
Tolerance of $U_{\rm D}$	AC/DC +15 %	
Frequency range of U_0	DC 0.1460 Hz	Operating mode linear, mid-scale $28 \text{ k}\Omega/120 \text{ k}\Omega$
Max. AC voltage U_{\sim} in the frequency range $f_{\rm n}$ =		Functions insulation value, DC offset
	0~ IIIdX — 30 V (11 /III / IIZ)	Current $020 \text{ mA} (< 600 \Omega), 420 \text{ mA} (< 600 \Omega), 0400 \mu\text{A} (< 4 k\Omega)$
Response values		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/voltage final value $\pm 20\%$
Response value R_{an2} (Alarm 2)	1 kΩ10 MΩ	Interfaces
Relative uncertainty (acc. to IEC 61557-8)	profile-dependent, ± 15 %, min. ± 1 k Ω	interfaces
Hysteresis	profile-dependent, $\pm 15\%$, film. $\pm 1 \text{ K}\Omega$	Field bus
HYSICICSIS	23 %, IIIII. 1 KL2	Interface/protocol web server/Modbus TCP/BCOM
Time response		Data rate 10/100 Mbit/s, autodetect
Response time t_{an} at $R_F = 0.5$ x R_{an} ($R_{an} = 10$ kg	Ω) and $C_{\rm e} = 1$ uF acc. to IEC 61557-8	Max. amount Modbus requests < 100/s
	le-dependent, typ. 4 s (see diagrams in the manual)	Cable length ≤ 100 m
•	file-dependent, typ. 2 s (see diagrams in the manual)	Connection RJ45
		IP address DHCP/manual 192.168.0.5
Start-up delay T _{start-up}	0120 s	Network mask 255.255.255.0
Measuring circuit		
	file-dependent, ±10 V, ±50 V (see profile overview)	BCOM address system-1-0
		Function communication interface
Measuring current I _m	≤ 403 µA	ISOnet .
Internal resistance R _i , Z _i	≥ 124 kΩ	Number of ISOnet devices 220 dev
Internal resistance with system isolation (inactive		Maximum nominal system voltage ISOnet AC, 690 V/DC, 1000 V
Permissible extraneous DC voltage Ufg	≤ 1200 V	
	profile-dependent, 01000 μF	ISOloop
Permissible system leakage capacitance C_e	prome acpenaent, o rooo µi	ISOloop devices 210 dev



Technical data (contin	nued)					
Sensor bus						
Interface/protocol			RS-485/isoData/BS bus/Modbus RTU			
Data rate						kbaud/s
Cable length			≤ 1200 m			
Cable: twisted pair, one end of shi	eld connected t	:0 PE	recon		J-Y(St)Y m	
Connection					erminals X	I.A, X I.B
Terminating resistor at the beginn	ing and end of	the transn	•			. 4 11.
Davies address DC has			120 1.	z, can be co	onnected i	
Device address, BS bus						190
Switching elements						
Switching elements					nangeover	
Operating mode					on or N/O o	
Contact 11-12-14/21-22-24					fault, DC-	
	DC+ alarm 4)					
		irement co	mplete, de	evice inacti	ive, DC offs	
Electrical endurance, number of cy	cles					10000
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 n						250 V
Rated insulation voltage ≤ 3000 n	n NN					160 V
Minimum contact rating				1 m	nA at AC/D	C ≥ 10 V
Environment/EMC						
EMC			DIN E	N 50121-3-	-2, IEC 613	26-2-4 ⁵⁾
Ambient temperatures:						
Operating temperature						+70 ℃
Transport						+85°C
Long-term storage					-40	+70 ℃
Classification of climatic condi	tions acc. to I	EC 60721	(related to ter	nperature and	d relative hum	idity)
Stationary use (IEC 60721-3-3)						3K24
Transport (IEC 60721-3-2)						2K11
Long-term storage (IEC 60721-3-1)					1K22
Classification of mechanical co	nditions acc.	to IEC 607	721:			
Stationary use (IEC 60721-3-3)						3M12
Transport (IEC 60721-3-2)						2M4
Long-term storage (IEC 60721-3-1)					1M12
Area of application					≤ 30	00 m NN
Connection						
Connection type		pluggab	le screw te	rminal or p	push-wire	terminal
Screw-type terminals:						
Nominal current						≤ 10 A
Tightening torque				0.50	.6 Nm (5	
Conductor sizes					AWG	2412
Ctrinning langth						7 mm

Nominal current	≤ 10 A
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 terminals X1:	
Nominal current	≤ 8 A
Conductor sizes	AWG 2416

Nominal current	≤ 8 A
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 position (0°)	display-oriented, cooling slots must be ventilated vertically 6
Degree of protection internal com	ponents IP40
Degree of protection terminals	IP20
DIN rail mounting acc. to	IEC 60715
Screw mounting	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

- 1) At a frequency > 200 Hz, the connection of X1 must be insulated. Only permanently installed devices which at least have overvoltage category CAT2 (300 V) may be connected.
- $^{2)}$ Indication limited outside the temperature range -25 \ldots +55 °C.
- ³⁾ $U_{\rm S}$ [Volt] = supply voltage ISOMETER*
- ⁴⁾ Only for $U_n \ge 50 \text{ V}$.

Push-wire terminals:

- 5) This is a class A product. In a domestic environment, this product may cause radio interference. In this case, the user may be required to take corrective actions.
- 6) Recommendation: Mounting position 0° (display-oriented, cooling slots must be ventilated vertically).

At mounting position 45°, the max. operating temperature is reduced by 10 °C. At mounting position 90°, the max. operating temperature is reduced by 20 °C.

Dimension diagram (dimensions in mm)

. Multiple conductor flexible with ferrule without plastic sleeve

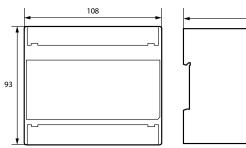
Multiple conductor flexible with TWIN ferrule with plastic sleeve

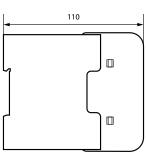
flexible with ferrule with/without plastic sleeve

Stripping length rigid/flexible

Multiple conductor rigid

Multiple conductor flexible





0.2...2.5 mm²

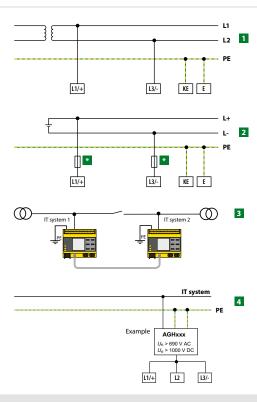
0.25...2.5 mm²

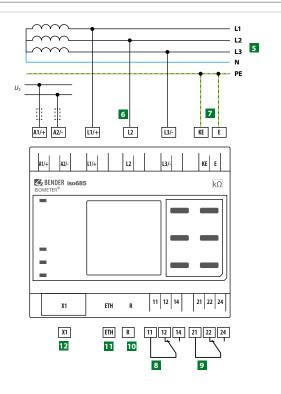
0.2...1 mm²

0.2...1.5 mm²

0.25...1 mm²

0.5...1.5 mm²





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

- 8 (K1) Alarm relay 1, available changeover contacts
- 9 (K2) Alarm relay 2, available changeover contacts
- 10 Switchable resistor R for RS-485 bus termination
- 11 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 ≤ 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.

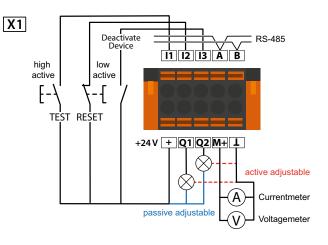
For UL applications:

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 24 V source, A1/+, A2/- must not be connected.
	Q1, Q2	Configurable digital output
	M+	Configurable analogue output (e.g. measuring instrument)
	1	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

Supply voltage/frequency range U₅	Power consumption	Туре	Art. No.	
DC				
241// 20 1.25 0/	tun 2 W	FP200	B91067904	
24V/-20+25 %	typ. 3 W	FP200W ¹⁾	B91067904W	

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

Accessories

Description	Art. No.
FP200 mechanical accessories comprising: 2 screw attachments	B91067907
Front cover 144x72 transparent (for IP65)	B98060005
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
Front cover 144x96 transparent (for IP65)	B98060007

Insulation co-ordination (IEC 60664-1/IEC 60664-3)

	10000.0,
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 o	utside of the device housing 3
Supply voltage	
Supply voltage <i>U</i> 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 CATSe
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.	
Stationary use (IEC 60721-3-3)	3K23 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K11
Long-time storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions a	
Stationary use (IEC 60721-3-3)	3M11
Transportation (IEC 60721-3-2)	2M4
1 +t (IFC (0721 2 1)	1M12
Long-term storage (IEC 60721-3-1) Area of application	<3000 m NN

Connection	
Connection type	plug connectors
Other	
Operating mode	continuous operation
Mounting (0°)	display oriented,
cooli	ng slots must be ventilated vertically ¹
Degree of protection, built-in components (DIN EN 60529)	IP40
Degree of protection, terminals (DIN EN 60529)	IP20
Degree of protection with transparent cover	IP65
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
Option "W" data different from the standard version	
(Only for remote mounting)	
Ambient temperatures:	
Operating temperature	-40+70°C

()* = factory setting

Stationary use (IEC 60721-3-3)

Stationary use (IEC 60721-3-3)

Transport

Long-term storage

Classification of climatic conditions acc. to IEC 60721:

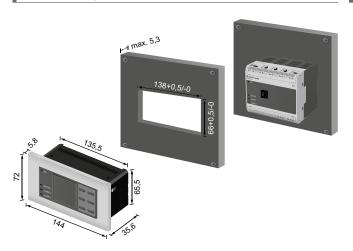
Classification of mechanical conditions acc. to IEC 60721:

-40...+85 °C

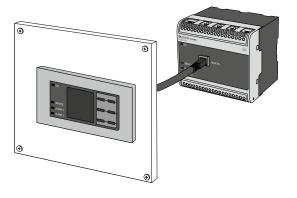
-40...+70 °C

3K23 (condensation and formation of ice possible)

Dimension diagram (dimensions in mm)



Connection to iso685



¹⁾ Recommendation: Devices mounted at 0° (display-oriented, cooling slots must be ventilated vertically). For devices mounted at an angle ≠ 0°, the max. working temperature is reduced by 10 °C for devices with a "W" in the device name.

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 features

- 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
- 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

Nominal system voltage <i>U</i> _n	Supply v	oltage <i>U</i> s	Cable length	Cable length Type	Туре	Art. No.	Page
AC, 3(N)AC/DC	AC	DC	cubic ictigen	.,,,-	711 (1 110)	i uge	
-	19.255 V	19.272 V	-	IRDH275BM-727	B91065120	-	
0 721// 0 460 11-	(0.11 -		2000 mm	AGH675S-7-2000	B913061	354	
07.2 kV, 0460 Hz –	-	500 mm	AGH675S-7-500	B913060	354		
015.5 kV, 0460 Hz	-	-	500 mm	AGH675S-7MV15-500	B913058	354	

Suitable system components

Description	Туре	Art. No.	Page
External kΩ measuring instruments	9620-1421	B986849	398



Technical data IRDH275BM-7	
Insulation coordination acc. to IEC 60664-1	
Rated voltage	AC 800 V
Rated impulse voltage/pollution degree	8 kV/3
Voltage ranges	
Nominal voltage range <i>U</i> _n	via AGH675S-7
Supply voltage U_{S} (also see nameplate)	AC 19.255 V*
Frequency range U _S	42460 Hz
Supply voltage U _s (also see nameplate)	DC 19.272 V*
Power consumption	≤14 VA
Response values	
Response value Ran1 (Alarm 1)	100 kΩ10 MΩ
Response value Ran2 (Alarm 2)	100 kΩ10 MΩ
Relative percentage error $100500 \text{ k}\Omega$	±100 kΩ
Relative percentage error 500 k Ω 10 M Ω	0 %+20 %
Response time tan	≤ 5 mir
Hysteresis	25 %
Measuring circuit	
Measuring voltage Um	≤ 50 \
Measuring current Im (at RF = 0 Ω)	≤ 21 µ <i>A</i>
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 µI
Factory setting	2 µГ
Displays	
Display, illuminated	two-line display
Characters (number of characters)	2 x 16
Display range, measuring value	50 kΩ10 MΩ
Relative percentage error 50500 k Ω	±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 m
Current output for measuring instrument SKMP (scale centr	re point = 1.2 M Ω):
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/BMS
	terminals A/B
Connection	
Cable length	≤ 1200 m
Cable length Recommended cable (screened, screen on one side connected to PE)	≤ 1200 m J-Y(St)Y 2x0.6
Cable length	\leq 1200 m J-Y(St)Y 2x0.6 120 Ω (0.5 W) 130 (factory setting = 3)

ivitching components 2 changeover contacts: K1 (A	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 or N/C operation
Electrical endurance	12 000 switching operations
Contact class	IIB (IEC 60255-23)
Rated contact voltage	AC 250 V/DC 300 V
Making capacity	AC/DC 5 A
reaking capacity	2 A, AC 230 V, cos phi = 0.4
realing capacity	0,2 A, DC 220 V, L/R = 0.04 s
Ninimum contact current at DC 24 V	\geq 2 mA (50 mW)
invironment/EMC	
MC immunity	acc. to EN 61326
MC emission	acc. to EN 61326
hock resistance IEC 60068-2-27 (device in operation)	15 g/11 ms
umping IEC 60068-2-29 (during transport)	40 g/6 ms
ibration resistance IEC 60068-2-6 (device in operation)	1 g/10150 Hz
libration resistance IEC 60068-2-6 (during transport)	2 g/10150 Hz
Imbient temperature (during operation)	-10+55 °C
torage temperature range	-40+70 °C
limatic class acc. to IEC 60721-3-3	3K23
Connection	
Connection	screw terminals
Connection	
igid, flexible	0.24 mm ² /0.22.5 mm ²
lexible with connector sleeve, without/with plastic sleeve	0.252.5 mm ²
Conductor sizes	AWG 2412
Other	
Operating mode	continuous operation
Nounting	as indicated on the display
Protection class, internal components (DIN EN 60529)	IP30
Protection class, terminals (DIN EN 60529)	IP20
ype of enclosure	X112, free from halogen
DIN rail mounting	IEC 60715
Flammability class	UL94 V-0

Tightening torque

Documentation number Weight approx.



0.5 Nm D00123

510 g

D00095

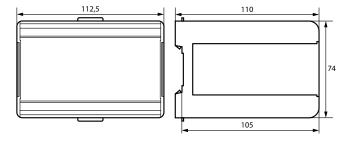
≤ 5100 g

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 $U_{\rm n}$	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	\geq 4.7 M Ω

Operating temperature (normal operation)	- 10+ 60 °C
Operating temperature (continuous operation with	h asymetrical earth fault - 10+ 55 °C
Classification of climatic conditions acc. to	IEC 60721
Stationary use (IEC 60721-3-3)	3K23 (no condensation, no formation of ice
Transport (IEC 60721-3-2)	2K1
Long-term storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions ac	c. 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
Connection	
Connection terminal 2 (medium voltage)	high-voltage cable (encapsulated on the device side)
Connection, flexible with ring terminal	M ⁴
Connection 3, 4, 5	screw-type terminal:
Connection	
rigid, flexible	0.24 mm ² /0.22.5 mm
flexible with connector sleeve	0.252.5 mm
Other	
Operating mode	continuous operatior
Mounting	any positior
Protection class, internal components (DIN EN 6	50529) IP64
Protection class, terminals (DIN EN 60529)	IP20
Type of enclosure	resin-encapsulated bloc
Screw mounting	M:
Flammability class	UL94 HI
Documentation number	DODOO

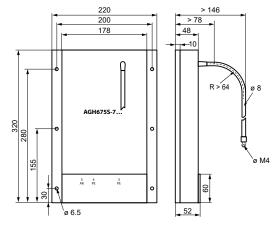
Dimension diagrams (dimensions in mm)

IRDH275BM-7

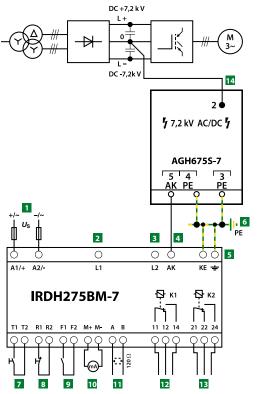


AGH675S-7...

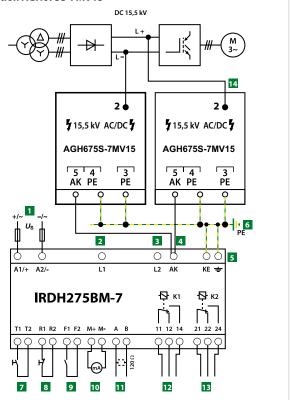
Documentation number Weight approx.



Connection AGH675S-7



Connection AGH675S-7MV15



- Supply voltage U_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

- 5 Separate connection of $\stackrel{\leftarrow}{+}$ and KE to PE
- 6 Separate connection of the terminals 3 and 4 of the AGH675S-7 or AGH675S-7MV15 to PE
- 7 External TEST button (NO contact)
- External RESET button (NC contact or wire jumper), when the 8 terminals are open, the fault message will not be stored

- STANDBY by means of the function input F1, F2: When the 9 contact is closed, insulation measurement does not take place.
- Current output, galvanically separated: 0...20 mA or 4...20 mA 10
- Serial interface RS-485 (termination 120 Ω resistor) 11
- 12 Alarm relay 1; changeover contacts provided
- 13 Alarm relay 2 (system fault relay); changeover contacts provided
- Connection of the coupling device AGH675S-7 to the converter: 14 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)







Device features

- · Monitoring of the insulation resistance for unearthed 3(N)AC, AC and DC systems with galvanically connected rectifiers
- \bullet 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 k Ω ...1000 k Ω
- · Alarms are output via LEDs (AL1, AL2) and an alarm relay
- Selectable N/C or N/O relay operation ¹
- Selectable start-up delay, response delay and delay on release $\ensuremath{^{1}}$
- Fault memory 1
- · RS-485 interface with Modbus RTU protocol
- · NFC interface
- ¹ Only adjustable via Modbus RTU or Bender App

(IT systems) Approvals

Typical applications

• Unearthed 3(N)AC, AC and

DC main and control circuits



Standards

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

• IEC 61557-8

For UL applications: Use 60 °C/75 °C copper lines only!

Licences

Open source software:

https://www.bender.de/fileadmin/content/Products/t/0/Open-source_software_information.pdf

Further information

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

Ordering information

Supply voltage <i>U</i> ₅		Nominal syste	m voltage <i>U</i> n	Туре	Art. No.
AC/DC	DC	AC	DC	1,765	ALC NO.
-	24 V	0415 V	0400 V	iso415R-24	B71602000
100240 V	-	100240 V [3(N)AC, AC (= U_{S})]	100240 V	iso415R-2	B71603000

Technical data

Definitions:	
Measuring circuit (IC1)	L1, L2
Control circuit (IC2)	E, KE, +, -, A, E
Output circuit (IC3)	11, 14, 12
Rated voltage	400 V
Overvoltage category	II
Operating altitude	2000 m AMSI
Rated impulse voltage:	
IC1/(IC2-3)	6 kV
IC2/IC3	4 k\
Rated insulation voltage:	
IC1/(IC2-3)	400 \
IC2/IC3	250 \
Pollution degree	2
Protective separation between:	
IC1/(IC2-3)	Overvoltage category III, 600 \
IC2/(IC3)	Overvoltage category III, 300 \
Voltage tests (routine test) acc. to IEC 61010-1	
IC3/(IC1-2)	AC 2.2 k\
Supply voltage	
iso415R-24: Only via galvanically separated power supply (+/–)	
Supply voltage <i>U</i> s	DC 24 \
Tolerance of U _S	-20+25 %
Power consumption	≤ 2 W
Inrush current (< 5 ms)	< 10 Å
iso415R-2: Only via the system to be monitored $U_S = U_D$ (L1/L2))	

lominal system voltage $U_{\rm n}$	3(N)AC, AC 0415 V/DC 0400 V
Tolerance of <i>U</i> n	AC +15 %, DC +25 %
Frequency range of U _n	DC 42460 Hz
Monitored IT system iso415R-2	
Nominal system voltage $U_{\rm n} = U_{\rm s}$	
3(N)AC, AC, DC	100240 \
Tolerance of <i>U</i> n	−30 %+15 %
Frequency range of <i>U</i> n	DC 42460 Hz
Power consumption (at 50 Hz)	\leq 2 W / \leq 3.5 VA
Inrush current (< 2 ms)	< 1.8 A
Measuring circuit	
Measuring voltage U_{m}	±16\
Measuring voltage $I_{\rm m}$ at $R_{\rm F}$, $Z_{\rm F}$ = 0 Ω	≤ 90 µ <i>l</i>
Internal resistance R_i , Z_i	≥ 180 kΩ
Permissible system leakage capacitance C _e	≤ 25 μI
Permissible extraneous DC voltage <i>U</i> fg	≤ 500 V
Response values	
Response value R _{an1}	101000 kΩ (40 kΩ)*
Response value R _{an2}	5700 kΩ (10 kΩ)*
Relative uncertainty R _{an}	$\pm 15\% \pm 2 \text{ k}\Omega$
Hysteresis R _{an}	25 %, minimum 1 kΩ
Time response	
Response time t_{an} at $R_F = 0.5 \times R_{an}$ and $C_e = 1 \mu F$	
acc. to IEC 61557-8	≤69
Start-up delay t 1)	01800 s (0 s)*
Response delay $t_{ m on}$ 1)	01800 s (0 s)*
Delay on release t _{off} 1)	01800 s (0 s)
Recovery time	< 0.4 9

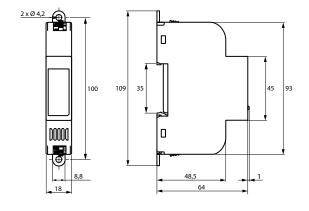
Displays, memory					/- · ·
Display		status LE	D incl. LED	bar graph	
Display range insulation resistance (R _F)					1000 kΩ
Measuring range insulation resistance (R_F)					00 kΩ ⁶⁾
Operating uncertainty					6 ±2 kΩ
Fault memory alarm messages				on/o	off (off)*
RS-485 interface					
Protocol					lbus RTU
Baud rate 1)		max		ts/s (19.2	
Parity 1)			eve	en, no, odd	. ,
Stop bits 1)				1/ 2/ auto	. ,
Cable length (9.6 kbits/s)					1200 m
Cable: twisted pair 2)				min. J-Y(St	
Terminating resistor (external)					(0.25 W)
Device address, Modbus RTU 5)			1.	247 (100) + SN)*
Switching elements					
Switching elements			10	hangeove	r contact
Operating principle 1)	NC o	peration/N	10 operatio	on (NO ope	eration)*
Electrical endurance, number of cycles					10000
Contact data acc. to IEC 60947-5-1:					
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	3 A	1 A	0.2 A	0.1 A
Minimum contact rating 3)			1 m	nA at AC/D	C ≥ 10 V
Connection					
Connection type					Push-in
Nominal current					≤ 10 A
Connection properties					
rigid				m² (AWG 2	
flexible		0.	21.5 m	m² (AWG 2	,
with ferrule with plastic sleeve				0.250	
with ferrule without plastic sleeve 4)				0.75	1.5 mm ²

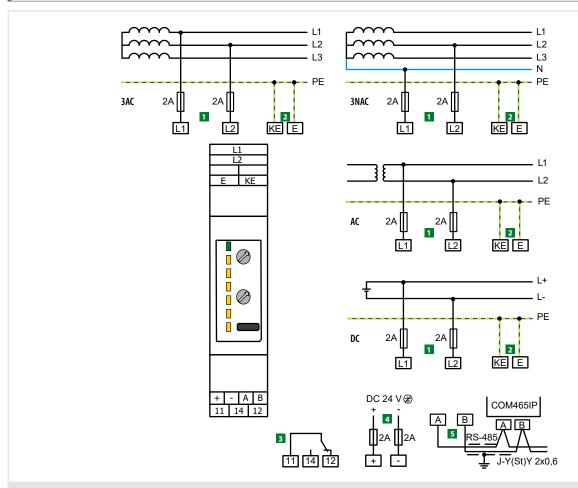
EMC	IEC 61326-2-4
Ambient temperatures	
Operation .	-25+55 °C
Transport	-40+85 °C
Storage	-40+70°C
Classification of climatic conditions acc. to IEC 60721 (except condensation and formation of ice)	
Stationary use (IEC 60721-3-3)	3K23
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions acc. to 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 slot	s must be ventilated vertically
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
Flammability class	UL94 V-0
Documentation number	D00401
Weight	≤ 100 g

()* Factory setting

- 1) Configurable via App and Modbus
- ²⁾ When supplied by or when monitoring systems with a frequency \geq 200 Hz, the cable must be laid in a shockproof manner.
- $^{\scriptsize 3)}$ Refers to relays that have not been operated with high contact currents
- $^{4)}$ Use crimping pliers similar to CRIMPFOX 6 / Weidmüller PZ6/PZ6/5 only.
- $^{5)}$ Factory setting: 100 + last two digits of serial number
- $^{6)}$ Resolution/step size 1 k Ω

Dimension diagram (dimensions in mm)





1 L1, L2

Connection to the system to be monitored. (U_n)

iso415R-2: Supply voltage $U_s = U_n$ (AC/DC 100...240 V)

2 E, KE Earth, Control earth

3 11,14,12 Alarm relay K1

4 +, - iso415R-24: floating supply voltage $U_s = DC 24 V$

5 A, B RS-485 interface



Caution! Select correct supply voltage!

Applying an excessive supply voltage U_{s} can destroy the device. Correct values are:

iso415R-24: $U_s = DC 24 V$ (floating!) iso415R-2: $U_s = U_n = AC/DC 100...240 V$

ISOMETER® IR420-D4



AC



• AC control circuits in the industrial

sector, mechanical engineering,

• 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

lighting systems, mobile generators

• Smaller AC IT systems such as

with DIN VDE 0100-725

power plants, elevators, automation

Typical applications

systems etc.

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)

Approvals





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





Ordering information

Supply voltage ¹⁾ U _S		Туре	Art	. No.
AC	DC	1,762	Screw-type terminal	Push-wire terminal
1672 V, 42460 Hz	9.694 V	IR420-D4-1	B91016409	B71016409
70300 V, 42460 Hz	70300 V	IR420-D4-2	B91016405	B71016405

¹⁾ Absolute values

Accessories

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



IEC 61326-2-4 -25...+55 °C

2.1 mm

Insulation coordination acc. to IEC 60664-1/IEC	C 60664-3
Rated insulation voltage	250 V
Rated impulse voltage/pollution degree	4 kV/3
Protective separation (reinforced insulation) betwee	ın
(A1, A	2) -(L1, L2, E, KE, T/R) -(11, 12, 14) -(21, 22, 24)
Voltage test acc. to IEC 61010-1	2.2 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_S	AC/DC 70300 V
Frequency range Us	42460 Hz, DC
Power consumption	≤ 4 VA
	21111
IT system being monitored Nominal system voltage U _n	AC 0300 V
Nominal frequency f_n	42460 Hz
Nonlina frequency /n	42400 112
Response values	
Response value R _{an1} (Alarm 1)	1200 kΩ
Response value R _{an2} (Alarm 2)	1200 kΩ
Preset mode	2010/1010
$U_{\rm n} \le 72 \text{V} R_{\rm an1} \text{(ALARM 1)} / R_{\rm an2} \text{(ALARM 2)}$	20 kΩ/10 kΩ
$U_{\rm n} > 72 \text{ V } R_{\rm an1} \text{ (ALARM 1)} / R_{\rm an2} \text{ (ALARM 2)}$	46 kΩ/23 kΩ
Relative uncertainty $(15 \text{ k}\Omega)/(5200 \text{ k}\Omega)$ Hysteresis $(15 \text{ k}\Omega)/(5200 \text{ k}\Omega)$	±0.5 kΩ/±15 % +1 kΩ/+25 %
nysteresis (13 kg2)/(3200 kg2)	+1 K22/+25 70
Time response	
Response time t_{an} at $R_F = 0.5 \times R_{an}$ and $C_e = 1 \mu F$	≤1s
Start-up delay (start time) t	010 s (0 s)*
Response delay t _{on}	099 s (0 s)*
Measuring circuit	
Measuring voltage $U_{\rm m}$	±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 U_{fg}	≤ DC 300 V
Permissible system leakage capacitance $C_{\rm e}$	≤ 20 µF
Displays, memory	
Display	LC display, multi-functional, non-illuminated
Display range, measured value	1 kΩ1 MΩ
Operating uncertainty $(15 \text{ k}\Omega)$	±0.5 kΩ
Operating uncertainty (5 k Ω 1 M Ω)	±15 %
Password	off/0999 (off)*
Fault memory, alarm relay	on/off*
Inputs	
Cable length test and reset button	≤ 10 m

NC/N/		changeove on (N/O ope	
NC/N/	O operatio	on (N/O ope	
			10 000
			10,000
AC-14	DC-12	DC-12	DC-12
230 V	220 V	110 V	24 V
3 A	0.1 A	0.2 A	1 A
	1 n	nA at AC/D	C ≥ 10 V
	230 V	230 V 220 V 3 A 0.1 A	230 V 220 V 110 V

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 (except condensation and formation of ice)
Long-time storage (IFC 60721-3-1)	1K22 (except condensation and formation of ice)

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

EMC

Operating temperature

onnection type screw-type terminal or push-wire			
Connection	screw termina		
Connection properties			
rigid	0.24 mm ² (AWG 24 12)		
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	8 mm		
Tightening torque, terminal screws	0.50.6 Nm		
Connection	push-wire terminals		

Connection	push-wire terminais		
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

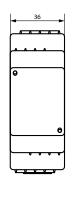
Other

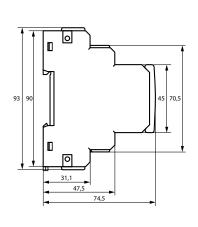
Test opening, diameter

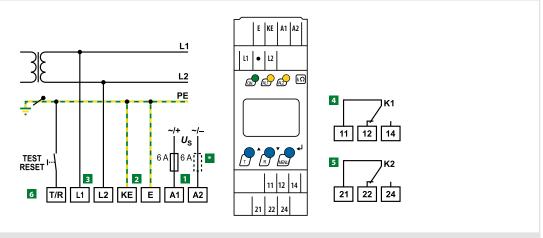
continuous operation
any position
IP30
IP20
polycarbonate
UL94 V-0
IEC 60715
2 x M4 with mounting clip
D00037
≤ 150 g

()* = factory setting

Dimension diagram (dimensions in mm)







- 1 A1, A2 Supply voltage U_s (see ordering details) via fuse
- 2 E, KE Separate connection of E, KE to PE
- 3 L1, L2 Connection of the AC system to be monitored: AC: connect terminals L1, L2 to conductor L1, L2.
- 4 11, 12, 14 Alarm relay K1: Alarm 1 5 21, 22, 23 Alarm relay K2: Alarm 2

- 6 T/R Combined test and reset button "T/R": short-time pressing (< 1.5 s) = RESET, long-time pressing (> 1.5 s) = TEST
- Line protection by a fuse in accordance with IEC 60364-4-43 (6 A fuse recommended). In case of supply (A1/A2) from an IT system, both lines have to be protected by a fuse.

ISOMETER® IR425

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





Typical applications

· AC/DC control circuits in the

industrial sector, mechanical

tors, automation systems etc.

engineering, power plants, eleva-

· AC/DC control and auxiliary circuits

· AC/DC auxiliary circuits in accor-

dance with DIN VDE 0100-725

• Smaller AC/DC IT systems such as

(VDE 0100-725)

lighting systems

in accordance with DIN EN 60204-1 "Electrical equipment of machines", IEC 60204-1, EN 60204-1

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

Approvals For fur

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





Ordering information

Supply vo	ltage ¹⁾ U _S	Type	Art. No.		
AC	DC	1,745	Screw-type terminal	Push-wire terminal	
16 721/ 15 46011-	0.6 0414	IR425-D4-1	B91036403	B71036403	
1672 V, 15460 Hz 9.6.	9.694 V	IR425-D4W-1	B91036403W	B71036403W	
70 2001/15 4/01/- 70 2001/		IR425-D4-2	B91036402	B71036402	
70300 V, 15460 Hz	70300 V	IR425-D4W-2	B91036402W	B71036402W	

¹⁾ Absolute values

Accessories

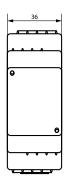
Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B98060008

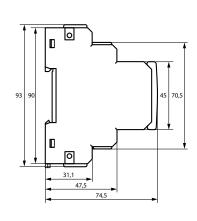
Insulation coordination acc. to IEC 60664-1/IEC		Switching elements					
Rated insulation voltage	250 V	Number of switching elements			2 x 1 c	changeove	
Rated impulse voltage/pollution degree	4 kV/3	Operating principle				NC/N/O o	
Protective separation (reinforced insulation) betwee		Electrical endurance, number of cycles					10,000
	2) -(L1, L2, E, KE, T/R) -(11, 12, 14) -(21, 22, 24)	Contact data acc. to IEC 60947-5-1					
Voltage test acc. to IEC 61010-1	2.2 kV	Utilisation 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
IR425-D4-1, IR425-D4W-1:		Rated operational current	5 A	3 A	0.1 A	0.2 A	1 A
Supply voltage U_S	AC 1672 V/DC 9.694 V	Minimum contact rating			1 n	nA at AC/D	C ≥ 10 V
Frequency range U _S	15460 Hz / DC	Environment/EMC					
. , ,	13400 1127 00	EMC				IFC 61	326-2-4
IR425-D4-2, IR425-D4W-2:	AC/DC 70 200 V	Operating temperature					.+55°C
Supply voltage U _s	AC/DC 70300 V					23	. 1 33 C
Frequency range U_s	15460 Hz, DC	Classification of climatic conditions acc.				.16	
Power consumption	≤ 4 VA	Stationary use (IEC 60721-3-3)			ensation an		
IT system being monitored		Transport (IEC 60721-3-2)		•	ensation an		
Nominal system voltage $U_{\rm D}$	AC/DC 0300 V	Long-time storage (IEC 60721-3-1)		cept conae	ensation an	ia iormatio	in or ice)
Nominal frequency $f_{\rm D}$	DC 15460 Hz	Classification of mechanical conditions I	EC 60721				
		Stationary use (IEC 60721-3-3)					3M11
Response values		for option W					3M12
Response value R _{an1} (ALARM 1)	1200 kΩ	Transport (IEC 60721-3-2)					2M4
Response value R _{an2} (ALARM 2)	1200 kΩ	Long-time storage (IEC 60721-3-1)					1M12
Preset mode		Connection					
$U_{\rm n} \le 72 \mathrm{V} R_{\rm an1} (\mathrm{ALARM} 1)/R_{\rm an2} (\mathrm{ALARM} 2)$	20 kΩ/10 kΩ		ccr	our typo to	erminal or p	nuch wire	torminal
U _n > 72 V R _{an1} (ALARM 1)/R _{an2} (ALARM 2)	46 kΩ/23 kΩ	Connection type	SCIE	ew-type te	erriniai or į		
Relative uncertainty $(15 \text{ k}\Omega)/(5200 \text{ k}\Omega)$	±0.5 kΩ/±15 %	Connection				screw te	rminals
Hysteresis $(15 \text{ k}\Omega)/(5200 \text{ k}\Omega)$	+1 kΩ/+25 %	Connection properties				3 (4)4/6 3	4 42\
Time response		rigid			0.24 mi		,
Response time t_{an} at $R_F = 0.5 \times R_{an}$ and $C_e = 1 \mu F$	≤ 2 s	flexible Two conductors with the same cross section		0	.22.5 m	m² (AWG 2	(414)
Start-up delay (start time) <i>t</i>	010 s	rigid/flexible		0) 1 E m	m? (AMC ?	14 16\
Response delay ton	099 s	Stripping length		U	.21.5 m	III- (AWG 2	8 mm
		Tightening torque, terminal screws				0.5	.0.6 Nm
Measuring circuit							
Measuring voltage $U_{\rm m}$	±12 V	Connection			pus	h-wire te	rminals
Measuring current $I_{\rm m}$ (at $R_{\rm F}=0~\Omega$)	≤ 200 µA	Connection properties			2 25	2 (4)4/6 2	
Internal DC resistance R _i	≥ 62 kΩ	rigid		U	.22.5 m	m² (AWG 2	(414)
Impedance Z _i at 50 Hz	≥ 60 kΩ	flexible without ferrules		0.7	7E 2Em	m? (ANIC 1	0 14
Admissible extraneous d.c. voltage Ufg	≤ DC 300 V	with ferrules			752.5 m .21.5 m		
Permissible system leakage capacitance	≤ 20 μF	Stripping length		U	.21.3 111	III (AWG 2	10 mm
Displays, memory		Opening force					50 N
Display	LC display, multi-functional, non-illuminated	Test opening, diameter					2.1 mm
Display range, measured value	1 kΩ1 MΩ	rest opening, diameter					2.1 111111
Operating error $(15 \text{ k}\Omega)$	±0.5 kΩ	Other					
Percentage operating error (5 k Ω 1 M Ω)	±15 %	Operating mode			со	ntinuous o	peration
Password	off/0999	Mounting				any	position
Fault memory, alarm relay	on/off	Degree of protection, internal components (D					IP30
In months		Degree of protection, terminals (DIN EN 6052)	9)				IP20
Inputs		Enclosure material					rbonate
Cable length test and reset button	≤ 10 m	Flammability class					JL94 V-0
		DIN rail mounting acc. to					C 60715
		Screw mounting			2 x M4	with moun	ting clip

Documentation number

Weight

Dimension diagram (dimensions in mm)

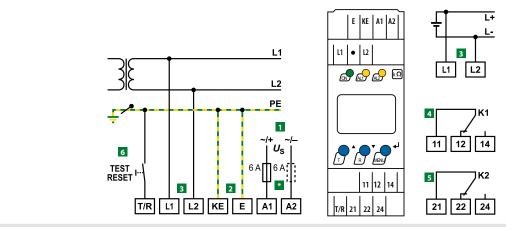






D00039

≤ 150 g



- 1 A1, A2 Supply voltage U_s (see ordering details) via fuse
- 2 KE, E Separate connection of E, KE to PE
- 3 L1, L2 Connection to the IT system to be monitored
- 4 11, 12, 14 Alarm relay K1: Alarm 1 5 21, 22, 24 Alarm relay K2: Alarm 2
- 6 T/R Combined test and reset button:
- short-time pressing (< 1.5 s) = RESET long-time pressing (> 1.5 s) = TEST

Line protection by a fuse in accordance with IEC 60364-4-43 (6 A fuse recommended). In case of supply (A1/A2) from an IT system, both lines have to be protected by a fuse.

ISOMETER® iso1685DP/isoHV1685D/isoLR1685DP

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





Typical applications

- Extensive systems up to AC 1000 $\mbox{V}/$ DC 1500 V which are designed as IT systems

Approvals



Device features

- ISOMETER® for AC IT systems with galvanically connected rectifiers or inverters and for DC IT systems. (IT = unearthed systems)
- Automatic adjustment to high system leakage capacitances
- Combination of AMP^{Plus} and other profile-specific measurement method
- Separately adjustable response values R_{an1} (alarm 1) and R_{an2} (alarm 2) for prewarning and alarm
- · High-resolution graphic LC display for excellent readability and recording of the device status
- · Connection monitoring
- Device self test with automatic alarm message in the event of a fault
- Graphical representation of the insulation resistance over time (isoGraph)
- · History memory with real-time clock (buffer for 13 days) for storing 1023 alarm messages with date and time
- Freely programmable digital inputs
- Remote setting of certain parameters via the Internet (COMTRAXX® gateway)
- · Remote diagnosis by the Bender service via the Internet
- RS-485 interface for data exchange with other Bender devices

iso1685DP-425

• Measurement of insulations faults 200 $\Omega...1$ M Ω , also in photovoltaic systems

isoLR1685Dx-425

• Measurement of low-resistance insulation faults $20 \Omega... 100 k\Omega$

isoHV1685D-425

• Measurement of insulations faults $200 \Omega...1 M\Omega$ at system voltages AC 2000 V, DC 3000 V

iso1685DP-425 and isoLR1685DP-325

- 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® has been developed in compliance with the following standards::

- DIN EN 61557-8 (VDE 0413-8)
- IEC 61557-8
- IEC 61557-8 Annex C (photovoltaic systems, for Fast 2000 µF profile only)
- DIN EN 61557-9 (VDE 0413-9)
- IEC 61557-9 (not for isoHV1685D)
- · 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

Supply voltage 1)	Response value range	Nomina	Nominal voltage		Art. No.	
DC	nesponse value lange	AC	DC	Туре	7.1. 1.1.	
	20 Ω…100 kΩ	0690 V	0690 V	isoLR1685DP-325	B91065803	
1830 V	200 Ω…1 ΜΩ	02000 V	03000 V	isoHV1685D-425	B91065805	
		01000 V	01500 V	iso1685DP-425	B91065802	

¹⁾ Absolute values

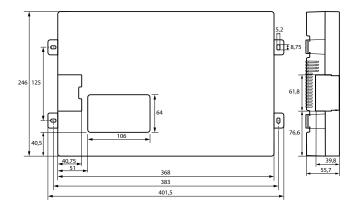
Insulation coordination acc. to IEC 60664-1/IEC 60	664-3	Response values for insulation monitoring			
Definitions:	(14/ 15/) (5/(5)	Response value R_{an1} (alarm 1) and R_{an2} (alarm 2)			
Measuring circuit (IC1)	(L1/+, L2/-), (E, KE)	iso1685DP, isoHV1685D $200 \Omega 1 M\Omega (40 k\Omega/10 k\Omega)^{*2}$			
Supply circuit (IC2)	A1, A2	isoLR1685DP $20 \Omega 100 k\Omega (4 k\Omega / 1 k\Omega)^{*2}$			
Output circuit 1 (IC3)	11, 12, 14	Condition response value $R_{an1} \ge R_{al}$			
Output circuit 2 (IC4)	21, 22, 24	Upper measuring range limit with setting for measurement profile "Fast" Cemax = 2000 μ F			
Output circuit 3 (IC4)	31, 32, 34				
Control circuit (IC6)	(A, B), (I1+, I1-, I2+, I2-)	·			
		200 kΩ			
Rated voltage [for isoHV1685D]	1500 V [3000 V]				
Overvoltage category	<u> </u>	Relative uncertainty (iso 1685DP; isoHV1685D)			
Rated impulse voltage:		$(10 \text{ k}\Omega1 \text{ M}\Omega)$ (acc. to IEC 61557-8) $\pm 15 \%$			
IC1/(IC2-5) [for isoHV1685D]	10 kV [16.670 kV]	(0.2 kΩ < 10 kΩ) ±200 Ω ±15 %			
IC2/(IC3-5)	4 kV	Relative uncertainty (isoLR1685DP)			
IC2/IC1+IC6	800 V	(1 kΩ100 kΩ) (acc. to IEC 61557-8) ±15 %			
IC3/(IC4-6)	4 kV	$(20 \Omega < 1 \text{ k}\Omega)$ $\pm 20\Omega \pm 15 \%$			
•					
IC4/(IC5-6)	4 kV	Hysteresis 25 %			
IC5/IC6	4 kV	Time response			
Rated insulation voltage:					
IC1/(IC2-6) [for isoHV1685D]	1500 V [3000 V]	Response time t_{an} at $R_F = 0.5$ x R_{an} ($R_{an} = 10$ k Ω) and $C_e = 1$ μ F acc. to IEC 61557-8			
IC2/(IC3-5)	250 V	profile-dependent, typ. 10 s			
IC2/IC6	50 V				
IC3/(IC4-6)	250 V	Measuring circuit for insulation fault location (EDS) (iso1685DP and isoLR1685DP)			
		Locating current I_L DC \leq 50 mA (1/2,5/5/10/25/50 mA)			
IC4/(IC5-6)	250 V	Test cycle/pause 2 s/4 s			
IC5/IC6	250 V	, ,			
Pollution degree	3	Display			
Protective separation (reinforced insulation) between:		Display Graphic display 127x127 pixels, 40x40 mm			
IC1/(IC2-5) [for isoHV1685D]	overvoltage category III, 1500 V [3000 V]	Display range measured value			
IC2/(IC3-5)	overvoltage category III, 300 V	iso1685DP, isoHV1685D $200 \Omega50 M\Omega$			
IC2/IC6	overvoltage category III, 50 V				
		isoLR1685DP $20 \Omega 1 M\Omega$			
IC3/(IC4-6)	overvoltage category III, 300 V	I EDe			
IC4/(IC5-6)	overvoltage category III, 300 V	LEDs			
IC5/IC6	overvoltage category III, 300 V	ON (operation LED) green			
Voltage test (routine test) acc. to IEC 61010-1:		PGH ON yellow			
IC2/(IC3-5)	AC 2.2 kV	SERVICE yellow			
IC2/IC6	DC ±0.50 kV	ALARM 1 yellow			
		ALARM 2 yellow			
IC3/(IC4-6)	AC 2.2 kV	ALANNI 2 yellow			
IC4/(IC5-6)	AC 2.2 kV	Digital inputs			
IC5/IC6	AC 2.2 kV				
w to		Operating mode, adjustable active high, active low			
Voltage ranges		Functions off, test, reset, deactivate device, insulation fault location			
Nominal system voltage range U_n		High level 1030 V			
iso1685DP	AC 01000 V; DC 01500 V	Low level 00.5 V			
isoHV1685D	AC 02000 V; DC 03000 V				
isoLR1685DP	AC 0690 V; DC 0690 V	Serial interface			
		Interface/protocol RS-485/BMS/Modbus RTU			
Tolerance of U _n	AC +10 %/DC +5%	Connection terminals A/B			
Frequency range of U_n	DC 0.1460 Hz	Cable length ≤ 1200 m			
Supply voltage U_S (see also device nameplate)	DC 1830 V	-			
Frequency range of $U_{\rm S}$	DC	Shielded cable (shield to functional earth on one end) $2\text{-core}, \ge 0.6 \text{ mm}^2, \text{ e.g. J-Y(St)Y} 2x0.6$			
Power consumption	≤ 9 W	Shield terminal S			
		Terminating resistor, can be connected (Term. RS-485) 120 Ω (0.5 W)			
Measuring circuit for insulation monitoring		Device address, BMS bus (1) 290 (2)*			
Measuring voltage $U_{\rm m}$ (peak value)	±50 V	Device address, Modbus RTU 1 - 247			
Measuring current $I_{\rm m}$ (at $R_{\rm F}=0~\Omega$)	±30 V	Baud rate 9.6/19.2/38.4/57.6/115 kB			
	~ 1 F A				
iso1685DP, isoHV1685D	≤ 1.5 mA	,			
isoLR1685DP	≤ 3.5 mA	Stop bits 1/2/auto			
Internal resistance DC R_i		Switching elements			
iso1685DP, isoHV1685D	\geq 70 k Ω				
isoLR1685DP	\geq 15 k Ω *1)	Switching elements 3 changeover contacts: K1 (insulation fault alarm 1),			
Impedance Z _i at 50 Hz		K2 (insulation fault alarm 2), K3 (device error)			
iso1685DP, isoHV1685D	≥ 70 kΩ	Operating principle K1, K2 N/C operation or N/O operation (N/C operation)*			
		Operating principle K3 N/C operation, not changeable			
isoLR1685DP	≥ 15 kΩ *1)	Electrical endurance under rated operating conditions, number of cycles 100,000			
Permissible extraneous DC voltage U_{fg}					
iso1685DP	≤ DC 1600 V	Contact data acc. to IEC 60947-5-1:			
isoHV1685D	≤ DC 3150 V	Utilisation category AC 13 AC 14 DC-12 DC-12 DC-12			
isoLR1685DP	≤ DC 720 V	Rated operational voltage 230 V 230 V 24 V 110 V 220 V			
Permissible system leakage capacitance Ce	profile-dependent, 02000 μF	Rated operational current 5 A 3 A 1 A 0.2 A 0.1 A			
i erinissibile systemi leakaye Capacitalice Ce	ргоние-иерениени, о2000 дг	•			
		Rated insulation voltage 250 V			
		Minimum contact rating 1 mA at AC/DC \geq 10 V			
		Connection (except mains connection)			
		Connection (except mains connection)			
		Connection type pluggable push-wire terminals			
		Connection type pluggable push-wire terminals Connection, rigid/flexible 0.22.5 mm²/0.22.5 mm²			
		Connection type pluggable push-wire terminals Connection, rigid/flexible 0.22.5 mm²/0.22.5 mm²			



Mains connection	
Connection type	pluggable push-wire terminals
Connection, rigid/flexible	0.210 mm ² /0.26 mm ²
Connection, flexible with ferrule, without/with plastic	c 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
Classification of climatic conditions acc. to IE	EC 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)	1K22
Classification of mechanical conditions acc. t	to IEC 60721:
Stationary use (IEC 60721-3-3)	3M1°
Transport (IEC 60721-3-2)	2M ⁴
Long-term storage (IEC 60721-3-1)	1M12
Deviation from the classification of climatic	conditions:
Ambient temperature during operation (iso 1685D	P, isoLR1685DP -40+70 °C
Ambient temperature during operation (isoHV168	35D) -40+55 °C
Ambient temperature transport	-40+80 °C
Ambient temperature long-term storage	-25+80 °C

Dimension diagram (dimensions in mm)

Area of application



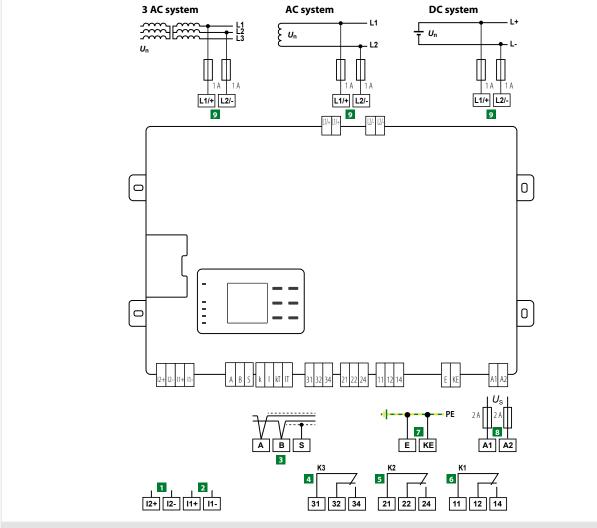
Other Operating mode continuous operation vertical, mains connection on top Position of normal use Tightening torque of the screws (4x M5) for enclosure mounting 1.0...1.5 Nm Degree of protection, internal components IP30 Degree of protection, terminals IP30 Enclosure material polycarbonate Flammability class V-0 Documentation number D00272 Weight ≤ 1600 g

()* = Factory settings

≤ 3000 m AMSL

 $^{^{1)}}$ for $U_{\rm n}$ > 500 V no longer according to IEC61557-8

 $^{^{\}rm 2)}$ Values in brackets are factory settings for alarm1/alarm 2



- 1 I2+, I2- Standby, digital input
- 2 I1+, I1- Test, digital input
- Connection to BMS bus, RS-485, S = shield (connect one end to PE), can be terminated with S700
- **31, 32, 34** Alarm relay K3 for internal device errors
- 5 21, 22, 24 Alarm relay K2 for insulation faults alarm 2
- 6 11, 12, 14 Alarm relay K1 for insulation faults alarm 1
- **7 E,KE** Separate connections of E and KE to PE
- **8** A1, A2 Connection to $U_s = DC 24 \text{ V}$ via fuses, 2 A each
- 9 L1/+, L2/- Connection to the IT system to be monitored

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 Ω ...20 G Ω
- · Automatic adjustment to high system leakage capacitances

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

Supply voltage 1)	_ Response value range	Nominal system voltage		Туре	Art. No.
DC		AC	DC	1,782	,
1830 V	100 kΩ…100 MΩ	01000 V	01500 V	isoHR1685DW-925	B91065806W

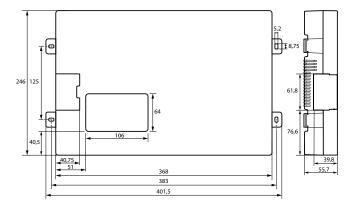
¹⁾ Absolute values



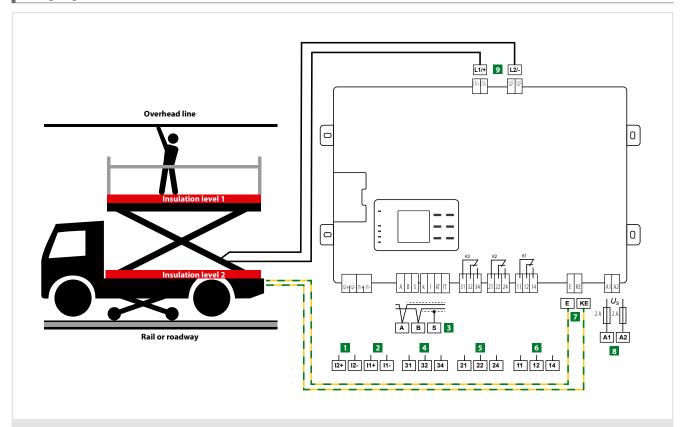
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Insulation coordination acc. to IEC 60664-1/IEC 60664-3		Digital inputs
Definitions:		Operating mode, variable active high, active
Measuring circuit (IC1)	(L1/+, L2/-), (E, KE)	Functions off, test, reset, disable device, insulation fault loc
Supply circuit (IC2)	A1, A2	High level 10
Output circuit 1 (IC3)	11, 12, 14	Low level 0
Output circuit 2 (IC4)	21, 22, 24	201110101
Output circuit 2 (IC4)	31, 32, 34	Serial interface
Control circuit (IC6)	(A, B), (I1+, I1-, I2+, I2-)	Interface/Protocol RS-485/BMS/Modbu:
· ·		Connection Terminal
Rated voltage	1500 V	Cable length ≤ 12
Overvoltage category		Shielded cable (shield to functional earth on one side)
Rated impulse voltage:		2-core, \geq 0.6 mm ² , e.g. J-Y(St)Y
IC1/(IC2-5)	10 kV	Shield Term
IC2/(IC3-5)	4 kV	
IC2/IC1+IC6	800 V	
IC3/(IC4-6)	4 kV	Device address, BMS bus (1) 290
IC4/(IC5-6)	4 kV	Device address, Modbus RTU 1-
IC5/IC6	4 kV	Baud rate 9.6/19.2/38.4/57.6/1
Rated insulation voltage:		Parity even/ur
IC1/(IC2-6)	1500 V	Stop bits 1/2
IC2/(IC3-5)	250 V	Commendation (commendation committee)
IC2/IC6	50 V	Connection (except mains coupling)
IC2/IC0 IC3/(IC4-6)	250 V	Type of connection Pluggable push-wire term
	250 V 250 V	Connection, rigid/flexible 0.22.5 mm ² /0.22.5
IC4/(IC5-6)		Connection, flexible with ferrule, without/with plastic sleeve 0.252.5
IC5/IC6	250 V	Conductor sizes AWG 24.
Pollution degree	3	
Protective separation (reinforced insulation) between:		Connection of the mains coupling
IC1/(IC2-5)	Overvoltage category III, 1500 V	Type of connection Pluggable push-wire term
IC2/(IC3-5)	Overvoltage category III, 300 V	Connection, rigid/flexible 0.210 mm²/0.26
IC2/IC6	Overvoltage category III, 50 V	Connection, flexible with ferrule, without/with plastic sleeve 0.256 mm²/0.254
IC3/(IC4-6)	Overvoltage category III, 300 V	Conductor sizes AWG 24
IC4/(IC5-6)	Overvoltage category III, 300 V	Stripping length
IC5/IC6	Overvoltage category III, 300 V	Opening force 901
Voltage test (routine test) as per IEC 61010-1:	, , , , , , , , , , , , , , , , , , ,	opening loree 70
IC2/(IC3-5)	AC 2.2 kV	Switching elements
IC2/IC6	DC ±0.50 kV	Switching elements
IC3/(IC4-6)	AC 2.2 kV	3 changeover contacts: K1 (insulation fault alarm 1), K2 (insulation fault alarm 2), K3 (device
IC4/(IC5-6)	AC 2.2 kV	Operating mode K1, K2 N/C operation / N/O operation (N/C operat
	AC 2.2 kV	Operating mode K3 N/C operation, not modifi
IC5/IC6	AC 2.2 KV	Electrical endurance under rated operating conditions 100,000 c
Voltage ranges		Electrical endurance under rated operating conditions
Nominal system voltage range $U_{\rm D}$	AC 01000 V	Contact data acc. to IEC 60947-5-1:
Nothina system voltage range of	DC 01500 V	Utilisation category AC 13 AC 14 DC-12 DC-12 E
Talaransa of II		Rated operational voltage 230 V 230 V 24 V 110 V 2
Tolerance of <i>U</i> _n	AC +10 %/DC +5 %	Rated operational current 5 A 3 A 1 A 0.2 A
Frequency range of <i>U</i> _n	DC 0.1460 Hz	Rated insulation voltage
Supply voltage $U_{\rm S}$ (also see device name plate)	DC 1830 V	Minimum contact rating $1 \text{ mA at AC/DC} \ge$
Frequency range of U _s	DC	<u>, </u>
Power consumption	≤ 9 W	Environment/EMC
Measuring circuit for insulation monitoring		EMC IEC 6132
	. 50 V	Classification of climatic conditions acc. to IEC 60721:
Measuring voltage $U_{\rm m}$ (peak value)	± 50 V	Stationary use (IEC 60721-3-3) Stationary use (IEC 60721-3-3) 3K23 (no condensation, no formation of the first of the fi
Measuring current $I_{\rm m}$ (at $R_{\rm F} = 0 \Omega$)	≤ 1 μA	·
Internal resistance DC R _i	≥ 50 MΩ	Transport (IEC 60721-3-2)
Impedance Z _i at 50 Hz	≥ 50 MΩ	Long-term storage (IEC 60721-3-1)
Permissible extraneous DC voltage U_{fg}	≤ DC 1600 V	Mechanical conditions acc. to IEC 60721:
Permissible system leakage capacitance C _e isoHR1685DW-925	profile-dependent, 0 1 μF	Stationary use (IEC 60721-3-3)
		Transport (IEC 60721-3-2)
Response values for insulation monitoring		Long-term storage (IEC 60721-3-1)
Response value R_{an1} (alarm 1) and R_{an2} (alarm 2)	100 kΩ…100 MΩ	Deviation from climate classes:
Response value condition	$R_{an1} \ge R_{an2}$	
Upper limit of the measuring range when setting measuring pro	file to	Ambient temperature during operation -40+
"high capacity" $C_{\text{emax}} = 5 \mu\text{F}$	24 ΜΩ	Ambient temperature during transport -40+
Relative uncertainty (acc. to IEC 61557-8)	±15 %	Ambient temperature during long-term storage -25+
100 kΩ10 MΩ	±200 kΩ ±15 %	Application range ≤ 3000 m /
Hysteresis	25 %	Other
, » 	25 /0	
Time response		Operating mode Continuous oper
Response time t_{an} at $R_F = 0.5$ x R_{an} ($R_{an} = 100$ k Ω) and $C_e = 1$ μ l	F acc. to IEC 61557-8	Position of normal use Vertical, mains coupling a
	profile-dependent, typ. 10 s	Tightening torque for screws (4x M5) to fasten enclosure 1.01.
	,	Degree of protection, internal components
Display		Degree of protection, terminals
Display graphic d	isplay 127 x 127 pixels, 40 x 40 mm	Enclosure material Polycarbo
Display range, measured value	100 kΩ20 GΩ	Flammability class
<u> </u>		Documentation number D0
LEDs		Weight ≤ 10
ON (operation LED)	green	
•	•	()* = factory setting
PGH ON (no function)	yellow	
PGH ON (no function) SERVICE	yellow yellow	
PGH ON (no function)	yellow	





Wiring diagram



- 1 12+, 12- Initial measurement, digital input
- 2 I1+, I1- Test, digital input
- **3** A, B, S Connection to RS-485 with BMS bus, Modbus RTU, S = shield (connect to PE on one side), can be terminated with S700
- 4 31, 32, 34 Alarm relay K3 for internal device faults
- 5 21, 22, 24 Alarm relay K2 for insulation faults, alarm 2
- 6 11, 12, 14 Alarm relay K1 for insulation faults, alarm 1
- **E, KE** Separate connections of E and KE to PE and/or vehicle chassis
- **8** A1, A2 Connection to $U_s = DC 24 \text{ V}$ via fuses, 2 A each
- 2 L1/+, L2/- Connection of both coupling terminals L1/+ and L2/- to lifting arm of the work platform

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

Installations including switch

· Heaters with phase control

mode power supplies

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 Ω ...1 M Ω
- 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

Approvals

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

Design	Supply vo	oltage U s ¹⁾	Type	Art. No.	
Design.	AC	DC	.,,,,,		
	88264 V	77286 V	IR1575-435	B91064000	
Standard	340460 V	//200 V	IR1575PG1-435	B91064002	
Standard	1672 V	10.284 V	IR1575-434	B91064003	
	10/2 V	10.20 4 V	IR1575PG1-434	B91064004	
Increased shock and	88264 V	77 20CV	IR1575W-435	B91064000W	
vibration resistance		77286 V	IR1575PG1W-435	B91064002W	

¹⁾ Absolute values

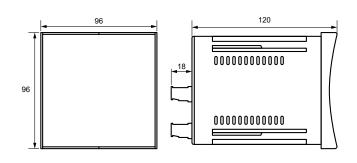


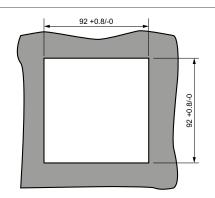
Insulation coordination acc. to IEC 60664-1		Outputs	
Rated voltage	AC 500 V	Test and reset button internal/external	
Rated impulse voltage/pollution degree	4 kV/3	Switching elements	
Voltage ranges		Switching elements	2 x 1 changeover contact
IR1575:		Operating principle	N/O or N/C operation
Nominal system voltage $U_{\rm n}$	AC, 3(N)AC 0480 V, DC 0480 V	Factory setting (Alarm1/Alarm2)	N/O operation
Nominal frequency f_n	DC, 30420 Hz	Admissible number of operations/h	12 000 cycles
	DC, 30120 Hz	Contact class	IIB (DIN EN 60255-23)
IR1575PG1:	AC/2 AC 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, $\cos \phi = 0.4$
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_S at AO/A1 (see nameplate)	AC 88264 V	Environment	
Frequency range of $U_{\rm S}$	42460 Hz	Environment	. FN (422)
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) Vibration resistance acc. to IEC 60068-2-6 (device in operation)	40 g/6 ms
Supply voltage U _S at AO/A1 (see nameplate)	AC 1672 V	Vibration resistance acc. to IEC 60068-2-6 (device in operation) Vibration resistance acc. to IEC 60068-2-6 (transport)	1 g/10150 Hz
Frequency range of U _S	42460 Hz	, , ,	2 g/10150 Hz
Supply voltage U_S at AO/A1 (see nameplate)	DC 10.284 V	Ambient temperature (during operation) Ambient temperature (during storage)	-10+55 °C -40+70 °C
IR1575:		Classification of climatic conditions acc. to DIN IEC 60721-3-3	3K23
Power consumption	≤ 5 V	Classification of chilifatic conditions acc. to DIN IEC 00721-3-3	JN23
·		Connection	
Response values		Connection	plug-in terminals
Response value R _{an1} (Alarm1)	2 kΩ1 MΩ	Connection properties	
Response value R _{an2} (Alarm2)	2 kΩ1 MΩ	rigid/flexible	0.24/0.22.5 mm ²
Specified response value (2 k Ω 10 k Ω)	$+ 2 k\Omega$	flexible with ferrule with/without plastic sleeve	0.252.5 mm ²
Specified response value (10 k Ω 1 M Ω)	0 %+20 %	Conductor sizes	AWG 2412
Response time t_{an} at $R_F = 0.5$ x R_{an} and $C_e = 1$ μF	≤5s	Tightening torque	0.50.6 Nm (4.35.3 lb-in)
Hysteresis (2 k Ω 10 k Ω)	+2 kΩ		
Hysteresis (10 k Ω 1 M Ω)	25 %	Other	
Measuring circuit for insulation measurement		Operating mode Mounting position	continuous operation
Measuring voltage $U_{\rm m}$	±20 V	Degree of protection, internal components (DIN EN 60529)	display-oriented IP30
Measuring current $I_{\rm m}$ (bei $R_{\rm F} = 0$ W)	<u>−</u> 170 μA	Degree of protection, internal components (DIN EN 60529)	IP30
Internal DC resistance R _i	≥ 119 kΩ	Mounting	panel mounting
Internal impedance Z _i , at 50 Hz		Flammability class	UL94 V-2
IR1575	\geq 14 k Ω	Documentation number	UL74 V-Z
IR1575PG1	≥ 119 kΩ	IR1575	D00116
Permissible extraneous DC voltage U_{fq}	≤ DC 680 V	IR1575PG1	D00110 D00357
Permissible system leakage capacitance Ce	≤ 60 µF	Weight	≤ 400 g
Measuring circuit for insulation fault location (EDS) (on	nly IR1575PG1)	Option "W"	<u> </u>
Test current /p DC	10/25 mA		20/11
Test pulse/break	2 s/4 s	Shock resistance acc. to IEC 60068-2-27 (during operation) Bumping acc. to IEC 60068-2-29 (during transport)	30 g/11 ms
•	23/13	Vibration resistance acc. to IEC 60068-2-6	40 g/6 ms
Displays		VIDIATION FESISTANCE ACC. TO IEC 00008-7-0	1.6 mm/1025 Hz
Display, illuminated	LC display	Ambient temperature (during operation)	4 g/25150 Hz
Characters (number of characters, height)	2 x 16 (4.5 mm)	Storage temperature (during operation)	-10 °C+55 °C -40 °C+85 °C
Display range measuring value	1 kΩ5 MΩ	Storage temperature range	- 4 0 (+δ5 (
Absolute error (1 k Ω 10 k Ω)	±1 kΩ		
Relative percentage error (1 kO 10 kO)	+10.0%		

±10 %

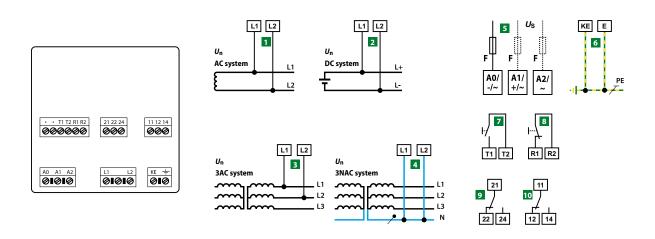
Dimension diagram (dimensions in mm)

Relative percentage error (1 k Ω . . . 10 k Ω)









- 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-
- 3 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

- 6 Separate connection of E and KE to PE
- External test button "T1, T2" (N/O contact)
- 8 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







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

Approvals

Typical applications

and DIN VDE 0100-710



• Medical IT systems in accordance

with IEC 60364-7-710, IEC 61557-8

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
- IFC 61557-8
- DIN VDE 0100-710

Further information

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

Ordering information

Supply v	oltage <i>U</i> ₅	Nominal system voltage U n ¹⁾	Type	Art.	No.
AC	DC	AC	1,765	screw-type terminals	push-wire terminals
70264 V, 42460 Hz	-	70264 V, 42460 Hz	IR427-2	B92075300	B72075300
-	1828 V	-	MK7 Remote alarm indicator and test combination	B95100201	-

¹⁾ Absolute values

Accessories

Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B98060008
MK-cavity-wall-box-60mm	B95100203

Suitable system components

Description	Туре	Art. No.
Measuring current transformers	STW2	B942709
Temperature sensor (PTC)	ES0107	B924186
Mounting frame	XM420	B990994



Insulation monitoring device ISOMETER® IR427

Insulation coordination acc. to IEC 60664-1/IEC 60664-3		Cable lengths for the connection of the mea	asuring cu	rrent tra	nsformer	STW2 and	d the
Rated insulation voltage	250 V	temperature sensor					
Rated impulse voltage/pollution degree	4 kV/3	single wire > 0.5 mm ²					≤1 m
•	, E, KE, 1, 2, 3, 4 Z, Z/k, I) -(11, 12, 14)	single wire, twisted > 0.5 mm ²					≤ 10 m
Voltage test acc. to IEC 61010-1	2.21 kV	twisted in pairs, twisted > 0.5 mm ²					≤ 40 m
Supply voltage		Cable (shield on one side connected to PE)		recon	imended: .	J-Y(St)Y m	in. 2x0.6
Supply voltage U _S	$=U_{n}$	Switching elements					
Power consumption	≤ 4 VA	Number			10	hangeove	r contact
	= 1 1/1	Operating principle	N/C opera	tion or N/			
IT system being monitored		Electrical endurance, number of cycles	, c opera		о орегино	(, с ор.	10000
Nominal system voltage $U_{\rm n}$	AC 70264 V	•					
Nominal frequency f_n	4763 Hz	Contact data acc. to IEC 60947-5-1 Utilisation category	AC-13	AC 14	DC 12	DC 12	DC-12
Insulation monitoring		Rated operational voltage	230 V	AC-14 230 V	DC-12 24 V	DC-12 110 V	220 V
	50	Rated operational current	5 A	3 A	1 A	0.2 A	0.1 A
Response value Ran	50500 kΩ (50 kΩ)*	Minimum contact rating	J N	. J N		I mA at AC	
Relative uncertainty Hysteresis	±10 %	willing contact rating				i iiin at ne	./DC 10 V
Response time t_{an} at $R_F = 0.5$ x R_{an} and $C_e = 0.5 \mu\text{F}$	≤5s	Environment/EMC					
Permissible system leakage capacitance C_e	≤ 5 μF	EMC				IEC 61	1326-2-4
remissione system rearage capacitance ce	≥ 2 µr	Operating temperature				-25	+55 ℃
Measuring circuit		Classification of climatic conditions acc. to I	EC 60721:				
Measuring voltage $U_{\rm m}$	±12 V	Stationary use (IEC 60721-3-3)	3K23 (exc	ept conde	nsation an	d formatio	on of ice)
Measuring current $I_{\rm m}$ (at $R_{\rm F}=0~\Omega$)	≤ 50 µA	Transport (IEC 69721-3-2)	2K11 (exc	•			
Internal DC resistance R _i	\geq 240 k Ω	Long-term storage (IEC 60721-3-1)	1K22 (exc				
Impedance Z _i at 50 Hz	\geq 200 k Ω	Classification of mechanical conditions acc.	``	•			
Permissible extraneous DC voltage U_{fg}	\leq DC 300 V	Stationary use (IEC 60721-3-3)	to IEC 607.	21:			3M11
Load grayout monitoring							2M4
Load current monitoring	F F0 A (7 A)*	Transport (IEC 60721-3-2) Storage (IEC 60721-3-1)					1M12
Response value, adjustable	550 A (7 A)*	Storage (IEC 00721-5-1)					TIVITZ
Relative uncertainty	±5 % 4 %	Connection					
Hysteresis Setting values load current measurement:	4 %	Connection type	scre	w-type te	rminal or p	oush-wire	terminal
Transformer 3150 VA 4000 VA 5000 V	/A 6300 VA 8000 VA 10000 VA	Connection				screw te	rminals
/ _{alarm} 1~ 14 A 18 A 22		Connection properties					
Response time overload, (50 % to 120 %)	<5s	rigid .		().24 mi	n² (AWG 2	4 12)
Response time for measuring current transformer monitoring	at restart, test or every 1 h	flexible		0.	22.5 m	m² (AWG 2	2414)
	•	Two conductors with the same cross section					
Temperature monitoring:		rigid/flexible		0.	21.5 m	m² (AWG 2	2416)
Response value (fixed value)	4 kΩ	Stripping length					8 mm
Release value (fixed value)	1.6 kΩ	Tightening torque, terminal screws				0.5	.0.6 Nm
PTC resistors acc. to DIN 44081	max. 6 in series	Connection			pus	h-wire te	rminals
Response time overtemperature	<2s	Connection properties					
Response time connection fault PTC resistors	<2s	rigid		0.	22.5 m	m² (AWG 2	2414)
Displays, memory		flexible					
LC display	multifunctional, not illuminated	without ferrules		0.7	52.5 m	m² (AWG 1	1914)
Measured value insulation resistance	10 kΩ1 MΩ	with ferrules		0.	21.5 m	m² (AWG 2	2416)
Operating uncertainty	±10 %, ±2 kΩ	Stripping length					10 mm
Measured value load current (as % of the set response value)	10199 %	Opening force					50 N
Operating uncertainty	±5 %, ±0.2 A	Test opening, diameter					2.1 mm
Password	on, off/0999 (off, 0)*	Other					
Interface for MK7		Operating mode			rn.	ntinuous o	peration
	200	Position of normal use					any
Cable length, twisted in pairs, shielded	200 m	Degree of protection, internal components (DIN E	N 60529)				IP30
Cable (twisted in pairs, one end of shield connected to PE)	recommended: J-Y(St)Y min. 2x0.8	Degree of protection, terminals (DIN EN 60529)	,				IP20
Power supply (terminals 1 and 2):		Enclosure material				polyca	arbonate
Uoff	DC 24 V	Flammability class					UL94V-0
I _{max} (max. 4 MK7)	80 mA	Screw mounting					2 x M4
Communication (terminal 3 and 4):		DIN rail mounting acc. to				IE	EC 60715
Interface/protocol	RS-485/proprietary, no BMS	Documentation number					D00118
Terminating resistor	120 (0.25 W), internal, switchable	Weight					≤ 150 g
		()* — Factory softing					
		()* = Factory setting					

Transport (IEC 69721-3-2)

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

Rated insulation voltage	50 V
Rated impulse voltage/pollution degree	500 V/3
Supply voltage	
Supply voltage $U_{\rm S}$	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:
Stationary use (IEC 60721-3-3)	3K23 (except condensation and formation of ice)

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 delive	ry) 66 mm

 \leq 80 g

ccification	of machanical	conditions acc	to IEC 60721.

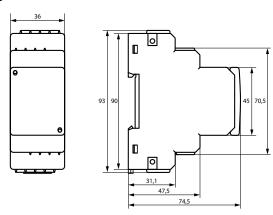
Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M4
Storage (IEC 60721-3-1)	1M12

2K11 (except condensation and formation of ice)

1K22 (except condensation and formation of ice)

Dimension diagram (dimensions in mm)

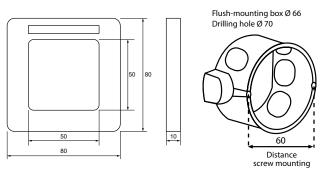
IR427



MK7

Weight (including mounting frame)

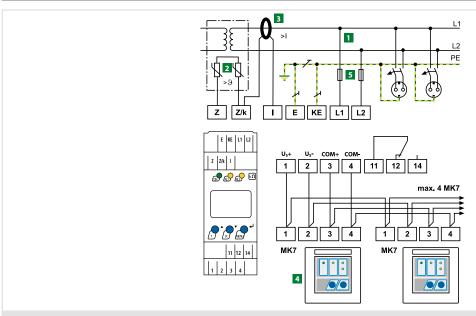
Connection



Alarm messages LEDs

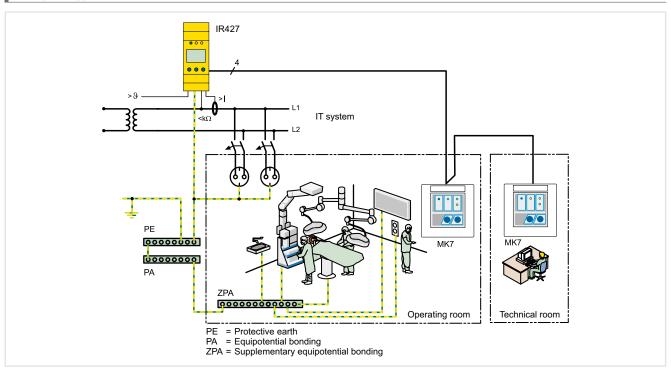
	IR427				MK7		
	"ON"	"AL1"	"AL2"	ON	Ins. fault	Overload	Overtemp.
Operation	-	-	-		-	-	-
System fault ¹⁾	flashing	flashing	flashing	flashing	flashing	flashing	flashing
Insulation fault	-		-			-	-
Overcurrent	-	-			-	=	-
Overtemperature	-	-			-	-	
No communication betw. IR 427+MK7	-	-	-	flashing	-	-	-

¹⁾ Detailed alarm information on LCD



- **1** Connection to the IT system to be monitored = supply voltage U_s via fuse
- 2 Temperature sensor
- 3 Measuring current transformer for load current monitoring
- 4 Connection alarm indicator and test combination MK7 (max. 4 pieces)
- 5 Line protection by a fuse in accordance with IEC 60364-4-43 (6 A fuse recommended) In case of supply (L1/L2) from an IT system, both lines have to be protected by a fuse.

Example of application



ISOMETER® isoMED427x-(PT)







• 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



Typical applications





The Lloyd's Register certification is only valid for the springtype terminal version of the isoMED427P-2 (B72075301).

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
- EN61373 cat I class B

Further information

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

Ordering information

Supply voltage <i>U</i> ₅	Туре	Art.	No.
AC	1,740	Screw-type terminal	Push-wire terminal
	isoMED427-2	B92075306	B72075306
70264 V, 4763 Hz	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

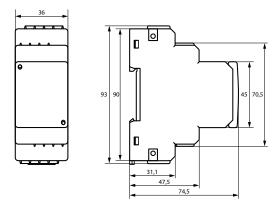
Suitable system components

Description	Туре	Art. No.
Measuring current transformers	STW2	B942709
Temperature sensor (PTC)	ES0107	B924186
Mounting frame	XM420	B990994

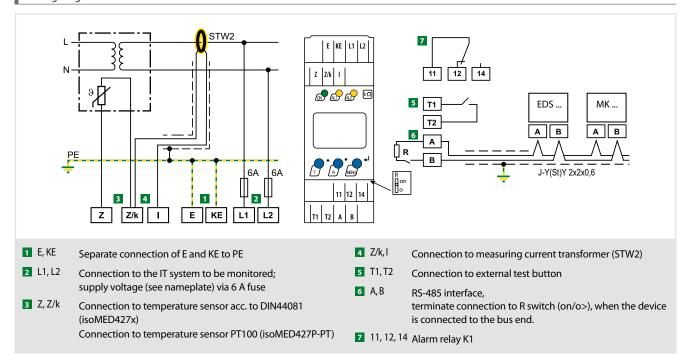


Insulation coordination acc. to IEC 60664-1/-3	Interface
	Interface/protocol RS-485/BMS
Definitions	Baud rate 9.6 kBit/s
Measuring circuit (IC1) L1, L2	Cable length ≤ 1200 m
Control circuit (IC2) E, KE, Z, Z/k, I, T1, T2, A, B	Cable: twisted pair, one end of shield connected to PE recommended J-Y(St)Y min. n x 2 x 0.8
Output circuit (IC3) 11, 12, 14	Terminating resistor 120Ω (0.25 W), internal, switchable
Rated voltage 250 V	Device address, BMS bus 290
Overvoltage category III	עריוכג מעמוכיז, טויוס טעז באַט ביירוכ מעמוכיז, טויוס טעז
Operating altitude < 2000 m AMSL	Switching elements
Rated impulse voltage	Number 1 changeover contact
IC1/(IC2-3) 4 kV	Operating principle N/C operation / N/O operation
IC2/IC3 4 kV	Electrical endurance under rated operating conditions 10 000 cycles
Rated insulation voltage	
IC1/(IC2-3) 250 V	Contact data acc. to IEC 60947-5-1
IC2/IC3 250 V	Utilisation category AC-13 / AC-14 / DC-12 / DC-12 / DC-12
Pollution degree 3	Rated operational voltage 230 V / 230 V / 24 V / 110 V / 220 V
Protective separation between	Rated operational current 5 A / 3 A / 1 A / 0.2 A / 0.1 A
IC1/(IC2-3) Overvoltage category III, 300 V	Minimum contact load 10 mA/DC 5 V
IC2/IC3 Overvoltage category III, 300 V	Environment/EMC
Voltage test (routine test) according to IEC 61010-1	EMC IEC 61326-2-4
(IC1-2)/IC3 2.2 kV	Operating temperature -25+55 °C
Cunnivuoltago	· • ·
Supply voltage	Classification of climatic conditions acc. to IEC 60721
Supply voltage $U_{\rm S}$ 100240 V	(related to temperature and relative humidity)
Tolerance <i>U</i> _s -30+10 %	Stationary use (IEC 60721-3-3) 3K22
Power consumption $\leq 3 \text{ W}$	Transport (IEC 60721-3-2) 2K11
Monitored IT system	Long-term storage (IEC 60721-3-1) 1K22
·	Classification of mechanical conditions acc. to IEC 60721
, , , , , , , , , , , , , , , , , , , ,	Stationary use (IEC 60721-3-3) 3M11
Nominal frequency $f_{\rm n}$ 4763 Hz	Transport (IEC 60721-3-2) 2M4
Insulation monitoring acc. to IEC 61557-8: 2007-01	Long-term storage (IEC 60721-3-1) 1M12
Response value R_{an} 50500 k Ω	
Relative uncertainty ±10 %	Connection
Hysteresis 25 %	Connection type Push-wire terminals
Response time t_{an} at $R_F = 0.5 \times R_{an}$ and $C_e = 0.5 \mu\text{F}$ $\leq 5 \text{s}$	Nominal current ≤ 10 A
Response time for connection monitoring PE $\leq 1h$	Stripping length 10 mm
Permissible system leakage capacitance C _e max. 5 YF	Opening force 50 N
	Test opening, diameter 2.1 mm
Measuring circuit	Connection properties:
Measuring voltage $U_{\rm m}$ ± 12 V	rigid 0.22.5 mm ² (AWG 2414)
Measuring current $I_{\rm m}$ at $R_{\rm F}=0~\Omega$ $\leq 50~\mu{\rm A}$	flexible without ferrule 0.752.5 mm² (AWG 1914)
Internal DC resistance R_i $\geq 240 \text{ k}\Omega$	flexible with ferrule 0.21.5 mm² (AWG 2416)
Impedance Z_i at 50 Hz $\geq 200 \text{ k}\Omega$	· · ·
Permissible extraneous DC voltage U_{fg} \leq DC 300 V	Connection type Screw-type terminals
·	Nominal current ≤ 10 A
Load current monitoring	Tightening torque 0.50.6 Nm (57 lb-in)
Response value adjustable 550 A	Cross section AWG 2412
Relative uncertainty $$\pm5\%$$	Stripping length 8 mm
Hysteresis 4 %	Connection properties:
Nominal frequency $f_{\rm n}$ 4763 Hz	rigid / flexible 0.252.5 mm ²
Setting values load current measurement	Flexible with ferrules with/without plastic sleeve 0.252.5 mm ²
Transformer 3150 VA / 4000 VA / 5000 VA / 6300 VA / 8000 VA / 10000 VA	Multi-conductor rigid/flexible 0.21.5 mm ²
Idlamn1 14 A / 18 A / 22 A / 28 A / 35 A / 45 A	Multi-conductor flexible with ferrule without plastic sleeve 0.251.5 mm ²
Response time, overload (50 % to 120 %) < 5 s	Multi-conductor flexible with TWIN ferrule with plastic sleeve 0.251.5 mm ²
Response time, CT monitoring at restart, test or every 1 h	Other
actionary continuing	Operating mode Continuous operation
Temperature monitoring	· • • · · · · · · · · · · · · · · · · ·
isoMED427x	,
Sensor PTC recistors are to DIM MARI (may 4 in carios)	Degree of protection, built-in components (DIN EN 60529) IP20
Sensor PTC resistors acc. to DIN 44081 (max. 6 in series)	Enclosure material
Response value $4 k\Omega$	Enclosure material Polycarbonate
$\begin{array}{c} \text{Response value} & 4 \text{k} \Omega \\ \text{Release value} & 1.6 \text{k} \Omega \end{array}$	Flammability class UL94V-0
$ \begin{array}{lll} \text{Response value} & 4 \text{k} \Omega \\ \text{Release value} & 1.6 \text{k} \Omega \\ \text{Relative uncertainty} & \pm 10 \% \\ \end{array} $	Flammability class UL94V-0 DIN rail mounting IEC 60715
$ \begin{array}{lll} \text{Response value} & 4 \text{k} \Omega \\ \text{Release value} & 1.6 \text{k} \Omega \\ \text{Relative uncertainty} & \pm 10 \% \\ \text{Response time, overtemperature} & < 2 \text{s} \end{array} $	Flammability class UL94V-0 DIN rail mounting IEC 60715 Screw mounting 2 x M4
Response value $4 k\Omega$ Release value $1.6 k\Omega$ Relative uncertainty $\pm 10 \%$ Response time, overtemperature $< 2 s$ isoMED427P-PT	Flammability class UL94V-0 DIN rail mounting IEC 60715
Response value $4 \text{ k}\Omega$ Release value $1.6 \text{ k}\Omega$ Relative uncertainty $\pm 10 \%$ Response time, overtemperature $< 2 \text{ s}$ isoMED427P-PT Sensor PT100 (no series or parallel connections)	Flammability classUL94V-0DIN rail mountingIEC 60715Screw mounting $2 \times M4$ Weight≤ 150 g
Response value 4 kΩ Release value 1.6 kΩ Relative uncertainty ± 10 % Response time, overtemperature < 2 s	Flammability class UL94V-0 DIN rail mounting IEC 60715 Screw mounting $2 \times M4$ Weight ≤ 150 g Factory settings isoMED427x-(PT)
Response value 4 kΩ Release value 1.6 kΩ Relative uncertainty ± 10 % Response time, overtemperature < 2 s	Flammability class UL94V-0 DIN rail mounting IEC 60715 Screw mounting $2 \times M4$ Weight $\leq 150 \text{ g}$ Factory settings isoMED427x-(PT) Response value R_{an} $50 \text{ k}\Omega (< R)$
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-PTSensorPT100 (no series or parallel connections)Response value $50150 ^{\circ}\text{C}$ Hysteresis $10 ^{\circ}\text{M}$ Relative uncertainty $\pm 5 ^{\circ}\text{M}$	Flammability classUL94V-0DIN rail mountingIEC 60715Screw mounting2 x M4Weight≤ 150 gFactory settings isoMED427x-(PT)Response value R_{an} 50 kΩ (< R)
Response value 4 kΩ Release value 1.6 kΩ Relative uncertainty ± 10 % Response time, overtemperature < 2 s	Flammability class UL94V-0 DIN rail mounting IEC 60715 Screw mounting 2 x M4 Weight ≤ 150 g Factory settings isoMED427x-(PT) Response value $R_{\rm an}$ 50 k Ω ($<$ R) Response value $I_{\rm alarm}$ 7 A ($>$ I) Response value $I_{\rm class}$ 7 A ($>$ I) Response value $I_{\rm class}$ 7 A ($>$ II)
Response value $4 k\Omega$ Release value $1.6 k\Omega$ Relative uncertainty $\pm 10 \%$ Response time, overtemperature $< 2 s$ isoMED427P-PTFT100 (no series or parallel connections)SensorPT100 (no series or parallel connections)Response value $50150 ^{\circ}C$ Hysteresis 10% Relative uncertainty $\pm 5 \%$ Response time, overtemperature $< 5 s$	Flammability class UL94V-0 DIN rail mounting IEC 60715 Screw mounting 2 x M4 Weight $\leq 150 \mathrm{g}$ Factory settings isoMED427x-(PT) Response value R_{an} 50 k Ω ($<$ R) Response value I_{alarm} 7 A ($>$ I) Response value Ω 4 k Ω (fixed value for isoMED427x) 120 °C (configurable for isoMED427P-PT)
Response value $4 \mathrm{k}\Omega$ Release value $1.6 \mathrm{k}\Omega$ Relative uncertainty $\pm 10 \mathrm{w}$ Response time, overtemperature $< 2 \mathrm{s}$ isoMED427P-PTSensorPT100 (no series or parallel connections)Response value $50150 ^{\circ}\mathrm{C}$ Hysteresis $10 \mathrm{w}$ Relative uncertainty $\pm 5 \mathrm{w}$ Response time, overtemperature $< 5 \mathrm{s}$ Displays, memory	Flammability class UL94V-0 DIN rail mounting IEC 60715 Screw mounting $2 \times M4$ Weight $2 \times M5$ Weight $2 \times M5$ Weight $2 \times M5$ Factory settings isoMED427x-(PT) Response value R_{an} $50 \times \Omega$ ($< R$) Response value I_{alarm} 7×10^{-5} Response value I_{alarm} 10×10^{-5} Response value I_{alarm}
Response value 4 kΩ Release value 1.6 kΩ Relative uncertainty ± 10 % Response time, overtemperature < 2 s	Flammability classUL94V-0DIN rail mountingIEC 60715Screw mounting $2 \times M4$ Weight≤ 150 gFactory settings isoMED427x-(PT)Response value R_{an} $50 \text{ kΩ} (< R)$ Response value l_{alarm} $7 \text{ A} (> 1)$ Response value ${}^{\circ}$ 4 kΩ (fixed value for isoMED427x)Poperating principle K1N/C operation (n.c.)BMS address3
Response value 4 kΩ Release value 1.6 kΩ Relative uncertainty ± 10 % Response time, overtemperature < 2 s	Flammability classUL94V-0DIN rail mountingIEC 60715Screw mounting $2 \times M4$ Weight≤ 150 gFactory settings isoMED427x-(PT)Response value R_{an} $50 \text{ kΩ} (< R)$ Response value l_{alarm} $7 \text{ A} (> 1)$ Response value $^{\circ}$ 4 kΩ (fixed value for isoMED427x)Operating principle K1N/C operation (n.c.)BMS address3Automatic insulation fault locationoff, deactivated
Response value $4 \mathrm{k}\Omega$ Release value $1.6 \mathrm{k}\Omega$ Relative uncertainty $\pm 10 \mathrm{w}$ Response time, overtemperature $< 2 \mathrm{s}$ isoMED427P-PTSensorPT100 (no series or parallel connections)Response value $50150 ^{\circ}\mathrm{C}$ Hysteresis $10 \mathrm{w}$ Relative uncertainty $\pm 5 \mathrm{w}$ Response time, overtemperature $< 5 \mathrm{s}$ Displays, memoryDisplay nage measured value insulation resistance (R_F) $10 \mathrm{k}\Omega 1 \mathrm{k}\Omega$ Operating uncertainty $\pm 10 \mathrm{w}, \pm 2 \mathrm{k}\Omega$	Flammability classUL94V-0DIN rail mountingIEC 60715Screw mounting $2 \times M4$ Weight≤ 150 gFactory settings isoMED427x-(PT)Response value R_{an} $50 \text{ kΩ} (< R)$ Response value I_{alarm} $7 \text{ A} (> 1)$ Response value $^{\circ}$ 4 kΩ (fixed value for isoMED427x)120 °C (configurable for isoMED427P-PT)Operating principle K1N/C operation (n.c.)BMS address3Automatic insulation fault locationoff, deactivatedPassword0, disabled
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-PTSensorPT100 (no series or parallel connections)Response value 50150 °CHysteresis 10 % Relative uncertainty $\pm 5 \text{ %}$ Response time, overtemperature $< 5 \text{ s}$ Displays, memoryDisplays, memoryLC display, multi-functional, not illuminated Display range measured value insulation resistance (R_F) $10 \text{ k}\Omega1 \text{ k}\Omega$ Operating uncertainty $\pm 10 \text{ k}, \pm 2 \text{ k}\Omega$ Measured value load current (as % of the set response value) $10 \text{ %}199 \text{ %}$	Flammability classUL94V-0DIN rail mountingIEC 60715Screw mounting2 x M4Weight≤ 150 gFactory settings isoMED427x-(PT)Response value R_{an} 50 kΩ (< R)
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-PTSensorPT100 (no series or parallel connections)Response value 50150 °C Hysteresis 10 % Relative uncertainty $\pm 5 \text{ %}$ Response time, overtemperature $< 5 \text{ s}$ Displays, memoryDisplays, memoryLC display, multi-functional, not illuminated Display range measured value insulation resistance (R_F) $10 \text{ k}\Omega1 \text{ k}\Omega$ Operating uncertainty $\pm 10 \text{ %}, \pm 2 \text{ k}\Omega$ Measured value load current (as % of the set response value) $10 \text{ %}199 \text{ %}$ Operating uncertainty $\pm 5 \text{ %}, \pm 0.2 \text{ A}$	Flammability classUL94V-0DIN rail mountingIEC 60715Screw mounting $2 \times M4$ Weight≤ 150 gFactory settings isoMED427x-(PT)Response value R_{an} $50 \text{ kΩ} (< R)$ Response value I_{alarm} $7 \text{ A} (> 1)$ Response value $^{\circ}$ 4 kΩ (fixed value for isoMED427x)120 °C (configurable for isoMED427P-PT)Operating principle K1N/C operation (n.c.)BMS address3Automatic insulation fault locationoff, deactivatedPassword0, disabled
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-PTSensorPT100 (no series or parallel connections)Response value 50150 °CHysteresis 10 % Relative uncertainty $\pm 5 \text{ %}$ Response time, overtemperature $< 5 \text{ s}$ Displays, memoryDisplayLC display, multi-functional, not illuminatedDisplay range measured value insulation resistance (R_F) $10 \text{ k}\Omega1 \text{ k}\Omega$ Operating uncertainty $\pm 10 \text{ k}, \pm 2 \text{ k}\Omega$ Measured value load current (as % of the set response value) $10 \text{ %}199 \text{ %}$	Flammability classUL94V-0DIN rail mountingIEC 60715Screw mounting2 x M4Weight≤ 150 gFactory settings isoMED427x-(PT)Response value R_{an} 50 kΩ (< R)

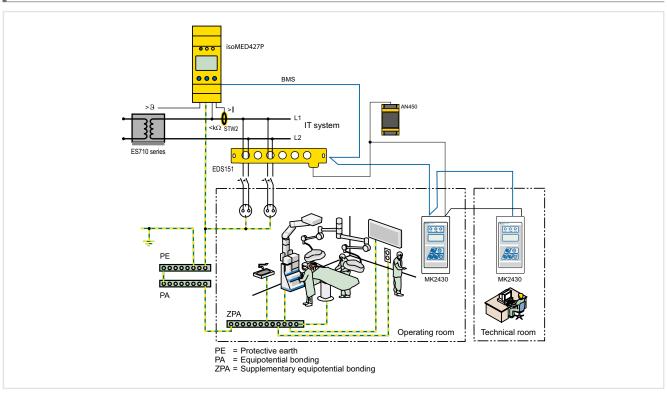




Wiring diagram



Example of application



ISOMETER® isoLR275 with coupling device AGH-LR







Typical applications

• AC, DC or AC/DC main circuits

• IT systems with high system

capacitances of up to 500 μF

• IT systems with high but slow

· Installations including switch mode

voltage fluctuations

power supplies

· Coupled IT systems

• IT systems with directly connected

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)
- Internal disconnection of the ISOMETER® from the IT system to be monitored (via control signal; terminals F1/F2) (e.g. if several ISOMETERs® are interconnected)
- $\bullet \ \ Current \ output \ 0 (4) \dots 20 mA \ (electrically \ isolated) \ analogously \ to \ the \ measured \ insulation \ value$

AGH-I R

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

Approvals

inverters



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

Supply voltage <i>U</i> ₅		Set comprising		Art. No.		
AC	DC	Туре	Art. No.	711 (110)		
19.255 V	19.272 V	isoLR275-327	B91065700W	B91065702W		
19.233 V	19.2/2 V	19.2/2 V AGH-LR-3	B98039022W	D91003702W		
00 26411	88264 V 77286 V		isoLR275-335	isoLR275-335	B91065701W	D01045702W
oo204 V			B98039022W	B91065703W		

Devices are available as a set.

Accessories

Description	Art. No.
Screw mounting	B990056

Suitable system components

Description	Туре	Art. No.	Page
External kΩ measuring instruments	9620-1421	B986841	398



Insulation coordination acc. to IEC 60664-1/IEC 60664-3		Outputs/Inputs					
Rated insulation voltage for isoLR275-3	AC 250 V	"TEST"-/"RESET" button				internal/	'external
Rated impulse voltage/pollution degree	6 kV/3	Cable length "TEST"-/"RESET" button, external					≤ 10 m
Protective separation (reinforced insulation) between		Current output (load)			0/4	.20 mA (≤	500 Ω)
(A1/+, A2/-) - (11,12, 14, 21, 22, 24) - (AK1, AK2, KE, PE, 1	Γ1, T2, R1, R2, F1, F2, M+, M-, A, B)	Accuracy current output,					
Voltage test acc. to IEC 61010-1	3.536 kV	related to the value indicated $(1100 \text{ k}\Omega)$				±15 %	, ±1 kΩ
Rated insulation voltage	AC 250 V						
Rated impulse voltage/pollution degree	4 kV/3	Serial interface					
Basic insulation between:	(11, 12, 14) - (21, 22, 24)	Interface/protocol					185/BMS
Voltage test acc. to IEC 61010-1	2.21 kV	Connection					nals A/B
Volta and many		Cable length			, .		1200 m
Voltage ranges		Shielded cable (shield to PE on one end)	2-cor	e, ≥ 0.6 m	ım², e.g. J-	Y(St)Y mir	
Nominal system voltage $U_{\rm n}$	via AGH-LR	Terminating resistor					(0.5 W)
isoLR275-335:		Device address, BMS bus				1	.30 (3)*
Supply voltage U _s (also see nameplate)	AC 88264 V**	Switching elements					
Frequency range U _s	42460 Hz	Switching elements 2 changeover	contacts:	K1 (Alarm	1), K2 (Ala	ırm 2. devi	ce error)
Power consumption	≤ 21.5 VA	Operating mode K1, K2 (Alarm 1/Alarm 2)				n (N/O ope	
Supply voltage U_{S} (also see nameplate)	DC 77286 V**	Contact data acc. to IEC 60947-5-1:				· ·	,
Power consumption	≤ 5.5 W	Utilisation category	AC 13	AC 14	DC-12	DC-12	DC-12
isoLR275-327:		Rated operational voltage	230 V	230 V	24 V	110 V	220 V
Supply voltage U_S (also see nameplate)	AC 19.255 V**	Rated operational current	5 A	3 A	1 A	0.2 A	0.1 A
Frequency range U _S	42460 Hz	Minimum contact rating	371	3 N		nA at AC/D	
Supply voltage U_S (also see nameplate)	DC 19.272 V**	minimum contact ruting			- '''	in at ne, b	C = 10 V
Power consumption	≤ 6 VA	Environment/EMC					
For UL applications:		EMC					
Nominal system voltage $U_{\rm n}$	via AGH-LR	not suitable for household and small companies			IEC	61326-2-	4 Ed. 1.0
isoLR275-335:		Operating temperature				-25	.+65 ℃
Supply voltage $U_{\rm S}$ (also see nameplate)	AC 88250 V	Classification of climatic conditions acc. to II	C 60721:				
Frequency range U _S	42460 Hz	Stationary use (IEC 60721-3-3)	3K23 (v	vith conde	nsation an	d formatio	n of ice)
Power consumption AC	≤ 21,5 VA	Transport (IEC 60721-3-2)				d formatio	
Supply voltage $U_{\rm S}$ (also see nameplate)	DC 80250 V	Long-term storage (IEC 60721-3-1)	1K22 (v	vith conde	nsation an	d formatio	n of ice)
Power consumption DC	≤ 5,5 VA	Classification of mechanical conditions acc. 1	to IEC 607	21:			
isoLR275-327:		Stationary use (IEC 60721-3-3)					
Supply voltage $U_{\rm S}$ (also see nameplate)	DC 2465 V	for screw mounting with accessories B990056					3M12
Power consumption	≤ 6 VA	for DIN rail mounting					3M11
<u> </u>		Transport (IEC 60721-3-2)					2M4
Response values		Long term storage (IEC 60721-3-1)					1M12
Response value R _{an1}	0.2100 kΩ	Connection					
Factory setting R _{an1} (Alarm1)	4 kΩ	Connection					
Response value R _{an2}	0.2100 kΩ	Connection			SCI	rew-type t	erminals
Factory setting R _{an2} (Alarm2)	1 kΩ	Connection properties			0.2 4	m²/0.2	2 5
Relative uncertainty $(7100 \text{ k}\Omega)$ (acc. to IEC 61557-8)	± 15 %	rigid/flexible			0.Z4 III		
Relative uncertainty (0.27 k Ω)	±1kΩ	flexible with ferrules without/with plastic sleeve				0.25	
Response time t _{an}	see table in the manual	Tightening torque Conductor sizes				AWC	0.5 Nm 2412
Hysteresis	25 %, + 1 kΩ	Cable length between isoLR275 and AGH-LR					≤ 0.5 m
Measuring circuit		cable length between 130En273 and Adir En					≥ 0.J III
Measuring voltage $U_{\rm m}$ (peak value)	± 50 V	Other					
Measuring current $I_{\rm m}$ (at $R_{\rm F}=0~\Omega$)	≤ 1.5 mA	Operating mode			CO	ntinuous o	peration
Internal DC resistance R _i	≥ 35 kΩ	Mounting				display-	oriented
Impedance Z _i at 50 Hz	≥ 35 kΩ	Distance to adjacent devices				2	≥ 30 mm
Permissible extraneous DC voltage $U_{\rm fg}$	≤ DC 1100 V	Degree of protection, terminals (DIN EN 60529)					IP30
Permissible system leakage capacitance $C_{\rm e}$	\leq 500 μ F (150 μ F)*	Degree of protection, terminals (DIN EN 60529)					IP20
Dienlave		Type of enclosure			X112,	free from	
Displays Display: Illusticated	haalds e to . dt - 1	Screw mounting with mounting clip					2 x M4
Display, illuminated	backlit two-line display	Flammability class				l	JL94 V-0
Characters (number/height)	2 x 16/4/mm	Documentation number					D00127
Display range measured value	0.2 kΩ1 MΩ +15% +1 kΩ	Weight					≤ 510 g
Operating uncertainty	±15%, ±1 kΩ	()* = factory setting					
		Data labelled with ** are absolute values					

Data labelled with ** are absolute values



≤ 0.5 m

Insulation coordination acc. to IEC 60664-1		
Rated insulation voltage	AC 800 V	
Rated impulse voltage/pollution degree		
Voltage ranges		
Nominal system voltage $U_{\rm n}$	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 $f_0 = 0.110$ Hz	$U_{\sim \text{max}} = 110 \text{ V/Hz} * f_n$	

Environment/EMC

EMC	IEC 61326-2-4 Ed. 1.0
Operating temperature	-25+65 ℃

Classification of climatic conditions acc. to IEC 60721:

Stationary use (IEC 60721-3-3)	3K23 (with condensation and formation of ice)
Transport (IEC 60721-3-2)	2K11 (with condensation and formation of ice)
Long-term storage (IEC 60721-3-1)	1K22 (with condensation and formation of ice)

Classification of mechanical conditions acc. to IEC 60721:

classification of incentantal conditions accide to the out he	
Stationary use (IEC 60721-3-3)	3M12
Transport (IEC 60721-3-2)	2M4
Storage (IEC 60721-3-1)	1M12

Connection screw-type terminals Connection properties rigid/flexible 0.2...4 mm²/0.2...2.5 mm² flexible with ferrules without/with plastic sleeve 0.25...2.5 mm² Tightening torque 0.5 Nm Conductor sizes AWG 24...12

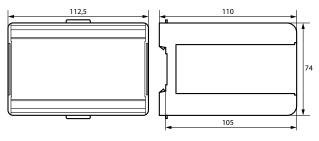
Other

Cable length between isoLR275 and AGH-LR

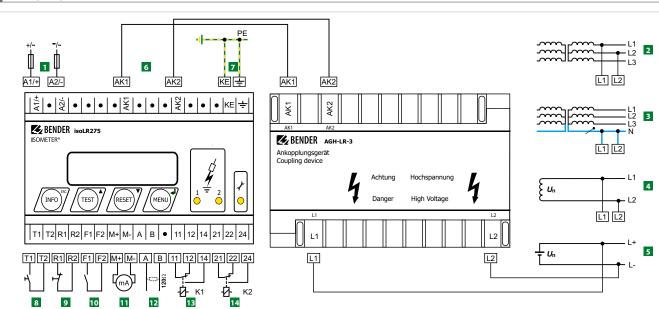
Operating mode	continuous operation
Mounting	cooling slots must be ventilated vertically!
Distance to adjacent devices	≥ 30 mm
Degree of protection, internal components (DIN EN 605)	29) IP30
Degree of protection, terminals (DIN EN 60529)	IP20
Type of enclosure	X200, free from halogen
DIN rail mounting	DIN EN 60715/IEC 60715
Screw mounting	2 x M4
Flammability class	UL94 V-0
Weight	≤ 230 g

Dimension diagrams (dimensions in mm)

isoLR275



Wiring diagrams



- Supply voltage U_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
- **7** Separate connection of ↓ and KE to PE
- 8 * 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

nected inverters

voltage fluctuations

• Coupled IT systems

Approvals

• AC, DC or AC/DC main circuits

· Solar systems with directly con-

· Solar systems with large system

capacitances of up to 2000 μF

• Solar systems with high but slow

 Installations including switch mode power supplies

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

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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

Nominal v	roltage U _n	Supply voltage <i>U</i> s		Set comprising		Art. No.
3(N)AC	DC	AC	DC	Туре	Art. No.	ALC. NO.
		19.255 V	10.2 72.V	isoPV-327	B91065130W	D01045122W
0 703 1/	0 11001/		55 V 19.272 V	AGH-PV	B98039020W	B91065132W
0793 V	01100 V 88264 V 77286 V	00 2641	77 206 V	isoPV-335	B91065131W	D01045133W
		88264 V		AGH-PV	B98039020W	B91065133W

Devices are available as a set.

Accessories

Description	Art. No.
Screw mounting	B990056

Suitable system components

Description	Туре	Art. No.	Page
External kΩ measuring instruments	9620-1421	B986841	398

recinical data isome ren ison v							
Insulation coordination acc. to IEC 60664-1		Displays					
Definitions:		Display, illuminated					ne display
Supply circuit (IC2)	A1, A2	Characters (number/height)				2 x 1	16/4 mm
Output circuit (IC3)	11, 14, 24	Display range measured value				$0.2 \mathrm{k}\Omega$	1 MΩ
Control circuit (IC4) Up, KE, T/	R, A, B, AK1, GND, AK2	Operating uncertainty				±15%	6, ±1 kΩ
Rated voltage	240 V	Outnuts/Innuts					
Overvoltage category	III	Outputs/Inputs					/
Rated impulse voltage:		Test/reset button				internal	/external
IC2/(IC3-4)	4 kV	Cable length test/reset button, external			0/4	20 1 /	≤ 10 m
IC 3/(IC4)	4 kV	Current output (load)		100 (-0)	0/4	. 20 mA (≤	
Rated insulated voltage:		Accuracy current output, related to the value	ie indicated (i	. 100 KL2)		±15 %	6, ±1 kΩ
IC2/(IC3-4)	250 V	Serial interface					
IC 3/(IC4)	250 V	Interface/protocol				RS-4	485/BMS
Polution degree	3	Connection					inals A/B
Protective separation (reinforced insulation) between:		Cable length					≤ 1200 m
	age category III, 300 V	Shielded cable (shield to PE on one end)	2	!-core, ≥ ().6 mm2, z		
	age category III, 300 V	Terminating resistor		,	, , , , , ,		2 (0.5 Ω)
Voltage test (routine test) according to IEC 61010-1:		Device address, BMS bus					30 (3)*
IC2/(IC3-4)	AC 2.2 kV	·					
IC 3/(IC4)	AC 2.2 kV	Switching elements					
Voltage ranges		<u> </u>	geover contacts:				
Nominal system voltage $U_{\rm D}$	via AGH-PV	Operating mode K1, K2 N/C	operation n.c./N	/0 operat	ion n.o. (N	/O operati	on n.o.)*
•	VIU /IGIT I V	Contact data acc. to IEC 60947-5-1:					
isoPV-335:	AC 00 2C4 V##	Utilisation category	AC 13	AC 14	DC-12	DC-12	DC-12
Supply voltage $U_{\rm S}$ (also see nameplate)	AC 88264 V**	Rated operational voltage	230 V	230 V	24 V	110 V	220 V
Frequency range <i>U</i> _S	42460 Hz	Rated operational current	5 A	3 A	1 A	0.2 A	0.1 A
Power consumption	≤ 21,5 VA	Minimum contact rating			1 m	nA at AC/D	C ≥ 10 V
Supply voltage U_{S} (also see nameplate)	DC 77286 V**	F					
Power consumption	≤ 5,5 VA	Environment/EMC					
isoPV-327:		EMC- not suitable for household and small	companies				1326-2-4
Supply voltage $U_{\rm S}$ (also see nameplate)	AC 19,255 V**	Operating temperature				-25	+65℃
Frequency range U _s	42460 Hz	Classification of climatic conditions acc	c. to IEC 60721:				
Supply voltage U_5 (also see nameplate)	DC 19.272 V**	Stationary use (IEC 60721-3-3)	3K23 (v	vith conde	ensation ar	d formatio	on of ice)
Power consumption	≤ 6 VA	Transport (IEC 60721-3-2)	2K11 (v	vith conde	ensation ar	d formation	on of ice)
For UL-application		Long-term storage (IEC 60721-3-1)	1K22 (v	vith conde	ensation ar	d formation	on of ice)
Nominal system voltage U_n	via AGH-PV	Classification of mechanical conditions	acc. to IEC 607	21:			
isoPV-335:		Stationary use (IEC 60721-3-3)					
Supply voltage $U_{\rm S}$ (also see nameplate)	AC 88250 V	for screw fixing with accessories B990056					3M12
Frequency range U _S	42460 Hz	for DIN rail mounting					3M11
Power consumption AC	≤ 21,5 VA	Transport (IEC 60721-3-2)					2M4
Supply voltage $U_{\rm S}$ (also see nameplate)	DC 80250 V	Long-time storage (IEC 60721-3-1)					1M12
Power consumption DC	≤ 5,5 VA	Connection					
isoPV-327:							
Supply voltage $U_{\rm S}$ (also see nameplate)	DC 2465 V	Connection Connection, rigid/flexible			0.24 m	rew-type t	
Power consumption	≤ 6 VA	Connection flexible with connector sleeve,	without/with pla				.2.5 mm ²
		Tightening torque	without/ with pla	שנונ אוכבעל			0.8 Nm
Response values		Conductor sizes					2412
Response value R _{an1}	0.2100 kΩ	Cable length between isoPV and AGH-PV				7177	≤ 0.5 m
Factory setting R _{an1} (Alarm1)	4 kΩ						0.5 111
Response value R ^{an2}	0.2100 kΩ	Other					
Factory setting R_{an2} (Alarm2)	1 kΩ	Operating mode			CO	ntinuous o	peration
Relative uncertainty $(7100 \text{ k}\Omega)$ (in accordance with IEC 61557-8:2007-01)		Mounting				display	oriented
Relative uncertainty (0.27 kΩ)	±1 kΩ	Distance to adjacent devices				2	≥ 30 mm
Response time t _{an}	see table in manual	Degree of protection, internal components					IP30
Hysteresis	25 %, +1 kΩ	Degree of protection, terminals (DIN EN 605	529)				IP20
Measuring circuit		Type of enclosure				free from	
Measuring voltage $U_{\rm m}$ (peak value)	± 50 V	DIN rail mounting		n.	DIN E	N 60715/II	
Measuring current $I_{\rm m}$ (at $R_{\rm F}=0~\Omega$)	≤ 1.5 mA	Screw mounting by means of support (see S	seite 67 in manu	al)			2 x M4
Internal DC resistance DC R _i	≥ 35 kΩ	Flammability class					UL94 V-0
Impedance Z _i at 50 Hz	≥ 35 kΩ	Software version				D	351 V2.0
Permissible extraneous DC voltage U_{fg}	≤ DC 1100 V	Weight					< 510 g
Max. system leakage capacitance C _e	\leq 2000 μF (2000 $\mu F)*$	()* = factory setting					
		The values marked with** are absolute values	ies				



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	z: $U \sim \text{max} = 110 \text{ V/Hz} * f_n$

Environment/EMC

EMC	IEC61326-2-4
Operating temperature	-25+65 °C

Classification of climatic conditions acc. to IEC 60721:

Stationary use (IEC 60721-3-3)	3K23 (with condensation and formation of ice)
Transport (IEC 60721-3-2)	2K11 (with condensation and formation of ice)
Long-term storage (IEC 60721-3-1)	1K22 (with condensation and formation of ice)

Classification of mechanical conditions acc. to IEC 60721:

Classification of inechanical conditions acc. to fee 00/21.	
Stationary use (IEC 60721-3-3)	3M12
Transport (IEC 60721-3-2)	2M4
Long-time storage (IEC 60721-3-1)	1M12

Connection

Connection		screw-type	terminals
Connection, rigid/flexible	0.24	1 mm²/0.2	.2.5 mm ²
Connection flexible with connector sleeve, without/with plastic sleeve	e	0.25	.2.5 mm ²
Tightening torque			0.5 Nm
Conductor sizes		AW	G 2412
Cable length between isoPV and AGH-PV			≤ 0.5 m

Other

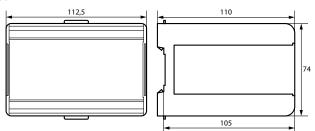
vuiei	
Operating mode	continuous operation
Mounting	cooling slots must be ventilated vertically!
Distance to adjacent devices	≥ 30 mm
Degree of protection, internal components (DIN EN 605)	29) IP30
Degree of protection, terminals (DIN EN 60529)	IP20
Type of enclosure	X200, free from halogen
DIN rail mounting	DIN EN 60715/IEC 60715
Screw fixing	2 x M4
Flammability class	UL94 V-0
Weight	< 230 g

()* = factory setting

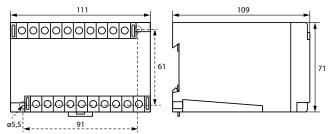
The values marked with** are absolute values

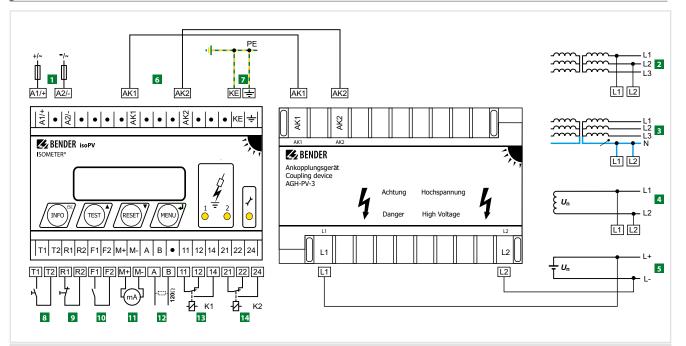
Dimension diagrams (dimensions in mm)

isoPV



AGH-PV

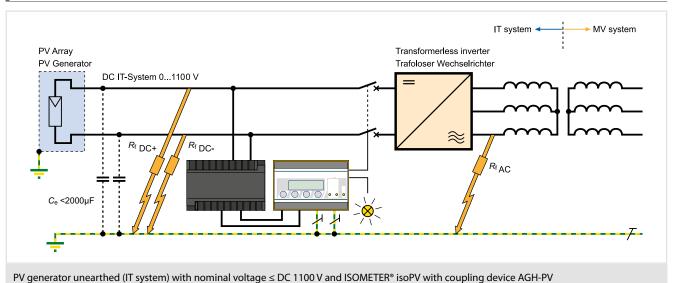




- Supply voltage U_s (see nameplate) via 6 A fuse; For UL and CSA applications, it is mandatory to use 5 A fuses
- 2 3 Connection to the 3 AC system to be monitored: Connect the terminals L1, L2 to neutral conductor N or terminals L1, L2 to conductor L1, L2.
- Connection to the AC system to be monitored: 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 L-
- 6 Connection to the coupling device AGH-PV
- 8 External test button "T1, T2" (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

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 500 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 k Ω (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 RTU
- isoData (for continuous data output)
- · Password protection to prevent unauthorised parameter changes

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

Supply vo	oltage U _s	Nominal v	oltage U _n	System leakage	Туре	Art.	No.
AC	DC	AC	DC	capacitance	.,,,,	Screw-type terminal	Push-wire terminal
100240 V, 4763 Hz	24240 V	0690 V	01000 V	≤ 500 µF	isoPV425-D4-4 with AGH420	B91036303	B71036303

Accessories

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



	Switching elements					
	Switching elements		2 x 1 N/0 c	ontacts, co	mmon teri	minal 1
A1, A2	Operating principle	N/C op	eration/N/	0 operatio	n (N/O ope	eration) ³
11, 14, 24	Electrical endurance, number of cycles					10000
, T/R, A, B, AK1, GND, AK2	Contact data acc. to IEC 60947-5-1					
240 V		ΔC-12	ΔC-14	DC-12	DC-12	DC-12
III						220 \
						0.1
4 kV	•	371				
4 kV	Minimum contact ruting			• • • • • • • • • • • • • • • • • • • •	iir at ric, b	C 10 .
	Environment/EMC					
250 V	EMC				IEC 61	1326-2-4
250 V	Ambient temperatures:					
3					-40	+70 º
	•					+85 º(
J J , .	•					+70 º
voltage category III, 300 V		IF <i>C (</i> 0731				
			cont cond	ancation ar	d formatio	on of ico
AC 2.2 kV						
			•	ensation ar	iu iormatic	on of ice
0 240 V/DC 24 240 V		. to IEC 60	721			
	Stationary use (IEC 60721-3-3)					3M1′
						2M ²
	Long-term storage (IEC 60721-3-1)					1M12
≤ 3 W, ≤ 9 VA	Connection					
0690 V/DC 01000 V	Connection type	scr	ew-type te	erminal or	push-wire	termina
AC +15 %, DC +10 %	Screw-type terminals:					
AC/DC 0600 V	Nominal current					≤10 <i>F</i>
DC, 15460 Hz	Tightening torque			0.50	.6 Nm (5	.7 lb-in
	Conductor sizes				AWG	2412
						8 mm
•					0.2	2.5 mm
·	•	Δ				
≤ 1150 V	·				0.23	2.5 111111
					0.2	1 5 mm
2 500 kQ (10 kQ)*	•	•				
	•					
	ilexible with Twin lerrules with plastic sie	eve			0.5	1.3 111111
	Push-wire terminals:					
	Nominal current					≤10 <i>F</i>
	Conductor sizes				AWG	2414
	Stripping length					10 mm
-0.03 %/Hz	Rigid				0.2	2.5 mm
5 %, at least 5 V	Flexible without ferrules				0.75	2.5 mm
	Flexible with ferrules with/without plastic sleev	e			0.25	2.5 mm
	· · · · · · · · · · · · · · · · · · ·		eve			1.5 mm
≤ 10 s		• • • •				50 N
						2.1 mm
099 s (0 s)*		nical data A	GH420 un	der the he	adina "Con	nection
			, 411		. 3 2011	
unctional not illuminated	Other					
	Operating mode			CO	ntinuous o	peration
	Mounting		ooling slot	s must be v	entilated v	
		EN 60529)				IP30
	Degree of protection, terminals (DIN EN 60529)					IP20
-0.03 %/Hz	Enclosure material					arbonat
	DIN rail mounting acc. to				IE	EC 6071.
	-					
01000 μF	Screw fixing			2 x M4	with moun	
01000 μF ± 15 %, at least ± 2 μF	Screw fixing Documentation number			2 x M4		D00028
$01000 \mu F$ $\pm 15 \%$, at least $\pm 2 \mu F$ off/ $0999 (0, off)*$	Screw fixing			2 x M4		
01000 μF ± 15 %, at least ± 2 μF	Screw fixing Documentation number			2 x M4		D00028
	11, 14, 24 2, T/R, A, B, AK1, GND, AK2 240 V III 4 kV 4 kV 250 V 250 V 250 V 3 voltage category III, 300 V AC 2.2 kV AC 2.2 kV AC 2.2 kV -30+15 % 4763 Hz \leq 3 W, \leq 9 VA 0690 V/DC 01000 V AC +15 %, DC +10 % AC/DC 0600 V DC, 15460 Hz \leq 1000 μF \leq 500 μF \leq 1150 V 2500 kΩ (10 kΩ)* 1490 kΩ (5 kΩ)* ± 15 %, at least ± 1 kΩ 301.14 kV (off)* 311.15 kV (off)* ± 5 %, at least ± 5 V -0.03 %/Hz 5 %, at least 5 V	Switching elements Operating principle A1, A2 Operating principle Electrical endurance, number of cycles Contact data acc. to IEC 60947-5-1: Utilisation category Rated operational voltage Rated operational current Minimum contact rating Environment/EMC EMC Abbient temperatures: Operation Transport Storage Classification of climatic conditions acc. to Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Con240 V/DC 24240 V -30+15 % A763 Hz \leq 3 W, \leq 9 VA Classification of mechanical conditions acc Stationary use (IEC 60721-3-1) Classification of mechanical conditions acc Stationary use (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection Connection Connection type Screw-type terminals: Nominal current Tightening torque Conductor sizes Stripping length Rigid/flexible Flexible with ferrules with/without plastic sleev Multi-conductor rigid /flexible flexible with ferrules without plastic sleev Multi-conductor rigid /flexible flexible with ferrules without plastic sleev Multi-conductor rigid /flexible flexible with ferrules without plastic sleev Multi-conductor fiexible with TWIN ferrules with Multi-conductor flexible with TWIN ferrules with Multi-conductor flexible with TWIN ferrules with Multi-conductor flexible with TWIN ferrules with Opening force Test opening, diameter Wirring of the terminals Up, AK1, GND, AK2 refer to tech Other Other	Switching elements A1, A, A A1, A, A A1, A, A Corparing principle Petrical endurance, number of cycles Contact data acc. to IEC 60947-5-1: Williadion category AC-12 Rated operational voltage AC-12 Rated operational current SA Minimum contact rating Emironment/EMC EMC Abient temperatures: Operation Transport Storage Classification of climatic conditions acc. to IEC 60721 Stationary use (IEC 60721-3-3) AC-2.2 kV AC-2.2 kV AC-2.2 kV AC-2.3 kV AC-3.3 kL S-3 N, S-9 VA Classification of mechanical conditions acc. to IEC 60721 Stationary use (IEC 60721-3-1) Long-term storage (IEC 60721-3-1) Long-term storage (IEC 60721-3-1) Connection O690 V/DC 01000V AC-15 %, AC-10 % AC-DC 0600 V DC, 15460 Hz S-500 μF S-500 μF S-500 μF S-1150 V Minimum contact rating Minimum contact rating AC-12 Rated operational current Transport Storage Classification of dimatic conditions acc. to IEC 60721-3-3 AC-2 kV AC-2 kV	Switching elements	Math Math	Ali

RS-485/BMS, Modbus RTU, isoData

120 Ω (0,25 W), internal, can be connected

≤ 1200 m

3...90 (3)*

min. J-Y(St)Y 2x0.6

BMS (9.6 kBit/s), Modbus RTU (selectable), isoData (115.2 kBits/s)



Device address, BMS bus, Modbus RTU

Cable: twisted pairs, shield connected to PE on one side

Interface/protocol

Cable length (9.6 kBits/s)

Terminating resistor

Baud rate

Technical data AGH420	
Insulation coordination acc. to IEC 6066	4-1/IEC 60664-3
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 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 $U_{\rm n}$	AC/DC 01000 V
Tolerance of U_n	AC/DC +10 %
Nominal system voltage range U_n (UL508)	AC/DC 0600 V
Measuring circuit	
Measuring voltage $U_{\rm m}$	± 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 °C
Transport	-40+85 °C
Storage	-40+70 °C
Classification of climatic conditions acc.	to IEC 60721:
Stationary use (IEC 60721-3-3)	3K24 (except condensation and formation of ice)

Transport (IEC 60721-3-2)	2K11 (except condensation and formation of ice	
	, ,	
Long-term storage (IEC 60721-3-1)	1K22 (except condensation and formation of ice)	
Classification of mechanical condition	s 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	

Connection Connection type screw-type terminal or push-wire terminal Screw-type terminals: ≤10 A Nominal current 0.5...0.6 Nm (5...7 lb-in) Tightening torque Conductor sizes AWG 24...12 Stripping length 8 mm Rigid/flexible 0.2...2.5 mm² Flexible with ferrules with/without plastic sleeve $0.25...2.5 \text{ mm}^2$ Multi-conductor rigid 0.2...1.5 mm² Multi-conductor flexible $0.2...1.5 \text{ mm}^2$ Multi-conductor flexible with ferrules without plastic sleeve 0.25...1.5 mm² Multi-conductor flexible with TWIN ferrules with plastic sleeve 0.25...1.5 mm² **Push-wire terminals:** Nominal current ≤10 A AWG 24...14 Conductor sizes Stripping length 10 mm Rigid 0.2...2.5 mm² 0.75...2.5 mm² Flexible without ferrules Flexible with ferrules with/without plastic sleeve 0.25...2.5 mm² Multi-conductor flexible with TWIN ferrules with plastic sleeve 0.5...1.5 mm² Opening force 50 N 2.1 mm Test opening, diameter Connection type terminals Up, AK1, GND, AK2 Single cables for terminals Up, AK1, GND, AK2: Cable lengths ≤ 0.5 m Connection properties $\geq 0.75 \text{ mm}^2$ **Other** Operating mode Continuous operation cooling slots must be ventilated vertically Mounting 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

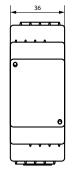
Enclosure material

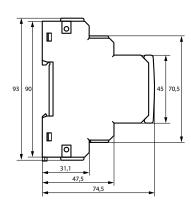
Screw mounting

Weight

DIN rail mounting acc. to

Dimension diagram (dimensions in mm)



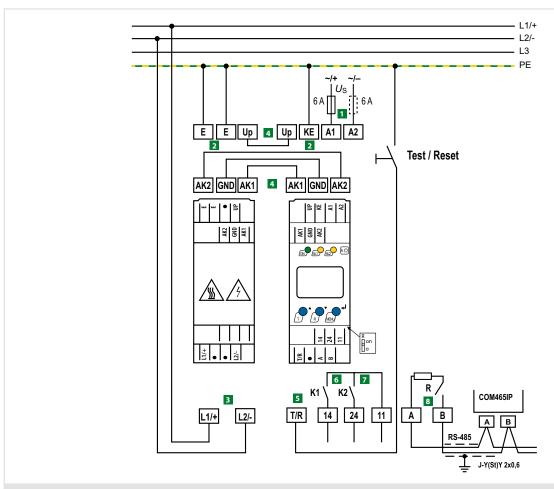


polycarbonate

2 x M4 with mounting clip

IEC 60715

≤ 150 g



- 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 must be used.
- 3 L1/+, L2/- Connection to the 3(N)AC, AC or DC system to be monitored.
- Up, AK1, Connect the terminals of the AGH420 to the correspondingGND, AK2 terminals of the isoPV425
- 5 T/R Connection for external combined test and reset button
- 6 11, 14 Connection to alarm relay K1
- 7 11, 24 Connection to alarm relay K2
- 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.

