

The Power in Electrical Safety

Main Catalogue Edition 2/2013



Subject to change! – © Bender GmbH & Co. KG, Germany

The catalogue and the articles and illustrations which it contains are protected by copyright. Distribution, translation, microfilming and storing in electronic systems, particularly for commercial purposes, are not permitted without prior permission from the author. We accept no liability for errors and omissions. All specifications are based on manufacturer data. All logos and product designations are registered trademarks of the respective manufacturer.

Bender GmbH & Co. KG
Londorfer Str. 65
D-35305 Grünberg
P.O.Box 1161
D-35301 Grünberg
Tel. +49 6401 807-0
Fax +49 6401 807-259
E mail: info@bender-de.com
Internet: www.bender-de.com

Insulation monitoring devices

ISOMETER®



7



1

Equipment for insulation fault location

ISOSCAN®



85



2

Measuring and monitoring relays

LINETRAXX®

Power Quality and Energy Measurement

LINETRAXX®



121



3

Residual current monitoring systems

LINETRAXX®



175



4

System components

Coupling devices

Measuring current transformers

Transformers

Measuring transducers

Power supply units

Measuring instruments

Interface converters

Interface repeaters

COMTRAXX® Gateways

COMTRAXX® Alarm indicator and test combinations

COMTRAXX® condition monitors

Visualisation



203



5

Switching equipment

ATICS® transfer switching and monitoring devices



285



6

Test systems

UNIMET® Safety analyser

Annex

Standards and guidelines applied
Alphabetical list of devices

Technical terms
Service & project management



315



i



The Power in Electrical Safety



In the past 60 years we have learnt thinking ahead in a strategic and forward-looking way and to consider today what customers are going to need tomorrow. Innovative solutions und service activities, excellent know-how global expertise when it comes to electrical safety provide answers to the challenges of various application areas. As a global market and technology leader we underline this by our quality promise 5foryou. With almost 600 employees we are globally present in over 60 countries.



Since January 2012 we provide a five-year warranty for "5forU"-relevant devices registered not later than 24 months after the date of purchase.

Insulation monitoring devices

ISOMETER®



7



1

Equipment for insulation fault location

ISOSCAN®



85



2

Measuring and monitoring relays

LINETRAXX®

Power Quality and Energy Measurement

LINETRAXX®



121



3

Residual current monitoring systems

LINETRAXX®



175



4

System components

Coupling devices

Measuring current transformers

Transformers

Measuring transducers

Power supply units

Measuring instruments

Interface converters

Interface repeaters

COMTRAXX® Gateways

COMTRAXX® Alarm indicator and test combinations

COMTRAXX® condition monitors

Visualisation



203



5

Switching equipment

ATICS® transfer switching and monitoring devices



285



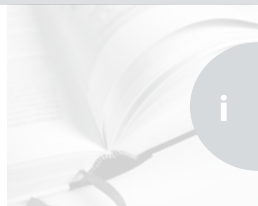
6

Test systems

UNIMET® Safety analyser



315



i

Annex

Standards and guidelines applied
Alphabetical list of devices

Technical terms
Service & project management

Overview insulation monitoring devices ISOMETER®



Page		12	15	17	20	23
Circuits	Control circuits	■	■	■		
	Auxiliary circuits	■	■	■		
	Main circuits				■	■
Voltage system	3(N)AC				■	■
	AC	■	■	■	■	■
	AC/DC		■	■		
	DC		■	■		
Nominal system voltage U_n		AC 0...300 V	AC 19.2...265 V, DC 19.2...308 V	AC/DC 0...300 V	AC, 3(N)AC 0...793 V	AC, 3(N)AC 0...793 V
System leakage capacitance C_e μ F		≤ 20	≤ 10	≤ 20	≤ 20	≤ 20
Response value R_{an} k Ω		1...200	10...200	1...200	1...200	10...100 35...500
Special applications						
Installation	DIN rail	■	■	■	■	■
	Screw mounting	■	■	■	■	■
	Panel mounting/ wall fastening					

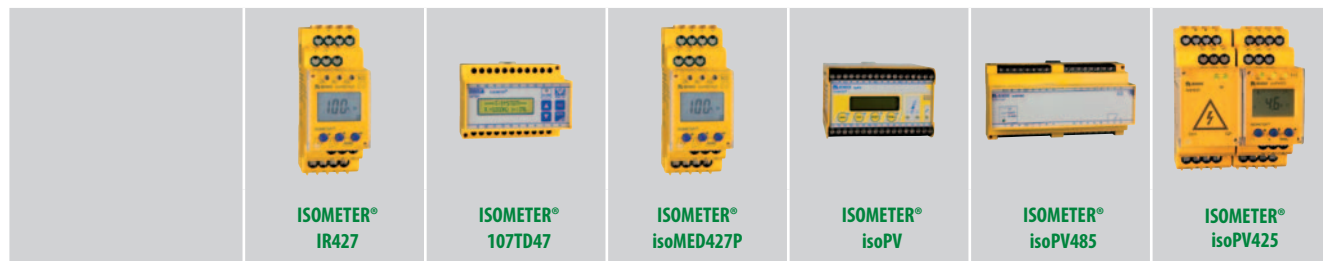
	Type	P.	Suitable system components			
Coupling devices	AGH150W-4	212				
	AGH204S-4	213			■	■
	AGH520S	214			■	■
Measuring instruments	7204-1421	257			■	■
	9604-1421	257			■	■
	9620-1421	257				
Measuring current transformers	STW2	-				
Power supply unit	AN450	255				
	AN450-133	255				



26	30	33	88	37
			■	
■	■	■	■	■
■	■	■	■	■
■	■	■	■	■
■	■	■	■	■
■	■	■	■	■
AC, 3/(N)AC 0...793 V DC 0...650 V	AC, 3(N)AC/DC 0...7.2 kV	AC, 3/(N)AC 0...793 V DC 0...650 V	dependent on type	AC, 3/(N)AC 0...480 V DC 0...480 V
≤ 500	≤ 5	≤ 500	≤ 500 (150)	≤ 60
1...10000	100...10000	1...10000	1...10000	2...1000
	AC, DC or AC/DC medium voltage systems		Equipment for insulation fault location	
■	■			
■	■	■		
		■	■	■

Suitable system components				
■		■		
■		■		
■		■		
■		■		
■	■	■		
■		■	■	

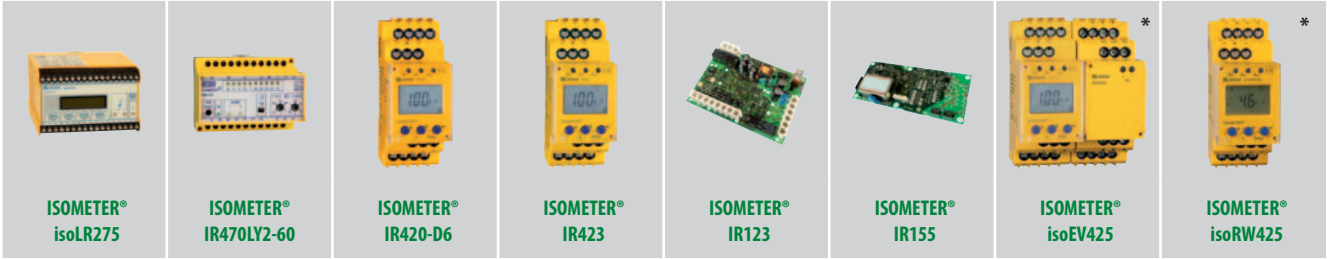
Overview insulation monitoring devices ISOMETER®



Page		40	44	92	48	53	56
Circuits	Control circuits			■			
	Auxiliary circuits						
	Main circuits	■	■	■	■	■	■
Voltage system	3(N)AC		■		■		
	AC	■	■	■	■		■
	AC/DC				■	■	■
	DC				■	■	■
Nominal system voltage U_n		AC 70...264 V	AC 230 V AC 127 V	AC 70...264 V	via AGH-PV 3(N)AC 0...793 V DC 0...1100 V	AC 0...800 V DC 0...1000 V	DC 0...1100 V, AC 0...793 V, 15...460 Hz
System leakage capacitance C_e μ F		≤ 5	≤ 5	≤ 5	≤ 2000	≤ 100	≤ 350
Response value R_{an} k Ω		50...500	50...500	50...500 k Ω	0.2...100	10	1...990
Special applications		Medical locations	Medical locations	Equipment for insulation fault location	Photovoltaic	Photovoltaic	Photovoltaic
Installation	DIN rail	■	■	■	■	■	■
	Screw mounting	■	■	■	■	■	■
	Panel mounting/ wall fastening						

	Type	P.	Suitable system components				
Coupling devices	AGH150W-4	212					
	AGH204S-4	213					
	AGH520S	214					
Measuring instruments	7204-1421	257					
	9604-1421	257					
	9620-1421	257			■		
Measuring current transformers	STW2	-	■	■	■		
Power supply unit	AN450	255		■			
	AN450-133	255		■			

* Delivery time on request



59	62	65	68	71	73	77	81
■	■	■	■	■	■	■	■
■	■	■	■	■			■
■		■			■	■	
via AGH-LR 3(N)AC 0...793 V DC 0...1100 V	AC, 3(N)AC 0...793 V	Offline	AC 0...300 V	AC 100...300 V	DC 0...1000 V	DC 0...1100 V AC 0...793 V, 15...460 Hz	AC/DC 0...400 V
≤ 500	≤ 10	≤ 10	≤ 5	≤ 1	≤ 1	≤ 5	≤ 300
0.2...100	10...1000 500...5000	100...10000	1...200	46/23	100...10000	10...990	1...990
Installations with a low level of insulation	Disconnected loads	Disconnected loads	Mobile generators	Mobile generators	Electric mobility	Electric mobility	Railway
■	■	■	■	■	■	■	■
■	■	■	■	■	■	■	■

Suitable system components

	■	■					
	■						
	■						

ISOMETER® IR420

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



1

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® of the IR420 series complies with the requirements of the device 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.com.

Ordering information

Supply voltage ¹⁾ U _S		Type	Art. No.
DC	AC		
9.6...94 V	16...72 V, 42...460 Hz	IR420-D4-1	B 7101 6409
70...300 V	70...300 V, 42...460 Hz	IR420-D4-2	B 7101 6405

Device version with screw terminals on request.

¹⁾ Absolute values

Accessories

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

Technical data

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

Rated insulation voltage	250 V
Rated impulse voltage/pollution degree	2.5 kV/3
Protective separation (reinforced insulation) between (A1, A2) - (L1, L2, E, KE, T/R) - (11, 12, 14) - (21, 22, 24)	
Voltage test acc. to IEC 61010-1	2.21 kV

Supply voltage

Supply voltage U_S	see ordering information
Power consumption	≤ 3 VA

IT system being monitored

Nominal system voltage U_n	AC 0...300 V
Nominal frequency f_n	42...460 Hz

Response values

Response value R_{an1} (Alarm 1) 1...200 k Ω	
Response value R_{an2} (Alarm 2)	1...200 k Ω
PreSet mode	$U_n \leq 72$ V R_{an1} (Alarm 1) = 20 k Ω / R_{an2} (Alarm 2) = 10 k Ω $U_n > 72$ V R_{an1} (Alarm 1) = 46 k Ω / R_{an2} (Alarm 2) = 23 k Ω
Relative uncertainty 1...5 k Ω /5...200 k Ω	± 0.5 k Ω / ± 15 %
Hysteresis	25%

Time response

Response time t_{an} at $R_F = 0.5 \times R_{an}$ and $C_e = 1$ μ F	≤ 1 s
Start-up delay (start time) t	0...10 s (0 s)*
Response delay t_{on}	0...99 s (0 s)*

Measuring circuit

Measuring voltage U_m	12 V
Measuring current I_m (at $R_F = 0$ Ω)	≤ 200 μ A
Internal DC resistance R_i	≥ 62 k Ω
Impedance Z_i at 50 Hz	≥ 60 k Ω
Permissible extraneous DC voltage U_{fg}	\leq DC 300 V
Permissible system leakage capacitance C_e	≤ 20 μ F

Displays, memory

Display range, measured value	1 k Ω ...1 M Ω
Operating uncertainty 1...5 k Ω /5 k Ω ...1 M Ω	± 0.5 k Ω / ± 15 %
Password	off/0...999 (off)*
Fault memory, alarm relay	on/off*

Outputs

Cable length test and reset button	≤ 10 m
------------------------------------	-------------

Switching elements

Number of switching elements	2 x 1 changeover contact				
Operating principle	NC/N/O operation (N/O operation)*				
Electrical service life, number of cycles	10000				
Contact data acc. to IEC 60947-5-1					
Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-12
Rated operational voltage	230 V	230 V	220 V	110 V	24 V
Rated operational current	5 A	3 A	0.1 A	0.2 A	1 A
Minimum contact rating	1 mA at AC/DC ≥ 10 V				

Environment/EMC

EMC	IEC 61326-2-4				
Operating temperature	-25...+55 $^{\circ}$ C				
Climatic class acc. to IEC 60721					
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)				
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)				
Long-time storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)				
Classification of mechanical conditions IEC 60721					
Stationary use (IEC 60721-3-3)	3M4				
Transport (IEC 60721-3-2)	2M2				
Long-time storage (IEC 60721-3-1)	1M3				

Connection

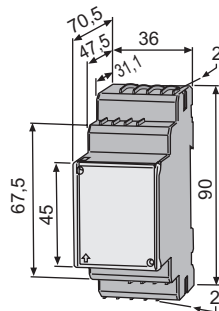
Connection type	push-wire terminal				
Connection properties					
rigid	0.2...2.5 mm ² (AWG 24...14)				
Flexible without ferrule	0.2...2.5 mm ² (AWG 24...14)				
Flexible with ferrule	0.2...1.5 mm ² (AWG 24...16)				
Stripping length	10 mm				
Opening force	50 N				
Test opening, diameter	2.1 mm				

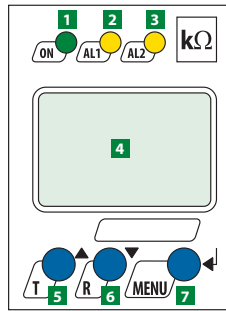
Other

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				
Screw mounting	2 x M4 with mounting clip				
DIN rail mounting acc. to	IEC 60715				
Operating manual	TBP101012				
Weight	≤ 150 g				

(*) = factory setting

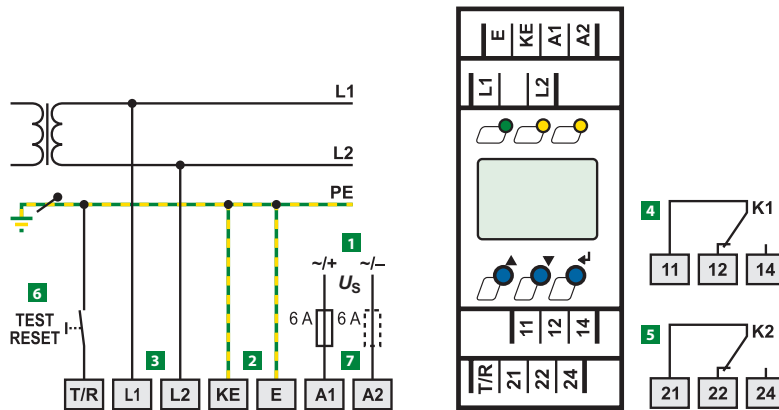
Dimension diagram (dimensions in mm)





- 1** LED power "ON", (flashes in case of interruption of the connecting leads E/KE or L1/L2).
- 2** Alarm LED "AL1", lights when the value falls below the set response value Alarm 1 and flashes in case of interruption of the connecting leads E/KE or L1/L2.
- 3** Alarm LED "AL2", lights when the value falls below the set response value Alarm 2 and flashes in case of interruption of the connecting leads E/KE or L1/L2.
- 4** LC display
- 5** Test button "T": to call up the self test.
Arrow up button: parameter change, to move up in the menu
- 6** Reset button "R": to delete stored insulation fault alarms
Arrow down button: parameter change, to move down in the menu
- 7** Menu button "MENU": to call up the menu system.
Enter button: Confirms parameter changes

Wiring diagram



- 1** Supply voltage U_s (see ordering details) via fuse
- 2** Separate connection of E, KE to PE
- 3** Connection of the AC system to be monitored:
AC: connect terminals L1, L2 to conductor L1, L2.
- 4** Alarm relay "K1": Alarm 1
- 5** Alarm relay "K2": Alarm 2
- 6** Combined test and reset button "T/R":
short-time pressing (< 1.5 s) = RESET, long-time pressing (> 1.5 s) = TEST
- 7** Line protection by a fuse in accordance with IEC 60364-4-43 (6 A fuse recommended). In case of supply (A1/A2) from an IT system, both lines have to be protected by a fuse.

ISOMETER® IR125Y-4

Insulation monitoring device for unearthed AC and DC systems



Device features

- Insulation monitoring for AC and DC systems (IT systems)
- Response values, adjustable 10...200 kΩ
- LEDs: Power On LED, alarm LED to signal insulation faults
- Internal combined test and reset button
- Connection external reset button
- Alarm relay with one potential-free changeover contact
- N/C operation
- Fault memory behaviour, selectable

Typical applications

- AC and DC control and auxiliary circuits in accordance with DIN EN 60204-1, "Electrical equipment of machines", IEC 60204-1, EN 60204-1
- DC auxiliary circuits in accordance with DIN VDE 0100-725
- Simple battery systems

Standards

The ISOMETER® of the IR125Y-4 series complies with the requirements of the standards: DIN EN 61557-8 (VDE 0413-8), EN 61557-8, IEC 61557-8, ASTM F1669M-96 (2007)

Further information

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

Approvals



Ordering information

Nominal system voltage ¹⁾ U _n		Type	Art. No.
AC	DC		
19.2...265 V	19.2...308 V	IR125Y-4	B 9102 3005

¹⁾ Absolute values

Accessories

Type designation	Art. No.
Mounting plate	B 990 056

Response values/measuring circuits

Type	Response value R _{an}	Response time t _{an}	System leakage capacitance C _e
IR125Y-4...	10...200 kΩ	≤ 6 s	≤ 10 μF
Type	Measuring voltage U _m	Measuring current I _m	Internal DC resistance R _i
IR125Y-4...	13 V	≤ 0.12 mA	112 kΩ

Technical data

Insulation coordination acc. to IEC 60664-1

Rated insulation voltage	AC 250 V
Rated impulse withstand voltage/pollution degree	4 kV/3

Voltage ranges

Nominal system voltage U_n	AC 19.2...265 V, DC 19.2...308 V
Supply voltage U_s	$= U_n$
Power consumption	≤ 1.5 W

Response values see table "Response values/measuring circuit"

Measuring circuit see table "Response values/measuring circuit"

Outputs

Test button	internal
Reset button	internal/external

Switching elements

Number of switching elements	1 changeover contact
Operating principle	N/C operation
Electrical endurance, number of cycles	12000
Contact class	IIB in accordance with DIN IEC 60255-0-20
Rated contact voltage	AC 250 V/DC 300 V
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

Environment

Shock resistance IEC 60068-2-27 (device in operation)	15 g/11 ms
Bumping IEC 60068-2-29 (transport)	40 g/6 ms
Vibration resistance IEC 60068-2-6 (device in operation)	1 g/10...150 Hz
Vibration resistance IEC 60068-2-6 (transport)	2 g/10...150 Hz
Ambient temperature (during operation/during storage)	-10...+55 °C/-40...+70 °C
Climatic class acc. to DIN IEC 60721-3-3	3K5

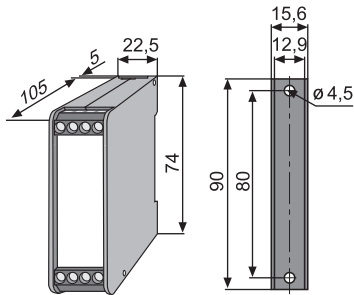
Connection

Connection type	modular terminals
Connection properties rigid/flexible	0.2...4 mm ² /0.2...2.5 mm ²

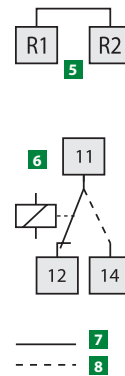
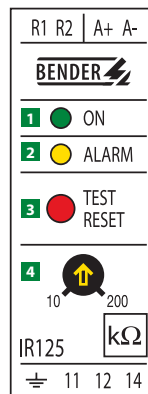
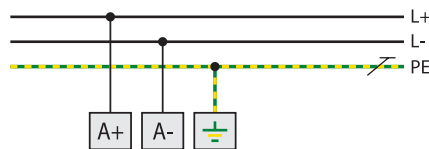
Other

Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (DIN EN 60529)	IP30
Degree of protection, terminals (DIN EN 60529)	IP20
Screw mounting	with mounting plate
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Operating manual	TBP102005
Weight	≤ 130 g

Dimension diagram (dimensions in mm)



Wiring diagram



- | | |
|---|--|
| <p>1 Power On LED "ON"</p> <p>2 LED "ALARM"</p> <p>3 Combined test and reset button "TEST/RESET", short-time pressing (< 1 s) = RESET; long-time pressing (> 1 s) = TEST</p> | <p>4 Adjustable response value 10...200 kΩ</p> <p>5 "R1/R2" bridged: Fault memory active</p> <p>6 Alarm relay in N/C operation</p> <p>7 Alarm</p> <p>8 No alarm</p> |
|---|--|

ISOMETER® IR425

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



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
- 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® of the IR425 complies with the requirements of the device standards: DIN EN 61557-8 (VDE 0413-8), IEC 61557-8, ASTM F 1669M-96 (2007).

Further information

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

Ordering information

Supply voltage ¹⁾ U _S		Type	Art. No.
DC	AC		
9.6...94 V	16...72 V, 15...460 Hz	IR425-D4-1	B 7103 6403
70...300 V	70...300 V, 15...460 Hz	IR425-D4-2	B 7103 6402

Device version with screw terminals on request.

¹⁾ Absolute values

Accessories

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

Technical data

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

Rated insulation voltage	250 V
Rated impulse voltage/pollution degree	2.5 kV/3
Protective separation (reinforced insulation) between (A1, A2) - (L1, L2, E, KE, T/R) - (11, 12, 14) - (21, 22, 24)	
Voltage test acc. to IEC 61010-1	2.21 kV

Supply voltage

Supply voltage U_s	see ordering information
Power consumption	≤ 3 VA

IT system being monitored

Nominal system voltage U_n	AC/DC 0...300 V
Nominal frequency f_n	DC 15...460 Hz

Response values

Response value R_{an1} (Alarm 1) 1...200 k Ω	
Response value R_{an2} (Alarm 2)	1...200 k Ω
Preset mode	$U_n \leq 72 \text{ V}$ R_{an1} (Alarm 1) = 20 k Ω / R_{an2} (Alarm 2) = 10 k Ω $U_n > 72 \text{ V}$ R_{an1} (Alarm 1) = 46 k Ω / R_{an2} (Alarm 2) = 23 k Ω
Relative uncertainty 1...5 k Ω /5...200 k Ω	± 0.5 k Ω /± 15 %
Hysteresis	25 %

Time response

Response time t_{an} at $R_f = 0.5 \times R_{an}$ and $C_e = 1 \mu\text{F}$	≤ 2 s
Start-up delay (start time) t	0...10 s (0 s)*
Response delay t_{on}	0...99 s (0 s)*

Measuring circuit

Measuring voltage U_m	± 12 V
Measuring current I_m (at $R_f = 0 \Omega$)	≤ 200 μA
Internal DC resistance R_i	≥ 62 k Ω
Impedance Z_i at 50 Hz	≥ 60 k Ω
Permissible system leakage capacitance	≤ 20 μF

Displays, memory

Display range, measured value	1 k Ω ...1 M Ω
Operating uncertainty 1...5 k Ω /5 k Ω ...1 M Ω	± 0.5 k Ω /± 15 %
Password	off/0...999 (off)*
Fault memory, alarm relay	on/off*

Outputs

Cable length test and reset button	≤ 10 m
------------------------------------	--------

Switching elements

Number of switching elements	2 x 1 changeover contact				
Operating principle	NC/N/O operation (N/O operation)*				
Electrical endurance, number of cycles	10000				
Contact data acc. to IEC 60947-5-1					
Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-12
Rated operational voltage	230 V	230 V	220 V	110 V	24 V
Rated operational current	5 A	3 A	0.1 A	0.2 A	1 A
Minimum contact rating	1 mA at AC/DC ≥ 10 V				

Environment/EMC

EMC	IEC 61326-2-4				
Operating temperature	-25...+55 °C				
Climatic class acc. to IEC 60721					
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)				
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)				
Long-time storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)				
Classification of mechanical conditions IEC 60721					
Stationary use (IEC 60721-3-3)	3M4				
Transport (IEC 60721-3-2)	2M2				
Long-time storage (IEC 60721-3-1)	1M3				

Connection

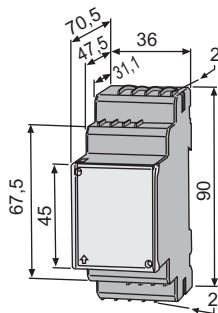
Connection type	push-wire terminal				
Connection properties					
rigid	0.2...2.5 mm ² (AWG 24...14)				
Flexible without ferrule	0.2...2.5 mm ² (AWG 24...14)				
Flexible with ferrule	0.2...1.5 mm ² (AWG 24...16)				
Stripping length	10 mm				
Opening force	50 N				
Test opening, diameter	2.1 mm				

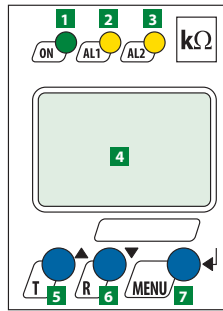
Other

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				
Screw mounting	2 x M4 with mounting clip				
DIN rail mounting acc. to	IEC 60715				
Operating manual	TBP103005				
Weight	≤ 150 g				

• ()* = factory setting

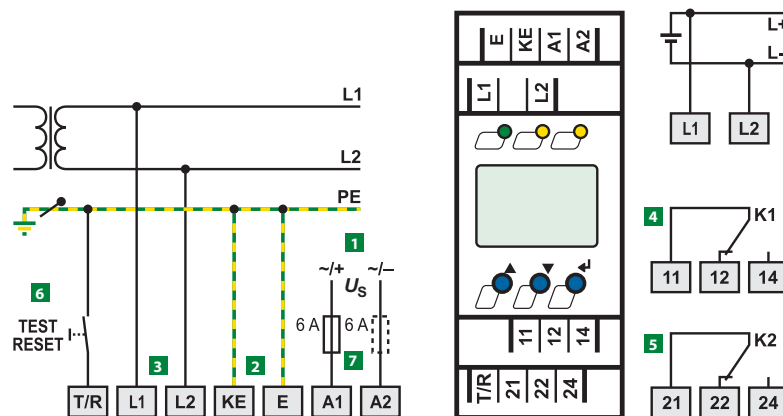
Dimension diagram (dimensions in mm)





- 1** LED power "ON", (flashes in case of interruption of the connecting leads E/KE or L1/L2).
- 2** Alarm LED "AL1", lights when the value falls below the set response value Alarm 1 and flashes in case of interruption of the connecting leads E/KE or L1/L2.
- 3** Alarm LED "AL2", lights when the value falls below the set response value Alarm 2 and flashes in case of interruption of the connecting leads E/KE or L1/L2.
- 4** LC display
- 5** Test button "T": to call up the self test.
Arrow up button: parameter change, to move up in the menu
- 6** Reset button "R": to delete stored insulation fault alarms
Arrow down button: parameter change, to move down in the menu
- 7** Menu button "MENU": to call up the menu system.
Enter button: Confirms parameter changes

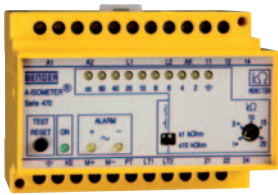
Wiring diagram



- 1** Supply voltage U_S (see ordering details) via fuse
- 2** Separate connection of E, KE to PE
- 3** Connection to the IT system to be monitored:
AC: connect terminals L1, L2 to conductor L1, L2.
- 4** Alarm relay "K1": Alarm 1
- 5** Alarm relay "K2": Alarm 2
- 6** Combined test and reset button "T/R":
short-time pressing (< 1.5 s) = RESET, long-time pressing (> 1.5 s) = TEST
- 7** Line protection by a fuse in accordance with IEC 60364-4-43 (6 A fuse recommended). In case of supply (A1/A2) from an IT system, both lines have to be protected by a fuse.

ISOMETER® IR470LY...

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



Device features

- Insulation monitoring for AC, 3(N)AC systems 0...793 V (IT systems)
- Nominal voltage extendable via coupling device
- Response values, adjustable 1...200 kΩ
- Connection monitoring system/earth
- Power ON LED, Alarm LED for signalling AC, L+, L- insulation faults
- LED bar graph indicator for signalling AC, L+, L- insulation faults
- Connection for external kΩ indication
- Combined test and reset button
- Connection external test/reset button
- Alarm relay with two potential-free changeover contacts
- Selectable N/O or N/C operation
- Fault memory behaviour, selectable

Typical applications

- AC, 3(N)AC main circuits (without directly connected rectifiers), such as motors, pumps, rolling mills without variable-speed drives, air cooling and air conditioning systems, lighting systems, heating systems, mobile generators, building services, domestic electrical installation practice, etc.

Standards

The ISOMETER® of the IR470LY series complies with the requirements of the device standards: DIN EN 61557-8 (VDE 0413-8), IEC 61557-8, ASTM F 1669M-96 (2007).

Approvals



Further information

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

Ordering information

Supply voltage U_s		Type	Art. No.
DC	AC		
–	230 V	IR470LY-40	B 9104 8007
–	24 V	IR470LY-4011	B 9104 8012
–	42 V	IR470LY-4012	B 9104 8002
–	90...132 V ¹⁾	IR470LY-4013	B 9104 8011
–	400 V	IR470LY-4015	B 9104 8008
–	500 V	IR470LY-4016	B 9104 8018
–	690 V	IR470LY-4017	B 9104 8017
–	440 V	IR470LY-4018	B 9104 8024
9.6...84 V ¹⁾	–	IR470LY-4021	B 9104 8006
77...286 V ¹⁾	–	IR470LY-4023	B 9104 8026

Other supply voltages on request

¹⁾ Absolute values

Suitable system components

Type designation	Type	Page
External kΩ measuring instruments	7204-1421	257
	9604-1421	257
Coupling devices	AGH204S-4	213
	AGH520S	214

Technical data

Insulation coordination acc. to IEC 60664-1

Rated insulation voltage	AC 630 V
Rated impulse voltage/pollution degree	6 kV/3

Voltage ranges

Nominal system voltage U_n	AC, 3(N)AC 0...793 V
Nominal frequency f_n	40...460 Hz
Supply voltage U_s	see ordering information
Operating range of U_s	0.8...1.15 x U_s
Frequency range U_s	50...460 Hz
Power consumption	≤ 3 VA

Response values

Response value R_{an1} (Alarm 1)	1...200 k Ω
Response time t_{an} at $R_F = 0.5 \times R_{an}$ and $C_e = 1 \mu F$	
10...200 k Ω range	≤ 1 s
1...10 k Ω range	≤ 3 s

Measuring circuit

Measuring voltage U_m	≤ 40 V
Measuring current I_m (at $R_F = 0 \Omega$)	≤ 200 μA
Internal DC resistance R_i	≥ 200 k Ω
Impedance Z_i at 50 Hz	≥ 180 k Ω
Permissible extraneous DC voltage U_{fg}	≤ 800 V
Permissible system leakage capacitance C_e	≤ 20 μF

Outputs

Test/reset button	internal/external
Current output for measuring instrument (scale centre point = 120 k Ω)	0...400 μA
Load	≤ 25 k Ω

Switching elements

Switching elements	2 changeover contacts
Operating principle	N/O operation/N/C operation
Factory setting	N/O operation
Electrical endurance, number of cycles	12000
Contact class	IIB in accordance with DIN IEC 602550-20
Rated contact voltage	AC 250 V/DC 300 V
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
Contact rating at DC 24 V	≥ 2 mA (50 mW)

Environment

Shock resistance IEC 60068-2-27 (device in operation)	15 g/11 ms
Bumping IEC 60068-2-29 (transport)	40 g/6 ms
Vibration resistance IEC 60068-2-6 (device in operation)	1 g/10...150 Hz
Vibration resistance IEC 60068-2-6 (transport)	2 g/10...150 Hz
Ambient temperature (during operation/during storage)	-10...+55 °C/-40...+70 °C
Climatic class acc. to DIN IEC 60721-3-3	3K5

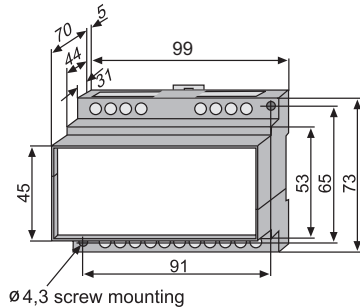
Connection

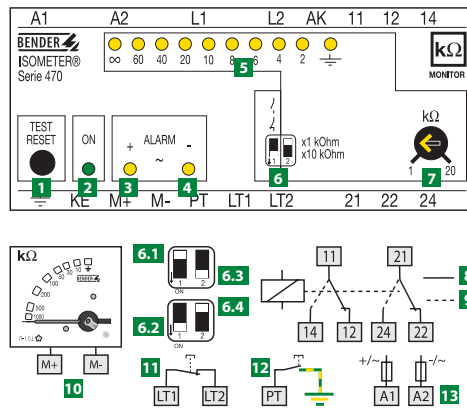
Connection type	modular terminals
Connection properties	
rigid/flexible	0.2...4 mm ² /0.2...2.5 mm ²

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
Screw mounting	2 x M4
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Operating manual	TBP104001
Weight	≤ 360 g

Dimension diagram (dimensions in mm)

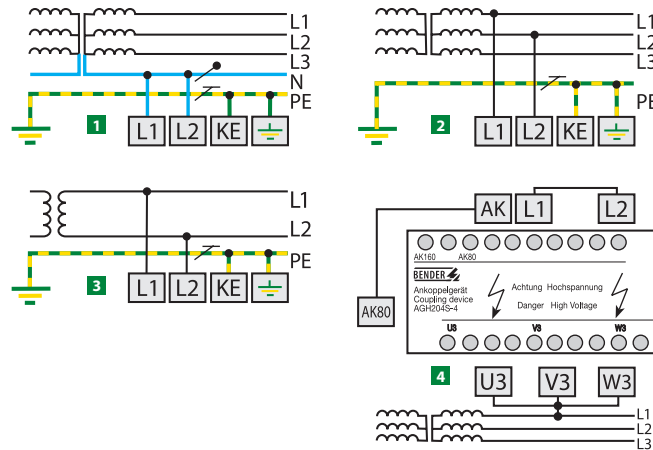




- 1** Combined test/reset button "TEST/RESET"; short-time pressing (< 1 s) = RESET, long-time pressing (> 1 s) = TEST
- 2** LED Power on "ON"
- 3 4** Alarm LEDs "+ ALARM -", yellow, light when the value falls below the set response value and flash in case of interruption of the connecting leads $\overline{=}$ /KE or L1/L2
- 5** LED bar graph indicator
- 6** Operating principle of the alarm relays and setting range R_{ALARM}
 - 6.1** N/O operation **6.3** x 10 kΩ
 - 6.2** N/C operation **6.4** x 1 kΩ
- 7** Potentiometer to set the response value R_{ALARM}
- 8** Alarm relay – N/O operation (basic setting)
- 9** Alarm relay – N/C operation
- 10** External kΩ indicating instrument
- 11** External reset button "LT1, LT2" or bridge for fault memory
- 12** External test button "PT"
- 13** U_S see ordering information, 6 A fuse recommended

Changing the setting range from x 1 kΩ to x 10 kΩ automatically changes the indication of the kΩ values on the LED bar graph indicator: Setting range x 1 kΩ: Meter scale point x 1 kΩ. Setting range x 10 kΩ: Meter scale point has to be multiplied by 10 kΩ.

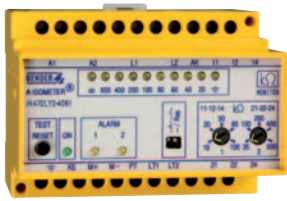
Wiring diagram – system connection



- 1** U_n 3NAC system
- 2** U_n 3AC system
- 3** U_n AC system
- 4** U_n with coupling devices: AGH204S-4 = 0...1300 V resp. 0...1650 V, AGH520S = 0...7200 V, here: coupling device AGH204S-4 connected to U_n 3AC system

ISOMETER® IR470LY2-4061

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



Device features

- Insulation monitoring for AC, 3(N)AC systems 0...793 V (IT systems)
- Nominal voltage extendable via coupling device
- Two separately adjustable response values 10...100 kΩ/35...500 kΩ
- Connection monitoring system/earth
- LEDs: Power ON LED, LED to signal AC insulation faults
- LED bar graph indicator for the indication of the insulation resistance
- Connection for external kΩ indication
- Combined test and reset button
- Two separate alarm relays with one potential-free changeover contact each
- N/O or N/C operation, selectable
- Fault memory behaviour, selectable

Typical applications

- AC, 3(N)AC main circuits (without directly connected rectifiers), such as motors, pumps, rolling mills without variable-speed drives, air cooling and air conditioning systems, lighting systems, heating systems, mobile generators, building services, domestic electrical installation practice, etc.

Standards

The ISOMETER® of the IR470LY2-4061 series complies with the requirements of the device standards: DIN EN 61557-8 (VDE 0413-8), IEC 61557-8, ASTM F 1669M-96 (2007).

Further information

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

Approvals



Ordering information

Supply voltage U_s	Type	Art. No.
AC		
230 V	IR470LY2-4061	B 9104 8052

Other supply voltages on request

Suitable system components

Type designation	Type	Page
External kΩ measuring instruments	7204-1421	257
	9604-1421	257
Coupling devices	AGH204S-4	213
	AGH520S	214

Technical data

Insulation coordination acc. to IEC 60664-1

Rated insulation voltage	AC 630 V
Rated impulse voltage/pollution degree	6 kV/3

Voltage ranges

Nominal system voltage U_n	AC, 3(N)AC 0...793 V
Nominal frequency f_n	40...460 Hz
Supply voltage U_s	see ordering information
Operating range of U_s	0.85...1.15 x U_s
Frequency range U_s	50...460 Hz
Power consumption	≤ 3 VA

Response values

Response value R_{an1} (Alarm 1)	10...100 k Ω
Response value R_{an2} (Alarm 2)	35...500 k Ω
Response time t_{an} at $R_F = 0.5 \times R_{an}$ and $C_e = 1 \mu\text{F}$	≤ 1 s

Measuring circuit

Measuring voltage U_m	≤ 40 V
Measuring current I_m (at $R_F = 0 \Omega$)	≤ 200 μA
Internal DC resistance R_i	≥ 200 k Ω
Impedance Z_i at 50 Hz	≥ 180 k Ω
Permissible extraneous DC voltage U_{fg}	≤ 800 V
Permissible system leakage capacitance	≤ 20 μF

Outputs

Test/reset button	internal/external
Current output for measuring instrument (scale centre point = 120 k Ω)	0...400 μA
Load	≤ 25 k Ω

Switching elements

Number of switching elements	2 x 1 changeover contact
Operating principle	N/O operation/N/C operation
Factory setting	N/O operation
Electrical endurance, number of cycles	12000
Contact class	IIB in accordance with DIN IEC 60255-0-20
Rated contact voltage	AC 250 V/DC 300 V
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
Contact rating at DC 24 V	≥ 2 mA (50 mW)

Environment

Shock resistance IEC 60068-2-27 (device in operation)	15 g/11 ms
Bumping IEC 60068-2-29 (transport)	40 g/6 ms
Vibration resistance IEC 60068-2-6 (device in operation)	1 g/10...150 Hz
Vibration resistance IEC 60068-2-6 (transport)	2 g/10...150 Hz
Ambient temperature (during operation)	-10...+55 °C
Ambient temperature (during storage)	-40...+70 °C
Climatic class acc. to DIN IEC 60721-3-3	3K5

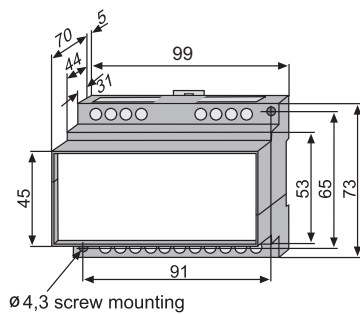
Connection

Connection type	modular terminals
Connection properties	
rigid/flexible	0.2...4 mm ² /0.2...2.5 mm ²

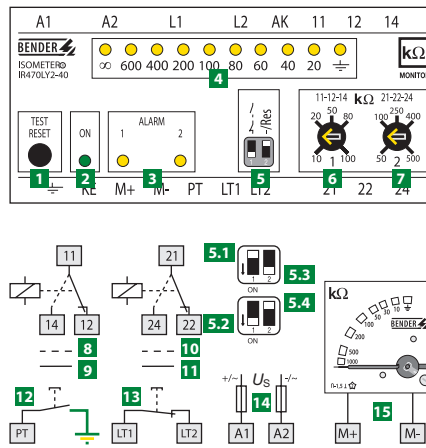
Other

Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (DIN EN 60529)	IP30
Degree of protection, terminals (DIN EN 60529)	IP20
Screw mounting	2 x M4
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Operating manual	TBP104010
Weight	≤ 360 g

Dimension diagram (dimensions in mm)

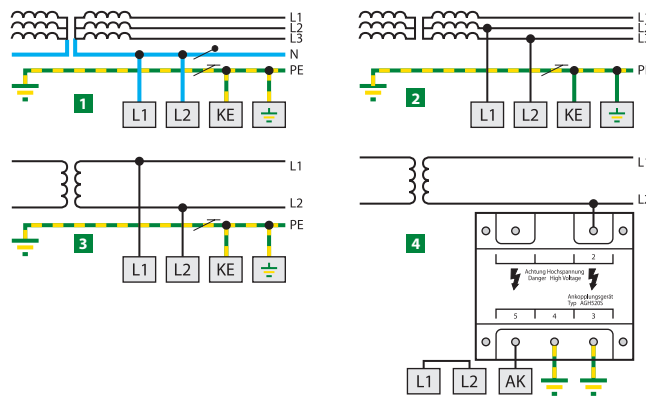


Wiring diagram – front plate



- | | | | | | |
|---|---------------------------------|---------------------------------|--------------------------|------------------------------|---|
| <p>1 Combined test and reset button "TEST RESET", short-time pressing (< 1 s) = RESET, long-time pressing (> 2 s) = TEST</p> <p>2 Power On LED "ON"</p> <p>3 Alarm LEDs "1 ALARM 2", yellow; light when the value falls below the set response value and flash in case of interruption of the connecting leads \overline{KE} or L1/L2</p> <p>4 kΩ LED bar graph indicator</p> <p>5 Operating principle of the alarm relay</p> <table border="0"> <tr> <td style="padding-right: 20px;">5.1 N/O operation</td> <td>5.3 without fault memory</td> </tr> <tr> <td>5.2 N/C operation</td> <td>5.4 with fault memory</td> </tr> </table> | 5.1 N/O operation | 5.3 without fault memory | 5.2 N/C operation | 5.4 with fault memory | <p>6 Potentiometer to set the response value RALARM1</p> <p>7 Potentiometer to set the response value RALARM2</p> <p>8 Alarm relay 1: N/O operation</p> <p>9 Alarm relay 1: N/C operation</p> <p>10 Alarm relay 2: N/O operation</p> <p>11 Alarm relay 2: N/C operation</p> <p>12 External test button "PT"</p> <p>13 External reset button "LT1, LT2" or bridge for fault memory</p> <p>14 U_S see ordering information, 6 A fuse recommended</p> <p>15 External kΩ indicating instrument</p> |
| 5.1 N/O operation | 5.3 without fault memory | | | | |
| 5.2 N/C operation | 5.4 with fault memory | | | | |

Wiring diagram – system connection



- | |
|---|
| 1 3NAC system |
| 2 3AC system |
| 3 AC system |
| 4 AC system AC 0...7200 V with coupling device AGH520S |

ISOMETER® IRDH275

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



1

Typical applications

- AC, DC or AC/DC main circuits
- AC/DC main circuits with directly connected DC components, such as rectifiers, converters, and thyristor-controlled DC drives
- UPS systems, battery systems
- Heaters with phase control
- Installations including switch-mode power supplies
- IT systems including high leakage capacitances
- Coupled IT systems

Approvals



Device features

- Insulation monitoring for unearthed AC, AC/DC systems 0...793 V, DC 0...650 V
- Nominal voltage extendable via coupling device
- Two separately adjustable response values 1 kΩ...10 MΩ
- **AMP^{plus}** measurement method
- Automatic adaptation to the system leakage capacitance
- Info button to display device settings and system leakage capacitance
- Self monitoring with automatic alarm
- Automatic self test, selectable
- Connection for external kΩ indication
- Test and reset button
- External test/reset button can be connected
- Two separate alarm relays with two potential-free changeover contacts
- N/O or N/C operation, selectable
- Backlit LC display
- RS-485 interface

Additional device features, version IRDH275B

- 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® of the IRDH257 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 (VDE 0110-3), ASTM F1669M-96 (2007), ASTM F1207M-96 (2007)

Further information

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

Ordering information

RS-485 interface	Coupled IT systems	Output	Supply voltage $U_S^{1)}$		Type	Art. No.
			AC	DC		
ASCII-IsoData	not applicable	Current output 0...400 μA	88...264 V	77...286 V	IRDH275-435	B 9106 5100
			–	19.2...72 V	IRDH275-427	B 9106 5104
			–	10.2...36 V	IRDH275-425	B 9106 5108
BMS	applicable	Current output 0(4)...20 mA	88...264 V	77...286 V	IRDH275B-435	B 9106 5101
			–	19.2...72 V	IRDH275B-427	B 9106 5105
			–	10.2...36 V	IRDH275B-425	B 9106 5109

¹⁾ Absolute values

Device "Option-W" with increased shock and vibration resistance: Indicated by the letter "W" at the end of the order number.

Suitable system components

Type designation	Type	Page
External kΩ measuring instruments	7204-1421	257
	9604-1421	257
	9620-1421	257
Coupling devices	AGH150W-4	212
	AGH204S-4	213
	AGH520S	214

Technical data

Insulation coordination acc. to IEC 60664-1

Rated insulation voltage	AC 800 V
Rated impulse voltage/pollution degree	8 kV/3

Voltage ranges

IRDH275...:	
Nominal system voltage U_n	AC, 3/(N)AC 0...793 V*
Nominal frequency f_n	50...460 Hz
Nominal system voltage U_n	DC 0...650 V*

IRDH275...-435:

Supply voltage U_S (also see nameplate)	AC 88...264 V*
Frequency range U_S	42...460 Hz
Supply voltage U_S (also see nameplate)	DC 77...286 V*

IRDH275...-427:

Supply voltage U_S (also see nameplate)	DC 19.2...72 V*
---	-----------------

IRDH275...

Power consumption	≤ 14 VA
-------------------	---------

Response values

Response value R_{an1} (Alarm1)	1 kΩ...10 MΩ
Response value R_{an2} (Alarm2)	1 kΩ...10 MΩ
Relative uncertainty (20 kΩ...1 MΩ) (acc. to IEC 61557-8)	± 15 %
Relative uncertainty (1...20 kΩ +2 kΩ/+20 %)	
Relative uncertainty (1...10 MΩ)	0.2 kΩ/+20 %
Response time t_{an} at $R_f = 0.5 \times R_{an}$ and $C_e = 1 \mu F$	≤ 5 s
Hysteresis (1...10 kΩ)	+2 kΩ
Hysteresis (10 kΩ...10 MΩ)	25 %

Measuring circuit

Measuring voltage U_m	≤ 50 V
Measuring current I_m (at $R_f = 0 \Omega$)	≤ 280 μA
Internal DC resistance R_i	≥ 180 kΩ
Impedance Z_i at 50 Hz	≥ 180 kΩ
Permissible extraneous DC voltage U_{fg}	≤ DC 1200 V
Permissible system leakage capacitance	≤ 500 μF
Factory setting	150 μF

Displays

Display, illuminated	two-line display
Characteristics (number)	2 x 16
Display range measured value	1 kΩ...10 MΩ
Operating uncertainty (20 kΩ...1 MΩ) (nach IEC 61557-8)	± 15 %**
Operating uncertainty (1...20 kΩ)	± 1 kΩ/± 15 %**
Operating uncertainty (1...10 MΩ)	± 0.1 MΩ/± 15 %**

Outputs/Inputs

Test/reset button	internal/external
Cable length test/reset button, external	≤ 10 m
Current output for measuring instrument SKMP (scale centre point = 120 kΩ):	
Current output IRDH275 (load)	400 μA (≤ 12.5 kΩ)
Current output IRDH275B (load)	20 mA (≤ 500 Ω)
Accuracy current output (1 kΩ...1 MΩ)	
related to the value indicated	±10 %, ±1 kΩ

Serial interface

Interface/protocol IRDH275	RS-485/ASCII-IsoData
Interface/protocol IRDH275B	RS-485/BMS
Connection	terminals A/B
Cable length	≤ 1200 m
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 (0.5 W)
Device address, BMS bus	1...30 (factory setting = 3)

Switching elements

Switching elements	2 changeover contacts: K1 (Alarm 1), K2 (Alarm 2, device error)
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, number of cycles	12000
Contact class	IIB (DIN IEC 60255-23)
Rated contact voltage	AC 250 V/DC 300 V
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
Contact rating at DC 24 V	≥ 2 mA (50 mW)

Environment/EMC

EMC	acc. to IEC 61326-2-4 Ed. 1.0
Shock resistance IEC 60068-2-27 (device in operation)	15 g/11 ms
Bumping IEC 60068-2-29 (transport)	40 g/6 ms
Vibration resistance IEC 60068-2-6 (device in operation)	1 g/10...150 Hz
Vibration resistance IEC 60068-2-6 (transport)	2 g/10...150 Hz
Ambient temperature (during operation)	-10...+55 °C
Ambient temperature (during storage)	-40...+70 °C
Climatic class acc. to IEC 60721-3-3	3K5

Connection

Connection	screw-type terminals
Connection properties	
rigid/flexible	0.2...4 mm ² /0.2...2.5 mm ²
flexible with ferrules without/with plastic sleeve	0.25...2.5 mm ²
Tightening torque	0.5 Nm
Conductor sizes (AWG)	24...12

Other

Operating mode	continuous operation
Mounting	display-oriented
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	X112, free from halogen
DIN rail mounting	DIN EN 60715/IEC 60715
Flammability class	UL94 V-0
Software version IRDH275	D160 V1.4
Software version IRDH275B	D159 V1.4
Operating manual	TGH1361
Weight	≤ 510 g

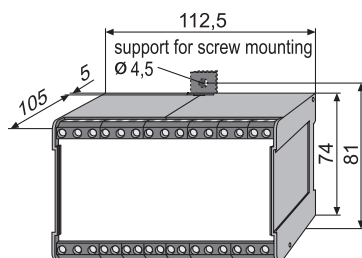
Option "W"

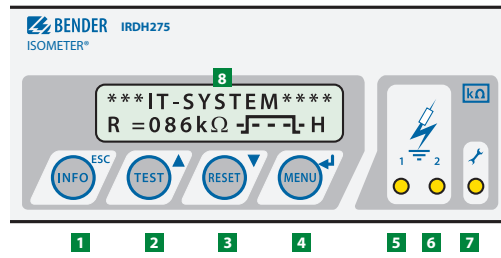
Shock resistance IEC 60068-2-27 (device in operation)	30 g/11 ms
Bumping IEC 60068-2-29 (transport)	40 g/6 ms
Vibration resistance IEC 60068-2-6	1.6 mm/10...25 Hz 4 g/25...150 Hz
Ambient temperature (during operation)	-40...+70 °C
Storage temperature range -40...+85 °C	
Screw mounting	2 x M4

The data labelled with an * are absolute values

** = Under EMC test conditions in accordance with IEC 61326-2-4 the specified tolerances can double

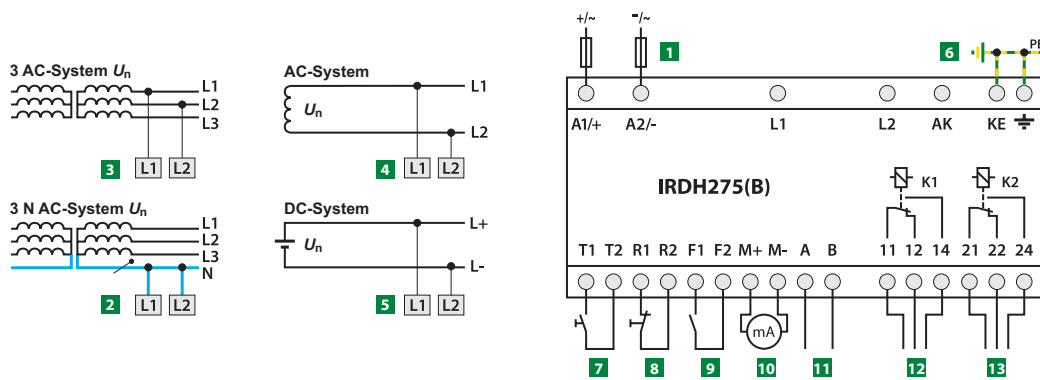
Dimension diagram (dimensions in mm)



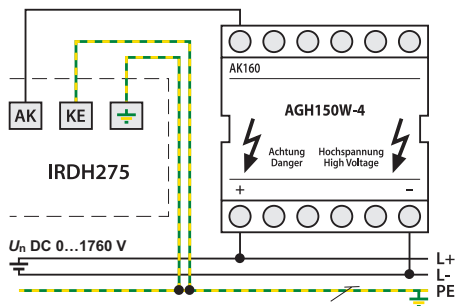


- 1** "INFO" button: to query standard information
ESC button: back to the menu function
- 2** "TEST" button: to call up the self test
Arrow up button: Parameter changes, scroll
- 3** "RESET" button: to delete alarm and fault messages
Arrow down button: Parameter change, scroll.
- 4** "MENU" button: to activate the menu system
Enter button: to confirm parameter changes
- 5** Alarm LED "1" lights: insulation fault, 1st warning level reached
- 6** Alarm LED "2" lights: insulation fault, 2nd warning level reached
- 7** LED lights: system fault
- 8** LC display

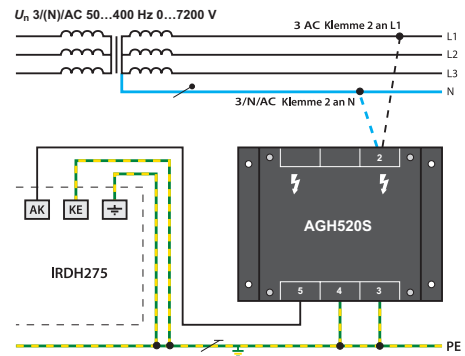
Wiring diagram



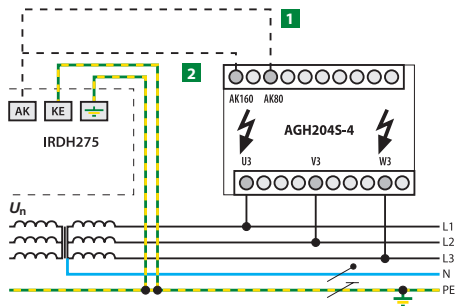
- 1** Supply voltage U_s (see ordering information) 6 A fuse recommended; for UL and CSA applications, it is mandatory to use 5 A fuses.
 - 2 3** Connection to the 3AC system being monitored:
Connect the terminals L1, L2 to neutral conductor N or terminals L1, L2 to conductor L1, L2.
 - 4** Connection of the AC system to be monitored:
Connect terminals L1, L2 to conductor L1, L2.
 - 5** Connection to the DC systems to be monitored:
Connect terminal L1 to conductor L+, terminal L2 to conductor L-
 - 6** Separate connection of the equipotential bonding conductor to PE and KE
 - 7*** External test button "T1/T2" (N/O contact)
 - 8*** External reset button "R1, R2" (N/C contact or wire jumper). When the terminals are open the fault messages will not be stored, provided that the fault memory has not been activated via the operating menu.
 - 9*** Standby by means of the function input "F1, F2":
with the contact in closed position no insulation measurement takes place (Isometer disconnection B version only/no disconnection when operated via AK).
 - 10** IRDH275: Current output, electrically isolated: 0...400 μ A
IRDH275B: Current output, electrically isolated: 0...20 mA or 4...20 mA
 - 11** RS-485 interface
 - 12** Alarm relay: Alarm 1
 - 13** Alarm relay: Alarm 2/system
- * the terminal pairs 7, 8 and 9 have to be wired electrically isolated and do not have to be connected to earth!



ISOMETER® IRDH275 with coupling device AGH150W-4



ISOMETER® IRDH275 with coupling device AGH520S



ISOMETER® IRDH275 with coupling device AGH204S-4

1 without rectifiers
 $U_n = 3AC\ 0 \dots 1650\ V$ (DC max. 1000 V)

2 with rectifiers
 $U_n = 3AC\ 0 \dots 1300\ V$ (peak voltage downstream of the rectifier or intermediate circuit voltage of max. 1840 V)

Insulation monitoring device ISOMETER® IRDH275BM-7 with coupling device AGH675-7

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

1



Device features

- Insulation monitoring for drives including medium voltage converters up to 7.2 kV
- Two separately adjustable response values 100 kΩ...10 MΩ
- **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 kΩ 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)

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



Standards

The ISOMETER® of the IRDH275BM-7 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 (VDE 0110-3), ASTM F1669M-96 (2007), ASTM F1207M-96 (2007)

Further information

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

Ordering information

Nominal system voltage U_n	Supply voltage U_s	Cable length	Type	Art. No.
AC, 3(N)AC/DC	DC			
–	19.2...72V	–	IRDH275BM-7	B 9106 5120
0...7.2 kV	–	2000 mm	AGH675S-7-2000	B 913 054
		500 mm	AGH675S-7-500	B 913 056

Suitable system components

Type designation	Type	Page
External kΩ measuring instruments	9620-1421	257

Technical data

Insulation coordination acc. to IEC 61800-5-1:

Rated voltage with AGH675S-7	AC 7.2 kV
------------------------------	-----------

Voltage test acc. to DIN EN 61800-5-1 (VDE 0160-105-1)

Voltage impulse test (basic insulation)	≥ AC 40 kV
AC voltage test (basic insulation)	≥ AC 20 kV
Partial discharge test	≥ 14 kV

Voltage ranges

Nominal system voltage U_n with AGH675S-7	0...7.2 kV
Nominal frequency f_n	DC, 0.2...460 Hz
Supply voltage U_s	DC 19.2...72 V
Frequency range of U_s	42...460 Hz
Power consumption	≤ 14 VA

Response values

Response value R_{an1} (Alarm1)	100 kΩ...10 MΩ
Response value R_{an2} (Alarm2)	100 kΩ...10 MΩ
Relative uncertainty 100...500 kΩ	± 100 kΩ
Relative uncertainty 500 kΩ...10 MΩ	0%...+ 20%
Response time t_{an}	≤ 5 min.
Hysteresis	25%

Measuring circuit

Measuring voltage U_m	≤ 50 V
Measuring current I_m (at $R_f = 0 \Omega$)	≤ 21 μA
Internal DC resistance R_i	≥ 2.4 MΩ
Impedance Z_i at 50 Hz	≥ 2.4 MΩ
Permissible system leakage capacitance	≤ 5 μF
Factory setting	2 μF

Displays

Display, illuminated	two-line display
Characteristics (number)	2 x 16
Display range, measured value	50 kΩ...10 MΩ
Operating uncertainty 50...500 kΩ	± 50 kΩ
Operating uncertainty 500 kΩ...10 MΩ	± 10%

Outputs/Inputs

Test/reset button	internal/external
Cable length test and reset button	≤ 10 m
Current output for measuring instrument SKMP	scale centre point = 2.8 MΩ
Current output (load)	0/4...20 mA (≤ 500 Ω)
Accuracy current output (100 kΩ...10 MΩ)	± 10%, ±100 k

Serial interface

Interface/protocol IRDH275B	RS-485/BMS
Connection	terminals A/B
Cable length	≤ 1200 m
Shielded cable (shield connected to PE at one end)	recommended: J-Y(St)Y min. 2 x 0.6
Terminating resistor	120 Ω (0.5 W)
Device address, BMS bus	1...30 (factory setting = 3)

Switching elements

Switching elements	2 changeover 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, number of cycles	12000
Contact class	IIB in accordance with DIN IEC 60255-0-20
Rated contact voltage	AC 250 V/DC 300 V
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
Contact rating at DC 24 V	≥ 2 mA (50 mW)

Environment

Shock resistance IEC 60068-2-27 (device in operation)	15 g/11 ms
Bumping IEC 60068-2-29 (transport)	40 g/6 ms
Vibration resistance IEC 60068-2-6 (device in operation)	1 g/10...150 Hz
Vibration resistance IEC 60068-2-6 (transport)	2 g/10...150 Hz
Ambient temperature (during operation/during storage)	-10...+ 55 °C/-40...+ 70 °C
Climatic class acc. to DIN IEC 60721-3-3	3K5

Connection

Connection	screw-type terminals
Connection properties	
rigid/flexible	0.2...4 mm ² /0.2...2.5 mm ²
flexible with ferrules without/with plastic sleeve	0.25...2.5 mm ²
Conductor sizes (AWG)	24...12

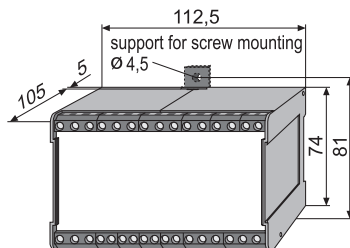
Other

Operating mode	continuous operation
Mounting	display-oriented
Degree of protection, internal components (DIN EN 60529)	IP30
Degree of protection, terminals (DIN EN 60529)	IP20
Type of enclosure	X112, free from halogen
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Operating manual	TGH1395
Weight	≤ 510 g

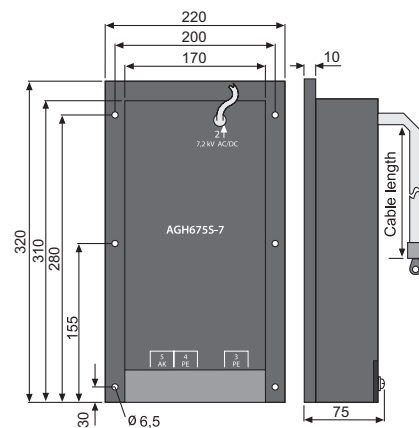
Values marked with * are absolute values

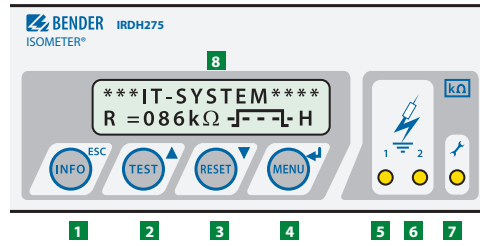
Dimension diagrams (dimensions in mm)

IRDH275BM-7



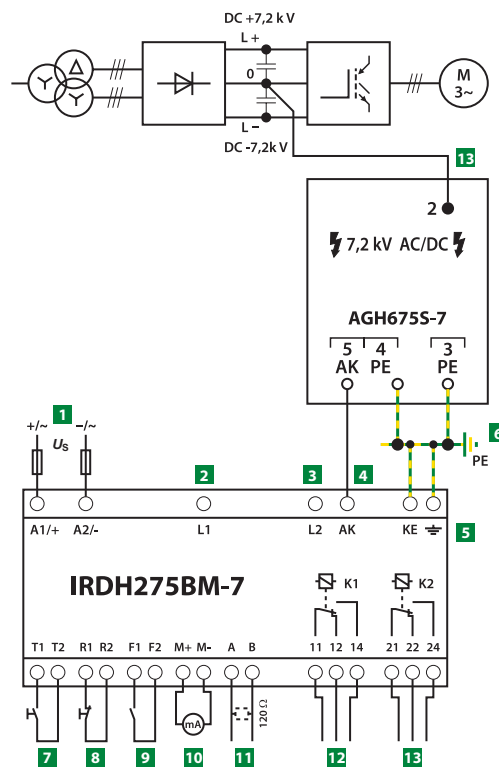
AGH675S-7





- 1** "INFO" button: to query standard information
ESC button: back to the menu function
- 2** "TEST" button: to call up the self test
Arrow up button: Parameter changes, scroll
- 3** "RESET" button: to delete installation and fault messages
Arrow down button: Parameter change, scroll.
- 4** "MENU" button: to activate the menu system
Enter button: to confirm parameter changes
- 5** Alarm LED "1" lights: insulation fault, 1st warning level reached
- 6** Alarm LED "2" lights: insulation fault, 2nd warning level reached
- 7** LED lights: system fault
- 8** LC display

Wiring diagrams



- 1** Supply voltage U_S (see ordering information)
6 A fuse recommended
- 2 3** Terminals L1, L2 are left unconnected!
- 4** Connection to the coupling device AGH675S-7:
Connect terminal AK with terminal 5 of the coupling device.
- 5** Separate connection of and PE/KE to PE
- 6** Connect the terminals 3 and 4 of the AGH675S-7 separately to PE
- 7** External test button "T1/T2" (N/O contact)
- 8** External reset button "R1/R2" (N/C contact or wire jumper).
When the terminals are open, the fault message will not be stored.
- 9** STANDBY by means of the function input F1, F2:
when the contact is closed, insulation measurement does not take place
- 10** Current output, electrically isolated: 0...20 mA or 4...20 mA
- 11** Serial interface RS-485 (termination with a 120 Ω resistor)
- 12** Alarm relay "K1": available changeover contacts
- 13** Alarm relay "K2" (system fault relay); available changeover contacts
- 14** Connection of the coupling device to the converter:
Terminal 2 to the mid-point of the DC intermediate circuit

ISOMETER® IRDH375

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, and thyristor-controlled DC drives
- UPS systems, battery systems
- Heaters with phase control
- Installations including switch-mode power supplies
- IT systems including high leakage capacitances
- Coupled IT systems

Approvals



Device features

- Insulation monitoring for unearthed AC, AC/DC systems 0...793 V, DC 0...650 V
- Nominal voltage extendable via coupling device
- Two separately adjustable response values 1 kΩ...10 MΩ
- **AMP^{plus}** measurement method
- Automatic adaptation to the system leakage capacitance
- Info button to display device settings and the system leakage capacitance
- Continuous self monitoring, with automatic alarm message
- Automatic self test, selectable
- Connection for external kΩ 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
- Alarm relay for system fault (N/C operation)
- Backlit LC display
- RS-485 interface
- Plug-in terminals

Additional device features, version IRDH375B

- 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

Standards

The ISOMETER® of the IRDH375 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 (VDE 0110-3), ASTM F1669M-96 (2007), ASTM F1207M-96 (2007)

Further information

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

Ordering information

RS-485 interface	Coupled IT systems	Output	1 - Supply voltage U_S		Type	Art. No.
			AC	DC		
ASCII	not applicable	external kΩ indication 0...400 μA	88...264 V	77...286 V	IRDH375-435	B 9106 5000
			–	19.2...72 V	IRDH375-427	B 9106 5002
BMS	applicable	Current output 0(4...20 mA)	88...264 V	77...286 V	IRDH375B-435	B 9106 5004
			–	19.2...72 V	IRDH375B-427	B 9106 5006

¹⁾ Absolute values

Device "Option-W" with increased shock and vibration resistance : Indicated by the letter "W" at the end of the order number.

Suitable system components

Type designation	Type	Page
External kΩ measuring instruments	7204-1421	257
	9604-1421	257
	9620-1421	257
Coupling devices	AGH150W-4	212
	AGH204S-4	213
	AGH520S	214
Transparent front plate cover IP65	144x72	283

Technical data

Insulation coordination acc. to IEC 60664-1

Rated insulation voltage	AC 800 V
Rated impulse voltage/pollution degree	8 kV/3

Voltage ranges

IRDH375...:

Nominal system voltage U_n	AC, 3/(N)AC 0...793 V*
Nominal frequency f_n	50...460 Hz
Nominal system voltage U_n	DC 0...650 V*

IRDH375...-435:

Supply voltage U_S (also see nameplate)	AC 88...264 V*
Frequency range U_S	42...460 Hz
Supply voltage U_S (also see nameplate)	DC 77...286 V*

IRDH375...-427:

Supply voltage U_S (also see nameplate)	DC 19.2...72 V*
---	-----------------

IRDH375...:

Power consumption	≤ 14 VA
-------------------	---------

Response values

Response value R_{an1} (Alarm1)	1 kΩ...10 MΩ
Response value R_{an2} (Alarm2)	1 kΩ...10 MΩ
Relative uncertainty (20 kΩ...1 MΩ) (acc. to IEC 61557-8)	± 15 %
Relative uncertainty (1...20 kΩ)	+2 kΩ/+20 %
Relative uncertainty (1...10 MΩ)	0.2 MΩ/+20 %
Response time t_{an} at $R_f = 0.5 \times R_{an}$ and $C_e = 1 \mu\text{F}$	≤ 5 s
Hysteresis (1...10 kΩ)	+2 kΩ
Hysteresis (10 kΩ...10 MΩ)	25 %

Measuring circuit

Measuring voltage U_m	≤ 40 V
Measuring current I_m (at $R_f = 0 \Omega$)	≤ 220 μA
Internal DC resistance R_i	≥ 180 kΩ
Impedance Z_i at 50 Hz	≥ 180 kΩ
Permissible extraneous DC voltage U_{fg}	≤ DC 1200 V
Permissible system leakage capacitance C_e	≤ 500 μF
Factory setting	150 μF

Displays

Display, illuminated	two-line display
Characteristics (number)	2 x 16
Display range measured value	1 kΩ...10 MΩ
Operating uncertainty (20 kΩ...1 MΩ) (acc. to IEC 61557-8)	±15 %**
Operating uncertainty (1...20 kΩ)	±1 kΩ/±15 %**
Operating uncertainty (1 MΩ...10 kΩ)	±0.1 MΩ/±15 %**

Outputs/Inputs

Test/reset button	internal/external
Cable length test/reset button, external	≤ 10 m
Current output for measuring instrument SKMP (scale centre point = 120 kΩ):	
Current output IRDH375 (load)	400 μA (≤ 12.5 kΩ)
Current output IRDH375B (load)	20 mA (≤ 500 Ω)
Accuracy current output (1 kΩ...1 MΩ) related to the value indicated	±10 %, ±1 kΩ

Serial interface

Interface/protocol IRDH375	RS-485/ASCII
Interface/protocol IRDH375B	RS-485/BMS
Connection	terminals A/B
Cable length	≤ 1200 m
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 (0.5 W)
Device address, BMS bus	1...30 (factory setting = 3)

Switching elements

Switching elements	3 changeover contacts
	K1 (Alarm 1), K2 (Alarm 2), K3 (device error)
Operating principle K1, K2 (Alarm 1/Alarm 2)	N/O or N/C operation
Factory setting (Alarm 1/Alarm 2)	N/O operation
Operating principle K3 (device error)	N/C operation
Electrical endurance, number of cycles	12000
Contact class	IIB acc. to DIN IEC 60255 Part 0-20
Rated contact voltage	AC 250 V/DC 300 V
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
Contact rating at DC 24 V	≥ 2 mA (50 mW)

Environment/EMC

EMC	according to IEC 61326-2-4 Ed. 1.0
Shock resistance IEC 60068-2-27 (device in operation)	15 g/11 ms
Bumping IEC 60068-2-29 (transport)	40 g/6 ms
Vibration resistance IEC 60068-2-6 (device in operation)	1 g/10...150 Hz
Vibration resistance IEC 60068-2-6 (transport)	2 g/10...150 Hz
Ambient temperature (during operation)	-10...+55 °C
Ambient temperature (during storage)	-40...+70 °C
Climatic class acc. to IEC 60721-3-3	3K5

Connection

Connection	screw-type terminals
Connection properties	
rigid/flexible	0.2...4 mm ² /0.2...2.5 mm ²
flexible with ferrules without/with plastic sleeve	0.25...2.5 mm ²
Conductor sizes (AWG)	24...12

Other

Operating mode	continuous operation
Mounting	display-oriented
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	X300, free from halogen
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Software version IRDH375	D183 V1.4
Software version IRDH375B	D184 V1.4
Operating manual	TGH1352
Weight	≤ 510 g

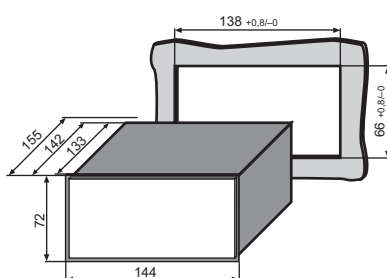
Option "W"

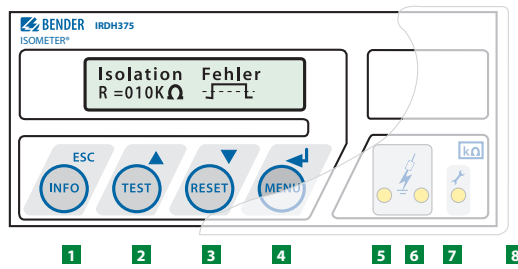
Shock resistance IEC 60068-2-27 (device in operation)	30 g/11 ms
Bumping IEC 60068-2-29 (transport)	40 g/6 ms
Vibration resistance IEC 60068-2-6	1.6 mm/10...25 Hz 4 g/25...150 Hz
Ambient temperature, during operation	-25...+70 °C
Ambient temperature for storage	-40...+85 °C
Screw mounting	2 x M4

The data labelled with an * are absolute values

** = Under EMC test conditions in accordance with IEC 61326-2-4 the specified tolerances can double

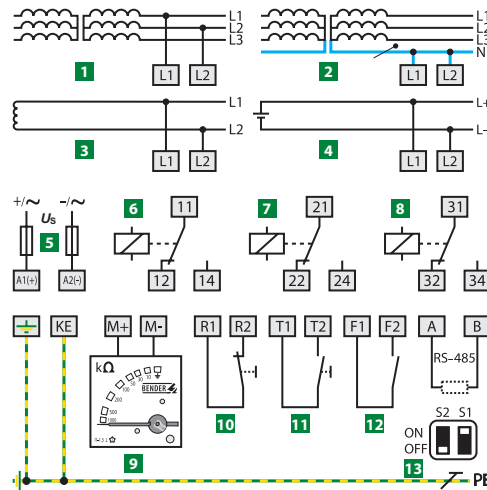
Dimension diagram (dimensions in mm)



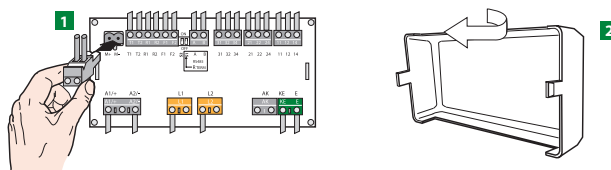


- 1** "INFO" button: to query standard information
ESC button: back to the menu function
- 2** "TEST" button: to call up the self test
Arrow up button: Parameter changes, scroll
- 3** "RESET" button: to delete alarm and fault messages
Arrow down button: Parameter changes, scroll
- 4** "MENU" button: to activate the menu system
Enter button: to confirm parameter changes
- 5** Alarm LED 1, yellow, lights when the value falls below the set response value R_{ALARM1}
- 6** Alarm LED 2, yellow, lights when the value falls below the set response value R_{ALARM2}
- 7** Alarm LED, yellow, lights in case of fault in the connecting leads to the system or to earth, or in case of system fault
- 8** Transparent front plate cover (accessory)

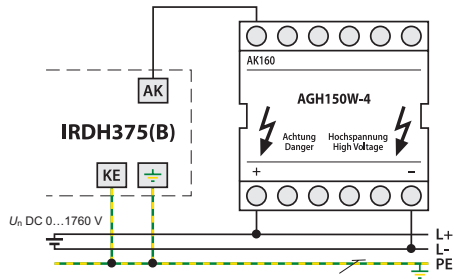
Wiring diagrams



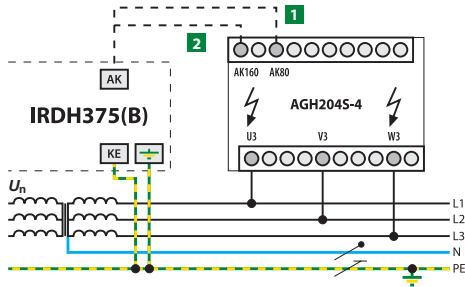
- 1** 3AC system
 - 2** 3NAC system
 - 3** AC system
 - 4** DC system
 - 5** Supply voltage U_S (see ordering information) 6 A fuse recommended. For UL and CSA applications, the use of 5 A fuses is mandatory.
 - 6** Alarm relay R_{ALARM1}
 - 7** Alarm relay R_{ALARM2}
 - 8** Alarm relay system fault
 - 9** External $k\Omega$ indication 0...400 μA or current output 0(4)...20 mA (option).
 - 10** External reset button "R1, R2" (N/C contact or wire jumper). When the terminals are open the fault messages will not be stored, provided that the fault memory has not been activated via the operating menu.
 - 11** External test button "T1/T2" (N/O contact)
 - 12** Standby by means of the function input "F1, F2": with the contact in closed position no insulation measurement takes place
 - 13** DIP switch, S1 "ON"- RS-485 terminated (120 Ω on), S2 – unassigned
- * The terminal pairs 10, 11 and 12 must be wired electrically isolated and may not be connected to earth!



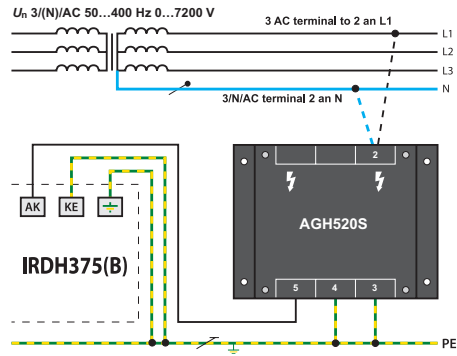
- 1** Rear view IRDH375
- 2** Detachable terminal cover



ISOMETER® IRDH375 with coupling device AGH150W-4



ISOMETER® IRDH375 with coupling device AGH204S-4



ISOMETER® IRDH375 with coupling device AGH520S

1 without rectifier
 $U_n = 3AC 0 \dots 1650 \text{ V}$ (DC max. 1000 V)

2 with rectifier
 $U_n = 3AC 0 \dots 1300 \text{ V}$ (peak voltage downstream of the rectifier or intermediate circuit voltage of max. 1840 V)

1

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 kΩ...1 MΩ
- AMP measurement method
- Automatic adaptation to the system leakage capacitance
- LEDs: Alarm 1/Alarm 2
- Fault memory behaviour, selectable
- Connection monitoring system/earth
- Test and reset button
- Connection external test and reset button
- Two separate alarm relays with one changeover contact each
- N/O or N/C operation, selectable
- Backlit LC display
- Self monitoring with automatic alarm
- Plug-in terminals
- Enclosure for door mounting 96 x 96 mm

Standards

The ISOMETER® of the IR1575 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 (VDE 0110-3), ASTM F1669M-96 (2007), ASTM F1207M-96 (2007)

Further information

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

Ordering information

Design	Supply voltage $U_S^{1)}$		Type	Art. No.
	AC	DC		
Standard	88...264 V 340...460 V	77...286 V	IR1575-435	B 9106 4000
Increased shock and vibration resistance	88...264 V 340...460 V	77...286 V	IR1575W-435	B9106 4000W

¹⁾ Absolute values

Technical data

Insulation coordination acc. to IEC 60664-1

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

Voltage ranges

Nominal system voltage U_n	AC, 3(N)AC 0...480 V, DC 0...480 V
Nominal frequency f_n	DC, 30...420 Hz
Supply voltage U_s	see ordering information
Power consumption	≤ 5 VA

Response values

Response value R_{an1} (Alarm 1)	2 k Ω ...1 M Ω
Response value R_{an2} (Alarm 2)	2 k Ω ...1 M Ω
Relative uncertainty	0...+20 %/min. +2 k Ω
Response time t_{an} at $R_f = 0.5 \times R_{an}$ and $C_e = 1 \mu\text{F}$	≤ 5 s
Hysteresis	25%

Measuring circuit

Measuring voltage U_m	± 20 V
Measuring current I_m (at $R_f = 0 \Omega$)	$\leq 170 \mu\text{A}$
Internal DC resistance R_i	$\geq 119 \text{ k}\Omega$
Impedance Z_i at 50 Hz	$\geq 14 \text{ k}\Omega$
Permissible extraneous DC voltage U_{fg}	$\leq \text{DC } 680$ V
Permissible system leakage capacitance	$\leq 60 \mu\text{F}$

Displays

Display	backlit LC display
Characters (number of characters, height)	2 x 16 (4,5 mm)
Display range, measured value	1 k Ω ...5 M Ω
Operating uncertainty (1...10 k Ω)	$\pm 1 \text{ k}\Omega$
Operating uncertainty (10 k Ω ...5 M Ω)	$\pm 10 \%$

Outputs

Test and reset button	internal/external
-----------------------	-------------------

Switching elements

Number of switching elements	2 x 1 changeover contact
Operating principle	N/C operation/N/O operation
Factory setting	N/O operation
Contact class	IIB (IEC 60255-0-20)
Rated contact voltage	AC 250 V/DC 300 V
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
Contact rating at DC 24 V	≥ 2 mA (50 mW)

Environment

Shock resistance IEC 60068-2-27 (device in operation)	15 g/11 ms
Bumping IEC 60068-2-29 (transport)	40 g/6 ms
Vibration resistance IEC 60068-2-6 (device in operation)	1 g/10...150 Hz
Vibration resistance IEC 60068-2-6 (transport)	2 g/10...150 Hz
Ambient temperature (during operation)	-10...+55 °C
Ambient temperature (during storage)	-40...+70 °C
Climatic class acc. to DIN IEC 60721-3-3	3K5

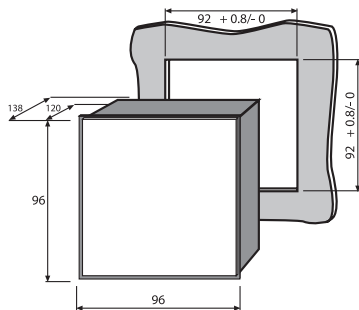
Connection

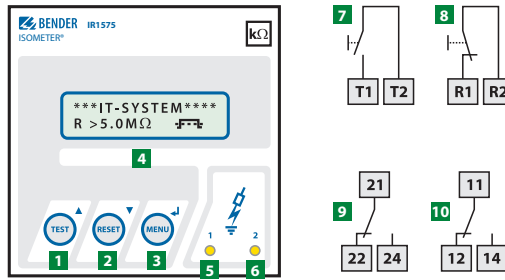
Connection	plug-in terminals
Connection properties	
rigid/flexible	0.2.../4/0.2...2.5 mm ²
flexible with ferrules without/with plastic sleeve	0.25...2.5 mm ²
Conductor sizes (AWG)	24...12
Tightening torque	0.5...0.6 Nm (4.3...5.3 lb-in)

Other

Operating mode	continuous operation
Mounting position	display-oriented
Degree of protection, internal components (DIN EN 60529)	IP30
Degree of protection, terminals (DIN EN 60529)	IP20
Mounting	panel mounting
Flammability class	UL94 V-2
Operating manual	TGH1370
Weight	≤ 400 g

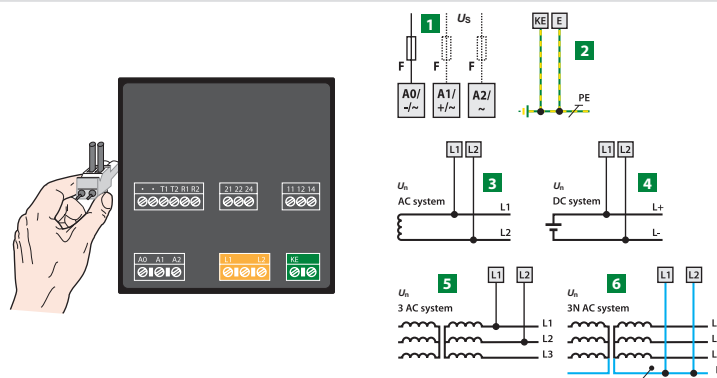
Dimension diagram (dimensions in mm)





- 1** "TEST" button: to call up the self test
Arrow up button: Parameter changes, scroll
- 2** "RESET" button: to delete alarm and fault messages
Arrow down button: Parameter changes, scroll
- 3** "MENU" button: to call up the menu system
Enter button: to confirm parameter changes
- 4** LC display 2 x 16 characters
- 5** Alarm LED "1" lights: insulation fault, first warning level reached
- 6** Alarm LED "2" lights: insulation fault, second warning level reached.
- 7** External test button "T1/T2" (N/O contact)
- 8** External reset button "R1/R2" (N/C contact or wire jumper). When the terminals are open, the fault message will not be stored.
- 9** Alarm relay. Alarm 2
- 10** Alarm relay. Alarm 1

Wiring diagram – System connection



- 1** Supply voltage U_S (see nameplate), 6 A fuse protection recommended:
A0 - A1 = AC 88...264 V, DC 77...286 V
A0 - A2 = AC 340...460 V
- 2** Separate connection of E and KE to PE
- 3** Connection of the AC system to be monitored:
connect terminals L1, L2 to conductor L1, L2.
- 4** Connection to the DC systems to be monitored:
Connect terminal L1 to conductor L+, terminal L2 to conductor L-
- 5 6** Connection to the 3AC system being monitored:
Connect the terminals L1, L2 to neutral conductor N or terminals L1, L2 to conductor L1, L2.

