Main Catalogue

Edition 01/2023



Design the future of energy



Main Catalogue Edition 01/2023

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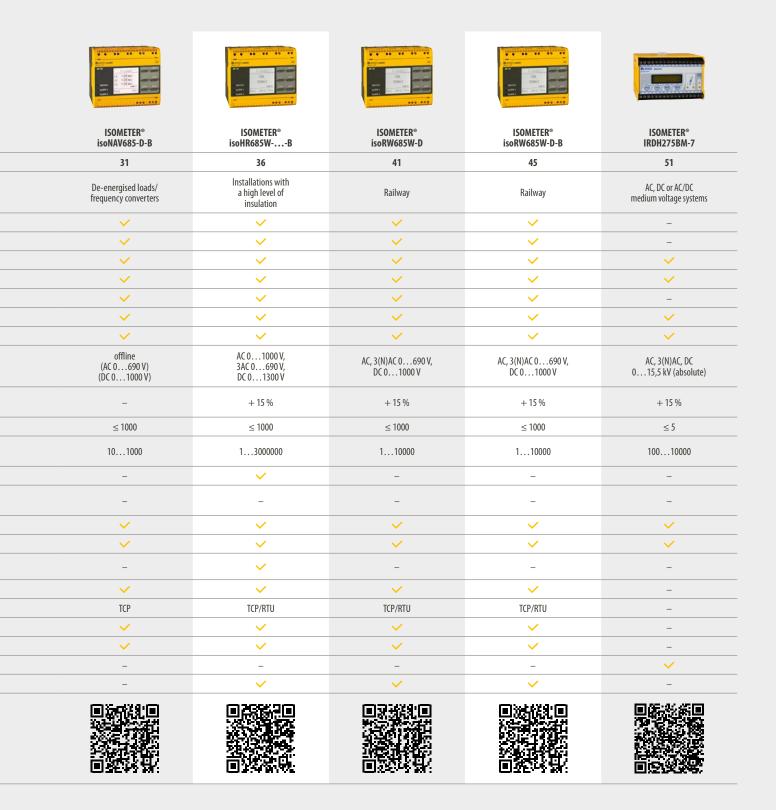
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Device overview insulation monitoring devices ISOMETER®

		Brown and Color	1190 C	Account 1990	Discourant
		ISOMETER® iso685	ISOMETER® iso685B	ISOMETER® iso685P	ISOMETER® isoNAV685-D
	Catalogue page	12	16	20	26
Sį	pecial applications	-	+	-	Quick response to combined resistance and offset voltage measurement
s	Control circuits	✓	✓	~	✓
Circuits	Auxiliary circuits	~	~	~	✓
	Main circuits	~	~	~	~
E _	3(N)AC	~	~	✓	~
Voltage system	AC	~	~	~	~
ltage	AC/DC	~	~	~	~
ολ	DC	~	~	~	-
Nomi	nal 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 U _n	+ 15 %	+ 15 %	+ 15 %	+ 15 %
System lo	eakage capacitance C _e μF	≤ 1000	≤ 1000	≤ 1000	≤ 1000
Res	ponse value R_{an} kΩ	110000	110000	110000	110000
(Coupled systems	-	~	~	-
Loca for ins	nting current injector sulation fault location	-	-	~	-
u _	DIN rail	~	~	~	~
Installation	Screw mounting	~	~	~	~
Inst	Panel mounting/ wall fastening	~	~	~	-
_	Web server	<u> </u>	~	~	~
χ; –	Modbus	TCP/RTU	TCP/RTU	TCP/RTU	ТСР
Interfaces	ВСОМ	<u> </u>	<u> </u>	~	~
Inte	BS	<u> </u>	~	~	<u> </u>
_	BMS	-	-	-	-
	isoData	<u> </u>	~	~	-
	Product details (Products on www.bender.de/en)				
	Type C. p.		Suitable syster	m components	
	FP200 49	✓	~	~	-

	Туре	С. р.		Suitable system components				
	FP200	49	~	~	~	+		
10	AGH150W-4	363	~	~	_	-		
evices	AGH204S-4	365	~	~	_	+		
ing de	AGH520S	366	~	~	_	+		
Coupli	AGH675S-7	367	-	-	_	+		
	AGH676S-4	369	✓	~	_	_		



Suitable system components

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

Device overview insulation monitoring devices ISOMETER®

			ISOMETER® iso415R	ISOMETER® IR420-D4	ISOMETER® IR425	ISOMETER® iso 1685DP
		Catalogue page	55	58	61	64
		Special applications	-	-	-	-
	ابر	Control circuits	~	~	~	-
	Circuits	Auxiliary circuits	~	~	~	-
_		Main circuits	-	-	_	~
	ma .	3(N)AC	-	-	-	-
	Voltage system	AC	~	~	~	~
	oltage	AC/DC	~	-	~	~
	۸	DC	~	-	~	<u> </u>
	Nor	ninal system voltage <i>U</i> n	Depending on variant	AC 0250 V	AC/DC 0300 V	AC 01000 V, DC 01500 V
		Tolerance of <i>U</i> _n	-30 %+15 %	+ 20 %	+ 20 %	+10 %, +5%
	System leakage capacitance C _e μF		≤ 25	≤ 20	≤ 20	≤ 2000
	R	esponse value R _{an} kΩ	51000	1200	1200	0.21000
		Coupled systems	-	-	-	~
	Lo for i	cating current injector Insulation fault location	-	-	-	-
	E	DIN rail	~	~	~	-
	Installation	Screw mounting	~	~	~	~
	Insta	Panel mounting/ wall fastening	-	-	-	-
		Web server	-	-	-	-
	10	Modbus	RTU	-	-	RTU
	Interfaces	ВСОМ	_	-	-	-
	Inte	BS	-	-	-	-
		BMS	-	-	-	<u> </u>
		isoData	-	-	-	-
		Product details (Products on www.bender.de/en)				
		Type C. p.		Suitable syster	m components	
		FP200 49	_	-	-	-
	S	AGH150W-4 363	-	-	_	-
	devices	AGH204S-4 365	-	-	-	-
	77					

366

367

369

AGH520S

AGH675S-7

AGH676S-4



Suitable system components

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

Device overview insulation monitoring devices ISOMETER®

		ISOMETER® isoLRZ75	ISOMETER® isoPV	ISOMETER® isoPV425	ISOMETER® isoPV1685RTU
	Catalogue page	81	84	88	92
	Special applications	Installations with a low level of insulation	Photovoltaic	Photovoltaic	Photovoltaic
s	Control circuits	-	-	-	-
Circuits	Auxiliary circuits	-	+	-	-
	Main circuits	~	~	~	✓
Ę	3(N)AC	✓	~	~	~
syste	AC	✓	~	~	~
Voltage system	AC/DC	~	~	✓	~
ν	DC	~	~	~	~
Noi	minal system voltage <i>U</i> n	via AGH-LR 3(N)AC 0690 V DC 01000 V	via AGH-PV 3(N)AC 0 793 V DC 0 1000 V	DC 01000 V, AC 0690 V , 15460 Hz	AC 01000 V DC 01500 V
	Tolerance of <i>U</i> _n	+ 15 % + 10 %	+ 10 %	+ 15 %	+6%
Systen	n leakage capacitance C _e μF	≤ 500	≤ 2000	≤ 500	≤ 2000
R	esponse value $R_{ m an}$ k Ω	0.2100	0.2100	1990	0.2990
	Coupled systems	-	~	-	-
Lo for	cating current injector insulation fault location	-	-	-	-
E	DIN rail	✓	✓	✓	-
Installation	Screw mounting	~	~	~	✓
lnst	Panel mounting/ wall fastening	-	-	-	-
	Web server	-	-	_	-
s	Modbus	-	-	RTU	RTU
Interfaces	ВСОМ	-	-	-	-
Inte	BS	-	-	_	-
	BMS	<u> </u>	~	~	~
	isoData	-	-	~	-
	Product details (Products on www.bender.de/en)				
	Type C. p.		Suitable syster	m components	
	FP200 49	-	-	-	-
v)	AGH150W-4 363	-	-	-	-
evice	AGH204S-4 365	-	-	_	-
ing d	AGH520S 366	-	-	-	-
Coupling devices	AGH675S-7 367	-	-	_	-
	AGH676S-4 369	-	-	-	-













ISOMETER® isoPV1685P	ISOMETER® isoPV1685DP	ISOMETER® IR420-D6	ISOMETER® IR423	ISOMETER® IR123	ISOMETER® isoGEN423
92	95	98	101	104	107
Photovoltaic	Photovoltaic	Disconnected loads	Mobile generators	Mobile generators	Generators acc. to standard DIN VDE 0100-551
_	-	-	-	_	-
-	-	-	-	-	-
✓	✓	~	✓	~	✓
-	✓	~	-	-	✓
-	✓	~	~	~	✓
-	✓	-	-	-	✓
✓	✓	~	-	-	✓
DC 01500 V	AC 01000 V DC 01500 V	offline (AC 0 400 V)	AC 0250 V	AC 100250 V	3(N)AC, AC 0400 V, DC 0400 V
+6%	+10 %, +5%	-	+ 20 %	+ 20 %	+25 %
≤ 2000	≤ 4000	≤ 10	≤ 5	≤1	≤ 5
0.2990	0.2200	10010000	1200	46/23	5200
-	✓	-	-	-	-
~	~	-	-	-	-
-	-	~	~	-	✓
✓	✓	~	✓	~	✓
-	-	-	-	-	-
-	-	-	-	-	-
-	RTU	-	-	-	RTU
-	-	-	-	-	-
-	-	-	-	-	-
~	✓	-	-	-	✓
-	-	-	-	-	✓











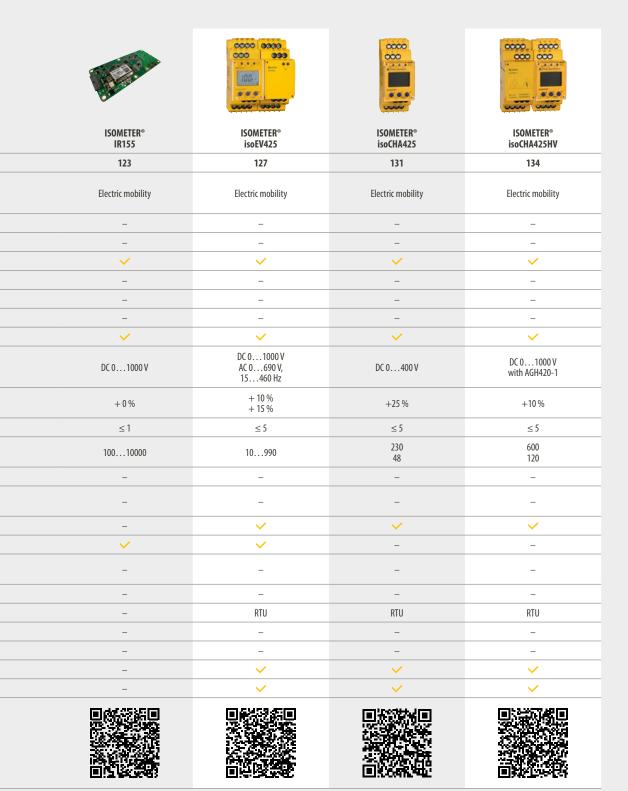


Suitable system components

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

Device overview insulation monitoring devices ISOMETER®

			ISOMETER® isoRW425	ISOMETER® isoUG425	ISOMETER® isoES425	ISOMETER® isoHV425	
-		Catalogue page	110	113	116	119	
-		Special applications	Railway	Unearthed DC systems	Energy storage VDE-AR-E 2510-2	-	
		Control circuits	-	-	_	-	
	Gircuits	Auxiliary circuits	-	-	-	-	
	5	Main circuits	<u> </u>	~	✓		
-		3(N)AC	<u> </u>	-	<u> </u>	<u>✓</u>	
	stem	AC	<u> </u>		~	<u> </u>	
	ge sy			-			
	Voltage system	AC/DC	~	+	~	~	
-		DC	<u> </u>	✓	~	~	
_	Nor	ninal 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 <i>U</i> _n	+ 25 %	+20 %	+25 %	+10 %	
	System	n leakage capacitance Ce μF	≤ 300	≤ 50	≤ 100	≤ 150	
_	R	esponse value R _{an} kΩ	1990	2100	2990	11500	
		Coupled systems	-	-	-	-	
	Lo for i	cating current injector insulation fault location	-	+	-	-	
	Ē	DIN rail	✓	~	~	✓	
	llatio	Screw mounting	~	~	✓	✓	
_	Installation	Panel mounting/ wall fastening	-	-	-	-	
		Web server	-	-	-	-	
		Modbus	RTU	RTU	_	RTU	
	aces	ВСОМ	-	-	-	-	
	Interfaces	BS	-	_	_	_	
	=	BMS	<u> </u>	✓	✓		
		isoData	✓	✓	~	✓	
-		Product details (Products on www.bender.de/en)					
		Type C. p.		Suitable syster	m components		
		FP200 49	-	-	-	-	
		AGH150W-4 363	-	-	_	_	
	ices	AGH204S-4 365		-	_	_	
	Coupling devices	AGH520S 366					
	pline						
	Sou	AGH675S-7 367		-	_	-	
		AGH676S-4 369	-	-	-	-	



Suitable system components

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

ISOMETER® iso685-...

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





Typical applications

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

Approvals





Device features

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

Device variants

iso685-D

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

iso685-S

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

Option "W"

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

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

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

Further information

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

Ordering information

Туре		Nominal system voltage range <i>U</i> n	Supply voltage <i>U</i> s	Display	Option W	Art. No.
iso685-D		3 1 10 10 10 10 10 10 10 10 10 10 10 10 1		:	-	B91067010
iso685W-D			AC 24240 V; 50400 Hz	integrated	-40+70°C, 3K23, 3M12	B91067010W
iso685-S + FP200		DC 01000 V	DC 24240 V	datadhad	-	B91067210
iso685W-S + FP200W				detached	-40+70°C, 3K23,3M12	B91067210W

Suitable system components

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

1) ii	ıcluded	in	the	scope	of	deliver	٧
-------	---------	----	-----	-------	----	---------	---

Description	Туре	Art. No.	Page
Device version	iso685-S	B91067110	-
without display	iso685W-S	B91067110W	-
Display for front	FP200	B91067904	49
panel mounting	FP200W	B91067904W	49
	AGH150W-4	B98018006	363
Carreline danisas	AGH204S-4	B914013	365
Coupling devices	AGH520S	B913033	366
	AGH676S-4	B913055	369

Suitable measuring instruments on request!

Technical data

Insulation coordination according to IEC 60664-1/IE	C 60664-3	Measuring circuit	
Definitions:		Measuring voltage U _m	profile dependent, $\pm 10 \text{ V}$, $\pm 50 \text{ V}$ (see profile overview)
Measuring circuit (IC1)	(L1/+, L2, L3/-)	Measuring current I _m	≤ 403 µ/
Supply circuit (IC2)	A1, A2	Internal resistance R_i , Z_i	≥ 124 kΩ
Output circuit 1 (IC3)	11, 12, 14	Permissible extraneous DC voltage U_{fq}	≤ 1200 \
Output circuit 2 (IC4)	21, 22, 24	Permissible system leakage capacitant	
Control circuit (IC5)	(E, KE), (X1, ETH, X3, X4)	. cssizie system reunuge cupucitum	prome acpeniantly of the party
Rated voltage	1000 V	Measuring ranges	
Overvoltage category	III	Measuring range $f_{\rm n}$	0,1460 Hz
	III	Tolerance measurement of f_n	±1% ±0.1 H;
Rated impulse voltage:	0.114	Voltage range measurement of f_n	AC 25690 V
IC1/(IC2-5)	8 kV	Measuring range $U_{\rm n}$	AC 25690 \
IC2/(IC3-5)	4 kV	Measuring range on	DC 251000 \
IC3/(IC4-5)	4 kV	Volta na van na managurana ant af II	AC/DC > 10 \
IC4/IC5	4 kV	Voltage range measurement of U_n	
Rated insulation voltage:		Tolerance measurement of U _n	±5 % ±5 \
IC1/(IC2-5)	1000 V	Measuring range C _e	01000 µl
IC2/(IC3-5)	250 V	Tolerance measurement of C_e	±10 % ±10 μl
IC3/(IC4-5)	250 V	Frequency range measurement of C_e	DC, 30460 Hz
IC4/IC5	250 V	Min. insulation resistance measureme	nt of C _e
Pollution degree for accessible parts on the outside of the			depending on the profile and coupling mode, typ. $> 10 \text{ k}\Omega$
Pollution degree for accessible parts on the outside of the			
Protective separation (reinforced insulation) between:	device flousing (off > 000 × 1000 V)	Display	
IC1/(IC2-5)	Overvoltage category III, 1000 V	Indication	graphic display 127 x 127 pixels, 40 x 40 mm ²
		Display range measured value	0.1 kΩ20 MΩ
IC2/(IC3-5)	Overvoltage category III, 300 V	Operating uncertainty (according to IE	C 61557-8) $\pm 15\%$, at least $\pm 1 \text{ k}\Omega$
IC3/(IC4-5)	Overvoltage categorylll, 300 V	, , , , , , , , , , , , , , , , , , , ,	
IC4/IC5	Overvoltage category III, 300 V	LEDs	
Voltage test (routine test) according to IEC 61010-1:		ON (operation LED)	greer
IC2/(IC3-5)	AC 2,2 kV	SERVICE	yellow
IC3/(IC4-5)	AC 2,2 kV	ALARM 1	yellow
IC4/IC5	AC 2,2 kV	ALARM 2	yellow
Supply voltage		In-/Outputs (X1-Interface)	•
Supply via A1/+, A2/-:		Cable length X1 (unshielded cable)	≤ 10 m
Supply voltage range $U_{\rm S}$	AC/DC 24240 V		I connected to earth (PE) on one end, recommended:
Tolerance of U_{S}		J-Y(St)Y min. 2x0,8)	$\leq 100 \mathrm{m}$
-	-30+15%		
Maximum permissible input current of U _s	650 mA		ach output (device supplied by X1.+/X1.GND) max. 1 A
Frequency range of <i>U</i> _s	DC, 50400 Hz ¹⁾	Total max. supply output current on X	
Tolerance of the frequency range of U_s	-5+15 %	Total max. supply output current on X	1 (device supplied by A1+/A2- between 16,8 V and 40 V)
Power consumption, typically DC	≤ 12 W		$I_{\text{LmaxX1}} = 10 \text{ mA} + 7 \text{ mA/V} * U_{\text{S}}^{3}$
Power consumption, typically 50/60 Hz	≤ 12 W/21 VA		(negative values are not allowed for I _{LmaxX1})
Power consumption, typically 400 Hz	≤ 12 W/45 VA	Digital Innuts (II II II)	
Supply via X1:		Digital Inputs (I1, I2, I3)	
Supply voltage $U_{\rm S}$	DC 24 V	Number	3
Tolerance of U_{S}	DC -20+25 %	Operating mode, adjustable	active high, active low
Tolerance of Us	DC -20+25 %	Functions	off, test, reset, deactivate device, start initial measurement
IT system being monitored		Voltage	Low DC -35 V, High DC 1132 V
Nominal system voltage range Un	AC 0690 V	Tolerance Voltage	±10 %
Nonlinal system voltage range of	DC 01000 V		
		Digital Outputs (Q1, Q2)	
T-1	AC/DC 0600 V (for UL applications)	Number	2
Tolerance of U _n	AC/DC +15 %	Operating mode, adjustable	active, passive
Frequency range of U _n	DC, 0.1460 Hz	Functions	off, Ins. alarm 1, Ins. alarm 2, connection fault, DC- alarm 4)
Max. AC voltage U_{\sim} in the frequency range $f_{\rm n}=0.14$ H	$U_{\sim \text{max}} = 50 \text{ V/Hz}^2 * (1 + f_n^2)$		DC+ alarm 4), symmetrical alarm, device fault, common alarm,
			measurement complete, device inactive, DC offset alarm
Resnonse values		Voltage	passive DC 032 V, active DC 0/19.232 V
Response values	11.0 10.110		passive D = 0.1.132 1, detire D = 0, 13.2.1.132 1
Response value R _{an1} (alarm 1)	1 kΩ10 MΩ		
Response value R _{an1} (alarm 1) Response value R _{an2} (alarm 2)	1 kΩ10 MΩ	Analogue Output (M+)	
Response value <i>R</i> _{an1} (alarm 1) Response value <i>R</i> _{an2} (alarm 2) Relative uncertainty (acc. to IEC 61557-8)	$\begin{array}{c} 1 \ k\Omega \dots 10 \ M\Omega \\ \\ \text{profile dependent, } \pm 15 \ \text{\%, at least} \ \pm 1 \ k\Omega \end{array}$	Analogue Output (M+)	
Response value R _{an1} (alarm 1) Response value R _{an2} (alarm 2)	1 kΩ10 MΩ	Analogue Output (M+) Number	
Response value R _{an1} (alarm 1) Response value R _{an2} (alarm 2) Relative uncertainty (acc. to IEC 61557-8) Hysteresis	$\begin{array}{c} 1 \ k\Omega \dots 10 \ M\Omega \\ \\ \text{profile dependent, } \pm 15 \ \text{\%, at least} \ \pm 1 \ k\Omega \end{array}$	Analogue Output (M+) Number Operating mode	linear, midscale point 28 k Ω /120 k Ω
Response value R _{an1} (alarm 1) Response value R _{an2} (alarm 2) Relative uncertainty (acc. to IEC 61557-8) Hysteresis Time response	1 k Ω 10 M Ω profile dependent, \pm 15 %, at least \pm 1 k Ω 25 %, at least 1 k Ω	Analogue Output (M+) Number Operating mode Functions	linear, midscale point 28 k Ω /120 k Ω insulation value, DC offset
Response value $R_{\rm an1}$ (alarm 1) Response value $R_{\rm an2}$ (alarm 2) Relative uncertainty (acc. to IEC 61557-8) Hysteresis Time response Response time $t_{\rm an}$ at $R_{\rm F}=0.5$ x $R_{\rm an}$ ($R_{\rm an}=10$ k Ω) and $C_{\rm C}=0.5$	1 kΩ10 MΩ profile dependent, ±15 %, at least ±1 kΩ 25 %, at least 1 kΩ $= 1 \mu F \text{according to IEC 61557-8}$	Analogue Output (M+) Number Operating mode Functions Current O2	linear, midscale point 28 k Ω /120 k Ω insulation value, DC offset 20 mA (< 600 Ω), 420 mA (< 600 Ω), 0400 μA (< 4 k Ω)
Response value $R_{\rm an1}$ (alarm 1) Response value $R_{\rm an2}$ (alarm 2) Relative uncertainty (acc. to IEC 61557-8) Hysteresis Time response Response time $t_{\rm an}$ at $R_{\rm F}=0.5$ x $R_{\rm an}$ ($R_{\rm an}=10$ k Ω) and $C_{\rm C}=0.5$	1 kΩ10 MΩ profile dependent, ±15 %, at least ±1 kΩ 25 %, at least 1 kΩ = 1 μF according to IEC 61557-8 ependent, typ. 4 s (see diagrams in manual)	Analogue Output (M+) Number Operating mode Functions Current 02 Voltage	linear, midscale point 28 kΩ/120 kΩ insulation value, DC offset 20 mA (< 600 Ω), 420 mA (< 600 Ω), 0400 μA (< 4 kΩ) 010 V (> 1 kΩ), 210 V (> 1 kΩ)
Response value $R_{\rm an1}$ (alarm 1) Response value $R_{\rm an2}$ (alarm 2) Relative uncertainty (acc. to IEC 61557-8) Hysteresis Time response Response time $t_{\rm an}$ at $R_{\rm F}=0.5$ x $R_{\rm an}$ ($R_{\rm an}=10$ k Ω) and $C_{\rm C}=0.5$	1 kΩ10 MΩ profile dependent, ±15 %, at least ±1 kΩ 25 %, at least 1 kΩ $= 1 \mu F \text{according to IEC 61557-8}$	Analogue Output (M+) Number Operating mode Functions Current O2	linear, midscale point 28 kΩ/120 kΩ insulation value, DC offset 20 mA (< 600 Ω), 420 mA (< 600 Ω), 0400 μA (< 4 kΩ) 010 V (> 1 kΩ), 210 V (> 1 kΩ)

Interfaces						
Field bus:						
Interface/protocol			W	eb server/	Modbus TC	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	55.255.0
BCOM address						tem-1-(
Function				comm	unication i	interfac
Sensor bus:						
Interface/protocol				RS-48	35/BS/Mod	
Data rate					9.6	kBaud/
Cable length						1200 n
Cable: twisted pair, one end of shield o	onnected to l	PE	recom		J-Y(St)Y m	
Connection					erminals X	1.A, X1.
Terminating resistor at the beginning a	and at the en	d of the tra				
			120 Ω	, can be co	onnected in	
Device address, BS bus						19
Switching elements						
Number of switching elements				2 ch	nangeover	contact
Operating mode					tion/N/O o	
Contact 11-12-14/21-22-24	off, Ins. a	larm 1, Ins				
•	DC+ alarm 4					
	measu	irement co	mplete, de	vice inacti	ve, DC offs	et alarr
Electrical endurance under rated opera	ting conditio	ns, numbe	r of cycles			10.00
Contact data acc. to IEC 60947-5-1:			,			
Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-12	DC-1
	230 V	230 V	24 V	48 V	110 V	220
Rated operational voltage			27 V	TU V	0.2 A	0.1
		3 V	1 /	1 /		
Rated operational current	5 A	3 A	1 A	1 A	0.2 A	
Rated operational current Rated insulation voltage ≤ 2000 m NN	5 A	3 A	1 A	1 A	0.2 A	250
Rated operational current Rated insulation voltage \leq 2000 m NN Rated insulation voltage \leq 3000 m NN	5 A	3 A	1 A			250 160
Rated operational current Rated insulation voltage \leq 2000 m NN Rated insulation voltage \leq 3000 m NN	5 A	3 A	1 A		nA at AC/D	250 160
Rated operational current Rated insulation voltage ≤ 2000 m NN Rated insulation voltage ≤ 3000 m NN Minimum contact rating	5 A					250 160
Rated operational current Rated insulation voltage ≤ 2000 m NN Rated insulation voltage ≤ 3000 m NN Minimum contact rating Condiciones Ambientales/Compati	5 A					250 160 C ≥ 10
Rated operational current Rated insulation voltage ≤ 2000 m NN Rated insulation voltage ≤ 3000 m NN Minimum contact rating Condiciones Ambientales/Compati	5 A				nA at AC/D	250 \ 160 \ C ≥ 10 \
Rated operational current Rated insulation voltage ≤ 2000 m NN Rated insulation voltage ≤ 3000 m NN Minimum contact rating Condiciones Ambientales/Compati CEM Ambient temperatures:	5 A				IEC 613	250 \\ 160 \\ C ≥ 10 \\ 26-2-4
Rated operational voltage Rated operational current Rated insulation voltage ≤ 2000 m NN Rated insulation voltage ≤ 3000 m NN Minimum contact rating Condiciones Ambientales/Compati CEM Ambient temperatures: Operating temperature Transport	5 A				nA at AC/D IEC 613.	250 \ 160 \ C ≥ 10 \

Classification of climatic conditions acc. to IEC 60721 (related to temperature and relative humidity):

Connection	
Connection type	oluggable 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 24-12
Stripping length	7 mm
rigid/flexible	0.22.5 mm ²
flexible with ferrules, with/without plastic sleeve	
Multiple conductor, rigid	0.21 mm ²
Multiple conductor, flexible	0.21.5 mm ²
Multiple conductor, flexible with ferrule without	
Multiple conductor, flexible with TWIN ferrule w	th plastic sleeve 0.51.5 mm ²
Push-wire terminals:	
Nominal current	≤ 10 A
Conductor sizes	AWG 24-12
Stripping length	10 mm
rigid/flexible	0.22.5 mm ²
flexible with ferrules, with/without plastic sleeve	e 0.252.5 mm ²
Multiple conductor, flexible with TWIN ferrule w	th plastic sleeve 0.51.5 mm ²
Push-wire terminals X1:	
Nominal current	≤ 8 A
Conductor sizes	AWG 24-16
Stripping length	10 mm
rigid/flexible	0.21.5 mm ²
flexible with ferrule without plastic sleeve	0.251.5 mm ²
flexible with TWIN ferrule with plastic sleeve	0.250.75 mm ²
Other	
Operating mode	continuous operation
Mounting (0°) display	oriented, cooling clots must be ventilated vertically 6

Other	
Operating mode	continuous operation
Mounting (0°)	display oriented, cooling slots must be ventilated vertically 6
Degree of protection internal componer	its 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	D00022
Weight	< 390 g

Weight	< 390 g
Option "W" data different from the standard version	
Rated operational current of switching elements	max. 3 A (for UL applications)
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
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 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 $^{\scriptscriptstyle \odot}$
- $^{\scriptscriptstyle 4)}~$ For $\textit{U}_{n} \geq 50~\text{V}$ only.

2K11

1K22

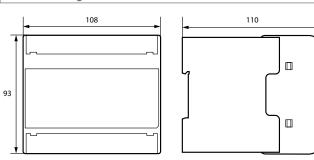
3M11

2M4

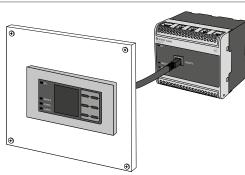
1M12 ≤ 3000 m NN

- 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.
- 61 Recommendation: Devices mounted at 0 $^{\circ}$ (display-oriented, cooling slots must be ventilated vertically). For devices mounted at an angle of 45 $^{\circ}$, the max. working temperature is reduced by 10 $^{\circ}$ 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



Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2)

Stationary use (IEC 60721-3-3)

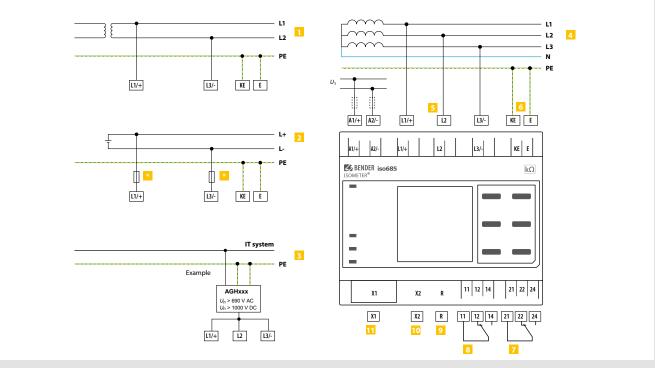
Transport (IEC 60721-3-2)

Area of application

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

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

Classification of mechanical conditions acc. to IEC 60721:



- 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
- 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
- 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.

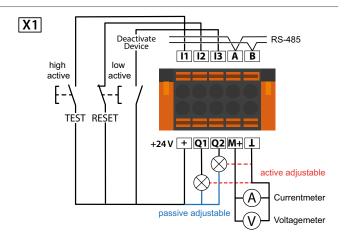
For UL applications:

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
	l1	Input 1
11 12 13 A B + Q1 Q2 M+ 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
	上	Ground



ISOMETER® iso685-...-B

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





Typical applications

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

Approvals





Device features

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

Device variants

iso685-D-B

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

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

Option "W"

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

Standards

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

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

Further information

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

Ordering information

Тур	e	Nominal system voltage range <i>U</i> n	Supply voltage <i>U</i> ₅	Display	Option W	Art. No.	
iso685-D-B					-	B91067020	
iso685W-D-B	(m) (m)	Name of Street, or other Designation of the last of th	AC 0690 V; 0.1460 Hz	AC 24240 V; 50400 Hz	integrated	-40+70°C, 3K23, 3M12	B91067020W
iso685-S-B + FP200		DC 01000 V	DC 24240 V	detached	-	B91067220	
iso685W-S-B + FP200W				uetached	-40+70°C, 3K23, 3M12	B91067220W	

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

Description	Туре	Art. No.	Page
Device version	iso685-S-B	B91067120	-
without display	iso685W-S-B	B91067120W	-
Display for front panel mounting	FP200	B91067904	49
	FP200W	B91067904W	49
Coupling devices	AGH150W-4	B98018006	363
	AGH204S-4	B914013	365
	AGH520S	B913033	366
	AGH676S-4	B913055	369

Suitable measuring instruments on request!

Technical data

Insulation coordination according to IEC 60664-1 Definitions:	
Measuring circuit (IC1)	L1/+, L2, L3
Supply circuit (IC2)	A1, A
Output circuit 1 (IC3)	11, 12,
Output circuit 2 (IC4)	21, 22, 2
Control circuit (IC5)	(E, KE), (X1, ETH, X3, X
Rated voltage	1000
Overvoltage category	
Rated impulse voltage:	
IC1/(IC2-5)	81
IC2/(IC3-5)	4
IC3/(IC4-5)	4
IC4/IC5	4
Rated insulation voltage:	
IC1/(IC2-5)	1000
IC2/(IC3-5)	250
IC3/(IC4-5)	250
IC4/IC5	250
Pollution degree for accessible parts on the outside of the de	
Pollution degree for accessible parts on the outside of the de	
$\label{protective} \textbf{Protective separation (reinforced insulation) between:}$	
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
Voltage test (routine test) according to IEC 61010-1:	
IC2/(IC3-5)	AC 2,2
IC3/(IC4-5)	AC 2,2
IC4/IC5	AC 2,2
Supply voltage	
Supply via A1/+, A2/-:	
Supply voltage range $U_{\rm S}$	AC/DC 24240
Tolerance of $U_{\rm S}$	-30+15
Maximum permissible input current of U_{S}	650 n
Frequency range of $U_{\rm S}$	DC, 50400 Hz
Tolerance of the frequency range of $U_{\rm S}$	-5+15
Power consumption, typically DC	≤ 12
Power consumption, typically 50/60 Hz	≤ 12 W/21 V
Power consumption, typically 400 Hz	≤ 12 W/45 V
	= 12 117 13
Supply via X1: Supply voltage <i>U</i> s	DC 24
Tolerance of U_5	DC -20+25
rolei alice oi oş	DC -20∓23
IT system being monitored	
Nominal system voltage range <i>U</i> n	AC 0690
	DC 01000
	AC/DC 0600 V (for UL application
Tolerance of U _n	AC/DC +15
Frequency range of <i>U</i> n	DC, 0.1460
Max. AC voltage U_{\sim} in the frequency range $f_{\rm n}=0.1\dots$	4 Hz $U_{\sim \text{ max}} = 50 \text{ V/Hz}^2 * (1 + f_1)$
Response values	
Response value R _{an1} (alarm 1)	1 kΩ10 M
Response value R_{an2} (alarm 2)	1 kΩ10 M
Relative uncertainty (acc. to IEC 61557-8)	profile dependent, ± 15 %, at least ± 1 k
Hysteresis	25 %, at least 1 k
Time response	

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

0...600 s

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
	: (inactive by I/O, inactive by ISOnet or cut-off) typ. 50 M Ω \leq 1200 V
Permissible extraneous DC voltage U_{fg} Permissible system leakage capacitance (
	.е ртоше перешент, о тооо да
Measuring ranges	0.1 400 H
Measuring range f _n Tolerance measurement of f _n	0.1460 Hz ±1 % ±0.1 Hz
Voltage range measurement of f_n	AC 25690 V
Measuring range $U_{\rm D}$	AC 25690 V
measuring range on	DC 01000 V
Voltage range measurement of $U_{\rm D}$	AC/DC > 10 V
Tolerance measurement of U _n	±5 % ±5 V
Measuring range Ce	01000 µF
Tolerance measurement of Ce	±10 % ±10 μF
Frequency range measurement of Ce	DC, 30460 Hz
Min. insulation resistance measurement	
	depending on the profile and coupling mode, typ. $> 10 \text{ k}\Omega$
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 6	$\pm 15 \%$, at least $\pm 1 \ k\Omega$
LEDs	
ON (operation LED)	green
SERVICE	yellow
ALARM 1	yellow
ALARM 2	yellow
In-/Outputs (X1-Interface)	
Cable length X1 (unshielded cable)	≤10 m
	cted to earth (PE) on one end, recommended:
J-Y(St)Y min. 2x0,8)	≤ 100 m
Total max. supply output current for each out	put (device supplied by X1.+/X1.GND) max. 1 A
Total max. supply output current on X1 (device	ce supplied by A1+/A2-) max. 200 mA
Total max. supply output current on X1 (device	ce 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
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),
DO	C+ alarm 4), symmetrical alarm, device fault, common alarm,
Voltago	measurement complete, device inactive, DC offset alarm passive DC 032 V, active DC 0/19.232 V
Voltage	passive DC U32 V, aCLIVE DC U/ 19.232 V
Analogue Output (M+)	
	1
Operating mode	linear, midscale point 28 k Ω /120 k Ω
Operating mode Functions	linear, midscale point 28 k Ω /120 k Ω insulation value, DC offset
Number Operating mode Functions Current 0201 Voltage	linear, midscale point 28 kΩ/120 kΩ insulation value, DC offset mA ($<$ 600 Ω), 420 mA ($<$ 600 Ω), 0400 μA ($<$ 4 kΩ) 010 V ($>$ 1 kΩ), 210 V ($>$ 1 kΩ)

Response time DC alarm at $\textit{C}_{e}=1~\mu\text{F}$ Start-up delay $\textit{T}_{\text{start-up}}$

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	itodetect
Max. amount Modbus requests						< 100/s
Cable length						≤ 100 m
Connection						RJ45
IP address				DHCP/n	nanual 192	2.168.0.5
Network mask					255.2	55.255.0
BCOM address					sys	stem-1-0
Function				comm	unication	interface
ISOnet:						
Number ISOnet devices						≤ 20
Max. nominal system voltage range IS	0net			A	C 690 V; D	C 1000 V
Sensor bus:						
Interface/protocol				RS-48	85/BS/Mod	
Data rate						kBaud/s
Cable length						1200 m
Cable: twisted pair, one end of shield of	connected to I	PE	recom		J-Y(St)Y m	
Connection					erminals X	1.A, X1.E
Terminating resistor at the beginning a	and at the en	d of the tra		-		
Davies address DC has			120 Ω	, can be co	onnected i	
Device address, BS bus						190
Switching elements						
Number of switching elements				2 cl	hangeover	contacts
Operating mode				N/C opera	tion/N/O o	peration
Contact 11-12-14/21-22-24	off, Ins. al	arm 1, Ins	. alarm 2, c	onnection	fault, DC-	alarm 4),
	DC+ alarm 4)	, symmetr	ical alarm,	device fau	ılt, commo	n alarm
			mplete, de	vice inacti	ive, DC offs	
Electrical endurance under rated opera	ating conditio	ns, numbe	r 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	1					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					IEC 613	26-2-4 5
Ambient temperatures:						
Operating temperature					-25	+55°C
Transport						+85°C
Long-term storage						+70°0
Classification of climatic conditions ac	cc. to IEC 6072	21 (related	to temperat	ure and rel	ative humic	litv):
Stationary use (IEC 60721-3-3)						3K22
Transport (IEC 60721-3-2)						2K11
Long-term storage (IEC 60721-3-1)						1K22
Classification of mechanical condition	tions are to	IFC 6072	1:			
Stationary use (IEC 60721-3-3)	10	.22 30/2				3M11
Transport (IEC 60721-3-2)						2M4
Long-term storage (IEC 60721-3-1)						1M12
Area of application					- 20	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 24-12
Stripping length	7 mm
rigid/flexible	0.22.5 mm ²
flexible with ferrules, with/without plastic sleev	e 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 w	ith plastic sleeve 0.51.5 mm ²
Push-wire terminals:	
Nominal current	≤ 10 A
Conductor sizes	AWG 24-12
Stripping length	10 mm
rigid/flexible	0.22.5 mm ²

Push-wire	termina	lc X1

flexible with ferrules, with/without plastic sleeve

Multiple conductor, flexible with TWIN ferrule with plastic sleeve

≤ 8 A
AWG 24-16
10 mm
0.21.5 mm ²
0.251.5 mm ²
0.250.75 mm ²

0.25...2.5 mm²

0.5...1.5 mm²

Other

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	D00177
Weight	< 390 q

Option "W" data different from the standard version

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

Ambient temperatures:

Operating temperature	-40+70°C
	-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

Classification of mechanical conditions acc. to IEC 60721:

Stationary use (IEC 60721-3-3)	3M12
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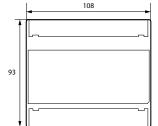
- $^{1)}\,$ At a frequency > 200 Hz, the connection of X1 must be insulated. Only permanently installed devices which at least have overvoltage category CAT2 (300V) may be connected.
- $^{2)}$ Indication limited outside the temperature range -25 \ldots +55 °C.
- $^{3)}$ U_{S} [Volt] = supply voltage ISOMETER $^{\circ}$
- $^{\scriptscriptstyle 4)}~$ For $\textit{U}_{n} \geq 50~\text{V}$ only.

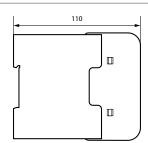
≤ 3000 m NN

- 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.
- $^{\rm 6)}$ Recommendation: Devices mounted at 0 $^{\circ}$ (display-oriented, cooling slots must be ventilated

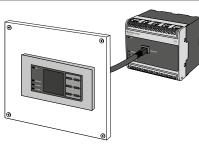
For devices mounted at an angle of 45°, the max. working temperature is reduced by 10 °C. For devices mounted at an angle of 90°, the max. working temperature is reduced by 20 °C.

Dimension diagram (dimensions in mm)

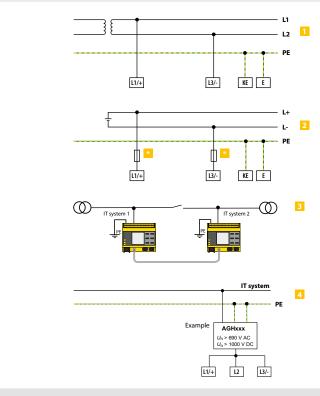


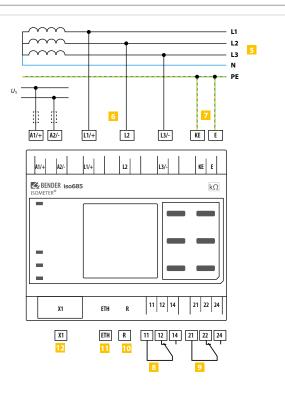


Connection to FP200



Area of application





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

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

Provide line protection!

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

NOTE

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

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

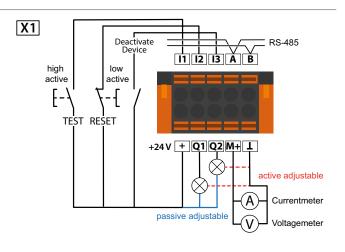
For UL applications:

Use 60/70°C copper lines only!

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

Digital interface X1

Digital interface	Terminal	Colour
	l1	Input 1
	I2	Input 2
	13	Input 3
11 12 13 A B + Q1 Q2 M+ L	А	RS-485 A
	В	RS-485 B
	+	+24 V
	Q1	Output 1
X1	Q2	Output 2
	M+	Analogue output
		Ground



ISOMETER® iso685-...-P

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





Typical applications

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

Approvals





Device features

iso685-...-P

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

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.

Option "W"

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

Standards

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

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

Further information

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



Ordering information

Туро	2	Nominal system voltage range <i>U</i> n	Supply voltage <i>U</i> ₅	Display	Option W	Art. No.
iso685-D-P	And the second s				-	B91067030
iso685W-D-P		AC 0690 V; 0,1460 Hz	AC 24240 V; 50400 Hz	integrated	-40+70°C, 3K23,3M12	B91067030W
iso685-S-P + FP200		DC 01000 V DC 24240 V		data dha d	-	B91067230
iso685W-S-P + FP200W	To the last of the			detached	-40+70 °C, 3K23, 3M12	B91067230W

Insulation fault locators

Description	Supply voltage U s 1)	Response value	Туре	Art. No.	Page		
			EDS440-S-1	B91080201	140		
		210 mA	EDS440W-S-1	B91080201W	140		
		2IU MA	EDS440-L-4	B91080202	140		
			EDS440W-L-4	B91080202W	140		
la colodina facilità a cons	aulation fault locators AC/DC 24240V 0.21 mA		EDS441-S-1	B91080204	140		
insulation fault locators		AC/DC 24240V		AC/DC 24240V EDS441W-S-1	EDS441W-S-1	B91080204W	140
		EDS441-L-4	B91080205	140			
		0.21 MA EDS441W-L-4 B91080205W	B91080205W	140			
			EDS441-LAB-4	B91080207	140		
			EDS441W-LAB-4	B91080207W	140		
Dalassas dala	DC 24V		IOM441-S	B95012057	392		
Relay module	DC 24 V	_	IOM441W-S	B95012057W	392		

¹⁾ Absolute values

Accessories

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

 $^{^{\}scriptscriptstyle 1)}~$ 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	49
panel mounting	FP200W	B91067904W	49

Suitable measuring instruments on request!

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

Insulation coordination according to IEC 60664-1/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 $f_{\rm n}$	AC 25690 V
Output circuit 1 (IC3)	11, 12, 14	Measuring range $U_{\rm n}$	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 $U_{\rm n}$	±5 % ±5 V
Overvoltage category	III	Measuring range C _e	01000 μF
Rated impulse voltage:		Tolerance measurement of C _e	±10 % ±10 µF
IC1/(IC2-5)	8 kV		C, 30460 Hz
IC2/(IC3-5)	4 kV	Min. insulation resistance measurement of $C_{\rm e}$, c, 50 100 112
IC3/(IC4-5)	4 kV	depending on the profile and coupling mod	a tvn > 10 kO
IC4/IC5	4 kV	acpending on the profile and coupling mod	c, typ. > 10 ks2
Rated insulation voltage:	- T N V	Display	
IC1/(IC2-5)	1000 V	Indication graphic display 127 x 127 pixel	s, 40 x 40 mm ²
IC1/(IC2-5) IC2/(IC3-5)	250 V		1 kΩ…20 MΩ
	250 V	. , ,	at least ±1 kΩ
IC3/(IC4-5)			
IC4/IC5	250 V	LEDs	
Pollution degree for accessible parts on the outside of the device housing (U_n		ON (operation LED)	green
Pollution degree for accessible parts on the outside of the device housing (U_n	>690 < 1000 V) 2	PGH ON	yellow
Protective separation (reinforced insulation) between:	h	SERVICE	yellow
	tage category III, 1000 V	ALARM 1	yellow
• •	oltage category III, 300 V	ALARM 2	yellow
	oltage categoryIII, 300 V		,. ,
	oltage category III, 300 V	In-/Outputs (X1-Interface)	
Voltage test (routine test) according to IEC 61010-1:		Cable length X1 (unshielded cable)	≤ 10 m
IC2/(IC3-5)	AC 2,2 kV	Cable length X1 (shielded cable, shield connected to earth (PE) on one end, recommended:	
IC3/(IC4-5)	AC 2,2 kV	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 X1.+/X1.GND)	max. 1 A
Cunnly voltage		Total max. supply output current on X1 (device supplied by A1+/A2-)	max. 200 mA
Supply voltage		Total max. supply output current on X1 (device supplied by A1+/A2- between 16,8 V and 40 V)	
Supply via A1/+, A2/-:			
Supply voltage range $U_{\rm S}$	AC/DC 24240 V	$I_{\text{Lmax}X1} = 10 \text{ mA}$	
Tolerance of U_{S}	-30+15%	(negative values are not all	owed for I _{LmaxX1})
Maximum permissible input current of U_s	650 mA	Digital Inputs (11, 12, 13)	
Frequency range of $U_{\rm S}$	DC, 50400 Hz 1)	Number	
Tolerance of the frequency range of U _s	-5+15 %		
Power consumption, typically DC	≤ 12 W		high, active low
Power consumption, typically 50/60 Hz	≤ 12 W/21 VA	Functions off, test, reset, deactivate device, start initial measurement, insulation	
Power consumption, typically 400 Hz	≤ 12 W/45 VA	Voltage Low DC -35 V, Hig	
Supply via X1:		Tolerance Voltage	±10 %
Supply voltage U_S	DC 24 V	Digital Outputs (Q1, Q2)	
Tolerance of U_S	DC -20+25 %	Number	
Tolerance of Us	DC -20+25 %	Operating mode, adjustable	active, passive
IT system being monitored		Functions off, Ins. alarm 1, Ins. alarm 2, connection fac	
Nominal system voltage range $U_{\rm D}$	AC 0690 V	DC+ alarm 4, symmetrical alarm, device fault,	
	DC 01000 V	measurement complete, device inactive,	
AC/DC 0 60	00 V (for UL applications)	Voltage passive DC 032 V, active D	
Tolerance of $U_{\rm D}$	AC/DC +15 %	passive DC 032 v, active D	L U/ 19.232 V
Frequency range of U_0	DC 0.1460 Hz	Analogue Output (M+)	
	$max = 50 \text{ V/Hz}^2 * (1 + f_n^2)$	Number	1
wax. Ac voltage $0 \sim 111$ the frequency range $\eta_1 = 0.14112$	max — 30 V/112 (1 + /h)	Operating mode linear, midscale point	
Response values		, ,	value, DC offset
Response value R _{an1} (alarm 1)	1 kΩ10 MΩ	Current $020 \text{ mA} (< 600 \Omega), 420 \text{ mA} (< 600 \Omega), 04$	
Response value R _{an2} (alarm 2)	1 kΩ10 MΩ	Voltage $010 \text{ V} (> 1 \text{ k}\Omega), 2$	
Relative uncertainty (acc. to IEC 61557-8) dependent on the profile		Tolerance related to the current/voltage final value	±20 %
Hysteresis	25% , at least $1 \text{ k}\Omega$		/LU /(
•	,	Interfaces	
Time response		Field bus:	
Response time $t_{\rm an}$ at $R_{\rm F}=0.5$ x $R_{\rm an}$ ($R_{\rm an}=10~{\rm k}\Omega$) and $C_{\rm e}=1~{\rm \mu}F$ according to	IEC 61557-8	Interface/protocol web server/Moo	dhus TCD/RCOM
profile dependent, typ. 4 s (see diagrams in manual)		it/s, autodetect
Response time DC alarm at $Ce = 1 \mu F$ profile dependent, typ. 2 s	(see diagram in manual)	Max. amount Modbus requests	,
Start-up delay T _{start-up}	0600 s	•	< 100/s
<u> </u>		Cable length	≤ 100 m
Measuring circuit		Connection ID address: DUCD/manual	RJ45
Measuring voltage $U_{\rm m}$ profile dependent, $\pm 10 \text{ V}$, $\pm 50 \text{ m}$			l* 192.168.0.5*
Measuring current Im	≤ 403 µA		255.255.255.0*
Internal resistance Ri, Zi	\geq 124 k Ω	BCOM address	system-1-0
Internal resistance on decouppled systems (inactive by I/O, inactive by ISOnet or	r cut-off) typ. 50 MΩ	Function communi	cation interface
Permissible extraneous DC voltage $U_{\rm fg}$	≤ 1200 V	ISOnet:	
	dependent, 01000 μF	Number ISOnet devices	020 devices
		Max. nominal system voltage range ISOnet AC 6	90 V/DC 1000 V
		EDSsync:	
		•) 10 davies
		Number EDSsync devices	210 devices
		1001	
		ISOloop Number ISOloop devices	210 devices

Technical data (continu	eu)					
Sensor bus:						
Interface/protocol				RS-485/BE	B-Bus/Mod	dbus RTU
Data rate					9.6	kBaud/s
Cable length					≤	1200 m
Cable: twisted pair, one end of shield con	nected to PE		recom	mended:	J-Y(St)Y m	in. 2x0.8
Connection				te	erminals X	1.A, X1.E
Terminating resistor			120 Ω	, can be co	nnected i	nternally
Device address						190
Switching elements						
Number of switching elements				2 ch	nangeover	contacts
Operating mode				N/C operat	tion/N/O o	peration
Contact 11-12-14/21-22-24	off, Ins. al	arm 1, Ins.	. alarm 2, c	onnection	fault, DC-	alarm 4)
Electrical endurance under rated oper		rement co	mplete, de			
		iis, iiuiiibe	i di cycles			10.000
Contact data acc. to IEC 60947-5-	AC-13	AC 14	DC-12	DC 13	DC 13	DC 11
Utilisation category		AC-14		DC-12	DC-12	DC-12
Rated operational voltage Rated operational current	230 V	230 V	24 V	48 V	110 V	220 \
'	5 A	3 A	1 A	1 A	0.2 A	0.1 /
Rated insulation voltage \leq 2000 m N						250 \ 160 \
Rated insulation voltage ≤ 3000 m N	N			1	A =4 AC/D	
Minimum contact rating				1 11	nA at AC/D	C ≥ 10 '
Environment/EMC						
EMC					IEC 613	26-2-4
Ambient temperatures:						
Operating temperature						+55°(
Transport						+85°(
Long-term storage						+70°(
Classification of climatic conditions	acc. to IEC 6072	21 (related	to temperat	ure and rela	ative humic	
Stationary use (IEC 60721-3-3)						3K22
Transport (IEC 60721-3-2)						2K1
Long-term storage (IEC 60721-3-1)						1K22
Classification of mechanical cond	itions acc. to	IEC 6072	1:			
Stationary use (IEC 60721-3-3)						3M1
Transport (IEC 60721-3-2)						2M ²
Long-term storage (IEC 60721-3-1)						1M12
Area of application					≤ 30	00 m NN
Connection						
Connection Connection type	plu	ggable scro	ew-type te	rminal or p	oush-wire	termina
Connection type Screw-type terminals:	plu	ggable scro	ew-type te	rminal or p	oush-wire	
Connection type Screw-type terminals:	plu	ggable scro	ew-type te	•		≤ 10 <i>k</i>
Connection type Screw-type terminals: Nominal current Tightening torque	plu	ggable scro	ew-type te	•	6 Nm (5	≤ 10 <i>l</i> .7 lb-in
Connection type Screw-type terminals: Nominal current Tightening torque Conductor sizes	plu	ggable scro	ew-type te	•	6 Nm (5	≤ 10 / .7 lb-in VG 24-12
Connection type Screw-type terminals: Nominal current Tightening torque Conductor sizes Stripping length	plu	ggable scro	ew-type te	•	6 Nm (5 AV	≤ 10 / .7 lb-in /G 24-1; 7 mn
Connection type Screw-type terminals: Nominal current Tightening torque Conductor sizes Stripping length rigid/flexible		ggable scro	ew-type te	•	6 Nm (5 AV 0.2	≤ 10 / .7 lb-in /G 24-12 7 mm 2.5 mm
Connection type Screw-type terminals: Nominal current Tightening torque Conductor sizes Stripping length rigid/flexible flexible with ferrules, with/without p		ggable scro	ew-type te	•	6 Nm (5 AW 0.2 0.25	≤ 10 / .7 lb-in /G 24-12 7 mm 2.5 mm 2.5 mm
Connection type Screw-type terminals: Nominal current Tightening torque Conductor sizes Stripping length rigid/flexible flexible with ferrules, with/without p Multiple conductor, rigid		ggable scro	ew-type te	•	6 Nm (5 AW 0.2 0.25	≤ 10 / .7 lb-in /G 24-12 7 mm 2.5 mm 2.5 mm .1 mm
Connection type Screw-type terminals: Nominal current Tightening torque Conductor sizes Stripping length rigid/flexible flexible with ferrules, with/without p Multiple conductor, rigid Multiple conductor, flexible	lastic sleeve			•	6 Nm (5 AW 0.2 0.25 0.2. 0.2	≤ 10 / .7 lb-in √G 24-12 7 mm 2.5 mm 2.5 mm 1 mm
Connection type Screw-type terminals: Nominal current	lastic sleeve ule without pla	sstic sleeve		•	6 Nm (5 AW 0.2 0.25 0.2 0.25	≤ 10 <i>F</i>

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

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

Other	
Operating mode	continuous operation
Mounting (0°)	display oriented, cooling slots must be ventilated vertically 6)
Degree of protection internal component	ts 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)
Ambient temperatures	
Operating temperature	-40+70 °C
	-40+65 °C (for UL applications)

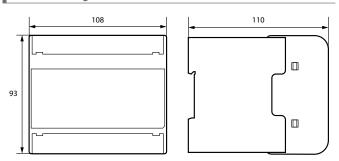
Classification of climatic conditions acc. to IEC 60721:	
Long-term storage	-40+70 °C
Transport	-40+85 °C
	10 105 C (101 OE applications)

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

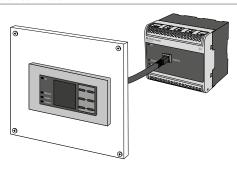
Stationary use (IEC 60/21-3-3)	31/11/2
1) At a framework 2000 He the compaction of V1 and a Damata must be involved Only	
At a frequency $>$ 200 Hz, the connection of X1 and Remote must be insulated. Only p	ermanentiy
installed devices which at least have overvoltage category CAT2 (300V) may be conne	cted.

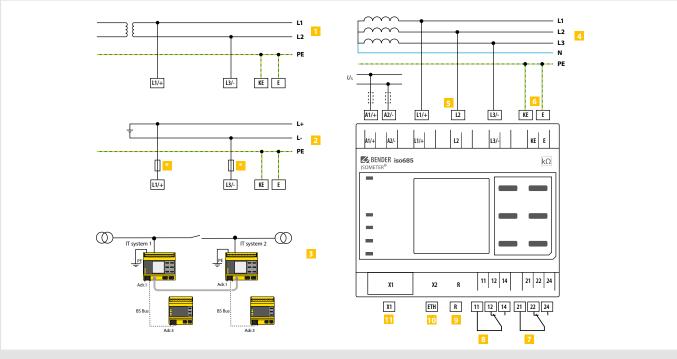
- $^{2)}$ Indication limited outside the temperature range -25 \ldots +55 °C.
- ³⁾ U_{S} [Volt] = ISOMETER® supply voltage
- ⁴⁾ For $U_n \ge 50 \text{ V}$ only.
- 51 This is a class A product. This product may cause radio interference in residential areas. In this case, the user may be required to take corrective actions.
- 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 °C.

Dimension diagram (dimensions in mm)



Connection to FP200





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

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

Provide line protection!

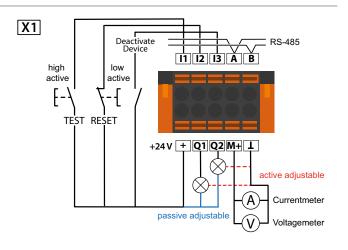
According to DIN VDE 0100-430, a line protection shall be provided for the supply voltage.

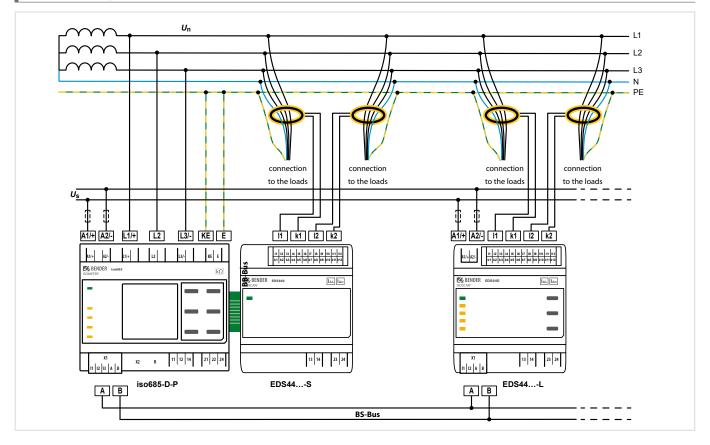
According to DIN VDE 0100-430, devices for protection against a short circuit can be omitted for the coupling of terminals L1/+ and L3/- to the IT system ≤ 690 V to be monitored if the wiring is carried out in such a manner as to reduce the risk of a short circuit to a minimum. (A short-circuit-proof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

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

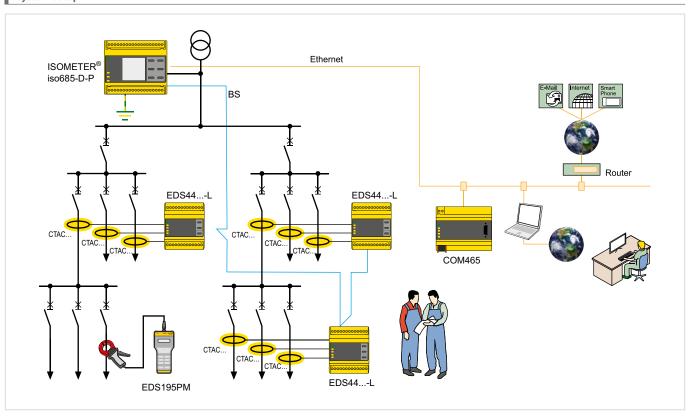
Digital interface X1

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





System setup



ISOMETER® isoNAV685-D

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





Typical applications

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

Approvals





Device features

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

Standards

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

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

Further information

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

Ordering information

Ту	pe	Nominal system voltage range <i>U</i> n	Supply voltage U₅	Art. No.
isoNAV685-D	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	AC 0690 V; 1460 Hz DC 01000 V	AC 24240 V; 50400 Hz DC 24240 V	B91067014

Accessories

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

¹⁾ included in the scope of delivery

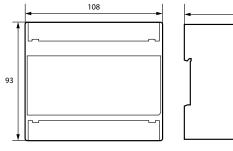
Suitable measuring instruments on request!

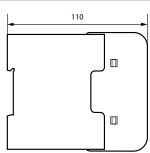
Definitions:	EC 60664-3	Display	
Delililiuolis.		Indication graphic disp	olay 127 x 127 pixels, 40 x 40 mm ³
Measuring circuit (IC1)	(L1/+, L2, L3/-)	Display range measured value	0.1 kΩ20 ΜΩ
Supply circuit (IC2)	A1, A2	Operating uncertainty (according to IEC 61557-8)	± 15 %, at least ± 1 k Ω
** *		operating direct tainty (according to lee 01337-07	±15 /0, at icast ±1 k22
Output circuit 1 (IC3)	11, 12, 14	LEDs	
Output circuit 2 (IC4)	21, 22, 24		groon
Control circuit (IC5)	(E, KE), (X1, ETH, X3)	ON (operation LED)	green
Rated voltage	1000 V	SERVICE	yellow
Overvoltage category	III	ALARM 1 (Iso. Alarm 1)	yellow
Rated impulse voltage:		ALARM 2 (Insulation fault + DC offset fault)	yellow
IC1/(IC2-5)	8 kV	I. (O. t t. (V4 I. t f)	
IC2/(IC3-5)	4 kV	In-/Outputs (X1-Interface)	
	4 kV	Cable length X1 (unshielded cable)	≤ 10 m
IC3/(IC4-5)		Cable length X1 (shielded cable, shield connected to earth (PE) on one end	d, recommended:
IC4/IC5	4 kV	J-Y(St)Y min. 2x0,8)	≤ 100 m
Rated insulation voltage:		Total max. supply output current for each output (device supplied by X1	
IC1/(IC2-5)	1000 V		max. 200 mA
IC2/(IC3-5)	250 V	Total max. supply output current on X1 (device supplied by A1+/A2-)	
IC3/(IC4-5)	250 V	Total max. supply output current on X1 (device supplied by A1+/A2- between	
IC4/IC5	250 V		$I_{\text{LmaxX1}} = 10 \text{ mA} + 7 \text{ mA/V} * U_5^{3}$
Pollution degree for accessible parts on the outside of the		(nega	tive values are not allowed for I_{LmaxX1})
	J ,	B. L. II (14 ID ID)	
Pollution degree for accessible parts on the outside of the	device housing ($U_{\rm n} > 690 < 1000 \text{ V}$)	Digital Inputs (I1, I2, I3)	
Protective separation (reinforced insulation) between:		Number	3
IC1/(IC2-5)	Overvoltage category III, 1000 V	Operation mode, adjustable	active high, active low
IC2/(IC3-5)	Overvoltage category III, 300 V		e deactivated, initial measurement
IC3/(IC4-5)	Overvoltage categoryIII, 300 V		ow DC -35 V, High DC 1132 V
IC4/IC5	Overvoltage category III, 300 V	Tolerance Voltage	
Voltage test (routine test) according to IEC 61010-1:	2.2. Orange caregory m, 500 V	roiciance voitage	±10 %
	AC 2 2 LA	Digital Outputs (Q1, Q2)	
IC2/(IC3-5)	AC 2,2 kV		
IC3/(IC4-5)	AC 2,2 kV	Number	
IC4/IC5	AC 2,2 kV	Operating mode, adjustable	active, passive
C		Functions none, insulation Alarm 1, ins	ulation fault + DC residual voltage,
Supply voltage		connection fault, device fault, collective alarm, m	leasurement ended, device inactive
Supply via A1/+, A2/-:			32 V, active DC 0/19.2 32 V
Supply voltage range $U_{\rm S}$	AC/DC 24240 V	rottage	
		Analogue Output (M+)	
Tolerance of <i>U</i> s	-30+15 %	Number	1
Maximum permissible input current of U_s	650 mA		lear, midscale point 28 kΩ/120 kΩ
Frequency range of U_s	DC, 50400 Hz ¹⁾	Functions	insulation value, DC offset
	F . 1F 0/		insulation value, DC onset
Tolerance of the frequency range of U_S	-5+15 %		
Tolerance of the frequency range of U_s Power consumption, typically 50/60 Hz	-5+15 % ≤ 12 W/21 VA	Current $020 \text{ mA } (< 600 \Omega), 420 \text{ m}$	A (< 600 Ω), 0400 μA (< 4 kΩ)
Power consumption, typically 50/60 Hz	≤ 12 W/21 VA	Current $020 \text{ mA } (< 600 \Omega), 420 \text{ m}$	
Power consumption, typically 50/60 Hz Power consumption, typically 400 Hz		Current $020 \text{ mA } (< 600 \Omega), 420 \text{ m}$	A (< 600 Ω), 0400 μA (< 4 kΩ)
Power consumption, typically 50/60 Hz Power consumption, typically 400 Hz Supply via X1:	≤ 12 W/21 VA ≤ 12 W/45 VA	Current $020~\text{mA}~(<600~\Omega), 420~\text{m}$ Voltage 0 Tolerance related to the current/voltage final value	A (< 600 Ω), 0400 μA (< 4 kΩ) .10 V (> 1 kΩ), 210 V (> 1 kΩ)
Power consumption, typically 50/60 Hz Power consumption, typically 400 Hz Supply via X1: Supply voltage <i>U</i> s	≤ 12 W/21 VA ≤ 12 W/45 VA	Current 020 mA (< 600 Ω), 420 m. Voltage 0	A (< 600 Ω), 0400 μA (< 4 kΩ) .10 V (> 1 kΩ), 210 V (> 1 kΩ)
Power consumption, typically 50/60 Hz	≤ 12 W/21 VA ≤ 12 W/45 VA	Current $020 \text{mA} \ (< 600 \Omega), 420 \text{m.}$ Voltage 0 Tolerance related to the current/voltage final value	A (< 600 Ω), 0400 μA (< 4 kΩ) .10 V (> 1 kΩ), 210 V (> 1 kΩ)
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/45 VA	Current $020 \text{mA} \ (< 600 \Omega), 420 \text{m.}$ Voltage 0 Tolerance related to the current/voltage final value Interfaces Field bus:	A (< 600 Ω), 0400 μÅ (< 4 kΩ) .10 V (> 1 kΩ), 210 V (> 1 kΩ) $\pm 20 \%$
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	≤ 12 W/21 VA ≤ 12 W/45 VA DC 24 V DC -20+25 %	Current 020 mA (< 600 Ω), 420 m. Voltage 0 Tolerance related to the current/voltage final value Interfaces Field bus: Interface/protocol	A (< 600 Ω), 0400 μA (< 4 kΩ). 10 V (> 1 kΩ), 210 V (> 1 kΩ) ±20 % web server/Modbus TCP/BCOM
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	≤ 12 W/21 VA ≤ 12 W/45 VA DC 24 V DC -20+25 % AC 0690 V; DC 01000 V	Current 020 mA (< 600 Ω), 420 m. Voltage 0 Tolerance related to the current/voltage final value Interfaces Field bus: Interface/protocol Data rate	A (< 600 Ω), 0400 μA (< 4 kΩ). 10 V (> 1 kΩ), 210 V (> 1 kΩ) ±20 % web server/Modbus TCP/BCOM 10/100 Mbit/s, autodetect
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	≤ 12 W/21 VA ≤ 12 W/45 VA DC 24 V DC -20+25 %	Current 020 mA (< 600 Ω), 420 m. Voltage 0 Tolerance related to the current/voltage final value Interfaces Field bus: Interface/protocol Data rate Max. amount Modbus requests	A (< 600 Ω), 0400 μA (< 4 kΩ). 10 V (> 1 kΩ), 210 V (> 1 kΩ) ±20 % web server/Modbus TCP/BCOM 10/100 Mbit/s, autodetect < 100/s
Power consumption, typically 50/60 Hz Power consumption, typically 400 Hz Supply via X1: Supply voltage Us Tolerance of Us IT system being monitored Nominal system voltage range Un	≤ 12 W/21 VA ≤ 12 W/45 VA DC 24 V DC -20+25 % AC 0690 V; DC 01000 V	Current 020 mA (< 600 Ω), 420 m. Voltage 0 Tolerance related to the current/voltage final value Interfaces Field bus: Interface/protocol Data rate Max. amount Modbus requests Cable length	$A (< 600 \Omega), 0400 \mu A (< 4 k\Omega)$.10 V (> 1 kΩ), 210 V (> 1 kΩ) $\pm 20 \%$ web server/Modbus TCP/BCOM 10/100 Mbit/s, autodetect < 100/s $\le 100 m$
Power consumption, typically 50/60 Hz Power consumption, typically 400 Hz Supply via X1: Supply voltage Us Tolerance of Us IT system being monitored Nominal system voltage range Un Tolerance of Un	≤ 12 W/21 VA ≤ 12 W/45 VA DC 24 V DC -20+25 % AC 0690 V; DC 01000 V AC/DC 0600 V (for UL applications)	Current 020 mA (< 600 Ω), 420 m. Voltage 0 Tolerance related to the current/voltage final value Interfaces Field bus: Interface/protocol Data rate Max. amount Modbus requests Cable length Connection	A (< 600 Ω), 0400 μA (< 4 kΩ) .10 V (> 1 kΩ), 210 V (> 1 kΩ) ±20 % web server/Modbus TCP/BCOM 10/100 Mbit/s, autodetect < 100/s ≤ 100 m RJ45
Power consumption, typically 50/60 Hz Power consumption, typically 400 Hz Supply via X1: Supply voltage Us Tolerance of Us IT system being monitored Nominal system voltage range Un Tolerance of Un	≤ 12 W/21 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 %	Current 020 mA (< 600 Ω), 420 m. Voltage 0 Tolerance related to the current/voltage final value Interfaces Field bus: Interface/protocol Data rate Max. amount Modbus requests Cable length	$A (< 600 \Omega), 0400 \mu A (< 4 k\Omega)$.10 V (> 1 kΩ), 210 V (> 1 kΩ) $\pm 20 \%$ web server/Modbus TCP/BCOM 10/100 Mbit/s, autodetect < 100/s $\le 100 m$
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/45 VA DC 24 V DC -20+25 % AC 0690 V; DC 01000 V AC/DC 0600 V (for UL applications) AC/DC +15 %	Current 020 mA (< 600 Ω), 420 m. Voltage 0 Tolerance related to the current/voltage final value Interfaces Field bus: Interface/protocol Data rate Max. amount Modbus requests Cable length Connection	A (< 600 Ω), 0400 μA (< 4 kΩ) .10 V (> 1 kΩ), 210 V (> 1 kΩ) ±20 % web server/Modbus TCP/BCOM 10/100 Mbit/s, autodetect < 100/s ≤ 100 m RJ45
Power consumption, typically 50/60 Hz Power consumption, typically 400 Hz Supply via X1: Supply voltage Us Tolerance of Us IT system being monitored Nominal system voltage range Un Tolerance of Un Frequency range of Un Response values	≤ 12 W/21 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 % 60 Hz	Current 020 mA (< 600 Ω), 420 m. Voltage 0 Tolerance related to the current/voltage final value Interfaces Field bus: Interface/protocol Data rate Max. amount Modbus requests Cable length Connection IP address	A (< 600 Ω), 0400 μA (< 4 kΩ) .10 V (> 1 kΩ), 210 V (> 1 kΩ) ±20 % web server/Modbus TCP/BCOM 10/100 Mbit/s, autodetect < 100/s ≤ 100 m RJ45 DHCP/manual 192.168.0.5
Power consumption, typically 50/60 Hz Power consumption, typically 400 Hz Supply via X1: Supply voltage Us Tolerance of Us IT system being monitored Nominal system voltage range Un Tolerance of Un Frequency range of Un Response values Response value Ran1 (alarm 1)	\leq 12 W/21 VA \leq 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 % 60 Hz	Current 020 mA (< 600 Ω), 420 m. Voltage 0 Tolerance related to the current/voltage final value Interfaces Field bus: Interface/protocol Data rate Max. amount Modbus requests Cable length Connection IP address Network mask BCOM address	A (< 600 Ω), 0400 μA (< 4 k Ω), 10 V (> 1 k Ω), 210 V (> 1 k Ω) \pm 20 % web server/Modbus TCP/BCOM 10/100 Mbit/s, autodetect < 100/s \leq 100 m R/45 DHCP/manual 192.168.0.5 255.255.255.0 system-1-0
Power consumption, typically 50/60 Hz Power consumption, typically 400 Hz Supply via X1: Supply voltage Us Tolerance of Us IT system being monitored Nominal system voltage range Un Tolerance of Un Frequency range of Un Response values Response value Ban1 (alarm 1) Response value DC residual voltage (Alarm 2) (Upc)	≤ 12 W/21 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 % 60 Hz 1 kΩ10 MΩ 20 V1 k V	Current 020 mA (< 600 Ω), 420 m. Voltage 0 Tolerance related to the current/voltage final value Interfaces Field bus: Interface/protocol Data rate Max. amount Modbus requests Cable length Connection IP address Network mask	A (< 600 Ω), 0400 μA (< 4 kΩ) .10 V (> 1 kΩ), 210 V (> 1 kΩ) ±20 % web server/Modbus TCP/BCOM 10/100 Mbit/s, autodetect < 100/s ≤ 100 m RJ45 DHCP/manual 192.168.0.5 255.255.255.255.0
Power consumption, typically 50/60 Hz Power consumption, typically 400 Hz Supply via X1: Supply voltage Us Tolerance of Us IT system being monitored Nominal system voltage range Un Tolerance of Un Frequency range of Un Response values Response value DC residual voltage (Alarm 2) (UDC) Relative uncertainty (acc. to IEC 61557-8)	$\leq 12 \text{ W/21 VA}$ $\leq 12 \text{ W/45 VA}$ $DC 24 \text{ V}$ $DC -20 + 25 \%$ $AC 0690 \text{ V; DC } 01000 \text{ V}$ $AC/DC 0600 \text{ V (for UL applications)}$ $AC/DC + 15 \%$ 60 Hz $1 \text{ k}\Omega10 \text{ M}\Omega$ $20 \text{ V}1 \text{ k V}$ profile dependent, $\pm 15 \%$, at least $\pm 1 \text{ k}\Omega$	Current 020 mA (< 600 Ω), 420 m. Voltage 0 Tolerance related to the current/voltage final value Interfaces Field bus: Interface/protocol Data rate Max. amount Modbus requests Cable length Connection IP address Network mask BCOM address	A (< 600 Ω), 0400 μA (< 4 k Ω), 10 V (> 1 k Ω), 210 V (> 1 k Ω) \pm 20 % web server/Modbus TCP/BCOM 10/100 Mbit/s, autodetect < 100/s \leq 100 m R/45 DHCP/manual 192.168.0.5 255.255.255.0 system-1-0
Power consumption, typically 50/60 Hz Power consumption, typically 400 Hz Supply via X1: Supply voltage Us Tolerance of Us Tolerance of Un Tolerance of Un Response values Response value Ran1 (alarm 1) Response value DC residual voltage (Alarm 2) (Upc) Relative uncertainty (acc. to IEC 61557-8)	≤ 12 W/21 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 % 60 Hz 1 kΩ10 MΩ 20 V1 k V	Current 020 mA (< 600 Ω), 420 m. Voltage 0 Tolerance related to the current/voltage final value Interfaces Field bus: Interface/protocol Data rate Max. amount Modbus requests Cable length Connection IP address Network mask BCOM address Function Switching elements	A (< 600 Ω), 0400 μA (< 4 k Ω). 10 V (> 1 k Ω), 210 V (> 1 k Ω) ±20 % web server/Modbus TCP/BCOM 10/100 Mbit/s, autodetect < 100/s ≤ 100 m RJ45 DHCP/manual 192.168.0.5 255.255.255.0 system-1-0 communication interface
Power consumption, typically 50/60 Hz Power consumption, typically 400 Hz Supply via X1: Supply voltage \(\mu_s \) Tolerance of \(U_s \) IT system being monitored Nominal system voltage range \(U_n \) Tolerance of \(U_n \) Frequency range of \(U_n \) Response values Response value \(R_{an1} \) (alarm 1) Response value \(DC \) residual voltage (Alarm 2) (\(U_{DC} \)) Relative uncertainty (acc. to IEC 61557-8) Hysteresis	$\leq 12 \text{ W/21 VA}$ $\leq 12 \text{ W/45 VA}$ $DC 24 \text{ V}$ $DC -20 + 25 \%$ $AC 0690 \text{ V; DC } 01000 \text{ V}$ $AC/DC 0600 \text{ V (for UL applications)}$ $AC/DC + 15 \%$ 60 Hz $1 \text{ k}\Omega10 \text{ M}\Omega$ $20 \text{ V}1 \text{ k V}$ profile dependent, $\pm 15 \%$, at least $\pm 1 \text{ k}\Omega$	Current 020 mA (< 600 Ω), 420 m. Voltage 0 Tolerance related to the current/voltage final value Interfaces Field bus: Interface/protocol Data rate Max. amount Modbus requests Cable length Connection IP address Network mask BCOM address Function Switching elements Number of switching elements	A $(< 600 \Omega)$, 0400 μ A $(< 4 k\Omega)$.10 V $(> 1 k\Omega)$, 210 V $(> 1 k\Omega)$ $\pm 20 \%$ web server/Modbus TCP/BCOM 10/100 Mbit/s, autodetect < 100/s $\leq 100 m$ RJ45 DHCP/manual 192.168.0.5 255.255.255.0 system-1-0 communication interface
Power consumption, typically 50/60 Hz Power consumption, typically 400 Hz Supply via X1: Supply voltage \(\mu_s \) Tolerance of \(U_s \) IT system being monitored Nominal system voltage range \(U_n \) Tolerance of \(U_n \) Frequency range of \(U_n \) Response values Response value \(R_{an1} \) (alarm 1) Response value \(D \) (residual voltage (Alarm 2) (\(U_{DC} \)) Relative uncertainty (acc. to IEC 61557-8) Hysteresis Time response	$\leq 12 \text{ W/21 VA}$ $\leq 12 \text{ W/45 VA}$ $DC 24 \text{ V}$ $DC -20 + 25 \%$ $AC 0690 \text{ V; DC } 01000 \text{ V}$ $AC/DC 0600 \text{ V (for UL applications)}$ $AC/DC + 15 \%$ 60 Hz $1 \text{ k}\Omega10 \text{ M}\Omega$ $20 \text{ V}1 \text{ k V}$ profile dependent, $\pm 15 \%$, at least $\pm 1 \text{ k}\Omega$ 25% , at least $1 \text{ k}\Omega$	Current 020 mA (< 600 Ω), 420 m. Voltage 0 Tolerance related to the current/voltage final value Interfaces Field bus: Interface/protocol Data rate Max. amount Modbus requests Cable length Connection IP address Network mask BCOM address Function Switching elements Number of switching elements Operating mode	$\begin{array}{l} A~(<600~\Omega), 0\dots 400~\mu A~(<4~k\Omega)\\ 1.10~V~(>1~k\Omega), 2\dots 10~V~(>1~k\Omega)\\ \pm 20~\% \\ \\ \end{array}$ web server/Modbus TCP/BCOM 10/100 Mbit/s, autodetect $<100/s$ $\leq 100~m$ RJ45 DHCP/manual 192.168.0.5 255.255.255.0 system-1-0 communication interface $2~c$ changeover contacts N/C operation/N/O operation
Power consumption, typically 50/60 Hz Power consumption, typically 400 Hz Supply via X1: Supply voltage \(\mu_s \) Tolerance of \(U_s \) IT system being monitored Nominal system voltage range \(U_n \) Tolerance of \(U_n \) Frequency range of \(U_n \) Response values Response value \(R_{an1} \) (alarm 1) Response value DC residual voltage (Alarm 2) (\(U_{DC} \)) Relative uncertainty (acc. to IEC 61557-8) Hysteresis Time response Response time \(t_{an} \) for DC residual voltage > 1,1x\(U_{DC} \) and	$ \leq 12 \text{ W/21 VA} \\ \leq 12 \text{ W/45 VA} \\ \\ DC 24 \text{ V} \\ DC -20+25 \% \\ \\ AC 0690 \text{ V; DC } 01000 \text{ V} \\ AC/DC 0690 \text{ V (for UL applications)} \\ AC/DC +15 \% \\ 60 \text{ Hz} \\ \\ \\ 1 \text{ k}\Omega10 \text{ M}\Omega \\ 20 \text{ V}1 \text{ k V} \\ \\ \text{profile dependent, } \pm15 \%, \text{ at least } \pm1 \text{ k}\Omega \\ 25 \%, \text{ at least } 1 \text{ k}\Omega \\ \\ \\ Alarm 1 \\ \\ \text{max. } 150 \text{ ms}^{2} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	Current 020 mA (< 600 Ω), 420 m. Voltage 0 Tolerance related to the current/voltage final value Interfaces Field bus: Interface/protocol Data rate Max. amount Modbus requests Cable length Connection IP address Network mask BCOM address Function Switching elements Number of switching elements Operating mode Contact 11-12-14 none, insulation Alarm 1, ins	$\begin{array}{l} A~(<600~\Omega), 0 \dots 400~\mu A~(<4~k\Omega)\\ 1.10~V~(>1~k\Omega), 2 \dots 10~V~(>1~k\Omega)\\ \pm 20~\%\\ \end{array}$ web server/Modbus TCP/BCOM 10/100 Mbit/s, autodetect $<100/s$ $\leq 100~m$ RJ45 DHCP/manual 192.168.0.5 255.255.255.0 system-1-0 communication interface $\begin{array}{l} 2~changeover~contacts\\ N/C~operation/N/O~operation\\ ulation~fault + DC~residual~voltage, \end{array}$
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_D Tolerance of U_D Frequency range of U_D Response values Response value U_D Response value U_D Response value U_D Relative uncertainty (acc. to IEC 61557-8) Hysteresis Time response Response time U_D Response ti	$ \leq 12 \text{ W/21 VA} $ $ \leq 12 \text{ W/45 VA} $ $ DC 24 \text{ V} $ $ DC -20+25 \% $ $ AC 0690 \text{ V; DC } 01000 \text{ V} $ $ AC/DC 0690 \text{ V (for UL applications)} $ $ AC/DC +15 \% $ $ 60 \text{ Hz} $ $ 1 \text{ k}\Omega10 \text{ M}\Omega $ $ 20 \text{ V}1 \text{ k V} $ $ profile dependent, \pm 15 \%, at least \pm 1 \text{ k}\Omega 25 \%, at least 1 \text{ k}\Omega Alarm 1 \qquad \text{max. 150 ms}^{2} $	Current 020 mA (< 600 Ω), 420 m. Voltage 0 Tolerance related to the current/voltage final value Interfaces Field bus: Interface/protocol Data rate Max. amount Modbus requests Cable length Connection IP address Network mask BCOM address Function Switching elements Operating mode Contact 11-12-14 none, insulation Alarm 1, ins connection fault, device fault, collective alarm, m	A (< 600 Ω), 0400 μA (< 4 kΩ). 10 V (> 1 kΩ), 210 V (> 1 kΩ) ±20 % web server/Modbus TCP/BCOM 10/100 Mbit/s, autodetect < 100/s ≤ 100 m RJ45 DHCP/manual 192.168.0.5 255.255.255.25.55.0 system-1-0 communication interface 2 changeover contacts N/C operation/N/O operation ulation fault + DC residual voltage, leasurement ended, device inactive
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_D Tolerance of U_D Frequency range of U_D Response values Response value PC residual voltage (Alarm 2) (U_DC) Relative uncertainty (acc. to IEC 61557-8) Hysteresis Time response Response time t_{AD} for DC residual voltage > 1,1x U_DC and C_DC Response time t_{AD} at C_DC and C_DC Response time C_DC residual voltage > 10 k C_DC) and C_DC	$ \leq 12 \text{ W/21 VA} \\ \leq 12 \text{ W/45 VA} \\ \\ DC 24 \text{ V} \\ DC -20+25 \% \\ \\ AC 0690 \text{ V; DC } 01000 \text{ V} \\ AC/DC 0690 \text{ V (for UL applications)} \\ AC/DC +15 \% \\ 60 \text{ Hz} \\ \\ \\ 1 \text{ k}\Omega10 \text{ M}\Omega \\ 20 \text{ V}1 \text{ k V} \\ \\ \text{profile dependent, } \pm15 \%, \text{ at least } \pm1 \text{ k}\Omega \\ 25 \%, \text{ at least } 1 \text{ k}\Omega \\ \\ \\ Alarm 1 \\ \\ \text{max. } 150 \text{ ms}^{2} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	Current 020 mA (< 600 Ω), 420 m. Voltage 0 Tolerance related to the current/voltage final value Interfaces Field bus: Interface/protocol Data rate Max. amount Modbus requests Cable length Connection IP address Network mask BCOM address Function Switching elements Operating mode Contact 11-12-14 none, insulation Alarm 1, ins connection fault, device fault, collective alarm, m. Contact 21-22-24 none, insulation Alarm 1, ins	A (< 600 Ω), 0400 μA (< 4 kΩ). 10 V (> 1 kΩ), 210 V (> 1 kΩ) ±20 % web server/Modbus TCP/BCOM 10/100 Mbit/s, autodetect < 100/s ≤ 100 m RJ45 DHCP/manual 192.168.0.5 255.255.255.0 system-1-0 communication interface 2 changeover contacts N/C operation/N/O operation ulation fault + DC residual voltage, reasurement ended, device inactive ulation fault + DC residual voltage, reasurement ended, device inactive ulation fault + DC residual voltage, reasurement ended, device inactive ulation fault + DC residual voltage,
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_D Tolerance of U_D Frequency range of U_D Response values Response value PC residual voltage (Alarm 2) (U_DC) Relative uncertainty (acc. to IEC 61557-8) Hysteresis Time response Response time t_{AD} for DC residual voltage > 1,1x U_DC and C_DC Response time t_{AD} at C_DC and C_DC Response time C_DC residual voltage > 10 k C_DC) and C_DC	$ \leq 12 \text{ W/21 VA} $ $ \leq 12 \text{ W/45 VA} $ $ DC 24 \text{ V} $ $ DC -20+25 \% $ $ AC 0690 \text{ V; DC } 01000 \text{ V} $ $ AC/DC 0690 \text{ V (for UL applications)} $ $ AC/DC +15 \% $ $ 60 \text{ Hz} $ $ 1 \text{ k}\Omega10 \text{ M}\Omega $ $ 20 \text{ V}1 \text{ k V} $ $ profile dependent, \pm 15 \%, at least \pm 1 \text{ k}\Omega 25 \%, at least 1 \text{ k}\Omega Alarm 1 \qquad \text{max. 150 ms}^{2} $	Current 020 mA (< 600 Ω), 420 m. Voltage 0 Tolerance related to the current/voltage final value Interfaces Field bus: Interface/protocol Data rate Max. amount Modbus requests Cable length Connection IP address Network mask BCOM address Function Switching elements Operating mode Contact 11-12-14 none, insulation Alarm 1, ins connection fault, device fault, collective alarm, m	A (< 600 Ω), 0400 μA (< 4 kΩ). 10 V (> 1 kΩ), 210 V (> 1 kΩ) ±20 % web server/Modbus TCP/BCOM 10/100 Mbit/s, autodetect < 100/s ≤ 100 m RJ45 DHCP/manual 192.168.0.5 255.255.255.0 system-1-0 communication interface 2 changeover contacts N/C operation/N/O operation ulation fault + DC residual voltage, reasurement ended, device inactive ulation fault + DC residual voltage, reasurement ended, device inactive ulation fault + DC residual voltage, reasurement ended, device inactive ulation fault + DC residual voltage,
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_B Tolerance of U_B Tolerance of U_B Response values Response value R_{an1} (alarm 1) Response value DC residual voltage (Alarm 2) (U_DC) Relative uncertainty (acc. to IEC 61557-8) Hysteresis Time response Response time t_{an} for DC residual voltage > 1,1x U_DC and C_BC profile Startup delay $T_{Startup}$	$\leq 12 \text{ W/21 VA}$ $\leq 12 \text{ W/45 VA}$ $DC 24 \text{ V}$ $DC -20 + 25 \%$ $AC 0 690 \text{ V; DC } 0 1000 \text{ V}$ $AC/DC 0 600 \text{ V (for UL applications)}$ $AC/DC + 15 \%$ 60 Hz $1 \text{ k}\Omega 10 \text{ M}\Omega$ $20 \text{ V } 1 \text{ k V}$ $profile dependent, \pm 15 \%, \text{ at least } \pm 1 \text{ k}\Omega$ $25 \%, \text{ at least } 1 \text{ k}\Omega$ $Alarm 1 \qquad \text{max. } 150 \text{ ms}^{2}$ $e = 1 \text{ µF acc. to IEC } 61557 - 8 \text{ dependent, typ. 4 s (see diagrams in manual)}$	Current 020 mA (< 600 Ω), 420 m. Voltage 0 Tolerance related to the current/voltage final value Interfaces Field bus: Interface/protocol Data rate Max. amount Modbus requests Cable length Connection IP address Network mask BCOM address Function Switching elements Operating mode Contact 11-12-14 none, insulation Alarm 1, ins connection fault, device fault, collective alarm, m. Contact 21-22-24 none, insulation Alarm 1, ins	A (< 600 Ω), 0400 μA (< 4 kΩ). 10 V (> 1 kΩ), 210 V (> 1 kΩ) ±20 % web server/Modbus TCP/BCOM 10/100 Mbit/s, autodetect < 100/s ≤ 100 m RJ45 DHCP/manual 192.168.0.5 255.255.255.0 system-1-0 communication interface 2 changeover contacts N/C operation/N/O operation ulation fault + DC residual voltage, reasurement ended, device inactive ulation fault + DC residual voltage, reasurement ended, device inactive ulation fault + DC residual voltage, reasurement ended, device inactive
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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_D Tolerance of U_D Frequency range of U_D Response values Response value U_D Response value DC residual voltage (Alarm 2) (U_D C) Relative uncertainty (acc. to IEC 61557-8) Hysteresis Time response Response time U_D	≤ 12 W/21 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 % 60 Hz 1 kΩ10 MΩ 20 V1 k V profile dependent, ±15 %, at least ±1 kΩ 25 %, at least 1 kΩ Alarm 1 max. 150 ms ²¹ e = 1 μF acc. to IEC 61557-8 dependent, typ. 4 s (see diagrams in manual) 0120 s ±50 V ≤ 403 μA	Current 020 mA (< 600 Ω), 420 m. Voltage 0 Tolerance related to the current/voltage final value Interfaces Field bus: Interface/protocol Data rate Max. amount Modbus requests Cable length Connection IP address Network mask BCOM address Function Switching elements Operating mode Contact 11-12-14 none, insulation Alarm 1, ins connection fault, device fault, collective alarm, m contact 21-22-24 none, insulation Alarm 1, ins connection fault, device fault, collective alarm, m Electrical endurance under rated operating conditions, number of Contact data acc. to IEC 60947-5-1: Utilisation category AC-13 AC-14 DC Rated operational voltage 230 V 240 V	Web server/Modbus TCP/BCOM 10 V (> 1 kΩ), 210 V (> 1 kΩ) ±20 % web server/Modbus TCP/BCOM 10/100 Mbit/s, autodetect < 100/s ≤ 100 m RJ45 DHCP/manual 192.168.0.5 255.255.255.0 system-1-0 communication interface 2 changeover contacts N/C operation/N/O operation ulation fault + DC residual voltage, reasurement ended, device inactive ulation fault + DC residual voltage, reasurement ended, device inactive cycles 10.000 2-12 DC-12 DC-12 DC-12 24 V 48 V 110 V 220 V
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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 Response values Response value S Response value (Alarm 1) Response value D Response value D Response value O Relative uncertainty (acc. to IEC 61557-8) Hysteresis Time response Response time t _{an} for DC residual voltage > 1,1xUDC and C profile Startup delay T _{startup} Measuring circuit Measuring circuit Measuring voltage U _m 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 Tolerance measurement of f _n Voltage range measurement of f _n Measuring range U _m	≤ 12 W/21 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 % 60 Hz 1 kΩ10 MΩ 20 V1 k V profile dependent, ±15 %, at least ±1 kΩ 25 %, at least 1 kΩ Alarm 1 max. 150 ms ²⁾ e = 1 μF acc. to IEC 61557-8 dependent, typ. 4 s (see diagrams in manual) 0120 s ±50 V ≤ 403 μA ≥ 124 kΩ ≤ 1200 V profile dependent, 0150 μF 10460 Hz ±1 % ±0.1 Hz AC 25690 V AC 25690 V	Current 020 mA (< 600 Ω), 420 m. Voltage 0 Tolerance related to the current/voltage final value Interfaces Field bus: Interface/protocol Data rate Max. amount Modbus requests Cable length Connection IP address Network mask BCOM address Function Switching elements Operating mode Contact 11-12-14 none, insulation Alarm 1, ins connection fault, device fault, collective alarm, m Contact 21-22-24 none, insulation Alarm 1, ins connection fault, device fault, collective alarm, m Electrical endurance under rated operating conditions, number of or Contact data acc. to IEC 60947-5-1: Utilisation category AC-13 AC-14 DC Rated operational voltage ≤ 2000 m NN Rated insulation voltage ≤ 2000 m NN Rated insulation voltage ≤ 3000 m NN	A (< 600 Ω), 0400 μA (< 4 kΩ). 10 V (> 1 kΩ), 210 V (> 1 kΩ). ±20 % web server/Modbus TCP/BCOM 10/100 Mbit/s, autodetect < 100/s ≤ 100 m RJ45 DHCP/manual 192.168.0.5 255.255.255.0 system-1-0 communication interface 2 changeover contacts N/C operation/N/O operation ulation fault + DC residual voltage, reasurement ended, device inactive resultation fault + DC residual voltage, reasurement ended, device inactive resultation fault + DC residual voltage, reasurement ended, device inactive resultation fault + DC residual voltage, reasurement ended, device inactive resultation fault + DC residual voltage, reasurement ended, device inactive resultation fault + DC residual voltage, reasurement ended, device inactive resultation fault + DC residual voltage, reasurement ended, device inactive resultation fault + DC residual voltage, reasurement ended, device inactive resultation fault + DC residual voltage, reasurement ended, device inactive resultation fault + DC residual voltage, reasurement ended, device inactive resultation fault + DC residual voltage, reasurement ended, device inactive resultation fault + DC residual voltage, reasurement ended, device inactive resultation fault + DC residual voltage, reasurement ended, device inactive resultation fault + DC residual voltage, reasurement ended, device inactive resultation fault + DC residual voltage, reasurement ended, device inactive resultation fault + DC residual voltage, reasurement ended, device inactive resultation fault + DC residual voltage, reasurement ended, device inactive resultation fault + DC residual voltage, reasurement ended, device inactive resultation fault + DC residual voltage, reasurement ended, device inactive resultation fault + DC residual voltage, reasurement ended, device inactive resultation fault + DC residual voltage, reasurement ended, device inactive resultation fault + DC residual voltage, reasurement ended, device inactive resultation fault + DC residual voltage, reasurement ended, device inactive resultation fault + DC re
Power consumption, typically 50/60 Hz Power consumption, typically 400 Hz Supply via X1: Supply voltage Us Tolerance of Us IT system being monitored Nominal system voltage range Un Tolerance of Un Frequency range of Un Response values Response value Ban1 (alarm 1) Response value DC residual voltage (Alarm 2) (Upc) Relative uncertainty (acc. to IEC 61557-8) Hysteresis Time response Response time tan for DC residual voltage > 1,1xUpc and Response time tan at RF = 0.5 x Ran (Ran = 10 kΩ) and Coprofile Startup delay Tstartup Measuring circuit Measuring circuit Measuring voltage Um Measuring current Im Internal resistance Ri, Zi Permissible extraneous DC voltage Ufg Permissible system leakage capacitance Ce Measuring ranges Measuring range fn Tolerance measurement of fn Voltage range measurement of fn Measuring range Un Voltage range measurement of Un	≤ 12 W/21 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 % 60 Hz 1 kΩ10 MΩ 20 V1 k V profile dependent, ±15 %, at least ±1 kΩ 25 %, at least 1 kΩ Alarm 1 max. 150 ms²² e = 1 μF acc. to IEC 61557-8 dependent, typ. 4 s (see diagrams in manual) 0120 s ±50 V ≤ 403 μA ≥ 124 kΩ ≤ 1200 V profile dependent, 0150 μF 10460 Hz ±1 % ±0.1 Hz AC 25690 V AC/DC > 10 V	Current 020 mA (< 600 Ω), 420 m. Voltage 0 Tolerance related to the current/voltage final value Interfaces Field bus: Interface/protocol Data rate Max. amount Modbus requests Cable length Connection IP address Network mask BCOM address Function Switching elements Operating mode Contact 11-12-14 none, insulation Alarm 1, ins connection fault, device fault, collective alarm, m Contact 21-22-24 none, insulation Alarm 1, ins connection fault, device fault, collective alarm, m Electrical endurance under rated operating conditions, number of or Contact data acc. to IEC 60947-5-1: Utilisation category AC-13 AC-14 DC Rated operational voltage ≤ 2000 m NN Rated insulation voltage ≤ 2000 m NN Rated insulation voltage ≤ 3000 m NN	Web server/Modbus TCP/BCOM 10 V (> 1 kΩ), 210 V (> 1 kΩ) ±20 % web server/Modbus TCP/BCOM 10/100 Mbit/s, autodetect < 100/s ≤ 100 m RJ45 DHCP/manual 192.168.0.5 255.255.255.0 system-1-0 communication interface 2 changeover contacts N/C operation/N/O operation ulation fault + DC residual voltage, leasurement ended, device inactive ulation fault + DC residual voltage, leasurement ended, device inactive cycles 10.000 2-12 DC-12 DC-12 DC-12 24 V 48 V 110 V 220 V 1 A 1 A 0.2 A 0.1 A 250 V
Power consumption, typically 50/60 Hz Power consumption, typically 400 Hz Supply via X1: Supply voltage Us Tolerance of Us IT system being monitored Nominal system voltage range Un Tolerance of Un Frequency range of Un Response values Response value Bc residual voltage (Alarm 2) (UDC) Relative uncertainty (acc. to IEC 61557-8) Hysteresis Time response Response time tan for DC residual voltage > 1,1xUDC and Response time tan at RF = 0.5 x Ran (Ran = 10 kΩ) and Coprofile Startup delay Tstartup Measuring circuit Measuring voltage Um Measuring voltage Um Measuring current Im Internal resistance Ri, Zi Permissible extraneous DC voltage Ufg Permissible system leakage capacitance Ce Measuring ranges Measuring range fn Tolerance measurement of fn Voltage range measurement of fn Measuring range Un Voltage range measurement of Un Tolerance measurement of Un	≤ 12 W/21 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 % 60 Hz 1 kΩ10 MΩ 20 V1 k V profile dependent, ±15 %, at least ±1 kΩ 25 %, at least 1 kΩ Alarm 1 max. 150 ms²² E = 1 μF acc. to IEC 61557-8 dependent, typ. 4 s (see diagrams in manual) 0120 s ±50 V ≤ 403 μA ≥ 124 kΩ ≤ 1200 V profile dependent, 0150 μF 10460 Hz ±1 % ±0.1 Hz AC 25690 V AC/DC > 10 V ±5 % ±5 V	Current 020 mA (< 600 Ω), 420 m. Voltage 0 Tolerance related to the current/voltage final value Interfaces Field bus: Interface/protocol Data rate Max. amount Modbus requests Cable length Connection IP address Network mask BCOM address Function Switching elements Operating mode Contact 11-12-14 none, insulation Alarm 1, ins connection fault, device fault, collective alarm, m Contact 21-22-24 none, insulation Alarm 1, ins connection fault, device fault, collective alarm, m Electrical endurance under rated operating conditions, number of or Contact data acc. to IEC 60947-5-1: Utilisation category AC-13 AC-14 DC Rated operational voltage ≤ 2000 m NN Rated insulation voltage ≤ 2000 m NN Rated insulation voltage ≤ 3000 m NN	A (< 600 Ω), 0400 μA (< 4 kΩ). 10 V (> 1 kΩ), 210 V (> 1 kΩ) ±20 % web server/Modbus TCP/BCOM 10/100 Mbit/s, autodetect < 100/s ≤ 100 M RJ45 DHCP/manual 192.168.0.5 255.255.255.0 system-1-0 communication interface 2 changeover contacts N/C operation/N/O operation ulation fault + DC residual voltage, leasurement ended, device inactive ulation fault + DC residual voltage, leasurement ended, device inactive ulation fault + DC residual voltage, leasurement ended, device inactive cycles 10.000 2-12 DC-12 DC-12 DC-12 24 V 48 V 110 V 220 V 1 A 1 A 0.2 A 0.1 A 250 V 160 V
Power consumption, typically 50/60 Hz Power consumption, typically 400 Hz Supply via X1: Supply voltage Us Tolerance of Us IT system being monitored Nominal system voltage range Un Tolerance of Un Frequency range of Un Response values Response value Ran1 (alarm 1) Response value DC residual voltage (Alarm 2) (Upc) Relative uncertainty (acc. to IEC 61557-8) Hysteresis Time response Response time tan for DC residual voltage > 1,1xUpc and Response time tan at RF = 0.5 x Ran (Ran = 10 kΩ) and Coprofile Startup delay Tstartup Measuring circuit Measuring voltage Um Measuring voltage Um Measuring voltage Um Measuring current Im Internal resistance Ri, Zi Permissible extraneous DC voltage Ufg Permissible system leakage capacitance Ce Measuring range S Measuring range fn Tolerance measurement of fn Voltage range measurement of Un Tolerance measurement of Un Measuring range Ce	≤ 12 W/21 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 % 60 Hz 1 kΩ10 MΩ 20 V1 k V profile dependent, ±15 %, at least ±1 kΩ 25 %, at least 1 kΩ Alarm 1 max. 150 ms² E = 1 μF acc. to IEC 61557-8 dependent, typ. 4 s (see diagrams in manual) 0120 s ±50 V ≤ 403 μA ≥ 124 kΩ ≤ 1200 V profile dependent, 0150 μF 10460 Hz ±1 % ±0.1 Hz AC 25690 V AC 25690 V AC 25690 V AC/DC > 10 V ±5 % ±5 V 01000 μF	Current 020 mA (< 600 Ω), 420 m. Voltage 0 Tolerance related to the current/voltage final value Interfaces Field bus: Interface/protocol Data rate Max. amount Modbus requests Cable length Connection IP address Network mask BCOM address Function Switching elements Operating mode Contact 11-12-14 none, insulation Alarm 1, ins connection fault, device fault, collective alarm, m Contact 21-22-24 none, insulation Alarm 1, ins connection fault, device fault, collective alarm, m Electrical endurance under rated operating conditions, number of or Contact data acc. to IEC 60947-5-1: Utilisation category AC-13 AC-14 DC Rated operational voltage ≤ 2000 m NN Rated insulation voltage ≤ 2000 m NN Rated insulation voltage ≤ 3000 m NN	A (< 600 Ω), 0400 μA (< 4 kΩ). 10 V (> 1 kΩ), 210 V (> 1 kΩ) ±20 % web server/Modbus TCP/BCOM 10/100 Mbit/s, autodetect < 100/s ≤ 100 M RJ45 DHCP/manual 192.168.0.5 255.255.255.0 system-1-0 communication interface 2 changeover contacts N/C operation/N/O operation ulation fault + DC residual voltage, leasurement ended, device inactive ulation fault + DC residual voltage, leasurement ended, device inactive ulation fault + DC residual voltage, leasurement ended, device inactive cycles 10.000 2-12 DC-12 DC-12 DC-12 24 V 48 V 110 V 220 V 1 A 1 A 0.2 A 0.1 A 250 V 160 V
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 Response values Response value R_{an1} (alarm 1) Response value DC residual voltage (Alarm 2) (U_DC) Relative uncertainty (acc. to IEC 61557-8) Hysteresis Time response Response time t_{an} for DC residual voltage $> 1,1xU_{DC}$ and C_0 profile Startup delay $T_{Startup}$ Measuring circuit Measuring voltage U_m Measuring voltage U_m Measuring current I_m Internal resistance R_i , Z_i Permissible extraneous DC voltage U_{fg} Permissible system leakage capacitance C_0 Measuring ranges Measuring range T_0 Tolerance measurement of T_0 Voltage range measurement of T_0	≤ 12 W/21 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 % 60 Hz 1 kΩ10 MΩ 20 V1 k V profile dependent, ±15 %, at least ±1 kΩ 25 %, at least 1 kΩ Alarm 1 max. 150 ms²² E = 1 μF acc. to IEC 61557-8 dependent, typ. 4 s (see diagrams in manual) 0120 s ±50 V ≤ 403 μA ≥ 124 kΩ ≤ 1200 V profile dependent, 0150 μF 10460 Hz ±1 % ±0.1 Hz AC 25690 V AC/DC > 10 V ±5 % ±5 V	Current 020 mA (< 600 Ω), 420 m. Voltage 0 Tolerance related to the current/voltage final value Interfaces Field bus: Interface/protocol Data rate Max. amount Modbus requests Cable length Connection IP address Network mask BCOM address Function Switching elements Operating mode Contact 11-12-14 none, insulation Alarm 1, ins connection fault, device fault, collective alarm, m Contact 21-22-24 none, insulation Alarm 1, ins connection fault, device fault, collective alarm, m Electrical endurance under rated operating conditions, number of or Contact data acc. to IEC 60947-5-1: Utilisation category AC-13 AC-14 DC Rated operational voltage ≤ 2000 m NN Rated insulation voltage ≤ 2000 m NN Rated insulation voltage ≤ 3000 m NN	A (< 600 Ω), 0400 μA (< 4 kΩ). 10 V (> 1 kΩ), 210 V (> 1 kΩ) ±20 % web server/Modbus TCP/BCOM 10/100 Mbit/s, autodetect < 100/s ≤ 100 M RJ45 DHCP/manual 192.168.0.5 255.255.255.0 system-1-0 communication interface 2 changeover contacts N/C operation/N/O operation ulation fault + DC residual voltage, leasurement ended, device inactive ulation fault + DC residual voltage, leasurement ended, device inactive ulation fault + DC residual voltage, leasurement ended, device inactive cycles 10.000 2-12 DC-12 DC-12 DC-12 24 V 48 V 110 V 220 V 1 A 1 A 0.2 A 0.1 A 250 V 160 V

Technical data (continued)

EMC	IEC 61326-2-4 5)
Ambient temperatures:	
Operating temperature	-25+55 °C
Transport	-40+85 °C
Long-term storage	-40+70°C
Classification of climatic conditions acc. to IEC 60721 (related to temper	erature and relative humidity):
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	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 24-12
Stripping length	-
	7 mm
	0.22.5 mm ²
	0.22.5 mm ²
flexible with ferrules, with/without plastic sleeve	0.2 2.5 mm ² 0.25 2.5 mm ² 0.2 1 mm ²
rigid/flexible flexible with ferrules, with/without plastic sleeve Multiple conductor, rigid Multiple conductor, flexible	0.22.5 mm ²
flexible with ferrules, with/without plastic sleeve Multiple conductor, rigid Multiple conductor, flexible	0.2 2.5 mm ² 0.25 2.5 mm ² 0.2 1 mm ²
Mexible with ferrules, with/without plastic sleeve Multiple conductor, rigid Multiple conductor, flexible Multiple conductor, flexible with ferrule without plastic sleeve	0.22.5 mm ² 0.252.5 mm ² 0.21 mm ² 0.21.5 mm ² 0.251 mm ²
flexible with ferrules, with/without plastic sleeve Multiple conductor, rigid	0.22.5 mm ² 0.252.5 mm ² 0.21 mm ² 0.21.5 mm ²
Mexible with ferrules, with/without plastic sleeve Multiple conductor, rigid Multiple conductor, flexible Multiple conductor, flexible with ferrule without plastic sleeve Multiple conductor, flexible with TWIN ferrule with plastic sleeve Push-wire terminals:	0.22.5 mm ² 0.252.5 mm ² 0.21 mm ² 0.21.5 mm ² 0.251 mm ²
Mexible with ferrules, with/without plastic sleeve Multiple conductor, rigid Multiple conductor, flexible Multiple conductor, flexible with ferrule without plastic sleeve Multiple conductor, flexible with TWIN ferrule with plastic sleeve Push-wire terminals: Nominal current	0.22.5 mm ² 0.2525 mm ² 0.21 mm ² 0.21.5 mm ² 0.51.5 mm ²
Mexible with ferrules, with/without plastic sleeve Multiple conductor, rigid Multiple conductor, flexible Multiple conductor, flexible with ferrule without plastic sleeve Multiple conductor, flexible with TWIN ferrule with plastic sleeve Push-wire terminals: Nominal current Conductor sizes	0.22.5 mm 0.252.5 mm 0.21 mm 0.21.5 mm 0.251 mm 0.51.5 mm
flexible with ferrules, with/without plastic sleeve Multiple conductor, rigid Multiple conductor, flexible Multiple conductor, flexible with ferrule without plastic sleeve Multiple conductor, flexible with TWIN ferrule with plastic sleeve	0.22.5 mm ² 0.251 mm ² 0.21 mm ² 0.21.5 mm ² 0.51 mm ²
Mexible with ferrules, with/without plastic sleeve Multiple conductor, rigid Multiple conductor, flexible Multiple conductor, flexible with ferrule without plastic sleeve Multiple conductor, flexible with TWIN ferrule with plastic sleeve Push-wire terminals: Nominal current Conductor sizes Stripping length	0.22.5 mm* 0.252.5 mm* 0.21 mm* 0.21.5 mm* 0.251 mm* 0.51.5 mm* ≤ 10 A AWG 24-12

Dimension diagram (dimensions in mm)





Push-wire terminals X1:

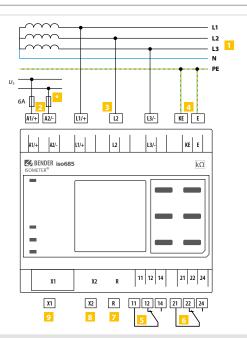
Nominal current	≤ 8 A
Conductor sizes	AWG 24-16
Stripping length	10 mm
rigid/flexible	0.21.5 mm ²
flexible with ferrule without plastic sleeve	0.251.5 mm ²
flexible with TWIN ferrule with plastic sleeve	0.250.75 mm ²

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Operating mode	continuous operation
Mounting (0°)	display oriented, cooling slots must be ventilated vertically 6
Degree of protection internal comp	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	D00215
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⁾ Fast tripping only works in IT networks with a mains frequency of 60 Hz.
- $^{\scriptscriptstyle 3)}$ Indication limited outside the temperature range -25 \ldots +55 °C.
- ⁴⁾ U_{S} [Volt] = supply voltage ISOMETER®
- 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 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
- Supply voltage U_s (see nameplate) via 6 A fuse
- Connection to the IT system to be monitored (L1/+, L2, L3/-)
- Separate connection of KE, E to PE
- 5 (K1) Alarm relay 1, available changeover contacts

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

NOTE:

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

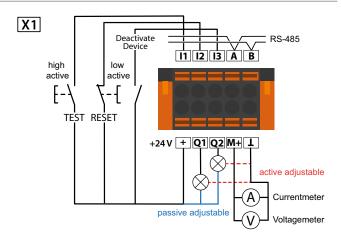
 $The connecting \ lines \ L1/+, L2, L3/- \ to \ the system \ to \ be \ monitored \ must \ be \ carried \ out \ as \ spur \ lines. \ No \ load \ current \ may \ be \ conducted \ through \ the \ terminals.$

For UL applications:

Use 60/70 °C copper lines only!

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

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



Connection to X1



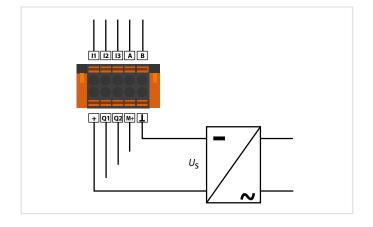
Danger of damage to property due to faulty connections!

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



Danger of damage to property due to incorrect nominal voltage!

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



ISOMETER® isoNAV685-D-B

Insulation monitoring device for offline monitoring of de-energised loads





Typical applications

• Monitoring of de-energised loads and systems

Approvals





Device features

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

Standards

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

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

Further information

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

Ordering information

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

Accessories

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

¹⁾ included in the scope of delivery

Suitable measuring instruments on request!

Insulation coordination according to IEC 60664-1/IEC 60664-3	In-/Outputs (X1-Interface)
Definitions:	Cable length X1 (unshielded cable) \leq 10 m
Measuring circuit (IC1) (L1/+, L2, L3/-)	Cable length X1 (shielded cable, shield connected to earth (PE) on one end, recommended:
Supply circuit (IC2) A1, A2	$J-Y(St)Y \min. 2x0,8) \leq 100 \text{ m}$
Output circuit 1 (IC3) 11, 12, 14	Total max. supply output current for each output (device supplied by X1.+/X1.GND) max. 1A
Output circuit 2 (IC4) 21, 22, 24	Total max. supply output current on X1 (device supplied by A1+/A2-) max. 200 mA
Control circuit (ICS) (E, KE), (X1, ETH, X3, X4)	Total max. supply output current on X1 (device supplied by A1+/A2- between 16,8 V and 40 V)
Rated voltage 1000 V	$I_{\text{Lmax}X1} = 10 \text{ mA} + 7 \text{ mA/V} * U_5^{-3}$
Overvoltage category III	(negative values are not allowed for / _{LmaxX1})
Rated impulse voltage:	(Hegative values are not allowed for I _{LMaxX}))
, ,	Digital Inputs (11, 12, 13)
IC1/(IC2-5) 8 kV	Number 3
IC2/(IC3-5) 4 kV	Operating mode, adjustable active high, active low
IG/(IC4-5) 4 kV	Functions none, test, reset, device deactivated
IC4/IC5 4 kV	Voltage: Low DC -35 V, High DC 1132 V
Rated insulation voltage:	Tolerance Voltage ±10 %
IC1/(IC2-5) 1000 V	Tolerance voltage ± 10 %
IC2/(IC3-5) 250 V	Digital Outputs (Q1, Q2)
IC3/(IC4-5) 250 V	Number 2
IC4/IC5 250 V	Operating mode, adjustable active, passive
Pollution degree for accessible parts on the outside of the device housing ($U_n < 690 \text{ V}$) 3	Functions off, connection fault, Alarm L1, Alarm L2, Alarm L3, device fault, common alarm
Pollution degree for accessible parts on the outside of the device housing ($U_n > 690 < 1000 \text{ V}$)	Voltage passive DC 032 V, active DC 0/19.232 V
Protective separation (reinforced insulation) between:	passive DC 032 v, active DC 0/13.232 v
IC1/(IC2-5) Overvoltage category III, 1000 V	Interfaces
IC2/(IC3-5) Overvoltage category III, 300 V	
IC3/(IC4-5) Overvoltage categorylli, 300 V	Field bus:
IC4/IC5 Overvoltage category III, 300 V	Interface/protocol web server/Modbus TCP/BCOM
Voltage test (routine test) according to IEC 61010-1:	Data rate 10/100 Mbit/s, autodetect
IC2/(IC3-5) AC 2,2 kV	Max. amount Modbus requests < 100/s
IC3/(IC4-5) AC 2,2 kV	Cable length ≤ 100 m
IC4/IC5 AC 2,2 kV	Connection RJ45
Tie 1/2 Ki	IP address DHCP/manual 192.168.0.5
Supply voltage	Network mask 255.255.255.0
Supply via A1/+, A2/-:	BCOM address system-1-0
Supply voltage range U_S AC/DC 24240 V	Function communication interface
Tolerance of U_5 $-30+15\%$	Curitakina alamanta
Maximum permissible input current of U_S 650 mA	Switching elements
	Number of switching elements 2 changeover contacts
	Operating mode N/C operation/N/O operation
Tolerance of the frequency range of U_S $-5+15\%$	Contact 11-12-14/21-22-24 off, connection fault, Alarm L1, Alarm L2, Alarm L3,
Power consumption, DC ≤ 12 W	device fault, common alarm
Power consumption, typically 50/60 Hz ≤ 12 W/21 VA	Electrical endurance under rated operating conditions, number of cycles 10.000
Power consumption, typically 400 Hz \leq 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 $U_{\rm S}$ DC -20+25 %	Rated operational current 5 A 3 A 1 A 1 A 0.2 A 0.1 A
IT system being monitored	Rated insulation voltage \leq 2000 m NN 250 V
_ · _ ·	Rated insulation voltage \leq 3000 m NN 160 V
Nominal system voltage range U_n offline	Minimum contact rating 1 mA at AC/DC \geq 10 V
Circuit capacity internal mains switch AC 0690 V; DC 01000 V	•
AC/DC 0600 V (for UL applications)	Environment/EMC
Response values	EMC IEC 61326-2-4 ⁴⁾
Response value R_{an1} (alarm 1) $1 \text{ k}\Omega10 \text{ M}\Omega$	Ambient temperatures:
Response value R_{an2} (alarm 2) $1 \text{ k}\Omega10 \text{ M}\Omega$	Operating temperature -25+55 °C
· · · · · · · · · · · · · · · · · · ·	Transport -40+85 °C
Hysteresis 25 %, at least 1 k Ω	Long-term storage -40+70 °C
Time response	
Response time t_{an} at $R_F = 0.5 \times R_{an}$ ($R_{an} = 10 \text{ k}\Omega$) and $C_e = 1 \mu\text{F}$ according to IEC 61557-8 30 s	Classification of climatic conditions acc. to IEC 60721 (related to temperature and relative humidity):
Start-up delay $T_{\text{start-up}}$ 0120 s	Stationary use (IEC 60721-3-3) 3K22
o1203	Transport (IEC 60721-3-2) 2K11
Measuring circuit	Long-term storage (IEC 60721-3-1) 1K22
Measuring voltage $U_{\rm m}$ ± 5 V	Classification of mechanical conditions acc. to IEC 60721:
Measuring current $I_{\rm m}$ $\leq 13.4 \mu{\rm A}$	Stationary use (IEC 60721-3-3) 3M11
Internal resistance R_{i} , Z_{i} $\geq 372 \text{ k}\Omega$	Transport (IEC 60721-3-2) 2M4
Permissible extraneous DC voltage U_{fo} $\leq 1200 \text{ V}$	Long-term storage (IEC 60721-3-1) 1M12
Permissible extrahedus DC voltage ofg \$1200 V	Area of application \leq 3000 m NN
130 µr	
Display	
Indication graphic display 127 x 127 pixels, 40 x 40 mm ²⁾	
Display range measured value $0.1 \text{ k}\Omega20 \text{ M}\Omega$	
Operating uncertainty (according to IEC 61557-8) $\pm 15\%$, at least $\pm 1 \text{ k}\Omega$	
LEDs	
ON (operation LED) green	
SERVICE yellow	
ALARM 1 (L1 and L2) yellow	
ALARM 2 (L3) yellow	

Technical data (continued)

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 24-12
Stripping length	7 mm
rigid/flexible	0.22.5 mm ²
flexible with ferrules, with/without plastic sleev	e 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	t plastic sleeve 0.251 mm ²
Multiple conductor, flexible with TWIN ferrule w	rith plastic sleeve 0.51.5 mm ²
Push-wire terminals:	
Nominal current	≤ 10 A
Conductor sizes	AWG 24-12
Stripping length	10 mm
rigid/flexible	0.22.5 mm ²
flexible with ferrules, with/without plastic sleev	e 0.252.5 mm ²
Multiple conductor, flexible with TWIN ferrule w	rith plastic sleeve 0.51.5 mm ²
Push-wire terminals X1:	
Nominal current	≤ 8 A
Conductor sizes	AWG 24-16
Stripping length	10 mm
rigid/flexible	0.21.5 mm ²
flexible with ferrule without plastic sleeve	0.251.5 mm ²
flexible with TWIN ferrule with plastic sleeve	0.250.75 mm ²

Operating mode	continuous operation
Mounting (0°)	display oriented, cooling slots must be ventilated vertically 5)
Degree of protection internal compone	ents 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	D00264
Weight	< 390 q

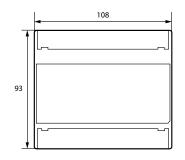
- installed devices which at least have overvoltage category CAT2 (300V) may be connected.
- ²⁾ Indication limited outside the temperature range -25...+55 °C.
- ³⁾ $U_{\rm S}$ [Volt] = supply voltage ISOMETER®

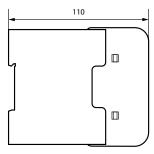
Other

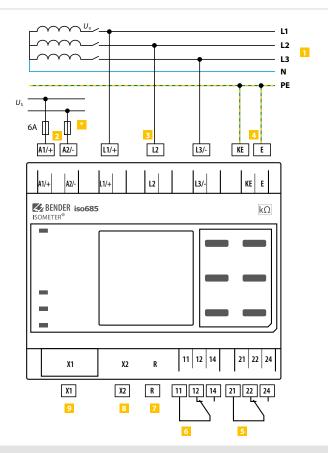
- 4) This is a class A product. In a domestic environment, this product may cause radio interference. In this case, the user may be required to take corrective actions.
- $^{\rm 5)}~$ Recommendation: Devices mounted at 0 $^{\circ}$ (display-oriented, cooling slots must be ventilated vertically).

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.

Dimension diagram (dimensions in mm)







- 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
- Switchable resistor R for RS-485 bus termination
- Ethernet interface
- Digital interface
- 6 A fuse for systems > 690 V

NOTE:

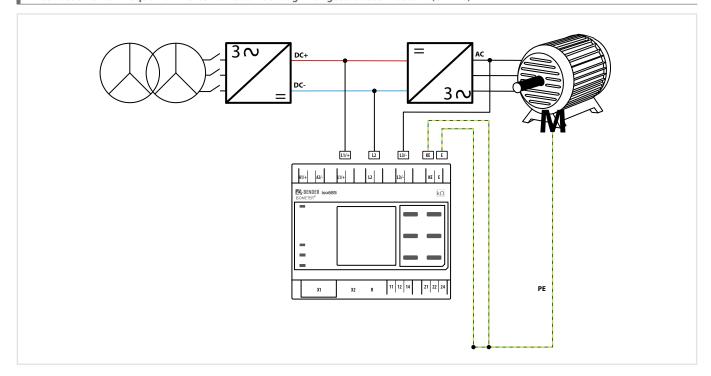
According to DIN VDE 0100-430, devices for protection against a short circuit can be omitted for the coupling of terminals L1/+ and L3/- to the IT system ≤ 690 V to be monitored if the wiring is carried out in such a manner as to reduce the risk of a short circuit to a minimum. (Recommendation: Ensure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

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

For UL applications:

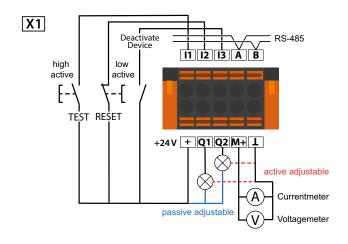
Use 60/70 °C copper lines only!

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



Digital interface X1

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



Connection to X1



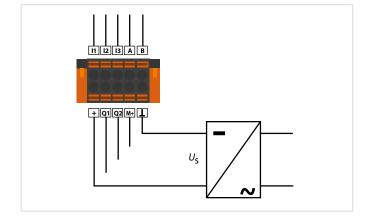
Danger of damage to property due to faulty connections!

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

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 ...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)

Device variants

· isoHR685W-D-I-B

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

isoHR685W-S-I-B

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

Standards

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

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

Further information

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

Ordering information

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

¹⁾ nur in Kombination erhältlich

Suitable system components

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

1)	included	in the scope	of delivery

Description	Туре	Art. No.	Page
Device version without display	isoHR685W-S-I-B	B91067125W	-
Display for front panel mounting	FP200W	B91067904W	49
Coupling devices	AGH150W-4	B98018006	363
	AGH204S-4	B914013	365
	AGH520S	B913033	366
	AGH676S-4	B913055	369

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, 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	1300 \
Overvoltage category	I
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 \
IC2/(IC3-5)	300 V
IC3/(IC4-5)	300 V
IC4/IC5	300 V
Pollution degree outside ($U_{\rm n}$ < 690 V)	3
Pollution degree outside ($U_n > 690 < 1000 \text{ V}$)	
Safe isolation (reinforced insulation) between:	
IC1/(IC2-5)	Overvoltage category III, 1000 \
(1)	Overvoltage category II, 1300 V
IC2/(IC3-5)	Overvoltage category III, 300 V
IC3/(IC4-5)	Overvoltage category III, 300 V
IC4/IC5	overvoltage category III, 300 \
Voltage tests (routine test) acc. to IEC 61010-1	overvoltage category III, 500 v
IC2/(IC3-5)	AC 2.2 kV
IC3/(IC4-5)	AC 2.2 kV
IC4/IC5	AC 2.2 kV
Supply voltage	
Supply via A1/+, A2/-:	
Supply voltage range $U_{\rm S}$	AC/DC 24240 V
Tolerance of U_{s}	-30+15 %
Maximum permissible input current of U_s	650 mA
Frequency range of U_s	DC, 50400 Hz ¹
Tolerance of the frequency range of U_{S}	-5+15 %
Power consumption, typically DC	≤ 12 W
Power consumption, typically 50/60 Hz	≤ 12 W/21 VA
Power consumption, typically 400 Hz	≤ 12 W/45 VA
Supply via X1:	
Supply voltage $U_{\rm S}$	DC 24 V
Tolerance of $U_{\rm S}$	DC -20+25 %
	50 201111 25 7
IT system being monitored	ACO 1000 V 2ACO COO V DCO 1200 V
Nominal system voltage range $U_{ m n}$	AC 01000 V, 3AC 0690 V, DC 01300 V AC/DC 01000 V (for UL applications)
Tolerance of <i>U</i> n	AC/DC +15 %
Frequency range of Un	DC 0.1460 Hz
Max. AC voltage U_{\sim} in the frequency range $f_{\rm n}=0.14$	Hz $U_{\sim \text{max}} = 50 \text{ V/Hz}^2 * (1 + f_n^2)$
Response values	
Response value R _{an1} (Alarm 1)	1 kΩ3 GΩ
	410 360
Response value R _{an2} (Alarm 2)	1 kΩ3 GΩ
Response value R _{an2} (Alarm 2) Relative uncertainty (acc. to IEC 61557-8)	$1 \text{ k}\Omega \dots 3 \text{ k}\Omega$ dependent on the profile, $\pm 15 \%$, at least $\pm 1 \text{ k}\Omega$

Time response		
	$R_{\rm an}=10~{\rm k}\Omega$) and $C_{\rm e}=1~{\rm \mu F}$ according to IEC 61557	-8
nesponse time tall actif	profile dependent, typ. 10 s (see diagrar	
Response time DC Alarm at $C_e = 1 \mu\text{F}$		
Start-up delay T _{start-up}	· · · · · · · · · · · · · · · · · · ·	0120
Measuring circuit	CL 1 10 1 150 17	CI ·
Measuring voltage U _m	profile dependent, ±10 V, ±50 V (see pro	
Measuring current I _m Internal resistance R _i , Z _i		≤ 403 μ/ ≥ 124 kΩ
	ems (inactive by I/O, inactive by ISOnet or cut-off)	≥ 124 KS.
Permissible extraneous DC voltage <i>U</i> f		typ. 30 Ms. ≤ 1500 \
Permissible system leakage capacitan	,	
	prome dependent	, σ ισσσ μι
Measuring ranges		
Measuring range f _n		0.1460 Hz
Tolerance measurement of f_{n}		±1 % ±0.1 H
Voltage range measurement of f _n		C 25690 \
Measuring range U_{n} (without an externa		
	AC 251000 V; 3AC 25690 V; D	
Voltage range measurement of U_n	AC/DC 1	01000 V
Tolerance measurement of U_n		±5 % ±5 \
Measuring range Ce		01000 μΙ
Tolerance measurement of Ce		:10 % ±10 μl
Frequency range measurement of C_e		, 30460 Hz
Min. insulation resistance measureme	ent or Ce	
	depending on the profile and coupling mode	tun > 10 l/C
	depending on the profile and coupling mode,	typ. > 10 kΩ
Display	depending on the profile and coupling mode,	typ. > 10 kΩ
Display Indication	depending on the profile and coupling mode, graphic display 127 x 127 pixels,	•
	graphic display 127 x 127 pixels,	40 x 40 mm ²
Indication	graphic display 127 x 127 pixels, 0.1	40 x 40 mm ² kΩ…10 GΩ
Indication Display range measured value Operating uncertainty (according to I	graphic display 127 x 127 pixels, 0.1	40 x 40 mm ² kΩ…10 GΩ
Indication Display range measured value Operating uncertainty (according to II LEDs	graphic display 127 x 127 pixels, 0.1	40 x 40 mm ² kΩ10 GΩ t least ±1 kΩ
Indication Display range measured value Operating uncertainty (according to I LEDs ON (operation LED)	graphic display 127 x 127 pixels, 0.1	$40 \times 40 \text{ mm}^2$ $k\Omega10 GΩ$ t least $\pm 1 \text{ kΩ}$ greer
Indication Display range measured value Operating uncertainty (according to I LEDs ON (operation LED) SERVICE	graphic display 127 x 127 pixels, 0.1	40 x 40 mm ² kΩ10 GΩ t least ±1 kΩ greer yellow
Indication Display range measured value Operating uncertainty (according to I LEDs ON (operation LED) SERVICE ALARM 1	graphic display 127 x 127 pixels, 0.1	40 x 40 mm ² kΩ10 GΩ t least ±1 kΩ greer yellow yellow
Indication Display range measured value Operating uncertainty (according to I LEDs ON (operation LED) SERVICE	graphic display 127 x 127 pixels, 0.1	40 x 40 mm ² kΩ10 GΩ t least ±1 kΩ greer yellov
Indication Display range measured value Operating uncertainty (according to I LEDs ON (operation LED) SERVICE ALARM 1	graphic display 127 x 127 pixels, 0.1	$40 \times 40 \text{ mm}^2$ $k\Omega10 GΩ$ t least $\pm 1 \text{ kΩ}$ greer
Indication Display range measured value Operating uncertainty (according to I LEDs ON (operation LED) SERVICE ALARM 1 ALARM 2	graphic display 127 x 127 pixels, 0.1	40 x 40 mm ² kΩ10 GΩ t least ±1 kΩ greer yellow yellow
Indication Display range measured value Operating uncertainty (according to l LEDs ON (operation LED) SERVICE ALARM 1 ALARM 2 In-/Outputs (X1-Interface) Cable length X1 (unshielded cable) shield of	graphic display 127 x 127 pixels, 0.1 EC 61557-8) ±15 %, at	40 x 40 mm ² kΩ10 GΩ t least ±1 kΩ greer yellow yellow yellow ≤ 10 m
Indication Display range measured value Operating uncertainty (according to l LEDs DN (operation LED) SERVICE ALARM 1 ALARM 2 In-/Outputs (X1-Interface) Cable length X1 (unshielded cable) cable length X1 (shielded cable, shield of cold max. supply output current via i	graphic display 127 x 127 pixels, 0.1 EC 61557-8) ±15 %, at connected to earth PE on one side J-Y(St)Y min. 2x0,8) X1.+/X1.GND for each output	40 x 40 mm ² kΩ10 GΩ t least ±1 kΩ greer yellow yellow
Indication Display range measured value Operating uncertainty (according to l LEDs ON (operation LED) SERVICE ALARM 1 ALARM 2 In-/Outputs (X1-Interface) Cable length X1 (unshielded cable) shield of	graphic display 127 x 127 pixels, 0.1 EC 61557-8) ±15 %, at connected to earth PE on one side J-Y(St)Y min. 2x0,8) X1.+/X1.GND for each output	$40 \times 40 \text{ mm}^{-2}$ $k\Omega \dots 10 \text{ G}\Omega$ t least ±1 k Ω greer yellow yellow yellow ≤ 10 m ≤ 100 m
Indication Display range measured value Operating uncertainty (according to l LEDs DN (operation LED) SERVICE ALARM 1 ALARM 2 In-/Outputs (X1-Interface) Cable length X1 (unshielded cable) Cable length X1 (shielded cable, shield of cold max. supply output current via i Total max. supply output current via i	graphic display 127 x 127 pixels, 0.1 EC 61557-8) ±15 %, at connected to earth PE on one side J-Y(St)Y min. 2x0,8) X1.+/X1.GND for each output	40 x 40 mm ² kΩ10 GΩ t least ±1 kΩ greer yellow yellow yellow ≤ 10 m ≤ 100 m max. 1 <i>f</i>
Indication Display range measured value Operating uncertainty (according to l LEDs DN (operation LED) SERVICE ALARM 1 ALARM 2 In-/Outputs (X1-Interface) Cable length X1 (unshielded cable) Cable length X1 (shielded cable, shield of cold max. supply output current via i Total max. supply output current via i	graphic display 127 x 127 pixels, 0.1 EC 61557-8) ±15 %, at connected to earth PE on one side J-Y(St)Y min. 2x0,8) X1.+/X1.GND for each output A1/A2 in total on X1 A1/A2 in total on X1 between 16.8 V and 40 V ILmaxX1 = 10 mA +	$40 \times 40 \text{ mm}$ $k\Omega \dots 10 \text{ GC}$ I least $\pm 1 \text{ kC}$ green yellov yellov $\pm 10 \text{ n}$ $\pm 10 \text{ n}$ $\pm 100 \text{ n}$ max. $\pm 100 \text{ m}$ max. $\pm 100 \text{ m}$ $\pm 100 \text{ m}$
Indication Display range measured value Operating uncertainty (according to l LEDs DN (operation LED) SERVICE ALARM 1 ALARM 2 In-/Outputs (X1-Interface) Cable length X1 (unshielded cable) Cable length X1 (shielded cable, shield of cold max. supply output current via i Total max. supply output current via i	graphic display 127 x 127 pixels, 0.1 EC 61557-8) ±15 %, as connected to earth PE on one side J-Y(St)Y min. 2x0,8) X1.+/X1.GND for each output A1/A2 in total on X1 A1/A2 in total on X1	$40 \times 40 \text{ mm}$ $k\Omega \dots 10 \text{ GC}$ I least $\pm 1 \text{ kC}$ green yellov yellov $\pm 10 \text{ n}$ $\pm 10 \text{ n}$ $\pm 100 \text{ n}$ max. $\pm 100 \text{ m}$ max. $\pm 100 \text{ m}$ $\pm 100 \text{ m}$
Indication Display range measured value Operating uncertainty (according to I LEDs DN (operation LED) SERVICE ALARM 1 ALARM 2 In-/Outputs (X1-Interface) Cable length X1 (unshielded cable) Cable length X1 (shielded cable, shield of the control of	graphic display 127 x 127 pixels, 0.1 EC 61557-8) ±15 %, at connected to earth PE on one side J-Y(St)Y min. 2x0,8) X1.+/X1.GND for each output A1/A2 in total on X1 A1/A2 in total on X1 between 16.8 V and 40 V ILmaxX1 = 10 mA +	$40 \times 40 \text{ mm}$ $k\Omega \dots 10 \text{ GC}$ I least $\pm 1 \text{ kC}$ green yellov yellov $\pm 10 \text{ n}$ $\pm 10 \text{ n}$ $\pm 100 \text{ n}$ max. $\pm 100 \text{ m}$ max. $\pm 100 \text{ m}$ $\pm 100 \text{ m}$
Indication Display range measured value Operating uncertainty (according to II LEDs ON (operation LED) SERVICE ALARM 1 ALARM 2 In-/Outputs (X1-Interface) Cable length X1 (unshielded cable) Cable length X1 (shielded cable, shield of the content o	graphic display 127 x 127 pixels, 0.1 EC 61557-8) ±15 %, at connected to earth PE on one side J-Y(St)Y min. 2x0,8) X1.+/X1.GND for each output A1/A2 in total on X1 A1/A2 in total on X1 between 16.8 V and 40 V ILmaxX1 = 10 mA +	40 x 40 mm / kΩ10 GΩ t least ±1 kΩ greet yellov yellov sellov yellov yellov 4 100 m max. 1 / max. 200 m/ 7 mA/V * U _s ded for /LmaxX1
Indication Display range measured value Operating uncertainty (according to I LEDs ON (operation LED) SERVICE ALARM 1 ALARM 2 In-/Outputs (X1-Interface) Cable length X1 (unshielded cable), shield of Cable length X1 (shielded cable, shield of Total max. supply output current via information in the company of the current via information in the company of the current via information in the current via	graphic display 127 x 127 pixels, 0.1 EC 61557-8) ±15 %, at connected to earth PE on one side J-Y(St)Y min. 2x0,8) X1.+/X1.GND for each output A1/A2 in total on X1 A1/A2 in total on X1 between 16.8 V and 40 V $l_{LmaxX1} = 10 \text{ mA} + l_{LmaxX1} = 10 \text{ mA} + l_{LmaxX1$	40 x 40 mm / kΩ10 GΩ t least ±1 kΩ greet yellov yellov sellov yellov yellov 4 100 m max. 1 / max. 200 m/ 7 mA/V * U _s d for /LmaxX1
Indication Display range measured value Operating uncertainty (according to II LEDs ON (operation LED) SERVICE ALARM 1 ALARM 2 In-/Outputs (X1-Interface) Cable length X1 (unshielded cable), shield of Cable length X1 (shielded cable, shield of Total max. supply output current via information in the company of the compan	graphic display 127 x 127 pixels, 0.1 EC 61557-8) ±15 %, at connected to earth PE on one side J-Y(St)Y min. 2x0,8) K1.+/X1.GND for each output A1/A2 in total on X1 A1/A2 in total on X1 between 16.8 V and 40 V I_LmaxX1 = 10 mA +	40 x 40 mm kΩ10 GΩ t least ±1 kΩ greet yellov yellov yellov a silve
Indication Display range measured value Operating uncertainty (according to li LEDs DN (operation LED) SERVICE ALARM 1 ALARM 2 In-/Outputs (X1-Interface) Cable length X1 (unshielded cable) cable length X1 (shielded cable, shield of lotal max. supply output current via information in the sup	graphic display 127 x 127 pixels, 0.1 EC 61557-8) ±15 %, a connected to earth PE on one side J-Y(St)Y min. 2x0,8) K1.+/X1.GND for each output A1/A2 in total on X1 A1/A2 in total on X1 LmaxX1 = 10 mA + (negative values are not allowed) active his off, test, reset, deactivate device, start initial	40 x 40 mm kΩ10 GC t least ±1 kC greet yellov yellov yellov syellov yellov yellov yellov yellov yellov yellov yellov syellov syel
Indication Display range measured value Operating uncertainty (according to li LEDs DN (operation LED) SERVICE ALARM 1 ALARM 2 In-/Outputs (X1-Interface) Cable length X1 (unshielded cable) cable length X1 (shielded cable, shield of total max. supply output current via information in the sup	graphic display 127 x 127 pixels, 0.1 EC 61557-8) ±15 %, at connected to earth PE on one side J-Y(St)Y min. 2x0,8) K1.+/X1.GND for each output A1/A2 in total on X1 A1/A2 in total on X1 between 16.8 V and 40 V I_LmaxX1 = 10 mA +	40 x 40 mm kΩ10 GC t least ±1 kC greet yellov yellov yellov yellov yellov hand. 1 max. 200 m/max. 1 max. 200 m/max. 2
Indication Display range measured value Operating uncertainty (according to l LEDs DN (operation LED) SERVICE ALARM 1 ALARM 2 In-/Outputs (X1-Interface) Cable length X1 (unshielded cable), shield of cable length X1 (shielded cable, shield of cable length X1 (shielded cable), shield of cable length X1 (shielded cable, shield of cable length X1 (shielded cable), shield of cable leng	graphic display 127 x 127 pixels, 0.1 EC 61557-8) ±15 %, a connected to earth PE on one side J-Y(St)Y min. 2x0,8) K1.+/X1.GND for each output A1/A2 in total on X1 A1/A2 in total on X1 LmaxX1 = 10 mA + (negative values are not allowed) active his off, test, reset, deactivate device, start initial	40 x 40 mm kΩ10 GC t least ±1 kC greet yellov yellov yellov yellov yellov hand. 1 max. 200 m/max. 1 max. 200 m/max. 2
Indication Display range measured value Operating uncertainty (according to li LEDs DN (operation LED) SERVICE ALARM 1 ALARM 2 In-/Outputs (X1-Interface) Cable length X1 (unshielded cable) cable length X1 (shielded cable, shield of total max. supply output current via information in the sup	graphic display 127 x 127 pixels, 0.1 EC 61557-8) ±15 %, a connected to earth PE on one side J-Y(St)Y min. 2x0,8) K1.+/X1.GND for each output A1/A2 in total on X1 A1/A2 in total on X1 LmaxX1 = 10 mA + (negative values are not allowed) active his off, test, reset, deactivate device, start initial	40 x 40 mm kΩ10 GC t least ±1 kC greet yellov yellov yellov yellov yellov hand. 1 max. 200 m/max. 1 max. 200 m/max. 2
Indication Display range measured value Operating uncertainty (according to l LEDs DN (operation LED) SERVICE ALARM 1 ALARM 2 In-/Outputs (X1-Interface) Cable length X1 (unshielded cable), Shield of Total max. supply output current via interface in the current via interface in	graphic display 127 x 127 pixels, 0.1 EC 61557-8) ±15 %, a connected to earth PE on one side J-Y(St)Y min. 2x0,8) K1.+/X1.GND for each output A1/A2 in total on X1 A1/A2 in total on X1 LmaxX1 = 10 mA + (negative values are not allowed) active his off, test, reset, deactivate device, start initial	40 x 40 mm ² kΩ10 GΩ t least ±1 kΩ greer yellow yellow yellow ≤ 10 m ≤ 100 m max. 1 H max. 200 mH 7 mA/V * U ₅ ³ ed for I _{Lmax} X1
Indication Display range measured value Operating uncertainty (according to li LEDs DN (operation LED) SERVICE ALARM 1 ALARM 2 In-/Outputs (X1-Interface) Cable length X1 (unshielded cable) Cable length X1 (shielded cable, shield of total max. supply output current via interface) Total max. supply output current via interface in the c	graphic display 127 x 127 pixels, 0.1 EC 61557-8) ±15 %, as connected to earth PE on one side J-Y(St)Y min. 2x0,8) X1.+/X1.GND for each output A1/A2 in total on X1 A1/A2 in total on X1 h_maxX1 = 10 mA +	40 x 40 mm kΩ10 GC t least ±1 kC greet yellow yellow yellow sellow yellow yellow for lumax. 1 max. 200 mm ax. 200 mm

Voltage passive

Analogue output (M+)

measurement complete, device inactive, DC offset alarm

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

Technical data (continued)

Technical data (continue	d)
Number	1
Operating mode	linear, midscale point 28 k Ω /120 k Ω
Functions	insulation value, DC shift
Current 02	0 mA (< 600 Ω), 420 mA (< 600 Ω), 0400 μ A (< 4 k Ω)
Voltage	$010 \text{ V} (>1 \text{ k}\Omega), 210 \text{ V} (>1 \text{ k}\Omega)$
Tolerance related to the current/voltag	ge final value \pm 20 %
Interfaces	
Field 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
ISOnet	
Number of ISOnet devices	220 dev
Max. nominal system voltage ISOnet	AC, 690 V/DC, 1000V
, ,	AC, 090 V/DC, 1000V
ISOloop	
Number of ISOloop devices	220 dev
ISOsync:	
Number of ISOsync devices	≤ 50
Sensor bus:	
Interface/Protocol	RS-485/BB bus
Data rate mode 1	9.6 kBaud/s
Cable length (depending on the baud r	
Cable: twisted pair, one end of shield co	
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 opera	
·	•
Contact data acc. to IEC 60947-5-1:	
Utilisation category	AC-13 / AC-14 / DC-12 / 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 / 0.2 A / 0.1 A
Rated insulation voltage ≤ 2000 m NN	
Rated insulation voltage ≤ 3000 m NN Minimum contact rating	
	1 mA at AC/DC ≥ 10 V
Environment/EMC and temperatur	
EMC	IEC 60533, IEC 61326-2-4 ⁵
Operating temperature	-25+55 °C
Transport	-40+85 °C
Long-term storage	-40+70°C
	acc. to IEC 60721 (related to temperature and relative humidity):
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22
Classification of mechanical condit	tions acc. to IEC 60721:
Stationary use (IEC 60721-3-3)	3M12
Transport (IEC 60721-3-2)	2M4
Long term storage (IEC 60721 2 1)	1M12

Screw-type terminals: Nominal current ≤ 10 Tightening torque 0.50.6 Nm (57 lb-i Conductor sizes AWG 24- Stripping length 7 m rigid/flexible 0.22.5 mi Multiple conductor, rigid 0.21 m Multiple conductor, flexible with ferrule without plastic sleeve 0.21.5 mi Multiple conductor, flexible with ferrule with plastic sleeve 0.51.5 mi Multiple conductor, flexible with ferrule with plastic sleeve 0.51.5 mi Multiple conductor, flexible with ferrule with plastic sleeve 0.51.5 mi Multiple conductor, flexible with ferrule with plastic sleeve 0.51.5 mi Multiple conductor, flexible with ferrule with plastic sleeve 0.51.5 mi Multiple conductor, flexible with ferrule with plastic sleeve 0.51.5 mi Multiple conductor sizes AWG 24- Stripping length 10 m rigid/flexible 0.22.5 mi Multiple conductor, flexible with fwithout plastic collar 0.252.5 mi Multiple conductor, flexible with fwilh ferrule with plastic sleeve 0.51.5 mi Multiple conductor, flexible with ferrule with plastic sleeve 0.51.5 mi Push-wire terminals X1: Nominal current ≤ 8 Stripping length 10 m rigid/flexible 0.21.5 mi Push-wire terminals X1: Nominal current ≤ 8 Stripping length 10 m rigid/flexible 0.21.5 mi Push-wire terminals X1: Nominal current ≤ 8 Stripping length 10 m rigid/flexible 0.21.5 mi Push-wire terminals X1: Nominal current ≤ 8 Stripping length 10 m rigid/flexible 0.21.5 mi Push-wire terminals X1: Nominal current ≤ 8 Stripping length 10 m rigid/flexible 0.21.5 mi Push-wire terminals X1: Nominal current ≤ 8 Stripping length 10 m rigid/flexible 0.21.5 mi Push-wire terminals X1: Nominal current ≤ 8 Stripping length 10 m rigid/flexible 0.21.5 mi Push-wire terminals X1: Nominal current ≤ 8 Stripping length 10 m rigid/flexible 0.21.5 mi Push-wire terminals X1: Nominal current ≤ 8 Stripping length 10 m rigid/flexible 0.21.5 mi Push-wire terminals X1: Nominal current ≤ 8 Stripping length 10 m rigid/flexible 0.21.5 mi	Connection	
Nominal current \$ 100 conductor sizes AWG 24-5tripping length 7 m rigid/flexible Rexible with ferrules, with/without plastic collar 0.215 mi Multiple conductor, rigid 0.215 mi Multiple conductor, flexible with ferrule without plastic sleeve 0.2515 mi Multiple conductor, flexible with ferrule without plastic sleeve 0.2515 mi Multiple conductor, flexible with ferrule with plastic sleeve 0.515 mi Multiple conductor, flexible with ferrule with plastic sleeve 0.515 mi Multiple conductor, flexible with ferrule with plastic sleeve 0.515 mi Multiple conductor, flexible with ferrule with plastic sleeve 0.515 mi Multiple conductor, flexible with ferrule with plastic sleeve 0.515 mi Multiple conductor, flexible with ferrule with plastic sleeve 0.515 mi Multiple conductor, flexible with ferrule with plastic sleeve 0.515 mi Multiple conductor sizes AWG 24-5tripping length 10 m rigid/flexible 0.225 mi Multiple conductor, flexible with firm with plastic sleeve 0.515 mi Multiple conductor, flexible with firm with plastic sleeve 0.515 mi Multiple conductor, flexible with firm with plastic sleeve 0.515 mi Multiple conductor, flexible with firm with plastic sleeve 0.515 mi Multiple conductor, flexible with firm with plastic sleeve 0.515 mi Multiple conductor, flexible with firm with plastic sleeve 0.515 mi Multiple conductor, flexible with firm with plastic sleeve 0.2515 mi Multiple conductor sizes AWG 24-5tripping length 10 m rigid/flexible 0.215 mi Multiple conductor sizes AWG 24-5tripping length 10 m rigid/flexible 0.215 mi Multiple conductor sizes AWG 24-5tripping length 10 m rigid/flexible 0.215 mi Multiple conductor sizes AWG 24-5tripping length 10 m rigid/flexible 0.215 mi Multiple conductor sizes AWG 24-5tripping length 10 m rigid/flexible 0.215 mi Multiple conductor sizes AWG 24-5tripping length 10 m rigid/flexible 0.215 mi Multiple conductor sizes AWG 24-5tripping length 10 m rigid/flexible 0.215 mi Multiple conductor sizes AWG 24-5tripping le	Connection type	pluggable screw terminal or push-wire termina
Tightening torque Conductor sizes AWG 24- Stripping length 7 m rigid/flexible Rexible with ferrules, with/without plastic collar Multiple conductor, rigid Multiple conductor, flexible with ferrule without plastic sleeve Multiple conductor, flexible with ferrule without plastic sleeve Multiple conductor, flexible with ferrule with plastic sleeve Multiple conductor, flexible with ferrule with plastic sleeve Multiple conductor, flexible with ferrule with plastic sleeve Push-wire terminals: Nominal current Conductor sizes AWG 24- Stripping length 10 m rigid/flexible Rexible with ferrules, with/without plastic collar Multiple conductor, flexible withTWIN ferrule with plastic sleeve Push-wire terminals X1: Nominal current Conductor sizes AWG 24- Stripping length 10 m rigid/flexible Rexible with ferrule with plastic sleeve 0.51.5 m Rultiple conductor sizes AWG 24- Stripping length 10 m rigid/flexible Rexible with ferrule without plastic sleeve 0.251.5 m Rexible with ferrule without plastic sleeve 0.251.5 m Rexible with ferrule with plastic sleeve 0.	Screw-type terminals:	
Conductor sizes AWG 24- Stripping length 7 m rigid/flexible 0.22.5 mi flexible with ferrules, with/without plastic collar 0.252.5 mi Multiple conductor, rigid 0.21 mi Multiple conductor, flexible Multiple conductor, flexible with ferrule without plastic sleeve Multiple conductor, flexible with Ferrule with plastic sleeve Multiple conductor, flexible with Ferrule with plastic sleeve Push-wire terminals: Nominal current Conductor sizes AWG 24- Stripping length 10 m rigid/flexible flexible with ferrules, with/without plastic collar Multiple conductor, flexible withTWIN ferrule with plastic sleeve 0.51.5 mi Multiple conductor, flexible withTWIN ferrule with plastic sleeve 0.51.5 mi Multiple conductor, flexible withTWIN ferrule with plastic sleeve 0.51.5 mi Multiple conductor, flexible withTWIN ferrule with plastic sleeve 0.51.5 mi flexible with ferrules, with/without plastic collar 0.252.5 mi Multiple conductor sizes AWG 24- Stripping length 10 m rigid/flexible 6.0.21.5 mi flexible with ferrule without plastic sleeve 0.251.5 mi flexible with ferrule without plastic sleeve 0.251.5 mi flexible with ferrule with plastic sleeve 0.250.75 mi Other Oth	Nominal current	≤ 10 <i>k</i>
Stripping length rigid/flexible flexible with ferrules, with/without plastic collar Multiple conductor, rigid Multiple conductor, flexible Multiple conductor, flexible with ferrule without plastic sleeve Multiple conductor, flexible with ferrule without plastic sleeve Multiple conductor, flexible with ferrule with plastic sleeve Multiple conductor, flexible withTWIN ferrule with plastic sleeve Push-wire terminals: Nominal current Conductor sizes AWG 24- Stripping length 10 m rigid/flexible flexible with ferrules, with/without plastic collar Multiple conductor, flexible withTWIN ferrule with plastic sleeve Push-wire terminals X1: Nominal current Sets of the side with ferrules with plastic sleeve Push-wire terminals X1: Nominal current Sets of the side with ferrule with plastic sleeve Push-wire terminals X1: Nominal current Sets of the side with ferrule with plastic sleeve O.51.5 mi Push-wire terminals X1: Nominal current Sets of the side with ferrule without plastic sleeve O.252.5 mi Other Other Other Other Operating mode Sortinuous operating mode Mounting (0°) Sortinuous operating mode Mounting (0°) Sortinuous operating mode Sortinuous operating sortinuous operating mode Sortinuous operating mode Sortinuous operating mode Sortinuous operating mode Sortinuous operating sortinuou	Tightening torque	0.50.6 Nm (57 lb-in
figid/flexible flexible with ferrules, with/without plastic collar flexible with ferrules, with/without plastic collar flexible with ferrules, with/without plastic collar flexible conductor, rigid flexible conductor, flexible flexible with ferrule without plastic sleeve flexible with ferrule without plastic sleeve flexible with ferrules with plastic sleeve flexible with ferrules flexible with ferrules, with/without plastic collar flexible with ferrules without plastic sleeve flexible with ferrule with plastic sleeve flexible with fer	Conductor sizes	AWG 24-12
Multiple conductor, rigid Multiple conductor, flexible with ferrule without plastic sleeve Multiple conductor, flexible withTWIN ferrule with plastic sleeve Multiple conductor, flexible withTWIN ferrule with plastic sleeve Push-wire terminals: Nominal current Conductor sizes AWG 24- Stripping length flexible Multiple conductor, flexible withTWIN ferrule with plastic sleeve Push-wire terminals X1: Nominal current Conductor, flexible withTWIN ferrule with plastic sleeve Push-wire terminals X1: Nominal current Conductor sizes AWG 24- Stripping length flexible with ferrule with plastic sleeve Nominal current Conductor sizes AWG 24- Stripping length flexible with ferrule with plastic sleeve O.251.5 min flexible with ferrule with plastic sleeve Operating mode Continuous operating mode Mounting (0°) display oriented, cooling slots must be ventilated vertically begree of protection internal components Push pegree of protection terminals Push rail mounting acc. to IEC 607 Screw fixing 3 x M4 with mounting controlled services Enclosure material polycarbona Flammability class ANSI code	Stripping length	7 mm
Multiple conductor, rigid Multiple conductor, flexible Multiple conductor, flexible Multiple conductor, flexible with ferrule without plastic sleeve Multiple conductor, flexible withTWIN ferrule with plastic sleeve Multiple conductor, flexible withTWIN ferrule with plastic sleeve Push-wire terminals: Nominal current Conductor sizes AWG 24- Stripping length flexible with ferrules, with/without plastic collar Multiple conductor, flexible withTWIN ferrule with plastic sleeve 0.2525 mm Multiple conductor, flexible withTWIN ferrule with plastic sleeve 0.515 mm Push-wire terminals X1: Nominal current Conductor sizes AWG 24- Stripping length flexible with ferrule without plastic sleeve 0.2515 mm flexible with ferrule without plastic sleeve 0.2515 mm flexible with ferrule with plastic sleeve 0.2515 mm flexible with ferrule with plastic sleeve 0.250.75 mm Other Operating mode Continuous operating mode Mounting (0°) display oriented, cooling slots must be ventilated vertically begree of protection internal components IP Degree of protection iternal components Pusperee of protection terminals IP Degree of protection term	rigid/flexible	0.22.5 mm
Multiple conductor, flexible Multiple conductor, flexible with ferrule without plastic sleeve Multiple conductor, flexible with ferrule with plastic sleeve Multiple conductor, flexible withTWIN ferrule with plastic sleeve Push-wire terminals: Nominal current Conductor sizes AWG 24- Stripping length 10 m rigid/flexible flexible with ferrules, with/without plastic collar Multiple conductor, flexible withTWIN ferrule with plastic sleeve 0.51.5 mi Multiple conductor, flexible withTWIN ferrule with plastic sleeve 0.51.5 mi Multiple conductor, flexible withTWIN ferrule with plastic sleeve 0.51.5 mi flexible with ferrule without plastic sleeve 0.251.5 mi flexible with ferrule without plastic sleeve 0.251.5 mi flexible with ferrule without plastic sleeve 0.251.5 mi flexible with ferrule with plastic sleeve 0.251.5 mi flexible mith ferrule mith plastic sleeve 0.251.5 mi flexible mith ferrule mit	flexible with ferrules, with/without plastic	collar 0.252.5 mm
Multiple conductor, flexible with ferrule without plastic sleeve 0.251 mm Multiple conductor, flexible withTWIN ferrule with plastic sleeve 0.51.5 mm Multiple conductor, flexible withTWIN ferrule with plastic sleeve 0.51.5 mm Multiple conductor sizes AWG 24- Stripping length 10 m rigid/flexible 0.22.5 mm Multiple conductor, flexible withTWIN ferrule with plastic sleeve 0.51.5 mm Multiple conductor, flexible withTWIN ferrule with plastic sleeve 0.51.5 mm Multiple conductor, flexible withTWIN ferrule with plastic sleeve 0.51.5 mm Multiple conductor sizes AWG 24- Stripping length 10 m rigid/flexible 0.21.5 mm flexible with ferrule with plastic sleeve 0.251.5 mm flexible with ferrule without plastic sleeve 0.251.5 mm flexible with ferrule with plastic sleeve 0.250.75 mm flexible with flexible with ferrule with plastic sleeve 0.250.75 mm flexible with flexible wi	Multiple conductor, rigid	0.21 mm
Multiple conductor, flexible withTWIN ferrule with plastic sleeve 0.51.5 mm Push-wire terminals: Nominal current ≤ 10 Conductor sizes AWG 24- Stripping length 10 m rigid/flexible 0.22.5 mm Multiple conductor, flexible withTWIN ferrule with plastic sleeve 0.51.5 mm Multiple conductor, flexible withTWIN ferrule with plastic sleeve 0.51.5 mm Multiple conductor, flexible withTWIN ferrule with plastic sleeve 0.51.5 mm Multiple conductor sizes AWG 24- Stripping length 10 m rigid/flexible 0.21.5 mm flexible with ferrule without plastic sleeve 0.251.5 mm flexible with ferrule with plastic sleeve 0.251.5 mm flexible with ferrule with plastic sleeve 0.250.75 mm Other Operating mode continuous operating mode display oriented, cooling slots must be ventilated vertically obegree of protection internal components IP Degree of protection internal components IP Degree of protection terminals IP DIN rail mounting acc. to IEC 607 Screw fixing 3 x M4 with mounting contends in polycarbona flammability class Vents of the size of the siz	Multiple conductor, flexible	0.21.5 mm
Push-wire terminals: Nominal current ≤ 10 Conductor sizes AWG 24- Stripping length 10 m rigid/flexible 0.22.5 m flexible with ferrules, with/without plastic collar 0.252.5 m Multiple conductor, flexible withTWIN ferrule with plastic sleeve 0.51.5 m Fush-wire terminals X1: Nominal current ≤ 8 Conductor sizes AWG 24- Stripping length 10 m rigid/flexible 0.21.5 m flexible with ferrule without plastic sleeve 0.251.5 m flexible with ferrule without plastic sleeve 0.251.5 m flexible with ferrule with plastic sleeve 0.251.5 m flexible with ferrule with plastic sleeve 0.250.75 m flexible with ferrule mithout plastic sleeve 0.250.75 m flexible mith ferrule with plastic sleeve 0.250.75 m flexible mith ferrule with plastic sleeve 0.250.75 m flexible mith ferrule with plastic sleeve 0.250.75 m flexible mith ferrule mithout plastic sleeve 0.250.75 m flexible mithout plastic sleeve 0.250.75 m flexibl	Multiple conductor, flexible with ferrule wit	thout plastic sleeve 0.251 mm
Nominal current Conductor sizes AWG 24- Stripping length rigid/flexible flexible with ferrules, with/without plastic collar Multiple conductor, flexible withTWIN ferrule with plastic sleeve O.51.5 mi Multiple conductor, flexible withTWIN ferrule with plastic sleeve O.51.5 mi Push-wire terminals X1: Nominal current Conductor sizes AWG 24- Stripping length 10 m rigid/flexible flexible with ferrule without plastic sleeve O.251.5 mi flexible with ferrule without plastic sleeve O.251.5 mi flexible with ferrule with plastic sleeve O.251.5 mi flexible with ferrule with plastic sleeve Operating mode Continuous operati Mounting (0°) display oriented, cooling slots must be ventilated vertically Degree of protection internal components Degree of protection internal components Degree of protection terminals DIN rail mounting acc. to EEC 607 Screw fixing S x M4 with mounting contended in polycarbona Flammability class ANSI code	Multiple conductor, flexible withTWIN ferru	lle with plastic sleeve 0.51.5 mm
Conductor sizes AWG 24- Stripping length 10 m rigid/flexible 0.22.5 m flexible with ferrules, with/without plastic collar 0.252.5 m Multiple conductor, flexible withTWIN ferrule with plastic sleeve 0.51.5 m Fush-wire terminals X1: Nominal current ≤ 8 Conductor sizes AWG 24- Stripping length 10 m rigid/flexible 0.21.5 m flexible with ferrule without plastic sleeve 0.251.5 m flexible with ferrule without plastic sleeve 0.251.5 m flexible with ferrule with plastic sleeve 0.251.5 m flexible with ferrule with plastic sleeve 0.250.75 m flexible mith ferrule mode continuous operatic mode in the flexible mode of protection internal components in poperation internal components in poperation internal components in poperation internal components in poperation internal mounting acc. to internal components in poperation internal mounting acc. to inte	Push-wire terminals:	
Stripping length 10 m rigid/flexible 0.22.5 mm flexible with ferrules, with/without plastic collar 0.252.5 mm Multiple conductor, flexible withTWIN ferrule with plastic sleeve 0.51.5 mm Fush-wire terminals X1: Nominal current ≤8 Conductor sizes AWG 24-Stripping length 10 m rigid/flexible 0.21.5 mm flexible with ferrule without plastic sleeve 0.251.5 mm flexible with ferrule without plastic sleeve 0.251.5 mm flexible with ferrule with plastic sleeve 0.251.5 mm flexible with ferrule with plastic sleeve 0.250.75 mm flexible with ferrule with flexible with ferrule with flexible with fl	Nominal current	≤ 10 /
rigid/flexible 0.225 mm flexible with ferrules, with/without plastic collar 0.2525 mm Multiple conductor, flexible withTWIN ferrule with plastic sleeve 0.515 mm Push-wire terminals X1: Nominal current ≤8 Conductor sizes AWG 24- Stripping length 10 mm rigid/flexible 0.21.5 mm flexible with ferrule without plastic sleeve 0.251.5 mm flexible with ferrule without plastic sleeve 0.251.5 mm flexible with ferrule with plastic sleeve 0.250.75 mm Obter Operating mode continuous operating mode continuous operating mode display oriented, cooling slots must be ventilated vertically obegree of protection internal components IP Degree of protection internal components IP Degree of protection terminals IP ON rail mounting acc. to IEC 607 Screw fixing 3 x M4 with mounting continuous operating mode IEC 607 Screw fixing 3 x M4 with mounting continuous operating mode IEC 607 Screw fixing 3 x M4 with mounting continuous operating mode IEC 607 Screw fixing 3 x M4 with mounting continuous operating mode IEC 607 Screw fixing 3 x M4 with mounting continuous operating mode IEC 607 Screw fixing 3 x M4 with mounting continuous operating material IP Screw fixing 3 x M4 with mounting continuous operating material IP Screw fixing 3 x M4 with mounting continuous operating material IP Screw fixing 3 x M4 with mounting continuous operating material IP Screw fixing 3 x M4 with mounting continuous operating material IP Screw fixing 3 x M4 with mounting continuous operating material IP Screw fixing 3 x M4 with mounting continuous operating material IP Screw fixing 3 x M4 with mounting continuous operating material IP Screw fixing 3 x M4 with mounting continuous operating material IP Screw fixing 3 x M4 with mounting continuous operating material IP Screw fixing 3 x M4 with mounting continuous operating material IP Screw fixing 3 x M4 with mounting continuous operating material IP Screw fixing 3 x M4 with mounting continuous operating material IP Screw fixing 3 x M4 with mounting continuous operating material IP Screw fixin	Conductor sizes	AWG 24-12
Rexible with ferrules, with/without plastic collar Multiple conductor, flexible withTWIN ferrule with plastic sleeve Push-wire terminals X1: Nominal current Conductor sizes AWG 24- Stripping length 10 m rigid/flexible 0.21.5 mr Rexible with ferrule without plastic sleeve 0.251.5 mr Rexible with ferrule without plastic sleeve 0.251.5 mr Rexible with ferrule with plastic sleeve 0.250.75 mr Rexible with ferrule with plastic sleeve 0.250.75 mr Deparating mode Continuous operating mode Mounting (0°) display oriented, cooling slots must be ventilated vertically Degree of protection internal components IP Degree of protection terminals IP DIN rail mounting acc. to IEC 607 Screw fixing 3 x M4 with mounting centrols polycarbona frammability class V ANSI code	Stripping length	10 mn
Multiple conductor, flexible withTWIN ferrule with plastic sleeve 0.51.5 mm Push-wire terminals X1: Nominal current ≤ 8 Conductor sizes AWG 24- Stripping length 10 m rigid/flexible 0.21.5 mm flexible with ferrule without plastic sleeve 0.251.5 mm flexible with ferrule with plastic sleeve 0.250.75 mm Other Operating mode continuous operating mode display oriented, cooling slots must be ventilated vertically Degree of protection internal components IP Degree of protection terminals IP DIN rail mounting acc. to IEC 607 Screw fixing 3 x M4 with mounting centolsure material polycarbona flammability class VANSI code	rigid/flexible	0.22.5 mm
Push-wire terminals X1: Nominal current Conductor sizes AWG 24- Stripping length frigid/flexible flexible with ferrule without plastic sleeve flexible with ferrule with plastic sleeve flexible with ferrule with plastic sleeve O.251.5 mi flexible with ferrule with plastic sleeve O.250.75 mi Other Operating mode Continuous operating mode Mounting (0°) display oriented, cooling slots must be ventilated vertically begree of protection internal components IP DIN rail mounting acc. to Ercolosure material Flammability class V ANSI code	flexible with ferrules, with/without plastic	collar 0.252.5 mm
Nominal current \$\iiiis \text{S} \text{Conductor sizes} AWG 24- Stripping length 10 m rigid/flexible 0.21.5 mr flexible with ferrule without plastic sleeve 0.251.5 mr flexible with ferrule with plastic sleeve 0.250.75 mr **Other*** **Operating mode** **Outing (0°) display oriented, cooling slots must be ventilated vertically obegree of protection internal components	Multiple conductor, flexible withTWIN ferru	lle with plastic sleeve 0.51.5 mm
Conductor sizes AWG 24- Stripping length 10 m rigid/flexible 0.21.5 mr flexible with ferrule without plastic sleeve 0.251.5 mr flexible with ferrule with plastic sleeve 0.250.75 mr flexible with ferrule with plastic sleeve 0.250.75 mr Other Operating mode continuous operating mode continuous operating mode sipplay oriented, cooling slots must be ventilated vertically pegree of protection internal components IP Degree of protection terminals IP DIN rail mounting acc. to IEC 607 Screw fixing 3 x M4 with mounting continuous operating mode six mounting continuous operating mode six must be ventilated vertically objected of protection internal components IP DIN rail mounting acc. to IEC 607 Screw fixing 3 x M4 with mounting continuous operating mode six must be ventilated vertically objected on the protection internal components IP Screw fixing 3 x M4 with mounting continuous operating in the protection internal components IP Screw fixing 3 x M4 with mounting continuous operating in the protection internal components IP Screw fixing 3 x M4 with mounting continuous operating in the protection internal components IP Screw fixing 3 x M4 with mounting continuous operating in the protection internal components IP Screw fixing 3 x M4 with mounting continuous operating in the protection internal components IP Screw fixing 3 x M4 with mounting continuous operating in the protection internal components IP Screw fixing 3 x M4 with mounting continuous operating in the protection internal components IP Screw fixing in the protection inte	Push-wire terminals X1:	
Stripping length 10 m rigid/flexible 0.21.5 mi flexible with ferrule without plastic sleeve 0.251.5 mi flexible with ferrule with plastic sleeve 0.250.75 mi	Nominal current	≤ 8 /
rigid/flexible 0.21.5 mm flexible with ferrule without plastic sleeve 0.251.5 mm flexible with ferrule with plastic sleeve 0.250.75 mm Other Operating mode continuous operating mode display oriented, cooling slots must be ventilated vertically Degree of protection internal components IP Degree of protection terminals IP DIN rail mounting acc. to IEC 607 Screw fixing 3 x M4 with mounting centrolsure material polycarbona flammability class V ANSI code	Conductor sizes	AWG 24-10
Bexible with ferrule without plastic sleeve 0.251.5 mi flexible with ferrule with plastic sleeve 0.250.75 mi flexible with f	Stripping length	10 mn
Other Operating mode continuous operating Mounting (0°) display oriented, cooling slots must be ventilated vertically Degree of protection internal components IP. DIN rail mounting acc. to IEC 607 Screw fixing 3 x M4 with mounting centrols polycarbona polyc	rigid/flexible	0.21.5 mm
Operating mode continuous operating mode display oriented, cooling slots must be ventilated vertically Degree of protection internal components IPD	flexible with ferrule without plastic sleeve	0.251.5 mm
Operating mode continuous operating mode display oriented, cooling slots must be ventilated vertically obegree of protection internal components IP. Degree of protection terminals IP. DIN rail mounting acc. to IEC 607 Screw fixing 3 x M4 with mounting central polycarbona polycarbona polycarbona standardility class VANSI code	flexible with ferrule with plastic sleeve	0.250.75 mm
Mounting (0°) display oriented, cooling slots must be ventilated vertically Degree of protection internal components IP. Degree of protection terminals IP. DIN rail mounting acc. to IEC 607 Screw fixing 3 x M4 with mounting c Enclosure material polycarbona Flammability class VANSI code	Other	
Degree of protection internal components IP Degree of protection terminals IP DIN rail mounting acc. to IEC 607 Screw fixing 3 x M4 with mounting c Enclosure material polycarbona Flammability class V ANSI code	Operating mode	continuous operation
Degree of protection terminals IP DIN rail mounting acc. to IEC 607 Screw fixing 3 x M4 with mounting c Enclosure material polycarbona Flammability class V ANSI code	Mounting (0°) dis	splay oriented, cooling slots must be ventilated vertically (
DIN rail mounting acc. to IEC 607 Screw fixing 3 x M4 with mounting c Enclosure material polycarbona Flammability class V ANSI code	Degree of protection internal components	IP40
Screw fixing 3 x M4 with mounting c Enclosure material polycarbona Flammability class V ANSI code	Degree of protection terminals	IP2
Enclosure material polycarbona Flammability class V ANSI code	DIN rail mounting acc. to	IEC 6071
Flammability class V ANSI code	Screw fixing	3 x M4 with mounting cli
ANSI code	Enclosure material	polycarbonat
	Flammability class	V-
Dimensions (W x H x D) 108 x 93 x 110 m	ANSI code	64
	Dimensions (W x H x D)	108 x 93 x 110 mn

- $^{1)}$ 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...+55 °C.
- ³⁾ $U_{\rm S}$ [Volt] = supply voltage ISOMETER®
- ⁴⁾ Only for $U_{\rm n} \ge 50$ V.