ISOMETER® isoPV1685...

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



* Not for UL applications



Typical applications

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

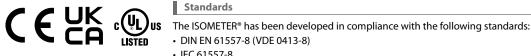
* Not for UL applications

Device features

Only device version isoPV1685P provide a locating current injector.

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

Approvals









only for isoPV1685RTU in DC circuits

Standards

- IEC 61557-8
- IEC 61557-9
- IEC 61326-2-4
- IEC 60730-1
- DIN EN 60664-1 (VDE 0110-1)

only for isoPV1685RTU in DC circuits

- UL1998 (Software)
- UL508

Further information

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

Ordering information

Response value range	Supply voltage U ₅¹)	Nominal system voltage <i>U</i> n		m voltage <i>U</i> n		Art. No.
nesponse raide range	DC DC	AC	DC	man poo cara	Туре	
200 O 1MO	10 201/	01000 V ²⁾	01500 V	-	isoPV1685RTU-425	B91065603
200 Ω1 MΩ 1830 V	1830 V	-	01500 V	-	isoPV1685P-425	B91065604

¹⁾ Absolute values



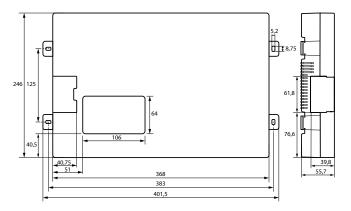
²⁾ not for UL applications

Insulation coordination acc. to IEC 60664-1/IEC 60664-3	Switching elements
Insulation coordination acc. to IEC 60664-1	Switching elements 3 changeover contacts
Rated voltage DC 1500 V Rated impulse voltage/pollution degree 8 kV/2	K1 (insulation fault alarm 1), K2 (insulation fault alarm 2)
Rated impulse voltage/pollution degree 8 kV/2	KZ (IIISUIALIOI I AUIT AIAITI Z) K3 (device error)
Voltage ranges	Operating principle K1, K2 N/C operation or N/O operation (N/C operation)*
Nominal system voltage U_{n}	Operating principle K3 N/C operation, not changeable
isoPV1685RTU AC 01000 V*/DC 01500 V (* not for UL applicatons)	Contact data acc. to IEC 60947-5-1:
isoPV1685P DC 01500 V	Utilisation category AC 13 AC 14 DC-12 DC-12 DC-12
Nominal frequency $50/60 \text{ HZ} \pm 1 \text{ Hz}$	Rated operational voltage 230 V 230 V 24 V 110 V 220 V
Tolerance of U_n AC +10%/DC +6 %	Rated operational current 5 A 3 A 1 A 0.2 A 0.1 A
Supply voltage $U_{\rm S}$ (refer also to device name plate) DC 1830 V	Minimum contact load 10 mA/5 V DC
Power consumption $\leq 7 \text{ W}$	
Measuring circuit for insulation monitoring	For UL application:
Measuring voltage $U_{\rm m}$ (peak value) $\pm 50 {\rm V}$	Utilisation category for AC control circuits with 50/60 Hz (Pilot duty) AC load of the alarm relay outputs AC 240 V, 1.5 A in case of a power factor of 0.35
Measuring current $I_{\rm m}$ (at $R_{\rm F}=0~\Omega$) $\leq 1.5~{\rm mA}$	AC load of the alarm relay outputs AC 240 V, 1.5 A in case of a power factor of 0.35 AC load of the alarm relay outputs AC 120 V, 3 A in case of a power factor of 0.35
Internal DC resistance $R_{\rm i}$ $\geq 70 \rm k\Omega$	AC load of the alarm relay outputs AC 250 V, 8 A in case of a power factor of 0.75 to 0.80
Impedance Z_1 at 50 Hz $\geq 70 \text{ k}\Omega$	DC load of the alarm relay outputs DC 30 V, 8 A in case of a power factor of 0.75 to 0.80 DC 30 V, 8 A in case of ohmic load
Permissible extraneous DC voltage U_{fq} \leq DC 1500 V	De load of the diaffil felay outputs
Permissible system leakage capacitance C_e $\leq 2000 \ \mu\text{F} (500 \ \mu\text{F})^*$	Connection (except system coupling)
	Connection type pluggable push-wire terminals
Response values for insulation monitoring	Connection
Response value R_{an1} (Alarm 1) $200 \Omega1 M\Omega (10 k\Omega)^*$	rigid/flexible 0.22.5 mm²/0.22.5 mm²
Response value R_{an2} (Alarm 2) $200 \Omega 1 M\Omega (1 k\Omega)^*$	flexible with ferrule, without/with plastic sleeve 0.252.5 mm ²
Upper limit of the measuring range when set to $C_{emax} = 2000 \mu\text{F}$ 50 k Ω	Conductor sizes AWG 2412
Relative uncertainty (10 k Ω 1 M Ω) (acc. to IEC 61557-8) \pm 15 %	Connection of the system coupling
Relative uncertainty (0.2 k Ω < 10 k Ω) $\pm 200\Omega \pm 15 \%$	
Response time t_{an} see graphic in the manual	Connection type pluggable push-wire terminals
Hysteresis 25% , $+1 k\Omega$	Connection rigid/flexible 0.210 mm²/0.26 mm²
isoPV1685P only:	rigid/flexible 0.210 mm²/0.26 mm² flexible with ferrule, without/with plastic sleeve 0.256 mm²/0.254 mm²
Measuring circuit for insulation fault location (EDS)	Conductor sizes AWG 248
Locating current /L DC ≤ 50 mA	Stripping length 15 mm
Test cycle/pause 2/4 s	Opening force 90120 N
Number of turns of test winding 10	70120 N
	Environment/EMC
Displays, memory	EMC IEC 61326-2-4 Ed. 1.0
LEDs for alarms and operating states 2x green, 4 x yellow	Classification of climatic conditions acc. to IEC 60721:
μ SD card (Spec. 2.0) for history memory and log files \leq 32 GByte	Without solar radiation, precipitation, water, icinq. Condensation possible temporarily:
Inputs	Stationary use (IEC 60721-3-3) 3K23
	Transport (IEC 60721-3-2) 2K11
Digital inputs DigIn1/DigIn2:	Long-term storage (IEC 60721-3-1) 1K22
High level 1030 V Low level 005 V	Classification of mechanical conditions acc. to IEC 60721:
LOW IEVEL 00.3 V	Stationary use (IEC 60721-3-3) 3M11
Serial interfaces	Transport (IEC 60721-3-2) 2M4
BMS/Modbus:	Long-term storage (IEC 60721-3-1) 1M12
Interface/protocol	Deviation from the classification of climatic conditions:
isoPV1685RTU: RS-485/BMS(Slave)/Modbus RTU (Slave); Protocol switchable	Ambient temperature during operation -40+70 °C
isoPV1685P: RS-485/BMS	Ambient temperature for transport -40+80 °C
Connection terminals A/B	Ambient temperature for long-term storage -25+80 °C
Shield: Terminal S	Relative humidity 10100 %
Cable length ≤ 1200 m	Atmospheric pressure 7001060 hPa (max. height 4000 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.) $120 \Omega (0.5 \text{ W})$	Other
Device address, BMS bus or Modbus adjustable (DIP switch) isoPV1685RTU: 217	Operating mode continuous operation
Device address, BMS bus adjustable (DIP switch) isoPV1685P: 233 W	Position of normal use vertical, system coupling on top
CAN:	PCB fixation lens head screw DIN7985TX
	Tightening torque 4.5 Nm
Protocol acc. to SMA/Bender specification V2.5	Degree of protection, internal components IP30
·	Daniel of autorities to make all a
Frame format CAN 2.0A 11-bit identifier	Degree of protection, terminals IP30
Frame format CAN 2.0A 11-bit identifier Baud rate 500 kBit/s	Documentation number D00007
Frame format CAN 2.0A 11-bit identifier Baud rate 500 kBit/s	
Frame format CAN 2.0A 11-bit identifier Baud rate 500 kBit/s Connection via 2 x RJ45 acc. to CiA-303-1 connected in parallel Pin 1: CAN-H	Documentation number D00007
Frame format CAN 2.0A 11-bit identifier Baud rate 500 kBit/s Connection via 2 x RJ45 acc. to CiA-303-1 connected in parallel Pin 1: CAN-H Pin 2: CAN-L	Documentation numberD00007Weight \leq 1300 g
Frame format CAN 2.0A 11-bit identifier Baud rate 500 kBit/s Connection via 2 x RJ45 acc. to CiA-303-1 connected in parallel Pin 1: CAN-H Pin 2: CAN-L Pin 3, 7: CAN-GND CAN identifier permanently set acc. to the specification above Cable length ≤ 130 m	Documentation numberD00007Weight \leq 1300 g
Frame format CAN 2.0A 11-bit identifier Baud rate 500 kBit/s Connection via 2 x RJ45 acc. to CiA-303-1 connected in parallel Pin 1: CAN-H Pin 2: CAN-L Pin 3, 7: CAN-GND CAN identifier permanently set acc. to the specification above Cable length ≤ 130 m Shielded cable CAT 5 with RJ45 plug	Documentation numberD00007Weight \leq 1300 g
Frame format CAN 2.0A 11-bit identifier Baud rate 500 kBit/s Connection via 2 x RJ45 acc. to CiA-303-1 connected in parallel Pin 1: CAN-H Pin 2: CAN-L Pin 3, 7: CAN-GND CAN identifier permanently set acc. to the specification above Cable length ≤ 130 m	Documentation numberD00007Weight \leq 1300 g

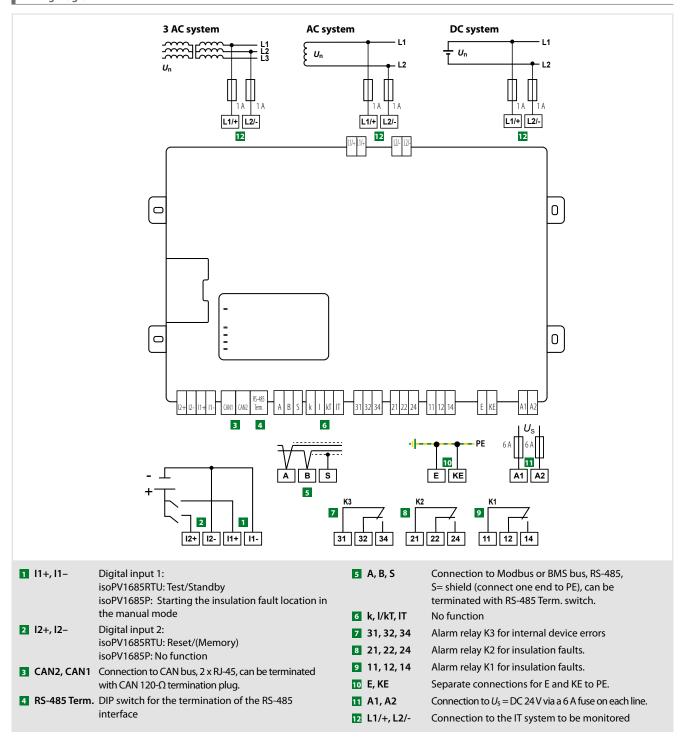
functional earth potential



Potential of the socket housing



Wiring diagram



ISOMETER® IR420-D6

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





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 Ω
- 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)

Typical applications

 De-energised loads such as automatic fire extinguisher pumps, 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

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.

Approvals





Ordering information

Supply voltage ¹¹ <i>U</i> ₅		Type	Art. No.		
AC	DC	1,72	Screw-type terminal	Push-wire terminal	
1672 V, 42460 Hz	9.694V	IR420-D6-1	B91016415	B71016415	
70 200 / 42 400 //-	70 2001/	IR420-D6-2	B91016407	B71016407	
70300 V, 42460 Hz	70300 V	IR420-D64-2	B91016408	B71016408	

¹⁾ Absolute values

Accessories

Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B 9806 0008

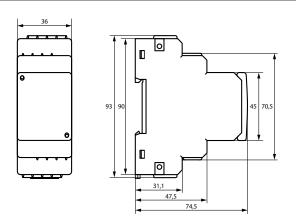
Suitable system components

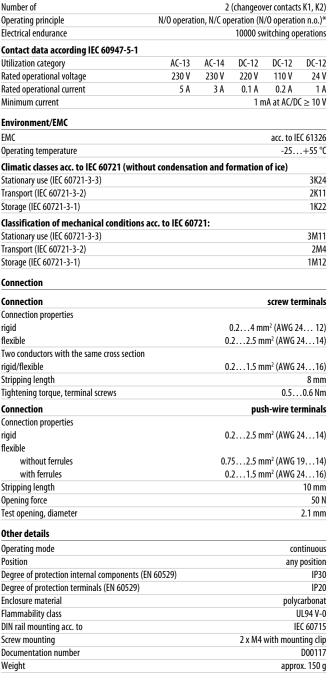
Description	Nominal voltage <i>U</i> n ¹⁾	Туре	Art. No.	Page
	AC 01150 V, DC 01100 V	AGH150W	B915576	350
	AC 01650 V AC + DC 01300 V	AGH204S-4	B914013	352
Coupling device	AC 50400 Hz, 07200 V	AGH520S	B913033	353
	AC 230 V; 50 Hz	AG70	B984718	-
	3 AC 50400 Hz, 0500 V	DS2-31	B984092	-

¹⁾ Absolute values

Insulation coordination acc. to IEC 60664-1/IEC	C 60664-3	Inputs
Rated insulation voltage		Cable length external test/reset button
(A1, A2) - (11, 12, 14) - (21, 22, 24)	300 V	
(L1, AK, E, KE, T/R)	500 V	Switching elements
Rated impulse voltage	6 kV	Number of
Overvoltage category	II	Operating principle N/
Pollution degree	3	Electrical endurance
Protective separation (reinforced insulation) between	en:	Contact data according IEC 60947-5-1
(A1, A2)	- (L1, AK, E, KE, T/R) - (11, 12, 14) - (21, 22, 24)	Utilization category
Voltage test acc. IEC 61010-1	2.2 kV	Rated operational voltage
		Rated operational current
Supply voltage		Minimum current
IR420-D6-1:		Environment/EMC
Supply voltage $U_{\rm S}$	AC 1672 V/DC 9.694 V	
Frequency range $U_{\rm S}$	42460 Hz/DC	EMC
IR420-D6-2:		Operating temperature
Supply voltage $U_{\rm S}$	AC/DC 70300 V	Climatic classes acc. to IEC 60721 (without co
Frequency range $U_{\rm S}$	42460 Hz, DC	Stationary use (IEC 60721-3-3)
Power consumption	≤ 3 VA	Transport (IEC 60721-3-2)
System being monitored		Storage (IEC 60721-3-1)
Nominal system voltage $U_{\rm n}$	AC 0400 V	Classification of mechanical conditions acc. to
Tolerance of U_n	25 %	Stationary use (IEC 60721-3-3)
Frequency range of $U_{\rm D}$	42460 Hz	Transport (IEC 60721-3-2)
, , , ,	age of the N/C. contact K3 (switch-on contactor)	Storage (IEC 60721-3-1)
with AGH520S	AC 50400 Hz, 07200 V	
with AGH150W	AC 01150 V	Connection
	DC 01100 V	Connection
with AGH204S-4	AC 01650 V	Connection properties
including DC components	01300 V	rigid
		flexible
Response values		Two conductors with the same cross section
Response value R _{an1} (AL 1)	100 k Ω10 M Ω (1 MΩ)*	rigid/flexible
Response value R _{an2} (AL 2)	100 k Ω10 M Ω (100 kΩ)*	Stripping length
Operating error ($\leq 1 \text{ M}\Omega$)	±15 %	Tightening torque, terminal screws
Hysteresis	+25 %	Connection
Time response		Connection properties
Response time t_{an} at $R_F = 0.5 \times R_{an}$ and $C_e = 1 \mu F$	≤ 4 s	rigid
Start-up delay t	010 s (0 s)*	flexible
Response delay t _{on}	099 s (0 s)*	without ferrules
	0111333 (03)	with ferrules
Measuring circuit		Stripping length
Measuring voltage $U_{\rm m}$	+12 V	Opening force
Measuring current $I_{\rm m}$ ($R_{\rm F}=0~\Omega$)	≤ 10 µA	Test opening, diameter
Internal d.c. resistance R _i	\geq 1.2 M Ω	Other details
Internal impedance Z _i (50 Hz)	≥ 1.1 MΩ	Operating mode
Admissible extraneous d.c. voltage U_{fg}	≤ DC 300 V	Position
System leakage capacitance C _e	≤ 10 µF	Degree of protection internal components (EN 605
Displays, memory		Degree of protection internal components (EN 60529)
Display Display	LC display, multi-functional, non-illuminated	Enclosure material
Display Display range, measuring value	LC display, multi-functional, non-illuminated $10 \text{ k}\Omega20 \text{ M}\Omega$	Flammability class
Percentage operating error ($\leq 1 \text{ M}\Omega$)	±15 %	DIN rail mounting acc. to
Password	off/0999 (off)*	Screw mounting
Fault memory (alarm relay)	on/off (off)*	Documentation number
radic memory (diamirrelay)	on/on (on)	Weight
		· . ·

Dimension	diagram	(dimensions	in mm)
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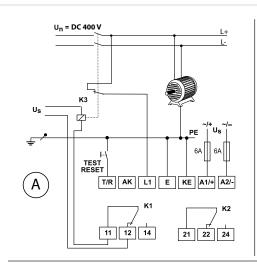


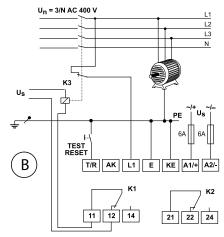


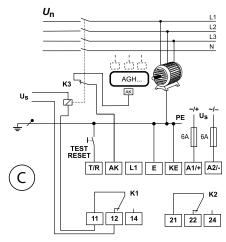
≤ 10 m

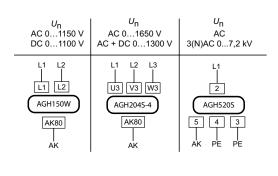
()* = Factory setting

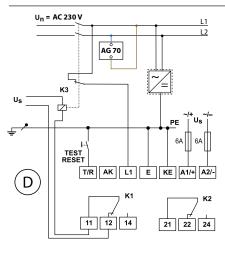


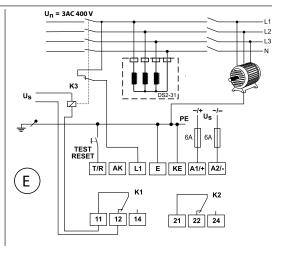












		Description

Monitoring of disconnected DC loads up to 400 V with is a low-resistance connection between L + and L- via the load.

Monitoring of disconnected 3-phase AC loads up to 400 V with a low-resistance connection between L1, L2 and L3 via the load.

Monitoring of disconnected AC loads up to U_n with a low-resistance connection between L1, L2, and L3 via the load.

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.

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.

Terminal	Connection
E, KE	Connect the leads E and KE separately to PE
A1, A2	Supply voltage $U_{\rm S}$ (see nameplate) via 6 A fuse
11, 12, 14	Alarm relay K1
21, 22, 23	Alarm relay K2 (system fault relay)
К3	relay for isolating the ISOMETER®
AGH	Coupling device for the monitoring of loads up to \textit{U}_{n}
AG70 DS2-31	For the monitoring of loads with an undefined internal resistance or an open single conductor in cables
T/R	for combined external test/reset button
L1, AK	Connection to the system being monitored

ISOMETER® IR423

Insulation monitoring device for mobile generators

AC



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

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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

Version		Supply voltage ¹⁾ U s	Type		Art. No.	
reision	AC	DC	AC/DC	.,,,,,	Screw-type terminal	Push-wire terminal
Champland	1672 V, 30460 Hz	9,694 V	-	IR423-D4-1	B91016304	B71016304
Standard	-	=	70300 V, 30460 Hz	IR423-D4-2	B91016305	B71016305
High was showing at stress	1672 V, 30460 Hz	9,694 V	-	IR423-D4W-1	B91016304W	B71016304W
High mechanical stress	-	-	70300 V, 30460 Hz	IR423-D4W-2	B91016305W	B71016305W

¹⁾ Absolute values

Accessories

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

2M4

1M12

Technical data					
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) be	etween				
(,	A1, A2) -(L1,	L2, E, KE, T	/R) -(11, 1	2, 14) -(21	
Voltage test acc. to IEC 61010-1					2.21 kV
Supply voltage					
Supply voltage $U_{\rm S}$			see or	dering info	rmation
Frequency range $U_{\rm S}$					460 Hz
Power consumption					$\leq 4 \text{ VA}$
IT system being monitored					
Nominal system voltage <i>U</i> n				AC 0.	300 V
Nominal frequency f _n				30	460 Hz
Response values					
Response value R _{an1} (Alarm 1)			1	.200 kΩ (46 kΩ)*
Response value Ran2 (Alarm 2)				.200 kΩ (
Relative uncertainty $(15 \text{ k}\Omega)$				-	±0.5 kΩ
Relative uncertainty $(5200 \text{ k}\Omega)$					±15 %
Hysteresis (15 kΩ)					+1 kΩ
Hysteresis (5200 kΩ)					+25 %
Time response					
Response time t_{an} at $R_F = 0.5 \times R_{an}$ and $C_e = 1$	μF				≤19
Start-up delay (start time) t				010	0 s (0 s) ³
Response delay ton				099	9 s (0 s)*
Measuring circuit					
Measuring voltage <i>U</i> m					±12 V
Measuring current $I_{\rm m}$ (at $R_{\rm F}=0~\Omega$)				≤	≤ 200 µ <i>P</i>
Internal DC resistance R _i				ì	≥ 62 kΩ
Impedance Z _i at 50 Hz				2	≥ 60 kΩ
Permissible extraneous DC voltage $U_{ m fg}$				≤ l	DC 300 V
Permissible system leakage capacitance					≤ 5 µf
Displays, memory					
Display	LC dis	play, mult	i-function	al, non-illu	minated
Display range, measured value				1 kΩ.	1 MΩ
Operating uncertainty (15 k Ω)				=	±0.5 kΩ
Operating uncertainty (5 k Ω 1 M Ω)					±15 %
Password				off/09	99 (off) ³
Fault memory (alarm relay)					on/off
Outputs					
Cable length test and reset button					≤ 10 m
Switching elements					
Number of switching elements				changeove	
Operating principle		NC or N/	0 operatio	n (N/O ope	
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-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
Contact rating			1 n	nA at AC/D	C ≥ 10 \

EMC	acc. to IEC 61326
Operating temperature	-25+55 °C
Classification of climatic conditions ac	c. to IEC 60721
Stationary use (IEC 60721-3-3)	3K23 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K11 (except condensation and formation of ice)
Long-time storage (IEC 60721-3-1)	1K22 (except condensation and formation of ice)
Classification of mechanical condition	s IEC 60721
Stationary use (IEC 60721-3-3)	3M11

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Transport (IEC 60721-3-2)

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

Connection	screw terminals
Connection properties	
rigid	0.24 mm ² (AWG 24 12)
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	8 mm
Tightening torque, terminal screws	0.50.6 Nm
Connection	push-wire terminals
Connection properties	·

Connection	push-wire terminals
Connection properties	F
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

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
Weight	≤ 150 q

0	ption	"W"
•	p	•••

Ambient temperature	-40+70 °C

Classification of climatic conditions acc. to IEC 60721:

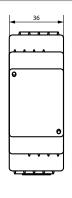
Stationary use (IEC 60721-3-3) 3K23 (with condensation and formation of ice)

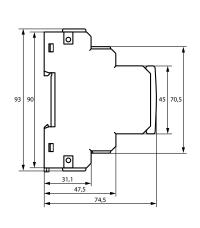
Classification of mechanical conditions acc. to IEC 60721:

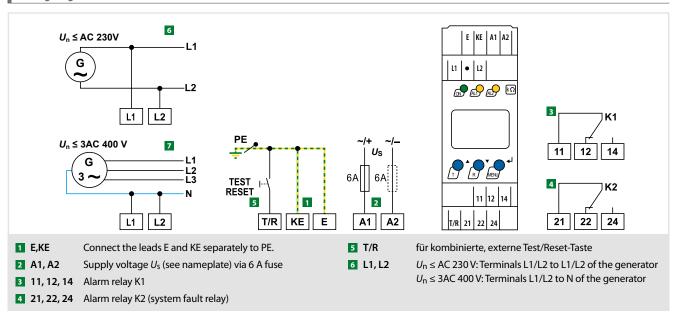
3M12
acc. to IEC 60068-2-6
3 g/30150 Hz
6 g/30150 Hz

()* = factory setting

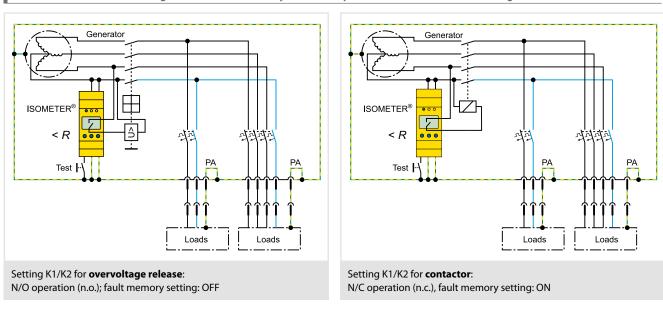
Dimension diagram (dimensions in mm)







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



ISOMETER® IR123P

Insulation monitoring device for mobile generators





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.

Typical applications

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

Approvals

Ordering information

Connection	Nominal system voltage <i>U</i> n	Supply voltage U s¹)	Туре	Art. No.
Connection	AC	AC	,,,,,,	
Connectors	100300 V, 22460 Hz	$U_{\rm s} = U_{\rm n}$	IR123P-4-2	B91016308

¹⁾ Absolute values



Insulation coordination acc. to IEC 60664-1	
Rated insulation voltage	250 V
Rated impulse voltage/pollution degree	2.5 kV/3
Protective separation (reinforced insulation) between:	
	M+, M-/0K-, 0K+) -(11-12-14) -(21-22-24)
Voltage test acc. to IEC 61010-1	2.21 kV
Supply voltage	
Supply voltage U_{S}	$=U_{\Gamma}$
Power consumption	≤ 3 VA
IT system being monitored	
Nominal system voltage $U_{\rm D}$	AC 100300 V
Nominal frequency $f_{\rm n}$	22460 Hz
Response values	
Response value Ran2 (Alarm 2)	(46 kΩ)*
Response value R _{an1} (Alarm 1)	(23 kΩ)*
Second response range, adjustable via jumper JP1	80/40 kΩ
Relative percentage error	±15 %
Hysteresis	+25 %
Time response	
Response time t_{an} at $R_F = 0.5$ x R_{an} and $C_e = 1 \mu F$	≤1s
Measuring circuit	
Measuring voltage $U_{\rm m}$	±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 U_{fq}	≤ DC 300 V
Permissible system leakage capacitance C _e	≤ 5 µF
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)*
Electrical endurance, number of cycles	10,000

Interfaces	
Optocoupler, alarm	<i>U</i> _{CE} 24 V, I _C 10 mA
Optocoupler, measured value	$U_{CE} \le DC 24 \text{ V}, I_C \le 10 \text{ mA}$
	PWM signal, duty cycle 0 $\% = \infty$ k Ω
	PWM signal, duty cycle 50 $\% = 120 \text{ k}\Omega$
	PWM signal, duty cycle 100 % = 0 k Ω

n nc 12	
2 DC-12	DC-12
V 110 V	24 V
A 0.2 A	1 A
1 mA at AC/I)C ≥ 10 V
	V 110 V

Environment/EMC	
EMC	acc. to IEC 61326-2-4
Operating temperature	-25+60°C

Climatic categories acc. to IEC 60721, valid for one encapsulated p.c.b.:		
Stationary use (IEC 60721-3-3) 3K23 (except condensation and formation of ice		
Transport (IEC 60721-3-2)	2K11 (except condensation and formation of ice)	
Storage (IEC 60721-3-1)	1K22 (except condensation and formation of ice)	

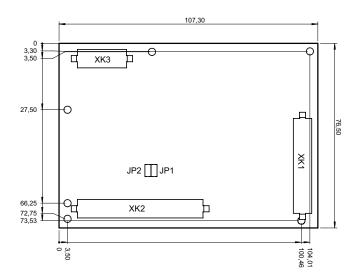
Classification of mechanical conditions acc. to IEC 60721, valid for one encapsulated p.c.b:		
Stationary use (IEC 60721-3-3)	3M12	
Transport (IEC 60721-3-2)	2M4	
Storage (IEC 60721-3-1)	1M12	

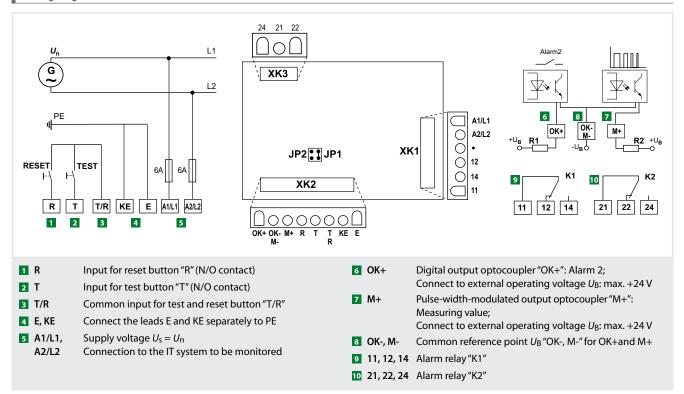
Connection	
Connection	connectors Universal MATE-N-LOK
	3-pole TE Connectivity Nr. 350789-1
	6-pole TE Connectivity Nr. 641831-1
	8-pole TE Connectivity Nr. 641828-1

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
Enclosure	without
Documentation number	D00113
Weight	≤ 150 g

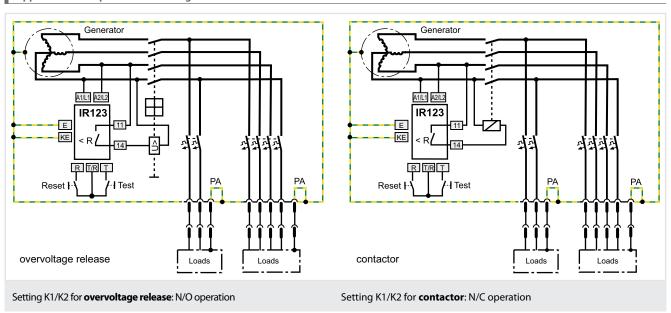
()* = factory setting

Dimension diagrams (dimensions in mm)





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



Device features

- Monitoring the insulation resistance for unearthed AC/DC systems
- Measurement of the system voltage (true r.m.s.) with undervoltage and overvoltage detection
- Measurement of DC system voltages to earth (L1+/PE and L2-/PE)
- Two operating modes: GEn and DC
- Automatic adaptation to the system leakage capacitance up to 5 μ F
- Selectable start-up delay, response delay and delay on release
- Two separately adjustable response value ranges of 5...200 kΩ (Alarm 1, Alarm 2)
- 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 multifunctional 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 RTU
- IsoData (for continuous data output)
- Password protection to prevent unauthorised parameter changes

Approvals



Typical applications

• AC main circuits up to 400 V

• DC main circuits up to 400 V

· Generators according to

DIN VDE 0100-551



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

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

Accessories

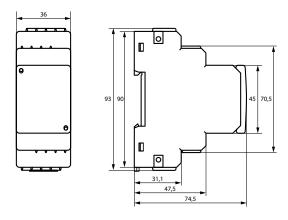
Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B98060008



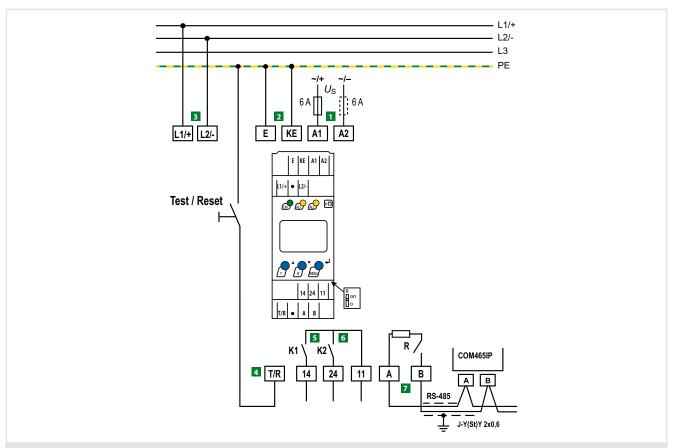
Insulation coordination acc. to IEC 60664-1/IEC 60664-3		Interface				
Definitions:		Interface/protocol	ı	RS-485/BMS, Mo	odbus RTU,	, isoData
Measuring circuit (IC1)	L1/+, L2/-	•		(selectable), isoD		
Supply circuit (IC2)	A1, A2	Cable length (9.6 kBits/s)	<i>,,</i>	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		1200 m
Output circuit (IC3)	11, 14, 24	Cable: twisted pairs, shield connected to PE on o	ne side	m	nin. J-Y(St)\	
Control circuit (IC4)	E, KE, T/R, A, B	Terminating resistor).25 W), internal		
Rated voltage	400 V	Device address, BMS bus, Modbus RTU	120 12 (0	7.23 W), IIICIIIui		.90 (3)*
Overvoltage category	H	Device address, Divis bus, Modbus NTO			٠	. 50 (3)
		Switching elements				
Rated impulse voltage:	4114	Switching elements		x 1 contacts, co	mmon terr	minal 11
IC1/(IC2-4)	6 kV	Operating principle		on/N/O operation		
IC2/(IC3-4)	4 kV	Electrical endurance, number of cycles	N/C operatio	on/N/O operation	i (iv/o ope	
IC3/IC4	4 kV					10 000
Rated insulation voltage:		Contact data acc. to IEC 60947-5-1:				
IC1/(IC2-4)	400 V	Utilisation category		14 DC-12	DC-12	DC-12
IC2/(IC3-4)	250 V	Rated operational voltage		30 V 24 V	110 V	220 V
IC3/IC4	250 V	Rated operational current	5 A	2 A 1 A	0.2 A	0,1 A
Polution degree	3	Minimum contact rating		1 m	nA at AC/DC	$C \ge 10 \text{ V}$
Protective separation (reinforced insulation) between:						
•	O	Environment/EMC				
IC1/(IC2-4)	Overvoltage category III, 600 V	EMC			IEC 61	326-2-4
IC2/(IC3-4)	Overvoltage category III, 300 V	Ambient temperatures				
IC 3/IC4	Overvoltage category III, 300 V	Ambient temperatures:				, 70
Voltage test (routine test) according to IEC 61010-1:		Operation				.+70 °C
IC2/(IC3-4)	AC 2,2 kV	Transport				.+85 ℃
IC 3/IC4	AC 2,2 kV	Storage			-40	.+70 °C
		Climatic class acc. to IEC 60721:				
Supply voltage			2K24 /with	condoncation co	d formati-	n cf;\
Supply voltage $U_{\rm S}$	AC 100240 V/DC 24240 V	Stationary use (IEC 60721-3-3)		condensation an		
Tolerance of $U_{\rm S}$	-30+15 %	Transport (IEC 60721-3-2)	•	condensation an		
Frequency range U_S	4763 Hz	Long-time storage (IEC 60721-3-1)	1K22 (without o	condensation an	d formatio	n of ice)
		Classification of mechanical conditions acc.	to IFC 60721:			
Power consumption	≤ 3 W, ≤ 9 VA	Stationary use (IEC 60721-3-3)	10 124 007 211			3M11
IT system being monitored		•				
· ·	(N) AC ACO 400 V/DC 0 400 V	for option W				3M12
,	B(N)AC, AC 0400 V/DC 0400 V	Transport (IEC 60721-3-2)				2M4
Tolerance of U _n	+25 %	Long-term storage (IEC 60721-3-1)				1M12
Frequency range of <i>U</i> _n	DC, 35460 Hz	Connection				
M		Connection				
Measuring circuit		Connection type	screw-ty	ype terminal or p	oush-wire t	terminal
Measuring voltage $U_{\rm m}$	±12 V	Cerau tuna tarminala				
Measuring current $I_{\rm m}$ at $R_{\rm F}$, $Z_{\rm F}=0$	≤ 110 µA	Screw-type terminals:				
Internal resistance R_i , Z_i	≥ 115 kΩ	Nominal current				≤10 A
Permissible system leakage capacitance C_e	≤ 5 µF	Tightening torque		0.50.	6 Nm (5	.7 lb-in)
Permissible extraneous DC voltage U_{fq}	≤ 700 V	Conductor sizes			AWG	2412
r crimissible excludeous be voltage ofg		Stripping length				8 mm
Response values		Rigid/flexible			0.2	2.5 mm ²
Response value R _{an1}	R _{an2} 200 kΩ (46 kΩ)*	3				
Response value R _{an2}		Flexible with ferrules with/without plastic sleeve	:		0.252	2.5 mm ²
	$5 \text{ k}\Omega \dots R_{\text{an1}} (23 \text{ k}\Omega)^*$	Multi-conductor				
Relative uncertainty R_{an}	± 15 %, at least ± 2 k Ω	rigid /flexible			0.2	1.5 mm ²
Hysteresis R _{an}	25 %, at least 1 kΩ	flexible with ferrules without plastic sleeve	,		0.251	
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 slee	eve		0.5	1.5 mm ²
Relative uncertainty <i>U</i>	±5 %, at least ±5 V	Push-wire terminals:				
Relative uncertainty depending on the frequency ≥ 400 Hz	-0,015 %/Hz	Nominal current				≤10 A
Hysteresis <i>U</i>	5 %, at least 5 V	Conductor sizes			AWIC	2414
1,550,000	J 70, at icast J V				- AVVO	
Time response		Stripping length				10 mm
Response time t_{an} of $R_F = 0.5$ x R_{an} and $C_e = 1$ μ F according to IEC	C 61557-8 ≤ 1 s	Rigid				2.5 mm ²
Start-up delay t	010 s (0 s)*	Flexible without ferrules			0.752	2.5 mm ²
• •		Flexible with ferrules with/without plastic sleeve	1		0.252	
Response delay t_{on}	099 s (0 s)*	Multi-conductor flexible with TWIN ferrules with				1.5 mm ²
Delay on release t _{off}	099 s (0 s)*		אומזנור זובפעפ		U.J	
Displays mamory		Opening force				50 N
Displays, memory	10.6 0 1 00 1	Test opening, diameter				2.1 mm
. ,	y, multi-functional, not illuminated	O4h a				
Display range measured value insulation resistance $(R_{\rm F})$	1 kΩ2 MΩ	Other				
Operating uncertainty	± 15 %, at least ± 2 k Ω	Operating mode		cor	ntinuous op	peration
Display range measured value nominal system voltage (U_n)	0500 VRMS	Mounting	cooling	g slots must be v	entilated v	ertically
Operating uncertainty	±5 %, at least ±5 V	Degree of protection, built-in components (DIN E				IP30
Display range measured value system leakage capacitance of $R_{\rm F} > 10$	·	Degree of protection, terminals (DIN EN 60529)				IP20
Display range incasared value system learnage capacitaine of N ₁ > 10		Enclosure material			nolyca	rbonate
Operating uncertainty of DE > 20 to and C = EE	017 μF					C 60715
Operating uncertainty of RF \geq 20 k Ω and $C_e \leq 5 \mu\text{F}$	± 15 %, at least ± 0.1 µF	DIN rail mounting acc. to		2 11.		
Password	off/0999 (0, off)*	Screw fixing		2 x M4 \	with moun	
Fault memory alarm messages	on/(off)*	Documentation number				D00221
		Weight				≤ 150 g
		()* 6-4				
		()* = factory setting				







Wiring diagram



- 1 A1, A2 Connection to the supply voltage via fuse (line protection).
 - If 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 L1/+, L2/- Connection to the IT 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 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.

ISOMETER® isoRW425







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 mode) or the insulation impedance (Z mode) of unearthed 3(N)AC, AC and DC systems (IT systems) with galvanically connected rectifiers or inverters
- Insulation impedance (Z mode) for 50 Hz or 60 Hz
- · Measurement of the nominal system voltage (RMS) 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 300 μF in R mode and $1\mu F$ in Z mode
- · Automatic device self test with connection monitoring
- Selectable start-up delay, response delay and delay on release
- Two separately adjustable response ranges of 1...990 k Ω (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) interface 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 changes of parameters

Standards

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

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

Further information

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

Ordering information

Nominal system voltage <i>U</i> n	Supply vo	oltage <i>U</i> s	System leakage	Туре	Art.	No.
3(N)AC, AC/DC	AC	DC	capacitance C _e	.,,,-	Screw-type terminal	Push-wire terminal
0440 V, 15460 Hz	100240 V, 4763 Hz	24240 V	< 300 μF	isoRW425-D4W-4	B91037000W	B71037000W

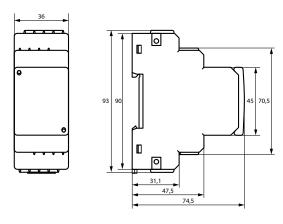
Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B98060008

Insulation coordination acc. to IEC 60664-1/IEC 60664-3	Interface
Definitions:	Interface/protocol RS-485/BMS, Modbus RTU, isoDat
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 t
Output circuit (IC3) 11, 14, 24	Cable: twisted pairs, shield connected to PE on one side min. J-Y(St)Y 2x0.
Control circuit (IC4) E, KE, T/R, A, B	Terminating resistor 120 Ω (0,25 W), internal, can be connected
Rated voltage 440 V	Device address, BMS bus, Modbus RTU 390 (3)
Overvoltage category III	
Rated impulse voltage:	Switching elements
IC1/(IC2-4) 6 kV	Switching elements 2 x 1 N/O contacts, common terminal 1
IC2/(IC3-4) 4 kV	Operating principle N/C operation/N/O operation (N/O operation)
IC2/(IC3-4) 4 kV IC 3/(IC4) 4 kV	Electrical endurance, number of cycles 1000
• •	•
Rated insulated voltage:	Contact data acc. to IEC 60947-5-1:
IC1/(IC2-4) 500 V	Utilisation category AC-12 AC-14 DC-12 DC-12 DC-1
IC2/(IC3-4) 250 V	Rated operational voltage 230 V 230 V 24 V 110 V 220
IC 3/(IC4) 250 V	Rated operational current 5 A 2 A 1 A 0.2 A 0.1
Polution degree 3	Minimum contact rating $1 \text{ mA at AC/DC} \ge 10$
Protective separation (reinforced insulation) between:	Environment/EMC
IC1/(IC2-4) Overvoltage category III, 600 V	
IC2/(IC3-4) Overvoltage category III, 300 V	EMC IEC 61326-2-4, DIN EN50121-3-
IC 3/(IC4) Overvoltage category III, 300 V	Ambient temperatures:
Voltage test (routine test) according to IEC 61010-1:	Operation -40+70 °C
IC2/(IC3-4) AC 2,2 kV	Transport -50+85 °C
IC 3/(IC4) AC 2,2 kV	Storage -55+80 °C
The Equity	•
Supply voltage	Climatic class acc. to IEC 60721
Supply voltage <i>U</i> _S AC 100240 V/DC 24240 V	Stationary use (IEC 60721-3-3) 3K2-
Tolerance of $U_{\rm S}$ $-30+15\%$	Transport (IEC 60721-3-2) 2K1
Frequency range U_5 4763 Hz	Long-time storage (IEC 60721-3-1) 1K2
Power consumption $\leq 3 \text{ W}, \leq 9 \text{ VA}$	Classification of mechanical conditions acc. to IEC 60721
rower consumption \$3 W, \$9 VA	Stationary use (IEC 60721-3-3) 3M1:
IT system being monitored	Transport (IEC 60721-3-2) 2M-
Nominal system voltage $U_{\rm D}$ 3(N)AC, AC 0440V/DC 0440 V	
Nominal system voltage U_n (UL508) AC/DC 0400 V	Long-term storage (IEC 60721-3-1)
	Connection
Tolerance of <i>U</i> _n +15 %	
Frequency range of <i>U</i> _n DC, 15460 Hz	Connection type screw-type terminal or push-wire terminal
Measuring circuit	Screw-type terminals:
	Nominal current ≤10 /
Measuring voltage $U_{\rm m}$ $\pm 12 {\rm V}$	
Measuring current I_m at R_F , $Z_F = 0 \Omega$ $\leq 110 \mu A$	Tightening torque 0.50.6 Nm (57 lb-in
Internal resistance R_i , Z_i $\geq 115 \text{ k}\Omega$	Conductor sizes AWG 241
Permissible system leakage capacitance C_e (R mode) $\leq 300 \mu$ F	Stripping length 8 mm
Permissible system leakage capacitance C_e (Z mode) $\leq 1 \mu$ F	Rigid/flexible 0.22.5 mm
Permissible extraneous DC voltage $U_{\rm fg}$ \leq 700 V	Flexible with ferrules with/without plastic sleeve 0.252.5 mm
·	Multi-conductor
Response values	
Response value $R_{\rm an1}$ 2990 k Ω (40 k Ω)*	•
Response value $R_{\rm an2}$ 1980 k Ω (10 k Ω)*	flexible with ferrules without plastic sleeve 0.251.5 mm
Relative uncertainty $R_{\rm an}$ (R mode or $Z_{\rm F} \approx R_{\rm F}$) \pm 15 %, at least \pm 1 k Ω	flexible with TWIN ferrules with plastic sleeve 0.51.5 mm
Hysteresis $R_{\rm an}$ 25 %, at least 1 k Ω	Push-wire terminals:
Response value Z_{an1} 11500 k Ω (off)*	
Response value Z_{an2} 10490 k Ω (off)*	
Relative uncertainty Z_{an} \pm 15 %, at least \pm 1 k Ω	Conductor sizes AWG 241
Hysteresis Z_{an} 25 %, at least 1 k Ω	Stripping length 10 mm
Undervoltage detection 25 %, at least 1 K2	Rigid 0.22.5 mm
·	Flexible without ferrules 0.752.5 mm
•	Flexible with ferrules with/without plastic sleeve 0.252.5 mm
Relative uncertainty U \pm 5 %, at least \pm 5 V	·
Relative uncertainty depending on the frequency ≥ 400 Hz -0.015 %/Hz	Multi-conductor flexible with TWIN ferrules with plastic sleeve 0.51.5 mm
Hysteresis <i>U</i> 5 %, at least 5 V	Opening force 50 N
Time response	Test opening, diameter 2.1 mm
•	Othor
Response time t_{an} of $R_F = 0.5 \times R_{an}$ and $C_e = 1 \mu F$ according to IEC 61557-8 $\leq 10 \text{ s}$	Other
Response time t_{an} of $Z_F = 0.5 \times Z_{an}$ $\leq 5 \text{ s}$	Operating mode continuous operation
Start-up delay t 010 s (0 s)*	Mounting cooling slots must be ventilated verticall
Response delay t_{on} 099 s (0 s)*	Degree of protection, built-in components (DIN EN 60529) IP3
Delay on release t_{off} 099 s (0 s)*	Degree of protection, terminals (DIN EN 60529) IP20
	Enclosure material polycarbonate
Displays, memory	DIN rail mounting acc. to IEC 6071:
Display LC display, multi-functional, not illuminated	Screw fixing 2 x M4 with mounting cli
Display range measured value insulation resistance (R_F) 1 k Ω 4 M Ω	Flammability class UL94 V-
Display range measured value impedance ($Z_{\rm F}$) with $f_{\rm D} = 50/60 {\rm Hz}$ 1 k $\Omega 1 {\rm M}\Omega$	Documentation number D0005
Operating uncertainty (R_F in R mode, Z_F in Z mode) \pm 15 %, at least \pm 1 k Ω	
Display range measured value nominal system voltage (U_n) 0500 V r.m.s.	Weight ≤ 150
Operating uncertainty $\pm 5\%$, at least $\pm 5\%$	()* = factory setting
Display range measured value system leakage capacitance of $R_{\rm F}$ > 10 k Ω 0300 $\mu{\rm F}$	(,
Operating uncertainty \pm 15 %, at least \pm 2 μ F	
Display range measured value system leakage capacitance of $Z_F > 10 \text{ k}\Omega$ 1 nF1 μ F	
Operating uncertainty ($Z_F \approx X_C$) \pm 15 %, at least \pm 2 nF	
Password off/0999 (0, off)*	
Fault mamoru alarm massages	

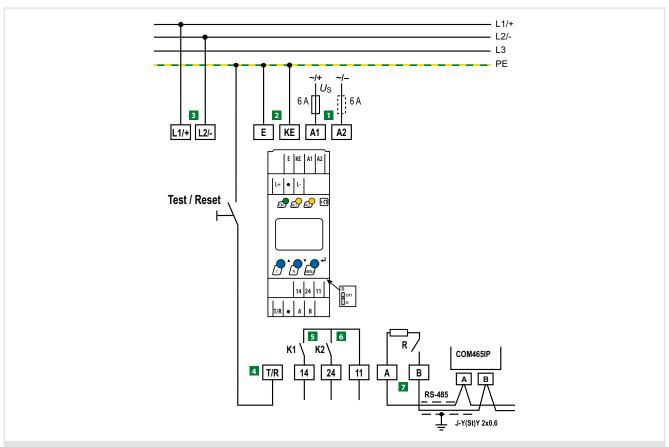
on/(off)*



Fault memory alarm messages



Wiring diagram



- 1 A1, A2 Connection to the supply voltage via fuse (line protection).
 - If supplied from an IT system, both lines have to be protected by a fuse.*
- **EXECUTE** Connect each terminal separately to PE: The same wire cross section as for A1, A2 is to be used.
- 3 L1/+, L2/- Connection to the 3(N)AC, AC or DC system to be monitored
- **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
- RS-485 communication interface with connectable 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.

ISOMETER® isoUG425

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 resistances for unearthed DC systems
- · Measurement of the system voltage (r.m.s. and DC) with undervoltage and overvoltage detection
- Measurement of the system DC voltages to earth (L+/PE and L-/PE)
- Configurable adaptation to the system leakage capacitance up to 5 μF
- · Selectable start-up delay, response delay and delay on release
- Two separately adjustable response value ranges of 1...100 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 of the relays 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 RTU
- IsoData (for continuous data output)
- Password protection to prevent unauthorised parameter changes

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

Supply v	Supply voltage <i>U</i> ₅		Nominal voltage <i>U</i> n System leakage		Art. No.
AC	DC	DC	capacitance Type		push-wire terminal
100240 V, 4763 Hz	24240 V	12120 V	≤ 50 µF	isoUG425-D4-4	B71036320

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

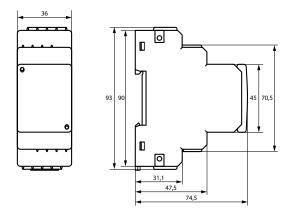


Insulation coordination acc. to IEC 60664-1/IEC 60664-3		Interface					
Definitions:		Interface/protocol		RS-48	B5/BMS, M	odbus RTU	, isoData
Measuring circuit (IC1)	L1/+, L2/-		oit/s), Modbus	RTU (selec	table), iso[Data (115.2	kbits/s)
Supply circuit (IC2)	A1, A2	Cable length (9.6 kbits/s)	,		,,		1200 m
Output circuit(IC3)	11, 14, 24	Cable: twisted pairs, shield connected to PE of	n one side			min. J-Y(St	
Control circuit (IC4)	E, KE, T/R, A, B	Terminating resistor		O (0.25 V	V), interna		
Rated voltage	400 V	Device address, BMS bus, Modbus RTU	120	12 (0.23)	,, meema	,	.90 (3)*
Overvoltage category		Device address, Divis bas, Modbas 1110				J	. 70 (3)
Rated impulse voltage:		Switching elements					
IC1/(IC2-4)	6 kV	Switching elements		2 x 1 N/0 c	ontacts, co	mmon teri	minal 11
* *	4 kV	Operating principle			0 operatio		
IC2/(IC3-4)		Electrical endurance, number of cycles					10,000
IC 3/IC4	4 kV						.0,000
Rated insulated voltage:		Contact data acc. to IEC 60947-5-1:	16.40		20.42	20.42	
IC1/(IC2-4)	400 V	Utilisation category	AC-12	AC-14	DC-12	DC-12	DC-12
IC2/(IC3-4)	250 V	Rated operational voltage	230 V	230 V	24 V	110 V	220 V
IC 3/IC4	250 V	Rated operational current	5 A	2 A	1 A	0.2 A	0.1 A
Pollution	3	Minimum contact rating			1 m	nA at AC/D	$C \ge 10 \text{ V}$
Protective separation (reinforced insulation) between:		Environment/EMC					
IC1/(IC2-4)	Overvoltage category III, 600 V					150.00	1226.2.4
IC2/(IC3-4)	Overvoltage category III, 300 V	EMC				IEC 6 I	326-2-4
IC 3/IC4	Overvoltage category III, 300 V	Ambient temperatures:					
Voltage test (routine test) according to IEC 61010-1:		Operation				-40	.+70 ℃
IC2/(IC3-4)	AC 2.2 kV	Transport				-40	.+85 ℃
IC 3/IC4	AC 2.2 kV	Storage				-40	.+70 ℃
			4. IFC (0731				
Supply voltage		Classification of climatic conditions acc.					
Supply voltage U_{S}	AC 100240 V/DC 24240 V	Stationary use (IEC 60721-3-3)			ensation ar		
Tolerance of $U_{\rm S}$	-30+15 %	Transport (IEC 60721-3-2)	•	•	ensation ar		
Frequency range U _S	4763 Hz	Long-term storage (IEC 60721-3-1)	1K22 (ex	cept conde	ensation ar	nd formatio	on of ice)
Power consumption	≤ 3 W, ≤ 9 VA	Classification of mechanical conditions a	acc. to IEC 60	721			
·	•	Stationary use (IEC 60721-3-3)					3M11
IT system being monitored		Transport (IEC 60721-3-2)					2M4
Nominal system voltage $U_{\rm n}$	DC 12120 V	Long-term storage (IEC 60721-3-1)					1M12
Tolerance of U _n	+20 %	, ,					
		Connection					
Measuring circuit		Connection type				push-wire	terminal
Internal resistance R _i	≥ 115 kΩ	Nominal current					≤10 A
Permissible system leakage capacitance C _e	≤ 50 µF	Conductor sizes				AWG	2414
Response values		Stripping length					10 mm
•	2 10010 (5010)*	Rigid				0.2	2.5 mm ²
Response value R _{an1}	2100 kΩ (50 kΩ)*	Flexible without ferrules					2.5 mm ²
Response value R _{an2}	195 kΩ (25 kΩ)*						
Relative uncertainty R _{an}	± 15 %, at least ± 2 k Ω	Flexible with ferrules with/without plastic sle					2.5 mm ²
Hysteresis R _{an}	25 %, at least 1 kΩ	Multi-conductor flexible with TWIN ferrules v	vith plastic sle	eve		0.5	1.5 mm ²
Undervoltage detection U_{DC}	8143 V (off)*	Opening force					50 N
Overvoltage detection U_{DC}	8.1144 V (off)*	Test opening, diameter					2.1 mm
Relative uncertainty U_{DC}	\pm 5 %, at least \pm 0.5 V						
Hysteresis U _{DC}	5 %, at least 1 V	<u>Other</u>					
		Operating mode			CO	ntinuous o	peration
Time response		Mounting		ooling slot	s must be v	entilated v	ertically/
Response time t_{an} at $R_F = 0.5$ x R_{an} and $C_e = 1$ μF acc. to IEC 61557		Degree of protection, built-in components (D	IN EN 60529)				IP30
Start-up delay t	010 s (0 s)*	Degree of protection, terminals (DIN EN 6052	9)				IP20
Response delay t_{on}	099 s (0 s)*	Enclosure material				polyca	arbonate
Delay on release t _{off}	099 s (0 s)*	DIN rail mounting acc. to					C 60715
D: 1	<u> </u>	Screw fixing			2 x M4	with moun	
Displays, memory		Documentaion number			_ ~ 1		D00220
Display LC display,	multi-functional, not illuminated	Weight					≤ 150 q
Display range measured value insulation resistance (RF)	1 kΩ1 MΩ	Traigill					- 130 g
Operating uncertainty	± 15 %, at least ± 2 k Ω	()* = Factory setting					
Display range measured value nominal system voltage (U_n)							
, , , , , , , , , , , , , , , , , , , ,	$=∞$: 300 VP; R_F = 0 kΩ: 150 VP)						
Operating uncertainty $U_{\rm DC}$	\pm 5 %, at least \pm 0.5 V						
Operating uncertainty U_{RMS}	\pm 5 %, at least \pm 1.5 V						
Password	off/0999 (0, off)*						
r ussiroiu	011, 0, 227 (0, 011)						

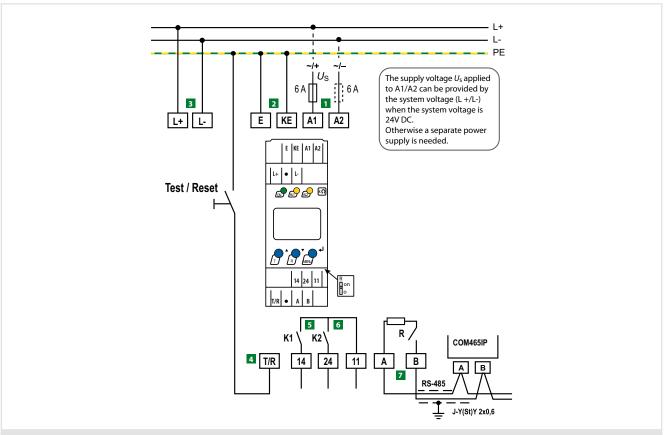
on/(off)*



Fault memory alarm messages



Wiring diagram



- 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 L1/+, L2/- 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
 Example: Connection of a BMS Ethernet gateway
 COM465IP
- * 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.

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

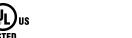




Standards

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

Nominal system voltage <i>U</i> n	Supply voltage <i>U</i> s		System leakage	Туре	Art. No.
AC/DC	AC	DC	capacitance C _e	-,,,-	Push-wire terminal
0400 V, 15460 Hz	100240 V, 4763 Hz	24240 V	< 100 μF	isoES425-D4-4	B71037020

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



- · Insulation monitoring for unearthed systems AC/DC
- · Measurement of the mains voltage (r.m.s.) with undervoltage and overvoltage detection
- Measurement of DC voltages system to earth (L1+/PE und L2-/PE)
- Automatic adaptation to the system leakage capacitance up to 100 μF
- Selectable start-up delay, response delay and delay on release
- Two separately adjustable response value ranges of 1...990 kΩ (Alarm 1, Alarm 2)
- 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 of the relays selectable
- · Measured value indication via multifunctional 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
- IsoData (for continuous data output)
- Password protection to prevent unauthorised parameter changes

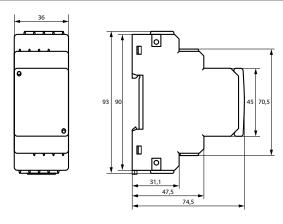


	Interface
Definitions:	Interface/protocol RS-485/BMS, isoData
Measuring circuit (IC1) L1/+	L2/- Baud rate BMS (9.6 kBit/s), isoData (115.2 kBits/s)
	1, A2 Cable length (9.6 kBits/s \leq 1200 m
***	·
Control circuit (IC4) E, KE, T/F	
	100 V Device address, BMS bus 390 (3)*
Overvoltage category	
Rated impulse withstand voltage:	Switching elements
IC1/(IC2-4)	6 kV Switching elements 2 x 1 NO contacts, common terminal 11
	Operating principle N/C eneration/N/O eneration/N/C eneration/N/C
IC2/(IC3-4)	The trivial and war as murchay of mules
IC 3/(IC4)	4 kV Electrical endurance, number of cycles 10000
Rated insulation voltage:	Contact data acc. to IEC 60947-5-1:
IC1/(IC2-4)	100 V Utilisation category AC-12 AC-14 DC-12 DC-12 DC-12
	250 V Rated operational voltage 230 V 230 V 24 V 110 V 220 V
	250 V Rated operational current 5 A 2 A 1 A 0.2 A 0.1 A
Pollution degree	$\frac{3}{2} \text{Minimum contact rating} \qquad \qquad 1 \text{ mA at AC/DC} \geq 10 \text{ V}$
Protective separation (reinforced insulation) between:	Environment/EMC
IC1/(IC2-4) Overvoltage category III,	500 V
IC2/(IC3-4) Overvoltage category III,	
IC 3/(IC4) Overvoltage category III,	
Voltage tests (routine test) acc. to IEC 61010-1:	•
	Operation -25+70 °C
	.2 kV Transport -40+85 °C
IC 3/(IC4) AC 2	.2 kV Storage -25+70 °C
C	Climatic class acc. to IEC 60721:
Supply voltage	
Supply voltage $U_{\rm S}$ AC 100240 V/DC 24	Stationary use (IEC 60721-3-3) 3K23 (without condensation and icing)
Tolerance of U_5 $-30+$	Transport (IEC 60721-3-2) 2K11 (without condensation and icing)
Frequency range U_5 47	I ong-time storage (IEC 60771-3-1)
Power consumption $\leq 3 \text{ W}, \leq$	· ····
IT system being monitored	Stationary use (IEC 60721-3-3) 3M11
	Transport (IEC 60721-3-2) 2M4
Nominal system voltage U_n 3(N)AC, AC 0400 V/DC 0	Eong term storage (ize 60721 5 1)
Tolerance of U_n	25%
Frequency range of $U_{\rm n}$ DC, 154	50 Hz Connection
	Connection type Push-wire terminal
Measuring circuit	— Nominal current ≤10 A
Measuring voltage $U_{\rm m}$ \pm	12 V Conductor sizes AWG 2414
Measuring current $I_{\rm m}$ at $R_{\rm F}$ ≤ 1	N 11 A
Internal resistance R_i ≥ 11	SkO Stripping length 10 mm
·	8 Rigid 0.22.5 mm ²
	— Flavihla without tarrulas 0.75 2.5 mm ²
Permissible external DC voltage U_{fg} \leq	700 V Flexible with ferrules with/without plastic sleeve 0.252.5 mm ²
Demones values	
Response values	Multi-conductor flexible with TWIN ferrules with plastic sleeve 0.51.5 mm ²
Response value $R_{\rm an1}$ 2990 k Ω (69	
Response value R_{an2} 1980 k Ω (23	
Operating uncertainty R_{an} \pm 15 %. at least \pm	1 kΩ
	1 kΩ
Hysteresis $R_{\rm an}$ 25 %, at least	1 kΩ 1 kΩ Other
	1 kΩ 1 kΩ Other Operating mode Continuous operation
	1 kΩ 1 kΩ Other off)* Operating mode Continuous operation off)* Mounting Cooling slots must be ventilated vertically
Hysteresis R_{an} 25 %, at leastUndervoltage detection U 10499 V	1 kΩ off) × lα off)* Other Off)* Operating mode Continuous operation Off)* Mounting Cooling slots must be ventilated vertically L 5 V Degree of protection, built-in components (DIN EN 60529) IP30
$\begin{tabular}{lll} Hysteresis $R_{\rm an}$ & 25 \%, at least $$Undervoltage detection U & 10499 V $$Overvoltage detection U & 11500 V $$Operating uncertainty U & \pm 5 %, at least $$U$	1 kO 1 kO 0ff)* Operating mode Off)* Mounting Cooling slots must be ventilated vertically Degree of protection, built-in components (DIN EN 60529) IP30
Hysteresis R_{an} 25 %, at least Undervoltage detection U 10499 V Overvoltage detection U 11500 V Operating uncertainty U ± 5 %, at least Frequency dependent operating uncertainty ≥ 400 Hz -0.015	I kΩ off) * Other 0erating mode Continuous operation 0erating mode Cooling slots must be ventilated vertically ½ 5 V Degree of protection, built-in components (DIN EN 60529) IP30 %/Hz Degree of protection, terminals (DIN EN 60529) IP20
Hysteresis R_{an} 25 %, at least 10499 VUndervoltage detection U 10499 VOvervoltage detection U 11500 VOperating uncertainty U \pm 5 %, at leastFrequency dependent operating uncertainty \ge 400 Hz-0.015	I kΩ off) kΩ off)* Other Operating mode Continuous operation Off)* Mounting Cooling slots must be ventilated vertically E 5 V Degree of protection, built-in components (DIN EN 60529) IP30 %/Hz Degree of protection, terminals (DIN EN 60529) IP20 Enclosure material Polycarbonate
Hysteresis R_{an} 25 %, at least 10499 VUndervoltage detection U 10499 VOvervoltage detection U 11500 VOperating uncertainty U \pm 5 %, at leastFrequency dependent operating uncertainty \ge 400 Hz-0.015Hysteresis U 5 %, at least	1 kΩ off) kΩ off)* Other Operating mode Continuous operation Off)* Mounting Cooling slots must be ventilated vertically ½ 5 V Degree of protection, built-in components (DIN EN 60529) IP30 ½/Hz Degree of protection, terminals (DIN EN 60529) IP20 Enclosure material Polycarbonate DIN rail mounting acc. to IEC 60715
Hysteresis R_{an} 25 %, at least 10499 VUndervoltage detection U 10499 VOvervoltage detection U 11500 VOperating uncertainty U \pm 5 %, at leastFrequency dependent operating uncertainty \ge 400 Hz-0.015Hysteresis U 5 %, at leastTime response	1 kΩ off) kΩ off)* Other Operating mode Continuous operation Off)* Mounting Cooling slots must be ventilated vertically ½ 5 V Degree of protection, built-in components (DIN EN 60529) IP30 ½/Hz 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
Hysteresis R_{an} 25 %, at least Undervoltage detection U 10 499 V Overvoltage detection U 11 500 V Operating uncertainty U ± 5 %, at least Frequency dependent operating uncertainty ≥ 400 Hz -0.015 Hysteresis U 5 %, at least Time response Response time t_{an} at R_F = 0.5 x R_{an} and C_e =1 μF acc. to IEC 61557-8	t kΩ off kΩ off kΩ off Other Ooff)* Operating mode Continuous operation off Mounting Cooling slots must be ventilated vertically begree of protection, built-in components (DIN EN 60529) IP30 Mo/Hz 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 Weight ≤ 150 g
Hysteresis R_{an} 25 %, at least Undervoltage detection U 10499 V Overvoltage detection U 11500 V Operating uncertainty U ± 5 %, at least Frequency dependent operating uncertainty ≥ 400 Hz -0.015 Hysteresis U 5 %, at least Time response Time response Response time t_{an} at R_F = 0.5 x R_{an} and C_e =1 μF acc. to IEC 61557-8 2 Start-up delay t 010 s	1 kΩ Other off)* Operating mode Continuous operation off)* Mounting Cooling slots must be ventilated vertically begree of protection, built-in components (DIN EN 60529) IP30 begree 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 weight ≤ 150 g
Hysteresis R_{an} 25 %, at least Undervoltage detection U 10499 V Overvoltage detection U 11500 V Operating uncertainty U ± 5 %, at least Frequency dependent operating uncertainty ≥ 400 Hz -0.015 Hysteresis U 5 %, at least Time response Time response Response time t_{an} at R_F = 0.5 x R_{an} and C_e =1 μF acc. to IEC 61557-8 2 Start-up delay t 010 s	1 kΩ Other off)* Operating mode Continuous operation off)* Mounting Cooling slots must be ventilated vertically begree of protection, built-in components (DIN EN 60529) IP30 begree 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 weight ≤ 150 g
Hysteresis R_{an} 25 %, at least Undervoltage detection U 10499 V Overvoltage detection U 11500 V Operating uncertainty U ± 5 %, at least Frequency dependent operating uncertainty ≥ 400 Hz -0.015 Hysteresis U 5 %, at least Time response Time response Response time t_{an} at R_F = 0.5 x R_{an} and C_e =1 μF acc. to IEC 61557-8 5 at 1010 s Response delay t_{on} 099 s	1 kΩ off)* Other off)* Operating mode Continuous operation off)* Mounting Cooling slots must be ventilated vertically begree of protection, built-in components (DIN EN 60529) IP30 begree 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 weight ≤ 150 g ()*= Factory setting
Hysteresis R_{an} 25 %, at least Undervoltage detection U 10499 V Overvoltage detection U 11500 V Operating uncertainty U ± 5 %, at least Frequency dependent operating uncertainty ≥ 400 Hz -0.015 Hysteresis U 5 %, at least Time response Response time t_{an} at R_F = 0.5 x R_{an} and C_F =1 μF acc. to IEC 61557-8 2 Start-up delay t 010 s Response delay t_{on} 099 s Delay on release t_{off} 099 s	1 kΩ off)* Other off)* Operating mode Continuous operation off)* Mounting Cooling slots must be ventilated vertically begree of protection, built-in components (DIN EN 60529) IP30 begree 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 weight ≤ 150 g ()*= Factory setting
Hysteresis R_{an} 25 %, at least Undervoltage detection U 10499 V Overvoltage detection U 11500 V Operating uncertainty U ± 5 %, at least Frequency dependent operating uncertainty ≥ 400 Hz -0.015 Hysteresis U 5 %, at least Time response Response time t_{an} at R_F = 0.5 x R_{an} and C_e =1 μF acc. to IEC 61557-8 2 Start-up delay t 010 s Response delay t_{on} 099 s Delay on release t_{off} 099 s	t kΩ off) kΩ off)* Operating mode Continuous operation off)* Mounting Cooling slots must be ventilated vertically begree of protection, built-in components (DIN EN 60529) IP30 begree 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 Weight ≤ 150 g ()* = Factory setting
Hysteresis R_{an} 25 %, at least Undervoltage detection U 10499 V Overvoltage detection U 11500 V Operating uncertainty U ± 5 %, at least Frequency dependent operating uncertainty ≥ 400 Hz -0.015 Hysteresis U 5 %, at least Time response Response time t_{an} at R_F = 0.5 x R_{an} and C_e =1 μF acc. to IEC 61557-8 2 Start-up delay t 010 s Response delay t_{on} 099 s Delay on release t_{off} 099 s	t kΩ off) kΩ off)* Operating mode Continuous operation off)* Mounting Cooling slots must be ventilated vertically begree of protection, built-in components (DIN EN 60529) IP3C begree of protection, terminals (DIN EN 60529) IP2C Enclosure material Polycarbonate DIN rail mounting acc. to IEC 60715 Screw fixing 2 x M4 with mounting clip Weight ≤ 150 g ()* = Factory setting
Hysteresis R_{an} 25 %, at least Undervoltage detection U 10499 V Overvoltage detection U 11500 V Operating uncertainty U ± 5 %, at least Frequency dependent operating uncertainty ≥ 400 Hz -0.015 Hysteresis U 5 %, at least Time response Response time t_{an} at R_F = 0.5 × R_{an} and C_e =1 μF acc. to IEC 61557-8 2 Start-up delay t 010 s Response delay t_{on} 099 s Delay on release t_{off} 099 s Displays, memory Display LC display, multi-functional, not illuming the sponse of the sponse	1 kΩ off) kΩ off)* Operating mode Continuous operation off)* Mounting Cooling slots must be ventilated vertically begree of protection, built-in components (DIN EN 60529) IP30 begree 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 Weight ≤ 150 g ()* = Factory setting
Hysteresis R_{an} 25 %, at least Undervoltage detection U 10 499 V Overvoltage detection U 11 500 V Operating uncertainty U ± 5 %, at least Frequency dependent operating uncertainty ≥ 400 Hz -0.015 Hysteresis U 5 %, at least Frequency dependent operating uncertainty ≥ 400 Hz -0.015 Hysteresis U 5 %, at least Frequency dependent operating uncertainty ≥ 400 Hz -0.015 Hysteresis U 5 %, at least Frequency dependent operating uncertainty ≥ 400 Hz -0.015 Hysteresis U 5 %, at least U 5 %, at least Frequency dependent operating uncertainty ≥ 400 Hz -0.015 Hysteresis U 5 %, at least U 5 %, at least Frequency dependent operating uncertainty ≥ 400 Hz -0.015 Hysteresis U 5 %, at least U 6 %, at least Prequency dependent operating uncertainty U 6 %, at least Prequency dependent operating uncertainty U 6 %, at least Prequency dependent operating uncertainty U 6 %, at least Prequency dependent operating uncertainty U 6 %, at least Prequency dependent operating uncertainty U 6 %, at least Prequency dependent operating uncertainty U 6 %, at least Prequency dependent operating uncertainty U 6 %, at least Prequency dependent operating uncertainty U 6 %, at least Prequency dependent operating uncertainty U 6 %, at least Prequency dependent operating uncertainty U 6 %, at least Prequency dependent operating uncertainty U 6 %, at least Prequency dependent operating uncertainty U 6 %, at least Prequency U 6 %, at least Prequency dependent operating uncertainty U 6 %, at least Prequency dependent U 6 %, at least Prequency dependent U 7 %, at least Prequency dependent U 7 %, at least Prequency dependent U 7 %, at least Prequency dependent U 8 %, at least Prequency U 8 %, at least Prequency U 8	1 kΩ off) kΩ off)* Operating mode Continuous operation 0ff)* Mounting Cooling slots must be ventilated vertically ½ 5 V b/HZ Degree of protection, built-in components (DIN EN 60529) IP30 №/HZ 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 Weight ≤ 150 g ()* = Factory setting
Hysteresis R_{an} 25 %, at least Undervoltage detection U 10499 VOvervoltage detection U 11500 VOperating uncertainty U ± 5 %, at least Frequency dependent operating uncertainty ≥ 400 Hz-0.015 Hysteresis U Time responseResponse time t_{an} at R_F = 0.5 × R_{an} and C_e =1 μF acc. to IEC 61557-82Start-up delay t 010 sResponse delay t_{on} 099 sDelay on release t_{off} 099 sDisplays, memoryDisplay range measured value insulation resistance (R_F) 1 kΩOperating uncertainty± 15 %, at least	1 kΩ off) kΩ off)* Other 0off)* Operating mode Continuous operation Mounting Cooling slots must be ventilated vertically Degree of protection, built-in components (DIN EN 60529) IP3C Degree of protection, terminals (DIN EN 60529) IP2C Enclosure material Polycarbonate DIN rail mounting acc. to IEC 60715 Screw fixing 2 x M4 with mounting clip Weight ≤ 150 g ()* = Factory setting
Hysteresis R_{an} 25 %, at least Undervoltage detection U 10499 V Overvoltage detection U 11500 V Operating uncertainty U ± 5 %, at least Frequency dependent operating uncertainty ≥ 400 Hz -0.015 Hysteresis U 5 %, at least Frequency dependent operating uncertainty ≥ 400 Hz -0.015 Hysteresis U 5 %, at least Time response Response time t_{an} at R_F = 0.5 x R_{an} and C_F = 1 μF acc. to IEC 61557-8 25tart-up delay t 010 s Response delay t_{on} 099 s Delay on release t_{off} 099 s Delay on release t_{off} 099 s Delay on release t_{off} 190 s ICC display, multi-functional, not illumin Display range measured value insulation resistance (R_F) 1 kΩ4 Operating uncertainty ± 15 %, at least ± Display range measured nominal system voltage value (U_n) 0500 V	1 kΩ off) kΩ off)* Other 0 perating mode Continuous operation Mounting Cooling slots must be ventilated vertically begree 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 fixing 2 x M4 with mounting clip Weight ≤ 150 g ()* = Factory setting
Hysteresis R_{an} 25 %, at least Undervoltage detection U 10 499 V Overvoltage detection U 11 500 V Operating uncertainty U ± 5 %, at least Frequency dependent operating uncertainty ≥ 400 Hz -0.015 Hysteresis U 5 %, at least Frequency dependent operating uncertainty ≥ 400 Hz -0.015 Hysteresis U 5 %, at least Frequency dependent operating uncertainty ≥ 400 Hz -0.015 Hysteresis U 5 %, at least Frequency dependent operating uncertainty ≥ 400 Hz -0.015 Hysteresis U 5 %, at least Frequency dependent operating uncertainty U 5 %, at least ± 0.0.10 s Sesponse time t_{an} at R_F = 0.5 x R_{an} and C_e =1 μF acc. to IEC 61557-8 2 Start-up delay t 010 s Response delay t_{on} 099 s Delay on release t_{off} 099 s Delay on release t_{off} 099 s Delay on release t_{off} 099 s Delay necessary U 1 LC display, multi-functional, not illuming Display range measured value insulation resistance U 1 LS U 1 LS U 2 LS U 2 LS U 3 LS U 3 LS U 3 LS U 4 LS U 4 LS U 4 LS U 4 LS U 5 %, at least ± Display range measured nominal system voltage value U 1 D 0500 V 0 operating uncertainty U ± 5 %, at least ± 5 %, at least U 1 Hz U 2 Hz U 3 Hz U 3 Hz U 4 Hz U 5 %, at least U 1 Hz U 3 Hz U 4 Hz U 5 %, at least U 1 Hz U 3 Hz U 4 Hz U 5 %, at least U 1 Hz U 1 Hz U 2 Hz U 3 Hz U 3 Hz U 4 Hz U 5 %, at least U 1 Hz U 1 Hz U 2 Hz U 3 Hz U 3 Hz U 4 Hz U 5 %, at least U 1 Hz U 3 Hz U 4 Hz U 5 %, at least U 1 Hz U 4 Hz U 5 %, at least U 1 Hz U 4 Hz U 5 %, at least U 1 Hz U 4 Hz U 5 %, at least U 1 Hz U 4 Hz U 5 %, at least U 1 Hz	t kΩ off)* Other 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) IP20 Enclosure material Polycarbonate DIN rail mounting acc. to IEC 60715 Screw fixing 2 x M4 with mounting clip Weight ≤ 150 g ()* = Factory setting
Hysteresis R_{an} 25 %, at least Undervoltage detection U 10	t kΩ off)* Other 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) IP20 Enclosure material Polycarbonate DIN rail mounting acc. to IEC 60715 Screw fixing 2 x M4 with mounting clip Weight ≤ 150 g ()* = Factory setting
Hysteresis R_{an} 25 %, at least Undervoltage detection U 10 499 V Overvoltage detection U 11 500 V Operating uncertainty U ± 5 %, at least Frequency dependent operating uncertainty ≥ 400 Hz -0.015 Hysteresis U 5 %, at least Frequency dependent operating uncertainty ≥ 400 Hz -0.015 Hysteresis U 5 %, at least U 6 U 7 U 8 U 8 U 9	1 kΩ off)* (off)* Other 0 perating 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) IP20 Enclosure material Polycarbonate DIN rail mounting acc. to Screw fixing Screw fixing 2 x M4 with mounting clip Weight ≤ 150 g 0 s)** ()* = Factory setting
Hysteresis R_{an} 25 %, at least Undervoltage detection U 10	1 kΩ off)* Operating mode Continuous operation off)* begin by Degree of protection, built-in components (DIN EN 60529) Degree of protection, terminals (DIN EN 60529) Degree of

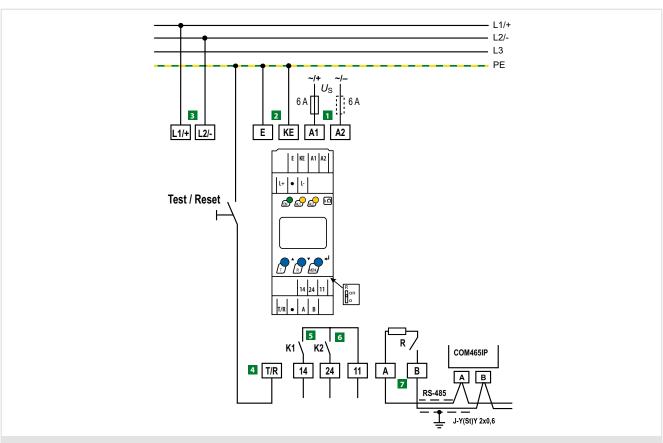
on/(off)*



Fault memory alarm message



Wiring diagram



- 1 A1, A2 Connection to the supply voltage via a fuse. If supplied from an IT system, both lines have to be protected by a fuse.*
 - Connect each terminal separately to PE:
 - The same wire cross section as for A1, A2 is to be used.
- 3 L1/+, L2/- Connection to the AC or DC system to be monitored.
- 4 T/R Connection for external combined test and reset button.
- 5 11, 14 Connection to alarm relay K1

2 E, KE

- 6 11, 24 Connection to alarm relay K2
- 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.

$\textbf{ISOMETER}^{\texttt{@}}~\textbf{isoHV425}...~\textbf{with coupling device AGH422}$

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 feature

- Monitoring the insulation resistance for unearthed AC/DC systems
- Measurement of the system voltage (true r.m.s.) with undervoltage and overvoltage detection
- Measurement of DC system voltages to earth (L1+/PE and L2-/PE)
- Automatic adaptation to the system leakage capacitance up to 150 μF
- Selectable start-up delay, response delay and delay on release
- Two separately adjustable response value ranges of 10...500 kΩ (Alarm 1, Alarm 2)
- 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
- 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
- Modbus RTL
- IsoData (for continuous data output)

isoHV425-D4M-4

• 0(4)...20 mA, 0...400 μA, 0...10 V 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

Further information

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

Ordering information

Supply v	oltage <i>U</i> s	Nominal voltage <i>U</i> n				No.
AC	DC	AC-, 3(N)AC, DC	Version	Туре	Screw-type terminal	Push-wire terminal
			Carrial intentant	isoHV425-D4-4 with AGH422	B91036501S	B71036501
100240 V,	24 2401/	0 10001/	Serial interface	isoHV425W-D4-4 with AGH422W	B91036501W	B71036501W
4763 Hz	24240 V	01000 V		isoHV425-D4M-4 with AGH422	-	B71036503
			Analogue output	isoHV425W-D4M-4 with AGH422W	B91036503W	B71036503W

Accessories

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



Insulation coordination acc. to IEC 60664-1/IEC 60664-3	Analogue output (valid for isoHV425-D4M-4 only)
Definitions:	Operating mode mid-scale R or full-scale $U(R = 120 \text{ k}\Omega)^*$
Supply circuit (IC2) A1, A2	Functions insulation value R_F or mains voltage U_n (R_F)*
Output circuit (IC3) 11, 14, 24	Max. no load voltage (open terminals) DC 12 V
Control circuit (IC4) Up, KE, T/R, A, B, AK1, GND, AK2, M+, M-	Max. short-circuit current 25 mA short-circuit proof
Rated voltage 240 V	Voltage output $DC 010 \text{ V, load} \ge 20 \text{ k}\Omega^*$
Overvoltage category III	Current output $DC 0/420 \text{ mA, load} \leq 130 \Omega$
Rated impulse voltage:	Current output $DC 0400 \mu\text{A}, \text{load} \leq 3 \text{k}\Omega$
IC2/(IC3-4) 4 kV	
IC 3/IC4 4 kV	Switching elements
Rated insulation voltage:	Switching elements 2 x 1 N/O contact, common terminal 11
IC2/(IC3-4) 250 V	Operating principle N/C operation/N/O operation (N/C operation)*
IC 3/IC4 250 V	Electrical endurance under rated operating conditions, number of cycles 10,000
Pollution degree 3	Contact data acc. to IEC 60947-5-1:
Protective separation (reinforced insulation) between:	Utilisation category AC-12 AC-14 DC-12 DC-12 DC-12
IC2/(IC3-4) overvoltage category III, 300 V	Rated operational voltage 230 V 230 V 24 V 110 V 220 V
IC 3/IC4 overvoltage category III, 300 V	Rated operational current 5 A 2 A 1 A 0.2 A 0.1 A
Voltage tests (routine test) acc. to IEC 61010-1:	Minimum contact rating 1 mA at AC/DC \geq 10 V
IC2/(IC3-4) AC 2.2 kV	F :
IC 3/IC4 AC 2.2 kV	Environment/EMC
	EMC IEC 61326-2-4, EN 50121-3-2
Supply voltage	Ambient temperatures:
Supply voltage U_s AC 100240 V/DC 24240 V	Operation -40+70 °C
Tolerance of $U_{\rm S}$ $-30+15\%$	Transport -40+85 ℃
Frequency range U_s 4763 Hz	Storage -40+70 ℃
Power consumption $\leq 3 \text{ W}, \leq 9 \text{ VA}$	Classification of climatic conditions acc. to IEC 60721:
IT system being monitored	Stationary use (IEC 60721-3-3) Stationary use (IEC 60721-3-3) 3K23 (except condensation and formation of ice)
Nominal system voltage U_0 with AGH422 AC 01000 V/DC 01000 V	for W variant 3K24
Tolerance of $U_{\rm n}$ AC +10 %, DC +10 %	Transport (IEC 60721-3-2) 2K11 (except condensation and formation of ice)
Nominal system voltage range U_n (UL508) AC/DC 0600 V	Long-term storage (IEC 60721-3-1) 1K22 (except condensation and formation of ice)
Frequency range of <i>U</i> _n DC, 15460 Hz	
11 Equation 1 and	Classification of mechanical conditions acc. to IEC 60721:
Measuring circuit	Stationary use (IEC 60721-3-3) 3M11
Permissible system leakage capacitance C_e $\leq 150 \mu\text{F}$	for W variant 3M12
Permissible extraneous DC voltage U_{fq} \leq 1600 V	Transport (IEC 60721-3-2) 2M4
· •	Long-term storage (IEC 60721-3-1) 1M12
Response values	Connection
Response value R_{an1} 11500 k Ω (50 k Ω)*	Connection type screw-type terminal or push-wire terminal
Response value R_{an2} 10490 k Ω (25 k Ω)*	Screw-type terminals:
Relative uncertainty $R_{\rm an}$ ± 15 %, at least ± 3 k Ω	Nominal current ≤10 A
Hysteresis R_{an} 25 %, at least 1 k Ω	Tightening torque 0.50.6 Nm (57 lb-in)
Undervoltage detection 301.09 kV (off)*	Conductor sizes AWG 2412
Overvoltage detection 311.10 kV (off)*	Stripping length 8 mm
Relative uncertainty U $\pm 5\%$, at least ± 5 V	Rigid/flexible 0.22.5 mm ²
Relative uncertainty depending on the frequency \geq 200 Hz -0.075 %/Hz	Flexible with ferrules with/without plastic sleeve 0.252.5 mm ²
Hysteresis <i>U</i> 5 %, at least 5 V	Multi-conductor
Time response	rigid /flexible 0.21.5 mm ²
Response time t_{an} at $R_F = 0.5$ x R_{an} and $C_e = 1$ μ F acc. to IEC 61557-8 ≤ 20 s	flexible with ferrules without plastic sleeve 0.251.5 mm ²
Start-up delay t 010 s (0 s)*	flexible with TWIN ferrules with plastic sleeve 0.51.5 mm ²
Response delay t _{on} 099 s (0 s)*	·
Delay on release t_{off} 099 s (0 s)*	Push-wire terminals:
	Nominal current ≤10 A
Displays, memory	Conductor sizes AWG 2414
Display LC display, multi-functional, not illuminated	Stripping length 10 mm Riqid 0.22.5 mm ²
Display range measured value insulation resistance (R_F) 1 k $\Omega 4$ M Ω	Rigid 0.22.5 mm ² Flexible without ferrules 0.752.5 mm ²
Operating uncertainty ± 15 %, at least ± 3 k Ω	
Display range measured value nominal system voltage (U_n) 301.15 kV _{RMS}	Flexible with ferrules with/without plastic sleeve 0.252.5 mm ² Multi-conductor flexible with TWIN ferrules with plastic sleeve 0.51.5 mm ²
Operating uncertainty ± 5 %, at least ± 5 V	Opening force 50 N
Display range measured value system leakage capacitance for $R_F > 20 \text{ k}\Omega$ 0200 μF	Test opening, diameter 2.1 mm
Operating uncertainty ± 15 %, at least ± 2 μF	rest opening, diameter 2.1 min
Password off/0999 (0, off)*	Other
Fault memory alarm messages on/(off)*	Operating mode continuous operation
Interface (valid for isoHV425-D4-4 only)	Mounting cooling slots must be ventilated vertically
	Minimum horizontal distance between the devices (DIN EN 45545) see note **
Interface/protocol RS-485/BMS, Modbus RTU, isoData (BMS)* Raud rate PMS (0.6 kbit/s) Modbus RTU (colortable) isoData (115.2 kbit/s)	Degree of protection, built-in components (DIN EN 60529) IP30
Baud rate BMS (9.6 kbit/s), Modbus RTU (selectable), isoData (115.2 kbits/s)	Degree of protection, terminals (DIN EN 60529) IP20
Cable length (9.6 kbits/s) ≤ 1200 m Cable: twisted pairs chield connected to PE on one cide min. L V(St)V 2v0.6	Enclosure material polycarbonate
Cable: twisted pairs, shield connected to PE on one side min. J-Y(St)Y 2x0.6	DIN rail mounting acc. to IEC 60715
Terminating resistor 120 Ω (0.25 W), internal, can be connected	Screw mounting 2 x M4 with mounting clip
Device address, BMS bus, Modbus RTU 390 (3)*	Documentation number D00082
	Weight ≤ 150 g
	()* = Factory setting

()* = Factory setting



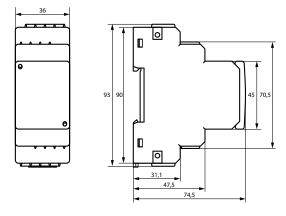
rechnical data coupling de	VICE AGR422
Insulation coordination acc. to IEC 600	664-1/IEC 60664-3
Definitions:	
Measuring circuit (IC1)	L1/+, L2/-
Control circuit (IC2)	AK1, GND, AK2, Up, E
Rated voltage	1000 V
Overvoltage category	III
Rated impulse voltage:	
IC1/IC2	8 kV
Rated insulation voltage:	
IC1/IC2	1000 V
Pollution degree	3
Protective separation (reinforced insulation	n) between:
IC1/IC2	Overvoltage category III, 1000 V
IT system being monitored	
Nominal system voltage range U_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 _m for R _F	 ≤ 120 μA
Internal resistance R _i	≥ 390 kΩ
Environment/EMC	
EMC	IEC 61326-2-4, EN 50121-3-2
Ambient temperatures:	, , , , , , , , , , , , , , , , , , , ,
Operation	
$U_0 < 700$	-40+70 °C
$U_0 > 700$	-40+55 °C
Transport	-40+85 °C
Storage	-40+70 °C
Classification of climatic conditions ac	cc. to IEC 60721:
Stationary use (IEC 60721-3-3)	3K23 (except condensation and formation of ice)
for W variant	3K24
Transport (IEC 60721-3-2)	2K11 (except condensation and formation of ice)
Long-term storage (IEC 60721-3-1)	1K22 (except condensation and formation of ice)
Classification of mechanical condition	s acc. to IEC 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

Connection	
Connection type	screw-type terminal or push-wire terminal
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	0.5 1.5 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 0.51.5 mm ²
Opening force	50 N
Test opening, diameter	2.1 mm
Single cables for terminals Up, AK1, GND, AK2 – Requirement for connecting cables between isoH\	
Cable length	≤ 0.5 m
Wire cross-section	$\geq 0.75 \text{ mm}^2$
Other	
Operating mode	continuous operation
Mounting	cooling slots must be ventilated vertically
Distance to adjacent devices from $U_{\rm n}$ $>$ 800 V	≥ 30 mm
Minimum horizontal distance between the devices (DIN	EN 45545) see note *
Degree of protection, built-in components (DIN EN 60529	9) 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

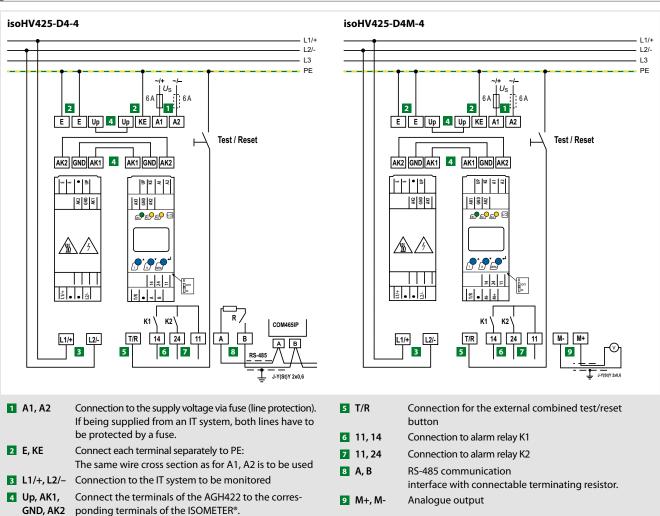
** Application in rail vehicles / DIN EN 45545-2:2016! If the distance to neighbouring components that do not meet the requirements of the DIN EN 45545-2 Table 2 standard is < 20 mm horizontally or < 200 mm vertically, these are to be regarded as grouped. See DIN EN 45545-2 Chapter 4.3 Grouping rules.

Weight

Dimension diagram (dimensions in mm)



150 g



ISOMETER® IR155-3203/IR155-3204







Typical applications

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

Approvals

C € 2 ER[



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 μ 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 $(M_{HS}/M_{LS} \text{ output})$
- Protective coating (SL 1301ECO-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

Parameters	Response value R _{an}	F _{ave}	Undervoltage detection	Measured value output	Туре	Art. No.
Cambinuscualusabusalus	100 1-0	10	300 V	Low-side	IR155-3203	B91068138V4
Continuously set value $100 \text{ k}\Omega$	10	0 V (inactive)	High-side	IR155-3204	B91068139V4	
Customon on a life a attimu	100 kΩ…1 MΩ	1 10	0.7 500.7	Low-side	IR155-3203	B91068138CV4
Customer-specific setting		110	0 V500 V	High-side	IR155-3204	B91068139CV4

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

Insulation coordination acc. to IEC 60664-1

Protective separation (reinforced insulation)

	between (L+/L-) — (KI. 31, KI. 15, E, KE, M _{HS} , M _{LS} , OK _{HS})
Voltage test	AC 3500 V/1 min

Suppl	v/IT s	vstem l	beina	monitored

Supply voltage $U_{\rm S}$	DC 1036 V
Max. operating current Is	150 mA
Max. current /k	2 A
	6 A/2 ms inrush current
HV voltage range (L+/L-) $U_{\rm n}$	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 MΩ
Undervoltage detection	0500 V

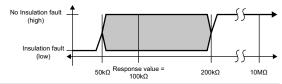
Measuring range

Measuring range	010 MΩ
Undervoltage detection	0500 V default setting: 0 V (inactive)
Relative uncertainty	
$SST (\leq 2 s)$	$good > 2* R_{an}$; 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 $U_{\rm n} \ge 100 \, \text{V} \implies \pm 10 \, \text{\%}$; at $U_{\rm n} \ge 300 \, \text{V} \implies \pm 5 \, \text{\%}$

Relative uncertainty (SST) "Good condition" \geq 2* $R_{\rm an}$ "Bad condition" \leq 0.5* $R_{\rm an}$



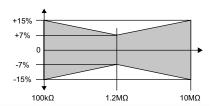
Relative uncertainty DCP

100 kΩ...10 MΩ ±15 %

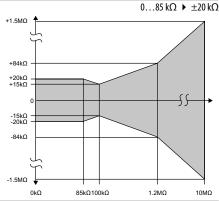
100 k Ω ...1.2 M Ω \blacktriangleright ±15 % to ±7 %

1.2 MΩ ▶ ±7 %

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



Absolute uncertainty



Time response

	Response time t_{an} (OK _{HS} ; SST)	$t_{an} \le 2 \text{ s (typ.} < 1 \text{ s at } U_n > 100 \text{ V})$
)	Response time t _{an} (OK _{HS} ; DCP)	
1	(when changing over from $R_F = 10 \text{ M}\Omega$ to R_{an} /	2; at $C_e = 1 \mu F$; $U_n = DC 1000 V$)

over from $\kappa_{\rm F} = 10$ ML2 to $\kappa_{\rm an}/2$; at $C_{\rm e} = 1$ µr; $U_{\rm n} = {\rm DC} \ 1000 \ {\rm V})$ $t_{\rm an} \leq 17.5 \ {\rm cat} \ F_{\rm ave} = 9)$ $t_{\rm an} \leq 17.5 \ {\rm cat} \ F_{\rm ave} = 8)$ $t_{\rm an} \leq 15 \ {\rm S} \ {\rm cat} \ F_{\rm ave} = 7)$ $t_{\rm an} \leq 12.5 \ {\rm cat} \ F_{\rm ave} = 6)$ $t_{\rm an} \leq 12.5 \ {\rm cat} \ F_{\rm ave} = 5)$ $t_{\rm an} \leq 10 \ {\rm S} \ {\rm cat} \ F_{\rm ave} = 4)$ $t_{\rm an} \leq 7.5 \ {\rm cat} \ F_{\rm ave} = 3)$ $t_{\rm an} \leq 7.5 \ {\rm cat} \ F_{\rm ave} = 2)$

Switch-off time t_{ab} (OK_{HS}; DCP)

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

 $t_{ab} \le 40 \text{ s } (at F_{ave} = 9)$ $t_{ab} \le 33 \text{ s } (at F_{ave} = 8)$ $t_{ab} \le 33 \text{ s } (at F_{ave} = 7)$ $t_{ab} \le 33 \text{ s } (at F_{ave} = 6)$ $t_{ab} \le 26 \text{ s } (at F_{ave} = 5)$ $t_{ab} \le 26 \text{ s } (at F_{ave} = 4)$

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

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

 $t_{ab} \le 26 \text{ s (at } F_{ave} = 3)$ $t_{ab} \le 20 \text{ s (at } F_{ave} = 2)$

 $t_{ab} \le 20 \text{ s (at } F_{ave} = 1)$ during a self test $t_{ab} + 10 \text{ s}$

Duration of the self test 10 s (every five minutes; should be added to t_{an}/t_{ab})

Measuring circuit

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

 $t_{an} = 68$ s when changing over from $R_E = 1$ MO to $R_{an}/2$)

	raii	oo 5 when changing over nom // 1 maz to //aii/ 2/
Measuring voltage U _M		±40 V
Measuring current I_{M} at $R_{F} = 0$		±33 μA
Impedance Zi at 50 Hz		≥ 1.2 MΩ
Internal DC resistance R _i		≥ 1.2 MΩ

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 Ω

0 Hz ► Hi > short circuit to U_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 $0\dots 500 \ V$

(Bender configurable)

30 Hz ➤ Speed start measurement Insulation measurement (only good/bad evaluation) starts directly after power on ≤ 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 (KI. 31) PWM 47.5...52.5 %

^{*} $F_{ave} = 10$ is recommended for electric and hybrid vehicles

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

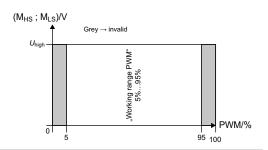
Operating principle PWM driver

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

Duty cycle 5 % = > 50 M Ω (∞) Duty cycle 50 % = 1200 k Ω Duty cycle 95 % = 0 k Ω

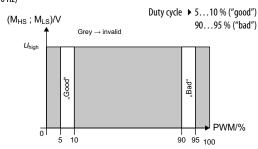
$$R_{\rm F} = \frac{90 \% \text{ x } 1200 \text{ k}\Omega}{dc_{\rm mass} - 5\%}$$
 -1200 k Ω

dcmeas = measured duty cycle (5 %...95 %)



Operating principle PWM driver

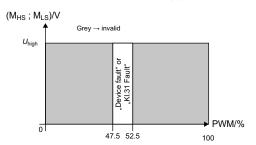
· Condition "SST" (30 Hz)



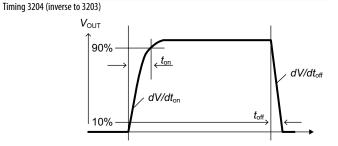
Operating principle PWM driver

• 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



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 kV
Contact discharge — indirectly to environment	≤ 25 kV
Air discharge — handling of the PCB	≤ 6 kV

Co			

On-board connectors	TYCO-MICRO MATE-N-LOK
	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

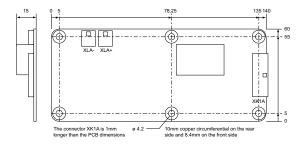
Necessary crimp tongs (TYCO)	91501-1
Operating mode/mounting	continuous operation/any position
Temperature range	-40+105 ℃
Voltage failure	≤ 2 ms
Flammability class acc. to	UL 94 V-0

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.

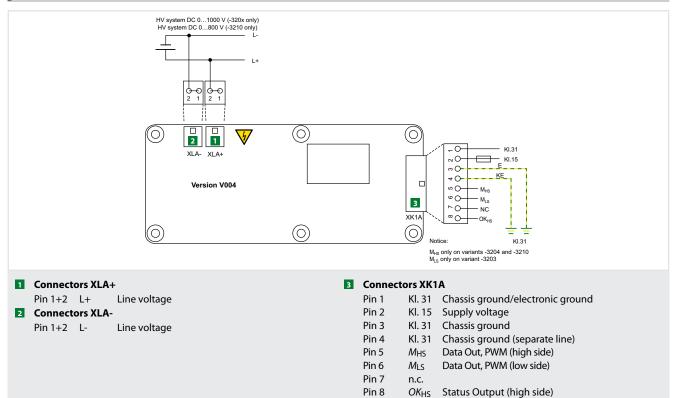
Mounting and connector kits are not included in delivery, but are available as accessories. The maximum diameter of the mounting points is 10 mm.

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).

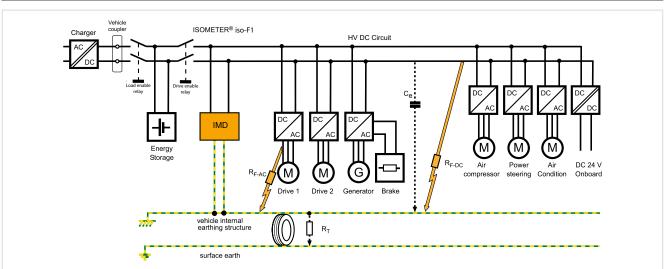
Deflection	max. 1 % of the length or width of the PCB
Coating	thick-film lacquer
Documentation number	D00115
Weight	52 a ±2 a



Wiring diagram



Example of application



ISOMETER® isoEV425 with coupling device AGH420

Insulation monitoring device for unearthed DC circuits (IT systems) for charging electric vehicles





Typical applications

• DC charging stations for electric vehicles according to IEC 61851-23

Approvals







Device features

- Monitoring for DC charging stations (mode 4 according to IEC 61851-23) for charging electric vehicles
- Mains voltage measurement (r.m.s.) with under-/overvoltage detection
- DC voltage measurement to earth (L+/PE and L-/PE)
- Automatic adaptation to the system leakage capacitance up to 5 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...500kΩ (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
- IsoData (for continuous data output)
- Password protection to prevent unauthorised parameter changes

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

Supply voltage $U_{\rm S}$ System leakage capacitance $C_{ m e}$		Type .	Art. No.		
AC	DC	System reakage tapacitance te	17/2-	Screw-type terminal	Push-wire terminal
100240 V, 4763 Hz 24240 V	≤ 5 µF	isoEV425-D4-4 with AGH420	B91036401	B71036401	
	24240 V	≤ 20 µF	isoEV425HC-D4-4 with AGH420	-	B71036397

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



Insulation coordination acc. to IEC 60664-1/IEC 60664-3 Definitions: Supply circuit (IC2)	Cable length (9.6 kbits/s) \leq 1200 m Cable: twisted pairs, shield connected to PE on one side min. J-Y(St)Y 2x0.6 Terminating resistor 120 Ω (0,25 W), internal, can be connected Device address, BMS bus, Modbus RTU 390 (3)* Switching elements
Supply circuit (IC2) Output circuit (IC3) Control circuit (IC4) Rated voltage Overvoltage category Rated impulse voltage: IC2/(IC3-4) IC 3/(IC4) Rated insulated voltage:	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 connected to PE on one side min. J-Y(St)Y 2x0.6 Terminating resistor 120 Ω (0,25 W), internal, can be connected Device address, BMS bus, Modbus RTU 390 (3)* Switching elements
Output circuit (IC3) 11, 14, 2- Control circuit (IC4) Up, KE, T/R, A, B, AK1, GND, AK Rated voltage 240 Overvoltage category III Rated impulse voltage: IC2/(IC3-4) 4 k1 IC 3/(IC4) 4 k1 Rated insulated voltage:	Cable length (9.6 kbits/s) \leq 1200 m Cable: twisted pairs, shield connected to PE on one side min. J-Y(5t)Y 2x0.6 Terminating resistor 120 Ω (0,25 W), internal, can be connected Device address, BMS bus, Modbus RTU 390 (3)* Switching elements
Control circuit (IC4) Rated voltage Overvoltage category Rated impulse voltage: IC2/(IC3-4) IC 3/(IC4) Rated insulated voltage:	Cable: twisted pairs, shield connected to PE on one side min. J-Y(St)Y 2x0.6 Terminating resistor 120 Ω (0,25 W), internal, can be connected Device address, BMS bus, Modbus RTU 390 (3)* Switching elements
Rated voltage 240 °C Overvoltage category III Rated impulse voltage: IC2/(IC3-4) IC 3/(IC4) 4 k² Rated insulated voltage: 4 k²	Terminating resistor Device address, BMS bus, Modbus RTU Switching elements 120 Ω (0,25 W), internal, can be connected 390 (3)*
Overvoltage category Rated impulse voltage: IC2/(IC3-4) 4 k' IC 3/(IC4) 4 k' Rated insulated voltage:	Device address, BMS bus, Modbus RTU 390 (3)* Switching elements
Rated impulse voltage: IC2/(IC3-4) 4 k¹ IC 3/(IC4) 4 k¹ Rated insulated voltage:	Switching elements
IC2/(IC3-4) 4 k ¹ IC 3/(IC4) 4 k ¹ Rated insulated voltage:	C. it him allowed a second and a second a second and a second a second and a second a second and
IC 3/(IC4) 4 k ¹ Rated insulated voltage:	C. it him allowed a second and a second a second and a second a second and a second a second and
Rated insulated voltage:	
•	Operating principle N/C operation/N/O operation (N/O operation)*
	Floatrical and common number of scales
IC2/(IC3-4) 250 ¹ IC 3/(IC4) 250 ¹	
Polution degree	
Protective separation (reinforced insulation) between:	Rated operational voltage 230 V 230 V 24 V 110 V 220 V
IC2/(IC3-4) Overvoltage category III, 300 ¹	
IC 3/(IC4) Overvoltage category III, 300 ¹	
Voltage test (routine test) according to IEC 61010-1:	Till at NG DC 2 10 V
IC2/(IC3-4) AC 2.2 k	Environment/EMC
IC 3/(IC4) AC 2.2 k	FMC IFC (133)(3.4)
	Ambient temperatures:
Supply voltage	Operation -40+70 °C
Supply voltage U_s AC 100240 V/DC 24240 V	Transport -40+85°C
Tolerance of U_s $-30+15$ 9	Storage -40 +70°C
Frequency range $U_{\rm S}$ 4763 H	Classification of climatic conditions are to IEC 60721
Power consumption $\leq 3 \text{ W}, \leq 9 \text{ V}$	Stationary use (IEC 60721-3-3) 3K24 (except condensation and formation of ice)
IT system being monitored	Transport (IEC 60721-3-2) 2K11 (except condensation and formation of ice)
Nominal system voltage U_0 with AGH420 3(N)AC, AC 0690 V/DC 01000 N	
Tolerance of $U_{\rm n}$ AC +15 %, DC +10 %	
Nominal system voltage range U_n with AGH420 (UL508) AC/DC 0600 Nominal system voltage range U_n with AGH420 (UL508)	Classification of mechanical conditions acc. to 12c 00721
Frequency range of <i>U</i> _n DC, 40460 H	Stationary ase (IEC 60721 3 3)
Trequency runge of on	Turisport (IEC 00721 3 2)
Measuring circuit	Long-term storage (IEC 60721-3-1) 1M12
Permissible system leakage capacitance $C_{\rm e}$	Connection
isoEV425 \leq 5 μ	Connection type screw-type terminal or push-wire terminal
isoEV425HC \leq 20 μ	
Permissible extraneous DC voltage U_{fg} $\leq 1150^{\circ}$	
Response values	Nominal current ≤10 A
Response value R _{an1}	Tightening torque 0.50.6 Nm (57 lb-in)
isoEV425 2500 kΩ (500 kΩ)	Conductor sizes AWG 2412
isoEV425HC 2500 kΩ (200 kΩ)	Stripping length 6 min
Response value R_{an2} 1490 k Ω (100 k Ω)	KIGIO/HEXIDIE U.ZZ.5 MM ⁻
Operating uncertainty R_{an} (\leq 5 μ F) \pm 15 %, at least \pm 1 kC	Flexible with terrilles with/without plastic sleeve (1.75 - 7.5 mm²
Operating uncertainty $R_{an} > 100 \text{ k}\Omega$ ($\leq 5 \mu\text{F}$, isoEV425HC) $\pm (5 \% * R_{an}/100 \text{ k}\Omega + 10\%)$	Multi-conductor
Hysteresis R_{an} 25 %, at least 1 kC	rigid /flovible 0.2.15 mm/
Undervoltage detection 301.14 kV (off)	f it is a factor of the control
Overvoltage detection 311.15 kV (off)	the contract of the contract o
Relative uncertainty $U \pm 5\%$, at least $\pm 5\%$	
Relative uncertainty depending on the frequency ≥ 200 Hz -0.03 %/H	
Hysteresis <i>U</i> 5 %, at least 5	
Time vernence	Stripping length 10 mm
Time response	D:::J 0.2 2.5
Response time t_{an} at $R_F = 0.5$ x R_{an} and $C_e = 1$ µF acc. to IEC 61557-8 ≤ 10	075 25 3
Start-up delay t 010 s (0 s)	
Response delay t _{on} 099 s (0 s)	
Delay on release t_{off} 099 s (0 s)	· · · · · · · · · · · · · · · · · · ·
Displays, memory	Opening force 50 N
Display LC display, multi-functional, not illuminated	Test opening, diameter 2.1 mm Wiring of the terminals Up, AK1, GND, AK2
Display range measured value insulation resistance (R_F) 1 k Ω 1 M Ω	- WITHOUT THE TERMINALS OD, AN I. GIND, ANZ
Operating uncertainty $R_F (\le 5 \mu F)$ $\pm 15 \%$, at least $\pm 1 \text{ kC}$	refer to technical data AGN420 under the heading Connection
Operating uncertainty $R_{\rm F} > 100 \text{ k}\Omega$ ($\leq 5 \mu\text{F}$, isoEV425HC) $\pm (5 \% * R_{\rm F}/100 \text{ k}\Omega + 10\%)$	Other
operating uncertainty $n_1 > 100 \text{ kg 2} (\le 3 \text{ µr, isoev425Hc})$ $\pm (3 \% n_1 / 100 \text{ kg 2} + 10\%)$	Operating mode continuous operation
Display range measured value nominal system voltage (U_n) 301.15 kV r.m.s	
Display range measured value nominal system voltage (U_n) 301.15 kV r.m.s. Operating uncertainty \pm 5 %, at least \pm 5 %	. <u></u>
Display range measured value nominal system voltage ($U_{\rm n}$) 301.15 kV r.m.s	Mounting cooling slots must be ventilated vertically
Display range measured value nominal system voltage ($U_{\rm n}$) 301.15 kV r.m.s Operating uncertainty \pm 5 %, at least \pm 5 % Relative uncertainty depending on the frequency \geq 200 Hz -0.03 %/H Display range measured value system leakage capacitance $R_{\rm F} >$ 10 k Ω	Mounting cooling slots must be ventilated vertically
Display range measured value nominal system voltage (U_n) 301.15 kV r.m.s Operating uncertainty \pm 5 %, at least \pm 5 % Relative uncertainty depending on the frequency \geq 200 Hz -0.03 %/H Display range measured value system leakage capacitance $R_F > 10 \text{ k}\Omega$ isoEV425 010 μ	Mounting cooling slots must be ventilated vertically Degree of protection, built-in components (DIN EN 60529) IP30 Degree of protection, terminals (DIN EN 60529) IP20 Enclosure material polycarbonate
Display range measured value nominal system voltage (U_n) 301.15 kV r.m.s Operating uncertainty \pm 5%, at least \pm 5% Relative uncertainty depending on the frequency \geq 200 Hz -0.03 %/H Display range measured value system leakage capacitance $R_F > 10$ k Ω isoEV425 010 μ isoEV425HC 025 μ	Mounting cooling slots must be ventilated vertically 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
Display range measured value nominal system voltage (U_n) 301.15 kV r.m.s. Operating uncertainty ± 5 %, at least ± 5 \(\) Relative uncertainty depending on the frequency ≥ 200 Hz -0.03 %/H Display range measured value system leakage capacitance $R_F > 10 \text{ kΩ}$ isoEV425 010 μ isoEV425HC 025 μ Operating uncertainty ± 15 %, at least ± 2 μ	Mounting cooling slots must be ventilated vertically 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 fixing 2 x M4 with mounting clip
Display range measured value nominal system voltage (U_n) 301.15 kV r.m.s. Operating uncertainty ± 5 %, at least ± 5 \(\) Relative uncertainty depending on the frequency ≥ 200 Hz -0.03 %/H Display range measured value system leakage capacitance $R_F > 10 \text{ kΩ}$ isoEV425 010 μ isoEV425HC 025 μ Operating uncertainty ± 15 %, at least ± 2 μ Password off/0999 (0, off)	Mounting cooling slots must be ventilated vertically 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 fixing 2 x M4 with mounting clip Documentation number D00126
Display range measured value nominal system voltage (U_n) 301.15 kV r.m.s. Operating uncertainty \pm 5 %, at least \pm 5 % leative uncertainty depending on the frequency \geq 200 Hz \pm 0.03 %/H Display range measured value system leakage capacitance $R_F > 10 \text{ k}\Omega$ isoEV425 \pm 010 \pm isoEV425HC 025 \pm 025 \pm 025 \pm 025 \pm 025 \pm 025 \pm 15 %, at least \pm 2 \pm 16 %, at least \pm 2 \pm 17 %, at least \pm 2 \pm 17 %, at least \pm 2 \pm 18 %, at least \pm 2 \pm 2 \pm 2 \pm 18 %, at least \pm 2 \pm 3 %, at least \pm 2	Mounting cooling slots must be ventilated vertically 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 fixing 2 x M4 with mounting clip Documentation number D00126

Insulation coordination acc. to IEC 60664-1/IEC	60664-3
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 insulated voltage:	
IC1/(IC2)	1000 V
Polution degree	3
Protective separation (reinforced insulation) between	n:
IC1/(IC2)	Overvoltage category III, 1000 V
Monitored IT system	
Nominal system voltage range $U_{\rm n}$	AC/DC 01000 V
Tolerance of $U_{\rm n}$	AC/DC +10 %
Nominal system voltage range <i>U</i> _n (UL508)	AC/DC 0600 V
Measuring circuit	
Measuring voltage $U_{\rm m}$	± 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

Classification of	climatic	conditions acc	to IEC	60721.

Ambient temperatures:

Operation

Transport

Storage

Stationary use (IEC 60721-3-3)	3K24 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K11 (except condensation and formation of ice)
Long-term storage (IEC 60721-3-1)	1K22 (except condensation and formation of ice)

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 screw-type terminal or push-wire terminal

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	0.21.5 mm ²
Multi-conductor flexible	0.21.5 mm ²
Multi-conductor flexible with ferrules without plastic sleeve	0.251.5 mm ²
Multi-conductor flexible with TWIN ferrule with plastic sleeve	0.251.5 mm ²

Push-wire terminals:

Pusn-wire terminais:	
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 plastic sleeve	0.252.5 mm ²
Multi-conductor flexible with TWIN ferrules with plastic sleeve	0.51.5 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	≥ 0.75 mm ²

Other

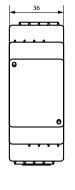
-40...+70 °C

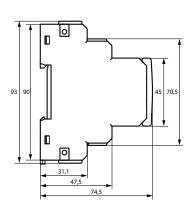
-40...+85 °C

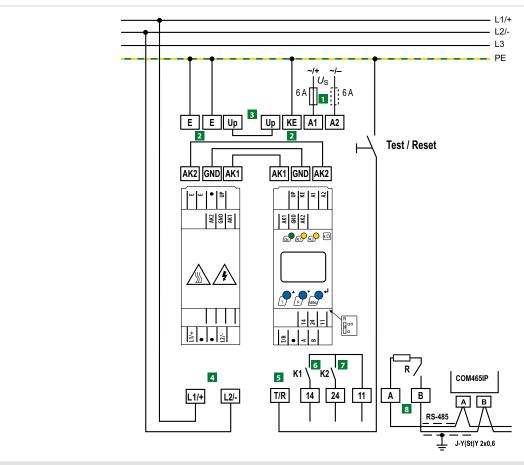
-40...+70 °C

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	P) 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

Dimension diagram (dimensions in mm)





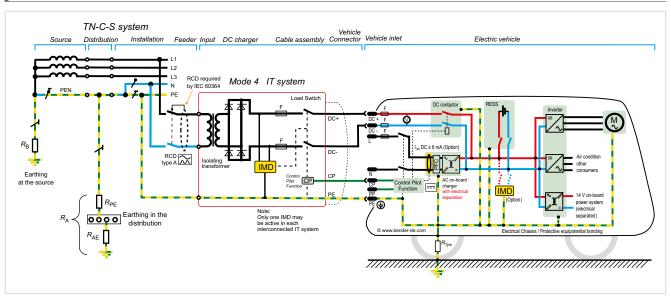


- A1, A2 Connection to the supply voltage via a fuse. If supplied from an IT system, both lines have to be protected by a fuse.*
- **2 E, KE**Connect each terminal separately to PE:
 The same wire cross section as for A1, A2 is to be used.
- **1** L1/+, L2/- Connection to the 3(N)AC, AC or DC system to be monitored.
- Up, AK1, Connect the terminals of the AGH420 to the correspon-GND, AK2 ding terminals of the ISOMETER®.
- **5** T/R Connection for external combined test and reset button.
- 6 11, 14 Connection to alarm relay K1
- 7 11, 24 Connection to alarm relay K2
- RS-485 communication interface with selectable terminating resistance.

* For UL applications:

Only use 60/75°C copper lines! UL and CSA applications require the supply voltage to be protected via 5 A fuses.

Example of application



ISOMETER® isoCHA425



Insulation monitoring device for unearthed DC systems (IT systems) DC 50 V up to 400 V Suitable for the charging of electric vehicles acc. to Japanese charging standard CHAdeMO



• DC charging stations for electric

charging standard CHAdeMO

vehicles according the Japanese

CE CA CULUS

Typical applications

Device features

- Monitoring the insulation resistance R_F for DC charging stations according to Japanese charging standard CHAdeMO
- Detection of unipolar insulation faults in the nominal voltage range between 50 V und 400 V within 1 s
- Detection of two-pole insulation faults within 10 s
- · Measurement of the nominal system voltage Un (true RMS) with undervoltage and overvoltage detection
- Measurement of residual voltages U_{L+e} (between U_{L+} and earth) and U_{L-e} (between U_{L-} and earth)
- Automatic adaptation to the system leakage capacitance Ce up to 2 μF
- Selectable start-up delay, response delay and delay on release
- 2 separately adjustable response value ranges of 5...250 kΩ (Alarm 1, Alarm 2)
- 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 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 RTU
- IsoData (for continuous data output)
- Password protection to prevent unauthorised parameter changes



Approvals



Standards

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

- DIN EN 61557-8 (VDE 0413-8)
- IEC 61557-8
- · CHAdeMO Spec V1.0

Further information

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

Ordering information

Supply v	Supply voltage U _s		Type	Art. No.
AC	DC	System leakage capacitance C _e Type		Push-wire terminal
100240 V, 4763 Hz	24240 V	≤ 2 µF	isoCHA425-D4-4	B71036395

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



Insulation coordination acc. to IEC 60664-1/IEC 60664-3		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), 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 connected to PE on one side recommended: CAT6/CAT7 min. AWG23*
Control circuit (IC4)	E, KE, T/R, A, B	* alternative: twisted pairs, shield connected to PE on one side J-Y(St)Y min. 2 x 0.6
Rated voltage	400 V	Terminating resistor 120 Ω (0.25 W), internal, can be connected
Overvoltage category		Device address, BMS bus, Modbus RTU 390 (3)*
Rated impulse voltage:		570 (3)
IC1/(IC2-4)	6 kV	Switching elements
	4 kV	Switching elements 2 x 1 contacts, common terminal 11
IC2/(IC3-4)		Operating principle N/C operation (N/C operation)*
103/104	4 kV	Electrical endurance, number of cycles 10 000
Rated insulation voltage:		
IC1/(IC2-4)	400 V	Contact data acc. to IEC 60947-5-1:
IC2/(IC3-4)	250 V	Utilisation category AC-12 AC-14 DC-12 DC-12 DC-12
IC3/IC4	250 V	Rated operational voltage 230 V 230 V 24 V 110 V 220 V
Polution degree	3	Rated operational current 5 A 2 A 1 A 0.2 A 0.1 A
Protective separation (reinforced insulation) between:		Necessary minimum contact load (relay manufacturer's reference) 10 mA/DC 5 V
IC1/(IC2-4)	Overvoltage category III, 600 V	Environment/EMC
IC2/(IC3-4)	Overvoltage category III, 300 V	Environment/EMC
IC 3/IC4	Overvoltage category III, 300 V	EMC IEC 61326-2-4
Voltage test (routine test) according to IEC 61010-1:		Ambient temperatures:
IC2/(IC3-4)	AC 2.2 kV	Operation -40+70 °C
IC 3/IC4	AC 2.2 kV	Transport -40+85 °C
		Storage -40+70 °C
Supply voltage		
Supply voltage $U_{\rm S}$	AC 100240 V/DC 24240 V	Climatic class acc. to IEC 60721:
Tolerance of U _s	-30+15 %	Stationary use (IEC 60721-3-3) 3K24 (without condensation and formation of ice)
Frequency range U _S	4763 Hz	Transport (IEC 60721-3-2) 2K11 (without condensation and formation of ice)
Power consumption	≤ 3 W, ≤ 9 VA	Long-time storage (IEC 60721-3-1) 1K22 (without condensation and formation of ice)
		Classification of mechanical conditions acc. to IEC 60721:
IT system being monitored		Stationary use (IEC 60721-3-3) 3M11
Nominal system voltage $U_{\rm n}$	DC 50400 V	Transport (IEC 60721-3-2) 2M4
Tolerance of U _n	+25 %	Long-term storage (IEC 60721-3-1) 1M12
Measuring circuit		Connection
Measuring voltage $U_{\rm m}$	±12 V	Connection type push-wire terminal
Measuring current $I_{\rm m}$ at $R_{\rm F}$, $Z_{\rm F}=0$	≤ 110 µA	connection type pass whe terminal
Internal resistance R_{i} , Z_{i}	≥ 115 kΩ	Connection
Permissible system leakage capacitance C _e	≤ 2 μF	Connection type screw-type terminal or push-wire terminal
		Nominal current ≤10 A
Response values		
Response value R _{an1}	$R_{an2}250 \text{ k}\Omega \text{ (46 k}\Omega)^*$	
Response value R _{an2}	5 kΩR _{an1} (23 kΩ)*	Stripping length 10 mm
Relative uncertainty Ran	± 15 %, at least ± 2 k Ω	Rigid 0.22.5 mm ²
Hysteresis R _{an}	25 %, at least 1 kΩ	Flexible without ferrules 0.752.5 mm ²
Undervoltage detection <i>U</i> <	10 V <i>U</i> > (off/10 V)*	Flexible with ferrules with/without plastic sleeve 0.252.5 mm ²
Overvoltage detection <i>U</i> >	<i>U</i> <500 V (off/500 V)*	Multi-conductor flexible with TWIN ferrules with plastic sleeve 0.51.5 mm ²
Relative uncertainty <i>U</i>	±5 %, at least ±5 V	Opening force 50 N
Hysteresis <i>U</i>	5 %, at least 5 V	Test opening, diameter 2.1 mm
Time response		Other
Response time t_{an} of $R_F = 0.5 \times R_{an}$ and $C_e = 1 \mu F$ according to IEC	61557-8 ≤ 1 s	Operating mode continuous operation
Start-up delay t		· · · · · · · · · · · · · · · · · · ·
1 /	010 s (0 s)*	Mounting cooling slots must be ventilated vertically
Response delay t _{on}	099 s (0 s)*	Degree of protection, built-in components (DIN EN 60529) IP30
Delay on release $t_{ m off}$	099 s (0 s)*	Degree of protection, terminals (DIN EN 60529) [P20]
Displays, memory		Enclosure material polycarbonate
	multi-functional not illuminated	DIN rail mounting acc. to IEC 60715
_ · · /	, multi-functional, not illuminated	Screw fixing 2 x M4 with mounting clip
Display range measured value insulation resistance (R _F)	1 kΩ2 MΩ	Documentation number D00352
Operating uncertainty	± 15 %, at least ± 2 k Ω	Weight \leq 150 g
Display range measured value nominal system voltage (U_n)	50500 V _{RMS}	()* — factory cotting
Operating uncertainty	\pm 5 %, at least \pm 5 V	()* = factory setting
Display range measured value system leakage capacitance of $R_{\rm F}$:		
	017 μF	

 ± 5 %, at least \pm 0,1 μ F off/0...999 (0, off)*

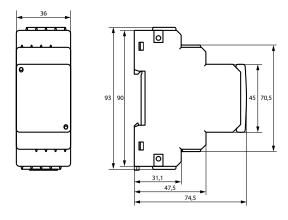
on/(off)*



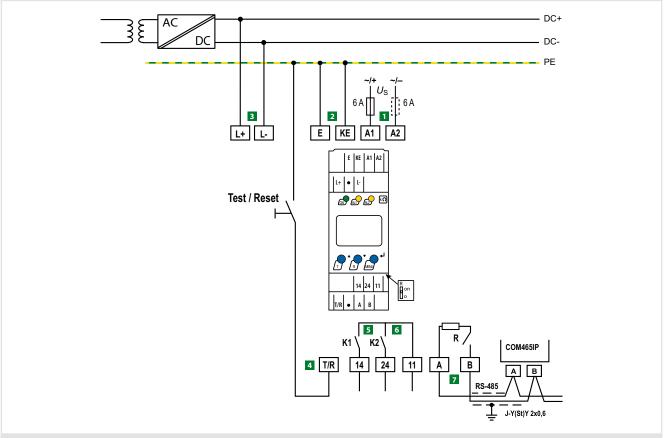
Operating uncertainty of $\textit{R}_F \geq 20~\text{k}\Omega$ and $\textit{C}_e \leq 5~\mu\text{F}$

Password

Fault memory alarm messages



Wiring diagram



- 1 A1, A2 Connection to the supply voltage via fuse (line protection): If 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 IT system to be monitored.
- 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
- RS-485 communication interface with connectable 7 A, B terminating resistance. Example: Connection of a BMS-Ethernet-Gateway COM465IP
- 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.