ISOMETER® IR427 with alarm indicator and test combination MK7

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



Device features

ISOMETER® IR427

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

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® of the IR427 series complies with the requirements of the device standards: IEC 60364-7-710, IEC 61557-8 and DIN VDE 0100-710.

Further information

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

Ordering information

Supply voltage U_S		Nominal system voltage $U_N^{1)}$	Type	Art. No.
AC	DC	AC		
70...264 V, 42...460 Hz	–	70...264 V, 42...460 Hz	IR427-2	B 7207 5300
–	18...28 V	–	MK7 Remote alarm indicator and test combination	B 9510 0201

Device version with screw terminals on request.

¹⁾ Absolute values

Accessories

Type designation	Art. No.
Mounting clip for screw mounting (1 piece per device)	B 9806 0008
MK-cavity-wall-box-60mm	B 95100203

Suitable system components

Type designation	Type	Page
Measuring current transformers	STW2	–
Temperature sensor (PTC)	ES0107	–
Mounting frame	XM420	282

Technical data IR427

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

Rated insulation voltage	250 V
Rated impulse voltage/pollution degree	2.5 kV/3
Protective separation (reinforced insulation) between (L1, L2, E, KE, 1, 2, 3, 4 Z, Z/k, I) - (11, 12, 14)	
Voltage test acc. to IEC 61010-1	2.21 kV

Supply voltage

Supply voltage U_s	= U_n
Power consumption	≤ 4 VA

IT system being monitored

Nominal system voltage U_n	AC 70...264 V
Nominal frequency f_n	47...63 Hz

Insulation monitoring

Response value R_{an}	50...500 kΩ (50 kΩ)*
Relative uncertainty	±10 %
Hysteresis	25 %
Response time t_{an} at $R_f = 0.5 \times R_{an}$ and $C_e = 0.5 \mu F$	≤ 5 s
Permissible system leakage capacitance C_e	≤ 5 μF

Measuring circuit

Measuring voltage U_m	±12 V
Measuring current I_m (at $R_f = 0 \Omega$)	≤ 50 μA
Internal DC resistance R_i	≥ 240 kΩ
Impedance Z_1 at 50 Hz	≥ 200 kΩ
Permissible extraneous DC voltage U_{fz}	≤ DC 300 V

Load current monitoring

Response value, adjustable	5...50 A (7 A)*
Relative uncertainty	± 5 %
Hysteresis	4 %
Setting values load current measurement:	
Transformer	3150 VA 4000 VA 5000 VA 6300 VA 8000 VA 10000 VA
$I_{alarm} 1\sim$	14 A 18 A 22 A 28 A 35 A 45 A

Temperature monitoring:

Response value (fixed value)	4 kΩ
Release value (fixed value)	1.6 kΩ
PTC resistors acc. to DIN 44081	max. 6 in series

Displays, memory

LC display	multifunctional, not illuminated
Measured value insulation resistance	10 kΩ...1 MΩ
Operating uncertainty	± 10 %, ± 2 kΩ
Measured value load current (as % of the set response value)	10 %...199 %
Operating uncertainty	± 5 %, ± 0.2 A
Password	on, off/0...999 (off, 0)*

Interface for MK7

Cable length, twisted in pairs, shielded	200 m
Cable (twisted in pairs, one end of shield connected to PE)	recommended: J-Y(St)Y min. 2 x 0.8

Power supply (terminals 1 and 2):

U_{off}	DC 24 V
I_{max} (max. 4 MK7)	80 mA

Communication (terminal 3 and 4):

Interface/protocol	RS-485/proprietary, no BMS
Terminating resistor	120 (0.25 W), internal, switchable

Cable lengths for the connection of the measuring current transformer STW2 and the temperature sensor

single wire > 0.5 mm ²	≤ 1 m
single wire, twisted > 0.5 mm ²	≤ 10 m
twisted in pairs, twisted > 0.5 mm ²	≤ 40 m
Cable (shield on one side connected to PE)	recommended: J-Y(St)Y min. 2 x 0.6

Switching elements

Number	1 changeover contact				
Operating principle	N/C operation or N/O operation (N/C operation)*				
Electrical endurance, number of cycles	10000				
Contact data acc. to IEC 60947-5-1					
Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-12
Rated operational voltage	230 V	230 V	24 V	110 V	220 V
Rated operational current	5 A	3 A	1 A	0.2 A	0.1 A
Minimum contact rating	1 mA at AC/DC 10 V				

Environment/EMC

EMC	IEC 61326-2-4				
Operating temperature	-25...+55 °C				
Classification of climatic conditions acc. to IEC 60721:					
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)				
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)				
Long-term storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)				
Classification of mechanical conditions acc. to IEC 60721:					
Stationary use (IEC 60721-3-3)	3M4				
Transport (IEC 60721-3-2)	2M2				
Storage (IEC 60721-3-1)	1M3				

Connection

Connection type	push-wire terminals				
Connection properties					
rigid/flexible	0.2...2.5 mm ² (AWG 24...14)				
Flexible with ferrule	0.2...1.5 mm ² (AWG 24...16)				
Stripping length	10 mm				
Opening force	50 N				
Test opening, diameter	2.1 mm				

Other

Operating mode	continuous operation				
Position of normal use	any				
Degree of protection, internal components (DIN EN 60529)	IP30				
Degree of protection, terminals (DIN EN 60529)	IP20				
Enclosure material	polycarbonate				
Flammability class	UL94V-0				
Screw mounting	2 x M4				
DIN rail mounting acc. to	IEC 60715				
Software version	D288 V1.0x				
Instruction leaflet	TBP201007				
Weight	≤ 150 g				

() * = Factory setting

Technical data MK7

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

Rated insulation voltage	50 V
Rated impulse voltage/pollution degree	500 V/3

Supply voltage

Supply voltage U_s	DC 18...28 V
Power consumption	0.5 VA

Environment/EMC

EMC	IEC 61326				
Operating temperature	-10...+55 °C				
Classification of climatic conditions acc. to IEC 60721:					
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)				
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)				
Long-term storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)				
Classification of mechanical conditions acc. to IEC 60721:					
Stationary use (IEC 60721-3-3)	3M4				
Transport (IEC 60721-3-2)	2M2				
Storage (IEC 60721-3-1)	1M3				

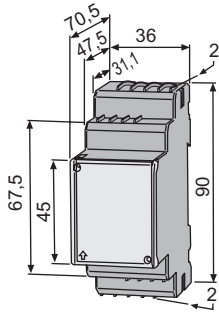
Connection

Connection	screw-type terminals				
Connection properties					
rigid/flexible	0.2...2.5 mm ² (AWG 24...14)				
Flexible with ferrule	0.2...1.5 mm ² (AWG 24...16)				
Stripping length	8 mm				

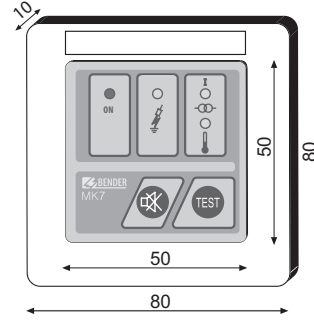
Other

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 g				

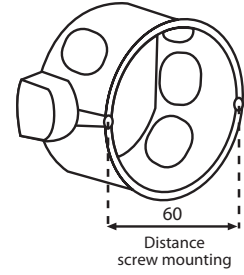
IR427



MK7



Flush-mounting box Ø 66
 Drilling hole Ø 70



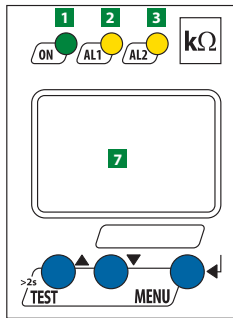
Alarm messages LEDs

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

¹⁾ Detailed alarm information on LCD

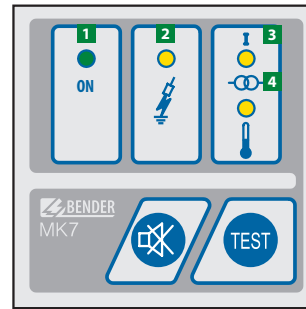
Displays and controls

IR427



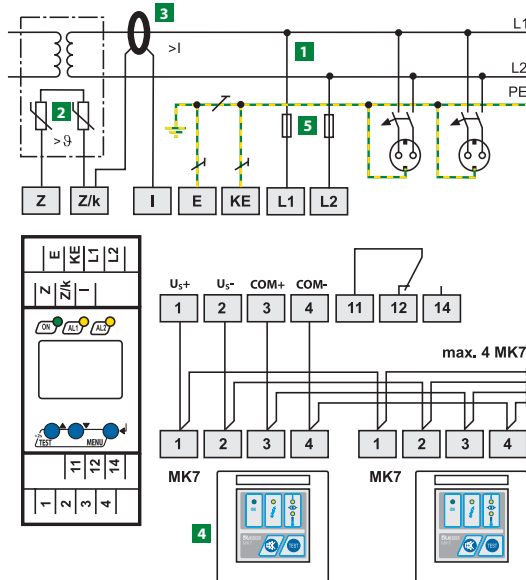
- 1 Power On LED "ON"
- 2 3 Alarm LEDs "AL1", "AL2"
- 4 Test button "TEST" (>2 s): To call up the self test.
 Arrow up button: parameter change to move up in the menu
- 5 Arrow down button: parameter change to move down in the menu
- 6 "MENU" button (> 2 s): to call up the menu system.
 Enter button: to confirm parameter changes
- 7 LC display

MK7



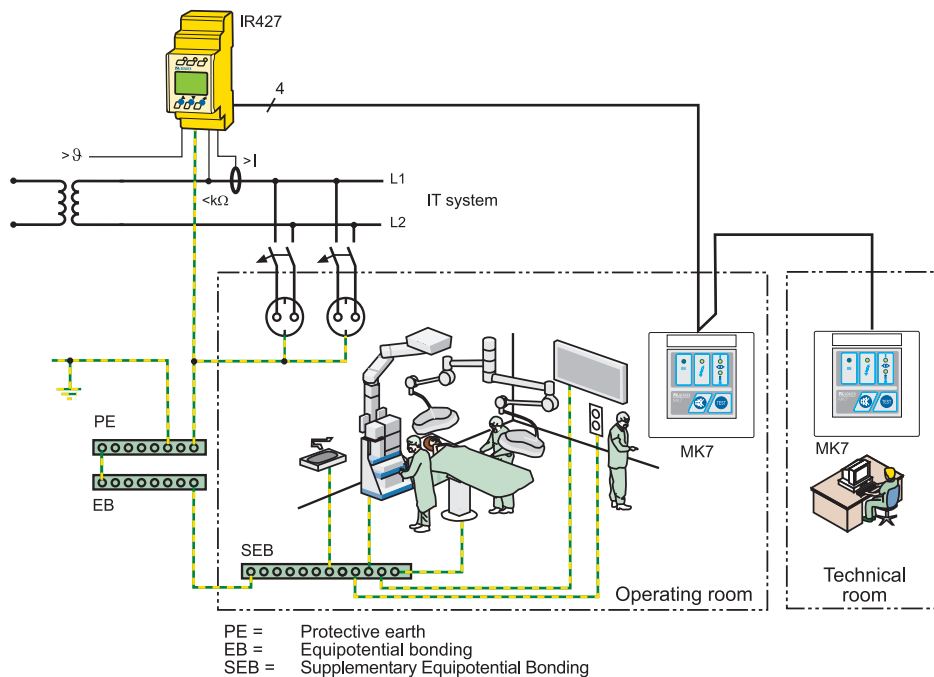
- 1 Power On LED "ON"
- 2 LED to signal insulation faults
- 3 LED to signal overload
- 4 LED to signal overtemperature
- 5 Mute button
- 6 Test button "TEST"

Wiring diagram



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

Example of application



ISOMETER® 107TD47

Insulation monitoring device with load and temperature monitoring for medical locations



Device features

- Monitoring device for medical IT systems AC, 3(N)AC
- Adjustable response value 50...500 kΩ
- Load and temperature monitoring
- Alarm LED
- Monitoring of the connection to the system, earth, measuring current transformer, temperature sensors
- Test button
- External test button can be connected
- BMS-bus interface
- Common alarm relay with one potential-free changeover contact
- Backlit LC display

Typical applications

- IT systems for the power supply in medical locations, hospitals, medical practices and outpatient surgical centres
- IT systems with restricted power source with additional load current monitoring

Standards

The 107TD47 series ISOMETER® complies with the requirements of the device standards: DIN EN 61557-8 (VDE 0413-8), EN 61557-8, IEC 61557-8, DIN VDE 0100-710 (VDE 0100-710), IEC 60364-7-710, ASTM F 1207 1996-00

Approvals



Further information

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

Ordering information

Nominal system voltage U_n (V)	Supply voltage U_s (V)	Type	Art. No.
AC	AC		
230 V, 50...60 Hz	230 V, 50...60 Hz	107TD47	B 9201 6003
127 V, 50...60 Hz	127 V, 50...60 Hz	107TD47-133	B 9201 6004

Suitable system components

Type designation	Type	Page
Measuring current transformers	STW2	–
Power supply unit	AN450	255
	AN450-133	255
Measuring adapter	LSD470	–

Technical data

Insulation coordination acc. to IEC 60664-1

Rated insulation voltage	AC 250 V
Rated impulse withstand voltage/pollution degree	4 kV/3

Voltage ranges

Nominal system voltage U_N /Nominal frequency f_N	see ordering information
Supply voltage U_S	see ordering information
Operating range of U_S	0.85...1.15 x U_S
Frequency range U_S	40...460 Hz
Power consumption	≤ 3 VA

Measuring circuit insulation monitoring

Response value R_{an}	50...500 k Ω
Relative uncertainty	0...+ 10 %
Response time t_{an} at $R_F = 0.5 \times R_{an}$ and $C_e = 1 \mu F$	3 s
Hysteresis	25 %
Measuring voltage U_m	≤ 12 V
Measuring current I_m max. (at $R_F = 0 \Omega$)	≤ 50 μA
Internal DC resistance R_i	≥ 240 k Ω
Impedance Z_i at 50 Hz	≥ 200 k Ω
Permissible extraneous DC voltage U_{fg}	≤ DC 375 V
Permissible system leakage capacitance	≤ 5 μF

Measuring circuit load current monitoring

Response value	5...50 A
Hysteresis	4 %
Temperature influence	< 0.15 %/°C

Measuring circuit temperature monitoring

Response value	4 k Ω
Release value	1.6 k Ω
PTC resistors acc. to DIN 44081	max. 6 in series

Displays

Display (illuminated)/characters(number, height)	LC display/2 x 16 (3.5 mm)
Display range, measured value	10...5000 k Ω
Operating uncertainty in accordance with IEC 61557-8	± 10 %

Inputs

Test button	N/O contact
Message "Insulation fault operating theatre light"	N/C contact
Cable length inputs max.	10 m

Outputs

Test button	internal/external
-------------	-------------------

Interfaces

Interface/protocol	RS-485/BMS
Max. cable length 1200 m	
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)

Switching elements

Number of switching elements	1 changeover contact
Operating principle	N/O operation/N/C operation
Factory setting	N/O operation
Electrical endurance, number of cycles	12000
Contact class	IB
Rated contact voltage	AC 250 V/DC 300 V
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

Shock resistance IEC 60068-2-27 (during operation)	15 g/11 ms
Bumping IEC 60068-2-29 (transport)	40 g/6 ms
Vibration resistance IEC 60068-2-6 (during operation)	1 g/10...150 Hz
Vibration resistance IEC 60068-2-6 (transport)	2 g/10...150 Hz
Ambient temperature (during operation/during storage)	-10...+55 °C/-40...+70 °C
Climatic class acc. to DIN IEC 60721-3-3	3K5

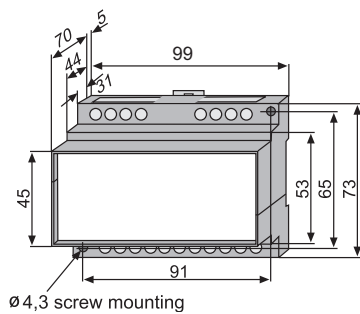
Connection

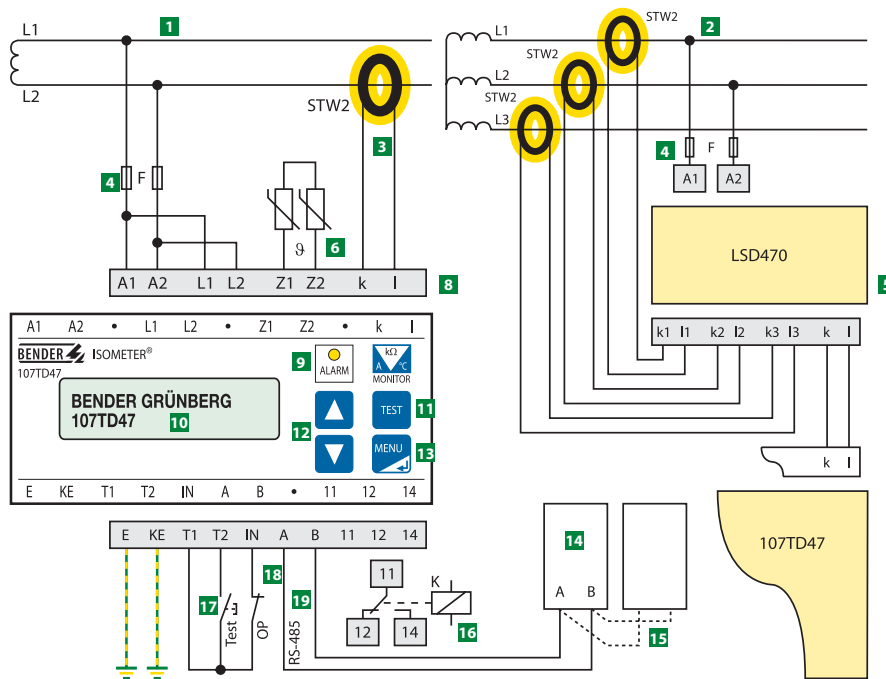
Connection type	modular terminals
Connection properties rigid/flexible	0.2...4 mm ² /0.2...2.5 mm ²

Other

Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (DIN EN 60529)	IP30
Degree of protection, terminals (DIN EN 60529)	IP30
Screw mounting	2 x M4
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Operating manual	TBP201002
Weight	≤ 400 g

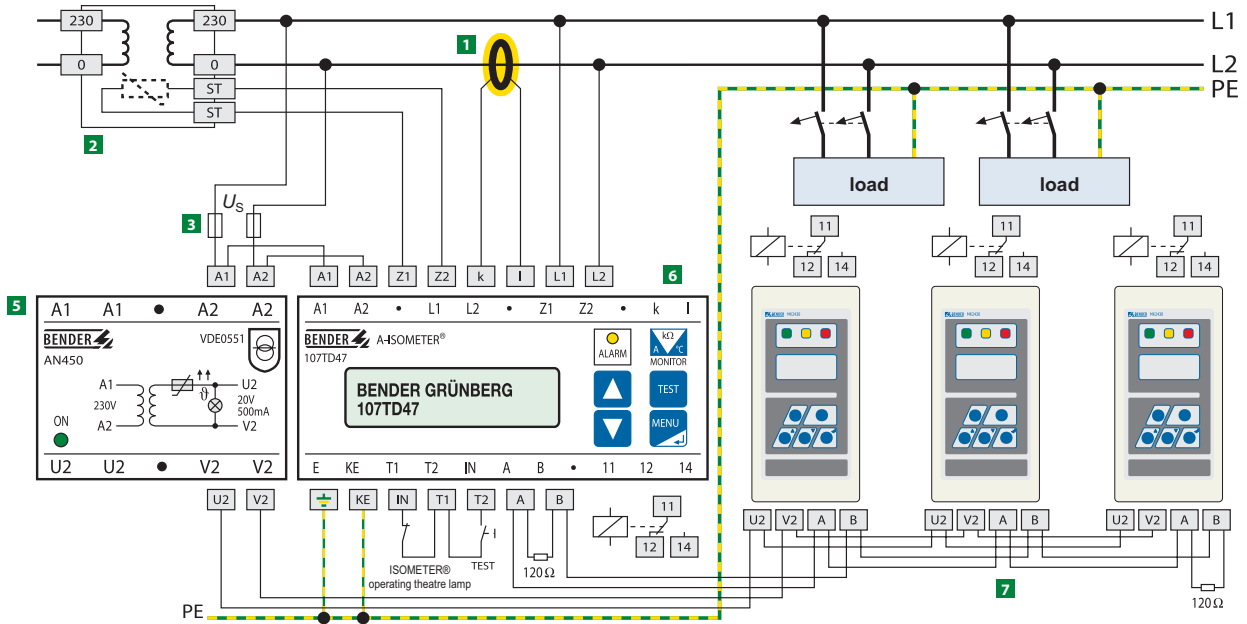
Dimension diagram (dimensions in mm)



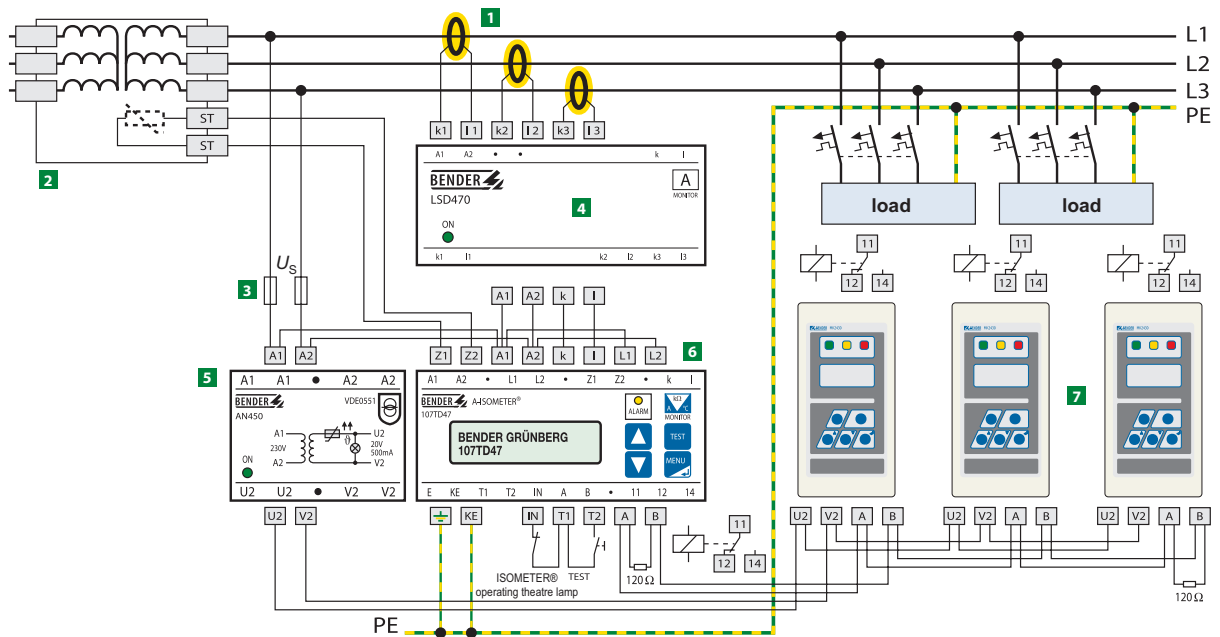


- 1 AC IT system
- 2 3AC IT system
- 3 STW2 Measuring current transformer for load current monitoring
- 4 Short-circuit protection supply voltage, 6 A fuse recommended
- 5 LSD470 Three-phase adapter for load current monitoring 3AC systems
- 7 PTC resistors (or N/C contacts) in the transformer winding. Will operate when the temperature in the transformer core reaches an excessive level. Max. 6 PTC thermistors should be connected in series.
- 8 The measuring connections L1, L2, k, I, Z1, Z2, E, KE are monitored for interruption resp. short-circuit (k, I). A1 and A2 are intended for the power supply of the 107TD47 resp. LSD470
- 9 Alarm LED "ALARM"
- 10 Display
- 11 "TEST" button in display mode: activates the test function (self test). In the menu mode: causes a return to the display mode from any position. If activated during a parameter change, the last change will not be stored.
- 12 In the menu mode: for navigation within the menus and for setting parameters. Adjustment: upwards/in ascending resp. downwards in descending order. No function in the display mode.
- 13 "MENU" button: Changes from the display mode to the menu mode. In the menu mode: this button serves as an Enter button.
- 14 Alarm indicator and test combination MK2418-12
- 15 TM operator panels
- 16 Alarm relay without fault memory to signal insulation faults, over-current, overtemperature and device errors.
- 17 Optional external test button for testing the insulation monitoring function (42 kΩ test resistance) and the measuring circuits for load current and temperature.
- 18 Input "IN" for displaying the message "Insulation fault operating theatre light", initiated by the N/C contact of the respective insulation monitoring device
- 19 BMS-bus interface "RS-485", e.g. for the connection of alarm indicator and test combinations or panels.

AC system



3(N)AC system



- 1 Measuring current transformers for load current monitoring
- 2 Temperature sensor, isolating transformer ES0107
- 3 6 A fuse (recommended)
- 4 LSD470 measuring adapter

- 5 Power supply unit AN450 for max. 3 MK2430
- 6 ISOMETER® 107TD47
- 7 Alarm indicator and test combination MK2430

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

1



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

Device features

- Insulation monitoring for unearthed systems AC, AC/DC 0...793 V, DC 0...1100 V
- Two separately adjustable response values 0.2...100 kΩ
- Various **AMP^{plus}** measurement methods selectable
- Automatic adaptation to the system leakage capacitance
- Info button to display device settings and the system leakage capacitance
- Self monitoring with automatic alarm
- Automatic self test, selectable
- Connection for external kΩ indication
- Test and reset button
- External test/reset button can be connected
- Two separate alarm relays with two potential-free changeover contacts
- N/O or N/C operation, selectable
- Backlit LC display
- RS-485 interface
- Presetting for PV systems via menu

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® of the isoPV series complies with the requirements of the device standards: DIN EN 61557-8 (VDE 0413-8), IEC 61557-8, IEC 61326-2-4 Ed. 1.0, 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.com.

Ordering information

Supply voltage U_s		Set comprising		Art. No.
DC	AC	Type	Art. No.	
19.2...72V	–	isoPV-327	B 9106 5130W	B 9106 5132W
		AGH-PV	B 9803 9020W	
77...286V	88...264V	isoPV-335	B 9106 5131W	B 9106 5133W
		AGH-PV	B 9803 9020W	

Devices are available as a set.

Accessories

Type designation	Art. No.
Screw mounting	B 990 056

Suitable system components

Type designation	Type	Page
External kΩ measuring instruments	9620-1421	257

Insulation coordination acc. to IEC 60664-1

Rated insulation voltage	AC 800 V
Rated impulse withstand voltage/pollution degree	8 kV/3

Voltage ranges

Nominal system voltage U_n	via AGH-PV
------------------------------	------------

isoPV-335:

Supply voltage U_S (also see nameplate)	AC 88...264 V**
Frequency range U_S	42...460 Hz
Supply voltage U_S (also see nameplate)	DC 77...286 V**

isoPV-327:

Supply voltage U_S (also see nameplate)	DC 19.2...72 V**
---	------------------

isoPV...:

Power consumption	≤ 8 VA
-------------------	--------

Response values

Response value R_{an1}	0.2...100 kΩ
Factory setting R_{an1} (Alarm1)	4 kΩ
Response value R_{an2}	0.2...100 kΩ
Factory setting R_{an2} (Alarm2)	1 kΩ
Relative uncertainty (7...100 kΩ) (acc. to IEC 61557-8)	±15 %
Relative uncertainty (0.2...7 kΩ)	±1 kΩ
Response time t_{an}	see table THG1454 from page 39 onwards
Hysteresis	25 %, +1 kΩ

Measuring circuit

Measuring voltage U_m (peak value)	± 50 V
Measuring current I_m (at $R_f = 0 \Omega$)	≤ 1.5 mA
Internal DC resistance R_i	≥ 35 kΩ
Impedance Z_i at 50 Hz	≥ 35 kΩ
Permissible extraneous DC voltage U_{fg}	≤ DC 1100 V
Permissible system leakage capacitance C_e	≤ 2000 μF (2000 μF)*

Displays

Display, illuminated	two-line display
Characters (number/height)	2 x 16/4/mm
Display range measured value	0.2 kΩ...1 MΩ
Operating uncertainty	±15%, ±1 kΩ

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 (1...100 kΩ)	±15 %, ±1 kΩ

Serial interface

Interface/protocol	RS-485/BMS
Connection	terminals A/B
Cable length	≤ 1200 m
Cable (twisted in pairs, shield connected to PE)	2-core, ≥ 0.6 mm ² , recommended: J-Y(St)Y min. 2 x 0.8
Terminating resistor	120 Ω (0.5 W)
Device address, BMS bus	1...30 (3)*

Switching elements

Switching elements	2 changeover contacts: K1 (Alarm 1), K2 (Alarm 2, device error)				
Operating mode K1, K2 (Alarm 1/Alarm 2)	N/C operation/N/O operation (N/O operation)*				
Contact data acc. to IEC 60947-5-1:					
Utilisation category	AC 13	AC 14	DC-12	DC-12	DC-12
Rated operational voltage	230 V	230 V	24 V	110 V	220 V
Rated operational current	5 A	3 A	1 A	0.2 A	0.1 A
Minimum contact rating	1 mA at AC/DC ≥ 10 V				

Environment/EMC

EMC	
not suitable for household and small companies	IEC 61326-2-4: 1.0
Operating temperature	-25...+70 °C
Classification of climatic conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3K5 (with condensation and formation of ice)
Transport (IEC 60721-3-2)	2K3 (with condensation and formation of ice)
Long-term storage (IEC 60721-3-1)	1K4 (with condensation and formation of ice)
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	
for screw mounting with accessories 990 056	3M7
for DIN rail mounting	3M4
Transport (IEC 60721-3-2)	2M2
Long term storage (IEC 60721-3-1)	1M3

Connection

Connection	screw-type terminals
Connection properties	
rigid/flexible	0.2...4 mm ² /0.2...2.5 mm ²
flexible with ferrules without/with plastic sleeve	0.25...2.5 mm ²
Tightening torque	0.5 Nm
Conductor sizes (AWG)	24...12
Cable length between iso-PV and AGH-PV	≤ 0.5 m

Other

Operating mode	continuous operation
Mounting	display-oriented
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	X112, free from halogen
Screw mounting	2 x M4 with mounting clip
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Software version	D351 V2.0
Weight	≤ 510 g

() * = factory setting

Data labelled with ** are absolute values

Technical data coupling device AGH-PV

Voltage ranges

Nominal system voltage U_n	AC, 3(N)AC 0...793 V, DC 0...1100 V
Nominal frequency f_n	DC, 10...460 Hz
Max. AC voltage U_{\sim} in the frequency range $f_n = 0.1...10$ Hz	$U_{\sim\max} = 110 \text{ V/Hz} * f_n$

Environment/EMC

EMC	IEC 61326-2-4 Ed. 1.0
Operating temperature	-25...+70 °C
Classification of climatic conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3K5 (with condensation and formation of ice)
Transport (IEC 60721-3-2)	2K3 (with condensation and formation of ice)
Long-term storage (IEC 60721-3-1)	1K4 (with condensation and formation of ice)
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3M7
Transport (IEC 60721-3-2)	2M2
Long-time storage (IEC 60721-3-1)	1M3

Connection

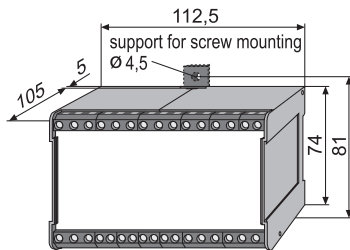
Connection	screw-type terminals
Connection properties	
rigid/flexible	0.2...4 mm ² /0.2...2.5 mm ²
flexible with ferrules without/with plastic sleeve	0.25...2.5 mm ²
Tightening torque	0.5 Nm
Conductor sizes (AWG)	24...12
Cable length between iso-PV and AGH-PV	≤ 0.5 m

Other

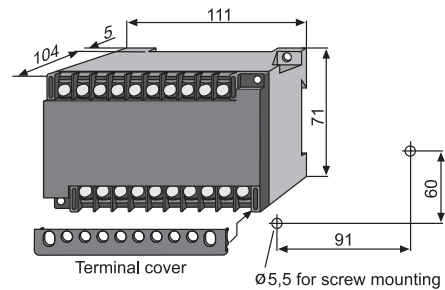
Operating mode	continuous operation
Mounting	cooling slots must be ventilated vertically!
Distance to adjacent devices	≥ 30 mm
Degree of protection, internal components (DIN EN 60529)	IP30
Degree of protection, terminals (DIN EN 60529)	IP20
Type of enclosure	X200
Screw mounting	2 x M4
DIN rail mounting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

Dimension diagrams (dimensions in mm)

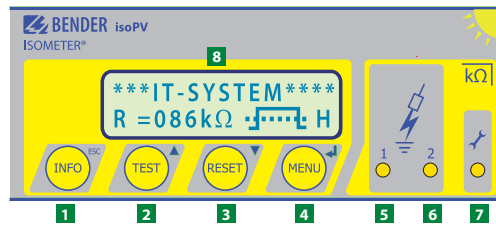
isoPV



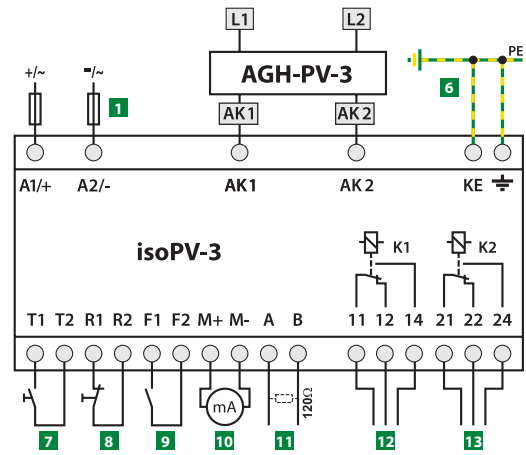
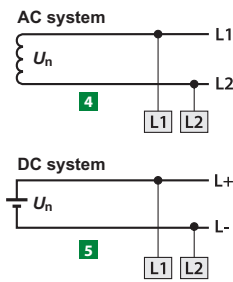
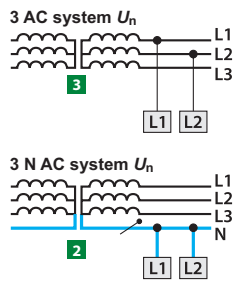
AGH-PV



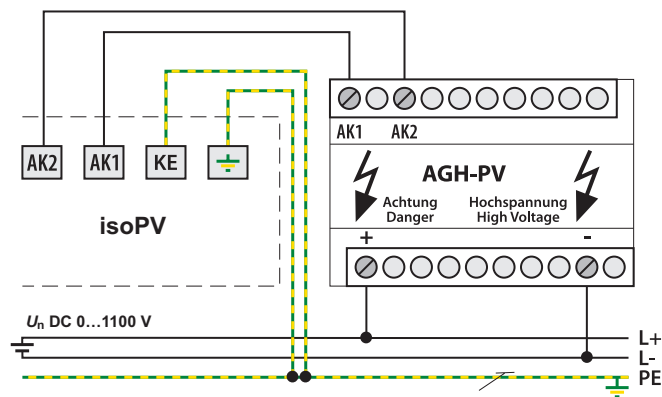
Operating elements isoPV



- | | |
|--|--|
| <p>1 "INFO" button: to query standard information
"ESC" button: back (menu function), to confirm parameter change</p> <p>2 "TEST" button: to call up the self test.
Arrow up button: parameter change, to move up in the menu</p> <p>3 "RESET" button: to delete stored insulation fault alarms
Arrow down button: parameter change, to move down in the menu</p> | <p>4 "MENU" button: to call up the menu system.
Enter button: to confirm parameter changes</p> <p>5 Alarm LED "1" lights: insulation fault, first warning level reached</p> <p>6 Alarm LED "2" lights: insulation fault, second warning level reached</p> <p>7 Device error LED lights: isoPV faulty</p> <p>8 Two-line display for standard and menu mode</p> |
|--|--|

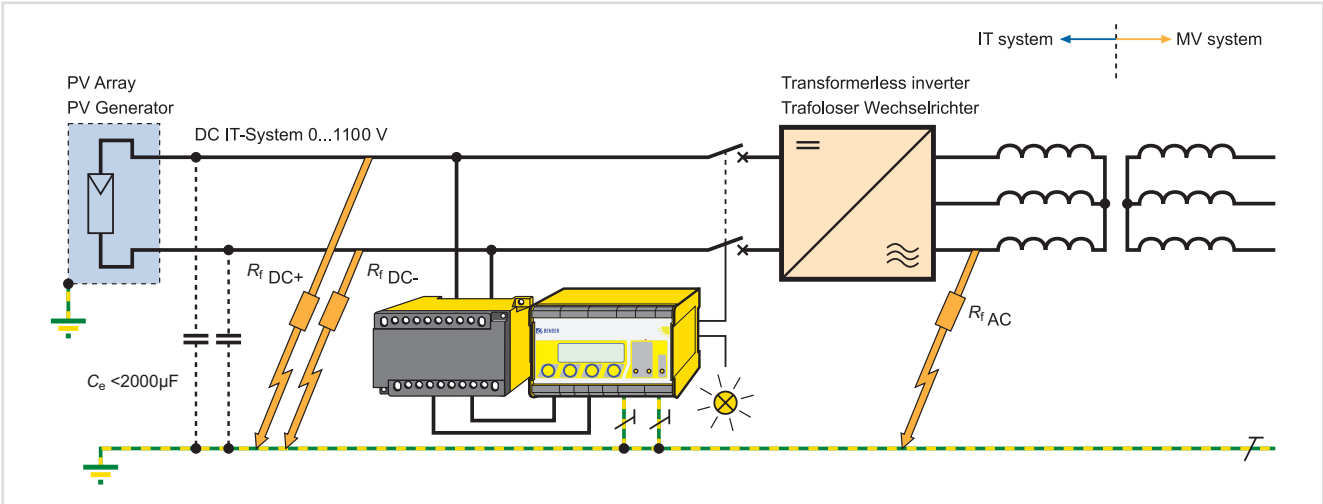


- 1** Supply voltage U_s (see nameplate) via 6 A fuse; For UL and CSA applications, it is mandatory to use 5 A fuses
- 2 3** Connection to the 3 AC system to be monitored: Connect the terminals L1, L2 to neutral conductor N or terminals L1, L2 to conductor L1, L2.
- 4** Connection to the AC system to be monitored: connect terminals L1, L2 to conductor L1, L2.
- 5** Connection to the DC system to be monitored: Connect terminal L1 to conductor L+, terminal L2 to conductor L-
- 6** Separate connection of \perp and KE to PE
- 7** External test button "T1, T2" (N/O contact)
- 8** External reset button (N/C contact or wire jumper), when the terminals are open, the fault message will not be stored.
- 9** 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
- 10** Current output, electrically isolated: 0...20 mA or 4...20 mA
- 11** Serial interface RS-485 (termination by means of a 120 Ω resistor)
- 12** Alarm relay "K1": available changeover contacts
- 13** Alarm relay "K2" (device error relay); available changeover contacts

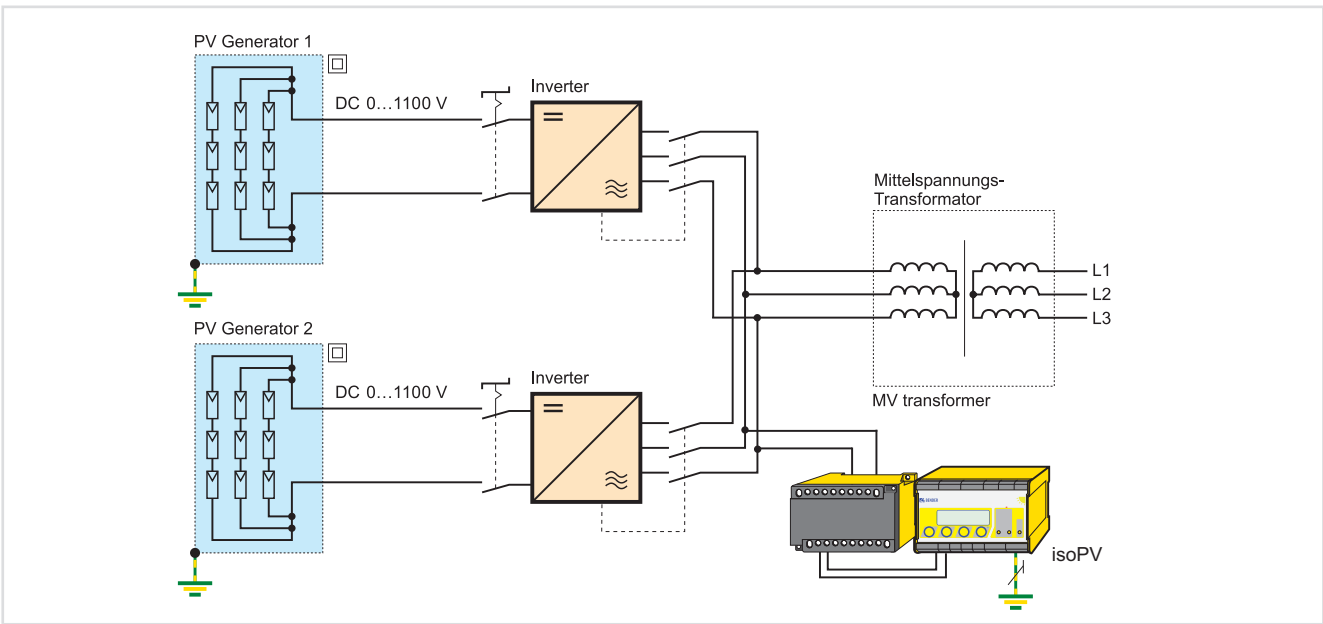
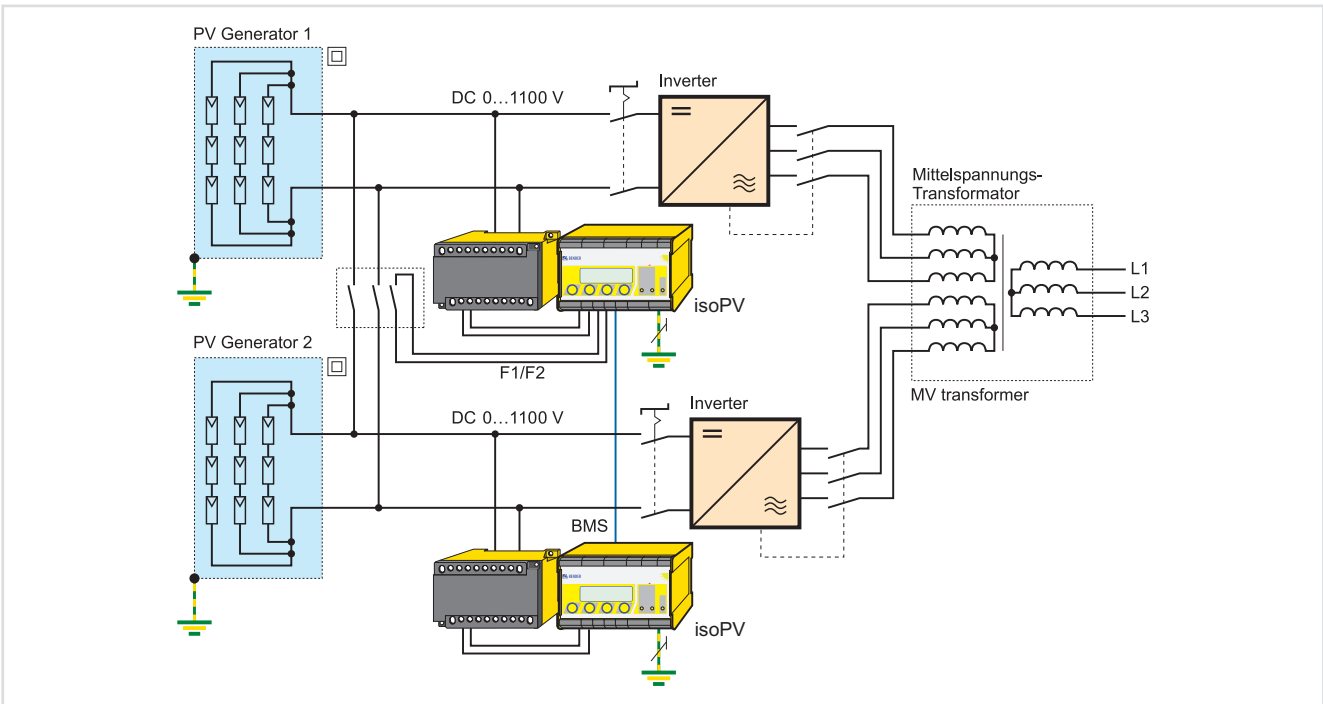


isoPV with coupling device AGH-PV

1



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



Several PV generators unearthed (IT system) with nominal voltage \leq DC 1100 V as a coupled system and ISOMETER[®] iso-PV with coupling device AGH-PV

ISOMETER® isoPV485

Insulation monitoring device for unearthed AC/DC IT systems in small and medium-sized photovoltaic systems



Device features

- Insulation monitoring for IT systems AC 0...800 V, 42...460 Hz, DC 0...1000 V
- System leakage capacitance $\leq 100 \mu\text{F}$, corresponds to a power generation capacity of up to approx. 100 kW
- Combined alarm LED
 - lights up when operating correctly
 - flashes in the event of an alarm message or system fault
- Potential-free voltage output $2...10 \text{ V} = 2 \text{ k}\Omega...1 \text{ M}\Omega$ for further processing in SCADA systems
- Continuous self monitoring
- External test and reset button
- 9-module enclosure (162 mm)

Typical applications

- Unearthed AC/DC IT systems
- Photovoltaic systems
- Solar power stations

Standards

The ISOMETER® of the isoPV485 series complies with the requirements of the device standards: DIN EN 61557-8 (VDE 0413-8), IEC 61557-8, IEC 61326-2-4 Ed. 1.0, 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.com.

Ordering information

Nominal system voltage ¹⁾ U_n		Supply voltage ¹⁾ U_S	Type	Art. No.
AC	DC	DC		
0...800 V	0...1000 V	12...72 V	isoPV485-421	B 9106 8144

¹⁾ Absolute values of the voltage ranges.

Technical data

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

Rated insulation voltage	1000 V
Rated impulse voltage/pollution degree	8 kV/3
Protective separation (reinforced insulation) between (A1, A2) - (L1, L2, E, KE, T/R) - (11, 12, 14) - (M+, M-)	

Voltage ranges

Nominal system voltage U_n	DC 0...1000 V, AC 0...800 V
Nominal frequency f_n	42...460 Hz
Supply voltage U_s	DC 12...72 V
Power consumption	≤ 3.5 VA

Response values

Response value R_{an} (ALARM)	10 k Ω
Relative uncertainty	± 15 %
Response time t_{an} at $R_F = 0.5 \times R_{an}$ and $C_e = 1 \mu F$	≤ 90 s
Hysteresis	50%

Measuring circuit

Measuring voltage U_m	± 30 V
Measuring current I_m (at $R_F = 0 \Omega$)	≤ 150 μA
Internal DC resistance R_i	≥ 200 k Ω
Impedance Z_i at 50 Hz	≥ 200 k Ω
Permissible system leakage capacitance C_e	≤ 100 μF

Displays

LED, green	normal operation (lights continuously), alarm (0.3 Hz), system fault (2 Hz)
------------	---

Inputs/outputs

Test/reset button	external
Cable length test and reset button	≤ 10 m
Output signal at M+/M-	2...10 V (2 k Ω ...10 M Ω)

Switching elements

Number of switching elements	1 changeover contact (11, 12, 14)				
Operating principle	N/C operation				
Contact data acc. to IEC 60947-5-1:					
Utilisation category	AC 13	AC 14	DC-12	DC-12	DC-12
Rated operational voltage	230 V	230 V	24 V	110 V	220 V
Rated operational current	5 A	3 A	1 A	0.2 A	0.1 A
Minimum contact rating	1 mA at AC/DC ≥ 10 V				

Environment/EMC

EMC	IEC 61326-2-4
Operating temperature	-25...+55 °C
Classification of climatic conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)
Long-time storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3M4
Transport (IEC 60721-3-2)	2M2
Storage (IEC 60721-3-1)	1M3

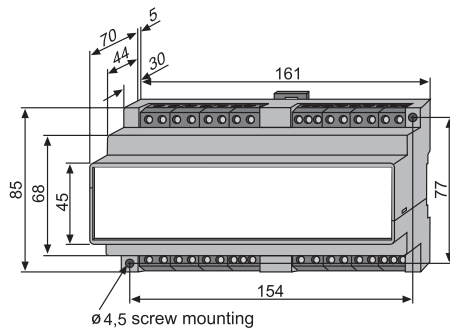
Connection

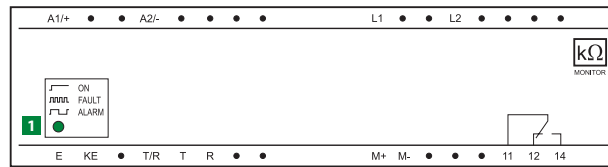
Connection properties	
rigid/flexible/conductor sizes	0.2...4/0.2...2.5 mm ² (AWG 24...12)
flexible with ferrule, without/with plastic sleeve	0.25...2.5 mm ²
Multi-conductor connection (conductors with the same cross section)	
rigid/flexible	0.2...1.5/0.2...1.5 mm ²
Stripping length	8...9 mm
Tightening torque	0.5...0.6 Nm

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
Type of enclosure	X480
Screw mounting	2 x M4
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Operating manual	TBP106032
Weight	≤ 300 g

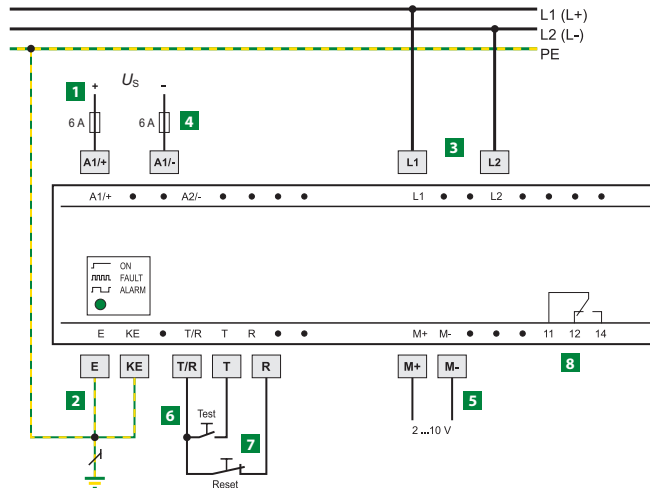
Dimension diagram (dimensions in mm)





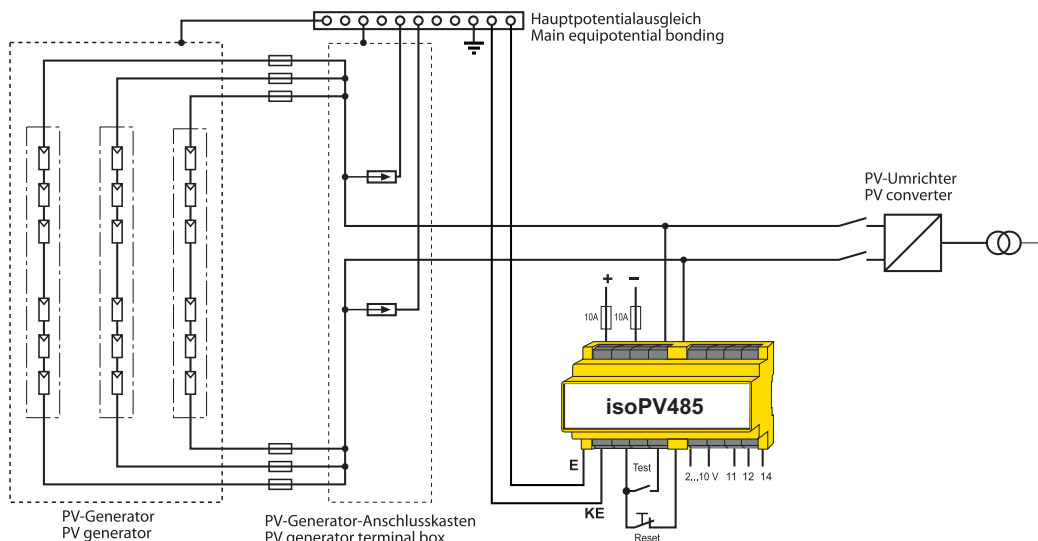
- 1 Power On and alarm LED: lights when the device is in operation, flashes in case of alarm (0.3 Hz) or system faults (2 Hz)

Wiring diagram



- 1 Supply voltage U_S (see ordering information) via fuse
- 2 Separate connection of E, KE to PE
- 3 Connection of the AC system to be monitored, DC: Connect terminal L1, L2 to L+ and L-
- 4 Line protection by a fuse in accordance with DIN VDE 0100-430/IEC 60364-4-43 (10 A fuse recommended). In case of supply (A1/A2) from an IT system, both lines have to be protected by a fuse.
- 5 Voltage output 2...10 V (0...1 M Ω)
- 6 Test button "T": Calls up the self test
- 7 External reset button "R" (N/C contact or wire jumper) when the terminals R1/R2 are open, the fault message will not be stored
- 8 Alarm relay (N/C operation)

Typical application – Insulation monitoring in a photovoltaic system



ISOMETER® isoPV425 with AGH420

Insulation monitoring device for unearthed AC, AC/DC and DC systems (IT systems) for photovoltaic systems of up to AC 690 V/DC 1000 V



1

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

Device features

- Insulation monitoring for unearthed systems AC, AC/DC 0...690 V, DC 0...1000 V
- Nominal system voltage measurement with undervoltage/overvoltage detection
- Measurement of the voltages system to earth (L+/PE and L-/PE)
- Measurement of the system leakage capacitance
- BMS interface
- Information about the point of fault L+/L- via display and relay contacts
- Automatic adaptation to the system leakage capacitance up to 500 µF
- Supply voltage range DC 24...240 V/AC 100...240 V
- Self monitoring and connection monitoring system/earth with automatic notification
- LEDs: Power On, Alarm 1, Alarm 2
- Internal/external test/reset button
- Two alarm relays with single pole (one N/O contact each)
- N/O or N/C operation, selectable
- Fault memory behaviour, selectable
- Multi-functional LC display
- Adjustable response delay
- Compact two-module enclosure (36 mm) plus coupling in a two-module enclosure
- Quick wiring by push-wire terminals

Standards

The ISOMETER® of the isoPV425 series complies with the requirements of the device standards: DIN EN 61557-8 (VDE 0413-8), IEC 61557-8, ASTM F 1669M-96 (2007).

Further information

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

Ordering information

Supply voltage ¹⁾ U _S		Type	Art. No.
DC	AC		
24...240 V	100...240 V	isoPV425-D4 with AGH420	B 7103 6303

Device version with screw terminals on request.

¹⁾ Absolute values

Accessories

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

Technical data isoPV425

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

Rated insulation voltage	250 V
Rated impulse voltage/pollution degree	4 kV/3
Protective separation (reinforced insulation) between	(A1, A2) - (AK1, GND, AK2, Up, KE) - (11, 14, 24)
Voltage test acc. to IEC 61010-1	2.21 kV

Supply voltage

Supply voltage U_S	DC 24...240 V, AC 100...240 V
Tolerance of U_S	-20...+15 %
Frequency range	47...63 Hz
Power consumption	≤ 3 W, ≤ 6 VA

IT system being monitored

Nominal system voltage U_n	via AGH420
------------------------------	------------

Response values

Undervoltage detection	30...1149 V (off)*
Overvoltage detection	31...1150 V (off)*
Hysteresis	5 %
Response value R_{an1} (Alarm 1)	1...500 k Ω (10 k Ω)*
Response value R_{an2} (Alarm 2)	1...500 k Ω (5 k Ω)*
Relative uncertainty	± 15 %
Hysteresis	25 %

Time response

Response time t_{an} at $R_f = 0.5 \times R_{an}$ and $C_e = 1 \mu F$ IEC 61557-8	≤ 10 s
Start-up delay (start time) t	0...10 s (0 s)*
Response delay t_{on}	0...99 s (0 s)*

Displays, memory

Display range, measured value insulation resistance	1 k Ω ...1 M Ω
Operating uncertainty 1...5 k Ω /5 k Ω ...1 M Ω	± 0.5 k Ω /± 15 %
Display range, measured value nominal system voltage	10...1150 V RMS
Operating uncertainty	± 3 V/± 15 %
Display range, measured value system leakage capacitance	1 μF ...500 μF
Operating uncertainty	± 30 %
Password	off/0...999 (off)*
Fault memory alarm relay	on/(off)*

Interface

Interface/protocol	RS-485/BMS
Baud rate	9.6 kbit/s
Cable length	0...1200 m
Shielded cable (shield connected to PE on one side)	recommended: J-Y(St)Y min. 2 x 0.6
Terminating resistor	120 Ω (0.25 W), can be enabled in the device
Device address, BMS bus	3...90 (3)*

Switching elements

Switching elements	2 x 1 N/O contact (single pole)				
Operating principle	N/C operation/N/O operation (N/C operation)*				
Contact 11-14 indication	Alarm 1				
Contact 11-24 indication	Alarm 2				
Electrical endurance, number of cycles	10000				
Contact data acc. to IEC 60947-5-1					
Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-12
Rated operational voltage	230 V	230 V	220 V	110 V	24 V
Rated operational current	5 A	3 A	0.1 A	0.2 A	1 A
Minimum contact rating	1 mA at AC/DC ≥ 10 V				

Environment/EMC

EMC	IEC 61326-2-4				
Operating temperature	-25...+70 °C				
Classification of climatic conditions acc. to IEC 60721:					
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)				
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)				
Long-term storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)				
Classification of mechanical conditions acc. to IEC 60721:					
Stationary use (IEC 60721-3-3)	3M4				
Transport (IEC 60721-3-2)	2M2				
Storage (IEC 60721-3-1)	1M3				

Connection

Connection type	push-wire terminal				
Connection properties					
rigid	0.2...2.5 mm ² (AWG 24...14)				
flexible without ferrule	0.2...2.5 mm ² (AWG 24...14)				
flexible with ferrule	0.2...1.5 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	cooling slots must be ventilated vertically				
Degree of protection, internal components (IEC 60529)	IP30				
Degree of protection, terminals (IEC 60529)	IP20				
Enclosure material	polycarbonate				
DIN rail mounting acc. to	IEC 60715				
Screw mounting	2 x M4 with mounting clip				
Operating manual	D610009200				
Weight	≤ 150 g				

(*) = factory setting

Technical data AGH420

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

Rated insulation voltage	1000 V
Rated impulse voltage/pollution degree	8 kV/3
Protective separation (reinforced insulation) between	(L1/+, L2/-) - (AK1, GND, AK2, Up, E)
Voltage test acc. to IEC 61010-1	4.3 kV

IT system being monitored

Nominal system voltage U_n	DC 0...1000 V, AC 0...690 V
Tolerance of U_n	+15 %
Frequency range of U_n	DC, 10...460 Hz
Max. AC voltage U_{\sim} in the frequency range 0.1...10 Hz	$U_{\sim} \text{max} = 120 \text{ V/Hz} \times f_n$

Measuring circuit

Measuring voltage U_m	± 45 V
Measuring current I_m (at $R_f = 0 \Omega$)	≤ 400 μA
Internal DC resistance R_i	≥ 120 k Ω
Impedance Z_i at 50 Hz	≥ 120 k Ω
Permissible system leakage capacitance	≤ 500 μF

Environment/EMC

EMC	IEC 61326-2-4				
Operating temperature	-25...+70 °C				
Classification of climatic conditions acc. to IEC 60721:					
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)				
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)				
Long-term storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)				
Classification of mechanical conditions acc. to IEC 60721:					
Stationary use (IEC 60721-3-3)	3M4				
Transport (IEC 60721-3-2)	2M2				
Storage (IEC 60721-3-1)	1M3				

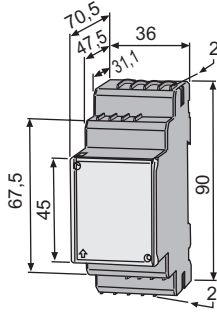
Connection

Connection type	push-wire terminal				
Connection properties					
rigid	0.2...2.5 mm ² (AWG 24...14)				
flexible without ferrule	0.2...2.5 mm ² (AWG 24...14)				
flexible with ferrule	0.2...1.5 mm ² (AWG 24...16)				
Stripping length	10 mm				
Opening force	50 N				
Test opening, diameter	2.1 mm				

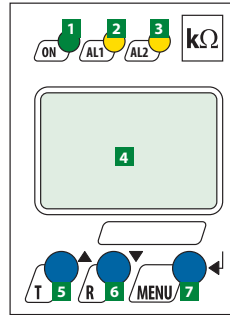
Other

Operating mode	continuous operation				
Mounting	cooling slots must be ventilated vertically				
Distance to adjacent devices, $U_n > 800 \text{ V}$	≥ 30 mm				
Degree of protection, internal components (IEC 60529)	IP30				
Degree of protection, terminals (IEC 60529)	IP20				
Enclosure material	polycarbonate				
DIN rail mounting acc. to	IEC 60715				
Screw mounting	2 x M4 with mounting clip				
Operating manual	D620014900				
Weight	≤ 150 g				

Dimension diagram (dimensions in mm)

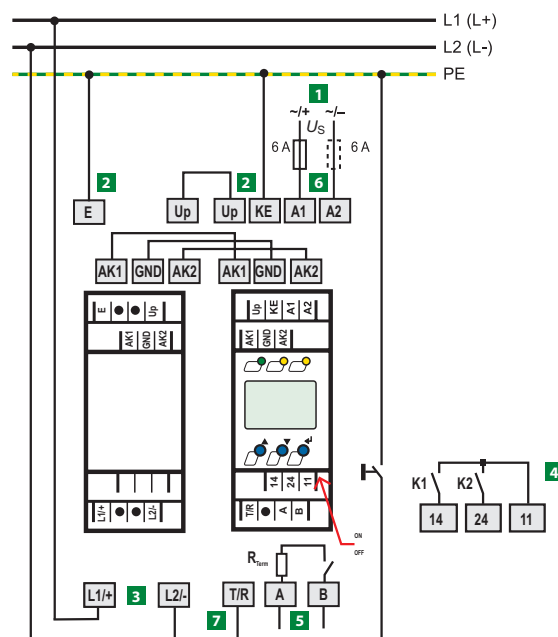


Displays and controls



- 1** Power On LED "ON", (flashes in case of interruption of the connecting leads E/KE or L1(+)/ L2(-) or system fault).
- 2** Alarm LED "AL1", lights when the value falls below the set response value Alarm 1 and flashes in case of interruption of the connecting leads E/KE or L1(+)/L2(-), system faults and in case of overvoltage (can be activated).
- 3** Alarm LED "AL2", lights when the value falls below the set response value Alarm 2 and flashes in case of interruption of the connecting leads E/KE or L1(+)/L2(-), system faults and in case of undervoltage (can be activated).
- 4** LC display
- 5** Test button "T": To call up the self test.
Arrow up button: To change parameters, move upwards in the menu.
- 6** Reset button "R": To delete stored fault alarms
Arrow down button : parameter change, to move down in the menu
- 7** "MENU" button: to call up the menu system.
Enter button: to confirm parameter changes

Wiring diagram



- 1** Supply voltage U_s (see ordering information) via fuse
- 2** Separate connection of the functional earth E and KE to PE
- 3** Connection to the IT system to be monitored:
AC: Connect terminals L1(+), L2(-) to conductor L1, L2
DC: Connect terminals L1(+) to L+, and L2(-) to L-
- 4** Alarm relay K1, K2 with single pole
- 5** Serial interface RS-485 (termination with a 120 Ω resistor, can be enabled in the device) Bender protocol BMS
- 6** Line protection by a fuse in accordance with IEC 60364-4-43/DIN VDE 0100-430 (6 A fuse recommended). In case of supply (A1/A2) from an IT system, both lines have to be protected by a fuse.
- 7** Connection external T/R button to PE.

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

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 kΩ (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® of the isoLR275 series complies with the requirements of the device standards: DIN EN 61557-8 (VDE 0413-8), IEC 61557-8, IEC 61326-2-4 Ed. 1.0, 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.com.

Ordering information

Supply voltage U_s		Set comprising		Art. No.
DC	AC	Type	Art. No.	
19.2...72 V	–	isoLR275-327	B 9106 5700W	B 9106 5702W
		AGH-LR-3	B 9803 9022W	
77...286 V	88...264 V	isoLR275-335	B 9106 5701W	B 9106 5703W
		AGH-LR-3	B 9803 9022W	

Devices are available as a set.

Accessories

Type designation	Art. No.
Screw mounting	B 990 056

Suitable system components

Type designation	Type	Page
External kΩ measuring instruments	9620-1421	257

Technical data ISOMETER® isoLR275

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

Rated insulation voltage for isoLR275-3	AC 250 V
Rated impulse voltage/pollution degree	6 kV/III
Protective separation (reinforced insulation) between (A1/+, A2/-) - (11, 12, 14, 21, 22, 24) - (AK1, AK2, KE, PE, T1, T2, R1, R2, F1, F2, M+, M-, A, B)	
Voltage test acc. to IEC 61010-1	3.536 kV
Rated insulation voltage	AC 250 V
Rated impulse voltage/pollution degree	4 kV/3
Basic insulation between: (11, 12, 14) - (21, 22, 24)	
Voltage test acc. to IEC 61010-1	2.21 kV

Voltage ranges

Nominal system voltage U_n	via AGH-LR
------------------------------	------------

isoLR275-335:

Supply voltage U_S (also see nameplate)	AC 88...264 V**
Frequency range U_S	42...460 Hz
Power consumption	≤ 16 VA
Supply voltage U_S (also see nameplate)	DC 77...286 V**
Power consumption	≤ 8 W

isoLR275-327:

Supply voltage U_S (also see nameplate)	DC 19.2...72 V**
Power consumption	≤ 8 W

Response values

Response value R_{an1}	0.2...100 kΩ
Factory setting R_{an1} (Alarm1)	4 kΩ
Response value R_{an2}	0.2...100 kΩ
Factory setting R_{an2} (Alarm2)	1 kΩ
Relative uncertainty (7...100 kΩ) (acc. to IEC 61557-8)	± 15 %
Relative uncertainty (0.2...7 kΩ)	± 1 kΩ
Response time t_{an}	see table TGH1468 from page 39 onwards
Hysteresis	25 %, + 1 kΩ

Measuring circuit

Measuring voltage U_m (peak value)	± 50 V
Measuring current I_m (at $R_f = 0 \Omega$)	≤ 1.5 mA
Internal DC resistance R_i	≥ 35 kΩ
Impedance Z_i at 50 Hz	≥ 35 kΩ
Permissible extraneous DC voltage U_{fg}	≤ DC 1100 V
Permissible system leakage capacitance C_e	≤ 500 μF (150 μF)*

Displays

Display, illuminated	two-line display
Characters (number/height)	2 x 16/4/mm
Display range measured value	0.2 kΩ...1 MΩ
Operating uncertainty	±15%, ±1 kΩ

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 (1...100 kΩ)	±15 %, ±1 kΩ

Serial interface

Interface/protocol	RS-485/BMS
Connection	terminals A/B
Cable length	≤ 1200 m
Shielded cable (shield to PE on one end)	2-core, ≥ 0.6 mm ² , e.g. J-Y(St)Y min. 2 x 0.6
Terminating resistor	120 Ω (0.5 W)
Device address, BMS bus	1...30 (3)*

Switching elements

Switching elements	2 changeover contacts: K1 (Alarm 1), K2 (Alarm 2, device error)				
Operating mode K1, K2 (Alarm 1/Alarm 2)	N/C operation/N/O operation (N/O operation)*				
Contact data acc. to IEC 60947-5-1:					
Utilisation category	AC 13	AC 14	DC-12	DC-12	DC-12
Rated operational voltage	230 V	230 V	24 V	110 V	220 V
Rated operational current	5 A	3 A	1 A	0.2 A	0.1 A
Minimum contact rating	1 mA at AC/DC ≥ 10 V				

Environment/EMC

EMC	
not suitable for household and small companies	IEC 61326-2-4 Ed. 1.0
Operating temperature	-25...+70 °C
Classification of climatic conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3K5 (with condensation and formation of ice)
Transport (IEC 60721-3-2)	2K3 (with condensation and formation of ice)
Long-term storage (IEC 60721-3-1)	1K4 (with condensation and formation of ice)
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	
for screw mounting with accessories B990056	3M7
for DIN rail mounting	3M4
Transport (IEC 60721-3-2)	2M2
Long term storage (IEC 60721-3-1)	1M3

Connection

Connection	screw-type terminals
Connection properties	
rigid/flexible	0.2...4 mm ² /0.2...2.5 mm ²
flexible with ferrules without/with plastic sleeve	0.25...2.5 mm ²
Tightening torque	0.5 Nm
Conductor sizes (AWG)	24...12
Cable length between isoLR275 and AGH-LR	≤ 0.5 m

Other

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
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Software version	D369 V2.1
Weight	≤ 510 g

(*) = factory setting

Data labelled with ** are absolute values

Technical data coupling device AGH-LR

Insulation coordination acc. to IEC 60664-1

Rated insulation voltage	AC 800 V
Rated impulse voltage/pollution degree	8 kV/3

Voltage ranges

Nominal system voltage U_n	AC, 3(N)AC 0...793 V, DC 0...1100 V
Nominal frequency f_n	DC, 10...460 Hz
Max. AC voltage U_{-} in the frequency range $f_n = 0.1...10$ Hz	$U_{-max} = 110$ V/Hz * f_n

Environment/EMC

EMC	IEC 61326-2-4 Ed. 1.0
Operating temperature	-25...+70 °C
Classification of climatic conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3K5 (with condensation and formation of ice)
Transport (IEC 60721-3-2)	2K3 (with condensation and formation of ice)
Long-term storage (IEC 60721-3-1)	1K4 (with condensation and formation of ice)
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3M7
Transport (IEC 60721-3-2)	2M2
Storage (IEC 60721-3-1)	1M3

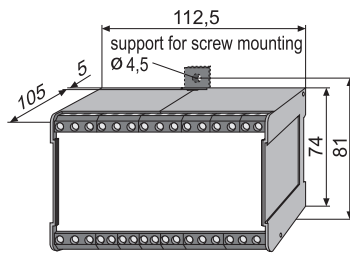
Connection

Connection	screw-type terminals
Connection properties	
rigid/flexible	0.2...4 mm ² /0.2...2.5 mm ²
flexible with ferrules without/with plastic sleeve	0.25...2.5 mm ²
Tightening torque	0.5 Nm
Conductor sizes (AWG)	24...12
Cable length between isoLR275 and AGH-LR	≤ 0.5 m

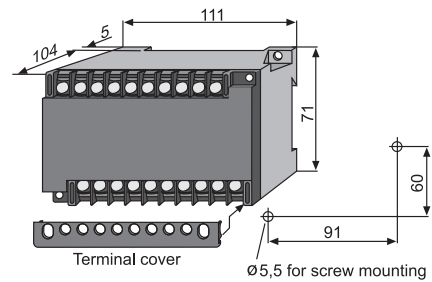
Other

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

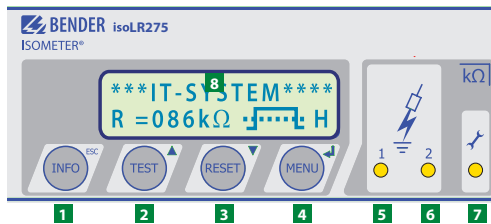
isoLR275



AGH-LR

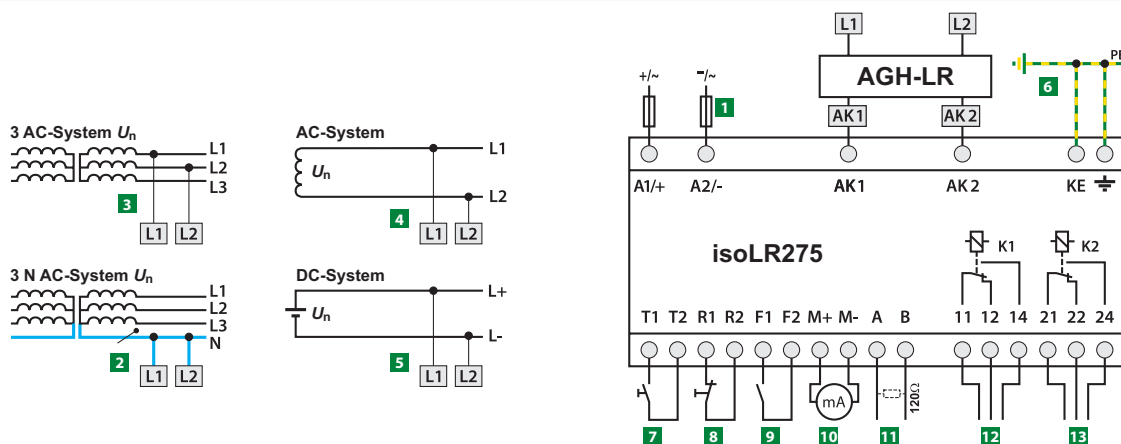


Operating elements isoLR275



- 1 "INFO" button: to query standard information/ "ESC" button: back (menu function), to confirm parameter change
- 2 "TEST" button: to call up the self test/arrow up button: parameter change, to move up in the menu
- 3 "RESET" button: to delete stored insulation fault alarms Arrow down button: parameter change, to move down in the menu
- 4 "MENU" button: to call up the menu system. Enter button: to confirm parameter changes
- 5 Alarm LED "1" lights: insulation fault, first warning level reached
- 6 Alarm LED "2" lights: insulation fault, second warning level reached.
- 7 Device error LED lights: isoLR275 faulty
- 8 Two-line display for standard and menu mode

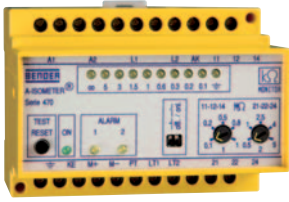
Wiring diagrams



- 1 Supply voltage U_s (see nameplate) via 6 A fuse; For UL and CSA applications, it is mandatory to use 5 A fuses
 - 2 3 Connection to the 3AC system to be monitored: Connect the terminals L1, L2 to neutral conductor N or terminals L1, L2 to conductor L1, L2.
 - 4 Connection to the AC system to be monitored: connect terminals L1, L2 to conductor L1, L2.
 - 5 Connection to the DC system to be monitored: Connect terminal L1 to conductor L+, terminal L2 to conductor L-
 - 6 Separate connection of \perp and KE to PE
 - 7 External test button (N/O contact)
 - 8 External reset button (N/C contact or wire jumper), when the terminals are open, the fault message will not be stored
 - 9 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
 - 10 Current output, electrically isolated: 0...20 mA or 4...20 mA
 - 11 Serial interface RS-485 (termination by means of a 120-Ω resistor)
 - 12 Alarm relay "K1"; available changeover contacts
 - 13 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® IR470LY2-60...

Insulation monitoring device for unearthed AC and 3(N)AC systems (IT systems) and de-energised loads



1

Typical applications

- AC, 3(N)AC main circuits (without directly connected rectifiers), such as motors, pumps, rolling mills without variable-speed drives, air cooling and air conditioning systems, lighting systems, heating systems, mobile generators, building services, domestic electrical installation practice, etc.
- De-energised loads, such as fire extinguisher pumps, slide-valve drives (gas, water, oil etc.), flue gas valves, cranes

Approvals



Device features

- Insulation monitoring for unearthed AC, 3(N)AC systems 0...793 V
- Off-line monitoring for TN, TT and IT systems 0...793 V
- Nominal voltage extendable via coupling device
- Operating mode selectable: Insulation monitoring/off-line monitoring
- Two separately adjustable response values 100 kΩ...1 MΩ/500 kΩ...5 MΩ
- Connection monitoring system/earth
- Power ON LED, Alarm LED for signalling AC, L+, L- insulation faults
- LED bar graph indicator for the indication of the insulation resistance
- Connection for external kΩ indication
- Combined test and reset button
- Two separate alarm relays with one potential-free changeover contact each
- N/O or N/C operation
- Fault memory behaviour, selectable

Standards

The ISOMETER® of the IR470LY2-60 series complies with the requirements of the device standards: DIN EN 61557-8 (VDE 0413-8), IEC 61557-8, ASTM F 1669M-96 (2007), ASTM F1134-94.

Further information

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

Ordering information

Supply voltage U_s		Type	Art. No.
DC	AC		
–	AC 230 V	IR470LY2-60	B 9104 8010
–	AC 90...132 V ¹⁾	IR470LY2-6013	B 9104 8013
–	AC 400 V	IR470LY2-6015	B 9104 8009
9.6...84 V ¹⁾	–	IR470LY2-6021	B 9104 8014

Other supply voltages on request

¹⁾ Absolute values

Suitable system components

Type designation	Type	Page
External kΩ measuring instruments	7204-1421	257
	9604-1421	257
Coupling devices	AGH520S	214

Technical data

Insulation coordination acc. to IEC 60664-1

Rated insulation voltage	AC 630 V
Rated impulse voltage/pollution degree	6 kV/3

Voltage ranges

Nominal system voltage U_n	AC, 3(N)AC 0...793 V
Nominal frequency f_n	40...460 Hz
Supply voltage U_s	see ordering information
Operating range of U_s	0.8...1.15 x U_s
Frequency range U_s	50...460 Hz
Power consumption	≤ 3 VA

Response values

Response value R_{an1} (Alarm 1)	100 kΩ...1 MΩ
Response value R_{an2} (Alarm 2)	500 kΩ...5 MΩ
Response time t_{an} at $R_F = 0.5 \times R_{an}$ and $C_e = 1 \mu F$	≤ 4 s

Measuring circuit

Measuring voltage U_m	≤ 40 V
Measuring current I_m (at $R_F = 0 \Omega$)	≤ 33 μA
Internal DC resistance R_i	≥ 1.2 MΩ
Impedance Z_i at 50 Hz	≥ 1 MΩ
Permissible extraneous DC voltage U_{fg}	≤ 800 V
Permissible system leakage capacitance C_e	≤ 10 μF

Outputs

Test/reset button	internal/external
Current output for measuring instrument (scale centre point = 120 kΩ)	0...400 μA
Load	≤ 25 kΩ

Switching elements

Number of switching elements	2 x 1 changeover contact
Operating principle	N/O operation/N/C operation
Factory setting	N/O operation
Electrical endurance, number of cycles	12000
Contact class	IIB in accordance with DIN IEC 602550-20
Rated contact voltage	AC 250 V/DC 300 V
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
Contact rating at DC 24 V	≥ 2 mA (50 mW)

Environment

Shock resistance IEC 60068-2-27 (device in operation)	15 g/11 ms
Bumping IEC 60068-2-29 (transport)	40 g/6 ms
Vibration resistance IEC 60068-2-6 (during operation)	1 g/10...150 Hz
Vibration resistance IEC 60068-2-6 (during transport)	2 g/10...150 Hz
Ambient temperature (during operation)	-10...+55 °C
Ambient temperature (during storage)	-40...+70 °C
Climatic class acc. to DIN IEC 60721-3-3	3K5

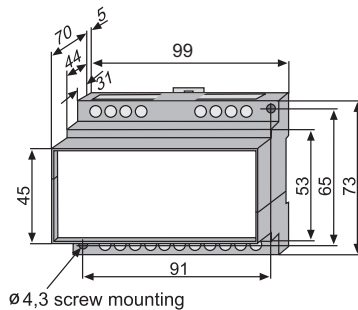
Connection

Connection type	modular terminals
Connection properties rigid/flexible	0.2...4 mm ² /0.2...2.5 mm ²

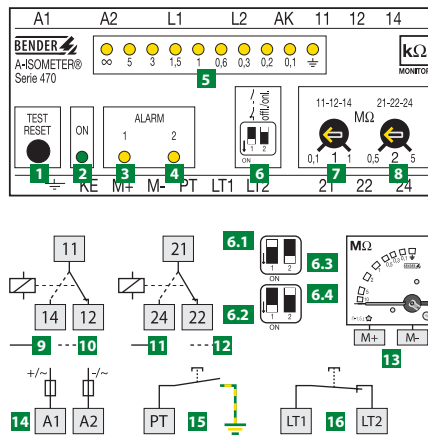
Other

Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (DIN EN 60529)	IP30
Degree of protection, terminals (DIN EN 60529)	IP20
Screw mounting	2 x M4
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Operating manual	TBP104002
Weight	≤ 360 g

Dimension diagram (dimensions in mm)

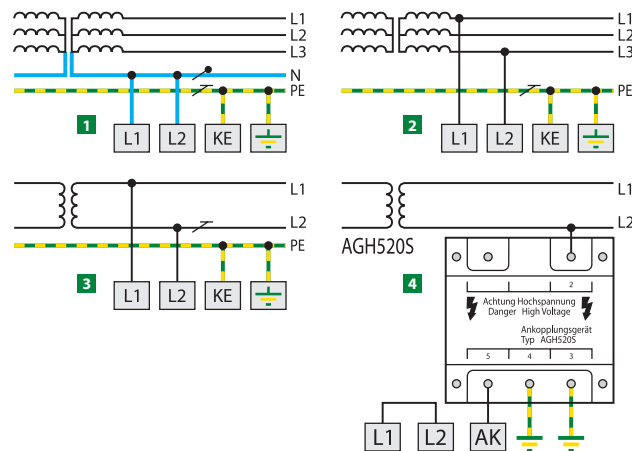


Wiring diagram – front plate



- | | | | | | |
|--|--------------------------|--------------------------|---------------------|--------------------|--|
| <p>1 Combined test and reset button "TEST RESET"; short-time pressing (< 1 s) = RESET, long-time pressing (> 2 s) = TEST</p> <p>2 Power On LED "ON"</p> <p>3 Alarm LEDs "1 ALARM 2"; yellow, light when the value falls below the set response value and flash</p> <p>4 In case of interruption of the connecting leads \perp/KE or L1/L2</p> <p>5 LED bar graph indicator</p> <p>6 Operating principle of the alarm relays on-line/off-line</p> <table border="0"> <tr> <td>6.1 N/O operation</td> <td>6.2 N/C operation</td> </tr> <tr> <td>6.3 OFF-Line</td> <td>6.4 ON-Line</td> </tr> </table> | 6.1 N/O operation | 6.2 N/C operation | 6.3 OFF-Line | 6.4 ON-Line | <p>7 Potentiometer to set the response value R_{an1} (Alarm 1)</p> <p>8 Potentiometer to set the response value R_{an2} (Alarm 2)</p> <p>9 Alarm relay 1: N/O operation (basic setting)</p> <p>10 Alarm relay 1: N/C operation</p> <p>11 Alarm relay 2: N/O operation (basic setting)</p> <p>12 Alarm relay 2: N/C operation</p> <p>13 External MΩ indicating instrument</p> <p>14 U_S see ordering information, 6 A fuse recommended</p> <p>15 External test button "PT"</p> <p>16 External reset button "LT1, LT2" or bridge for fault memory</p> |
| 6.1 N/O operation | 6.2 N/C operation | | | | |
| 6.3 OFF-Line | 6.4 ON-Line | | | | |

Wiring diagram – system connection



- | | |
|--|--|
| <p>1 3NAC system</p> <p>2 3AC system</p> | <p>3 AC system</p> <p>4 AC > 690 V with coupling device</p> |
|--|--|

ISOMETER® IR420-D6

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



Device features

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

Typical applications

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

Standards

The ISOMETER® of the IR420 D6 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 (VDE 0110-3), ASTM F1669M-96 (2007), ASTM F1207M-96 (2007)

Further information

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

Approvals



Ordering information

Supply voltage ¹⁾ U _S		Type	Art. No.
DC	AC		
9.6...94 V	16...72 V, 42...460 Hz	IR420-D6-1	B 7101 6415
70...300 V	70...300 V, 42...460 Hz	IR420-D6-2	B 7101 6407

Device version with screw terminals on request.