Documentation number

Weight

1M12

≤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.
- $^{6)}$ 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.
- ⁷⁾ Deactivation of voltage metering in a DC system at $U_n > DC$ 1000 V and asymmetric insulation fault at \textit{R}_f < 500 k $\Omega.$ Reactivation of voltage metering if \textit{R}_f > 500 k $\Omega.$

"W" option data deviating from the standard version

Devices with the suffix "W" feature increased shock and vibration resistance. The electronics is covered with a special varnish to provide increased protection against mechanical stress and moisture. Rated operational current switching elements max. 3



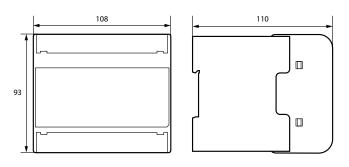
D00261

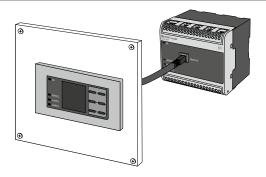
< 390 g

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

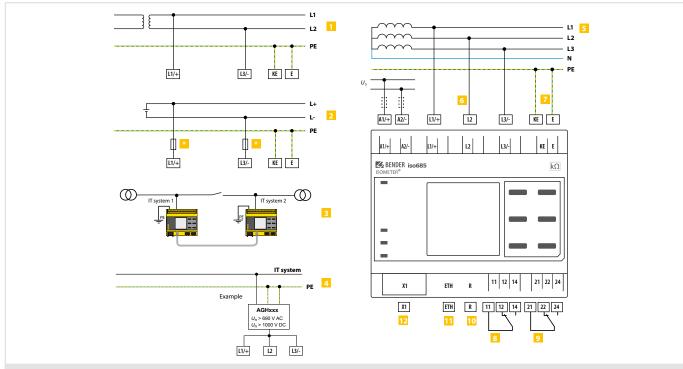
Area of application

Connection to FP200





Wiring diagram



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

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

Recommendation: 2A screw-in fuses.

Provide line protection!

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

NOTE

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

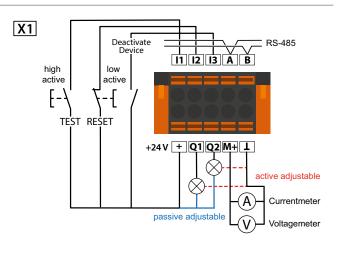
The connecting lines L1/+, L2, L3/- to the system to be monitored must be carried out as spur lines. No load current may be conducted through the terminals.

For UL applications:

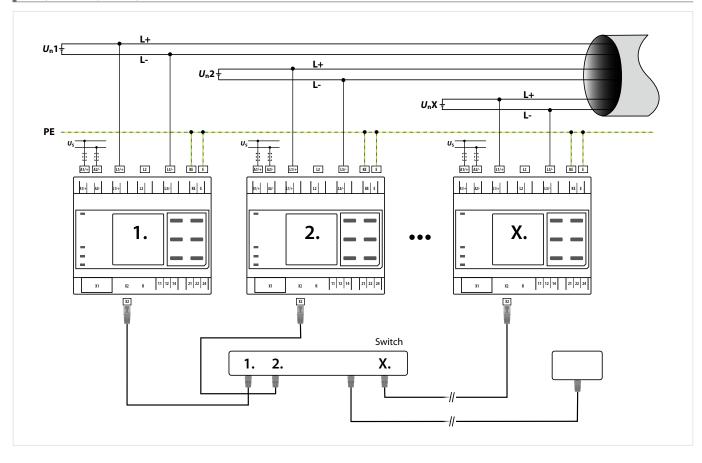
Use 60/70°C copper lines only!

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

Digital interface	Terminal	Description
	l1l3	Configurable digital inputs (e.g. test, reset,)
11 12 13 A B + Q1 Q2 M+ L	А, В	Serial interface RS-485, termination by means of a DIP switch R.
	+	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



ISOsync for coupled IT systems



ISOMETER® isoRW685W-D

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





Typical applications

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

Approvals





Device features

- ISOMETER® for IT AC systems with galvanically connected rectifiers or inverters and for IT DC systems (IT = unearthed systems)
- Automatic adaptation to the existing system leakage capacitance
- Combination of 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 and time
- Current and 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)
- 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

Туј	pe	Nominal system voltage range <i>U</i> n	Supply voltage U₅	Art. No.
isoRW685W-D	2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	AC 0690 V; 1460 Hz DC 01000 V	AC 24240 V; 50400 Hz DC 24240 V	B91067012W

Accessories

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

¹⁾ included in the scope of delivery

Suitable system components

Description	Туре	Art. No.	Page
Coupling devices	AGH150W-4	B98018006	363
	AGH204S-4	B914013	365
	AGH520S	B913033	366
	AGH676S-4	B913055	369

Suitable measuring instruments on request!



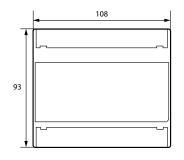
Insulation coordination according to IEC 60664-1/IEC 60664-3	Measuring ranges
Definitions:	Measuring range $f_{\rm n}$ 0.1460 Hz
Measuring circuit (IC1) $(L1/+, L2, L3/-)$	Tolerance measurement of $f_{\rm n}$ $\pm 1\% \pm 0.1$ Hz
Supply circuit (IC2) A1, A2	Voltage range measurement of $f_{\rm D}$ AC 25690 V
Output circuit 1 (IC3) 11, 12, 14	Measuring range U_0 AC 25690 V, DC 01000 V
•	3 3
Output circuit 2 (IC4) 21, 22, 24	Voltage range measurement of $U_{\rm n}$ AC/DC > 10 V
Control circuit (ICS) (E, KE), (X1, ETH, X3, X4)	Tolerance measurement of U_n $\pm 5 \% \pm 5 \text{ V}$
Rated voltage 1000 V	Measuring range C_e 01000 μF
Overvoltage category III	Tolerance measurement of C_{e} \pm 10 $\%$ \pm 10 μF
Rated impulse voltage:	Frequency range measurement of C _e DC, 30460 Hz
IC1/(IC2-5) 8 kV	Min. insulation resistance measurement of $C_{\rm P}$
IC2/(IC3-5) 4 kV	depending on the profile and coupling mode, typ. $>$ 10 k Ω
IC3/(IC4-5) 4 kV	acpending on the prome and touping mode, type 7 to 122
IC4/IC5 4 kV	Display
	Indication graphic display 127 x 127 pixels, 40 x 40 mm ²⁾
Rated insulation voltage:	Display range measured value $0.1 k\Omega \dots 20 M\Omega$
IC1/(IC2-5) 1000 V	. , , ,
IC2/(IC3-5) 250 V	Operating uncertainty (according to IEC 61557-8) $\pm 15 \%$, at least $\pm 1 \text{ k}\Omega$
IC3/(IC4-5) 250 V	LEDs
IC4/IC5 250 V	
Pollution degree outside (U_0 < 690 V)	•
Pollution degree outside ($U_{\rm D} > 690 < 1000 \text{ V}$)	SERVICE yellow
Safe isolation (reinforced insulation) between:	ALARM 1 yellow
	ALARM 2 yellow
IC1/(IC2-5) Overvoltage category III, 1000 V	In (Outrosts (V4 Intents as)
IC2/(IC3-5) Overvoltage category III, 300 V	In-/Outputs (X1-Interface)
IC3/(IC4-5) Overvoltage categoryIII, 300 V	Cable length X1 (unshielded cable) $\leq 10 \text{ m}$
IC4/IC5 Overvoltage category III, 300 V	Cable length X1 (shielded cable, shield connected to earth (PE) on one end, recommended:
Voltage test (routine test) according to IEC 61010-1:	$J-Y(St)Y min. 2x0,8)$ $\leq 100 m$
IC2/(IC3-5) AC 2.2 kV	Total max. supply output current via X1.+/X1.GND for each output max. 1 A
IC3/(IC4-5) AC 2.2 kV	Total max. supply output current via A1/A2 in total on X1 max. 200 mA
IC4/IC5 AC 2.2 kV	Total max. supply output current via A1/A2 in total on X1 between 16.8 V and 40 V
ICT/ICS //C Z.Z.RV	
Supply voltage	$I_{\text{LmaxX1}} = 10 \text{ mA} + 7 \text{ mA/V} * U_S^{3}$
Supply via A1/+, A2/-:	(negative values are not allowed for I _{LmaxX1})
•••	Digital Inputs (I1, I2, I3)
Supply voltage range <i>U</i> _S AC/DC 24240 V	· ·
Tolerance of U_S $-30+15\%$	Number 3
Maximum permissible input current of U_s 650 mA	Operating mode, adjustable active high, active low
Frequency range of $U_{\rm S}$ DC, 50400 Hz ¹⁾	Functions off, test, reset, deactivate device, start initial measurement
Tolerance of the frequency range of U_s $-5+15\%$	Voltage Low DC -35 V, High DC 1132 V
Typical power consumption DC ≤ 12 W	Tolerance Voltage ±10 %
Typical power consumption 50/60 Hz ≤ 12 W/21 VA	
Typical power consumption 400 Hz ≤ 12 W/45 VA	Digital Outputs (Q1, Q2)
· · · · · · · · · · · · · · · · · · ·	Number 2
Supply via X1:	Operating mode, adjustable active, passive
Supply voltage $U_{\rm S}$ DC 24 V	Functions off, Ins. alarm 1, Ins. alarm 2, connection fault, DC- alarm 4,
Tolerance of $U_{\rm S}$ DC -20+25 %	DC+ alarm ⁴⁾ , symmetrical alarm, device fault, common alarm,
	measurement complete, device inactive, DC offset alarm
IT system being monitored	
Nominal system voltage range $U_{\rm n}$ AC 0690 V, DC 01000 V	Voltage passive DC 032 V, active DC 0/19.232 V
AC/DC 0600 V (for UL applications)	Analogue Output (M+)
Tolerance of $U_{\rm D}$ AC/DC +15 %	
Frequency range of <i>U</i> _D DC, 0.1460 Hz	Number 1
Max. AC voltage U_{\sim} in the frequency range $f_{\rm n}=0.14$ Hz U_{\sim} $max=50$ V * $(1+f_{\rm n}^2/{\rm Hz}^2)$	Operating mode linear, midscale point 28 k Ω /120 k Ω
what. At voltage $0 \sim 111$ the frequency range $\eta_1 = 0.14112$ $0 \sim max = 30.0 \cdot (1 + 1) \cdot (11 + 1)$	Functions insulation value, DC shift
Response values	Current $0\dots 20~\text{mA}~(<600~\Omega), 4\dots 20~\text{mA}~(<600~\Omega), 0\dots 400~\mu\text{A}~(<4~\text{k}\Omega)$
Response value R_{an1} (alarm 1) 1 k Ω 10 M Ω	Voltage $010 \text{ V} (> 1 \text{ k}\Omega), 210 \text{ V} (> 1 \text{ k}\Omega)$
	Tolerance related to the current/voltage final value ±20 %
Response value R_{an2} (alarm 2) 1 k Ω 10 M Ω	
Relative uncertainty (acc. to IEC 61557-8) profile dependent, ± 15 %, at least ± 1 k Ω	Interfaces
Hysteresis 25 %, at least 1 k Ω	Field bus
T	
Time response	Interface/protocol web server/Modbus TCP/BCOM
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	Data rate 10/100 Mbit/s, autodetect
profile dependent, typ. 4 s (see diagrams in manual)	Max. amount Modbus requests < 100/s
Response time DC alarm at $C_e = 1 \mu\text{F}$ profile dependent, typ. 2 s (see diagrams in manual)	Cable length $\leq 100 \text{ m}$
Start-up delay T _{start-up} 0120 s	Connection RJ45
	IP address DHCP/manual 192.168.0.5
Measuring circuit	Network mask 255.255.255.0
Measuring voltage $U_{\rm m}$ profile dependent, $\pm 10 \text{ V}$, $\pm 50 \text{ V}$ (see profile overview)	BCOM address system-1-0
Measuring current / _m ≤ 403 µA	
Internal resistance R_i , Z_i $\geq 124 \text{ k}\Omega$	Function communication interface
	Sensor bus
Permissible extraneous DC voltage $U_{fg} \le 1200 \text{ V}$	Interface/protocol RS-485/isoData/BS bus/Modbus RTU
Permissible system leakage capacitance C _e profile dependent, 01000 μF	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
	Terminating resistor at the beginning and at the end of the transmission path
	$120~\Omega$, can be connected internally
	Device address, BS bus 190

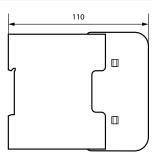


Technical data (continued)

Switching elements						
Number of switching elements				2 cł	nangeover	contact
Operating mode					tion/N/O o	
Contact 11-12-14/21-22-24		larm 1, Ins.				
De	C+ alarm 4)					
		rement co		evice inacti	ve, DC offs	
Electrical endurance under rated operati	ng conditio	ns, numbe	r of cycles			10.00
Contact data acc. to IEC 60947-5-1:						
Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-12	DC-1
Rated operational voltage	230 V	230 V	24 V	48 V	110 V	220
Rated operational current	5 A	3 A	1 A	1 A	0.2 A	0.1
Rated insulation voltage ≤ 2000 m NN						250
Rated insulation voltage ≤ 3000 m NN						160 \
Minimum contact rating				1 m	nA at AC/D	C ≥ 10 \
Environment/EMC						
EMC			DIN EI	N 50121-3-	-2, IEC 613	26-2-4
Ambient temperatures:						
Operating temperature					-40	.+70°
Transport						.+85°
Long-term storage						.+70°
Classification of climatic conditions ac	r to IFC 60	721 (relate	d to tempe	rature and	rolativo hu	midity)•
Stationary use (IEC 60721-3-3)	c. to ile ou	721 (ICIAIC	u to tempe	iature and	i Ciative iiu	3K2
Transport (IEC 60721-3-2)						2K1
Long-term storage (IEC 60721-3-1)						1K2
·		IFC (073)				
Classification of machanical condition	one acc to		1•			
Classification of mechanical condition	ons acc. to	IEC 60/2	1:			3M1
Stationary use (IEC 60721-3-3)	ons acc. to	IEC 60/2	1:			3M1:
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2)	ons acc. to	IEC 60/2	1:			2M
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1)	ons acc. to	IEC 6072	1:		< 30	2M- 1M1
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Area of application	ons acc. to	IEC 6U/2	1:		≤ 30	2M- 1M1
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Area of application Connection						2M- 1M1: 00 m NI
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Area of application Connection Connection type		ggable scr		erminal or p		2M- 1M1: 00 m NI
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Area of application Connection Connection type Screw-type terminals:				erminal or p		2M- 1M1. 00 m NI termina
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Area of application Connection Connection type Screw-type terminals: Nominal current					oush-wire	2M- 1M1. 000 m NI termina ≤ 10 a
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Area of application Connection Connection type Screw-type terminals: Nominal current Tightening torque					oush-wire 6 Nm (5	2M- 1M1. 00 m NI termina ≤ 10 / .7 lb-in
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Area of application Connection Connection type Screw-type terminals: Nominal current Tightening torque Conductor sizes					oush-wire 6 Nm (5	2M- 1M1. 00 m NI termina ≤ 10 / .7 lb-in /G 24-1.
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Area of application Connection Connection type Screw-type terminals: Nominal current Tightening torque Conductor sizes Stripping length					oush-wire 6 Nm (5 AW	2M- 1M1. 00 m NI termina ≤ 10 / .7 lb-in /G 24-1. 7 mn
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Area of application Connection Connection type Screw-type terminals: Nominal current Tightening torque Conductor sizes Stripping length rigid/flexible	plu				oush-wire 6 Nm (5 AW 0.2	2M- 1M1. 00 m NI termina ≤ 10 I .7 lb-in IG 24-1. 7 mn 2.5 mm
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Area of application Connection Connection type Screw-type terminals: Nominal current Tightening torque Conductor sizes Stripping length rigid/flexible flexible with ferrules, with/without plass	plu				oush-wire 6 Nm (5 AW	2M- 1M1. 00 m NI termina ≤ 10 I .7 lb-in IG 24-1. 7 mn 2.5 mm
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Area of application Connection Connection type Screw-type terminals: Nominal current Tightening torque Conductor sizes Stripping length rigid/flexible flexible with ferrules, with/without plass Multiple conductor	plu				0.25	2M· 1M1. 00 m NI termina ≤ 10 / .7 lb-in /G 24-1. 7 mn 2.5 mm
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Area of application Connection Connection type Screw-type terminals: Nominal current Tightening torque Conductor sizes Stripping length rigid/flexible flexible with ferrules, with/without plass Multiple conductor rigid	plu				0.2 0.2	2M· 1M1: 00 m NI termina ≤ 10 / .7 lb-in /G 24-1: 7 mm 2.5 mm
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Area of application Connection Connection type Screw-type terminals: Nominal current Tightening torque Conductor sizes Stripping length rigid/flexible flexible with ferrules, with/without plass Multiple conductor rigid flexible	plu tic sleeve				0.2 0.2 0.2	2M· 1M1: 00 m NI termina ≤ 10 / .7 lb-in /G 24-1: 7 mm 2.5 mm 2.5 mm
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Area of application Connection Connection type Screw-type terminals: Nominal current Tightening torque Conductor sizes Stripping length rigid/flexible flexible with ferrules, with/without plass Multiple conductor rigid	plu tic sleeve c sleeve				0.2 0.2 0.2 0.2	2M 1M1 00 m Ni termina ≤ 10 . .7 lb-in /G 24-1 7 mr 2.5 mm 2.5 mm

Dimension diagram (dimensions in mm)





Push-wire terminals:

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

Push-wire terminals X1:

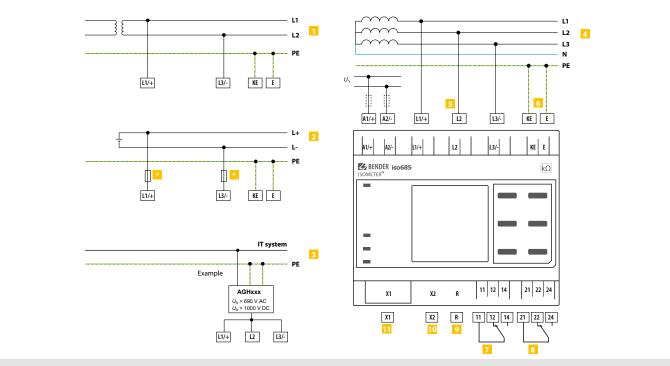
Nominal current	≤ 8 A
Conductor sizes	AWG 24-16
Stripping length	10 mm
rigid/flexible	0.21.5 mm ²
flexible with ferrule without plastic sleeve	0.251.5 mm ²
flexible with TWIN ferrule with plastic sleeve	0.250.75 mm ²

0ther

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	D00178
Weight	< 390 q

- 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®
- ⁴⁾ For $U_n \ge 50 \text{ V}$ only.
- 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.



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

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

Provide line protection!

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

NOTE:

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

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

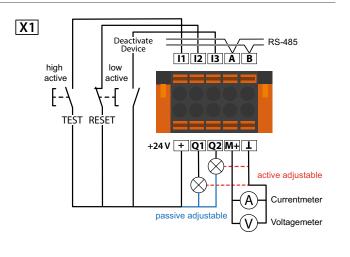
For UL applications:

Use 60/70°C copper lines only!

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

Digital interface X1

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



ISOMETER® isoRW685W-D-B

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





Typical applications

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

Approvals





Device features

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

Standards

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

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

Further information

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

Ordering information

Туре		Nominal system voltage range <i>U</i> n	Supply voltage U _s	Art. No.
isoRW685W-D-B	The state of the s	AC 0690 V; 0,1460 Hz DC 01000 V	AC 24240 V; 50400 Hz DC 24240 V	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
	AGH150W-4	B98018006	363
Counting devices	AGH204S-4	B914013	365
Coupling devices	AGH520S	B913033	366
	AGH676S-4	B913055	369

Suitable measuring instruments on request!

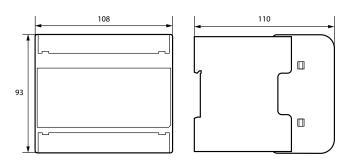


Insulation coordination acc. to IEC 60664-1/IEC 606	664-3	Measuring ranges
Definitions:		Measuring range $f_{\rm n}$ 0.1460 Hz
Measuring circuit (IC1)	(L1/+, L2, L3/-)	Measurement tolerance of f_0 $\pm 1\% \pm 0.1$ Hz
Supply circuit (IC2)	A1, A2	Measurement voltage range of f_n AC 25690 V
Output circuit 1 (IC3)	11, 12, 14	Measuring range $U_{\rm n}$ AC 25690 V, DC 251000 V
•	21, 22, 24	
Output circuit 2 (IC4)		, , , , , , , , , , , , , , , , , , ,
Control circuit (IC5)	(E, KE), (X1, ETH, X3, X4)	Measurement tolerance of U_n $\pm 5 \% \pm 5 \text{ V}$
Rated voltage	1000 V	Measuring range C _e 01000 μF
Overvoltage category	III	Measurement tolerance of $C_{\rm e}$ \pm 10 % \pm 10 μ F
Rated impulse voltage:		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	acperiality on profile and coupling mode, 490.7 To 122
		Display
IC3/(IC4-5)	4 kV	Display graphic display 127 x 127 pixels, 40 x 40 mm ²⁾
IC4/IC5	4 kV	Display range measured value $\frac{127 \times 127 \text{ pixels}}{127 \times 127 \text{ pixels}}$, 40 x 40 min $\frac{1}{127 \times 127 \text{ pixels}}$
Rated insulation voltage:		· · · ·
IC1/(IC2-5)	1000 V	Operating uncertainty (acc. to IEC 61557-8) \pm 15 %, min. 1 k Ω
IC2/(IC3-5)	250 V	IFD.
IC3/(IC4-5)	250 V	LEDs
IC4/IC5	250 V	ON (operation LED) green
		SERVICE yellow
Pollution degree outside ($U_n < 690 \text{ V}$)	3	ALARM 1 yellow
Pollution degree outside ($U_n > 690 < 1000 \text{ V}$)	2	ALARM 2 yellow
Protective separation (reinforced insulation) between:		yellon.
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 m
IC3/(IC4-5)	overvoltage category III, 300 V	
IC4/IC5	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)
	overvoitage 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	$I_{\text{LmaxX1}} = 10 \text{ mA} + 7 \text{ mA/V} * U_{\text{S}}^{3}$
		(negative values are not allowed for $I_{l,maxX1}$)
Supply voltage		(negative randes are not another to relinant)
Supply via A1/+, A2/-:		Digital inputs (11, 12, 13)
•••	AC/DC 24240 V	Number 3
Supply voltage range U _S		
Tolerance of U _s	-30+15 %	Operating mode, adjustable active high, active low
Maximum permissible input current of $U_{\rm S}$	650 mA	Functions off, test, reset, deactivate device, start initial measurement
Frequency range of $U_{\rm S}$	DC, 50400 Hz ¹⁾	Voltage Low DC -35 V, High DC 1132 V
Tolerance of the frequency range of U_S	-5+15 %	Voltage tolerance $\pm 10 \%$
Typical power consumption DC	≤ 12 W	D' '- L (04 02)
Typical power consumption 50/60 Hz	≤ 12 W/21 VA	Digital outputs (Q1, Q2)
Typical power consumption 400 Hz	≤ 12 W/45 VA	Number 2
	= 12 W/15 W	Operating mode, adjustable active, passive
Supply via X1:		Functions off, ins. alarm 1, ins. alarm 2, connection fault, DC- alarm 4),
Supply voltage $U_{\rm S}$	DC 24 V	DC+ alarm ⁴⁾ , symmetrical alarm, device error, common alarm,
Tolerance of $U_{\rm S}$	DC -20+25 %	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+)
Tronman system rorrage range on	AC/DC 0600 V (for UL applications)	
Tolorance of //	• • • • • • • • • • • • • • • • • • • •	Number 1
Tolerance of U_n	AC/DC +15 %	Operating mode linear, mid-scale $28 \text{ k}\Omega/120 \text{ k}\Omega$
Frequency range of U_n	DC 0.1460 Hz	Functions insulation value, DC offset
Max. AC voltage U_{\sim} in the frequency range $f_n = 0.14$	Hz $U_{\sim \text{ max}} = 50 \text{ V}^* (1 + f_n^2/\text{Hz}^2)$	Current $020 \text{ mA} (< 600 \Omega), 420 \text{ mA} (< 600 \Omega), 0400 \mu \text{A} (< 4 \text{ k}\Omega)$
D		Voltage $010 \text{ V} (> 1 \text{ k}\Omega), 210 \text{ V} (> 1 \text{ k}\Omega)$
Response values		<u> </u>
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	
Hysteresis	25% , min. 1 k Ω	Field bus
nyacicas	23 70, IIIII. I KS2	Interface/protocol web server/Modbus TCP/BCOM
Time response		Data rate 10/100 Mbit/s, autodetect
<u> </u>	. — 1 uE acc to IEC 61557 0	Max. amount Modbus requests < 100/s
Response time t_{an} at $R_F = 0.5 \times R_{an}$ ($R_{an} = 10 \times \Omega$) and $C_{an} = 0.5 \times R_{an}$		
· · · · ·	endent, typ. 4 s (see diagrams in the manual)	Cable length ≤ 100 m
Response time DC alarm at $C_e = 1 \mu F$ profile-dep	pendent, typ. 2 s (see diagram in the manual)	Connection RJ45
Start-up delay T _{start-up}	0120 s	IP address DHCP/manual 192.168.0.5
W		Network mask 255.255.255.0
Measuring circuit		BCOM address system-1-0
Measuring voltage $U_{\rm m}$ profile-dep	pendent, ±10 V, ±50 V (see profile overview)	Function communication interface
Measuring current I _m	≤ 403 μA	
Internal resistance R_i , Z_i		ISOnet
	≥ 124 kΩ	Number of ISOnet devices 220 dev
Internal resistance with system isolation (inactive via I/O; inactive via I/O; inact	active via ISOnet; shutdown) typ. 50 M Ω	
Internal resistance with system isolation (inactive via I/O; inapermissible extraneous DC voltage \textit{U}_{fg}	active via ISOnet; shutdown) typ. 50 M Ω \leq 1200 V	Maximum nominal system voltage ISOnet AC, 690 V/DC, 1000 V
Internal resistance with system isolation (inactive via I/O; inactive via I/O; inact	active via ISOnet; shutdown) typ. 50 M Ω	

Technical data (continued)

Sensor bus						
Interface/protocol			RS-485	/isoData/B	S bus/Mod	lbus RTU
Data rate						kbaud/
Cable length					<u> </u>	1200 m
Cable: twisted pair, one end of shiel	d connected to	PE	recom	mended: J	I-Y(St)Y m	in. 2x0.8
Connection					rminals X	
Terminating resistor at the beginning	ng and end of th	e transmis	sion path			,
,	,		•	, can be co	nnected in	nternall
Device address, BS bus						19
Switching elements						
Switching elements				2 ch	nangeover	contact
Operating mode			N/	'C operatio		
Contact 11-12-14/21-22-24	off. ins. a	larm 1, ins.				•
CONTACT 11 12 14/21 22 24	DC+ alarm 4					
		rement co				
Electrical endurance, number of cyc			p.c.ce, uc		,	1000
Contact data acc. to IEC 60947-5						
Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-12	DC-1
Rated operational voltage	230 V	230 V	24 V	48 V	110 V	220
Rated operational current	5 A	3 A	1 A	1 A	0.2 A	0.1
Rated insulation voltage ≤ 2000 m					V.2.	250
Rated insulation voltage \leq 3000 m						160
Minimum contact rating				1 m	A at AC/D	C > 10
Environment/EMC						
			DIN EI	N 50121-3-	2, IEC 613	26-2-4 ⁵
EMC			DIN E	N 50121-3-	2, IEC 613	26-2-4
EMC Ambient temperatures:			DIN EI	N 50121-3-		
EMC Ambient temperatures: Operating temperature			DIN E	N 50121-3-	-40	.+70°
EMC Ambient temperatures: Operating temperature Transport			DIN EI	N 50121-3-	-40 -40	.+70° .+85°
EMC Ambient temperatures: Operating temperature Transport Long-term storage	ns acc. to IEC 60	721 (relate			-40 -40 -40	.+70° .+85° .+70°
EMC Ambient temperatures: Operating temperature Transport Long-term storage Classification of climatic condition	ns acc. to IEC 60	721 (relate			-40 -40 -40	.+70° .+85° .+70° midity):
EMC Ambient temperatures: Operating temperature Transport Long-term storage Classification of climatic condition Stationary use (IEC 60721-3-3)	ns acc. to IEC 60	721 (relate			-40 -40 -40	.+70° .+85° .+70° midity):
EMC Ambient temperatures: Operating temperature Transport Long-term storage Classification of climatic condition Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2)	ns acc. to IEC 60	721 (relate			-40 -40 -40	.+70° .+85° .+70° midity): 3K2 2K1
EMC Ambient temperatures: Operating temperature Transport Long-term storage Classification of climatic condition Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1)			d to tempe		-40 -40 -40	.+70° .+85° .+70° midity): 3K2 2K1
EMC Ambient temperatures: Operating temperature Transport Long-term storage Classification of climatic condition Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical con			d to tempe		-40 -40 -40	.+70° .+85° .+70° midity): 3K2 2K1 1K2
EMC Ambient temperatures: Operating temperature Transport Long-term storage Classification of climatic condition Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical con Stationary use (IEC 60721-3-3)			d to tempe		-40 -40 -40	.+70° .+85° .+70° midity): 3K2 2K1 1K2
EMC Ambient temperatures: Operating temperature Transport Long-term storage Classification of climatic condition Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical con Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2)			d to tempe		-40 -40 -40	.+70 ° .+85 ° .+70 ° midity): 3K2 2K1 1K2
EMC Ambient temperatures: Operating temperature Transport Long-term storage Classification of climatic condition Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical con Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Long-term storage (IEC 60721-3-1)			d to tempe		-40 -40 -40 relative hu	. +70 °(. +85 °(. +70 °(midity): 3K2: 2K1: 1K2: 3M1: 2M- 1M1:
EMC Ambient temperatures: Operating temperature Transport Long-term storage Classification of climatic condition Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical con Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Area of application Connection			d to tempe		-40 -40 -40 relative hu	.+70 °(.+85 °(.+70 °(
EMC Ambient temperatures: Operating temperature Transport Long-term storage Classification of climatic condition Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical con Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Area of application		IEC 6072	d to tempe		-40 -40 -40 relative hun	.+70 ° .+85 ° .+70 ° midity): 3K2. 2K1 1K2. 3M1: 2M- 1M1. 00 m NI
EMC Ambient temperatures: Operating temperature Transport Long-term storage Classification of climatic condition Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical con Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Area of application Connection Connection type		IEC 6072	d to tempe	rature and	-40 -40 -40 relative hun	.+70° .+85° .+70° midity): 3K2 2K1 1K2 3M1 2M 1M1 00 m NI
EMC Ambient temperatures: Operating temperature Transport Long-term storage Classification of climatic condition Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical con Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Area of application Connection Connection Connection type Screw-type terminals:		IEC 6072	d to tempe	rature and	-40 -40 -40 relative hun	. +70 °0 . +85 °0 . +70 °0 3K2. 2K1 1K2. 3M1. 2M. 1M1. 1M1.
EMC Ambient temperatures: Operating temperature Transport Long-term storage Classification of climatic condition Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical con Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Area of application Connection Connection type Screw-type terminals: Nominal current		IEC 6072	d to tempe	rature and	-404040 relative hun ≤ 300	.+70° .+85° .+70° 3K2 2K1 1K2 3M1 2M 1M1 00 m NI
EMC Ambient temperatures: Operating temperature Transport Long-term storage Classification of climatic condition Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical con Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-3) Area of application Connection Connection Connection type Screw-type terminals: Nominal current Tightening torque		IEC 6072	d to tempe	rature and	-404040 relative hun ≤ 300 oush-wire 6 Nm (5	.+70° .+85° .+70° midity): 3K2 2K1 1K2 3M1 2M 1M1 00 m Ni termina
EMC Ambient temperatures: Operating temperature Transport Long-term storage Classification of climatic condition Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical con Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-3) Area of application Connection Connection Connection type Screw-type terminals: Nominal current Tightening torque Conductor sizes		IEC 6072	d to tempe	rature and	-404040 relative hun ≤ 300 oush-wire 6 Nm (5	.+70° .+85° .+70° midity): 3K2 2K1 1K2 3M1 2M 1M1 00 m NI ≤ 107 lb-in
EMC Ambient temperatures: Operating temperature Transport Long-term storage Classification of climatic condition Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical con Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Area of application Connection Connection type Screw-type terminals: Nominal current Tightening torque Conductor sizes Stripping length		IEC 6072	d to tempe	rature and	-40 -40 -40 relative hun ≤ 30 bush-wire 6 Nm (5	. +70 ° . +85 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° 3K2 2K1 1K2 3M1 2M 1M1 200 m N 1 termina ≤ 10 . 7 lb-ir /G 24-1 7 mr
EMC Ambient temperatures: Operating temperature Transport Long-term storage Classification of climatic condition Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical con Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Area of application Connection Connection type Screw-type terminals: Nominal current Tightening torque Conductor sizes Stripping length rigid/flexible	ditions acc. to	IEC 6072	d to tempe	rature and	-40 -40 -40 relative hun ≤ 30 bush-wire 6 Nm (5	. +70° . +85° . +70° . +70° . +70° 3K2 2K1 1K2 3M1 2M 1M1 200 m NI 4c1 4c1 4c2 4c1 4c2 4c1 4c2
EMC Ambient temperatures: Operating temperature Transport Long-term storage Classification of climatic condition Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical con Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Area of application Connection Connection type Screw-type terminals: Nominal current Tightening torque Conductor sizes Stripping length rigid/flexible flexible with ferrule with/without p	ditions acc. to	IEC 6072	d to tempe	rature and	-404040 relative hun ≤ 30 oush-wire 6 Nm (5 AW 0.2 0.25	. +70° . +85° . +70° . +70° . +70° 3K2 2K1 1K2 3M1 2M 1M1 200 m NI 4c1 4c1 4c2 4c1 4c2 4c1 4c2
EMC Ambient temperatures: Operating temperature Transport Long-term storage Classification of climatic condition Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical con Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Area of application Connection Connection type Screw-type terminals: Nominal current Tightening torque Conductor sizes Stripping length rigid/flexible flexible with ferrule with/without p Multiple conductor rigid	ditions acc. to	IEC 6072	d to tempe	rature and	-404040 relative hun ≤ 30 oush-wire 6 Nm (5 AW 0.2 0.25	.+70° .+85° .+70° .+70° .+70° .+70° .+70° .+70° .+70° .+70°710-in710
EMC Ambient temperatures: Operating temperature Transport Long-term storage Classification of climatic condition Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical con Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Area of application Connection	ditions acc. to	Pluggab	d to tempe	rature and	-404040 relative hun ≤ 30 oush-wire 6 Nm (5 AW 0.2 0.25 0.2. 0.2	. +70 ° . +85 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70 ° . +70

Dimension diagram (dimensions in mm)



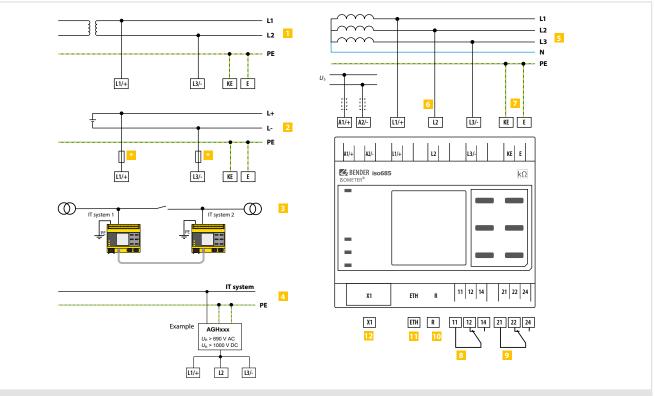
Push-wire terminals:	
Nominal current	≤ 10 A
Conductor sizes	AWG 24-12
Stripping length	10 mm
rigid/flexible	0.22.5 mm ²
flexible with ferrule with/without plastic sleeve	0.252.5 mm ²
Multiple conductor, flexible, with TWIN ferrule with plastic sleeve	0.51.5 mm ²

Push-wire terminals X1:	
Nominal current	≤ 8 A
Conductor sizes	AWG 24-16
Stripping length	10 mm
rigid/flexible	0.21.5 mm ²
flexible with ferrule without plastic sleeve	0.251.5 mm ²
flexible with ferrule with plastic sleeve	0.250.75 mm ²

Operating mode	Continuous operation
Mounting position (0°)	display-oriented, cooling slots must be ventilated vertically 6
Degree of protection internal compo	nents 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_{S} [Volt] = supply voltage ISOMETER $^{\circ}$
- ⁴⁾ Only for $U_n \ge 50 \text{ V}$.
- 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.



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

Provide line protection!

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

Note:

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

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

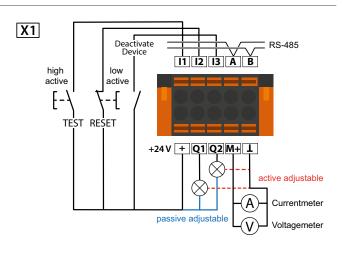
For UL applications:

Use 60/70 °C copper lines only!

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

Digital interface X1

Digital interface	Terminal	Description
	I1I3	Configurable digital inputs (e.g. test, reset,)
	A, B	Serial interface RS-485, termination by means of a DIP switch R.
11 12 13 A B + Q1 Q2 M+ L	of short circuits and transients (rese	
	Q1, Q2	Configurable digital output
	M+	Configurable analogue output (e.g. measuring instrument)
	上	Reference potential ground





Display FP200

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



Device features

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

Further information

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

Typical applications

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

Approvals





Ordering information

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

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

Accessories

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

Technical data

Technical data	
Insulation co-ordination (IEC 60664-1/IEC	60664-3)
Rated voltage	50 V
Overvoltage category (OVC)	!!!
Rated impulse voltage	800 V
Rated insulation voltage	50 V
Pollution degree for accessible parts on the out	side of the device housing 3
Supply voltage	
Supply voltage $U_{\rm S}$	DC 24 V (via iso685-S variant)
Power consumption	1.2 W
Display	
Graphic display	127 x 127 pixel, 40 x 40 mm
LEDs	
ON (operation LED)	green
SERVICE	yellow
ALARM 1	yellow
ALARM 2	yellow
Interfaces	
Interface/protocol	Internal Bender
Cable length	≤ 5 m
REMOTE Cable	Patch cable at least CAT5e
Environment/EMC	
EMC	IEC 61326-2-4; EN 50121-3-2; EN 50121-4
Ambient temperatures	
Operating temperature	-25+55 °C
Transport	-40+85 °C
Long-term storage	-40+70°0
	C 60721 (related to temperature and relative humidity):
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11
Long-time storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions ac	
Stationary use (IEC 60721-3-3)	3M11
Transportation (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12

Connection	
Connection type	plug connectors
Other	
Operating mode	continuous operation
Mounting (0°)	display oriented,
	cooling slots must be ventilated vertically 1)
Degree of protection, built-in components (DIN EN	60529) IP40
Degree of protection, terminals (DIN EN 60529)	IP20
Panel cut-out	138x66 mm
Permissible tolerance of panel cut-out	+0.5 /-0
Screw mounting	with mounting brackets
Torque screw mounting	0,3 Nm ±10%
Enclosure material	polycarbonate
Flammability class	UL94V-0
Dimensions (W x H x D)	144 x 72 x 35.6 mm
Documentation number	D00169
Weight	< 180 g
Option "W" data different from the standard	version
(Only for remote mounting)	
Ambient temperatures:	
Operating temperature	-40+70°C
Transport	-40+85 °C
Long-term storage	-40+70°C

Classification of climatic conditions acc. to IEC 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) 3M12

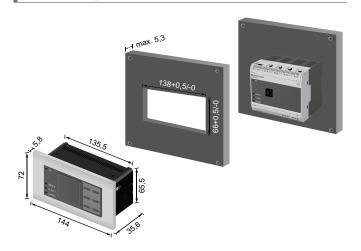
()* = factory setting

≤3000 m NN

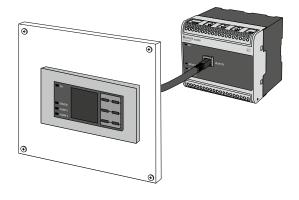
 $^{1)}\,$ Recommendation: Devices mounted at 0° (display-oriented, cooling slots must be ventilated vertically). For devices mounted at an angle \neq 0°, the max. working temperature is reduced by 10 °C for devices with a "W" in the device name.

Dimension diagram (dimensions in mm)

Area of application



Connection to iso685



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

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





Typical applications

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

Approvals



IRDH275BM-7



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

Further information

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

Ordering information

Туре	Nominal system voltage <i>U</i> n	Supply voltage <i>U</i> ₅	Cable length	Art. No.	Page
IRDH275BM-727	-	AC 19.255 V; 42460 Hz, DC 19.272 V	-	B91065120	-
AGH675S-7-2000	AC/DC 07.2 kV; 0460 Hz		2000 mm	B913061	367
AGH675S-7-500	AC/DC 0/.2 KV; 0460 HZ	_	500 mm	B913060	367
AGH675S-7MV15-500	AC/DC 015.5 kV, 0460 Hz	-	500 mm	B913058	367

Suitable system components

Description	Туре	Art. No.	Page
External kΩ measuring instruments	9620-1421	B986849	388

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 $U_{\rm n}$	via AGH675S-7
Supply voltage $U_{\rm S}$ (also see nameplate)	AC 19.255 V*
Frequency range $U_{\rm S}$	42460 Hz
Supply voltage U_5 (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 kΩ	±100 kΩ
Relative percentage error 500 k Ω 10 M Ω	0 %+20 %
Response time tan	≤ 5 min
Hysteresis	25 %
Measuring circuit	
Measuring voltage Um	≤ 50 V
Measuring current Im (at RF = 0Ω)	≤ 21 μA
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 μF
Factory setting	2 μF
Displays	
Display, illuminated	two-line display
Characters (number of characters)	2 x 16
Display range, measuring value	50 kΩ10 MΩ
Relative percentage error $50500 \text{ k}\Omega$	±50 kΩ
Relative percentage error 500 k Ω 10 M Ω	±10 %
Outputs/inputs	
TEST/ RESET button	internal/externa
Cable length TEST/RESET button external	≤ 10 m
Current output for measuring instrument SKMP (scale centro	e point = 1.2 M Ω):
Current output (load)	20 mA (≤ 500 Ω)
Accuracy current output (100 k Ω \dots 10 M Ω)	±10 %, ±100 kΩ
Serial interface	
Interface/Protocol	RS-485/BMS
Connection	terminals A/E
Cable length	≤ 1200 m
Recommended cable (screened, screen on one side connected to PE)	J-Y(St)Y 2x0.6
Terminating resistor	120 Ω (0.5 W)
Device address, BMS bus	130 (factory setting = 3)

	contacts: K1 (Alarm 1), K2 (Alarm 2, system fault
Operating principle K1, K2 (Alarm 1, Alarm 2)	N/O or N/C operation
Factory setting (Alarm 1/Alarm 2)	N/O operation
Electrical endurance	12 000 switching operations
Contact class	IIB (IEC 60255-23
Rated contact voltage	AC 250 V/DC 300 \
Making capacity	AC/DC 5 A
Breaking capacity	2 A, AC 230 V, cos phi = 0.4
	0.2 A, DC 220 V, L/R = 0.04 s
Minimum contact current at DC 24 V	≥ 2 mA (50 mW
Environment/EMC	
EMC immunity	acc. to EN 61326
EMC emission	acc. to EN 61326
Shock resistance IEC 60068-2-27 (device in operation)	15 g/11 m:
Bumping IEC 60068-2-29 (during transport)	40 g/6 m:
Vibration resistance IEC 60068-2-6 (device in operation	
Vibration resistance IEC 60068-2-6 (during transport)	2 g/10150 H
Ambient temperature (during operation)	-10+55 °C
Storage temperature range	-40+70 °C
Climatic class acc. to IEC 60721-3-3	3K22
Connection	
Connection	screw terminals
Connection	
rigid, flexible	0.24 mm ² /0.22.5 mm
flexible with connector sleeve, without/with plastic sle	eeve 0.252.5 mm
Conductor sizes	AWG 24-12
Other	
Operating mode	continuous operation
Mounting	as indicated on the display
Protection class, internal components (DIN EN 60529	P30
Protection class, terminals (DIN EN 60529)	IP20
Type of enclosure	X112, free from haloger
DIN rail mounting	IEC 60715
Flammability class	UL94 V-0
Tightening torque	0.5 Nn
Documentation number	D00123
Weight approx.	510 (

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

Environment	
Operating temperature (normal operation)	- 10+ 60 ℃
Operating temperature (continuous operation with asymetrical earth fault	- 10+ 55 ℃
Classification of climatic conditions acc. to IEC 60721 (no condensa	tion, no formation of ice)
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions acc. to IEC 60721	
Stationary use (IEC 60721-3-3)	3M11 (3M12 Y shaft)
Transport (IFC 60721-3-2)	2M4

1M12

Connection

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

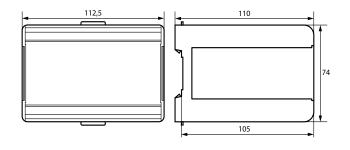
Connection terminal 2 (medium voltage)	high-voltage cable (encapsulated on the device side)
Connection, flexible with ring terminal	M4
Connection 3, 4, 5	screw-type terminals
Connection	
rigid, flexible	0.24 mm ² /0.22.5 mm ²
flexible with connector sleeve	0.252.5 mm ²

Other

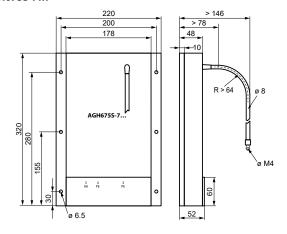
Operating mode	continuous operation
Mounting	any position
Protection class, internal components (DIN EN 60529)	IP64
Protection class, terminals (DIN EN 60529)	IP20
Type of enclosure	resin-encapsulated block
Screw mounting	M5
Flammability class	UL94 HB
Documentation number	D00095
Weight approx.	≤ 5100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

Dimension diagrams (dimensions in mm)

IRDH275BM-7

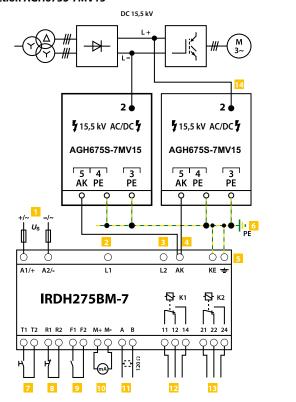


AGH675S-7...



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

Connection AGH675S-7MV15



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

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

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

ISOMETER® iso415R-x

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





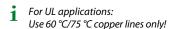


Typical applications

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

Approvals





Device features

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

Bender Connect App









Licences

Open source software:

https://www.bender.de/fileadmin/content/Products/t/0/Software-information.pdf

Standards

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

• IEC 61557-8

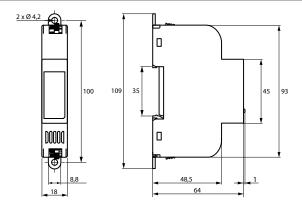
Further information

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

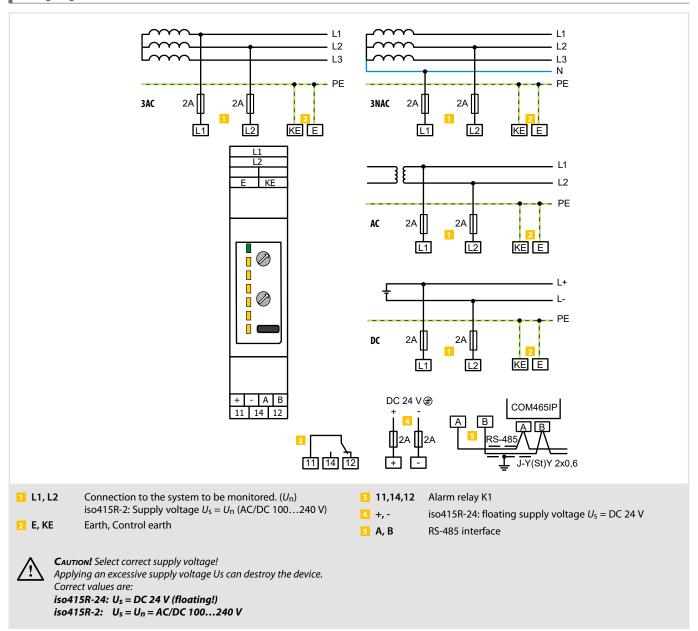
Ordering information

Туре	Supply voltage U₅	U _s Nominal system voltage U _n	
iso415R-24	DC 24 V	AC 0415 V / DC 0400 V	B71602000
iso415R-2	AC/DC 100240 V	(3)AC 100240 V / 3NAC 100415 V / DC 100240 V	B71603000

Insulation coordination acc. to IEC 60664-1/IEC 60664-3		RS-485 interface					
Definitions:		Protocol				Mod	dbus RTU
Measuring circuit (IC1)	L1, L2	Baud rate 1)		max	k. 115.2 kb	its/s (19.2	kbits/s)*
Control circuit (IC2)	E, KE, +, -, A, B	Parity 1)			eve	en, no, odo	d (even)*
Output circuit (IC3)	11, 14, 12	Stop bits 1)				1/ 2/ auto	o (auto)*
Rated voltage	400 V	Cable length (9.6 kbits/s)					≤ 1200 m
Overvoltage category	III	Cable: twisted pair 2)				min. J-Y(S	
Operating altitude	2000 m AMSL	Terminating resistor (external)					(0.25 W)
Rated impulse voltage:		Device address, Modbus RTU 5)			1.	247 (10	0 + SN)*
IC1/(IC2-3)	6 kV	Switching alaments					
IC2/IC3	4 kV	Switching elements					
Rated insulation voltage:		Switching elements	NC			changeove on (NO ope	
IC1/(IC2-3)	400 V	Operating principle 1) Electrical endurance, number of cycles	NC (peration/	NO operati	on (NO ope	10000
IC2/IC3	250 V	· · · · · · · · · · · · · · · · · · ·					10000
Pollution degree	2	Contact data acc. to IEC 60947-5-1:					
Protective separation between:		Utilisation category	AC-12	AC-14	DC-12	DC-12	DC-12
IC1/(IC2-3)	Overvoltage category III, 600 V	Rated operational voltage	230 V	230 V	24 V	110 V	220 V
IC2/(IC3)	Overvoltage category III, 300 V	Rated operational current	5 A	3 A	1 A	0.2 A	0.1 A
Voltage tests (routine test) acc. to IEC 61010-1		Minimum contact rating 3)			1 n	nA at AC/D	$C \ge 10 \text{ V}$
IC3/(IC1-2)	AC 2.2 kV	Connection					
Supply voltage		Connection type					Push-in
,		Nominal current					Yusn-in≤ 10 A
iso415R-24: Only via galvanically separated power supply (+/-)	865	Connection properties					≥ 10 A
Supply voltage $U_{\rm S}$	DC 24 V	rigid			02 15	mm² (AW	IG 24-16)
Tolerance of U _s	-20+25 %	flexible				mm ² (AW	,
Power consumption	≤ 2 W	with ferrule with plastic sleeve			0.21.3		0.75 mm ²
Inrush current (< 5 ms)	< 10 A	with ferrule with plastic sleeve 4)					.1.5 mm ²
iso415R-2: Only via the system to be monitored $U_s = U_n (L1/L2)$)		·				0.75	וווווו כ.ו
Monitored IT system iso415R-24		Environment/EMC					
Nominal system voltage $U_{\rm D}$ 3	(N)AC, AC 0415 V/DC 0400 V	EMC				IEC 6	1326-2-4
Tolerance of U _n	AC +15 %, DC +25 %	Ambient temperatures					
Frequency range of $U_{\rm D}$	DC 42460 Hz	Operation					+55 ℃
_ , , ,		Transport				-40	+85 ℃
Monitored IT system iso415R-2		Storage				-40	+70 ℃
Nominal system voltage $U_n = U_s$		Classification of climatic conditions acc. to I	EC 60721 (relate	ed to tempe	erature and	relative hu	ımidity):
3(N)AC, AC, DC	100240 V	Stationary use (IEC 60721-3-3)					3K22
Tolerance of U _n	−30 %…+15 %	Transport (IEC 60721-3-2)					2K11
Frequency range of U_n	DC 42460 Hz	Long-term storage (IEC 60721-3-1)					1K22
Power consumption (at 50 Hz)	\leq 2 W / \leq 3.5 VA	Classification of mechanical conditions a	rc to IEC 6072	1			
Inrush current (< 2 ms)	< 1.8 A	Stationary use (IEC 60721-3-3)	.c. to ile 00/2				3M11
Measuring circuit		Transport (IEC 60721-3-2)					2M4
Measuring voltage $U_{\rm m}$	±16 V	Long-term storage (IEC 60721-3-1)					1M12
Measuring voltage $I_{\rm m}$ at $R_{\rm F}$, $Z_{\rm F} = 0~\Omega$	±10 V ≤ 90 μA	Long term storage (IEC 00721 3 1)					111112
Internal resistance R_i , Z_i	≥ 180 kΩ	Other					
Permissible system leakage capacitance C _e	≥ 100 kΩ2 ≤ 25 μF	Operating mode			CO	ntinuous o	peration
Permissible extraneous DC voltage U_{fq}	≤ 500 V	Mounting	CC	ooling slots	s must be v	entilated v	vertically
remissible extraneous be voltage org		Degree of protection, internal components (DI	N EN 60529)				IP30
Response values		Degree of protection, terminals (DIN EN 60529)				IP20
Response value R _{an1}	101000 kΩ (40 kΩ)*	Enclosure material				polyc	arbonate
Response value R _{an2}	5700 kΩ (10 kΩ)*	DIN rail mounting acc. to				II	EC 60715
Relative uncertainty R_{an}	±15 % ±2 kΩ	Flammability class					UL94 V-0
Hysteresis R _{an}	25% , minimum $1k\Omega$	Documentation number					D00401
Time response		Weight					≤ 100 g
Response time t_{an} at $R_F = 0.5$ x R_{an} and $C_e = 1$ μF		()* Factory setting					
acc. to IEC 61557-8	≤6s	1) Configurable via App and Modbus					
Start-up delay t 1)	01800 s (0 s)*	,					
Response delay t_{on}^{-1}	01800 s (0 s)*	2) When supplied by or when monitoring syst		uency			
Delay on release $t_{\rm off}$ ¹⁾	01800 s (0 s)*	≥ 200 Hz, the cable must be laid in a shock	•				
Recovery time	< 0.4 s	3) Refers to relays that have not been operate	-				
Displays, memory		4) Use crimping pliers similar to CRIMPFOX 6 /	Weidmüller PZ	6/PZ6/5 oı	nly.		
• • •	us LED incl. LED bar graph (7 LEDs)	$^{5)}$ Factory setting: $100 + last two digits of ser$	ial number				
Display range insulation resistance (R _F)	$11000 \mathrm{k}\Omega$	⁶⁾ Resolution/step size 1 k Ω					
Measuring range insulation resistance (R_F)	11000 kΩ 2 110000 kΩ 6						
Operating uncertainty	$\pm 15\% \pm 2 \text{ k}\Omega$						
Fault memory alarm messages	on/off (off)*						
raut memory diarm messages	JII/JII (JII)						



Wiring diagram



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



Typical applications

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

Approvals







Device features

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

Standards

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

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

Further information

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

Ordering information

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

¹⁾ Absolute values

Accessories

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

Insulation coordination acc. to IEC 60664-1/IEC	60664-3	Switching elements					
Rated insulation voltage	250 V	Number of switching elements			2 (changed	ver contac	t K1, K2)
Rated impulse voltage/pollution degree	4 kV/3	1/3 Operating principle N/C / N/O operation (N/O operation)				eration)*	
Protective separation (reinforced insulation) between	l	Electrical service life, number of cycles					10000
(A1, A2	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	2.21 kV	Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-12
Comple make we		Rated operational voltage	230 V	230 V	220 V	110 V	24 V
Supply voltage		Rated operational current	5 A	3 A	0.1 A	0.2 A	1 A
IR420-D4-1:		Minimum contact rating				nA at AC/D	
Supply voltage $U_{\rm S}$	AC 1672 V / DC 9.694 V						
Frequency range U_s	42460 Hz / DC	Environment/EMC					
IR420-D4-2:		EMC					1326-2-4
Supply voltage U_{S}	AC/DC 70300 V	Operating temperature				-25.	+55 ℃
Frequency range $U_{\rm S}$	42460 Hz, DC	Classification of climatic conditions acc. to IEC 60	721 (relate	d to tempe	erature and	relative hu	midity):
Power consumption	≤ 4 VA	Stationary use (IEC 60721-3-3)					3K22
		Transport (IEC 60721-3-2)					2K11
IT system being monitored		Long-time storage (IEC 60721-3-1)					1K22
Nominal system voltage U_n	AC 0300 V	Classification of mechanical conditions IEC 60	721				
Nominal frequency f _n	42460 Hz	Stationary use (IEC 60721-3-3)	141				3M11
Response values		Transport (IEC 60721-3-2)					2M4
	1 2001-0	Long-time storage (IEC 60721-3-1)					1M12
Response value R _{an1} (Alarm 1)	1200 kΩ	Long-time storage (ILC 00721-3-1)					111112
Response value R _{an2} (Alarm 2)	1200 kΩ	Connection					
PreSet mode	20 1:0 /10 1:0	Connection type	scre	-w-tvne te	erminal or	nush-wire	terminal
$U_n \le 72 \text{ V } R_{\text{an1}} \text{ (Alarm 1)} / R_{\text{an2}} \text{ (Alarm 2)}$	20 kΩ/10 kΩ		54.	, pc		•	
$U_{\rm n} > 72 \text{ V } R_{\rm an1} \text{ (Alarm 1)} / R_{\rm an2} \text{ (Alarm 2)}$	46 kΩ/23 kΩ	Connection				screw te	erminais
Relative uncertainty 15 k Ω /5200 k Ω	$\pm 0.5 \mathrm{k\Omega}/\pm 15 \%$	Connection properties				2 (414)	
Hysteresis 15 k Ω /5200 k Ω	+ 1 kΩ/+25 %	rigid				mm² (AW	
Time response		flexible			0.22.5	mm² (AW	'G 24-14)
Response time t_{an} at $R_F = 0.5$ x R_{an} and $C_e = 1$ μ F	<u>≤1s</u>	Two conductors with the same cross section					
Start-up delay (start time) t	010 s (0 s)*	rigid/flexible			0.21.5	mm² (AW	'G 24-16)
Response delay t_{on}	099 s (0 s)*	Stripping length				8	9 mm
	211122 2 (2 2)	Tightening torque, terminal screws				0.5.	0.6 Nm
Measuring circuit		Connection			nus	h-wire te	rminals
Measuring voltage $U_{\rm m}$	±12 V	Connection properties			Pus		
Measuring current $I_{\rm m}$ (at $R_{\rm F}=0~\Omega$)	≤ 200 µA	rigid			02 25	mm² (AW	IG 24-14)
Internal DC resistance R _i	\geq 62 k Ω	flexible			0.22.3	IIIIII (AW	U 27 17)
Impedance Z _i at 50 Hz	\geq 60 k Ω				075 25		IC 10 14\
Permissible extraneous DC voltage U_{fg}	≤ DC 300 V	without ferrules		,	0.752.5	•	,
Permissible system leakage capacitance $C_{\rm e}$	≤ 20 µF	with ferrules			0.21.5	mm² (AW	
Dienlaus mamany		Stripping length					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	Other					
Operating uncertainty 15 k Ω /5 k Ω 1 M Ω	$\pm 0.5 \mathrm{k}\Omega/\pm 15 \%$					ntinuous s	noration
Password	off/0999 (off)*	Operating mode			CO	ntinuous	
Fault memory, alarm relay	on/off*	Mounting Degree of protection, internal components (DIN EN)	د0520\			any	position v
Inputs			00329)				IP30 IP20
Cable length test and reset button	≤ 10 m	Degree of protection, terminals (DIN EN 60529) Enclosure material				nalı	
capie rength test and reset button	2 10111						arbonate UL94 V-0
		Flammability class					UL94 V-U

()* =	factory	setting

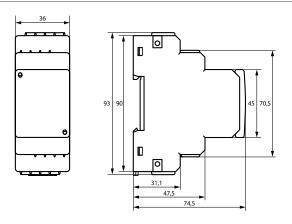
DIN rail mounting acc. to

Documentation number

Screw mounting

Weight

Dimension diagram (dimensions in mm)

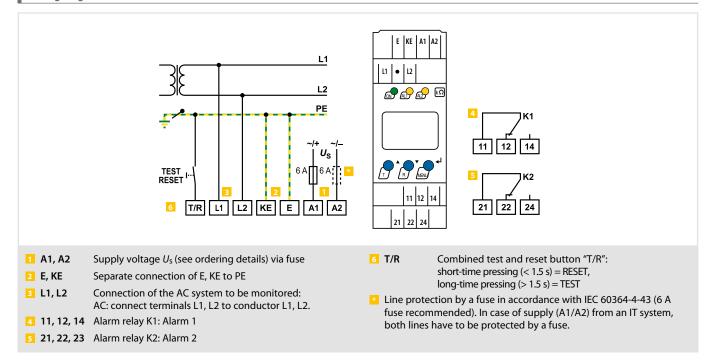


IEC 60715

D00037

≤ 150 g

2 x M4 with mounting clip







Typical applications

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

Approvals





Device features

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

Standards

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

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

Further information

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

Ordering information

Туре	Supply voltage ¹⁾ <i>U</i> s	Art. No.	
		Screw-type terminal	Push-wire terminal
IR425-D4-1	DC 9.694 V	B91036403	B71036403
IR425-D4W-1	AC 1672 V, 15460 Hz	B91036403W	B71036403W
IR425-D4-2	DC 70300 V	B91036402	B71036402
IR425-D4W-2	AC 70300 V, 15460 Hz	B91036402W	B71036402W

¹⁾ Absolute values

Accessories

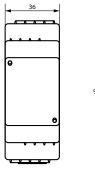
Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B98060008

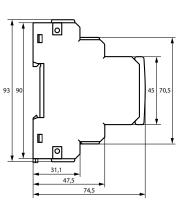
Insulation coordination acc. to IEC 60664-1/IE	C 60664-3	Switching elements					
Rated insulation voltage	250 V	Number of		2	(changeov	er contact	s K1, K2)
Rated impulse voltage/Pollution degree	4 kV/3	Operating principle		(N		on)(N/C op	
Protective separation (reinforced insulation) between		Electrical endurance			10000 sv	vitching op	erations
	A2) - (L1, L2, E, KE, T/R) - (11, 12, 14) - (21, 22, 24)	Contact data according IEC 60947-5-1					
Voltage test acc. IEC 61010-1	2.2 kV	Utilization category	AC-13	AC-14	DC-12	DC-12	DC-12
Supply voltage		Rated operational voltage	230 V	230 V	220 V	110 V	24 V
		Rated operational current	5 A	3 A	0.1 A	0.2 A	1 A
IR425-D4-1, IR425-D4W-1:		Minimum current			1 m	nA at AC/D	C ≥ 10 V
Supply voltage $U_{\rm S}$	AC 1672 V/DC 9.694 V	F					
Frequency range $U_{\rm S}$	15460 Hz/DC	Environment/EMC					
IR425-D4-2, IR425-D4W-2:		EMC				acc. to IE	
Supply voltage U_{S}	AC/DC 70300 V	Operating temperature				-25	.+55 ℃
Frequency range U _s	15460 Hz, DC	Classification of climatic conditions acc. to IEC 60	721 (relate	d to tempe	rature and	relative hu	midity):
Power consumption	≤ 4 VA	Stationary use (IEC 60721-3-3)					3K22
IT System being monitored		Transport (IEC 60721-3-2)					2K11
	AC/DC 0 200 V	Storage (IEC 60721-3-1)					1K22
Nominal system voltage U _n	AC/DC 0 300 V	Classification of mechanical conditions acc. to	IEC 6072	1:			
Nominal frequency f _n	15460 Hz	Stationary use (IEC 60721-3-3)					3M11
Response values		for W variant					3M12
Response value R _{an1} (ALARM 1)	1200 kΩ	Transport (IEC 60721-3-2)					2M4
Response value R _{an1} (ALARM 2)	1200 kΩ	Storage (IEC 60721-3-1)					1M12
Preset function:		C					
$U_{\rm n} \le 72 \text{ V: } R_{\rm an1} \text{ (ALARM 1)} / R_{\rm an2} \text{ (ALARM 2)}$	20 kΩ/10 kΩ	Connection					
$U_{\rm n} > 72 \text{ V: } R_{\rm an1} \text{ (ALARM 1)} / R_{\rm an2} \text{ (ALARM 2)}$	46 kΩ/23 kΩ	Connection type	scre	ew-type te	rminal or p	oush-wire	terminal
Operating error $(15 \text{ k}\Omega)/(5200 \text{ k}\Omega)$	±0.5 kΩ/±15 %	Connection	nection screw term			rminals	
Hysteresis $(15 \text{ k}\Omega)/(5200 \text{ k}\Omega)$	+1 kΩ/+25 %	Connection properties					
T:		rigid			0.24	mm ² (AW	G 24-12)
Time response		flexible			0.22.5	mm² (AW	G 24-14)
Response time t_{an} at $R_F = 0.5 \times R_{an}$ and $C_e = 1 \mu F$	≤2s	Two conductors with the same cross section					
Starting delay t	010 s	rigid/flexible			0.21.5	mm² (AW	G 24-16)
Response delay ton	099 s	Stripping length					9 mm
Measuring circuit		Tightening torque, terminal screws					.0.6 Nm
Measuring voltage $U_{\rm m}$	±12 V	Connection			nuc	h-wire te	
Measuring current $I_{\rm m}$ ($R_{\rm F}=0~\Omega$)	<u> </u>				pus	ii-wiie te	illilliais
Internal d.c. resistance R_i	≥ 62 kΩ	Connection properties			02 25		C 24 14\
Internal impedance Z _i (50 Hz)	≥ 60 kΩ	rigid			0.22.5	mm² (AW	u 24-14)
Admissible extraneous d.c. voltage U_{fq}	≤ DC 300 V	flexible				2 (4)41	C 10 11\
System leakage capacitance C _e	≤ 20 µF	without ferrules		(mm² (AW	
	·	with ferrules			0.21.5	mm² (AW	
Displays, memory		Stripping length					10 mm
Display	LC display, multi-functional, non-illuminated	Opening force					50 N
Display range, measuring value	1 kΩ1 MΩ	Test opening, diameter					2.1 mm
Operating error $(15 \text{ k}\Omega)$	±0.5 kΩ	Other details					
Percentage operating error (5 k Ω 1 M Ω)	±15 %	Operating mode					ntinuous
Password	off/0999	Position					position
Fault memory (alarm relay)	on/off	Degree of protection internal components (EN 6052	29)			ally	IP30
Inputs		Degree of protection internal components (EN 60529)	-//				IP20
Cable length external test/reset button	≤ 10 m	Enclosure material				nolve	carbonat
caste length external test/reset button	2 10111	Flammability class					JL94 V-0
		DIN rail mounting acc. to					C 60715
		Scrow fiving			2 v M4 v	with moun	

Screw fixing

Weight

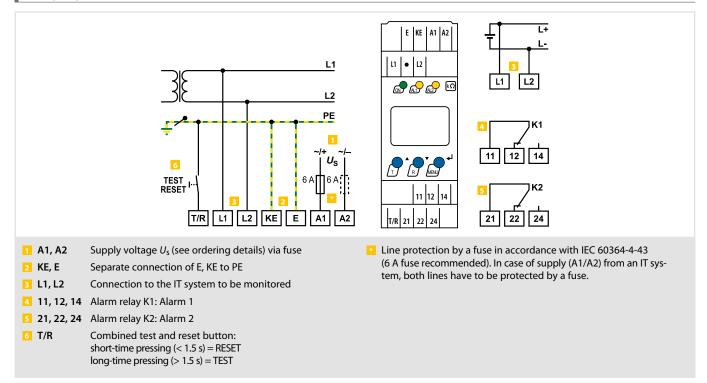
Dimension diagram (dimensions in mm)





2 x M4 with mounting clip

approx. 150 g



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 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
- · Automatic 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 insulation faults 200 $\Omega...1 M\Omega$
- 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

isoLR1685DP-425

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

isoHV1685D-425

• Measurement of insulation faults 200 $\Omega...1$ M Ω in IT systems with mains voltages of AC 2000 V and DC 3000 V

Standards

The isoxx1685Dx devices were designed according to the following standards:

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

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

¹⁾ Absolutwerte

Insulation coordination acc. to IEC 60664-1/IEC 60	0664-3	Response values for insulation monitoring
Definitions:		Response value R_{an1} (Alarm 1) and R_{an2} (Alarm 2) 200 $\Omega 1$ M
Measuring circuit (IC1)	(L1/+, L2/-), (E, KE)	Response value R_{an1} (Alarm 1) and R_{an2} (Alarm 2) isoLR1685DP 20 Ω 100
Supply circuit (IC2)	A1, A2	Condition response value $R_{an1} \ge R$
Output circuit 1 (IC3)	11, 12, 14	Upper limit of the measuring range for setting for measurement profile "Fast"
Output circuit 2 (IC4)	21, 22, 24	$C_{\text{emax}} = 2000 \mu\text{F} (\text{isoxx1685DP only})$ 50
Output circuit 3 (IC4)	31, 32, 34	Upper limit of the measuring range for setting for measurement profile "High capacity"
•		" " " " " " " " " " " " " " " " " " " "
Control circuit (IC6)	(A, B), (I1+, I1-, I2+, I2-)	$C_{\text{emax}} = 500 \mu\text{F}$ 200
Rated voltage [for isoHV1685D]	1500 V [3000 V]	Relative uncertainty iso1685DP
Overvoltage category	III	$(10 \text{ k}\Omega1 \text{ M}\Omega)$ (acc. to IEC 61557-8) ± 15
Rated impulse voltage:		$(0.2 \text{ k}\Omega < 10 \text{ k}\Omega)$ $\pm 200 \Omega \pm 15$
IC1 / (IC2-5) [for isoHV1685D]	8 kV [16.670 kV]	Relative uncertainty isoHV1685D
IC2 / (IC3-5)	4 kV	(10 kΩ1 MΩ) (acc. to IEC 61557-8) \pm 15
IC2 / IC1+IC6	800 V	$(0.2 \text{ k}\Omega < 10 \text{ k}\Omega)$ $\pm 1 \text{ k}\Omega \pm 15$
IC3 / (IC4-6)	4 kV	Relative uncertainty isoLR1685DP
IC4 / (IC5-6)	4 kV	$(1 kΩ100 kΩ)$ (acc. to IEC 61557-8) ± 15
IC5 / IC6	4 kV	$(20 \Omega < 1 k\Omega)$ $\pm 20 \Omega \pm 15$
Rated insulation voltage:		Hysteresis 25
IC1 / (IC2-6) [for isoHV1685D]	1500 V [3000 V]	Ti
IC2 / (IC3-5)	250 V	Time response
IC2 / IC6	50 V	Response time $t_{\rm an}$ at $R_{\rm F}=0.5$ x $R_{\rm an}$ ($R_{\rm an}=10$ k Ω) and $C_{\rm e}=1$ μF acc. to IEC 61557-8
IC3 / (IC4-6)	250 V	profile-dependent, typ. 1
IC4 / (IC5-6)	250 V	
		Measuring circuit for insulation fault location (EDS) (isoxx1685DP)
IC5 / IC6	250 V	Locating current I_L DC \leq 50 mA (1/2,5/5/10/25/50 m
Pollution degree	3	Test cycle/pause 2 s
Safe isolation (reinforced insulation) between:		, 1
IC1 / (IC2-5) [for isoHV1685D]	overvoltage category III, 1500 V [3000 V]	Display
IC2 / (IC3-5)	Overvoltage category III, 300 V	Display Graphic display 127 x 127 pixel, 40 x 40 r
IC2 / IC6	Overvoltage category III, 50 V	Display range measured value $200 \Omega 50 M$
IC3 / (IC4-6)	Overvoltage category III, 300 V	<u> </u>
	Overvoltage category III, 300 V	Display range measured value isoLR1685DP $20 \Omega1 M$
IC4 / (IC5-6)	3 3,	LEDs
IC5 / IC6	Overvoltage category III, 300 V	
Voltage test (routine test) acc. to IEC 61010-1:		ON (operation LED) gro
IC2 / (IC3-5)	AC 2.2 kV	PGH ON yell
IC2 / IC6	DC ± 0.50 kV	SERVICE yell
IC3 / (IC4-6)	AC 2.2 kV	ALARM 1 yell
IC4 / (IC5-6)	AC 2.2 kV	ALARM 2 yell
IC5 / IC6	AC 2.2 kV	
103 / 100	AC 2.2 KV	Digital inputs
Voltage ranges		Operating mode, adjustable active high, active l
Nominal system voltage range $U_{\rm D}$		Functions off, test, reset, deactivate device, insulation fault locat
, , , , , , , , , , , , , , , , , , , ,	ACO 1000 V DCO 1500 V	High level 103
iso1685DP	AC 01000 V; DC 01500 V	_ •
isoHV1685D	AC 02000 V; DC 03000 V	Low level 00.
isoLR1685DP	AC 0690 V; DC 0690 V	Serial interface
Tolerance of U _n	AC +10 %/DC +5%	
Frequency range of $U_{\rm D}$	DC 0.1460 Hz	Interface/protocol RS-485/BMS/Modbus F
Supply voltage $U_{\rm S}$ (see also device nameplate)	DC 1830 V	Connection terminals a
Frequency range of $U_{\rm S}$	DC DC	Cable length ≤ 1200
. , ,		Shielded cable (shield to functional earth on one end) $2\text{-core}, \ge 0.6 \text{ mm2}, \text{ e.g. J-Y(St)Y } 2x$
Power consumption	≤ 9 W	Shield termin
Measuring circuit for insulation monitoring		Terminating resistor, can be connected (Term. RS-485) 120 Ω (0.5
	. 50.1/	Device address, BMS bus (1) 290
Measuring voltage $U_{\rm m}$ (peak value)	±50 V	
Measuring current $I_{\rm m}$ (at $R_{\rm F}=0~\Omega$)	≤ 0.7 mA	Device address, Modbus RTU 1-2
Measuring current $I_{\rm m}$ isoLR1685DP (at $R_{\rm F}=0~\Omega$)	≤ 3.5 mA	Baud rate 9.6 / 19.2 / 38.4 / 57.6 / 115
Internal DC resistance R _i		Parity even / c
iso1685DP	\geq 70 k Ω	Stop bits 1/2/a
isoHV1685D (two-pole coupling)	≥ 210 kΩ	·
isoHV1685D (single-pole coupling)	$\geq 210 \text{ k}\Omega$ $\geq 420 \text{ k}\Omega$	Connection (except mains connection)
		Connection type pluggable push-wire termin
isoLR1685DP	\geq 15 k Ω 1)	Connection, rigid/flexible 0.22.5 mm²/0.22.5 m
Impedance Z _i at 50 Hz		Connection, flexible with ferrule, without/with plastic sleeve 0.252.5 min 70.212.5 min 702.5 min 702.5 min 702
iso1685DP	\geq 70 k Ω	· · · · · · · · · · · · · · · · · · ·
isoHV1685D (two-pole coupling)	≥ 210 kΩ	Conductor sizes AWG 24
isoHV1685D (single-pole coupling)	\geq 420 k Ω	Mains connection
isoLR1685DP	\geq 15 k Ω 1)	
Permissible extraneous DC voltage U_{fq}	5 Na2	Connection type pluggable push-wire termin
- 3	- DC 1600 V	Connection, rigid/flexible 0.210 mm ² /0.26 m
iso1685DP	≤ DC 1600 V	Connection, flexible with ferrule, without/with plastic sleeve 0.256 mm ² /0.254 m
	≤ DC 3150 V	Conductor sizes AWG 2
isoHV1685D		
isoLR1685DP	≤ DC 720 V	Stripping length 15 r
	≤ DC 720 V profile-dependent, 02000 μF	Stripping length 15 r Opening force 9012

Technical data (continued)

Switching elements			
Switching elements	3 changeover contacts		
K1	insulation fault alarm 1		
K2	insulation fault alarm 2		
К3	device erro		
Operating principle K1, K2	N/C operation or N/O operation		
Operating principle K3	N/C operation, cannot be change		
Electrical endurance under rated operating condition	ns, number of cycles 100,000		
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 / 4 V / 10 V / 20 V		
Rated operational current	5 A / 3 A / 1 A / 0.2 A / 0.1 A		
Rated insulation voltage	250 \		
Minimum contact rating	1 mA at AC/DC \geq 10 \		
Environment/EMC			
EMC	IEC 61326-2-4		

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Utilisation category	AC 13 / AC 14 / DC-12 / DC-12 / DC-12	Tightening torque of the screws (4x M5) for enclosure mounting	1.01.5 Nm
Rated operational voltage	230 V / 230 V / 4 V / 10 V / 20 V	Degree of protection, internal components	IP30
Rated operational current	5 A / 3 A / 1 A / 0.2 A / 0.1 A	Degree of protection, terminals	IP30
Rated insulation voltage	250 V	Enclosure material	polycarbonate
Minimum contact rating	1 mA at AC/DC \geq 10 V	Flammability class	V-0
Environment/EMC		Weight	≤ 1600 g
EMC	IEC 61326-2-4		
Classification of climatic conditions acc. to IEC 60721:			
Stationary use (IEC 60721-3-3)	3K22		

2K11

1K22

3M11

2M4

1M12

Deviation from the classification of climatic conditions: Ambient temperature during operation iso1685DP, isoLR1685DP

Ambient temperature during operation isoHV1685D

Ambient temperature transport

Area of application

Position of normal use

Other Operating mode

Ambient temperature long-term storage

-40...+70 °C

-40...+55 °C

-40...+80 °C -25 ...+80 °C

 $\leq 3000~m~\text{AMSL}$

continuous operation vertical, mains connection on top

Dimension diagram (dimensions in mm)

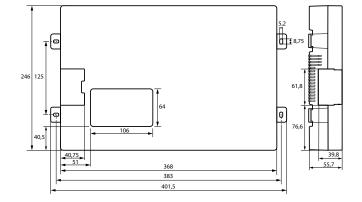
Classification of mechanical conditions acc. to IEC 60721:

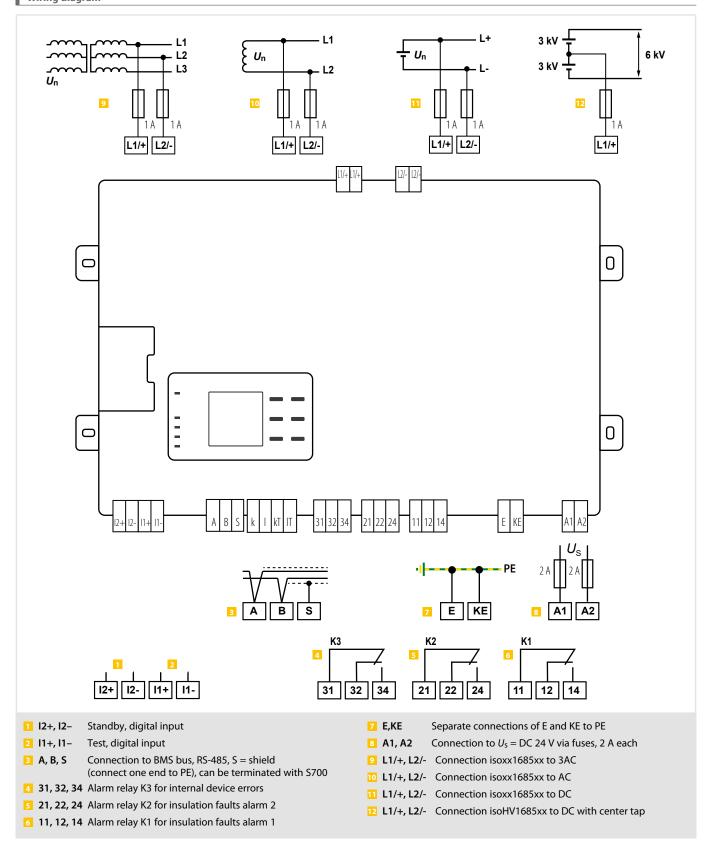
Transport (IEC 60721-3-2)

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

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

Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2)





ISOMETER® isoHR1685DW-925

Insulation monitoring device for mobile, insulated elevating work platforms





Typical applications

• Isolationsüberwachung von Hubarbeitsbühnen/Oberleitungsfahrzeugen.

Approvals



Device features

ISOMETER® for mobile, insulated elevating work platforms

- · Continuous monitoring of both insulation levels on elevating work platforms, also during operation
- Storage of data for verification of insulation condition. Where necessary, provision of documentary verification following a electrical accident
- Graphical representation of the insulation resistance over time (isoGraph)
- · RS-485 interface with BMS protocol and Modbus RTU for forwarding data, alarms and acknowledgements via existing communication to work platform
- · History memory with real-time clock (13-day buffer) for storing 1023 alarm messages with date and timestamp
- · Freely programmable digital inputs
- · Automatic device self-test with automatic message in the event of a fault
- Connection monitoring
- Separately adjustable response values R_{an1} (alarm 1) and R_{an2} (alarm 2) for prewarning and alarm
- High-resolution graphic LC display, for excellent readability and recording of the device status
- Measurement of high-resistance insulation faults 100 k $\!\Omega...20\,G\Omega$
- · Automatic adjustment to high system leakage capacitances

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

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

Further information

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

Ordering information

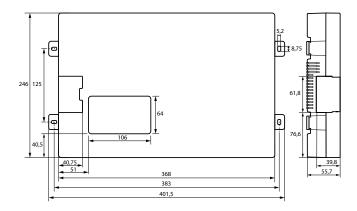
Туре	Supply voltage ¹⁾	Response value range	Nominal system voltage	Art. No.
isoHR1685DW-925	DC 1830 V	100 kΩ100 MΩ	AC 01000 V / DC 01500 V	B91065806W

¹⁾ Absolute values

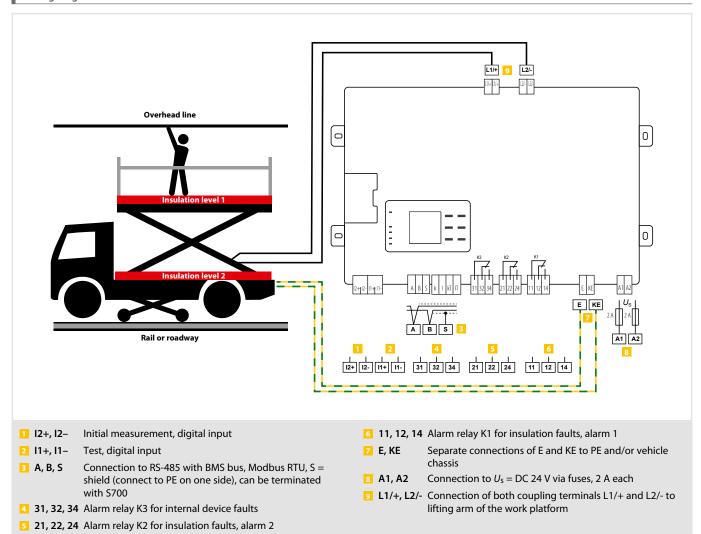
Insulation coordination acc. to IEC 60664-1/IEC 60	664-3	Digital inputs				
Definitions:		Operating mode, variable			ive high, a	
Measuring circuit (IC1)	(L1/+, L2/-), (E, KE)	Functions	off, test, reset, disable	device, insu		
Supply circuit (IC2)	A1, A2	High level			1	1030 V
Output circuit 1 (IC3)	11, 12, 14	Low level				00.5 V
Output circuit 2 (IC4)	21, 22, 24					
Output circuit 3 (IC4)	31, 32, 34	Serial interface				
Control circuit(IC6)	(A, B), (I1+, I1-, I2+, I2-)	Interface/Protocol		RS-485	5/BMS/Mo	dbus RTU
Rated voltage	1500 V	Connection			Term	ninals A/B
	1500 V	Cable length				≤ 1200 m
Overvoltage category		Shielded cable (shield to functional earth	on one side)			
Rated impulse voltage:		Sinciaca capic (Sincia to Tancaonal carti	•	$\geq 0.6 \text{ mm}^2$	an LV(S	St)V 2v0 6
IC1/(IC2-5)	10 kV	Shield	2-(016,	≥ 0.0 IIIII		erminal S
IC2/(IC3-5)	4 kV		DC 405\			
IC2/IC1+IC6	800 V	Terminating resistance, engageable (term	i. KS-485)			Ω (0.5 W)
IC3/(IC4-6)	4 kV	Device address, BMS bus			(1) 2.	90 (2)*
IC4/(IC5-6)	4 kV	Device address, Modbus RTU				1 – 247
IC5/IC6	4 kV	Baud rate		9.6/19.	2/38.4/57	.6/115 kB
Rated insulation voltage:		Parity			eve	n/uneven
IC1/(IC2-6)	1500 V	Stop bits				1/2/auto
		<u> </u>				
IC2/(IC3-5)	250 V	Connection (except mains coupling)				
IC2/IC6	50 V	Type of connection		Pluggable p	oush-wire	terminals
IC3/(IC4-6)	250 V	Connection, rigid/flexible		0.22.5 n		
IC4/(IC5-6)	250 V	Connection, flexible with ferrule, without	/with plastic sleeve			.2.5 mm ²
IC5/IC6	250 V	Conductor sizes	p			WG 24-12
Pollution degree	3	Conductor SIZCS			A)	47-12
Protective separation (reinforced insulation) between:		Connection of the mains coupling				
IC1/(IC2-5)	Overvoltage category III, 1500 V	Type of connection		Pluggable p	nush-wire	terminals
IC2/(IC3-5)	Overvoltage category III, 300 V	Connection, rigid/flexible			mm ² /0.2	
IC2/IC6	Overvoltage category III, 50 V		th plactic closus		mm ² /0.25	
IC3/(IC4-6)	Overvoltage category III, 300 V	Connection, flexible with ferrule, without/wi	ui piasuc sieeve	0.230		
IC4/(IC5-6)		Conductor sizes			F	AWG 24-8
	Overvoltage category III, 300 V	Stripping length				15 mm
IC5/IC6	Overvoltage category III, 300 V	Opening force			90)120 N
Voltage test (routine test) as per IEC 61010-1:		Conitation a classicants				
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	n fault alarm 1), K2 (insulation	fault alarm	2), K3 (de	vice fault)
IC4/(IC5-6)	AC 2.2 kV	Operating mode K1, K2	N/C operation /	N/O operation	on (N/C op	eration)*
IC5/IC6	AC 2.2 kV	Operating mode K3		N/C operat	tion, not m	nodifiable
		Electrical endurance under rated operating	a conditions	•	100.0	000 cycles
Voltage ranges			,		, .	, , , , , ,
Nominal system voltage range $U_{\rm D}$	AC 01000 V	Contact data acc. to IEC 60947-5-1:	1640 1644	20.42	20.42	20.40
	DC 01500 V	Utilisation category	AC 13 AC 14		DC-12	DC-12
Tolerance of U _n	AC +10 %/DC +5 %	Rated operational voltage	230 V 230 V	24 V	110 V	220 V
Frequency range of U _n	DC 0.1460 Hz	Rated operational current	5 A 3 A	1 A	0.2 A	0.1 A
		Rated insulation voltage				250 V
Supply voltage U_s (also see device name plate)	DC 1830 V	Minimum contact rating		1 r	nA at AC/[)C ≥ 10 V
Frequency range of U _s	DC					
Power consumption	≤ 9 W	Environment/EMC				
Measuring circuit for insulation monitoring		EMC			IEC 6	1326-2-4
		Classification of climatic conditions acc.	to IEC 60721 (related to tom	noraturo and	l rolativo hi	umiditu).
Measuring voltage $U_{\rm m}$ (peak value)	± 50 V		to IEC 00/21 (related to tell)	Jerature and	i leiative iit	
Measuring current $I_{\rm m}$ (at $R_{\rm F}=0~\Omega$)	≤ 1 µA	Stationary use (IEC 60721-3-3)				3K22
Internal resistance DC R _i	\geq 50 M Ω	Transport (IEC 60721-3-2)				2K11
Impedance Z _i at 50 Hz	≥ 50 MΩ	Long-term storage (IEC 60721-3-1)				1K22
Permissible extraneous DC voltage U_{fq}	≤ DC 1600 V	Mechanical conditions acc. to IEC 607	21:			
Permissible system leakage capacitance C _e isoHR1685DW-9		Stationary use (IEC 60721-3-3)				3M11
	prome acpendenty over 1 µi	Transport (IEC 60721-3-2)				2M4
Response values for insulation monitoring		Long-term storage (IEC 60721-3-1)				1M12
Response value R _{an1} (alarm 1) and R _{an2} (alarm 2)	100 kΩ100 MΩ					119112
Response value condition	$R_{\text{an1}} \ge R_{\text{an2}}$	Deviation from climate classes:				
Upper limit of the measuring range when setting measu		Ambient temperature during operation			-40.	+70°C
, , , ,	· ·	Ambient temperature during transport			-40.	+80°C
"high capacity" C _{emax} = 5 μF	24 MΩ	Ambient temperature during long-term st	torage			+80°C
Relative uncertainty (acc. to IEC 61557-8)	±15 %	Application range	•) m AMSL
100 kΩ10 MΩ	$\pm 200 \text{ k}\Omega \pm 15 \%$	11			_ 5000	
Hysteresis	25 %	Other				
Time response		Operating mode		Co	ntinuous	operation
Time response		Position of normal use		Vertical, ma		
Response time $t_{\rm an}$ at $R_{\rm F}=0.5$ x $R_{\rm an}$ ($R_{\rm an}=100~{\rm k}\Omega$) and		Tightening torque for screws (4x M5) to fa	octan anclocura	rerucal, Ille		1.5 Nm
	profile-dependent, typ. 10 s				1.0.	
Dienlou		Degree of protection, internal component)			IP30
Display		Degree of protection, terminals				IP30
Display	graphic display 127 x 127 pixels, 40 x 40 mm	Enclosure material			Polyo	carbonate
Display range, measured value	100 kΩ20 GΩ	Flammability class				V-0
<u> </u>		Documentation number				D00369
LEDs		Weight				≤ 1600 g
ON (operation LED)	green	-				
PGH ON (no function)	yellow	()* = factory setting				
SERVICE	vellow					
SERVICE ALARM 1	yellow yellow					

yellow

ALARM 2



Wiring diagram



ISOMETER® IR1575

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





Typical applications

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

Approvals





Device features

- Insulation monitoring for unearthed AC, AC/DC systems 0...480 V and DC systems 0...480 V
- Two separately adjustable response values 2 k 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

Standards

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

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

Further information

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

Ordering information

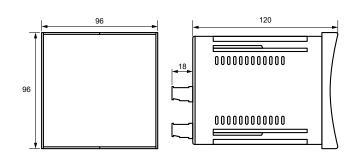
Туре	Supply voltage U _s ¹¹	Design	Art. No.
IR1575-435	AC 88264 V / AC 340460 V DC 77286 V AC 1672 V DC 10,284 V		B91064000
IR1575PG1-435		Standard	B91064002
IR1575-434		Standard	B91064003
IR1575PG1-434			B91064004
IR1575W-435	AC 88264 V / AC 340460 V DC 77286 V	Increased shock and	B91064000W
IR1575PG1W-435		vibration resistance	B91064002W

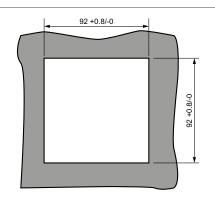
¹⁾ Absolute values

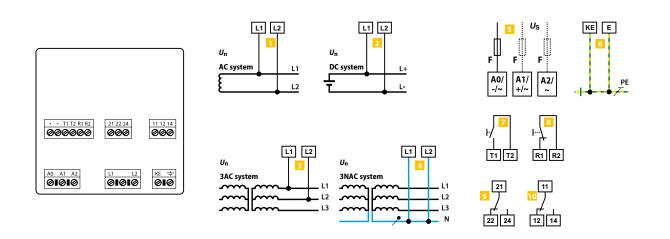


Insulation coordination acc. to IEC 60664-1		Outputs	
Rated voltage	AC 500 V	Test and reset button internal/external	
Rated impulse voltage/pollution degree	4 kV/3	Switching elements	
Voltage ranges		Switching elements	2 x 1 changeover contact
IR1575:		Operating principle	N/O or N/C operation
Nominal 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/ 30 120 112	Contact class	IIB (DIN EN 60255-23)
IR1575PG1:	AC/3 AC 20480 V	Rated contact voltage	AC 250 V/DC 300 V
Nominal system voltage U_n Nominal frequency f_n	30460 Hz	Making capacity	UC 5 A
Nominal requerty r_n Nominal system voltage U_n	DC 20480 V	Breaking capacity	2 A, AC 230 V, $\cos \phi = 0.4$
IR1575x-435:	DC 20400 V	Minimum contact current at DC 24 V	0.2 A, DC 220 V, L/R = 0.04 s
Supply voltage U_S at AO/A1 (see nameplate)	AC 88264 V	MINIMUM CONTACT CUFFERT AT DC 24 V	≥ 2 mA (50 mW)
Frequency range of U _S	42460 Hz	Environment	
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_5 at AO/A1 (see nameplate)	DC 77286 V	Shock resistance IEC 60068-2-27 (device in operation)	15 g/11 ms
	50,7,1112001	Bumping IEC 60068-2-29 (transport)	40 g/6 ms
IR1575x-434:	AC1C 72 V	Vibration resistance acc. to IEC 60068-2-6 (device in operation)	1 g/10150 Hz
Supply voltage U_S at AO/A1 (see nameplate)	AC 1672 V	Vibration resistance acc. to IEC 60068-2-6 (transport)	2 g/10150 Hz
Frequency range of U_s Supply voltage U_s at AO/A1 (see nameplate)	42460 Hz DC 10.284 V	Ambient temperature (during operation)	-10+55 ℃
	DC 10.264 V	Ambient temperature (during storage)	-40+70 °C
IR1575:		Classification of climatic conditions acc. to DIN IEC 60721-3-3	3K22
Power consumption	≤ 5 V	Commodian	
Response values		Connection Connection	plug-in terminals
Response value R _{an1} (Alarm1)	2 kΩ1 MΩ	Connection properties	piug in terminais
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 kΩ	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 24-12
Response time t_{an} at $R_F = 0.5$ x R_{an} and $C_e = 1$ μF	≤ 5 s	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	continuous operation
Measuring voltage $U_{\rm m}$	±20 V	Mounting position	display-oriented
Measuring votage σ_{III} Measuring current I_{III} (bei $R_{\text{F}} = 0$ W)	<u> </u>	Degree of protection, internal components (DIN EN 60529)	IP30
Internal DC resistance R _i	≥ 119 kΩ	Degree of protection, terminals (DIN EN 60529)	IP20
Internal impedance Z _i , at 50 Hz		Mounting Flammability class	panel mounting UL94 V-2
IR1575	\geq 14 k Ω	Documentation number	UL94 V-Z
IR1575PG1	≥ 119 kΩ	IR1575	D00116
Permissible extraneous DC voltage Ufq	≤ DC 680 V	IR1575PG1	D00110 D00357
Permissible system leakage capacitance Ce	≤ 60 µF	Weight	≤ 400 q
Measuring circuit for insulation fault location (EDS) (only IR1575PG1)	Option "W"	
Test current I _D DC	10/25 mA	Shock resistance acc. to IEC 60068-2-27 (during operation)	30 g/11 ms
Test pulse/break	2 s/4 s	Bumping acc. to IEC 60068-2-29 (during transport)	40 q/6 ms
Displays		Vibration resistance acc. to IEC 60068-2-6	1.6 mm/1025 Hz
	1 C di		4 g/25150 Hz
Display, illuminated Characters (number of characters, height)	LC display 2 x 16 (4.5 mm)	Ambient temperature (during operation)	-10 °C+55 °C
Display range measuring value	$\frac{2 \times 16 (4.5 \text{ mm})}{1 \text{ k}\Omega 5 \text{ M}\Omega}$	Storage temperature range	-40 °C+85 °C
Absolute error (1 k Ω 10 k Ω)	$\pm 1 \mathrm{k}\Omega$		
Relative percentage error (1 k Ω 10 k Ω)	±10%		
nciative percentage entit (1 k22 10 k22)	土10 %		

Dimension diagram (dimensions in mm)







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

ISOMETER® IR427 with alarm indicator and test combination MK7

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







Typical applications

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

Approvals



Device features

ISOMETER® IR427

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

Remote alarm indicator and test combination MK7

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

Standards

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

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

Further information

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

Ordering information

Туре	Supply voltage <i>U</i> ₅	Nominal system voltage <i>U</i> n ¹⁾	Art.	No.
		, , , , , , , , , , , , , , , , , , ,	screw-type terminals	push-wire terminals
IR427-2	AC 70264 V, 42460 Hz	AC 70264 V, 42460 Hz	B92075300	B72075300
MK7 Remote alarm indicator and test combination	DC 1828 V	-	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 coordination acc. to IEC 60664-1/IEC 60664-3		Cable lengths for the connection of the mea	asuring curr	ent trans	former S	ΓW2 and t	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	nmended:	J-Y(St)Y m	nin. 2x0.6
Supply voltage U _S	$=U_{D}$	Switching elements					
Power consumption	≤ 4 VA	Number			10	changeove	er contact
•		Operating principle	N/C oper	ation or N	/O operatio		
IT system being monitored		Electrical endurance, number of cycles	•		•	•	10000
Nominal system voltage <i>U</i> _n	AC 70264 V	Contact data acc. to IEC 60947-5-1					
Nominal frequency f _n	4763 Hz	Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-12
Insulation monitoring		Rated operational voltage	230 V	230 V	24 V	110 V	220 V
Response value R _{an}	50500 kΩ (50 kΩ)*	Rated operational current	5 A	3 A	1 A	0.2 A	0.1 A
Relative uncertainty	±10 %	Minimum contact rating				1 mA at AC	
Hysteresis	25 %						
Response time t_{an} at $R_F = 0.5 \times R_{an}$ and $C_e = 0.5 \mu\text{F}$	≤5s	Environment/EMC					
Permissible system leakage capacitance C_e	≤ 5 μF	EMC					1326-2-4
	= 5 μι	Operating temperature				-25	+55 ℃
Measuring circuit		Classification of climatic conditions acc. to IEC	60721 (relate	d to tempe	erature and	relative hu	umidity):
Measuring voltage U_{m}	±12 V	Stationary use (IEC 60721-3-3)		•			3K22
Measuring current $I_{\rm m}$ (at $R_{\rm F}=0~\Omega$)	≤ 50 µA	Transport (IEC 69721-3-2)					2K11
Internal DC resistance Ri	≥ 240 kΩ	Long-term storage (IEC 60721-3-1)					1K22
Impedance Z _i at 50 Hz	≥ 200 kΩ	Classification of mechanical conditions acc.	to IEC 6072	1			
Permissible extraneous DC voltage U_{fg}	≤ DC 300 V	Stationary use (IEC 60721-3-3)		•			3M11
Load current monitoring		Transport (IEC 60721-3-2)					2M4
Response value, adjustable	550 A (7 A)*	Storage (IEC 60721-3-1)					1M12
Relative uncertainty	±5 %						
Hysteresis	4 %	Connection					
Setting values load current measurement:	1 70	Connection type	scre	ew-type te	erminal or	push-wire	terminal
Transformer 3150 VA 4000 VA 5000 VA	6300 VA 8000 VA 10000 VA	Connection				screw te	erminals
/ _{alarm} 1~ 14 A 18 A 22 A	28 A 35 A 45 A	Connection properties					
Response time overload, (50 % to 120 %)	< 5 s	rigid				mm² (AW0	
Response time for measuring current transformer monitoring	at restart, test or every 1 h	flexible			0.22.5	mm² (AW	/G 24-14)
T		Two conductors with the same cross section	n				
Temperature monitoring:		rigid/flexible			0.21.5	mm² (AW	
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	erminals
Response time overtemperature	<2s	Connection properties					
Response time connection fault PTC resistors	<2s	rigid			0.22.5	mm ² (AW	/G 24-14)
Displays, memory		flexible					
LC display	multifunctional, not illuminated	without ferrules			0.752.5	,	,
Measured value insulation resistance	10 kΩ1 MΩ	with ferrules			0.21.5	mm² (AW	
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			CO	ntinuous o	•
Cable length, twisted in pairs, shielded	200 m	Position of normal use	N (0530)				any
Cable (twisted in pairs, one end of shield connected to PE)	recommended: J-Y(St)Y min. 2x0.8	Degree of protection, internal components (DIN E	-N 60529)				IP30
Power supply (terminals 1 and 2):	• •	Degree of protection, terminals (DIN EN 60529)				l	IP20
U _{off}	DC 24 V	Enclosure material					carbonate
J _{max} (max. 4 MK7)	80 mA	Flammability class Screw mounting					UL94V-0
· mus /······· /		M DEMOCRATION AND ADDRESS OF THE PARTY OF TH					2 x M4
Communication (torminal 2 and 4):	OV IIIA					11	EC 6071E
Communication (terminal 3 and 4):		DIN rail mounting acc. to				IE	D00118
Communication (terminal 3 and 4): Interface/protocol Terminating resistor	RS-485/proprietary, no BMS 120 (0.25 W), internal, switchable						D00118 ≤ 150 g

()* = Factory setting



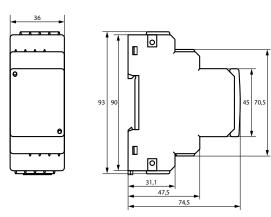
Technical data MK7

Rated insulation voltage	50 V
Rated impulse voltage/pollution degree	500 V/3
Supply voltage	
Supply voltage <i>U</i> _S	DC 1828 V
Power consumption	0.5 VA
Environment/EMC	
EMC	IEC 61326
Operating temperature	-10+55 °C
Classification of climatic conditions acc. to IEC 60721	
(except condensation and formation of ice):	
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 69721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M4
Storage (IEC 60721-3-1)	1M12

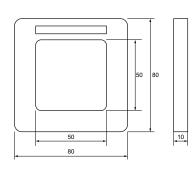
Connection	
Connection	screw-type terminals
Connection properties	
rigid/flexible	0.22.5 mm ² (AWG 24-14)
Flexible with ferrule	0.21.5 mm ² (AWG 24-16)
Stripping length	8 mm
Other	
Operating mode	continuous operation
Position of normal use	any
Degree of protection, internal components (IEC 60529)	IP30
Degree of protection, terminals (IEC 60529)	IP20
Front plate colour	alpine white
Flush-mounting enclosure, diameter (included in the scope of delivery)	66 mm
Weight (including mounting frame)	≤ 80 q

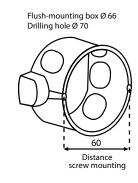
Dimension diagram (dimensions in mm)

IR427



MK7

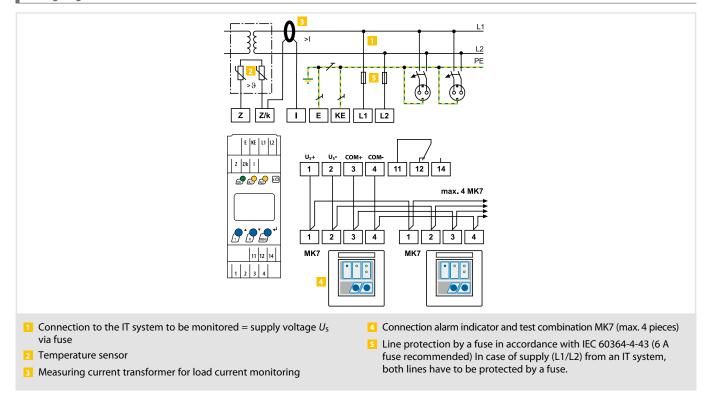




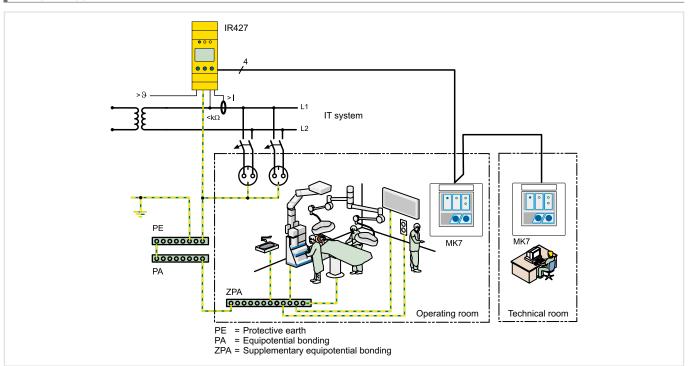
Alarm messages LEDs

	IR427			мк7			
	"ON"	"AL1"	"AL2"	ON	Ins. fault	Overload	Overtemp.
Operation	~	-	-	~	-	-	-
System fault ¹⁾	flashing	flashing	flashing	flashing	flashing	flashing	flashing
Insulation fault	~	~	-	~	~	-	_
Overcurrent	~	-	~	~	-	~	-
Overtemperature	~	-	~	~	-	-	~
No communication betw. IR 427+MK7	-	-	-	flashing	-	-	=

¹⁾ Detailed alarm information on LCD



Example of application



ISOMETER® isoMED427x-(PT)

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





Typical applications

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

Approvals







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

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

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

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

¹⁾ Only this device has a Lloyds Register approval

Accessories

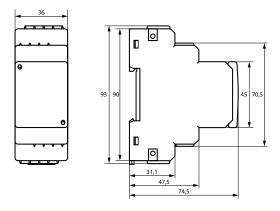
Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B98060008

Suitable system components

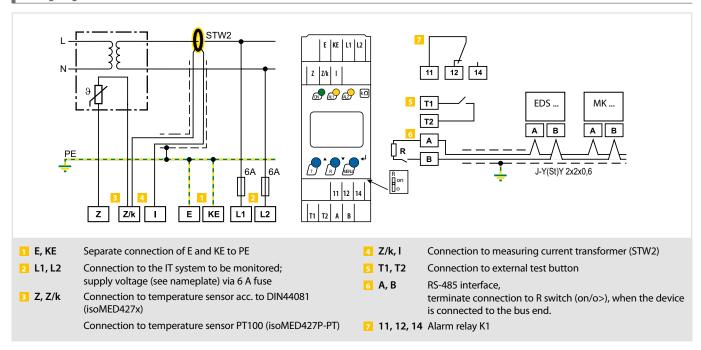
Description	Туре	Art. No.
Measuring current transformers	STW2	B942709
Temperature sensor (PTC)	ES0107	B924186
Mounting frame	XM420	B990994

Insulation coordination acc. to IEC 60664-1/-3	Interface
Definitions	Interface/protocol RS-485/BMS
	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 120 Ω (0.25 W), internal, switchable
Rated voltage 250 V	Device address, BMS bus 290
Overvoltage category III	Device address, Divis bus
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	
Rated insulation voltage	Electrical endurance under rated operating conditions 10 000 cycles
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
Sunnly voltage	
Supply voltage	Classification of climatic conditions acc. to IEC 60721
Supply voltage $U_{\rm S}$ 100240 V	(related to temperature and relative humidity)
Tolerance U_s $-30+10\%$	Stationary use (IEC 60721-3-3) 3K22
Power consumption $\leq 3 \text{ W}$	Transport (IEC 60721-3-2) 2K11
Manitana d IT anatom	Long-term storage (IEC 60721-3-1) 1K22
Monitored IT system	Classification of mechanical conditions acc. to IEC 60721
Nominal system voltage U_n 70264 V	Stationary use (IEC 60721-3-3) 3M11
Nominal frequency $f_{\rm n}$ 4763 Hz	
I I I I I I I I I I I I I I I I I I I	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	Connection
Relative uncertainty $\pm 10\%$	Connection
Hysteresis 25 %	Connection type Push-wire terminals
Response time t_{an} at $R_F = 0.5$ x R_{an} and $C_e = 0.5$ μF ≤ 5 s	Nominal current ≤ 10 A
Response time for connection monitoring PE $\leq 1 \text{ h}$	Stripping length 10 mm
Permissible system leakage capacitance C _e max. 5 YF	Opening force 50 N
Termissiste system reunage capacitance ce	Test opening, diameter 2.1 mm
Measuring circuit	Connection properties:
Measuring voltage $U_{\rm m}$ ± 12 V	rigid 0.22.5 mm ² (AWG 24-14)
Measuring current $I_{\rm m}$ at $R_{\rm F} = 0 \Omega$ $\leq 50 \mu \text{A}$	flexible without ferrule 0.752.5 mm² (AWG 24-14)
Internal DC resistance R_i $\geq 240 \text{ k}\Omega$	` ,
·	flexible with ferrule 0.21.5 mm ² (AWG 24-16)
	Connection type Screw-type terminals
Permissible extraneous DC voltage $U_{fg} \le DC 300 \text{ V}$	Nominal current ≤ 10 A
Load current monitoring	Tightening torque 0.50.6 Nm (57 lb-in)
	Cross section AWG 24-12
. ,	Stripping length 8 mm
Relative uncertainty ± 5 %	Connection properties:
Hysteresis 4%	rigid / flexible 0.252.5 mm ²
Nominal frequency f_n 4763 Hz	<u> </u>
Setting values load current measurement	Flexible with ferrules with/without plastic sleeve 0.252.5 mm
Transformer 3150 VA / 4000 VA / 5000 VA / 6300 VA / 8000 VA / 10000 VA	Multi-conductor rigid/flexible 0.21.5 mm
<i>I</i> _{alarm1} 14 A / 18 A / 22 A / 28 A / 35 A / 45 A	Multi-conductor flexible with ferrule without plastic sleeve 0.251.5 mm
Response time, overload (50 % to 120 %)	Multi-conductor flexible with TWIN ferrule with plastic sleeve 0.251.5 mm ²
. , , ,	Othor
Response time, CT monitoring at restart, test or every 1 h	Other
Temperature monitoring	Operating mode Continuous operation
<u> </u>	Position of normal use Any
isoMED427x	Degree of protection, built-in components (DIN EN 60529)
Sensor PTC resistors acc. to DIN 44081 (max. 6 in series)	Degree of protection, built-in components (DIN EN 60529) IP20
Response value $4 k\Omega$	Enclosure material Polycarbonate
Release value $1.6 \text{ k}\Omega$	Flammability class UL94V-C
Relative uncertainty \pm 10 %	DIN rail mounting IEC 60715
Response time, overtemperature < 2 s	Screw mounting 2 x M4
	Weight ≤ 150 g
isoMED427P-PT	<u>rrcigiit</u> ≤ 150 g
Sensor PT100 (no series or parallel connections)	Factory settings isoMED427x-(PT)
Response value 50150 °C	Response value R_{an} 50 k Ω (< R)
Hysteresis 10 %	_ ·
Relative uncertainty $\pm 5\%$	Response value I_{alarm} 7 A (>1)
	Response value °C 4 kΩ (fixed value for isoMED427x)
Response time, overtemperature < 5 s	120 °C (configurable for isoMED427P-PT)
	Operating principle K1 N/C operation (n.c.)
Response time, overtemperature < 5 s Displays, memory	_ , _ , _ ,
	BMS address 3
Displays, memory	_ , _ , _ ,
$\begin{tabular}{ll} \hline \textbf{Displays, memory} \\ \hline \textbf{Display} & \textbf{LC display, multi-functional, not illuminated} \\ \hline \textbf{Display range measured value insulation resistance (R_F)} & 10 \ k\Omega1 \ M\Omega \\ \hline \end{tabular}$	BMS address 3 Automatic insulation fault location off, deactivated Password 0, disabled
$\begin{tabular}{lllllllllllllllllllllllllllllllllll$	BMS address 3 Automatic insulation fault location off, deactivated
$\begin{tabular}{ll} \hline \textbf{Displays, memory} \\ \hline \textbf{Display} & \textbf{LC display, multi-functional, not illuminated} \\ \hline \textbf{Display range measured value insulation resistance (R_F)} & 10 \ k\Omega1 \ M\Omega \\ \hline \end{tabular}$	BMS address 3 Automatic insulation fault location off, deactivated Password 0, disabled

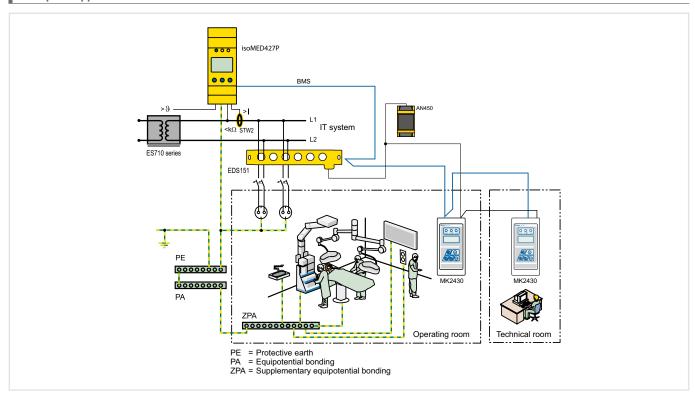




Wiring diagram



Example of application



ISOMETER® isoLR275 with coupling device AGH-LR

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





Typical applications

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

Approvals





Device features

isoLR275

- ISOMETER® for IT AC systems with galvanically connected rectifiers or converters and for IT DC systems (IT = unearthed systems)
- Particularly suitable to monitor installations with a low level of insulation
- Use the isoLR275 only combination with the coupling device AGH-LR
- Automatic adaptation to the existing system leakage capacitance
- AMP^{Plus} 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)
- Current output 0(4)...20mA (electrically isolated) analogously to the measured insulation value

AGH-LR

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

Standards

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

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

Further information

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

Ordering information

Set comprising		Nominal voltage <i>U</i> n	Supply voltage <i>U</i> s	Art. No.	
Type	Art. No.	Nominal Fortage of	supply rollage of	Thu no.	
isoLR275-327	B91065700W	3(N)AC 0793 V	AC 19.255 V, 42460 Hz	B91065702W	
AGH-LR-3	B98039022W	DC 01100 V	DC 19.272 V		
isoLR275-335	B91065701W	3(N) AC 0793 V	AC 88264 V	B91065703W	
AGH-LR-3	B98039022W	DC 01100 V	DC 77286 V		

Devices are available as a set.

Accessories

Description	Art. No.
Screw mounting	B990056

Suitable system components

Description	Туре	Art. No.	Page
External $k\Omega$ measuring instruments	9620-1421	B986841	388



Insulation coordination acc. to IEC 60664-1/IEC 60664-3		Outputs/Inputs	
Rated insulation voltage for isoLR275-3	AC 250 V	"TEST"-/"RESET" button	
Rated impulse voltage/pollution degree	6 kV/3	Cable length "TEST"-/"RESET" button, external	
Protective separation (reinforced insulation) between		Current output (load)	
(A1/+, A2/-) - (11,12, 14, 21, 22, 24) - (AK1, AK2, KE, PE,	, T1, 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 $(1100 \text{ k}\Omega)$	
Rated insulation voltage	AC 250 V	Serial interface	
Rated impulse voltage/pollution degree	4 kV/3		
Basic insulation between:	(11, 12, 14) - (21, 22, 24)	Interface/protocol Connection	
Voltage test acc. to IEC 61010-1	2.21 kV	Cable length	
Voltage ranges		Shielded cable (shield to PE on one end)	2-core,
Nominal system voltage U _n	via AGH-LR	Terminating resistor	2 00.0,
isoLR275-335:		Device address, BMS bus	
Supply voltage $U_{\rm S}$ (also see nameplate)	AC 88264 V**	Contrabinar alamanta	
Frequency range $U_{\rm S}$	42460 Hz	Switching elements	
Power consumption	≤ 21.5 VA		over contacts: K
Supply voltage $U_{\rm S}$ (also see nameplate)	DC 77286 V**	Operating mode K1, K2 (Alarm 1/Alarm 2)	N/C opera
Power consumption	≤ 5.5 W	Contact data acc. to IEC 60947-5-1:	
isoLR275-327:		Utilisation category	AC 13
Supply voltage U_{S} (also see nameplate)	AC 19.255 V**	Rated operational voltage	230 V
Frequency range $U_{\rm S}$	42460 Hz	Rated operational current	5 A
Supply voltage U_S (also see nameplate)	DC 19.272 V**	Minimum contact rating	
Power consumption	≤ 6 VA	Environment/EMC	
For UL applications:		EMC	
Nominal system voltage <i>U</i> _n	via AGH-LR	not suitable for household and small companies	5
, ,	VIG AGIT EN	Operating temperature	
isoLR275-335:	AC 99 350 V	Classification of climatic conditions acc. to	IEC 60721 (with
Supply voltage U_5 (also see nameplate) Frequency range U_5	AC 88250 V 42460 Hz	Stationary use (IEC 60721-3-3)	ILC 00721 (With
Power consumption AC	42400 HZ ≤ 21,5 VA	Transport (IEC 60721-3-2)	
Supply voltage U_{S} (also see nameplate)	DC 80250 V	Long-term storage (IEC 60721-3-1)	
Power consumption DC	≤ 5,5 VA	Classification of mechanical conditions acc	+ LEC 60721.
·	= 3/3 VA	Stationary use (IEC 60721-3-3)	to IEC 00/21.
isoLR275-327:	DC 2465 V	for screw mounting with accessories B99005	56
Supply voltage U _S (also see nameplate) Power consumption	DC 2463 V ≤ 6 VA	for DIN rail mounting	10
r ower consumption	5 0 VA	Transport (IEC 60721-3-2)	
Response values		Long term storage (IEC 60721-3-1)	
Response value R _{an1}	0.2100 kΩ		
Factory setting R _{an1} (Alarm1)	4 kΩ	Connection	
Response value R _{an2}	0.2100 kΩ	Connection	
Factory setting R _{an2} (Alarm2)	1 kΩ	Connection properties	
Relative uncertainty (7100 k Ω) (acc. to IEC 61557-8)	± 15 %	rigid/flexible	
Relative uncertainty (0.27 k Ω)	±1kΩ	flexible with ferrules without/with plastic sleev	e
Response time t _{an}	see table in the manual	Tightening torque	
Hysteresis	25 %, + 1 kΩ	Conductor sizes Cable length between isoLR275 and AGH-LR	
Measuring circuit		Cable leligtii betweeli isoLh2/3 aliu Adri-Lh	
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	
Internal DC resistance R _i	≥ 35 kΩ	Mounting	
Impedance Z _i at 50 Hz	≥ 35 kΩ	Distance to adjacent devices	
Permissible extraneous DC voltage $U_{ m fg}$	≤ DC 1100 V	Degree of protection, terminals (DIN EN 60529)	
Permissible system leakage capacitance C _e	\leq 500 µF (150 µF)*	Degree of protection, terminals (DIN EN 60529)	
Displays		Type of enclosure	
υυριαγο		Screw mounting with mounting clip	
Dienlay illuminated	haddit tua lina dicala		
• •	backlit two-line display	Flammability class	
Display, illuminated Characters (number/height) Display range measured value	2 x 16/4/mm	Documentation number	
_ · · · ·			

Outputs/Inputs					
"TEST"-/"RESET" button				internal/	/external
Cable length "TEST"-/"RESET" button, external					≤ 10 m
Current output (load)			0/4	.20 mA (≤	500 Ω)
Accuracy current output,					
related to the value indicated $(1100 \text{ k}\Omega)$				±15 %	, ±1 kΩ
Serial interface					
Interface/protocol				RS-4	485/BMS
Connection				termi	inals A/B
Cable length				<u> </u>	1200 m
Shielded cable (shield to PE on one end)	2-cor	re, ≥ 0.6 m	ım², e.g. J-	Y(St)Y mir	n. 2 x 0.6
Terminating resistor				120 Ω	(0.5 W)
Device address, BMS bus				1	.30 (3)*
Switching elements					
Switching elements 2 changeover	r contacts:	K1 (Alarm	1), K2 (Ala	rm 2. devi	ice error)
Operating mode K1, K2 (Alarm 1/Alarm 2)		eration/N/			
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					
not suitable for household and small companies			IEC	61326-2-	4 Ed. 1.0
Operating temperature				-25	+65 °C
Classification of climatic conditions acc. to IEC	. 60721 (w	ith conden	sation and	formation o	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	1:			
Stationary use (IEC 60721-3-3)					
for screw mounting with accessories B990056					3M12
for DIN rail mounting					3M11
Transport (IEC 60721-3-2)					2M4
Long term storage (IEC 60721-3-1)					1M12

Connection	
Connection	screw-type terminal
Connection properties	
rigid/flexible	0.24 mm ² /0.22.5 mm
flexible with ferrules without/with plastic sleeve	0.252.5 mm
Tightening torque	0.5 Nr
Conductor sizes	AWG 24-1
Cable length between isoLR275 and AGH-LR	≤ 0.5 r
0ther	

utner	
Operating mode	continuous operation
Mounting	display-oriented
Distance to adjacent devices	≥ 30 mm
Degree of protection, terminals (DIN EN 60529)	IP30
Degree of protection, terminals (DIN EN 60529)	IP20
Type of enclosure	X112, free from halogen
Screw mounting with mounting clip	2 x M4
Flammability class	UL94 V-0
Documentation number	D00127
Weight	≤ 510 g

()* = factory setting
Data labelled with ** are absolute values

Rated insulation voltage	AC 800 V
Rated impulse voltage/pollution degree	8 kV/3
Voltage ranges	
Nominal system voltage U _n	AC, 3(N)AC 0793 V, DC 01100 V
Nominal frequency f_n	DC, 10460 Hz
Max. AC voltage $U \sim$ in the frequency range $f_n = 0.110$ Hz	$U_{\sim \text{max}} = 110 \text{ V/Hz} * f_{\Gamma}$
Environment/EMC	
EMC	IEC 61326-2-4 Ed. 1.0
Operating temperature	-25+65°C
Classification of climatic conditions acc. to IEC 60721 (with	n condensation and formation of ice):
Stationary use (IEC 60721-3-3)	3K23
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions acc. to IEC 6072	l:
Stationary use (IEC 60721-3-3)	3M12
Transport (IEC 60721-3-2)	2M4
Storage (IEC 60721-3-1)	1M12

Connection	
Connection	screw-type terminals
Connection properties	
rigid/flexible	0.24 mm ² /0.22.5 mm ²
flexible with ferrules without/with plastic sleeve	0.252.5 mm ²
Tightening torque	0.5 Nm
Conductor sizes	AWG 24-12
Cable length between isoLR275 and AGH-LR	≤ 0.5 m

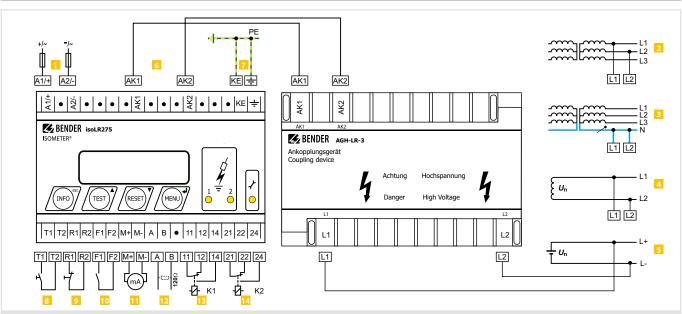
Operating mode	continuous operation
Mounting	cooling slots must be ventilated vertically!
Distance to adjacent devices	≥ 30 mm
Degree of protection, internal components (DIN EN 60529) IP30
Degree of protection, terminals (DIN EN 60529)	IP20
Type of enclosure	X200, free from halogen
DIN rail mounting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

Dimension diagrams (dimensions in mm)

112,5 110 74 105

AGH-LR 111 109 71 61 71

Wiring diagrams



- Supply voltage U_5 (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-
- 6 Connection to the coupling device AGH-PV
- * External test button (N/O contact)

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

Disconnection from the IT system

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

ISOMETER® isoPV with coupling device AGH-PV

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





Typical applications

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

Approvals





Device features

isoPV

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

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

Additional functions

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

Standards

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

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

Further information

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

Ordering information

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

Devices are available as a set.

Accessories

Description	Art. No.
Screw mounting	B990056

Suitable system components

Description	Туре	Art. No.	Page
External $k\Omega$ measuring instruments	9620-1421	B986841	388

Insulation coordination acc. to IEC 60664-1	
Definitions:	
Supply circuit (IC2)	A1, A2
Output circuit (IC3)	11, 14, 24
Control circuit (IC4)	Up, KE, T/R, A, B, AK1, GND, AK2
Rated voltage	240 \
Overvoltage category	
Rated impulse voltage:	
IC2/(IC3-4)	4 k\
IC 3/(IC4)	4 k\
Rated insulated voltage:	250\
IC2/(IC3-4) IC 3/(IC4)	250 \
Polution degree	230 (
Protective separation (reinforced insulation) between:	
IC2/(IC3-4)	Overvoltage category III, 300 \
IC 3/(IC4)	Overvoltage category III, 300 \
Voltage test (routine test) according to IEC 61010-1:	overvoltage category iii, 500 i
IC2/(IC3-4)	AC 2.2 k\
IC 3/(IC4)	AC 2.2 k\
Voltage ranges	
Nominal system voltage U _n	via AGH-P\
soPV-335:	
Supply voltage $U_{\rm S}$ (also see nameplate)	AC 88264 V**
Frequency range $U_{\rm S}$	42460 Hz
Power consumption	≤ 21,5 VA
Supply voltage $U_{\rm S}$ (also see nameplate)	DC 77286 V**
Power consumption	≤ 5,5 VA
isoPV-327:	
Supply voltage $U_{\rm S}$ (also see nameplate)	AC 19,255 V**
Frequency range $U_{\rm S}$	42460 Hz
Supply voltage $U_{\rm S}$ (also see nameplate)	DC 19.272 V**
Power consumption	≤ 6 VA
For UL-application	
Nominal system voltage <i>U</i> n	via AGH-P\
isoPV-335:	
Supply voltage $U_{\rm S}$ (also see nameplate)	AC 88250 \
Frequency range U _S	42460 Hz
Power consumption AC	≤ 21,5 VA
Supply voltage $U_{\rm S}$ (also see nameplate)	DC 80250 \
Power consumption DC	≤ 5,5 VA
isoPV-327:	
Supply voltage $U_{\rm S}$ (also see nameplate)	DC 2465 \
Power consumption	≤ 6 VA
Response values	
Response value R _{an1}	0.2100 kΩ
Factory setting R _{an1} (Alarm1)	4 kΩ
Response value R ^{an2}	0.2100 kΩ
Factory setting R _{an2} (Alarm2)	1 kΩ
Relative uncertainty (7 \dots 100 k Ω) (in accordance with IEC 615	557-8:2007-01) ±15 %
Relative uncertainty (0.27 k Ω)	±1 kΩ
Response time t _{an}	see table in manua
Hysteresis	25 %, +1 kΩ
Measuring circuit	
Measuring voltage U_{m} (peak value)	± 50 \
Measuring current $I_{\rm m}$ (at $R_{\rm F}=0~\Omega$)	≤ 1.5 mA
	≥ 35 kΩ
Impedance Z _i at 50 Hz	≥ 35 kΩ ≥ 35 kΩ
Internal DC resistance DC R _i Impedance Z _i at 50 Hz Permissible extraneous DC voltage Ufg Max. system leakage capacitance C _e	

Displays Display, illuminated					two-line	e displa
Characters (number/height)						6/4 mn
Display range measured value					0.2 kΩ.	
Operating uncertainty					±15%	, ±1 kΩ
Outputs/Inputs						
Test/reset button					internal/	'externa
Cable length test/reset button, e	xternal					≤ 10 n
Current output (load)				0/4	.20 mA (≤	500 Ω
Accuracy current output, related	to the value indicate	ed (11)	00 kΩ)		±15 %	, ±1 kΩ
Serial interface						
Interface/protocol					RS-4	185/BM
Connection					termi	nals A/
Cable length						1200 r
Shielded cable (shield to PE on o	ne end)	2	?-core, ≥ (0.6 mm2, z	. B. J-Y(St)	
Terminating resistor						(0.5 Ω
Device address, BMS bus					1	.30 (3)
Switching elements						
Switching elements	2 changeover					
Operating mode K1, K2	N/C operat	ion n.c./N	I/O operat	ion n.o. (N	/0 operation	on n.o.)
Contact data acc. to IEC 6094	7-5-1:					
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 nA at AC/D	0.1
Minimum contact rating				IN	na at ac/Di	L ≥ 10
Environment/EMC						
EMC- not suitable for household	and small companie	S				326-2-
Operating temperature						.+65°
Classification of climatic cond	itions acc. to IEC 60	721 (with	n condens	ation and f	ormation of	
Stationary use (IEC 60721-3-3)						3K2
Transport (IEC 60721-3-2)	-1					2K1
Long-term storage (IEC 60721-3						1K2
Classification of mechanical	conditions acc. to I	EC 6072	l:			
Stationary use (IEC 60721-3-3) for screw fixing with accessories	P0000E6					3M1
for DIN rail mounting	8990056					3M1
Transport (IEC 60721-3-2)						2M
Long-time storage (IEC 60721-3-	-1)					1M1
Connection						
Connection				sc	rew-type to	ermina
Connection, rigid/flexible					m²/0.2	
Connection flexible with connect	tor sleeve, without/v	vith plasti	ic sleeve		0.25	
Tightening torque	,				0.6	.0.8 Nr
Conductor sizes					AW	/G 24-1
Cable length between isoPV and	AGH-PV					≤ 0.5 r
Other						
Operating mode				CO	ntinuous o	peratio
Mounting					display	oriente
Distance to adjacent devices					2	≥ 30 mn
Degree of protection, internal co		0529)				IP3
Degree of protection, terminals (DIN EN 60529)					IP2
Type of enclosure					, free from	
DIN rail mounting				DIN E	N 60715/IE	
Screw mounting by means of su	pport (see Seite 67 ir	n manual)				2 x M
Flammability class Software version						JL94 V- R51 V2

()* = factory setting

Software version Weight

The values marked with** are absolute values

D351 V2.0 < 510 g

Technical data coupling device AGH-PV

Rated insulation voltage	AC 800 V
Rated impulse voltage/pollution degree	8 kV/3
Voltage ranges	
Nominal system voltage U _n	AC, 3(N)AC 0793 V, DC 01100 V
Nominal frequency f_n	DC, 10460 Hz
Max. AC voltage $U\sim$ in the frequency range $f_n=0.110$ Hz:	$U\sim \max=110 \text{ V/Hz}*f_{\Gamma}$
Environment/EMC	
EMC	IEC61326-2-4
Operating temperature	-25+65 °C
Classification of climatic conditions acc. to IEC 60721 (with	condensation and formation of ice):
Stationary use (IEC 60721-3-3)	3K23
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions acc. to IEC 60721	:
Stationary use (IEC 60721-3-3)	3M12
Transport (IEC 60721-3-2)	2M4
Long-time storage (IEC 60721-3-1)	1M12

_			٠.	
Co	nr	ec	tı	on

Connection	screw-type terminals
Connection, rigid/flexible	0.24 mm ² /0.22.5 mm ²
Connection flexible with connector sleeve, without/with plastic sleeve	0.252.5 mm ²
Tightening torque	0.5 Nm
Conductor sizes	AWG 24-12
Cable length between isoPV and AGH-PV	≤ 0.5 m

Other

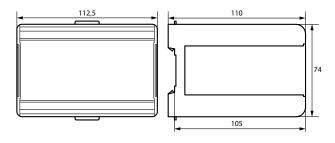
Operating mode	continuous operation
Mounting	cooling slots must be ventilated vertically!
Distance to adjacent devices	≥ 30 mm
Degree of protection, internal components (DIN EN 60529)	IP30
Degree of protection, terminals (DIN EN 60529)	IP20
Type of enclosure	X200, free from halogen
DIN rail mounting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

()* = factory setting

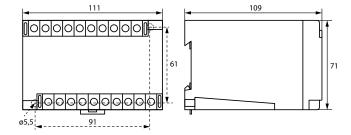
The values marked with** are absolute values

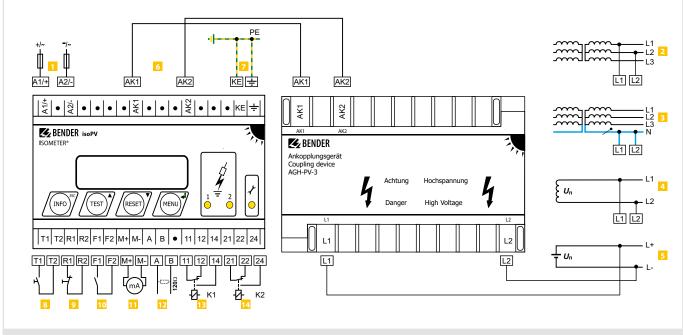
Dimension diagrams (dimensions in mm)

isoPV



AGH-PV

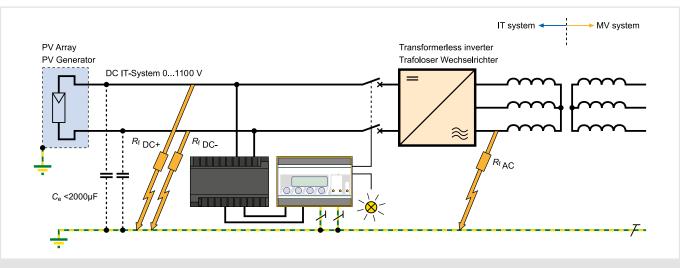




- Supply voltage U_s (see nameplate) via 6 A fuse; For UL and CSA applications, it is mandatory to use 5 A fuses
- Connection to the 3 AC system to be monitored: Connect the terminals L1, L2 to neutral conductor N or terminals L1, L2 to conductor L1, L2.
- Connection to the AC system to be monitored: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

- 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



PV generator unearthed (IT system) with nominal voltage ≤ DC 1100 V and ISOMETER® isoPV with coupling device AGH-PV

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 kΩ (Alarm 1, Alarm 2)
- Alarm signalling via LEDs (AL1, AL2), a display and alarm relays (K1, K2)
- N/C operation or N/O operation selectable
- · Measured value indication via multi-functional LCD
- Fault memory can be activated
- RS-485 (galvanically isolated) including the following protocols:
- BMS interface (Bender measuring device interface) for data exchange with other Bender components
- isoData (for continuous data output)
- · Password protection to prevent unauthorised parameter changes

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

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

Further information

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



Ordering information

	Туре	Supply voltage <i>U</i> s	Nominal voltage <i>U</i> n	System leakage	Art.	No.
	.,,,,,	54pp.y 15114gc 03			Screw-type terminal	Push-wire terminal
ſ	isoPV425-D4-4 with AGH420	AC 100240 V, 4763 Hz / DC 24240 V	3(N)AC, AC 0690 V / DC 01000 V	≤ 500 µF	B91036303	B71036303

Accessories

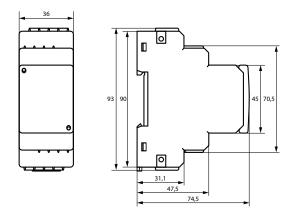
Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B98060008

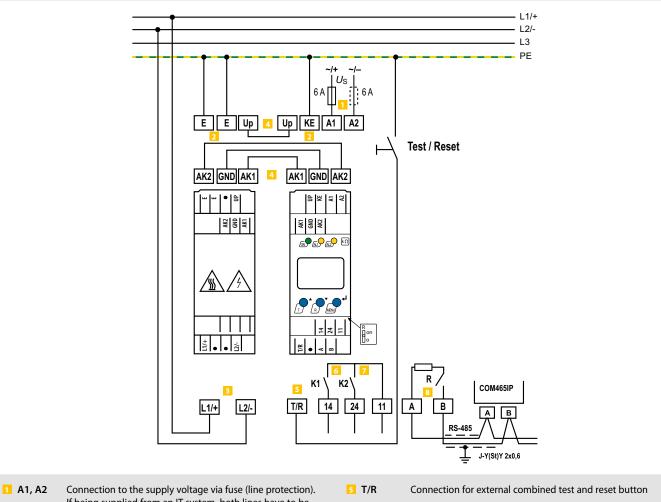
Insulation coordination acc. to IEC 60664-1/IEC 60664-3		Switching elements					
Definitions:		Switching elements				mmon ter	
Supply circuit (IC2)	A1, A2	Operating principle	N/C op	peration/N	O operatio	n (N/O ope	
Output circuit (IC3)	11, 14, 24	Electrical endurance, number of cycles					10000
	E, T/R, A, B, AK1, GND, AK2	Contact data acc. to IEC 60947-5-1:					
Rated voltage	240 V	Utilisation category	AC-12	AC-14	DC-12	DC-12	DC-1
Overvoltage category	III	Rated operational voltage	230 V	230 V	24 V	110 V	220
lated impulse voltage:	410/	Rated operational current	5 A	2 A	1 A	0.2 A	0.1
IC2/(IC3-4)	4 kV	Minimum contact rating			1 n	nA at AC/D	C ≥ 10 \
IC 3/(IC4)	4 kV	Environment/EMC					
Rated insulated voltage:	2507					IFC C1	1226.2
IC2/(IC3-4) IC 3/(IC4)	250 V	EMC				IEC 0	1326-2-
Polution degree	250 V	Ambient temperatures:					
Protective separation (reinforced insulation) between:	3	Operation					+70 º
·	voltage category III, 300 V	Transport					+85 º
	voltage category III, 300 V	Storage				-40	+70 °
/oltage test (routine test) according to IEC 61010-1:	voltage category iii, 500 v	Classification of climatic conditions acc. to IEC	60721 (relate	ed to tempe	erature and	relative hu	midity):
IC2/(IC3-4)	AC 2.2 kV	Stationary use (IEC 60721-3-3)					3K2
IC 3/(IC4)	AC 2.2 kV	Transport (IEC 60721-3-2)					2K1
ic 3/(ict)	71C 2.2 RV	Long-term storage (IEC 60721-3-1)					1K22
Supply voltage		Classification of mechanical conditions acc.	to IEC 6072	1			
Supply voltage $U_{\rm S}$ AC 10	0240 V/DC 24240 V	Stationary use (IEC 60721-3-3)					3M1
Folerance of U _S	-30+15 %	Transport (IEC 60721-3-2)					2M4
Frequency range $U_{\rm S}$	4763 Hz	Long-term storage (IEC 60721-3-1)					1M12
Power consumption	\leq 3 W, \leq 9 VA						
T system being monitored		Connection					
•	0 (00)//0(0 1000)/	Connection type	scr	ew-type to	erminal or	push-wire	termina
,	0690 V/DC 01000 V	Screw-type terminals:					
Tolerance of U _n	AC +15 %, DC +10 % AC/DC 0600 V	Nominal current					≤10 /
Nominal system voltage range <i>U</i> _n with AGH420 (UL508)		Tightening torque			0.5 0	.6 Nm (5	
Frequency range of U_{n}	DC, 15460 Hz	Conductor sizes			0.50		VG 24-12
Measuring circuit						AVI	8 mn
Permissible system leakage capacitance C_e at insulation value $\leq 300 \text{ k}\Omega$	≤ 1000 µF	Stripping length Rigid/flexible				0.3	
Permissible system leakage capacitance C_e at insulation value $\geq 300 \text{ k}\Omega$	≤ 500 μF	3					.2.5 mm
Permissible extraneous DC voltage $U_{\rm fg}$	≤ 1150 V	Flexible with ferrules with/without plastic sleeve				0.25	.2.5 mm
<u> </u>		Multi-conductor					
Response values		rigid /flexible					.1.5 mm
Response value R _{an1}	2500 kΩ (10 kΩ)*	flexible with ferrules without plastic sleeve				0.25	.1.5 mm
Response value R _{an2}	1490 kΩ (5 kΩ)*	flexible with TWIN ferrules with plastic slee	ve			0.5	.1.5 mm
Relative uncertainty R _{an}	\pm 15 %, at least \pm 1 k Ω	Push-wire terminals:					
Hysteresis R _{an}	25 %, at least 1 kΩ	Nominal current					≤10
Undervoltage detection	301.14 kV (off)*	Conductor sizes				AW	VG 24-1
Overvoltage detection	311.15 kV (off)*	Stripping length				711	10 mn
Relative uncertainty <i>U</i>	\pm 5 %, at least \pm 5 V					0.2	
Relative uncertainty depending on the frequency ≥ 200 Hz	-0.03 %/Hz	Rigid					2.5 mm
Hysteresis <i>U</i>	5 %, at least 5 V	Flexible without ferrules				0.75	
Time response		Flexible with ferrules with/without plastic sleeve	1 1				.2.5 mm
Response time t_{an} at $R_F = 0.5 \times R_{an}$ and $C_e = 1 \mu F$ acc. to IEC 61557-8	≤ 10 s	Multi-conductor flexible with TWIN ferrules with	plastic sleev	e		0.5	.1.5 mm
Start-up delay t	010 s (0 s)*	Opening force					501
Response delay t _{on}	099 s (0 s)*	Test opening, diameter					2.1 mn
Delay on release t _{off}	099 s (0 s)*	Wiring of the terminals Up, AK1, GND, AK2					
or release tom	0773 (03)	refer to tec	hnical data <i>F</i>	AGH420 un	der the hea	ading "Con	inection
Displays, memory		Other					
Display LC display, multi-1	unctional, not illuminated	Operating mode				ntinuous o	noratio
Display range measured value insulation resistance (R _F)	1 kΩ1 MΩ	Mounting		ooling clot		rentilated v	•
Operating uncertainty at $R_F \le 1 \text{ M}\Omega$	\pm 15 %, at least \pm 1 k Ω	Degree of protection, built-in components (DIN E		ooning side	s illust be v	rentilated	IP3
Display range measured value nominal system voltage (U_n)	301.15 kV r.m.s.	Degree of protection, built in components (bit E	14 00327)				IP2
Operating uncertainty	\pm 5 %, at least \pm 5 V	Enclosure material				nolve:	arbonat
Relative uncertainty depending on the frequency ≥ 200 Hz	-0.03 %/Hz	DIN rail mounting acc. to					EC 6071.
Display range measured value system leakage capacitance at $R_F > 10 \text{ k}\Omega$	01000 μF	Screw fixing			2 x M/	with mour	
Operating uncertainty	\pm 15 %, at least \pm 2 μ F	Documentation number			∠ ∧ IVI 1	with HIUUI	D0002
Password	off/0999 (0, off)*	Weight					≤ 150 (
ault memory alarm messages	on/(off)*	adynt					_ 130
	·	()* = Factory setting					
ludanda aa							
	NAC AA II STU : T						
nterface/protocol RS-485/I	BMS, Modbus RTU, isoData						
nterface/protocol RS-485// Baud rate BMS (9.6 kBit/s), Modbus RTU (selectab	le), isoData (115.2 kBits/s)						
nterface/protocol RS-485// Baud rate BMS (9.6 kBit/s), Modbus RTU (selectab Cable length (9.6 kBits/s)	le), isoData (115.2 kBits/s) ≤ 1200 m						
Interface/protocol RS-485/l Baud rate BMS (9.6 kBit/s), Modbus RTU (selectab Cable length (9.6 kBits/s) Cable: twisted pairs, shield connected to PE on one side	le), isoData (115.2 kBits/s) ≤ 1200 m min. J-Y(St)Y 2x0.6						
Baud rate BMS (9.6 kBit/s), Modbus RTU (selectab Cable length (9.6 kBits/s) Cable: twisted pairs, shield connected to PE on one side	le), isoData (115.2 kBits/s) ≤ 1200 m						

Definitions:	
Measuring circuit (IC1)	L1/+, L2/-
Control circuit (IC2)	AK1, GND, AK2, Up, F
Rated voltage	1000 V
Overvoltage category	III
Rated impulse voltage:	
IC1/(IC2)	8 kV
Rated insulated voltage:	
IC1/(IC2)	1000 V
Polution degree	3
Protective separation (reinforced insulation) between:	
IC1/(IC2)	Overvoltage category III, 1000 V
Monitored IT system	
Nominal system voltage range U_n	AC/DC 01000 V
Tolerance of U_n	AC/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
Ambient temperatures:	
Operation	-40+70°C
Transport	-40+85°C
Storage	-40+70°C
Classification of climatic conditions acc. to IEC 60721 (exce	ept condensation and formation of ice):
Stationary use (IEC 60721-3-3)	3K24
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions acc. to IEC 607	21:
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 24-12
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 sleev	ve 0.251.5 mm ²
Multi-conductor flexible with TWIN ferrules with plastic sle	eeve 0.251.5 mm ²
Push-wire terminals:	
Nominal current	≤10 A
Conductor sizes	AWG 24-14
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 sle	eeve 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	
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 internal components (DIN EN 60529)	IP30
Degree of protection terminals (DIN EN 60529)	IP20
Enclosure material	polycarbonate
DIN rail mounting acc. to	IEC 60715
Screw mounting	2 x M4 with mounting clip
Weight	≤ 150 g

Dimension diagram (dimensions in mm)





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

* For UL applications:

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

ISOMETER® isoPV1685...

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





Typical applications

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

Approvals





only for isoPV1685RTU in DC circuits

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
- · RS-485 interface
 - isoPV1685P: BMS bus, e.g. to control the insulation fault location
 - isoPV1685RTU: BMS bus or Modbus (can be switched using the DIP switch)
- µSD card with data logger and history memory for alarms

Standards

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

- DIN EN 61557-8 (VDE 0413-8)
- IFC 61557-8
- IEC 61557-9
- IEC 61326-2-4
- IEC 60730-1
- DIN EN 60664-1 (VDE 0110-1)
- UL1998 (software) isoPV1685RTU in DC cirquits only

Further information

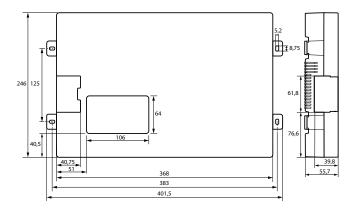
For further information refer to our product range on www.bender.de.