ISOMETER® isoCHA425HV with AGH420-1







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).

• CHAdeMO (Mode CHd and CHA):

CHAdeM0		Mode	
		СНА	
Maximum system leakage capacitance 1.6 μF per conductor		✓	
Detection of insulation faults in the system voltage range 50 V to 1000 V		✓	
One-pole insulation faults $R_{\rm FU}$ $R_{\rm FU} \le 100~{\rm k}\Omega$: Response time $\le 1~{\rm s}$ $100~{\rm k}\Omega < R_{\rm FU} \le 2~{\rm M}\Omega$: Response time $\le 10~{\rm s}$	1	1	
Two-pole insulation faults $R_{\rm FS}$ $R_{\rm FS} \le 160~{\rm k}\Omega$: Response time $\le 10~{\rm s}$ no detection (Deactivation)	1		

· CCS (Mode dc):

Detection of insulation faults up to 2 $M\Omega$ with a response time of 10 s Maximum system leakage capacitance 5 μF

- Measurement of the system leakage capacitance Ce
- Measurement of the system voltage U_n (True RMS) with undervoltage/overvoltage detection
- Measurement of the DC residual voltages UL1e (between L1/+ and earth) and UL2e (between L2/- and earth)
- Selectable start-up delay, response delay and delay on release
- Two separately adjustable response value ranges of 5...600 kΩ (Alarm 1, Alarm 2)
- 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 multifunctional LC display
- · Fault memory can be activated
- RS-485 (galvanically separated) including the following protocols:
- BMS interface (Bender measuring device interface) for data exchange with other Bender components
- Modbus RTU
- IsoData (for continuous data output)
- · Password protection to prevent unauthorised parameter changes
- · Stop mode to deactivate the measuring pulse generator

Standards

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

- DIN EN 61557-8 (VDE 0413-8)
- IEC 61557-8: 2014/COR1
- IEC 61851-21-2
- IEC 61851-23

Further information

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

Ordering information

Nominal system voltage <i>U</i> n	Type	Art. No.
	.,,	Push-wire terminal
DC 0 (50*)1 000 V	isoCHA425HV-D4-4 + AGH420-1	B71036396

^{*} Value for CHAdeMo

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

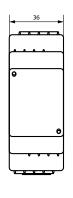


	Displays, memory	
	Password	off/0999 (off/0)
A1, A2	, , , , , , , , , , , , , , , , , , , ,	on/(off)
	Display LC display,	multifunctional, not illuminated
• · · · · · · · · · · · · · · · · · · ·	Time recnance	
	•	0 10 c (0 c)
		010 s (0 s)* 099 s (0 s)*
	•	
	Delay of release toff	099 s (0 s)*
4 kV	Interface	
250.1/	Interface/protocol RS	5-485/BMS, Modbus RTU, isoData
	Baud rate BMS (9.6 kbit/s), Modbus RTU (se	electable), isoData (115.2 kbits/s
	Cable length (9.6 kBits/s)	≤ 1 200 m
	Cable: twisted pairs, shield connected to PE on one side	min. J-Y(St)Y 2 x 0.6
ovenieltage category III 200 V	Terminating resistor 120 Ω (0.2	25 W), internal, can be connected
3 3 ,	Device address, BMS bus, Modbus RTU	390 (3)
overvoitage category III, 500 v	Curitahina alamanta	
DC +3 1 kV		
		I/O contact, common terminal 11
AC 2.2 KV	1 71 1	/N/O operation (N/O operation)*
	Electrical endurance under rated operating conditions, number of	cycles 10,000
AC 100240 V/DC 24240 V	Contact data acc. to IEC 60947-5-1:	
-30+15 %	Utilisation category AC-12 AC-1	
4763 Hz	Rated operational voltage 230 V 230	V 24 V 110 V 220 V
≤ 3 W, ≤ 9 VA		A 1 A 0.2 A 0.1 A
	Minimum contact load	10 mA/5 V DO
	Environment/EMC	
DC 01 000 V		IFC (10F1 24 2 2040 04 F / 11
DC +10 %		, IEC 61851-21-2:2018-04 Ed. 1.0
DC 0600 V	Ambient temperatures:	
	Operation	-40+70 °C
0 (0010 (0010)*	Transport	-40+85 °C
	Storage	-40+70°0
	Classification of climatic conditions acc. to IEC 60721:	
		ndensation and formation of ice
		ndensation and formation of ice
		ndensation and formation of ice
		Traction and Torridation of Tee
5 %, > 5 V		21414
		3M11
DC 0 1000 V ±10 %	• •	2M ²
	Long-term storage (IEC 60/21-3-1)	1M12
	Connection (for isoCHA425HV and AGH420-1)	
		e terminal or push-wire termina
25 /0/ > 25 1		
		≤10 <i>F</i>
≤ 5 µF		0.50.6 Nm (57 lb-in)
1 kΩ2 MΩ	<u> </u>	AWG 2412
$\pm 15 \%$, $\pm 2 \text{ k}\Omega$		8 mm
017 μF		0.22.5 mm
	3	0.252.5 mm
no measurement	·	U.Z3Z.3 []][]]
±15 %, ±0.1 μF		0.21.5 mm
	•	0.251.5 mm
≤ 10 s		0.51.5 mm
≤ 10 s	·	اااااا د.۱ د.۷
curament only from II > DC FOX		≤10 A
		AWG 2414
per conductor ≤ 1.6 µF		10 mm
110 240	<u> </u>	0.22.5 mm
1 KL22 ML2		0.752.5 mm
1150/ 1210	•	0.252.5 mm
	•	0.51.5 mm
±13 %, ±2 KL2	. 3	50 N
11/0 1/01/0	rest opening, admeter	2.1 mm
1 KZ 5 100 KZ 2	Other	
±15 0/ ±2 ! ∕	Operating mode	continuous operation
±13 %, ±2 κs2 017 μF	. 3	lots must be ventilated vertically
υι/ μΓ	Degree of protection, built-in components (DIN EN 60529)	IP30
		IP20
no moscuroment	Degree of protection, terminals (DIN EN 60579)	
no measurement	Degree of protection, terminals (DIN EN 60529) Enclosure material	
no measurement ±15 %, ±0.1 μF	Enclosure material	polycarbonate
±15 %, ±0.1 μF	Enclosure material DIN rail mounting acc. to	polycarbonate IEC 60715
$\pm 15\%, \pm 0.1 \mu\text{F}$ ≤ 1.0 s	Enclosure material DIN rail mounting acc. to Screw mounting	polycarbonate IEC 60715 2 x M4 with mounting clip
±15 %, ±0.1 μF	Enclosure material DIN rail mounting acc. to Screw mounting Documentation number	polycarbonate IEC 60715 2 x M4 with mounting clip D00404
$\pm 15\%, \pm 0.1 \mu\text{F}$ ≤ 1.0 s	Enclosure material DIN rail mounting acc. to Screw mounting	polycarbona IEC 607 2 x M4 with mounting c
	11, 14, 24 Up, KE, T/R, A, B, AK1, GND, AK2 240 V III 4 kV 4 kV 250 V 250 V 250 V 3 overvoltage category III, 300 V overvoltage category III, 300 V overvoltage category III, 300 V $DC \pm 3.1 \text{ kV}$ $AC 2.2 \text{ kV}$ AC 100240 V/DC 24240 V $-30+15 \%$ 4763 Hz $\leq 3 \text{ W}, \leq 9 \text{ VA}$ $DC 01 000 \text{ V}$ $DC +10 \%$ $DC 0600 \text{ V}$ $R_{an2}600 \text{ kΩ} (600 \text{ kΩ})^*$ $5 \text{ kΩ}R_{an1} (120 \text{ kΩ})^*$ $25 \%, > 1 \text{ kΩ}$ $101.09 \text{ kV (off)}^*$ $111.10 \text{ kV (off)}^*$ $1.20 \text{ kV (cannot be deactivated)}$ $5 \%, > 5 \text{ V}$ $DC 01000 \text{ V} + 10 \%$ $\pm 1200 \text{ VpEAK}$ $1.2 \text{ kV (measurement True RMS)}$ $\pm 5 \%, > \pm 5 \text{ V}$ $\leq 5 \mu \text{F}$ $1 \text{ kΩ}2 \text{ MΩ}$ $\pm 15 \%, \pm 2 \text{ kΩ}$ $017 \mu \text{F}$ no measurement $\pm 15 \%, \pm 0.1 \mu \text{F}$ $\leq 10 \text{ s}$	Password Fault memory alarm messages Display LC display,



Technical data AGH420-1	
Insulation coordination acc. to IEC 60664-1/IEC 60664-3	
Definitions:	14/- 12/
Measuring circuit (IC1)	L1/+, L2/-
Control circuit (IC2)	AK1, GND, AK2, Up, E
Rated voltage	1000 V
Overvoltage category	<u> </u>
Rated impulse voltage:	
IC1/IC2	8 kV
Rated insulation voltage:	
IC1/IC2	1000 V
Pollution degree	3
Protective separation (protective impedance) between:	
IC1/IC2	overvoltage category III, 1000 V
IT system being monitored	
Nominal system voltage range $U_{\rm n}$	DC 01000 V
Tolerance of U_n	DC +10 %
Nominal system voltage range U_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
Environment/EMC	
EMC	IEC 61326-2-4
Ambient temperatures:	
Operation	-40+70°C
Transport	-40+85°C
Storage	-40+70°C
Classification of climatic conditions acc. to IEC 60721:	

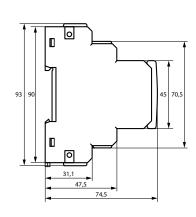
Dimension diagram (dimensions in mm)



Stationary use (IEC 60721-3-3)

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

Transport (IEC 60721-3-2)

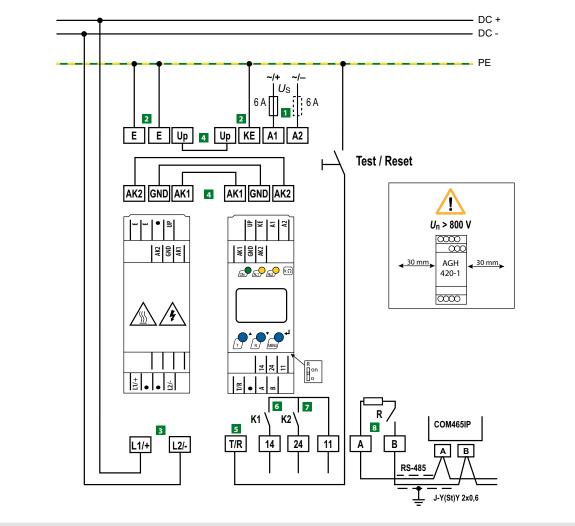


3K24 (except condensation and formation of ice)

2K11

1K22

Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12
Single cables for terminals Up, AK1, GND, AK2:	
Cable length (AGH420-1 → isoCHA425HV)	≤ 0.5 m
Cross section	$\geq 0.75 \text{ mm}^2$
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) 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 a



1 A1, A2 Connection to the supply voltage via fuse.

If being supplied from an IT system, both lines

have to be protected by a fuse.*

2 E, E, KE Connect each terminal separately to PE:

The same wire cross section as for A1, A2

is to be used.

Connection to the IT system to be monitored. 3 L+, L-

4 Up, AK1, Connect the terminals of the AGH420-1 to the GND, AK2 corresponding terminals of the ISOMETER®

isoCHA425HV.

5 T/R Connection for external combined test and reset

button.

6 11, 14 Connection to alarm relay K1

7 11, 24 Connection to alarm relay K2

8 A, B RS-485 communication interface with connectable

terminating resistor.

Example: Connection of a BMS Ethernet gateway

COM465IP

* For UL applications:

Use 60/75 °C copper lines only!

UL and CSA applications require the supply voltage to be protected via

ISOMETER® iso165C...

Insulation Monitoring Device (IMD) 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

- Insulation monitoring of AC and DC insulation faults for unearthed systems (IT systems) from 0...600 V peak
- · Power supply for all internal voltages
- Continuous measurement of insulation resistance from 0 $\Omega...50~M\Omega$
- Response time of ≤ 20 s for measured insulation resistance (using Direct Current Pulse (DCP))
- Automatic adaptation to the existing system leakage capacitance ($\leq 1~\mu F)$
- · Detection of ground faults and lost ground line
- · Measurement of a second voltage
- The device works when:
- HV is unstable
- HV is powered off
- There are symmetric or asymmetric insulation faults
- Faults exist between HV lines and the supply voltage
- · Galvanic insulation of all signals from the HV side
- · HV coupled network
- · CAN bus interface
- Light weight: < 220 g (including housing and connection frame)
- iso165C-1 only: The iso165C-1 variant features Error and Warning signals on the separated high-side driver

Standards – corresponding norms and regulations

General

IEC 61557-8; IEC 60664-1; ISO 6469-3; ISO 23273-3

EMV

CISPR 25; ISO 7637-2; ISO 11452-2; ISO 11452-4; ISO 11452-8; ISO 10605; IEC 61326-2-4; IEC 61000-4-4; E1 gem. 72/245/EWG/EEC; ISO 16750-2

Environmental

ISO 16750-1; ISO 20653; ISO 16750-3; IEC 60068-2-14; IEC 60068-2-27; IEC 60068-2-32; IEC 60068-2-64; ISO 16750-4; IEC 60068-2-1; IEC 60068-2-2; IEC 60068-2-38; IEC 60068-2-60; IEC 60068-2-78

Normative exclusion

The device has gone through an automotive test procedure in accordance with multi customer requirements as outlined by reg. ISO 16750-x. IEC 61557-8 will be fulfilled by creating an LED warning function and test button at the customer site if necessary.

Further information

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

Ordering information

Nominal voltage	Supply voltage	Response value range	Туре	Art. No.
DC	DC	nesponse value range	.,,,,,	Art. No.
0600 V 12 V		Alarm 1 (Error): 30 k Ω 1 M Ω (default: 300 k Ω); Alarm 2 (Warning): 40 k Ω 2 M Ω (default: 55 k Ω)	iso165C	B91068175
		Alarm 1 (Error): 30 k Ω 1 M Ω (default: 400 k Ω); Alarm 2 (Warning): 40 k Ω 2 M Ω (default: 250 k Ω)	iso165C-1	B91068176

Туре	Art. No.
iso165C connecting kit	B 9106 8503

Supply voltage		
Supply voltage $U_{\rm S}$		DC 916 V
Nominal supply voltage		DC 12 V
Max. operational current Is		300 mA (typ. 185 mA)
Max. current I _K		5 A
Power dissipation P _S		< 2.5 W
Supervised IT system		
Rated voltage range Un		DC 0600 V
Tolerance		+15 %
Frequency range		10 Hz1 kHz
System leakage capacitance Ce		≤ 1 μF
Withstand voltage test		AC 1.9 kV/1 min
Measuring circuit		
Measurement method		Bender DCP technology
Measuring voltage U _m		±40 V
Measuring current $I_{\rm m}$ at $R_{\rm F} = 0$		±33 μA
Impedance Zi at 50 Hz (HV1)	\geq 1.2 M Ω (\geq 2.4 M Ω each,	each line, high resistance in off state)
Internal resistance Ri (HV1)	\geq 1.2 M Ω (\geq 2.4 M Ω each,	each line, high resistance in off state)
Impedance Zi at 50 Hz (HV2)		\geq 10.5 M Ω (\geq 21 M Ω each line)
Internal resistance R _i (HV2)		\geq 10.5 M Ω (\geq 21 M Ω each line)
Measuring ranges		
Insulation resistance range		0 Ω50 ΜΩ
Insulation resistance duration/F	ulse (normal operation)	$\sim 1.6 \text{ s} (\leq 1 \mu\text{F/O M}\Omega)$

Insulation resistance range	0 Ω50 ΜΩ
Insulation resistance duration/Pulse (normal operation)	$\sim 1.6 \text{ s } (\leq 1 \mu\text{F/0 M}\Omega)$
	\sim 6 s (\leq 1 μ F/10 M Ω)
Relative error (DCP)	100 kΩ5 MΩ, ±15 %
Absolute error (DCP)	0 Ω100 kΩ, ±15 kΩ
High-voltage range	0600 V
High-voltage tolerance	0100 V, ±5 V
	100600 V, ±5 %

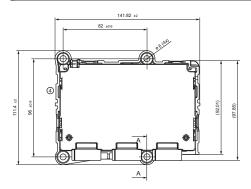
High-side drive	r output (iso165C-1)
-----------------	----------------------

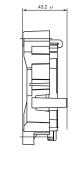
HST_1*	High-side driver 1, iso Warning
Maximum current, I _{out_max}	80 mA
HST_2*	High-side driver 2, iso Error
Maximum current, I _{out_max}	80 mA

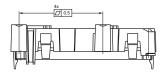
Response values

30 kΩ1 MΩ (default: 300 kΩ)
40 kΩ2 MΩ (default: 55 kΩ)
30 kΩ1 MΩ (default: 400 kΩ)
40 kΩ2 MΩ (default: 250 kΩ)

Dimension diagram (dimensions in mm)







Response uncertainty (according to IEC 61557-8)	±15 %
Hysteresis	+25 %
Factor averaging F _{ave}	110 (default: 3
Response time t_{an} (DCP)	
(Changeover R_F : 10 M Ω - $R_{an/2}$; at $C_e = 1 \mu F$; $U_n = D$	$t_{an} \le 20 \text{ s (at } F_{ave} = 10^{**}$
	during self test t_{an} +10
Measurement time after power on (and after HV rela	ays are closed) \leq 3 s (< 1 μF/150 kΩ
Switch-off time tab (DCP)	
(Changeover R_F : $R_{an/2}$ - 10 M Ω ; at $C_e=1~\mu F$; $U_n=D$	$t_{ab} \le 40 \text{ s (at } F_{ave} = 10 \text{ s}$
	during self test t_{ab} +10
Interface	
Protocol	HS-CA
so165C	
Data rate	250 kBau
Ferminating resistance	124 Ω internal
so165C-1	
Data rate	500 kBau
Ferminating resistance	Non
Environment/EMC	
EMC	IEC 61326-2-
Overvoltage category/degree of pollution	II/
Temperature range	-40+85°
Range of application	5,000 m above sea leve
Connectors (Tyco)	
Receptacle housing type 1719183	3-1, 1719183-2, 1719183-3 (black, white, blue
Receptacle drawing number	C-171918
Contact type (tin plated)	5-963715-
Contact wire range	0,500,75 mm
Contact drawing number	92945
Crimp hand tool	539635-
Other	
Operating mode	Continuous operatio
Degree of protection	IP5K
Software version	
so165C	V1.0 - Release S010 (VIFC: V5.0 , IMC V5.0
iso165C-1	V2.0 - Release S010 (VIFC: V10.0 , IMC V5.0
Mounting	
D	4 M5 / 1 L

- * External 2.2 $k\Omega$ pull-down resistor to chassis ground (KL.31) is required. Not protected against a short circuit in the event that KL.31 is missing. $\label{eq:local_loca$ Therefore, a 100 Ω resistor is required on each driver output.
- ** Fave = 10 is recommended for electric vehicles

Recommended screws for mounting Max. tightening torque

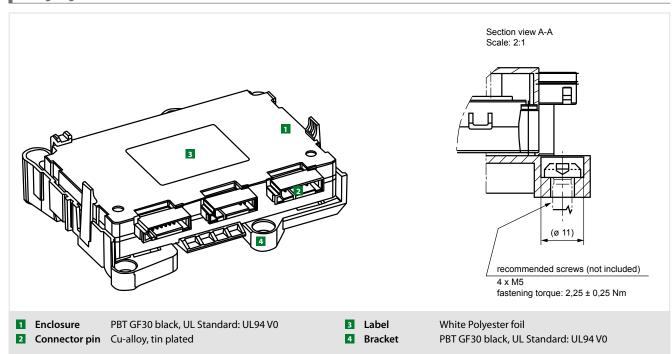
Documentation number

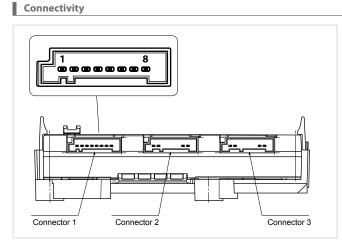


4 x M5 (not included)

D00154

 2.25 ± 0.25 Nm (XX lbs-in)

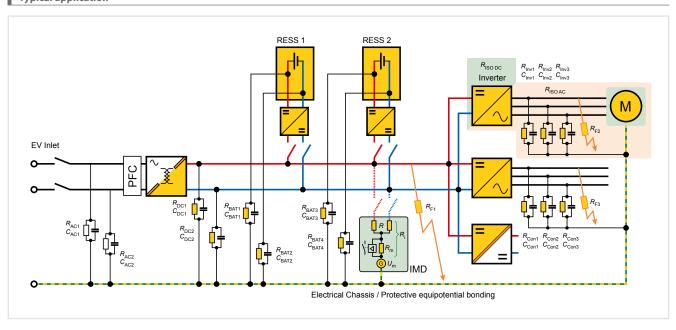




Connector 1)	Туре	Code	Colour
1	1719183-1	Α	Black
2	1719183-2	В	White
3	1719183-3	C	Blue

¹⁾ Please refer to "Technical Data" for detailed connector information.

Typical application



Insulation monitoring devices







Equipment for insulation fault locationISOSCAN®







Residual current monitoring systems







Neutral Grounding Resistor Monitor (NGR)







Charge Controller



255



Power Quality and Energy Measurement

Measuring and monitoring relays

LINETRAXX®



277 292



Coupling devices

Power supply units Measuring instruments Interface converters Interface repeaters OMTRAXX® Gateways OMTRAXX® Alarm indicator and test combination OMTRAXX® condition monitors



339



Switching equipment

ATICS® transfer switching and monitoring devices

Test systems

UNIMET® Safety analyser



429



Anney

Technical terms
Alphabetical list of devices
Service



463





Device overview Equipment for insulation fault location ISOSCAN®



Catalogue page		146	146	146	146
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
Circuits	Control circuits	-			-
	Main circuits		-	-	
Voltage system	3(N)AC		-	-	
	AC				
	AC/DC				
	DC				
Nominal 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 C _e μF		acc. to characteristic curve	acc. to characteristic curve	acc. to characteristic curve	acc. to characteristic curve
Response value R _{an} kΩ		acc. to characteristic curve	acc. to characteristic curve	acc. to characteristic curve	acc. to characteristic curve
- <u>e</u> =	DIN rail				
Installa- tion	Screw mounting				
Interfaces	ВВ	EDS440-S	EDS441-S	-	-
	BS	EDS440-L	EDS441-L		
	BMS	-	-	-	-
Product details (Products on www.bender.de/en)					

	_	1. 1						
	Type	С. р.	Suitable system components					
Suitable ISOMETER®s with integrated PGH	iso685-D-P	24				-		
	isoMED427P	82	-		+	+		
able IS integ	isoPV1685P	96	-	-	+	+		
Suit	iso1685DP	68	-	-	-	-		
	CTAC	358			-	-		
	CTUB100	361	-	-		+		
urrent iers	WRS(P)	365		-	-	-		
ıring c ısform	CTBS25	370		-	-	Ŧ		
Measuring current transformers	WS	372		-	+	+		
	WS8000	372	-			+		
	CTAF	-	-	-	-			
yldy	AN410	392	-	-		-		
Power supply unit	AN450	394	-	-		-		
	STEP-PS	389	-	-		-		
Relay module	IOM441	400						



153	153	156
-	Medical locations	EDS3096PG for de-energised systems
stationary	stationary	portable
-		
	-	
	-	
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

3AC and DC IT systems

· Insulation fault location in AC,

· Main circuits and control circuits

in industrial plants and ships

· Diode-decoupled DC IT systems

• Systems for medical locations



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..., 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, Modbus RTU
- Connection to higher-level control and visualisation systems possible

Approvals

in power plants





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

Response value	Supply voltage <i>U</i> S ¹⁾		Option "W"	Туре	Art. No.
nesponse value	Supply voltage 05		-40+70°C, 3K23, 3M12	1,745	ALC: NO.
	DC 24 V		-	EDS440-S-1	B91080201
2 10 mA		-	-	EDS440W-S-1	B91080201W
2IU IIIA	210 mA AC/DC 24240 V		-	EDS440-L-4	B91080202
			-	EDS440W-L-4	B91080202W
	DC 24V –	DC 24V	-	EDS441-S-1	B91080204
		DC 24 V —	-	EDS441W-S-1	B91080204W
0.2 11		AC/DC 24240 V	-	EDS441-L-4	B91080205
0,21 mA AC/DC 24240 V	AC/DC 24 240 V		-	EDS441W-L-4	B91080205W
	AC/DC 24240 V		-	EDS441-LAB-4	B91080207
			-	EDS441W-LAB-4	B91080207W
10 mA	AC/DC 24240 V		-	EDS440-LAF-4	B91080209

¹⁾ 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

²⁾ included in the scope of delivery of EDS44x-S-4

Description	Design	Type of construction	Туре	Art. No.	Page
DC 405 *******	Bus repeater	-	DI-1PSM	B95012044	-
RS-485 repeater	Supplied by the USB port	-	DI-2USB	B95012045	399
Relay module	12-fold relay module (input/output mudule)	-	I0M441(W)-S	B95012057(W)	400
			CTAC	B981100	358
	circular	CTUB104-CTBC	B781200	361	
Measuring current	Measuring current		WS	B9117	356
transformers pulsed DC sensitive	puisea DC sensitive	rectangular	WRS(P)	B9117	365
		split-core	WS	B980806	372
	flexible	CTAF	B981100	-	

Cable length

Connection

AC ±15 %, DC ±40 % CTAC..., WR..., WS...

WS.../8000 CTBC...

CTAF...

47 Ω

1.5 kΩ

800 V

Terminating resistor

Device address, BS bus

Cable: twisted pair, one end of shield connected to PE

Technical data

Insulation coordination acc. to IEC 60664-1/IEC 60664-3	
Definitions	
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 ($U_{\rm D} > 690 < 1000 \text{ V}$)	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	overvoltage category iii, 500 v
IC2/(IC3-4)	AC 2.2 kV
IC3/IC4	AC 2.2 kV
	THE LIE H
Supply voltage	AC/DC 24 240 V
Supply voltage range <i>U</i> _S EDS44L (LAB,LAF)	AC/DC 24240 V
Supply voltage range U _s EDS44S	DC 24 V
Tolerance of U _s	-20+15%
Frequency range of U _s	DC, 50400 Hz ^{(1 (2)}
Tolerance of the frequency range of U_s	-5+15 %
Power consumption, typically 50 Hz (400 Hz) EDS44L	≤ 4 W/7 VA (≤ 4 W, 28 VA)
Power consumption, typically (DC via BB bus) EDS44S	≤1W
Response values	
Response value insulation fault location ($I_{\Delta L}$) EDS440	210 mA
Response value insulation fault location (I _{DL}) EDS441	0.21 mA
Relative uncertainty (I _{ΔL}) EDS440	±30 %, min. ±2 mA ⁽³
Relative uncertainty (Ial) EDS441	± 30 %, min. ± 0.2 mA ⁽³⁾
Response value residual current measurement ($I_{\Delta n}$) EDS440	100 mA10 A
Response value residual current measurement (/Δn) EDS441	100 mA1 A
Relative uncertainty (I∆n) EDS44x (4260 Hz)	±5 %
Relative uncertainty (I∆n) EDS44x (611000 Hz)	-200 %
Hysteresis	20 %
Time response	
Scanning time for all channels insulation fault location ($I_{\Delta L}$)	profile-dependent, min. 6 s
Response time residual current measurement $(I_{\Lambda n})$	≤ 400 ms
Response time for measuring current transformer monitoring	max. 18 min
Measuring circuit	
	injector (e.g. ISOMETER® iso685-D-P)
Nominal system voltage U_0 EDS441	AC 230 V, DC 220 V
Talayana of II FDC441	AC +150/ DC +400/

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 s	ide) 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 m <i>l</i>
Measuring range insulation fault location (I _{AL}) EDS441	0.155 m/
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	100mA20 <i>F</i>
Rated frequency range EDS440-x	501000 Hz
Measuring range residual current measurement ($I_{\Delta n}$) EDS441	100mA2
Rated frequency range EDS441-x	5060 Hz
LEDs	
ON (operation LED)	greer
COM	yellow
SERVICE	yellov
IΔL ALARM	yellov
IΔn ALARM	yellov
112 channel indication	yellow
Digital inputs	
Number	7
Operating mode, adjustable	active high, active low
Function	none, test, rese
Voltage level I	Low DC -55 V, High DC 1132 \
Digital current output	
Number	
	ne, $I_{\Delta L}$ alarm, $I_{\Delta n}$ alarm, device error
current transformer connection fault,	
Current	0 mA DC inactive, 20 mA DC active
Tolerance	±10 %
Load resistance	$R \le 500 \Omega/PR \ge 0.25W$
Buzzer	
Number	
	ne, $I_{\Delta L}$ alarm, $I_{\Delta n}$ alarm, device error
transformer connection fault, insulation	iauit iocation active, common alarn
Interfaces	De toel Det live " =="
Interface/protocol	RS-485 BS bus Modbus RTU
Data rate BS bus	9.6 kBaud/
Data rate Modbus RTU	9.6 19.2 37.4 57.6 115 kBaud/s
Calala Languella	



Measuring current transformers external for EDS440 type Measuring current transformers external for EDS441type

Measuring current transformers external for EDS441-LAB Measuring current transformers external for EDS440-LAF

Rated insulation voltage measuring current transformers

Tolerance of U_n EDS441

Load EDS441, EDS440-LAF

Load EDS440

≤ 1200 m

X1.A, X1.B

recommended: J-Y (St) Y min. 2 x 0.8

120 Ω , can be activated internally

0, 2...79 (optional 0, 2...159)

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	g conditions 30000 hrs.
Rated operational voltage	AC 250 V
Rated operational current	7 A
Rated insulation voltage	4 kV
Kontaktdaten nach IEC 60947-5-1	
Gebrauchskategorie	AC-13/AC-14/DC-12/DC-12/DC-12/DC-12
Bem.betriebsspannung	230 V/230 V/24 V/48 V/110 V/220 V
Bem.betriebsstrom	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 °C +55 °C
Transport	-40 °C +85 °C
Storage	-25 °C+70 °C
Classification of climatic conditions a	cc. to IEC 60721:
Stationary use (IEC 60721-3-3)	3K23 (no condensation, no formation of ice)
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22
Classification of mechanical condition	ns 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	pluggable screw-type terminal or push-wire terminal
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 ²
flexible with ferrule, with/without plastic	
Multiple conductor, rigid	0.21 mm ²
Multiple conductor, flexible	0.21.5 mm ²
Multiple conductor, flexible with ferrule w	
Multiple conductor, flexible with TWIN fer	rule with plastic sleeve 0.51.5 mm ²

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 terminals X1, X2:	
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 at an ambient t	emperature > 55 °C vertical mounting required
at an a	mbient temperature $<$ 55 °C mounting optional
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
Weight	approx. 122 g (EDS44x-S)
	approx. 242 g (EDS44x-L,LAB,LAF)

"W" option data deviating from the standard version

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 °C
Long-term storage	-25 +70 °C

Classification of climatic conditions acc. to IEC 60721:		
Stationary use (IEC 60721-3-3)	3K23 (condensation and formation of ice possible)	

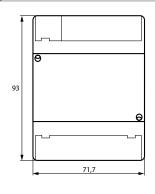
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3M1

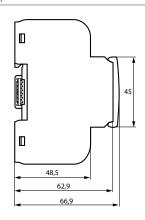
 $^{1)}$ = At a frequency > 200 Hz, the connection of X1 and k1-12/I1-12 must be insulated. Only permanently installed devices which at least have overvoltage category CAT2 (300 V) may be connected.

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

 $^{3)}$ = Residual current effect of > 100 mA results in a greater relative uncertainty.

Dimension diagram (dimensions in mm)



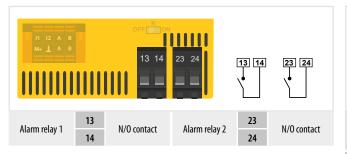


U₅ = AC/DC 24...240 V

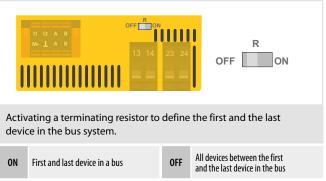
| I1 | I2 | A | B | M+ | L | A | B | M+

Connection of relays

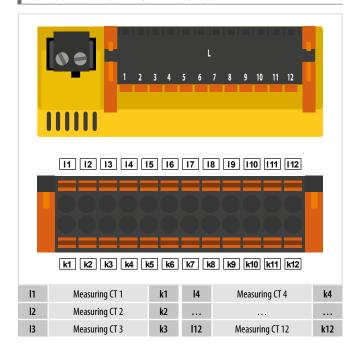
Connection to the voltage supply

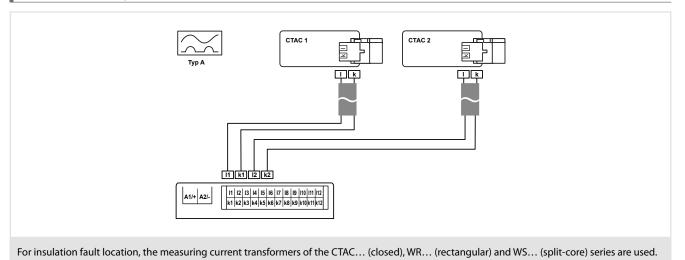


BS bus termination

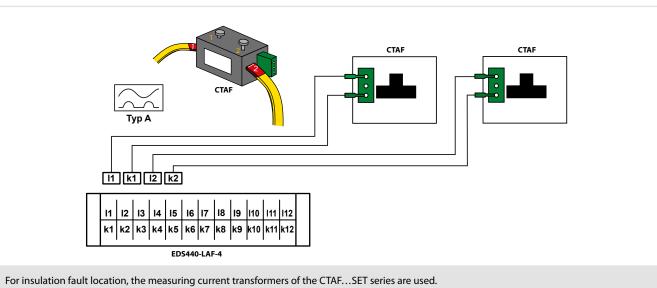


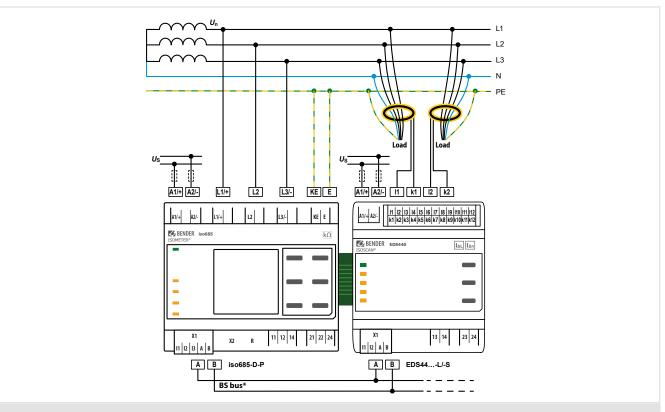
Connection to the k1-12/l1-12 interface





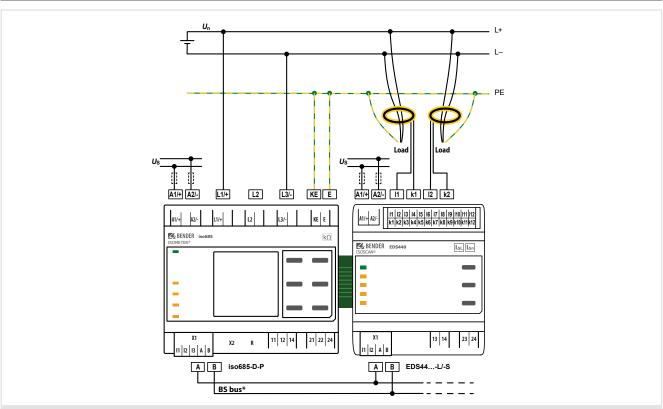
Connection of CTAF...SET series measuring current transformers to EDS440-LAF-4





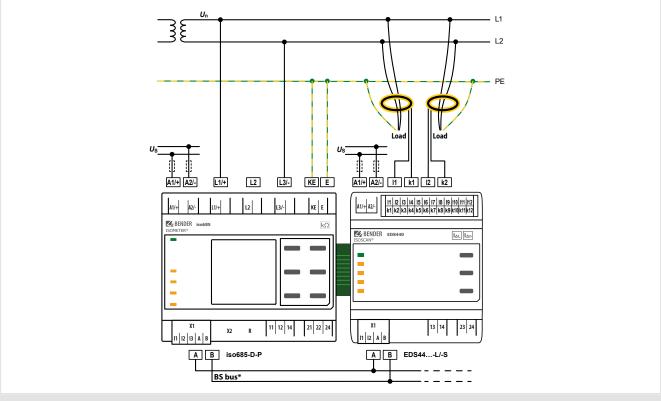
For systems > 690 V and with overvoltage category III a fuse for the connection to the system to be monitored must be provided. Recommendation: 2A fuses.

Wiring diagram to DC system with iso685-D-P



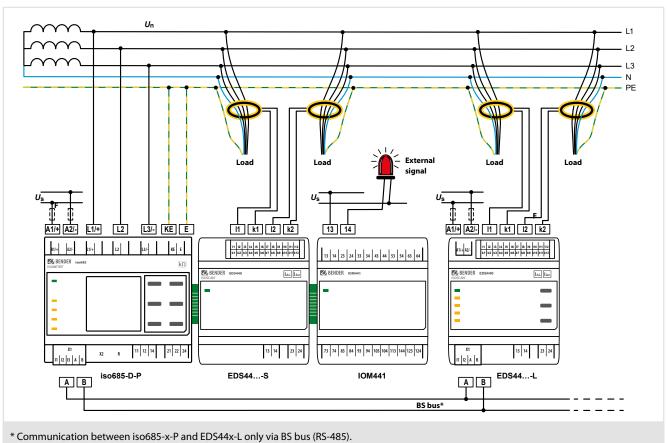
* Communication between iso685-x-P and EDS44x-L only via BS bus (RS-485).

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



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

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



ISOSCAN® EDS150/EDS151

Insulation fault locator with integrated measuring current transformers for EDS systems





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 (EDS151)

Device features

- Insulation fault location in AC, AC/DC and DC IT systems
- 6 measuring channels with measuring current transformer per EDS150/151
- Up to 528 measuring channels can be combined by the BMS bus in the IT system being monitored: 88×6 measuring channels
- Response sensitivity EDS150: 5 mA, EDS151 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

Standards

The ISOSCAN® EDS150/151 series complies with the requirements of the device standards:

• IEC 61557-9

Approvals

Further information

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



Ordering information

	Measuring range	Response value		Supply voltage ¹⁾ <i>U</i> s		Туре	Art. No.		
	measuring range	EDS function	RCM function	AC	DC	1,762	711 11 11 11 11 11 11 11 11 11 11 11 11		
	525 mA	5 mA	10 A	1724 V/5060 Hz	1724 V/5060 Hz	1724 V/5060 Hz	14 201/	EDS150	B91080103
	0.52.5 mA	0.5 mA	1 A				1428 V	EDS151	B91080101

¹⁾ Absolute values

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	392
Power supply unit	AC 230 V/5060 Hz	AC 20 V, 500 mA	For the supply of max. 6 EDS15	AN450	B924201	394
	AC 127 V/5060 Hz	AC 20 V, 500 mA	For the supply of max. 6 EDS15	AN450-133	B924203	394



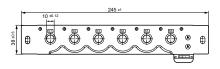
According to IEC 60364-7-710 only power supply units providing "Safe separation" (reinforced insulation) may be used for the supply voltage between the primary and secondary side. All power supply units listed above comply with this requirement!

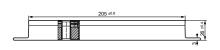


Insulation coordination acc. to IEC 60664-1/IEC 606	64-3	Environment/EMC	
Rated insulation voltage	AC 250 V	EMC	IEC 61326-2-4
Rated impulse voltage/pollution degree	6 kV/3	Operating temperature	-25+55 °C
Valta na namana		For UL application:	
Voltage ranges		Maximum ambient temperature 55 °C	
IT system being monitored:		Classification of climatic conditions acc. to	o IEC 60721:
Nominal system voltage U_n see Locating current inject	tor (e. g. ISOMETER® iso685-D-P) (EDS150)	Stationary use (IEC 60721-3-3)	3K23 (except condensation and formation of ice)
	AC 20276 V, DC 20308 V (EDS151)	Transport (IEC 60721-3-2)	2K11 (except condensation and formation of ice)
Nominal frequency f _n	42460 Hz	Long-term storage (IEC 60721-3-1)	1K22 (except condensation and formation of ice)
Supply voltage:		Classification of mechanical conditions ac	c. to IEC 60721:
Supply voltage $U_{\rm S}$	AC 1724 V, DC 1428 V	Stationary use (IEC 60721-3-3)	3M11
Frequency range of the supply voltage	5060 Hz	Transport (IEC 60721-3-2)	2M4
Power consumption AC	≤ 3 VA	Storage (IEC 60721-3-1)	1M12
Power consumption DC	≤ 1.5 VA		
Measuring circuit		Connection	
Number of measuring channels (per device/system)	6/528	Connection type	pluggable push-wire terminal
	0/320	For UL application:	
EDS function:		Only use 60/75°C copper conductors!	2,000
Response value	EDS150: 5 mA	Connection rigid /flexible/conductor sizes	0.21.5 mm² (AWG 2416)
District	EDS151: 0.5 mA	Multi-conductor connection (2 conductors of the	
Relative uncertainty	±30 %	rigid flexible	0.21.5 mm ² 0.21.5 mm ²
Rated frequency	42460 Hz	flexible with ferrule without plastic sleeve	0.251.5 mm ²
Measuring range EDS function	EDS150: 525 mA, EDS151: 0.52.5 mA	flexible with ferrule with plastic sleeve	0.250.75 mm ²
Response time in the AC system acc. to IEC 61557-9	ED3131. C.32.3 IIIA ≤85	Stripping length	0.250.75 mm
. ,	≥ 03	Stripping icrigiti	10 111111
RCM function:	FDC450 40 A	Other	
Response value	EDS150: 10 A	Operating mode	continuous operation
Deletine un esuteintu	EDS151: 1 A	Position of normal use	any
Relative uncertainty Frequency range	±30 % 4268 Hz	Enclosure material	polycarbonate
riequency range	4200 П2	Flammability class	UL94 V-0
Displays		Screw mounting	2 x M6
LEDs:		Tightening torque	1.5 Nm
ON/COM, green	operation indicator/bus activity	Documentation number	D00106 (EDS150)
Alarm K1K6, yellow	EDS and RCM function	Weight	D00107 (EDS151) ≤ 340 q
			≤ 340 y
Interface	DC 405/D145	()* = factory setting	
Interface/protocol	RS-485/BMS		
Connection	terminals A/B		
Cable (twisted pair, one end of shield connected to PE) Cable length	two-core, recommended: J-Y(St)Y min. 2x0.8 ≤ 1200 m		
Terminating resistor	≤ 1200 m 120 Ω (0.25 W)		
Davise address DMC has	120 12 (0.25 W)		

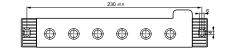
Dimension diagrams (dimensions in mm)

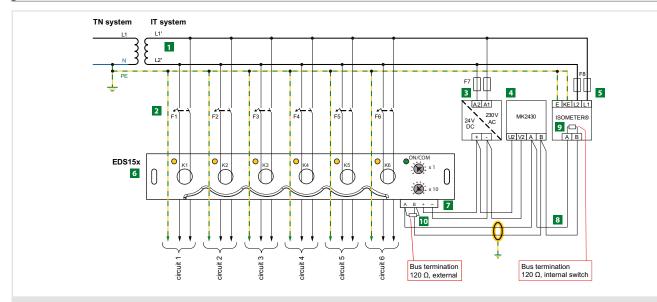
Terminating resistor Device address, BMS bus





3...90 (3)*





- 1 Transformer for the IT system to be monitored
- Circuit breakers for the circuits
- 3 AN410 for DC 24 V supply voltage
- Alarm indicator and test combination MK2430 for indication of alarm messages from the EDS150/151 (BMS master)
- Insulation monitoring devices with locating current injector for insulation fault location systems
- Insulation fault locator EDS150/151 with integrated measuring current transformers
- **I** Supply voltage *U*_s DC 24 V
- 8 Serial interface BMS
- **9** Terminating resistor BMS bus (120 Ω , internally connected)
- Terminating resistor BMS bus

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 EDS195PM

- 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

The ISOSCAN® EDS30... series complies with the requirements of the device 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, DIN EN 61557-9, VDE 0413-9, IEC 61557-9, ASTM F1669M-96 (2007), ASTM F1207M-96 (2007)

Further information

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

Ordering information

Main	Main circuits		l circuits	Nominal voltage <i>U</i> n		Supply voltage <i>U</i> s	Туре	Art. No.
with EDS	without EDS	with EDS	without EDS	AC	DC	AC	.,,,,,	711 11101
EDS440	-	-	-	20575 V, 42460 Hz	20504 V	-	EDS3090	B91082026
				20575 V, 42460 Hz	20 5041/	230 V, 5060 Hz	EDS3090PG	B91082021
	20575 V, 42460 Hz	203/3 V, 42400 П2	20504 V	90132 V, 5060 Hz	EDS3090PG-13	B91082022		
_		0 575 V 42 460 U- 0 504 V	230 V, 5060 Hz	EDS3096PG	B91082025			
				U3/3 V, 4240U HZ U	U3/3 V, 42400 HZ	0504 V	90132 V, 5060 Hz	EDS3096PG-13
-	-	EDS441	-	20265 V, 42460 Hz	20308 V	-	EDS3091	B91082027
	-	-	_	20 2651/42 46011	20308 V	230 V, 5060 Hz	EDS3091PG	B91082023
_			_	_	20265 V, 42460 Hz	20306 V	90132 V, 5060 Hz	EDS3091PG-13
-		-		20265 V, 42460 Hz	20308 V	230 V, 5060 Hz	EDS3092PG	B91082030
-		-		20575 V, 42460 Hz	20504 V	230 V, 5060 Hz	ED33092PG	D91U62U3U
-		-	-	20575 V, 42460 Hz	20504 V	230 V, 5060 Hz	EDS3096PV	B91082031

Suitable system components

Designation	Nominal v	oltage <i>U</i> n	Туре	Art. No.	Page	
Designation	AC	DC	Турс	AIL NO.	T uyc	
Measuring clamp 115 mm for EDS3090 and EDS3096	+	+	PSA3165	B980852	-	
Coupling device to extend the voltage range of the PGH185/186	500790 V/ 42460 Hz	400960 V	AGE185	B980305	164	
Accessories for fault location in diode-decoupled systems	-	-	EDS165-SET	B91082007	-	

Scope of delivery

Insulation fault locator	Locating current injector	Measuring clamps 20 mm	Measuring clamps 52 mm	Туре
EDS195PM	-	PSA3020	PSA3052	EDS3090
EDS195PM	PGH185	PSA3020	PSA3052	EDS3090PG
EDS195PM	PGH185-13	PSA3020	PSA3052	EDS3090PG-13
EDS195PM	PGH186	PSA3020	PSA3052	EDS3096PG
EDS195PM	PGH186-13	PSA3020	PSA3052	EDS3096PG-13
EDS195PM	-	PSA3320	PSA3352	EDS3091
EDS195PM	PGH183	PSA3320	PSA3352	EDS3091PG
EDS195PM	PGH183-13	PSA3320	PSA3352	EDS3091PG-13
EDS195PM	PGH183	PSA3320	PSA3352	EDS3092PG
נעס וארכיניו נעם	PGH185	PSA3020	PSA3052	ED33092PG
EDS195PM	PGH186	-	2 x PSA3052	EDS3096PV

The technical data listed in this chapter apply to the components	s:
PGH18 EDS195PM, AGH185.	

Environment/	/EMC
--------------	------

EMC	IEC 61326-2-4
Operating temperature	-10+55 °C
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 (except condensation and formation of ice)
Storage (IEC 60721-3-1)	1K22 (except condensation and formation of ice)
Classification of mechanical condition	ons 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

Other

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

Technical data PGH18...

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

Rated insulation voltage	AC 500 V
Rated impulse withstand voltage/pollution degree	4 kV/3

Nominal system voltage *U*_n

PGH183	AC 20265 V 42460 Hz, DC 20308 V
PGH185	3AC/AC 20575 V 42460 Hz, DC 20504 V
PGH186	3AC/AC 0575 V 42460 Hz, DC 0504 V

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

PGH183, PGH185:

i owei consumption	≥ 2 AV
PGH186:	
Power consumption	< 6 VA

Locating current

_			
Р	GH	11	83

Test current, selectable, max.	1/2.5 mA
PGH185/186	
Locating current I _L , selectable, max.	10/25 mA

PGH183/185/186

Clock pulse	2
Idle time	4

Measuring voltage U_m

PGH186	DC 50 V

0ther

- · · · · ·	
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

Technical data EDS195PM

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

Rated insulation voltage	50 V
Rated impulse withstand voltage/pollution degree	0.8 kV/3

Voltage supply

Supply voltage U_S	accumulators, batteries or USB power supply unit
Accumulators	3 x NiMh ≥ 2000 mAh
Hours of operation (without display illumination)	≥ 150 h
Charging time	≤ 5 h
Size	AA R6
Batteries	3 x LR6 AA – 1.5 V
USB power supply unit:	
Primary:	100240 V, 5060 Hz
Secondary:	DC 5 V, ±10 %
Power consumption	≤ 0.5 W

Measuring circuit insulation fault location

Nominal system voltage	conductors uninsulated, including measuring clamp up to 600 V
Rated frequency	DC, 422000 Hz

Main circuit (/Lmax = 50 mA)

man an and (remax so man)	
Measuring range	2 mA50 mA
Measuring clamps	PSA3020, PSA3052, PSA3165
Response value I _{AL} , adjustable	210 mA (5 mA)*
Relative uncertainty	±30 %/±2 mA of the reference value

Control circuit ($I_{Lmax} = 5 \text{ mA}$)

Measuring range	0.2 mA5 mA
Measuring clamps	PSA3320, PSA3352
Response value I∆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

with measuring clamps	PSA3020, PSA3052, PSA3165
Measuring range	5 mA10 A (crest factor up to 3)
Response value I _{AL} , adjustable	10 mA10 A (100 mA)*
with measuring clamps	PSA3320, PSA3352
Measuring range	2 mA2 A (crest factor up to 3)
Response value I _{AL} , adjustable	5 mA1 A (100 mA)*
Frequency range	421000 Hz
Relative uncertainty, 4260 Hz	±5 %
Relative uncertainty, 611000 Hz	±20 %
Hysteresis	20 %
Harmonics, adjustable	1st to 8th harmonic component

Connection

Type of connection measuring clamp	BNC plug
Power supply unit (DC 5 V)	μUSB plug

Indication

LCD	3 x 16 characters, selectable illumination
LED	Alarm

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)	Class III
Enclosure material	ABS plastic
Flammability class	UL94 V-0
Dimensions WxHxD	84 x 197 x 30 mm
Weight	≤ 350 g

()* = Factory settings

Electrical safety

Standard	IEC 61010-2-030
Pollution degree	2
Installation category	III
Operating voltage	600 V
Nominal insulation voltage	AC 600 V CAT III resp. AC 300 V CAT IV

Transmission ratio

PSA30	10 A/10 mA
PSA33	1 A/0.1 mA
PSA3165	10 A/10 mA

Other

Degree of	f protection, internal components DIN EN 60529 (VDE 0470-1)	IP40
Protection	n class acc. to IEC 60947-1, DIN EN 60947-1 (VDE 0660-100)	Class III
Test port		BNC plug
Dimensio	ns PSA3052/3352	216 x 111 x 45 mm
Dimensio	ns PSA3020/3320	135 x 65 x 30 mm
Dimensio	ns PSA3165	285 x 179 x 45 mm
Permissib	le cable diameter PSA3052/3352	52 mm
Permissib	le cable diameter PSA3052/3320	20 mm
Permissib	le cable diameter PSA3165	115 mm
Weight	PSA3052/3352	≤ 700 g
	PSA3020/3320	≤ 300 g
	PSA3165	≤ 1300 g

Technical data AGE185

Insulation coordination acc. to IEC 60664-1 AC 1000 V Rated insulation voltage Rated impulse voltage/pollution degree 4 kV/3 3AC, AC 500...790 V, DC 400...960 V/42...460 Hz Nominal system voltage U_n

Other

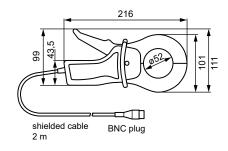
oonents DIN EN 60529 (VDE 0470-1)	IP30
safety plug with green-yellow connec	ting wire 1 mm ²
	≤ 400 g
8	4 x 197 x 30 mm
	≤ 200 g
88	3.5 x 42 x 21 mm
	-

Dimension diagram PSA3020/3320 (dimensions in mm)

135 shielded cable 2 m BNC plug

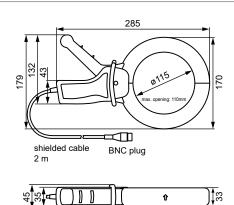


Dimension diagram PSA3052/3352 (dimensions in mm)

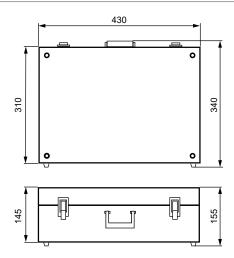


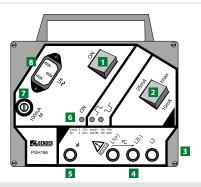


Dimension diagram PSA3165 (dimensions in mm)



Dimension diagram aluminium case(dimensions in mm)





- 1 On/Off switch "ON", activates the test current
- 2 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
- 5 Socket for PE connection

6 LED indicators:

"ON" Power On LED

Indication of the positive clock pulse of the locating current Indication of the negative clock pulse of the locating current

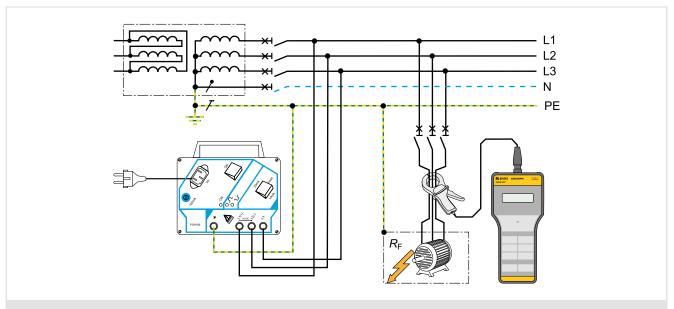
- 7 Microfuse 100 mA
- 8 Panel plug for supply voltage

Operating elements EDS195PM

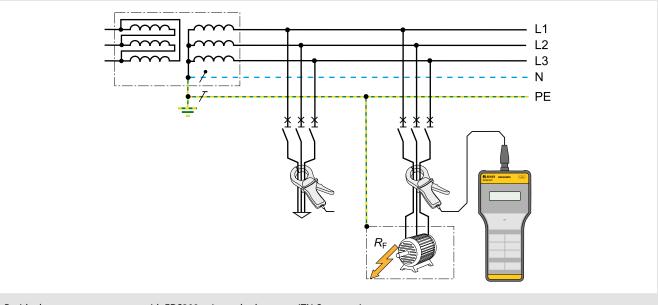


- Micro USB connection for charging the device's rechargeable battery
- 2 BNC connection for the measuring clamp
- 3 LC display, backlit, 3 lines à 16 characters
- 4 LED "ALARM", lights when the response value is exceeded
- Button for the selection of the operating mode : $I_{\Delta S}$ = insulation fault location in IT systems (EDS mode) $I_{\Delta n}$ = residual current measurement in TN-S systems in (RCM mode)
- 6 Button for transformer selection

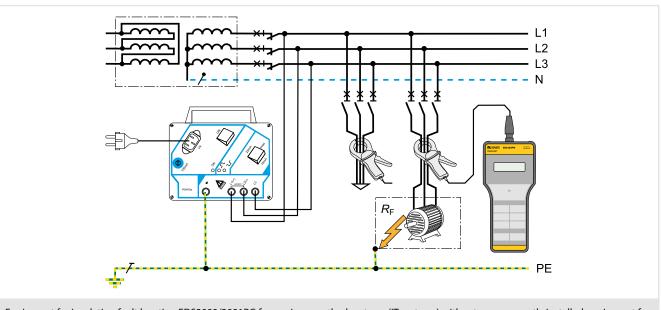
- 7 "INFO" button: device type software version current response values $I_{\Delta S}$ and $I_{\Delta n}$ setup status
 - ESC button: to exit the menu function without changing parameters
- 8 "MENU" button: to toggle between the standard display and the menu selection
- 9 On-Off button
- "HOLD" button: to store the currently indicated measured value Arrow up button: Parameter changes, scroll
- "RESET" button: fault memory acknowledgement Arrow down button: Parameter changes, scroll
- 12 Illumination button: to switch on the display lighting



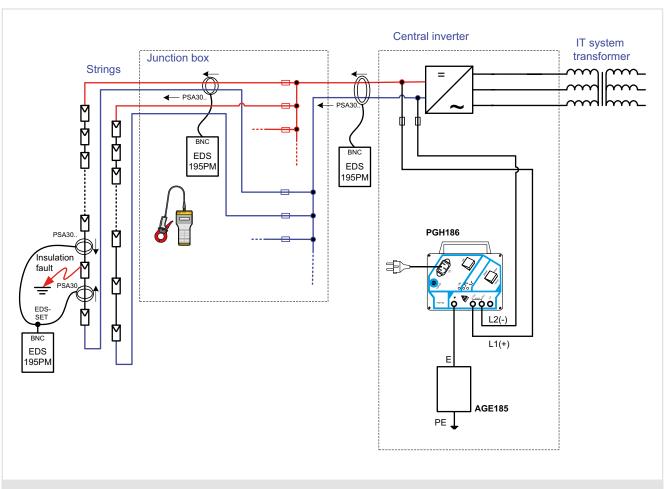
Equipment for insulation fault location EDS3096PG in de-energised systems (IT systems) (Note: TN-S system with all poles disconnected)



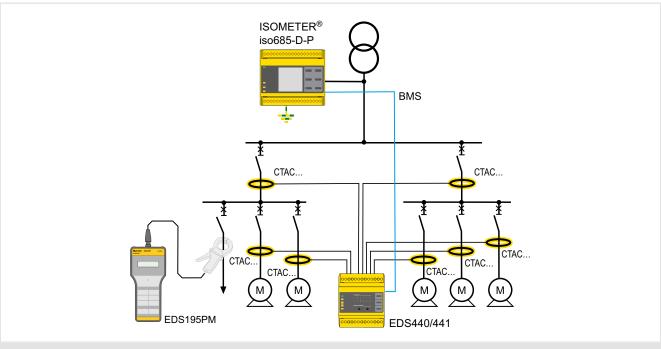
Residual current measurement with EDS309... in earthed systems (TN-S systems)



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



Insulation fault location system EDS3096PV in unearthed photovoltaic systems (IT systems)



Insulation fault location system EDS3090/3091 in unearthed systems (IT systems) with permanently installed equipment for insulation fault location EDS



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





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 /L	1/1.8/2.5/5/10/25/50 mA	1/2.5/5/10/25/50 mA
Response values	1 kΩ…10 MΩ	isoLR1685DP: 20 $\Omega\dots$ 100 k Ω iso1685DP: 200 $\Omega\dots$ 1 M Ω
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	EDS195PM	
LC display	3 x 16 characters	
Evaluating current I∆L	0.250 mA	
Response value	0.21/210 mA selectable	

Messzangen							
Application range	Main circuits	Control circuits					











Туре	PSA3020	PSA3052	PSA3165 (optional)	PSA3320	PSA3352
20 mm					
52 mm		•			
115 mm			•		

Complete systems Complete Systems											
Туре	EDS	3090	EDS3091								
Comprising	Aluminium case, EDS195PM, PSA3020, PSA3052, power supply unit	Aluminium case, EDS195PM, PSA3020, PSA3052, power supply unit	Aluminium case, EDS195PM, 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 <i>U</i> n	3AC, AC 20575 V DC 20504 V	3AC, AC 0575 V DC 0504 V	AC 20265 V, DC 20308 V
<i>U</i> ₅ AC 230 V	PGH185	PGH186	PGH183
<i>U</i> ₅ AC 90132 V	PGH185-13	PGH186-13	PGH183-13
Locating current I _L max.	10/25 mA	10/25 mA	1/2.5 mA

Insulation fault locator



Туре	EDS195PM
LC display	3 x 16 characters
Evaluating current I _{AL}	0.250 mA
Response value	0.21/210 mA selectable

Measuring clamps











Туре	PSA3020	PSA3052	PSA3165 (optional)	PSA3320	PSA3352
20 mm	•			•	
52 mm					
115 mm			•		

	Components EDS309																	
	ndle		EDS195PM with Accessories						PGI	118	with acc	essori	es 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 BNG-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 clamps 52 mm	Measuring clamps 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



Coupling device AGE185





Typical applications

- Monitoring of AC IT systems of up to 790 V and DC IT systems of up to 960 V

Further information

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

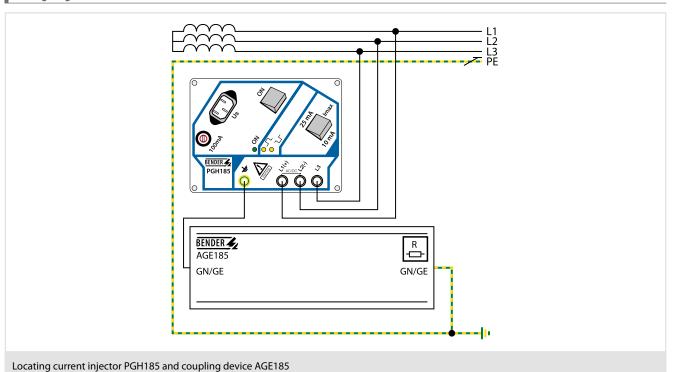
Approvals



Ordering information

Nominal sys	em voltage Us	Туре	Art. No.
AC, 3(N)AC	DC	1,762	7.11.11.57
500790 V	400960 V	AGE185	B980305

Wiring diagram



Insulation monitoring devices







Equipment for insulation fault location







Residual current monitoring systems LINETRAXX®

















Power Quality and Energy Measurement











Switching equipment

Test systems











Device overview residual current monitors LINETRAXX®



Co		170	472	17/	170	186
Ca	talogue page	170	173	176	179	
Spec	ial applications	-	1+	+	-	Monitoring of final circuits, DGUV Regulation 3 (German Social Accident Insurance)
e of oution em	S E TN/TT ■					
distriit sys		-	-	-	-	-
Residual currents	\approx					
Resi		-				
Rated	frequency range	422000 Hz	02000 Hz	02000 Hz	02000 Hz	01000 Hz
Numb	er of measuring channels	1	1	1	12 (per device) 1080 (per system)	6 virtual 12
Response value		50100 % x /Δn2	50100 % x /Δn2	50100 % x /∆n2	10100 % x / _{Δn2} min. 5 mA	50100 % x /Δn2
Resp		10 mA10 A	10500 mA	30 mA3 A	10 mA10 A (Type B) 6 mA20 A (Type A)	3300 mA (Type B) 3300 mA (DC)
Res	oonse delay t _{on}	010 s	010 s	010 s	099 s	0600 s
Sta	art-up delay <i>t</i>	010 s	010 s	010 s	099 s	0.5600 s
Dela	y on release t _{off}	0300 s	099 s	099 s	0999 s	0600 s
	ating principle, Ilarm relays	N/C operation or N/O operation	-			
ation		-	-			
Install	Screw mounting					
Interfaces Installation	BMS	-	-	-		
Inter	Modbus	-	-	-	-	RTU
	oduct details (Products on w.bender.de/en)					

	Type	С. р.		Suitable syste	m components	
	CTAC	358		-	+	-
ŧ	CTUB100	361	-			-
g curre ormers	WRS(P)	365		-	+	-
Measuring current transformers	CTBS25	370	-	-	-	-
We	WS	372		-	-	-
	WF	376		-	Ψ.	-
RS-485 repeater	DI-1DL	397	-	-	Ŧ	
Power supply units	STEP-PS	389	-	-	-	







LINETRAXX® MRCDB300 series



LINETRAXX® RCMB300 series



LINETRAXX® RCMB330



LINETRAXX® RCM410R-24/-2

189	193	197	201	204
Additional protection (MRCD applications)	Additional protection (MRCD applications)	-	-	-
-	-	-	-	-
				-
02000 Hz	DC100000 Hz	DC100000 Hz	DC100000 Hz	4270 Hz
1	-	-	-	-
50100 % von <i>I</i> _{Δn2}	50100 % x /Δn2	50100 % x /∆n2	50100 % x /Δn2	50100 % x /Δn
30 mA3 A	30 mA3 A	30 mA3 A	30500 mA	10 mA30 A
010 s	0 s60 min	50 ms60 min	50 ms60 min	010 s
1 s	0 s60 min	0 s60 min	0 s60 min	0999 s
-	0 s60 min	0 s60 min	0 s60 min	0999 s
N/C operation	N/C operation or N/O operation	N/C operation or N/O operation	-	N/C operation or N/O operation
	partly	partly		
-	-	-	-	-
-	RTU	RTU	RTU	RTU

Suitable system components					
-	-	-	-		
	-	-	-	-	
-	-	-	-		
-	-	-	-	-	
_	-	-	-		
-	-	-	-		
-	-	-	-	-	
-					



Device overview residual current monitors LINETRAXX®







RCMB131-02



RCMB132-01



RCMB104



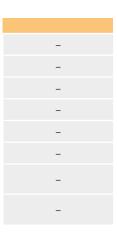
RDC104-4

Cat	talogue page	207	210	213	216	219
Speci	ial applications	Monitoring of final circuits, integration in power distribution units (PDUs)	Monitoring of final circuits, integration in power distribution units (PDUs)	Monitoring of final circuits, integration in power distribution units (PDUs)	Electric vehicle charging systems	Electric vehicle charging systems
e of ution	TN/TT					
Typ distrib syst	IT	-	-	-	-	-
dual	\approx					
Residual						
Rated	frequency range	DC2000 Hz	DC2000 Hz	DC2000 Hz	02000 Hz	02000 Hz
	er of measuring channels	-	-	+	-	-
Response value	J _{Δn1}	3,5100 mA (DC)	3,5100 mA (DC)	3,5100 mA (DC)	DC 6 mA (RCMB104-1) r.m.s. 5 mA (RCMB104-2)	-
Resp	I _{Δn2}	3,5100 mA (r.m.s.)	3,5100 mA (r.m.s.)	3,5100 mA (r.m.s.)	r.m.s. 30 mA (RCMB104-1) r.m.s. 20 mA (RCMB104-2)	DC 6 mA
Resp	onse delay t _{on}	-	-	+	-	-
Sta	rt-up delay <i>t</i>	-	-	-	-	-
Delay	y on release t _{off}	-	-	-	-	-
Oper a	ating principle, larm relays	-	+	17	-	-
Installation					+	-
Instal	Screw mounting				-	-
Interfaces	BMS	-	-	-	-	-
Inter	Modbus	RTU	-	RTU	-	-
Product details (Products on www.bender.de/en)						

	Туре	С. р.		Suitable system components			
	CTAC	358	-	-	-	-	-
Ħ	CTUB100	361	-	-	-	-	-
Measuring current transformers	WRS(P)	365	-	-	-	-	-
easurin transfc	CTBS25	370	-	-	-	-	-
₩ W	WS	372	-	-	-	-	-
	WF	376	-	-	-	-	-
RS-485 repeater	DI-1DL	397	-	+	-	-	-
Power supply units	STEP-PS	389				-	-



222
Fault current monitoring of electric vehicle AC charging stations
-
02000 Hz
1 (RCMB422EC) or 2 (RCMB420EC)
DC 6 mA
RMS 30 mA
-
-
2 s (after reset)
N/C operation
-
-



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
- $\bullet \ \ Impact \ on \ N \ conductors$
- Trace heating systems

Approvals







Device features

- AC and pulsed DC sensitive residual current monitor Type A according to DIN EN 62020
- r.m.s. value measurement (AC)
- Two separately adjustable response values
- Frequency range 42...2000 Hz
- Start-up delay, response delay and delay on release
- · Restart function
- · Digital measured value display via LC display
- · Measured value memory for operating value
- · CT connection monitoring
- 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 and fault memory behaviour selectable
- · Password protection for device setting
- · Device self monitoring
- Sealable transparent cover
- Two-module enclosure (36 mm)
- · RoHS compliant
- Push-wire terminal (two terminals per connection)

Further information

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

Ordering information

Supply voltage ¹⁾ U s		Type	Art. No.	
AC		3,62	Screw-type terminal	Push-wire terminal
1672 V, 40460 Hz	9.694 V	RCM420-D-1	B94014001	B74014001
70300 V, 40460 Hz	70300 V	RCM420-D-2	B94014002	B74014002

¹⁾ Absolute values

Accessories

Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B 9806 0008

Suitable system components

		circular	CTAC	B981100	360
	Measuring current transformers	rectangular	WRS(P)	B9117	367
		split-core	WS	B980806	374
		flexible	WF	B780802	378



use 60/70°C copper conductors only

0.2...1.5 mm² (AWG 24...16)

10 mm

2.1 mm

50 N

Total motor	
Insulation coordination acc. to IEC 60664-1/IEC 60664-3	
RCM420-D-1	
Rated insulation voltage	100 V
Overvoltage category/pollution degree	III/3
Rated impulse voltage	2,5 kV
RCM420-D-2	
Rated insulation voltage	250 V
Overvoltage category/pollution degree	III/3
Rated impulse voltage	4 kV
Supply voltage	
RCM420-D-1	
Supply voltage range $U_{\rm S}$	AC 2460 V/DC 2478 V
Operating range U _s	AC 1672 V/DC 9.694 V
Frequency range U _s	DC, 42460 Hz
RCM420-D-2	
Supply voltage range $U_{\rm S}$	AC/DC 100250 V
Operating range $U_{\rm S}$	AC/DC 70300 V
Frequency range U _s	42460 Hz
Protective separation (reinforced insulation) between	/I T/D) /44 42 44) /24 22 24)
(A1, A2) - (K. Voltage test according to IEC 61010-1	/I, T/R) - (11, 12, 14) - (21, 22, 24)
Power consumption	2.21 kV < 4 VA
	2414
Measuring circuit	
External measuring current transformer type	CTAC, WR, WS
Load	68 Ω
Rated insulation voltage (measuring current transformer) Operating characteristic acc. to DIN EN 62020	800 V type A
Frequency range	422000 Hz
Measuring range	3 mA16 A
Relative uncertainty	020 %
Operating uncertainty	030 %
Response values	
Rated residual operating current $I_{\Delta n1}$ (prewarning, AL1)	50100 % x /Δn2, (50 %)*
Rated residual operating current I∆n2 (Alarm, AL2)	10 mA10 A (30 mA)*
Hysteresis	1025 % (15%)*
Specified time	
Starting delay t	010 s (0.5 s)*
Response delay t_{on2} (Alarm)	010 s (0 s)*
Response delay t _{on1} (prewarning)	010 s (1 s)*
Delay on release toff	0300 s (1 s)*
Operating time t_{ae} at $I_{\Delta n} = 1 \times I_{\Delta n 1/2}$	≤ 180 ms
Operating time t_{ae} at $I_{\Delta n} = 5 \times I_{\Delta n 1/2}$	≤ 30 ms
Response time t _{an}	$t_{\rm an} = t_{\rm ae} + t_{\rm on1/2}$
Recovery time t _b Number of reload cycles	≤ 300 ms 0100 (0)*
·	0100 (0)
Cable lengths for measuring current transformers	0 1
Single wire $\geq 0.75 \text{ mm}^2$ Single wire, twisted $\geq 0.75 \text{ mm}^2$	01 m 010 m
Shielded cable ≥ 0.75 mm ²	040 m
Recommended cable (shielded, shield on one side connected to to	
of the RCM420, not connected to earth)	J-Y(St)Y min. 2x0.8
Connection	screw terminals
Displays, memory	
Display range, measured value	3 mA16 A
From of indication	+ 15 %/+ 2 digit

Cable length for external test/reset button				0	10 m
Switching elements					
Number of switching elements			2 x 1 c	hangeove	r contact
Operating principle	N/C ope	ration/ N/	0 operatio	n (N/O ope	eration)*
Electrical service life under rated operating con	ditions		10000 sv	itching op	erations
Contact data acc. to IEC 60947-5-1:					
Jtilization 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 voltage UL	200 V	200 V	24 V	110 V	200 V
Rated operational current	5 A	3 A	1 A	0.2 A	0.1 A
Minimum contact load (relay manufacturer's re	eference)			10 m	A/5 V DC
Environment/EMC					
EMC				DIN E	N 62020
Operating temperature				-25	.+55℃
Classification of climatic conditions IEC 60	721 (except	condensat	ion and fo	rmation of	ice)
Stationary use (IEC 60721-3-3)					3K23
Transportation (IEC 60721-3-2)					2K11
Storage (IEC 60721-3-1)					1K22
Classification of mechanical conditions ac	c. to IEC 607	21			
Stationary use (IEC 60721-3-3)					3M11
Transportation (IEC 60721-3-2)					2M4
Storage (IEC 60721-3-1)					1M12

Connection				
For UL application				

Connection type	screw-type terminal or push-wire terminal
Screw-type terminal	
Connection properties:	
rigid/flexible/conductor sizes	0.24/0.22.5 mm ² /AWG 2412
Two conductors with the same cross section:	
rigid/flexible	0.21.5/0.21.5 mm ²
Stripping length	89 mm
Tightening torque, terminal screws	0.50.6 Nm
Push-wire terminals	
Connection properties:	
rigid	0.22.5 mm ² (AWG 2414)
flexible without ferrules	0.752.5 mm ² (AWG 1914)
0.91.91.6.1	0.2 1.5 2 (ANIC 24 10)

Other

flexible with ferrules

Test opening, diameter

Stripping length

Opening force

Operating mode	continuous operation
Position of normal use	any
Protection class, internal components (DIN EN 60529)	IP30
Degree of protection, terminals (DIN EN 60529	IP20
Enclosure material	polycarbonate
Flammability class	UL94V-0
DIN rail mounting acc. to	IEC 60715
Screw mounting	2 x M4 with mounting clip
Documentation number	D00057
Weight	≤ 150 g

()* = factory setting

± 15 %/± 2 digit

off/0...999 (OFF)*

on/off (off)*

data record measured values

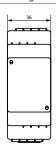
Dimension diagram (dimensions in mm)

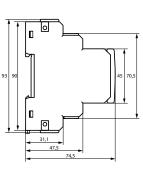
Fault memory alarm relay

Measured-value memory for alarm value

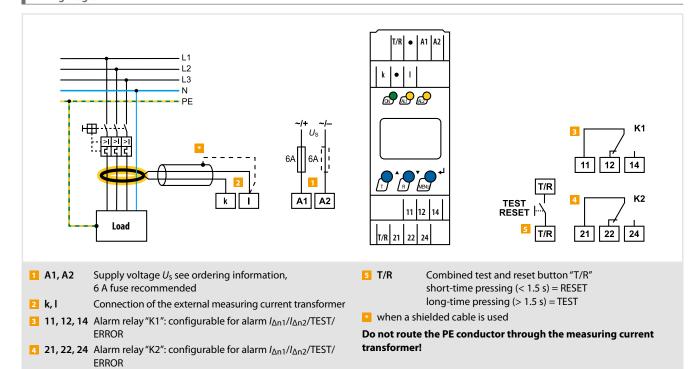
Error of indication

Password





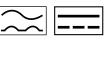




LINETRAXX® RCMA420

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)

Device features

- AC/DC sensitive residual current monitor Type B acc. to DIN EN 62020 and IEC/TR 60755
- · r.m.s. value measurement (AC+DC)
- Two separately adjustable response values 10...500 mA
- Frequency range 0...2000 Hz
- Start-up delay, response delay and delay on release
- · Digital measured value display via LC display
- · Measured value memory for operating value
- · CT connection monitoring
- 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 and fault memory selectable
- · Continuous self monitoring
- · Multi-functional LC display
- · Password protection for device settings
- Sealable transparent cover
- Two-module enclosure (36 mm)
- · RoHS compliant

Further information

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

Approvals







Ordering information

Supply vo	oltage ⁾ <i>U</i> s	Type	Art. No.		
AC	DC	21.7	Screw-type terminal	Push-wire terminal	
1672 V, 42460 Hz	9.694 V	RCMA420-D-1	B94043001	B74043001	
70300 V, 42460 Hz	70300 V	RCMA420-D-2	B94043002	B74043002	

¹⁾ Absolute values

Accessories

Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B 9806 0008

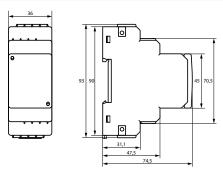
Suitable system components

Description	Type of construction	Туре	Art. No.	Page
Measuring current transformers	circular	CTUB100	B781200	361
Connecting cables for Measunging current transformers	-	СТХ	B9811008	361



Insulation coordination acc. to IEC 60664-1/IEC 60664-3		Inputs/outputs
RCMA420-D-1:		Cable length for external test/reset button
Rated insulation voltage	100 V	Cable lengths for measuring current tran
Overvoltage category/pollution degree	III/3	Connection CTX
Rated impulse voltage	2.5 kV/3	or alternatively: single wire 6 x 0.75 mm ²
RCMA420-D-2:		, ,
Rated insulation voltage	250 V	Switching elements
Overvoltage category/pollution degree	III/3	Number of switching elements
Rated impulse voltage	4 kV	Operating principle
Supply voltage		Electrical service life under rated operating con
RCMA420-D-1:		Contact data acc. to IEC 60947-5-1
Supply voltage range $U_{\rm S}$	AC 2460 V/DC 2478 V	Utilization category
Operating range <i>U</i> s	AC 1672 V/DC 9.694 V	Rated operational voltage Rated operational voltage UL
Frequency range $U_{\rm S}$	DC, 42460 Hz	Rated operational current
	DC, 12 100 112	Minimum contact load (relay manufacturer's r
RCMA420-D-2: Supply voltage range U _S	AC/DC 100250 V	minimum contact load (Iciay manufacturer 5 I
Supply voltage range U_5 Operating range U_5	AC/DC 100250 V AC/DC 70300 V	Environment/EMC
Frequency range <i>U</i> s	42460 Hz	EMC
Protective separation (reinforced insulation) between	72700 112	Operating temperature
,	x/I, T/R) - (11, 12, 14) - (21, 22, 24)	Classification of climatic conditions IEC 60
Voltage test according to IEC 61010-1	2.21 kV	Stationary use (IEC 60721-3-3)
Power consumption	≤ 6.5 VA	Transportation (IEC 60721-3-2)
		Storage (IEC 60721-3-1)
Measuring circuit		Classification of mechanical conditions a
External measuring current transformer	CTUB101-CTBC20210(P)	Stationary use (IEC 60721-3-3)
Rated insulation voltage (measuring current transformer)	800 V	Transportation (IEC 60721-3-2)
Operating characteristic acc. to DIN EN 62020	type B	Storage (IEC 60721-3-1)
Frequency range	02000 Hz	Connection
Measuring range AC	01.5 A	For UL applications:
Measuring range DC Relative uncertainty for f	0600 mA	use 60°C/70°C copper conductors only
Relative uncertainty for f	035 %	ase 55 G/76 C copper conductors only
≤ 2 mz > 2<16 Hz	-35+100 %	Connection type
≥ 16 ≤ 1000 Hz	035 %	Screw-type terminal
> 1000 ≤ 2000Hz	± 35 %	Connection properties:
Operating uncertainty	±17.5 %	rigid/flexible/conductor sizes
		Two conductors with the same cross section:
Response values		rigid/flexible
Rated residual operating current $I_{\Delta n1}$ (prewarning, AL1)	50100 % x /Δn2, (50 %)*	Stripping length
Rated residual operating current $I_{\Delta n2}$ (Alarm, AL2)	10500 mA (30 mA)*	Tightening torque, terminal screws
Hysteresis	1025 % (15%)*	Push-wire terminals
Specified times		Connection properties:
Starting delay t	010 s (0.5 s)*	rigid
Response delay t _{on1} (prewarning)	010 s (1 s)*	flexible without ferrules
Response delay t _{on2} (alarm)	010 s (0 s)*	flexible with ferrules
Delay on release t _{off}	099 s (1 s)*	Stripping length Opening force
Operating time t_{ae} at $I_{\Delta n} = 1 \times I_{\Delta n 1/2}$	≤ 180 ms	Test opening, diameter
Operating time t_{ae} at $I_{\Delta n} = 5 \times I_{\Delta n 1/2}$	≤ 30 ms	rest opening, didinetel
Response time t _{an}	$t_{\rm an} = t_{\rm ae} + t_{\rm on1/2}$	Other
Recovery time t _b	≤ 300 ms	Operating mode
Displays, memory		Position of normal use
Display range, measured value AC	01.5 A	Degree of protection, internal components (IE
Display range, measured value DC	0600 mA	Degree of protection, terminals (IEC 60529)
Error of indication	±17.5 %/± 2 digit	Enclosure material
Measured-value memory for alarm value	data record measured values	Flammability class
Password	off/0999 (off)*	DIN rail mounting acc. to
Fault memory alarm relay	on/off (on)*	Screw fixing
· · · · · · · · · · · · · · · · · · ·		Documentation number

Dimension	diagram	(dimensions in mm)



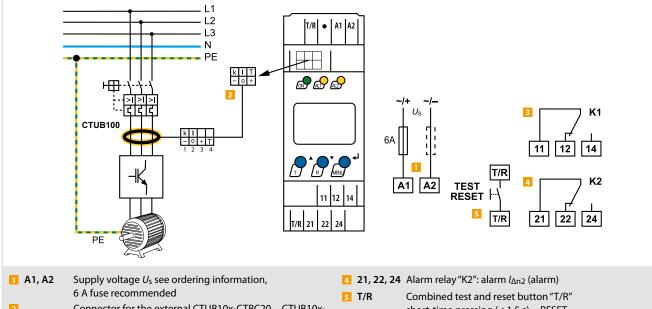
Cable laweth for cotom-14-4/					- 10
Cable length for external test/reset button				0	10 r
Cable lengths for measuring current trans	sformers				
Connection CTX			11	m/2.5 m/5	
or alternatively: single wire 6 x 0.75 mm ²				0	10 r
Switching elements					
Number of switching elements			2 x 1 c	hangeove	r conta
Operating principle	N/C op	eration/N/	0 operatio	n (N/C ope	ration)
Electrical service life under rated operating con	ditions		10000 sv	vitching op	eration
Contact data acc. to IEC 60947-5-1					
Utilization 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 voltage UL	200 V	200 V	24 V	110 V	200
Rated operational current	5 A	3 A	1 A	0.2 A	0.1
Minimum contact load (relay manufacturer's re	eterence)			10 m/	A/5 V D
Environment/EMC					
EMC					N 6202
Operating temperature				-25	.+55 °
Classification of climatic conditions IEC 60	721 (except	condensat	ion and fo	rmation of	ice)
Stationary use (IEC 60721-3-3)					3K2
Transportation (IEC 60721-3-2)					2K1
Storage (IEC 60721-3-1)					1K2
Classification of mechanical conditions ac	c. to IEC 607	21:			
Stationary use (IEC 60721-3-3)					3M1
Transportation (IEC 60721-3-2)					2N
Storage (IEC 60721-3-1)					1M1
Connection					
For UL applications:					
use 60°C/70°C copper conductors only					
Connection type	scre	ew-type te	rminal or p	push-wire	termina
Screw-type terminal					
Connection properties:				2,,,,,	
rigid/flexible/conductor sizes				mm²//\\\(-	
		0.24/0	J.22.5 r	IIIII /AWU	241
Two conductors with the same cross section:		0.24/0			
rigid/flexible		0.24/0		1.5/0.2	1.5 mn
rigid/flexible Stripping length		0.24/0		1.5/0.2 8.	1.5 mn 9 mı
rigid/flexible Stripping length Tightening torque, terminal screws		0.24/0		1.5/0.2 8.	1.5 mn 9 mı
rigid/flexible Stripping length Tightening torque, terminal screws Push-wire terminal s		0.24/0		1.5/0.2 8.	1.5 mn 9 mı
rigid/flexible Stripping length Tightening torque, terminal screws Push-wire terminals Connection properties:			0.2	1.5/0.2 8. 0.5	1.5 mn 9 mı .0.6 Nı
rigid/flexible Stripping length Tightening torque, terminal screws Push-wire terminal s		0.	0.2 22.5 m	1.5/0.2 8. 0.5 m² (AWG 2	1.5 mn 9 m .0.6 N
rigid/flexible Stripping length Tightening torque, terminal screws Push-wire terminals Connection properties: rigid		0. 0.7	0.2 22.5 m 52.5 m	1.5/0.2 8. 0.5	1.5 mn 9 mi .0.6 Ni 2414
rigid/flexible Stripping length Tightening torque, terminal screws Push-wire terminals Connection properties: rigid flexible without ferrules		0. 0.7	0.2 22.5 m 52.5 m	1.5/0.2 8. 0.5 m² (AWG 2 m² (AWG 1	1.5 mn 9 mi .0.6 Ni .2414
rigid/flexible Stripping length Tightening torque, terminal screws Push-wire terminals Connection properties: rigid flexible without ferrules flexible with ferrules Stripping length Opening force		0. 0.7	0.2 22.5 m 52.5 m	1.5/0.2 8. 0.5 m² (AWG 2 m² (AWG 1	1.5 mn 9 mi .0.6 Ni .2414 1914 2416
rigid/flexible Stripping length Tightening torque, terminal screws Push-wire terminals Connection properties: rigid flexible without ferrules flexible with ferrules Stripping length		0. 0.7	0.2 22.5 m 52.5 m	1.5/0.2 8. 0.5 m² (AWG 2 m² (AWG 1	1.5 mn 9 mi .0.6 Ni 2414 1914 2416 10 mi
rigid/flexible Stripping length Tightening torque, terminal screws Push-wire terminals Connection properties: rigid flexible without ferrules flexible with ferrules Stripping length Opening force Test opening, diameter		0. 0.7	0.2 22.5 m 52.5 m	1.5/0.2 8. 0.5 m² (AWG 2 m² (AWG 1	1.5 mn 9 mi .0.6 Ni 2414 1914 2416 10 mi
rigid/flexible Stripping length Tightening torque, terminal screws Push-wire terminals Connection properties: rigid flexible without ferrules flexible with ferrules Stripping length Opening force Test opening, diameter		0. 0.7	0.2 22.5 m 52.5 m 21.5 m	1.5/0.2 8. 0.5 m² (AWG 2 m² (AWG 1 m² (AWG 2	1.5 mn 9 mi .0.6 Ni .2414 1914 2416 10 mi 50 2.1 mi
rigid/flexible Stripping length Tightening torque, terminal screws Push-wire terminals Connection properties: rigid flexible without ferrules flexible with ferrules Stripping length Opening force Test opening, diameter		0. 0.7	0.2 22.5 m 52.5 m 21.5 m	1.5/0.2 8. 0.5 m² (AWG 2 m² (AWG 2	1.5 mn 9 mi .0.6 Ni 2414 1914 2416 10 mi 50 2.1 mi
rigid/flexible Stripping length Tightening torque, terminal screws Push-wire terminals Connection properties: rigid flexible without ferrules flexible with ferrules Stripping length Opening force Test opening, diameter Other Operating mode Position of normal use	C 60529)	0. 0.7	0.2 22.5 m 52.5 m 21.5 m	1.5/0.2 8. 0.5 m² (AWG 2 m² (AWG 1 m² (AWG 2	1.5 mm 9 mm 10 mm 10 mm 50 2.1 mm 50 peraticion oriente
rigid/flexible Stripping length Tightening torque, terminal screws Push-wire terminals Connection properties: rigid flexible without ferrules flexible with ferrules Stripping length Opening force Test opening, diameter Other Operating mode	C 60529)	0. 0.7	0.2 22.5 m 52.5 m 21.5 m	1.5/0.2 8. 0.5 m² (AWG 2 m² (AWG 2	1.5 mm9 mm9 mm9 mm9 mm
rigid/flexible Stripping length Tightening torque, terminal screws Push-wire terminals Connection properties: rigid flexible without ferrules flexible with ferrules Stripping length Opening force Test opening, diameter Other Operating mode Position of normal use Degree of protection, internal components (IEC)	C 60529)	0. 0.7	0.2 22.5 m 52.5 m 21.5 m	1.5/0.2 8. 0.5 m² (AWG 2 m² (AWG 2 m² (AWG 2	1.5 mm9 mm9 mm9 mm
rigid/flexible Stripping length Tightening torque, terminal screws Push-wire terminals Connection properties: rigid flexible without ferrules flexible with ferrules Stripping length Opening force Test opening, diameter Other Operating mode Position of normal use Degree of protection, internal components (IEC Obegree of protection, terminals (IEC 60529)	C 60529)	0. 0.7	0.2 22.5 m 52.5 m 21.5 m	1.5/0.2 8. 0.5 m² (AWG 2 m² (AWG 2 ntinuous o display-	1.5 mm9 mm
rigid/flexible Stripping length Tightening torque, terminal screws Push-wire terminals Connection properties: rigid flexible without ferrules flexible with ferrules Stripping length Opening force Test opening, diameter Other Operating mode Position of normal use Degree of protection, internal components (IEC Degree of protection, terminals (IEC 60529) Enclosure material Flammability class DIN rail mounting acc. to	C 60529)	0. 0.7	0.2 22.5 m 52.5 m 21.5 m	1.5/0.2 8. 0.5 m² (AWG 2 m² (AWG 2 m² (AWG 2	1.5 mm 9 mm 9 mm 9 mm 9 mm 9 mm 9 mm 10.0 Mm 10 mm 50 2.1 mm 10 mm 50 2.1 mm 10 mm 1
rigid/flexible Stripping length Tightening torque, terminal screws Push-wire terminals Connection properties: rigid flexible without ferrules flexible with ferrules Stripping length Opening force Test opening, diameter Other Operating mode Position of normal use Degree of protection, internal components (IEC 60529) Enclosure material Flammability class DIN rail mounting acc. to Screw fixing	C 60529)	0. 0.7	0.2 22.5 m 52.5 m 21.5 m	1.5/0.2 8. 0.5 m² (AWG 2 m² (AWG 2 ntinuous o display-	1.5 mm 9 mm 0.6 Nm
rigid/flexible Stripping length Tightening torque, terminal screws Push-wire terminals Connection properties: rigid flexible without ferrules flexible with ferrules Stripping length Opening force Test opening, diameter Other Operating mode Position of normal use Degree of protection, internal components (IEC Degree of protection, terminals (IEC 60529) Enclosure material Flammability class DIN rail mounting acc. to	C 60529)	0. 0.7	0.2 22.5 m 52.5 m 21.5 m	1.5/0.2 8. 0.5 m² (AWG 2 m² (AWG 2 m² (AWG 2	9 mm9 mm9 mm

()* = factory setting

Weight



≤ 150 g

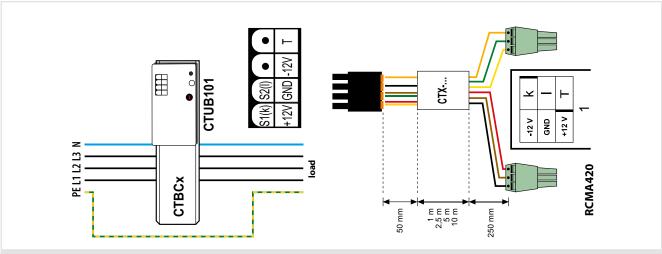


- Connector for the external CTUB10x-CTBC20...CTUB10x-CTBC60 series measuring current transformer
- 3 **11, 12, 14** Alarm relay "K1": *I*_{Δn1} (prewarning)

5 T/R Combined test and reset button "T/R" short-time pressing (< 1.5 s) = RESET long-time pressing (> 1.5 s) = TEST

Do not route the PE conductor through the measuring current transformer!

Connection of measuring current transformers



Connection to the RCMA423 residual current monitor using the CTX-... connecting cable. Colour coding for CTX...: k = yellow, l = green, -12 V = black, GND = brown, +12 V = red, Test (T) = orange

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 acc. to DIN EN 62020 and IEC/TR 60755
- r.m.s. value measurement (AC+DC)
- Two separately adjustable response values 30...3 A
- Frequency range 0...2000 Hz
- Start-up delay, response delay and delay on release
- · Digital measured value display via LC display
- · Measured value memory for operating value
- · CT connection monitoring
- 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 and fault memory selectable
- · Continuous self monitoring
- Multi-functional LC display
- · Password protection for device settings
- Sealable transparent cover
- Two-module enclosure (36 mm)

Further information

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

Approvals







Ordering information

Supply vo	oltage ⁾ U _S	Type	Art. No.		
AC	DC	1,742	Screw-type terminal		
1672 V, 42460 Hz	9.694 V	RCMA423-D-1	B94043023	B74043023	
70300 V, 42460 Hz	70300 V	RCMA423-D-2	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	Type of construction Type		Page
Measuring current transformers	circular	CTUB100	B781200	361
Connecting cables for Measunging current transformers	-	СТХ	B9811008	361



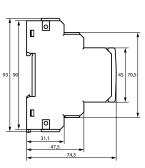
D00063

≤ 150 g

Technical data							
Insulation coordination acc. to IEC 60664-1/IEC 60664-3	3	Cable lengths for measuring current transform	ners				
RCMA423-D-1:		Connection CTX 1 m/2.5 m/5 m/10 m					
Rated insulation voltage	100 V	or alternatively: single wire 6 x 0.75 mm ²				()10 n
Overvoltage category/pollution degree	III/3	Contact in a classical contact					
Rated impulse voltage	2.5 kV	Switching elements					
RCMA423-D-2:		Number of switching elements	NIC	(1)		changeove	
Rated insulation voltage	250 V	Operating principle	N/C op	peration/N	O operation	n (N/C op	
Overvoltage category/pollution degree	III/3	Electrical endurance, number of cycles					10,00
Rated impulse voltage/pollution degree	4 kV	Contact data acc. to IEC 60947-5-1					
nateu impuise voitage/pollution degree	4 KV	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
RCMA423-D-1:		Rated operational voltage UL	200 V	200 V	24 V	110 V	200
Supply voltage range U_S	AC 2460 V/DC 2478 V	Rated operational current	5 A	3 A	1 A	0.2 A	0.1
Operating range U_S	AC 1672 V/DC 9.694 V	Minimum contact load (relay manufacturer's refere	nce)			10 m	A/5 V [
Frequency range <i>U</i> _S	DC, 42460 Hz	Environment/EMC					
RCMA423-D-2:		EMC				FN	61326-
Supply voltage range <i>U</i> S	AC/DC 100250 V						01320
Operating range U _S	AC/DC 70300 V	Ambient temperatures: Operating temperature				זר	+55°
Frequency range <i>U</i> s	42460 Hz						
		Transport					+70° +55°
	A2) -(k/l, T/R) -(11, 12, 14) -(21, 22, 24)	Long-term storage				-25.	+ɔɔ
Voltage test according to IEC 61010-1	2.21 kV	Classification of climatic conditions acc. to IEC					
Power consumption	≤ 6.5 VA	Stationary use (IEC 60721-3-3)	3K2	3 (no cond	ensation, r	no formation	
Measuring circuit		Transport (IEC 60721-3-2)					2K1
External measuring current transformer	CTUB101-CTBC20210(P)	Long-term storage (IEC 60721-3-1)					1K2
Rated insulation voltage (measuring current transformer)	800 V	Classification of mechanical conditions acc. to	IEC 60	721:			
Operating characteristic acc. to DIN EN 62020 and IEC 60755	type B	Stationary use (IEC 60721-3-3)					3M1
Rated frequency	02000 Hz	Transport (IEC 60721-3-2)					2M
Relative uncertainty for f	02000 112	Long-term storage (IEC 60721-3-1)					1M1
≤ 2 Hz	035 %	Commontion					
> 2<16 Hz	-35+100 %	Connection					
≥ 16 ≤ 1000 Hz	035 %	For UL application					
> 1000 ≤ 2000 Hz	±35 %	use 60/70°C copper conductors only					
Operating uncertainty	±17,5 %	Connection type	SCI	rew-type te	erminal or	push-wire	termina
Response values		Screw-type terminal		,,			
Rated residual operating current $I_{\Delta n1}$ (prewarning, AL1)	50100 % of /Δn2 (50 %)*	Connection properties:					
Rated residual operating current $I_{\Delta n1}$ (prewarming, AL1)	30 mA3 A (30 mA)*	rigid/flexible/conductor sizes		0.24/	0.22.5 ı	mm²/AWG	241
Hysteresis	1025 % (15%)*	Two conductors with the same cross section:					
nysteresis	1025 % (13%)	rigid/flexible			0.2	1.5/0.2	1.5 mm
Specified time		Stripping length				8	9 mr
Start-up delay t	010 s (0.5 s)*	Tightening torque, terminal screws				0.5.	.0.6 Nr
Response delay t _{on1} (prewarning)	010 s (1 s)*	Push-wire terminals					
Response delay t _{on2} (alarm)	010 s (0 s)*	Connection properties:					
Delay on release $t_{\rm off}$	099 s (1 s)*	rigid		0	.22.5 m	m² (AWG	2414
Operating time t_{ae} bei $I_{\Delta n} = 1 \times I_{\Delta n 1/2}$	≤ 180 ms	flexible without ferrules			752.5 m	•	
Operating time t_{ae} bei $I_{\Delta n} = 5 \times I_{\Delta n 1/2}$	≤ 30 ms	flexible with ferrules			.21.5 m		
Response time t _{an}	$t_{\rm an} = t_{\rm ae} + t_{\rm on1/2}$	Stripping length				. ,	10 mi
Recovery time $t_{\rm b}$	≤ 300 ms	Opening force					50
Displays, memory		Test opening, diameter					2.1 mr
Display range, measured value AC/DC	06 A	Other					
Error of indication	±17.5 %/±2 digit	Operating mode				ntinuous c	naratio
Measured-value memory for alarm value	data record measured values	Position of normal use			CO	display-	•
Password	off/0999 (off)*	Degree of protection, internal components (IEC 605	20)			uispiay-	-oriente IP3
Fault memory alarm relay	on/off (on)*	Degree of protection, internal components (IEC 60529)	4 7)				IP3
. ,	on, on (on)	Enclosure material				nolve	arbonat
Inputs/outputs		Flammability class					UL94V-
Cable length for external test/reset button	010 m	DIN rail mounting acc. to					UL94V- EC 6071
		Screw mounting			2 v M4	יי with mour	
		Documentation number			4 V IVI4	vvicii iiiUUI	DOODE

Dimension diagram (dimensions in mm)



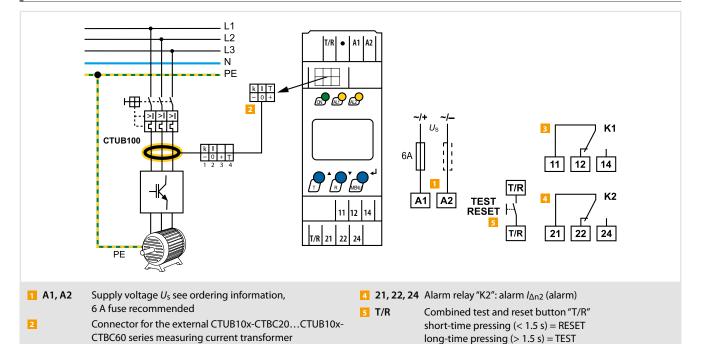




Weight

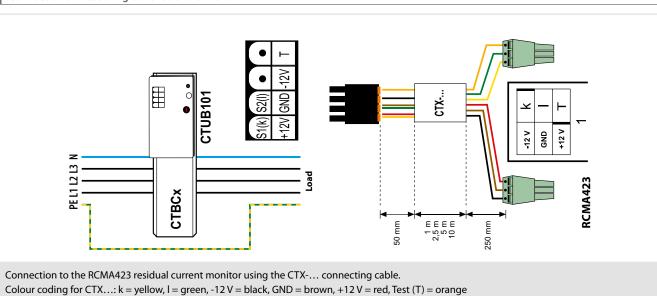
Documentation number





Connection of measuring current transformers

11, 12, 14 Alarm relay "K1": *I*_{∆n1} (prewarning)



transformer!

Do not route the PE conductor through the measuring current

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

Approvals







UL File number: E173157

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)

Further information

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



Differential measurement method		Common alarm relay for all	Alarm relay per load current		Supply voltage <i>U</i> s		Туре	Art. No.
pulsed DC sensitive	AC/DC sensitive	channels	channel	channel measurement		DC	1775	711 11 1101
	_			1672 V, 50/60 Hz	1694 V	RCMS460-D-1	B94053001	
		2 x 1 changeover contact	-	-	70276 V, 50/60 Hz	70276 V	RCMS460-D-2	B94053002
				100 mA125 A	1672 V, 50/60 Hz	1694 V	RCMS460-D4-1	B94053009
C A 20 A	10 10 1				70276 V, 50/60 Hz	70276 V	RCMS460-D4-2	B94053010
6 mA20 A	10 mA10 A		12 x 1 N/O contact	– 12 x 1	1672 V, 50/60 Hz	1694 V	RCMS490-D-1	B94053005
					70276 V, 50/60 Hz	70276 V	RCMS490-D-2	B94053006
				100 mA125 A	1672 V, 50/60 Hz	1694 V	RCMS490-D4-1	B94053011
					70276 V, 50/60 Hz	70276 V	RCMS490-D4-2	B94053012

Ordering information RCMS460/490-L

Current me	asurement	Common alarm relay for all chan-	Alarm relay per	Supply volt	age Us	Туре	Art. No.	
pulsed DC sensitive	AC/DC sensitive	nels	channel	AC		.,,,,,	711 (1 110)	
	10 mA10 A	2 x 1 changeover contact	-	1672 V, 50/60 Hz	1694 V	RCMS460-L-1	B94053003	
C A 20 A				70276 V, 50/60 Hz	70276 V	RCMS460-L-2	B94053004	
6 mA20 A		2 x 1 changeover contact	12 x 1 N/O contact	1672 V, 50/60 Hz	1694 V	RCMS490-L-1	B94053007	
				70276 V, 50/60 Hz	70276 V	RCMS490-L-2	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
Measuring current transformers	pulsed DC sensitive	circular	CTAC	B981100	358
		rectangular	WRS(P)	B9117	365
		split-core	WS	B980806	372
		flexible	WF	B780802	376
	AC/DC sensitive	circular	CTUB100	B781200	361
			CTBS25	B98120060	370
Connecting cables for Measunging current transformers CTUB100 series	-	-	CTXS	B9811009	361
Condition Monitor	with integrated gateway: Bender system/Ethernet	-	COM465IP	B950610	402
	with display and an integrated gateway	-	CP9I	B9506103	416
RS-485 repeater	-	-	DI-1DL	B95012047	397
Power supply unit	for supplying up to six CTUB100 series measuring current transformers $\label{eq:constraint} % \begin{center} $	-	STEP-PS	B940531	389
Alarm indicator and test combination	acc. DIN VDE 0100-710	-	MK2430	B951000	422



Device features/distinguishing features		RCMS460-D	RCMS460-L	RCMS490 -D	RCMS490-L	
	Parameter setting function Master/Slave			-		-
		Address range	190	190	190	190
	Measuring channels per device		12	12	12	12
	CTAC, WRS(P), WS, CTUB100, CTBS25, WF series measuring current transformers					
	CT monitoring					
		AC/DC sensitive 02000 Hz (Type B)	10 mA10 A	10 mA10 A	10 mA10 A	10 mA10 A
Measuring circuit	Rated residual operating	pulsed DC sensitive 422000 Hz (Type A)	6 mA20 A	6 mA20 A	6 mA20 A	6 mA20 A
	current IΔn2 (Ålarm)	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 operating current $I_{\Delta n1}$ (prewarning)		10100 %, min. 5 mA			
	Function selectable per channel off, $<$, $>$, $1/0$					
	Cut-off frequency adjustable for personnel, plant and fire protection			*		*
	Preset function for $I_{\Delta n2}$ and I/O					
	Hysteresis		240 %	240 %	240 %	240 %
	Factor for additional CT					
Switching	Common alarm relay for all channels		2 x 1 changeover contact			
elements	Alarm relay per channel		-	-	12 x 1 N/O contact	12 x 1 N/O contact
	Start-up delay 099 s					
Time	Response delay tv, adjustable 0999 s		-	-	-	
response	Operating time at	$I_{\Delta n} = 1 \times I_{\Delta n2}$: $\leq 180 \text{ ms}$				
	$I_{\Delta n} = 5 \times I_{\Delta n} 2$: $\leq 30 \text{ms}$					
	Analysis of the harmonics (/△, DC, THF)			*		*
Displays, memory	History memory 300 data records		-	-		-
	Data logger for 300 data records/ channel		-	-		-
	Internal clock		-	-		-
	Password		-	-	-	-
	Language English, German, French, Swedish		-	-		-
	Backlit graphics LC display		-	-	-	-
	7-segment display and LED line		-		=	

b) RCMS4x0-D2

Technical data

Insulation coordination acc. to IEC 60664-1/IEC 6	60664-3 for the versions:
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
Rated impulse voltage/pollution degree	2.5 kV/3
Overvoltage category	III
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
Rated impulse voltage/pollution degree	4 kV/3
Overvoltage category	III
Basic insulation between	(A1, A2), (k1, l k12, R, T/R, T, A, B) -
(C11, C12, C14), (C21	I, C22, C24), (11,14), (21,24), (31,34), (41,44),
(51,54), (61,64), (71,74), (81	1,84), (91,94),(101,104), (111,114), (121,124)
Basic insulation between: (11, 14) - (2	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
Rated impulse voltage/pollution degree	6 kV/3
Overvoltage category	III
Protective separation (reinforced insulation) between	(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)
Voltage test acc. to IEC 61010-1	3.536 kV

D) NCM34XU-DZ		
Supply voltage U _S		AC/DC 100240 V (-20+15 %)
Supply voltage frequency		DC, 50/60 Hz
Rated insulation voltage		250 V
Rated impulse voltage/pollution de	egree	6 kV/3
Overvoltage category		III
Protective separation (reinforced in	sulation) between	(A1, A2) - (k1, Ik12, R, T/R, T, A, B),
(0	11, C12, C14), (C21, C	22, C24), (11,14), (21,24), (31,34), (41,44),
(51,54), (61,64), (71,74), (81,84	4), (91,94),(101,104), (111,114), (121,124)
Protective separation (reinforced in	sulation) between	(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)
Voltage test acc. to IEC 61010-1		3.536 kV
Rated insulation voltage		250 V
Rated impulse voltage/pollution de	egree	4 kV/3
Overvoltage category		III
Basic insulation between:	k1, lk12, R, T/F	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



 $[\]mbox{\ensuremath{^{\ast}}}$ only in conjunction with RCMS4xx-D, MK2430 or COM460IP

Measuring circuit	
External measuring current transformers	CTAC, WR, WS, WF series (Type A),
	CTUB100, CTBS25 series (Type B)
CT monitoring	on/off (on)*
Rated burden RCMSD/-L	68 Ω
Rated burden RCMSD4/-L4 (channels 912 of	•
Rated insulation voltage (measuring current trans	
Operating characteristics acc. to IEC/TR 60755	type A and type B
	on measuring current transformer series (type A)*
Rated frequency	02000 Hz (Type B) / 422000 Hz (type A)
Cut-off frequency	none, IEC, 50 Hz, 60 Hz (none)*
5 5	030 A (measuring current transformer type A) 020 A (measuring current transformer type B)
	Crest factor up to 10 A = 4, up to 20 A = 2
Measuring range RCMSD4/-L4 (channels 9	
Rated residual operating current IΔn2 (alarm)	10 mA10 A (type B)
nated residual operating current izinz (diarin)	6 mA20 A (type A)
	(100 mA overcurrent)*
Rated residual operating current $I_{\Delta n2}$ (alarm) for R	
	100 mA125 A (16 A overcurrent)*
Rated residual operating current $I_{\Delta n1}$ (prewarning	10100 % x / _{Δn2}
	min. 5 mA (50 %)*
Digital input	1: < 100 Ω
	$0: > 250 \Omega$
Preset for alarm	/∆ x factor 199 (3)*
	Offset 020 A (30 mA)*
Preset for digital input	0/1 (1)*
Relative uncertainty RCMSD/-L	020 %**
Relative uncertainty RCMSD4/-L4 (channels 9	
Hysteresis	240% (20 %)*
Factor for additional CT	/110; x 1250 (x 1)*
Number of measuring channels (per device/system	n) 12/1080
Time response	
Start-up delay t (start-up) per device	099 s (0 ms)*
Response delay ton per channel	0999 s (200 ms)*
Delay on release toff per channel	0999 s (200 ms)*
Operating time t_{ae} at $I_{\Delta n} = 1 \times I_{\Delta n 1/2}$	≤ 180 ms
Operating time t_{ae} at $I_{\Delta n} = 5 \times I_{\Delta n 1/2}$	≤ 30 ms
Response time t_{an} for residual current measureme	
Operating time <i>t</i> _{ae} digital inputs	≤ 3.5 s
Scanning time for all measuring channels (residual Recovery time t_b	l current measurement) \leq 180 ms 500600 ms
recovery time to	300000 IIIS
Displays, memory	
Measured value display range RCMSD / -L	030 A (CT Type A)
	020 A (CT type B)
Display range, measured value RCMSD4/-L4 (o	thannels 912) 0125 A (CT type A)
Error of indication	± 10 %
LEDs	ON/ALARM (RCMSD)
	ARM / measuring channel 112 (RCMSL)
LC display	backlit graphical display (RCMSD)
7-segment display	2 x 7.62 mm (RCMS4L)
History memory	300 data records (RCMSD)
	a records per measuring channel (RCMSD)
Password	off / 0999 (off)*
Language Fault mamory alarm relay	D, GB, F (GB)*
Fault memory alarm relay	on/off (off)*
Inputs/outputs	
Inputs/outputs Test/reset button	internal/external
	internal/external 010 m

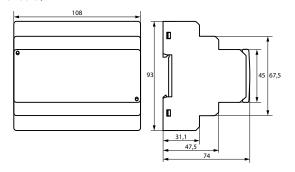
Interface				50	105/01/2
Interface/protocol					185/BMS
Baud rate					.6 kbit/s .1200 m
Cable length Cable (shielded, shield connected to PE on one s	ida)	recommend	lad min		
cable (sinclucu, sinclu connected to 12 on one s	iuc)	iccommen	icu. IIIII.		
For UL application: Copper lines					60/70 °C
Terminating resistor	120	Ω (0.25 W	/) connect		
Device address, BMS bus				1	.90 (2)*
Cable lengths for CTAC, WR, WS, W	/F serie	s measurir	ng curren	t transfo	rmers
Single wire ≥ 0.75 mm ²					01 m
Single wire, twisted ≥ 0.75 mm ²				0	10 m
Shielded cable ≥ 0.5 mm ²					40 m
Cable (shielded, shield connected to terminal I a	it one end, i				
		recomn	nended: J-	-Y(St)Y mir	1. 2 x 0.8
Cable lengths for CTUB100 and CTBS25 seri	ies measuı	ing currer	t transfo	ormers	
Single wire ≥ 0.75 mm ²				0	10 m
Connection	pl	ug-in conne	ector, reco	mmended	CTXS
Switching elements					
Number		2 x 1 ch	angeover	contact (R	MS460)
	changeove				
Operating principle				n (N/O ope	
Electrical endurance under rated operating cond	litions, num	ber of cycle	<u>.</u>		10.000
Contact data acc. to IEC 60947-5-1					
Utilisation category	AC-13	AC-14	DC-1	DC-12	DC-12
Rated operational voltage	230 V	230 V	24 V	110 V	220 V
Rated operational current (common alarm relay		3 A	1 A	0.2 A	0.1 A
Rated operational current (alarm relay)	2 A	0.5 A	5 A	0.2 A	0.1 A
Minimum contact rating				10 m	A/5 V DC
Environment/EMC					
EMC					N 62020
Operating temperature				-25	.+ 55 ℃
Climatic class acc. to IEC 60721 (except conde	ensation an	d formatior	of ice)		
Stationary use (IEC 60721-3-3					3K23
Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1)					2K11 1K22
	4- IFC CO.	731			INZZ
Classification of mechanical conditions acc Stationary use (IEC 60721-3-3)	. TO IEC 6U	/21			3M11
Transport (IEC 60721-3-2)					2M4
Long-term storage (IEC 60721-3-1)					1M12
Connection					
4444					
Connection Connection properties:				screw t	erminals
Rigid/flexible/conductor sizes		0.2 4/0	12 251	mm²/AWG	24 12
Multi-conductor connection (2 conductors with	the same cr			//G	_ ,,,,,,
Rigid/flexible		,		1.5/0.2	1.5 mm2
Stripping length				8.	9 mm
Tightening torque				0.5	.0.6 Nm
Other					
Operating mode			m	ntinuous o	neration
Mounting					oriented
Degree of protection, internal components (IEC (60529)			uispiuj	IP30
Degree of protection, terminals (IEC 60529)	•				IP20
Enclosure material				polyca	arbonate
Flammability class					UL94V-0
Screw mounting					2 x M4
DIN rail mounting acc. to					C 60715
Power consumption				≤10 VA (R(<12 VA (R(
Documentation number			:	≤12 VA (R0	LMS490) D00067
Weight				300 g (RC	
				: 500 g (RC ≤ 510 g (RC	
				y (III	

^{()*} factory setting

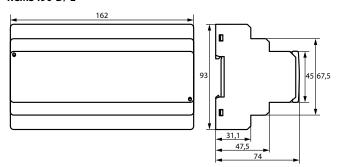


^{**} In the frequency range of < 15 Hz, the relative uncertainty is between -35 % and 100 % .

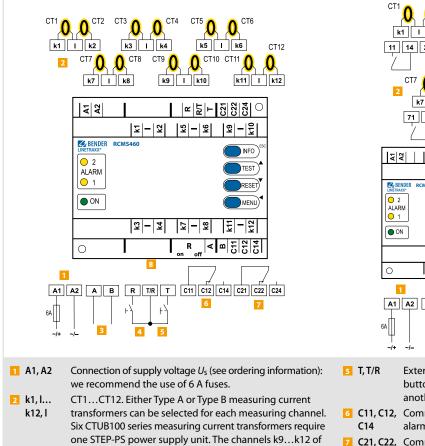
RCMS460-D/-L



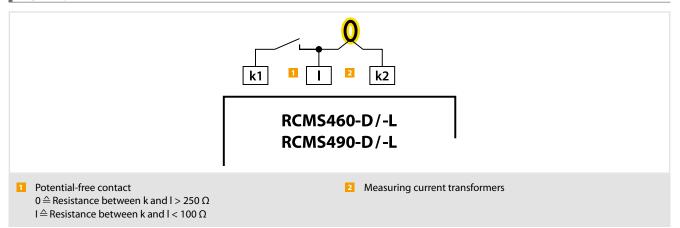
RCMS490-D/-L



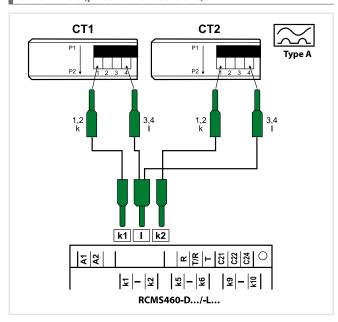
Wiring diagrams



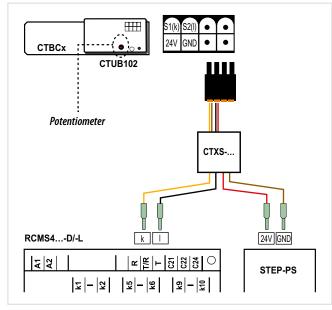
- CT4 CT5 k5 I k6 k1 | l | k2 k3 I k4 11 14 21 24 31 34 41 44 51 54 61 64 k7 I k8 k9 I k10 71 74 81 84 91 94 101 104 111 114 121 124 | Z | - | Z | | Z | - | Z | - | Z | - | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | | Z | 0 R off | A | E | 2 | 2 | 2 | 4 | 2 2 2 5 8 8 A1 A2 A B R T/R T C11 C12 C14 C21 C22 C24
- the device versions RCMS460-D4/-L4 require the connection of Type A measuring current transformers.
- 3 A, B BMS bus (RS-485 interface with BMS protocol)
- 4 R, T/R External reset button (N/O contact). The external reset buttons of several devices must not be connected to one another.
- External test button (N/O contact). The external test buttons of several devices must not be connected to one another.
- 6 C11, C12, Common alarm relay K1: Alarm 1, common message for alarm, prewarning, device error.
- C21, C22, Common alarm relay K2: ALARM 2, common message for C24 alarm, prewarning, device error.
- 8 Ron/off Activate or deactivate the terminating resistor of the BMS bus (120 Ω).
- Measuring current transformers (CTAC..., CTBS25, 9 CT CTUB100, WR..., WS..., WF... series)



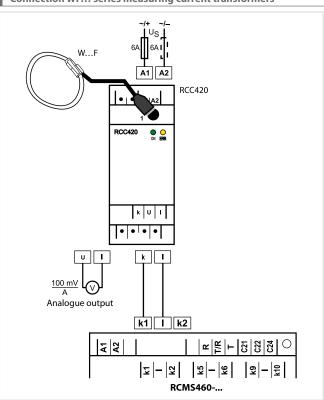
Connection CTAC..., WR...S(P), WS... series measuring current transformers (pulsed current sensitive)



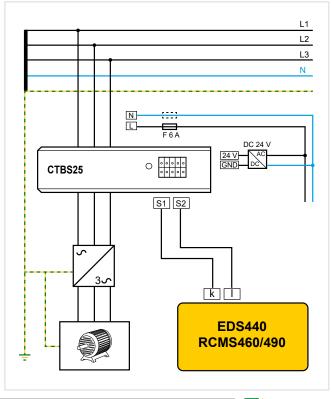
Connection CTUB100 series measuring current transformer (AC/DC current sensitive)

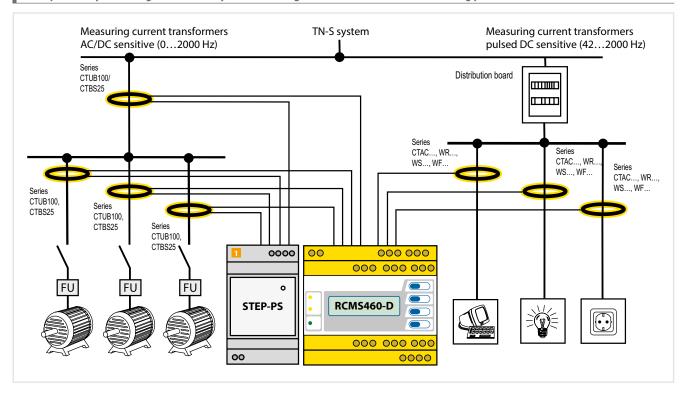


Connection WF... series measuring current transformers

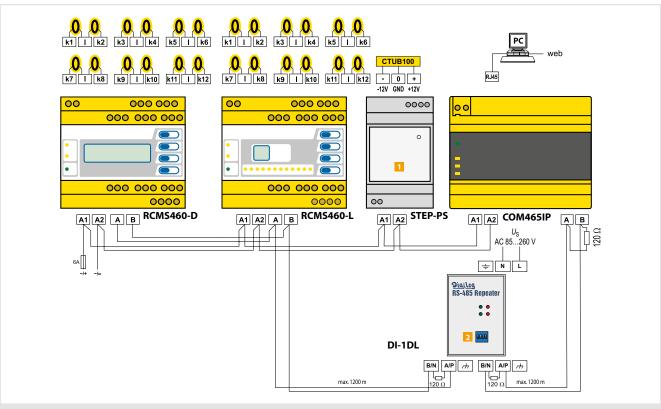


Connection CTUB100 series measuring current transformer (AC/DC current sensitive)





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.
- 2 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

final circuits

Regulation)

atmospheres

· Residual current monitoring

system for current outlets and

· Monitoring residual currents of

and equipment to determine

Regulation 3 (German Social

Accident Insurance) and BetrSichV

(Occupational Safety and Health

• EMC monitoring of TN-S systems

· Monitoring currents regarded

as fire hazards in flammable

· Monitoring the PE to ensure that there is no current flow

for "stray" currents and additional unwanted N-PE bridges

in accordance with DGUV

practice-oriented test intervals

stationary electrical installations

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







only B94053025

LR in preparation

Ordering information

Supply voltage <i>U</i> s	Protocol	Type	Art. No.	
DC	110000	1,500		
24 V	BMS	RCMS150	B94053025	
Z4 V	Modbus RTU	RCMS150-01	B94053026	

Accessories

Description	Art. No.
Mounting clip for DIN rail mounting	B91080110

Suitable system components

Description	RCMS 150	RCMS 150-01			
Power supply			STEP-PS	B940531	389
Condition Monitor with integrated gateway			COM465IP ¹⁾	B95061065	402
Condition Monitor			CP9I	B9506103	416
RS-485 repeater			DI-1DL	B95012047	397
Pacidual current monitor ²⁾	al current monitor ²⁾	-	RCMS460-D	B940530	179
Residual Current monitor			RCMS490-D	B940530	179

¹⁾ from function module C



 $^{^{\}rm 2)}\,$ In this case no Condition Monitor/Gateway necessary. Suitable for measured value and alarm indication only, not suitable for parameter setting

Technical data	
Insulation coordination according to IE	C 60664-1
The data are valid for the monitored primary	
Primary circuit	Primary conductors routed through the transformer
Output circuit	(+, -, A, B)
Rated insulation voltage	300 V
Overvoltage category	III
Rated impulse withstand voltage monitored	circuit/output circuit 4 kV
Range of use	≤ 2000 m AMSL
Rated insulation voltage	250 V
Pollution degree	3
Insulation	
	vervoltage category III, insulated primary
	e must be used on the application side.
BI	Overvoltage category III
DI	Overvoltage category II
Voltage test acc. to IEC 61010-1	AC 2.2 kV
Power supply	
Nominal supply voltage $U_{\rm S}$ with galvanic sep	paration DC 24 V
Operating range $U_{\rm S}$	±20 %
Power consumption	< 4 W
Residual current measuring range	
Frequency range	02000 Hz
Measuring range	±500 mA
Resolution measured value	1 % of the set response value
_	
Response values	
Residual current I _{AN2}	RMS 0300 mA (30 mA)*
Residual current I _{ΔN2}	DC 3300 mA (6 mA)*
Ratio I _{ΔN2} RMS/I _{ΔN2} DC	0.25
Prewarning / _{AN1} RMS/DC	50100 % of / _{ΔN2} (50 %)*
Response tolerance I _{ΔN2}	20 00/
DC 10500 Hz	-200 %
500 Hz1 kHz	-20+100 %
Hysteresis	1025 % (15 %)
Time response	
Start-up delay t _{start-up}	0.5600 s (0.5 s)*
Response delay	
t _{on1} RMS/DC	0600 s (0 s)*
t _{on2} RMS/DC	0600 s (0 s)*
Delay on release	
t _{off} DC	0600 s (1 s)*
Indication (LEDs)	
ON	green
ALARM K16	yellow
Interface	
Interface/protocol	RS-485
Connection	terminals A/B
Cable	Shield on one side connected to PE
recommended:	CAT6/CAT7 min. AWG23
alternative:	twisted pair, J-Y(St)Y min. 2x0,8
Bus terminating resistor external	(2x) 120 Ω (0.25 W)
Protocol	BMS
Cable length	≤ 1200 m
Device address	290 (2)*
Protocol	Modbus RTU
Cable length Device address	≤ 1200 m
Device address	1247 (last 2 digits of serial number + 100)*

Environment/EMC	
EMC	
Immunity	IEC 62020-1
Emission	IEC 62020-1
Operating temperature	-25+70°C
for UL applications	-25+65 °C
Classification of climatic conditions acc. to IEC 6072	1:
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 6	0721:
Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M ²
Long-term storage (IEC 60721-3-1)	1M12
Connection	
Connection type	pluggable double push-wire termina
Connection properties:	
rigid, flexible/conductor sizes	0.21.5 mm ² /AWG 2416
Multi-conductor connection (2 conductors with the	same cross section):
rigid	0.21.5 mm
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
Stripping length	10 mm
Other	
Operating mode	continuous operation

Operating mode	continuous operation
Position of normal use	any
Enclosure material	polycarbonate
Flammability class	UL94 V-0
Screw mounting to standard distribution panels with 12 TE	2 x M6
DIN rail mounting	mounting clip (accessories)
Tightening torque	1.5 Nm
Documentation number	D00259
Weight	170 g

Measuring current transformer

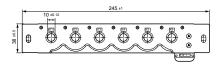
Diameter cable gland	10 mm
Load current	32 A
Load current	

Bus parameter

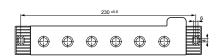
Alarm	threshold value exceeded, system fault
Measured value	measured value, DC component, RMS (resolution 0.1 mA)
Times	response delay, delay on release, start-up delay

()* = factory settings

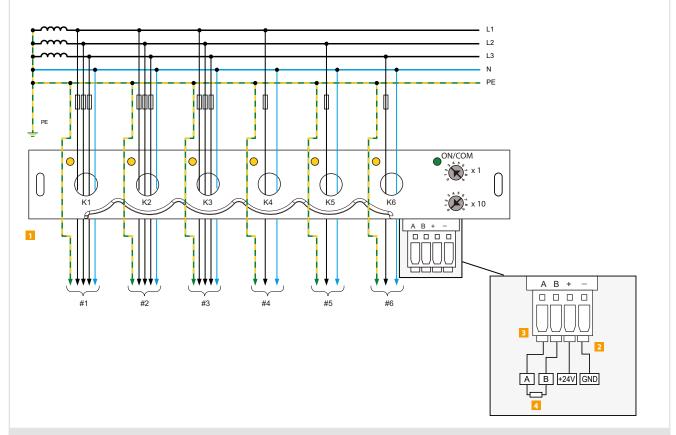
Dimension diagrams (dimensions in mm)











- Residual current monitor RCMS150
- 2 Supply voltage Us DC 24 V

- RS-485 interface with BMS bus (Modbus RTU on request)
- Terminating resistor (required at the beginning and at the end of the bus)



Note:

Only insulated primary conductors suited for the indicated rated voltages are to be used!