¹⁾ Absolute values

Accessories

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

Suitable system components

Type designation	Type	Page
Coupling device	AGH520S	214

Technical data

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

Rated insulation voltage	400 V
Rated impulse voltage/pollution degree	4 kV/3
Protective separation (reinforced insulation) between (A1, A2) – (L1, AK, E, KE, T/R) – (11, 12, 14) – (21, 22, 24)	
Voltage test acc. to IEC 61010-1	2.21 kV

Supply voltage

Supply voltage U_s	see ordering information
Power consumption	≤ 3 VA

IT system being monitored

Nominal system voltage U_n	off-line
without AGH	nominal contact voltage of the N/C contact of K3 (switch-on contactor)
with AGH520S	AC 0...7200 V, 50...400 Hz

Response values

Response value R_{an1} (Alarm 1)	100 kΩ...10 MΩ (1 MΩ)*
Response value R_{an2} (Alarm 2)	100 kΩ...10 MΩ (100 kΩ)*
Relative uncertainty	± 15 %
Hysteresis	25 %

Time response

Response time t_{an} at $R_F = 0.5 \times R_{an}$ and $C_e = 1 \mu F$	≤ 4 s
Start-up delay (start time) t	0...10 s (0 s)*
Response delay t_{on}	0...99 s (0 s)*

Measuring circuit

Measuring voltage U_m	± 12 V
Measuring current I_m (at $R_F = 0 \Omega$)	≤ 10 μA
Internal DC resistance R_i	≥ 1.2 MΩ
Impedance Z_i at 50 Hz	≥ 1.1 MΩ
Permissible extraneous DC voltage U_{fg}	≤ DC 300 V
Permissible system leakage capacitance C_e	≤ 10 μF

Displays, memory

Display range, measured value	10 kΩ...20 MΩ
Operating uncertainty	± 15 %
Password	off/0...999 (off)*
Fault memory alarm relay	on/off (off)*

Outputs

Cable length test and reset button	≤ 10 m
------------------------------------	--------

Switching elements

Number of switching elements	2 x 1 changeover contact				
Operating principle	NC or N/O operation (N/O operation)*				
Electrical service life, number of cycles	10000				
Contact data acc. to IEC 60947-5-1					
Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-12
Rated operational voltage	230 V	230 V	220 V	110 V	24 V
Rated operational current	5 A	3 A	0.1 A	0.2 A	1 A
Minimum contact rating	1 mA at AC/DC > 10 V				

Environment/EMC

EMC	IEC61326-2-4
Operating temperature	-25...+55 °C
Climatic class acc. to IEC 60721	
Stationary use (IEC 60721-3-3)K5 (except condensation and formation of ice)	
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)
Long-time storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)
Classification of mechanical conditions IEC 60721	
Stationary use (IEC 60721-3-3)	3M4
Transport (IEC 60721-3-2)	2M2
Long-time storage (IEC 60721-3-1)	1M3

Connection

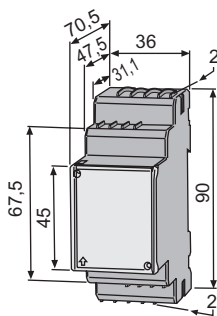
Connection type	push-wire terminal
Connection properties	
rigid	0.2...2.5 mm ² (AWG 24...14)
flexible without ferrule	0.2...2.5 mm ² (AWG 24...14)
flexible with ferrule	0.2...1.5 mm ² (AWG 24...16)
Stripping length	10 mm
Opening force	50 N
Test opening, diameter	2.1 mm

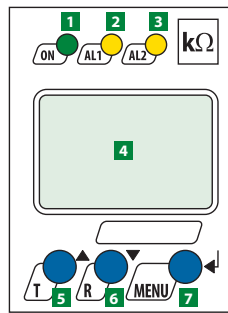
Other

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
Screw mounting	2 x M4 with mounting clip
DIN rail mounting acc. to	IEC 60715
Operating manual	TBP101014
Weight	≤ 150 g

() * = Factory setting

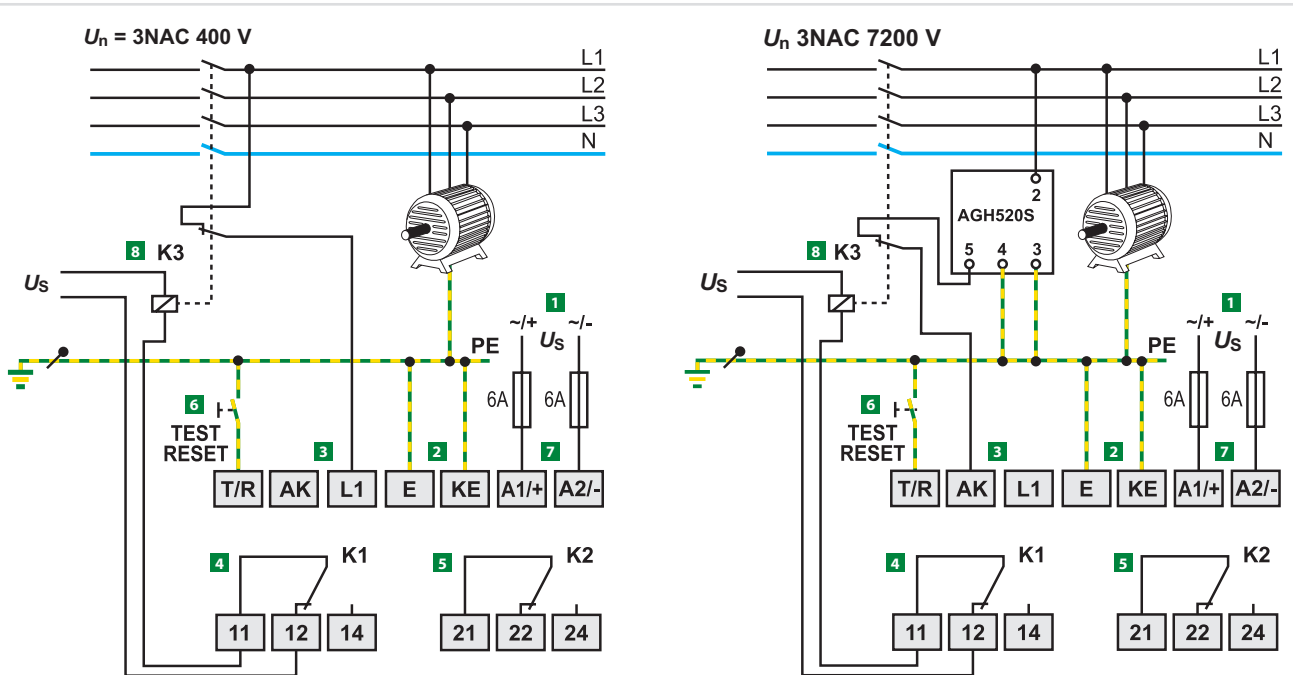
Dimension diagram (dimensions in mm)





- 1** Power On LED "ON", flashes in case of interruption of the connecting leads E/KE
- 2** Alarm LED "AL1", lights when the value falls below the set response value Alarm 1 and flashes in case of interruption of the connecting leads E/KE
- 3** Alarm LED "AL2", lights when the value falls below the set response value Alarm 2 and flashes in case of interruption of the connecting leads E/KE
- 4** LC display
- 5** Test button "T": to call up the self test.
Arrow up button: parameter change, to move up in the menu
- 6** Reset button "R": to delete stored insulation fault alarms parameter change, to move down in the menu
- 7** "MENU" button: to call up the menu system.
Enter button: to confirm parameter changes

Wiring diagrams



- 1** Supply voltage U_S (see ordering details) via fuse
- 2** Separate connection of E, KE to PE
- 3** Connection of the AC system to be monitored:
- 4** Alarm relay "K1": Alarm 1
- 5** Alarm relay "K2": Alarm 2
- 6** Combined test and reset button "TEST RESET"
short-time pressing (< 1.5 s) = RESET
long-time pressing (> 1.5 s) = TEST
- 7** Line protection by a fuse in accordance with IEC 60364-4-43 (6 A fuse recommended). In case of supply (A1/A2) from an IT system, both lines have to be protected by a fuse.
- 8** K3 is also required and is not included in IR420-D6

ISOMETER® IR423

Insulation monitoring device for mobile generators



1

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)

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® of the IR423 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 (VDE 0110-3), ASTM F1669M-96 (2007), ASTM F1207M-96 (2007)

Further information

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

Approvals



Ordering information

Version	Supply voltage ¹⁾ U _S			Type	Art. No.
	AC	DC	AC/DC		
Standard	9.6...94 V	16...72 V, 30...460 Hz	–	IR423-D4-1	B 7101 6304
	–	–	70...300 V, 30...460 Hz	IR423-D4-2	B 7101 6305
High mechanical stress	9.6...94 V	16...72 V, 30...460 Hz	–	IR423-D4W-1	B 7101 6304W
	–	–	70...300 V, 30...460 Hz	IR423-D4W-2	B 7101 6305W

Device version with screw terminals on request.

¹⁾ Absolute values

Accessories

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

Technical data

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

Rated insulation voltage	250 V
Rated impulse voltage/pollution degree	2.5 kV/3
Protective separation (reinforced insulation) between (A1, A2) - (L1, L2, E, KE, T/R) - (11, 12, 14) - (21, 22, 24)	
Voltage test acc. to IEC 61010-1	2.21 kV

Supply voltage

Supply voltage U_S	see ordering information
Power consumption	≤ 3 VA

IT system being monitored

Nominal system voltage U_n	AC 0...300 V
Nominal frequency f_n	30...460 Hz

Response values

Response value R_{an1} (Alarm 1)	1...200 k Ω (46 k Ω)*
Response value R_{an2} (Alarm 2)	1...200 k Ω (23 k Ω)*
Relative uncertainty 1...5 k Ω /5...200 k Ω	± 0.5 k Ω / ± 15 %
Hysteresis	25% of the response value

Time response

Response time t_{on} at $R_F = 0.5 \times R_{an}$ and $C_e = 1 \mu F$	≤ 1 s
Start-up delay (start time) t	0...10 s (0 s)*
Response delay t_{on}	0...99 s (0 s)*

Measuring circuit

Measuring voltage U_m	± 12 V
Measuring current I_m (at $R_F = 0 \Omega$)	$\leq 200 \mu A$
Internal DC resistance R_i	≥ 62 k Ω
Impedance Z_i at 50 Hz	≥ 60 k Ω
Permissible extraneous DC voltage U_{fg}	$\leq DC 300$ V
Permissible system leakage capacitance	$\leq 5 \mu F$

Displays, memory

Display range, measured value	1 k Ω ...1 M Ω
Operating uncertainty 1...5 k Ω /5 k Ω ...1 M Ω	± 0.5 k Ω / ± 15 %
Password	off/0...999 (off)*
Fault memory (alarm relay)	on/off*

Outputs

Cable length test and reset button	≤ 10 m
------------------------------------	-------------

Switching elements

Number of switching elements	2 x 1 changeover contact				
Operating principle	NC or N/O operation (N/O operation)*				
Electrical endurance, number of cycles	10000				
Contact data acc. to IEC 60947-5-1					
Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-12
Rated operational voltage	230 V	230 V	220 V	110 V	24 V
Rated operational current	5 A	3 A	0.1 A	0.2 A	1 A
Contact rating	1 mA at AC/DC ≥ 10 V				

Environment/EMC

EMC	IEC 61326-2-4
Operating temperature	-40...+70 °C
Climatic class acc. to IEC 60721	
Stationary use (IEC 60721-3-3)	3K5 (with condensation and formation of ice)
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)
Long-time storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)
Classification of mechanical conditions IEC 60721	
Stationary use (IEC 60721-3-3)	3M7
Transport (IEC 60721-3-2)	2M2
Long-time storage (IEC 60721-3-1)	1M3
Vibration resistance:	acc. to IEC 60068-2-6
For DIN rail mounting	3 g/30...150 Hz
For screw mounting	6 g/30...150 Hz

Connection

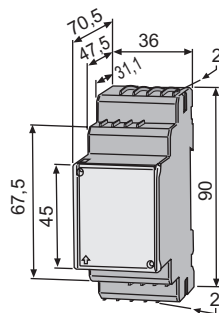
Connection type	push-wire terminal
Connection properties	
rigid	0.2...2.5 mm ² (AWG 24...14)
flexible without ferrule	0.2...2.5 mm ² (AWG 24...14)
flexible with ferrule	0.2...1.5 mm ² (AWG 24...16)
Stripping length	10 mm
Opening force	50 N
Test opening, diameter	2.1 mm

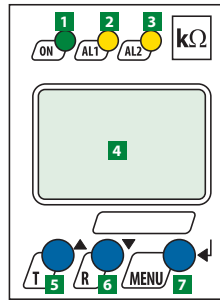
Other

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
Screw mounting	2 x M4 with mounting clip
DIN rail mounting acc. to	IEC 60715
Operating manual	TBP101013
Weight	≤ 150 g

() * = factory setting

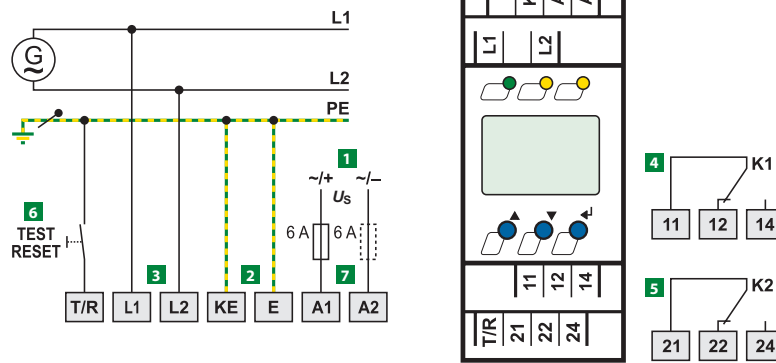
Dimension diagram (dimensions in mm)





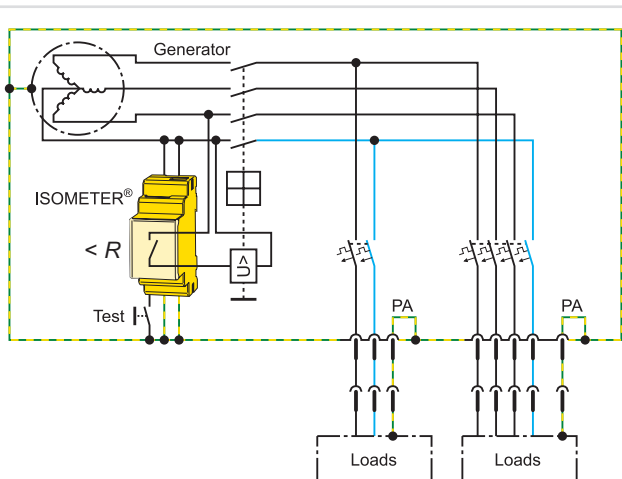
- 1 Power On LED "ON", flashes in case of interruption of the connecting leads E/KE or L1/L2
- 2 Alarm LED "AL1", lights when the value falls below the set response value Alarm 1 and flashes in case of interruption of the connecting leads E/KE or L1/L2
- 3 Alarm LED "AL2", lights when the value falls below the set response value Alarm 2 and flashes in case of interruption of the connecting leads E/KE or L1/L2
- 4 LC display
- 5 Test button "T": to call up the self test.
Arrow up button: parameter change, to move up in the menu
- 6 Reset button "R": to delete stored insulation fault alarms parameter change, to move down in the menu
- 7 "MENU" button: to call up the menu system.
Enter button: to confirm parameter changes

Wiring diagram

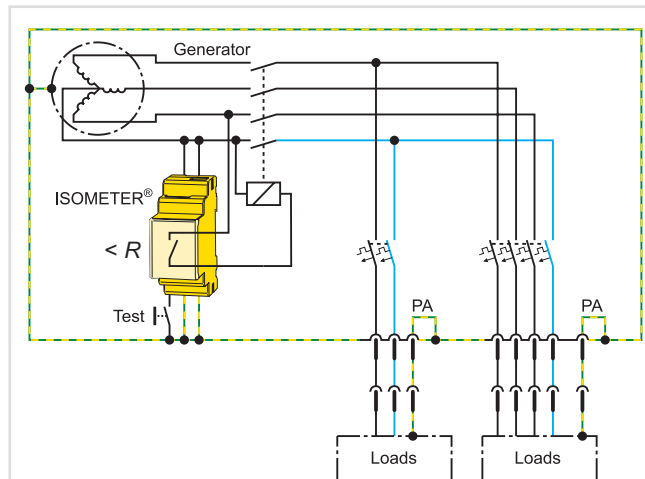


- 1 Supply voltage U_s (see ordering details) via fuse
- 2 Separate connection of E, KE to PE
- 3 Connection of the AC system to be monitored:
AC: connect terminals L1, L2 to conductor L1, L2.
- 4 Alarm relay "K1": Alarm 1
- 5 Alarm relay "K2": Alarm 2
- 6 Combined test and reset button "T/R":
short-time pressing (< 1.5 s) = RESET,
long-time pressing (> 1.5 s) = TEST
- 7 Line protection by a fuse in accordance with IEC 60364-4-43
(6 A fuse recommended). In case of supply (A1/A2) from an IT system, both lines have to be protected by a fuse.

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



Setting K1/K2 for **overvoltage release**:
N/O operation (n.o.); Fault memory setting: OFF



Setting K1/K2 for **contactor**:
N/C operation (n.c.), fault memory setting: ON

ISOMETER® IR123P

Insulation monitoring device for mobile generators



Device features

- Insulation monitoring for unearthed DC systems (IT systems) 100...300 V
- Automatic adaptation to the existing system leakage capacitance
- Optimised measurement technique for low-frequency control processes
- Electrically isolated PWM output for the kΩ 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 kΩ
- Second response range 40/80 kΩ selectable via a jumper

Typical applications

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

Further information

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

Ordering information

Connection	Nominal system voltage U_n	Supply voltage $U_S^{1)}$	Type	Art. No.
	AC	AC		
Connectors	100...300 V, 22...460 Hz	$U_S = U_n$	IR123P-4-2	B 9101 6308

* Absolute values

Technical data

Insulation coordination acc. to IEC 60664-1

Rated insulation voltage	250 V
Rated impulse voltage/pollution degree	2.5 kV/3
Protective separation (reinforced insulation) between: (A1/L1, A2/L2, E, KE, T/R, T, R, M+, M-/OK-, OK+) - (11-12-14) - (21-22-24)	
Voltage test acc. to IEC 61010-1	2.21 kV

Supply voltage

Supply voltage U_S	$= U_n$
Power consumption	≤ 3 VA

IT system being monitored

Nominal system voltage U_n	AC 100...300 V
Nominal frequency f_n	22...460 Hz

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 uncertainty	± 15 %
Hysteresis	+25 %

Time response

Response time t_{an} at $R_F = 0.5 \times R_{an}$ and $C_e = 1 \mu F$	≤ 1 s
---	------------

Measuring circuit

Measuring voltage U_m	± 12 V
Measuring current I_m (at $R_F = 0 \Omega$)	$\leq 200 \mu A$
Internal DC resistance R_i	≥ 62 kΩ
Impedance Z_i at 50 Hz	≥ 60 kΩ
Permissible extraneous DC voltage U_{fg}	\leq DC 300 V
Permissible system leakage capacitance	$\leq 5 \mu F$

Memory

Fault memory (alarm relay)	on/off (on)*
----------------------------	--------------

Inputs

Reset button	N/O contact
Test button	N/O contact
Cable length external test/reset button	3 m

Switching elements

Number of switching elements	2 (changeover contacts K1, K2)
Operating principle K1/K2	N/C operation/N/O operation (N/O operation)*
Electrical endurance, number of cycles	10000

Interfaces

Optocoupler, alarm	$U_{CE} \leq 24$ V, $I_C \leq 10$ mA
Optocoupler, measured value	$U_{CE} \leq DC 24$ V, $I_C \leq 10$ mA
	PWM signal, duty cycle 0 % = ∞ kΩ
	PWM signal, duty cycle 50 % = 120 kΩ
	PWM signal, duty cycle 100 % = 0 kΩ

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

Rated operational voltage AC	230 V	230 V	
Utilisation category AC	AC 13	AC 14	
Rated operational current AC	5 A	3 A	
Rated operational voltage DC	220 V	110 V	24 V
Utilisation category DC	DC 12	DC 12	DC 12
Rated operational current DC	0.1 A	0.2 A	1 A
Minimum current	1 mA at AC/DC ≥ 10 V		

Environment/EMC

EMC	IEC61326-2-4
Operating temperature	-25...+60 °C

Climatic categories acc. to IEC 60721, valid for one encapsulated p.c.b.:

Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)
Long-term storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)

Classification of mechanical conditions acc. to IEC 60721, valid for one encapsulated p.c.b.:

Stationary use (IEC 60721-3-3)	3M7
Transport (IEC 60721-3-2)	2M2
Storage (IEC 60721-3-1)	1M3

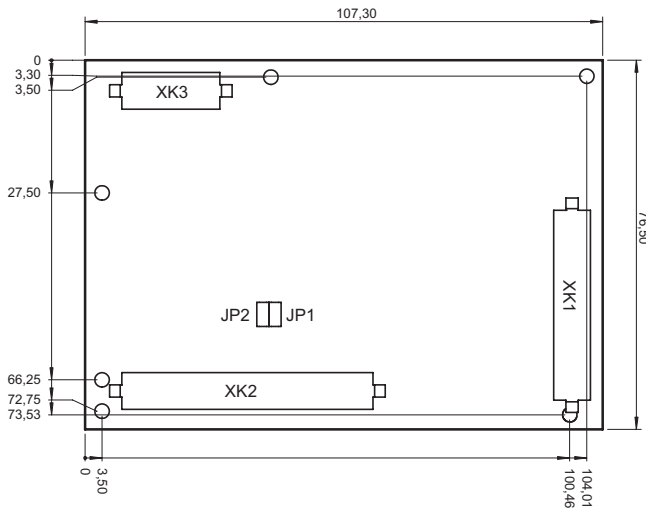
Connection	connectors Universal MATE-N-LOK
	3-pole-AMP-826840-3
	6-pole-AMP-826843-3
	8-pole-AMP-826844-3

Other

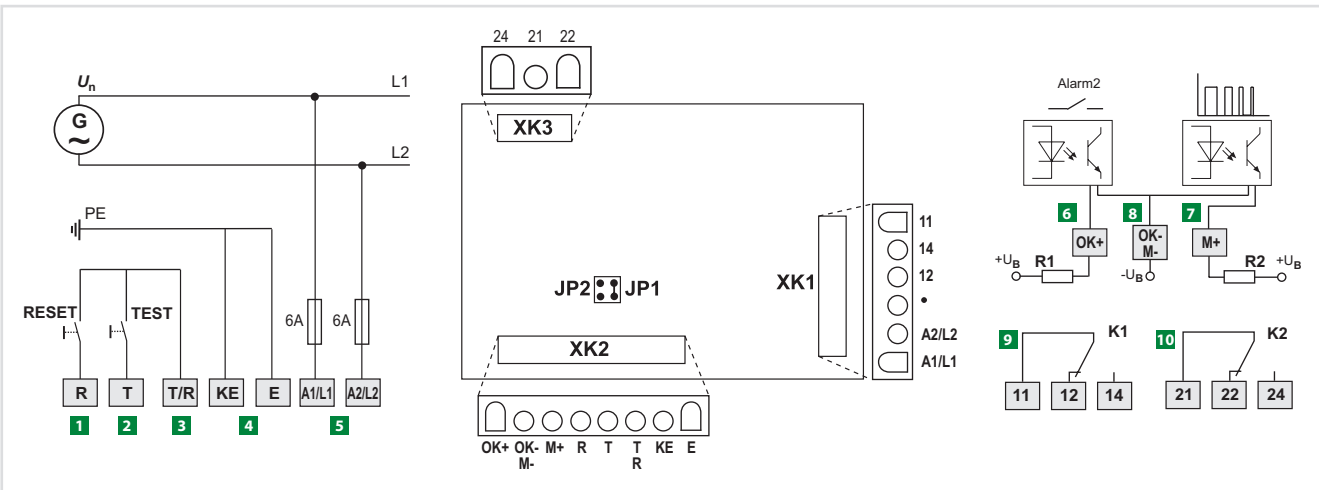
Operating mode	continuous operation
Mounting	any position
Dimensions of the p.c.b., L x W x H	without connectors 107.5 mm x 76.5 mm x 20 mm
	with connectors 107.5 mm x 76.5 mm x 35 mm
Enclosure	without
Software version	D282 V1.0x
Weight	≤ 150 g

(*) = factory setting

Dimension diagrams (dimensions in mm)



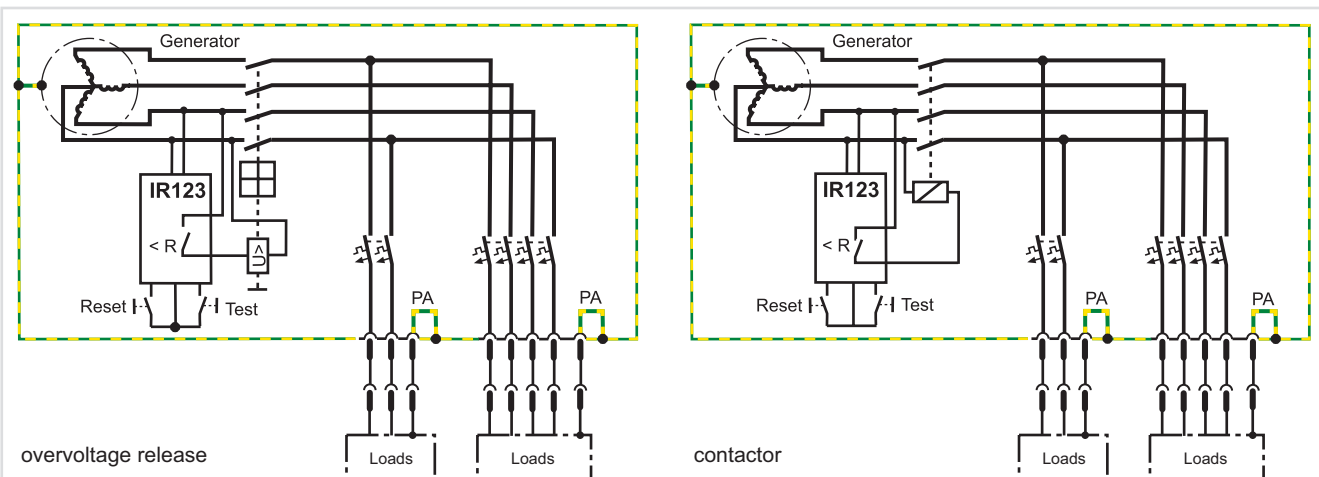
Wiring diagrams



- 1 Input for reset button "R" (N/O contact)
- 2 Input for test button "T" (N/O contact)
- 3 Common input for test and reset button "T/R"
- 4 Connect the leads E and KE separately to PE
- 5 Supply voltage $U_S = U_n$
Connection to the IT system to be monitored

- 6 Digital output optocoupler "OK+": Alarm 2;
Connect to external operating voltage U_B : max. +24 V
- 7 Pulse-width-modulated output optocoupler "M+": Measuring value;
Connect to external operating voltage U_B : max. +24 V
- 8 Common reference point $-U_B$ "OK-, M-" for OK+ and M+
- 9 Alarm relay "K1"
- 10 Alarm relay "K2"

Application example with overvoltage release or contactor



Setting K1/K2 for **overvoltage release**: N/O operation

Setting K1/K2 for **contactor**: N/C operation

ISOMETER® IR155-3203/IR155-3204

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



Typical applications

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

Device features

- Suitable for 12 V and 24 V systems
- Automatic device self test
- Continuous measurement of the insulation resistance 0...10 MΩ
 - Response time for the first measurement of the system state (SST), < 2 s after switching the supply voltage on
 - Response time < 20 s for insulation resistance measurement (DCP)
- Automatic adaptation to the existing systemleakage capacitance ($\leq 1 \mu\text{F}$)
- 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 ($f = 10...50 \text{ Hz}$) at high or inverted low-side driver (M_{HS}/M_{LS} output)
- Protective coating (SL 1301ECO-FLZ)

Standards

IEC 61557-8	2007-01
IEC 61010-1	2010-06
IEC 60664-1	2004-04
ISO 6469-3	2001-11
ISO 23273-3	2006-11
ISO 16750-1	2006-08
ISO 16750-2	2010-03
ISO 16750-4	2010-04
e1 acc. 72/245/EWG/EEC	2009/19/EG/EC
DIN EN 60068-2-38	Z/AD:2010
DIN EN 60068-2-30	Db:2006
DIN EN 60068-2-14	Nb:2010
DIN EN 60068-2-64	Fh:2009
DIN EN 60068-2-27	Ea:2010

Exclusion of standards

The device went through an automotive test procedure in combination with special customer requirements.

In order to fulfill the requirements of the IEC 61557-8 standard, a visual warning device and a test facility for detecting whether the device is fulfilling its function have to be realised by the customer.

The devices provides no surge and load dump protection above 60 V. An additional central protection is necessary.

Further information

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

Ordering information

Parameters	Response value R_{an}	F_{ave}	Undervoltage detection	Measured value output	Type	Art. No.
Continuously set value	100 kΩ	10	300 V	Low-side	IR155-3203	B 9106 8138V4
			0 V (inactive)	High-side	IR155-3204	B 9106 8139 V4
Customer-specific setting	100 kΩ...1 MΩ	1...10	0 V...500 V	Low-side	IR155-3203	B 9106 8138CV4
				High-side	IR155-3204	B 9106 8139CV4

Accessories

Type designation	Art. No.
Fastening set	B 9106 8500
Connector set IR155-32xx	B 9106 8501

Technical data

Insulation coordination acc. to IEC 60664-1

Protective separation (reinforced insulation)	between (L+/-) – (Kl. 31, Kl. 15, E, KE, M _{HS} , M _{LS} , OK _{HS})
Voltage test	AC 3500 V/1 min

Supply/IT system being monitored

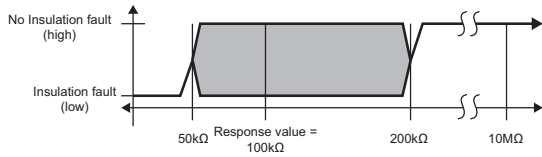
Supply voltage U_S	DC 10...36 V
Max. operating current I_S	150 mA
Max. current I_k	2 A
	6 A/2 ms inrush current
HV voltage range (L+/-) U_n	AC 0...1000 V (peak value) 0...660 V rms (10 Hz...1 kHz) DC 0...1000 V
Power consumption	< 2 W

Response values

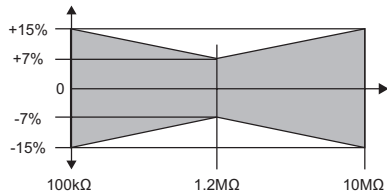
Response value hysteresis (DCP)	25 %
Response value R_{an}	100 k Ω ...1 M Ω
Undervoltage detection	0...500 V

Measuring range

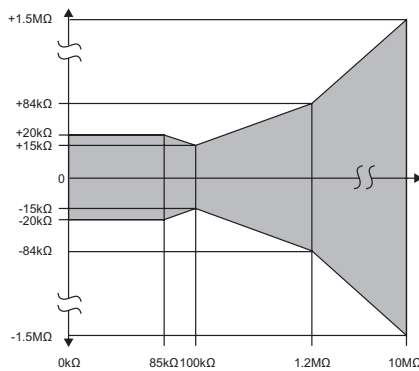
Measuring range	0...10 M Ω
Undervoltage detection	0...500 V default setting: 0 V (inactive)
Relative uncertainty	
SST (≤ 2 s)	good $> 2 * R_{an}$; bad $< 0.5 * R_{an}$
Relative uncertainty DCP	0...85 k Ω \triangleright ± 20 k Ω
(default setting 100 k Ω)	100 k Ω ...10 M Ω \triangleright ± 15 %
Relative uncertainty output M (fundamental frequency)	± 5 % at each frequency (10 Hz; 20 Hz; 30 Hz; 40 Hz; 50 Hz)
Relative uncertainty undervoltage detection	$U_n \geq 100$ V \triangleright ± 10 %; at $U_n \geq 300$ V \triangleright ± 5 %
Relative uncertainty (SST)	"Good condition" $\geq 2 * R_{an}$ "Bad condition" $\leq 0.5 * R_{an}$



Relative uncertainty DCP	100 k Ω ...10 M Ω ± 15 % 100 k Ω ...1.2 M Ω \triangleright ± 15 % to ± 7 % 1.2 M Ω \triangleright ± 7 % 1.2...10 M Ω \triangleright ± 7 % to ± 15 % 10 M Ω \triangleright ± 15 %
--------------------------	---



Absolute uncertainty	0...85 k Ω \triangleright ± 20 k Ω
----------------------	--



Time response

Response time t_{an} (OK _{HS} ; SST)	$t_{an} \leq 2$ s (typ. < 1 s at $U_n > 100$ V)
Response time t_{an} (OK _{HS} ; DCP)	(when changing over from $R_F = 10$ M Ω to $R_{an}/2$; at $C_e = 1$ μ F; $U_n = DC$ 1000 V)
	$t_{an} \leq 20$ s (at $F_{ave} = 10^*$) $t_{an} \leq 17.5$ s (at $F_{ave} = 9$) $t_{an} \leq 17.5$ s (at $F_{ave} = 8$) $t_{an} \leq 15$ s (at $F_{ave} = 7$) $t_{an} \leq 12.5$ s (at $F_{ave} = 6$) $t_{an} \leq 12.5$ s (at $F_{ave} = 5$) $t_{an} \leq 10$ s (at $F_{ave} = 4$) $t_{an} \leq 7.5$ s (at $F_{ave} = 3$) $t_{an} \leq 7.5$ s (at $F_{ave} = 2$) $t_{an} \leq 5$ s (at $F_{ave} = 1$)
	during the self test $t_{an} + 10$ s

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

(when changing over from $R_F = 10$ M Ω to $R_{an}/2$; at $C_e = 1$ μ F; $U_n = DC$ 1000 V)	
	$t_{ab} \leq 40$ s (at $F_{ave} = 10$) $t_{ab} \leq 40$ s (bei $F_{ave} = 9$) $t_{ab} \leq 33$ s (at $F_{ave} = 8$) $t_{ab} \leq 33$ s (at $F_{ave} = 7$) $t_{ab} \leq 33$ s (at $F_{ave} = 6$) $t_{ab} \leq 26$ s (at $F_{ave} = 5$) $t_{ab} \leq 26$ s (at $F_{ave} = 4$) $t_{ab} \leq 26$ s (at $F_{ave} = 3$) $t_{ab} \leq 20$ s (at $F_{ave} = 2$) $t_{ab} \leq 20$ s (at $F_{ave} = 1$)
	during a self test $t_{ab} + 10$ s

Duration of the self test

	10 s (every five minutes; should be added to t_{an}/t_{ab})
--	---

Measuring circuit

System leakage capacitance C_e	≤ 1 μ F
Smaller measurement range and increased measuring time at C_e	> 1 μ F (e.g. max. range 1 M Ω @ 3 μ F; $t_{an} = 68$ s when changing over from R_F 1 M Ω to $R_{an}/2$)
Measuring voltage U_M	± 40 V
Measuring current I_M at $R_F = 0$	± 33 μ A
Impedance Z_i at 50 Hz	≥ 1.2 M Ω
Internal DC resistance R_i	≥ 1.2 M Ω

Output

Measurement output (M)	
M_{HS} switches to $U_S - 2$ V (3204)	
(external pull-down resistor to Kl. 31 necessary 2.2 k Ω)	
M_{LS} switches to Kl. 31 + 2 V (3203)	
(external pull-down resistor to U_b required 2.2 k Ω)	
	0 Hz \triangleright Hi > short-circuit to U_b + (Kl. 15); Low > IMD off or short-circuit to Kl. 31
	10 Hz \triangleright Normal condition Insulation measurement DCP; starts two seconds after power on; First successful insulation measurement at ≤ 17.5 s PWM active 5...95 %
	20 Hz \triangleright undervoltage condition Insulation measurement DCP (continuous measurement); starts two seconds after power on; PWM active 5...95 % First successful insulation measurement at ≤ 17.5 s Undervoltage detection 0...500 V (Bender configurable)
	30 Hz \triangleright Speed start measurement Insulation measurement (only good/bad evaluation) starts directly after power on ≤ 2 s; PWM 5...10 % (good) and 90...95 % (bad)
	40 Hz \triangleright Device error Device error detected; PWM 47.5...52.5 %
	50 Hz \triangleright Connection fault earth Fault detected on the grounding connection (Kl. 31) PWM 47.5...52.5 %

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

Technical data (continued)

Status output (OK_{HS})

OK_{HS} switches to U_S – 2 V
(external pull-down resistor to Kl. 31 required 2.2 kΩ)

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

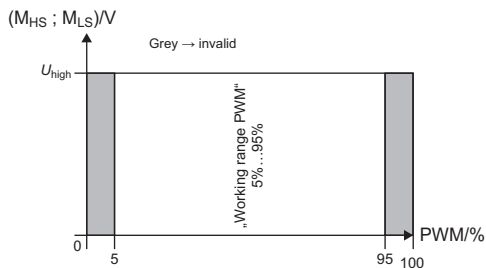
Operating principle PWM driver

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

Duty cycle 5 % = >50 MΩ (∞)
Duty cycle 50 % = 1200 kΩ
Duty cycle 95 % = 0 kΩ

$$R_F = \frac{90\% \times 1200\text{ k}\Omega}{d_{\text{Cmeas}} - 5\%} - 1200\text{ k}\Omega$$

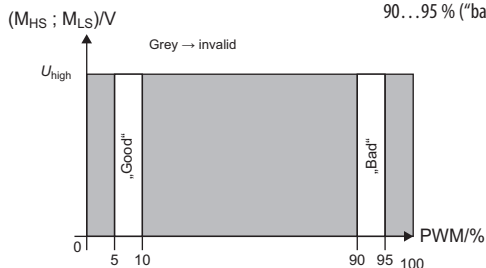
d_{Cmeas} = measured duty cycle (5 %...95 %)



Operating principle PWM driver

- Condition "SST" (30 Hz)

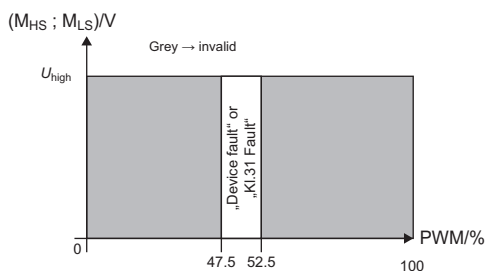
Duty cycle ▶ 5...10 % ("good")
90...95 % ("bad")



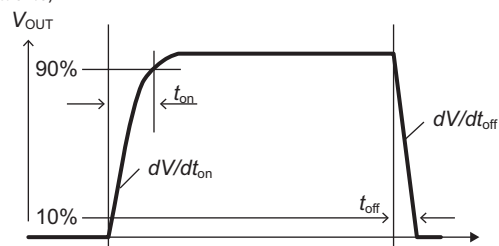
Operating principle PWM driver

- Condition "Device error" and "Kl.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-on time ▶ to 10 % V _{out}	max. 175 μs
Slew rate on ▶ 10...30 % V _{out}	max. 6 V/μs
Slew rate off ▶ 70...40 % V _{out}	max. 8 V/μs
Timing 3204 (inverse to 3203)	



EMC

Load dump protection	< 60 V
Measurement method	Bender-DCP technology
Factor averaging	
F _{ave} (output M)	1...10 (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

Connectors	TYCO-MICRO MATE-N-LOK 1 x 2-1445088-8 (Kl. 31, Kl.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+ resp. 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

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	UL94 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 maximum 10 Nm pressure to the PCB at the mounting points.

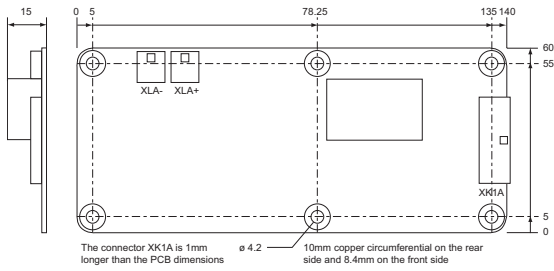
Mounting and connector kits are not included in delivery, but are available as accessories.

The maximum diameter of the mounting points is 10 mm.

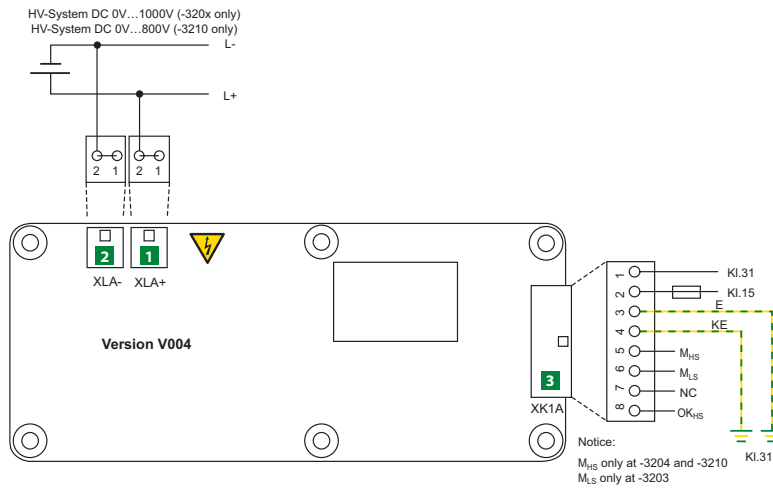
Before mounting the device, ensure sufficient insulation between the device and the vehicle resp. the mounting points (min. 11,4 mm to other parts). If the device is mounted on a metal or conductive subsurface, this subsurface has to get ground potential (Kl.31; vehicle mass).

Deflection	max. 1% of the length resp. width of the PCB
Coating	thick-film-lacquer
Weight	52 g ± 2 g

Dimension diagrams (dimensions in mm)



Wiring diagrams



1 Connectors XLA+

Pin 1+2 L+ mains voltage

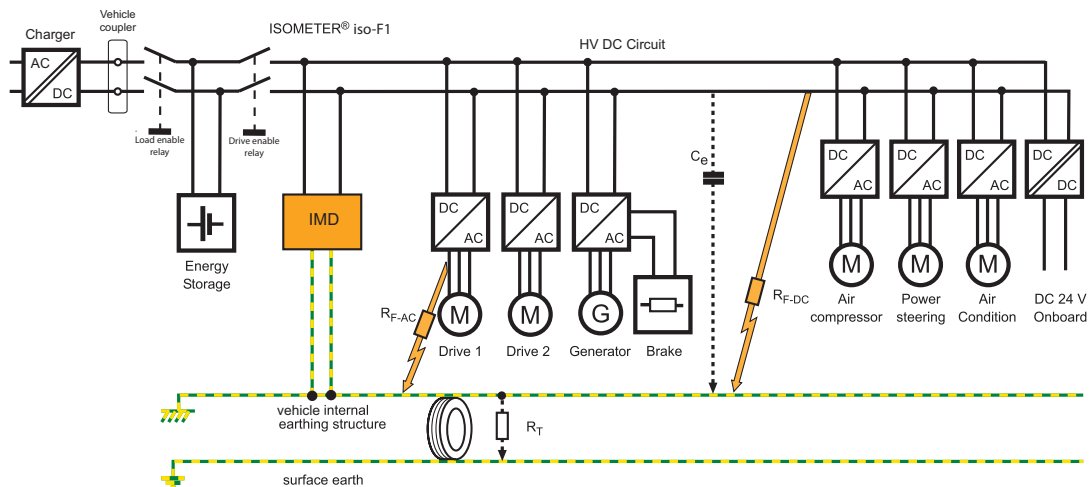
2 Connectors XLA-

Pin 1+2 L- mains voltage

3 Connectors XK1A

Pin 1	KI. 31	Ground connection
Pin 2	KI. 15	Supply voltage
Pin 3	KI. 31	Ground connection
Pin 4	KI 31	Ground connection (separate line)
Pin 5	M_{HS}	Measured value output, PWM (High-Side)
Pin 6	M_{LS}	Measured value output, PWM (Low-Side)
Pin 7	n.c.	
Pin 8	OK_{HS}	Status output (High-Side)

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 CD IEC 61851-23

Device features

- Insulation monitoring for DC charging stations (mode 4 according to IEC 61851-1/CD 61851-12) for charging electric vehicles
- Mains voltage DC 0...1100 V and AC 0...793 V
- Two factory-set response values
- Leakage capacitance $\leq 5 \mu\text{F}$
- Continuous monitoring of system/earth connections
- LEDs: Power On, Alarm 1, Alarm 2
- Internal test/reset button
- Two alarm relays with single pole (one N/O contact each)
- N/O or N/C operation, selectable
- Fault memory behaviour, selectable
- Self monitoring with automatic alarm
- Multi-functional LC display
- RS-485 interface
- Compact two-module enclosure (36 mm) plus coupling in a two-module enclosure
- Quick wiring by push-wire terminals

Standards

The ISOMETER® of the isoEV425 series complies with the requirements of the device 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.com.

Ordering information

Supply voltage ¹⁾ U _S		Type	Art. No.
DC	AC		
22...250 V	90...250 V, 42...460 Hz	isoEV425-D4 with AGH420	B 7103 6401

Device version with screw terminals on request.

¹⁾ Absolute values

Accessories

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

* Delivery time on request

Technical data

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

Rated insulation voltage	250 V
Rated impulse voltage/pollution degree	2.5 kV/3
Protective separation (reinforced insulation) between	(A1, A2) - (L1/+ , L2/- , E, KE) - (11, 12, 14)
Voltage test acc. to IEC 61010-1	2.21 kV

Supply voltage

Supply voltage	DC 22...250 V, AC 90...250 V, 42...460 Hz
Tolerance	0.8...1.1
Power consumption	≤ 3 W, ≤ 6 VA

IT system being monitored

Nominal system voltage U_n	DC 0...1100 V AC 0...793 V, 15...460 Hz
------------------------------	--

Response values

Response value R_{an1} (Alarm 1)	10...990 k Ω (300 k Ω)*
Response value R_{an2} (Alarm 2)	10...990 k Ω (100 k Ω)*
Relative uncertainty	-0 +30 %
Hysteresis	25 %

Time response

Response time t_{an} at $R_f = 0.5 \times R_{an}$ and $C_e = 1 \mu F$	≤ 2 s
Start-up delay (start time) t	0...10 s (0 s)*
Response delay t_{on}	0...10 s (0 s)*

Measuring circuit

Measuring voltage U_m	± 45 V
Measuring current	≤ 400 μA
Internal DC resistance R_i	120 k Ω
Permissible system leakage capacitance	≤ 5 μF
Measuring range	1...990 k Ω

Displays, memory

Display range, measured value	1 k Ω ...1 M Ω
Betriebsmessunsicherheit 1...5 k Ω /5 k Ω ...1 M Ω	± 0.5 k Ω /± 15 %
Password	off/0...999 (off)*
Fault memory alarm relay	on/(off)*
Power LED	green
Alarm-plus LED	yellow
Alarm-minus LED	yellow

Interface

Interface/protocol	RS-485/BMS
Baud rate	9.6 kbit/s
Cable length	0...1200 m
Shielded cable (shield connected to PE on one side)	recommended: J-Y(St)Y min. 2 x 0.6
Terminating resistor	120 Ω (0.25 W), can be enabled in the device
Device address, BMS bus	2...90 (3)*

Switching elements

Switching elements	2 x 1 N/O contact (single pole)				
Operating principle	N/C operation or N/O operation (N/C operation)*				
Contact 11-14					indicator Alarm 1
Contact 11-24					indicator Alarm 2
Electrical endurance, number of cycles	10000				
Contact data acc. to IEC 60947-5-1					
Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-12
Rated operational voltage	230 V	230 V	220 V	110 V	24 V
Rated operational current	5 A	3 A	0.1 A	0.2 A	1 A
Minimum contact rating	1 mA at AC/DC ≥ 10 V				

Environment/EMC

EMC	IEC 61326-2-4				
Operating temperature	-25...+55 °C				
Climatic class acc. to IEC 60721					
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)				
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)				
Long-time storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)				
Classification of mechanical conditions IEC 60721					
Stationary use (IEC 60721-3-3)					3M4
Transport (IEC 60721-3-2)					2M2
Long-time storage (IEC 60721-3-1)					1M3

Connection

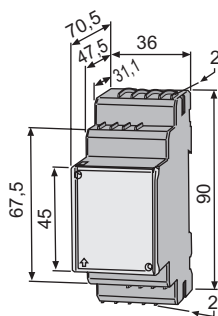
Connection type	push-wire terminal				
Connection properties					
rigid	0.2...2.5 mm ² (AWG 24...14)				
flexible without ferrule	0.2...2.5 mm ² (AWG 24...14)				
flexible with ferrule	0.2...1.5 mm ² (AWG 24...16)				
Stripping length	10 mm				
Opening force	50 N				
Test opening, diameter	2.1 mm				

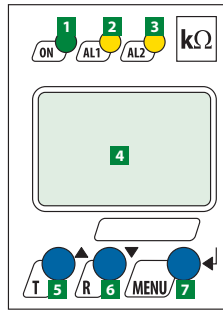
Other

Operating mode	continuous operation				
Mounting	any position				
Degree of protection, internal components (IEC 60529)	IP30				
Degree of protection, terminals (IEC 60529)	IP20				
Enclosure material	polycarbonate				
DIN rail mounting acc. to	IEC 60715				
Screw mounting	2 x M4 with mounting clip				
Operating manual					
Weight with coupling device	≤ 200 g				

(*) = factory setting

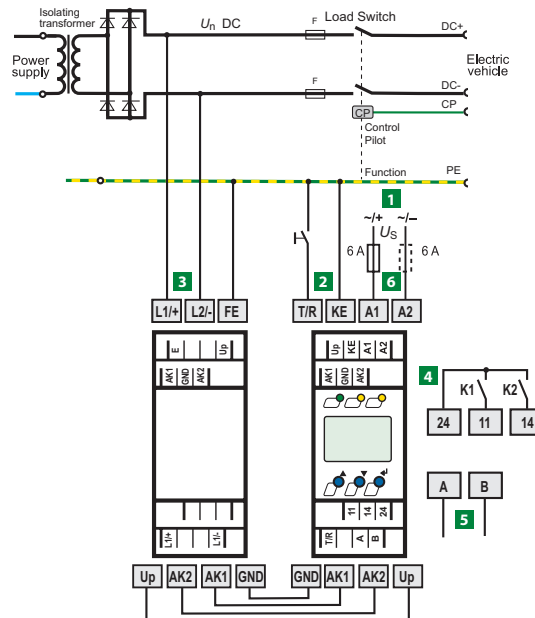
Dimension diagram (dimensions in mm)



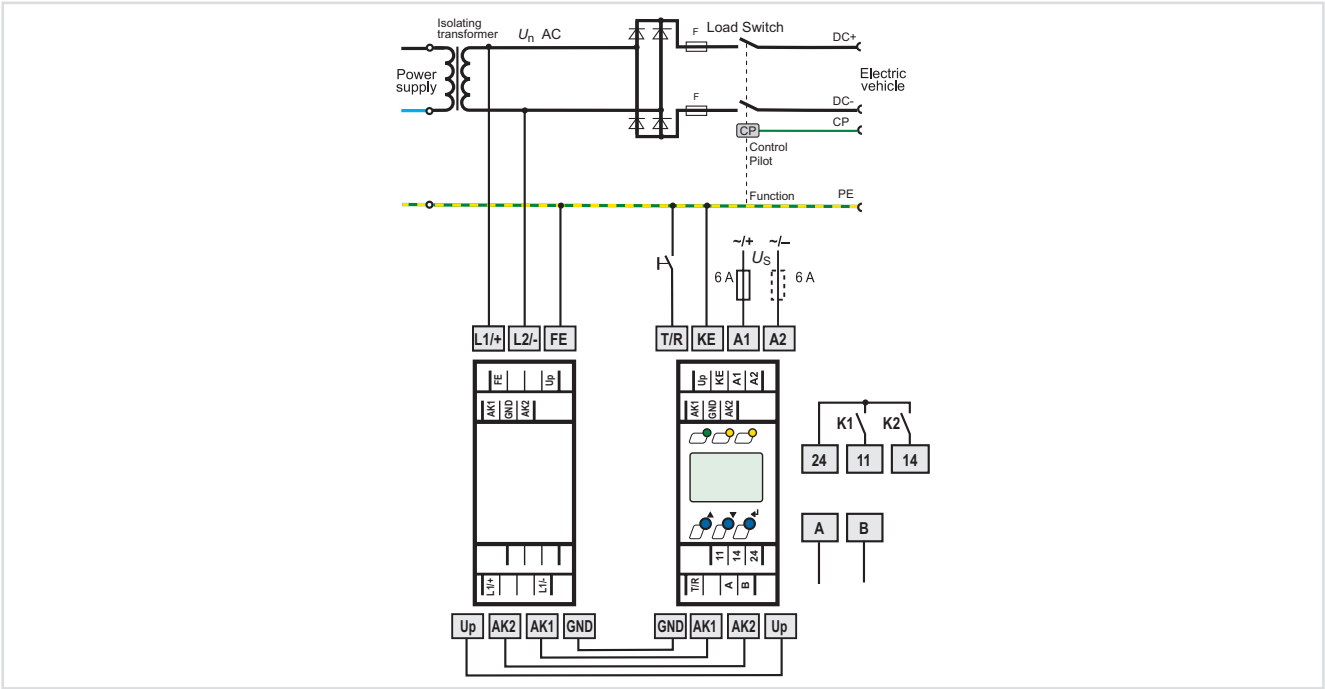


- 1** Power On LED "ON" flashes in case of interruption of the connecting leads E/KE or L1/L2 or system fault.
- 2** Alarm LED "AL1", lights when the value falls below the set response value Alarm 1 and flashes in case of interruption of the connecting leads E/KE or L1/L2 or system fault.
- 3** Alarm LED "AL2", lights when the value falls below the set response value Alarm 2 and flashes in case of interruption of the connecting leads E/KE or L1/L2 or system fault.
- 4** LC display
- 5** Test button "T": to call up the self test.
Arrow up button: Parameter change, to move up in the menu
- 6** Reset button "R": to delete stored insulation fault alarms
Down button: parameter change, to move down in the menu
- 7** Menu button "MENU": to call up the menu system.
Enter button: to confirm parameter changes

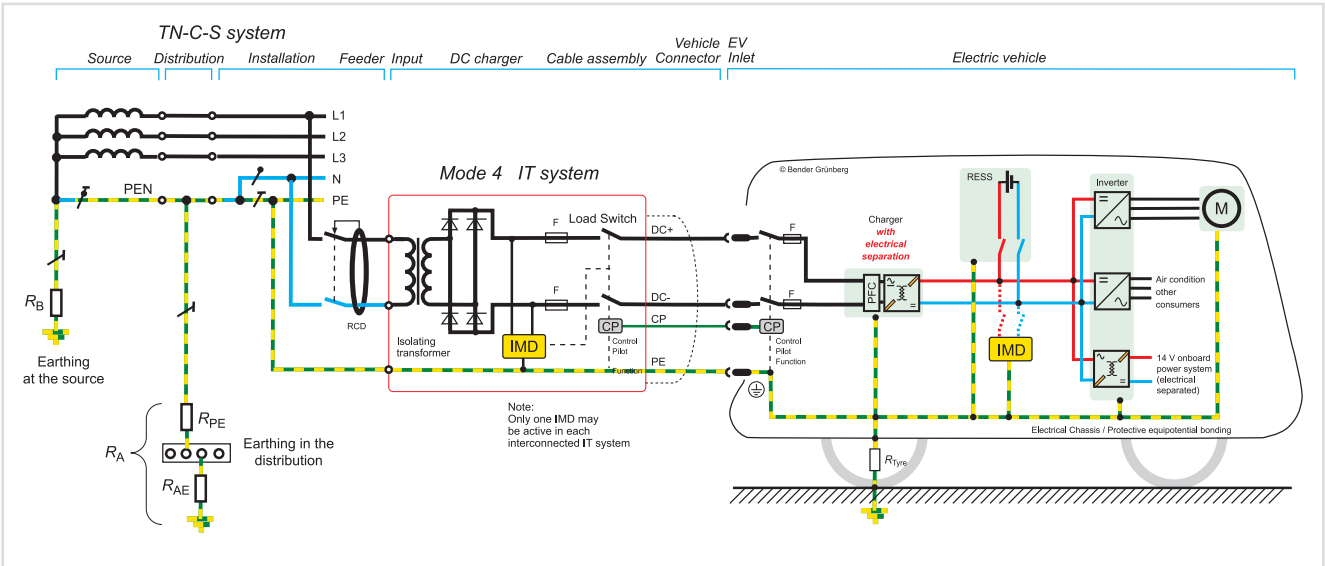
Wiring diagram



- 1** Supply voltage U_S (see ordering details) via fuse
- 2** Separate connection of FE, KE to PE
- 3** Connection to the IT system to be monitored: Connect terminals L1 (+) to L+, and L2 (-) to L-
- 4** Alarm relays "K1", "K2" with single pole
- 5** Serial interface RS-485 (termination with a 120 Ω resistor, can be enabled in the device) Bender protocol BMS
- 6** Line protection by a fuse in accordance with IEC 60364-4-43 (6 A fuse recommended).
If being supplied from an IT system, both lines have to be protected by a fuse.



Example of application



ISOMETER® isoRW425 *

Insulation monitoring device for unearthed AC/DC control circuits (IT systems) for railway applications up to AC/DC 400 V



Typical applications

- AC control circuits in industry, mechanical engineering, power stations, elevators, automation systems and railway systems in accordance with EN 50155
- 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 (VDE 0100-725)
- Smaller AC IT systems such as lighting systems, mobile generators

Device features

- Insulation monitoring for unearthed systems AC/DC 0...400 V
- Measurement of the nominal system voltage with undervoltage and overvoltage detection
- Measurement of the voltages system to earth (L+/PE and L-/PE)
- Measurement of the system leakage capacitance
- BMS interface
- Information about the point of fault L+/L- via display and relay contacts
- Automatic adaptation to the system leakage capacitance up to 300 µF
- Supply voltage range DC 24...240 V/AC 100...240 V
- Self monitoring with automatic alarm message
- Mains/earth connection monitoring
- LEDs: Power On, Alarm 1, Alarm 2
- Internal and external test/reset button
- Two alarm relays with single pole (one N/O contact each)
- N/O or N/C operation selectable
- Fault memory, selectable
- Multi-functional LC display
- Adjustable response delay
- Compact two-module enclosure (36 mm)
- Quick wiring by push-wire terminals
- Adjustable response value for R_e and Z_e

Standards

The ISOMETER® isoRW425 complies with the requirements of the device standards: DIN EN 61557-8 (VDE 0413-8), IEC 61557-8 and EN 50155

Further information

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

Ordering information

Nominal system voltage U_n	Supply voltage ¹⁾ U_s		Type	Art. No.	
	DC/AC	DC			AC
0...400 V, 10...460 Hz		24...240 V	100...240 V, 47...63 Hz	isoRW425-D4W-4	B 7103 7001W

Device version with screw terminals on request.

¹⁾ Absolute values

Accessories

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

* Delivery time on request

Technical data

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

Rated insulation voltage	400 V
Rated impulse voltage/pollution degree	4.0 kV/3
Protective separation (reinforced insulation) between (A1, A2) - (L1, L2, E, KE, T/R, A, B) - (11, 14, 24)	
Voltage test acc. to IEC 61010-1	2.21 kV

Supply voltage

Supply voltage U_S	DC 24...240 V, AC 100...240 V
Tolerance of U_S	-30...+15 %
Frequency range	47...63 Hz
Power consumption	≤ 3 W, ≤ 10 VA

IT system being monitored

Nominal system voltage U_n	AC/DC 0...400 V
Tolerance of U_n	+25 %
Nominal frequency f_n	DC, 10...460 Hz

Response values

Undervoltage detection	30...499 V (off)*
Overvoltage detection	31...500 V (off)*
Hysteresis	5 %
Response value R_{an1} (Alarm 1)	1...990 kΩ (10 kΩ)*
Response value R_{an2} (Alarm 2)	1...990 kΩ (5 kΩ)*
Response value Z_{an}	1...990 kΩ (off)*
Relative uncertainty	± 15 %
Hysteresis	25 %

Time response

Response time t_{an} at $R_F = 0.5 \times R_{an}$ and $C_e = 1 \mu F$	≤ 5 s
Start-up delay (start time) t	0...10 s (0 s)*
Response delay t_{on}	0...99 s (0 s)*
Delay on release t_{off}	0...99 s (0 s)*

Measuring circuit

Measuring voltage U_m	12 V
Measuring current I_m (at $R_F = 0 \Omega$)	≤ 100 μA
Internal DC resistance R_i	≥ 120 kΩ
Impedance Z_i at 50 Hz	≥ 120 kΩ
Permissible system leakage capacitance	≤ 300 μF

Displays, memory

Display range, measured value	0.5 kΩ...1 MΩ
Operating uncertainty 0.5...5 kΩ/5 kΩ...1 MΩ	± 0.3 kΩ/± 15 %
Display range, measured value nominal system voltage	10...500 VRMS
Operating uncertainty	± 3 V/± 15 %
Display range, measured value system leakage capacitance	1 nF...300 μF
Relative uncertainty	± 1 nF/± 30 %
Password	off / 0...999 (off)*
Fault memory, alarm relay	on/off*

Outputs

Cable length test and reset button	≤ 10 m
------------------------------------	--------

Interface

Interface/protocol	RS-485/BMS
Baud rate	9.6 kbit/s
Cable length	0...1200 m
Shielded cable (shield connected to PE on one side)	recommended: J-Y(St)Y min. 2x0.6
Terminating resistor	120 Ω (0.25 W), can be enabled in the device
Device address, BMS bus	3...90 (3)*

Switching elements

Switching elements	2 x 1 N/O contact
Operating principle	N/C operation/N/O operation (N/C operation)*
Electrical endurance, number of cycles	10000
Contact data acc. to IEC 60947-5-1	
Utilisation category	AC-13 AC-14 DC-12 DC-12 DC-12
Rated operational voltage	230 V 230 V 220 V 110 V 24 V
Rated operational current	5 A 3 A 0.1 A 0.2 A 1 A
Minimum contact rating	1 mA at AC/DC ≥ 10 V

Environment/EMC

EMC	EN 50121-3-2/IEC 61326-2-4
Operating temperature	-40...+70 °C
Classification of mechanical conditions IEC 60721/EN 50125-1	
Stationary use (IEC 60721-3-3)	3K7
Transport (IEC 60721-3-2)	2K4
Long-time storage (IEC 60721-3-1)	1K6
Classification of mechanical conditions IEC 60721/EN 61373	
Stationary use (IEC 60721-3-3)	3M7
Transport (IEC 60721-3-2)	2M2
Long-time storage (IEC 60721-3-1)	1M3

Connection

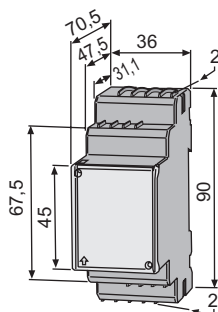
Connection type	push-wire terminal
Connection properties	
rigid	0.2...2.5 mm ² (AWG 24...14)
flexible without ferrule	0.2...2.5 mm ² (AWG 24...14)
flexible with ferrule	0.2...1.5 mm ² (AWG 24...16)
Stripping length	10 mm
Opening force	50 N
Test opening, diameter	2.1 mm

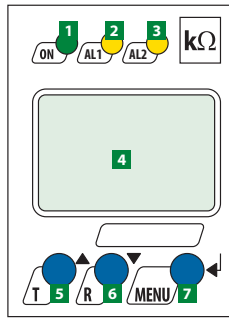
Other

Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (IEC 60529)	IP 30
Degree of protection, terminals (IEC 60529)	IP 20
Enclosure material	polycarbonate
DIN rail mounting acc. to	IEC 60715
Screw mounting	2 x M4 with mounting clip
Operating manual	TBP103010
Weight	≤ 150 g

(*) = factory setting

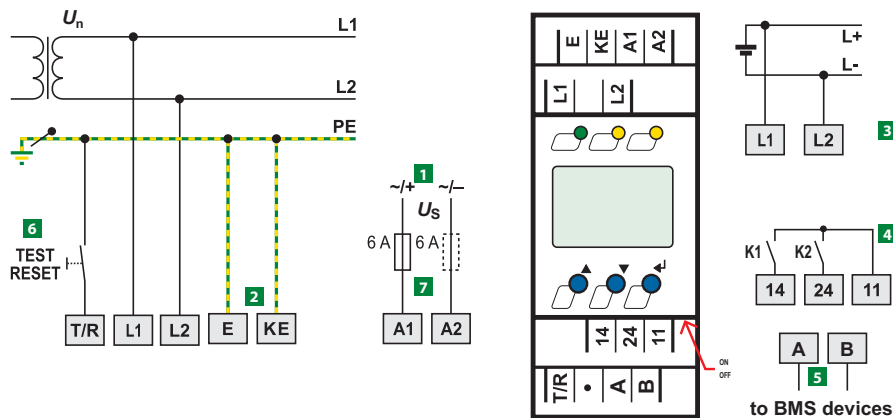
Dimension diagram (dimensions in mm)





- 1** LED power "ON", flashes in case of interruption of the connecting leads E/KE, L1/L2 or system fault.
- 2** Alarm LED "AL1", lights when the value falls below the set response value Alarm 1 and flashes in case of interruption of the connecting leads E/KE or L1/L2 or system fault and in case of overvoltage (can be activated).
- 3** Alarm LED "AL2", lights when the value falls below the set response value Alarm 2 and flashes in case of interruption of the connecting leads E/KE or L1/L2 or system fault and in case of undervoltage (can be activated).
- 4** LC display
- 5** Test button "T": To call up the self test
Arrow up button: to change parameters, move upwards in the menu.
- 6** Reset button "R": to delete stored insulation fault alarms.
Down button: to change parameters, move downwards in the menu.
- 7** Menu button "MENU": to call up the menu system.
Enter button: to confirm parameter changes.

Wiring diagram



- 1** Supply voltage U_s (see ordering information) via fuse
- 2** Separate connection of E, KE to PE
- 3** Connection to the IT system to be monitored:
AC: Connect terminals L1, L2 to conductor L1, L2. DC: Connect terminal L1 to L+ and L2 to L-.
- 4** Alarm relay K1, K2 with single pole
- 5** Serial interface RS-485 (termination with a 120 Ω resistor, can be enabled in the device) Bender protocol BMS
- 6** Combined test and reset button "T/R"
short-time pressing (< 1.5 s) = RESET
long-time pressing (> 1.5 s) = TEST
- 7** Line protection by a fuse in accordance with DIN VDE 0100-430/IEC 60364-4-43 (6 A fuse recommended). In case of supply (A1/A2) from an IT system, both lines have to be protected by a fuse.

Insulation monitoring devices

ISOMETER®



7



Equipment for insulation fault location

ISOSCAN®



85



Measuring and monitoring relays

LINETRAXX®

Power Quality and Energy Measurement

LINETRAXX®



121



Residual current monitoring systems

LINETRAXX®



175



System components

Coupling devices

Measuring current transformers

Transformers

Measuring transducers

Power supply units

Measuring instruments

Interface converters

Interface repeaters

COMTRAXX® Gateways

COMTRAXX® Alarm indicator and test combinations

COMTRAXX® condition monitors

Visualisation



203



Switching equipment

ATICS® transfer switching and monitoring devices



285



Test systems

UNIMET® Safety analyser



315



Annex

Standards and guidelines applied
Alphabetical list of devices

Technical terms
Service & project management



Device overview Equipment for insulation fault location ISOSCAN®



Page		88	92	95	100	104	107	107	110
Application		stationary	stationary	stationary	stationary	stationary	stationary	stationary	portable
Circuits	Control circuits	■	■	■			■		■
	Main circuits	■	■	■	■	■		■	■
Voltage system	3(N)AC	■					■	■	
	AC		■	■		■	■	■	
	AC/DC	■		■		■			
	DC	■		■	■	■	■	■	
Nominal voltage U_n max		dependent on type	AC 70...264 V	AC 20...276 V DC 20...308 (EDS 461,491)	DC 20...308 V		AC, 3(N)AC 20...575 V DC 20...500 V	AC, 3(N)AC 20...265 V DC 20...308 V	dependent on type
System leakage capacitance C_e μ F		≤ 500 (150)	≤ 5	acc. to characteristic curve	acc. to characteristic curve	acc. to characteristic curve			acc. to characteristic curve
Response value R_{an} k Ω		1...10000	50...500 k Ω	acc. to characteristic curve	acc. to characteristic curve	acc. to characteristic curve			acc. to characteristic curve
Special applications		Industrial plants, ships, power stations	Medical locations	Industrial plants, ships, power stations, med. locations	Industrial plants, ships, power stations	Medical locations	Locating current injector	Locating current injector	for de-energised systems
Installation	DIN rail		■	■	■		■	■	
	Screw mounting		■	■	■	■	■	■	
	Panel mounting/wall fastening	■							



			Type							
			ISOMETER® IRDH575	ISOMETER® isoMED427P	ISOSCAN® EDS460/490 EDS461/491	ISOSCAN® EDS460-DG	ISOSCAN® EDS150/151	ISOSCAN® PGH471	ISOSCAN® PGH473	ISOSCAN® EDS30...
			Page							
			88	92	95	100	104	107	107	110
			Suitable system components							
Type	P.									
Coupling device to extend the voltage range of the PGH185/186	AGE185	118								■
Measuring instruments	9620-1421	257	■							
	9620S-1421	257	■							
Panel seal for IP 42	– ¹⁾		■							
Transparent cover for IP 65		283	■							
Adapter for DIN rail mounting		–	■							
Measuring current transformers	W...	218			■	■				
	WR...	224			■	■				
	WS...	228			■	■				
	STW2	–		■						
Power supply unit	AN410	251					■			
	AN430	–					■			
	AN450	255					■			
	AN450-133	255					■			
	AN471	–			■	■				
Repeater	DI-1DL	258			■	■				
	DI-2USB	259			■	■				
Protocol converter	COM460IP	261	■	■	■	■	■	■	■	
	FTC470XMB	266	■	■	■	■	■	■	■	
	FTC470XDP	268	■	■	■	■	■	■	■	
Measuring clamp 115 mm	PSA3165	–								■
Accessories for fault location in diode-decoupled systems	EDS165-SET	–								■



ISOMETER® IRDH575

Insulation monitoring device for unearthed AC, DC and AC/DC systems (IT systems) with control and display function for EDS insulation fault location systems



Device features

- Universal application in 3(N)AC, AC/DC and DC IT systems 20...575 V/340...760 V
- Response range 1 kΩ...10 MΩ
- Info button for the indication of various parameters and the system leakage capacitance
- Comprehensive self-monitoring function including system fault alarm relay
- Internal/external test and reset button
- Two separate alarm relays, N/C or N/O operation selectable
- Backlit plain text display 4 x 16 characters
- RS-485 interface
- Data memory, disconnection from supply and 0/4...20 mA current output
- Can be extended to an insulation fault location system for max.1080 circuits
- Adjustable locating current for insulation fault location
- Appropriate for EDS4... insulation fault location systems
- AMP measurement method

Typical applications

- Insulation resistance monitoring in IT systems
- Localisation of insulation faults with additional insulation fault locators EDS4...

Approvals



Other functions

- History memory to store max. 99 alarm messages with date and time stamp
- Isometer disconnecting relays for the operation of several ISOMETER®s in coupled IT systems
- Built-in RS-485 interface (BMS bus) for communication with other Bender devices

Standards

The ISOMETER® of the IRDH575 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.com.

Ordering information

Permissible extraneous DC voltage U_{f0}	Nominal system voltage U_n		Supply voltage U_s		Type	Art. No.
	AC	DC	DC	AC		
≤ 810 V	20...575 V	20...575 V	19.2...72 V	–	IRDH575B1-427	B 9106 5502
			77...286 V	88...264 V	IRDH575B1-435	B 9106 5500
	20...150 V	20...150 V	19.2...72 V	–	IRDH575B1-4227 ¹⁾	B 9106 5505
			77...286 V	88...264 V	IRDH575B1-4235	B 9106 5504
≤ 1060 V	340...760 V	340...575 V	19.2...72 V	–	IRDH575B2-427	B 9106 5506
			77...286 V	88...264 V	IRDH575B2-435	B 9106 5503

¹⁾ Measuring voltage U_m 10 V (version -4227) for usage in control circuits
Device "Option-W" with increased resistance to shock and vibrations: Indicated by the letter "W" at the end of the order number.

Suitable system components

Designation	Type	Art. No.	Page
Panel seal for IP 42	–	B 9806 0006	–
Transparent cover for IP 65	–	B 9806 0007	283
Adapter for DIN rail mounting	–	B 9806 0010	–
Measuring instruments	9620-1421	B 986 841	257
	9620S-1421	B 986 842	257

Technical data

Insulation coordination acc. to IEC 60664-1

Rated insulation voltage	AC 800 V
Rated impulse voltage/pollution degree	8 kV/3

Voltage ranges

IRDH575B1-4235:

Nominal system voltage U_n	AC, 3/(N)AC 20...150 V*
Nominal frequency f_n	50...460 Hz
Nominal system voltage U_n	DC 20...150 V*

IRDH575B1-435:

Nominal system voltage U_n	AC, 3/(N)AC 20...575 V*
Nominal frequency f_n	50...460 Hz
Nominal system voltage U_n	DC 20...575 V*

IRDH575B2-435:

Nominal system voltage U_n	AC, 3/(N)AC 340...760 V*
Nominal frequency f_n	50...460 Hz
Nominal system voltage U_n	DC 340...575 V*

IRDH575B1-435:

Supply voltage U_S (also see nameplate)	88...264 V*
Frequency range U_S	42...460 Hz
Supply voltage U_S (also see nameplate)	DC 77...286 V*

IRDH575B1-427:

Supply voltage U_S (also see nameplate)	DC 19.2...72 V*
Power consumption	≤ 14 VA

Response values

Response value R_{an1} (Alarm1)	1 k Ω ...10 M Ω
Response value R_{an2} (Alarm2)	1 k Ω ...10 M Ω
Relative uncertainty (20 k Ω ...1 M Ω) (acc. to IEC 61557-8)	±15 %
Relative uncertainty (1...20 k Ω)	+2 k Ω /+20 %
Relative uncertainty (1...10 M Ω)	0.2 M Ω /+20 %
Measuring time	see characteristic curves
Hysteresis (1...10 k Ω)	+2 k Ω
Hysteresis (10 k Ω ...10 M Ω)	25 %

Measuring circuit for insulation measurement

Measuring voltage U_m	≤ 40 V
Measuring voltage U_m (IRDH575B1-4227)	≤ 10 V
Measuring current I_m (at $R_F = 0\Omega$)	≤ 220 μ A
Internal DC resistance R_i	≥ 180 k Ω
Impedance Z_i at 50 Hz	≥ 180 k Ω
Permissible extraneous DC voltage U_{f1} (variant B1)	≤ DC 810 V
Permissible extraneous DC voltage U_{f2} (variant B2)	≤ DC 1060 V
System leakage capacitance C_e	500 μ F
Factory setting C_e	150 μ F

Measuring circuit for insulation fault location (EDS)

Locating current I_L DC	1/2.5/10/25/50 mA
Test pulse/break	2/4 s

Displays

Display, illuminated	four-line display
Characters (number of characters)	4 x 16
Display range measured value	1 k Ω ...10 M Ω
Operating uncertainty (20 k Ω ...1 M Ω) (acc. to IEC 61557-8)	±15 %**
Operating uncertainty (1...20 k Ω)	±1 k Ω /15 %**
Operating uncertainty (1...10 M Ω)	±0.1 M Ω /15 %**

Outputs/Inputs

Test/reset button	internal/external
Current output for measuring instrument SKMP (scale centre point = 120 k Ω):	
Current output IRDH575 (max. load)	0/4...20 mA (≤ 500 Ω)
Accuracy current output (1 k Ω ...1 M Ω)	±10 %, ±1 k Ω

Serial interface

Interface/protocol	RS-485/BMS
Max. cable length	≤ 1200 m
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 (0.5 W)

Switching elements

Switching components	3 changeover contacts: K1 (Alarm 1), K2 (Alarm 2), K3 (device error, additionally selectable EDS alarm)
Operating principle K1, K2	N/O or N/C operation
Factory setting (Alarm 1/Alarm 2)	N/O operation
Operating principle K3	N/C operation
Electrical endurance, number of cycles	12000
Contact class	IIB (DIN IEC 60255-23)
Rated contact voltage	AC 250 V/DC 300 V
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
Contact rating at DC 24 V	≥ 2 mA (50 mW)

Environment/EMC

EMC	acc. to IEC 61326-2-4 Ed. 1.0
Shock resistance IEC 60068-2-27 (device in operation)	15 g/11 ms
Bumping IEC 60068-2-29 (transport)	40 g/6 ms
Vibration resistance IEC 60068-2-6 (during operation)	1 g/10...150 Hz
Vibration resistance IEC 60068-2-6 (transport)	2 g/10...150 Hz
Ambient temperature (during operation)	-10...+55 °C
Ambient temperature (during storage)	-40...+70 °C
Climatic class acc. to DIN IEC 60721-3-3	3K5

Connection

Connection	screw-type terminals
Connection properties	
rigid/flexible	0.2...4 mm ² /0.2...2.5 mm ²
flexible with ferrules without/with plastic sleeve	0.25...2.5 mm ²
Conductor sizes (AWG)	24...12

Other

Operating mode	continuous operation
Mounting	display-oriented
Distance to adjacent devices	≥ 30 mm
Degree of protection, internal components (DIN EN 60529)	IP30
Degree of protection, terminals (DIN EN 60529)	IP20
Degree of protection, for door mounting (DIN EN 60529)	IP40
Degree of protection, for door mounting with panel sealing (DIN EN 60529)	IP42
Degree of protection, for mounting the transparent front plate cover (DIN EN 60529)	IP65
Type of enclosure: suitable for panel mounting	free from halogen
Flammability class	UL94 V-0
Software version	D185 V1.6
Operating manual	TGH1364
Weight	≤ 900 g

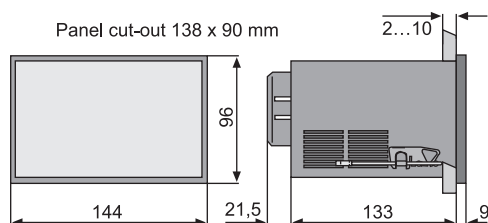
Option "W"

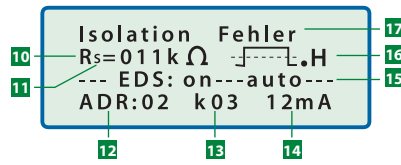
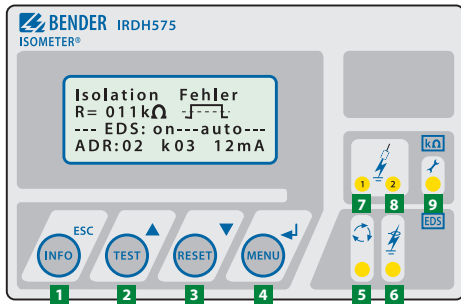
Shock resistance IEC 60068-2-27 (device in operation)	30 g/11 ms
Bumping IEC 60068-2-29 (transport)	40 g/6 ms
Vibration resistance IEC 60068-2-6	1.6 mm/10...25 Hz 4 g/25...150 Hz
Ambient temperature, during operation	-25...+70 °C
Ambient temperature, during operation	> 55 °C (not for continuous operation in the insulation fault location mode with 50 mA)
Ambient temperature for storage	-40...+85 °C

The data labelled with an * are absolute values

** = Under EMC test conditions in accordance with IEC 61326-2-4 the specified tolerances can double

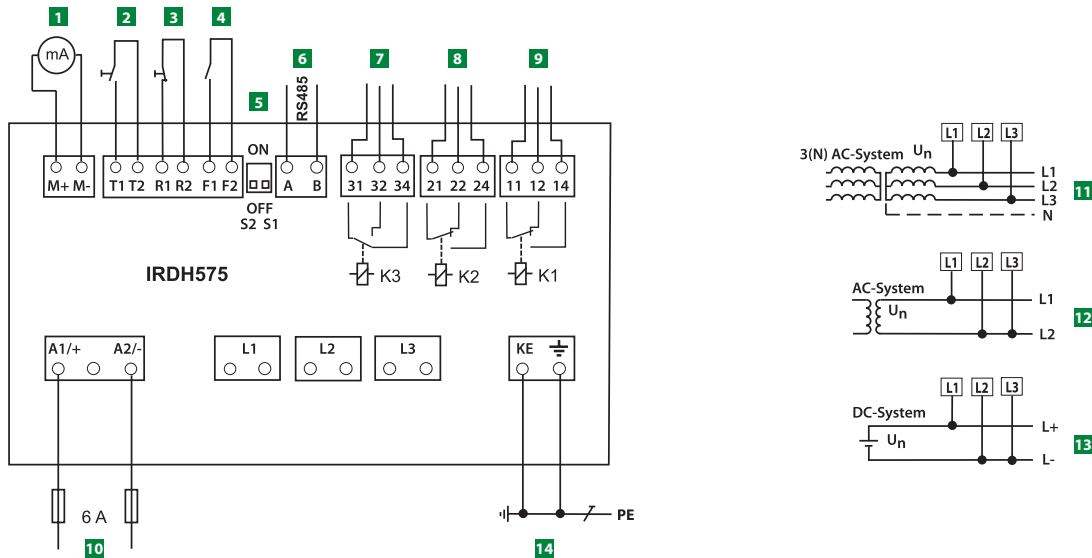
Dimension diagram (dimensions in mm)





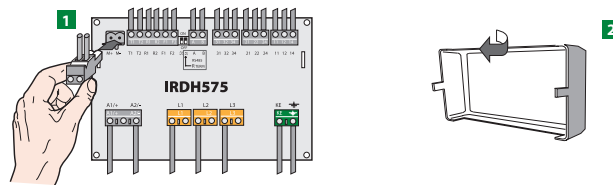
- 1** "INFO" button: to query standard information
ESC button: back (menu function), confirms parameter changes
- 2** "TEST" button: to call up the self test (Isometer function only)
Arrow up button: parameter change, to move up in the menu
- 3** "RESET" button: to delete insulation fault alarms (Isometer function only)
Arrow down button: parameter change, to move down in the menu
- 4** "MENU" button: to call up the menu system.
Enter button: to confirm parameter changes
- 5** EDS LED lights: Insulation fault location has been started
- 6** EDS alarm LED lights: Insulation fault localised
- 7** Alarm LED "1" lights: insulation fault, first warning level reached
- 8** Alarm LED "2" lights: insulation fault, second warning level reached.
- 9** LED lights: Device error
- 10** Indication of the insulation resistance in kΩ
- 11** Additional information about the insulation resistance: + = Fault at L+, - = Fault at L-, s = A new measuring process has been started.
- 12** Bus address of the testing EDS46... (indication in case of fault detection)
- 13** Channel being monitored by EDS4... (indication in case of fault detection)
- 14** Locating current in mA or μ A (indication in case of fault detection)
- 15** EDS in AUTO mode und just running. Further modes are: on, off, pos: address and channel of the EDS can be predefined (in the Master mode only). 1 cycle: When all the channels have been checked once, the EDS will be deactivated.
- 16** Polarity of the locating current. Point = valid BMS traffic, H = a new entry is made in the history memory.
- 17** Plain text fault messages

Wiring diagram



- 1** For external indicating instrument
Current output 0...20 mA or 4...20 mA
 - 2*** External test button "T1, T2" (N/O contact)
 - 3*** External reset button "R1, R2" (N/C contact or wire jumper), (with the terminals open and the ISO-SETUP setting Memory:off, insulation faults will not be stored)
 - 4*** STANDBY, when the contact is closed, no insulation measurement is carried out;
disconnection from the IT system being monitored
 - 5** S1 = ON : Termination of the serial RS-485 interface (A/B) with 120 Ω
S2 = not wired)
 - 6** Serial RS-485 interface (BMS bus)
 - 7** Alarm relay "K3" (device error and EDS alarm) (addr.: 1)
 - 8** Alarm relay "K2" (insulation fault 2); available changeover contacts
 - 9** Alarm relay "K1" (insulation fault 1); available changeover contacts
 - 10** Supply voltage U_S (see nameplate) via 6 A fuse; for UL and CSA applications, it is mandatory to use 5 A fuses.
 - 11** Connection to the 3AC system to be monitored:
Connect terminals L1, L2 L3 to conductor L1, L2, L3
 - 12** Connection to the AC system to be monitored:
Connect L1 to conductor L1 and terminals L2, L3 to conductor L2
 - 13** Connection to the DC system to be monitored:
Connect L1 to conductor L+ and terminals L2, L3 to conductor L-
 - 14** Separate connection of $\overline{\text{PE}}$ and KE to PE
- * The terminal pairs 2, 3 and 4 have to be wired electrically isolated and must not be connected to PE!

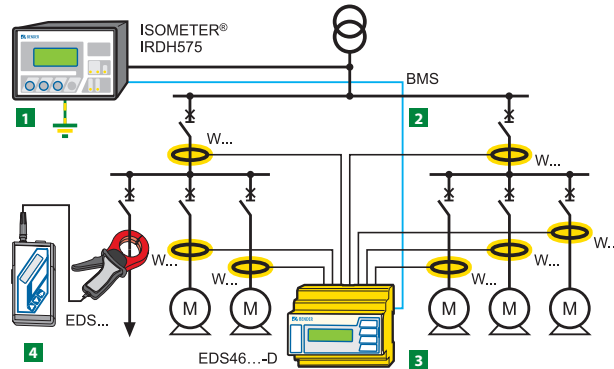
Rear view



1 Rear view IRDH575

2 Detachable terminal cover

System configuration – Example



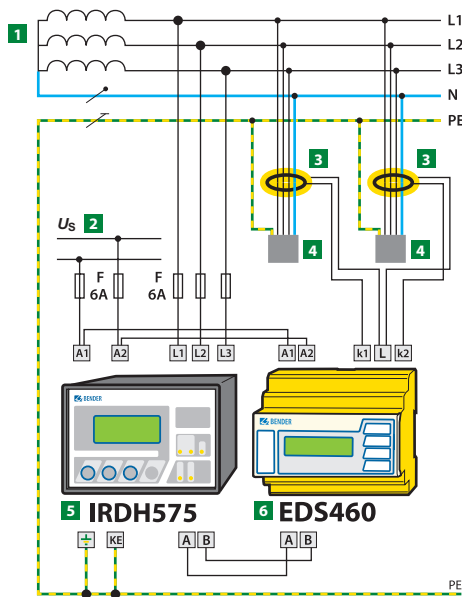
1 ISOMETER® IRDH575

2 RS-485/BMS protocol

3 EDS460/EDS461

4 EDS3090/EDS3091

Wiring example EDS system with EDS460 and IRDH575



EDS system with IRDH575, EDS460 and measuring current transformers W... in a 3AC system

1 3AC, 3NAC, DC 20...575 V bzw. 3AC, 3NAC, DC 340...760 V

2 U_s see ordering information, 6 A fuse recommended.
Note: Supply voltage U_s in the IT system requires two fuses.

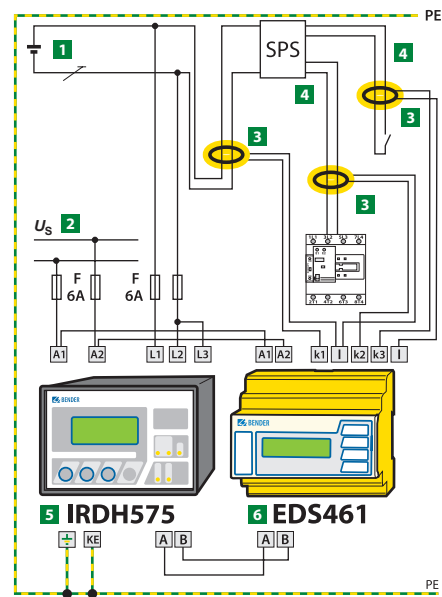
3 Measuring current transformers W...