Ordering information

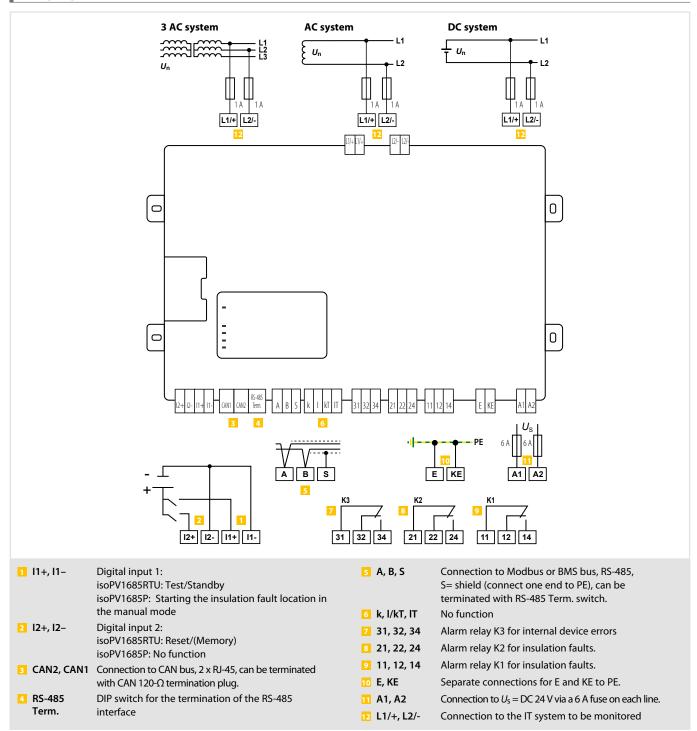
Туре	Response value range	Supply voltage U s ¹⁾	Nominal system voltage <i>U</i> n	Incl. μSD card	Art. No.
isoPV1685RTU-425	2000 1110	DC 10 20 V	AC 01000 V / DC 01500 V	-	B91065603
isoPV1685P-425	- 200 Ω…1 ΜΩ	DC 1830 V	DC 01500 V	~	B91065604

¹⁾ Absolutwerte

Insulation coordination acc. to IEC 60664-1/IEC 60664-3	Switching elements
Insulation coordination acc. to IEC 60664-1	Switching elements 3 changeover contact
Rated voltage DC 1500 V	K1 (insulation fault alarm 1)
Rated impulse voltage/pollution degree 8 kV/2	K2 (insulation fault alarm 2
Voltage ranges	K3 (device error
Nominal system voltage U _n	Operating principle K1, K2 N/C operation or N/O operation (N/C operation)
isoPV1685RTU AC 01000 V/DC 01500 V	Operating principle K3 N/C operation, not changeable
isoPV1685P DC 01500 V	Contact data acc. to IEC 60947-5-1:
	Utilisation category AC 13 AC 14 DC-12 DC-12 DC-1
Nominal frequency 50/60 HZ ±1 Hz	Rated operational voltage 230 V 230 V 24 V 110 V 220
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 <i>U</i> _S (refer also to device name plate) DC 1830 V	Minimum contact rating 1 mA at AC/DC \geq 10
Power consumption $\leq 7 \text{ W}$	For III application.
Measuring circuit for insulation monitoring	For UL application: Utilisation category for AC control circuits with 50/60 Hz (Pilot duty) B30
Measuring voltage $U_{\rm m}$ (peak value) $\pm 50 {\rm V}$	AC load of the alarm relay outputs AC 240 V, 1.5 A in case of a power factor of 0.3
Measuring current $I_{\rm m}$ (at $R_{\rm F}=0~\Omega$) $\leq 1.5~{\rm mA}$	AC load of the alarm relay outputs AC 120 V, 3 A in case of a power factor of 0.3
Internal DC resistance R_i $\geq 70 \text{ k}\Omega$	AC load of the alarm relay outputs AC 250 V, 8 A in case of a power factor of 0.75 to 0.8
Impedance Z_i at 50 Hz \geq 70 k Ω	DC load of the alarm relay outputs DC 30 V, 8 A in case of ohmic loa
Permissible extraneous DC voltage U_{fq} \leq DC 1500 V	be load of the diaminetaly outputs
Permissible system leakage capacitance $C_{\rm e}$ $\leq 2000 \mu\text{F} (500 \mu\text{F})^*$	Connection (except system coupling)
, , , , , , , , , , , , , , , , , , , ,	Connection type pluggable push-wire terminal
Response values for insulation monitoring	Connection
Response value R_{an1} (Alarm 1) 200 $\Omega 1 M\Omega$ (10 $k\Omega$)*	rigid/flexible 0.22.5 mm ² /0.22.5 mm
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
Upper limit of the measuring range when set to $C_{emax} = 2000 \mu\text{F}$ 50 k Ω	Conductor sizes (AWG) 241
Relative uncertainty (10 k Ω 1 M Ω) (acc. to IEC 61557-8) \pm 15 %	
Relative uncertainty (0.2 k Ω < 10 k Ω) $\pm 200\Omega \pm 15 \%$	Connection of the system coupling
Response time t _{an} see graphic in the manual	Connection type pluggable push-wire terminal
Hysteresis 25% , $+1$ k Ω	Connection
	rigid/flexible 0.210 mm ² /0.26 mm
isoPV1685P only:	flexible with ferrule, without/with plastic sleeve 0.256 mm ² /0.254 mm
Measuring circuit for insulation fault location (EDS)	Conductor sizes (AWG) 24
Locating current I_L DC \leq 50 mA	Stripping length 15 mr
Test cycle/pause 2/4 s	Opening force 90120
Number of turns of test winding 10	
Dimlous maman	Environment/EMC
Displays, memory	EMC IEC 61326-2-4 Ed. 1.
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, icing. Condensation possible temporarily:
Inputs	Stationary use (IEC 60721-3-3) 3K2
·	Transport (IEC 60721-3-2) 2K1
Digital inputs Digln1/Digln2:	Long-term storage (IEC 60721-3-1) 1K2
High level 1030 V	Classification of mechanical conditions acc. to IEC 60721:
Low level 00.5 V	Stationary use (IEC 60721-3-3) 3M1
Serial interfaces	Transport (IEC 60721-3-2) 2M
Serial interfaces	Long-term storage (IEC 60721-3-1) 1M1
BMS/Modbus:	
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 °
isoPV1685P: RS-485/BMS (Slave)	Ambient temperature for transport -40 +80 °
Connection terminals A/B	Ambient temperature for long-term storage -25+80 °
Shield: Terminal S	Relative humidity 10100 9
Cable length \leq 1200 m	Atmospheric pressure 7001060 hPa (max. height 4000 m
Cable length \leq 1200 m Shielded cable (shield to functional earth on one end) 2-core, \geq 0.6 mm ² , e.g. J-Y(5t)Y 2 x 0.6	Atmospheric pressure 7001060 hPa (max. height 4000 m
Cable length ≤ 1200 m Shielded cable (shield to functional earth on one end) 2-core, ≥ 0.6 mm², e.g. J-Y(St)Y 2 x 0.6 Terminating resistor, switchable (RS-485 Term.) 120 Ω (0.5 W)	Atmospheric pressure 7001060 hPa (max. height 4000 m
Cable length ≤ 1200 m Shielded cable (shield to functional earth on one end) 2-core, ≥ 0.6 mm², e.g. J-Y(St)Y 2 x 0.6 Terminating resistor, switchable (RS-485 Term.) 120 Ω (0.5 W) Device address, BMS bus or Modbus adjustable (DIP switch) isoPV1685RTU: 217	Atmospheric pressure 7001060 hPa (max. height 4000 m Other Operating mode continuous operatio
Cable length ≤ 1200 m Shielded cable (shield to functional earth on one end) 2-core, ≥ 0.6 mm², e.g. J-Y(St)Y 2 x 0.6 Terminating resistor, switchable (RS-485 Term.) 120 Ω (0.5 W)	Atmospheric pressure 7001060 hPa (max. height 4000 m Other Operating mode continuous operatio Position of normal use vertical, system coupling on to
Cable length ≤ 1200 m Shielded cable (shield to functional earth on one end) 2-core, ≥ 0.6 mm², e.g. J-Y(St)Y 2 x 0.6 Terminating resistor, switchable (RS-485 Term.) 120 Ω (0.5 W) Device address, BMS bus or Modbus adjustable (DIP switch) isoPV1685RTU: 217 Device address, BMS bus adjustable (DIP switch) isoPV1685P: 233 W	Atmospheric pressure 7001060 hPa (max. height 4000 m Other Operating mode continuous operatio Position of normal use vertical, system coupling on to PCB fixation lens head screw DIN7985T.
Cable length ≤ 1200 m Shielded cable (shield to functional earth on one end) 2-core, ≥ 0.6 mm², e.g. J-Y(St)Y 2 x 0.6 Terminating resistor, switchable (RS-485 Term.) 120 Ω (0.5 W) Device address, BMS bus or Modbus adjustable (DIP switch) isoPV1685RTU: 217 Device address, BMS bus adjustable (DIP switch) isoPV1685P: 233 W	Atmospheric pressure 7001060 hPa (max. height 4000 m Other Operating mode continuous operatio Position of normal use vertical, system coupling on to PCB fixation lens head screw DIN7985T Tightening torque 4.5 Nr
Cable length ≤ 1200 m Shielded cable (shield to functional earth on one end) 2-core, ≥ 0.6 mm², e.g. J-Y(St)Y 2 x 0.6 Terminating resistor, switchable (RS-485 Term.) 120 Ω (0.5 W) Device address, BMS bus or Modbus adjustable (DIP switch) isoPV1685RTU: 217 Device address, BMS bus adjustable (DIP switch) isoPV1685P: 233 W CAN: acc. to SMA/Bender specification V2.5	Atmospheric pressure 7001060 hPa (max. height 4000 m Other Operating mode continuous operatio Position of normal use vertical, system coupling on to PCB fixation lens head screw DIN7985T Tightening torque 4.5 Nr Degree of protection, internal components IP3
Cable length≤ 1200 mShielded cable (shield to functional earth on one end)2-core, ≥ 0.6 mm², e.g. J-Y(St)Y 2 x 0.6Terminating resistor, switchable (RS-485 Term.)120 Ω (0.5 W)Device address, BMS bus or Modbus adjustable (DIP switch)isoPV1685RTU: 217Device address, BMS bus adjustable (DIP switch)isoPV1685P: 233 WCAN:Protocolacc. to SMA/Bender specification V2.5Frame formatCAN 2.0A 11-bit identifier	Atmospheric pressure 7001060 hPa (max. height 4000 m Other Operating mode continuous operatio Position of normal use vertical, system coupling on to PCB fixation lens head screw DIN7985T. Tightening torque 4.5 Nr Degree of protection, internal components IP3 Degree of protection, terminals IP3
Cable length≤ 1200 mShielded cable (shield to functional earth on one end)2-core, ≥ 0.6 mm², e.g. J-Y(St)Y 2 x 0.6Terminating resistor, switchable (RS-485 Term.)120 Ω (0.5 W)Device address, BMS bus or Modbus adjustable (DIP switch)isoPV1685RTU: 217Device address, BMS bus adjustable (DIP switch)isoPV1685P: 233 WCAN:Protocolacc. to SMA/Bender specification V2.5Frame formatCAN 2.0A 11-bit identifierBaud rate500 kBit/s	Atmospheric pressure 7001060 hPa (max. height 4000 m Other Operating mode continuous operatio Position of normal use vertical, system coupling on to PCB fixation lens head screw DIN7985T. Tightening torque 4.5 Nr Degree of protection, internal components IP3 Degree of protection, terminals IP3 Documentation number D0000
Cable length ≤ 1200 m Shielded cable (shield to functional earth on one end) 2-core, ≥ 0.6 mm², e.g. J-Y(St)Y 2 x 0.6 Terminating resistor, switchable (RS-485 Term.) 120 Ω (0.5 W) Device address, BMS bus or Modbus adjustable (DIP switch) isoPV1685RTU: 217 Device address, BMS bus adjustable (DIP switch) isoPV1685P: 233 W CAN: Protocol accc. to SMA/Bender specification V2.5 Frame format CAN 2.0A 11-bit identifier Baud rate 500 kBit/s Connection via 2 x RJ45 acc. to CiA-303-1 connected in parallel Pin 1: CAN-H	Atmospheric pressure 7001060 hPa (max. height 4000 m Other Operating mode continuous operatio Position of normal use vertical, system coupling on to PCB fixation lens head screw DIN7985T. Tightening torque 4.5 Nr Degree of protection, internal components IP3 Degree of protection, terminals IP3
Cable length≤ 1200 mShielded cable (shield to functional earth on one end)2-core, ≥ 0.6 mm², e.g. J-Y(St)Y 2 x 0.6Terminating resistor, switchable (RS-485 Term.)120 Ω (0.5 W)Device address, BMS bus or Modbus adjustable (DIP switch)isoPV1685RTU: 217Device address, BMS bus adjustable (DIP switch)isoPV1685P: 233 WCAN:Protocolaccc. to SMA/Bender specification V2.5Frame formatCAN 2.0A 11-bit identifierBaud rate500 kBit/sConnection via 2 x RJ45 acc. to CiA-303-1 connected in parallelPin 1: CAN-HPin 2: CAN-L	Atmospheric pressure 7001060 hPa (max. height 4000 m Other Operating mode continuous operatio Position of normal use vertical, system coupling on to PCB fixation lens head screw DIN7985T. Tightening torque 4.5 Nr Degree of protection, internal components IP3 Degree of protection, terminals IP3 Documentation number D0000
Cable length≤ 1200 mShielded cable (shield to functional earth on one end)2-core, ≥ 0.6 mm², e.g. J-Y(St)Y 2 x 0.6Terminating resistor, switchable (RS-485 Term.)120 Ω (0.5 W)Device address, BMS bus or Modbus adjustable (DIP switch)isoPV1685RTU: 217Device address, BMS bus adjustable (DIP switch)isoPV1685P: 233 WCAN:Protocolacc. to SMA/Bender specification V2.5Frame formatCAN 2.0A 11-bit identifierBaud rate500 kBit/sConnection via 2 x RJ45 acc. to CiA-303-1 connected in parallelPin 1: CAN-HPin 2: CAN-LPin 3, 7: CAN-GND	Atmospheric pressure 7001060 hPa (max. height 4000 m Other Operating mode continuous operatio Position of normal use vertical, system coupling on to PCB fixation lens head screw DIN7985T Tightening torque 4.5 Nr Degree of protection, internal components IP3 Degree of protection, terminals IP3 Documentation number D0000 Weight ≤ 1300
Cable length ≤ 1200 m Shielded cable (shield to functional earth on one end) 2-core, ≥ 0.6 mm², e.g. J-Y(St)Y 2 x 0.6 Terminating resistor, switchable (RS-485 Term.) 120 Ω (0.5 W) Device address, BMS bus or Modbus adjustable (DIP switch) isoPV1685RTU: 217 Device address, BMS bus adjustable (DIP switch) isoPV1685P: 233 W CAN: Protocol acc. to SMA/Bender specification V2.5 Frame format CAN 2.0A 11-bit identifier Baud rate 500 kBit/s Connection via 2 x RJ45 acc. to CiA-303-1 connected in parallel Pin 1: CAN-H Pin 2: CAN-L Pin 3, 7: CAN-GND CAN identifier permanently set acc. to the specification above	Atmospheric pressure 7001060 hPa (max. height 4000 m Other Operating mode continuous operatio Position of normal use vertical, system coupling on to PCB fixation lens head screw DIN7985T Tightening torque 4.5 Nr Degree of protection, internal components IP3 Degree of protection, terminals IP3 Documentation number D0000 Weight ≤ 1300
Cable length ≤ 1200 m Shielded cable (shield to functional earth on one end) 2-core, ≥ 0.6 mm², e.g. J-Y(St)Y 2 x 0.6 Terminating resistor, switchable (RS-485 Term.) 120 Ω (0.5 W) Device address, BMS bus or Modbus adjustable (DIP switch) isoPV1685RTU: 217 Device address, BMS bus adjustable (DIP switch) isoPV1685P: 233 W CAN: Protocol acc. to SMA/Bender specification V2.5 Frame format CAN 2.0A 11-bit identifier Baud rate 500 kBit/s Connection via 2 x RJ45 acc. to CiA-303-1 connected in parallel Pin 1: CAN-H Pin 2; CAN-L Pin 3, 7: CAN-GND CAN identifier permanently set acc. to the specification above Cable length ≤ 130 m	Atmospheric pressure 7001060 hPa (max. height 4000 m Other Operating mode continuous operatio Position of normal use vertical, system coupling on to PCB fixation lens head screw DIN7985T Tightening torque 4.5 Nr Degree of protection, internal components IP3 Degree of protection, terminals IP3 Documentation number D0000 Weight ≤ 1300
Cable length ≤ 1200 m Shielded cable (shield to functional earth on one end) 2-core, ≥ 0.6 mm², e.g. J-Y(St)Y 2 x 0.6 Terminating resistor, switchable (RS-485 Term.) 120 Ω (0.5 W) Device address, BMS bus or Modbus adjustable (DIP switch) isoPV1685RTU: 217 Device address, BMS bus adjustable (DIP switch) isoPV1685P: 233 W CAN: Protocol acc. to SMA/Bender specification V2.5 Frame format CAN 2.0A 11-bit identifier Baud rate 500 kBit/s Connection via 2 x RJ45 acc. to CiA-303-1 connected in parallel Pin 1: CAN-H Pin 2: CAN-L Pin 3, 7: CAN-GND CAN identifier permanently set acc. to the specification above Cable length ≤ 130 m Shielded cable CAT 5 with RJ45 plug	Atmospheric pressure 7001060 hPa (max. height 4000 m Other Operating mode continuous operatio Position of normal use vertical, system coupling on to PCB fixation lens head screw DIN7985T Tightening torque 4.5 Nr Degree of protection, internal components IP3 Degree of protection, terminals IP3 Documentation number D0000 Weight ≤ 1300
Cable length ≤ 1200 m Shielded cable (shield to functional earth on one end) 2-core, ≥ 0.6 mm², e.g. J-Y(St)Y 2 x 0.6 Terminating resistor, switchable (RS-485 Term.) 120 Ω (0.5 W) Device address, BMS bus or Modbus adjustable (DIP switch) isoPV1685RTU: 217 Device address, BMS bus adjustable (DIP switch) isoPV1685P: 233 W CAN: Protocol acc. to SMA/Bender specification V2.5 Frame format CAN 2.0A 11-bit identifier Baud rate 500 kBit/s Connection via 2 x RJ45 acc. to CiA-303-1 connected in parallel Pin 1: CAN-H Pin 2; CAN-L Pin 3, 7: CAN-GND CAN identifier permanently set acc. to the specification above Cable length ≤ 130 m	Atmospheric pressure 7001060 hPa (max. height 4000 m Other Operating mode continuous operatio Position of normal use vertical, system coupling on to PCB fixation lens head screw DIN7985T Tightening torque 4.5 Nr Degree of protection, internal components IP3 Degree of protection, terminals IP3 Documentation number D0000 Weight ≤ 1300



Wiring diagram



ISOMETER® isoPV1685DP

Insulation monitoring device for unearthed systems in photovoltaic systems





Typical applications

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

Approvals



Device features

- Automatic adjustment to high system leakage capacitances
- Special measuring method ideal for DC systems in combination with 50/60 Hz systems
- · Separately adjustable response values Ran1 (alarm 1) and Ran2 (alarm 2) for prewarning and alarm
- · High-resolution graphic LC display for excellent readability and recording of the device status
- · Connection monitoring
- Automatic 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
- 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
- Measurement of insulation faults 200 Ω...200 kΩ (profile-dependent)
- Integrated locating current injector up to 50 mA for insulation fault location
- Display of insulation faults selectively located by EDS systems
- Parameter setting of EDS systems
- Customer-specific texts for each measuring channel via the menu

Standards

The isoPV1685DP devices were designed according to the following standards:

- DIN EN 61557-8 (VDE 0413-8)
- IEC 61557-8
- IEC 61557-8 Annex C (for Fast 2000 μF profile only)
- DIN EN 61557-9 (VDE 0413-9)
- IEC 61557-9
- IEC 61326-2-4
- DIN EN 60664-1 (VDE 0110-1)

Further information

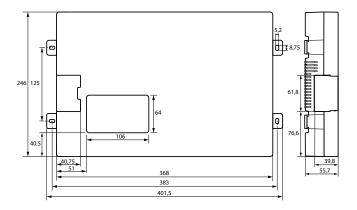
For further information refer to our product range on www.bender.de.

Ordering information

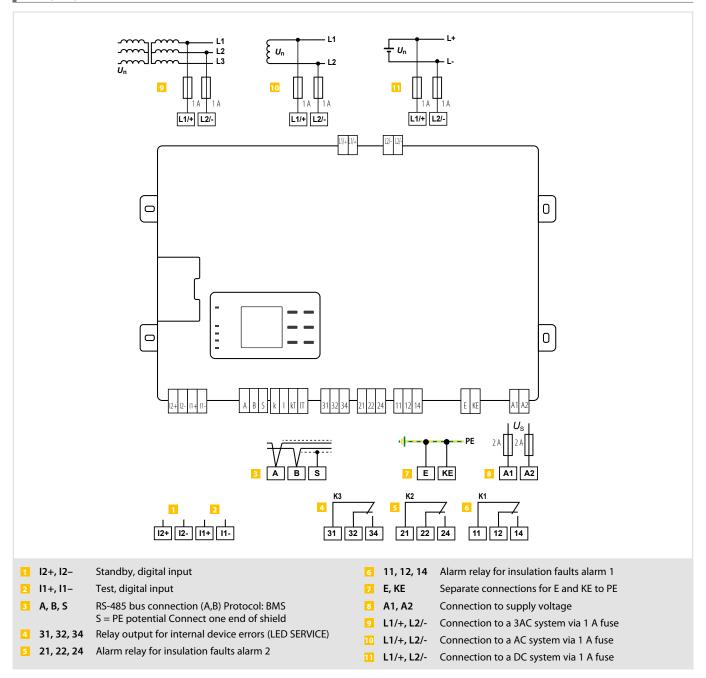
Туре	Response value range	Supply voltage <i>U</i> s ¹⁾	Nominal voltage <i>U</i> n	Art. No.
isoPV1685DP	200 Ω200 kΩ	DC 1830 V	AC 01000 V / DC 01500 V	B91065808

¹⁾ Absolute values

Insulation coordination acc. to IEC 60664-1/IEC 6	50664-3	Digital inputs	
Definitions:		Operating mode, adjustable	active high, active low
Measuring circuit (IC1)	(L1/+, L2/-), (E, KE)	Functions off, test, reset, dea	ctivate device, insulation fault location
Supply circuit (IC2)	A1, A2	High level	1030 V
Output circuit 1 (IC3)	11, 12, 14	Low level	00.5 V
Output circuit 2 (IC4)	21, 22, 24	Serial interface	
Output circuit 3 (IC4)	31, 32, 34	Interface/protocol	RS-485 / BMS / Modbus RTU
Control circuit (IC6)	(A, B), (I1+, I1-, I2+, I2-)	Connection	terminals A/B
Rated voltage	1500 V	Cable length	≤ 1200 m
Overvoltage category	III	Shielded cable (shield to functional earth on one end)	≥ 1200 III
Rated impulse voltage:		Sinciaca casic (sincia to functional curtil on one cha)	2-core, ≥ 0.6 mm2, e.g. J-Y(St)Y 2x0.6
IC1 / (IC2-5)	8 kV	Shield	terminal S
IC2 / (IC3-5)	4 kV	Terminating resistor, can be connected (Term. RS-485)	120 Ω (0.5 W)
IC2 / IC1+IC6	800 V	Device address, BMS bus	(1) 290 (2)*
IC3 / (IC4-6)	4 kV	Device address, Modbus RTU	1247
IC4 / (IC5-6)	4 kV	Baud rate	9.6 / 19.2 / 38.4 / 57.6 / 115 kB
IC5 / IC6	4 kV	Parity	even/odd
Rated insulation voltage:		Stop bits	1/2/auto
IC1 / (IC2-6)	1500 V	•	17 27 uut
IC2 / (IC3-5)	250 V	Connection (except mains connection)	
IC2 / IC6	50 V	Connection type	pluggable push-wire terminals
IC3 / (IC4-6)	250 V	Connection	
IC4 / (IC5-6)	250 V	rigid/flexible	0.22.5 mm ² /0.22.5 mm ²
IC5 / IC6	250 V	flexible with ferrule, without/with plastic sleeve	0.252.5 mm ²
Pollution degree	3	Conductor sizes (AWG)	2412
Safe isolation (reinforced insulation) between:		Mains connection	
IC1 / (IC2-5)	overvoltage category III, 1500 V	Connection type	pluggable push-wire terminals
IC2 / (IC3-5)	Overvoltage category III, 300 V	Connection	praggable pasti wite terrilliais
IC2 / IC6	Overvoltage category III, 50 V	rigid/flexible	0.210 mm ² /0.26 mm ²
IC3 / (IC4-6)	Overvoltage category III, 300 V	flexible with ferrule, without/with plastic sleeve	0.256 mm ² /0.254 mm ²
IC4 / (IC5-6)	Overvoltage category III, 300 V	Conductor sizes (AWG)	248
IC5 / IC6	Overvoltage category III, 300 V	Stripping length	15 mm
Voltage test (routine test) acc. to IEC 61010-1:	<u> </u>	Opening force	90120 N
IC2 / (IC3-5)	AC 2.2 kV		90120 N
IC2 / IC6	DC ± 0.50 kV	Switching elements	
IC3 / (IC4-6)	AC 2.2 kV	Switching elements	3 changeover contacts:
IC4 / (IC5-6)	AC 2.2 kV	K1	insulation fault alarm 1
IC5 / IC6	AC 2.2 kV	K2	insulation fault alarm 2
Voltage ranges		К3	device error
	ACO 1000 V-DCO 1500 V	Operating principle K1, K2	N/C operation or N/O operation
Nominal system voltage range Un	AC 01000 V; DC 01500 V	Operating principle K3	N/C operation, cannot be changed
Tolerance of U _n	AC +10 %/DC +5%	Electrical endurance under rated operating conditions, number	r of cycles 100,000
Frequency range of U _n	DC; 50 Hz; 60 Hz	Contact data acc. to IEC 60947-5-1:	
Supply voltage U_5 (see also device nameplate)	DC 1830 V	Utilisation category	AC 13 / AC 14 / DC-12 / DC-12 / DC-12
Frequency range of U _S	DC - O.W	Rated operational voltage	230 V / 230 V / 24 V / 10 V / 20 V
Power consumption	≤ 9 W	Rated operational current	5 A / 3 A / 1 A / 0.2 A / 0.1 A
Measuring circuit for insulation monitoring		Rated insulation voltage	250 V
Measuring voltage $U_{\rm m}$ (peak value)	±50 V	Minimum contact rating	1 mA at AC/DC \geq 10 V
Measuring current $I_{\rm m}$ (at $R_{\rm F} = 0 \Omega$)	≤ 0.7 mA	Environment/EMC	
Internal DC resistance R _i	≥ 70 kΩ		150,4224
Impedance Z _i at 50 Hz	≥ 70 kΩ	EMC	IEC 61326-2-4
IPermissible extraneous DC voltage U_{fq}	≤ DC 1600 V	Classification of climatic conditions acc. to IEC 60721:	
Permissible system leakage capacitance Ce	profile-dependent, 04000 μF	Stationary use (IEC 60721-3-3)	3K22
Response values for insulation monitoring		Transport (IEC 60721-3-2)	2K11
_ · <i>- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -</i>	200 O 200 kO (profile dependent)	Long-term storage (IEC 60721-3-1)	1K22
Response value R _{an1} (Alarm 1) and R _{an2} (Alarm 2)	200 Ω200 kΩ (profile-dependent)	Classification of mechanical conditions acc. to IEC 60721	•
Condition response value	$R_{\text{an1}} \ge R_{\text{an2}}$	Stationary use (IEC 60721-3-3)	3M11
Upper limit of the measuring range for setting for mea		Transport (IEC 60721-3-2)	2M4
"PV up to 500 μ F" $C_{\text{emax}} = 500 \mu$ F	200 kΩ	Long-term storage (IEC 60721-3-1)	1M12
Upper limit of the measuring range for setting for mea	•		
"PV up to 4000 μ F" $C_{\text{emax}} = 4000 \mu$ F	50 kΩ	Deviation from the classification of climatic conditions:	
Relative uncertainty	.150/	Ambient temperature during operation	-40+70°C
10 kΩ1 MΩ (acc. to IEC 61557-8)	±15 %	Ambient temperature transport	-40+80°C
$0.2 \mathrm{k}\Omega < 10 \mathrm{k}\Omega$	±200 Ω ±15 %	Ambient temperature long-term storage	-25+80 °C
Hysteresis	25 %	Area of application	≤ 3000 m AMSL
Time response		Other	
Response time t_{an} at $R_F = 0.5 \times R_{an}$ ($R_{an} = 10 \times \Omega$) and	C_e = 1 µF acc. to IEC 61557-8	Operating mode	continuous operation
	profile-dependent, typ. 10 s	Position of normal use	vertical, mains connection on top
Measuring circuit for insulation fault location (E	DS)	Tightening torque of the screws (4x M5) for enclosure mounting	
Locating current / DC	≤ 50 mA (1/2,5/5/10/25/50 mA)	Degree of protection, internal components	IP30
Test cycle/pause	2 s/4 s	Degree of protection, terminals	IP30
	2 3/4 5	Enclosure material	polycarbonate
Display		Flammability class	V-0
Display	Graphic display 127 x 127 pixel, 40 x 40 mm	Documentation number	D00479
Display range measured value	200 Ω200 kΩ	Weight	≤ 1600 g
LEDs		-	y
ON (operation LFD)	aroon		
	green		
PGH ON	yellow		
ON (operation LED) PGH ON SERVICE ALARM 1	yellow yellow		
PGH ON	yellow		



Wiring diagram



ISOMETER® IR420-D6

AC

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



Typical applications

· De-energised loads such as 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

Approvals

Device features

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

Standards

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

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

Further information

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





Ordering information

Туре	Supply voltage ¹⁾ <i>U</i> s	Art.	No.
1,752	Supply foliage 03	Screw-type terminal	Push-wire terminal
IR420-D6-1	DC 9,694 V / AC 1672 V, 42460 Hz	B91016415	B71016415
IR420-D6-2	DC 70 200 V / AC 70 200 V / AC 11-	B91016407	B71016407
IR420-D64-2	DC 70300 V / AC 70300 V, 42460 Hz	B91016408	B71016408

¹⁾ Absolute values

Accessories

Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	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	363
	AC 01650 V AC + DC 01300 V	AGH204S-4	B914013	365
Coupling device AC 50400 Hz, 07200		AGH520S	B913033	366
	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 60664	-3	Inputs					
Rated insulation voltage		Cable length external test/reset button					≤ 10 m
(A1, A2) - (11, 12, 14) - (21, 22, 24)	300 V	6 22 1					
(L1, AK, E, KE, T/R)	500 V	Switching elements					
Rated impulse voltage	6 kV	Number of				ver contact	
Overvoltage category	II	Operating principle	N/O operat	ion, N/C op			
Pollution degree	3	Electrical endurance			10000 sv	vitching o _l	perations
Protective separation (reinforced insulation) between:		Contact data according IEC 60947-5-1					
(A1, A2) - (L1,	AK, E, KE, T/R) - (11, 12, 14) - (21, 22, 24)	Utilization category	AC-13	AC-14	DC-12	DC-12	DC-12
Voltage test acc. IEC 61010-1	2.2 kV	Rated operational voltage	230 V	230 V	220 V	110 V	24 V
Supply voltage		Rated operational current	5 A	3 A	0.1 A	0.2 A	1 A
IR420-D6-1:		Minimum current			1 П	nA at AC/D	C ≥ 10 V
Supply voltage U_S	AC 1672 V/DC 9.694 V	Environment/EMC					
Frequency range U _s	42460 Hz/DC	EMC				acc. to I	EC 61326
IR420-D6-2:		Operating temperature				-25.	+55℃
Supply voltage U_5	AC/DC 70300 V	Classification of climatic conditions acc. to I	EC 60721 (relate	ed to tempe	erature and	relative hu	midity):
Frequency range U_S	42460 Hz, DC	Stationary use (IEC 60721-3-3)	· · · · · ·				3K22
Power consumption	42400 HZ, DC ≤ 3 VA	Transport (IEC 60721-3-2)					2K11
·	2344	Storage (IEC 60721-3-1)					1K22
System being monitored	ACO 400 V	Classification of mechanical conditions a	cc. to IFC 6072	1:			
Nominal system voltage U_n	AC 0400 V	Stationary use (IEC 60721-3-3)	CC. 10 ILC 0072	•••			3M11
Tolerance of U _n	25 %	Transport (IEC 60721-3-2)					2M4
Frequency range of <i>U</i> _n	42460 Hz	Storage (IEC 60721-3-1)					1M12
without AGH nominal contact voltage of with AGH520S	the N/C. contact K3 (switch-on contactor)						
with AGH150W	AC 50400 Hz, 07200 V AC 01150 V	Connection					
WILLIAGUIOW	DC 01100 V	Connection				screw te	rminals
with AGH204S-4	AC 01650 V	Connection properties					
including DC components	01300 V	rigid			0.24	mm² (AW	G 24-12)
including be components	01300 V	flexible			0.22.5	mm² (AW	G 24-14)
Response values		Two conductors with the same cross section				`	
Response value R _{an1} (AL 1)	100 k Ω10 M Ω (1 MΩ)*	rigid/flexible			0.21.5	mm² (AW	G 24-16)
Response value Ran2 (AL 2)	100 k Ω10 M Ω (100 kΩ)*						8 mm
Operating error ($\leq 1 \text{ M}\Omega$)	±15 %	Tightening torque, terminal screws				0.5.	.0.6 Nm
Hysteresis	+25 %	Connection			pus	h-wire te	rminals
Time response		Connection properties					
<u> </u>		rigid			0.22.5	mm² (AW	G 24-14)
Response time t_{an} at $R_F = 0.5$ x R_{an} and $C_e = 1 \mu F$	≤ 4 s	flexible					
Start-up delay t	010 s (0 s)*	without ferrules		(0.752.5	mm² (AW	G 19-14)
Response delay ton	099 s (0 s)*	with ferrules			0.21.5	mm² (AW	G 24-16)
Measuring circuit		Stripping length					10 mm
Measuring voltage $U_{\rm m}$	+12 V	Opening force					50 N
Measuring current $I_{\rm m}$ ($R_{\rm F}=0~\Omega$)	≤ 10 µA					2.1 mm	
Internal d.c. resistance R _i	≥ 1.2 MΩ	Othou dotaile					
Internal impedance Z _i (50 Hz)	≥ 1.1 MΩ	Other details					
Admissible extraneous d.c. voltage Ufq	≤ DC 300 V	Operating mode					ntinuous
System leakage capacitance C _e	≤ 10 µF	Position	(0520)			any	position
Displays, memory		Degree of protection internal components (EN Degree of protection terminals (EN 60529)	60529)				IP30 IP20
	liambar, mariki firmatianal man illizooto de d	Enclosure material				noly	carbonat
	lisplay, multi-functional, non-illuminated	Flammability class					UL94 V-0
Display range, measuring value Percentage operating error ($\leq 1 \text{ M}\Omega$)	10 kΩ20 MΩ	DIN rail mounting acc. to					EC 60715
reitentage operating error (\simeq 1 ML2)	±15 %	Screw mounting				with mou	

off/0...999 (off)*

on/off (off)*

Screw mounting

Weight

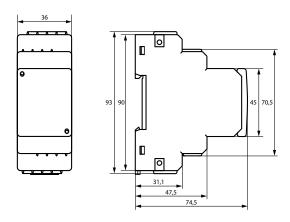
Documentation number

()* = Factory setting

Dimension diagram (dimensions in mm)

Password

Fault memory (alarm relay)

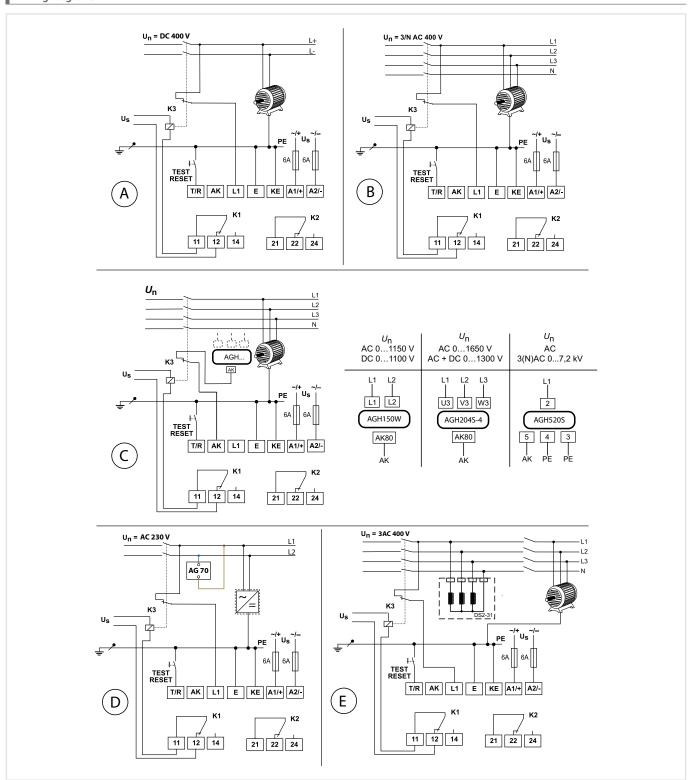




D00117

approx. 150 g

2 x M4 with mounting clip



	Description	Terminal	Connection
$\overline{(A)}$	Monitoring of disconnected DC loads up to 400 V with is a low-resistance connection between L + and L- via the load.	E, KE	Connect the leads E and KE separately to PE
$\stackrel{\smile}{=}$		A1, A2	Supply voltage U_{S} (see nameplate) via 6 A fuse
B	Monitoring of disconnected 3-phase AC loads up to 400 V with a low-resistance connection between L1, L2 and L3 via the load.	11, 12, 14	Alarm relay K1
	Monitoring of disconnected AC loads up to $U_{\rm D}$ with a low-resistance connection between	21, 22, 23	Alarm relay K2 (system fault relay)
\odot	L1, L2, and L3 via the load.	К3	relay for isolating the ISOMETER®
D	Monitoring of disconnected lines or disconnected loads with high resistance between the active conductors L1 and L2. The inductive load AG70 connects the lines L1 and L2 via an	AGH	Coupling device for the monitoring of loads up to $U_{\rm n}$
	inductance so that both lines can be monitored.	AG70 DS2-31	For the monitoring of loads with an undefined internal resistance or an open single conductor in cables
_	Monitoring of disconnected lines or disconnected loads with high resistance between the	υ32-31	single conductor in cables
(E)	active conductors L1, L2 and L3. The inductive star-point coupling device DS2-31 connects lines L1, L2 and L3 via an inductance so that four	T/R	for combined external test/reset button
	lines Cr, L2 and L3 via an inductance so that roun	L1, AK	Connection to the system being monitored

Insulation monitoring device for mobile generators



Typical applications

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

Approvals

Device features

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

Standards

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

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

Further information

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



Ordering information

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

¹⁾ Absolute values

Accessories

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

lechnical data					
Insulation coordination acc. to IEC 60664-1/I	EC 60664-3				
Rated insulation voltage					250
Rated impulse voltage/pollution degree					4 kV/
Protective separation (reinforced insulation) betw	een				
(A1)	, A2) - (L1, L	2, E, KE, T/	R) - (11, 1	2, 14) - (21	, 22, 24
Voltage test acc. to IEC 61010-1					2.21 k
Supply voltage					
Supply voltage <i>U</i> S			see or	dering info	rmatio
Frequency range <i>U</i> s			500 0.		.460 H
Power consumption					≤ 4 V
IT system being monitored					
Nominal system voltage <i>U</i> _D				۸۲۸	300
Nominal frequency f _n					300 460 H
Nonlina frequency /n				30	40011
Response values					
Response value R _{an1} (Alarm 1)				.200 kΩ (
Response value R _{an2} (Alarm 2)			1	.200 kΩ (
Relative uncertainty 15 kΩ/5200 kΩ				± 0.5 kΩ	
Hysteresis 15 k Ω /5200 k Ω				+ 1 kΩ	/+ 25 9
Time response					
Response time t_{an} at $R_F=0.5$ x R_{an} and $C_e=1$ μF					≤1
Start-up delay (start time) t				010) s (0 s)
Response delay t _{on}				099	9 s (0 s)
Measuring circuit					
Measuring voltage $U_{\rm m}$					± 12
Measuring current $I_{\rm m}$ (at $R_{\rm F}=0~\Omega$)				<	≤ 200 µ
Internal DC resistance R _i				2	≥ 62 kΩ
Impedance Z _i at 50 Hz				2	≥ 60 kΩ
Permissible extraneous DC voltage <i>U</i> fg				≤l	DC 300
Permissible system leakage capacitance					≤ 5 µ
Displays, memory					
Display	LC dis	splay, mult	ti-function	al, non-illu	minate
Display range, measured value					1 MΩ
Operating uncertainty $15 \text{ k}\Omega/5 \text{ k}\Omega1 \text{ M}\Omega$				$\pm 0.5 \mathrm{k}\Omega$	/± 15 9
Password				off/099	99 (off)
Fault memory (alarm relay)					on/off
Outputs					
Cable length test and reset button					≤ 10 r
Switching elements					
Number of switching elements			2 x 1 a	changeove	r conta
Operating principle		NC or N/		n (N/O ope	
Electrical endurance, number of cycles					1000
Contact data acc. to IEC 60947-5-1					
Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-1
	230 V	230 V	220 V	110 V	24
Kated operational voltage					_ 1
Rated operational voltage Rated operational current	5 A	3 A	0.1 A	0.2 A	1

acc. to IEC 61326
-25+55 ℃
related to temperature and relative humidity):
3K22
2K11
1K22
3M11
2M4
1M12
screw-type terminal or push-wire terminal
screw terminals
0.2 4 mm ² (AWG 24-12)
0.22.5 mm ² (AWG 24-14)

Two conductors with the same cross section	
rigid/flexible	0.2 1.5 mm ² (AWG 24-16)
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 24-14)
flexible	
without ferrules	0.75 2.5 mm ² (AWG 19-14)
with ferrules	0.21.5 mm ² (AWG 24-16)
Stripping length	10 mm
Opening force	50 N
Test opening, diameter	2.1 mm

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 g

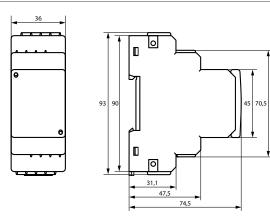
Ambient temperature	-40+70°C
Climatic categories acc. to IEC 60721 (with condensation and formation of ice):	

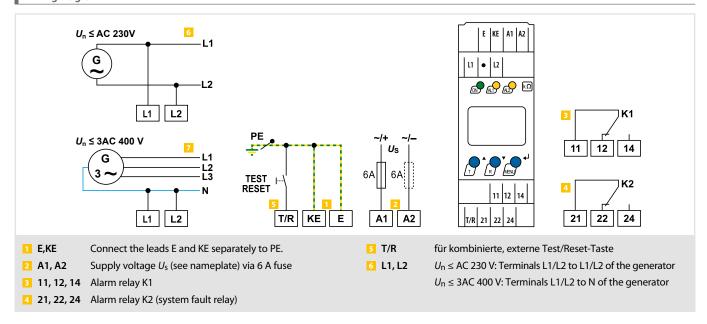
3K23

Stationary use (IEC 60721-3-3)	3W1Z
Vibration resistance	acc. to IEC 60068-2-6
For DIN rail mounting	3 g/30150 Hz
For screw mounting	6 g/30150 Hz

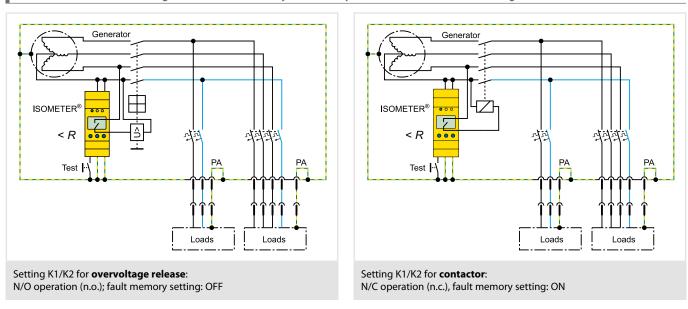
()* = factory setting

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





Typical applications

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

Approvals

€器訊

Device features

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

Further information

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

Ordering information

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

¹⁾ Absolute values

Rated insulation voltage	250 \
Rated impulse voltage/pollution degree	2.5 kV/3
Protective separation (reinforced insulation) between:	
(A1/L1, A2/L2, E, KE, T/R, T, R,	M+, M-/0K-, 0K+) -(11-12-14) -(21-22-24
Voltage test acc. to IEC 61010-1	2.21 k
Supply voltage	
Supply voltage $U_{\rm S}$	=U
Power consumption	≤ 3 V
IT system being monitored	
Nominal system voltage <i>U</i> _n	AC 100300 N
Nominal frequency f _n	22460 H
Response values	
Response value R _{an2} (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 9
Hysteresis	+25 %
Time response	
Response time t_{an} at $R_F = 0.5$ x R_{an} and $C_e = 1$ μF	≤1
Measuring circuit	
Measuring voltage U _m	±12 \
Measuring current $I_{\rm m}$ (at $R_{\rm F}=0~\Omega$	≤ 200 µ
Internal DC resistance R _i	≥ 62 kΩ
Impedance Z _i at 50 Hz	≥ 60 kΩ
Permissible extraneous DC voltage <i>U</i> fg	≤ DC 300 °
Permissible system leakage capacitance C _e	≤ 5 µ
Memory	
Fault memory (alarm relay)	on / off (on)
Inputs	
Reset button	N/O contac
Test button	N/O contac
Cable length external test/reset button	3 n
Switching elements	
Number of switching elements	2 (changeover contacts K1, K2
Operating principle K1/K2	N/C or N/O operation (N/O operation)

Optocoupler, alarm		<i>U</i> _{CE} 24 V, I _C 10 mA			
Optocoupler, measured value				C 24 V, I _C :	
				cycle 0 % :	
		PWM signa			
		PWM sigi	nal, duty cy	ycle 100 %	$= 0 k\Omega$
Contact data acc. to IEC 60947-5-1:					
Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-12
Rated operational voltage	230 V	230 V	220 V	110 V	24 V
Rated operational current	5 A	3 A	0.1 A	0.2 A	1 A
Minimum current		1 mA at AC/DC \geq 10 $^{\circ}$			C ≥ 10 V
Environment/EMC					
EMC			ac	c. to IEC 61	326-2-4
Operating temperature		-25+60 °C			.+60°C
Climatic categories acc. to IEC 60721, valic	l for one enca	psulated	p.c.b.:		
(related to temperature and relative humidity)		• · · · · · · · ·	•		
Stationary use (IEC 60721-3-3)					3K22
Transport (IEC 60721-3-2)					2K11
Storage (IEC 60721-3-1)					1K22
Classification of mechanical conditions acc.	to IEC 60721,	valid for	one encap	sulated p	.c.b:
Stationary use (IEC 60721-3-3)					3M12
Transport (IEC 60721-3-2)					2M4
Storage (IEC 60721-3-1)					1M12
Connection					
Connection		conn	ectors Univ	versal MAT	E-N-LOK

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 D00113 Documentation number Weight ≤ 150 g

3-pole TE Connectivity Nr. 350789-1 6-pole TE Connectivity Nr. 641831-1 8-pole TE Connectivity Nr. 641828-1

continuous operation

any position

()* = factory setting

10,000

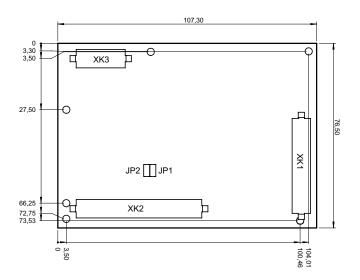
Other Operating mode

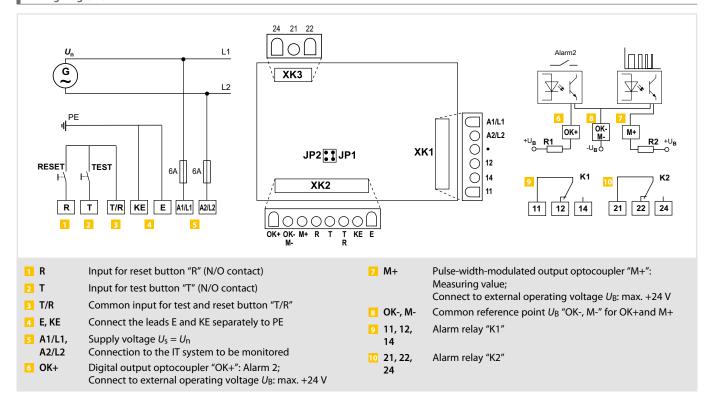
Mounting

Interfaces

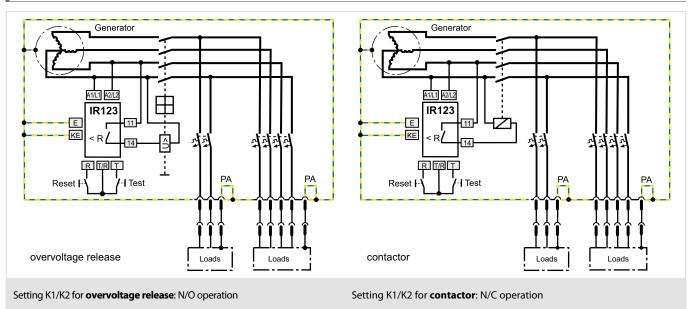
Dimension diagrams (dimensions in mm)

Electrical endurance, number of cycles





Application example with overvoltage release or contactor



ISOMETER® isoGEN423

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





Typical applications

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

Approvals





Device features

- Monitoring the insulation resistance 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

Standards

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

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

Further information

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

Ordering information

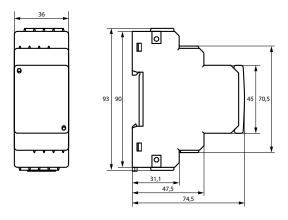
Туре	Nominal voltage <i>U</i> n	Supply voltage <i>U</i> s	Art.	No.
1,792	itommar voitage on	Supply fortage 03	Screw-type terminal	Push-wire terminal
isoGEN423-D4-4	3(N)AC, AC 0400 V	AC 100240 V	B91036325	B71036325
isoGEN423-D4W-4	DC 0400 V	DC 24240 V	-	B71036325W

Accessories

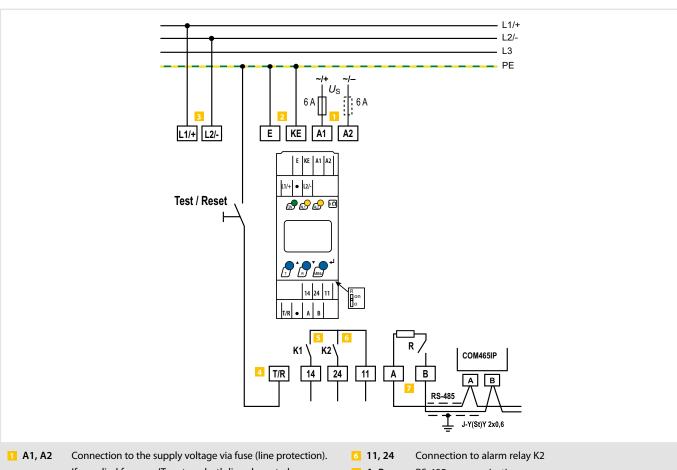
Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B98060008



	Interface	
	Interface/protocol	RS-485/BMS, Modbus RTU, isoData
L1/+, L2/-	Baud rate BMS (9.6 kBit/s), N	Nodbus RTU (selectable), isoData (115.2 kBits/s)
A1, A2	Cable length (9.6 kBits/s)	≤ 1200 m
11, 14, 24	•	e min. J-Y(St)Y 2 x 0,6
E, KE, T/R, A, B		120 Ω (0.25 W), internal, can be connected
400 V	Device address, BMS bus, Modbus RTU	390 (3)*
III	Curitahina olomonta	
		2.4
6 kV		2 x 1 contacts, common terminal 11
4 kV		N/C operation/N/O operation (N/O operation)*
4 kV		10 000
		AC 42 AC 44 DC 42 DC 42 DC 42
400 V		AC-12 AC-14 DC-12 DC-12 DC-12
250 V		230 V 230 V 24 V 110 V 220 \
250 V		5 A 2 A 1 A 0.2 A 0,1 A
3	Minimum contact rating	1 mA at AC/DC ≥ 10 \
	Environment/EMC	
Overvoltage category III, 600 V		IEC 61326-2-4
Overvoltage category III, 300 V		120 01320 2
Overvoltage category III, 300 V	· · · · · · · · · · · · · · · · · · ·	
	•	-40+70 °C
AC 2,2 kV	_ ·	-40+85 °C
AC 2,2 kV	Storage	-40+70 °C
	Classification of climatic conditions acc. to IEC 6072	1 (related to temperature and relative humidity):
	Stationary use (IEC 60721-3-3)	3K22
AC 100240 V/DC 24240 V	Transport (IEC 60721-3-2)	2K11
-30+15 %		1K22
4763 Hz		
\leq 3 W, \leq 9 VA		3M11
		3M11 3M12
1) A C A C O 400 W/DC O 400 W		2M4
	Long-term storage (IEC 60/21-3-1)	1M12
DC, 35460 Hz	Connection	
	Connection type	screw-type terminal or push-wire terminal
±12 V		
<u>.</u>		≤10 A
		0.50.6 Nm (57 lb-in)
	Conductor sizes	AWG 24-12
	Stripping length	8 mm
	Rigid/flexible	0.22.5 mm ²
$R_{an2}200 \text{ k}\Omega \text{ (46 k}\Omega)^*$	Flexible with ferrules with/without plastic sleeve	0.252.5 mm ²
$5 \text{ k}\Omega \dots R_{\text{an1}} (23 \text{ k}\Omega)^*$	Multi-conductor	
± 15 %, at least ± 2 k Ω		0.21.5 mm ²
25 %, at least 1 k Ω	3	0.251.5 mm
10 VU> (off/10 V)*		0.51.5 mm
U<500 V (off/500 V)*	· ·	0.51.5
± 5 %, at least ± 5 V	Push-wire terminals:	
-0,015 %/Hz	Nominal current	≤10 A
5 %, at least 5 V	Conductor sizes	AWG 24-14
	Stripping length	10 mm
	Rigid	0.22.5 mm
	Flexible without ferrules	0.752.5 mm ²
		0.252.5 mm ²
099 s (0 s)*		50 N
	• •	
multi-functional not illuminated	rest opening, diameter	2.1 mm
	Other	
		continuous operation
0500 VRMS	Mounting	cooling slots must be ventilated vertically
VSUU VKIVIS		,
	Degree of profection built-in components (I)IN FN 605	
\pm 5 %, at least \pm 5 V	Degree of protection, built-in components (DIN EN 605)	
\pm 5 %, at least \pm 5 V (only "dc" mode)	Degree of protection, terminals (DIN EN 60529)	IP20
± 5 %, at least ± 5 V (only "dc" mode) $0\dots 17~\mu\text{F}$	Degree of protection, terminals (DIN EN 60529) Enclosure material	IP20 polycarbonate
± 5 %, at least ± 5 V (only "dc" mode) $0\dots 17~\mu F$ ± 15 %, at least \pm 0,1 μF	Degree of protection, terminals (DIN EN 60529) Enclosure material DIN rail mounting acc. to	IP20 polycarbonate IEC 60715
$\begin{array}{c} \pm 5~\%,~at~least~\pm 5~V\\ (only~'dc''~mode)\\ 017~\mu F\\ \pm 15~\%,~at~least~\pm~0,1~\mu F\\ off/0999~(0,~off)*\\ \end{array}$	Degree of protection, terminals (DIN EN 60529) Enclosure material DIN rail mounting acc. to Screw fixing	IP20 polycarbonate IEC 60715 2 x M4 with mounting clip
± 5 %, at least ± 5 V (only "dc" mode) $0\dots 17~\mu F$ ± 15 %, at least \pm 0,1 μF	Degree of protection, terminals (DIN EN 60529) Enclosure material DIN rail mounting acc. to	IP20 polycarbonate IEC 60715
	A1, A2 11, 14, 24 E, KE, T/R, A, B 400 V III 6 kV 4 kV 4 kV 4 kV 4 kV 250 V 250 V 250 V 0 V 0 V 0 V 0 V 0 V 0 V 0 V	Interface/protocol Baud rate BMS (9.6 kBit/s), M A1, A2 A1, A2 A1, A2 A2 A2 A2 A3 A4 A4 A5 A4 A4 A4 A5 A4 A5 A4 A4 A5 A4 A5 A4 A5 A4 A5 A4 A6 A4 A6 A4 A6 A4 A6 A6 A6 A7



Wiring diagram



- 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.

 L1/+, L2/- 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

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

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





Typical applications

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

Approvals



Device features

- · Monitoring of the insulation resistance (R 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 kΩ (Alarm 1, Alarm 2)
- Alarm signalling via LEDs (AL1, AL2), a display and alarm relays (K1, K2)
- N/C operation or N/O operation selectable
- · Measured value indication via multi-functional LCD
- Fault memory can be activated
- RS-485 (galvanically isolated) interface 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 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

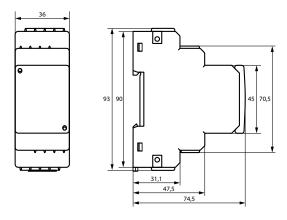
Туре	Nominal system voltage $U_{\rm n}$ Supply voltage $U_{\rm s}$		System leakage	Art. No.	
.,,,,		54pp.y 15114ge 53	capacitance C _e	Screw-type terminal	Push-wire terminal
isoRW425-D4W-4	3(N)AC, AC 0440 V/DC 0440 V	AC 100240 V, 4763 Hz / DC 24240 V	< 300 μF	B91037000W	B71037000W

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

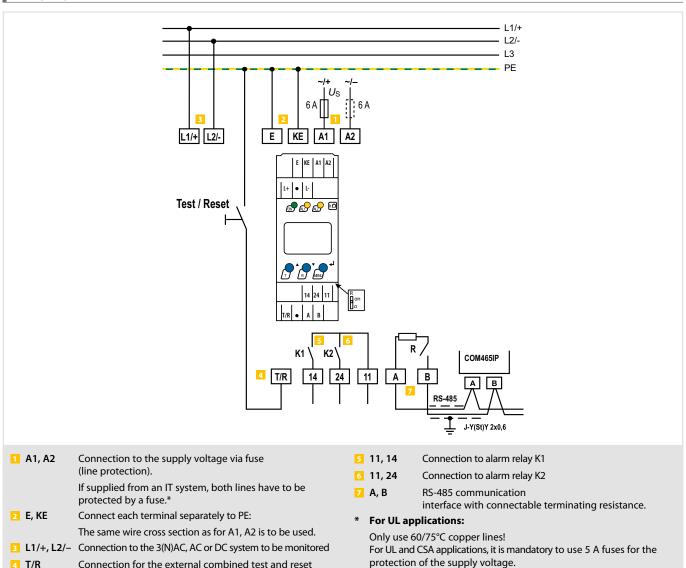
Insulation coordination acc. to IEC 60664-1/IEC 60664-3		Interface	
Definitions:		Interface/protocol	RS-485/BMS, Modbus RTU, isoData
Measuring circuit (IC1)	L1/+, L2/-	Baud rate BMS (9.6 kbit/s), Modbu	us RTU (selectable), isoData (115.2 kbits/s)
Supply circuit (IC2)	A1, A2	Cable length (9.6 kbits/s)	≤ 1200 m
Output circuit (IC3)	11, 14, 24	Cable: twisted pairs, shield connected to PE on one side	min. J-Y(St)Y 2x0.6
Control circuit (IC4)	E, KE, T/R, A, B	·	20Ω (0,25 W), internal, can be connected
Rated voltage	440 V	Device address, BMS bus, Modbus RTU	390 (3)*
Overvoltage category	III	Switching elements	
Rated impulse voltage:		Switching elements	2 x 1 N/O contacts, common terminal 11
IC1/(IC2-4)	6 kV		
IC2/(IC3-4)	4 kV		operation/N/O operation (N/O operation)*
IC 3/(IC4)	4 kV	Electrical endurance, number of cycles	10000
Rated insulated voltage:		Contact data acc. to IEC 60947-5-1:	
IC1/(IC2-4)	500 V	Utilisation category AC-12	2 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	
Polution degree	3	Minimum contact rating	$1 \text{ mA at AC/DC} \ge 10 \text{ V}$
Protective separation (reinforced insulation) between:	<u>J</u>	willing contact rating	I IIIA dt AC/DC ≥ 10 V
•	l	Environment/EMC	
	rvoltage category III, 600 V	EMC	IEC 61326-2-4, DIN EN50121-3-2
	rvoltage category III, 300 V	LIVIC	IEC 01320-2-4, DIN EN30121-3-2
IC 3/(IC4) Over	rvoltage 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	-50+85 ℃
IC 3/(IC4)	AC 2,2 kV	Storage	-55+80 °C
	=		
Supply voltage		Classification of climatic conditions acc. to IEC 60721 (rela	
Supply voltage U_5 AC 10	00240 V/DC 24240 V	Stationary use (IEC 60721-3-3)	3K22
Tolerance of Us	-30+15 %	Transport (IEC 60721-3-2)	2K11
Frequency range U _S	4763 Hz	Long-time storage (IEC 60721-3-1)	1K23
. , ,		Classification of mechanical conditions acc. to IEC 607	
Power consumption	≤ 3 W, ≤ 9 VA		
IT system being monitored		Stationary use (IEC 60721-3-3)	3M12
	ACO 440V/DCO 440V	Transport (IEC 60721-3-2)	2M4
	AC 0440V/DC 0440 V	Long-term storage (IEC 60721-3-1)	1M12
Nominal system voltage range U_n (UL508)	AC/DC 0400 V	_	
Tolerance of U _n	+15 %	Connection	
Frequency range of U_n	DC, 15460 Hz	Connection type s	screw-type terminal or push-wire terminal
		Carate tuna tarminala	
Measuring circuit		Screw-type terminals:	
Measuring voltage $U_{\rm m}$	± 12 V	Nominal current	≤10 A
Measuring current $I_{\rm m}$ at $R_{\rm F}$, $Z_{\rm F}=0$ Ω	≤ 110 µA	Tightening torque	0.50.6 Nm (57 lb-in)
Internal resistance R _i , Z _i	≥ 115 kΩ	Conductor sizes	AWG 24-12
Permissible system leakage capacitance C _e (R mode)	≤ 300 µF	Stripping length	8 mm
Permissible system leakage capacitance C _e (Z mode)	≤ 1 μF	Rigid/flexible	0.22.5 mm ²
Permissible extraneous DC voltage U_{fq}	= 1 p	•	
Termissible extraneous De voltage ofg		Flexible with ferrules with/without plastic sleeve	0.252.5 mm ²
Response values		Multi-conductor	
Response value R _{an1}	2990 kΩ (40 kΩ)*	rigid /flexible	0.21.5 mm ²
Response value R _{an2}	1980 kΩ (10 kΩ)*	flexible with ferrules without plastic sleeve	0.251.5 mm ²
Relative uncertainty R_{an} (R mode or $Z_F \approx R_F$)	\pm 15 %, at least \pm 1 k Ω	flexible with TWIN ferrules with plastic sleeve	0.51.5 mm ²
·		nexible with twint lettures with plastic sieeve	0.51.5 11111
Hysteresis R _{an}	25 %, at least 1 kΩ	Push-wire terminals:	
Response value Z _{an1}	11500 kΩ (off)*	Nominal current	≤10 A
Response value Z _{an2}	10490 kΩ (off)*	Conductor sizes	AWG 24-14
Relative uncertainty Z_{an}	\pm 15 %, at least \pm 1 k Ω		10 mm
Hysteresis Z _{an}	25 %, at least 1 kΩ	Stripping length	
Undervoltage detection	10499 V (off)*	Rigid	0.22.5 mm ²
Overvoltage detection	11500 V (off)*	Flexible without ferrules	0.752.5 mm ²
Relative uncertainty <i>U</i>	\pm 5 %, at least \pm 5 V	Flexible with ferrules with/without plastic sleeve	0.252.5 mm ²
Relative uncertainty o Relative uncertainty depending on the frequency ≥ 400 Hz	-0.015 %/Hz	Multi-conductor flexible with TWIN ferrules with plastic slee	
Hysteresis <i>U</i>	5 %, at least 5 V	Opening force	50 N
nyacicas v	J 70, at 18dSt 3 V		
Time response		Test opening, diameter	2.1 mm
	~ 10 -	Other	
Response time t_{an} of $R_F = 0.5 \times R_{an}$ and $C_e = 1 \mu F$ according to IEC 61557-8	≤ 10 s		
Response time t_{an} of $Z_F = 0.5 \times Z_{an}$	≤5s	Operating mode	continuous operation
Start-up delay t	010 s (0 s)*		cooling slots must be ventilated vertically
Response delay ton	099 s (0 s)*	Degree of protection, built-in components (DIN EN 60529)	IP30
Delay on release t _{off}	099 s (0 s)*	Degree of protection, terminals (DIN EN 60529)	IP20
Displays mamany		Enclosure material	polycarbonate
Displays, memory		DIN rail mounting acc. to	IEC 60715
	functional, not illuminated	Screw fixing	2 x M4 with mounting clip
Display range measured value insulation resistance (R_F)	1 kΩ4 MΩ	Flammability class	UL94 V-0
Display range measured value impedance (Z_F) with $f_n = 50/60$ Hz	1 kΩ1 MΩ	Documentation number	D00052
Operating uncertainty (R_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 g
Operating uncertainty	\pm 5 %, at least \pm 5 V	()* = factory setting	
Display range measured value system leakage capacitance of $R_{\rm F} > 10 \rm k\Omega$	± 3 %, at least ± 3 V	(,	
	·		
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 μF		
Operating uncertainty ($Z_F \approx X_c$)	\pm 15 %, at least \pm 2 nF		
Password	off/0999 (0, off)*		
Fault memory alarm messages	on/(off)*		

on/(off)*

Fault memory alarm messages



Wiring diagram



Connection for the external combined test and reset

4 T/R

button.

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 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 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

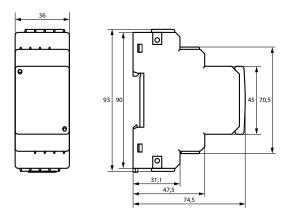
Туре	Supply voltage <i>U</i> ₅ Nominal	Nominal voltage Un System leakag		Art. No.
.,,,,	Supply foliage 05		capacitance	push-wire terminal
isoUG425-D4-4	AC 100240 V, 4763 Hz / DC 24240 V	DC 12120 V	≤ 50 µF	B71036320

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

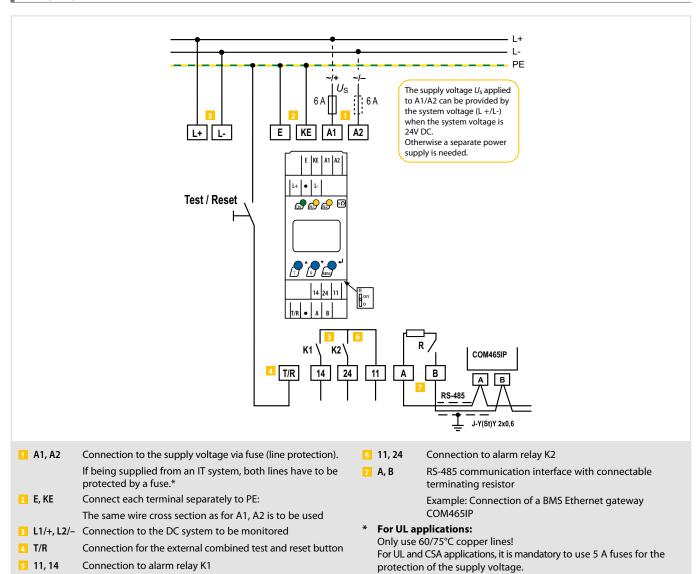


Insulation coordination acc. to IEC 60664-1/IEC 60664-	3	Interface					
Definitions:		Interface/protocol		RS-4	85/BMS, M	odbus RTU	J, isoData
Measuring circuit (IC1)	L1/+, L2/-	-	.6 kbit/s), Modbus	RTU (selec	table), isol	Data (115.2	2 kbits/s)
Supply circuit (IC2)	A1, A2	Cable length (9.6 kbits/s)					≤ 1200 m
Output circuit(IC3)	11, 14, 24	Cable: twisted pairs, shield connected to P				min. J-Y(S1	
Control circuit (IC4)	E, KE, T/R, A, B	Terminating resistor	120	Ω (0.25 \	N), interna	l, can be co	
Rated voltage	400 V	Device address, BMS bus, Modbus RTU				3	90 (3)*
Overvoltage category	III	Switching elements					
Rated impulse voltage:		Switching elements		2 v 1 N/O	ontacts co	mmon ter	rminal 11
IC1/(IC2-4)	6 kV	Operating principle				n (N/O ope	
IC2/(IC3-4)	4 kV	Electrical endurance, number of cycles	14/ C 0	Clation, N	o opcialio	лі (іч/ о орс	10,000
IC 3/IC4	4 kV						10,000
Rated insulated voltage:	400 V	Contact data acc. to IEC 60947-5-1:	16.12	AC 14	DC 13	DC 13	DC 13
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			1.0	nA at AC/D	/C ≥ 10 V
Protective separation (reinforced insulation) between:	Overveltere seterem III COOV	Environment/EMC					
IC1/(IC2-4)	Overvoltage category III, 600 V	EMC				JEC 61	1326-2-4
IC2/(IC3-4) IC 3/IC4	Overvoltage category III, 300 V Overvoltage category III, 300 V						
	overvoltage category III, 300 V	Ambient temperatures:				40	+70°C
Voltage test (routine test) according to IEC 61010-1: IC2/(IC3-4)	AC 2.2 kV	Operation					+70 ℃
IC2/(IC5-4) IC 3/IC4		Transport					+85 € +70 °C
IC 3/IC4	AC 2.2 kV	Storage					
Supply voltage		Classification of climatic conditions acc.	to IEC 60721 (relate	ed to temp	erature and	relative hu	
Supply voltage U_{S}	AC 100240 V/DC 24240 V	Stationary use (IEC 60721-3-3)					3K22
Tolerance of $U_{\rm S}$	-30+15 %	Transport (IEC 60721-3-2)					2K11
Frequency range U _s	4763 Hz	Long-term storage (IEC 60721-3-1)					1K22
Power consumption	\leq 3 W, \leq 9 VA	Classification of mechanical condition	s acc. to IEC 6072	1:			
		Stationary use (IEC 60721-3-3)					3M11
IT system being monitored		Transport (IEC 60721-3-2)					2M4
Nominal system voltage U_n	DC 12120 V	Long-term storage (IEC 60721-3-1)					1M12
Tolerance of U _n	+20 %	Connection					
Measuring circuit							***********
Internal resistance R _i	≥ 115 kΩ	Connection type				push-wire	
Permissible system leakage capacitance C _e	<u>= 113 kΩ2</u> ≤ 50 μF	Nominal current				***	≤10 A
Termissible system realitage capacitainee eg	Ξ 30 μ	Conductor sizes				AW	NG 24-14
Response values		Stripping length					10 mm
Response value R _{an1}	$2100 \text{ k}\Omega \text{ (50 k}\Omega)^*$	Rigid					.2.5 mm ²
Response value R _{an2}	195 kΩ (25 kΩ)*	Flexible without ferrules					.2.5 mm ²
Relative uncertainty R _{an}	± 15 %, at least ± 2 k Ω	Flexible with ferrules with/without plastic	sleeve			0.25	.2.5 mm ²
Hysteresis R _{an}	25 %, at least 1 k Ω	Multi-conductor flexible with TWIN ferrule	s with plastic sleev	e		0.5	.1.5 mm ²
Undervoltage detection U_{DC}	8143 V (off)*	Opening force					50 N
Overvoltage detection $U_{\rm DC}$	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	Other					
Time response		Operating mode				ntinuous o	•
Time response	1557.0	Mounting		ooling slot	s must be v	entilated v	
Response time t_{an} at $R_F = 0.5$ x R_{an} and $C_e = 1$ μF acc. to IEC 6		Degree of protection, built-in components					IP30
Start-up delay t	010 s (0 s)*	Degree of protection, terminals (DIN EN 60	529)				IP20
Response delay ton	099 s (0 s)*	Enclosure material					arbonate
Delay on release t _{off}	099 s (0 s)*	DIN rail mounting acc. to					EC 60715
Displays, memory		Screw fixing			2 x M4	with mour	
- · · ·	display, multi-functional, not illuminated	Documentaion number					D00220
Display range measured value insulation resistance (R_F)	1 kΩ1 MΩ	Weight					≤ 150 g
Operating uncertainty	± 15 %, at least ± 2 k Ω	()* = Factory setting					
Display range measured value nominal system voltage (U_n)		(,					
	$V(R_F = ∞ : 300 \text{ VP}; R_F = 0 \text{ k}Ω : 150 \text{ VP})$						
Operating uncertainty $U_{\rm DC}$	\pm 5 %, at least \pm 0.5 V						
Operating uncertainty U_{RMS}	±5 %, at least ±1.5 V						
	,						
Password	off/0999 (0, off)*						

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Wiring diagram



ISOMETER® isoES425

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





Typical applications

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

Approvals







Device features

- 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 $100\,\mu F$
- 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

Standards

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

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

Further information

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

Ordering information

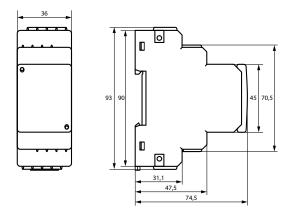
Туре	Nominal system voltage <i>U</i> n	Supply voltage <i>U</i> s	System leakage capacitance Co	Art. No.
			tapatitante te	Push-wire terminal
isoES425-D4-4	3 (N)AC, AC 0400 V/DC 0400 V	AC 100240 V, 4763 Hz / DC 24240 V	< 100 μF	B71037020

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

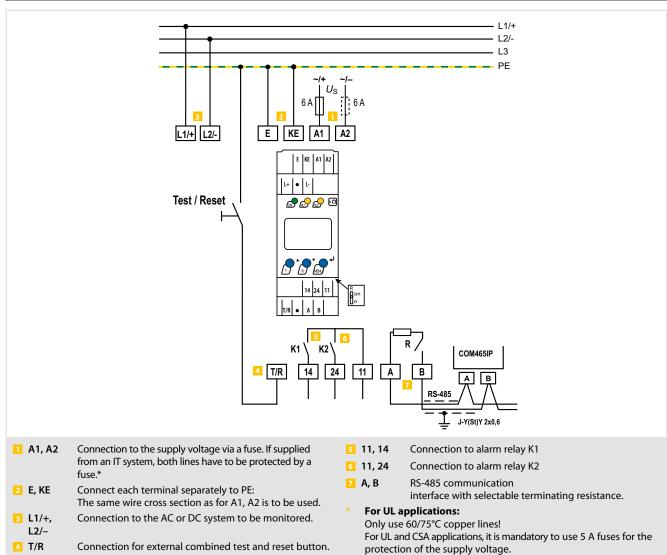
D . C 'at'	
Definitions:	11/: 12/
Measuring circuit (IC1)	L1/+, L2/-
Supply circuit (IC2)	A1, A2
Output circuit (IC3)	11, 14, 24
Control circuit (IC4)	E, KE, T/R, A, B
Rated voltage	400 V
Overvoltage category	
Rated impulse withstand voltage:	
IC1/(IC2-4)	6 kV
IC2/(IC3-4)	4 kV
IC 3/(IC4)	4 kV
Rated insulation voltage:	
IC1/(IC2-4)	400 V
IC2/(IC3-4)	250 V
IC 3/IC4	250 \
Pollution degree	3
Protective separation (reinforced insulation) between:	
IC1/(IC2-4)	Overvoltage category III, 600 V
IC2/(IC3-4)	Overvoltage category III, 300 \
IC 3/(IC4)	Overvoltage category III, 300 V
Voltage tests (routine test) acc. to IEC 61010-1:	
IC2/(IC3-4)	DC 2.2 k\
IC 3/(IC4)	AC 2.2 k\
Supply voltage	
Supply voltage Us	AC 100240 V/DC 24240 V
Tolerance of U _S	-30+15 %
Frequency range $U_{\rm S}$	4763 Hz
Power consumption	\leq 3 W, \leq 9 VA
IT system being monitored	
	3(N)AC, AC 0400 V/DC 0400 \
Nominal system voltage U _n	
Tolerance of U _n	25%
· •	25%
Tolerance of U _n	25%
Tolerance of $U_{\rm n}$ Frequency range of $U_{\rm n}$	25% DC, 15460 Hz
Tolerance of U _n Frequency range of U _n Measuring circuit	25% DC, 15460 Hz ± 12 V
Tolerance of U _n Frequency range of U _n Measuring circuit Measuring voltage U _m	25% DC, 15460 Hz ± 12 V ≤ 110 μF
Tolerance of U _n Frequency range of U _n Measuring circuit Measuring voltage U _m Measuring current I _m at R _F	25% DC, 15460 Hz ± 12 V ≤ 110 μA ≥ 115 kΩ
Tolerance of U _n Frequency range of U _n Measuring circuit Measuring voltage U _m Measuring current I _m at R _F Internal resistance R _i	25% DC, 15460 Hz ± 12 V ≤ 110 μA ≥ 115 kΩ ≤ 100 μF
Tolerance of U _n Frequency range of U _n Measuring circuit Measuring voltage U _m Measuring current I _m at R _F Internal resistance R _i Permissible leakage capacitance C _e	25% DC, 15460 Hz ± 12 V ≤ 110 µF ≥ 115 kC ≤ 100 µF
Tolerance of U _n Frequency range of U _n Measuring circuit Measuring voltage U _m Measuring current I _m at R _F Internal resistance R _i Permissible leakage capacitance C _e Permissible external DC voltage U _{fg}	25% DC, 15460 Hz ± 12 \ ≤ 110 \(\mu \) ≥ 115 kC ≤ 100 \(\mu \) ≤ 700 \(\mu \)
Tolerance of U _n Frequency range of U _n Measuring circuit Measuring voltage U _m Measuring current I _m at R _F Internal resistance R _i Permissible leakage capacitance C _e Permissible external DC voltage U _{fg}	25% $DC, 15460 Hz$ $\pm 12 V$ $\leq 110 μA$ $\geq 115 kΩ$ $\leq 100 μI$ $\leq 700 V$ $2990 kΩ (69 kΩ)*$
Tolerance of U _n Frequency range of U _n Measuring circuit Measuring voltage U _m Measuring current I _m at R _F Internal resistance R _i Permissible leakage capacitance C _e Permissible external DC voltage U _{fg}	25% $DC, 15460 Hz$ $± 12 V$ $≤ 110 μA$ $≥ 115 kΩ$ $≤ 100 μI$ $≤ 700 V$ $2990 kΩ (69 kΩ)*$ $1980 kΩ (23 kΩ)*$
Tolerance of U _n Frequency range of U _n Measuring circuit Measuring voltage U _m Measuring current I _m at R _F Internal resistance R _i Permissible leakage capacitance C _e Permissible external DC voltage U _{fg} Response values Response value R _{an1} Response value R _{an2}	25% DC, 15460 Hz $ \pm $ 12 \($ \le $ 110 μ/ $ \ge $ 115 kΩ $ \le $ 100 μ/ $ \le $ 700 \($ \times $ 2990 kΩ (69 kΩ)* 1980 kΩ (23 kΩ)* $ \pm $ 15 %, at least ±1 kΩ
Tolerance of U _n Frequency range of U _n Measuring circuit Measuring voltage U _m Measuring current I _m at R _F Internal resistance R _i Permissible leakage capacitance C _e Permissible external DC voltage U _{fg} Response values Response value R _{an1} Response value R _{an2} Operating uncertainty R _{an}	25% DC, 15460 Hz \pm 12 \(\leq \text{110 } \mu \text{12} \) $\leq 110 \text{ μ} \(\leq \text{110 } \mu \text{1} \) \leq 110 \text{ μ} \(\leq \text{100 } \mu \text{1} \) \leq 100 \text{ μ} \(\leq \text{700 } \text{ \leq \text{1}} \) 2990 \ k\Omega \((69 \ k\Omega)^{\text{9}} \) 1980 \ k\Omega \((23 \ k\Omega)^{\text{9}} \) \(\pm \text{15 %, at least } \pm \text{ kΩ} \)$
Tolerance of U _n Frequency range of U _n Measuring circuit Measuring voltage U _m Measuring current I _m at R _F Internal resistance R _i Permissible leakage capacitance C _e Permissible external DC voltage U _{fg} Response values Response value R _{an1} Response value R _{an2} Operating uncertainty R _{an} Hysteresis R _{an} Undervoltage detection U	25% $DC, 15460 Hz$ $\pm 12 V$ $\leq 110 μb$ $\geq 115 kΩ$ $\leq 100 μl$ $\leq 700 V$ $2990 kΩ (69 kΩ)^{o}$ $1980 kΩ (23 kΩ)^{o}$ $\pm 15 %, at least ± 1 kΩ$ $25 %, at least ± 1 kΩ$ $10499 V (off)^{o}$
Tolerance of U _n Frequency range of U _n Measuring circuit Measuring voltage U _m Measuring current I _m at R _F Internal resistance R _i Permissible leakage capacitance C _e Permissible external DC voltage U _{fg} Response values Response value R _{an1} Response value R _{an2} Operating uncertainty R _{an} Hysteresis R _{an} Undervoltage detection U Overvoltage detection U	25% $DC, 15460 Hz$ $\pm 12 V$ $\leq 110 μb$ $\geq 115 kΩ$ $\leq 100 μl$ $\leq 700 V$ $2990 kΩ (69 kΩ)^{o}$ $1980 kΩ (23 kΩ)^{o}$ $\pm 15 %, at least ± 1 kΩ$ $25 %, at least \pm 1 kΩ 10499 V (off)^{o} 11500 V (off)^{o}$
Tolerance of U _n Frequency range of U _n Measuring circuit Measuring voltage U _m Measuring current I _m at R _F Internal resistance R _i Permissible leakage capacitance C _e Permissible external DC voltage U _{fg} Response values Response value R _{an1} Response value R _{an2} Operating uncertainty R _{an} Hysteresis R _{an} Undervoltage detection U Overvoltage detection U Operating uncertainty U	25% DC, 15460 Hz \pm 12 V \leq 110 μ/ \geq 115 kΩ \leq 100 μ/ \leq 700 V 1980 kΩ (69 kΩ)* \pm 15 %, at least \pm 1 kΩ 10499 V (off)* 11500 V (off)* \pm 5 %, at least \pm 6
Tolerance of U _n Frequency range of U _n Measuring circuit Measuring voltage U _m Measuring current I _m at R _F Internal resistance R _i Permissible leakage capacitance C _e Permissible external DC voltage U _{fg} Response values Response value R _{an1} Response value R _{an2} Operating uncertainty R _{an} Hysteresis R _{an} Undervoltage detection U Overvoltage detection U	25% DC, 15460 Hz \pm 12 V \leq 110 μ/ \geq 115 kΩ \leq 100 μ/ \leq 700 V 1980 kΩ (69 kΩ)* \pm 15 %, at least \pm 1 kΩ 25 %, at least \pm 1 kΩ 10499 V (off)* 11500 V (off)* \pm 5 %, at least \pm 5 V -0.015 %/Hz
Tolerance of U_n Frequency range of U_n Measuring circuit Measuring voltage U_m Measuring current I_m at R_F Internal resistance R_i Permissible leakage capacitance C_e Permissible external DC voltage U_{fg} Response values Response values Response value R_{an1} Response value R_{an2} Operating uncertainty R_{an} Hysteresis R_{an} Undervoltage detection U Overvoltage detection U Operating uncertainty U Frequency dependent operating uncertainty \geq 400 Hz Hysteresis U	25% DC, 15460 Hz \pm 12 V \leq 110 μ/ \geq 115 kΩ \leq 100 μ/ \leq 700 V 1980 kΩ (69 kΩ)* \pm 15 %, at least \pm 1 kΩ 25 %, at least \pm 1 kΩ 10499 V (off)* 11500 V (off)* \pm 5 %, at least \pm 5 V -0.015 %/Hz
Tolerance of U_n Frequency range of U_n Measuring circuit Measuring voltage U_m Measuring current I_m at R_F Internal resistance R_i Permissible leakage capacitance C_e Permissible external DC voltage U_{fg} Response values Response value R_{an1} Response value R_{an2} Operating uncertainty R_{an} Hysteresis R_{an} Undervoltage detection U Overvoltage detection U Operating uncertainty U Frequency dependent operating uncertainty $V = 0$ Hysteresis $V = 0$ Time response	25% $DC, 15460 Hz$ $± 12 V$ $≤ 110 μA$ $≥ 115 kΩ$ $≤ 100 μf$ $≤ 700 V$ $1980 kΩ (69 kΩ)*$ $± 15 %, at least ± 1 kΩ$ $25 %, at least ± 1 kΩ$ $10499 V (off)*$ $11500 V (off)*$ $± 5 %, at least ± 5 V$ $-0.015 %/Hz$ $5 %, at least 5 V$
Tolerance of U_n Frequency range of U_n Measuring circuit Measuring voltage U_m Measuring current I_m at R_F Internal resistance R_i Permissible leakage capacitance C_e Permissible external DC voltage U_{fg} Response values Response value R_{an1} Response value R_{an2} Operating uncertainty R_{an} Hysteresis R_{an} Undervoltage detection U Overvoltage detection U Operating uncertainty U Frequency dependent operating uncertainty V Hysteresis U Time response Response time U_{an} at U_{F} and U_{F} are U_{F} and U_{F} and U_{F} and U_{F} are U_{F} and U_{F} and U_{F} and U_{F} and U_{F} are U_{F} and U_{F} and U_{F} and U_{F} are U_{F} are U_{F} and U_{F} are U_{F} are U_{F} and U_{F} are U_{F	25% $DC, 15460 Hz$ $± 12 V$ ≤ 110 μA ≥ 115 kΩ ≤ 100 μf ≤ 700 V 2990 kΩ (69 kΩ)* $1980 kΩ (23 kΩ)* ± 15 %, at least ± 1 kΩ 25 %, at least ± 1 kΩ 10499 V (off)* ± 5 \%, at least ± 5 V -0.015 \%/Hz 5 %, at least 5 V$
Tolerance of U_n Frequency range of U_n Measuring circuit Measuring voltage U_m Measuring current I_m at R_F Internal resistance R_i Permissible leakage capacitance C_e Permissible external DC voltage U_{fg} Response values Response value R_{an1} Response value R_{an2} Operating uncertainty R_{an} Hysteresis R_{an} Undervoltage detection U Overvoltage detection U Operating uncertainty U Frequency dependent operating uncertainty $V = 0$ Hysteresis $V = 0$ Time response	25% $DC, 15460 Hz$ $± 12 V$ $≤ 110 μA$ $≥ 115 kΩ$ $≤ 100 μf$ $≤ 700 V$ $1980 kΩ (69 kΩ)*$ $± 15 %, at least ± 1 kΩ$ $25 %, at least ± 1 kΩ$ $10499 V (off)*$ $11500 V (off)*$ $± 5 %, at least ± 5 V$ $-0.015 %/Hz$ $5 %, at least 5 V$

Display	LC di	splay, mul	ti-function	al, not illu	minate
Display range measured value insulation resistant					4 MC
Operating uncertainty			± 15	%, at least	t ±1 kΩ
Display range measured nominal system voltage	value (<i>U</i> n)			0500) V r.m.
Operating uncertainty <i>U</i>			±	5 %, at lea	st ± 5 \
Display range measured leakage capacitance valu	$e for R_F > 10$	kΩ			.105 μ
Operating uncertainty			± 15 %,	mindesten	$s\pm 2\mu$
Password			of	f/0999	(0, off)
Fault memory alarm message				(on/(off)
Interface					
Interface/protocol			RS	-485/BMS	isoDat
Baud rate		BMS (9.6 k	Bit/s), isoD	ata (115.2	kBits/s
Cable length (9.6 kBits/s					1200 r
Cable: twisted pair, shield connected to PE				min. J-Y(St	,
Terminating resistor	120	Ω (0.25 W	/), internal	, can be co	
Device address, BMS bus				3	.90 (3)
Switching elements					
Switching elements		2 x 1 N0 c	ontacts, co	mmon teri	ninal 1
Operating principle				n (N/C ope	
Electrical endurance, number of cycles					1000
Contact data acc. to IEC 60947-5-1:					
Utilisation category	AC-12	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	2 A	1 A	0.2 A	0.1
Minimum contact rating			1 m	A at AC/D	2 ≥ 10
Environment/EMC					
EMC				IFC 61	326-2-
				ilcoi	J20 Z
Ambient temperatures:				זר	.+70°
Operation Transport					.+70 .+85°
Storage					.+70°
storage					
Classification of dimentic conditions are to IEC	60771 (volato	d to tompo	ratura and	rolativo bu	miditu).
	60721 (relate	d to tempe	rature and	relative hui	
Stationary use (IEC 60721-3-3)	60721 (relate	d to tempe	rature and	relative hui	3K2
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2)	60721 (relate	d to tempe	rature and	relative hui	3K2 2K1
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-time storage (IEC 60721-3-1)			rature and	relative hui	3K2 2K1
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-time storage (IEC 60721-3-1) Classification of mechanical conditions acc.			rature and	relative hui	3K2 2K1 1K2
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-time storage (IEC 60721-3-1) Classification of mechanical conditions acc. Stationary use (IEC 60721-3-3)			rature and	relative hui	3K2 2K1 1K2 3M2
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-time storage (IEC 60721-3-1) Classification of mechanical conditions acc. stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2)			rature and	relative hui	3K2 2K1 1K2 3M2 2M
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-time storage (IEC 60721-3-1) Classification of mechanical conditions acc. (Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1)			rature and	relative hui	3K2 2K1 1K2 3M2 2M
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-time storage (IEC 60721-3-1) Classification of mechanical conditions acc. Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection					3K2 2K1 1K2 3M2 2M 1M1
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-time storage (IEC 60721-3-1) Classification of mechanical conditions acc. (Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type				relative hui	3K2 2K1 1K2 3M2 2M 1M1
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-time storage (IEC 60721-3-1) Classification of mechanical conditions acc. (Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type Nominal current				^D ush-wire	3K2 2K1 1K2 3M2 2M 1M1 termin. ≤ 10
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-time storage (IEC 60721-3-1) Classification of mechanical conditions acc. (Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type Nominal current Conductor sizes				^D ush-wire	3K2 2K1 1K2 3M2 2M 1M1 termin ≤ 10
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-time storage (IEC 60721-3-1) Classification of mechanical conditions acc. (Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type Nominal current Conductor sizes Stripping length				^P ush-wire [*]	3K2 2K1 1K2 3M2 2M 1M1 ≤ 10 /G 24-1
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-time storage (IEC 60721-3-1) Classification of mechanical conditions acc. Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type Nominal current Conductor sizes Stripping length rigid				Push-wire AW	3K2 2K1 1K2 3M2 2M 1M1 termin. ≤ 10 /G 24-1 10 mi 2.5 mn
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-time storage (IEC 60721-3-1) Classification of mechanical conditions acc. Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type Nominal current Conductor sizes Stripping length rigid flexible without ferrules				Oush-wire AW 0.2	3K2 2K1 1K2 3M2 2M 1M1 1M1 ≤ 10 10 mi 10 mi 22.5 mn
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-time storage (IEC 60721-3-1) Classification of mechanical conditions acc. Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type Nominal current Conductor sizes Stripping length rigid flexible without ferrules flexible with ferrules, with/without plastic collar	to IEC 6072	1:		O.2 0.75	3K2 2K11 1K2 3M2 2M 1M1 ≤ 10 1G 24-1 10 mi 22.5 mn 22.5 mn
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-time storage (IEC 60721-3-1) Classification of mechanical conditions acc. Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type Nominal current Conductor sizes Stripping length rigid flexible without ferrules flexible with ferrules, with/without plastic collar Multiple conductor, flexible with TWIN ferrule with	to IEC 6072	1:		Oush-wire AW 0.2	3K2 2K1 1K2 3M2 2M 1M1 ≤ 10 (G 24-1 10 mr 10 mr 22.5 mn 22.5 mn
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-time storage (IEC 60721-3-1) Classification of mechanical conditions acc. Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type Nominal current Conductor sizes Stripping length rigid flexible without ferrules flexible with ferrules, with/without plastic collar Multiple conductor, flexible with TWIN ferrule wit Opening force	to IEC 6072	1:		O.2 0.75	3K2 2K1 1K2 3M2 2M 1M1 ≤ 10 1G 24-1 10 mi 22.5 mn 22.5 mn 50
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-time storage (IEC 60721-3-1) Classification of mechanical conditions acc. (Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type Nominal current Conductor sizes Stripping length rigid flexible without ferrules flexible with ferrules, with/without plastic collar Multiple conductor, flexible with TWIN ferrule with Opening force Test opening, diameter	to IEC 6072	1:		O.2 0.75	3K2 2K1 1K2 3M2 2M 1M1 ≤ 10 1G 24-1 10 mi 22.5 mn 22.5 mn 50
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-time storage (IEC 60721-3-1) Classification of mechanical conditions acc. (Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type Nominal current Conductor sizes Stripping length rigid flexible without ferrules flexible with ferrules, with/without plastic collar Multiple conductor, flexible with TWIN ferrule wit Opening force Test opening, diameter Other	to IEC 6072	1:	f	O.2 0.75 0.25	3K2 2K1 1K2 3M2 2M 1M1 ≤ 10 1G 24-1 10 m1 10 m1 1.5 mn 50 2.1 mn
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-time storage (IEC 60721-3-1) Classification of mechanical conditions acc. (Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type Nominal current Conductor sizes Stripping length rigid flexible without ferrules flexible with ferrules, with/without plastic collar Multiple conductor, flexible with TWIN ferrule with Opening force Test opening, diameter Other Other Operating mode	to IEC 6072	1:	. F	Push-wire 1 AW 0.2 0.75 0.25 0.5	3K2 2K1 1K2 3M2 2M 1M1 Example 1
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-time storage (IEC 60721-3-1) Classification of mechanical conditions acc. (Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type Nominal current Conductor sizes Stripping length rigid flexible without ferrules flexible with ferrules, with/without plastic collar Multiple conductor, flexible with TWIN ferrule with Opening force Test opening, diameter Other Operating mode Mounting	to IEC 6072	1:	. F	O.2 0.75 0.25	3K2 2K1 1K2 3M2 2M 1M1 **Example 1
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-time storage (IEC 60721-3-1) Classification of mechanical conditions acc. of Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type Nominal current Conductor sizes Stripping length rigid flexible without ferrules flexible with ferrules, with/without plastic collar Multiple conductor, flexible with TWIN ferrule with Opening force Test opening, diameter Other Operating mode Mounting Degree of protection, built-in components (DIN El	to IEC 6072	1:	. F	Push-wire 1 AW 0.2 0.75 0.25 0.5	3K2 2K1 1K2 2M1 1K2 2M1 1M1 ≤ 10 1G 24-1 10 mn 22.5 mn 50 22.1 mn 50 peratical
Classification of climatic conditions acc. to IEC of Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-time storage (IEC 60721-3-1) Classification of mechanical conditions acc. of Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type Nominal current Conductor sizes Stripping length rigid flexible without ferrules flexible with ferrules, with/without plastic collar Multiple conductor, flexible with TWIN ferrule with Opening force Test opening, diameter Other Operating mode Mounting Degree of protection, built-in components (DIN El Degree of protection, terminals (DIN EN 60529)	to IEC 6072	1:	. F	Push-wire of AW 0.2 0.75 0.25 0.5 o.tinuous o entilated w	3K2 2K1 1K2 3M2 2M1 1M1 ≤ 10 1G 24-1 10 mr 2.5 mr 50 2.1 mr 50 2.1 mr
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-time storage (IEC 60721-3-1) Classification of mechanical conditions acc. (Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type Nominal current Conductor sizes Stripping length rigid flexible without ferrules flexible with ferrules, with/without plastic collar Multiple conductor, flexible with TWIN ferrule with Opening force Test opening, diameter Other Operating mode Mounting Degree of protection, built-in components (DIN EI) Degree of protection, terminals (DIN EN 60529) Enclosure material	to IEC 6072	1:	. F	O.2 0.2 0.75 0.25 0.5 viintinuous o	3K2 2K1 1K2 3M2 2MM 1M1 ≤ 10 1G 24-1 10 mr 2.5 mr 50 2.1 mr 50 2.1 mr peratio liP3 liP2
Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-time storage (IEC 60721-3-1) Classification of mechanical conditions acc. of Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type Nominal current Conductor sizes Stripping length rigid flexible without ferrules flexible with ferrules, with/without plastic collar Multiple conductor, flexible with TWIN ferrule with Opening force Test opening, diameter Other Operating mode Mounting Degree of protection, built-in components (DIN EI) Degree of protection, terminals (DIN EN 60529)	to IEC 6072	1:	Coo must be v	O.2 0.2 0.75 0.25 0.5 viintinuous o	3K2 2K1 1K2 3M2 2MM1 1M1 1M1 ≤ 10 1G 24-1 10 mr 2.5 mr 50 2.1 mr 50 2.1 mr 1.5 mr 50 1.5 mr 1.5 mr 50 2.1 mr

()* = Factory setting



Wiring diagram



ISOMETER® isoHV425... with coupling device AGH422

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





Typical applications

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

Approvals





Device features

- Monitoring the insulation resistance 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
- IsoData (for continuous data output)

isoHV425-D4M-4

+ 0(4)...20 mA, 0...400 μ A, 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

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

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



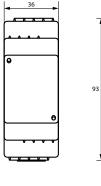
	Analogue output (valid for isoHV425-D4M-4 only)
Definitions:	Operating mode mid-scale R or full-scale $U(R = 120 \text{ k}\Omega)$
Supply circuit (IC2) A1, A2	Functions insulation value R_F or mains voltage U_n (R_F)
Output circuit (IC3) 11, 14, 24	Max. no load voltage (open terminals) DC 12
Control circuit (IC4) Up, KE, T/R, A, B, AK1, GND, AK2, M+, M-	Max. short-circuit current 25 mA short-circuit production
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 μ A, load \leq 3 kg
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 1
IC2/(IC3-4) 250 V	Operating principle N/C operation/N/O operation (N/C operation)
IC3/IC4 250 V	Electrical endurance under rated operating conditions, number of cycles 10,00
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-1
IC2/(IC3-4) overvoltage category III, 300 V	Rated operational voltage 230 V 230 V 24 V 110 V 220
IC 3/IC4 overvoltage category III, 300 V	Rated operational current 5 A 2 A 1 A 0.2 A 0.1
	· · · · · · · · · · · · · · · · · · ·
Voltage tests (routine test) acc. to IEC 61010-1:	Minimum contact rating 1 mA at AC/DC ≥ 10
IC2/(IC3-4) AC 2.2 kV	Environment/EMC
IC 3/IC4 AC 2.2 kV	EMC IEC 61326-2-4, EN 50121-3-
Supply voltage	·
	Ambient temperatures:
Supply voltage <i>U</i> _S AC 100240 V/DC 24240 V	Operation -40+70 °
Tolerance of U_S $-30+15\%$	Transport -40+85°
Frequency range <i>U</i> _s 4763 Hz	Storage -40+70 °
Power consumption $\leq 3 \text{ W}, \leq 9 \text{ VA}$	Classification of climatic conditions acc. to IEC 60721 (related to temperature and relative humidity):
IT system being manitored	
IT system being monitored	Stationary use (IEC 60721-3-3) for W variant 3K2
Nominal system voltage <i>U</i> _n with AGH422 AC 01000 V/DC 01000 V	
Tolerance of U_n AC +10 %, DC +10 %	Transport (IEC 60721-3-2) 2K1
Nominal system voltage range U_n (UL508) AC/DC 0600 V	Long-term storage (IEC 60721-3-1) 1K2
Frequency range of U_n DC, 15460 Hz	Classification of mechanical conditions acc. to IEC 60721:
Management and a street	Stationary use (IEC 60721-3-3) 3M1
Measuring circuit	for W variant 3M1
Permissible system leakage capacitance C_e $\leq 150 \mu F$	Transport (IEC 60721-3-2) 2M
Permissible extraneous DC voltage U_{fg} \leq 1600 V	Long-term storage (IEC 60721-3-1) 1M1
D	Long term storage (IEC 00721 3 1)
Response values	Connection
Response value R_{an1} 11500 k Ω (50 k Ω)*	Connection type screw-type terminal or push-wire termin
Response value R_{an2} 10490 k Ω (25 k Ω)*	
Relative uncertainty $R_{\rm an}$ ± 15 %, at least ± 3 k Ω	Screw-type terminals:
Hysteresis $R_{\rm an}$ 25 %, at least 1 k Ω	Nominal current ≤10
Undervoltage detection 301.09 kV (off)*	Tightening torque 0.50.6 Nm (57 lb-in
Overvoltage detection 311.10 kV (off)*	Conductor sizes AWG 241
Relative uncertainty U $\pm 5\%$, at least $\pm 5\text{ V}$	Stripping length 8 mi
Relative uncertainty depending on the frequency \geq 200 Hz -0.075 %/Hz	Rigid/flexible 0.22.5 mn
Hysteresis <i>U</i> 5 %, at least 5 V	Flexible with ferrules with/without plastic sleeve 0.252.5 mn
nystelesis 0 5 %, at least 5 v	Multi-conductor
Time response	rigid /flexible 0.21.5 mn
Response time t_{an} at $R_F = 0.5 \times R_{an}$ and $C_e = 1 \mu F$ acc. to IEC 61557-8 $\leq 20 \text{ s}$	flexible with ferrules without plastic sleeve 0.251.5 mm
	·
	flexible with TWIN ferrules with plastic sleeve 0.51.5 mm
Response delay t_{on} 099 s (0 s)*	Push-wire terminals:
Delay on release t_{off} 099 s (0 s)*	Nominal current ≤10
Displays memory	Conductor sizes AWG 241
Displays, memory	Stripping length 10 mi
Display LC display, multi-functional, not illuminated	Rigid 0.22.5 mn
Display range measured value insulation resistance (R_F) 1 k Ω 4 M Ω	Flexible without ferrules 0.752.5 mm
Operating uncertainty ± 15 %, at least ± 3 k Ω	
Display range measured value nominal system voltage (U_n) 301.15 kV _{RMS}	
Operating uncertainty $\pm 5\%$, at least $\pm 5 \text{ V}$	Multi-conductor flexible with TWIN ferrules with plastic sleeve 0.51.5 mm
Display range measured value system leakage capacitance for $R_F > 20 \text{ k}\Omega$ 0200 µF	Opening force 50
Operating uncertainty ± 15 %, at least ± 2 μ F	Test opening, diameter 2.1 mi
Password off/0999 (0, off)*	Other
Fault memory alarm messages on/(off)*	
Oli/(01)	Operating mode continuous operation
Interface (valid for isoHV425-D4-4 only)	Mounting cooling slots must be ventilated vertical
Interface/protocol RS-485/BMS, Modbus RTU, isoData (BMS)*	Minimum horizontal distance between the devices (DIN EN 45545) see note *
Baud rate BMS (9.6 kbit/s), Modbus RTU (selectable), isoData (115.2 kbits/s)	Degree of protection, built-in components (DIN EN 60529)
שמש זמנכ אווע טיב) כואוס אווע (אפופרומאופ), ואוס אווע (אפופרומאופ), ואוס אווע (אווע אווע) אווע אווע אווע אווע א	Degree of protection, terminals (DIN EN 60529) IP2
, , , , , , , , , , , , , , , , , , , ,	Enclosure material polycarbonat
Cable length (9.6 kbits/s) ≤ 1200 m	
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	DIN rail mounting acc. to IFC 6071
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	DIN rail mounting acc. to IEC 6071 Screw mounting 2 x M4 with mounting cli
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	Screw mounting 2 x M4 with mounting cli
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	Screw mounting 2 x M4 with mounting cli Documentation number D0008
	Screw mounting 2 x M4 with mounting cli

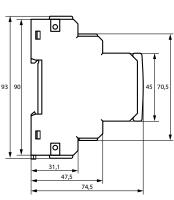
Definitions:	
Measuring circuit (IC1)	L1/+, L2/-
Control circuit (IC2)	AK1, GND, AK2, Up, E
Rated voltage	1000 V
Overvoltage category	!!!
Rated impulse voltage: IC1/IC2	8 K\
Rated insulation voltage:	OKY
IC1/IC2	1000 \
Pollution degree	1000 1
Protective separation (reinforced insulation) between	
IC1/IC2	Overvoltage category III, 1000 V
	overvoltage tategory, 1000 i
IT system being monitored	
Nominal system voltage range U _n	AC 01000 V/DC 01000 V
Tolerance of $U_{\rm n}$	AC +10 %/DC +10 %
Measuring circuit	
Measuring voltage $U_{\rm m}$	±45 \
Measuring current $I_{\rm m}$ for $R_{\rm F}$	≤ 120 µ/
Internal resistance R _i	≥ 390 kΩ
Environment/EMC	
EMC	IEC 61326-2-4, EN 50121-3-2
Ambient temperatures:	
Operation	
<i>U</i> _n < 700	-40+70°C
$U_{\rm n} > 700$	-40+55 °C
Transport	-40+85 °C
Storage	-40+70 °C
Classification of climatic conditions acc. to IEC 6072	21 (related to temperature and relative humidity):
Stationary use (IEC 60721-3-3)	3K22
for W variant	3K24
Transport (IEC 60721-3-2)	2K1°
Long-term storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions acc. to II	EC 60721:
Stationary use (IEC 60721-3-3)	3M1°
for W variant	3M12
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M1:

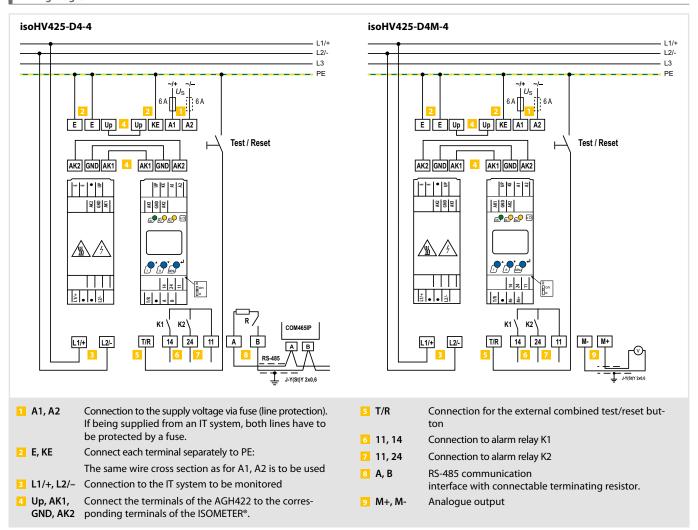
Connection	
Connection type	screw-type terminal or push-wire terminal
Screw-type terminals:	
Nominal current	≤10 A
Tightening torque	0.50.6 Nm (57 lb-in)
Conductor sizes	AWG 2412
Stripping length	8 mm
Rigid/flexible	0.22.5 mm ²
Flexible with ferrules with/without plastic sleeve	0.252.5 mm ²
Multi-conductor	
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	0.51.5 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 sle	eve 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 isoHV42	25xx and AGH422
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 $U_{\rm n} > 800 \text{ V}$	≥ 30 mm
Minimum horizontal distance between the devices (DIN EN	45545) see note *
Degree of protection, built-in components (DIN EN 60529)	IP30
Degree of protection, terminals (DIN EN 60529)	IP20
Enclosure material	polycarbonate
DIN rail mounting acc. to	IEC 60715
Screw mounting	2 x M4 with mounting clip
Weight	150 g

** 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.

Dimension diagram (dimensions in mm)







ISOMETER® IR155-3203/IR155-3204







Typical applications

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

Approvals





Device features

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

Туре	Parameters	Response value R _{an}	F _{ave}	Undervoltage detection	Measured value output	Art. No.
IR155-3203	Cambianianalinashiralina	300 V	300 V	Low-side	B91068138V4	
IR155-3204	Continuously set value	100 KZ 2	100 kΩ 10	0 V (inactive)	High-side	B91068139V4
IR155-3203	Customer and if a nottine	100 kΩ1 MΩ 110	0 500 //	Low-side	B91068138CV4	
IR155-3204	Customer-specific setting		0500 V	High-side	B91068139CV4	

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

Insulation coordination acc. to IEC 60664-1

Protective separation (reinforced insulation)

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

Supply/IT system being monitored

tem being monitorea	
Us	DC 1036 V
current Is	150 mA
	2 A
	6 A/2 ms inrush current
ge (L+/L-) <i>U</i> n	AC 01000 V (peak value)
	0660 V r.m.s. (10 Hz1 kHz)
	DC 01000 V
ption	< 2 W

Response values

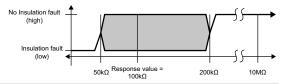
Response value hysteresis (DCP)	25 %
Response value Ran	100 kΩ1 MΩ
Undervoltage detection	0500 V

Measuring range

Measuring range	010 MΩ
Undervoltage detection	0500 V default setting: 0 V (inactive)
Relative uncertainty	
SST (≤ 2 s)	$good > 2* R_{an}$; $bad < 0.5* R_{ar}$
Relative uncertainty DCP	085 kΩ ▶ ±20 kΩ
(default setting 100 kΩ)	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 $U_{\rm n} \ge 100~{\rm V}~~ b \pm 10~{\rm W};$ at $U_{\rm n} \ge 300~{\rm V}~~ b \pm 5~{\rm W}$ Relative uncertainty (SST) "Good condition" $\ge 2^*~R_{\rm an}$ "Bad condition" $\le 0.5^*~R_{\rm an}$

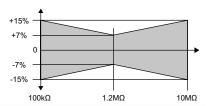


Relative uncertainty DCP

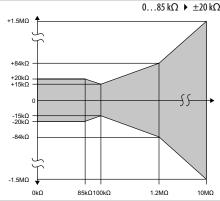
100 kΩ...10 MΩ ±15 % 100 kΩ...1.2 MΩ \blacktriangleright ±15 % to ±7 %

1.2 M Ω \blacktriangleright ±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} (OKHS; DCP)

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

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

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

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

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

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

 $t_{ab} \leq 40 \text{ s (at } F_{ave} = 9)$ $t_{ab} \leq 33 \text{ s (at } F_{ave} = 8)$ $t_{ab} \leq 33 \text{ s (at } F_{ave} = 7)$ $t_{ab} \leq 33 \text{ s (at } F_{ave} = 6)$ $t_{ab} \leq 26 \text{ s (at } F_{ave} = 5)$ $t_{ab} \leq 26 \text{ s (at } F_{ave} = 4)$ $t_{ab} \leq 26 \text{ s (at } F_{ave} = 4)$ $t_{ab} \leq 20 \text{ s (at } F_{ave} = 3)$ $t_{ab} \leq 20 \text{ s (at } F_{ave} = 2)$ $t_{ab} \leq 20 \text{ s (at } F_{ave} = 1)$ $during \text{ a self test } t_{ab} + 10 \text{ s}$ $during \text{ a self test } t_{ab} + 10 \text{ s}$ $(every five minutes; should be added to <math>t_{an}/t_{ab}$)

Measuring circuit

System leakage capacitance C _e	≤ 1 μF
Smaller measurement range and increased measuring time at Ce	> 1 μF
	(e.g. may range 1 MO @ 3 uF

--- 68 s when changing over from Rr 1 MO to R--/2

	$t_{an} = 68$ s when changing over from $K_F + ML2$ to $K_{an}/2$)
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 Ri	≥ 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

St successful insulation measurement at ≤ 17.5 s

PWM active 5...95 %

20 Hz ▶ undervoltage condition

Insulation measurement DCP (continuous measurement);

starts two seconds after power on;

PWM active $5...95\,\%$

First successful insulation measurement at \leq 17.5 s

Undervoltage detection 0...500 V

(Bender configurable)

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

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

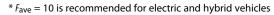
40 Hz ▶ Device error

Device error detected; PWM 47.5...52.5 %

50 Hz ➤ Connection fault earth

Fault detected on the earth connection (Kl. 31) $\,$

PWM 47.5...52.5 %



Status output (OKHS)

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

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

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

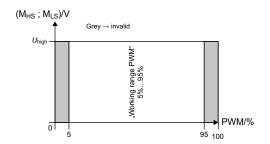
Operating principle PWM driver

• 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

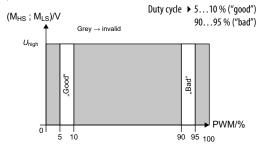
$$R_{\rm F} = \frac{90 \% \text{ x } 1200 \text{ k}\Omega}{dc_{\rm meas} - 5\%}$$
 -1200 k\O

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



Operating principle PWM driver

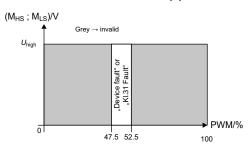
• Condition "SST" (30 Hz)



Operating principle PWM driver

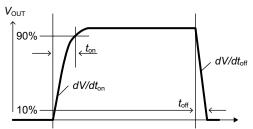
• Condition "Device error" and "KI.31 fault" (40 Hz; 50 Hz;)

Duty cycle ▶ 47.5...52.5 %



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

Timing 3204 (inverse to 3203)



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

Connection

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 °C	
Voltage failure	≤ 2 ms	
Flammability class acc. to	UL 94 V-0	

Mounting

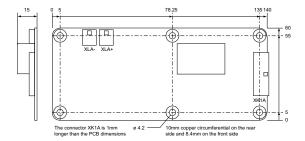
M4 metal screws with locking washers between screw head and PCB. Torx, T20 with a maximum tightening torque of 4 Nm for the screws. Furthermore, a maximum of 10 Nm tightening torque to the PCB at the mounting points.

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

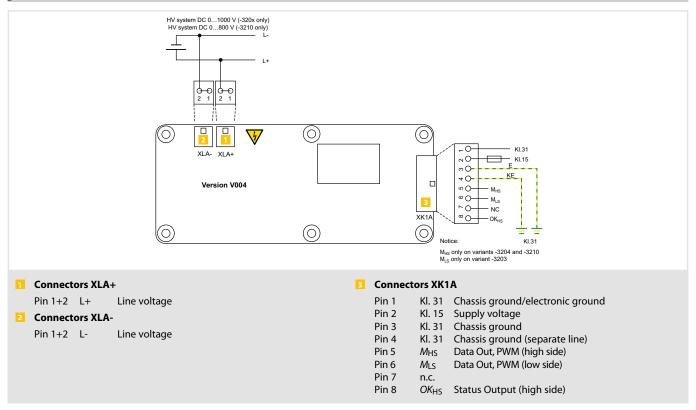
Before mounting the device, ensure sufficient insulation between the device and the vehicle or the mounting points (min. 11.4 mm to other parts). If the device is mounted on a metal or conductive subsurface, this subsurface has to be at earth potential (Kl.31; vehicle mass).

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

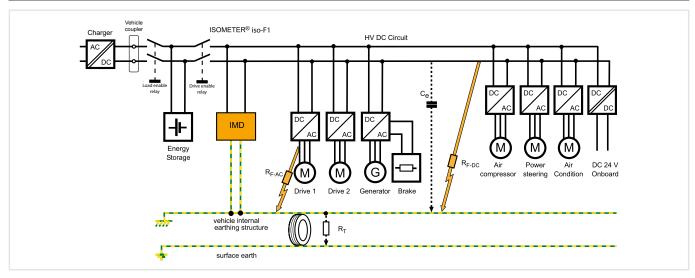
Dimension diagrams (dimensions in mm)



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

Type	Supply voltage <i>U</i> ₅	System leakage capacitance C _e Art. No.		No.
.,,,,,	supply colleges;	- Jyztam taunuge tupu utumta te	Screw-type terminal	Push-wire terminal
isoEV425-D4-4 with AGH420	AC 100240 V, 4763 Hz	≤ 5 µF	B91036401	B71036401
isoEV425HC-D4-4 with AGH420	DC 24240 V	≤ 20 µF	=	B71036397

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	85/BMS, M	odbus RTU	J, isoData
Supply circuit (IC2)	A1, A2	Baud rate BMS (9.6 k	Bit/s), Modbus	RTU (selec	table), isol	Data (115.2	2 kBits/s)
Output circuit (IC3)	11, 14, 24	Cable length (9.6 kbits/s)				<	≤ 1200 m
Control circuit (IC4)	Up, KE, T/R, A, B, AK1, GND, AK2	Cable	shi	elded, one	end of shie	eld connect	ted to PE
Rated voltage	240 V	recommended			CAT6	/CAT7 min	ı. AWG23
Overvoltage category	III	alternatively		tw	isted pair,	J-Y(St)Y m	in. 2x0.8
Rated impulse voltage:		Terminating resistor	120	Ω (0,25 V	V), interna	l, can be co	onnected
IC2/(IC3-4)	4 kV	Device address, BMS bus, Modbus RTU				3	90 (3)*
IC 3/(IC4)	4 kV						
Rated insulated voltage:		Switching elements					
IC2/(IC3-4)	250 V	Switching elements		2 x 1 N/0 c	ontacts, co	mmon teri	rminal 11
IC 3/(IC4)	250 V	Operating principle	N/C op	eration/N/	'O operatio	n (N/O ope	eration)*
Polution degree	3	Electrical endurance, number of cycles					10000
Protective separation (reinforced insulation) between:		Contact data acc. to IEC 60947-5-1:					
IC2/(IC3-4)	Overvoltage category III, 300 V	Utilisation category	AC-12	AC-14	DC-12	DC-12	DC-12
IC3/(IC4)	Overvoltage category III, 300 V	Rated operational voltage	230 V	230 V	24 V	110 V	220 V
Voltage test (routine test) according to IEC 61010-1:	overvoltage category iii, 300 v	Rated operational current	5 A	230 V	1 A	0.2 A	0.1 A
IC2/(IC3-4)	AC 2.2 kV	Minimum contact load relay manufacturer's re		2.1	1 / 1	10 μA / 1	
IC 3/(IC4)		Millimum contact load relay mandiacturer s re	letelice			10 μΑ / 1	IO IIIV DC
IC 3/(IC4)	AC 2.2 kV	Environment/EMC					
Supply voltage		EMC				IFC 61	1326-2-4
Supply voltage U_S	AC 100240 V/DC 24240 V					12001	.520 4 7
Tolerance of U_{S}	-30+15 %	Ambient temperatures:					. 70 05
Frequency range U_s	4763 Hz	Operation					+70°C
Power consumption	4703 HZ ≤ 3 W, ≤ 9 VA	Transport					+85°C
i ower consumption	≥ J VV, ≤ J VA	Storage				-40	+70 ℃
IT system being monitored		Classification of climatic conditions acc. to II	EC 60721 (relate	ed to tempe	erature and	relative hu	ımidity):
	AC, AC 0690 V/DC 01000 V	Stationary use (IEC 60721-3-3)		•			3K22
Tolerance of $U_{\rm n}$	AC + 15 %, DC +10 %	Transport (IEC 60721-3-2)					2K11
Nominal system voltage range U_n with AGH420 (UL508)	AC/DC 0600 V	Long-term storage (IEC 60721-3-1)					1K22
Frequency range of U_n	DC, 40460 Hz		. 4. IFC (072	•			
requeries range or on	DC, 10100 HZ	Classification of mechanical conditions ac	C. TO IEC 60/2	1			21411
Measuring circuit		Stationary use (IEC 60721-3-3)					3M11
Permissible system leakage capacitance C _e		Transport (IEC 60721-3-2)					2M4
isoEV425	≤ 5 µF	Long-term storage (IEC 60721-3-1)					1M12
isoEV425HC	_ 5 μ. ≤ 20 μF	Connection					
Permissible extraneous DC voltage U_{fq}	≤ 1150 V			4 4.			
remissible extraneous be votage org	_ 1130 Y	Connection type	20	ew-type te	eriiiiiai or	push-wire	terminai
Response values		Screw-type terminals:					
Response value R _{an1}		Nominal current					≤10 A
isoEV425	2500 kΩ (500 kΩ)*	Tightening torque			0.50	.6 Nm (5	
isoEV425HC	2500 kΩ (200 kΩ)*	Conductor sizes				AW	NG 24-12
Response value R _{an2}	1490 kΩ (100 kΩ)*	Stripping length					8 mm
Operating uncertainty R_{an} ($\leq 5 \mu F$)	\pm 15 %, at least \pm 1 k Ω	Rigid/flexible				0.2	.2.5 mm ²
Operating uncertainty $R_{an} > 100 \text{ k}\Omega \text{ (} \leq 5 \mu\text{F, isoEV425HC)}$	$\pm (5 \% * R_{an}/100 k\Omega + 10\%)$	Flexible with ferrules with/without plastic slee	ve			0.25	.2.5 mm ²
Hysteresis R_{an}	25 %, at least 1 kΩ	Multi-conductor					
Undervoltage detection	301.14 kV (off)*	rigid/flexible				0.2	.1.5 mm ²
Overvoltage detection	311.15 kV (off)*	flexible with ferrules without plastic slee	ve			0.25	.1.5 mm ²
Relative uncertainty <i>U</i>	\pm 5 %, at least \pm 5 V	flexible with TWIN ferrules with plastic s	leeve			0.5	.1.5 mm ²
Relative uncertainty o Relative uncertainty depending on the frequency ≥ 200 Hz		·					
, , , ,	-0.03 %/Hz	Push-wire terminals:					-10 A
Hysteresis <i>U</i>	5 %, at least 5 V	Nominal current				414	≤10 A
Time response		Conductor sizes				AW	NG 24-14
Response time t_{an} at $R_F = 0.5 \times R_{an}$ and $C_e = 1 \mu F$ acc. to IEC 61557-8	≤ 10 s	Stripping length				0.7	10 mm
Start-up delay t	010 s (0 s)*	Rigid					.2.5 mm ²
Response delay ton	099 s (0 s)*	Flexible without ferrules					.2.5 mm ²
Delay on release t _{off}		Flexible with ferrules with/without plastic slee					.2.5 mm ²
Delay on release 10H	099 s (0 s)*	Multi-conductor flexible with TWIN ferrules wi	th plastic sleev	e		0.5	.1.5 mm ²
Displays, memory		Opening force					50 N
	multi-functional, not illuminated	Test opening, diameter					2.1 mm
Display range measured value insulation resistance (R_F)	1 kΩ1 MΩ	Wiring of the terminals Up, AK1, GND, AK2					
Operating uncertainty $R_F (\le 5 \mu F)$	\pm 15 %, at least \pm 1 k Ω	refer to t	echnical data A	GH420 un	der the hea	ading "Con	nection"
Operating uncertainty $N_F (= 5 \mu F)$ Operating uncertainty $R_F > 100 \text{ k}\Omega (\leq 5 \mu F)$, isoEV425HC)	$\pm (5 \% * R_F / 100 k\Omega + 10\%)$	Other					
Display range measured value nominal system voltage (U_n)	301.15 kV r.m.s.						
Operating uncertainty	\pm 5 %, at least \pm 5 V	Operating mode				ntinuous o	
Relative uncertainty depending on the frequency \geq 200 Hz	-0.03 %/Hz	Mounting		poling slots	s must be v	entilated v	
Display range measured value system leakage capacitance $R_F > 10 \text{ kg}$		Degree of protection, built-in components (DI					IP30
		Degree of protection, terminals (DIN EN 60529)				IP20
isoEV425	010 μF	Enclosure material				polyca	carbonate
isoEV425HC	025 μF	DIN rail mounting acc. to				IE	EC 60715
Operating uncertainty	\pm 15 %, at least \pm 2 μ F	Screw fixing			2 x M4	with moun	nting clip
Password	off/0999 (0, off)*	Documentation number					D00126
Fault memory alarm messages	on/(off)*	Weight					≤ 150 g
		()* = factory setting					
		. ,,					

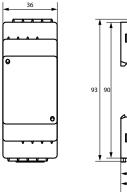
Definitions:	
Measuring circuit (IC1)	L1/+, L2/-
Control circuit (IC2)	AK1, GND, AK2, Up, I
Rated voltage	1000 \
Overvoltage category	
Rated impulse voltage:	
IC1/(IC2)	8 k\
Rated insulated voltage:	
IC1/(IC2)	1000 \
Polution degree	
Protective separation (reinforced insulation) between:	
IC1/(IC2)	Overvoltage category III, 1000 \
Monitored IT system	
Nominal system voltage range Un	AC/DC 01000 \
Tolerance of U _n	AC/DC +10 %
Nominal system voltage range $U_{\rm n}$ (UL508)	AC/DC 0600 \
Measuring circuit	
Measuring voltage $U_{\rm m}$	± 45 \
Measuring current I _m at R _F	≤ 400 µA
Internal resistance DC Ri	≥ 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 (related to temperature and relative humidity):
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions acc. to IEC (60721:
Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M ²
Long-term storage (IEC 60721-3-1)	1M12

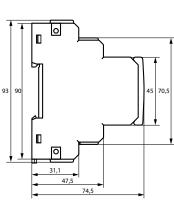
toimettion	
Connection type screw-type terminal or push-wire termina	al
Screw-type terminals:	
Nominal current	≤10 A
Tightening torque	0.50.6 Nm (57 lb-in)
Conductor sizes	AWG 24-12
Stripping length	8 mm
Rigid/flexible	0.22.5 mm ²
Flexible with ferrules with/without plastic sleeve	0.252.5 mm ²
Multi-conductor	
rigid/flexible	0.21.5 mm ²
flexible with ferrules without plastic sleeve	0.251.5 mm ²
flexible with TWIN ferrule with plastic sleeve	0.251.5 mm ²
Push-wire terminals:	
Nominal current	≤10 A
Conductor sizes	AWG 24-14
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 slo	eeve 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	
Operating mode	Continuous operation
Mounting	cooling slots must be ventilated vertically
Distance to adjacent devices from $U_{\rm D} > 800 \rm V$	≥ 30 mm
Degree of protection internal components (DIN EN 60529)	IP30
Degree of protection terminals (DIN EN 60529)	IP20
Enclosure material	polycarbonate
DIN rail mounting acc. to	IEC 60715
Screw mounting	2 x M4 with mounting clip

Connection

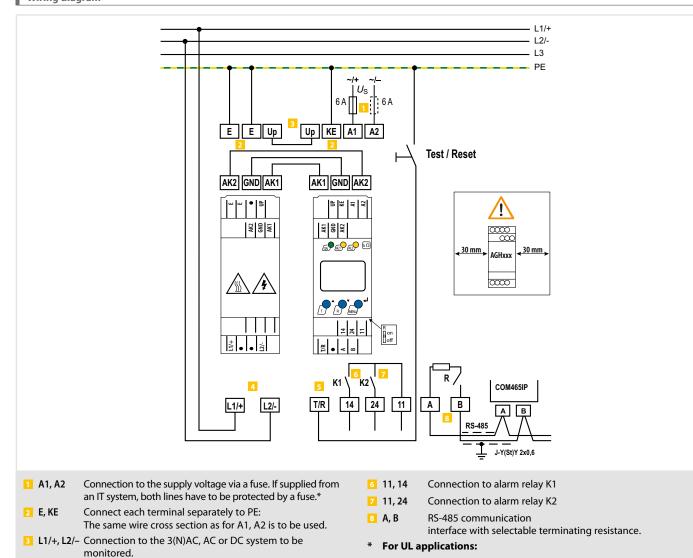
Weight

Dimension diagram (dimensions in mm)



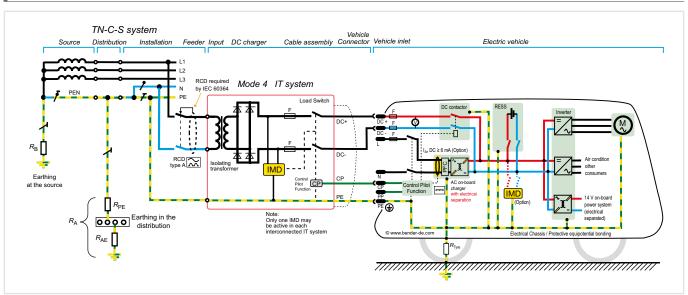


≤ 150 g



Example of application

5 T/R



Only use 60/75°C copper lines!

via 5 A fuses.

UL and CSA applications require the supply voltage to be protected

4 Up, AK1, Connect the terminals of the AGH420 to the correspon-

Connection for external combined test and reset button.

GND, AK2 ding terminals of the ISOMETER®.

ISOMETER® isoCHA425

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





Typical applications

• DC charging stations for electric vehicles according to CSS or CHAdeMO

Approvals









Device features

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

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

EU Declaration of Conformity

Hereby, Bender GmbH & Co. KG declares that the device covered by the Radio Directive complies with Directive 2014/53/EU. The full text of the EU Declaration of Conformity is available at the following Internet address:

https://www.bender.de/fileadmin/content/Products/CE/CEKO_isoXX425.pdf

UKCA Declaration of Conformity

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

https://www.bender.de/fileadmin/content/Products/UKCA/UKCA_isoXX425.pdf

Further information

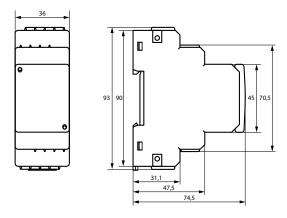
For further information refer to our product range on www.bender.de.

Ordering information

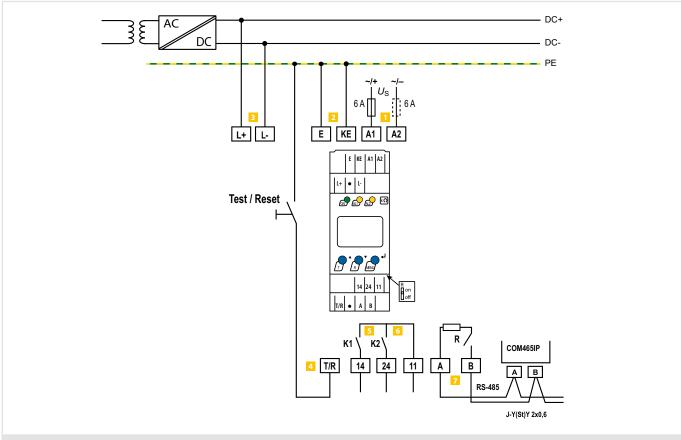
Type	Nominal voltage <i>U</i> n	Art. No	
.,,,,		Screw terminal Push-wire termi	
isoCHA425-D4-4	CCS: DC 0400 V CHAdeM0: DC 50400 V	B91036395	B71036395

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

Insulation coordination acc. to IEC 60664-1/-3		Interface	
Definitions		Interface / protocol	RS-485 / BMS, Modbus RTU, isoData
Measuring circuit (IC1)	L+,L	•	MS (9.6 kbit/s), Modbus RTU (selectable),
Supply circuit (IC2)	A1, A2		isoData (115.2 kbit/s)
Output circuit (IC3)	11, 14, 24	Cable length (9.6 kbit/s)	≤ 1200 m
Control circuit (IC4)	E, KE, T/R, A, B	Cable: twisted pairs Terminating resistor 120	min. J-Y(St)Y 2 x 0.6
Rated impulse voltage IC1/(IC2-4)	6 kV	Device address, BMS bus, Modbus RTU	Ω (0.25 W), internal, can be connected 390 (3)*
IC2/(IC3-4)	4 kV	Device address, Divis Dus, Modubus NTO	390 (3)
IC3/IC4	4 kV	Switching elements	
Rated insulation voltage		Switching elements	2 x 1 N/O contact, common terminal 11
IC1/(IC2-4)	400 V		peration, N/O operation (N/C operation)*
IC2/(IC3-4)	250 V	Electrical endurance under rated operating conditions	10,000 cycles
IC3/IC4	250 V	Contact data acc. to IEC 60947-5-1	
Pollution degree	3	Utilisation category	AC-12 / AC-14 / DC-12 / DC-12 / DC-12
Protective separation (reinforced insulation) between IC1/(IC2-4)	Overvoltage category III, 600 V	Rated operational voltage Rated operational current	230 V / 230 V / 24 V / 110 V / 220 V 5 A / 2 A / 1 A / 0.2 A / 0.1 A
IC1/(IC2 4)	Overvoltage category III, 300 V	Minimum contact load	$1 \text{ mA at DC} \ge 5 \text{ V}$
IC3/IC4	Overvoltage category III, 300 V	Contact data acc. to UL 508	T MM de De E 3 T
Voltage test (routine test) according to IEC 61010-1		Rated operational voltage	AC 250 V
IC2/(IC3-4)	AC 2.2 kV	Rated operational current	2 A
IC3/IC4	AC 2.2 kV	·	
Supply voltage		Environment/EMC	224 2 4 154 44654 24 2 5 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
Supply voltage $U_{\rm S}$	AC 100240 V / DC 24240 V		326-2-4; IEC 61851-21-2:2018-04 Ed. 1.0
Tolerance of U_5	-30+15 %	Ambient temperatures	
Frequency range U_S	4763 Hz	Operation	-40+70 °C¹)
Power consumption	≤ 3 W, ≤ 9 VA	Transport	-40+85 °C
IT system being monitored		Storage	-40+70 °C
Nominal system voltage $U_{\rm D}$	DC 0400 V	$^{1)}$ Below $-25^{\circ}\mathrm{C}$ the readability of the display is limited.	
Tolerance of U_n	+25 %	Classification of climatic conditions acc. to IEC 60721	
	125 %	(related to temperature and relative humidity)	
Response values		Stationary use (IEC 60721-3-3)	3K22
Response value R _{an1}	$R_{an2}250 \text{ k}\Omega (230 \text{ k}\Omega)^*$	Transport (IEC 60721-3-2)	2K11
Response value R _{an2}	$5 \text{ k}\Omega \dots R_{\text{an1}} (48 \text{ k}\Omega)^*$	Long-term storage (IEC 60721-3-1)	1K22
Hysteresis R _{an} Undervoltage detection <i>U</i>	25 %, > 1 kΩ < 10499 V (off)*	Classification of mechanical conditions acc. to IEC 6072	21
Overvoltage detection <i>U</i>	> 11500 V (off)*	Stationary use (IEC 60721-3-3)	3M11
Overload detection <i>U</i>	> 510 V (cannot be deactivated)	Transport (IEC 60721-3-2)	2M4
Hysteresis <i>U</i>	5 %, > 5 V	Long-term storage (IEC 60721-3-1)	1M12
Sustam valtaga		Connection	
System voltage			
	500 Vaus	Scrow terminals	
Measuring range Display range	500 V _{RMS}	Screw terminals Nominal current	< 10 A
Display range Measurement and relative uncertainty	0500 V (measurement True-RMS)	Screw terminals Nominal current Tightening torque	≤ 10 A 0.50.6 Nm (57 lb-in)
Display range Measurement and relative uncertainty		Nominal current	
Display range Measurement and relative uncertainty Mode CCS (dc)	0500 V (measurement True-RMS) \pm 5 %, $>$ \pm 5 V	Nominal current Tightening torque Conductor sizes Stripping length	0.50.6 Nm (57 lb-in) AWG 2412 8 mm
Display range Measurement and relative uncertainty Mode CCS (dc) Permissible system leakage capacitance C	0500 V (measurement True-RMS) ± 5 %, $> \pm 5$ V ≤ 5 µF	Nominal current Tightening torque Conductor sizes Stripping length Rigid/flexible	0.50.6 Nm (57 lb-in) AWG 2412 8 mm 0.22.5 mm ²
Display range Measurement and relative uncertainty Mode CCS (dc) Permissible system leakage capacitance C Measuring and display range RF	0500 V (measurement True-RMS) $\pm 5\%, > \pm 5V$ $\leq 5\mu\text{F}$ $1\text{k}\Omega2\text{M}\Omega$	Nominal current Tightening torque Conductor sizes Stripping length Rigid/flexible Flexible with ferrules with/without plastic sleeve	0.50.6 Nm (57 lb-in) AWG 2412 8 mm
Display range Measurement and relative uncertainty Mode CCS (dc) Permissible system leakage capacitance C Measuring and display range R _F Measurement uncertainty R _F / relative uncertainty R _{an}	0500 V (measurement True-RMS) $\pm 5~\%,>\pm 5~V$ $\leq 5~\mu\text{F}$ $1~\text{k}\Omega\dots2~\text{M}\Omega$ $\pm 15~\%,\pm 2~\text{k}\Omega$	Nominal current Tightening torque Conductor sizes Stripping length Rigid/flexible Flexible with ferrules with/without plastic sleeve Multiple conductor	0.50.6 Nm (57 lb-in) AWG 2412 8 mm 0.22.5 mm ²
Display range Measurement and relative uncertainty Mode CCS (dc) Permissible system leakage capacitance C Measuring and display range RF	0500 V (measurement True-RMS) $\pm 5\%, > \pm 5V$ $\leq 5\mu\text{F}$ $1\text{k}\Omega2\text{M}\Omega$	Nominal current Tightening torque Conductor sizes Stripping length Rigid/flexible Flexible with ferrules with/without plastic sleeve Multiple conductor rigid/flexible	0.50.6 Nm (57 lb-in) AWG 2412 8 mm 0.22.5 mm² 0.252.5 mm²
Display range Measurement and relative uncertainty Mode CCS (dc) Permissible system leakage capacitance C Measuring and display range R_F Measurement uncertainty R_F / relative uncertainty $R_{\rm an}$ Measuring and display range $C_{\rm e}$	0500 V (measurement True-RMS) $\pm 5~\%,>\pm 5~V$ $\leq 5~\mu\text{F}$ $1~\text{k}\Omega\dots2~\text{M}\Omega$ $\pm 15~\%,\pm 2~\text{k}\Omega$	Nominal current Tightening torque Conductor sizes Stripping length Rigid/flexible Flexible with ferrules with/without plastic sleeve Multiple conductor rigid/flexible with ferrules without plastic sleeve	0.50.6 Nm (57 lb-in) AWG 2412 8 mm 0.22.5 mm ²
Display range Measurement and relative uncertainty Mode CCS (dc) Permissible system leakage capacitance C Measuring and display range $R_{\rm F}$ Measurement uncertainty $R_{\rm F}$ / relative uncertainty $R_{\rm an}$ Measurement uncertainty $C_{\rm C}$:	0500 V (measurement True-RMS) $\pm 5\%,>\pm 5V$ $\leq 5\mu\text{F}$ $1k\Omega\dots2M\Omega$ $\pm 15\%,\pm 2k\Omega$ $017\mu\text{F}$	Nominal current Tightening torque Conductor sizes Stripping length Rigid/flexible Flexible with ferrules with/without plastic sleeve Multiple conductor rigid/flexible with ferrules without plastic sleeve with TWIN ferrules with plastic sleeve	0.50.6 Nm (57 lb-in) AWG 2412 8 mm 0.22.5 mm² 0.252.5 mm² 0.21.5 mm² 0.251.5 mm²
Display range Measurement and relative uncertainty Mode CCS (dc) Permissible system leakage capacitance C Measuring and display range R_F Measurement uncertainty R_F / relative uncertainty $R_{\rm an}$ Measuring and display range $C_{\rm e}$ Measurement uncertainty $C_{\rm e}$: $C_$	0500 V (measurement True-RMS) $\pm 5~\%,>\pm 5~V$ $\leq 5~\mu\text{F}$ $1~k\Omega\dots2~M\Omega$ $\pm 15~\%,\pm 2~k\Omega$ $017~\mu\text{F}$ no measurement $\pm 15~\%,\pm 0.1~\mu\text{F}$	Nominal current Tightening torque Conductor sizes Stripping length Rigid/flexible Flexible with ferrules with/without plastic sleeve Multiple conductor rigid/flexible with ferrules without plastic sleeve with TWIN ferrules with plastic sleeve Push-wire terminals	0.50.6 Nm (57 lb-in) AWG 2412 8 mm 0.22.5 mm² 0.252.5 mm² 0.21.5 mm² 0.251.5 mm²
Display range Measurement and relative uncertainty Mode CCS (dc) Permissible system leakage capacitance C Measuring and display range R_F Measurement uncertainty R_F / relative uncertainty R_{an} Measuring and display range C_{e} Measurement uncertainty C_{e} : $R_F < 10 \text{ k}\Omega$ $R_F \ge 10 \text{ k}\Omega$ Response time t_{an} : $R_{an} = 2.0 \times R_F$ and $C_e = 1 \mu\text{F}$ acc. to IEC 61557-8	0500 V (measurement True-RMS) $\pm 5~\%,>\pm 5~V$ $\leq 5~\mu\text{F}$ $1~k\Omega\dots2~M\Omega$ $\pm 15~\%,\pm 2~k\Omega$ $017~\mu\text{F}$ no measurement $\pm 15~\%,\pm 0.1~\mu\text{F}$ $\leq 10~\text{S}$	Nominal current Tightening torque Conductor sizes Stripping length Rigid/flexible Flexible with ferrules with/without plastic sleeve Multiple conductor rigid/flexible with ferrules without plastic sleeve with TWIN ferrules with plastic sleeve	0.50.6 Nm (57 lb-in) AWG 2412 8 mm 0.22.5 mm² 0.252.5 mm² 0.21.5 mm² 0.251.5 mm² 0.251.5 mm²
Display range Measurement and relative uncertainty Mode CCS (dc) Permissible system leakage capacitance C Measuring and display range R_F Measurement uncertainty R_F / relative uncertainty $R_{\rm an}$ Measuring and display range $C_{\rm e}$ Measurement uncertainty $C_{\rm e}$: C	0500 V (measurement True-RMS) $\pm 5~\%,>\pm 5~V$ $\leq 5~\mu\text{F}$ $1~k\Omega\dots2~M\Omega$ $\pm 15~\%,\pm 2~k\Omega$ $017~\mu\text{F}$ no measurement $\pm 15~\%,\pm 0.1~\mu\text{F}$	Nominal current Tightening torque Conductor sizes Stripping length Rigid/flexible Flexible with ferrules with/without plastic sleeve Multiple conductor rigid/flexible with ferrules without plastic sleeve with TWIN ferrules with plastic sleeve Push-wire terminals Nominal current	0.50.6 Nm (57 lb-in) AWG 2412 8 mm 0.22.5 mm² 0.252.5 mm² 0.21.5 mm² 0.251.5 mm²
Display range Measurement and relative uncertainty Mode CCS (dc) Permissible system leakage capacitance C Measuring and display range $R_{\rm F}$ Measurement uncertainty $R_{\rm F}$ / relative uncertainty $R_{\rm an}$ Measuring and display range $C_{\rm e}$ Measurement uncertainty $C_{\rm e}$: $R_{\rm F} < 10~{\rm k}\Omega$ $R_{\rm F} \ge 10~{\rm k}\Omega$ Response time $t_{\rm an}$: $R_{\rm an} = 2.0~{\rm x}~R_{\rm F}$ and $C_{\rm e} = 1~{\rm \mu}{\rm F}$ acc. to IEC 61557-8	0500 V (measurement True-RMS) $\pm 5~\%,>\pm 5~V$ $\leq 5~\mu\text{F}$ $1~k\Omega\dots2~M\Omega$ $\pm 15~\%,\pm 2~k\Omega$ $017~\mu\text{F}$ no measurement $\pm 15~\%,\pm 0.1~\mu\text{F}$ $\leq 10~\text{S}$	Nominal current Tightening torque Conductor sizes Stripping length Rigid/flexible Flexible with ferrules with/without plastic sleeve Multiple conductor rigid/flexible with ferrules without plastic sleeve with TWIN ferrules with plastic sleeve Push-wire terminals Nominal current Cross section	0.50.6 Nm (57 lb-in) AWG 2412 8 mm 0.22.5 mm² 0.252.5 mm² 0.21.5 mm² 0.251.5 mm² 0.251.5 mm²
Display range Measurement and relative uncertainty Mode CCS (dc) Permissible system leakage capacitance C Measuring and display range R_F Measurement uncertainty R_F / relative uncertainty $R_{\rm an}$ Measurement uncertainty $C_{\rm e}$: $R_F < 10~{\rm k}\Omega$ $R_F \ge 10~{\rm k}\Omega$ Response time $C_{\rm an}$: $R_{\rm an} = 2.0~{\rm k}$ $R_{\rm F} = 10~{\rm k}$ $R_{\rm F} = 100~{\rm k}$	0500 V (measurement True-RMS) $\pm 5~\%,>\pm 5~V$ $\leq 5~\mu\text{F}$ $1~k\Omega\dots2~M\Omega$ $\pm 15~\%,\pm 2~k\Omega$ $017~\mu\text{F}$ no measurement $\pm 15~\%,\pm 0.1~\mu\text{F}$ $\leq 10~\text{S}$	Nominal current Tightening torque Conductor sizes Stripping length Rigid/flexible Flexible with ferrules with/without plastic sleeve Multiple conductor rigid/flexible with ferrules without plastic sleeve with TWIN ferrules with plastic sleeve Push-wire terminals Nominal current Cross section Stripping length Rigid Flexible	0.50.6 Nm (57 lb-in) AWG 2412 8 mm 0.22.5 mm² 0.252.5 mm² 0.21.5 mm² 0.251.5 mm² ≤ 10 A AWG 2414 10 mm 0.22.5 mm²
Display range Measurement and relative uncertainty Mode CCS (dc) Permissible system leakage capacitance C Measuring and display range R_F Measurement uncertainty R_F / relative uncertainty $R_{\rm an}$ Measurement uncertainty $C_{\rm e}$: $C_{\rm e}$ C_{\rm	0500 V (measurement True-RMS) $\pm 5 \%, > \pm 5 V$ $\leq 5 \mu F$ $1 k\Omega2 M\Omega$ $\pm 15 \%, \pm 2 k\Omega$ $017 \mu F$ no measurement $\pm 15 \%, \pm 0.1 \mu F$ $\leq 10 s$ $\leq 10 s$	Nominal current Tightening torque Conductor sizes Stripping length Rigid/flexible Flexible with ferrules with/without plastic sleeve Multiple conductor rigid/flexible with ferrules without plastic sleeve with TWIN ferrules with plastic sleeve With TWIN ferrules with plastic sleeve Fush-wire terminals Nominal current Cross section Stripping length Rigid Flexible without ferrules	0.50.6 Nm (57 lb-in) AWG 2412 8 mm 0.22.5 mm² 0.252.5 mm² 0.251.5 mm² 0.251.5 mm² ≤ 10 A AWG 2414 10 mm 0.22.5 mm²
Display range Measurement and relative uncertainty Mode CCS (dc) Permissible system leakage capacitance C Measuring and display range R_F Measurement uncertainty R_F / relative uncertainty $R_{\rm an}$ Measurement uncertainty $C_{\rm e}$: $R_F < 10~{\rm k}\Omega$ $R_F > 10~{\rm k}\Omega$ Response time $t_{\rm an}$: $R_{\rm an} = 2.0~{\rm x}~R_F$ and $C_{\rm e} = 1~{\rm \mu}F$ acc. to IEC 61557-8 $R_{\rm an} = 2.0~{\rm x}~R_F$ and $R_F \le 100~{\rm k}\Omega$ Mode CHAdeMO (CHd) System voltage $U_{\rm n}$ Permissible system leakage capacitance $C_{\rm e}$ Measuring and display range $R_F \& R_{\rm FU}$	0500 V (measurement True-RMS) $\pm 5 \%, > \pm 5 \text{ V}$ $\leq 5 \text{ µF}$ $1 \text{ k}\Omega2 \text{ M}\Omega$ $\pm 15 \%, \pm 2 \text{ k}\Omega$ 017 µF no measurement $\pm 15 \%, \pm 0.1 \text{ µF}$ $\leq 10 \text{ s}$ $\leq 10 \text{ s}$ $\leq 10 \text{ s}$ $\leq 10 \text{ s}$ $= 10 $	Nominal current Tightening torque Conductor sizes Stripping length Rigid/flexible Flexible with ferrules with/without plastic sleeve Multiple conductor rigid/flexible with ferrules without plastic sleeve with TWIN ferrules with plastic sleeve Push-wire terminals Nominal current Cross section Stripping length Rigid Flexible without ferrules with ferrules with/without plastic sleeve	0.50.6 Nm (57 lb-in) AWG 2412 8 mm 0.22.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm²
Display range Measurement and relative uncertainty Mode CCS (dc) Permissible system leakage capacitance C Measuring and display range R_F Measurement uncertainty R_F / relative uncertainty $R_{\rm an}$ Measurement uncertainty $C_{\rm e}$: $R_F < 10~{\rm k}\Omega$ $R_F \ge 10~{\rm k}\Omega$ Response time $t_{\rm an}$: $R_{\rm an} = 2.0~{\rm x}~R_F$ and $C_{\rm e} = 1~{\rm \mu}F$ acc. to IEC 61557-8 $R_{\rm an} = 2.0~{\rm x}~R_F$ and $R_F \le 100~{\rm k}\Omega$ Mode CHAdeMO (CHd) System voltage $U_{\rm n}$ Permissible system leakage capacitance $C_{\rm e}$ Measuring and display range $R_F \& R_{\rm FU}$ Measurement uncertainty $R_{\rm an}$ $R_{\rm c}$ relative uncertainty $R_{\rm an}$	0500 V (measurement True-RMS) $\pm 5 \%, > \pm 5 \text{V}$ $\leq 5 \mu\text{F}$ $1 k\Omega \dots 2 M\Omega$ $\pm 15 \%, \pm 2 k\Omega$ $017 \mu\text{F}$ no measurement $\pm 15 \%, \pm 0.1 \mu\text{F}$ $\leq 10 \text{s}$ $= 10 \text{s}$ $\leq 10 \text{s}$ $= 10 \text{s}$ $\leq 10 \text{s}$ \leq	Nominal current Tightening torque Conductor sizes Stripping length Rigid/flexible Flexible with ferrules with/without plastic sleeve Multiple conductor rigid/flexible with ferrules without plastic sleeve with TWIN ferrules with plastic sleeve Push-wire terminals Nominal current Cross section Stripping length Rigid Flexible without ferrules with ferrules with/without plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve	0.50.6 Nm (57 lb-in) AWG 2412 8 mm 0.22.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm²
Display range Measurement and relative uncertainty Mode CCS (dc) Permissible system leakage capacitance C Measuring and display range R_F Measurement uncertainty R_F / relative uncertainty $R_{\rm an}$ Measuring and display range $C_{\rm e}$ Measurement uncertainty $C_{\rm e}$: $R_F < 10~{\rm k}\Omega$ $R_F \ge 10~{\rm k}\Omega$ Response time $t_{\rm an}$: $R_{\rm an} = 2.0~{\rm x}~R_F$ and $C_{\rm e} = 1~{\rm \mu}F$ acc. to IEC 61557-8 $R_{\rm an} = 2.0~{\rm x}~R_F$ and $R_F \le 100~{\rm k}\Omega$ Mode CHAdeMO (CHd) System voltage $U_{\rm n}$ Permissible system leakage capacitance $C_{\rm e}$ Measuring and display range $R_F \& R_{\rm FU}$ Measurement uncertainty $R_{\rm F}$ / relative uncertainty $R_{\rm an}$ Measuring and display range $C_{\rm e}$	0500 V (measurement True-RMS) $\pm 5 \%, > \pm 5 \text{ V}$ $\leq 5 \text{ µF}$ $1 \text{ k}\Omega2 \text{ M}\Omega$ $\pm 15 \%, \pm 2 \text{ k}\Omega$ 017 µF no measurement $\pm 15 \%, \pm 0.1 \text{ µF}$ $\leq 10 \text{ s}$ $\leq 10 \text{ s}$ $\leq 10 \text{ s}$ $\leq 10 \text{ s}$ $= 10 $	Nominal current Tightening torque Conductor sizes Stripping length Rigid/flexible Flexible with ferrules with/without plastic sleeve Multiple conductor rigid/flexible with ferrules without plastic sleeve with TWIN ferrules with plastic sleeve Push-wire terminals Nominal current Cross section Stripping length Rigid Flexible without ferrules with ferrules with/without plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve Opening force	0.50.6 Nm (57 lb-in) AWG 2412 8 mm 0.22.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm²
Display range Measurement and relative uncertainty Mode CCS (dc) Permissible system leakage capacitance C Measuring and display range R_F Measurement uncertainty R_F / relative uncertainty $R_{\rm an}$ Measuring and display range C Measurement uncertainty C Response time C to C Measurement uncertainty C Response time C And C Response time C	0500 V (measurement True-RMS) $\pm 5 \%, > \pm 5 \text{ V}$ $\leq 5 \text{ µF}$ $1 \text{ k}\Omega \dots 2 \text{ M}\Omega$ $\pm 15 \%, \pm 2 \text{ k}\Omega$ 017 µF no measurement $\pm 15 \%, \pm 0.1 \text{ µF}$ $\leq 10 \text{ s}$	Nominal current Tightening torque Conductor sizes Stripping length Rigid/flexible Flexible with ferrules with/without plastic sleeve Multiple conductor rigid/flexible with ferrules without plastic sleeve with TWIN ferrules with plastic sleeve Push-wire terminals Nominal current Cross section Stripping length Rigid Flexible without ferrules with ferrules with/without plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve Test opening	0.50.6 Nm (57 lb-in) AWG 2412 8 mm 0.22.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm²
Display range Measurement and relative uncertainty Mode CCS (dc) Permissible system leakage capacitance C Measuring and display range R_F Measurement uncertainty R_F / relative uncertainty $R_{\rm an}$ Measuring and display range C Measurement uncertainty $C_{\rm c}$: $C_{\rm c}$ Measurement uncertainty $C_{\rm c}$: $C_{\rm c}$ Measurement uncertainty $C_{\rm c}$: $C_{\rm c}$ Measurement $C_{\rm c}$ Mode CHAdeMO (CHd) System voltage $C_{\rm c}$ Measuring and display range $C_{\rm c}$ Measuring and display range $C_{\rm c}$ Measurement uncertainty $C_{\rm c}$: $C_{\rm c}$ Measurement uncertainty $C_{\rm c}$: $C_{\rm c}$ Measurement uncertainty $C_{\rm c}$: $C_{\rm c}$	0500 V (measurement True-RMS) ± 5 %, $> \pm 5$ V $= 5$ V $= 5$ μF $= 1$ kΩ2 MΩ $= 15$ %, ± 2 kΩ $= 10$ s $= 1$	Nominal current Tightening torque Conductor sizes Stripping length Rigid/flexible Flexible with ferrules with/without plastic sleeve Multiple conductor rigid/flexible with ferrules without plastic sleeve with TWIN ferrules with plastic sleeve Push-wire terminals Nominal current Cross section Stripping length Rigid Flexible without ferrules with ferrules with/without plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve Test opening Other	0.50.6 Nm (57 lb-in) AWG 2412 8 mm 0.22.5 mm² 0.251.5 mm² 0.752.5 mm² 0.752.5 mm² 0.752.5 mm² 0.752.5 mm²
Display range Measurement and relative uncertainty Mode CCS (dc) Permissible system leakage capacitance C Measuring and display range R_F Measurement uncertainty R_F / relative uncertainty $R_{\rm an}$ Measuring and display range C Measurement uncertainty C Response time C Land C Response time C Land C Response time C Land C Mode CHAdeMO (CHd) System voltage C Land	0500 V (measurement True-RMS) $\pm 5 \%, > \pm 5 \text{ V}$ $\leq 5 \text{ µF}$ $1 \text{ k}\Omega \dots 2 \text{ M}\Omega$ $\pm 15 \%, \pm 2 \text{ k}\Omega$ 017 µF no measurement $\pm 15 \%, \pm 0.1 \text{ µF}$ $\leq 10 \text{ s}$	Nominal current Tightening torque Conductor sizes Stripping length Rigid/flexible Flexible with ferrules with/without plastic sleeve Multiple conductor rigid/flexible with ferrules without plastic sleeve with TWIN ferrules with plastic sleeve Push-wire terminals Nominal current Cross section Stripping length Rigid Flexible without ferrules with ferrules with/without plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve Test opening Other Operating mode	0.50.6 Nm (57 lb-in) AWG 2412 8 mm 0.22.5 mm² 0.251.5 mm² 0.10 mm 0.22.5 mm² 0.752.5 mm² 0.752.5 mm² 0.751.5 mm² 0.751.5 mm² 0.751.5 mm² 0.751.5 mm² 0.751.5 mm²
Display range Measurement and relative uncertainty Mode CCS (dc) Permissible system leakage capacitance C Measuring and display range R_F Measurement uncertainty R_F / relative uncertainty $R_{\rm an}$ Measuring and display range $C_{\rm e}$ Measurement uncertainty $C_{\rm e}$: $C_{\rm e}$ Measurement $C_{\rm e}$ Measurement $C_{\rm e}$ Measurement $C_{\rm e}$ Measurement $C_{\rm e}$ Mode CHAdeMO (CHd) System voltage $C_{\rm e}$ Measuring and display range $C_{\rm e}$ Measuring and display range $C_{\rm e}$ Measurement uncertainty $C_{\rm e}$:	0500 V (measurement True-RMS) ± 5 %, $> \pm 5$ V $= 5$ V $= 5$ μF $= 1$ kΩ2 MΩ $= 15$ %, ± 2 kΩ $= 10$ s $= 1$	Nominal current Tightening torque Conductor sizes Stripping length Rigid/flexible Flexible with ferrules with/without plastic sleeve Multiple conductor rigid/flexible with ferrules without plastic sleeve with TWIN ferrules with plastic sleeve Push-wire terminals Nominal current Cross section Stripping length Rigid Flexible without ferrules with ferrules with/without plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve Opening force Test opening Other Operating mode Mounting	0.50.6 Nm (57 lb-in) AWG 2412 8 mm 0.22.5 mm² 0.251.5 mm² 0.21.15 mm² ≤ 10 A AWG 2414 10 mm 0.22.5 mm² 0.752.5 mm² 0.752.5 mm² 0.752.1 mm² continuous operation cooling slots must be ventilated vertically
Display range Measurement and relative uncertainty Mode CCS (dc) Permissible system leakage capacitance C Measuring and display range R_F Measurement uncertainty R_F / relative uncertainty R_{an} Measuring and display range C_{e} Measurement uncertainty C_{e} : $R_F < 10 \text{ k}\Omega$ $R_F \ge 10 \text{ k}\Omega$ Response time t_{an} : $R_{an} = 2.0 \text{ x } R_F \text{ and } C_e = 1 \mu \text{F acc. to IEC 61557-8}$ $R_{an} = 2.0 \text{ x } R_F \text{ and } R_F \le 100 \text{ k}\Omega$ Mode CHAdeMO (CHd) System voltage U_n Permissible system leakage capacitance C_e Measuring and display range $R_F \& R_{FU}$ Measurement uncertainty R_F / relative uncertainty R_{an} Measuring and display range C_e Measurement uncertainty C_e : C_e Measurement uncertainty C_e Measurement C_e Measurement uncertainty C_e : C_e Measurement C_e Measur	0500 V (measurement True-RMS) ±5 %, > ± 5 V $ ≤ 5 μF 1 kΩ2 MΩ ±15 %, ±2 kΩ 017 μF $ no measurement ±15 %, ±0.1 μF $ ≤ 10 s ≤ 10 s $ measurement from $U_n ≥ DC 50 V$ per conductor ≤ 1.6 μF $ 1 kΩ2 MΩ ±15 %, ±2 kΩ 017 μF $ no measurement ±15 %, ±0.1 μF	Nominal current Tightening torque Conductor sizes Stripping length Rigid/flexible Flexible with ferrules with/without plastic sleeve Multiple conductor rigid/flexible with ferrules without plastic sleeve with TWIN ferrules with plastic sleeve Push-wire terminals Nominal current Cross section Stripping length Rigid Flexible with out ferrules with ferrules with/without plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve Test opening Other Operating mode Mounting Degree of protection, built-in components (DIN EN 60529)	0.50.6 Nm (57 lb-in) AWG 2412 8 mm 0.22.5 mm² 0.252.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² ≤ 10 A AWG 2414 10 mm 0.22.5 mm² 0.752.5 mm²
Display range Measurement and relative uncertainty Mode CCS (dc) Permissible system leakage capacitance C Measuring and display range R_F Measurement uncertainty R_F / relative uncertainty R_{an} Measuring and display range C_F Measurement uncertainty C_F : $C_F = 10 \text{ k}\Omega$ Response time $C_F = 10 \text{ k}\Omega$ Response time $C_F = 10 \text{ k}\Omega$ Response time $C_F = 10 \text{ k}\Omega$ Mode CHAdeMO (CHd) System voltage $C_F = 10 \text{ k}\Omega$ System voltage $C_F = 10 \text{ k}\Omega$ Measurement uncertainty $C_F = 10 \text{ k}\Omega$ Response time $C_F = 10 \text{ k}\Omega$ R	0500 V (measurement True-RMS) $\pm 5 \%, > \pm 5 V$ $\leq 5 \mu\text{F}$ $1 k\Omega \dots 2 M\Omega$ $\pm 15 \%, \pm 2 k\Omega$ $017 \mu\text{F}$ no measurement $\pm 15 \%, \pm 0.1 \mu\text{F}$ $\leq 10 \text{s}$ $\leq 10 \text{s}$ $\leq 10 \text{s}$ measurement from $U_n \geq DC 50 V$ per conductor $\leq 1.6 \mu\text{F}$ $1 k\Omega \dots 2 M\Omega$ $\pm 15 \%, \pm 2 k\Omega$ $017 \mu\text{F}$ no measurement $\pm 15 \%, \pm 0.1 \mu\text{F}$ $\leq 10 \text{s}$	Nominal current Tightening torque Conductor sizes Stripping length Rigid/flexible Flexible with ferrules with/without plastic sleeve Multiple conductor rigid/flexible with ferrules without plastic sleeve with TWIN ferrules with plastic sleeve With TWIN ferrules with plastic sleeve Fush-wire terminals Nominal current Cross section Stripping length Rigid Flexible without ferrules with ferrules with/without plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve Opening force Test opening Other Operating mode Mounting Degree of protection, built-in components (DIN EN 60529) Degree of protection, terminals (DIN EN 60529)	0.50.6 Nm (57 lb-in) AWG 2412 8 mm 0.22.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² ≤ 10 A AWG 2414 10 mm 0.22.5 mm² 0.752.5 mm² 0.51.5 mm² continuous operation ololing slots must be ventilated vertically IP30 IP20
Display range Measurement and relative uncertainty Mode CCS (dc) Permissible system leakage capacitance C Measuring and display range R_F Measurement uncertainty R_F / relative uncertainty $R_{\rm an}$ Measuring and display range C Measurement uncertainty C Measurement C Measurement C Measurement C Measurement C Measurement uncertainty C Measurement C Measure	0500 V (measurement True-RMS) $\pm 5 \%, > \pm 5 V$ $\leq 5 \mu F$ $1 k\Omega \dots 2 M\Omega$ $\pm 15 \%, \pm 2 k\Omega$ $0 \dots 17 \mu F$ no measurement $\pm 15 \%, \pm 0.1 \mu F$ $\leq 10 S$ $\leq 10 S$ $\leq 10 S$ $\leq 10 S$ $= 10 S$	Nominal current Tightening torque Conductor sizes Stripping length Rigid/flexible Flexible with ferrules with/without plastic sleeve Multiple conductor rigid/flexible with ferrules without plastic sleeve with TWIN ferrules with plastic sleeve With TWIN ferrules with plastic sleeve Push-wire terminals Nominal current Cross section Stripping length Rigid Flexible without ferrules with ferrules with/without plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleev Opening force Test opening Other Operating mode Mounting Degree of protection, built-in components (DIN EN 60529) Degree of protection, terminals (DIN EN 60529) Enclosure material	0.50.6 Nm (57 lb-in) AWG 2412 8 mm 0.22.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² ≤ 10 A AWG 2414 10 mm 0.22.5 mm² 0.752.5 mm² 0.752.5 mm² 0.752.5 mm² continuous operation cooling slots must be ventilated vertically IP30 IP20 polycarbonate
Display range Measurement and relative uncertainty Mode CCS (dc) Permissible system leakage capacitance C Measuring and display range R_F Measurement uncertainty R_F / relative uncertainty R_{an} Measuring and display range C_F Measurement uncertainty C_F : $C_F = 10 \text{ k}\Omega$ Response time $C_F = 1 \text{ k} \Omega$ Response time $C_F = 1 \text{ k} \Omega$ Mode CHAdeMO (CHd) System voltage $C_F = 1 \text{ k} \Omega$ Measuring and display range $C_F = 1 \text{ k} \Omega$ Measuring and display range $C_F = 1 \text{ k} \Omega$ Measurement uncertainty $C_F = 1 $	0500 V (measurement True-RMS) $\pm 5 \%, > \pm 5 V$ $\leq 5 \mu\text{F}$ $1 k\Omega \dots 2 M\Omega$ $\pm 15 \%, \pm 2 k\Omega$ $017 \mu\text{F}$ no measurement $\pm 15 \%, \pm 0.1 \mu\text{F}$ $\leq 10 \text{s}$ $\leq 10 \text{s}$ $\leq 10 \text{s}$ $\leq 10 \text{s}$ $= 1 k\Omega \dots 2 M\Omega$ $\pm 15 \%, \pm 2 k\Omega$ $017 \mu\text{F}$ no measurement $\pm 15 \%, \pm 0.1 \mu\text{F}$ $= 1 k\Omega \dots 2 M\Omega$ $\pm 15 \%, \pm 0.1 \mu\text{F}$ $= 10 \text{s}$ $\leq 10 \text{s}$ $\leq 10 \text{s}$ $\leq 10 \text{s}$ $\leq 10 \text{s}$	Nominal current Tightening torque Conductor sizes Stripping length Rigid/flexible Flexible with ferrules with/without plastic sleeve Multiple conductor rigid/flexible with ferrules without plastic sleeve with TWIN ferrules with plastic sleeve With TWIN ferrules with plastic sleeve Fush-wire terminals Nominal current Cross section Stripping length Rigid Flexible without ferrules with ferrules with/without plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve Opening force Test opening Other Operating mode Mounting Degree of protection, built-in components (DIN EN 60529) Degree of protection, terminals (DIN EN 60529)	0.50.6 Nm (57 lb-in) AWG 2412 8 mm 0.22.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² ≤ 10 A AWG 2414 10 mm 0.22.5 mm² 0.752.5 mm² 0.752.5 mm² 0.752.5 mm² continuous operation cooling slots must be ventilated vertically IP30 IP30
Display range Measurement and relative uncertainty Mode CCS (dc) Permissible system leakage capacitance C Measuring and display range R_F Measurement uncertainty R_F / relative uncertainty R_{an} Measuring and display range C_F Measurement uncertainty C_F : $C_F = 10 \text{ k}\Omega$ Response time $C_F = 1 \text{ k}\Gamma$ $C_F = 10 \text{ k}\Gamma$ Mode CHAdeMO (CHd) System voltage $C_F = 1 \text{ k}\Gamma$ Measuring and display range $C_F = 1 \text{ k}\Gamma$ Measuring and display range $C_F = 1 \text{ k}\Gamma$ Measurement uncertainty $C_F = 1 \text{ k}\Gamma$ Meas	0500 V (measurement True-RMS) $\pm 5 \%, > \pm 5 \text{ V}$ $\leq 5 \text{ µF}$ $1 \text{ k}\Omega2 \text{ M}\Omega$ $\pm 15 \%, \pm 2 \text{ k}\Omega$ 017 µF no measurement $\pm 15 \%, \pm 0.1 \text{ µF}$ $\leq 10 \text{ s}$ $\leq 10 \text{ s}$ $\leq 10 \text{ s}$ $\leq 10 \text{ s}$ $= 1 \text{ k}\Omega2 \text{ M}\Omega$ $\pm 15 \%, \pm 2 \text{ k}\Omega$ 017 µF no measurement $\pm 15 \%, \pm 0.1 \text{ µF}$ $= 1 \text{ momeasurement}$ $\pm 15 \%, \pm 0.1 \text{ µF}$ $= 10 \text{ s}$ $\leq 10 \text{ s}$ $\leq 10 \text{ s}$ $\leq 10 \text{ s}$ $\leq 10 \text{ s}$	Nominal current Tightening torque Conductor sizes Stripping length Rigid/flexible Flexible with ferrules with/without plastic sleeve Multiple conductor rigid/flexible with ferrules without plastic sleeve with TWIN ferrules with plastic sleeve With TWIN ferrules with plastic sleeve Push-wire terminals Nominal current Cross section Stripping length Rigid Flexible without ferrules with ferrules with/without plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleev Opening force Test opening Other Operating mode Mounting Degree of protection, built-in components (DIN EN 60529) Degree of protection, terminals (DIN EN 60529) Enclosure material DIN rail mounting acc. to	0.50.6 Nm (57 lb-in) AWG 2412 8 mm 0.22.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 2 ≤ 10 A AWG 2414 10 mm 0.22.5 mm² 0.752.5 mm² 0.752.5 mm² 0.752.5 mm² ce 0.51.5 mm² re 0.51.5 mm² 10.20.2.1 mm 20.20.20 mm²
Display range Measurement and relative uncertainty Mode CCS (dc) Permissible system leakage capacitance C Measuring and display range R_F Measurement uncertainty R_F / relative uncertainty R_{an} Measuring and display range C_{e} Measurement uncertainty C_{e} : $R_F < 10 \text{ k}\Omega$ $R_F \ge 10 \text{ k}\Omega$ Response time t_{an} : $R_{an} = 2.0 \text{ x} R_F$ and $C_e = 1 \text{ \mu}F$ acc. to IEC 61557-8 $R_{an} = 2.0 \text{ x} R_F$ and $R_F \le 100 \text{ k}\Omega$ Mode CHAdeMO (CHd) System voltage U_n Permissible system leakage capacitance C_e Measuring and display range $R_F \& R_{FU}$ Measurement uncertainty R_F / relative uncertainty R_{an} Measurement uncertainty C_e : $R_F < 10 \text{ k}\Omega$ $R_F \ge 10 \text{ k}\Omega$ Response time t_{an} : $R_{an} = 2.0 \text{ x} R_{FU}$ and $R_{FU} \le 100 \text{ k}\Omega$ $R_{an} = 2.0 \text{ x} R_{FU}$ and $R_{an} = 2.0 \text{ x} R_{FU}$ Displays, memory Password Fault memory alarm messages	0500 V (measurement True-RMS) $\pm 5 \%, > \pm 5 V$ $\leq 5 \mu\text{F}$ $1 k\Omega \dots 2 M\Omega$ $\pm 15 \%, \pm 2 k\Omega$ $017 \mu\text{F}$ no measurement $\pm 15 \%, \pm 0.1 \mu\text{F}$ $\leq 10 \text{s}$ $\leq 10 \text{s}$ $\leq 10 \text{s}$ $\leq 10 \text{s}$ $= 1 k\Omega \dots 2 M\Omega$ $\pm 15 \%, \pm 2 k\Omega$ $017 \mu\text{F}$ no measurement $\pm 15 \%, \pm 0.1 \mu\text{F}$ $= 1 k\Omega \dots 2 M\Omega$ $\pm 15 \%, \pm 0.1 \mu\text{F}$ $= 10 \text{s}$ $\leq 10 \text{s}$ $\leq 10 \text{s}$ $\leq 10 \text{s}$ $\leq 10 \text{s}$	Nominal current Tightening torque Conductor sizes Stripping length Rigid/flexible Flexible with ferrules with/without plastic sleeve Multiple conductor rigid/flexible with ferrules without plastic sleeve with TWIN ferrules with plastic sleeve With TWIN ferrules with plastic sleeve Push-wire terminals Nominal current Cross section Stripping length Rigid Flexible without ferrules with ferrules with/without plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve Opening force Test opening Other Operating mode Mounting Degree of protection, built-in components (DIN EN 60529) Enclosure material DIN rail mounting acc. to Screw mounting	0.50.6 Nm (57 lb-in) AWG 2412 8 mm 0.22.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 2 10 A AWG 2414 10 mm 0.22.5 mm² 0.752.5 mm²
Display range Measurement and relative uncertainty Mode CCS (dc) Permissible system leakage capacitance C Measuring and display range R_F Measurement uncertainty R_F / relative uncertainty R_{an} Measuring and display range C_{e} Measurement uncertainty C_{e} : $R_F < 10 \text{ k}\Omega$ Response time t_{an} : $R_{an} = 2.0 \text{ x}$ R_F and $C_e = 1 \text{ \mu}F$ acc. to IEC 61557-8 $R_{an} = 2.0 \text{ x}$ R_F and $R_F \le 100 \text{ k}\Omega$ Mode CHAdeMO (CHd) System voltage U_n Permissible system leakage capacitance C_e Measuring and display range $R_F \& R_{FU}$ Measurement uncertainty R_F / relative uncertainty R_{an} Measurement uncertainty C_e : $R_F < 10 \text{ k}\Omega$ $R_F \ge 10 \text{ k}\Omega$ Response time t_{an} : $R_{an} = 2.0 \text{ x}$ R_{FU} and $R_{FU} \le 100 \text{ k}\Omega$ $R_{an} = 2.0 \text{ x}$ R_{FU} and $R_{A} = 2.0 \text{ x}$	$0500 \text{ V (measurement True-RMS)} \\ \pm 5 \%, > \pm 5 \text{ V} \\ \\ \leq 5 \text{ µF} \\ 1 \text{ k}\Omega2 \text{ M}\Omega \\ \pm 15 \%, \pm 2 \text{ k}\Omega \\ 017 \text{ µF} \\ \\ \text{no measurement} \\ \pm 15 \%, \pm 0.1 \text{ µF} \\ \\ \leq 10 \text{ s} \\ \leq 10 \text{ s} \\ \\ \leq 10 \text{ s} \\ \\ \leq 10 \text{ s} \\ \\ \\ \text{measurement from } U_n \geq \text{DC 50 V} \\ \\ \text{per conductor} \leq 1.6 \text{ µF} \\ 1 \text{ k}\Omega2 \text{ M}\Omega \\ \\ \pm 15 \%, \pm 2 \text{ k}\Omega \\ 017 \text{ µF} \\ \\ \text{no measurement} \\ \\ \pm 15 \%, \pm 0.1 \text{ µF} \\ \\ \leq 10 \text{ s} \\ \\ \leq 10 \text{ s} \\ \\ \\ \leq 10 \text{ s} \\ \\ \\ \text{on}/(\text{off})^* \\ \\ \text{LC display, multifunctional, not illuminated} \\ \\$	Nominal current Tightening torque Conductor sizes Stripping length Rigid/flexible Flexible with ferrules with/without plastic sleeve Multiple conductor rigid/flexible with ferrules without plastic sleeve with TWIN ferrules with plastic sleeve With TWIN ferrules with plastic sleeve Push-wire terminals Nominal current Cross section Stripping length Rigid Flexible without ferrules with ferrules with/without plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve Opening force Test opening Other Operating mode Mounting Octher Operating mode Mounting Degree of protection, built-in components (DIN EN 60529) Degree of protection, terminals (DIN EN 60529) Enclosure material DIN rail mounting Documentation number Weight	0.50.6 Nm (57 lb-in) AWG 2412 8 mm 0.22.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 2 10 A AWG 2414 10 mm 0.22.5 mm² 0.752.5 mm²
Display range Measurement and relative uncertainty Mode CCS (dc) Permissible system leakage capacitance C Measuring and display range R_F Measurement uncertainty R_F / relative uncertainty $R_{\rm an}$ Measuring and display range $C_{\rm e}$ Measurement uncertainty $C_{\rm e}$: $R_F < 10 \text{ k}\Omega$ $R_F \ge 10 \text{ k}\Omega$ Response time $t_{\rm an}$: $R_{\rm an} = 2.0 \text{ x } R_F \text{ and } C_{\rm e} = 1 \text{ µF acc. to IEC 61557-8}$ $R_{\rm an} = 2.0 \text{ x } R_F \text{ and } R_F \le 100 \text{ k}\Omega$ Mode CHAdeMO (CHd) System voltage $U_{\rm n}$ Permissible system leakage capacitance $C_{\rm e}$ Measuring and display range $R_F \& R_{\rm FU}$ Measurement uncertainty R_F / relative uncertainty $R_{\rm an}$ Measuring and display range $C_{\rm e}$ Measurement uncertainty $C_{\rm e}$: $R_F < 10 \text{ k}\Omega$ $R_F \ge 10 \text{ k}\Omega$ Response time $t_{\rm an}$: $R_{\rm an} = 2.0 \text{ x } R_{\rm FU}$ and $R_{\rm FU} \le 100 \text{ k}\Omega$ $R_{\rm an} = 2.0 \text{ x } R_{\rm FU}$ Displays, memory Password Fault memory alarm messages Display Time response Start-up delay t	0500 V (measurement True-RMS) $\pm 5 \%, > \pm 5 V$ $\leq 5 \mu F$ $1 k\Omega \dots 2 M\Omega$ $\pm 15 \%, \pm 2 k\Omega$ $017 \mu F$ no measurement $\pm 15 \%, \pm 0.1 \mu F$ $\leq 10 \leq 10 \leq 10 $	Nominal current Tightening torque Conductor sizes Stripping length Rigid/flexible Flexible with ferrules with/without plastic sleeve Multiple conductor rigid/flexible with ferrules without plastic sleeve with TWIN ferrules with plastic sleeve Push-wire terminals Nominal current Cross section Stripping length Rigid Flexible without ferrules with ferrules with/without plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve Opening force Test opening Other Operating mode Mounting Degree of protection, built-in components (DIN EN 60529) Enclosure material DIN rail mounting acc. to Screw mounting Documentation number	0.50.6 Nm (57 lb-in) AWG 2412 8 mm 0.22.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 2 10 A AWG 2414 10 mm 0.22.5 mm² 0.752.5 mm²
Display range Measurement and relative uncertainty Mode CCS (dc) Permissible system leakage capacitance C Measuring and display range R_F Measurement uncertainty R_F / relative uncertainty R_{an} Measuring and display range C_{e} Measurement uncertainty C_{e} : $R_F < 10 \text{ k}\Omega$ Response time t_{an} : $R_{an} = 2.0 \text{ x}$ R_F and $C_e = 1 \text{ \mu}F$ acc. to IEC 61557-8 $R_{an} = 2.0 \text{ x}$ R_F and $R_F \le 100 \text{ k}\Omega$ Mode CHAdeMO (CHd) System voltage U_n Permissible system leakage capacitance C_e Measuring and display range $R_F \& R_{FU}$ Measurement uncertainty R_F / relative uncertainty R_{an} Measurement uncertainty C_e : $R_F < 10 \text{ k}\Omega$ $R_F \ge 10 \text{ k}\Omega$ Response time t_{an} : $R_{an} = 2.0 \text{ x}$ R_{FU} and $R_{FU} \le 100 \text{ k}\Omega$ $R_{an} = 2.0 \text{ x}$ R_{FU} and $R_{A} = 2.0 \text{ x}$	$0500 \text{ V (measurement True-RMS)} \\ \pm 5 \%, > \pm 5 \text{ V} \\ \\ \leq 5 \text{ µF} \\ 1 \text{ k}\Omega2 \text{ M}\Omega \\ \pm 15 \%, \pm 2 \text{ k}\Omega \\ 017 \text{ µF} \\ \\ \text{no measurement} \\ \pm 15 \%, \pm 0.1 \text{ µF} \\ \\ \leq 10 \text{ s} \\ \leq 10 \text{ s} \\ \\ \leq 10 \text{ s} \\ \\ \leq 10 \text{ s} \\ \\ \\ \text{measurement from } U_n \geq \text{DC 50 V} \\ \\ \text{per conductor} \leq 1.6 \text{ µF} \\ 1 \text{ k}\Omega2 \text{ M}\Omega \\ \\ \pm 15 \%, \pm 2 \text{ k}\Omega \\ 017 \text{ µF} \\ \\ \text{no measurement} \\ \\ \pm 15 \%, \pm 0.1 \text{ µF} \\ \\ \leq 10 \text{ s} \\ \\ \leq 10 \text{ s} \\ \\ \\ \leq 10 \text{ s} \\ \\ \\ \text{on}/(\text{off})^* \\ \\ \text{LC display, multifunctional, not illuminated} \\ \\$	Nominal current Tightening torque Conductor sizes Stripping length Rigid/flexible Flexible with ferrules with/without plastic sleeve Multiple conductor rigid/flexible with ferrules without plastic sleeve with TWIN ferrules with plastic sleeve With TWIN ferrules with plastic sleeve Push-wire terminals Nominal current Cross section Stripping length Rigid Flexible without ferrules with ferrules with/without plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve Multi-conductor flexible with TWIN ferrules with plastic sleeve Opening force Test opening Other Operating mode Mounting Octher Operating mode Mounting Degree of protection, built-in components (DIN EN 60529) Degree of protection, terminals (DIN EN 60529) Enclosure material DIN rail mounting Documentation number Weight	0.50.6 Nm (57 lb-in) AWG 2412 8 mm 0.22.5 mm² 0.251.5 mm² 0.251.5 mm² 0.251.5 mm² 2 10 A AWG 2414 10 mm 0.22.5 mm² 0.752.5 mm²



Wiring diagram



- **11** A1, A2 Connection to the supply voltage U_s via fuse (line protection):
- If supplied from an IT system, protect both lines by a fuse.*

 E, KE

 Connect each terminal separately to PE:

 Use same wire cross section as for ,A1', ,A2'.
- L+, L- Connection to the system to be monitored Indication in display: ,L1' for L+; ,L2' for L
- T/R Connection for the external combined test and reset button
- 11, 14 Connection to alarm relay ,K1'

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

Use 60/70 °C copper lines only!