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)

Approvals

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.



Ordering information

MRCDB423

Response range I∆n	Supply voltage <i>U</i> s¹¹ Supply voltage <i>U</i> s¹¹		Туре	Art. No.	
nesponse runge r <u>un</u>	nateu nequency			.,,,-	
20 4 2 4	20 4 2.4 0 2000 H-		42460 Hz, 1672 V	MRCDB423-D-1	B94043055
30 mA3 A	02000 Hz	70300 V	42460 Hz, 70300 V	MRCDB423-D-2	B94043056

¹⁾ Absolute values of the voltage range

External measuring current transformers

CT diameter	Shield	Туре	Art. No.	Page
« 20	-	CTUB101-CTBC20	B78120010	361
ø 20		CTUB101-CTBC20P	B78120020	361
ø 35	-	CTUB101-CTBC35	B78120012	361
		CTUB101-CTBC35P	B78120022	361
ø 60	-	CTUB101-CTBC60	B78120014	361
00 ש		CTUB101-CTBC60P	B78120024	361

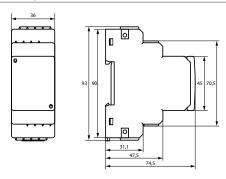
CT diameter	Shield	Туре	Art. No.	Page
a 120	-	CTUB101-CTBC120	B78120016	361
ø 120		CTUB101-CTBC120P	B78120026	361
a 210	-	CTUB101-CTBC210	B78120018	361
ø 210		CTUB101-CTBC210P	B78120028	361



Insulation coordination acc. to IEC 60664-1/IEC	60664-3	Inputs/outputs					
MRCDB423-D-1:		Cable length for external test/reset butt	on				03 m
Rated voltage	100 V	Cable length for measuring current trans					03 m
Overvoltage category/pollution degree	III/2	Conit de immediane a la maneta					
Rated impulse voltage	2.5 kV	SWITCHING Elements					
		Number of switching elements 2 x 1 changeover col					
MRCDB423-D-2:	250 V	Operating principle				N/C o	peration
Rated voltage	250 V	Electrical endurance, number of cycles					10000
Overvoltage category/pollution degree	III/2	Contact data acc. to IEC 60947-5-1:					
Rated impulse voltage	4 kV	Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-12
Protective separation (reinforced insulation) between	(A1, A2) - (k, I, T/R) - (11, 12, 14) - (21, 22, 24)	Rated operational voltage	230 V	230 V	24 V	110 V	220 V
Voltage tests acc. to IEC 61010-1	2.21 kV	Rated operational voltage UL	200 V	200 V	24 V	110 V	200 V
Supply voltage		Rated operational current	5 A	3 A	1 A	0.2 A	0.1 A
MRCDB42-D-1:		Minimum contact rating			1 m	A at AC/D	C ≥ 10 V
Supply voltage range U_S	AC 2460 V/DC 2478 V	Environment/EMC					
, 3 3	AC 1672 V/DC 9.694 V						
Operating range supply voltage $U_{\rm S}$			60947-2 annex M (ımıt value	class A acc		
Frequency range U _s	DC, 42460 Hz	Operating temperature					+55 °C
MRCDB423-D-2:		Transport					.+70 °C
Supply voltage range $U_{\rm S}$	AC/DC 100250 V	Long-term storage				-25	.+55 ℃
Operating range supply voltage U_s	AC/DC 70300 V	Classification of climatic conditions	acc. to IEC 60721				
Frequency range U _S	DC, 42460 Hz	Stationary use (IEC 60721-3-3)	3K23 (ex	cept conde	nsation an	d formatio	on of ice)
Power consumption	≤ 6.5 VA	Transport (IEC 60721-3-2)					2K11
Measuring circuit		Long-term storage (IEC 60721-3-1)					1K22
External measuring current transformer type	CTUB101-CTBCxx(P); CTUB101-CTBCxxx(P)	Classification of mechanical conditi	ons acc. to IEC 60	721			
Rated voltage (measuring current transformer)	800 V	Stationary use (IEC 60721-3-3)					3M11
Operating characteristic type B in accordance with IE		Transport (IEC 60721-3-2)					2M4
Rated frequency	02000 Hz	Long-term storage (IEC 60721-3-1)					1M12
Operating uncertainty	035 %	Connection					
	***********	Connection type			scr.	ew-type t	orminals
Response values	50 1000/ £1 /500/*	Connection properties:			30	cw type t	Cililiais
Rated residual operating current I _{∆n1}	50100 % of /Δn2 (50 %)*	Rigid/flexible		0.24/0.	2 25 m	m² (AWG :	24 12)
Rated residual operating current I∆n2	30 mA3 A (30 mA)*	Multi-conductor connection (2 conductor	ors with the same cr			III (/1110 2	2712)
Time response		Rigid/flexible	ns with the same ti	oss section		1.5/0.2	1 5 mm ²
Start-up delay t	(1 s)*	Stripping length			0.2		9 mm
Response delay t _{on1}	010 s (1 s)*	Tightening torque					.0.6 Nm
Response delay ton2	010 s (0 s)*	rightening torque				0.5	.0.0 11111
Operating time t_{ae} at $I_{\Delta n} = 1 \times I_{\Delta n 1/2}$	≤ 180 ms	Other					
Operating time t_{ae} at $I_{\Delta n} = 1 \times I_{\Delta n1/2}$	≤ 100 ms	Operating mode			COI	ntinuous o	peration
Response time t_{an}	$t_{\rm an} = t_{\rm ae} + t_{\rm on1/2}$	Position of normal use				display-	oriented
Recovery time t _b	≤ 300 ms	m1/2 Demos of protection internal company (IEC (0730)			IP30		
necovery time to	≤ 300 III3	Degree of protection, terminals (IEC 605					IP20
Displays, memory		Enclosure material				polyca	arbonate
Display range measured value AC/DC	06 A	Flammability class					UL94V-0
Error of measured value indication	±17.5 %/±2 digits	DIN rail mounting acc. to				IE	C 60715
Measured-value memory for alarm value	Data record measured values	Screw fixing			2 x M4 v	with moun	nting clip
Password	off/0999 (on)*	Documentation number					D00396
Fault memory output relay	yes	Weight					≤ 150 g
	,	()* = Factory setting					

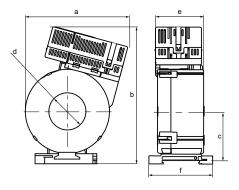
()* = Factory setting



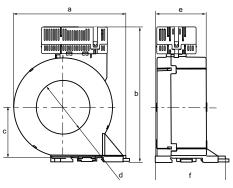


Dimension diagram CTUB10...-CTBC...

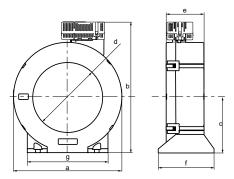
A



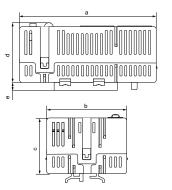
В



C

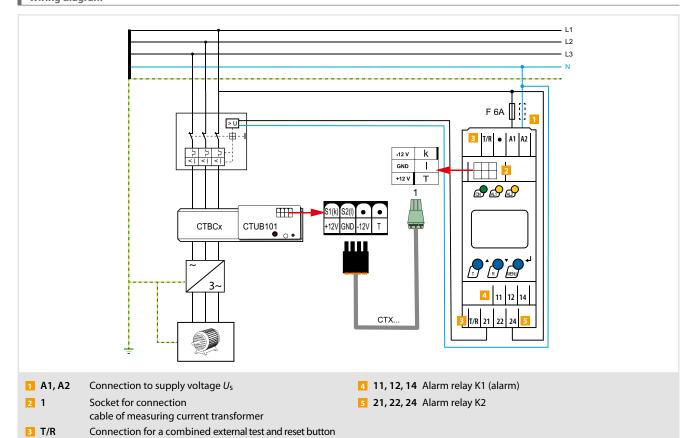


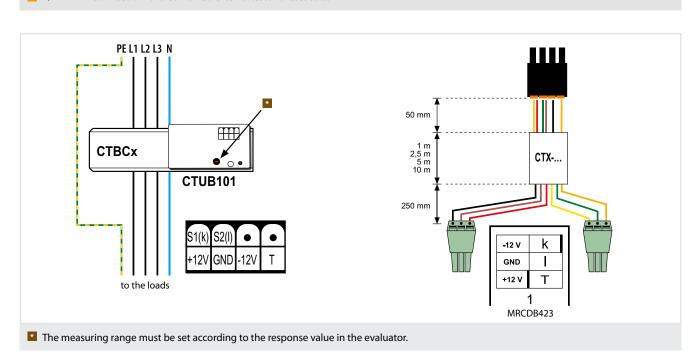
D



	Dimensions (mm)							
	Туре	a	b	c	d	e	f	g
^	CTUB10CTBC20(P)	75	83	37	ø 20	46	60,5	-
A	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
C	CTUB10CTBC210(P)	302	339	153	ø 210	67	113	277
D	CTUB10	74	44	30	32	4,6	-	-

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 (CTBC20P...210P only)
- Connection monitoring of the measuring current transformer with cyclical test current
- Use of all MRCDB300 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

Supply voltage <i>U</i> s	Variant	Туре	Art. No.
	Protection of persons	MRCDB301	B74043120
	Fire protection	MRCDB302	B74043121
24V (19.228.8V)	Protection of persons, fire protection and plant protection (freely configurable)	MRCDB303	B74043122
	Protection of persons for applications with pulsed, very high peak load currents (> 1 kA for < 1 s), e.g. welding applications	MRCDB305	B74043125

Required terminals are included in the scope of delivery.

Measuring current transformers

Internal diameter	Туре	Art. No.
20 mm	CTBC20	B98120001
20 111111	CTBC20P	B98120002
35 mm	CTBC35	B98120003
	CTBC35P	B98120004
60 mm	CTBC60	B98120005
OU IIIIII	CTBC60P	B98120006
120 mm	CTBC120	B98120007
120 mm	CTBC120P	B98120020
240	CTBC210	B98120008
210 mm	CTBC210P	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

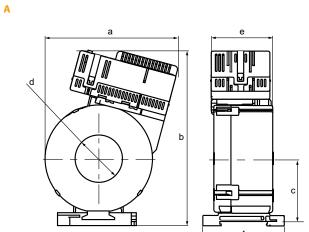
Description	max. connected current transformers	Туре	Art. No.	Page
Voltage supply	14	STEP-PS/1 AC/24 DC/1.75	B94053111	389
	34	STEP-PS/1 AC/24 DC/4.2	B94053112	389



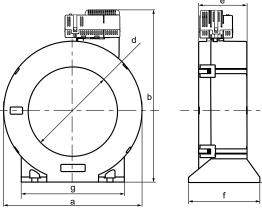
Insulation coordination acc. to IEC 6066 Definitions:	04-1/IEC 60664-3	Inputs	T/R, GND, D1, DG
Measuring circuit (IC1)	Primary conductors routed through the current transformer	Maximum length connecting cable	10 m
Secondary (IC2)	Terminal block 1 (24 V, GND, D1, DG, T/R, GND, A, B, X1, X2)		
Control circuit 1 (IC3)	Terminal block 2 (11,12,14)	Outputs	
Control circuit 2 (IC4)	Terminal block 3 (21,22,24)	Number of changeover contacts	2
Rated insulation voltage	800 V	Operating principle	N/C
Overvoltage category		MRCDB301, MRCDB302, MRCDB305 MRCDB303 N/C princip	N/C principle N/C principle N/C principle N/C principle
Area of application	≤ 2000 m AMSL	Switching outputs (K1, K2)	le or N/O principle, (freely configurable), (N/C principle)* 250 V, 5 Ā
Rated impulse voltage:	0.137	Switching capacity	1500 VA/144 W
IC1((IC2-IC4) IC2/(IC3-IC4)	8 kV 4 kV		1500 470 144 44
IC3/IC4	4 kV	Contact data acc. to IEC 60947-5-1	AC 12 AC 14 DC 12 DC 12 DC 12
Rated insulation voltage:	4 KV	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 V
Pollution degree	2	Electrical endurance, number of cycles	10,000
Safe isolation (reinforced insulation) betwee		F :	
IC2/(IC3-IC4)	300 V	Environment/EMC	
Basic insulation between:	222 1	EMC	IEC 60947-2 Annex M
IC1/(I2-IC4)	800 V	Operating temperature	-2570 °C
IC3/IC4 Voltage test (routine test) acc. to IEC 61010-	300 V	Classification of climatic conditions acc. to I	
IC2/(IC3-IC4)	AC 2.2 kV	Stationary use (IEC 60721-3-3)	3K23 (except condensation and formation of ice)
IC3/IC4	AC 2.2 kV AC 2.2 kV	Transport (IEC 60721-3-2)	2K11 (except condensation and formation of ice)
ics/ici	AC Z.Z KV	Long-term storage (IEC 60721-3-1)	1K22 (except condensation and formation of ice)
Supply voltage		Classification of mechanical conditions acc.	
Supply voltage <i>U</i> s	DC 24 V	Stationary use (IEC 60721-3-3)	3M11
Operating range of $U_{\rm S}$	±20 %	Transport (IEC 60721-3-2)	2M4
Ripple U _s	≤1%	Long-term storage (IEC 60721-3-1)	1M12
Power consumption	≤ 2.5 W	Connection	
Inrush current	1.7 A for 1 ms	Required terminals are included in the scope of del	ivery.
Measuring circuit		Terminal block 1	
Internal diameter measuring current transfo	ormer see dimension diagrams page 196	Manufacturer	Phoenix Contact
Characteristics according to IEC 62020 and IE		Type	DFMC 1.5/5-ST-3.5 BK
Measuring range	5 mA20 A	The connection conditions of the manufacturer a	
Response value I∆n	see frequency responses in manual	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 mm ² (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)	30 mA	Terminal block 2, 3	
Prewarning Rated current I _n	50 %100 % $I_{\Delta n}$ (freely configurable), (60 %)*	Manufacturer	Phoenix Contact
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 a	pply.
CTBC20P	80 A	Connection capacity	0.2 25 7/44/524 42)
CTBC35 at $I_{\Delta n} = 30 \text{ mA}$	80 A	rigid flexible	0.22.5 mm ² (AWG 2413) 0.22.5 mm ² (AWG 2413)
CTBC35 at $I_{\Delta n} = 300 \text{ mA}$	125 A	with ferrule	0.252.5 mm² (AWG 2413)
CTBC35P	160 A	with ferrule	0.232.3 IIIII (AWG 2413)
CTBC60 at $I_{\Delta n} = 30 \text{ mA}$	160 A	Mounting CTBC	
CTBC60 at $I_{\Delta n} = 300 \text{ mA}$	250 A	Screw type	
CTBC60P	320 A	CTBC2060(P)	DIN EN ISO 7045 - M5
CTBC120 at $I_{\Delta n} = 100 \text{ mA}$	330 A	CTCB120210(P)	DIN EN ISO 7045 - M6
CTBC120P at $I_{\Delta n} = 100 \text{ mA}$	630 A	Washer type	
CTBC210 at $I_{\Delta n} = 300 \text{ mA}$	630 A 630 A	CTBC2060(P)	DIN EN ISO 7089/7090 - 5
CTBC210P at $I_{\Delta n} = 100 \text{ mA}$ CTBC210P at $I_{\Delta n} = 300 \text{ mA}$	1000 A	CTCB120210(P)	DIN EN ISO 7089/7090 - 6
Operating uncertainty	±17.5 %	Tightening torque	0.61
Relative uncertainty	035 %	CTBC2035 (P) CTCB60210(P)	0.6 Nm 1 Nm
Test winding	yes	C1CDUU210(F)	I NM
	·	Other	
Possible response values (to be set on t		Operating mode	continuous operation
CTBC20, CTBC20P	10500 mA	Mounting	any position
CTBC35, CTBC35P, CTUBC60, CTBC60P	30 mA10 A	Degree of protection, internal components (DIN E	
CTBC120P, CTBC210P	100 mA10 A	Degree of protection, terminals (DIN EN 60529)	IP20
CTBC120, CTBC210	300 mA10 A	Flammability class	UL94 V-0
Time response		Software	D0579
Response delay ton		Documentation number	D00343
MRCDB301, MRCDB302, MRCDB305	0 s	Weight	. 100
MRCDB303	0 s 60 min (freely configurable), (0 s)*	MRCDB300	≤ 100 g
Start-up delay t _{an}	0 s 60 min (freely configurable), (0 s)*	CTBC20	≤ 160 g
Delay on release t _{off}	2 s after reset	CTBC20P CTBC35	≤ 220 g ≤ 240 q
Operating time tae		CTBC35P	≤ 240 g ≤ 320 q
at 1 x /∆n	≤ 180 ms	CTBC60	≤ 320 g ≤ 460 g
at 2 x / _{\Delta n}	≤ 130 ms	CTBC60P	≤ 400 g ≤ 620 g
at 5 x I∆n	≤ 20 ms	CTBC120	≤ 020 g ≤ 1390 g
Response time	$t_{an} = t_{ae} + t_{on}$	CTBC120P	≤ 1370 g ≤ 1750 g
Recovery time t _b	≤1s	CTBC210	= 1736 g ≤ 4220 g
Indication		CTBC210P	≤ 4870 g
	see table "System states: LED and output relays" on page 195		
rea/green,	occ came bystem states, LED and output relays on page 195	()* Factory setting	

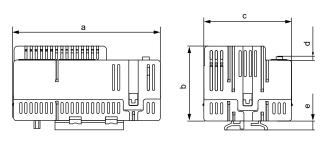


The use of the power supply units listed at "Accessories" is recommended. The use of a surge protection device is mandatory for these power supply units.



C





	Dimensions (mm)							
	Type a b c d e f g							
Λ	MRCDB30CTBC20(P)	81	112	37	ø 20	46	60	-
A	MRCDB30CTBC35(P)	97	130	47	ø 35	46	61	-
В	MRCDB30CTBC60(P)	126	158	57	ø 60	56	78	-
C	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	-	-

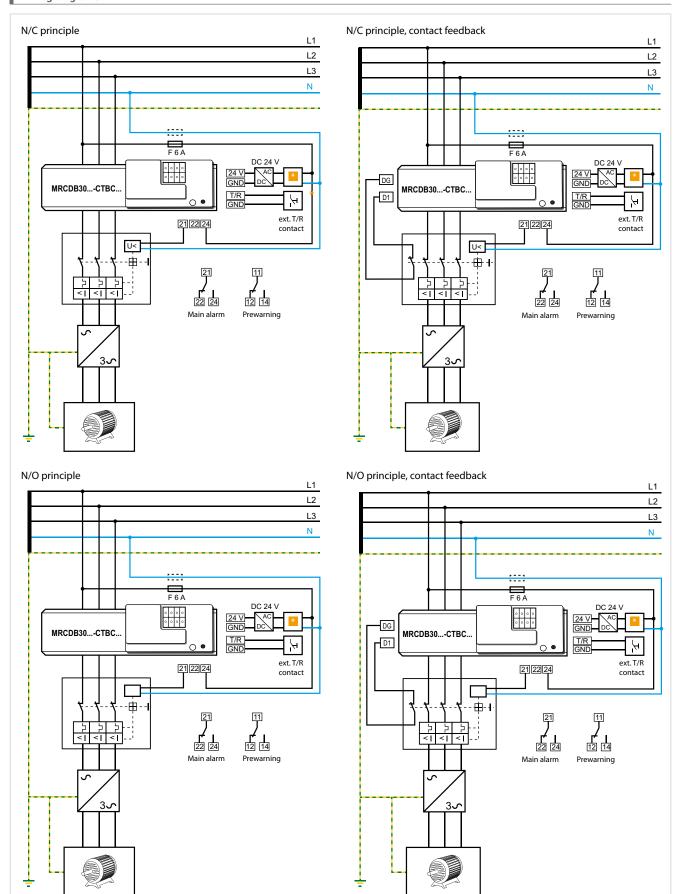
В

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.

System state	LI	ED	Notes	Changeover contact	
System state	green (ON)	red (alarm)	notes	K1	К2
Device switched off	off	off	Device is deenergised, 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
Alarm state	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



- 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 In (8/20 μs): 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







UL File number: E493737, E173157

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

Supply voltage <i>U</i> s	Variant	Туре	Art. No.	
DC				
24 V (19.228.8 V)	Modbus RTU	RCMB301	B74043100	

Required terminals are included in the scope of delivery.

Measuring current transformers

Туре	Art. No.	
CTBC20	B98120001	
CTBC20P	B98120002	
CTBC35	B98120003	
CTBC35P	B98120004	
CTBC60	B98120005	
CTBC60P	B98120006	
CTBC120	B98120007	
CTBC120P	B98120020	
CTBC210	B98120008	
CTBC210P	B98120021	
	CTBC20 CTBC20P CTBC35 CTBC35P CTBC60 CTBC60P CTBC120 CTBC120P CTBC1210	

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
Voltage supply	4	STEP-PS/1 AC/24 DC/0.5	B94053110	389
	14	STEP-PS/1 AC/24 DC/1.75	B94053111	389
	34	STEP-PS/1 AC/24 DC/4.2	B94053112	389



Insulation coordination acc. to IE	C 60664-1/IEC 60664-3	Outputs	
Definitions:		Number of changeover contacts	
Measuring circuit (IC1)	Primary conductors routed through the current transformer	Operating principle	N/C or N/O principle (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 1 (11,12,14)	Switching capacity	1500 VA/144 V
Control circuit 2 (IC4)	Terminal block 2 (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-1:
Overvoltage category	III	Rated operational voltage	250 V 250 V 220 V 110 V 24 V
Area of application	≤ 2000 m AMSL	Rated operational current	5 A 3 A 0.1 A 0.2 A 1/2
Rated impulse voltage:			3A 3A 0.1A 0.2A 17
IC1((IC2-IC4)	8 kV	(for UL applications)	
IC2/(IC3-IC4)	4 kV	Minimum current	10 mA at DC 5
IC3/IC4	4 kV	Electrical endurance, number of cycles	10,00
Rated insulation voltage:	1111	Environment/EMC	
IC1/(IC2-IC4)	800 V	EMC	IEC 62020-1:202
IC2/(IC3-IC4)	250 V	Operating temperature	-2570°
IC3/IC4	250 V		
ollution degree	2	Classification of climatic condition	
afe isolation (reinforced insulation)		Stationary use (IEC 60721-3-3)	3K23 (except condensation and formation of ice
IC2/(IC3-IC4)	300 V	Transport (IEC 60721-3-2)	2K11 (except condensation and formation of ice
Basic insulation between:	300 ¥	Long-term storage (IEC 60721-3-1)	1K22 (except condensation and formation of ice
IC1/(I2-IC4)	800 V	Classification of mechanical condi-	tions acc. to IEC 60721
IC3/IC4)	300 V	Stationary use (IEC 60721-3-3)	3M1
/oltage test (routine test) acc. to IEC		Transport (IEC 60721-3-2)	2M-
IC2/(IC3-IC4)	61010-1: AC 2.2 kV	Long-term storage (IEC 60721-3-1)	1M1.
,			
IC3/IC4	AC 2.2 kV	Connection	
upply voltage		Required terminals are included in the s	cope of delivery.
upply voltage U_{S}	DC 24 V	Terminal block 1	
Operating range of $U_{\rm S}$	±20 %	Manufacturer	Phoenix Contac
Ripple Us	±20 % ≤ 1 %	Туре	DFMC 1.5/5-ST-3.5 BI
ower consumption	≤ 2.5 W	The connection conditions of the manu	
nrush current		Connection properties	лассине арріу.
irusii curreiit	1.7 A for 1 ms	rigid	0.21.5 mm² (AWG 2416
Measuring circuit		flexible	0.21.5 mm² (AWG 2416
nternal diameter measuring current	transformer see dimension diagrams on page 199	with ferrule	0.251.5 IIIII (AWG 2416 0.250.75 mm² (AWG 2419
Characteristics according to IEC 62020			0.230.73 IIIII (AWG 2419)
Measuring range	5 mA20 A	Terminal block 2, 3	
Response value $I_{\Delta n}$	30 mA3 A (freely configurable), (30 mA)*	Manufacturer	Phoenix Contact
Prewarning	50100 % I_{An} (freely configurable), (60 %)*	Туре	FKCVW 2.5/ 3-ST-5.08
Rated current In	30100 /0 /Δ (freely configurable), (00 /0)	The connection conditions of the manu	ıfacturer apply.
CTBC20 at $I_{\Delta n} = 30 \text{ mA}$	40 A	Connection capacity	
CTBC20 at $I_{\Delta n} = 300 \text{ mA}$	63 A	rigid	0.22.5 mm ² (AWG 2413
CTBC20 at 7 <u>0</u> n = 300 IIIA	80 A	flexible	0.22.5 mm ² (AWG 2413
CTBC35 at $I_{\Delta n} = 30 \text{ mA}$	80 A	with ferrule	0.252.5 mm ² (AWG 2413
	125 A	Manustin of CTDC	
CTBC35 at $I_{\Delta n} = 300 \text{ mA}$ CTBC35P	123 A 160 A	Mounting CTBC	
	160 A	Screw type	
CTBC60 at $I_{\Delta n} = 30 \text{ mA}$	250 A	CTBC2060(P)	DIN EN ISO 7045 - M.
CTBC60 at $I_{\Delta n} = 300 \text{ mA}$		CTCB120210(P)	DIN EN ISO 7045 - M
CTBC60P	320 A	Washer type	
CTBC120 at $I_{\Delta n} = 100 \text{ mA}$	330 A	CTBC2060(P)	DIN EN ISO 7089/7090 - 5
CTBC120P at $I_{\Delta n} = 100 \text{ mA}$	630 A	CTCB120210(P)	DIN EN ISO 7089/7090 - (
CTBC210 at $I_{\Delta n} = 300 \text{ mA}$	630 A	Tightening torque	
CTBC210P at $I_{\Delta n} = 100 \text{ mA}$	630 A	CTBC2035 (P)	0.6 Nn
CTBC210P at $I_{\Delta n} = 300 \text{ mA}$	1000 A	CTCB60210(P)	1 Nn
perating uncertainty	±17.5 %	Othor	
lelative uncertainty	035 %	Other	
est winding	yes	Operating mode	continuous operation
Possible response values (to be s	et on the evaluator)	Mounting	any position
•		Degree of protection, internal compon	
TBC20, CTBC20P	10 mA500 mA	Degree of protection, terminals (DIN El	
CTBC35, CTBC35P, CTUBC60, CTBC60P		Flammability class	UL94 V-(
TBC120P, CTBC210P	100 mA10 A	Software	D0610
TBC120, CTBC210	300 mA10 A	Documentation number	D00372
ime response		Weight	
•	50 ms60 min (freely configurable), (0 s)*	RCMB301	≤ 100 (
Response delay t _{on}		CTBC20	≤ 160 (
tart-up delay t _{an}	0 s 60 min (freely configurable), (0 s)*	CTBC20P	≤ 220 (
Delay on release toff	0 s60 min (freely configurable), (1 s)*	CTBC35	≤ 240
perating time t _{ae}	g	CTBC35P	≤ 320
at 1 x /∆n	≤ 230 ms	CTBC60	≤ 460
at 2 x /∆n	≤ 180 ms	CTBC60P	≤ 620
at 5 x I∆n	≤ 70 ms	CTBC120	≤ 1390
lesponse time	$t_{an} = t_{ae} + t_{on}$	CTBC120P	≤ 1750 ≤ 1750
lecovery time t _b	≤1s	CTBC210	≤ 1730 v ≤ 4220 c
ndication		CTBC210P	≤ 4220 Q ≤ 4870 Q
ndication	D. (. (CIDCLIVI	≥ 48/0 (
Multicolour LED	Refer to "System states: LED and output relays" on page 199	()* Factory setting	
		· -	
nputs			1 . # 4
nputs	T/R, GND	The use of the power supply units lister	d at "Accessories" is recommended.

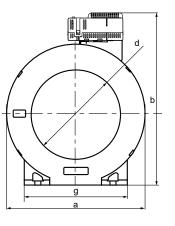
T/R, GND

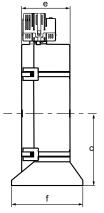
The use of the power supply units listed at "Accessories" is recommended. The use of a surge protection device is mandatory for these power supply units.

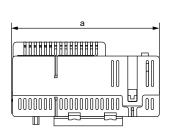


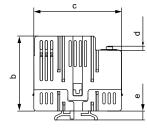
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a e e









Dimensions (mm)								
	Type a b c d e f g							
^	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	-	=

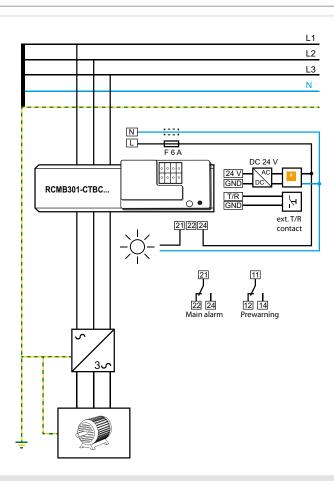
В

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.

System state	LI	ED	Notes	Changeov	er contact
	green (ON)	red (alarm)	Hotes	K1	К2
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
Alarm state	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



- 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 In (8/20 μs): 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

Supply voltage <i>U</i> s	Variant	Туре	Art. No.
DC 24 V (19,228,8 V)	Modbus RTU	RCMB330	B74043160

Ordering information

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		Туре	Art. No.	Page
	4	STEP-PS/1 AC/24 DC/0.5	B94053110	389
Voltage supply	14	STEP-PS/1 AC/24 DC/1.75	B94053111	389
	34	STEP-PS/1 AC/24 DC/4 2	R94053112	389



Insulation coordination acc. to IEC	60664-1/IEC 60664-3
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 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 $U_{\rm S}$	DC 24 V
Operating range of $U_{\rm S}$	±5 %
Ripple U _s	≤ 2 %
Power consumption	≤ 0.5 W typ. (2.5 W max.)
Inrush current	10 A for 25 μs
Measuring circuit	
Measuring current transformer, interna	l diameter 25 mm
Characteristics according to IEC 62020-	AC/DC sensitive, type B
Measuring range	10500 mA
Residual operating current $I_{\Delta n}$	30500 mA (freely configurable), (30 mA)*
Prewarning	50100 % <i>I</i> _{Δn} (freely configurable), (60 %)*
Rated current I _n	100 A
Operating uncertainty	
DC50 kHz	±17.5 %
50100 kHz	0+55 %
Relative uncertainty	
DC50 kHz	035 %
50100 kHz	−15…+35 %
Time response	
Response delay ton (prewarning)	50 ms60 min (1 s)*
Response delay ton (main alarm)	50 ms60 min (50 ms)*
Start-up delay t_{an}	0 s60 min (freely configurable), (0 s)*
Delay on release $t_{\rm off}$	0 s60 min (freely configurable), (1 s)*
Operating time tae	
at 1 x /Δn	≤ 500 ms
at 2 x /An	≤ 230 ms
at 5 x /An	= 250 ms ≤ 100 ms
Response time	$t_{an} = t_{ae} + t_{on}$
Recovery time t _b	≤1s
,	217

Displays	
Multicolour LED	Refer to chapter "LED" in the manual
Interface	
Interface/protocol	RS-485/Modbus RTU
Baud rate	1.257.6 kbit/
Cable length	01200 n
Environment/EMC	
EMC	IEC 62020-
Operating temperature	-2570 °C
Classification of climatic conditions ac	
Stationary use (IEC 60721-3-3)	3K23 (except condensation and formation of ice
Transport (IEC 60721-3-2)	2K11 (except condensation and formation of ice
Long-term storage (IEC 60721-3-1)	1K22 (except condensation and formation of ice
Classification of mechanical condition	s acc. to IEC 60721
Stationary use (IEC 60721-3-3)	3M1 ⁻
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12
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-2.54
The connection conditions of the manufact	urer apply.
Connection properties	
rigid	0.140.5 mm ² (AWG 2620
flexible	0.140.5 mm ² (AWG 2620
with ferrules	0.250.34 mm ² (AWG 2422
Other	
Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components	
Degree of protection, terminals (DIN EN 60)	
Flammability class	UL94 V-(
Software	D0609

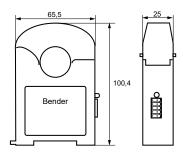
()* factory setting

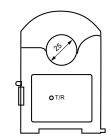
Documentation number

Software

Weight

Dimension diagram (dimensions in mm, tolerance ±0.5 mm)

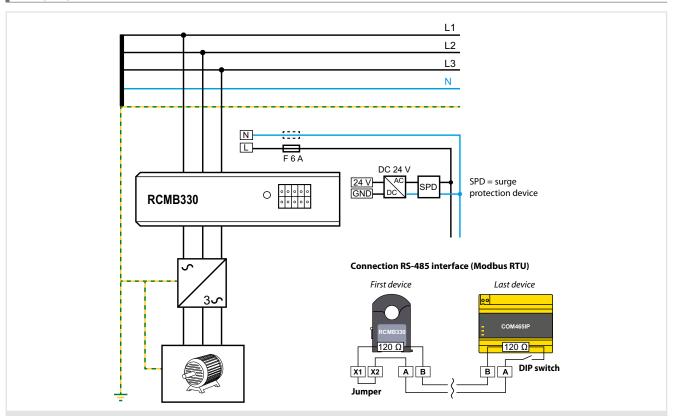




UL94 V-0 D0609

D00389

≤ 170 g



RCMB330

By using the jumper, the internal 120 Ω terminating resistor can be connected.

COM465IP

By means of the **DIP switch**, the internal $120\,\Omega$ 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® RCM410R-24/-2

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)

Device features

- AC and pulsed DC sensitive residual current monitor type A according to IEC 62020-1
- · r.m.s. value measurement
- Up to 247 monitors in the system
- Residual operating current $I_{\Delta n}$ adjustable: 10 mA...30 A (42...70 Hz)
- Supply voltage DC 24 V (-24) or AC/DC 100...240 V (-2)
- · LED strip measured value display
- · Adjustable response delay
- One alarm relay (changeover contact)
- N/C or N/O operation and fault memory behaviour selectable
- RS-485 with Modbus RTU
- · Continuous measuring current transformer connection monitoring

Approvals

C € ĽK

Standards

Devices of the RCM410R series have been developed according to the following standards:

• IEC 62020-1

Further information

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

Ordering information

Supply v	oltage U₅	Туре	Art. No.	
AC/DC	DC	1782	1	
-	24 V	RCM410R-24	B74602000	
100240 V	24 V	RCM410R-2	B74603000	

Technical data

RCM410R-24:	
Definitions:	
Measuring & control circuit (IC1)	S1, S2, +, -, A, B
Output circuit (IC2)	11, 14, 12
Rated voltage	250 V
Overvoltage category	III
Operating altitude	≤ 2000 m AMSL
Rated impulse voltage:	
IC1/IC2	4 kV
Rated insulation voltage:	
IC1/IC2	250 V
Pollution degree	2
Protective separation (reinforced insulation) between:	
IC1/IC2	Overvoltage category III, 300 V
Voltage test (routine test) acc. to IEC 61010-1:	
IC1/IC2	AC 2.2 kV
RCM410R-2:	
Definitions:	
Supply circuit (IC1)	A1, A2
Output circuit (IC2)	11, 14, 12
Measuring & control circuit (IC3)	S1, S2, +, -, A, B
Rated voltage	250 V
Overvoltage category	III
Operating altitude	≤ 2000 m AMSL
Rated impulse voltage:	
IC1/(IC2-3)	4 kV
IC2/IC3	4 kV
Rated insulation voltage:	
IC1/(IC2-3)	250 V
IC2/IC3	250 V
Pollution degree	2
Protective separation (reinforced insulation) between:	
IC1/(IC2-3)	Overvoltage category III, 300 V
IC2/IC3	Overvoltage category III, 300 V
Voltage test (routine test) acc. to IEC 61010-1:	
IC1/(IC2-3)	AC 2.2 kV
IC2/IC3	AC 2.2 kV

Supply voltage	
RCM410R-24:	
Supply voltage U _S	DC 24
Tolerance of U _s	-30+25 9
Power consumption	≤2 \
Inrush current (< 5 ms)	< 10
RCM410R-2:	
Supply voltage $U_{\rm S}$	AC/DC 100240 V (4763 Hz
Tolerance of $U_{\rm S}$	±15 9
Power consumption	≤ 2 W / ≤ 3.5 V
Inrush current (< 2 ms)	< 1.8
Measuring circuit	
External measuring current transformer (type A)	CTAC, W, WR, WS, WF serie
Measuring current transformer monitoring ¹⁾	on*/o
Load	33 Ω
Rated voltage <i>U</i> n	see datasheet measuring current transforme
Operating characteristics	type
Frequency range	4270 H
Measuring range (Peak)	2 mA70
Measuring range (RMS)	2 mA50
Rated residual operating current	30
Residual operating current I _{An} (AL2)	10 mA30 A (10 mA)
Prewarning (AL1) ¹⁾	50100 % x I _{Δn} (50 %)
Operating uncertainty	±10 % (at 0.55 x /Δι
Relative uncertainty	020 9
Hysteresis 1)	1025 % (15 %)
Time response	
Start-up delay t 1)	0999 s (0 s)
Response delay ton	010 s (0 s)
Delay on release $t_{ m off}$ 1)	0999 s (0 s)
Operating time	
t_{ae} at $I_{\Delta n} = 1 \times I_{\Delta n}$	≤ 250 m
t_{ae} at $I_{\Delta n} = 5 \times I_{\Delta n}$	≤ 100 m
Recovery time t _b 4)	≤3

Response time for measuring current transformer monitoring

 $\leq 10 \, \mathrm{s}$

Displays, memory Display			etatus I FN	ind LED L	2
Display range measured value		status LED incl. LED bar graph 0100 %			
Fault memory alarm messages		0100 % on/off (off)*			
· · · · · ·	_			011/	011 (011)
Cable lengths for measuring current trans	formers				
Single wire ≥ 0.75 mm ²					01 m
Single wire, twisted $\geq 0.75 \text{ mm}^2$ Shielded cable $\geq 0.75 \text{ mm}^2$					10 m
Shielded cable ≥ 0./5 mm²				0	40 m
RS-485 interface					
Protocol					lbus RTU
Baud rate		max		its/s (19.2	
Parity			eve	en, no, odd	
Stop bits				1/2/auto	
Cable length (at 9.6 kbits/s)					1200 m
Cable: twisted pair			min. J-	Y(St)Y 2 x	
Required terminating resistor					(0.25 W)
Device address 3)			1	247 (10)0+SN)*
Switching elements					
Switching elements				:hangeove	
Operating principle		N/C or N/O operation (N/C operation)*			
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	24 V	110 V	220 V
Rated operational current	5 A	3 A	1 A	0.2 A	0.1 A
Minimum contact rating 2)			1 m	nA at AC/D	C ≥ 10 V
Environment/EMC					
EMC				IEC	62020-1
Ambient temperatures					
Operation					.+55°0
Transport					.+85°C
Storage				-40	.+70°0
Classification of climatic conditions acc. to					
(except condensation and formation of ice	e)				
Stationary use (IEC 60721-3-3)					3K23
Transport (IEC 60721-3-2)					2K11
Long-term storage (IEC 60721-3-1)					1K22
<u> </u>					
	c. to IEC 607	721			2116
Classification of mechanical conditions acc Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2)	c. to IEC 607	721			3M11 2M4

Connection	
Connection type	push-in
Connection properties	
rigid	0.21.5 mm ² (AWG 24-16)
flexible	0.21.5 mm ² (AWG 24-16)
with ferrule	0.250.75 mm ²
with ferrule	1.01.5 mm ² **

0ther

Operating mode	continuous operation
Mounting	vertical
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
Flammability class	UL94 V-0
Documentation number	D00403
Weight	≤ 100 g

- * Factory setting
- *** Use crimping pliers similar to CRIMPFOX 6 / Weidmüller PZ6/PZ6/5 only.

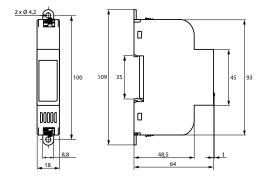
 1) Can only be configured via RS-485

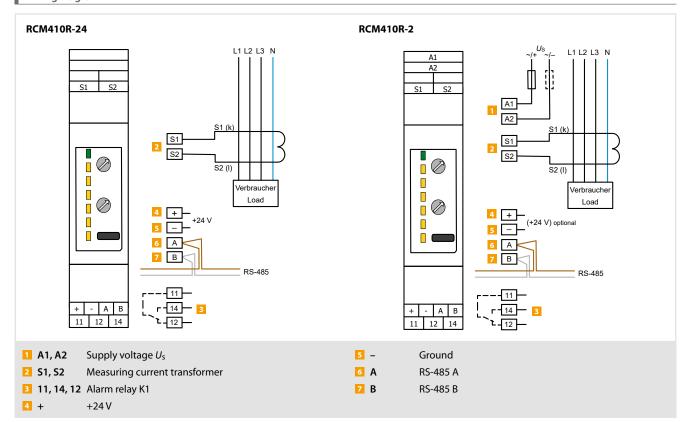
 2) Refers to relays that have not been operated with high contact currents

 3) Factory setting: 100 + last two digits of serial number

- 4) See chapter 2.2.5.1 in the manual

Dimension diagram (dimensions in mm)





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

Output range	Supply voltage <i>U</i> s	Туре	Art. No.	
varparrange		-76-2		
0100 mA (r.m.s.)	1224V	RCMB131-01	B94042131	



recinital data	
Insulation coordination according to IEC 606	664-1
Primary circuit	monitored primary conductors
Secondary circuit	Connections Vcc, GND, A, B, S1, S2
All following specifications apply to the insulation	n between the primary and secondary circuit
Rated voltage	300 V
Overvoltage category	III
Rated impulse voltage	4 kV
Operating altitude	up to 3000 m AMSI
Rated insulation voltage	320 \
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, r.m.s.
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 / _{∆n1}
$I_{\Delta n2}$	
Response value	r.m.s. 3.5 100 mA (* 30 mA)
Response tolerance	
DC1 kHz	0.71.0 x I∆n2
12 kHz	1.02.0 x / _{Δn2}
Output range	0100 mA (r.m.s.)
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 % ±0.5 mA)

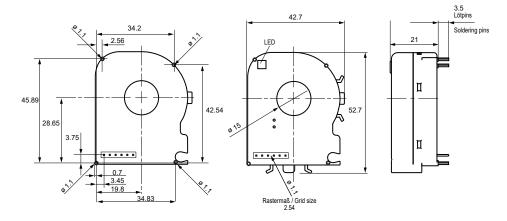
Time response Response time tae (relay switching time of 10) ms considered)	
for 1 x /An) iiis considered)	< 290 ms
for 2 x /An		< 140 ms
for 5 x /An		< 30 ms
Recovery time $t_{\rm b}$		_ 50s ≤ 2s
Disturbances		
Load current /n		32 A
Response value assignment		
$I_{\Delta n1}$ (DC)		S1
<i>I</i> _{Δn2} (r.m.s.)		S2
Outputs		
Interface		RS-485
Protocol		Modbus RTU
Switching outputs	Open Collector, not sh	ort-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		
EMC	DIN EN 62020:2003 (VDE 0663), v	
Ambient temperature (incl. primary conductor	rs routed through module)	-25+70 °C
Classification of climatic conditions acc.	to IEC 60721	
Stationary use (IEC 60721-3-3)	3K23 (except condensation and f	ormation of ice)
Transport (IEC 60721-3-2)	2K11 (except condensation and f	
Long-term storage (IEC 60271-3-1)	1K22 (except condensation and f	formation of ice)
Classification of mechanical conditions a	occ. 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	conti	nuous operation
Mounting		any position
Protection class		IP 30

Documentation number ${}^*\!=\!\mathsf{factory}\,\mathsf{settings}$

Flammability rating Service life at 40 °C

Software

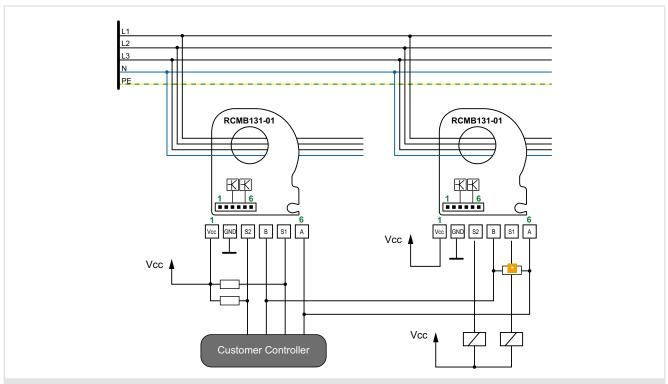
Dimension diagram (dimensions in mm)



UL94 V-0

10 years D0604

D00358



 ${\color{red} {f \square}}$ Terminating resistor 120 ${\color{red} {\Omega}}$ must only be set on the last device in the RS-485 bus chain

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 r.m.s. 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
- $\bullet \ \ \text{Frequency range DC...2 kHz}$
- 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



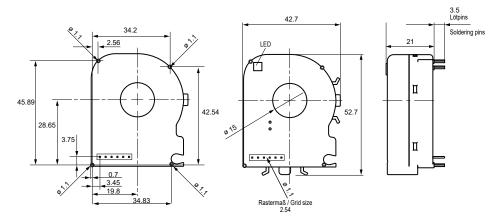
Ordering information

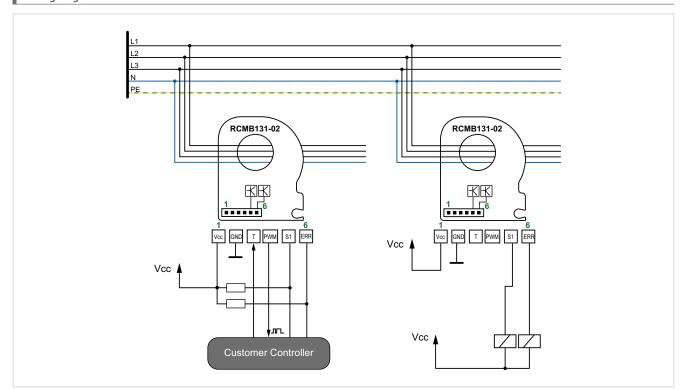
Output range	Supply voltage <i>U</i> s	Туре	Art. No.	
	DC			
0100 mA (r.m.s.)	1224 V	RCMB131-02	B94042132	



Insulation coordination according to IEC 60664-1		Disturbances	
Primary circuit	monitored primary conductors	Load current In	32 A
Secondary circuit	Connections Vcc, GND, T, PWM, S1, ERR	Outmute	
All following specifications apply to the insulation between	n the primary and secondary circuit	Outputs	0 6 11 2 2 1 2 1 2 1
Rated voltage	300 V	Switching outputs S1, ERR	Open Collector, not short-circuit-proof
Overvoltage category	III	Switching capacity	40 V / 50 mA
Rated impulse voltage	4 kV	Hysteresis	≤ 30 %
Operating altitude	up to 3000 m AMSL	PWM	PWM signal, push pull
Rated insulation voltage	320 V	Internal resistance PWM signal	4.7 kΩ
Pollution degree	2	Voltage HIGH level	3.13.6 V
Safe separation (reinforced insulation)	between primary and secondary circuit	Voltage LOW level	00.6 V
Voltage test acc. to IEC 61010-1	AC 2.2 kV	Frequency PWM signal	8 kHz
		Specification of the PWM signal	(0100) % = (0100) mA
Voltage supply		Output resistance	not short-circuit-proof
Supply voltage $U_{\rm S}$	DC 1224 V	Response value assignment	
Operating range of the supply voltage	±20 %	/ _{Δn1} (DC)	
Ripple	100 mV	Internal error	ERR
Power consumption	< 0.75 W	internal error	Enn
Measuring circuit		Environment/EMC	
Internal diameter primary conductor opening	15 mm	EMC	DIN EN 62020:2003 (VDE 0663), where applicable
Measured value evaluation	DC, r.m.s.	Ambient temperature (incl. primary conduc	tors routed through module) -25+70 °C
Characteristics according to IEC 60755	AC/DC sensitive, type B	Classification of climatic conditions acc	c. to IEC 60721
Response value $I_{\Delta n1}$	DC 3.5100 mA (* 6 mA)	Stationary use (IEC 60721-3-3)	3K23 (except condensation and formation of ice)
Response tolerance $I_{\Delta n1}$	0.71.0 x /∆n1	Transport (IEC 60721-3-2)	2K11 (except condensation and formation of ice)
Measuring range	AC/DC ±300 mA	Long-term storage (IEC 60271-3-1)	1K22 (except condensation and formation of ice)
Resolution	< 0.2 mA	Classification of mechanical conditions	sacc. to IFC 60271
Frequency range	DC2 kHz	Stationary use (IEC 60721-3-3)	3M11
Measuring time	180 ms	Transport (IEC 60721-3-2)	2M4
Operating uncertainty		Long-term storage (IEC 60271-3-1)	1M12
DC500 Hz	±(5 % + 0.5 mA)	Other	
5011000 Hz	$\pm (15\% + 0.5 \text{ mA})$	Operating mode	continuous operation
10012000 Hz	$\pm (50 \% + 0.5 \text{ mA})$	Mounting	any position
Time response		Protection class	IP 30
•	urad)	Flammability rating	UL94 V-0
Response time t _{ae} (relay switching time of 10 ms consider		Service life at 40 °C	10 years
for 1 x /∆n	≤ 290 ms	Software	D0604
for 2 x I∆n	≤ 140 ms	Documentation number	D00354
for 5 x /Δn	≤ 30 ms		
Recovery time t _b	≤ 2s	* = factory settings	

Dimension diagram (dimensions in mm)





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)

Approvals



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.

Ordering information

Measuring range	Supply voltage U₅	Туре	Art. No.	
AC/DC	DC	1,7,62		
±100 mA	1224 V	RCMB132-01	B94042136	
		Mounting foot MCCT20	B91080111	



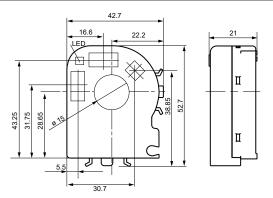
Insulation coordination according to IEC 606 Primary circuit	monitored primary conductors
Secondary circuit	Connections Vcc, GND, A, B, S1, S2
All following specifications apply to the insulation by	
Rated voltage	300 V
Overvoltage category	300 V
Rated impulse voltage	'' 4 k∖
Operating altitude	up to 3000 m AMSI
Rated insulation voltage	320 V
Pollution degree	320 (
Safe separation (reinforced insulation)	between primary and secondary circuit
Voltage test acc. to IEC 61010-1	AC 2.2 kV
voltage lest acc. to IEC 01010-1	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, r.m.s.
Measuring range	AC/DC ±300 mA
Characteristics according to IEC 60755	AC/DC sensitive, type E
/ _{∆n1}	
Response value	DC 3.5100 mA (* 6 mA
Response tolerance	0.7 1.0 x <i>I</i> _{∆n} ·
$I_{\Delta n2}$	
Response value	r.m.s. 3.5 100 mA (* 30 mA)
Response tolerance	
DC1 kHz	0.71.0 x / _{Δn2}
12 kHz	1.02.0 x / _{Δn2}
Output range	0100 mA (r.m.s.)
Resolution	< 0.2 mA
Frequency range	DC2 kHz
Measuring time	180 ms
Operating uncertainty	
DC500 Hz	$\pm (5 \% + 0.5 \text{ mA})$
5011000 Hz	$\pm (15 \% + 0.5 \text{ mA})$
	$-(50 \% \pm 0.5 \text{ mA})$

Response time t_{ae} (relay switching time of	10 ms considered)
for 1 x $I_{\Delta n}$. ≤ 290 ms
for 2 x $I_{\Delta n}$	≤ 140 ms
for 5 x I _{Δn}	≤ 30 ms
Recovery time t _b	≤ 2 9
Disturbances	
Load current In	32 A
Response value assignment	
I _{Δn1} (DC)	S1
$I_{\Delta n2}$ (r.m.s.)	S2
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	
EMC	DIN EN 62020:2003 (VDE 0663), where applicable
Ambient temperature (incl. primary condu	ctors routed through module) -25+70 °C
Classification of climatic conditions a	
Stationary use (IEC 60721-3-3)	3K23 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K11 (except condensation and formation of ice)
Long-term storage (IEC 60271-3-1)	1K22 (except condensation and formation of ice)
Classification of mechanical condition	s 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
C 1: C - + 70 0C + - IEC (1700	20

Documentation number

Software

Dimension diagram (dimensions in mm)

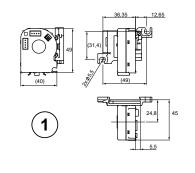


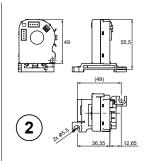
Rail mounting

Service life at 70 °C acc. to IEC 61709

Plug (included in scope of delivery)

with mounting foot MCCT20 (accessories, see ordering data)



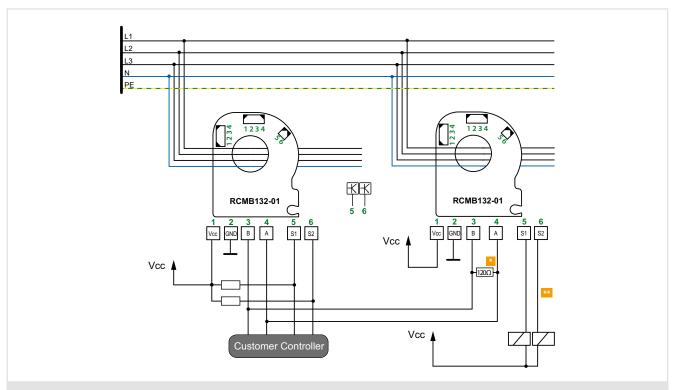


20 years D0604

D00356

Phoenix Contact, PTSM 0.5/4-P-2.5

^{* =} factory settings



- $\hfill \square$ 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.

RCMB104

AC/DC sensitive residual current monitoring module for electric vehicle charging systems



• AC charging systems for electric

Device features

- Three outputs (DC, RMS, Error)
- · Measuring range ±300 mA
- · Residual current resolution 0.2 mA
- · Patented measurement technology
- Load current up to 80 A r.m.s. (single-phase) or 3 x 32 A r.m.s. (three-phase)
- Fault output (integrated self monitoring and test functions)
- · High insensitivity to external interferences
- Available variants for application according to DIN EN 61851-1/IEC 62752 and UL 2231-2
- Wide range of use even in severe environments (e.g. in the event of external interference fields)
- In applications according to DIN EN 61851-1 or IEC 62752, the RCMB104 can replace a type B RCD when combined with a type A RCD and a suitable switching device (e.g. a power relay).

vehiclesin Approvals



Typical applications

Standards

The RCMB104... series complies with the following device standards:

- IEC 60364-7-722 (Low-voltage electrical installations Part 7-722: Requirements for special installations or locations Supplies for electric vehicles)
- **DIN EN 61851-1** (Electrical equipment of electric road vehicles Electric vehicle conductive charging system Part 1: General requirements)
- IEC 62752 (In-Cable Residual Current Device for mode 2 charging of electric road vehicles (IC-RCD))

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

Description	Туре	Art. No.
02 kHZ IEC 6/30 mA	RCMB104-1	B94042480
02 kHZ UL2231 5/20 mA	RCMB104-2	B94042481

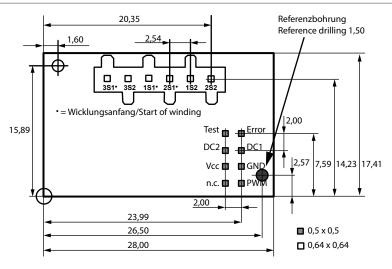
Ordering information Measuring current transformer

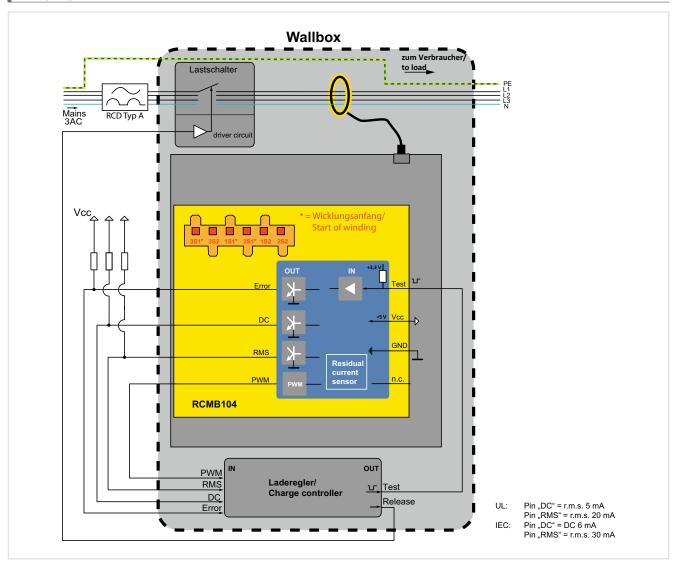
Description	Diameter/ Connection cable	Туре	Art. No.	Page
Measuring current transformer	17 mm/–	CTBC17	B98080070	268
Connection cable CTBC17	$-/180 \pm 30 \text{mm}$	CTBC17-Kabel180MM	B98080540	268
	$-/325 \pm 25 \text{mm}$	CTBC17-Kabel325MM	B98080541	268
	$-/1470 \pm 30 \text{mm}$	CTBC17-Kabel1470MM	B98080542	268



Primary circuit (monitored circuit)		Outputs DC, RMS, Error
Rated voltage $U_{\rm n}$	250 V	Type Open Collector (NPN)
Rated current I _n	single-phase: 48 A	Switching capacity DC 40 V/20 mA
	three-phase: 32 A	Signalling times in the event of module and hardware errors
Short-term continuous current I _n for 1 s	200 A	Error ≤ 1.5 s
nsulation coordination according to IEC 6060	54-1/IFC 60664-3	DC ≤ 2.5 s
	94-1/1EC 00004-3	RMS ≤ 2.5 s
Definitions:	//1 /2 /2 N/\	Measurement output (PWM)
Measuring circuit IC1	(L1, L2, L3, N)	Type PushPull
Electronics IC2	(af, Test, Error, RMS, DC, Vcc, GND, PWM)	HIGH level 3.13.5 V
Rated voltage	250 V	LOW level 00.5 V
Overvoltage category (OVC)	III	PWM frequency 8 kHz
Rated impulse voltage:		Scaling
IC1/IC2	4 kV	RCMB104-1 0100 % = DC 030 mA
Rated insulation voltage:		RCMB104-2 0100 % = r.m.s. 050 mA
IC1/IC2	250 V	Maximum current-carrying ability 10 mA
Pollution degree	2	Maximum current-carrying ability 10 max
Protective separation (reinforced insulation) betwe	een:	Control input (TEST)
IC/IC2	OVC III, 250 V	Type LOW: activated state
he data are valid from the monitored primary circ	uit to the output circuit.	HIGH: deactivated state
· · ·	·	Switching thresholds HIGH: 3.1 5.5 V
Power supply		LOW: 0 0.6 V
Nominal supply voltage $V_{ m cc}$	DC 5 V	LUW: U 0.6 V
Tolerance of the supply voltage $V_{\rm cc}$	±5 %	EMC (DIN EN 61851-1, IEC 62752, UL 2231-2)
Voltage ripple V _{cc}	< 100 mV	ESD restrictions: The RCMB104 must be mounted in an enclosure that complies with the menti-
Absolute maximum supply voltage V_{cc}	DC 5.5 V	oned standards.
Nominal current I _{cc}	45 mA	Restrictions line-conducted interferences: The supply conductor must fulfil the
		requirements of the voltage supply (see manual)
Residual current measuring range		
Frequency range /∆n	02000 Hz	, ,
Measuring range I∆n	±300 mA	±2 kV (contact)
Resolution $I_{\Delta n}$	0.2 mA	Operating temperature -3080 °C
		Storage temperature -4085 °C
Response values		Climatic class
RCMB104-1(IEC)		Stationary use (IEC 60721-3-3) (except condensation, water and formation of ice) 3K24
Rated residual operating current	r.m.s. 30 mA	Transport (IEC 60721-3-2) 2K11
Residual current /Δn1	DC 6 mA	Long-term storage (IEC 60721-3-1) 1K21
Response tolerance /Δn1	0.51 x /∆n1	Classification of mechanical conditions
Residual current /Δn2	r.m.s. 30 mA	
Response tolerance /Δn2	1.111.3. 30 1111	· · · · · · · · · · · · · · · · · · ·
for $f = DV \dots \le 100 \text{ Hz}$	0,71 x /Δn2	
for $f = 100 \le 1000 \text{ Hz}$	0,71 χ /Δn2 25 χ /Δn2	Long-term storage (IEC 60721-3-1) 1M12
		Range of use ≤ 4000 m
for $f = 1 \dots 2$ kHz Restart value	36 x I _{dn2}	Degree of protection
	. 2 4	RCMB104 IP00
/ _{∆n1}	< 3 mA	
/ _{An2}	< 12 mA	Measuring current transformer (without connector plug) IP55
Operating time t_{ae} (at DC or > 15 Hz)		Connections
1x / _{∆n1}	< 480 ms	
2x / _{Δn1}	< 240 ms	Measuring current transformer
5x /∆n1	< 120 ms	Connection type PCB plug-in connector 0.65 x 0.65 mm
Operating time t_{ae} (at r.m.s. or $>$ 15 Hz)		Modular dimensions single row 6 x 2.54 mm
1x /∆n2	< 180 ms	Contact surface tinned
2x / _{Δn2}	< 70 ms	Pin length 2.5 mm
5x /Δn2	< 20 ms	Inputs/outputs
RCMB104-2 (UL)		Connection type PCB plug-in connector 0.5 x 0.5 mm
	~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~	Arrangement of connections double row 2 x 4 pins
Rated residual operating current	r.m.s. 20 mA	Modular dimensions 2.00 mm
Residual current / _{An1}	r.m.s. 5 mA	
Response tolerance I _{Δn1}		Contact surface tinned
for $f = DC1$ kHz	0.81.2 x /Δn1	Pin length 2.5 mm
for $f = 12$ kHz	0.82.5 x / _{Δn1}	Soldering process for PCB recommended: selective soldering
Residual current $I_{\Delta n2}$	r.m.s. 20 mA	Connection measuring current transformer CTBC17
Response tolerance $I_{\Delta n2}$		Maximum distance RCMB104 to connector 100 mm
for $f = DC1$ kHz	0.81.2 x <i>I</i> ∆n2	
for <i>f</i> = 12 kHz	0.82.5 x / _{Δn2}	Connection type PCB plug-in connector
lestart value		Number of poles 6 (2x3 poles)
$I_{\Delta n1}$	< 3 mA	Modular dimensions 3.0 mm
I _{Δn2}	< 12 mA	Number of mating cycles 30
Operating time t_{ae} (at DC or > 15 Hz)		Manufacturer type designation Molex MicroFit 3.0 Header
AC and mixed currents	$< (20/\Delta I)^{1.43} - 10 \text{ ms}$	Article number 43045-0607
		The connector is not included in the scope of delivery.
DC 30 mA100.6 mA	$< (40 \times 1.414/\Delta I)^4 - 10 \text{ ms}$	For further information, refer to the original data sheet created by Molex.
DC > 100.6 mA	< (20/ΔI) ^{1.43} –10 ms	
Recovery time t _b Release time t _{off}	300 ms < 2.5 s	Documentation number D00294







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

- Three outputs (DC1, DC2, Error)
- · Measuring range DC ±300 mA
- · Residual current resolution 0.2 mA
- Load current up to 48 A r.m.s. (single-phase) or 3 x 32 A r.m.s. (three-phase)
- Fault output (integrated self monitoring and test functions)
- · High insensitivity to external interferences
- Wide range of use even in severe environments (e.g. in the event of external magnetic fields)
- As a RDC-M module in applications according to DIN EN 61851 or IEC 62955, the RCD104-4 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 device RDC104-4 series complies with the following device standards:

- IEC 62955 (Residual direct current detecting device (RDC-DD) to be used for mode 3 charging of electric vehicles)
- IEC 60364-7-722 (Low-voltage electrical installations Part 7-722: Requirements for special installations or locations Supplies for electric vehicles)
- DIN EN 61851-1 (Electrical equipment of electric road vehicles Electric vehicle conductive charging system – Part 2-2: AC electric vehicle charging station)

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

Description	Туре	Art. No.
RDC-M module acc. to IEC 62955	RDC104-4-1	B94042483

Ordering information Measuring current transformer

Description	Diameter/ Connection cable	Туре	Art. No.	Page
Measuring current transformer	17 mm/–	CTBC17	B98080070	268
	$-/180 \pm 30 \text{mm}$	CTBC17-Kabel180MM	B98080540	268
Connection cable CTBC17	$-/325 \pm 25 \text{mm}$	CTBC17-Kabel325MM	B98080541	268
	$-/1470 \pm 30 \text{mm}$	CTBC17-Kabel1470MM	B98080542	268



Primary circuit (monitored circuit)		Control input (TEST)	
Rated voltage U_n	250 V	Type LOW:	activated state
Rated current I _n	single-phase: 48 A	HIGH: de	activated state
	three-phase: 32 A	Switching thresholds HIG	iH: 3.1 5.5 \
Short-term continuous current In for 1 s	200 A		.0W: 0 0.6 \
Insulation coordination according to IEC 60664-1/IEC 60664-3		EMV (DIN EN 61851-1, DIN EN 61851)	
Definitions:		ESD restrictions: The RDC104-4 must be mounted in an enclosure that complies wi	ith the
Measuring circuit IC1	(L1, L2, L3, N)	mentioned standards.	
-	, DC1, DC2, Vcc, GND, PWM)	Restrictions line-conducted interferences: The supply conductor must fulfil the	
Rated voltage	250 V	requirements of the voltage supply (see manual)	
Overvoltage category (OVC)		ESD immunity acc. to Human Body Model JESD22-A114	±2 kV (air)
Rated impulse voltage:			±2 kV (contact)
IC1/IC2	4 kV	Operating temperature	-3080°C
Rated insulation voltage:		Storage temperature	-4085 °C
IC1/IC2	250 V		1005
Pollution degree	250 7	Climatic class	21/2
Protective separation (reinforced insulation) between:		Stationary use (IEC 60721-3-3) (except condensation, water and formation of ice)	3K24
IC/IC2	OVC III, 250 V	Transport (IEC 60721-3-2)	2K11
The data are valid from the monitored primary circuit to the output circu	·	Long-term storage (IEC 60721-3-1)	1K21
The data are valid from the monitored primary circuit to the output circu	JIL.	Classification of mechanical conditions	
Power supply		Stationary use (IEC 60721-3-3)	3M11
Nominal supply voltage V_{cc}	DC 5 V	Transport (IEC 60721-3-2)	2M4
Tolerance of the supply voltage V_{cc}	±5 %	Long-term storage (IEC 60721-3-1)	1M12
Voltage ripple V_{cc}	< 100 mV	Range of use	< 4000 m
Absolute maximum supply voltage V_{cc}	DC 5,5 V		
Supply current I_{CC}	45 mA	Degree of protection	
		RDC-104-4	IP00
Residual current measuring range		Measuring current transformer (without connector plug)	IP55
Measuring range $I_{\Delta n}$	DC $\pm 300 \text{mA}$	Connections	
Resolution I∆n	DC 0.2 mA		
Dagmanaa yaliisa		Measuring current transformer	
Response values		Connection type PCB plug-in connector (0.65 x 0.65 mm
RDC104-4 (IEC 62955)		Modular dimensions single ro	w 6 x 2.54 mm
Rated DC residual operating current I∆dc	6 mA	Contact surface	tinned
Response value I _{Δn2}	DC 6 mA	Pin length	2.5 mm
Response tolerance $I_{\Delta n2}$	50100 %	Inputs/outputs	
Restart value I _{Δn2}	< 3 mA	Connection type PCB plug-in connector	or 0.5 x 0.5 mm
Operating time tae			row 2 x 4 pins
DC 6 mA	< 480 ms	Modular dimensions	2.00 mm
DC 12 mA	< 240 ms	Contact surface	tinned
DC 30 mA	< 120 ms	Pin length	2.5 mm
DC 60 mA	< 70 ms	Soldering process for PCB recommended: sele	
DC 200 mA	< 30 ms	Solution g process to the second control of	. care solucing
DC 300 mA	< 30 ms	Connection measuring current transformer CTBC17	
		Maximum distance RDC104-4 to connector	100 mm
Outputs DC1, DC2, Error		Connection type PCB plu	ıg-in connectoi
Туре	Open Collector (NPN)	Number of poles	6 (2x3 poles)
Switching capacity	DC 40 V/20 mA	Modular dimensions	3.0 mm
Signalling times in the event of module and hardware errors		Number of mating cycles	30
Error	≤ 1.5 s	Manufacturer type designation Molex Micr	oFit 3.0 Header
DC1	≤ 2.5 s	Article number	43045-0607
DC2	≤ 2.5 s	The connector is not included in the scope of delivery. For further information,	
Measurement output (PWM)		refer to the original data sheet created by Molex.	
Type	PushPull	Documentation number	D00402
HIGH level	3.13.5 V		
LOW level	00.5 V		
PWM frequency	8 kHz		
. ,	100 % = DC 0 30 mA		

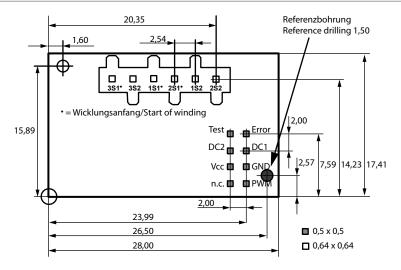
0...100 % = DC 0...30 mA

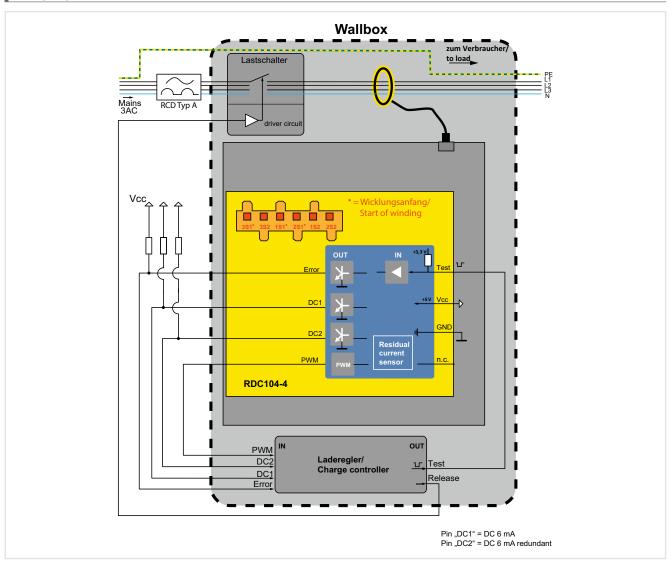
10 mA



Scaling

Maximum current-carrying ability





LINETRAXX® RCMB42...

AC/DC sensitive residual current monitor





Device features

- DC sensor with additional AC tripping (type B characteristic)
- Response value 2 AC/DC 30 mA: r.m.s. value measurement
- Response value 1: DC 6 mA
- Frequency range residual current 0...2000 Hz
- Frequency range load current 45...65 Hz
- Monitoring of the connection to the measuring current transformer
- Fully shielded residual current transformer to avoid influences due to external disturbances
- Connection via push-wire terminals
- · Variants: One-channel and two-channel residual current measurement

Typical applications

• Residual current monitoring of AC charging stations for electric vehicles

Sandards

The LINETRAXX $^{\!\!\! \bullet}$ RCMB42... series complies with the following device standard:

• IEC 62752

Approvals



Further information

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

Ordering information

Measuring range		Frequency range	Number of measuring current transformers	Channels	Supply v	oltage U _s	Туре	Art. No.	
DC	r.m.s.	range	(Ø 15 mm, 1.5 m cable)		AC				
	0 20 4	a 2000 II	2	2 x residual current	110240 V, 50/60 Hz	150220 V	RCMB420-2	B74042500	
0 (1					-	1836 V	RCMB420-25	B74042503	
06 mA	030 mA	02000 Hz	1	1 x residual current	110240 V, 50/60 Hz	150220 V	RCMB422-2	B74042502	
					-	1836 V	RCMB422-25	B74042504	

Delivery incl. measuring current transformers.

Measuring current transformers available with shorter cable on request (minimum order quantity 250 pcs.)

Accessories

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



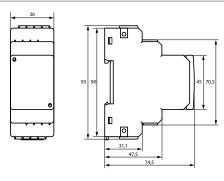
Insulation coordination according to IEC 60664-1		Residual current measuring range	
Definitions		Rated frequency	02000 Hz
Supply circuit (IC1)	A1, A2	Measuring range	±300 mA
Measuring circuit (IC2)	ld1, ld2 Err, Test, GND	Response values	
Output circuit 1 (IC3)	13, 14	<u> </u>	6 m/l
Output circuit 2 (IC4)	23, 24	Residual current I∆n1	6 mA
Monitored current circuit (IC5)	Un	Response tolerance I _{Δn1}	-500 %
Rated voltage	250 V	Residual current I∆n2	30 mA (r.m.s.)
Overvoltage category (OVC)	III	Response tolerance $I_{\Delta n2}$	
Pollution degree	2	for $f \le 1 \text{ kHz}$	-200 %
RCMB4225		for f > 1 kHz	-20+100 %
Rated insulation voltage		Restart sequence value	
IC1/IC2	40 V	DC 6 mA	< 3 mA
(IC1-IC2)/(IC3-IC5)	250 V	AC/DC 30 mA (r.m.s.) for $f \le 1$ kHz	< 12 mA
IC3/(IC4-IC5)	250 V	AC/DC 30 mA (r.m.s.) for f > 1 kHz	< 22 mA
IC4/IC5	250 V	Operating time t_{ae1} for 1 x $I_{\Delta n1}$	< 600 ms
Rated impulse voltage	250 1	Operating time t_{ae2} for	
IC1/IC2	800 V	1 x I _{Δn2}	< 180 ms
(IC1-IC2)/(IC3-IC5)	4 kV	2 x I _{Δn2}	< 70 ms
IC3/(IC4-IC5)	4 kV	5 x I _{Δn2}	< 20 ms
IC4/IC5	4 kV	Innute and eneration	
	4 KV	Inputs and operation	
Safe isolation (reinforced insulation) between	OUC III DEO V	Test button	on front side
(IC1-IC2)/(IC3-IC5)	OVC III, 250 V	Test	internal/externa
(IC3-IC4)-IC5	OVC III, 250 V	Cable length Test/Err, GND	< 10 m
Basic insulation between	01/5 111 0 5 0 1/4	Transformer connection	externa
103/104	OVC III, 250 V	LED device function	greer
Functional insulation between		LED alarm channel 1	yellow
IC1/IC2	DC 1 kV 60 s	LED alarm channel 2	yellow
Voltage tests (routine test) acc. to IEC 61010-1		0	
(IC1-IC2)/(IC3-IC4)	AC 2.2 kV	Output	0 6 11 . (
IC2-IC5	AC 2.2 kV	Common alarm signal Err	Open-Collector (npn)
IC3/IC4	AC 2.2 kV	No error	00.6\
RCMB422		Error	11.412.6 \
Rated insulation voltage		Switching elements	
IC1/(IC2-IC5)	250 V	Alarm relays K1, K2	$I_{\Delta n} \ge 6 \text{ mA DC}$
IC2/(IC3-IC5)	250 V	Aldrii relays K1, K2	/Δn ≥ 0 mA r.m.s
IC3/IC4-IC5	250 V	Switching elements	$7\Delta n \ge 30$ mA 1.11.5 2×1 N/O contacts
IC4/IC5	250 V		
Rated impulse voltage		Operating principle Electrical endurance, number of cycles	N/C operation
IC1/(IC2-IC5)	4 kV		10,000
IC2/(IC3-IC5)	4 kV	Contact data according to IEC 60947-5-1	
IC3/IC4-IC5	4 kV	Utilisation category	AC-14/DC-13
IC4/IC5	4 kV	Rated operational voltage U_e	250 V
Safe isolation (reinforced insulation) between	T K V	Rated operational current Ie	5 A
· · · · · · · · · · · · · · · · · · ·	OVC III. 250 V	Minimum contact rating	1 mA at AC/DC ≥ 10 V
IC1/(IC2-IC5) IC2-(IC3-IC5)	OVC III, 250 V OVC III, 250 V		
IC3-(IC4-IC5)	0VC III, 250 V	Environment/EMC	
,		EMC	IEC 61851-1, IEC 61851-22
(IC3-IC4)-IC5	OVC III, 250 V	Operating temperature	-30+75 °C
Basic insulation between	0//01/11/2507/	Classification of climatic conditions acc. 1	to IEC 60721
IC3/IC4	OVC III, 250 V	Stationary use (IEC 60721-3-3)	3K23 (except condensation and formation of ice)
Voltage tests (routine test) acc. to IEC 61010-1	160011	Transport (IEC 60721-3-2)	2K11
IC1/(IC2-IC5)	AC 2.2 kV	Long-term storage (IEC 60721-3-1)	1K21
IC2/(IC3-IC5)	AC 2.2 kV		
IC2/(IC3-IC4)	AC 2.2 kV	Classification of mechanical conditions a	
IC4-IC5	AC 2.2 kV	Stationary use (IEC 60721-3-3)	3M11
Supply voltage		Transport (IEC 60721-3-2)	2M4
Supply voltage		Long-term storage (IEC 60721-3-1)	1M12
RCMB4225		Connection	
Nominal voltage $U_{\rm S}$	DC 24 V		المستوع معانية عاميه
Nominal voltage range $U_{\rm S}$	DC 1836 V	Connection type	push-wire terminal
Nominal current	110 mA (RCMB420-25)	Connection properties	0.3 35
	70 mA (RCMB422-25)	Rigid	0.22.5 mm² (AWG 2414)
Internal protection against reverse polarity and short circuit		Flexible without ferrules	0.752.5 mm² (AWG 1914)
RCMB422		Flexible with ferrules	0.21.5 mm² (AWG 2416)
Nominal voltage range U_S	AC 110240 V, 50/60 Hz	Stripping length	10 mm
ivoniniai voitage iange os	DC 150220 V	Opening force	50 N
	DC 130220 V	Test opening, diameter	2.1 mm
Tolerance of the nominal voltage range of $U_{\rm S}$	-5+15 %	rest opening, diameter	2.1 11111



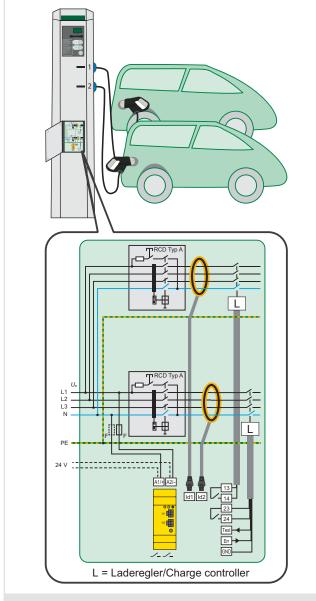
Other	
Operating mode	continuous operation
Degree of protection, internal components	IP 30
Degree of protection, terminals	IP 20
Area of application	≤ 2000 m AMS
Quick DIN rail mounting acc. to	IEC 6071:
Screw mounting	2 x M4 with mounting clip
Documentation number	D0016

Measuring current transformer	
Diameter cable gland measuring current transformer	15 mm
Cable length	1.5 m
Max. cable cross section	4 x 6 mm ²
Mounting	with cable ties
Connection to RCMB42	plug-in connector with 6 poles
Rated voltage U _n	3/(N) AC 400/230 V
Rated current In	3x32 A
Rated impulse withstand voltage $U_{\rm imp}$	4 kV

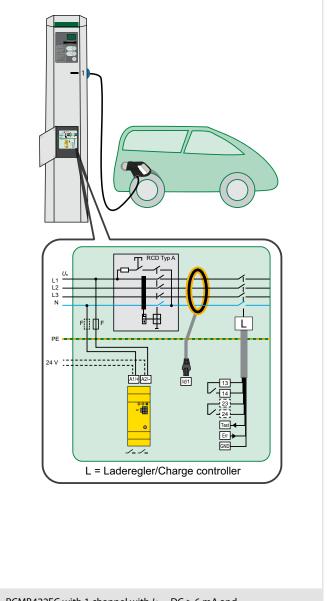
Dimension diagram (dimensions in mm)



Wiring diagrams



RCMB420EC with 2 channels with $I_{\Delta} = DC \ge 6$ mA and $I_{\Delta} = AC/DC \ge 30 \text{ mA (r.m.s.)}$



RCMB422EC with 1 channel with $I_{\Delta} = DC \ge 6$ mA and $I_{\Delta} = AC/DC \ge 30 \text{ mA (r.m.s.)}$



Insulation monitoring devices







Equipment for insulation fault location







Residual current monitoring systems







Neutral Grounding Resistor Monitor (NGR) LINETRAXX®







Charge Controller



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Power Quality and Energy Measurement

Measuring and monitoring relays LINETRAXX®







System components

Coupling devices
Measuring current transformers
Transformers
Relay modules

Power supply units Measuring instruments Interface converters Interface repeaters

COMTRAXX® Gateways
COMTRAXX® Alarm indicator and test combination
COMTRAXX® condition monitors
Visualization



339



Switching equipment

ATICS® transfer switching and monitoring devices

Test systems

UNIMET® Safety analyser



429 440



Anney

Technical terms Alphabetical list of device: Service



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Device overview neutral grounding resistance monitoring (NGR) LINETRAXX®



	Catalogue page	228	228	233	233		
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 type		HRG ■			-		
	LRG	-		-			
Fault currents	\approx						
Fault	===						
Ph	ase monitoring L1, L2, L3	-	-				
	System voltage L-L*	600 V25000 V	600 V25000 V	600 V25000 V	600 V25000 V		
Harmonic analysis	RMS 032						
Harm	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		
9	Detachable HMI for front panel mounting	-	-				
Mounting	DIN rail			-	-		
-	Screw mounting –		-				
Product details (Products on www.bender.de/en)		(Products on					

^{*} Freely configurable in the device, taking suitable coupling devices into account.



Device overview coupling devices for NGR monitoring



	Catalogue page	239	242	245	247	249	251	253
Special applications		AC/DC sensitive measuring current transformer	Ground-fault neutral-grounding monitor	Coupling device for HRG applications	Coupling device for HRG applications	Coupling device for HRG applications	Coupling device for HRG applications	Coupling device for HRG applications
System voltage L-L (U _{NGR} voltage)		-	-	Up to $U_{LL} = 690 \text{ V}$ Up to $U_{LL} = 1000 \text{ V}$ ($U_{NGR} = 400 \text{ V}$) ($U_{NGR} = 600 \text{ V}$)		Up to $U_{LL} = 4300 \text{ V}$ ($U_{NGR} = 2500 \text{ V}$)	Up to $U_{LL} = 14400 \text{ V}$ ($U_{NGR} = 8400 \text{ V}$)	Up to $U_{LL} = 25 \text{ kV}$ ($U_{NGR} = 14.5 \text{ kV}$)
Mounting								
Mour				-	-	-	-	-
Product details (Products on www.bender.de/en)								

	Recommended minimum value $R_{ m NGR}$ (tripping level 50 %)															
CD1000				CD10	000-2		CD	5000			CD14400			CD25000		
U _{sys}		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	381 Ω	416 Ω	635 Ω	831 Ω	1443 Ω
	15 A	(15 Ω)	(23 Ω)	(27 Ω)	(15Ω)	(23 Ω)	(27 Ω)	38 Ω	92Ω	162 Ω	231 Ω	254 Ω	277 Ω	423 Ω	554Ω	962 Ω
INGR	20 A	-	(17 Ω)	(20 Ω)	-	(17Ω)	(20 Ω)	29 Ω	69Ω	121 Ω	(173 Ω)	191 Ω	208 Ω	318Ω	416 Ω	722 Ω
INC	25 A	-	-	(16Ω)	-	-	(16 Ω)	(23 Ω)	55 Ω	97 Ω	(139 Ω)	(152 Ω)	(166 Ω)	254 Ω	333 Ω	577 Ω
	30 A	-	-	-	-	-	-	(19Ω)	(46 Ω)	81 Ω	(115 Ω)	(127 Ω)	(139 Ω)	212 Ω	277 Ω	481 Ω
	40 A	-	-	-	-	-	-	-	(35 Ω)	61Ω	(87 Ω)	(95 Ω)	(104 Ω)	(159Ω)	208 Ω	361 Ω
	50 A	-	-	-	-	-	-	-	(28 Ω)	(48 Ω)	-	(76 Ω)	(83 Ω)	(127Ω)	(166 Ω)	289 Ω
	100 A	-	-	-	-	-	-	-	-	(24Ω)	-	-	-	-	(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 U_{NGR}
- · Ethernet communication
- 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

Further information

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

Ordering information

Supply voltage <i>U_s</i> /	Frequency range Hz	System type	Туре	Art. No.	
AC					
40 240 40 70 11-	40 2401/	HRG	NGRM500	B94013500	
48240 V, 4070 Hz	48240 V	LRG	NGRM550	B94013550	

Suitable system components

Description			Page
Coupling device	CD	B980390	245
Measuring current transformer	CTUB	B781200	363
Voltage supply for measuring current transformers	STEP-PS	B940531	391



Insulation coordination according to IEC 60664-1/IE	C 60664-3/DIN EN 50187	Coupling
Definitions		$R_{\rm S}$ for $U_{\rm SyS} \leq 4.3$ kV CD1000, CD1000-2, CD5000 (20 k Ω)
Supply circuit (IC1)	(A1, A2)	$R_{\rm S}$ for $U_{\rm Sys} > 4.3$ kV CD14400, CD25000 (100 k Ω)
Measuring circuit/Control circuit (IC2)	(RS, E, CT), (X1, Ethernet)	Manitaring //
Output circuit 1 (IC3)	(11, 12, 14)	Monitoring UNGR
Output circuit 2 (IC4)	(21, 22, 24)	U_{NGR} with $R_S = 20 \text{ k}\Omega$ DC / 50/60 Hz / 503200 Hz; $(400/\sqrt{3})$ $\leq (4300/\sqrt{3})$ V
Output circuit 3 (IC5)	(31, 32, 34)	U_{NGR} with $R_S = 100$ kΩ DC / 50/60 Hz / 503200 Hz; > (4.3 / $\sqrt{3}$)(25/ $\sqrt{3}$) kV
Rated voltage	250 V	Measuring range 1.2 x U _{NGR nom}
Overvoltage category	III	Overload capacity 2 x U _{NGR} for 10 s
Rated impulse voltage		Measurement accuracy 2 % of $U_{NGR nom}$ with $U_{NGR nom} = (U_{sys}(L-L)/\sqrt{3})$
IC1/(IC25)	4 kV	Voltage response value 1090 % UNGR nom
IC2/(IC35)	4 kV	Response delay ground-fault relay $\leq 40 \text{ ms } (\pm 10 \text{ ms})$
IC3/(IC45)	4 kV	Response delay trip relay (configurable) 100 ms48 h, ∞
IC4/(IC5)	4 kV	Tolerance t _{trip} when set to
Rated insulation voltage		RMS -200 ms
IC1/(IC25)	250 V	Fundamental $0+150 \text{ ms (filter time)}$
IC2/(IC35)	250 V	Harmonics 0+150 ms (filter time)
IC3/(IC45)	250 V	DC immunity in case of active R _{NGR} measurement
IC4/(IC5)	250 V	with $R_S = 20 \text{ k}\Omega$
Pollution degree exterior	3	with $R_S = 100 \text{ k}\Omega$
Safe isolation (reinforced insulation) between		Digital inputs
IC1/(IC25)	overvoltage category III, 300 V	Digital inputs
IC2/(IC35)	overvoltage category III, 300 V	Galvanic separation no
IC3/(IC45)	overvoltage category III, 300 V	Length connecting cables max. 10 m
IC4/(IC5)	overvoltage category III, 300 V	<i>U</i> _{in} DC 0 V, 24 V
Voltage tests (routine test) acc. to IEC 61010-1		Overload capacity -532 V
IC1/(IC25)	AC 2.2 kV	Digital outputs
IC2/(IC35)	AC 2.2 kV	
IC3/(IC45)	AC 2.2 kV	
IC4/(IC5)	AC 2.2 kV	Length connecting cables max. 10 m
ici/(ici)	AC Z.Z RV	Currents (sink) for each output max. 300 mA
Supply voltage		Voltage 24 V
Nominal supply voltage $U_{\rm S}$	AC/DC, 48240 V	Overload capacity -532 V
for UL applications	AC/DC, 48240 V	Analogue output (M+)
for AS/NZS 2081 applications	AC/DC, 48230 V	Operating principle linear
Tolerance $U_{\rm S}$	±15 %	· • • · ·
Tolerance U_s (for UL applications)	-50+15 %	Functions I_{NGR} , R_{NGR} Current $020 \text{ mA} (\le 600 \Omega), 420 \text{ mA} (\le 600 \Omega), 0400 \text{ µA} (\le 4 \text{ k}\Omega)$
Tolerance U_s (for AS/NZS 2081 applications)	-25+20 %	
Frequency range U_S	DC, 4070 Hz	Voltage $010 \text{ V} (\ge 1 \text{ k}\Omega), 210 \text{ V} (\ge 1 \text{ k}\Omega)$
Power consumption (max.)	≤ 7 W/16 VA	Tolerance related to the current/voltage end value $\pm 20\%$
,		Ground-fault, NGR, trip relay
Monitoring R _{NGR}		Switching elements changeover contacts
Measuring input R _S	< 33 V RMS	Operating mode configurable fail-safe/non-fail-safe
Measuring range NGR (with $R_S = 20 \text{ k}\Omega$) active	010 kΩ	Electrical endurance, number of cycles 10,000
Measurement uncertainty for $T = 0+40$ °C	±20 Ω	Switching capacity 2000 VA/150 W
Measurement uncertainty for $T = -40+70$ °C	. 40.0	3 1 /
	±40 Ω	
Measuring range NGR (with $R_S = 100 \text{ k}\Omega$) active	±40 Ω 010 kΩ	Contact data acc. to IEC 60947-5-1
		Rated operational voltage AC 250 V/250 V
Measurement uncertainty for $T = 0+40$ °C	010 kΩ ±30 Ω	Rated operational voltage AC 250 V/250 V Utilisation category AC-13/AC-14
	010 kΩ	Rated operational voltage AC Utilisation category Rated operational current AC 250 V/250 V AC-13/AC-14 Rated operational current AC
$\label{eq:measurement} \begin{array}{c} \text{Measurement uncertainty for T} = 0 \ldots + 40 \text{ °C} \\ \text{Measurement uncertainty for T} = -40 \ldots + 70 \text{ °C} \\ \hline \text{HRG} \end{array}$	010 kΩ ±30 Ω ±80 Ω	Rated operational voltage AC Utilisation category Rated operational current AC Rated operational current AC (for UL applications) AC-13/AC-14 Rated operational current AC (for UL applications)
$\label{eq:measurement} \begin{array}{l} \text{Measurement uncertainty for } T=0\ldots +40 \text{ °C} \\ \text{Measurement uncertainty for } T=-40\ldots +70 \text{ °C} \\ \hline \text{HRG} \\ \text{Setting range } \textit{R}_{\text{NGR nom}} \end{array}$	010 kΩ ±30 Ω ±80 Ω 15 Ω5 kΩ	Rated operational voltage AC Utilisation category Rated operational current AC Rated operational current AC (for UL applications) Rated operational voltage DC 250 V/250 V AC-13/AC-14 5 A/3 A Rated operational voltage DC 220/110/24 V
Measurement uncertainty for $I = 0+40$ °C Measurement uncertainty for $I = -40+70$ °C HRG Setting range $R_{NGR nom}$ Response value $< R_{NGR nom}$	010 kΩ ±30 Ω ±80 Ω 15 Ω5 kΩ 1090 % R _{NGR nom}	Rated operational voltage AC Utilisation category AC-13/AC-14 Rated operational current AC Rated operational current AC (for UL applications) Rated operational voltage DC Utilisation category C220/110/24 V Utilisation category DC-12
Measurement uncertainty for $I = 0+40$ °C Measurement uncertainty for $I = -40+70$ °C HRG Setting range $R_{NGR nom}$ Response value $< R_{NGR nom}$ Response value $> R_{NGR nom}$	010 kΩ ±30 Ω ±80 Ω 15 Ω5 kΩ	Rated operational voltage AC Utilisation category AC-13/AC-14 Rated operational current AC Rated operational current AC (for UL applications) Rated operational voltage DC Utilisation category DC-12 Rated operational current DC 250 V/250 V AC-13/AC-14 AC-13/
$\label{eq:measurement uncertainty for T = 0+40 °C} Measurement uncertainty for T = -40+70 °C \\ HRG \\ Setting range R_{NGR nom} \\ Response value < R_{NGR nom} \\ Response value > R_{NGR nom} \\ LRG \\$	010 kΩ ±30 Ω ±80 Ω 15 Ω5 kΩ 1090 % RNGR nom 110200 % RNGR nom	Rated operational voltage AC Utilisation category AC-13/AC-14 Rated operational current AC Rated operational current AC (for UL applications) Rated operational voltage DC 220/110/24 V Utilisation category DC-12
$\label{eq:measurement uncertainty for I = 0+40 °C} Measurement uncertainty for I = -40+70 °C \\ \overline{\text{HRG}} \\ Setting range R_{NGR nom} \\ Response value < R_{NGR nom} \\ Response value > R_{NGR nom} \\ \overline{\text{LRG}} \\ Setting range R_{NGR nom} \\$	$\begin{array}{c} 0 \dots 10 \ k\Omega \\ \pm 30 \ \Omega \\ \pm 80 \ \Omega \\ \\ \end{array}$ $\begin{array}{c} 15 \ \Omega \dots 5 \ k\Omega \\ 10 \dots 90 \ \% \ R_{\rm NGR \ nom} \\ \\ 110 \dots 200 \ \% \ R_{\rm NGR \ nom} \\ \\ \end{array}$ $0.1 \dots 200 \ \Omega$	Rated operational voltage AC Utilisation category Rated operational current AC Rated operational current AC (for UL applications) Rated operational voltage DC Utilisation category DC-12 Rated operational current DC Minimum current 1 mA at AC/DC > 10 V
$\label{eq:measurement uncertainty for I = 0+40 °C} Measurement uncertainty for I = -40+70 °C \\ HRG \\ Setting range R_{NGR nom} \\ Response value < R_{NGR nom} \\ Response value > R_{NGR nom} \\ ERG \\ Setting range R_{NGR nom} \\ Response value > R_{N$	$\begin{array}{c} 0 \dots 10 \ k\Omega \\ \pm 30 \ \Omega \\ \pm 80 \ \Omega \\ \\ \end{array}$ $\begin{array}{c} 15 \ \Omega \dots 5 \ k\Omega \\ 10 \dots 90 \ \% \ R_{\rm NGR \ nom} \\ \\ 110 \dots 200 \ \% \ R_{\rm NGR \ nom} \\ \\ 0.1 \dots 200 \ \Omega \\ \\ \end{array}$	Rated operational voltage AC 250 V/250 V Utilisation category AC-13/AC-14 Rated operational current AC 5 A/3 A Rated operational current AC (for UL applications) 3 A/3 A Rated operational voltage DC 220/110/24 V Utilisation category DC-12 Rated operational current DC 0.1/0.2/1 A Minimum current 1 mA at AC/DC > 10 V
Measurement uncertainty for T = 0+40 °C Measurement uncertainty for T = -40+70 °C HRG Setting range RNGR nom Response value < RNGR nom Response value > RNGR nom LRG Setting range RNGR nom Response value > RNGR nom	$\begin{array}{c} 0 \dots 10 \text{ k}\Omega \\ \pm 30 \ \Omega \\ \pm 80 \ \Omega \\ \\ \end{array}$ $\begin{array}{c} \pm 80 \ \Omega \\ \\ 15 \ \Omega \dots 5 \text{ k}\Omega \\ \\ 10 \dots 90 \ \% \ R_{\text{NGR nom}} \\ \\ 110 \dots 200 \ \% \ R_{\text{NGR nom}} \\ \\ 0.1 \dots 200 \ \Omega \\ \\ 200 \dots 500 \ \Omega \\ \\ 7 \text{ s} \ (\pm 2.5 \text{ s}) \end{array}$	Rated operational voltage AC Utilisation category Rated operational current AC Rated operational current AC (for UL applications) Rated operational voltage DC Utilisation category DC-12 Rated operational voltage DC Utilisation category DC-12 Rated operational current DC Alminimum current I mA at AC/DC > 10 V Environment/EMC EMC immunity (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-2
$\label{eq:measurement uncertainty for I = 0+40 °C} Measurement uncertainty for I = -40+70 °C \\ HRG \\ Setting range R_{NGR nom} \\ Response value < R_{NGR nom} \\ Response value > R_{NGR nom} \\ ERG \\ Setting range R_{NGR nom} \\ Response value > R_{N$	$\begin{array}{c} 0 \dots 10 \ k\Omega \\ \pm 30 \ \Omega \\ \pm 80 \ \Omega \\ \\ \end{array}$ $\begin{array}{c} 15 \ \Omega \dots 5 \ k\Omega \\ 10 \dots 90 \ \% \ R_{\rm NGR \ nom} \\ \\ 110 \dots 200 \ \% \ R_{\rm NGR \ nom} \\ \\ 0.1 \dots 200 \ \Omega \\ \\ \end{array}$	Rated operational voltage AC 250 V/250 V Utilisation category AC-13/AC-14 Rated operational current AC 5 A/3 A Rated operational current AC (for UL applications) 3 A/3 A Rated operational voltage DC 220/110/24 V Utilisation category DC-12 Rated operational current DC 0.1/0.2/1 A Minimum current 1 mA at AC/DC > 10 V Environment/EMC EMC immunity (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-2 EMC emission (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-4
Measurement uncertainty for T = 0+40 °C Measurement uncertainty for T = -40+70 °C HRG Setting range RNGR nom Response value < RNGR nom Response value > RNGR nom LRG Setting range RNGR nom Response value > RNGR nom	$\begin{array}{c} 0 \dots 10 \text{ k}\Omega \\ \pm 30 \ \Omega \\ \pm 80 \ \Omega \\ \\ \end{array}$ $\begin{array}{c} \pm 80 \ \Omega \\ \\ 15 \ \Omega \dots 5 \text{ k}\Omega \\ \\ 10 \dots 90 \ \% \ R_{\text{NGR nom}} \\ \\ 110 \dots 200 \ \% \ R_{\text{NGR nom}} \\ \\ 0.1 \dots 200 \ \Omega \\ \\ 200 \dots 500 \ \Omega \\ \\ 7 \text{ s} \ (\pm 2.5 \text{ s}) \end{array}$	Rated operational voltage AC 250 V/250 V Utilisation category AC-13/AC-14 Rated operational current AC 5 A/3 A Rated operational current AC (for UL applications) 3 A/3 A Rated operational voltage DC 220/110/24 V Utilisation category DC-12 Rated operational current DC 0.1/0.2/1 A Minimum current 1 mA at AC/DC > 10 V Environment/EMC EMC immunity (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-2 EMC emission (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-4 Operating temperature -40+60°C
Measurement uncertainty for T = 0+40 °C Measurement uncertainty for T = -40+70 °C HRG Setting range R _{NGR nom} Response value < R _{NGR nom} Response value > R _{NGR nom} Response value > R _{NGR nom} Response delay NGR-fault relay Response delay trip relay	$\begin{array}{c} 0 \dots 10 \text{ k}\Omega \\ \pm 30 \ \Omega \\ \pm 80 \ \Omega \\ \\ \end{array}$ $\begin{array}{c} \pm 80 \ \Omega \\ \\ 15 \ \Omega \dots 5 \text{ k}\Omega \\ \\ 10 \dots 90 \ \% \ R_{\text{NGR nom}} \\ \\ 110 \dots 200 \ \% \ R_{\text{NGR nom}} \\ \\ 0.1 \dots 200 \ \Omega \\ \\ 200 \dots 500 \ \Omega \\ \\ 7 \text{ s} \ (\pm 2.5 \text{ s}) \end{array}$	Rated operational voltage AC 250 V/250 V Utilisation category AC-13/AC-14 Rated operational current AC 5 A/3 A Rated operational current AC (for UL applications) 3 A/3 A Rated operational voltage DC 220/110/24 V Utilisation category DC-12 Rated operational current DC 0.1/0.2/1 A Minimum current 1 mA at AC/DC > 10 V Environment/EMC EMC immunity (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-2 EMC emission (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-4 Operating temperature -40+60 °C -40+60 °C (for UL applications)
Measurement uncertainty for T = 0+40 °C Measurement uncertainty for T = -40+70 °C HRG Setting range R _{NGR nom} Response value < R _{NGR nom} Response value > R _{NGR nom} Response value > R _{NGR nom} Response delay NGR-fault relay Response delay trip relay Monitoring / _{NGR}	$\begin{array}{c} 0 \dots 10 \text{ k}\Omega \\ \pm 30 \ \Omega \\ \pm 80 \ \Omega \\ \\ \end{array}$ $\begin{array}{c} \pm 80 \ \Omega \\ \\ 15 \ \Omega \dots 5 \text{ k}\Omega \\ \\ 10 \dots 90 \ \% \ R_{\text{NGR nom}} \\ \\ 110 \dots 200 \ \% \ R_{\text{NGR nom}} \\ \\ 0.1 \dots 200 \ \Omega \\ \\ 200 \dots 500 \ \Omega \\ \\ 7 \text{ s} \ (\pm 2.5 \text{ s}) \end{array}$	Rated operational voltage AC 250 V/250 V Utilisation category AC-13/AC-14 Rated operational current AC 5 A/3 A Rated operational current AC (for UL applications) 3 A/3 A Rated operational voltage DC 220/110/24 V Utilisation category DC-12 Rated operational current DC 0.1/0.2/1 A Minimum current 1 mA at AC/DC > 10 V Environment/EMC EMC immunity (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-2 EMC emission (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-4 Operating temperature -40+60 °C -40+60 °C (for UL applications)
Measurement uncertainty for T = 0+40 °C Measurement uncertainty for T = -40+70 °C HRG Setting range RNGR nom Response value < RNGR nom Response value > RNGR nom Response value > RNGR nom Response value > RNGR nom Response delay NGR-fault relay Response delay trip relay Monitoring /NGR Measuring circuit 5 A	010 kΩ ±30 Ω ±80 Ω 15 Ω5 kΩ 1090 % RNGR nom 110200 Ω 200500 Ω 7 s (±2.5 s) 048 h	Rated operational voltage AC 250 V/250 V Utilisation category AC-13/AC-14 Rated operational current AC 5 A/3 A Rated operational current AC (for UL applications) 3 A/3 A Rated operational voltage DC 220/110/24 V Utilisation category DC-12 Rated operational current DC 0.1/0.2/1 A Minimum current 1 mA at AC/DC > 10 V Environment/EMC EMC immunity (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-2 EMC emission (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-4 Operating temperature -40+60 °C -40+60 °C (for UL applications)
Measurement uncertainty for T = 0+40 °C Measurement uncertainty for T = -40+70 °C HRG Setting range R _{NGR nom} Response value < R _{NGR nom} Response value > R _{NGR nom} Response value > R _{NGR nom} Response delay NGR-fault relay Response delay trip relay Monitoring I _{NGR} Measuring circuit 5 A Nominal measuring current I _n Maximum continuous current	$\begin{array}{c} 0 \dots 10 \text{ k}\Omega \\ \pm 30 \ \Omega \\ \pm 80 \ \Omega \\ \\ \end{array}$ $\begin{array}{c} \pm 80 \ \Omega \\ \\ 15 \ \Omega \dots 5 \text{ k}\Omega \\ \\ 10 \dots 90 \ \% \ R_{\text{NGR nom}} \\ \\ 110 \dots 200 \ \% \ R_{\text{NGR nom}} \\ \\ 0.1 \dots 200 \ \Omega \\ \\ 200 \dots 500 \ \Omega \\ \\ 7 \text{ s } (\pm 2.5 \text{ s}) \\ \\ 0 \dots 48 \ \text{h} \\ \end{array}$	Rated operational voltage AC Utilisation category Rated operational current AC Rated operational current AC (for UL applications) Rated operational current AC (for UL applications) Rated operational voltage DC Utilisation category DC-12 Rated operational current DC Minimum current I mA at AC/DC > 10 V Environment/EMC EMC immunity (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-2 EMC emission (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-4 Operating temperature -40+60 °C -40+60 °C (for UL applications) Humidity $\leq 98\%$
Measurement uncertainty for T = 0+40 °C Measurement uncertainty for T = -40+70 °C HRG Setting range R _{NGR nom} Response value < R _{NGR nom} Response value > R _{NGR nom} Response delay NGR-fault relay Response delay trip relay Monitoring I _{NGR} Measuring circuit 5 A Nominal measuring current I _n Maximum continuous current Overload capacity	010 kΩ ±30 Ω ±80 Ω 15 Ω5 kΩ 1090 % RNGR nom 110200 Ω RNGR nom 0.1200 Ω 200500 Ω 7 s (±2.5 s) 048 h DC / 50/60 Hz / 503200 Hz 5 A 2 x I _n 10 x I _n for 0.03 s	Rated operational voltage AC Utilisation category AC-13/AC-14 Rated operational current AC Rated operational current AC (for UL applications) Rated operational voltage DC Utilisation category DC-12 Rated operational current DC Aninimum current I mA at AC/DC > 10 V Environment/EMC EMC immunity (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) EMC emission (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-2 EMC emission (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-2 EMC emission (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) Unit New 61000-6-4 Operating temperature -40+60 °C -40+60 °C (for UL applications) Humidity S 98 % Classification of climatic conditions acc. to IEC 60721 (except condensation and formation of ice)
Measurement uncertainty for T = 0+40 °C Measurement uncertainty for T = -40+70 °C HRG Setting range RNGR nom Response value < RNGR nom Response value > RNGR nom Response delay NGR-fault relay Response delay trip relay Monitoring /NGR Measuring circuit 5 A Nominal measuring current /n Maximum continuous current Overload capacity Measurement accuracy	010 kΩ ±30 Ω ±80 Ω 15 Ω5 kΩ 1090 % RNGR nom 110200 Ω RNGR nom 0.1200 Ω 200500 Ω 7 s (±2.5 s) 048 h DC / 50/60 Hz / 503200 Hz 5 A 2 x I _n 10 x I _n for 0.03 s ±2 % of I _n	Rated operational voltage AC Utilisation category AC-13/AC-14 Rated operational current AC Rated operational current AC (for UL applications) Rated operational voltage DC Utilisation category DC-12 Rated operational current DC Aninimum current Environment/EMC EMC immunity (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) EMC emission (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-2 EMC emission (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-2 EMC emission (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-4 Operating temperature -40+60 °C (for UL applications) Humidity S 98 % Classification of climatic conditions acc. to IEC 60721 (except condensation and formation of ice) Stationary use (IEC 60721-3-3) 3 K23
Measurement uncertainty for T = 0+40 °C Measurement uncertainty for T = -40+70 °C HRG Setting range RNGR nom Response value < RNGR nom Response value > RNGR nom Response value > RNGR nom Response value > RNGR nom Response delay NGR-fault relay Response delay trip relay Monitoring /NGR Measuring circuit 5 A Nominal measuring current /n Maximum continuous current Overload capacity Measurement accuracy Load	010 kΩ ±30 Ω ±80 Ω 15 Ω5 kΩ 1090 % RNGR nom 110200 Ω RNGR nom 0.1200 Ω 200500 Ω 7 s (±2.5 s) 048 h DC / 50/60 Hz / 503200 Hz 5 A 2 x I _n 10 x I _n for 0.03 s	Rated operational voltage AC Utilisation category Rated operational current AC Rated operational current AC (for UL applications) Rated operational current AC (for UL applications) Rated operational voltage DC 220/110/24 V Utilisation category Roc-12 Rated operational current DC Roc-12 Rated operational current DC Minimum current Environment/EMC EMC immunity (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) EMC emission (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-2 EMC emission (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-2 EMC emission (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-2 EMC emission (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-2 Constitution of Climatic conditions acc. to IEC 60721 (except condensation and formation of ice) Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) 2K11 (-40+85°C)
Measurement uncertainty for T = 0+40 °C Measurement uncertainty for T = -40+70 °C HRG Setting range RNGR nom Response value < RNGR nom Response value > RNGR nom Response value > RNGR nom Response value > RNGR nom Response delay NGR-fault relay Response delay trip relay Monitoring INGR Measuring circuit 5 A Nominal measuring current In Maximum continuous current Overload capacity Measurement accuracy Load Measuring circuit 50 mA	010 kΩ ±30 Ω ±80 Ω 15 Ω5 kΩ 1090 % R _{NGR nom} 110200 Ω 200500 Ω 7 s (±2.5 s) 048 h DC / 50/60 Hz / 503200 Hz 5 A 2 x I _n 10 x I _n for 0.03 s ±2 % of I _n 10 mΩ	Rated operational voltage AC Utilisation category AC-13/AC-14 Rated operational current AC Rated operational current AC (for UL applications) Rated operational voltage DC Utilisation category DC-12 Rated operational voltage DC Utilisation category DC-12 Rated operational current DC Minimum current 1 mA at AC/DC > 10 V Environment/EMC EMC immunity (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) EMC emission (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-2 EMC emission (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-4 Operating temperature -40+60 °C -40+60 °C (for UL applications) Humidity S 98 % Classification of climatic conditions acc. to IEC 60721 (except condensation and formation of ice) Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) 1K22 (-40+70 °C)
Measurement uncertainty for T = 0+40 °C Measurement uncertainty for T = -40+70 °C HRG Setting range RNGR nom Response value < RNGR nom Response value > RNGR nom Response value > RNGR nom Response value > RNGR nom Response delay NGR-fault relay Response delay trip relay Monitoring INGR Measuring circuit 5 A Nominal measuring current In Maximum continuous current Overload capacity Measurement accuracy Load Measuring circuit 50 mA Nominal measuring current In	010 kΩ ±30 Ω ±80 Ω 15 Ω5 kΩ 1090 % RNGR nom 110200 Ω RNGR nom 0.1200 Ω 200500 Ω 7 s (±2.5 s) 048 h DC / 50/60 Hz / 503200 Hz 5 A 2 x / _n 10 x / _n for 0.03 s ±2 % of / _n 10 mΩ	Rated operational voltage AC 250 V/250 V Utilisation category AC-13/AC-14 Rated operational current AC 5 A/3 A Rated operational voltage DC 220/110/24 V Utilisation category DC-12 Rated operational current DC 0.1/0.2/1 A Minimum current 1 mA at AC/DC > 10 V Environment/EMC EMC immunity (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-2 EMC emission (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-4 Operating temperature -40+60 °C -40+60 °C -40+60 °C Immidity ≤ 98 % Classification of climatic conditions acc. to IEC 60721 (except condensation and formation of ice) 3 K23 Stationary use (IEC 60721-3-3) 3 K23 Transport (IEC 60721-3-2) 2K11 (-40+85 °C) Long-term storage (IEC 60721-3-1) 1 K22 (-40+70 °C) Classification of mechanical conditions 1 K22 (-40+70 °C)
Measurement uncertainty for T = 0+40 °C Measurement uncertainty for T = -40+70 °C HRG Setting range RNGR nom Response value < RNGR nom Response value > RNGR nom Response value > RNGR nom Response value > RNGR nom Response delay NGR-fault relay Response delay trip relay Monitoring INGR Measuring circuit 5 A Nominal measuring current In Maximum continuous current Overload capacity Measurement accuracy Load Measuring circuit 50 mA Nominal measuring current In Maximum continuous current	010 kΩ ±30 Ω ±80 Ω 15 Ω5 kΩ 1090 % RNGR nom 110200 Ω RNGR nom 0.1200 Ω 200500 Ω 7 s (±2.5 s) 048 h DC / 50/60 Hz / 503200 Hz 5 A 2 x / _n 10 x / _n for 0.03 s ±2 % of / _n 10 mΩ DC / 50/60 Hz / 503200 Hz 50 mA 2 x / _n	Rated operational voltage AC 250 V/250 V Utilisation category AC-13/AC-14 Rated operational current AC 5 A/3 A Rated operational current AC (for UL applications) 3 A/3 A Rated operational voltage DC 220/110/24 V Utilisation category DC-12 Rated operational current DC 0.1/0.2/1 A Minimum current 1 mA at AC/DC > 10 V Environment/EMC EMC immunity (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-2 EMC emission (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-2 Operating temperature -40+60 °C (for UL applications) Humidity ≤ 98 % Classification of climatic conditions acc. to IEC 60721 (cycept condensation and formation of ice) Stationary use (IEC 60721-3-3) 3K23 Transport (IEC 60721-3-2) 2K11 (-40+85 °C) Long-term storage (IEC 60721-3-1) 1K22 (-40+70 °C) Classification of mechanical conditions acc. to IEC 60721/IEC 60255-21/DIN EN 60068-2-6 A
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Measurement uncertainty for T = 0+40 °C Measurement uncertainty for T = -40+70 °C HRG Setting range RNGR nom Response value < RNGR nom Response value > RNGR nom Response value > RNGR nom Response delay NGR-fault relay Response delay trip relay Monitoring /NGR Measuring circuit 5 A Nominal measuring current In Maximum continuous current Overload capacity Measuring circuit 50 mA Nominal measuring current In Maximum continuous current Overload capacity Measurement accuracy Load Measuring circuit 50 mA Nominal measuring current In Maximum continuous current Overload capacity Measurement accuracy	010 kΩ ±30 Ω ±80 Ω 15 Ω5 kΩ 1090 % RNGR nom 110200 Ω RNGR nom 0.1200 Ω 200500 Ω 7 s (±2.5 s) 048 h DC / 50/60 Hz / 503200 Hz 5 A 2 x / _n 10 x / _n for 0.03 s ±2 % of / _n 10 mΩ DC / 50/60 Hz / 503200 Hz 50 mA 2 x / _n 10 x / _n for 2 s ±2 % of / _n	Rated operational voltage AC 250 V/250 V Utilisation category AC-13/AC-14 Rated operational current AC 5 A/3 A Rated operational current AC (for UL applications) 3 A/3 A Rated operational voltage DC 220/110/24 V Utilisation category DC-12 Rated operational current DC 0.1/0.2/1 A Minimum current 1 mA at AC/DC > 10 V Environment/EMC EMC immunity (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-2 EMC emission (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-2 Operating temperature -40+60 °C (for UL applications) Humidity ≤ 98 % Classification of climatic conditions acc. to IEC 60721 (cycept condensation and formation of ice) Stationary use (IEC 60721-3-2) 2K11 (-40+85 °C) Long-term storage (IEC 60721-3-1) 1K22 (-40+70 °C) Classification of mechanical conditions acc. to IEC 60721/IEC 60255-21/DIN EN 60068-2-6 3M7 Stationary use 3M7 Transport 2M4
Measurement uncertainty for T = 0+40 °C Measurement uncertainty for T = -40+70 °C HRG Setting range RNGR nom Response value > RNGR nom Response value > RNGR nom Response value > RNGR nom Response delay NGR-fault relay Response delay trip relay Monitoring /NGR Measuring circuit 5 A Nominal measuring current /n Maximum continuous current Overload capacity Measurement accuracy Load Measuring circuit 50 mA Nominal measuring current /n Maximum continuous current Overload capacity Measurement accuracy Load Measuring circuit 50 mA Nominal measuring current /n Maximum continuous current Overload capacity Measurement accuracy Load	010 kΩ ±30 Ω ±80 Ω 15 Ω5 kΩ 1090 % RNGR nom 110200 Ω RNGR nom 0.1200 Ω 200500 Ω 7 s (±2.5 s) 048 h DC / 50/60 Hz / 503200 Hz 5 A 2 x / _n 10 x / _n for 0.03 s ±2 % of I _n 10 mΩ DC / 50/60 Hz / 503200 Hz 50 mA 2 x / _n 10 x / _n for 2 s	Rated operational voltage AC 250 V/250 V Utilisation category AC-13/AC-14 Rated operational current AC 5 A/3 A Rated operational current AC (for UL applications) 3 A/3 A Rated operational voltage DC 220/110/24 V Utilisation category DC-12 Rated operational current DC 0.1/0.2/1 A Minimum current 1 mA at AC/DC > 10 V Environment/EMC EMC immunity (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-2 EMC emission (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-2 Operating temperature -40+60 °C -40+60 °C -40+60 °C Immidity ≤ 98 % Classification of climatic conditions acc. to IEC 60721 (C (for UL applications) Extra (EC 60721-3-2) 2K11 (-40+85 °C) Long-term storage (IEC 60721-3-1) 1K22 (-40+70 °C) Classification of mechanical conditions acc. to IEC 60721/IEC 60255-21/DIN EN 60068-2-6 3M7 Stationary use 3M7 Transport 2M4
Measurement uncertainty for T = 0+40 °C Measurement uncertainty for T = -40+70 °C HRG Setting range RNGR nom Response value < RNGR nom Response value > RNGR nom Response delay NGR-fault relay Response delay trip relay Monitoring /NGR Measuring circuit 5 A Nominal measuring current /n Maximum continuous current Overload capacity Measurement accuracy Load Measuring circuit 50 mA Nominal measuring current /n Maximum continuous current Overload capacity Measurement accuracy Load Measurement accuracy Load Measurement accuracy Load Measuring circuits 5 A and 50 mA	010 kΩ ±30 Ω ±80 Ω 15 Ω5 kΩ 1090 % RNGR nom 110200 Ω RNGR nom 0.1200 Ω 200500 Ω 7 s (±2.5 s) 048 h DC / 50/60 Hz / 503200 Hz 5 A 2 x I _n 10 x I _n for 0.03 s ±2 % of I _n 10 mΩ DC / 50/60 Hz / 503200 Hz 50 mA 2 x I _n 10 x I _n for 2 s ±2 % of I _n 68 Ω	Rated operational voltage AC 250 V/250 V Utilisation category AC-13/AC-14 Rated operational current AC 5 A/3 A Rated operational current AC (for UL applications) 3 A/3 A Rated operational voltage DC 220/110/24 V Utilisation category DC-12 Rated operational current DC 0.1/0.2/1 A Minimum current 1 mA at AC/DC > 10 V Environment/EMC EMC immunity (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-2 EMC emission (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-2 Operating temperature -40+60 °C (for UL applications) Humidity ≤ 98 % Classification of climatic conditions acc. to IEC 60721 (cycept condensation and formation of ice) Stationary use (IEC 60721-3-2) 2K11 (-40+85 °C) Long-term storage (IEC 60721-3-1) 1K22 (-40+70 °C) Classification of mechanical conditions acc. to IEC 60721/IEC 60255-21/DIN EN 60068-2-6 3M7 Stationary use 3M7 Transport 2M4
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Measurement uncertainty for T = 0+40 °C Measurement uncertainty for T = -40+70 °C HRG Setting range RNGR nom Response value < RNGR nom Response value > RNGR nom Response value > RNGR nom Response value > RNGR nom Response delay NGR-fault relay Response delay trip relay Monitoring INGR Measuring circuit 5 A Nominal measuring current In Maximum continuous current Overload capacity Measurement accuracy Load Measuring circuit 50 mA Nominal measuring current In Maximum continuous current Overload capacity Measurement accuracy Load Measuring circuits 5 A and 50 mA Response value INGR Response delay ground-fault relay	$\begin{array}{c} 0 \dots 10 \text{ k}\Omega \\ \pm 30 \ \Omega \\ \pm 80 \ \Omega \\ \\ \end{array}$ $\begin{array}{c} \pm 30 \ \Omega \\ \pm 80 \ \Omega \\ \\ \end{array}$ $\begin{array}{c} 15 \ \Omega \dots 5 \ \text{k}\Omega \\ 10 \dots 90 \ \% \ R_{\text{NGR nom}} \\ 110 \dots 200 \ \% \ R_{\text{NGR nom}} \\ \\ 0.1 \dots 200 \ \Omega \\ 200 \dots 500 \ \Omega \\ \\ \end{array}$ $\begin{array}{c} 0.1 \dots 200 \ \Omega \\ 200 \dots 500 \ \Omega \\ \\ 7 \ \text{s} \ (\pm 2.5 \ \text{s}) \\ \\ 0 \dots 48 \ \text{h} \\ \end{array}$ $\begin{array}{c} 0 \text{C} \ / \ 50/60 \ \text{Hz} \ / \ 50 \dots 3200 \ \text{Hz} \ 5 \ \text{A} \\ \\ 2 \ x \ I_{n} \\ \\ 10 \ x \ I_{n} \ \text{for} \ 0.03 \ \text{s} \\ \\ \pm 2 \ \% \ \text{of} \ I_{n} \\ \\ 10 \ x \ I_{n} \ \text{for} \ 2 \ \text{s} \\ \\ \pm 2 \ \% \ \text{of} \ I_{n} \\ \\ 68 \ \Omega \\ \end{array}$ $\begin{array}{c} 10 \dots 90 \ \% \ /_{\text{NGR nom}} \\ \\ \leq 40 \ \text{ms} \ (\pm 10 \ \text{ms}) \end{array}$	Rated operational voltage AC 250 V/250 V Utilisation category AC-13/AC-14 Rated operational current AC 5 A/3 A Rated operational current AC (for UL applications) 3 A/3 A Rated operational voltage DC 220/110/24 V Utilisation category DC-12 Rated operational current DC 0.1/0.2/1 A Minimum current 1 mA at AC/DC > 10 V Environment/EMC EMC immunity (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-2 EMC emission (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-2 Operating temperature -40+60 °C (for UL applications) Humidity ≤ 98 % Classification of climatic conditions acc. to IEC 60721 (cycept condensation and formation of ice) Stationary use (IEC 60721-3-2) 2K11 (-40+85 °C) Long-term storage (IEC 60721-3-1) 1K22 (-40+70 °C) Classification of mechanical conditions acc. to IEC 60721/IEC 60255-21/DIN EN 60068-2-6 3M7 Stationary use 3M7 Transport 2M4
Measurement uncertainty for T = 0+40 °C Measurement uncertainty for T = -40+70 °C HRG Setting range RNGR nom Response value < RNGR nom Response value > RNGR nom Response delay NGR-fault relay Response delay trip relay Monitoring /NGR Measuring circuit 5 A Nominal measuring current /n Maximum continuous current Overload capacity Measurement accuracy Load Measuring circuit 50 mA Nominal measuring current /n Maximum continuous current Overload capacity Measurement accuracy Load Measuring circuits 5 A and 50 mA Response value /NGR	010 kΩ ±30 Ω ±80 Ω 15 Ω5 kΩ 1090 % RNGR nom 110200 Ω RNGR nom 0.1200 Ω 200500 Ω 7 s (±2.5 s) 048 h DC / 50/60 Hz / 503200 Hz 5 A 2 x I _n 10 x I _n for 0.03 s ±2 % of I _n 10 mΩ DC / 50/60 Hz / 503200 Hz 50 mA 2 x I _n 10 x I _n for 2 s ±2 % of I _n 68 Ω	Rated operational voltage AC 250 V/250 V Utilisation category AC-13/AC-14 Rated operational current AC 5 A/3 A Rated operational current AC (for UL applications) 3 A/3 A Rated operational voltage DC 220/110/24 V Utilisation category DC-12 Rated operational current DC 0.1/0.2/1 A Minimum current 1 mA at AC/DC > 10 V Environment/EMC EMC immunity (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-2 EMC emission (IEC 6100-6-2/IEC 60255-26 Ed. 3.0) DIN EN 61000-6-2 Operating temperature -40+60 °C (for UL applications) Humidity ≤ 98 % Classification of climatic conditions acc. to IEC 60721 (cycept condensation and formation of ice) Stationary use (IEC 60721-3-2) 2K11 (-40+85 °C) Long-term storage (IEC 60721-3-1) 1K22 (-40+70 °C) Classification of mechanical conditions acc. to IEC 60721/IEC 60255-21/DIN EN 60068-2-6 3M7 Stationary use 3M7 Transport 2M4

1...10,000 2 x /NGR nom

-20...0 ms 0...+150 ms (filter time)

0...+150 ms (filter time)



Tolerance t_{trip} when set to

RMS Fundamental Harmonics

Connection	
Screw-type terminals	
Tightening torque	0.50.6 Nm (57 lb-in)
Stripping length	7 mm
Recommended connecting cables	see overview in the manual
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 2416)
Push-wire terminals X1	
Stripping length	10 mm

PIO	0.252.5 mm ² (AWG 2413)
Doo	0.21 mm ² (AWG 2418)
We	0.21.5 mm ² (AWG 2416)
	0.251 mm ² (AWG 2418)
	0.51.5 mm ² (AWG 2416)
	10 mm
	0.21.5 mm ² (AWG 2416)

0.25...1.5 mm² (AWG 24...16)

0.25...0.75 mm² (AWG24...18)

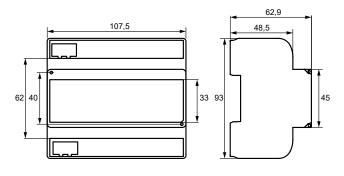
Other	
Operating mode	continuous operation
Mounting	display-oriented
Altitude	≤ 2000 m AMSL
Degree of protection, internal components (DIN EN 60529)	IP30
Flammability class	UL 94V-0
Protective coating measurement equipment	SL1307, UL file E80315
Documentation number	D00373
Weight	< 500 g

Dimension diagram (dimensions in mm)

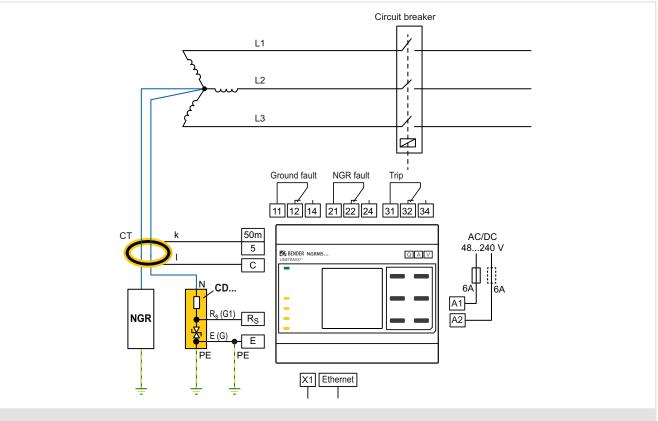
flexible with ferrule without plastic sleeve

flexible with ferrule with plastic sleeve

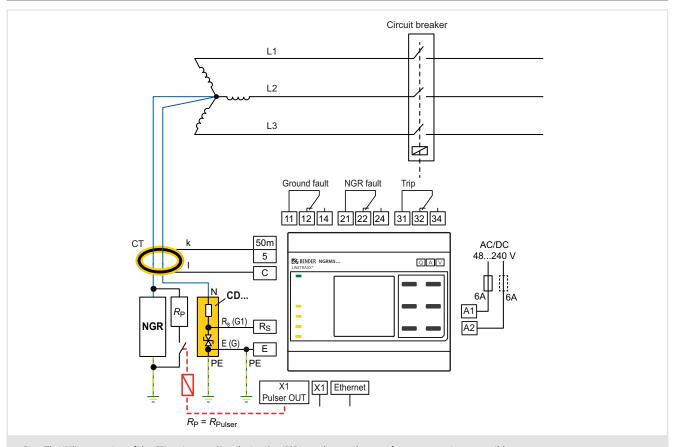
rigid/flexible



Connection star connection



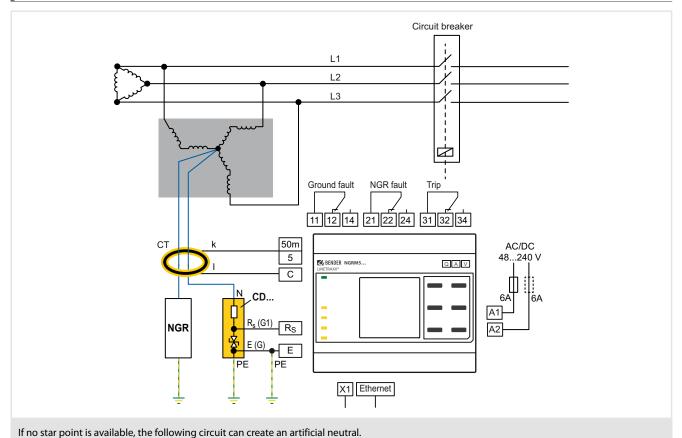
The "N" connection of the CD-series coupling device should be as close to the transformer star point as possible.