4 Outgoing circuits to the loads

5 ISOMETER® IRDH575

6 Insulation fault locator EDS460

Wiring example EDS system with EDS461 and IRDH575



1 AC 20...265V/DC 20 V...308 V

2 U_s see ordering information, 6 A fuse recommended.
Note: Supply voltage U_s in the IT system requires two fuses.

3 Measuring current transformers W.../8000

4 Outgoing circuits PLC: inputs and outputs

5 ISOMETER® IRDH575

6 Insulation fault locator EDS461

Design of an insulation fault location system with EDS461

The example above shows an EDS461 system in a DC system for the supply of a programmable logic controller (PLC). Due to the fact that the inputs of PLC systems are very sensitive, the use of an EDS461 is recommended.

The locating current of the IRDH575 is to be set to max. 2.5 mA or as necessary to 1 mA, in order to avoid influences on the PLC system.



ISOMETER® isoMED427P

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



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® of the isoMED427P series complies with the requirements of the device standards: IEC 60364-7-710, IEC 61557-8, IEC 61557-9 and DIN VDE 0100-710.

Further information

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

Ordering information

Supply voltage $U_S = U_n^{1)}$	Type	Art. No.
AC		
70...264 V/42...460 Hz	isoMED427P-2	B 7207 5301

¹⁾ Absolute values of the voltage range

Accessories

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

Suitable system components

Type designation	Type	Page
Measuring current transformers	STW2	–
Temperature sensor (PTC)	ES0107	–
Mounting frame	XM420	282

Technical data

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

Rated insulation voltage	250 V
Rated impulse voltage/pollution degree	4 kV/3
Protective separation (reinforced insulation) between	(L1, L2, E, KE, T1, T2, A, B, Z, Z/k, I) - (11, 12, 14)
Voltage test acc. to IEC 61010-1	2.21 kV

Voltage supply

Supply voltage U_s	$= U_n$
Power consumption	≤ 4 VA

IT system being monitored acc. to IEC 60364-7-710

Nominal system voltage U_n	AC 70...264 V
Nominal frequency f_n	42...460 Hz

Insulation monitoring acc. to IEC 61557-8

Response value R_{an}	50...500 k Ω (50 k Ω)*
Relative uncertainty	± 10 %
Hysteresis	25 %
Response time t_{an} at $R_F = 0.5 \times R_{an}$ and $C_e = 0.5 \mu F$	≤ 5 s
Permissible system leakage capacitance C_e	5 μF

Measuring circuit

Measuring voltage U_m	± 12 V
Measuring current I_m (at $R_F = 0 \Omega$)	≤ 50 μA
Internal DC resistance R_i	≥ 240 k Ω
Impedance Z_i at 50 Hz	≥ 200 k Ω
Permissible extraneous DC voltage U_{dq}	$\leq DC 300$ V

Locating current injector acc. to IEC 61557-9

Locating current	≤ 1 mA
Test pulse/break	2/4 s

Load current monitoring

Response value, adjustable	5...50 A (7 A)*					
Nominal frequency f_n	47...63 Hz					
Relative uncertainty	± 5 %					
Hysteresis	4 %					
Setting values load current measurement:						
Transformer	3150 VA	4000 VA	5000 VA	6300 VA	8000 VA	10000 VA
/alarm 1~	14 A	18 A	22 A	28 A	35 A	45 A

Temperature monitoring:

Response value (fixed value)	4 k Ω
Rated frequency f_n	47...63 Hz
Release value (fixed value)	1.6 k Ω
PTC resistors acc. to DIN 44081	max. 6 in series
Relative uncertainty	± 10 %

Displays, memory

LC display	multifunctional, not illuminated
Measured value insulation resistance	10 k Ω ...1 M Ω
Operating uncertainty	± 10 %, ± 2 k Ω
Measured value load current (as % of the set response value)	10 %...199 %
Operating error	± 5 %, ± 0.2 A
Password	on, off/0...999 (off, 0)*

Interface

Interface/protocol	RS-485/BMS
Baud rate	9.6 kbit/s
Cable length	0...1200 m
Cable (twisted in pairs, one end of shield connected to PE)	recommended: J-Y(St)Y min. 2 x 0.8
Terminating resistor	120 (0.25 W), internal, switchable
Device address, BMS bus	2...90 (3)*

Interfaces for measuring current transformer STW2 and temperature sensor

Cable lengths:	
single wire > 0.5 mm ²	≤ 1 m
single wire, twisted > 0.5 mm ²	≤ 10 m
twisted in pairs, shielded > 0.5 mm ²	≤ 40 m
Cable (shield on one side connected to PE)	recommended: J-Y(St)Y min. 2 x 0.6

Switching elements

Number	1 changeover contact				
Operating principle	N/C operation or N/O operation (N/C operation)*				
Electrical endurance, number of cycles	10000				
Contact data acc. to IEC 60947-5-1					
Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-12
Rated operational voltage	230 V	230 V	24 V	110 V	220 V
Rated operational current	5 A	3 A	1 A	0.2 A	0.1 A
Minimum contact rating	1 mA at AC/DC 10 V				

Environment/EMC

EMC	IEC 61326-2-4				
Operating temperature	-25...+55 °C				
Classification of climatic conditions acc. to IEC 60721:					
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)				
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)				
Long-term storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)				
Classification of mechanical conditions acc. to IEC 60721:					
Stationary use (IEC 60721-3-3)	3M4				
Transport (IEC 60721-3-2)	2M2				
Storage (IEC 60721-3-1)	1M3				

Connection

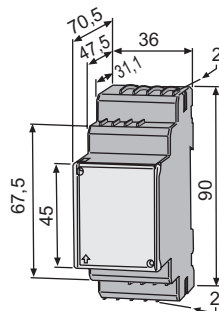
Connection type	push-wire terminals				
Connection properties					
rigid	0.2...2.5 mm ² (AWG 24...14)				
flexible without ferrule	0.2...2.5 mm ² (AWG 24...14)				
flexible with ferrule	0.2...1.5 mm ² (AWG 24...16)				
Stripping length	10 mm				
Opening force	50 N				
Test opening, diameter	2.1 mm				

Other

Operating mode	continuous operation				
Position of normal use	any				
Degree of protection, internal components (DIN EN 60529)	IP30				
Degree of protection, terminals (DIN EN 60529)	IP20				
Enclosure material	polycarbonate				
Screw mounting	2 x M4 with mounting clip				
DIN rail mounting acc. to	IEC 60715				
Flammability class	UL94V-0				
Software version	D355 V1.0x				
Operating manual	TBP201009				
Weight	≤ 150 g				

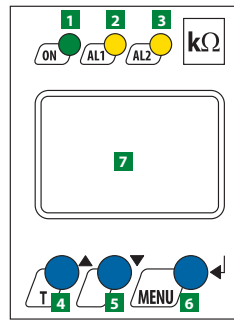
(*) = factory setting

Dimension diagram (dimensions in mm)



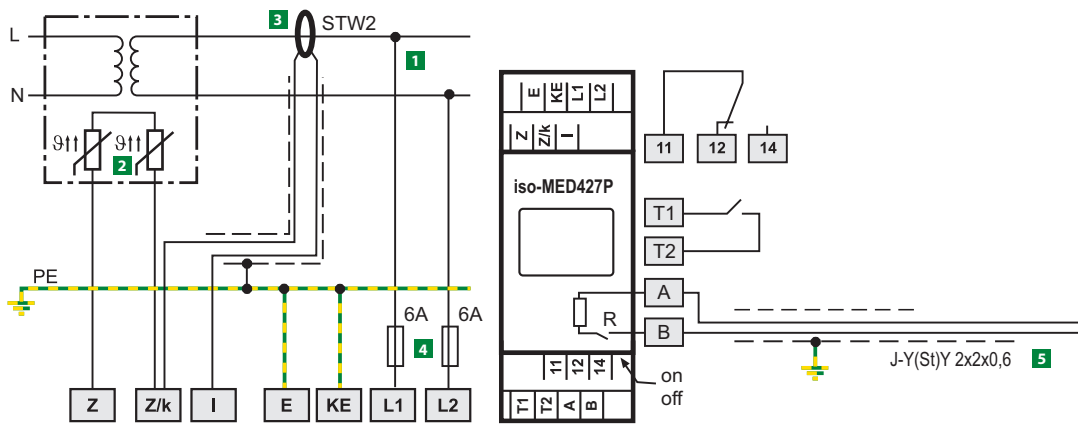
Alarm messages LEDs

	isoMED427P		
	"ON"	"AL1"	"AL2"
Operation	■	-	-
System fault*	flashing	flashing	flashing
Insulation fault	■	■	-
Overcurrent	■	-	■
Overtemperature	■	-	■



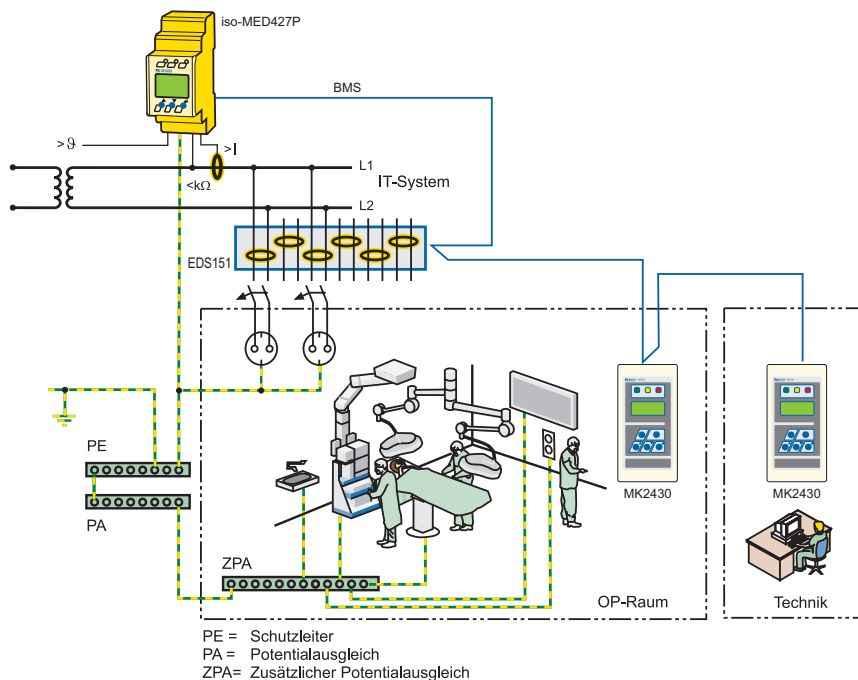
- 1** Power On LED "ON"
- 2 3** Alarm LEDs "AL1", "AL2"
- 4** "TEST" button (> 2 s): to call up the self test.
Arrow up button: parameter change, to move up in the menu
- 5** Arrow down button: parameter change to move down in the menu
- 6** "MENU" button (> 2 s): to call up the menu system.
Enter button: confirms parameter changes
- 7** LC display

Wiring diagram



- 1** Connection to the IT system to be monitored = supply voltage U_S via fuse
- 2** Temperatur sensor
- 3** Measuring current transformer for load current monitoring
- 4** Line protection by a fuse in accordance with IEC 60364-4-43 (6 A fuse recommended). In case of supply (L1/L2) from an IT system, both lines have to be protected by a fuse.
- 5** Serial interface BMS

Example of application





ISOSCAN® EDS460/490 – EDS461/491

Insulation fault locators with control and display function for EDS systems (insulation fault location systems)



Device features

- Insulation fault location in IT systems
- For AC, 3AC, DC and IT systems
- Control and display function in a single device (EDS...-D)
- 12 measuring channels (circuits) for measuring current transformers of the W, WR, WS series
- Up to 90 EDS insulation fault locators in the system (1080 measuring channels)
- Scanning time max. 10 s for all measuring channels (parallel scanning)
- Response sensitivity EDS460/490 2...10 mA, EDS461/491 0.2...1 mA
- History memory to store 300 events
- Two alarm relays with one changeover contact each
- N/O or N/C operation, selectable
- Connection external test/reset button
- Indication via graphical display resp. 7-segment display and alarm LEDs
- BMS address range 1...90
- Serial interface RS-485
- Continuous CT connection monitoring
- Fault memory behaviour selectable
- Device version EDS490/491 with one alarm contactor per channel
- Additional AC residual current measurement

Typical applications

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

Approvals



Standards

The ISOSCAN® EDS46... 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.com.

Ordering information EDS460/490-D, EDS461/491-D

Measuring range		Common alarm relay for all channels	Alarm relay per channel	Supply voltage ¹⁾ U _S			Type	Art. No.
EDS function	RCM function			DC	AC/DC	AC		
2...10 mA	100 mA...10 A	2 x 1 changeover contact	–	16...94 V	–	16...72 V/42...460 Hz	EDS460-D-1	B 9108 0001
				–	70...276 V	42...460 Hz	EDS460-D-2	B 9108 0002
0.2...1 mA	10 mA...1 A	2 x 1 changeover contact	–	16...94 V	–	16...72 V/42...460 Hz	EDS461-D-1	B 9108 0005
				–	70...276 V	42...460 Hz	EDS461-D-2	B 9108 0006
2...10 mA	100 mA...10 A	2 x 1 changeover contact	12 x 1 N/O contact	16...94 V	–	16...72 V/42...460 Hz	EDS490-D-1	B 9108 0009
				–	70...276 V	42...460 Hz	EDS490-D-2	B 9108 0010
0.2...1 mA	10 mA...1 A	2 x 1 changeover contact	12 x 1 N/O contact	16...94 V	–	16...72 V/42...460 Hz	EDS491-D-1	B 9108 0013
				–	70...276 V	42...460 Hz	EDS491-D-2	B 9108 0014

¹⁾ Absolut values

Ordering information EDS460/490-L, EDS461/491-L

Measuring range		Common alarm relay for all channels	Alarm relay per channel	Supply voltage ¹⁾ U _S			Type	Art. No.
EDS function	RCM function			DC	AC/DC	AC		
2...10 mA	100 mA...10 A	2 x 1 changeover contact	–	16...94 V	–	16...72 V/42...460 Hz	EDS460-L-1	B 9108 0003
				–	70...276 V	42...460 Hz	EDS460-L-2	B 9108 0004
0.2...1 mA	10 mA...1 A	2 x 1 changeover contact	–	16...94 V	–	16...72 V/42...460 Hz	EDS461-L-1	B 9108 0007
				–	70...276 V	42...460 Hz	EDS461-L-2	B 9108 0008
2...10 mA	100 mA...10 A	2 x 1 changeover contact	12 x 1 N/O contact	16...94 V	–	16...72 V/42...460 Hz	EDS490-L-1	B 9108 0011
				–	70...276 V	42...460 Hz	EDS490-L-2	B 9108 0012
0.2...1 mA	10 mA...1 A	2 x 1 changeover contact	12 x 1 N/O contact	16...94 V	–	16...72 V/42...460 Hz	EDS491-L-1	B 9108 0015
				–	70...276 V	42...460 Hz	EDS491-L-2	B 9108 0016

¹⁾ Absolut values

Type designation	Design	Type of construction	Type	Page
RS-485 repeater	Bus repeater	–	DI-1DL	258
	Supplied by the USB port, no additional power supply required.	–	DI-2USB	260
	Power supply unit for DI-1 or DI-2	–	AN471	–
Protocol converters	BMS bus – TCP/IP via Ethernet	–	COM460IP	261
	BMS bus – Modbus/RTU	–	FTC470XMB	266
	BMS bus – PROFIBUS DP	–	FTC470XDP	268
Measuring current transformers	pulsed DC sensitive	circular	W...	218
		rectangular	WR...	224
		split-core	WS...	228

Technical data

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

for versions with a supply voltage of AC/DC 70...276 V/AC 42...460 Hz

Rated insulation voltage	AC 250 V
Rated impulse voltage/pollution degree	6 kV/3
Protective separation (reinforced insulation) between (A1, A2) - (k1, l...k12, R, T/R, T, A, B,), C11, C12, C14), (C21, C22, C24), (11,14), (21,24), (31,34), (41,44), (51,54), (61,64), (71,74), (81,84), (91,94), (101,104), (111,114), (121,124)	
Protective separation (reinforced insulation) between (C11, C12, C14) - (C21, C22, C24) - (11, 14, 21, 24, 31, 34) - (41, 44, 51, 54, 61, 64) - (71,74) - (81,84) - (91,94) - (101,104) - (111,114) - (121,124)	
Voltage test acc. to IEC 61010-1	3.536 kV
Rated insulation voltage	AC 250 V
Rated impulse voltage/pollution degree	4 kV/3
Basic insulation between: k1, l...k12, R, T/R, T, A, B) - (C11, C12, C14), (C21, C22, C24)	
Basic insulation between: (11, 14) - (21, 24) - (31, 34) - (41, 44) - (51, 54) - (61, 64)	
Voltage test acc. to IEC 61010-1	2.21 kV

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

for versions with a supply voltage of DC 16...94 V, AC 16...72 V/42...460 Hz

Rated insulation voltage	AC 100 V
Rated impulse voltage/pollution degree	2.5 kV/3
Protective separation (reinforced insulation) between (A1, A2) - (k1, l...k12, R, T/R, T, A, B)	
Voltage test acc. to IEC 61010-1	1.344 kV
Rated insulation voltage	AC 250 V
Rated impulse voltage/pollution degree	4 kV/3
Basic insulation between (A1, A2), (k1, l...k12, R, T/R, T, A, B) - (C11, C12, C14), (C21, C22, C24), (11,14), (21,24), (31,34), (41,44), (51,54), (61,64), (71,74), (81,84), (91,94), (101,104), (111,114), (121,124)	
Basic insulation between: (11, 14) - (21, 24) - (31, 34) - (41, 44) - (51, 54) - (61, 64)	
Voltage test acc. to IEC 61010-1	2.21 kV
Rated insulation voltage	AC 250 V
Rated impulse voltage/pollution degree	6 kV/3
Protective separation (reinforced insulation) between (C11, C12, C14) - (C21, C22, C24) - (11, 14, 21, 24, 31, 34) - (41, 44, 51, 54, 61, 64) - (71,74) - (81,84) - (91,94) - (101,104) - (111,114) - (121,124)	
Voltage test acc. to IEC 61010-1	3.536 kV

Supply voltage

Supply voltage U_S	see ordering information
Frequency range U_S	AC 42...460 Hz
Power consumption	≤ 10 VA (EDS460/461) ≤ 14 VA (EDS490/491)

Measuring circuit

Nominal system voltage U_n	see IRDH575, PGH (EDS460, EDS490) AC 20...276 V, DC 20...308 V (EDS461, EDS491)
External measuring current transformers type	W..., WR..., WS... (EDS460, EDS490) W.../8000, WS.../8000 (EDS461, EDS491)
CT monitoring	on/off (on)*
Load	10 Ω (EDS460/490), 1.5 kΩ (EDS461/491)
Rated insulation voltage (measuring current transformer)	800 V
Response sensitivity EDS460/490	2...10 mA EDS461/491 0.2...1 mA
Rated frequency	DC, AC 400, 60, 50 Hz
Measuring range EDS function	1.5...50 mA (EDS460/490) 0.15...5 mA (EDS461/491)
Measuring range RCM function	100 mA...10 A (EDS460/490) 10 mA...1 A (EDS461/491)
Number of measuring channels (per device/system)	12/1080

Time response

Response delay t_{on}	0...24 s
Delay on release t_{off}	0...24 s
Scanning time for all channels	approx. 8...24 s (EDS460 490/) approx. 14...30 s (EDS461/491)

Displays, memory

LEDs	ON/ALARM (EDS4...-D) ON/ALARM/measuring channel 1...12 (EDS4...-L)
LC display	backlit graphical display (EDS4...-D)
7-segment display	2 x 7.62 mm (EDS4...-L)
History memory	300 data records (EDS4...-D)
Password	off/0...999 (off)*
Language	D, GB, F (GB)*
Fault memory alarm relay	on/ ff (off)*

Inputs/outputs

Test/reset button	internal/external
Cable length for external test/reset button	0...10 m

Interface

Interface/protocol	RS-485/BMS
Baud rate	9.6 kbit/s
Cable length	0...1200 m
Cable (twisted pair, 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
Device address, BMS bus	1...90 (2)*

Connection: EDS - measuring current transformer

Single wire ≥ 0.75 mm ²	0...1 m
Single wire, twisted ≥ 0.75 mm ²	1...10 m
Shielded cable ≥ 0.5 mm ²	10...40 m
Shielded cable (shield on one side connected to L-conductor, not connected to earth)	recommended: J-Y(St)Y min. 2 x 0.8

Switching elements

Number	two relays, each with one changeover contact (EDS46.) two relays, each with one changeover contact, 12 relays, each with one N/O contact (EDS49.)
Operating principle	NC or N/O operation (N/O operation)*
Electrical endurance, number of cycles	10000
Contact data acc. to IEC 60947-5-1	
Utilisation category	AC-13 AC-14 DC-12 DC-12 DC-12
Rated operational voltage	230 V 230 V 24 V 110 V 220 V
Rated operational current (common alarm relays)	5 A 3 A 1 A 0.2 A 0.1 A
Rated operational current (alarm relay)	2 A 0.5 A 5 A 0.2 A 0.1 A
Minimum contact rating	1 mA at AC/DC ≥ 10 V

Environment/EMC

EMC	IEC 61326-2-4 Ed. 1.0
Operating temperature	-25...+55 °C
Climatic class acc. to IEC 60721	
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)
Long-time storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)
Classification of mechanical conditions acc. to IEC 60721	
Stationary use (IEC 60721-3-3)	3M4
Transport (IEC 60721-3-2)	2M2
Long-time storage (IEC 60721-3-1)	1M3

Technical data (continued)

Connection

Connection	screw-type terminals
Connection	rigid/flexible
rigid/flexible	0.2...4/0.2...2.5 mm ² (AWG 24...12)
Multi-conductor connection (2 conductors with the same cross section):	
rigid/flexible	0.2...1.5/0.2...1.5 mm ²
Stripping length	8...9 mm
Tightening torque	0.5...0.6 Nm

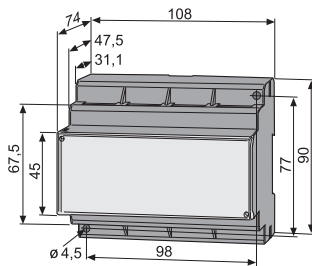
Other

Operating mode	continuous operation
Position of normal use	any
Degree of protection, terminals (DIN EN 60529)	IP20
Enclosure material	polycarbonate
Flammability class	UL94 V-0
Screw mounting	2 x M4
DIN rail mounting acc. to	IEC 60715
Weight	≤ 360 g (EDS460) ≤ 530 g (EDS490)

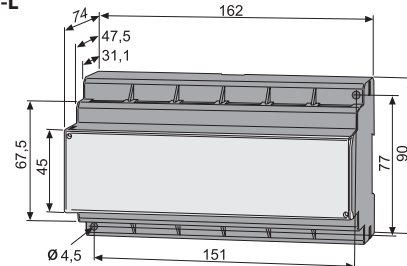
() * factory setting

Dimension diagrams (dimensions in mm)

EDS46...-D/-L

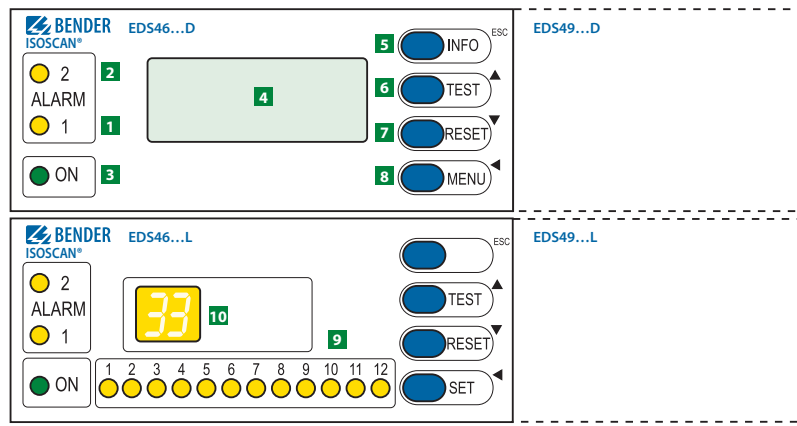


EDS49...-D/-L



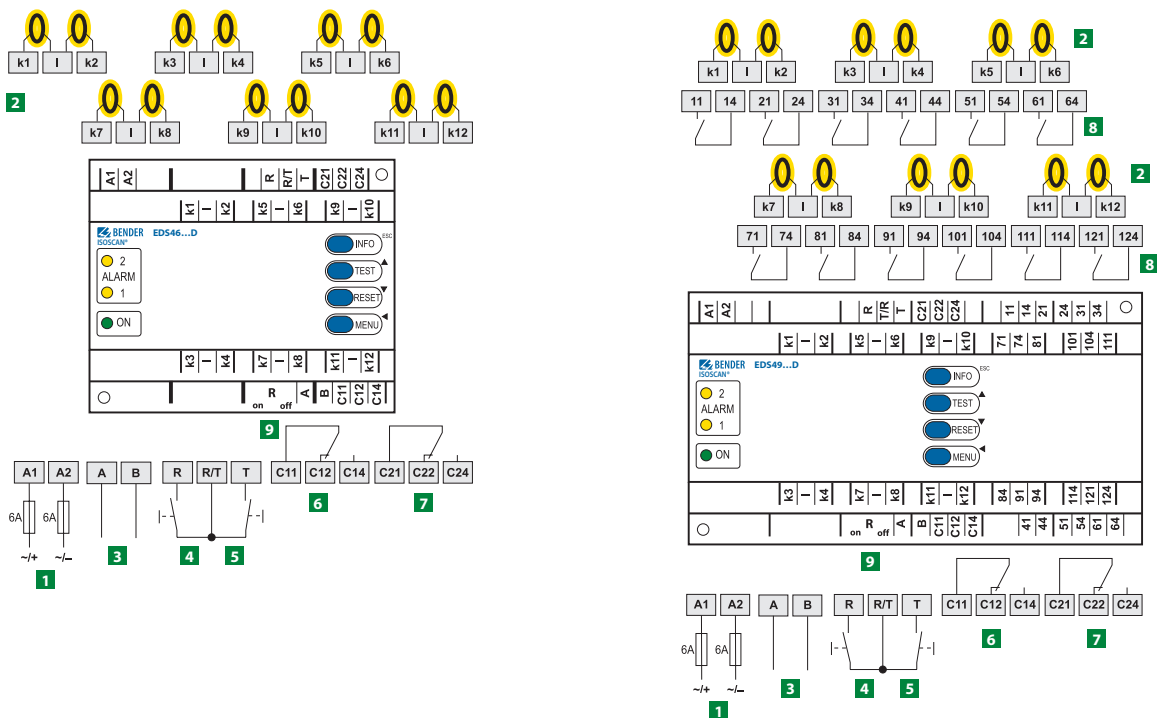
Overview of device types

Distinctive device features	EDS460-D/EDS461-D	EDS460-L/EDS461-L	EDS490-D/EDS491-D	EDS490-L/EDS491-L
Response value	EDS460: 2...10 mA		EDS490: 2...10 mA	
	EDS461: 0.2...1 mA		EDS491: 0.2...1 mA	
Residual current indication	EDS460: 100 mA...10 A		EDS490: 100 mA...10 A	
	EDS461: 10 mA...1 A		EDS491: 10 mA...1 A	
Backlit graphics LC display	■	–	■	–
7-segment display and LED line	–	■	–	■
Parameter setting function	■	–	■	–
Error code indication	–	■	–	■
Address range	1...90	1...90	1...90	1...90
Internal clock	■	–	■	–
History memory	■	–	■	–
Alarm contact "Common alarm" for all channels	2 x 1 changeover contact	2 x 1 changeover contact	2 x 1 changeover contact	2 x 1 changeover contact
Alarm contact per channel	–		12 x 1 N/O contact	
Enclosure	XM460		XM490	



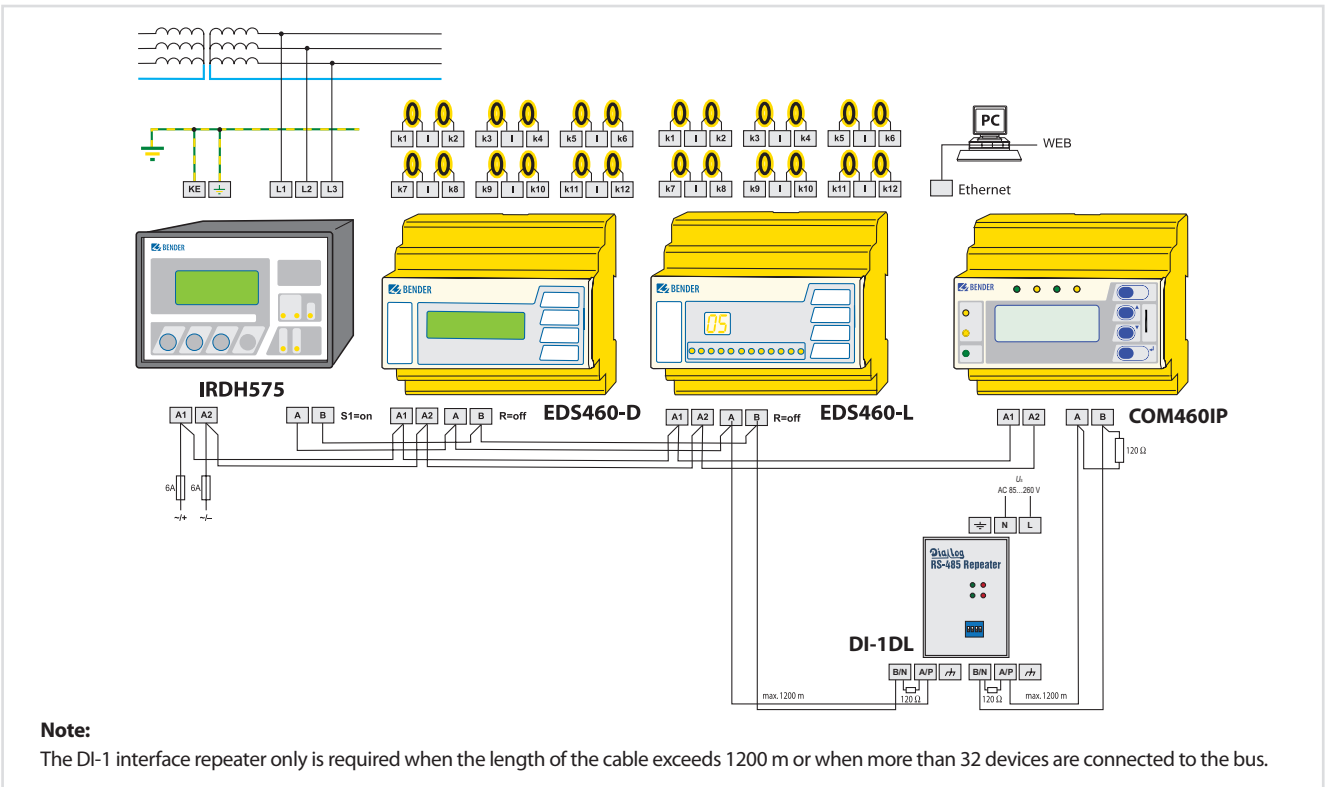
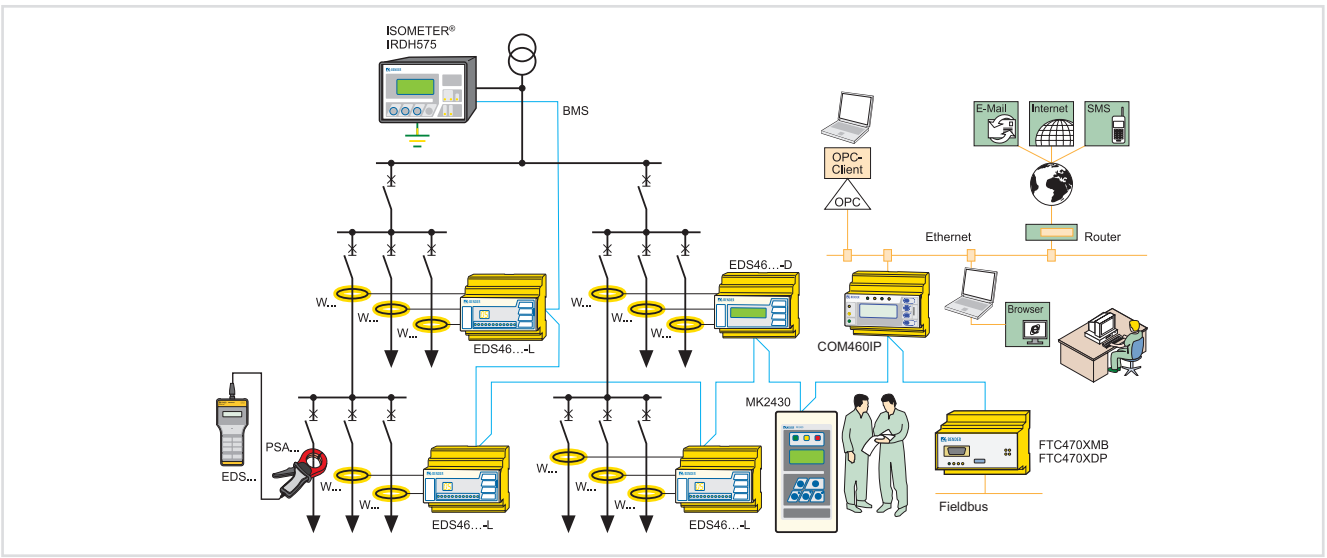
- 1** LED "ALARM 1" lights up in case of the following system faults:
 - when the residual current exceeds > 10 A (EDS460/490) or > 1 A (EDS461/EDS491) (RCM function)
 - when there is a loss of power or short circuit in a measuring current transformer circuit (this function can be deactivated)
- 2** LED "Alarm 2" lights up when an insulation fault is detected on a channel (EDS function)
- 3** Power On LED "ON"
- 4** LC graphical display
- 5** "INFO" button: to query standard information (does not apply to EDS...L).
ESC button: back to menu function.
- 6** "TEST" button: to call up the self test
Arrow up button: Parameter changes, scroll
- 7** "RESET" button: to acknowledge insulation and fault messages
Arrow down button: Parameter changes, scroll
- 8** "MENU" button: EDS...-D: to toggle between the standard display, menu and alarm indication
EDS...-L: to set the BMS address
Enter button: to confirm parameter changes
- 9** Alarm LEDs "1...12", light up if an insulation fault has been detected in the relevant channel
- 10** Digital display for device address and error codes (parameter setting (EDS460/490-D only))

Wiring diagrams



- 1** Supply voltage U_S (see ordering information), 6 A fuse recommended; two-pole fuses are required on IT systems
 - 2** Connection measuring current transformers k1...k12
 - 3** Serial interface RS-485
 - 4** External reset button "R" (N/O contact)*
 - 5** External test button "T" (N/O contact)*
 - 6** Alarm relay 1
 - 7** Alarm relay 2
 - 8** Alarm relay: one N/O contact per channel (EDS490/491 only)
 - 9** $R_{on/off}$: Termination of the serial RS-485 interface (A/B) with 120 Ω
- * The external test/reset buttons of several devices must not be connected to one another

Example for system configuration



Note:

The DI-1 interface repeater only is required when the length of the cable exceeds 1200 m or when more than 32 devices are connected to the bus.



ISOSCAN® EDS460-DG

Insulation fault locator for DC IT systems with high system leakage capacitances



Device features

- Insulation fault location in IT systems
- For DC-IT systems (20...308 V)
- Control and display function in a single device
- 12 measuring channels (circuits) for measuring current transformers of the W, WR, WS series
- Up to 90 EDS insulation fault locators in the system (1080 measuring channels)
- Scanning time max. 10 s for all measuring channels (parallel scanning)
- Response sensitivity 2...10 mA
- History memory to store 300 events
- Two alarm relays with one changeover contact each
- N/O or N/C operation, selectable
- Connection external test/reset button
- Indication via graphical display
- BMS address range 1...90
- Serial interface RS-485
- Continuous CT connection monitoring
- Fault memory behaviour selectable
- Additional AC residual current measurement

Typical applications

- Insulation fault location in DC IT systems
- DC main circuits in industrial installations and ships
- Diode-decoupled DC IT systems in power stations

Approvals



Standards

The ISOSCAN® EDS460-DG 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.com.

Ordering information

Design	Measuring range		Supply voltage ¹⁾ U _S			Type	Art. No.
	EDS function	RCM function	DC	AC/DC	AC		
Standard	2...50 mA	100 mA...2 A	16...94 V	–	16...72 V/42...460 Hz	EDS460-DG-1	B 9108 0018
			–	70...276 V	42...460 Hz	EDS460-DG-2	B 9108 0019
Capable of withstanding high climatic and mechanical stress	2...50 mA	100 mA...2 A	16...94 V	–	16...72 V/42...460 Hz	EDS460-DGW-1	B 9108 0018W
			–	70...276 V	42...460 Hz	EDS460-DGW-1	B 9108 0019W

¹⁾ Absolut values

Suitable system components

Designation	Design	Type of construction	Type	Page
RS-485 repeater	Bus repeater	–	DI-1DL	258
	Supplied by the USB port	–	DI-2USB	260
	Power supply unit for DI-1 or DI-2	–	AN471	–
Protocol converters	BMS bus – TCP/IP via Ethernet	–	COM460IP	261
	BMS bus – Modbus/RTU	–	FTC470XMB	266
	BMS bus – PROFIBUS DP	–	FTC470XDP	268
Measuring current transformers	pulsed DC sensitive	circular	W...	218
		rectangular	WR...	224
		split-core	WS...	228

Technical data

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

Rated insulation voltage	AC 250 V
Rated impulse voltage/pollution degree	6 kV/3
Protective separation (reinforced insulation) between: (A1, A2) - (k1, l...k12, R, T/R, T, A, B), (C11, C12, C14), (C21, C22, C24)	
Protective separation (reinforced insulation) between (C11, C12, C14) - (C21, C22, C24)	
Voltage test acc. to IEC 61010-1	3.536 kV
Rated insulation voltage	AC 250 V
Rated impulse voltage/pollution degree	4 kV/3
Basic insulation between: (k1, l...k12, R, T/R, T, A, B) - (C11, C12, C14), (C21, C22, C24)	
Voltage test acc. to IEC 61010-1	2.21 kV

Voltage supply

Supply voltage U_S	see ordering information
Power consumption	≤ 10 VA

Measuring circuit

Nominal system voltage U_N	DC 20...308 V
Measuring current transformers, external type	W..., WR..., WS...
CT monitoring	on/off (on)*
Load	68 Ω
Rated insulation voltage (measuring current transformer)	800 V
Response sensitivity	2...10 mA (2 mA)*
Rated frequency	400/60/40 Hz
Measuring range EDS function	2...50 mA
Measuring range RCM function	100 mA...2 A
Number of measuring channels (per device/system)	12/1080

Time response

Response delay t_{on}	0...24 s
Delay on release t_{off}	0...24 s
Scanning time for all channels	approx. 4...10 s

Displays, memory

LEDs	ON/ALARM
LC display	backlit graphical display
History memory	300 data records
Password	off/0...999 (off)*
Language	D, GB, F (GB)*
Fault memory alarm relay	on/off (off)*

Inputs/outputs

Test/reset button	internal/external
Cable length for external test/reset button	0...10 m

Interface

Interface/protocol	RS-485/BMS
Baud rate	9.6 kbit/s
Cable length	0...1200 m
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
Device address, BMS bus	1...90 (2)*

Connection: EDS - measuring current transformer

Single wire ≥ 0.75 mm ²	0...1 m
Single wire, twisted ≥ 0.75 mm ²	1...10 m
Shielded cable ≥ 0.5 mm ²	10...40 m
Shielded cable (shield on one side connected to L-conductor, not connected to earth)	
	recommended: J-Y(St)Y min. 2 x 0.8

Switching elements

Number	2 relays, each with 1 changeover contact				
Operating principle	NC or N/O operation (N/O operation)*				
Electrical endurance, number of cycles	10000				
Contact data acc. to IEC 60947-5-1					
Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-12
Rated operational voltage	230 V	230 V	24 V	110 V	220 V
Rated operational current (common alarm relays)	5 A	3 A	1 A	0.2 A	0.1 A
Rated operational current (alarm relay)	2 A	0.5 A	5 A	0.2 A	0.1 A
Minimum contact rating	1 mA at AC/DC ≥ 10 V				

Environment/EMC

EMC	IEC 61326-2-4				
Operating temperature	-25...+55 °C				
Climatic class acc. to IEC 60721					
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)				
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)				
Long-time storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)				
Classification of mechanical conditions IEC 60721					
Stationary use (IEC 60721-3-3)	3M4				
Transport (IEC 60721-3-2)	2M2				
Long-time storage (IEC 60721-3-1)	1M3				

Connection

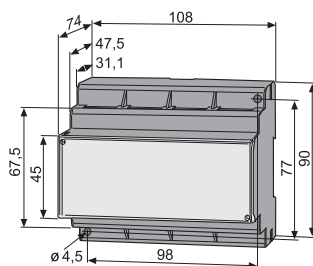
Connection	screw-type terminals				
Connection					
rigid/flexible	0.2...4/0.2...2.5 mm ² (AWG 24...12)				
Multi-conductor connection (2 conductors with the same cross section)					
rigid/flexible	0.2...1.5/0.2...1.5 mm ²				
Stripping length	8...9 mm				
Tightening torque	0.5...0.6 Nm				

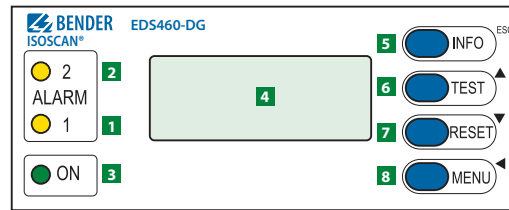
Other

Operating mode	continuous operation				
Position of normal use	any				
Degree of protection, terminals (DIN EN 60529)	IP20				
Enclosure material	polycarbonate				
Screw mounting	2 x M4				
DIN rail mounting acc. to	IEC 60715				
Flammability class	UL94 V-0				
Operating manual	TGH1429				
Weight	≤ 360 g				

() * factory setting

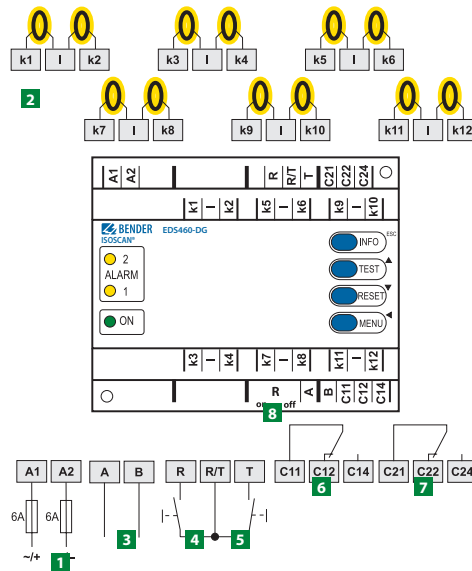
Dimension diagram (dimensions in mm)





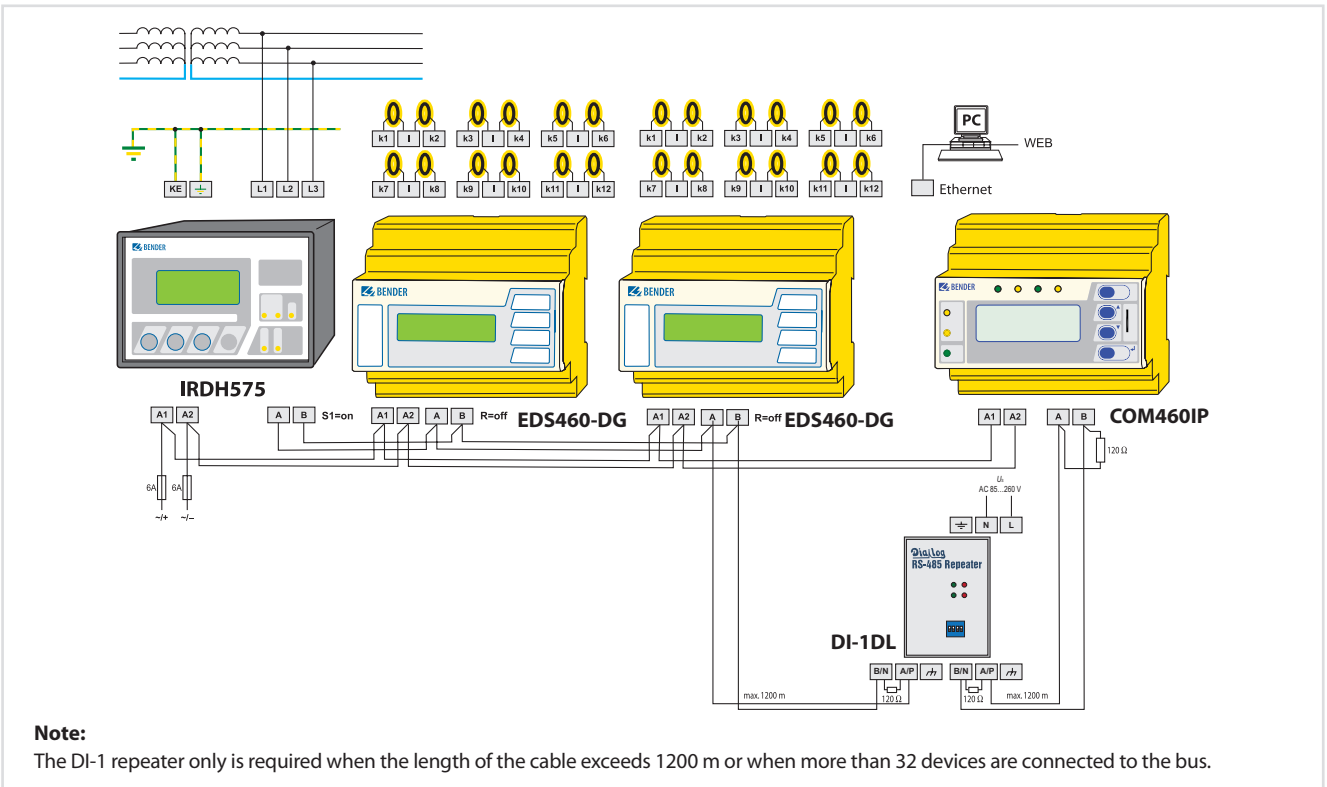
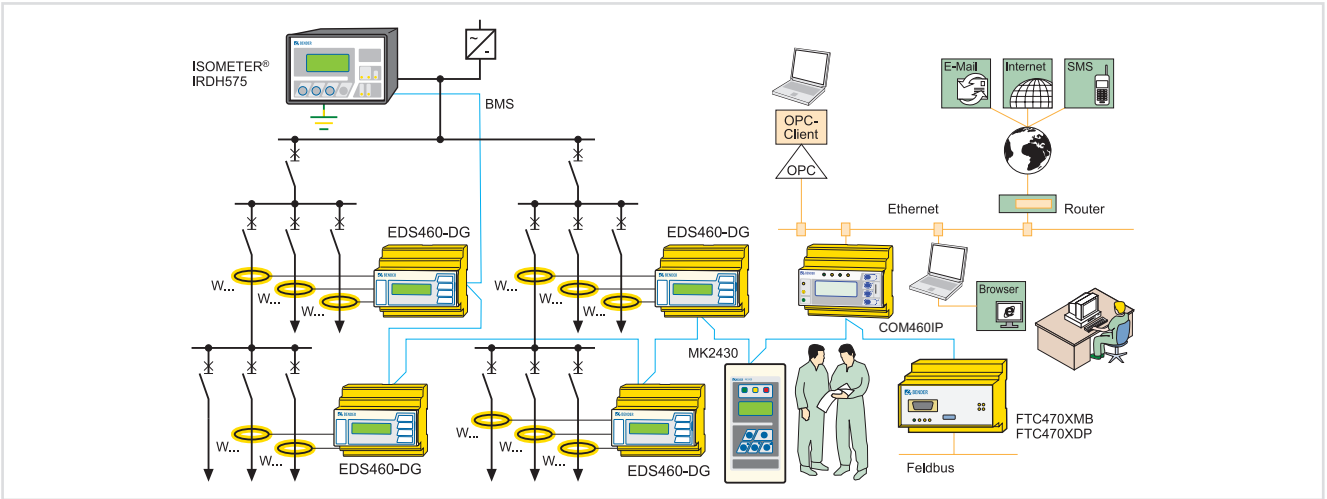
- | | |
|--|--|
| <p>1 LED "ALARM 1" lights in case of the following system faults:</p> <ul style="list-style-type: none"> when the residual current is exceeded > 2 A (RCM function) when there is a loss of power or short circuit in a measuring current transformer circuit (this function can be deactivated) <p>2 LED "Alarm 2" lights up when an insulation fault is detected on a channel (EDS function)</p> <p>3 Power On LED "ON"</p> <p>4 LC graphical display</p> | <p>5 "INFO" button: to query standard information
ESC button: back to menu function</p> <p>6 "TEST" button: to call up the self test
Arrow up button: Parameter changes, scroll</p> <p>7 "RESET" button: to acknowledge insulation and fault messages
Arrow down button: Parameter changes, scroll</p> <p>8 "MENU" button: to toggle between the standard display, menu and alarm display
Enter button: to confirm parameter changes</p> |
|--|--|

Wiring diagram



- | | |
|--|--|
| <p>1 Supply voltage U_S (see ordering information), 6 A fuse recommended; two-pole fuses should be used on IT systems</p> <p>2 Connection measuring current transformers k1...k12</p> <p>3 Serial interface RS-485</p> <p>4 External reset button "R" (N/O contact)*</p> <p>5 External test button "T" (N/O contact)</p> | <p>6 Alarm relay 1</p> <p>7 Alarm relay 2</p> <p>8 $R_{on/off}$: Termination of the serial RS-485 interface (A/B) with 120 Ω</p> <p>* Do not connect external test/reset buttons of several devices to one another.</p> |
|--|--|

Example for system configuration

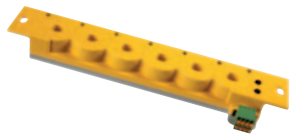


Note:
The DI-1 repeater only is required when the length of the cable exceeds 1200 m or when more than 32 devices are connected to the bus.



ISOSCAN® EDS150/151

Insulation fault locator with integrated measuring current transformers for EDS systems



Typical applications

- Insulation fault location in AC, AC/DC and DC IT systems
- DC main circuits in industrial plants, power stations and ships
- IT systems for medical locations and control circuits (EDS151)

Approvals



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 x 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.com.

Ordering information

Measuring range	Response value		Supply voltage ¹⁾ U _S		Type	Art. No.
	EDS function	RCM function	DC	AC		
5...25 mA	5 mA	10 A	14...28 V	17...24 V/50...60 Hz	EDS150	B 9108 0103
0.5...2.5 mA	0.5 mA	1 A			EDS151	B 9108 0101

¹⁾ Absolut values

Suitable system components

Type designation	Voltage supply	Output voltage	Explanation	Type	Page
Power supply unit	AC 90...264 V/DC 120...370 V/47...63 Hz	DC 24 V, 420 mA	For the supply of max. 6 EDS15...	AN410	251
	AC 85...264 V/47...63 Hz	DC 24 V, 1300 mA	For the supply of max. 20 EDS15...	AN430	–
	AC 230 V/50...60 Hz	AC 20 V, 500 mA	For the supply of max. 6 EDS15...	AN450	255
	AC 127 V/50...60 Hz	AC 20 V, 500 mA	For the supply of max. 6 EDS15...	AN450-133	255



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!

Technical data

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

Rated insulation voltage	AC 250 V
Rated impulse voltage/pollution degree	6 kV/3

Voltage ranges

IT system being monitored:

Nominal system voltage U_n	see IRDH575, PGH (EDS150) AC 20...276 V, DC 20...308 V (EDS151)
Nominal frequency f_n	42...460 Hz

Supply voltage:

Supply voltage U_s	AC 17...24 V, DC 14...28 V
Frequency range of the supply voltage	50...60 Hz
Power consumption AC	≤ 3 VA
Power consumption DC	≤ 1.5 VA

Measuring circuit

Number of measuring channels (per device/system)	6/528
--	-------

EDS function:

Response value	EDS150: 5 mA EDS151: 0.5 mA
Relative uncertainty	± 30 %
Rated frequency	42...460 Hz
Measuring range EDS function	EDS150: 5...25 mA, EDS151: 0.5...2.5 mA
Response time in the AC system acc. to IEC 61557-9	≤ 8 s
Scanning time for all channels	approx. 72 s

RCM function:

Response value	EDS150: 10 A EDS151: 1 A
Relative uncertainty	± 30 %
Frequency range	42...68 Hz

Displays

LEDs:	
ON/COM, green	operation indicator/bus activity
Alarm K1...K6, yellow	EDS and RCM function

Interface

Interface/protocol	RS-485/BMS
Connection	terminals A/B
Cable (twisted pair, one end of shield connected to PE)	two-core, recommended: J-Y(St)Y min. 2 x 0.8
Cable length	≤ 1200 m
Terminating resistor	120 Ω (0.25 W)
Device address, BMS bus	3...90 (3)*

Environment/EMC

EMC	IEC 61326-2-4
Operating temperature	-25...+55 °C

For UL application:

Maximum ambient temperature 55 °C	
Classification of climatic conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)
Long-term storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3M4
Transport (IEC 60721-3-2)	2M2
Storage (IEC 60721-3-1)	1M3

Connection

Connection type	pluggable push-wire terminal
-----------------	------------------------------

For UL application:

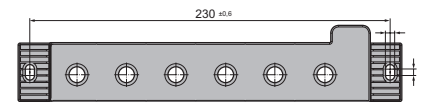
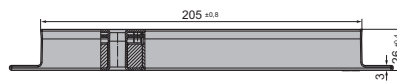
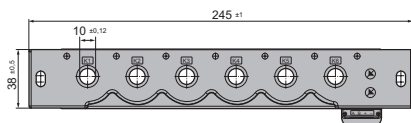
Only use 60/75°C copper conductors!	
Connection rigid /flexible/conductor sizes	0.2...1.5 mm ² (AWG 24...16)
Multi-conductor connection (2 conductors of the same cross section)	
rigid	0.2...1.5 mm ²
flexible	0.2...1.5 mm ²
flexible with ferrule without plastic sleeve	0.25...1.5 mm ²
flexible with ferrule with plastic sleeve	0.25...0.75 mm ²
Stripping length	10 mm

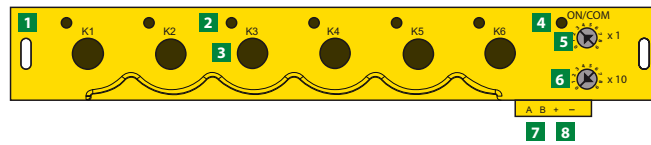
Other

Operating mode	continuous operation
Position of normal use	any
Enclosure material	polycarbonate
Flammability class	UL94 V-0
Screw mounting	2 x M6
Tightening torque	1.5 Nm
Software version	D353 V1.0x
Weight	≤ 340 g

(*) = factory setting

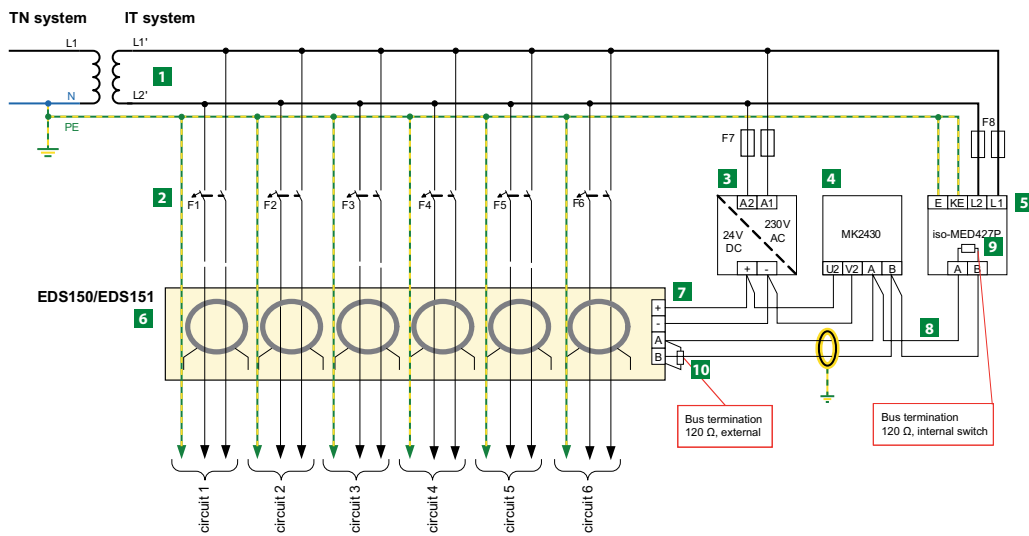
Dimension diagrams (dimensions in mm)





- | | |
|---|--|
| <ul style="list-style-type: none"> 1 Opening for screw mounting 2 Alarm LEDs measuring channels "K1...K6" 3 Cable lead-through of the measuring current transformers for the measuring channels K1...K6 4 "ON/COM" LED: Power On LED and bus activity | <ul style="list-style-type: none"> 5 Set the ones position of the BMS address 6 Set the tens position of the BMS address 7 Connection to the supply voltage 8 Connection RS-485, BMS bus |
|---|--|

Wiring diagrams

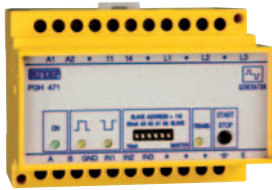


- | | |
|---|--|
| <ul style="list-style-type: none"> 1 Transformer for the IT system to be monitored 2 Circuit-breakers for the circuits 3 AN430 resp. AN410 for DC 24 V supply voltage 4 Alarm indicator and test combination MK2430/MK800 for indication of alarm messages from the EDS150/151 (BMS master) 5 IRDH575 insulation monitoring devices with locating current injector for insulation fault location systems | <ul style="list-style-type: none"> 6 Insulation fault locator EDS150/151 with integrated measuring current transformers 7 Supply voltage U_S DC 24 V 8 Serial interface BMS 9 Terminating resistor BMS bus (120 Ω, internally connected) 10 Terminating resistor BMS bus |
|---|--|



ISOSCAN® PGH471/PGH473

Locating current injector for existing installations with an integrated insulation monitoring device



Device features

- Locating current: PGH471: max. 25/10 mA; PGH473: max. 2.5/1 mA
- Power On LED
- Alarm LED RS-485 active
- Two alarm LEDs for positive and negative clock signals of the locating current
- Alarm relay with one voltage-free N/O contact to signal that insulation fault location is being carried out
- Start/stop button to activate resp. deactivate insulation fault location

Typical applications

Locating current injector for insulation fault location systems

- PGH471: IT main circuits
- PGH473: IT control circuits

Standards

The ISOSCAN® PGH47... 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.com.

Approvals

PGH471:



PGH473:



Ordering information

Locating current	BMS bus address range	Supply voltage U_s		Type	Art. No.
		DC	AC		
25/10 mA	111...119	–	230 V	PGH471	B 9501 8004
		–	90...132 V ¹⁾	PGH471-13	B 9501 8005
		10.5...80 V ¹⁾	–	PGH471-21	B 9501 8006
		77...286 V ¹⁾	–	PGH471-23	B 9501 8007
2.5/1 mA	121...150	–	230 V	PGH471E	B 9501 8008
		–	230 V	PGH473	B 9501 8009
	111...119	–	90...132 V ¹⁾	PGH473-13	B 9501 8010
		10.5...80 V ¹⁾	–	PGH473-21	B 9501 8011
	121...150	–	230 V	PGH473E	B 9501 8015
		10.5...80 V ¹⁾	42...460 Hz	PGH473E-21	B 9501 8016

¹⁾ Absolut values

Technical data

Insulation coordination acc. to IEC 60664-1

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

Voltage ranges

Nominal system voltage U_n PGH473	AC, 3(N)AC 20...265 V/DC 20...308 V/45...400 Hz
Nominal system voltage U_n PGH471	AC, 3(N)AC 20...575 V/DC 20...500 V/45...400 Hz
Supply voltage U_s	see ordering information
Operating range of U_s	0.85...1.15 x U_s
Power consumption	≤ 3 VA

Measuring circuit

Locating current	PGH473: 2.5 mA/1 mA; PGH471: 25 mA/10 mA
Clock pulse/break	2/4 s

Switching elements

Switching elements	1 N/O contact
Rated contact voltage	AC 250 V/DC 300 V
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

Environment

Shock resistance IEC 60068-2-27 (device in operation)	15 g/10 ms
Bumping IEC 60068-2-29 (transport)	40 g/6 ms
Vibration resistance IEC 60068-2-6 (device in operation)	1 g/10...150 Hz
Vibration resistance IEC 60068-2-6 (transport)	2 g/10...150 Hz
Ambient temperature (during operation)	-10...+55 °C
Ambient temperature (during storage)	-40...+70 °C
Climatic class acc. to DIN IEC 60721-3-3	3K5

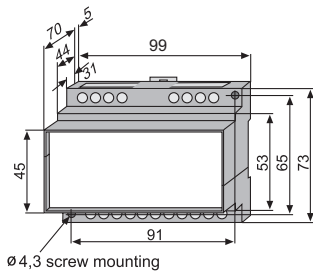
Connection

Connection type	modular terminals
Connection properties rigid/flexible	0.2...4 mm ² /0.2...2.5 mm ²

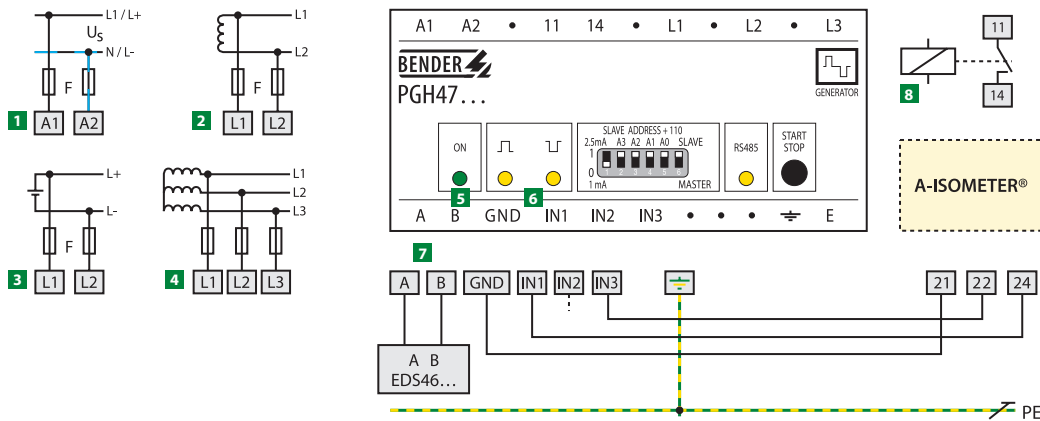
Other

Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (DIN EN 60529)	IP30
Degree of protection, terminals (DIN EN 60529)	IP20
Screw mounting	2 x M4
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Operating manual	PGH470 TGH1243/PGH473 TGH1321
Weight	≤ 350 g

Dimension diagram (dimensions in mm)

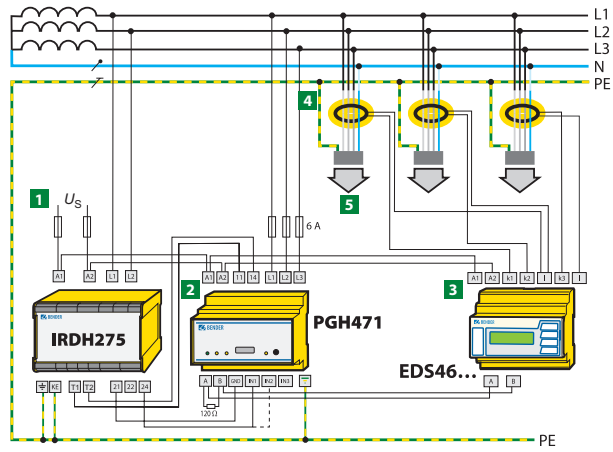


Wiring diagram



- 1 U_s see nameplate, 6 A fuse recommended. Supply voltage U_s in the IT system requires two fuses.
- 2 IT system AC "L1, L2"
- 3 IT system DC "L1, L2"
- 4 IT system 3AC "L1, L2, L3"

- 5 Power On LED "ON"
- 6 LEDs clock pulse
- 7 Connection BMS bus
- 8 Alarm relay



- | | |
|---|--|
| <ul style="list-style-type: none"> 1 ISOMETER® IRDH275 2 Locating current injector PGH471 3 Insulation fault locator EDS46... | <ul style="list-style-type: none"> 4 Measuring current transformers 5 Outgoing circuits to the loads |
|---|--|



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



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
- 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)

Typical applications

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

Insulation fault locator EDS195P

- 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.com.

Ordering information

Main circuits		Control circuits		Nominal voltage U_n		Supply voltage U_s	Type	Art. No.
with EDS	without EDS	with EDS	without EDS	AC	DC	AC		
EDS460/490	–	–	–	20...575 V/42...460 Hz	20...504 V	–	EDS3090	B 9108 2026
–	■	–	–	20...575 V/42...460 Hz	20...504 V	230 V/50...60 Hz	EDS3090PG	B 9108 2021
				0...575 V/42...460 Hz	0...504 V	90...132 V/50...60 Hz	EDS3090PG-13	B 9108 2022
–	–	EDS461/491	–	20...265 V/42...460 Hz	20...308 V	230 V/50...60 Hz	EDS3096PG	B 9108 2025
				20...265 V/42...460 Hz	20...308 V	90...132 V/50...60 Hz	EDS3096PG-13	B 9108 2029
–	–	–	■	20...265 V/42...460 Hz	20...308 V	–	EDS3091	B 9108 2027
				20...265 V/42...460 Hz	20...308 V	230 V/50...60 Hz	EDS3091PG	B 9108 2023
–	–	–	■	20...265 V/42...460 Hz	20...308 V	90...132 V/50...60 Hz	EDS3091PG-13	B 9108 2024
				20...575 V/42...460 Hz	20...504 V	230 V/50...60 Hz	EDS3092PG	B 9108 2030

Suitable system components

Designation	Nominal voltage U_n		Type	Page
	AC	DC		
Measuring clamp 115 mm for EDS3090... and EDS3096...	–	–	PSA3165	–
Coupling device to extend the voltage range of the PGH185/186	500...790 V/42...460 Hz	400...960 V	AGE185	118
Accessories for fault location in diode-decoupled systems	–	–	EDS165-SET	–

Scope of delivery

Insulation fault locator	Locating current injector	Measuring clamps 20 mm	Measuring clamps 52 mm	Type
EDS195P	–	PSA3020	PSA3052	EDS3090
EDS195P	PGH185	PSA3020	PSA3052	EDS3090PG
EDS195P	PGH185-13	PSA3020	PSA3052	EDS3090PG-13
EDS195P	PGH186	PSA3020	PSA3052	EDS3096PG
EDS195P	PGH186-13	PSA3020	PSA3052	EDS3096PG-13
EDS195P	–	PSA3320	PSA3352	EDS3091
EDS195P	PGH183	PSA3320	PSA3352	EDS3091PG
EDS195P	PGH183-13	PSA3320	PSA3352	EDS3091PG-13
EDS195P	PGH183	PSA3320	PSA3352	EDS3092PG
	PGH185	PSA3020	PSA3052	

Technical data EDS309...system

The technical data listed in this chapter apply to the components: PGH18..., EDS195P, AGH185.

Environment/EMC

EMC	IEC 61326-2-4
Operating temperature	-10...+55 °C
Classification of climatic conditions acc. to IEC 60721	
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)
Storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)
Climatic class acc. to IEC 60721	
Stationary use (IEC 60721-3-3)	3M4
Transport (IEC 60721-3-2)	2M2
Long-time storage (IEC 60721-3-1)	1M3

Other

Operating mode	continuous operation
Position of normal use	any
Operating manual	TGH1420
Weight EDS309...	≤ 7000 g
Weight EDS309... with PSA3165	≤ 8500 g
Weight EDS3092	≤ 9000 g
Dimensions W x H x D	430 x 340 x 155 mm

Technical data PGH18...

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

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

Nominal system voltage U_n

PGH183	AC 20...265 V, DC 20...308 V/42...460 Hz
PGH185	3AC, AC 20...575 V, DC 20...504 V/42...460 Hz
PGH186	3AC, AC 0...575 V, DC 0...504 V/42...460 Hz

Voltage supply

Supply voltage U_S	AC 230 V/50...60 Hz
Operating range of U_S	0.85...1.15 x U_S
Supply voltage U_S version -13	AC 90...132 V/50...60 Hz

PGH183, PGH185:

Power consumption	≤ 3 VA
-------------------	--------

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
---	----------

PGH183/185/186

Clock pulse	2 s
Idle time	4 s

Measuring voltage U_m

PGH186	DC 50 V
--------	---------

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 W x H x D	160 x 148 x 81 mm

Technical data EDS195P

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

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

Voltage supply

Supply voltage U_S	DC 6 V +/- 10 %, external power supply unit
Batteries	3 x LR6 AA – 1.5 V
Accumulators	3 x NiMH ≥ 2000 mAh
Size	AA R6
Power consumption	≤ 0.5 W
Hours of operation (without display illumination)	60 h

Measuring circuit insulation fault location

Nominal system voltage	conductors uninsulated, including measuring clamp up to 600 V
Rated frequency	DC, 42...2000 Hz

Main circuit ($I_{Lmax} = 50$ mA)

Measuring range	2 mA...50 mA
Measuring clamps	PSA3020, PSA3052, PSA3165
Response value $I_{\Delta L}$, adjustable	2...10 mA (5 mA)*
Relative uncertainty	±30 %/±2 mA of the reference value

Control circuit

Measuring range	0,2 mA...5 mA
Measuring clamps	PSA3320, PSA3352
Response value $I_{\Delta L}$, adjustable	0.2...1.0 mA (0.5 mA)*
Relative uncertainty 0.2...0.9 mA	±30 %/±0.2 mA of the reference value
Relative uncertainty 1...5 mA	±30 %/±2 mA of the reference value

Measuring circuit residual current

with measuring clamps	PSA3020, PSA3052, PSA3165
Measuring range	5 mA...10 A (crest factor up to 3)
Response value $I_{\Delta L}$, adjustable	10 mA...10 A (100 mA)*
with measuring clamps	PSA3320, PSA3352
Measuring range	2 mA...2 A (crest factor up to 3)
Response value $I_{\Delta L}$, adjustable	5 mA...1 A (100 mA)*
Frequency range	42...1000 Hz
Relative uncertainty, 42...60 Hz	±5 %
Relative uncertainty, 61...1000 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
LED	Alarm

Other

Degree of protection, internal components DIN EN 60529 (VDE 0470-1)	IP40
Protection class acc. to IEC 60947-1, DIN EN 60947-1 (VDE 0660-100)	Class III
Enclosure material	ABS plastic
Flammability class	UL94 V-0
Operating manual	TGH1420
Weight	≤ 350 g
Software version	D399 V1.2
Dimensions W x H x D	84 x 197 x 30 mm

()* = 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

Other

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

Technical data AGE185

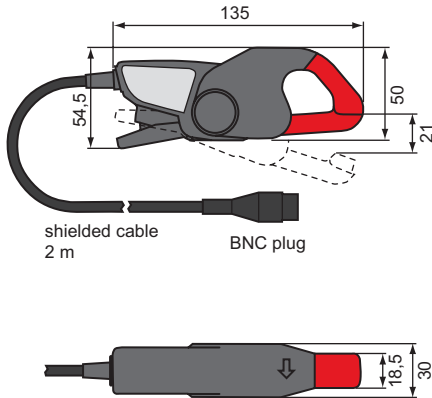
Insulation coordination acc. to IEC 60664-1

Rated insulation voltage	AC 1000 V
Rated impulse voltage/pollution degree	4 kV/3
Nominal system voltage U_n	3AC, AC 500...790 V, DC 400...960 V/42...460 Hz

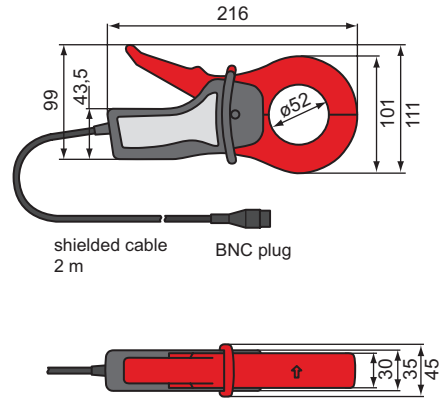
Other

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

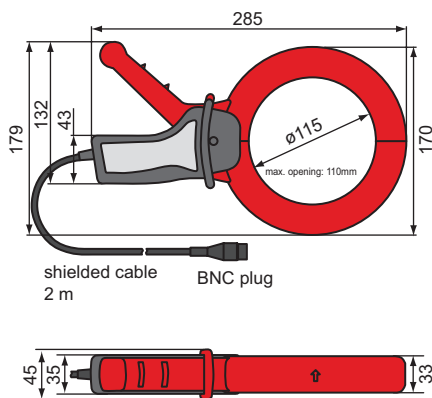
Dimension diagram PSA3020/3320 (dimensions in mm)



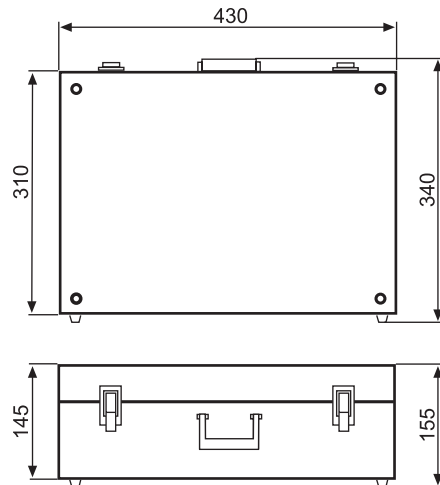
Dimension diagram PSA3052/3352 (dimensions in mm)



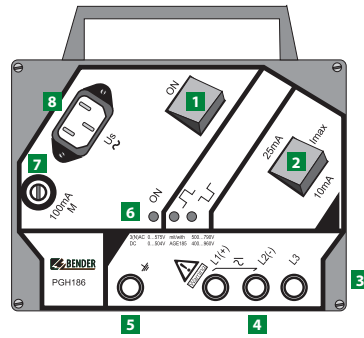
Dimension diagram PSA3165 (dimensions in mm)



Dimension diagram aluminium case (dimensions in mm)

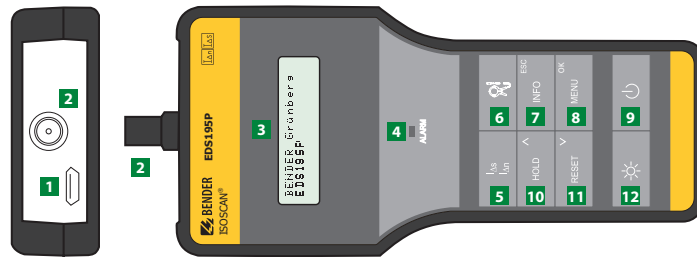


Operating elements PGH18...