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

ISOMETER® isoCHA425HV with AGH420-1

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





Typical applications

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

Approvals









Device features

- · Monitoring of the insulation resistance RF of DC charging stations according to CHAdeMO standard or Combined Charging System (CCS).
- 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_{FU} $R_{FU} \le 100 \text{ k}\Omega$: Response time $\le 1 \text{ s}$ $100 \text{ k}\Omega < R_{FU} \le 2 \text{ M}\Omega$: Response time $\le 10 \text{ s}$	~	~	
Two-pole insulation faults R_{FS} $R_{FS} \le 160 \text{ k}\Omega$: Response time $\le 10 \text{ s}$ $R_{FS} > 160 \text{ k}\Omega$ (200 k Ω): no detection (Deactivation)	~		

• CCS (Mode dc):

Detection of insulation faults up to 2 $M\Omega$
Maximum system leakage capacitance 20 μF
Response time t_{an} at $C_e \le 5 \mu F$ or $R_F \le 100 \text{ k}\Omega$: $\le 10 \text{ s}$

- Measurement of the system leakage capacitance C_e
- Measurement of the system voltage U_n (True RMS) with undervoltage/overvoltage
- Measurement of the DC residual voltages $U_{\rm L1e}$ (between L1/+ and earth) and $U_{\rm L2e}$ (between L2/- and earth)
- · Selectable start-up delay, response delay and delay on release
- Two separately adjustable response value ranges of 5...600 k Ω (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): 2015-12/Ber1: 2016-12
- IFC 61557-8: 2014/COR1: 2016
- IEC 61851-21-2: 2018-04 Version 1.0
- IEC 61851-23
- UL2231-1/-2

Further information

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



Туре	Nominal system voltage <i>U</i> n	Art. No.	
Турс	Nominal System voltage of	Screw-type terminal Push-wire terminal	
isoCHA425HV-D4-4 + AGH420-1	DC 0 (50*)1 000 V	B91036396	B71036396

^{*} Value for CHAdeMo

Accessories

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

Technical data isoCHA425HV

Insulation coordination acc. to IEC 60664-1/IEC 60664-	3
Definitions:	
Supply circuit (IC2)	A1, A
Output circuit (IC3)	11, 14, 2
Control circuit (IC4)	Up, KE, T/R, A, B, AK1, GND, AK
Rated voltage	240
Overvoltage category	
Rated impulse voltage:	41
IC2/(IC3-4)	4 k
IC3/IC4	4 k
Rated insulation voltage:	250
IC2/(IC3-4)	250
IC3/IC4	250
Pollution degree	
Protective separation (reinforced insulation) between:	
IC2/(IC3-4)	overvoltage category III, 300
IC3/IC4	overvoltage category III, 300
Voltage tests (routine test) acc. to IEC 61010-1:	DC +2.11
IC2/(IC3-4)	DC ±3.1 k
IC3/IC4	AC 2.2 k
Supply voltage	
Supply voltage $U_{\rm S}$	AC 100240 V/DC 24240
Tolerance of U_{S}	-30+15
Frequency range $U_{\rm S}$	4763 H
Power consumption	≤ 3 W, ≤ 9 V
IT system being monitored	
Nominal system voltage <i>U</i> _D with AGH420-1	DC 01000
Tolerance of U_n	DC +10 °
Nominal system voltage range Un with AGH420-1 (UL508)	DC 0600
Response values	
Response value R_{an1}	<i>R</i> _{an2} 600 kΩ (600 kΩ
Response value R _{an2}	5 kΩR _{an1} (120 kΩ
Hysteresis R _{an}	25 %, > 1 k
Undervoltage detection U <	10 V1.09 kV (off
Overvoltage detection <i>U</i> >	11 V1.10 kV (off
Overload detection <i>U</i>	1.20 kV (cannot be deactivated
Hysteresis <i>U</i>	5 %, > 5
,	5 /0, > 5
System voltage	
Measuring range	DC ±1200
Display range	0 V1.2 kV (measurement True RM
Measurement and relative uncertainty	±5 %, > ±5
Mode CCS (dc)	
Permissible system leakage capacitance C _e	≤ 20
Permissible system leakage capacitance C_{e} (acc. to UL2231-1/	/-2) ≤ 5 μ
Measuring and display range R _F	1 kΩ2 M
Measurement uncertainty $R_{\rm F}$ / relative uncertainty $R_{\rm an}$:	
$C_{\rm e} \leq 5 \mu {\rm F}$	$\pm 15 \%, \pm 2 \text{ k}$
$C_{\rm e} > 5 \mu {\rm F}$ and $R_{\rm F} > 100 {\rm k}\Omega$	$\pm (5 \% * R_{an}/100 k\Omega + 10\%$
Measuring and display range $C_{ m e}$	035 μ
Measurement uncertainty C_e :	
$R_{\rm F} < 10~{\rm k}\Omega$	no measureme
$R_{\rm F} \ge 10 \; {\rm k}\Omega$	±15 %, ±0.1 µ
Response time t _{an} :	
nesponse unie tan.	
$R_{an} = 2.0 \times R_F$ and $C_e = 1 \mu F$ acc. to IEC 61557-8 $R_{an} = 2.0 \times R_F$ and $C_e \le 5 \mu F$ or $R_F \le 100 \text{ k}\Omega$	≤ 10 ≤ 10

System voltage $U_{\rm h}$ Permissible system leakage capacitance $C_{\rm e}$ One-pole fault $R_{\rm FU}$ Measuring and display range $R_{\rm FU}$ Measurement uncertainty $R_{\rm FU}$ / relative uncertainty $R_{\rm a}$ $U_{\rm h} \geq 100$ V and $R_{\rm FU} \leq 200$ k Ω $U_{\rm h} > 200$ V	measurement only from $U_{\rm n} \ge {\rm DC}50^{ {\rm t}}$ per conductor $\le 1.6 \mu$ 1 k $\Omega \dots 2$ M $_{\rm n}$
One-pole fault R_{FU} Measuring and display range R_{FU} Measurement uncertainty R_{FU} / relative uncertainty R_a $U_n \geq 100 \text{ V}$ and $R_{FU} \leq 200 \text{ k}\Omega$ $U_n > 200 \text{ V}$	1 kΩ2 M
Measuring and display range R_{FU} Measurement uncertainty R_{FU} / relative uncertainty R_a $U_n \geq 100$ V and $R_{FU} \leq 200$ k Ω $U_n > 200$ V	
Measurement uncertainty R_{FU} / relative uncertainty R_a $U_n \ge 100$ V and $R_{FU} \le 200$ kΩ $U_n > 200$ V	
$U_{\rm n} \ge 100 \text{ V}$ and $R_{\rm FU} \le 200 \text{ k}\Omega$ $U_{\rm n} > 200 \text{ V}$	n:
<i>U</i> _n > 200 V	
	±15 %, ±2 ki ±15 %, ±2 ki
	±13 /0, ±2 kg
Two-pole fault RFS (only CHd Mode) Measuring and display range <i>R</i> _{FS}	1 kΩ160 kΩ
Measurement uncertainty R_{FS} / Relative uncertainty R_{a}	
< 160 kΩ	±15 %, ±2 ks
Measuring and display range Ce	035 μ
Measurement uncertainty C_e :	·
$R_{\rm F} < 10~{\rm k}\Omega$	no measuremen
$R_{\rm F} \ge 10 \text{ k}\Omega$	±15 %, ±0.1 μ
Response time t _{an} :	
$R_{\text{an}} = 1.2 \text{ x } R_{\text{FU}} \text{ and } R_{\text{FU}} \le 100 \text{ k}\Omega \text{ and } U_{\text{n}} > 100 \text{ m}$	
$R_{\rm an} = 1.2 \mathrm{x}R_{\rm F}$	≤ 10
Displays, memory	
Password	off/0999 (off/0)
Fault memory alarm messages	on/(off)
Display	LC display, multifunctional, not illuminated
Time response	
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)
·	
Interface	DC 405 /DMC M III DTII : D 4
Interface/protocol Baud rate BMS (9.6 kbit/s), N	RS-485/BMS, Modbus RTU, isoData
Cable length (9.6 kBits/s)	odbus RTU (selectable), isoData (115.2 kbits/s \leq 1 200 n
Cable: twisted pairs	min. J-Y(St)Y 2 x 0.
Terminating resistor	120 Ω (0.25 W), internal, can be connected
Device address, BMS bus, Modbus RTU	390 (3)
	20002 (2)
Switching elements	
Switching elements	2 x 1 N/O contact, common terminal 1
Operating principle	N/C operation, N/O operation (N/C operation)
Electrical endurance under rated operating conditions,	number of cycles 1000
Contact data acc. to IEC 60947-5-1:	AC 12 / AC 14 / DC 12 / DC 12 / DC 12
Utilisation category	AC-12 / AC-14 / DC-12 / DC-12 / DC-1.
Rated operational voltage Rated operational current	230 V / 230 V / 24 V / 110 V / 220 V
Minimum contact load	5 A / 2 A / 1 A / 0,2 A / 0,1 / 1 mA at DC ≥ 5 \
	T HIM OLD C 2 J
Contact data acc. to UL508	AC 250.1
Rated operational voltage Rated operational current	AC 250 V
nateu operational current	21
Environment/EMC	
EMC	IEC 61326-2-4, IEC 61851-21-2:2018-04 Ed. 1.
Ambient temperatures:	
Operation	-40+70 °C 1
Transport Storage	-40+85 °(-40+70 °(

Technical data isoCHA425HV

Classification of climatic conditions acc. to IEC 60721 (related to temperature and relative humidity):	
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12

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 mounting	2 x M4 with mounting clip
Weight	≤ 150 g

Technical data AGH420-1

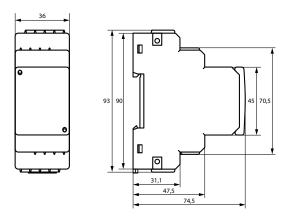
Definitions:	
Measuring circuit (IC1)	L1/+, L2/-
Control circuit (IC2)	AK1, GND, AK2, Up, E
Rated voltage	1000 \
Overvoltage category	!!
Rated impulse voltage:	
IC1/IC2	8 k\
Rated insulation voltage:	
IC1/IC2	1 000 \
Pollution degree	3
Protective separation (protective impedance) between:	
IC1/IC2	overvoltage category III, 1000 \
IT system being monitored	
Nominal system voltage range U_n	DC 01 000 \
Tolerance of U _n	DC +10 %
Nominal system voltage range <i>U</i> _n (UL508)	DC 0600 \
Measuring circuit	
Measuring voltage $U_{\rm m}$	±45\
Measuring current $I_{\rm m}$ at $R_{\rm F}$	≤ 400 µA
Internal DC resistance Ri	> 120 kC

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	l
(related to temperature and relative humidity):	
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions acc. to IEC 60	721:
Stationary use (IEC 60721-3-3)	3M1°
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 n
Cross section	≥ 0.75 mm
Other	
Operating mode	continuous operatior
Mounting	cooling slots must be ventilated vertically
Distance to adjacent devices from $U_{\rm n} > 800 \text{ V}$	≥ 30 mm
Degree of protection, built-in components (DIN EN 60529)	IP30
Degree of protection, terminals (DIN EN 60529)	IP20
Enclosure material	polycarbonate
DIN rail mounting acc. to	IEC 60715
Screw mounting	2 x M4 with mounting clip
Weight	≤ 150 g

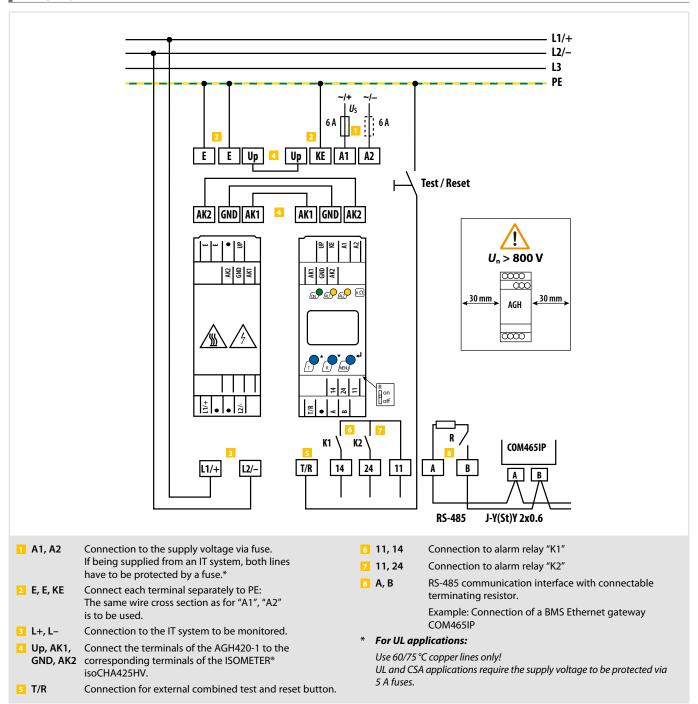
Connection (for isoCHA425HV and AGH420-1)

Connection type	Screw or push-wire terminal	
Screw terminals:		
Nominal current	≤ 10 A	
Tightening torque	0,50,6 Nm (57 lb-in)	
Conductor sizes.	AWG 24-12	
Stripping length	8 mm	
Rigid / flexible	0.22.5 mm ²	
Flexible with ferrules with/without plastic sleeve	0.252.5 mm ²	
Multiple conductor rigid.	0.21.5 mm ²	
Multiple conductor flexible	0.21.5 mm ²	
Multiple conductor with ferrules without plastic sleeve	0.251.5 mm ²	
Multiple conductor flexible with TWIN ferrules with plastic sleeve	0.251.5 mm ²	

Push-wire terminals:	
Nominal current	≤ 10 A
Cross section	AWG 24-14
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	Ø 2.1 mm



Wiring diagram



Device overview Equipment for insulation fault location ISOSCAN®

			ISOSCAN° EDS440	ISOSCAN® ED5441	ISOSCAN® EDS441-LAB	ISOSCAN® EDS440-LAF	
	Catalogue page		140	140	140	140	
S	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	
lits	Control circuits		-	~	✓	-	
Circuits	Main circuits		✓	-	-	✓	
E	3(N)AC		✓	-	-	✓	
Voltage system	AC		✓	~	✓	✓	
tage	AC/DC		✓	~	~	✓	
No.	DC		✓	✓	~	✓	
Nor	minal voltage <i>U</i> n max		see Locating current injector (e. g. ISOMETER® iso685-D-P)	AC 20276 V, DC 20308 V	AC 20276 V, DC 20308 V	see Locating current injector (e.g. ISOMETER® iso685-D-P)	
System	leakage capacitance (.e μF	acc. to characteristic curve	acc. to characteristic curve	acc. to characteristic curve	acc. to characteristic curve	
	sponse value $R_{ m an}$ k Ω		acc. to characteristic curve	acc. to characteristic curve	acc. to characteristic curve	acc. to characteristic curve	
Installa- tion	DIN rail		~	~	~	✓	
Inst	Screw mounting	ı	~	~	~	~	
Ces	ВВ		EDS440-S	EDS441-S	-		
Interfaces	BS		EDS440-L	EDS441-L	~	✓	
<u>=</u>	BMS		_	-	-		
	Product details (Products on www.bender.de/en)						
	Туре	С. р.		Suitable syste	em components		
Suitable ISOMETER®s with integrated PGH	iso685-D-P	20	<u> </u>	~	<u> </u>		
ISOMI	isoMED427P	78	<u>-</u> ,	~	-		
table th inte	isoPV1685P	92	_	-	-		
Sui	iso1685DP	64	_	=	-	_	
	CTAC	342	~	~	-	_	
ent	CTUB100	345		-	~		
Measuring current transformers	WRS(P)	349	<u> </u>	-	-		
surin	CTBS25	354	<u> </u>	_	-		
Mea	WS	356	~	-	-		
	WS8000	356	_	<u> </u>	~	<u>-</u> 	
	CTAF	204	_	-	-	<u> </u>	
	AN410	384	-	-	~	-	
suppl	ANACO		_	_	~	-	
Relay Power supply module unit	AN450 STEP-PS	381	_	-	✓	_	









Suitable system components

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

ISOSCAN® EDS440/441

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





Typical applications

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

Approvals







Device features

- · Universal system concept
- Modular design, therefore easily adjustable to the given circumstances
- · Measuring current transformers available in various sizes and versions
- · CT connection monitoring
- 12 measuring channels for measuring current transformer series CTAC..., 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

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.



Type Response value	Response value	nse value Supply voltage Us 1) LED display	I FD display	Option "W"	Art. No.
1,700	nesponse value		-40+70°C, 3K23, 3M12	ALC: NO.	
EDS440-S-1		DC 24V	-	-	B91080201
EDS440W-S-1	2 10 4	DC 24 V AC/DC 24240 V		~	B91080201W
EDS440-L-4	210 mA		~	-	B91080202
EDS440W-L-4				~	B91080202W
EDS441-S-1		DC 24 V	DC 24 V –	-	B91080204
EDS441W-S-1				~	B91080204W
EDS441-L-4	0.2 14		~	-	B91080205
EDS441W-L-4	0,21 mA	AC/DC 24 240V		~	B91080205W
EDS441-LAB-4		AC/DC 24240 V		-	B91080207
EDS441W-LAB-4				~	B91080207W
EDS440-LAF-4	10 mA	AC/DC 24240 V	~	-	B91080209

¹⁾ Absolute values

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

¹⁾ included in the scope of delivery

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

Description	Design	Type of construction	Туре	Art. No.	Page
DC 40F versester	Bus repeater	-	DI-1PSM	B95012044	-
RS-485 repeater	Supplied by the USB port	-	DI-2USB	B95012045	391
Relay module	12-fold relay module (input/output mudule)	-	I0M441(W)-S	B95012057(W)	392
	pulsed DC sensitive	circular	CTAC	B981100	342
			CTUB104-CTBC	B781200	345
Measuring current transformers			WS	B9117	340
		rectangular	WRS(P)	B9117	349
		split-core	WS	B980806	356
		flexible	CTAF	B981100	-

Technical data

Insulation coordination acc. to IEC 60664-1/IEC 60664-3		Measuring circuit
Definitions		Nominal system voltage <i>U</i> _n EDS440 refer to locating current injector (e.g. ISOMETER® iso685-D-P)
Supply circuit (IC1)	A1, A2	Nominal system voltage $U_{\rm D}$ EDS441 AC 230 V, DC 220 V
Output circuit 1 (IC2)	13, 14	Tolerance of $U_{\rm D}$ EDS441 AC ± 15 %, DC ± 40 %
Output circuit 2 (IC3)	23, 24	Measuring current transformers external for EDS440 type CTAC, WR, WS
Control circuit (IC4)	(A1, A2), (13,14)-(23,24)-(X1, X3)	Measuring current transformers external for EDS441type WS/8000
Rated voltage	1000 V	Measuring current transformers external for EDS441-LAB CTBC
Overvoltage category	III	Measuring current transformers external for EDS440-LAF CTAF
Range of use	≤ 2000 m AMSL	Load EDS440 47 Ω
Rated impulse voltage		Load EDS441, EDS440-LAF 1.5 kΩ
IC1/(IC2-4)	4 kV	Rated insulation voltage measuring current transformers 800 V
IC2/(IC3-4)	4 kV	
IC3/(IC4)	4 kV	Connection EDS measuring current transformers
Rated insulation voltage		Single wire $\geq 0.75 \text{ mm}^2$ 01 m
IC1/(IC2-4)	AC 250 V	Single wire, twisted $\geq 0.75 \text{ mm}^2$ 110 m
IC2/(IC3-4)	250 V	Shielded cable $\geq 0.5 \text{ mm}^2$ 1040 m
IC3/IC4	250 V	Recommended cable (shielded, shield connected to PE on one side) J-Y (St) Y min. 2 x 0.8
Pollution degree outside (U_0 < 690 V)	3	
Pollution degree outside ($U_0 > 690 < 1000 \text{ V}$)		Measuring ranges insulation fault location $I_{\Delta L}$
Protective separation (reinforced insulation) between		Rated frequency range DC, 16.71000 Hz
IC1/(IC2-4)	Overvoltage category III, 1000 V	Measuring range insulation fault location ($I_{\Delta L}$) EDS440 1.550 mA
IC1/(IC2-4) IC2/(IC3-4)	Overvoltage category III, 300 V	Measuring range insulation fault location ($I_{\Delta L}$) EDS441 0.155 mA
IC2/(IC3-4) IC3/IC4	Overvoltage category III, 300 V	Maximum permissible residual current refer to "Diagrams" in the manual
Voltage tests (routine test) acc. to IEC 61010-1	overvoltage category III, 300 v	
IC2/(IC3-4)	AC 2.2 kV	Measuring range residual current measurement I∆n
IC2/(IC3-4) IC3/IC4	AC 2.2 kV AC 2.2 kV	Measuring range residual current measurement ($I_{\Delta n}$) EDS440 100mA20 A
ICS/IC4	AC 2.2 KV	Rated frequency range EDS440-x 501000 Hz
Supply voltage		Measuring range residual current measurement ($I_{\Delta n}$) EDS441 100mA2 A
Supply voltage range U _S EDS44L (LAB,LAF)	AC/DC 24240 V	Rated frequency range EDS441-x 5060 Hz
Supply voltage range U_S EDS44S	DC 24 V	LEDs
Tolerance of U _S	-20+15%	ON (operation LED) green
Frequency range of U_S	DC, 50400 Hz ^{(1 (2)}	COM yellow
Tolerance of the frequency range of U_S	-5+15 %	<u>, , , , , , , , , , , , , , , , , , , </u>
Power consumption, typically 50 Hz (400 Hz) EDS44L	≤ 4 W/7 VA (≤ 4 W, 28 VA)	
Power consumption, typically (DC via BB bus) EDS44S	≤ 1 W	IAL ALARM yellow
Tower consumption, typically (be via bb bus) Eb344	21W	IΔn ALARM yellow
Response values		112 channel indication yellow
Response value insulation fault location ($I_{\Delta L}$) EDS440	210 mA	Digital inputs
Response value insulation fault location ($I_{\Delta L}$) EDS441	0.21 mA	Number 2
Relative uncertainty (I _{ΔL}) EDS440	±30 %, min. ±2 mA ⁽³	Operating mode, adjustable active high, active low
Relative uncertainty (I _{ΔL}) EDS441	±30 %, min. ±0.2 mA ⁽³⁾	Function none, test, reset
Response value residual current measurement (IΔn) EDS440	100 mA10 A	Voltage level Low DC -55 V, High DC 1132 V
Response value residual current measurement ($I_{\Delta n}$) EDS441	100 mA1 A	10 to
Relative uncertainty (/Δn) EDS44x (4260 Hz)	±5 %	Digital current output
Relative uncertainty (/Δn) EDS44x (611000 Hz)	-200 %	Number 1
Hysteresis	20 %	Function none, $I_{\Delta L}$ alarm, $I_{\Delta n}$ alarm, device error,
•		current transformer connection fault, common alarm, BS bus malfunction
Time response		Current 0 mA DC inactive, 20 mA DC active
Scanning time for all channels insulation fault location ($I_{\Delta L}$)	profile-dependent, min. 6 s	Tolerance ±10 %
Response time residual current measurement ($I_{\Delta n}$)	≤ 400 ms	Load resistance $R \le 500 \Omega/PR \ge 0.25W$
Response time for measuring current transformer monitoring	max. 18 min	
		Buzzer
		Number 1
		Franchism none / clause desire amon

Function

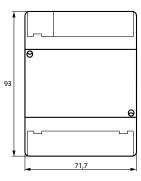
none, $I_{\Delta L}$ alarm, $I_{\Delta n}$ alarm, device error,

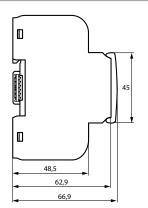
transformer connection fault, insulation fault location active, common alarm

Technical data (continued)

Interfaces	
Interface/protocol	RS-485 BS bus Modbus RTU
Data rate BS bus	9.6 kBaud/s
Data rate Modbus RTU	9.6 19.2 37.4 57.6 115 kBaud/s
Cable length	≤ 1200 m
Cable: twisted pair, one end of shield co	onnected to PE recommended: J-Y (St) Y min. 2 x 0.8
Connection	X1.A, X1.B
Terminating resistor	120 Ω , can be activated internally
Device address, BS bus	0, 279 (optional 0, 2159)
Switching elements	
Number	2 N/O contacts
Operating mode	N/C operation / N/O operation
Function contact 13,14	none, $I_{\Delta L}$ alarm, $I_{\Delta n}$ alarm, device error
	CT connection fault, common alarm, BS bus malfunction
Function contact 23,24	none, $I_{\Delta L}$ alarm, $I_{\Delta n}$ alarm, device error,
	CT connection fault, common alarm, BS bus malfunction
Electrical endurance under rated operat	ting 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
EMC Ambient temperatures	
EMC Ambient temperatures Operating temperature	-25 °C +55 °C
EMC Ambient temperatures Operating temperature Transport	-25 °C +55 °C -40 °C +85 °C
EMC Ambient temperatures Operating temperature Transport	-25 °C +55 °C -40 °C +85 °C
EMC Ambient temperatures Operating temperature Transport Storage Classification of climatic conditions	-25 °C +55 °C -40 °C +85 °C -25 °C+70 °C
EMC Ambient temperatures Operating temperature Transport Storage Classification of climatic conditions Stationary use (IEC 60721-3-3)	-25 °C +55 °C -40 °C +85 °C -25 °C+70 °C s acc. to IEC 60721: 3K23 (no condensation, no formation of ice)
EMC Ambient temperatures Operating temperature Transport Storage Classification of climatic conditions Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2)	-25 °C +55 °C -40 °C +85 °C -25 °C+70 °C s acc. to IEC 60721: 3K23 (no condensation, no formation of ice) 2K11
EMC Ambient temperatures Operating temperature Transport Storage Classification of climatic conditions Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2)	-25 °C +55 °C -40 °C +85 °C -25 °C+70 °C s acc. to IEC 60721: 3K23 (no condensation, no formation of ice) 2K11
EMC Ambient temperatures Operating temperature Transport Storage Classification of climatic conditions Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical condit	-25 °C +55 °C -40 °C +85 °C -25 °C+70 °C s acc. to IEC 60721: 3K23 (no condensation, no formation of ice) 2K11 1K22
EMC Ambient temperatures Operating temperature Transport Storage Classification of climatic conditions Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical condit Stationary use (IEC 60721-3-3)	-25 °C +55 °C -40 °C +85 °C -25 °C+70 °C s acc. to IEC 60721: 3K23 (no condensation, no formation of ice) 2K11 1K22 ions acc. to IEC 60721:
EMC Ambient temperatures Operating temperature Transport Storage Classification of climatic conditions Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical condit Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2)	-25 °C +55 °C -40 °C +85 °C -25 °C+70 °C s acc. to IEC 60721: 3K23 (no condensation, no formation of ice) 2K11 1K22 ions acc. to IEC 60721: 3M11 2M4
EMC Ambient temperatures Operating temperature Transport Storage Classification of climatic conditions Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical condit Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2)	-25 °C +55 °C -40 °C +85 °C -25 °C+70 °C s acc. to IEC 60721: 3K23 (no condensation, no formation of ice) 2K11 1K22 ions acc. to IEC 60721: 3M11 2M4
EMC Ambient temperatures Operating temperature Transport Storage Classification of climatic conditions Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical condit Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection	-25 °C +55 °C -40 °C +85 °C -25 °C+70 °C s acc. to IEC 60721: 3K23 (no condensation, no formation of ice) 2K11 1K22
EMC Ambient temperatures Operating temperature Transport Storage Classification of climatic conditions Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical condit Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection	-25 °C +55 °C -40 °C +85 °C -25 °C +70 °C s acc. to IEC 60721: 3K23 (no condensation, no formation of ice) 2K11 1K22 ions acc. to IEC 60721: 3M11 2M4 1M12
EMC Ambient temperatures Operating temperature Transport Storage Classification of climatic conditions Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical condit Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection Connection type Screw-type terminals:	-25 °C +55 °C -40 °C +85 °C -25 °C +70 °C s acc. to IEC 60721: 3K23 (no condensation, no formation of ice) 2K11 1K22 ions acc. to IEC 60721: 3M11 2M4 1M12
EMC Ambient temperatures Operating temperature Transport Storage Classification of climatic conditions Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical condit Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection Connection type Screw-type terminals: Tightening torque	-25 °C +55 °C +85 °C +85 °C +85 °C +70 °C +85 °C +70 °C +85 °C +70 °C
EMC Ambient temperatures Operating temperature Transport Storage Classification of climatic conditions Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical condit Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type Screw-type terminals: Tightening torque Conductor sizes	-25 °C +55 °C -40 °C +85 °C -25 °C +70 °C s acc. to IEC 60721: 3K23 (no condensation, no formation of ice) 2K11 1K22 ions acc. to IEC 60721: 3M11 2M4 1M12 pluggable screw-type terminal or push-wire termina 0.50.6 Nm (57 lb-in) AWG 24-12
EMC Ambient temperatures Operating temperature Transport Storage Classification of climatic conditions Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical condit Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type Screw-type terminals: Tightening torque Conductor sizes Stripping length	-25 °C +55 °C -40 °C +85 °C -25 °C +70 °C s acc. to IEC 60721: 3K23 (no condensation, no formation of ice) 2K11 1K22 ions acc. to IEC 60721: 3M11 2M4 1M12 pluggable screw-type terminal or push-wire termina 0.50.6 Nm (57 lb-in) AWG 24-12 7 mm
EMC Ambient temperatures Operating temperature Transport Storage Classification of climatic conditions Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical condit Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type Screw-type terminals: Tightening torque Conductor sizes Stripping length rigid/flexible	-25 °C +55 °C -40 °C +85 °C -25 °C +70 °C s acc. to IEC 60721: 3K23 (no condensation, no formation of ice) 2K11 1K22 ions acc. to IEC 60721: 3M11 2M4 1M12 pluggable screw-type terminal or push-wire terminal 0.50.6 Nm (57 lb-in) AWG 24-12 7 mm 0.22.5 mm
EMC Ambient temperatures Operating temperature Transport Storage Classification of climatic conditions Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical condit Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type Screw-type terminals: Tightening torque Conductor sizes Stripping length rigid/flexible flexible with ferrule, with/without plas	-25 °C +55 °C -40 °C +85 °C -25 °C +70 °C s acc. to IEC 60721: 3K23 (no condensation, no formation of ice) 2K11 1K22 ions acc. to IEC 60721: 3M11 2M4 1M12 pluggable screw-type terminal or push-wire terminal 0.50.6 Nm (57 lb-in) AWG 24-12 7 mm 0.22.5 mm tic sleeve 0.252.5 mm
EMC Ambient temperatures Operating temperature Transport Storage Classification of climatic conditions Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical condit Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Connection Connection type Screw-type terminals: Tightening torque Conductor sizes Stripping length rigid/flexible flexible with ferrule, with/without plas Multiple conductor, rigid	-25 °C +55 °C -40 °C +85 °C -25 °C +70 °C s acc. to IEC 60721: 3K23 (no condensation, no formation of ice) 2K11 1K22 ions acc. to IEC 60721: 3M11 2M4 1M12 pluggable screw-type terminal or push-wire terminal 0.50.6 Nm (57 lb-in) AWG 24-12 7 mm 0.22.5 mm² tic sleeve 0.2525 mm² 0.21 mm²
EMC Ambient temperatures Operating temperature Transport Storage Classification of climatic conditions Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical condit Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1)	-25 °C +55 °C -40 °C +85 °C -25 °C +70 °C s acc. to IEC 60721: 3K23 (no condensation, no formation of ice) 2K11 1K22 ions acc. to IEC 60721: 3M11 2M4 1M12 pluggable screw-type terminal or push-wire terminal 0.50.6 Nm (57 lb-in) AWG 24-12 7 mm 0.22.5 mm² tic sleeve 0.252.5 mm² 0.21 mm² 0.21 mm² 0.21 mm²

Dimension diagram (dimensions in mm)





Push-wire terminals:	
Conductor sizes	AWG 24-12
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 24-16
Stripping length	10 mm
rigid/flexible	0.21.5 mm ²
flexible with ferrule without plastic sleeve	0.251.5 mm ²
flexible with ferrule with plastic sleeve	0.250.75 mm ²

Operating mode	continuous operation
Mounting	at an ambient temperature > 55 °C vertical mounting required
	at an ambient temperature $<$ 55 $^{\circ}$ C mounting optional
Degree of protection internal comp	ponents 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 covered with a special varnish to provide increased protection against mechanical stress and moisture.

Ambient temperatures:		
Operating temperature	-40+70 ℃	
Transport	-40+85 ℃	

Classification o	f climatic condition	s acc to IFC 60721.

Long-term storage	-25+70 ℃

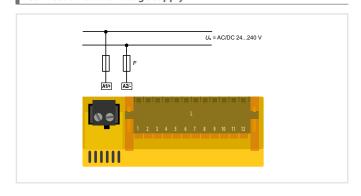
Stationary use (IEC 60721-3-3)	3K23 (condensation and formation of ice possible)

Classification of mecha	anical conditions acc. to IEC 60721:	

Stationar	y use (IEC	60721-3-3)			3

- $^{1)}$ = At a frequency > 200 Hz, the connection of X1 and k1-12/l1-12 must be insulated. Only permanently installed devices which at least have overvoltage category CAT2 (300 V) may be connected.
- $^{2)}$ = Only 50/60 Hz are permitted for UL applications.
- ³⁾ = Residual current effect of > 100 mA results in a greater relative uncertainty.

Connection to the voltage supply

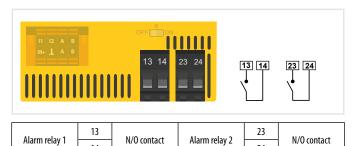


Connection to the X1 interface



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

Connection of relays



BS bus termination

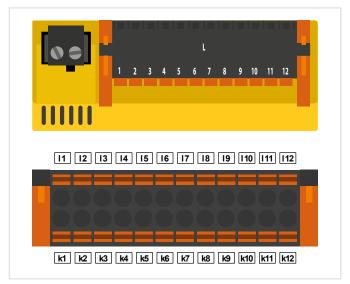


Activating a terminating resistor to define the first and the last device in the bus system.

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

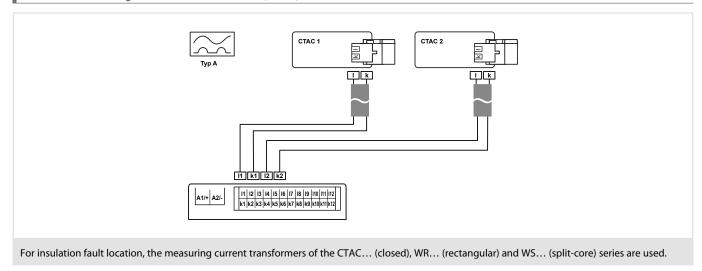
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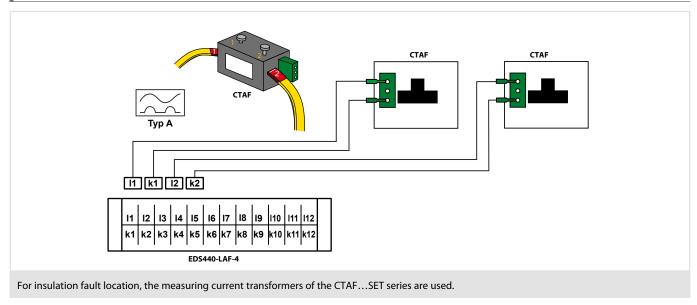
l1	Measuring CT 1	k1
I2	2 Measuring CT 2	
13	Measuring CT 3	k3

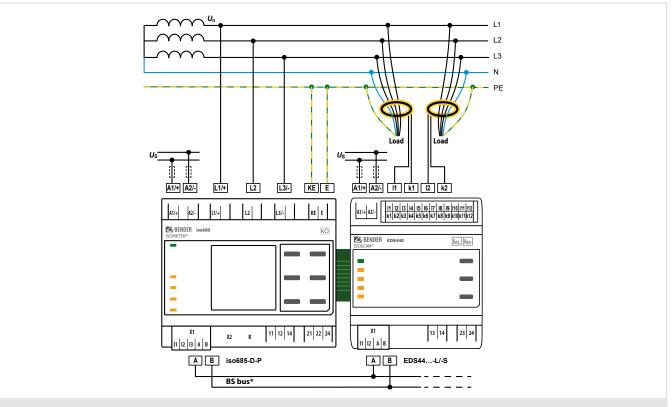
14	Measuring CT 4	k4
l12	Measuring CT 12	k12

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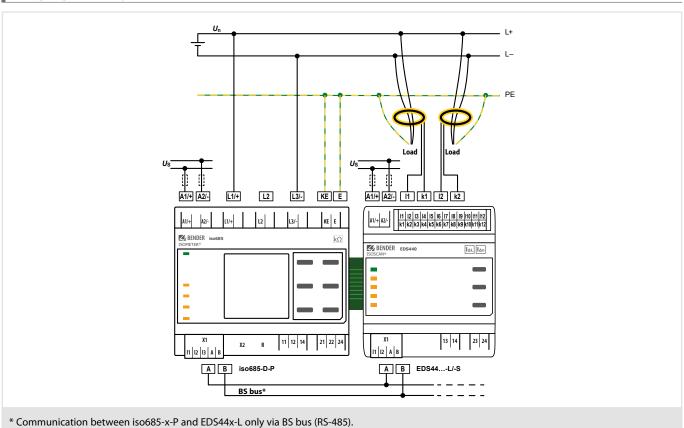
Connection of CTAF...SET series measuring current transformers to EDS440-LAF-4



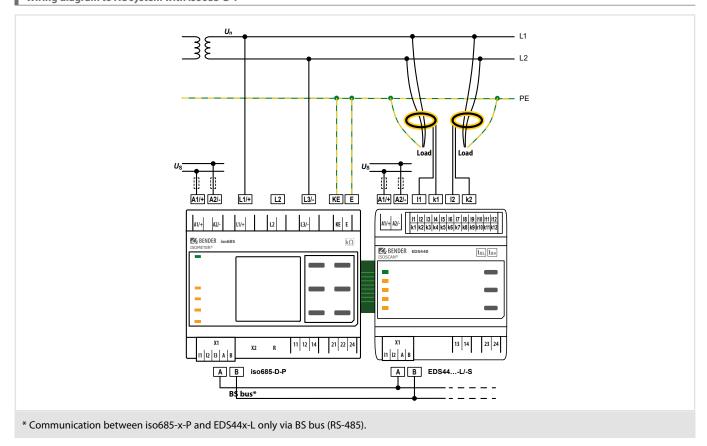


For systems > 690 V and with overvoltage category III a fuse for the connection to the system to be monitored must be provided. Recommendation: 2A fuses.

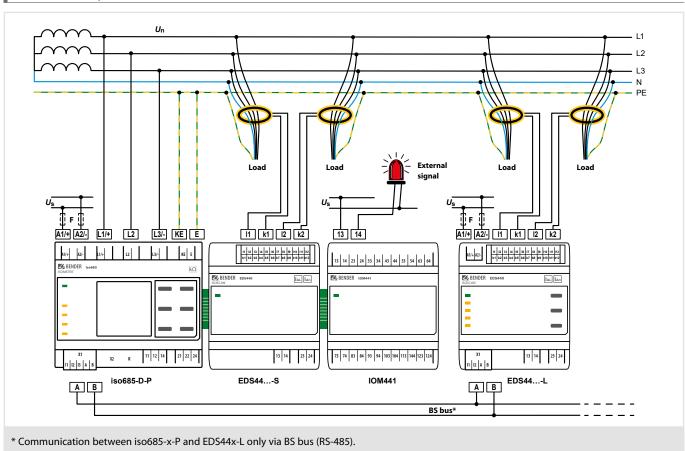
Wiring diagram to DC system with iso685-D-P



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



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



ISOSCAN® EDS150/EDS151

Insulation fault locator with integrated measuring current transformers for EDS systems



Device features

- Insulation fault location in AC, AC/DC and DC IT systems
- 6 measuring channels with measuring current transformer per 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

Further information

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

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)

Approvals



Ordering information

Туре	Measuring range	Response value		Supply voltage ¹¹ <i>U</i> ₅	Art. No.
		EDS function	RCM function		
EDS150	525 mA	5 mA	10 A	AC 1724 V, 5060 Hz	B91080103
EDS151	0,52,5 mA	0,5 mA	1 A	DC 1428 V	B91080101

¹⁾ Absolutwerte

Accessories

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

Suitable system components

Description	Voltage supply	Output voltage	Explanation	Туре	Art. No.	Page
	AC 90264 V/DC 120370 V/4763 Hz	DC 24 V, 420 mA	For the supply of max. 6 EDS15	AN410	B924209	384
Power supply unit	AC 230 V/5060 Hz	AC 20 V, 500 mA	For the supply of max. 6 EDS15	AN450	B924201	386
	AC 127 V/5060 Hz	AC 20 V, 500 mA	For the supply of max. 6 EDS15	AN450-133	B924203	386



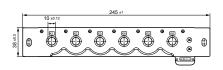
According to IEC 60364-7-710 only power supply units providing "Safe separation" (reinforced insulation) may be used for the supply voltage between the primary and secondary side. All power supply units listed above comply with this requirement!



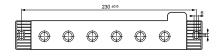
Insulation coordination acc. to IEC 60664-1/IEC 6		Environment/EMC	
Rated insulation voltage	AC 250 V	EMC	IEC 61326-2-4
Rated impulse voltage/pollution degree	6 kV/3	Operating temperature	-25+55 °C
Voltage ranges		For UL application:	
		Maximum ambient temperature 55 °C	
T system being monitored:		Classification of climatic conditions acc. to IEC 60721:	
Nominal system voltage U_{n} see Locating current	t injector (e. g. ISOMETER® iso685-D-P) (EDS150)	Stationary use (IEC 60721-3-3)	3K22
	AC 20276 V, DC 20308 V (EDS151)	Transport (IEC 60721-3-2)	2K11
Nominal frequency f _n	42460 Hz	Long-term storage (IEC 60721-3-1)	1K22
Supply voltage:		Classification of mechanical conditions acc. to IEC 60721:	
Supply voltage $U_{\rm S}$	AC 1724 V, DC 1428 V	Stationary use (IEC 60721-3-3)	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 termina
3 4 , ,	0/328	For UL application:	
EDS function:		Only use 60/75°C copper conductors!	2
Response value	EDS150: 5 mA	Connection rigid /flexible/conductor sizes	0.21.5 mm ² (AWG 24-16)
	EDS151: 0.5 mA	Multi-conductor connection (2 conductors of the same cross section)	
Relative uncertainty	±30 %	rigid	0.21.5 mm ²
Rated frequency	42460 Hz	flexible	0.21.5 mm ²
Measuring range EDS function	EDS150: 525 mA,	flexible with ferrule without plastic sleeve	0.251.5 mm ²
D	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	≤ 8 s	Stripping length	10 mm
RCM function:		Other	
Response value	EDS150: 10 A	Operating mode	continuous operation
	EDS151: 1 A	Position of normal use	any
Relative uncertainty	±30 %	Enclosure material	polycarbonate
Frequency range	4268 Hz	Flammability class	UL94 V-0
Displays		Screw mounting	2 x M6
• •		Tightening torque	1.5 Nm
LEDs:		Documentation number	D00106 (EDS150)
ON/COM, green	operation indicator/bus activity		D00107 (EDS151)
Alarm K1K6, yellow	EDS and RCM function	Weight	≤ 340 q
Interface		()* = factory setting	
Interface/protocol	RS-485/BMS	() — lactory setting	
Connection	terminals A/B		
Cable (twisted pair, one end of shield connected to PE)	two-core, recommended: J-Y(St)Y min. 2x0.8		
Cable length	≤ 1200 m		
Terminating resistor	120 Ω (0.25 W)		
Device address, BMS bus	390 (3)*		

Dimension diagrams (dimensions in mm)

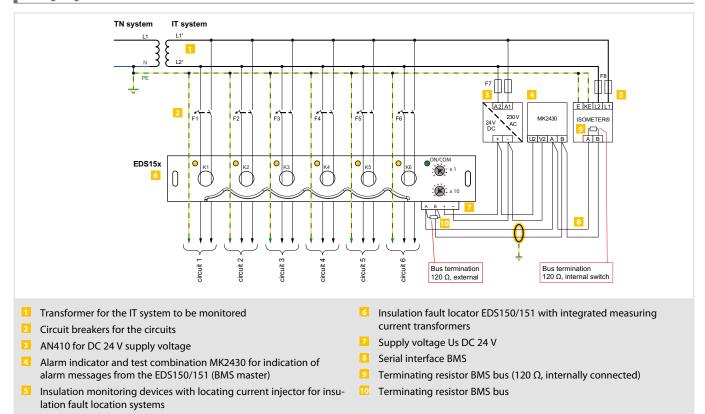
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ISOSCAN® EDS30...

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

Type	Supply voltage <i>U</i> s	Nominal voltage <i>U</i> n	Main circuits		Control circuits		Art. No.
Туре	Supply voltage os	Nominal Voltage on	with EDS	without EDS	with EDS	without EDS	AI C. NO.
EDS3090	=	AC 20575 V, 42460 Hz / DC 20504 V	EDS440	-	-	-	B91082026
EDS3090PG	AC 230 V, 50 60 Hz	AC 20575 V, 42460 Hz / DC 20504 V	-	~	-	-	B91082021
EDS3090PG-13	AC 90132 V, 5060 Hz	AC 20575 V, 42460 Hz / DC 20504 V	-	~	-	-	B91082022
EDS3096PG	AC 230 V, 50 60 Hz	AC 0575 V, 42460 Hz / DC 0504 V	-	~	-	-	B91082025
EDS3096PG-13	AC 90132 V, 5060 Hz	AC 0575 V, 42460 Hz / DC 0504 V	-	~	-	-	B91082029
EDS3091	=	AC 20265 V, 42460 Hz / DC 20308 V	-	-	EDS441	-	B91082027
EDS3091PG	AC 230 V, 5060 Hz	AC 20265 V, 42460 Hz / DC 20308 V	-	-	-	~	B91082023
EDS3091PG-13	AC 90132 V, 5060 Hz	AC 20265 V, 42460 Hz / DC 20308 V	-	-	-	~	B91082024
EDC2002DC	AC 230 V, 5060 Hz	AC 20265 V, 42460 Hz / DC 20308 V	-	~	-	~	D01002020
EDS3092PG -	AC 230 V, 50 60 Hz	AC 20575 V, 42460 Hz / DC 20504 V	_	~	_	~	B91082030
EDS3096PV	AC 230 V, 50 60 Hz	AC 20575 V, 42460 Hz / DC 20504 V	-	~	-	_	B91082031

Suitable system components

Designation	Nominal voltage <i>U</i> n		Туре	Art. No.	Page
Measuring clamp 115 mm for EDS3090 and EDS3096	-	-	PSA3165	B980852	-
Coupling device to extend the voltage range of the PGH185/186	AC 500790 V, 42460 Hz DC 400960 V		AGE185	B980305	162
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
MYCEICU3	PGH185	PSA3020	PSA3052	ED35092PG
EDS195PM PGH186 – 2 x PSA3052		EDS3096PV		

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

Environment/EMC		
EMC		

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

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

Dimensions WxHxD	430 x 340 x 155 mm
Documentation number	D00012

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

Technical data PGH18...

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_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:	
Power consumption	≤ 3 VA

Power consumption PGH186:

Power consumption	≤ 6 VA

Locating current

PGH183	
Test current, selectable, max.	1/2.5 mA
PGH185/186	
Locating current I _L , selectable, max.	10/25 mA

PGH 183/ 185/ 186	
Clock pulse	2 s
Idle time	4 s

Measuring voltage U_m PGH186

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

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

y	
Supply voltage $U_{\rm S}$	accumulators, batteries or USB power supply unit
Accumulators	3 x NiMh ≥ 2000 mAh
Hours of operation (without display illumination)	≥ 150 h
Charging time	≤5h
Size	AA Re
Batteries	3 x LR6 AA — 1.5 \
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)

Measuring range	2 mA50 mA
Measuring clamps	PSA3020, PSA3052, PSA3165
Response value I∆L, 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

measuring circuit residual current	
with measuring clamps	PSA3020, PSA3052, PSA3165
Measuring range	5 mA10 A (crest factor up to 3)
Response value I∆L, adjustable	10 mA10 A (100 mA)*
with measuring clamps	PSA3320, PSA3352
Measuring range	2 mA2 A (crest factor up to 3)
Response value I∆L, 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

DC 50 V

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

Technical data measuring clamps

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	

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

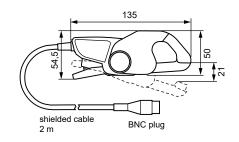
Technical data AGE185

Insulation coordination acc. to IEC 60664-1		
Rated insulation voltage	AC 1000 V	
Rated impulse voltage/pollution degree	4 kV/3	
Nominal system voltage $U_{\rm n}$	3AC, AC 500790 V, DC 400960 V/42460 Hz	

Other

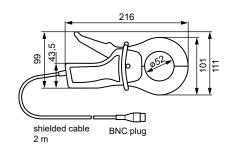
Degree of protection, internal comp	onents DIN EN 60529 (VDE 0470-1)	IP30
Type of connection/cable:	safety plug with green-yellow con	necting wire 1 mm ²
Weight	≤ 400 g	
Dimensions W x H x D	84 x 197 x 30 m	
Weight		≤ 200 g
Dimensions W x H x D		88.5 x 42 x 21 mm

Dimension diagram PSA3020/3320 (dimensions in mm)



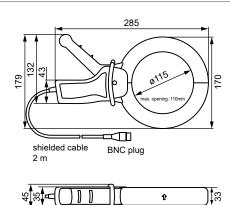


Dimension diagram PSA3052/3352 (dimensions in mm)

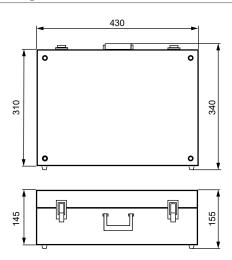


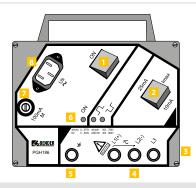


Dimension diagram PSA3165 (dimensions in mm)



Dimension diagram aluminium case(dimensions in mm)





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

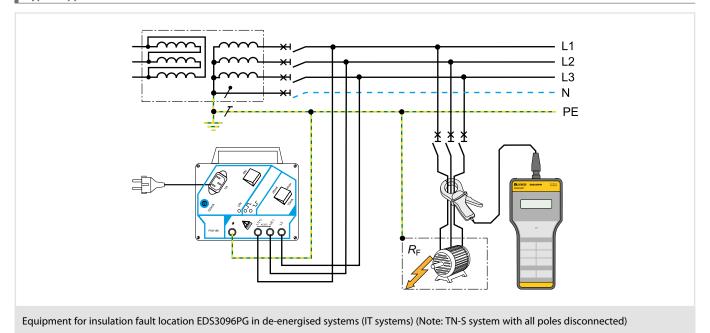
Operating elements EDS195PM

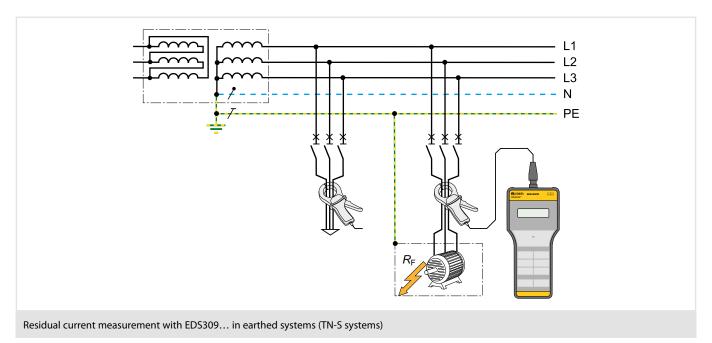


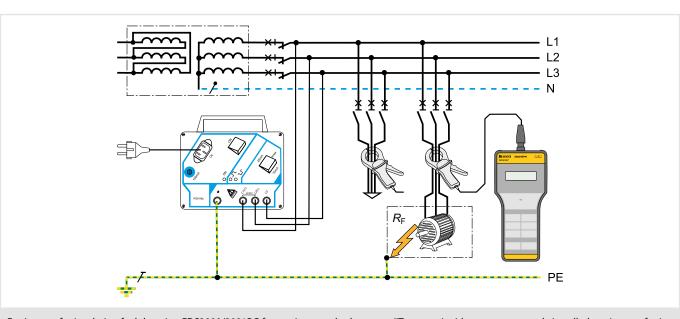
- Micro USB connection for charging the device's rechargeable battery
- 2 BNC connection for the measuring clamp
- 3 LC display, backlit, 3 lines à 16 characters
- 4 LED "ALARM", lights when the response value is exceeded
- Button for the selection of the operating mode : $I_{\Delta S} = \text{insulation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

Post of the property of the pr

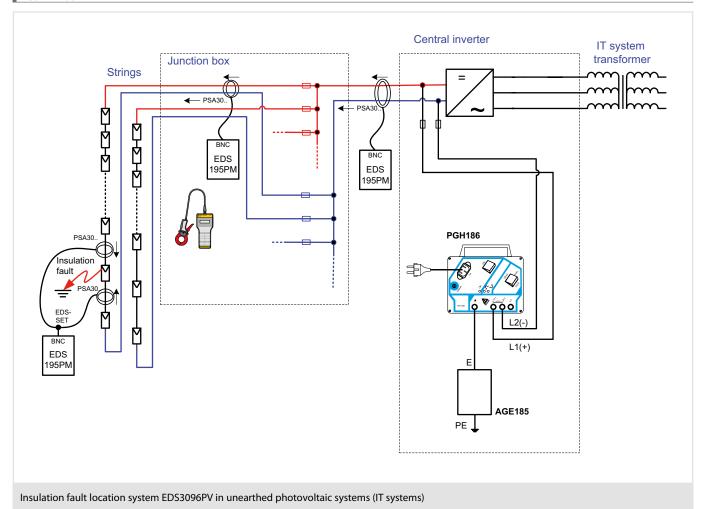
- "INFO" button: device type software version current response values $I_{\Delta S}$ and $I_{\Delta n}$ setup status
 - ESC button: to exit the menu function without changing parameters
- "MENU" button: to toggle between the standard display and the menu selection
- On-Off button
- "HOLD" button: to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

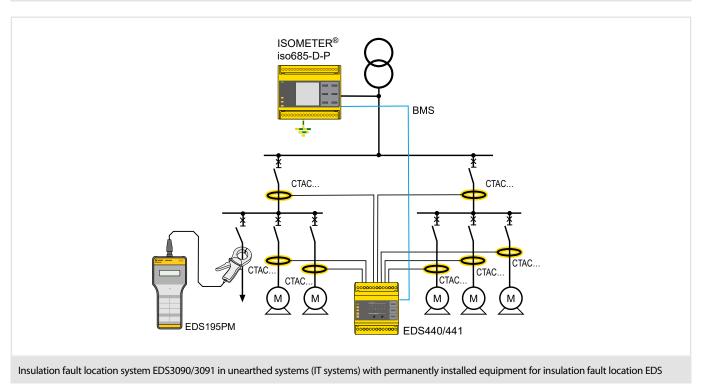






Equipment for insulation fault location EDS3090/3091PG for use in unearthed systems (IT systems) without a permanently installed equipment for insulation fault location





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

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

Insulation monitoring device ISOMETER®/Locating current injector PGH

	TOTAL	
Туре	iso685-x-P	isoxx1685xP
Nominal system voltage <i>U</i> _n	AC 0690 V, DC 01000 V	iso1R1685DP: AC 0690, DC 0690 V iso1685DP: AC 01000 V, DC 01500 V
Locating current I _L	1/1.8/2.5/5/10/25/50 mA	1/2.5/5/10/25/50 mA
Response values	1 kΩ10 MΩ	isoLR1685DP: 20 Ω 100 kΩ iso1685DP: 200 Ω 1 MΩ
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

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

Messzangen

Application range	ation range Main circuits Control circuits			l circuits	
	O	020	070	O	0>0
Туре	PSA3020	PSA3052	PSA3165 (optional)	PSA3320	PSA3352
20 mm	~			~	
52 mm		~			~
115 mm			~		

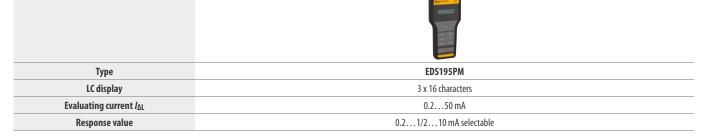
Complete systems

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							
	Man & W		Many Control of the C					
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> _S AC 90132 V	PGH185-13	PGH186-13	PGH183-13					
Locating current /L max.	10/25 mA	10/25 mA	1/2.5 mA					

Insulation fault locator



Measuring clamps



	Components EDS309																	
	EDS195PM with Accessories PGH18 with accessories for								Measuring clamps									
Device type	Aluminium case with carrying handle	Operating manual	Insulation fault locator	Clamping connector on 4 mm	Adapter BNC/4mm connector for curr. transform	Adapter BNC-PS2 for WF-CT, optional	Plug power supply for EDS195PM	Locating current injector	Supply cable for PGH18	Safety measuring cable, black	Safety measuring cable, green/yellow	Safety claw grip, black	Safety claw grip, green/yellow	Coupling device, optional (EDS3096PV only: in the scope of delivery)	Measuring damps 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
EDS3096PV	1	1	EDS195PM	-	-	-	1	PGH186	1	3	1	3	1	AGE185		2 x PSA3052		

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.

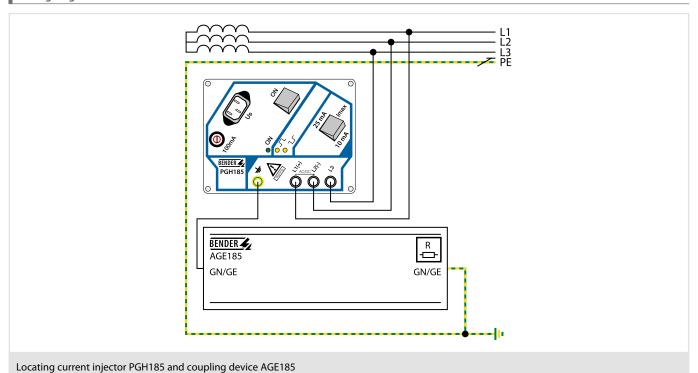
Approvals



Ordering information

Туре	Nominal system voltage <i>U</i> _S	Art. No.
AGE185	AC, 3(N)AC 500790 V / DC 400960 V	B980305

Wiring diagram



Device overview residual current monitors LINETRAXX®

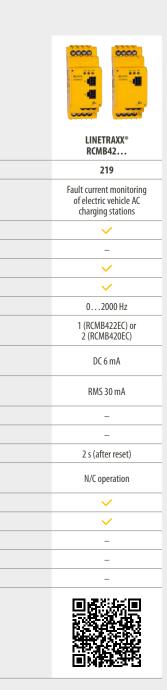
		LINETRAXX®	LINETRAXX®	LINETRAXX®	LINETRAXX®	99 99399999999999999999999999999999999	
	atalagua naga	RCM420 164	RCMA420 167	RCMA423 170	SmartDetect RCMS410	RCMS460/RCMS490 176	
	atalogue page	104	107	1/0	1/3	1/0	
	cial applications	-	-	-	-	-	
Type of distribution system	TN/TT	~	~	~	~	✓	
distri sys	IT	-	-	-	-	-	
Residual	\cong	~	~	~	~	~	
Resi		-	~	~	~	~	
Rated	l frequency range	422000 Hz	02000 Hz	02000 Hz	020000 Hz	02000 Hz	
Num	ber of measuring channels	1	1	1	4	12 (per device) 1080 (per system)	
Response value	<i>I</i> Δn1	50100 % x I _{Δn2}	50100 % x / _{Δn2}	50100 % x / _{Δn2}	10100 % x /Δn	10100 % x /Δn2 min. 5 mA	
Res	I _{Δn2}	10 mA10 A	10500 mA	30 mA3 A	6 mA30 A (Typ A, Typ F) 10 mA10 A (Typ B, Typ B+)	10 mA10 A (Type B) 6 mA20 A (Type A)	
Res	ponse delay t _{on}	010 s	010 s	010 s	010 s	099 s	
S1	tart-up delay <i>t</i>	010 s	010 s	010 s	0999 s	099 s	
Dela	ay on release t _{off}	0300 s	099 s	099 s	0999 s	0999 s	
0pe	rating principle, alarm relays	N/C operation or N/O operation	N/C operation or N/O operation	N/C operation or N/O operation	Multifunctional digital and analogue inputs and outputs	N/C operation or N/O operation	
Installa- tion	DIN rail	~	~	~	~	~	
linst	Screw mounting	~	~	~	~	~	
S	BMS	-	+	-	-	~	
Interfaces	Modbus	-	+	-	~	-	
프	NFC	-	-	-	~	-	
	roduct details (Products on ww.bender.de/en)						
	Type C. p.			Suitable system components			
	CTAC 342	✓	-	-	~	✓	
ent	CTUB100 345	-	~	✓	~	✓	
gcurr	WRS(P) 349	~	-	-	~	✓	
Measuring current transformers	CTBS25 354	-	-	-	~	~	
Meas	WS 356	~	-	-	~	~	
	WF 360	~	-	-	~	~	
RS-485	5 DI-1DL 389	-	-	-	-	~	
Power su units	pply STEP-PS 381	-	-	-	~	~	

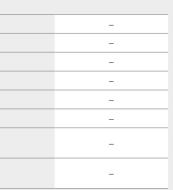


-	-	-	_	-	~
-	~	-	-	-	-
-	-	-	-	-	✓
-	-	-	-	-	_
-	-	-	_	-	✓
-	-	-	_	-	✓
~	-	-	-	-	-
~	-	~	~	~	~

Device overview residual current monitors LINETRAXX®

		2) (ON Emiles	States States	Manual Control of the	Emilia .	
		RCMB131-01	RCMB131-02	RCMB132-01	RCMB104	RDC104-4	
Cat	alogue page	204	207	210	213	216	
	al 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	
Type of distribution system	TN/TT	~	~	~	~	✓	
distr on sy	IT	-	-	-	-	-	
Residual	\cong	~	~	~	~	~	
Resi		~	~	~	~	~	
Rated f	frequency range	DC2000 Hz	DC2000 Hz	DC2000 Hz	02000 Hz	02000 Hz	
Numbe	er of measuring channels	-	-	-	-	-	
Response value	<i>I</i> 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 t	_	-	_	+	_	
Delay	on release t _{off}	-	-	-	-	-	
Opera al	nting principle, larm relays	-	-	-	-	-	
Installa- tion	DIN rail	~	~	~	-	-	
linst	Screw mounting	~	~	~	+	-	
89	BMS	_	-	-	-	-	
Interfaces	Modbus	RTU	-	RTU	-	-	
重	NFC	-	-	-	-	-	
(oduct details Products on w.bender.de/en)						
	Type C. p.			Suitable system components			
	CTAC 342	-	-	-	-	-	
ent	CTUB100 345	-	-	-	-	-	
Measuring current transformers	WRS(P) 349	-	-	-	-	-	
uring	CTBS25 354	-	-	-	-	-	
Meas	WS 356	-	-	-	-	-	
	WF 360	_	+	_	+	_	
RS-485 repeater	NI 1NI 200	-	-	-	-	-	
Power suppunits	ply STEP-PS 381	~	~	~	-	-	





LINETRAXX® RCM420

Residual current monitor for AC current monitoring in TN and TT systems





Typical applications

- · Residual current monitoring in earthed 2, 3 or 4-conductor systems
- · Current monitoring of, in the normal case, de-energised single conductors
- · Socket-outlet circuits for devices which are operated unattended for a long time and which may not fail
- · Alarm systems, safety devices
- · Air conditioning systems, EDP systems
- · Cooling equipment with valuable frozen goods
- · Canteen kitchens
- · Monitoring of earthed power supplies for stray currents
- · Impact on N conductors
- · Trace heating systems

Device features

- AC and pulsed DC sensitive residual current monitor Type A according to DIN EN 62020
- 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)

Approvals







UL508 - Standard for Industrial Control Equipment CSA C22.2 No. 14-13 - Industrial Control Equipment UL File number E173157 (for all RCM420)

UL1053 – Standard for Safety Ground-Fault Sensing and Relaying Equipment UL File number E478610

(Only for B74014002 and B94014002 and solely in combination with Marina Guard MG-1.3 and MG-T.3. If necessary, other applications are to be evaluated separately after consulting the manufacturer.)

Further information

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

Ordering information

Туре	Supply voltage 1) II.	Supply voltage ¹⁾ <i>U</i> s	
3,72	5pp., 10g2 03	Screw-type terminal	Push-wire terminal
RCM420-D-1	AC 1672 V, 40460 Hz / DC 9,694 V	B94014001	B74014001
RCM420-D-2	AC 70300 V, 40460 Hz / DC 70300 V	B94014002	B74014002

¹⁾ Absolute values

Accessories

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

Suitable system components

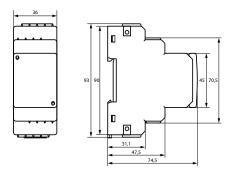
Description	Type of construction	Туре	Art. No.	Page
	circular	CTAC	B981100	342
Measuring current	rectangular	WRS(P)	B9117	349
transformers	split-core	WS	B980806	356
	flexible	WF	B780802	360



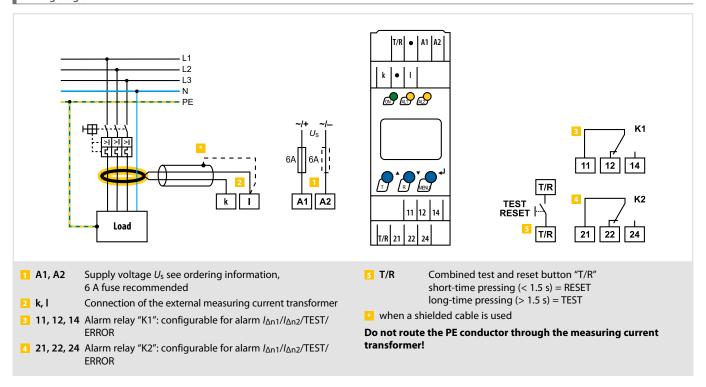
Insulation coordination acc. to IEC 60664-1/IEC 606	664-3
	10T J
RCM420-D-1 Rated insulation voltage	100 V
Overvoltage category/pollution degree	III/3
Rated impulse voltage	2,5 kV
RCM420-D-2	
Rated insulation voltage	250 V
Overvoltage category/pollution degree	III/3
Rated impulse voltage	4 kV
<u> </u>	
Supply voltage	
RCM420-D-1	AC 24 CO V/DC 24 70 V
Supply voltage range $U_{\rm S}$ Operating range $U_{\rm S}$	AC 2460 V/DC 2478 V AC 1672 V/DC 9.694 V
Frequency range U_S	DC, 42460 Hz
	DC, 72700 Hz
RCM420-D-2	AC/DC 100 - 350 V
Supply voltage range U_S Operating range U_S	AC/DC 100250 V AC/DC 70300 V
Frequency range U_S	42460 Hz
Protective separation (reinforced insulation) between	TZ400 IIZ
. ,	A1, A2) - (k/l, T/R) - (11, 12, 14) - (21, 22, 24)
Voltage test according to IEC 61010-1	2.21 kV
Power consumption	≤ 4 VA
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	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 $I_{\Delta n2}$ (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 $t_{ m off}$	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	≤ 300 ms
Number of reload cycles	0100 (0)*
Cable lengths for measuring current transformers	
Single wire ≥ 0.75 mm ²	01 m
Single wire, twisted ≥ 0.75 mm ²	010 m
Shielded cable ≥ 0.75 mm ²	040 m
Recommended cable (shielded, shield on one side connected to profits a party)	
of the RCM420, not connected to earth) Connection	J-Y(St)Y min. 2x0.8 screw terminals
	Sciew relillings
Displays, memory	3 A . 4 . A
Display range, measured value	3 mA16 A
Error of indication	± 15 %/± 2 digit
Measured-value memory for alarm value Password	data record measured values off/0999 (OFF)*
Fault memory alarm relay	on/off (off)*
· · · · · · · · · · · · · · · · · · ·	OII/OII (OII)
Inputs/outputs	
Cable length for external test/reset button	010 m

Switching elements					
Number of switching elements				hangeove	
Operating principle		eration/ N/			
Electrical service life under rated operating condit	tions		10000 sv	vitching op	perations
Contact data acc. to IEC 60947-5-1:					
Utilization category	AC-13	AC-14	DC-12	DC-12	DC-12
Rated operational voltage	230 V	230 V	24 V	110 V	220 V
Rated operational 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 refe	rence)			10 m	A/5 V DC
Environment/EMC					
EMC				DIN F	N 62020
Operating temperature					+55 °C
• •	FC (0721			25	
Classification of climatic conditions acc. to II	EC 00/21				
(related to temperature and relative humidity) Stationary use (IEC 60721-3-3)					3K22
Transportation (IEC 60721-3-2)					2K11
Storage (IEC 60721-3-1)					1K22
		_			IIIZZ
Classification of mechanical conditions acc.	to IEC 6072	1			21144
Stationary use (IEC 60721-3-3)					3M11
Transportation (IEC 60721-3-2)					2M4
Storage (IEC 60721-3-1)					1M12
Connection					
For UL application:					
Use copper conductors only!					
Use 60/70 °C copper conductors only!					
Connection type	scr	ew-type te	rminal or p	oush-wire	terminal
Connection type Screw-type terminal	scr	ew-type te	rminal or p	push-wire	terminal
Screw-type terminal Connection properties:	scr	,	·		
Screw-type terminal Connection properties: rigid/flexible	SCF	,	rminal or p		
Screw-type terminal Connection properties: rigid/flexible Two conductors with the same cross section:	SCr	,	/0.22.5	mm² (AW	G 24-12)
Screw-type terminal Connection properties: rigid/flexible Two conductors with the same cross section: rigid/flexible	scri	,	/0.22.5	mm² (AW	G 24-12)
Screw-type terminal Connection properties: rigid/flexible Two conductors with the same cross section: rigid/flexible Stripping length	SCN	,	/0.22.5	mm² (AW 1.5/0.2	G 24-12) 1.5 mm ² 9 mm
Screw-type terminal Connection properties: rigid/flexible Two conductors with the same cross section: rigid/flexible Stripping length	SCri	,	/0.22.5	mm² (AW 1.5/0.2	G 24-12)
Screw-type terminal Connection properties: rigid/flexible Two conductors with the same cross section: rigid/flexible Stripping length Tightening torque, terminal screws Push-wire terminals	SCF	,	/0.22.5	mm² (AW 1.5/0.2	G 24-12) 1.5 mm ² 9 mm
Screw-type terminal Connection properties: rigid/flexible Two conductors with the same cross section: rigid/flexible Stripping length Tightening torque, terminal screws Push-wire terminals Connection properties:	SCF	,	0.2	mm² (AW 1.5/0.2 8 0.5	G 24-12) 1.5 mm ² 9 mm .0.6 Nm
Screw-type terminal Connection properties: rigid/flexible Two conductors with the same cross section: rigid/flexible Stripping length Tightening torque, terminal screws Push-wire terminals Connection properties: rigid	SCri	0.24	0.22.5	mm² (AW 1.5/0.2 8 0.5	G 24-12) 1.5 mm ² 9 mm0.6 Nm
Screw-type terminal Connection properties: rigid/flexible Two conductors with the same cross section: rigid/flexible Stripping length Tightening torque, terminal screws Push-wire terminals Connection properties: rigid flexible without ferrules	SCO	0.24	0.22.5 0.22.5 0.752.5	mm² (AW 1.5/0.2 8 0.5 mm² (AW mm² (AW	G 24-12) 1.5 mm ² 9 mm .0.6 Nm G 24-14) G 19-14)
Screw-type terminal Connection properties: rigid/flexible Two conductors with the same cross section: rigid/flexible Stripping length Tightening torque, terminal screws Push-wire terminals Connection properties: rigid flexible without ferrules flexible with ferrules	SCR	0.24	0.22.5 0.22.5 0.752.5	mm² (AW 1.5/0.2 8 0.5	G 24-12) 1.5 mm²9 mm .0.6 Nm G 24-14) G 19-14) G 24-16)
Screw-type terminal Connection properties: rigid/flexible Two conductors with the same cross section: rigid/flexible Stripping length Tightening torque, terminal screws Push-wire terminals Connection properties: rigid flexible without ferrules flexible with ferrules Stripping length	SCI	0.24	0.22.5 0.22.5 0.752.5	mm² (AW 1.5/0.2 8 0.5 mm² (AW mm² (AW	G 24-12) 1.5 mm ² 9 mm .0.6 Nm G 24-14) G 19-14) G 24-16) 10 mm
Screw-type terminal Connection properties: rigid/flexible Two conductors with the same cross section: rigid/flexible Stripping length Tightening torque, terminal screws Push-wire terminals Connection properties: rigid flexible without ferrules flexible with ferrules Stripping length Opening force	SCI	0.24	0.22.5 0.22.5 0.752.5	mm² (AW 1.5/0.2 8 0.5 mm² (AW mm² (AW	G 24-12) 1.5 mm ² 9 mm .0.6 Nm G 24-14) G 19-14) G 24-16) 10 mm 50 N
Screw-type terminal Connection properties: rigid/flexible Two conductors with the same cross section: rigid/flexible Stripping length Tightening torque, terminal screws Push-wire terminals Connection properties: rigid flexible without ferrules flexible with ferrules Stripping length Opening force	SCI	0.24	0.22.5 0.22.5 0.752.5	mm² (AW 1.5/0.2 8 0.5 mm² (AW mm² (AW	G 24-12) 1.5 mm ² 9 mm .0.6 Nm G 24-14) G 19-14) G 24-16) 10 mm
Screw-type terminal Connection properties: rigid/flexible Two conductors with the same cross section: 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	SCO	0.24	0.22.5 0.22.5 0.752.5	mm² (AW 1.5/0.2 8 0.5 mm² (AW mm² (AW	G 24-12) 1.5 mm ² 9 mm .0.6 Nm G 24-14) G 19-14) G 24-16) 10 mm 50 N
Screw-type terminal Connection properties: rigid/flexible Two conductors with the same cross section: 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	SCO	0.24	0.22.5 0.2 0.22.5 0.752.5 0.21.5	mm² (AW 1.5/0.2 8 0.5 mm² (AW mm² (AW	G 24-12) 1.5 mm²9 mm .0.6 Nm G 24-14) G 19-14) G 24-16) 10 mm 50 N 2.1 mm
Screw-type terminal Connection properties: rigid/flexible Two conductors with the same cross section: rigid/flexible Stripping length Tightening torque, terminal screws Push-wire terminals Connection properties: rigid flexible without ferrules flexible with terrules Stripping length Opening force Test opening, diameter Other Operating mode Position of normal use		0.24	0.22.5 0.2 0.22.5 0.752.5 0.21.5	mm² (AW 1.5/0.2 8 0.5 mm² (AW mm² (AW	G 24-12) 1.5 mm²9 mm .0.6 Nm G 24-14) G 19-14) G 24-16) 10 mm 50 N 2.1 mm
Screw-type terminal Connection properties: rigid/flexible Two conductors with the same cross section: 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 Protection class, internal components (DIN EN 60)		0.24	0.22.5 0.2 0.22.5 0.752.5 0.21.5	mm² (AW 1.5/0.2 8 0.5 mm² (AW mm² (AW	G 24-12) 1.5 mm²9 mm .0.6 Nm G 24-14) G 19-14) G 24-16) 10 mm 50 N 2.1 mm peration any IP30
Screw-type terminal Connection properties: rigid/flexible Two conductors with the same cross section: 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 Protection class, internal components (DIN EN 60529) Degree of protection, terminals (DIN EN 60529)		0.24	0.22.5 0.2 0.22.5 0.752.5 0.21.5	mm² (AW 1.5/0.2 8 0.5 mm² (AW mm² (AW mm² (AW	G 24-12) 1.5 mm²9 mm .0.6 Nm G 24-14) G 19-14) G 24-16) 10 mm 50 N 2.1 mm peration any IP30 IP20
Screw-type terminal Connection properties: rigid/flexible Two conductors with the same cross section: rigid/flexible Stripping length Tightening torque, terminal screws Push-wire terminals Connection properties: rigid flexible without ferrules flexible without ferrules Stripping length Opening force Test opening, diameter Other Operating mode Position of normal use Protection class, internal components (DIN EN 60529 Enclosure material		0.24	0.22.5 0.2 0.22.5 0.752.5 0.21.5	mm² (AW 1.5/0.2 8 0.5 mm² (AW mm² (AW mm² (AW	G 24-12) 1.5 mm²9 mm .0.6 Nm G 24-14) G 19-14) G 24-16) 10 mm 50 N 2.1 mm speration any IP30 IP20 arbonate
Screw-type terminal Connection properties: rigid/flexible Two conductors with the same cross section: rigid/flexible Stripping length Tightening torque, terminal screws Push-wire terminals Connection properties: rigid flexible without ferrules flexible without ferrules Stripping length Opening force Test opening, diameter Other Operating mode Position of normal use Protection class, internal components (DIN EN 60529 Enclosure material Flammability class		0.24	0.22.5 0.2 0.22.5 0.752.5 0.21.5	mm² (AW 1.5/0.2 8 0.5 mm² (AW mm² (AW mm² (AW	G 24-12) 1.5 mm²9 mm .0.6 Nm G 24-14) G 19-14) G 24-16) 10 mm 50 N 2.1 mm Peration any IP30 IP20 arbonate UL94V-0
Screw-type terminal Connection properties: rigid/flexible Two conductors with the same cross section: rigid/flexible Stripping length Tightening torque, terminal screws Push-wire terminals Connection properties: rigid flexible without ferrules flexible without ferrules Stripping length Opening force Test opening, diameter Other Operating mode Position of normal use Protection class, internal components (DIN EN 60529 Enclosure material Flammability class DIN rail mounting acc. to		0.24	0.22.5 0.2 0.22.5 0.752.5 0.21.5	mm² (AW 1.5/0.2 8 0.5 mm² (AW mm² (AW mm² (AW	G 24-12) 1.5 mm²9 mm .0.6 Nm G 24-14) G 19-14) G 24-16) 10 mm 50 N 2.1 mm Peration any IP30 IP20 arbonate UL94V-0 EC 60715
Screw-type terminal Connection properties: rigid/flexible Two conductors with the same cross section: rigid/flexible Stripping length Tightening torque, terminal screws Push-wire terminals Connection properties: rigid flexible without ferrules flexible without ferrules Stripping length Opening force Test opening, diameter Other Operating mode Position of normal use Protection class, internal components (DIN EN 60529 Enclosure material Flammability class DIN rail mounting acc. to Screw mounting		0.24	0.22.5 0.2 0.22.5 0.752.5 0.21.5	mm² (AW 1.5/0.2 8 0.5 mm² (AW mm² (AW mm² (AW	G 24-12) 1.5 mm²9 mm .0.6 Nm G 24-14) G 19-14) G 24-16) 10 mm 50 N 2.1 mm Peration any IP30 IP20 arbonate UL94V-0 EC 60715 nting clip
Screw-type terminal Connection properties: rigid/flexible Two conductors with the same cross section: 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		0.24	0.22.5 0.2 0.22.5 0.752.5 0.21.5	mm² (AW 1.5/0.2 8 0.5 mm² (AW mm² (AW mm² (AW	G 24-12) 1.5 mm²9 mm .0.6 Nm G 24-14) G 19-14) G 24-16) 10 mm 50 N 2.1 mm Peration any IP30 IP20 arbonate UL94V-0 EC 60715

actory setting



Wiring diagram



LINETRAXX® RCMA420

Residual current monitor for monitoring AC, DC and pulsed DC currents in TN and TT systems





Typical applications

- AC/DC sensitive residual current monitoring in earthed two, three or four conductor systems (TN and TT systems)
- Monitoring of variable-speed drives, UPS systems, construction site equipment, printing machines, battery systems, laboratory equipment, wood working machines, MF welding systems, furniture industry, medical electrical equipment, etc.
- AC/DC sensitive current monitoring of, in the normal case, de-energised single conductors (e.g. N and PE conductors)

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

Туре	Supply voltage ¹⁾ U _S	Art. No.		
,,,,,	5pp., 101gu 03	Screw-type terminal	Push-wire terminal	
RCMA420-D-1	AC 1672 V, 42460 Hz / DC 9,694 V	B94043001	B74043001	
RCMA420-D-2	AC 70300 V, 42460 Hz / DC 70300 V	B94043002 B740		

¹⁾ Absolute values

Accessories

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

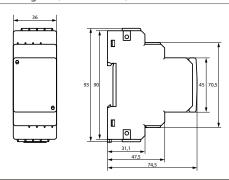
Suitable system components

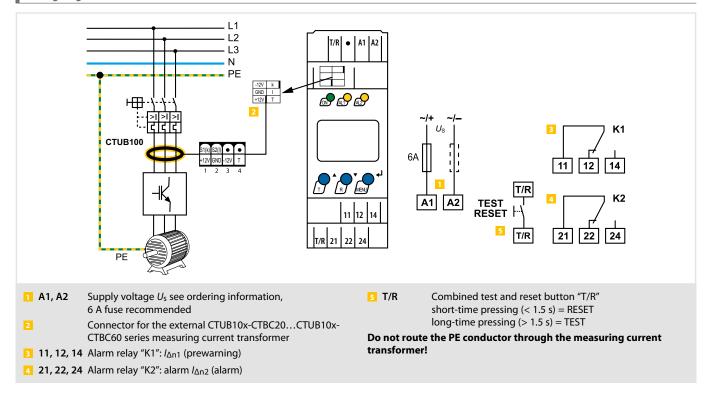
Description	Type of construction	Туре	Art. No.	Page
Measuring current transformers	circular	CTUB100	B781200	345
Connecting cables for Measunging current transformers	_	СТХ	B9811008	345

Insulation coordination acc. to IEC 60664-1/IEC 606	664-3	Inputs/outputs					
RCMA420-D-1:		Cable length for external test/reset button				0)10 m
Rated insulation voltage	100 V						
Overvoltage category/pollution degree	III/3	Cable lengths for measuring current tran	sformers				
Rated impulse voltage	2.5 kV/3	Connection CTX			11	m/2.5 m/5	
RCMA420-D-2:	2.5 KV/5	or alternatively: single wire 6 x 0.75 mm ²				0)10 m
Rated insulation voltage	250 V	Switching elements					
Overvoltage category/pollution degree	III/3	Number of switching elements			2 x 1 c	:hangeove	r contact
Rated impulse voltage	4 kV	Operating principle	N/C op	eration/N/	'O operatio		
		Electrical service life under rated operating con	nditions		10000 sv	vitching op	perations
Supply voltage		Contact data acc. to IEC 60947-5-1					
RCMA420-D-1:		Utilization category	AC-13	AC-14	DC-12	DC-12	DC-12
Supply voltage range $U_{\rm S}$	AC 2460 V/DC 2478 V	Rated operational voltage	230 V	230 V	24 V	110 V	220 V
Operating range U _s	AC 1672 V/DC 9.694 V	Rated operational voltage UL	200 V	200 V	24 V	110 V	200 V
Frequency range $U_{\rm S}$	DC, 42460 Hz	Rated operational current	5 A	3 A	1 A	0.2 A	0.1 A
RCMA420-D-2:		Minimum contact load (relay manufacturer's r	reterence)			10 m	A/5 V DC
Supply voltage range $U_{\rm S}$	AC/DC 100250 V	Environment/EMC					
Operating range Us	AC/DC 70300 V	EMC				DIN E	EN 62020
Frequency range $U_{\rm S}$	DC, 42460 Hz	Operating temperature					+55 °C
· .	(A1, A2) - (k/I, T/R) - (11, 12, 14) - (21, 22, 24)	Classification of climatic conditions acc. to I	FC 60721 (rolate	ıd to tomno	rature and		
Voltage test according to IEC 61010-1	2.21 kV	Stationary use (IEC 60721-3-3)	LC 00721 (ICIAIC	u to tempe	iature and	iciative iiu	3K22
Power consumption	≤ 6.5 VA	Transportation (IEC 60721-3-2)					2K11
Measuring circuit		Storage (IEC 60721-3-1)					1K22
External measuring current transformer	CTUB101-CTBC20210(P)	Classification of mechanical conditions a	cc to IFC 6072	1.			
Rated insulation voltage (measuring current transformer		Stationary use (IEC 60721-3-3)	cc. to icc ou/2	1.			3M11
Operating characteristic acc. to DIN EN 62020	type B	Transportation (IEC 60721-3-2)					2M4
Frequency range	02000 Hz	Storage (IEC 60721-3-1)					1M12
Measuring range AC	01.5 A						
Measuring range DC	0600 mA	Connection					
Relative uncertainty for f		For UL applications:					
≤ 2 Hz	035 %	use 60°C/70°C copper conductors only					
> 2 < 16 Hz	-35+100 %	Connection type	scr	ew-type te	rminal or	nush-wire	terminal
≥ 16 ≤ 1000 Hz	035 %			, p		, , , , , , , , , ,	· ·
> 1000≤ 2000Hz	± 35 %	Screw-type terminal Connection properties:					
Operating uncertainty	±17.5 %	rigid/flexible		0.2 4	/0.22.5	mm² (AW	G 24-12)
Response values		Two conductors with the same cross section:		0.2	0.22.3	(****	G Z 1 1Z)
Rated residual operating current $I_{\Delta n1}$ (prewarning, AL1)	50100 % x /∆n2, (50 %)*	rigid/flexible			0.2	1.5/0.2	.1.5 mm ²
Rated residual operating current $I_{\Delta n2}$ (Alarm, AL2)	10500 mA (30 mA)*	Stripping length				8.	9 mm
Hysteresis	1025 % (15%)*	Tightening torque, terminal screws				0.5	0.6 Nm
Specified times		Push-wire terminals					
Starting delay t	010 s (0.5 s)*	Connection properties:					
Response delay t_{on1} (prewarning)	010 s (1 s)*	rigid				mm² (AW	
Response delay t _{on2} (alarm)	010 s (0 s)*	flexible without ferrules		(0.752.5		
Delay on release t _{off}	099 s (1 s)*	flexible with ferrules			0.21.5	mm ² (AW	
Operating time t_{ae} at $I_{\Delta n} = 1 \times I_{\Delta n 1/2}$	≤ 180 ms	Stripping length					10 mm
Operating time t_{ae} at $I_{\Delta n} = 5 \times I_{\Delta n 1/2}$	≤ 30 ms	Opening force					50 N
Response time tan	$t_{\rm an}=t_{\rm ae}+t_{\rm on1/2}$	Test opening, diameter					2.1 mm
Recovery time $t_{\rm b}$	≤ 300 ms	Other					
Displays, memory		Operating mode			CO	ntinuous o	•
Display range, measured value AC	01.5 A	Position of normal use	C (0E30)			display-	-oriented
Display range, measured value DC	0600 mA	Degree of protection, internal components (IE	L 00529)				IP30
Error of indication	±17.5 %/± 2 digit	Degree of protection, terminals (IEC 60529) Enclosure material				nalve	IP20
Measured-value memory for alarm value	data record measured values	Flammability class					arbonate UL94V-0
Password	off/0999 (off)*	DIN rail mounting acc. to					EC 60715
Fault memory alarm relay	on/off (on)*	Screw fixing			2 x M4	with mour	
		Documentation number			2 A III T	moai	D00059
		Weight					≤ 150 g
		· · - · y···•					50 9

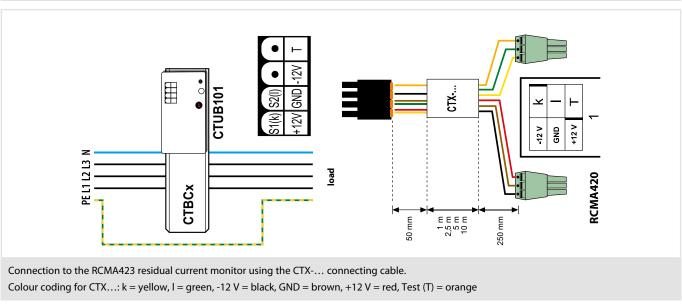
()* = factory setting

Dimension diagram (dimensions in mm)





Connection of measuring current transformers



LINETRAXX® RCMA423

Residual current monitor for monitoring AC, DC and pulsed DC currents in TN-and TT systems







Typical applications

- AC/DC sensitive residual current monitoring in earthed two, three or four conductor systems (TN and TT systems)
- · Monitoring of variable-speed drives, UPS systems, construction site equipment, printing machines, battery systems, laboratory equipment, wood working machines, MF welding systems, furniture industry, medical electrical equipment, etc.
- · AC/DC sensitive current monitoring of, in the normal case, de-energised single conductors (e.g. N conductors)

Device features

- AC/DC sensitive residual current monitor Type B 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

Туре	Supply voltage¹ <i>U</i> s	Art.	No.
1,7,80	Supply tollage 05	Screw-type terminal	Push-wire terminal
RCMA423-D-1	AC 1672 V, 42460 Hz / DC 9.694 V	B94043023	B74043023
RCMA423-D-2	AC 70300 V, 42460 Hz / DC 70300 V	B94043025	B74043025

¹⁾ Absolute values

Accessories

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

Suitable system components

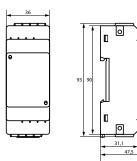
Description	Type of construction	Туре	Art. No.	Page
Measuring current transformers	circular	CTUB100	B781200	345
Connecting cables for Measunging current transformers	-	СТХ	B9811008	345

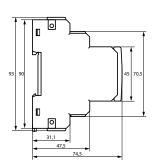
Insulation coordination acc. to IEC 60664-1/IEC 606	64-3	Switching elements					
RCMA423-D-1:		Number of switching elements				hangeove	
Rated insulation voltage	100 V	Operating principle	N/C ope	eration/N/	/O operatio	n (N/C ope	eration)*
Overvoltage category/pollution degree	III/3	Electrical endurance, number of cycles					10,000
Rated impulse voltage	2.5 kV	Contact data acc. to IEC 60947-5-1					
RCMA423-D-2:			AC-13	AC-14	DC-12	DC-12	DC-12
Rated insulation voltage	250 V	Rated operational voltage	230 V	230 V	24 V	110 V	220 V
Overvoltage category/pollution degree	Z50 V III/3	Rated operational voltage UL	200 V	200 V	24 V	110 V	200 V
Rated impulse voltage/pollution degree	4 kV	Rated operational current	5 A	3 A	1 A	0.2 A	0.1 A
rated impulse voitage/pollution degree	4 KV	Minimum contact load (relay manufacturer's reference					A/5 V DC
Supply voltage		Environment/EMC					
RCMA423-D-1:		EMC				FN	61326-1
Supply voltage range U _S	AC 2460 V/DC 2478 V						01320 1
Operating range U _S	AC 1672 V/DC 9.694 V	Ambient temperatures:				25	. 55.00
Frequency range U _S	DC, 42460 Hz	Operating temperature					+55 °C
RCMA423-D-2:		Transport					+70°C
Supply voltage range U _S	AC/DC 100250 V	Long-term storage				-25	+55 ℃
Operating range U_S	AC/DC 70300 V	Classification of climatic conditions acc. to IEC 6072	?1 (related	d to tempe	erature and	relative hu	midity):
Frequency range Us	42460 Hz	Stationary use (IEC 60721-3-3)					3K22
Protective separation (reinforced insulation) between	(A1, A2) -(k/l, T/R) -(11, 12, 14) -(21, 22, 24)	Transport (IEC 60721-3-2)					2K11
. , , , , , , , , , , , , , , , , , , ,		Long-term storage (IEC 60721-3-1)					1K22
Voltage test according to IEC 61010-1	2.21 kV	Classification of mechanical conditions acc. to IE	C 60721	•			
Power consumption	≤ 6.5 VA	Stationary use (IEC 60721-3-3)		•			3M11
Measuring circuit		Transport (IEC 60721-3-2)					2M4
External measuring current transformer	CTUB101-CTBC20210(P)	Long-term storage (IEC 60721-3-1)					1M12
Rated insulation voltage (measuring current transformer)		Long term storage (ILC 00721 3 1)					111112
Operating characteristic acc. to DIN EN 62020 and IEC 607		Connection					
Rated frequency	02000 Hz	For UL application					
Relative uncertainty for f	02000 Hz	use 60/70°C copper conductors only					
≤ 2 Hz	035 %	· · · · · · · · · · · · · · · · · · ·					
> 2 < 16 Hz	-35+100 %	Connection type	scre	w-type te	erminal or p	oush-wire	terminal
≥ 16 ≤ 1000 Hz	035 %	Screw-type terminal					
≥ 10 ≤ 1000 Hz > 1000 ≤ 2000 Hz	±35 %	Connection properties:					
Operating uncertainty	±17,5 %	rigid/flexible		0.24	/0.22.5	mm ² (AW	G 24-12)
operating uncertainty	±17,5 70	Two conductors with the same cross section:					
Response values		rigid/flexible			0.2	1.5/0.2	1.5 mm ²
Rated residual operating current $I_{\Delta n1}$ (prewarning, AL1)	50100 % of /Δn2 (50 %)*	Stripping length				8.	9 mm
Rated residual operating current I _{Δn2} (alarm, AL2)	30 mA3 A (30 mA)*	Tightening torque, terminal screws				0.5	.0.6 Nm
Hysteresis	1025 % (15%)*	Push-wire terminals					
Specified time		Connection properties:					
Start-up delay t	010 s (0.5 s)*	rigid				mm ² (AW	. ,
Response delay t _{on1} (prewarning)	010 s (1 s)*	flexible without ferrules		(0.752.5	mm ² (AW	G 19-14)
Response delay t _{on2} (alarm)	010 s (0 s)*	flexible with ferrules			0.21.5	mm² (AW	G 24-16)
Delay on release t_{off}	099 s (1 s)*	Stripping length					10 mm
Operating time t_{ae} bei $I_{\Delta n} = 1 \times I_{\Delta n 1/2}$	099 S (1 S) ≤ 180 ms	Opening force					50 N
Operating time t_{ae} bei $I_{\Delta n} = 1 \times I_{\Delta n 1/2}$	≤ 100 IIIS	Test opening, diameter					2.1 mm
		Othor					
Response time t _{an} Recovery time t _b	$t_{an} = t_{ae} + t_{on1/2}$ $\leq 300 \text{ ms}$	Other					
necovery time to	≥ 300 IIIS	Operating mode Position of normal use			CO	ntinuous o	peration oriented
Displays, memory		Degree of protection, internal components (IEC 60529)			uispiay-	-oriented IP30
Display range, measured value AC/DC	06 A	Degree of protection, terminals (IEC 60529)					IP20
Error of indication	±17.5 %/±2 digit	Enclosure material				polyca	arbonate
Measured-value memory for alarm value	data record measured values	Flammability class					UL94V-0
Password	off/0999 (off)*	DIN rail mounting acc. to					EC 60715
Fault memory alarm relay	on/off (on)*	Screw mounting			2 x M4	 with mour	
Inputs/outputs		Documentation number					D00063
Cable length for external test/reset button	010 m	Weight					≤ 150 g
	VIVIII	()* = factory setting					
Cable lengths for measuring current transformers		() — lactory setting					
Connection CTX	1 m/2.5 m/5 m/10 m						

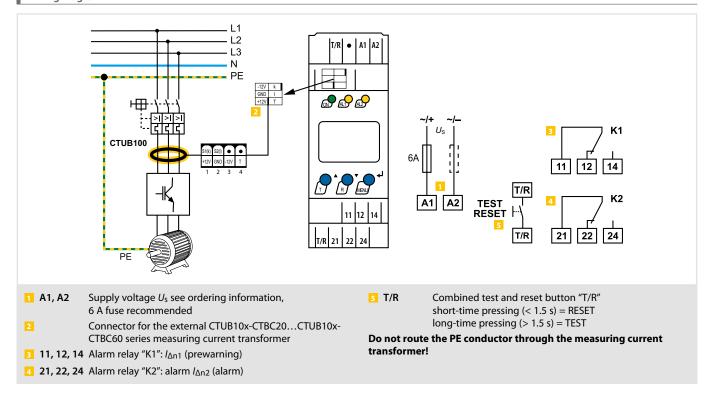
0...10 m

Dimension diagram (dimensions in mm)

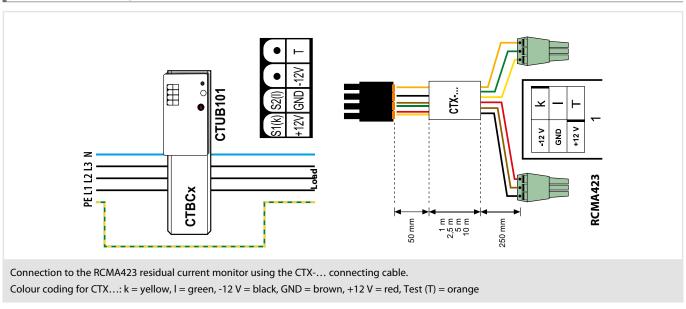
or alternatively: single wire 6 x 0.75 mm²







Connection of measuring current transformers



LINETRAXX® SmartDetect RCMS410

Four-channel residual current monitor sensitive to AC, pulsed DC, and smooth DC for earthed AC, AC/DC, and DC systems





Typical applications

· Fault or residual current monitoring in earthed systems (TN/TT)

Approvals





Device features

- AC, pulsed-DC, and smooth-DC sensitive residual-current monitor type A, type F, type B and type B+ according to IEC 62020-1 (depending on the connected measuring-current transformers and activated function modules)
- Four channels
- · Measurement modes for each channel: overcurrent (standard), undercurrent, or window mode (out-of-rangevalues). Every channel can alternatively also be configured as digital input
- One digital input, one digital input/output, and one multifunctional digital/analogue output
- · Measurement of the r.m.s. value
- Residual operating current
- Type A: 6 mA...30 A
- Type F: 6 mA...30 A (15 Hz...20 kHz)
- Type B/Type B+: 10 mA...10 A

(only with function module B "AC/DC sensitive measuring and evaluation of values")

- · Separate evaluation of AC/DC (RMS), AC and DC
- Prewarning: 10...100 % of the residual operating current
- Supply voltage 24 V DC
- · Alarm-LED for each channel
- Device status and Alarm LEDs
- Fault-memory behaviour selectable
- RS-485 with Modbus RTU
- NFC interface for device parameter setting via Bender Connect App with the device engerised or de-energised
- Continuous CT-connection monitoring
- Expanded functions available by enabling these function modules:
- Harmonic analysis (FFT)
- AC/DC sensitive measuring and evaluation of values
- Connection of Type A external transformers

Bender Connect App









Licences

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

Standards

The RCMS410 device has been developed in accordance with the following standards:

- DIN EN IEC 62020-1
- DIN EN 50155
- UL508

Further information

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



Туре	Supply		ent transformers 1 be used	Configurable	Enabled function modules *	Art. No.
, ,	voltage <i>U</i> s	Type A / Type F	Type B / Type B+	at the factory	runction modules "	
		~	(√) with function module B	Factory settings**, function modules	Customised (A, B, C can be bought later)	B84604040
RCMS410-24	RCMS410-24 DC 24 V		~	-	B (A and C can be bought later)	B84604041
		~	~	-	A, B, C	B84604042

^{*} Function modules:

Technical data

Technical data			
Insulation coordination (IEC 60664-1/IEC 60664-3)		Time response	
Rated voltage	50 V	Start-up delay t	0999 s (0 s)*
Overvoltage category	III	Response delay ton	010 s (0 s)*
Rated impulse voltage	800 V	Delay on release t _{off}	0999 s (1 s)*
Rated insulation voltage	50 V	Operating time tae	
Pollution degree	2	with 1 x $I_{\Delta n}$	≤250ms
Complements on		with 5 x $I_{\Delta n}$	40100 ms
Supply voltage		Response time tan	$= t_{ae} + t_{on}$
Connection	+,-	Recovery time tb	≤ 500 ms
Supply voltage $U_{\rm S}$	24 V DC	Response time for CT connection monitoring	≤ 10 s
Protection class of power supply unit	2 or 3	Omenation	
Permissible tolerance	-30+25 %	Operation	
Permissible ripple	5 %	Display	status LED, alarm LEDs, channel LEDs
Power consumption	≤ 2 W	Buttons	reset/test / NFC / address setting
Inrush current (5 ms)	< 10 A	Terminating resistor DIP switches	on/off (off)*
Measuring circuit		RS-485 interface	
Burden (internal)	33 Ω	Connection	А, В
Frequency range	DC, 15 Hz20 kHz	Protocol	Modbus RTU
for details	see chapter 8.1 in the manual	Baud rate	max 115.2 kbits/s (19.2 kbits/s)*
Measuring range (peak)	3 mA100 A	Parity	even, no, odd (even)*
Measuring range rms	2 mA70 A	Stop bits	1/2/auto (auto)*
Rated residual operating current		Cable length (at 9.6 kbits/s)	≤ 1200 m
Type A, type F	30 A	Device address	1247 (100+ last 2 digits of SN)*
Type B, type B+	10 A	Recommended lines, shield on one side connected to PE	
Residual operating current I∆n (main alarm, AL2) 1)		CAT6/CAT7	min AWG23
Type A, type F	6 mA30 A (30 mA)*	min. J-Y(St)Y 2 x 0.6 mm ²	twisted pair
Type B, type B+	10 mA10 A (30 mA)*		
Prewarning (AL1)	10100 % x /Δn (50 %)*	NFC interface	
Operating uncertainty	$\pm 10\%$ (at 0.55 x $I_{\Delta n}$)	Frequency	13.56 MHz
Relative response uncertainty	020 %	Transmitting power ²⁾	0 W
for Lloyds applications	050 %	Input I	
for railway applications as per EN 50121-3-2/-4 and EN 50155	050 %	_	
Hysteresis	1025 % (15 %)*	Connection	l,⊥
Fault-memory alarm messages	on/off (off)*	max. cable length (recommended)	10 m
permissible continuous residual current with	<u> </u>	external connections	potential-free contact
single-channel use	85 A	Input/output Q	
dual-channel use	60 A	Connection	Q, 1
use of three channels	49 A	max. cable length (recommended)	10 m
use of four channels	42 A	max. load	20 mA
		Low voltage level (output)	02V
Measuring-current transformers		High voltage level (output)	10 V <i>U</i> s
Connection	of CT1, CT2, CT3, CT4	External voltage (passive mode)	DC 0(U _s - 1 V)
Measuring-current transformer series		External voltage (passive mode)	DC 0(05 1 V)
Type A	CTAC, CTAS, W, WR, WS	Output M+	
Type F	CTAC	Connection	M+, 1
Type B, type B+	CTUB-CTBC, CTBS	max. cable length (recommended)	10 m
CT connection monitoring	yes	max. load	20 mA
Rated voltage $U_{\rm n}$ see measur	ing-current-transformer manual	Burden	20 11111
	ing-current-transformer manual	current output	≤ 600 Ω
For UL applications	60/75 °C copper conductors	voltage output	≥ 10 kΩ
External transformers		Tolerance with respect to final current/voltage value	±20 %
permissible continuous secondary current with		External voltage (passive mode)	DC 0U _s
single-channel use	140 A		20005
dual-channel use	100 A		
use of three channels	80 A		
use of four channels	70 A		

100...1000

Permissible number of windings

A: Harmonic analysis (FFT)

B: AC/DC sensitive measuring and evaluation of values

C: Connection of type A external current transformers

^{**} As part of the ordering process, customer-specific factory settings can be defined together with our sales department for some parameters (e.g. response values and interface settings) with which the units are delivered. The reference to a customer-specific configured variant can then be found on the packaging of the individual product as well as in the delivery note (the changed parameters are listed there, the assignment is made via the item number in the delivery note and the serial number of the unit).

Technical data (continuation)

Connections	
terminals	plug-in screw-type terminals
Terminal series	Phoenix Contact MC 1,5/ -ST-3,5 BK
Connection properties	
rigid	0.141.5 mm ²
flexible, without plastic sleeve	0.251.5 mm ²
flexible, with plastic sleeve	0.250.5 mm ²
Stripping length	7 mm
Tightening torque	0.220.25 Nm
Conductor cross section AWG	2816

_		-					
ы	MC	/I-n	Wir	'nn	m	an	t

EMC	DIN EN IEC 62020-1
Operating temperature	-40+70 ℃
Transport	-40+85 ℃
Long-time storage	-40+70 ℃

Classification of climatic conditions acc. to IEC 60721 (related to temperature and relative humidity):

Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22

Classification of mechanical conditions acc. to IEC 60721

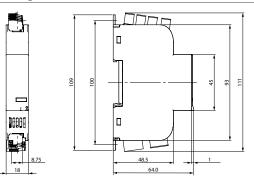
Stationary use (IEC 60721-3-3)	
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12

Other

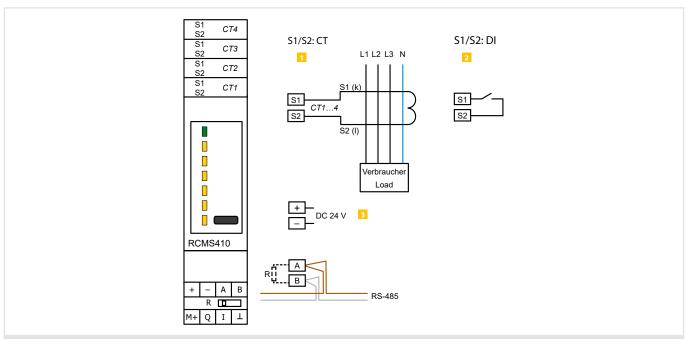
Operating mode	continuous operation
Mounting	vertical
Degree of protection (DIN EN 60529)	
internal components	IP30
terminals	IP20
Enclosure material	polycarbonate
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Documentation number	D00424
Weight	< 65 g

- * Factory setting
- 1) The requirements of the respective standards are only met with a response value from 30 mA to 9.9 A
- ²⁾ EMC influences may lead to communication interruptions at the NFC interface

Dimension diagram (dimensions in mm)



Wiring diagram



1 S1/S2 CT Measuring-current-transformer connection

2 S1/S2 DI CT1...4 as digital input

3 +24 V

The device must be operated with a voltage of +24 V DC. The connection is made at the bottom side of the device.

- The RCMS410 and all connected CTUB102-CTBCxx devices must be supplied from the same mains part.
- Ensure that the 24-V-DC supply is connected correctly. Otherwise the RCMS410 can be destroyed!
- For UL applications:

Use 60/75 °C copper conductors only!

Only power supply units of protection class 2 or 3 shall be used.

LINETRAXX® RCMS460-D/-L - RCMS490-D/-L

Multi-channel AC, pulsed DC and AC/DC sensitive residual current monitors for earthed AC, DC and AC/DC systems (TN and TT systems)



Typical applications

- · Measuring and evaluating residual, fault and rated currents of loads and installations in the frequency range of
- -0...2000 Hz (CTUB100 or CTBS25 series measuring current transformers),
- 42...2000 Hz (CTAC..., WR..., WS..., WF... series measuring current transformers)
- · Monitoring of currents regarded as fire hazards in flammable atmospheres
- EMC monitoring of TN-S systems for "stray currents" and additional N-PE connections
- · Monitoring of N conductors for overload caused by harmonics
- · Monitoring of PE and equipotential bonding conductors to ensure they are free of current
- · Residual current monitoring of stationary electrical equipment and systems to determine test intervals which meet practical requirements in compliance with the DGUV regulation 3 (German Social Accident Insurance).
- · Personnel and fire protection due to rapid disconnection
- · Monitoring of digital inputs

Device features

- Optional AC, pulsed DC or AC/DC sensitive measurement by selecting the respective measuring current transformer for each channel
- True r.m.s. value measurement
- 12 measuring channels per device for residual current measurement or digital input
- Up to 90 RCMS... monitors, up to 1080 measuring channels in the system
- · Fast parallel scanning for all channels
- · Response ranges: 10 mA...10 A (0...2000 Hz), 6 mA...20 A (42...2000 Hz), 100 mA...125 A (42...2000 Hz) RCMS...-D4
- · Preset function
- Adjustable time delays
- The frequency response characteristics can be set for the protection of persons, fire and plant protection
- History memory with date and time stamp for 300 data records
- Data logger for 300 data records/channel
- · Analysis of the harmonics, DC, THF
- · Two alarm relays with one changeover contact each
- Device version RCMS490 with one alarm contact per channel
- N/O or N/C operation and fault memory selectable
- Connection external test/reset button
- Backlit graphical display (7-segment display) and alarm LEDs
- · Data exchange via BMS bus
- Password protection for device setting
- · Continuous CT connection monitoring
- · RoHS compliant

Standards

The LINETRAXX® RCMS460/490 series complies with the requirements of the device standards:

• DIN EN 62020 (VDE 0663)

Approvals







UL508 - Standard for Industrial Control Equipment CSA C22.2 No. 14-13 - Industrial Control Equipment UL File number E173157 (for all RCMS460/RCMS490)

UL1053 - Standard for Safety Ground-Fault Sensing and Relaying Equipment UL File number E478610

(Only for B94053006 and solely in combination with Marina Guard MG-1.3 and MG-T.3. If necessary, other applications are to be evaluated separately after consulting the manufacturer.)

Further information

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



Ordering information RCMS460/490-D

Туре	Type Supply voltage <i>U</i> ₅		Differential measurement method		Alarm relay per	4 channels for load current	Art. No.	
Турс	Supply voltage os	pulsed DC sensitive AC/DC sensitive		relay for all channels	channel	measurement	711 11 11 11 11	
RCMS460-D-1	AC 1672 V, 50/60 Hz / DC 1694 V	6 mA20 A 10 mA10 A					B94053001	
RCMS460-D-2	AC 70276 V, 50/60 Hz / DC 70276 V		2x1		_	B94053002		
RCMS460-D4-1	AC 1672 V, 50/60 Hz / DC 1694 V			. =	-	100 4 125 4	B94053009	
RCMS460-D4-2	AC 70276 V, 50/60 Hz / DC 70276 V					100 mA125 A	B94053010	
RCMS490-D-1	AC 1672 V, 50/60 Hz / DC 1694 V		6 IIIA20 A	10 MA 10 A	changeover contact			B94053005
RCMS490-D-2	AC 70276 V, 50/60 Hz / DC 70276 V					12 x 1	_	B94053006
RCMS490-D4-1	AC 1672 V, 50/60 Hz / DC 1694 V					N/O contact	100 1 125 1	B94053011
RCMS490-D4-2	AC 70276 V, 50/60 Hz / DC 70276 V]				100 mA125 A	B94053012	

Ordering information RCMS460/490-L

Туре	Supply voltage <i>U</i> ₅	Current me	asurement	Common alarm relay	Alarm relay per	Art. No.	
Турс	Supply voltage of	pulsed DC sensitive AC/DC sensitive		for all channels	channel	AI C. NO.	
RCMS460-L-1	AC 1672 V, 50/60 Hz / DC 1694 V						B94053003
RCMS460-L-2	AC 70276 V, 50/60 Hz / DC 70276 V	CA 20.4	10 4 10 4	2 x 1	_	B94053004	
RCMS490-L-1	AC 1672 V, 50/60 Hz / DC 1694 V	6 mA20 A	6 MA20 A	10 mA10 A	changeover contact	12 1 N/O contact	B94053007
RCMS490-L-2	AC 70276 V, 50/60 Hz / DC 70276 V				12 x 1 N/O contact	B94053008	

Accessories

Description	Art. No.
XM460 mounting frame, 144 x 72 mm	B990995
XM490 mounting frame, 198 x 72 mm	B990996

Suitable system components

		Type of			
Description	Version	construction	Type	Art. No.	Page
		circular	CTAC	B981100	342
	pulsed DC sensitive	rectangular	WRS(P)	B9117	349
Massuring surrent transformers	puiseu DC sensitive	split-core	WS	B980806	356
Measuring current transformers		flexible	WF	B780802	360
	AC/DC consisting	circular	CTUB100	B781200	345
	AC/DC sensitive		CTBS25	B98120060	354
Connecting cables for Measunging current transformers CTUB100 series	-	-	CTXS	B9811009	345
Condition Monitor	with integrated gateway: Bender system/Ethernet	-	COM465IP	B950610	394
Condition Monitor	with display and an integrated gateway	-	CP9I	B9506103	408
RS-485 repeater –		_	DI-1DL	B95012047	389
Power supply unit	for supplying up to six CTUB100 series measuring current transformers	-	STEP-PS	B940531	381
Alarm indicator and test combination	acc. DIN VDE 0100-710	_	MK2430	B951000	418

	Device features/d	istinguishing features	RCMS460-D	RCMS460-L	RCMS490 -D	RCMS490-L
	Paran	neter setting function	>	-	~	-
		Master/Slave	~	~	~	~
		Address range	190	190	190	190
	Measur	ing channels per device	12	12	12	12
	CTAC, WRS(P), W measuri	VS, CTUB100, CTBS25, WF series ng current transformers	>	>	~	~
		CT monitoring	~	~	~	~
		AC/DC sensitive 02000 Hz (Type B)	10 mA10 A	10 mA10 A	10 mA10 A	10 mA10 A
	Rated residual operating	pulsed DC sensitive 422000 Hz (Type A)	6 mA20 A	6 mA20 A	6 mA20 A	6 mA20 A
Measuring circuit	current /∆n2 (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 op	erating current /Δn1 (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	Alar	m relay per channel	-	-	12 x 1 N/O contact	12 x 1 N/O contact
	Sta	rt-up delay 099 s	>	>	~	~
Time	Response de	elay tv, adjustable 0999 s	>	>	~	~
response	Operating time at	$I_{\Delta n} = 1 \times I_{\Delta n2} \le 180 \text{ ms}$	>	>	~	~
	operating time at	/ _{Δn} = 5 x / _{Δn2} : ≤ 30ms	>	>	~	~
	Analysis of	the harmonics (/a, DC, THF)	>	*	~	*
	History n	nemory 300 data records	>	_	~	_
	Data logger 1	for 300 data records/ channel	~	_	~	_
Displays,	Internal clock		>	_	~	_
memory		Password	>	-	~	-
	Language Eng	lish, German, French, Swedish	>	-	~	_
	Back	lit graphics LC display	>	-	~	_
	7-segm	ent display and LED line	-	>	-	~

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

Technical data

664-3 for the versions:
DC 2475 V/AC 2460 V (AC/DC ±20 %)
DC, 50/60 Hz
100 V
2.5 kV/3
III
(A1, A2) - (k1, Ik12, R, T/R, T, A, B)
1.344 kV
250 V
4 kV/3
III
(A1, A2), (k1, Ik12, R, T/R, T, A, B) -
, C22, C24), (11,14), (21,24), (31,34), (41,44),
,84), (91,94),(101,104), (111,114), (121,124)
1, 24) - (31, 34) - (41, 44) - (51, 54) - (61, 64)
2.21 kV
250 V
6 kV/3
III
(C11, C12, C14) - (C21, C22, C24) -
) - (41, 44, 51, 54, 61, 64) - (71,74) - (81,84) -
(91,94) - (101,104) - (111,114) - (121,124)
3.536 kV

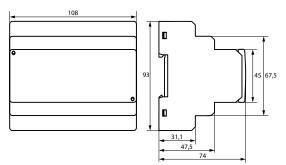
b) RCMS4x0-D2		
Supply voltage $U_{\rm S}$	AC/DC 100240 V (-20+15 %)	
Supply voltage frequency		DC, 50/60 Hz
Rated insulation voltage		250 V
Rated impulse voltage/pollution degree		6 kV/3
Overvoltage category		III
Protective separation (reinforced insulat	ion) between	(A1, A2) - (k1, Ik12, R, T/R, T, A, B),
(C11	, C12, C14), (C21	, C22, C24), (11,14), (21,24), (31,34), (41,44),
(51,54), (61,	,64), (71,74), (8 ⁻	1,84), (91,94),(101,104), (111,114), (121,124)
Protective separation (reinforced insulat	ion) between	(C11, C12, C14) - (C21, C22, C24) -
	(11, 14, 21, 2	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 degree		4 kV/3
Overvoltage category		III
Basic insulation between:	k1, lk12, R,	T/R, T, A, B) - (C11, C12, C14), (C21, C22, C24)
Basic insulation between:	(11, 14) - (2	1, 24) - (31, 34) - (41, 44) - (51, 54) - (61, 64)
Voltage test acc. to IEC 61010-1		2.21 kV
-		

Measuring circuit		Cable lengths for CTAC, WR, WS, WF			
External measuring current transformers	CTAC, WR, WS, WF series (Type A), CTUB100, CTBS25 series (Type B)	Single wire ≥ 0.75 mm ²			
	Single wire, twisted $\geq 0.75 \text{ mm}^2$ Shielded cable $\geq 0.5 \text{ mm}^2$				
CT monitoring					
Rated burden RCMSD/-L	68 Ω	Cable (shielded, shield connected to terminal I at o			
Rated burden RCMSD4/-L4 (channels 912	•				
Rated insulation voltage (measuring current tran Operating characteristics acc. to IEC/TR 60755	nsformer) 800 V type A and type B	Cable lengths for CTUB100 and CTBS25 series			
	ng on measuring current transformer series (type A)*	Single wire ≥ 0.75 mm ²			
Rated frequency	02000 Hz (Type B) / 422000 Hz (type A)	Connection			
Cut-off frequency	none, IEC, 50 Hz, 60 Hz (none)*	Switching elements			
Measuring range RCMSD/-L	030 A (measuring current transformer type A)	Number			
	020 A (measuring current transformer type B)	2 x 1			
	Crest factor up to 10 A = 4, up to 20 A = 2	Operating principle			
Measuring range RCMS \dots -D4/-L4 (channels 9 \dots		Electrical endurance under rated operating conditi			
Rated residual operating current l∆n2 (alarm)	10 mA10 A (type B)	Contact data acc. to IEC 60947-5-1			
	6 mA20 A (type A)	Utilisation category			
Rated residual operating current $I_{\Delta n2}$ (alarm) for	(100 mA overcurrent)*	Rated operational voltage			
nated residual operating current 1002 (alann) for	100 mA125 A (16 A overcurrent)*	Rated operational current (common alarm relay)			
Rated residual operating current $I_{\Delta n1}$ (prewarning		Rated operational current (alarm relay)			
	min. 5 mA (50 %)*	Minimum contact rating			
Digital input	1: < 100 Ω	Environment/EMC			
	$0: > 250 \Omega$	EMC			
Preset for alarm	/∆ x factor 199 (3)*	Operating temperature			
	Offset 020 A (30 mA)*	Classification of climatic conditions acc. to IE			
Preset for digital input	0/1 (1)*	(related to temperature and relative humidity)			
Relative uncertainty RCMSD/-L	020 %**	Stationary use (IEC 60721-3-3			
Relative uncertainty RCMSD4/-L4 (channels		Transport (IEC 60721-3-2)			
Hysteresis Factor for additional CT	240% (20 %)*	Long-term storage (IEC 60721-3-1)			
Factor for additional C1 Number of measuring channels (per device/systo	/110; x 1250 (x 1)* em) 12/1080	Classification of mechanical conditions acc. t			
number of measuring channels (per device/systi	12/1000	Stationary use (IEC 60721-3-3)			
Time response		Transport (IEC 60721-3-2)			
Start-up delay t (start-up) per device	099 s (0 ms)*	Long-term storage (IEC 60721-3-1)			
Response delay t _{on} per channel	0999 s (200 ms)*	Connection			
Delay on release t _{off} per channel	0999 s (200 ms)*	For UL applications:			
Operating time t_{ae} at $I_{\Delta n} = 1 \times I_{\Delta n 1/2}$	≤ 180 ms	Use copper wire only!			
Operating time t_{ae} at $I_{\Delta n} = 5 \times I_{\Delta n 1/2}$ Response time t_{an} for residual current measuren	$\leq 30 \text{ ms}$	Use 60/70 °C copper conductors only!			
Operating time t _{ae} digital inputs	tent $t_{an} = t_{ae} + t_{on1/2}$ $\leq 3.5 \text{ s}$	Connection			
Scanning time for all measuring channels (reside		Connection properties:			
Recovery time t_b	500600 ms	Rigid/flexible/conductor sizes			
n. 1		Multi-conductor connection (2 conductors with th			
Displays, memory	2 22 4 (577 4)	Rigid/flexible			
Measured value display range RCMSD / -L	030 A (CT Type A)	Stripping length			
Display range, measured value RCMSD4/-L4	020 A (CT type B)	Tightening torque			
Display range, measured value KCMSD4/-L4 Error of indication	(channels 912) 0125 A (CT type A) ± 10 %	Other			
LEDs	ON/ALARM (RCMSD)	Operating mode			
	/ALARM / measuring channel 112 (RCMSL)	Mounting			
LC display	backlit graphical display (RCMSD)	Degree of protection, internal components (IEC 60			
7-segment display	2 x 7.62 mm (RCMS4L)	Degree of protection, terminals (IEC 60529)			
History memory	300 data records (RCMSD)	Enclosure material			
Data logger 300	data records per measuring channel (RCMSD)	Flammability class			
Password	off / 0999 (off)*	Screw mounting			
Language		DIN rail mounting acc. to Software version measurement technique			
German, English, French	D256 V2.3x	Software version display			
German, English, Swedish	D339 V2.3x	RCMS4L			
German, English, Italian	D403 V2.3x	German, English, French			
Fault memory alarm relay	on/off (off)*	German, English, Swedish			
Inputs/outputs		German, English, Italian			
Test/reset button	internal/external	Power consumption			
Cable length for external test/reset button	010 m				
		Documentation number			
Interface	P6 102 2211	Weight			
Interface/protocol	RS-485/BMS				
•					
Baud rate	9.6 kbit/s	()* factory setting			
Baud rate Cable length	9.6 kbit/s 01200 m	()* factory setting			
Baud rate	9.6 kbit/s 01200 m	()* factory setting** In the frequency range of < 15 Hz, the relati and 100 %.			

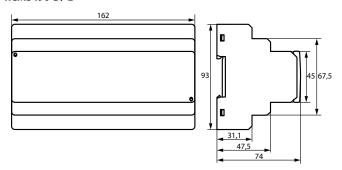
Cabla lawatha fay CTAC WD WC WF						
Cable lengths for CTAC, WR, WS, WF. Single wire ≥ 0.75 mm ²	series n	neasuring	current		1ers 01 m	
Single wire, twisted $\geq 0.75 \text{ mm}^2$)10 n	
Shielded cable $\geq 0.5 \text{ mm}^2$)40 n	
Cable (shielded, shield connected to terminal I at o	no and mi	ict not ho o	orthod)		7 4 0 II	
cable (sillelded, silleld conflected to terminal ratio	ne enu, mi			-Y(St)Y mir	n. 2 x 0.8	
Calda law other for CTUPAGG and CTDCOT and						
Cable lengths for CTUB100 and CTBS25 series Single wire ≥ 0.75 mm ²	measurın	g current	transtorr)10 n	
Single wire ≥ 0.75 mm Connection		!				
Connection	pii	ug-in conne	ctor, reco	mmenaea	CIXS	
Switching elements						
Number			,	contact (R		
	2 x 1 changeover contact, 12 x 1 N/O contact (RCMS490 NC or N/O operation (N/O operation)					
Operating principle			operatio	n (N/U ope		
Electrical endurance under rated operating condition	ons, numbe	er or cycles			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 \	
Rated operational current (common alarm relay)	5 A	3 A	1 A	0.2 A	0.1	
Rated operational current (alarm relay)	2 A	0.5 A	5 A	0.2 A	0.17	
Minimum contact rating				10 m	A/5 V D(
Environment/EMC						
EMC					N 62020	
Operating temperature				-25	.+ 55 °(
Classification of climatic conditions acc. to IEC	60721					
(related to temperature and relative humidity)					21/2	
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			2114	
Stationary use (IEC 60721-3-3)					3M1′	
Transport (IEC 60721-3-2)					2M ²	
Long-term storage (IEC 60721-3-1)					1M12	
Connection						
For UL applications:						
Use copper wire only!						
Use 60/70 °C copper conductors only!						
Connection				screw t	erminal	
Connection properties:				2		
Rigid/flexible/conductor sizes			.22.5 1	mm²/AWG	2412	
Multi-conductor connection (2 conductors with the	same cros	s section):	0.2	1.5/0.3	1 5	
Rigid/flexible			0.2	1.5/0.2		
Stripping length Tightening torque					9 mm 0.6 Nm	
				0.5	.0.0 1111	
Other						
Operating mode			CO	ntinuous o	•	
Mounting				display-	oriente	
Degree of protection, internal components (IEC 605	529)				IP3	
Degree of protection, terminals (IEC 60529)					IP20	
Enclosure material					arbonate	
Flammability class					UL94V-(
Screw mounting					2 x M	
DIN rail mounting acc. to					EC 6071	
Software version measurement technique				υ2.	33 V2.60	
Software version display				0.5	16 1/2 2	
RCMS4L					16 V2.3	
German, English, French					56 V2.3	
German, English, Swedish					39 V2.3	
German, English, Italian					03 V2.3	
Power consumption				≤10 VA (RI		
Documentation number			:	≤12 VA (R		
Documentation number Weight				. 300 a (DC	D00063	
Weight				300 g (RC		
			=	≤ 510 g (R	CN12440	

ative uncertainty is between -35 %

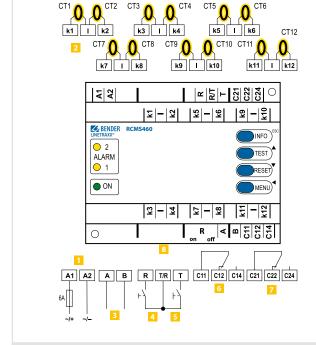
RCMS460-D/-L



RCMS490-D/-L

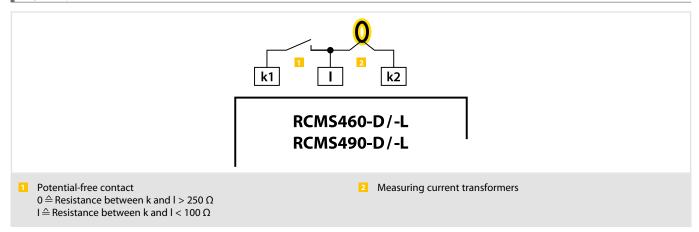


Wiring diagrams

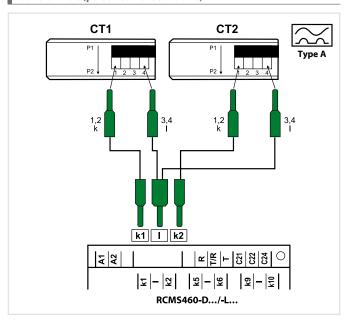


k1 | k2 k3 | k4 k5 I k6 11 14 21 24 31 34 41 44 51 54 61 64 k7 | k8 k9 I k10 k11 | I | k12 71 74 81 84 91 94 101 104 111 114 121 124 | \[\begin{array}{c} | \begin{a **₩** BENDER O 2 ALARM TEST RESET ON MENU) 0 A1 A2 A B R T/R T C11 C12 C14 C21 C22 C24

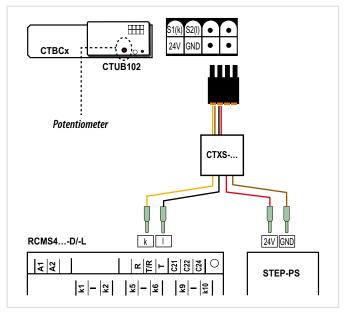
- 1 A1, A2 Connection of supply voltage U_s (see ordering information): we recommend the use of 6 A fuses.
- 2 k1, l... CT1...CT12. Either Type A or Type B measuring current k12, l transformers can be selected for each measuring channel. Six CTUB100 series measuring current transformers require one STEP-PS power supply unit. The channels k9...k12 of the device versions RCMS460-D4/-L4 require the connection of Type A measuring current transformers.
- BMS bus (RS-485 interface with BMS protocol) 3 A, B
- External reset button (N/O contact). The external reset 4 R, T/R buttons of several devices must not be connected to one another.
- 5 T, T/R External test button (N/O contact). The external test buttons of several devices must not be connected to one
- 6 C11, C12, Common alarm relay K1: Alarm 1, common message for C14 alarm, prewarning, device error.
- C21, C22, Common alarm relay K2: ALARM 2, common message for C24 alarm, prewarning, device error.
- Activate or deactivate the terminating resistor of the BMS 8 Ron/off bus (120 Ω).
- 9 CT Measuring current transformers (CTAC..., CTBS25, CTUB100, WR..., WS..., WF... series)



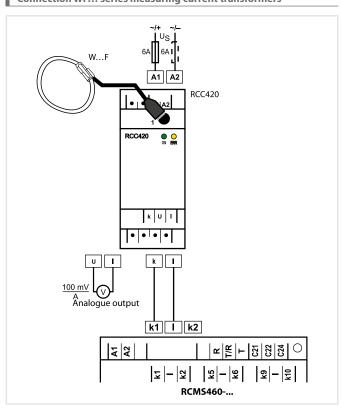
Connection CTAC..., WR...S(P), WS... series measuring current transformers (pulsed current sensitive)



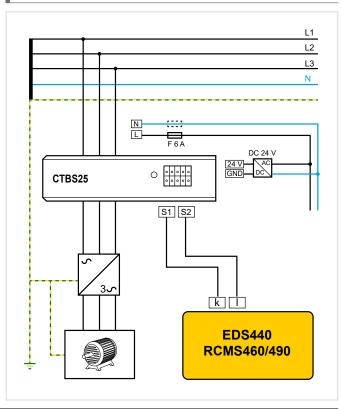
Connection CTUB100 series measuring current transformer (AC/DC current sensitive)

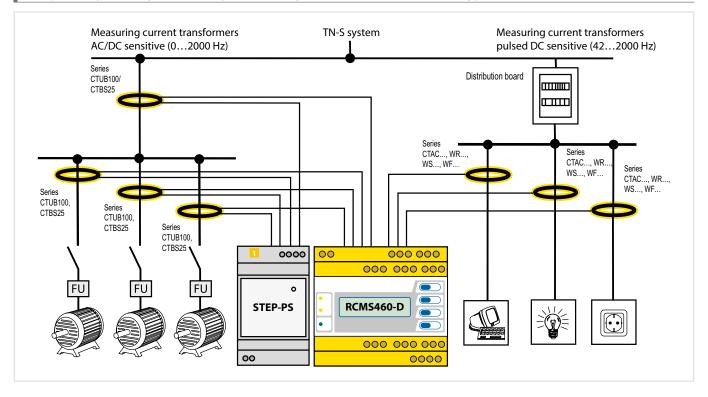


Connection WF... series measuring current transformers

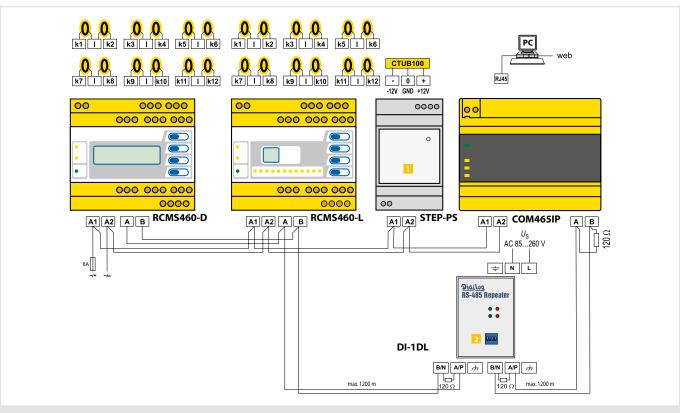


Connection CTUB100 series measuring current transformer (AC/DC current sensitive)





Example for a system design of – standard system consisting of an RCMS460-D and RCMS460-L and a protocol converter COM460IP



Note:

- When using AC/DC current sensitive measuring current transformers of the CTUB100 and CTBS25 series , a DC 24 V power supply unit (e.g. STEP-PS series) is required to supply the measuring current transformers with voltage. For this purpose, the technical data of the respective measuring current transformer series must be observed.
- The DI-1DL repeater only is required when the length of the cable exceeds 1200 m.