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
/NGR	125 A	525 A	51000 A
f	03800 Hz	423800 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	
Community will	max. 30 m	max. 40 m	max. 25 m (4 mm ² /AWG 12)
Connecting cable	provided cable or 0.75.	1.5 mm²/AWG1816	max. 40 m (6 mm²/AWG 10)
I∆n	\(\)	\gtrsim	\approx
Туре	CTUB103 CTUB103 S1(k) S2(l)	W20120 W5	CTB4151
CT: Terminal k	NGRM5: 50 mA	NGRM5: 50 mA	NGRM5: 5 A
CT: Terminal I	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 serve
- 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

Further information

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

Ordering information

Supply voltage <i>U</i> s/	Supply voltage <i>U_S /</i> Frequency range Hz		Туре	Art. No.
AC	DC	System type	, and the second	
24 2401/40 7011-	24 2401/	HRG	NGRM700	B94013700
24240 V, 4070 Hz	24240 V	LRG	NGRM750	B94013750

Accessories

Description	Art. No.
Accessory for FP200-NGRM: Transparent front cover 144x72 (for IP65) ¹⁾	B98060005

When using the "transparent front cover 144x72 (IP 65)" the cutout in the switchboard cabinet must be extended in height from 66 mm to 68 mm (+0.7/-0 mm).

The degree of protection IP65 applies only to the user interface FP200-NGRM when using the front cover. The degree of protection for the complete device is still IP30.

Suitable system components

Description			Page
Coupling device	CD	B980390	245
Measuring current transformer	CTUB	B781200	363
Voltage supply for measuring current transformers	STEP-PS	B940531	391



Insulation coordination according to IEC 60664-1/IEC	60664-3/DIN EN 50187	Monitoring I _{NGR}	
Definitions	// a 1 a 1 a 1	Measuring circuit 5 A	Delfoldo II Ing
Measuring circuit 1 (IC1)	(L1, L2, L3)	Nominal measuring current In	DC/50/60 Hz/503200 Hz 5
Supply circuit (IC2)	(A1, A2)	Maximum continuous current	2 x
Measuring circuit/Control circuit (IC3) Output circuit 1 (IC4)	(RS, E, CT), (X1, Ethernet) (11, 12, 14)	Overload capacity Measurement accuracy	10 x I _n for 2 ±2 % of
Output circuit 1 (1C4) Output circuit 2 (1C5)	(21, 22, 24)	Load	±2 % 01 / 10 mΩ
Output circuit 2 (ICS) Output circuit 3 (IC6)	(31, 32, 34)	Measuring circuit 50 mA	200 01
Rated voltage	(31, 32, 34) 690 V	Nominal measuring current I _n	DC/50/60 Hz/503200 Hz 50 m
Overvoltage category		Maximum continuous current	2 x I
Rated impulse voltage		Overload capacity	10 x I _n for 2
IC1/(IC26)	8 kV	Measurement accuracy	±2 % of /
IC2/(IC36)	4 kV	Load	68.0
IC3/(IC46)	4 kV	Measuring circuits 5 A and 50 mA	00.2
IC4/(IC56)	4 kV	Response value I _{NGR}	1090 % / _{NGR nor}
IC5/(IC6)	4 kV	Response delay ground-fault relay	\leq 40 ms (±10 ms
Rated insulation voltage		Response delay trip relay (configurable)	100 ms48 h, ∘
IC1/(IC26)	800 V	Tolerance t _{trip} when set to	
IC2/(IC36)	250 V	RMS	-200 m
IC3/(IC46)	250 V	Fundamental	0+150 ms (filter time
IC4/(IC56)	250 V	Harmonics	0+150 ms (filter time
IC5/(IC6)	250 V	Measuring current transformer ratio primary	110,00
Pollution degree exterior	3	Measuring current transformer ratio secondar	y 110,000
Safe isolation (reinforced insulation) between		Measuring range	2 x /NGR non
IC1/(IC26)	overvoltage category III, 800 V	Counling	
IC2/(IC36)	overvoltage category III, 300 V	Coupling	CD1000 CD1000 2 CD5000 (22 L C
IC3/(IC46)	overvoltage category III, 300 V	R_S for $U_{SyS} \le 4.3 \text{ kV}$	CD1000, CD1000-2, CD5000 (20 kΩ
IC4/(IC56)	overvoltage category III, 300 V	Rs for U _{sys} > 4.3 kV	CD14400, CD25000 (100 kΩ
IC5/(IC6)	overvoltage category III, 300 V	Monitoring $U_{ m NGR}$	
Voltage tests (routine test) acc. to IEC 61010-1			$50/60 \text{ Hz}/503200 \text{ Hz}; (400/\sqrt{3}) \le (4300/\sqrt{3})$
IC2/(IC36)	AC 2.2 kV		C/50/60 Hz/503200 Hz; $> (4.3 / \sqrt{3}) (25 / \sqrt{3}) k$
IC3/(IC46)	AC 2.2 kV	Measuring range	1.2 x <i>U</i> _{NGR non}
IC4/(IC56)	AC 2.2 kV	Overload capacity	2 x <i>U</i> _{NGR} for 10
IC5/(IC6)	AC 2.2 kV	Measurement accuracy	2 % of $U_{NGR \text{ nom}}$ with $U_{NGR \text{ nom}} = (U_{sys} (L-L)/\sqrt{3})$
Supply voltage		Voltage response value	1090 % UNGR non
Nominal supply voltage $U_{\rm S}$		Response delay ground-fault relay	\leq 40 ms (±10 ms
≤ 2000 m	AC/DC, 24240 V	Response delay trip relay (configurable)	100 ms48 h, ∝
≤ 2000 m (for UL applications)	AC/DC, 48240 V	Tolerance t _{trip} when set to	
≤ 2000 m (for AS/NZS 2081 applications)	AC/DC, 48230 V	RMS	-200 m
> 2000 ≤ 5000 m	AC/DC, 24120 V	Fundamental	0+150 ms (filter time
> 2000≤ 5000 m (for UL applications, AS/NZS 208		Harmonics	0+150 ms (filter time
Tolerance U_{s}	±15 %	DC immunity in case of active R _{NGR} measurem	nent
Tolerance <i>U</i> _s (for UL applications)	-50+15 %	with $R_S = 20 \text{ k}\Omega$	DC ±12 \
Tolerance U _s (for AS/NZS 2081 applications)	-25+20 %	with $R_S = 100 \text{ k}\Omega$	DC ±60 \
Frequency range U _s	DC, 4070 Hz	Digital inputs	
Power consumption (typ. 50/60 Hz)	≤ 6.5 W/13 VA		
·		Galvanic separation	no.
Phase monitoring		Length connecting cables	max. 10 n DC 0 V, 24 V
Nominal measuring voltage $U_{\rm n}$	3 AC 100690 V, CAT III	U _{in} Overload capacity	-532
Measuring range	1.2 x <i>U</i> _n	Overload Capacity	-532
Measurement accuracy	±1 % of U _n	Digital outputs	
Power consumption per phase	≤ 0.5 W	Galvanic separation	no
Overload capacity	2 x U _n continuous	Length connecting cables	max. 10 n
Input resistance	1.76 ΜΩ	Currents (sink) for each output	max. 300 m/
PT ratio primary	110,000	Voltage	24 \
PT ratio secondary	110,000	Overload capacity	-532
Measuring range with PT	100 V25 kV	· · ·	
Monitoring R _{NGR}		Analogue output (M+)	
Measuring input Rs	< 33 V RMS	Operating mode	linea
Measuring input N_S Measuring range NGR (with $R_S = 20 \text{ k}\Omega$) active	010 kΩ	Functions	I _{NGR} , R _{NG}
Measurement uncertainty for $T = 0+40$ °C	±20 Ω		600Ω), 420 mA ($\leq 600 \Omega$), 0400μ A ($\leq 4 k\Omega$
Measurement uncertainty for $T = -40+70$ °C	±40 Ω	Voltage	$010 \text{ V} (\geq 1 \text{ k}\Omega), 210 \text{ V} (\geq 1 \text{ k}\Omega)$
Measuring range NGR (with $R_S = 100 \text{ k}\Omega$) active	010 kΩ	Tolerance related to the current/voltage end v	ralue ±20 %
Measurement uncertainty for $T = 0+40$ °C	±30 Ω	Ground-fault, NGR, trip relay	
Measurement uncertainty for $T = -40+70$ °C	±80 Ω		
HRG		Switching elements	changeover contact
Setting range R _{NGR nom}	15 Ω5 kΩ	Operating mode Electrical endurance, number of cycles	configurable fail-safe/non-fail-safe
Response value $< R_{NGR \ nom}$	1090 % RNGR nom		10,000 2000 VA /150 M
Response value $> R_{NGR nom}$	110200 % RNGR nom	Switching capacity	2000 VA/150 V
LRG		Contact data acc. to IEC 60947-5-1	
Setting range $R_{NGR \text{ nom}}$	0.1200 Ω	Rated operational voltage AC	250 V/250 V
Response value $> R_{\text{NGR nom}}$	200500 Ω	Utilisation category	AC-13/AC-1
Response delay, NGR-fault relay	7 s (±2.5 s)	Rated operational current AC	5 A/3 /
Response delay, trip relay	048 h	Rated operational current AC (for UL application	
	V IV II	Rated operational voltage DC	220/110/24 \
,			
		Utilisation category	DC-12
			DC-1: 0.1/0.2/1 / 1 mA at AC/DC > 10 V



Screw-type terminals

Multiple conductor, rigid

Multiple conductor flexible

flexible with ferrule with/without plastic sleeve

Multiple conductor flexible with ferrule without plastic sleeve

Multiple conductor, flexible with TWIN ferrule with plastic sleeve

Tightening torque

Conductor sizes Stripping length

rigid/flexible

Environment/EMC	DIN EN 61000-6-2
EMC immunity (IEC 6100-6-2/IEC 60255-26 Ed. 3.0)	
EMC emission (IEC 6100-6-2/IEC 60255-26 Ed. 3.0)	DIN EN 61000-6-4
Operating temperature	-40+70°C
	-40+60 °C (for UL applications)
Humidity	≤ 98 %
Classification of climatic conditions acc. to IEC 60721	
(except condensation and formation of ice)	
Stationary use (IEC 60721-3-3)	3K23
Transport (IEC 60721-3-2)	2K11 (-40+85 °C)
Long-term storage (IEC 60721-3-1)	1K22 (-40+70 °C)
Classification of mechanical conditions	
acc. to IEC 60721/IEC 60255-21/DIN EN 60068-2-6	
Stationary use	3M12
Transport	2M4
Long-term storage	1M12
Connection	

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

AWG 24...12

0.2...2.5 mm²

0.25...2.5 mm² 0.2...1 mm²

0.2...1.5 mm²

0.25...1 mm²

0.5...1.5 mm²

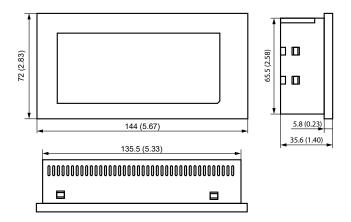
7 mm

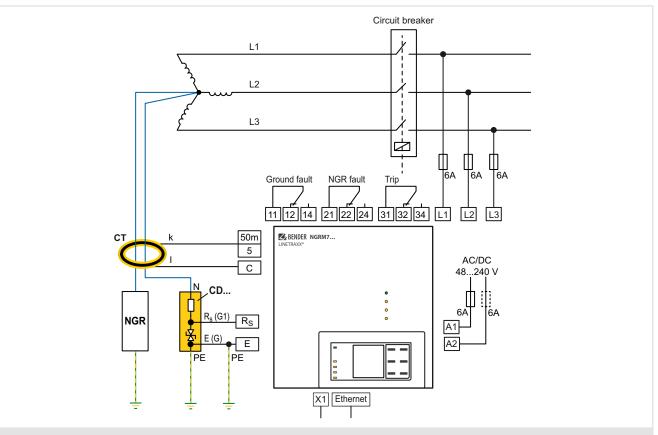
Push-wire terminals X1	
Conductor sizes	AWG 2416
Stripping length	10 mm
rigid/flexible	0.21.5 mm ²
flexible with ferrule without plastic sleeve	0.251.5 mm ²
flexible with ferrule with plastic sleeve	0.250.75 mm ²
Other	
Operating mode	continuous operation
Mounting	display-oriented
Altitude	≤ 5000 m AMSL
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 g

Dimension diagram NGRM7... (dimensions in mm (in))

3 (0.12) 205 (8.07) 211 (8.31) 230 (9.06) 245 (9.65)

Dimension diagram FP200-NGRM (dimensions in mm (in))



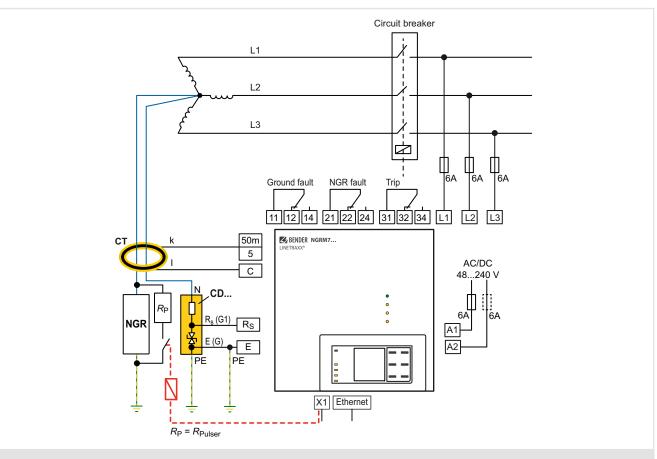


 $For these \ voltages, the \ phase \ monitor \ of \ the \ NGRM7... \ can be connected \ directly \ to \ the \ conductors \ to \ be \ monitored.$



The "N" connection of the CD-series coupling device should be as close to the transformer star point as possible.

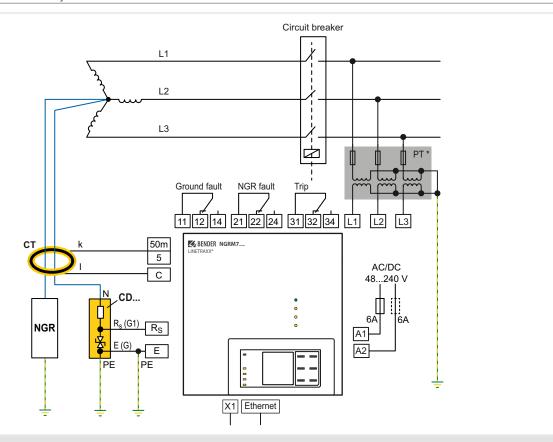
Connection Star connection: $U_{sys} \le 690 \text{ V}$ with pulser



The An I

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.



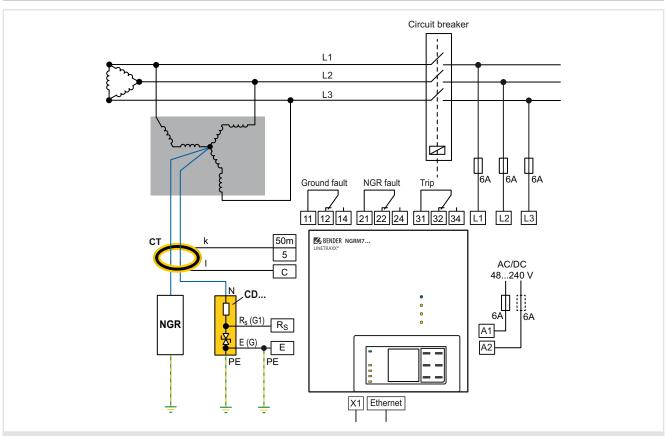
For these voltages, the phase monitor of the NGRM7... can only be connected to the conductors to be monitored via potential transformers (PT).

Note: * PT ratio "primary: secondary" can be adjusted in the NGRM7....



 $The \ {\it "N" connection of the CD-series coupling device should be as close to the transformer star point as possible.}$

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
/ _{NGR}	125 A	525 A	51000 A
f	03800 Hz	423800 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 mm ² /AWG 12)
Connecting Cable	provided cable or 0.75.	1.5 mm²/AWG1816	max. 40 m (6 mm²/AWG 10)
IΔn		\sim	\sim
Туре	CTUB103 CTUB103 S1(k) S2(l)	W20120 WS	CTB
CT: Terminal k	NGRM7: 50 mA	NGRM7: 50 mA	NGRM7: 5 A
CT: Terminal I	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

ø current transformers	Permissible measuring range	Set	Art. No.
35	5 A, 10 A	CTUB103-CTBC35	B78120030
60	5 A, 10 A, 25 A	CTUB103-CTBC60	B78120031
120	5 A, 10 A, 25 A	CTUB103-CTBC120	B78120032

Ordering details for spare parts and accessories

Electronic modules

Supply voltage <i>U</i> ₅	Туре	Art. No.	
DC	"		
24 V	CTUB103	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	391
Voltage supply	14	STEP-PS/1 AC/24 DC/1.75	B94053111	391
зарріу	34	STEP-PS/1 AC/24 DC/4.2	B94053112	391

Measuring current transformer cores

ø current transformers	Туре	Art. No.
35 mm	CTBC35	B98120003
60 mm	CTBC60	B98120005
120 mm	CTBC120	B98120007

Accessories

Description	Art. No.
DIN rail mounting clip for CTBC35	B91080112

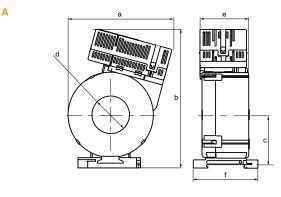
Included in the scope of delivery



Insulation coordination acc. to IEC	60664-1/IEC 60664-3
Definitions	
Measuring circuit (IC1)	primary conductors routed through thecurrent transformer
Secondary (IC2)	connections X plug
Rated voltage	800 V
Overvoltage category	III
Area of application	≤ 2000 m AMSL
Rated impulse voltage (IC1/IC2)	8 kV
Rated insulation voltage (reinforced in:	sulation; IC1/IC2) 800 V
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 _s	≤1%
Power consumption	≤ 5.3 W
Inrush current	1 A for 1 ms
Measuring circuit	
Internal diameter measuring current tr	ransformer see dimension diagrams on page 4
Measurement accuracy	±2 %
Rated continuous thermal current I_{cth}	42 A
Rated short-time thermal current I_{th}	2.4 kA/1 s
Rated dynamic current I _{dyn}	6 kA/40 ms
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 Ω

Environment/EMC	
EMC	IEC 61000-
Operating temperature	-2555°
Classification of climatic conditions acc. to IEC 60721 (except 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. to IEC 60721	
Stationary use (IEC 60721-3-3)	3M1
Transport (IEC 60721-3-2)	2M
Long-term storage (IEC 60721-3-1)	1M1
Connection	
Use 60 ℃/75 ℃ copper lines only.	
X plug	DI
Manufacturer T	Phoenix Contac
Type	DFMC 1.5/4-ST-3.5 B
The connection conditions of the manufacturer apply.	
Connection properties rigid	0.21.5 mm² (AWG 2416
flexible	0.21.5 mm ² (AWG 2416
with ferrule	0.21.3 IIIIII (AWG 2410
Mounting CTBC	0.250.75 11111
Screw type	
CTBC35, CTBC60	DIN EN ISO 7045 - M
CTBC120	DIN EN ISO 7045 - M
Washer type	DIN EN 130 70 13 III
CTBC35, CTBC60	DIN EN ISO 7089/7090 -
CTBC120	DIN EN ISO 7089/7090 -
Tightening torque	
CTBC35	0.6 Nr
CTBC60, CTBC120	1 Nr
Other	
Operating mode	continuous operatio
Mounting	any positio
Degree of protection, built-in components (DIN EN 60529)	IP4
Degree of protection, terminals (DIN EN 60529)	IP2
Flammability class	UL94 V-
Software	D59
Documentation number	D0041
Weight	
CTUB103- CTBC35	≤ 310
CTUB103- CTBC60	≤ 530
CTUB103- CTBC120	≤ 1460





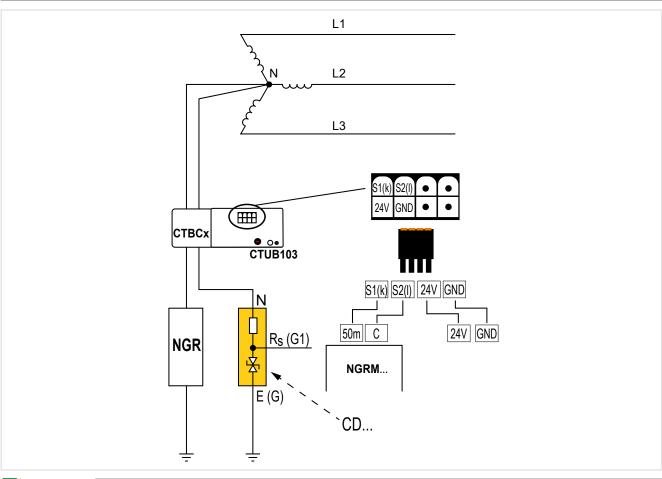
C d

	Dimensions in mm							
	Туре	a	b	c	d	e	f	g
A	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	-	-

В

D

Tolerance: ± 0.5 mm



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

Supply voltage <i>U</i> s	Response value, residual current	Type	Art. No.	
AC/DC				
60264 V, 5060 Hz	adjustable 0,11 A respectively 110 A	RC48N-935	B94013005	

Suitable system components

Description	Innendurchmesser		Art. No.	Page
Coupling device	-	CD	B980390	245
Remote alarm indicator and operator panel	-	RI2000NC	B94071001	-
Dacidual current transformer	70 mm	W2-S70	B911732	356
Residual current transformer	105 mm	W3-S105	B911733	356



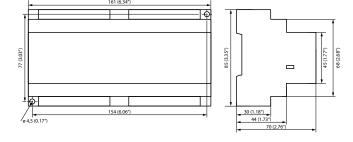
approx. 350 g

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
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	adjustable 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 Grour	nd) 1025 m (3075')
Connection to the remote alarm indicator and operator p	and RI2000NC
Connection to the remote alarm mulcator and operator p	anci mzooone.

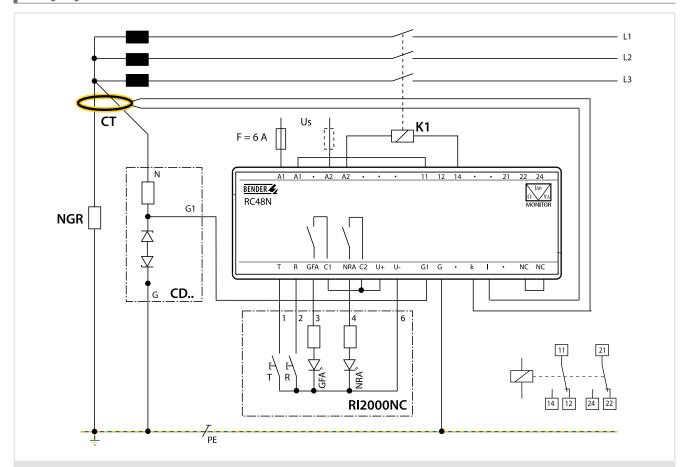
Outputs	
Switching elements (alarm relay)	2 changeover contacts
Rated contact voltage	AC 250 V/DC 300 V
Limited making capacity	AC/DC 5 A
Limited breaking capacity	AC/DC 2/0.2 A
Permissible number of operations	12 000 cycles
Operating mode, alarm relay, selectable	N/O operation/N/C operation
Switching 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 62020:2003-11
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	3K23
Connection	
Connection type	screw terminals
Wire cross section, single wire	0.24 mm² (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

Dimension diagram (dimensions in mm (inch))







Connections

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

Connection external TEST button R Connection external RESET button GFA Connection external "Alarm Ground Fault" LED

NRA Connection external "Alarm Resistor Fault" LED Output DC 12 V, for the supply of the remote alarm U+, Uindicator and operator panel RI2000NC.

C1, C2, U+ Bridge supplies the remote alarm indicator and operator panel RI2000NC with supply voltage from the RC48N.

CD1000

Coupling device



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

Further information

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

Approvals

Typical applications

 The coupling device is suitable for HRG applications up to AC 690 V and/or DC 400 V.



Ordering information

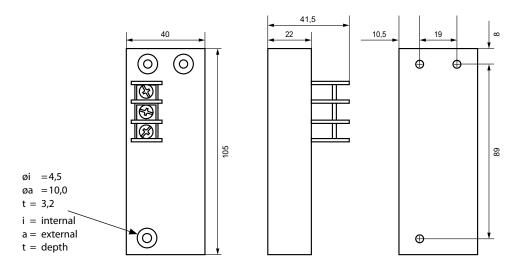
Nominal system voltage U _{LL} (U _{NGR})	Туре	Art. No.
Up to $U_{LL} = 690 \text{ V} (U_{NGR} = 400 \text{ V})$	CD1000	B98039010

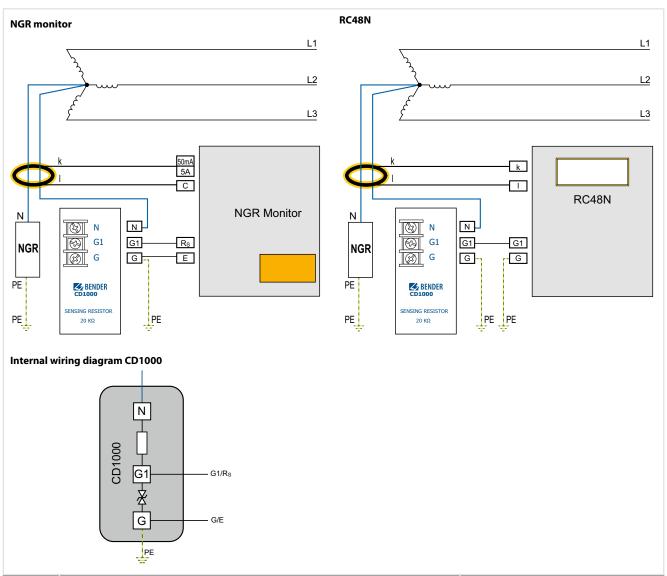
Technical data

recilifical data	
Insulation coordination DIN EN 50178:199	7
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 circu	
IC1/(IC2 – IC3)	400 V
IC2/IC3	50 V
Voltage range	
Un	DC / 50/60 Hz / 503200 Hz 400 V
I _n	30 mA
Overload capacity	1.15 x <i>U</i> _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 ℃
Humidity	≤ 98 %
Classification of climatic conditions acc. to	IEC 60721
(except condensation and formation of ice)	
Stationary use (IEC 60721-3-3)	3K23
Transport (IEC 60721-3-2)	2K11 (-40+85 °C)
Long-term storage (IEC 60721-3-1)	1K22 (-40+70 °C)
Classification of mechanical conditions ac	
Stationary use	3M12
Transport	2M4
Long-term storage	1M12

Connection	
Tightening torque	0.50.6 Nm (57 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	
Tightening torque mountings screws (M4x30)	2.5 Nm (22.1 lb-in)
Operating mode	continuous operation
Mounting	any position
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







Terminal	Use	Connect	ing cable
remma		Metrical	Imperial
N	Connection to the star point of the HRG system		
G1	Connection to Rs of the NGRM	1.5 mm ²	AWG16
G	Connection to E of the NGRM (internally connected to PE, see internal wiring diagram)		
PE	Connection to enclosure	$\geq 1.5 \text{ mm}^2$	AWG16 or greater

CD1000-2

Coupling device



Device features

- Coupling device for NGRM
- Range of use up to AC 1000 V/DC 600 V system voltage
- Application up to 5000 m

Further information

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

Approvals

CEUK EHE GULUS

Typical applications

 The coupling device is suitable for HRG applications up to AC 1000 V and/or DC 690 V.

Ordering information

Nominal system voltage <i>U</i> n	Туре	Art. No.
Up to $U_{LL} = 1000 \text{ V} (U_{NGR} = 600 \text{ V})$	CD1000-2	B98039053

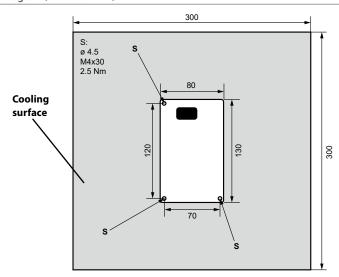
Technical data

Insulation coordination DIN EN 50178:1997	
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	
U_{n}	DC / 50/60 Hz / 503200 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°C
Ambient temperature for U _L	-40+60°C
Humidity	≤ 98 %
Classification of climatic conditions acc. to IEC	60721
(except condensation and formation of ice)	
Stationary use (IEC 60721-3-3)	3K23
Transport (IEC 60721-3-2)	2K11 (-40+85 °C)
Long-term storage (IEC 60721-3-1)	1K22 (-40+70 °C)
Classification of mechanical conditions acc. to	
Stationary use	3M12
Transport	2M4
Long-term storage	1M12

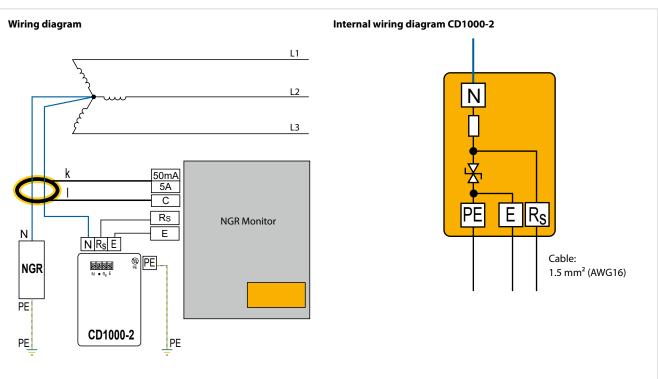
Tightening torque	0.50.6 Nm (57 lb-in)
Conductor sizes	AWG 2412
Stripping length	7 mm
Conductor, rigid	0.24 mm
Conductor, flexible	0.22.5 mm
Multiple conductor, flexible with ferrule	
without plastic sleeve	0.251.5 mm
with plastic sleeve	0.252.5 mm
Multiple conductor, flexible with TWIN ferrule	
with plastic sleeve	0.51.5 mm
Other	
Tightening torque mounting screws (M4x30)	2.5 Nm (22.1 lb-in)

Other	
Tightening torque mounting screws (M4x30)	2.5 Nm (22.1 lb-in)
Operating mode	continuous operation
Mounting	any position
Operating altitude	up to 5000 m AMSL
Degree of protection, internal components (DIN EN 60529)	IP30
Flammability class	UL 94V-0
Documentation number	D00345
Weight	< 700 g









Terminal	Use	Connecting cable	
remma	•	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 E of the NGRM (internally connected to PE, see internal wiring diagram)		
PE	Connection to the protective conductor (internally connected to E, see internal wiring diagram)	$\geq 1.5 \text{ mm}^2$	AWG16 or greater

CD5000

Coupling device



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

Further information

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

Approvals

CEUK EHE CULISTED

Typical applications

 The coupling device is suitable for HRG applications up to AC 4300 V and/or DC 2500 V.

Ordering information

Nominal system voltage U _{LL} (U _{NGR})	Туре	Art. No.
Up to $U_{LL} = 4300 \text{ V} (U_{NGR} = 2500 \text{ V})$	CD5000	B98039011

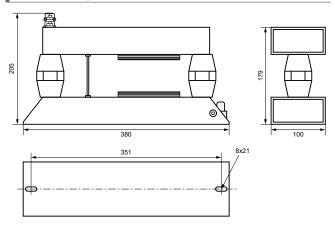
Technical data

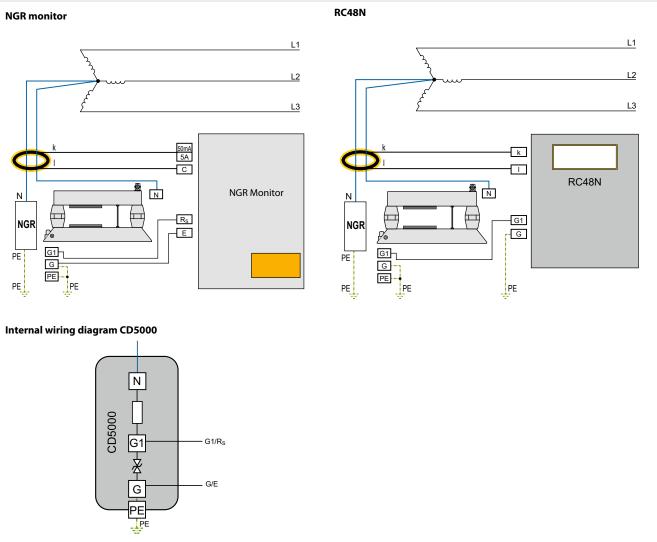
Insulation coordination DIN EN 50178:199	9/
Definition	
Measuring circuit (IC1)	N
Output circuit (IC2)	G1
Protective circuit (IC3)	G, PE
Rated voltage	3 kV
Overvoltage category	
Pollution degree	2
Rated insulation voltage	
no galvanic separation between the circu	
IC1/(IC2 – IC3)	3 kV
IC2/IC3	50 V
Voltage range	
<i>U</i> n	DC / 50/60 Hz / 503200 Hz 2500 V
I _n	125 mA
Overload capacity	1.15 x <i>U</i> _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	o IEC 60721
(except condensation and formation of ice)	
Stationary use (IEC 60721-3-3)	3K23
Transport (IEC 60721-3-2)	2K11 (-40+85 °C)
Long-term storage (IEC 60721-3-1)	1K22 (-40+70 °C)
Classification of mechanical conditions ac	c. to IEC 60721
Stationary use	3M12
Transport	2M4
Long-term storage	1M12

Connection	
Tightening torque G1 and G	0.50.6 Nm (57 lb-in)
Conductor sizes	AWG 2412
Connection G1 and G	cable lug
Conductor	$\geq 1.5 \text{ mm}^2$
Connection PE	cable lug M6
Conductor	$\geq 2.5 \text{ mm}^2$
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 AMSL
Degree of protection, internal components (DIN EN 60529)	IPO
Flammability class	UL 94V-0
Documentation number	D00398
Weight	< 3800 g







Terminal	Use	Connecting cable	
reminar		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?	ANIC16
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)	$\geq 1.5 \text{ mm}^2$	AWG16 or greater

CD14400

Coupling device



Device features

- Coupling device for NGRM
- Range of use up to 14400 V system voltage
- Application up to 5000 m
- IP54

Further information

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

Typical applications

• The coupling device is suitable for HRG applications up to a system voltage of 14400 V.

Approvals



Ordering information

Nominal system voltage U n	Туре	Art. No.
Up to $U_{LL} = 14400 \text{ V} (U_{NGR} = 8400 \text{ V})$	CD14400	B98039054

Documentation number

Technical data

Insulation coordination DIN EN 50178:1997	Connectio	n
Definitions	Connectio	n Rc and
Measuring circuit (IC1)	N Tightening	
Output circuit (IC2)	Rs Conductor	
Protective circuit (IC3)	E, PE Stripping le	
Rated voltage	8400 V Conductor,	
Overvoltage category	III Conductor,	
Pollution degree) —	
Rated insulation voltage	Multiple o	
no galvanic separation between the circuits!	without pla	
IC1/(IC2 – IC3)	8400 V with plastic	
IC2/IC3	50 V Multiple c	
Voltage range	with plastic	c sleeve
$U_{\rm n}$	DC / 50/60 Hz / 503200 Hz 8400 V	
σ ₁₁ I _n	1ightening	
Operating time	Tightening	torque ca
without ground fault (1900 V)	unlimited Other	
with ground fault (4200 V)		
with ground fault (4200 V) with ground fault (8400 V)	Co de	
Cool-down period	LOVEI	rscrews
Overload capacity	illoui illoui	nting scre
overload capacity	operating i	mode
Resistance	Mounting	. 4:4
100 kΩ	±0.5 % Operating a	
Temperature coefficient	20 ppm/K Degree of p	
	Flammabili Documenta	,
Environment	W. L.	ition num
Ambient temperature	-40+70 °C Weight	
Ambient temperature for U_L	-40+60 °C	
Humidity	≤ 98 %	
Classification of climatic conditions acc. to IEC	60721	
(except condensation and formation of ice)		
Stationary use (IEC 60721-3-3)	3K23	
Transport (IEC 60721-3-2)	2K11 (-40+85 °C)	
Long-term storage (IEC 60721-3-1)	1K22 (-40+70 °C)	
Classification of mechanical conditions acc. to	IEC 60721	
Stationary use	3M12	
Transport	2M4	
Long-term storage	1M12	

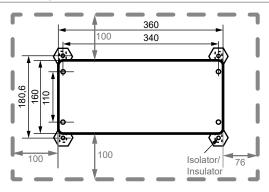
Connection	
Connection R _S and E	
Tightening torque	0.50.6 Nm (4.45.3 lb-in)
Conductor sizes	AWG 2412
Stripping length	7 mm
Conductor, rigid	0.24 mm ²
Conductor, flexible	0.22.5 mm ²
Multiple conductor, flexible with ferrule	
without plastic sleeve	0.251.5 mm ²
with plastic sleeve	0.252.5 mm ²
Multiple conductor, flexible with TWIN ferrule	
with plastic sleeve	0.51.5 mm ²
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 s
Mounting	any position
Operating altitude	up to 5000 m AMSL
Degree of protection, internal components (DIN EN 60529)	IP54

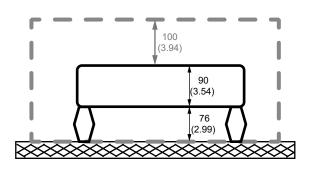


UL 94V-0

D00346

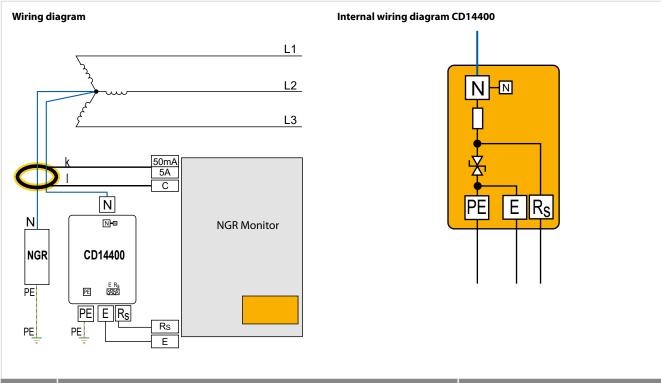
< 4.4 kg





Tightening torque cover screws: 2.5 Nm

Minimum distance to adjacent devices



Terminal	Use	Connecting cable	
		Metrical	Imperial
Rs	Connection to Rs of the NGRM	1.5 mm ²	AWG16
E	Connection to E of the NGRM; internally connected to PE	1.5 mm ⁻	AWGIO
N	Connection to the star point of the HRG system; via cable lug M5 or M10	> 1.5 mm ² AWG16 or greater	
PE	Connection to protective earth conductor; internally connected to E, cable lug M5	≥ 1.3 mm²	AWG16 or greater

CD25000

Coupling device



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

Further information

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

Approvals

Typical applications

• The coupling device is suitable for HRG applications up to AC 25 kV and/or DC 14.5 kV



Ordering information

Nominal system voltage U n	Туре	Art. No.
Up to $U_{LL} = 25 \text{ kV} (U_{NGR} = 14.5 \text{ kV})$	CD25000	B98039055

Technical data

Insulation coordination DIN EN 50178:19	97
Definition	
Measuring circuit (IC1)	N
Output circuit (IC2)	Rs
Protective circuit (IC3)	E, PE
Rated voltage	14500 V
Overvoltage category	III
Pollution degree	2
Rated insulation voltage	
no galvanic separation between the circ	uits!
IC1/(IC2 – IC3)	14500 V
IC2/IC3	50 V
Voltage range	
<i>U</i> _n	DC / 50/60 Hz / 503200 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. 1	
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)
	$+85$ °C) (except condensation and formation of ice)
Long-term storage (IEC 60721-3-1) 1K4 (-40	$0+70^{\circ}\text{C}$) (except condensation and formation of ice)
Classification of mechanical conditions a IEC 60721 / IEC 60255-21 / DIN EN 60068-	
Stationary use	3M7
Transport	2M2

_							
(or	ın	ρ	r	tı	n	n

Connection	
Connection R _S and E	
Tightening torque	0.50.6 Nm (4.45.3 lb-ir
Conductor sizes	AWG 241
Stripping length	7 mi
Conductor, rigid	0.24 mn
Conductor, flexible	0.22.5 mn
Multiple conductor, flexible with ferrule with	out plastic sleeve 0.251.5 mn
Multiple conductor, flexible with ferrule with	plastic sleeve 0.252.5 mn
Multiple conductor, flexible with TWIN ferrule	with plastic sleeve 0.51.5 mn
Connection PE for cable lug	
Tightening torque cable lug M5	2.2 Nm (19.5 lb-ir
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

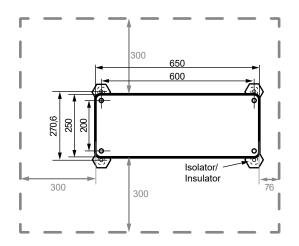
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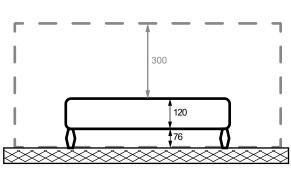
1M3

Operating mode	in case of a ground fault maximum 10 s
Mounting	any position
Operating altitude (when mounted on insulators)	up to 5000 m AMSL
Degree of protection, internal components (DIN EN 60529)	IP54
Flammability class	UL 94V-0
Documentation number	D00347
Weight	< 11 kg
Tightening torque cover screws	2.5 Nm (22.1 lb-in)

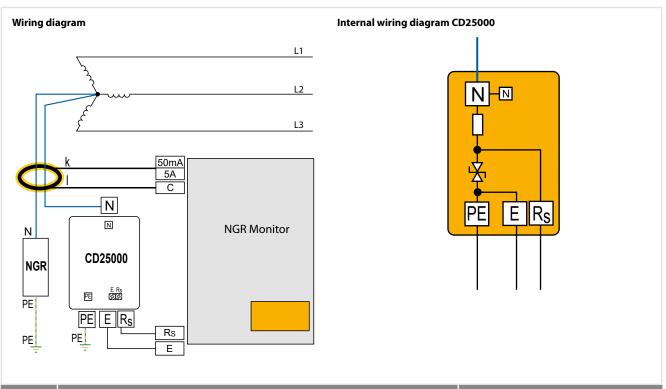


Long-term storage





Wiring diagram



Terminal	Use	Connecting cable		
Terminal		Metrical	Imperial	
Rs	Connection to R _S of the NGRM	1.5 mm ²	AWG16	
E	Connection to E of the NGRM (internally connected to PE, see internal wiring diagram)	1.3	AWUTO	
N	N Connection to the star point of the HRG system (cable lug M5 or M10)		NWC16 or greater	
PE	Connection to the protective conductor (internally connected to E, cable lug M5)	≥ 1.5 mm ²	AWG16 or greater	

Insulation monitoring devices







Equipment for insulation fault location







Residual current monitoring systems







Neutral Grounding Resistor Monitor (NGR)







Charge Controller







Power Quality and Energy Measurement

Measuring and monitoring relays LINETRAXX®







System components

Coupling devices
Measuring current transformers
Transformers
Relay modules

Power supply units Measuring instruments Interface converters Interface repeaters

COMTRAXX® Gateways
COMTRAXX® Alarm indicator and test combination
COMTRAXX® condition monitors
Visualization



339



Switching equipment

ATICS® transfer switching and monitoring devices

Test systems

UNIMET® Safety analyser



429 440



Anney

Technical terms Alphabetical list of devices Service









Device overview charge controller



	Catalogue page	258	261	265
Modem		4G modem (optional)	4G modem (optional)	-
Integrated patented 6 mA DC fault current detection				
In: Co	tegrated Powerline mmunication (PLC)			
E	mergency Opener	-		
Ba with 0	asis for compliance German calibration law		-	-
	eHZ		-	-
face	S0		-	-
Interface	Ethernet	-		
	Modbus			
	Product details (Products on www.bender.de/en)			

Device overview accessories charge controller



C	atalogue page	268	272	273	274	275
Spe	cial applications	Measuring current transformer	Display module	RFID module	RFID module	RFID module
	CC612					
æ	CC613					
For series	СС613-Нхх		-	+	-	-
윤	RCMB104		-	÷	-	-
	RCD104		-	+	-	-
	Product details (Products on ww.bender.de/en)					

Charge controller CC612



Typical applications

• Electric vehicle (EV) charging stations, wall boxes or street light charging points

Approvals



Device features

- Charge controller acc. to IEC 61851-1 (mode 3)
- It can be configured as either a Master or Slave
- The charge controller can be integrated into a single or three-phase system up to 80 A
- Smart Grid enabled using standard OCPP functionality
- OCPP 1.5 and OCPP 1.6 compliant with JSON, SOAP and Binary implementation
- · Supported mobile networks: 4G (LTE), 3G (UMTS) and 2G (GSM) with an integrated 4G modem
- · Two USB interfaces:
 - CONFIG for local configuration
 - Extension port for peripheral USB devices (Ethernet/WiFi home applications)
- Master/slave hardware configuartion
- · Control Pilot and Proximity Pilot signal management
- Universal charge plug control (support for different vendors of sockets)
- · Configurable support for one additional household socket
- Can connect to eHZ or Modbus meters and to meters with an S0 interface
- User interface board for customer-specific applications
- Configurable 3-channel input/output extension interface for additional functionality
- Only an external RCD type A is required.
- · Continuous monitoring of AC and DC fault currents using the patented DC fault current monitoring module
- Internal temperature sensors
- Dynamic load management to optimally distribute the available power among all charging points and signal the maximum power to the vehicle
- ISO/IEC 15118 power line communication (PLC) for plug & charge and load management systems

Standards

The charge controller has been developed in compliance with the following standards:

- EN 50581: 2012
- EN 61851-1: 2011
- EN 301 489-1: V2.2.0 Draft
- EN 301 511 V12.5.1
- EN 301 908-13 V11.1.2
- EN 62311: 2008
- EN 61851-22: 2002
- EN 301 489-52 V1.1.0 Draft
- EN 301 908-1 V11.1.1

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

User interface	RDC-MD ²⁾	Modem	PLC ¹⁾	LEDs	Meter	Туре	Art. No.
				Doady Alarm DIC	eHZ- and SO interface		
	4G Modbu S0 inte - Ready, Alarm Modbu S0 inte EReady, Alarm, PLC Modbu Modbu S0 inte ENZ- S0 inte Modbu	4G		Ready, Alarm, PLC	Modbus and SO interface	CC612-2M4PR	B94060013
		_	-	Ready, Alarm	Modbus and SO interface	CC612-2M4R	B94060015
			_	Dandy Alays DIC	eHZ- and SO interface	CC612-1S0PR	B94060005
		Modbus and SO interface	CC612-2S0PR	B94060007			
			Ŧ	Ready, Alarm	Modbus and SO interface	CC612-2S0R	B94060010

¹⁾ Powerline Communication acc. to ISO/IEC 15118.

²⁾ The charge controller with optional RDC-MD only works in combination with the measuring current transformer, which must be ordered separately. Various cable lengths are available.



Art. No.	Page
B94060105	273
B94060114	274
B94060117	275
B9808007	268
B980805	268
B94060120	272
	B94060105 B94060114 B94060117 B9808007

¹⁾ Internal diameter: 17 mm

■ Technical data

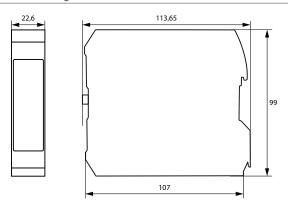
Marcel winabye 12.50	Technical data			
New oldings 1987 1988 1988 1989 1988 1989	Insulation coordination acc. to IEC 60664-1/IEC 60664-3			
Marcial model withband willings Sapply Wildings			• •	
Supply voltage		, 5	·	
Supply voltage	Rated impulse withstand voltage	800 V		
Marinal values 0,11	Altitude ≤ 2000 m	n AMSL	User interface	User interface RJ45
Mary	Supply voltage		Switching elements	
Second content monitoring module* Second content for file supply voiling	Nominal voltage D	DC 12 V	Relay 1	configurable
Monimaci	3		Relay 2	charging contactor
Regional offerct current monitoring module* Measuring range	1 3 3 117 3		Switching elements	2 x 1 N/O contacts
Residual direct current monitoring module* Response values:				N/C operation
Residuals current by	Residual direct current monitoring module*			10,000 switching cycles
Response values:	Measuring range 1	100 mA	Contact data acc. to IEC 60947-5-1:	· · · · · · · · · · · · · · · · · · ·
Residual current f _{ar} (segonas tolerane f _{ar} (a spear) (a spear	Response values:			30 V
Research sequence value		C 6 mA		
Ret al voltage (n) Act work September Septembe				
Default Company Comp				
Patentic of Am D Or esidual current ripping Patentic P D 271 128 / US 9,397,494 / Zi 201210157968.6 / CN 10300175; EP 2131 365/0 File Patentic P D 271 128 / US 9,397,494 / Zi 201210157968.6 / CN 10300175; EP 2131 365/0 File Patentic P D 271 128 / US 9,397,494 / Zi 201210157968.6 / CN 10300175; EP 2131 360 MHz 2700 MHz	· ·	√ 3 m/l		32 V
Planetic: EP 2 571 128 / US 9, 397, 494 / ŽI. 201210157968.6 / CN 103001175, EP 2 813 850) Wifeless parameters (Optional for data gateways with 46 modem only) Partie requery bands		< 3 IIIA		
Second S	(Patents: EP 2 571 128 / US 9,397,494 / ZL 201210157968.6 / CN 103001175, EP 2 813 856)			
Section Sect			Operating temperature	-30+70°C
Tarspace	Wireless parameters (Optional for data gateways with 4G modem only)		Climatic conditions acc. to IEC 60721:	
Separate General Communication PLC accord Solitor Communication PLC accord Solit	Frequency bands 800 MHz/850 MHz/900 MHz/1800 MHz/2100 MHz/260	00 MHz	Stationary use (IEC 60721-3-3)	3K23 (except condensation, water and formation of ice)
Separate	Impedance	50 Ω	Transport (IEC 60721-3-2)	2K11
Mechanical conditions act. to IEC 60721-3 Storage Mechanical Conditions act. to IEC 60721-3 St	Data rate		• • • • • • • • • • • • • • • • • • • •	1K21
Actionary use (EC 60721-3-2) 3 Mit 1 major use (EC 60721-3-2) 3 Mit 1 majo	GPRS: UL 85,6 kBit/s; DL 107	7 kBit/s		21.
MITCHAPP	EDGE: UL 236,8 kBit/s; DL 296	6 kBit/s		
Company Comp		UMTS:		
Securing	WCDMA: UL 384 kBit/s; DL 384	4 kBit/s		
Marche			Long-term storage (IEC 60721-3-1)	IMIZ
LTE FDD: UL 5 MBitr/s; DL 10 MBitr/s Required antenna Paroarma Antennas B4BE-72-70-5557 Imputs/outputs and display LED ALARM pellow LED READY green LED PLC (Optional) green LED PLC (Optional) green LED PLC (Optional) green LED PLC (Optional) green LED Reduration interface (Ethernet, WLAN,) US 8 socket type AB LOOK Groffiguration interface (Ethernet, WLAN,) US 8 socket type AB LOOK Groffiguration interface (Ethernet, WLAN,) US 8 socket type AB LOOK Groffiguration interface (Ethernet, WLAN,) US 8 socket type AB LOOK Groffiguration interface (Ethernet, WLAN,) US 8 socket type AB LOOK Groffiguration interface (Ethernet, WLAN,) US 8 socket type AB LOOK Groffiguration interface (Ethernet, WLAN,) US 8 socket type AB LOOK Groffiguration interface (Ethernet, WLAN,) US 8 socket type AB LOOK Groffiguration interface (Ethernet, WLAN,) US 8 socket type AB LOOK Groffiguration interface (Ethernet, WLAN,) US 8 socket type AB LOOK Groffiguration interface (Ethernet, WLAN,) US 8 socket type AB LOOK Groffiguration interface (Ethernet, WLAN,) US 8 socket type AB LOOK Groffiguration interface (Ethernet, WLAN,) US 8 socket type AB LOOK Groffiguration interface (Ethernet, WLAN,) US 8 socket type AB LOOK Groffiguration interface (Ethernet, WLAN,) US 8 socket type AB LOOK Groffiguration interface (Ethernet, WLAN,) US 8 socket type AB LOOK Groffiguration interface (Ethernet, WLAN,) US 8 socket type AB LOOK Groffiguration interface (Ethernet, WLAN,) US 8 socket type AB LOOK Groffiguration interface (Ethernet, WLAN,) US 8 socket type AB LOOK Groffiguration interface (Ethernet, WLAN,) US 8 socket type AB LOOK Groffiguration interface (Ethernet, WLAN,) US 8 socket type AB LOOK Groffiguration interface (Ethernet, WLAN,) US 8 socket type AB LOOK Groffiguration interface (Ethernet, WLAN,) US 8 socket type AB LOOK Groffiguration interface (Ethernet, WLAN,) US 8 socket type AB LOOK Groffiguration interface (Ethernet, WLAN,) US 8 socket type AB LO			Connection	
		LTE:	Connection cable	RJ45
Connection type (terminal block C) Spush-in terminal plock C) Spush-	LTE FDD: UL 5 MBit/s; DL 10			< 3 m
Inputs/outputs and display LED RLANRM LED RLANRY LED PLC (Optional) USB Scrick type A USB Scrick type A SIM Card (For data gateways with 4G modern only) Mark Card (For data gateways with 4G moder	LTE TDD: UL 3,1 MBit/s; DL 8,96			
Inputs/outputs and display LED ALARM LED ALARM LED ALARM LED RELO (Ciptional) LED RELO (Liptional) LED R	Required antenna Panorama Antennas B4BE-7-27	7-05SP		pusn-ın terminai
Serial Delication Seri				0.2 1 E mm ² (AWC 24 16)
Exert Name Spetter S	· · · · · · · · · · · · · · · · · · ·		3	,
Stipping length Stipping force Stipping fo				
DUSE Extension interface (Ethermet, WLAN,) USB Socket type AB Micro socket type AB SIM card (For data gateways with 4G modem only) Micro SIM Card (For data gateways with 4G modem only) Micro SIM Card (For data gateways with 4G modem only) Mactuator IN Actuator IN Actuator IN Actuator IN CONFIG (Configuration interface) Mactuator PUT Actuator IN CONFIGURATION IN CONFIGUR	LED READY	green	•	
CONFIG (Configuration interface) Micro socket type AB SIM card (For data gateways with 4G modem only) micro SIM CATC (For data gateways with 4G modem only) micro SIM Part (For data gateways with 4G modem only of Simple Part (For data gateways with 4G mode only of Simple Part (For data gateways with 4G mode only of Simple Part (For data gateways with 4G mode only of Simple Part (For data gateways with 4G mode only of Simple Part (For data gateways with 4G mode only of Simple Part (For data gateways with 4G mode only of Simple Part (For data gateways with 4G mode only of Simple Part (For data gateways with 4G mode only of Simple Part (For data gateways with 4G mode only of Simple Part (For data gateways with 4G mode only of Simple Part (For data gateways with 4G mode only of Simple Part (For data gateways with 4G mode only of Simple Part (For data gateways with 4G mode only of Simple Part (For data ga	LED PLC (Optional)	green	, ,	
Sink card (For data gateways with 4G modem only) Ferminal A: IN Actuator IN H Actuator PULY Ferminal B: ITEMPHINE TERMINAL TERMIN		LLypc A	Opening force	0.5 - 0.6 Nm (4 - 5 lb-in)
Ferminal A: rigid/flexible 0.22.5 mm² (AWG 2412 flexible with ferrule without plastic sleeve out of the plantic	CONFIG (Configuration interface) Micro socket ty	type AB	Connection type (terminal blocks A ar	nd B) screw terminal
M Actuator IN	SIM card (For data gateways with 4G modem only) mic	cro SIM	Connection properties:	
Actuator IN Actuator IN Actuator IN Actuator Pul- Pul In Actuator Pul In	Terminal A:		rigid/flexible	0.22.5 mm ² (AWG 2412)
Actuator + Actuator + Actuator + Actuator + DUT Actuator - Actuato		iator IN	flexible with ferrule without plastic sleeve	0.252.5 mm ² (AWG 2414)
Stripping length 7 mm 7		iatoi iiv	•	0.251.5 mm ² (AWG 2416)
Actuator			Stripping length	7 mm
Comminable Com		output		
12V		tuatol -		
10 V IN 11 Relay 1 NO 12 Relay 1 NO 13 Relay 1 NO 14 Relay 1 NO 15 Relay 1 NO 15 Relay 1 NO 16 Pilot (Powerline Communication PLC acc. to ISO/IEC 15118) Maximum cable length (PP, CP)		2 1/ 11/2		continuous operation
11 Relay 1 NO 14 Relay 1 NO 15 Proximity Pilot CP Control Pilot (Powerline Communication PLC acc. to ISO/IEC 15118) Maximum cable length (PP, CP) < 15 m 21 Relay 2 NO 124 Relay 2 NO 1N1- Input 1-				IP20
Relay 1 NO Ferminal C: PP Proximity Pilot CP Control Pilot (Powerline Communication PLC acc. to ISO/IEC 15118) Maximum cable length (PP, CP) < 15 m 21 Relay 2 NO 24 Relay 2 NO IN1- Input 1-	0V			IEC 60715
Terminal C: PP Proximity Pilot (Powerline Communication PLC acc. to ISO/IEC 15118) Maximum cable length (PP, CP) < 15 m 21 Relay 2 NO 24 Relay 2 NO IN1- Input 1-				D00325
Proximity Pilot CP Control Pilot (Powerline Communication PLC acc. to ISO/IEC 15118) Maximum cable length (PP, CP) < 15 m 21 Relay 2 NO 24 Relay 2 NO IN1- Input 1-		ay 1 NO	Weight	160 g
Proximity Pilot CP Control Pilot (Powerline Communication PLC acc. to ISO/IEC 15118) Maximum cable length (PP, CP) < 15 m 21 Relay 2 NO 24 Relay 2 NO IN1- Input 1-	Terminal C:		*) Surge test is carried out at Phoenix nowe	er supply STEP-PS/1AC/12DC/1 5
Maximum cable length (PP, CP) < 15 m 21 Relay 2 NO 24 Relay 2 NO IN1- Input 1-		ty Pilot	3	11 /
21 Relay 2 NO 24 Relay 2 NO N1- Input 1-	CP Control Pilot (Powerline Communication PLC acc. to ISO/IEC	15118)	e 121 casie length is less than I lifeter	•
24 Relay 2 NO Input 1-				
N1- Input 1-		ay 2 NO		
	24 Rela	ay 2 NO		
N1+ Input 1+	IN1- Ir	nput 1-		
	IN1+ Inp	put 1+		

Input 2-Input 2+ Current transformer

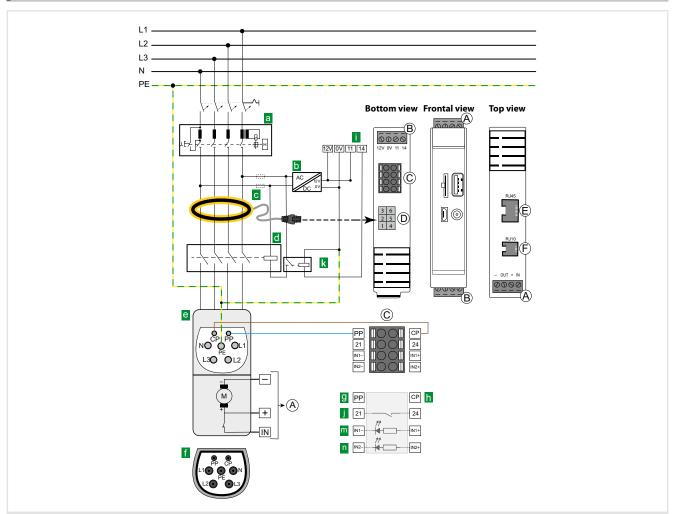


IN2-

continuous operation IP20 IEC 60715 D00325 160 g PS/1AC/12DC/1.5.



Wiring diagram



- A Connection locking engine
- **B** Connection socket User Interface
- © Connection socket
- (CT) © Connection Current Transformer (CT)
- **€** Terminal User Interface (RJ45)
- F Terminal Modbus/eHZ meter (RJ10)
- RCD Type A
- **b** Voltage supply DC 12 V
- **Current Transformer (CT) with plug**
- d Contactor
- Type 2 socket 1)
- Type 2 plug 1)
- g Connection Proximity Pilot
- **h** Connection Control Pilot
- Relay 1: Control pin contactor
- Output relay 2

- Intermediate relay
- m Optocoupler input 1
- Optocoupler input 2
- 1) Mennekes Typ-2-socket

Assignment of the terminals

A1	IN	C1	PP
A2	+	C2	СР
А3	OUT	СЗ	21
A 4	-	C4	24
B1	12V	C5	IN1-
B2	0 V	C6	IN1+
В3	11	C 7	IN2-
B4	14	C8	IN2+

Charge controller CC613



Typical applications

• Electric vehicle charging stations, wallboxes or street light charging points

Approvals



Device features

- · Charge controller in accordance with IEC 61851-1 (mode 3 charging)
- · Master and slave operation configurable
- Setting up charging stations 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) 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 (acc. to IEC 61851-1)
- Configurable support for additional domestic 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 sensors to reduce the charging current with regard of the ambient temperature
- ISO 15118 Powerline Communication (PLC) for plug & charge and load management systems

Standards

The charge controller has been developed in compliance with the following standards:

- EN 50581
- EN IEC 61851-1
- EN 301 489-1: V2.2.0
- EN 301 511 V12.5.1
- EN 301 908-13 V11.1.2
- EN ISO 15118-2
- IEC 62955
- EN 62311
- IEC 61851-21-2
- EN 301 489-52 V1.1.0 Draft
- EN 301 908-1 V13.1.1
- EN 301 908-2 V11.1.2
- EN ISO 15118-3

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

Interface	RDC-M	LED	PLC 1)	User interface	Modem	External Modbus	Туре	Art. No.
		STATUS	_	_	4G	-	CC613-ELM4PR	B94060026
Modbus,							CC613-ELM4PR-M	B94060020
Ethernet						-	CC613-ELPR	B94060027
					-		CC613-ELPR-M	B94060021

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
RFID105-L1 with RJ45 cable (length 500 mm)	B94060105	273
RFID114 with RJ45 cable (length 500 mm)	B94060114	274
RFID117-L1 with RJ45 cable (length 500 mm)	B94060117	275
Current transformer CTBC17 (cable variant, cable length 325 mm) $^{1)}$	B98080071	268
Current transformer CTBC17 (PCB variant) 1), 2)	B98080070	268
Connection cable CTBC17-Cable incl. clip housing	B980805	268
DPM2x16FP (display module)	B94060120	272

Plug kit	Content / Quantity	Art. No.
Plug kit (to be ordered separatly)	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	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
Overvoltage category	II (within terminal H)
Overvoltage category	III (terminal H and all other terminals)
Rated impulse voltage	6 kV (terminal H and all other terminals)
Rated impulse voltage	2.5 kV (within terminal H)
Double insulation acc. to OVC I	
Basic insulation acc. to OVC II	within terminal H
Operating altitude	≤ 2000 m AMSL
Supply voltage (terminal B	
Nominal voltage	DC 12 V
Operating range of the nomina	3
Max. nominal current	750 mA
Max. nominal current without	
Max. nominal current with ma	x. USB load 750 mA
Residual direct current mor	nitoring module (RDC-M, terminal A)*
Measuring range	100 mA
Response values:	
Residual current I∆n	DC 6 mA
Response tolerance $I_{\Delta n}$	-500 %
Restart sequence value:	
	97,494 / ZL 201210157968.6 / CN 103001175, EP 2 813 856)
Frequency bands	nna (optionally with 4G modem, terminal E) 800 MHz/850 MHz/900 MHz/1800 MHz/2100 MHz/2600 MHz
mpedance	50 Ω
Data rate	GSM:
zutu rute	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
	HSUPA: UL 5.76 MBit/s LTE:
	HSUPA: UL 5.76 MBit/s LTE: LTE FDD: UL 5 MBit/s; DL 10 MBit/s
specified antenna	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 PSI-GSM/UMTS-QB-ANT
•	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
NOTE: SMA plug connector mus	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 PSI-GSM/UMTS-QB-ANT
NOTE: SMA plug connector mus	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 PSI-GSM/UMTS-QB-ANT It be protected against ESD discharges by the customer
NOTE: SMA plug connector mus	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 PSI-GSM/UMTS-QB-ANT It be protected against ESD discharges by the customer orange: power on/system not ready for operation
NOTE: SMA plug connector mus	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 PSI-GSM/UMTS-QB-ANT It be protected against ESD discharges by the customer orange: power on/system not ready for operation blue: system is starting
NOTE: SMA plug connector mus	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 PSI-GSM/UMTS-QB-ANT It be protected against ESD discharges by the customer orange: power on/system not ready for operation blue: system is starting green: system started, not ready for operation yet
Specified antenna NOTE: SMA plug connector mus LED indications STATUS (front panel)	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 PSI-GSM/UMTS-QB-ANT at be protected against ESD discharges by the customer orange: power on/system not ready for operation blue: system is starting green: system started, not ready for operation yet flashing green: system running, system ready for operation
NOTE: SMA plug connector mus	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 PSI-GSM/UMTS-QB-ANT

steady green: Ethernet connection at 100 Mbit/s flashing green: data exchange at 100 Mbit/s steady yellow: Ethernet connection at 10 Mbit/s flashing yellow: data exchange at 10 Mbit/s

Data interface	
USB host 1 (terminal C1)	USB port type A; USB 2.0 max. 250 m
USB host 2 (terminal C2)	USB port type A; USB 2.0 max. 250 m.
Ethernet (terminal D)	10/100 Mb
CONFIG (configuration interface, terminal F)) micro USB port type A
SIM card (only with 4G modem, front panel) micro SII
HMI (terminal K)	interna
Modbus meter (terminal B)	9.6 kB
Modbus external (terminal I)	9.6 kB
Control Pilot (terminal B (CP))	acc. to IEC 6185
Proximity Pilot (terminal B (PP))	acc. to IEC 6185
Inputs	
Optocoupler (terminal J (Opto 1 In+, O	•
Input voltage	DC 11.425.2
Input current	2.36.4 m
Weld check (terminal (WB, WA))	
Input voltage	AC 180277
Input current	0.61.3 m
Input PE (terminal B (PE, PE))	
•	
Outputs Contact data acc. to IEC 60947-5-1:	
Outputs	nis 14))
Outputs Contact data acc. to IEC 60947-5-1:	
Outputs Contact data acc. to IEC 60947-5-1: Relay (12 V) (terminal J (Relais 13, Rela Rated operational voltage $U_{\rm e}$	DC 24
Outputs Contact data acc. to IEC 60947-5-1: Relay (12 V) (terminal J (Relais 13, Rela	DC 24 DC 1
Outputs Contact data acc. to IEC 60947-5-1: Relay (12 V) (terminal J (Relais 13, Rela Rated operational voltage U_e Rated operational current I_e	DC 24 DC 1 1 mA at ≥ 10
Outputs Contact data acc. to IEC 60947-5-1: Relay (12 V) (terminal J (Relais 13, Rela Rated operational voltage Ue Rated operational current Ie Minimum contact rating	DC 24 DC 1 1 mA at \geq 10 and (Relais 23, Relais 24))
Outputs Contact data acc. to IEC 60947-5-1: Relay (12 V) (terminal J (Relais 13, Rela Rated operational voltage Ue Rated operational current Ie Minimum contact rating Switching contact for contactor (terminal)	DC 24 DC 1 1 mA at ≥ 10 nal (Relais 23, Relais 24)) AC 230
Outputs Contact data acc. to IEC 60947-5-1: Relay (12 V) (terminal J (Relais 13, Rela Rated operational voltage U_e Rated operational current I_e Minimum contact rating Switching contact for contactor (terminal Rated operational voltage U_e	DC 24 DC 1 1 mA at ≥ 10 nal (Relais 23, Relais 24)) AC 230 AC 4
Outputs Contact data acc. to IEC 60947-5-1: Relay (12 V) (terminal J (Relais 13, Rela Rated operational voltage U_e Rated operational current I_e Minimum contact rating Switching contact for contactor (terminated operational voltage U_e Rated operational current I_e Minimum contact rating	DC 24 DC 1 1 mA at ≥ 10 nal (Relais 23, Relais 24)) AC 230 AC 4
Outputs Contact data acc. to IEC 60947-5-1: Relay (12 V) (terminal J (Relais 13, Rela Rated operational voltage U_e Rated operational current I_e Minimum contact rating Switching contact for contactor (terminated operational voltage U_e Rated operational voltage U_e Rated operational current I_e Minimum contact rating Environment/EMC	DC 24 DC 1 1 mA at ≥ 10 nal (Relais 23, Relais 24)) AC 230 AC 4 50 mA at ≥ 10 V (AC
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Outputs Contact data acc. to IEC 60947-5-1: Relay (12 V) (terminal J (Relais 13, Rela Rated operational voltage Ue Rated operational current Ie Minimum contact rating Switching contact for contactor (terminated operational voltage Ue Rated operational voltage Ue Rated operational current Ie Minimum contact rating Environment/EMC EMC Operating temperature Classification of climatic conditions acc	DC 24 DC 1 1 mA at \geq 10 anal (Relais 23, Relais 24)) AC 230 AC 4 50 mA at \geq 10 V (AC see CE declaratio $-30+70$ ° a. to IEC 60721:
Outputs Contact data acc. to IEC 60947-5-1: Relay (12 V) (terminal J (Relais 13, Rela Rated operational voltage Ue Rated operational current Ie Minimum contact rating Switching contact for contactor (terminated operational voltage Ue Rated operational voltage Ue Rated operational current Ie Minimum contact rating Environment/EMC EMC Operating temperature Classification of climatic conditions accessifications yuse (IEC 60721-3-3)	DC 24 DC 1 1 mA at \geq 10 anal (Relais 23, Relais 24)) AC 230 AC 4 50 mA at \geq 10 V (AC see CE declaratio $-30+70$ ° a. to IEC 60721:
Outputs Contact data acc. to IEC 60947-5-1: Relay (12 V) (terminal J (Relais 13, Rela Rated operational voltage U_e Rated operational current I_e Minimum contact rating Switching contact for contactor (terminal Rated operational voltage U_e Rated operational current I_e Minimum contact rating Environment/EMC EMC	DC 24 DC 1 1 mA at \geq 10 anal (Relais 23, Relais 24)) AC 230 AC 4 50 mA at \geq 10 V (AC see CE declaratio $-30+70^{\circ}$ 5. to IEC 60721: 3K23 (except condensation and formation of ice
Outputs Contact data acc. to IEC 60947-5-1: Relay (12 V) (terminal J (Relais 13, Rela Rated operational voltage U_e Rated operational current I_e Minimum contact rating Switching contact for contactor (terminal Rated operational voltage U_e Rated operational voltage U_e Rated operational current I_e Minimum contact rating Environment/EMC EMC Operating temperature Classification of climatic conditions access ac	DC 24 DC 1 1 mA at \geq 10 anal (Relais 23, Relais 24)) AC 230 AC 4 50 mA at \geq 10 V (AC see CE declaratio $-30+70^{\circ}$ 5. to IEC 60721: 3K23 (except condensation and formation of ice
Outputs Contact data acc. to IEC 60947-5-1: Relay (12 V) (terminal J (Relais 13, Rela Rated operational voltage U_e Rated operational current I_e Minimum contact rating Switching contact for contactor (terminal Rated operational voltage U_e Rated operational voltage U_e Rated operational current I_e Minimum contact rating Environment/EMC EMC Operating temperature Classification of climatic conditions accessifications of climatic conditions accessification of climatic conditions accessification of climatic conditions accessification of mechanical conditions Classification of mechanical conditions	DC 24 DC 1 1 mA at \geq 10 anal (Relais 23, Relais 24)) AC 230 AC 4 50 mA at \geq 10 V (AC see CE declaratio -30+70° at the image of the
Outputs Contact data acc. to IEC 60947-5-1: Relay (12 V) (terminal J (Relais 13, Rela Rated operational voltage U_e Rated operational current I_e Minimum contact rating Switching contact for contactor (terminated operational voltage U_e Rated operational voltage U_e Rated operational current I_e Minimum contact rating Environment/EMC EMC Operating temperature Classification of climatic conditions accessifications of climatic conditions accessifications of climatic conditions accessification of mechanical conditions Stationary use (IEC 60721-3-1) Classification of mechanical conditions Stationary use (IEC 60721-3-3)	DC 24 DC 1 1 mA at \geq 10 anal (Relais 23, Relais 24)) AC 230 AC 4 50 mA at \geq 10 V (AC see CE declaratio -30+70° at to IEC 60721: 3K23 (except condensation and formation of ice 2K1 1K2 acc. to IEC 60721: 3M1
Outputs Contact data acc. to IEC 60947-5-1: Relay (12 V) (terminal J (Relais 13, Rela Rated operational voltage Ue Rated operational current Ie Minimum contact rating Switching contact for contactor (terminated operational voltage Ue Rated operational current Ie Minimum contact rating Environment/EMC EMC Operating temperature Classification of climatic conditions acc Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical conditions	DC 24 DC 1 1 mA at \geq 10 anal (Relais 23, Relais 24)) AC 230 AC 4 50 mA at \geq 10 V (AC see CE declaratio $-30+70^{\circ}$ at to IEC 60721: 3K23 (except condensation and formation of ice 2K1 1K2



¹⁾ Internal diameter: 17 mm

 $^{^{\}rm 2)}$ The PCB-variant can be combined with the connection cables of different lengths

HMI (terminal K)	
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)	$\geq 1 \text{ mm}^2$
Connection type (terminal block I)	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)

0.25...0.75 mm² (AWG 24...18)

10 mm

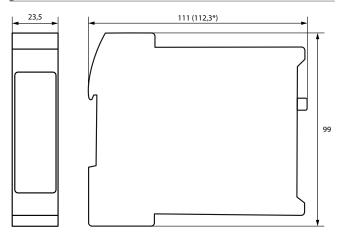
250 m

Connection type (term	iinal block H)	push-wire terminal
Connection specifications	:	
rigid /flexible		0.21.5 mm ² (AWG 2416)
flexible with ferrule with	out plastic sleeve	0.251.5 mm ² (AWG 2416)
flexible with ferrule with	plastic sleeve	0.250.75 mm ² (AWG 2418)
Stripping length		10 mm
Max. connection cable le	ngth	2 m
Cross-section		$\geq 0.75 \text{ mm}^2$
Other		
Operating mode		continuous operation
Mounting position	front panel orientated,	, air must pass through cooling slots vertically
Degree of protection		IP20
DIN rail		IEC 60715
Weight		max. 500 g (depends on variant)

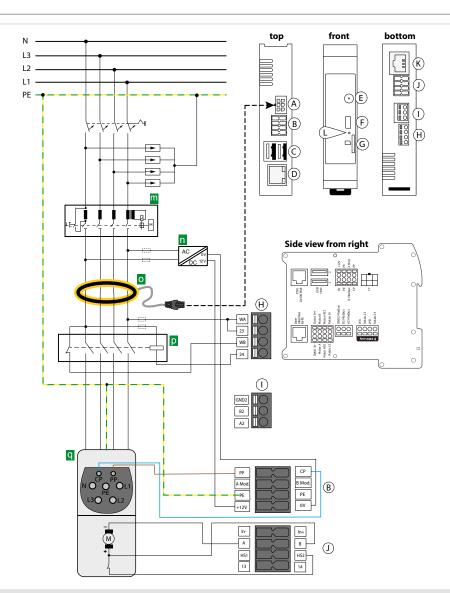
Dimension diagram (dimensions in mm)

flexible with ferrule with plastic sleeve

Stripping length
Max. connection cable length



^{*} Dimensions with antenna socket



- Connection measuring current transformer (CT)
- (B) 12 V supply, PE, Modbus meter, CP, PP
- © 2x USB type A (1, 2)
- © Connection Ethernet (ETH1)
- **(E)** Antenna socket 4G (only available for variants with 4G modem¹)
- **(F)** 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)
- © STATUS LED
- RCD type A
- Voltage supply DC 12 V
- Measuring current transformer (CT) with plug
- Contactor
- Type 2 socket-outlet
- ¹⁾ 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	
В	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 contac contactor	
Н	WB	Weld check input N	
	24	Relais 24: Switching contact contactor	

GND2	External Modbus GND (shield connected on one side)
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	Motor A: Locking motor output negative
В	Motor B: Locking motor output positive
HS2	Motor HS2: Locking input motor switch
HS1	Motor HS1: Locking 12 V output motor switch
14	Relais 14: Relay contacts GPIO (12 V)
13	Relais 14: Relay contacts GPIO (12 V)
	B2 A2 In- In+ A B HS2 HS1

Charge controller CC613-Hxx

Home variants



Typical applications

 Charging points and wallboxes for private AC charging of electric vehicles

Approvals



Device features

- Charge controller in accordance with IEC 61851-1 (mode 3 charging)
- Patented residual direct current monitoring module RDC-M (external RCD type A required), different cable lengths can be selected
- 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
- 3 USB interfaces:
- 1 CONFIG interface for local configuration and installation of software updates
- 2 USB host interfaces
- Control Pilot and Proximity Pilot communication (acc. to IEC 61851-1)
- Internal temperature sensor to reduce the charging current depending on the ambient temperature
- ISO 15118 Powerline Communication (PLC) for plug & charge or autocharge
- · Ethernet interface

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

LED	RDC-M	PLC ¹⁾	Meter interface	Ethernet interface	USB host interface	Туре	Art. No.
CTATUC		Ŧ	-	Ŧ	-	CC613-HB	B94060024
STATUS	•		Modbus			CC613-HEM-X2	B94060028

¹⁾ Powerline Communication acc. to 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.

Accessory

Description	Art. No.	Page
Current transformer CTBC17 (PCB variant) ¹⁾	B9808007	268
Connection cable CTBC17-Cable incl. clip housing	B980805	268

¹⁾ Internal diameter: 17 mm

Plug kit	Content / Quantity	Art. No.	
Plug kit (to be ordered separatly)	3-pole (1 x), 4-pole (1 x), 8-pole (2 x)	B94060129	
Plug kit bulk pack, HB	4-pole (50 x), 8-pole (50 x)	B94060127	
Plug kit bulk pack, HEM-X2	4-pole (50 x), 8-pole (100 x)	B94060126	



Input current

Input PE (terminal B (PE, PE))

Insulation coordination acc. to IEC 60664-1/IEC 60664-3 Rated voltage II (within termi Overvoltage category Overvoltage category III (terminal H and all other term 6 kV (terminal H and all other term Rated impulse voltage Rated impulse voltage 2.5 kV (within terminal Double insulation acc. to OVC III between terminal H and all other term Basic insulation acc. to OVC II within term Operating altitude ≤ 2000 m Supply voltage (terminal B (0V, +12V)) Nominal voltage DO DC 11.4 V Operating range of the nominal voltage Max. nominal current Max. nominal current without USB load 40 Max. nominal current with max. USB load 75 Residual direct current monitoring module (RDC-M, terminal A)* 10 Measuring range Response values: Residual current I∆n DC Response tolerance I∆n -50. Restart sequence value: * patented 6 mA DC residual current tripping (Patents: EP 2 571 128 / US 9,397,494 / ZL 201210157968.6 / CN 103001175, EP 2 813 856) **LED** indications orange: power on/system not ready for open STATUS (front panel blue: system is sta green: system started, not ready for operation flashing green: system running, system ready for ope red: system error Ethernet (terminal D) off: no Ethernet connection steady green: Ethernet connection at 100 Mbit/s flashing green: data exchange at 100 Mbit/s steady yellow: Ethernet connection at 10 Mbit/s flashing yellow: data exchange at 10 Mbit/s **Data interface** USB host 1 (terminal C1) USB port type A; USB 2.0 max. 250 mA USB host 2 (terminal C2) USB port type A; USB 2.0 max. 250 mA Ethernet (terminal D) 10/100 Mbit CONFIG (configuration interface, terminal F) micro USB port type AB Modbus meter (terminal B) 9.6 kBit Control Pilot (terminal B (CP)) acc. to IEC 61851 Proximity Pilot (terminal B (PP)) acc. to IEC 61851 Inputs Weld check (terminal H (WB, WA)) Input voltage AC 180 V...277 V

	Outputs	
	Contact data acc. to IEC 60947-5-1:	
	Switching contact for contactor (terminal H	(relay 23, relay 24))
Ì	Rated operational voltage $U_{\rm e}$	
į	Rated operational current /e	
į	Minimum contact rating	
	Environment/EMC	
i	EMC	
i	Operating temperature	
	Classification of climatic conditions acc. to	IEC 60721:
	Stationary use (IEC 60721-3-3)	3K23 (except condens
	Transport (IEC 60721-3-2)	
į	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)	
Ì	Long-term storage (IEC 60721-3-1)	
	Cable lengths/cable types	
	Ethernet (terminal D)	
i	Connection cable	
į	Max. connection cable length	
	Connection type (terminal blocks B and J)	
	Connection specifications:	
ı	rigid /flexible	0.2.
İ	flexible with ferrule without plastic sleeve	0.25.
İ	flexible with ferrule with plastic sleeve	0.14
	Stripping length	
į	Max. connection cable length	
	Cross-section Cross-section	
į	Max. connection cable length (PE)	

Cross-section (PE)

Mounting position

0.6...1.3 mA

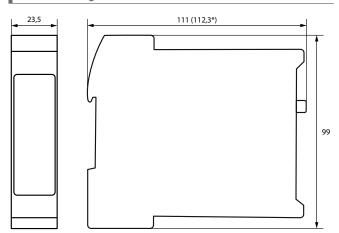
Degree of protection

Documentation number

Connection type (terminal H)	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	0.250.75 mm ² (AWG 2418)
Stripping length	10 mm
Max. connection cable length	2 m
Cross-section	≥ 0.75 mm ²
Other	
Operating mode	continuous operation

front panel orientated, air must pass through cooling slots vertically

Dimension diagram (dimensions in mm)



^{*} Dimensions incl. antenna socket (depending on the variant)



AC 230 V

50 mA at ≥ 10 V (AC)

see CE declaration -30...+70 °C

(except condensation and formation of ice)

AC 4 A

2K11

3M11

2M4

1M12

CAT 6

100 m

2 m

4 m

IP20 IEC 60715

D00423

max. 500 g (depends on variant)

 $\geq 0.5 \text{ mm}^2$

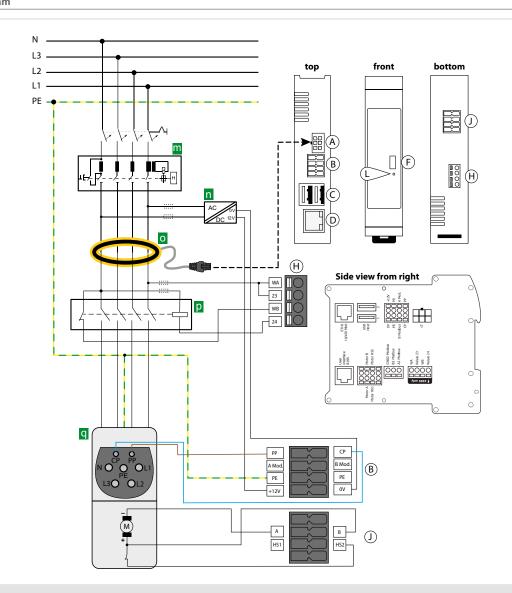
 $\geq 1 \text{ mm}^2$

push-wire terminal

0.2...1.5 mm² (AWG 24...16)

0.25...1.5 mm² (AWG 24...16)

0.14...0.75 mm² (AWG 26...18)



- A Connection measuring current transformer (CT)
- (B) 12 V supply, PE, Modbus meter, CP, PP
- © 2x USB type A (1, 2)
- © Connection Ethernet (ETH1)
- **F** Configuration interface
- $oldsymbol{\Theta}$ Weld check, relay for contactor control rated for 230 V/4 A
- ① Locking
- C STATUS LED
- m RCD type A
- Voltage supply DC 12 V
- Measuring current transformer (CT) with plug
- Contactor
- Type 2 socket-outlet

Terminal assignment

	0V	Input 0 V		
	+ 12 V	Supply voltage +12 V		
	PE	Input PE		
В	PE	Input PE		
В	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 п	WB	Weld check input N		
	24	Relais 24: Switching contact contactor		

	A	Motor A: Locking motor output negative
	В	Motor B: Locking motor output positive
J	HS2	Motor HS2: Locking input motor switch
	HS1	Motor HS1: Locking 12 V output motor switch

CTBC17 series

AC/DC sensitive measuring current transformers



Typical applications

 Electric vehicle charging stations, wallboxes or street light charging points

Approvals

CE/UKCA 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

Version	Sensor	Art. No.
PCB mounting	CTBC17P-03	B98080070
Cable variant (length 325 mm)	CTBC17P-03-K0325	B98080071

Connector length (mm)	Cable incl. clip enclosure	Art. No.
1470 ±30	CTBC17-Kabel1470	B98080542
325 ±25	CTBC17-Kabel325	B98080541
180 ±25	CTBC17-Kabel180	B98080540

Accessories

Description	Recommended mounting screws
Mounting screws M3	2 x Würth-WüPlast 2.5 x 8 mm

Suitable system components

Description	Cable	РСВ	Туре	Art. No.	Page
Charge controller		-	CC612	B940600	258
Charge controller		-	CC613	B940600	261
	1)		RCMB104	B940424	216
Residual current monitoring modules	1)		RDC104	B94042483	219
monitoring modules		-	RCMB4xx	B740425	222

1) Molex adapter connector required by customer

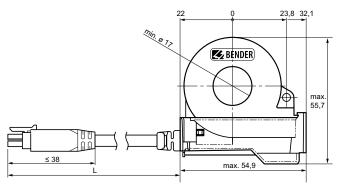


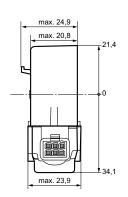
Technical data	
Insulation coordination according to IEC 60664-1	
Definitions	
CT cable feed-through opening on primary side	(IC1)
Measuring circuit; CT on secondary side	(IC2
Connection cable measuring circuit	(IC3
Operating altitude	
Basic insulation	≤ 4000 m AMSI
Double insulation	≤ 2000 m AMSI
Rated voltage	600 \
Overvoltage category	!!
Rated impulse voltage	
IC1/IC2	8 k\
IG	4 k\
Rated insulation voltage	
IC1/IC2	600 \
IG	300 \
Pollution degree	7
Safe separation (double insulation) between	
IC1/IC2	OVC III/600 \
Insulation coordination according to IEC 62955	
IC1/IC2	8 mm/400 \
Measuring current transformer circuit	
Diameter cable feed-through opening	17 mm
Rated load current	80 A
Rated primary residual current	1000 m/
Rated DC residual operating current I∆dc acc. to 62955	6 m/
Rated continuous thermal current lcth	80 /
Rated short-time thermal current Ith	2400 /
Rated dynamic current Idyn	6000 /
Environment	
Operating temperature with cable	-30+80 °C
Operating temperature sensor	-35+85 °C
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	man rec
	ition and formation of ice
Transport (IEC 60721-3-2)	2K1
Long-term storage (IEC 60721-3-1)	1K2
	INZ
Classification of mechanical conditions acc. to IEC 60721	2114
Stationary use (IEC 60721-3-3)	3M12
Transport (IEC 60721-3-2)	2M ²
Long-term storage (IEC 60721-3-1)	1M12

PCB mounting	
Fastening CTBC17P-03	solderable retaining pins
Pin length from top edge of PCB	3.6 ±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	
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
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
Documentation number	D00421
Weight	
CTBC17 cable1470	< 75 g
CTBC17 cable325	< 30 g
CTBC17 cable180	< 25 g
CTBC17P-03	< 40 g

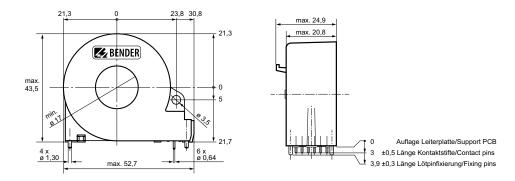
Dimension diagram (dimensions in mm)

Cable variant



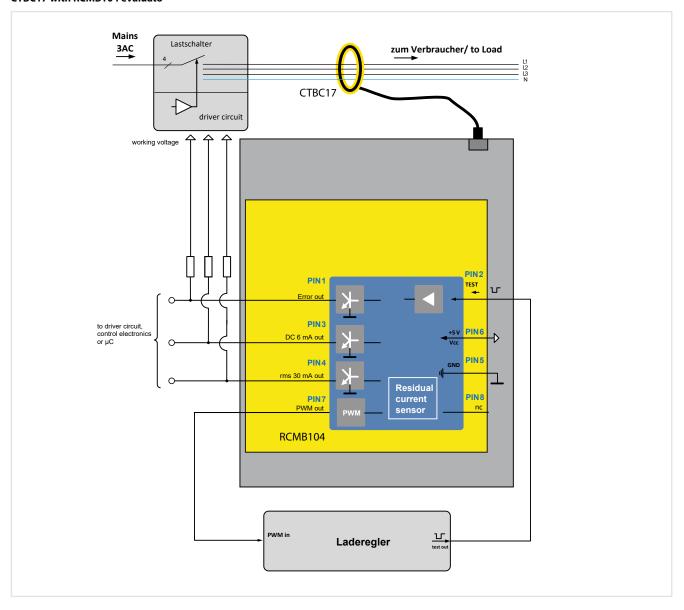


PCB variant

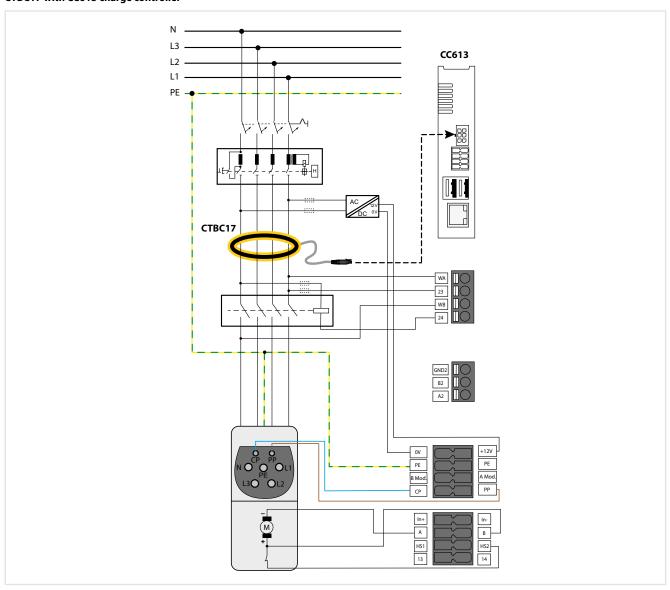


Wiring diagram – PCB variant

CTBC17 with RCMB104 evaluato



CTBC17 with CC613 charge controller





DPM2x16FP Display Module

To visualize the status of the charge controller or charging station/wallbox



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.

Typical applications

• For use in electric vehicle (EV) charging stations, wall boxes and street light charging points

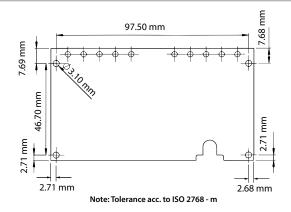
Approvals

C€ KK

Ordering information

Туре	Art. NO.
DPM2x16FP	B94060120

Dimension diagram (dimensions in mm)



Insulation coordination acc. to IEC 60664-1	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 leve
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 °C
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)	1K22
Classification of mechanical conditions acc	t. 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 illumination	to 0100 %
Bus	120
Protection class	IPOC
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 60950-1
- EN 61851-1
- EN 61851-22
- EN 50581
- ETSI EN 301 489-1 V2.1.1
- ETSI EN 301 489-3 V2.1.1
- EN 300 330 V2.1.1

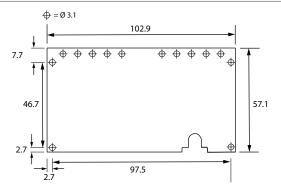
Further information

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

Ordering information

Туре	Art. No.
RFID105-L1 (RJ45 cable (length 500 mm) included)	B94060105

Dimension diagram (dimensions in mm)



recilificat auto	
Insulation coordination acc. to IEC	60664-1/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	≤ 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
Environment/EMC	
Operating temperature	-30+70 ℃
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
Connection	
Connection to charge controller	via RJ45 cable
Maximum cable length	< 3 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

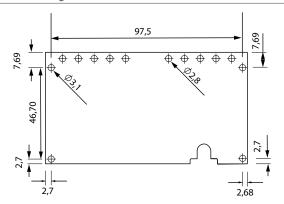
Further information

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)



Rated voltage	12.5 V
Overvoltage category	III
Pollution degree	3
Rated impulse withstand voltage	800 \
Rated insulation voltage	12.5 \
Altitude	≤ 2000 m AMSI
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 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. 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
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 60950-1
- EN 61851-1
- EN 61851-22
- EN 50581
- ETSI EN 301 489-1 V2.1.1
- ETSI EN 301 489-3 V2.1.1
- EN 300 330 V2.1.1

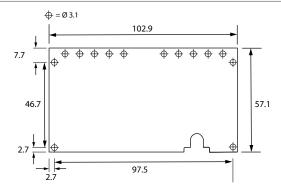
Further information

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

Ordering information

Туре	Art. No.
RFID117-L1 (RJ45 cable (length 500 mm) included)	B94060117

Dimension diagram (dimensions in mm)



Insulation coordination acc. to IEC	60664-1/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	≤ 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
Environment/EMC	
Operating temperature	-30+70 ℃
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
Connection	
Connection to charge controller	via RJ45 cable
Maximum cable length	< 3 m
Other	
Protection class	IP00
Maximum read distance	100 mm
Documentation number	D00422
Weight	25 g



Insulation monitoring devices







Equipment for insulation fault location







Residual current monitoring systems







Neutral Grounding Resistor Monitor (NGR)







Charge Controller



255



Power Quality and Energy Measurement LINETRAXX®

Measuring and monitoring relays LINETRAXX®



277



System components

Coupling devices
Measuring current transformers
Transformers
Relay modules

Power supply units Measuring instruments Interface converters Interface repeaters

COMTRAXX® Gateways COMTRAXX® Alarm indicator and test combinatio COMTRAXX® condition monitors Visualisation



339



Switching equipment

ATICS® transfer switching and monitoring devices

Test systems

UNIMET® Safety analyser



429 440



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Technical terms Alphabetical list of devices Service



463



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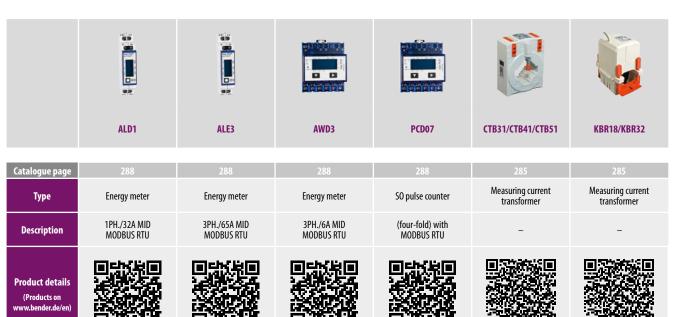
Device overview Universal Devices for Power Quality and Energy Measurement PEM



	Catalogue page	280	
22	Accuracy class according to IEC 62053-22	0.5 s	
ative	DIN EN 50160 (report)	-	
Normative equirements	DIN EN 61000-4-7 (harmonic)	Class II	
N rec	DIN EN 61000-4-15 (flicker) DIN EN 61000-4-30 (PQ measurement method)	-	
	Phase voltages/ Line voltages		
	Phase currents		
	Neutral current /4	■ (PEM353-N only)	
	Neutral current /4 (calculated)	-	
	Frequency/phase angle		
	Reactive and active power import/		
	Reactive and active power export Voltage unbalance/current unbalance		
ters	Power	per phase and total S in kVA, P in kW, Q in kvar	
Parameters	Displacement factor cos (φ)/	per priase and total s in kny, t in kny, g in kna	
æ	power factor λ Total harmonic distortion (THD _{II} /THD _I)	un to the 21th	
	<u> </u>	up to the 31rd	
	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)	
acts	Voltage supply	AC/DC 95250 V (47440 Hz)	
asbe	Sampling rate	3,2 kHz	
Fechnical aspects	Temperature	-25…+55 ℃	
Tec	Communication	Modbus RTU	
	Product details (Products on www.bender.de/en)		



Energy meter and Measuring current transformer for universal measuring devices



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 S
- · Measured quantities
- Phase voltages U_{L1}, U_{L2}, U_{L3} in V
- Line voltages UL1L2, UL2L3, UL3L1 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 I
- · 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 S and 0.5 S) (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.

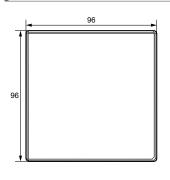
Ordering information

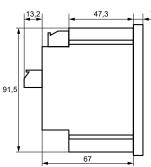
			PEM353	PEM353-P	PEM353-N
Ordering details			B93100355	B93100354	B93100353
ā	Acc	curacy class of the active energy (acc. to IEC 62053-22)	Current transformer 5 A: Class 0,5 Current transformer 1 A: Class 1,0		
Measurement technique		Volatage inputs (L1, L2, L3)	45 65 Hz TN and TT system (earthed): AC 230/400 400/690 V, CAT III 600 V IT system (unearthed): AC 400 480 V, CAT III 300 V / AC 500 690 V, CAT II 1000 V		T III 600 V 90 V, CAT II 1000 V
men [Current inputs (I ₁ , I ₂ , I ₃)		5 A / 1 A	
sure		I4	-	-	5 A
Mea	Harmonic / Distortion U/I		up to the 31st		
	Sampling rate		3,2 kHz		
	Setpoints limit value monitoring			9	
Data logger	Logs		Pi	Event log (SOE log), Max./Min. log eak demand log, Energy meter log (monthly value	es)
ata	<u>_</u>	Data recorder	-	-	5
	4 MB	Load data log (daily and monthly values)	-	-	
		Digital inputs		4	
ies	Digital outputs		2 x relay	2 x pulse	2 x relay
Properties	Supply voltage			95250 V; DC, AC 47440 Hz	
Pro		Communication interface		RS-485 (Modbus RTU, BACnet MS/TP, DNP)	
	Language			English	

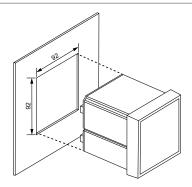


Insulation coordination acc. to IEC 60664-1/IEC 60664-3		Transformation ratio of the measuring	
Pollution degree	2	Primary	11,000,000 V
Climate category operation	3K24	Secondary	1690 V
Max. installation altitude above NN:	2000 m	Max. transformation ratio	10,000
Definitionen		Measuring current transformer inputs	
Measuring circuit 1 (IC1)	(L1, L2, L3, N)	I _{nom}	5 A
TN and TT system	100/0001/	Measuring range	0.1 200 % I _{nom}
Nominal voltage	400/690 V	Load	< 0.15 VA
Overvoltage category/Rated insulation voltage	III/600 V	Overload range	2 x I _{nom} permanent,
IT system	400 V		$20 \times I_{\text{nom}} \leq 1 \text{ s}$
Nominal voltage Overvoltage category/Rated insulation voltage	480 V	Transformation ratio of the measuring	autuont transformar
Nominal voltage	III/300 V 690 V	Transformation ratio of the measuring	
Overvoltage category/Rated insulation voltage	II/1000 V	Primary	1 30000 A
Measuring circuit 2 (IC2)	(•111, 112, •121, 122, •131, 132)	Secondary	15 A
Overvoltage category/Rated insulation voltage	III/300 V	Accuracies (OMV = of measured value/0	FS = of full-scale value)
Supply circuit (IC3)	(A1/+, A2/-)	Phase voltage U _{L1-N,L2-N,L3-N}	±0.2 % 0MV, +0.05 % 0FS
Overvoltage category/Rated insulation voltage	III/300 V	Current <i>I</i> _{1, 2, 3}	±0.2 % OMV, +0.05 % OFS
Output circuit 1 (IC4) at PEM353-N and PEM353	(D013, D014)	Neutral current /4 (PEM353-N)	±0.2 % 0MV
Overvoltage category/Rated insulation voltage	III/300 V	Frequency f	±0.02 Hz
Output circuit 1 (IC4) at PEM353-P	(E1+, E1-)	Phasing	±1°
Overvoltage category/Rated insulation voltage	III/50 V	Active power, reactive power	±0.5 % 0MV, +0.05 % 0FS
Output circuit 2 (IC5) at PEM353-N and PEM353	(D023, D024)	Power factor \(\lambda \)	±0.5 %
Overvoltage category/Rated insulation voltage	III/300 V	Measurement of the active energy acc. to DI	N EN 62053-22 (VDE 0418 part 3-22)
Output circuit 2 (IC5) at PEM353-P	(E2+, E2-)	Accuracy class with 5 A measuring curr	rent transformers 0.5 S
Overvoltage category/Rated insulation voltage	III/50 V	Accuracy class with 1 A measuring curr	rent transformers 1 S
Control circuit 1 (IC6)	(DIC, DI1, DI2, DI3, DI4)	Measurement of the voltage rms values	acc. to DIN EN 61557-12 (VDE 0413-12), chapter 4.7.6
Overvoltage category/Rated insulation voltage	III/50 V	Measurement of the phase current rms value	25
Control circuit 2 -RS-485 (IC7)	(D+, D-)		acc. to DIN EN 61557-12 (VDE 0413-12), chapter 4.7.5
Overvoltage category/Rated insulation voltage	III/50 V	Frequency measurement	acc. to DIN EN 61557-12 (VDE 0413-12), chapter 4.7.4
Rated impulse voltage		Interface	
IC1/(IC27)	6 kV		DC 40C Madhua DTU DACaat MC/TD DND
IC2/(IC37)	4 kV	Interface: Protocol Baud rate	RS-485: Modbus RTU, BACnet MS/TP, DNF
IC3/(IC47)	4 kV	Cable length	1.238.4 kbit/s 01200 m
IC4/(IC57)	4 kV	Recommended cable (shielded)	J-Y(St)Y min. 2 x 0.8
IC5/(IC67)	4 kV	neconfinenced capie (silienced)	J-1(3t)1 IIIIII. 2 X 0.8
IC6/IC7	800 V	Switching elements	
Rated insulation voltage		Outputs	2 N/O contacts
IC1/(IC27)	1000 V	Operating principle	N/O operation
IC2/(IC35)	250 V	PEM353-N, PEM353	
IC2/(IC67)	250 V	Relay contacts, N/O operation, A	C 250 V or DC 30 V 5 A
IC3/(IC47)	250 V	Minimum current I _{min}	1 mA at AC/DC \geq 10 V
IC4/(IC57)	250 V	PEM353-P	
IC5/(IC67)	250 V	Pulse output	max. DC 30 V, max. 30 mA
IC6/IC7 Safe separation (reinforced insulation) between	32 V	Cable length	≤ 30 m
	overvoltage category III 600 V	Inputs	4 common galv. isolated digital inputs
IC1/(IC27) IC2/(IC37)	overvoltage category III, 600 V overvoltage category III, 300 V	/ _{min}	1 mA
IC2/(IC37) IC3/(IC47)	overvoltage category III, 300 V	U_{DI}	DC 24 V
IC3/(IC47)	overvoltage category III, 300 V	Environment/EMC	
IC5/(IC67)	overvoltage category III, 300 V	EMC	IEC 61326-1
Voltage test (routine test) acc. to IEC 61010-1:	overvoltage category in, 500 v	Operating temperature	-25+55 °C
IC1/(IC27)	AC 2.0 kV, 1 minute	Classification of climatic conditions acc. to IE	
IC2/(IC37)	AC 2.0 kV, 1 minute	Classification of mechanical conditions acc. t	, , ,
IC3/(IC47)	AC 2.0 kV, 1 minute	Range of use	< 2000 m
IC4/(IC57)	AC 2.0 kV, 1 minute		\
IC5/(IC67)	AC 2.0 kV, 1 minute	Connection	
	,	Connection type	screw-type terminals, plug-in connector
Supply voltage		Other	
Supply voltage	AC/DC 95250 V (±10 %)		IDO
Frequency range	DC, 47 440 Hz	Degree of protection, installation	IP20
Power consumption	< 5 VA	Degree of protection, front (with rubber seal) IP54 D00335
Measuring voltage inputs		Documentation number Weight	
		Weight	≤ 350 g
CAS INCIDIATION COOMINATION			
see insulation coordination Measuring range	10 828 V (120 % //_ may)		
See insulation coordination Measuring range Rated frequency	10 828 V (120 % <i>U</i> _n , max) 4565 Hz		

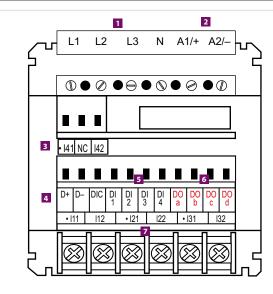








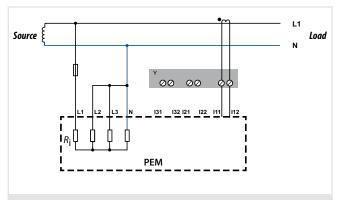
Terminals



- 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.
- DO a
 DO b
 DO d
 DO d

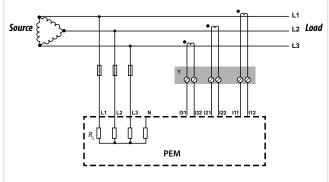
 PEM353(-N)
 D013
 D014
 D023
 D024

 PEM353-P
 E1+
 E1 E2+
 E2
- Measuring current inputs I4 (only PEM353-N)
- 4 RS-485 bus connection
- 5 Digital inputs
- 6 Digital outputs (N/O contacts)
- **7** Measuring current inputs $I_{1...3}$



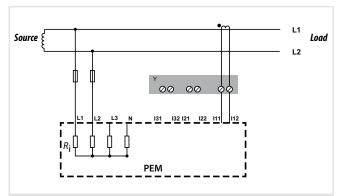
Single-phase 2-wire system 1P2W L-N

When using this wiring, the connection type (Setup > Basic > Wiring Mode) must be set to **1P2W L-N**.



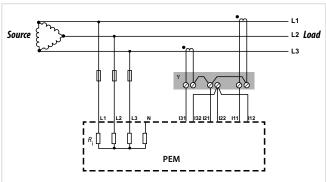
3P3W with 3 measuring current transformers

When used in a 3-wire system, the connection type (Setup > Basic > Wiring Mode) must be set to **3P3W**.

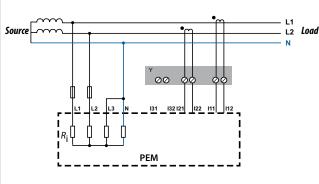


Single-phase 2-wire system 1P2W L-L

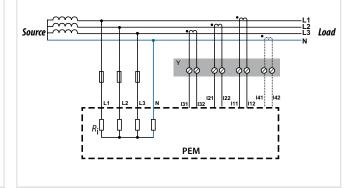
When using this wiring, the connection type (Setup > Basic > Wiring Mode) must be set to 1P2W L-L.



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 **1P3W**.

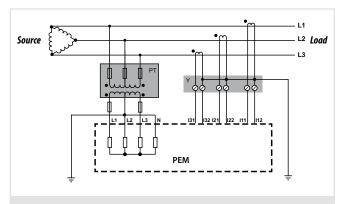


3P4W with 3 (4) measuring current transformers

When using this wiring, the connection type (Setup > Basic > Wiring Mode) must be set to **3P4W**.

- Isolating terminal of the measuring current transformers
- Measurement /4 for PEM353-N only

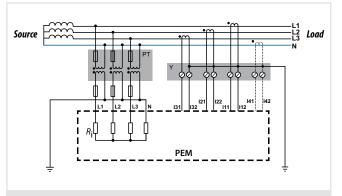
Isolating terminal of the measuring current transformers



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.

- Isolating terminal of the measuring current transformers
- 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**.

- Isolating terminal of the measuring current transformers
- Measurement /4 for PEM353-N only
- The transformation ratio in the PEM353 can be set by specifying the primary and secondary $\,$ transformation ratio. Odd ratios can also be configured.

Measuring current transformer for universal measuring devices

Window-type/Split-core current transformer



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
- 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

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Approvals

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

Primary current	Secondary current	Accuracy	Туре	Model	Art. No.
(0	5	1	WL605 CL. 1	CTB31	B98086001
60	1	1	WL601 CL. 1	CTB31	B98086002
75	5	1	WL755 CL. 1	CTB31	B98086003
75	1	1	WL751 CL. 1	CTB31	B98086004
	-	0.5	WL1255 CL. 0.5	CTB31	B98086005
125	5	1	WL1255 CL. 1	CTB31	B98086007
125	1	0.5	WL1251 CL. 0.5	CTB31	B98086006
	1	1	WL1251 CL. 1	CTB31	B98086008
	-	0.5	WL1505 CL. 0.5	CTB31	B98086009
150	5	1	WL1505 CL. 1	CTB31	B98086011
150		0.5	WL1501 CL. 0.5	CTB31	B98086010
	1	1	WL1501 CL. 1	CTB31	B98086012
	r	0.5	WL2005 CL. 0.5	CTB31	1 B98086013
200	5	1	WL2005 CL. 1	CTB31	B98086015
200	1	0.5	WL2001 CL. 0.5	CTB31	B98086014
		1	WL2001 CL. 1	CTB31	B98086016
	г	0.5	WL2505 CL. 0.5	CTB41	B98086017
250	5	1	WL2505 CL. 1	CTB41	B98086019
230	1	0.5	WL2501 CL. 0.5	CTB41	B98086018
	'	1	WL2501 CL. 1	CTB41	B98086020
	5	0.5	WL3005 CL. 0.5	CTB41	B98086021
300	3	1	WL3005 CL. 1	CTB41	B98086023
300	1	0.5	WL3001 CL. 0.5	CTB41	B98086022
	1	1	WL3001 CL. 1	CTB41	B98086024
	5	1	WL4005 CL. 1	CTB41	B98086026
400	3	0.5	WL4005 CL. 0.5	CTB41	B98086027
400	1	1	WL4001 CL. 1	CTB41	B98086028
		0.5	WL4001 CL. 0.5	CTB41	B98086025
	5	1	WL5005 CL. 1	CTB41	B98086029
500	3	0.5	WL5005 CL. 0.5	CTB41	B98086031
300	500	1	WL5001 CL. 1	CTB41	B98086032
		0.5	WL5001 CL. 0.5	CTB41	B98086033

Primary current	Secondary current	Accuracy	Туре	Model	Art. No.
	5	1	WL6005 CL. 1	CTB51	B98086034
600	3	0.5	WL6005 CL. 0.5	CTB51	B98086035
000	1	1	WL6001 CL. 1	CTB51	B98086036
	1	0.5	WL6001 CL. 0.5	CTB51	B98086037
	5	1	WL8005 CL. 1	CTB51	B98086038
800		0.5	WL8005 CL. 0.5	CTB51	B98086039
800		1	WL8001 CL. 1	CTB51	B98086040
		0.5	WL8001 CL. 0.5	CTB51	B98086041
	5 0.5 WL10005 C	1	WL10005 CL. 1	CTB51	B98086042
1000		WL10005 CL. 0.5	CTB51	B98086043	
1000	1	. 1	WL10001 CL. 1	CTB51	B98086044
	'	0.5	WL10001 CL. 0.5	CTB51	B98086045



Primary current	Secondary current	Accuracy	Туре	Model	Art. No.
50	1	3FS5	WLS501 KL. 3FS5	KBR18	B98086046
100	1	3FS5	WLS1001 KL. 3FS5	KBR18	B98086047
150	1	3FS5	WLS1501 KL. 3FS5	KBR18	B98086048

Primary current	Secondary current	Accuracy	Туре	Model	Art. No.
250	1	3FS5	WLS2501 KL. 3FS5	KBR32	B98086049
500	1	3FS5	WLS5001 KL. 1FS5	KBR32	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	РЕМ3xx (0.5 S)	PEM5xx (0.5 S)
1	1	1
0.5	1	ī

Technical Data

9	I	B31	

Rated continuous thermal current I _{cth}	1.2 x / ₁
Rated short-time thermal current Ith	60 x / _N , 1 s
Max. operating voltage $U_{\rm m}$	1.2 kV, <i>U</i> ef
Insulation test voltage	6 kV, <i>U</i> eff, 50 Hz, 1 mir
Nominal frequency	50/60 Hz
Insulation class	[
Operating temperature	-550 °C

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, U _{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
	20000
Documentation number	D00231

KBR18

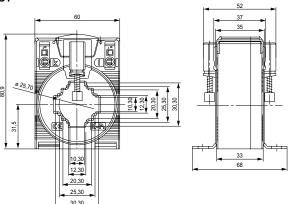
Rated continuous thermal current I _{cth}	1.2 x / _N
Rated short-time thermal current Ith	60 x / _N , 1 s
Max. operating voltage $U_{\rm m}$	0.72 kV, <i>U</i> eff
Insulation test voltage	3 kV, <i>U</i> _{eff} , 50 Hz, 1 min
Nominal frequency	50 Hz
Insulation class	E
Operating temperature	-550 ℃

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> _{eff}
Insulation test voltage	3 kV, U _{eff} , 50 Hz, 1 min
Nominal frequency	50 Hz
Insulation class	E
Operating temperature	-550 ℃

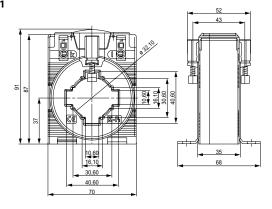
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CTB31



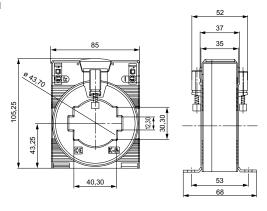
Dimensions (mm)			
Busbar 1	30 x 10		
Busbar 2	25 x 12		
Busbar 3	20 x 20		
Circular conductor	25,7		
Installation width	60		
Installation height	80,9		
Overall depth	52		

CTB41



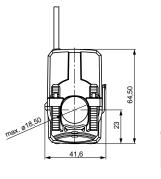
Dimensions (mm)			
Busbar 1	40 x 10		
Busbar 2	30 x 15		
Circular conductor	32		
Installation width	70		
Installation height	91		
Overall depth	52		

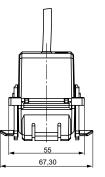
CTB51



Dimensions (mm)		
Busbar 1	50 x 12	
Busbar 2	40 x 30	
Circular conductor	44	
Installation width	85	
Installation height	105.25	
Overall depth	52	

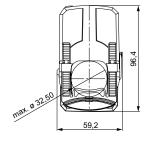
KBR18

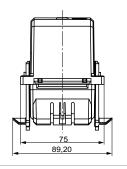




Dimensions (mm)	
Circular conductor	18
Installation width	41.6
Installation height	64.5
Installation depth incl. fixation clips	67.3

KBR32





Dimensions (mm)	
Circular conductor	32.5
Installation width	59.2
Installation height	96.4
Installation depth incl. fixation clips	89.2

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Energy meter



Device features

- Energy meter with Modbus RTU interface
- · MID approved
- 7-digit display
- Automatic recognition of bus transmission rate and parity
- · Lead seal possible with cap as accessory
- · Resettable, partial reading
- In addition to active energy metering, measured data such as current, voltage, power and cos (phi) is also available.
- DIN rail mounting

Approvals



Application fields

- Registration of relevant energy management data
- Suitable for billing purposes

Standards

The energy meters have been developed in accordance with the following standards: $\frac{1}{2} \int_{-\infty}^{\infty} \frac{1}{2} \int_{-\infty}^{\infty} \frac{1}$

- Accuracy class B acc. to EN 50470-3
- Accuracy class 1 acc. to IEC 62053-21

Further information

For more information see our product range on www.bender.de.