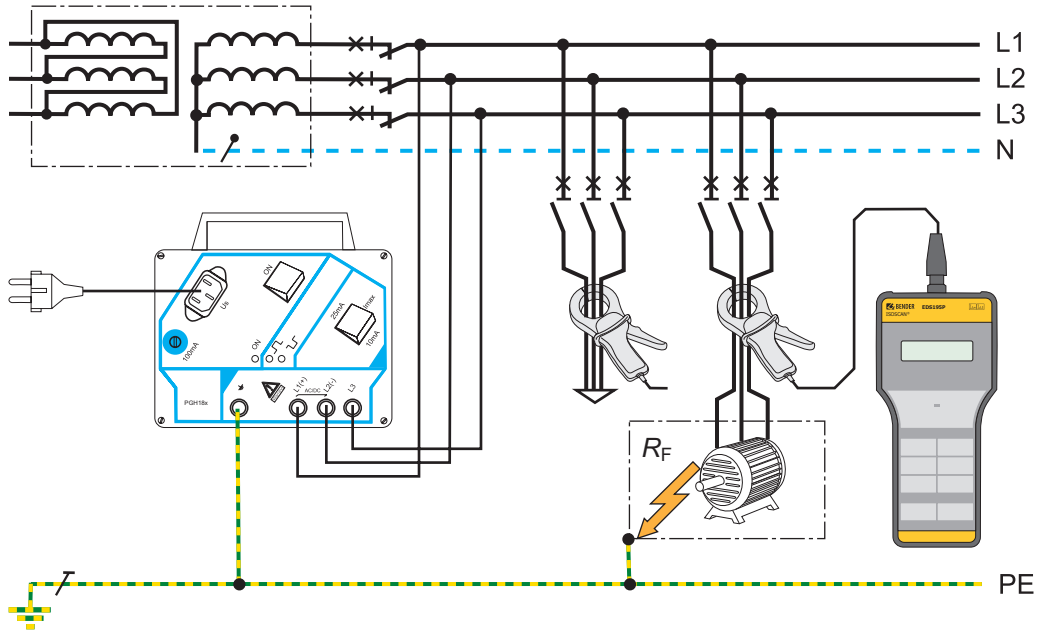


- | | |
|--|---|
| <ul style="list-style-type: none"> 1 On/Off switch "ON", activates the test current 2 Selector switch for the maximum locating current 25/10 mA or 2.5/1 mA 3 Not visible: Magnetic adhesive strip at the back of the enclosure for fixing to metal parts (e.g. switchboard cabinet) 4 3 sockets for system coupling 5 Socket for PE connection | <ul style="list-style-type: none"> 6 LED indicators:
 "ON" Power On LED
 Indication of the positive clock pulse of the locating current
 Indication of the negative clock pulse of the locating current 7 Microfuse 100 mA 8 Panel plug for supply voltage |
|--|---|

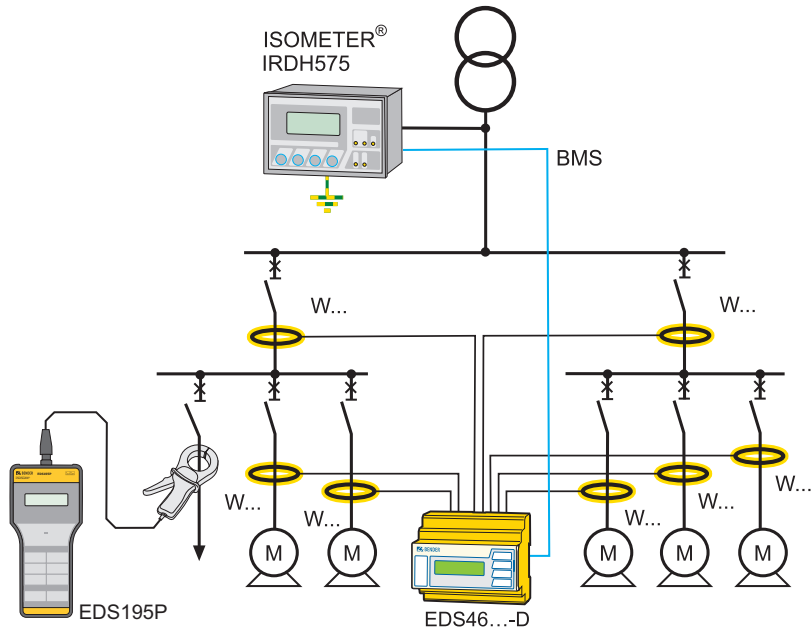
Operating elements EDS195P



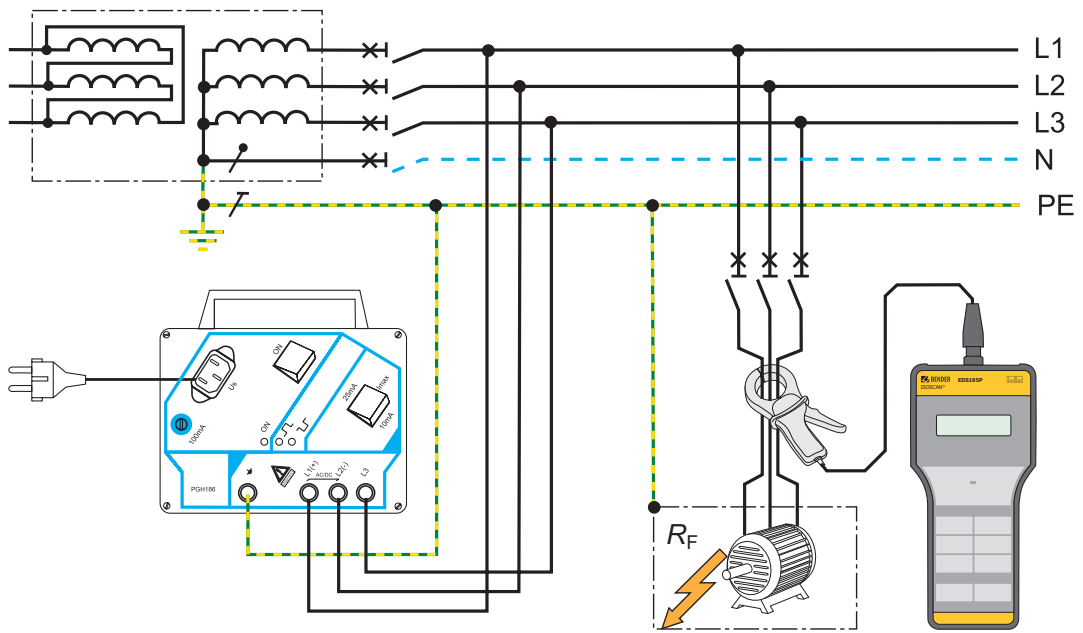
- | | |
|--|---|
| <ul style="list-style-type: none"> 1 Micro USB connection for charging the device's rechargeable battery 2 BNC connection for the measuring clamp 3 LC display, backlit, 3 lines à 16 characters 4 LED "ALARM", lights when the response value is exceeded 5 Button for the selection of the operating mode :
 $I_{\Delta S}$ = insulation fault location in IT systems (EDS mode)
 $I_{\Delta n}$ = residual current measurement in TN-S systems in (RCM mode) 6 Button for transformer selection
 for $I_{Tmax} = 50$ mA: for $I_{Tmax} = 5$ mA:
 P20 = PSA3020 = PSA3320
 P52 = PSA3052 = PSA3352
 P165 = PSA3165 -----
 W/WR = W.../WR... = W...-8000
 WS = WS... = W...-8000 | <ul style="list-style-type: none"> 7 "INFO" button: – device type – software version – current response values $I_{\Delta S}$ and $I_{\Delta n}$ – setup status
 ESC button: to exit the menu function without changing parameters 8 "MENU" button
 to toggle between the standard display and the menu selection 9 On-Off button 10 "HOLD" button: to store the currently indicated measured value
 Arrow up button: Parameter changes, scroll 11 "RESET" button: fault memory acknowledgement
 Arrow down button: Parameter changes, scroll 12 Illumination button: to switch on the display lighting |
|--|---|



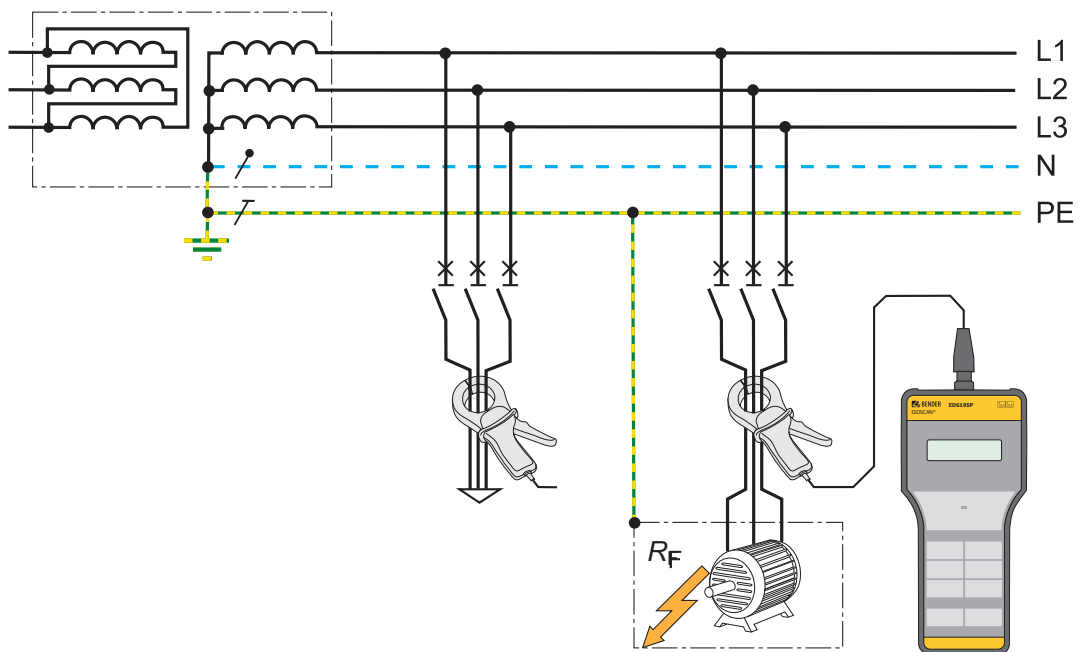
Equipment for insulation fault location EDS3090/3091PG for use in ungrounded systems (IT systems) without a permanently installed equipment for insulation fault location



Equipment for insulation fault location EDS3090/3091 in ungrounded systems (IT systems) with permanently installed equipment for insulation fault location EDS



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



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



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

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

Insulation monitoring device ISOMETER®/Locating current injector PGH



Nominal system voltage U_n (B1)	3AC, AC 20...575 V, DC 20...504 V	3AC, AC 20...150 V, DC 20...150 V
Nominal system voltage U_n (B2)	3AC, AC 340...760 V, DC 340...575 V	–
U_5 DC 19.2-72 V	IRDH575B1-427	IRDH575B1-4227
U_5 AC 88-264 V, DC 77-286 V	IRDH575B1-435	IRDH575B1-4235
U_5 AC 88-264 V DC 77-286 V	IRDH575B2-435	–
Locating current I_L	10/25/50 mA	1/2.5 mA
Response values	1 k Ω ...10 M Ω	1 k Ω ...10 M Ω
LC display	4 x 20 characters	4 x 20 characters
Alarm relay	3 changeover contacts	3 changeover contacts
Interface/protocol	RS-485 (BMS)	RS-485 (BMS)
Address range	1...30	1...30

Insulation fault locator



Type	EDS195P
LC display	3 x 16 characters
Evaluating current I_{DL}	0.2...50 mA
Response value	0.2...1/2...10 mA selectable

Measuring clamps



Type	PSA3020	PSA3052	PSA3165 (optional)	PSA3320	PSA3352
20 mm	■			■	
52 mm		■			■
115 mm			■		

Complete systems

Type	EDS3090		EDS3091
Comprising	Aluminium case, EDS195P, PSA3020, PSA3052, power supply unit	Aluminium case, EDS195P, PSA3020, PSA3052, power supply unit	Aluminium case, EDS195P, PSA3320, PSA3352, power supply unit



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

Application	Main circuit		Control circuit
	energised	offline	energised

Locating current injector PGH



Nominal system voltage U_n	3AC, AC 20...575 V DC 20...504 V	3AC, AC 0...575 V DC 0...504 V	AC 20...265 V, DC 20...308 V
U_S AC 230 V	PGH185	PGH186	PGH183
U_S AC 90...132 V	PGH185-13	PGH186-13	PGH183-13
Locating current I_L max.	10/25 mA	10/25 mA	1/2.5 mA

Insulation fault locator



Type	EDS195P
LC display	3 x 16 characters
Evaluating current $I_{\Delta L}$	0.2...50 mA
Response value	0.2...1/2...10 mA selectable

Measuring clamps



Type	PSA3020	PSA3052	PSA3165 (optional)	PSA3320	PSA3352
20 mm	■			■	
52 mm		■			■
115 mm			■		

Complete system

Type	EDS3090PG (-13)	EDS3096PG (-13)	EDS3091PG (-13)
Comprising	EDS3090PG for $U_S =$ AC 230 V, 50...60 Hz EDS3090-13 for $U_S =$ AC 90...132 V, 50...60 Hz	EDS3096PG for $U_S =$ AC 230 V, 50...60 Hz EDS3096PG-13 for $U_S =$ AC 90...132 V, 50...60 Hz	EDS3091PG for $U_S =$ AC 230 V, 50...60 Hz EDS3091PG-13 for $U_S =$ AC 90...132 V, 50...60 Hz
Type	EDS3092PG		
Comprising	Aluminium case, PGH185, EDS195, PSA3020, PSA3052, power supply unit, cable set	Aluminium case, PGH186, EDS195, PSA3020, PSA3052, power supply unit, cable set	Aluminium case, PGH183, EDS195, PSA3320, PSA3352, power supply unit, cable set

Accessories

Type	AGE185
------	--------



Extension	AC 500...790 V, 45...400 Hz
Nominal voltage range	DC 400...960 V



Coupling device AGE185



Typical applications

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

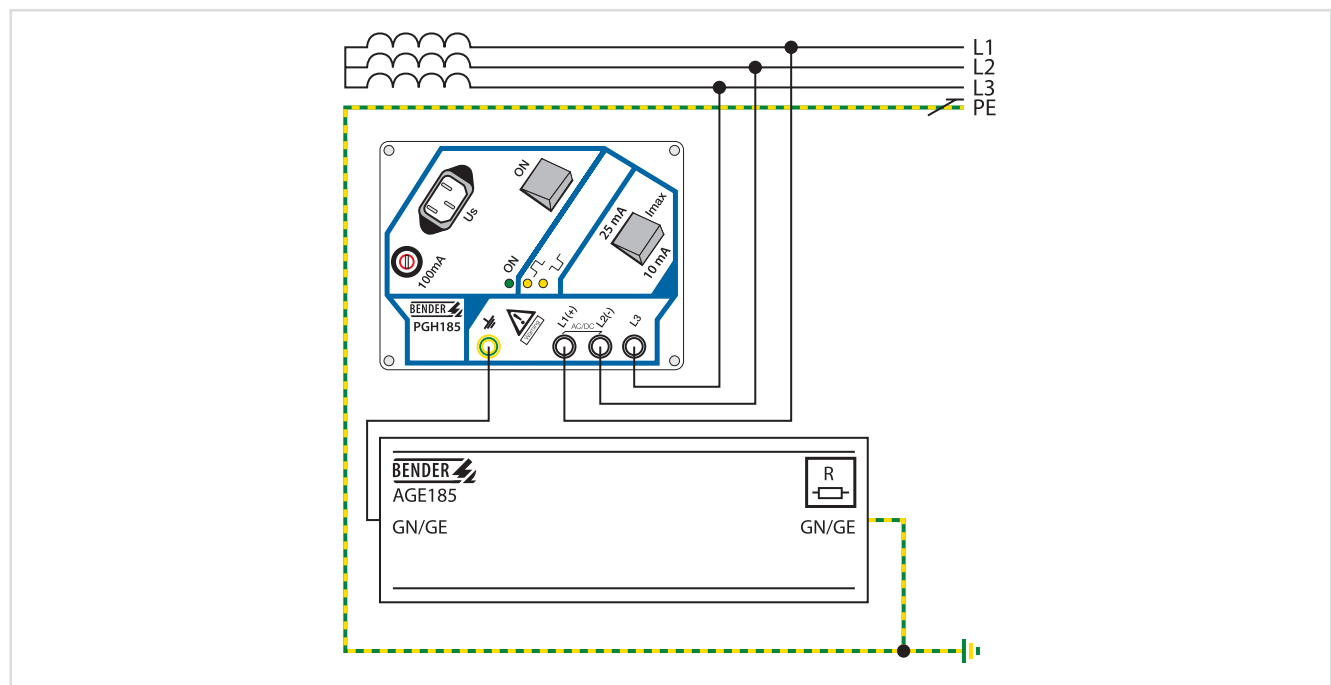
Further information

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

Ordering information

Nominal system voltage U_s		Type	Art. No.
AC, 3(N)AC	DC		
500...790 V	400...960 V	AGE185	B 980 305

Wiring diagram



Locating current injector PGH185 and coupling device AGE185

Insulation monitoring devices

ISOMETER®



7



1

Equipment for insulation fault location

ISOSCAN®



85



2

Measuring and monitoring relays

LINETRAXX®

Power Quality and Energy Measurement

LINETRAXX®



121



3

Residual current monitoring systems

LINETRAXX®



175



4

System components

Coupling devices

Measuring current transformers

Transformers

Measuring transducers

Power supply units

Measuring instruments

Interface converters

Interface repeaters

COMTRAXX® Gateways

COMTRAXX® Alarm indicator and test combinations

COMTRAXX® condition monitors

Visualisation



203



5

Switching equipment

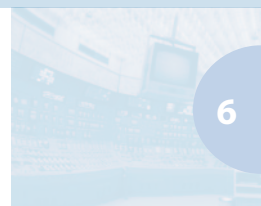
ATICS® transfer switching and monitoring devices

Test systems

UNIMET® Safety analyser



285



6

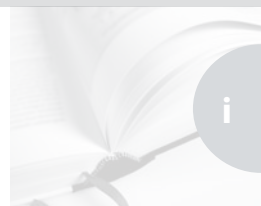
Annex

Standards and guidelines applied
Alphabetical list of devices

Technical terms
Service & project management



315



i



Device overview measuring and monitoring relays LINETRAXX®



Page		124	127	130	133	136	
Voltage monitoring	AC	with U_s	$\langle U, > U$				
		without U_s		$\langle U, > U$			
	3(N)AC	with U_s			$\langle U, > U$		$\langle U, > U$ (423)
		without U_s				$\langle U, > U$	$\langle U, > U$ (423H)
	DC	with U_s	$\langle U, > U$				
		without U_s		$\langle U, > U$			
Measuring range/ nominal system voltage U_N		AC/DC systems 0...300 V	AC/DC systems 9.6...150 V (VME421H-D-1), 70...300 V (VMD421H-D-2)	(L-N) 0...288 V (L-L) 0...500 V	(L-N) 0...288 V (L-L) 0...500 V	(L-N) 0...288 V (L-L) 0...500 V	
Frequency		$\langle f, > f$	$\langle f, > f$	$\langle f, > f$	$\langle f, > f$	$\langle f, > f$	
Asymmetry/phase failure				■	■	■	
Phase sequence				■	■	■	
Current monitoring	1 AC with U_s						
	3 AC with U_s						
Special function							
Special applications						Interface Protection System/ Decoupling protection relay	
Installation	DIN rail	■	■	■	■	■	
	Screw mounting	■	■	■	■	■	

3.1



	140	144	147	150	155	158	160
$\langle U, >U$							
$\langle U, >U$							
(L-N) 0...300 V (L-L) 0...520 V							
$\langle f, >f$							
■							
■							
		$\langle I, >I$					
			$\langle I, >I$	$\langle I, >I$			
Islanding detection with df/dt							
Interface Protection System/ Decoupling protection relay					Loop monitoring	Loop monitoring	Fault voltage relay
	■	■	■	■	■	■	■
	■	■	■	■	■		

3.1

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 medium-voltage 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

Further information

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

Ordering information

Supply voltage ¹⁾ U _S		Type	Art. No.
DC	AC		
9.6...94 V	16...72 V, 15...460 Hz	VME420-D-1	B 7301 0001
70...300 V	70...300 V, 15...460 Hz	VME420-D-2	B 7301 0002

Device version with screw terminals on request.

¹⁾ Absolut values

Accessories

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

3.1

Technical data

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

Rated insulation voltage	250 V
Overtoltage category/pollution degree	III/3
Rated impulse voltage	4 kV
Protective separation (reinforced insulation) between:	
	(A1, A2) - (U1/+, U2/-) - (11-12-14) - (21-22-24)

Supply voltage

VME420-D-1:	
Supply voltage U_S	AC 16...72 V/DC 9.6...94 V
Frequency range U_S	15...460 Hz

VME420-D-2:	
Supply voltage U_S	AC/DC 70...300 V
Frequency range U_S	15...460 Hz
Power consumption	≤ 4 VA

Measuring circuit

Measuring range (r.m.s. value)	AC/DC 0...300 V
Rated frequency f_n	DC, 15...460 Hz
Frequency display range	10...500 Hz

Response values

Undervoltage < U (Alarm 2)	AC/DC 6...300 V
Overtoltage > U (Alarm 1)	AC/DC 6...300 V
Resolution of setting U 6.0...49.9 V	0.1 V
Resolution of setting U 50...300 V	1 V

Preset function:

Undervoltage < $U = (0.85 U_n)^*$ for $U_n = 230/120/60/24$ V	196/102/51/20.4 V
Overtoltage > $U = (1.1 U_n)^*$ for $U_n = 230/120/60/24$ V	253/132/66/26.4 V
Relative uncertainty voltage at 50/60 Hz	± 1.5 %, ± 2 digits
Relative uncertainty, voltage in the range of 15...460 Hz	± 3 %, ± 2 digit
Hysteresis U	1...40 % (5 %)*
Underfrequency < Hz	10...500 Hz**
Overfrequency > Hz	10...500 Hz**
Resolution of setting f 10.0...99.9 Hz	0.1 Hz
Resolution of setting f 100...500 Hz	1 Hz

Preset function:

Underfrequency for $f_n = 400/60/50/16.7$ Hz	399/59/49/15.7 Hz
Overfrequency for $f_n = 400/60/50/16.7$ Hz	401/61/51/17.7 Hz
Hysteresis frequency Hys Hz	0.1...2 Hz (0.2 Hz)*
Relative uncertainty, frequency range 15...460 Hz	± 0.2 %, ± 1 digit

Time response

Start-up delay t	0...300 s (0 s)*
Response delay $t_{on1/2}$	0...300 s (0 s)*
Delay on release t_{off}	0...300 s (0.5 s)*
Resolution of setting $t, t_{on1/2}, t_{off}$ (0...10 s)	0.1 s
Resolution of setting $t, t_{on1/2}, t_{off}$ (10...99 s)	1 s
Resolution of setting $t, t_{on1/2}, t_{off}$ (100...300 s)	10 s
Operating time, voltage t_{ae}	DC/AC 16.7 Hz: ≤ 130 ms, AC 42...460 Hz: ≤ 70 ms
Operating time frequency t_{ae}	AC 15...460 Hz: ≤ 310 ms
Response time t_{an}	$t_{an} = t_{ae} + t_{on1/2}$
Recovery time t_b	≤ 300 ms

Displays, memory

Display	LC display, multifunctional, not illuminated
Display range measured value	AC/DC 0...300 V
Operating uncertainty at 50/60 Hz	± 1.5 %, ± 2 digits
Operating uncertainty, voltage in the range of 15...460 Hz	± 3 %, ± 2 digits
Operating uncertainty, frequency in the range of 15...460 Hz	± 0.2 %, ± 1 digit
History memory (HIS) for the first alarm value	data record measured values
Password	off/0...999 (off)*
Fault memory (M) alarm relay	on/off/con (on)*

Switching elements

Number	2 x 1 changeover contacts (K1, K2)				
Operating principle	N/C operation/N/O operation				
	K2: Err, < U , > U , < Hz, > Hz, S.AL (undervoltage < U : N/C operation n.c.)*				
	K1: Err, < U , > U , < Hz, > Hz, S.AL (overtoltage > U : N/O operation n.o.)*				
Electrical endurance, number of cycles	10000				
Contact data acc. to IEC 60947-5-1:					
Utilisation category	AC 13	AC 14	DC-12	DC-12	DC-12
Rated operational voltage	230 V	230 V	24 V	110 V	220 V
Rated operational current	5 A	3 A	1 A	0.2 A	0.1 A
Minimum contact rating	1 mA at AC/DC ≥ 10 V				

Environment/EMC

EMC	IEC 61326-1
Operating temperature	-25...+55 °C
Classification of climatic conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)
Long-time storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3M4
Transport (IEC 60721-3-2)	2M2
Storage (IEC 60721-3-1)	1M3

Connection

Connection type	push-wire terminals
Connection properties:	
rigid	0.2...2.5 mm ² (AWG 24...14)
flexible without ferrule	0.2...2.5 mm ² (AWG 24...14)
flexible with ferrule	0.2...1.5 mm ² (AWG 24...16)
Stripping length	10 mm
Opening force	50 N
Test opening, diameter	2.1 mm

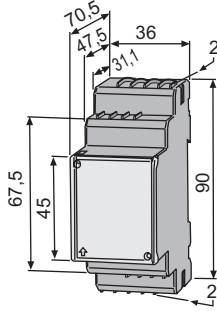
Other

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
Screw mounting	2 x M4 with mounting clip
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Software version	D235 V2.2x
Operating manual	TGH1399
Weight	≤ 150 g

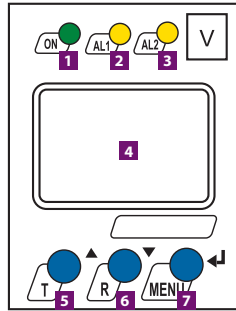
(*) = factory setting

** = The technical data applies to the operating range of the rated frequency 15...460 Hz only

Dimension diagram (dimensions in mm)



Displays and controls

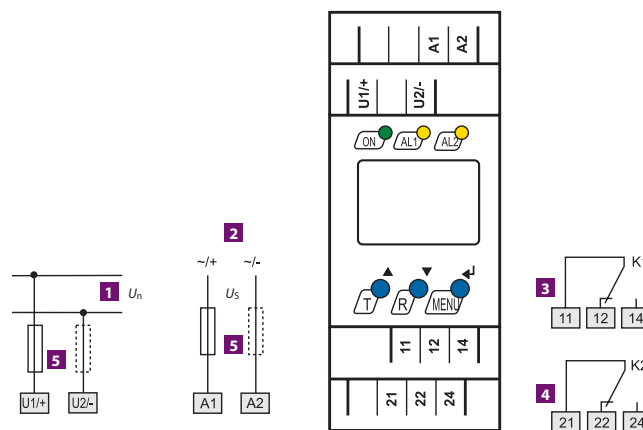


- 1** Power On LED "ON" (green); lights when supply voltage is applied and flashes in the event of system fault alarm
- 2** Alarm LED "AL1" (yellow), lights when the set response value $>U/f$ is exceeded and flashes in the event of system fault alarm
- 3** Alarm LED "AL2" (yellow), lights when the value falls below the set response value $<U/f$ and flashes in the event of system fault alarm
- 4** Multi-functional LC display
- 5** Test button "T":
Arrow up button: To change the measured value display, move upwards in the menu or to change parameters.
To call up the self test: press the button > 1.5 s

- 6** Reset button "R":
Arrow down button: to change the measured value indication, move downwards in the menu or to change parameters
To delete stored alarms: press the button "T" > 1.5 s
- 7** "MENU" button:
Enter button: to confirm the measured value indication or to confirm changed parameters
To call up the menu system, press the button "T" > 1.5 s
Press the ESC button > 1.5 s to abort an action or to return to the previous menu level

When the menu item LED is activated, the alarm LED "AL1" indicates that K1 is in the alarm state. When "AL2" lights up, K2 is in the alarm position.

Wiring diagram



- 1** Connection to the system/load being monitored
- 2** Supply voltage U_s (see ordering information)
- 3** Alarm relay "K1": Configurable for $<U>U/f$ /ERROR

- 4** Alarm relay "K2": Configurable for $<U>U/f$ /ERROR
- 5** Line protection according to IEC 60364-4-43:
A fuse recommended. If being supplied from an IT system, both lines have to be protected by a fuse.

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 medium-voltage systems via voltage transformers
- Monitoring of battery systems
- Switching machinery and equipment on and off at a certain voltage level

Approvals



Device features

- Monitoring undervoltage, overvoltage and frequency of AC/DC systems of 9.6...150 V (VME421H-D-1), 70...300 V (VME421H-D-2)
- Without external supply voltage
- Integrated energy backup
- Various monitoring functions selectable $< U, > U, < f, > f$
- Start-up delay, response delay, 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

Further information

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

Ordering information

Nominal system voltage ¹⁾ U _n		Type	Art. No.
DC	AC		
9.6...150 V	9.6...150 V, 15...460 Hz	VME421H-D-1	B 7301 0003
70...300 V	70...300 V, 15...460 Hz	VME421H-D-2	B 7301 0004

Device version with screw terminals on request.

¹⁾ Absolut values

Accessories

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

Technical data

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

Rated insulation voltage	250 V
Rated impulse voltage/pollution degree	2.5 kV/3
Protective separation (reinforced insulation) between:	(U1/+, U2/-) - (11-12-14) - (21-22-24)
Voltage test acc. to IEC 61010-1	2.21 kV

Supply voltage

VME421H-D-1:	
Supply voltage U_s	none (internally supplied by U_n)

VME421H-D-2:	
Supply voltage U_s	none (internally supplied by U_n)
Power consumption	≤ 6 VA

Measuring circuit

Measuring range (r.m.s. value) (VME421H-D-1)	AC/DC 0...150 V
Measuring range (r.m.s. value) (VME421H-D-2)	AC/DC 0...300 V
Rated frequency f_n	DC, 15...460 Hz
Frequency display range	10...500 Hz

Response values

VME421H-D-1:	
Undervoltage < U (Alarm 2)	AC/DC 9.6...150 V
Overvoltage > U (Alarm 1)	AC/DC 9.6...150 V

Preset function:	
Undervoltage < U (0.85 U_n)* for $U_n = 120/60/24$ V	102/51/20.4 V
Overvoltage > U (1.1 U_n)* for $U_n = 120/60/24$ V	132/66/26.4 V
Resolution of setting U 9.6...49.9 V	0.1 V
Resolution of setting U 50...150 V	1 V

VME421H-D-2:	
Undervoltage < U (ALARM 2)	AC/DC 70...300 V
Overvoltage > U (ALARM 1)	AC/DC 70...300 V
Resolution of setting U 70...300 V	1 V

Preset function:	
Undervoltage < U (0.85 U_n)* for $U_n = 230/120$ V	196/102 V
Overvoltage > U (1.1 U_n)* for $U_n = 230/120$ V	253/132 V

VME421H...:	
Relative uncertainty voltage at 50/60 Hz	1.5 %, 2 digits
Relative uncertainty voltage in the range 15...460 Hz	± 3 %, ± 2 digit
Hysteresis U	1...40 % (5 %)*
Underfrequency < Hz	10...500 Hz**
Overfrequency > Hz	10...500 Hz**

Resolution of setting f 10.0...99.9 Hz	0.1 Hz
Resolution of setting f 100...500 Hz	1 Hz
Preset function:	
Underfrequency for $f_n = 400/60/50/16.7$ Hz	399/59/49/15.7 Hz
Overfrequency for $f_n = 400/60/50/16.7$ Hz	401/61/51/17.7 Hz
Hysteresis frequency Hys Hz	0.1...2 Hz (0.2 Hz)*
Relative uncertainty, frequency in the range of 15...460 Hz	± 0.2 %, ± 1 digit

Time response	
Start-up delay t	0...300 s (0 s)*
Response delay $t_{on1/2}$	0...300 s (0 s)*
Delay on release t_{off}	0...300 s (0.5 s)*
Resolution of setting t , $t_{on1/2}$, t_{off} (0...10 s)	0.1 s
Resolution of setting t , $t_{on1/2}$, t_{off} (10...99 s)	1 s
Resolution of setting t , $t_{on1/2}$, t_{off} (100...300 s)	10 s

Operating time, voltage t_{ae}	DC/AC 16.7 Hz: ≤ 130 ms, AC 42...460 Hz: ≤ 70 ms
Operating time frequency t_{ae}	AC 15...460 Hz: ≤ 310 ms
Response time t_{an}	$t_{an} = t_{ae} + t_{on1/2}$

Discharging time energy backup on power failure (VME421H-D-1)	3 s
Discharging time energy backup on power failure (VME421H-D-1)	2.5 s at $f_n < 42$ Hz
Discharging time energy backup (VME421H-D-2)	≥ 4 s at DC 70 V
	≥ 6 s at DC 80 V/AC 70 V

Charging time energy backup (VME421H-D-1)	60 s
Charging time energy backup (VME421H-D-2)	120 s
Recovery time t_b	≤ 300 ms

Displays, memory

Display	LC display, multifunctional, not illuminated
Display range measured value (VME421H-D-1)	AC/DC 0...150 V
Display range measured value (VME421H-D-2)	AC/DC 0...300 V
Operating uncertainty at 50/60 Hz	± 1.5 %, ± 2 digits
Operating uncertainty voltage in the range of 15...460 Hz	± 3 %, ± 2 digits
Operating uncertainty in the frequency range 15...460 Hz	± 0.2 %, ± 1 digit
History memory (HIS) for the first alarm value	data record measured values
Password	off/0...999 (off)*
Fault memory (M) alarm relay	on/off/con (on)*

Switching elements

Number	2 x 1 changeover contacts (K1, K2)
Operating principle	N/C operation/N/O operation
	K2: Err, < U , > U , < Hz, > Hz, S.AL (undervoltage < U : N/C operation n.c.)*
	K1: Err, < U , > U , < Hz, > Hz, S.AL (overvoltage > U : N/O operation n.o.)*
Electrical endurance, number of cycles	10000

Contact data acc. to IEC 60947-5-1:					
Utilisation category	AC 13	AC 14	DC-12	DC-12	DC-12
Rated operational voltage	230 V	230 V	24 V	110 V	220 V
Rated operational current	5 A	3 A	1 A	0.2 A	0.1 A
Minimum contact rating	1 mA at AC/DC ≥ 10 V				

Environment/EMC

EMC	IEC 61326-1
Operating temperature	-25...+55 °C
Classification of climatic conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)
Long-time storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3M4
Transport (IEC 60721-3-2)	2M2
Storage (IEC 60721-3-1)	1M3

Connection

Connection type	push-wire terminals
Connection properties	
rigid	0.2...2.5 mm ² (AWG 24...14)
flexible without ferrule	0.2...2.5 mm ² (AWG 24...14)
flexible with ferrule	0.2...1.5 mm ² (AWG 24...16)
Stripping length	10 mm
Opening force	50 N
Test opening, diameter	2.1 mm

Other

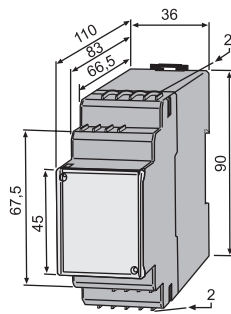
Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (DIN EN 60529)	IP30
Degree of protection, terminals (DIN EN 60529)	IP20
Enclosure material	polycarbonate
Screw mounting	2 x M4 with mounting clip
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Software version VME421H-D-1	D236 V2.2x
Software version VME421H-D-2	D237 V2.2x
Operating manual	TGH1403
Weight	≤ 240 g

(*)* = factory setting

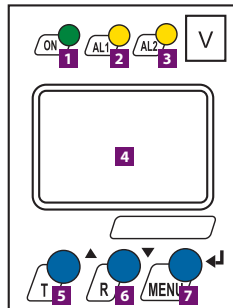
** = The technical data applies to the operating range of the rated frequency 15...460 Hz only.

3.1

Dimension diagram (dimensions in mm)

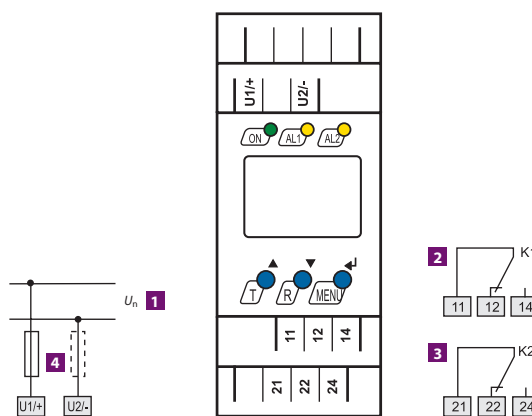


Displays and controls



- 1** Power On LED "ON" (green); lights when supply voltage is applied and flashes in the event of system fault alarm
- 2** Alarm LED "AL1" (yellow), lights when the set response value $>U/<f/>f$ is exceeded and flashes in the event of system fault alarm
- 3** Alarm LED "AL2" (yellow), lights when the value falls below the set response value $<U/<f/>f$ and flashes in the event of system fault alarm
- 4** Multi-functional LC display
- 5** Test button "T":
Arrow up button: To change the measured value display, move upwards in the menu or to change parameters.
To call up the self test: press the button "T" >1.5 s
- 6** Reset button "R":
Arrow down button: to change the measured value indication, move downwards in the menu or to change parameters
To delete stored alarms: press the button "T" >1.5 s
- 7** "MENU" button:
Enter button: to confirm the measured value indication or to confirm changed parameters
To call up the menu system, press the button "T" >1.5 s
Press the ESC button >1.5 s to abort an action or to return to the previous menu level

Wiring diagram



- 1** Connection to the system/load being monitored
- 2** Alarm relay "K1": Configurable for $<U/>U/<f/>f$ /ERROR
- 3** Alarm relay "K2": Configurable for $<U/>U/<f/>f$ /ERROR
- 4** Line protection according to IEC 60364-4-43:
A fuse recommended recommended. If being supplied from an IT system, both lines have to be protected by a fuse.

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
- 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

Further information

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

Approvals



Ordering information

Supply voltage ¹⁾ U _s			Type	Art. No.
DC	AC	AC/DC		
9.6...94V, 15...460 Hz	16...72V	–	VMD420-D-1	B 7301 0005
–	–	70...300V, 15...460 Hz	VMD420-D-2	B 7301 0006

Device version with screw terminals on request.

¹⁾ Absolut values

Accessories

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

3.1

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

Rated insulation voltage	400 V
Rated impulse voltage/pollution degree	4 kV/3
Protective separation (reinforced insulation) between (A1, A2) - (N, L1, L2, L3) - (11, 12, 14) - (21, 22, 24)	
Voltage test acc. to IEC 61010-1: (N, L1, L2, L3) - (A1, A2), (11, 12, 14)	3.32 kV
(N, L1, L2, L3) - (21, 22, 24)	2.21 kV
(A1, A2) - (11, 12, 14) - (21, 22, 24)	2.21 kV

Supply voltage

VMD420-D-1:	
Supply voltage U_s	AC 16...72 V/DC 9.6...94 V
Frequency range U_s	15...460 Hz
VMD420-D-2:	
Supply voltage U_s	AC/DC 70...300 V
Frequency range U_s	15...460 Hz
Power consumption	≤ 4 VA

Measuring circuit

Measuring range (r.m.s. value) (L-N)	AC 0...288 V
Measuring range (r.m.s. value) (L-L)	AC 0...500 V
Rated frequency f_n	15...460 Hz
Frequency display range	10...500 Hz

Response values

Type of distribution system	3(N)AC/3AC (3AC)*
Undervoltage < U (Alarm 2) (measurement method:	AC 6...500/6...288 V
Overvoltage > U (Alarm 1) (measurement method: 3Ph/3n)	AC 6...500/6...288 V
Resolution of setting U	1 V

Preset function for 3AC measurement:

Undervoltage < U (0.85 U_n)* for $U_n = 400/208$ V	340/177 V
Overvoltage > U (1.1 U_n)* for $U_n = 400/208$ V	440/229 V

Preset function for 3(N)AC measurement:

Undervoltage < U (0.85 U_n)* for $U_n = 230/120$ V	196/102 V
Overvoltage > U (1.1 U_n)* for $U_n = 230/120$ V	253/132 V

Asymmetry	5...30 % (30 %)*
Phase failure	by setting the asymmetry
Phase sequence	clockwise/anticlockwise rotation (off)*
Relative uncertainty, voltage at 50/60 Hz	± 1.5 %, ± 2 digits
Relative uncertainty, voltage in the range 15...460 Hz	± 3 %, ± 2 digits
Hysteresis U	1...40 % (5 %)*
Underfrequency < Hz	10...500 Hz**
Overfrequency > Hz	10...500 Hz**
Resolution of setting f (10.0...99.9 Hz)	0.1 Hz
Resolution of setting f (100...500 Hz)	1 Hz

Preset function:

Underfrequency for $f_n = 400/60/50/16.7$ Hz	399/59/49/15.7 Hz
Overfrequency for $f_n = 400/60/50/16.7$ Hz	401/61/51/17.7 Hz
Hysteresis, frequency Hys Hz	0.1...2 Hz (0.2 Hz)*
Relative uncertainty, frequency range 15...460 Hz	± 0.2 %, ± 1 digit

Time response

Start-up delay t	0...300 s (0 s)*
Response delay $t_{on1/2}$	0...300 s (0 s)*
Delay on release t_{off}	0...300 s (0.5 s)*
Resolution of setting t, $t_{on1/2}$, t_{off} (0...10 s)	0.1 s
Resolution of setting t, $t_{on1/2}$, t_{off} (10...99 s)	1 s
Resolution of setting t, $t_{on1/2}$, t_{off} (100...300 s)	10 s
Operating time, voltage t_{ae}	≤ 140 ms
Operating time, frequency t_{ae}	≤ 335 ms
Response time t_{an}	$t_{an} = t_{ae} + t_{on1/2}$
Recovery time t_b	≤ 300 ms

Displays, memory

Display	LC display, multifunctional, not illuminated
Display range measured value	AC/DC 0...500 V
Operating uncertainty, voltage at 50 Hz/60 Hz	1.5 %, 2 digits
Operating uncertainty voltage in the range of 15...460 Hz	± 3 %, ± 2 digits
Operating uncertainty, frequency in the range of 15...460 Hz	± 0.2 %, ± 1 digit
History memory (HIS) for the first alarm value	data record measured values
Password	off/0...999 (off/0)*
Fault memory (M) alarm relay	on/off/con (on)*

Switching elements

Number	2 x 1 changeover contacts (K1, K2)
Operating principle	N/C operation n.c. or N/O operation n.o. K2: Err, < U, > U, Asy, < Hz, > Hz, PHS, S.AL (undervoltage < U, asymmetry Asy, N/C operation n.c.)* K1: Err, < U, > U, Asy, < Hz, > Hz, PHS, S.AL (overvoltage > U, asymmetry Asy, N/O operation n.o.)*
Electrical endurance, number of cycles	10000
Contact data acc. to IEC 60947-5-1:	
Utilisation category	AC 13 AC 14 DC-12 DC-12 DC-12
Rated operational voltage	230 V 230 V 24 V 110 V 220 V
Rated operational current	5 A 3 A 1 A 0.2 A 0.1 A
Minimum contact rating	1 mA at AC/DC ≥ 10 V

Environment/EMC

EMC	IEC61326-1
Operating temperature	-25...+55 °C
Classification of climatic conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)
Long-time storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3M4
Transport (IEC 60721-3-2)	2M2
Storage (IEC 60721-3-1)	1M3

Connection

Connection type	push-wire terminals
Connection properties	
rigid	0.2...2.5 mm ² (AWG 24...14)
flexible without ferrule	0.2...2.5 mm ² (AWG 24...14)
flexible with ferrule	0.2...1.5 mm ² (AWG 24...16)
Stripping length	10 mm
Opening force	50 N
Test opening, diameter	2.1 mm

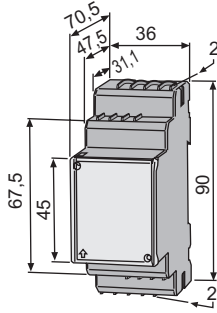
Other

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
Screw mounting	2 x M4 with mounting clip
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Software version	D238 V2.2x
Operating manual	TGH1396
Weight	≤ 150 g

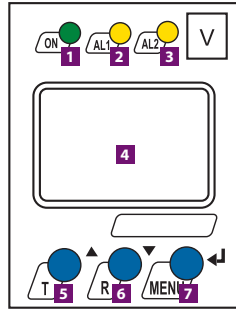
(*) = factory setting

** = The technical data can only be ensured in the operating range of the nominal frequency 15...460 Hz.

Dimension diagram (dimensions in mm)



Displays and controls

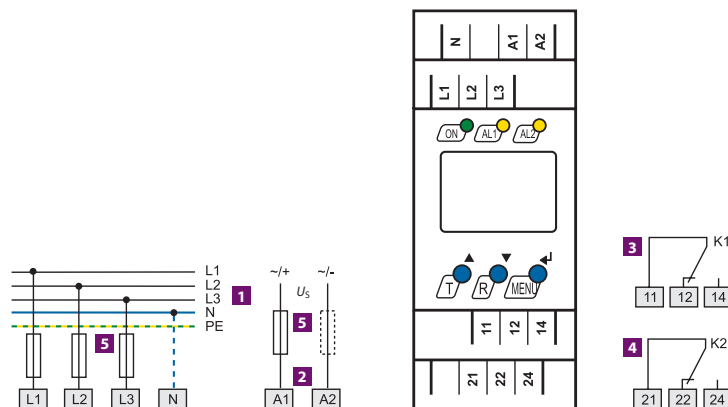


- 1** Power On LED "ON" (green); lights when supply voltage is applied and flashes in the event of system fault alarm
- 2** Alarm LED "AL1" (yellow), lights when the set response value $>U/f>/f/Asy/PHS$ is exceeded and flashes in the event of system fault alarm
- 3** Alarm LED "AL2" (yellow), lights when the set response value $>U/f>/f/Asy/PHS$ is exceeded and flashes in the event of system fault alarm
- 4** Multi-functional LC display
- 5** Test button "T":
Arrow up button: to change the measured value display, move upwards in the menu or to change parameters
To call up the self test: press the button "T" >1.5 s

- 6** Reset button "R":
Arrow down button: to change the measured value display, move downwards in the menu or to change parameters
To delete stored alarms: press the button "T" >1.5 s
- 7** "MENU" button:
Enter button: to confirm the measured value indication or to confirm changed parameters
To call up the menu system, press the button "T" >1.5 s
Press the ESC button >1.5 s to abort an action or to return to the previous menu level

When the menu item LED is activated, the alarm LED "AL1" indicates that K1 is in the alarm state. When "AL2" lights up, K2 is in the alarm position.

Wiring diagram



- 1** Connection to the system/load to be monitored
- 2** Supply voltage U_s (see ordering information)
- 3** Alarm relay "K1":
Configurable for $<U>U/f>/f/Asy/PHS/ERROR$

- 4** Alarm relay "K2":
Configurable for $<U>U/f>/f/Asy/PHS/ERROR$
- 5** Fuse as line protection.
6 A fuse recommended. If being supplied from an IT system, both lines have to be protected by a fuse.

LINETRAXX® VMD421H

Multi-functional voltage relay for 3(N)AC systems, frequency/overvoltage/undervoltage, phase, phase failure, asymmetry



Typical applications

- Monitoring of voltage-sensitive machines and electrical installations
- Switching machinery and equipment on and off at a certain voltage level
- Monitoring of stand-by and emergency supply systems
- Supply voltage monitoring of portable loads
- Protection of three-phase motors against phase failure and phase open-circuit
- Transformer protection, asymmetrical load can be recognised

Approvals



Device features

- Undervoltage, overvoltage and frequency monitoring in 3(N)AC systems 70...500/288 V
- Without external supply voltage
- Integrated energy backup
- Asymmetry, phase failure and phase sequence monitoring
- Various monitoring functions selectable $<U, >U, <f, >f$
- Start-up delay, response delay, delay on release
- Adjustable switching hysteresis
- 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 LINETRAXX® VMD421H series complies with the requirements of the device standards: IEC 61010-1 and IEC 60255-6.

Further information

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

Ordering information

Nominal system voltage ¹⁾ U_n	Type	Art. No.
3(N)AC		
70...500 V, 15...460 Hz	VMD421H-D-3	B 7301 0007

Device version with screw terminals on request.

¹⁾ Absolute values

Accessories

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

Technical data

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

Rated insulation voltage	400 V
Rated impulse voltage/pollution degree	4 kV/3
Protective separation (reinforced insulation) between (N, L1, L2, L3) - (11, 12, 14) - (21, 22, 24)	
Voltage test acc. to IEC 61010-1:	
(N, L1, L2, L3) - (11, 12, 14)	3.32 kV
(N, L1, L2, L3) - (21, 22, 24)	2.21 kV

Supply voltage

Supply voltage U_S	none (internally supplied by U_n)
Power consumption	≤ 6 VA

Measuring circuit

Measuring range (r.m.s. value) (L-N)	AC 0...288 V
Measuring range (r.m.s. value) (L-L)	AC 0...500 V
Rated frequency f_n	15...460 Hz
Frequency display range	10...500 Hz

Response values

Type of distribution system	3(N)AC/3AC (3AC)*
Undervoltage < U (Alarm 2) (measurement method: 3Ph/3n)	AC 70...500/70...288 V
Overvoltage > U (Alarm 1) (measurement method: 3Ph/3n)	AC 70...500 V/70...288 V
Resolution of setting U	1 V
Preset function for 3AC measurement:	
Undervoltage < U (0.85 U_n)* for $U_n = 400/208$ V	340/177 V
Overvoltage > U (1.1 U_n)* for $U_n = 400/208$ V	440/229 V
Preset function for 3(N)AC measurement:	
Undervoltage < U (0.85 U_n)* for $U_n = 230/120$ V	196/102 V
Overvoltage > U (1.1 U_n)* for $U_n = 230/120$ V	253/132 V
Asymmetry	5...30 % (30 %)*
Phase failure	by setting the asymmetry
Phase sequence	clockwise/anticlockwise rotation (off)*
Relative uncertainty, voltage at 50/60 Hz	± 1.5 %, ± 2 digits
Relative uncertainty voltage in the range 15...460 Hz	± 3 %, ± 2 digits
Hysteresis U	1...40 % (5 %)*
Underfrequency < Hz	10...500 Hz
Overfrequency > Hz	10...500 Hz
Resolution of setting f 10.0...99.9 Hz	0.1 Hz
Resolution of setting f 100...500 Hz	1 Hz
By preset function :	
Underfrequency for $f_n = 400/60/50/16.7$ Hz	399/59.5/49.5/16.2 Hz
Overfrequency for $f_n = 400/60/50/16.7$ Hz	401/60.5/50.5/17.2 Hz
Hysteresis frequency Hys Hz	0.2...2 Hz (0.2 Hz)*
Relative uncertainty, frequency in the range of 15...460 Hz	± 0.2 %, ± 1 digit

Time response

Start-up delay t	0...99 s (0 s)*
Response delay $t_{on1/2}$	0...99 s (0 s)*
Delay on release t_{off}	0...99 s (0.5 s)*
Operating time, voltage t_{ae}	≤ 140 ms
Operating time, frequency t_{ae}	≤ 335 ms
Response time t_{an}	$t_{an} = t_{ae} + t_{on1/2}$
Discharging time energy backup on power failure	2.5 s
Charging time energy storage	60 s
Recovery time t_b	≤ 300 ms

Displays, memory

Display	LC display, multifunctional, not illuminated
Display range measured value	AC/DC 0...500 V
Operating uncertainty, voltage at 50/60 Hz	± 1.5 %, ± 2 digits
Operating uncertainty voltage in the range of 15...460 Hz	± 3 %, ± 2 digits
Operating uncertainty, frequency in the range of 15...460 Hz	± 0.2 %, ± 1 digit
History memory (HiS) for the first alarm value	data record measured values
Password	Off/0...999 (OFF)*
Fault memory (M) alarm relay	on/off/con (on)*

Switching elements

Number	2 x 1 changeover contacts (K1, K2)				
Operating principle	N/C operation n.c. or N/O operation n.o.				
	K2: Err, < U, > U, Asy, < Hz, > Hz, PHS (undervoltage < U, asymmetry Asy, N/C operation n.c.)*				
	K1: Err, < U, > U, Asy, < Hz, > Hz, PHS (overvoltage > U, asymmetry Asy, N/O operation n.o.)*				
Electrical endurance, number of cycles	10000				
Fault memory	on/off (on)*				
Contact data acc. to IEC 60947-5-1:					
Utilisation category	AC 13	AC 14	DC-12	DC-12	DC-12
Rated operational voltage	230 V	230 V	24 V	110 V	220 V
Rated operational current	5 A	3 A	1 A	0.2 A	0.1 A
Minimum contact rating	1 mA at AC/DC ≥ 10 V				

Environment/EMC

EMC	IEC 61326-1
Operating temperature	-25...+55 °C
Classification of climatic conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)
Long-term storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3M4
Transport (IEC 60721-3-2)	2M2
Storage (IEC 60721-3-1)	1M3

Connection

Connection type	push-wire terminals
Connection properties	
rigid	0.2...2.5 mm ² (AWG 24...14)
flexible without ferrule	0.2...2.5 mm ² (AWG 24...14)
flexible with ferrule	0.2...1.5 mm ² (AWG 24...16)
Stripping length	10 mm
Opening force	50 N
Test opening, diameter	2.1 mm

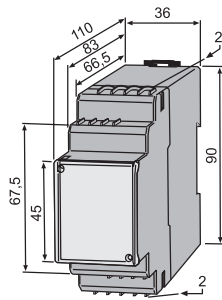
Other

Operating mode	continuous operation
Mounting position	vertically, see dimension diagram
Degree of protection, internal components (IEC 60529)	IP30
Degree of protection, terminals (IEC 60529)	IP30
Enclosure material	polycarbonate
Screw mounting	2 x M4 with mounting clip
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Operating manual	TGH1405
Weight	≤ 240 g

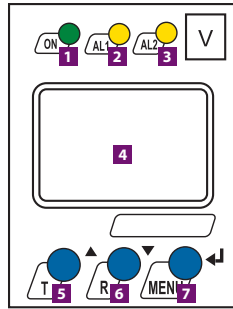
(*) = factory setting

3.1

Dimension diagram (dimensions in mm)

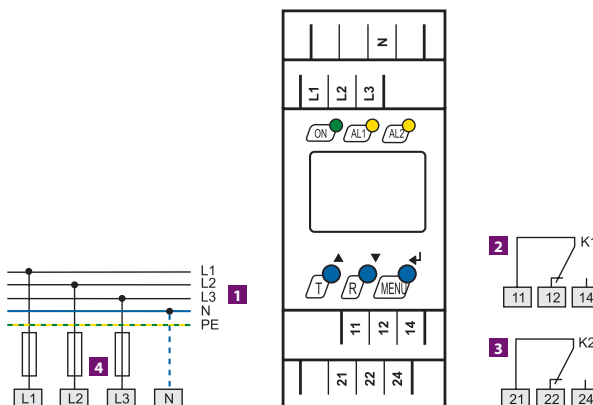


Displays and controls



- 1** Power On LED "ON" (green), lights when the supply voltage is applied or flashes in the event of system fault alarm
- 2** Alarm LED "AL1" (yellow), lights when the set response value $>U/<f>f>/Asy/PHS$ is exceeded and flashes in the event of system fault alarm
- 3** Alarm LED "AL2" (yellow), lights when value falls below the set response value $>U/<f>f>/Asy/PHS$ and flashes in the event of system fault alarm
- 4** Multi-functional LC display
- 5** Test button "T":
Arrow up button: To change the measured value display, move upwards in the menu or to change parameters.
To call up the self test: press the button >1.5 s
- 6** Reset button "R":
Arrow down button: to change the measured value indication, move downwards in the menu or to change parameters
To delete stored alarms: press the button "T" >1.5 s
- 7** "MENU" button:
Enter button: to confirm the measured value indication or to confirm changed parameters press the button "T" >1.5 s
Press the ESC button >1.5 s to abort an action or to return to the previous menu level

Wiring diagram



- 1** Connection to the system/load to be monitored
- 2** Alarm relay "K1":
Configurable for $<U/>U/<f>f>/Asy/PHS/ERROR$
- 3** Alarm relay "K2":
Configurable for $<U/>U/<f>f>/Asy/PHS/ERROR$
- 4** Fuse as line protection.
6 A fuse recommended. If being supplied from an IT system, both lines have to be protected by a fuse.

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): 2006-02, C 10/11, EN 50438:2007
- 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
- r.m.s. 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 0126-1-1:2006-2 (France, Switzerland)
- DIN V VDE V 0126-1-1:2006-2 and EN 50438:2007 (Czech Republic)
- C 10/11 (Belgium)

Further information

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

Ordering information

Supply voltage ¹⁾ U _S		Response value	Type	Art. No.
DC	AC	AC		
9.6...94 V	16...72 V, 15...460 Hz	10...500 V	VMD423-D-1	B 7301 0020
70...300 V	70...300 V, 15...460 Hz	10...500 V	VMD423-D-2	B 7301 0021
U _n	U _n	70...500 V	VMD423H-D-3	B 7301 0022

Device version with screw terminals on request.

¹⁾ Absolut values

Accessories

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

Technical data

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

Rated insulation voltage	400 V
Rated impulse voltage/pollution degree	4 kV/3
Protective separation (reinforced insulation) between (A1, A2) - (N, L1, L2, L3) - (11, 12, 14) - (21, 22, 24)	

Voltage test according to IEC 61010-1:

VMD423 and VMD423H: (N, L1, L2, L3) - (A1, A2), (11, 12, 14) (N, L1, L2, L3) - (21, 22, 24)	3.32 kV 2.21 kV
VMD423: (A1, A2) - (11, 12, 14) - (21, 22, 24)	2.21 kV

Supply voltage

VMD423-D-1:

Supply voltage U_S	AC 16...72 V/DC 9.6...94 V
Frequency range U_S	15...460 Hz

VMD423-D-2:

Supply voltage U_S	AC/DC 70...300 V
Frequency range U_S	15...460 Hz
Power consumption	≤ 4 VA

VMD423H-D-3:

Supply voltage U_S	none (internally supplied by U_n)
Power consumption	≤ 6 VA

Measuring circuit

Measuring range (r.m.s. value) (L-N)	AC 0...288 V
Measuring range (r.m.s. value) (L-L)	AC 0...500 V
Rated frequency f_n	40...65 Hz
Frequency display range	25...100 Hz

Response values

VMD423-D-1/VMD423-D-2

Type of distribution system	3(N)AC/3AC (3(N)AC)*
Undervoltage < U (Alarm 2) (measurement method: 3Ph/3n)	AC 10...500/10...288 V (184)*
Overvoltage > U_1 (Alarm 1) (measurement method: 3Ph/3n)	AC 10...500/10...288 V (264)*
Overvoltage > U_2 (Alarm 1) (measurement method: 3Ph/3n)	AC 10...288 V (253)*
Overvoltage U_2	10-minute average determination
Schrittweite U	1 V

VMD423H-D-3

Type of distribution system	3(N)AC/3AC (3(N)AC)*
Undervoltage < U (Alarm 2) (measurement method: 3Ph/3n)	AC 70...500/70...288 V
Overvoltage > U (Alarm 1) (measurement method: 3Ph/3n)	AC 70...500/70...288 V
Resolution of setting U	1 V

Asymmetry	5...30 % (30 %)*
Phase failure	by setting the asymmetry
Phase sequence	clockwise R/anticlockwise L (R/on)*
Relative uncertainty, voltage at 50/60 Hz	±1.5 %, ±2 digits
Hysteresis U	1...40 % (5 %)*
Underfrequency < Hz	45...65 Hz (47.5 Hz)*
Overfrequency > Hz	45...65 Hz (50.2 Hz)*
Resolution of setting f	0.1 Hz
Hysteresis frequency Hys Hz	0.1...2 Hz (0.1 Hz)*
Relative uncertainty, frequency 40...65 Hz	±0.1 %, ±1 digit

Time response

Start-up delay t	0...300 s (30 s)*
Response delay $t_{on1/2}$	0...300 s (0.1)
Delay on release t_{off}	0...300 s (30 s)*
Resolution of setting t , t_{off} , $t_{on1/2}$ (0...10 s)	0.1 s
Resolution of setting t , t_{off} , $t_{on1/2}$ (10...99 s)	1 s
Resolution of setting t , t_{off} , $t_{on1/2}$ (10.0...300 s)	10 s
Operating time, voltage t_{ae}	≤ 80 ms
Operating time, frequency t_{ae}	≤ 80 ms
Response time t_{an}	$t_{an} = t_{ae} + t_{on1/2}$
Recovery time t_b	≤ 300 ms
Discharging time energy backup on power failure for VMD423H	≥ 2.5 s
Charging time energy backup for VMD423H	≤ 60 s

Displays, memory

Display	LC display, multifunctional, not illuminated
Display range measured value	AC/DC 0...500 V
Operating uncertainty, voltage at 50/60 Hz	± 1.5 %, ± 2 digits
Operating uncertainty, frequency in the range of 40...65 Hz	± 0.1 %, ± 1 digit
History memory (HIS) for the first alarm value	data record measured values
Password	off/on/0...999 (on/126)*
Fault memory (M) alarm relay	on/off/con (OFF)*

Switching elements

Number	2 x 1 changeover contacts (K1, K2)
Operating principle K1/K2	N/O operation n.o/N/C operation n.c K1: (undervoltage < U , overvoltage > U_1 , asymmetry Asy, underfrequency < Hz, overfrequency > Hz, alarm when starting SAL, N/C operation n.c.)* K2: (device error Err, undervoltage < U , overvoltage > U_1 , asymmetry Asy, underfrequency < Hz, overfrequency > Hz, phase sequence PHS, overvoltage > U_2 , alarm when starting SAL, N/C operation n.c.)*
Electrical endurance, number of cycles	10000
Fehlerspeicherung	on/off/con (off)*
Contact data acc. to IEC 60947-5-1:	
Utilisation category	AC 13 AC 14 DC-12 DC-12 DC-12
Rated operational voltage	230 V 230 V 24 V 110 V 220 V
Rated operational current	5 A 3 A 1 A 0.2 A 0.1 A
Minimum contact rating	1 mA at AC/DC ≥ 10 V

Environment/EMC

EMC	IEC 61326-1
Operating temperature	-25...+55 °C
Classification of climatic conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)
Storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3M4
Transport (IEC 60721-3-2)	2M2
Storage (IEC 60721-3-1)	1M3

Connection

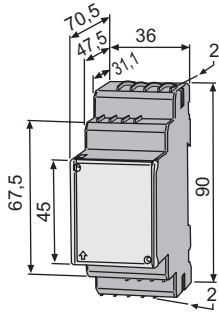
Connection type	push-wire terminals
Connection properties	
rigid	0.2...2.5 mm ² (AWG 24...14)
flexible without ferrule	0.2...2.5 mm ² (AWG 24...14)
flexible with ferrule	0.2...1.5 mm ² (AWG 24...16)
Stripping length	10 mm
Opening force	50 N
Test opening, diameter	2.1 mm

Other

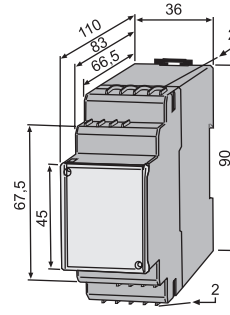
Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (IEC 60529)	IP30
Degree of protection, terminals (IEC 60529)	IP30
Enclosure material	polycarbonate
Screw mounting	2 x M4 with mounting clip
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Software version	D344 V3.1x
Operating manual	TGH1444
Weight VMD423	≤ 150 g
VMD423H	≤ 240 g

(*) = Factory setting

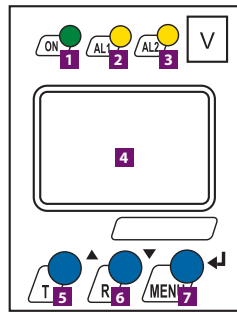
VMD423



VMD423H



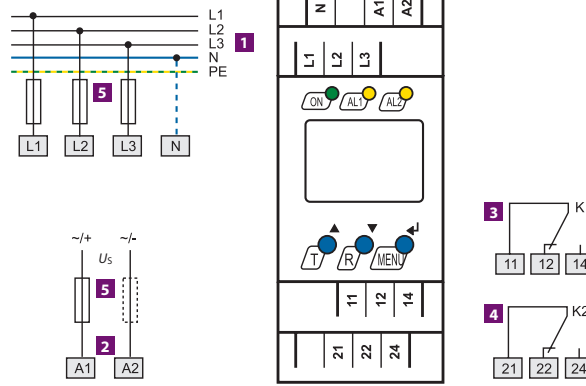
Displays and controls



3.1

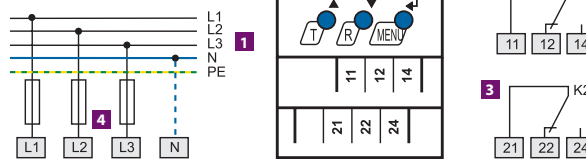
- 1** Power On LED "ON" (green); Lights up when voltage is available and when the device is in operation or flashes in case of system fault alarm.
- 2** Alarm LED "AL1" (yellow): Lights up in case of the following fault messages: $>U1/>U2$ (10 minute average determination)
- 3** Alarm LED "AL2" (yellow): Lights up in case of the following fault message: $<U$
Both the alarm LEDs "AL1" and "AL2" light up in case of the following fault messages: $<f/>f/Asy/PHS$, the alarm LEDs flash in case of system fault alarm.
- 4** Display: Displays operating information.
- 5** Test button "T": UPWARDS (<1.5 s)/TEST (>1.5 s):
The arrow up button is used to increase input values or to navigate through the menu.
The test button is used to start a manual self test.

- 6** Reset button "R": Down (<1.5 s)/Reset (>1.5 s):
The arrow down button is used to decrease input values or to navigate through the menu.
The reset button "R" is used to activate a manual reset.
- 7** ENTER (<1.5 s)/MENU (>1.5 s) button:
The Enter button is used to save input data and changed data.
Press the "MENU" button to call up the menu system.
Press the "MENU" (ESC) button >1.5 s in the menu mode to abort an action or to return to the previous menu level. (ESC)
When the menu item LED is activated, the alarm LED "AL1" indicates that K1 is in the alarm state. When "AL2" lights up, K2 is in the alarm position.



- 1** Connection to the system/load to be monitored
- 2** Supply voltage U_s (see ordering information)
- 3** Alarm relay "K1":
Configurable for $\langle U \rangle U1 / \langle U2 \rangle / \langle f \rangle / \text{Asy} / \text{PHS} / \text{ERROR}$
- 4** Alarm relay "K2":
Configurable for $\langle U \rangle U1 / \langle U2 \rangle / \langle f \rangle / \text{Asy} / \text{PHS} / \text{ERROR}$
- 5** Fuse as line protection.
6 A fuse recommended. If being supplied from an IT system, both lines have to be protected by a fuse.

Wiring diagram



- 1** Connection to the system to be monitored and to supply voltage
- 2** Alarm relay "K1":
Configurable for $\langle U \rangle U1 / \langle U2 \rangle / \langle f \rangle / \text{Asy} / \text{PHS} / \text{ERROR}$
- 3** Alarm relay "K2":
Configurable for $\langle U \rangle U1 / \langle U2 \rangle / \langle f \rangle / \text{Asy} / \text{PHS} / \text{ERROR}$
- 4** Fuse as line protection.
6 A fuse recommended. If being supplied from an IT system, both lines have to be protected by a fuse.



LINETRAXX® VMD460-NA

Network and system protection (NS protection)
for monitoring the power feed-in of power generation systems



Typical applications

- Automatic switching point between a power generation system operated in parallel with the network and the public grid
- Application in accordance with CEI 0-21, VDE-AR-N 4105, BDEW guideline, C10/11, G59/2, G83/2, DIN V VDE V 0126-1-1
- Universally applicable for safe mains decoupling of power generation systems

Device features

- Straightforward commissioning due to pre-set basic programs for national standards and regulations
- Single-fault tolerance
- Monitoring of the connected coupling switch (configurable: NC/NO/off)
- Islanding detection df/dt (ROCOF)
- Interface RS-485 (software update)
- Test function for the determination of the disconnection time
- Test button for the trigger circuit
- The last 300 distribution network faults can be recalled with time stamp/real-time clock
- Continuous monitoring of the phase and line-to-line voltage
- Separate switching conditions after a threshold infringement
- Language selection (German, English, Italian)
- Backlit graphics LC display
- Password protection for device setting
- Remote shutdown via ripple control signal receiver
- Sealable enclosure

Certificates of non-objection/certificate of conformity

- CEI 0-21
- VDE-AR-N 4105
- BDEW guideline in preparation
- C10/11 in preparation
- G59/2 in preparation
- G83/2 in preparation
- DIN V VDE V 0126-1-1 in preparation

Further information

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

Ordering information

Supply voltage U_s		Type	Art. No.
DC	AC		
50/60 Hz	100...240 V	VMD460-NA-D-2	B 9301 0045

Accessories

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

3.1

Technical data

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

Rated insulation voltage	400 V
Rated impulse voltage/pollution degree	6 kV/II
Safe separation (reinforced insulation) between (A1, A2) - (L1, L2, L3, N) - (11, 12, 14, 21, 22, 24) (D1, D2, D3, D4, DG1/2, DG3/4, RTG, RT1)-(A1, A2, L1, L2, L3, N)	
Voltage test acc. to IEC 61010-1: (N, L1, L2, L3) - (A1, A2), (11, 12, 14, 21, 22, 24)	3.32 kV

Supply voltage

Nominal supply voltage U_s	AC/DC 100...240 V DC/50/60 Hz
Operating range U_s	AC/DC 75...300 V DC/40...70 Hz
Power consumption	8 VA/3 W

Measuring circuit

Nominal system voltage U_n (r.m.s. value) (L-N)	AC 0...300 V
Nominal system voltage U_n (r.m.s. value) (L-L)	AC 0...520 V
Rated frequency f_n	45...65 Hz

Response values

Type of distribution system	1NAC: 230 V, 50 Hz 3NAC: 400/230 V, 50 Hz
Relative uncertainty, voltage	$U \leq 280$ V: ≤ 1 % $U > 280$ V: ± 3 %
Resolution of setting, voltage	1 %
Rated frequency	50 Hz
Relative uncertainty, frequency	$\leq \pm 0.1$ %
Resolution of setting f	0.05 Hz

Recording of measurement values, condition for connection

L-N, L-L	0...1.3 U_n
$< f$	45...60 Hz
$> f$	50...65 Hz

Recording of measurement value, condition for disconnection

L-N, L-L	0...1.3 U_n
$< f$	45...60 Hz
$> f$	50...65 Hz
df/dt	0.1...5 Hz/s

Time response

Delay time for connection t_{on}	40 ms...30 s/1...3600 s
Resolution of setting t_{on}	< 10 s: 0.1 s > 10 s: 1 s
Operating time voltage t_{ae}	≤ 15 ms
Operating time frequency t_{ae}	≤ 15 ms
Recovery time t_b	300 ms

Digital inputs

Monitoring of potential-free contacts or voltage inputs:

closed = low; 0...4 V; $I_{in} < -5$ mA
open = high; > 6 ... ≤ 30 V

D1	Feedback signal contact K1
D2	Feedback signal contact K2
D3	Local control (mode)
D4	External signal (mode)
RT1	Remote trip
DG1/2, DG3/4, RTG	GND

Displays, memory

Display	LC display, multi-functional, illuminated
Display range measured value	AC/DC 0...520 V
Operating uncertainty, voltage	$U \leq 280$ V: ≤ 1 % $U > 280$ V: ± 3 %
Operating uncertainty, frequency	$\leq \pm 0.1$ %
History memory for the last 300 messages	per data record measured values
Password	on/off/0...999 (off*)

Switching elements

Number	2 x 1 changeover contacts (K1, K2)				
Operating mode	N/C operation n.c./N/O operation n.o.				
Electrical endurance, number of cycles	10000				
Contact data acc. to IEC 60947-5-1:					
Utilisation category	AC 13	AC 14	DC-12	DC-12	DC-12
Rated operational voltage	230 V	230 V	24 V	110 V	220 V
Rated operational current	5 A	3 A	1 A	0.2 A	0.1 A
Minimum contact rating	1 mA at AC/DC ≥ 10 V				

Environment/EMC

EMC	DIN EN 60255-26/CEI 0-21
Operating temperature	-25...+55 °C
Classification of climatic conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)
Storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3M4
Transport (IEC 60721-3-2)	2M2
Storage (IEC 60721-3-1)	1M3

Connection

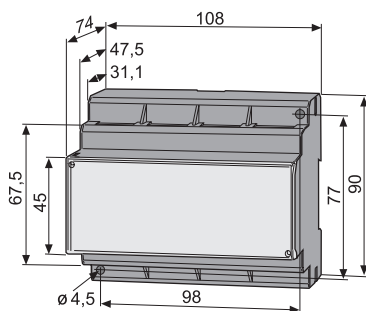
Connection type	screw terminals or push-wire terminals
Connection properties:	
rigid	0.2...4 mm ² (AWG 24...12)
flexible	0.2...2.5 mm ² (AWG 24...14)
Stripping length	8...9 mm
Tightening torque	0.5...0.6 Nm

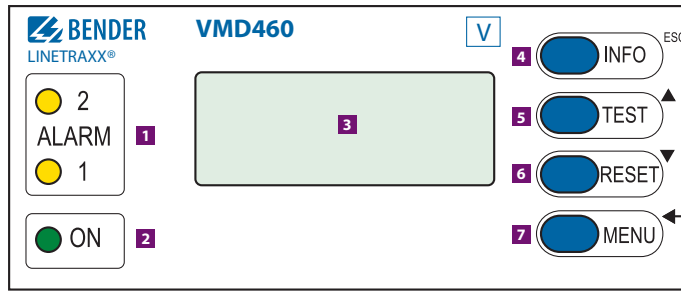
Other

Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (IEC 60529)	IP30
Degree of protection, terminals (IEC 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
Weight	≤ 360 g

(*) = factory setting

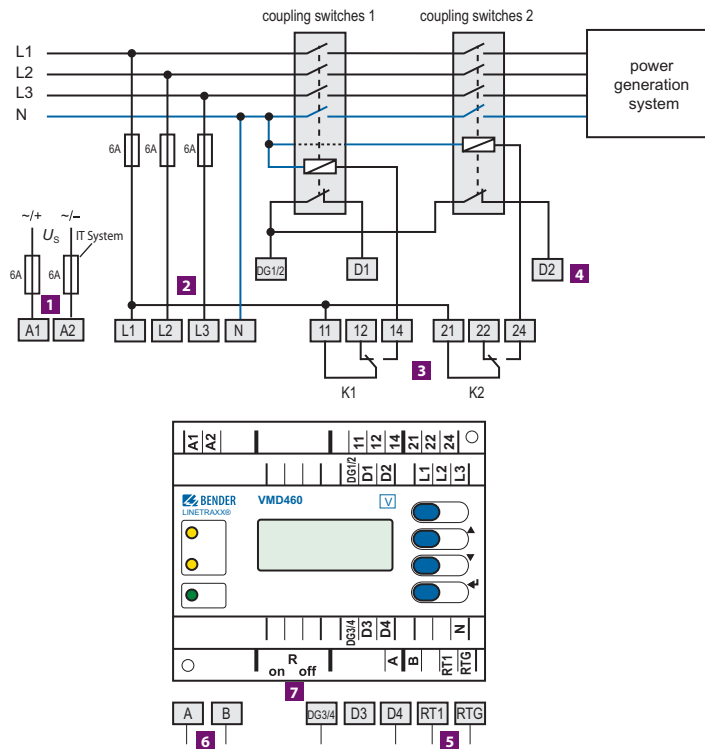
Dimension diagrams (dimensions in mm)



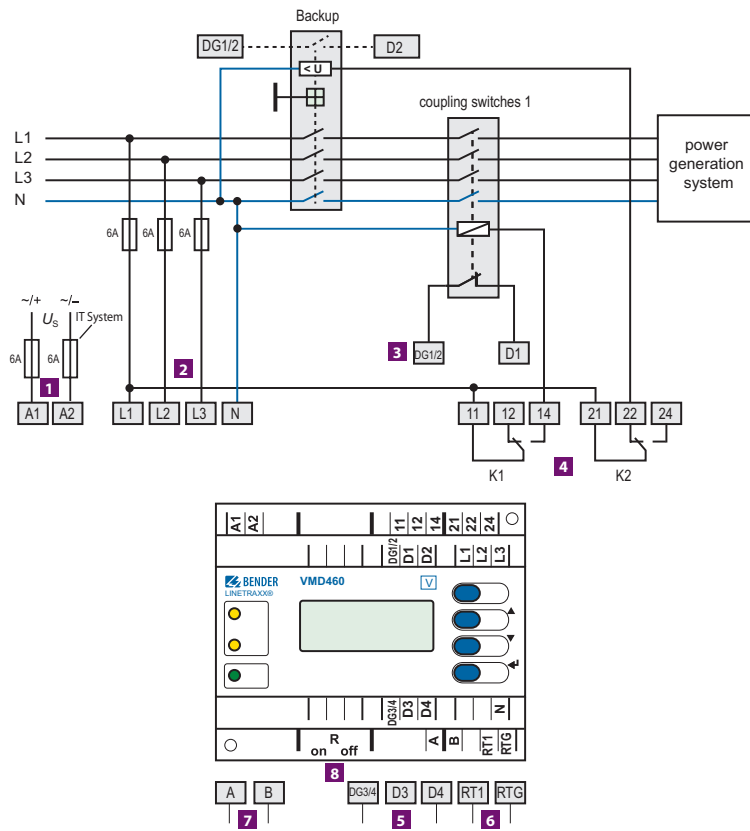


- 1** Both alarm LEDs "AL1" and "AL2": light when voltage and frequency values are outside the thresholds.
- 2** LED "ON" (green): lights up when voltage is available and when the device is in operation or flashes in case of system fault alarm (external watchdog).
- 3** Backlit LC display
- 4** "INFO" button
- 5** The test button "TEST" is used to start a manual self test that triggers both alarm relays (trigger test to check the coupling switches). In addition, a fault is simulated to determine the disconnection time. Arrow up button: parameter change, scroll
- 6** "RESET" button: to acknowledge alarm and fault messages. Arrow down button: parameter change, scroll
- 7** "MENU" button: to toggle between the standard display, menu and alarm display

3.1 Wiring diagram VMD460 (VDE-AR-N-4105)

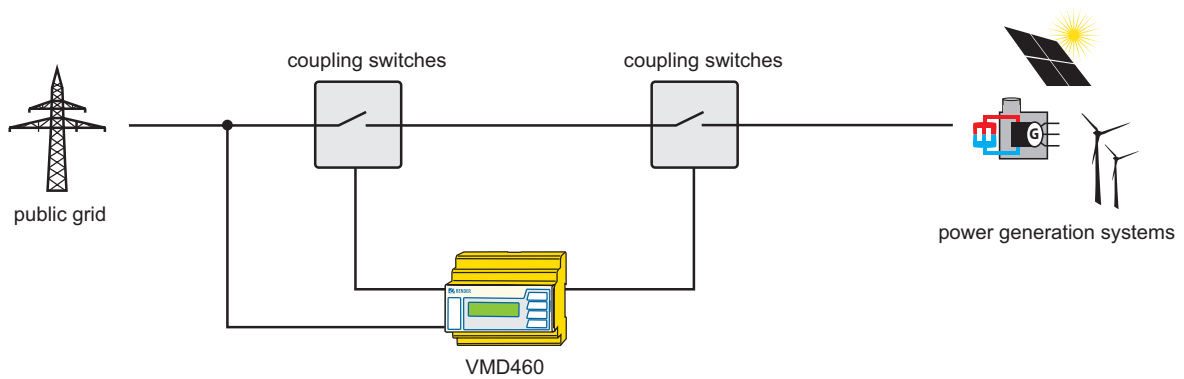


- 1** Supply voltage U_S (see ordering information)
- 2** Coupling to the grid
- 3** Relay connections
- 4** Contact monitoring coupling switch (feedback signal contacts, optional NC/NO/off)
 - NO** (in non-operating state open)
 - NC** (in non-operating state open)
 - off** (contact monitoring switched off)
- 5** Remote trip input (NC/NO)
- 6** RS-485 interface
- 7** Activate or deactivate the BMS bus terminating resistor (120 Ω)



- 1** Supply voltage U_s (see ordering information)
 - 2** Coupling to the grid
 - 3** Contact monitoring coupling switch (feedback signal contacts, optional NC/NO/off)
 - 4** Relay connections
 - 5** GND, digital inputs (external monitoring)
 - 6** Remote trip input (NC/NO)
 - 7** RS-485 interface
 - 8** Activate or deactivate the BMS bus terminating resistor (120 Ω)
- NO** (in non-operating state open)
NC (in non-operating state open)
off (contact monitoring switched off)

Intended use



The principle of an installation according to CEI 0-21; VDE-AR-N 4105 (30 kW and higher), C10/11, BDEW-Richtlinie, DIN VDE 0126-1-1, G59/2, G83/2

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
- Indirect current monitoring with standard current transformers x/5 A
- Transformation ratio n allows adaptation to all standard current transformers x/5 A
- Different monitoring functions selectable <math>< I</math>, $> I$ or <math>< I/> I</math>
- 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.com.

Ordering information

Supply voltage ¹⁾ U _s		Type	Art. No.
DC	AC		
9.6...94 V	16...72 V, 42...460 Hz	CME420-D-1	B 7306 0001
70...300 V	70...300 V, 42...460 Hz	CME420-D-2	B 7306 0002

Device version with screw terminals on request.

¹⁾ Absolut values

Accessories

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

3.1

Technical data

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

Rated insulation voltage	250 V
Rated impulse voltage/pollution degree	2.5 kV/3
Protective separation (reinforced insulation) between (A1, A2) - (k, l) - (11, 12, 14) - (21, 22, 24)	
Maximum rated voltage of the system being monitored (conductor to be monitored directly connected)	
With protective separation AC 230 V	
Without protective separation	AC 400 V
Voltage test acc. to IEC 61010-1	2.21 kV

Supply voltage

Supply voltage U_S	see ordering information
Power consumption	≤ 4 VA

Measuring circuit

Rated frequency	42...460 Hz
Measuring range	AC 0.05...16 A
Overload capability, continuous	17.6 A
Overload capability < 1 s	40 A
Frequency display range	10...2000 Hz

Response values

Undercurrent (alarm 2)	direct connection: AC 0.1...16 A (1 A)*
Overcurrent (alarm 1)	direct connection: AC 0.1...16 A (10 A)* current transformer x/5 A: 0.1 x n...999 A (10 A)*
Transformation ratio n	1...2000 (1)*
Relative uncertainty in the range of 50/60 Hz	$\pm 3\% \pm 2$ digit
Relative uncertainty in the range of 40...460 Hz	$\pm 5\% \pm 2$ digits
Hysteresis	1...40% (15%)*

Time response

Start-up delay t	0...99 s (0.5 s)*
Response delay t_{on1}	0...99 s (1 s)*
Response delay t_{on2}	0...99 s (0 s)*
Delay on release t_{off}	0...99 s (0.1 s)*
Operating time t_{ae}	≤ 70 ms
Response time t_{an}	$t_{an} = t_{ae} + t_{on1}/2$
Recovery time t_b	≤ 300 ms

Displays, memory

Display range measured value	AC 0.01...16 A x n
Operating uncertainty in the range of 50/60 Hz	$\pm 3\% \pm 2$ digit
Operating uncertainty in the range of 40...460 Hz	$\pm 5\% \pm 2$ digit
Measured-value memory for alarm value	data record measured values
Password	off/0...999 (off)*
Fault memory alarm relay	on/off (on)*

Switching elements

Number	2 relays, each with 1 changeover contact				
Operating principle	NC/N/O operation (N/O operation)*				
Electrical endurance, number of cycles	10000				
Contact data acc. to IEC 60947-5-1					
Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-12
Rated operational voltage	230 V	230 V	24 V	110 V	220 V
Rated operational current	5 A	3 A	1 A	0.2 A	0.1 A
Minimum contact load/gold-plated relay contacts	1 mA at AC/DC ≥ 10 V				

Environment/EMC

EMC	IEC 61326-1				
Operating temperature	-25...+55 °C				
Climatic class acc. to IEC 60721					
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)				
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)				
Long-time storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)				
Classification of mechanical conditions IEC 60721					
Stationary use (IEC 60721-3-3)	3M4				
Transport (IEC 60721-3-2)	2M2				
Long-time storage (IEC 60721-3-1)	1M3				

Connection

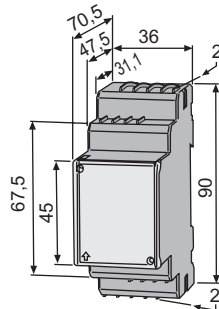
Connection type	push-wire terminals				
Connection properties					
rigid	0.2...2.5 mm ² (AWG 24...14)				
flexible without ferrule	0.2...2.5 mm ² (AWG 24...14)				
flexible with ferrule	0.2...1.5 mm ² (AWG 24...16)				
Stripping length	10 mm				
Opening force	50 N				
Test opening, diameter	2.1 mm				

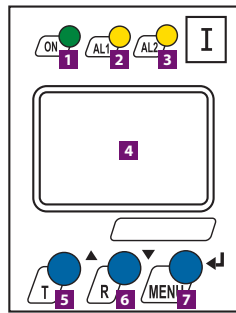
Other

Operating mode	continuous operation				
Position of normal use	any				
Degree of protection, internal components (IEC 60529)	IP30				
Degree of protection, terminals (IEC 60529)	IP30				
Enclosure material	polycarbonate				
Screw mounting	2 x M4 with mounting clip				
DIN rail mounting acc. to	IEC 60715				
Flammability class	UL94V-0				
Operating manual	TGH1400				
Weight	≤ 160 g				

() * factory setting

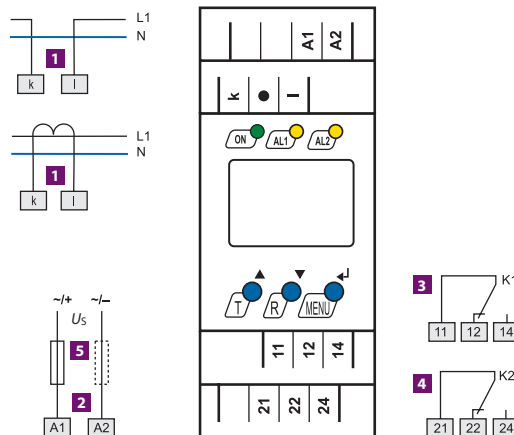
Dimension diagram (dimensions in mm)





- 1** Power On LED "ON" (green); lights when supply voltage is applied and flashes in the event of system fault alarm
- 2** Alarm LED "AL1" (yellow): lights when the set response value is exceeded or flashes in the event of system fault alarm
- 3** Alarm LED "AL2" (yellow): lights when the value falls below the set response value or flashes in the event of system fault alarm.
- 4** Multi-functional LC display
- 5** Test button "T":
Arrow up button: to change the measured value display, move upwards in the menu or to change parameters.
To call up the self test: press the button "T" >1.5 s
- 6** Reset button "R":
Arrow down button: to change the measured value indication, move downwards in the menu or to change parameters
to delete stored alarms: press the button "T" >1.5 s
- 7** "MENU" button:
Enter button: to confirm the measured value indication or to confirm changed parameters
To call up the menu system, press the button "T" >1.5 s
Press the ESC button >1.5 s to abort an action or to return to the previous menu level

Wiring diagram



- 1** Connection to the system/load being monitored
- 2** Supply voltage U_s (see ordering information)
- 3** Alarm relay "K1": configurable for $\lt;I, >I$ or $\lt;I/>I$/ERROR/TEST
- 4** Alarm relay "K2": configurable for $\lt;I, >I$ or $\lt;I/>I$/ERROR/TEST
- 5** Line protection according to IEC 60364-4-43:
6 A fuse recommended. If being supplied from an IT system, both lines have to be protected by a fuse.



LINETRAXX® 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
- 70 % agreement in accordance with EEG 2012 for PV inverters

Approvals



Device features

- Undercurrent and overcurrent monitoring in AC systems with prealarm and main alarm or current monitoring with window discriminator function
- Current monitoring using current transformers, suitable for standard transformers x/1 A, x/5 A (depending on the device type)
- Transformation ratio n allows adaptation to all standard current transformers x/1 A, x/5 A
- Start-up delay, response delay and 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
- Fault memory for the operating value
- Cyclical 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.com.

Ordering information

Suitable for current transformer types	Response value	Supply voltage ¹⁾ U _S			Type	Art. No.
		DC	AC	AC/DC		
x/1A	0.1...1 A x n	9.6 V...94 V, 15...460 Hz	16...72 V	70...300 V, 15...460 Hz	CMD420-D-1	B 7306 0006
		–	–		CMD420-D-2	B 7306 0007
x/5A	0.5...5 A x n	9.6...94 V, 15...460 Hz	16...72 V	70...300 V, 15...460 Hz	CMD421-D-1	B 7306 0008
		–	–		CMD421-D-2	B 7306 0009

Device version with screw terminals on request.

¹⁾ Absolut values

Accessories

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

3.1

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

Rated insulation voltage	AC 250 V
Rated impulse voltage/pollution degree	6 kV/3
Protective separation (reinforced insulation) between	(A1, A2) - (k, l) - (11, 12, 14) - (21, 22, 24)
Protective separation (reinforced insulation) between	(k1, l1, k2, l2, k3, l3) - (11, 12, 14)
Voltage test acc. to IEC 61010-1	3.536 kV
Rated insulation voltage	AC 250 V
Rated impulse voltage/pollution degree	4 kV/3
Basic insulation between:	(k1, l1, k2, l2, k3, l3) - (A1, A2), (21, 22, 24)
Basic insulation between:	(11, 12, 14) - (21, 22, 24)
Voltage test acc. to IEC 61010-1	2.21 kV

Supply voltage

CMD420-D-1, CMD421-D-1:

Supply voltage U_S	AC 16...72 V/DC 9.6...94 V
Frequency range f_S	15...460 Hz

CMD420-D-2, CMD421-D-2:

Supply voltage U_S	AC/DC 70...300 V
Frequency range f_S	15...460 Hz
Power consumption	≤ 4 VA

Measuring circuit CMD420

Nominal measuring range (r.m.s. value) $n = 1$	AC 0...1 A
Overload capability, continuous	2 A
Overload capability < 5 s	5 A
Load per measuring input	50 mΩ
Rated frequency f_n	42...460 Hz

Response values CMD420

Undercurrent $I_o < I$ (Alarm 2) $n = 1$	AC 0.1...1 A (0.3 A)*
Undercurrent $I_o < I$ (Alarm 1) $n = 1$	100...200% (150%)*
Take a maximum nominal current of 1 A into consideration!	
Overcurrent $I_i > I$ (Alarm 2) $n = 1$	AC 0.1...1 A (0.3 A)* (Hi)*
Overcurrent $I_i > I$ (Alarm 1) $n = 1$	50...100% (50%)* (Hi)*
Window $I_n > I$ (Alarm 2) $n = 1$	AC 0.1...1 A (0.3 A)*
Window $I_n < I$ (Alarm 1) $n = 1$	50...100% (50%)*
External current transformer	x/1 A
Transformation ratio n	1...2000 (1)*
Relative uncertainty in the range of 42...460 Hz	± 5%, ± 2 digits
Hysteresis	3...40% (15%)*

Measuring circuit CMD421

Nominal measuring range (r.m.s. value)	AC 0...5 A
Overload capability, continuous	7.5 A
Overload capability < 5 s	with screw-type terminal connection: 20 A with push-wire terminals: 12 A
Load per measuring input	3 mΩ
Rated frequency f_n	42...460 Hz

Response values CMD421

Undercurrent $I_o < I$ (Alarm 2) $n = 1$	AC 0.5...5 A (1.5 A)*
Undercurrent $I_o < I$ (Alarm 1) $n = 1$	100...200% (150%)*
Take a maximum nominal current of 5 A into consideration!	
Overcurrent $I_i > I$ (Alarm 2) $n = 1$	AC 0.5...5 A (1.5 A)* (Hi)*
Overcurrent $I_i > I$ (Alarm 1) $n = 1$	50...100% (50%)* (Hi)*
Window $I_n > I$ (Alarm 2) $n = 1$	AC 0.5...5 A (1.5 A)*
Window $I_n < I$ (Alarm 1) $n = 1$	50...100% (50%)*
External current transformer	x/5 A
Transformation ratio n	1...2000 (1)*
Relative uncertainty in the range of 42...460 Hz	± 5%, ± 2 digits
Hysteresis	3...40% (15%)*

Time response

Start-up delay t	0...300 s (0.5 s)*
Response delay t_{on1}	0...300 s (1 s)*
Response delay t_{on2}	0...300 s (0 s)*
Delay on release t_{off}	0...300 s (1 s)*
Resolution of setting $t, t_{on1/2}, t_{off}$ (0...10 s)	0.1 s
Resolution of setting $t, t_{on1/2}, t_{off}$ (10...99 s)	1 s
Resolution of setting $t, t_{on1/2}, t_{off}$ (100...300 s)	10 s
Operating time t_{ae}	≤ 130 ms
Response time t_{an}	$t_{an} = t_{ae} + t_{on1/2}$
Device release time t_{re}	≤ 135 ms
Release time t_{off}	$t_{off} = t_{re} + t_{off}$
Recovery time t_b	≤ 300 ms

Displays, memory

Display	LC display, multifunctional, not illuminated
Display range, measured value (r.m.s. value) x transformation ratio n	CMD420: AC 0...1 A x n CMD421: AC 0...5 A x n
Operating uncertainty in the range of 42...460 Hz	± 5%, ± 2 digit
Measured-value memory (HiS) for the first alarm value	data record measured values
Password	on/off/0...999 (OFF)*
Fault memory (M) alarm relay	on/off/con (on)*

Switching elements

Number	2 x 1 changeover contacts (K1, K2)
Operating principle	N/C operation/N/O operation K1: Err, I1, I2, tES (device error Err, overcurrent prewarning > I1, test button tES)* K2: Err, I1, I2, tES (device error Err, overcurrent alarm > I2, test button tES)*

Electrical endurance, number of cycles	10000
Contact data acc. to IEC 60947-5-1:	
Utilisation category	AC 13 AC 14 DC-12 DC-12 DC-12
Rated operational voltage	230 V 230 V 24 V 110 V 220 V
Rated operational current	5 A 3 A 1 A 0.2 A 0.1 A
Minimum contact rating	1 mA at AC/DC ≥ 10 V

Environment/EMC

EMC	IEC 61326-1
Operating temperature	-25...+55 °C
Classification of climatic conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)
Storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3M4
Transport (IEC 60721-3-2)	2M2
Storage (IEC 60721-3-1)	1M3

Connection

Connection type	push-wire terminals
Connection properties	
rigid	0.2...2.5 mm ² (AWG 24...14)
flexible without ferrule	0.2...2.5 mm ² (AWG 24...14)
flexible with ferrule	0.2...1.5 mm ² (AWG 24...16)
Stripping length	10 mm
Opening force	50 N
Test opening, diameter	2.1 mm

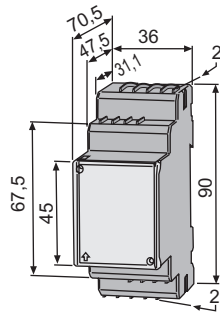
Other

Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (IEC 60529)	IP30
Degree of protection, terminals (IEC 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
Software version CMD420	D287 V1.1x
Software version CMD421	D294 V1.1x
Weight	≤ 150 g

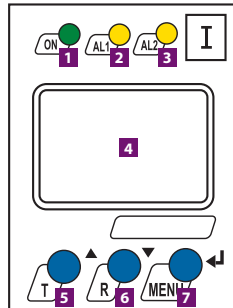
(*) = factory setting

3.1

Dimension diagram (dimensions in mm)

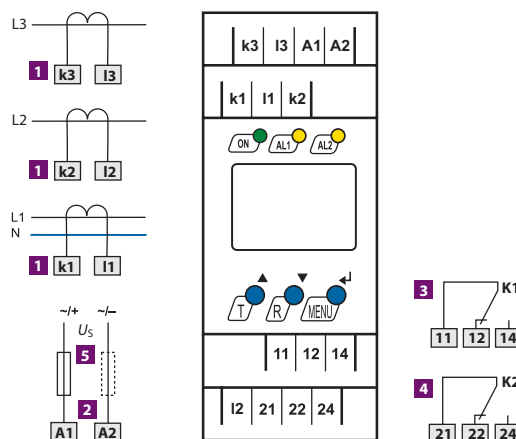


Displays and controls



- 1** Power On LED "ON" (green); lights when supply voltage is applied and flashes in the event of system fault alarm
- 2** Alarm LED "AL1" (yellow): lights when the value exceeds or falls below the set response values and flashes in the event of system fault alarm
- 3** Alarm LED "AL2" (yellow): lights when the value exceeds or falls below the set response values and flashes in the event of system fault alarm
- 4** Multi-functional LC display
- 5** Test button "T":
Arrow up button: To change the measured value display, move upwards in the menu or to change parameters.
To call up the self test: press the button "T" > 1.5 s
- 6** Reset button "R":
Arrow down button: to change the measured value indication, move downwards in the menu or to change parameters
to delete stored alarms: press the button "T" > 1.5 s
- 7** "MENU" button:
Enter button: to confirm the measured value indication or to confirm changed parameters
To call up the menu system, press the button "T" > 1.5 s
Press the ESC button > 1.5 s to abort an action or to return to the previous menu level

Wiring diagram



- 1** Connection to the conductors to be monitored; using current transformers
- 2** Supply voltage U_s (see ordering information)
- 3** Alarm relay "K1": configurable for $\lt;I>>I$ or $\lt;I/>I$/ERROR/TEST
- 4** Alarm relay "K2": configurable for alarm $\lt;I>>I$ or $\lt;I/>I$/ERROR/TEST
- 5** Line protection according to IEC 60364-4-43:
6 A fuse recommended. If being supplied from an IT system, both lines have to be protected by a fuse.