LINETRAXX® RCMS150 series

Residual current monitor type B with integrated measuring current transformers for unearthed AC/DC systems (TN and TT systems)



Typical applications

- · Residual current monitoring system for current outlets and final circuits
- · Monitoring residual currents of stationary electrical installations and equipment to determine practice-oriented test intervals in accordance with DGUV Regulation 3 (German Social Accident Insurance) and BetrSichV (Occupational Safety and Health Regulation)
- EMC monitoring of TN-S systems for "stray" currents and additional unwanted N-PE bridges
- · Monitoring currents regarded as fire hazards in flammable atmospheres
- Monitoring the PE to ensure that there is no current flow

Device features

- · Continuous residual current monitoring in compliance with DGUV Vorschrift 3 (German Social Accident Insurance Regulation 3)
- AC/DC sensitive residual current monitor type B with 6 channels K1...6 (each channel features 2 measuring channels: 1 x r.m.s., 1 x DC)
- · Ideal for applications with space limitations
- · Easy DIN rail or screw mounting to standard distribution panels
- 2 separately adjustable response values (RMS or DC) per channel
- · Continuous self monitoring
- Fully shielded measuring current transformers to avoid external influences due to magnetic fields that may cause disturbances
- Compatible with Bender gateways of type COM465IP, CP9...
- RCMS150 (RS-485 interface with BMS protocol)
 - In the system network compatible with RCMS460/490
 - Address range 2...90, can be set directly on the unit
- Up to 89 RCMS150 can be used on the bus
- RCMS150-01 (RS-485 interface with Modbus RTU protocol)
 - In the system network, compatible with other Modbus RTU-capable device series from Bender, including the RCMB300 series and RCMB13...-01
- Address range 1... 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

Туре	Supply voltage U₅	Protocol	Art. No.
RCMS150	DC 24 V	BMS	B94053025
RCMS150-01	DC 24 V	Modbus RTU	B94053026

Accessories

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

Suitable system components

Description	RCMS 150	RCMS 150-01	Туре	Art. No.	Page
Power supply	~	<	STEP-PS	B940531	381
Condition Monitor with integrated gateway	~	>	COM465IP ¹⁾	B95061065	394
Condition Monitor	~	>	CP9I	B9506103	408
RS-485 repeater	~	<	DI-1DL	B95012047	389
Residual current monitor ²⁾			RCMS460-D	B940530	176
		_	RCMS490-D	B940530	176

¹⁾ from function module C

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

rechnical data	
Insulation coordination according to IEC 6066	4-1
The data are valid for the monitored primary circuit to	the output circuit
Primary circuit Pi	imary conductors routed through the transforme
Output circuit	(+, -, A, B
Rated insulation voltage	300 \
Overvoltage category	II
Rated impulse withstand voltage monitored circuit/	output circuit 4 kN
Range of use	≤ 2000 m AMSI
Rated insulation voltage	250 \
Pollution degree	3
Insulation	
To achieve double insulation (DI) for overvolta	ge category III, insulated primary
conductors with sufficient rated voltage must	be used on the application side.
BI	Overvoltage category II
DI	Overvoltage category
Voltage test acc. to IEC 61010-1	AC 2.2 k
Power supply	
	DC 24 \
Nominal supply voltage $U_{ m S}$ with galvanic separation Operating range $U_{ m S}$	±20 %
Power consumption	±20 9
rower consumption	< 4 V
Residual current measuring range	
Frequency range	02000 H
Measuring range	±500 m/
Resolution measured value	1 % of the set response value
Response values	
Residual current I _{ΔN2}	RMS 0300 mA (30 mA)
Residual current / _{DN2}	DC 3300 mA (6 mA)
Ratio I _{ΔN2} RMS/I _{ΔN2} DC	0.2
Prewarning I _{AN1} RMS/DC	50100 % of I _{ΔN2} (50 %)
Response tolerance I _{ΔN2}	2000
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	
$t_{ m off}$ DC	0600 s (1 s)
Indication (LEDs)	
ON	graan
ALARM K16	greer yellov
ALARIVI KI0	yellov
Interface	
Interface/protocol	RS-48:
Connection	terminals A/I
Cable	Shield on one side connected to Pl
recommended:	CAT6/CAT7 min. AWG 23
alternative:	twisted pair, J-Y(St)Y min. 2x0,8
Bus terminating resistor external	(2x) 120 Ω (0.25 W
Protocol	BMS
	≤ 1200 n
Cable length	
Cable length Device address	290 (2)
3	
Device address	290 (2) ³ Modbus RTU ≤ 1200 m

Environment/EMC	
EMC	
Immunity	IEC 62020-1
Emission	IEC 62020-1
Operating temperature	-25+70 ℃
for UL applications	-25+65 °C
Classification of climatic conditions acc. to IEC	60721 (related to temperature and relative humidity):
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions acc.	to IEC 60721:
Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12
Connection	
Connection type	pluggable double push-wire terminal
Connection properties:	

·	 •	 v	
_			-

connection type	piuggabie double push-wire terminal
Connection properties:	
rigid, flexible/conductor sizes	0.21.5 mm ² (AWG 24-16)
Multi-conductor connection (2 conductors with the sar	me cross section):
rigid	0.21.5 mm ²
flexible	0.21.5 mm ²
flexible with ferrule without plastic sleeve	0.251.5 mm ²
flexible with ferrule with plastic sleeve	0.250.75 mm ²
Stripping length	10 mm

Other

	
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

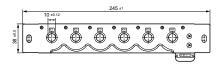
Diameter cable gland	10 mm
Load current	32 A

Bus parameter

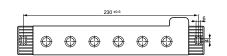
Alarm	threshold value exceeded, system fault
Measured value	measured value, DC component, RMS (resolution 0.1 mA)
Times	response delay, delay on release, start-up delay

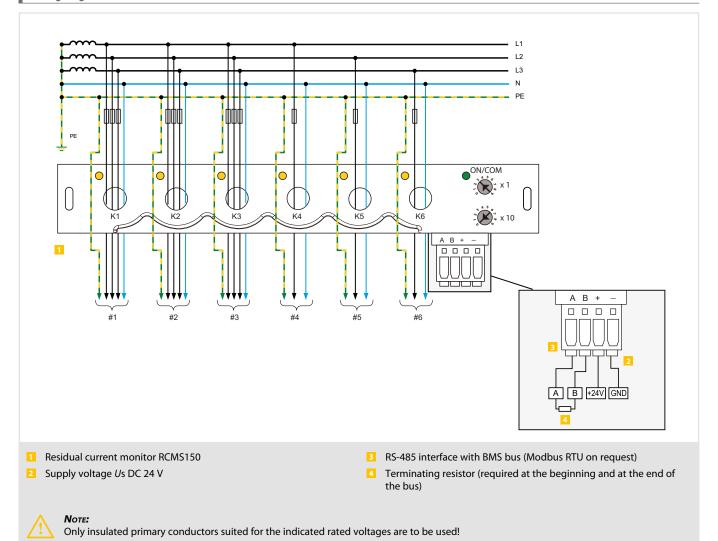
()* = factory settings

Dimension diagrams (dimensions in mm)









LINETRAXX® MRCDB423

Modular residual current device type B for additional protection (protection against indirect contact) in earthed systems (TN and TT systems)



Typical applications

against indirect contact) in earthed systems (TN and TT systems)

• Additional protection (protection

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

Туре	Supply voltage U _S 1)	Response range I∆n	Rated frequency	Art. No.
MRCDB423-D-1	DC 9.694 V / AC 42460 Hz, 1672 V	20 m A 2 A	30 mA3 A 02000 Hz	B94043055
MRCDB423-D-2	DC 70300 V / AC 42460 Hz, 70300 V	SU IIIAS A		B94043056

¹⁾ Absolute values of the voltage range

External measuring current transformers

Туре	CT diameter	Shield	Art. No.	Page
CTUB101-CTBC20	a 20	-	B78120010	345
CTUB101-CTBC20P	ø 20	>	B78120020	345
CTUB101-CTBC35	ø 35	-	B78120012	345
CTUB101-CTBC35P		~	B78120022	345
CTUB101-CTBC60	ø 60	-	B78120014	345
CTUB101-CTBC60P		~	B78120024	345

Туре	CT diameter	Shield	Art. No.	Page
CTUB101-CTBC120	~ 120	-	B78120016	345
CTUB101-CTBC120P	ø 120	~	B78120026	345
CTUB101-CTBC210	~ 210	-	B78120018	345
CTUB101-CTBC210P	ø 210	~	B78120028	345

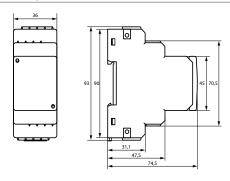
MRCDB423-D-1:	
Rated voltage	100 \
Overvoltage category/pollution degree	100 \
Rated impulse voltage	2.5 k\
	2.3 KI
MRCDB423-D-2:	0.50
Rated voltage	250 \
Overvoltage category/pollution degree	III/2
Rated impulse voltage	4 k)
Protective separation (reinforced insulation) between	(A1, A2) - (k, l, T/R) - (11, 12, 14) - (21, 22, 24
Voltage tests acc. to IEC 61010-1	2.21 k\
Supply voltage	
MRCDB42-D-1:	
Supply voltage range Us	AC 2460 V/DC 2478 \
Operating range supply voltage $U_{\rm S}$	AC 1672 V/DC 9.694 \
Frequency range U _S	DC, 42460 H
MRCDB423-D-2:	
Supply voltage range $U_{\rm S}$	AC/DC 100250 \
Operating range supply voltage $U_{\rm S}$	AC/DC 70300 \
Frequency range U_S	DC, 42460 H
Power consumption	≤ 6.5 V/
Measuring circuit	
External measuring current transformer type	CTUB101-CTBCxx(P); CTUB101-CTBCxxx(P)
Rated voltage (measuring current transformer)	800 \
Operating characteristic type B in accordance with IEC 60	
Rated frequency	02000 H
Operating uncertainty	035 %
Response values	
Rated residual operating current I∆n1	50100 % of I _{Δn2} (50 %)*
Rated residual operating current /∆n2	30 mA3 A (30 mA)
Time response	
Start-up delay <i>t</i>	(1 s) ^s
Response delay t _{on1}	010 s (1 s)
Response delay ton2	010 s (0 s)
Operating time t_{ae} at $I_{\Delta n} = 1 \times I_{\Delta n 1/2}$	≤ 180 m:
Operating time t_{ae} at $I_{\Delta n} = 5 \times I_{\Delta n 1/2}$	≤ 23 m:
Response time t _{an}	$t_{\rm an} = t_{\rm ae} + t_{ m on1/2}$
Recovery time t _b	≤ 300 m:
Displays, memory	
Display range measured value AC/DC	06
Error of measured value indication	±17.5 %/±2 digit
Measured-value memory for alarm value	Data record measured value
measured value memory for diarm value	
Password	off/0999 (on)

Inputs/outputs Cable length for external test/reset but	ton				03 m
Cable length for measuring current trai					03 m
	isionner connection				05 111
Switching elements			21	d	
Number of switching elements Operating principle			2 X T C	changeove	
Electrical endurance, number of cycles				N/C 0	peratior 10000
					10000
Contact data acc. to IEC 60947-5-1:	AC-13	AC-14	DC 13	DC 12	DC 12
Utilisation category Rated operational voltage	230 V	230 V	DC-12 24 V	DC-12 110 V	DC-12 220 V
Rated operational voltage UL	230 V 200 V	200 V	24 V	110 V	200 V
Rated operational current	200 V	200 V	1 A	0.2 A	0.1 A
Minimum contact rating				nA at AC/D	
			• • • •		
Environment/EMC EMC	EC 60947-2 annex M (li	mit value	class A acc	cording to (CICDD11
Operating temperature	IEC 00947-2 dilliex IVI (II	iiiit value	Class A acc		+55 °(
Transport					+70°(
Long-term storage					.+55°C
	4- IFC (0731 /valata)	J 4 4			
Classification of climatic conditions a Stationary use (IEC 60721-3-3)	cc. to IEC 00/21 (related	ı to tempe	rature and	relative Hui	3K22
Transport (IEC 60721-3-2)					2K11
Long-term storage (IEC 60721-3-1)					1K22
Classification of mechanical condit	ions acc to IEC 60721				
Stationary use (IEC 60721-3-3)	10113 acc. to 12c 00721				3M11
Transport (IEC 60721-3-2)					2M4
Long-term storage (IEC 60721-3-1)					1M12
Connection					
Connection type				rau tuna t	orminal.
Connection type Connection properties:			SC	rew-type t	emmais
Rigid/flexible		0.2 4	/0.2 2.5	mm² (AW	G 2/L-12)
Multi-conductor connection (2 conduct	ors with the same cross		/0.22.3	IIIIII (AW	u 24-12)
Rigid/flexible	ors with the sume cross	section).	0.2	1.5/0.2	1.5 mm
Stripping length			012111		9 mm
Tightening torque					.0.6 Nm
Other .					
Operating mode			co	ntinuous o	peration
Position of normal use				display-	
Degree of protection, internal compone	ents (IEC 60529)				IP30
Degree of protection, terminals (IEC 60					IP20
Enclosure material	•			polyca	arbonate
Flammability class					UL94V-0
DIN rail mounting acc. to				IE	C 60715
Screw fixing			2 x M4	with moun	nting clip
Documentation number					D00396
Woight					~ 150 a

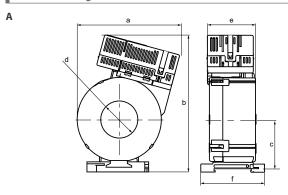
()* = Factory setting

Weight

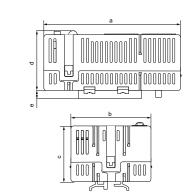
≤ 150 g



Dimension diagram CTUB10...-CTBC...



C

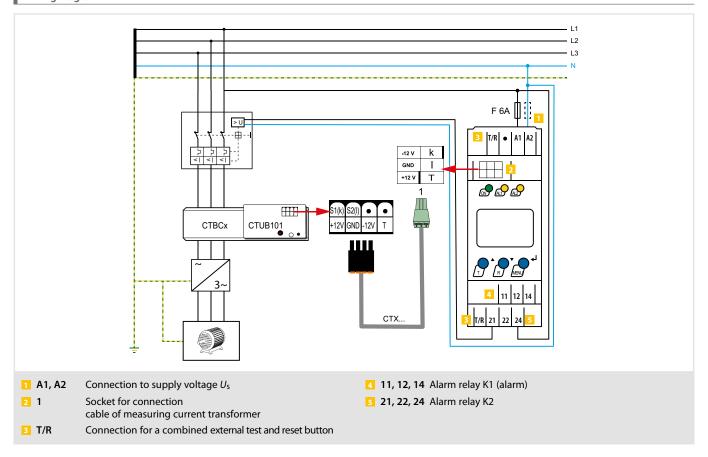


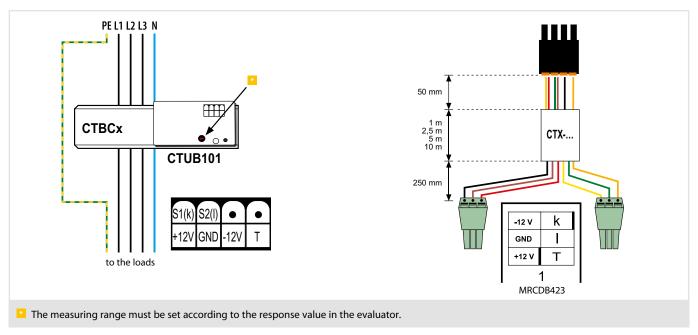
	Dimensions (mm)							
Type a b c d e f							f	g
	CTUB10CTBC20(P)	75	83	37	ø 20	46	60,5	-
Α	CTUB10CTBC35(P)	97	130	47	ø 35	46	61	_
В	CTUB10CTBC60(P)	126	151	57	ø 60	56	78	-
	CTUB10CTBC120(P)	188	225	96	ø 120	65	96	139
	CTUB10CTBC210(P)	302	339	153	ø 210	67	113	277
D	CTUB10	74	44	30	32	4,6	-	-

В

D

Tolerance:: ±0,5 mm





LINETRAXX® MRCDB300 series

AC/DC sensitive residual current monitoring modules for MRCD applications



Typical applications

• for MRCD applications

Approvals







Device features

- Structure of a protective device in accordance with IEC 60947-2 Annex M in combination with a circuit breaker providing isolating properties
- · Monitoring of the connected circuit breaker by means of contact feedback
- RS-485 interface with Modbus RTU (reading out measured values/setting parameters)
- Integrated switching outputs with two changeover contacts K1 and K2 (galvanically isolated)
- · Fulfils the protection goals protection of persons, fire protection and plant protection (depending on the variant)
- Frequency range DC...100 kHz
- · Combined test and reset button
- · Multicolour LED indicating operation, exceeded response value, disturbances and status messages
- AC/DC sensitive type B measured value acquisition acc. to IEC 60755
- AC/DC sensitive type B+ measured value acquisition acc. to VDE 0664-400
- Exchangeable electronic enclosure without mechanical separation of the primary conductors
- · Extension/retrofitting or modification of functionalities in case of changed monitoring requirements
- Insensitive to load currents due to full magnetic shield (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

Туре	Supply voltage <i>U</i> s	Variant	Art. No.
MRCDB301		Protection of persons	B74043120
MRCDB302		Fire protection	B74043121
MRCDB303	DC 24 V (10 2 28 8 V)	Protection of persons, fire protection and plant protection (freely configurable)	B74043122
MRCDB305	OC 24 V (19.228.8 V)	Protection of persons for applications with pulsed, very high peak load currents (> 1 kA for < 1 s), e.g. welding applications	B74043125

Required terminals are included in the scope of delivery.

Measuring current transformers

Туре	Internal diameter	Art. No.
CTBC20	- 20 mm	B98120001
CTBC20P		B98120002
CTBC35	35 mm	B98120003
CTBC35P		B98120004
CTBC60	60 mm	B98120005
CTBC60P		B98120006
CTBC120	120	B98120007
CTBC120P	120 mm	B98120020
CTBC210	210 mm	B98120008
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	14	STEP-PS/1 AC/24 DC/1.75	B94053111	381
supply	34	STEP-PS/1 AC/24 DC/4.2	B94053112	381



Insulation coordination acc. to IEC 60664-1	/IEC 60664-3	Inputs	
Definitions: Measuring circuit (IC1)	Primary conductors routed through the current transformer	Maximum length connecting cable	T/R, GND, D1, D0 10 m
	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	
Rated insulation voltage	800 V	Operating principle	
Overvoltage category	III	MRCDB301, MRCDB302, MRCDB305	N/C principl
Area of application	≤ 2000 m AMSL		principle, (freely configurable), (N/C principle)
Rated impulse voltage:		Switching outputs (K1, K2)	250 V, 5
IC1((IC2-IC4)	8 kV	Switching capacity	1500 VA/144 V
IC2/(IC3-IC4)	4 kV	Contact data acc. to IEC 60947-5-1	
IC3/IC4	4 kV	Utilisation category AC	-13 AC-14 DC-12 DC-12 DC-1
Rated insulation voltage:		Rated operational voltage 25	0 V 250 V 24 V 110 V 220
IC1/(IC2-IC4)	800 V	Rated operational current	5 A 3 A 1 A 0.2 A 0.1 A
IC2/(IC3-IC4)	250 V	(for UL applications)	3 A 3 A
IC3/IC4	250 V	Minimum current	10 mA at DC 5
Pollution degree	2	Electrical endurance, number of cycles	10,00
Safe isolation (reinforced insulation) between:	2001/	Environment/EMC	
IC2/(IC3-IC4)	300 V		IEC (0047-2 Annous)
Basic insulation between:	2001/	EMC	IEC 60947-2 Annex M -2570 °
IC1/(I2-IC4)	800 V	Operating temperature	-25/0
C3/ C4	300 V	Classification of climatic conditions acc. to IEC 60721 (related to temperature and relative humidity):
Voltage test (routine test) acc. to IEC 61010-1:	16.2.2.14/	Stationary use (IEC 60721-3-3)	3K2
IC2/(IC3-IC4)	AC 2.2 kV	Transport (IEC 60721-3-2)	2K1
IC3/IC4	AC 2.2 kV	Long-term storage (IEC 60721-3-1)	1K2
Supply voltage		Classification of mechanical conditions acc. to IEC 6072	21
Supply voltage $U_{\rm S}$	DC 24 V	Stationary use (IEC 60721-3-3)	3M1
Operating range of U_S	±20 %	Transport (IEC 60721-3-2)	2M
Ripple U_S	≤1%	Long-term storage (IEC 60721-3-1)	1M1.
Power consumption	≤ 2.5 W	zong term storage (ize oor z. i s. i,	
Inrush current	1.7 A for 1 ms	Connection	
		Required terminals are included in the scope of delivery.	
Measuring circuit		Terminal block 1	
Internal diameter measuring current transforme		Manufacturer	Phoenix Contac
Characteristics according to IEC 62020 and IEC/TR		Туре	DFMC 1.5/5-ST-3.5 BI
Measuring range	5 mA20 A	The connection conditions of the manufacturer apply.	51.111e 115/5 51 515 51
Response value I∆n	see frequency responses in manual	Connection properties	
MRCDB301 (protection of persons)	30 mA	rigid	0.21.5 mm ² (AWG 24-16
MRCDB302 (fire protection)	300 mA	flexible	0.21.5 mm ² (AWG 24-16
MRCDB303 (plant protection)	30 mA3 A (freely configurable), (30 mA)*	with ferrule	0.250.75 mm ² (AWG 24-19
MRCDB305 (protection of persons)	30 mA	Terminal block 2, 3	
Prewarning	50 %100 % $I_{\Delta n}$ (freely configurable), (60 %)*	Manufacturer	Phoenix Contact
Rated current In	40.4	Type	FKCVW 2.5/ 3-ST-5.08
CTBC20 at $I_{\Delta n} = 30 \text{ mA}$	40 A	The connection conditions of the manufacturer apply.	
CTBC20 at $I_{\Delta n} = 300 \text{ mA}$	63 A	Connection capacity	
CTBC2OP	80 A 80 A	rigid	0.22.5 mm ² (AWG 24-13
CTBC35 at $I_{\Delta n} = 30 \text{ mA}$ CTBC35 at $I_{\Delta n} = 300 \text{ mA}$	80 A 125 A	flexible	0.22.5 mm² (AWG 24-13
СТВСЗ5Р асты — 300 під	160 A	with ferrule	0.252.5 mm ² (AWG 24-13
CTBC60 at $I_{\Delta n} = 30 \text{ mA}$	160 A		
CTBC60 at $I_{\Delta n} = 300 \text{ mA}$	250 A	Mounting CTBC	
CTBC60P	320 A	Screw type	
CTBC001 CTBC120 at $I_{\Delta n} = 100 \text{ mA}$	330 A	CTBC2060(P)	DIN EN ISO 7045 - M5
CTBC120 at $I_{\Delta n} = 100 \text{ mA}$	630 A	CTCB120210(P)	DIN EN ISO 7045 - M
CTBC210 at $I_{\Delta n} = 300 \text{ mA}$	630 A	Washer type	
CTBC210 at $I_{\Delta n} = 300 \text{ mA}$	630 A	CTBC2060(P)	DIN EN ISO 7089/7090 - 5
CTBC2101 at $I_{\Delta n} = 100 \text{ mA}$	1000 A	CTCB120210(P)	DIN EN ISO 7089/7090 - (
Operating uncertainty	±17.5 %	Tightening torque	
Relative uncertainty	035 %	CTBC2035 (P)	0.6 Nn
Test winding	yes	CTCB60210(P)	1 Nn
		Other	
Possible response values (to be set on the e		Operating mode	continuous operation
CTBC20, CTBC20P	10500 mA	Mounting	continuous operation any positior
CTBC35, CTBC35P, CTUBC60, CTBC60P	30 mA10 A	Degree of protection, internal components (DIN EN 60529)	IP4(
CTBC120P, CTBC210P	100 mA10 A	Degree of protection, internal components (DIN EN 60529)	IP20
CTBC120, CTBC210	300 mA10 A	Flammability class	UL94 V-(
Timo rosponso		Software	D0579
Time response		Documentation number	D0074
Response delay ton	•	Weight	20034.
MRCDB301, MRCDB302, MRCDB305	0 s	MRCDB300	≤ 100 €
MRCDB303	0 s60 min (freely configurable), (0 s)*	CTBC20	≤ 160 g
Start-up delay t _{an}	0 s60 min (freely configurable), (0 s)*	CTBC20P	≤ 220 c
Delay on release t _{off}	2 s after reset	CTBC35	= 220 s
Operating time t_{ae}	~ 100 ····	CTBC35P	≤ 320 g
at 1 x / _{An}	≤ 180 ms ≤ 130 ms	CTBC60	≤ 460 d
at 2 x / _{An}	≤ 130 ms ≤ 20 ms	CTBC60P	≤ 620 0
at 5 x /Δn		CTBC120	≤ 1390 s
Response time	$t_{\rm an} = t_{\rm ae} + t_{\rm on}$	CTBC120P	≤ 1750 d
Recovery time t _b	<u>≤1s</u>	CTBC210	≤ 4220 c
Indication		CTBC210P	≤ 4870 g
	ee table "System states: LED and output relays" on page 192		
	, , , , , , , , , , , , , , , , , , , ,	()* Factory setting	
		The use of the power supply units listed at "Accessories" is re	commended.
		The use of a surge protection device is mandatory for these p	ower supply units.

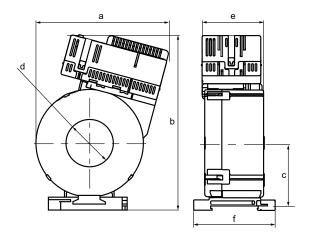


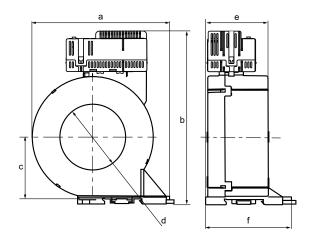
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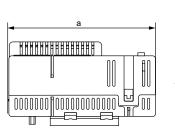
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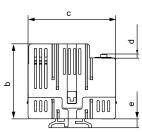
В

D









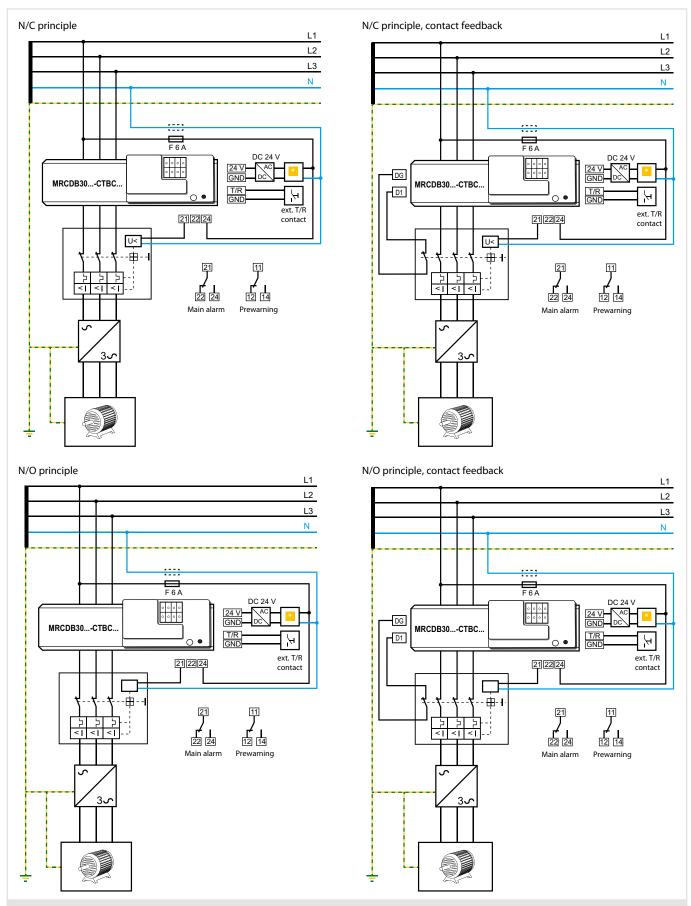
	Dimensions (mm)							
Type a b c d e						f	g	
	MRCDB30CTBC20(P)	81	112	37	ø 20	46	60	-
A	MRCDB30CTBC35(P)	97	130	47	ø 35	46	61	-
В	MRCDB30CTBC60(P)	126	158	57	ø 60	56	78	-
	MRCDB30CTBC120(P)	188	232	96	ø 120	65	96	139
(MRCDB30CTBC210(P)	302	346	153	ø 210	67	113	277
D	MRCDB30	74	37	44	2	4,6	-	-

Tolerance: $\pm 0.5 \text{ mm}$

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.

Contain state	LI	ED	Changeover cor		er contact
System state	green (ON)	red (alarm)	Notes	K1	K2
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 $I_{\rm n}$ (8/20 μ s): 20 kA Response time: 25 ns

two-stage: 1 varistor + 1 spark gab

Alternatively, the power supply unit must be connected to a CAT II supply without a surge protection device.

LINETRAXX® RCMB300 series

AC/DC sensitive residual current monitoring modules with an integrated measuring current transformer



Typical applications

• AC and DC fault currents in earthed systems (TN and TT systems).

Approvals







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

Туре	Supply voltage <i>U</i> ₅	Variant	Art. No.
RCMB301	DC 24 V (19.228.8 V)	Modbus RTU	B74043100

Required terminals are included in the scope of delivery.

Measuring current transformers

Туре	Internal diameter	Art. No.
CTBC20	20 mm	B98120001
CTBC20P	20 111111	B98120002
CTBC35	35 mm	B98120003
CTBC35P	35 MM	B98120004
CTBC60	60 mm	B98120005
CTBC60P		B98120006
CTBC120	120	B98120007
CTBC120P	120 mm	B98120020
CTBC210	210	B98120008
CTBC210P	210 mm	B98120021

P = full magnetic shield

Accessories

Description	Art. No.
Interface converter USB to RS-485	B95012045
Terminal block for RCMB301 module ¹⁾	B74043124
Snap-on mounting for CTBC20 and CTBC20P1)	B91080111
Snap-on mounting for CTBC35 and CTBC35P1)	B91080112

¹⁾ Included in scope of delivery

Suitable system components

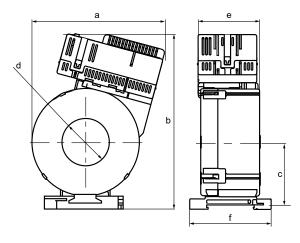
Description	max. connected current transformers	Туре	Art. No.	Page
	4	STEP-PS/1 AC/24 DC/0.5	B94053110	381
Voltage supply	14	STEP-PS/1 AC/24 DC/1.75	B94053111	381
3 4 PP-)	34	STEP-PS/1 AC/24 DC/4.2	B94053112	381

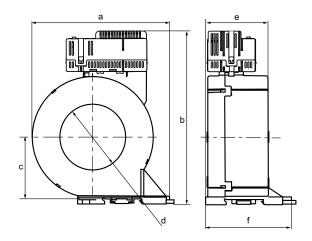


Number of changeover contacts Operating principle Switching outputs (K1, K2) Switching outputs (K1, K2) Switching capacity Contact data acc. to IEC 60947-5-1 Utilisation category Rated operational voltage Rated operational current (for UL applications) Rated operational current (for UL applications) Required Emotional current Electrical endurance, number of cycles Environment/EMC EMC Derating temperature Classification of climatic conditions acc. to IEC 60721 (related to temperature and relative humicity): Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Transport (IEC 60721-3-2) Classification of mechanical conditions acc. to IEC 60721 Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Transport (IEC 60721-3-2) Transport (IEC 60721-3-3) Transport (IEC 60721-3-1) Stationary use (IEC 60721-3-3) Transport
Switching outputs (K1, K2) Switching capacity Contact data acc. to IEC 60947-5-1 Utilisation category AC-13 AC-14 DC-12 DC-12 DC-12 Rated operational voltage 250 V 250 V 220 V 110 V 24 V Rated operational current (for UL applications) 3 A 3 A Minimum current Ilectrical endurance, number of cycles Environment/EMC EMC Derating temperature Classification of climatic conditions acc. to IEC 60721 (related to temperature and relative humidity): Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-3) Transport (IEC 60721-3-1) Connection Required terminals are included in the scope of delivery. Terminal block 1 Manufacturer Phoenix Contact Type DFMC 1.5/5-51-3.5 BK The connection conditions of the manufacturer apply. Connection properties rigid 0.21.5 mm² (AWG 24-16) flexible
Switching capacity Contact data acc. to IEC 60947-5-1 Utilisation category Rated operational voltage Rated operational current (for UL applications) Minimum current Electrical endurance, number of cycles Environment/EMC EMC Operating temperature Classification of climatic conditions acc. to IEC 60721 (related to temperature and relative humidity): Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 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 Required terminals are included in the scope of delivery. Terminal block 1 Manufacturer Phoenix Contact Type DFMC 1.5/5-ST-3.5 Bk The connection conditions of the manufacturer apply. Connection properties rigid 0.21.5 mm² (AWG 24-16) flexible
Contact data acc. to IEC 60947-5-1 Utilisation category AC-13 AC-14 DC-12 DC-12 DC-12 Rated operational voltage 250 V 250 V 220 V 110 V 24 V Rated operational current 5 A 3 A 0.1 A 0.2 A 1 A (for UL applications) 3 A 3 A Minimum current 10 mA at DC 5 V Electrical endurance, number of cycles 10,000 Environment/EMC EMC IEC 62020-1:2020 Operating temperature -2570 °C Classification of climatic conditions acc. to IEC 60721 (related to temperature and relative humidity): Stationary use (IEC 60721-3-3) 3K22 Transport (IEC 60721-3-2) 2K11 Long-term storage (IEC 60721-3-1) 1K22 Classification of mechanical conditions acc. to IEC 60721 Stationary use (IEC 60721-3-3) 3M11 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 1 Manufacturer Phoenix Contact Type DFMC 1.5/5-ST-3.5 B& The connection conditions of the manufacturer apply. Connection properties rigid 0.21.5 mm² (AWG 24-16) flexible 0.21.5 mm² (AWG 24-16)
Utilisation category Rated operational voltage Rated operational current (for UL applications) Record operational current S A
Rated operational voltage Rated operational current (for UL applications) Rated operational current (for UL applications) Minimum current Electrical endurance, number of cycles Environment/EMC EMC Operating temperature Classification of climatic conditions acc. to IEC 60721 (related to temperature and relative humidity): Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-3) Transport (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 60721 Stationary use (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 60721 Stationary use (IEC 60721-3-1) Transport (IEC 60721-3-3) Transport (IEC 60721-3-3) Transport (IEC 60721-3-1) Connection Required terminals are included in the scope of delivery. Terminal block 1 Manufacturer Phoenix Contact Type DFMC 1.5/5-ST-3.5 Bi The connection conditions of the manufacturer apply. Connection properties rigid 0.21.5 mm² (AWG 24-16) flexible
Rated operational current (for UL applications) Minimum current Electrical endurance, number of cycles Environment/EMC EMC Operating temperature Classification of climatic conditions acc. to IEC 60721 (related to temperature and relative humidity): Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 60721 Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-1) Connection Required terminals are included in the scope of delivery. Terminal block 1 Manufacturer Phoenix Contact Type DFMC 1.5/5-ST-3.5 BW The connection conditions of the manufacturer apply. Connection properties rigid 0.21.5 mm² (AWG 24-16) flexible
Rated operational current (for UL applications) 3 A 3 A Minimum current Electrical endurance, number of cycles 10,000 Environment/EMC EMC Operating temperature -2570°C Classification of climatic conditions acc. to IEC 60721 (related to temperature and relative humidity): Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) 1K22 Classification of mechanical conditions acc. to IEC 60721 Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-3) Transport (IEC 60
(for UL applications) Minimum current Electrical endurance, number of cycles Environment/EMC EMC Operating temperature Classification of climatic conditions acc. to IEC 60721 (related to temperature and relative humidity): Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 60721 Stationary use (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 60721 Stationary use (IEC 60721-3-1) Transport (IEC 60721-3-3) Transport (IEC 60721-3-1) Conjection Required terminals are included in the scope of delivery. Terminal block 1 Manufacturer Phoenix Contact Type DFMC 1.5/5-ST-3.5 BK The connection conditions of the manufacturer apply. Connection properties rigid 0.21.5 mm² (AWG 24-16) flexible
Minimum current Electrical endurance, number of cycles Environment/EMC EMC Operating temperature Classification of climatic conditions acc. to IEC 60721 (related to temperature and relative humidity): Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 60721 Stationary use (IEC 60721-3-1) Transport (IEC 60721-3-3) Transport (IEC 60721-3-3) Transport (IEC 60721-3-1) Classification of mechanical conditions acc. to IEC 60721 Stationary use (IEC 60721-3-1) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Transport (IEC 60721-3-1) Connection Required terminals are included in the scope of delivery. Terminal block 1 Manufacturer Phoenix Contact Type DFMC 1.5/5-ST-3.5 BK The connection conditions of the manufacturer apply. Connection properties rigid 0.21.5 mm² (AWG 24-16) flexible
Environment/EMC EMC IEC 62020-1:2020 Operating temperature -2570 °C Classification of climatic conditions acc. to IEC 60721 (related to temperature and relative humidity): Stationary use (IEC 60721-3-3) 3K22 Transport (IEC 60721-3-2) 2K11 Long-term storage (IEC 60721-3-1) 1K22 Classification of mechanical conditions acc. to IEC 60721 Stationary use (IEC 60721-3-3) 3M11 Transport (IEC 60721-3-3) 3M11 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 1 Manufacturer Phoenix Contact Type DFMC 1.5/5-ST-3.5 BK The connection conditions of the manufacturer apply. Connection properties rigid 0.21.5 mm² (AWG 24-16) flexible 0.21.5 mm² (AWG 24-16)
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Operating temperature Classification of climatic conditions acc. to IEC 60721 (related to temperature and relative humidity): Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-3) Transport (IEC 60721-3-3) Transport (IEC 60721-3-2) Long-term storage (IEC 60721-3-1) Transport (IEC 60721-3-1) The connection Required terminals are included in the scope of delivery. Terminal block 1 Manufacturer Phoenix Contact Type DFMC 1.5/5-ST-3.5 BK The connection conditions of the manufacturer apply. Connection properties rigid 0.21.5 mm² (AWG 24-16) flexible 0.21.5 mm² (AWG 24-16)
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rigid 0.21.5 mm² (AWG 24-16) flexible 0.21.5 mm² (AWG 24-16)
flexible 0.21.5 mm² (AWG 24-16)
.) with farrula 0.25 0.75 mm ² /ANAC 24 10\
Terminal block 2, 3
Manufacturer Phoenix Contact
T.m.
The connection conditions of the manufacturer apply.
,
Connection capacity rigid 0.22.5 mm² (AWG 24-13)
rigid 0.22.5 mm² (AWG 24-13) flexible 0.22.5 mm² (AWG 24-13)
,
with ferrule 0.252.5 mm ² (AWG 24-13)
Mounting CTBC
Screw type
CTBC2060(P) DIN EN ISO 7045 - M5
CTCB120210(P) DIN EN ISO 7045 - M6
Washer type
CTBC2060(P) DIN EN ISO 7089/7090 - 5
CTCB120210(P) DIN EN ISO 7089/7090 - 6
CICD 120210(1)
rightening torque
(1)
CTCB60210(P) 1 Nm
Other
5 Operating mode continuous operation
Mounting any position
Degree of protection, internal components (DIN EN 60529) IP40
Degree of protection, terminals (DIN EN 60529) IP20
Joitware
Documentation number Doost 2
Weight RCMB301 ≤ 100 q
CTRC20 < 160 a
CTRC20P < 220.0
·
CTBC35P ≤ 320 g CTBC60 ≤ 460 q
-
LIRLEUD ~ COV =
CIBCOP ≤ 620 g CTBC120 ≤ 1390 g
CTBC120 ≤ 620 g CTBC120 ≤ 1390 g CTBC120P ≤ 1750 g
CTBC60P ≤ 620 g CTBC120 ≤ 1390 g CTBC120P ≤ 1750 g CTBC210 ≤ 4220 g
C18C60P ≤ 620 g C CTBC120 ≤ 1390 g C TBC120P ≤ 1750 g C TBC210 ≤ 4220 g CTBC210P ≤ 4870 g
CTBC60P ≤ 620 g CTBC120 ≤ 1390 g CTBC120P ≤ 1750 g CTBC210 ≤ 4220 g CTBC210P ≤ 4870 g
C18C60P ≤ 620 g C CTBC120 ≤ 1390 g C TBC120P ≤ 1750 g C TBC210 ≤ 4220 g CTBC210P ≤ 4870 g
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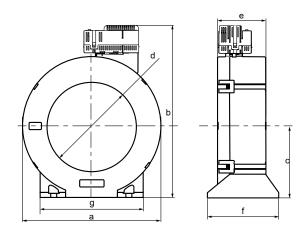
Α

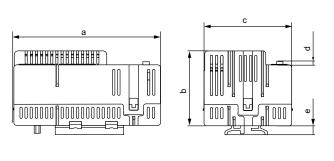
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C D





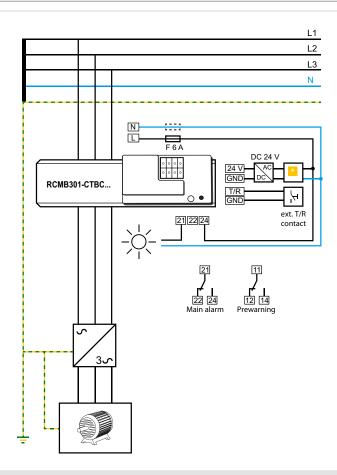
					,			
	Dimensions (mm)							
	Type	a	b	c	d	e	f	g
_	RCMB301-CTBC20(P)	81	112	37	ø 20	46	60	-
Α	RCMB301-CTBC35(P)	97	130	47	ø 35	46	61	-
В	RCMB301-CTBC60(P)	126	158	57	ø 60	56	78	-
	RCMB301-CTBC120(P)	188	232	96	ø 120	65	96	139
	RCMB301-CTBC210(P)	302	346	153	ø 210	67	113	277
D	RCMB301	74	37	44	2	4.6	-	-

Tolerance: $\pm 0.5 \text{ mm}$

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	LED				Changeover contact	
System state	green (ON)	red (alarm)	notes	K1	K2	
Device switched off	off	off	Device is de-energised, no monitoring, no monitoring function	de-energised	de-energised	
Normal operating state	lights	off	The device is supplied with the specified voltage and monitors the primary circuit. No residual current flows which would lead to tripping.	energised	energised	
Prewarning	lights	Flashes briefly	The device is supplied with the specified voltage and monitors the primary circuit. A fault current flows which exceeds the set limit of the prewarning.	de-energised	energised	
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 I_n (8/20 μ s): 20 kA

Response time: 25 ns

two-stage: 1 varistor + 1 spark gab

Alternatively, the power supply unit must be connected to a CAT II supply without a surge protection device.

LINETRAXX® RCMB330

AC/DC sensitive residual current monitoring module with integrated split-core measuring current transformer



Typical applications

· Measuring AC and DC fault currents in earthed systems (TN and TT systems)

Approvals



Device features

- · Continuous residual current monitoring in compliance with DGUV Vorschrift 3 (German Accident Prevention Regulation 3)
- · Easy DIN rail or screw mounting
- RS-485 interface with Modbus RTU (reading out measured values/setting parameters)
- Frequency range DC...100 kHz
- · Multicolour LED for operation and status messages
- Digitally adjustable filters for AC/DC sensitive measured value acquisition (lowpass filters, type B acc. to IEC 60755, type B+ acc. to VDE 0664-400)
- Separate evaluation of the AC and DC components as well as the RMS value of the residual current possible
- Installation without mechanical separation of the primary conductors
- Extension or modification of functionalities through software updates via Modbus
- Insensitive to load currents due to magnetic screen
- Supply voltage DC 24 V

Normen

The RCMB330 residual current monitoring modules comply with the device standard:

• IEC 62020-1

Further information

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

Ordering information

Туре	Supply voltage <i>U</i> ₅	Variant	Art. No.
RCMB330	DC 24 V (19,228,8 V)	Modbus RTU	B74043160

Accessories

Description	Art. No.
RS-485/USB interface converter	B95012045

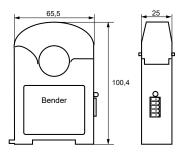
Suitable system components

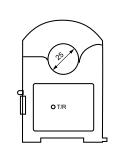
The use of the listed power supply units is recommended. The use of a surge protection device is mandatory for these power supply units.

Description	max. connected current transformers	Туре	Art. No.	Page
	4	STEP-PS/1 AC/24 DC/0.5	B94053110	381
Voltage supply	14	STEP-PS/1 AC/24 DC/1.75	B94053111	381
	34	STEP-PS/1 AC/24 DC/4.2	B94053112	381

Definitions	
Measuring circuit (IC1)	Primary conductors routed through the current transforme
Secondary (IC2)	terminal block (24 V, GND, A, B, X1, X2
Rated voltage	300 \
Overvoltage category	II
Operating altitude	≤ 2000 m AMSI
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 $U_{\rm S}$	±5 %
Ripple $U_{\rm S}$	≤ 2 %
Power consumption	≤ 0.5 W typ. (2.5 W max.
Inrush current	10 A for 25 μ
Measuring circuit	
Measuring current transformer, internal	diameter 25 mm
Characteristics according to IEC 62020-1	AC/DC sensitive, type I
Measuring range	10500 m
Residual operating current $I_{\Delta n}$	30500 mA (freely configurable), (30 mA)
Prewarning	50100 % I∆n (freely configurable), (60 %)
Rated current I _n	100 /
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 toff	0 s60 min (freely configurable), (1 s)
Operating time tae	
at 1 x / _{\Dn}	≤ 500 m
at 2 x I _{Δn}	≤ 230 m
at 5 x IAn	≤ 100 m
Response time	$t_{an} = t_{ae} + t_{0i}$
nesponse unie	

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





Multicolour LED	Refer to chapter "LED" in the manual
Multicoloul LED	helel to chapter LED in the manual
Interface	
Interface/protocol	RS-485/Modbus RTU
Baud rate	1.257.6 kbit/s
Cable length	01200 m
Environment/EMC	
EMC	IEC 62020-1
Operating temperature	-2570°C
Classification of climatic conditions acc. to IEC 607	721 (related to temperature and relative humidity):
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions acc. to	IEC 60721
Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12
Connection	
Required terminals are included in the scope of deliver	у
Terminal block	
Manufacturer	Phoenix Contact
Type	PCB plug-in connector - DFMC 0.5/ 8-ST-2.54

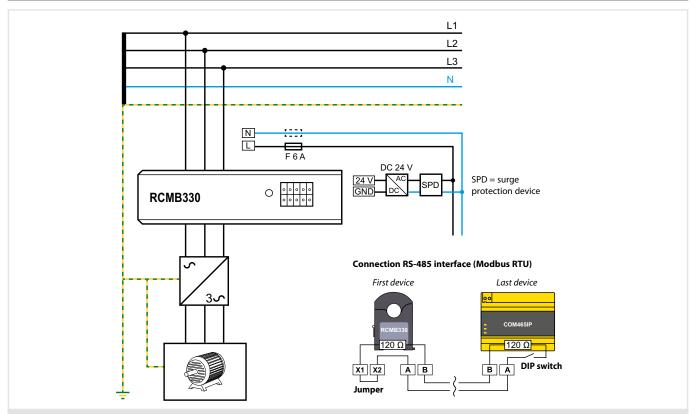
Other	
Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (DIN EN 60529)	IP40
Degree of protection, terminals (DIN EN 60529)	IP20
Flammability class	UL94 V-0
Software	D0609
Documentation number	D00389
Weight	≤ 170 g

0.14...0.5 mm² (AWG 26-20) 0.14...0.5 mm² (AWG 26-20) 0.25...0.34 mm² (AWG 24-22)

()* factory setting

Connection properties

rigid flexible with ferrules



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

COM465IP

By means of the $\mbox{\bf DIP}$ switch, the internal 120 Ω terminating resistor can be connected.

The connections for the power supply (X1, X2) and the RS-485 interface (A, B) are doubled, so that the wiring can be carried out directly on the device according to the **daisy-chain** principle required for **Modbus**.

LINETRAXX® 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)

Approvals







Device features

- AC and pulsed DC sensitive residual current monitor type A according to DIN EN 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
- · NFC interface for configuration of the unit in energised and de-energised state

Bender Connect App









Licences

Software information:

https://www.bender.de/fileadmin/content/Products/t/0/Software-information.pdf

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.

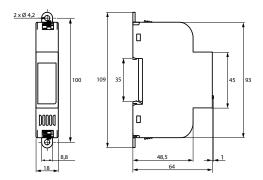
Ordering information

Туре	Supply voltage U _s	Art. No.
RCM410R-24	DC 24 V	B74602000
RCM410R-2	AC/DC 100240 V / DC 24 V	B74603000

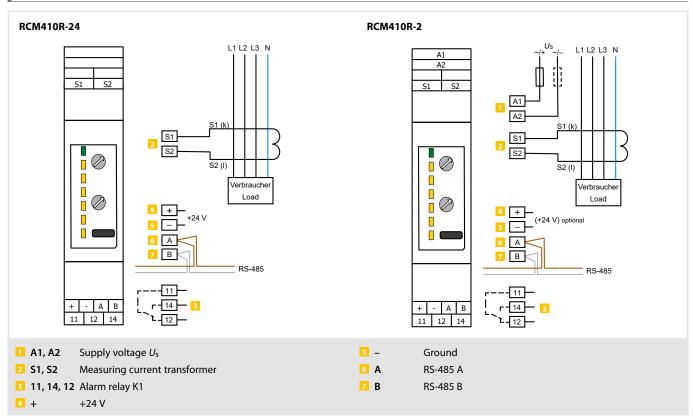


Insulation coordination acc. to IEC 60664-1/IEC 60		Displays, memory	ctatus IED incl. IED have
RCM410R-24:		Display	status LED incl. LED bar grapl
Definitions:		Display range measured value	0100 9
Measuring & control circuit (IC1)	S1, S2, +, -, A, B	Fault memory alarm messages	on/off (off)
Output circuit (IC2)	11, 14, 12	Cable lengths for measuring current transformers	
Rated voltage	250 V		0 1-
Overvoltage category	III	Single wire ≥ 0.75 mm ²	01 n
Operating altitude	≤ 2000 m AMSL	Single wire, twisted ≥ 0.75 mm ²	010 n
Rated impulse voltage:	_ 2000 / /	Shielded cable $\geq 0.75 \text{ mm}^2$	040 n
IC1/IC2	4 kV	RS-485 interface	
Rated insulation voltage:	TIV		M. J DTI
IC1/IC2	350 //	Protocol	Modbus RTU
	250 V	Baud rate	max 115.2 kbits/s (19.2 kbits/s)
Pollution degree	2	Parity	even, no, odd (even)
Protective separation (reinforced insulation) between:		Stop bits	1/2/auto (auto)
IC1/IC2	Overvoltage category III, 300 V	Cable length (at 9.6 kbits/s)	≤ 1200 n
Voltage test (routine test) acc. to IEC 61010-1:		Cable: twisted pair	min. J-Y(St)Y 2 x 0.6 mm
IC1/IC2	AC 2.2 kV	Required terminating resistor	120 Ω (0.25 W
RCM410R-2:		Device address 3)	1247 (100+SN)
Definitions:			
Supply circuit (IC1)	A1, A2	Switching elements	
•••		Switching elements	1 changeover contac
Output circuit (IC2)	11, 14, 12	Operating principle	N/C or N/O operation (N/C operation)
Measuring & control circuit (IC3)	S1, S2, +, -, A, B	Electrical endurance, number of cycles	1000
Rated voltage	250 V	•	1000
Overvoltage category	III	Contact data acc. to IEC 60947-5-1:	
Operating altitude	≤ 2000 m AMSL	Utilisation category AC-13	AC-14 DC-12 DC-12 DC-12
Rated impulse voltage:		Rated operational voltage 230 V	230 V 24 V 110 V 220 V
IC1/(IC2-3)	4 kV	Rated operational current 5 A	3 A 1 A 0.2 A 0.1 A
IC2/IC3	4 kV	Minimum contact rating 2)	1 mA at AC/DC \geq 10 V
Rated insulation voltage:			
IC1/(IC2-3)	250 V	Environment/EMC	
IC2/IC3	250 V	EMC	IEC 62020-
Pollution degree	250 7	Ambient temperatures	
		Operation	-25+55°(
Protective separation (reinforced insulation) between:	0	Transport	-40+85°(
IC1/(IC2-3)	Overvoltage category III, 300 V	·	
IC2/IC3	Overvoltage category III, 300 V	Storage	-40+70°
Voltage test (routine test) acc. to IEC 61010-1:		Classification of climatic conditions acc. to IEC 60721	
IC1/(IC2-3)	AC 2.2 kV	(except condensation and formation of ice)	
IC2/IC3	AC 2.2 kV	Stationary use (IEC 60721-3-3)	3K2
		Transport (IEC 60721-3-2)	2K1
Supply voltage		Long-term storage (IEC 60721-3-1)	1K2:
RCM410R-24:			
Supply voltage $U_{\rm S}$	DC 24 V	Classification of mechanical conditions acc. to IEC 607	
Tolerance of Us	-30+25 %	Stationary use (IEC 60721-3-3)	3M1
Power consumption	≤ 2 W	Transport (IEC 60721-3-2)	2M4
Inrush current (< 5 ms)	< 10 A	Long-term storage (IEC 60721-3-1)	1M12
	1071	Connection	
RCM410R-2:			
Supply voltage $U_{\rm S}$	AC/DC 100240 V (4763 Hz)	Connection type	push-ii
Tolerance of U _s	±15 %	Nominal current	≤ 10 /
Power consumption	\leq 2 W / \leq 3.5 VA	Connection properties	
Inrush current (< 2 ms)	< 1.8 A	rigid	0.21.5 mm² (AWG 24-16
		flexible	0.21.5 mm² (AWG 24-16
Measuring circuit		with ferrule without plastic sleeve	0.21.5 mm ² (AWG24-16) ⁵
External measuring current transformer (type A)	CTAC, W, WR, WS series	with ferrule with plastic sleeve	0,20,75 mm
Measuring current transformer monitoring ¹⁾	on*/off	Stripping length	8 mn
Load	33 Ω		
Rated voltage Un	see datasheet measuring current transformer	Other	
Operating characteristics	type A	Operating mode	continuous operation
Frequency range	4270 Hz	Mounting	vertica
Measuring range (Peak)	2 mA70 A	Degree of protection, internal components (DIN EN 60529)	IP30
Measuring range (RMS)	2 mA50 A	Degree of protection, terminals (DIN EN 60529)	IP20
Rated residual operating current	30 A	Enclosure material	polycarbonate
· •		DIN rail mounting acc. to	IEC 6071
Residual operating current /Δn (AL2)	10 mA30 A (10 mA)*		UL94 V-(
Prewarning (AL1) ¹⁾	50100 % x /Δn (50 %)*	Flammability class	
Operating uncertainty	±10 % (at 0.55 x /Δn)	Documentation number	D00403
Relative uncertainty	020 %	Weight	≤ 100 g
Hysteresis 1)	1025 % (15 %)*	* Factory setting	
Time verneuse		1) Can only be configured via RS-485	
Time response			ntact currents
Start-up delay t 1)	0999 s (0 s)*	hereis to relays that have not been operated with high ed	miaci currents
Response delay t _{on}	010 s (0 s)*	Factory setting: 100 + last two digits of serial number	
Delay on release $t_{ m off}$ 1)	0999 s (0 s)*	See chapter 2.2.5.1 in the manual	
Operating time	· ,	5) > 0,75 mm ² use crimping pliers similar to CRIMPFOX 6 / V	Veidmüller PZ6/PZ6/5 only.
t_{ae} at $I_{\Delta n} = 1 \times I_{\Delta n}$	≤ 250 ms		
	≤ 100 ms		
$I_{ae} \text{ at } I_{An} = 5 \text{ X } I_{An}$			
$t_{\rm ae}$ at $I_{\Delta n} = 5$ x $I_{\Delta n}$ Recovery time $t_{\rm b}$ ⁴⁾	<u>≤3s</u>		

Dimension diagram (dimensions in mm)



Wiring diagram



RCMB131-01

AC/DC sensitive residual current monitoring module for measuring AC and DC currents up to ± 100 mA



Typical applications

- Designed for installation in PDUs and outlet boxes
- Communication with a master via an RS-485 interface via Modbus RTU

Device features

- AC/DC sensitive leakage and fault current monitoring for preventive maintenance
- · Suitable for PCB mounting
- High resolution for implementing equipment leakage current monitoring
- Measured value and alarm transmission via Modbus RTU (RS-485)
- Frequency range DC...2 kHz
- Compact design for monitoring nominal loads up to $I_n = 32 \text{ A}$
- · Low load current sensitivity due to fully shielded measuring current transformer
- Continuous monitoring of the connection to the measuring current transformer
- · Integrated test function
- Supply voltage DC 12...24 V

Further information

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

Approvals



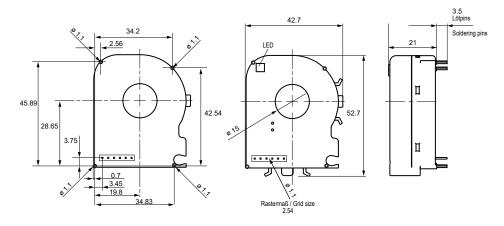
Ordering information

Туре	Output range	Supply voltage U₅	Art. No.
RCMB131-01	0100 mA (r.m.s.)	DC 1224 V	B94042131

Insulation coordination according to IEC 6066	54-1	Time response
Primary circuit	monitored primary conductors	
Secondary circuit	Connections Vcc, GND, A, B, S1, S2	
All following specifications apply to the insulation	. , ,	for 2 x I _{∆n}
Rated voltage	300 V	for 5 x I _{∆n}
Overvoltage category	III	Recovery time t _b
Rated impulse voltage	4 kV	Disturbances
Operating altitude	up to 3000 m AMSL	
Rated insulation voltage	320 V	Load current In
Pollution degree	2	Response value ass
Safe separation (reinforced insulation)	between primary and secondary circuit	/ _{Δn1} (DC)
Voltage test acc. to IEC 61010-1	AC 2.2 kV	$I_{\Delta n2}$ (r.m.s.)
Voltage supply		Outputs
Supply voltage $U_{\rm S}$	DC 1224 V	Interface
Operating range of the supply voltage	±20 %	Protocol
Ripple	100 mV	Switching outputs
Power consumption	< 0.75 W	Switching capacity
Measuring circuit		Output voltage LOW
Internal diameter primary conductor opening	15 mm	Output voltage HIGH
Measured value evaluation	DC, r.m.s.	Hysteresis
	AC/DC ±300 mA	
Measuring range Characteristics according to IEC 60755	AC/DC ±300 ma AC/DC sensitive, type B	Environment/EMC
	AC/DC sensitive, type B	EMC
I _{Δn1}	DC 2 F 100 1 (* C 1)	Ambient temperature
Response value	DC 3.5100 mA (* 6 mA)	Classification of clin
Response tolerance	0.71.0 x <i>I</i> _{∆n1}	Stationary use (IEC 60
I _{Δn2}	25 100 - 4 (* 20 - 4)	Transport (IEC 60721
Response value	r.m.s. 3.5100 mA (* 30 mA)	Long-term storage (I
Response tolerance DC1 kHz	0.7 10	
	0.71.0 x /∆n2	Classification of mo
12 kHz	1.02.0 x /∆n2	Stationary use (IEC 60
Output range	0100 mA (r.m.s.)	Transport (IEC 60721
Resolution	< 0.2 mA	Long-term storage (I
Frequency range	DC2 kHz	Other
Measuring time	180 ms	Operating mode
Operating uncertainty		Mounting
DC500 Hz	±(5 % +0.5 mA)	Protection class
5011000 Hz	$\pm (15\% + 0.5 \text{ mA})$	Flammability rating
12 kHz	$-(50\% \pm 0.5 \text{ mA})$	Service life at 40 °C
	,	Software

Response time tae (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 /∆n	≤ 30 ms
Recovery time t _b	≤ 29
Disturbances	
Load current In	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 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 conducto	rs routed through module) -25+70 °C
	EC 60721 (related to temperature and relative humidity):
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60271-3-1)	1K22
Classification of mechanical conditions a	cc. 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 nosition

Dimension diagram (dimensions in mm)



any position IP 30

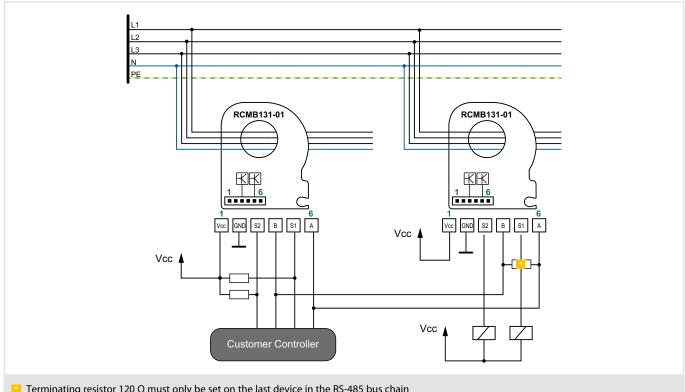
UL94 V-0

10 years D0604

D00358

Documentation number

* = factory settings



 ${\color{orange}ullet}$ Terminating resistor 120 Ω 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

Approvals

Device features

- AC/DC sensitive leakage and fault current monitoring for preventive maintenance
- · Suitable for PCB mounting
- High resolution for implementing equipment leakage current monitoring
- Measurement signal output via PWM output
- Frequency range DC...2 kHz
- Compact design for monitoring nominal loads up to $I_n = 32 \text{ A}$
- · Low load current sensitivity due to fully shielded measuring current transformer
- Continuous monitoring of the connection to the measuring current transformer
- Integrated test function
- Supply voltage DC 12...24 \mbox{V}

Further information

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

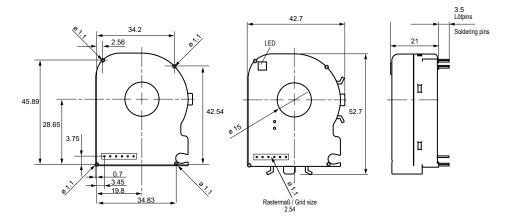


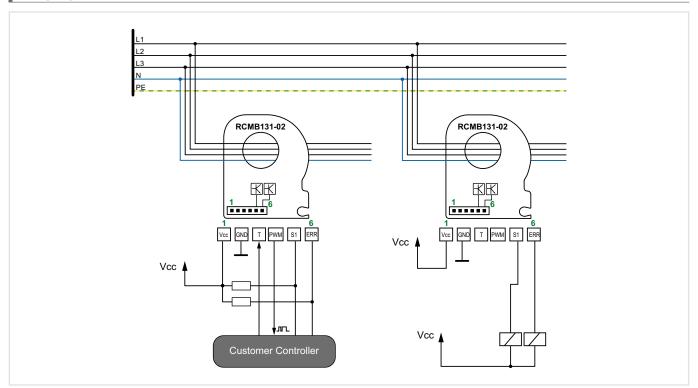
Ordering information

Туре	Output range	Supply voltage <i>U</i> ₅	Art. No.
RCMB131-02	0100 mA (r.m.s.)	DC 1224 V	B94042132

Insulation coordination according to IEC 60664-1		Disturbances	
Primary circuit	monitored primary conductors	Load current /n	32 A
Secondary circuit	Connections Vcc, GND, T, PWM, S1, ERR	Outputs	
All following specifications apply to the insulation between	en the primary and secondary circuit	<u> </u>	
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 %		C1
Ripple	100 mV	/ _{∆n1} (DC)	<u>\$1</u>
Power consumption	< 0.75 W	Internal error	ERR
Measuring circuit		Environment/EMC	
Internal diameter primary conductor opening	15 mm		
Measured value evaluation	DC, r.m.s.	Ambient temperature (incl. primary conductors	routed through module) -25+70 °C
Characteristics according to IEC 60755	AC/DC sensitive, type B	Classification of climatic conditions acc. to IEC	60721 (related to temperature and relative humidity):
Response value I _{∆n1}	DC 3.5100 mA (* 6 mA)	Stationary use (IEC 60721-3-3)	3K22
Response tolerance $I_{\Delta n1}$	0.71.0 x / _{∆n1}	Transport (IEC 60721-3-2)	2K11
Measuring range	AC/DC ±300 mA	Long-term storage (IEC 60271-3-1)	1K22
Resolution	< 0.2 mA	Classification of mechanical conditions acc	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	±(15 % + 0.5 mA)		
10012000 Hz	$\pm (50 \% + 0.5 \text{ mA})$	Operating mode	continuous operation
	<u>=(50 % 1 0.5 mm)</u>	Mounting	any position
Time response		Protection class	IP 30
Response time t_{ae} (relay switching time of 10 ms considently)	lered)	Flammability rating	UL94 V-0
for 1 x I∆n	≤ 290 ms	Service life at 40 °C	10 years
for 2 x I∆n	≤ 140 ms	Software	D0604
for 5 x I∆n	≤ 30 ms	Documentation number	D00354
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

Туре	Measuring range	Supply voltage <i>U</i> ₅	Art. No.
RCMB132-01	AC/DC ±100 mA	DC1224V	B94042136
Mounting foot MCCT20			B91080111

Primary circuit	monitored primary conductors
Secondary circuit	Connections Vcc, GND, A, B, S1, S2
All following specifications apply to the insulation b	
Rated voltage	300 V
Overvoltage category	III
Rated impulse voltage	4 kV
Operating altitude	up to 3000 m AMSL
Rated insulation voltage	320 V
Pollution degree	2
Safe separation (reinforced insulation)	between primary and secondary circuit
Voltage test acc. to IEC 61010-1	AC 2.2 kV
Voltage supply	
Supply voltage $U_{\rm S}$	DC 1224 V
Operating range of the supply voltage	±20 %
Ripple	100 mV
Power consumption	< 0.75 W
Measuring circuit	
Internal diameter primary conductor opening	15 mm
Measured value evaluation	DC, r.m.s.
Measuring range	AC/DC \pm 300 mA
Characteristics according to IEC 60755	AC/DC sensitive, type B
$I_{\Delta n1}$	
Response value	DC 3.5100 mA (* 6 mA)
Response tolerance	0.71.0 x <i>I</i> _{Δn1}
$I_{\Delta n2}$	
Response value	r.m.s. 3.5100 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 mA)
5011000 Hz	±(15 % + 0.5 mA)
12 kHz	-(50 % ± 0.5 mA)

Time response Response time t_{ae} (relay switching time of	10 ms considered)
for 1 x / _{An}	≤ 290 ms
for 2 x I _{Δn}	≤ 140 ms
for 5 x $I_{\Delta n}$	≤ 30 ms
Recovery time t _b	≤2s
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 acc. 1	to IEC 60721 (related to temperature and relative humidity):
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60271-3-1)	1K22
Classification of mechanical condition	
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
Drotaction class	nc al

Protection class

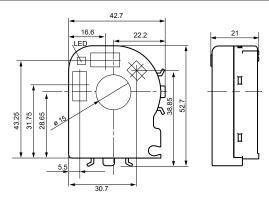
Software

Flammability rating

Service life at 70 °C acc. to IEC 61709

Plug (included in scope of delivery)

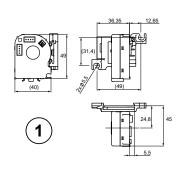
Dimension diagram (dimensions in mm)

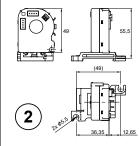


Rail mounting

Documentation number

with mounting foot MCCT20 (accessories, see ordering data)





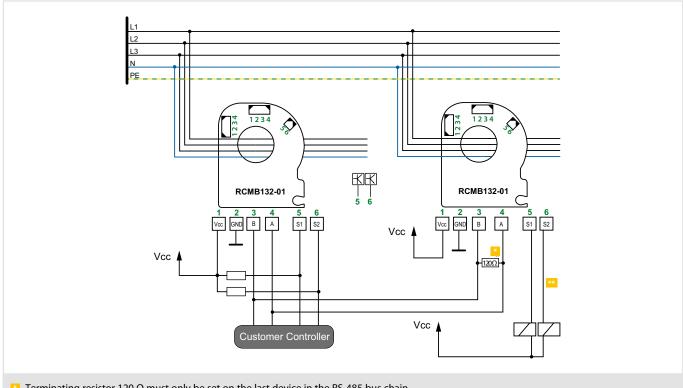
IP 30 UL94 V-0

20 years D0604

D00356

Phoenix Contact, PTSM 0.5/4-P-2.5

^{* =} factory settings



- ${\color{red} {
 m \square}}$ Terminating resistor 120 ${\color{red} {\Omega}}$ 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



Typical applications

AC charging systems for electric vehicles

Approvals



eccept RCMB104-1

Device features

- · Four outputs (Switch1, Switch2, Error, PWM)
- · Measuring range ±300 mA
- Residual current resolution < 0.2 mA
- · Patented measurement technology
- Load current up to 32 A or 80 A* RMS (singlephase) or 3 x 32 A RMS (three-phase)
- Fault output (integrated self monitoring and test functions)
- · High insensitivity to external interferences
- Available variants for application according to IEC 62752 and UL 2231-2
- Wide range of use even in severe environments (e.g. in the event of external fields)
- In applications according to IEC 62752, the device can replace a type B RCD when combined with a type A RCD and a suitable switching device (e.g. a power relay)

Standards

The monitoring modules compliens, depending on the variant, with the following device standards:

RCMB104-1

IEC 62752 In-cable control and protection device for mode 2 charging of electric road vehicles (IC-CPD)

RCMR104-2

CCID20 acc. to UL 2231-2 (Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits: Particular Requirements for Protection Devices for Use in Charging Systems)

RCMB104-2

CCID5 acc. to UL 2231-2 (Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits: Particular Requirements for Protection Devices for Use in Charging Systems)

Patents

EP 2 571 128 / US 9,397,494 / ZL 201210157968.6 / CN 103001175, EP 2 813 856

Further information

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

Ordering information RCMB104

Туре	Description	Art. No.
RCMB104-1	02000 Hz IEC 6/30 mA	B94042480
RCMB104-2	02000 Hz UL 2231 5/20 mA	B94042481

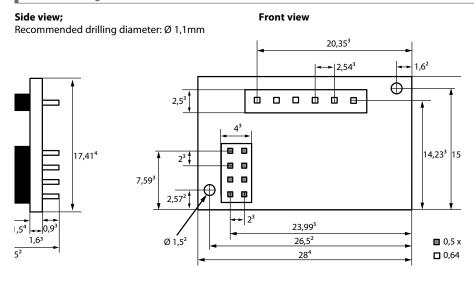
Ordering information Measuring current transformer

Description	Diameter/ Connection cable	Туре	Art. No.	Page
Measuring current transformer	17 mm/–	CTBC17	B98080070	262
Connection cable CTBC17	−/180 ± 30 mm	CTBC17-Kabel180MM	B98080540	262
	−/325 ± 25 mm	CTBC17-Kabel325MM	B98080541	262
	−/600 ± 30 mm	CTBC17- Kabel600MM	B98080543	262
	−/1470 ± 30 mm	CTBC17-Kabel1470MM	B98080542	262

^{*} Only in case of use according to UL2231-2

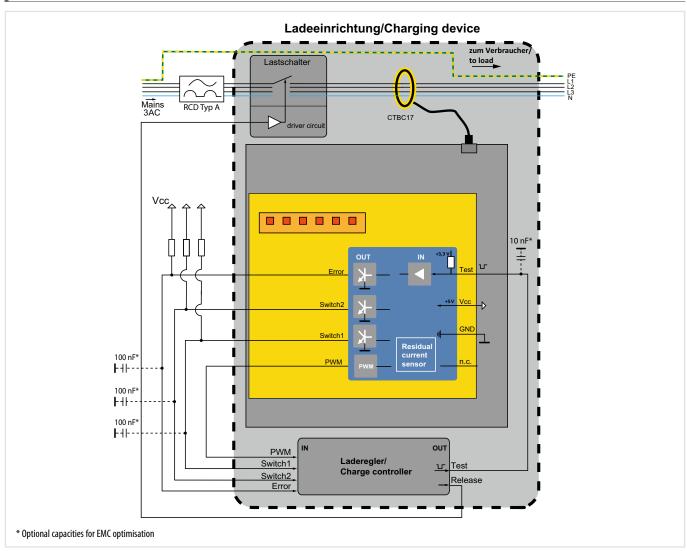
Main circuit (current paths trough CT)	220/4001	RCMB104-2 (Switch2, CCID5 acc. to UL 2231-2) Ground fault threshold I ₂
Rated operational voltage <i>U</i> e Rated current <i>I</i> n	230/400 V single-phase: 32 A (80 A)	60 Hz RMS 5 n
rateu current 1 _n	three-phase: 32 A	DC 30 n
	•	Response tolerance I ₂
Insulation coordination according to IEC 60664	I-1/IEC 60664-3	for $f = \ge 60 \le 500 \text{ Hz}$ 0.941.1 x
Definitions:	(I1 I2 I2 N)	for $f = > 500 \le 2000 \text{ Hz}$ 0.82 x
Main circuit IC1 Control circuit IC2 (a	(L1, L2, L3, N) .f, Test, Error, Switch2, Switch1, Vcc, GND, PWM)	Restart value I_2 < 2 n
Rated voltage (a	250 V	Operating time t_{ae} (DC \leq 100 Hz)
Overvoltage category (ÜK)	250 V	All fault current except pure DC $< (20/I)^{1.43} - 10 \text{ r}$
Rated impulse voltage:	III	$DC > 30 \le 100.6 \text{ mA}$ < $(40 \times 1.414/I)^4 - 10 \text{ r}$
IC1/IC2	4 kV	$DC > 100.6 \text{ mA}$ < $(20/I)^{1.43} - 10 \text{ r}$
Rated insulation voltage U_1 :	TRY	Release time $t_{\rm off}$ < 2.5
IC1/IC2	250 V	
Pollution degree	2	Outputs Switch1, Switch2, Error
Protective separation (reinforced insulation) between		Type Open Collector (NP
IC/IC2	ÜK III, 250 V	Switching capacity DC 40 V/20 m.
The data are valid from the main circuit to the control		Signalling times in the event of module and hardware errors
The data are valid from the main circuit to the contr	or circuit.	Error ≤ 1.: Switch1 ≤ 2.:
Power supply		Switch1 ≤ 2. Switch2 ≤ 2.
Nominal supply voltage V_{CC}	DC 5 V	
Tolerance of the supply voltage V_{CC}	±5 %	PMW output
Voltage ripple V _{CC}	< 100 mV	Type PushP
Absolute maximum supply voltage V_{cc}	DC 5.5 V	HIGH level 3.13.5
Supply current I _{CC}	45 mA	LOW level 00.5
		PWM frequency 8000
Residual current measuring range	200011	Scaling
Rated frequency /∆n	02000 Hz	RCMB104-1 $0100\% = DC 030 \text{ n}$
Measuring range I∆n	±300 mA	RCMB104-2 0100 % = RMS 050 n
Resolution I∆n	< 0.2 mA	Maximum current-carrying ability 10 n
Response values		* The overvoltage protection must be ensured by the customer.
RCMB104-1 (Switch1)		,
Rated residual operating current /∆rms1	RMS 30 mA	Control input (TEST)
Response tolerance I _{\Delta\text{ms1}}		Type LOW: activated sta
for $f = DC \dots \le 100 \text{ Hz}$	0.71 x / _{Δrms1}	HIGH: deactivated sta
for $f = 100 \le 400 \text{ Hz}$	0.82.5 x / _{Δrms1}	Switching thresholds HIGH: 3.1 5.5
for $f = 4002000 \text{ Hz}$	1.56 x /∆rms1	LOW: 0 0.6
Restart value I _{Δrms1}	< 10 mA	EMV (IEC 62752, UL 2231-2)
Operating time t_{ae} (DC \leq 100 Hz)		ESD restrictions : The device must be mounted in an enclosure that complies with the mentioned standard.
1x I _{Δn1}	< 270 ms	Restrictions line-conducted interferences:
2x <i>I</i> ∆n1	< 80 ms	Maximum connection length: 100 m
5x <i>I</i> Δn1	< 20 ms	ESD immunity acc. to Human Body Model JESD22-A114 ±2 kV (a
RCMB104-1 (Switch2, IEC 62752)		±2 kV (contains
Rated residual operating current I _{Adc2}	DC 6 mA	Operating temperature —3080
Response tolerance $I_{\Delta dc2}$	> 0.51 x /Δdc2	Storage temperature –4085
Rated residual operating current I _{Δrms2}	RMS 30 mA	Climatic class
Response tolerance I _{Δrms2}		
for $f = DC \dots \leq 100 \text{ Hz}$	0.71 x /∆rms2	Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2) 3K24 (except condensation, water and formation of ic
for $f = 100 \le 400 \text{ Hz}$	0.82.5 x /∆rms2	Long-term storage (IEC 60721-3-1) 1K
for $f = 4002000 \text{ Hz}$	1.56 x /∆rms2	
Restart value		Classification of mechanical conditions
/ _{Δdc2}	< 2.5 mA	Stationary use (IEC 60721-3-3) 3M
I _{Δrms2}	< 10 mA	Transport (IEC 60721-3-2) 2N
Operating time t_{ae}		Long-term storage (IEC 60721-3-1) 1M Range of use < 4000
DC 6 mA	< 700 ms	-
DC 60 mA	< 240 ms	Degree of protection
DC 300 mA	< 20 ms	RCMB104 IP
Operating time t_{ae} (DC \leq 100 Hz)		Measuring current transformer (without connector plug)
1x I _{Δrms2}	< 270 ms	Connections
2x / _{Δrms2}	< 80 ms	
5x /Δrms2	< 20 ms	Measuring current transformer
RCMB104-2 (Switch1, CCID20 acc. to UL 2231-2		Connection type PCB plug-in connector 0.65 x 0.65 m Modular dimensions single row 6 x 2.54 m
Ground fault threshold I ₁		Modular dimensions single row 6 x 2.54 m Contact surface tinn
60 Hz	RMS 20 mA	Pin length 2.5 m
DC	40 mA x 1.141	
Response tolerance I_1		Inputs/outputs Connection time PCR plug in connector 0.5 v 0.5 m
for $f = 60 \text{ Hz}$	0.751 x l1	Connection type PCB plug-in connector 0.5 x 0.5 m
for $f = > 60 \le 2000 \text{ Hz}$	0.83.5 x l1	Arrangement of connections double row 2 x 4 pi Modular dimensions 2.00 m
Restart value I ₁	< 10 mA	Modular dimensions 2.00 m Contact surface tinn
Operating time t_{ae} (DC \leq 100 Hz)		Pin length 2.5 m
All fault current except pure DC	$< (20/I)^{1.43} - 10 \text{ ms}$	Soldering process for PCB recommended: selective soldering
DC > 30≤ 100.6 mA	$< (40 \text{ x } 1.414/l)^4 - 10 \text{ ms}$	
DC > 100.6 mA	< (20/l) ^{1.43} –10 ms	Connection measuring current transformer CTBC17
Release time t _{off}	< 2.5 s	Maximum distance to connector 100 m
		Connection type PCB plug-in connect
		Number of poles 6 (2x3 pole Modular dimensions 3.0 m
		Number of mating cycles Manufacturer type designation Molex MicroFit 3.0 Head
		Article number 43045-06
		73 USS 194 194 1
		The connector is not included in the scope of delivery. For further information, refer to the original data sheet created by Molex.





Tolerances dimensions				
x ¹	± 0,05			
x ²	± 0,1			
χ ³	± 0,2			
х4	± 0,3			

Wiring diagram



RDC104-4

DC sensitive residual current monitoring module for electric vehicle charging systems



Typical applications

· DC fault current monitoring of AC charging systems for electric vehicles

Approvals



Device features

- Four outputs (Switch1, Switch2, Error, PWM)
- Measuring range ±300 mA
- Residual current resolution < 0.2 mA
- Patented measurement technology
- Rated current up to 32 A (singlephase) or 3 x 32 A RMS (three-phase)
- Fault output (integrated self monitoring and test functions)
- · High insensitivity to external interferences
- Available variants for application according to IEC 62955
- Wide range of use even in severe environments (e.g. in the event of external fields)
- In applications according to IEC 62955, the device can replace a type B RCD when combined with a type A RCD and a suitable switching device (e.g. a power relay)

Standards

The monitoring modules compliens, depending on the variant, with the following device standards:

RDC104-4:

IEC 62955 Residual direct current detecting device (RDC-DD) to be used for mode 3 charging of electric vehicles)

EP 2 571 128 / US 9,397,494 / ZL 201210157968.6 / CN 103001175, EP 2 813 856.

Further information

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

Ordering information RDC104-4

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

Ordering information Measuring current transformer

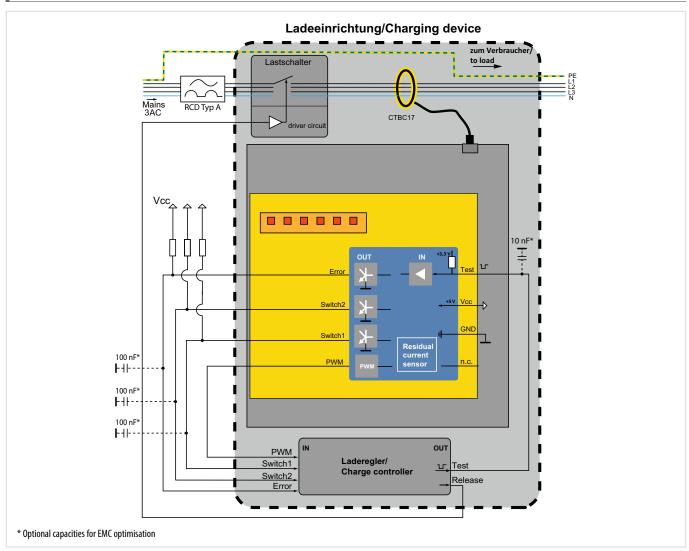
Description	Diameter/ Connection cable	Туре	Art. No.	Page
Measuring current transformer	17 mm/–	CTBC17	B98080070	262
Connection cable CTBC17	$-/180 \pm 30 \text{mm}$	CTBC17-Kabel180MM	B98080540	262
	−/325 ± 25 mm	CTBC17-Kabel325MM	B98080541	262
	$-/600 \pm 30 \text{mm}$	CTBC17- Kabel600MM	B98080543	262
	-/1470 ± 30 mm	CTBC17-Kabel1470MM	B98080542	262

Main circuit (current paths trough CT)		PMW output	0.10.0
Rated operational voltage $U_{\rm e}$	230/400 V	Туре	PushPull
Rated current I _n	single-phase: 32 A (80 A)	HIGH level	3.13.5 V*
	three-phase: 32 A	LOW level	00.5 V*
Insulation coordination according to IEC 6	50664-1/IEC 60664-3	PWM frequency	8000 Hz
Definitions:		Scaling RDC104-4	0100 % = DC 030 mA
Main circuit IC1	(L1, L2, L3, N)	Maximum current-carrying ability	0100 % = DC 030 IIIA 10 mA
Control circuit IC2	(af, Test, Error, Switch2, Switch1, Vcc, GND, PWM)	Maximum current-carrying ability	10 1118
Rated voltage	250 V	* The overvoltage protection must be e	nsured by the customer.
Overvoltage category (ÜK)			
Rated impulse voltage:		Control input (TEST)	
IC1/IC2	4 kV	Туре	LOW: activated state
Rated insulation voltage <i>U</i> _I :	TRV		HIGH: deactivated state
IC1/IC2	250 V	Switching thresholds	HIGH: 3.1 5.5 V
			LOW: 0 0.6 V
Pollution degree	2	FMV (IFC COOFF)	
Protective separation (reinforced insulation) be		EMV (IEC 62955)	and the state of the
IC/IC2	ÜK III, 250 V		nounted in an enclosure that complies with the mentioned
The data are valid from the main circuit to the	control circuit.	standards.	
		Restrictions line-conducted interfe	rences:
Power supply		Maximum connection length:	100 mm
Nominal supply voltage $V_{\rm CC}$	DC 5 V	ESD immunity acc. to Human Body Mod	
Tolerance of the supply voltage V_{cc}	±5 %		±2 kV (contact)
Voltage ripple V_{cc}	< 100 mV	Operating temperature	-3080 °C
Absolute maximum supply voltage V_{cc}	DC 5.5 V	Storage temperature	−40…85 °C
Supply current I _{cc}	45 mA	Climatic class	
· ·		Stationary use (IEC 60721-3-3)	3K24 (except condensation, water and formation of ice)
Residual current measuring range		Transport (IEC 60721-3-2)	2K11
Rated frequency $I_{\Delta n}$	02000 Hz	Long-term storage (IEC 60721-3-1)	1K21
Measuring range I∆n	100 mA	Classification of mechanical condit	ions
Resolution $I_{\Delta n}$	< 0.2 mA	Stationary use (IEC 60721-3-3)	3M11
D		Transport (IEC 60721-3-2)	
Response values		Long-term storage (IEC 60721-3-1)	1M12
RDC104-4 (Switch1)		Range of use	< 4000 m
Rated residual operating current I _{dc1}	DC 6 mA		
Response tolerance I _{Δdc1}	0.51 x /Δdc1	Degree of protection	
Restart value I _{Δdc1}	< 2.5 mA	RDC104-4	IPOC
Operating time tae		Connections	
DC 6 mA	< 480 ms	Connections	
DC 12 mA	< 240 ms	Inputs/outputs	
DC 30 mA	< 120 ms	Connection type	PCB plug-in connector 0.5 x 0.5 mm
DC 60 mA	< 70 ms	Arrangement of connections	double row 2 x 4 pins
DC 200 mA	< 30 ms	Modular dimensions	2.00 mm
DC 300 mA	< 30 ms	Contact surface	tinned
	< 30 IIIS	Pin length	2.5 mm
RDC104-4 (Switch2, IEC 62955)		Soldering process for PCB	recommended: selective soldering
Rated residual operating current $I_{\Delta dc2}$	DC 6 mA	Connection measuring current tran	nsformer CTBC17
Response tolerance $I_{\Delta dc2}$	> 0.51 x I _{Δdc2}	Maximum distance to connector	100 mm
Restart value I∆dc2	< 2.5 mA	Manufacturer type designation	Molex MicroFit 3.0 Header
Operating time t_{ae}		Article number	43045-0607
DC 6 mA	< 480 ms	The connector is not included in the sco	
DC 12 mA	< 240 ms	For further information, refer to the original	. ,
DC 30 mA	< 120 ms	arener mormation, refer to the one	g ==== sneet ereated s _f sten
DC 60 mA	< 70 ms		
DC 200 mA	< 30 ms		
DC 300 mA	< 30 ms		
Outputs Switch1, Switch2, Error			
Туре	Open Collector (NPN)		
Switching capacity	DC 40 V/20 mA*		
Signalling times in the event of module and ha	ardware errors		
Error	≤ 1.5 s		
Switch1	≤ 1.5 s		
Switch2	≤ 1.5 s		

Side view; Front view Recommended drilling diameter: Ø 1,1mm 20,35³ -|2,54³ 1,6² Φ ф 2,5³ ф ф 0 17,41⁴ 14,23³ 15 _ _ $7,59^{3}$ φ 2,57² 23,99³ Ø 1,5² 26,5² 1,63 ■ 0,5 x 28⁴ **0**,64

Tolerances dimensions					
x ¹	± 0,05				
x ²	± 0,1				
χ ³	± 0,2				
х4	± 0,3				

Wiring diagram



LINETRAXX® RCMB42...

AC/DC sensitive residual current monitor





Typical applications

• Residual current monitoring of AC charging stations for electric vehicles

Approvals



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

Sandards

The LINETRAXX® RCMB42... series complies with the following device standard:

• IEC 62752

Further information

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

Ordering information

Type	Measuring range	Frequency range	Number of measuring current transformers (Ø 15 mm, 1.5 m cable)	Channels	Supply voltage <i>U</i> s	Art. No.
RCMB420-2			3	2 x residual current	AC 110240 V, 50/60 Hz / DC 150220 V	B74042500
RCMB420-25	DC 06 mA	0 200011-	2	2 x residual current	DC 1836 V	B74042503
RCMB422-2	RMS 030 mA	02000 Hz		1	AC 110240 V, 50/60 Hz / DC 150220 V	B74042502
RCMB422-25			I	1 x residual current	DC 1836 V	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		
Output circuit 1 (IC3)	13, 14	Response values	
Output circuit 2 (IC4)	23, 24	Residual current I∆n1	6 mA
Monitored current circuit (IC5)	Un	Response tolerance $I_{\Delta n1}$	-500 %
Rated voltage	250 V	Residual current /∆n2	30 mA (r.m.s.)
Overvoltage category (OVC)	III	Response tolerance $I_{\Delta n2}$	
Pollution degree	2	for $f \le 1$ kHz	-200 %
		for <i>f</i> > 1 kHz	-20+100 %
RCMB4225		Restart sequence value	
Rated insulation voltage		DC 6 mA	< 3 mA
IC1/IC2	40 V	AC/DC 30 mA (r.m.s.) for $f \le 1$ kHz	< 12 mA
(IC1-IC2)/(IC3-IC5)	250 V	AC/DC 30 mA (r.m.s.) for $f > 1$ kHz	< 22 mA
IC3/(IC4-IC5)	250 V	Operating time t_{ae1} for 1 x $I_{\Delta n1}$	< 600 ms
IC4/IC5	250 V	Operating time t_{ae2} for	
Rated impulse voltage		1 x / _{Δn2}	< 180 ms
IC1/IC2	800 V	2 x I _{Δn2}	< 70 ms
(IC1-IC2)/(IC3-IC5)	4 kV	5 x / _{Δn2}	< 20 ms
IC3/(IC4-IC5)	4 kV	2 X 1 7 1 1 2	< 20 III3
IC4/IC5	4 kV	Inputs and operation	
Safe isolation (reinforced insulation) between		Test button	on front side
(IC1-IC2)/(IC3-IC5)	OVC III, 250 V	Test	internal/external
(IC3-IC4)-IC5	OVC III, 250 V	Cable length Test/Err, GND	< 10 m
Basic insulation between	,	Transformer connection	external
IC3/IC4	OVC III, 250 V	LED device function	green
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	DC 1 KV 00 3	LED didilii Ciidililei 2	yellow
(IC1-IC2)/(IC3-IC4)	AC 2.2 kV	Output	
IC2-IC5	AC 2.2 kV	Common alarm signal Err	Open-Collector (npn)
IC3/IC4	AC 2.2 kV	No error	00.6 V
	AC 2.2 KV	Error	11.412.6 V
RCMB422		LIIO	11.712.0 ¥
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	······································	$I_{\Delta n} \ge 30 \text{ mA r.m.s.}$
IC3/IC4-IC5	250 V	Switching elements	2 x 1 N/O contacts
IC4/IC5	250 V	Operating principle	N/C operation
Rated impulse voltage		Electrical endurance, number of cycles	10,000
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 $U_{\rm e}$	250 V
Safe isolation (reinforced insulation) between		Rated operational current le	5 A
IC1/(IC2-IC5)	OVC III, 250 V	Minimum contact rating	1 mA at AC/DC \geq 10 V
IC2-(IC3-IC5)	OVC III, 250 V	F	
IC3-(IC4-IC5)	OVC III, 250 V	Environment/EMC	
(IC3-IC4)-IC5	OVC III, 250 V	EMC	IEC 61851-1, IEC 61851-22
Basic insulation between	0VC III, 230 V	Operating temperature	-30+75 °C
	OVC III. 250 V	Classification of climatic conditions acc. to IEC 60	721 (related to temperature and relative humidity):
IC3/IC4	OVC III, 250 V	Stationary use (IEC 60721-3-3)	3K22
Voltage tests (routine test) acc. to IEC 61010-1	162214	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 acc. to	
IC4-IC5	AC 2.2 kV	Stationary use (IEC 60721-3-3)	3M11
Supply voltage		Transport (IEC 60721-3-2)	2M4
зирріу чогаде		Long-term storage (IEC 60721-3-1)	1M12
RCMB4225		Connection	
Nominal voltage $U_{\rm S}$	DC 24 V		
Nominal voltage range $U_{\rm S}$	DC 1836 V	Connection type	push-wire terminals
Nominal current	110 mA (RCMB420-25)	Connection properties	
	70 mA (RCMB422-25)	Rigid	0.22.5 mm² (AWG 24-14)
Internal protection against reverse polarity and short circuit	,	Flexible without ferrules	0.752.5 mm ² (AWG 19-14)
		Flexible with ferrules	0.21.5 mm ² (AWG 24-16)
RCMB422	AC 110 340 V 50/60 V	Stripping length	10 mm
Nominal voltage range $U_{\rm S}$	AC 110240 V, 50/60 Hz	Opening force	50 N
T. 1 (d) 1 (1 (d) 2 (d)	DC 150220 V	Test opening, diameter	2.1 mm
Tolerance of the nominal voltage range of $U_{\rm S}$	-5+15 %		
Nominal current	30 mA		

Technical data (continued)

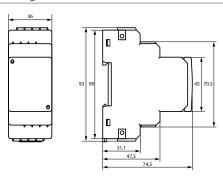
Documentation number

Other	
Operating mode	continuous operation
Degree of protection, internal components	IP 30
Degree of protection, terminals	IP 20
Area of application	≤ 2000 m AMSL
Quick DIN rail mounting acc. to	IEC 60715
Screw mounting	2 x M4 with mounting clin

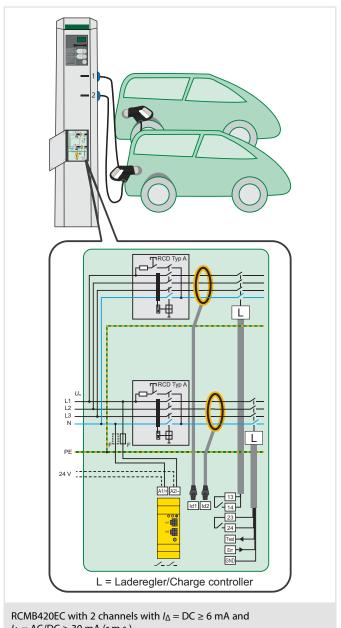
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Measuring current transformer	
Diameter cable gland measuring current transformer	15 mm
Cable length	1.5 m
Max. cable cross section	4 x 6 mm ²
Mounting	with cable ties
Connection to RCMB42	plug-in connector with 6 poles
Rated voltage U _n	3/(N) AC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

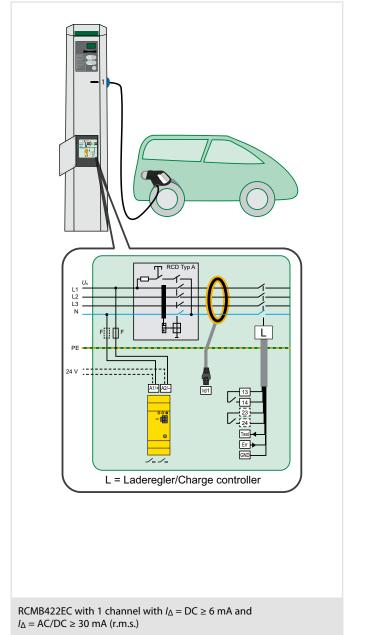
Dimension diagram (dimensions in mm)



Wiring diagrams



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



Device overview neutral grounding resistance monitoring (NGR) LINETRAXX®

		LINETRAXX®	LINETRAXX°	LINETRAXX®	E LINETRAXX®
		NGRM500	NGRM550	NGRM700	NGRM750
	Catalogue page	224	224	229	229
	Special applications	Neutral grounding resistance monitoring (NGR monitoring)			
System	HRG	✓	+	~	-
	LRG	-	~	-	~
Fault	\approx	✓	~	~	~
Curr		~	~	~	✓
Ph	ase monitoring L1, L2, L3	-	-	~	~
	System voltage L-L*	60025000 V	60025000 V	60025000 V	60025000 V
Harmonic analysis	RMS 032	✓	~	✓	✓
Harn	Analysis range	✓	~	✓	✓
	Relay operating mode	Configurable fail-safe or non-fail-safe			
	Communication	Webserver, BCOM, Modbus RTU, Modbus TCP			
	Maximum altitude	2000 m	2000 m	5000 m	5000 m
ing	Detachable HMI for front panel mounting	-	-	~	~
Mounting	DIN rail	✓	~	-	-
_	Screw mounting	-		~	✓
	Product details (Products on www.bender.de/en)				

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

Device overview coupling devices for NGR monitoring



Recommended minimum value R_{NGR} (tripping level 50 %)

		CD1000				CD10	00-2		CD5000 CD14400					CD25000		
	Usys	400 V	600 V	690 V	400 V	600 V	690 V	1000 V	2400 V	4200 V	6 kV	6.6 V	7.2 kV	11 kV	14.4 kV	25 kV
	1 A	231 Ω	346 Ω	398Ω	231 Ω	346 Ω	398 Ω	577 Ω	1386 Ω	-	-	-	-	-	-	-
	5 A	46 Ω	69 Ω	80 Ω	46 Ω	69 Ω	80 Ω	115 Ω	277 Ω	485 Ω	693 Ω	762 Ω	831 Ω	1270 Ω	1663 Ω	-
	10 A	(23 Ω)	35 Ω	40 Ω	(23 Ω)	35 Ω	40 Ω	58 Ω	139 Ω	242 Ω	346 Ω	381Ω	416 Ω	635 Ω	831 Ω	1443 Ω
	15 A	(15 Ω)	(23 Ω)	(27 Ω)	(15 Ω)	(23 Ω)	(27 Ω)	38 Ω	92 Ω	162 Ω	231 Ω	254 Ω	277 Ω	423 Ω	554Ω	962 Ω
/NGR	20 A	-	<i>(17 Ω)</i>	(20 Ω)	-	(17 Ω)	(20 Ω)	29 Ω	69 Ω	121 Ω	(173 Ω)	191 Ω	208 Ω	318 Ω	416 Ω	722 Ω
Ž	25 A	-	-	<i>(16 Ω)</i>	-	-	<i>(16 Ω)</i>	(23 Ω)	55 Ω	97 Ω	(139 Ω)	(152 Ω)	(166 Ω)	254Ω	333 Ω	577 Ω
	30 A	-	-	-	-	-	-	(19 Ω)	(46 Ω)	81 Ω	(115 Ω)	(127 Ω)	(139Ω)	212 Ω	277 Ω	481 Ω
	40 A	-	-	-	-	-	-	-	(35 Ω)	61 Ω	<i>(87 Ω)</i>	<i>(95 Ω)</i>	<i>(104 Ω)</i>	(159Ω)	208 Ω	361 Ω
	50 A	-	-	-	-	-	-	-	(28 Ω)	(48 Ω)	-	(76 Ω)	(83 Ω)	(127 Ω)	(166 Ω)	289 Ω
	100 A	-	_	_	-	_	-	-	-	(24 Ω)	-	-	-	-	(83 Ω)	(144 Ω)

Temperature range -40 . . . +70 °C, field calibration at 25 °C (Limited temperature range 0...+40 °C, field calibration at 25 °C)

LINETRAXX® NGRM500 (HRG)/NGRM550 (LRG)

Neutral Grounding Resistor Monitor



Typical applications

- · For use in high-resistance grounded systems (NGRM500)
- For use in low-resistance grounded systems (NGRM550)

Approvals



UL File Number: E493737, E173157

Device features

- Determination of R_{NGR} with passive and active measurement methods
- Continuous monitoring of the RNGR even if the installation is de-energized;
- · Alarm or trip on ground fault
- Monitoring of the current INGR
- Monitoring of the voltage U_{NGR}
- · Ethernet communication
- · Web server
- Language selection (German, English GB and US, Spanish, French)
- · Test button (internal, external) with/without tripping
- · FFT analysis of neutral current and voltage
- Pulser control for manual ground fault location
- Relay outputs for detection of ground faults and resistor faults
- · Relay output for shutdown of the installation after a configurable time
- Can be combined with RCMS... for automatic shutdown of feeders
- · Graphical user interface
- Wide supply voltage range for operating the NGR monitor
- Range of use up to 2000 m AMSL
- · Fault/History memory
- Analogue output of measured values (0...10 V, 4...20 mA, etc., selectable parameters)
- Password protection
- Tripping on RMS, fundamental component signal or harmonics
- · Detection of AC and DC ground faults
- Variants High Resistance Grounded (HRG), Low Resistance Grounded (LRG)

	HI	RG	LRG				
	NGRM500	NGRM700	NGRM550	NGRM750			
U _{sys LL}		40025000V					
/NGR nom	0100 A 102000 A						
R _{NGR nom}	155	5000 Ω	0,1200 Ω				

Further information

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

Ordering information

Туре	System type	Supply voltage U₅/ Frequency range Hz	Art. No.
NGRM500	HRG	AC 48240 V, 4070 Hz	B94013500
NGRM550	LRG	DC 48240 V	B94013550

Suitable system components

Description	Туре	Art. No.	Page
Coupling device	CD	B980390	247
	CTAC	B981100	342
Measuring current transformer	CTAS	B981100	351
Measuring current transformer	CTB31CTB51	B980860	283
	CTUB103	B781200	241
Voltage supply for measuring current transformers	STEP-PS	B940531	381

Insulation coordination according to IEC 60664-1/IEC	60664-3/DIN EN 50178	Tolerance t_{trip} when set to	
Definitions		RMS	−200 ms
Supply circuit (IC1)	(A1, A2)	Fundamental	0+150 ms (filter time)
Measuring circuit/Control circuit (IC2)	(RS, E, CT), (X1, ETH)	Harmonics	0+150 ms (filter time)
Output circuit 1 (IC3)	(11, 12, 14)	Measuring current transformer ratio primary	110,000
Output circuit 2 (IC4)	(21, 22, 24)	Measuring current transformer ratio secondary	110,000
Output circuit 3 (IC5)	(31, 32, 34)	Measuring range	2 x /NGR nom
Rated voltage	250 V		1101110111
<u> </u>	230 V	Coupling	
Overvoltage category		$R_{\rm S}$ for $U_{\rm sys} \le 4.3$ kV	CD1000, CD1000-2, CD5000 (20 kΩ)
Rated impulse voltage		$R_{\rm S}$ for $U_{\rm sys} > 4.3$ kV	CD14400, CD25000 (100 kΩ)
IC1/(IC25)	4 kV	19 101 0393 2 115 111	(100 122)
IC2/(IC35)	4 kV	Monitoring U _{NGR}	
IC3/(IC45)	4 kV	U_{NGR} with $R_{\text{S}} = 20 \text{ k}\Omega$ DC / 50	$0/60 \text{ Hz} / 103200 \text{ Hz}; (400/\sqrt{3}) \le (4300/\sqrt{3}) \text{ V}$
IC4/(IC5)	4 kV		$50/60 \text{ Hz} / 103200 \text{ Hz}; > (4.3 /\sqrt{3}) (25/\sqrt{3}) \text{ kV}$
Rated insulation voltage		Measuring range	1.2 x UNGR nom
IC1/(IC25)	250 V	Overload capacity	2 x <i>U</i> _{NGR} for 10 s
IC2/(IC35)	250 V		
IC3/(IC45)	250 V	Measurement accuracy	2 % of $U_{NGR \text{ nom}}$ with $U_{NGR \text{ nom}} = (U_{sys} (L-L)/\sqrt{3})$
IC4/(IC5)		Voltage response value	1090 % <i>U</i> NGR nom
	250 V	Response delay, ground-fault relay	\leq 40 ms (±10 ms)
Pollution degree exterior	3	Response delay, trip relay (configurable)	100 ms48 h, ∞
Safe isolation (reinforced insulation) between		Tolerance ttrip when set to	
IC1/(IC25)	overvoltage category III, 300 V	RMS	–200 ms
IC2/(IC35)	overvoltage category III, 300 V	Fundamental	0+150 ms (filter time)
IC3/(IC45)	overvoltage category III, 300 V	Harmonics	0+150 ms (filter time)
IC4/(IC5)	overvoltage category III, 300 V	DC immunity in case of active R _{NGR} measurement	
Voltage tests (routine test) acc. to IEC 61010-1		•	
IC1/(IC25)	AC 2.2 kV	with $R_S = 20 \text{ k}\Omega$	DC ±12 V
IC2/(IC35)	AC 2.2 kV	with RS = $100 \text{ k}\Omega$	DC ±60 V
IC3/(IC45)	AC 2.2 kV	Digital inputs	
• •		_ · · ·	
IC4/(IC5)	AC 2.2 kV	Galvanic separation	no
Supply voltage		Length connecting cables	max. 10 m
	AC/DC 40 240 V	U_{in}	DC 0 V, 24 V
Nominal supply voltage $U_{\rm S}$	AC/DC, 48240 V	Overload capacity	−532 V
for UL applications	AC/DC, 48240 V		
for AS/NZS 2081 applications	AC/DC, 48230 V	Digital outputs	
Tolerance U_{S}	±15 %	Galvanic separation	no
Tolerance U_s (for UL applications)	-50+15 %	Length connecting cables	max. 10 m
Tolerance U _s (for AS/NZS 2081 applications)	-25+20 %	Currents (sink) for each output	max. 300 mA
Frequency range U _s	DC, 4070 Hz	Voltage	24 V
Power consumption (max.)	≤ 7 W / 16 VA	Overload capacity	_532 V
Torret consumption (main)	_, ., ., .,		532 1
Monitoring R _{NGR}		Analogue output (M+)	
Measuring input Rs	< 33 V RMS	Operating principle	linear
Measuring range NGR (with $R_S = 20 \text{ k}\Omega$) active	010 kΩ	Functions	Ingr, Rngr
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 value	
Measurement uncertainty for $T = 0+40$ °C		Tolerance related to the current/voltage end valu	±20 70
•	±30 Ω	Ground-fault, NGR, trip relay	
Measurement uncertainty for $T = -40+70$ °C	±80 Ω	Switching elements	changeover contacts
HRG			•
Setting range R _{NGR nom}	15 Ω5 kΩ	Operating mode	configurable fail-safe/non-fail-safe
Response value $< R_{NGR nom}$	1090 % R _{NGR nom}	Electrical endurance, number of cycles	10,000
Response value $>R_{NGR nom}$	110200 % R _{NGR nom}	Switching capacity	2000 VA / 150 W
LRG		Contact data acc. to IEC 60947-5-1	
Setting range R _{NGR nom}	0.1200 Ω	Rated operational voltage AC	250 V/250 V
Response value > RNGR nom	200500 Ω	Utilisation category	AC-13/AC-14
Response delay, NGR-fault relay	7 s (±2.5 s)	Rated operational current AC	5 A/3 A
	· ,	•	
Response delay, trip relay	048 h	Rated operational current AC (for UL applications	
Monitoring I _{NGR}		Rated operational voltage DC	220/110/24 V
Measuring circuit 5 A		Utilisation category	DC12
	DC / E0/C0 H= / 10 3300 H= 5 A	Rated operational current DC	0.1/0.2/1 A
Nominal measuring current /n	DC / 50/60 Hz / 103200 Hz 5 A	Minimum current	1 mA at AC/DC $>$ 10 V
Maximum continuous current	$2 \times I_n$	F	
Overload capacity	10 x I _n for 0.03 s	Environment/EMC	
Measurement accuracy	$\pm 2\%$ of I_n	EMC immunity (IEC 61000-6-2 / IEC 60255-26 Ed.	. 3.0) DIN EN 61000-6-2
Load	10 mΩ	EMC emission (IEC 61000-6-4 / IEC 60255-26 Ed.	3.0) DIN EN 61000-6-4
Measuring circuit 50 mA		Operating temperature	-40+60°C
	DC / 50/60 Hz / 103200 Hz 50 mA	Operating temperature for UL applications	-40+60°C
	2 x In	Transport	-40+85 °C
Nominal measuring current In		manaport	
Nominal measuring current <i>I</i> _n Maximum continuous current	**	lang torm storass	
Nominal measuring current I _n Maximum continuous current Overload capacity	10 x / _n for 2 s	Long-term storage	-40+70 °C
Nominal measuring current / _n Maximum continuous current Overload capacity Measurement accuracy	10 x I _n for 2 s ±2 % of I _n	Long-term storage Humidity	-40+70 °C ≤ 98 %
Nominal measuring current I _n Maximum continuous current Overload capacity Measurement accuracy Load	10 x / _n for 2 s	Humidity	
Nominal measuring current I _n Maximum continuous current Overload capacity Measurement accuracy Load Measuring circuits 5 A and 50 mA	10 x I _n for 2 s ±2 % of I _n	Humidity Classification of climatic conditions acc. to IEC	$\leq 98~\%$ 60721 (related to temperature and relative humidity):
Nominal measuring current I _n Maximum continuous current Overload capacity Measurement accuracy	10 x I _n for 2 s ±2 % of I _n	Humidity Classification of climatic conditions acc. to IEC Stationary use (IEC 60721-3-3)	\leq 98 % 60721 (related to temperature and relative humidity): 3K22
Nominal measuring current I _n Maximum continuous current Overload capacity Measurement accuracy Load Measuring circuits 5 A and 50 mA	10 x / _n for 2 s ±2 % of / _n 68 Ω	Humidity Classification of climatic conditions acc. to IEC	$\leq 98~\%$ 60721 (related to temperature and relative humidity):

Technical data (continued)

Classification of mechanical conditions acc. to IEC 60721 / IEC 60255-21 / DIN EN 60068-2-6

Stationary use	3M7
Transport	2M4
Long-term storage	1M12

Connection

Screw-type terminals	
Tightening torque	0.50.6 Nm (57 lb-in)
Stripping length	7 mm
Recommended connecting cables	see overview in the manual
rigid/flexible	0.22.5 mm ² (AWG 24-13)
flexible with ferrule with/without plastic sleeve	0.25 2.5 mm ² (AWG 24-13)
Multiple conductor rigid	0.21 mm ² (AWG 24-18)
Multiple conductor flexible	0.21.5 mm ² (AWG 24-16)
Multiple conductor, flexible with ferrule without plastic sleeve	0.251 mm ² (AWG 24-18)
Multiple conductor, flexible with TWIN ferrule with plastic sleeve	0.51,5 mm ² (AWG 21-16)
Multiple conductor, flexible with TWIN ferrule with plastic sleeve	0.51,5 mm² (AWG 21-1

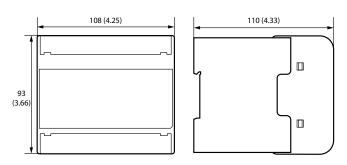
Push-wire terminal X1

Stripping length	10 mm
rigid/flexible	0.21.5 mm ² (AWG 24-16)
flexible with ferrule without plastic sleeve	0.251.5 mm ² (AWG 24-16)
flexible with ferrule with plastic sleeve	0.250.75 mm ² (AWG 24-18)

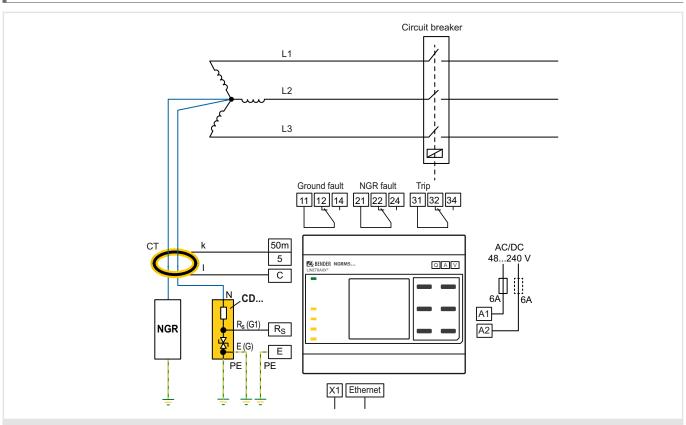
Other

Operating mode	continuous operation
Mounting	display-oriented
Operating 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 q

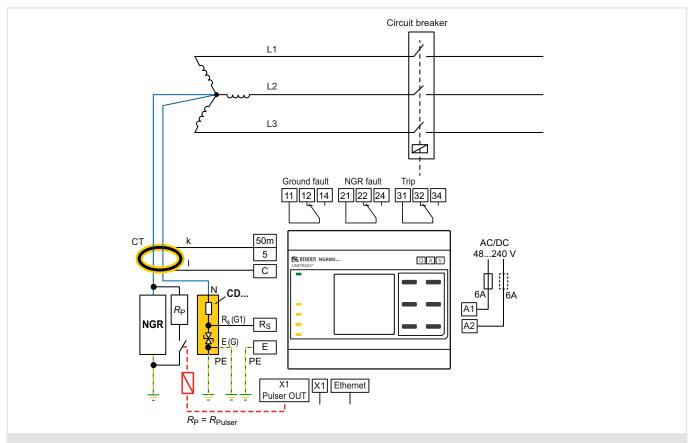
Dimension diagram (dimensions in mm)



Connection star connection



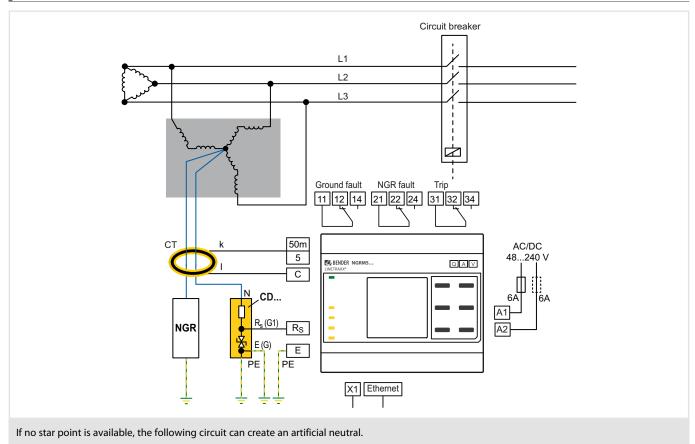
 $oldsymbol{1}$ The "N" connection of the CD-series coupling device should be as close to the transformer star point as possible.



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

An intermediate relay may be required between the power contactor of the pulser and the digital output at X1 of the FP200-NGRM.

Connection artificial neutral (delta connection): zigzag transformer



Depending on the system to be monitored, a suitable measuring current transformer has to be chosen. All common measuring current transformers (50 mA or 5 A on the secondary side) can be used. The following table helps you with the choice:

System type	AC + DC	AC	AC	AC
I _{NGR}	0,525 A	525 A	51000 A	102000 A
f	03800 Hz	423800 Hz	50/60 Hz	50/60 Hz
Transformation ratio Bender measuring current transformer	Measuring range (see CTUB103 manual) 5 A 100:1 10 A 200:1 25 A 500:1	600:1		
Connecting cable	max. 30 m	max. 40 m		mm²/AWG12
Connecting Cable	provided cable or 0.75.	.1.5 mm²/AWG1816	max. 40 m: 6	mm²/AWG10
IΔn		\\\	\sim	\sim
Туре	CTUB103 CTUB103 24 V S1(k) S2(l)	CTAC / CTAS CTAC K I CTAS	CTB3151	Any standard current transformer can be used.
CT: Terminal k	NGRM5: 50 mA	NGRM5: 50 mA	NGRM5: 5 A	NGRM5: 5 A
CT: Terminal I	NGRM5: C	NGRM5: C	NGRM5: C	NGRM5: C

LINETRAXX® NGRM700 (HRG)/NGRM750 (LRG)

Neutral Grounding Resistor Monitor



Typical applications

- For use in high-resistance grounded systems (NGRM700)
- For use in low-resistance grounded systems (NGRM750)

Approvals



UL File number: E493737, E173157

Device features

- Determination of 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}
- Faulted phase indication (optional; up to 690 V direct coupling, otherwise via potential transformers)
- Ethernet communication
- Web server
- · Language selection (German, English GB and US, Spanish, French)
- Test button (internal, external) with/without tripping
- FFT analysis of neutral current and voltage
- Pulser control for manual ground fault location
- · Relay outputs for detection of ground faults and resistor faults
- Relay output for shutdown of the installation after a configurable time
- Can be combined with RCMS... for automatic shutdown of feeders
- Graphical user interface
- Integrated wide-range power supply unit for operating the NGR monitor (AC/DC 24...240 V)
- Range of use up to 5000 m AMSL
- · Fault/History memory
- Analogue output of measured values (0...10 V, 4...20 mA, etc., selectable parameter)
- Detachable HMI for door mounting
- · Password protection
- Tripping on RMS, fundamental component signal or harmonics
- · Detection of AC and DC ground faults
- Variants High Resistance Grounded (HRG), Low Resistance Grounded (LRG)

	HRG		LRG	
	NGRM500	NGRM700	NGRM550	NGRM750
Usys LL	40025000V			
/NGR nom	0100 A		102000 A	
R _{NGR nom}	155000 Ω		0,1200 Ω	

Further information

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

Ordering information

Туре	System type	Supply voltage U₅/ Frequency range Hz	Art. No.
NGRM700	HRG	AC 24240 V, 4070 Hz	B94013700
NGRM750	LRG	DC 24240 V	B94013750

Suitable system components

Description	Туре	Art. No.	Page
Coupling device	CD	B980390	245
	CTAC	B981100	342
Measuring current transformer	CTAS	B981100	351
	CTB31CTB51	B980860	281
	CTUB103	B781200	239
Voltage supply for measuring current transformers	STEP-PS	B940531	381

Insulation coordination according to IEC 60664-1/IEC 60664-	3/DIN EN 50178	Monitoring I _{NGR}	
Definitions	(14.10.10)	Measuring circuit 5 A	DC / FO / CO !! / CO
Measuring circuit 1 (IC1)	(L1, L2, L3)	Nominal measuring current In	DC / 50/60 Hz / 103200 Hz 5
Supply circuit (IC2)	(A1, A2)	Maximum continuous current	2 x I
Measuring circuit/Control circuit (IC3)	(RS, E, CT), (X1, Ethernet)	Overload capacity	10 x I _n for 0.03
Output circuit 1 (IC4)	(11, 12, 14)	Measurement accuracy	±2 % of <i>i</i>
Output circuit 2 (IC5)	(21, 22, 24)	Load	10 mΩ
Output circuit 3 (IC6)	(31, 32, 34)	Measuring circuit 50 mA	
Rated voltage	690 V	Nominal measuring current In	DC / 50/60 Hz / 103200 Hz 50 m.
Overvoltage category		Maximum continuous current	2 x /
Rated impulse voltage		Overload capacity	10 x In for 2
	0.137	' /	
IC1 / (IC26)	8 kV	Measurement accuracy	±2 % of i
IC2 / (IC36)	4 kV	Load	68 0
IC3 / (IC46)	4 kV	Measuring circuits 5 A and 50 mA	
IC4 / (IC56)	4 kV	Response value I _{NGR}	1090 % /NGR noi
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 secondary	110,00
Safe isolation (reinforced insulation) between		Measuring range	2 x /NGR nor
IC1 / (IC26)	overvoltage category III, 800 V		Hun Hu
IC2 / (IC36)	overvoltage category III, 300 V	Coupling	
	overvoltage category III, 300 V	$R_{\rm S}$ for $U_{\rm Sys} \le 4.3$ kV	CD1000, CD1000-2, CD5000 (20 kΩ
IC3 / (IC46)		R_S for $U_{Sys} > 4.3 \text{ kV}$	CD14400, CD25000 (100 kΩ
IC4 / (IC56)	overvoltage category III, 300 V		CD 1 1 100, CD25000 (100 K22
IC5 / (IC6)	overvoltage category III, 300 V	Monitoring U _{NGR}	
Voltage tests (routine test) acc. to IEC 61010-1			$50/60 \text{ Hz} / 103200 \text{ Hz}; (400/\sqrt{3}) \le (4300/\sqrt{3})$
IC2 / (IC36)	AC 2.2 kV		
IC3 / (IC46)	AC 2.2 kV		/ 50/60 Hz / 103200 Hz; > $(4.3 / \sqrt{3})$ $(25 / \sqrt{3})$ k
IC4 / (IC56)	AC 2.2 kV	Measuring range	1.2 x <i>U</i> _{NGR nor}
IC5 / (IC6)	AC 2.2 kV	Overload capacity	2 x <i>U</i> _{NGR} for 10
1657 (160)	AC 2.2 RV	Measurement accuracy	2 % of $U_{NGR nom}$ with $U_{NGR nom} = (U_{sys (L-L)}/\sqrt{3})$
Supply voltage		Voltage response value	1090 % <i>U</i> NGR nor
Nominal supply voltage $U_{\rm S}$		Response delay, ground-fault relay	≤ 40 ms (±10 ms
· · · · · · · ·	AC/DC 24 240 V	Response delay, trip relay (configurable)	100 ms48 h, ∘
≤ 2000 m	AC/DC, 24240 V	Tolerance t _{trip} when set to	100 115 10 11/ -
≤ 2000 m (for UL applications)	AC/DC, 48240 V	RMS	20 0
≤ 2000 m (for AS/NZS 2081 applications)	AC/DC, 48230 V		-200 m
> 2000≤ 5000 m	AC/DC, 24120 V	Fundamental	0+150 ms (filter time
> 2000 ≤ 5000 m (for UL and AS/NZS 2081 applications)	AC/DC, 48120 V	Harmonics	0+150 ms (filter time
Tolerance U _S	±15 %	DC immunity in case of active R _{NGR} measurement	nt
Tolerance $U_{\rm S}$ (for UL applications)	-50+15 %	with $R_S = 20 \text{ k}\Omega$	DC ±12
Tolerance $U_{\rm S}$ (for AS/NZS 2081 applications)	-25+20 %	with $R_S = 100 \text{ k}\Omega$	DC ±60 '
Frequency range $U_{\rm S}$	DC, 4070 Hz		
	•	Digital inputs	
Power consumption (typ. 50/60 Hz)	≤ 6.5 W / 13 VA	Galvanic separation	n
Phase monitoring		Length connecting cables	max. 10 r
-	2 AC 100 COO V CAT III	U _{in}	DC 0 V, 24
Nominal measuring voltage <i>U</i> n	3 AC 100690 V, CAT III	Overload capacity	-532
Measuring range	1.2 x <i>U</i> _n	overload capacity	-JJ2
Measurement accuracy	±1 % of <i>U</i> _n	Digital outputs	
Power consumption per phase	≤ 0.5 W		
Overload capacity	2 x U _n continuous	Galvanic separation	n
Input resistance	1.76 ΜΩ	Length connecting cables	max. 10 r
PT ratio primary	110,000	Currents (sink) for each output	max. 300 m
PT ratio printary	110,000	Voltage	24
•		Overload capacity	-532
Measuring range with PT	100 V25 kV		
Monitoring R _{NGR}		Analogue output (M+)	
	22 1/ 2011	Operating principle	linea
Measuring input R _S	< 33 V RMS	Functions	Ingr, Rng
Measuring range NGR (with $R_S = 20 \text{ k}\Omega$) active	010 kΩ		600Ω), 420 mA (≤ 600Ω), 0400 μA (≤ $4 k\Omega$
Measurement uncertainty for $T = 0+40$ °C	±20 Ω		
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 va	lue ±20 9
Measurement uncertainty for $T = 0+40$ °C	±30 Ω	Ground-fault, NGR, trip relay	
Measurement uncertainty for $T = -40+70$ °C	±80 Ω		
•	±0012	Switching elements	changeover contact
HRG	450 515	Operating mode	configurable fail-safe/non-fail-saf
Setting range R _{NGR nom}	15 Ω5 kΩ	Electrical endurance, number of cycles	10,00
Response value $< R_{NGR nom}$	1090 % R _{NGR nom}	Switching capacity	2000 VA / 150 V
Response value >R _{NGR nom}	110200 % R _{NGR nom}		
LRG		Contact data acc. to IEC 60947-5-1	050///
Setting range R _{NGR nom}	0.1200 Ω	Rated operational voltage AC	250 V/250 V
Response value >RNGR nom	200500 Ω	Utilisation category	AC-13/AC-1
Response delay, NGR-fault relay		Rated operational current AC	5 A/3
• • • • • • • • • • • • • • • • • • • •	7 s (±2.5 s)	Rated operational current AC (for UL application	
Response delay, trip relay	048 h	Rated operational voltage DC	220/110/24
		Utilisation category	DC1
		Dated enerational assurant DC	0.1/0.3/4
		Rated operational current DC Minimum current	0.1/0.2/1 at AC/DC > 10



Technical data (continued)

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

Connection	
Screw-type terminals	
Tightening torque	0.50.6 Nm (57 lb-in)
Conductor sizes	AWG 24-12
Stripping length	7 mm
rigid/flexible	0.22.5 mm ²
flexible with ferrule 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 X1	
Conductor sizes	AWG 24-16
Stripping length	10 mm
rigid/flexible	0.21.5 mm ²
flexible with ferrule without plastic sleeve	0.251.5 mm ²
flexible with ferrule with plastic sleeve	0.250.75 mm ²

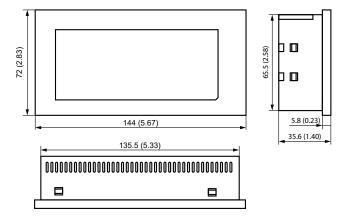
Other

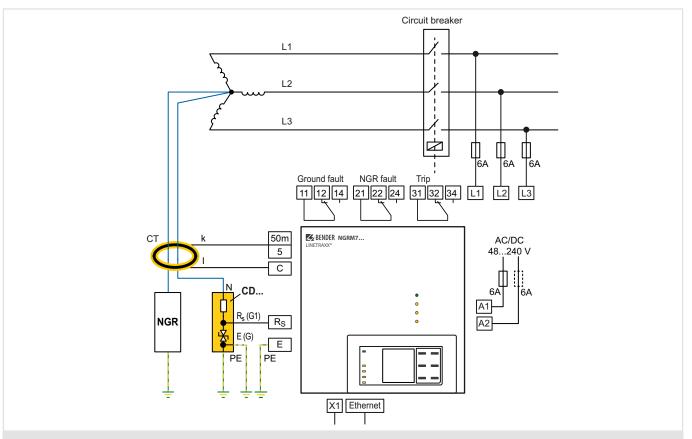
Operating mode	continuous operation
Mounting	display-oriented
Operating altitude	≤ 5000 m AMSL
Degree of protection, internal components (DIN EN 60529)	IP30
Flammability class	UL 94V-0
Protective coating measurement equipment	SL1307, UL file E80315
Documentation number	D00292
Weight	1050 g

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

61.40 (2.42) 223.50 (8.80) ф Ф 205 (8.07) 211 (8.31) 230 (9.06) 245 (9.65)

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

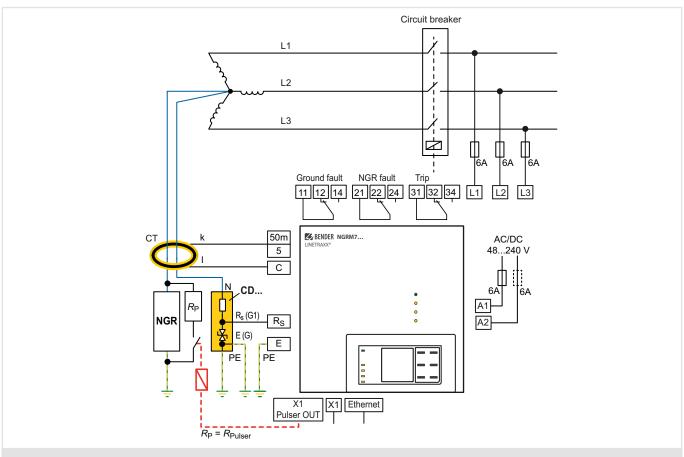




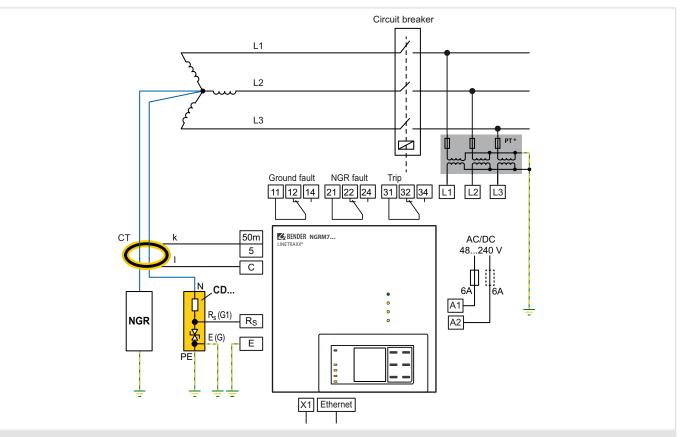
 $For these \ voltages, the \ phase \ monitor \ of \ the \ NGRM7... \ can be connected \ directly \ to \ the \ conductors \ to \ be \ monitored.$

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

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



The "N" connection of the CD-series coupling device should be as close to the transformer star point as possible. An intermediate relay may be required between the power contactor of the pulser and the digital output at X1 of the FP200-NGRM.

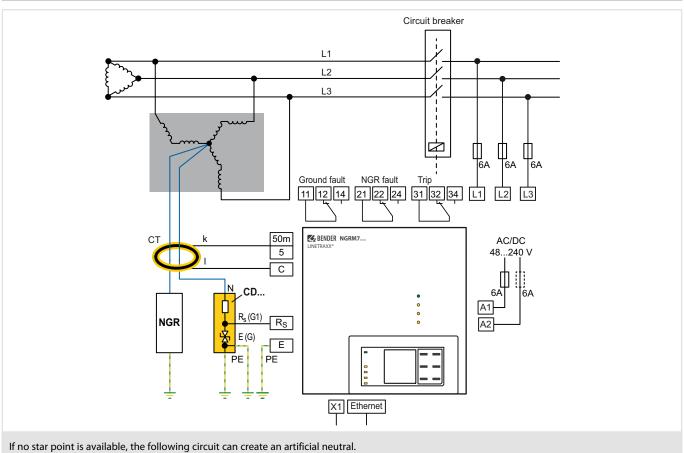


For these voltages, the phase monitor of the NGRM7... can only be connected to the conductors to be monitored via potential transformers (PT).

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

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

Connection artificial neutral (delta connection): zigzag transformer



Depending on the system to be monitored, a suitable measuring current transformer has to be chosen. All common measuring current transformers (50 mA or 5 A on the secondary side) can be used. The following table helps you with the choice:

System type	AC + DC	AC	AC	AC
I _{NGR}	Ingr 0.525 A 52		51000 A	102000 A
f	03800 Hz	423800 Hz	50/60 Hz	50/60 Hz
Transformation ratio Bender measuring current transformer	Measuring range (see CTUB103 manual) 5 A 100:1 10 A 200:1 25 A 500:1	600:1		
Connecting cable	max. 30 m	max. 40 m	max. 25 m: 4	mm²/AWG12
Connecting capie	provided cable or 0.75	.1.5 mm²/AWG1816	max. 40 m: 6	mm ² /AWG10
IΔn	~ [\\	\\\\	\(\)
Туре	CTUB103 CTUB103 24 V S1(k) S2(l)	CTAC / CTAS CTAC K I CTAS	CTB3151	Any standard current transformer can be used.
CT: Terminal k	NGRM7: 50 mA	NGRM7: 50 mA	NGRM7: 5 A	NGRM7: 5 A
CT: Terminal I	NGRM7: C	NGRM7: C	NGRM7: C	NGRM7: C

LINETRAXX® CTUB103

AC/DC sensitive measuring current transformer (Type B)



Device features

- Multicolour LED for operation, fault and status messages
- · Electronic module can be exchanged without mechanical separation of the primary conductors
- Monitoring of the connection to the measuring current transformer
- Evaluator: NGRM500, NGRM700

Further information

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

Typical applications

 Convert system leakage and fault currents into an evaluable measurement signal.

Approvals







Ordering details

CTUB103 set

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

Ordering details for spare parts and accessories

Electronic modules

Туре	Supply voltage <i>U</i> ₅	Art. No.
CTUB103	DC 24 V	B78120052

Required terminals or connecting cables are optionally available.

Suitable system components

Description	max. connected current transformers	Туре	Art. No.	Page
	4	STEP-PS/1 AC/24 DC/0.5	B94053110	381
Voltage supply	14	STEP-PS/1 AC/24 DC/1.75	B94053111	381
заррі)	34	STEP-PS/1 AC/24 DC/4.2	B94053112	381

Measuring current transformer cores

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

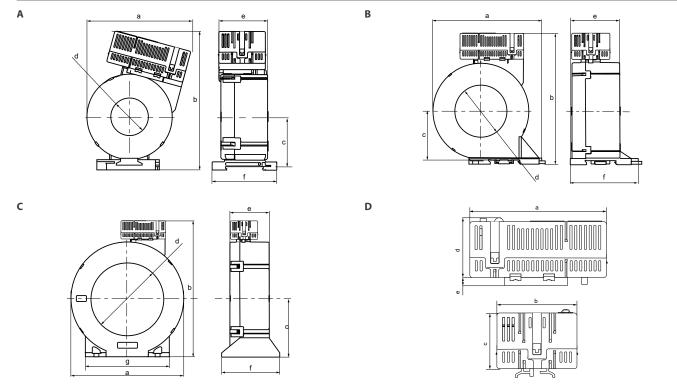
Accessories

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

Included in the scope of delivery

Insulation coordination acc. to IEC 60	0664-1/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 insul	lation; 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 $U_{\rm S}$	≤1%
Power consumption	≤ 5.3 W
Inrush current	1 A for 1 ms
Measuring circuit	
Internal diameter measuring current tran	sformer see dimension diagrams on page 4
Measurement accuracy	±2 %
Rated continuous thermal current I _{cth}	42 A
Rated short-time thermal current Ith	2.4 kA/1 s
Rated dynamic current I _{dyn}	6 kA/40 ms
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 (l)
Max. voltage	±10 V
Max. current	±100 mA
Max. cable length	30 m
Load	68 Ω

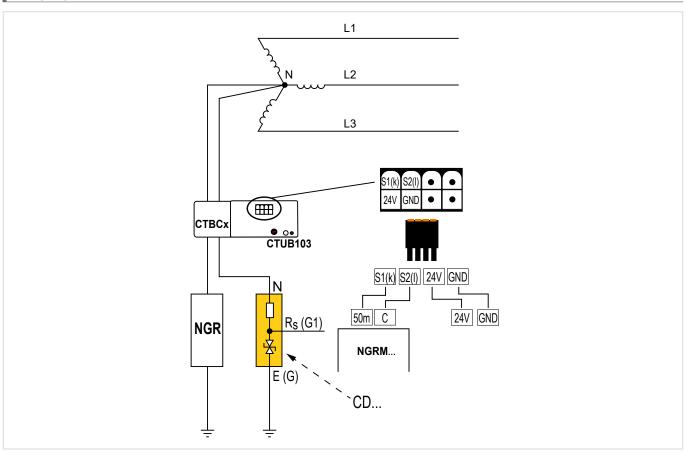
Environment/EMC EMC	IEC 61000-
	-2555°
Operating temperature	
Classification of climatic conditions acc. to IEC 60721 (related	
Stationary use (IEC 60721-3-3)	3K2
Transport (IEC 60721-3-2)	2K1
Long-term storage (IEC 60721-3-1)	1K2
Classification of mechanical conditions acc. to IEC 60721	
Stationary use (IEC 60721-3-3)	3M1
Transport (IEC 60721-3-2)	2M
Long-term storage (IEC 60721-3-1)	1M1
Connection	
Use 60 °C/75 °C copper lines only.	
X plug	
Manufacturer	Phoenix Contac
Туре	DFMC 1.5/4-ST-3.5 B
The connection conditions of the manufacturer apply.	
Connection properties	
rigid	0.21.5 mm ² (AWG 2416
flexible	0.21.5 mm ² (AWG 2416
with ferrule	0.250.75 mm
Mounting CTBC	
Screw type	
CTBC35, CTBC60	DIN EN ISO 7045 - M
CTBC120	DIN EN ISO 7045 - M
Washer type	
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
begree of protection, built in components (bit by 0032)	IP2
Degree of protection, terminals (DIN EN 60529) Flammability class	UL94 V-
Degree of protection, terminals (DIN EN 60529)	
Degree of protection, terminals (DIN EN 60529) Flammability class	D59
Degree of protection, terminals (DIN EN 60529) Flammability class Software	D59
Degree of protection, terminals (DIN EN 60529) Flammability class Software Documentation number	UL94 V- D59 D0041 ≤ 310
Degree of protection, terminals (DIN EN 60529) Flammability class Software Documentation number Weight	D59 D0041



	Dimensions in mm							
	Туре	a	b	c	d	e	f	g
Α	CTUB10CTBC35	97	130	47	ø 35	46	61	-
В	CTUB10CTBC60	126	151	57	ø 60	56	78	-
С	CTUB10CTBC120	188	225	96	ø 120	65	96	139
D	CTUB103	74	44	30	32	4,6	-	-

Tolerance: ±0,5 mm

Wiring diagram



RC48N

Ground-fault neutral-grounding monitor



Device features

- Ground-fault monitor for high-resistance grounded installations with a limited fault current of 5...25 A
- Three-in-one functionality: Residual current, voltage and grounding resistor continuity
- Measures the residual current by means of a Bender residual current transformer
- Alarm easily recognizable by LED lights
- · Alarm relay with adjustable trip time
- Measures resistance value and voltage drop of the NGR via coupling devices
- · Alarm easily recognizable by LED lights
- The alarm relay can be used for the tripping of a load switch
- Depending on the type of load switch the operating mode of the alarm relay can be set to N/O operation or N/C operation

Typical applications

• High-resistance grounded installations with a limited fault current of 5...25 A

Standards

• CSA M421-00: Use of electricity in mines

Approvals



Further information

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

Ordering information

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

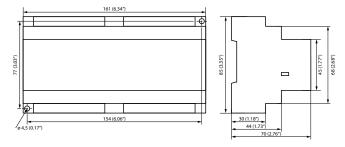
Suitable system components

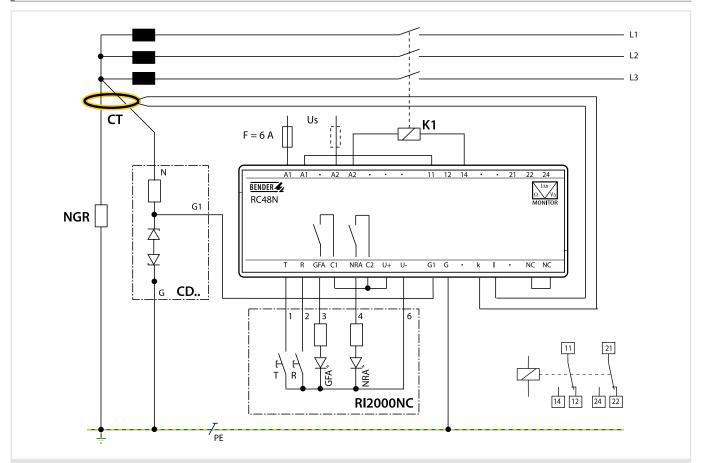
Description	Innendurchmesser	Туре	Art. No.	Page
Coupling device	-	CD	B980390	245
Remote alarm indicator and operator panel	-	RI2000NC	B94071001	-
Desidual summent two metawas as	70 mm	W2-S70	B911732	342
Residual current transformer	105 mm	W3-S105	B911733	342

Rated insulation voltage	AC 250 V
Rated impulse withstand voltage/pollution degree	2.5 kV/3
Voltage ranges	
Supply voltage U_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
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:	
connection to the residual current dunstonner.	up to 1 m (3')
Single wire 0.75 mm² (AWG 18)	
	110 m (330′)
Single wire 0.75 mm² (AWG 18)	110 m (330′)
Single wire 0.75 mm² (AWG 18) Single wire, twisted 0.75 mm² (AWG 18)	110 m (330') 1025 m (3075'

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	3K22
Connection	
Connection type	screw terminals
Wire cross section, single wire	0.24 mm ² (AWG 24-12)
Wire cross section, flexible	0.22,5 mm ² (AWG 24-14)
Other	
Operating mode	continuous operation
Mounting	any position
Protection class	according to DIN EN 60529
Built-in components	IP30
Terminals	IP20
Flammability class	UL94V-0
Documentation number	D00426
Weight	approx. 350 g

Dimension diagram (dimensions in mm (inch))





Connections Connection of the remote alarm indicator and operator 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 RI2000	panel RI2000NC			
Т	Connection external TEST button			
R	Connection external RESET button			
GFA	Connection external "Alarm Ground Fault" LED			
NRA	Connection external "Alarm Resistor Fault" LED			
U+, U-	Output DC 12 V, for the supply of the remote alarm indicator and operator panel RI2000NC.			
C1, C2, U+	Bridge supplies the remote alarm indicator and operator panel RI2000NC with supply voltage from the RC48N.			

Coupling device



Typical applications

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

Device features

- Coupling device for NGRM
- Range of use up to AC 690 V/DC 400 V system voltage
- Range of use up to 2000 m

Approvals



Further information

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

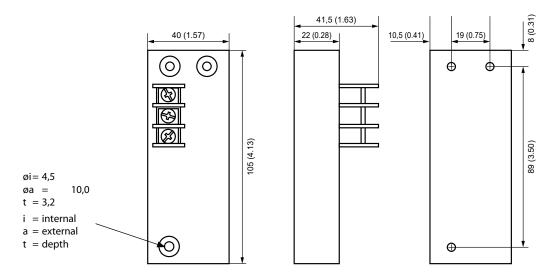
Ordering information

Туре	<i>U</i> LL	Ungr	Art. No.
CD1000	up to 690 V	400 V	B98039010

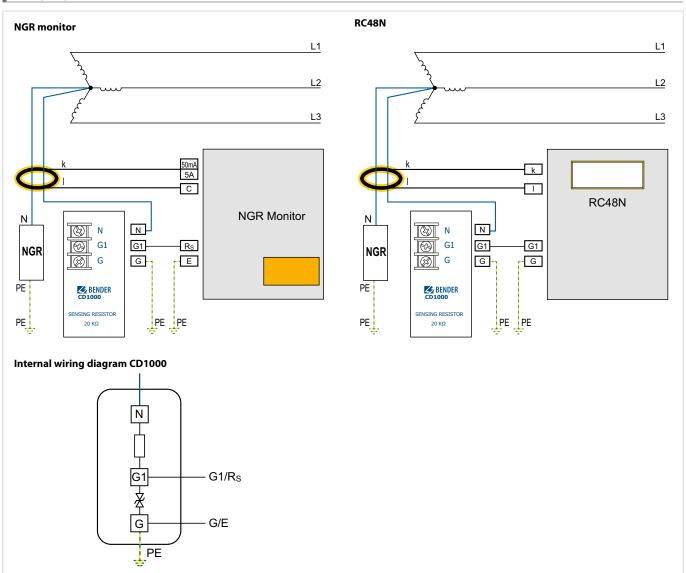
Technical data

Insulation coordination DIN EN 50178:1997	
Definition	
Measuring circuit (IC1)	N
Output circuit (IC2)	G1
Protective circuit (IC3)	G, PE
Rated voltage	400 V
Overvoltage category	III
Pollution degree	2
Rated insulation voltage	
no galvanic separation between the circuits!	
IC1/(IC2 – IC3)	400 V
IC2/IC3	50 V
Voltage range	
$\overline{U_{n}}$	DC, 50/60 Hz, 103200 Hz 400 V
I _n	30 mA
Overload capacity	1.15 x $U_{\rm n}$ for $<$ 30 minutes
Resistance	
20 kΩ	±5 %
Temperature coefficient	25 ppm/K
Environment	
Ambient temperature	-40+70 °C
Ambient temperature for UL	-40+60 °C
Humidity	≤ 98 %
Classification of climatic conditions acc. to IEC 60721	
(related to temperature and relative humidity)	
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22

Stationary use	3M12
Transport	2M4
Long-term storage	1M12
Connection	
Tightening torque	0.50.6 Nm (4,45,3 lb-in)
Conductor sizes	AWG 24-12
Stripping length	7 mm
Conductor, rigid	0.24 mm ²
Conductor, flexible	0.22.5 mm ²
Multiple conductor, flexible with ring cable lug	
without plastic sleeve	0.251.5 mm ²
with plastic sleeve	0.252.5 mm ²
Other	
Operating mode	continuous operation
Mounting	any position
Screw type mounting screws	M4x30
Tightening torque mounting screws	2.5 Nm (22.1 lb-in)
Operating altitude	up to 2000 m AMSL
Degree of protection, internal components (DIN EN 60529)	IP30
Flammability class	UL94 HB
Documentation number	D00397
Weight	< 190 a



Wiring diagram



Terminal	Use	Connecting cable	
Icinina	•	Metrical	Imperial
N	Connection to the star point of the HRG system		
G1	Connection to R _S of the NGRM	1.5 mm ²	AWG16
G	Connection to E of the NGRM; internally connected to PE		
PE	Connection to enclosure	≥ 1.5 mm ²	≥ AWG16

Coupling device



Typical applications

 ${\boldsymbol{\cdot}}$ The coupling device is suitable for HRG applications up to AC 1000 V and/or DC 690 V.

Insulation coordination DIN EN 50178:1997

Device features

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

Approvals



Further information

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

Ordering information

Туре	$u_{ m LL}$	U _{NGR}	Art. No.
CD1000-2	up to 1000 V	600 V	B98039053

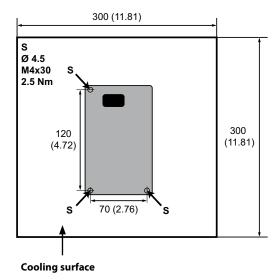
Technical data

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		
- Un	DC, 50/60 Hz, 103200 Hz 600 V	
I _n	30 mA	
Overload capacity	1.15 x $U_{\rm n}$ 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		
(related to temperature and relative humidity)		
Stationary use (IEC 60721-3-3)	3K22	
Transport (IEC 60721-3-2)	2K11	
Long-term storage (IEC 60721-3-1)	1K22	

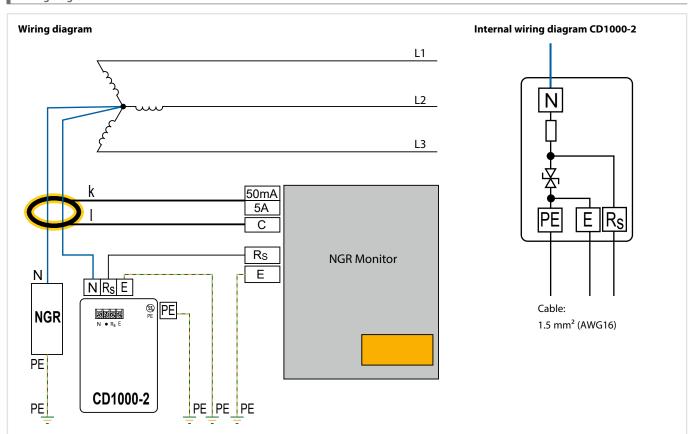
Classification of mechanical conditions acc. to IEC 60721	
Stationary use	3M12
Transport	2M4
Long-term storage	1M12
Connection	
Tightening torque	0.50.6 Nm (4.45.3 lb-in)
Conductor sizes	AWG 24-12
Stripping length	7 mm
Conductor, rigid	0.24 mm ²
Conductor, flexible	0.22.5 mm
Multiple conductor, flexible 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
Other	
Operating mode	continuous operation
Mounting	any position
Screw type mounting screws	M4x30
Tightening torque mounting screws	2.5 Nm (22.1 lb-in)
Operating altitude	up to 5000 m AMSI
Degree of protection, internal components (DIN EN 60529)	IP30
Flammability class	UL 94V-0
Documentation number	D00345
Weight	< 700 g

24 (0.94) 27 (1.06) 80 (3.15) 130 (5.12)

The device is suitable for screw mounting. For $U_{LL} > 690 \text{ V}$, a cooling surface of 300 x 300 mm (11.81 in²) must be provided.



Wiring diagram



So that the connection between NGR and star point is also monitored, the "N" terminal of the CD1000-2 should be connected directly to the star point of the transformer.

A direct connection between the "N" connections of the CD1000-2 and the NGR is not recommended, as in this case a line interruption between the star point and the NGR connection ${}_{\textit{"}}\!\textit{N"}$ would not be monitored.

Terminal	Terminal Use	Connecting cable	
ICIIIIII	•	Metrical	Imperial
N	Connection to the star point of the HRG system		
Rs	Connection to R _S of the NGRM	1.5 mm ²	AWG16
E	Connection to protective earth conductor (internally connected to PE)		
PE	Connection to the protective conductor (internally connected to E), cable lug M4	≥ 1,5 mm ²	≥ AWG16

Coupling device



Typical applications

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

Insulation coordination DIN EN 50178:1997

Device features

- Coupling device for NGRM
- Range of use up to AC 4300 V/DC 2500 V system voltage
- Range of use up to 5000 m

Approvals



Further information

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

Ordering information

Туре	U LL	Ungr	Art. No.
CD5000	up to 4300 V	2500 V	B98039011

Documentation number

Weight

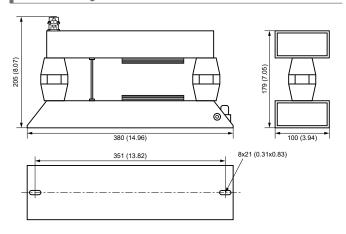
Technical data

Definition		
Measuring circuit (IC1)	N	
Output circuit (IC2)	G1	
Protective circuit (IC3)	G, PE	
Rated voltage	3 kV	
Overvoltage category	III	
Pollution degree	2	
Rated insulation voltage		
no galvanic separation between the circuits!		
IC1/(IC2 – IC3)	3 kV	
IC2/IC3	50 V	
Voltage range		
U_{n}	DC, 50/60 Hz, 103200 Hz 2500 V	
Ī _n	125 mA	
Overload capacity	1.15 x $U_{\rm n}$ for $<$ 5 minutes	
Resistance		
20 kΩ	±1%	
Temperature coefficient	20 ppm/K	
Environment		
Ambient temperature	-40+70°C	
Ambient temperature for U_L	-40+60°C	
Humidity	≤ 98 %	
Classification of climatic conditions acc. to IEC 60721		
(related to temperature and relative humidity)		
Stationary use (IEC 60721-3-3)	3K22	
Transport (IEC 60721-3-2)	2K11	
Long-term storage (IEC 60721-3-1)	1K22	

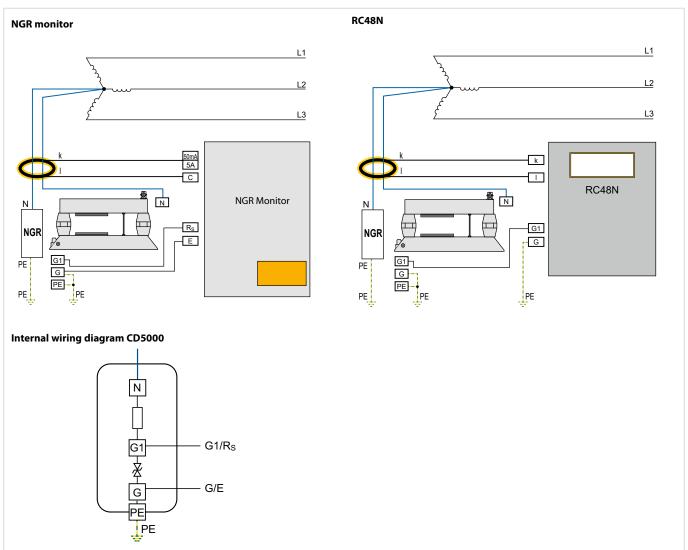
Stationary use	3M12
Transport	2M4
Long-term storage	1M12
Connection	
Tightening torque G1 and G	0.50.6 Nm (4,45,3 lb-in)
Conductor sizes	AWG 24-12
Connection G1 and G	cable lug
Conductor	≥ 1.5 mm ²
Connection PE	cable lug M6
Conductor	≥ 2.5 mm ²
Connection N (use minimum 110 °C conductor)	cable lug M6, 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

D00398

< 3800 g



Wiring diagram



Terminal	Use	Connecting cable	
icilililai ose		Metrical	Imperial
N	Connection to the star point of the HRG system	via cable lug	J M6 or M10
G1	Connection to R _S of the NGRM	1.5 mm ²	MMC16
G	Connection to E of the NGRM (internally connected to PE, see internal wiring diagram)	1.5 mm ² AWG16	
PE to enclosure	Connection to the protective conductor (internally connected to E, see internal wiring diagram)	≥ 1.5 mm ²	≥ AWG16

Coupling device



Device features

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

Approvals



Typical applications

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

Further information

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

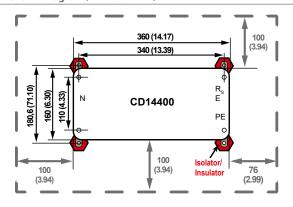
Ordering information

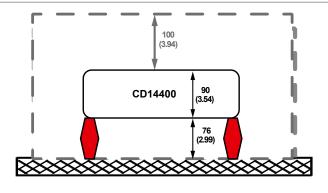
Туре	U LL	Ungr	Art. No.
CD14400	up to 14400 V	8400 V	B98039054

Technical data

Definitions	
Measuring circuit (IC1)	N
Output circuit (IC2)	R
Protective circuit (IC3)	E, PE
Rated voltage	8400 V
Overvoltage category	0400 V
Pollution degree	2
Rated insulation voltage	
no galvanic separation between the circuits!	
IC1/(IC2 – IC3)	8400 V
102/103	50 V
Voltage range	30.
U _n	DC, 50/60 Hz, 103200 Hz 8400 V
In	84 mA
Operating time	
without ground fault (1900 V)	unlimited
with ground fault (4200 V)	90 seconds
with ground fault (8400 V)	60 seconds
Cool-down period	120 minutes
Overload capacity	1.15 x <i>U</i> _n for < 30 seconds
Resistance	
100 kΩ	±0.5 %
Temperature coefficient	20 ppm/k
Environment	
Ambient temperature	-40+70 °C
Ambient temperature for U_L	-40+60°C
Humidity	≤ 98 %
Classification of climatic conditions acc. to IEC 60721	
(related to temperature and relative humidity)	
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22

Stationary use	3M12
Transport	2M4
Long-term storage	1M12
Connection	
Connection R _S and E	
Tightening torque	0.50.6 Nm (4.45.3 lb-in
Conductor sizes	AWG 24-12
Stripping length	7 mm
Conductor, rigid	0.24 mm
Conductor, flexible	0.22.5 mm
Multiple conductor, flexible with ferrule	
without plastic sleeve	0.251.5 mm
with plastic sleeve	0.252.5 mm
Multiple conductor, flexible with TWIN ferrule	
with plastic sleeve	0.51.5 mm
Connection N and PE	
Tightening torque cable lug M10	17 Nm (150 lb-in
Tightening torque cable lug M5	2.2 Nm (19.5 lb-in
Other	
Tightening torque	
cover screws	2.5 Nm (22.1 lb-in
mounting screws	21 Nm (186 lb-in
Operating mode	in case of a ground fault maximum 60
Mounting	any positior
Operating altitude	up to 5000 m AMSI
Degree of protection, internal components (DIN EN 60529)	IP54
Flammability class	UL 94V-0
Documentation number	D00346
Weight	< 4.4 kg

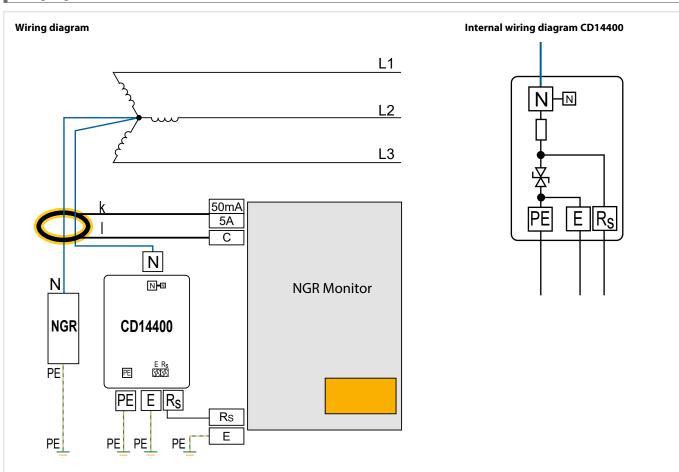




Tightening torque cover screws: 2.5 Nm (22.1 lb-in)

Minimum distance to adjacent devices

Wiring diagram



The "N" terminal of the CD14400 should be connected directly to the star point of the transformer, so that the connection between NGR and star point is also monitored.

A direct connection between the "N" connections of the CD14400 and the NGR is not recommended, as in this case a line interruption between the star point and the NGR connection "N" would not be monitored.

Terminal	Use	Connecting cable	
remina	use use	Metrical	Imperial
Rs	Connection to R _S of the NGRM	1.5?	AVAIC 1.C
E	Connection to E of the NGRM; internally connected to PE	- 1.5 mm ² AWG16	
N	Connection to the star point of the HRG system; via cable lug M5 or M10	AWC1C or proster	
PE	Connection to protective earth conductor; internally connected to E, cable lug M5	\geq 1.5 mm ² AWG16 or greater	

Coupling device



Typical applications

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

Device features

- Coupling device for NGRM
- Range of use up to AC 25 kV/DC 14.5 kV system voltage
- Application up to 5000 m

Approvals



Further information

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

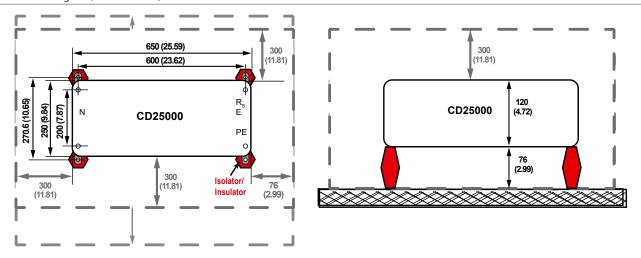
Ordering information

Туре	U LL	Ungr	Art. No.
CD25000	up to 25000 V	14500 V	B98039055

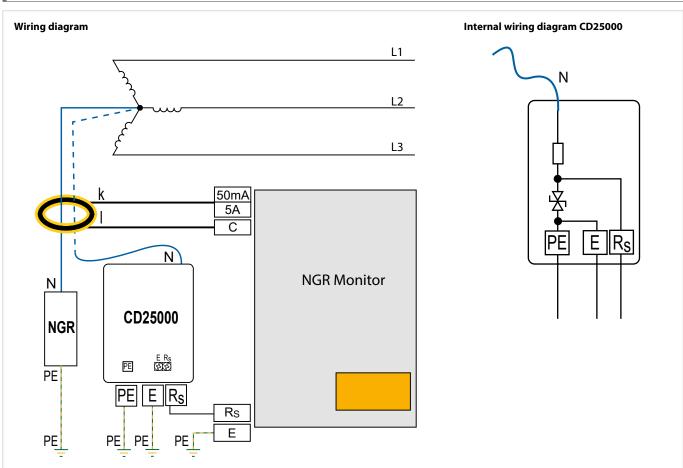
Technical data

Insulation coordination DIN EN 50178:1997	
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 circuits!	
IC1/(IC2 – IC3)	14500 V
IC2/IC3	50 V
Voltage range	
Un	DC, 50/60 Hz, 103200 Hz 14500 V
I _n	145 mA
Operating time	
without ground fault (2800 V)	unlimited
with ground fault (14500 V)	10 seconds
Cool-down period	120 minutes
Overload capacity	1.15 x U_n for $<$ 10 seconds
Resistance	
100 kΩ	±0.5 %
Temperature coefficient	20 ppm/K
Environment	
Ambient temperature	-40+70 ℃
Ambient temperature for U_L	-40+60°C
Humidity	≤ 98 %
Classification of climatic conditions acc. to IEC 60721	
(related to temperature and relative humidity)	
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22

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 24-12
Stripping length	7 mm
Conductor, rigid	0.24 mm ²
Conductor, flexible	0.22.5 mm
Multiple conductor, flexible with ferrule	
without plastic sleeve	0.251.5 mm ²
with ferrule with plastic sleeve	0.252.5 mm ²
Multiple conductor, flexible with TWIN ferrule	
with plastic sleeve	0.5 1.5 mm
Connection PE for cable lug	
Tightening torque cable lug M5	2.2 Nm (19.5 lb-in)
Connection N	
Connection via HV line with open end	cable lug provided by the customer
Other	
Operating mode	in case of a ground fault maximum 10 s
Mounting	any positior
Tightening torque cover screws	2.5 Nm (22.1 lb-in)
Operating altitude (when mounted on insulators)	up to 5000 m AMSI
Degree of protection, internal components (DIN EN 60529)	IP54
Flammability class	UL 94V-0
Documentation number	D00347
Weight	< 11 kg



Wiring diagram



 $The {\tt ,N''} terminal of the {\tt CD25000} should be connected directly to the star point of the transformer, so that the connection between NGR and star point of the transformer. The {\tt ,N''} terminal of the {\tt CD25000} should be connected directly to the star point of the transformer, so that the connection between NGR and star point of the transformer. The {\tt ,N''} terminal of {\tt ,N''} terminal$ is also monitored.

A direct connection between the "N" connections of the CD25000 and the NGR is not recommended, as in this case a line interruption between the star point and the NGR connection "N" would not be monitored.

Terminal	Use	Connecting cable	
	To the state of th		Imperial
N	Connection to the star point of the HRG system: permanently connected cable (1.8 m), cable lug provided by the customer	0.36	mm²
Rs	Connection to R _S of the NGRM	1.5 mm ²	AWG16
E	Connection to E of the NGRM; Internally connected to PE	1.5 mm ²	AWG16
PE	Connection to the protective conductor, internally connected to E, M5 cable lug	≥ 1.5 mm ²	AWG16 or greater

Device overview charge controller





-	 13

ICC1324

		66013	ICCIDET
Catalogue page		254	258
Modem		4G modem (optional)	4G modem (optional)
Integrated patented 6 mA DC fault current detection		~	~
Integrated Powerline Communication (PLC)		~	~
Emergency Opener		~	✓
WiFi module		-	✓ (optional)
Integrated power supply unit		-	✓
Interface	Ethernet	✓	✓
	Modbus	~	✓
Variant	Enclosure for DIN rail mounting	~	-
	PCB version	-	~
Product details (Products on www.bender.de/en)			



Device overview accessories charge controller

		CTBC17	DPM2x16FP	RFID105-L1	RFID114	RFID117-L1
	Catalogue page	262	266	267	268	269
Sp	pecial applications	Measuring current transformer	Display module	RFID module	RFID module	RFID module
	CC613	✓	~	~	~	~
eries	ICC1324	~	-	-	-	-
For series	RCMB104	✓	-	-	-	-
	RCD104	✓	-	-	-	-
	Product details (Products on www.bender.de/en)					

Charge controller CC613

Charge controller for use in electric vehicle charging stations, wallboxes or street light charging points



Typical applications

 Electric vehicle charging stations, wallboxes or street light charging points

Approvals



Device features

- Charge controller in accordance with IEC 61851-1 (charging mode 3)
- Configurable master and slave operation

Setting up charging stations with two charging points:

- 1 charge controller as data gateway with 4G modem
- 1 charge controller as slave without 4G modem
- Dynamic load management to optimally distribute the available power among all charging points and signal the maximum power available in each case to the vehicle
- Residual direct current monitoring module (external RCD type A required), different cable lengths can be selected
- $\bullet \ \ Integrated\ emergency\ opener\ for\ actuator\ control\ (locking/unlocking)\ and\ monitoring\ of\ the\ 12\ V\ supply\ voltage$
- Can be integrated in single- or three-phase systems up to 80 A
- OCPP 1.5 and OCPP 1.6 compliant with JSON, SOAP
- Supported mobile networks: 4G (LTE), 3G (UMTS) and 2G (GSM) with an integrated 4G modem
- · 3 USB interfaces:
- 1 CONFIG interface for local configuration and installation of software updates
- 2 USB host interfaces
- Control Pilot and Proximity Pilot communication
- Configurable support for additional SCHUKO socket-outlets
- Meter interface: Modbus TCP and RTU
- External Modbus interface (second meter for dynamic load management)
- User interface modules for customer-specific applications (e.g. RFID, LED, antenna)
- · Configurable 2-channel input/output extension interface for additional functionality
- Internal temperature sensor to reduce the charging current depending on the ambient temperature
- ISO 15118 Powerline Communication (PLC) for plug & charge and load management systems
- ISO 15118 Powerline Communication (PLC) for plug & charge or autocharge
- · Ethernet interface

Standards

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

- EN IEC 63000
- EN IEC 62311
- EN IEC 61851-1
- IEC 61851-21-2
- EN 61851-22EN 301 489-1
- EN 301 489-
- EN 301 908-1
- EN 301 908-13
- EN 301 908-2
- EN ISO 15118-2
- EN ISO 15118-3
- IEC 62955
- EN 301 489-52 Draft

Patents

EP 2 571 128 / US 9,397,494 / ZL 201210157968.6 / CN 103001175, EP 2 813 856.