Ordering information

Description	Туре	Art. No.
Energy meter 1Ph/32 A MID Modbus RTU	ALD1	B93101005
Energy meter 3Ph/65 A MID Modbus RTU	ALE3	B93101006
Energy meter 3Ph/6 A MID Modbus RTU AWD3		B93101007
SO pulse counter (four-fold) with Modbus RTU	PCD7	B93101008

Accessories

Туре	Art. No.
-	B93101009
-	B93101010
	Type _ _

Technical data

ALD1	
Accuracy class	B acc. to EN 50470-3
	1 acc. to IEC 62053-21
Operating voltage	AC 230 V, 50 Hz
Tolerance	-20 %/+15 %
Reference current/maximum current	$I_{\text{ref}} = 5 \text{ A}, I_{\text{max}} = 32 \text{ A}$
Starting current/minimum current	$I_{st} = 20 \text{ mA}, I_{min} = 0.25 \text{ A}$
Power consumption	active power 0.4 W
Counting range	00′000.0099′999.99
	100′000.0999′999.9
Pulses per kWh	LC display 2000 imp/kWh

ALE3

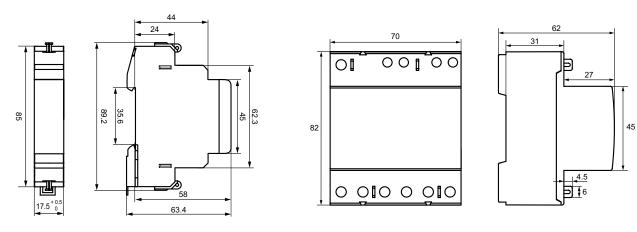
Accuracy class	B acc. to EN 50470-3
,	1 acc. to IEC 62053-21
Operating voltage	3 x AC 230/400 V, 50 Hz
Tolerance	-20 %/+15 %
Reference current/maximum current	$I_{\text{ref}} = 10 \text{ A}, I_{\text{max}} = 65 \text{ A}$
Starting current/minimum current	$I_{st} = 40 \text{ mA}, I_{min} = 0.5 \text{ A}$
Power consumption	active 0.4 W per phase
Counting range	00 000.0099 999.99
	100 000.0999 999.9
LC display with background illumination,	
	6 mm high digits
Display without mains voltage	capacitor supported LCD
	maximum for two periods of 10 days
Pulses per kWh	LED 1000 imp/kWh

AWD3

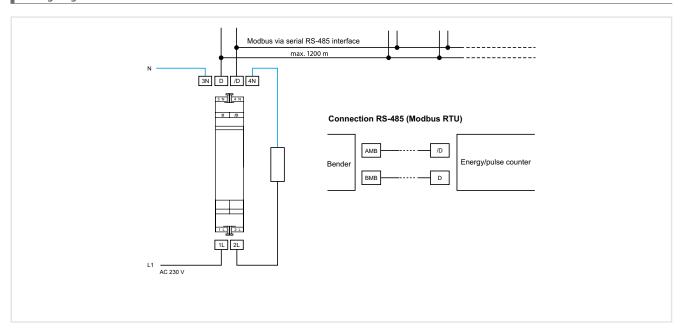
Accuracy class	B acc. to EN50470-3,
	1 acc. to IEC 62053-21
Operating voltage	3 x AC 230/400 V, 50 Hz
Tolerance	-20 %/+15 %
Transformer measurement	51500 A
Reference current/maximum current	$I_{\text{ref}} = 5 \text{ A}, I_{\text{max}} = 6 \text{ A}$
Starting current/minimum current	$I_{st} = 10 \text{ mA}, I_{min} = 0.05 \text{ A}$
Conversion factor	5:5, 50:5, 100:5, 150:5, 200:5, 250:5, 300:5, 400:5,
	500:5, 600:5, 750:5, 1000:5, 1250:5, 1500:5
Power consumption	active 0.4 W per phase
Counting range	000`000.0999`999.9
	1.000.0009.999.999
LC display with background illumination	6 mm high digits
Display without mains voltage	capacitor supported LCD
	maximum for two periods of 10 days
Documentation number	D00230

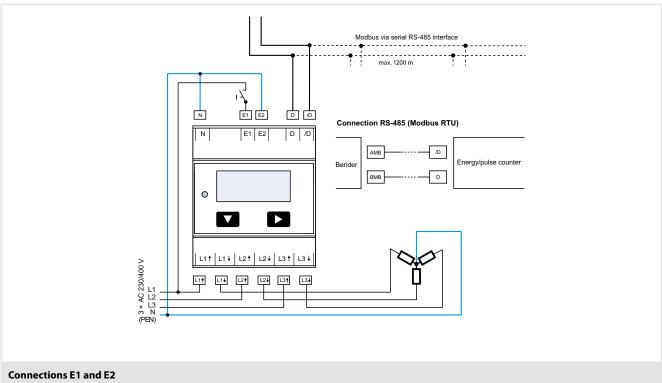


1 phase 3 phase



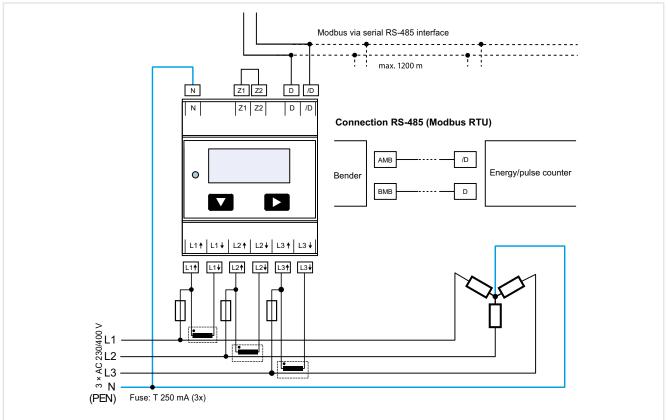
Wiring diagrams





To switch between tariffs, connect to the control signal of the ripple control receiver.





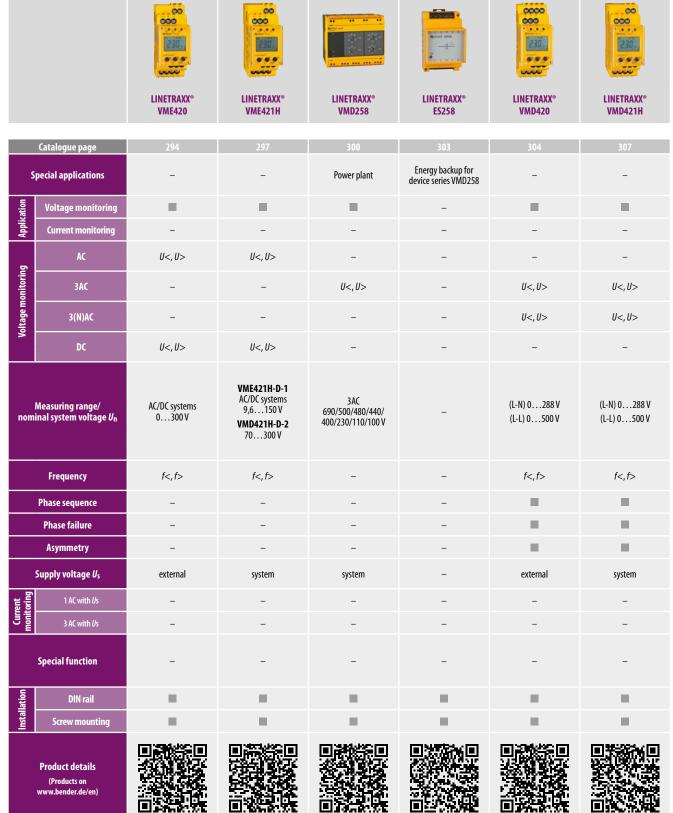
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The secondary current transformer connection on the network side has to be connected to the phase to be measured. For this reason the current transformer must not be earthed.





Device overview measuring and monitoring relays LINETRAXX®





















LINETRAXX® VMD423/VMD423H	LINETRAXX® VMD460-NA	LINETRAXX [®] VMD461	LINETRAXX® CME420	LINETRAXX° CMD420/CMD421	LINETRAXX® CMS460	LINETRAXX® GM420	RC48C
310	313	318	324	327	330	333	336
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	-	Ŧ	-	extern	extern
-	-	-	<i>l</i> <, <i>l</i> >	-	<i>l</i> <, <i>l</i> >	-	-
-	-	-	-	<i>l</i> <, <i>l</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

Supply vo	ltage ¹⁾ U _s	Туре	Art. No.		
AC	DC		Screw-type terminal	Push-wire terminal	
1672 V, 15460 Hz	9,694 V	VME420-D-1	B93010001	B73010001	
70300 V, 15460 Hz	70300 V	VME420-D-2	B93010002	B73010002	

¹⁾ Absolute values

Accessories

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



Technical data	
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, $U <$, $U >$, Hz $<$, Hz $>$, S.AL (und
Protective separation (reinforced insulation) between:	K1: Err, $U <$, $U >$, Hz $<$, Hz $>$, S.AL (over
(A1, A2) -(U1/+, U2/-) -(11-12-14) -(21-	22-24) Electrical endurance, number of cycles
Supply voltage	Contact data acc. to IEC 60947-5-1
	Utilisation category AC-13 A
VME420-D-1: Supply voltage <i>U</i> ₅ AC 1672 V/DC 9.6.	Rated operational voltage 230 V 2
117	ACO II-
. , ,	Minimum contact rating
VME420-D-2: Supply voltage Us AC/DC 70	200 V Environment/EMC
	460 Hz EMC
	Operating temperature
Power consumption :	≤ 4 VA Classification of climatic conditions acc. to IEC 60721
Measuring circuit	(except condensation and formation of ice)
Measuring range (r.m.s. value) AC/DC 0	
Rated frequency f_n DC, 15	
Frequency display range 10	500 Hz Long-term storage (IEC 60721-3-1)
Response values	Classification of mechanical conditions acc. to IEC 60721
Undervoltage $U < (Alarm 2)$ AC/DC 6	Stationary use (IFC 60721-3-3)
Overvoltage <i>U</i> > (Alarm 1) AC/DC 6	300 V Transport (IEC 60721-3-2)
Resolution of setting <i>U</i> 6.049.9 V	0.1 V Long-term storage (IEC 60721-3-1)
Resolution of setting U 50300 V	1 V Connection
Preset function:	Connection type screw-1
Undervoltage $U < = (0.85 U_{\rm n})$:*	Connection
for $U_0 = 230/120/60/24 \text{ V}$ 196/102/51/	
Overvoltage $U > = (1.1 U_n)$:*	rigid
for $U_{\rm n} = 230/120/60/24 \rm V$ 253/132/66/	
Relative uncertainty voltage at 50/60 Hz $\pm 1.5 \%$, ± 2	2 digits Two conductors with the same cross section
Relative uncertainty, voltage in the range of 15460 Hz $\pm 3\%$, \pm	
Hysteresis <i>U</i> 140 %	Stripping icrigati
Underfrequency Hz < 1050	Tiuliteliilu toluue, telliiliai strews
Overfrequency Hz > 1050 Resolution of setting f 10.099.9 Hz	Connection
Resolution of setting / 10.099.9 Hz	0.1 Hz 1 Hz Connection properties
•	rigid
Preset function:	flexible
Underfrequency for $f_n = 16,7/50/60/400 \text{ Hz}$ 15,7/49/59/. Overfrequency for $f_n = 16,7/50/60/400 \text{ Hz}$ 17,7/51/61/-	WIGHOUT ICTUICS
Overfrequency for 7 _n = 16,7/30/00/400 Hz 17,7/31/61/- Hysteresis frequency Hys Hz 0.12 Hz (0.	With refruies
Relative uncertainty, frequency range 15460 Hz ±0.2 %, ±	Stripping length
	Opening force Test opening, diameter
Time response	
Start-up delay t 0300 s	(0.1%
Response delay t _{0n1/2} 0300 s	(0 C = 1)*
Delay on release t _{off} 0300 s (Mounting
Resolution of setting t , $t_{on1/2}$, $t_{off}(010 \text{ s})$ Resolution of setting t , $t_{on1/2}$, $t_{off}(1099 \text{ s})$	0.1 s Degree of protection, internal components (DIN EN 60529)
Resolution of setting t , $t_{on1/2}$, t_{off} (1039 s)	10 -
Operating time, voltage t_{ae} DC/AC 16.7 Hz: \leq 130 ms, AC 42460 Hz: \leq	70
Operating time frequency t_{ae} AC 15460 Hz: \leq	JCEW IIIOUIIUIU
Response time t_{an} $t_{an} = t_{ae} + t_{ae$	Dirital mounting acc. to
	300 ms Documentation number
·	Weight
Displays, memory Display LC display, multifunctional, not illum	
Display range measured value AC/DC 0	(/ idetoi) setting
Operating uncertainty at 50/60 Hz $\pm 1.5 \%, \pm 2$	
Operating uncertainty, voltage in the range of 15460 Hz $\pm 3\%$, ± 2	
Operating uncertainty, frequency in the range of 15460 Hz ±0.2 %, ±	•
History memory (HiS) for the first alarm value data record measured	values
Password off/0999	9 (off)*

data record measured values off/0...999 (off)*

on/off/con (on)*

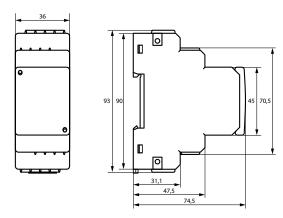
Number		2 x 1	changeove	er contacts	(K1, K2)
Operating principle			N/C opera	tion/N/O o	peration
K2: Err, $U <$, $U >$, Hz	<, Hz >, S.AL	(undervolt	age <i>U</i> <: N	I/C operation	on n.c.)*
K1: Err, $U <$, $U >$, Hz	z <, Hz >, S.AL	(overvolta	ige <i>U</i> >: N	/O operation	n.o.)*
Electrical endurance, number of cycles					10,000
Contact data acc. to IEC 60947-5-1					
Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-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	nA at AC/D	C ≥ 10 V
Environment/EMC					
EMC				IEC	61326-1
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)					3K23
Transport (IEC 60721-3-2)					2K11
Long-term storage (IEC 60721-3-1)					1K22
Classification of mechanical conditions a	acc. to IEC 607	721			
Stationary use (IEC 60721-3-3)					3M11
Transport (IEC 60721-3-2)					2M4
					1M12
Long-term storage (IEC 60721-3-1)					
Long-term storage (IEC 60721-3-1) Connection					
	scr	ew-type te	rminal or p	push-wire	terminal
Connection Connection type Connection	scr	ew-type te	rminal or p	push-wire	
Connection Connection type Connection Connection Connection	scr	,,		screw te	rminals
Connection Connection type Connection	SCF		0.24 mi		rminals 4 12)

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

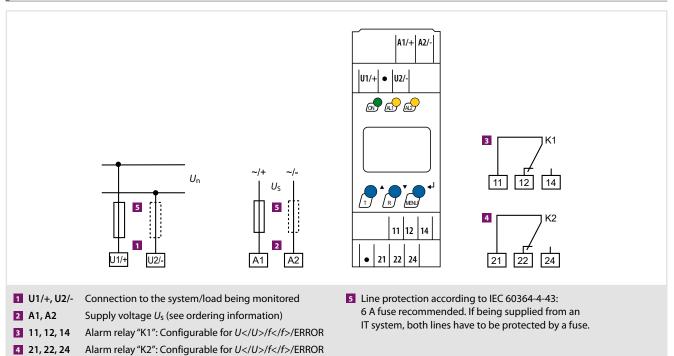
viner	
Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (DIN EN 60529)	IP30
Degree of protection, terminals (DIN EN 60529	IP20
Enclosure material	polycarbonate
Screw mounting	2 x M4 with mounting clip
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Documentation number	D00026
Weight	≤ 150 g

the rated frequency 15...460 Hz only

Fault memory (M) alarm relay



Wiring diagram



6.2

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









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

Ordering information

Nominal syste	m voltage ¹⁾ U _n	Type	Art. No.		
AC	DC		Screw-type terminal	Push-wire terminal	
9.6150 V, 15460 Hz	9.6150 V	VME421H-D-1	B93010003	B73010003	
70300 V, 15460 Hz	70300 V	VME421H-D-2	B93010004	B73010004	

¹⁾ Absolute values

Accessories

Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B 9806 0008



Rated insulation voltage	250 V
Rated impulse voltage/overvoltage category	4 kV/III
Pollution degree	3
Protective separation (reinforced insulation) between: Voltage test acc. to IEC 61010-1	(U1/+, U2/-) -(11-12-14) -(21-22-24)
	2.21 kV
Supply voltage	
VME421H-D-1:	
117	one (internally supplied by U_n : 9,6150 V)
VME421H-D-2:	
Supply voltage $U_{ extsf{S}}$ n Power consumption	none (internally supplied by U_n : 70300 V) \leq 6 VA
•	≤ 0 VA
Measuring circuit	15/050 470
Measuring range (rms value) (VME421H-D-1)	AC/DC 0150 V
Measuring range (rms value) (VME421H-D-2) Rated frequency f _n	AC/DC 0300 V DC, 15460 Hz
Frequency display range	10500 Hz**
	10500 112
Response values	
VME421H-D-1:	10/000
Undervoltage U < (Alarm 1)	AC/DC 9.6150 V
Overvoltage <i>U</i> > (Alarm 1) Preset function:	AC/DC 9.6150 V
Preset function: Undervoltage $U < (0.85 U_n)^*$ for $U_n = 120/60/24 V$	102/51/20.4 V
Overvoltage $U > (1.1 U_{\rm D})^*$ for $U_{\rm D} = 120/60/24 \text{ V}$	132/66/26.4 V
Resolution of setting <i>U</i> 9.649.9 V	0.1 V
Resolution of setting <i>U</i> 50150 V	1 V
VME421H-D-2:	
Undervoltage $U < (ALARM 2)$	AC/DC 70300 V
Overvoltage <i>U</i> > (ALARM 1)	AC/DC 70300 V
Resolution of setting U 70300 V	1 V
Preset function:	107/1031
Undervoltage $U < (0.85 U_n)^*$ for $U_n = 230/120 \text{ V}$ Overvoltage $U > (1.1 U_n)^*$ for $U_n = 230/120 \text{ V}$	196/102 V 253/132 V
VME421H:	255/ 152 V
Relative uncertainty voltage at 50/60 Hz	±1.5 %, ±2 digits
Relative uncertainty voltage in the range 15460 Hz	±3 %, ±2 digit
	140 % (5 %)*
Hysteresis <i>U</i>	140 % (3 %)
Juderfrequency Hz < Overfrequency Hz >	10500 Hz** 10500 Hz**
Underfrequency Hz < Overfrequency Hz > Resolution of setting f 10.099.9 Hz	10500 Hz*** 10500 Hz** 0.1 Hz
Underfrequency Hz < Overfrequency Hz > Resolution of setting f 10.099.9 Hz Resolution of setting f 100500 Hz	10500 Hz*** 10500 Hz** 0.1 Hz
Underfrequency Hz < Overfrequency Hz > Resolution of setting f 10.099.9 Hz Resolution of setting f 100500 Hz Preset function:	10500 Hz** 10500 Hz** 0.1 Hz 1 Hz
Underfrequency Hz < Overfrequency Hz > Overfrequency Hz > Resolution of setting f 10.099.9 Hz Resolution of setting f 100500 Hz Preset function: Underfrequency for f _n = 16.7 Hz / 50 Hz / 60 Hz / 400 H	10500 Hz** 10500 Hz** 0.1 Hz 1 Hz z 15.7 Hz / 49 Hz / 59 Hz / 399 Hz
Underfrequency Hz $<$ Overfrequency Hz $>$ Resolution of setting f 10.099.9 Hz Resolution of setting f 100500 Hz Preset function: Underfrequency for $f_n = 16.7 \text{Hz} / 50 \text{Hz} / 60 \text{Hz} / 400 \text{Hz}$ Overfrequency for $f_n = 16.7 \text{Hz} / 50 \text{Hz} / 60 \text{Hz} / 400 \text{Hz}$	10500 Hz** 10500 Hz** 0.1 Hz 1 Hz 2 15.7 Hz / 49 Hz / 59 Hz / 399 Hz 17.7 Hz / 51 Hz / 61 Hz / 401 Hz
Underfrequency Hz $<$ Overfrequency Hz $>$ Resolution of setting f 10.099.9 Hz Resolution of setting f 100500 Hz Preset function: Underfrequency for $f_n = 16.7 \text{ Hz} / 50 \text{ Hz} / 60 \text{ Hz} / 400 \text{ Hz}$ Overfrequency for $f_n = 16.7 \text{ Hz} / 50 \text{ Hz} / 60 \text{ Hz} / 400 \text{ Hz}$ Hysteresis frequency Hys Hz	10500 Hz** 10500 Hz** 0.1 Hz 1 Hz 2 15.7 Hz / 49 Hz / 59 Hz / 399 Hz 17.7 Hz / 51 Hz / 61 Hz / 401 Hz
Underfrequency Hz $<$ Overfrequency Hz $>$ Resolution of setting f 10.099.9 Hz Resolution of setting f 100500 Hz Preset function: Underfrequency for $f_n = 16.7$ Hz $/$ 50 Hz $/$ 60 Hz $/$ 400 Hz Overfrequency for $f_n = 16.7$ Hz $/$ 50 Hz $/$ 60 Hz $/$ 400 Hz Hysteresis frequency Hys Hz Relative uncertainty, frequency in the range of 1546	10500 Hz** 10500 Hz** 0.1 Hz 1 Hz 2 15.7 Hz / 49 Hz / 59 Hz / 399 Hz 17.7 Hz / 51 Hz / 61 Hz / 401 Hz
Underfrequency Hz $<$ Overfrequency Hz $>$ Resolution of setting f 10.099.9 Hz Resolution of setting f 100500 Hz Preset function: Underfrequency for $f_n = 16.7$ Hz $/$ 50 Hz $/$ 60 Hz $/$ 400 Hz Overfrequency for $f_n = 16.7$ Hz $/$ 50 Hz $/$ 60 Hz $/$ 400 Hz Hysteresis frequency Hys Hz Relative uncertainty, frequency in the range of 15466 Time response	10500 Hz** 10500 Hz** 0.1 Hz 1 Hz 2
Underfrequency Hz $<$ Overfrequency Hz $>$ Resolution of setting f 10.0 99.9 Hz Resolution of setting f 100 500 Hz Preset function: Underfrequency for $f_n = 16.7$ Hz $/$ 50 Hz $/$ 60 Hz $/$ 400 Hz Overfrequency for $f_n = 16.7$ Hz $/$ 50 Hz $/$ 60 Hz $/$ 400 Hz Hysteresis frequency Hys Hz Relative uncertainty, frequency in the range of 15 461 Fine response	10500 Hz** 10500 Hz** 0.1 Hz 1 Hz 2
Underfrequency Hz $<$ Overfrequency Hz $>$ Resolution of setting f 10.099.9 Hz Resolution of setting f 100500 Hz Preset function: Underfrequency for $f_n = 16.7$ Hz $/$ 50 Hz $/$ 60 Hz $/$ 400 Hz Overfrequency for $f_n = 16.7$ Hz $/$ 50 Hz $/$ 60 Hz $/$ 400 Hz Hysteresis frequency Hys Hz Relative uncertainty, frequency in the range of 15461 Fine response Start-up delay t Response delay t Response delay t	10500 Hz** 10500 Hz** 0.1 Hz 1 Hz 2
Inderfrequency Hz $<$ Overfrequency Hz $>$ Resolution of setting f 10.099.9 Hz Resolution of setting f 100500 Hz Resolution of setting f 100500 Hz Preset function: Underfrequency for $f_n = 16.7$ Hz $/$ 50 Hz $/$ 60 Hz $/$ 400 Hz Overfrequency for $f_n = 16.7$ Hz $/$ 50 Hz $/$ 60 Hz $/$ 400 Hz Hysteresis frequency Hys Hz Relative uncertainty, frequency in the range of 15461 Clime response Start-up delay t Response delay t Response delay t Response delay t Response delay t Response delay t	10500 Hz** 10500 Hz** 0.1 Hz 1 Hz z 15.7 Hz / 49 Hz / 59 Hz / 399 Hz 17.7 Hz / 51 Hz / 61 Hz / 401 Hz 0.12 Hz (0.2 Hz)* 0 Hz ±0.2 %, ±1 digit 0300 s (0 s)* 0300 s (0 s)*
Underfrequency Hz $<$ Overfrequency Hz $>$ Resolution of setting f 10.099.9 Hz Resolution of setting f 100500 Hz Preset function: Underfrequency for $f_n = 16.7$ Hz $/$ 50 Hz $/$ 60 Hz $/$ 400 Hz Overfrequency for $f_n = 16.7$ Hz $/$ 50 Hz $/$ 60 Hz $/$ 400 Hz Hysteresis frequency Hys Hz Relative uncertainty, frequency in the range of 15461 Filme response Start-up delay t Response delay $t_{0n1/2}$ Delay on release t_{off} Resolution of setting t , $t_{0n1/2}$, t_{off} (010 s)	10500 Hz** 10500 Hz** 0.1 Hz 1 Hz z 15.7 Hz / 49 Hz / 59 Hz / 399 Hz 17.7 Hz / 51 Hz / 61 Hz / 401 Hz 0.12 Hz (0.2 Hz)* 0 Hz 0300 s (0 s)* 0300 s (0 s)* 0300 s (0.5 s)*
Underfrequency Hz $<$ Overfrequency Hz $>$ Resolution of setting f 10.099.9 Hz Resolution of setting f 100500 Hz Preset function: Underfrequency for $f_n = 16.7 \text{ Hz} / 50 \text{ Hz} / 60 \text{ Hz} / 400 \text{ Hz}$ Overfrequency for $f_n = 16.7 \text{ Hz} / 50 \text{ Hz} / 60 \text{ Hz} / 400 \text{ Hz}$ Hysteresis frequency Hys Hz Relative uncertainty, frequency in the range of 15461 Fime response Start-up delay t Response delay $t_{0n1/2}$ Delay on release t_{off}	10500 Hz** 10500 Hz** 0.1 Hz 1 Hz z 15.7 Hz / 49 Hz / 59 Hz / 399 Hz 17.7 Hz / 51 Hz / 61 Hz / 401 Hz 0.12 Hz (0.2 Hz)* 0 Hz ±0.2 %, ±1 digit 0300 s (0 s)* 0300 s (0.5 s)* 0300 s (0.5 s)*
Underfrequency Hz $<$ Overfrequency Hz $>$ Resolution of setting f 10.099.9 Hz Resolution of setting f 100500 Hz Preset function: Underfrequency for $f_n = 16.7$ Hz $/$ 50 Hz $/$ 60 Hz $/$ 400 Hz Overfrequency for $f_n = 16.7$ Hz $/$ 50 Hz $/$ 60 Hz $/$ 400 Hz Hysteresis frequency Hys Hz Relative uncertainty, frequency in the range of 15460 Filme response Start-up delay t Response delay $t_{0.01/2}$ Delay on release t_{off} Resolution of setting t , $t_{0.01/2}$, t_{off} (010 s) Resolution of setting t , $t_{0.01/2}$, t_{off} (1099 s) Resolution of setting t , $t_{0.01/2}$, t_{off} (10300 s)	10500 Hz** 10500 Hz** 0.1 Hz 1 Hz z 15.7 Hz / 49 Hz / 59 Hz / 399 Hz 17.7 Hz / 51 Hz / 61 Hz / 401 Hz 0.12 Hz (0.2 Hz)* 0 Hz ±0.2 %, ±1 digit 0300 s (0.5)* 0300 s (0.5)* 0300 s (0.5 s)* 15.7 Hz / 61 Hz
Underfrequency Hz $<$ Overfrequency Hz $>$ Resolution of setting f 10.099.9 Hz Resolution of setting f 100500 Hz Preset function: Underfrequency for $f_n = 16.7$ Hz $/$ 50 Hz $/$ 60 Hz $/$ 400 Hz Overfrequency for $f_n = 16.7$ Hz $/$ 50 Hz $/$ 60 Hz $/$ 400 Hz Hysteresis frequency Hys Hz Relative uncertainty, frequency in the range of 15460 Filme response Start-up delay t Response delay $t_{on1/2}$ Delay on release t_{off} Resolution of setting t , $t_{on1/2}$, t_{off} (010 s) Resolution of setting t , $t_{on1/2}$, t_{off} (10099 s) Resolution of setting t , $t_{on1/2}$, t_{off} (100300 s) Operating time, voltage t_{ae} DC/AC 1	10500 Hz** 10500 Hz** 0.1 Hz 1 Hz z 15.7 Hz / 49 Hz / 59 Hz / 399 Hz 17.7 Hz / 51 Hz / 61 Hz / 401 Hz 0.12 Hz (0.2 Hz)* 0 Hz ±0.2 %, ±1 digit 0300 s (0.5)* 0300 s (0.5)* 0300 s (0.5)* 1.3 1.3 1.5 1.5 1.6 1.7 Hz: ≤ 130 ms, AC 42460 Hz: ≤ 70 ms AC 15460 Hz: ≤ 310 ms
Underfrequency Hz $<$ Overfrequency Hz $>$ Resolution of setting f 10.099.9 Hz Resolution of setting f 100500 Hz Preset function: Underfrequency for $f_n = 16.7$ Hz $/$ 50 Hz $/$ 60 Hz $/$ 400 Hz Overfrequency for $f_n = 16.7$ Hz $/$ 50 Hz $/$ 60 Hz $/$ 400 Hz Hysteresis frequency Hys Hz Relative uncertainty, frequency in the range of 1546 Fime response Start-up delay f Response delay $f_{on1/2}$ Delay on release f_{off} Resolution of setting $f_{on1/2}$, f_{off} (010 s) Resolution of setting $f_{on1/2}$, f_{off} (1099 s) Resolution of setting $f_{on1/2}$, f_{off} (100300 s) Operating time, voltage f_{ae} DC/AC 1 Deperating time frequency f_{ae} Response time f_{an}	10500Hz^{**} 10500Hz^{**} 0.1Hz 1Hz 1Hz $2 15.7 \text{Hz} / 49 \text{Hz} / 59 \text{Hz} / 399 \text{Hz}$ $17.7 \text{Hz} / 51 \text{Hz} / 61 \text{Hz} / 401 \text{Hz}$ $0.12 \text{Hz} (0.2 \text{Hz})^*$ $0 \text{Hz} 2.2 \%, \pm 1 \text{digit}$ $0300 \text{s} (0.5)^*$
Underfrequency Hz $<$ Overfrequency Hz $>$ Resolution of setting f 10.099.9 Hz Resolution of setting f 100500 Hz Preset function: Underfrequency for $f_n = 16.7$ Hz $/$ 50 Hz $/$ 60 Hz $/$ 400 Hz Overfrequency for $f_n = 16.7$ Hz $/$ 50 Hz $/$ 60 Hz $/$ 400 Hz Hysteresis frequency Hys Hz Relative uncertainty, frequency in the range of 1546 Fime response Start-up delay f Response delay $f_{on1/2}$ Delay on release f_{off} Resolution of setting $f_{on1/2}$, f_{off} (010 s) Resolution of setting $f_{on1/2}$, f_{off} (1099 s) Resolution of setting $f_{on1/2}$, f_{off} (1099 s) Resolution of setting $f_{on1/2}$, f_{off} (100300 s) Operating time, voltage f_{ae} DC/AC 1 Deparating time frequency f_{ae} Response time f_{an} Discharging time energy backup on power failure (VME-	10500 Hz** 10500 Hz** 0.1 Hz 1 Hz z 15.7 Hz / 49 Hz / 59 Hz / 399 Hz 17.7 Hz / 51 Hz / 61 Hz / 401 Hz 0.12 Hz (0.2 Hz)* 0 Hz $\pm 0.2\%$, ± 1 digit 0300 s (0.5)* 0300 s (0.5)* 0300 s (0.5)* 1.5 6.7 Hz: ≤ 130 ms, AC 42460 Hz: ≤ 70 ms AC 15460 Hz: ≤ 310 ms $t_{an} = t_{ae} + t_{on}1/2$ 421H-D-1)
Underfrequency Hz $<$ Overfrequency Hz $>$ Resolution of setting f 10.099.9 Hz Resolution of setting f 100500 Hz Preset function: Underfrequency for $f_n = 16.7$ Hz $/$ 50 Hz $/$ 60 Hz $/$ 400 Hz Overfrequency for $f_n = 16.7$ Hz $/$ 50 Hz $/$ 60 Hz $/$ 400 Hz Hysteresis frequency Hys Hz Relative uncertainty, frequency in the range of 1546 Fime response Start-up delay t Response delay $t_{on1/2}$ Delay on release t_{off} Resolution of setting t , $t_{on1/2}$, t_{off} (010 s) Resolution of setting t , $t_{on1/2}$, t_{off} (1099 s) Resolution of setting t , $t_{on1/2}$, t_{off} (100300 s) Operating time, voltage t_{ae} Departing time frequency t_{ae} Response time t_{an} Discharging time energy backup on power failure (VME-Discharging time energy backup on power failure (VME	10500 Hz** 10500 Hz** 10500 Hz** 0.1 Hz 1 Hz z 15.7 Hz / 49 Hz / 59 Hz / 399 Hz 17.7 Hz / 51 Hz / 61 Hz / 401 Hz 0.12 Hz (0.2 Hz)* 0 Hz $\pm 0.2\%$, ± 1 digit 0300 s (0.5)* 0300 s (0.5)* 0300 s (0.5)* 1.5 1.5 1.6.7 Hz: ≤ 130 ms, AC 42460 Hz: ≤ 70 ms AC 15460 Hz: ≤ 310 ms $t_{an} = t_{ae} + t_{on}1/2$ 421H-D-1) 3.5
Underfrequency Hz $<$ Overfrequency Hz $>$ Resolution of setting f 10.099.9 Hz Resolution of setting f 100500 Hz Preset function: Underfrequency for $f_n = 16.7$ Hz $/$ 50 Hz $/$ 60 Hz $/$ 400 Hz Overfrequency for $f_n = 16.7$ Hz $/$ 50 Hz $/$ 60 Hz $/$ 400 Hz Hysteresis frequency Hys Hz Relative uncertainty, frequency in the range of 1546 Fime response Start-up delay t Response delay $t_{on1/2}$ Delay on release t_{off} Resolution of setting t , $t_{on1/2}$, t_{off} (010 s) Resolution of setting t , $t_{on1/2}$, t_{off} (1099 s) Resolution of setting t , $t_{on1/2}$, t_{off} (100300 s) Operating time, voltage t_{ae} Departing time frequency t_{ae} Response time t_{an} Discharging time energy backup on power failure (VME-Discharging time energy backup on power failure (VME	10500Hz^{**} 10500Hz^{**} 0.1Hz 0.1Hz 1Hz $2 15.7 \text{Hz} / 49 \text{Hz} / 59 \text{Hz} / 399 \text{Hz}$ $17.7 \text{Hz} / 51 \text{Hz} / 61 \text{Hz} / 401 \text{Hz}$ $0.12 \text{Hz} (0.2 \text{Hz})^*$ $0 \text{Hz} 20.2 \%, \pm 1 \text{digit}$ $0300 \text{s} (0.5)^*$ $0300 s$
Underfrequency Hz < Overfrequency Hz > Resolution of setting f 10.099.9 Hz Resolution of setting f 10.099.9 Hz Resolution of setting f 100500 Hz Preset function: Underfrequency for f _n = 16.7 Hz / 50 Hz / 60 Hz / 400 Hz Overfrequency for f _n = 16.7 Hz / 50 Hz / 60 Hz / 400 Hz Hysteresis frequency Hys Hz Relative uncertainty, frequency in the range of 1546 Fime response Start-up delay t Response delay ton1/2 Delay on release toff Resolution of setting t, ton1/2, toff (1010 s) Resolution of setting t, ton1/2, toff (1099 s) Resolution of setting t, ton1/2, toff (1099 s) Resolution of setting t, ton1/2, toff (10300 s) Operating time, voltage tae Departing time frequency tae Response time tan Discharging time energy backup on power failure (VME- Discharging time energy backup on power failure (VME- Discharging time energy backup (VME421H-D-2)	10500 Hz** 10500 Hz** 0.1 Hz 1 Hz z 15.7 Hz / 49 Hz / 59 Hz / 399 Hz 17.7 Hz / 51 Hz / 61 Hz / 401 Hz 0.12 Hz (0.2 Hz)* 0 Hz ±0.2 %, ±1 digit 0300 s (0.5)* 0300 s (0.5)* 0300 s (0.5)* 1s 1s 1os 6.7 Hz: ≤ 130 ms, AC 42460 Hz: ≤ 70 ms AC 15460 Hz: ≤ 310 ms tan = tae +ton1/z 421H-D-1) 3 s 421H-D-1) 2.5 s at fn < 42 Hz ≥ 4 s at DC 70 V ≥ 6 s at DC 80 V/AC 70 V
Underfrequency Hz $<$ Overfrequency Hz $>$ Resolution of setting f 10.099.9 Hz Resolution of setting f 100500 Hz Preset function: Underfrequency for $f_n = 16.7$ Hz $/$ 50 Hz $/$ 60 Hz $/$ 400 Hz Overfrequency for $f_n = 16.7$ Hz $/$ 50 Hz $/$ 60 Hz $/$ 400 Hz Hysteresis frequency Hys Hz Relative uncertainty, frequency in the range of 15460 Filme response Start-up delay t Response delay $t_{0.01/2}$ Delay on release t_{off} Resolution of setting t , $t_{0.01/2}$, t_{off} (010 s) Resolution of setting t , $t_{0.01/2}$, t_{off} (1099 s) Resolution of setting t , $t_{0.01/2}$, t_{off} (10300 s)	10500 Hz** 10500 Hz** 0.1 Hz 1 Hz z 15.7 Hz / 49 Hz / 59 Hz / 399 Hz 17.7 Hz / 51 Hz / 61 Hz / 401 Hz 0.12 Hz (0.2 Hz)* 0 Hz $\pm 0.2\%$, ± 1 digit 0300 s (0.5)* 0300 s (0.5)* 0300 s (0.5)* 1 s 1 s 10 s 6.7 Hz: ≤ 130 ms, AC 42460 Hz: ≤ 70 ms AC 15460 Hz: ≤ 310 ms $t_{an} = t_{ae} + t_{on1/2}$

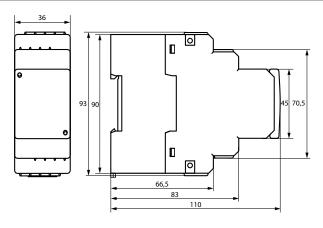
Displays, memory					
Display	LC	display, mu	ltifunction	nal, not illu	minated
Display range measured value (VME421H-D- 1)			AC/DC 0	150
Display range measured value (VME421H-D- 2)			AC/DC 0	
Operating uncertainty at 50/60 Hz				±1.5 %, =	
Operating uncertainty voltage in the range of				±3 %, =	
Operating uncertainty in the frequency range				±0.2 %,	
History memory (HiS) for the first alarm value			data recor	rd measure	
Password Fault memory (M) alarm relay				off/09	,
				UII/UII/C	oli (oli)
Switching elements		2.4			()/4 //2
Number		2 x 1		er contacts	
Operating principle K2: Err, $U < U >$, Hz <	∠ U ₇ \ C AI	(undorvolt		tion/N/O o	•
K2: E11, U <, U >, H2 K1: Err, U <, U >, Hz			-		
Electrical endurance, number of cycles	. < , 11∠ ∕, 3.∧L	. (UVEI VUIL	ige 0 /. N	70 operaci	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
Rated operational current	5 A	3 A	1 A	0.2 A	0.1
Minimum contact rating			1 n	nA at AC/D	C ≥ 10
Environment/EMC					
EMC				IEC	61326-
Operating temperature				-25	.+55°
Classification of climatic conditions acc. 1	to IEC 60721				
Stationary use (IEC 60721-3-3)	3K23 (ex	cept conde	nsation an	d formatio	n of ice
Transport (IEC 60721-3-2)	2K11 (ex	cept conde	nsation an	d formatio	n of ice
Long-term storage (IEC 60721-3-1)	1K22 (ex	cept conde	nsation an	d formatio	n of ice
Classification of mechanical conditions a	cc. to IEC 607	21			
Stationary use (IEC 60721-3-3)					3M1
Transport (IEC 60721-3-2)					2M4
Long-term storage (IEC 60721-3-1)					1M12
Connection					
Connection type	scr	ew-type te	rminal or i	push-wire	termina
Connection		,,,		screw te	
Connection properties				sciew te	ııııııaı
rigid/ flexible	(0.24/0	.22.5 m	ım² / AWG	241
Multi-conductor connection (2 conductors wit					
rigid/ flexible		0.2	21.5 mr	n² / 0.2	1.5 mm
Stripping length				8.	9 mn
Tightening torque				0.5	.0.6 Nn
Connection			pus	h-wire te	rminal
Connection properties					
rigid		0.	22.5 m	m² (AWG 2	2414
flexible		^-	r 2r	? (ANIC ·	10 14
without ferrules with ferrules				m ² (AWG 1	
Stripping length		0.	۷۱.۵ M	m² (AWG 2	416 10 mn
Opening force					501
Test opening, diameter					2.1 mn
Other Operating mode				ntinuous o	noratio
Operating mode Mounting			CO	ntinuous o	peratioi positioi
Mounting Degree of protection, internal components (DI	IN FN 605291			aily	IP3
Degree of protection, internal components (DIN EN 60529					IP20

·	
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
Screw mounting	2 x M4 with mounting clip
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Documentation number	D00141
Weight	≤ 240 g

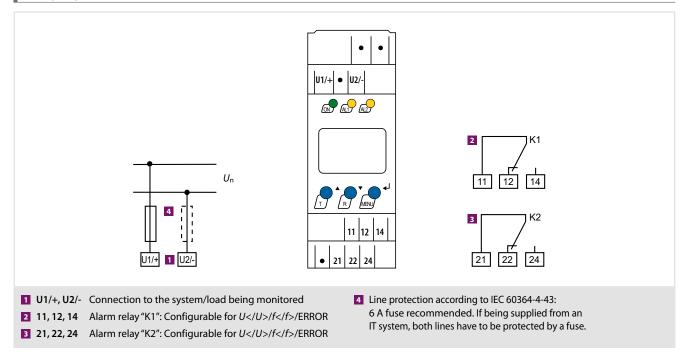
()* = factory setting



^{** =} The technical data applies to the operating range of the rated frequency 15...460 Hz only.



Wiring diagram



LINETRAXX® VMD258

Undervoltage/overvoltage relay for monitoring three-phase AC systems (window function) for power plant applications



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: $0.7...0.95 \times U_n / 1.05...1.3 \times U_n$
- Nominal system voltages: 3AC 690/500/480/440/400/230/110/100 V
- Adjustable response delay: 0...5 s
- LEDs for operation, overvoltage, undervoltage

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

Standards

The LINETRAXX® VMD258 series complies with the requirements of the device standards:

- DIN EN 60255-1 VDE 0435-300
- E DIN IEC 60255-127 VDE 0435-3127.

Further information

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

Approvals



Ordering details

Connection	Туре	Art. No.
3AC, 100 V	VMD258 3AC 100 V	B93010060
3AC, 110 V	VMD258 3AC 110 V	B93010061
3AC, 230 V	VMD258 3AC 230 V	B93010062
3AC, 400 V	VMD258 3AC 400 V	B93010063
3AC, 440 V	VMD258 3AC 440 V	B93010064
3AC, 480 V	VMD258 3AC 480 V	B93010065
3AC, 500 V	VMD258 3AC 500 V	B93010066
3AC, 690 V	VMD258 3AC 690 V	B93010067

Accessories

Suitable system components

Description	Art. No.	Description	Туре	Art. No.	Page
Additional mounting clips (screw mounting)	B98060008	Energy backup	ES258	B93010068	303



6.2

IP20 polycarbonate

UL94 V-0 IEC 60715

4 x M4 D00068

825 g

Supply voltage U_S AC (V)	690	48	30/500	40	0/440	230	100)/110
Rated voltage AC (V)	1000		1000		600	300		150
Rated impulse voltage (kV)	12		12		8	6		
Pollution degree								3
Overvoltage category								II
Voltage ranges								
Frequency range of U_S						4	56	56 Hz
Operating range						0.5	1.5	x U
Nominal supply voltage U _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 $U_{\rm S}$ (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/	110/1	۱00 ا
Setting range						0.7.	1.3	x Ur
Frequency range U _n						4	56	56 Hz
Max. permissible measuring voltage							1.5	x Ur
Response value U_n adjustable							U>	·, U<
Response values								
Undervoltage $U <$ (alarm)						0.7	.0.95	x Ur
Overvoltage $U >$ (alarm)						1.05.	1.3	x Ur
Relative uncertainty at the setting limits						4566	Hz: :	±3 %
					47	,563	Hz: ±	±2 %
Hysteresis							<	3 %
Repetition accuracy							=	±1%
LED ON							ED (gı	
Alarm for <i>U</i> <							D (ye	
Alarm for <i>U</i> >						LE	D (ye	llow)
Time response								
Start-up delay <i>t</i>						500 ı	ms ±	20 %
Response delay ton							5 s ±	
Delay on release toff							ms ±	
Operating time t_{ae} at overvoltage							ıs* ±	
Operating time t_{ae} at undervoltage						100 m		
Response time t _{an}						t _{an} :	= t _{ae}	
Long-term influence								10 %
Overshoot time tov							< 6	0 ms
Connection for external energy storage	device							
U _{min}								24 V
U _{max}								68 \
U _{typ} at 1.0 x U _n						4247		
Short circuit proof (Z+, Z-)						sho	rt tim	e yes

Number of switching elements			2 x 2 cl	nangeover	contacts
Operating mode N/C op			J		
				ation (over	
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-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 <i>A</i>
Minimum current			1 m	nA at AC/D	C > 10 V
Environment/EMC					
EMC immunity			a	cc. to IEC 6	0255-26
EMC emission			a	cc. to IEC 6	0255-25
Operating temperature				-20	.+70°C
Classification of climatic conditions acc.	to DIN IEC 60	721-3-3			
Stationary use					3K23
Transport					2K1
Long-term storage					1K22
Classification of mechanical conditions	acc. to IEC 607	21			
Stationary use					3M11
Transport					2M ²
Long-term storage					1M12
Requirements acc. to IEC 60255					Class 2
Connection					
Connection				screw t	erminals
Connection properties					-
rigid/flexible					2.5 mm
flexible with connector sleeve				0.25	
without/with plastic sleeve				0.25	
Conductor sizes					2413
Tightening torque					.0.6 Nm
Current through L1L1, L2L2 , L3L3				eacn	max. 3 A
Other					
Operating mode			CO	ntinuous o	
Position	NII PH 40 FF - '			any	position
Degree of protection, internal components (I	JIN EN 60529)				IP30

* Operating time t_{ae} overvoltage increase from 100 % to 130 %, switching threshold at 105 %

Degree of protection, terminals (DIN EN 60529)

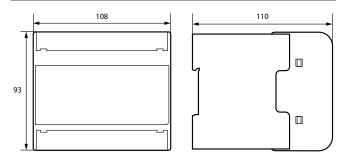
Enclosure material Flammability class

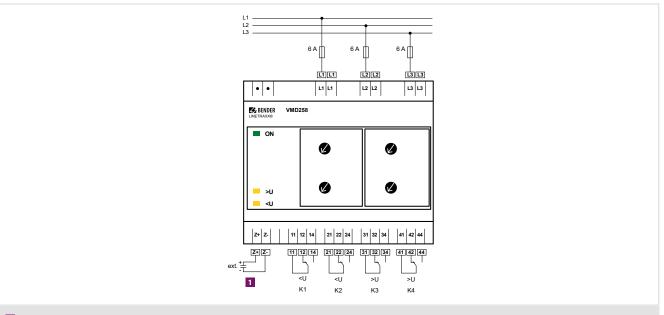
DIN rail mounting acc. to Screw mounting

Documentation number

** Operating time t_{ae} undervoltage decrease from 100 % to 0 %, switching threshold at 95 %

Dimension diagram (dimensions in mm)





1 Z+, Z- Connection ES258 for a backup time of > 5 s

ES258

Energy backup for undervoltage/overvoltage relays



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

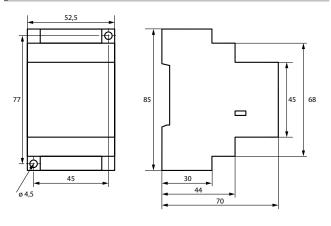
Environment/EMC

EMC immunity	acc. to IEC 61000-6-2
EMC emission	acc. to IEC 61000-6-4
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

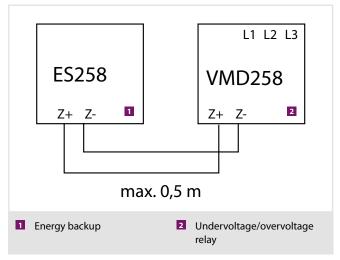
Other

Operating mode	continuous aparation
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.

Approvals







Ordering information

Supply voltage ¹⁾ <i>U</i> s			Type	Art.	No.
AC	DC	AC/DC		Screw-type terminal	Push-wire terminal
1672 V	9.694 V, 15460 Hz	-	VMD420-D-1	B93010005	B73010005
-	-	70300 V, 15460 Hz	VMD420-D-2	B93010006	B73010006

¹⁾ Absolute values

Accessories

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



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Insulation coordination acc. to IEC 60664-1/IEC 60664-3		Switching elements					
Rated insulation voltage	400 V	Number		2 x 1	changeove	er contacts	(K1, K2)
Rated impulse voltage/pollution degree	4 kV/III	Operating principle		N/C operat	ion n.c. or	N/O opera	tion n.o
Protective separation (reinforced insulation) between		K2: Err, $U <$, $U >$, Asy, Hz <, Hz >, PHS,	S.AL (undervoltage	U <, asym	metry Asy,	N/C operati	on n.c.)
(A1, A2) -(N, L1, L	2, L3) -(11, 12, 14) -(21, 22, 24)	K1: Err, $U <$, $U >$, Asy, Hz $<$, Hz $>$, PHS	, S.AL (overvoltage	U >, asymr	netry Asy, N	1/0 operati	on n.o.)*
Voltage test acc. to IEC 61010-1:		Electrical endurance, number of cycles					10,000
(N, L1, L2, L3) -(A1, A2), (11, 12, 14)	3.32 kV	Contact data acc. to IEC 60947-5-1:					
(N, L1, L2, L3) -(21, 22, 24)	2.21 kV	Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-12
(A1, A2) -(11, 12, 14) -(21, 22, 24)	2.21 kV	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
Supply voltage		Minimum contact load (relay manufactur		371		nA at AC/D	
VMD420-D-1:		contact road (real) managed	er s rererence,		• • • •		
Supply voltage U _s	AC 1672 V/DC 9.694 V	Environment/EMC					
Frequency range U _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 $U_{\rm S}$	15460 Hz	Transport					.+70 °C
Power consumption	≤ 4 VA	Storage					.+55 °C
r ower consumption		Classification of climatic conditions	acc to IEC 60721				
Measuring circuit		(related to temperature and relative hun					
Measuring range (rms value) (L-N)	AC 0288 V	Stationary use (IEC 60721-3-3)		3 (no cond	ensation n	n formatio	n of ice
Measuring range (rms value) (L-L)	AC 0500 V	Transport (IEC 60721-3-3)	JIVZ	o (110 COIIU	insucion, I	o ivilladi	2K11
Input impedance (burden) L1-N, L2-N, L3-N	1 ΜΩ	Long-term storage (IEC 60721-3-1)					1K22
Input impedance (burden) N	n.a.			774			11142
Rated frequency f _n	15460 Hz	Classification of mechanical condition	ns acc. to IEC 60	/21			21144
Frequency display range	10500 Hz	Stationary use (IEC 60721-3-3)					3M11
Desmanas valvas		Transport (IEC 60721-3-2)					2M4
Response values		Long-term storage (IEC 60721-3-1)					1M12
Type of distribution system	3(N)AC/3AC (3AC)*	Option "W" data different from the					
Undervoltage $U < (Alarm 2)$ (measurement method: 3Ph/3n)	AC 6500/6288 V	Classification of climatic conditions acc. t					
Overvoltage <i>U</i> > (Alarm 1) (measurement method: 3Ph/3n)	AC 6500/6288 V	Stationary use (IEC 60721-3-3)	3K23 (conde	nsation an	d formatio	n of ice is p	oossible)
Resolution of setting <i>U</i>	1V	Classification of mechanical conditions ac	cc. to IEC 60721:				2114
Preset function for 3AC measurement:	240/177.	Stationary use (IEC 60721-3-3)					3M12
Undervoltage U < (0.85 Un)* for Un = 400/208 V Overvoltage U > (1.1 Un)* for Un = 400/208 V	340/177 V 440/229 V	Connection					
Preset function for 3(N)AC measurement:	440/229 V	Connection type	scr	ew-type te	rminal or i	nush-wire	termina
Undervoltage $U < (0.85 U_{\rm n})^*$ for $U_{\rm n} = 230/120 \text{ V}$	196/102 V	· · · · · · · · · · · · · · · · · · ·		, pe			
Overvoltage $U > (1.1 U_n)^*$ for $U_n = 230/120 \text{ V}$	253/132 V	Connection				screw te	rminais
Asymmetry	530 % (30 %)*	Connection properties			0.24 mı	m? (AMC)	4 12)
Phase failure	by setting the asymmetry	rigid flexible			2 2.5 m	•	,
	se/anticlockwise rotation (off)*	Two conductors with the same cross sect	ion	U	22.3 111	III (AWU 2	.414
Relative uncertainty, voltage at 50/60 Hz	±1.5 %, ±2 digits	rigid/flexible	1011	٥	21.5 m	m² (AWG 1	0/ 16)
Relative uncertainty, voltage in the range 15460 Hz	±3 %, ±2 digits	Stripping length			21.5 111	, .	9 mm
Hysteresis <i>U</i>	140 % (5 %)*	Tightening torque, terminal screws					.0.6 Nm
Underfrequency Hz <	10500 Hz**						
Overfrequency Hz >	10500 Hz**	Connection			pus	h-wire te	rminais
Resolution of setting $f(10.099.9 \text{ Hz})$	0.1 Hz	Connection properties		0	2 25	? (AVVC :	14 14
Resolution of setting $f(100500 \text{ Hz})$	1 Hz	rigid Havibla		0	22.5 m	m² (AWG 2	2414)
Preset function:		flexible		0.7	r 25	? (ANIC :	10 14)
Underfrequency for $f_0 = 16,7/50/60/400 \text{ Hz}$	15.7/49/59/399 Hz	without ferrules			52.5 m		
Overfrequency for $f_n = 16,7/50/60/400 \text{ Hz}$	17.7/51/61/401 Hz	with ferrules		U	21.5 m	m² (AWG 2	
Hysteresis, frequency Hys Hz	0.12 Hz (0.2 Hz)*	Stripping length Opening force					10 mm
Relative uncertainty, frequency range 15460 Hz	±0.2 %, ±1 digit	Test opening, diameter					50 N
Specified time	±0.2 /0, ±1 digit	Other					2.1 mm
Start-up delay t	0300 s (0 s)*	Operating mode				ntinuous o	noration
Response delay t _{on1/2}	0300 s (0 s)*	Mounting			CO		position
Delay on release toff	0300 s (0.5 s)*	Degree of protection, internal componen	ts (DIN FN 60520)			aily	IP30
,		Degree of protection, terminals (DIN EN 6					IP20
Resolution of setting t , $t_{on1/2}$, t_{off} (010 s)	0.1 s	Pearce or protection, terrillian (DIN EN C	,,,,,,			nolve	arbonate
	0.1 s 1 s					שטועני	
Resolution of setting t , $t_{on1/2}$, t_{off} (1099 s)		Enclosure material					JI 94 V-0
Resolution of setting t , $t_{on1/2}$, t_{off} (1099 s) Resolution of setting t , $t_{on1/2}$, t_{off} (100300 s)	1 s	Enclosure material Flammability class				·	JL94 V-0
Resolution of setting t , $t_{on1/2}$, t_{off} (1099 s) Resolution of setting t , $t_{on1/2}$, t_{off} (100300 s) Operating time, voltage t_{ae}	1 s 10 s ≤ 140 ms	Enclosure material Flammability class DIN rail mounting acc. to			2 v MA	l IE	C 60715
Resolution of setting t , $t_{on1/2}$, t_{off} (1099 s) Resolution of setting t , $t_{on1/2}$, t_{off} (100300 s) Operating time, voltage t_{ae} Operating time, frequency t_{ae}	1 s 10 s ≤ 140 ms ≤ 335 ms	Enclosure material Flammability class DIN rail mounting acc. to Screw mounting			2 x M4	·	C 60715 ting clip
Resolution of setting <i>t</i> , <i>t</i> _{on1/2} , <i>t</i> _{off} (1099 s) Resolution of setting <i>t</i> , <i>t</i> _{on1/2} , <i>t</i> _{off} (100300 s) Operating time, voltage <i>t</i> _{ae} Operating time, frequency <i>t</i> _{ae} Response time <i>t</i> _{an}	$ \begin{array}{c} 1 \text{ s} \\ 10 \text{ s} \\ \leq 140 \text{ ms} \\ \leq 335 \text{ ms} \\ t_{an} = t_{ae} + t_{on1/2} \end{array} $	Enclosure material Flammability class DIN rail mounting acc. to Screw mounting Documentation number			2 x M4	l II with mour	C 60715 iting clip D00137
Resolution of setting t , $t_{\rm on1/2}$, $t_{\rm off}$ (1099 s) Resolution of setting t , $t_{\rm on1/2}$, $t_{\rm off}$ (100300 s) Operating time, voltage $t_{\rm ae}$ Operating time, frequency $t_{\rm ae}$ Response time $t_{\rm an}$ Recovery time $t_{\rm b}$	1 s 10 s ≤ 140 ms ≤ 335 ms	Enclosure material Flammability class DIN rail mounting acc. to Screw mounting Documentation number Weight			2 x M4	l II with mour	C 60715 ting clip
Resolution of setting <i>t</i> , <i>t</i> _{on1/2} , <i>t</i> _{off} (1099 s) Resolution of setting <i>t</i> , <i>t</i> _{on1/2} , <i>t</i> _{off} (100300 s) Operating time, voltage <i>t</i> _{ae} Operating time, frequency <i>t</i> _{ae} Response time <i>t</i> _{an} Recovery time <i>t</i> _b	$ \begin{array}{c} 1 \text{ s} \\ 10 \text{ s} \\ \leq 140 \text{ ms} \\ \leq 335 \text{ ms} \\ t_{an} = t_{ae} + t_{on1/2} \\ \leq 300 \text{ ms} \end{array} $	Enclosure material Flammability class DIN rail mounting acc. to Screw mounting Documentation number Weight ()* = factory setting	cured in the operate	ing range o		l II with mour	C 60715 iting clip D00137
Resolution of setting t, t _{on1/2} , t _{off} (010 s) Resolution of setting t, t _{on1/2} , t _{off} (1099 s) Resolution of setting t, t _{on1/2} , t _{off} (100300 s) Operating time, voltage t _{ae} Operating time, frequency t _{ae} Response time t _{an} Recovery time t _b Displays, memory Display LC display, I Display range measured value	$ \begin{array}{c} 1 \text{ s} \\ 10 \text{ s} \\ \leq 140 \text{ ms} \\ \leq 335 \text{ ms} \\ t_{an} = t_{ae} + t_{on1/2} \end{array} $	Enclosure material Flammability class DIN rail mounting acc. to Screw mounting Documentation number Weight	sured in the operati	ing range o		l II with mour	C 60715 iting clip D00137

 $\pm 1.5\,\%$, 2 digits

±3 %, ±2 digits

±0.2 %, ±1 digit data record measured values off/0...999 (off/ 0)*

on/off/con (on)*



Fault memory (M) alarm relay

Operating uncertainty, voltage at 50 Hz/60 Hz

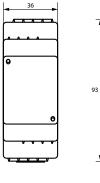
History memory (HiS) for the first alarm value

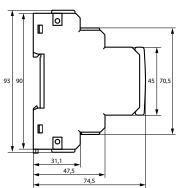
Password

Operating uncertainty voltage in the range of 15...460 Hz

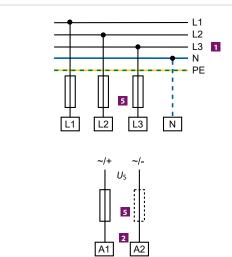
Operating uncertainty, frequency in the range of 15...460 Hz

frequency 15...460 Hz.





Wiring diagram



N • A1 A2

- 1 L1, L2, L3, (N) Connection to the system/load to be monitored
- **2** A1, A2 Supply voltage U_s (see ordering information)
- **11, 12, 14** Alarm relay "K1": Configurable for U < U > f < f > Asy/PHS/ERROR
- 4 21, 22, 24 Alarm relay "K2":

 Configurable for U</U>/f</f>/Asy/PHS/ERROR
- 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.

U**.**Z

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

Approvals







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

Further information

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

Ordering information

Nominal system voltage ¹⁾	Type	Art	No.
3(N)AC	,,,,,	Screw-type terminal	Push-wire terminal
70500 V, 15460 Hz	VMD421H-D-3	B93010007	B73010007

¹⁾ Absolute values

Accessories

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



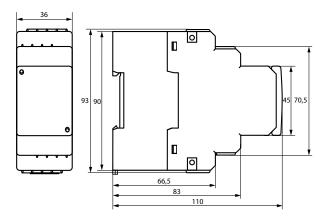
Technical data			
Insulation coordination acc. to IEC 60664-1/IEC 60664-3		Switching elements	
Rated insulation voltage	400 V	Number	2 x 1 changeover contacts (K1, K2)
Rated impulse voltage/pollution degree	4 kV/3	Operating principle	N/C operation n.c. or N/O operation n.o.
Overvoltage category		. 5	ndervoltage $U <$, asymmetry Asy, N/C operation n.c.)*
Protective separation (reinforced insulation) between			overvoltage $U >$, asymmetry Asy, N/O operation n.o.)*
(N, L1, L2, L3) -(11, 12, 14) -(21, 22, 24)		Electrical endurance, number of cycles	10,000
Voltage test acc. to IEC 61010-1:		Fault memory	on/off (on)*
(N, L1, L2, L3) -(11, 12, 14)	3.32 kV	•	011, 011 (011)
(N, L1, L2, L3) -(21, 22, 24)	2.21 kV	Contact data acc. to IEC 60947-5-1	1642 1644 2642 2642
(1), (1), (1), (1), (1), (1), (1), (1),	Z.Z.I.KY	Utilisation category	AC-13 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 <i>U</i> s	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 V
		Environment/EMC	
Measuring circuit		EMC	IEC 61326-1
Measuring range (rms value) (L-N)	AC 0288 V	Operating temperature	-25+55 °C
Measuring range (rms value) (L-L)	AC 0500 V	· · · ·	
Rated frequency f _n	15460 Hz	Classification of climatic conditions acc. to I	EC 60721
Frequency display range	10500 Hz	Stationary use (IEC 60721-3-3)	3K23 (no condensation, no formation of ice)
Pasmansa valuas		Transport (IEC 60721-3-2)	2K11
Response values		Long-term storage (IEC 60721-3-1)	1K22
Type of distribution system	3(N)AC/3AC (3AC)*	Classification of mechanical conditions acc.	to IFC 60721
Undervoltage $U < (Alarm 2)$ (measurement method: 3Ph/3n)	AC 70500/70288 V	Stationary use (IEC 60721-3-3)	3M11
Overvoltage $U >$ (Alarm 1) (measurement method: 3Ph/3n)	AC 70500 V/70288 V	Transport (IEC 60721-3-2)	2M4
Resolution of setting U	1 V	Long-term storage (IEC 60721-3-1)	1M12
Preset function for 3AC measurement:		Long term storage (IEC 00721 3 1)	IIWIZ
Undervoltage $U < (0.85 U_n)^*$ for $U_n = 400/208 V$	340/177 V	Connection	
Overvoltage $U > (1.1 U_{\rm n})^*$ for $U_{\rm n} = 400/208 \rm V$	440/229 V	Connection type	screw-type terminal or push-wire terminal
Preset function for 3(N)AC measurement:			· · · · · · · · · · · · · · · · · · ·
Undervoltage $U > (0.85 U_{\rm n})^*$ for $U_{\rm n} = 230/120 \rm V$	196/102 V	Connection	screw terminals
Overvoltage $U > (1.1 U_n)^*$ for $U_n = 230/120 \text{ V}$	253/132 V	Connection properties	0.2 4 2/AMC 24 12)
Asymmetry	530 % (30 %)*	rigid	0.24 mm² (AWG 24 12)
Phase failure	by setting the asymmetry	flexible	0.22.5 mm ² (AWG 2414)
Phase sequence clock	kwise/anticlockwise rotation (off)*	Two conductors with the same cross section	20.45.2/11/524.40
Relative uncertainty, voltage at 50/60 Hz	±1.5 %, ±2 digits	rigid/flexible	0.21.5 mm ² (AWG 2416)
Relative uncertainty voltage in the range 15460 Hz	±3 %, ±2 digits	Stripping length	8 mm
Hysteresis <i>U</i>	140 % (5 %)*	Tightening torque, terminal screws	0.50.6 Nm
Underfrequency Hz <	10500 Hz	Connection	push-wire terminals
Overfrequency Hz >	10500 Hz	Connection properties	
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	
By preset function :		without ferrules	0.752.5 mm ² (AWG 1914)
Underfrequency for $f_0 = 400/60/50/16.7 \text{ Hz}$	399/59.5/49.5/16.2 Hz	with ferrules	0.21.5 mm ² (AWG 2416)
Overfrequency for $f_n = 400/60/50/16.7 \text{ Hz}$	401/60.5/50.5/17.2 Hz	Stripping length	10 mm
Hysteresis frequency Hys Hz	0.22 Hz (0.2 Hz)*	Opening force	50 N
Relative uncertainty, frequency in the range of 15460 Hz	±0.2 %, ±1 digit	Test opening, diameter	2.1 mm
Time response		Other	
Start-up delay <i>t</i>	0300 s (0 s)*	Operating mode	continuous operation
Response delay t _{on1/2}	0300 s (0 s)*	Mounting position	vertically, see dimension diagram
Delay on release t _{off}	0300 s (0.5 s)*	Degree of protection, internal components (IEC 60	0529) IP30
Operating time, voltage t _{ae}	≤ 140 ms	Degree of protection, terminals (IEC 60529)	IP30
Operating time, frequency t_{ae}	≤ 335 ms	Enclosure material	polycarbonate
Response time t _{an}	$t_{\rm an} = t_{\rm ae} + t_{\rm on1/2}$	Screw mounting	2 x M4 with mounting clip
Discharging time energy backup on power failure	2.5 s	DIN rail mounting acc. to	IEC 60715
Charging time energy storage	60 s	Flammability class	UL94 V-0
Recovery time $t_{\rm b}$	≤ 300 ms	Documentation number	D00138
•		Weight	≤ 240 g
Displays, memory			
• • • • • • • • • • • • • • • • • • • •	y, multifunctional, not illuminated	()* = factory setting	
Display range measured value	AC/DC 0500 V		
Operating uncertainty, voltage 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 Hz	±0.2 %, ±1 digit		
History memory (HiS) for the first alarm value	data record measured values		
Password	Off/0999 (OFF)*		
455			

Off/0...999 (OFF)*

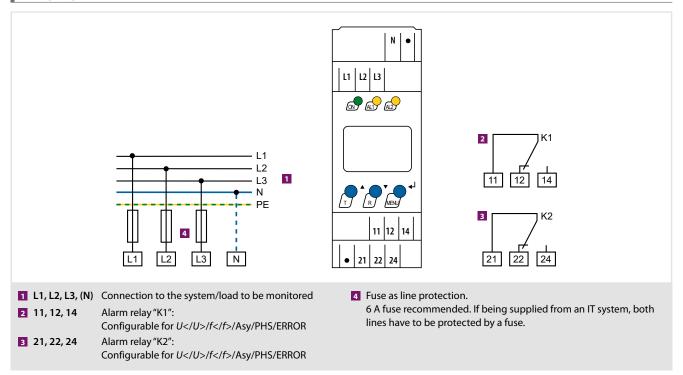
on/off/con (on)*



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



· Monitoring of automatic switching

points between private electric-

ity generation power system in

• Universally applicable for photo-

voltaic systems, CHPs (Combined Heat and Power plants), wind power and hydro power plants

parallel operation with the public

Typical applications

low voltage grid

EN 50438

• Applications according to

DIN V VDE V 0126-1-1 (VDE V 0126-1-1), C 10/11,

Device features

- VMD423 with separate supply voltage
- 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

Approvals

C € ĽK [H[

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

Supply voltage ¹⁾ U s		Response value	Туре	Art.	. No.
AC	DC	AC	.,,,,,	Screw-type terminal	Push-wire terminal
1672 V, 15460 Hz	9,694 V	10500 V	VMD423-D-1	B93010020	B73010020
70300 V, 15460 Hz	70300 V	10500 V	VMD423-D-2	B93010021	B73010021
U_{n}	U_{n}	70500 V	VMD423H-D-3	B93010022	B73010022

¹⁾ Absolute values

Accessories

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



6.2

0.2...2.5 mm² (AWG 24...14)

0.75...2.5 mm² (AWG 19...14)

≤ 150 g (VMD423) ≤ 240 g (VMD423H)

Insulation coordination acc. to IEC 60664-1/IEC 60664-3		Displays, memory
Rated insulation voltage	400 V	Display
Rated impulse voltage/pollution degree	4 kV/3	Display range measured
Overvoltage category	<u> </u>	Operating uncertainty,
Protective separation (reinforced insulation) between (A1, A2) -(N, L)	1, L2, L3) -(11, 12, 14) -(21, 22, 24)	Operating uncertainty, the History memory (HiS) for
Voltage test according to IEC 61010-1:	., -2, 25, (, .2,, (2.1, 22, 2.1,	Password
VMD423 and VMD423H: (N, L1, L2, L3) -(A1, A2), (11, 12, 14)	3.32 kV	Fault memory (M) alarn
(N, L1, L2, L3) -(21, 22, 24)	2.21 kV	Switching elements
VMD423: (A1, A2) -(11, 12, 14) -(21, 22, 24)	2.21 kV	Number
Supply voltage		Operating principle K1/
VMD423-D-1:		
Supply voltage $U_{\rm S}$	AC 1672 V/DC 9.694 V	underfrequen
Frequency range U _S	15460 Hz	
VMD423-D-2:		
Supply voltage U _S	AC/DC 70300 V	Electrical endurance, nu
Frequency range $U_{\rm S}$	15460 Hz	Fault memory
Power consumption	≤ 4 VA	•
VMD423H-D-3:		Contact data acc. to I Utilisation category
Supply voltage $U_{\rm S}$	U_{n}	Rated operational volta
Power consumption	≤ 6 VA	Rated operational curre
Measuring circuit		Minimum contact rating
Measuring range (rms value) (L-N)	AC 0288 V	Environment/EMC
Measuring range (rms value) (L-L)	AC 0500 V	
Rated frequency f _n	4065 Hz	EMC Operating temperature
Frequency display range	25100 Hz	
Response values		Classification of clima Stationary use (IEC 6072
VMD423-D-1/VMD423-D-2		Transport (IEC 60721-3-
Type of distribution system	3(N)AC/3AC (3(N)AC)*	Long-term storage (IEC
Undervoltage $U < (Alarm 2)$	S(N)Nersine (S(N)Ner	Classification of mec
(measurement method: 3Ph/3n)	AC 10500/10288 V (184)*	Stationary use (IEC 607)
Overvoltage U1 > (Alarm 1)		Transport (IEC 60721-3-
(measurement method: 3Ph/3n)	AC 10500/10288 V (264)*	Long-term storage (IEC
Overvoltage <i>U</i> 2 > (Alarm 1)		Commontion
(measurement method: 3Ph/3n)	AC 10288 V (253)*	Connection
Overvoltage U2	10-minute average determination	Connection type
Resolution of setting <i>U</i>	1V	Connection
VMD423H-D-3	2/11/16/216/21/11/16/*	Connection properties
Type of distribution system Undervoltage $U < (Alarm 2)$ (measurement method: $3Ph/3n$)	3(N)AC/3AC (3(N)AC)* AC 70500/70288 V	rigid flexible
Overvoltage $U > (Alarm 1)$	AC 70300/70200 V	Two conductors with th
(measurement method: 3Ph/3n)	AC 70500/70288 V	rigid/flexible
Resolution of setting <i>U</i>	17	Stripping length
	5 20.0/ (20.0/)*	Tightening torque, tern
Asymmetry Phase failure	530 % (30 %)* by setting the asymmetry	Connection
	lockwise R/anticlockwise L (R/on)*	Connection properties
Relative uncertainty, voltage at 50/60 Hz	±1.5 %, ±2 digits	rigid
Hysteresis <i>U</i>	140 % (5 %)*	flexible
Únderfrequency Hz <	4565 Hz (47.5 Hz)*	without ferrules
Overfrequency Hz >	4565 Hz (50.2 Hz)*	with ferrules
Resolution of setting <i>f</i>	0.1 Hz	Stripping length
Hysteresis frequency Hys Hz	0.12 Hz (0.1 Hz)*	Opening force
Relative uncertainty, frequency 4065 Hz	±0.1 %, ±1 digit	Test opening, diameter
Time response		Other
Start-up delay <i>t</i>	0300 s (30 s)*	Operating mode
Response delay t _{on1/2}	0300 s (0.1)	Mounting
Delay on release t _{off}	0300 s (30 s)*	Degree of protection, in
Resolution of setting t, t _{off} , t _{on1/2} (010 s)	0.1 s	Degree of protection, to
Resolution of setting t , t_{off} , $t_{\text{on1/2}}$ (1099 s) Resolution of setting t , t_{off} , $t_{\text{on1/2}}$ (10.0300 s)	1 s 10 s	Enclosure material
Operating time, voltage t _{ae}	≤ 80 ms	Screw mounting
Operating time, voltage t_{ae}	≤ 80 ms	DIN rail mounting acc. t
Response time t _{an}	$t_{\rm an} = t_{\rm ae} + t_{\rm on1/2}$	Flammability class Documentation number
		pocumentation number
Recovery time t _b	≤ 300 ms	
Recovery time t _b Discharging time energy backup on power failure for VMD423H Charging time energy backup for VMD423H	≤ 300 ms ≥ 2.5 s	Weight

Displays, memory					
Display	LC disp	lay, mult	tifunctior	nal, not illu	minated
Display range measured value				AC/DC 0	500 V
Operating uncertainty, voltage at 50/60 H	lz			±1.5 %, =	£2 digits
Operating uncertainty, frequency in the r	ange of 4065 Hz			±0.1%,	±1 digit
History memory (HiS) for the first alarm v	alue	(data reco	rd measure	d values
Password			off/on/	'0…999 (d	n/126)*
Fault memory (M) alarm relay				on/off/co	n (OFF)*
Switching elements					
Number		2 x 1 c	hangeov	er contacts	(K1, K2)
Operating principle K1/K2		N/O ope	ration n.o	o/N/C oper	ation n.c
	K1: (undervoltage $\it U$ $<$, overvo	ltage <i>U</i> 1	>, asymm	etry Asy,
underfrequency Hz <, overfreq	iency Hz >, alarm who	en starti	ng SAL, N	I/C operati	on n.c.)*
	Err, undervoltage $\it U <$				
	equency Hz <, overfre	. ,			
overvo	Itage $U2 >$, alarm whe	en starti	ng SAL, N	I/C operati	on n.c.)*
Electrical endurance, number of cycles					10,000
Fault memory				on/off/co	on (off)*
Contact data acc. to IEC 60947-5-1					
Utilisation category	AC-13 A	C-14	DC-12	DC-12	DC-12
Rated operational voltage	230 V 2	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 n	nA at AC/D	C ≥ 10 V
Environment/EMC					
FMC				IFC	61326-1
Operating temperature					.+55 ℃
Classification of climatic conditions a	4- IFC (0731				
Stationary use (IEC 60721-3-3)		o condor	acation r	no formatio	n of ical
Transport (IEC 60721-3-2)	אוו) כאוכ	o conuci	isation, i	io ioiiiiatic	2K11
Long-term storage (IEC 60721-3-1)					1K22
					INZZ
Classification of mechanical condition Stationary use (IEC 60721-3-3)	ns acc. to IEC 60721				3M11
Transport (IEC 60721-3-2)					2M4
Long-term storage (IEC 60721-3-1)					1M12
Connection Connection type	ccrow-	tuna tari	minal or	push-wire	torminal
Connection	3CIEW-	type ten	illilai vi	screw te	
				sciew te	IIIIIIIais
Connection properties		٥	2 4 m	m² (AWG 2	4 12\
rigid flexible					
Two conductors with the same cross sect	• • • • • • • • • • • • • • • • • • •	0.2	2.5 [[ım² (AWG 2	2414)
TWO CONDUCTORS WITH THE SAME CROSS SECT	on	۸.	1	? (ANIC -	14 16
			1.5 m	ım² (AWG 2	′4Ib)
rigid/flexible		0.2		(////	
rigid/flexible Stripping length		0.2			8 mm
rigid/flexible		0.2			8 mm .0.6 Nm

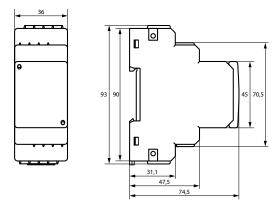
Without ferrures	0.752.5 11111 (71774 1711)
with ferrules	0.21.5 mm ² (AWG 2416)
Stripping length	10 mm
Opening force	50 N
Test opening, diameter	2.1 mm
Other	
Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (IEC 60529)	IP30
Degree of protection, terminals (IEC 60529)	IP30
Enclosure material	polycarbonate
Screw mounting	2 x M4 with mounting clip
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Documentation number	D00139 (VMD423)
	D00140 (VMD423H)

()* = Factory setting

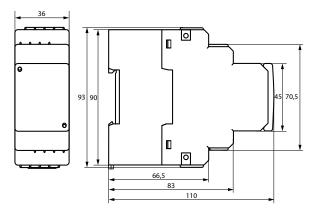


6.2

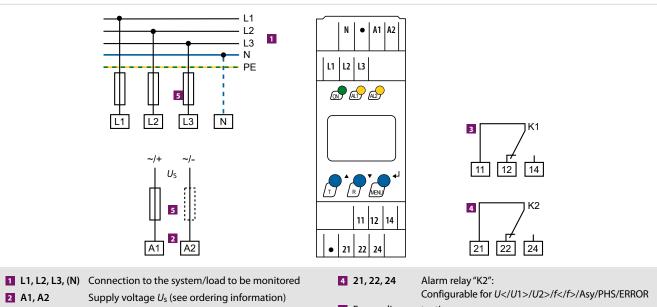
VMD423



VMD423H

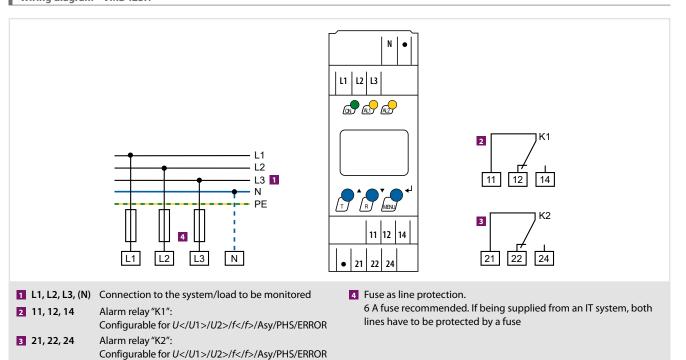


Wiring diagram – VMD423



- 3 11, 12, 14 Alarm relay "K1": Configurable for *U*</*U*1>/*U*2>/*f*</*f*>/Asy/PHS/ERROR
- 5 Fuse as line protection. 6 A fuse recommended. If being supplied from an IT system, both lines have to be protected by a fuse

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 network
- 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

Supply voltage <i>U</i> s	Type	Art. No.
AC	1782	7.11.01.13.1
100240 V	VMD460-NA-D-2	B93010045

Device version with push-wire terminal on request.

Accessories

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



la collection and distribution and the IFC COCCA I (IFC COCCA I	
Insulation coordination acc. to IEC 60664-1/IEC 60664-3	
Rated voltage	400 V
Rated impulse voltage/ Overvoltage category	6 kV/II
Pollution degree	
Protective separation (reinforced insulation) between	.1, L2, L3, N) - (11, 12, 14, 21, 22, 24
, , , ,	i3/4, RTG, RT1)-(A1, A2, L1, L2, L3, N)
Voltage test according to IEC 61010-1:	13/4, KIU, KI I)-(AI, AZ, LI, LZ, L3, N
(N, L1, L2, L3) - (A1, A2), (11, 12, 14, 21, 22, 24)	3.32 kV
(N, L1, L2, L3) - (N1, N2), (11, 12, 14, 21, 22, 24)	J.J2 NV
Supply voltage	
Nominal supply voltage U_S	AC/DC 100240 \
	DC/50/60 Hz
Operating range U_{S}	AC/DC 75300 \
	DC/4070 Hz
Power consumption at AC 230 V	< 7.5 VA/< 3.5 W
maximum	9 VA/3.5 W
Bridging time at $U_{\rm S} = 230$ V and dip to 0 V	600 ms
Measuring circuit	
System type	1AC, 3(N)AC
Nominal system voltage U_n (r.m.s. value) (L-N)	AC 0300 V
Nominal system voltage U_n (r.m.s. value) (L-L)	AC 0520 V
Input impedance (Load) L1, L2, N	480 kΩ
Input impedance (Load) L3	680 kΩ
Rated frequency f_n ($U_n > 20 \text{ V}$)	4565 Hz
Response values	1150 %
Relative uncertainty, voltage	$U \le 280 \text{ V}: \le \pm 1 \%$
	$U > 280 \text{ V: } \pm 3 \%$
Resolution of setting, voltage	1 %
Nominal frequency	50 Hz
Relative uncertainty, frequency	≤ ±0.1 %
Resolution of setting f	0.05 Hz
Recording of measured value, switching condition (reconnection and disconnection)	
L-N, L-L	01.5 <i>U</i> _r
f< ,f<<	4560 Hz
, f>,f>>	5065 Hz
Recording of measurement value, condition for disconr	noction
df/dt	0.059.9 Hz/s
	0.037.7 112/3
Time response	
Delay time for connection ton	40 ms60 min
Resolution of setting $t_{ m on}$	
< 50 ms:	5 ms
50 200 ms:	10 ms
200 ms 5 s:	50 ms
510 s	0.1 9
10 s60 s:	1:
60300 s:	10:
300 s60 min:	1 mir
Operating time voltage t _{ae}	half a supply period
	≤ 40 ms
Operating time, frequency tae Recovery time th	≤ 40 ms

Departing uncertainty, voltage LC display, multi-functional, illuminate John Sammer John Sa	Digital inputs					
	Monitoring of potential-free contacts or voltage inp	uts:	close	d = low; 0	4 V; / _{in}	< -5 m
December December						
Docation Docation	D1					
A	D2					
Temote to Tem						•
Max. length of the connecting cables of digital inputs Sample	- ·			exte		
Max. Ength of the connecting cables of digital inputs Spisplays, memory					ren	
Display nange, measured value Display range, measured values Display range, measured values Display range, measured values eaver an accussion off/on/o999 (off sexious) Display range memory for the last 300 messages 1 data record of measured values eaver accussion off/on/o999 (off sexious) Display range memory for the last 300 messages 1 data record of measured values eaver accussion off/on/o999 (off sexious) Display range memory for the last 300 messages 1 data record of measured values eaver accussion off/on/o999 (off sexious) Display range, measured values eaver accussion of floor off measured values eaver accussion of floor off measured values eaver accussion of the control of the control off the control of the	· · · · · · · · · · · · · · · · · · ·	ts				3 r
Display nange, measured value Display range, measured values Display range, measured values Display range, measured values eaver an accussion off/on/o999 (off sexious) Display range memory for the last 300 messages 1 data record of measured values eaver accussion off/on/o999 (off sexious) Display range memory for the last 300 messages 1 data record of measured values eaver accussion off/on/o999 (off sexious) Display range memory for the last 300 messages 1 data record of measured values eaver accussion off/on/o999 (off sexious) Display range, measured values eaver accussion of floor off measured values eaver accussion of floor off measured values eaver accussion of the control of the control off the control of the	Displays, memory					
### Sperating uncertainty, voltage	Display		C display,	multi-func	tional, illu	minate
### ACT A	Display range, measured value		1 //			
Isistory memory for the last 300 messages Password Off/on/0999 (off Switching elements Number of changeover contacts Deparating mode NC operation/NO operation NC operation/NO operation NC operation/NO operation In Journal of Market operation of changeover contacts Ontact data acc. to IEC 60947-5-1 Particle operational voltage Particle operational current To Ar* Ac-13	Operating uncertainty, voltage			U		
## Saword ## Off/on/O	Operating uncertainty, frequency				≤	±0.19
Switching elements	History memory for the last 300 messages		1 data re	cord of me	asured val	ues eac
Sumber of changeover contacts 2 x 1 (K1, K2)	Password			off	/on/09	99 (off)
Contact data acc. to IEC 60947-5-1 Italisation category AC-13 AC-14 DC-12 DC-12 DC-12 DC-13 AC-14 DC-12 DC-12 DC-13 AC-14 DC-13 AC-14 DC-12 DC-13 AC-14 DC-13 AC-14 DC-12 DC-13 AC-14 DC-13 AC-14 DC-13 AC-14 DC-13 AC-14 DC-13 DC-13 DC-13 AC-14 DC-13 AC-14 DC-13 DC-13 DC-13 AC-14 DC-13 DC-13 DC-13 AC-14 DC-13 DC-13 DC-13 DC-13 DC-13 AC-14 DC-13	Switching elements					
Contact data acc. to IEC 60947-5-1 Stillisation category AC-13 AC-14 DC-12 DC-12 DC-12 DC-13 DC-14 DC-13 DC-12 DC-14 DC-15 DC-14 DC-15	Number of changeover contacts					
Total acc. to IEC 60947-5-1 Ditilisation category				NC opera		
### AC-13	Electrical endurance in rated operating conditions				10,00	00 cycle
Rated operational voltage Rated operational current Rated operational current Rated operational current Rated operational current for UL508 and CSA C22.2 = 4 A Winimum contact rating Reference	Contact data acc. to IEC 60947-5-1					
Rated operational current Rated operational current for UL508 and CSA C22.2 = 4 A Minimum contact rating IO mA at AC/DC ≥ 5 Environment/EMC EMC DIN EN 60255-26/CEI 0-2 Classification of climatic conditions acc. to IEC 60721 related to temperature and relative humidity) Stationary use (IEC 60721-3-3) Gransport (IEC 60721-3-2) Classification of mechanical conditions acc. to IEC 60721 Stationary use (IEC 60721-3-3) Stationary use (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 60721 Stationary use (IEC 60721-3-1) Connection Connection Connection Connection type Screw-type terminals or push-wire terminal connection type Connection type Screw-type terminals or push-wire terminal delay in the state of th	5 /					DC-1
** Rated operational current for UL508 and CSA C22.2 = 4 A Minimum contact rating 10 mA at AC/DC ≥ 5 Environment/EMC EMC DIN EN 60255-26/CEI 0-2 Operating temperature -25+55 Classification of climatic conditions acc. to IEC 60721 related to temperature and relative humidity) Stationary use (IEC 60721-3-3) 3K. Fransport (IEC 60721-3-2) 2K. Classification of mechanical conditions acc. to IEC 60721 Stationary use (IEC 60721-3-1) 1K. Classification of mechanical conditions acc. to IEC 60721 Stationary use (IEC 60721-3-3) 3M. Fransport (IEC 60721-3-2) 2M. Cong-term storage (IEC 60721-3-1) 1M. Connection Connection Connection type screw-type terminals or push-wire terminal connection type screw-type terminals or push-wire terminal fightening torque 0.22 mm² (AWG 241 and 241 and 252 mm² (AWG 24	, ,					
Minimum contact rating 10 mA at AC/DC ≥ 5 Environment/EMC EMC DIN EN 60255-26/CEI 0-2 Operating temperature -25+55 Classification of climatic conditions acc. to IEC 60721 related to temperature and relative humidity) Stationary use (IEC 60721-3-3) 3K. Fransport (IEC 60721-3-2) 2K Cong-term storage (IEC 60721-3-1) 1K. Classification of mechanical conditions acc. to IEC 60721 Stationary use (IEC 60721-3-3) 3M: Fransport (IEC 60721-3-3) 3M: Fransport (IEC 60721-3-3) 3M: Fransport (IEC 60721-3-3) 3M: Fransport (IEC 60721-3-1) 1M. Connection Connection type screw-type terminals or push-wire terminal Connection type screw-type terminals or push-wire terminal Connection type screw-type terminals or push-wire terminal Connection type 0.22.5 mm² (AWG 241 Stripping length 89 m Fightening torque 0.50.6 Nm (57 lb-in Contention Contention type 0.50.6 Nm (57 lb-in Contention type 0.50 Nm (57 lb-in Contention type 0.5	•			1 A	0.2 A	0.1
Environment/EMC EMC DIN EN 60255-26/CEI 0-2 Operating temperature -25+55° Classification of climatic conditions acc. to IEC 60721 related to temperature and relative humidity) Stationary use (IEC 60721-3-3) 3K3 fransport (IEC 60721-3-2) 2K* Cong-term storage (IEC 60721-3-1) 1K3 Classification of mechanical conditions acc. to IEC 60721 Stationary use (IEC 60721-3-3) 3M7 fransport (IEC 60721-3-2) 2K3 Cong-term storage (IEC 60721-3-3) 3M7 fransport (IEC 60721-3-2) 2K3 Connection Connection Connection type screw-type terminals or push-wire terminals Connection type screw-type terminals or push-wire terminals Connection type screw-type terminals or push-wire terminals Connection type screw-type terminals Connection type screw-type terminals Connection type screw-type terminals Connection type scr	•	2.2 = 41	4	10	A -+ AC/I)C
Classification of climatic conditions acc. to IEC 60721 related to temperature and relative humidity) frainsport (IEC 60721-3-2) cong-term storage (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 60721 Classification of mechanical conditions acc. to IEC 60721 Classification of mechanical conditions acc. to IEC 60721 Classification of second conditions	Minimum contact rating			101	mA at AC/I)(≥ 5
Operating temperature -25+55 Classification of climatic conditions acc. to IEC 60721 related to temperature and relative humidity) Stationary use (IEC 60721-3-3) 3K. Transport (IEC 60721-3-2) 2K. Cong-term storage (IEC 60721-3-1) 1K. Classification of mechanical conditions acc. to IEC 60721 Stationary use (IEC 60721-3-3) 3M. Transport (IEC 60721-3-3) 3M. Transport (IEC 60721-3-3) 1M. Connection Connection Connection type screw-type terminals or push-wire terminal connection type screw-type terminals or push-wire terminal connection properties: rigid 0.24 mm² (AWG 241 Rexible 0.22.5 mm² (AWG 241 Rexipping length 89 m Connection type 0.50.6 Nm (57 lb-inconnection) Connection type 0.50.6	Environment/EMC					
Classification of climatic conditions acc. to IEC 60721 related to temperature and relative humidity) stationary use (IEC 60721-3-3) fransport (IEC 60721-3-2) cong-term storage (IEC 60721-3-1) Stationary use (IEC 60721-3-1) Stationary use (IEC 60721-3-3) stationary use (IEC 60721-3-3) stationary use (IEC 60721-3-3) stationary use (IEC 60721-3-3) stationary use (IEC 60721-3-1) Stationary use (IEC 6072				DIN EN		
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Stationary use (IEC 60721-3-3) Stationary use (IEC 60721-3-2) Stationary use (IEC 60721-3-1) Stationary use (IEC 60721-3-1) Stationary use (IEC 60721-3-3) Stationary use (IEC 60721-3-3) Stationary use (IEC 60721-3-3) Stationary use (IEC 60721-3-3) Stationary use (IEC 60721-3-1)		60721				
Fransport (IEC 60721-3-2) 2K' Long-term storage (IEC 60721-3-1) 1KC Classification of mechanical conditions acc. to IEC 60721 Stationary use (IEC 60721-3-3) 3M' Fransport (IEC 60721-3-2) 2M Long-term storage (IEC 60721-3-1) 1MC Connection Connection Connection type screw-type terminals or push-wire terminal connection properties: Iniquid 0.24 mm² (AWG 241 Rexible 0.22.5 mm² (AWG 241 Rexible 0.22.5 mm² (AWG 241 Retripping length 89 m Rightening torque 0.50.6 Nm (57 lb-in Connection properties: Connection properties	•					21/2
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) Long-term storage (IEC 60721-3-1) Connection Connection type Connection type Connection properties: Igid Indicate the state of push-wire terminals or push-wire te						
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Connection Connection type Connection type Connection properties: Initial Connection properti	Transport (IEC 60721-3-2)					2M
connection type screw-type terminals or push-wire terminal connection properties: igid 0.24 mm² (AWG 241 lexible 0.22.5 mm² (AWG 241 stripping length 89 m lightening torque 0.50.6 Nm (57 lb-i Other Operating mode continuous operation Mounting any position Degree of protection, internal components (DIN EN 60529) IP3 Degree of protection, terminals (DIN EN 60529) IP3 Enclosure material polycarbona clammability class UL94 V- DIN rail mounting acc. to IEC 607	Long-term storage (IEC 60721-3-1)					1M2
Connection properties: igid 0.24 mm² (AWG 241 dexible 0.22.5 mm² (AWG 241 Stripping length 89 m Gightening torque 0.50.6 Nm (57 lb-i Other Operating mode continuous operatic Mounting any positic Degree of protection, internal components (DIN EN 60529) IP: Enclosure material polycarbona Clammability class UL94 V- DIN rail mounting acc. to IEC 607	Connection					
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Pekible 0.22.5 mm² (AWG 241 Stripping length 89 m Gightening torque 0.50.6 Nm (57 lb-i Other Operating mode continuous operation Mounting any position Degree of protection, internal components (DIN EN 60529) IP3 Degree of protection, terminals (DIN EN 60529) IP3 Enclosure material polycarbona clammability class UL94 V DIN rail mounting acc. to IEC 607						
Stripping length 89 m Fightening torque 0.50.6 Nm (57 lb-i Other Operating mode continuous operation Mounting any position Degree of protection, internal components (DIN EN 60529) IP: Enclosure material polycarbona Flammability class UL94 V- OlN rail mounting acc. to IEC 607	5					
Tightening torque 0.50.6 Nm (57 lb-in particular properties of protection, internal components (DIN EN 60529) IP3 polycarbona polyca			0.	22.5 m		
Departing mode continuous operation Mounting any position Degree of protection, internal components (DIN EN 60529) Degree of protection, terminals (DIN EN 60529) Enclosure material polycarbona Flammability class UL94 V- DIN rail mounting acc. to Continuous operation IP3 Any position IP3 Degree of protection, terminals (DIN EN 60529) IP3 Enclosure material polycarbona IP4 DIN rail mounting acc. to IEC 607						
Departing mode continuous operation Mounting any position Degree of protection, internal components (DIN EN 60529) IP: Degree of protection, terminals (DIN EN 60529) IP: Enclosure material polycarbona DIN Fail mounting acc. to IEC 607	lightening torque			0.50.	6 NM (5	./Ib-ir
Mounting any positic Degree of protection, internal components (DIN EN 60529) IP3 Degree of protection, terminals (DIN EN 60529) IP3 Enclosure material polycarbona polycarbona UL94 V DIN rail mounting acc. to IEC 607	Other					
Degree of protection, internal components (DIN EN 60529) Degree of protection, terminals (DIN EN 60529) Enclosure material Flammability class UL94 V DIN rail mounting acc. to	Operating mode			100	ntinuous o	peratio
Degree of protection, terminals (DIN EN 60529) Enclosure material polycarbona Flammability class UL94 V DIN rail mounting acc. to IEC 607					any	positio
Enclosure material polycarbona Flammability class UL94 V DIN rail mounting acc. to IEC 607	• • • • • • • • • • • • • • • • • • • •	60529)				IP3
Flammability class UL94 V- DIN rail mounting acc. to IEC 607	• • • • • • • • • • • • • • • • • • • •					IP2
DIN rail mounting acc. to IEC 607						
					I L	.c 00/1

()* = Factory setting

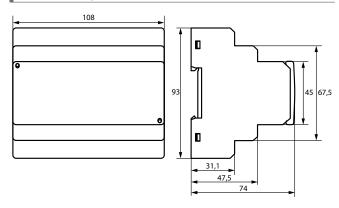
Weight

Documentation number

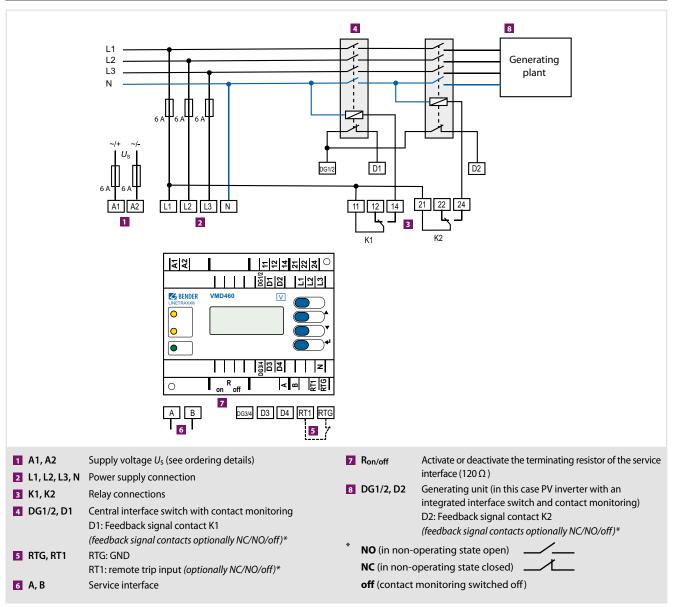


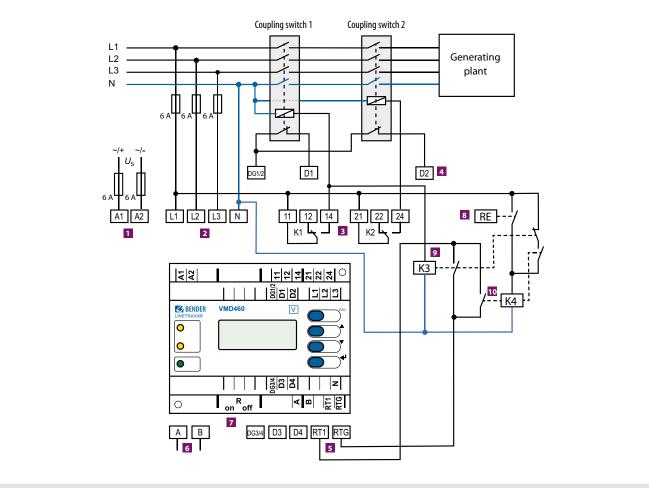
D00001

≤ 360 g



Wiring diagram VMD460 (VDE-AR-N 4105:2018 – basic program 4105_2)



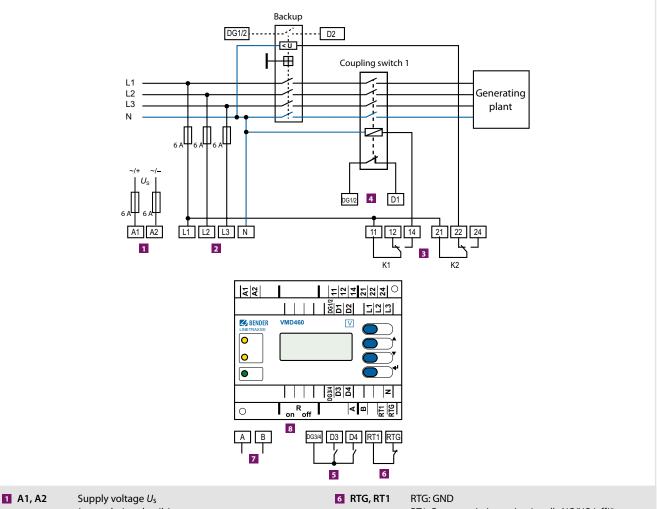


Within the scope of VDE-AR-N 4110, the VMD460-NA can be used as protective disconnection device for the generating unit or as higher-level protective disconnection, the latter, however, only if the Q-U protection function may be dispensed with. According to VDE-AR-N 4110 chapter 10.3.3.4 par. 5, this 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	Supply voltage U_s (see ordering details)	7 Ron/off	Activate or deactivate the terminating resistor of the
2 L1, L2, L3, N	Power supply connection		service interface (120 Ω)
3 K1, K2	Relay connections	8 RE	Ripple-control receiver
4 DG1/2,	Contact monitoring coupling switchDG1/2: GND	9 K3	External relay with an N/C contact and an N/O contact
D1, D2	D1: Feedback signal contact K1	10 K4	External relay with two N/O contacts
	D2: Feedback signal contact K2	DG3/4, D3	, D4 Not used for the standard mentioned before
	(feedback signal contacts optionally NC/NO/off)*	* NO (in nor	n-operating state open)
5 RTG, RT1	RTG: GND		
	RT1: remote trip input (optionally NC/NO/off)*	NC (in nor	n-operating state closed)
6 A, B	Service interface	off (contact	ct monitoring switched off)



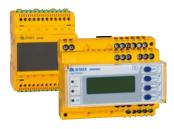
(see ordering details) 2 L1, L2, L3, N Power supply connection 3 K1, K2 Relay connections 4 DG1/2, Contact monitoring, coupling switch D1, D2 DG1/2: GND D1: Feedback signal contact K1 D2: Feedback signal contact K2 (feedback signal contacts optionally NC/NO/off)* 5 DG3/4, Digital inputs (external monitoring) D3, D4 DG3/4: GND D3: local control (CEI 0-21 8.6.2.1.1)** D4: external signal (CEI 0-21 8.6.2.1.2)**

(optionally NC/NO/off)*

RTG, RT1 RTG: GND
 RT1: Remote trip input (optionally NC/NO/off)*
 A, B Service interface
 R_{on/off} Activate or deactivate the terminating resistor of the BMS bus (120 Ω)
 NO (in non-operating state open)
 NC (in non-operating state closed)
 off (contact monitoring switched off)
 In order to evaluate the inputs D3 and D4, the mode can be adjusted correspondingly in the menu (menu: 3. Settings -> 1. General -> 4. Mode)

LINETRAXX® VMD461 with CD440 coupling device

Multifunctional voltage relay for AC, DC, 3(N)AC systems



· Monitoring of voltage-sensitive

• Switching installations on and off

• Protection of three-phase motors

against phase failure and phase

· Vector shift detection for protec-

• Islanding detection ROCOF (rate

Transformer protection by recognising asymmetrical load

tion of electrical machines

of change of frequency)

machines and installations

at a certain voltage level

Typical applications

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

Approvals

open-circuit



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

Description	Supply voltage <i>U</i> ş Type		Art. No.	
Description.	AC/DC	1,750	71141101	
Multifunctional voltage relay	100240 V	VMD461-D-2	B93010047	
Coupling device	-	CD440	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> ₅	Туре	Art. No.	Page
Camditian Manitan	with an interrupted metacon. Dander sustant /File and	COM465IP	B950610	402
Condition Monitor	with an integrated gateway: Bender system/Ethernet	CP9I	B9506103	416
RS-485 repeater	AC/DC 24 V \pm 20 %	DI-1PSM	B95012044	-



6.2

Insulation coordination of the device co	ombination VMD461/CD440:	VMD461 with CD440
Rated voltage ≤ 1000 V	acc. to IEC 60664-1/IEC 60664-3	System type DC, 1AC, 3AC, 3NAC
Rated voltage > 1000 V	acc. to EN 50178:1998	Nominal voltage $U_{\rm n}$
Definitions		(L-N) AC 250690 V
Measuring circuit (IC1)	CD440 (L1, L2/DC+, L3, N/DC-)	(L-L) AC 4401200 V
Measuring circuit (IC2)	VMD461 (L1, L2/DC+, L3, N/DC-)	(DC+/DC-) DC 2501200 V
Supply circuit (IC3)	VMD461 (A1, A2)	Nominal voltage U_n for Canada
Control circuit (IC4)	VMD461 (D1, D2, DG1/2, RTG, RT1)	(L-N) AC 250600 V
Output circuit 1 (IC5)	VMD461 (11, 12, 14)	(L-L) AC 440600 V
Output circuit 2 (IC6)	VMD461 (11, 12, 14)	(DC+/DC-) DC 250600 V
Output circuit 3 (IC7)	VMD461 (A, B)	Measuring range $01.15 \times U_n$
	VIVID401 (A, D)	Overload capacity $1.5 \times U_n \text{ max for } 5 \text{ s}$
Rated voltage		Response values 1150 %
IC1	DC, 3AC: 1200 V	Operating uncertainty $U_{\rm n}$ $\leq \pm 2 \%$
	1AC, 3NAC: 690 V	Resolution of setting $U_{\rm n}$ 1 %
IC2	400 V	Rated frequency DC, 50/60 Hz
IC3	250 V	Frequency range <i>U</i> _n DC, 4565 Hz
IC5, IC6	250 V	Resolution of setting <i>f</i> 0.05 Hz
Rated impulse voltage		Relative uncertainty $f \le \pm 0.1\%$
Overvoltage category		•
Max. altitude	2000 m	Recording of measurement values, switch-on condition
IC1/(IC26)	10.5 kV	<i>U</i> <, <i>U</i> <<, <i>U</i> <<< 1100 %
IC2/(IC36)	4 kV	<i>U</i> >, <i>U</i> >>, <i>U</i> >>> 100150 %
		f<,f<<,f<<< 4560 Hz
IC3/(IC46)	4 kV	f>,f>>,f>>> 5065 Hz
IC4/(IC56)	4 kV	Phase sequence/Polarity right, left
IC5/IC6	4 kV	
Rated insulation voltage		Recording of measurement value, switch-off condition
Pollution degree	3	<i>U</i> <, <i>U</i> <<, <i>U</i> <<< 1100 %
IC1/(IC26)	DC, 3AC: 1250 V	<i>U</i> >, <i>U</i> >>, <i>U</i> >>> 100150 %
	1AC, 3NAC: 800 V	f<, f<<, f<<< 4560 Hz
IC2/(IC36)	400 V	f>, f>>, f>>> 5065 Hz
IC3/(IC46)	400 V	df/dt 0.059.95 Hz/s
IC4/(IC56)	400 V	Vector shift 125 %
IC5/IC6	4 kV	Unbalance 150 %
Protective separation (reinforced insula	ation):	Time response
IC1/(IC36)	DC, 3AC: Overvoltage category III, 1250 V	<u> </u>
,	1AC, 3NAC: Overvoltage category III, 1000 V	Start-up delay t _{start-up} 200 ms60 min (200 ms)*
IC2/(IC36)	300 V	Switch-on delay <i>t</i> _{on} off, 50 ms 60 min (100 ms)*
IC3/(IC46)	300 V	Response delay t_{off} off, 50 ms60 min (100 ms)*
IC4/(IC56)	300 V	Operating time voltage t _{ae} half a supply period
IC5/IC6	300 V	Operating time, frequency $t_{ae} \le 40 \text{ ms}$
		Recovery time $t_{\rm b}$ 300 ms
Voltage test (routine test) acc. to IEC 6		Digital inputs
IC2/(IC36)	2.21 kV	Monitoring of potential-free contacts or voltage inputs: $closed = low; 04 \text{ V}; lin < -5 \text{ mA}$
IC3/(IC46)	2.21 kV	open = high; $> 6 \le 30 \text{ V}$
IC4/(IC56)	2.21 kV	D1 Feedback signal contact of alarm relay K1
IC5/IC6	2.21 kV	D2 Feedback signal contact of alarm relay K1
Supply voltage		
	100 240 V	·
Nominal supply voltage U_s	100240 V	
Tolerance U _s	±25 %	max. length of the connecting cables of the digital inputs
Nominal frequency range U _s	DC, 50/60 Hz	(shielded cable recommended) 10 m
Power consumption at AC 230 V	< 3.5 W/ < 7.5 VA	Displays, memory
maximum	3.5 W/9 VA	Display LC display, multi-functional, illuminated
Measuring circuit		Display range, measured value 09.99 kV
		History memory for the last 300 messages per 1 data record measured values
VMD461		Password on/off/0999 (off*)
System type	DC, 1AC, 3AC, 3NAC	l assword Oil/Oil/O/// (Oil)
Nominal voltage U_n		Interface
L-N)	AC 50260 V	Interface/protocol RS-485/BMS
(L-L)	AC 87450 V	Baud rate 9.6 kBit/s
(DC+/DC-)	DC 50450 V	Cable length 01200 m
Measuring range	01.15 x <i>U</i> _n	Recommended cable (shielded, shield connected to PE on one side) min. J-Y(St)Y min. 2 x 0.8
Overload capacity	1.5 x <i>U</i> _n max for 5 s	Terminating resistor $120 \Omega (0.25 \text{ W})$ connectable via DIP switch
Response values	1150 %	Device address, BMS bus 190 (2)*
Operating uncertainty U_n	≤±1%	Device address, Divis Das 190 (2)
Resolution of setting U_n	1%	
Rated frequency	DC, 50/60 Hz	
Frequency range U_n	DC, 4565 Hz	
Resolution of setting f	0.05 Hz	

0.05 Hz

 $\leq \pm 0.1\,\%$



Resolution of setting f

Relative uncertainty f

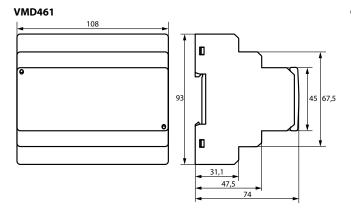
6.2

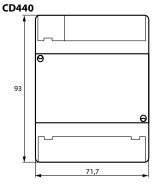
Number of changeover contacts				2 x 1	(K1, K2)
Operating principle K1, K2		N/C opera	ation or N/	0 operatio	n (N/C)*
Electrical endurance under rated operating	conditions, num	ber of cycl	es		10,000
Contact data acc. to IEC 60947-5-1:					
Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-12
Rated operational voltage	230 V	230 V	24 V	110 V	220 V
Rated operational current	5 A	3 A	1 A	0.2 A	0.1 A
Minimum contact rating			1 m	A at AC/D	C ≥ 10 V
Environment/EMC					
EMC				DIN EN 6	0255-26
Operating temperature				-25	.+55 ℃
at 161 -1 6 11 -1 11-1	4- 150 (0734				
Classification of climatic conditions acc	to IEC 60/21:				
			nsation an	d formatio	n of ice)
Classification of climatic conditions acc Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2)			nsation an	d formatio	n of ice) 2K11
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2)			nsation an	d formatio	2K11
Stationary use (IEC 60721-3-3)	3K23 (ex	cept conde	nsation an	d formatio	
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1)	3K23 (ex	cept conde	nsation an	d formatio	2K11
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical conditions	3K23 (ex	cept conde	nsation an	d formatio	2K11 1K22

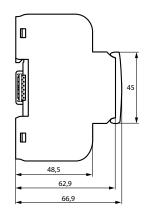
Connection	
Connection VMD461	
Connection	screw-type terminal
Connection properties:	
Rigid	0.24 mm ² (AWG 2412)
Flexible with ferrule	0.22.5 mm ² (AWG 2414)
Stripping length	89 mm
Tightening torque	0.50.6 Nm (57 lb-in)
Connection CD440	
Connection	push-wire terminals
Rigid	0.22.5 mm ² (AWG 2414)
Flexible without ferrule	0.752.5 mm ² (AWG 1914)
Flexible with ferrule	0.21.5 mm ² (AWG 2416)
Stripping length	10 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)	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 CD440	2 x M4 with mounting clip
Screw mounting VMD461	2 x M ²
Software version, measurement technology	D570 V1.2x
Software version, display	D256 V2.3>
Weight	
VMD461	≤ 360 g
CD440	≤ 125 g

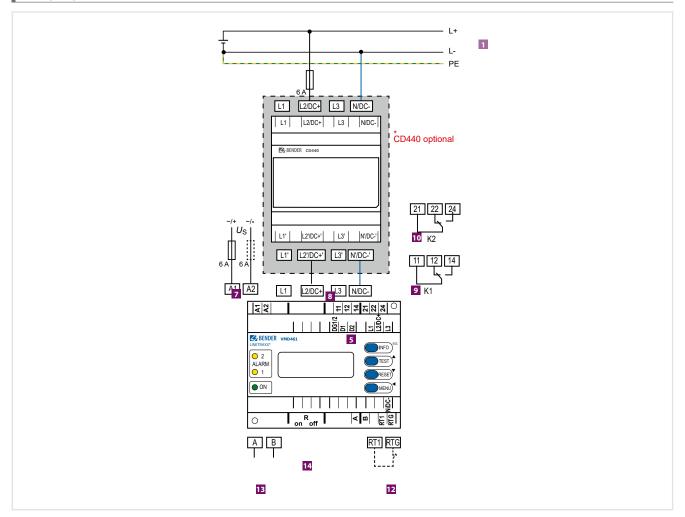
()* Factory setting

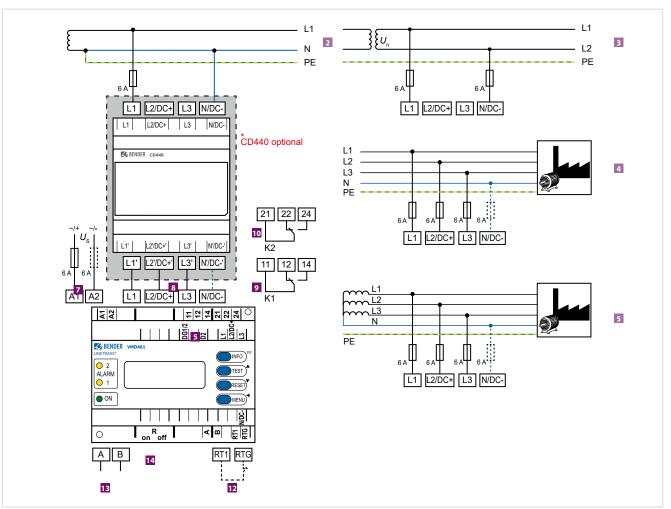
Dimension diagram (dimensions in mm)

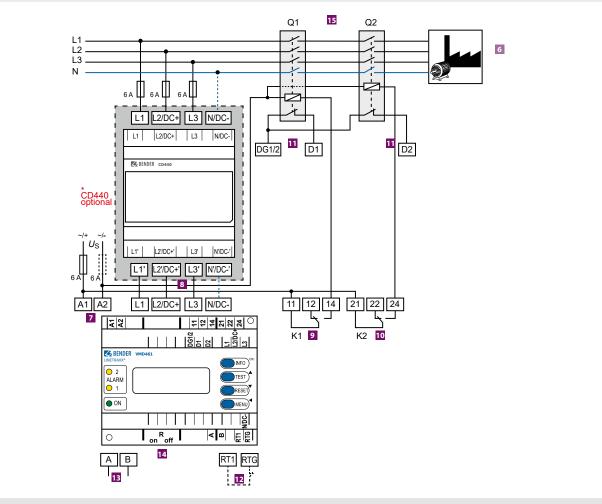










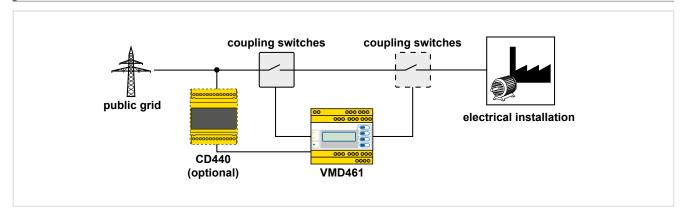


- Connection DC: VMD461 with CD440
- 2 Connection AC: VMD461 with CD440 (earthed system)
- 3 Connection AC: VMD461 with CD440 (unearthed system)
- 4 Connection 3(N)AC: VMD461 with CD440 (earthed system)
- 5 Connection 3(N)AC: VMD461 with CD440 (unearthed system)
- 6 Possible wiring diagram with 2 circuit breakers
- Supply voltage U_s (see ordering details) 7 A1, A2
- 8 L1, L2/DC+, L3, N/DC-
- Power supply connection
- 9 11, 12, 14 Connection to alarm relay K1 10 21, 22, 24 Connection to alarm relay K2

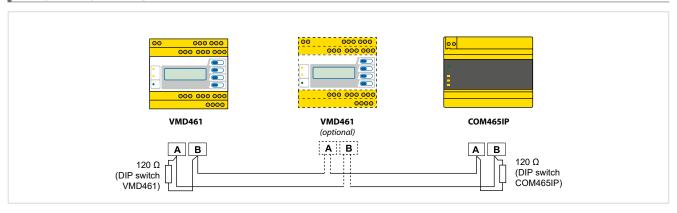
- 11 DG1/2, Contact monitoring D1, D2 DG1/2: GND
 - D1: Feedback signal contact to alarm relay K1 D2: Feedback signal contact to alarm relay K2 (feedback signal contacts optionally NC/NO/off)*
- 12 RTG, RT1
 - RT1: Remote-trip input (optionally NC/NO/off)*
- 13 A, B Connection to communication interface BMS bus
- 14 Ron/off Activate or deactivate the terminating resistor of
 - the BMS bus (120 Ω)
- 15 Q1, Q2 Circuit breakers
- NC (open in non-operating state)

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

Further information

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

Ordering information

Supply voltage ¹⁾ U s		Type	Art. No.		
AC	DC		Screw-type terminal	Push-wire terminal	
1672 V, 42460 Hz	9.694 V	CME420-D-1	B93060001	B73060001	
70300 V, 42460 Hz	70300 V	CME420-D-2	B93060002	B73060002	

¹⁾ Absolute values

Accessories

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

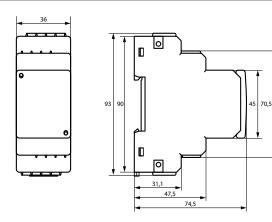


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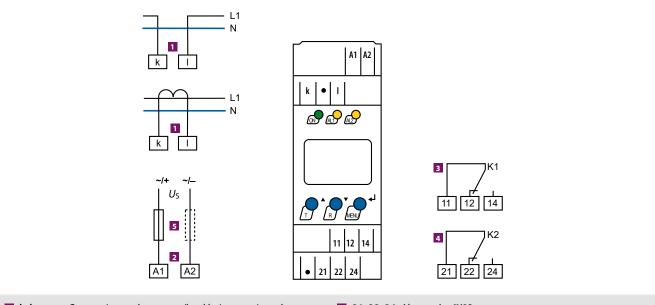
Technical data							
Insulation coordination acc. to IEC 60664-1/IEC 60664-3		Displays, memory					
Rated insulation voltage	250 V	Display	LC d	isplay, mul	ti-function	ıal, not illu	minated
Rated impulse voltage/overvoltage category	4 kV/III	Measuring range measured value x	transformation ratio fac	tor		AC 0.01	16 A x r
pollution degree	3	Operating error at 50/60 Hz				±3 %, =	£2 digits
	-(k, l) -(11, 12, 14) -(21, 22, 24)	Operating error in the range of 42.				±5 %, =	£2 digits
Maximum nominal voltage of the system being monitored		Measured-value memory (HiS) for	the first alarm value		data recor	d measure	d value
when the conductor being monitored is directly connected:		Password				Off/09	99 (Off)*
With protective separation	AC 230 V	Fault memory (M) alarm relay				on/	off (on)*
Without protective separation	AC 400 V	Switching elements					
Supply voltage		Number	2 relays, wit	th one char	ngeover co	ntact each	(K1, K2)
CME420-D-1:		Operating principle	N/C operation n.c./	N/O operat	ion n.o. (N	I/C operati	on n.c.)*
Supply voltage U_S	AC 1672 V/DC 9.694 V	Electrical service life under rated or	perating conditions		10,000 sv	vitching op	erations
Frequency range U_5	42460 Hz	Contact data acc. to IEC 60947-	5.1				
rrequerity range os	42400 112	Utilization category	AC-13	AC-14	DC-12	DC-12	DC-12
CME420-D-2:		Rated operational voltage	230 V	230 V	24 V	110 V	220 V
Supply voltage $U_{\rm S}$	AC/DC 70300 V	Rated operational current	5 A		1 A	0.2 A	0.1 A
Frequency range U_S	42460 Hz	Minimum contact load	3 A	3 A			
Power consumption	≤ 4 VA	MINIMUM CONTACT 10ad			ım	nA at AC/D	C ≥ 10 V
Measuring circuit		Environment/EMC					
Measuring range (r.m.s. value, screw-type terminal)	AC 0.0516 A	EMC					C 61326
Measuring range (r.m.s. value, push-wire terminal)	AC 0.0512 A	Operating temperature				-25	.+55°C
Overload capability < 1 s	40 A	Classification of climatic condit	tions acc. to IEC 60721				
Rated frequency f_0	422000 Hz	Stationary use (IEC 60721-3-3)	3K23 (ex	cept conde	nsation an	ıd formatio	n of ice)
nated frequency /ij	122000 112	Transportation (IEC 60721-3-2)	2K11 (ex	cept conde	nsation an	ıd formatio	n of ice)
Response values		Storage (IEC 60721-3-1)	1K22 (ex	cept conde	nsation an	ıd formatio	n of ice)
Undercurrent		Classification of mechanical co	nditions acc. to IEC 603	721			
Undercurrent /< (alarm / ₂), direct connection:		Stationary use (IEC 60721-3-3)					3M11
Push-wire terminal	AC 0.112 A (1 A)*	Transportation (IEC 60721-3-2)					2M4
Screw-type terminal	AC 0.116 A (1 A)*	Storage (IEC 60721-3-1)					1M12
or external current transformer							
Undercurrent /< (prewarning / ₁)	100200 % (150 %)*	Connection					
Overcurrent		Connection type	scr	ew-type te	rminal or p	oush-wire	termina
Overcurrent /> (alarm / ₂), direct connection:		Connection				screw te	rminals
Push-wire terminal	AC 0.112 A (1 A)*	Connection properties					
Screw-type terminal	AC 0.116 A (1 A)*	rigid			0.24 mi	m² (AWG 2	4 12)
or external current transformer	ne o. i i o n (i n)	flexible		0.	.22.5 m	m² (AWG 2	2414)
Overcurrent /> (prewarning / ₁)	10100 % (50 %)*	Two conductors with the same cros	ss section				
	10100 /0 (30 /0)	rigid/flexible		0.	.21.5 m	m² (AWG 2	2416)
Others	/4.4. /5.4. /40.4	Stripping length					8 mm
External current transformer	x/1 A, x/5 A, x/10 A	Tightening torque, terminal screws	5			0.5	.0.6 Nm
Transformation ratio factor n	12000 (1)*	Connection			pus	h-wire te	rminals
Relative percentage error at 50/60 Hz	±3 %, ±2 digits	Connection properties			•		
Relative percentage error in the range of 422000 Hz	±5 %, ±2 digits	rigid		0.	.22.5 m	m² (AWG 2	2414
Hysteresis	1040 % (15 %)*	flexible		-		(,
Specified time		without ferrules				m² (AWG 1	,
Starting delay	0300 s (0.5 s)*	with ferrules		0.	.21.5 m	m ² (AWG 2	
Response delay t _{on1}	0300 s (1 s)*	Stripping length					10 mm
Response delay t _{on2}	0300 s (0 s)*	Opening force					50 N
Delay on release t _{off}	0300 s (1 s)*	Test opening, diameter					2.1 mm
Operating time tae	≤ 70 ms	Other					
Response time t _{an}	$t_{\rm an} = t_{\rm ae} + t_{\rm on1/2}$					ntinuous o	noration
Recovery time t _b	≤ 300 ms	Operating mode Position			CO		
			internal components			dily	position
		Degree of protection DIN EN 60529					IP30
		Degree of protection DIN EN 60529	, terminais				IP20

Operating mode	continuous operation
Position	any position
Degree of protection DIN EN 60529, internal components	IP30
Degree of protection DIN EN 60529, terminals	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	D00034
Weight	≤ 160 g

()* = factory setting



Wiring diagram



- 1 k, l Connection to the system/load being monitored
- 2 A1, A2 Supply voltage U_s (see ordering information)
- **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 I < , I > or I < /I > /ERROR/TEST
- 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® CME420

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

Approvals



- 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.