LINETRAXX® CMS460-D

Multi-channel AC, pulsed DC sensitive load current evaluator for AC systems (TN, TT and IT systems)



Typical applications

- Monitoring of loads and installations for load currents in the frequency range of 42...2000 Hz (measuring current transformers W..., WR..., 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
- r.m.s. 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.com.

Ordering information

Supply voltage ¹⁾ U _S		Type	Art. No.
DC	AC		
16...94 V	16...72 V, 42...460 Hz	CMD460-D-1	B 9405 3017
70...276 V	70...276 V, 42...460 Hz	CMD460-D-2	B 9405 3018

¹⁾ Absolut values

Accessories

Type designation	Art. No.
XM460 mounting frame, 144 x 82 mm	B 990 995

Suitable system components

Type designation	Version	Type of construction	Type	Page
Measuring current transformers	pulsed DC sensitive	circular	W...	218
		rectangular	WR...	224
		split-core	WS...	228
		flexible	WF...	232
Protocol converters	BMS bus – TCP/IP via Ethernet	–	COM460IP	261
	BMS bus – Modbus/RTU	–	FTC470XMB	266
	BMS bus – PROFIBUS DP	–	FTC470XDP	268
Alarm indicator and test combination	–	–	MK800	273
RS-485 repeater	–	–	DI-1DL	258
Power supply unit	for DI-1	–	AN471	–

Technical data

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

Rated insulation voltage	AC 250 V
Rated impulse voltage/pollution degree	6 kV/3
Protective separation (reinforced insulation) between:	
(A1, A2) - (k1, l...k12, R, T/R, T, A, B), (C11, C12, C14), (C21, C22, C24)	
Protective separation (reinforced insulation) between	(C11, C12, C14) - (C21, C22, C24)
Voltage test acc. to IEC 61010-1	3.536 kV
Rated insulation voltage	AC 250 V
Rated impulse voltage/pollution degree	4 kV/3
Basic insulation between:	(k1, l...k12, R, T/R, T, A, B) - (C11, C12, C14), (C21, C22, C24)
Voltage test acc. to IEC 61010-1	2.21 kV

Supply voltage

Rated supply voltage U_s	see ordering information
Frequency range of U_s	see ordering information
Power consumption	≤ 10 VA

Measuring circuit

External measuring current transformer	W... , WR... , WS... , WF... series (Type A)
Load	1 Ω
Rated insulation voltage (measuring current transformer)	800 V
Operating characteristics acc. to IEC 60755	Type A, depending on the type of current transformer (Type A)*
Rated frequency	42...2000 Hz (Type A)
Cut-off frequency	none, IEC, 50 Hz, 60 Hz (none)*
Measuring range	100 mA...125 A (measuring current transformer Type A) 100 mA...30 A (measuring current transformer Flex) crest factor up to 10 A = 4, up to 125 A = 2
Rated operating current I_{n2} (alarm)	100 mA...125 A (16 A overcurrent)*
Rated operating current I_{n1} (prewarning)	10...100 % x I_{n2} *
Preset for alarm	offset: 0...20 A (1 A)* and 1 x factor 1...99 (3)*
Relative uncertainty	+10...-20 %
Hysteresis	2...40% (20 %)*
Factor for additional CT	2...10; x 1...10 (x 1)*
Number of measuring channels (per device/system)	12/1080

Time response

Start-up delay t (start-up) per device	0...99 s (0 ms)*
Response delay t_{on} per channel	0...999 s (200 ms)*
Delay on release t_{off} per channel	0...999 s (200 ms)*
Operating time t_{ae} at $I_{dn} = 1 \times I_n / 2$	≤ 180 ms
Operating time t_{ae} at $I_{dn} = 5 \times I_n / 2$	≤ 30 ms
Response time t_{an} for current measurement	$t_{an} = t_{ae} + t_{on}/2$
Scanning time for all measuring channels (current measurement)	≤ 180 ms
Recovery time t_b	500...600 ms

Displays, memory

Display range measured value	< 10 mA...125 A (measuring current transformer Type A) < 10 mA...30 A (measuring current transformer Flex)
Operating uncertainty	± 10 %
LEDs	ON/ALARM
LC display	backlit graphical display
History memory	300 data records
Data logger	300 data records per measuring channel
Password	off/0...999 (off)*
Language	D, GB, F (GB)*
Fault memory alarm relay	on/off (off)*

Inputs/outputs

Test/reset button	internal/external
Cable length for external test/reset button	0...10 m

Interface

Interface/protocol	RS-485/BMS
Baud rate	9.6 kbit/s
Cable length	0...1200 m
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
Device address, BMS bus	1...90 (2)*

Cable lengths for W..., WR..., WS..., WF... series measuring current transformers

Single wire ≥ 0.75 mm ²	0...1 m
Single wire, twisted ≥ 0.75 mm ²	0...10 m
Shielded cable ≥ 0.5 mm ²	0...40 m
Shielded cable (shield connected to terminal I at one end, not connected to earth)	recommended: J-Y(St)Y min. 2 x 0.8

Switching elements

Number	2 x 1 changeover contact				
Operating principle	NC/N/O operation (N/O operation)*				
Electrical endurance, number of cycles	10000				
Contact data acc. to IEC 60947-5-1					
Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-12
Rated operational voltage	230 V	230 V	24 V	110 V	220 V
Rated operational current (common alarm relays)	5 A	3 A	1 A	0.2 A	0.1 A
Rated operational current (alarm relay)	2 A	0.5 A	5 A	0.2 A	0.1 A
Minimum contact rating	1 mA at AC/DC ≥ 10 V				

Environment/EMC

EMC	IEC 61326-1
Operating temperature	-25...+55 °C
Climatic class acc. to IEC 60721	
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)
Long-time storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)
Climatic class acc. to IEC 60721	
Stationary use (IEC 60721-3-3)	3M4
Transport (IEC 60721-3-2)	2M2
Long-time storage (IEC 60721-3-1)	1M3

Connection

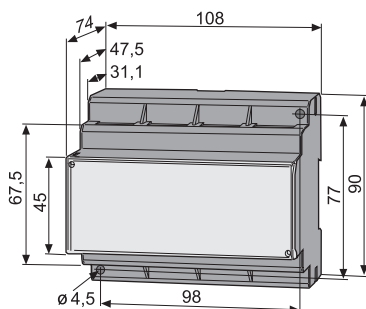
Connection	screw-type terminals
Connection	
rigid/flexible/conductor sizes	0.2...4/0.2...2.5 mm ² (AWG 24...12)
Multi-conductor connection (2 conductors with the same cross section)	
rigid/flexible	0.2...1.5/0.2...1.5 mm ²
Stripping length	8...9 mm
Tightening torque	0.5...0.6 Nm

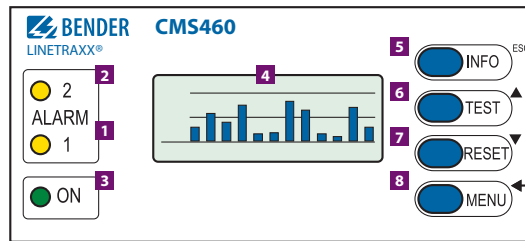
Other

Operating mode	continuous operation
Mounting	display-oriented
Degree of protection, internal components (IEC 60529)	IP30
Degree of protection, terminals (IEC 60529)	IP20
Enclosure material	polycarbonate
Flammability class	UL94V-0
Screw mounting	2 x M4
DIN rail mounting acc. to	IEC 60715
Operating manual	TGH1450
Weight	≤ 360 g

() * factory setting

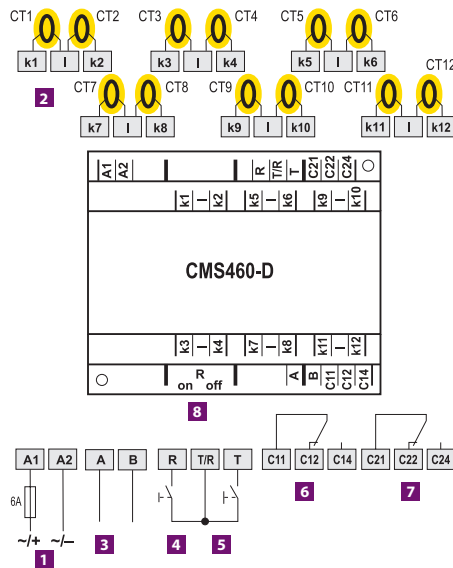
Dimension diagrams (dimensions in mm)





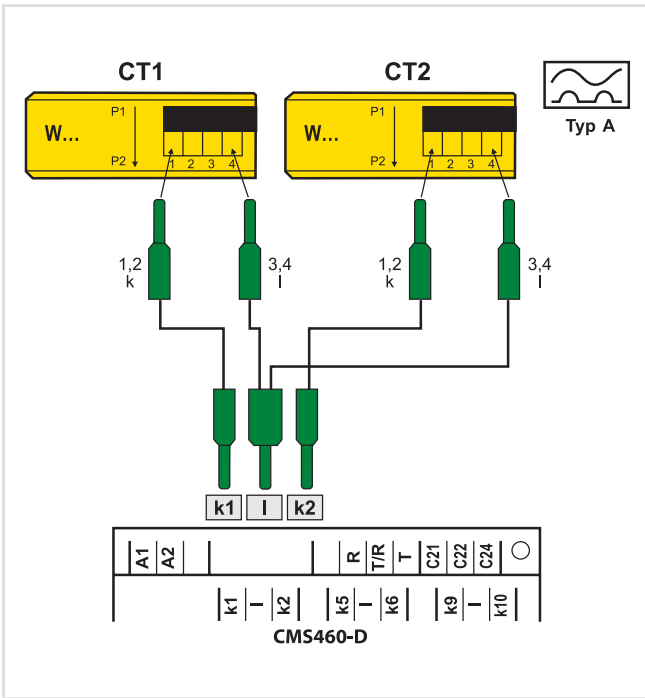
- 1** LED "ALARM 2" lights up if the measured value falls below or exceeds the "Alarm" response value in a measuring channel.
- 2** LED "ALARM 1" lights up if the measured value falls below or exceeds the "Alarm" response value in a measuring channel. In the event of a device error, the LED lights up.
- 3** The LED "ON" lights up when the device is switched on and flashes during power on until the device is ready for operation.
- 4** Backlit graphics LC display
- 5** "INFO" button: to call up standard information
ESC button: to exit the menu function without changing parameters
- 6** "TEST" button: to call up the automatic self test
Arrow up button: Parameter changes, scroll
- 7** "RESET" button: to delete alarm and fault messages
Arrow down button: Parameter changes, scroll
- 8** "MENU" button: to toggle between the standard display, MENU and alarm display
Enter button: to confirm parameter changes

Wiring diagrams

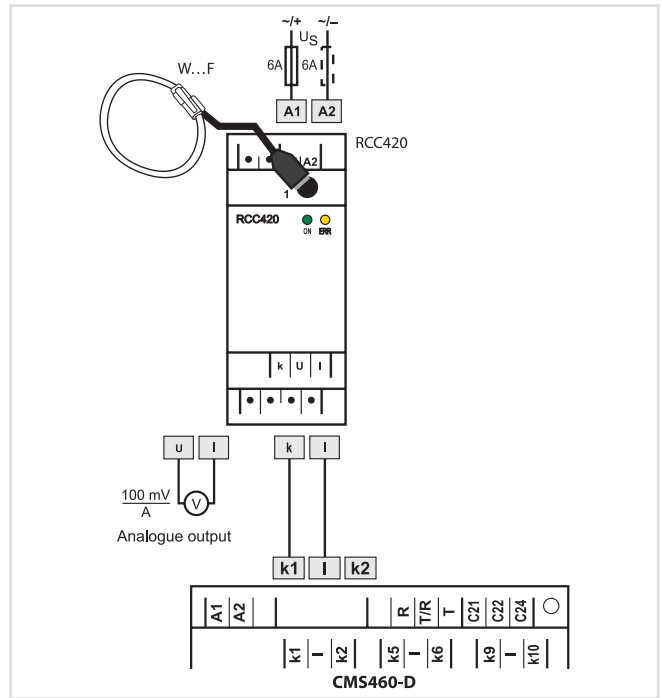


- 1** Connection of supply voltage U_S (see ordering information), 6 A fuse recommended.
- 2** Connection of measuring current transformers CT1...CT12
- 3** RS-485 interface with BMS protocol
- 4** External reset button "R" (N/O contact)*
- 5** External test button "T" (N/O contact). The external "T/R" buttons of several devices must not be connected to one another.
- 6** Alarm relay "K1": Alarm 1, common alarm for alarm, prewarning, device error, ext. alarm (adjustable)
- 7** Alarm relay "K2": Alarm 2, common alarm for alarm, prewarning, device error, ext. alarm (adjustable)
- 8** $R_{on/off}$: Activate or deactivate the BMS bus terminating resistor (120 Ω)

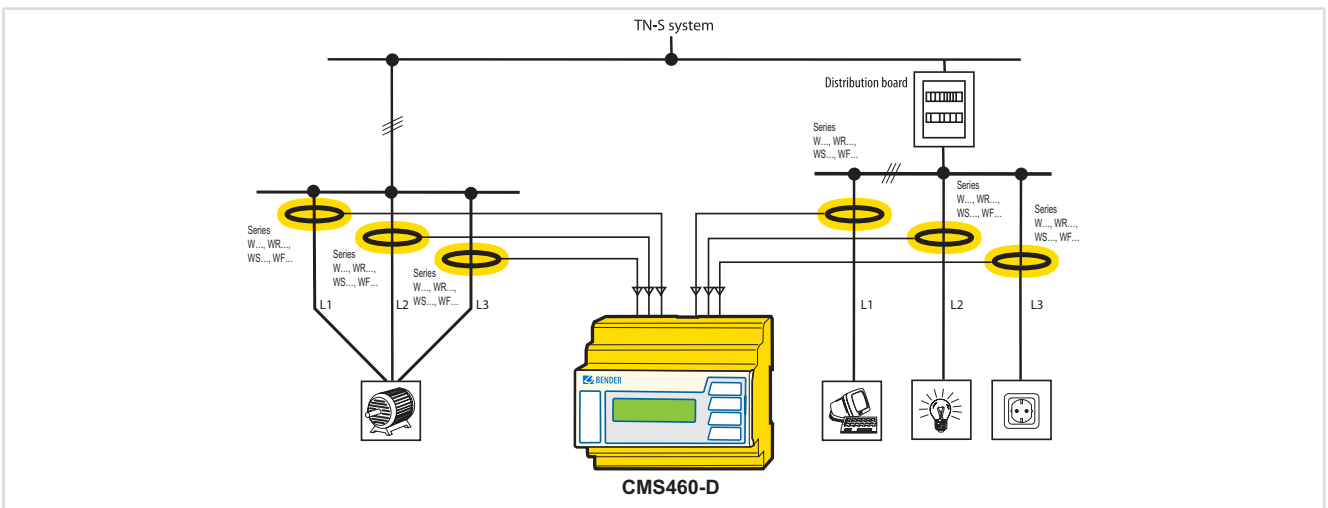
Connection W..., WR..., WS... series measuring current transformers (pulsed DC sensitive)

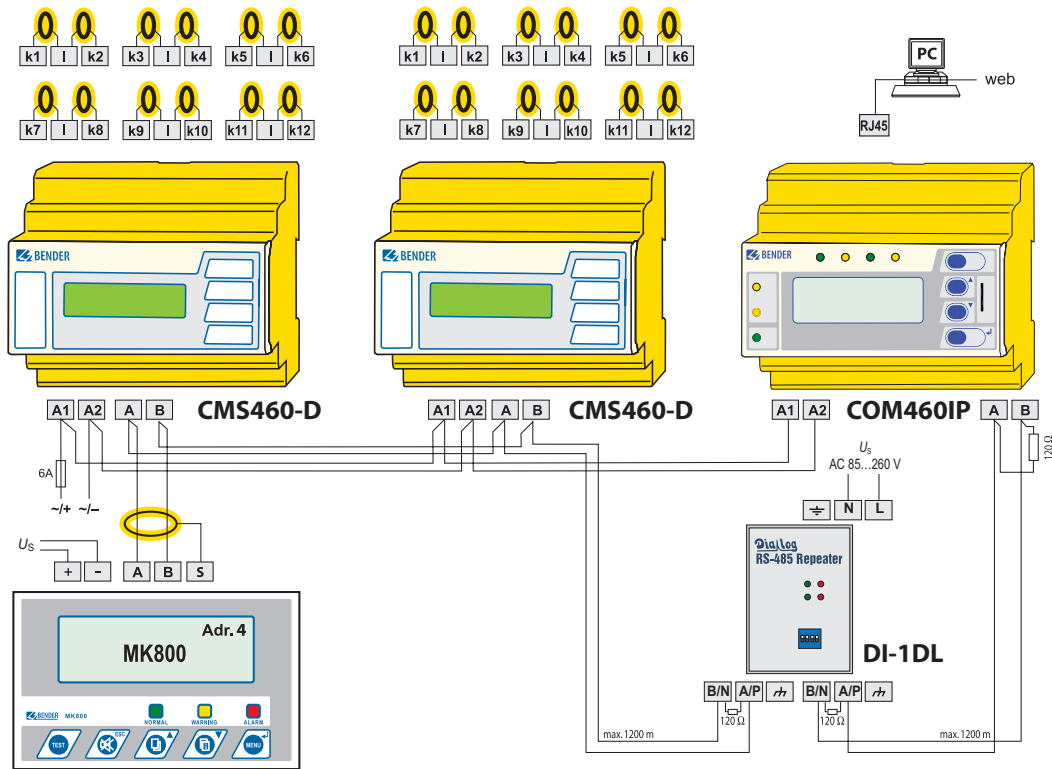


Connection WF... series measuring current transformer (pulsed DC sensitive)



Example for the design of a standard system consisting of an CMS460-D with up to 12 measuring points





Note:

The DI-1 repeater only is required when the length of the cable exceeds 1200 m or when more than 32 devices are connected to the bus.

3.1

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.com.

Ordering information

Supply voltage ¹⁾ U _S		Type	Art. No.
DC	AC		
9.6...94 V	16...72 V, 15...460 Hz	GM420-D-1	B 7308 2001
70...300 V	70...300 V, 15...460 Hz	GM420-D-2	B 7308 2002

Device version with screw terminals on request.

¹⁾ Absolut values

Accessories

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

Technical data

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

Rated insulation voltage	400 V
Rated impulse voltage/pollution degree	4 kV/3
Protective separation (reinforced insulation) between:	(A1, A2) - (E, KE) - (11-12-14) - (21-22-24)
Voltage test acc. to IEC 61010-1:	
(E, KE) - [(A1-A2), (11-12-14)]	3.32 kV
(E, KE) - (21-22-24)	2.21 kV
(A1-A2) - (11-12-14) - (21-22-24)	2.21 kV

Supply voltage

Supply voltage U_s	see ordering information
Frequency range U_s	see ordering information
Power consumption	≤ 4 VA

Measuring circuit

Loop resistance R_m :

Measuring range R_m	0...100 Ω
Measuring current I_m	DC 20 mA
Measuring voltage U_m	≤ DC 24 V

Extraneous voltage U_f :

Measuring range U_f	AC 0...50 V
Rated frequency f_n	42...460 Hz
Disconnection of the measuring loop at U_f	≥ 12 V
Reconnection of the measuring loop	≤ 10 V
Permissible extraneous voltage U_f	≤ 440 V
Permissible extraneous DC voltage, without influence on the measurement	DC 0 V

Response values

Loop resistance > R (Alarm 1)	0.1...100 Ω
Resolution of setting $R = 0...10 \Omega$	0.1 Ω
Resolution of setting $R = 10...100 \Omega$	1 Ω

Preset function:

Loop resistance (> R) =	$((R_m + 0.5 \Omega) \times 1.5)^*$
Relative uncertainty 0...1 Ω	±20 %, ±1 digit
Relative uncertainty 1...100 Ω	±5 %, ±1 digit
Hysteresis > R	1...40 % (25 %)*
Extraneous voltage > U (Alarm 2)	1...50 V (25 V)*
Resolution of setting U_f 1...50 V	0.5 V
Relative uncertainty U_f (> U) in the range of 50/60 Hz	±2 %, ±1 digit
Relative uncertainty U_f (> U) in the range of 42...460 Hz	±10 %, ±1 digit
Hysteresis > U	1...40 % (5 %)*

Time response

Start-up delay t	0...99 s (0 s)*
Response delay $t_{on1/2}$	0...99 s (0 s)*
Delay on release t_{off}	0...99 s (0.5 s)*

Operating time

In the case of loop interruption ($R > 50 \text{ k}\Omega$) t_{ae}	≤ 40 ms
In the case of closed loop (> R) t_{ae}	≤ 500 ms
in case of extraneous voltage (> U) and overload (OL) t_{ae}	≤ 100 ms
Response time t_{an}	$t_{an} = t_{ae} + t_{on1/2}$
Recovery time t_b	≤ 300 ms
Recovery time t_b after safety shutdown	≤ 1 s

Displays, memory

Display	LC display, multifunctional, not illuminated
Display range, measuring value R_m	0...100 Ω
Display range, measuring value U_f	AC 0...50 V
Operating uncertainty, loop resistance 0...1 Ω	±20 %, ±1 digit
Operating uncertainty loop resistance 1...100 Ω	±5 %, ±1 digit
Operating uncertainty voltage in the range of 50/60 Hz	±2 %, ±1 digit
Operating uncertainty voltage in the range of 42...460 Hz	±10 %, ±1 digits
History memory (HiS) for the first alarm value	data record measured values
Password	off/0...999 (off)*
Fault memory (M) alarm relay	on/off (on)*

Switching elements

Number	2 x 1 changeover contacts (K1, K2)
Operating principle	N/C operation or N/O operation
	K1: Err, > R , OL, > U , tES (device error, loop resistance, measuring current disconnection: N/O operation n.o.)*
	K2: Err, > R , OL, > U , tES (overvoltage: N/O operation n.o.)*
Electrical endurance, number of cycles	10000

Contact data acc. to IEC 60947-5-1

Utilisation category	AC13	AC14	DC-12	DC-12	DC-12
Rated operational voltage	230 V	230 V	24 V	110 V	220 V
Rated operational current	5 A	3 A	1 A	0.2 A	0.1 A
Minimum contact rating	1 mA at AC/DC ≥ 10 V				

Environment/EMC

EMC	IEC 61326
Operating temperature	-25...+55 °C
Climatic class acc. to IEC 60721	
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)
Long time storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)
Climatic class acc. to IEC 60721	
Stationary use (IEC 60721-3-3)	3M4
Transport (IEC 60721-3-2)	2M2
Long-time storage (IEC 60721-3-1)	1M3

Connection

Connection type	push-wire terminals
Connection properties	
rigid	0.2...2.5 mm ² (AWG 24...14)
flexible without ferrule	0.2...2.5 mm ² (AWG 24...14)
flexible with ferrule	0.2...1.5 mm ² (AWG 24...16)
Stripping length	10 mm
Opening force	50 N
Test opening, diameter	2.1 mm

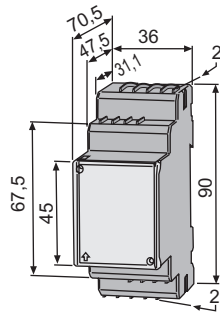
Other

Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (IEC 60529)	IP30
Degree of protection, terminals (IEC 60529)	IP30
Enclosure material	polycarbonate
Screw mounting	2 x M4 with mounting clip
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Software version	D268 V1.0x
Weight	≤ 150 g

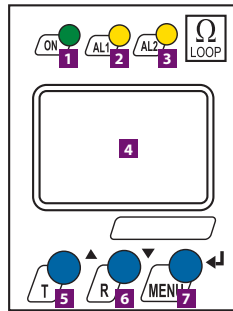
(*) = factory setting

3.1

Dimension diagram (dimensions in mm)

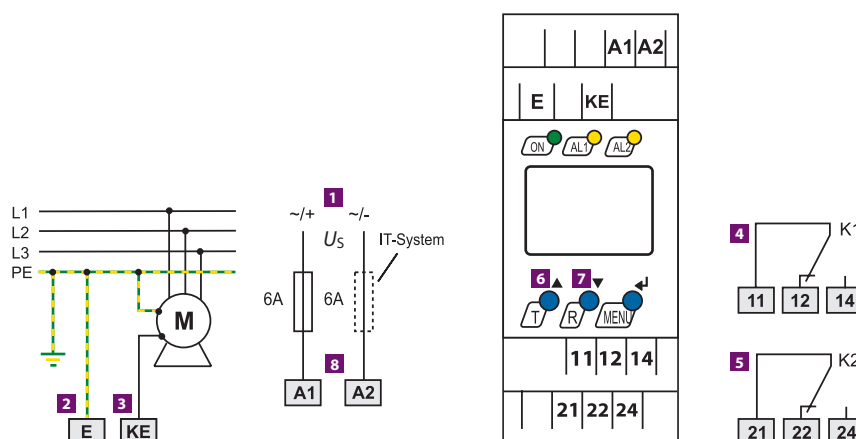


Displays and controls



- 1** Power On LED "ON" (green); lights when supply voltage is applied and flashes in the event of system fault alarm
 - 2** Alarm LED "AL1" (yellow), lights when the set response value $> R$, OL , $> U_f$, ERROR, TEST is exceeded and flashes in the event of system fault alarm
 - 3** Alarm LED "AL2" (yellow), lights when the value falls below the set response value $> R$, OL , $> U_f$, ERROR, TEST and flashes in the event of system fault alarm
 - 4** Multi-functional LC display
 - 5** Test button "T":
Arrow up button: To change the measured value display, move upwards in the menu or to change parameters.
To call up the self test: press the button > 1.5 s
 - 6** Reset button "R":
Arrow down button: to change the measured value indication, move downwards in the menu or to change parameters
To delete stored alarms: press the button "T" > 1.5 s
 - 7** "MENU" button:
Enter button: to confirm the measured value indication or to confirm changed parameters
To call up the menu system, press the button "T" > 1.5 s
Press the ESC button > 1.5 s to abort an action or to return to the previous menu level
- When the menu item LED is activated, the alarm LED "AL1" indicates that K1 is in the alarm state. When "AL2" lights up, K2 is in the alarm position.

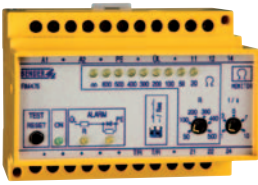
Wiring diagram



- 1** Supply voltage U_S (see ordering details) via fuse
- 2** Connection of E to the PE conductor
- 3** Connection of KE to the loads or the monitoring conductor
- 4** Alarm relay "K1": Alarm 1 configurable for $> R$, OL , $> U_f$, ERROR, TEST
- 5** Alarm relay "K2": Alarm 2 configurable for $> R$, OL , $> U_f$, ERROR, TEST
- 6** Test button "T"
- 7** Reset button "R"
- 8** Line protection by a fuse in accordance with DIN VDE 0100-430/IEC 60364-4-43 (6 A fuse recommended). In case of supply (A1/A2) from an IT system, both lines have to be protected by a fuse.

RM475/RM475LY

Loop monitor



Device features

- RM475: permanently set response value: series resistance 200 Ω, cross resistance 1000 Ω
- RM475LY: series resistance, adjustable 50...500 Ω, cross resistance 1000 Ω
- Adjustable response delay 1...10 s (RM475LY)
- N/O or N/C operation, selectable
- Fault memory behaviour selectable
- Internal/external test/reset button
- LEDs: Power On, alarm, extraneous voltage
- LED bar graph for series resistance
- 2 potential-free changeover contacts
- Modular DIN rail enclosure

Typical applications

- Monitoring conductor for monitoring cables and conductors
- Monitoring of PE loops

Further information

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

Ordering information

Series resistance	Response delay	Supply voltage U_S		Type	Art. No.
		AC	DC		
200 Ω	< 1 s	230 V, 50...60 Hz	–	RM475	B 9702 2001
		90...132 V, 50...60 Hz	–	RM475-13	B 9702 2002
		400 V, 50...60 Hz	–	RM475-15	B 9702 2003
		500 V, 50...60 Hz	–	RM475-16	B 9702 2004
		–	9.8...84 V	RM475-21	B 9702 2005
		–	77...286 V	RM475-23	B 9702 2006
adjustable 50...500 Ω	adjustable 1...10 s	230 V, 50...60 Hz	–	RM475LY	B 9702 2007
		90...132 V, 50...60 Hz	–	RM475LY-13	B 9702 2008
		400 V, 50...60 Hz	–	RM475LY-15	B 9702 2009
		500 V, 50...60 Hz	–	RM475LY-16	B 9702 2010
		–	9.8...84 V	RM475LY-21	B 9702 2011
		–	77...286 V	RM475LY-23	B 9702 2012

Accessories

Type designation	Type	Art. No.
Terminating resistor	EV22S	B 984 800

3.1

Technical data

Insulation coordination acc. to IEC 60664-1

Rated insulation voltage	AC 250 V
Rated impulse withstand voltage/pollution degree	4 kV/3

Supply voltage

Supply voltage U_S	see ordering information
Operating range U_S	0.85...1.1 x U_S
Power consumption	≤ 3 VA

Measuring circuit

RM475	
Response value, series resistance	200 Ω
Response value, cross resistance	1000 Ω
Response time t_{an}	< 1 s

RM475LY

Response value, series resistance	50...500 Ω (200 Ω)*
Response value, cross resistance	1000 Ω
Response time t_V	1...10 s
Max. extraneous voltage measuring circuit	≤ AC 30 V
Terminating resistor conductor loop EV225	AC 500 V 1 s

Switching elements

Number of changeover contacts	1 x 2
Operating principle	N/C operation/N/O operation (N/C operation)*
Fault memory behaviour selectable	ON/OFF
Electrical endurance, number of cycles	12000
Contact class IEC 60255-0-20	IIB
Rated contact voltage	AC 250 V/DC 300 V
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

Environment/EMC

EMC immunity	acc. to IEC 61000-6-2
EMC emission	acc. to IEC 61000-6-4
Shock resistance IEC 60068-2-27 (device in operation)	15 g/11 ms
Bumping IEC 60068-2-29 (transport)	40 g/6 ms
Vibration resistance IEC 60068-2-6 (device in operation)	1 g/10...150 Hz
Vibration resistance IEC 60068-2-6 (device not in operation)	2 g/10...150 Hz
Ambient temperature, during operation	-10...+55 °C
Ambient temperature for storage	-40...+70 °C
Climatic class acc. to IEC 60721-3-3	3K5 (except condensation and formation of ice)

Connection

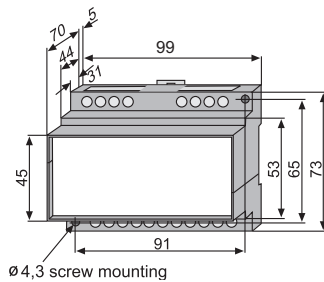
Connection type	modular terminals
Connection properties	
single wire	0.2...4 mm ²
flexible	0.25...2.5 mm ²

Other

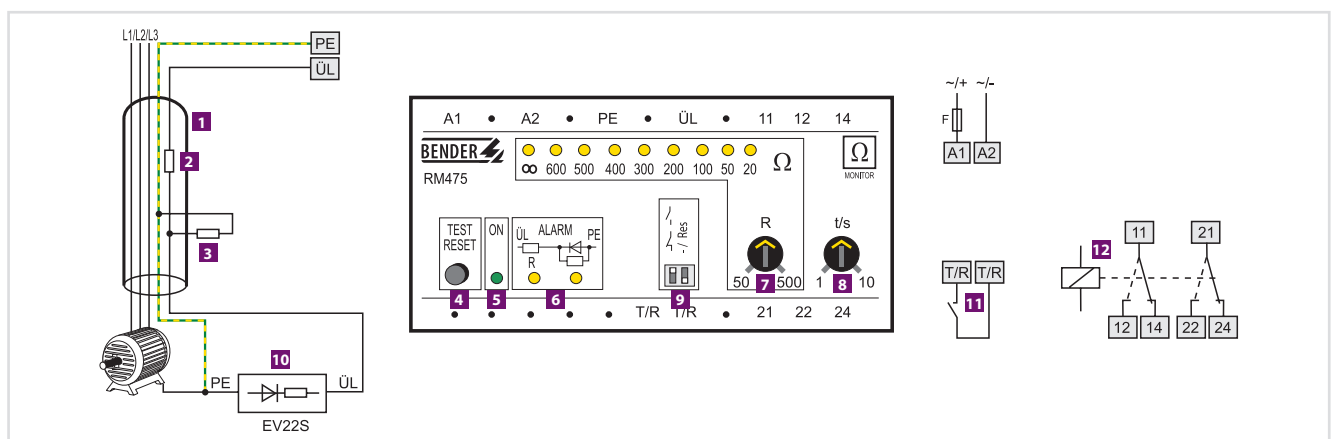
Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (IEC 60529)	IP30
Degree of protection, terminals (IEC 60529)	IP30
Screw mounting	2 x M4
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94V-0
Operating manual	BP702001
Weight	≤ 400 g

() * factory setting

Dimension diagram (dimensions in mm)



Wiring diagram



- | | |
|--|--|
| <p>1 Line</p> <p>2 Series resistance</p> <p>3 Cross resistance</p> <p>4 Test and reset button "TEST RESET"</p> <p>5 Power On LED "ON"</p> <p>6 Alarm LEDs, light in the case of cross resistance and series resistance faults, flash in the case of extraneous voltage</p> <p>7 Adjustable response value "R", cross resistance 50...500 Ω (RM475LY only)</p> <p>8 Adjustable time delay "t/s" 1...10 s (RM475LY only)</p> | <p>9 DIP switch for setting the
– operating principle -N/C or N/O operation
– Fault memory on/off (on)*</p> <p>10 Terminating resistor</p> <p>11 External test and reset button</p> <p>12 Alarm relay:
— N/C operation
- - - N/O operation</p> <p>F Short-circuit protection supply voltage 6 A fuse is recommended</p> |
|--|--|

SB146

Fault voltage monitor



Device features

- Voltage monitoring of 6 secondary circuits of welding transformers
- Alarm LEDs for fault voltage per channel, PE/KE interruption, interruption of the measuring line
- Connection monitoring of measuring line and earth connection
- Fault memory
- Reset button
- 1 potential-free changeover contact
- 45 mm enclosure

Typical applications

- Monitoring of welding equipment according to DIN VDE 0545 (VDE 0545-1)

Standards

The SB146 series complies with the requirements of the device standard: DIN VDE 0545-1.

Further information

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

Ordering information

Supply voltage U_s		Type	Art. No.
AC	DC		
10...65 V	10...90 V	SB146-34	B 9308 3017
65...276 V	90...308 V	SB146-35	B 9308 3018

Technical data

Insulation coordination acc. to IEC 60664-1

Rated insulation voltage	AC 800 V
Rated impulse voltage/pollution degree	6 kV/3

Supply voltage

Supply voltage U_s	see ordering information
Power consumption	≤ 3 VA

Measuring circuit

Nominal system voltage U_n	600 V
Nominal voltage range	0...1.15 x U_n
Response value	
U_f for sinusoidal voltages	AC 21.6...24 V, 50...1000 Hz
U_f for DC voltages	DC 19...24 V
Response time t_{an} at $1.1 \times U_{fmax}$	≤ 100 ms
Response time for coupling monitoring	≤ 5 s
Recovery time t_b	≤ 500 ms

Switching elements

Number of changeover contacts	1 x 1
Operating principle	N/C operation

Fault memory behaviour

Electrical endurance, number of cycles	12000
Contact class IEC 60255-0-20	IIB
Rated contact voltage	AC 250 V/DC 300 V
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

Environment/EMC

EMC immunity	acc. to IEC 61000-6-2
EMC emission	acc. to IEC 61000-6-4
Shock resistance IEC 60068-2-27 (device in operation)	15 g/11 ms
Bumping IEC 60068-2-29 (transport)	40 g/6 ms
Vibration resistance IEC 60068-2-6 (device in operation)	1 g/10...150 Hz
Vibration resistance IEC 60068-2-6 (device not in operation)	2 g/10...150 Hz
Ambient temperature, during operation	-10...+55 °C
Ambient temperature for storage	-45...+70 °C
Climatic class acc. to IEC 60721-3-3	3K5 (except condensation and formation of ice)

Connection

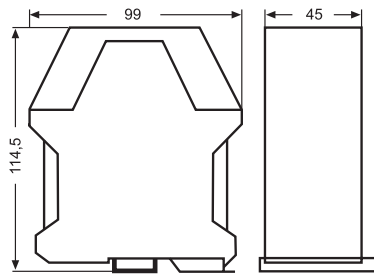
Connection type	modular terminals
Connection properties single wire/flexible	0.14...2.5 mm ²

Other

Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (IEC 60529)	IP30
Degree of protection, terminals (IEC 60529)	IP30
Screw mounting	no
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94V-0
Operating manual	BP308008
Weight	≤ 210 g

3.1

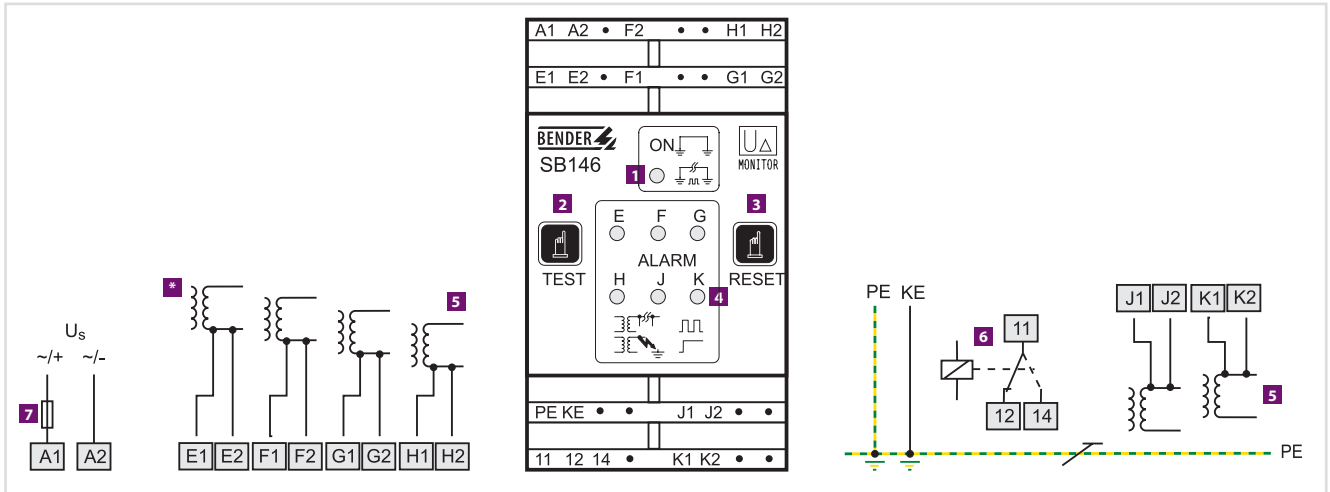
Dimension diagram (dimensions in mm)



Alarm messages

Condition		Connection		Messages		Relay
U_S	$U_F >$	System	PE	LED ON	"E...K"	
on	–	OK	OK	■	–	on
on	–	open	OK	■	flashes	de-energised
on	■	OK	OK	■	on	de-energised
on	–	OK	open	flashes	–	de-energised
off	–	–	–	–	–	de-energised

Wiring diagram



- 1** Power On LED "ON":
 - lights during operating mode
 - flashes in case of interruption of the connection PE/KE
- 2** Test button "TEST"
- 3** Reset button "RESET"
- 4** Alarm LEDs
 - light in the case of fault voltage
 - flash in case of a fault in the connection monitoring

- 5** Welding transformers monitored
- 6** Alarm relay in N/C operation (marked by dotted lines: without fault voltage)
- 7** 6 A fuse recommended.
- *** Unassigned inputs have to be bridged individually



Device overview Universal Devices for Power Quality and Energy Measurement PEM

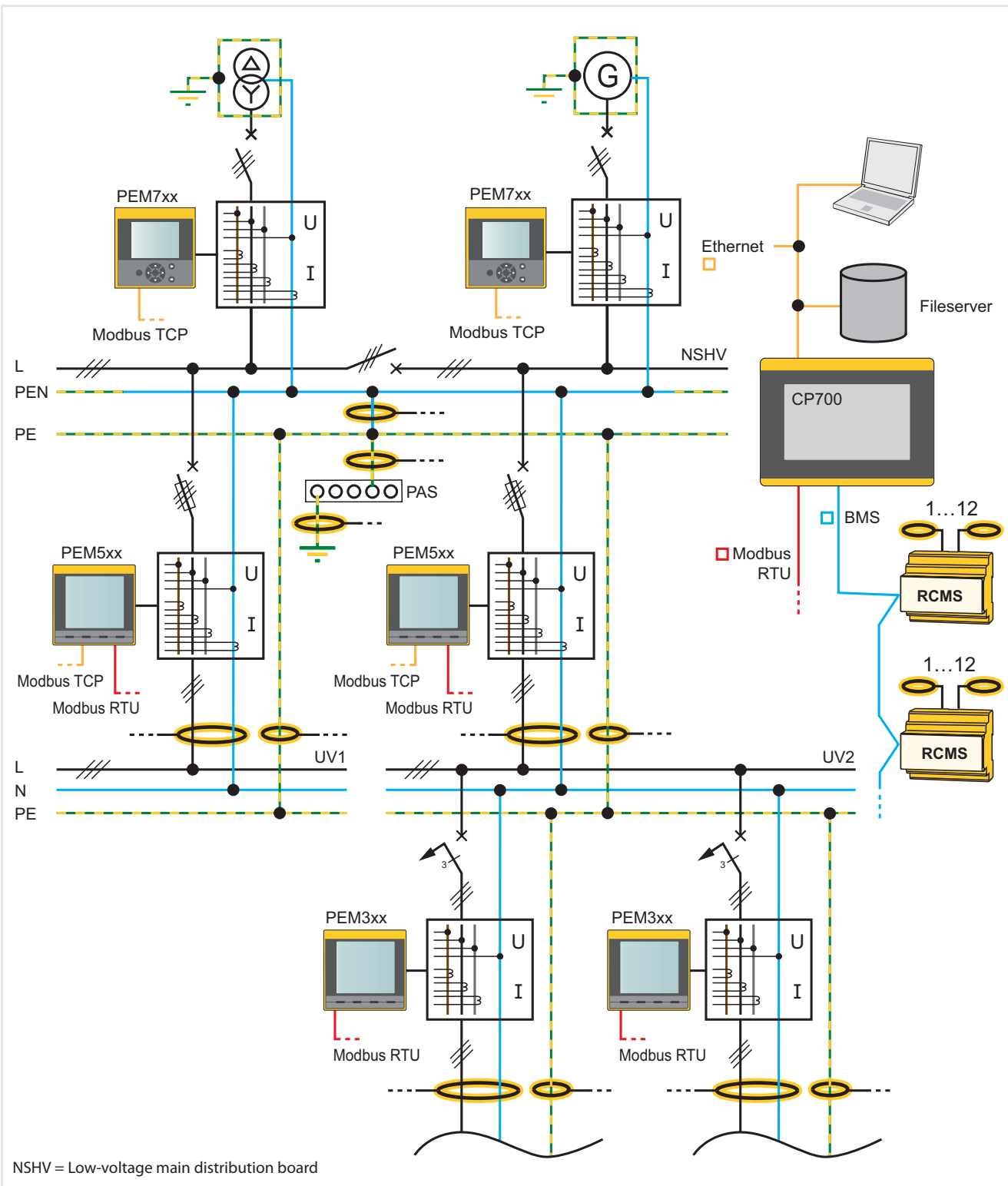


	Page	164	164	167	170	170	–	–
Normative requirements	Accuracy class according to IEC 62053-22	0.5 s	0.5 s	0.5 s	0.2 s	0.2 s	0.2 s	0.2 s
	DIN EN 50160						■	■
	DIN EN 61000-4-7, DIN EN 61000-4-15, DIN EN 61000-4-30						■	■
	DIN EN 61000-2-2, DIN EN 61000-2-4							■
Parameters	Phase voltages/ Line voltages	■	■	■	■	■	■	■
	Phase currents	■	■	■	■	■	■	■
	Neutral current I_4				■	■	■	■
	Neutral current I_4 (calculated)	■	■	■	■	■	■	■
	Frequency/phase angle	■	■	■	■	■	■	■
	Reactive and active power import/ Reactive and active power export	■	■	■	■	■	■	■
	Voltage unbalance/current unbalance	■	■	■	■	■	■	■
	Power	per phase and total S in kVA, P in kW, Q in kvar						
	Displacement factor $\cos(\varphi)$ / power factor λ	■	■	■	■	■	■	■
	Total harmonic distortion (THDU/THDI)	up to the 15 th	up to the 15 th	up to the 31 st	up to the 31 st	up to the 63 rd	up to the 63 rd	up to the 63 rd
	Harmonic components voltage			up to the 31 st	up to the 31 st	up to the 63 rd	up to the 63 rd	up to the 63 rd
	Harmonic components current			up to the 31 st	up to the 31 st	up to the 63 rd	up to the 63 rd	up to the 63 rd
	Transient detection					longer than 80 μ s	longer than 40 μ s	longer than 40 μ s
	Overvoltage (swell)					■	■	■
Undervoltage (sag)					■	■	■	
Flicker severity P_{ST}						■	■	
Features	Digital inputs		2	6	6	6	8	8
	Digital outputs		2	2	3	3	2	3
Technical aspects	Voltage supply	AC 95...260 V (47...440 Hz), DC						
	Sampling rate	1.6 kHz	1.6 kHz	3.2 kHz	12.8 kHz	12.8 kHz	25.6 kHz	25.6 kHz
	Temperature	-25...+55 °C						
	Communication		Modbus/RTU	Modbus/RTU	Modbus/RTU & TCP	Modbus/RTU & TCP	Modbus/RTU & TCP	Modbus/RTU & TCP

* Delivery on request



Example of system design



Power Quality and Energy Measurement PEM330/PEM333



Typical applications

- As a compact device for front panel mounting, the PEM330/333 is a replacement for analogue indicating instruments
- Typical application in low and medium-voltage networks (via measuring voltage transformer)
- Power quality monitoring
- Collection of relevant data for energy management systems
- Energy consumption allocation to cost accounting centers

Device features

- Accuracy class according to IEC 62053-22: 0.5 S
- Measured quantities
 - Phase voltages U_{L1}, U_{L2}, U_{L3} in V
 - Line voltages $U_{L1L2}, U_{L2L3}, U_{L3L1}$ in V
 - Phase currents I_1, I_2, I_3 in A
 - Neutral current (calculated) I_4 in A
 - Frequency f in Hz
 - Phase angle for U and I in $^\circ$
 - 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 $\cos(\varphi)$
 - Power factor λ
 - Active and reactive energy import in kWh, kvarh
 - Active and reactive energy export in kWh, kvarh
 - Voltage unbalance in %
 - Current unbalance in %
 - Harmonic distortion (THD) for U and I
 - k-factor for I
- Programmable setpoint monitoring (PEM333 only)
- LED pulse outputs for active and reactive energy
- Modbus/RTU communication via RS-485 (PEM333 only)
- 2 digital outputs (PEM333 only)
- Demands of energy and current for particular time frames
- Peak demands with timestamps

Standards

The universal measuring device for Power Quality and Energy Measurement PEM330/PEM333 was developed in accordance with the following standards: DIN EN 62053-22 (VDE 0418 Part 3-22), DIN EN 61557-12 (VDE 0413-12)

Further information

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

Ordering information

Interface	Digital inputs/outputs	Current input	Type	Art. No.
–	–	5 A	PEM330	B 9310 0330
		1 A	PEM330-251	B 9310 0331
RS-485	2/2	5 A	PEM333	B 9310 0333
		1 A	PEM333-251	B 9310 0334

Technical data

Insulation co-ordination

Measuring circuit

Rated insulation voltage	300 V
Overvoltage category	III
Pollution degree	2

Supply circuit

Rated insulation voltage	300 V
Overvoltage category	II
Pollution degree	2

Supply voltage

Rated supply voltage U_s	95...250 V
Frequency range of U_s	DC, 44...440 Hz
Power consumption	≤ 3 VA

Measuring circuit

Measuring voltage inputs

$U_{L1-N, L2-N, L3-N}$	230 V
$U_{L1-L2, L2-L3, L3-L1}$	400 V
Measuring range	10...120% U_N
Rated frequency	45...65 Hz
Internal resistance (L-N)	> 500 k Ω

Measuring current inputs

External measuring current transformer should at least comply with accuracy class 0.5 S

Burden	n.A., internal current transformers
Measuring range	0.1...120% I_N
PEM330/333	
I_N	5 A
Measuring current transformer ratio	1...6000
PEM330-251/PEM333-251	
I_N	1 A
Measuring current transformer ratio	1...30000

Accuracies (of measured value/of full scale value)

Phase voltage $U_{L1-N}, U_{L2-N}, U_{L3-N}$	± 0.2 % of measured value
Current	± 0.2 % of measured value + 0.05 % of full scale value
Neutral current I_4	1 % of full scale value
Frequency	± 0.02 Hz
Phase position	$\pm 1^\circ$
Active energy measurement according to	DIN EN 62053-22 (VDE 0418 Part 3-22)
r.m.s. voltage measurement according to	DIN EN 61557-12 (VDE 0413-12), chapter 4.7.6
r.m.s. phase current measurement according to	DIN 61557-12 (VDE 0413-12), chapter 4.7.5
Frequency measurement according to	DIN EN 61557-12 (VDE 0413-12), chapter 4.7.4

Interface*

Interface/protocol	RS-485/Modbus/RTU
Baud rate	1.2...19.2 kbits/s
Cable length	0...1200 m
Shielded cable (shield connected to terminal SH on one side)	recommended: J-Y(St)Y min. 2 x 0.8

Switching elements*

Outputs	2 N/O contacts
Operating principle	N/O operation
Rated operational voltage	AC 230 V DC 24 V AC 110 V DC 12 V
Rated operational current	5 A 5 A 6 A 5 A
Minimum contact rating	1 mA at AC/DC ≥ 10 V
Inputs	2 electrically separated digital inputs
I_{min}	2.4 mA
U_{DI}	DC 24 V

Environment/EMC

EMC	DIN EN 61326-1
Operating temperature	-25...+55 °C
Climatic class acc. to DIN EN 60721	
Stationary use	3K5
Classification of mechanical conditions acc. to DIN EN 60721	
Stationary use	3M4

Connection

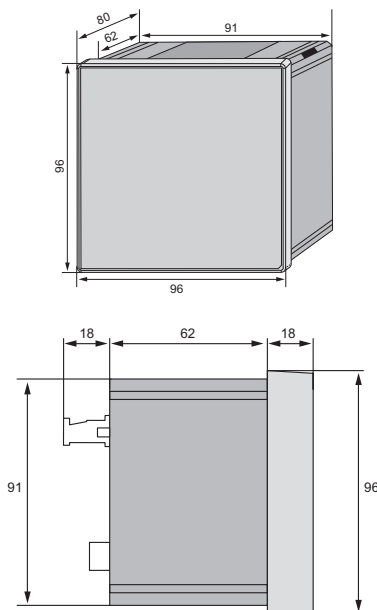
Connection	screw-type terminals
------------	----------------------

Other

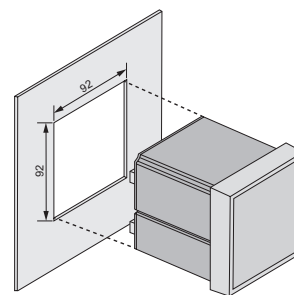
Degree of protection, installation	IP20
Degree of protection, front	IP54
Operating manual	TGH1476
Weight	≤ 550 g

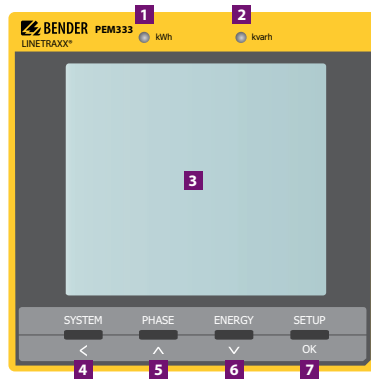
* PEM333 only

Dimension diagram (dimensions in mm)



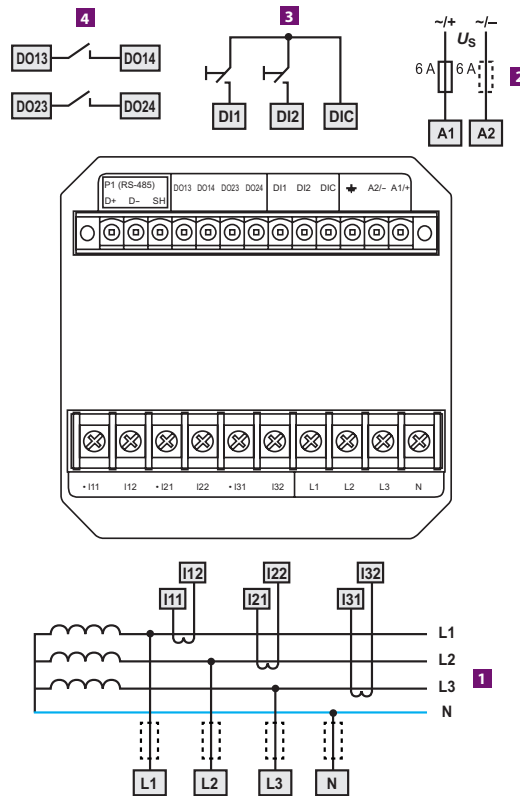
Panel cut out (dimensions in mm)





- 1** Pulse LED: kWh
- 2** Pulse LED: kvarh
- 3** Display
- 4** "SYSTEM" button: Selection (in the menu)
- 5** "PHASE" button: Up (in the menu)
- 6** "ENERGY" button: Down (in the menu)
- 7** "SETUP" button: OK (in the menu)
Press the "SETUP" button > 1.5 s to enter/leave the Setup menu.

Wiring diagram



- 1** Connection to the system to be monitored:
The measuring leads should be protected with appropriate fuses.
- 2** Supply voltage. Line protection by a fast-acting 6-A fuse. If being supplied from an IT system, both lines have to be protected by a fuse.
- 3** Digital inputs
- 4** Digital outputs (N/O contacts)

3.2

Power Quality and Energy Measurement PEM533



Typical applications

- As a compact device for front panel mounting, the PEM533 is a replacement for analogue indicating instruments
- Typical application in low and medium-voltage networks (via measuring voltage transformer)
- Power quality monitoring
- Collection of relevant data for energy management systems
- Energy consumption allocation to cost accounting centers

Device features

- Accuracy class according to IEC 62053-22: 0.5 S
- Measured quantities
 - (Phase) voltages U_{L1}, U_{L2}, U_{L3} in V
 - Line-to-line voltages $U_{L1L2}, U_{L2L3}, U_{L3L1}$ in V
 - Phase currents I_1, I_2, I_3 in A
 - Neutral current (calculated) I_4 in A
 - Frequency f in Hz
 - Phase angle for U and I in $^\circ$
 - 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 $\cos(\varphi)$
 - 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 %
 - Total harmonic distortion (THD) for U and I
 - k-Factor for I
- Programmable setpoint monitoring
- LED pulse outputs for active and reactive energy
- Modbus/RTU communication via RS-485
- 2 digital outputs
- Demands of energy and current for particular time frames
- Peak demands with timestamps
- Individual current/voltage harmonics up to the 31st harmonic
- Minimum and maximum values

Standards

The universal measuring device for Power Quality and Energy Measurement PEM533 was developed in accordance with the following standards: DIN EN 62053-22 (VDE 0418 Part 3-22), DIN EN 61557-12 (VDE 0413-12)

Further information

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

Ordering information

Interface	Nominal system voltage	Current input	Type	Art. No.
RS-485	3(N)AC 400/230 V	5 A	PEM533	B 9310 0533
		1 A	PEM533-251	B 9310 0534
	3(N)AC 690/400 V	5 A	PEM533-455	B 9310 0535
		1 A	PEM533-451	B 9310 0536

Technical data

Insulation co-ordination

Measuring circuit

Rated insulation voltage	300 V
Overvoltage category	III
Pollution degree	2

Supply circuit

Rated insulation voltage	300 V
Overvoltage category	II
Pollution degree	2

Supply voltage

Rated supply voltage U_S	95...250 V
Frequency range of U_S	DC, 44...440 Hz
Power consumption	≤ 4 VA

Measuring circuit

Measuring voltage inputs

$U_{L1-N, L2-N, L3-N}$	230 V
$U_{L1-L2, L2-L3, L3-L1}$	400 V
Measuring range	10...120 % U_N
Rated frequency	45...65 Hz
Internal resistance (L-N)	> 500 k Ω

Measuring current inputs

External measuring current transformer should at least comply with accuracy class 0.5 S

Burden	n.A., internal current transformers
Measuring range	0.1...120 % I_N
PEM533/PEM533-455	
I_N	5 A
Measuring current transformer ratio	1...6000
PEM533-251/PEM533-451	
I_N	1 A
Measuring current transformer ratio	1...30000

Accuracies (of measured value/of full scale value)

Phase voltage $U_{L1-N}, U_{L2-N}, U_{L3-N}$	± 0.2 % of measured value
Current	± 0.2 % of measured value + 0.05 % of full scale value
Neutral current I_4	1 % of full scale value
Frequency	± 0,02 Hz
Phase position	± 1 °
Active energy measurement according to	DIN EN 62053-22 (VDE 0418 Part 3-22)
r.m.s. voltage measurement according to	DIN EN 61557-12 (VDE 0413-12), chapter 4.7.6
r.m.s. phase current measurement according to	DIN 61557-12 (VDE 0413-12), chapter 4.7.5
Frequency measurement according to	DIN EN 61557-12 (VDE 0413-12), chapter 4.7.4

Interface

Interface/protocol	RS-485/Modbus/RTU
Baud rate	1.2...19.2 kbits/s
Cable length	0...1200 m
Shielded cable (shield connected to terminal SH on one side)	recommended: J-Y(St)Y min. 2 x 0.8

Switching elements

Outputs	2 N/O contacts
Operating principle	N/O operation
Rated operational voltage	AC 230 V DC 24 V AC 110 V DC 12 V
Rated operational current	5 A 5 A 6 A 5 A
Minimum contact rating	1 mA at AC/DC ≥ 10 V
Inputs	6 electrically separated digital inputs
I_{min}	2.4 mA
U_{DI}	DC 24 V

Environment/EMC

EMC	DIN EN 61326-1
Operating temperature	-25...+55 °C
Climatic class acc. to DIN EN 60721	
Stationary use	3K5
Classification of mechanical conditions acc. to DIN EN 60721	
Stationary use	3M4

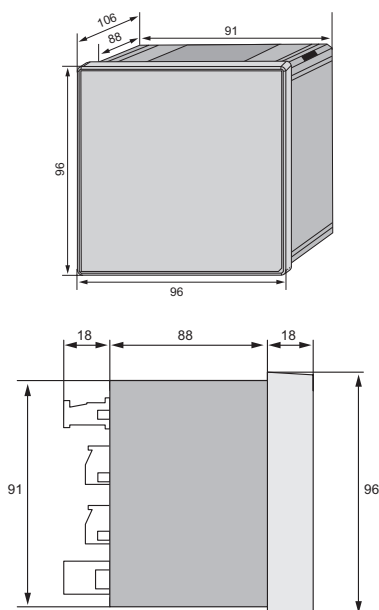
Connection

Connection	screw-type terminals
------------	----------------------

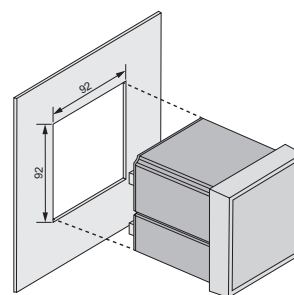
Other

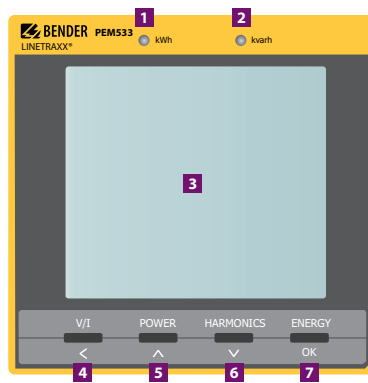
Degree of protection, front	IP54
Operating manual	TGH1476
Weight	≤ 1100 g

Dimension diagram (dimensions in mm)



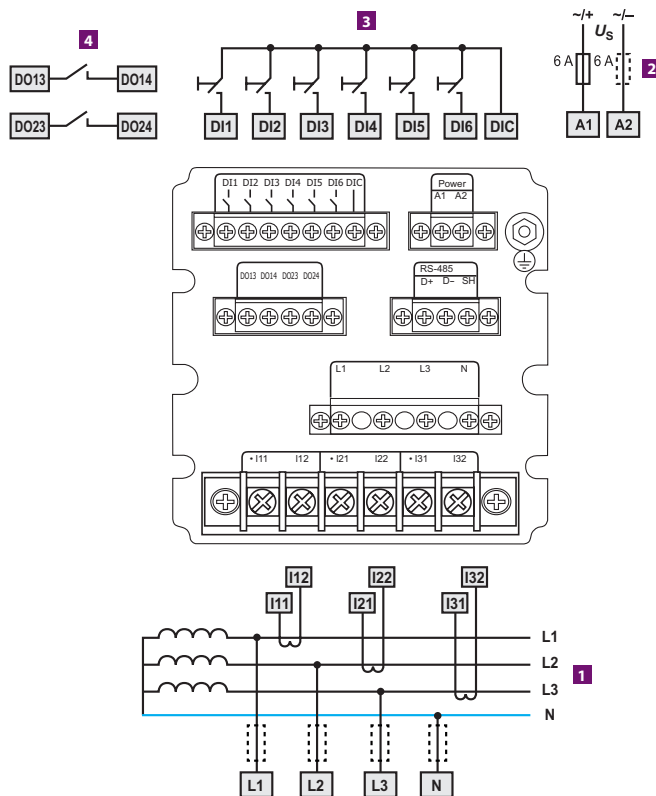
Panel cut out (dimensions in mm)





- 1** Pulse LED: kWh
- 2** Pulse LED: kvarh
- 3** Display
- 4** "V/I" button: Selection (in the menu)
- 5** "POWER" button: Up (in the menu)
- 6** "HARMONICS" button: Down (in the menu)
- 7** "ENERGY" button: OK (in the menu)
Press the "ENERGY" button > 1.5 s to enter/leave the Setup menu.

Wiring diagram



- 1** Connection to the system to be monitored:
The measuring leads should be protected with appropriate fuses.
- 2** Supply voltage. Line protection by a fast-acting 6-A fuse. If being supplied from an IT system, both lines have to be protected by a fuse.
- 3** Digital inputs
- 4** Digital outputs (N/O contacts)

Power Quality and Energy Measurement PEM555/PEM575



Typical applications

- As a compact device for front panel mounting, the PEM575 is a replacement for analogue indicating instruments
- Typical application in low and medium-voltage networks (via measuring voltage transformer)
- Power quality monitoring
- Collection of relevant data for energy management
- Cost allocation of energy consumption
- High-resolution waveform recording allows analysis of power quality phenomena

Device features

- Accuracy class according to IEC 62053-22: 0.2S
- Parameters
 - Phase conductor voltages U_{L1}, U_{L2}, U_{L3} in V
 - Line voltages $U_{L1L2}, U_{L2L3}, U_{L3L1}$ in V
 - Phase currents I_1, I_2, I_3 in A
 - Neutral current (calculated) I_4 in A
 - Frequency f in Hz
 - Phase angle for U and I in $^\circ$
 - 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 $\cos(\varphi)$
 - Power factor λ
 - Active and reactive power import in kWh, kvarh
 - Active and reactive power export in kWh, kvarh
 - Voltage unbalance in %
 - Current unbalance in %
 - Harmonic distortion (THD) for U and I
 - Harmonic factor for I
- Programmable setpoint monitoring
- LED pulse outputs for active and reactive power
- Modbus/RTU communication via RS-485
- 2 digital outputs
- Demands of energy and current for particular time frames
- Peak demands with timestamps
- Individual, harmonic components in current and voltage up to the 31st harmonic
- Minimum and maximum values
- Waveform test (12.8 kHz)
- Data recorder
- Sag/swell detection
- High-resolution recording can be triggered by transient events (PEM575 only)

Standards

The universal measuring device for Power Quality and Energy Measurement PEM555/PEM575 was developed in accordance with the following standards: DIN EN 62053-22 (VDE 0418 Part 3-22), DIN EN 61557-12 (VDE 0413-12)

Further information

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

Ordering information

Interface	Nominal system voltage	Current input	Type	Art. No.
	3(N)AC			
RS-485/Ethernet	400/230 V	5 A	PEM555	B 9310 0555
		1 A	PEM555-251	B 9310 0556
	690/400 V	5 A	PEM555-455	B 9310 0557
		1 A	PEM555-451	B 9310 0558
RS-485/Ethernet	400/230 V	5 A	PEM575	B 9310 0575
		1 A	PEM575-251	B 9310 0576
	690/400 V	5 A	PEM575-455	B 9310 0577
		1 A	PEM575-451	B 9310 0578

Technical data

Insulation co-ordination

Measuring circuit

Rated insulation voltage	300 V
Overvoltage category	III
Pollution degree	2

Supply circuit

Rated insulation voltage	300 V
Overvoltage category	II
Pollution degree	2

Supply voltage

Rated supply voltage U_s	95...250 V
Frequency range of U_s	DC, 44...440 Hz
Power consumption	≤ 5 VA

Measuring circuit

Measuring voltage inputs

$U_{L1-N, L2-N, L3-N}$	230 V
$U_{L1-L2, L2-L3, L3-L1}$	400 V
Measuring range	10...120 % U_N
Rated frequency	45...65 Hz
Internal resistance (L-N)	> 500 k Ω

Measuring current inputs

External measuring current transformer should at least comply with accuracy class 0.5 S

Burden	n.A., internal current transformers
Measuring range	0.1...120 % I_N
PEM575/PEM575-455	
I_N	5 A
Measuring current transformer ratio	1...6000
PEM575-251/PEM575-451	
I_N	1 A
Measuring current transformer ratio	1...30000

Accuracies (of measured value/of full scale value)

Phase voltage $U_{L1-N}, U_{L2-N}, U_{L3-N}$	± 0.1 % of measured value.
Current	± 0.1 % of measured value + 0.05 % of full scale value.
Neutral current I_4	0.5 % of full scale value
Frequency	± 0.01 Hz
Phase position	$\pm 1^\circ$
Active energy measurement according to	DIN EN 62053-22 (VDE 0418 Part 3-22)
r.m.s. voltage measurement according to	DIN EN 61557-12 (VDE 0413-12), chapter 4.7.6
r.m.s. phase current measurement according to	DIN 61557-12 (VDE 0413-12), chapter 4.7.5
Frequency measurement according to	DIN EN 61557-12 (VDE 0413-12), chapter 4.7.4

Interface

Interface/protocol	RS-485/Modbus/RTU
Baud rate	1.2...19.2 kbits/s
Cable length	0...1200 m
Shielded cable (shield connected to terminal SH on one side)	recommended: J-Y(St)Y min. 2 x 0.8

Switching elements

Outputs	3 N/O contacts
Operating principle	N/O operation
Rated operational voltage	AC 230 V DC 24 V AC 110 V DC 12 V
Rated operational current	5 A 5 A 6 A 5 A
Minimum contact rating	1 mA at AC/DC ≥ 10 V
Inputs	6 electrically separated digital inputs
I_{min}	2.4 mA
U_{DI}	DC 24 V

Environment/EMC

EMC	DIN EN 61326-1
Operating temperature	-25...+55 °C
Climatic class acc. to DIN EN 60721	
Stationary use	3K5
Classification of mechanical conditions acc. to DIN EN 60721	
Stationary use	3M4

Connection

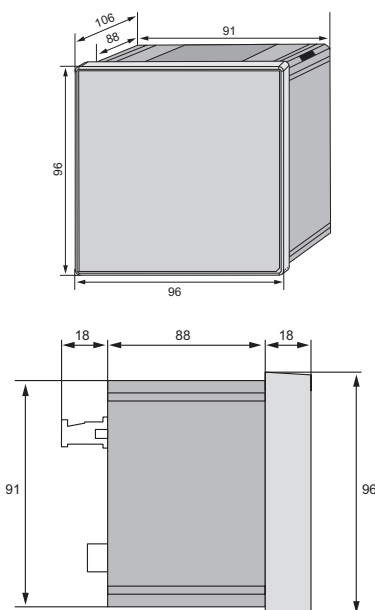
Connection	screw-type terminals
------------	----------------------

Other

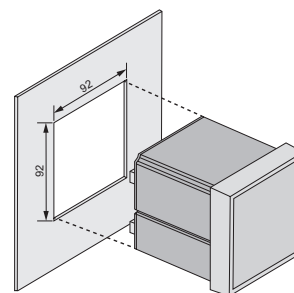
Degree of protection, front	IP54
Operating manual	TGH1476
Weight	≤ 1100 g

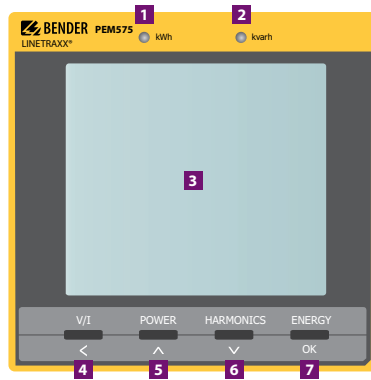
3.2

Dimension diagram (dimensions in mm)



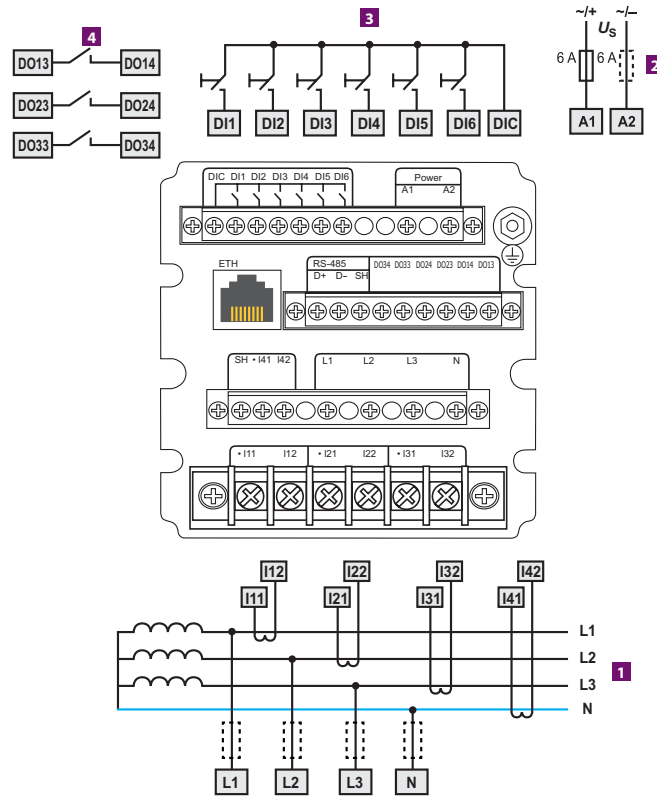
Panel cut out (dimensions in mm)





- 1** Pulse LED: kWh
 - 2** Pulse LED: kvarh
 - 3** Display
 - 4** "V/I" button: Selection (in the menu)
 - 5** "POWER" button: Up (in the menu)
 - 6** "HARMONICS" button: Down (in the menu)
 - 7** "ENERGY" button: OK (in the menu)
- Press the "ENERGY" button > 1.5 s to enter/leave the Setup menu.

Wiring diagram



- 1** Connection to the system to be monitored: The measuring leads should be protected with appropriate fuses.
- 2** Supply voltage. Line protection by a fast-acting 6-A fuse. If being supplied from an IT system, both lines have to be protected by a fuse.
- 3** Digital inputs
- 4** Digital outputs (N/O contacts)

Insulation monitoring devices

ISOMETER®



7



1

Equipment for insulation fault location

ISOSCAN®



85



2

Measuring and monitoring relays

LINETRAXX®

Power Quality and Energy Measurement

LINETRAXX®



121



3

Residual current monitoring systems

LINETRAXX®



175



4

System components

Coupling devices

Measuring current transformers

Transformers

Measuring transducers

Power supply units

Measuring instruments

Interface converters

Interface repeaters

COMTRAXX® Gateways

COMTRAXX® Alarm indicator and test combinations

COMTRAXX® condition monitors

Visualisation



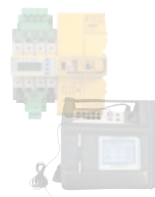
203



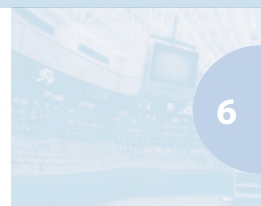
5

Switching equipment

ATICS® transfer switching and monitoring devices



285



6

Test systems

UNIMET® Safety analyser

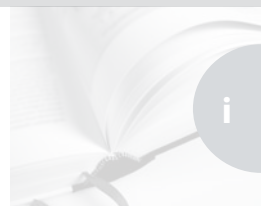
Annex

Standards and guidelines applied
Alphabetical list of devices

Technical terms
Service & project management



315



i

Device overview residual current monitors LINETRAXX®



Page		178	181	184	187
Type of distribution system	TN/TT	■	■	■	■
	IT				
Residual currents		■	■	■	■
			■	■	■
Number of measuring channels		1	1	1	12 (per device) 1080 (per system)
Response value	$I_{\Delta n1}$	50...100% x $I_{\Delta n2}$	50...100% x $I_{\Delta n2}$	50...100% x $I_{\Delta n2}$	10...100% x $I_{\Delta n2}$ min. 5 mA
	$I_{\Delta n2}$	10 mA...10 A	10...500 mA	30 mA...3 A	10 mA...10 A (Type AB) 6 mA...20 A (Type A)
Response delay t_{on}		0...10 s	0...10 s	0...10 s	0...99 s
Start-up delay t		0...10 s	0...10 s	0...10 s	0...99 s
Delay on release t_{off}		0...300 s	0...99 s	0...99 s	0...999 s
Operating principle, alarm relays		N/C operation or N/O operation	N/C operation or N/O operation	N/C operation or N/O operation	N/C operation or N/O operation
Special applications					
Installation	DIN rail	■	■	■	■
	Screw mounting	■	■	■	■

	Type	P.	Suitable system components			
Measuring current transformers	W...	218	■			■
	WR...	224	■			■
	WS...	228	■			■
	WF...	232	■			■
	W...AB	221		■	■	■
Coupling device	AKS470	-				
Connection cable measuring current transformer	WX...	221		■	■	
	WXS...	221				■
RS-485 repeater	DI-1DL	258				■
Power supply units	AN420-1	253				■
	AN420-2	253				■
	AN110-1	248				■
	AN110-2	248				■

LINETRAXX® RCM420

Residual current monitor for TN and TT systems (AC and pulsed DC currents)



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

Approvals



Device features

- AC and pulsed DC sensitive residual current monitor Type A according to IEC 62020
- r.m.s. value measurement (AC)
- Two separately adjustable response values
- Frequency range 42...2000 Hz
- Start-up delay, response delay and delay on release
- Restart function
- Digital measured value display via LC display
- Measured value memory for operating value
- CT connection monitoring
- LEDs: Power On, Alarm 1, Alarm 2
- Internal/external test/reset button
- Two separate alarm relays (one changeover contact each)
- N/O or N/C operation and fault memory behaviour selectable
- Password protection for device setting
- Device self monitoring
- Sealable transparent cover
- Two-module enclosure (36 mm)
- RoHS compliant
- Push-wire terminal (two terminals per connection)

Further information

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

Ordering information

Supply voltage ¹⁾ U _S		Type	Art. No.
DC	AC		
9.6...94 V	16...72 V, 40...460 Hz	RCM420-D-1	B 7401 4001
70...300 V	70...300 V, 40...460 Hz	RCM420-D-2	B 7401 4002

Device version with screw terminals on request.

¹⁾ Absolute values

Accessories

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

Suitable system components

Type designation	Type of construction	Type	Page
Measuring current transformers	circular	W...	218
	rectangular	WR...	224
	split-core	WS...	228
	flexible	WF...	232

Technical data

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

Rated insulation voltage	250 V
Rated impulse voltage/pollution degree	4 kV/3
Protective separation (reinforced insulation) between	(A1, A2) - (k, l, T/R) - (11, 12, 14) - (21, 22, 24)

Voltage tests according to IEC 61010-1	2.21 kV
--	---------

Supply voltage

RCM420-D-1:

Supply voltage U_S	AC 16...72 V/DC 9.6...94 V
Frequency range U_S	42...460 Hz

RCM420-D-2:

Supply voltage U_S	AC/DC 70...300 V
Frequency range U_S	42...460 Hz
Power consumption	≤ 4 VA

Measuring circuit

External measuring current transformers type	W..., WR..., WS..., WF...
Load	68 Ω
Rated insulation voltage (measuring current transformer)	800 V
Operating characteristic acc. to IEC 62020	type A
Rated frequency	42...2000 Hz
Measuring range	3 mA...16 A
Relative uncertainty	0...-20%
Operating uncertainty	0...30%

Response values

Rated residual operating current $I_{\Delta n1}$ (prewarning, AL1)	50...100% x $I_{\Delta n2}$, (50%)*
Rated residual operating current $I_{\Delta n2}$ (alarm, AL2)	10 mA...10 A (30 mA)*
Hysteresis	10...25% (15%)*

Time response

Start-up delay t	0...10 s (0.5 s)*
Response delay t_{on2} (alarm)	0...10 s (0 s)*
Response delay t_{on1} (prewarning)	0...10 s (1 s)*
Delay on release t_{off}	0...99 s (1 s)*
Operating time t_{ae} at $I_{\Delta n} = 1 \times I_{\Delta n1/2}$	≤ 180 ms
Operating time t_{ae} at $I_{\Delta n} = 5 \times I_{\Delta n1/2}$	≤ 30 ms
Response time t_{an}	$t_{an} = t_{ae} + t_{on1/2}$
Recovery time t_b	≤ 300 ms
Number of restart cycles	0...100 (0)*

Cable lengths for measuring current transformers

Single wire ≥ 0.75 mm ²	0...1 m
Single wire, twisted ≥ 0.75 mm ²	0...10 m
Shielded cable ≥ 0.75 mm ²	0...40 m

Shielded cable (shield on one side connected to terminal L of the RCM420, not connected to earth)
recommended: J-Y(St)Y min. 2 x 0.8

Connection	screw-type terminals
------------	----------------------

Displays, memory

Display range, measuring value	3 mA...16 A
Error of indication	±15%/±2 digits
Measured-value memory for alarm value	data record measured values
Password	off/0...999 (off)*
Fault memory alarm relay	on/off (on)*

Inputs/outputs

Cable length for external test/reset button	0...10 m
---	----------

Switching elements

Number of switching elements	2 x 1 changeover contact				
Operating principle	N/C operation or N/O operation (N/C operation)*				
Electrical endurance, number of cycles	10000				
Contact data acc. to IEC 60947-5-1:					
Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-12
Rated operational voltage	230 V	230 V	24 V	110 V	220 V
Rated operational current	5 A	3 A	1 A	0.2 A	0.1 A
Minimum contact rating	1 mA at AC/DC ≥ 10 V				

Environment/EMC

EMC	IEC 62020				
Operating temperature	-25...+55 °C				
Climatic class acc. to IEC 60721					
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)				
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)				
Long-time storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)				
Classification of mechanical conditions IEC 60721					
Stationary use (IEC 60721-3-3)	3M4				
Transport (IEC 60721-3-2)	2M2				
Long-time storage (IEC 60721-3-1)	1M3				

Connection

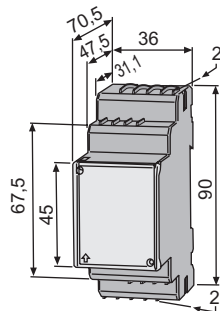
Connection type	push-wire terminal				
Connection properties					
rigid	0.2...2.5 mm ² (AWG 24...12)				
flexible without ferrule	0.2...2.5 mm ² (AWG 24...12)				
flexible with ferrule	0.2...1.5 mm ² (AWG 24...16)				
Stripping length	10 mm				
Opening force	50 N				
Test opening, diameter	2.1 mm				

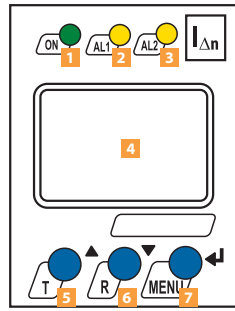
Other

Operating mode	continuous operation				
Position of normal use	any				
Degree of protection, internal components (DIN EN 60529)	IP30				
Degree of protection, terminals (DIN EN 60529)	IP20				
Enclosure material	polycarbonate				
Screw mounting	2 x M4 with mounting clip				
DIN rail mounting acc. to	IEC 60715				
Flammability class	UL94 V-0				
Operating manual	TGH1410				
Weight	≤ 150 g				

(*) = factory setting

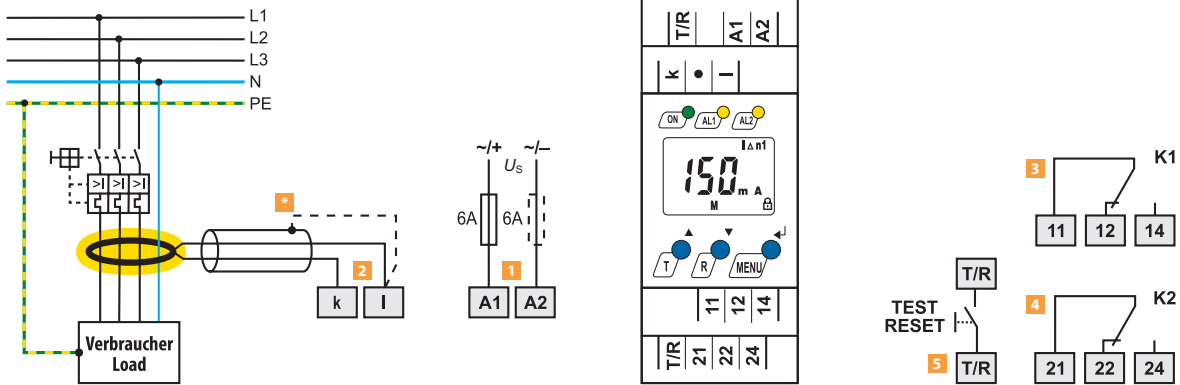
Dimension diagram (dimensions in mm)





- 1 Power On LED "ON" (green); lights when supply voltage is applied and flashes in the event of system fault alarm respectively in the event of CT malfunction.
- 2 Alarm LED "AL1" (yellow), prewarning; lights when the set response value $I_{\Delta n1}$ is exceeded or flashes in the event of system fault alarm respectively in the event of CT malfunction
- 3 Alarm LED "AL2" (yellow), alarm; lights when the set response value $I_{\Delta n2}$ is exceeded or flashes in the event of system fault alarm respectively in the event of CT malfunction
- 4 Multi-functional LC display
- 5 Test button "T": to call up the self test.
Arrow up button: parameter change, to move up in the menu
- 6 Reset button "R": to delete saved alarms.
Arrow down button: parameter change, to move down in the menu
- 7 "MENU" button: to call up the menu system.
Enter button: to confirm parameter change.
"ESC" button: press the button "T" > 1.5 s

Wiring diagram



- 1 Supply voltage U_s see ordering information, 6 A fuse recommended
 - 2 Connection of the external measuring current transformer
 - 3 Alarm relay "K1": configurable for alarm $I_{\Delta n1}/I_{\Delta n2}$ /TEST/ERROR
 - 4 Alarm relay "K2": configurable for alarm $I_{\Delta n1}/I_{\Delta n2}$ /TEST/ERROR
 - 5 Combined test and reset button "T/R" short-time pressing (< 1.5 s) = RESET long-time pressing (> 1.5 s) = TEST
 - * when a shielded cable is used
- Do not route the PE conductor through the measuring current transformer!**

4

LINETRAXX® RCMA420

AC/DC sensitive residual current monitor for TN and TT systems
(AC, DC and pulsed DC currents)



Typical applications

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

Approvals



Device features

- AC/DC sensitive residual current monitor Type B acc. to IEC 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
- Push-wire terminal (two terminals per connection)

Further information

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

Ordering information

Supply voltage ¹⁾ U _S		Type	Art. No.
DC	AC		
9.6...94 V	16...72 V, 42...460 Hz	RCMA420-D-1	B 7404 3001
70...300 V	70...300 V, 42...460 Hz	RCMA420-D-2	B 7404 3002

Device version with screw terminals on request.