Further information

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



Туре	Modem	Interface	RDC-M	External Modbus	OCPP-capable	PLC*	User interface	I/O extension	Art. No.
CC613-ELM4PR-M	4G			~	~		~	~	B94060020
CC613-ELPR-M	-			~	~		~	~	B94060021
CC613-ELM4PR	4G	Modbus, Ethernet	~	_	~	~	~	~	B94060026
CC613-ELPR	-	Luiciici		-	~		~	~	B94060027
CC613-HEM-X2	-			_	-		-	-	B94060028

^{*} Powerline Communication acc. to ISO/IEC 15118

The charge controller with residual direct current monitoring module (RDC-M) only works in combination with a measuring current transformer (to be ordered separately). Different cable lengths are available.

Accessory

Description	Art. No.	Page
RFID105-L1 with RJ45 cable (length 500 mm)	B94060105	271
RFID114 with RJ45 cable (length 500 mm)	B94060114	272
Current transformer CTBC17 (cable variant, cable length 325 mm) ¹⁾	B98080071	266
Current transformer CTBC17 (PCB variant) ^{11, 2)}	B98080070	266
Connection cable CTBC17-Cable incl. clip housing	B980805	266
DPM2x16FP (display module)	B94060120	270

Plug kit	Content / Quantity	Art. No.
Plug kit (can be ordered separately)	3-pole (1 x), 4-pole (1 x), 8-pole (2 x)	B94060129
Plug kit bulk pack, ELM4PR-M, ELPR-M	3-pole (50 x), 4-pole (50 x), 8-pole (100 x)	B94060128
Plug kit bulk pack, ELM4PR, ELPR, HEM-X2	4-pole (50 x), 8-pole (100 x)	B94060126

Technical data

Insulation coordination a	cc. to IEC 60664-1/IEC 60664-3		Data interfaces
Rated voltage		250 V	USB host 1 (terminal C1)*
Pollution degree		2	USB host 2 (terminal C2)*
Overvoltage category within	terminal H	II	Ethernet (terminal D)
Overvoltage category, termin	nal H and all other terminals	III	CONFIG (configuration inte
Rated impulse voltage, term	inal H and all other terminals	6 kV	SIM card (only with 4G mo
Rated impulse voltage within	n terminal H	2.5 kV	HMI (user interface, termin
Double insulation between t	erminal H and all other terminals	OCV III	Modbus meter (terminal B)
Basic insulation within termi	inal H	OCV II	External Modbus (terminal
Operating altitude AMSL		≤ 2000 m	Control Pilot (terminal B (C
Supply voltage (terminal	R (OCV +12CV))		Proximity Pilot (terminal B
Nominal voltage	D (000) 1 1200))	DC 12 V	* USB host 1 and USB hos
Operating range of the nomi	nal voltage	DC 11.412.6 V	
Max. nominal current		750 mA	Inputs (depending on th
Max. nominal current withou	ut USB load	400 mA	Optocoupler (terminal J
Max. nominal current with U	ISB load	750 mA	Input voltage
Docidual direct current m	onitoring module* (RDC-M, terminal A)		Input current
	onitoring module" (KDC-M, terminal A)	100 mA	Weld check (terminal H
Measuring range		TOU IIIA	Input voltage
Response values:			Input current
Residual current I∆n		DC 6 mA	Input PE (terminal B (PE
Response tolerance I∆n		-500 %	
Measuring current transf	ormers		Outputs (depending on
Max. connection cable lengtl	h	≤ 1.47 m	Contact data acc. to IEC
Restart sequence value:			Relays (12 V) (terminal J
DC 6 mA		< 3 mA	Rated operational voltage
* Patented 6 mA DC residua	al current trip		Rated operational current /
	9,397,494/ZL 201210157968.6/CN 10300117	75, EP 2 813 856)	Minimum contact rating
			Switching contact for co
	4G antenna (optionally with 4G modem		Rated operational voltage (
Frequency bands	800 MHz/850 MHz/900 MHz/180	00 MHz/2100 MHz/2600 MHz	Rated operational current /
			·

Frequency bands	800 MHz/850 MHz/900 MHz/1800 MHz/2100 MHz/2600 MHz
Impedance	50 Ω
Data rate	GSM:
	GPRS: UL 85.6 kBit/s; DL 107 kBit/s
	EDGE: UL 236.8 kBit/s; DL 296 kBit/s
	UMTS:
	WCDMA: UL 384 kBit/s; DL 384 kBit/s
	DC-HSDPA: DL 42 MBit/s
	HSUPA: UL 5.76 MBit/s
	LTE:
	LTE FDD: UL 5 MBit/s; DL 10 MBit/s
	LTE TDD: UL 3.1 MBit/s; DL 8.96 MBit/s
Specified antenna	PSI-GSM/UMTS-QB-ANT

* SMA plug connector must be safeguarded against ESD discharges by the customer

Data interfaces	
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 Mbir
CONFIG (configuration interface, terminal F)	micro USB port type AE
SIM card (only with 4G modem, front panel)	micro SIN
HMI (user interface, terminal K)	interna
Modbus meter (terminal B)	9.6 kBit
External Modbus (terminal I)	9.6 kBit
Control Pilot (terminal B (CP))	acc. to IEC 61851
Proximity Pilot (terminal B (PP))	acc. to IEC 61851

st 2: in total 500 mA

the variant)

Optocoupler (terminal J (Opto 1 In+, Opto 1 In-))	
Input voltage	DC 11.4 V25.2 V
Input current	2.3 6.4 mA
Weld check (terminal H (WB, WA))	

input voitage	AC 1802// V
Input current	0.61.3 mA

E, PE)) the variant)

60947-5-1:

J (relay 13, relay 14))

Rated operational voltage U_e	DC 24 V
Rated operational current /e	DC 1 A
Minimum contact rating	DC 1 mA at \geq 10 V

ontactor (terminal H (relay 23, relay 24))

Rated operational voltage U_e	AC 230 V
Rated operational current I _e	AC 4 A
Minimum contact rating	AC 50 mA at \geq 10 V

Environment/EMC

EMC	see CE declaration
Operating temperature	-3070 ℃

Classification of climatic conditions acc. to IEC 60721:

Stationary use (IEC 60721-3-3)	3K23 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K21
Classification of mechanical conditions acc. to IE	C 60721:
Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12

¹⁾ Internal diameter: 17 mm

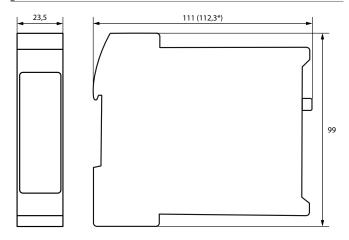
 $^{^{\}rm 2)}~{\rm The}~{\rm PCB\text{-}variant}$ can be combined with the connection cables of different lengths

Technical data (continued)

Cable lengths/cable types	
Cable	Shielded, one end of shield connected to PE
HMI (user interface, terminal K) (depending on	the variant)
Connection cable RJ45, shielded	
Max. connection cable length	internal 2 m
Ethernet (terminal D)	
Connection cable	CAT 6
Max. connection cable length	100 m
Connection type (terminal blocks B and J)	push-wire terminal
Connection specifications:	
Rigid/flexible	0.21.5 mm ² (AWG 24-16)
Flexible with ferrule without plastic sleeve	0.25 1.5 mm ² (AWG 24-16)
Flexible with ferrule with plastic sleeve	0.140.75 mm ² (AWG 26-18)
Stripping length	10 mm
Max. connection cable length	2 m
Cross-section	≥ 0.5 mm ²
Max. connection cable length (PE)	4 m
Cross-section (PE)	≥ 1 mm ²

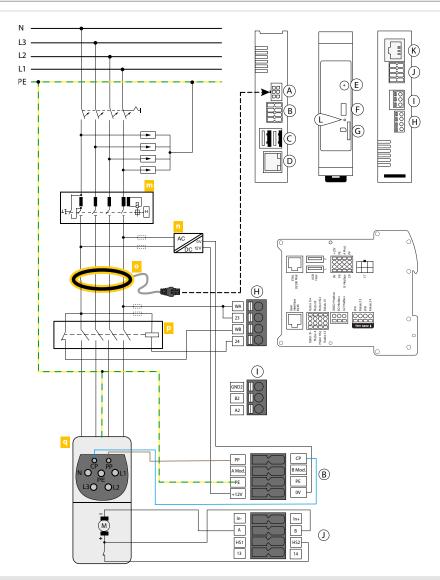
Connection specification	S:		
Rigid/flexible		0.21.5 mm ² (AWG 24-16)	
Flexible with ferru	le without plastic sleeve	0.251.5 mm ² (AWG 24-16)	
Flexible with ferru	le with plastic sleeve	0.140.75 mm ² (AWG 26-18)	
Stripping length		10 mm	
Max. connection cable le	ength	2 m	
Cross-section		$\geq 0.5 \text{ mm}^2$	
Max. connection cable le	ength (PE)	4 m	
Cross-section (PE)		≥ 1 mm ²	
Other			
Operating mode		Continuous operation	
Mounting position	Orientated to front panel; air	r must pass through cooling slots vertically	
Degree of protection		IP20	
DIN rail		IEC 60715	
Documentation number		D00381	
Weight (depends on the	variant)	max. 500 g	

Dimension diagram



Dimensions in mm acc. to ISO 2768 - m

 $^{{\}it *Dimensions with antenna socket}$



- 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)
- ${\Large \Large {\mathbb F}} \ \ {\it Configuration interface}$
- © Micro SIM card slot (only available for variants with 4G modem¹)
- (H) Weld check, relay for contactor control rated for 230 V/4 A
- ① External Modbus (galvanic separation)
- ① Locking, control relay GPIO, optocoupler input
- (K) Connection user interface (HMI) (not available with HEM-X2 variant)
- © STATUS LED
- RCD type A
- Voltage supply DC 12 V
- Measuring current transformer (CT) with plug
- Contactor
- Type 2 socket-outlet
- Data gateways with 4G modem: CC613-ELM4PR-M and CC613-ELM4PR

Terminal assignment

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

	GND2	External Modbus GND (shield connected on one side)
ı	B2	External Modbus B (galvanic separation)
	A2	External Modbus A (galvanic separation)

	ln-	Opto 1 In-: Optocoupler input 12 V negative
	ln+	Opto 1 In-: Optocoupler input 12 V positive
	A	Actuator A: Locking actuator output negative
	В	Actuator B: Locking actuator output positive
,	HS2	Actuator HS2: Locking input actuator switch
	HS1	Actuator HS1: Locking 12 V output actuator switch
	14	Relay 14: Relay contacts GPIO (12 V)
	13	Relay 13: Relay contacts GPIO (12 V)



ADVICE

CAUTION! Switching contact contactor and weld check at terminal H are only suitable for mains voltage (230 V)! Not permitted for SELV/PELV voltages.

ICC1324 charge controller

Charge controller for charging systems for electric vehicle charging



Image similar

Typical applications

• AC charging stations for electric vehicles, wallboxes

Approvals



Device features

- Charge controller in accordance with IEC 61851-1 (mode 3 charging)
- · Master and slave operation configurable
- Setting up charging ssystems with two charging points: 1 charge controller as data gateway with 4G modem and 1 charge controller as slave without 4G modem
- Dynamic load management to optimally distribute the available power among all charging points and signal the maximum power to the vehicle
- Patented residual direct current monitoring module (external RCD type A required), different cable lengths can be selected
- Integrated emergency opener for actuator control (locking/unlocking)
- Can be integrated in single- or three-phase systems up to 3x 32 A
- · OCPP 1.5 and OCPP 1.6 compliant with JSON, SOAP
- Integrated 4G modem
- · 3 USB interfaces:
 - 1 CONFIG interface (type B) for local configuration and installation of software updates
 - 2 USB host interfaces (type A)
- Control Pilot and Proximity Pilot communication (acc. to IEC 61851-1)
- · Additional SCHUKO socket-outlet control
- · Meter interface: Modbus TCP and RTU
- External Modbus interface for remote control via energy management systems
- Additional inputs and outputs for extended control of the charge controller
- · Internal temperature sensor to reduce the charging current depending on the ambient temperature
- ISO 15118 Powerline Communication (PLC) for plug & charge, autocharge and load management systems
- Integrated WiFi module and two Ethernet interfaces
- Integrated DC 15 V voltage source for customer-specific applications
- Supply voltage AC 230 V

Standards

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

• EN 61851-22

• EN IEC 63000

• EN 301 489-52

• EN IEC 61439-1

• EN ISO 15118-2

• EN 301 511

• EN IEC 61439-7 • EN IEC 61851-1 • EN ISO 15118-3 • FN 300 328

• FN 301 908-1 • FN 301 908-13

• EN IEC 61851-21-2

• EN 301 489-1

• EN 301 908-2

• EN IEC 62311

• EN 301 489-17

• IEC 62955

Patents

EP 2 571 128 / US 9,397,494 / ZL 201210157968.6 / CN 103001175, EP 2 813 856.

Further information

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

Ordering information

Туре	4G modem	WiFi	PLC 1)	Insulated input	12 V relay output	Interface	Art. No.
ICC1324-Connect Plus	(Cat 1)	~	~	2x	2x		B94060080
ICC1324-Connect	(Cat M1/NB1)	-	~	1x	_	USB, Modbus meter, Ethernet, RFID	B94060079
ICC1324-Connect SP	-	~	~	1x	1x		B94060074
ICC1324-Home Plus	-	~	~	1x	-		B94060078
ICC1324-Home	-	-	-	1x	_	USB	B94060077

¹⁾ Powerline Communication acc. ISO/IEC 15118

The charge controller with residual direct current monitoring module (RDC-M) only works in combination with the measuring current transformer (to be ordered separately). Different cable lengths are available.

Description	Art. No.	Page
HMI150	B94060150	-
HMI145	B94060151	-
HMI140	B94060152	-
Current transformer CTBC17 (cable variant, cable length 325 mm) ¹⁾ B98080071 2		268
Current transformer CTBC17 (PCB variant) ^{1), 2)}	B98080070	268
Connection cable CTBC17-Cable incl. clip housing	B980805 268	

Plug kit	Content / Quantity	Art. No.
Plug kit (can be ordered separately)	2-pole (1 x), 4-pole (1 x), 8-pole (3 x)	B94060125
Plug kit bulk pack Connect Plus, Connect, Home Plus	2-pole (50 x), 4-pole (50 x), 8-pole (150 x)	B94060124
Plug kit bulk pack Home	2-pole (50 x), 4-pole (50 x), 8-pole (100 x)	B94060123

Technical data

Rated voltage / Pollution degree	250 V / 2
Overvoltage category	II (within terminal M)
Overvoltage category	III (terminal M and all other terminals)
Rated impulse voltage	6 kV (terminal M and all other terminals)
Rated impulse voltage	2.5 kV (within terminal M)
Double insulation acc. to OVC III between	terminal M and all other terminals
Basic insulation acc. to OVC II	within terminal M
Operating altitude	≤ 2000 m AMSL
Supply voltage AC 230 V (terminal N (L1, N))	
Supply voltage range $U_{\rm S}$	184 264 V
Frequency of $U_{\rm S}$	50 Hz
maximum Power consumption	12 W
average Power consumption	6 W
External circuit breaker recommended	B6A
Residual direct current monitoring module* ((RDC-M, terminal J)
Measuring range	100 mA
Response values:	
Residual current I _{dc}	DC 6 mA
Response tolerance I _{dc}	-500 %
Measuring current transformer:	
Max. Length of the connection cable	≤1,47 m
Restart sequence value:	
DC 6 mA	< 3 mA
* patented 6 mA DC fault current tripping	
	157968.6 / CN 103001175, EP 2 813 856)

Frequency bands	800 MHz/850 MHz/900 MHz/1800 MHz/2100 MHz/2600 MHz
	LTE-FDD: B1/B3/B7/B8/B20/B28; WCDMA: B1/B8; GSM: B3/B8
Impedance	50 Ω
Data rate	GSM:
	GPRS: UL 85.6 kBit/s; DL 107 kBit/s
	EDGE: UL 236.8 kBit/s; DL 296 kBit/s
	UMTS:
	WCDMA: UL 384 kBit/s; DL 384 kBit/s
	DC-HSDPA: DL 42 MBit/s
	HSUPA: UL 5.76 MBit/s
	LTE:
	LTE FDD: UL 5 MBit/s; DL 10 MBit/s
	LTE TDD: UL 3.1 MBit/s; DL 8.96 MBit/s
Recommended antenna	TC ANT MOBILE WALL 0.5M - 2702274
Max. length of the antenna cable	< 3 m
Max. output power	GSM850/EGSM900: 33dBm
	DCS1800/PCS1900: 30dBm
	WDMA: 24dBm
	LTE: 23dBm

SMA connector for LTE-M1 antenna & LTM-NB1/2 antenna

Modem LTE CAT M1/NB1 & GSM	
Frequency bands	Cat M1/Cat NB1: LTE FDD: B1/B2/B3/B4/B5/B8/B12/B13/B18, B19/B20/B25/B26*/B28 LTE TDD: B39 (For Cat M1 Only
Impedance	50 Ω
Data rate	GSM
	850/900/1800/1900MHz
	GPRS
	UL 85,6 kBit/s; DL 107 kBit/s
	GSM:
	UL 236,8 kBit/s; DL 296 kBit,
	LTE-M1:
	Max. 375Kbps (DL), max. 375Kbps (UL)
	LTE-NB:
	Max. 32Kbps (DL), max. 70Kbps (UL)
Recommended antenna	TC ANT MOBILE WALL 0.5M - 2702274
Max. length of the antenna cable	< 3 m
Max. output power	GSM850/EGSM900: 33dBm
max. output power	DCS1800/PCS1900: 30dBm
	LTE: 23dBm
	ETE. 25ubit
WiFi	IFFF 000 441 / /
Standards	IEEE 802.11b/g/r
Frequency bands	2.4 GHz Kanäle 1-13 (2.412 GHz - 2.472)
Channel band width	20 MHz
Data rate	802.11b1, 2, 5.5 and 11 Mbps
	802.11g 6, 9, 12, 18, 24, 36, 48 and 54 Mbps
	802.11n MCSO-MCS7 (max 72.2Mbps)
max. output power:	19 dBm EIR
LED indications	
Service	blue: system is starting
	green: system started, not ready for operation yet
	flashing green: system running, system ready for operation
	red: system error
Ethernet (terminals B, C)	off: no Ethernet connection
	steady green: active Ethernet connection
	flashing green: data exchange
	steady yellow: transmission rate 100 Mbit/s
	yellow off: transmission rate 10 Mbit/s
Data interface	
USB host 1 (terminal D1)	USB port type A; USB 2.0 max. 250 mA
USB host 2 (terminal D2)	USB port type A; USB 2.0 max. 250 mA
Ethernet (terminal B, C)	10/100 Mbit
CONFIG (configuration interface, term	inal H) USB port type E
SIM card (only with 4G modem, termi	
SIM card (only with 4G modem, termi Modbus meter (terminal A)	9.6 kBit

¹⁾ Internal diameter: 17 mm

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

Technical data (continued)

Optocoupler 1 (terminal L (Opto 1 In+, Opto 1 In-))	
Input voltage (HIGH)	DC 11.425.2 \
Input voltage (LOW)	DC 0 \
Input current	2.36.4 mA
Optocoupler 2 (terminal L (Opto 2 In+, Opto 2 In-))	
Input voltage (HIGH)	DC 11.425.2 \
Input voltage (LOW)	DC 0 \
Input current	2.3 6.4 mA
Potential difference to PE/GND	max. 100 V*
Weld check (terminal M (WB, WA))	
Input voltage	AC 184264 \
Input current	0.61.3 mA
Potential difference to PE/GND	max. 100 V*

*	he potential difference between the optocoupler inputs and other inputs/outputs must be les	S
	han 100 V.	

Input PE (terminal A (PE, PE))

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

DC 15 V voltage source (terminal A (15 V, 0 V))		
Output voltage	DC 15 V	
maximum load capacity	0,4 A / 4,8 VA	
Tolerance	DC ± 0,75 V	
Dolay 1 (13 V) (torminal V (volay 13 volay 14))		

nelay 1 (12 v) (terillillal k (relay 13, relay 14))	
Rated operational voltage U_e	DC 24 V
Rated operational current I _e	DC 1 A
Minimum contact rating	1 mA at ≥ 10 V
<u> </u>	

Relay 2 (12 V) (terminal K (relay 23, relay 24))		
Rated operational voltage U_e	DC 24 V	
Rated operational current I _e	DC 1 A	
Minimum contact rating	1 mA at \geq 10 V	

Switching contact for contactor (terminal M (relay 33, relay 34))		
Rated operational voltage U_e	AC 230 V	
Rated operational current /e	AC 4 A	
Minimum contact rating	50 mA at ≥ 10 V (AC)	

Environment/EMC	
EMC	see CE declaration
Operating temperature	25 165 %

Operating temperature -25.	
Classification of climatic conditions a	occ. to IEC 60721:
Stationary use (IEC 60721-3-3)	3K23 (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 ²
Long-term storage (IEC 60721-3-1)	1M12

Cable lengths/cable types

:+h	arnat	(termina	Ir D (1)
ELII	emet	t ter iiiiiia	13 D. CI

Max. connection cable length (PE)

Cable	shielded on one side, shield on charge controller side to Pf
Connection cable	CAT 6
Max. connection cable length	100 m

Connection type (terminal blocks A, K and L	L) push-wire terminal
Connection specifications:	
rigid /flexible	0.21.5 mm² (AWG 24-16)
flexible with ferrule without plastic sleeve	0.25 1.5 mm ² (AWG 24-16)
flexible with ferrule with plastic sleeve	0.14 0.75 mm² (AWG 26-18)
Stripping length	10 mm
Max. connection cable length	< 3 m
Cable (Modbus) sh	ielded and twisted in pairs, shield on both sides to PE
Max. connection cable length (Modbus)	250 m
Cross section (Modbus)	≥ 0.5 mm ²

Cross-section (PE)	≥ 1 mm ²	
Connection type (terminal block M)	push-wire terminal	
Connection specifications:		
rigid /flexible	0.752.5 mm ² (AWG 24-16)	
	3	

< 3 m

10 mm

rigia / rickibic	0.7 5 2.5 Hilli (MVG 27 10)
flexible with ferrule without plastic sleeve	0.752.5 mm ² (AWG 24-16)
flexible with ferrule with plastic sleeve	0.752.5 mm ² (AWG 24-18)
Stripping length	10 mm
Max. connection cable length	< 3 m

Connection type (terminal block N)	push-wire terminal	
Connection specifications:		
rigid /flexible	0.22.5 mm ² (AWG 24-12)	
flexible with ferrule without plastic sleeve	0.252.5 mm ² (AWG 24-12)	
flexible with ferrule with plastic sleeve	0.252.5 mm ² (AWG 24-12)	

Other

2K11

1K21

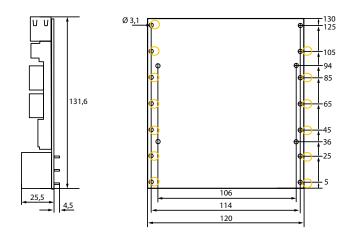
Stripping length

Operating mode	continuous operation
Mounting position	standing
Degree of protection	IP20
Documentation number	D00436
Weight	max. 500 g (depends on variant)

Dimension diagram (dimensions in mm)

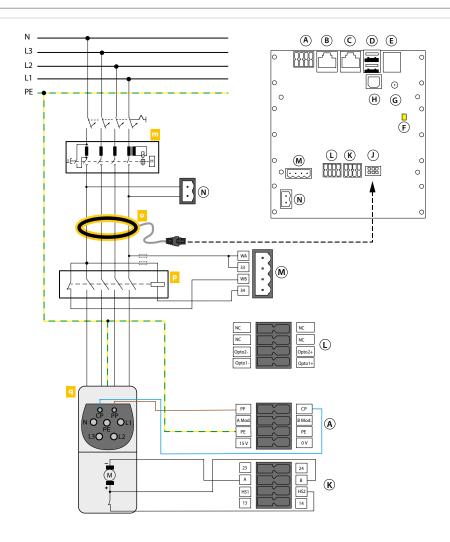
Transport (IEC 60721-3-2)

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



- Red marks: Possible fastening points
- Fastening recommendation: Fillister head screws: 4 x M 2.5 Torque specification: 0.36 Nm





- A PE, Modbus meter, CP, PP
- **®** Connection Ethernet (ETH2)
- © Connection Ethernet (ETH1)
- ② 2x USB type A (1, 2)
- € Micro SIM card slot (only available for variants with 4G modem)¹
- E LED service
- © Antenna socket 4G (only available for variants with 4G modem¹)
- (H) Configuration interface USB type B
- ① Connection measuring current transformer (CT)
- **K** Locking, control relay GPIO
- © Optocoupler input
- M Weld check, relay for contactor control rated for 230 V/4 A
- N Power supply AC 230 V
- RCD type A
- Measuring current transformer (CT) with plug
- Contactor
- Type 2 socket-outlet
- Data gateways with 4G modem: ICC1324-Connect Plus and ICC1324-Connect

Terminal assignment

	0 V	DC 15 V voltage source for
	15 V	customer-specific application
	PE	Input PE
	PE	Input PE
Α	B Mod.	Modbus meter B
	A Mod.	Modbus meter A
	СР	Control Pilot
	PP	Proximity Pilot

М	WA	Weld check input L1
	33	Relay 33: Switching contact contactor
	WB	Weld check input N
	34	Relay 34: Switching contact contactor

К	23	Relay 23: Relay contacts GPIO (12 V)
	24	Relay 24: Relay contacts GPIO (12 V)
	A	Actuator A: Locking actuator output negative
	В	Actuator B: Locking actuator output positive
	HS2	Actuator HS2: Locking input actuator switch
	HS1	Actuator HS1: Locking 12 V output actuator switch
	14	Relay 14: Relay contacts GPIO (12 V)
	13	Relay 13: Relay contacts GPIO (12 V)

L	Opto1-	Optocoupler input 1 12 V negative
	Opto1+	Optocoupler input 1 12 V positive
	Opto2-	Optocoupler input 2 12 V negative
	Opto2+	Optocoupler input 2 12 V positive

N	N	Neutral conductor
IN	L1	230 V supply (phase 1)

The 230 V supply (terminal N), the weld check input (terminal M, WA) and the switching contact contactor (terminal M, 33) must be connected to the same phase (L1) to ensure protection against overvoltage!

CTBC17 series

AC/DC sensitive measuring current transformers



Typical applications

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

Approvals



(conformity for cable variant only)



UL File E173157

Ordering information

Sensor	Version	Art. No.
CTBC17P-03	DCD maximation m	B98080070
CTBC17P-04	PCB mounting	B98080074
CTBC17P-03-K0325	Cable variant (length 325 ±25 mm)	B98080071

Accessories

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

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
- $\bullet \ \ Shield \ to \ prevent \ interferences \ caused \ by \ high \ load \ currents \ and \ external \ magnetic \ fields$
- 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.

Cable incl. clip enclosure	Connector length (mm)	Art. No.
CTBC17 cabel1470	1470 ±30	B98080542
CTBC17 cabel600	600 ±25	B98080543
CTBC17 cabel325	325 ±25	B98080541
CTBC17 cabel180	180 ±25	B98080540

Suitable system components

CTBC17P-03

Description	Cable	PCB	Туре	Art. No.	Page
Charma santuallar	~	-	CC613	B940600	254
Charge controller	~	-	ICC1324	B940600	258
Residual current	V 1)	>	RCMB104	B940424	213
monitoring modules	V 1)	~	RDC104	B94042483	216

¹⁾ Molex adapter connector required by customer

CTBC17P-04²⁾

Description	Cable	PCB
Residual current monitoring modules	√ 1)	<

¹⁾ Molex adapter connector required by customer

 $^{^{2)}}$ Various residual current monitoring modules for charge controllers in combination with the CTBC17P-04 are available on request.

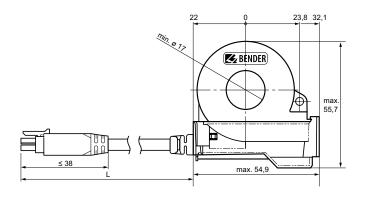
Technical data

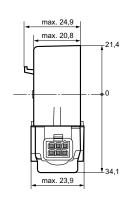
Insulation coordination according to IEC 60664-1	
Definitions	
CT cable feed-through opening on primary side	(IC1
Measuring circuit; CT on secondary side	(IC2
Connection cable measuring circuit	(IC3
Operating altitude	
Basic insulation	≤ 4000 m AMS
Double insulation	≤ 2000 m AMS
Rated voltage	600
Overvoltage category	
Rated impulse voltage	0.11
IC1/IC2	8 k
IG	4 k'
Rated insulation voltage	(00)
IC1/IC2 IC3	600 °
Pollution degree	300
Safe separation (double insulation) between	
IC1/IC2	OVC III/600
Insulation coordination according to IEC 62955	OVC III/000
IC1/IC2	8 mm/400
ICI/ICZ	0 11111/400
Measuring current transformer circuit	
Diameter cable feed-through opening	17 mn
Rated load current	80 /
Rated primary residual current	1000 m
Rated DC residual operating current $I_{\Delta dc}$ acc. to IEC 62955	6 m.
Rated continuous thermal current I _{cth}	80 /
Rated short-time thermal current Ith	2400
Rated dynamic current I _{dyn}	6000
Environment	
Operating temperature with cable	-30+80°
Operating temperature sensor	-35+85°
Temperature in the cable feed-through opening	max. 100 °
Environment (UL applications)	
Operating temperature with cable	-30+75°
Operating temperature sensor	-35+85°
Temperature in the cable feed-through opening	max. 100 °
Classification of climatic conditions acc. to IEC 60721	
Stationary use (IEC 60721-3-3)	3K2
Fransport (IEC 60721-3-2)	2K1
Long-term storage (IEC 60721-3-1)	1K2
Classification of mechanical conditions acc. to IEC 60721	THE
Stationary use (IEC 60721-3-3)	3M1
Fransport (IEC 60721-3-2)	2M
Long-term storage (IEC 60721-3-1)	1M1
Long term storage (ILC 00/21-3-1)	I IM I .

PCB mounting (CTBC17P-03, CTBC17P-04)	
Fastening	solderable fixing pins
Pin length from top edge of PCB	3.9 ±0.3 mm
Connection windings	solderable contact pins
Pin length from top edge of PCB	min. 3 mm
Enclosure retaining pin pull-out forces	50N/PIN
Soldering profile	260 °C for 10 s
Recommended PCB thickness	1.62.4 mm
Connection	
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
Weight	
CTBC17 cable1470	< 75 g
CTBC17 cable600	< 40 g
CTBC17 cable325	< 30 g
CTBC17 cable180	< 25 g
CTBC17P-03	< 40 g
CTBC17P-03-K0325	< 70 g
CTBC17P-04	< 40 g

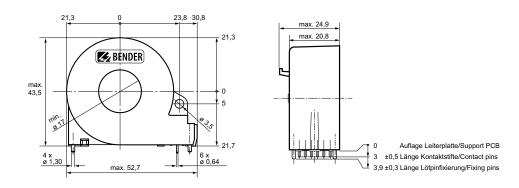
Dimension diagram (dimensions in mm)

Cable variant



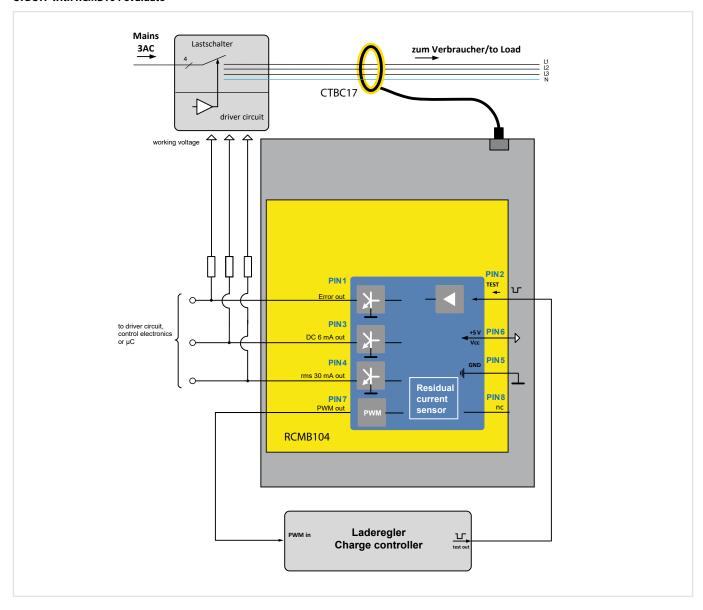


PCB variant

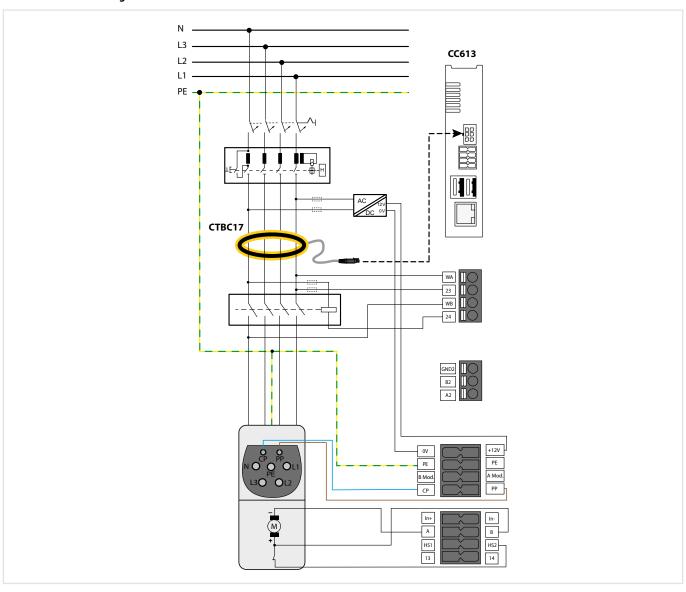


Wiring diagram – PCB variant

CTBC17 with RCMB104 evaluato



CTBC17 with CC613 charge controller



DPM2x16FP Display Module

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



Typical applications

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

Approvals

Device features

- LED display with 2 x 16 characters
- Two RJ45 interface sockets

Standards

The display module has been developed in compliance with:

- EN 61851-1
- EN 61851-22
- EN 61439-1
- DIN IEC/TS 61439-7

Further information

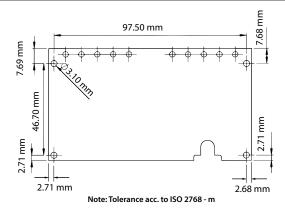
For further information refer to our product range on www.bender.de. $\label{eq:control}$



Ordering information

Туре	Art. NO.
DPM2x16FP	B94060120

Dimension diagram (dimensions in mm)



Technical data

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	≤ 2000 m above sea level
Nominal voltage/nominal current	
Nominal voltage	DC 3.3/5 V
Nominal voltage tolerance	±5%
Nominal current	< 100 mA
Environment/EMC	
EMC	EN 61851-22
Operating temperature	-25+75 ℃
Classification of climatic conditions acc. to	IEC 60721:
Stationary use (IEC 60721-3-3)	3K23 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions acc.	to IEC 60721:
Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12
Connection	
Connection to charge controller	via RJ45 cable
Connection to RFID module	via RJ45 cable
Cable length	< 1 m
Other	
Brightness of display background illumination	to 0100 %
Bus	120
Protection class	IP00
Documentation number	D00296
Weight	150 g

RFID105-L1

RFID module with integrated status LEDs for use in combination with charge controllers used in electric vehicle charging stations, wall boxes and street light charging points



Approvals



Typical applications

· For use in combination with charge controllers used in electric vehicle charging stations, wall boxes and street light charging points

Standards

The RFID has been developed in compliance with:

- ISO 14443A/MIFARE
- EN 50364
- EN IEC 61851-21-2
- EN IEC 62368-1
- EN IEC 63000
- ETSI EN 300 330
- ETSI EN 301 489-1
- ETSI EN 301 489-3

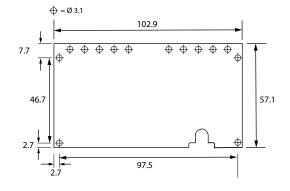
Further information

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

Ordering information

Туре	Art. No.
RFID105-L1	B94060105

Dimension diagram (dimensions in mm)



Technical data

Rated voltage	12.5 V
Pollution degree	2
Rated impulse withstand voltage	800 V
Rated insulation voltage	12.5 V
Altitude	≤ 2,000 m AMSL
Rated voltage/rated current	
Rated voltage	DC 3.3/5 V
Rated voltage tolerance	±5%
Rated current	140/64 mA
Frequency	
Radio frequency	13.56 MHz
Max. transmitting power* 42 dBμA/m	
* at a distance of 10Lm	
Environment/EMC	
Operating temperature	-30+70 ℃

Climatic conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3K23 (except condensation, water and formation of ice)
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K21
Mechanical conditions acc. toIEC 6072	21:
Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M4

Long-term storage (IEC 60721-3-1) 1M12		
	Transport (IEC 60721-3-2)	2M4

^{*} Type: CAT 5e Class D, RF/UTP, twisted pair patch cable, AWG 26/7

Maximum cable length

Weight

Other	
Protection class	IP00
Maximum read distance	100 mm
Documentation number	D00453

< 2 m

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

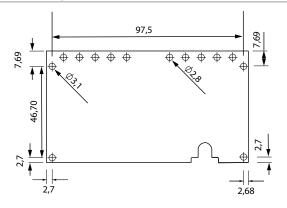
Further information

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)



Technical data

Insulation coordination acc. to IEC 6	60664-1/IEC 60664-3
Rated voltage	12.5 V
Overvoltage category	III
Pollution degree	3
Rated impulse withstand voltage	800 V
Rated insulation voltage	12.5 V
Altitude	≤ 2000 m AMSL
Nominal voltage/nominal current	
Nominal voltage	DC 3.3 V
Nominal voltage tolerance	±5 %
Nominal current	80 mA
Frequency	
Radio frequency	13.56 MHz
Environment	
Operating temperature	-30+70 ℃
Climatic conditions acc. to IEC 60721	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	1721 :
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	IP00
Maximum reading distance	100 mm
Documentation number	D00328
Weight	25 g

RFID117-L1

RFID module with integrated status LEDs and reinforced antenna power, for use in combination with charge controllers used in electric vehicle charging stations, wall boxes and street light charging points



Approvals



Typical applications

- For use in combination with charge controllers used in electric vehicle charging stations, wall boxes and street light charging points
- For e.g. Giro-e applications

Standards

The RFID has been developed in compliance with:

- ISO 14443A/MIFARE
- EN 50364
- EN IEC 61851-21-2
- EN IEC 62368-1
- EN IEC 63000
- ETSI EN 300 330 V2.1.1
- ETSI EN 301 489-1 V2.2.3
- ETSI EN 301 489-3

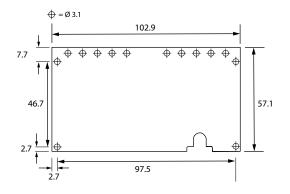
Further information

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

Ordering information

Туре	Art. No.
RFID117-L1 (RJ45 cable (length 500 mm) included)	B94060117

Dimension diagram (dimensions in mm)



Technical data

Insulation coordination acc. to IEC 6066	64-1/IEC 60664-3
Rated voltage	12.5 V
Pollution degree	2
Rated impulse withstand voltage	800 V
Rated insulation voltage	12.5 V
Altitude	≤ 2,000 m AMSL
Rated voltage/rated current	
Rated voltage	DC 3.3/5 V
Rated voltage tolerance	±5%
Rated current	140/64 mA
Frequency	
Radio frequency	13.56 MHz
Max. transmitting power*	42 dBμA/m
* at a distance of 10Lm	
Environment/EMC	
Operating temperature	-30+70 ℃
Climatic conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3K23 (except condensation, water and formation of ice)
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K21
Mechanical conditions acc. toIEC 60721	:
Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12
Connection	
Charge controller connection	RJ45 cable*
Maximum cable length	< 2 m

IP00
100 mm
D00422
25 g

Device overview Universal Devices for Power Quality and Energy Measurement PEM

		LINETRAXX® PEM353	
	Catalogue page	272	
	Accuracy class according to IEC 62053-22	0.5 s	
Normative requirements	DIN EN 50160 (report)	-	
orma	DIN EN 61000-4-7 (harmonic)	Class II	
red	DIN EN 61000-4-15 (flicker) DIN EN 61000-4-30 (PQ measurement method)	-	
_	Phase voltages/Line voltages	✓	
	Phase currents	∨	
	Neutral current I4	✓ (PEM353-N only)	
	Neutral current I4 (calculated)	✓	
	Frequency / phase angle	∨	
	Reactive and active power import/ Reactive and active power export	~	
₹.	Voltage unbalance/current unbalance	~	
Parameters 	Power	per phase and total S in kVA, P in kW, Q in kvar	
Para	Displacement factor $\cos{(\phi)}/power$ factor λ	~	
	Total harmonic distortion (THD _U /THD _I)	up to the 31 rd	
	Harmonic components voltage	up to the 31 rd	
	Harmonic components current	up to the 31 rd	
	Transient detection	-	
	Overvoltage (swell)	-	
	Undervoltage (sag)	-	
	Flicker severity P _{ST}	-	
	Data recorder / HighSpeed data recorder	5/0	
S	Waveform recorder	-	
Features	Digital inputs	4	
Ψ.	Digital outputs	2 (PEM353-P only)	
	Relay outputs (R0)	2 (PEM353, PEM353-N only)	
acts	Voltage supply	AC/DC 95250 V (47440 Hz)	
laspe	Sampling rate	3,2 kHz	
Technical aspects	Temperature	-25+55 °C	
Tec	Communication	Modbus RTU	
	Product details (Products on www.bender.de/en)		

Energy meter and Measuring current transformer for universal measuring devices

	ALD1	ALE3	AWD3	PCD07	CTB31/CTB41/CTB51	KBR18/KBR32
Catalogue page	280	280	280	280	277	277
Catalogue page	200	200	200	200		
Туре	Energy meter	Energy meter	Energy meter	SO pulse counter	Measuring current transformer	Measuring current transformer
Description	1PH./32A MID Modbus RTU	3PH./65A MID Modbus RTU	3PH./6A MID MODBUS RTU	(four-fold) with MODBUS RTU	-	-
Product details (Products on www.bender.de/en)						

Power Quality and Energy Measurement LINETRAXX® PEM353



Typical applications

- · Modern indicating instrument for electrical quantities, e.g. as a replacement for analogue indicating instruments
- · Power quality monitoring
- Limit value monitoring (setpoints) with alarm forwarding
- · Measurement and monitoring of the N conductor
- · Energy and power measurement, e.g. as part of energy data monitoring

Approvals



Device features

- · Accuracy class according to IEC 62053-22: 0,5
- · Measured quantities
- Phase voltages U_{L1}, U_{L2}, U_{L3} in V
- Line voltages U_{L1L2}, U_{L2L3}, U_{L3L1} in V
- Phase currents I1, I2, I3 in A
- Neutral current (calculated) I4 in A
- Frequency f in Hz
- Phase angle for U and I in °
- Power per phase conductor S in kVA, P in kW, Q in kvar
- Total power S in kVA, P in kW, Q in kvar
- Displacement factor cos (φ)
- Power factor λ
- Active and reactive energy import in kWh, kvarh
- Active and reactive energy export in kWh, kvarh
- Voltage unbalance in %
- Current unbalance in %
- Harmonic distortion (THD) for U and I
- · Limit value monitoring (setpoints) with alarm forwarding
- · Energy and power measurement with log and tariff system
- Configurable start page with 4 measured quantities
- Measurement and monitoring of the N conductor (PEM353-N only)

Standards

PEM353 was designed in accordance with the following standards:

• DIN EN 62053-22 (VDE 0418 Part 3-22)

Electricity metering equipment (a.c.) - Particular requirements - Part 22: Static meters for active energy (classes 0.2 and 0.5) (IEC 62053);

DIN EN 61557-12 (VDE 0413-12)

 $Electrical\ safety\ in\ low\ voltage\ distribution\ systems\ up\ to\ 1000\ V\ a.c.\ and\ 1500\ V\ d.c.\ -\ Equipment\ for\ testing,$ measuring or monitoring of protective measures - Part 12: Performance measuring and monitoring devices (PMD)

• DIN IEC 61554:2002-08

Panel mounted equipment – Electrical measuring instruments – Dimensions for panel mounting (IEC 61554:1999)

Further information

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



			PEM353	PEM353-P	PEM353-N
		Ordering details	B93100355	B93100354	B93100353
		Accuracy class of the active energy (acc. to IEC 62053-22)		Current transformer 5 A: Class 0,5 Current transformer 1 A: Class 1,0	
Volatage inputs (L1, L2, L3) TN and TT system (earthed IT system (unearthed): AC 4004 Current inputs (I1, I2, I3) I4 —			45 65 Hz T system (earthed): AC 230/400 400/690 V, CAT hed): AC 400 480 V, CAT III 300 V / AC 500 69	T III 600 V 90 V, CAT II 1000 V	
emen	Current inputs (I ₁ , I ₂ , I ₃)		5 A / 1 A		
leasu		I 4	-	-	5 A
2		Harmonic / Distortion U/I	up to the 31st		
		Sampling rate	3,2 kHz		
		Setpoints limit value monitoring	9		
Data logger	Logs		Pe	Event log (SOE log), Max./Min. log Peak demand log, Energy meter log (monthly values)	
Data		Data recorder	-	-	5
	4 MB	Load data log (daily and monthly values)	-	-	~
		Digital inputs	4		
ಸಿ		Digital outputs	2 x relay	2 x pulse 2 x relay	
Properties		Supply voltage	95250 V; DC, AC 47440 Hz		
L		Communication interface		RS-485 (Modbus RTU, BACnet MS/TP, DNP)	
	Language		English		

Technical data

Pollution degree	2
Climate category operation	3K24
Max. installation altitude above NN:	2000 m
Definitionen	
Measuring circuit 1 (IC1)	(L1, L2, L3, N)
TN and TT system	
Nominal voltage	400/690 V
Overvoltage category/Rated insulation voltage	III/600 V
IT system	
Nominal voltage	480 V
Overvoltage category/Rated insulation voltage	III/300 V
Nominal voltage	690 V
Overvoltage category/Rated insulation voltage	II/1000 V
Measuring circuit 2 (IC2)	(•111, 112, •121, 122, •131, 132)
Overvoltage category/Rated insulation voltage	III/300 V
Supply circuit (IC3)	(A1/+, A2/-)
Overvoltage category/Rated insulation voltage	III/300 V
Output circuit 1 (IC4) at PEM353-N and PEM353	(D013, D014)
Overvoltage category/Rated insulation voltage	III/300 V
Output circuit 1 (IC4) at PEM353-P	(E1+, E1-)
Overvoltage category/Rated insulation voltage	III/50 V
Output circuit 2 (IC5) at PEM353-N and PEM353	(D023, D024)
Overvoltage category/Rated insulation voltage	III/300 V
Output circuit 2 (IC5) at PEM353-P	(E2+, E2-)
Overvoltage category/Rated insulation voltage	III/50 V
Control circuit 1 (IC6)	(DIC, DI1, DI2, DI3, DI4)
Overvoltage category/Rated insulation voltage	III/50 V
Control circuit 2 -RS-485 (IC7)	(D+, D-)
Overvoltage category/Rated insulation voltage	III/50 V
Rated impulse voltage	
IC1/(IC27)	6 kV
IC2/(IC37)	4 k\
IC3/(IC47)	4 kV
IC4/(IC57)	4 kV
IC5/(IC67)	4 kV
IC6/IC7	800 V

Rated insulation voltage	
IC1/(IC27)	1000 \
IC2/(IC35)	250 \
IC2/(IC67)	250 \
IC3/(IC47)	250 V
IC4/(IC57)	250 V
IC5/(IC67)	250 V
IC6/IC7	32 V
Safe separation (reinforced insulation) between	
IC1/(IC27)	overvoltage category III, 600 V
IC2/(IC37)	overvoltage category III, 300 V
IC3/(IC47)	overvoltage category III, 300 V
IC4/(IC57)	overvoltage category III, 300 V
IC5/(IC67)	overvoltage category III, 300 V
Voltage test (routine test) acc. to IEC 61010-1:	
IC1/(IC27)	AC 2.0 kV, 1 minute
IC2/(IC37)	AC 2.0 kV, 1 minute
IC3/(IC47)	AC 2.0 kV, 1 minute
IC4/(IC57)	AC 2.0 kV, 1 minute
IC5/(IC67)	AC 2.0 kV, 1 minute
Supply voltage	
Supply voltage	AC/DC 95250 V (±10 %)
Frequency range	DC, 47 440 Hz
Power consumption	< 5 VA
Measuring voltage inputs	
see insulation coordination	
Measuring range	10 828 V (120 % <i>U</i> _n , max)
Rated frequency	4565 Hz
Internal resistance U _{L1-N,L2-N,L3-N}	> 12 MΩ
Transformation ratio of the measuring voltage transforme	er
Primary	1 1,000,000 V
Secondary	1690 \
Max. transformation ratio	10,000
Measuring current transformer inputs	
Inom	5 A
	0.1 200 % / _{norr}
Measuring range	
Measuring range Load	< 0.15 VA
<u> </u>	< 0.15 VA 2 x / _{nom} permanent,

Technical data (continued)

Transformation ratio of the measuring current transformer		
Primary	1 30000 A	
Secondary	15 A	

$\label{eq:accuracies} \textbf{Accuracies (OMV = of measured value/OFS = of full-scale value)}$

	00 (105 0110 000)
Power factor λ	±0.5 %
Active power, reactive power	$\pm 0.5 \%$ OMV, $+0.05 \%$ OFS
Phasing	±1°
Frequency f	±0.02 Hz
Neutral current I4 (PEM353-N)	±0.2 % 0MV
Current <i>I</i> _{1, 2, 3}	$\pm 0.2 \%$ OMV, $+0.05 \%$ OFS
Phase voltage <i>U</i> _{L1-N,L2-N,L3-N}	±0.2 % 0MV, +0.05 % 0FS

Measurement of the active energy acc. to DIN EN 62053-22 (VDE 0418 part 3-22)

Accuracy class with 5 A measuring curren	t transformers	0.5
Accuracy class with 1 A measuring curren	t transformers	1
ancurament of the voltage rmc values	acc to DIN EN 61557 12 (VDE 0412-12) ch	antor 476

Measurement of the voltage rms values acc. to DIN EN 61557-12 (VDE 0413-12), chapter 4.7.6 Measurement of the phase current rms values acc. to DIN EN 61557-12 (VDE 0413-12), chapter 4.7.5 Frequency measurement acc. to DIN EN 61557-12 (VDE 0413-12), chapter 4.7.4

Interface

Interface: Protocol	RS-485: Modbus RTU, BACnet MS/TP, DNP		
Baud rate	1.238.4 kbit/s		
Cable length	01200 m		
Recommended cable (shielded)	J-Y(St)Y min. 2 x 0.8		

Switching elements

Outputs	2 N/O contacts
Operating principle	N/O operation
PEM353-N, PEM353	
Relay contacts, N/O operation, AC 250 V or DC 30 V	5 A
Minimum current I _{min}	1 mA at AC/DC \geq 10 V
PEM353-P	
Pulse output	max. DC 30 V, max. 30 mA
Cable length	≤ 30 m
Inputs	4 common galv. isolated digital inputs

1 mA

DC 24 V

U_{DI} Environment/EMC

EMC	IEC 61326-1
Operating temperature	-25+55 ℃
Classification of climatic conditions acc. to IEC 60721 (stationary use)	3K24
Classification of mechanical conditions acc. to IEC 60721 (stationary use)	3M11
Range of use	< 2000 m

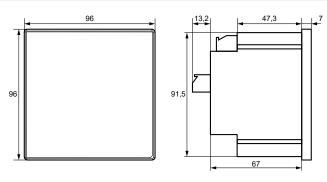
Connection

Connection type	screw-type terminals, plug-in connector
	, p, p

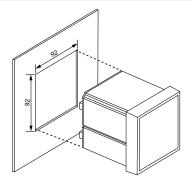
Other

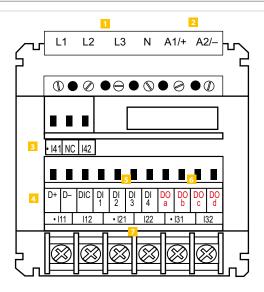
Degree of protection, installation	IP20
Degree of protection, front (with rubber seal)	IP54
Documentation number	D00335
Weight	≤ 350 g

Dimension diagram (dimensions in mm)



Panel cutout (dimensions in mm)

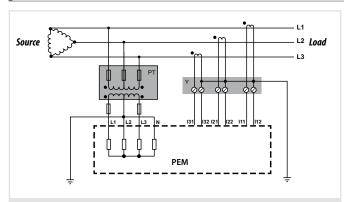




- Measuring voltage inputs:
 - The measuring leads should be protected with appropriate fuses.
- Supply voltage: Power protection by a 6 A fuse, quick response. If being supplied from an IT system, both lines have to be protected by a fuse.
- Measuring current inputs I4 (only PEM353-N)
- RS-485 bus connection
- 5 Digital inputs
- Digital outputs (N/O contacts)
- Measuring current inputs I1...3

	DO a	DO b	DO c	DO d
PEM353(-N)	D013	D014	D023	D024
PEM353-P	E1+	E1-	E2+	E2-

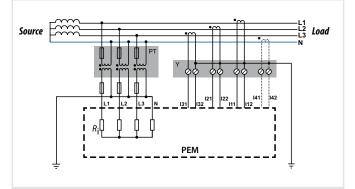
Wiring diagrams with voltage transformers (medium and high voltage)



Three-phase 3-wire system 3P3W with 3 measuring current transformers

When used in a 3-wire system, the connection type (Setup > Basic > Wiring Mode) must be set to **3P3W**.

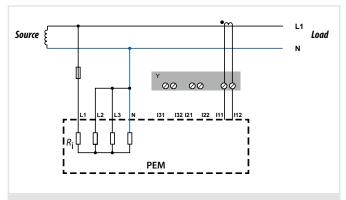
- Y Isolating terminal of the measuring current transformers
- PT The transformation ratio in the PEM353 can be set by specifying the primary and secondary transformation ratio. Odd ratios can also be configured.



Three-phase 4-wire system (example TN-S system) 3P4W with 3 voltage transformers

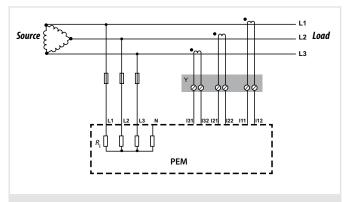
When using this wiring, the connection type (Setup > Basic > Wiring Mode) must be set to **3P4W**.

- Y Isolating terminal of the measuring current transformers
- 14 Measurement 14 for PEM353-N only
- PT The transformation ratio in the PEM353 can be set by specifying the primary and secondary transformation ratio. Odd ratios can also be configured.



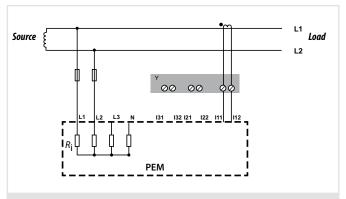
Single-phase 2-wire system 1P2W L-N

When using this wiring, the connection type (Setup > Basic > Wiring Mode) must be set to 1P2W L-N.



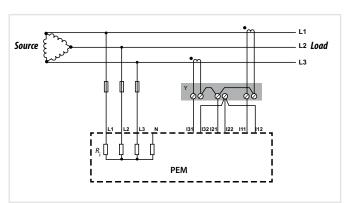
3P3W with 3 measuring current transformers

When used in a 3-wire system, the connection type (Setup > Basic > Wiring Mode) must be set to **3P3W**.

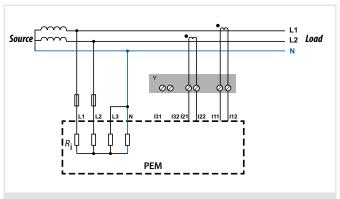


Single-phase 2-wire system 1P2W L-L

When using this wiring, the connection type (Setup > Basic > Wiring Mode) must be set to 1P2W L-L.



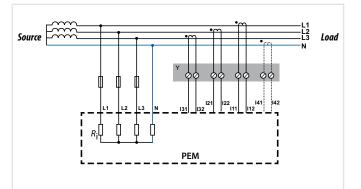
3P3W with 2 measuring current transformers (Aron circuit)



Single-phase 3-wire system 1P3W with 2 measuring current transformers

When used in a 3-wire system, the connection type (Setup > Basic > Wiring Mode) must be set to **1P3W**.

Y Isolating terminal of the measuring current transformers



3P4W with 3 (4) measuring current transformers

When using this wiring, the connection type (Setup > Basic > Wiring Mode) must be set to **3P4W**.

- Isolating terminal of the measuring current transformers
- Measurement I4 for PEM353-N only

Measuring current transformer for universal measuring devices

Window-type/Split-core current transformer



Approvals



Device features

CTB41/CTB51

- Window-type current transformer
- Screwless connection technique
- Maintenance-free, gas-tight connection
- Max. operating voltages up to 1.2 kV
- Can also be used in 690 V systems
- $\bullet \ \ Unbreakable \ plastic \ enclosure, self-extinguishing, UL94-V0, flame-resistant$

KBR18/KBR32

- Split-core current transformer (mounting without disconnecting the primary conductor)
- Incl. connecting cable (2.5 m)
- Max. operating voltages up to 0.72 kV

Standards

The measuring current transformers were designed in accordance with the following standards:

- IEC 61869-1
- IEC 61869-2
- IEC 61010-1

Further information

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

Ordering details window-type current transformer

Model	Туре	Accuracy	Secondary current	Primary current	Art. No.
CTB31	WL605 CL. 1	1	5		B98086001
CTB31	WL601 CL. 1	1	1	60	B98086002
CTB31	WL755 CL. 1	1	5	75	B98086003
CTB31	WL751 CL. 1	1	1		B98086004
CTB31	WL1255 CL. 0.5	0.5	-		B98086005
CTB31	WL1255 CL. 1	1	- 5	125	B98086007
CTB31	WL1251 CL. 0.5	0.5		125	B98086006
CTB31	WL1251 CL. 1	1	1		B98086008
CTB31	WL1505 CL. 0.5	0.5	-		B98086009
CTB31	WL1505 CL. 1	1	5	150	B98086011
CTB31	WL1501 CL. 0.5	0.5		150	B98086010
CTB31	WL1501 CL. 1	1	1		B98086012
CTB31	WL2005 CL. 0.5	0.5	_	200	B98086013
CTB31	WL2005 CL. 1	1	- 5		B98086015
CTB31	WL2001 CL. 0.5	0.5			B98086014
CTB31	WL2001 CL. 1	1	1		B98086016
CTB41	WL2505 CL. 0.5	0.5	_		B98086017
CTB41	WL2505 CL. 1	1	- 5	250	B98086019
CTB41	WL2501 CL. 0.5	0.5		250	B98086018
CTB41	WL2501 CL. 1	1	1		B98086020
CTB41	WL3005 CL. 0.5	0.5	-		B98086021
CTB41	WL3005 CL. 1	1	- 5	200	B98086023
CTB41	WL3001 CL. 0.5	0.5		300	B98086022
CTB41	WL3001 CL. 1	1	1		B98086024
CTB41	WL4005 CL. 1	1	_		B98086026
CTB41	WL4005 CL. 0.5	0.5	- 5	400	B98086027
CTB41	WL4001 CL. 1	1		400	B98086028
CTB41	WL4001 CL. 0.5	0.5	1		B98086025
CTB41	WL5005 CL. 1	1	-		B98086029
CTB41	WL5005 CL. 0.5	0.5	5	500	B98086031
CTB41	WL5001 CL. 1	1	_		B98086032
CTB41	WI 5001 CL 0.5	0.5	1		B98086033

Model	Туре	Accuracy	Secondary current	Primary current	Art. No.
CTB51	WL6005 CL. 1	1	5		B98086034
CTB51	WL6005 CL. 0.5	0.5)	C00	B98086035
CTB51	WL6001 CL. 1	1	1	600	B98086036
CTB51	WL6001 CL. 0.5	0.5] '		B98086037
CTB51	WL8005 CL. 1	1	5	000	B98086038
CTB51	WL8005 CL. 0.5	0.5]		B98086039
CTB51	WL8001 CL. 1	1	1	800	B98086040
CTB51	WL8001 CL. 0.5	0.5			B98086041
CTB51	WL10005 CL. 1	1	_	1000	B98086042
CTB51	WL10005 CL. 0.5	0.5	5		B98086043
CTB51	WL10001 CL. 1	1	1		B98086044
CTB51	WL10001 CL. 0.5	0.5	l		B98086045

Ordering details split-core current transformer

Model	Туре	Accuracy	Secondary current	Primary current	Art. No.
KBR18	WLS501 KL. 3FS5	3FS5	1	50	B98086046
KBR18	WLS1001 KL. 3FS5	3FS5	1	100	B98086047
KBR18	WLS1501 KL. 3FS5	3FS5	1	150	B98086048

Model	Туре	Accuracy	Secondary current	Primary current	Art. No.
KBR32	WLS2501 KL. 3FS5	3FS5	1	250	B98086049
KBR32	WLS5001 KL. 1FS5	3FS5	1	500	B98086050

Selection guide current transformer/PEM

Design specifications of the measuring ranges current transformer/PEM

The secondary current of the current transformer has to be adjusted to the current input of the measuring device. The following table will help you to select the device type.

Current transformer secondary current	PEM353(-x) (5 A)	PEMxxx(-xx5) (5 A)	PEMxxx-xx1 (1 A)
5 A	~	~	_
1 A	_1)	_1)	~

¹⁾ Note: In principle, measuring current transformers can also be operated with 1 A secondary current on measuring devices with 5 A current input. In this case, the accuracy class is expected to be reduced by one class (e.g. 0.5 to 1).

The measurement accuracy classes of the system

The measurement accuracy class of the system is influenced by both the accuracy classes of the measuring current transformers und the measuring device. Refer to DIN EN 61557-12, Annex E.2.

Accuracy classes of measuring current transformers	PEM3xx (0.5 S)	PEM5xx (0.5 S)
1	1	1
0.5	1	1

Technical Data

CTB31

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> efl
Insulation test voltage	6 kV, <i>U</i> _{eff} , 50 Hz, 1 min
Nominal frequency	50/60 Hz
Insulation class	E
Operating temperature	-550°C

CTB41

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, <i>U</i> _{eff} , 50 Hz, 1 min
Nominal frequency	50/60 Hz
Insulation class	E
Operating temperature	-550 ℃

CTB51

60 x / _N , 1 s
1.2 kV, <i>U</i> eff
6 kV, U _{eff} , 50 Hz, 1 min
50/60 Hz
E
-550 ℃

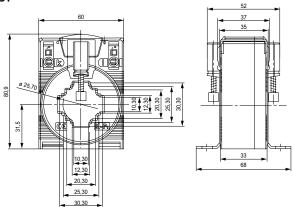
KBR18

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, U _{eff} , 50 Hz, 1 min
Nominal frequency	50 Hz
Insulation class	E
Operating temperature	-550 ℃

KBR32

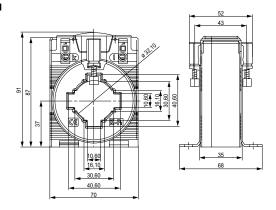
1.2 x / _N
60 x / _N , 1 s
0.72 kV, <i>U</i> eff
3 kV, <i>U</i> eff, 50 Hz, 1 min
50 Hz
E
-5…50℃

CTB31



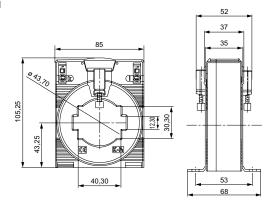
Dimensions (mm)		
Busbar 1	30 x 10	
Busbar 2	25 x 12	
Busbar 3	20 x 20	
Circular conductor	25,7	
Installation width	60	
Installation height	80,9	
Overall depth	52	

CTB41



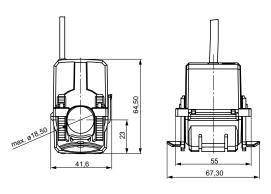
Dimensions (mm)		
Busbar 1	40 x 10	
Busbar 2	30 x 15	
Circular conductor	32	
Installation width	70	
Installation height	91	
Overall depth	52	

CTB51



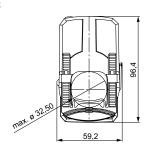
Dimensions (mm)		
Busbar 1	50 x 12	
Busbar 2	40 x 30	
Circular conductor	44	
Installation width	85	
Installation height	105.25	
Overall depth	52	

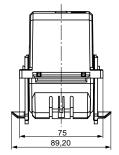
KBR18



Dimensions (mm)		
Circular conductor	18	
Installation width	41.6	
Installation height	64.5	
Installation depth incl. fixation clips	67.3	

KBR32





Dimensi	ions (mm)
Circular conductor	32.5
Installation width	59.2
Installation height	96.4
Installation depth incl. fixation clips	89.2

Energy meter



Approvals



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

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:

- 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

Туре	Description	Art. No.
ALD1	Energy meter 1Ph/32 A MID Modbus RTU	B93101005
ALE3	Energy meter 3Ph/65 A MID Modbus RTU	B93101006
AWD3	Energy meter 3Ph/6 A MID Modbus RTU	B93101007
PCD7	SO pulse counter (four-fold) with Modbus RTU	B93101008

Accessories

Description	Art. No.
Sealable cover for ALD1 (two per counter)	B93101009
Sealable cover for ALE3/AWD3 (four per counter)	B93101010

Technical data

ΔΙ	D1
AL	וט

A course ou classe	D to EN E0470 3
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

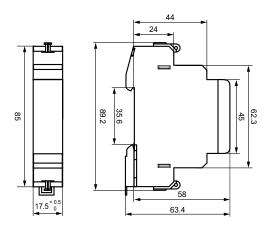
ALE3

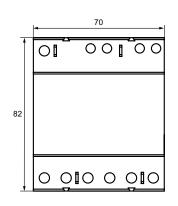
ALES	
Accuracy class	B acc. to EN 50470-3
	1 acc. to IEC 62053-21
Operating voltage	3 x AC 230/400 V, 50 Hz
Tolerance	-20 %/+15 %
Reference current/maximum current	$I_{\text{ref}} = 10 \text{ A}, I_{\text{max}} = 65 \text{ A}$
Starting current/minimum current	$I_{st} = 40 \text{ mA}, I_{min} = 0.5 \text{ A}$
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

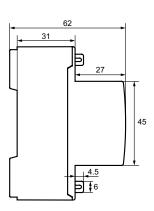
VMD3

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

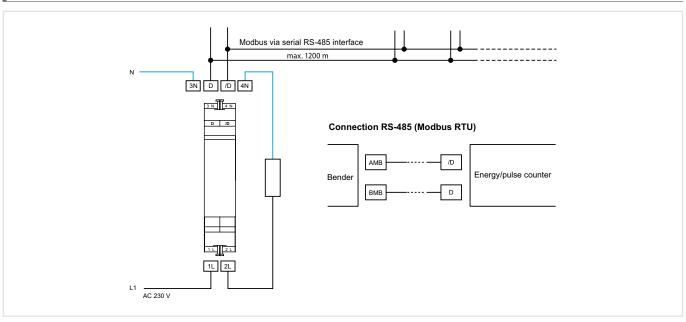
1 phase 3 phase

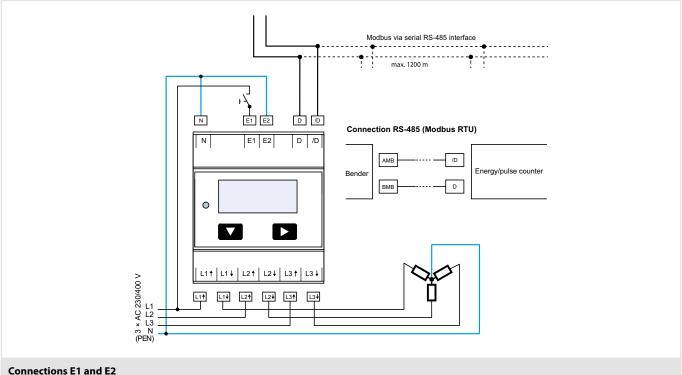




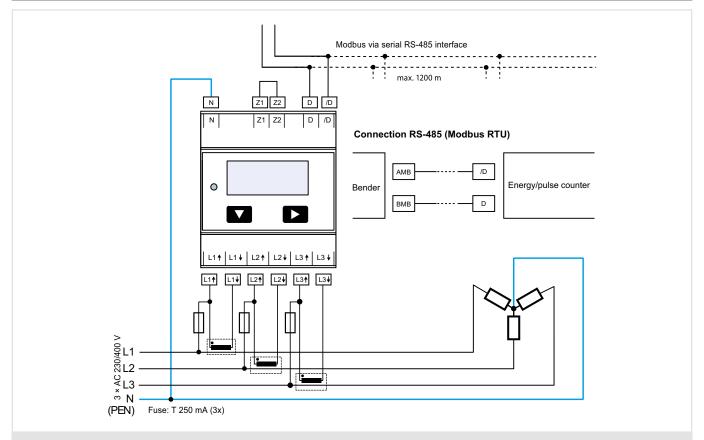


Wiring diagrams





To switch between tariffs, connect to the control signal of the ripple control receiver.



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®

		230.	230	11 11 12 12 12 12 12 12 12 12 12 12 12 1		230.	230.	
		LINETRAXX° VME420	LINETRAXX° VME421H	LINETRAXX° VMD258	LINETRAXX® ES258	LINETRAXX® VMD420	LINETRAXX® VMD421H	
	Catalogue page	286	289	292	295	296	299	
	pecial applications	-	+	Power plant	Energy backup for device series VMD258	-	-	
ation	Voltage monitoring	~	~	~	-	~	~	
Application	Current monitoring	-	-	-	-	-	-	
	AC	U<,U>	U<, U>	-	-	_	-	
Voltage monitoring	3AC	-	-	U<,U>	-	U<, U>	U<,U>	
Voltage	3(N)AC	-	-	-	-	U<, U>	U<, U>	
	DC	U<, U>	U<, U>	-	-	_	-	
nom	Measuring range/ inal system voltage <i>U</i> n	AC/DC systems 0300 V	VME421H-D-1 AC/DC systems 9,6150 V VMD421H-D-2 70300 V	3AC 690/500/480/440/ 400/230/110/100 V	-	(L-N) 0288 V (L-L) 0500 V	(L-N) 0288 V (L-L) 0500 V	
	Frequency	f<,f>	f<,f>	-	+	f<,f>	f<,f>	
	Phase sequence	-	-	-	-	~	~	
	Phase failure	_	-	_	-	~	~	
	Asymmetry	_	-	_	-	~	~	
	Supply voltage <i>U</i> s	external	system	system	+	external	system	
Current monito-	1 AC with <i>U</i> s	_	-	_	-	_	-	
3 8	3 AC with <i>U</i> s	_	-	_	-	_	_	
	Special function	-	-	-	-	-	-	
Installa- tion	DIN rail	~	~	~	~	~	~	
Inst	Screw mounting	~	~	~	~	~	~	
	Product details (Products on www.bender.de/en)							



















LINETRAXX° VMD423/VMD423H	LINETRAXX® VMD460-NA	LINETRAXX® VMD461	LINETRAXX [®] CME420	LINETRAXX [®] CMD420/CMD421	LINETRAXX® CMS460	LINETRAXX® GM420	RC48C
302	305	310	316	319	322	325	328
Interface Protection System/Decoupling protection relay	Interface Protection System/Decoupling protection relay	Interface Protection System/Decoupling protection relay	-	-	-	Loop monitoring	Residual current/loop monitoring
✓	~	~		-	-	-	-
-	-	-	~	~	~	-	~
-	U<, U<<, U>, U>>, U _{10min} >	U<, U<<, U<<<, U>, U>>, U>>>	-	+	-	-	-
-	U<, U<<, U>, U>>, U _{10min} >	U<,U<<,U<<<, U>,U>>,U>>>	-	-	-	-	-
<i>U</i> <, <i>U</i> >, <i>U</i> _{10min} >	U<, U<<, U>, U>>, U _{10min} >	U<,U<<,U<<<, U>,U>>,U>>>	-	+	-	—	-
_	_	_	-	-	-	-	-
(L-N) 0288 V (L-L) 0500 V	(L-N) 0300 V (L-L) 0520 V	VMD461 (L-N) AC 50260 V (L-L) AC 87450 V (DC+/DC-) DC 50450 V VMD461 +CD440 (L-N) AC 250690 V (L-L) AC 4401200 V (DC+/DC-) DC 2501200 V	-	-	-	-	-
f<,f>	f<,f<<,f>,f>>	f<,f<<,f<<, f>,f>>,f>>>	-	-	-	-	-
~	~	~	-	-	-	-	-
~	~	~	-	-	-	_	-
✓	~	~		-	-	-	-
external (VMD423) system (VMD423H)	external	external	-	-	-	extern	extern
_	-	-	<i>l</i> <, <i>l</i> >	-	<i>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
~	~	~	~	~	~	~	~
✓	~	~	~	~	~	~	~
							果然就果

















LINETRAXX® VME420

Multi-functional monitoring relay for undervoltage, overvoltage and frequency monitoring in AC/DC systems with separate supply voltage



Typical applications

- Voltage and frequency monitoring of single-phase machines and electrical installations
- Earth fault monitoring in mediumvoltage systems via voltage transformers
- · Monitoring of battery systems
- Switching machinery and equipment on and off at a certain voltage level

Approvals







Device features

- Monitoring AC/DC systems for undervoltage, overvoltage and frequency in the voltage range of 0...300 V
- Various monitoring functions selectable *U* <, *U* >, *f* <, *f* >
- Start-up delay, response delay and delay on release
- Adjustable switching hysteresis
- r.m.s. value measurement (AC+DC)
- Digital measured value display via multi-functional LC display
- Preset function (automatic setting of basic parameters)
- LEDs: Power On, Alarm 1, Alarm 2
- · Measured value memory for operating value
- · Continuous self monitoring
- Internal test/reset button
- Two separate alarm relays (one changeover contact each)
- N/C or N/O operation and fault memory behaviour selectable
- · Password protection for device setting
- · Sealable transparent cover
- Two-module enclosure (36 mm)
- Push-wire terminal (two terminals per connection)
- · RoHS compliant

Standards

The VME420 complies with the requirements of

• DIN EN 45545-2.

Further information

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

Ordering information

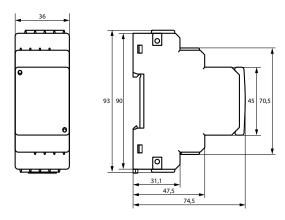
Туре	Supply voltage ¹⁾ U _S	Art. No.		
,,,,,	5pp., 10.1gc - 03	Screw-type terminal	Push-wire terminal	
VME420-D-1	AC 1672 V, 15460 Hz / DC 9,694 V	B93010001	B73010001	
VME420-D-2	AC 70300 V, 15460 Hz / DC 70300 V	B93010002	B73010002	

¹⁾ Absolute values

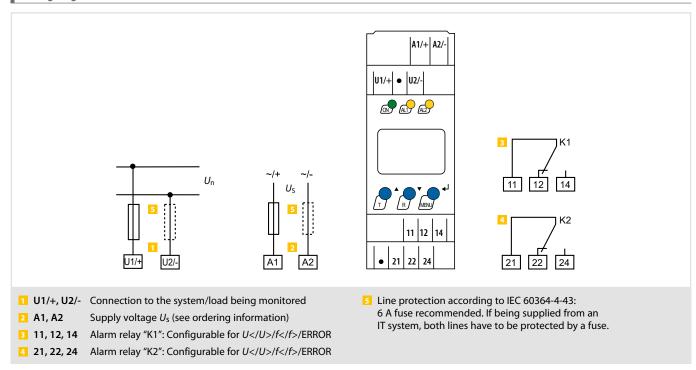
Accessories

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

Insulation coordination acc. to IEC 60664-1/IEC 60		Switching elements	
Rated insulation voltage	250 V	Number	2 x 1 changeover contacts (K1, K2)
Rated impulse voltage/pollution degree	4 kV/3	Operating principle	N/C operation/N/O operation
Overvoltage category	III	K2: Err, <i>U</i> <, <i>U</i> >	, Hz <, Hz >, S.AL (undervoltage U <: N/C operation n.c.)*
Protective separation (reinforced insulation) between:	(A1, A2) -(U1/+, U2/-) -(11-12-14) -(21-22-24)	K1: Err, <i>U</i> < , <i>U</i> :	>, Hz <, Hz >, S.AL (overvoltage U >: N/O operation n.o.)*
C		Electrical endurance, number of cycles	10,000
Supply voltage		Contact data acc. to IEC 60947-5-1	
VME420-D-1:		Utilisation category	AC-13 AC-14 DC-12 DC-12 DC-12
Supply voltage $U_{\rm S}$	AC 1672 V/DC 9.694 V	Rated operational voltage	230 V 230 V 24 V 110 V 220 V
Frequency range U _s	15460 Hz	Rated operational current	5 A 3 A 1 A 0.2 A 0.1 A
VME420-D-2:		Minimum contact rating	1 mA at AC/DC ≥ 10 V
Supply voltage $U_{\rm S}$	AC/DC 70300 V		, u
Frequency range U_S	15460 Hz	Environment/EMC	
		EMC	IEC 61326-1
Power consumption	≤ 4 VA	Operating temperature	-25+55 °C
Measuring circuit		Classification of climatic conditions acc.	to IEC 60721 (related to temperature and relative humidity):
Measuring range (r.m.s. value)	AC/DC 0300 V	Stationary use (IEC 60721-3-3)	3K22
Rated frequency f _n	DC, 15460 Hz	Transport (IEC 60721-3-2)	2K11
Frequency display range	10500 Hz	Long-term storage (IEC 60721-3-1)	1K22
	10300 112	Classification of mechanical condition	
Response values		Stationary use (IEC 60721-3-3)	
Undervoltage <i>U</i> < (Alarm 2)	AC/DC 6300 V	,	3M11
Overvoltage U > (Alarm 1)	AC/DC 6300 V	Transport (IEC 60721-3-2)	2M4
Resolution of setting U 6.049.9 V	0.1 V	Long-term storage (IEC 60721-3-1)	1M12
Resolution of setting <i>U</i> 50300 V	1 V	Connection	
Preset function:		Connection type	screw-type terminal or push-wire terminal
Undervoltage $U < = (0.85 U_{\rm n})$:*		,,	,, , , , , , , , , , , , , , , , , , ,
for $U_n = 230/120/60/24 \text{ V}$	196/102/51/20.4 V	Connection	screw terminals
Overvoltage $U > = (1.1 U_{\rm n})$:*	150, 102,51,20.11	Connection properties	0.2 4 (AMC 24 12)
for $U_0 = 230/120/60/24 \text{ V}$	253/132/66/26.4 V	rigid	0.24 mm² (AWG 24-12)
Relative uncertainty voltage at 50/60 Hz	±1.5 %, ±2 digits	flexible	0.22.5 mm² (AWG 24-14)
Relative uncertainty, voltage in the range of 15460		Two conductors with the same cross section	
Hysteresis <i>U</i>	140 % (5 %)*	rigid/flexible	0.21.5 mm² (AWG 24-16)
Underfrequency Hz <	10500 Hz**	Stripping length	89 mm
Overfrequency Hz >	10500 Hz**	Tightening torque, terminal screws	0.50.6 Nm
Resolution of setting f 10.099.9 Hz	0.1 Hz	Connection	push-wire terminals
Resolution of setting f 100500 Hz	1 Hz	Connection properties	
	2	rigid	0.22.5 mm ² (AWG 24-14)
Preset function:	15 7/40/50/200 H-	flexible	
Underfrequency for $f_n = 16.7/50/60/400 \text{ Hz}$	15,7/49/59/399 Hz	without ferrules	0.752.5 mm ² (AWG 19-14)
Overfrequency for $f_n = 16,7/50/60/400 \text{ Hz}$	17,7/51/61/401 Hz	with ferrules	0.21.5 mm² (AWG 24-16)
Hysteresis frequency Hys Hz	0.12 Hz (0.2 Hz)*	Stripping length	10 mm
Relative uncertainty, frequency range 15460 Hz	±0.2 %, ±1 digit	Opening force	50 N
Time response		Test opening, diameter	2.1 mm
Start-up delay t	0300 s (0 s)*	Other	
Response delay t _{on1/2}	0300 s (0 s)*		
Delay on release t _{off}	0300 s (0.5 s)*	Operating mode	continuous operation
Resolution of setting t , $t_{on1/2}$, t_{off} (010 s)	0.1.500 3 (0.5 3) 0.1 s	Mounting	any position
Resolution of setting t , $t_{on1/2}$, t_{off} (0103)	1s	Degree of protection, internal components	
Resolution of setting t , $t_{on1/2}$, t_{off} (10300 s)	10 s	Degree of protection, terminals (DIN EN 60.	
-	C 16.7 Hz: ≤ 130 ms, AC 42460 Hz: ≤ 70 ms	Enclosure material	polycarbonate
Operating time, voltage (ae DC/A)	AC 15460 Hz: \leq 310 ms	Screw mounting	2 x M4 with mounting clip
Response time tan	$t_{an} = t_{ae} + t_{on1/2}$	DIN rail mounting acc. to	IEC 60715
Recovery time t _b	\(\tan - \tan + \tan \) \(\text{tan} - \tan \) \(\text{tan} + \tan \) \(\text{ton} \) \(\text{1/2} \) \(\text{ \leq 300 ms}	Flammability class	UL94 V-0
necovery unite ty	≥ 300 III3	Documentation number	D00026
Displays, memory		Weight	≤ 150 g
Display	LC display, multifunctional, not illuminated	()* = factory setting	
Display range measured value	AC/DC 0300 V		wating range of the rated frequency 15 400 Hz and
. , ,	±1.5 %, ±2 digits	= The technical data applies to the ope	erating range of the rated frequency 15460 Hz only
Operating uncertainty at 50/60 Hz			
Operating uncertainty at 50/60 Hz Operating uncertainty, voltage in the range of 1546	0 Hz $\pm 3\%$, ± 2 digits		
Operating uncertainty, voltage in the range of 1546			
<u> </u>			
Operating uncertainty, voltage in the range of 1546 Operating uncertainty, frequency in the range of 15	460 Hz $\pm 0.2 \%$, $\pm 1 \text{ digit}$		



Wiring diagram



LINETRAXX® VME421H

Multi-functional monitoring relay for undervoltage, overvoltage and frequency monitoring in AC/DC systems without separate supply voltage



Typical applications

- Voltage and frequency monitoring of single-phase machines and electrical installations
- Earth fault monitoring in mediumvoltage systems via voltage transformers
- · Monitoring of battery systems
- Switching machinery and equipment on and off at a certain voltage level

Device features

- Undervoltage and overvoltage monitoring of AC/DC systems in the frequency range DC/15...460 Hz device variant -1: 9,6...150 V device variant -2: 70...300 V
- Preset function: Automatic response value setting for undervoltage and overvoltage, < U and > U as well as for underfrequency and overfrequency < f and > f
- Voltage and frequency monitoring with window discriminator function, < U and > U as well as < f and > f
- · Without external supply voltage
- Integrated energy backup
- Indication of the system frequency f
- · Starting delay, response delay and release delay
- Adjustable switching hysteresis for *U* and *f*
- r.m.s. value measurement AC + DC
- · Measured value display via multi-functional LC display
- Alarm indication via LEDs (AL1, AL2) and changeover contacts (K1, K2)
- N/C operation or N/O operation selectable
- Password protection against unauthorised parameter changing
- The fault memory can be activated or deactivated. In the "con" mode, all alarm parameters remain stored on failure of the nominal voltage being monitored $(U_n = U_S)$
- Start-up of the device with or without simulated alarm message
- Frequency alarm behaviour in case of measuring voltage failure can be parameterised

Approvals





Further information

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





Ordering information

Type	Nominal system voltage ¹⁾ U n	Art.	No.	
,,,,,		Screw-type terminal	Push-wire terminal	
VME421H-D-1	AC 9.6150 V, 15460 Hz / DC 9.6150 V	B93010003	B73010003	
VME421H-D-2	AC 70300 V, 15460 Hz / DC 70300 V	B93010004	B73010004	

¹⁾ Absolute values

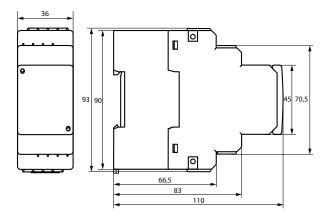
Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B 9806 0008

Insulation coordination acc. to IEC 60664-1/IEC 60664-3		Displays, memory					
Rated insulation voltage	250 V	Display	LC o	lisplay, mu	ıltifunctio	nal, not illu	
Rated impulse voltage/overvoltage category	4 kV/III	Display range measured value (VME421H-D-1))150 V
Pollution degree	3	Display range measured value (VME421H-D- 2))300 V
	/+, U2/-) -(11-12-14) -(21-22-24)	Operating uncertainty at 50/60 Hz	440.11			±1.5 %,	
Voltage test acc. to IEC 61010-1	2.21 kV	Operating uncertainty voltage in the range of 15.					±2 digits
Supply voltage		Operating uncertainty in the frequency range 15.	460 Hz			±0.2 %,	
VME421H-D-1:		History memory (HiS) for the first alarm value			data reco	rd measure	
	ally supplied by <i>U</i> _n : 9,6150 V)	Password				off/09	
	ally supplied by O_0 , 9,0130 v)	Fault memory (M) alarm relay				on/off/o	con (on)*
VME421H-D-2:	II I: II // 70 2001/)	Switching elements					
117	nally supplied by U_n : 70300 V)	Number		2 v 1	changeov	er contacts	c (K1 K2)
Power consumption	≤ 6 VA	Operating principle		2 X I		tion/N/O o	
Measuring circuit		K2: Err, $U <$, $U >$, Hz $<$	Uz > CAL	(undorvolt			
Measuring range (rms value) (VME421H-D-1)	AC/DC 0150 V	K2. EII, <i>U</i> <, <i>U</i> >, H2 < K1: Err, <i>U</i> <, <i>U</i> >, H2 <					
Measuring range (rms value) (VME421H-D-2)	AC/DC 0300 V		<, ΠZ >, 3.AL	. (overvoit	age 0 >: N	i/O operati	
Rated frequency $f_{\rm D}$	DC, 15460 Hz	Electrical endurance, number of cycles					10,000
Frequency display range	10500 Hz**	Contact data acc. to IEC 60947-5-1					
		Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-12
Response values		Rated operational voltage	230 V	230 V	24 V	110 V	220 V
VME421H-D-1:		Rated operational current	5 A	3 A	1 A	0.2 A	0.1 A
Undervoltage <i>U</i> < (Alarm 2)	AC/DC 9.6150 V	Minimum contact rating			1 r	nA at AC/D)C ≥ 10 V
Overvoltage <i>U</i> > (Alarm 1)	AC/DC 9.6150 V	Environment/EMC					
Preset function:						150	
Undervoltage $U < (0.85 U_{\rm n})^*$ for $U_{\rm n} = 120/60/24 \text{ V}$	102/51/20.4 V	EMC					61326-1
Overvoltage $U > (1.1 U_{\rm p})^*$ for $U_{\rm p} = 120/60/24 \text{ V}$	132/66/26.4 V	Operating temperature				-25	+55 ℃
Resolution of setting U 9.649.9 V	0.1 V	Classification of climatic conditions acc. to IEC	60721 (relate	d to tempe	rature and	relative hu	ımidity):
Resolution of setting <i>U</i> 50150 V	1 V	Stationary use (IEC 60721-3-3)					3K22
VME421H-D-2:		Transport (IEC 60721-3-2)					2K11
Undervoltage <i>U</i> < (ALARM 2)	AC/DC 70300 V	Long-term storage (IEC 60721-3-1)					1K22
Overvoltage <i>U</i> > (ALARM 1)	AC/DC 70300 V	Classification of mechanical conditions acc.	to IFC 6072	1			
Resolution of setting U 70300 V	17	Stationary use (IEC 60721-3-3)	10 110 0072	•			3M11
Preset function:		Transport (IEC 60721-3-2)					2M4
Undervoltage $U < (0.85 U_{\rm n})^*$ for $U_{\rm n} = 230/120 \text{ V}$	196/102 V	Long-term storage (IEC 60721-3-1)					1M12
Overvoltage $U < (0.05 \text{ GH})^*$ for $U_0 = 230/120 \text{ V}$	253/132 V	Long term storage (ILC 00721-3-1)					111112
	ZJJ/ 1JZ V	Connection					
VME421H:	1150/ 12 4:	Connection type	scre	ew-type te	rminal or	push-wire	termina
Relative uncertainty voltage at 50/60 Hz	±1.5 %, ±2 digits	Connection				screw te	
Relative uncertainty voltage in the range 15460 Hz	±3 %, ±2 digit	Connection properties				sciew te	::::::::ais
Hysteresis <i>U</i>	140 % (5 %)*	• •			0.2 4	mm² (AW	C 24 12)
Underfrequency Hz <	10500 Hz**	rigid flexible				•	,
Overfrequency Hz >	10500 Hz**	Two conductors with the same cross section			0.22.3	mm² (AW	G 24-14)
Resolution of setting f 10.099.9 Hz	0.1 Hz	rigid/flexible			02 15	mm² (AW	IC 24 16)
Resolution of setting f 100500 Hz	1 Hz				0.21.3		,
Preset function:	45.711 / 40.11 / 50.11 / 200.11	Stripping length Tightening torque, terminal screws					09 mm
Underfrequency for $f_n = 16.7 \text{ Hz} / 50 \text{ Hz} / 60 \text{ Hz} / 400 \text{ Hz}$	15.7 Hz / 49 Hz / 59 Hz / 399 Hz						0.6 Nm
Overfrequency for $f_n = 16.7 \text{ Hz} / 50 \text{ Hz} / 60 \text{ Hz} / 400 \text{ Hz}$	17.7 Hz / 51 Hz / 61 Hz / 401 Hz	Connection			pus	h-wire te	erminals
Hysteresis frequency Hys Hz	0.12 Hz (0.2 Hz)*	Connection properties					
Relative uncertainty, frequency in the range of 15460 Hz	±0.2 %, ±1 digit	rigid			0.22.5	mm² (AW	/G 24-14)
Time response		flexible					
Start-up delay t	0300 s (0 s)*	without ferrules			0.752.5	mm² (AW	/G 19-14)
Response delay t _{on1/2}	0300 s (0 s)*	with ferrules			0.21.5	mm² (AW	/G 24-16)
Delay on release t _{off}	0300 s (0.5 s)*	Stripping length					10 mm
Resolution of setting t , $t_{on1/2}$, t_{off} (010 s)	0.1.500 3 (0.5 3)	Opening force					50 N
Resolution of setting t , $t_{on1/2}$, t_{off} (099 s)	1s	Test opening, diameter					2.1 mm
Resolution of setting t , $t_{0n1/2}$, $t_{0ff}(1030)$ s	10 s	Othor					
-	30 ms, AC 42460 Hz: ≤ 70 ms	Other				4	
Operating time, voltage (ae DC/AC 10.7 112. S 1	AC 15460 Hz: \leq 310 ms	Operating mode			CC	ntinuous o	
Response time t _{an}	$t_{an} = t_{ae} + t_{on1/2}$	Mounting	N cores			any	y position
Discharging time energy backup on power failure (VME421H-D-1)	$\frac{t_{an} - t_{ae} + t_{on1/2}}{3 s}$	Degree of protection, internal components (DIN E	N 60529)				IP30
Discharging time energy backup on power failure (VME421H-D-1)	2.5 s at f _n < 42 Hz	Degree of protection, terminals (DIN EN 60529					IP20
Discharging time energy backup on power failure (VME421H-D-1)	$2.5 \text{ s at } 7_{\text{n}} < 42 \text{ Hz}$ $\geq 4 \text{ s at DC 70 V}$	Enclosure material					carbonate
vischarging tille ellergy backup (VME421H-D- Z)		Screw mounting			2 x M4	with mour	_ ,
Charging time energy backup (VME421H-D-1)	\geq 6 s at DC 80 V/AC 70 V	DIN rail mounting acc. to					EC 60715
Charging time energy packtip (VMF4/TH-D-T)		Flamma hilitar alasa					UL94 V-0
3 3 1	60 s	Flammability class					027
Charging time energy backup (VME421H-D- 2) Recovery time t _b	120 s ≤ 300 ms	Documentation number					D00141

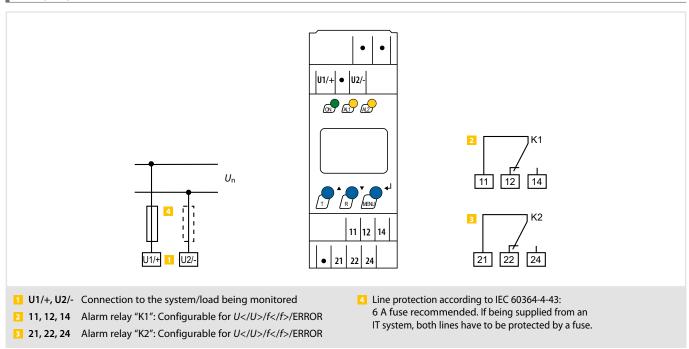
^{()* =} factory setting



^{** =} 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



Typical applications

- · Monitoring of the power supply of machines and electrical installations
- · Monitoring of loads
- Switching electrical systems on and off at a certain voltage level
- · Monitoring of stand-by and emergency supply systems

Approvals

C € ĽK

Device features

- · High availability due to purely analogue technology
- · Undervoltage and overvoltage monitoring for 3AC systems
- · No separate supply voltage required
- · Separate alarm relays for undervoltage and overvoltage with two potential-free changeover contacts
- Adjustable response value: 0.7...0.95 x U_n / 1.05...1.3 x U_n
- Nominal system voltages: 3AC 690/500/480/440/400/230/110/100 V
- Adjustable response delay: 0...5 s
- LEDs for operation, overvoltage, undervoltage

Standards

The LINETRAXX® VMD258 series complies with the requirements of the device standards:

- DIN EN 60255-1 VDE 0435-300 (Measuring relays and protection equipment - Part 1: Common requirements (IEC 60255-1:2009)
- IEC 60255-127 Measuring relays and protection equipment - Part 127: Functional requirements for over/under voltage protection.

Further information

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

Ordering details

Туре	Connection	Art. No.
VMD258 3AC 100 V	3AC, 100 V	B93010060
VMD258 3AC 110 V	3AC, 110 V	B93010061
VMD258 3AC 230 V	3AC, 230 V	B93010062
VMD258 3AC 400 V	3AC, 400 V	B93010063
VMD258 3AC 440 V	3AC, 440 V	B93010064
VMD258 3AC 480 V	3AC, 480 V	B93010065
VMD258 3AC 500 V	3AC, 500 V	B93010066
VMD258 3AC 690 V	3AC, 690 V	B93010067

Accessories

Description	Art. No.
Additional mounting clips (screw mounting)	B98060008

Suitable system components

Description	Туре	Art. No.	Page
Energy backup	ES258	B93010068	299



Supply voltage U_S AC (V)	690	48	80/500	40	0/440	230	100	/110
Rated voltage AC (V)	1000)	1000		600	300		15
Rated impulse voltage (kV)	12		12		8	6		-
Pollution degree								
Overvoltage category								II
Voltage ranges								
Frequency range of U_S						4	156	66 H
Operating range							1.3	
Short-time overload capability						1.5	x <i>U</i> _S ⋅	< 1
Power consumption							≤ 1	0 V
Nominal supply voltage <i>U</i> _S 3AC (V)	690	500	480	440	400	230	110	100
Power consumption at 50 Hz, 1.3 x U_S (VA)	19	15	12	14	9	16	15	10
Power consumption at 60 Hz, 1.3 x U_S (VA)	11	9	8	8	6	9	9	- 7
Measuring circuit								
Nominal system voltage <i>U</i> n		3AC	690/50	00/480	/440/4	00/230/		
Setting range							1.3	
Short-time overload capability							x U _n ⋅	
Frequency range of $U_{\rm n}$							156	
Max. permissible measuring voltage								x U
Response value U_n adjustable	>U,			, <l< td=""></l<>				
Response values								
Undervoltage < U (alarm)							.0.95	
Overvoltage >U (alarm)		1.051.						
Relative uncertainty at the setting limits						4566		
Hysteresis					4/	.563		±2 % : 3 %
Repetition accuracy								:1%
LED ON								een
Alarm for < U						I F	D (yel	
Alarm for >U							D (yel	
							.b (yci	10 11
Time response Start-up delay <i>t</i>						500	ms ±2	20 %
Response delay t _{on}							5 s ±	
Delay on release t _{off}	, , , ,							
Operating time t_{ae} at overvoltage		60 ms* ±2						
Operating time t_{ae} at undervoltage		100 ms** ±2						
Response time t_{an}		$t_{\rm an} = t_{\rm ae} +$						
Long-term influence					10 %			
Overshooting time t _{ov}								0 m
Connection for external energy storage d	evice							
U _{min}	- -						DC	24 \
U _{max}					DC	68 \		
U_{typ} at 1.0 x U_{n}	4247 V ±15			15 %				
Short-circuit proof (Z+, Z-)						sho	rt tim	P VP

Switching elements	2 2
Number of switching elements	2 x 2 changeover contacts
Operating mode	N/C operation (undervoltage) N/O operation (overvoltage)
Floatrical and management and analysis	N/O operation (overvoltage, 10000
Electrical endurance, number of cycles	10000
Contact data acc. to IEC 60947-5-1	
Rated operational voltage	230 V/230 V/ 220/110/24 V
Utilisation category	AC-13/AC-14/DC 12/DC 12/DC 12
Rated operational current	5 A/3 A/ 0,1/0,2/1 A
Minimum current	1 mA at AC/DC > 10 \
Environment/EMC	
EMC immunity	acc. to IEC 60255-26
EMC emission	acc. to IEC 60255-25
Operating temperature	-20+70°C
Climatic class acc. to DIN IEC 60721-3-3 (related t	to temperature and relative humidity)
Stationary use, except condensation	3K22
Transport	2K11
Long-term storage	1K22
Classification of mechanical conditions acc. to	IEC 60721
Stationary use	3M11
Transport	2M ⁴
Long-term storage	1M12
Requirements acc. to IEC 60255	Class 2
Connection	
Connection	screw terminals
Connection properties	
rigid/flexible	0.22.5 mm
flexible with ferrule	0.252.5 mm
without/with plastic sleeve	0.252.5 mm
Conductor sizes (AWG)	24-13
Tightening torque	0.50.6 Nm
Current through L1L1, L2L2 or L3L3	each max. 3 /
Other	
Operating mode	continuous operation
Position	any position
Degree of protection, internal components (DIN EN 6	50529) IP30
Degree of protection, terminals (DIN EN 60529)	IP20
Enclarura material	

* Operating time f_{ae} overvoltage increase from 100 % to 130 %, switching threshold at 105 %

Enclosure material

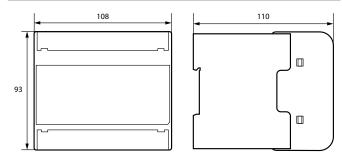
Flammability class
DIN rail mounting acc. to

Screw mounting

Weight

*** Operating time \emph{t}_{ae} undervoltage decrease from 100 % to 0 %, switching threshold at 95 %

Dimension diagram (dimensions in mm)

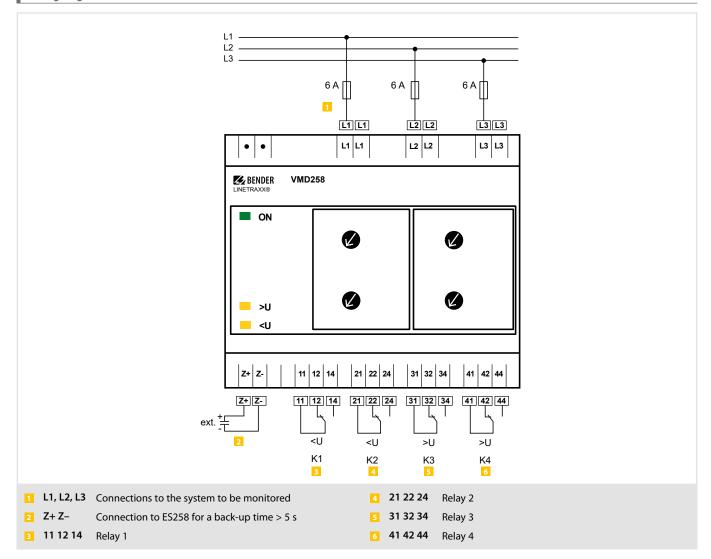


polycarbonate UL94 V-0

IEC 60715

4 x M4

825 g





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

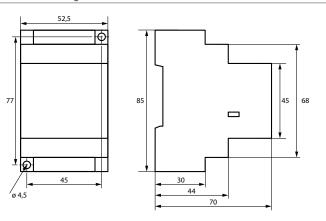
Connection

Connection	screw -type termina	
Connection properties		
single wire	2 x (0.54) mm ²	
flexible with end ferrule	2 x (0.52.5) mm ²	

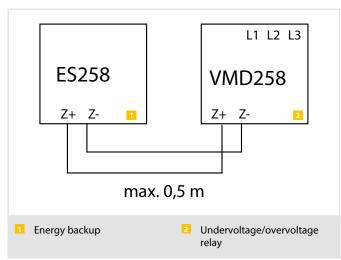
0ther

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







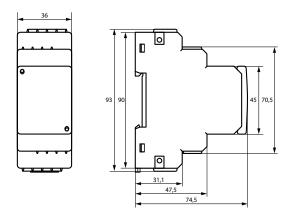
Ordering information

Type	Supply voltage 1) U _S	Art.	Art. No.	
7,78-	5pp., 10.1gc - 03	Screw-type terminal	Push-wire terminal	
VMD420-D-1	AC 1672 V, 15460 Hz / DC 9,694 V	B93010005	B73010005	
VMD420-D-2	AC/DC 70300 V, 15460 Hz	B93010006 B73010006		

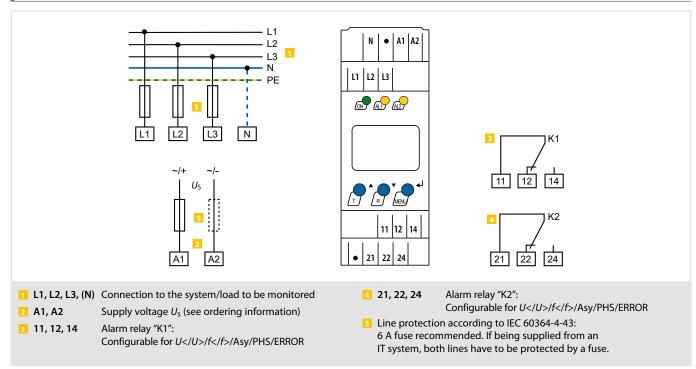
¹⁾ Absolute values

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

Insulation coordination acc. to IEC 60664-1/IEC 60664-3		Switching elements	
Rated insulation voltage	400 V	Number	2 x 1 changeover contacts (K1, K2
Rated impulse voltage/pollution degree	4 kV/III	Operating principle	N/C operation n.c. or N/O operation n.c
	, L2, L3) -(11, 12, 14) -(21, 22, 24)	K1: Err, <i>U</i> <, <i>U</i> >, Asy, Hz <, Hz >	, PHS, S.AL (undervoltage $U <$, asymmetry Asy, N/C operation n.c.) >, PHS, S.AL (overvoltage $U >$, asymmetry Asy, N/O operation n.o.)
Voltage test acc. to IEC 61010-1:		Electrical endurance, number of cycles	10,00
(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-13
(A1, A2) -(11, 12, 14) -(21, 22, 24)	2.21 kV	Rated operational voltage	230 V 230 V 24 V 110 V 220 V
Supply voltage		Rated operational current Minimum contact load (relay manufacturer'	$5 A$ $3 A$ $1 A$ $0.2 A$ $0.1 /$'s reference) $1 \text{ mA at AC/DC} \ge 10 \text{ N}$
VMD420-D-1:		Minimum contact load (relay manufacturer	s reference) I ma at ac/DC ≥ 10 v
Supply voltage U_{S}	AC 1672 V/DC 9.694 V	Environment/EMC	
Frequency range U _s	15460 Hz	EMC	EN 61326-7
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	-25+70 °C
	≤ 4 VA	Storage	-25+55 °C
Power consumption	≤ 4 VA	•	o IEC 60721 (related to temperature and relative humidity):
Measuring circuit		Stationary use (IEC 60721-3-3)	3K22
Measuring range (rms value) (L-N)	AC 0288 V	Transport (IEC 60721-3-2)	2K17
Measuring range (rms value) (L-L)	AC 0500 V	Long-term storage (IEC 60721-3-1)	1K22
Input impedance (burden) L1-N, L2-N, L3-N	1 ΜΩ		
Input impedance (burden) N	n.a.	Classification of mechanical conditions	
Rated frequency $f_{\rm D}$	15460 Hz	Stationary use (IEC 60721-3-3)	3M11
Frequency display range	10500 Hz	Transport (IEC 60721-3-2)	2M ⁴
		Long-term storage (IEC 60721-3-1)	1M12
Response values		Option "W" data different from the sta	ndard version
Type of distribution system	3(N)AC/3AC (3AC)*	Classification of climatic conditions acc. to IE	EC 60721:
Undervoltage $U < (Alarm 2)$ (measurement method: $3Ph/3n$)	AC 6500/6288 V	Stationary use (IEC 60721-3-3)	3K23 (condensation and formation of ice is possible)
Overvoltage $U > (Alarm 1)$ (measurement method: $3Ph/3n$)	AC 6500/6288 V	Classification of mechanical conditions acc. 1	to IEC 60721:
Resolution of setting <i>U</i>	1 V	Stationary use (IEC 60721-3-3)	3M12
Preset function for 3AC measurement:			
Undervoltage U $<$ (0.85 Un)* for Un $=$ 400/208 V	340/177 V	Connection	
Overvoltage U > (1.1 Un)* for Un = 400/208 V	440/229 V	Connection type	screw-type terminal or push-wire terminal
Preset function for 3(N)AC measurement:		Connection	screw terminals
Undervoltage $U < (0.85 U_{\rm n})^*$ for $U_{\rm n} = 230/120 \text{ V}$	196/102 V	Connection properties	
Overvoltage $U > (1.1 U_{\rm n})^*$ for $U_{\rm n} = 230/120 \text{ V}$	253/132 V	rigid	0.2 4 mm² (AWG 24- 12)
Asymmetry	530 % (30 %)*	flexible	0.22.5 mm² (AWG 24-14)
Phase failure	by setting the asymmetry	Two conductors with the same cross section	
Phase sequence clock	kwise/anticlockwise rotation (off)*	rigid/flexible	0.2 1.5 mm² (AWG 24-16)
Relative uncertainty, voltage at 50/60 Hz	±1.5 %, ±2 digits	Stripping length	89 mm
Relative uncertainty, voltage in the range 15460 Hz	±3 %, ±2 digits	Tightening torque, terminal screws	0.50.6 Nm
Hysteresis <i>U</i>	140 % (5 %)*	Connection	push-wire terminals
Underfrequency Hz <	10500 Hz**		pusn-wire terminals
Overfrequency Hz >	10500 Hz**	Connection properties	0.2 2.5 mm ² (AWC 24.14)
Resolution of setting $f(10.099.9 \text{ Hz})$	0.1 Hz	rigid	0.22.5 mm ² (AWG 24-14)
Resolution of setting $f(100500 \text{ Hz})$	1 Hz	flexible	0.75 2.5 (ANIC 10.14)
Preset function:		without ferrules	0.752.5 mm² (AWG 19-14)
Underfrequency for $f_0 = 16,7/50/60/400 \text{ Hz}$	15.7/49/59/399 Hz	with ferrules	0.21.5 mm² (AWG 24-16)
Overfrequency for $r_n = 16,7/50/60/400 \text{ Hz}$	17.7/51/61/401 Hz	Stripping length	10 mm
		Opening force	50 N
Hysteresis, frequency Hys Hz	0.12 Hz (0.2 Hz)* +0.2 % +1 digit	Test opening, diameter	2.1 mm
Relative uncertainty, frequency range 15460 Hz	±0.2 %, ±1 digit	Other	
Specified time		Operating mode	continuous operation
Start-up delay t	0300 s (0 s)*	Mounting	any position
Response delay $t_{\text{on1/2}}$	0300 s (0 s)*	Degree of protection, internal components (, · · · · · · · · · · · · · · · · · · ·
Delay on release t _{off}	0300 s (0.5 s)*	Degree of protection, internal components (DIN EN 605	
Resolution of setting t , $t_{on1/2}$, t_{off} (010 s)	0.1.500 3 (0.5 3)	Enclosure material	polycarbonate
Resolution of setting t , $t_{on1/2}$, t_{off} (099 s)	1s	Flammability class	porycarbonate UL94 V-0
Resolution of setting t , t_{off} (70300 s)	10 s		
Operating time, voltage t_{ae}	≤ 140 ms	DIN rail mounting acc. to Screw mounting	IEC 60715
Operating time, frequency tae	≤ 335 ms	Documentation number	2 x M4 with mounting clip D00137
Response time t _{an}	$t_{\rm an} = t_{\rm ae} + t_{\rm on1/2}$		
Recovery time t _b	$\frac{t_{an} - t_{ae} + t_{on1/2}}{\leq 300 \text{ ms}}$	Weight	≤ 150 g
	= 200 III3	()* = factory setting	
Displays, memory		** = The technical data can only be ensure	red in the operating range of the nominal
. ,	y, multifunctional, not illuminated	frequency 15460 Hz.	, J. J
Display range measured value	AC/DC 0500 V	, ,	
Operating uncertainty, voltage at 50 Hz/60 Hz	±1.5 %, 2 digits		
Operating uncertainty voltage in the range of 15460 Hz	±3 %, ±2 digits		
Operating uncertainty, frequency in the range of 15460 Hz	±0.2 %, ±1 digit		
History memory (HiS) for the first alarm value	data record measured values		
	data record measured values off/0999 (off/ 0)*		



Wiring diagram



LINETRAXX® VMD421H

Multi-functional voltage relay for 3(N)AC systems, frequency/overvoltage/undervoltage, phase, phase failure, asymmetry



Typical applications

- Monitoring of voltage-sensitive machines and electrical installations
- Switching machinery and equipment on and off at a certain voltage level
- Monitoring of stand-by and emergency supply systems
- Supply voltage monitoring of portable loads
- Protection of three-phase motors against phase failure and phase open-circuit
- Transformer protection, asymmetrical load can be recognised

Approvals

C € 2 EM EM





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

Type Nominal system voltage ¹⁾ <i>U</i> n		Art	No.
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		Screw-type terminal	Push-wire terminal
VMD421H-D-3	3(N)AC 70500 V, 15460 Hz	B93010007	B73010007

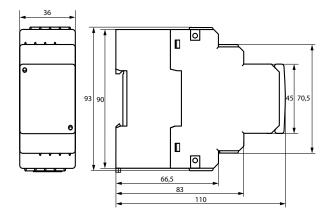
¹⁾ Absolute values

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

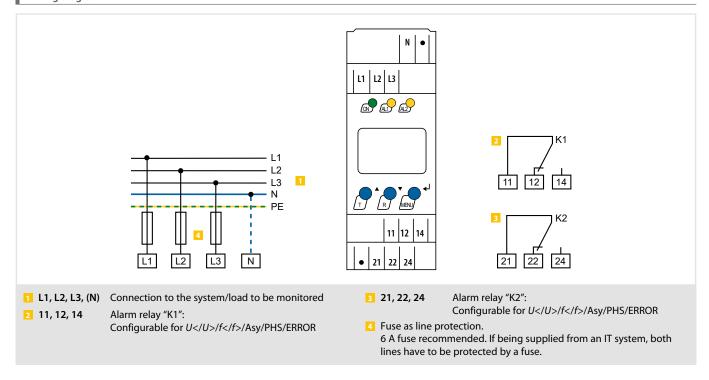
Insulation coordination acc. to IEC 60664-1/IEC 60664-3		Switching elements	
Rated insulation voltage	400 V	Number of changeover contacts	2 x 1 (K1, K
ated impulse voltage/Pollution degree	4 kV/III	Operating principle	N/C operation / N/O operation
	L2, L3) - (11, 12, 14) - (21, 22, 24)	the state of the s	THS $(undervoltage < U, asymmetry Asy, N/C operation)$
oltage test acc. to IEC 61010-1:		K1: Err, $<$ U, $>$ U, Asy, $<$ Hz, $>$ Hz,	PHS (overvoltage > U, asymmetry Asy, N/O operation)
N, L1, L2, L3) - (11, 12, 14)	3.32 kV	Electrical endurance, number of cycles	1000
N, L1, L2, L3) - (21, 22, 24)	2.21 kV	Contact data acc. to IEC 60947-5-1	
unnly voltage		Utilisation category	AC-13 AC-14 DC-12 DC-12 DC-1
upply voltage	/:	Rated operational voltage	230 V 230 V 24 V 110 V 220
upply voltage U _S	none (internally supplied by U_n)	Rated operational current	5 A 3 A 1 A 0.2 A 0.1
ower consumption	≤ 6 VA	Minimum contact rating	1 mA at AC/DC \geq 10
Measuring circuit			
Measuring range (r.m.s. value) (L-N)	AC 0288 V	Environment/EMC	
Measuring range (r.m.s. value) (L-L)	AC 0500 V	EMC	IEC 613.
Rated frequency f_n	15460 Hz	Operating temperature	-25+55
requency display range	10500 Hz	Classification of climatic conditions acc. to	IEC 60721 (related to temperature and relative humidity)
requestly display range	10111300112	Stationary use (IEC 60721-3-3)	3K
Response values		Transport (IEC 60721-3-2)	2K
Type of distribution system	3(N)AC/3AC (3AC)*	Long-term storage (IEC 60721-3-1)	1K2
Jndervoltage < U (Alarm 2) (measurement method: 3Ph/3n)	AC 70500/70288 V	Classification of mechanical conditions a	occ. to IEC 60721
Overvoltage $> U$ (Alarm 1) (measurement method: 3Ph/3n)	AC 70500 V/70288 V	Stationary use (IEC 60721-3-3)	3M1
Resolution of setting U	1 V	Transport (IEC 60721-3-2)	
Preset function for 3AC measurement:		Long-term storage (IEC 60721-3-1)	1M
Indervoltage $< U (0.85 U_{\rm n})^*$ for $U_{\rm n} = 400/208 \text{ V}$	340/177 V	Long-term storage (ILC 00721-3-1)	IIVI
Overvoltage $> U (1.1 U_n)^*$ for $U_n = 400/208 \text{ V}$	440/229 V	Connection	
Preset function for 3(N)AC measurement:		Connection type	screw-type terminal or push-wire termin
Indervoltage $< U (0.85 U_{\rm n})^*$ for $U_{\rm n} = 230/120 \text{ V}$	196/102 V	Connection	screw termina
Overvoltage $> U (1.1 U_n)^*$ for $U_n = 230/120 \text{ V}$	253/132 V	Connection properties	Sciew termina
lysteresis <i>U</i>	140 % (5 %)*	rigid	0.2 4 mm² (AWG 24- 1
symmetry	530 % (30 %)*	flexible	0.22.5 mm ² (AWG 24-1
Phase failure	by setting the asymmetry	Two conductors with the same cross section	0.22.3 Hilli (AWG 2+ 1
Phase sequence clock	wise/anticlockwise rotation (off)*	rigid/flexible	0.21.5 mm ² (AWG 24-1
Relative uncertainty, voltage at 50/60 Hz	\pm 1.5 %, \pm 2 digits	Stripping length	89 m
Relative uncertainty voltage in the range 15460 Hz	$\pm 3\%$, ± 2 digits	Tightening torque, terminal screws	0.50.6 N
Jnderfrequency < Hz	10500 Hz**	3 1	
Overfrequency > Hz	10500 Hz**	Connection	push-wire termina
Resolution of setting <i>f</i> 10.099.9 Hz	0.1 Hz	Connection properties	0.3 (ANIC 34.1
Resolution of setting <i>f</i> 100500 Hz	1 Hz	rigid	0.22.5 mm ² (AWG 24-1
By preset function :		flexible without ferrules	0.75 2.5 mm ² (AWC 10.1
Underfrequency for $f_n = 16.7/50/60/400 \text{ Hz}$	15.7/49/59/399 Hz	with ferrules	0.752.5 mm² (AWG 19-1 0.21.5 mm² (AWG 24-1
Overfrequency for $f_n = 16.7/50/60/400 \text{ Hz}$	17.7/51/61/401 Hz		0.21.3 IIIIIF (AWG 24-1
Hysteresis frequency Hys Hz	0.12 Hz (0.2 Hz)*	Stripping length	50
Relative uncertainty, frequency in the range of 15460 Hz	±0.2 %, ±1 digit	Opening force Test opening, diameter	
ime response		rest opening, diameter	2.1 m
•	0 200 c (0 c)*	Other	
Start-up delay t	0300 s (0 s)*	Operating mode	continuous operation
Response delay t _{001/2}	0300 s (0 s)*	Mounting position	vertically, see dimension diagra
Delay on release t_{off}	0300 s (0.5 s)*	Degree of protection, internal components (II	
Resolution of setting t , $t_{on1/2}$, t_{off} (010 s)	0.1 s	Degree of protection, terminals (IEC 60529)	IP.
Resolution of setting t, t _{on1/2} , t _{off} (1099 s)	1 5	Enclosure material	polycarbona
Resolution of setting t , $t_{on1/2}$, t_{off} (100300 s)	10 s	Flammability class	UL94 V
Operating time, voltage tae	≤ 140 ms	DIN rail mounting acc. to	IEC 607
Operating time, frequency t _{ae}	≤ 335 ms	Screw mounting	2 x M4 with mounting c
Response time t _{an}	$t_{\rm an} = t_{\rm ae} + t_{\rm on1/2}$	Documentation number	D001.
Discharging time energy backup on power failure	≥ 2.5 s	Weight	≤ 240
harging time energy storage	≤ 60 s	weight	
ecovery time t _b	≤ 300 ms	()* = factory setting	
Displays, memory		** The technical data are only quaranteed wi	thin the operating range of the rated
	, multifunctional, not illuminated	frequency (15460 Hz).	
Display range measured value	AC/DC 0500 V		
perating uncertainty, voltage at 50/60 Hz	±1.5 %, ±2 digits		
perating uncertainty, voltage at 50/60 Hz	$\pm 1.5\%$, ± 2 digits $\pm 3\%$, ± 2 digits		
Operating uncertainty voltage in the range of 15400 Hz	$\pm 3\%, \pm 2$ digits $\pm 0.2\%, \pm 1$ digit		
distory memory (HiS) for the first alarm value	data record measured values		
Password	Off/0999 (OFF)*		
-assword	on/off/con (on)*		
ann mennory uyu alami relay			

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



Typical applications

- · Monitoring of automatic switching points between private electricity generation power system in parallel operation with the public low voltage grid
- Applications according to DIN V VDE V 0126-1-1 (VDE V 0126-1-1), C 10/11, EN 50438
- Universally applicable for photovoltaic systems, CHPs (Combined Heat and Power plants), wind power and hydro power plants

Approvals



Device features

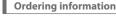
- · VMD423 with separate supply voltage
- VMD423H is supplied by the system being monitored
- Undervoltage, overvoltage and underfrequency and overfrequency monitoring in 3(N)AC systems AC 0...500 V
- · Monitoring of overvoltage by average determination of the latest 10-minute measuring interval
- · 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

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.



Туре	Supply voltage 1) U _S	Response value	Art.	No.
.,,,,,	Supply foliage 05	nesponse value	Screw-type terminal	Push-wire terminal
VMD423-D-1	AC 1672 V, 15460 Hz / DC 9,694 V	AC 10500 V	B93010020	B73010020
VMD423-D-2	AC 70300 V, 15460 Hz / DC 70300 V	AC 10500 V	B93010021	B73010021
VMD423H-D-3	<i>U</i> n	AC 70500 V	B93010022	B73010022

¹⁾ Absolute values

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

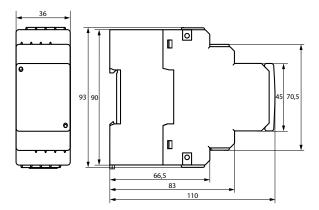
Insulation coordination acc. to IEC 60664-1/IEC		Switching elements					
Rated insulation voltage	400 V	Number			changeov		
Rated impulse voltage/pollution degree	4 kV/III	Operating principle K1/K2			eration n.		
Protective separation (reinforced insulation) between		K1: (undervoltage < U					
	1, A2) - (N, L1, L2, L3) - (11, 12, 14) - (21, 22, 24)		uency > Hz, alarm				
Voltage test according to IEC 61010-1:	2 22 14/		r Err, undervoltage ·				
(N, L1, L2, L3) - (A1, A2), (11, 12, 14)	3.32 kV 2.21 kV		requency < Hz, ove oltage > <i>U</i> 2, alarm				
(N, L1, L2, L3) - (21, 22, 24)	2.21 kV 2.21 kV	Electrical endurance, number of cycles	onage > 02, aiarin	wnen star	ung SAL, I	v/C operati	1000
(A1, A2) - (11, 12, 14) - (21, 22, 24)	Z.21 KV	· · · · · · · · · · · · · · · · · · ·					10000
Supply voltage		Contact data acc. to IEC 60947-5-1:			20.42	20.42	- nc -
VMD423-D-1:		Utilisation category	AC 13	AC 14	DC-12	DC-12	DC-12
Supply voltage $U_{\rm S}$	AC 1672 V/DC 9.694 V	Rated operational voltage	230 V	230 V	24 V	110 V	220\
Frequency range U_S	15460 Hz	Rated operational current	5 A	3 A	1 A	0.2 A	0.17
_ · · · ·	15111103112	Minimum contact rating			11	nA at AC/D	JC ≥ 10 V
VMD423-D-2: Supply voltage <i>U</i> _S	AC/DC 70300 V	Environment/EMC					
Frequency range U _S	15460 Hz	EMC				I	IEC 61320
Power consumption	15400 HZ ≤ 3.5 VA	Operating temperature				- 25	+ 55 °(
·	≥ 3.3 ¼	Classification of climatic conditions acc. t	to IFC 60721 (relate	d to tempe	erature and	relative hu	umidity)•
VMD423H-D-3:	7: . II II II II II	Stationary use (IEC 60721-3-3)	to ILC 00721 (ICIate	u to tempe	.iatuic and	iciative iiu	3K22
Supply voltage Us	none (internally supplied by U_0)	Transport (IEC 60721-3-3)					2K1
Power consumption	≤ 5 VA	Long-term storage (IEC 60721-3-1)					1K22
Measuring circuit		Classification of mechanical conditions	c acc to IEC 60721				.1122
Measuring range (r.m.s. value) (L-N)	AC 0288 V	Stationary use (IEC 60721-3-3)	S acc. to IEC 00/2	1:			3M1
Measuring range (r.m.s. value) (L-L)	AC 0500 V	Transport (IEC 60721-3-2)					2M4
Rated frequency f _n	4065 Hz	Long-term storage (IEC 60721-3-1)					1M12
Frequency display range	25100 Hz	Long term storage (IEC 00721 3 1)					111112
D		Connection					
Response values	2/10.4.5/2.4.5 (2/10.4.5)	Connection type	scre	w-type te	erminal or	push-wire	termina ؛
Type of distribution system	3(N)AC/3AC (3(N)AC)*	Connection				screw te	erminal [.]
Undervoltage< U (Alarm 2)	AC 10	Connection properties					
(measurement method: 3Ph/3n)	AC 10500/10288 V (3n: AC 184 V)*	rigid			0.24	mm ² (AW	G 24- 12
Overvoltage > U1 (Alarm 1) (measurement method: 3Ph/3n)	AC 10	flexible			0.22.5	mm² (AW	VG 24-14
Overvoltage > U2 (Alarm 1)	AC 10500/10288 V (3n: AC 264 V)*	Two conductors with the same cross section	n				
(measurement method: 3Ph/3n)	AC 10500 V/10288 V (3n: AC 253 V)*	rigid/flexible			0.21.5	mm² (AW	VG 24-16
Overvoltage <i>U</i> 2	10-minute average determination	Stripping length				8	39 mm
Schrittweite <i>U</i>	1V	Tightening torque, terminal screws				0.5.	0.6 Nm
Hysteresis <i>U</i>	140 % (5 %)*	Connection			pus	h-wire te	erminal [.]
Asymmetry	530 % (30 %)*	Connection properties			•		
Phase failure	by setting the asymmetry	rigid			0.22.5	mm² (AW	VG 24-14
Phase sequence	clockwise R/anticlockwise L (R/on)*	flexible					
Relative uncertainty, voltage at 50/60 Hz	±1.5 %, ±2 digits	without ferrules			0.752.5	mm² (AW	√G 19-14
Underfrequency< Hz	4565 Hz (47.5 Hz)*	with ferrules			0.21.5	mm² (AW	/G 24-16
Overfrequency > Hz	4565 Hz (50.2 Hz)*	Stripping length					10 mm
Resolution of setting f	0.1 Hz	Opening force					50 N
Hysteresis frequency Hys Hz	0.12 Hz (0.1 Hz)*	Test opening, diameter					2.1 mm
Relative uncertainty, frequency 4065 Hz	±0.1 %, ±1 digit	Other					
Time response		Operating mode			r	ntinuous (operation
Start-up delay t	0300 s (30 s)*	Mounting					y position
Response delay t _{on1/2}	0300 s (30 s)** 0300 s (0.1)	Degree of protection, internal components	(IEC 60529)			ully	IP3(
Delay on release $t_{\rm off}$	0300 s (30 s)*	Degree of protection, terminals (IEC 60529)					IP30
Resolution of setting t , t_{off} , $t_{on1/2}$ (010 s)	0.1.s	Flammability class					UL94 V-(
Resolution of setting t , t_{off} , $t_{on1/2}$ (010 s)	1s	DIN rail mounting acc. to					IEC 60715
Resolution of setting t , t_{off} , $t_{on1/2}$ (10.0300 s)	10 s	Enclosure material					carbonate
Operating time, voltage t_{ae}	≤ 80 ms	Screw mounting			2 x M4	with mou	
Operating time, frequency t_{ae}	≤ 80 ms	Documentation number					D00139
Response time t_{an}	$t_{\rm an} = t_{\rm ae} + t_{\rm on1/2}$	Weight					
Recovery time t _b	≤ 300 ms	VMD423					≤ 150 g
<u> </u>		VMD423H					≤ 240 g
Displays, memory	Tele Live or Live or	()* = Factory setting					
Display	LC display, multifunctional, not illuminated	() — ractory setting					
Display range measured value	AC 0500 V						
Operating uncertainty, voltage at 50/60 Hz	$\pm 1.5\%$, ± 2 digits						
Operating uncertainty, frequency in the range of 40.							
History memory (HiS) for the first alarm value	data record measured values off/on / 0999 (on/126)*						
Password Fault memory (M) alarm relay	on/off/con (off)*						

on/off/con (off)*

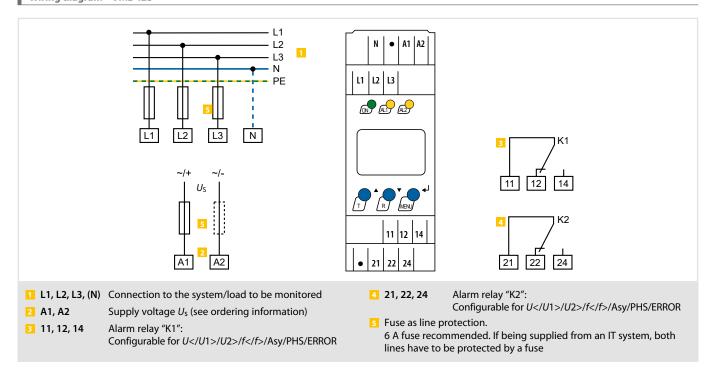
Fault memory (M) alarm relay

VMD423

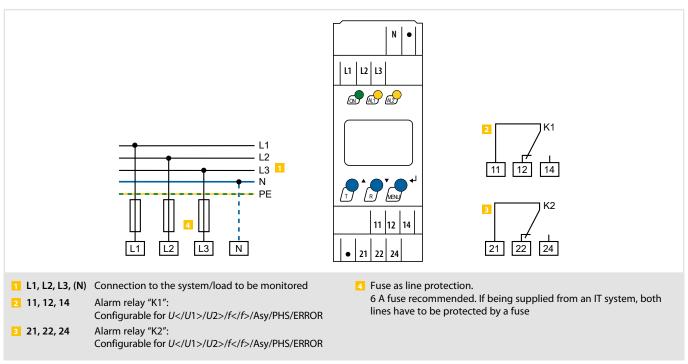
VMD423H



Wiring diagram – VMD423



Wiring diagram – VMD423H



LINETRAXX® VMD460-NA

Network and system protection (NS protection) for monitoring the power feed-in of power generation systems



Typical applications

- · Central NS protection (VDE-AR-N 4105)
- Protective disconnection (VDE-AR-N 4110, BDEW)
- Interface Protection (IP) (Engineering Recommendations; EREC G99, G59, G83, G59)
- · Protezione di interfaccia (CEI 0-21)
- · Automatic disconnection device between a generating plant parallel to the network and the public
- · Universal for generating plants for safe network decoupling

Approvals





Device features

- · Monitoring of different system types: 1AC, 3AC, 3NAC
- · Continuous monitoring of the phase voltage and line-to-line voltage
- (Re)connection and monitoring of the conditions
- Reconnection after
 - short interruptions
- df/dt detection (ROCOF)
- vector shift detection
- Voltage protection functions U<, U<<, U>> and U>
- Frequency protection functions f<, f<<, f>> and f>
- Islanding detection df/dt (ROCOF), vector shift detection
- · Unbalance detection
- · Monitoring of the tripping circuits and interface switches by means of contact feedback
- Remote trip: remote disconnection via ripple-control receiver
- Test function for checking the tripping circuit, the interface switch and for determining the connection times
- · Automatic self test
- Password protection
- · Reset device to factory settings
- · History memory of the last 300 faults with time stamp (real-time clock)
- Language selection (German, English, Italian)
- Remote configuration and remote maintenance using COM465IP and/or CP9...-I (RS-485)
- · Backlit graphic LC display
- · Sealable enclosure
- · Single-fault tolerance

Standard/application guide

- VDE-AR-N 4105:2018-09
- VDE-AR-N 4105:2011-08
- VDE-AR-N 4110:2018-11
- BDEW-Richtlinie 2008 einschl. Ergänzungen bis 01.2013
- DIN V VDE V 0126-1-1(:2016-06, /A1:2012-02)
- CEI 0-21 (:2012-06, :V1:2012-12, :V2:2013-12, :2014-09, :V1:2014-12, :2016-07, V1:2017-07)
- · C10/11:2012-06
- · G98/1-4:2019
- · G83/2:2012
- · G99/1-4:2019
- G59/3:2013
- G59/2(:2010, -1:2011
- UL File No. E173157

Further information

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

Ordering information

Туре	Supply voltage <i>U</i> s	Art. No.
VMD460-NA-D-2	AC/DC 100240 V	B93010045

Device version with push-wire terminal on request.

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



Insulation coordination acc. to IEC 60664-1/IEC 60664-3		Digital inputs					
Rated voltage	400 V	Monitoring of potential-free contacts or voltage	inputs:	close	d = low; 0	4 V; / _{in}	< -5 mA
Rated impulse voltage/ Overvoltage category	6 kV/III				open = h	nigh; > 6.	≤30 V
Pollution degree	2	D1			feedbac	k signal co	ontact K1
Protective separation (reinforced insulation) between		D2			feedbac	k signal co	ontact K2
(A1, A2) - (L1, L2, L3,	N) - (11, 12, 14, 21, 22, 24)	D3			lo	ocal contro	l (mode)
(D1, D2, D3, D4, DG1/2, DG3/4, RTG,	RT1)-(A1, A2, L1, L2, L3, N)	D4			exte	ernal signa	l (mode)
Voltage test according to IEC 61010-1:		RT1				rei	mote trip
(N, L1, L2, L3) - (A1, A2), (11, 12, 14, 21, 22, 24)	3.32 kV	DG1/2, DG3/4, RTG					GND
Supply voltage		Max. length of the connecting cables of digital in	iputs				3 m
Nominal supply voltage <i>U</i> _S	AC/DC 100240 V	Displays, memory					
Nonlinar Supply Voltage 03	DC/50/60 Hz	Display		l C display	multi-fund	tional illi	ıminated
Operating range U _S	AC/DC 75300 V	Display range, measured value		cc display,	mara ranc		520 V
operating range of	DC/4070 Hz	Operating uncertainty, voltage			- 1	J ≤ 280 V:	
Power consumption at AC 230 V	< 7.5 VA/< 3.5 W	operating uncertainty, voltage			,		V: ±3 %
maximum	9 VA/3.5 W	Operating uncertainty, frequency					±0.1%
Bridging time at $U_s = 230 \text{ V}$ and dip to 0 V	600 ms	History memory for the last 300 messages		1 data re	cord of me		
		Password				/on/09	
Measuring circuit		6 11 1					,
System type	1AC, 3(N)AC	Switching elements					
Nominal system voltage U_n (r.m.s. value) (L-N)	AC 0300 V	Number of changeover contacts					(K1, K2)
Nominal system voltage <i>U</i> _n (r.m.s. value) (L-L)	AC 0520 V	Operating mode			NC opera	ation/NO c	
Input impedance (Load) L1, L2, N	480 kΩ	Electrical endurance in rated operating condition	S			10,0	00 cycles
Input impedance (Load) L3	680 kΩ	Contact data acc. to IEC 60947-5-1					
Rated frequency f_n ($U_n > 20 \text{ V}$)	4565 Hz	Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-12
Response values	1150 %	Rated operational voltage	230 V	230 V	24 V	110 V	220 V
Relative uncertainty, voltage	$U \le 280 \text{ V}: \le \pm 1 \%$	Rated operational current	5 A**	3 A	1 A	0.2 A	0.1 A
D. Lee, C. ee, Li	U > 280 V: ±3 %	** Rated operational current for UL508 and CSA	C22.2 = 4 A				
Resolution of setting, voltage	1%	Minimum contact rating			10	mA at AC/	$DC \ge 5 V$
Nominal frequency	50 Hz	Environment/EMC					
Relative uncertainty, frequency	≤ ±0.1 %				DIN FN	(0255.26	/CEL 0. 24
Resolution of setting f	0.05 Hz	EMC			DIN EN	60255-26	
Recording of measured value, switching condition		Operating temperature					+55℃
(reconnection and disconnection)		Classification of climatic conditions acc. to IEC	60721 (relate	ed to tempe	erature and	relative hu	
L-N, L-L	01.5 <i>U</i> _n	Stationary use (IEC 60721-3-3)					3K22
f< ,f<<	4560 Hz	Transport (IEC 60721-3-2)					2K11
f>,f>>	5065 Hz	Long-term storage (IEC 60721-3-1)					1K22
Recording of measurement value, condition for disconnection		Classification of mechanical conditions acc.	to IEC 6072	1			21/11
df/dt	0.059.9 Hz/s	Stationary use (IEC 60721-3-3) Transport (IEC 60721-3-2)					3M11 2M4
ui/ ut	0.037.7 112/3	Long-term storage (IEC 60721-3-1)					1M22
Time response		Long-term storage (IEC 00721-3-1)					TIVIZZ
Delay time for connection $t_{ m on}$	40 ms60 min	Connection					
Resolution of setting t_{on}		Connection type	scre	w-type teri	minals or p	ush-wire t	erminals
< 50 ms:	5 ms	Connection properties:					
50200 ms:	10 ms	rigid			0.24	mm ² (AW	G 24-12)
200 ms5 s:	50 ms	flexible			0.22.5	mm ² (AW	G 24-14)
5 10 s	0.1 s	Stripping length				8	9 mm
10 s60 s:	1s	Tightening torque			0.50	.6 Nm (5	.7 lb-in)
60 300 s:	10 s	Other					
300 s60 min:	1 min	Operating mode				ntinuous c	neration
Operating time voltage $t_{\rm ae}$ Operating time, frequency $t_{\rm ae}$	half a supply period	Mounting			CO.		position
	≤ 40 ms	Degree of protection, internal components (DIN I	FN 605291			aily	IP30
Recovery time t _b	≤ 300 ms	Degree of protection, internal components (bin in Degree of protection, terminals (DIN EN 60529)	LIT 00327)				IP20
		Enclosure material				nolve	arbonate
		Flammability class					UL94 V-0
		DIN rail mounting acc. to					EC 60715
		Community acc. to					2 144

()* = Factory setting

Documentation number

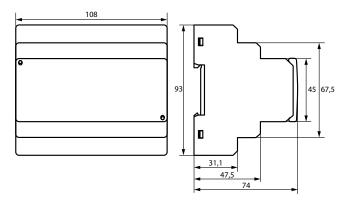
Screw mounting

Weight

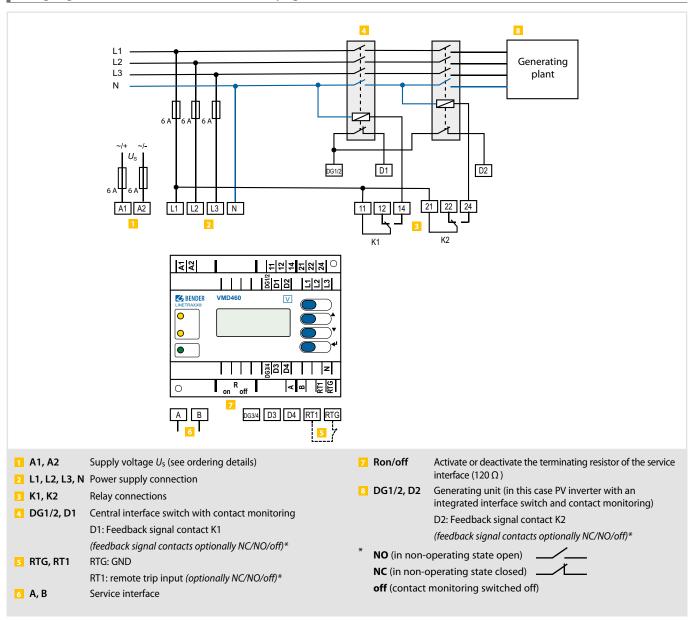
2 x M4

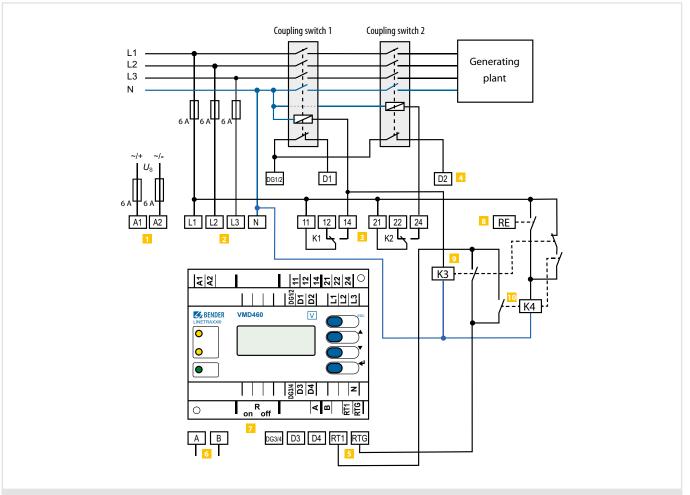
D00001

≤ 360 g



Wiring diagram VMD460 (VDE-AR-N 4105:2018 – basic program 4105_2)



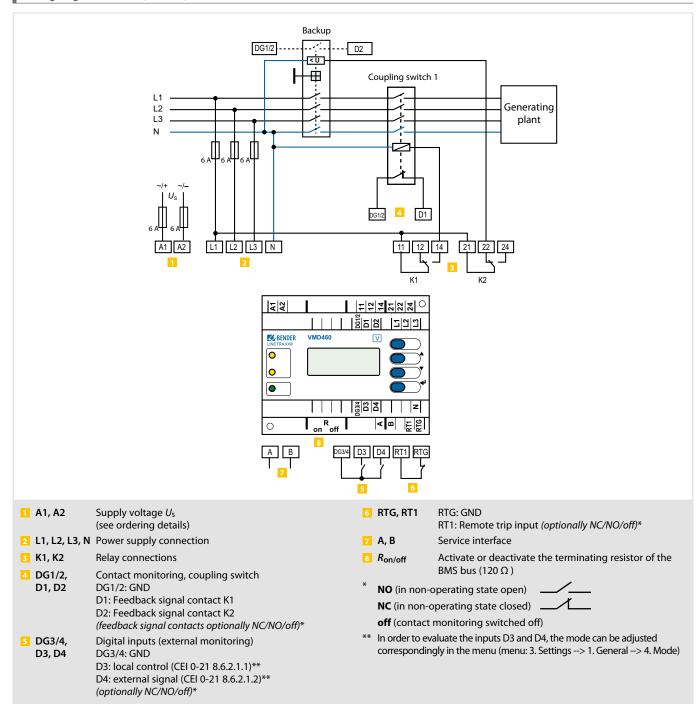


Within the scope of VDE-AR-N 4110, the VMD460-NA can be used as protective disconnection device for the generating unit or as higher-level protective disconnection, the latter, however, only if the Q-U protection function may be dispensed with. According to VDE-AR-N 4110 chapter 10.3.3.4 par. 5, this 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	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 (contac	ct monitoring switched off)



LINETRAXX® VMD461 with CD440 coupling device

Multifunctional voltage relay for AC, DC, 3(N)AC systems



Typical applications

- · Monitoring of voltage-sensitive machines and installations
- · Switching installations on and off at a certain voltage level
- Protection of three-phase motors against phase failure and phase open-circuit
- Vector shift detection for protection of electrical machines
- Islanding detection ROCOF (rate of change of frequency)
- Transformer protection by recognising asymmetrical load

Approvals





Device features

- When combined with a CD440 coupling device, DC systems up to 1200 V, 1AC systems up to 690 V, 3AC systems up to 1200 V and 3NAC systems up to 690 V can be monitored
- · All functions are represented in ANSI codes
- Monitoring of DC, 1AC, 3(N)AC systems DIN EN 60255-1:2010-9
- · Single-fault safety
- · Unbalance, phase failure and phase sequence monitoring
- Monitoring of the connected switches and/or disconnectors (configurable: NC/NO/off)
- Islanding detection df/dt (ROCOF)
- Vector shift function
- RS-485 interface (data exchange/parameter setting/software update)
- Test function to determine the switch-off time
- Test button for the trigger circuit
- The last 300 network faults can be recalled with time stamp/real-time clock
- · Continuous monitoring of the phase voltage and line-to-line voltage
- Special switch-on conditions after an infringement of a response value
- Language selection (German, English, French)
- · Backlit graphic LC display
- · Password protection for device setting
- · Remote shutdown via ripple control signal receiver
- · Sealable enclosure

Standards

The device fulfils the requirements of the following standards:

- DIN EN 60255-127 (IEC 60255-127)
- VDE 0435-3127
- · UL File: E173157

Further information

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

Ordering information

Туре	Description	Supply voltage <i>U</i> ₅	Art. No.
VMD461-D-2	Multifunctional voltage relay	AC/DC 100240 V	B93010047
CD440	Coupling device	=	B73010046

Accessories

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

Suitable system components

Description	Device variants / Supply voltage <i>U</i> s	Туре	Art. No.	Page
Candition Moniton	The state of the s	COM465IP	B950610	394
Condition Monitor	with an integrated gateway: Bender system/Ethernet	CP9I	B9506103	408
RS-485 repeater	AC/DC 24 V ± 20 %	DI-1PSM	B95012044	-

Insulation coordination of the device combinatio	n 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 (E1, E2/DC+, E3, N/DC-) 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 (D1, D2, DG1) 2, R1G, R11)	(L-L)	AC 440600 V
Output circuit 7 (ICS)	VMD461 (11, 12, 14) VMD461 (21, 22, 24)	(DC+/DC-)	DC 250600 V
Output circuit 3 (IC7)	VMD461 (A, B)	Measuring range	01.15 x <i>U</i> _n
·	VINID401 (A, D)	Overload capacity	1.5 x <i>U</i> _n max for 5 s
Rated voltage		Response values	1150 %
IC1	DC, 3AC: 1200 V	Operating uncertainty U_n	≤ ±2 %
-	1AC, 3NAC: 690 V	Resolution of setting U_n	1 %
IC2	400 V	Rated frequency	DC, 50/60 Hz
IG	250 V	Frequency range U_n	DC, 4565 Hz
IC5, IC6	250 V	Resolution of setting f	0.05 Hz
Rated impulse voltage		Relative uncertainty f	≤ ±0.1 %
Overvoltage category	III	D	**
Max. altitude	2000 m	Recording of measurement values, switch-on condi	
IC1/(IC26)	10.5 kV	U<, U<<, U<<<	1100 %
IC2/(IC36)	4 kV	U>, U>>, U>>>	100150 %
IC3/(IC46)	4 kV	f<,f<<,	4560 Hz
IC4/(IC56)	4 kV	f>,f>>,f>>>	5065 Hz
IC5/IC6	4 kV	Phase sequence/Polarity	right, left
Rated insulation voltage		Recording of measurement value, switch-off condit	tion
Pollution degree	3		
IC1/(IC26)	DC, 3AC: 1250 V	U<, U<<, U<<	1100 % 100150 %
101/(1020)	1AC, 3NAC: 800 V	<i>U</i> >, <i>U</i> >>, <i>U</i> >>>	
IC2/(IC36)	400 V	f<,f<<,f<<	4560 Hz 5065 Hz
IC3/(IC46)	400 V	f>,f>>,f>>> df/dt	
IC4/(IC56)	400 V	Vector shift	0.059.95 Hz/s 125 %
IC5/IC6	4 kV	Unbalance	150 %
	T KV	Olipalance	130 70
Protective separation (reinforced insulation): IC1/(IC36)	DC, 3AC: Overvoltage category III, 1250 V	Time response	
ICI/(IC30)	1AC, 3NAC: Overvoltage category III, 1200 V	Start-up delay t _{start-up}	200 ms60 min (200 ms)*
IC2/(IC36)	300 V	Switch-on delay ton	off, 50 ms60 min (100 ms)*
IC3/(IC46)	300 V	Response delay t _{off}	off, 50 ms60 min (100 ms)*
IC4/(IC56)	300 V	Operating time voltage tae	half a supply period
IC5/IC6	300 V	Operating time, frequency t_{ae}	≤ 40 ms
		Recovery time t _b	300 ms
Voltage test (routine test) acc. to IEC 60255-27/D		Digital innuts	
IC2/(IC36)	2.21 kV	Digital inputs	
IC3/(IC46)	2.21 kV	Monitoring of potential-free contacts or voltage inputs:	closed = low; 04 V; lin < -5 mA
IC4/(IC56)	2.21 kV		open = high; $> 6 \le 30 \text{ V}$
IC5/IC6	2.21 kV	D1	Feedback signal contact of alarm relay K1
Supply voltage		D2	Feedback signal contact of alarm relay K2
Nominal supply voltage $U_{\rm S}$	100240 V	RT1	remote trip
Tolerance U_s	±25 %	DG1/2, RTG	GND
Nominal frequency range U_s	DC, 50/60 Hz	max. length of the connecting cables of the digital inputs	
Power consumption at AC 230 V	< 3.5 W/ < 7.5 VA	(shielded cable recommended)	10 m
maximum	3.5 W/ < 7.3 VA	Displays, memory	
Illaxilliuili	3.3 W/9 VA		LC display, multi-functional, illuminated
Measuring circuit		Display	09.99 kV
VMD461		Display range, measured value History memory for the last 300 messages	per 1 data record measured values
System type	DC, 1AC, 3AC, 3NAC	Password	on/off/0999 (off*)
Nominal voltage U_0	νς, IAC, SAC, SNAC	I UJJYVIU	(ווי) פפפ (עווי) פפפ
L-N)	AC 50260 V	Interface	
L-IV) (L-L)		Interface/protocol	RS-485/BMS
(L-L) (DC+/DC-)	AC 87450 V DC 50450 V	Baud rate	9.6 kBit/s
		Cable length	01200 m
Measuring range Overload capacity	01.15 x U _n	Recommended cable (shielded, shield connected to PE on	
Overload capacity Response values	1.5 x U _n max for 5 s	Terminating resistor	120 Ω (0.25 W) connectable via DIP switch
Response values Operating uncertainty U_n	1150 %	Device address, BMS bus	190 (2)*
COPERATION OF PROPERTY III	≤ ±1 %		1,3 (2)
	1 0/		
Resolution of setting U_n	1 %		
Resolution of setting $U_{\rm n}$ Rated frequency	DC, 50/60 Hz		
Resolution of setting U_n Rated frequency Frequency range U_n	DC, 50/60 Hz DC, 4565 Hz		
Resolution of setting U_n Rated frequency	DC, 50/60 Hz		

Technical data (continued))

Switching elements Number of changeover contacts				2 x 1	(K1, K2)
Operating principle K1, K2		N/C opera	ation or N/		` ' '
Electrical endurance under rated operating co	onditions, numbe				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				DIN EN 6	0255-26
Operating temperature				-25	+55°C
Classification of climatic conditions acc. to	IEC 60721 (relate	d to tempe	rature and	relative hu	midity):
Stationary use (IEC 60721-3-3)					3K22
Transport (IEC 60721-3-2)					2K11
Long-term storage (IEC 60721-3-1)					1K22
Classification of mechanical conditions a	acc. to IEC 6072	1:			
Stationary use (IEC 60721-3-3)					3M11
Transport (IEC 60721-3-2)					2M4
Long-term storage (IEC 60721-3-1)					1M12

Connection	
Connection VMD461	
Connection	screw-type terminals
Connection properties:	
Rigid	0.2 4 mm ² (AWG 24-12)
Flexible with ferrule	0.22.5 mm ² (AWG 24-14)
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 24-14)
Flexible without ferrule	0.752.5 mm ² (AWG 19-14)
Flexible with ferrule	0.21.5 mm ² (AWG 24-16)
Stripping length	10 mm
Opening force	50 N
Test opening, diameter	2.1 mm
Other	
Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (DIN EN 60529)	IP30
Degree of protection, terminals (DIN EN 60529)	IP20
Enclosure material	polycarbonate
Flammability class	UL94 V-0

CD440 ()* Factory setting

DIN rail mounting acc. to Screw mounting CD440

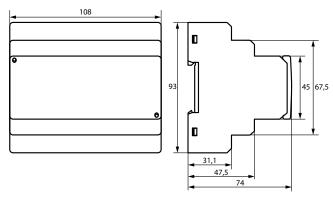
Screw mounting VMD461

Software version, display

Software version, measurement technology

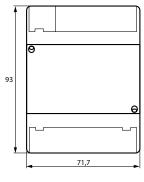
Dimension diagram (dimensions in mm)

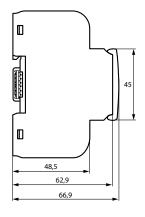
VMD461



CD440

Weight VMD461





IEC 60715

D570 V1.2x

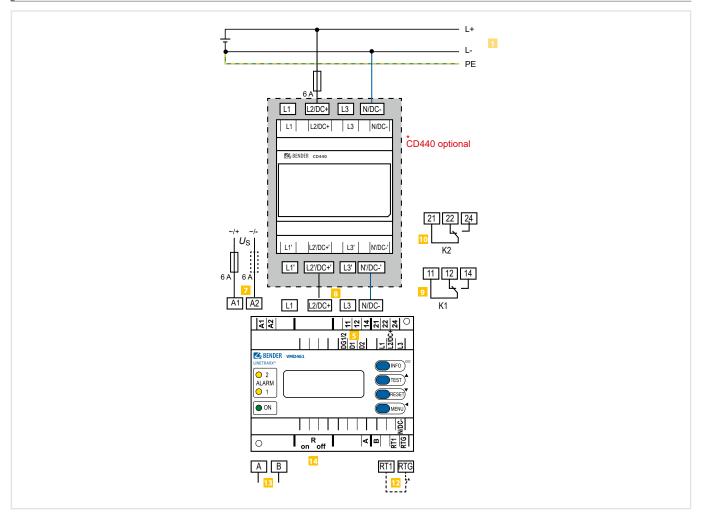
D256 V2.3x

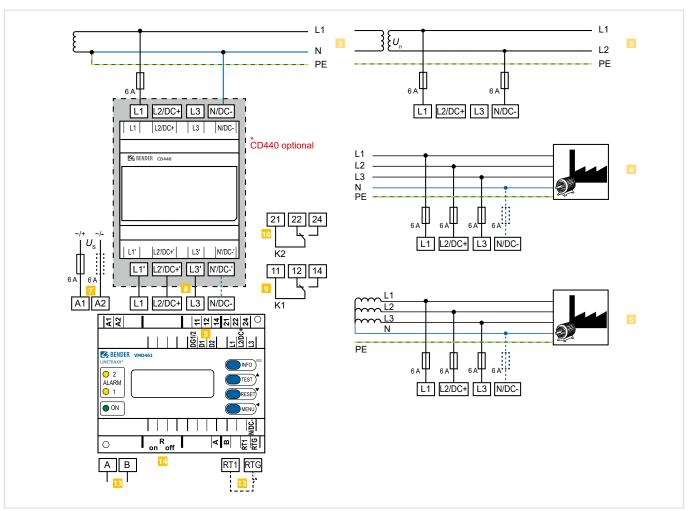
≤ 360 g

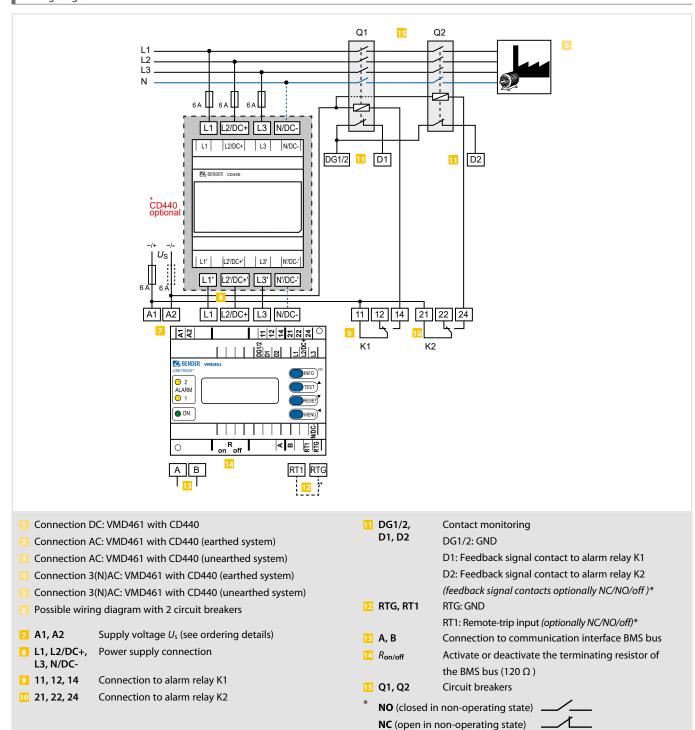
≤ 125 g

2 x M4

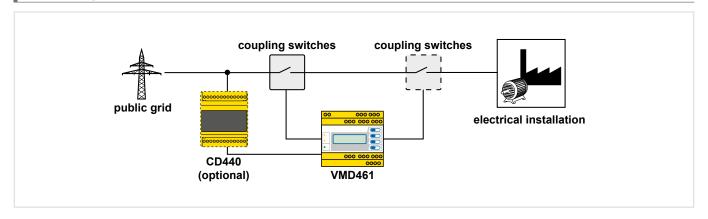
2 x M4 with mounting clip



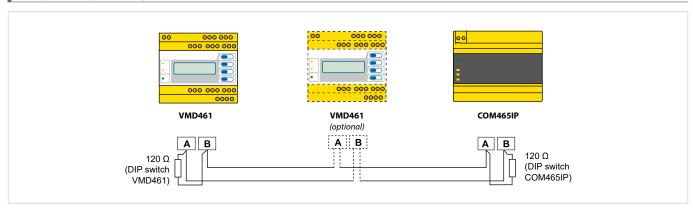




aus (switched off)



Example for a system design



LINETRAXX® CME420

Multi-functional current relay, AC, overcurrent/undercurrent/window discriminator function



Typical applications

- · Current consumption of motors, such as pumps, elevators, cranes
- Monitoring of lighting circuits, heating circuits, charging stations
- Monitoring of emergency lighting
- Monitoring of screw conveyors, e.g. in sewage plants
- Dust removal in wood working

Approvals







Device features

- Undercurrent and overcurrent monitoring in AC systems 0.1...16 A without measuring current transformer
- Indirect current monitoring with standard current transformers x/1 A, x/5 A, x/10 A
- Transformation ratio n allows adaptation to all standard current transformers x/1 A, x/5 A, x/10 A
- Different monitoring functions selectable I <, I > or I </I >
- Start-up delay, response delay, delay on release
- · Adjustable switching hysteresis
- r.m.s. value measurement (AC)
- Digital measured value display via multi-functional LC display
- LEDs: Power On, Alarm 1, Alarm 2
- · Measured value memory for operating value
- · Continuous self monitoring
- Internal test/reset button
- Two separate alarm relays (one changeover contact each)
- N/C or N/O operation and fault memory behaviour selectable
- · Password protection for device setting
- · Sealable transparent cover
- Two-module enclosure (36 mm)
- Push-wire terminal (two terminals per connection)
- · RoHS compliant

Standards

The LINETRAXX® CME420 series complies with the requirements of the device standards:

· IEC 60255-6.