Ordering information

Suitable for current	Response value	Supply voltage ¹¹ <i>U</i> ₅		Туре	Art.	. No.	
transformer types	nesponse value	AC	DC	AC/DC		Screw-type terminal	Push-wire terminal
/14	0.11 A x n	1672 V, 15460 Hz	9.6 V 94 V		CMD420-D-1	B93060006	B73060006
x/1A	U. I I A X II	-	-	70300 V, 15460 Hz	CMD420-D-2	B93060007	B73060007
/F.A	0.5 5.4	1672 V, 15460 Hz	9.6 V 94 V		CMD421-D-1	B93060008	B73060008
x/5A	0.55 A x n	-	-	70300 V, 15460 Hz	CMD421-D-2	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	60664-3	Displays, memory	
CMD420		Display	LC display, multifunctional, not illuminat
Rated insulation voltage	AC 250 V	Display range, measured value (r.m.s. valu	ue) x transformation ratio n CMD420: AC 01 A x
Rated impulse voltage/pollution degree	6 kV/3		CMD421: AC 05 A >
Protective separation (reinforced insulation) between	(A1, A2) -(k, I) -(11, 12, 14) -(21, 22, 24)	Operating uncertainty in the range of 42.	•
Protective separation (reinforced insulation) between	(k1, l1, k2, l2, k3, l3) -(11, 12, 14)	Measured-value memory (HiS) for the first	
Voltage test acc. to IEC 61010-1	3.536 kV	Password	on/off/0999 (OFF
CMD421		Fault memory (M) alarm relay	on/off/con (on
Rated insulation voltage	AC 250 V	Switching elements	
Rated impulse voltage/pollution degree	4 kV/3	Number	2 x 1 changeover contacts (K1, K
Basic insulation between:	(k1, l1, k2, l2, k3, l3) -(A1, A2), (21, 22, 24)	Operating principle	N/C operation/N/O operati
Basic insulation between:	(11, 12, 14) -(21, 22, 24)		ce error Err, overcurrent prewarning > 11, test button tES
Voltage test acc. to IEC 61010-1	2.21 kV		(device error Err, overcurrent alarm > 12 , test button tES
		Electrical endurance, number of cycles	10,0
Supply voltage		Contact data acc. to IEC 60947-5-1	7
CMD420-D-1, CMD421-D-1:		Utilisation category	AC-13 AC-14 DC-12 DC-12 DC-
Supply voltage $U_{\rm S}$	AC 1672 V/DC 9.694 V	Rated operational voltage	230 V 230 V 24 V 110 V 220
Frequency range U _s	15460 Hz	Rated operational current	5 A 3 A 1 A 0.2 A 0.1
CMD420-D-2, CMD421-D-2:		Minimum contact rating	1 mA at AC/DC \geq 10
Supply voltage $U_{\rm S}$	AC/DC 70300 V		
Frequency range U _s	15460 Hz	Environment/EMC	
Power consumption	≤ 4 VA	EMC	IEC 61326
		Operating temperature	-25+55
Measuring circuit CMD420		Classification of climatic conditions a	acc. to IEC 60721
Nominal measuring range (r.m.s. value) $n = 1$	AC 01 A	(except condensation and formation of ice	e)
Overload capability, continuous	2 A	Stationary use (IEC 60721-3-3)	3K
Overload capability < 5 s	5 A	Transport (IEC 60721-3-2)	2K
Load per measuring input	50 mΩ	Storage (IEC 60721-3-1)	1K
Rated frequency f _n	422000 Hz	Classification of mechanical condition	ns acc to IFC 60721
Response values CMD420		Stationary use (IEC 60721-3-3)	3M
Undercurrent Lo /< (Alarm 2) n = 1	AC 0.11 A (0.3 A)*	Transport (IEC 60721-3-2)	21
Undercurrent Lo $I < (Alarm 1)$ $n = 1$	100200 % (150 %)*	Storage (IEC 60721-3-1)	1M
	mum nominal current of 1 A into consideration!	Storage (IEC 00721 3 1)	IIII
Overcurrent Hi /> (Alarm 2) n = 1	AC 0.11 A (0.3 A)* (Hi)*	Connection	
Overcurrent Hi $I > (Alarm 1)$ n = 1	50100 % (50 %)* (Hi)*	Connection type	screw-type terminal or push-wire termir
Window $I_n I >$ (Alarm 2) $n = 1$	AC 0.11 A (0.3 A)*	Connection	screw termina
Window $I_n I <$ (Alarm 1) $n = 1$	50100 % (50 %)*	Connection properties	
External current transformer	x/1 A	rigid / flexible / conductor sizes	0,24 / 0,22,5 mm ² / AWG 24
Transformation ratio n	12000 (1)*	Two conductors with the same cross section	
Relative uncertainty in the range of 42460 Hz	±5 %, ±2 digits	rigid / flexible	0.21.5 mi
Hysteresis	340% (15 %)*	Stripping length	8 m
		Tightening torque, terminal screws	0.50.6 N
Measuring circuit CMD421		Connection	push-wire termina
Nominal measuring range (r.m.s. value)	AC 05 A	Connection properties	F
Overload capability, continuous	7.5 A	rigid	0.22.5 mm ² (AWG 241
Overload capability < 5 s	with screw-type terminal connection: 20 A	flexible	
	with push-wire terminals: 12 A	without ferrules	0.752.5 mm ² (AWG 191
Load per measuring input	3 mΩ	with ferrules	0.21.5 mm ² (AWG 241
Rated frequency fn	42460 Hz	Stripping length	10 m
Response values CMD421		Opening force	50
Undercurrent Lo / < (Alarm 2) n = 1	AC 0.55 A (1.5 A)*	Test opening, diameter	2.1 m
Undercurrent Lo $I < (Alarm 1) n = 1$	100200 % (150 %)*		
	mum nominal current of 5 A into consideration!	Other	
Overcurrent Hi / > (Alarm 2) n = 1	AC 0.55 A (1.5 A)* (Hi)*	Operating mode	continuous operati
Overcurrent Hi $l > (Alarm 1) n = 1$	50100 % (50 %)* (Hi)*	Mounting	any positi
	AC 0.55 A (1.5 A)*	Degree of protection, internal components	
Window $I_n I > (Alarm 2) n = 1$		Degree of protection, terminals (IEC 60529	
Window $I_n I >$ (Alarm 2) $n = 1$ Window $I_n I <$ (Alarm 1) $n = 1$	50100 % (50 %)*		polycarbona
Window $I_n I <$ (Alarm 1) $n = 1$	50100 % (50 %)* x/5 A	Enclosure material	
	x/5 A	Flammability class	UL94 V
Window I _n I < (Alarm 1) n = 1 External current transformer Transformation ratio n	x/5 A 12000 (1)*	Flammability class DIN rail mounting acc. to	UL94 V IEC 607
Window $I_n I <$ (Alarm 1) $n = 1$ External current transformer	x/5 A	Flammability class DIN rail mounting acc. to Screw mounting	UL94 V IEC 607 2 x M4 with mounting c
Window I _n I< (Alarm 1) n = 1 External current transformer Transformation ratio n Relative uncertainty in the range of 42460 Hz Hysteresis	x/5 A 12000 (1)* ±5 %, ±2 digits	Flammability class DIN rail mounting acc. to Screw mounting Documentation number	UL94 V IEC 607 2 x M4 with mounting c D001
Window I _n I/< (Alarm 1) n = 1 External current transformer Transformation ratio n Relative uncertainty in the range of 42460 Hz Hysteresis Time response	x/5 A 12000 (1)* ±5 %, ±2 digits 340% (15 %)*	Flammability class DIN rail mounting acc. to Screw mounting	UL94 V IEC 607 2 x M4 with mounting c
Window I _n I< (Alarm 1) n = 1 External current transformer Transformation ratio n Relative uncertainty in the range of 42460 Hz Hysteresis Time response Start-up delay t	x/5 A 12000 (1)* ±5 %, ±2 digits 340% (15 %)*	Flammability class DIN rail mounting acc. to Screw mounting Documentation number	UL94 V IEC 607 2 x M4 with mounting c D001
Window I_n /< (Alarm 1) n = 1 External current transformer Transformation ratio n Relative uncertainty in the range of 42460 Hz Hysteresis Time response Start-up delay t Response delay t_{on1}	x/5 A 12000 (1)* ±5 %, ±2 digits 340% (15 %)* 0300 s (0.5 s)* 0300 s (15)*	Flammability class DIN rail mounting acc. to Screw mounting Documentation number Weight	UL94 V IEC 607 2 x M4 with mounting c D001
Window I_n /< (Alarm 1) n = 1 External current transformer Transformation ratio n Relative uncertainty in the range of 42460 Hz Hysteresis Time response Start-up delay t Response delay t_{0n1} Response delay t_{0n2}	x/5 A 12000 (1)* ±5 %, ±2 digits 340% (15 %)* 0300 s (0.5 s)* 0300 s (15)* 0300 s (0 s)*	Flammability class DIN rail mounting acc. to Screw mounting Documentation number Weight	UL94 V IEC 607 2 x M4 with mounting c D001
Window I_n /< (Alarm 1) n = 1 External current transformer Transformation ratio n Relative uncertainty in the range of 42460 Hz Hysteresis Time response Start-up delay t Response delay t_{on1} Response delay t_{on2} Delay on release t_{off}	x/5 A 12000 (1)* ±5 %, ±2 digits 340% (15 %)* 0300 s (0.5 s)* 0300 s (15)* 0300 s (0.5)*	Flammability class DIN rail mounting acc. to Screw mounting Documentation number Weight	UL94 V IEC 607 2 x M4 with mounting c D001
Window I_n /< (Alarm 1) n = 1 External current transformer Transformation ratio n Relative uncertainty in the range of 42460 Hz Hysteresis Time response Start-up delay t Response delay t_{on1} Response delay t_{on2} Delay on release t_{off} Resolution of setting t , $t_{on1/2}$, t_{off} (010 s)	x/5 A 12000 (1)* ±5 %, ±2 digits 340% (15 %)* 0300 s (0.5 s)* 0300 s (15)* 0300 s (05)* 0300 s (15)* 0300 s (15)*	Flammability class DIN rail mounting acc. to Screw mounting Documentation number Weight	UL94 V IEC 607 2 x M4 with mounting c D001
Window I_n /< (Alarm 1) n = 1 External current transformer Transformation ratio n Relative uncertainty in the range of 42460 Hz Hysteresis Time response Start-up delay t Response delay t_{0n1} Response delay t_{0n2}	x/5 A 12000 (1)* ±5 %, ±2 digits 340% (15 %)* 0300 s (0.5 s)* 0300 s (15)* 0300 s (0.5)*	Flammability class DIN rail mounting acc. to Screw mounting Documentation number Weight	UL94 V IEC 607 2 x M4 with mounting c D001

10 s ≤ 130 ms

 $t_{\rm an} = t_{\rm ae} + t_{\rm on1/2}$

≤ 135 ms

≤ 300 ms

 $t_{\text{off}} = t_{\text{re}} + t_{\text{off}}$



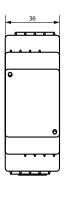
Resolution of setting t, $t_{on1/2}$, t_{off} (100...300 s)

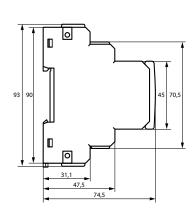
Operating time t_{ae} Response time tan

Release time toff

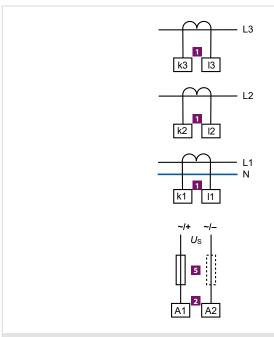
Recovery time $t_{\rm b}$

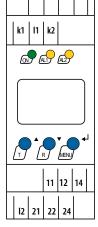
Device release time $t_{\rm re}$





Wiring diagram





k3 | I3 | A1 | A2



- Connection to the conductors to be monitored; using current transformers
- **2** A1, A2 Supply voltage U_s (see ordering information)
- **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

22 24

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

Supply vo	Supply voltage ¹¹ <i>U</i> ₅		Art. No.
DC	AC	. Туре	
1694 V	1672 V, 42460 Hz	CMS460-D-1	B94053017
70276 V	70276 V, 42460 Hz	CMS460-D-2	B94053018

¹⁾ Absolute values

Accessories

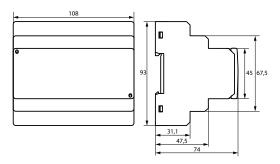
Description	Art. No.
XM460 mounting frame, 144 x 82 mm	B990995

Suitable system components

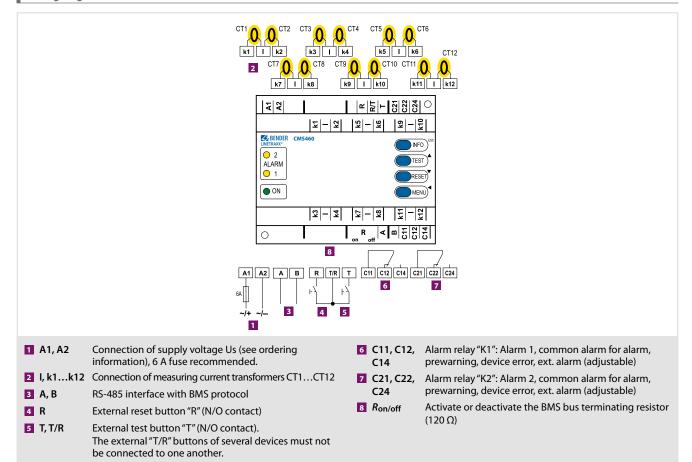
Description	Version	Type of construction	Туре	Art. No.	Page
		circular	CTAC	B981100	358
Massuring surrent transformers	pulsed DC sensitive	rectangular	WRS(P)	B9117	365
Measuring current transformers		split-core	WS	B980806	372
		flexible	WF	B780802	376
Condition Monitor	with integrated gateway: Bender system/Ethernet	-	COM465IP	B950610	402
		-	CP9I	B9506103	416
RS-485 repeater	-	-	DI-1DL	B95012047	397

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_5 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 ± 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
Rated impulse voltage 2.5 kV	Data logger 300 data records per measuring channel
Protective separation (reinforced insulation) between (A1, A2) - (k1, I k12, 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) -	Test/reset button internal/external
(C11, C12, C14), (C21, C22, C24), (11,14), (21,24), (31,34), (41,44),	Cable length for external test/reset button 010 m
(51,54), (61,64), (71,74), (81,84), (91,94), (101,104), (111,114), (121,124)	Cable length for external test/reset batton
Basic insulation between: (11, 14) - (21, 24) - (31, 34) - (41, 44) - (51, 54) - (61, 64)	Interface
Voltage test acc. to IEC 61010-1 2.21 kV	Interface/protocol RS-485/BMS
Rated insulation voltage 250 V Overvoltage category/pollution degree III/3	Baud rate 9.6 kbit/s
Rated impulse voltage 6 kV	Cable length 01200 m 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 $U_{\rm S}$ AC/DC 100240 V (-20+15 %)	Single wire $\geq 0.75 \text{ mm}^2$ 01 m
Supply voltage frequency DC, 50/60 Hz	Single wire, twisted $\geq 0.75 \text{ mm}^2$ 010 m
Rated insulation voltage 250 V	Shielded cable $\geq 0.5 \text{ mm}^2$ 040 m
Overvoltage category/pollution degree III/3 Rated impulse voltage 6 kV	Recommended cable (shielded, shield connected to terminal I at one end, must not be earthed)
Protective separation (reinforced insulation) between (A1, A2) - (k1, 1k12, R, T/R, T, A, B),	J-Y(St)Y min. 2x0.8
(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
Protective 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)	Contact data acc. to IEC 60947-5-1
Voltage test acc. to IEC 61010-1 3.536 kV 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
Basic insulation between: k1, I k12, R, T/R, T, A, B) - (C11, C12, C14), (C21, C22, C24)	Rated operational current (alarm relay) 2 A 0.5 A 5 A 0.2 A 0.1 A
Basic insulation between: (11, 14) - (21, 24) - (31, 34) - (41, 44) - (51, 54) - (61, 64)	Minimum contact rating $1 \text{ mA at AC/DC} \ge 10 \text{ V}$
Voltage test acc. to IEC 61010-1 2.21 kV	Environment/EMC
Measuring circuit	EMC IEC 61326-1
External measuring current transformers CTAC, WR, WS, WF series (type A)	Operating temperature $-25^{\circ}\mathrm{C}$
Load 1Ω	Climatic class acc. to IEC 60721
Rated insulation voltage (measuring current transformer) 800 V	Stationary use (IEC 60721-3-3) 3K23 (except condensation and formation of ice)
Operating characteristics acc. to IEC 60755 type A	Transport (IEC 60721-3-2) 2K11 (except condensation and formation of ice)
depending on measuring current transformer series (type A)*	Long-term storage (IEC 60721-3-1) 1K22 (except condensation and formation of ice)
Rated frequency 422000 Hz (type A) Cut-off frequency none, IEC, 50 Hz, 60 Hz (none)*	Classification of mechanical conditions acc. to IEC 60721
Measuring range 100 mA125 A (measuring current transformer type A)	Stationary use (IEC 60721-3-3) 3M11 Transport (IEC 60721-3-2) 2M4
100 mA30 A (measuring current transformer Flex)	Long-term storage (IEC 60721-3-1) 1M12
Crest factor up to 10 A = 4, up to 125 A = 2	
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)* Relative uncertainty +1020 %	Connection properties: Rigid/flexible/conductor sizes 0.24/0.22.5 mm²/AWG 2412
Hysteresis 240% (20 %)*	Multi-conductor connection (2 conductors with the same cross section):
Factor for additional CT /210; x 110 (x 1)*	Rigid/flexible 0.21.5/0.21.5 mm ²
Number of measuring channels (per device/system) 12/1080	Stripping length 89 mm
Time response	Tightening torque 0.50.6 Nm
Start-up delay t(start-up) per device 099 s (0 ms)*	Other
Response delay ton per channel 0999 s (200 ms)*	Operating mode continuous operation
Delay on release t _{off} per channel 0999 s (200 ms)*	Mounting display-oriented
Operating time t_{ae} at $l_n = 1 \times l_{n1/2}$ $\leq 180 \text{ ms}$	Degree of protection, internal components (IEC 60529) IP30
Operating time t_{ae} at $I_n = 5 \times I_{n1/2}$ $\leq 30 \text{ ms}$	Degree of protection, terminals (IEC 60529) IP20
Response time t_{an} for current measurement $t_{an} = t_{ae} + t_{on1/2}$	Enclosure material polycarbonate
Scanning time for all measuring channels (current measurement) ≤ 180 ms	Flammability class UL94V-0
Recovery time t_b 500600 ms	Screw fixing 2 x M4 DIN rail mounting acc. to IEC 60715
	Power consumption ≤ 10 VA
	Weight ≤ 360 g
	()* Factory setting

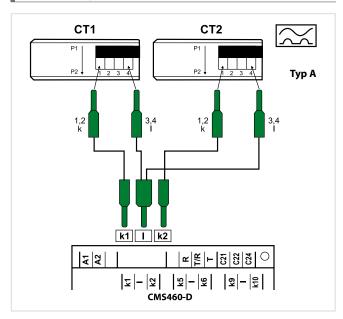




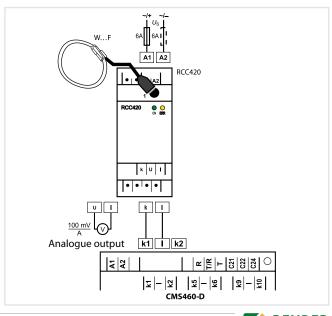
Wiring diagrams



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

Supply voltage ¹¹ U₅		Type	Art.	No.
AC	DC	.,,,,,	Screw-type terminal	Push-wire terminal
1672 V, 15460 Hz	9.694 V	GM420-D-1	B93082001	B73082001
70300 V, 15460 Hz	70300 V	GM420-D-2	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/3	Operating principle	N/C operation or N/O operation
	E) -(11-12-14) -(21-22-24)	31 11	K1: Err, $> R$, OL, $> U$, tES (device error, loop resistance,
Voltage test acc. to IEC 61010-1:	-, (, (,		measuring current disconnection: 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	10,000
(A1-A2) -(11-12-14) -(21-22-24)	2.21 kV		10,000
(A1-A2) -(11-12-14) -(21-22-24)	Z.Z1 KV	Contact data acc. to IEC 60947-5-1	
Supply voltage		Utilisation category	AC-13 AC-14 DC-12 DC-12 DC-12
Supply voltage U _s	see ordering information	Rated operational voltage	230 V 230 V 24 V 110 V 220 V
Frequency range $U_{\rm S}$	see ordering information	Rated operational current	5 A 3 A 1 A 0.2 A 0.1 A
Power consumption	≤ 4 VA	Minimum contact rating	1 mA at AC/DC \geq 10 V
'		Environment/EMC	
Measuring circuit		EMC	IEC 61326
Loop resistance R _m :		Operating temperature	-25+55 °C
Measuring range $R_{\rm m}$	0100 Ω	Classification of climatic conditions	s ass to IEC 60721
Measuring current I _m	DC 20 mA		
Measuring voltage $U_{\rm m}$	≤ DC 24 V	Stationary use (IEC 60721-3-3)	3K23 (except condensation and formation of ice)
Extraneous voltage <i>U</i> _f :		Transport (IEC 60721-3-2)	2K11 (except condensation and formation of ice)
Measuring range U _f	AC 050 V	Long time storage (IEC 60721-3-1)	1K22 (except condensation and formation of ice)
Rated frequency f _n	42460 Hz	Classification of mechanical condit	tions acc. to IEC 60721
Disconnection of the measuring loop at U_f	≥ 12 V	Stationary use (IEC 60721-3-3)	3M11
Reconnection of the measuring loop		Transport (IEC 60721-3-2)	2M4
Permissible extraneous voltage <i>U</i> _f	≤ 10 V ≤ 440 V	Long-time storage (IEC 60721-3-1)	1M12
Permissible extraneous DC voltage, without influence on the measureme		Composition	
Termissible extraneous DC voltage, without influence on the measurement	iit DC 0 V	Connection	annon for a farmatical an arrial voice farmatical
Response values		Connection type	screw-type terminal or push-wire terminal
Loop resistance $> R$ (Alarm 1)	0.1100 Ω	Connection	screw terminals
Resolution of setting $R = 010 \Omega$	0.1 Ω	Connection properties	
Resolution of setting $R = 10100 \Omega$	1Ω	rigid	0.24 mm ² (AWG 24 12)
Preset function:		flexible	0.22.5 mm ² (AWG 2414)
Loop resistance $(> R) =$	$((R_{\rm m} + 0.5 \Omega) \times 1.5)^*$	Two conductors with the same cross se	
Relative uncertainty 01Ω	±20 %, ±1 digit	rigid/flexible	0.21.5 mm ² (AWG 2416)
Relative uncertainty 1100 Ω	±5 %, ±1 digit	Stripping length	8 mm
Hysteresis $> R$	140 % (25 %)*	Tightening torque, terminal screws	0.50.6 Nm
Extraneous voltage > U (Alarm 2)	150 V (25 V)*	Connection	push-wire terminals
Resolution of setting $U_f 150 \text{ V}$	0.5 V	Connection properties	•
Relative uncertainty Uf (> U) in the range of 50/60 Hz	±2 %, ±1 digit	rigid	0.22.5 mm ² (AWG 2414)
Relative uncertainty $U_f (> U)$ in the range of 42460 Hz	±10 %, ±1 digit	flexible	
Hysteresis > U	140 % (5 %)*	without ferrules	0.752.5 mm ² (AWG 1914)
nyseresis > 0	111110 70 (3 70)	with ferrules	0.21.5 mm ² (AWG 2416)
Time response		Stripping length	10 mm
Start-up delay t	099 s (0 s)*	Opening force	50 N
Response delay $t_{on1/2}$	099 s (0 s)*	Test opening, diameter	2.1 mm
Delay on release $t_{ m off}$	099 s (0.5 s)*		
Operating time		Other	
In the case of loop interruption ($R > 50 \text{ k}\Omega$) t_{ae}	≤ 40 ms	Operating mode	continuous operation
		Mounting	any position
In the case of closed loop (> R) t_{ae}	≤ 500 ms ≤ 100 ms	Degree of protection, internal compone	
In the case of extraneous voltage ($> U$) and overload (OL) t_{ae}		Degree of protection, terminals (IEC 60)	
Response time tan	$t_{\rm an} = t_{\rm ae} + t_{\rm on1/2}$	Enclosure material	polycarbonate
Recovery time t _b Recovery time t _b after safety shutdown	≤ 300 ms	Screw mounting	2 x M4 with mounting clip
necovery time () after safety SMULOOWN	<u>≤1s</u>	DIN rail mounting acc. to	IEC 60715
Displays, memory		Flammability class	UL94 V-0
	functional, not illuminated	Documentation number	D00112
Display range, measuring value R _m	0100 Ω	Weight	≤ 150 g
Display range, measuring value <i>U</i> _f	AC 050 V	()* = factory setting	
Operating uncertainty, loop resistance 01Ω	±20 %, ±1 digit	· · · · · · · · · · · · · · · · · · ·	
· · · · ·			
Operating uncertainty loop resistance 1 100 O	±5 %. +1 dinit		
Operating uncertainty loop resistance 1100Ω Operating uncertainty voltage in the range of $50/60 \text{Hz}$	±5 %, ±1 digit ±2 %, ±1 digit		

±10 %, ±1 digits

on/off (on)*

data record measured values off/0...999 (off)*

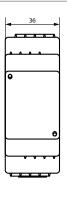


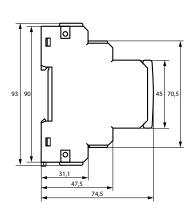
Operating uncertainty voltage in the range of 42 \ldots 460 Hz

History memory (HiS) for the first alarm value

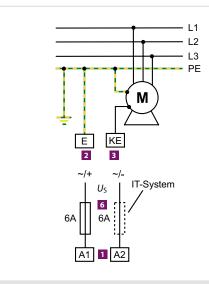
Fault memory (M) alarm relay

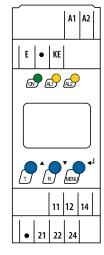
Password

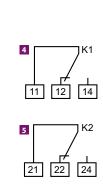




Wiring diagram







- **1 A1, A2** Supply voltage U_s (see ordering details) via fuse
- **E** Connection of E to the PE conductor
- **KE** Connection of KE to the loads or the monitoring conductor
- **11, 12, 14** Alarm relay "K1":

Alarm 1 configurable for > R, OL, $> U_f$, ERROR, TEST

- **5 21, 22, 24** Alarm relay "K2":
 - Alarm 2 configurable for > R, OL, $> U_f$, ERROR, TEST
- Line protection by a fuse in accordance with DIN VDE 0100-430/ IEC 60364-4-43 (6 A fuse recommended). In case of supply (A1/A2) from an IT system, both lines have to be protected by a fuse.



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

Typical applications

- Monitoring cables that feature a pilot wire
- Monitoring of earthing systems

Standard

- CSA M421-16
- NEC 250.188(D)

Approvals



Further information

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

Ordering information

Supply voltage U₅	Supply voltage <i>U</i> ₅ für UL	Type	Art. No.	
AC/DC	AC/DC	.,,,,,		
60264 V, 5060 Hz	110240 V, 50/60 Hz	RC48C-935	B94013002	

Accessories

Description	Art. No.
Termination device for RC48C, $P = 5 W$ (without an enclosure)	B94013008
Termination device for RC48C, $P = 50 \text{W}$ (without an enclosure)	B94013009
Termination device for RC48C, $P = 50 \text{ W}$	B94013006
Termination device for RC48C with an integrated resistor for remote disconnection, $P=50\mathrm{W}$	B94013007

Suitable system components

Description	Inside diameter	Туре	Art. No.	Seite
Remote alarm indicator and test combination	-	RI2000GC	B94071000	-
Decidual augment transferment	70 mm	W2-S70	B911732	356
Residual current transformer	105 mm	W3-S105	B911733	356



IP 30

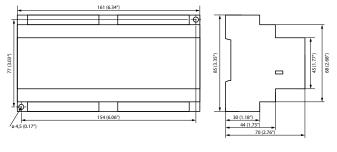
IP 20 UL94V-0

D00318

approx. 360 g

Insulation coordination acc. to IEC 60664-1:	
Rated insulation voltage	AC 250 V
Rated impulse 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 Å slow fuse
Power consumption	approx. 5 VA at AC 60 V
F	approx. 8.5 VA at AC 264 V
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 s
Accuracy of the response delay	±20 %
Continuous short-circuit current	200 A
	2500 A for 2 seconds
Operating mode	latching
Ground conductor monitoring	
Response value, series resistance fault	40 Ω
Accuracy	±10 Ω
Open-circuit voltage	DC 12 V
Output impedance	240 Ω
Rated current of the measuring loop	DC 25 mA
Protection against extraneous voltage	AC 25 V continuous
•	AC 120 V for 3 s
Delay on release	1.5 s
Response time, series resistance faults	0.2 s
Response time, cross resistance faults	0.2 s
Accuracy of the response time	±20 %
Operating mode	no 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 com	
Single wire 0.75 mm ² (AWG 18)	010 m (030')
	(-1112-7

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 V
Making capacity	AC/DC 5 /
Breaking capacity AC/DC	2/0.2 /
Permissible number of operating cycles	12000 cycle
Operating mode, switching elements (alarm relay)	Fail-Safe
Switching elements (GFA, GCS)	2 NO contact
Rated contact voltage	AC 250 V/DC 300 \
Making capacity	AC/DC 5 /
Breaking capacity AC/DC	2/0.27
Permissible number of operating cycles	12000 cycle:
crinissible number of operating cycles	12000 Cycle
Type tests	
Test of the electromagnetic compatibility (EMC)	
Immunity	according to IEC 62020
Emission	according to EN 50081
Emissions according to EN 55011/CISPR11	class A
Environment	
Ambient temperature, during operation	-40+60°C
Ambient temperature, for storage	-55+80°C
Climatic class acc. to IEC 60721 (except condensation	and formation of ice) 3K23
Connection	
Connection type	screw-type terminal:
Connection properties rigid	0.24 mm ² (AWG 2412
Connection properties flexible	0.22.5 mm ² (AWG 2414
Other	
Operating mode	continuous operation
Mounting	any position
Protection class	according to DIN EN 60529
D.:: 4 :	ID 24

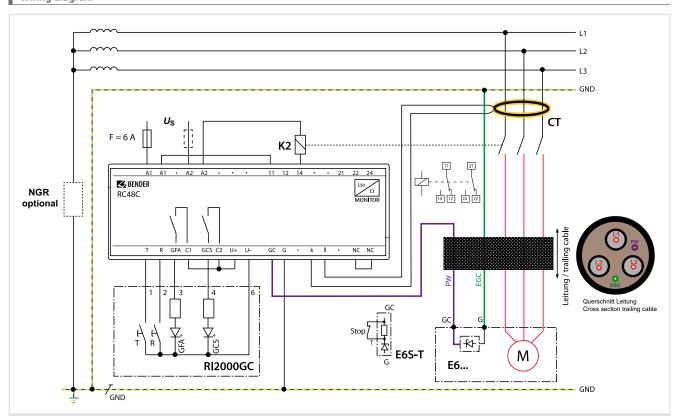
Built-in components

Flammability class

Documentation number

Terminals

Weight



Connections	
A1, A2	Connection supply voltage U_s .
11, 12, 14 21, 22, 24	Two voltage-free changeover contacts trip in case of an alarm. N/C operation or N/O operation selectable.
NC, NC	Set contact configuration for voltage-free changeover contacts: Bridge open: N/O Bridge closed: N/C (factory setting)
k, l	Connection residual current transformer
GC	Connection to the PW (pilot wire) conductor of the cable
G	Connection to the EGC (equipment grounding conductor = GND) conductor of the cable.

Connection to the RI2000GC remote alarm indicator and test combination			
Т	Connection external Test button		
R	Connection external Reset button		
GFA	Connection external "Alarm Ground Fault" LED		
GCS	Connection external "Ground Check Safe" LED		
U+, U-	Output DC 12 V, e.g. for the supply of the RI2000GC remote alarm indicator and test combination		
C1, C2, U+	Bridge supplying the RI2000GC remote alarm indicator and test combination with supply voltage from the RC48C.		

Insulation monitoring devices





Equipment for insulation fault location







Residual current monitoring systems







Neutral Grounding Resistor Monitor (NGR)







Charge Controller







Power Quality and Energy Measurement LINETRAXX®

Measuring and monitoring relays







System components

Coupling devices Measuring current transformers Transformers Relay modules Power supply units Measuring instruments Interface converters Interface repeaters COMTRAXX® Gateways COMTRAXX® Alarm indicator and test combinations COMTRAXX® condition monitors Visualisation



339



Switching equipment

ATICS® transfer switching and monitoring devices

Test systems

UNIMET® Safety analyser



429 440



Anney

Technical terms Alphabetical list of device: Service



463



Device overview coupling devices







AGH204S-4



AGH520S

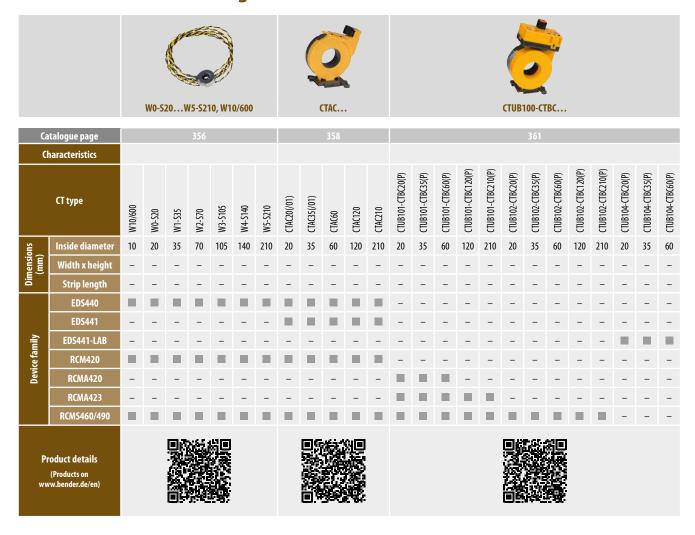


AGH675S-7/ AGH675S-7MV



Catalogue page Extension of the nominal voltage **Application** range for ISOMETER $\ensuremath{^{\circ}} s$ range for ISOMETER $^{\!\circ}\text{s}$ range for ISOMETER $\ensuremath{^{\circ}} s$ range for ISOMETER®s range for ISOMETER $\ensuremath{^{\circ}} s$ AC 0...1150 V, AC 0...1300 V / AC, 3(N)AC, DC 0...7.2 kV Nominal system voltage Un AC/3(N)AC 0...7200 V AC/3(N)AC 0...12 kV DC 0...1760 V AC 0...1650 V AC, 3(N)AC, DC 0...15.5 kV IRDH275BM-7 IR420-D64 iso685-D iso685-S **Product details** www.bender.de/en)

Device overview measuring current transformers









Device overview isolating transformers, transformers for operating theatre lights



	Catalogue page	379	384	387	
	Application	Design of medical IT systems	Supply of three-phase loads in group 0, 1 or 2 medical locations	Supply of operating theatre luminaires	
Type of distribution system		single-phase	three-phase	single-phase	
Input		AC 230 V	3AC 400 V	AC 230 V (±5 %, ±10 %)	
Voltages	Output	AC 230 V	3NAC 230 V	AC 2328 V	
ž	Frequency range	5060 Hz	5060 Hz	5060 Hz	
	Power	3150 VA 4000 VA 5000 VA 6300 VA 8000 VA 10000 VA	2000 VA 3150 VA 4000 VA 5000 VA 6300 VA 8000 VA 10000 VA	120 VA 160 VA 280 VA 400 VA 630 VA 1000 VA	
ā	vertical				
Design type	horizontal			-	
encapsulated (protection class B)				-	
	Product details (Products on www.bender.de/en)				

Device overview power supply units



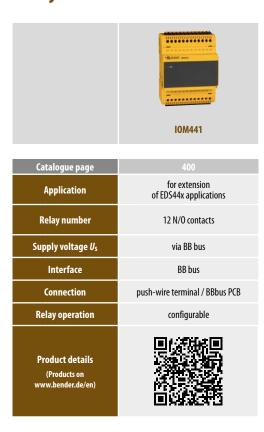
Device overview measuring instruments



Device overview interface converters and repeaters



Device overview Relay module



Device overview condition monitors/gateways











COMTRAXX® COM465IP COMTRAXX® COM465DP COMTRAXX® COM465ID COMTRAXX® COM463BC COMTRAXX® CP9...-I

Catalogue page		402	406	410	414	416
	Application	Condition Monitor/Gateway	Condition Monitor/ PROFIBUS-Gateway	Condition Monitor/Gateway	Condition Monitor/Gateway	Condition Monitor/Gateway
	Protocol input	BMS / BCOM / Modbus RTU/TCP	BMS / BCOM / Modbus RTU/TCP	isoData / Modbus TCP	BMS (extern) / BCOM	BMS (intern) / BCOM / Modbus RTU/TCP
	Protocol output	Ethernet / Modbus RTU/TCP / SNMP / PROFINET	Ethernet / Modbus RTU/TCP / SNMP / PROFINET / PROFIBUS DP	Ethernet / Modbus TCP / OPC-UA ⁵⁾	Ethernet	Ethernet / Modbus RTU/TCP / SNMP / PROFINET
	Display	LED	LED	LED	LED	Display in 7" oder 15,6"
	Alarm messages	1, 2)	1, 2)	1, 2)	1, 2)	1, 2, 3)
	Measured values	1, 2)	1, 2)	1, 2)	1, 2)	1, 2, 3)
Functions	Device parameter setting	1)	1)	1)	÷	1)
튣	Device tests	1, 2)	1, 2)	1, 2)	+	1, 2)
	Alarm list	1)	1)	1).	-	1,3)
	History memory	1)	1)	1)	-	1)
	Diagrams	1)	1)	1)	Ψ.	1,3)
	Visualisation	1)	1)	1)	Ŧ	1)
	E-mail notification	1,4)	1,4)	1,4)	1,4)	1, 4)
	Data logger	1)	1)	1)	Ψ.	1)
	BMS	screw-type terminal	screw-type terminal	-	screw-type terminal	screw-type terminal
Connection	Modbus RTU	screw-type terminal	screw-type terminal	-	screw-type terminal	screw-type terminal
Conne	isoData	-	Ψ.	screw-type terminal	Ψ.	-
	Output	RJ 45	RJ 45, Sub-D 9-pole	RJ 45	RJ 45	RJ 45
System requirements	Supply voltage <i>U</i> s	AC/DC 24240 V	AC/DC 24240 V	AC/DC 24240 V	AC/DC 24240 V	DC 24 V
Syst require	Browser	Google Chrome, Microsoft Edge, Mozilla Firefox	Google Chrome, Microsoft Edge, Mozilla Firefox	Google Chrome, Microsoft Edge, Mozilla Firefox	Google Chrome, Microsoft Edge, Mozilla Firefox	Google Chrome, Microsoft Edge, Mozilla Firefox
Product details (Products on www.bender.de/en)						

 $^{^{1)}}$ Functions available on the web server – accessible via a personal computer with browser

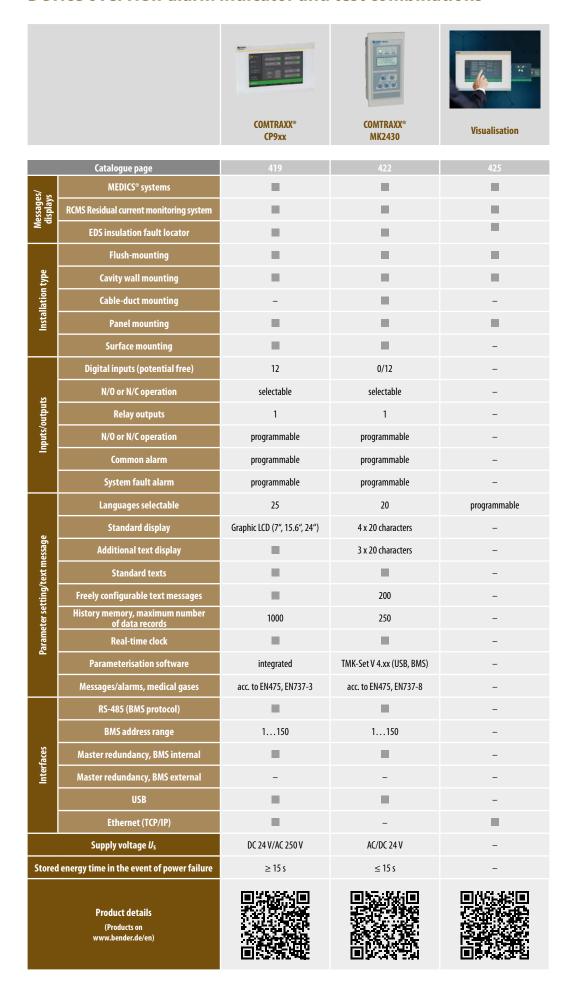
²⁾ Available via the protocol

 $^{^{\}scriptscriptstyle 3)}$ On the device's own LC display

⁴⁾ TLS/SSL Support

⁵⁾ Special OPC-UA profile stored for railway applications

Device overview alarm indicator and test combinations





Device overview POWERSCOUT®



	Catalogue page	426
	Multi-tenant	Unlimited
	User management	Unlimited
	Logger	Unlimited (all measured values)
	Web front end	
	Cloud	
	Max. number of devices/data points	Unlimited
tions	Creation of dashboards	
Functions	Event aggregation on the main page	
	Configuration of an individual main page	
	Reporting	
	Export data	csv export
	Import data	csv import
	Virtual measuring point calculation	
	Login overview	
	Graph	
	Event statistics	
	Measurement statistics	
	Text editor	
v	Table view	
/idget	Alarm state	
5	Event protocol	
	Gauge	
	Heat map	
	Sankey diagram	
	Bar graph	
Product details (Products on www.bender.de/en)		





AGH150W-4 Coupling device





Typical applications

 $\bullet \ \text{Extension of the nominal voltage range for the ISOMETER} \\ \text{$^\circ$s iso685... series to AC 0...1150 V, DC 0...1760 V}$

Standards

The AGH150W(-4) complies with the requirements of

• DIN EN 45545-2.

Approvals





AGH150W-4



Further information

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

Ordering information

Nominal system voltage <i>U</i> s		Type	Art. No.
AC	DC	1,562	711.110.
	01100 V	AGH150W	B915576
01150 V	01760 V	AGH150W-4	B98018006



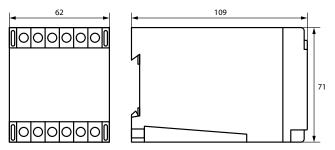
Insulation coordination acc. to DIN EN 61800-	5-1 (VDE 0160-105-1)
AGH150W	
Rated insulation voltage	AC 1000 V
Voltage test acc. to IEC 60255	12 kV
Pollution degree	3
AGH150W-4	
Rated insulation voltage	AC 1600 V
Voltage test acc. to IEC 60255	17 kV
Pollution degree	3
Voltage test acc. to DIN EN 61800-5-1 (VDE 01	60-105-1)
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 $U_{n (sinus)}$	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 U _n	AC 01150 V, DC 01760 V
	DC 01600 V (for UL applications)
Frequency range of $U_{n (sinus)}$	DC 1460 Hz
Overvoltage category	CAT III
Rated impulse voltage	≥11 kV
Internal DC resistance R _i	≥160 kΩ
T	. 410*

Environment	
Class of extended operating temperature at switch-on	Class ST1
Operating altitude	≤ 2000 m AMSL
Ambient temperatures	
Operation	-10+55 °C
Storage	-40+70 ℃
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)	2M4
Long-term storage (IEC 60721–3-1)	1M12
Connection	
Connection	flat terminals
Connection properties	
rigid/flexible	0.24/0.22.5 mm ²
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
Degree of protection, terminals (DIN EN 60529)	IP20
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Documentation number	D00093

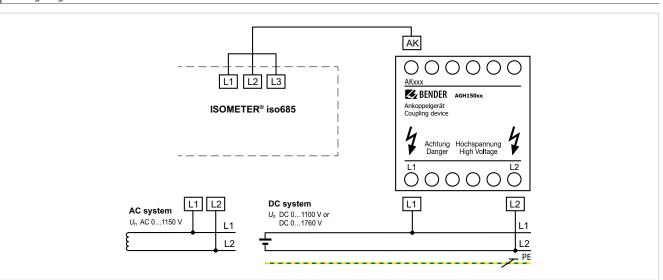
* The tolerance range affects the measured value of the insulation monitoring device used and must be taken into account accordingly

Dimension diagram (dimensions in mm)

Tolerance of internal DC resistance Ri



Wiring diagram



 $\pm 4\,k\Omega^*$

AGH204S-4 Coupling device





Typical applications

• Extension of the nominal voltage range to AC, 3(N)AC 0...1650 V/0...1300 V, 50... 400 Hz for the ISOMETER®s iso685... series.

Approvals







Further information

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

Ordering information

Nominal system voltage <i>U</i> s	Type	Art. No.
AC	туре	
01650 V/01300 V	AGH204S-4	B914013

80 kΩ

160 kΩ

Technical data

Insulation coordination acc. to DIN EN 61800-5-1 (VDE 0160-105-1) Rated insulation voltage AC 1500 V Voltage test acc. to DIN EN 61800-5-1 (VDE 0160-105-1) Impulse voltage test (basic insulation) \geq AC 10.4 kV AC voltage test (basic insulation) \geq AC 5 kV Partial discharge test \geq 3 kV Voltage ranges Nominal system voltage U_n (including DC components) 0...1300 V Nominal system voltage U_n (AC only) 0...1650 V 50...400 Hz Nominal frequency f_n Overvoltage category/rated impluse voltage III/≥10.4 kV Internal DC resistance Ri

Coupling to AK80 Coupling to AK160

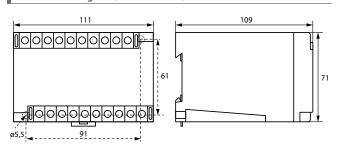
Environment			
Shock resistance IEC 60068-2-27 (device in ope	ration)		15 g/11 ms
Bumping IEC 60068-2-29 (transport)			40 g/6 ms
Vibration resistance IEC 60068-2-6 (device in op-	peration)	1 g/	10150 Hz
Vibration resistance IEC 60068-2-6 (transport)		2 g/	10150 Hz
Ambient temperature (during operation)		-1	10+55 ℃
Ambient temperature for UL applications (durin	ng operation)	-1	10+45 °C
Ambient temperature (during storage)		-4	40+70 °C
Climatic class acc. to DIN IEC 60721-3-3	3K23 (except co	ndensation and form	nation of ice)

Connection

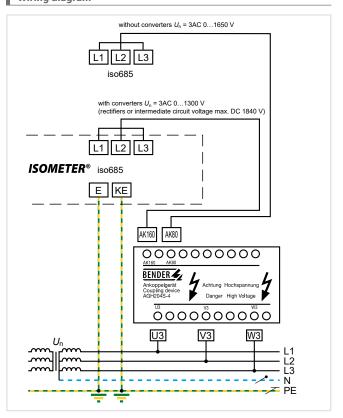
Connection	screw-type terminals
Connection properties	
rigid/flexible	0.24 mm ² /0.22.5 mm ²
Tightening torque	0.5 Nm
Conductor sizes	AWG 2412
Length of the connecting lead between the ISOMETER® and AGH	≤ 0.5 m
Other	
Operating mode	continuous operation
Mounting	any position
Danuar of mustastian internal common anto (DIN EN COESO)	ID20

Degree of protection, internal components (DIN EN 60529) IP30 Degree of protection, terminals (DIN EN 60529) IP20 Type of enclosure X112, free from halogen Screw mounting 2 x M4 DIN rail mounting DIN EN 60715/IEC 60715 Flammability class UL94 HB Documentation number D00094 Weight $\leq 1350 \, g$

Dimension diagram (dimensions in mm)



Wiring diagram









Typical applications

• Extension of the nominal voltage range to (3)AC 0...7200 V, 50...400 Hz for the ISOMETER®s iso685... series.

Approvals







Further information

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

Ordering information

Nominal system voltage <i>U</i> s	Туре	Art. No.
3(N)AC		
07200 V	AGH520S	B913033

AC 6.3 kV

Technical data

Insulation coordination acc. to IEC 61800-5-1 Operating voltage

Voltage test according to IEC 61800-5-1

Overvoltage category/impulse voltage test (basic insulation)	III/AC 35 kV
AC voltage test (basic insulation)	AC 17.5 kV
Partial discharge test	12 kV

Voltage ranges

Nominal system voltage U_n	AC, 3(N)AC 07.2 kV
Nominal system voltage U_n for UL applications	AC, 3(N)AC 06 kV
Nominal frequency f _n	50400 Hz
Internal DC resistance R _i	≥ 80 kΩ
Impedance Z _i at 7.2 kV and 50 Hz	\geq 6 M Ω

Environmental conditions

Classification of mechanical conditions acc. to IEC 60721:

Stationary use (IEC 60721-3-3)	3M ²
Transport (IEC 60721-3-2)	2N
Storage (IEC 60721-3-1)	1M1
Ambient temperature (during operation)	-10+55
Ambient temperature for UL applications (du	ring operation) -10+45
Ambient temperature (during storage)	-20+70
Climatic class acc. to IEC 60721-3-3	3K23 (except condensation and formation of ic

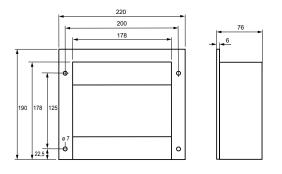
Connection

Connection terminal 2 (medium voltage)	screw-type terminal
Connection terminals 3, 4, 5	screw-type terminals
Connection properties	
rigid/flexible	0.24 mm ² / 0.22.5 mm ² (AWG 2412)
Tightening torque	2.9 Nm

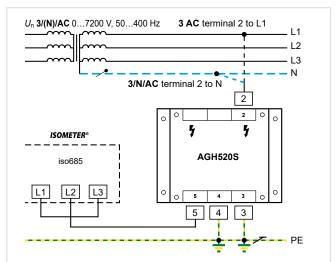
General data

veneral data	
Operating mode	continuous operation
Position	any position
Degree of protection, internal components (DIN EN 60529)	IP64
Degree of protection, terminals (DIN EN 60529)	IP20
Type of enclosure	resin-encapsulated block
Screw mounting	4 x M5
Flammability class	UL94 HB
Documentation number	D00073
Weight	≤ 4500 g

Dimension diagram (dimensions in mm)



Wiring diagram



AGH675S-7/AGH675S-7MV15

Coupling device





Typical applications

• Extension of the nominal voltage range to AC/DC 0...15.5 kV for the ISOMETER® IRDH275BM-7

Approvals

C€器 [ff]

Further information

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

Ordering information

Nominal system voltage <i>U</i> n	Cable length	Type	Art. No.	
AC/DC	tuble length	.,,,,,	u. 1.5.	
0 7210 46011-	500 mm	AGH675S-7-500	B913060	
07.2 kV, 0460 Hz	2000 mm	AGH675S-7-2000	B913061	
0 15.5 kV, 0 460 Hz	500 mm	AGH675S-7-MV15-500	B913058	

Documentation number

Weight

Technical data

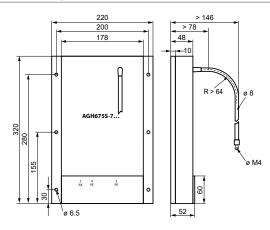
AGH675S-7	
Rated insulation voltage	AC 7.2 k\
AGH675S-7MV15	
Rated insulation voltage	AC 15.5 k\
Voltage test according to IEC 61800-5-1	
Type test:	
AGH675S-7	
AC voltage test (basic insulation)	40 k\
AC voltage test (basic insulation)	20 k\
Partial discharge test	14 k\
AGH675S-7MV15	
Impulse voltage test (basic insulation)	111 k\
AC voltage test (basic insulation)	70 k\
Partial discharge test	29 k\
Routine test:	
AC voltage test	40 k [\]
Voltage ranges	
AGH675S-7	
Nominal system voltage U _n	AC, 3(N)AC, DC 07.2 k\
Nominal frequency f _n	0460 Hz
Internal DC resistance R _i	≥ 2.39 MΩ
AGH675S-7MV15	
Nominal system voltage U _n	AC, 3(N)AC, DC 015.5 k\
Nominal frequency for	0460 H
Internal DC resistance Ri	≥ 4.7 MΩ

Operating temperature (normal operation)		- 10+ 60 °C
Operating temperature (continuous operation	n with asymmetrical earth fault)	- 10+ 55 °C
Classification of climatic conditions acc.	to IEC 60721:	
Stationary use (IEC 60721-3-3)	3K23 (except condensation a	nd formation of ice
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 (3M12 Y axis)
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		M ²
Connection type terminals 3, 4, 5	SC	rew-type terminals
Connection		
rigid/flexible	0.24 n	nm²/0.22.5 mm²
flexible connector sleeve		0.252.5 mm ²
Other .		
Operating mode	CO	ntinuous operation
Mounting		any position
Degree of protection, internal components (C	DIN EN 60529)	IP 64
Degree of protection, terminals (DIN EN 6052	19)	IP 20
Type of enclosure	resin-	encapsulated block
Screw mounting		M5
Flammability class		UL94 HB

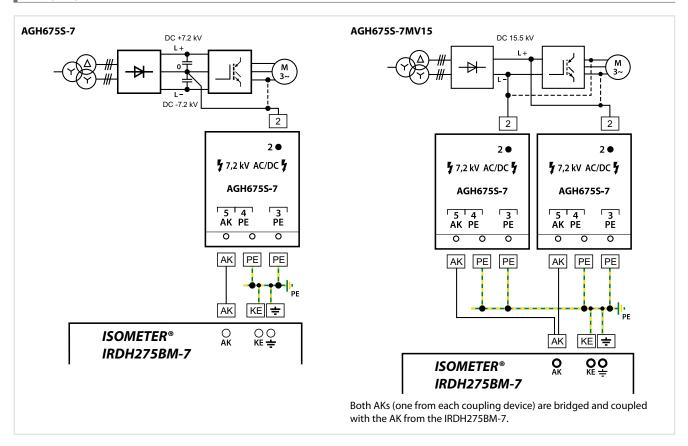


D00095

≤ 5100 g



Wiring diagram



AGH676S-4 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. $\label{eq:control}$

Ordering information

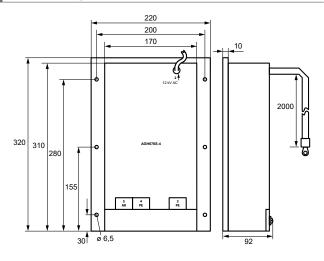
Nominal system voltage <i>U</i> s	Cable length	Type	Art. No.	
AC, 3(N)AC		.,,,-		
012 kV, 50460 Hz	2000 mm	AGH676S-4	B913055	

Technical data

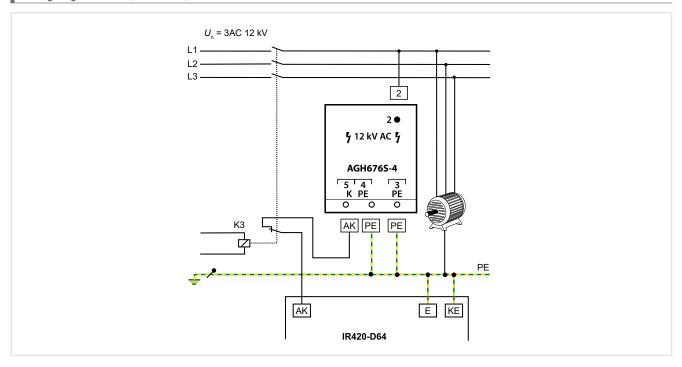
Insulation coordination acc. to IEC 61800-5	-1
Rated insulation voltage	AC 12 kV
Voltage test acc. to IEC 61800-5-1	
Type test	
Voltage impulse test	≥ AC 75 kV
AC voltage test	≥ AC 45 kV
Partial discharge test	≥ 16.5 kVeff
Routine test	
AC voltage test, rate of increase < 2 kV/s	AC 25 kV
Voltage ranges	
Nominal system voltage Un	AC / 3(N)AC 012 kV
Nominal frequency fn	50460 Hz
Internal DC resistance Ri	≥ 160 kΩ
Impedance Zi at 12 kV and 50 Hz	≥ 12 MΩ
Environmental conditions	
Shock resistance IEC 60068-2-27 (during operation	on) 15 g/11 ms
Bumping IEC 60068-2-29 (during transport)	40 g/6 ms
Vibration resistance IEC 60068-2-6 (during opera	ntion) 1 g / 10150 Hz
Vibration resistance IEC 60068-2-6 (during trans	port) 2 g / 10150 Hz
Ambient temperature, during operation	-10+55 °C
Storage temperature range	-40+70 °C
Climatic class acc. to IEC 60721-3-3	3K23 (except condensation and formation of ice)

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
Other	
Operating mode	continuous operation
Position	any position
Degree of protection, internal components (D	IN EN 60529) IP64
Degree of protection, terminals (DIN EN 6052	9) IP20
Type of enclosure	resin-encapsulated block
Screw fixing	M5
Flammability class	UL94 HB
Documentation number	D00096
Weight	≤ 8400 g

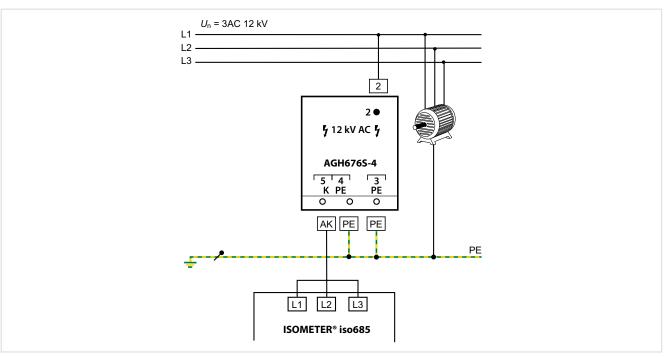




Wiring diagram offline (IR420-D64)



Wiring diagram online (iso685)



W0-S20...W5-S210, W10/600

Measuring current transformers



Measuring current transformer W10/600

Typical applications

- For residual current monitors (RCM)
- For residual current monitoring systems (RCMS)
- \bullet For insulation fault locators with additional EDS in AC and DC systems

Standards

 $W0\text{-}S20...W5\text{-}S210 \ series \ measuring \ current \ transformers \ comply \ with \ the \ device \ standard:$

• IEC 61869-1.

Approvals





Measuring current transformer W0-S20

Further information

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



Measuring current transformer W1-S35

Ordering information

Inside diameter		Approvals		Туре	Art. No.	
morae diameter	UL	EAC	LR	.,,,,,		
10 mm	-	-		W10/600	B911761	
20 mm	-			W0-S20	B911787	
35 mm				W1-S35	B911731	
70 mm				W2-S70	B911732	
105 mm				W3-S105	B911733	
140 mm				W4-S140	B911734	
210 mm				W5-S210	B911735	

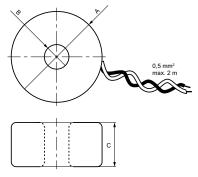


Insulation coordination acc. to IEC 60044-1	
Highest system voltage for electrical equipment $U_{\rm m}$	AC 720 V
Rated impulse withstand voltage $U_{ m isol}$	3 kV
Measuring circuit	
Rated transformation ratio	600/1
Rated burden	180 Ω (18 Ω at 100 A)
Phase displacement	<4°
Rated primary current	≤10 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 P6KE6V8CP
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	3K23

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 ≥ 0.75 mm²	01 m
single wire, twisted ≥ 0.75 mm²	010 m
hielded 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 60:	529) 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)

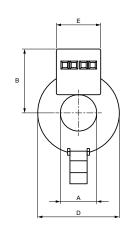
Dimension diagrams

Type W10/600

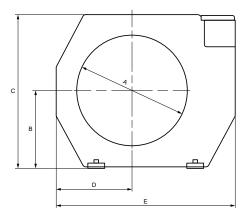


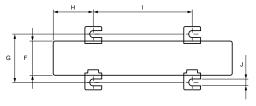


Type W0-S20



Type W1-S35...W5-S210





Dimensions (mm)							Weight				
Туре	A	В	C	D	E	F	G	Н	-1	J	Weight
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 a



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
- Suitable for use in insulation fault location for IT systems (EDS)

Approvals







Ordering information

Mounting	Inside diameter	Туре	Art. No. ²⁾		
	20 mm	CTAC20	B98110005		
	20 111111	CTAC20/01 ¹⁾	B98110006		
Mounting brackets, DIN rail	25	CTAC35	B98110007		
J. N. Tuli	35 mm	CTAC35/01 ¹⁾	B98110008		
	60 mm	CTAC60	B98110017		
Marine broaders	120 mm	CTAC120	B98110019		
Mounting brackets	210 mm	CTAC210	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	-	-	-	

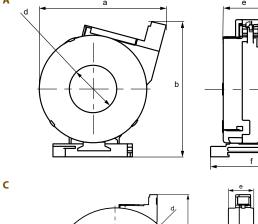
²⁾ B781100xxMIL variants available on request

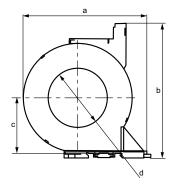
Rated insulation voltage	800
Overvoltage category	
Rated impulse voltage/pollution degree	8 kV/
Measuring current transformer circuit	
CTAC	
Rated transformation ratio K _r	600/
Rated continuous thermal current* Icth	125
Frequency range	15 Hz100 kH
Rated short-time thermal current* Ith	2.4 kA/1
Rated dynamic current* I _{dyn}	6.0 kA/40 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* Icth	6.
Rated short-time thermal current* Ith	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)	3K23 (except condensation and formation of ice
Transport (IEC 60721-3-2)	2K11 (except condensation and formation of ice
Long-time storage (IEC 60721-3-1)	1K22 (except condensation and formation of ice
Classification of mechanical conditions IEC 6	
Stationary use (IEC 60721-3-3)	3M1
B781100xxMIL devices ¹⁾	3M1
Transport (IEC 60721-3-2)	2M

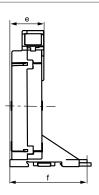
Connection	
Ferminal type	MSTB 2.5/2-ST-5.08
for B781100xxMIL devices	FKC 2.5/2-ST-5.08
Manufacturer	Phoenix Contact
Connection type	screw type termina
for B781100xxMIL devices	push-wire termina
The connection conditions of the manufacturer apply.	
Corresponding PCB connectors are included in the scope of del	livery
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 transform	ners
Single wire ≥ 0.75 mm ²	01 m
Single wire, twisted ≥ 0.75 mm ²	010 m
Shielded cable ≥ 0.5 mm ²	040 m
Shielded cable	recommended: J-Y(St)Y min. 2x0.8
miciaea capie	reconninenaea. J-1(St)1 IIIII. 2XV.0
RCM: shield on one side connected to L-conductor, not	
RCM: shield on one side connected to L-conductor, not	
RCM: shield on one side connected to L-conductor, not EDS: shield on one side connected to PE	
RCM: shield on one side connected to L-conductor, not EDS: shield on one side connected to PE Mounting	connected to earth
RCM: shield on one side connected to L-conductor, not EDS: shield on one side connected to PE Mounting Screw Type	connected to earth DIN EN ISO 7045 - M5x
RCM: shield on one side connected to L-conductor, not EDS: shield on one side connected to PE Mounting Screw Type CTAC20(/01), CTAC35(/01), CTAC60	connected to earth DIN EN ISO 7045 - M5x
RCM: shield on one side connected to L-conductor, not EDS: shield on one side connected to PE Mounting Screw Type CTAC20(/01), CTAC35(/01), CTAC60 CTAC120, CTAC210	DIN EN ISO 7045 - M5x DIN EN ISO 7045 - M6x
RCM: shield on one side connected to L-conductor, not EDS: shield on one side connected to PE Mounting Screw Type CTAC20(/01), CTAC35(/01), CTAC60 CTAC120, CTAC210 Washer type	DIN EN ISO 7045 - M5x DIN EN ISO 7045 - M6x DIN EN ISO 7089/7090 - 5
RCM: shield on one side connected to L-conductor, not EDS: shield on one side connected to PE Mounting Crew Type CTAC20(/01), CTAC35(/01), CTAC60 CTAC120, CTAC210 Washer type CTAC20(/01), CTAC35(/01), CTAC60 CTAC120, CTAC210	DIN EN ISO 7045 - M5x DIN EN ISO 7045 - M6x DIN EN ISO 7089/7090 - 5
RCM: shield on one side connected to L-conductor, not EDS: shield on one side connected to PE Mounting Crew Type CTAC20(/01), CTAC35(/01), CTAC60 CTAC120, CTAC210 Washer type CTAC20(/01), CTAC35(/01), CTAC60 CTAC120, CTAC210 Grightening torque	
RCM: shield on one side connected to L-conductor, not EDS: shield on one side connected to PE Mounting Crew Type CTAC20(/01), CTAC35(/01), CTAC60 CTAC120, CTAC210 Washer type CTAC20(/01), CTAC35(/01), CTAC60 CTAC120, CTAC210	DIN EN ISO 7045 - M5x DIN EN ISO 7045 - M6x DIN EN ISO 7089/7090 - 5 DIN EN ISO 7089/7090 - 6
RCM: shield on one side connected to L-conductor, not EDS: shield on one side connected to PE Mounting Crew Type CTAC20(/01), CTAC35(/01), CTAC60 CTAC120, CTAC210 Washer type CTAC20(/01), CTAC35(/01), CTAC60 CTAC120, CTAC210 Fightening torque CTAC20(/01), CTAC35(/01)	DIN EN ISO 7045 - M5x DIN EN ISO 7045 - M6x DIN EN ISO 7089/7090 - 5 DIN EN ISO 7089/7090 - 6
RCM: shield on one side connected to L-conductor, not EDS: shield on one side connected to PE Mounting Grew Type CTAC20(/01), CTAC35(/01), CTAC60 CTAC120, CTAC210 Washer type CTAC20(/01), CTAC35(/01), CTAC60 CTAC120, CTAC210 Ightening torque CTAC20(/01), CTAC35(/01) CTAC60, CTAC120, CTAC210	DIN EN ISO 7045 - M5x DIN EN ISO 7045 - M6x DIN EN ISO 7089/7090 - 5 DIN EN ISO 7089/7090 - 6 0.6 Nm 1 Nm
RCM: shield on one side connected to L-conductor, not EDS: shield on one side connected to PE Mounting Screw Type CTAC20(/01), CTAC35(/01), CTAC60 CTAC120, CTAC210 Washer type CTAC20(/01), CTAC35(/01), CTAC60 CTAC120, CTAC210 Injutening torque CTAC20(/01), CTAC35(/01) CTAC60, CTAC120, CTAC210 Other	DIN EN ISO 7045 - M5x DIN EN ISO 7045 - M6x DIN EN ISO 7089/7090 - 5 DIN EN ISO 7089/7090 - 6 0.6 Nm 1 Nm
RCM: shield on one side connected to L-conductor, not EDS: shield on one side connected to PE Mounting CTAC20(/01), CTAC35(/01), CTAC60 CTAC120, CTAC210 Washer type CTAC20(/01), CTAC35(/01), CTAC60 CTAC120, CTAC210 Igntening torque CTAC20(/01), CTAC35(/01) CTAC60, CTAC120, CTAC210 Other Degree of protection, internal components (DIN EN 60529)	DIN EN ISO 7045 - M5x DIN EN ISO 7045 - M6x DIN EN ISO 7089/7090 - 5 DIN EN ISO 7089/7090 - 6

¹⁾ CTAC120 and CTAC210 must be additionally mounted for the 3M12. (see Mountings)









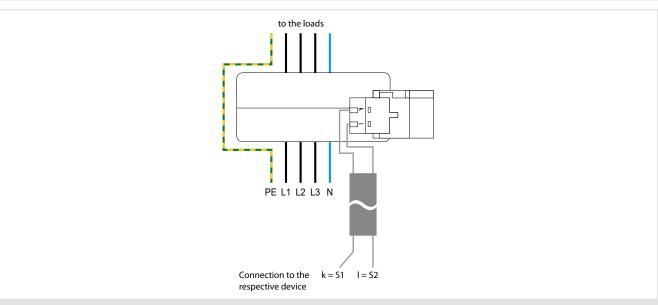
4	

Dimensions (mm)					Weight in g			
Type	a	b	c	d	e	f	g	(gross)
CTAC20(/01)	75	82	37	ø 20	32	60	-	160
CTAC35(/01)	94	100	47	ø 35	30	61	-	220
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

В

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® CTUB100 series

AC/DC sensitive measuring current transformer (Type B)



Typical applications

- For RCMS460/490 residual current monitoring systems
- For RCM420/423 residual current monitors
- For insulation fault locators of the EDS440 and EDS441LAB series

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-CTBC20P...210P only)
- Monitoring of the connection to the measuring current transformer
- Supply voltage DC ±12 V/DC 24 V
- CTUB10x-CTBC20...210 for residual current monitoring systems of the RCMS460/490 series as well as for RCMA420/423 residual current monitors
- CTUB10x-CTBC20P...210P for residual current monitoring systems of the RCMS460/490 series as well as for RCMA420/423 residual current monitors. Can be used for very high system-related peak load currents.
- CTUB104-CTBC20...210(P) for insulation fault locators of the EDS440 and EDS441LAB series.

Standards

CTUB10x series measuring current transformers comply with the following device standard:

- IEC 62020-1 for CTUB101 and CTUB102 in combination with a residual current monitor/residual current monitoring system (RCMS460/490 or RCMA420/423)
- IEC 61557-9 for CTUB104 in combination with an insulation fault locator (EDS440 or EDS441LAB)

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

Suitable for evaluator	Supply voltage	Current transformer diameter	Shielding	Туре	Art. No.
		20	-	CTUB101-CTBC20	B78120010
		ø 20		CTUB101-CTBC20P	B78120020
		ø 35	-	CTUB101-CTBC35	B78120012
		033		CTUB101-CTBC35P	B78120022
RCMA420	DC ±12 V	ø 60	-	CTUB101-CTBC60	B78120014
RCMA423	DC ±12 V	0 00		CTUB101-CTBC60P	B78120024
		ø 120	-	CTUB101-CTBC120	B78120016
		Ø 120		CTUB101-CTBC120P	B78120026
		ø 210	-	CTUB101-CTBC210	B78120018
		Ø Z 10		CTUB101-CTBC210P	B78120028
		ø 20	-	CTUB102-CTBC20	B78120011
		Ø 20		CTUB102-CTBC20P	B78120021
		ø 35	-	CTUB102-CTBC35	B78120013
	DC 24 V			CTUB102-CTBC35P	B78120023
RCMS460		ø 60	-	CTUB102-CTBC60	B78120015
RCMS490		0 00		CTUB102-CTBC60P	B78120025
		ø 120	-	CTUB102-CTBC120	B78120017
		Ø 120		CTUB102-CTBC120P	B78120027
		ø 210	-	CTUB102-CTBC210	B78120019
		Ø Z 1U		CTUB102-CTBC210P	B78120029
EDS440 EDS441LAB		ø 20		CTUB104-CTBC20P	B78120033
	DC 24 V	ø 35		CTUB104-CTBC35P	B78120034
		ø 60		CTUB104-CTBC60P	B78120035

Electronic modules

Suitable for evaluator	Supply voltage <i>U</i> s	Туре	Art. No.	
evaluatoi	DC			
RCMA420/423	±12 V	CTUB101	B78120050	
RCMS460/490	24 V	CTUB102	B78120051	
EDS440/441LAB	24 V	CTUB104	B78120053	

Required terminals are included in the scope of delivery. Connecting cables are optionally available.

Connecting cables

Length (m)	Connection to	Name	Art. No.
1		CTX-100	B98110080
2.5	RCMA42	CTX-250	B98110081
5		CTX-500	B98110082
10		CTX-1000	B98110083
1		CTXS-100	B98110090
2.5	RCMS46 RCMS49 EDS44	CTXS-250	B98110091
5		CTXS-500	B98110092
10		CTXS-1000	B98110093
10		CTXS-1000	B98110093

Suitable system components

Description	max. connected current transformers	Туре	Art. No.	Page
Voltage supply	4	STEP-PS/1 AC/24 DC/0.5	B94053110	389
	14	STEP-PS/1 AC/24 DC/1.75	B94053111	389
	34	STEP-PS/1 AC/24 DC/4.2	B94053112	389

Measuring current transformer cores

Internal diameter	Туре	Art. No.
20 mm	CTBC20	B98120001
20 111111	CTBC20P	B98120002
35 mm	CTBC35	B98120003
וווווו ככ	CTBC35P	B98120004
60 mm	CTBC60	B98120005
00 111111	CTBC60P	B98120006
120 mm	CTBC120	B98120007
120 111111	CTBC120P	B98120020
210	CTBC210	B98120008
210 mm	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 (reinforce	ed 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_s	±2 %
Ripple $U_{\rm S}$	≤ 1 %
Power consumption	≤ 2.5 W
CTUB102, CTUB104	
Description	24 V, GND
Supply voltage $U_{\rm S}$	DC 24 V
Operating range of U_s	±20 %
Ripple U _s	≤1%
Power consumption	≤ 2.5 W
Inrush current	1A for 1 ms

Measuring circuit

I I . I	and the section of the section
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/40 ms
1) refers to the residual current	
Possible response values (to be set on the evaluate	or)

Possible response values (to be set on the evaluator)	
CTBC20, CTBC20P	10500 mA
CTBC35, CTBC35P, CTUBC60, CTBC60P	30 mA10 A
CTBC120P, CTBC210P	100 mA10 A
CTBC120, CTBC210	300 mA10 A

Mea	suring	ranges (C	TUB101	, 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)

Measuring range	DC 070 mA

Indication

Multicolour LED table on page 364



Technical data (continued)	
Output	
Name	S1 (k), S2 (I)
Scaling	400 mV/1 A
Max. voltage	±10 V
Max. connector length	10 m
Output resistance	172 Ω
Input	
Name	T (for CTUB101 only)
Current load	< 300 mA
Environment/EMC	
EMC (CTUB101, CTUB102)	IEC 62020-1
EMC (CTUB104)	IEC 61326-2-4
Operating temperature	-2570°C
Classification of climatic conditions acc. to IEC 6 ice)	0721 (except condensation and formation of
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 (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M ²
Long-term storage (IEC 60721-3-1)	1M12
Connection	
Max. connection length	10 m
Connecting cables are optionally available.	
Use 60/75 ℃ copper lines only.	
Terminal block	
Manufacturer	Phoenix Contact
Туре	DFMC 1.5/4-ST-3.5 BM
The connection conditions of the manufacturer apply	y.
Connection properties	•
rigid	0.21.5 mm ² (AWG 2416)
flexible	0.21.5 mm
with formula	0.25 0.75 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	

n	•	L	_
v	ι	П	е

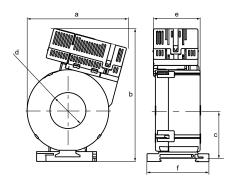
Other	
Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (DIN EN 60529)	IP40
Degree of protection, terminals (DIN EN 60529)	IP20
Flammability class	UL94 V-0
Software	D591
Documentation number	D00362
Weight	
CTUB10x- CTBC20	≤ 230 g
CTUB10x- CTBC20P	≤ 290 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 (not required for CTUB104).

Dimension diagrams

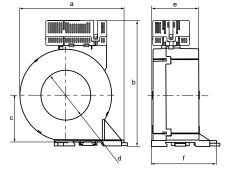
Α

with ferrule

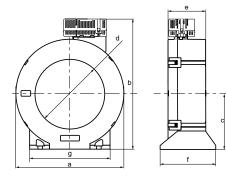


В

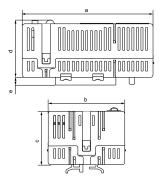
0.25...0.75 mm²



C



D



	Dimensions (mm)							
	Туре	a	b	c	d	e	f	g
A	CTUB10CTBC20(P)	75	83	37	ø 20	46	60.5	-
A	CTUB10CTBC35(P)	97	130	47	ø 35	46	61	-
В	CTUB10CTBC60(P)	126	151	57	ø 60	56	78	-
C	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	-	-

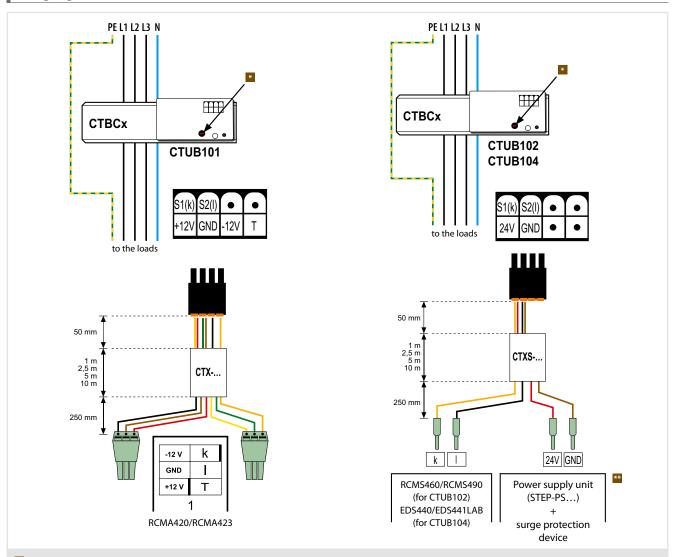
Tolerance: ±0.5 mm



The LED indicates the system state by means of colours and lighting/flashing.

System state	LED		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 $I_{\Delta N}$ set on the RCMS460 or RCMA420/423 evaluator. If, however, a larger measuring range is selected, the resolution deteriorates. For the CTUB104, a selection of the measuring range is not required.

	Setting measuring range (not required for CTUB104)					
#	Potentiometer setting	Response value RCMA/RCMS	Measuring range rms	Measuring range peak		
1		$I_{\Delta n} \leq 0.1 \text{ A}$	0450 mA	0900 mA		
2		$0.1 A < I_{\Delta n} \le 0.5 A$	00.75 A	03.5 A		
3	\bigcirc	$I_{\Delta n} > 0.5 \text{ A}$	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 (not required for CTUB104).
 - 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.



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).



WR70x175S(P)...WR200x500S(P) series

Measuring current transformers



Measuring current transformers WR70x175S(P)



Measuring current transformers WR200x500S(P)

Approvals







Ordering information

Screening	Internal	Appr	rovals	Type	Art. No.	
Streening	dimensions	UL	LR	.,,,,		
	70 x 175 mm			WR70x175S	B911738	
without carooning	115 x 305 mm			WR115x305S	B911739	
without screening	150 x 350 mm			WR150x350S	B911740	
	200 x 500 mm	-		WR200x500S	B911763	
	70 x 175 mm	-		WR70x175SP	B911790	
Screening integrated	115 x 305 mm	-		WR115x305SP	B911791	
	150 x 350 mm	-		WR150x350SP	B911792	
	200 x 500 mm	-		WR200x500SP	B911793	

Typical applications

- For RCMS460/490 residual current monitoring systems
- For RCM420 residual current monitors
- 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 60044-1
- IEC 61869

Further information

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

Highest system voltage for electrical equipment U _m	AC 720 V
Rated impulse withstand voltage $U_{\rm isol}$	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 P6KE6V8CP
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	
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
MI IEC (00(0 2 C /)	2 g/10150 Hz
VIDITATION resistance IEC 60068-2-6 (transport)	- j,
Vibration resistance IEC 60068-2-6 (transport) Ambient temperature (during operation)	-10+50 °C
` ' '	3

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 2412
Connection to the evaluator	
single wire ≥ 0.75 mm ²	01 m
single wire, twisted ≥ 0.75 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

3K23

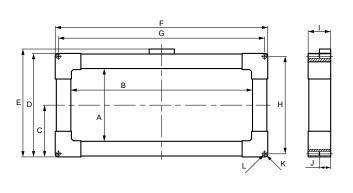
Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (DIN EN 60529)	IP40
Degree of protection, terminals (DIN EN 60529)	IP20
Screw mounting	M5
Flammability class	UL94 V-0
Documentation number	D00144

Dimension diagrams

Climatic class acc. to DIN IEC 60721-3-3

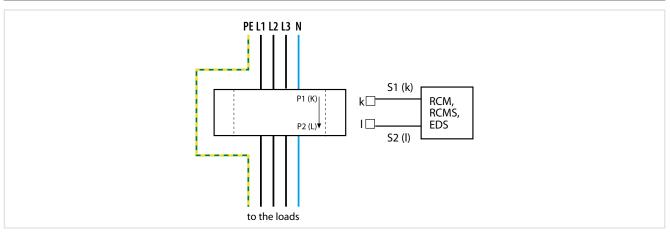
WR70x175S(P)...WR150x350S(P)

WR200x500S(P)



Dimensions (mm)									Weight				
Type	A	В	C	D	E	F	G	Н	1	J	K	L	Weight
WR70x175S(P)	70	175	85	165	180	261	2.5	46	22	225	13	7,5	2900 g
WR115x305S(P)	115	305	402	225	240	402	2.5	55	25	360	18.5	8	6300 g
WR150x350S(P)	150	350	460	272	286	460	2.5	55	28	418	23	8	8250 g
WR200x500S(P)	200	500	142.5	285	297	585	567.9	267.9	62	30	ø12	ø5.5	9000 g

Wiring diagram



LINETRAXX® CTAS series

Split-core type measuring current transformers



Typical applications

CTAS... measuring current transformers

- For residual current monitoring systems of the RCMS460/490 series
- For residual current monitors of the RCM420 series
- \bullet 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

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

Ordering information

Mounting	Internal diameter	Туре	Art. No.
Screw mounting, DIN rail	FO	CTAS50	B98110009
	50 mm	CTAS50/01	B98110012
	80 mm	CTAS80	B98110010
		CTAS80/01	B98110013
	120	CTAS120	B98110011
Screw mounting	120 mm	CTAS120/01	B98110014

Accessories

Description	Art. No.
Mounting clip 1)	B98110015
Mounting bracket	B98110016

Included in the scope of delivery of the CTAS50(/01) and CTAS80(/01). For CTAS120(/01) reduced mechanical conditions apply.

Selection list

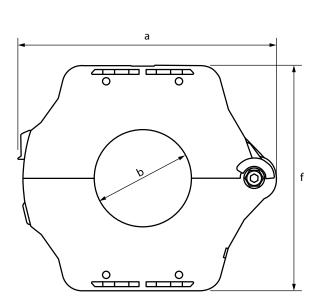
Туре	RCM420	RCMS460 RCMS490	EDS440	EDS441
CTAS50				-
CTAS80				-
CTAS120				-
CTAS50/01	-	-	-	
CTAS80/01	-	-	-	
CTAS120/01	-	-	-	

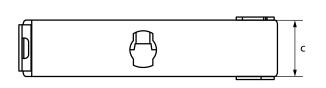


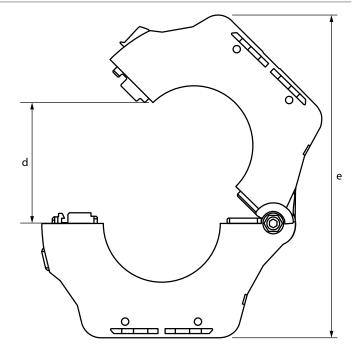
Rated voltage	720 \
Overvoltage category	, , , , , , , , , , , , , , , , , , ,
Rated impulse voltage/pollution degree	8 kV/3
Measuring current transformer circuit	
CTAS	
Rated transformation ratio K_r	600/
Rated continuous thermal current* I _{cth}	125 <i>F</i>
Frequency range	42 Hz3 kHz
Rated short-time thermal current* /th	2.4 kA/1
Rated dynamic current* I _{dyn}	6.0 kA/40 m
Rated current In	
CTAS50 at $I_{\Delta n} \ge 30 \text{ mA}$	85 A
CTAS80 at $I_{\Delta n} \ge 100 \text{ mA}$	160 A
CTAS120 at $I_{\Delta n} \ge 300 \text{ mA}$	250 A
CTAS/01	
Rated transformation ratio K _r	8000/
Rated continuous thermal current* Icth	125 <i>l</i>
Rated short-time thermal current* /th	0.36 kA/1
Rated dynamic current* I _{dyn}	0.9 kA/40 m
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	
Environment	
Operating temperature	-40+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 (-40+80 °C

Classification of mechanical conditions acc. to IEC 60721	
Stationary use (IEC 60721-3-3)	2142
Mounting clip	3M3
Mounting bracket	3M4
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12
Connection	
Connection type	screw-type terminals
Connection properties	
rigid	0.22.5 mm ² (AWG2412)
flexible	0.22.5 mm ² (AWG 2412)
Stripping length	89 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 m
Shielded cable	recommended: J-Y(St)Y min. 2x0.8
RCM: shield connected to L conductor, must not be earth EDS: shield to PE	ed
Mounting	
Mounting clip	3M3
Mounting bracket	3M4
Other	
Degree of protection, internal components (DIN EN 60529)	IP40
Degree of protection, terminals (DIN EN 60529)	IP20
Flammability class	UL94 V-0
Documentation number	D00452

Dimension diagram



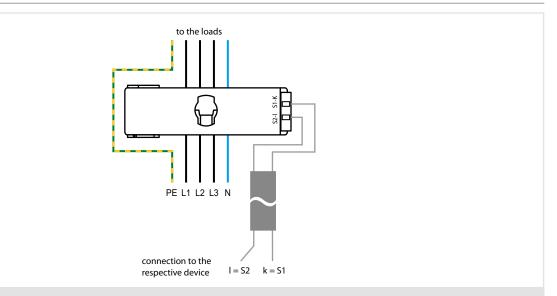




	Weight in g						
Туре	a	b	С	d	е	f	(gross)
CTAS50	133	ø 50	29	77	175	116	425
CTAS50/01	133	ø 50	29	77	175	116	460
CTAS80	177	ø 80	29	108	235	156	875
CTAS80/01	177	ø 80	29	108	235	156	950
CTAS120	225	ø 120	50	150	303	205	1500
CTAS120/01	225	ø 120	50	150	303	205	1550

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



LINETRAXX® CTBS25

Split-core AC/DC sensitive measuring current transformer



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
- 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.

Typical applications

- For residual current monitoring systems (RCMS)
- For insulation fault locators (EDS)

Approvals

C € ĽK

Ordering information

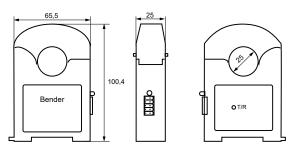
Supply voltage <i>U</i> s	Туре	Art. No.
DC 24 V	CTBS25	B98120060

Technical data

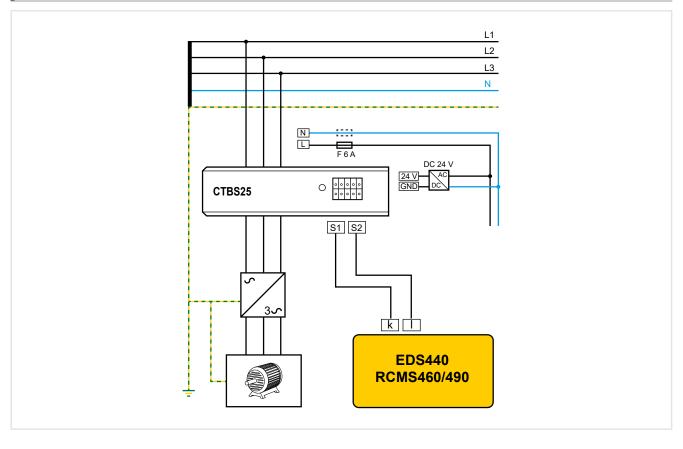
Definitions	
Measuring circuit (IC1)	Primary conductors routed through the current transform
Secondary (IC2)	Terminal block 1 (24 V, GND, S1, S
Rated voltage	300
Overvoltage category	
Operating altitude	≤ 2000 m AMS
Rated impulse voltage IC1/IC2	4 k
Rated insulation voltage IC1/IC2	300
Pollution degree	
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
Inrush current	10 A for 25 j
Power consumption	≤ 0.25 W typ. (2.5 W max
Measuring circuit	
Measuring current transformer, interi	nal diameter 25 m
Characteristics according to IEC 62020	and IEC/TR 60755 AC/DC sensitive, type
Frequency bandwidth	DC 100 kH
Measuring range I∆n	
DC/AC (< 100 kHz)	10500 m
Rated current In	100
Rated continuous thermal current Icth	
Operating uncertainty	±1 % ± 1 m
Cable length between (S1, S2) and (k	, l) 10 i
Displays	
Multicolour LED	red, gree

EMC	IEC 62020:1998+A1:2003
Operating temperature	-2575 °C
Classification of climatic condition (except condensation and formation of	
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	s acc. to IEC 60721
Stationary use (IEC 60721-3-3)	3M1°
Transport (IEC 60721-3-2)	2M ⁴
Long-term storage (IEC 60721-3-1)	1M12
Terminal block 1, reverse polarity prot Required terminals are included in the scope The connection conditions of the manufactur	of delivery.
Manufacturer	Phoenix Contact
Туре	PCB plug-in connector - DFMC 0.5/ 5-ST-2.54
Connection properties	. co plug cocc.
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-(
Documentation number	D00388
Weight	≤ 165 c





Wiring diagram





WS.../WS...-8000 series

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

Mounting	Internal dimensions	Туре	Art. No.
	20 x 30 mm	WS20x30	B98080601
Mounting brackets	20 X 30 IIIIII	WS20x30-8000 ¹⁾	B98080602
	5000	WS50x80	B98080603
	50 x 80 mm	WS50x80-8000 ¹⁾	B98080604
	80 x 120 mm	WS80x120	B98080606

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	-	-	-		

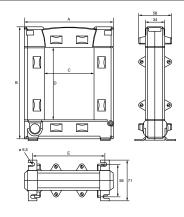


D00077

Rated insulation voltage	800 \
Rated impulse voltage/pollution degree	8 kV/3
CT circuit WS	
Rated primary residual current	10 /
Rated secondary residual current	0.0167 A
Rated transformation ratio K _n	10/0.0167 <i>F</i>
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}	$2.5 \text{ x } I_{\text{th}} = 6.0 \text{ kA}/40 \text{ m}$
CT circuit WS8000	
Rated primary residual current	1 A
Rated secondary residual current	0.125 m <i>l</i>
Rated transformation ratio K _n	1 A/0.125 mA
Frequency range	42 Hz3 kH
Rated continuous thermal current I _{cth}	6 /
Rated short-time thermal current I _{th}	$60 \text{ x } I_{\text{cth}} = 0.36 \text{ kA/1} \text{ s}$
Rated dynamic current I _{dyn}	$2.5 \text{ x } I_{\text{th}} = 0.9 \text{ kA/40 ms}$

Environmental conditions	
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)	3K23
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 terminals
Connection	
rigid/flexible/conductor sizes	0.082.5 mm ² (AWG 2812)
Stripping length	89 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 \geq 0.5 mm ²	040 m
Shielded cable (shield on one side connected to L-conductor, not conr	nected 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

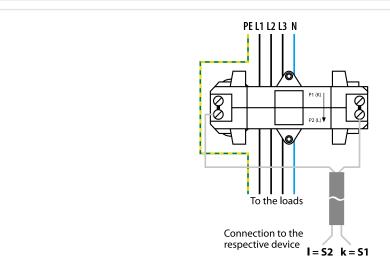
Dimension diagram



	Weight							
Туре	Type A B C D E							
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		

Documentation number

Wiring diagram



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



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

CECA [H[AL AL



Further information

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

Ordering information

Internal dimensions		Approvals		Туре	Art. No.	
	UL	EAC	LR	.,,,,,		
50 x 80 mm				WS50x80S	B911741	
80 x 80 mm				WS80x80S	B911742	
80 x 120 mm				WS80x120S	B911743	
80 x 160 mm	-			WS80x160S	B911755	

Screw mounting

Flammability class

Documentation number

Technical data

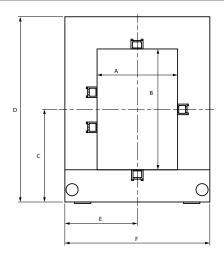
Insulation coordination acc. to IEC 60044-1	
Highest system voltage for electrical equipment $U_{\rm m}$	AC 720 V
Rated impulse withstand voltage $U_{\rm isol}$	3 kV
Measuring circuit	
Rated transformation ratio	600/1
Rated burden	180 Ω
Rated primary current	≤ 10 A (100 A)
Rated primary current	≥ 10 mA
Nominal power	50 mVA
Rated frequency	50400 Hz
Internal resistance	58Ω
Secondary overvoltage protection	with suppressor diode P6KE6V8CP
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
Vibration resistance IEC 60068-2-6 (transport)	2 g/10150 Hz
Ambient temperature (during operation)	-10+50 ℃
Storage temperature range	-40+70 °C
Climatic class acc. to DIN IEC 60721-3-3	3K23

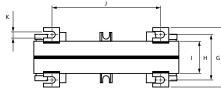
Connection	
Connection	screw-type terminals
Connection	
rigid/flexible	0.24/0.22.5 mm ²
flexible with ferrules with/without plastic sleeve	0.252.5 mm ²
Conductor sizes	AWG 2412
Connection to the evaluator	
single wire $\geq 0.75 \text{ mm}^2$	01 m
single wire, twisted ≥ 0.75 mm ²	010 m
shielded cable ≥ 0.6 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 operation
Mounting	any position
Degree of protection, internal components (DIN EN 60529)	IP40
Degree of protection, terminals (DIN EN 60529)	IP20

M5

UL94 V-0

D00145





Dimensions (mm)									. Weight							
Туре	A	В	C	D	E	F	G	Н	1	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	225	92	184	59	45	32	120	6.5	2550 g				

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

C € ĽK

- 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 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

Length A			Туре	Art. No.	
measuring current transformer	DC	AC	1,745		
170 mm	9.694 V	1672 V, 42460 Hz	WF170-1	B78080201	
1/0 111111	70300 V	70300 V, 42460 Hz	WF170-2	B78080202	
250 mm	9.694 V	1672 V, 42460 Hz	WF250-1	B78080203	
250 111111	70300 V	70300 V, 42460 Hz	WF250-2	B78080204	
500 mm	9.694 V	1672 V, 42460 Hz	WF500-1	B78080205	
JOO IIIIII	70300 V	70300 V, 42460 Hz	WF500-2	B78080206	
800 mm	9.694 V	1672 V, 42460 Hz	WF800-1	B78080207	
ood IIIII	70300 V	70300 V, 42460 Hz	WF800-2	B78080208	
1200 mm	9.694V	1672 V, 42460 Hz	WF1200-1	B78080209	
1200 111111	70300 V	42460 Hz, 70300 V	WF1200-2	B78080210	
1800 mm	9.694V	1672 V, 42460 Hz	WF1800-1	B78080221	
1000 111111	70300 V	42460 Hz, 70300 V	WF1800-2	B78080222	

¹⁾ Absolute values

Accessories

Description	Туре	Art. No.
Mounting clip for screw mounting (1 piece per device)	XM420 (RCC420)	B98060008



Technical data	
Electrical safety	
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 II
Pollution degree	2
Rated insulation voltage (CAT III)	1000 V _{rms} or DO
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 C
Rated frequency	422000 Hz
Rated continuous thermal current I _{cth}	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
Stationary use (IEC 60721-3-3)	3K23 (except condensation and formation of ice
Transport (IEC 60721-3-2)	2K11 (except condensation and formation of ice)
Long-time storage (IEC 60721-3-1)	1K22 (except condensation and formation of ice)
Classification of mechanical conditions	acc. to IEC 60721
Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M ⁴
Long-time storage (IEC 60721-3-1)	1M12

Connection RCC420		manala antina kame teral
Connection type		push-wire terminal
Connection properties	02.25	2 (114) (24 44)
rigid		mm² (AWG 2414)
flexible without ferrule		mm² (AWG 1914)
flexible with ferrule	0.21.5	mm ² (AWG 2416)
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 ≥ 0.5 mm ²		040 m
Shielded cable (shield to terminal I, not connected to earth)	recommended	l: 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 M	4 with mounting clip
DIN rail mounting acc. to		IEC 60715
Flammability class		UL94V-0
Documentation number		D00072
Weight		RCC 420 ≤ 160 g
-	WF170 \leq 160 g	WF800 ≤ 230 q

 $\textbf{Note:} \ The \ measuring \ current \ transformer \ is \ adapted \ to \ the \ associated \ signal \ converter \ RCC420.$

WF250 ≤ 180 g

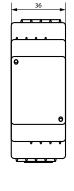
WF500 \leq 200 g

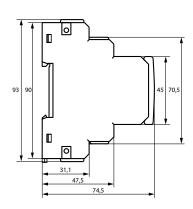
WF1200 ≤ 310 g

 $\mathsf{WF1800} \leq \mathsf{430g}$

Dimension diagrams (dimensions in mm)

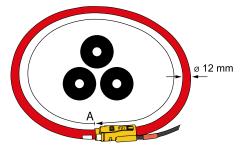
XM420 (RCC420)





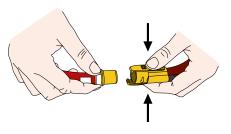
WF... measuring current transformers

 ${\sf A}={\sf For}$ details about the length of the measuring current transformer refer to ordering information.



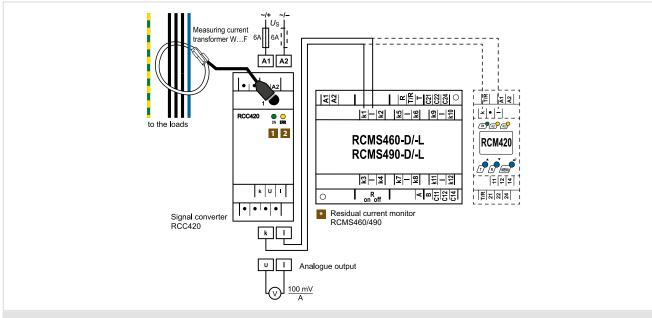
Dimension diagrams (dimensions in mm)

Locking connector measuring current transformer WF500...WF1800 Keep the locking connector clean



Locking connector WF170...WF250





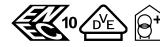
Connection to the respective RCMS460/490 residual monitoring system or to an RCM420 residual current monitor.

- 1 Power On LED "ON": lights up when voltage is available and when the device is in operation
- 2 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".

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 ES710/3150... ES710/10000 and ES...GL types, ES...SK2, ES...SN-GL are not VDE certified.



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 < 8 x Î_n

Standards

 ${\sf ES710}\ isolating\ transformers\ comply\ with\ the\ device\ standards\ and\ the\ regulations\ for\ installation:$

- 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

Further information

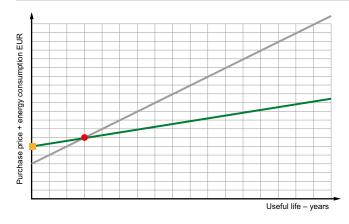
For further information refer to our product range on www.bender.de.



Type 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					
Rated input voltage	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					
Rated output current	13.7 A	17.4 A	21.7 A	27.4 A	34.7 A	43.5 A
Inrush current I _E	< 12 x Î _n	< 12 x Î _n	< 12 x Î _n	< 12 x Î _n	< 12 x Î _n	< 12 x Î _n
Inrush current I _E GL version	< 8 x Î _n	$< 8 x \hat{l}_n$	$< 8 x \hat{l}_n$	$< 8 x \hat{I}_n$	< 8 x Î _n	$< 8 x \hat{l}_n$
Leakage current	≤ 0.5 mA					
No-load input current 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 $U_{\mathbf{k}}$	≤ 3 %	≤ 3 %	≤ 3 %	≤ 3 %	≤ 3 %	≤ 3 %
Environmental conditions						
Ambient temperature	≤ 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)	\leq 35 dB(A)	\leq 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	0.080 Ω	0.064 Ω	0.050 Ω (-GL 0,054)
R _{secondary} ±5 %	0.230 Ω	0.110 Ω	0.095 Ω	0.070 Ω	0.056 Ω	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	i				
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.

= Deprecation of wear and tear Afa

= Standard version

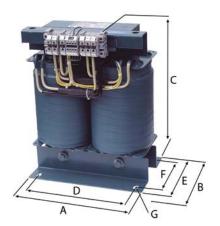
= GL version (Green Line)

= A higher purchase price of approx. 15-20%

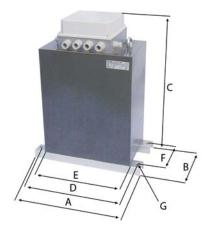
= ROI (Return on Investment) after about 1-3 years



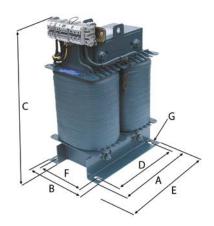
Standard
Dimension B is the depth incl. terminals



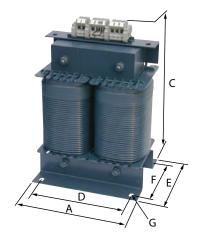
SK2 series



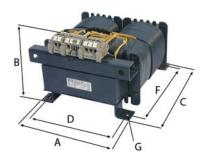
S series
Dimension E is the depth incl. terminals



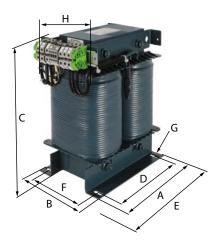
K series



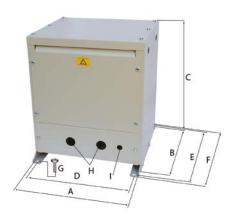
LG series



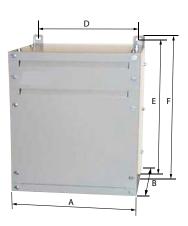
SN-GL series



Enclosure ESDS0107-1



Enclosure ESDS710



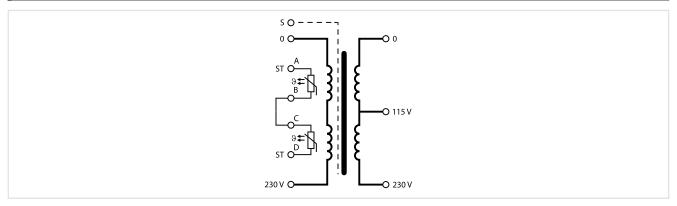
			Dim	ensions (r	nm)			Cu weight Weigl		Core	Туре	Art. No.
	A	В	C	D	E	F	G	(kg)	(kg)	U/I	Туре	AIT. NO.
	240	230	325	200	180	145	11 x 28	15	49	180/93	ES710/3150-GL	B92090001
	280	200	370	240	150	115	11 x 28	24	59	210/63	ES710/4000-GL	B92090002
ries	280	210	370	240	160	125	11 x 28	25	61	210/73	ES710/5000-GL	B92090003
GL series	280	225	370	240	175	140	11 x 28	26	65	210/88	ES710/6300-GL	B92090004
	280	240	370	240	190	155	11 x 28	27	74	210/103	ES710/8000-GL	B92090005
	280	255	370	240	205	170	11 x 28	33	85	210/120	ES710/10000-GL	B92090006
	280	180	370	240	290	145	11 x 28	15	49	180/93	ES710/3150S-GL	B92090061
	280	150	420	240	290	115	11 x 28	24	59	210/63	ES710/4000S-GL	B92090062
S-GL series	280	160	420	240	290	125	11 x 28	25	61	210/73	ES710/5000S-GL	B92090063
فِ	280	175	420	240	290	140	11 x 28	26	65	210/88	ES710/6300S-GL	B92090064
S	280	190	420	240	290	155	11 x 28	27	74	210/103	ES710/8000S-GL	B92090065
	280	205	420	240	290	170	11 x 28	33	85	210/120	ES710/10000S-GL	B92090066
	280	180	370	240	290	145	11 x 28	15	49	180/93	ES710/3150SN-GL	B92090121
	280	150	370	240	320	115	11 x 28	24	59	210/63	ES710/4000SN-GL	B92090122
SN-GL series	280	160	370	240	320	125	11 x 28	25	61	210/73	ES710/5000SN-GL	B92090123
ᅾ	280	175	370	240	320	140	11 x 28	26	65	210/88	ES710/6300SN-GL	B92090124
S	280	190	370	240	320	155	11 x 28	27	74	210/103	ES710/8000SN-GL	B92090125
	280	205	375	240	325	170	11 x 28	33	85	210/120	ES710/10000SN-GL	B92090126
	240	230	325	200	180	145	11 x 28	15	49	180/93	ES710/3150	B924211
	280	200	370	240	150	115	11 x 28	24	59	210/63	ES710/4000	B924212
ard	280	210	370	240	160	125	11 x 28	25	61	210/73	ES710/5000	B924213
Standard	280	225	370	240	175	140	11 x 28	26	65	210/88	ES710/6300	B924214
Š	280	240	370	240	190	155	11 x 28	27	74	210/103	ES710/8000	B924215
	320	260	420	270	200	160	13 x 35	39	85	240/83	ES710/10000	B924216
	240	200	360	200	180	145	11 x 28	15	49	180/93	ES710/3150K	B924221
	280		420	240	150	115	11 x 28	24	59	210/63	ES710/4000K	B924222
S	280		420	240	160	125	11 x 28	25	61	210/03	ES710/5000K	B924223
K series	280		420	240	175	140	11 x 28	26	65	210/73	ES710/6300K	B924224
_	280		420	240	190	155	11 x 28	27	74	210/103	ES710/8000K	B924225
	320		480	270	200	160	13 x 35	39	85	240/83	ES710/10000K	B924226
	230	235	320	204	200	240	9 x 14	15	49	180/93	ES710/3150LG	B924231
	260	210	365	234		280	9 x 14	24	59	210/63	ES710/4000LG	B924232
es												
LG serie	260 260	220 235	365 365	234 234		280 280	9 x 14 9 x 14	25 26	61 65	210/73 210/88	ES710/5000LG ES710/6300LG	B924233 B924234
_	260	250	365	234		280	9 x 14	27	74	210/00	ES710/8000LG	B924234
	294	240	410	264		320	13 x 20	39	85	240/83	ES710/8000LG	B924236
	380	200	450	350	270	150	13 x 20 11 x 16	15	69	180/93	ES710/10000EG ES710/3150SK2	B924230 B924241
		190			310	150						
ies	380		500	350			11 x 16	24	75 77	210/63	ES710/4000SK2	B924242
SK2 series	380	200	500	350	310	160	11 x 16	25	77	210/73 210/88	ES710/5000SK2	B924243
×	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	210/103	ES710/8000SK2	B924245
	410	240	560	380	350	200	11 x 16	39	105	240/83	ES710/10000SK2	B924246
	280	180	370	240	290	145	11 x 28	15	49	180/93	ES710/3150S	B924261
S	280	150	420	240	290	115	11 x 28	24	59	210/63	ES710/4000S	B924262
S series	280	160	420	240	290	125	11 x 28	25	61	210/73	ES710/5000S	B924263
Š	280	175	420	240	290	140	11 x 28	26	65	210/88	ES710/6300S	B924264
	280	190	420	240	290	155	11 x 28	27	74	210/103	ES710/8000S	B924265
	320	200	440	270	330	160	13 x 35	39	85	240/83	ES710/10000S	B924266

Ordering information enclosure

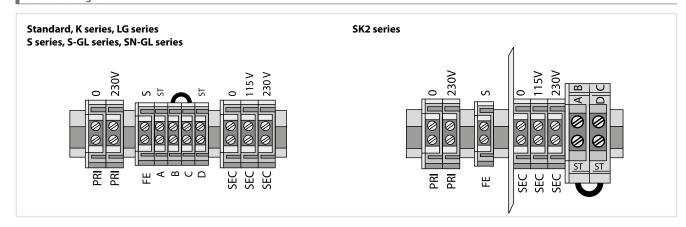
			Dim	nensions (n	nm)				Weight (kg)	Version	Туре	Art. No.
A	В	С	D	E	F	G	Н	1			.,,,,,	
430	380	500	385	420	450	M10	ø 37,5	ø 20,5	16	floor mounting	ESDS0107-1	B924673
350	300		315	550	580				18	hanging mounting	ESDS710	B924741



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 °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.

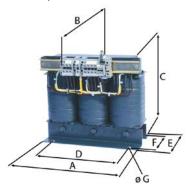
Technical data

Туре	DS0107/2000	DS0107/3150	DS0107/4000	DS0107/5000	DS0107/6300	DS0107/8000	DS0107/10000
Insulation classification	t _a 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						
Protection class	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						
Rated input voltage	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						
Rated output current	5 A	7.9 A	10 A	12.6 A	15.8 A	20.1 A	25.2 A
Inrush current /E	< 12 x <i>Î</i> n						
Leakage current	≤ 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 u _k	≤ 2.9 %	≤ 2.9 %	≤ 2.8 %	≤ 3 %	≤ 2.8 %	≤ 2.8 %	≤ 2.5 %
Environmental conditions							
Ambient temperature	≤ 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)	≤ 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	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							

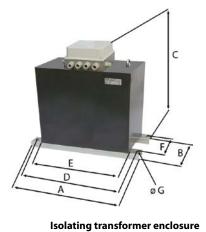
^{*} Option: completely encapsulated version



Standard – Dimension B: depth incl. terminals



SK2 series

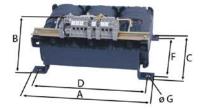


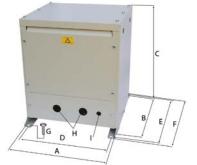
K series

All other dimensions correspond to the standard dimensions.



LG series



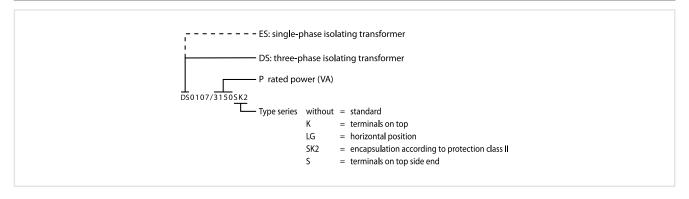


Ordering information

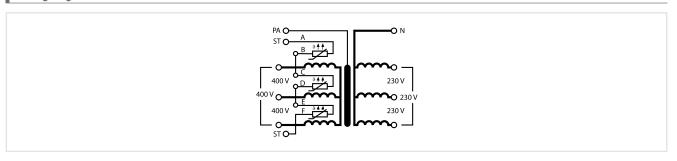
	_		Di	mensions (mr	n)			Cu weight	Weight	Туре	Art. No.
	Α	В	C	D	E	F	G	(kg)	(kg)	1,780	AI C. NO.
	300	200	270	240	160	130	11	16	34	DS0107/2000	B924694
	360	210	325	310	170	135	11	28	63	DS0107/3150	B924106
핕	360	225	325	310	185	150	11	29	70	DS0107/4000	B924121
Standard	360	240	325	310	200	165	11	31	77	DS0107/5000	B924112
똤	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
S	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
9	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
ies	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
X	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

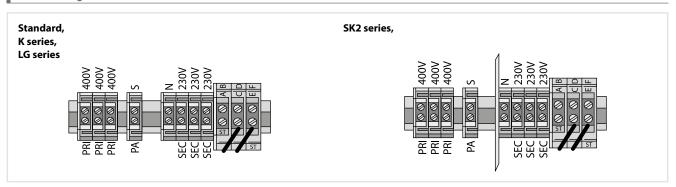
Dimensions (mm)									Suitable for the following	Weight (kg)	Type	Art. No.	
A	В	C	D	E	F	G	Н	1	device types		-,,-		
430	380	490	385	420	450	M10	ø 29	ø 21	DS0107/2000 bis DS0107/5000	16	ESDS0107-1	B924673	
600	420	490	555	460	490	M10	ø 36	ø 16	DS0107/6300 bis DS0107/10000	23	ESDS0107-2	B924674	



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



Typical applications

 For the supply of operating theatre lights in group 2 medical locations

Approvals



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

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

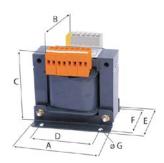
Further information

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

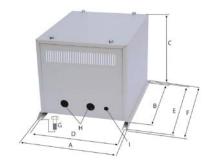
Technical data

Туре	ESL0107/120	ESL0107/160	ESL0107/280	ESL0107/400	ESL0107/630	ESL0107/1000
Insulation classification	t _a 40/E					
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					
Rated input voltage	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					
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 Î _n	< 15 x Î _n	< 15 x Î _n	< 15 x Î _n	< 15 x Î _n
Leakage current	≤ 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 $u_{\mathbf{k}}$	≤ 11 %	≤ 8.8 %	≤ 7.9 %	≤ 5.3 %	≤ 5 %	≤ 4.3 %
Environmental conditions						
Ambient temperature	40 °C	40 ℃	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)	\leq 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



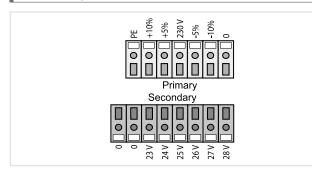
Ordering information

		Di	mensions (mr	n)			Cu weight	Weight	Туре	Art. No.	
A	В	С	D	E	F	G	(kg) (kg)		1,792	ALC: 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

			Di	mensions (m	m)				Weight (kg)	Туре	Art. No.
A	В	С	D	E	F	G	Н	1	reight (ag)	.,,,-	711 (1110)
240	280	220	220	300	320	M6	ø 29	ø 21	3.5	ESL0107-0	B924204

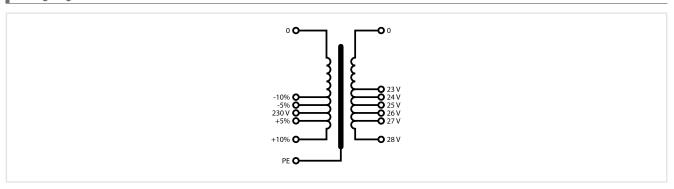
Terminal diagram



Connection properties

Туре	Input terminals flexible/rigid	Screen winding flexible/rigid	Output terminals flexible/rigid
ESL0107/120	4/6 mm ²	4/6 mm ²	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

Further information

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

Typical applications

- For supply of Bender devices with a supply voltage of DC 24 V
- The compact design makes them especially suitable for installation distributors and flat control panels

Approvals



Ordering information

Rated input	voltage U _{IN}	Rated voltage	Туре	Art. No.	
AC	AC DC DC				
			STEP-PS/1 AC/24 DC/0.5	B94053110	
85 264 V, 45 65 Hz	95250 V	24 V	STEP-PS/1 AC/24 DC/1.75	B94053111	
1303112			STEP-PS/1 AC/24 DC/4.2	B94053112	



Teaminean adda			
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
STEP-PS/1AC/24DC/0.5 (12 W)		Control deviation	< 1 % (change in load, static 1090 %)
Current consumption	approx. 0.28 A (AC 120 V)		< 2 % (change in load, dynamic 1090 %)
cuit consumption	approx. 0.13 A (AC 230 V)		$<$ 0.1 % (change in input voltage \pm 10 %)
Inrush current limitation	< 15 A (typical)	Maximum power loss nominal load	13.2 W
l²t	< 0.1 A ² s	Maximum power dissipation idling	0.7 W
Power failure buffering	> 15 ms (AC 120 V)	Efficiency	> 88 % (for AC 230 V and nominal values)
Tower randre buriering	> 90 ms (AC 230 V)	Ascent time	< 0.5 s (<i>U</i> _{OUT} (1090 %))
Typical turn-on time	< 0.5 s	Residual ripple	< 25 mV _{SS} (with nominal values)
Input fuse, integrated	1.25 A (slow acting, internal)	Peak switching voltages	< 25 mV _{SS} (with nominal values)
· •	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)		
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)	Maximum power dissipation idling	< 0.3 W
Typical turn-on time	< 0.5 s	Maximum power loss nominal load	< 2.2 W
Input fuse, integrated	3.15 A (slow acting, internal)		\ Z.Z \\
Recommended back-up fuse for line protection	6 A	STEP-PS/1AC/24DC/1.75 (40 W)	
	10 A	Maximum power dissipation idling	5 W
	16 A (characteristic B)	Maximum power loss nominal load	0.7 W
STEP-PS/1AC/24DC/4.2 (100 W)		STEP-PS/1AC/24DC/4.2 (100 W)	
Current consumption	approx. 1.3 A (AC 120 V)	Maximum power dissipation idling	13.2 W
Current consumption	approx. 0.8 A (AC 230 V)	Maximum power loss nominal load	0.7 W
Inrush current limitation	< 15 A (typical)		
l ² t		LED status indicator	
	< 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
Turnical turns on time	> 100 ms (AC 230 V)	Environmental conditions	
Typical turn-on time	< 0.5 s		25 70.00 (55.00)
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)	≤ 95 % (at 25 °C, no condensation)
	16 A (characteristic B)	Vibration (operation) < 15	Hz, amplitude ± 2.5 mm acc. to IEC 60068-2-6
Output data			15150 Hz, 2.3 g, 90 min.
Nominal output voltage	DC 24 V ±1 %	Shock	30 g in all directions, acc. to IEC 60068-2-27
	DC 24 V ±1 /0	Pollution degree acc. to EN 50178	2
STEP-PS/1AC/24DC/0.5 (12 W)	0.5.4 / 25	Classification of climatic conditions	3K22 (acc. to EN 60721)
Output current	0.5 A (-25+55 °C)	Connection	
	0.55 A (-2540 °C permanent)	Connection type	screw connection
	1 A (maximum output current)	Connection properties	Sciew connection
Control deviation	< 1 % (change in load, static 1090 %)	· ·	0.2 2.5 mm ²
	< 2 % (change in load, dynamic 1090 %)	Rigid/flexible	0.2 2.5 mm² AWG 2412
	$<$ 0.1 % (change in input voltage \pm 10 %)	Conductor sizes	
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	Insulation voltage input/output	AC 4 kV (type test)
Connection in series	yes	modation voltage input/output	AC 2 kV (routine test)
Protection against internal overvoltages	yes, limited to approx. DC 35 V	Insulation voltage input/PE	AC 3.5 kV (type test)
Resistance to reverse feed	≤ DC 35 V	mouation voltage iliput/re	AC 2 kV (routine test)
STEP-PS/1AC/24DC/1.75 (40 W)		Insulation voltage output/PE	DC 500 V ((routine test)
Setting range of the output voltage	DC 22.5 V 29.5 V (> 24 V constant power)		
Output current	1.75 A (-2570 °C)	Degree of protection	IP20
output turrent	1.75 A (-2570 °C)	Protection class	
	3.75 A (maximum output current)	MTBF (IEC 61709)	500000 h
Derating	above +55 °C: 2.5 % per kelvin	Enclosure material	polycarbonate
Control deviation	< 1 % (change in load, static 1090 %)	Foot latch material	plastic POM
Control ucviation		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
Maximum nowar loss naminal loss	< 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
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)		
Connection in parallel	yes, for increased power		
Connection in series	yes		
$Overvoltage\ protection\ against\ internal\ overvoltages$			
Resistance to reverse feed	max. DC 35 V		



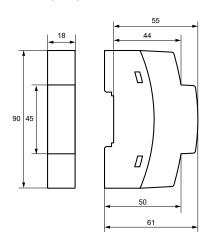
Standards EN 60204 Electrical equipment of machines Safety isolating transformers for switch mode power supplies IEC 61558-2-17 IEC 60950-1/VDE 0805 (SELV) Electrical safety (of information technology equipment) EN 50178/VDE 0160 (PELV) Electronic equipment for use in power installations Protective extra-low 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 DIN VDE 0106-101 protective separation in electrical equipment EN 61000-3-2 Limits for harmonic current emissions STEP-PS/1AC/24DC/1.75 (40W) and STEP-PS/1AC/24DC/4.2 (100 W) CB Scheme

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-U	L 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

Germanischer Lloyd

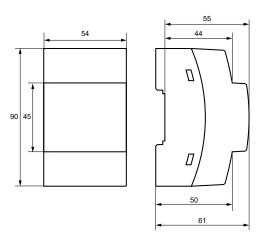
Dimension diagram (dimensions in mm)

STEP-PS/1AC/24DC/0.5 (12 W)

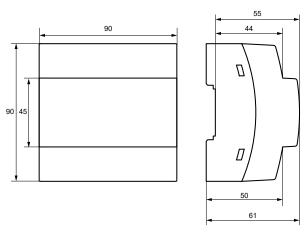


STEP-PS/1AC/24DC/1.75 (40 W)

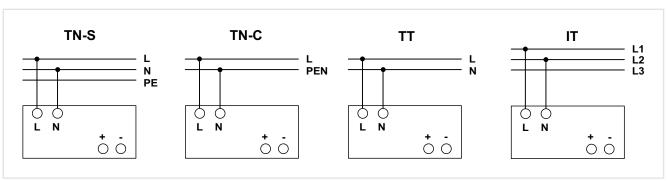
Shipbuilding sector



STEP-PS/1AC/24DC/4.2 (100 W)



Connection to different systems





AN410

Power supply unit for DC 24 V supply



Device features

- 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

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.