¹⁾ Absolute values

Accessories

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

Suitable system components

Type designation	Type of construction	Type	Page
Measuring current transformers	circular	W...AB	221
Connection cable measuring current transformer	–	WX...	221

Technical data

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

Rated insulation voltage	250 V
Rated impulse voltage/pollution degree	2.5 kV/3
Protective separation (reinforced insulation) between	(A1, A2) - (k, l, T/R) - (11, 12, 14) - (21, 22, 24)

Voltage tests according to IEC 61010-1 2.21 kV

Supply voltage

RCMA420-D-1:

Supply voltage U_S	AC 16...72 V/DC 9.6...94 V
Frequency range U_S	42...460 Hz

RCMA420-D-2:

Supply voltage U_S	AC/DC 70...300 V
Frequency range U_S	42...460 Hz
Power consumption	≤ 4 VA

Measuring circuit

External measuring current transformer	W20AB, W35AB, W60AB series
Rated insulation voltage (measuring current transformer)	800 V
Operating characteristic acc. to IEC 62020 and IEC/TR 60755	Type B
Rated frequency	0...2000 Hz
Measuring range AC	0...1.5 A
Measuring range DC	0...600 mA
Relative uncertainty	0...-35%
Operating uncertainty	0...35%

Response values

Rated residual operating current $I_{\Delta n1}$ (prewarning, AL1)	50...100 % $\times I_{\Delta n2}$ (50 %)*
Rated residual operating current $I_{\Delta n2}$ (alarm, AL2)	10...500 mA (30 mA)*
Hysteresis	10...25% (15 %)*

Time response

Start-up delay t	0...10 s (0.5 s)*
Response delay t_{on2} (alarm)	0...10 s (0 s)*
Response delay t_{on1} (prewarning)	0...10 s (1 s)*
Delay on release t_{off}	0...99 s (1 s)*
Operating time t_{ae} at $I_{\Delta n} = 1 \times I_{\Delta n1/2}$	≤ 180 ms
Operating time t_{ae} at $I_{\Delta n} = 5 \times I_{\Delta n1/2}$	≤ 30 ms
Response time t_{an}	$t_{an} = t_{ae} + t_{on1/2}$
Recovery time t_b	≤ 300 ms

Cable lengths for measuring current transformers

Connection (see ordering information)	connecting cable WX... 1 m/2.5 m/5 m/10 m
---------------------------------------	---

Displays, memory

Display range, measured value AC	0...1.5 A
Display range, measured value DC	0...600 mA
Error of indication	±17.5 %/± 2 digits
Measured-value memory for alarm value	data record measured values
Password	off/0...999 (off)*
Fault memory alarm relay	on/off (on)*

Inputs/outputs

Cable length for external test/reset button	0...10 m
---	----------

Switching elements

Number of switching elements	2 x 1 changeover contact				
Operating principle	N/C operation or N/O operation (N/C operation)*				
Electrical endurance, number of cycles	10000				
Contact data acc. to IEC 60947-5-1					
Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-12
Rated operational voltage	230 V	230 V	24 V	110 V	220 V
Rated operational current	5 A	3 A	1 A	0.2 A	0.1 A
Minimum contact rating	1 mA at AC/DC ≥ 10 V				

Environment/EMC

EMC	IEC 62020				
Operating temperature	-25...+55 °C				
Climatic class acc. to IEC 60721					
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)				
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)				
Long-time storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)				
Climatic class acc. to IEC 60721					
Stationary use (IEC 60721-3-3)	3M4				
Transport (IEC 60721-3-2)	2M2				
Long-time storage (IEC 60721-3-1)	1M3				

Connection

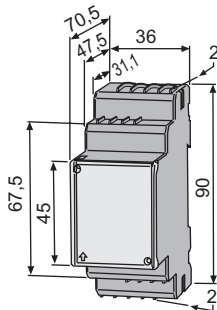
Connection type	push-wire terminal				
Connection properties					
rigid	0.2...2.5 mm ² (AWG 24...12)				
flexible without ferrule	0.2...2.5 mm ² (AWG 24...12)				
flexible with ferrule	0.2...1.5 mm ² (AWG 24...16)				
Stripping length	10 mm				
Opening force	50 N				
Test opening, diameter	2.1 mm				

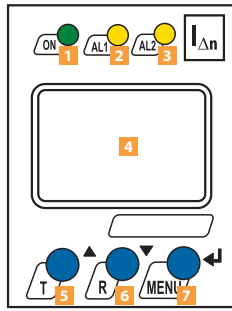
Other

Operating mode	continuous operation
Position of normal use	display-oriented
Degree of protection, internal components (IEC 60529)	IP30
Degree of protection, terminals (IEC 60529)	IP30
Enclosure material	polycarbonate
Screw mounting	2 x M4 with mounting clip
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94V-0
Software version	D242 V1.1x
Operating manual	TGH1411
Weight	≤ 150 g

()* = factory setting

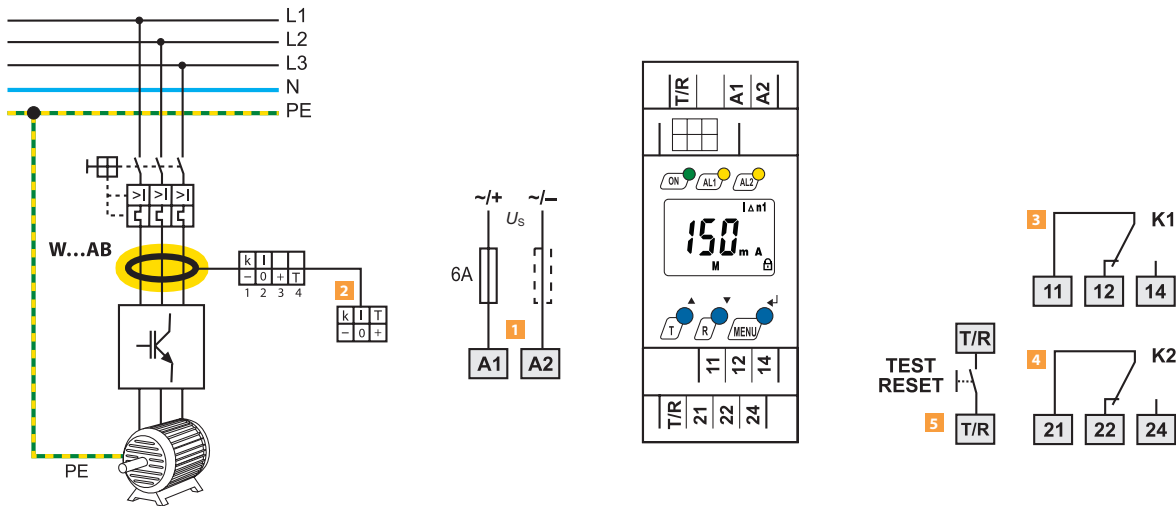
Dimension diagram (dimensions in mm)





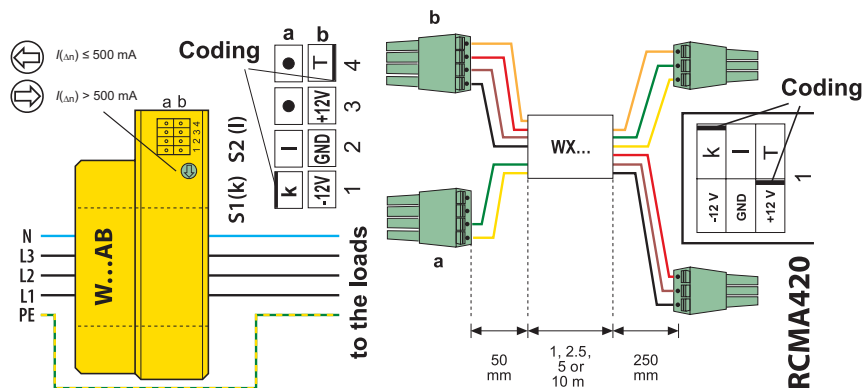
- 1 Power On LED "ON" (green); lights when supply voltage is applied and flashes in the event of system fault alarm respectively in the event of CT malfunction.
- 2 Alarm LED "AL1" (yellow), prewarning; lights when the set response value $I_{\Delta n1}$ is exceeded or flashes in the event of system fault alarm respectively in the event of CT malfunction
- 3 Alarm LED "AL2" (yellow), alarm; lights when the set response value $I_{\Delta n2}$ is exceeded or flashes in the event of system fault alarm respectively in the event of CT malfunction.
- 4 Multi-functional LC display
- 5 Test button "T": to call up the self test.
Arrow up button: parameter change, to move up in the menu
- 6 Reset button "R": to delete saved alarms.
Arrow down button: parameter change, to move down in the menu
- 7 "MENU" button: to call up the menu system.
Enter button: to confirm parameter change.
"ESC" button: press the button > 1.5 seconds.

Wiring diagram



- 1 Supply voltage U_S see ordering information, 6 A fuse recommended
 - 2 Connector for the external W20AB...W60AB series measuring current transformer
 - 3 Alarm relay "K1": $I_{\Delta n1}$ (prewarning)
 - 4 Alarm relay "K2": alarm $I_{\Delta n2}$ (alarm)
 - 5 Combined test and reset button "T/R"
short-time pressing (< 1.5 s) = RESET
long-time pressing (> 1.5 s) = TEST
- Do not route the PE conductor through the measuring current transformer!**

Connection of measuring current transformers



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

LINETRAXX® RCMA423

AC/DC sensitive residual current monitor for TN and TT systems (AC, DC and pulsed DC currents)



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)

Approvals



Device features

- AC/DC sensitive residual current monitor Type B acc. to IEC 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
- Push-wire terminal (two terminals per connection)
- Two-module enclosure (36 mm)

Further information

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

Ordering information

Supply voltage ¹⁾ U _s		Type	Art. No.
DC	AC		
9.6...94 V	16...72 V, 42...460 Hz	RCMA423-D-1	B 7404 3023
70...300 V	70...300 V, 42...460 Hz	RCMA423-D-2	B 7404 3025

Device version with screw terminals on request.

¹⁾ Absolute values

Accessories

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

Suitable system components

Type designation	Type of construction	Type	Page
Measuring current transformers	circular	W...AB	221
Connection cable measuring current transformer	–	WX...	221

Technical data

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

Rated insulation voltage	250 V
Rated impulse voltage/pollution degree	2.5 kV/3
Protective separation (reinforced insulation) between	

(A1, A2) - (K/I/T/-/GND/+, T/R) - (11, 12, 14) - (21, 22, 24)

Voltage tests according to IEC 61010-1	2.21 kV
--	---------

Supply voltage

RCMA423-D-1:

Supply voltage U_S	AC 16...72 V/DC 9.6...94 V
Frequency range U_S	42...460 Hz

RCMA423-D-2:

Supply voltage U_S	AC/DC 70...300 V
Frequency range U_S	42...460 Hz

Power consumption	≤ 6.5 VA
-------------------	----------

Measuring circuit

External measuring current transformer	W20AB, W35AB, W60AB, W120AB, W210AB series
Rated insulation voltage (measuring current transformer)	800 V
Operating characteristic acc. to IEC 62020 and IEC/TR 60755	Type B
Rated frequency	0...2000 Hz
Measuring range AC/DC	3 mA...6 A
Relative uncertainty for $f \leq 2$ Hz oder ≥ 16 Hz	0...-35 %
Relative uncertainty for $f > 2$ Hz...<16 Hz	-35...+100 %
Operating uncertainty	0...35 %

Response values

Rated residual operating current $I_{\Delta n1}$ (prewarning, AL1)	50...100 % of $I_{\Delta n2}$ (50 %)*
Rated residual operating current $I_{\Delta n2}$ (alarm, AL2)	30 mA...3 A (30 mA)*
Hysteresis	10...25% (15 %)*

Time response

Start-up delay t	0...10 s (0 s)*
Response delay t_{on1} (prewarning)	0...10 s (1 s)*
Response delay t_{on2} (alarm)	0...10 s (0 s)*
Delay on release t_{off}	0...99 s (1 s)*
Operating time t_{ae} at $I_{\Delta n} = 1 \times I_{\Delta n1/2}$	≤ 180 ms
Operating time t_{ae} at $I_{\Delta n} = 5 \times I_{\Delta n1/2}$	≤ 30 ms
Response time t_{an}	$t_{an} = t_{ae} + t_{on1/2}$
Recovery time t_b	≤ 300 ms

Displays, memory

Display range measured value AC/DC	0...6 V
Error of indication	±17.5 %/± 2 digits
Measured-value memory for alarm value	data record measured values
Password	off/0...999 (off)*
Fault memory alarm relay	on/off (on)*

Inputs/outputs

Cable length for external test/reset button	0...10 m
---	----------

Cable lengths for measuring current transformers

Connecting cable WX... (see ordering information)	1 m/2.5 m/5 m/10 m
Alternatively: single wire $6 \times 0.75 \text{ mm}^2$	0...10 m

Switching elements

Number of switching elements	2 x 1 changeover contact				
Operating principle	N/C operation or N/O operation (N/C operation)*				
Electrical endurance, number of cycles	10000				
Contact data acc. to IEC 60947-5-1					
Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-12
Rated operational voltage	230 V	230 V	24 V	110 V	220 V
Rated operational current	5 A	3 A	1 A	0.2 A	0.1 A
Minimum contact rating	1 mA at AC/DC ≥ 10 V				

Environment/EMC

EMC	IEC 62020				
Operating temperature	-25...+55 °C				
Climatic class acc. to IEC 60721					
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)				
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)				
Long-time storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)				
Classification of mechanical conditions IEC 60721					
Stationary use (IEC 60721-3-3)	3M4				
Transport (IEC 60721-3-2)	2M2				
Long-time storage (IEC 60721-3-1)	1M3				

Connection

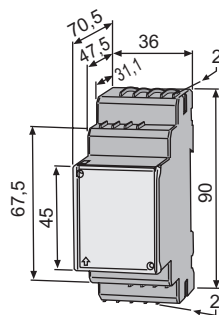
Connection type	push-wire terminals				
Connection properties					
rigid	0.2...2.5 mm ² (AWG 24...14)				
flexible without ferrule	0.2...2.5 mm ² (AWG 24...14)				
flexible with ferrule	0.2...1.5 mm ² (AWG 24...16)				
Stripping length	10 mm				
Opening force	50 N				
Test opening, diameter	2.1 mm				

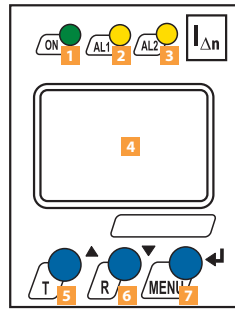
Other

Operating mode	continuous operation				
Position of normal use	display-oriented				
Degree of protection, internal components (IEC 60529)	IP30				
Degree of protection, terminals (IEC 60529)	IP30				
Enclosure material	polycarbonate				
Screw mounting	2 x M4 with mounting clip				
DIN rail mounting acc. to	IEC 60715				
Flammability class	UL94V-0				
Software version	D330 V1.0x				
Operating manual	TGH1442				
Weight	≤ 150 g				

(*) = factory setting

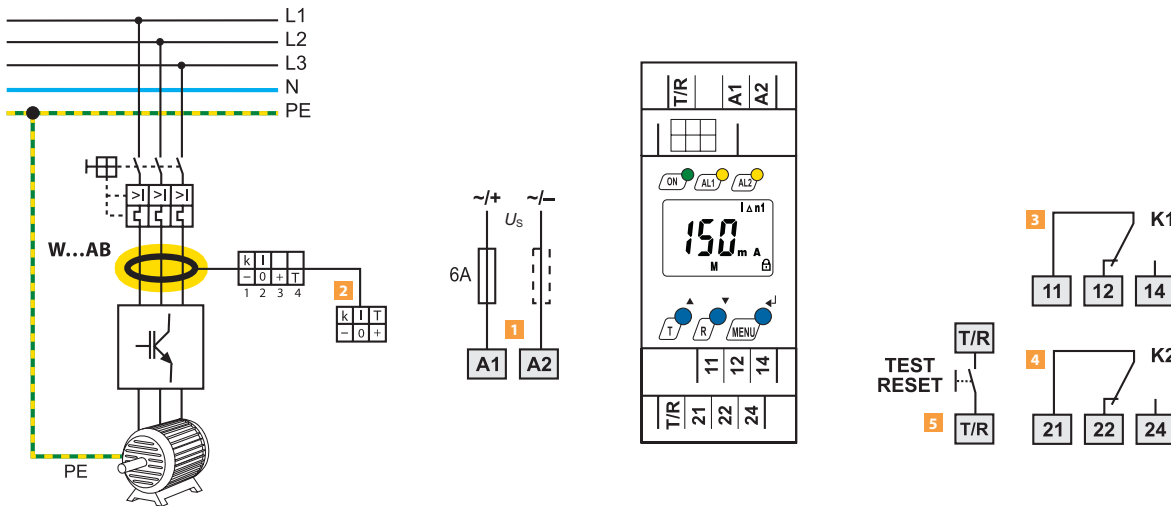
Dimension diagram (dimensions in mm)





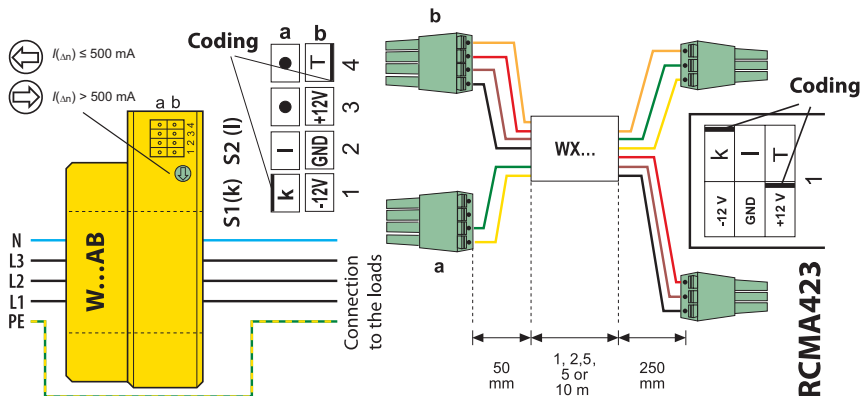
- 1 Power On LED "ON" (green); lights when supply voltage is applied and flashes in the event of system fault alarm respectively in the event of CT malfunction.
- 2 Alarm LED "AL1" (yellow), prewarning; lights when the set response value $I_{\Delta n1}$ is exceeded or flashes in the event of system fault alarm respectively in the event of CT malfunction
- 3 Alarm LED "AL2" (yellow), alarm; lights when the set response value $I_{\Delta n2}$ is exceeded or flashes in the event of system fault alarm respectively in the event of CT malfunction
- 4 Multi-functional LC display
- 5 Test button "T": to call up the self test.
Arrow up button: parameter change, to move up in the menu
- 6 Reset button "R": to delete saved alarms.
Arrow down button: parameter change, to move down in the menu
- 7 "MENU" button: to call up the menu system.
Enter button: to confirm parameter change.
"ESC" button: press the button > 1.5 seconds.

Wiring diagram



- 1 Supply voltage U_S see ordering information, 6 A fuse recommended
 - 2 Connector for the external W20AB...W210AB series measuring current transformer
 - 3 Alarm relay "K1": $I_{\Delta n1}$ (prewarning)
 - 4 Alarm relay "K2": alarm $I_{\Delta n2}$ (alarm)
 - 5 Combined test and reset button "T/R"
short-time pressing (< 1.5 s) = RESET
long-time pressing (> 1.5 s) = TEST
- Do not route the PE conductor through the measuring current transformer!**

Connection of measuring current transformers



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

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 (W...AB series measuring current transformers), 42...2000 Hz (W, 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 accident prevention regulations BGV A3 (Germany).
- Personnel and fire protection due to rapid disconnection
- Monitoring of digital inputs

Approvals



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, THD
- 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) and IEC 62020.

Further information

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

Ordering information RCMS460/490-D

Differential measurement method		Common alarm relay	Alarm relay per channel	4 channels for load current measurement	Supply voltage ¹⁾ U _S		Type	Art. No.
pulsed DC sensitive	AC/DC sensitive				DC	AC		
6 mA...20 A	10 mA...10 A	2 x 1 changeover contact	-	-	16...94 V	16...72 V, 42...460 Hz	RCMS460-D-1	B 9405 3001
					70...276 V	70...276 V, 42...460 Hz	RCMS460-D-2	B 9405 3002
				100 mA...125 A	16...94 V	16...72 V, 42...460 Hz	RCMS460-D4-1	B 9405 3009
				70...276 V	70...276 V, 42...460 Hz	RCMS460-D4-2	B 9405 3010	
			12 x 1 N/O contact	-	16...94 V	16...72 V, 42...460 Hz	RCMS490-D-1	B 9405 3005
					70...276 V	70...276 V, 42...460 Hz	RCMS490-D-2	B 9405 3006
				100 mA...125 A	16...94 V	16...72 V, 42...460 Hz	RCMS490-D4-1	B 9405 3011
					70...276 V	70...276 V, 42...460 Hz	RCMS490-D4-2	B 9405 3012

¹⁾ Absolute values

Ordering information RCMS460/490-L

Current measurement		Common alarm relay for all channels	Alarm relay per channel	Supply voltage ¹⁾ U _S		Type	Art. No.
pulsed DC sensitive	AC/DC sensitive			DC	AC		
6 mA...20 A	10 mA...10 A	2 x 1 changeover contact	-	16...94 V	16...72 V, 42...460 Hz	RCMS460-L-1	B 9405 3003
				70...276 V	70...276 V, 42...460 Hz	RCMS460-L-2	B 9405 3004
		2 x 1 changeover contact	12 x 1 N/O contact	16...94 V	16...72 V, 42...460 Hz	RCMS490-L-1	B 9405 3007
				70...276 V	70...276 V, 42...460 Hz	RCMS490-L-2	B 9405 3008

¹⁾ Absolute values

RCMS460-L4 and RCMS490-L4 on request

Accessories

Type designation	Art. No.
XM460 mounting frame, 144 x 82 mm	B 990 995

Suitable system components

Type designation	Version	Type of construction	Type	Page
Measuring current transformers	pulsed DC sensitive	circular	W...	218
		rectangular	WR...	224
		split-core	WS...	228
		flexible	WF...	232
	AC/DC sensitive	circular	W...AB	221
Connecting cable measuring current transformers W...AB	-	-	WXS...	221
Protocol converters	BMS-Ethernet-Gateway	-	COM460IP	261
	BMS bus – Modbus/RTU	-	FTC470XMB	266
	BMS bus – PROFIBUS DP	-	FTC470XDP	268
RS-485 repeater	-	-	DI-1DL	258
Power supply unit	for supplying up to six W...AB series measuring current transformers	-	AN420-1	253
		-	AN420-2	253
		-	AN110-1	248
		-	AN110-2	248
	for DI-1	-	AN471	-

Overview of device types

Distinctive device features		RCMS460-D...	RCMS460-L	RCMS490-D...	RCMS490-L...	
	Parameter setting function	■	–	■	–	
	Master/Slave	■	■	■	■	
	Address range	1...90	1...90	1...90	1...90	
Measuring circuit	Measuring channels per device	12	12	12	12	
	W... , WR... , WS... , W... AB, W... F series measuring current transformers	■	■	■	■	
	CT monitoring	■	■	■	■	
	Rated residual operating current $I_{\Delta n2}$ (Alarm)	AC/DC sensitive 0...2000 Hz (Type B)	10 mA...10 A	10 mA...10 A	10 mA...10 A	10 mA...10 A
		pulsed DC sensitive 42...2000 Hz (Type A)	6 mA...20 A	6 mA...20 A	6 mA...20 A	6 mA...20 A
		pulsed DC sensitive 42...2000 Hz (Type A) for the channels 9...12 (RCMS4x0-D4/-L4)	100 mA...125 A	100 mA...125 A	100 mA...125 A	100 mA...125 A
	Rated residual operating current $I_{\Delta n1}$ (prewarning)	10...100 %, min. 5 mA	10...100 %, min. 5 mA	10...100 %, min. 5 mA	10...100 %, min. 5 mA	
	Function selectable per channel off, <, >, I/O	■	■	■	■	
	Cut-off frequency adjustable for personnel, plant and fire protection	■	*	■	*	
	Preset function for $I_{\Delta n2}$ and I/O	■	■	■	■	
	Hysteresis	2...40 %	2...40 %	2...40 %	2...40 %	
	Factor for additional CT	■	■	■	■	
Switching elements	Common alarm relay for all channels	2 x 1 changeover contact	2 x 1 changeover contact	2 x 1 changeover contact	2 x 1 changeover contact	
	Alarm relay per channel	–	–	12 x 1 N/O contact	12 x 1 N/O contact	
Time response	Start-up delay 0...99 s	■	■	■	■	
	Response delay t_v , adjustable 0...999 s	■	■	■	■	
	Operating time at	$I_{\Delta n} = 1 \times I_{\Delta n2} \leq 180$ ms	■	■	■	■
$I_{\Delta n} = 5 \times I_{\Delta n2} \leq 30$ ms		■	■	■	■	
Displays, memory	Analysis of the harmonics (I_h , DC, THD)	■	*	■	*	
	History memory 300 data records	■	–	■	--	
	Data logger for 300 data records/ channel	■	–	■	–	
	Internal clock	■	–	■	–	
	Password	■	–	■	–	
	Language English, German, French, Swedish	■	–	■	–	
	Backlit graphics LC display	■	–	■	–	
7-segment display and LED line	–	■	–	■		

* only in conjunction with RCMS4xx-D, MK2430 or COM460IP

Technical data

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

Rated insulation voltage	AC 250 V
Rated impulse voltage/pollution degree	6 kV/3
Protective separation (reinforced insulation) between (A1, A2) - (k1, l...k12, R, T/R, T, A, B), (C11, C12, C14), (C21, C22, C24), (11,14), (21,24), (31,34), (41,44), (51,54), (61,64), (71,74), (81,84), (91,94), (101,104), (111,114), (121,124)	
Protective separation (reinforced insulation) between (C11, C12, C14) - (C21, C22, C24) - (11, 14, 21, 24, 31, 34) - (41, 44, 51, 54, 61, 64) - (71,74) - (81,84) - (91,94) - (101,104) - (111,114) - (121,124)	
Voltage test acc. to IEC 61010-1	3.536 kV
Rated insulation voltage	AC 250 V
Rated impulse voltage/pollution degree	4 kV/3
Basic insulation between: k1, l...k12, R, T/R, T, A, B) - (C11, C12, C14), (C21, C22, C24)	
Basic insulation between: (11, 14) - (21, 24) - (31, 34) - (41, 44) - (51, 54) - (61, 64)	
Voltage test acc. to IEC 61010-1	2.21 kV

Supply voltage

Rated supply voltage U_s	see ordering information
Frequency range of U_s	see ordering information
Power consumption	≤ 10 VA (RCMS460) ≤ 12 VA (RCMS490)

Measuring circuit

External measuring current transformer	W..., WR..., WS..., WF... series (Type A) W...AB series (Type B)
CT monitoring	on/off (on)*
Rated burden RCMS...-D/-L	68 Ω
Rated burden RCMS...-D4/-L4 (channels 9...12 only)	1 Ω
Rated insulation voltage (measuring current transformer)	800 V
Operating characteristics acc. to IEC 62020 and IEC/TR 60755	Type A and Type B (Type A)* depending on measuring current transformer series
Rated frequency	0...2000 Hz (Type B)/42...2000 Hz (Type A)
Cut-off frequency	none, IEC, 50 Hz, 60 Hz (none)*
Measuring range RCMS...-D/-L	0...30 A (measuring current transformer type A) 0...20 A (measuring current transformer type B) crest factor up to 10 A = 4, up to 20 A = 2
Measuring range RCMS...-D4/-L4 (channels 9...12 only)	100 mA...125 A
Rated residual operating current $I_{\Delta n2}$ (alarm)	10 mA...10 A (Type B) 6 mA...20 A (Type A) (100 mA overcurrent)*
Rated residual operating current $I_{\Delta n2}$ (alarm) for RCMS...-D4/-L4 (channels 9...12 only)	100 mA...125 A (16 A overcurrent)*
Rated residual operating current $I_{\Delta n1}$ (prewarning)	10...100 % x $I_{\Delta n2}$ min 5 mA (50 %)*
Digital input	$1 \leq < 100 \Omega, 0 \geq > 250 \Omega$
Preset for alarm	I_{Δ} x factor 1...99 (3)* Offset 0...20 A (30 mA)*
Preset for digital input	0/1 (1)*
Relative uncertainty RCMS...-D/-L	0...-20 %**
Relative uncertainty RCMS...-D4/-L4 (channels 9...12 only)	+10...-20 %**
Hysteresis	2...40 % (20 %)*
Factor for additional CT	1...10; x 1...250 (x 1)*
Number of measuring channels (per device/system)	12/1080

Time response

Start-up delay t (start-up) per device	0...99 s (0 ms)*
Response delay t_{on} per channel	0...999 s (200 ms)*
Delay on release t_{off} per channel	0...999 s (200 ms)*
Operating time t_{ae} at $I_{\Delta n} = 1 \times I_{\Delta n1/2}$	≤ 180 ms
Operating time t_{ae} at $I_{\Delta n} = 5 \times I_{\Delta n1/2}$	≤ 30 ms
Response time t_{an} for residual current measurement	$t_{an} = t_{ae} + t_{on1/2}$
Operating time t_{ae} digital inputs	≤ 3.5 s
Scanning time for all measuring channels (residual current measurement)	≤ 180 ms
Recovery time t_b	500...600 ms

Displays, memory

Display range measured value RCMS...-D/-L	0...30 A (measuring current transformer type A) 0...20 A (measuring current transformer type B)
Display range, measured value RCMS...-D4/-L4 (channels 9...12)	0...125 A (measuring current transformer type A)
Error of indication	± 10 %
LEDs	ON/ALARM (RCMS...-D...) ON/ALARM/measuring channel 1...12 (RCMS...-L...)
LC display	backlit graphical display (RCMS...-D...)
7-segment display	2 x 7.62 mm (RCMS4...-L)
History memory	300 data records (RCMS...-D...)
Data logger	300 data records per measuring channel (RCMS...-D...)
Password	off/0...999 (off)*
Language	D, GB, F (GB)*
Fault memory alarm relay	on/off (off)*

Inputs/outputs

Test/reset button	internal/external
Cable length for external test/reset button	0...10 m

Interface

Interface/protocol	RS-485/BMS
Baud rate	9.6 kbit/s
Cable length	0...1200 m
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
Device address, BMS bus	1...90 (2)*

Cable lengths for W..., WR..., WS..., WF... series measuring current transformers

Single wire $\geq 0.75 \text{ mm}^2$	0...1 m
Single wire, twisted $\geq 0.75 \text{ mm}^2$	0...10 m
Shielded cable $\geq 0.5 \text{ mm}^2$	0...40 m
Shielded cable (shield to terminal 1 on one end, not connected to earth)	recommended: J-Y(St)Y min. 2 x 0.8

Cable lengths for W...AB series measuring current transformers

Single wire $\geq 0.75 \text{ mm}^2$	0...10 m
Connection	plug-in connector, recommended WXS...

Switching elements

Number	2 x 1 changeover contacts (RCMS460), 2 x 1 changeover contacts, 12 x 1 N/O contact (RCMS490)
Operating principle	NC or N/O operation (N/O operation)*
Electrical endurance, number of cycles	10000
Contact data acc. to IEC 60947-5-1	
Utilisation category	AC-13 AC-14 DC-12 DC-12 DC-12
Rated operational voltage	230 V 230 V 24 V 110 V 220 V
Rated operational current (common alarm relays)	5 A 3 A 1 A 0.2 A 0.1 A
Rated operational current (alarm relay)	2 A 0.5 A 5 A 0.2 A 0.1 A
Minimum contact rating	1 mA at AC/DC ≥ 10 V

Environment/EMC

EMC	IEC 62020
Operating temperature	-25 °C...+55 °C
Climatic class acc. to IEC 60721	
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)
Long-time storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)
Classification of mechanical conditions IEC 60721	
Stationary use (IEC 60721-3-3)	3M4
Transport (IEC 60721-3-2)	2M2
Long-time storage (IEC 60721-3-1)	1M3

Connection

Connection	screw-type terminals
Connection	
rigid/flexible/conductor sizes	0.2...4/0.2...2.5 mm ² (AWG 24...12)
Multi-conductor connection (2 conductors with the same cross section)	
rigid/flexible	0.2...1.5/0.2...1.5 mm ²
Stripping length	8...9 mm
Tightening torque	0.5...0.6 Nm

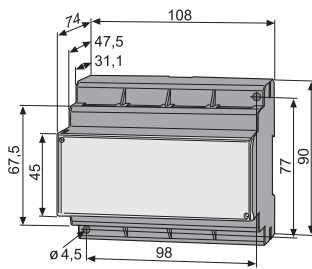
Other

Operating mode	continuous operation
Mounting	display-oriented
Degree of protection, internal components (IEC 60529)	IP30
Degree of protection, terminals (IEC 60529)	IP30
Enclosure material	polycarbonate
Screw mounting	2 x M4
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94V-0
Operating manual	TGH1393
Weight	≤360 g (RCMS460), ≤510 g (RCMS490)

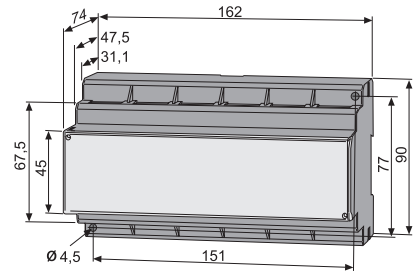
() * factory setting

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

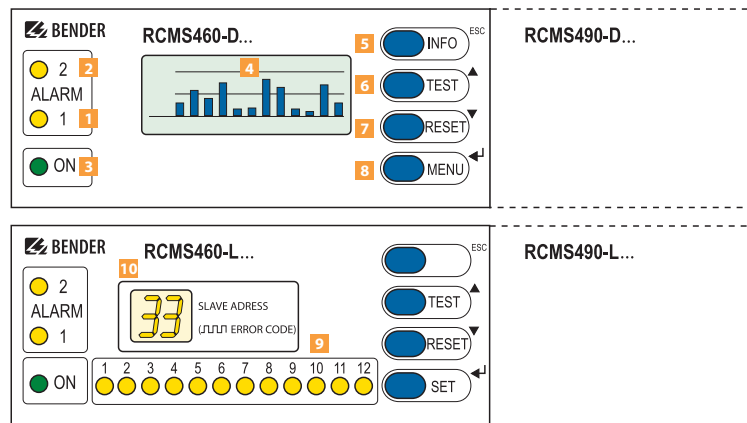
RCMS460-D/-L



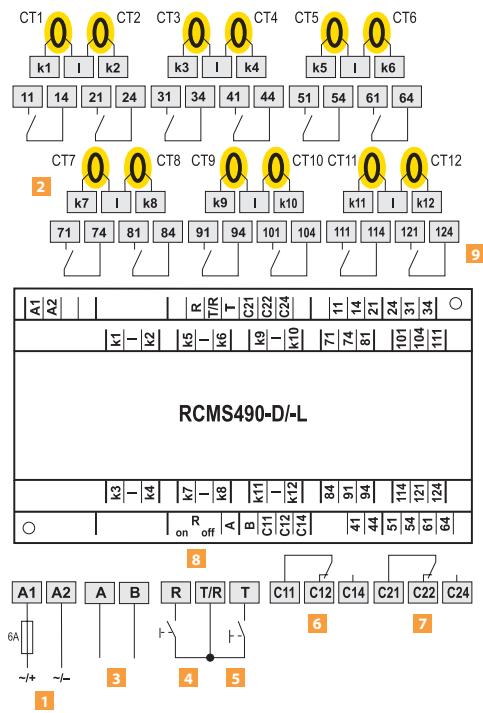
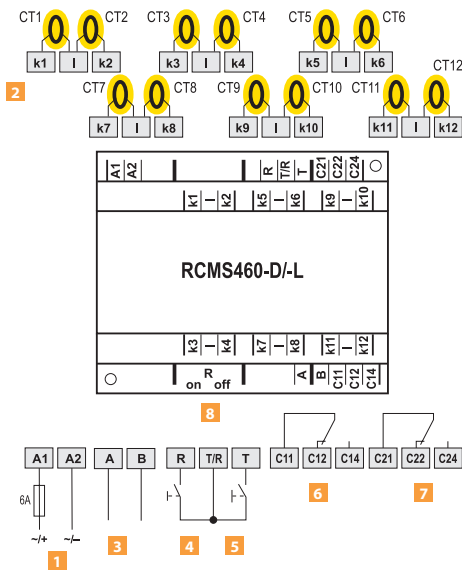
RCMS490-D/-L



Displays and controls

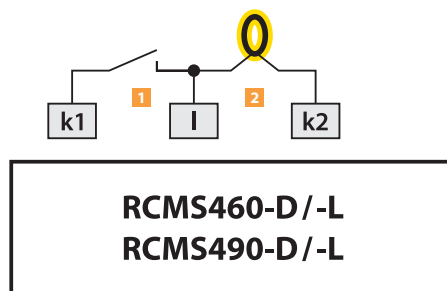


- 1** LED ALARM "2" lights up when the measured value falls below or exceeds the response value in a measuring channel or an error is indicated by the digital input.
- 2** LED "ALARM 1" lights up if the measured value exceeds or falls below the "Prewarning" response value in a channel or in the event of device error.
- 3** Power On LED "ON" lights up when the device is switched on or flashes until the device is ready for operation during switching on.
- 4** Illuminated graphic LCD
- 5** "INFO" button: to query standard information (does not apply to RCMS4...-L)
ESC button: to exit the menu function without changing parameters
- 6** Test button "TEST": to call up the self test
Arrow up button: Parameter changes, scroll
- 7** Reset button "RESET": to delete alarm and fault messages
Arrow down button: Parameter changes, scroll
- 8** "MENU" button: RCMS460-D/490-D: to toggle between the standard display, menu and alarm display
"SET" button: RCMS460-L/490-L: to set the BMS address
Enter button: to confirm parameter changes
- 9** Alarm LEDs "1...12" light up when a fault has been detected in the relevant measuring channel or flash if there is a fault with the measuring current transformer
- 10** Digital display for device address and error codes.



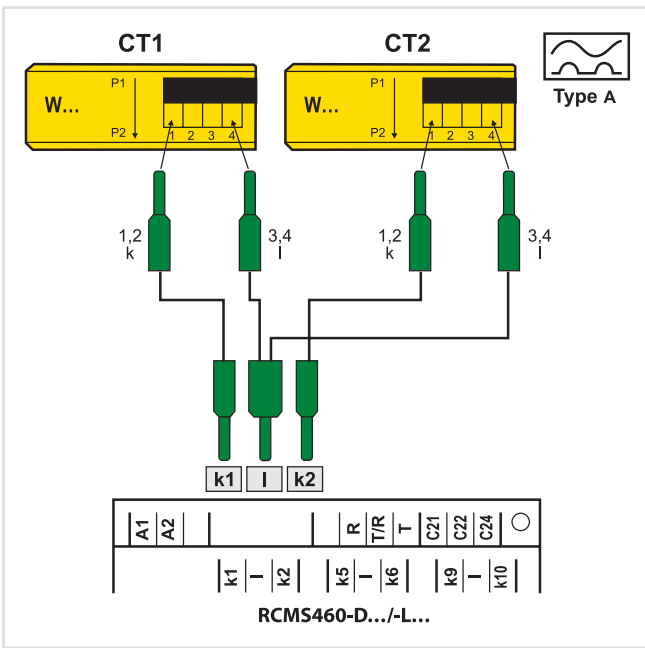
- 1** Connection of supply voltage U_S (see ordering information), 6 A fuse recommended.
- 2** Connection of measuring current transformers CT1...CT12. Either Type A or Type B measuring current transformers can be selected for each measuring channel. Six W...AB series measuring current transformers require one AN420 or AN110 power supply unit. The channels k9...k12 of the device versions RCMS460-D4/-L4 require the connection of Type A measuring current transformers.
- 3** RS-485 interface with BMS protocol
- 4** External reset button "R" (N/O contact)*
- 5** External test button "T" (N/O contact) The external "T/R" buttons of several devices must not be connected to one another.
- 6** Alarm relay "K1": Alarm 1, common alarm for alarm, prewarning, device error, ext. alarm (adjustable)
- 7** Alarm relay "K2": Alarm 2, common alarm for alarm, prewarning, device error, ext. alarm (adjustable)
- 8** $R_{on/off}$: Activate or deactivate the BMS bus terminating resistor (120)
- 9** Alarm relay: N/O contact per channel

Digital input

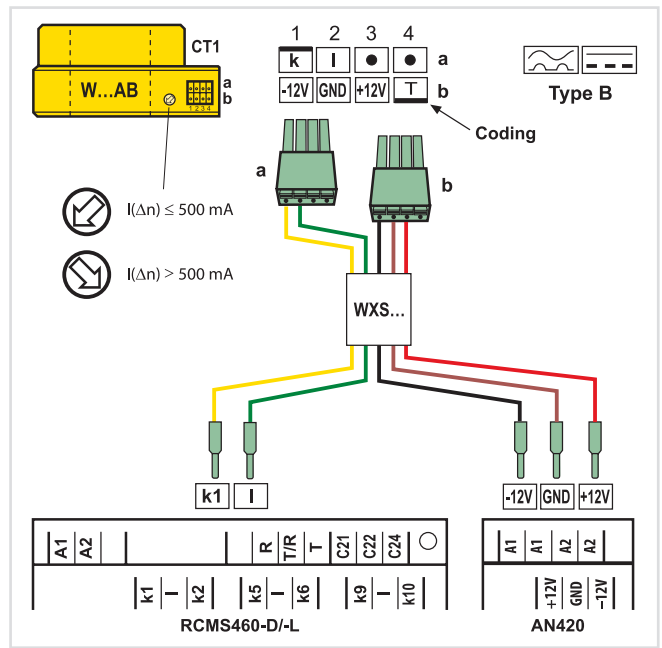


- 1** Potential-free contact
 $0 \triangleq$ Resistance between k and I > 250 Ω
 $1 \triangleq$ Resistance between k and I < 100 Ω
- 2** Measuring current transformers

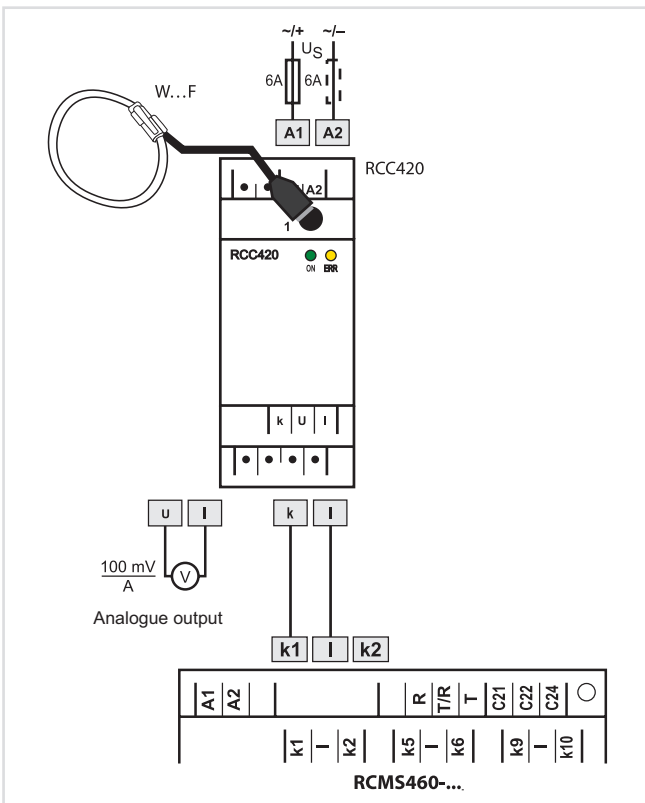
Connection W..., WR..., WS... series measuring current transformers (pulsed current sensitive)



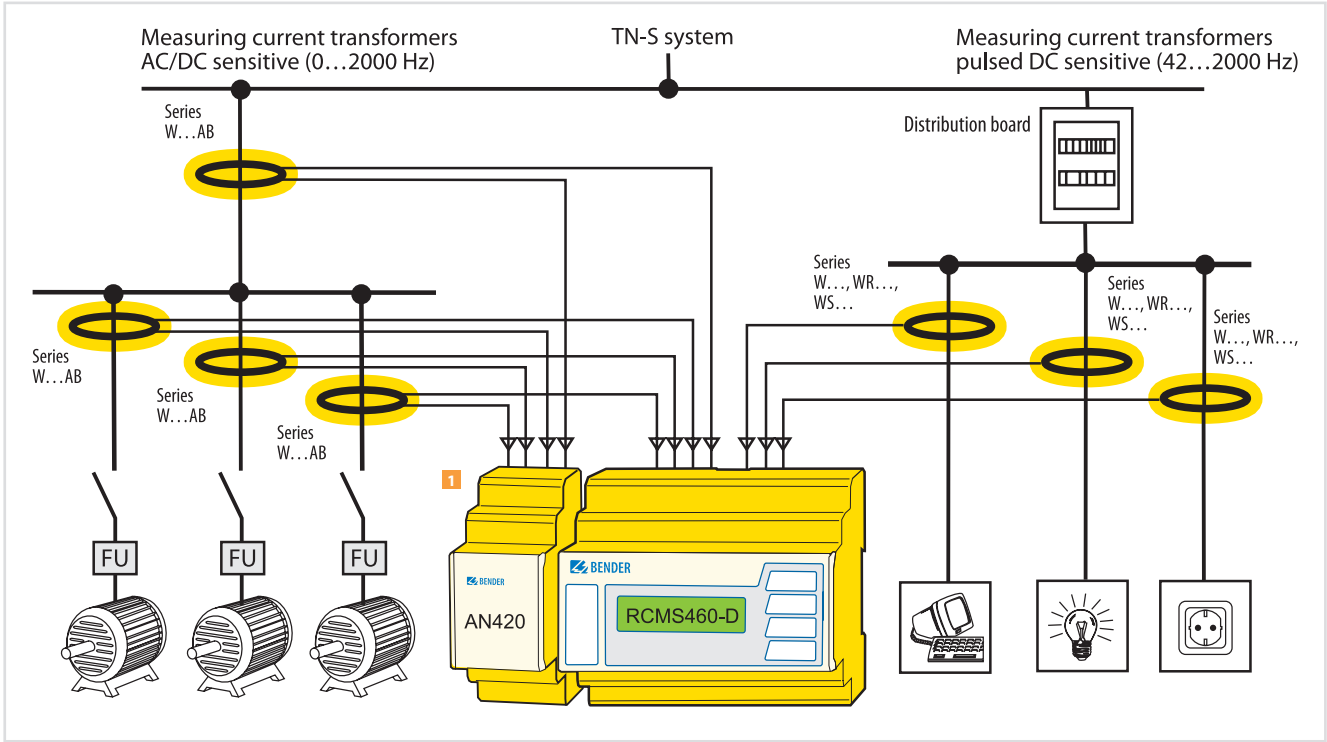
Connection W...AB series measuring current transformer (AC/DC current sensitive)



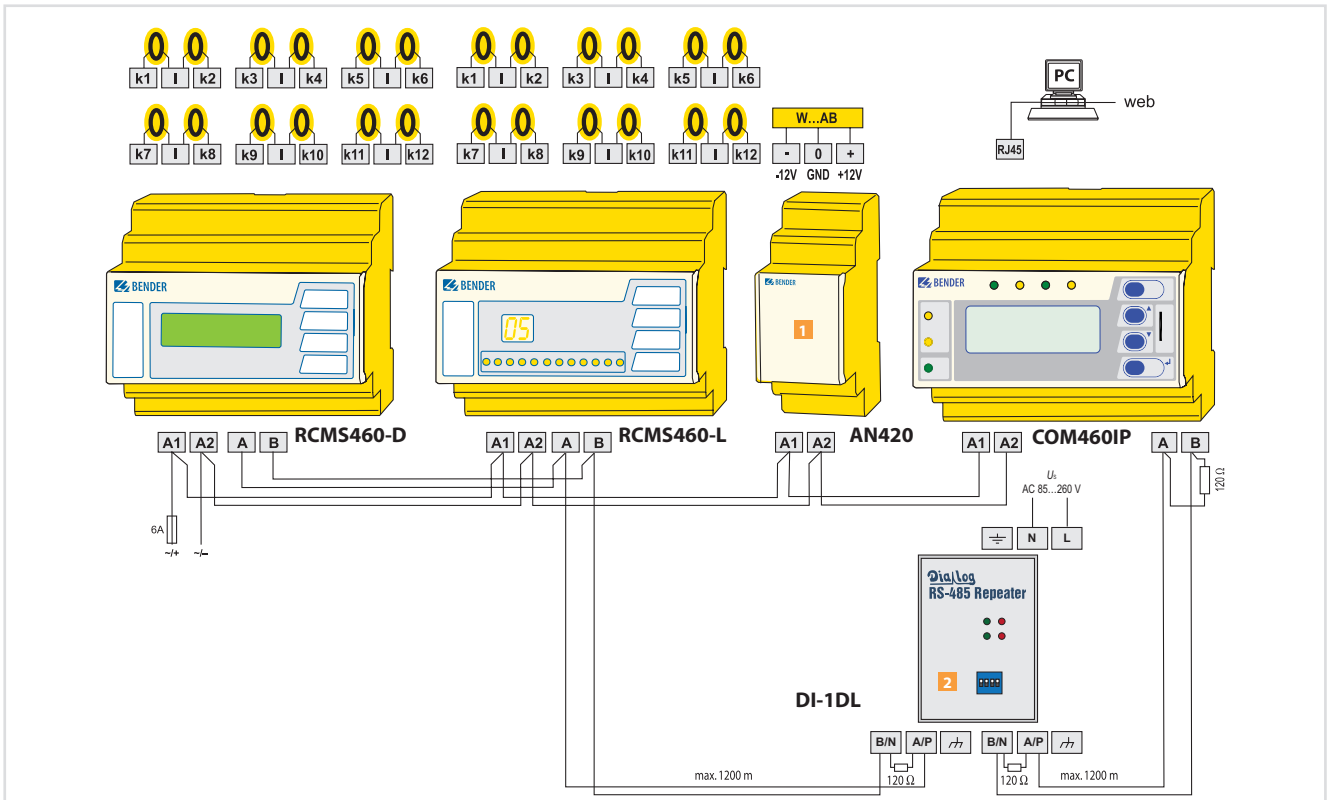
Connection WF... series measuring current transformers



Example for a system design – minimum system consisting of an RCMS460-D and 12 measuring points



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



Note:

1 When AC/DC sensitive measuring current transformers of the W... AB series are used, an AN420 or AN110* is required that supplies up to six measuring current transformers of this type.

2 The DI-1DL repeater only is required when the length of the cable exceeds 1200 m or when more than 32 devices are connected to the bus.

When the supply voltage of AN110-1 is < 30 V, the output power decreases, so that only 5 measuring current transformers can be connected.

LINETRAXX® RCMB20-500-01/RCMB35-500-01

AC/DC sensitive residual current monitoring module with frequency converters



Device features

- AC/DC sensitive measured value acquisition
- Frequency range 0...500 Hz
- Measuring current transformer, inside diameter 20 mm/35 mm
- Measuring range 500 mA
- Measuring time
- Supply voltage
- Analogue output current DC 4...20 mA
- Insensitive to load currents ensured by a full magnetic shielding
- Connection monitoring measuring current transformers using cyclical test current
- Multicolour LEDs for operation and fault indication

Approvals



Further information

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

Ordering information

Supply voltage ¹⁾ U _S	Inside diameter	Type	Art. No.
DC			
20.4...28.8V	ø 20 mm	RCMB20-500-01	B 9404 2103
	ø 35 mm	RCMB35-500-01	B 9404 2104

¹⁾ Absolute values

Scope of delivery

The connection set supplied consists of the following individual parts:

For type	Accessories	Dimen- sions	Units
RCMB20-500-01	Single conductor with integrally moulded ferrule (black, white, red, blue)	45 cm	4
	PVC insulating tube	45 cm	1
RCMB35-500-01	Single conductor with integrally moulded ferrule (black, white, red, blue)	80 cm	4
	PVC insulating tube	80 cm	1
RCMB20-500-01 RCMB35-500-01	Push-wire plug, four-pole, encoded	–	2
	Mounting brackets for measuring current transformers	–	1
	Ferrule (mm ² x mm)	0.5 x 6	4
	Cable ties (mm x mm)	100 x 2.5	2
	Lens head screw	M6 x 12	2
	Spring washer	M6	2

Technical data

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

Rated insulation voltage	AC 800 V
Rated impulse voltage/pollution degree	12 kV/2
Overtoltage category	CAT III
Protective separation (reinforced insulation) between primary conductor and measurement electronics	
Voltage tests according to IEC 61010-1	6.88 kV

Supply voltage

Supply voltage U_S	DC 24 V
Operating range of U_S	20.4...28.8 V
Ripple U_S	$\leq 1\%$
Power consumption	≤ 2.5 VA

Measuring circuit

Measuring current transformer RCMB20/RCMB35, inside diameter	20 mm/35 mm
Rated insulation voltage (measuring current transformer)	800 V
Characteristics according to IEC 62020 and IEC/TR 60755	AC/DC sensitive, Type B
Frequency range	0...500 Hz
Measuring range $I_{\Delta n}$	AC/DC 0...500 mA
Nominal current at 3NAC (RCMB20/RCMB35)	32 A/80 A
Operating uncertainty	$\pm 4\%$
Operating uncertainty at 10...30 Hz	$+3\% \dots -15\% *$
Operating uncertainty at 30...400 Hz	$\pm 3\% *$
Operating uncertainty at 400...500 Hz	$\pm 10\% *$
Resolution measuring circuit	2 mA
Test winding	yes

Time response

Response delay t_{on}	0 s
Delay on release t_{off} (if outside the measuring range)	≤ 1 s
Operating time t_{ae} at I_{Δ}	≤ 180 ms
Response time t_{an}	$= t_{ae} + t_{on}$
Recovery time t_b	≤ 1 s

Displays

LED	lights constantly green = operation indicator flashes red = fault (output current > 20 mA)
-----	---

Outputs

Current output, proportional to the residual current	DC 4...20 mA
Current output, resolution	$I_{\Delta n} = 31,25 \times$ (analogue output current - 4 mA)
Load	$\leq 300 \Omega$

Environment/EMC

EMC	IEC 60947-2 Annex M
Operating temperature	-25...70 °C

For UL application:

Maximum ambient temperature	70 °C
-----------------------------	-------

Climatic class acc. to IEC 60721

Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)
Long-time storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)

Classification of mechanical conditions IEC 60721

Stationary use (IEC 60721-3-3)	3M4
Transport (IEC 60721-3-2)	2M3
Long-time storage (IEC 60721-3-1)	1M3

Chemical stresses acc. to IEC 60721

Stationary use (IEC 60721-3-3)	3C4
--------------------------------	-----

Connection

Primary conductor:	
RCMB20	$\leq 4 \times 6 \text{ mm}^2$ or $3 \times 10 \text{ mm}^2$
RCMB35	$\leq 4 \times 35 \text{ mm}^2$ or $3 \times 50 \text{ mm}^2$
Connector XK1:	
Connection type	pluggable push-wire terminals, 2 x four-pole

For UL application:

Use at least 60/75 °C copper lines!

Connection properties

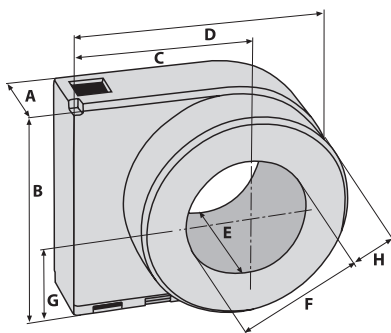
rigid	0.2...2.5 mm ² (AWG 24...14)
flexible without ferrule	0.2...2.5 mm ² (AWG 24...14)
flexible with ferrule	0.2...1.5 mm ² (AWG 24...16)
Stripping length	10 mm
Opening force	50 N

General data

Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (DIN EN 60529)	IP40
Degree of protection, terminals (DIN EN 60529)	IP20
Enclosure material	polycarbonate
Flammability class	UL94 V-0
Screw mounting	M5 with mounting brackets
DIN rail mounting acc. to	IEC 60715
Software version RCMB20-500-01	D378 V1.0
Software version RCMB35-500-01	D379 V1.0
Weight RCMB20	200 g
Weight RCMB35	250 g

* of full scale value of the measuring range

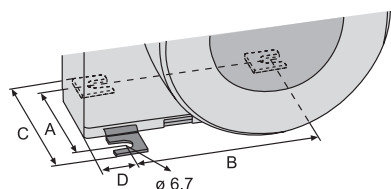
Dimension diagram



Dimensions (mm)

Type	A	B	C	D	E	F	G	H
RCMB20	30	56.3	50	76.4	48.5	ø 20	29.8	16.4
RCMB35	30	79.2	62	99.5	55	ø 35	41.7	20

Screw mounting

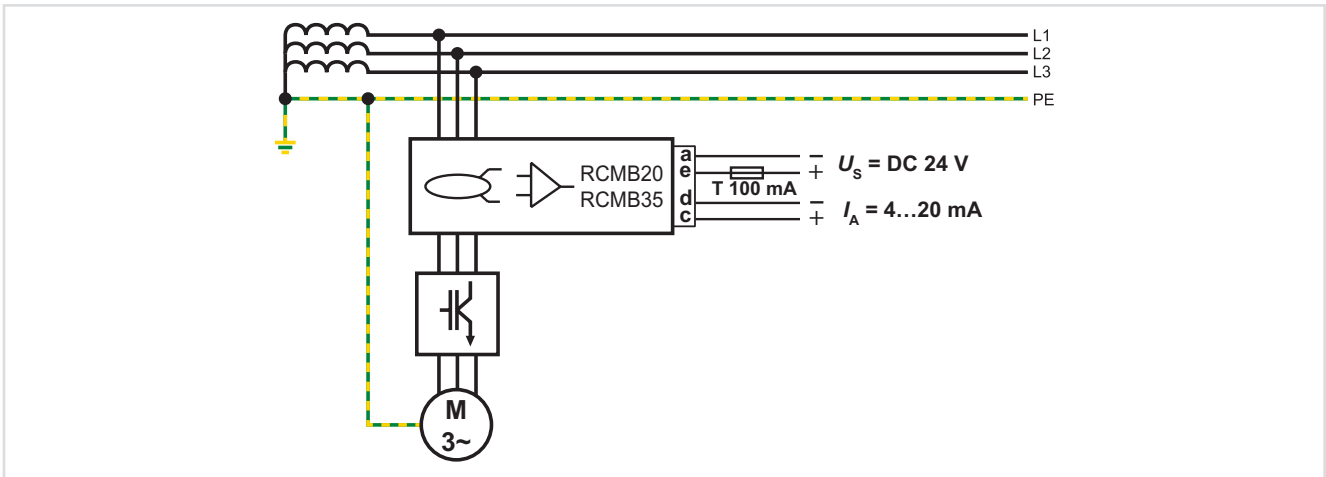


Dimensions (mm)

Type	A	B	C	D
RCMB20 (mounting with 2 angles diagonal)	47	29	63	20.35
RCMB35 (mounting with 2 angles diagonal)	47	48.5	63	12.85

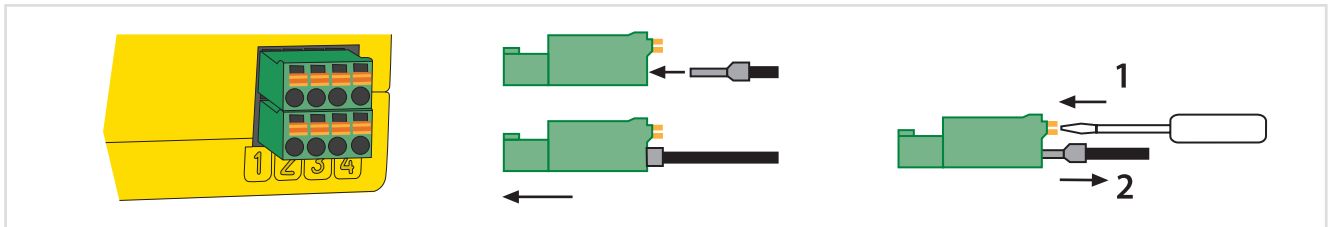
Wiring diagram

Connect the residual current monitoring module according to the wiring diagram. The output current in proportion to the residual current I_A must be made available to the frequency converter.



Connections

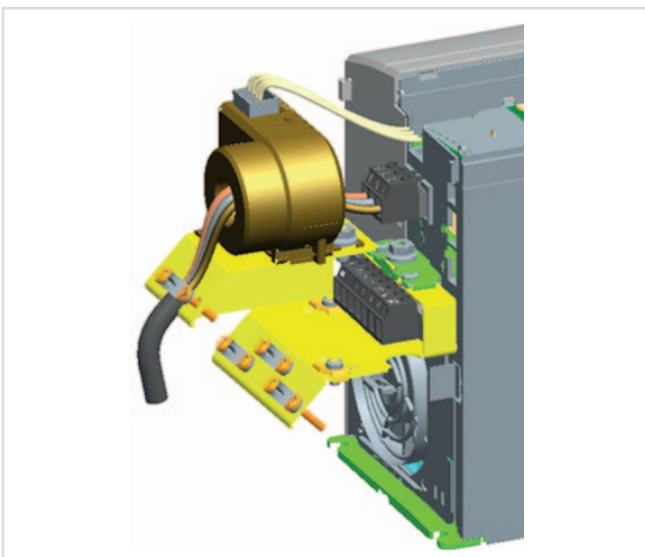
Position of the terminals, connection and disconnection of the conductors



Wiring of the plug-in terminal XK1

Coding socket	Pluggable push-wire terminal	Terminal	Colour	RCMB20/RCMB35
		A	black	GND (U_S)
		B	–	–
		C	white	DC 4...20 mA
		D	blue	GND (DC 4...20 mA)
		E	red	+24 V (U_S)
		F	–	–
		G	–	–
		H	–	–

Installation examples



LINETRAXX® RCMB35-30-01

AC/DC sensitive residual current monitoring module
for residual current monitoring in earthed systems (TN and TT systems)



Device features

- Realisation of a protective device in accordance with DIN EN 60947-2 Annex M in combination with circuit-breakers providing isolating properties
- Integral switching output for controlling an undervoltage release
- Combined test and reset button
- Monitoring of the connection to the measuring current transformer with cyclical test current
- Insensitive to load currents due to a full magnetic shielding
- Multicolour LED indicating operation, response value exceeded and fault detected
- AC/DC sensitive measured value acquisition
- Response value $I_{\Delta n} \leq 30 \text{ mA}$
- Frequency range 0...1 kHz
- Supply voltage DC 24 V
- Measuring current transformer, inside diameter 35 mm

Approvals



Further information

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

Ordering information

Supply voltage ¹⁾ U_S	Inside diameter	Type	Art. No.
DC			
20.4...28.8	ø 35 mm	RCMB35-30-01	B 9404 2100

¹⁾ Absolute values

Technical data

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

Rated insulation voltage	AC 800 V
Rated impulse voltage/pollution degree	12 kV/2
Oversvoltage category	CAT III
Protective separation (reinforced insulation) between primary conductor and measurement electronics	
Voltage tests according to IEC 61010-1	6.88 kV

Supply voltage

Supply voltage U_S	DC 24 V
Operating range of U_S	DC 20.4...28.8 V
Ripple U_S	$\leq 1\%$
Power consumption	≤ 2.5 VA
Making current	5 A, 1 ms

Measuring circuit

Measuring current transformer, inside diameter	35 mm
Rated insulation voltage (measuring current transformer)	800 V
Characteristics according to IEC 62020 and IEC/TR 60755	AC/DC sensitive, Type B
Rated frequency	1 kHz
Response value $I_{\Delta n}$	30 mA
Nominal current	160 A
Relative uncertainty	0...-35%
Test winding	yes

Time response

Response delay t_{on}	0 s
Delay on release t_{off}	2 s after reset
Operating time t_{ae} at $1 I_{\Delta}$	≤ 180 ms
Operating time t_{ae} at $2 \times I_{\Delta n}$	≤ 130 ms
Operating time t_{ae} at $5 \times I_{\Delta n}$	≤ 20 ms
Response time t_{an}	$= t_{ae} + t_{on}$
Recovery time t_b	≤ 1 s

Displays

Multicolour LED

lights constantly green	operation indicator
Flashes green (quickly)	self test
lights constantly red,	response value exceeded/self test: no faults detected
flashes red (quickly)	Reset
flashes red (slowly)	fault/during a self test: fault occurred

Outputs

Number	1 N/O contact in N/C operation
Operating principle	N/C operation
Switching output	AC 24 V/DC 48 V; 200 mA
Electrical endurance, number of cycles	100000

Environment/EMC

EMC	IEC 60947-2 Annex M
Operating temperature	-25...70 °C
For UL application:	
Maximum ambient temperature	70 °C
Climatic class acc. to IEC 60721	
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)
Long-time storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)
Classification of mechanical conditions IEC 60721	
Stationary use (IEC 60721-3-3)	3M4
Transport (IEC 60721-3-2)	2M3
Long-time storage (IEC 60721-3-1)	1M3
Chemical stresses acc. to IEC 60721	
Stationary use (IEC 60721-3-3)	3C4

Connection

Primary conductor:	$\leq 4 \times 35$ mm ² or 3×50 mm ²
Connector XK1:	
Connection type	pluggable push-wire terminals, 2 x four-pole

For UL application:

Use at least 60/75 °C copper lines!

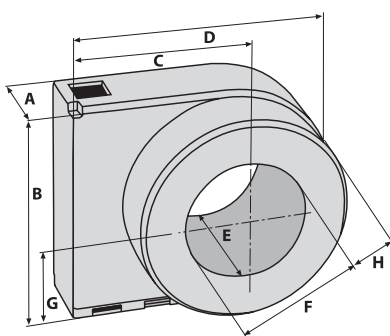
Connection properties

rigid	0.2...2.5 mm ² (AWG 24...14)
flexible without ferrule	0.2...2.5 mm ² (AWG 24...14)
flexible with ferrule	0.2...1.5 mm ² (AWG 24...16)
Stripping length	10 mm
Opening force	50 N

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
Enclosure material	polycarbonate
Flammability class	UL94 V-0
Screw mounting	M5 with mounting brackets
DIN rail mounting acc. to	IEC 60715
Software version	D371 V1.00
Weight	≤ 250 g

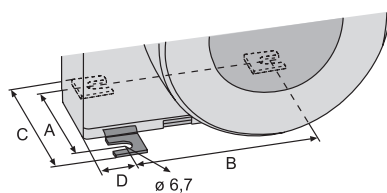
Dimension diagram



Dimensions (mm)

Type	A	B	C	D	E	F	G	H
RCMB35-30-01	30	79.2	62	99.5	55	ø 35	41.7	20

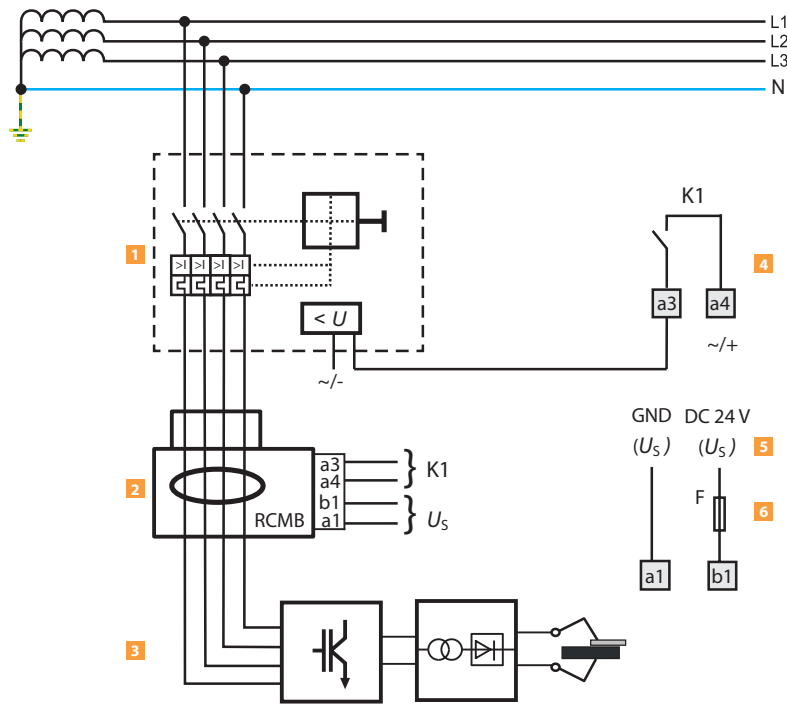
Screw mounting



Dimensions (mm)

Type	A	B	C	D
RCMB35-30-01 (mounting with 2 angles diagonal)	47	48.5	63	12.85

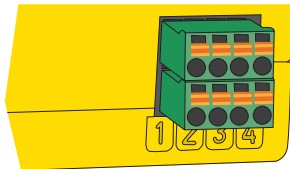
Wiring diagram



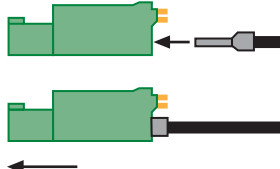
Connect the residual current monitoring module according to the wiring diagram. The output current in proportion to the residual current I_A must be made available to the frequency converter.

- 1 Circuit-breaker with undervoltage release in accordance with DIN EN 60947-2; $t_{ab} \leq 20$ ms
- 2 RCMB35-30-01
- 3 Loads, e.g. welding inverter
- 4 N/O contact in N/C operation for controlling the undervoltage release
- 5 Supply voltage for RCMB35-30-01
- 6 Fuse F: 100 mA, time-lag

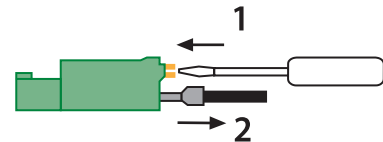
Connections



Position of the terminals



connecting of the conductors



disconnecting of the conductors

Wiring of the plug-in terminal XK1

Coding socket	Pluggable push-wire terminal	Terminal	RCMB35-30-01
a		a1	GND (U_S)
		a2	–
		a3	N/O contact K1(13)
		a4	N/O contact K1(14)
b		b1	+24 V (U_S)
		b2	–
		b3	–
		b4	–

Insulation monitoring devices

ISOMETER®



7



1

Equipment for insulation fault location

ISOSCAN®



85



2

Measuring and monitoring relays

LINETRAXX®

Power Quality and Energy Measurement

LINETRAXX®



121



3

Residual current monitoring systems

LINETRAXX®



175



4

System components

Coupling devices

Measuring current transformers

Transformers

Measuring transducers

Power supply units

Measuring instruments

Interface converters

Interface repeaters

COMTRAXX® Gateways

COMTRAXX® Alarm indicator and test combinations

COMTRAXX® condition monitors

Visualisation



203



5

Switching equipment

ATICS® transfer switching and monitoring devices



285



6

Test systems

UNIMET® Safety analyser

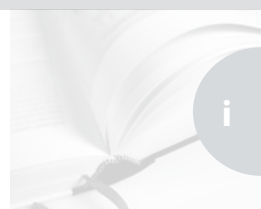
Annex

Standards and guidelines applied
Alphabetical list of devices

Technical terms
Service & project management



315



i

Device overview coupling devices

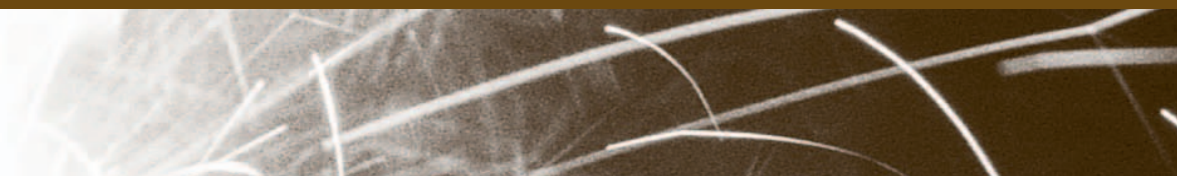


Page		212	213	214	215
Application		Extension of the nominal voltage range for ISOMETER®s	Extension of the nominal voltage range for ISOMETER®s	Extension of the nominal voltage range for ISOMETER®s	Extension of the nominal voltage range for ISOMETER®s
Nominal system voltage U_n		AC 0...1150 V, DC 0...1760 V	AC 0...1300 V/ AC 0...1650 V	AC, 3(N)AC 0...7200 V	AC, 3(N)AC 0...7200 V
Device family	IR470LV...		■	■	
	IRDH275/375	■	■	■	
	IRDH275BM				■

Device overview measuring current transformers



Page		216																218						221					224	
Characteristics																														
CT type		W10/600	W0-S20	W1-S35	W2-S70	W3-S105	W4-S140	W5-S210	W20	W35	W60	W120	W210	W20-8000	W35-8000	W60-8000	W20AB	W35AB(P)	W60AB(P)	W120AB	W210AB	WR70x175	WR115x305							
Dimensions (mm)	Inside diameter	10	20	35	70	105	140	210	20	35	60	120	210	20	35	60	20	35	60	120	210									
	Width x height																					70 x 175	115 x 305							
	Strip length																													
Device family	EDS460/490	■	■	■	■	■	■	■	■	■	■	■	■									■	■							
	EDS460-DG	■	■	■	■	■	■	■	■	■	■	■	■									■	■							
	EDS461/491													■	■	■														
	RCM420	■	■	■	■	■	■	■	■	■	■	■	■									■	■							
	RCM470DY								■	■	■	■	■									■	■							
	RCMA420																■	■	■											
	RCMA423																■	■	■	■	■									
	RCMS460/490	■	■	■	■	■	■	■	■	■	■	■	■	■				■	■	■	■	■	■	■						



226				228					230				232				
				split-core					split-core				flexible				
WR70x175S(P)	WR115x305S(P)	WR150x350S(P)	WR200x500S(P)	WS20x30	WS50x80	WS80x120	WS20x30-8000	WS50x80-8000	WS50x80S	WS80x80S	WS80x120S	WS80x160S	WF170	WF250	WF500	WF800	WF1200
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
				■	■	■			■	■	■	■					
				■	■	■			■	■	■	■					
							■	■									
■	■	■	■	■	■	■			■	■	■	■	■	■	■	■	■
■	■	■	■														
■	■	■	■	■	■	■			■	■	■	■	■	■	■	■	■

Device overview isolating transformers, transformers for operating theatre lights



Page		238	241	244
Application		Design of medical IT systems	Supply of three-phase loads in group 0, 1 or 2 medical locations	Supply of operating theatre luminaires
Type of distribution system		single-phase	three-phase	single-phase
Voltages	Input	AC 230 V	3AC 400 V	AC 230 V ($\pm 5\%$, $\pm 10\%$)
	Output	AC 230 V	3NAC 230 V	AC 23...28 V
Frequency range		50...60 Hz	50...60 Hz	50...60 Hz
Power		3150 VA 4000 VA 5000 VA 6300 VA 8000 VA	2000 VA 3150 VA 4000 VA 5000 VA 6300 VA 8000 VA 10000 VA	120 VA 160 VA 280 VA 400 VA 630 VA 1000 VA
Design type	vertical	■	■	■
	horizontal	■	■	
	encapsulated (protection class B)	■	■	

5

Device overview measuring transducer



Page		246
Application		Conversion of DC currents
Input	Current	DC 0...400 μ A
	Current	0/4...20 mA
Output	Current	0/4...20 mA
	Voltage	DC 0...10 V

Device overview power supply units



Page	248	250	251	253	255
Application	for measuring current transformers	for DC 24 V power supply	for DC 24 V power supply	for measuring current transformers	for voltage supply
Output voltage	± 12 V	DC 24 V on double terminals	DC 24 V	DC ± 12 V	20 V, AC 50...60 Hz
Supply voltage U_s	AC 20...60 V; DC 18...72 V AC 90...264 V; DC 100...353 V	L-L	AC 90...264 V DC 120...370 V	AC 16...72; DC 9.6...94 V AC/DC 70...276 V	230 V, AC 50...60 Hz 127 V, AC 50...60 Hz

Device overview measuring instruments



Page	257	257	257	257
Input current	0...400 μ A	0...20 mA	0...400 μ A	0...20 mA
Dimensions (mm)	72 x 72	72 x 72	96 x 96	96 x 96
Device family	IR470LY...	■	■	
	IR470LY2-6...		■	
	IRDH275/375	■	■	
	IRDH275B/375B		■	■
	IRDH575		■	■

Device overview interface converters and repeaters



Page		258	259	260
Application		Interface repeater BMS bus	Interface converter BMS/RS-232	Interface converter BMS/USB
Input	Input	RS-485	RS-485	RS-485
	Connection	screw-type terminal	screw-type terminal	screw-type terminal
	Cable length	≤ 1200 m	≤ 1200 m	≤ 1200 m
Output	Output	RS-485	RS-232	USB
	Connection	screw-type terminal	9-pin SUB-D	USB Type B
	Cable length	≤ 1200 m	≤ 15 m	≤ 5 m
	Expansion of bus devices	≤ 30		
Supply voltage U_s		85...260 V, AC 50...60 Hz	DC 10...30 V	via USB
Particular features				Driver CD

Device overview gateways



Page		261	264	266	268	270
Application		BMS-Ethernet-Gateway	BMS-Ethernet-Gateway	BMS-Modbus/RTU-Gateway	BMS-PROFIBUS DP-Gateway	Condition Monitor/Gateway
Functions	Protocol input	BMS	BMS	BMS	BMS	BMS/Modbus/RTU/TCP
	Protocol output	Ethernet/Modbus/TCP	Ethernet/Modbus/TCP	Modbus/RTU	PROFIBUS DP	Ethernet/Modbus/TCP
	Display	LCD/LED	LED	LED	LED	7"-colour LCD
	Alarm messages	■ ^{1,2)}	■	■	■	■ ^{1,2,3)}
	Measured values	■ ^{1,2)}	■	■	■	■ ^{1,2,3)}
	Device parameter setting	■ ¹⁾		■	■	■ ¹⁾
	Alarm list	■ ¹⁾				■ ^{1,3)}
	History memory	■ ¹⁾				■ ¹⁾
	Diagrams	■ ¹⁾				■ ^{1,3)}
	Visualisation	■ ¹⁾				■ ¹⁾
	E-mail notification	■ ¹⁾				■ ¹⁾
	Device tests	■ ^{1,2)}	■	■	■	■ ^{1,2)}
	Data logger	■ ¹⁾				■ ¹⁾
Connection	BMS	screw-type terminal	screw-type terminal	screw-type terminal	screw-type terminal	pluggable screw terminals
	Output	RJ 45	RJ 45	9-pin SUB-D	9-pin SUB-D	RJ 45
System requirements	Supply voltage U_s	AC 76...276 V AC 16...72 V, DC 16...94 V	AC/DC 76...276 V	AC 85...276 V	AC 85...276 V	DC 24 V
	Browser	Internet Explorer, Opera, Firefox etc. with Silverlight plugIN	Internet Explorer, Opera, Firefox etc.			Internet Explorer, Opera, Firefox etc. with Silverlight plugIN

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

Device overview alarm indicator and test combinations



		273	277	280
Messages/ displays	Page	273	277	280
	MEDICS® systems	■	■	■
	RCMS Residual current monitoring system	■	■	■
Installation type	EDS insulation fault locator	■	■	■
	Flush-mounting	■	■	■
	Cavity wall mounting	■	■	■
	Cable-duct mounting		■	
	Panel mounting	■	■	■
	Surface mounting	■	■	
	Digital inputs (potential free)	0/16	0/12	
Inputs/outputs	N/O or N/C operation	selectable	selectable	
	Relay outputs	1	1	
	N/O or N/C operation	programmable	programmable	
	Common alarm	programmable	programmable	
	System fault alarm	programmable	programmable	
Parameter setting/text message	Languages selectable	21	20	programmable
	Standard display	4 x 20 characters	4 x 20 characters	
	Additional text display	3 x 20 characters	3 x 20 characters	
	Standard texts	■	■	
	Freely configurable text messages	1000	200	
	History memory, maximum number of data records	1000	250	
	Real-time clock	■	■	
	Parameterisation software	TMK-Set V 4.xx (USB, BMS)	TMK-Set V 4.xx (USB, BMS)	
Interfaces	Messages/alarms, medical gases	acc. to EN475, EN737-3	acc. to EN475, EN737-8	
	RS-485 (BMS protocol)	2	■	
	BMS address range	internal: 1 (...150), external: 1...99	1...150	
	Master redundancy, BMS internal	■	■	
	Master redundancy, BMS external	■		
	USB	■	■	
Ethernet (TCP/IP)			■	
Supply voltage U_S		AC/DC 24 V	AC/DC 24 V	
Stored energy time in the event of power failure		≤ 2 s	≤ 15 s	



AGH150W-4

Coupling device



Typical applications

- Extension of the nominal voltage range for the ISOMETER®'s IRDH... series to AC 0...1150 V, DC 0...1760 V

Further information

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

Approvals



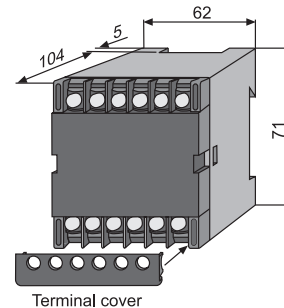
Ordering information

Nominal system voltage U_s		Type	Art. No.
DC	AC		
0...1760 V	0...1150 V	AGH150W-4	B 9801 8006