Further information

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

Ordering information

Type	Supply voltage ¹⁾ U _s	Art.	No.
1,7,60		Screw-type terminal	Push-wire terminal
CME420-D-1	AC 1672 V, 42460 Hz / DC 9.694 V	B93060001	B73060001
CME420-D-2	AC 70300 V, 42460 Hz / DC 70300 V	B93060002	B73060002

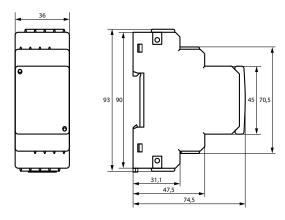
¹⁾ Absolute values

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

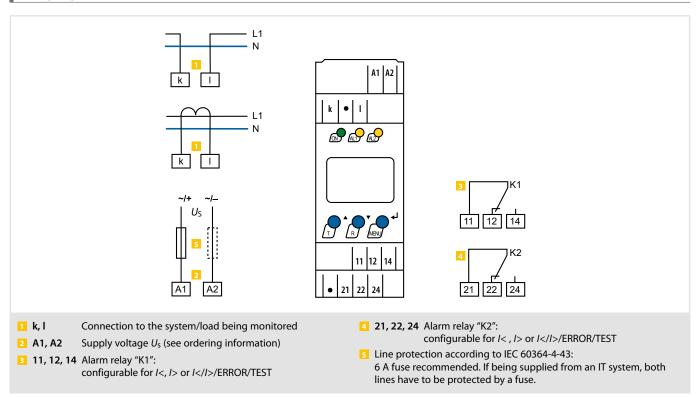
Insulation coordination acc. to IEC 60664-1/IEC 6066	4-3	Displays, r
Rated insulation voltage	250 V	Display
Rated impulse voltage/overvoltage category	4 kV/III	Measuring
pollution degree	3	Operating 6
Protective separation (reinforced insulation) between	(A1, A2) -(k, I) -(11, 12, 14) -(21, 22, 24)	Operating 6
Maximum nominal voltage of the system being monitored		Measured-
when the conductor being monitored is directly connected	:	Password
With protective separation	AC 230 V	Fault memo
Without protective separation	AC 400 V	Switching
Supply voltage		Number
CME420-D-1:		Operating
Supply voltage $U_{\rm S}$	AC 1672 V/DC 9.694 V	Electrical se
Frequency range U _s	42460 Hz	Contact d
CME420-D-2:		Utilization
Supply voltage $U_{\rm S}$	AC/DC 70300 V	Rated oper
Frequency range $U_{\rm S}$	42460 Hz	Rated oper Minimum o
Power consumption	≤ 4 VA	wiiiiIIIIuiII (
Measuring circuit		Environm
Measuring circuit Measuring range (r.m.s. value, screw-type terminal)	AC 0.0516 A	EMC
Measuring range (r.m.s. value, screw-type terminal)	AC 0.0510 A	Operating 1
Overload capability < 1 s	40 A	Classificat
Rated frequency f_0	422000 Hz	Stationary
Burden	n.A., due to internal current transformers	Transporta
	nati, due to internal current durisionners	Storage (IE
Response values		Classifica
Undercurrent		Stationary
Undercurrent $I < (alarm I_2), direct connection:$		Transporta
Push-wire terminal	AC 0.112 A (1 A)*	Storage (IE
Screw-type terminal	AC 0.116 A (1 A)*	Connectio
or external current transformer		Connection
Undercurrent I < (prewarning I ₁)	100200 % (150 %)*	
Overcurrent		Connection
Overcurrent $l > (alarm I_2)$, direct connection:		Connection
Push-wire terminal	AC 0.112 A (1 A)*	rigid
Screw-type terminal	AC 0.116 A (1 A)*	flexible
or external current transformer		Two condu
Overcurrent /> (prewarning /1)	10100 % (50 %)*	rigid/flexil
Others		Stripping l
External current transformer	x/1 A, x/5 A, x/10 A	Tightening
Transformation ratio factor n	12000 (1)*	Connection
Relative percentage error at 50/60 Hz	±3 %, ±2 digits	Connection
Relative percentage error in the range of 422000 Hz	±5 %, ±2 digits	rigid
Hysteresis	1040 % (15 %)*	flexible with
Specified time		with
Starting delay	0300 s (0.5 s)*	Stripping I
Response delay t _{on1}	0300 s (1 s)*	Opening fo
Response delay t _{on2}	0300 s (0 s)*	Test openi
Delay on release t _{off}	0300 s (1 s)*	O+h
Operating time tae	≤ 70 ms	Other
Response time t _{an}	$t_{\rm an} = t_{\rm ae} + t_{\rm on1/2}$	Operating
Recovery time t _b	≤ 300 ms	Position

Displays, memory	·			:		
Display Massuring range measured value v transformation r				ulti-functional, not illuminated AC 0.0116 A x n		
	uring range measured value x transformation ratio factor		±3 %, ±2 digit			
Operating error at 50/60 Hz Operating error in the range of 422000 Hz				±5 %, =		
Measured-value memory (HiS) for the first alarm val			data record			
Measured-value memory (mis) for the first alarm val Password	ue					
Fault memory (M) alarm relay			Off/0999 (Off)* on/off (on)*			
rault memory (m) alami relay				UII/	UII (UII)	
Switching elements						
			igeover con			
		V/O operat	ion n.o. (N/			
Electrical service life under rated operating condition	ıs		10,000 swi	itching 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 current	5 A	3 A	1 A	0.2 A	0.1	
Minimum contact load			1 m/	A at AC/D	C ≥ 10 \	
Environment/EMC						
EMC				IE	C 6132	
Operating temperature				-25	.+55°	
Classification of climatic conditions acc. to IEC 607	'21 (relate	d to tempe	rature and r	elative hu	midity):	
Stationary use (IEC 60721-3-3)					3K2	
Transportation (IEC 60721-3-2)					2K1	
Storage (IEC 60721-3-1)					1K2	
	IEC 6072 ⁻	1				
Classification of mechanical conditions acc. to					3M1	
					21/1	
Stationary use (IEC 60721-3-3)						
Stationary use (IEC 60721-3-3) Transportation (IEC 60721-3-2)					2M	
Classification of mechanical conditions acc. to Stationary use (IEC 60721-3-3) Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1)					2M- 1M1:	
Stationary use (IEC 60721-3-3) Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection	ccra	pw-tyna ta	rminal or n	ush-wira	2M 1M1	
Stationary use (IEC 60721-3-3) Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type	scre	ew-type te	rminal or p		2M 1M1 termina	
Stationary use (IEC 60721-3-3) Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type Connection	scro	ew-type te		ush-wire screw te	2M 1M1 termina	
Stationary use (IEC 60721-3-3) Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type Connection Connection properties	SCF	ew-type te		screw te	2M 1M1 termina	
Stationary use (IEC 60721-3-3) Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type Connection Connection properties rigid	scre	ew-type te	0.24 n	screw te	2M 1M1 termina rminal	
Stationary use (IEC 60721-3-3) Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type Connection Connection properties rigid flexible	SCFG	ew-type te		screw te	2M 1M1 termina rminal	
Stationary use (IEC 60721-3-3) Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type Connection Connection properties rigid flexible Two conductors with the same cross section	scre	ew-type te	0.24 n 0.22.5 r	screw te nm² (AW¢ mm² (AW¢	2M 1M1 terminal rminal 5 24- 12 G 24-14	
Stationary use (IEC 60721-3-3) Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type Connection Connection properties rigid flexible Two conductors with the same cross section rigid/flexible	SCro	ew-type te	0.24 n	screw te nm² (AW¢ mm² (AW¢	2M 1M1 terminal 5 24- 12 G 24-14	
Stationary use (IEC 60721-3-3) Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type Connection properties rigid flexible Two conductors with the same cross section rigid/flexible Stripping length	scro	ew-type te	0.24 n 0.22.5 r	nm² (AWC nm² (AWC nm² (AWC	2M 1M1 terminal 5 24- 12 G 24-14 G 24-16 8 mr	
Stationary use (IEC 60721-3-3) Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type Connection Connection properties rigid flexible Two conductors with the same cross section rigid/flexible Stripping length Tightening torque, terminal screws	SCre	ew-type te	0.24 m 0.22.5 r 0.21.5 r	nm² (AW0 mm² (AW0 mm² (AW0 0.5	2M 1M1 terminal 5 24- 12 G 24-14 G 24-16 8 mr .0.6 Nr	
Stationary use (IEC 60721-3-3) Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type Connection Connection properties rigid flexible Two conductors with the same cross section rigid/flexible Stripping length Tightening torque, terminal screws Connection	SCT	ew-type te	0.24 m 0.22.5 r 0.21.5 r	nm² (AWC nm² (AWC nm² (AWC	2M 1M1 terminal 5 24- 12 G 24-14 G 24-16 8 mr .0.6 Nr	
Stationary use (IEC 60721-3-3) Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type Connection Connection properties rigid flexible Two conductors with the same cross section rigid/flexible Stripping length Tightening torque, terminal screws Connection Connection Connection	SCri	ew-type te	0.24 m 0.22.5 r 0.21.5 r	nm² (AWC nm² (AWC nm² (AWC 0.5	2M 1M1 terminal 5 24- 12 G 24-14 G 24-16 8 mr .0.6 Nr	
Stationary use (IEC 60721-3-3) Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type Connection Properties rigid flexible Two conductors with the same cross section rigid/flexible Stripping length Tightening torque, terminal screws Connection Connection Connection Connection Connection	SCri	ew-type te	0.24 m 0.22.5 r 0.21.5 r	nm² (AWC nm² (AWC nm² (AWC 0.5	2M 1M1 terminal 5 24- 12 G 24-14 G 24-16 8 mr .0.6 Nr	
Stationary use (IEC 60721-3-3) Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type Connection Connection properties rigid flexible Two conductors with the same cross section rigid/flexible Stripping length Tightening torque, terminal screws Connection Connection Connection Connection Connection properties rigid flexible	SCri		0.24 n 0.22.5 r 0.21.5 r push	nm² (AWC nm² (AWC nm² (AWC 0.5 n-wire te	2M 1M1 1m1 1m2 5 24- 12 6 24- 14 8 mr .0.6 Nr 1mmal	
Stationary use (IEC 60721-3-3) Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type Connection Connection properties rigid flexible Two conductors with the same cross section rigid/flexible Stripping length Tightening torque, terminal screws Connection Connection Connection properties rigid flexible without ferrules	SCri		0.24 n 0.22.5 r 0.21.5 r push 0.22.5 r	nm² (AWC nm² (AWC nm² (AWC 0.5 n-wire te nm² (AWC	2M 1M1 1m1 1m1 5 24- 12 6 24- 14 8 mr . 0.6 Nr rminal	
Stationary use (IEC 60721-3-3) Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type Connection Properties rigid flexible Two conductors with the same cross section rigid/flexible Stripping length Tightening torque, terminal screws Connection Connection Connection properties rigid flexible without ferrules with ferrules	SCI		0.24 n 0.22.5 r 0.21.5 r push	nm² (AWC nm² (AWC nm² (AWC 0.5 n-wire te nm² (AWC	2MM 1M1 teterminal 5 24- 12 6 24-14 6 24-16 8 mr .0.6 Nr rminal G 24-14 G 24-14	
Stationary use (IEC 60721-3-3) Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type Connection properties rigid flexible Two conductors with the same cross section rigid/flexible Stripping length Tightening torque, terminal screws Connection Connection Connection properties rigid flexible Stripping length Tightening torque, terminal screws Connection Connection properties rigid flexible without ferrules with ferrules Stripping length	SCT		0.24 n 0.22.5 r 0.21.5 r push 0.22.5 r	nm² (AWC nm² (AWC nm² (AWC 0.5 n-wire te nm² (AWC	2MM 1M1 1M1 5 24- 12 6 24-14 8 mr .0.6 Nr rminal G 24-14 G 24-16 G 24-10 T 10 mr	
Stationary use (IEC 60721-3-3) Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type Connection Connection properties rigid flexible Two conductors with the same cross section rigid/flexible Stripping length Tightening torque, terminal screws Connection Connection properties rigid flexible without ferrules with ferrules Stripping length Opening force	SCT		0.24 n 0.22.5 r 0.21.5 r push 0.22.5 r	nm² (AWC nm² (AWC nm² (AWC 0.5 n-wire te nm² (AWC	2MM 1M1 1M1 5 24- 12 6 24-14 6 24-16 8 mr .0.6 Nr rrminal G 24-16 10 mr 50 I	
Stationary use (IEC 60721-3-3) Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type Connection Connection properties rigid flexible Two conductors with the same cross section rigid/flexible Stripping length Tightening torque, terminal screws Connection Connection properties rigid flexible without ferrules with ferrules Stripping length Opening force	SCI		0.24 n 0.22.5 r 0.21.5 r push 0.22.5 r	nm² (AWC nm² (AWC nm² (AWC 0.5 n-wire te nm² (AWC	2M 1M1 1m1 1m1 5 24- 12 6 24- 14 8 mr . 0.6 Nr rminal	
Stationary use (IEC 60721-3-3) Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type Connection Connection properties rigid flexible Two conductors with the same cross section rigid/flexible Stripping length Tightening torque, terminal screws Connection Connection Connection properties rigid flexible without ferrules with ferrules with ferrules Stripping length Opening length Opening force Test opening, diameter	SCF		0.24 n 0.22.5 r 0.21.5 r push 0.22.5 r	nm² (AWC nm² (AWC nm² (AWC 0.5 n-wire te nm² (AWC	2MM 1M1 1M1 5 24- 12 6 24-14 6 24-16 8 mr .0.6 Nr rrminal G 24-16 10 mr 50 I	
Stationary use (IEC 60721-3-3) Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection Connection (Connection (Conne	SCFG		0.24n 0.22.5r 0.21.5r push 0.22.5r 0.752.5r	nm² (AWC nm² (AWC nm² (AWC 0.5 n-wire te nm² (AWC nm² (AWC nm² (AWC nm² (AWC	2MM 1M1 1M1 5 24- 12 6 24-14 8 mr .0.6 Nr rminal 6 G 24-14 10 mr 50 I 2.1 mr	
Stationary use (IEC 60721-3-3) Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type Connection Connection properties rigid flexible Two conductors with the same cross section rigid/flexible Stripping length Tightening torque, terminal screws Connection Connection properties rigid flexible stripping length Tightening torque, terminal screws Connection Connection Connection properties rigid flexible without ferrules with ferrules Stripping length Opening force Test opening, diameter Other Operating mode Position			0.24n 0.22.5r 0.21.5r push 0.22.5r 0.752.5r	nm² (AWC nm² (AWC nm² (AWC 0.5 n-wire te nm² (AWC nm² (AWC nm² (AWC nm² (AWC	2MM 1M1 1M1 5 24- 12 6 24-14 8 mr .0.6 Nr rminal 10 mr 50 1 2.1 mr	
Stationary use (IEC 60721-3-3) Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type Connection Connection properties rigid flexible Two conductors with the same cross section rigid/flexible Stripping length Tightening torque, terminal screws Connection Connection properties rigid flexible without ferrules with ferrules with ferrules Stripping length Opening force Test opening, diameter Other Operating mode Position Degree of protection DIN EN 60529, internal compon			0.24n 0.22.5r 0.21.5r push 0.22.5r 0.752.5r	nm² (AWC nm² (AWC nm² (AWC 0.5 n-wire te nm² (AWC nm² (AWC nm² (AWC nm² (AWC	2MM 1M1 1M1 5 24- 12 6 24-14 8 mr .0.6 Nr rminal 6 24-14 10 mr 50 1 2.1 mr	
Stationary use (IEC 60721-3-3) Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection Connection Type Connection Connection properties rigid flexible Two conductors with the same cross section rigid/flexible Stripping length Tightening torque, terminal screws Connection Connection properties rigid flexible without ferrules with ferrules with ferrules Stripping length Opening force Test opening, diameter Other Operating mode Position Degree of protection DIN EN 60529, internal compon Degree of protection DIN EN 60529, terminals			0.24n 0.22.5r 0.21.5r push 0.22.5r 0.752.5r	screw te nm² (AWC nm² (AWC nm² (AWC nm² (AWC nm² (AWC 0.5 n-wire te nm² (AWC nm² (AWC)	2MM 1M1 1M1 1M1 1M1 5 24- 12 6 24-16 8 mr 1.0.6 Nr 1minal 6 24-16 6 24-16 10 mr 50 12.1 mr peratio positio IP3 IP2	
Stationary use (IEC 60721-3-3) Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type Connection Connection properties rigid flexible Two conductors with the same cross section rigid/flexible Stripping length Tightening torque, terminal screws Connection Connection properties rigid flexible without ferrules with ferrules Stripping length Opening force Test opening, diameter Other Operating mode Position Degree of protection DIN EN 60529, internal compon Degree of protection DIN EN 60529, terminals Enclosure material			0.24n 0.22.5r 0.21.5r push 0.22.5r 0.752.5r	screw te nm² (AWC nm² (AWC)	2MM 1M1 1M1 1M1 1M1 5 24- 12 6 24-16 8 mm 2.0.6 Nr 1mminal 6 24-16 10 mr 50 1 2.1 mr peratio positio 1P3 1P2 1P3 1P2 1P3 1P2 1P3 1P2	
Stationary use (IEC 60721-3-3) Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type Connection Topoerties rigid flexible Two conductors with the same cross section rigid/flexible Stripping length Tightening torque, terminal screws Connection Connection properties rigid flexible without ferrules with ferrules Stripping length Opening force Test opening, diameter Other Operating mode Position Degree of protection DIN EN 60529, internal compon Degree of protection DIN EN 60529, terminals Enclosure material Flammability class			0.24n 0.22.5r 0.21.5r push 0.22.5r 0.752.5r	screw te nm² (AWC nm²	2MM 1M1 1M1 1M1 1M1 5 24- 12 6 24-14 8 mr 1.0.6 Nr 1minal 6 24-16 G 24-17 10 mr 50 I 2.1 mr peratio positio IP3 IP2 IP3 IP4	
Stationary use (IEC 60721-3-3) Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type Connection Connection properties rigid flexible Two conductors with the same cross section rigid/flexible Stripping length Tightening torque, terminal screws Connection Connection properties rigid flexible without ferrules with ferrules Stripping length Opening force Test opening, diameter Other Operating mode Position Degree of protection DIN EN 60529, internal compon Degree of protection DIN EN 60529, terminals Enclosure material Flammability class DIN rail mounting acc. to			0.24n 0.22.5r 0.21.5r push 0.22.5r 0.752.5r 0.21.5r	screw te nm² (AWC nm²	2MM 1M1 1M1 1M1 1M1 5 24- 12 6 24-16 8 mm 2.0.6 Nr 1minal 6 24-16 10 mr 50 l 2.1 mr 1P3 1P2 1P3 1P4 1P4 1P4 1P5 1P5 1P5 1P6 1P7	
Stationary use (IEC 60721-3-3) Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection Connection type Connection Connection properties rigid flexible Stripping length Tightening torque, terminal screws Connection Connection properties rigid flexible Stripping length Tightening torque, terminal screws Connection Connection Connection properties rigid flexible without ferrules with ferrules Stripping length Opening force Test opening, diameter Other Operating mode Position Degree of protection DIN EN 60529, internal compon Degree of protection DIN EN 60529, terminals Enclosure material Flammability class DIN rail mounting acc. to Screw mounting			0.24n 0.22.5r 0.21.5r push 0.22.5r 0.752.5r 0.21.5r	screw te nm² (AWC nm²	2MM 1M1 1M1 1M1 1M1 1M1 5 24- 12 6 24-14 8 mr 1.0.6 Nr 1minal 6 24-16 10 mr 50 I 2.1 mr 1P3 IP2 1rbonat JL94 V- 1CC 6071 Itting cli	
Stationary use (IEC 60721-3-3) Transportation (IEC 60721-3-2) Storage (IEC 60721-3-1) Connection Connection type Connection Connection properties rigid flexible Two conductors with the same cross section rigid/flexible Stripping length Tightening torque, terminal screws Connection Connection properties rigid flexible without ferrules with ferrules Stripping length Opening force Test opening, diameter Other Operating mode Position Degree of protection DIN EN 60529, internal compon Degree of protection DIN EN 60529, terminals Enclosure material Flammability class DIN rail mounting acc. to			0.24n 0.22.5r 0.21.5r push 0.22.5r 0.752.5r 0.21.5r	screw te nm² (AWC nm²	2MM 1M1 1M1 1M1 1M1 5 24- 12 6 24-16 8 mm 2.0.6 Nr 1minal 6 24-16 10 mr 50 l 2.1 mr 1P3 1P2 1P3 1P4 1P4 1P4 1P5 1P5 1P5 1P6 1P7	

()* = factory setting



Wiring diagram



LINETRAXX® CMD420/CMD421

Current monitoring relays for monitoring 3AC currents for overcurrent and undercurrent using measuring current transformers or current monitoring with window discriminator function



Typical applications

- Current consumption of motors, such as pumps, elevators, cranes
- Monitoring of lighting circuits, heating circuits, charging stations
- Monitoring of emergency lighting
- Monitoring of screw conveyors, e.g. in sewage plants
- Dust removal in wood working

Approvals







Device features

- Undercurrent and overcurrent monitoring in AC systems, current monitoring with window discriminator function
- Current monitoring using standard current transformers: x/ 1A (CMD420), x/ 5A (CMD421)
- Two separately adjustable alarm relays with one changeover contact each (K1, K2)
- Fault memory behaviour for the alarm relays selectable
- N/C or N/O operation selectable for K1, K2
- Digital measured value display via multi-functional LC display
- LEDs: Power On (ON), Alarm 1 (AL1) and Alarm 2 (AL2)
- Start-up delay, response delay and delay on release
- · Adjustable switching hysteresis
- · r.m.s. value measurement AC
- · History memory for the operating value
- Cyclical self test
- Test and reset button
- Password protection to prevent unauthorised changes being made to device settings
- Sealable transparent cover
- · Available with screw-type or push-wire terminals

Further information

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

Ordering information

Туре	Suitable for current	Response value	Supply voltage ¹⁾ <i>U</i> s	Art.	No.
Турс	transformer types	nesponse value	Supply voltage 05	Screw-type terminal	Push-wire terminal
CMD420-D-1	/1 A	0.1 1.4	AC 1672 V, 15460 Hz / DC 9.6 V94 V	B93060006	B73060006
CMD420-D-2	x/1A	0.11 A x n	AC/DC 70300 V, 15460 Hz	B93060007	B73060007
CMD421-D-1	/FA	05 54	AC 1672 V, 15460 Hz / DC 9.6 V94 V	B93060008	B73060008
CMD421-D-2	x/5A	0.55 A x n	AC/DC 70300 V, 15460 Hz	B93060009	B73060009

¹⁾ Absolute values

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

Insulation coordination acc. to IEC 60664-1/IEC 6	00664-3	Displays, memory	
CMD420		Display	LC display, multifunctional, not illuminate
Rated insulation voltage	AC 250 V	Display range, measured value (r.m.s. value) x transformation ratio n CMD420: AC 01	
Rated impulse voltage/pollution degree	6 kV/3		CMD421: AC 05 A x
Protective separation (reinforced insulation) between	(A1, A2) -(k, I) -(11, 12, 14) -(21, 22, 24)	Operating uncertainty in the range of 424	
Protective separation (reinforced insulation) between	(k1, l1, k2, l2, k3, l3) -(11, 12, 14)	Measured-value memory (HiS) for the first al	arm value data record measured value
Voltage test acc. to IEC 61010-1	3.536 kV	Password	on/off/0999 (OFF)
		Fault memory (M) alarm relay	on/off/con (on)
CMD421	AC 250 V	Control to an alternative	
Rated insulation voltage	AC 250 V	Switching elements	
Rated impulse voltage/pollution degree	4 kV/3	Number	2 x 1 changeover contacts (K1, K2
Basic insulation between:	(k1, l1, k2, l2, k3, l3) -(A1, A2), (21, 22, 24)	Operating principle	N/C operation/N/O operation
Basic insulation between:	(11, 12, 14) -(21, 22, 24)		error Err, overcurrent prewarning $>$ 11, test button tES)
Voltage test acc. to IEC 61010-1	2.21 kV		device error Err, overcurrent alarm $>$ I2, test button tES)
Supply voltage		Electrical endurance, number of cycles	10,00
		Contact data acc. to IEC 60947-5-1	
CMD420-D-1, CMD421-D-1:	ACAC TOWNS OF THE	Utilisation category	AC-13 AC-14 DC-12 DC-12 DC-1
Supply voltage U _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 ≥ 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 dimatic conditions acc. to	IEC 60721 (related to temperature and relative humidity):
Nominal measuring range (r.m.s. value) $n = 1$	AC 01 A	Stationary use (IEC 60721-3-3)	3K2
Overload capability, continuous	2 A	Transport (IEC 60721-3-2)	
Overload capability < 5 s	5 A	Storage (IEC 60721-3-1)	
Load per measuring input	50 mΩ		
Rated frequency f_n	422000 Hz	Classification of mechanical conditions a	
		Stationary use (IEC 60721-3-3)	3M1
Response values CMD420		Transport (IEC 60721-3-2)	2M
Undercurrent Lo $I <$ (Alarm 2) n = 1	AC 0.11 A (0.3 A)*	Storage (IEC 60721-3-1)	1M1.
Undercurrent Lo $I <$ (Alarm 1) n = 1	100200 % (150 %)*	Connection	
Take a maxi	imum nominal current of 1 A into consideration!		
Overcurrent Hi $I >$ (Alarm 2) $n = 1$	AC 0.11 A (0.3 A)* (Hi)*	Connection type	screw-type terminal or push-wire termina
Overcurrent Hi /> (Alarm 1) n = 1	50100 % (50 %)* (Hi)*	Connection	screw terminal
Window $I_n I > \text{(Alarm 2) } n = 1$	AC 0.11 A (0.3 A)*	Connection properties	
Window $I_n I < (Alarm 1) n = 1$	50100 % (50 %)*	rigid	0.24 mm² (AWG 24- 12
External current transformer	x/1 A	flexible	0.22.5 mm ² (AWG 24-14
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 mm ² (AWG 24-16
Hysteresis	340% (15 %)*	Stripping length	8 mr
		Tightening torque, terminal screws	0.50.6 Nr
Measuring circuit CMD421		Connection	push-wire terminal
Nominal measuring range (r.m.s. value)	AC 05 A	Connection properties	push whe terminal
Overload capability, continuous	7.5 A	rigid	0.22.5 mm ² (AWG 24-14
Overload capability < 5 s	with screw-type terminal connection: 20 A	flexible	0.22.5 IIIII (AWG 24-14
	with push-wire terminals: 12 A	without ferrules	0.752.5 mm² (AWG 19-14
Load per measuring input	3 mΩ	with ferrules	•
Rated frequency fn	42460 Hz		0.21.5 mm² (AWG 24-16
Despense values CMD424		Stripping length	10 mr
Response values CMD421		Opening force	50 3.1 mg
Undercurrent Lo / < (Alarm 2) n = 1	AC 0.55 A (1.5 A)*	Test opening, diameter	2.1 mr
Undercurrent Lo / < (Alarm 1) n = 1	100200 % (150 %)*	Other	
	imum nominal current of 5 A into consideration!	Operating mode	continuous operatio
Overcurrent Hi / > (Alarm 2) n = 1	AC 0.55 A (1.5 A)* (Hi)*	Mounting	any positio
Overcurrent Hi $I >$ (Alarm 1) n = 1	50100 % (50 %)* (Hi)*	Degree of protection, internal components (II	· · · · · · · · · · · · · · · · · · ·
Window $I_n I > (Alarm 2) n = 1$	AC 0.55 A (1.5 A)*	Degree of protection, internal components (in	EC 00329) IP3
Window $I_n I <$ (Alarm 1) $n = 1$	50100 % (50 %)*	Enclosure material	polycarbonat
External current transformer	x/5 A	Flammability class	polycarbonat UL94 V-
Transformation ratio n	12000 (1)*		IEC 6071
Relative uncertainty in the range of 42460 Hz	±5 %, ±2 digits	DIN rail mounting acc. to	
Hysteresis	340% (15 %)*	Screw mounting	2 x M4 with mounting cli
Time was an an		Documentation number	D0010
Time response		Weight	≤ 150
Start-up delay t	0300 s (0.5 s)*	()* = factory setting	
Response delay ton1	0300 s (1 s)*	c, accordance	
Response delay ton2	0300 s (0 s)*		
Delay on release $t_{ m off}$	0300 s (1 s)*		
Resolution of setting t , $t_{on1/2}$, t_{off} (010 s)	0.1 s		
Resolution of setting t , $t_{on1/2}$, t_{off} (1099 s)	1 s		
Resolution of setting t , $t_{on1/2}$, t_{off} (100300 s)	10 s		
Operating time tae	≤ 130 ms		
Response time t_{an}	$t_{\rm an} = t_{\rm ae} + t_{\rm on1/2}$		
Device release time tre	< 135 ms		

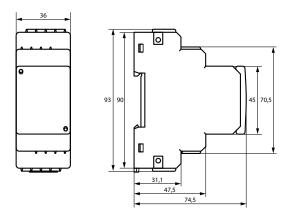
≤ 135 ms

 $t_{\text{off}} = t_{\text{re}} + t_{\text{off}}$ ≤ 300 ms

Device release time $t_{\rm re}$

Release time $t_{\rm off}$

Recovery time $t_{\rm b}$



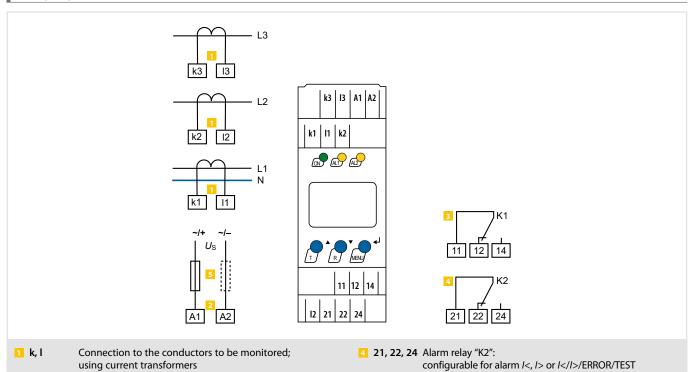
Supply voltage $U_{\rm S}$ (see ordering information)

configurable for I <, I > or I < /I > /ERROR/TEST

Wiring diagram

2 A1, A2

11, 12, 14 Alarm relay "K1":



Line protection according to IEC 60364-4-43:

lines have to be protected by a fuse.

6 A fuse recommended. If being supplied from an IT system, both

LINETRAXX® CMS460-D

Multi-channel AC, pulsed DC sensitive load current evaluator for AC systems (TN, TT and IT systems)



Typical applications

- · Monitoring of loads and installations for load currents in the frequency range of 42...2000 Hz (measuring current transformers CTAC..., WR...S(P), WS..., WF...)
- · Monitoring of currents regarded as fire hazards in flammable atmospheres
- EMC monitoring of TN systems for "stray currents" and additional N-PE connections
- Monitoring of N conductors for overload caused by harmonics
- · Monitoring of PE and equipotential bonding conductors to ensure they are free of current

Device features

- Optional AC or pulsed DC sensitive measurements for each channel
- · rms value measurement
- 12 measuring channels per individual device for load current
- Up to 90 evaluators CMS460-D in the system (1080 measuring channels)
- Fast parallel scanning for all channels
- Response ranges 100 mA...125 A (42...2000 Hz)
- · Preset function
- · Adjustable time delays
- · Adjustable frequency behaviour (e.g. fire and plant protection)
- History memory with date and time stamp for 300 data records/channel
- Data logger for 300 data records/channel
- · Analysis of the harmonics, THD
- Two alarm relays with one changeover contact each
- N/O or N/C operation and fault memory selectable
- · Connection external test and reset button
- Backlit graphical display (7-segment display) and alarm LEDs
- · Data exchange via BMS bus
- · Password protection for device setting
- · RoHS compliant

Further information

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

Approvals





Ordering information

Туре	Supply voltage ¹⁾ U s	Art. No.
CMS460-D-1	AC 1672 V, 42460 Hz / DC 1694 V	B94053017
CMS460-D-2	AC 70276 V, 42460 Hz / DC 70276 V	B94053018

Accessories

Description	Art. No.
XM460 mounting frame, 144 x 82 mm	B990995

Suitable system components

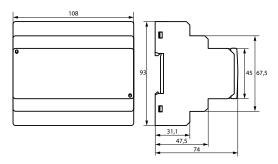
Description	Version	Type of construction	Туре	Art. No.	Page	
		circular	CTAC	B981100	348	
Management to a second	pulsed DC sensitive	rectangular	WRS(P)	B9117	355	
Measuring current transformers		puised DC sensitive	split-core	WS	B980806	362
			flexible WF	WF	B780802	366
Condition Marie	with integrated gateway: Bender system/Ethernet	-	COM465IP	B950610	394	
Condition Monitor		-	CP9I	B9506103	408	
RS-485 repeater	_	-	DI-1DL	B95012047	389	

¹⁾ Absolute values

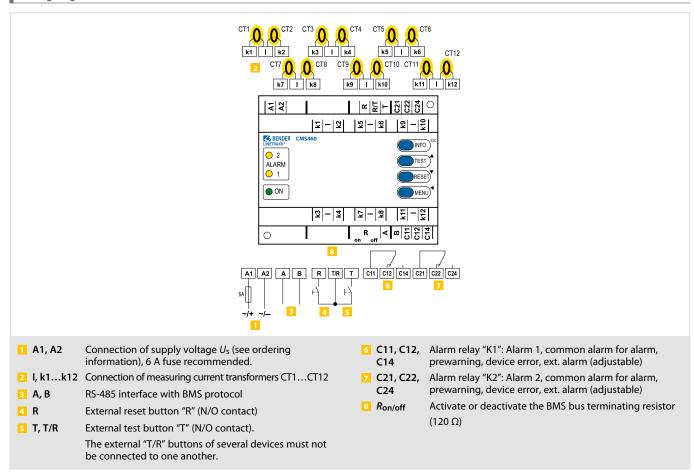
Insulation coordination acc. to IEC 60664-1/IEC 60664-3 for the versions:	Displays, memory
a) CMS460-D1	Display range, measuring value < 10 mA125 A (CT type A)
Supply voltage U_s DC 2475V/AC 2460 V (AC/DC \pm 20 %)	< 10 mA30 A (measuring current transformer Flex)
Supply voltage frequency DC, 50/60 Hz	Operating uncertainty $\pm 10\%$
Rated insulation voltage 100 V	LEDs ON/ALARN
Overvoltage category/pollution degree III/3	LC display backlit graphical display
Rated impulse voltage 2.5 kV	History memory 300 data records
Protective separation (reinforced insulation) between (A1, A2) - (k1, Ik12, R, T/R, T, A, B)	Data logger 300 data records per measuring channe
Voltage test acc. to IEC 61010-1 1.344 kV	Password off/0999 (off)*
•	Language D, GB, F (GB)*
Rated insulation voltage 250 V	Fault memory alarm relay on/off (off)
Overvoltage category/pollution degree III/3	Tudit memory damin relay
Rated impulse voltage 4 kV	Inputs/outputs
Basic insulation between: (A1, A2), (k1, Ik12, R, T/R, T, A, B) -	Test/reset button internal/externa
(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)	caste length for external test reset suctors
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	Baud rate 9.6 kbit/
Overvoltage category/pollution degree III/3	Cable length 01200 m
Rated impulse voltage 6 kV	
Protective separation (reinforced insulation) between (C11, C12, C14) - (C21, C22, C24) -	Recommended cable (shielded, shield connected to PE on one side)
	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	
Supply voltage U_S AC/DC 100240 V (-20+15 %)	Cable lengths for CTAC, WR, WS, WF series measuring current transformers
Supply voltage frequency DC, 50/60 Hz	Single wire $\geq 0.75 \text{ mm}^2$ 01 m
	Single wire, twisted $\geq 0.75 \text{ mm}^2$ 010 m
•	Shielded cable $\geq 0.5 \text{ mm}^2$ 040 m
Overvoltage category/pollution degree III/3	Recommended cable (shielded, shield connected to terminal I at one end, must not be earthed)
Rated impulse voltage 6 kV	J-Y(St)Y min. 2x0.8
Protective separation (reinforced insulation) between (A1, A2) - (k1, Ik12, R, T/R, T, A, B),	7 1(30)1 mm. 2x0.0
(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)	•
Voltage test acc. to IEC 61010-1 3.536 kV	Contact data acc. to IEC 60947-5-1
Rated insulation voltage 250 V	Utilisation category AC-13 AC-14 DC-12 DC-12 DC-12
Overvoltage category/pollution degree III/3	Rated operational voltage 230 V 230 V 24 V 110 V 220 V
Rated impulse voltage 4 kV	Rated operational current (common alarm relay) 5 A 3 A 1 A 0.2 A 0.1 A
···· J···· J·	Rated operational current (alarm relay) 2 A 0.5 A 5 A 0.2 A 0.1 A
Basic insulation between: k1, 1k12, R, T/R, T, A, B) - (C11, C12, C14), (C21, C22, C24)	Minimum contact rating 1 mA at AC/DC \geq 10 V
Basic insulation between: (11, 14) - (21, 24) - (31, 34) - (41, 44) - (51, 54) - (61, 64)	
Voltage test acc. to IEC 61010-1 2.21 kV	Environment/EMC
Measuring circuit	EMC IEC 61326-1
•	Operating temperature -25 °C
External measuring current transformers CTAC, WR, WS, WF series (type A)	
Load 1Ω	Classification of climatic conditions acc. to IEC 60721 (related to temperature and relative humidity):
Rated insulation voltage (measuring current transformer) 800 V	Stationary use (IEC 60721-3-3) 3K22
Operating characteristics acc. to IEC 60755 type A	Transport (IEC 60721-3-2) 2K11
depending on measuring current transformer series (type A)*	Long-term storage (IEC 60721-3-1) 1K22
Rated frequency 422000 Hz (type A)	Classification of mechanical conditions acc. to IEC 60721
Cut-off frequency none, IEC, 50 Hz, 60 Hz (none)*	Stationary use (IEC 60721-3-3) 3M11
Measuring range 100 mA125 A (measuring current transformer type A)	Transport (IEC 60721-3-2) 2M4
100 mA30 A (measuring current transformer Flex)	• • • • • • • • • • • • • • • • • • • •
Crest factor up to 10 A = 4, up to 125 A = 2	Long-term storage (IEC 60721-3-1) 1M12
Rated operating current In2 (alarm) 100 mA125 A (16 A overcurrent)*	Connection
	Connection screw-type terminals
Rated operating current In1 (prewarning) 10100 % x In2*	71
Preset for alarm offset: 020 A (1 A)* and I x factor 199 (3)*	Connection properties:
Relative uncertainty +1020 %	Rigid/flexible/conductor sizes 0.24/0.22.5 mm ² /AWG 24-12
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	Tightening torque 0.50.6 Nm
Time response	OAL
Start-up delay t (start-up) per device $099 \text{ s } (0 \text{ ms})^*$	Other
Response delay t_{0n} per channel 0999 s (200 ms)*	Operating mode continuous operation
Delay on release $t_{\rm off}$ per channel 0999 s (200 ms)*	Mounting display-oriented
Operating time t_{ae} at $I_n = 1 \times I_{n1/2}$ $\leq 180 \text{ ms}$	Degree of protection, internal components (IEC 60529)
Operating time t_{ae} at $l_n = 5 \times l_{n1/2}$ $\leq 30 \text{ ms}$	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) $\leq 180 \text{ ms}$	Flammability class UL94V-C
A CONTROL OF THE CONTROL CONTR	· · · · · · · · · · · · · · · · · · ·
·	Screw fixing
Recovery time $t_{\rm b}$ 500600 ms	Screw fixing 2 x M4 DIN rail mounting acc to IEC 60715
·	DIN rail mounting acc. to IEC 60715
·	DIN rail mounting acc. to IEC 60715 Power consumption ≤ 10 VA
•	DIN rail mounting acc. to IEC 60715

()* Factory setting

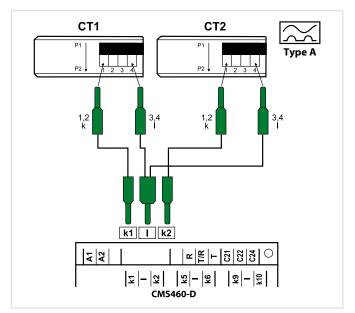




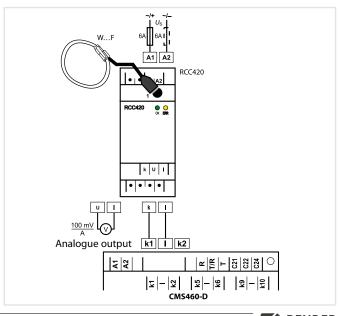
Wiring diagrams



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



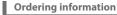


Device features

- 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.



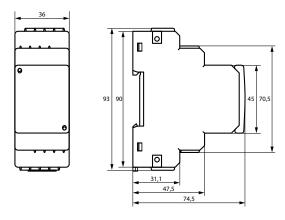
Type	Supply voltage 1) Us	Art.	No.
1,7,42	Supply to tage 1, 65	Screw-type terminal	Push-wire terminal
GM420-D-1	AC 1672 V, 15460 Hz / DC 9.694 V	B93082001	B73082001
GM420-D-2	AC 70300 V, 15460 Hz / DC 70300 V	B93082002	B73082002

¹⁾ Absolute values

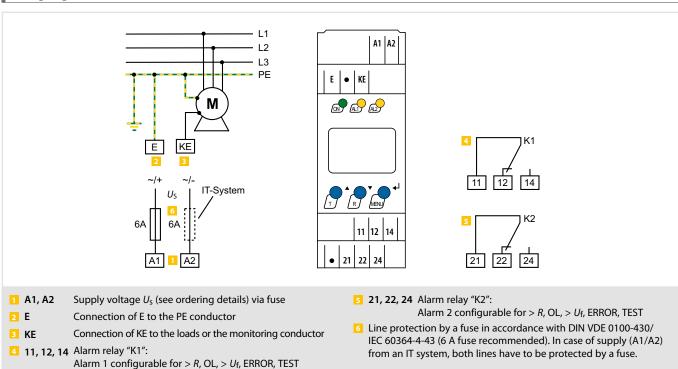
Accessories

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

Insulation coordination acc. to IEC 60664-1/IEC 60664-3		Switching elements					
Rated insulation voltage	400 V	Number			changeove		
Rated impulse voltage/pollution degree	4 kV/3	Operating principle			'C operatio		
Protective separation (reinforced insulation) between:			K1: Err, > <i>R</i> , Ol				
	(E, KE) - (11-12-14) - (21-22-24)		measuring curi			•	
Voltage test acc. to IEC 61010-1:	2 22 1 1	El el la	K2: Err, $> R$, OL, $> U$, tES (over	voltage: N	/O operati	
(E, KE) - [(A1-A2), (11-12-14)]	3.32 kV	Electrical endurance, number of cycles					10000
(E, KE) - (21-22-24)	2.21 kV	Contact data acc. to IEC 60947-5-1					
(A1- A2) - (11-12-14) - (21-22-24)	2.21 kV	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 \
GM420-D-1		Rated operational current	5 A	3 A	1 A	0.2 A	0.1
Supply voltage U_{S}	AC 1672 V / DC 9.694 V	Minimum contact rating			1 m	nA at AC/D)C ≥ 10 \
Frequency range <i>U</i> s	15460 Hz	Environment/EMC					
_ · · · · ·	13400 П2	EMC					EC 6132
GM420-D-2:							LC 0132
Supply voltage U _s	AC/DC 70300 V	Ambient temperature					
Frequency range <i>U</i> s	15460 Hz	Operating temperature					+55°(
Power consumption	≤ 3.5 VA	Transport					+70°
Measuring circuit		Long-term storage					+55°(
Loon varietanes D.		Classification of climatic conditions ac	c. to IEC 60721 (relate	d to tempe	rature and	relative hu	
Loop resistance R_m : Measuring range R_m	0100 Ω	Stationary use (IEC 60721-3-3)					3K2
Measuring carrent I _m	DC 20 mA	Transport (IEC 60721-3-2)					2K1
Measuring current $I_{\rm m}$ Measuring voltage $U_{\rm m}$	DC 20 MA ≤ DC 24 V	Long time storage (IEC 60721-3-1)					1K2
	≥ DC 24 V	Climatic class acc. to IEC 60721					
Extraneous voltage <i>Uf</i> :		Stationary use (IEC 60721-3-3)					3M1
Measuring range U _f	AC 050 V	Transport (IEC 60721-3-2)					2M4
Rated frequency f _n	42460 Hz	Long-time storage (IEC 60721-3-1)					1M12
Disconnection of the measuring loop at $U_{\rm f}$	≥ 12 V	Connection					
Reconnection of the measuring loop	≤ 10 V	Connection					
Permissible extraneous voltage <i>U</i> _f	≤ 440 V	Connection type	scr	ew-type te	rminal or p	ousn-wire	termina
Permissible extraneous DC voltage, without influence on the measure	ement DC 0 V	Connection				screw te	erminal
Response values		Connection properties					
Loop resistance > R (Alarm 1)	0.1100 Ω	rigid				mm² (AW0	
Resolution of setting $R = 010 \Omega$	0.1 Ω	flexible	_		0.22.5	mm² (AW	/G 24-14
Resolution of setting $R = 10100 \Omega$	1Ω	Two conductors with the same cro	ss section			2 (***	
Preset function:		rigid/flexible			0.21.5		
Loop resistance $(>R) =$	$((R_{\rm m} + 0.5 \Omega) \times 1.5)^*$	Stripping length					39 mn
Relative uncertainty 01Ω	±20 %, ±1 digit	Tightening torque, terminal screws				0.5.	0.6 Nn
Relative uncertainty 1100 Ω	±5 %, ±1 digit	Connection			pus	h-wire te	erminal
Hysteresis > R	140 % (25 %)*	Connection properties					
Extraneous voltage > U (Alarm 2)	150 V (25 V)*	rigid			0.22.5	mm ² (AW	/G 24-14
Resolution of setting $U_{\rm f}$ 150 V	0.5 V	flexible				2 / * * * *	
Relative uncertainty Uf (> U) in the range of 50/60 Hz	±2 %, ±1 digit	without ferrules		().752.5		
Relative uncertainty U_f (> U) in the range of 42460 Hz	±10 %, ±1 digit	with ferrules			0.21.5	mm² (AW	
Hysteresis > U	140 % (5 %)*	Stripping length					10 mn
Time was and		Opening force					50 1
Time response	0 00 (0.)	Test opening, diameter					2.1 mn
Start-up delay t	099 s (0 s)*	Other					
Response delay t _{on1/2}	099 s (0 s)*	Operating mode			COI	ntinuous o	operation
Delay on release t _{off}	099 s (0.5 s)*	Mounting					y position
Operating time t_{ae}	. 40	Degree of protection, internal componer	nts (IEC 60529)			,	IP30
in the case of loop interruption ($R > 50 \text{ k}\Omega$)	≤ 40 ms	Degree of protection, terminals (IEC 605)	29)				IP30
in the case of closed loop $(>R)$ t_{ae}	≤ 500 ms	Enclosure material				polyc	arbonate
in case of extraneous voltage (> U) and overload (OL) t_{ae}	≤ 100 ms	Screw mounting			2 x M4	with mour	nting clip
Response time t _{an}	$t_{\rm an} = t_{\rm ae} + t_{\rm on1/2}$	DIN rail mounting acc. to				II	EC 6071
Recovery time $t_{\rm b}$ Recovery time $t_{\rm b}$ after safety shutdown	≤ 300 ms ≤ 1 s	Flammability class					UL94 V-(
necovery unic in anci saicty shataowii	71)	Software version				D2	268 V1.0
Displays, memory		Documentation number					D00112
Display LC display,	multifunctional, not illuminated	Weight					≤ 150 (
Display range, measuring value R _m	0100 Ω	()* = factory setting					
Display range, measuring value <i>U</i> f	AC 050 V	() — lactory setting					
Operating uncertainty							
loop resistance 01Ω	± 20 %, ± 1 digit						
operating uncertainty loop resistance 1100 $\boldsymbol{\Omega}$	±5 %, ±1 digit						
operating uncertainty voltage in the range of 50/60 Hz	±2 %, ±1 digit						
operating uncertainty voltage in the range of 42460 Hz	±10 %, ±1 digits						
History memory (HiS) for the first alarm value	data record measured values						
Password Fault memory (M) alarm relay	off/0999 (off)* on/off (on)*						



Wiring diagram



RC48C

Residual current/loop monitoring device



Device features

- · Earth fault monitor with integrated loop monitoring
- · Measurement of the fault current by means of a Bender measuring current transformer
- Alarm easily recognisable by LED lights
- Alarm relay with two voltage-free changeover contacts
- · Alarm contact can be delayed by a selectable time
- Detection of series and transverse resistance faults
- The alarm relay can be used to trigger a load switch
- · Depending on the type of load switch, the operating mode of the alarm relay can be set to normally open or normally closed operation

Standard

- CSA M421-16
- NEC 250.188(D)

Further information

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

Typical applications

- Monitoring cables that feature a pilot wire
- Monitoring of earthing systems

Approvals



Ordering information

Туре	Supply voltage <i>U</i> ₅	Supply voltage <i>U</i> _s für UL	Art. No.		
RC48C-935	AC/DC 60264 V, 5060 Hz	AC/DC 110240 V, 50/60 Hz	B94013002		

Accessories

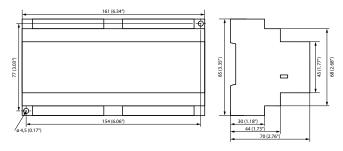
Description	Art. No.
Termination device for RC48C, P = 5 W (without an enclosure)	B94013008
Termination device for RC48C, P = 50 W (without an enclosure)	B94013009
Termination device for RC48C, $P = 50 W$	B94013006
Termination device for RC48C with an integrated resistor for remote disconnection, P = 50 W	B94013007

Suitable system components

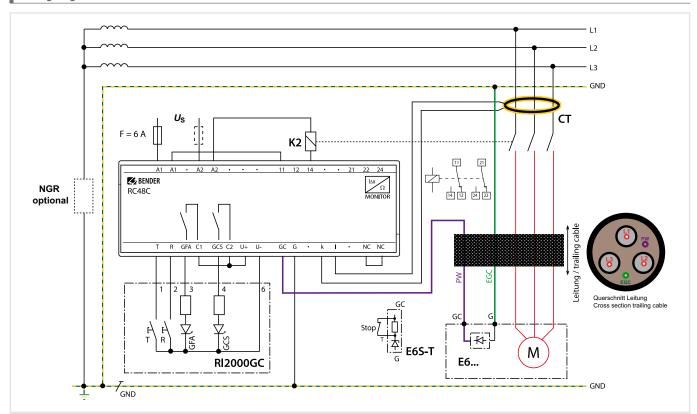
Description	Inside diameter	Туре	Art. No.	Seite		
Remote alarm indicator and test combination	_	RI2000GC	B94071000	-		
Residual current transformer	70 mm	W2-S70	B911732	346		
nesiduai current transformer	105 mm	W3-S105	B911733	346		

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 _s	AC/DC 110240 V, 50/60 Hz
Fuse	recommended: 6 A slow fuse
Power consumption	approx. 5 VA at AC 60 \
	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
Accuracy of the response delay	±20 %
Continuous short-circuit current	200 F
	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 \
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 :
Delay on release	1.5 :
Response time, series resistance faults	0.2 9
Response time, cross resistance faults	0.2 9
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 comb	ination
Single wire 0.75 mm ² (AWG 18)	010 m (030')

Dimension diagram (dimensions in mm (in))

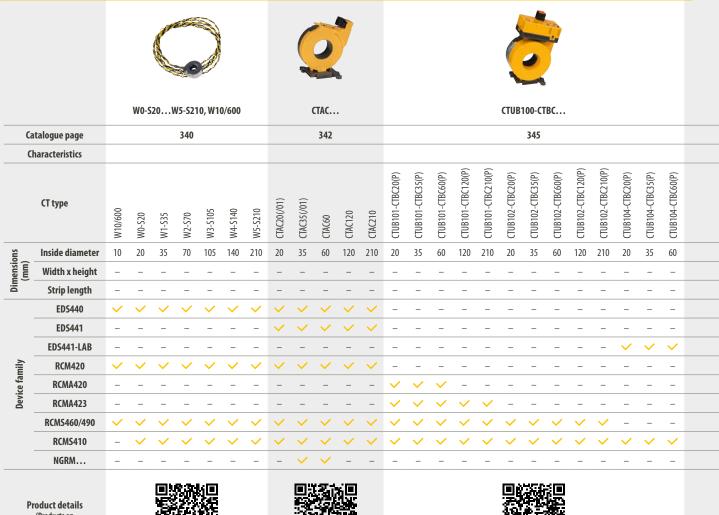


Outputs	
Switching elements (alarm relay)	2 changeover contacts (N/O and N/C, Form C)
Rated contact voltage	AC 250 V/DC 300 V
Making capacity	AC/DC 5 A
Breaking capacity AC/DC	2/0.2 A
Permissible number of operating cycles	12000 cycles
Operating mode, switching elements (alarm relay)	Fail-Safe
Switching elements (GFA, GCS)	2 NO contacts
Rated contact voltage	AC 250 V/DC 300 V
Making capacity	AC/DC 5 A
Breaking capacity AC/DC	2/0.2 A
Permissible number of operating cycles	12000 cycles
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 ℃
Climatic class acc. to IEC 60721 (except condensation a	and formation of ice) 3K22
Connection	
Connection type	screw-type terminals
Connection properties rigid	0.24 mm² (AWG 24-12)
Connection properties flexible	0.22.5 mm ² (AWG 24-14)
Other	
VIIICI	
Operating mode	continuous operation
	
Operating mode Mounting	any position
Operating mode	any position according to DIN EN 60529
Operating mode Mounting Protection class	any position according to DIN EN 60529 IP 30
Operating mode Mounting Protection class Built-in components	continuous operation any position according to DIN EN 60529 IP 30 IP 20 UL94V-0
Operating mode Mounting Protection class Built-in components Terminals	any position according to DIN EN 60529 IP 30 IP 20



Connections		Connection to the RI2000GC remote alarm indicator and test				
A1, A2	Connection supply voltage U_s .	combination	n			
11, 12, 14	Two voltage-free changeover contacts trip in case of	Т	Connection external Test button			
21, 22, 24	an alarm. N/C operation or N/O operation selectable.	R	Connection external Reset button			
NC, NC	Set contact configuration for voltage-free changeover	GFA	Connection external "Alarm Ground Fault" LED			
	contacts:	GCS	Connection external "Ground Check Safe" LED			
	Bridge open: N/O Bridge closed: N/C (factory setting)	U+, U-	Output DC 12 V, e.g. for the supply of the RI2000GC remote alarm indicator and test combination			
k, l	Connection residual current transformer	C1, C2, U+	Bridge supplying the RI2000GC remote alarm indicator			
GC	Connection to the PW (pilot wire) conductor of the cable		and test combination with supply voltage from the			
G	Connection to the EGC (equipment grounding conductor = GND) conductor of the cable.		RC48C.			

Device overview measuring current transformers



www.bender.de/en)





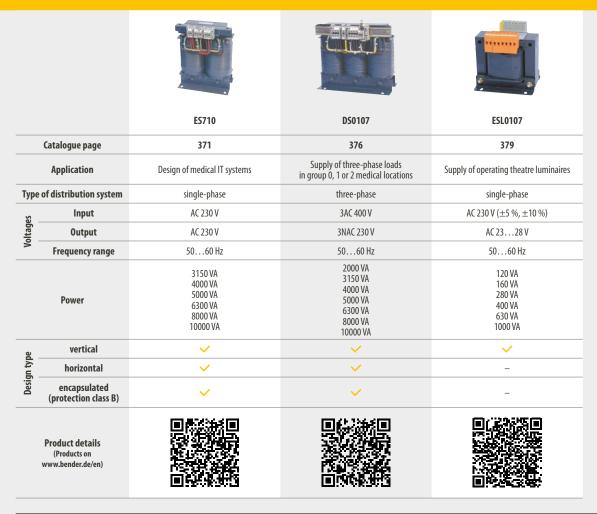


										17.6	The second											
	WR	.S(P)			CTAS	•	CTBS25		WS	./WS	-8000			WS.	S				WF.	•••		
	34	19			351		354			356				35	8				36	0		
					split-core	e	split-core			split-core	2			split-	core				flexi	ble		
WR70x1755(P)	WR115x3055(P)	WR150x350S(P)	WR200x500S(P)	CTAS50(/01)	CTAS80(/01)	CTAS120(/01)	CTBS25	W520x30	WS50x80	WS80x120	W520x30-8000	WS50x80-8000	WS50x80S	WS80x80S	WS80x120S	WS80x160S	WF170	WF250	WF500	WF800	WF1200	WF1800
-	-	-	-	50	80	120	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
70 x 175	115 x 305	150 x 350	200 x 500	-	_	_	-	20 x 30	50 x 80	80 x 120	20 x 30	50 x 80	50 x 80	80 x 80	80 x 120	80 x 160	_	-	-	-	-	_
_	_	_	_	-	_	_	-	_	-	_	_	-	_	_	_	_	170	250	500	800	1200 1	800
~	~	~	~	~	~	~	✓	~	~	~	_	_	_	_	_	_	_	-	-	-	-	_
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Device overview coupling devices



Device overview isolating transformers, transformers for operating theatre lights



Device overview power supply units



Device overview measuring instruments



Device overview interface converters and repeaters





D	ŀ	1	D	L

	US	

Catalogue page Application		389	391	
		Interface repeater BMS bus	Interface converter BMS/USB	
Input		RS-485	RS-485	
Input	Connection	screw-type terminal	screw-type terminal	
_	Cable length	≤ 1200 m	≤ 1200 m	
	Output	RS-485	USB	
¥	Connection	screw-type terminal	USB Type B	
Output	Cable length	≤ 1200 m	≤ 5 m	
	Expansion of bus devices	≤ 30	+	
Supply voltage <i>U</i> ₅		AC 85260 V, 5060 Hz	via USB	
Particular features		-	Driver CD	

Product details (Products on www.bender.de/en)





Device overview relay module



I0M441

Catalogue page	392
Application	for extension of EDS44x applications
Relay number	12 N/O contacts
Supply voltage U _s	via BB bus
Interface	BB bus
Connection	push-wire terminal / BBbus PCB
Relay operation	configurable

Product details (Products on www.bender.de/en)



Device overview condition monitors/gateways

				To the second se	To the second se	
		COMTRAXX® COM465IP	COMTRAXX [®] COM465DP	COMTRAXX° COM465ID	COMTRAXX® COM463BC	COMTRAXX® CP9I
	Catalogue page	394	398	402	406	408
	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)
교	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)	-	1,3)
	Visualisation	✓ 1)	✓ 1)	✓ 1)	-	√ 1)
	E-mail notification	1, 4)	1,4)	1,4)	1, 4)	1,4)
	Data logger	✓ 1)	✓ 1)	✓ 1)	-	√ 1)
_	BMS	screw-type terminal	screw-type terminal	-	screw-type terminal	screw-type terminal
ction	Modbus RTU	screw-type terminal	screw-type terminal	-	screw-type terminal	screw-type terminal
Connection	isoData	-	-	screw-type terminal	-	-
	Output	RJ 45	RJ 45, Sub-D 9-pole	RJ 45	RJ 45	RJ 45
ments	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
System requirements	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 vww.bender.de/en)					

 $^{^{1)}\,}$ Functions available on the web server – accessible via a personal computer with browser

²⁾ Available via the protocol

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

		No. of the latest section of the latest sect	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		
		COMTRAXX® CP9xx	COMTRAXX° CP305	COMTRAXX® MK2430	Visualisation
	Catalogue page	411	414	418	421
	MEDICS® systems	~	~	~	✓
Messages/ displays	RCMS Residual current monitoring system	✓	~	~	✓
di Me	EDS insulation fault locator	~	~	✓	✓
	Flush-mounting	~	~	~	~
type	Cavity wall mounting	~	~	~	~
ation	Cable-duct mounting	-	~	~	-
Installation type	Panel mounting	~	~	✓	✓
=	Surface mounting	✓	~	✓	-
	Digital inputs (potential free)	12	12	0/12	-
ts	N/O or N/C operation	selectable	selectable	selectable	-
Inputs/outputs	Relay outputs	1	2	1	-
uts/o	N/O or N/C operation	programmable	programmable	programmable	-
를	Common alarm	programmable	programmable	programmable	-
	System fault alarm	programmable	programmable	programmable	-
	Languages selectable	> 25	> 25	20	programmable
e	Standard display	Graphic LCD (7", 15.6", 24")	5" TFT touch display	4 x 20 characters	-
essag	Additional text display	~	~	3 x 20 characters	-
X m	Standard texts	✓	~	✓	-
ng/te	Freely configurable text messages	✓	~	200	-
Parameter setting/text message	History memory, maximum number of data records	2000	1000	250	-
rame	Real-time clock	✓	~	✓	-
Pa	Parameterisation software	integrated	integriert	TMK-Set V 4.xx (USB, BMS)	-
	Messages/alarms, medical gases	acc. to EN475, EN737-3	acc. to EN475, EN737-3	acc. to EN475, EN737-8	-
	RS-485 (BMS protocol)	~	~	~	-
	BMS address range	1150	190	1150	-
faces	Master redundancy, BMS internal	✓	~	~	-
Interfaces	Master redundancy, BMS external	-	-	-	-
_	USB	✓	-	✓	-
	Ethernet (TCP/IP)	~	~	_	~
	Supply voltage Us	DC 24 V/AC 250 V	AC 1828 V/DC 1830 V	AC/DC 24 V	-
Stored	energy time in the event of power failure	≥ 15 s	≥ 2 s	≤ 15 s	-
	Product details (Products on www.bender.de/en)				

Device overview POWERSCOUT®



POWERSCOUT®

	Catalogue page	422	
	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	✓	
.53	Table view	✓	
Widgets	Alarm state	~	
>	Event protocol	~	
	Gauge	~	
	Heat map	~	
	Sankey diagram	✓	
	Bar graph	✓	
		回類成物回	

Product details (Products on www.bender.de/en)



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)
- For insulation fault locators with additional EDS in AC and DC systems

Standards

W0-S20...W5-S210 series measuring current transformers comply with the device standard:

• IEC 61869-1.

Approvals





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

Туре	Inside diameter	Approvals			Art. No.
1,700	mode didirect	UL EAC		LR	,
W10/600	10 mm	-	-	>	B911761
W0-S20	20 mm	-	~	>	B911787
W1-S35	35 mm	~	~	~	B911731
W2-S70	70 mm	~	~	~	B911732
W3-S105	105 mm	~	~	~	B911733
W4-S140	140 mm	~	~	~	B911734
W5-S210	210 mm	~	~	~	B911735

Highest system voltage for electrical equipment $U_{ m m}$	AC 720 V
Rated impulse withstand voltage $U_{\rm isol}$	3 kV
Measuring circuit	
Rated transformation ratio	600/1
Rated burden	180 Ω (18 Ω at 100 A)
Phase displacement	<4°
Rated primary current	≤10 A (100 A)
Rated primary current	≥10 mA
Nominal power	50 mVA
Rated frequency	15400 Hz
Internal resistance	58Ω
Secondary overvoltage protection	with suppressor diode P6KE6V8CF
Accuracy class	3
Rated continuous thermal current	100 A
Rated short-time thermal current	14 kA 1 s
Rated dynamic current	35 kA 30 ms
Environment	
Shock resistance IEC 60068-2-27 (device in operation)	15 g/11 ms
Bumping IEC 60068-2-29 (transport)	40 g/6 ms
Virbation resistance IEC 60068-2-6 (device in operation)	
W1-S35W3-S105	1 g/10150 Hz
W4-S140, W5-S210	1 g/10150 Hz/0.075 mm
Vibration resistance IEC 60068-2-6 (device not in operation)	2 g/10150 Hz

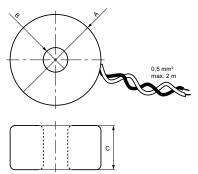
Connection	
Connection	screw-type terminals
Connection	
rigid/flexible	0.2/4/0.22.5 mm ²
flexible with ferrules with/without plastic sleeve	0.252.5 mm ²
Conductor sizes	AWG 24-12
Connection to the evaluator	
single wire ≥ 0.75 mm ²	01 m
single wire, twisted $\geq 0.75 \text{ mm}^2$	010 m
shielded cable $\geq 0.6 \text{ mm}^2$	040 m
Shielded cable (shield connected to PE on one side)	recommended cable J-Y(St)Y min. 2 x 0.6
Other	
Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (DIN EN 60529)	IP40
Degree of protection, terminals (DIN EN 60529)	IP20
Screw mounting	M5

Dimension diagrams

Climatic class acc. to DIN IEC 60721-3-3

Ambient temperature (during operation/during storage)

Type W10/600



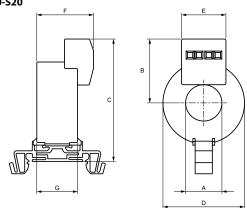
Type W0-S20

-10...+ 50 °C/-40...+ 70 °C

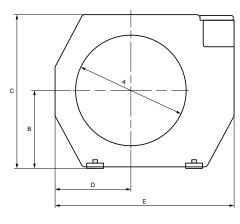
3K22

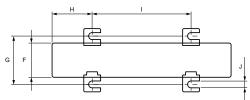
Flammability class

Documentation number



Type W1-S35...W5-S210





Dimensions (mm) Weight В G Н ı A D E Type W10/600 ø 37 ø 10 18 85 g W0-S20 ø 20.5 36 69 ø 46 25 32 70 g 250 g W1-S35 ø 35 44 79 35 100 32.5 46 26.5 48 6.5 W2-S70 ø 70 52 58 110 130 32.5 46 32 66 380 g W3-S105 ø 150 74 72 170 32.5 46 38 94 6.5 146 700 g W4-S140 ø 140 99.5 197 97.5 220 32.5 46 123 6.5 1500 g 48.5 W5-S210 ø 210 285 150 300 32.5 46 161 6.5 143 69 2500 g

UL94 V-0

D00142 (W(0-5)-S)

D00143 (W10)

LINETRAXX® CTAC...

Measuring current transformers



Device features

Measuring current transformers CTAC...

- For RCMS460/490 residual current monitoring systems
- For RCM420 residual current monitors
- For EDS440 insulation fault locators in AC and DC systems

Measuring current transformers CTAC.../01

• For EDS441 insulation fault locators

Further information

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

Typical applications

- For residual current monitoring systems of the series RCM or RCMS
- $\bullet \ \ Suitable \ for \ use \ in \ insulation \ fault$ location for IT systems (EDS)

Approvals







Ordering information

Туре	Mounting	Inside diameter	Art. No. ²⁾
CTAC20		20	B98110005
CTAC20/01 ¹⁾		20 mm	B98110006
CTAC35	Mounting brackets, DIN rail	25	B98110007
CTAC35/01 ¹⁾		35 mm	B98110008
CTAC60		60 mm	B98110017
CTAC120		120 mm	B98110019
CTAC210	Mounting brackets	210 mm	B98110020

¹⁾ For EDS441 insulation fault locators

Accessories

Type designation	Art. No.
Snap-on mounting for CTAC20 and CTAC20/01	B91080111
Snap-on mounting for CTAC35 and CTAC35/01	B91080112

Includet in scope of delivery

Selection list

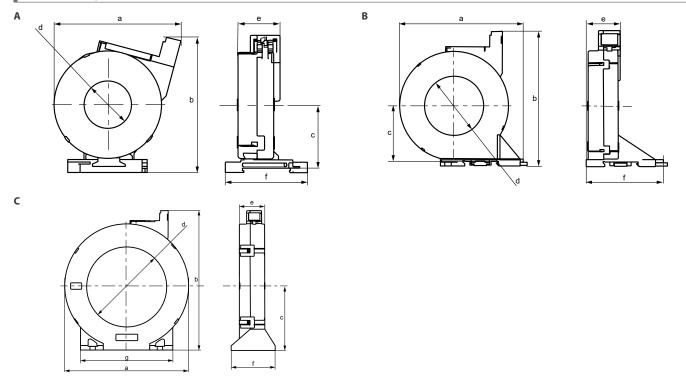
Туре	RCM420	RCMS460 RCMS490	EDS440	EDS441
CTAC20	~	~	~	-
CTAC35	~	~	~	-
CTAC60	~	~	~	_
CTAC120	~	~	~	_
CTAC210	~	~	~	-
CTAC20/01	-	-	-	~
CTAC35/01	_	_	_	~

 $^{^{\}rm 2)}~$ B781100xxMIL variants available on request

Rated insulation voltage	800 V
Overvoltage category	
Rated impulse voltage/pollution degree	8 kV/3
Measuring current transformer circuit	
CTAC	
Rated transformation ratio $K_{ m r}$	600/
Rated continuous thermal current* I _{cth}	125 <i>l</i>
Frequency range	15 Hz100 kH
Rated short-time thermal current* Ith	2.4 kA/1
Rated dynamic current* / _{dyn}	6.0 kA/40 m
Rated current /	
CTAC20 at $I_{\Delta n} \ge 30 \text{ mA}$	63 A
CTAC20 at $I_{\Delta n} \ge 300 \text{ mA}$	80 A
CTAC35 at $I_{\Delta n} \ge 30 \text{ mA}$	125 A
CTAC35 at $I_{\Delta n} \ge 300 \text{ mA}$	160 A
CTAC60 at $I_{\Delta n} \ge 30 \text{ mA}$	200 A
CTAC60 at $I_{\Delta n} \ge 300 \text{ mA}$	400 A
CTAC120 at $I_{\Delta n} \ge 100 \text{ mA}$	400 A
CTAC210 at $I_{\Delta n} \ge 300 \text{ mA}$	630 A
CTAC/01	
Rated transformation ratio K _r	8000/
Rated continuous thermal current* I _{cth}	6 A
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 A
CTAC20/01 at $I_{\Delta n} \ge 300 \text{ mA}$	80 A
CTAC35/01 at $I_{\Delta n} \ge 30 \text{ mA}$	125 <i>F</i>
CTAC35/01 at $I_{\Delta n} \ge 300 \text{ mA}$	160 A
* refers to the residual current	
Environment	
Operating temperature	-25+70°0
B781100xxMIL (for applications with EDS)	-40+70°0
Climatic class acc. to IEC 60721	
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K1 ⁻
Long-time storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions IEC 60721	
Stationary use (IEC 60721-3-3)	3M1
B781100xxMIL devices ¹⁾	3M12
Transport (IEC 60721-3-2)	2M ²
Long-time storage (IEC 60721-3-1)	1M12

Connection	
Terminal type	MSTB 2.5/2-ST-5.08
for B781100xxMIL devices	FKC 2.5/2-ST-5.08
Manufacturer	Phoenix Contac
Connection type	screw type termina
for B781100xxMIL devices	push-wire termina
The connection conditions of the manufacturer apply.	
Corresponding PCB connectors are included in the scope of deliv	rery
Connection properties	
rigid	0.22.5 mm ² (AWG 24-12
flexible	0.22.5 mm ² (AWG 24-12)
Stripping length	7 mm
Connection EDS, RCM(S) measuring current transforme	irs
Single wire ≥ 0.75 mm ²	01 m
Single wire, twisted ≥ 0.75 mm ²	010 n
Shielded cable $\geq 0.5 \text{ mm}^2$	040 n
Shielded cable ≥ 0.5 mm² Shielded cable	
	recommended: J-Y(St)Y min. 2x0.8
Shielded cable RCM: shield on one side connected to L-conductor, not c	recommended: J-Y(St)Y min. 2x0.8
Shielded cable RCM: shield on one side connected to L-conductor, not o EDS: shield on one side connected to PE	recommended: J-Y(St)Y min. 2x0.8
Shielded cable RCM: shield on one side connected to L-conductor, not o EDS: shield on one side connected to PE Mounting	recommended: J-Y(St)Y min. 2x0.8 connected to earth
Shielded cable RCM: shield on one side connected to L-conductor, not of EDS: shield on one side connected to PE Mounting Screw Type	recommended: J-Y(St)Y min. 2x0.8 connected to earth DIN EN ISO 7045 - M52
Shielded cable RCM: shield on one side connected to L-conductor, not of EDS: shield on one side connected to PE Mounting Screw Type CTAC20(/01), CTAC35(/01), CTAC60 CTAC120, CTAC210	040 m recommended: J-Y(St)Y min. 2x0.8 connected to earth DIN EN ISO 7045 - MS DIN EN ISO 7045 - MS
Shielded cable RCM: shield on one side connected to L-conductor, not of EDS: shield on one side connected to PE Mounting Screw Type CTAC20(/01), CTAC35(/01), CTAC60 CTAC120, CTAC210 Washer type	recommended: J-Y(St)Y min. 2x0.3 connected to earth DIN EN ISO 7045 - M5 DIN EN ISO 7045 - M6
Shielded cable RCM: shield on one side connected to L-conductor, not of 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	recommended: J-Y(St)Y min. 2x0.3 connected to earth DIN EN ISO 7045 - M5: DIN EN ISO 7089/7090 - :
Shielded cable RCM: shield on one side connected to L-conductor, not of 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	recommended: J-Y(St)Y min. 2x0.3 connected to earth DIN EN ISO 7045 - M5: DIN EN ISO 7089/7090 - :
Shielded cable RCM: shield on one side connected to L-conductor, not of 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 Tightening torque	recommended: J-Y(St)Y min. 2x0.3 connected to earth DIN EN ISO 7045 - M5: DIN EN ISO 7045 - M6: DIN EN ISO 7089/7090 - 0
Shielded cable RCM: shield on one side connected to L-conductor, not of 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	recommended: J-Y(St)Y min. 2x0.8 connected to earth DIN EN ISO 7045 - M5: DIN EN ISO 7045 - M6: DIN EN ISO 7089/7090 - 9 DIN EN ISO 7089/7090 - 0
Shielded cable RCM: shield on one side connected to L-conductor, not of 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 Tightening torque CTAC20(/01), CTAC35(/01)	recommended: J-Y(St)Y min. 2x0.8 connected to earth DIN EN ISO 7045 - M5: DIN EN ISO 7045 - M6: DIN EN ISO 7089/7090 - 9 DIN EN ISO 7089/7090 - 0
Shielded cable RCM: shield on one side connected to L-conductor, not of 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 Tightening torque CTAC20(/01), CTAC35(/01) CTAC60, CTAC120, CTAC210	recommended: J-Y(St)Y min. 2x0.3 connected to earth DIN EN ISO 7045 - M5: DIN EN ISO 7089/7090 - : DIN EN ISO 7089/7090 - : 0.6 Nn 1 Nn
Shielded cable RCM: shield on one side connected to L-conductor, not of 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 Tightening torque CTAC20(/01), CTAC35(/01) CTAC60, CTAC120, CTAC210	recommended: J-Y(St)Y min. 2x0.8 connected to earth DIN EN ISO 7045 - M5: DIN EN ISO 7089/7090 - 9 DIN EN ISO 7089/7090 - 0 0.6 Nm 1 Nm
Shielded cable RCM: shield on one side connected to L-conductor, not of 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 Tightening torque CTAC20(/01), CTAC35(/01) CTAC60, CTAC120, CTAC210 Other Degree of protection, internal components (DIN EN 60529)	recommended: J-Y(St)Y min. 2x0.8 connected to earth DIN EN ISO 7045 - M52

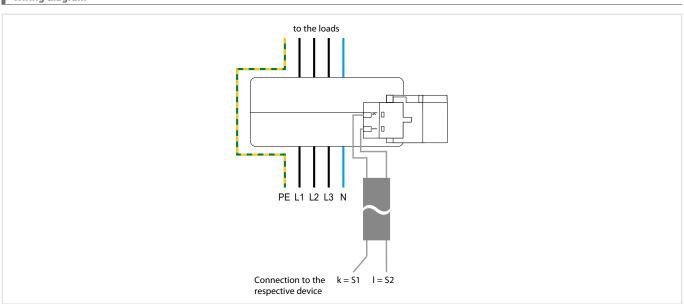
 $^{^{1)}\,}$ CTAC120 and CTAC210 must be additionally mounted for the 3M12. (see Mountings)



Dimensions (mm)					Weight in g				
	Туре	a	b	c	d	e	f	g	(gross)
	CTAC20(/01)	75	82	37	ø 20	32	60	-	160
Α	CTAC35(/01)	94	100	47	ø 35	30	61	-	220
В	CTAC60	126	137	57	ø 60	33	78	_	460
	CTAC120	188	211	96	ø 120	38	66	139	1140
	CTAC210	302	324	153	ø 210	40	74	277	2340

Tolerance: ±0,5 mm

Wiring diagram



Measuring current transformers CTAC...

Connection to the respective residual current monitoring system RCMS, residual current monitors RCM or to insulation fault location systems $\ensuremath{\mathsf{EDS}}$

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 EDS441-LAB 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
- $\bullet \ \ \text{Extension/retrofitting or modification of functionalities in case of changed monitoring requirements}$
- 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 EDS441-LAB 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 EDS441-LAB)

CTUB100 series measuring current transformers comply with the requirements of the standard DIN EN 45545-2 for application in railway vehicles.

Further information

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

Ordering information

Туре	Shielding	Current transformer diameter	Supply voltage	Suitable for evaluator	Art. No.
CTUB101-CTBC20	-	20			B78120010
CTUB101-CTBC20P	~	- ø 20			B78120020
CTUB101-CTBC35	-	~ 25			B78120012
CTUB101-CTBC35P	~	- ø 35			B78120022
CTUB101-CTBC60	-	~ (0	DC +12.V	RCMA420	B78120014
CTUB101-CTBC60P	~	- ø 60	DC ±12 V	RCMA423	B78120024
CTUB101-CTBC120	-	ø 120			B78120016
CTUB101-CTBC120P	~	- Ø 120			B78120026
CTUB101-CTBC210	-	210			B78120018
CTUB101-CTBC210P	~	- ø 210			B78120028
CTUB102-CTBC20	-			B78120011	
CTUB102-CTBC20P	~	- ø 20			B78120021
CTUB102-CTBC35	-	~ 25			B78120013
CTUB102-CTBC35P	~	- ø 35			B78120023
CTUB102-CTBC60	-	g 60	DC 24 V	RCMS460	B78120015
CTUB102-CTBC60P	~	0 00	DC 24 V	RCMS490	B78120025
CTUB102-CTBC120	-	- 120			B78120017
CTUB102-CTBC120P	~	- ø 120			B78120027
CTUB102-CTBC210	-	a 210			B78120019
CTUB102-CTBC210P	~	- ø 210			B78120029
CTUB104-CTBC20P	~	ø 20			B78120033
CTUB104-CTBC35P	~	ø 35	DC 24 V	EDS440 EDS441-LAB	B78120034
CTUB104-CTBC60P	~	ø 60			B78120035

Electronic modules

Туре	Supply voltage <i>U</i> s	Suitable for evaluator	Art. No.
CTUB101	DC ±12 V	RCMA420/423	B78120050
CTUB102	DC 24 V	RCMS460/490	B78120051
CTUB104	DC 24 V	EDS440/441	B78120053

Required terminals are included in the scope of delivery. Connecting cables are optionally available.

Connecting cables

Name	Length (m)	Connection to	Art. No.
CTX-100	1		B98110080
CTX-250	2.5	RCMA42	B98110081
CTX-500	5	KCMA42	B98110082
CTX-1000	10		B98110083
CTXS-100	1	RCMS46 RCMS49 EDS44	B98110090
CTXS-250	2.5		B98110091
CTXS-500	5		B98110092
CTXS-1000	10		B98110093

Suitable system components

Description	max. connected current transformers	Туре	Art. No.	Page
	4	STEP-PS/1 AC/24 DC/0.5	B94053110	387
Voltage supply	14	STEP-PS/1 AC/24 DC/1.75	B94053111	387
	34	STEP-PS/1 AC/24 DC/4.2	B94053112	387

Measuring current transformer cores

Туре	Internal diameter	Art. No.
CTBC20	20	B98120001
CTBC20P	20 mm	B98120002
CTBC35	35	B98120003
CTBC35P	35 mm	B98120004
CTBC60	60 mm	B98120005
CTBC60P		B98120006
CTBC120	120 mm	B98120007
CTBC120P		B98120020
CTBC210		B98120008
CTBC210P	210 mm	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	d insulation):
IC1/IC2	800 V
Pollution degree	2
Supply voltage	
CTUB101	
Description	+12 V, GND, -12 V
Supply voltage $U_{\rm S}$	DC ±12 V
Operating range of $U_{\rm S}$	±2 %
Ripple U _s	≤ 1 %
Power consumption	≤ 2.5 W
CTUB102, 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

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	±1 % of full scale value
Test winding	yes
Rated continuous thermal current 1) I _{cth}	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 evaluator)	
CTBC20, CTBC20P	10500 mA
CTBC35, CTBC35P, CTUBC60, CTBC60P	30 mA10 A
CTDC120 CTDC120D CTDC210D	100 m A 10 A

CTBC35, CTBC35P, CTUBC60, CTBC60P CTBC120, CTBC120P, CTBC210P

Measuring ranges (CTUB101, CTUB102)	
Measuring range 1 ($I_{\Delta n} \le 0.1 \text{ A}$)	0900 mA (peak)
Measuring range 2 (0.1 A $< I_{\Delta n} \le 0.5$ A)	03.5 A (peak)
Measuring range 3 ($I_{\Delta n} > 0.5 \text{ A}$)	020 A (peak)

Measuring range (CTUB104)

DC 0...70 mA Measuring range

100 mA...10 A 300 mA...10 A

■ Technical data (continued)

Technical data (continued)	
Indication	
Multicolour LED	table on page 348
Output	
Name	S1 (k), S2 (l)
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 ℃
Classification of climatic conditions acc. to IEC 60721 (e.	xcept condensation and formation of ice)
Stationary use (IEC 60721-3-3)	3K24
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions acc. to IEC 607	721
Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12
Connection	
Max. connection length	10 m
Connecting cables are optionally available.	
Use 60/75 ℃ copper lines only.	
Terminal block	
Manufacturer	Phoenix Contact
Туре	DFMC 1.5/4-ST-3.5 BK
The connection conditions of the manufacturer apply.	
Connection properties	2/11/25
rigid	0.21.5 mm ² (AWG 24-16)
flexible	0.21.5 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

0.25...0.75 mm²

В

D

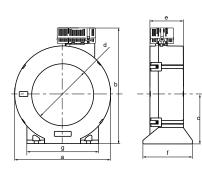
Utner	
Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (DIN EN 60529)	IP40
Degree of protection, terminals (DIN EN 60529)	IP20
Flammability class	UL94 V-0
Software	D591
Documentation number	D00362
Weight	
CTUB10x- CTBC20	≤ 230 g
CTUB10x- CTBC20P	≤ 290 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

with ferrule

C



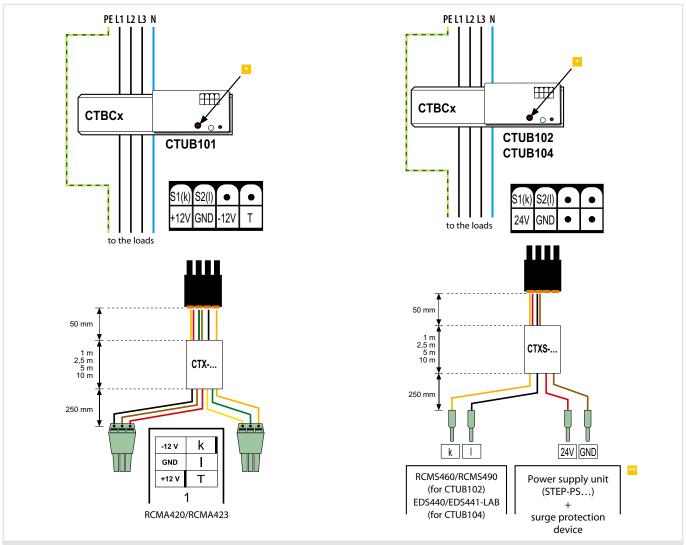
	Dimensions (mm)										
	Туре	a	b	c	d	e	f	g			
_	CTUB10CTBC20(P)	75	83	37	ø 20	46	60.5	_			
Α	CTUB10CTBC35(P)	97	130	47	ø 35	46	61	_			
В	CTUB10CTBC60(P)	126	151	57	ø 60	56	78	_			
	CTUB10CTBC120(P)	188	225	96	ø 120	65	96	139			
	CTUB10CTBC210(P)	302	339	153	ø 210	67	113	277			
D	CTUB10	74	44	30	32	4.6	_	_			

Tolerance: $\pm 0.5 \text{ mm}$

The LED indicates the system state by means of colours and lighting/flashing.

System state	L	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	Ø	<i>I</i> Δn ≤ 0.1 A	0450 mA	0900 mA							
2	1	$0.1 \text{A} < I_{\Delta n} \le 0.5 \text{A}$	00.75 A	03.5 A							
3	(S)	<i>I</i> _{Δn} > 0.5 A	010 A	020 A							

- The use of a type 2 surge protection device (SPD) is mandatory due to possible impulse voltages and in order to comply with normative requirements (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)

Typical applications

- For RCMS460/490 residual current monitoring systems
- For RCM420 residual current monitors
- \bullet For EDS470, EDS460/490 and EDS440 insulation fault locators in AC and DC systems
- The WR...SP measuring current transformers are particularly suitable for use in busbar systems. This series is to be used for load currents ≥ 500 A.

Standards

 $WR70x175S(P)...WR200x500S(P)\ measuring\ current\ transformers\ comply\ with\ the\ device\ standards:$

- DIN FN 60044-
- IEC 61869

Further information

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

Approvals







Ordering information

Type	Internal	Арр	rovals	Screening	Art. No.	
.,,,,,	dimensions UL LR		Justining	711.11.10.		
WR70x175S	70 x 175 mm	~	~		B911738	
WR115x305S	115 x 305 mm	~	~		B911739	
WR150x350S	150 x 350 mm	~	~	without screening	B911740	
WR200x500S	200 x 500 mm	-	~		B911763	
WR70x175SP	70 x 175 mm	-	~		B911790	
WR115x305SP	115 x 305 mm	-	~		B911791	
WR150x350SP	150 x 350 mm	_	~	Screening integrated	B911792	
WR200x500SP	200 x 500 mm	_	~		B911793	

Highest system voltage for electrical equipment $U_{\rm m}$	AC 720 \
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	58 ℃
Secondary overvoltage protection	suppressor diode P6KE6V8CF
Accuracy class	5
Rated continuous thermal current	100 A
Rated short-time thermal current	14 kA/1 s
Rated dynamic current	35 kA/30 ms
Environment	
Cl. 1. 1. 155 (00(0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	

Connection	
Connection	screw-type terminals
Connection	
rigid/flexible	0.24/0.22.5 mm ²
flexible with ferrules with/without plastic sleeve	0.252.5 mm ²
Conductor sizes	AWG 24-12
Connection to the evaluator	
single wire $\geq 0.75 \text{ mm}^2$	01 m
single wire, twisted ≥ 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

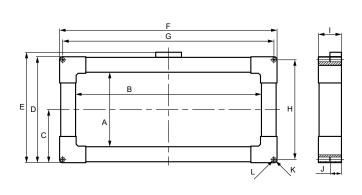
Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (DIN EN 60529)	IP40
Degree of protection, terminals (DIN EN 60529)	IP20
Screw mounting	M5
Flammability class	UL94 V-0
Documentation number	D00144

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
Vibration resistance IEC 60068-2-6 (transport)	2 g/10150 Hz
Ambient temperature (during operation)	-10+50 °C
Ambient temperature (during storage)	-40+70 °C
Climatic class acc. to DIN IEC 60721-3-3	3K22

Dimension diagrams

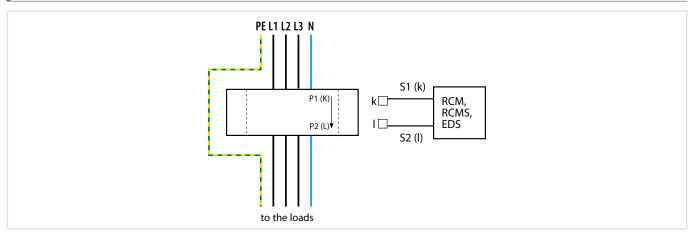
WR70x175S(P)...WR150x350S(P)

WR200x500S(P)



Dimensions (mm)									Weight				
Туре	A	В	C	D	E	F	G	Н	ı	J	K	L	g.ic
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
- For insulation fault locators of the EDS440 series in AC and DC systems

CTAS.../01 measuring current transformers

• For insulation fault locators EDS441

Further information

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





Ordering information

Туре	Internal diameter	Mounting	Art. No.
CTAS50	50 mm	Screw mounting,	B98110009
CTAS50/01	DU MIM		B98110012
CTAS80	80 mm	DIN rail	B98110010
CTAS80/01	80 mm		B98110013
CTAS120	120 mm	Carous mounting	B98110011
CTAS120/01	120 mm	Screw mounting	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	-	-	-	~

Technical data

Rated voltage	
CTAS50(/01)	500 V
CTAS80(/01)/CTAS120(/01)	630 V
Overvoltage category	I
Rated impulse voltage/pollution degree	8 kV/3
Insulation coordination according to IEC 61869-1	
Rated voltage	720 \
Measuring current transformer circuit	
CTAS	
Rated transformation ratio K_{Γ}	600/1
Rated continuous thermal current* I _{cth}	125 A
Rated continuous thermal current* I _{cth} Frequency range	·== :
	42 Hz3 kHz
Frequency range	42 Hz3 kHz 2.4 kA/1 s
Frequency range Rated short-time thermal current* I _{th} Rated dynamic current* I _{dyn}	42 Hz3 kHz 2.4 kA/1 s
Frequency range Rated short-time thermal current* I _{th} Rated dynamic current* I _{dyn}	42 Hz3 kHz 2.4 kA/1 s 6.0 kA/40 ms
Frequency range Rated short-time thermal current* I _{th} Rated dynamic current* I _{dyn} Rated current I _n	125 A 42 Hz3 kHz 2.4 kA/1 s 6.0 kA/40 ms 85 A 160 A

CTAS.../01

Rated transformation ratio K _r	8000/1
Rated continuous thermal current* I _{cth}	125 A
Rated short-time thermal current* Ith	0.36 kA/1 s
Rated dynamic current* /dyn	0.9 kA/40 ms
Rated current In	
CTAS50/01 at $I_{\Delta n} \ge 30 \text{ mA}$	85 A
CTAS80/01 at $I_{\Delta n} \ge 100 \text{ mA}$	160 A
CTAS120/01 at $I_{\Delta n} \ge 300 \text{ mA}$	250 A

* refers to the residual current

For UL applications:

Sensing voltage	630 V
Working voltage	30 V
Sensing current difference	
CTAS50(/01)	30 mA
CTAS80(/01)	100 mA
CTAS120(/01)	300 mA

Technical data (continued))

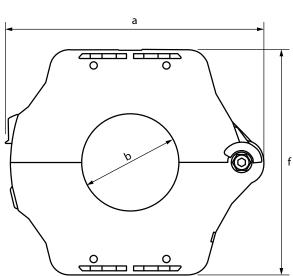
Environment	
Operating temperature	-25+70°C
Classification of climatic conditions acc. to IEC 60721	
Stationary use (IEC 60721-3-3)	3K23
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22 (-40+80 °C)
Classification of mechanical conditions acc. to IEC 60721	
Stationary use (IEC 60721-3-3)	
Mounting clip	3M12
Mounting bracket	3M12
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12
Connection	
Connection type	screw-type terminals
Connection properties	
rigid	0.342.5 mm ² (AWG 22-12)
flexible	0.342.5 mm ² (AWG 22-12)
Stripping length	89 mm

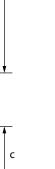
Single wire ≥ 0.75 mm ²	01 m
Single wire, twisted ≥ 0.75 mm ²	010 m
Shielded cable ≥ 0.5 mm ²	040 m
Shielded cable	
recommended	CAT6/CAT7 min. AWG 22
alternatively	Cables, twisted pairs, J-Y(St)Y min. 2x0,8
RCM	shield connected to L conductor, must not be earthed
EDS	shield to Pl
Other	
Degree of protection	
internal components (DIN EN 60529)	IP40
terminals (DIN EN 60529)	IP20
Flammability class	UL94 V-0
Number of opening cycles	max. 10
Documentation number	D00452

Dimension diagram

conductors

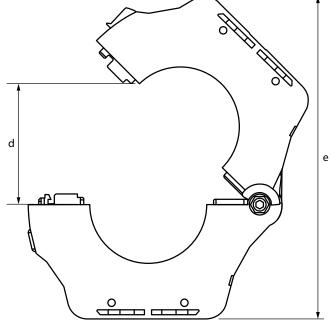
flexible Stripping length Tightening torque For UL applications





0.5 Nm (4.43lb-in)

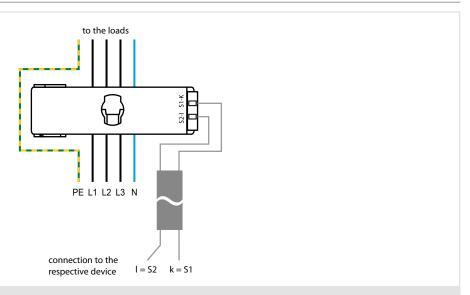
copper or copper-clad aluminium



Dimensions (mm)					Weight in g		
Туре	a	b	С	d	e	f	(gross)
CTAS50	133	ø 50	29	77	175	116	425
CTAS50/01	133	ø 50	29	77	175	116	460
CTAS80	177	ø 80	29	108	235	156	875
CTAS80/01	177	ø 80	29	108	235	156	950
CTAS120	225	ø 120	50	150	303	205	1500
CTAS120/01	225	ø 120	50	150	303	205	1550

Tolerance: ±0.5 mm





CTAS... measuring current transformers

Connection to residual current monitoring systems of the RCMS series, residual current monitors of the RCM series or insulation fault location systems of the EDS series

CTAS.../01 measuring current transformers

Connection to an insulation fault locator EDS441

LINETRAXX® CTBS25

Split-core AC/DC sensitive measuring current transformer

Device features



Typical applications

- For residual current monitoring systems (RCMS)
- For insulation fault locators (EDS)

Approvals

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)

· Split-core measuring current transformer for easy retrofitting without disconnecting the primary conductors

• IEC 61557-9 in combination with an insulation fault locator (EDS440)

• 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

Further information

• Supply voltage DC 24 V

Standards

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



Ordering information

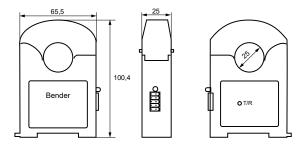
Туре	Supply voltage U _s	Art. No.
CTBS25	DC 24 V	B98120060

Technical data

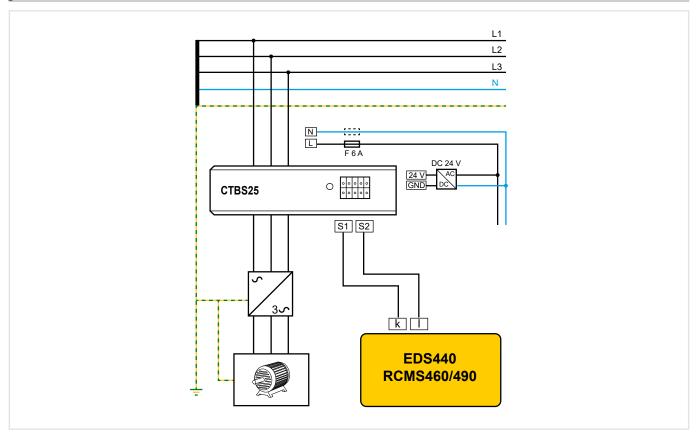
Values only apply to closed measuring of	urrent transformer
Insulation coordination acc. to IEC	
Definitions	1/1EC 00004-3
Measuring circuit (IC1)	Primary conductors routed through the current transforme
Secondary (IC2)	Terminal block 1 (24 V, GND, S1, S2
Rated voltage	300
Overvoltage category	
Operating 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 $U_{\rm S}$	±5 %
Ripple U _s	≤ 2 %
Inrush current	10 A for 25 μ
Power consumption	≤ 0.25 W typ. (2.5 W max.
Measuring circuit	
Measuring current transformer, interna	diameter 25 mm
Characteristics according to IEC 62020 a	nd IEC/TR 60755 AC/DC sensitive, type
Frequency bandwidth	DC 100 kH
Measuring range $I_{\Delta n}$	
DC/AC (< 100 kHz)	10500 m
Rated current In	100 /
Rated continuous thermal current I _{cth}	68 /
Operating uncertainty	±1 % ± 1 m/
Cable length between (S1, S2) and (k, I)	10 n
Displays	
Multicolour LED	red, gree

EMC IEC 62020:1998+A1:2003 Operating temperature -2575 °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 60721-3-3) 3M11 Transport (IEC 60721-3-3) 3M11 Transport (IEC 60721-3-3) 1M12 Terminal block 1, reverse polarity protection Required terminals are included in the scope of delivery. The connection conditions of the manufacturer apply. Manufacturer Phoenix Contact Type PCB plug-in connector - DFMC 0.5/ 5-5T-2.54 Connection properties	Environment/EMC	
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 60721-3-3) 3M11 Transport (IEC 60721-3-3) 1M12 Terminal block 1, reverse polarity protection Required terminals are included in the scope of delivery. The connection conditions of the manufacturer apply. Manufacturer Phoenix Contact Type PCB plug-in connector - DFMC 0.5/5-5T-2.54 Connection properties rigid 0.140.5 mm² (AWG 26-20) flexible 0.140.5 mm² (AWG 26-20) with ferrule 0.250.34 mm² (AWG 24-22) Other Operating mode continuous operation Mounting any position Degree of protection (DIN EN 60529) IP30 Flammability class UL94 V-0 Documentation number	EMC	IEC 62020:1998+A1:2003
(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 Terminal block 1, reverse polarity protection Required terminals are included in the scope of delivery. The connection conditions of the manufacturer apply. Manufacturer Phoenix Contact Type PCB plug-in connector - DFMC 0.5/5-ST-2.54 Connection properties rigid 0.140.5 mm² (AWG 26-20) flexible 0.140.5 mm² (AWG 26-20) with ferrule 0.250.34 mm² (AWG 24-22) Other Operating mode continuous operation Mounting any position Degree of protection (DIN EN 60529) IP30 Flammability class UL94 V-0 Documentation number	Operating temperature	-2575 ℃
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 Terminal block 1, reverse polarity protection Required terminals are included in the scope of delivery. The connection conditions of the manufacturer apply. Manufacturer Phoenix Contact Type PCB plug-in connector - DFMC 0.5/5-ST-2.54 Connection properties rigid 0.140.5 mm² (AWG 26-20) flexible 0.140.5 mm² (AWG 26-20) with ferrule 0.250.34 mm² (AWG 24-22) Other Operating mode continuous operation Mounting any position Degree of protection (DIN EN 60529) IP30 Flammability class UL94 V-0 Documentation number 500388	Classification of climatic conditions acc. to IEC 60	0721
Iransport (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 Terminal block 1, reverse polarity protection Required terminals are included in the scope of delivery. The connection conditions of the manufacturer apply. Manufacturer Phoenix Contact Type PCB plug-in connector - DFMC 0.5/5-ST-2.54 Connection properties rigid 0.140.5 mm² (AWG 26-20) flexible 0.140.5 mm² (AWG 26-20) with ferrule 0.250.34 mm² (AWG 24-22) Other Operating mode continuous operation Mounting any position Degree of protection (DIN EN 60529) IP30 Flammability class UL94 V-0 Documentation number	(except condensation and formation of ice)	
Classification of mechanical conditions acc. to IEC 60721 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 Terminal block 1, reverse polarity protection	Stationary use (IEC 60721-3-3)	3K23
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) Terminal block 1, reverse polarity protection Required terminals are included in the scope of delivery. The connection conditions of the manufacturer apply. Manufacturer Phoenix Contact Type PCB plug-in connector - DFMC 0.5/5-ST-2.54 Connection properties rigid 0.140.5 mm² (AWG 26-20) flexible 0.140.5 mm² (AWG 26-20) with ferrule 0.250.34 mm² (AWG 24-22) Other Operating mode continuous operation Mounting any position Degree of protection (DIN EN 60529) Flammability class UL94 V-0 Documentation number	Transport (IEC 60721-3-2)	2K11
Stationary use (IEC 60721-3-3) 3M11 Transport (IEC 60721-3-2) 2M4 Long-term storage (IEC 60721-3-1) 1M12 Terminal block 1, reverse polarity protection Required terminals are included in the scope of delivery. The connection conditions of the manufacturer apply. Manufacturer Phoenix Contact Type PCB plug-in connector - DFMC 0.5/5-ST-2.54 Connection properties rigid 0.140.5 mm² (AWG 26-20) flexible 0.140.5 mm² (AWG 26-20) with ferrule 0.250.34 mm² (AWG 24-22) Other Operating mode continuous operation Mounting any position Degree of protection (DIN EN 60529) IP30 Flammability class UL94 V-0 Documentation number 500388	Long-term storage (IEC 60721-3-1)	1K22
Iransport (IEC 60721-3-2)2M4Long-term storage (IEC 60721-3-1)1M12Terminal block 1, reverse polarity protectionRequired terminals are included in the scope of delivery.The connection conditions of the manufacturer apply.ManufacturerPhoenix ContactTypePCB plug-in connector - DFMC 0.5/ 5-ST-2.54Connection propertiesrigid0.140.5 mm² (AWG 26-20)flexible0.140.5 mm² (AWG 26-20)with ferrule0.250.34 mm² (AWG 24-22)OtherOperating modecontinuous operationMountingany positionDegree of protection (DIN EN 60529)IP30Flammability classUL94 V-0Documentation numberD00388	Classification of mechanical conditions acc. to IE	C 60721
Long-term storage (IEC 60721-3-1) 1M12 Terminal block 1, reverse polarity protection Required terminals are included in the scope of delivery. The connection conditions of the manufacturer apply. Manufacturer Phoenix Contact Type PCB plug-in connector - DFMC 0.5/ 5-ST-2.54 Connection properties rigid 0.140.5 mm² (AWG 26-20) flexible 0.140.5 mm² (AWG 26-20) and (AWG 26-20) With ferrule 0.250.34 mm² (AWG 24-22) Other Operating mode continuous operation Mounting any position Degree of protection (DIN EN 60529) IP30 Flammability class UL94 V-0 Documentation number D00388	Stationary use (IEC 60721-3-3)	3M11
Terminal block 1, reverse polarity protection Required terminals are included in the scope of delivery. The connection conditions of the manufacturer apply. Manufacturer Phoenix Contact Type PCB plug-in connector - DFMC 0.5/ 5-ST-2.54 Connection properties rigid 0.140.5 mm² (AWG 26-20) flexible 0.140.5 mm² (AWG 26-20) with ferrule 0.250.34 mm² (AWG 24-22) Other Operating mode continuous operation Mounting any position Degree of protection (DIN EN 60529) IP30 Flammability class UL94 V-0 Documentation number 500388	Transport (IEC 60721-3-2)	2M4
Required terminals are included in the scope of delivery. The connection conditions of the manufacturer apply. Manufacturer Phoenix Contact Type PCB plug-in connector - DFMC 0.5/ 5-ST-2.54 Connection properties rigid 0.140.5 mm² (AWG 26-20) flexible 0.140.5 mm² (AWG 26-20) with ferrule 0.250.34 mm² (AWG 24-22) Other Operating mode continuous operation Mounting any position Degree of protection (DIN EN 60529) IP30 Flammability class UL94 V-0 Documentation number 500388	Long-term storage (IEC 60721-3-1)	1M12
The connection conditions of the manufacturer apply. Manufacturer Phoenix Contact Type PCB plug-in connector - DFMC 0.5/ 5-ST-2.54 Connection properties rigid 0.140.5 mm² (AWG 26-20) flexible 0.140.5 mm² (AWG 26-20) with ferrule 0.250.34 mm² (AWG 24-22) Other Operating mode continuous operation Mounting any position Degree of protection (DIN EN 60529) IP30 Flammability class UL94 V-0 Documentation number 500388	Terminal block 1, reverse polarity protection	
Manufacturer Phoenix Contact Type PCB plug-in connector - DFMC 0.5/ 5-ST-2.54 Connection properties rigid 0.140.5 mm² (AWG 26-20) flexible 0.140.5 mm² (AWG 26-20) with ferrule 0.250.34 mm² (AWG 24-22) Other Operating mode continuous operation Mounting any position Degree of protection (DIN EN 60529) IP30 Flammability class UL94 V-0 Documentation number D00388	Required terminals are included in the scope of delivery.	
Type PCB plug-in connector - DFMC 0.5/ 5-ST-2.54 Connection properties rigid 0.140.5 mm² (AWG 26-20) flexible 0.140.5 mm² (AWG 26-20) with ferrule 0.250.34 mm² (AWG 24-22) Other Operating mode continuous operation Mounting any position Degree of protection (DIN EN 60529) IP30 Flammability class UL94 V-0 Documentation number D00388	The connection conditions of the manufacturer apply.	
Connection properties rigid 0.140.5 mm² (AWG 26-20) flexible 0.140.5 mm² (AWG 26-20) with ferrule 0.250.34 mm² (AWG 24-22) Other Operating mode continuous operation Mounting any position Degree of protection (DIN EN 60529) IP30 Flammability class UL94 V-0 Documentation number 000388	Manufacturer	Phoenix Contact
rigid 0.140.5 mm² (AWG 26-20) flexible 0.140.5 mm² (AWG 26-20) with ferrule 0.250.34 mm² (AWG 24-22) Other Operating mode continuous operation Mounting any position Degree of protection (DIN EN 60529) IP30 Flammability class UL94 V-0 Documentation number 000388	Туре	PCB plug-in connector - DFMC 0.5/ 5-ST-2.54
flexible 0.140.5 mm² (AWG 26-20) with ferrule 0.250.34 mm² (AWG 24-22) Other Operating mode continuous operation Mounting any position Degree of protection (DIN EN 60529) IP30 Flammability class UL94 V-0 Documentation number 000388	Connection properties	
with ferrule0.250.34 mm² (AWG 24-22)OtherOperating modecontinuous operationMountingany positionDegree of protection (DIN EN 60529)IP30Flammability classUL94 V-0Documentation numberD00388	3	, ,
OtherOperating modecontinuous operationMountingany positionDegree of protection (DIN EN 60529)IP30Flammability classUL94 V-0Documentation numberD00388	flexible	, ,
Operating modecontinuous operationMountingany positionDegree of protection (DIN EN 60529)IP30Flammability classUL94 V-0Documentation numberD00388	with ferrule	0.250.34 mm ² (AWG 24-22)
Mountingany positionDegree of protection (DIN EN 60529)IP30Flammability classUL94 V-0Documentation numberD00388	Other	
Degree of protection (DIN EN 60529)IP30Flammability classUL94 V-0Documentation numberD00388	Operating mode	continuous operation
Flammability class UL94 V-0 Documentation number D00388	Mounting	any position
Documentation number D00388	Degree of protection (DIN EN 60529)	IP30
	Flammability class	UL94 V-0
Weight \leq 165 g	Documentation number	D00388
	Weight	≤ 165 g

Dimension diagrams (dimensions in mm)



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

Туре	Internal dimensions	Mounting	Art. No.
WS20x30	20 x 30 mm		B98080601
WS20x30-8000 ¹⁾	20 X 30 MM		B98080602
WS50x80	F000	Mounting brackets	B98080603
WS50x80-8000 ¹⁾	50 x 80 mm		B98080604
WS80x120	80 x 120 mm		B98080606

¹⁾ For EDS461/491 and EDS473/474 insulation fault locators

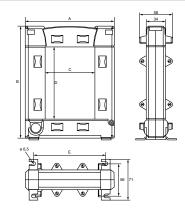
Selection list

Туре	RCM420	RCMS460 RCMS490	EDS440	EDS441	EDS441-LAB
WS20x30	~	~	~	-	-
WS50x80	~	~	~	-	-
WS80x120	~	~	~	-	-
WS20x30-8000	-	-	-	~	~
WS50x80-8000	_	_	-	~	~

Rated insulation voltage	800 V
Rated impulse voltage/pollution degree	8 kV/3
CT circuit WS	
Rated primary residual current	10 A
Rated secondary residual current	0.0167 A
Rated transformation ratio K_{n}	10/0.0167 A
Rated burden	max. 180 Ω
Nominal power	0.05 VA
Frequency range	42 Hz3 kHz
Rated continuous thermal current I _{cth}	40 A
Rated short-time thermal current Ith	$60 \text{ x } I_{\text{cth}} = 2.4 \text{ kA/1 s}$
Rated dynamic current I _{dyn}	$2.5 \text{ x } I_{\text{th}} = 6.0 \text{ kA/40 ms}$
CT circuit WS8000	
Rated primary residual current	1 A
Rated secondary residual current	0.125 mA
Rated transformation ratio K _n	1 A/0.125 mA
Frequency range	42 Hz3 kHz
Rated continuous thermal current Icth	6 A
Rated short-time thermal current Ith	$60 \text{ x } /_{\text{cth}} = 0.36 \text{ kA} / 1 \text{ s}$
Rated dynamic current I _{dyn}	$2.5 \text{ x } I_{th} = 0.9 \text{ kA/40 ms}$

Operating temperature	-25+70°C
Classification of climatic conditions acc. to IEC 60721 (except	condensation and formation of ice)
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K12
Long-time storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions IEC 60721	
Stationary use (IEC 60721-3-3)	3M1°
Transport (IEC 60721-3-2)	2M ²
Long-time storage (IEC 60721-3-1)	1M12
Connection	
Connection	screw-type terminal:
Connection	
rigid/flexible/conductor sizes	0.082.5 mm ² (AWG 28-12)
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 $\geq 0.5 \text{ mm}^2$	040 m
Shielded cable (shield on one side connected to L-conductor, not conn	ected to earth)
	recommended: J-Y(St)Y min. 2x0.8
Other	
Degree of protection, internal components (DIN EN 60529)	IP40

Dimension diagram



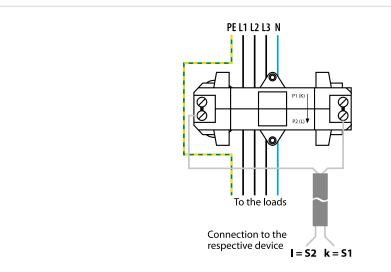
	Weight					
Туре	A	В	C	D	E	Weight
WS20x30	93	106.15	23	33	64	≤ 600 g
WS50x80	125	158.15	55	85	96	≤ 1040 g
WS80x120	155	198.15	85	125	126	≤ 1400 g
WS20x30-8000	93	106.15	33	33	64	≤ 630 g
WS50x80-8000	125	158.15	85	85	96	≤ 1080 g

Degree of protection, terminals (DIN EN 60529)

Screw mounting

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

IP20

D00077

M5 with mounting brackets

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)
- \bullet 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

CERE EN SAL PRESIDENT



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

Ordering information

Туре	Internal dimensions		Approvals		Art. No.	
туре	internal uninensions	UL	EAC	LR	ALC. NO.	
WS50x80S	50 x 80 mm	~	~	~	B911741	
WS80x80S	80 x 80 mm	~	~	~	B911742	
WS80x120S	80 x 120 mm	~	~	~	B911743	
WS80x160S	80 x 160 mm	-	~	~	B911755	

Technical data

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°C
Storage temperature range	-40+70°C
Climatic class acc. to DIN IEC 60721-3-3	3K22

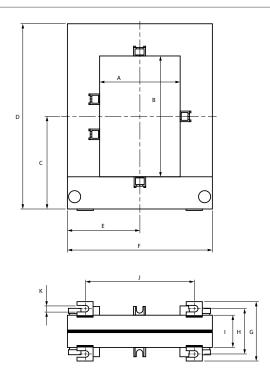
Connection	screw-type terminals
Connection	
rigid/flexible	0.24/0.22.5 mm ²
flexible with ferrules with/without plastic sleeve	0.252.5 mm ²
Conductor sizes	AWG 24-12
Connection to the evaluator	
single wire $\geq 0.75 \text{ mm}^2$	01 m

single wire, twisted $\geq 0.75 \text{ mm}^2$ 0...10 m $0...40\,m$ shielded cable $\geq 0.6 \text{ mm}^2$ Shielded cable (shield on one side connected to PE) recommended: J-Y(St)Y min. 2 x 0.6

0ther

Connection

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	D00145



Dimensions (mm)								Weight				
Type	A	В	C	D	E	F	G	Н	I	J	K	
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

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.

Approvals



Ordering information

Туре	Supply voltage <i>U</i> s ¹⁾	Length A measuring current transformer	Art. No.
WF170-1	AC 1672 V, 42460 Hz / DC 9.694 V	170 mm	B78080201
WF170-2	AC 70300 V, 42460 Hz / DC 70300 V	170 111111	B78080202
WF250-1	AC 1672 V, 42460 Hz / DC 9.694 V	250	B78080203
WF250-2	AC 70300 V, 42460 Hz / DC 70300 V	250 mm	B78080204
WF500-1	AC 1672 V, 42460 Hz / DC 9.694 V	F00	B78080205
WF500-2	AC 70300 V, 42460 Hz / DC 70300 V	500 mm	B78080206
WF800-1	AC 1672 V, 42460 Hz / DC 9.694 V	000	B78080207
WF800-2	AC 70300 V, 42460 Hz / DC 70300 V	800 mm	B78080208
WF1200-1	AC 1672 V, 42460 Hz / DC 9.694 V	1200	B78080209
WF1200-2	AC 42460 Hz, 70300 V / DC 70300 V	1200 mm	B78080210
WF1800-1	AC 1672 V, 42460 Hz / DC 9.694 V	1000	B78080221
WF1800-2	AC 42460 Hz, 70300 V / DC 70300 V	1800 mm	B78080222

¹⁾ Absolute values

Accessories

Description	Туре	Art. No.
Mounting clip for screw mounting (1 piece per device)	XM420 (RCC420)	B98060008

Technical data

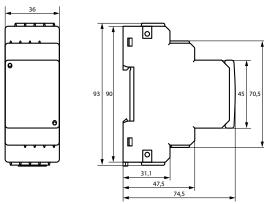
Electrical safety	
Standard: RCC420	IEC 61010-2-030: 2004-05-01
Pollution degree	3
Rated insulation voltage	250 V
Standard: WF	IEC 61010-1 and IEC 61010-2-032 CAT III
Pollution degree	2
Rated insulation voltage (CAT III)	1000 V _{rms} or DC
Supply voltage	
Supply voltage $U_{\rm S}$	see ordering information
Power consumption	≤ 3 VA
Measuring circuit	
Measuring range	100 mA20 A
Rated transformation ratio	Kn (U -I): 100 mV/A, KN (k -I): 1.67 mA/A
Rated burden (signal output k, l)	68 Ω
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 ℃
Classification of climatic conditions acc. to IEC 60	721 (except condensation and formation of ice)
Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11
Long-time storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions acc. to I	EC 60721
Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M4
Long-time storage (IEC 60721-3-1)	1M12

Connection RCC420		
Connection type		push-wire termina
Connection properties		
rigid		2.5 mm² (AWG 24-14)
flexible without ferrule		2.5 mm² (AWG 19-14)
flexible with ferrule	0.2	1.5 mm² (AWG 24-16)
Stripping length		10 mm
Opening force		50 N
Test opening, diameter		2.1 mm
Connection measuring current transformer WF		PS/2 plug
Cable length WF		2 m
Cable lengths RCMS-RCC420		
Single wire ≥ 0.75 mm²		01 m
Single wire, twisted ≥ 0.75 mm ²		010 m
Shielded cable $\geq 0.5 \text{ mm}^2$		040 m
Shielded cable (shield to terminal I, not connected to earth)	recommende	d: J-Y(St)Y min. 2x0.8
Other		
Operating mode		continuous operation
Mounting		any position
Degree of protection, internal components (IEC 60529)		IP30
Degree of protection, terminals (IEC 60529)		IP30
Enclosure material RCC420		polycarbonate
Screw mounting	2 x N	14 with mounting clip
DIN rail mounting acc. to		IEC 60715
Flammability class		UL94V-0
Documentation number		D00072
Weight		RCC 420 \leq 160 g
	WF170 ≤ 160 g	WF800 ≤ 230 g
	WF250 ≤ 180 g	WF1200 ≤ 310 g
	WF500 ≤ 200 q	WF1800 ≤ 430g

Note: The measuring current transformer is adapted to the associated signal converter RCC420.

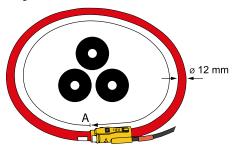
Dimension diagrams (dimensions in mm)

XM420 (RCC420)



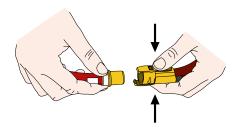
WF... measuring current transformers

 ${\sf A}={\sf For}$ details about the length of the measuring current transformer refer to ordering information.

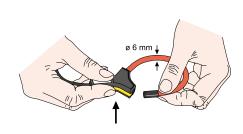


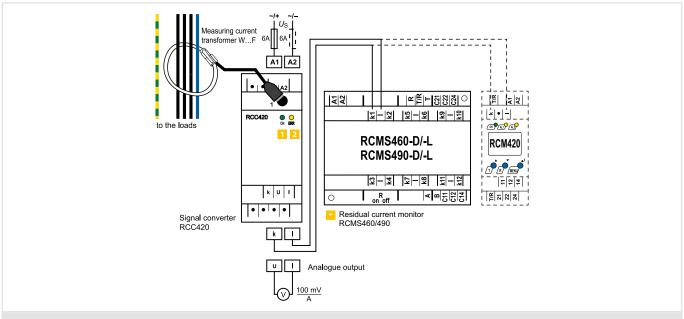
Dimension diagrams (dimensions in mm)

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.

- 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".





• Extension of the nominal voltage range for the ISOMETER®s iso685... series to AC 0...1150 V, DC 0...1760 V

Standards

The AGH150W(-4) complies with the requirements of

- DIN EN 45545-2.
- DIN EN 50155.

Approvals





AGH150W-4



Further information

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

Ordering information

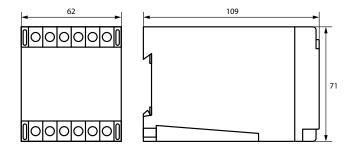
Туре	Nominal system voltage <i>U</i> s	Art. No.
AGH150W	AC 01150 V / DC 01100 V	B915576
AGH150W-4	AC 01150 V / DC 01760 V	B98018006

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	2
AGH150W-4	
Rated insulation voltage	AC 1600 V
Voltage test acc. to IEC 60255	17 kV
Pollution degree	2
Voltage test acc. to DIN EN 61800-5-1 (VDE 016	0-105-1)
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 $U_{\rm n}$	AC 01150 V, DC 01100 V
Frequency range of $U_{n \text{ (sinus)}}$	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 $U_{\rm n}$	AC 01150 V, DC 01760 V
	DC 01600 V (for UL applications)
Frequency range of Un (sinus)	DC 1460 Hz
Overvoltage category	CAT III
Rated impulse voltage	≥11 kV
Internal DC resistance R _i	≥160 kΩ
Tolerance of internal DC resistance Ri	±4 kΩ*

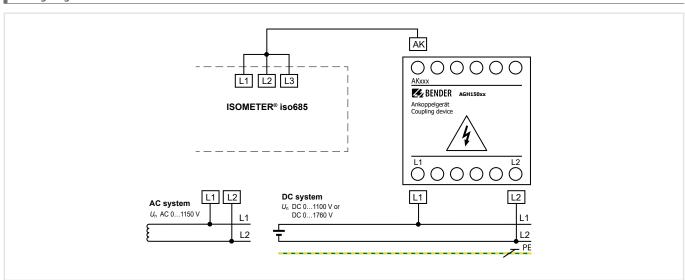
Class of extended operating temperature at switch-on	Class ST1
Operating altitude	≤ 2000 m AMSL
Ambient temperatures	
Operation	-10+55 ℃
Storage	-40+70°C
Classification of climatic conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3K22 (max. 98 % humidity)
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	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	\leq 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
et Life I	UL94 V-0
Flammability class	027110
Flammability class 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)



Wiring diagram







• 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

Туре	Nominal system voltage <i>U</i> _S	Art. No.
AGH204S-4	AC 01650 V/01300 V	B914013

-10...+55 °C

Technical data

Rated insulation voltage	AC 1500 V
Rated impulse voltage	≥10.4 kV
Overvoltage category	III
Voltage test acc. to DIN EN 61800-5-1 (VDE 0160-105-1)	
Impulse voltage test (basic insulation)	≥ AC 10.4 kV
AC voltage test (basic insulation)	≥ AC 5 kV
Partial discharge test	≥ 3 kV
Voltage ranges	
Nominal system voltage U_n (including DC components)	01300 V
Nominal system voltage U_n (AC only)	01650 V
Nominal system voltage U_n for UL applications	01500 V
Frequency range of Un	DC 1440 Hz
Internal DC resistance R _i coupling to AK80	80 kΩ
Internal DC resistance R _i coupling to AK160	160 kΩ

Storage	-40+/U C
Classification of climatic conditions acc. to IEC 60721	3K22
Shock resistance	
Operation (IEC 60068-2-27)	15 g / 11 ms
Transport (IEC 60068-2-29)	40 g / 6 ms
Vibration resistance acc to IEC 60068-2-6	
Operation	1 g / 10150 Hz
Transport	2 g / 10150 Hz

Connection

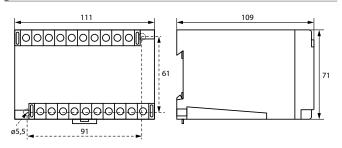
Ambient temperature

Operation

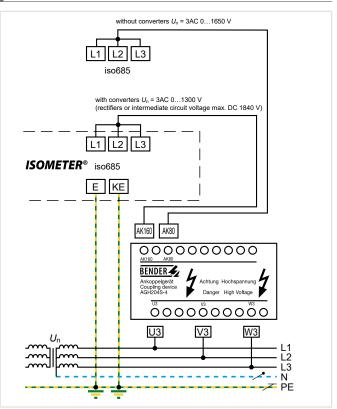
Connection	screw-type terminals
Connection properties rigid/flexible	0.24 mm ² /0.22.5 mm ²
Tightening torque	0.5 Nm
Conductor sizes	AWG 24-12
Length of the connecting lead (ISOMETER® to AGH)	≤ 0.5 m

Other	
Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (DIN EN 60529)	IP30
Degree of protection, terminals (DIN EN 60529)	IP20
Type of enclosure	X112, free from halogen
Screw mounting	2 x M4
DIN rail mounting	IEC 60715
Flammability class	UL94 V-0
Documentation number	D00094
Weight	≤ 1350 g

Dimension diagram (dimensions in mm)



Wiring diagram





• 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

Туре	Nominal system voltage <i>U</i> ₅	Art. No.
AGH520S	3(N)AC 07200 V	B913033

Technical data

AC 6.3 kV
AC 35 kV
II
AC 17.5 kV
12 kV
07.2 kV
06,0 kV
DC 50400 Hz
DC 30 4 00 Hz
≥ 80 kΩ

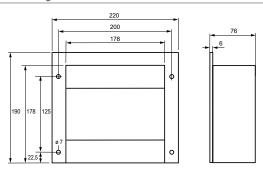
Ambient temperatures	
Operation	-10+55 °C
Operation UL-Applications	-10+45 °C
Storage	-40+70 °C
Classification of climatic conditions acc. to IEC 60721	3K22
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3	3M11
Transport (IEC 60721-3-2)	2M4
Storage (IEC 60721-3-1)	1M12

Connection

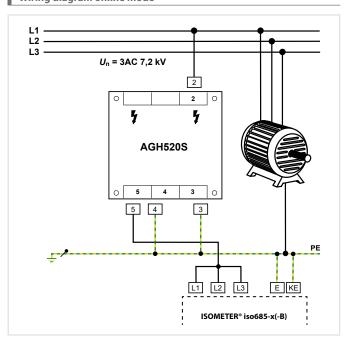
Connection terminal 2 (medium voltage)	dium voltage) screw-type termina			
Connection terminals 3-5	screw-type terminals			
Connection properties				
rigid/flexible	$0.24 \text{ mm}^2 / 0.22.5 \text{ mm}^2$			
AWG	24-12			
Tightening torque	2.9 Nm			

General 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 in housing
Screw mounting	4 x M5
Flammability class	UL94 V-HB
Documentation number	D00073
Weight	4500 g

Dimension diagram (dimensions in mm)



Wiring diagram online mode







• Extension of the nominal voltage range to AC/DC 0...15.5 kV for the ISOMETER® IRDH275BM-7

Approvals

Further information

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

Ordering information

Туре	Type Nominal system voltage <i>U</i> _n Cable length			
AGH675S-7-500	AC/DC0 7.214/ 0 4C0 H-	500 mm	B913060	
AGH675S-7-2000	AC/DC 07.2 kV, 0460 Hz	2000 mm	B913061	
AGH675S-7-MV15-500	AC/DC 0 15.5 kV, 0460 Hz	500 mm	B913058	

Environment/EMC

Type of enclosure

Screw mounting

Weight

Flammability class

Documentation number

Technical data

Insulation coordination acc. to DIN EN 61800-5-1 (VDE 0160-105-1)
AGH675S-7	
Rated insulation voltage	AC 7.2 kV
AGH675S-7MV15	
Rated insulation voltage	AC 15.5 kV
Voltage test according to DIN EN 61800-5-1 (VDE 0	160-105-1)
AGH675S-7	
AC voltage test (basic insulation)	≥ AC 40 kV
AC voltage test (basic insulation)	≥ AC 20 kV
Partial discharge test	≥ 14 kV
AGH675S-7MV15	
Impulse voltage test (basic insulation)	≥ AC 111 k\
AC voltage test (basic insulation)	≥ AC 70 kV
Partial discharge test	≥ 29 kV
Voltage ranges	
AGH675S-7	
Nominal system voltage U _n	AC, 3(N)AC, DC 07.2 kV
Nominal frequency f _n	0460 Hz
Frequency range of U_n (sinus)	DC 1460 Hz
Internal DC resistance R _i	≥ 2.39 MΩ
AGH675S-7MV15	
Nominal system voltage U _n	AC, 3(N)AC, DC 015.5 kV
Nominal frequency f_n	0460 Hz
Frequency range of U_n (sinus)	DC 1460 Hz
Internal DC resistance R _i	≥ 4.7 MΩ

Ambient temperature	
Operation	-10+55 °C
Storage	-40+70°C
Classification of climatic conditions acc. to II	EC 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. 1	to IEC 60721:
Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12
Connection	
Connection terminal 2 (medium voltage)	high-voltage cable (encapsulated on the device side)
Connection, flexible with ring eyelet	M4
Connection type terminals 3, 4, 5	screw-type terminals
Connection rigid/flexible	0.24 mm ² /0.22.5 mm ²
Tightening torque	0.5 Nm
Other	
Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (DIN E	N 60529) IP64
Degree of protection, terminals (DIN EN 60529)	IP20

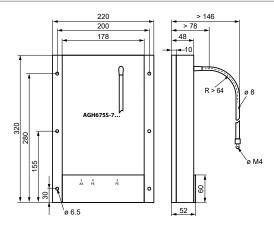
resin-encapsulated block

 $6 \times M5$

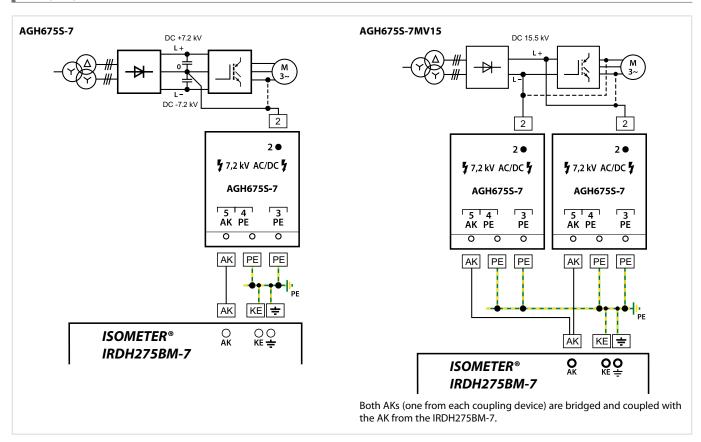
D00095

≤ 5100 g

UL94 V-HB



Wiring diagram



Coupling device



Typical applications

• Extension of the nominal voltage range to AC, 3(N)AC 0...12 kV, 50...460 Hz for the ISOMETER*s iso685... series and IR420-D64

Approvals



Further information

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

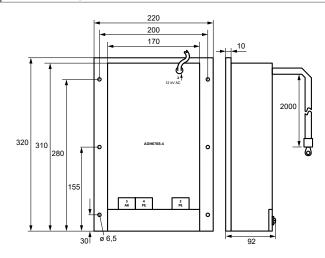
Ordering information

Туре	Nominal system voltage <i>U</i> s	Cable length	Art. No.	
AGH676S-4	AC, 3(N)AC 012 kV, 50460 Hz	2000 mm	B913055	

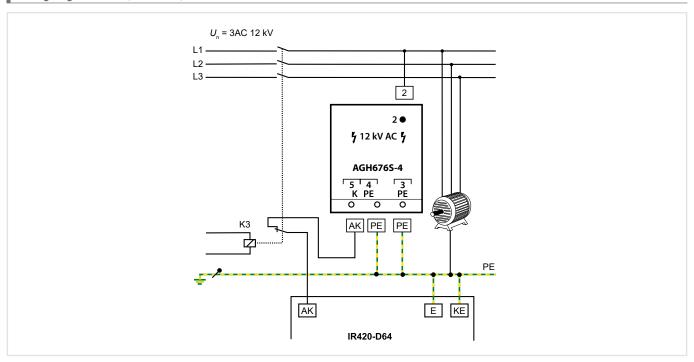
Technical data

Rated insulation voltage	AC 12 kV
Voltage test acc. to IEC 61800-5-1	
Type test	
Voltage impulse test	≥ AC 75 kV
AC voltage test	≥ AC 45 kV
Partial discharge test	≥ 16.5 kVefl
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)	15 g/11 ms
Bumping IEC 60068-2-29 (during transport)	40 g/6 ms
Vibration resistance IEC 60068-2-6 (during operation)	1 g / 10150 Hz
Vibration resistance IEC 60068-2-6 (during transport)	2 g / 10150 Hz
Ambient temperature, during operation	-10+55 ℃
Storage temperature range	-40+70 °C
Climatic class acc. to IEC 60721-3-3	3K22

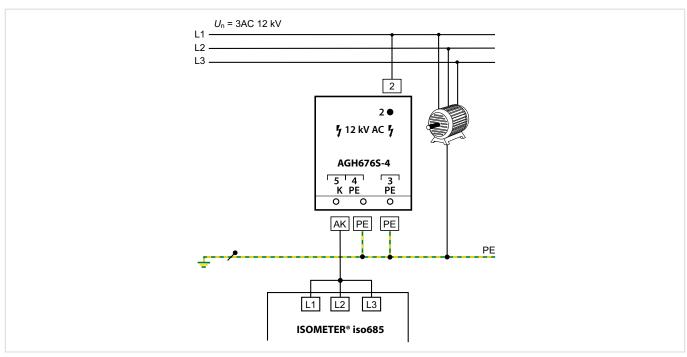
Connection medium voltage	high-voltage cable (encapsulated on the device side)
Connection, flexible with ring terminal	M8
Connection terminals 3, 4, 5	screw terminals
Connection properties	
rigid/flexible	0.24 mm ² /0.22.5 mm ²
Other	
Operating mode	continuous operation
Position	any position
Degree of protection, internal components (DIN	EN 60529) IP64
Degree of protection, terminals (DIN EN 60529)	IP20
Type of enclosure	resin-encapsulated block
Screw fixing	M5
Flammability class	UL94 HB
Documentation number	D00096
Weight	≤ 8400 g



Wiring diagram offline (IR420-D64)



Wiring diagram online (iso685)



Isolating transformer ES710

Single-phase isolating transformers for the design of medical IT systems







Typical applications

• For IT systems in medical locations

Approvals



VDE test mark for all 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 $< 8 \times \hat{I}_n$

Standards

ES710 isolating transformers comply with the device standards and the regulations for installation:

- DIN EN 61558-1 (VDE 570-1)
- IEC 61558-1
- DIN VDE 0100-710 (VDE 0100-710)
- DIN EN 61558-2-15 (VDE 0570-2-15)
- IEC 61558-2-15
- IEC 60364-7-710

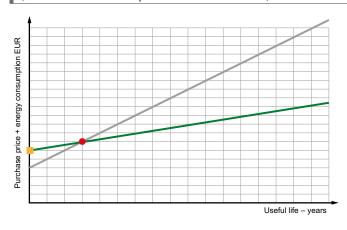
Further information

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

Туре	ES710/3150	ES710/4000	ES710/5000	ES710/6300	ES710/8000	ES710/10000
Power/voltages/currents						
Rated power	3150 VA	4000 VA	5000 VA	6300 VA	8000 VA	10000 VA
Rated frequency	5060 Hz	5060 Hz	5060 Hz	5060 Hz	5060 Hz	5060 Hz
Rated input voltage	AC 230 V	AC 230 V	AC 230 V	AC 230 V	AC 230 V	AC 230 V
Rated input current	14.2 A	18 A	22.5 A	28.5 A	36 A	45.3 A
Rated output voltage	AC 230/115 V	AC 230/115 V	AC 230/115 V	AC 230/115 V	AC 230/115 V	AC 230/115 V
Rated output current	13.7 A	17.4 A	21.7 A	27.4 A	34.7 A	43.5 A
Inrush current /E	< 12 x Î _n	< 12 x Î _n	$< 12 x \hat{I}_n$	< 12 x Î _n	$< 12 x \hat{I}_n$	< 12 x Î _n
Inrush current /E GL version	< 8 x Î _n	< 8 x Î _n	< 8 x Î _n	< 8 x Î _n	< 8 x Î _n	< 8 x Î _n
Leakage current	≤ 0.5 mA	≤ 0.5 mA	≤ 0.5 mA	≤ 0.5 mA	≤ 0.5 mA	≤ 0.5 mA
No-load input current i 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 <i>U</i> _k	≤ 3 %	≤ 3 %	≤ 3 %	≤ 3 %	≤ 3 %	≤ 3 %
Environmental conditions						
Ambient temperature	≤ 40 °C	≤ 40 °C	≤ 40 °C	≤ 40 °C	≤ 40 °C	≤ 40 °C
No-load temperature rise	≤ 20 °C	≤ 23 °C	≤ 26 °C	≤ 23 °C	≤ 35 °C	≤ 37 °C
Full-load temperature rise	≤ 69 °C	≤ 48 °C	≤ 62 °C	≤ 65 °C	≤ 70 °C	≤ 70 °C
Noise level (under no-load conditions and nominal load)	≤ 35 dB(A)	≤ 35 dB(A)	≤ 35 dB(A)	\leq 35 dB(A)	≤ 35 dB(A)	≤ 35 dB(A)
Other						
Insulation classification	t _a 40/B	t _a 40/B	t _a 40/B	<i>ta</i> 40/B	t _a 40/B	t _a 40/B
Degree of protection	IP00	IP00	IP00	IP00	IP00	IP00
Protection class	I/II*	I/II*	I/II*	I/II*	I/II*	I/II*
Core U/I	180/93	210/63	210/73	210/88	210/103	240/83
Core U/I GL version	180/93	210/63	210/73	210/88	210/103	210/120
Recommended use when						
used in accordance with DIN VDE 0100-710	25 A gL/gG	35 A gL/gG	50 A gL/gG	50 A gL/gG	63 A gL/gG	80 A gL/gG
Recommended use when used in accordance						
with DIN VDE 0100-710 GL version	25 A gL/gG	25 A gL/gG	35 A gL/gG	50 A gL/gG	50 A gL/gG	63 A gL/gG
Induction	0.86 T	0.94 T	1.00 T	1.05 T	1.05 T	1.05 T
R _{primary} ±5 %	0.255 Ω	0.135 Ω	0.100 Ω	Ω 080.0	0.064 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
leat dissipation loss at 40 $^\circ$ C ambient temperature and	100 % continuous load	d				
Heat dissipation loss	< 165 W	< 160 W	< 202 W	< 265 W	< 320 W	< 380 W
Heat dissipation loss GL version	< 125 W	< 115 W	< 140 W	< 185 W	< 230 W	< 270 W

^{*} Option: completely encapsulated version Energy efficient version GL = Green Line

Green Line transformer (energy efficient version) - High degree of energy saving over the life time (16 years AfA) (German AfA table for depreciation of wear and tear)



This general illustration is based on calculations of the transformer's energy consumption while energy costs remained constant at 13.4 ct/kWh (source: first energy) for 16 years. The wide variety of bandwidths result from the different transformer capacities.

= Deprecation of wear and tear

= Standard version

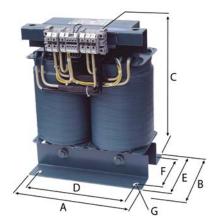
= GL version (Green Line)

= A higher purchase price of approx. 15-20%

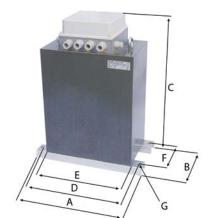
= ROI (Return on Investment) after about 1-3 years

Standard

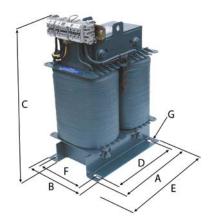
Dimension B is the depth incl. terminals



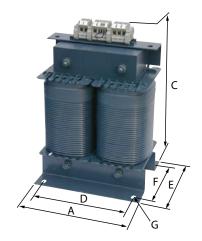
SK2 series



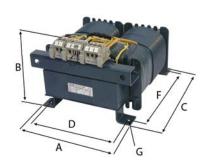
S series Dimension E is the depth incl. terminals



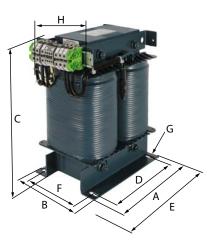
K series



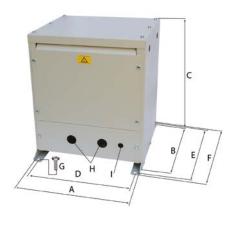
LG series



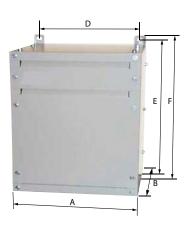
SN-GL series



Enclosure ESDS0107-1



Enclosure ESDS710

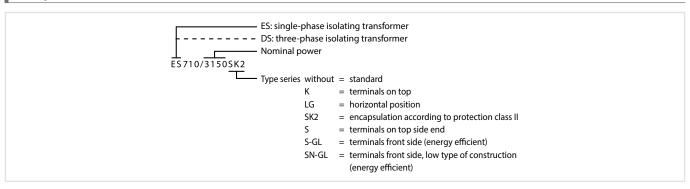


	Dimensions (mm)						Cu weight	Weight	Core	Type	Art. No.	
	A	В	C	D	E	F	G	(kg)	(kg)	U/I	Туре	AI C. NO.
	240	230	325	200	180	145	11 x 28	15	49	180/93	ES710/3150-GL	B92090001
	280	200	370	240	150	115	11 x 28	24	59	210/63	ES710/4000-GL	B92090002
series	280	210	370	240	160	125	11 x 28	25	61	210/73	ES710/5000-GL	B92090003
G. Se	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
П	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
eries	280	160	420	240	290	125	11 x 28	25	61	210/73	ES710/5000S-GL	B92090063
S-GL series	280	175	420	240	290	140	11 x 28	26	65	210/88	ES710/6300S-GL	B92090064
~	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
П	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
ries	280	160	370	240	320	125	11 x 28	25	61	210/73	ES710/5000SN-GL	B92090123
SN-GL series	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
\vdash	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	B924211
힏	280	210	370	240	160	125	11 x 28	25	61	210/03	ES710/5000	B924212
Standard	280	225	370	240	175	140		26	65	210/73	ES710/6300	B924213
اخ∣	280	240	370	240	190	155	11 x 28	27	74		ES710/8300 ES710/8000	B924214 B924215
							11 x 28			210/103		
\vdash	320	260	420	270	200	160	13 x 35	39	85	240/83	ES710/10000	B924216
	240		360	200	180	145	11 x 28	15	49	180/93	ES710/3150K	B924221
ا ي	280		420	240	150	115	11 x 28	24	59	210/63	ES710/4000K	B924222
K series	280		420	240	160	125	11 x 28	25	61	210/73	ES710/5000K	B924223
~	280		420	240	175	140	11 x 28	26	65	210/88	ES710/6300K	B924224
	280		420	240	190	155	11 x 28	27	74	210/103	ES710/8000K	B924225
\vdash	320		480	270	200	160	13 x 35	39	85	240/83	ES710/10000K	B924226
	230	235	320	204		240	9 x 14	15	49	180/93	ES710/3150LG	B924231
ر ا د	260	210	365	234		280	9 x 14	24	59	210/63	ES710/4000LG	B924232
LG series	260	220	365	234		280	9 x 14	25	61	210/73	ES710/5000LG	B924233
ㅂ	260	235	365	234		280	9 x 14	26	65	210/88	ES710/6300LG	B924234
	260	250	365	234		280	9 x 14	27	74	210/103	ES710/8000LG	B924235
\square	294	240	410	264		320	13 x 20	39	85	240/83	ES710/10000LG	B924236
	380	200	450	350	270	150	11 x 16	15	69	180/93	ES710/3150SK2	B924241
ا ي	380	190	500	350	310	150	11 x 16	24	75	210/63	ES710/4000SK2	B924242
SK2 series	380	200	500	350	310	160	11 x 16	25	77	210/73	ES710/5000SK2	B924243
SS	380	215	500	350	310	175	11 x 16	26	86	210/88	ES710/6300SK2	B924244
	380	230	500	350	310	190	11 x 16	27	90	210/103	ES710/8000SK2	B924245
\square	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
ا ي	280	150	420	240	290	115	11 x 28	24	59	210/63	ES710/4000S	B924262
Sseries	280	160	420	240	290	125	11 x 28	25	61	210/73	ES710/5000S	B924263
~	280	175 190	420 420	240	290 290	140 155	11 x 28 11 x 28	26 27	65 74	210/88	ES710/6300S ES710/8000S	B924264 B924265
	320	200	440	270	330	160	13 x 35	39	85	240/83	ES710/10000S	B924266
ш	327			1 3			1 .5 35		1 00	1 2.0,03		1 372.230

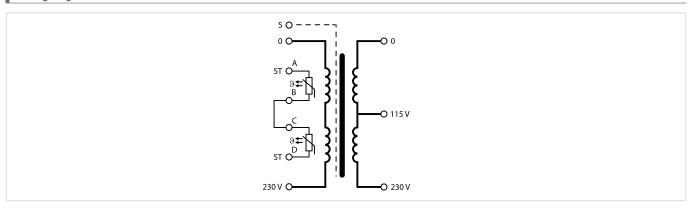
Ordering information enclosure

			Dim	ensions (n	nm)			Weight (kg)	Version	Туре	Art. No.	
A	В	C	D	E	F	G	Н	- 1	neight (ng)	VCISION	Турс	Alta No.
430	380	500	385	420	450	M10	ø 37,5	ø 20,5	16	floor mounting	ESDS0107-1	B924673
350	300		315	550	580				18	hanging mounting	ESDS710	B924741

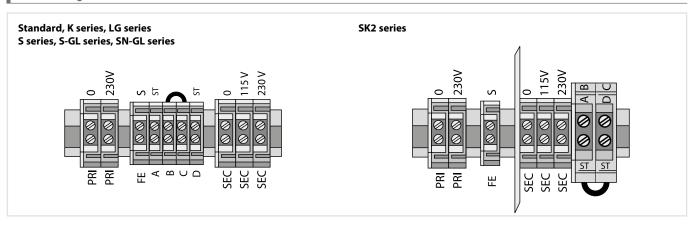
Nameplate



Wiring diagram



Terminal diagram



Connection properties

Туре	Input terminals flexible/rigid	Screen winding flexible/rigid	Control terminals flexible/rigid	Control terminals for protection class II flexible/rigid	Output terminals flexible/rigid
ES710/3150	16/25 mm ²	16/25 mm ²	4/6 mm ²	2.5/4 mm ²	16/25 mm ²
ES710/4000	16/25 mm ²	16/25 mm ²	4/6 mm ²	2.5/4 mm ²	16/25 mm ²
ES710/5000	16/25 mm ²	16/25 mm ²	4/6 mm ²	2.5/4 mm ²	16/25 mm ²
ES710/6300	16/25 mm ²	16/25 mm ²	4/6 mm ²	2.5/4 mm ²	16/25 mm ²
ES710/8000	16/25 mm ²	16/25 mm ²	4/6 mm ²	2.5/4 mm ²	16/25 mm ²
ES710/10000	35/35 mm ²	35/35 mm ²	4/6 mm ²	2.5/4 mm ²	35/35 mm ²

Isolating transformers DS0107

Three-phase isolating transformers for the supply of three-phase loads in medical locations



Typical applications

· For IT systems in medical locations

Approvals



Device features

- Built-in temperature sensors acc. to DIN 44081 (120 °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

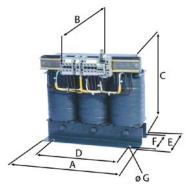
For further information refer to our product range on www.bender.de.

Technical data

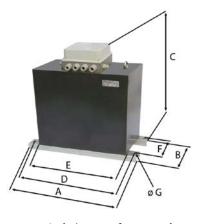
Туре	DS0107/2000	DS0107/3150	DS0107/4000	DS0107/5000	DS0107/6300	DS0107/8000	DS0107/10000
Insulation classification	t _a 40/B						
Degree of protection	IP00						
Protection class	I/II*						
Power/voltages/currents							
Rated power	2000 VA	3150 VA	4000 VA	5000 VA	6300 VA	8000 VA	10000 VA
Rated frequency	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 În	< 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 <i>u</i> 0	≤ 232 V	≤ 235 V	≤ 234 V	≤ 236 V	≤ 236 V	≤ 235 V	≤ 235 V
Short-circuit voltage <i>u</i> _k	≤ 2.9 %	≤ 2.9 %	≤ 2.8 %	≤ 3 %	≤ 2.8 %	≤ 2.8 %	≤ 2.5 %
Environmental conditions							
Ambient temperature	≤ 40 °C						
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)	≤ 35 dB(A)	\leq 35 dB(A)	≤ 35 dB(A)	≤ 35 dB(A)	\leq 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

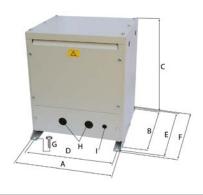
All other dimensions correspond to the standard dimensions.







Isolating transformer enclosure



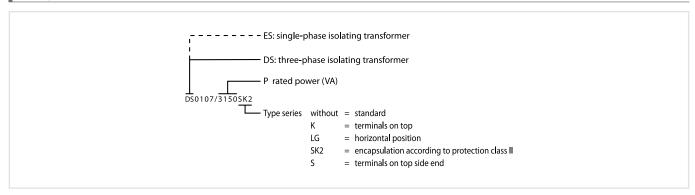
Ordering information

			Di	mensions (m	m)			Cu weight	Weight	Туре	Art. No.
	Α	В	C	D	E	F	G	(kg)	(kg)	Туре	Art. No.
	300	200	270	240	160	130	11	16	34	DS0107/2000	B924694
	360	210	325	310	170	135	11	28	63	DS0107/3150	B924106
Į p	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
155	420	230	370	370	200	160	11	48	97	DS0107/6300	B924107
	420	245	370	370	215	175	11	51	107	DS0107/8000	B924628
	420	260	370	370	230	190	11	59	130	DS0107/10000	B924672
	300	-	310	240	162	130	11	16	34	DS0107/2000K	B924687
	360	-	360	310	170	135	11	28	63	DS0107/3150K	B924688
	360	-	360	310	185	150	11	29	70	DS0107/4000K	B924689
K series	360	-	360	310	200	165	11	31	77	DS0107/5000K	B924690
~	420	-	420	370	200	160	11	48	97	DS0107/6300K	B924691
	420	-	420	370	215	175	11	51	107	DS0107/8000K	B924692
	420	-	420	370	230	190	11	59	130	DS0107/10000K	B924693
	330	195	265	298	-	200	7	16	34	DS0107/2000LG	B924695
	394	198	310	358	-	240	9	28	63	DS0107/3150LG	B924658
l s	394	214	310	358	-	240	9	29	70	DS0107/4000LG	B924659
LG series	394	228	310	358	-	240	9	31	77	DS0107/5000LG	B924660
=	452	212	360	408	-	280	12	48	97	DS0107/6300LG	B924661
	452	227	360	408	-	280	12	51	107	DS0107/8000LG	B924662
	452	250	360	408	-	280	12	59	130	DS0107/10000LG	B924679
	410	190	400	380	330	125	11	16	49	DS0107/2000SK2	B924696
	520	190	450	490	390	135	11	28	75	DS0107/3150SK2	B924122
8	520	190	450	490	390	135	11	29	80	DS0107/4000SK2	B924123
SK2 series	520	200	450	490	390	150	11	31	86	DS0107/5000SK2	B924124
🖔	520	200	500	490	450	150	11	48	107	DS0107/6300SK2	B924125
	520	215	500	490	450	175	11	51	130	DS0107/8000SK2	B924126
	520	230	500	490	450	175	11	59	155	DS0107/10000SK2	B924678

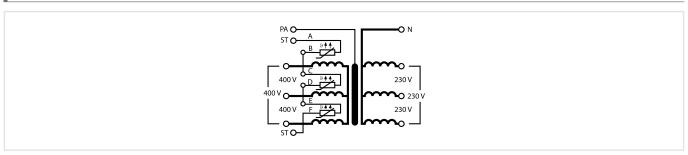
Ordering information enclosure

			Dime	ensions (mm)				Suitable for the following	Weight (kg)	Туре	Art. No.	
A	В	C	D	E	F	G	Н	I	device types	3 (3 /	-77-		
430	380	490	385	420	450	M10	ø 29	ø 21	DS0107/2000 bis DS0107/5000	16	ESDS0107-1	B924673	
600	420	490	555	460	490	M10	ø 36	ø 16	DS0107/6300 bis DS0107/10000	23	ESDS0107-2	B924674	

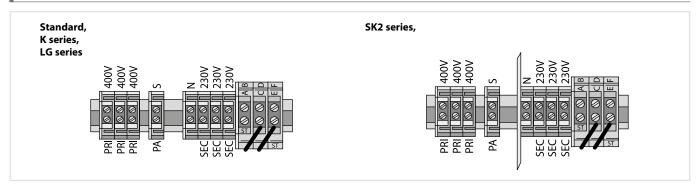
Nameplate



Wiring diagram



Terminal diagram



Connection properties

Туре	Input terminals flexible/rigid	Screen winding flexible/rigid	Control terminals flexible/rigid	Output terminals flexible/rigid
DS0107/2000	10/16 mm ²	10/16 mm ²	2.5/4 mm ²	10/16 mm ²
DS0107/3150	10/16 mm ²	10/16 mm ²	2.5/4 mm ²	10/16 mm ²
DS0107/4000	10/16 mm ²	10/16 mm ²	2.5/4 mm ²	10/16 mm ²
DS0107/5000	10/16 mm ²	10/16 mm ²	2.5/4 mm ²	10/16 mm ²
DS0107/6300	10/16 mm ²	10/16 mm ²	2.5/4 mm ²	16/25 mm ²
DS0107/8000	10/16 mm ²	10/16 mm ²	2.5/4 mm ²	16/25 mm ²
DS0107/10000	16/25 mm ²	16/25 mm ²	2.5/4 mm ²	16/25 mm ²

ESL0107 transformers for operating theatre lights

Single-phase isolating transformers for the supply of operating theatre lights



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

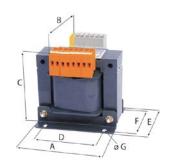
Further information

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

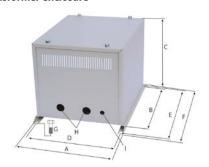
Technical data

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					
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 _k	≤ 11 %	≤ 8.8 %	≤ 7.9 %	≤ 5.3 %	≤ 5 %	≤ 4.3 %
Environmental conditions						
Ambient temperature	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)					
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	1 T
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



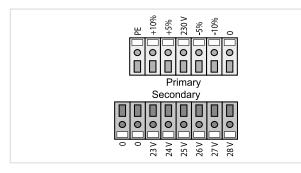
Ordering information

	Dimensions (mm)						Cu weight	Weight	Type	Art. No.	
Α	В	C	D	E	F	G	(kg)	(kg)	Турс	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

	Dimensions (mm)								Weight (kg)	Туре	Art. No.
Α	В	C	D	E	F	G	Н	I	Weight (kg)	1,700	Art. No.
240	280	220	220	300	320	M6	ø 29	ø 21	3.5	ESL0107-0	B924204

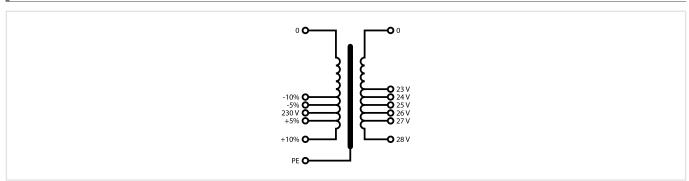
Terminal diagram



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

Typical applications

- For supply of Bender devices with a supply voltage of DC 24 V
- $\bullet \ \, \text{The compact design makes them}$ especially suitable for installation distributors and flat control panels

Further information

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

Approvals



Ordering information

Туре	Rated input voltage U _{IN}	Rated voltage	Art. No.
STEP-PS/1 AC/24 DC/0.5			B94053110
STEP-PS/1 AC/24 DC/1.75	AC 85264 V, 4565 Hz DC 95250 V	DC 24 V	B94053111
STEP-PS/1 AC/24 DC/4.2	36732501		B94053112



Lunch deta		CTED DC/44C/24DC/4 2/400 HD	
Input data	AC 100240 V	STEP-PS/1AC/24DC/4.2 (100 W) Setting range of the output voltage	DC 22.529.5 V (> 24 V constant power)
Nominal input voltage range	AC 85264 V	Output current	4.2 A (-2570 °C)
AC input voltage range	DC 95 V250 V	output current	4.4 A (-25 40 °C permanent)
DC input voltage range	4565 Hz		6.5 A (maximum output current)
AC frequency range	4563 Hz	Derating	above +55 °C: 2.5 % per kelvin
DC frequency range	U NZ	Control deviation	< 1 % (change in load, static 1090 %)
STEP-PS/1AC/24DC/0.5 (12 W)		Control acviation	< 2 % (change in load, state 1090 %)
Current consumption	approx. 0.28 A (AC 120 V)		$< 0.1 \%$ (change in input voltage $\pm 10 \%$)
	approx. 0.13 A (AC 230 V)	Maximum power loss nominal load	13.2 W
Inrush current limitation	< 15 A (typical)	Maximum power dissipation idling	0.7 W
l²t	$< 0.1 \text{ A}^2\text{s}$	Efficiency	> 88 % (for AC 230 V and nominal values)
Power failure buffering	> 15 ms (AC 120 V)	Ascent time	< 0.5 s (U _{OUT} (1090 %))
	> 90 ms (AC 230 V)	Residual ripple	< 25 mV _{SS} (with nominal values)
Typical turn-on time	< 0.5 s		< 25 mV _{SS} (with nominal values)
Input fuse, integrated	1.25 A (slow acting, internal)	Peak switching voltages Connection in parallel	
STEP-PS/1AC/24DC/1.75 (40 W)		Connection in parallel	yes, for increased power
Current consumption	approx. 0.6 A (AC 120 V)	Overvoltage protection against internal overvoltages	yes yes limited to approx DC 35 V
	approx. 0.3 A (AC 230 V)	Resistance to reverse feed	yes, limited to approx. DC 35 V max. DC 35 V
Inrush current limitation	< 15 A (typical)	resistance to reverse reeu	IIIdx. DC 33 V
l ² t	< 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	- 0.2 W
Typical turn-on time	< 0.5 s		< 0.3 W
Input fuse, integrated	3.15 A (slow acting, internal)	Maximum power loss nominal load	< 2.2 W
Recommended back-up fuse for line protection	5.13 A (slow acting, internal)	STEP-PS/1AC/24DC/1.75 (40 W)	
necommended back up tase for fille protection	10 A	Maximum power dissipation idling	5 W
	16 A (characteristic B)	Maximum power loss nominal load	0.7 W
	TO A (Characteristic b)	STEP-PS/1AC/24DC/4.2 (100 W)	
STEP-PS/1AC/24DC/4.2 (100 W)	4.2.4.(4.5.422.10	Maximum power dissipation idling	13.2 W
Current consumption	approx. 1.3 A (AC 120 V)	Maximum power loss nominal load	0.7 W
	approx. 0.8 A (AC 230 V)	The state of the s	3.7.11
Inrush current limitation	< 15 A (typical)	LED status indicator	
l²t	< 1 A ² s	Status display "C	OC OK" LED green/ $U_{\rm OUT}$ > 21.5 V: LED lights up
Power failure buffering	> 20 ms (AC 120 V)		< 21.5 V: LED off
	> 100 ms (AC 230 V)	Front comment of the distance	
Typical turn-on time	< 0.5 s	Environmental conditions	
Input fuse, integrated	4 A (slow acting, internal)	Ambient temperature (operation)	-2570 °C (> 55 °C derating)
Recommended back-up fuse for line protection	6 A	Ambient temperature (storage/transport)	-4085 °C
	10 A	Max. perm. humidity (operation)	\leq 95 % (at 25 °C, no condensation)
	16 A (characteristic B)	Vibration (operation) < 15	Hz, amplitude ± 2.5 mm acc. to IEC 60068-2-6
Output data			15150 Hz, 2.3 g, 90 min.
	DC 24 V ±1 %	Shock	30 g in all directions, acc. to IEC 60068-2-27
Nominal output voltage	DC 24 V ±1 70	Pollution degree acc. to EN 50178	2
STEP-PS/1AC/24DC/0.5 (12 W)		Classification of climatic conditions	3K22 (acc. to EN 60721)
Output current	0.5 A (-25+55 °C)	Connection	
	0.55 A (-2540 °C permanent)		cerous connection
	1 A (maximum output current)	Connection type	screw connection
Control deviation	< 1 % (change in load, static 1090 %)	Connection properties	0.2
	< 2 % (change in load, dynamic 1090 %)	Rigid/flexible	0.2 2.5 mm ²
	$<$ 0.1 % (change in input voltage \pm 10 %)	Conductor sizes	AWG 24-12
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	moditation 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	msulation voltage input/1 E	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 V29.5 V (> 24 V constant power)	Degree of protection	IP20
Output current	1.75 A (-2570 °C)	Protection class	
output current	1.9 A (-2540 °C permanent)	MTBF (IEC 61709)	500000 h
	3.75 A (maximum output current)	Enclosure material	
Derating	above +55 °C: 2.5 % per kelvin	Foot latch material	polycarbonate plactic POM
Control deviation	< 1 % (change in load, static 1090 %)	Dimensions W/H/D (state of delivery)	plastic POM
	< 2 % (change in load, dynamic 1090 %)		10/00/61
	< 0.1 % (change in input voltage ±10 %)	STEP-PS/1AC/24DC/0.5 (12 W)	18/90/61 mm
Maximum power loss nominal load	5 W	STEP-PS/1AC/24DC/1.75 (40 W)	54/90/61 mm
Maximum power loss normal load Maximum power dissipation idling	0.7 W	STEP-PS/1AC/24DC/4.2 (100 W)	90/90/61 mm
Efficiency	> 89 % (for AC 230 V and nominal values)	Weight	
Ascent time	< 0.5 s (<i>U</i> _{OUT} (1090 %))	STEP-PS/1AC/24DC/0.5 (12 W)	100 g
Residual ripple	< 35 mV _{SS} (with nominal values)	STEP-PS/1AC/24DC/1.75 (40 W)	200 g
Switching transients	< 35 mV _{SS} (with nominal values)	STEP-PS/1AC/24DC/4.2 (100 W)	400 g
Connection in parallel	yes, for increased power		
· ·	·		
Connection in series	yes limited to approx DC 25 V		
Overvoltage protection against internal overvoltages	yes, limited to approx. DC 35 V		
Resistance to reverse feed	max. DC 35 V		

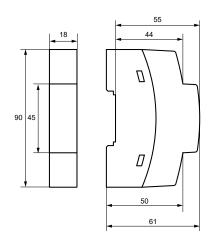
Technische Daten (Fortsetzung)

Standards	
Electrical equipment of machines	EN 60204
Safety isolating transformers for switch mode power supplie	es IEC 61558-2-17
Electrical safety (of information technology equipment)	IEC 60950-1/VDE 0805 (SELV)
Electronic equipment for use in power installations	EN 50178/VDE 0160 (PELV)
Protective extra-low voltage	IEC 60950-1 (SELV) and EN 60204 (PELV)
Protective separation	DIN VDE 0100-410
	DIN VDE 0106-1010
Protection against electric shock	DIN 57100-410
Protection against electric shock, basic requirements for	
protective separation in electrical equipment	DIN VDE 0106-101
Limits for harmonic current emissions	EN 61000-3-2
STEP-PS/1AC/24DC/1.75 (40W) and STEP-PS/1AC/24DC	:/4.2 (100 W)
Certificate	CR Scheme

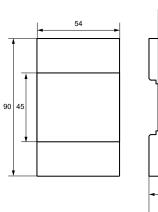
Approvals and certifications			
STEP-PS/1AC/24DC/0.5 (12W)	STEP-PS/1AC/24DC/0.5 (12W)		
UL approvals	UL/C-UL Listed UL 508		
	UL/C-UL Recognized UL 60950		
	NEC Class 2 as per UL 1310		
UL/C-UL Lis	ted ANSI/ISA-12.12.01 Class I, Division 2, Groups A, B, C, D		
STEP-PS/1AC/24DC/1.75 (40W)			
UL approvals	UL/C-UL Listed UL 508		
	UL/C-UL Recognized UL 60950		
	NEC Class 2 as per UL 1310		
Shipbuilding sector	Germanischer Lloyd		
STEP-PS/1AC/24DC/4.2 (100W)			
UL approvals	UL/C-UL Listed UL 508		
	UL/C-UL Recognized UL 60950		
Shipbuilding sector	Germanischer Lloyd		

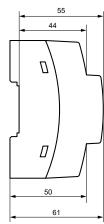
Dimension diagram (dimensions in mm)

STEP-PS/1AC/24DC/0.5 (12 W)

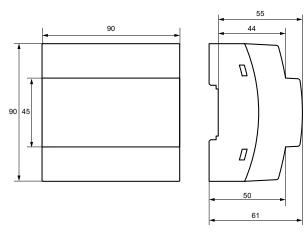


STEP-PS/1AC/24DC/1.75 (40 W)

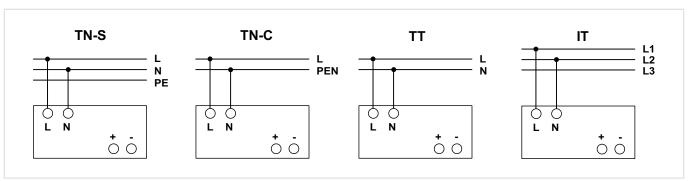




STEP-PS/1AC/24DC/4.2 (100 W)



Connection to different systems



AN410

Power supply unit for DC 24 V supply



Typical applications

• To supply Bender devices with DC 24 V and maximum 10 VA power consumption

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.