Typical applications

• To supply Bender devices with DC 24 V and maximum 10 VA power consumption

Approvals





^{*)} Approval relating to the rated input voltage U_{IN}

Insulation coordination acc. to IEC 60664-1

Ordering information

Rated input	voltage U _{IN}	Rated output voltage	ABB type	Туре	Art. No.
AC	DC	DC		-,,	
90264 V, 4763 Hz	120370 V	24 V	CP-D 24/0.42/Art. No. 1SVR 427 041 R0000	AN410	B924209
-	935 V	935 V	CP-D RU/Art. No. 1SVR 427 049 R0000	AN420-R	B95100250

screw-type terminals

6 mm (0.24 inches)

0.2...2 mm² (AWG 24...14)

Technical data

Rated impulse voltage/pollution degree		3 kV/2
Rated insulation voltage U_i input circuit/ou	tput 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 s	ystem failure	≥ 30 ms
Typical current/power consumption	at AC 110 V	184 mA/11.62 W
	at AC 230 V	120.6 mA/12 W
Primary fuse (internal device protection, ne	ot 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 $< T_U$:	≤ 70 °C	2.5 %/K
Parallel connection option		with redundance unit AN420-R
Protection against short circuits/no-load	continuous prot	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/d	uring storage)	-25+70 °C/-25+85 °C
Classification of mechanical conditions acc	to IEC/EN 60068-2	
Connection		

C UL US	UL 508, CAN/C	SA C22.2 No. 14*)
c '91 1'us	UL 1310, CAN/CSA C22.2 No. 223 (Class 2	Power Supply) *)
c '71 2'us	UL 6090, CAN/CSA C	22.2 No. 60950 *)
(W)		CCC *)
Mark		
C€		CE
Other		
Status indicators	2 LEDs: output	t voltage present,
	00	ıtput votlage low
Operating mode	cont	inuous operation
Mounting	vertically (terminal:	s + /- at the top)
Degree of protection, internal components DIN EN 60529 (VDE 0470-1)		IP30
Degree of protection, terminals (DIN I	EN 60529 (VDE 0470-1))	IP20
Protection class		II
Minimum distance to adjacent device	s vertically/horizontally	25/25 mm
Enclosure dimensions (W x H x D)	18 x 91 x 57.5 mm (0.71 x 3.	.58 x 2.26 inches)
DIN rail mounting acc. to		IEC 60715
Protective extra low voltage	SI	ELV (EN 60950-1)
Documentation number		D00099
Weight		≤ 70 q

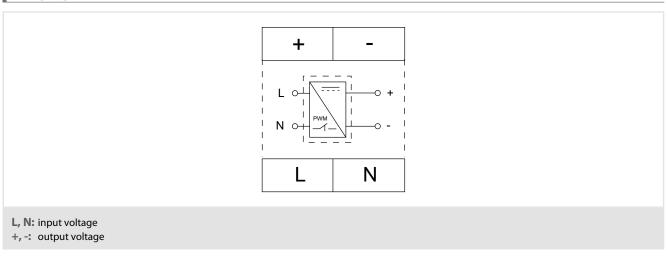
^{*)} Approval relating to the rated input voltage U_{IN}



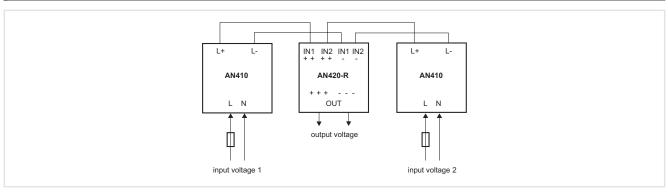
Connection

Stripping length Tightening torque

rigid, flexible (with or without ferrule)/conductor sizes



Option for redundant power supply



AN450

Power supply unit



Typical applications

 Supply of Bender devices with AC 20 V and a power consumption of maximum 9 VA

Approvals

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 61558-1 (VDE 0570-1)
- IEC 61558-1

Further information

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





Ordering information

Output voltage	Supply voltage <i>U</i> s Type		Art. No.	
AC	AC	.,,,,,	<i></i>	
20 V, 5060 Hz	230 V, 50 60 Hz	AN450	B924201	
	127 V, 50 60 Hz	AN450-133	B924203	

1M12

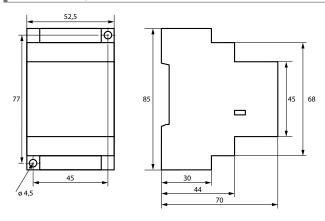
Technical data

Rated voltage	AC 250 V
Overvoltage category/pollution d	egree 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 cond	itions acc. to IEC 60721
Stationary use	3K23 (except condensation, water and formation of ice)
Transport	2K11
Storage	1K21
Operating temperature	- 10+ 55 °C
Classification of mechanical c	onditions acc. to IEC 60721
Stationary use	3M11
Transport	2M4

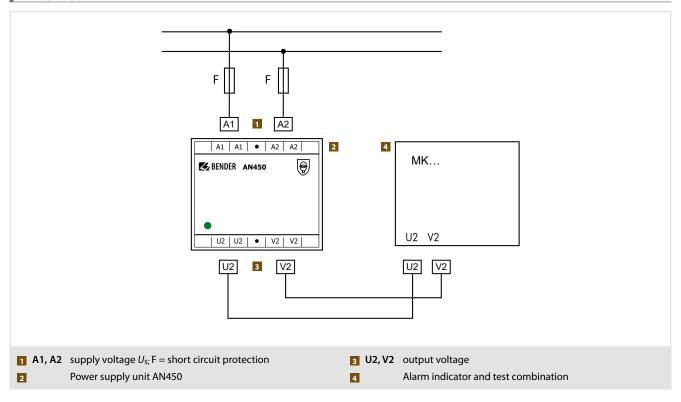
Connection	
Connection	screw terminals
Connection properties:	
rigid/flexible/Conductor sizes	0.24/0.22.5 mm ² /AWG 2412
Connection, flexible with connector sleeve	0.252 mm ²
Stripping length	8 mm
Tightening torque, terminal screws	0.5 Nm
Other	
Operating mode	continuous operation
Mounting	any position
Protection class internal components/terminals (DIN EN 6	0529) IP30/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
Weight	≤ 400 g



Storage



Wiring diagram



7204/7220/9604/9620

Measuring instruments



Measuring instruments 9604/7204/9620

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

€器照

Ordering information

Suitable ISOMETER®	Input current	Dimensions	Scale centre point (SKMP)	Туре	Art. No.
		72 x 72 mm	120 kΩ	7204-1421	B986763
	0 400 4			7204S-1421	B986804
iso685	0400 μΑ	96 x 96 mm	120 kΩ	9604-1421	B986764
				9604S-1421	B986784
	020 mA	96 x 96 mm	120 kΩ	9620-1421	B986841
				9620S-1421	B986842
	0400 μΑ	96 x 96 mm	1,2 ΜΩ	9604-1621	B986782
	020 mA 72 x 72 mm	70. 70	12010	7220-1421	B986844
		120 kΩ	7220S-1421	B986848	

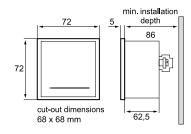
Technical data

3 kV
1.5
vertical +5°
-25+40 ℃

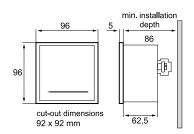
Protection class acc. to DIN 40050		
Enclosure	IP52	
Terminals	IP00	
Terminals with contact protection		
Documentation number	D00092	

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

Supply voltage U₅	Type	Art. No.	
AC	-77-		
85260 V, 5060 Hz	DI-1DL	B95012047	

Technical data

Supply voltage	
Supply voltage $U_{\rm S}$	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 allow	s a virtually unrestricted number of connections
Terminating resistor and bus bias voltage can be act	tivated by a switch
Device address, BMS bus	_
Alarm LEDs	activity indication: direction and faults (green) internal operating voltage (red)

E.	· · · i	ror	m	nn	4

Operating temperature 0...+70 °C

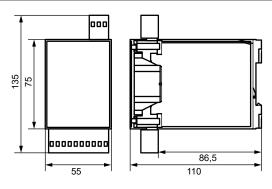
Connection

Connection push-wire/plug-in terminals

Other

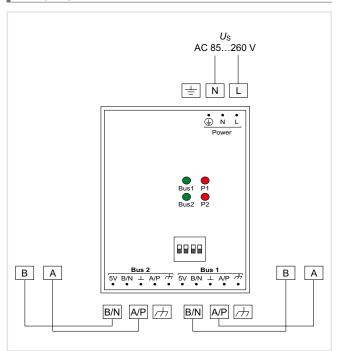
Operating mode	continuous operation
Mounting	any position
Enclosure	for standard DIN rail 32 mm (approx.110 x 75 x 55)
Operating manual	DiaLog RS-485 repeater type CN-2-1
Documentation number	D00125
Weight	approx. 90 g

Dimension diagram (dimensions in mm)



^{*} depending on used transceivers

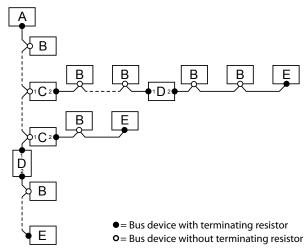




Settings

- 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
A	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)*
	RS-485 C interface repeater DI-1DL	Bus 1: Terminating resistor and bias voltage generation deactivated via switch on device (DIP switch 1, 2: OFF)
		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.



1M12

DI-2USB

Interface converter USB to RS-485



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

Supply voltage	Туре	Art. No.
from USB port, no additonal power supply required	DI-2USB	B95012045

Technical data

Rated voltage	
Rated impulse voltage/pollution degree	3 kV/3
Supply voltage	
Supply voltage <i>U</i> s	see ordering details
Power consumption	95 mVA
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, E
Integrated terminating resistors, selectable via jumper, factory settil	ng terminating resistors included
Device address	_
USB	
Serial interface	1 x USE
Alarm LEDs ON	(yellow), R x Data (green), T x Data (red)

_						
Env	riva:	nm	nn	+/	EM	11
CIIV	/II U	ш	eп	L/	CIV	ıL

EMC immunity/EMC emission	EN 61000-6-2/EN 61000-6-4
Operating temperature	-10+55 ℃
Classification of climatic conditions acc. to IEC 6	0721
Stationary use	3K23
Transport	2K11
Long-term storage	1K22
Classification of mechanical conditions acc. to I	EC 60721
Stationary use	3M11
Transport	2M4

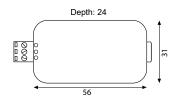
Long-term storage Connection

Connection	screw-type terminals/USB plug type B
Connection properties	
rigid/flexible/conductor sizes	0.52.5 mm ² (AWG 2212)

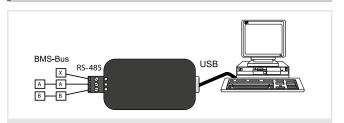
Other

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

IOM441-S / IOM441W-S

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

Supply voltage <i>U</i> s	Option "W"	Type	Art. No.	
DC	Financia	.,,,-		
24 V	-	IOM441-S	B95012057	
24 V		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

Definitions:	
Supply circuit	BB bus
Output circuits	relay contacts [(13, 14), (23, 24), (33, 34),
(43, 44),	(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°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
Area of application	≤ 2000 m AMSL

_		- •	
(n	nne	ction	1

pluggable push-wire terminal
AWG 2412
10 mm
0.22.5 mm ²
0.252.5 mm ²
0.51.5 mm ²

Other

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:

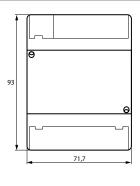
Operating temperature	-40+70 ℃
Transport	-40+85 ℃
Long-term storage	-25+70 ℃

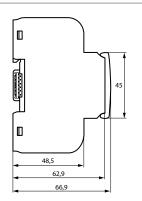
Classification of climatic conditions acc. to IEC 60721:

Stationary use (IEC 60721-3-3)	3K23
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3M12

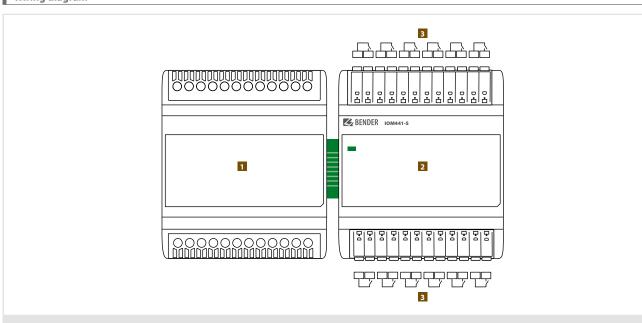
()* = Factory settings

Dimension diagram (dimensions in mm)





Wiring diagram



- Basic device
- 2 IOM441-S
- Relay outputs

- **1** Always connect the IOM441... only to the right of the basic device.
- **For UL applications:**Use 60/75 °C copper lines only!

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 (V4.5.0 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 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), $but not via \, Modbus. The \, parameters \, of \, assigned \, devices \, can \, only \, be \, read; \, Function \, module \, C \, is \, necessary \, for \, modification \, devices \, can \, only \, be \, read; \, Function \, module \, C \, is \, necessary \, for \, modification \, devices \, can \, only \, be \, read; \, Function \, module \, C \, is \, necessary \, for \, modification \, devices \, can \, only \, be \, read; \, Function \, module \, C \, is \, necessary \, for \, modification \, devices \, can \, only \, be \, read; \, Function \, module \, C \, is \, necessary \, for \, modification \, devices \, can \, only \, be \, read; \, Function \, module \, C \, is \, necessary \, for \, modification \, devices \, can \, only \, be \, read; \, Function \, module \, C \, is \, necessary \, for \, modification \, devices \, can \, only \, be \, read; \, Function \, module \, C \, is \, necessary \, for \, modification \, devices \, can \, only \, be \, read; \, Function \, module \, C \, is \, necessary \, for \, modification \, devices \, can \, device \,$ 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.

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.
- 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

Supply voltage/frequency range <i>U</i> s AC/DC	Power consumption	Application	Туре	Art. No.
24240 V, 5060 Hz	≤ 6.5 VA/≤ 4 W	Condition monitor with integrated gateway: Bender system/Ethernet	COM465IP-230V	B95061065

Function modules

Application	Function module (software licence)	Art. No.
Individual text messages for all devices/ channels, device failure monitoring, e-mail in the event of an alarm, device documentation	Function module A	B75061011
Provision of data via via Modbus TCP, Modbus RTU, SNMP and PROFINET	Function module B	B75061012
Parameter setting of all integrated devices, device backups	Function module C	B75061013
Visualisation application	Function module D	B75061014
Virtual devices	Function module E	B75061015
Integration of third-party devices	Function module F	B75061016

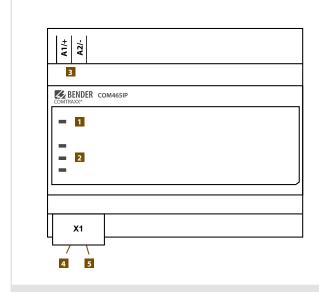


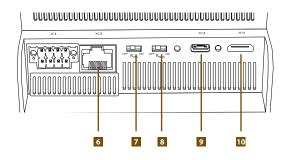
Selection produce voltage/owner large cortegors 4.5 Mg/s 5.0	Insulation coordination acc. to IEC 60664-1/IEC 60664-3	Modbus RTU
Marchet Marc	•	•
Supply works Supp		
Mary Mary	Pollution degree 3	
Supply violage	Protective separation (reinforced insulation) between	
Supply relation Supply rel	(A1/+, A2/-) - [(AMB, BMB), (ABMS, BBMS), (X2), (X3, X4)]	
Supply	C	recommended: CAT6/CAT7 min. AWG23
		alternative: twisted pair, J-Y(St)Y min. 2x0,8
Temper General Content G		Connection X1 (AMB, BMB)
Registry Registry		Connection type refer to connection "push-wire terminal X1"
Process Proc	Power consumption see ordering information	Terminating resistor 120 Ω (0.25 W), can be connected internally
PROPERTY PROPERTY	Indiantiana	Supported Modbus RTU slave addresses 2247
	indications	PROFINET
Marche March Mar	LEDs:	
THERETE	ON operation indicator	•
Charlemone Chemina X2 Signite during network connection, Rabeles during during the Chemic (Termina X2 Signite during network connection, Rabeles during during during the Chemical Ching (Chemical Standson model & Anni) United mulmed mulmed or tests sed with 100 durantees.	ETHERNET IP data traffic Ethernet	• •
	MODBUS RTU data traffic Modbus	
Separation Sep	BMS data traffic BMS	
Membry M	Ethernet (terminal X2) lights during network connection, flashes during data transfer	
Interface Part Pa		
Final Longinguistion and device failure monitoring Mumber of data Jongers Mumber of pages Mumber of pages Mumber of Jongers	Memory	Trap support yes
Email configuration and device failure monitoring make. 259 entires. 250 millione of data loognes. Williamber of d	Individual texts (function module A only) unlimited number of texts each with 100 characters	Used ports
Number of data points for "third-party devices" to Modius ICP and Modius RTU 50 1117 117	E-mail configuration and device failure monitoring max. 250 entries	•
Number of data logers		· · · · · · · · · · · · · · · · · · ·
Number of data points per data logory 10,000 123 137 13		
Number of Piskary memory entries 2,000 20 20 20 20 20 20		
162 SMMP TRAPS Sabground mange size 50 50 Sabground ma		
Winnber of pages Sabground mange size S	· ·	
Number of pages	Visualisation	
Micrifaces	Number of pages 50	
State St	Background image size 3 MB	
Marchaer Marchaer	<u> </u>	
Part	Interfaces	
Carle length	Fthernet	48862 BCOM (UDP)
Cache length		Environment/FMC
Data a fee		
HITP mode	j	LIVIC EN 01320-1
DRCP		•
Family Section Sect	,	
Paddress (192.168.0.2548 Canalways be reached via: non.non.non.non.non.non.non.non.non.non	, ,	•
nnn.nn.nn.nn (1921,68,0.254) Alashida (1921,6		Long-term storage -25+70 °C
Stationary use (IEC 60721-3-3) Stationary use (IEC 60721-3-3) Stationary use (IEC 60721-3-3) Stationary use (IEC 60721-3-3) Stationary use (IEC 60721-3-3) Stationary use (IEC 60721-3-1) Stationary use (IEC 60721-3-1		Classification of climatic conditions acc. to IEC 60721:
Net mask non-non-non-non-non-non-non-non-non-non		
Protectors (depending on function module selected) TCP/IP, Modbus TCP, Modbus RTU, DHCP, SMMP, SMTP, MTP BMS bus (internal/external) Interface/protorol RS-485/BMS internal or BMS external (BMS internal) Operating mode master/slave (master) Badd rate BMS external 19.2; 38.4; 57.6 kBit/s Cable length Sinkled, one end of shielded, one end of shielded connected or RT (Af6/CAT min. AMGC2) Albe length Sinkled Sink	,	•
TCP/IP, Modbus TCP, Modbus TLP, , ,		
Interface/protocol RS-485/BMS internal or BMS external (BMS internal) or BMS external (BMS internal) or BMS external 19.2; 38.4; 57.6 kBit/s external 19.2; 38.4; 5		
Interface/protocol RS-485/BMS internal or BMS external (BMS internal) of Derating mode master/slave (master) (Baud rate BMS internal or BMS external 19.2; 384, 57.6 kBitry (Cable Ingth 19.2; 384, 57.6 kBitry (TCP/IP, MODDUS TCP, MODDUS RTU, DHCP, SNMP, SMIP, NTP	
Deprating mode Master/slave (master) Baud rate BMS Internal 9.6, kBit/s external 19.2, 38.4, 57.6, kBit/s external 19.2, 38.4, 57.6, kBit/s external 9.2, 38.4, 37.6, kBit/s external 9.2, 38.4, 37.6, kBit/s external 9.2, 38.4, 39.	,	
Baul rate BMS internal 9.6 kBirls	Interface/protocol RS-485/BMS internal or BMS external (BMS internal)*	• • •
Cable length Shielded, one end of shield connected to Frecommended: CATE/CATT min. AWG23 CATE/CATT min. AWG23 Connection (ppe) pluggable push-wire terminal XI alkmative: TWH-wire terminal XI sizes CONDECTION (CATE TO MIN. AWG24.) STATE (ABMS, BBMS) to MINITED (Part) (SIZE) (Operating mode master/slave (master)*	Long-term storage (IEC 60721-3-1) 1M12
Cable length	Baud rate BMS internal 9.6 kBit/s	Connection
Cable 	external 19.2; 38.4; 57.6 kBit/s	
recommended: A CAT6/CAT7 min. A WGC24 alternative: twisted pair, J-Y(St)Y min. 20,8 Connection Y X1 (ABMS, BBMS) Connection Y Y (ABMS, BBMS) Terminating resistor 120 \(\Omega \) (0.25 \(W), can be connected internally Device address, internal/external BMS bus 1150 \(\Omega \) (1150 \(\Omega \) (1.85 \(\Omega \) (1150 \(\Omega \) (1255 \(\Omega \) (1	Cable length ≤ 1,200 m	,
alternative:twisted pair, J-Y(St)Y min. zxx, 8.Stripping length10 min. zxx, 10	Cable shielded, one end of shield connected to PE	Push-wire terminals
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Connection typerefer to connection "push-wire terminal XI" Terminating resistor120 Ω (0.25 W), can be connected internally Device address, internal/external BMS bus1150 (1)*/299Hexible with ferrule, with/without plastic sleeve0.2525 n Multiple conductor, flexible with TWIN ferrule with plastic sleeve0.515 n Multiple conductor, flexible with TWIN ferrule with plastic sleeve0.515 n Multiple conductor, flexible with TWIN ferrule with plastic sleeve0.515 n Multiple conductor, flexible with TWIN ferrule with plastic sleeve0.515 n Multiple conductor, flexible with TWIN ferrule with plastic sleeve0.515 n Multiple conductor, flexible with TWIN ferrule with plastic sleeve0.515 n Multiple conductor, flexible with TWIN ferrule with plastic sleeve0.515 n Multiple conductor, flexible with TWIN ferrule with plastic sleeve0.515 n Multiple conductor, flexible with TWIN ferrule with plastic sleeve0.515 n Multiple conductor, flexible with TWIN ferrule with plastic sleeve0.515 n Multiple conductor, flexible with TWIN ferrule with plastic sleeve0.515 n Multiple conductor, flexible with firth print with plastic sleeve0.515 n Multiple conductor, flexible with firth print with plastic sleeve0.515 n Multiple conductor, flexible with firth print with plastic sleeve0.515 n Multiple conductor, flexible with firth print with plastic sleeve0.515 n Multiple conductor, flexible with firth print with plastic sleeve0.515 n Multiple conductor, flexible with firth print with plastic sleeve0.515 n Multiple conductor, flexible with firth print with plastic sleeve0.515 n Multiple conductor, flexible with firth print with plastic sleeve0.515 n Multiple conductor, flexible with firth print with plastic sleeve0.515 n Multiple conductor, flexible	1 , , , ,	
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Device address, internal/external BMS bus 1150 (1)*/299 BCOM Interface/protocol Ethernet/BCOM BCOM system name (SYSTEM) BCOM subsystem address 1255 (1)* BCOM device address 0255 (0)* B	<u>'</u>	Multiple conductor, flexible with TWIN ferrule with plastic sleeve 0.51.5 mm ²
BCOMConductor sizesAWG 24Interface/protocolEthernet/BCOMStripping length10BCOM subsystem name(SYSTEM)rigid/flexible0.21.5 nBCOM subsystem address1255 (1)*flexible with out plastic sleeve0.251.5 nBCOM device address0255 (0)*flexible with ferrule without plastic sleeve0.251.5 nModbusTOTOpoerating modefront-oriented, cooling slots must be ventilated vertice.Moperating modeclient for Bender Modbus TCP devices and "third-party devices"Degree of protection, internal components (IEC 60529)1Operating modeserver for access to the process image and for Modbus control commands.Mountingfront-oriented, cooling slots must be ventilated vertice.Operating modeserver for access to the process image and for Modbus control commands.Degree of protection, internal components (IEC 60529)1Parallel data access from different clientsmax. 25Enclosure type1Enclosure typeLocsure materialpolycarborEnclosure typeEnclosure type1Enclosure typeEnclosure materialpolycarborHammability classUL94Dimensions (W x H x D)107.5 x 93 x 62.9Documentation numberDocumentation number	· · · · · · · · · · · · · · · · · · ·	Push-wire terminal X1
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Modbus TCP Interface/protocol		
Interface/protocol Ethernet/Modbus TCP Operating mode	<u> </u>	
Operating mode Operating Mode Oper		
Operating mode server for access to the process image and for Modbus control commands Parallel data access from different clients max. 25 Enclosure type Enclosure material polycarbor Flammability class UL94 Dimensions (W x H x D) Documentation number Ouk DIN rail mounting acc. to IEC 60 Screw mounting 2 x Enclosure type Indicate type Documentation number Ouk DIN rail mounting acc. to IEC 60 Screw mounting 2 x Enclosure type Indicate type Documentation number Documentation number	1	
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Enclosure type Enclosure material polycarbor Flammability class UL94 Dimensions (W x H x D) 107.5 x 93 x 62.9 Documentation number D00		
Enclosure materialpolycarborFlammability classUL94Dimensions (W x H x D)107.5 x 93 x 62.9Documentation numberD00	Parallel data access from different clients max. 25	
Flammability class UL94 Dimensions (W x H x D) 107.5 x 93 x 62.9 Documentation number D00		**
Dimensions (W x H x D) 107.5 x 93 x 62.9 Documentation number D00		
Documentation number D00		Flammability class UL94V-0
		Dimensions (W x H x D) 107.5 x 93 x 62.9 mm
Weight $\leq 2^2$		Documentation number D00216
		Weight ≤ 240 g
()* — factory cottings		-

()* = factory settings



Operating controls and connections





1 ON Flashes during start-up.

The LED lights permanently as soon as the device

is ready for operation.

ISODATA 1 ISODATA 2

3 A1/+, A2/-

2 ETHERNET/IP LEDs show activities on the different interfaces

Supply voltage: see nameplate and ordering

information

4 X1 Modbus/RTU interface: Terminals AMB and BMB

5 X1 BMS bus (Bender measuring device interface):

Terminals **A**BMS and **B**BMS

6 X2

Ethernet port (RJ45) for connection to the PC network as well as BCOM

7 RMB on/off Terminating resistor Modbus RTU switch

Terminating resistor BMS bus switch

8 RBMS on/off

9 X3 Micro USB interface (currently without function) 10 X4 Mini HDMI interface (currently without function)

For UL applications, the following has to be observed:

- Maximum ambient temperature: 55 °C

- Use 60/75-°C copper wires only



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 (V4.5.0 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.

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.
- For parameterisation via PROFIBUS, the function module C is required.

Further information

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

Ordering information

Supply voltage/frequency range U₅ AC/DC	Power consumption	Application	Туре	Art. no.
24240 V, 5060 Hz	≤ 6.5 VA/≤ 4 W	Condition Monitor with integrated gateway: Bender system/PROFIBUS DP/Ethernet	COM465DP-230 V	B95061060

Function modules

Application	Function module	Art. no.
Аррисасіон	(software licence)	AI C. IIV.
Individual text messages for all devices/ channels, device failure monitoring, e-mail in the event of an alarm, device documentation	Function module A	B75061011
Provision of data via Via Modbus TCP, Modbus RTU, SNMP and PROFINET	Function module B	B75061012
Parameter setting of all integrated devices, device backups	Function module C	B75061013
Visualisation application	Function module D	B75061014
Virtual devices	Function module E	B75061015
Integration of third-party devices	Function module F	B75061016

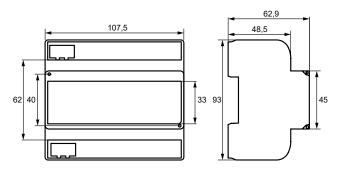


To diffine di didedi	
Insulation coordination acc. to IEC 60664-1/IEC 60664-3	PROFINET
Rated voltage AC 250 V	Interface/protocol Ethernet/PROFINET
Rated impulse voltage/overvoltage category 4 kV/III	Operating mode Slave (IO-Device)
Pollution degree 3	SNMP
Protective separation (reinforced insulation) between	Interface/protocol Ethernet/SNMP
(A1/+, A2/-) - [(AMB, BMB), (ABMS, BBMS), (X2), (X3, X4)]	Versions 1, 2c, 3
Supply voltage	Supported devices queries to all devices (channels) possible Trap support yes
Supply voltage $U_{\rm S}$ see ordering information	<u> </u>
Frequency range U_s see ordering information	PROFIBUS DP
Power consumption see ordering information	Interface/protocol RS-485 galvanically separated/PROFIBUS DP Operating mode slave
Indications	Baud rate automatic baud rate detection: 9.6 kBit/s1.5 MBit/s
LEDs:	9.6/19.2/93.75/187.5/500 kBit/s, 1.5 MBit/s
ON operation indicator	Connection 9-pole sub D
PROFIBUS data traffic PROFIBUS DP	Device address, PROFIBUS DP 1125 (3)*
ETHERNET IP data traffic Ethernet	Used ports
MODBUS RTU data traffic Modbus	53 DNS (UDP/TCP)
BMS data traffic BMS Ethernet (terminal X2) lights during network connection, flashes during data transfer	67, 68 DHCP (UDP)
	80 HTTP (TCP)
Memory	123 NTP (UDP) 161 SNMP (UDP)
Individual texts (function module A only) unlimited number of texts each with 100 characters	162 SNMP TRAPS (UDP)
E-mail configuration and device failure monitoring max. 250 entries Number of data points for "third-party devices" to Modbus TCP and Modbus RTU 50	443 HTTPS (TCP)
Number of data points for "third-party devices" to Modbus TCP and Modbus RTU 50 Number of data loggers 30	502 MODBUS (TCP)
Number of data points per data logger 10,000	4840 OPCUA (TCP)
Number of history memory entries 20,000	5353 MDNS (UDP)
·	48862 BCOM (UDP)
Visualisation	Environment/EMC
Number of pages 50 Background image size 3 MB	EMC EN 61326-1
	Ambient temperatures
Interfaces	Operating temperature -25+55 °C
Ethernet	Transport -40+85 °C
Port RJ45	Long-term storage -25+70 °C
Cable length < 100 m	Classification of climatic conditions acc. to IEC 60721
Data rate 10/100 MBit/s, autodetect HTTP mode HTTP/HTTPS (HTTP)*	Stationary use (IEC 60721-3-3) 3K22
DHCP on/off (off)*	Transport (IEC 60721-3-2) 2K11
t _{off} (DHCP) 560 s (30 s)*	Long-term storage (IEC 60721-3-1) 1K22
IP address nnn.nnn.nnn (192.168.0.254)*, can always be reached via: 169.254.0.1	Mechanical conditions acc. to IEC 60721:
Net mask nnn.nnn.nnn (255.255.0.0)*	Stationary use (IEC 60721-3-3) 3M11 Transport (IEC 60721-3-2) 2M4
Protocols (depending on function module selected)	Long-term storage (IEC 60721-3-1) 1M12
TCP/IP, Modbus TCP, Modbus RTU, DHCP, SNMP, SMTP, NTP	
BMS bus (internal/external)	Connection
Interface/protocol RS-485/BMS internal or BMS external (BMS internal)*	Connection type pluggable push-wire terminals
Operating mode master/slave (master)* Baud rate BMS internal 9.6 kBit/s	Push-wire terminals
external 19.2; 38,4; 57.6 kBit/s	Conductor sizes AWG 2412 Stripping length 10 mm
Cable length $\leq 1,200 \text{ m}$	rigid/flexible 0.22.5 mm ²
Cable shielded, one end of shield connected to PE	flexible with ferrule, with/without plastic sleeve 0.252.5 mm ²
recommended: CAT6/CAT7 min. AWG23	Multiple conductor, flexible with TWIN ferrule with plastic sleeve 0.51.5 mm ²
alternative: twisted pair, J-Y(5t)Y min. 2x0,8	Push-wire terminal X1
Connection X1 (ABMS, BBMS) Connection type 4 connection "puch wire torpinal V1"	Conductor sizes AWG 2416
Connection type refer to connection "push-wire terminal X1" Terminating resistor 120 Ω (0.25 W), can be connected internally	Stripping length 10 mm
Device address, internal/external BMS bus 1150 (1)*/299	rigid/flexible 0.21.5 mm ²
BCOM	flexible with ferrule without plastic sleeve 0.251.5 mm ²
Interface/protocol Ethernet/BCOM	flexible with ferrule with plastic sleeve 0.250.75 mm ²
BCOM system name (SYSTEM)	Other
BCOM subsystem address 1255 (1)*	Operating mode continuous operation
BCOM device address 0255 (0)*	Mounting front-oriented, cooling slots must be ventilated vertically
Modbus	Degree of protection, internal components (IEC 60529) IP30
Bender Modbus image V1, V2 (V2)*	Degree of protection, terminals (IEC 60529) P20 Out-of-DIAN arily projection and the property of the property of the project
Modbus TCP	Quick DIN rail mounting acc. to IEC 60715
Interface/protocol Ethernet/Modbus TCP	Screw mounting 2 x M4 Enclosure type J460
Operating mode client for Bender Modbus TCP devices and "third-party devices"	Enclosure material polycarbonate
Operating mode server for access to the process image and for Modbus control commands	Flammability class UL94V-0
Parallel data access from different clients max. 25	Dimensions (W x H x D) 107.5 x 93 x 62.9 mm
Modbus RTU	Documentation number D00216
Interface/protocol RS-485/Modbus RTU	Weight \leq 240 g
Operating mode master/slave (master)*	()* = factory settings
Baud rate 9.657.6 kBit/s	· ·
Cable length \leq 1,200 m Cable shielded, one end of shield connected to PE	
recommended: Snielded, one end of snield connected to PE	
alternative: twisted pair, J-Y(St)Y min. 2x0,8	
Connection X1 (AMB, BMB)	

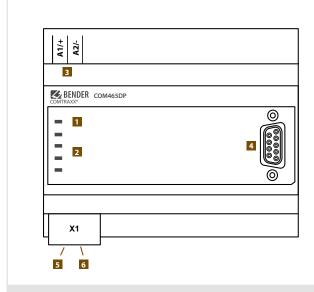


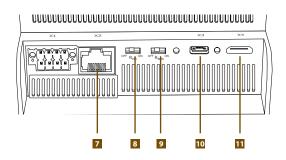
refer to connection "push-wire terminal X1" 120 Ω (0.25 W), can be connected internally

Terminating resistor
Supported Modbus RTU slave addresses



Operating controls and connections





1 ON Flashes during start-up.

The LED lights permanently as soon as the device is

ready for operation.

2 PROFIBUS ETHERNET/IP MODBUS RTU BMS

3 A1/+, A2/-

LEDs show activities on the different interfaces

Supply voltage: see nameplate and ordering information

4 PROFIBUS DP Connection PROFIBUS DP

X1 Modbus/RTU interface: Terminals AMB and BMB
 X1 BMS bus (Bender measuring device interface):

BMS bus (Bender measuring device interface): Terminals **A**BMS and **B**BMS

7 X2

network as well as BCOM
Terminating resistor Modbus RTU switch

8 RMB on/off

Terminating resistor BMS bus switch

9 R_{BMS on/off} 10 X3

Micro USB interface (currently without function)

Ethernet port (RJ45) for connection to the PC

11 X4

Mini HDMI interface (currently without function)

For UL applications, the following must be observed:

Maximum ambient temperature: 55 °C
 Only 60/75 °C copper wires must be used

(Pandar massuring davics interface)



C

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
- Integration of devices that are connected via IsoData or BCOM
- · OPC UA interface for data transmission

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 (see the BCOM operating manual),
- 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.
- · Setting for internal parameters and for configuration of Bender universal measuring devices and energy meters.*
- Time synchronisation for all assigned devices.
- · History memory (1,000 entries).
- Data loggers, freely configurable (30 * 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!

No reports can be generated – also not for your own device.

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 can be created by any device in the system. Present measured values, settings and software statuses are stored.
- System documentation can be created. It documents all devices in the system at once.

Function module B

- Supports external applications (e.g. visualisation programs or PLCs) by means of the Modbus TCP protocol.
- 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).

Function module C

- Quick and easy parameterisation of all devices* assigned to the gateway via web browser.
- Backups can be generated and restored from all devices in the system.
- *) Only BCOM devices can be parameterised. IsoData devices cannot be parameterised.

Function module D*

Fast, simple visualisation without programming. Device statuses, alarms or readings can be arranged and displayed (e.g. a spatial plan) in front of a background image.

- · Display of an overview covering several pages. Jump to another view page and return to the overview page.
- Graphical display of the data loggers with scaling of the time axis.
- *) Currently, the Silverlight web interface is still necessary for this function.



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

Supply voltage/Frequency range <i>U</i> ₅ AC/DC	Power consumption	Application	Туре	Art. No.
24240 V, 5060 Hz	≤ 6.5 VA/≤ 4 W	Condition Monitor with an integrated gateway: Bender system/Ethernet	COM465ID-230 V	B95061070

Function modules

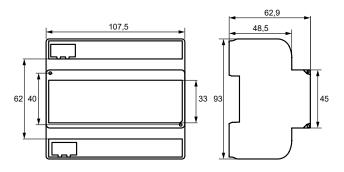
Application	Function module (software licence)	Art. No.
Individual texts for devices/channels, device failure monitoring, e-mail in case of an alarm	Function module A	B75061011
Modbus TCP server for max. 98 * 139 BMS nodes as well as BCOM and universal measuring devices, SNMP server	Function module B	B75061012
Parameter setting of BMS devices as well as BCOM and universal measuring devices	Function module C	B75061013
Visualisation of Bender systems, System visualisation	Function module D	B75061014
Virtual devices	Function module E	B75061015
Integrating third-party devices	Function module F	B75061016



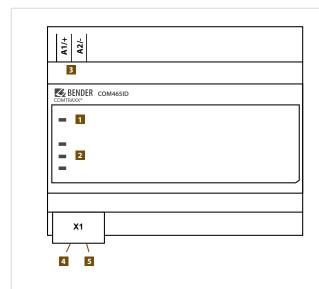
Insulation coordination acc. to IEC 60		BCOM
Rated voltage	AC 250 V	Interface/protocol
Rated impulse voltage/Overvoltage category	ory 4 kV/III	BCOM subsystem addi
Pollution degree	3	BCOM device address
Protective separation (reinforced insulation	on) between	Modbus TCP
	(A1/+, A2/-) - [(AMB, BMB), (ABMS, BBMS), (X2)]	Interface/protocol
Supply voltage		Operating mode
Supply voltage U_{S}	con ardaring datails	Operating mode
Frequency range U_S	see ordering details see ordering details	Parallel data access by
Power consumption	see ordering details	Environment/EMC
r ower consumption	see ordering details	EMC
Indication		
LEDs:		Ambient temperatu
ON	operation indicator	Operating temperatur
ETHERNET IP	data traffic Ethernet	Transport
ISODATA1	data traffic ISODATA1	Long-term storage
ISODATA2	data traffic ISODATA2	Classification of clin
	during network connection, flashes during data transmission	Stationary use (IEC 60
		Transport (IEC 60721-
Internal memory		Long-term storage (IE
E-mail configuration (function module A o	,,	Classification of me
Individual texts (function module A only)	unlimited number of texts with 100 characters each	Stationary use (IEC 60
Number of data points for "third-party de		Transport (IEC 60721-
Data loggers	30	Long-term storage (IE
Number of data points per data logger	10,000	C
Number of history memory entries	1,000	Connection
Visualisation		Connection type
Number of pages	20	Push-wire terminal
Size of the background image	50 kByte (scaled down if larger)	Conductor sizes
Data points (per page)	50 devices or channels, 150 text elements	Stripping length
	,	rigid/flexible
Interfaces		
interraces		flexible with ferrule, v
		flexible with ferrule, v
Ethernet Port	RJ45	flexible with ferrule, v Multiple conductor, flo Push-wire terminal
Ethernet Port		flexible with ferrule, v Multiple conductor, fle
Ethernet	RJ45 10/100 Mbit/s, autodetect on/off (on)*	flexible with ferrule, v Multiple conductor, fle Push-wire terminal
Ethernet Port Data rate DHCP	10/100 Mbit/s, autodetect	flexible with ferrule, v Multiple conductor, fle Push-wire terminal Conductor sizes Stripping length rigid/flexible
Ethernet Port Data rate DHCP toff (DHCP)	10/100 Mbit/s, autodetect on/off (on)*	flexible with ferrule, v Multiple conductor, fle Push-wire terminal Conductor sizes Stripping length rigid/flexible flexible with ferrule w
Ethernet Port Data rate DHCP t _{off} (DHCP) IP address nnn.nnn.nnn.nnn, ca	10/100 Mbit/s, autodetect on/off (on)* 560 s (30 s)*	flexible with ferrule, v Multiple conductor, fle Push-wire terminal Conductor sizes Stripping length rigid/flexible flexible with ferrule w
Ethernet Port Data rate DHCP toff (DHCP) IP address nnn.nnn.nnn.nnn, ca	10/100 Mbit/s, autodetect on/off (on)* 5 60 s (30 s)* an always be reached over: 192.168.0.254, (169.254.0.1)* nnn.nnn.nnn (255.255.0.0)*	flexible with ferrule, v Multiple conductor, fle Push-wire terminal Conductor sizes Stripping length rigid/flexible flexible with ferrule w flexible with ferrule w
Ethernet Port Data rate DHCP t _{off} (DHCP) IP address nnn.nnn.nnn.nnn, co Netmask Protocols (depending on function module	10/100 Mbit/s, autodetect on/off (on)* 5 60 s (30 s)* an always be reached over: 192.168.0.254, (169.254.0.1)* nnn.nnn.nnn (255.255.0.0)*	flexible with ferrule, v Multiple conductor, fle Push-wire terminal Conductor sizes Stripping length rigid/flexible flexible with ferrule w flexible with ferrule w Other
Ethernet Port Data rate DHCP foff (DHCP) IP address nnn.nnn.nnn.nnn, ca Netmask Protocols (depending on function module	10/100 Mbit/s, autodetect on/off (on)* 5 60 s (30 s)* an always be reached over: 192.168.0.254, (169.254.0.1)* nnn.nnn.nnn (255.255.0.0)*	flexible with ferrule, v Multiple conductor, fle Push-wire terminal Conductor sizes Stripping length rigid/flexible flexible with ferrule w flexible with ferrule w Other
Ethernet Port Data rate DHCP toff (DHCP) IP address nnn.nnn.nnn.nnn, co Netmask Protocols (depending on function module	10/100 Mbit/s, autodetect on/off (on)* 560 s (30 s)* an always be reached over: 192.168.0.254, (169.254.0.1)* nnn.nnn.nnn (255.255.0.0)* selected) //IP, Modbus TCP, Modbus RTU, DHCP, SMTP, NTP, OPC UA	flexible with ferrule, v Multiple conductor, fle Push-wire terminal Conductor sizes Stripping length rigid/flexible flexible with ferrule w flexible with ferrule w Other Operating mode Mounting
Ethernet Port Data rate DHCP foff (DHCP) IP address nnn.nnn.nnn.nnn, ca Netmask Protocols (depending on function module TCP SNMP Versions	10/100 Mbit/s, autodetect on/off (on)* 560 s (30 s)* an always be reached over: 192.168.0.254, (169.254.0.1)* nnn.nnn.nnn (255.255.0.0)* selected) //IP, Modbus TCP, Modbus RTU, DHCP, SMTP, NTP, OPC UA 1, 2c, 3	flexible with ferrule, v Multiple conductor, fle Push-wire terminal Conductor sizes Stripping length rigid/flexible flexible with ferrule w flexible with ferrule w Other Operating mode Mounting Degree of protection,
Ethernet Port Data rate DHCP toff (DHCP) IP address nnn.nnn.nnn.nnn, ca Netmask Protocols (depending on function module TCP SNMP Versions Devices supported Querie	10/100 Mbit/s, autodetect on/off (on)* 560 s (30 s)* an always be reached over: 192.168.0.254, (169.254.0.1)* nnn.nnn.nnn (255.255.0.0)* selected) //IP, Modbus TCP, Modbus RTU, DHCP, SMTP, NTP, OPC UA	flexible with ferrule, v Multiple conductor, fle Push-wire terminal Conductor sizes Stripping length rigid/flexible flexible with ferrule w flexible with ferrule w Other Operating mode Mounting Degree of protection, Degree of protection,
Ethernet Port Data rate DHCP toff (DHCP) IP address nnn.nnn.nnn.nnn, ca Netmask Protocols (depending on function module TCP SNMP Versions Devices supported Querie	10/100 Mbit/s, autodetect on/off (on)* 560 s (30 s)* an always be reached over: 192.168.0.254, (169.254.0.1)* nnn.nnn.nnn.nnn (255.255.0.0)* selected) P/IP, Modbus TCP, Modbus RTU, DHCP, SMTP, NTP, OPC UA 1, 2c, 3 es to all devices (channels) possible (no trap functionality)	flexible with ferrule, v Multiple conductor, fle Push-wire terminal Conductor sizes Stripping length rigid/flexible flexible with ferrule w flexible with ferrule w Other Operating mode Mounting Degree of protection, DIN rail mounting acc
Ethernet Port Data rate DhCP toff (DHCP) IP address nnn.nnn.nnn.nnn, ca Netmask Protocols (depending on function module TCP SNMP Versions Devices supported Queric ISODATA Interface/protocol	10/100 Mbit/s, autodetect on/off (on)* 560 s (30 s)* an always be reached over: 192.168.0.254, (169.254.0.1)* nnn.nnn.nnn.nnn (255.255.0.0)* selected) P/IP, Modbus TCP, Modbus RTU, DHCP, SMTP, NTP, OPC UA 1, 2c, 3 es to all devices (channels) possible (no trap functionality) RS-485/ISODATA	flexible with ferrule, v Multiple conductor, fle Push-wire terminal Conductor sizes Stripping length rigid/flexible flexible with ferrule w flexible with ferrule w Other Operating mode Mounting Degree of protection, Degree of protection, DIN rail mounting acc Screw fixing
Ethernet Port Data rate DHCP toff (DHCP) IP address nnn.nnn.nnn.nnn, ca Netmask Protocols (depending on function module TCP SNMP Versions Devices supported Queric ISODATA Interface/protocol Operating mode	10/100 Mbit/s, autodetect on/off (on)* 560 s (30 s)* an always be reached over: 192.168.0.254, (169.254.0.1)* nnn.nnn.nnn (255.255.0.0)* selected) //IP, Modbus TCP, Modbus RTU, DHCP, SMTP, NTP, OPC UA 1, 2c, 3 es to all devices (channels) possible (no trap functionality) RS-485/ISODATA master	flexible with ferrule, v Multiple conductor, fluid flexible with ferrule with ferru
Ethernet Port Data rate DHCP toff (DHCP) IP address nnn.nnn.nnn.nnn, ca Netmask Protocols (depending on function module TCP SNMP Versions Devices supported Queric ISODATA Interface/protocol Operating mode Baud rate ISODATA	10/100 Mbit/s, autodetect on/off (on)* 560 s (30 s)* an always be reached over: 192.168.0.254, (169.254.0.1)* nnn.nnn.nnn (255.255.0.0)* selected) //IP, Modbus TCP, Modbus RTU, DHCP, SMTP, NTP, OPC UA 1, 2c, 3 es to all devices (channels) possible (no trap functionality) RS-485/ISODATA master 9.6 kbit/s	flexible with ferrule, v Multiple conductor, fluid flexible with ferrule with ferru
Ethernet Port Data rate DHCP toff (DHCP) IP address nnn.nnn.nnn.nnn, ca Netmask Protocols (depending on function module TCP SNMP Versions Devices supported Queric ISODATA Interface/protocol Operating mode Baud rate ISODATA Cable length	10/100 Mbit/s, autodetect on/off (on)* 560 s (30 s)* an always be reached over: 192.168.0.254, (169.254.0.1)* nnn.nnn.nnn (255.255.0.0)* selected) '/IP, Modbus TCP, Modbus RTU, DHCP, SMTP, NTP, OPC UA 1, 2c, 3 es to all devices (channels) possible (no trap functionality) RS-485/ISODATA master 9.6 kbit/s ≤ 1200 m	flexible with ferrule, v Multiple conductor, fluid flexible with ferrule with ferru
Ethernet Port Data rate DHCP toff (DHCP) IP address nnn.nnn.nnn.nnn, ca Netmask Protocols (depending on function module TCP SNMP Versions Devices supported Queric ISODATA Interface/protocol Operating mode Baud rate ISODATA Cable length Cable: twisted pair, shielded, one end of sh	10/100 Mbit/s, autodetect on/off (on)* 560 s (30 s)* an always be reached over: 192.168.0.254, (169.254.0.1)* nnn.nnn.nnn (255.255.0.0)* selected) //IP, Modbus TCP, Modbus RTU, DHCP, SMTP, NTP, OPC UA 1, 2c, 3 es to all devices (channels) possible (no trap functionality) RS-485/ISODATA master 9.6 kbit/s ≤ 1200 m ield connected to PE recommended: J-Y(St)Y min. 2x0.8	flexible with ferrule, v Multiple conductor, flu Push-wire terminal Conductor sizes Stripping length rigid/flexible flexible with ferrule w flexible with ferrule w Other Operating mode Mounting Degree of protection, DIN rail mounting acc. Screw fixing Enclosure type Enclosure material Flammability class Dimensions (W x H x D
Ethernet Port Data rate DhtCP toff (DHCP) IP address nnn.nnn.nnn, ca Netmask Protocols (depending on function module TCP SNMP Versions Devices supported Queric ISODATA Interface/protocol Operating mode Baud rate ISODATA Cable length Cable: twisted pair, shielded, one end of sh Connection	10/100 Mbit/s, autodetect on/off (on)* 560 s (30 s)* an always be reached over: 192.168.0.254, (169.254.0.1)* nnn.nnn.nnn (255.255.0.0)* e selected) P/IP, Modbus TCP, Modbus RTU, DHCP, SMTP, NTP, OPC UA 1, 2c, 3 es to all devices (channels) possible (no trap functionality) RS-485/ISODATA master 9.6 kbit/s ≤ 1200 m ield connected to PE recommended: J-Y(St)Y min. 2x0.8 X1 (A-ID1, B-ID1, A-ID2, B-ID2)	flexible with ferrule, v Multiple conductor, fle Push-wire terminal Conductor sizes Stripping length rigid/flexible flexible with ferrule w flexible w
Ethernet Port Data rate DhCP toff (DHCP) IP address nnn.nnn.nnn, ca Netmask Protocols (depending on function module TCP SNMP Versions Devices supported Queric ISODATA Interface/protocol Operating mode Baud rate ISODATA Cable length Cable: twisted pair, shielded, one end of sh	10/100 Mbit/s, autodetect on/off (on)* 560 s (30 s)* an always be reached over: 192.168.0.254, (169.254.0.1)* nnn.nnn.nnn (255.255.0.0)* selected) //IP, Modbus TCP, Modbus RTU, DHCP, SMTP, NTP, OPC UA 1, 2c, 3 es to all devices (channels) possible (no trap functionality) RS-485/ISODATA master 9.6 kbit/s ≤ 1200 m ield connected to PE recommended: J-Y(St)Y min. 2x0.8	flexible with ferrule, v Multiple conductor, flu Push-wire terminal Conductor sizes Stripping length rigid/flexible flexible with ferrule w flexible with ferrule w Other Operating mode Mounting Degree of protection, DIN rail mounting acc. Screw fixing Enclosure type Enclosure material Flammability class Dimensions (W x H x D

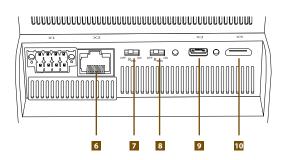
BCOM	
Interface/protocol	Ethernet/BCOM
BCOM subsystem address	199 (1)*
BCOM device address	199 (2)*
Modbus TCP	
Interface/protocol	Ethernet/Modbus TCP
Operating mode	client for associated PEM and "third-party devices"
• •	the process image and for Modbus control commands
Parallel data access by different clients	max. 8
Environment/EMC	
EMC	EN 61326-1
	EN 01320 1
Ambient temperatures	-25+55 ℃
Operating temperature	
Transport	-40+85 °C
Long-term storage	-25+70 °C
Classification of climatic conditions acc. t	
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 a	cc. 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
-	
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 slee	ve 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
	nt-oriented, cooling slots must be ventilated vertically
Degree of protection, internal components (IE	
Degree of protection, terminals (IEC 60529)	IP20
DIN rail mounting acc. to	IEC 60715
Screw fixing	2 x M4
Enclosure type	J460
Enclosure type Enclosure material	polycarbonate
Flammability class	polycarbonate UL94V-0
	107.5 x 93 x 62.9 mm
Dimensions (W x H x D)	
Weight	≤ 240 g





Operating controls and connections





- 1 ON
- The LED flashes during start-up.
- The LED lights permanently as soon as the device is ready for operation.
- **ISODATA 1** ISODATA 2
- 3 A1/+, A2/-4 X1
 - IsoData 1 interface 1
- **2 ETHERNET/IP** LEDs show activities on the different interfaces
 - 8 RBMS on/off 9 X3 Voltage supply: see nameplate and ordering details

5 X1

6 X2

7 RMB on/off

- 10 X4
- IsoData 1 interface 2
- Ethernet port (RJ45) for connection to the PC
- network as well as BCOM
 - IsoData 1 terminating resistor switch IsoData 2 terminating resistor switch
 - Micro USB interface (currently without function)
 - Mini HDMI interface (currently without function)

COMTRAXX® COM463BC

Gateway for data exchange between the interfaces BCOM and external BMS



Device features

- Gateway for data exchange between the interfaces BCOM and external BMS
- Ethernet (10/100 Mbit/s) for remote access via LAN, WAN or the Internet
- Configurable data exchange between BCOM and external BMS

Further information

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

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



Ordering information

Supply voltage/Frequency range <i>U</i> _s AC/DC	Power consumption	Application	Туре	Art. No.
24240 V, 5060 Hz	\leq 6.5 VA/ \leq 4 W	Gateway for the connection of systems with BCOM and external BMS	COM463BC-230 V	B95061051

Technical data

Rated insulation voltage	AC 250 V
Rated impulse voltage/Overvo	oltage category 4 kV/III
Pollution degree	3
Protective separation (reinfor	ced insulation) between
	(A1/+, A2/-) - [(AMB, BMB), (ABMS, BBMS), (X2), (X3, X4)]
Supply voltage	
Supply voltage $U_{\rm S}$	see ordering information
Frequency range Us	see ordering information
Power consumption	see ordering information
. orrer companipation	see ordering information
Indications	see ordering information
Indications LEDs:	,
Indications LEDs:	operation indicator
Indications	operation indicator
Indications LEDs:	operation indicator data traffic Ethernel
Indications LEDs: ON ETHERNET IP	operation indicator data traffic Ethernet data traffic BMS
Indications LEDs: ON ETHERNET IP BMS	operation indicator data traffic Ethernet data traffic BMS
Indications LEDs: ON ETHERNET IP BMS Ethernet (terminal X2) Memory	operation indicator data traffic Ethernet data traffic BMS lights during network connection, flashes during data transfer
Indications LEDs: ON ETHERNET IP BMS Ethernet (terminal X2)	operation indicator data traffic Ethernet data traffic BMS lights during network connection, flashes during data transfer

Interfaces	
Ethernet	
Port	RJ45
Data rate	10/100 MBit/s, autodetect
DHCP	on/off (on)*
t _{off} (DHCP)	560 s (30 s)*
IP address nnn.nnn.nnn, can always be	reached over: 192.168.0.254, (169.254.0.1)*
IP adresse	nnn.nnn.nnn (192.168.0.254)*
IP adresse static	169.254.0.1
Netmask	nnn.nnn.nnn (255.255.0.0)*
Protocols	TCP/IP, DHCP, SMTP, NTP
BMS bus (external)	
Interface/protocol	RS-485/external BMS (external BMS)*
Operating mode	master/slave (master)*
Baud rate BMS	external 19.2; 38.4; 57.6 kBit/s
Cable length	≤1,200 m
Cable: twisted pair, shielded, one end of shield connected to	PE recommended: 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, external BMS bus	299 (2)*
ВСОМ	
Interface/protocol	Ethernet/BCOM
BCOM subsystem address	1255 (1)*
BCOM device address	0255 (0)*



Environment/EMC	
EMC	EN 61326-1
Ambient temperatures	
Operation	-25+55 ℃
Transport	-40+85 ℃
Long-term storage	-25+70 ℃

Classification of climatic conditions a	ICC. TO IEC 60/21
Stationary use (IEC 60721-3-3)	3K24 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22
Classification of mechanical conditio	ns acc. to IEC 60721
Stationary use (IEC 60721-3-3)	3M11

Classification of mechanical conditions acc. to fec 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	

Connection type pluggable push-wire	
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

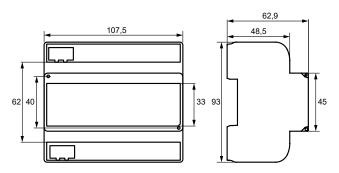
Push-wire terminal X1 AWG 24...16 Stripping length 10 mm rigid/flexible 0.2...1.5 mm² flexible with ferrule without plastic sleeve 0.25...1.5 mm² flexible with ferrule with plastic sleeve 0.25...0.75 mm²

Other

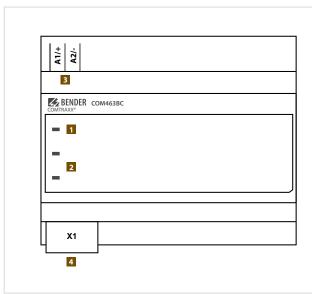
Operating mode	continuous operatio
Mounting	front-oriented, cooling slots must be ventilated vertical
Degree of protection, internal compo	nents (IEC 60529) IP3
Degree of protection, terminals (IEC	0529) IP2
Quick DIN rail mounting acc. to	IEC 6071
Screw fixing	2 x M
Enclosure type	J46
Enclosure material	polycarbonat
Flammability class	UL94V-
Dimensions (W x H x D)	107.5 x 93 x 62.9 mi
Documentation number	D0042
Weight	≤ 240

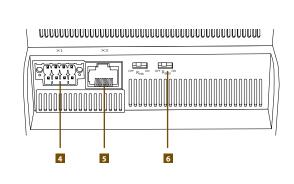
()* = factory settings

Dimension diagram (dimensions in mm)



Operating controls and connections





- 1 ON
- "ON" LED: Flashes during start-up.
- The LED lights permanently as soon as the device is ready for operation.
- **2** BCOM, BMS LEDs show activities on the different interfaces
- 3 A1/+, A2/-
- Supply voltage: see nameplate and ordering
- information

- 4 X1
- BMS bus (Bender measuring device interface)
- 5 X2
- Ethernet port (RJ45) for connection to the PC network as well as to BCOM
- 6 RBMS on/off
- Terminating resistor BMS bus switch



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	Art. No.
CP907-I	7" (17.6 cm)	DC 24 V, < 15 W	226 x 144 x 78 mm	1.1 kg	Flush-mounting enclosure	Glass, tempered, white	B95061031
CP907-1	7 (17.0 CIII)	III) DC 24 V, < 15 W	226 x 144 x 65 mm	1.0 kg	Control cabinet door mounting	Glass, tempered, white	B95061032
CP915-I	15.6" (38.6 cm)	AC 100240 V, < 30 W 505 x 350 x 92 mm	505 x 350 x 92 mm	6 1 kg	Flush mounting and acura	Glass, tempered, white	B95061033
(F915-1				505 X 350 X 92 IIIIII	7 202 X 220 X 92 MM	6.1 kg	g Flush-mounting enclosure

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
CP915-I	Display unit white	B95061090
	Display unit grey	B95061110
	Flush-mounting enclosure incl. mounting plate with electronics	B95061092

Accessories

Description	Art. No.
CP9xx-I replacement plug kit	B95061910
CP9xx-I suction lifter 1)	B95061911
CP907-I surface-mounting enclosure	B95061915

 $^{^{\}mbox{\scriptsize 1)}}$ The suction lifter is required to remove the display of the CP915-I.

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.

Insulation coordination acc. to IEC 60664-1	BCOM
CP907-I	Interface/protocol Ethernet/BCOM
	BCOM system name (SYSTEM)*
	BCOM subsystem address 1255 (1)*
Overvoltage category III Pollution degree 2	BCOM device address 0255 (0)*
	Modbus
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Bender Modbus image V1, V2 (V2)*
CP915-I	
Rated voltage AC 250 V	Modbus TCP
Overvoltage category III	Interface/protocol Ethernet/Modbus TCP
Pollution degree 2	Operating mode client for Bender Modbus TCP devices and "third-party devices"
Rated impulse voltage 4 kV	Operating mode server for access to process image and for Modbus control commands
Supply	Parallel data access for different clients max. 25
CP907-l via plug-in terminal (A1/+;A2/-)	Modbus RTU Interface/protocol RS-485/Modbus RTU
Nominal voltage DC 24 V SELV/PELV	Operating mode master/slave (master)*
Nominal voltage tolerance ±20 %	Baud rate 9.657.6 kBit/s
Typical power consumption at DC 24 V < 15 W	Cable length < 1200 m
Connection pluq-in terminal (A1/+;A2/-)	Cable shielded, one end of shield connected to PE
Maximum cable length when supplied via B95061210 (24-V DC power supply unit 1.75 A):	recommended: CAT6/CAT7 min. AWG23
0.28 mm ² 75 m	alternative: twisted pair, J-Y(St)Y min. 2x0,8
0.5 mm ² 130 m	
0.5 mm ² 200 m	.,
1.5 mm ² 400 m	
2.5 mm ² 650 m	Supported Modbus RTU slaves addresses 2247
	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
CP915-I via terminal block (L1; N)	Supported devices query of all devices (channels) possible
Nominal voltage CP915-I via external power supply unit AC 100 240 V	Trap support yes
Nominal voltage tolerance -15+10 %	USB (SEE
Frequency range $U_{\rm S}$ 5060 Hz	
Typical power consumption at AC 230 V < 30 W	Number 2
Connection terminal block (L1; N)	Operating mode USB 2.0 host (5 V, 500 mA)
	Data rate 480 Mbit/s
Stored energy time in the event of voltage failure	Cable length < 3 m
Time, date min. 3 days	Connection type USB 2 Standard-A
Displays, memory	Used ports
Display	53 DNS (UDP/TCP)
CP907-I 7" TFT touch display	67, 68 DHCP (UDP)
CP915-I 15.6" TFT touch display	80 HTTP (TCP)
E-mail configuration and device failure monitoring max. 250 entries	123 NTP (UDP)
Individual texts unlimited number of texts with 100 characters each	161 SNMP (UDP)
Number of data points for "third-party devices" to Modbus TCP and Modbus RTU 1600	162 SNMP TRAPS (UDP)
Number of data loggers 30	443 HTTPS (TCP)
Number of data points per data logger 10 000	502 MODBUS (TCP)
Number of history memory entries 20 000	4840 OPCUA (TCP)
Number of history memory entries 20 000	5353 MDNS (UDP)
Visualisation	48862 BCOM (UDP)
Number of pages 50	
Background image size max. 3 MB	Digital inputs (1-12)
	Number 12
Interfaces	Galvanic separation yes
Ethernet	Operating mode selectable for each input: active-high or active-low
Connection RJ45	Factory setting active-high
Cable shielded, both ends of shield connected to PE	Voltage range (high) AC/DC 1030 V
Cable length < 100 m	Voltage range (low) AC/DC 02 V
Data rate 10/100 Mbit/s, autodetect	Max. current per channel (at AC/DC 30 V) 8 mA
HTTP mode HTTP/HTTPS (HTTP)*	Connection push-in terminal (1-1) (2-2) (3-3) (12-12)
DHCP on/off (off)*	Maximum cable length < 1000 m
T_{off} (DHCP) 560 s (30 s)*	Cruitshing alamants
IP address nnn.nnn.nnn (192.168.0.254)*, can always be reached via: 169.254.0.1	Switching elements
Net mask nnn.nnn.nnn (255.255.0.0)*	Number 1 relay
Protocols TCP/IP, Modbus TCP, Modbus RTU, DHCP, SNMP, SMTP, NTP	Operating mode N/C operation or N/O operation
	Function programmable
BMS bus	Electrical endurance under rated operating conditions, number of cycles 10,000
Interface/protocol RS-485/BMS internal	Contact data acc. to IEC 60947-5-1:
Operating mode master/slave (master)*	Utilisation category AC-13 AC-14 DC-12
Baud rate 9.6 kBit/s	Rated operational voltage 24 V 24 V 24 V
Cable length < 1200 m	Rated operational current 2 A 2 A 2 A
Cable shielded, one end of shield connected to PE	Minimum contact load (relay manufacturer's reference) 10 µA / 10 mV DC
recommended: CAT6/CAT7 min. AWG23	Connection plug-in terminal (11;12;14)
alternative: twisted pair, J-Y(St)Y min. 2x0,8	Frag c (11)12/11)
Connection "ABMS" (see plug-in terminal)	

"ABMS", "BBMS" (see plug-in terminal)

1...150 (1)*

120 Ω (0.25 W), can be connected internally (see plug-in terminal)



Connection

Terminating resistor Device address

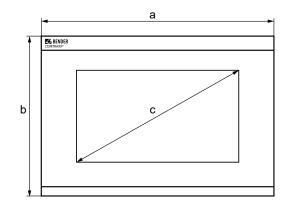
Buzzer		
Buzzer message	can be acknowledged, adoption of ch	
Buzzer interval		configurable
Buzzer frequency		configurable
Buzzer repetition		configurable
Audio		
Line IN		not used
Line OUT	Output to a STEREO playback de	evice via 3.5 mm jack plug
Cable length		< 3 m
Device connections		
Terminal block (L1; N; PE)	(for CP915-I only)	
Conductor sizes		AWG 2012
Stripping length		1011 mm
rigid/flexible		0.5 4 mm ²
flexible with ferrule with/wi	•	0.5 4 mm ²
Multiple conductor, flexible	with TWIN ferrule with plastic sleeve	0.54 mm ²
Plug-in terminal (A1/+;A2	2/) (11;12;14)	
Conductor sizes		AWG 2412
Stripping length		10 mm
rigid/flexible		0.22.5 mm ²
flexible with ferrule, with/w	ithout plastic sleeve	0.252.5 mm ²
Multiple conductor, flexible,	with TWIN ferrule with plastic sleeve	0.51.5 mm ²
), (k1k12), (MB), (BMS)	
Conductor sizes		AWG 2416
Stripping length		10 mm
rigid/flexible		0.21.5 mm ²
flexible with ferrule without	•	0.251.5 mm ²
flexible with ferrule with pla	stic sleeve	0.250.75 mm ²

Environment/EMC	
EMC	IEC 61326-
Operating temperature CP907-I	-10+55 °(
Operating temperature CP915-I	-5+40 °
Operating altitude	≤ 2000 m AMS
Rel. humidity	≤ 98 %
Classification of climatic conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3K2
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) CP907-I only	3M1°
Stationary use (IEC 60721-3-3) CP915-I only	3M10
Transport (IEC 60721-3-2)	2M-
Long-term storage (IEC 60721-3-1)	1M1:
Other	
Operating mode	continuous operation
Mounting	display-oriented
Degree of protection, front	IP54
Degree of protection, enclosure	IP20
Flammability class	UL 94V-(
Device dimensions	
CP907-I (W x H x D)	226 x 144 x 78 mn
CP915-I (W x H x D)	505 x 350 x 95 mn
Documentation number	D00418
Weight	
CP907-I	approx. 1.1 kg
CP915-I	approx. 6.1 kg

()* = factory settings

Dimensions

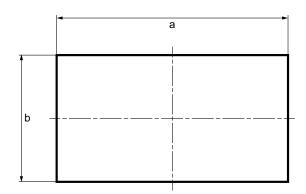
External dimensions



Туре		Dimensions (mm)	
Type	a	b	С
CP907-I	226	144	176 (7")
CP915-I	505	350	386 (15.6")

Glass thickness 3 mm

Installation dimensions - panel cut-out



Type Enclosure		Dimensi	ons (mm)	Required installation	
		a	b	depth	
	Flush-mounting enclosure	212	124	75	
CP907-I	Door mounting	213	123	65	
	Surface-mounting	299	173	-	
CP915-I	Flush-mounting enclosure	461	306	92	



COMTRAXX® CP9xx

Alarm indicator and operator panel for medical locations and other areas



Typical applications

Monitoring, operation and display of:

- Medical Isolated Power Systems (IPS)
- 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.

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

Further information

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

Approvals



only CP907

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 x 144 x 78 mm	1.1 kg	white	B95061080
CP907 without Flush-mounting enclosure	7" (17.6 cm) alternatively PoE possible		220 X 144 X / 6 IIIIII	0.9 kg	white	B95061093
CP915	15 6" (20 6 cm)	AC 100 240 V ~ 20 W	E0E v 2E0 v 02 mm	6.1 kg	white	B95061081
CFFIS	15,6" (39.6 cm) AC 100240 V, < 30 W 505 x 350 x 92 mm	6.1 ку	grey	B95061085		
CP924 24"	24" (61 cm)	AC 100240 V. < 55 W	CFA v AA1 v 100	0.1 ka	white	B95061083
	24 (01 (111)	AC 100240 V, < 33 W	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	B95061097
	Display unit grey	B95061111

¹⁾ In the offer phase the Art. No. may differ

Accessories

Description	Art. No.
CP907 surface-mounting enclosure	B95061915
CP9xx replacement plug connector kit	B95061910
CP9xx suction lifter 1)	B95061911

The suction lifter is needed to remove the display. For version CP915 and CP924



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
- Antibacterial or highly transparent foil
- Exchange of existing control panels (Retrofit)

Maximum cable length

5...60 s (30 s)*

nnn.nnn.nnn (255.255.0.0)*

TCP/IP, Modbus RTU, DHCP, SMTP, NTP

Technical data

Technical data	
Insulation coordination CP907 acc. to IEC 60664-1	
Rated voltage	50 \
Overvoltage category	II
Pollution degree	2
Rated impulse voltage	800 V
Insulation coordination CP915 acc. to IEC 60664-1	
Rated insulation voltage	AC 250 \
Overvoltage category Overvoltage category	II
Pollution degree	2
Rated impulse voltage	4 kV
Supply CP907 via plug-in terminal (A1/+;A2/-)	
Nominal voltage CP907	DC 24 V SELV/PELV
Nominal voltage tolerance	±20 %
Typical power consumption at DC 24 V	< 15 W
Connection plug	g-in terminal (A1/+;A2/-)
Maximum cable length when supplied via B95061210 (DC 24 V power sup	
0.28 mm ²	75 m
0.5 mm ²	130 m
0.75 mm ²	200 m
1.5 mm ² 2.5 mm ²	400 m 650 m
	111 000
Supply via PoE (only CP907)	IEEE 000 -
PoE standard	IEEE 802.3at
Nominal voltage	DC 48 V SELV/PELV
Nominal voltage tolerance Typical power consumption for PoE	-25+15 % < 15 W
Maximum cable length when supplied via AWG 26/7; 0.14 mm ²	< 15 W
Maximum Cable length when supplied via Avvo 20/7, 0.14 min	10011
Supply CP915/CP924 via terminal block (L1; N)	
Nominal voltage CP915 via external power supply unit	AC 100 240 V
Nominal voltage tolerance	-15+10 %
Frequency range <i>Us</i>	5060 Hz
	(CP915)/< 55 W (CP924)
Connection	terminal block (L1; N)
Stored energy time in the event of voltage failure	
Time, date	min. 3 days
Restart after voltage interruption	min. 15 seconds
Displays, memory	
Display/Resolution	
	T touch display/800 x 480
	touch display/1280 x 720
	1280 x 720 or 1920 x 1080
E-mail configuration and device failure monitoring	max. 250 entries
Individual texts unlimited number of texts	
Displayable devices	DTII 1600
Number of data points for "third-party devices" to Modbus TCP and Modb Number of data loggers	us RTU 1600 30
Number of data points per data logger	10,000
Number of entries in the history memory	1,000
	1,000
Visualisation	
Number of pages Background image size	50 max. 3 ME
	IIIdx. 5 IVIL
Interfaces	
Ethernet Connection	Diag
Connection	RJ45
Cable shielded, Cable length	shield on both sides to PE < 100 m
	10/100 Mbit/s, autodetect
DHCP	on/off (off)*
T. ((NHCD)	5 60 c (30 c)*

BMS bus	
Interface/protocol	RS-485/BMS internal
Operating mode	master/slave (master)*
Baud rate	9.6 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	"ABMS", "BBMS" (see plug-in terminal)
Terminating resistor	120 Ω (0.25 W), can be switched on internally (see plug-in terminal)
Device address	1150 (1)*
ВСОМ	,
Interface/protocol	Ethernet/BCOM
•	< 100 m
Cable length	
BCOM system name	(SYSTEM)*
BCOM devices address	1255 (1)*
BCOM device address	1255 (1)*
USB	
Number	2
Operating mode	USB-2.0-Host (5 V, 500 mA)
Datarate	480 Mbit/s
Cable length	< 3 m
onnection type	USB 2 Standard-A
Modbus TCP	
Interface/protocol	Ethernet/Modbus TCP
Cable length	< 100 m
Operating mode	Client for PEM and "third-party devices" assigned
	Server for access to process image and for Modbus control commands
•	server for access to process image and for mousins control communities
SNMP	F.I(511140
Interface/protocol	Ethernet/SNMP
Versions	1, 2c, 3
Devices supported	Queries to all devices (channels) possible (no trap functionality)
Trap support	No
Modbus RTU	
Interface/protocol	RS-485/Modbus RTU
Operating mode	master
Baud rate	9.657.6 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	"AMB", "BMB" (see plug-in terminal)
Terminating resistor	120 Ω (0.25 W), can be switched on internally (see plug-in terminal)
Supported Modbus RTU slave	
PROFINET	
Interface/protocol	Ethernet/PROFINET
Operating mode	Slave (IO-Device)
Digital inputs (1-12)	
Number	12
Galvanic separation	yes
Operating mode	selectable for each input: active-high or active-low
Factory setting	active-high
Voltage range (high)	AC/DC 1030 V
Voltage range (flow)	AC/DC 1030 V AC/DC 02 V
_ , , .	
Max. Current per channel (at A	
Connection plug-in terminal	(1-1) (2-2) (3-3)(12-12)
Maximum cable length	< 1000 m



nnn.nnn.nnn (192.168.0.254)*, can always be reached via: 169.254.0.1

 $T_{\rm off}$ (DHCP)

IP address

Net mask

Protocols (depending on function module selected)

Number				1 relay
Operating mode		N/C operati	on / N/O o	peration
Function			progra	mmable
Electrical endurance under rate	ed operating conditions, number	of cycles		10,000
Contact data acc. to IEC 609	947-5-1:			
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 n	nanufacturer's reference)		10 μΑ / 1	0 mV DC
Connection		plug-in t	erminal (1	1;12;14)
Buzzer				
Buzzer message	can be acknowledged, add	ption of characte	ristics of ne	ew value
Buzzer interval			conf	igurable
Buzzer frequency			conf	igurable
Buzzer repetition			conf	igurable
Audio				
Line IN			-	not used

Device connections

Line OUT Cable length

Terminal block (L1; N; PE) (for CP015 and CP924 only)	
Conductor sizes	AWG 2012
Stripping length	1011 mm
rigid/flexible	0.5 4 mm ²
flexible with ferrule with/without plastic sleeve	0.5 4 mm ²
Multiple conductor, flexible with TWIN ferrule with plastic sleeve	0.5 4 mm ²

Output to a STEREO playback device via 3.5 mm jack plug

Plug-in terminal (A1/+;A2/) (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 (I1;k1;l2;k2...I12;k12) (AMB;BMB;SMB;ABMS;BBMS;SBMS)

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-Connector	80 ℃

Environment/EMC

EMC	IEC 61326-1
Operating temperature	
CP907	-10+55°C
CP907 for UL-Applications	-10+50°C
CP915 and CP924	-5+40°C
Range of use	≤ 2000 m AMSL
Humidity	≤ 98%
Classification of climatic conditions acc. to IEC 6072	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) CP907	3M11
Stationary use (IEC 60721-3-3) CP915 and CP924	3M10
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12

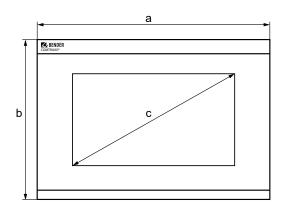
Other

< 3 m

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
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	approx. 1.1 kg
CP915	approx. 6.1 kg
CP924	approx. 9.1 kg

Dimensions

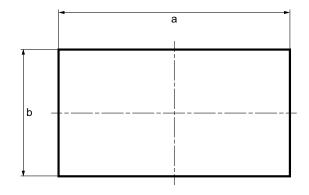
External dimensions



Туре		Dimensions (mm)	
.,,,,	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 .		Dimensi	Required installation	
.,,,,,	Linciosure	a	b	depth
CD007	Flush-mounting	212	124	75
CP907	Surface-mounting	299	173	-
CP915	Flush-mounting	461	306	92
CP924	Flush-mounting	610	398	95





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

Enclosure	Enclosure included in the scope of delivery	Digital inputs/ relay output	factory-programmed	Туре	Art. No.
		12/1	-	MK2430-11	B95100001
Flush mounting	_	12/1	_	MK2430C-11	B95100003C
Flush-mounting	nting	-	-	MK2430-12	B95100002
			_	MK2430C-12	B95100004C
Flush-mounting, horizontal mounting	-	-	-	MK2430H-12	B95100024
	12/1	12/1	12/1	MK2430A-11	B95100005
Surface-mounting			-	MK2430CA-11	B95100007C
			-	MK2430A-12	B95100006
		_	-	MK2430CA-12	B95100008C

Accessories

Type designation	Art. No.
Parameterisation software TMK-SET	as Internet download
MK2430-mounting kit, complete	B95101000
Flush-mounting enclosure	B923710

Suitable system components

Description	Туре	Art. No.	Page
Power supply unit	AN410	B924209	392
	AN450	B924201	394



flush mounting \leq 210 g, surface mounting \leq 400 g

IP20 UL94V-0

D00129

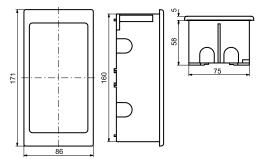
Insulation coordination ac	c. to IEC 60664-1	Max. cable length in case of power supply of	1/2/3 MK24 from one AN410
Rated insulation voltage	AC 250 V	0.28 mm² (e.g. J-Y(St)Y nx0.6)	300/150/100 m
Rated impulse withstand volta	age/pollution degree 4 kV/3	0.5 mm ² (e.g. J-Y(St)Y n x 0.8)	500 /250/150 m
C		0.75 mm ²	750/375/250 m
Supply voltage	AC/DC 24V	1.5 mm ²	1500/750/500 m
Supply voltage U _S	AC/DC 24 V	2.5 mm ²	2500/1200/750 m
Frequency range U _S	0/4060 Hz	Colours	
Operating range U _S	AC 1828/DC 1830 V		DAL 7035 (light grow), DAL 7040 (basalt grow)
Power consumption Voltage failure without reset	≤ 3 VA ≤ 15 s	Front foil Marking	RAL 7035 (light grey); RAL 7040 (basalt grey) RAL 5005 (ultramarine blue)
voltage failure without reset	₹ 133	Front plate	RAL 7035 (light grey)
Displays and LEDs		·	INE 7033 (light grey)
Display, characters	four lines, 4 x 20 characters	Switching elements (MK243011 only)	
Standard message texts in	20 languages	Number	1 changeover contact
Alarm addresses configurable		Function	programmable
Programmable text messages		Operation mode	N/C or N/O operation (programmable)
History memory (messages)	250	Electrical endurance, number of cycles	10000
Standard text message	3 x 20 characters	Contact data acc. to IEC 60947-5-1	
Additional text message (pres		Utilisation category	AC-13 AC-14 DC-12
Alarm LEDs (three different co	• • • • • • • • • • • • • • • • • • • •	Rated operational voltage	24 V 24 V 24 V
Menu texts	German/English	Rated operational current	5 A 3 A 1 A
Buttons	5 (Isometer test, buzzer mute, additional text, scroll, menu)	Minimum contact rating	1 mA at AC/DC > 10 V
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		
Inputs (MK243011 only	n)	Classification of climatic conditions acc. to IEC Stationary use	K 60/21: 3K23
Digital inputs	12 (IN1IN12)	Transport	2K11
Galvanic separation	Yes	Long-term storage	1K22
Activation of the digital inputs	<u> </u>	•	
Operating principle	N/O or N/C operation individually selectable for each input	Classification of mechanical conditions acc. to	3M11
Factory setting	N/O operation	Stationary use Transport	2M4
Voltage range (high)	AC/DC 1030 V	·	1M12
Voltage range (low)	AC/DC 02 V	Long-term storage	IMIZ
Recommended cable: J-Y(St)Y		Connection	
Cable length	≤ 500 m	Connection	pluggable screw terminals
		Connection properties (supply voltage, BMS l	bus):
Interfaces	20.00	Connection of single conductors	
Interfaces	RS-485 and USB (V2.0/V1.1)	rigid/flexible/conductor sizes	0.22.5/0.22.5 mm ² (AWG 2412)
Technical data for the RS-4	185 interface:	flexible with ferrule without/with plastic sleeve	0.252.5/0.252.5 mm ²
Protocol	BMS	Multi-conductor connection (2 conductors of the sa	
Baud rate	9.6 kbit/s	rigid/flexible	0.21/0.21.5 mm ²
Cable length	≤ 1200 m	flexible with ferrule without plastic sleeve	0.251 mm ²
Cable (twisted in pairs, one en		flexible with TWIN ferrules with plastic sleeve	0.51.5 mm ²
Terminating resistor	120 Ω (0.25 W) connectable via DIP switch	Connection properties (inputs):	
Device address, BMS bus	1150	Connection of single conductors	
Factory setting device address		rigid/flexible/conductor sizes	0.081.5/0.081.5 mm ² (AWG 2816)
ractory setting device address	i (iliaster)	flexible with ferrule without/with plastic sleeve	0.251.5/0.250.5 mm ²
Programming		Multi-conductor connection (2 conductors with the	
Interfaces	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 ²
Software	TMK-SET V 4.0 or higher	flexible with ferrules without plastic sleeve	0.250.34 mm ²
Factory setting password	activated	flexible with TWIN ferrules with plastic sleeve	0.5 mm ²
Max. cable length in case o	of power supply of 1/2/3 MK24 from one AN450	Stripping length	7 mm
0.28 mm ² (e.g. J-Y(St)Y nx0.6)	160/40/- m	Tightening torque	0.50.6 Nm
0.5 mm ² (e.g. J-Y(St)Y nx0.8)	250/70/- m	Other	
0.75 mm ²	400/100/- m	Operating mode	continuous operation
1.5 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	III 04V_0

Flammability class Documentation number

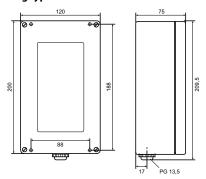
Weight



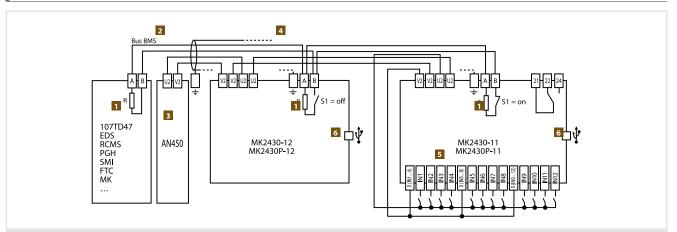
Flush-mounting type



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.
- 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
- $\bullet \ \ Customer-specific \ programming \ of the \ visualisation \ solution \ using \ a \ high-performance \ software$
- 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.



POWERSCOUT®

Recognising connections – optimising maintenance



Device features

- · Transmission of measured values every minute
- · Resolution of the data as a function of the velocity of the bus system
- 16 visible dashboards
- · 256 public dashboards
- · Commissioning wizards
- Residual current
- Stray currents
- Neutral conductor
- Central earthing point
- · Dashboard management
- Tree views management
- · Report management
- · Automated sending of reports
- Integration via CP9xx(-I), COM465IP and COM465DP
- Integration of third-party devices
- A web-based application for all types of devices
- Languages
 - English
 - German
- User management
- Supported browsers
 - Chrome
 - Firefox
 - Internet Explorer

Typical applications

Commissioning wizards

The wizards support the user in generating dashboards and reports. With just a few steps, meaningful dashboards related to a specific subject of electrical safety can be generated.

Residual current

The commissioning wizard supports you in creating a dashboard that allows evaluating the level of the residual current at a glance. The ratio of residual current and load current is calculated.

The wizard for stray currents indicates the system parts where excessive stray currents exist.

· Central earthing point

The central earthing point wizard generates a meaningful visualisation for the user by querying the current at the CEP and the corresponding phase current.

Neutral conductor

The excessive load on the neutral conductor challenges many system operators. The commissioning wizard evaluates the neutral currents and indicates whether they are too high.

Further information

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



Model	Collectors (gateways)	User	Туре	Art. No.
Hosted	up to 2	10	POWERSCOUT 2	B95061500
	up to 5	20	POWERSCOUT 5	B95061501
	up to 10	40	POWERSCOUT 10	B95061502
	> 10	> 40	POWERSCOUT project	B95061503

If you choose the Hosted model, we will operate POWERSCOUT for you in a German data centre. We take care of updates and maintenance for you.

System architecture





Insulation monitoring devices





Equipment for insulation fault locationISOSCAN®







Residual current monitoring systems



165



Neutral Grounding Resistor Monitor (NGR)



225



Charge Controller



255



Power Quality and Energy Measurement

Measuring and monitoring relays



277 292



System components

Coupling devices
Measuring current transformers
Transformers
Relay modules

Power supply units Measuring instrument: Interface converters Interface repeaters

COMTRAXX® Gateways
COMTRAXX® Alarm indicator and test combination
COMTRAXX® condition monitors



339



Switching equipment

ATICS® transfer switching and monitoring devices

Test systems

UNIMET® Safety analyser



429 440



Anney

Technical terms
Alphabetical list of devices
Service



463





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
- 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 power supply

Easy integration into existing installations



Device overview ATICS® switchover and monitoring devices



Catalogue page		432	436
Application		Unearthed safety power supplies	Safety power supplies
Rated insulation voltage		2-pole: 250 V	2-pole: 250 V 4-pole: 400 V
Voltages	Nominal system voltage U _n	AC 230 V (AC 160276 V)	2-pole: AC 230 V 4-pole: 3N AC 400/230 V
Volt	Frequency range	4862 Hz	4862 Hz
ı	Insulation monitoring Measuring range	10 kΩ…1 MΩ	-
Insulation monitoring Response value R _{an1}		50500 kΩ	-
Digital inputs/relays		1/1	4/4
Interface/protocol		RS-485/BMS	RS-485/BMS
Connection	Pluggable screw terminals		(up to 125 A)
Conne	Screw terminals	-	(160 A)
Installation	DIN rail		
Screw mounting		4 x M5	6 x M5
Product details (Products on www.bender.de/en)			



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

Rated operational current Ie	Rated operational voltage <i>U</i> e	Туре	Art. No.	
AC	AC	1,762		
	240 V	ATICS-2-63A-ISO	B92057202	
63 A		ATICS-2-63A-ISO-ES*	B92057206	
	415 V	ATICS-2-63A-ISO-400	B92057204	
80 A	240 V	ATICS-2-80A-ISO	B92057203	
		ATICS-2-80A-ISO-ES*	B92057207	
	415 V	ATICS-2-80A-ISO-400	B92057205	

^{*} with connection option for ATICS-ES energy storage device.



Description	Rated operational current <i>l</i> e	Туре	Art. No.
,	AC		
Dunaaa ayyitada bisa	63 A	ATICS-BP-2-63A-SET	B92057252
Bypass switch kit	80 A	ATICS-BP-2-80A-SET	B92057253
Energy storage for ATICS®	-	ATICS-ES*	B92057255

 $^{{\}rm *ATICS-ES\,may\,only\,be\,used\,in\,combination\,with\,the\,following\,ATICS^{\rm *}\,transfer\,switching\,devices:\,B92057206,\,B92057207.}$

Suitable system components

Description	Туре	Art. No.	Page
Insulation fault locator	EDS151	B91080101	153

Technical data

Overvoltage category	III	
Pollution degree outside, inside	2	
Rated insulation voltage	250 V	
Protective separation between	line 1 – line 2; line 1, 2, 3 – RS-485	
line 1, 2, 3 — digi	tal inputs; line 1, 2, 3 – relay outputs	
Voltage test according to IEC 61010-1 (basic insulation/protective sep	paration) 2.21 kV/3.54 kV	

Supply voltage

Rated operational voltage U_e	230 V, 50/60 Hz
Supply voltage U_S	see ordering details
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 $U_{\rm n}$	refer to ordering details	
Frequency range f_n	4862 Hz	
Crest factor	≤ 1.2	
Number of switching cycles (mechanical)	≥ 8000	
Short circuit current Icc and fuses		

refer to the 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 V
Operating uncertainty	±1%
Change over period	t < 500 ms100 s

Current monitoring (output current)

Measuring current transformers		STW3, STW4
Measuring range In (TRMS)	STW3: 0> 150 A, STW	4: 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 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 1 at one end, m	ust not be earthed	
	recommended: J-Y(St)Y	min. n x 2 x 0.8

IT system monitoring

Nominal system voltage (operating range)	230 V 50/60 Hz (80275 V)
Measuring range	10 kΩ1 ΜΩ
Measurement method	AMP (adaptive measuring pulse)
Response value R _{an1} (ALARM 1)	50250 kΩ
Relative uncertainty	±15 %
Hysteresis	≤ 25 %
Response time t_{an} at $R_F = 0.5$ x R_{an} and $C_e = 1$ μF	≤55
Measuring voltage $U_{\rm m}$	DC 12 V
Measuring current $I_{\rm m}$ (at $R_{\rm F}=0~\Omega$)	≤ 53 µA
Internal resistance R _i	≥ 240 kΩ
Impedance Z _i	≥ 220 kΩ
Internal resistance/impedance during test	≥ 100 kΩ
Permissible extraneous DC voltage Ufg	≤ 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 network connection maximum 1 hour

Load current monitoring (IT system transformer)

Measuring current transformers	STW2, STW3, SWL-100 A
Measuring range IL (TRMS)	10110 % of the response value
Adjustable response value (STW2, STW3, SWL-100A)	5(50) 100 Å (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 $\geq 0.75 \text{ mm}^2$	01 m
Single wire, twisted ≥ 0.75 mm ²	110 m
Shielded cable 0.5 mm ²	10 40 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)

Response value	4 kΩ
Relative uncertainty	±10 %
Release value	1.6 kΩ
Response time (overtemperature or open-circuit temperature sensor)	≤ 2 s
PTC resistors acc. to DIN 44081	max. 6 in series

Insulation fault location

Test current / _T	< 1 m/
Test cycle/pause	2/4

Displays and data memory

Display: graphic display	languages DE, EN, FR
Alarm LEDs	line 1, line 2, alarm, com
History memory	500 data records
Data logger	500 data records/channel
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 V
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 devices

Output		
Switching element	1 potential-free changeover cont	act
Mode of operation adjustable	N/O or N/C operat	ior
Adjustable function	ion refer to the manual, settings menu 5: "Rel	
Electrical endurance under rated operating conditions, number of cycles		000
Contact data according to IEC 61810		
Rated operational current AC (resistive load	d, cos φ=1) 5 A/AC 25	0 V
Rated operational current DC	5 A/DC 3	0 ۷
Overvoltage category		III

3 A/DC 30 V
III
10 mA at DC > 5 V
RS-485/BMS
9.6 kbit/s
≤ 1200 m
n one side)
recommended: J-Y(St)Y min. n x 2 x 0.8
120 Ω (0.25 W)
290

Environment/EMC	
EMC	

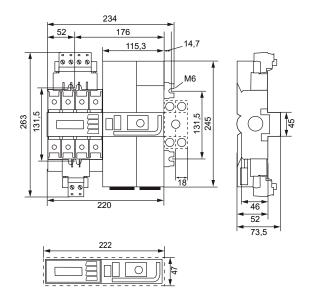
Classification of chiliatic conditions acc. to fee 60/21.	
Stationary use (IEC 60721-3-3)	3K24 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22
Operating temperature	-25+55 °C

EN 61326 (see CE declaration)

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

Dimension diagram (dimensions in mm)



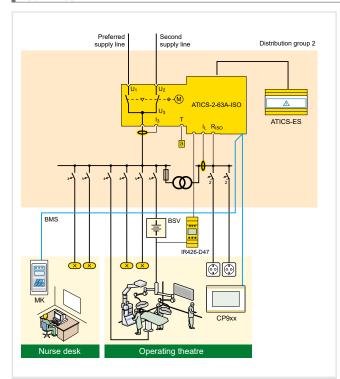
Terminals

Power section	
Connection directly on ATICS®, for plug connections	screw-type terminals
rigid (flexible)/conductor sizes	1070 mm ² (650 mm 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	1.5/35 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	l screwdriver 6.5 x 1.2 mm)
	$2.5 \text{ Nm } (\leq 25 \text{ mm}^2)$

	4.5 Nm (\geq 25 mm ²)
Torque setting for manual operation (Allen 5 mm)	approx. 6 Nm
Electronics	

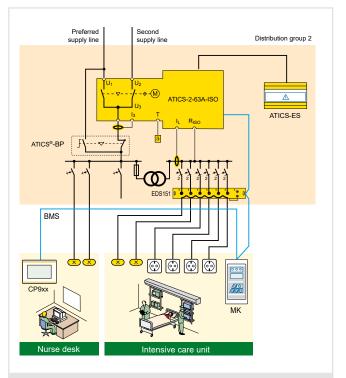
Electronics	
Connection	screw-type terminals
rigid/flexible/conductor sizes	0.141.5 mm ² /2816 AWG
Stripping length	7 mm
Tightening torque (slotted screws, screwdriver 2.5 x 0.4 mm)	0.220.25 Nm

Other	
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)
- MK2430/CP9xx: 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: Alarm at at least two points with independent power supplies for functional safety
- ATICS-ES: Energy storage (B92057206, B92057207 only)

ATICS®-...-DIO

Automatic transfer switching devices for safety power supplies



• Design of safety power supplies,

- main distribution boards

Typical applications

- computing centres

C € ĽK

e.g. for

Retrofit

- industry

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

Version	Rated operational current <i>l</i> e	Scope of delivery	Туре	Art. No.	
reision	AC Stope of delivery		.,,,,,	THE HOL	
2-pole	63 A	1 x STW3, bridge, connectors, terminal cover	ATICS-2-63A-DIO	B92057212	
z-poie	80 A	1 x STW3, bridge, connectors, terminal cover	ATICS-2-80A-DIO	B92057213	
Duma as suritate ant	63 A	Bridge, terminal cover, auxiliary contacts, LEDs green/red	ATICS-BP-2-63A-SET	B92057252	
Bypass switch set	80 A	Bridge, terminal cover, auxiliary contacts, LEDs green/red	ATICS-BP-2-80A-SET	B92057253	

Ordering information ATICS®...-DIO 4-pole

Version	Rated operational current I _e	Scope of delivery	Туре	Art. No.	
Version	AC	Stope of delitery	.,,,,,		
	80 A	4 x STW3, bridge, connectors, terminal cover	ATICS-4-80A-DIO	B92057222	
4-pole	125 A	4 x STW4, bridge, connectors, terminal cover	ATICS-4-125A-DIO	B92057223	
	160 A	4 x STW4, bridge, terminal cover	ATICS-4-160A-DIO	B92057224	
	80 A	Bridge, terminal cover, auxiliary contacts, LEDs green/red	ATICS-BP-4-80A-SET	B92057260	
Bypass switch set	125 A	Bridge, terminal cover, auxiliary contacts, LEDs green/red	ATICS-BP-4-125A-SET	B92057262	
	160 A	Bridge, terminal cover, auxiliary contacts, LEDs green/red	ATICS-BP-4-160A-SET	B92057264	

Insulation coordination acc. to IEC 60664-1/IEC 60664-3	Relay output 1
Overvoltage category III	Switching element 1 potential-free changeover contact
Pollution degree outside, inside 2	Mode of operation adjustable N/O or N/C operation
Rated insulation voltage ATICS-2-DIO/ATICS-4-DIO 250 V/400 V	Adjustable function see "Settings menu 4: Relay" in manual
Protective separation between Line 1 – Line 2; Line 1, 2, 3 – RS-485	Electrical endurance under rated operating conditions, number of cycles 10,000
Line 1, 2, 3 – digital inputs; Line 1, 2, 3 – relay outputs	Contact data according to IEC 61810
Voltage test according to IEC 61010-1 (basic insulation/protective separation)	•
2.21 kV/3.54 kV	
22111/33111	Rated operational current DC 5 A/DC 30 V
Supply voltage	Overvoltage category III
Rated operational voltage $U_{\rm e}$ 230 V 50/60 Hz	Minimum contact rating $10 \text{ mA at DC} > 5 \text{ V}$
Supply voltage <i>U</i> _S from monitored system	Relay outputs 24
Power consumption ATICS-2-63A-DIO ≤ 16 W	Switching element 1 potential-free N/O contact
Power consumption ATICS-2-80A-DIO ≤ 23 W	Mode of operation adjustable N/O or N/C operation
Power consumption ATICS-4-80A-DIO ≤ 39 W	Adjustable function see "Settings menu 4: Relay" in manual
Power consumption ATICS-4-125A-DIO ≤ 87 W	Electrical endurance under rated operating conditions, number of cycles 80,000
Power consumption ATICS-4-160A-DIO ≤ 119 W	
Current during the changeover process 17 A/< 30 ms	Contact data according to IEC 61810
D 41 / 14 11 1	Rated operational current AC (resistive load, cos φ=1) 5 A/AC 150 V
Power section/switching elements	Rated operational current DC 5 A/DC 30 V
Nominal system voltage U_n (operating range) ATICS-2-DIO/ATICS-4-DIO	Overvoltage category III
AC 230 V/3NAC 400 V	Minimum switching capacity 120 mW
Frequency range f_n 4862 Hz	BMS interface
Crest factor ≤ 1.2	Interface/protocol RS-485/BMS
Number of switching cycles (mechanical) ≥ 8000	Baud rate 9.6 kbit/s
Short-circuit currents see table "Short-circuit currents" in manual	Cable length ≤ 1200 m
Short-circuit current I_{cc} and fuses	Cable: shielded, one end of shield connected to PE CAT6/CAT7 min. AWG23*
refer to table "Utilisation category acc. to DIN EN 60947" in manual	* alternatively twisted pair, one end of shield connected to PE J-Y(St)Y min. 2x0.8
Voltage monitoring/changeover	Terminating resistor 120 Ω (0.25 W)
	Device address, BMS bus 290
Frequency range f _n 4070 Hz Undervoltage response value (Alarm 1) 160207 V (1-V steps)	Z70
	Environment/EMC
Overvoltage response value (Alarm 2) 240275 V (1-V steps)	EMC EN 61326 (see CE declaration)
Response delay t_{on} 50 ms 100 s (resolution of setting starting 50 ms)	Classification of climatic conditions according to IEC 60721:
Delay on release t _{off} 200 ms100 s (resolution of setting starting 50 ms)	Stationary use (IEC 60721-3-3) 3K24 (except condensation and formation of ice)
Hysteresis 210 % (1-% steps) Frequency measurement 4070 Hz (resolution 0.1 Hz)	Transport (IEC 60721-3-2) SK24 (except condensation and formation of ice) 2K11
Display range measured value ATICS-2-DIO 20276 V	Long-term storage (IEC 60721-3-1) 1K22
Display range measured value ATICS-2-DIO 20270 V	Operating temperature -25+55 °C
Operating uncertainty ±1%	7
Change over period $t < 500 \text{ ms} \dots 100 \text{ s}$	Classification of mechanical conditions acc. to IEC 60721:
change over period	Stationary use (IEC 60721-3-3) 3M11 Transport (IEC 60721-3-2) 2M4
Current monitoring (output current)	Long-term storage (IEC 60721-3-1) 1M12
Measuring current transformers STW3, STW4	Long term storage (IEC 00721 5 1)
Measuring range I _n (TRMS) STW3: 0> 150 A, STW4: 0> 260 A	Terminals
Response value for short-circuit detection ATICS-DIO	Power section
(versions 63 A and 80 A) with STW3	Connection directly on ATICS®, for plug connections and connection of 160 A version
(versions 125 A and 160 A) with STW4 250 A	screw-type terminals
Crest factor min. 2	rigid (flexible)/conductor sizes 1095 mm² (670 mm²)/8 (10)000 (00) AWG
Hysteresis for short-circuit alarm 5 %	Stripping length 15 mm
Cable length:	Tightening torque (hexagon socket 4 mm) 5 Nm
<u> </u>	Connection type (up to 125 A) pluggable screw terminals
Single wire \geq 0.75 mm ² 01 m Single wire, twisted \geq 0.75 mm ² 110 m	Conductor cross section, rigid min./max 1.5/35 mm ²
•	Conductor cross section, flexible min./max. 1.5/25 mm ²
	Conductor cross section AWG/min./max 16/2
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	Stripping length (without ferrules) 20 mm
	Tightening torque (Torx® screwdriver T20 or slotted screwdriver 6.5 x 1.2 mm)
Displays and data memory	$2.5 \text{ Nm} (\leq 25 \text{ mm}^2)$
Display: graphic display languages DE, EN, FR, PL	$4.5 \text{ Nm} \ (\geq 25 \text{ mm}^2)$
Alarm LEDs Line 1, Line 2, Alarm, Com	Torque setting for manual operation (Allen 5 mm) approx. 6 Nm
History memory 500 data records	Electronics
Data logger 500 data records/channel	Connection pluggable screw-type terminalsterminals
Config. logger 300 data records	riqid/flexible/conductor sizes 0.141.5 mm²/2816 AWG
Test data logger 100 data records	Stripping length 7 mm
Service logger 100 data records	Tightening torque (slotted screws, screwdriver 2.5 x 0.4 mm) 0.220.25 Nm
Input	Other
Digital inputs 4	Operating mode continuous operation
Galvanic separation yes	Mounting display-oriented
Control via potential-free contacts	For use at altitudes up to 2000 m AMSL
Mode of operation active at 0 V (low) or 24 V (high), adjustable	Protection class Class I
Voltage range high/low AC/DC 1030 V/AC/DC 00.5 V Adjustable function cuitching back interlegking function manual (automatic mode)	Protection class LCD under foil (DIN EN 60529) IP40
Adjustable function switching back interlocking function, manual/automatic mode,	Enclosure material polycarbonate
bypass mode, functional test, changeover to the preferred line,	Flammability class UL94V-0
alarm input for operating theatre lights, alarm input for other devices	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

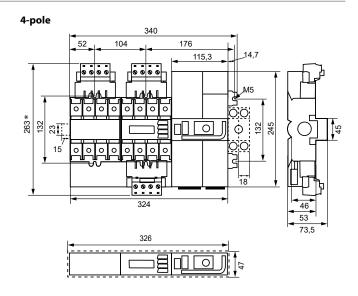
Weight

ATICS-2-DIO

ATICS-4-DIO

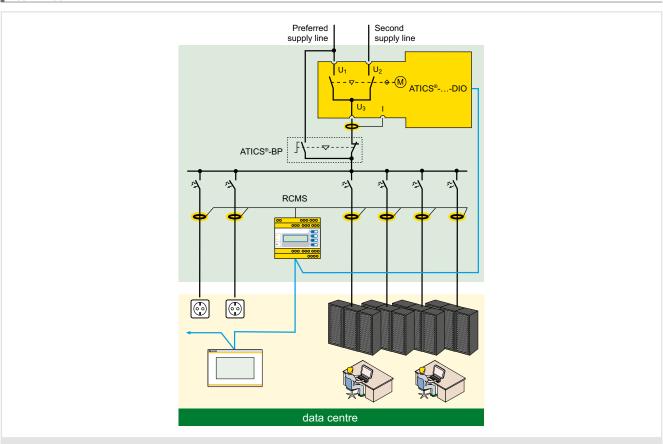


approx. 3400 g approx. 4800 g



* Version 80 A/125 A. Version 160 A without connectors.

Typical applications



Example application data centre

- ATICS $^{\circ}\text{-}\dots\text{-DIO}$: Changeover between the preferred and the redundant line
- MK2430/CP9xx: Alarm at at least two points for functional safety

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







UNIMET® 400ST



UNIMET® 610ST



UNIMET® 810ST

	Catalogue page	442	445	449	452
	Electrical equipment				
Application	Electric hospital and care beds			-	
Appli	Medical electrical equipment	1)		-	
	Electrical machines	-	-		-
	Supply voltage <i>U</i> s	AC 230 V	AC 230 V	AC 230 V	AC 100120 V, AC 220240 V
Voltages	Voltage measurement Measuring range	AC 90264 V	AC 90264 V	AC 90264 V	AC 90264 V
	Load current measurement	0.0116 A	0.0116 A	0.0116 A	0.0116 A
ice	manual				
Test sequence	semi-automatic	-	-		
Tes	automatic				
	Data exchange	UNIData300	UNIData300/400	UNIMET® 610ST Control Center	UNIMET® 810ST Control Center
	Product details (Products on www.bender.de/en)				

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

Supply voltage <i>U</i> s	Version	Type	Art. No	
AC		3,52	7	
220.4	Standard	UNIMET®300ST	B96023000	
230 V	СН	UNIMET®300ST	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	-
Three-phase adapter		DS32A	B96020098	457
	-	DS32A (CH/CH)	B96020110	457
		DS32DCT	B96020100	-

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 ℃
Degree of protection	IP20

Testing	of PE	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	± 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

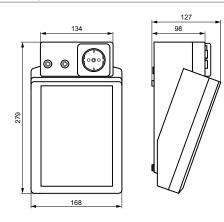
Equipment leakage current -Alternative method

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
T . It /F : .I I	

Test voltage (Equipment leakage current measurement — alternative method)

approx. system voltage, system frequency
Test current max. 3.5 mA

Dimension diagram (dimensions in mm)



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
	$100.00199.99 \text{ M}\Omega: \pm 10 \% \text{ of MV} \pm 2 \text{ digits}$

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	±5 % of MV, ±5 digits

Other

Dimensions (without bag)	ca. 168 x 272 x 124 mm (W x D x I	
Weight (without accessories or bag)	approx. 2.2 kg	
Calibration interval	36 months	
Documentation number	D00135	

of MV = of measured value

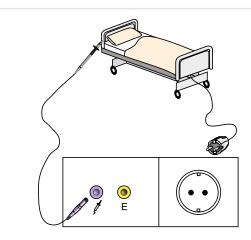




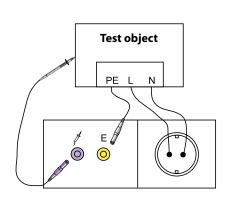


- 1 Function buttons
- Backlit LCD for displaying the user menu and the measurement results. Four lines of 20 characters each.
- 3 Permanently attached power cable for connection to the supply voltage.
- 4 Sockets
 - violet: Connection for test probe for testing exposed parts of the device under test.
 - 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

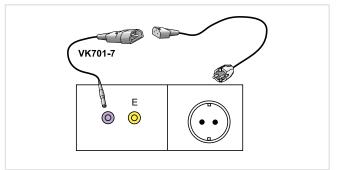


Connection of hospital and care beds and electrical equipment with plug-in connector.



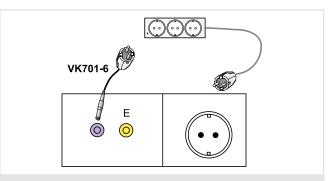
For connecting single-phase permanently installed equipment to the test system

- 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



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

Typical applications

 Safe testing of medical electrical equipment with patient connections, hospital and care beds and electrical equipment.

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



Approvals

Further information

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

Ordering information

Supply voltage U _s	Version	Type	Art. No.
AC		3,77	
2201/	Standard	UNIMET®400ST	B96024000
230 V	СН	UNIMET®400ST	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	457
Three-phase adapter	-	DS32A (CH/CH)	B96020110	457
		DS32DCT	B96020100	-



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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 °C
Storage temperature	-10+70 ℃
Degree of protection	IP20

Testing of PE resistance

> 2 A
0.00129.999 Ω
$0.0011.0~\Omega$: $\pm 2.5~\%$ of MV ± 2 digits
1.00129.999 Ω : ± 5 % of MV ± 2 digits

${\bf Leakage\ current,\ differential\ measuring\ method}$

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

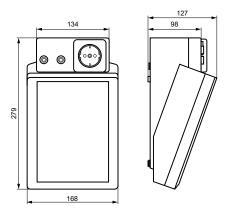
Equipment leakage current -alternative method

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 measurement — 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	$0.0199.99~\text{M}\Omega$: $\pm 5~\%$ of MV $\pm 2~\text{digits}$
	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	±5 % of MV, ±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



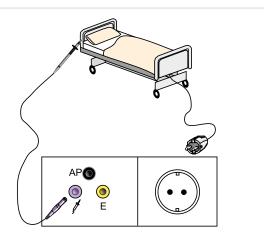




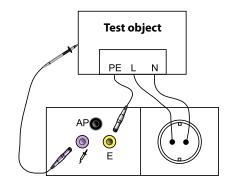
- Function buttons
- 2 Backlit LCD for displaying the user menu and the measurement results. Four lines of 20 characters each.
- 3 Permanently attached power cable for connection to the supply voltage.
- 4 Sockets
- black(AP): for testing applied parts
- violet: Connection for test probe for testing 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

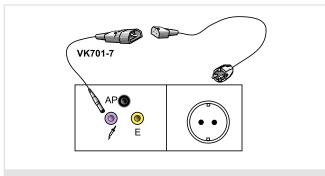


Connection of hospital and care beds and electrical equipment with plug-in connector.



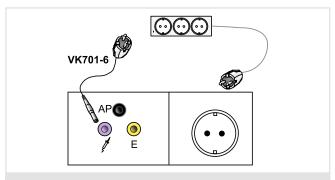
For connecting single-phase permanently installed equipment to the test system

- Disconnect the device
- Disconnect the connection to the supply voltage



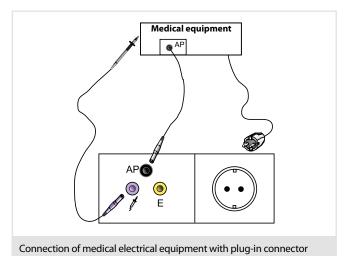
Testing of extension cables

- Connection of connecting and extension cords



Testing of extension cables

- 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 0701-0702 (VDE 0701-0702).
- DIN EN 60204-1/VDE 0113
 Safety of machinery Electrical equipment of machines Part 1:
 General requirements

Certifications

C € CA

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

Nominal voltage range	Maximum	Version	Туре	Art. No.
AC	output current		<i>,</i> , , , , , , , , , , , , , , , , , ,	
100120 V and 220240 V	16 A	Standard (DE/DE)	UNIMET® 610ST	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	459
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. A b.	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	457



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	П

Testing	of	PE	resistance
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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 ± 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 : ± 7.5 % of MV ± 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 : \pm 10 % of MV \pm 2 digits
Operating uncertainty	$0.0199.99~\text{M}\Omega$: $\pm 7.5~\%$ of MV $\pm 4~\text{digits}$
	$100.00199.99 \text{ M}\Omega$: $\pm 10 \%$ of MV ± 4 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 % 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	$\pm 2.5 \%$ of MV ± 3 digits

Load current measurement

measuring range	U.UUD10 A
Frequency range	4862 Hz
Intrinsic 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

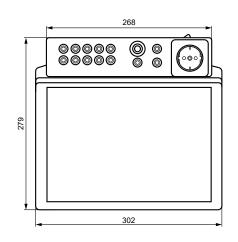
EMC	IEC 61326-1
Ambient temperature	0+40 °C
Storage temperature	-10+70 ℃
Relative humidity (up to 31 °C)	max. 80 %
Relative humidity (> 3140 °C)	decreasing linearly, max. 50 %
	condensation must be avoided
Height AMSL	max. 2000 m

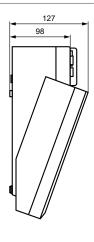
Other

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)





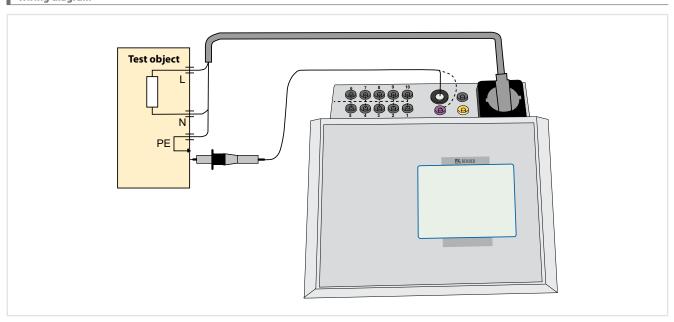




- 1 Touch screen for operation and display. For this purpose, a stylus is included in the scope of delivery.
- Durable plastic enclosure, with push buttons for safe storage in the carrier bag.
- 3 10 sockets (1...10) for the connection of VK adapters to test extension lines.
- 4 Measuring terminals
 - [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

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Further information

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

Ordering information

Nominal voltage range	Maximum load current	Version	Туре	Art. No.
AC	Maximum load current	Version	1,765	ALC: NO.
	16 A	Standard (DE/DE)	UNIMET®810ST	B96028020
100120 V and 13 A 220240 V	GB/GB	UNIMET®810ST	B96028024	
	13 A	B/B	UNIMET®810ST	B96028027
		Us/Us	UNIMET®810ST	B96028028
	10 A	СН	UNIMET®810ST	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	459
Cable	for connecting the test system with a PC, 9-pole, female-female (Null modem cable)	RS-232/RS-232interfacecable	B96012012	-
	Measuring lead, 150 cm, 4 mm connector	Cable150cm	B928703	-
Test probe	Test probe active (with switch)	TP800	B96020080	-
iest blone	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	460
Three phase adapter	for testing three phase devices during a section	DS32A	B96020098	457
mree-pnase adapter	Three-phase adapter for testing three-phase devices during operation	DS32A (CH/CH)	B96020110	457
External power source 25 A	for standard-compliant protective earth resistance measurements (only in conjunction with UNIMET® 810ST)	EPS800	B96028050	455

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 information
Protection class	SKII
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	$0.0011.000~\Omega$: $\pm 2.5~\%$ v. M. ± 5 digits
	1.00129.999 Ω : ±5 % v. M. ±5 digits
Operating uncertainty	$0.0011.000~\Omega$: $\pm 5~\%$ v. M. ± 10 digits
	1.00129.999 Ω: \pm 7.5 % v. M. \pm 10 digits

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 M Ω : \pm 10 % v. M. \pm 4 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 ℃
Storage temperature	-10+70 ℃
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

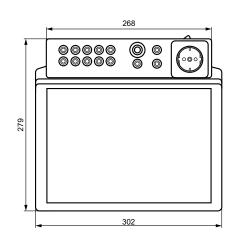
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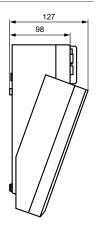
Degree of protection, enclosure: IP40, connections: IP20

	according to DIN VDE 04/0 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)









- 1 Touchscreen for operator control and indication. For this purpose, a stylus is included in the scope of supply.
- 2 Durable plastic enclosure, with pushbuttons for safe storage in the carrying bag.
- 10 sockets (1...10) for the connection of patient electrodes.
- 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 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
- 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.

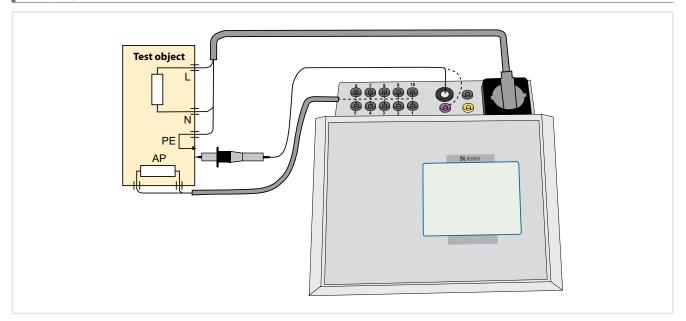
Note: The plug clicks into place and is secured against being pulled out accidentally.

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





EPS800

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

Further information

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

Typical applications

 External 25 A power source for standard-compliant protective earth resistance measurement acc. to IEC 60601-1 and IEC 61010-1

Approvals



Ordering information

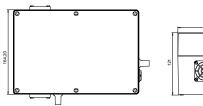
Version	for UN	IIMET*		Art. No.
Version	800ST	810ST	1,745	AI C. ITO.
Standard (German)	B96028010	B96028020	EPS800	B96028050
GB	B96028014	B96028024	EPS800	B96028054
СН	B96028016	B96028026	EPS800	B96028056
В	B96028017	B96028027	EPS800	B96028057
US	B96028018	B96028028	EPS800	B96028058

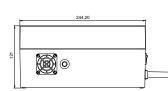
Technical data

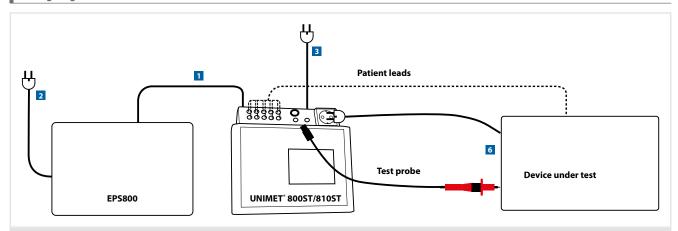
Nominal voltage	AC 207253 V, 48 62 Hz
Power consumption	400 VA
Measuring current	AC 25 A $\pm 10 \%$ (0 0.3 Ω)
Output power	230 VA
Operating mode	continuous operation
Protection class	II
Micro-fuse	5 x 20 mm, fast 5 A/250 V

Other	
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
Degree of protection	IP20
Dimensions	ca. 244 x 164 x 120 mm (W x D x H)
Documentation number	D00146
Weight	≤ 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.
- Connect the supply line of the UNIMET® 800ST/810ST to the power socket.
- 4 Switch on the power switch of the UNIMET® 800ST/810ST.
- **S** Switch on the power switch of the EPS800. The sound of the internal ventilator can be heard.
- **5** Connect the DUT. Determine the test sequence according to the classification.

D00147

DS32A

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

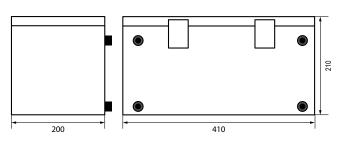
Technical data

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

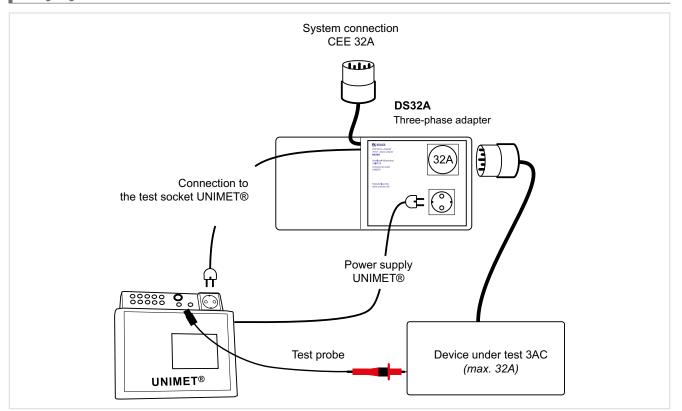
Supply voltage	
Supply voltage $U_{\rm S}$	3AC 400 V ±10 %
Frequency range U _s	5060 Hz
Power consumption	approx. 18 VA
Load current max.	32 A
Environmental conditions	
Storage temperature	-10+70°C
Operating temperature	0+50 ℃
Degree of protection	IP20
Dimensions	405 x 210 x 200 mm (width x height x depth)
Weight	8.9 kg
Height above sea level	max. 2000 m
Operating mode	not suitable for continuous operation

Documentation number

Dimension diagram (dimensions in mm)







VK701-8

Adapter kit 16 A for DS32A



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



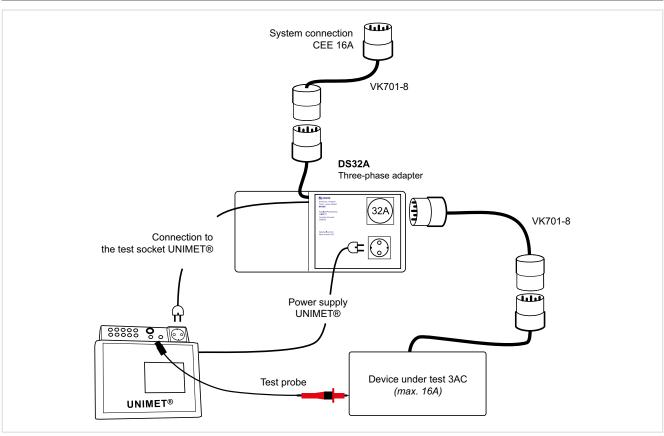
Ordering information

Туре	Art. No.
VK701-8	B96020097

Technical data

Nominal voltage	
Nominal voltage	3AC 400 V
Max. current	16 A
Documentation number	D00172

Wiring diagram





TB3 Test box



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.

Typical applications

- Testing the measured values of safety testers
- Comprehensive system self test

Approvals



Ordering information

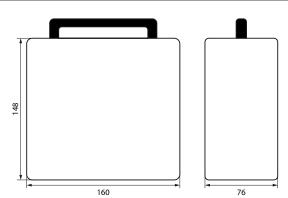
Version	Туре	Art. No.
Standard (German)	TB3 test box	B96020025

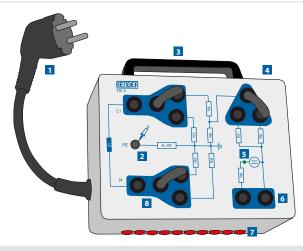
Technical data

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 <i>U</i> _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

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

Dimension diagram (dimensions in mm)





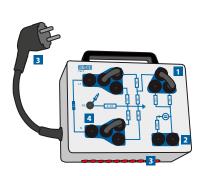
- 1 Mains plug; only to be used for the test socket of the safety tester
- 2 Socket for the connection of the test probe
- 3 Carrying handle
- Enclosure, magnetic adhesive stripes allow simple fixing to the safety tester μP601
- 5 LED lights when voltage is applied at the mains plug
- 6 Sockets for the patient connections 1 and 2 of the safety tester
- 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".

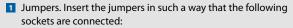
1 2 10 **00**00000000

Sockets on the side

3 Jumpers allow simulation of different test situations

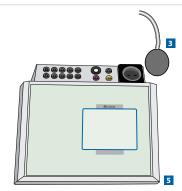
Connections





μΡ601	UNIMET® 810ST
a-b	a-b
d-e	d-f
h-i	h-i

2 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.



- 3 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

Insulation monitoring devices







Equipment for insulation fault locationISOSCAN®







Residual current monitoring systems



165



Neutral Grounding Resistor Monitor (NGR)



225



Charge Controller



255



Power Quality and Energy Measurement

Measuring and monitoring relays



277



System components

Coupling devices Measuring current transformers Transformers Relay modules Power supply units Measuring instruments Interface converters Interface repeaters

COMTRAXX® Gateways
COMTRAXX® Alarm indicator and test combination
COMTRAXX® condition monitors
Visualization



339



Switching equipment

ATICS® transfer switching and monitoring devices

Test systems

UNIMET® Safety analyser



429 440



Annex

Technical terms Alphabetical list of devices Service



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Technical terms

Alarm state	Alarm state indicates that the residual current in the installation monitored has exceeded the preset level of the RCM.
Direct contact	Electric contact of persons or animals with live parts.
Earth	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.
Earth electrode	Conductive part, which may be embedded in a specific conductive medium, e.g. concrete or caoke, in electric contact with the Earth.
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 of the supply voltage	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	Physiological effect resulting from an electric current through a human or animal body.
Equipment for insulation fault location	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.
Exposed-conductive part	Conductive part of equipment which can be touched and which is not normally live, but which can become live when basic insulation fails.
Extraneous conductive part	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}	DC voltage occurring in AC systems between the AC conductors and earth (derived from DC parts).
Extraneous voltage	Voltage 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∆	Current which flows across a given point of fault resulting from an insulation fault.
Fault voltage (<i>U</i> _f)	Voltage appearing under fault conditions between exposed conductive and/or extraneous conductive parts and earth.
Fiducial value	A clearly specified value to which reference is made in order to define the fiducial error.
Indirect contact	Electric contact of persons or animals with exposed-conductive parts which have become live under fault conditions.
Influence quantity	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.
Insulation fault	A defect in the insulation of an equipment which can result either in an abnormal current through this insulation or in a disruptive discharge.
Insulation fault locator	Device or part of device for the location of the insulation fault.
Insulation monitoring device	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.
Insulation resistance R _F	Resistance in the system being monitored, including the resistance of all the connected appliances to earth.



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 I _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 (<i>U</i> _q)	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 _{Δn}	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, residual pulsating direct currents or smooth residual direct currents, whether suddenly applied or slowly rising.
Residual current I∆	Algebraic sum of the values of the electric currents in all live conductors, at the same time at a given point of an electric circuit in an electrical installation.
Residual current monitor	Device or association of devices which monitors the residual current in an electrical installation, and which activates an alarm when the residual current exceeds the operating value of the device.
Residual current monitoring system	Usually consists of the residual current monitor and measuring current transformers. The system localises occurring residual currents and indicates the location of the fault.
Residual operating current	Value of the residual current which causes the RCM to operate under specified conditions.
Response sensitivity	Value of the evaluating current or insulation resistance at which the evaluator responds under specified conditions.
Response time t _{an}	Time required by an insulation monitoring device to respond under specified conditions.
Response value R _a	Value of the insulation resistance at which the device responds under specified conditions.
Short circuit to exposed-conductive part	A conductive connection caused by a fault between the exposed-conductive part and the live parts of electrical equipment.
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, short circuit to earth	A solid short circuit, short circuit to exposed-conductive parts or short-circuit to earth exists if the impedance of the conductive connection at the point of fault is almost zero.
Specified operating range	Range of values of a single influence quantity which forms a part of the rated operating conditions.
Specified response value R _{an}	Value of the insulation resistance, permanently set or adjustable, on the device and monitored if the insulation resistance falls below this limit.
Supply voltage (<i>U</i> _s)	Voltage at a point where the measuring equipment does or can accept electric energy as a supply.
System leakage capacitance C _e	Total capacitance to earth of the system to be monitored, including any connected appliances, up to which value the insulation monitoring device can work as specified.
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 indefinitely in specified conditions of external influences and is usually equal to AC 50 V, r.m.s. or 120 V ripple free DC.
Touch voltage <i>U</i> t	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 which exist when the quantity is considered.
Variation	The difference between the indicated values for the same value of the measured quantity of an indicating or recording instrument, of the (conventional) true value of a supply instrument, when a 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 phase conductor and the earthed neutral point.b) In all other distribution systems, the voltage present between the remaining phase conductors and earth when one of the phase conductors is shorted to earth.

02/2022 **BENDER**

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 Fl-bzw. Dl-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
RCBO	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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From planning to modernisation – Our extensive know-how is at your disposal during all project phases.

Furthermore, with our first-class service we guarantee maximum safety for your electrical installations.

We offer services ranging from support over telephone to repairs and on-site service - with modern measuring devices and competent employees.

Secure yourself:

- High availability of your installation thanks to fast reaction to fault messages
- Increased profitability of your capital expenditure (CapEx) via optimised maintenance processes
- Targeted operating expenditure (OpEx) due to less downtimes and shorter service visits
- Support for your prospective system monitoring and regular tests of your system/power quality/monitoring devices
- Automatic control, analysis, correction, new settings/updates
- Competent assistance with setting changes and updates

Bender Remote Assist

Bender Remote Assist offers you support via remote access, highquality service and advice for your challenging task consisting in ensuring consistent high safety in your systems.

Many service visits, fault clearance but also analyses and controls can be carried out remotely – without the expenses of time and money that an on-site visit of a technician implies.

This fast, efficient help and advice by our expert network allows the highest possible availability of your system.





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