*) Approval relating to the rated input voltage U_{IN}

Ordering information

Type	ABB type	Rated input voltage U _{IN}	Rated output voltage	Art. No.
AN410	CP-D 24/0.42/Art. No. 1SVR 427 041 R0000	AC 90264 V, 4763 Hz / DC 120370 V	DC 24 V	B924209
AN420-R	CP-D RU/Art. No. 1SVR 427 049 R0000	DC 935 V	DC 935 V	B95100250

Rated impulse voltage/pollution degree	0664-1	3 kV/2
Rated insulation voltage U_i input circuit/o	output circuit	3 kV
Input circuits		
Rated input voltage U_{IN}		see ordering information
Power consumption		≤ 3 W
Inrush current		≤ 30 A, ≤ 3 ms
Stored energy time in the event of power	system failure	≥ 30 ms
Typical current/power consumption	at AC 110 V	184 mA/11.62 W
	at AC 230 V	120.6 mA/12 W
Primary fuse (internal device protection,	not accessible)	1 A time-lag/AC 250 V
Output circuit		
Rated output voltage		DC 24 V (±1 %)
Rated output current		420 mA
Derating of the output current 60 °C $< T_L$	ر ≤ 70 °C	2.5 %/K
Parallel connection option		with redundance unit AN420-R
Protection against short circuits/no-load	continuous pro	otection against short circuits/no-load
F		
Environment/EMC		
EMC immunity		acc. to EN 61000-6-2
EMC immunity	during storage)	acc. to EN 61000-6-2 acc. to EN 61000-6-3 -25+70 °C/-25+85 °C

UL 1310, CAN/CSA C22.2 No. 223 (Class 2 Power Supply) UL 6090, CAN/CSA C22.2 No. 60950 UL 6090, CAN/CSA C22.2 No. 60950 CCC Mark CE Other Status indicators 2 LEDs: output voltage present output voltage present output voltage present output voltage lox Operating mode Continuous operatio Mounting vertically (terminals +/- at the top Degree of protection, internal components DIN EN 60529 (VDE 0470-1) Pogree of protection, terminals (DIN EN 60529 (VDE 0470-1)) Protection class Minimum distance to adjacent devices vertically/horizontally Enclosure dimensions (W x H x D) DIN rail mounting acc. to IEC 6071 Protective extra low voltage SELV (EN 60950-1 Documentation number	Standards, approvals and certificati	ons
UL 6090, CAN/CSA C22.2 No. 60950 CCC Mark CE Other Status indicators 2 LEDs: output voltage present output voltage low continuous operation Mounting Vertically (terminals +/- at the top Degree of protection, internal components DIN EN 60529 (VDE 0470-1) Degree of protection, terminals (DIN EN 60529 (VDE 0470-1)) Protection class Minimum distance to adjacent devices vertically/horizontally Enclosure dimensions (W x H x D) DIN rail mounting acc. to IEC 6071 Protective extra low voltage SELV (EN 60950-1 Documentation number	C (UL) US	UL 508, CAN/CSA C22.2 No. 14*)
Mark C € Other Status indicators Status indicators 2 LEDs: output voltage present output votlage present output votlage present output votlage low output votlage present output votlage low output v	c 711 us	UL 1310, CAN/CSA C22.2 No. 223 (Class 2 Power Supply) *
Mark C € Other Status indicators Status indica	c 71 2 us	UL 6090, CAN/CSA C22.2 No. 60950 *)
C € Other Status indicators Status indicators output voltage present output vol	((()	(((**
Other Status indicators 2 LEDs: output voltage present output voltage present output voltage present output voltage present output voltage los continuous operatio Mounting Operating mode Mounting Pegree of protection, internal components DIN EN 60529 (VDE 0470-1) Degree of protection, terminals (DIN EN 60529 (VDE 0470-1)) Protection class Minimum distance to adjacent devices vertically/horizontally Enclosure dimensions (W x H x D) DiN rail mounting acc. to IEC 6071 Protective extra low voltage Documentation number D0009	Mark	
Status indicators Status indicators 2 LEDs: output voltage present output votlage present output votlage low continuous operation Mounting Nounting Pegree of protection, internal components DIN EN 60529 (VDE 0470-1) Pegree of protection, terminals (DIN EN 60529 (VDE 0470-1)) Protection class Minimum distance to adjacent devices vertically/horizontally Enclosure dimensions (W x H x D) DIN rail mounting acc. to IEC 6071 Protective extra low voltage Documentation number SELV (EN 60950-1) Documentation number	C€	CE
Output votlage lox Operating mode continuous operatio Mounting vertically (terminals +/- at the top Degree of protection, internal components DIN EN 60529 (VDE 0470-1) IP3 Degree of protection, terminals (DIN EN 60529 (VDE 0470-1)) IP2 Protection class Minimum distance to adjacent devices vertically/horizontally 25/25 mr 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 6071 Protective extra low voltage SELV (EN 60950-1 Documentation number D0009	Other	
Mounting vertically (terminals +/- at the top Degree of protection, internal components DIN EN 60529 (VDE 0470-1) IP3 Degree of protection, terminals (DIN EN 60529 (VDE 0470-1)) IP2 Protection class Minimum distance to adjacent devices vertically/horizontally 25/25 mr 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 6071 Protective extra low voltage SELV (EN 60950-1 Documentation number D0009	Status indicators	2 LEDs: output voltage present, output votlage low
Degree of protection, internal components DIN EN 60529 (VDE 0470-1) Degree of protection, terminals (DIN EN 60529 (VDE 0470-1)) Protection class Minimum distance to adjacent devices vertically/horizontally Enclosure dimensions (W x H x D) DIN rail mounting acc. to Protective extra low voltage Documentation number DIN EN 60529 (VDE 0470-1)) 18 x 91 x 57.5 mm (0.71 x 3.58 x 2.26 inches of the composition of the compositi	Operating mode	continuous operation
Degree of protection, terminals (DIN EN 60529 (VDE 0470-1)) Protection class Minimum distance to adjacent devices vertically/horizontally Enclosure dimensions (W x H x D) DIN rail mounting acc. to Protective extra low voltage Documentation number Description: IP2 25/25 mr 25/25 mr 18 x 91 x 57.5 mm (0.71 x 3.58 x 2.26 inches of the second of	Mounting	vertically (terminals $+/-$ at the top)
Protection class Minimum distance to adjacent devices vertically/horizontally 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 1EC 6071 Protective extra low voltage Documentation number D0009	Degree of protection, internal componer	its DIN EN 60529 (VDE 0470-1) IP30
Minimum distance to adjacent devices vertically/horizontally 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 6071 Protective extra low voltage Documentation number D0009	Degree of protection, terminals (DIN EN	60529 (VDE 0470-1)) IP20
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 6071 Protective extra low voltage Documentation number 18 x 91 x 57.5 mm (0.71 x 3.58 x 2.26 inches IEC 6071 SELV (EN 60950-1 Documentation number	Protection class	I
DIN rail mounting acc. to IEC 6071 Protective extra low voltage SELV (EN 60950-1 Documentation number D0009	Minimum distance to adjacent devices v	ertically/horizontally 25/25 mm
Protective extra low voltage SELV (EN 60950-1 Documentation number D0009	Enclosure dimensions (W x H x D)	18 x 91 x 57.5 mm (0.71 x 3.58 x 2.26 inches)
Documentation number D0009	DIN rail mounting acc. to	IEC 60715
	Protective extra low voltage	SELV (EN 60950-1)
Weight ≤ 70	Documentation number	D00099
	Weight	≤ 70 g

 $^{^{*)}}$ Approval relating to the rated input voltage U_{IN}

Wiring diagram

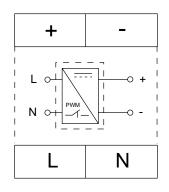
rigid, flexible (with or without ferrule)/conductor sizes

Connection Connection

Connection

Stripping length

Tightening torque



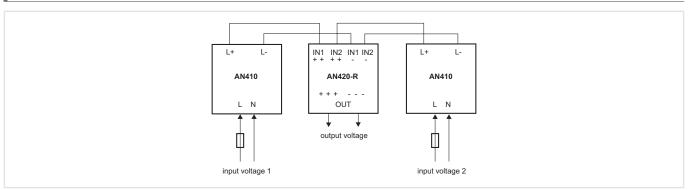
screw-type terminals

6 mm (0.24 inches) 0.36...0.56 Nm

0.2...2 mm² (AWG 24-14)

L, N: input voltage +, -: output voltage

Option for redundant power supply



Power supply unit



Typical applications

• Supply of Bender devices with AC 20 V and a power consumption of maximum 9 VA

Approvals

C € 2 EAL



Ordering information

Туре	Output voltage	Supply voltage <i>U</i> ₅	Art. No.
AN450	AC 20 V 50 CO II-	AC 230 V, 5060 Hz	B924201
AN450-133	AC 20 V, 5060 Hz	AC 127 V, 50 60 Hz	B924203

1M12

Technical data

Insulation coordination acc. to IEC 60664-1

Rated voltage	AC 250 V
Overvoltage category/pollution degree	III/2
Rated impulse voltage	4 kV
Altitude	≤ 2000 m NN
Voltage ranges	
Nominal voltage	see ordering details
Frequency range	see ordering details
Operating range of rated voltage	0.851.1
Output voltage	AC 20 V, 5060 Hz
Rated output Power	≤ 9 VA
Internal secondary protection	PTC resistor
Enviroment/EMC	
EMC immunity	acc. to EN 61000-6-2
EMC emission	acc. to EN 61000-6-4
Classification of climatic conditions acc. to IEC 60721	
Stationary use	3K22
Transport	2K11
Storage	1K21
Operating temperature	- 10+ 55 ℃
Classification of mechanical conditions acc. to IEC 60721	
Stationary use	3M11
Transport	2M4

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

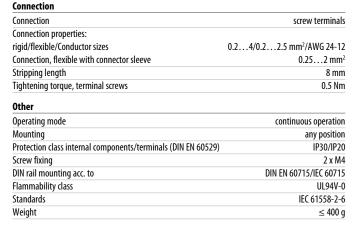
Standards

The AN450 series complies with the requirements of the device standards:

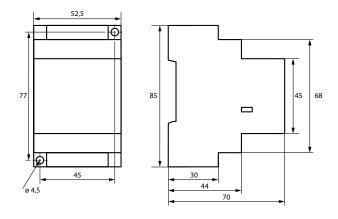
- DIN EN 61558-1 (VDE 0570-1)
- IEC 61558-1

Further information

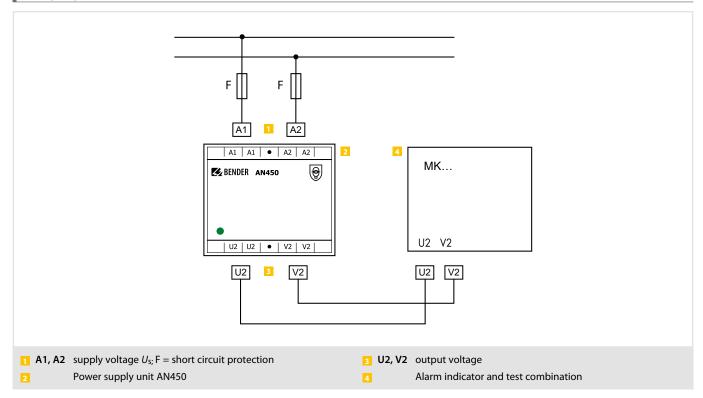
For further information refer to our product range on www.bender.de.



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



Ordering information

Туре	Scale centre point (SKMP)	Dimensions	Input current	Suitable ISOMETER®	Art. No.
7204-1421	12010	72 72			B986763
7204S-1421	- 120 kΩ	72 x 72 mm	0 400 4		B986804
9604-1421	120 kΩ	06 :: 06	0400 μΑ		B986764
9604S-1421		96 x 96 mm			B986784
9620-1421	- 120 kΩ 1,2 MΩ	06 :: 06	0 20 4	iso685	B986841
9620S-1421		96 x 96 mm	020 mA		B986842
9604-1621		96 x 96 mm	0400 μΑ		B986782
7220-1421	1201.0	72 72	0 20 4		B986844
7220S-1421	- 120 kΩ	72 x 72 mm	020 mA		B986848

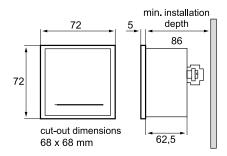
Technical data

Test voltage	3 kV
Accuracy class acc. to DIN 43780	1.5
Normal position	vertical +5°
Temperature range	-25+40 °C

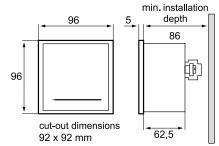
Protection class acc. to DIN 40050	
Enclosure	IP52
Terminals	IP00
Terminals with contact protection	
Documentation number	D00092

Dimension diagram (dimensions in mm)

7204/7220



9604/9620



RS-485 interface repeater for RS-485 bus extension



Approvals



Device features

- · Plastic enclosure for DIN rail mounting
- · Dynamic baud rate setting
- Galvanic separation between the input and output circuit and the power supply overvoltage protection
- Supply voltage AC 85...260 V, 50...60 Hz
- Automatic baud rate changeover can therefore be used for the internal BMS bus without limitations

Typical applications

- Extension of the maximum possible bus length by 1200 m in BMS systems (EDS, RCMS, MEDICS® systems)
- Extension of the maximum possible bus nodes by 31*
- Protection against spikes by galvanic separation between the input and output circuit and the power supply
- Implementation of resonant stubs (refer also to BSM instruction leaflet)

Further information

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

Ordering information

Туре	Supply voltage U _s	Art. No.
DI-1DL	AC 85260 V, 5060 Hz	B95012047

Technical data

AC 85260 V, 5060 Hz
0.1 A/7 W
2 x RS-485/BMS
dynamic
≤ 1200 m
recommended: J-Y(St)Y min. 2x0.8
automatic
yes
31 additional bus devices per repeater,
vs a virtually unrestricted number of connections
vated by a switch
activity indication: direction and faults (green) internal operating voltage (red)

Environment

Operating temperature $0...+70\,^{\circ}\text{C}$

Connection

Connection push-wire/plug-in terminals

Other

 Operating mode
 continuous operation

 Mounting
 any position

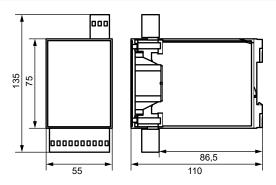
 Enclosure
 for standard DIN rail 32 mm (approx.110 x 75 x 55)

 Operating manual
 DiaLog RS-485 repeater type CN-2-1

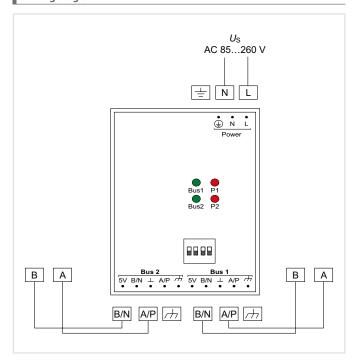
 Documentation number
 D00125

 Weight
 approx. 90 g

Dimension diagram (dimensions in mm)



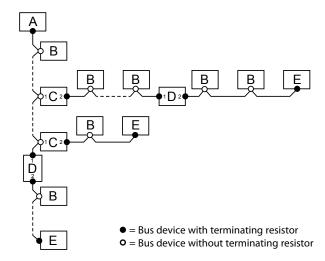




Settings

- 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 D interface repeater DI-1DL	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	
		Bus 2: Terminating resistor and bias voltage generation activated via switch on device (DIP switch 3, 4: 0N)*	
E	Slave	Terminating resistor activated via switch on device (ON) or external terminating resistor between terminals A and B	

The bias voltage generation is generally activated for the BMS bus master (via software) and deactivated for the BMS slaves.



Device features

- · Plastic enclosure
- · Galvanic separation between the input and output circuit
- Power supply via USB port
- USB cable and driver CD included in the scope of delivery

Approvals



Typical applications

- Conversion of USB interface into RS-485 interface
- Parameterisation of alarm indicator and operator panels (MK2430) via RS-485 interface by means of software
- Parameterisation of Modbus RTU devices via RS-485 interface by means of software

Further information

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

Ordering information

Туре	Supply voltage	Art. No.
DI-2USB	from USB port, no additonal power supply required	B95012045

Technical data

Insulation coordination acc. to IEC 60664-1	
Rated voltage	
Rated impulse voltage/pollution degree	3 kV/3
Supply voltage	
Supply voltage $U_{\rm S}$	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, B
Integrated terminating resistors, selectable via jumper, factory setti	ing terminating resistors included
Device address	<u> </u>
USB	
Serial interface	1 x USB
Alarm LEDs	ON (yellow), R x Data (green), T x Data (red)

Environment/EMC

EMC immunity/EMC emission

Operating temperature	-10+55 °C
Classification of climatic conditions acc. to IEC 60721	
Stationary use	3K22
Transport	2K11
Long-term storage	1K22
Classification of mechanical conditions acc. to IEC 60721	
Stationary use	3M11
Transport	2M4
Long-term storage	1M12

EN 61000-6-2/EN 61000-6-4

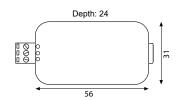
Connection

Connection	screw-type terminals/USB plug type B
Connection properties	
rigid/flexible/conductor sizes	0.52.5 mm ² (AWG 22-12)

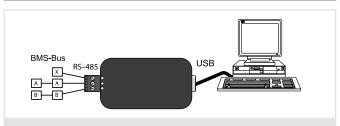
Other

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

Relay module



Device features

- Extension of Bender devices by 12 relays
- N/O and N/C selectable

Further information

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

Typical applications

• Extension of the measuring channels during insulation fault location by potential-free contacts

Approvals



Ordering information

Туре	Supply voltage <i>U</i> s	Option "W"	Art. No.
I0M441-S	DC 24V	-	B95012057
IOM441W-S	DC 24 V	✓	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	3, 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 <i>U</i> s	DC 24 V
Tolerance of U _s	5 %

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

Power consumption

< 1.7 W

Technical data (continued)

Connection	
Connection type	pluggable push-wire terminal
Conductor sizes	AWG 24-12
Stripping length	10 mm
rigid/flexible	0.22.5 mm ²
flexible with ferrule, with/without plastic sleeve	0.252.5 mm ²
Multiple conductor, flexible with TWIN ferrule with plastic sleeve	0.51.5 mm ²

Operating mode	continuous operation
Degree of protection internal components	IP40
Degree of protection terminals	IP20
DIN rail mounting acc. to	IEC 60715
Screw fixing	2 x M4 with mounting clip
Enclosure material	polycarbonate
Flammability class	UL 94V-0
Dimensions (W x H x D)	72 x 93 x 63
Documentation number	D00300
Weight	approx. 180 g

Device version "W"

Devices with the suffix "W" feature increased shock and vibration resistance.

The electronics is covered with a special varnish to provide increased protection against mechanical stress and moisture.

Ambient temperatures:

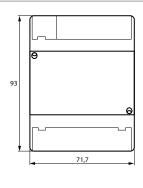
Operating temperature	-40+70 °C
Transport	-40+85 ℃
Long-term storage	-25+70 ℃

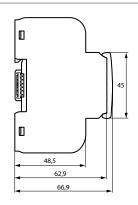
Classification of climatic conditions acc. to IEC 60721:

Stationary use (IEC 60721-3-3)	3K23		
Classification of mechanical conditions acc. to IEC 60721:			
Stationary use (IEC 60721-3-3)	3M12		

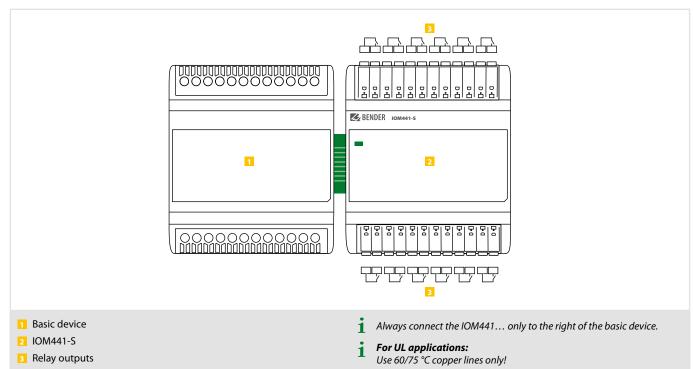
()* = Factory settings

Dimension diagram (dimensions in mm)





Wiring diagram



COMTRAXX® 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 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

Туре	Supply voltage/frequency range U _s	Power consumption	Application	Art. No.
COM465IP-230V	AC/DC 24240 V, 5060 Hz	≤ 6.5 VA/≤ 4 W	Condition monitor with integrated gateway: Bender system/Ethernet	B95061065

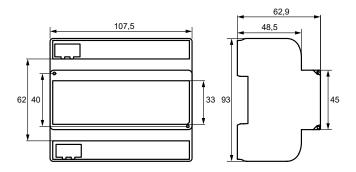
Function modules

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

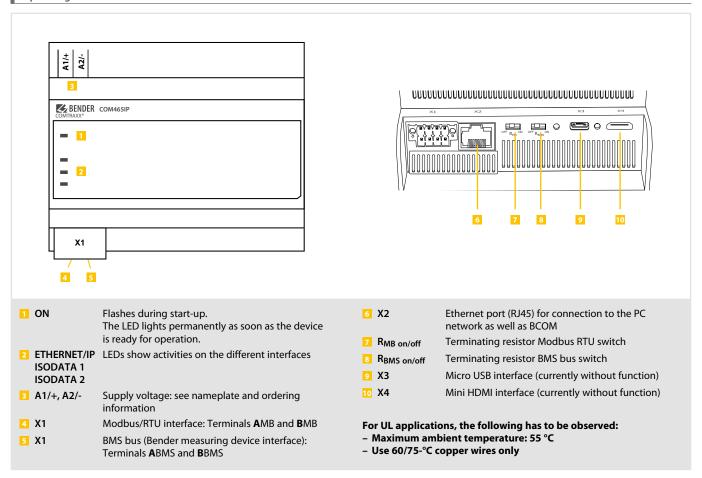


Insulation coordination acc. to IEC 60664-1/IEC 60664-3	Modbus RTU
Rated voltage AC 250 V	Interface/protocol RS-485/Modbus RTU
Rated impulse voltage/overvoltage category 4 kV/III	Operating mode master/slave (master)*
Pollution degree 3	Baud rate 9.657.6 kBit/s
Protective separation (reinforced insulation) between	Cable length \leq 1,200 m
(A1/+, A2/-) - [(AMB, BMB), (ABMS, BBMS), (X2), (X3, X4)]	Cable shielded, one end of shield connected to PE
Cumply valtage	recommended: CAT6/CAT7 min. AWG23
Supply voltage	alternative: twisted pair, J-Y(St)Y min. 2x0,8
Supply voltage $U_{\rm S}$ see ordering information	Connection X1 (AMB, BMB)
Frequency range U_s see ordering information	Connection type refer to connection "push-wire terminal X1"
Power consumption see ordering information	Terminating resistor 120 Ω (0.25 W), can be connected internally
Indications	Supported Modbus RTU slave addresses 2247
	PROFINET
LEDs:	Interface/protocol Ethernet/PROFINET
ON operation indicator	Operating mode Slave (IO-Device)
ETHERNET IP data traffic Ethernet	SNMP
MODBUS RTU data traffic Modbus	Interface/protocol Ethernet/SNMP
BMS data traffic BMS	Versions 1, 2c, 3
Ethernet (terminal X2) lights during network connection, flashes during data transfer	Supported devices queries to all devices (channels) possible
Memory	Trap support yes
Individual texts (function module A only) unlimited number of texts each with 100 characters	
E-mail configuration and device failure monitoring max. 250 entries	Used ports
Number of data points for "third-party devices" to Modbus TCP and Modbus RTU 50	53 DNS (UDP/TCP)
Number of data loggers 30	67, 68 DHCP (UDP)
Number of data points per data logger 10,000	80 HTTP (TCP)
Number of history memory entries 20,000	123 NTP (UDP)
	161 SNMP (UDP) 162 SNMP TRAPS (UDP)
Visualisation	
Number of pages 50	443 HTTPS (TCP) 502 MODBUS (TCP)
Background image size 3 MB	. , ,
	4840 OPCUA (TCP) 5353 MDNS (UDP)
Interfaces	
Ethernet	48862 BCOM (UDP)
Port RJ45	Environment/EMC
Cable length < 100 m	EMC EN 61326-1
Data rate 10/100 MBit/s, autodetect	
HTTP mode HTTP/HTTPS (HTTP)*	Ambient temperatures
DHCP on/off (off)*	Operating temperature -25+55 °C
$\overline{t}_{\text{off}}$ (DHCP) 560 s (30 s)*	Transport -40+85 °C
IP address	Long-term storage $-25+70$ °C
nnn.nnn.nnn (192.168.0.254)*	Classification of climatic conditions acc. to IEC 60721:
can always be reached via: 169.254.0.1	Stationary use (IEC 60721-3-3) 3K22
Net mask nnn.nnn.nnn (255.255.0.0)*	Transport (IEC 60721-3-2) 2K11
Protocols (depending on function module selected)	Long-term storage (IEC 60721-3-1) 1K22
TCP/IP, Modbus TCP, Modbus RTU, DHCP, SNMP, SMTP, NTP	Mechanical conditions acc. to IEC 60721:
BMS bus (internal/external)	Stationary use (IEC 60721-3-3) 3M11
Interface/protocol RS-485/BMS internal or BMS external (BMS internal)*	Transport (IEC 60721-3-2) 2M4
Operating mode master/slave (master)*	Long-term storage (IEC 60721-3-1) 1M12
Baud rate BMS internal 9.6 kBit/s	
external 19.2; 38.4; 57.6 kBit/s	Connection
Cable length ≤ 1,200 m	Connection type pluggable push-wire terminals
Cable Shielded, one end of shield connected to PE	Push-wire terminals
recommended: CAT6/CAT7 min. AWG23	Conductor sizes AWG 24-12
alternative: twisted pair, J-Y(St)Y min. 2x0,8	Stripping length 10 mm
Connection X1 (ABMS, BBMS)	rigid/flexible 0.22.5 mm ²
Connection type refer to connection "push-wire terminal X1"	flexible with ferrule, with/without plastic sleeve 0.252.5 mm ²
Terminating resistor 120 Ω (0.25 W), can be connected internally	Multiple conductor, flexible with TWIN ferrule with plastic sleeve 0.51.5 mm ²
Device address, internal/external BMS bus 1150 (1)*/299	Push-wire terminal X1
	Conductor sizes AWG 24-16
BCOM	Stripping length 10 mm
Interface/protocol Ethernet/BCOM	riqid/flexible 0.21.5 mm ²
BCOM system name (SYSTEM)	flexible with ferrule without plastic sleeve 0.251.5 mm ²
BCOM subsystem address 1255 (1)*	flexible with ferrule with plastic sleeve 0.251.5 mm ²
BCOM device address 0255 (0)*	-
Modbus	Other
Bender Modbus image V1, V2 (V2)*	Operating mode continuous operation
Modbus TCP	Mounting front-oriented, cooling slots must be ventilated vertically
Interface/protocol Ethernet/Modbus TCP	Degree of protection, internal components (IEC 60529) IP30
Operating mode client for Bender Modbus TCP devices and "third-party devices"	Degree of protection, terminals (IEC 60529) IP20
Operating mode server for access to the process image and for Modbus control commands	Quick DIN rail mounting acc. to IEC 60715
Parallel data access from different clients max. 25	Screw mounting 2 x M4
	Enclosure type J460
	Enclosure material polycarbonate
	Flammability class UL94V-0
	Dimensions (W x H x D) 107.5 x 93 x 62.9 mm
	Documentation number D00216
	Weight ≤ 240 g

()* = factory settings



Operating controls and connections



COMTRAXX® COM465DP

Condition Monitor with integrated gateway for the connection of Bender devices to PROFIBUS DP and Ethernet TCP/IP networks



Typical applications

- Optimum display and visualisation of device and system states in the web browser
- · Monitoring and analysis of compatible Bender products and third-party devices
- · Specific system overview through individual system description
- · Selective notification to various users in the event of alarms
- · Numerous interfaces for data transfer to higher-level systems
- · Clear setting of device parameters. Storing, documenting and restoring parameters is possible
- Commissioning and diagnosis of Bender systems
- · Remote diagnosis, remote maintenance

Data transfer interfaces







Approvals







Device features

- · Condition monitor for Bender systems
- · Integrated modular gateway between Bender systems and TCP/IP enables remote access via LAN, WAN or Internet
- Range of functions adjustable through function modules
- Ethernet (10/100 MBit/s) for remote access via LAN, WAN or Internet
- · Support of devices that are connected to the internal or external BMS bus, via BCOM, via Modbus RTU or Modbus TCP
- Integrated gateway between Bender system and PROFIBUS DP
- Individual visualisation can be generated, which is displayed via the web browser

Range of functions (V4.5.0 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

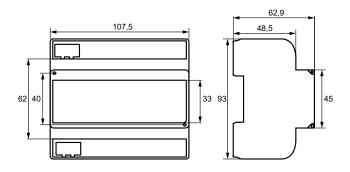
Туре	Supply voltage/frequency range U₅	Power consumption	Application	Art. no.
COM465DP-230 V	AC/DC 24240 V, 5060 Hz	≤ 6.5 VA/≤ 4 W	Condition Monitor with integrated gateway: Bender system/PROFIBUS DP/Ethernet	B95061060

Function modules

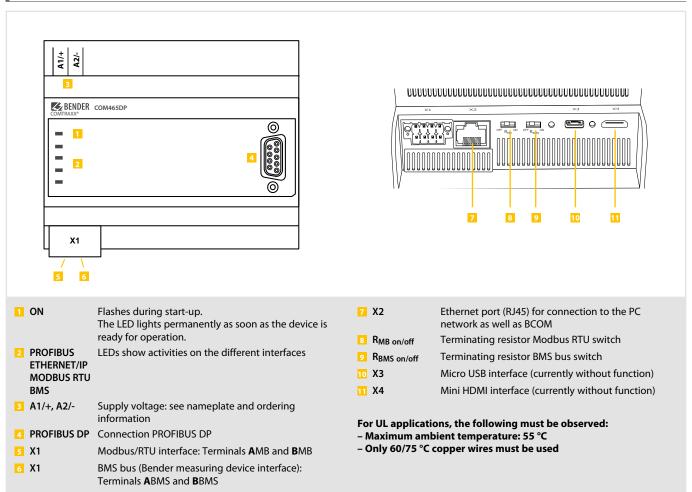
Application	Function module (software licence)	Art. no.
Individual text messages for all devices/ channels, device failure monitoring, e-mail in the event of an alarm, device documentation	Function module A	B75061011
Provision of data via via Modbus TCP, Modbus RTU, SNMP and PROFINET	Function module 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



Technical data	
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_5 see ordering information Frequency range U_5 see ordering information	PROFIBUS DP
Frequency range <i>U</i> _s see ordering information Power consumption see ordering information	Interface/protocol RS-485 galvanically separated/PROFIBUS DP
i ower consumption	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	
MODBUS RTU data traffic Modbus	Used ports 53 DNS (UDP/TCP)
BMS data traffic BMS	53 DNS (UDP/TCP) 67, 68 DHCP (UDP)
Ethernet (terminal X2) lights during network connection, flashes during data transfer	80 HTTP (TCP)
	123 NTP (UDP)
Memory	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	443 HTTPS (TCP)
Number of data points for "third-party devices" to Modbus TCP and Modbus RTU 50	502 MODBUS (TCP)
Number of data loggers 30	4840 OPCUA (TCP)
Number of data points per data logger 10,000	5353 MDNS (UDP)
Number of history memory entries 20,000	48862 BCOM (UDP)
Visualisation	
Number of pages 50	Environment/EMC
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	Stationary use (IEC 60721-3-3) 3K22
HTTP mode HTTP/HTTPS (HTTP)*	Transport (IEC 60721-3-2) 2K11
DHCP on/off (off)*	Long-term storage (IEC 60721-3-1) 1K22
t _{off} (DHCP) 560 s (30 s)*	
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
Protocols (depending on function module selected)	Transport (IEC 60721-3-2) 2M4
TCP/IP, Modbus TCP, Modbus RTU, DHCP, SNMP, SMTP, NTP	Long-term storage (IEC 60721-3-1) 1M12
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)*	Push-wire terminals
Baud rate BMS internal 9.6 kBit/s external 19.2; 38,4; 57.6 kBit/s	Conductor sizes AWG 24-12
Cable length ≤ 1,200 m	Stripping length 10 mm
Cable shielded, one end of shield connected to PE	rigid/flexible 0.22.5 mm ²
recommended: CAT6/CAT7 min. AWG23	flexible with ferrule, with/without plastic sleeve 0.252.5 mm ²
alternative: twisted pair, J-Y(St)Y min. 2x0,8	Multiple conductor, flexible with TWIN ferrule with plastic sleeve 0.51.5 mm ²
Connection X1 (ABMS, BBMS)	· · · · · · · · · · · · · · · · · · ·
Connection type refer to connection "push-wire terminal X1"	Push-wire terminal X1
Terminating resistor 120 Ω (0.25 W), can be connected internally	Conductor sizes AWG 24-16
Device address, internal/external BMS bus 1150 (1)*/299	Stripping length 10 mm riqid/flexible 0.21.5 mm²
BCOM	
Interface/protocol Ethernet/BCOM	flexible with ferrule without plastic sleeve 0.251.5 mm² flexible with ferrule with plastic sleeve 0.250.75 mm²
BCOM system name (SYSTEM)	incardic with retruite with plastic steeve 0.230./3 IIIIII
BCOM subsystem address 1255 (1)*	Other
BCOM device address 0255 (0)*	Operating mode continuous operation
Modbus	Mounting front-oriented, cooling slots must be ventilated vertically
Bender Modbus image V1, V2 (V2)*	Degree of protection, internal components (IEC 60529) IP30
Modbus TCP	Degree of protection, terminals (IEC 60529) IP20
Interface/protocol Ethernet/Modbus TCP	Quick DIN rail mounting acc. to IEC 60715
Operating mode client for Bender Modbus TCP devices and "third-party devices"	Screw mounting 2 x M4
Operating mode client for Bender Modous TCP devices and finite-party devices Operating mode server for access to the process image and for Modbus control commands	Enclosure type J460
Parallel data access from different clients max. 25	Enclosure material polycarbonate
	Flammability class UL94V-0
Modbus RTU Interface (protocol PS 495/Modbus PTI)	Dimensions (W x H x D) 107.5 x 93 x 62.9 mm
Interface/protocol RS-485/Modbus RTU Operating mode master/slave (master)*	Documentation number D00216
Operating mode master/slave (master)* Baud rate 9.657.6 kBit/s	Weight ≤ 240 g
Eaud rate 9.657.6 kBit/s Cable length $\leq 1,200 \text{ m}$	()* = factory settings
Cable Shielded, one end of shield connected to PE	() locioty settings
recommended: CAT6/CAT7 min. AWG23	
alternative: twisted pair, J-Y(St)Y min. 2x0,8	
Connection X1 (AMB, BMB)	
Connection type refer to connection "push-wire terminal X1"	
Terminating resistor $120 \Omega (0.25 \text{ W})$, can be connected internally	
Supported Modbus RTU slave addresses 2247	



Operating controls and connections



COMTRAXX® COM465ID

Condition Monitor with an integrated gateway for the connection of Bender isoData devices to Ethernet TCP/IP networks



Typical applications

- Optimum display and visualisation of device and plant statuses in the web browser
- · Collecting information from the Bender system and making it available via Modbus TCP and OPC UA
- · Specific system overview through individual installation description
- · Selective notification to various users in case of alarms
- · Information from the Bender system can be transmitted to POWERSCOUT® for analysis and archiving.
- · Commissioning and diagnosis of Bender systems
- · Remote diagnosis, remote maintenance

Approvals



Device features

- · Condition Monitor for Bender systems
- · Integrated modular gateway between Bender systems and TCP/IP enables remote access via LAN, WAN or the Internet
- Range of functions adjustable through function modules
- Ethernet (10/100 Mbit/s) for remote access via LAN, WAN or the Internet
- · 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
- · 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.
- $\bullet\,$ 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. $\label{eq:control}$

Ordering information

Туре	Supply voltage/Frequency range U _s	Power consumption	Application	Art. No.
COM465ID-230 V	AC/DC 24240 V, 5060 Hz	≤ 6.5 VA/≤ 4 W	Condition Monitor with an integrated gateway: Bender system/Ethernet	B95061070

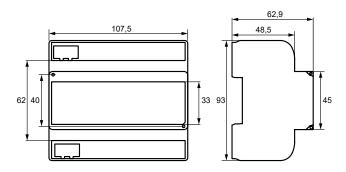
Function modules

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

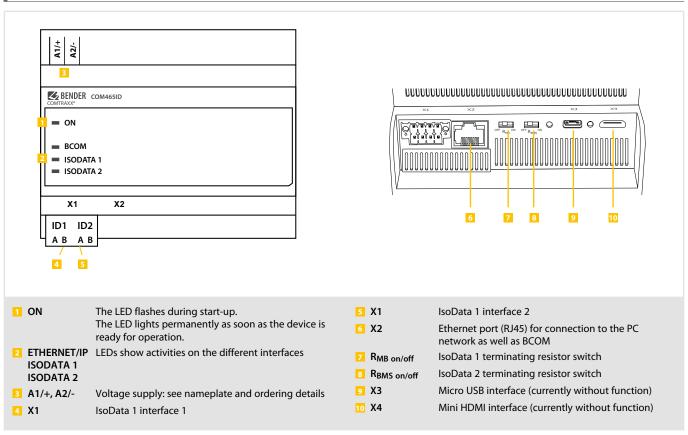


Insulation coordination acc. to IEC 60664-1/IEC 60664-3	BCOM
Rated voltage AC 250 V	Interface/protocol Ethernet/BCOM
Rated impulse voltage/Overvoltage category 4 kV/III	BCOM subsystem address 199 (1)*
Pollution degree 3	BCOM device address 199 (2)*
Protective separation (reinforced insulation) between	Modbus TCP
(A1/+, A2/-) - [(AMB, BMB), (ABMS, BBMS), (X2)]	Interface/protocol Ethernet/Modbus TCP
(, . ,	Operating mode client for associated PEM and "third-party devices"
Supply voltage	Operating mode server for access to the process image and for Modbus control commands
Supply voltage $U_{\rm S}$ see ordering details	Parallel data access by different clients max. 8
Frequency range $U_{\rm S}$ see ordering details	Turdici dada decess b) different circitos maxis
Power consumption see ordering details	Environment/EMC
Indication	EMC EN 61326-1
LEDs:	Ambient temperatures
ON operation indicator	Operating temperature $-25+55$ °C
ETHERNET IP data traffic Ethernet	Transport -40+85 ℃
ISODATA1 data traffic ISODATA1	Long-term storage -25+70 ℃
ISODATA2 data traffic ISODATA2	Classification of climatic conditions acc. to IEC 60721
Ethernet (X2 terminal) lights during network connection, flashes during data transmission	Stationary use (IEC 60721-3-3) 3K22 (except condensation and formation of ice)
igno using necrosic connector, maries using used data.	Transport (IEC 60721-3-2) 2K11
Internal memory	Long-term storage (IEC 60721-3-1) 1K22
E-mail configuration (function module A only) and device failure monitoring max. 250 entries	Classification of mechanical conditions acc. to IEC 60721
Individual texts (function module A only) unlimited number of texts with 100 characters each	Stationary use (IEC 60721-3-3) 3M11
Number of data points for "third-party devices" on Modbus TCP and Modbus RTU 50	Transport (IEC 60721-3-2) 2M4
Data loggers 30	Long-term storage (IEC 60721-3-1) 1M12
Number of data points per data logger 10,000	
Number of history memory entries 1,000	Connection
Visualisation	Connection type pluggable push-wire terminals
Number of pages 20	Push-wire terminals
Size of the background image 50 kByte (scaled down if larger)	Conductor sizes AWG 24-12
Data points (per page) 50 devices or channels, 150 text elements	Stripping length 10 mm
	rigid/flexible 0.22.5 mm ²
Interfaces	flexible with ferrule, with/without plastic sleeve 0.252.5 mm ²
Ethernet	Multiple conductor, flexible with TWIN ferrule with plastic sleeve 0.51.5 mm ²
Port RJ45	Push-wire terminal X1
Data rate 10/100 Mbit/s, autodetect	Conductor sizes AWG 24-16
DHCP on/off (on)*	Stripping length 10 mm
t_{off} (DHCP) 560 s (30 s)*	rigid/flexible 0.21.5 mm ²
IP address nnn.nnn.nnn, can always be reached over: 192.168.0.254, (169.254.0.1)*	flexible with ferrule without plastic sleeve 0.251.5 mm ²
Netmask nnn.nnn.nnn (255.255.0.0)*	flexible with ferrule with plastic sleeve 0.250.75 mm ²
Protocols (depending on function module selected)	Other
TCP/IP, Modbus TCP, Modbus RTU, DHCP, SMTP, NTP, OPC UA	
SNMP	
Versions 1, 2c, 3	Mounting front-oriented, cooling slots must be ventilated vertically Degree of protection, internal components (IEC 60529) IP30
Devices supported Queries to all devices (channels) possible (no trap functionality)	Degree of protection, terminals (IEC 60529) P20
ISODATA	DIN rail mounting acc. to IEC 60715
Interface/protocol RS-485/ISODATA	Screw fixing 2 x M4
Operating mode master	Enclosure type J460
Baud rate ISODATA 9.6 kbit/s	Enclosure material polycarbonate
Cable length ≤ 1200 m	Flammability class UL94V-0
Cable: twisted pair, shielded, one end of shield connected to PE recommended: J-Y(St)Y min. 2x0.8	Dimensions (W x H x D) 107.5 x 93 x 62.9 mm
Connection X1 (A-ID1, B-ID1, A-ID2, B-ID2)	Documentation number D00368
Connection type refer to connection "push-wire terminal X1"	Weight ≤ 240 g
Terminating resistor 120 Ω (0.25 W), can be connected internally	<u> </u>
Device address ISODATA1 (2); ISODATA2 (3)	()* = Factory settings
DODATA1 (2), DODATA2 (3)	





Operating controls and connections



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

Туре	Supply voltage/Frequency range U₅	Power consumption	Application	Art. No.
COM463BC-230 V	AC/DC 24240 V, 5060 Hz	≤ 6.5 VA/≤ 4 W	Gateway for the connection of systems with BCOM and external BMS	B95061051

Technical data

rechnical data	
Insulation coordination acc	. to IEC 60664-1/IEC 60664-3
Rated insulation voltage	AC 250 V
Rated impulse voltage/Overvol	tage category 4 kV/III
Pollution degree	3
Protective separation (reinforce	ed insulation) between
	(A1/+, A2/-) - [(AMB, BMB), (ABMS, BBMS), (X2), (X3, X4)]
Supply voltage	
Supply voltage $U_{\rm S}$	see ordering information
Frequency range U _S	see ordering information
Power consumption	see ordering information
Indications	
LEDs:	
ON	operation indicator
ETHERNET IP	data traffic Ethernet
BMS	data traffic BMS
Ethernet (terminal X2)	lights during network connection, flashes during data transfer
Memory	
E-mail configuration and device	e failure monitoring
	max. 250 entries
Individual texts	unlimited number of texts with 100 characters each

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)*

Technical data (continued)

Environment/EMC	
EMC	EN 61326-1
Ambient temperatures	
Operation	-25+55 ℃
Transport	-40+85°C
Long-term storage	-25+70°C
el 161 11 e ll 11 ll 11 ll 11	*******

	e 11 .1 11.1	
Classification	of climatic conditions a	acc. to IEC 60721

Classification of mechanical conditions a	cc. to IEC 60721
Long-term storage (IEC 60721-3-1)	1K22
Transport (IEC 60721-3-2)	2K11
Stationary use (IEC 60721-3-3)	3K24 (except condensation and formation of ice)

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 push-wire terminals
Push-wire terminals	
Conductor sizes	AWG 24-12
Stripping length	10 mm
rigid/flexible	0.22.5 mm ²
flexible with ferrule, with/without plastic sleeve	0.252.5 mm ²
Multiple conductor, flexible with TWIN ferrule with plastic sleeve	0.51.5 mm ²

Push-wire terminal X1

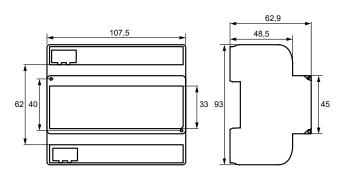
Conductor sizes	AWG 24-16
Stripping length	10 mm
rigid/flexible	0.21.5 mm ²
flexible with ferrule without plastic sleeve	0.251.5 mm ²
flexible with ferrule with plastic sleeve	0.250.75 mm ²

Other

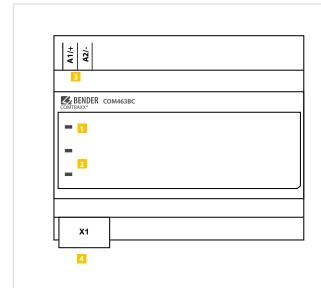
Operating mode		continuous operation
Mounting	front-oriented, cooling	slots must be ventilated vertically
Degree of protection, internal compo	nents (IEC 60529)	IP30
Degree of protection, terminals (IEC 6	0529)	IP20
Quick DIN rail mounting acc. to		IEC 60715
Screw fixing		2 x M4
Enclosure type		J460
Enclosure material		polycarbonate
Flammability class		UL94V-0
Dimensions (W x H x D)		107.5 x 93 x 62.9 mm
Documentation number		D00427
Weight		≤ 240 g

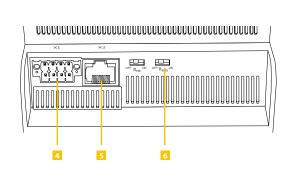
()* = factory settings

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.

3 A1/+, A2/-

BCOM, BMS LEDs show activities on the different interfaces Supply voltage: see nameplate and ordering

information

4 X1

5 X2

network as well as to BCOM

6 R_{BMS} on/off

BMS bus (Bender measuring device interface)

Ethernet port (RJ45) for connection to the PC

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

Type	Display size	Supply	Device dimensions (W x H x D)	Weight	Enclosure	Display unit Glass, tempered	Art. No.
CD007.1	7" (17 (***)	DC 24V + 15W	226 x 144 x 78 mm	1.1 kg	Flush-mounting enclosure	white	B95061031
CP907-I	7" (17.6 cm)	7-1 / (17.0 CIII) DC 24	DC 24 V, < 15 W		Control cabinet door mounting	white	B95061032
CD015 I	15 (" (20 ()	AC 100 240 V + 20 W	F0F :: 2F0 :: 02 *****	ć 1 km	Florida managetim manageness	white	B95061033
CP915-I	15.6" (38.6 cm)	AC 100240 V, < 30 W	505 x 350 x 92 mm	6.1 kg	Flush-mounting enclosure	grey	B95061034

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
	Display unit white	B95061090
CP915-I	Display unit grey	B95061110
C(7)31	Flush-mounting enclosure incl. mounting plate with electronics	B95061092

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.

Accessories

Device series	Description	Art. No.
all	CP9l replacement plug kit	B95061910
CP915-I	CP9l suction lifter 1)	B95061911
CP907-I	CP907-I surface-mounting enclosure	B95061915
CP915-I	CP915-I surface-mounting enclosure	B22301077

¹⁾ The suction lifter is required to remove the display of the CP915-I.

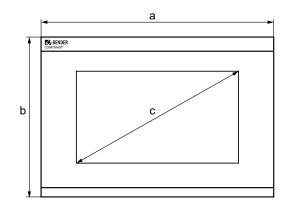
	BCOM
CP907-I	Interface/protocol Ethernet/BCOM
Rated voltage 50 V	Cable length < 100 m
Overvoltage category III	BCOM system name (SYSTEM)*
Pollution degree 2	BCOM subsystem address 1255 (1)*
Rated impulse voltage 800 V	BCOM device address 0255 (0)*
	Modbus
CP915-I	Bender Modbus image V1, V2 (V2)*
Rated voltage AC 250 V	
Overvoltage category III	Modbus TCP
Pollution degree 2	Interface/protocol Ethernet/Modbus TCP
Rated impulse voltage 4 kV	Cable length < 100 m
Supply	Operating mode client for Bender Modbus TCP devices and "third-party devices"
	Operating mode server for access to process image and for Modbus control commands
CP907-I via plug-in terminal (A1/+;A2/-)	Parallel data access for different clients max. 25
Nominal voltage DC 24 V SELV/PELV	Modbus RTU
Nominal voltage tolerance ±20 %	Interface/protocol RS-485/Modbus RTU
Typical power consumption at DC 24 V < 15 W	Cable length < 1200 m
Maximum cable length when supplied via B95061210 (24 V DC power supply unit 1.75 A):	Cable shielded, one end of shield connected to PE
0.28 mm ² 75 m	recommended: CAT6/CAT7 min. AWG23
0.5 mm ² 130 m	alternative: twisted pair, J-Y(St)Y min. 2x0,8
0.75 mm ² 200 m	Connection "AMB", "BMB" (see plug-in terminal)
1.5 mm ² 400 m	Operating mode master/slave (master)*
2.5 mm ² 650 m	Baud rate 9.657.6 kBit/s
CP907-I via Power-over-Ethernet (PoE)	Terminating resistor 120 Ω (0.25 W), can be connected internally (see plug-in terminal)
Nominal voltage DC 48 V SELV/PELV	Supported Modbus RTU slaves addresses 2247
Nominal voltage tolerance -25+15 %	PROFINET
Typical power consumption for PoE < 15 W	Interface/protocol Ethernet/PROFINET
Maximum cable length when supplied via AWG 26/7; 0.14 mm ² 100 m	Operating mode slave (IO device)
CP915-I via terminal block (L1; N)	SNMP
Nominal voltage CP915-I via external power supply unit AC 100 240 V	Interface/protocol Ethernet/SNMP
Nominal voltage tolerance -15+10 %	Versions 1, 2c, 3
Frequency range $U_{\rm S}$ 5060 Hz	
Typical power consumption at AC 230 V < 30 W	Trap support yes
77	·
Stored energy time in the event of voltage failure	USB
Time, date min. 3 days	Number 2
Displays mamary	Operating mode USB 2.0 host (5 V, 500 mA)
Displays, memory	Data rate 480 Mbit/s
Display 2" TT	Cable length < 3 m
CP907-I 7" TFT touch display	Connection type USB 2 Standard-A
CP915-1 15.6" TFT touch display	Used ports
E-mail configuration and device failure monitoring max. 250 entries Individual texts unlimited number of texts with 100 characters each	53 DNS (UDP/TCP)
Number of data points for "third-party devices" to Modbus TCP and Modbus RTU 1600	67, 68 DHCP (UDP)
,	80 HTTP (TCP)
Number of data loggers 30 Number of data points per data logger 10 000	123 NTP (UDP)
Number of history memory entries 20 000	161 SNMP (UDP)
Number of history memory entities 20 000	162 SNMP TRAPS (UDP)
Visualisation	443 HTTPS (TCP)
Number of pages 50	502 MODBUS (TCP)
Background image size max. 3 MB	4840 OPCUA (TCP)
	5353 MDNS (UDP)
	3333 INDIVIDUO (UUF)
Interfaces	48862 BCOM (UDP)
Intertaces Ethernet	48862 BCOM (UDP)
	48862 BCOM (UDP) Digital inputs (112)
Ethernet	48862 BCOM (UDP) Digital inputs (112) Number 12
Ethernet RJ45	A8862 BCOM (UDP) Digital inputs (112) Number 12 Galvanic separation yes
Ethernet Connection RJ45 Cable shielded, both ends of shield connected to PE	48862BCOM (UDP)Digital inputs (112)12Number12Galvanic separationyesMaximum cable length< 1000 m
Ethernet Connection RJ45 Cable shielded, both ends of shield connected to PE Cable length < 100 m	Digital inputs (112) Number 12 Galvanic separation yes Maximum cable length < 1000 m
EthernetConnectionRJ45Cableshielded, both ends of shield connected to PECable length< 100 m	Digital inputs (112) Number 12 Galvanic separation yes Maximum cable length < 1000 m
Ethernet Connection RJ45 Cable shielded, both ends of shield connected to PE Cable length < 100 m	A8862 BCOM (UDP) Digital inputs (112) Number 12 Galvanic separation yes Maximum cable length < 1000 m Operating mode selectable for each input: active-high or active-low Factory setting active-high Voltage range (high) AC/DC 1030 V
Ethernet Connection RJ45 Cable shielded, both ends of shield connected to PE Cable length < 100 m	Digital inputs (112) Number 12 Galvanic separation yes Maximum cable length < 1000 m
Ethernet Connection RJ45 Cable shielded, both ends of shield connected to PE Cable length < 100 m	Digital inputs (112) Number 12 Galvanic separation yes Maximum cable length < 1000 m
Ethernet Connection RJ45 Cable shielded, both ends of shield connected to PE Cable length < 100 m	Digital inputs (112) Number 12 Galvanic separation yes Maximum cable length < 1000 m
Ethernet Connection RJ45 Cable shielded, both ends of shield connected to PE Cable length < 100 m	BCOM (UDP)Digital inputs (112)Number12Galvanic separationyesMaximum cable length< 1000 m
Ethernet Connection RJ45 Cable shielded, both ends of shield connected to PE Cable length < 100 m	Assection (UDP) Digital inputs (112) Number 12 Galvanic separation yes Maximum cable length < 1000 m Operating mode selectable for each input: active-high or active-low Factory setting active-high Voltage range (high) AC/DC 1030 V Voltage range (low) AC/DC 02 V Max. current per channel (at AC/DC 30 V) 8 mA Connection push-in terminal (1-1) (2-2) (3-3) (12-12) Switching elements
Ethernet Connection RJ45 Cable shielded, both ends of shield connected to PE Cable length < 100 m Data rate 10/100 Mbit/s, autodetect HTTP mode HTTP/HTTPS (HTTP)* DHCP on/off (Off)* Toff (DHCP) 560 s (30 s)* IP address nnn.nnn.nnn.nnn (192.168.0.254)*, can always be reached via: 169.254.0.1 Net mask nnn.nnn.nnn (255.255.0.0)* Protocols TCP/IP, Modbus TCP, Modbus RTU, PROFINET, DHCP, SNMP, SMTP, NTP BMS bus	BCOM (UDP)Digital inputs (112)Number12Galvanic separationyesMaximum cable length< 1000 m
Ethernet Connection RJ45 Cable shielded, both ends of shield connected to PE Cable length < 100 m Data rate 10/100 Mbit/s, autodetect HTTP mode HTTP/HTTPS (HTTP)* DHCP on/off (off)* Toff (DHCP) 560 s (30 s)* IP address nnn.nnn.nnn.nnn (192.168.0.254)*, can always be reached via: 169.254.0.1 Net mask nnn.nnn.nnn (255.255.0.0)* Protocols TCP/IP, Modbus TCP, Modbus RTU, PROFINET, DHCP, SNMP, SMTP, NTP BMS bus Interface/protocol RS-485/BMS internal	Asked BCOM (UDP) Digital inputs (112) Number 12 Galvanic separation yes Maximum cable length < 1000 m Operating mode selectable for each input: active-high or active-low Factory setting active-high or Active-low Voltage range (ligh) AC/DC 1030 V Voltage range (low) AC/DC 02 V Max. current per channel (at AC/DC 30 V) 8 mA Connection push-in terminal (1-1) (2-2) (3-3) (12-12) Switching elements Number 1 relay Operating mode N/C operation or N/O operation
Ethernet Connection RJ45 Cable shielded, both ends of shield connected to PE Cable length < 100 m Data rate 10/100 Mbit/s, autodetect HTTP mode HTTP/HTTPS (HTTP)* DHCP 0n/off (DHCP) 560 s (30 s)* IP address nnn.nnn.nnnn (192.168.0.254)*, can always be reached via: 169.254.0.1 Net mask nnn.nnn.nnn (255.255.0.0)* Protocols TCP/IP, Modbus TCP, Modbus RTU, PROFINET, DHCP, SNMP, SMTP, NTP BMS bus Interface/protocol RS-485/BMS internal Operating mode master/slave (master)*	Assection (UDP) Digital inputs (112) Number 12 Galvanic separation yes Maximum cable length < 1000 m Operating mode selectable for each input: active-high or active-low factory setting active-high or active-low factory setting AC/DC 1030 V Voltage range (low) AC/DC 1030 V Voltage range (low) AC/DC 02 V Max. current per channel (at AC/DC 30 V) 8 mA Connection push-in terminal (1-1) (2-2) (3-3) (12-12) Switching elements Number 1 relay Operating mode N/C operation or N/O operation Function programmable
Ethernet Connection RJ45 Cable shielded, both ends of shield connected to PE Cable length < 100 m Data rate 10/100 Mbit/s, autodeted HTTP mode HTTP/HTTPS (HTTP)* DHCP 0no/off (off)* Toff (DHCP) 560 s (30 s)* IP address nnn.nnn.nnnn (192.168.0.254)*, can always be reached via: 169.254.0.1 Net mask nnn.nnn.nnn (255.255.0.0)* Protocols TCP/IP, Modbus TCP, Modbus RTU, PROFINET, DHCP, SNMP, SMTP, NTP BMS bus Interface/protocol RS-485/BMS internal Operating mode master/slave (master)* Baud rate 9.6 kBit/s	Digital inputs (112) Number 12 Galvanic separation yes Maximum cable length < 1000 m Operating mode selectable for each input: active-high or active-high Voltage range (high) AC/DC 1030 V Voltage range (low) AC/DC 02 V Max. current per channel (at AC/DC 30 V) 8 mA Connection push-in terminal (1-1) (2-2) (3-3) (12-12) Switching elements Number 1 relay Operating mode N/C operation or N/O operation Function programmable Electrical endurance under rated operating conditions, number of cycles 10,000
Ethernet Connection RJ45 Cable shielded, both ends of shield connected to PE Cable length < 100 m Data rate 10/100 Mbit/s, autodetect HTTP mode HTTP/HTTPS (HTTP)* DHCP 0n/off (Off)* Toff (DHCP) 560 s (30 s)* IP address nnn.nnn.nnnn (192.168.0.254)*, can always be reached via: 169.254.0.1 Net mask nnn.nnn.nnnn (252.255.0.0)* Protocols TCP/IP, Modbus TCP, Modbus RTU, PROFINET, DHCP, SNMP, SMTP, NTP BMS bus Interface/protocol RS-485/BMS internal Operating mode master/slave (master)* Baud rate 9.6 kBit/s Cable length < 1200 m	BCOM (UDP)
Ethernet Connection RJ45 Cable shielded, both ends of shield connected to PE Cable length < 100 m Data rate 10/100 Mbit/s, autodetect HTTP mode HTTP/HTTPS (HTTP)* DHCP 0n/off (Off)* Toff (DHCP) 560 s (30 s)* IP address nnn.nnn.nnn.nnn (192.168.0.254)*, Can always be reached via: 169.254.0.1 Net mask nnn.nnn.nnnn.nnn (255.255.0.0)* Protocols TCP/IP, Modbus TCP, Modbus RTU, PROFINET, DHCP, SNMP, SMTP, NTP 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	BCOM (UDP)
Ethernet Connection RJ45 Cable shielded, both ends of shield connected to PE Cable length < 100 m Data rate 10/100 Mbit/s, autodetect HTTP mode HTTP/HTTPS (HTTP)* DHCP 0n/off (Off)* Toff (DHCP) 560 s (30 s)* IP address nnn.nnn.nnn.nnn (192.168.0.254)*, Can always be reached via: 169.254.0.1 Net mask nnn.nnn.nnnn.nnn (255.255.0.0)* Protocols TCP/IP, Modbus TCP, Modbus RTU, PROFINET, DHCP, SNMP, SMTP, NTP 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	BCOM (UDP)
Ethernet Connection RJ45 Cable shielded, both ends of shield connected to PE Cable length < 100 m Data rate 10/100 Mbit/s, autodetect HTTP mode HTTP/HTTPS (HTTP)* DHCP 0n/off (off)* Toff (DHCP) 560 s (30 s)* IP address nnn.nnn.nnn.nnn (192.168.0.254)*, Can always be reached via: 169.254.0.1 Net mask nnn.nnn.nnnn.nnn (255.255.0.0)* Protocols TCP/IP, Modbus TCP, Modbus RTU, PROFINET, DHCP, SNMP, SMTP, NTP 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: alternative: twisted pair, J-Y(St)Y min. 2v0,8	BCOM (UDP)
Ethernet Connection RJ45 Cable shielded, both ends of shield connected to PE Cable length < 100 m Data rate 10/100 Mbit/s, autodetect HTTP mode HTTP/HTTPS (HTTP)* DHCP on/off (off)* Toff (DHCP) 560 s (30 s)* IP address nnn.nnn.nnn.nnn (192.168.0.254)*, Can always be reached via: 169.254.0.1 Net mask nnn.nnn.nnn.nnn (252.255.0.0)* Protocols TCP/IP, Modbus TCP, Modbus RTU, PROFINET, DHCP, SNMP, SMTP, NTP 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: alternative: twisted pair, J-Y(St)Y min. 2x0,8 Connection "ABMS", "BBMS" (see plug-in terminal)	Digital inputs (112) Number 12 Galvanic separation yes Maximum cable length < 1000 m Operating mode selectable for each input: active-high or active-high Voltage range (low) AC/DC 1030 V Voltage range (low) AC/DC 1030 V Max. current per channel (at AC/DC 30 V) 8 mA Connection push-in terminal (1-1) (2-2) (3-3) (12-12)
Ethernet Connection RJ45 Cable shielded, both ends of shield connected to PE Cable length < 100 m Data rate 10/100 Mbit/s, autodetect HTTP mode HTTP/HTTPS (HTTP)* DHCP 0n/off (off)* Toff (DHCP) 560 s (30 s)* IP address nnn.nnn.nnn.nnn (192.168.0.254)*, Can always be reached via: 169.254.0.1 Net mask nnn.nnn.nnnn.nnn (255.255.0.0)* Protocols TCP/IP, Modbus TCP, Modbus RTU, PROFINET, DHCP, SNMP, SMTP, NTP 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: alternative: twisted pair, J-Y(St)Y min. 2v0,8	BCOM (UDP)

Technical data (continued)

Buzzer		Environment/EMC	
Buzzer message can be acknowledged, adoption of characte		EMC	IEC 61326-
Buzzer interval	configurable	Operating temperature	
Buzzer frequency	configurable	CP907-I	-10+55°
Buzzer repetition	configurable	CP907-I for UL-Applications	-10+50°
Audio		CP915-I	-5+40 °(
Line IN	not used	Operating altitude	≤ 2000 m AMS
Line OUT Output to a STEREO playback device vi		Rel. humidity	≤ 98 % at 25 °C
Cable length	< 3 m	Classification of climatic conditions acc. to IEC 60721:	
cubic length		Stationary use (IEC 60721-3-3)	3K2
Device connections		Transport (IEC 60721-3-2)	2K1
Terminal block (L1; N; PE) (for CP915-l only)		Long-term storage (IEC 60721-3-1)	1K2
Conductor sizes	AWG 20-12	Classification of mechanical conditions acc. to IEC 60721:	
Stripping length	1011 mm	Stationary use (IEC 60721-3-3) CP907-I only	3M1 ⁻
rigid/flexible	0.54 mm ²	Stationary use (IEC 60721-3-3) CP915-I only	3M10
flexible with ferrule with/without plastic sleeve	0.54 mm ²	Transport (IEC 60721-3-2)	2M4
Multiple conductor, flexible with TWIN ferrule with plastic sleeve	0.54 mm ²	Long-term storage (IEC 60721-3-1)	1M1:
Plug-in terminal (A1/+;A2/-) (11;12;14)		Other	
Plug-in terminal (A1/+;A2/-PE) (11;12;14)		Operating mode	continuous operation
Conductor sizes	AWG 24-12	Mounting	display-oriented
Stripping length	10 mm	Degree of protection, front	IP54
rigid/flexible	0.22.5 mm ²	Degree of protection, front for UL applications	IP50
flexible with ferrule, with/without plastic sleeve	0.252.5 mm ²	Degree of protection, enclosure	IP20
Multiple conductor, flexible, with TWIN ferrule with plastic sleeve	0.51.5 mm ²	Flammability class	UL 94V-(
Plug-in terminal (I112), (k1k12), (MB), (BMS)		Device dimensions	
Conductor sizes	AWG 24-16	CP907-I (W x H x D)	226 x 144 x 78 mn
Stripping length	10 mm	CP915-I (W x H x D)	505 x 350 x 95 mn
rigid/flexible	0.21.5 mm ²	Documentation number	D00418
flexible with ferrule without plastic sleeve	0.251.5 mm ²	Weight	
flexible with ferrule with plastic sleeve	0.250.75 mm ²	CP907-I	< 1.1 kg
For UL-applications (only CP907-I)		CP915-I	< 6.1 kg
Use copper conductors only.		()* = factory settings	
Minimum temperature rating of the cable to be connected to the field wiring terminals	75 ℃	() lactory settings	
Minimum temperature rating of the cable to be connected to the PoE plug	80 ℃		

Dimensions

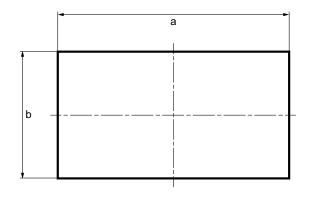
External dimensions



Туре			Dimensions (mm)	
	.,,,,,	a	b	c
	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	
1,700	Enclosure	a	b	depth	
	Flush-mounting enclosure	212	124	75	
CP907-I	Door	215	124	65	
	Surface-mounting		173	-	
CD015 I	Flush-mounting enclosure	464	309	92	
CP915-I	Surface-mounting	511	356	-	

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	DC 24 V. < 15 W;	=11 (4= 4)	DC 24 V, < 15 W;	226 :: 144 :: 70 ::::::	1.1 kg	white	B95061080		
CP907 without Flush-mounting enclosure	7" (17.6 cm)	alternatively PoE possible	226 x 144 x 78 mm	0.9 kg	white	B95061093			
CDO15	15,6" (39.6 cm)	5,6" (39.6 cm) AC 100240 V, < 30 W 505 x 350 x 92 mm	5 (II (20 ()) AC (20) 240 V 20 W 50 5 250 02	Z 1 l	white	B95061081			
CP915			505 X 350 X 92 IIIIII	6.1 kg	grey	B95061085			
CD024	2411/64	2411 (61)	2411/64	34" (c1) AC 100 340 V CFFW CF4 (A41) 100	15.00 0.00 55.00	CF4 v 441 v 100 mm	0.11	white	B95061083
CP924	24" (61 cm)	AC 100240 V, < 55 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	B95061115
	Display unit grey	B95061116

¹⁾ In the offer phase the Art. No. may differ

Accessories

Device series	Description	Art. No.
CP907	Surface-mounting enclosure	B95061915
CP915, CP924	CP9xx suction lifter 1)	B95061911
All	CP9xx replacement plug kit	B95061910

¹⁾ The suction lifter is needed to remove the display.

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)

Technical data

Technical data	
Insulation coordination acc. to IEC 60664-1	
CP907	
Rated voltage	50 V
Overvoltage category	
Pollution degree	200.14
Rated impulse voltage	800 V
CP915/CP924 Rated insulation voltage	AC 250 M
Overvoltage category	AC 250 V
Pollution degree	
Rated impulse voltage	4 kV
Supply	
CP907 via plug-in terminal (A1/+;A2/-)	
Nominal voltage	DC 24 V SELV/PELV
Nominal voltage tolerance	±20 %
Typical power consumption at DC 24 V	< 15 W
Maximum cable length when supplied via B950	61210 (DC 24 V power supply unit 1.75 A):
0.28 mm ²	75 m
0.5 mm ²	130 m
0.75 mm ²	200 m
1.5 mm ²	400 m
2.5 mm ²	650 m
CP907 via Power-over-Ethernet (PoE)	
Nominal voltage	DC 48 V SELV/PELV
Nominal voltage tolerance	-25+15 %
Typical power consumption for PoE	< 15 W
Maximum cable length when supplied via AWG	26/7; 0.14 mm ² 100 m
CP915 via terminal block (L1; N)	
Nominal voltage via external power supply unit	
Nominal voltage tolerance	-15+10 %
Frequency range U _s	5060 Hz
Typical power consumption at AC 230 V	< 30 W
CP924 via terminal block (L1; N)	
Nominal voltage via external power supply unit	
Nominal voltage tolerance	-15+10 %
Frequency range $U_{\rm S}$	5060 Hz
Typical power consumption at AC 230 V	< 55 W
Stored energy time in the event of voltage	
Time, date	min. 3 days
Displays, memory	
Display/Resolution	7// 757
CP907	7" TFT touch display/800 x 480
CP915	15.6" TFT touch display/1280 x 720
CP924	24" TFT touch display/1280 x 720 or 1920 x 1080
E-mail configuration and device failure monitori Individual texts	ing max. 250 entries unlimited number of texts with 100 characters each
Displayable devices	247
Number of data points for "third-party devices"	
Number of data loggers	30
Number of data points per data logger	10,000
Number of entries in the history memory	20,000
Visualisation	
Number of pages	50
Background image size	max. 3 MB
	max. 5 Mb
Interfaces Ethernet	
Connection	RJ45
Cable	shielded, shield on both sides to PE
Cable length	< 100 m
Data rate	10/100 Mbit/s, autodetect
HTTP mode	HTTP/HTTPS (HTTP)*
DHCP	on/off (off)*
t _{off} (DHCP)	560 s (30 s)*
IP address	nnn.nnn.nnn (192.168.0.254)*,
	can always be reached via: 169.254.0.1
Net mask	nnn.nnn.nnn (255.255.0.0)*
Protocols TCP/IP, Modbus	TCP. Modbus RTU, PROFINET, DHCP, SNMP, SMTP, NTP

BMS bus Interface/protocol	RS-485/BMS interna
Operating mode	KS-485/BMS INTERNA master/slave (master) ³
Baud rate	9.6 kbit/
Cable length	< 1200 m
Cable	shielded, one end of shield connected to PI
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)*
BCOM	50(1)
Interface/protocol	Ethernet/BCON
Cable length	< 100 m
BCOM system name	(SYSTEM)
BCOM subsystem address	1255 (1)**
BCOM device address	1255 (1)
Modbus	1111255 (1)
Bender Modbus image	V1, V2 (V2) ³
Modbus TCP	V 1, VZ (VZ)
Interface/protocol	Ethernet/Modbus TCI
Cable length	Ethernet/moadus i Ci < 100 m
Operating mode	Client for Nemder Modbus TCPdevices and "third-party devices
Operating mode	Server for access to process image and for Modbus control command:
Parallel data access from dif	
Modbus RTU	THUM. 2.
Interface/protocol	RS-485/Modbus RTU
Cable length	< 1200 n
Cable	shielded, one end of shield connected to Pl
recommended	CAT6/CAT7 min. AWG2:
alternative	twisted pair, J-Y(St)Y min. 2x0,
Connection	"AMB", "BMB" (see pluq-in terminal
Operating mode	master/slave (master)
Baud rate	9.657.6 kBit/
Terminating resistor	120 R (0.25 W), can be connected internally (see plug-in terminal
Supported Modbus RTU slav	
PROFINET	
Interface/protocol	Ethernet/PROFINE
Operating mode	Slave (IO-Device)
SNMP	State (10 Defice
Interface/protocol	Ethernet/SNMF
Versions	1, 2c, :
Devices supported	Queries to all devices (channels) possible
Trap support	Queries to all devices (charilles) possible
USB	THE STATE OF THE S
Number	
Operating mode	USB-2.0-Host (5 V, 500 mA
Datarate	480 Mbit/
Cable length	400 MIDIT/ < 3 n
Connection type	USB 2 Standard-
connection type	USD Z Standard 7
Used ports	
53	DNS (UDP/TCP
67, 68	DHCP (UDP
80	HTTP (TCP
123	NTP (UDP
161	SNMP (UDP
443	HTTPS (TCP
502	MODBUS (TCP
	OPCUA (TCP
4840	OFCOA (ICF
4840 5353	MDNS (UDP

TCP/IP, Modbus TCP, Modbus RTU, PROFINET, DHCP, SNMP, SMTP, NTP

Protocols

Digital inputs (112)	
Number	12
Galvanic separation	yes
Maximum cable length	< 1000 m
Operating mode	selectable for each input: active-high or active-low
Factory setting	active-high
Voltage range (high)	AC/DC 1030 V
Voltage range (low)	AC/DC 02 V
Max. Current per channel (at AC/DC 30 V)	8 mA
Connection plug-in terminal	(1-1) (2-2) (3-3)(12-12)
Switching elements	
Number	1 rolav

Switching elements			
Number			1 relay
Operating mode	N/C operation / N/O operation		
Function		progra	ammable
Electrical endurance under rated operating conditions, number of cycles	S		10,000
Contact data acc. to IEC 60947-5-1:			
Utilisation category	AC-13	AC-14	DC-12
Rated operational voltage	24 V	24 V	24 V
Rated operational current	2 A	2 A	2 A
Minimum contact load (relay manufacturer's reference)		10 μΑ / 1	10 mV DC
Connection	plug-in	terminal (1	11;12;14)

Buzzer	
Buzzer message	can be acknowledged, adoption of characteristics of new value
Buzzer interval	configurable
Buzzer frequency	configurable
Buzzer repetition	configurable

Audio	
Line IN	not used
Line OUT	Output to a STEREO playback device via 3.5 mm jack plug
Cable length	< 3 m

Device connections Terminal block (L1; N; PE) (for CP015 and CP924 only)

Conductor sizes	AWG 20-12
Stripping length	1011 mm
rigid/flexible	0.54 mm ²
flexible with ferrule with/without plastic sleeve	0.54 mm ²
Multiple conductor, flexible with TWIN ferrule with plastic sleeve	0.54 mm ²
multiple conductor, flexible with TWIN leftule with plastic sleeve	0.54 111111

Plug-in terminal (A1/+;A2/-) (11;12;14) Plug-in terminal (A1/+;A2/-;PE) (11;12;14)

1 lag in terminar (11, 1, 1, 12, 1, 12, 11, 12, 11, 1	
Conductor sizes	AWG 24-12
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 (l1...12), (k1...k12), (...MB), (...BMS)

Conductor sizes	AWG 24-16
Stripping length	10 mm
rigid/flexible	0.21.5 mm ²
flexible with ferrule without plastic sleeve	0.251.5 mm ²
flexible with 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 °C
Minimum temperature rating of the cable to be connected to the PoE plug	80 °C

Environment/EMC

EMC	IEC 61326-1
Operating temperature	
CP907	-10+55 °C
CP907 for UL-Applications	-10+50 °C
CP915	-5+40 °C
CP924	-5+40 °C
Range of use	≤ 2000 m AMSL
Rel. humidity	W 98 % at 25 °C

Classification of climatic conditions acc. to IEC 60721:

Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use (IEC 60721_3_3) CP907 only	3M11

21/11/1
3M10
2M4
1M12

Other

CP924

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	< 1.1 kg
CP915	< 6.1 kg

Dimensions

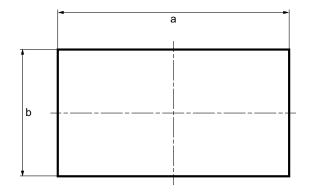
External dimensions

b

Туре	Dimensions (mm)		
Турс	a	b	c
CP907	226	144	176 (7")
CP915	505	350	386 (15,6")
CP924	654	441	610 (24")

 ${\it Glass\ thickness\ 3\ mm}$

Installation dimensions - panel cut-out



Type Enclosure		Dimensions (mm)		Required installation
.,,,,	inclosure	a	b	depth
CD007	Flush-mounting	212	124	75
CP907	Surface-mounting	299	173	-
CP915	Flush-mounting	464	309	92
CP924	Flush-mounting	613	401	95

< 9.1 kg

COMTRAXX® CP305 – Control Panel

Remote alarm indicator for medical locations and other areas



Typical applications

· For medical locations and other areas

Approvals





Device features

- · 5" touch screen
- · Parameter setting via web server, display or Bender Connect app
- Freely programmable alarm messages
- Flush-mounting and surface-mounting version
- Easy replacement MK2007/MK2430 (retrofit)

Device variants

CP305

The CP305 is used to display visual and audible alarms. ISOMETER®s can be tested via the test function. The CP305 can also be used as a parallel display in combination with other CP305 or CP9xx.

In the event of an alarm, the programmed alarm messages are shown on the display.

The CP305-IO features 12 digital inputs that can be freely assigned. This allows messages from third-party equipment such as battery systems or the state of medical gases to be indicated.

Any alarm message can be assigned to the inputs.

The CP305-IO has 2 additional relay outputs.

Bender Connect App









Further information

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

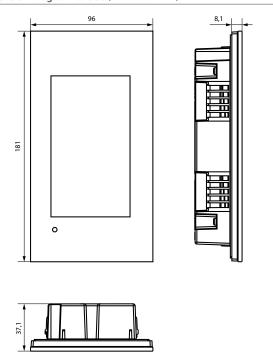
Ordering information

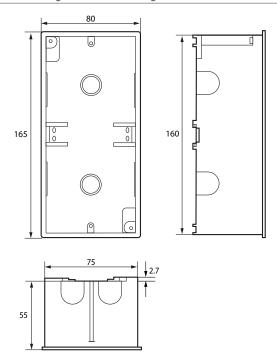
Туре	Description	Art. No.
CP305-I0		B95100051
CP305-C	Customised parameter settings	B22030051

Accessories

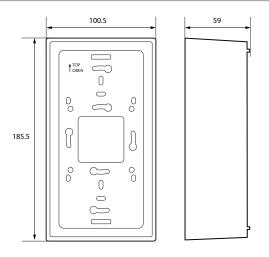
Description	Art. No.
Flush-mounting enclosure	B923710
Cavity-wall installation set for flush-mounting enclosures	B923711
CP305 surface-mounting enclosure	B95100153
CP305-IO plug kit	B95100151
Ethernet adapter kit (RJ45 socket insert, Cat.6 SLIM patch cable)	B95100152

Insulation coordination CP305 acc. to IEC 60664-1	Switching elements
Rated voltage 50 V	Connection Plug-in terminal
Overvoltage category II	K1 NC; K1 NO; K1 COM
Pollution degree 2	K2 NC; K2 NO; K2 COM
Overvoltage category II and pollution degree 2 is related to the relay contacts. Further insulation co-	Number of changeover contacts 2
ordination takes place after functional separation.	Operating principle (changeover contacts) N/C operation / N/O operation
	Function Programmable
Supply via plug-in terminal (A1/+, A2/-)	Electrical endurance under rated operating conditions 10,000 operating cycles
Rated voltage AC/DC 24 V	
Operating range of the supply voltage AC 1828 V/DC 1830 V	Contact data acc. to IEC 60947-5-1
Nominal frequency 50/60 Hz	Utilisation category AC-13 AC-14 DC-12
Typical power consumption < 4.2 W	Rated operational voltage AC 24 V AC 24 V DC 24 V
Maximum cable length with supply via B95061210 (24 V DC power supply unit 1.75 A)	Rated operational current AC 2 A AC 2 A AC 2 A
0.28 mm ² 75 m	Buzzer
0.5 mm ² 130 m	Buzzer alarm Can be acknowledged, adoption of characteristics of new value, can be muted
0.75 mm ² 200 m	Buzzer interval Configurable
1.5 mm ² 400 m	Buzzer frequency Configurable
2.5 mm ² 650 m	Buzzer repetition Configurable
Charles and the state of the st	buzzer repetition Connigurable
Stored energy time in the event of voltage failure	Device connections
Time, date Min. 2 days	Plug-in terminal (A1/+, A2/-)
Restart after power failure Min. 2 seconds	Conductor sizes AWG 24-12
Displays, memory	Stripping length 10 mm
Display 5" TFT touch display (720 x 1280 px)	Rigid/flexible 0.22.5 mm ²
Displayable devices 90	Flexible with ferrules, with/without plastic sleeve 0.252.5 mm ²
Number of alarm addresses 500	Multiple conductor flexible with TWIN ferrule with plastic sleeve 0.5 1.5 mm ²
Number of test addresses 50	· · · · · · · · · · · · · · · · · · ·
number of rest addresses 30	Plug-in terminals (BMS A, BMS B), (IN14, GND14, IN912, GND912)
Displays, memory	(IN58, GND58, K1, K2)
Number of history memory entries 1000	Conductor sizes AWG 18-16
	Stripping length 10 mm
Interfaces	Rigid/flexible 0.751.5 mm ²
Ethernet	Flexible with ferrule without plastic sleeve 0.751.5 mm ²
Connection RJ45	Flexible with ferrule with plastic sleeve 0.75 mm ²
Data rate 10/100 Mbit/s, autodetect	For UL applications
DHCP on/off (on)*	Use copper lines only.
IP address (1:1 connection) 169.254.xx.yy (xx and yy are unique for each device)	Minimum temperature range of the cable to be connected to the plug-in terminals $75^{\circ}\mathrm{C}$
Netmask nnn.nnn.nnn (255.255.255.0)*	Environment/EMC
Logs TCP/IP, Modbus TCP, DHCP, SNTP	
Modbus TCP	EMC IEC 61000-6-2:2016-08 Ed. 3.0
Interface/protocol Ethernet/Modbus TCP	IEC 61000-6-3:2020-07 Ed. 3.0
·	IEC 61326-1:2020-10 Ed. 3.0
· - 3	DIN EN 61326-1:2020-10 Ed. 3.0
BMS bus	DIN EN 61326-1:2013-07
Interface/protocol RS-485/BMS internal	DIN EN 50364:2019-05
Operating mode Master/slave (master)*	EN 300 330 V2.1.1
Baud rate 9.6 kBit/s	ETSI EN 301 489-3 V2.3.0
Cable length < 1200 m	Operating temperature -10+55 °C
Shielded cable, one end of shield connected to PE Recommended: CAT6/CAT7 min. AWG23	Operating temperature for UL applications -10+50 °C
Alternative: J-Y(St)Y min. 2 x 0.8	Operating altitude ≤ 2000 m AMSL
Galvanic separation Yes	Rel. humidity $\leq 98\%$ at 25 °C
Connection "BMS A", "BMS B" (see plug-in terminal)	Classification of climatic conditions acc. to IEC 60721
Terminating resistor 120 Ω (0.25 W), can be connected internally	Stationary use (IEC 60721-3-3) 3K22
Device address 190 (1)*	Transport (IEC 60721-3-2) 2K11
Digital inputs (112)	Long-term storage (IEC 60721-3-1) 1K22
Number 12	Classification of mechanical conditions acc. to IEC 60721
Galvanic separation In groups of four	Stationary use (IEC 60721-3-3) 3M11
IN 14/GND 1-4	Transport (IEC 60721-3-2) 2M4
IN 58 / GND 5-8	Long-term storage (IEC 60721-3-1) 1M12
IN 912 / GND 9-12	Othou
Relay mode Can be selected for each input: high-active or low-active	Other
Factory setting Off	Operating mode Continuous operation
Voltage range (high) AC/DC 1030 V	Mounting position Display-oriented,
Nominal: 24 V	adjustable horizontal/vertical display orientation
Voltage range (low) AC/DC 02 V	Degree of protection of front glass pane IP66
Max. current per channel (at AC/DC 30 V) 8 mA	Degree of protection of front for UL applications IP50
Connection Plug-in terminals	Degree of protection of enclosure IP20
IN 1 4 / GND1-4	Flammability class UL 94V-0
IN 58 / GND 5-8	Device dimensions (W x D x H) 181 x 96 x 37.31 mm
IN 912 / GND 9-12	Documentation number D00425
Maximum cable length < 500 m	Weight < 420 g
	()* = Factory setting
	() Tacony security



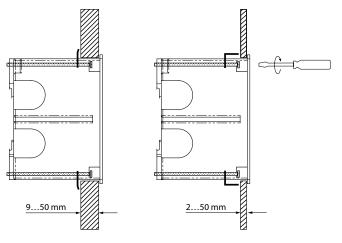


Dimension diagram surface mounting (dimensions in mm)



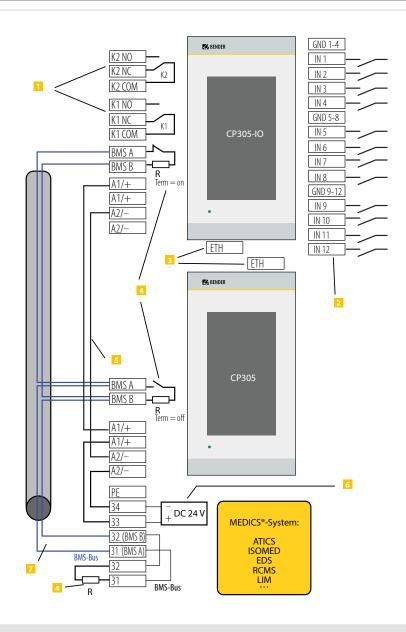
Dimension diagram cavity wall and panel mounting (dimensions in mm)

For cavity wall or panel mounting, you need the "Cavity wall mounting set" (item no. B923711).



Cavity wall mounting

Panel mounting



1 K...COM 2 Relay outputs

K...NC Parametrisable contacts for device errors, test of assignedK...NO devices*, device failure and common alarm message.

2 IN1...12 Digital inputs

GND...

The digital inputs are divided into three groups of four, which are galvanically separated from each other and from the device. Each group has its own GND terminal for the reference potential.

The digital inputs may be activated either via internal or external voltage or potential-free contacts. If the inputs are controlled via an external voltage, the common reference potential is connected to the "GND" terminal and the signal is connected to the respective input IN1...12.

Ethernet interface for connection to a PC

The CP305 can be integrated into the Bender/hospital network via the Ethernet interface. Parameters can be set on the PC and data as well as the history memory can be read out. Connected measuring devices can be displayed with their channels.

A R BMS bus terminating resistor

If two or more devices are connected to each other via the BMS bus, the bus line must be terminated at both ends with a resistor ($R = 120~\Omega$). (On the CP305, the resistors can be enabled via a switch at the bottom).

5 A1+/A2- Supply voltage

For the supply of the CP305 in the MEDICS® modules, observe the permissible cable lengths and cross-sections.

DC 24 V Power supply unit in the MEDICS® module, sufficient for supplying power to max two CP305.

BMS A BMS bus connection

BMS B Various Bender devices with a BMS bus interface can be connected to the BMS bus. Examples: ATICS®, iso-MED427P, EDS151, RCMS..., CP9xx, ...

* Devices without BMS bus connection, but with test input (e.g. ISOMETER*)

COMTRAXX® MK2430

Alarm indicator and test combination with LCD



Typical applications

- · Visual and acoustic signalling of operating status and alarm messages
- Display of measured values and setting of limit values for monitoring purposes from BMS-capable Bender monitoring systems

Approvals



Device features

- Display of operating status, warning and alarm messages in accordance with DIN VDE 0100-710, IEC 60364-7-710 and other standards
- Backlit clear LC text display (4 x 20 characters)
- · Predefined standard texts in 20 languages
- 200 freely programmable message texts
- · Bus technology for easy installation and reduced fire load
- · Acoustic alarm with mute function
- Parameter setting via menu (German/English)
- Suitable for flush and surface mounting
- Easy commissioning due to predefined message texts
- 12 digital inputs/1 relay output (MK2430-11 only)
- · History memory with real-time clock to store 250 warning and alarm messages
- MK2418 can easily be exchanged for MK2430/MK2007

Standards

The MK2430 alarm indicator and test combination meets the requirements for installation:

- DIN VDE 0100-710 (VDE 0100 Part 710)
- IEC 60364-7-710

Further information

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

Ordering information

Туре	Digital inputs/ relay output	Enclosure	Enclosure included in the scope of delivery	Art. No.	
MK2430-11	12/1			Flush manustins	B95100001
MK2430-12	-	Flush-mounting	~	B95100002	
MK2430H-12	-	Flush-mounting, horizontal mounting	-	B95100024	

Accessories

Type designation	Art. No.
Parameterisation software TMK-SET	as Internet download
MK2430-mounting kit, complete	B95101000
Flush-mounting enclosure	B923710
Cavity wall installation set for flushmounting enclosure	B923711
CPx05 surface-mounting enclosure	B95100153

Suitable system components

Description	Туре	Art. No.	Page
Power supply unit	AN410	B924209	384
	AN450	B924201	386

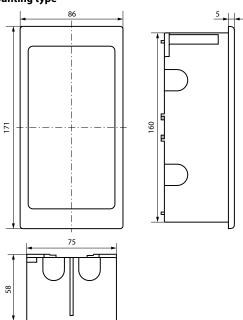
Insulation coordination acc. to IEC 60664-1	Max. cable length in case of power supply of 1/2/3 MK24 from one AN410
Rated insulation voltage AC 250 V	0.28 mm ² (e.g. J-Y(St)Y nx0.6) 300/150/100 m
Rated impulse withstand voltage/pollution degree 4 kV/3	0.5 mm ² (e.g. J-Y(St)Y n x 0.8) 500 /250/150 m
	0.75 mm ² 750/375/250 m
Supply voltage	1.5 mm ² 1500/750/500 m
Supply voltage $U_{\rm S}$ AC/DC 24 V	2.5 mm ² 2500/1200/750 m
Frequency range U_s 0/4060 Hz	
Operating range U_s AC 1828/DC 1830 V	Colours
Power consumption $\leq 3 \text{ VA}$	Front foil RAL 7035 (light grey); RAL 7040 (basalt grey)
Voltage failure without reset $\leq 15 \text{ s}$	Marking RAL 5005 (ultramarine blue)
Displays and LEDs	Front plate RAL 7035 (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 150	Function programmable
Programmable text messages 200	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 (press button to access) 3 x 20 characters	Utilisation category AC-13 AC-14 DC-12
Alarm LEDs (three different colours) NORMAL (green), WARNING (yellow), ALARM (red)	Rated operational voltage 24 V 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	
Buzzer message can be acknowledged, adoption of characteristics of new value operation	Environment/EMC
Buzzer interval configurable	EMC immunity DIN EN 61000-6-2
Buzzer frequency configurable	EMC emission DIN EN 61000-6-3
Buzzer repetition configurable	Operating temperature -5+55 °C
	Classification of climatic conditions acc. to IEC 60721:
Inputs (MK243011 only)	Stationary use 3K22
Digital inputs 12 (IN1IN12)	Transport 2K11
Galvanic separation yes	Long-term storage 1K22
Activation of the digital inputs via potential-free contacts/extraneous voltage	Classification of mechanical conditions acc. to IEC 60721:
Operating principle N/O or N/C operation individually selectable for each input	Stationary use 3M11
Factory setting N/O operation	Transport 2M4
Voltage range (high) AC/DC 1030 V	Long-term storage 1M12
Voltage range (low) AC/DC 02 V	Connection
Cable recommended: J-Y(St)Y min. 2 x 0.8	
Cable length ≤ 500 m	Connection pluggable screw terminals
Interfaces	Connection properties (supply voltage, BMS bus): Connection of single conductors
Interfaces RS-485 and USB (V2.0/V1.1)	riqid/flexible/conductor sizes 0.22.5/0.22.5 mm² (AWG 2412)
	flexible with ferrule without/with plastic sleeve 0.252.5/0.252.5 mm ²
Technical data for the RS-485 interface:	Multi-conductor connection (2 conductors of the same cross section)
Protocol BMS	rigid/flexible 0.21/0.21.5 mm ²
Baud rate 9.6 kbit/s	flexible with ferrule without plastic sleeve 0.251 mm ²
Cable length ≤ 1200 m	flexible with TWIN ferrules with plastic sleeve 0.51.5 mm ²
Cable (twisted in pairs, one end of shield connected to PE) recommended: J-Y(St)Y min. 2 x 0.8	·
Terminating resistor 120 Ω (0.25 W) connectable via DIP switch	Connection properties (inputs):
Device address, BMS bus 1150	Connection of single conductors riqid/flexible/conductor sizes 0.081.5/0.081.5 mm² (AWG 2816)
Factory setting device address 1 (master)	rigid/flexible/conductor sizes 0.081.5/0.081.5 mm² (AWG 2816) flexible with ferrule without/with plastic sleeve 0.251.5/0.250.5 mm²
Programming	Multi-conductor connection (2 conductors with the same cross section):
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 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 mm² (e.g. J-Y(St)Y nx0.8) 250/70/– m	Other
0.75 mm ² 400/100/- m	
1.5 mm ² 800/210/10 m	Operating mode continuous operation
2.5 mm ² 1300/360/20 m	Mounting display-oriented Degree of protection (DIN EN 60529 IP50 (surface-mounting type: IP54)
	Degree of protection (DIN EN 60529 IP50 (surface-mounting type: IP54) Degree of protection (DIN EN 60529) IP20
	Flammability class UL94V-0
	Documentation number D00129
	DOUTZ9

Weight

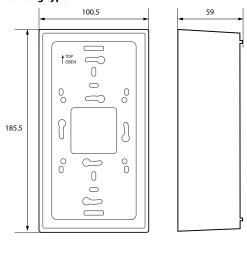


flush mounting \leq 210 g, surface mounting \leq 400 g

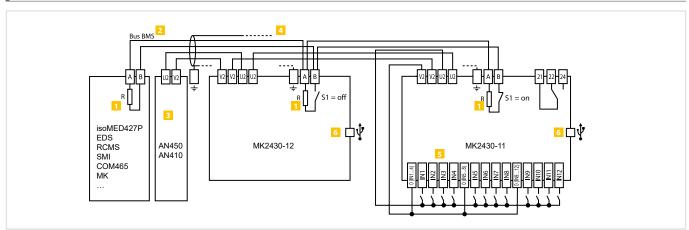
Flush-mounting type



Surface-mounting type



Wiring diagram



1 Terminating resistor BMS bus (120 Ω)

ble cross sections have to be considered.

- 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 ca-
- 5 Digital inputs
 - The digital inputs may be controlled either via potential-free contacts or via voltage signals. If you are using potential-free contacts, the voltage can be drawn from the AN410 or AN450 (3).
 - When the inputs are activated via an external voltage, the common 0(-) is connected to terminal 0 and the 1(+)-signal is connected to the respective input IN1...IN12. In this case, the connections between the terminals 0 and V2 and the common connections and U2 $\,$ are not required.
- USB connection for programming purposes

Visualisation



Typical applications

• Visualisation of Bender systems

Device features

- Graphical representation on a screen showing the design and status of Bender systems, e.g. in the form of an outline view or a circuit diagram
- · Localising and identifying faults easier and faster
- · Display of operating messages, alarm messages and currently measured values
- · Displaying and analysing historical data
- · Viewing and operating from remote computers
- Display and operation via the gateway COM465IP option D by means of a browser and a personal computer in the network.
- Individually programmed visualisation on a touch panel PC or a PC

Our service range:

Bender offers you the following solution package:

- Bender gateway to connect your Bender system to a computer
- Touch panel computer and/or computer with monitor for displaying the visualisation solution
- $\bullet \ \ Customer-specific \ programming \ of the \ visualisation \ solution \ using \ a \ high-performance \ software$
- \bullet On-site setting and testing of the visualisation

Your advantages:

- · Continuous overview of the system at any place
- Faults can be detected easily and hence remedied faster
- Correlations can be recognised and faults can be avoided in the future

Further information

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

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.

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.

Stray currents

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.



Overview price model

Model	Туре	Collectors (gateways)	User	Art. No.
	POWERSCOUT 2	up to 2	10	B95061500
Heated	POWERSCOUT 5	up to 5	20	B95061501
Hosted	POWERSCOUT 10	up to 10	40	B95061502
	POWERSCOUT project	> 10	> 40	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



ATICS®, the worldwide safest and most compact all-in-one changeover and monitoring device

for safety-relevant and medical locations

Safe

Functional safety SIL2 according to IEC 61508

guarantees protection against malfunction hazards

Continuous self monitoring

of electronic system and circuit paths with automatic notification

Preventive safety

by automatic reminders for prescribed tests

Maximum reliability during changeover

- Patented changeover system with mechanical and electrical interlock
- Weld-free switching contacts with circuit breaker mechanism
- Insensitive to voltage fluctuations or shocks, for example, due to stable operating position and constant contact pressure
- Monitoring for short circuits

Easy-to-use

Easy to operate and perfect overview

due to clear menu structure and user guidance

Correct information at the correct time

due to clear messages via an illuminated graphic display and via bus

Safe manual changeover during service

due to integrated manual/automatic mode with mechanical restart interlock

Complete documentation of events

- Changeover procedures
- Testing
- Parameter changes

External functional test or replacement without service interruption

by optional bypass switch

Compact

Compact design

of electronic system and switching elements in one enclosure

Changeover, IT system monitoring and locating current injector

in one device

Simple wiring

due to integrated design

Completely pluggable

Efficient

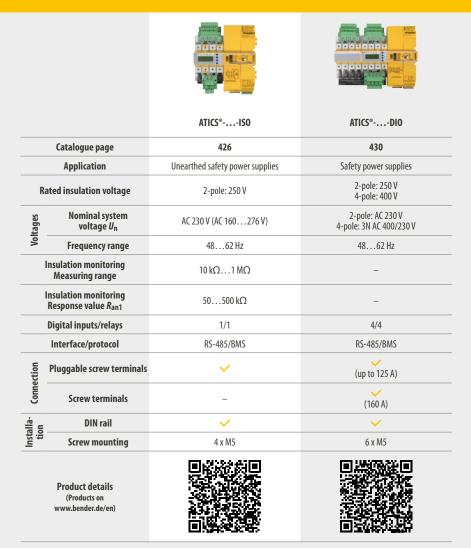
Small space required

Tests according to the regulations without interruption of the

Easy integration into existing installations



Device overview ATICS® switchover and monitoring devices



ATICS®-...-ISO

Automatic transfer switching devices with monitoring function for unearthed safety power supplies



Typical applications

- Design of safety power supplies in group 2 medical locations, e.g.
 - intensive care unit
 - operating theatres
- Retrofit

Approvals



Device features

Perfectly suitable for space-saving installation/retrofitting

- · Compact device for easy setup of safety power supplies with functional safety in accordance with DIN EN 61508 (SIL 2) e.g. for group 2 medical locations in compliance with DIN VDE 0100-710 (VDE 0100-710)/IEC 60364-7-710
- · Increased safety and availability by integrating changeover and IT system monitoring in one compact device
- · All-in-one: Integration of switch disconnector, control and monitoring electronics for unearthed safety power
- · Solutions for any application

Convenient installation and commissioning

Saves time and money

Safe operation

- · Robust switch disconnector contacts
- · Mechanical locking
- · Manual operation directly on the device
- · Functional safety SIL 2
- Certification by TÜV SÜD in accordance with EN 61508 (VDE 0803) SIL 2 and DIN VDE 0100-710 (VDE 0100-710)

Uninterrupted maintenance

- · Plug connectors and optional bypass switch
- · Excellent communication and parameterisation options

Standards

The transfer switching device conforms to the following standards:

- DIN VDE 0100-710 (VDE 0100-710)*
- DIN VDE 0100-718 (VDE 0100-718)
- ÖVE/ÖNORM E 8007
- IEC 60364-7-710*
- DIN EN 61508-1 (VDE 0803-1)*
- IEC 61508-1 (2010-04) Ed. 2.0*
- DIN EN 61508-2 (VDE 0803-2)*
- IEC 61508-2 (2010-04) Ed. 2.0*
- DIN EN 61508-3 (VDE 0803-3)*
- IEC 61508-3 (2010-04) Ed. 2.0* • DIN EN 60947-6-1 (VDE 0660-114)
- IEC 60947-6-1 (2013-12) Ed. 2.1
- DIN EN 61557-8 (VDE 0413-8)

Standard-compliant isolating transformer monitoring according to:

- DIN EN 61558-1 (VDE 0570-1)
- DIN EN 61558-1/A1 (VDE 0570-1/A1)

The standards marked with * were part of the test conducted by TÜV Süd.

Further information

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

Ordering information

Туре	Rated operational current I _e	Rated operational voltage <i>U</i> e	Art. No.
ATICS-2-63A-ISO		AC 240 V	B92057202
ATICS-2-63A-ISO-ES*	AC 63 A	AC 240 V	B92057206
ATICS-2-63A-ISO-400		AC 415 V	B92057204
ATICS-2-80A-ISO		AC 240 V	B92057203
ATICS-2-80A-ISO-ES*	AC 80 A	AC 240 V	B92057207
ATICS-2-80A-ISO-400		AC 415 V	B92057205

^{*} with connection option for ATICS-ES energy storage device.

Description	Rated operational current /e	Туре	Art. No.
Dimono quitade lite	AC 63 A	ATICS-BP-2-63A-SET	B92057252
Bypass switch kit	AC 80 A	ATICS-BP-2-80A-SET	B92057253
Energy storage for ATICS®	-	ATICS-ES*	B92057255

 $^{{\}rm *ATICS-ES\ may\ only\ be\ used\ in\ combination\ with\ the\ following\ ATICS^{\circ}\ transfer\ switching\ devices:\ B92057206,\ B92057207.}$

Suitable system components

Description	Туре	Art. No.	Page
Insulation fault locator	EDS151	B91080101	147

Technical data

Insulation coordination acc. to IEC 60664-1,	IEC 60664-3
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
li	ne 1, 2, 3 – digital inputs; line 1, 2, 3 – relay outputs
Voltage test according to IEC 61010-1 (basic insulation/protective separation) 2.21 kV/3.5-	
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

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 / and fuces	

refer to the manual, table "Utilisation category acc. to DIN EN 60947"

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

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 t _{off}	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	<i>t</i> <500 ms100 s

Current monitoring (output current)

Measuring current transformers	STW3, STW4
Measuring range In (TRMS)	STW3: 0> 150 A, STW4: 0> 260 A
Response value for short-circuit detection ATICS-ISO (versions 6	3 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 ≥ 0.75 mm ²	110 m
Shielded cable	1040 m
Cable: twisted pairs, shield to terminal 1 at one end, mus	t not be earthed

IT system monitoring

Nominal system voltage (operating range)	230 V 50/60 Hz (80275 V)
Measuring range	10 kΩ1 MΩ
Measurement method	AMP (adaptive measuring pulse)
Response value R _{an1} (ALARM 1)	50250 kΩ
Relative uncertainty	±15 %
Hysteresis	≤ 25 %
Response time t_{an} at $R_F = 0.5$ x R_{an} and $C_e = 1 \mu$ F	≤55
Measuring voltage U_{m}	DC 12 V
Measuring current $I_{\rm m}$ (at $R_{\rm F} = 0 \Omega$)	≤ 53 μA
Internal resistance Ri	≥ 240 kΩ
Impedance $Z_{\rm i}$	≥ 220 kΩ
Internal resistance/impedance during test	≥ 100 kΩ
Permissible extraneous DC voltage U_{fg}	≤ DC 370 V
Permissible system leakage capacitance Ce	≤ 5 µF
Automatic self test	every hou

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 A (1-A steps)
Relative uncertainty	±5 %
Crest factor	≤ 2
Response time	<19
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 mm² 1...10 m Shielded cable 0.5 mm² 10...40 m Cable: twisted pairs, shield to terminal 1 at one end, must not be earthed

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 mA
Test cycle/pause	2/4 s

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

maximum 1 hour

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

Technical data (continued)

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 contact
Mode of operation adjustable	N/O or N/C operation
Adjustable function	refer to the manual, settings menu 5: "Relay"

vurpur	
Switching element	1 potential-free changeover contact
Mode of operation adjustable	N/O or N/C operation
Adjustable function	refer to the manual, settings menu 5: "Relay"
Electrical endurance under rated operating co	nditions, number of cycles 10 000
Contact data a seculin m to IEC (1010	

are constant and a rect operating contained by manual or eyeres	
Contact data according to IEC 61810	
Rated operational current AC (resistive load, cos φ=1)	5 A/AC 250 V
Rated operational current DC	5 A/DC 30 V
Overvoltage category	III
Minimum contact rating	10 mA at DC > 5 V

Dino interruce	
Interface/protocol	RS-485/BMS
Baud rate	9.6 kbit/s
Cable length	≤ 1200 m
Cable (twisted pairs, shielded, shield connected to PE on one side)	

	recommended: J-Y(St)Y min. n x 2 x 0.8
Terminating resistor	120 Ω (0.25 W)
Device address, BMS bus	290

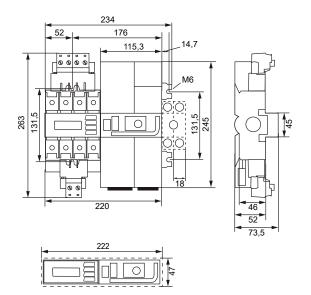
Environment/EMC

EMC	EN 61326 (see CE declaration)

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 ℃

Classification of inechanical 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	

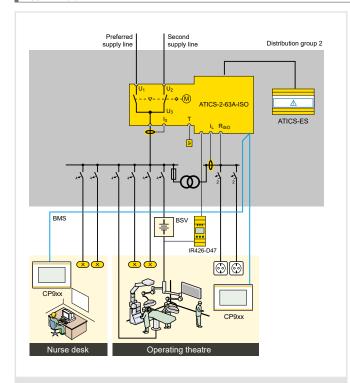
Dimension diagram (dimensions in mm)



Terminals

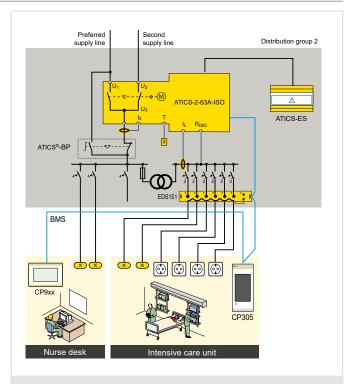
Power section	
Connection directly on ATICS®, for plug connections	screw-type terminals
rigid (flexible)/conductor sizes	1070 mm ² (650 mm ²)/8 (10)0 AWG
Stripping length	15 mm
Tightening torque (hexagon socket 4 mm)	5 Nm
Connection type	pluggable screw-type terminals
Conductor cross section, rigid min/max	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 scre	ewdriver 6.5 x 1.2 mm) 2.5 Nm (\leq 25 mm ²)
	4.5 Nm (≥ 25 mm ²)
Torque setting for manual operation (Allen 5 mm)	approx. 6 Nm
Electronics	
Connection	screw-type terminals
rigid/flexible/conductor sizes	0.141.5 mm ² /2816 AWG
Stripping length	7 mm
Tightening torque (slotted screws, screwdriver 2.5 x 0.4	1 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 acc. to IEC 60715 DIN rail mounting Screw mounting $4 \times M5$ 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)

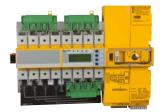


Example intensive care unit

- 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



Typical applications

- Design of safety power supplies, e.g. for
- main distribution boards
- computing centres
- industry
- Retrofit

Approvals



Device features

Perfectly suitable for space-saving installation/retrofitting

- · Compact device for designing safety power supplies with functional safety more easily, in accordance with DIN VDE 61508 (SIL 2), in computing centres, industry, or in group 2 medical locations in accordance with DIN VDE 0100-710 (VDE 0100-710)/IEC 60364-7-710
- · All-in-one: Integration of switch disconnector and control electronics
- Compact design
- · Solutions for any application

Convenient installation and commissioning

· Saves time and money

Safe operation

- · Switch disconnector contacts of robust design
- · Mechanical locking
- Manual operation directly on the device
- Functional safety SIL 2
- Certification by TÜV SÜD

Uninterrupted maintenance

- · Plug connectors and optional bypass switch
- · Excellent communication and parameterisation options

Standards

The transfer switching device conforms to the following standards:

- DIN VDE 0100-710 (VDE 0100 Part 710)*
- DIN VDE 0100-718 (VDE 0100-718)
- ÖVE/ÖNORM E 8007
- IEC 60364-7-710*
- DIN EN 61508-1 (VDE 0803-1)*
- IEC 61508-1 (2010-04) Ed. 2.0*
- DIN EN 61508-2 (VDE 0803-2)*
- IEC 61508-2 (2010-04) Ed. 2.0*
- DIN EN 61508-3 (VDE 0803-3)*
- IEC 61508-3 (2010-04) Ed. 2.0* • DIN EN 60947-6-1 (VDE 0660-114)
- IEC 60947-6-1 (2013-12) Ed. 2.1

Standard-compliant isolating transformer monitoring according to:

- DIN EN 61558-1 (VDE 0570-1)
- DIN EN 61558-1/A1 (VDE 0570-1/A1)

The standards marked with * were part of the test conducted by TÜV Süd.

Further information

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



Туре	Version	Rated operational current Ie	Scope of delivery	Art. No.
ATICS-2-63A-DIO	2 male	AC 63 A	1 x STW3, bridge, connectors, terminal cover	B92057212
ATICS-2-80A-DIO	2-pole	AC 80 A	1 x STW3, bridge, connectors, terminal cover	B92057213
ATICS-BP-2-63A-SET	Dumana quitab ant	AC 63 A	Bridge, terminal cover, auxiliary contacts, LEDs green/red	B92057252
ATICS-BP-2-80A-SET	Bypass switch set	AC 80 A	Bridge, terminal cover, auxiliary contacts, LEDs green/red	B92057253

Ordering information ATICS®...-DIO 4-pole

Туре	Version	Rated operational current <i>l</i> e	Scope of delivery	Art. No.
ATICS-4-80A-DIO		AC 80 A	4 x STW3, bridge, connectors, terminal cover	B92057222
ATICS-4-125A-DIO	4-pole	AC 125 A	4 x STW4, bridge, connectors, terminal cover	B92057223
ATICS-4-160A-DIO		AC 160 A	4 x STW4, bridge, terminal cover	B92057224
ATICS-BP-4-80A-SET		AC 80 A	Bridge, terminal cover, auxiliary contacts, LEDs green/red	B92057260
ATICS-BP-4-125A-SET	Bypass switch set	AC 125 A	Bridge, terminal cover, auxiliary contacts, LEDs green/red	B92057262
ATICS-BP-4-160A-SET		AC 160 A	Bridge, terminal cover, auxiliary contacts, LEDs green/red	B92057264

Cable length:

Overvoltage category

Minimum switching capacity

Technical data

Technical data	
Insulation coordination acc. to IEC 60664	-1/IEC 60664-3
Overvoltage category	II
Pollution degree outside, inside	
Rated insulation voltage ATICS-2-DIO/ATICS-4	-DIO 250 V/400 V
Protective separation between	Line 1 — Line 2; Line 1, 2, 3 — RS-48
	Line 1, 2, 3 — digital inputs; Line 1, 2, 3 — relay output
Voltage test according to IEC 61010-1 (basic in	nsulation/protective separation) 2.21 kV/3.54 kV
Supply voltage	21211177313111
Rated operational voltage U_e	230 V 50/60 H.
Supply voltage Us	from monitored system
Power consumption ATICS-2-63A-DIO	≤ 16 W
Power consumption ATICS-2-80A-DIO	≤ 23 W
Power consumption ATICS-4-80A-DIO	≤ 39 W
Power consumption ATICS-4-125A-DIO	≤ 87 W
Power consumption ATICS-4-160A-DIO	≤ 119 W
Current during the changeover process	17 A/< 30 m
<u> </u>	
Power section/switching elements	ATICC 2 DIO/ATICC A DIO
Nominal system voltage U_n (operating range)	AC 230 V/3NAC 400 N
Eroguancy rango f	4862 H
Frequency range f _n Crest factor	4002 n. ≤ 1.2
Number of switching cycles (mechanical)	≥ 1.a ≥ 8000
Short-circuit currents	see table "Short-circuit currents" in manua
Short-circuit current I _{cc} and fuses	See table. Short circuit currents in manua
	le "Utilisation category acc. to DIN EN 60947" in manua
Voltage monitoring/changeover	•
Frequency range f_n	4070 H
Undervoltage response value (Alarm 1)	160207 V (1-V steps
Overvoltage response value (Alarm 2)	240275 V (1-V steps
Response delay t_{on}	50 ms100 s (resolution of setting starting 50 ms
Delay on release t_{off}	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 ATICS-2-DIO	20276\
Display range measured value ATICS-4-DIO	20520 \
Operating uncertainty	±1%
Change over period	t <500 ms100
Current monitoring (output current)	
Measuring current transformers	STW3, STW4
Measuring current transformers Measuring range I _n (TRMS)	STW3: 0> 150 A, STW4: 0> 260 A
Response value for short-circuit detection ATIO	
(versions 63 A and 80 A) with STW3	130 /
(versions 125 A and 160 A) with STW4	250 A
Crest factor	230 F min. 2
Hysteresis for short-circuit alarm	5 %
HYSICICSIS IOI SHOIT-CHCUIL didIIII	3 %

Single wire ≥ 0.75 mm ²	01 m
Single wire, twisted ≥ 0.75 mm ²	110 m
Shielded cable	1040 m
Cable: twisted pairs, shield to terminal I at one end, mu	st not be earthed
	recommended: J-Y(St)Y min. n x 2 x 0.8
Displays and data memory	
Display: graphic display	languages DE, EN, FR, PL
Alarm LEDs	Line 1, Line 2, Alarm, Com
History memory	500 data records
Data logger	500 data records/channel
Config. logger	300 data records
Test data logger	100 data records
Service logger	100 data records
Input	
Digital inputs	4
Galvanic separation	yes
Control	via potential-free contacts
Mode of operation	active at 0 V (low) or 24 V (high), adjustable
Voltage range high/low	AC/DC 1030 V/AC/DC 00.5 V
	nterlocking function, manual/automatic mode,
	nctional test, changeover to the preferred line,
	ng theatre lights, alarm input for other devices
Relay output 1	
Switching element	1 potential-free changeover contact
Mode of operation adjustable	N/O or N/C operation
Adjustable function	see "Settings menu 4: Relay" in manual
Electrical endurance under rated operating conditions, i	
Contact data according to IEC 61810	
Rated operational current AC (resistive load, $\cos \varphi = 1$)	5 A/AC 250 V
Rated operational current DC	5 A/DC 30 V
Overvoltage category	31,56501
Minimum contact rating	 10 mA at DC > 5 V
Relay outputs 24	
Switching element	1 potential-free N/O contact
Mode of operation adjustable	N/O or N/C operation
Adjustable function	see "Settings menu 4: Relay" in manual
Electrical endurance under rated operating conditions, i	
Contact data according to IEC 61810	
Rated operational current AC (resistive load, $\cos \varphi = 1$)	5 A/AC 150 V
Rated operational current AC (resistive load, $\cos \phi = 1$) Rated operational current DC	5 A/AC 130 V 5 A/DC 30 V
nateu operational current DC	3 A/DC 30 V

120 mW

Technical data (continued)

BMS interface		
Interface/protocol	RS-485/BM:	
Baud rate	9.6 kbit/	
Cable length	≤ 1200 n	
Cable: shielded, one end of shield connec		
	ed pair, one end of shield connected to PE J-Y(St)Y min. 2x0.	
Terminating resistor 120 Ω		
Device address, BMS bus	29	
Environment/EMC		
EMC	EN 61326 (see CE declaration	
Classification of climatic conditions		
Stationary use (IEC 60721-3-3)	3K24 (except condensation and formation of ice	
Transport (IEC 60721-3-2)	2K1	
Long-term storage (IEC 60721-3-1)	1K2	
Operating temperature	oerature -25+55 °	
Classification of mechanical condition	ons 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	
Terminals		
Power section		
Connection directly on ATICS®, for plug o	onnections and connection of 160 A version	
	screw-type terminal	
rigid (flexible)/conductor sizes	1095 mm ² (670 mm ²)/8 (10)000 (00) AW	

5 Nm

16/2

20 mm

1.5/35 mm²

1.5/25 mm²

 $2.5~\text{Nm}~(\leq 25~\text{mm}^2)$ $4.5 \text{ Nm } (\geq 25 \text{ mm}^2)$

approx. 6 Nm

pluggable screw terminals

Electronics Connection	nluggable cerew type terminaleterminale
	pluggable screw-type terminalsterminals
rigid/flexible/conductor sizes	0.141.5 mm ² /2816 AWG
Stripping length	7 mm
Tightening torque (slotted screws, screwdriver 2.5 x 0.4 m	m) 0.220.25 Nm
Other	
Operating mode	continuous operation
Mounting	display-oriented
For use at altitudes	up to 2000 m AMSL
Protection class	Class
Protection class LCD under foil (DIN EN 60529)	IP40
Enclosure material	polycarbonate
Flammability class	UL94V-0
Mounting	DIN rail acc. to IEC 60715
Screw mounting	4 x M5
Dimensions incl. terminals (W x H x D)	234 x 270 x 73
Documentation number	D00080
Weight	
ATICS-2-DIO	approx. 3400 g
ATICS-4-DIO	approx. 4800 g

Dimension diagrams (dimensions in mm)

Torque setting for manual operation (Allen 5 mm)

Tightening torque (Torx® screwdriver T20 or slotted screwdriver 6.5 x 1.2 mm)

2-pole

Stripping length

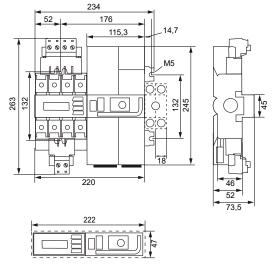
Tightening torque (hexagon socket 4 mm)

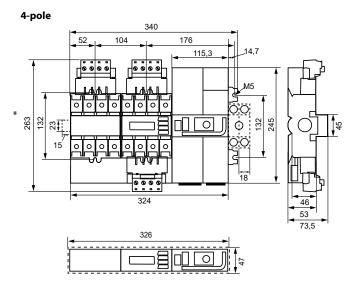
Conductor cross section, flexible min./max.

Conductor cross section AWG/min./max

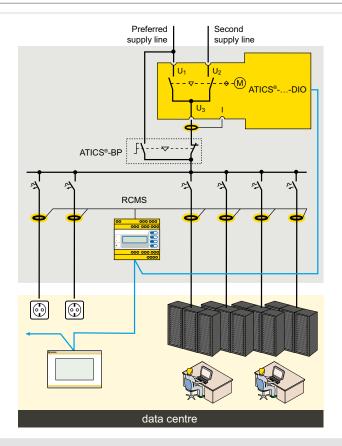
Stripping length (without ferrules)

Connection type (up to 125 A) Conductor cross section, rigid min./max





* Version 80 A/125 A. Version 160 A without connectors.



Example application data centre

- ATICS®-...-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



¹⁾ Medical electrical equipment without patient connections

UNIMET® 300ST

Test system for electrical equipment and electric hospital and care beds



Device features

- · Easy operation and handling
- · Automatic and manual test procedure
- Data input via keyboard or barcode scanner
- · Visual inspection, functional testing and electrical testing
- 600 data records can be stored
- Data exchange and storage via UNIData 300
- Compatible with common application programs such as visual FM, MT Data and Fundamed

Typical applications

• Safe tests of electrical equipment, hospital and healthcare beds as well as medical electrical equipment without patient connections.

Standards

The UNIMET® 300ST series tests are carried out in accordance with the requirements of the device standards:

- IEC 62353
- DIN EN 62353 (VDE 0751-1)
- ÖVE/ÖNORM EN 62353
- DIN VDE 0701-0702
- ÖVE E8701-1

Approvals

Further information

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



Ordering information

Туре	Supply voltage <i>U</i> ₅	Version	Art. No
UNIMET®300ST	AC 230 V	Standard	B96023000
UNIMET®300ST		СН	B96023001

Suitable system components

Description	Variant	Туре	Art No.	Page
	German Schuko	VK701-6	B96020067	-
Adapter	Non-heating appliances	VK701-7	B96020066	-
	Adapter kit 16 A for DS32A	VK701-8	B96020097	-
Interface cable	-	RS-232/RS-232	B96012012	_
Test probe	-	Testprobe	B928748	_
Test terminal	-	Testterminal	B928741	_
Barcode scanner	-	PS/2	B96020082	-
Converter	-	USB1.1RS-232converter	B96020086	_
Flex keyboard	-	Flexkeyboard	B96020093	_
		DS32A	B96020098	457
Three-phase adapter	-	DS32A (CH/CH)	B96020110	457
		DS32DCT	B96020100	-

Technical data

Supply voltage	AC 230 V \pm 10 %)
Frequency range	4565 Hz
Power consumption	max. 50 VA
Maximum load current	16 A
Max. connectable load at 230 V	3700 VA
Protection class	II
Ambient temperature	050 ℃
Storage temperature	-10+70 ℃
Degree of protection	IP20

Testing	of	PE	resis	tance
---------	----	----	-------	-------

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

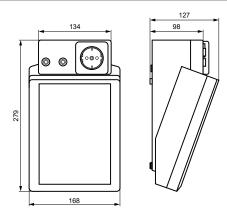
Leakage current, direct measurement

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
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	$0.0199.99~M\Omega$: $\pm 5~\%$ of MV ± 2 digits
	100.00199.99 M Ω : \pm 10 % of MV \pm 2 digits
Load current measurement	
Measuring range	0.01 A to 16 A
Measuring accuracy	± 2.5 % of MV, ± 3 digits
Voltage measurement	
Measuring range	90264 V
Measuring accuracy	±2.5 % of MV, ±2 digits
Apparent power	
Measuring range	53700 VA
Measuring accuracy	±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	D00135

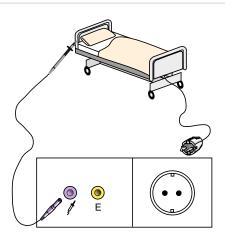
of MV = of measured value



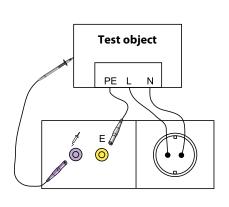


- Function buttons
- Backlit LCD for displaying the user menu and the measurement results. Four lines of 20 characters each.
- Permanently attached power cable for connection to the supply voltage.
- 4 Sockets
 - violet: Connection for test probe for testing exposed parts of the device under test.
 - yellow (E): for a second test lead when the low-resistance continuity of the PE conductor is to be measured between two points (e.g., on single-phase, permanently connected devices or extension cables).
- 5 Test socket: This is where the DUT's power supply cable is plugged in
- Durable plastic enclosure, with pushbuttons for safe storage in the carrying bag.
- Power switch with thermo-magnetic circuit breaker
- 8 Interfaces
 - 9-pole RS-232 interface, galvanically isolated, for connection to a personal computer
 - Centronics interface for connection to a printer
 - PS/2 port for connection to an external standard keyboard and a barcode reading wand or scanner.

Wiring diagrams

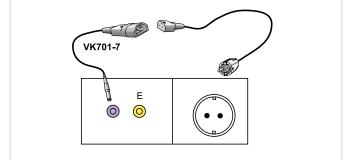


Connection of hospital and care beds and electrical equipment with plug-in connector.



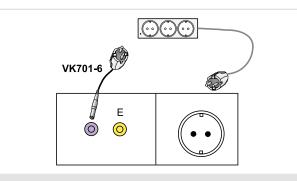
For connecting single-phase permanently installed equipment to the test system

- Disconnect the device
- Disconnect the connection to the supply voltage



Testing of extension cables

- Connection of connecting and extension cords



Testing of extension cables

- Connection of connecting and extension cords

UNIMET® 400ST

Test system for medical electrical equipment, electrical hospital and care beds and electrical equipment



Typical applications

• Safe testing of medical electrical equipment with patient connections, hospital and care beds and electrical equipment.

Approvals



Device features

- · Easy operation and handling
- · Automatic and manual test procedure
- Data input via keyboard or barcode scanner
- · Visual inspection, functional testing and electrical testing
- · 4mm socket for testing applied parts
- 600 data records can be stored
- Data exchange and storage via UNIData 300/400
- Compatible with common application programs such as visual FM, MT Data and Fundamed

Standards

The UNIMET® 400ST series carries out tests in accordance with the requirements of the device standards:

- IEC 62353
- DIN EN 62353 (VDE 0751-1)
- ÖVE/ÖNORM EN 62353
- DIN VDE 0701-0702
- ÖVE E8701-1

Further information

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

Ordering information

Туре	Supply voltage <i>U</i> ₅	Version	Art. No.
UNIMET®400ST	AC 230 V	Standard	B96024000
UNIMET®400ST		СН	B96024001

Suitable system components

Description	Variant	Туре	Art. No.	Page
PatBox	-	PatBox	B96020096	-
	German Schuko	VK701-6	B96020067	_
Adapter	Non-heating appliances	VK701-7	B96020066	-
	Adapter kit 16 A for DS32A	VK701-8	B96020097	_
Interface cable	-	RS-232/RS-232	B96012012	-
Test probe	-	Testprobe	B928748	_
Test terminal	-	Testterminal	B928741	-
Barcode scanner	-	PS/2	B96020082	_
Converter	-	USB1.1RS-232converter	B96020086	_
Flex keyboard	-	Flexkeyboard	B96020093	-
		DS32A	B96020098	457
Three-phase adapter	_	DS32A (CH/CH)	B96020110	457
		DS32DCT	B96020100	_

Technical data

Supply voltage	AC 230 V \pm 10 %)
Frequency range	4565 Hz
Power consumption	max. 50 VA
Maximum load current	16 A
Max. connectable load at 230 V	3700 VA
Protection class	II
Ambient temperature	050 ℃
Storage temperature	-10+70 ℃
Degree of protection	IP20

Testina	۸f	DE	rocicta	nco
resuma	oı	rc	resista	nce

Test voltage	approx. 5 V, system frequency
Short-circuit current	> 2 A
Measuring range	0.00129.999 Ω
Measuring accuracy	$0.0011.0~\Omega$: $\pm 2.5~\%$ of MV ± 2 digits
	1.00129.999 Ω : ±5 % of MV ±2 digits

Leakage current, differential measuring method

Measuring range	0.02 mA19.99 mA
Measuring accuracy	$\pm 5\%$ of MV ± 5 digits

Leakage current, direct measurement

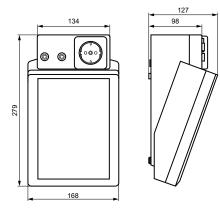
Test current

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 measureme	ent — alternative method)
	annrox system voltage system frequency

Dimension diagram (dimensions in mm)



Insulation resistance	
Test voltage	approx. DC 500 V
Max. test current	2.5 mA
Measuring range	0.01199.99 MΩ
Measuring accuracy	$0.0199.99~M\Omega$: $\pm 5~\%$ of MV ± 2 digits
	100.00199.99 M Ω : ± 10 % of MV ± 2 digits
Load current measurement	
Measuring range	0.0116 A
Measuring accuracy	± 2.5 % of MV, ± 3 digits
Voltage measurement	
Measuring range	90264 V
Measuring accuracy	$\pm 2.5\%$ 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

max. 3.5 mA

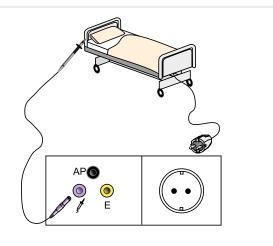




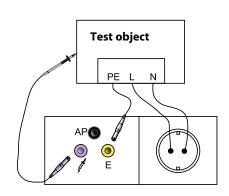
- Function buttons
- Backlit LCD for displaying the user menu and the measurement results. Four lines of 20 characters each.
- Permanently attached power cable for connection to the supply voltage.
- 4 Sockets
 - black(AP): for testing applied parts
 - violet: Connection for test probe for testing exposed parts of the device under test.
 - yellow (E): for a second test lead when the low-resistance continuity of the PE conductor is to be measured between two points (e.g., on single-phase, permanently connected devices or extension cables).

- 5 Test socket: This is where the DUT's power supply cable is plugged in
- Durable plastic enclosure, with pushbuttons for safe storage in the carrying bag.
- Power switch with thermo-magnetic circuit breaker
- 8 Interfaces
 - 9-pole RS-232 interface, galvanically isolated, for connection to a personal computer
 - Centronics interface for connection to a printer
 - PS/2 port for connection to an external standard keyboard and a barcode reading wand or scanner.

Wiring diagrams

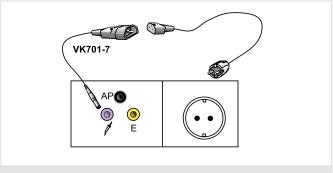


Connection of hospital and care beds and electrical equipment with plug-in connector.



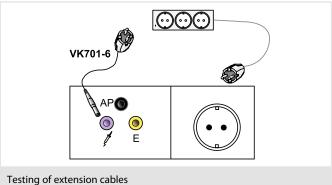
For connecting single-phase permanently installed equipment to the test system

- Disconnect the device
- Disconnect the connection to the supply voltage

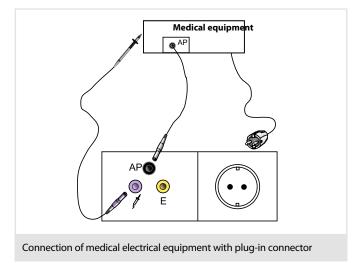


Testing of extension cables

- Connection of connecting and extension cords



- Connection of connecting and extension cords



UNIMET® 610ST

Test system for electrical equipment and machines



Areas of application

- Electrical equipment
 "Inspection after repair, modification of electrical appliances –
 Periodic inspection on electrical appliances" acc. to DIN VDE 0701-0702 (VDE 0701-0702).
- DIN EN 60204-1/VDE 0113 Safety of machinery - Electrical equipment of machines - Part 1: General requirements

Certifications



Device features

- The Windows user interface provides an easy-to-use solution
- · Data exchange and storage via Control Center
- Automatic, semi-automatic or manual test sequences
- Data input via touch screen, keyboard or barcode scanner
- Visual inspection, electrical safety and functional test user-definable
- Test sequences user-definable
- Data storage > 10,000 data records
- Filter function for fast data selection
- · Management of test dates
- Multitenancy
- · Catalogue systems
- Test probe with two switching contacts for semi-automatic testing of parts not connected to PE
- · Compatible with all common application programs

Standards

The UNIMET® 610ST series tests according to the device standards:

- DIN VDE 0701-0702
- DIN VDE 0113/EN 60204-1
- ÖVE/ÖNORM E 8701-1

Further information

For further information, refer to our product area at www.bender.de.

Ordering details

Туре	Nominal voltage range	Maximum output current	Version	Art. No.
UNIMET® 610ST	AC 100120 V and AC 220240 V	16 A	Standard (DE/DE)	B96026020

Suitable system components

Description	Variant	Туре	Art. No.	Page
	Schuko	VK701-6	B96020067	-
Adapter	Non-heating devices	VK701-7	B96020066	-
	Adapter kit 16 A for DS32A	VK701-8	B96020097	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	_
Testamble	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

Technical data

Nominal voltage range	AC 100120 V/±10 %, AC 220240 V/±10 %
Frequency range	4862 Hz
Power consumption	max. 100 VA
Maximum output current	see ordering details
Protection class	ll l
Testing of PE resistance	
Measuring range	0.001 29.999 Ω
Measuring current	max. AC 8 A
Measuring voltage	max. AC 8 V
Intrinsic uncertainty	$0.0011.000~\Omega$: $\pm 2.5~\%$ of MV $\pm 5~$ digits
·	1.00129.999 Ω : ± 5 % of MV ± 5 digits
Operating uncertainty	$0.001\dots1.000~\Omega$: $\pm5~\%$ of MV ±10 digits
	1.00129.999 Ω: \pm 7.5 % of MV \pm 10 digits
Insulation resistance	
Measuring range	0.01199.99 MΩ
Measuring voltage	max. DC 550 V
Measuring current	max. 2.5 mA
Intrinsic uncertainty	$0.0199.99~\mathrm{M}\Omega$: $\pm 5~\%$ of MV $\pm 2~\mathrm{digits}$
	100.00199.99 M Ω : \pm 10 % of MV \pm 2 digits
Operating uncertainty	$0.0199.99~M\Omega$: $\pm 7.5~\%$ of MV ± 4 digits
	$100.00199.99 \text{ M}\Omega$: $\pm 10 \%$ of MV ± 4 digits

Measuring range	0.00119.999 mA
Measuring voltage	max. AC 250 V
Measuring current	max. 3 mA
Intrinsic uncertainty	\pm 5 % of MV \pm 5 digits
Operating uncertainty	±7.5 % MV ±10 digits

Leakage current, residual current measuring method

Measuring range	0.0219.99 mA
Intrinsic uncertainty	\pm 5 % of MV \pm 2 digits
Operating uncertainty	$\pm 7.5\%$ of MV ± 4 digits
Frequency response	40100 kHz ±3 dB

Leakage current, direct measurement Measuring range 0.001...19.999 mA Intrinsic uncertainty ±5 % of MV ±2 digits Operating uncertainty ±7.5 % of MV ±4 digits Frequency response up to 100 kHz ± 3 dB

Voltage measurement

Measuring range	AC 90264 V
Frequency range	4862 Hz
Intrinsic uncertainty	±2.5 % of MV ±3 digits

Load current measurement

Measuring range	0.00516 A
Frequency range	4862 Hz
Intrinsic uncertainty	$\pm 2.5\%$ of MV ± 3 digits

Apparent power

Measuring range	53600 VA
Frequency range	4862 Hz
Intrinsic uncertainty	± 5 % of MV ± 3 digits

Environment/EMC

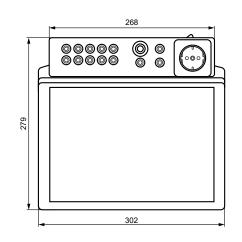
EMC	IEC 61326-1
Ambient temperature	0+40°C
Storage temperature	-10+70 °C
Relative humidity (up to 31 °C)	max. 80 %
Relative humidity (> 3140 °C)	decreasing linearly, max. 50 %
	condensation must be avoided
Height AMSL	max. 2000 m

Other

Degree of protection	enclosure: IP40, connections: IP20
	in acc. with DIN VDE 0470 Part 1/EN 60529
Dimensions (without bag)	approx. 300x277x126 mm (W x D x H)
Weight (without accessories or bag)	approx. 3.5 kg
Calibration interval	36 months
Documentation number	D00380

of MV = of measured value

Dimension diagram (dimensions in mm)





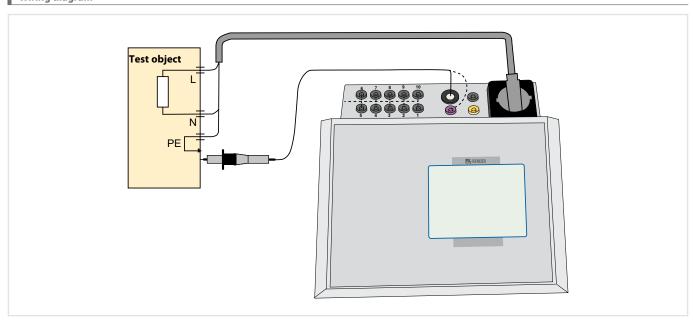




- Touch screen for operation and display. For this purpose, a stylus is included in the scope of delivery.
- Durable plastic enclosure, with push buttons for safe storage in the carrier bag.
- 10 sockets (1...10) for the connection of VK adapters to test extension lines.
- 4 Measuring terminals
 - [B] (violet) for the connection of the single-pole test probe supplied with the product.
 - [A] for active test probe TP800 with push button (optional).
 - Socket [C] for equipotential bonding (e.g. connection for single-pole line extension with clip for the testing of permanently installed equipment).
 - Socket [D] for functional earth

- 5 Test socket: This is where the DUT's power supply cable is plugged in.
- Connection to the supply voltage and power switch with thermo-magnetic circuit breaker.
- Without function.
- 8 Interfaces:
 - PS/2 port for external keyboard
 - RS-485 serial interface for Bender Service
 - RS-232 interface, 9-pin, electrically isolated, for connection to a PC
 - USB interface for connection to a printer, a USB stick, an external keyboard or a barcode scanner (2 x host) and a PC (1 x device, for Bender Service only)
 - Ethernet network connection (optional)

Wiring diagram



UNIMET® 810ST

Test system for medical electrical equipment



Typical applications

- · Tests of medical electrical equipment in accordance with DIN EN 60601-1 3rd edition
- · Recurrent tests of medical electrical equipment in accordance with DIN EN 62353 (VDE 0751-1).
- · Electrical equipment "Prüfung nach Instandsetzung, Änderung elektrischer Geräte (Recurrent test and test after repair and modification of electrical equipment)" in accordance with DIN VDE 0701-0702 (VDE 0701-0702).

Approvals

C € ĽK

Device features

- Easy operation by Windows user interface
- · Data exchange and storage via Control Center
- Automatic, semi-automatic or manual test sequence
- · Data input via touch screen, keyboard or barcode scanner
- Visual inspection, electrical tests, functional tests, user-definable
- Test sequences user-definable
- Data memory > 10,000 data records
- · Filter function for fast data selection
- · Management of test dates
- Multitenancy
- · Catalogue systems
- Test probe with two switching contacts –for semi-automatic testing of conductive parts not connected to PE
- Compatible with common application programs such as visual FM, MT Data and Fundamed

Standards

The UNIMET® 810ST series carries out tests in accordance with the requirements of the device standards:

- IEC 60601-1
- IEC 62353
- DIN EN 62353 (VDE 0751-1)
- IEC 61010-1
- ÖVE/ÖNORM EN 62353
- DIN VDE 0701-0702
- ÖVE E8701-1

Further information

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

Ordering information

Туре	Nominal voltage range	Maximum load current	Version	Art. No.
UNIMET®810ST		16 A	Standard (DE/DE)	B96028020
UNIMET®810ST	AC 100 120 V and AC 220 240 V		GB/GB	B96028024
UNIMET®810ST		13 A	B/B	B96028027
UNIMET®810ST			US/US	B96028028
UNIMET®810ST		10 A	СН	B96028026

Suitable system components

Description	Variant	Туре	Art No.	Page
	German Schuko	VK701-6	B96020067	-
Adapter	Non-heating appliances	VK701-7	B96020066	-
	Adapter kit 16 A for DS32A	VK701-8	B96020097	459
611	for connecting the test system with a PC, 9-pole, female-female (Null modem cable)	RS-232/RS-232interfacecable	B96012012	_
Cable	Measuring lead, 150 cm, 4 mm connector	Cable150cm	B928703	T -
To do mundo .	Test probe active (with switch)	TP800	B96020080	_
Test probe	3 m measuring lead with black test probe	_	B928748	_
Test terminal	black	-	B928741	_
Touchscreen pen	-	Styluspen	B928749	_
Barcode scanner	for the UNIMET® 810ST (PS/2 connection)	-	B96020082	T -
Flex keyboard	for the UNIMET® 810ST (USB connection)	-	B96020093	T -
Test kit	various adapters for connecting medical electrical equipment to test systems	PK3	B96020004	T -
Test box	for testing test systems	TB3	B96020025	460
Thurst all the second and the	Contraction also and a second assessment as	DS32A	B96020098	457
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

Technical data

Nominal voltage range	AC 100120 V/±10 %, AC 220240 V/±10 %
Frequency range	4862 Hz
Power consumption	max. 100 VA
Maximum output current	see ordering 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 Ω: ±2.5 % v. M. ±5 digits
	1.00129.999 Ω: \pm 5 % v. M. \pm 5 digits
Operating uncertainty	$0.0011.000~\Omega$: $\pm 5~\%$ v. M. ± 10 digits
	1.00129.999 Ω : $\pm 7.5 \%$ v. M. ± 10 digits

Insulation resistance

Measuring range	0.01199.99 MΩ
Measuring voltage	max. DC 550 V
Measuring current	max. 2.5 mA
Intrinsic uncertainty	$0.0199.99~M\Omega$: $\pm 5~\%$ v. M. ± 2 digits
	$100.00199.99~M\Omega$: $\pm 10~\%$ v. M. $\pm 2~digits$
Operating uncertainty	$0.0199.99~M\Omega$: $\pm 7,5~\%$ v. M. ± 4 digits
	$100.00199.99 \text{ M}\Omega$: $\pm 10 \% \text{ v. M. } \pm 4 \text{ digits}$

Equipment leakage current -alternative method

Measuring range	0.00119.999 mA
Measuring voltage	max. AC 250 V
Measuring current	max. 3 mA
Intrinsic uncertainty	±5 % v. M. ±5 digits
Operating uncertainty	±7.5 % v. M. ±10 digits

Leakage current, differential measurement method

0.0219.99 mA
±5 % v. M. ±2 digits
±7.5 % v. M. ±4 digits
40100 kHz ±3 dB

Leakage current, direct measurement

measuring range	0.00119.999 MF
Intrinsic uncertainty	±5 % v. M. ±2 digits
Operating uncertainty	±7.5 % v. M. ±4 digits
Frequency response	up to 100 kHz \pm 3 dE

Voltage measurement

Measuring range	AC 90264 V
Frequency range	4862 Hz
Intrinsic uncertainty	$\pm 2.5 \%$ v. M. ± 3 digits

Load current measurement

Measuring range	0.00516 A
Frequency range	4862 Hz
Intrinsic uncertainty	±2.5 % v. M. ±3 digits

Apparent power

Measuring range	53600 VA
Frequency range	4862 Hz
Intrinsic uncertainty	±5 % v. M. ±3 digits

Environment/EMC

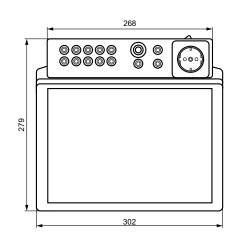
EMC	IEC 61326-1
Ambient temperature	0+40°C
Storage temperature	-10+70°C
Relative humidity (up to 31 °C)	max. 80 %
Relative humidity (> 3140 °C)	decreasing linearily, max. 50 %
	condensation must be avoided
Height above sea level	max. 2000 m

Degree of protection, enclosure: IP40, connections: IP20

	according to DIN VDE 0470 Part 1/EN 60529
Dimensions (without bag)	approx. 300x277x126 mm (W x D x H)
Documentation number	D00008
Weight (without accessories or bag)	approx. 3.5 kg
Calibration interval	36 months
Documentation number	D00008

of MV = of measured value

Dimension diagram (dimensions in mm)









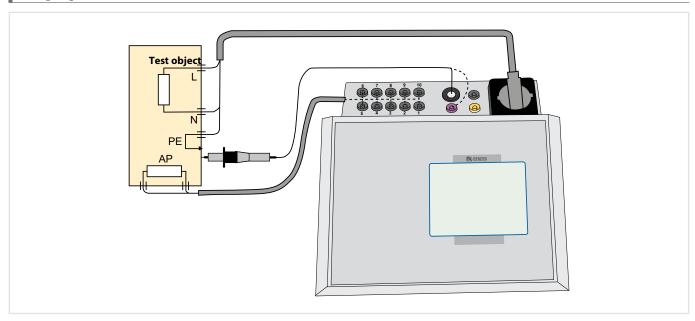
- Touchscreen for operator control and indication. For this purpose, a stylus is included in the scope of supply.
- Durable plastic enclosure, with pushbuttons for safe storage in the carrying bag.
- 10 sockets (1...10) for the connection of patient electrodes.
- Measuring terminals
 - [B] (violet) for the connection of the single-pole test probe supplied with the product.
 - [A] for active test probe TP800 with pushbutton (option).
 - Socket [C] for equipotential bonding (e.g. connection for singlepole line extension with clip for the testing of permanently installed equipment).
 - socket [D] for functional earth
- 5 Test socket: This is where the DUT's power supply cable is plugged in.
- Connection to the supply voltage and power switch with thermomagnetic circuit breaker.

- Connection for the external 25 A power source EPS800.
 - Note: The plug clicks into place and is secured against being pulled out accidentally.

The plug can only be removed after pushing the movable grip back.

- 8 Interfaces:
 - PS/2 connection for external keyboard
 - RS-485 serial interface for Bender Service
 - 9-pole RS-232 interface, galvanically isolated, for connection to a personal computer
 - USB interface for connection to a printer, a USB stick, an external keyboard or a barcode scanner (2 x host) and a PC (1 x device, for Bender Service only)
 - Ethernet network connection (optional)

Wiring diagram



External power source 25 A for UNIMET® 800/810ST



Device features

• To be used in conjunction with the appropriate UNIMET® 800/810ST

Standards

The EPS800 series carries out tests in compliance with the device standard:

- IEC 60601-1
- IEC 61010-1

Typical applications

 External 25 A power source for standard-compliant protective earth resistance measurement acc. to IEC 60601-1 and IEC 61010-1

Further information

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

Approvals



Ordering information

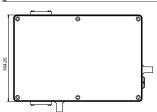
Tyne	Type Version .	for UNIMET®		Art. No.
Туре		800ST	810ST	AIL NO.
EPS800	Standard (German)	B96028010	B96028020	B96028050
EPS800	GB	B96028014	B96028024	B96028054
EPS800	СН	B96028016	B96028026	B96028056
EPS800	В	B96028017	B96028027	B96028057
EPS800	US	B96028018	B96028028	B96028058

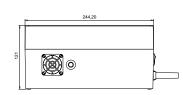
Technical data

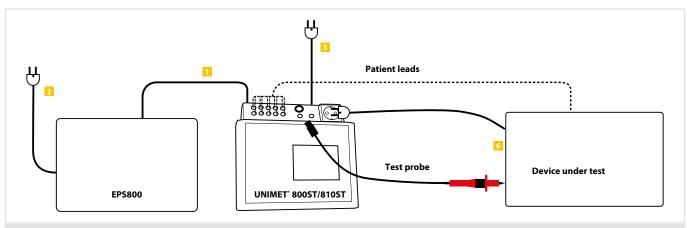
Nominal voltage	AC 207253 V, 48 62 Hz
Power consumption	400 VA
Measuring current	AC 25 A $\pm 10 \%$ (0 0.3 Ω)
Output power	230 VA
Operating mode	continuous operation
Protection class	II
Micro-fuse	5 x 20 mm, fast 5 A/250 V

Other	
EMC	IEC 61326-1
Ambient temperature	0+40°C
Storage temperature	-10+70 ℃
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.
- 3 Connect the supply line of the UNIMET® 800ST/810ST to the power socket.
- 4 Switch on the power switch of the UNIMET® 800ST/810ST.
- 5 Switch on the power switch of the EPS800. The sound of the internal ventilator can be heard.
- 6 Connect the DUT. Determine the test sequence according to the classification.

3AC three-phase adapter with differential current measurement



Device features

• To be used in conjunction with an UNIMET test system

Standards

The DS32A series carries out tests in compliance with the device standard:

- DIN VDE 0701-0702
- DIN EN 62353

Further information

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

Dimensions

Height above sea level

Operating mode
Documentation number

Weight

Typical applications

 Three-phase adapter for testing medical electrical three-phase devices during operation

Approvals

Ordering information

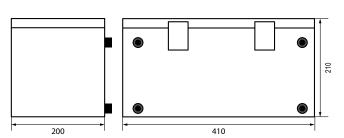
Туре	Art. No.
DS32A	B96020098
DS32A (CH/CH)	B96020110

Technical data

/EN 601010-1/VDE 0411-1
2
CAT II
1.69 kV
A/6 h three-phase current
EN 61326-1
AC 0.0220 mA
5 % v. M. ±50 μA

Supply voltage	
Supply voltage $U_{\rm S}$	3AC 400 V ±10 %
Frequency range $U_{\rm S}$	5060 Hz
Power consumption	approx. 18 VA
Load current max.	32 A
Environmental conditions	
Storage temperature	-10+70°C
Operating temperature	0+50°C
Degree of protection	IP20

Dimension diagram (dimensions in mm)

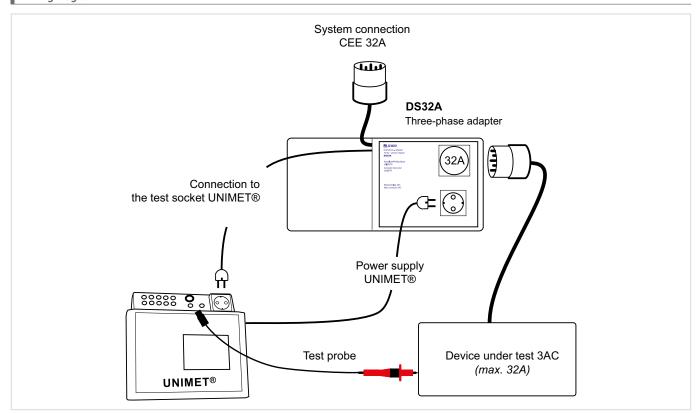


405 x 210 x 200 mm (width x height x depth)

not suitable for continuous operation

8.9 kg

D00147





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



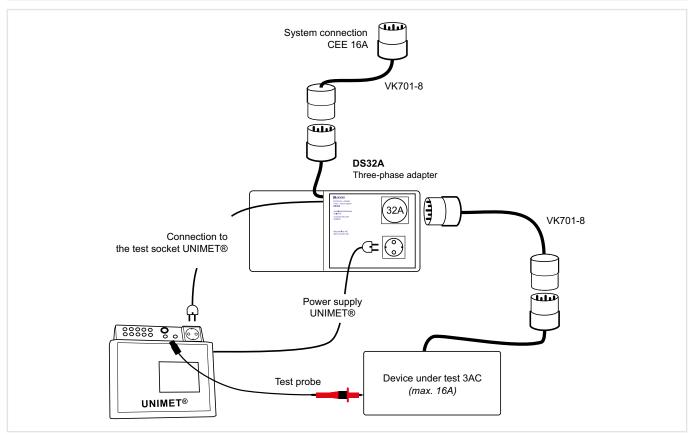
Ordering information

Туре	Art. No.
VK701-8	B96020097

Technical data

Nominal voltage	
Nominal voltage	3AC 400 V
Max. current	16 A
Documentation number	D00172

Wiring diagram





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. $\label{eq:control}$

Typical applications

- Testing the measured values of safety testers
- Comprehensive system self test

Approvals



Ordering information

Туре	Version	Art. No.
TB3 test box	Standard (German)	B96020025

Technical data

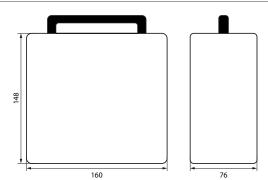
Insulation coordination acc. to IEC 60664-1

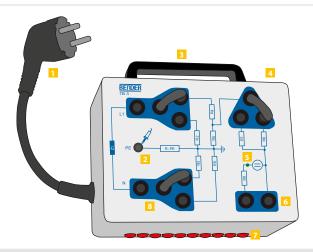
Rated insulation voltage	AC 250 V
Rated impulse voltage/pollution degree	4 kV/3
Voltage ranges	
Nominal system voltage <i>U</i> _n	100240 V
Rated frequency fn	AC 4862 Hz
Output voltage U12	7.39 V (±2.5 %)
Max. power consumption	35 VA at 50 Hz, 230 V
Evaluation of tolerance values	
Precalculation	110 %
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)





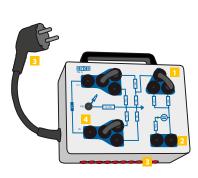
- Mains plug; only to be used for the test socket of the safety tester
- 2 Socket for the connection of the test probe
- Carrying handle
- Enclosure, magnetic adhesive stripes allow simple fixing to the safety tester μ P601
- 5 LED lights when voltage is applied at the mains plug
- 6 Sockets for the 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".

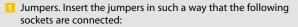


Sockets on the side

3 Jumpers allow simulation of different test situations

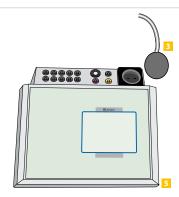
Connections





UNIMET® 810ST
a-b
d-f
h-i

Connect the patient sockets 1 and 2 of the safety tester (at UNIMET® 810ST socket 2 only) to the respective socket of the test box TB3.



- Insert the mains plug of TB3 into the test socket of the safety tester, as illustrated. Please observe the plug-in direction.
 - at UNIMET® 810ST, insert the supply cable from the top In case of wrong plug-in direction test results will become unusable.
- 4 Contact the test probe of the safety tester with the socket PE of TB3
- UNIMET® 800/810ST test system

Technical terms

Alarm state Alarm state indicates that the residual current in the installation monitored has exceeded the plevel of the RCM. 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 or parts which is/are in good contact with earth and form an electrical connect with it. Earth fault Occurrence of an accidental conductive path between a live conductor and the Earth. Earth fault current Current flowing to earth due to an insulation fault. Earth leakage current Current flowing from the live parts of the installation to earth in the absence of an insulation fault effect of the supply voltage Effect influencing the functioning of measuring equipment and, consequently, the measured of produced by it. Effects of the distribution system voltage Effect influencing the operation and, consequently, the measured value produced by it.	f tion t.
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 or parts which is/are in good contact with earth and form an electrical connect with it. Earth fault Occurrence of an accidental conductive path between a live conductor and the Earth. Earth fault current Current flowing to earth due to an insulation fault. Earth leakage current Current flowing from the live parts of the installation to earth in the absence of an insulation fault. Effect of the supply voltage Effect influencing the functioning of measuring equipment and, consequently, the measured of produced by it.	tion
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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. 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 of produced by it.	t.
Earth fault current Current flowing to earth due to an insulation fault. 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 varieties of the supply voltage.	
Earth leakage current Current flowing from the live parts of the installation to earth in the absence of an insulation faul Effect of the supply voltage Effect influencing the functioning of measuring equipment and, consequently, the measured value of the produced by it.	
Effect of the supply voltage Effect influencing the functioning of measuring equipment and, consequently, the measured of produced by it.	
produced by it.	alue
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 fault	s.
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 become live when basic insulation fails.	can
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 part	s).
Extraneous voltage Voltage to which the measuring equipment can be subjected by external influences. This is no required for the operation of the measuring equipment, but can interfere with its operation.	:
Fault current I_{Δ} Current which flows across a given point of fault resulting from an insulation fault.	
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 fault conditions.	ınder
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 thro this insulation or in a disruptive discharge.	ıgh
Insulation fault locator Device or part of device for the location of the insulation fault.	
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 d insulation resistance below a minimum limit, so that the cause of the reduction can be found to 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 appliance earth.	es to



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 $I_{\Delta n}$	The value of the residual operating current, assigned to the RCM by the manufacturer, at which the RCM shall operate under specified conditions.
RCM directionally discriminating	RCM used in IT systems, capable of directionally discriminating between supply side and load side residual currents.
RCM type A	RCM for which actuation is ensured for residual sinusoidal alternating currents and residual pulsating direct currents, whether suddenly applied or slowly rising.

RCM type B	RCM for which actuation is ensured for residual sinusoidal alternating currents, 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 U _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 (<i>U</i> _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.

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Short form	German term English term		
MRCD	Gerät oder Anordnung von Geräten, das/die eine Strommesseinrichtung und eine Auswerteeinheit zur Erkennung und Bewertung sowie zur Ansteuerung des Kontaktöffnens einer Abschaltvorrichtung enthält.	device or an association of devices comprising a current sensing means and a processing device designed to detect and to evaluate the residual current and to control the opening of the contacts of a current breaking device	
PRCD	ortsveränderliche FI-bzw. DI-Schutzeinrichtung (auch OVS)	portable residual current protective device	
PRCD-S	OVS mit erweitertem Schutzumfang und Sicherstellung der bestimmungsgemäßen Nutzbarkeit des Schutzleiters	portable residual current protective device-safety	
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 Fl-bzw-Dl-Schutzeinrichtung in Steckdosenausführung	fixed socket-outlets residual current protective device	

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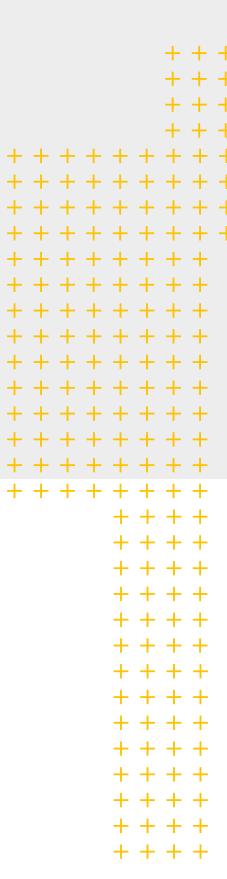
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