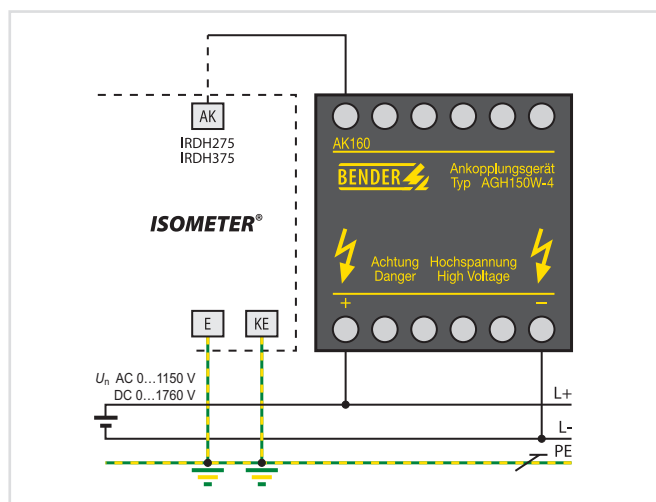
Technical data

Insulation coordination acc. to DIN EN 61800-5-1 (VDE 0160-105-1)	
Rated insulation voltage	AC 1600 V
Voltage test acc. to DIN EN 61800-5-1 (VDE 0160-105-1)	
Voltage impulse test (basic insulation)	≥ AC 11 kV
AC voltage test (basic insulation)	≥ AC 6.6 kV
Voltage ranges	
Nominal system voltage U_n	AC 0...1150 V, DC 0...1760 V
Overvoltage category/rated impulse voltage	CAT III/≥11 kV
Internal DC resistance R_i	≥160 kΩ
Environment	
Shock resistance IEC 60068-2-27 (device in operation)	15 g/11 ms
Bumping IEC 60068-2-29 (transport)	40 g/6 ms
Vibration resistance IEC 60068-2-6 (device in operation)	1 g/10...150 Hz
Vibration resistance IEC 60068-2-6 (transport)	2 g/10...150 Hz
Ambient temperature (during operation)	-10...+55 °C
Ambient temperature (during storage)	-40...+70 °C
Climatic class acc. to DIN IEC 60721-3-3	3K5
Connection	
Connection	flat terminals
Connection properties rigid/flexible	0.2...4/0.2...2.5 mm ²
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
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Operating manual	BP109001
Weight	≤ 900 g

Dimension diagram (dimensions in mm)



Wiring diagram



AGH204S-4

Coupling device



Typical applications

- Extension of the nominal voltage range to AC, 3(N)AC 0...1650 V/0...1300 V, 50...400 Hz for the ISOMETER®s IRDH275-4.../IRDH375-4.../IR470LY-40/IRDH1065B-4

Further information

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

Approvals



Ordering information

Nominal system voltage U_s	Type	Art. No.
AC	AGH204S-4	B 914 013
0...1650 V/0...1300 V		

Technical data

Insulation coordination acc. to DIN EN 61800-5-1 (VDE 0160-105-1)

Rated insulation voltage AC 1500 V

Voltage test acc. to DIN EN 61800-5-1 (VDE 0160-105-1)

Impulse voltage test (basic insulation) \geq AC 10.4 kV
 AC voltage test (basic insulation) \geq AC 5 kV
 Partial discharge test \geq 3 kV

Voltage ranges

Nominal system voltage U_n (including DC components) 0...1300 V
 Nominal system voltage U_n (AC only) 0...1650 V
 Nominal frequency f_n 50...400 Hz
 Overvoltage category/rated impulse voltage III/ \geq 10.4 kV

Internal DC resistance R_i

Coupling to AK80 80 k Ω
 Coupling to AK160 160 k Ω

Environment

Shock resistance IEC 60068-2-27 (device in operation) 15 g/11 ms
 Bumping IEC 60068-2-29 (transport) 40 g/6 ms
 Vibration resistance IEC 60068-2-6 (device in operation) 1 g/10...150 Hz
 Vibration resistance IEC 60068-2-6 (transport) 2 g/10...150 Hz
 Ambient temperature (during operation) -10...+55 °C
 Ambient temperature (during storage) -40...+70 °C
 Climatic class acc. to DIN IEC 60721-3-3 3K5

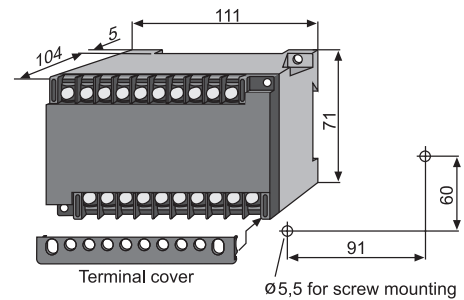
Connection

Connection screw-type terminals
 Connection properties rigid/flexible 0.2...4 mm²/0.2...2.5 mm²
 Tightening torque 0.5 Nm
 Conductor sizes (AWG) 24...12
 Length of the connecting lead between the ISOMETER® and AGH \leq 0.5 m

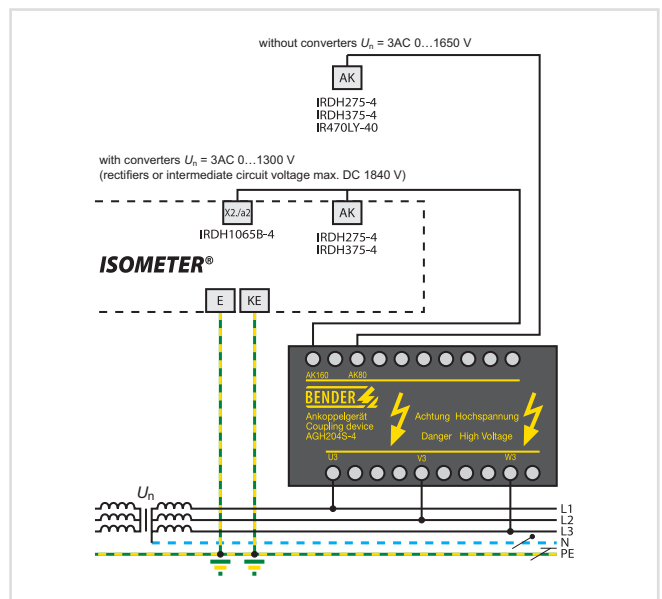
Other

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 DIN EN 60715/IEC 60715
 Flammability class UL94 V-HB
 Weight \leq 1350 g

Dimension diagram (dimensions in mm)



Wiring diagram



AGH520S

Coupling device



Typical applications

- Extension of the nominal voltage range to (3)AC 0...7200 V, 50...400 Hz for the ISOMETER®s IRDH275-4.../IRDH375-4.../IR470LY-40/IR420-D6/IRDH1065B-4

Further information

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

Approvals



Ordering information

Nominal system voltage U_s	Type	Art. No.
3(N)AC	AGH520S	B 913 033
0...7200 V		

Technical data

Insulation coordination acc. to DIN EN 61800-5-1

Rated insulation voltage AC 6.3 kV

Voltage test acc. to DIN EN 61800-5-1

Voltage impulse test (basic insulation) 35 kV
 AC voltage test (basic insulation) AC 17.5 kV
 Partial discharge test ≥ 12 kV

Voltage ranges

Nominal system voltage U_n AC, 3(N)AC 0...7.2 kV
 Nominal frequency f_n 50...400 Hz
 Internal DC resistance R_i ≥ 80 k Ω
 Impedance Z_i at 7.2 kV and 50 Hz ≥ 6 M Ω

Environment

Classification of mechanical conditions acc. to IEC 60721:
 Stationary use (IEC 60721-3-3) 3M4
 Transport (IEC 60721-3-2) 2M2
 Storage (IEC 60721-3-1) 1M3
 Ambient temperature (during operation) -10...+55 °C
 Ambient temperature (during storage) -20...+70 °C
 Climatic class acc. to IEC 60721-3-3 3K5

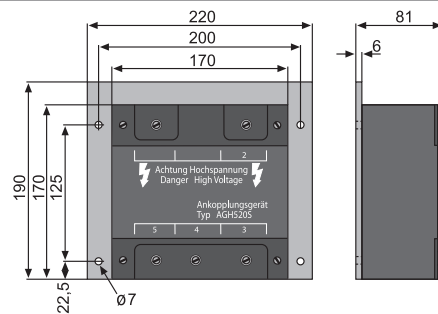
Connection

Connection terminal 2 (medium voltage) screw-type terminal
 Connection terminals 3, 4, 5 screw-type terminals
 Connection properties rigid/flexible 0.2...4 mm²/0.2...2.5 mm²

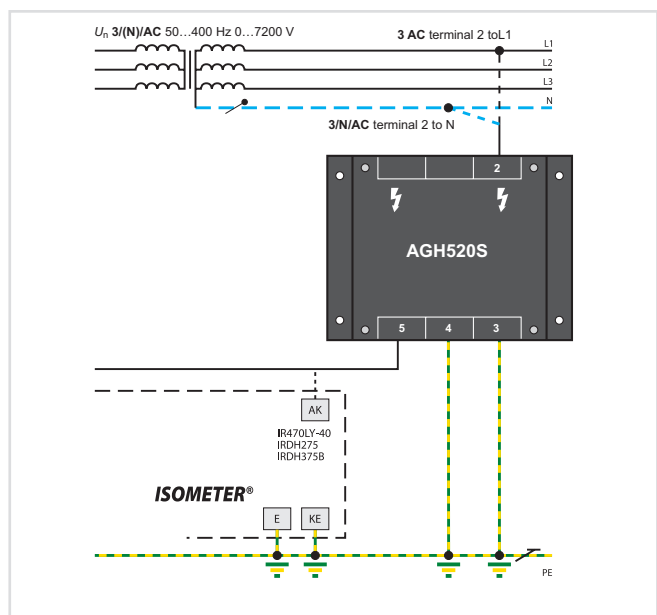
Other

Operating mode continuous operation
 Mounting any position
 Degree of protection, internal components (DIN EN 60529) IP64
 Degree of protection, terminals (DIN EN 60529) IP20
 Type of enclosure resin-encapsulated block
 Screw mounting 4 x M5
 Flammability class UL94 V-HB
 Weight ≤ 4500 g

Dimension diagram (dimensions in mm)



Wiring diagram



AGH675S-7

Coupling device



Typical applications

- Extension of the nominal voltage range to AC/DC 0...7.2 kV for the ISOMETER® IRDH275BM-7

Further information

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

Approvals



Ordering information

Nominal system voltage U_s	Cable length	Type	Art. No.
AC/DC			
0...7.2 kV, 0...460 Hz	500 mm	AGH675S-7-500	B 913 056
	2000 mm	AGH675S-7-2000	B 913 054

Technical data

Insulation coordination acc. to DIN EN 61800-5-1

Rated insulation voltage AC 7.2 kV

Voltage test acc. to DIN EN 61800-5-1

Voltage impulse test (basic insulation) 40 kV
 AC voltage test (basic insulation) 20 kV
 Partial discharge test ≥ 14 kV

Voltage ranges

Nominal system voltage U_n AC, 3(N)AC 0...7.2 kV
 Nominal frequency f_n 0...460 Hz
 Internal DC resistance R_i ≥ 2.8 M Ω

Environment

Classification of mechanical conditions acc. to IEC 60721:

Stationary use (IEC 60721-3-3) 3M4
 Transport (IEC 60721-3-2) 2M2
 Storage (IEC 60721-3-1) 1M3
 Ambient temperature (during operation) -10...+55 °C
 Ambient temperature (during storage) -40...+70 °C
 Climatic class acc. to IEC 60721-3-3 3K5

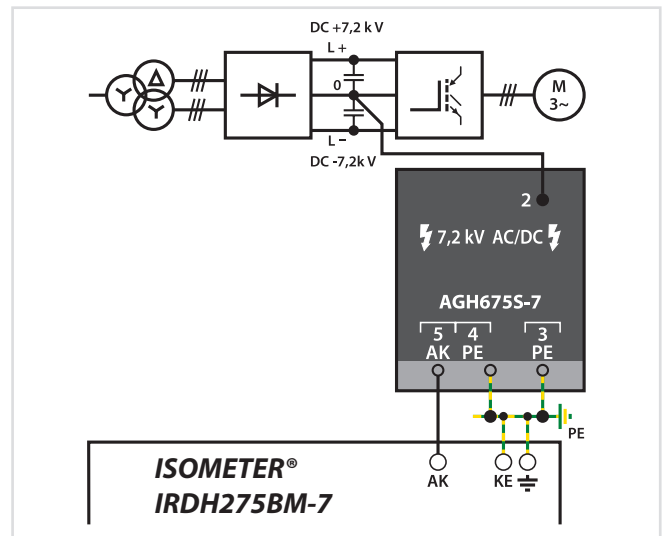
Connection

Connection terminal 2 (medium voltage) high-voltage cable (encapsulated on the device side)
 Connection terminals 3, 4, 5 screw-type terminals
 Connection properties rigid/flexible 0.2...4 mm²/0.2...2.5 mm²

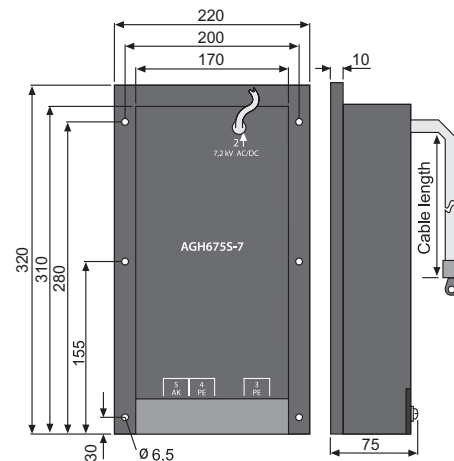
Other

Operating mode continuous operation
 Mounting any position
 Degree of protection, internal components (DIN EN 60529) IP64
 Degree of protection, terminals (DIN EN 60529) IP20
 Type of enclosure resin-encapsulated block
 Screw mounting 6 x M5
 Flammability class UL94 V-HB
 Weight ≤ 5100 g

Wiring diagram



Dimension diagram (dimensions in mm)



W0-S20...W5-S210, W10/600

Measuring current transformers



Measuring current transformer
W10/600



Measuring current transformer
W0-S20



Measuring current transformer
W1-S35

Typical applications

- For residual current monitors (RCM)
- For residual current monitoring systems (RCMS)

Standards

W0-S20...W5-S210 series measuring current transformers comply with the device standards:
DIN EN 60044-1, IEC 60044-1.

Approvals



Further information

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

Ordering information

Inside diameter	Type	Art. No.
10 mm	W10/600	B 911 761
20 mm	W0-S20	B 911 787
35 mm	W1-S35	B 911 731
70 mm	W2-S70	B 911 732
105 mm	W3-S105	B 911 733
140 mm	W4-S140	B 911 734
210 mm	W5-S210	B 911 735

Approvals

Type	UL	GL	GOST
W10/600	–	–	–
W0-S20	■	■	■
W1-S35	■	■	■
W2-S70	■	■	■
W3-S105	■	■	■
W4-S140	■	■	■
W5-S210	■	■	■

5.1

Technical data

Insulation coordination acc. to IEC 60044-1

Highest system voltage for electrical equipment U_m	AC 720 V
Rated impulse withstand voltage U_{iso1}	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	15...400 Hz
Internal resistance	5...8 Ω
Secondary overvoltage protection	with suppressor diode P6KE6V8CP
Accuracy class	3
Rated continuous thermal current	100 A
Rated short-time thermal current	14 kA 1 s
Rated dynamic current	35 kA 30 ms

Environment

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 ms
Vibration resistance IEC 60068-2-6 (device in operation)	
W1-S35...W3-S105	1 g/10...150 Hz
W4-S140, W5-S210	1 g/10...150 Hz/0.075 mm
Vibration resistance IEC 60068-2-6 (device not in operation)	2 g/10...150 Hz
Ambient temperature (during operation/during storage)	-10...+50 °C/-40...+70 °C
Climatic class acc. to DIN IEC 60721-3-3	3K5

Connection

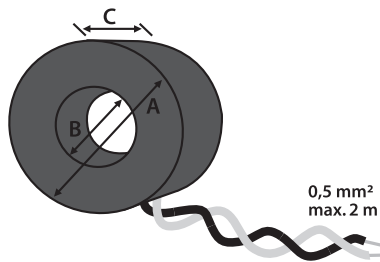
Connection	screw-type terminals
Connection	
rigid/flexible	0.2.../4/0.2...2.5 mm ²
flexible with ferrules with/without plastic sleeve	0.25...2.5 mm ²
Conductor sizes (AWG)	24...12
Connection to the evaluator	
single wire ≥ 0.75 mm ²	0...1 m
single wire, twisted ≥ 0.75 mm ²	0...10 m
shielded cable ≥ 0.6 mm ²	0...40 m
Shielded cable (shield connected to PE on one side)	recommended cable J-Y(St)Y min. 2 x 0.6

Other

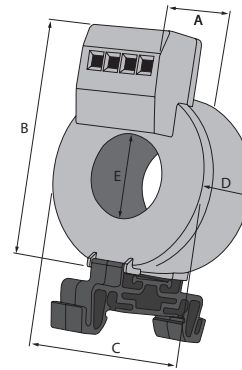
Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (DIN EN 60529)	IP40
Degree of protection, terminals (DIN EN 60529)	IP20
Screw mounting	M5
Flammability class	UL94 V-0
Operating manual	TBP409009

Dimension diagrams

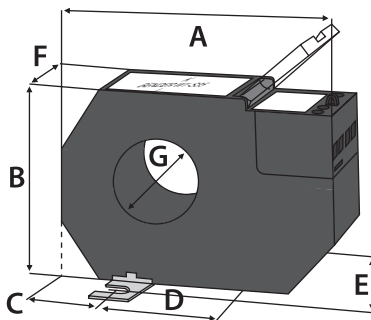
Type W10/600



Type W0-S20



Type W1-S35...W5-S210



Type	Dimensions (mm)							Weight
	A	B	C	D	E	F	G	
W10/600	$\varnothing 37$	$\varnothing 10$	18	—	—	—	—	85 g
W0-S20	32.4	60	$\varnothing 46$	23.2	$\varnothing 20$	—	—	70 g
W1-S35	100	79	26	48.5	33	46	$\varnothing 35$	250 g
W2-S70	130	110	32	66	33	46	$\varnothing 70$	380 g
W3-S105	170	146	38	94	33	46	$\varnothing 105$	700 g
W4-S140	220	196	48.5	123	33	46	$\varnothing 140$	1500 g
W5-S210	299	284	69	161	33	46	$\varnothing 210$	2500 g

W.../W...-8000 series

Measuring current transformers



Typical applications

Measuring current transformers W...

- For RCMS460/490 residual current monitoring systems
- For RCM420 residual current monitors
- For EDS470, EDS460/490 insulation fault locators

W...-8000 measuring current transformers

- For EDS461 and EDS491 insulation fault locators

Approvals



Standards

WS... and WS...-8000 measuring current transformers comply with the device standards:
DIN EN 60044-1, IEC 60044-1

Further information

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

Ordering information

Mounting	Inside diameter	Type	Art. No.
Mounting brackets, DIN rail	20 mm	W20	B 9808 0003
		W20-8000 ¹⁾	B 9808 0009
	35 mm	W35	B 9808 0010
		W35-8000 ¹⁾	B 9808 0017
	60 mm	W60	B 9808 0018
		W60-8000 ¹⁾	B 9808 0027
Mounting brackets	120 mm	W120	B 9808 0028
	210 mm	W210	B 9808 0034

¹⁾ For EDS461/491 and EDS473/474 insulation fault locators

Accessories

Type designation	Width	Art. No.
Snap-on mounting for W20-W35, W20-W35-8000	43.5 mm	B 9808 0501
Snap-on mounting for W60, W60-8000	50 mm	B 9808 0502

Selection list

Type	RCM420	RCMS460/490	EDS460/490	EDS461/491
W20	■	■	■	–
W35	■	■	■	–
W60	■	■	■	–
W120	■	■	■	–
W210	■	■	■	–
W20-8000	–	–	–	■
W35-8000	–	–	–	■
W60-8000	–	–	–	■

Technical data

Insulation coordination acc. to IEC 60664-1

Rated insulation voltage	800 V
Rated impulse voltage/pollution degree	8 kV/3

CT circuit W...

Rated primary residual current	10 mA...10 A
Rated secondary residual current	0.0167 A
Rated transformation ratio K_n	10/0.0167 A
Rated burden	$\leq 180 \Omega^*$
Nominal power	0.05 VA
Frequency range	42 Hz...3 kHz
Rated continuous thermal current I_{cth}	40 A
Rated short-time thermal current I_{th}	$60 \times I_{cth} = 2.4 \text{ kA}/1 \text{ s}$
Rated dynamic current I_{dyn}	$2.5 \times I_{th} = 6.0 \text{ kA}/40 \text{ ms}$

CT circuit W...-8000

Rated primary residual current	1 A
Rated secondary residual current	0.125 mA
Rated transformation ratio K_n	1 A/0.125 mA
Rated burden	2400 Ω
Nominal power	0.0375 VA
Frequency range	42 Hz...3 kHz
Rated continuous thermal current I_{cth}	6 A
Rated short-time thermal current I_{th}	$60 \times I_{cth} = 0.36 \text{ kA}/1 \text{ s}$
Rated dynamic current I_{dyn}	$2.5 \times I_{th} = 0.9 \text{ kA}/40 \text{ ms}$

Environment

Operating temperature	-25...+70 °C
Climatic class acc. to IEC 60721	
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K5 (except condensation and formation of ice)
Long-time storage (IEC 60721-3-1)	1K5 (except condensation and formation of ice)
Classification of mechanical conditions IEC 60721	
Stationary use (IEC 60721-3-3)	3M4
Transport (IEC 60721-3-2)	2M2
Long-time storage (IEC 60721-3-1)	1M3

Connection

Connection	cage clamp spring terminal
Connection	
rigid/flexible/conductor sizes	0.08...2.5/0.08...2.5 mm ² (AWG 28...12)
Stripping length	8...9 mm

Connection EDS, RCM(S) measuring current transformers

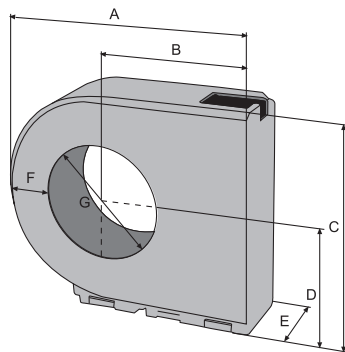
Single wire $\geq 0.75 \text{ mm}^2$	0...1 m
Single wire, twisted $\geq 0.75 \text{ mm}^2$	0...10 m
Shielded cable $\geq 0.5 \text{ mm}^2$	0...40 m
Shielded cable (shield on one side connected to L-conductor, not connected to earth)	recommended: J-Y(St)Y min. 2 x 0.8

Other

Degree of protection, internal components (DIN EN 60529)	IP40
Degree of protection, terminals (IEC 60529)	IP20
Screw mounting	lens head screw M5 acc. to DIN 7985 with mounting bracket
Flammability class	UL94 V-0
Operating manual W...W...-8000	TBP409013
Approvals and certifications	UL under development, GOST

* The rated burden may vary depending on the respective device data sheet.

Dimension diagram



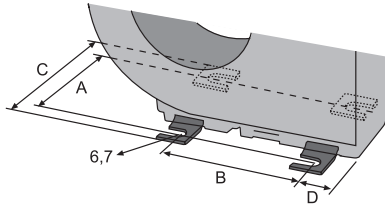
Type	Dimensions (mm)							Weight
	A	B	C	D	E	F	G	
W20	76.4	50	56.3	29.8	30	16.4	ø 20	≤ 130 g
W35	99.5	62	79.2	41.7	30	20	ø 35	≤ 175 g
W60	135	79	116.4	60.4	37	24	ø 60	≤ 315 g
W120	210	116.5	191.5	98	37	33.5	ø 120	≤ 960 g
W210	323	173	304.5	154.5	45	45	ø 210	≤ 2900 g
W20-8000*	76.4	50	56.3	29.8	30	16.4	ø 20	≤ 150 g
W35-8000*	99.5	62	79.2	41.7	30	20	ø 35	≤ 205 g
W60-8000*	135	79	116.4	60.4	37	24	ø 60	≤ 355 g

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

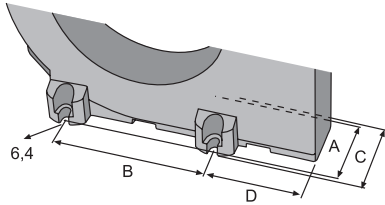
* For EDS461/491 insulation fault locators

Screw mounting

Screw mounting with mounting brackets for:
W20, W35, W60 and W20-8000, W35-8000, W60-8000



Screw mounting: W120, W210

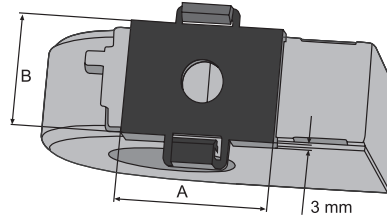
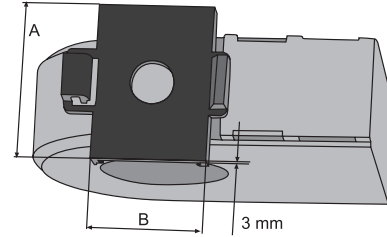


Dimensions (mm)				
Type	A	B	C	D
W20/W20-8000 (fixing with two mounting brackets, diagonally)	49	31.4	65	18.6
W35/W35-8000 (fixing with two mounting brackets, diagonally)	49	49.8	65	12.1
W60/W60-8000 (fixing with four mounting brackets)	56	66	72	17.7
W120 (screw mounting)	51	103	60.6	65
W210 (screw mounting)	59	180	68.6	83

Tolerance for screw mounting with mounting brackets: ± 1.5 mm

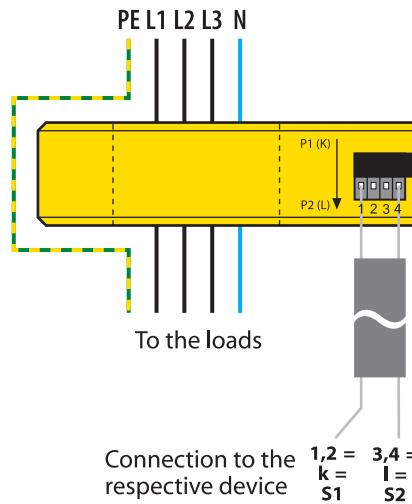
Snap-on mounting

Snap-on mounting on DIN rail: for vertical or horizontal mounting:
W20, W35, W60 und W20-8000, W35-8000, W60-8000



Dimensions (mm)		
Type	A	B
W20/W20-8000	43.5	32
W35/W35-8000	43.5	32
W60/W60-8000	50	39

Wiring diagram



Measuring current transformers W...

Connection to the respective residual current monitoring system RCMS, residual current monitors RCM or to insulation fault location systems EDS

W...-8000 measuring current transformers

Connection to the respective EDS461 and EDS491 insulation fault locator

5.1

W...AB(P) series

Measuring current transformers



Typical applications

- W20AB...W60AB for AC/DC sensitive RCMA420 residual current monitors
- W20AB...W210AB for RCMS460/490 residual current monitoring systems or for RCMA423 residual current monitors
- W35ABP and W60ABP for RCMS460/490 and for RCMA420/423 residual current monitors. For use in systems where short-term load currents are likely to occur.

Standards

W...AB series measuring current transformers comply with the device standards:
DIN EN 60044-1, IEC 60044-1

Further information

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

Approvals



Ordering information

Mounting	Inside diameter	Type	Art. No.
Mounting brackets, DIN rail	20 mm	W20AB	B 9808 0008
	35 mm	W35AB	B 9808 0016
		W35ABP	B 9808 0051
	60 mm	W60AB	B 9808 0026
		W60ABP	B 9808 0052
Mounting brackets	120 mm	W120AB	B 9808 0041
	210 mm	W210AB	B 9808 0040

Connecting wires

For device	Length	Type	Art. No.
RCMA420/423	1 m	WX-100	B 9808 0503
	2.5 m	WX-250	B 9808 0504
	5 m	WX-500	B 9808 0505
	10 m	WX-1000	B 9808 0511
RCMS460/490	1 m	WXS-100	B 9808 0506
	2.5 m	WXS-250	B 9808 0507
	5 m	WXS-500	B 9808 0508
	10 m	WXS-1000	B 9808 0509

Control cable LiYY flexible, 6 x AWG 20 (6 x 0.56 mm²), approved by UL 2464

Accessories

Type designation	For device	Art. No.
Snap-on mounting	W20AB, W35AB(P)	B 9808 0501
	W60AB(P)	B 9808 0502

Suitable system components

Type designation	Type	Page
Power supply units	AN420-1	253
	AN420-2	253
	AN110-1	248
	AN110-2	248

Selection list

Type	RCMA420	RCMA423	RCMS460/490
W20AB	■	■	■
W35AB(P)	■	■	■
W60AB(P)	■	■	■
W120AB	–	■	■
W210AB	–	■	■

Technical data

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

Rated insulation voltage	800 V
Rated impulse voltage/pollution degree	8 kV/3

Supply voltage

Supply voltage U_s	DC ± 12 V
Operating range of U_s	0.95...1.05 x U_s
Power consumption	≤ 2.5 VA

CT circuit

Rated primary residual current W20AB	10...500 mA
Rated primary residual current W35AB...W120AB	10 mA...10 A
Rated primary residual current W210AB	300 mA...10 A
Rated primary residual current W35ABP and W60ABP	10 mA...10 A
Rated continuous thermal current I_{cth}	40 A
Rated short-time thermal current I_{th}	2.4 kA/1 s
Rated dynamic current I_{dyn}	6.0 kA/40 ms

Environment/EMC

EMC	IEC 62020
Climatic class acc. to IEC 60721	-10...+55 °C
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K5 (except condensation and formation of ice)
Long-time storage (IEC 60721-3-1)	1K5 (except condensation and formation of ice)
Classification of mechanical conditions IEC 60721	
Stationary use (IEC 60721-3-3)	3M4
Transport (IEC 60721-3-2)	2M2
Long-time storage (IEC 60721-3-1)	1M3

Connection

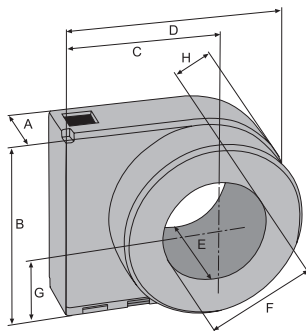
Type of connection	plug-in connectors
--------------------	--------------------

Connection RCMA/RCMS measuring current transformers see table "connecting cables"

Other

Degree of protection, internal components (IEC 60529)	IP40
Degree of protection, terminals (IEC 60529)	IP20
Screw mounting	lens head screw M5 acc. to DIN 7985 with mounting bracket
DIN rail mounting (W20AB, W35AB(P), W60AB(P) only)	with snap-on mounting
Flammability class	UL94 V-HB
Operating manual	TBP409012

Dimension diagram

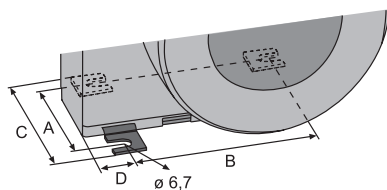


Type	Dimensions (mm)								Weight
	A	B	C	D	E	F	G	H	
W20AB	30	56.3	50	76.4	48.5	∅ 20	29.8	16.4	180 g
W35AB(P)	30	79.2	62	99.5	55	∅ 35	41.7	20	350 g
W60AB(P)	37	116.4	79	135	67	∅ 60	60.4	24	570 g
W120AB	37	191.5	116.5	210	67	∅ 120	98	33.5	1920 g
W210AB	45	304.5	173	323	80	∅ 210	154.5	45	5800 g

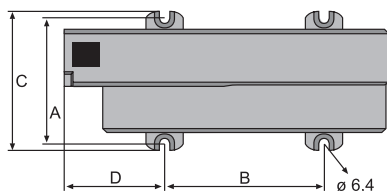
Tolerance: ± 0.5 mm

Screw mounting

Screw mounting with mounting brackets for W20AB, W35AB(P), W60AB(P)



Screw mounting: W120AB, W210AB



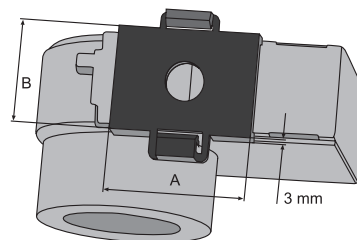
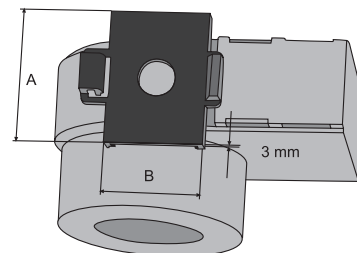
Dimensions (mm)				
Type	A	B	C	D
W35 (mounting with 2 mounting brackets diagonal)	49	31.4	65	18.6
W35AB(P) (mounting with 2 mounting brackets diagonal)	49	49.8	65	12.1
W60AB(P) (mounting with 3 mounting brackets diagonal)	56	66	72	17.7
W120AB (screw mounting)	81	103	90.6	65
W210AB (screw mounting)	98	180	117.1	83

Dimensions in mm

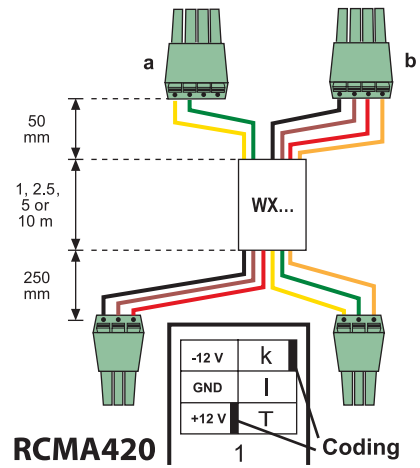
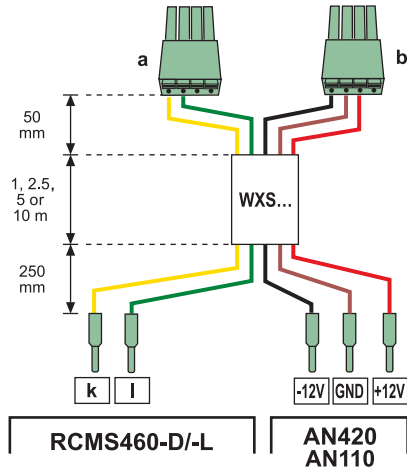
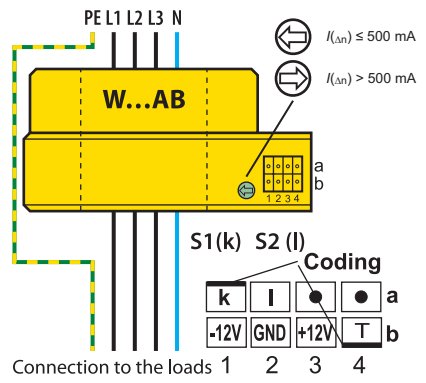
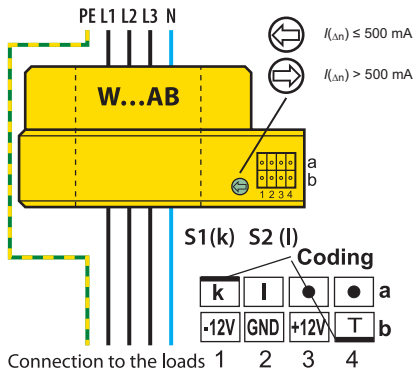
Tolerance for screw mounting with mounting brackets: ± 1.5 mm

Snap-on mounting

Snap-on mounting on DIN rail for vertical or horizontal mounting, for W20AB, W35AB(P), W60AB(P)



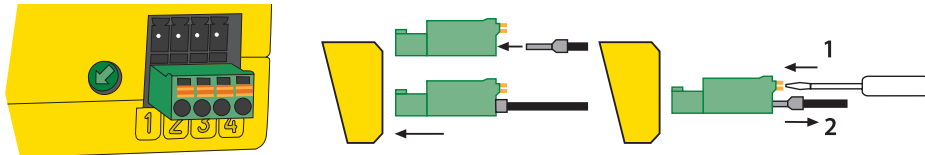
Dimensions (mm)		
Type	A	B
W20AB	43.5	32
W35AB(P)	43.5	32
W60AB(P)	50	39



Connection to the RCMS460/490 residual current monitoring system using the WXS... connecting cable.

Connection to the RCMA420/423 residual current monitor using the WX... connecting cable.

Colour coding for WXS... and WX...: k = yellow, I = green, -12 V = black, GND = brown, +12 V = red, test (T) = orange



WR... series

Measuring current transformers



Typical applications

- For RCMS460/490 residual current monitoring systems
- For RCM420 residual current monitors
- For EDS460/490 insulation fault locators

Standards

WR... series measuring current transformers comply with the device standards: IEC 60044-1, DIN EN 60044-1, IEC 60044-1.

Approvals



Further information

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

Ordering information

Mounting	Internal dimensions	Type	Art. No.
Mounting brackets	70 x 175 mm	WR70x175	B 9808 0609
	115 x 305 mm	WR115x305	B 9808 0610

Selection list

Type	RCM420	RCMS460 RCMS490	EDS460 EDS490
WR70x175	■	■	■
WR115x305	■	■	■

Technical data

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

Rated insulation voltage	800 V
Rated impulse voltage/pollution degree	8 kV/3

CT circuit

Rated primary residual current	30 mA...10 A
Rated secondary residual current	0.0167 A
Rated transformation ratio K_n	10/0.0167 A
Rated burden	$\leq 180 \Omega^*$
Nominal power	0.05 VA
Frequency range	42 Hz...3 kHz
Rated continuous thermal current I_{cth}	40 A
Rated short-time thermal current I_{tth}	$60 \times I_{cth} = 2.4 \text{ kA}/1 \text{ s}$
Rated dynamic current I_{dyn}	$2.5 \times I_{tth} = 6.0 \text{ kA}/40 \text{ ms}$

Environmental conditions

Operating temperature	-25...+70 °C
Climatic class acc. to IEC 60721	
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K5 (except condensation and formation of ice)
Long-time storage (IEC 60721-3-1)	1K5 (except condensation and formation of ice)
Classification of mechanical conditions acc. to IEC 60721	
Stationary use (IEC 60721-3-3)	3M4
Transport (IEC 60721-3-2)	2M2
Long-time storage (IEC 60721-3-1)	1M3

Connection

Connection	cage clamp spring terminal
Connection	
rigid/flexible/conductor sizes	0.08...2.5 mm ² (AWG 28...12)
Stripping length	8...9 mm

Connection EDS, RCM(S) measuring current transformers

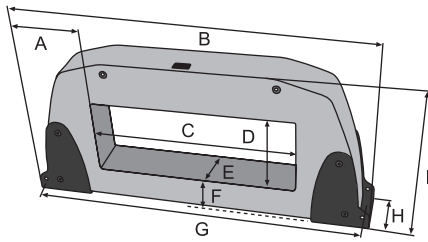
Single wire $\geq 0.75 \text{ mm}^2$	0...1 m
Single wire, twisted $\geq 0.75 \text{ mm}^2$	0...10 m
Shielded cable $\geq 0.5 \text{ mm}^2$	0...40 m
Shielded cable (shield on one side connected to L-conductor, not connected to earth)	
	recommended: J-Y(St)Y min. 2 x 0.8

Other

Degree of protection, internal components (DIN EN 60529)	IP40
Degree of protection, terminals (DIN EN 60529)	IP20
Screw mounting	M5 with mounting brackets
Flammability class	UL94 V-0
Operating manual	TBP409014
Approvals and certifications	UL under development, GOST

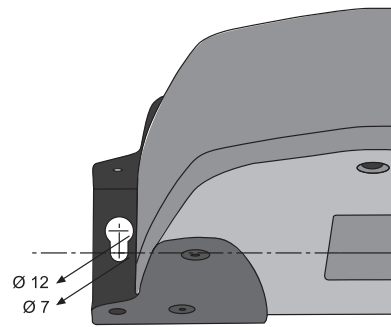
* The rated burden may vary depending on the respective device data sheet.

Dimension diagram

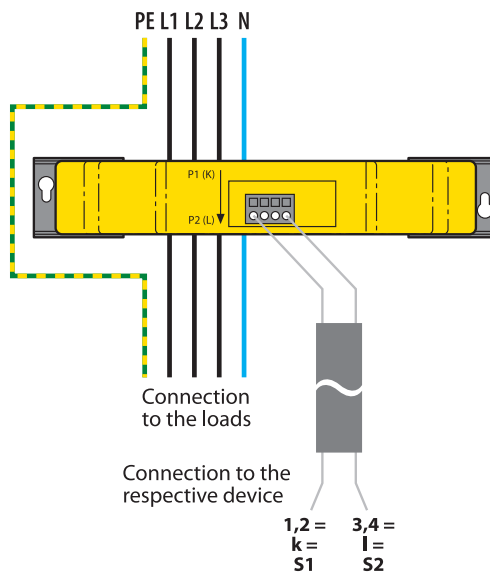


Type	Dimensions (mm)									Weight
	A	B	C	D	E	F	G	H	I	
WR70x175	90.75	357.5	176	71	56.5	51.5	337.5	61	190	2960 g
WR115x305	110	526	306	116	67	53	506	72.5	242.5	5560 g

Mounting details



Wiring diagram



Connection to the respective RCMS residual current monitoring system, RCM residual current monitors or to EDS insulation fault location systems

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
- For EDS460/490 insulation fault locators
- The WR...SP measuring current transformers are particularly suitable for use in busbar systems. This series is to be used for load currents ≥ 500 A.

Standards

WR70x175S(P)...WR200x500S(P) measuring current transformers comply with the device standards: DIN EN 60044-1, IEC 60044-1.

Further information

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

Approvals



Ordering information

Screening	Internal dimensions	Type	Art. No.
without screening	70 x 175 mm	WR70x175S	B 911 738
	115 x 305 mm	WR115x305S	B 911 739
	150 x 350 mm	WR115x350S	B 911 740
	200 x 500 mm	WR200x500S	B 911 763
Screening integrated	70 x 175 mm	WR70x175SP	B 911 790
	115 x 305 mm	WR115x305SP	B 911 791
	150 x 350 mm	WR150x350SP	B 911 792
	200 x 500 mm	WR200x500SP	B 911 793

Approvals

Type	UL	GL
WR70x175S(P)	■	■
WR115x305S(P)	■	■
WR150x350S(P)	■	–
WR200x500S(P)	–	–

Technical data

Insulation coordination acc. to IEC 60044-1

Highest system voltage for electrical equipment U_m	AC 720 V
Rated impulse withstand voltage U_{iso1}	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	50...400 Hz
Internal resistance	5...8 Ω
Secondary overvoltage protection	suppressor diode P6KE6V8CP
Accuracy class	5
Rated continuous thermal current	100 A
Rated short-time thermal current	14 kA/1 s
Rated dynamic current	35 kA/30 ms

Environment

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/10...150 Hz
Vibration resistance IEC 60068-2-6 (transport)	2 g/10...150 Hz
Ambient temperature (during operation)	-10...+50 °C
Ambient temperature (during storage)	-40...+70 °C
Climatic class acc. to DIN IEC 60721-3-3	3K5

Connection

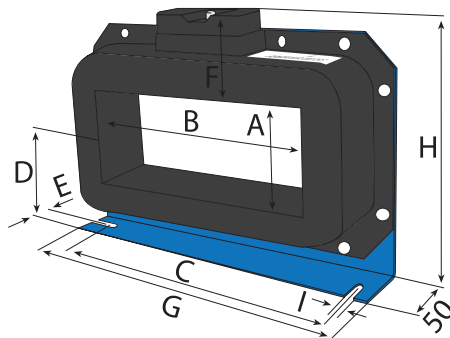
Connection	screw-type terminals
Connection rigid/flexible	0.2...4/0.2...2.5 mm ²
flexible with ferrules with/without plastic sleeve	0.25...2.5 mm ²
Conductor sizes (AWG)	24...12
Connection to the evaluator	
single wire ≥ 0.75 mm ²	0...1 m
single wire, twisted ≥ 0.75 mm ²	0...10 m
shielded cable ≥ 0.6 mm ²	0...40 m
Shielded cable (shield on one side connected to PE)	recommended: J-Y(St)Y min. 2 x 0.6

Other

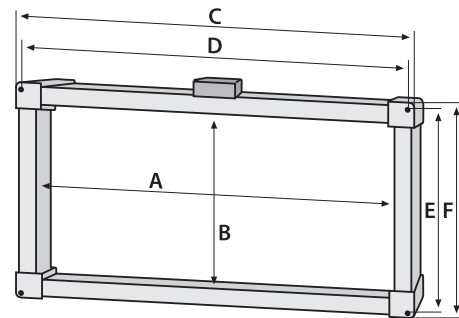
Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (DIN EN 60529)	IP40
Degree of protection, terminals (DIN EN 60529)	IP20
Screw mounting	M5
Flammability class	UL94 V-0
Operating manual	TBP409004

Dimension diagrams

WR70x175S(P)...WR150x350S(P)

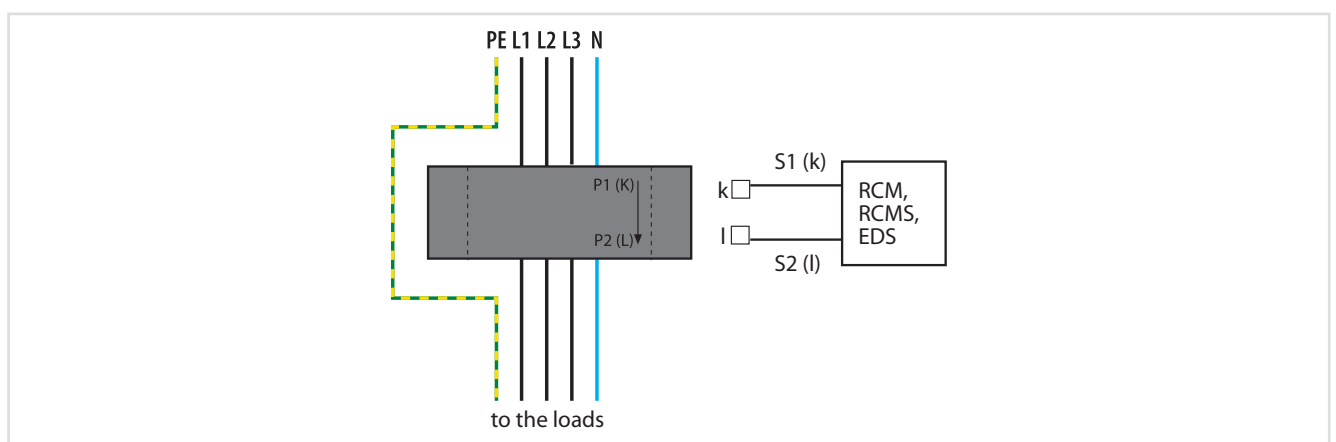


WR200x500S(P)



Type	Dimensions (mm)									Weight
	A	B	C	D	E	F	G	H	I	
WR70x175S(P)	70	175	225	85	22	46	261	176	7.5	2900 g
WR115x305S(P)	115	305	360	116	25	55	402	240	8	6300 g
WR150x350S(P)	150	350	415	140	28	55	460	285	8	8250 g
WR200x500S(P)	500	200	585	568.5	268.5	285	—	—	—	9000 g

Wiring diagram



WS.../WS...-8000

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 EDS460/490 insulation fault locators

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 standards: IEC 60044-1, VDE 0414-44-1, IEC 60044-1.

Further information

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

Ordering information

Mounting	Internal dimensions	Type	Art. No.
Mounting brackets	20 x 30 mm	WS20x30	B 9808 0601
		WS20x30-8000 ¹⁾	B 9808 0602
	50 x 80 mm	WS50x80	B 9808 0603
		WS50x80-8000 ¹⁾	B 9808 0604
	80 x 120 mm	WS80x120	B 9808 0606

¹⁾ For EDS461/491 and EDS473/474 insulation fault locators

Selection list

Type	RCM420	RCMS460 RCMS490	EDS460 EDS490	EDS461 EDS491
WS20x30	■	■	■	–
WS50x80	■	■	■	–
WS80x120	■	■	■	–
WS20x30-8000	–	–	–	■
WS50x80-8000	–	–	–	■

Technical data

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

Rated insulation voltage	800 V
Rated impulse voltage/pollution degree	8 kV/3

CT circuit WS...

Rated primary residual current	30 mA...10 A
Rated secondary residual current	0.0167 A
Rated transformation ratio K_n	10/0.0167 A
Rated burden	$\leq 180 \Omega^*$
Nominal power	0.05 VA
Frequency range	42 Hz...3 kHz
Rated continuous thermal current I_{cth}	40 A
Rated short-time thermal current I_{th}	$60 \times I_{cth} = 2.4 \text{ kA/1 s}$
Rated dynamic current I_{dyn}	$2.5 \times I_{th} = 6.0 \text{ kA/40 ms}$

CT circuit WS...-8000

Rated primary residual current	30 mA...1 A
Rated secondary residual current	0.000125 A
Rated transformation ratio K_n	10/0.000125 A
Rated burden	2400 Ω
Nominal power	0.0375 VA
Frequency range	42 Hz...3 kHz
Rated continuous thermal current I_{cth}	6 A
Rated short-time thermal current I_{th}	$60 \times I_{cth} = 0.36 \text{ kA/1 s}$
Rated dynamic current I_{dyn}	$2.5 \times I_{th} = 0.9 \text{ kA/40 ms}$

Environmental conditions

Operating temperature	-25...+70 °C
Climatic class acc. to IEC 60721	
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K5 (except condensation and formation of ice)
Long-time storage (IEC 60721-3-1)	1K5 (except condensation and formation of ice)
Classification of mechanical conditions IEC 60721	
Stationary use (IEC 60721-3-3)	3M4
Transport (IEC 60721-3-2)	2M2
Long-time storage (IEC 60721-3-1)	1M3

Connection

Connection	screw-type terminals
Connection	
rigid/flexible/conductor sizes	0.08...2.5 mm ² (AWG 28...12)
Stripping length	8...9 mm

Connection EDS, RCM(S) measuring current transformers

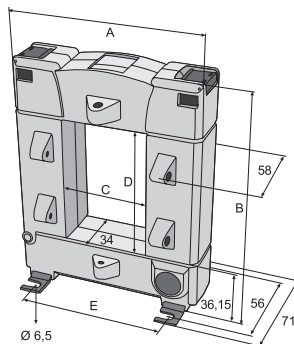
Single wire $\geq 0.75 \text{ mm}^2$	0...1 m
Single wire, twisted $\geq 0.75 \text{ mm}^2$	0...10 m
Shielded cable $\geq 0.5 \text{ mm}^2$	0...40 m
Shielded cable (shield on one side connected to L-conductor, not connected to earth)	
	recommended: J-Y(St)Y min. 2 x 0.8

Other

Degree of protection, internal components (DIN EN 60529)	IP40
Degree of protection, terminals (DIN EN 60529)	IP20
Screw mounting	M5 with mounting brackets
Flammability class	UL94 V-0
Operating manual WS...	TBP409015
Operating manual WS...-8000	TBP108018
Approvals and certifications	UL under development, GOST

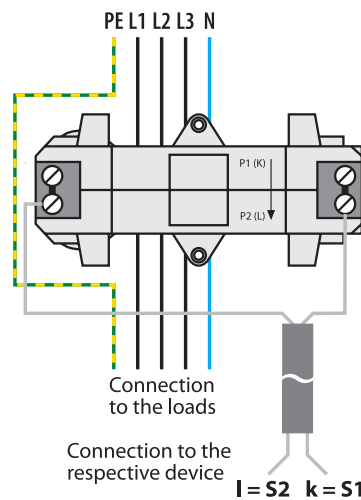
* The rated burden may vary depending on the respective device data sheet.

Dimension diagram



Type	Dimensions (mm)					Weight
	A	B	C	D	E	
WS20x30	93	106.15	23	33	64	$\leq 600 \text{ g}$
WS50x80	125	158.15	55	85	96	$\leq 1040 \text{ g}$
WS80x120	155	198.15	85	125	126	$\leq 1400 \text{ g}$
WS20x30-8000	93	106.15	33	33	64	$\leq 630 \text{ g}$
WS50x80-8000	125	158.15	85	85	96	$\leq 1080 \text{ g}$

Wiring diagram



WS... series measuring current transformers

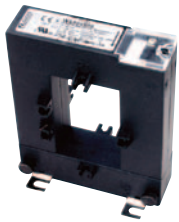
Connection to the respective RCMS series residual current monitoring system, RCM series residual current monitors or to EDS series insulation fault location systems

WS...-8000 measuring current transformer

Connection to the respective EDS461 and EDS491 insulation fault locator

WS50x80S...WS80x160S series

Split-core type measuring current transformers



Measuring current transformer
WS50x80S



Measuring current transformer
WS80x160S

Typical applications

- For residual current monitors (RCM)
- For residual current monitoring systems (RCMS)

Standards

WS... measuring current transformers comply with the device standards:
DIN EN 60044-1, IEC 60044-1

Approvals



Further information

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

Ordering information

Internal dimensions	Type	Art. No.
50 x 80 mm	WS50x80S	B 911 741
80 x 80 mm	WS80x80S	B 911 742
80 x 120 mm	WS80x120S	B 911 743
80 x 160 mm	WS80x160S	B 911 755

Approvals

Type	UL	GL
WS50x80S	■	■
WS80x80S	■	■
WS80x120S	■	■
WS80x160S	–	–

Technical data

Insulation coordination acc. to IEC 60044-1

Highest system voltage for electrical equipment U_m	AC 720 V
Rated impulse withstand voltage U_{iso1}	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	50...400 Hz
Internal resistance	5...8 Ω
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/10...150 Hz
Vibration resistance IEC 60068-2-6 (transport)	2 g/10...150 Hz
Ambient temperature (during operation)	-10...+50 °C
Storage temperature range	-40...+70 °C
Climatic class acc. to DIN IEC 60721-3-3	3K5

Connection

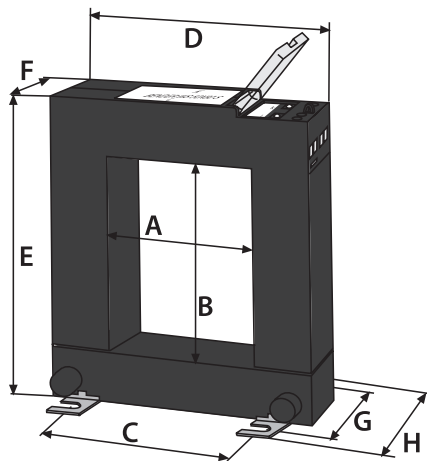
Connection	screw-type terminals
Connection	rigid/flexible
flexible with ferrules with/without plastic sleeve	0.2...4/0.2...2.5 mm ²
Conductor sizes (AWG)	0.25...2.5 mm ²
24...12	
Connection to the evaluator	
single wire ≥ 0.75 mm ²	0...1 m
single wire, twisted ≥ 0.75 mm ²	0...10 m
shielded cable ≥ 0.6 mm ²	0...40 m
Shielded cable (shield on one side connected to PE)	recommended: J-Y(St)Y min. 2 x 0.6

Other

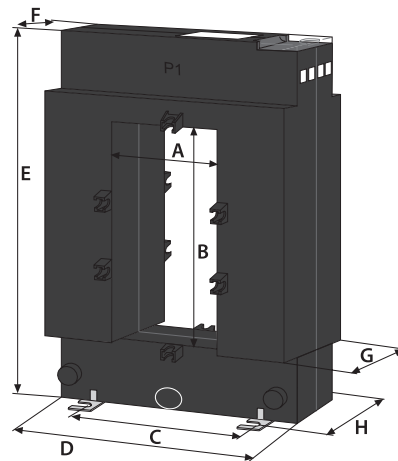
Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (DIN EN 60529)	IP40
Degree of protection, terminals (DIN EN 60529)	IP20
Screw mounting	M5
Flammability class	UL94 V-0
Operating manual	TBP409005

Dimension diagrams

WS50x80S...WS80x120S



WS80x160S



Type	Dimensions (mm)								Weight
	A	B	C	D	E	F	G	H	
WS50x80S	50	80	78	114	145	32	45	59	900 g
WS80x80S	80	80	108	144	145	32	45	59	1050 g
WS80x120S	80	120	108	144	185	32	45	59	1250 g
WS80x160S	80	160	120	184	225	32	52	59	2550 g

LINETRAXX® Series WF...

Consisting of an RCC420 signal converter and a W...F measuring current transformer
Flexible WF170, WF250, WF500, WF800, WF1200 measuring current transformers



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)

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

Further information

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

Approvals



Ordering information

Length A measuring current transformer	Supply voltage $U_S^{1)}$		Type	Art. No.
	DC	AC		
170 mm	9.6...94 V	16...72 V, 42...460 Hz	WF170-1	B 7808 0201
	70...300 V	70...300 V, 42...460 Hz	WF170-2	B 7808 0202
250 mm	9.6...94 V	16...72 V, 42...460 Hz	WF250-1	B 7808 0203
	70...300 V	70...300 V, 42...460 Hz	WF250-2	B 7808 0204
500 mm	9.6...94 V	16...72 V, 42...460 Hz	WF500-1	B 7808 0205
	70...300 V	70...300 V, 42...460 Hz	WF500-2	B 7808 0206
800 mm	9.6...94 V	16...72 V, 42...460 Hz	WF800-1	B 7808 0207
	70...300 V	70...300 V, 42...460 Hz	WF800-2	B 7808 0208
1200 mm	9.6...94 V	16...72 V, 42...460 Hz	WF1200-1	B 7808 0209
	70...300 V	42...460 Hz, 70...300 V	WF1200-2	B 7808 0210

¹⁾ Absolute values

Accessories

Type designation	Type	Art. No.
Mounting clip for screw mounting (1 piece per device)	XM420 (RCC420)	B 9806 0008

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 _s	see ordering information
Power consumption	≤ 3 VA

Measuring circuit

Measuring range	100 mA...20 A
Rated transformation ratio	K _N (U - I): 100 mV/A, K _N (k - I): 1.67 mA/A
Rated burden (signal output k, I)	68 Ω
Rated frequency	42...2000 Hz
Rated continuous thermal current I _{cth}	1 kA
Rated short-time thermal current I _{th}	60 kA/1 s
Rated dynamic current I _{dyn}	150 kA/40 ms

Environment/EMC

EMC	IEC 62020
Operating temperature	-25...+55 °C
Climatic class acc. to IEC 60721	
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)
Long-time storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)
Classification of mechanical conditions acc. to IEC 60721	
Stationary use (IEC 60721-3-3)	3M4
Transport (IEC 60721-3-2)	2M2
Long-time storage (IEC 60721-3-1)	1M3

Connection RCC420

Connection type	push-wire terminal
Connection properties	
rigid	0.2...2.5 mm ² (AWG 24...14)
flexible without ferrule	0.2...2.5 mm ² (AWG 24...14)
flexible with ferrule	0.2...1.5 mm ² (AWG 24...16)
Stripping length	10 mm
Opening force	50 N
Test opening, diameter	2.1 mm
Connection measuring current transformer W...F	PS/2 plug
Cable length WF...	2 m

Cable lengths RCMS-RCC420...

Single wire ≥ 0.75 mm ²	0...1 m
Single wire, twisted ≥ 0.75 mm ²	0...10 m
Shielded cable ≥ 0.5 mm ²	0...40 m
Shielded cable (shield to terminal I, not connected to earth)	recommended: J-Y(St)Y min. 2 x 0.8

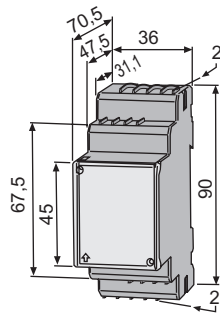
Other

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 M4 with mounting clip
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94V-0
Operating manual	TBP409020
Weight	RCC 420 ≤ 160 g WF500 ≤ 200 g WF170 ≤ 160 g WF800 ≤ 230 g WF250 ≤ 180 g WF1200 ≤ 310 g

Note: The measuring current transformer is adapted to the associated signal converter RCC420.

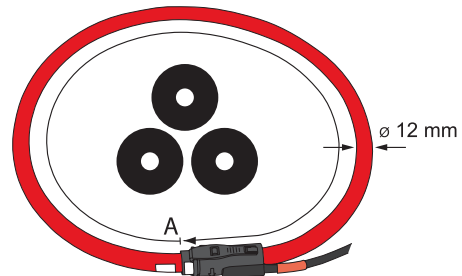
Dimension diagrams (dimensions in mm)

XM420 (RCC420)



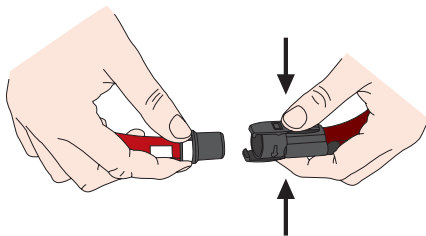
WF... measuring current transformers

A = For details about the length of the measuring current transformer refer to ordering information.

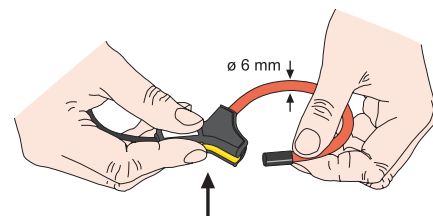


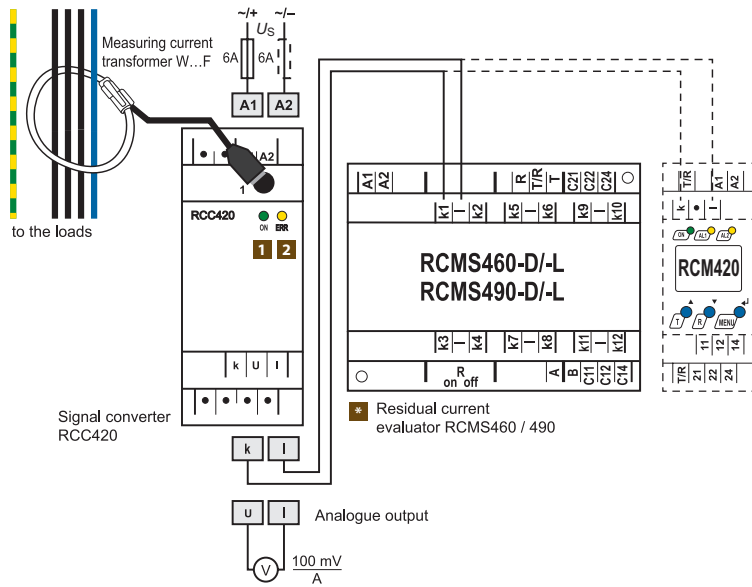
Dimension diagrams (dimensions in mm)

Locking connector measuring current transformer WF500...WF1200
Keep the locking connector clean



Locking connector WF170...WF250





Connection to the respective RCMS460/490 residual monitoring system or to an RCM420 residual current monitor.

- 1 Power On LED "ON": lights up when voltage is available and when the device is in operation
- 2 Alarm LED "ERR": Lights in the event of a short-circuit and interruption of the WF...

- * When using software version D233 V 2.21 or an earlier version, switch off CT monitoring

When using software version D233 V 2.31 or higher, set the CT type to "flex".

Measuring current transformer selection list

Cables and wires						Type												
						W...					W...-8000			W...AB				
Wire cross section mm ²	NYM Ø mm	NYY Ø mm	NYCY/ NYCWY Ø mm	H07RN-F Ø mm	NSSHÖU Ø mm	Page												
						218					218			221				
						Ø mm												
						20	35	60	120	210	20	35	60	20	35	60	120	210
3 x 1.5	10	11	13	12.5	15	■					■			■				
3 x 2.5	11	13	14	14.5	16.5	■					■			■				
3 x 4	12.5	15	16	16	20	■					■			■				
3 x 6	14	16	17	—	—	■					■			■				
	—	—	—	20	22		■					■			■			
3 x 10	17	19	18	—	—	■					■			■				
	—	—	—	25.5	—		■					■			■			
3 x 16	20	21	21	29	—		■					■			■			
4 x 1.5	10.5	13	14	13.5	16		■					■			■			
4 x 2	12	14	15	15.5	19		■					■			■			
4 x 4	14	16	17	18	21.5		■					■			■			
4 x 6	15	17	18	22	23		■					■			■			
4 x 10	18	20	20	23	27.5		■					■			■			
4 x 16	23	23	23	32	32		■					■			■			
4 x 25	27.5	27	28	—	—		■					■			■			
	—	—	—	37	39			■					■			■		
4 x 35	31	30	29	—	—		■					■			■			
	—	—	—	42	42.5			■					■			■		
4 x 50	—	35	34	48	49			■					■			■		
4 x 70	—	40	37	54	—			■					■			■		
4 x 95	—	45	42	—	—			■					■			■		
	—	—	—	60	—				■								■	
4 x 120	50	47	—	—	—			■					■			■		
	—	—	65.5	—	—				■								■	
4 x 150	53	52	—	—	—			■					■			■		
4 x 185	60	60	—	—	—				■								■	
4 x 240	71	70	—	—	—				■								■	
5 x 1.5	11	13.5	15	15	17	■					■			■				
5 x 2.5	13	15	17	17	—	■					■			■				
	—	—	—	—	20		■					■			■			
5 x 4	15	16.5	18	19	—	■					■			■				
	—	—	—	—	23		■					■			■			
5 x 6	18	19	—	—	—	■					■			■				
	—	—	20	24	26.5		■					■			■			
5 x 10	20	21	—	30	30		■					■			■			
	24	23	—	—	—		■					■			■			
5 x 16	—	—	—	35	34			■					■			■		
	31	—	—	—	—		■					■			■			
5 x 25	—	—	—	41	42			■					■			■		

	Type	Page	Suitable system components															
Insulation fault locators	EDS460	95	■	■	■	■	■											
	EDS490	95	■	■	■	■	■											
	EDS461	95								■	■	■						
	EDS491	95								■	■	■						
Residual current monitors	RCM420	178	■	■	■	■	■											
	RCMA420	181											■	■	■			
	RCMA423	184											■	■	■	■	■	
	RCMS460	187	■	■	■	■	■						■	■	■	■	■	
	RCMS490	187	■	■	■	■	■						■	■	■	■	■	

5.1

Isolating transformer ES710

Single-phase isolating transformers for the design of medical IT systems



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: liO

Typical applications

- For IT systems in medical locations

Approvals

VDE test mark for all ES710/3150... ES710/10000 types, ES...K, ES...LG and ES...S are not VDE certified.



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.com.

Technical data

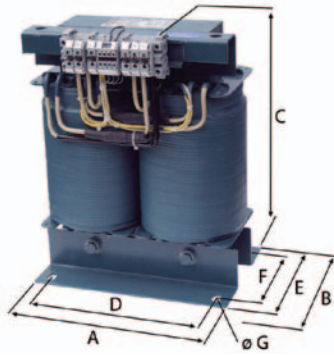
Type	ES710/3150	ES710/4000	ES710/5000	ES710/6300	ES710/8000	ES710/10000
Insulation classification	ta40/B	ta40/B	ta40/B	ta40/B	ta40/B	ta40/B
Degree of protection,	IP00	IP00	IP00	IP00	IP00	IP00
Degree of protection	I/II*	I/II*	I/II*	I/II*	I/II*	I/II*
Power/voltages/currents						
Rated power	3150 VA	4000 VA	5000 VA	6300 VA	8000 VA	10000 VA
Rated frequency	50...60 Hz	50...60 Hz	50...60 Hz	50...60 Hz	50...60 Hz	50...60 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 I_E	$< 12 \times \hat{I}_n$	$< 12 \times \hat{I}_n$	$< 12 \times \hat{I}_n$	$< 12 \times \hat{I}_n$	$< 12 \times \hat{I}_n$	$< 12 \times \hat{I}_n$
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 %	≤ 2.8 %	≤ 3 %
No-load output voltage u_0	≤ 236 V	≤ 233 V	≤ 234 V	≤ 235 V	≤ 233 V	≤ 233 V
Short-circuit voltage u_k	≤ 2.9 %	≤ 2.8 %	≤ 2.6 %	≤ 2.1 %	≤ 2.2 %	≤ 3 %
Environmental conditions						
Ambient temperature	≤ 40 °C	≤ 40 °C	≤ 40 °C	≤ 40 °C	≤ 40 °C	≤ 40 °C
No-load temperature rise	≤ 22 °C	≤ 22 °C	≤ 26 °C	≤ 31 °C	≤ 33 °C	≤ 36 °C
Full-load temperature rise	≤ 55 °C	≤ 53 °C	≤ 62 °C	≤ 67 °C	≤ 76 °C	≤ 65 °C
Noise level (no load and full load)	≤ 35 dB(A)	≤ 35 dB(A)	≤ 35 dB(A)	≤ 35 dB(A)	≤ 35 dB(A)	≤ 35 dB(A)
Other						
Recommended 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
Induction	0.86 T	0.94 T	1 T	1.05 T	1 T	1.1 T
$R_{\text{primär}}$	0.245 Ω	0.133 Ω	0.099 Ω	0.08 Ω	0.064 Ω	0.055 Ω
$R_{\text{sekundär}}$	0.228 Ω	0.108 Ω	0.095 Ω	0.07 Ω	0.056 Ω	0.033 Ω
Fe loss (iron loss)	55 W	56 W	77 W	107 W	105 W	150 W
Cu loss (copper loss)	120 W	105 W	125 W	170 W	200 W	230 W
Efficiency	95 %	96 %	96 %	96 %	96 %	96 %

* Option: completely encapsulated version

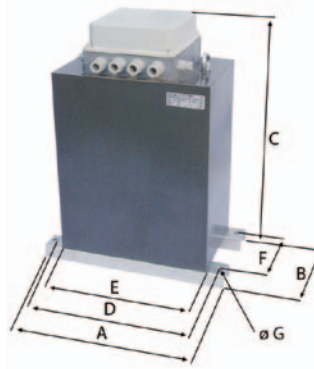
5.1

Dimension diagrams

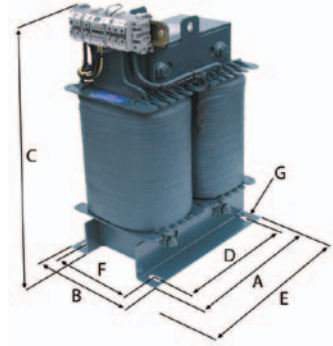
Standard – Dimension B: depth incl. terminals



SK2 series



S series – Dimension E: width incl. terminals

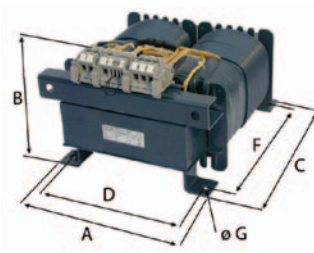


K series

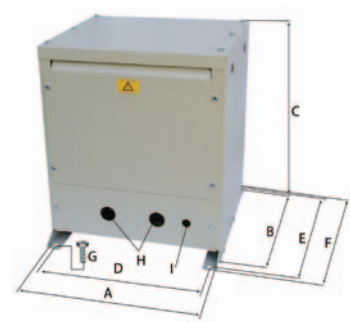


All other dimensions correspond to the standard dimensions.

LG series



Transformer enclosure



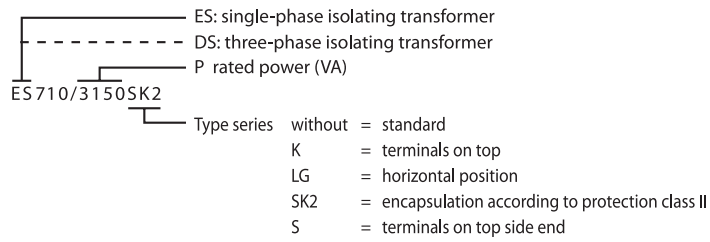
Ordering information

	Dimensions (mm)							Cu weight (kg)	Weight (kg)	Type	Art. No.
	A	B	C	D	E	F	G				
Standard	240	230	325	200	200	160	11	15	49	ES710/3150	B 924 211
	280	220	370	240	190	150	11	24	59	ES710/4000	B 924 212
	280	230	370	240	200	160	11	25	61	ES710/5000	B 924 213
	280	245	370	240	215	175	11	26	65	ES710/6300	B 924 214
	280	260	370	240	230	190	11	27	74	ES710/8000	B 924 215
	320	280	420	270	233	193	13	39	85	ES710/10000	B 924 216
K series	240		360	200	200	160	11	15	49	ES710/3150K	B 924 221
	280		420	240	190	150	11	24	59	ES710/4000K	B 924 222
	280		420	240	200	160	11	25	61	ES710/5000K	B 924 223
	280		420	240	215	175	11	26	65	ES710/6300K	B 924 224
	280		420	240	230	190	11	27	74	ES710/8000K	B 924 225
	320		480	270	270	193	13	39	85	ES710/10000K	B 924 226
LG series	230	235	320	204		240	9	15	49	ES710/3150LG	B 924 231
	260	210	365	234		280	9	24	59	ES710/4000LG	B 924 232
	260	220	365	234		280	9	25	61	ES710/5000LG	B 924 233
	260	235	365	234		280	9	26	65	ES710/6300LG	B 924 234
	260	250	365	234		280	9	27	74	ES710/8000LG	B 924 235
	294	240	410	264		320	12	39	85	ES710/10000LG	B 924 236
SK2 series	380	200	450	350	270	150	11	15	69	ES710/3150SK2	B 924 241
	380	190	500	350	310	150	11	24	75	ES710/4000SK2	B 924 242
	380	200	500	350	310	160	11	25	77	ES710/5000SK2	B 924 243
	380	215	500	350	310	175	11	26	86	ES710/6300SK2	B 924 244
	380	230	500	350	310	190	11	27	90	ES710/8000SK2	B 924 245
	410	240	560	380	350	200	13	39	105	ES710/10000SK2	B 924 246
S series	280	180	370	240	290	145	11 x 25	15	49	ES710/3150S	B 924 261
	280	150	420	240	290	115	11 x 25	24	59	ES710/4000S	B 924 262
	280	160	420	240	290	125	11 x 25	25	61	ES710/5000S	B 924 263
	280	175	420	240	290	140	11 x 25	26	65	ES710/6300S	B 924 264
	280	190	420	240	290	155	11 x 25	27	74	ES710/8000S	B 924 265
	320	233	440	270	330	193	13 x 18	39	85	ES710/10000S	B 924 266

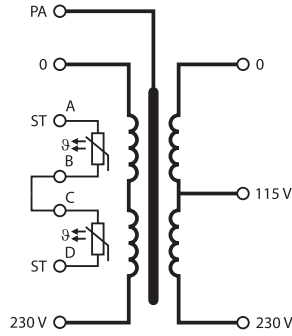
Ordering information enclosure

Dimensions (mm)									Weight (kg)	Type	Art. No.
A	B	C	D	E	F	G	H	I			
430	380	500	385	420	450	M10	ø 37.5	ø 20.5	16	ESDS0107-1	B 924 673

Nameplate



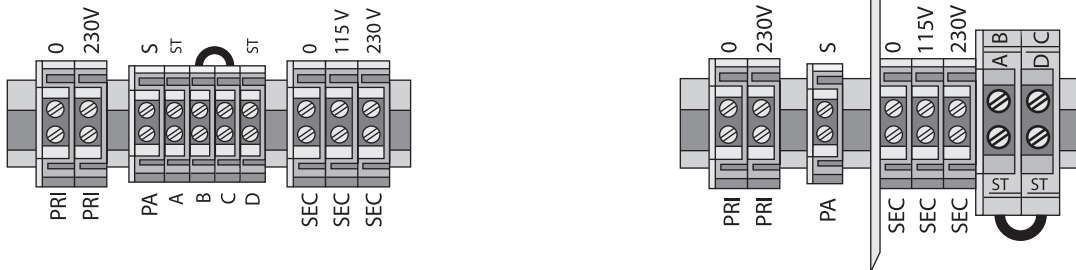
Wiring diagram



Terminal diagram

Standard
 K series
 LG series
 S series

SK2 series

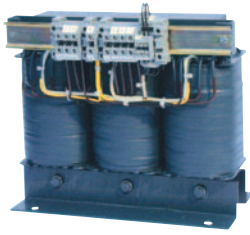


Connection properties

Type	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	10/16 mm ²	10/16 mm ²	4/6 mm ²	2.5/4 mm ²	10/16 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

DS0710

Three-phase isolating transformers for the supply of three-phase loads in medical locations



Typical applications

- For IT systems in medical locations

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

DS0710 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): 2002-11, 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.com.

Technical data

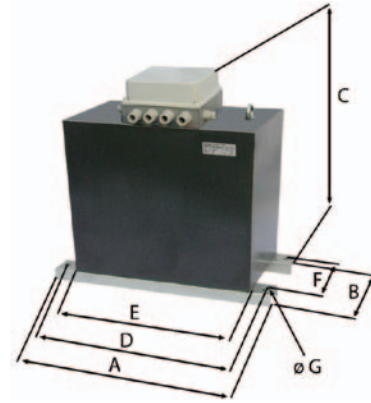
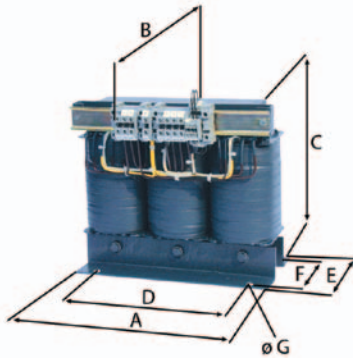
Type	DS0107/2000	DS0107/3150	DS0107/4000	DS0107/5000	DS0107/6300	DS0107/8000	DS0107/10000
Insulation classification	t _a 40/B	t _a 40/B	t _a 40/B	t _a 40/B	t _a 40/B	t _a 40/B	t _a 40/B
Degree of protection	IP00	IP00	IP00	IP00	IP00	IP00	IP00
Protection class	I/II*	I/II*	I/II*	I/II*	I/II*	I/II*	I/II*
Power/voltages/currents							
Rated power	2000 VA	3150 VA	4000 VA	5000 VA	6300 VA	8000 VA	10000 VA
Rated frequency	50...60 Hz	50...60 Hz	50...60 Hz	50...60 Hz	50...60 Hz	50...60 Hz	50...60 Hz
Rated input voltage	3AC 400 V	3AC 400 V	3AC 400 V	3AC 400 V	3AC 400 V	3AC 400 V	3AC 400 V
Rated input current	3 A	4.9 A	6.1 A	7.7 A	9.8 A	12.2 A	15.6 A
Rated output voltage	3NAC 230 V	3NAC 230 V	3NAC 230 V	3NAC 230 V	3NAC 230 V	3NAC 230 V	3NAC 230 V
Rated output current	5 A	7.9 A	10 A	12.6 A	15.8 A	20.1 A	25.2 A
Inrush current / <i>i</i> _ε	< 12 x / <i>i</i> _n	< 12 x / <i>i</i> _n	< 12 x / <i>i</i> _n	< 12 x / <i>i</i> _n	< 12 x / <i>i</i> _n	< 12 x / <i>i</i> _n	< 12 x / <i>i</i> _n
Leakage current	≤ 0.5 mA	≤ 0.5 mA	≤ 0.5 mA	≤ 0.5 mA	≤ 0.5 mA	≤ 0.5 mA	≤ 0.5 mA
No-load input current <i>i</i> ₀	≤ 3.0 %	≤ 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	≤ 40 °C	≤ 40 °C	≤ 40 °C	≤ 40 °C	≤ 40 °C	≤ 40 °C
No-load temperature rise	≤ 25 °C	≤ 21 °C	≤ 24 °C	≤ 28 °C	≤ 24 °C	≤ 27 °C	≤ 32 °C
Full-load temperature rise	≤ 50 °C	≤ 50 °C	≤ 53 °C	≤ 67 °C	≤ 60 °C	≤ 72 °C	≤ 75 °C
Noise level (no load and full load)	≤ 35 dB(A)	≤ 35 dB(A)	≤ 35 dB(A)	≤ 35 dB(A)	≤ 35 dB(A)	≤ 35 dB(A)	≤ 35 dB(A)
Other							
Recommended fuse when used in accordance with DIN VDE 0100-710	10 A gL/gG	16 A gL/gG	20 A gL/gG	20 A gL/gG	25 A gL/gG	35 A gL/gG	35 A gL/gG
Induction	1.0 T	0.8 T	0.86 T	0.8 T	0.8 T	0.8 T	0.82 T
<i>R</i> _{primary}	1.12 Ω	0.7 Ω	0.42 Ω	0.38 Ω	0.33 Ω	0.26 Ω	0.13 Ω
<i>R</i> _{secondary}	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 %

* Option: completely encapsulated version

Dimension diagrams

Standard – Dimension B: depth incl. terminals

SK2 series

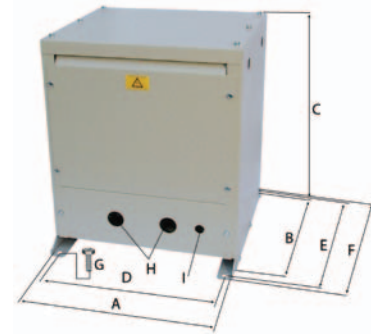
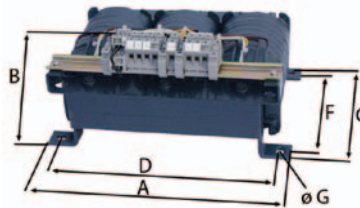
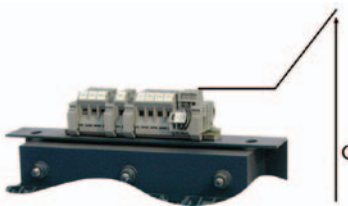


K series

All other dimensions correspond to the standard dimensions.

LG series

Isolating transformer enclosure



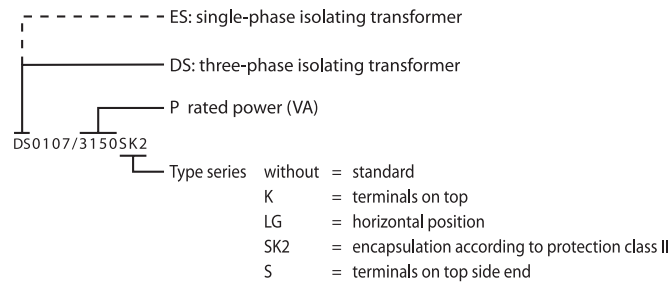
Ordering information

	Dimensions (mm)							Cu weight (kg)	Weight (kg)	Type	Art. No.
	A	B	C	D	E	F	G				
Standard	300	200	270	240	160	130	11	16	34	DS107/2000	B 924 694
	360	210	325	310	170	135	11	28	63	DS107/3150	B 924 106
	360	225	325	310	185	150	11	29	70	DS107/4000	B 924 121
	360	240	325	310	200	165	11	31	77	DS107/5000	B 924 112
	420	230	370	370	200	160	11	48	97	DS107/6300	B 924 107
	420	245	370	370	215	175	11	51	107	DS107/8000	B 924 628
	420	260	370	370	230	190	11	59	130	DS107/10000	B 924 672
K series	300		310	240	162	130	11	16	34	DS107/2000K	B 924 687
	360		360	310	170	135	11	28	63	DS107/3150K	B 924 688
	360		360	310	185	150	11	29	70	DS107/4000K	B 924 689
	360		360	310	200	165	11	31	77	DS107/5000K	B 924 690
	420		420	370	200	160	11	48	97	DS107/6300K	B 924 691
	420		420	370	215	175	11	51	107	DS107/8000K	B 924 692
	420		420	370	230	190	11	59	130	DS107/10000K	B 924 693
LG series	330	195	265	298		200	7	16	34	DS107/2000LG	B 924 695
	394	198	310	358		240	9	28	63	DS107/3150LG	B 924 658
	394	214	310	358		240	9	29	70	DS107/4000LG	B 924 659
	394	228	310	358		240	9	31	77	DS107/5000LG	B 924 660
	452	212	360	408		280	12	48	97	DS107/6300LG	B 924 661
	452	227	360	408		280	12	51	107	DS107/8000LG	B 924 662
	452	250	360	408		280	12	59	130	DS107/10000LG	B 924 679
SK2 series	410	190	400	380	330	125	11	16	49	DS107/2000SK2	B 924 696
	520	190	450	490	390	135	11	28	75	DS107/3150SK2	B 924 122
	520	190	450	490	390	135	11	29	80	DS107/4000SK2	B 924 123
	520	200	450	490	390	150	11	31	86	DS107/5000SK2	B 924 124
	520	200	500	490	450	150	11	48	107	DS107/6300SK2	B 924 125
	520	215	500	490	450	175	11	51	130	DS107/8000SK2	B 924 126
	520	230	500	490	450	175	11	59	155	DS107/10000SK2	B 924 678

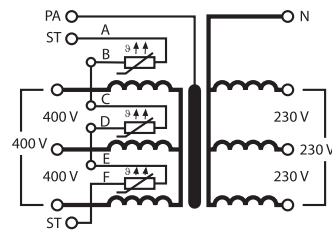
Ordering information enclosure

Dimensions (mm)									Suitable for the following device types	Weight (kg)	Type	Art. No.
A	B	C	D	E	F	G	H	I				
430	380	490	385	420	450	M10	ø 29	ø 21	DS0107/2000 bis DS0107/5000	16	ESDS0107-1	B 924 673
600	420	490	555	460	490	M10	ø 36	ø 16	DS0107/6300 bis DS0107/10000	23	ESDS0107-2	B 924 674

Nameplate



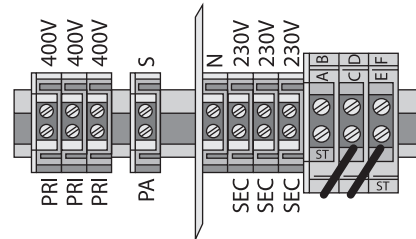
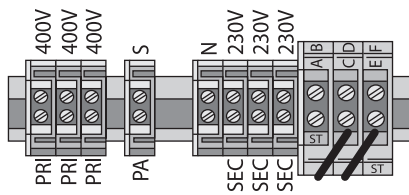
Wiring diagram



Terminal diagram

Standard,
K series,
LG series

SK2 series,



Connection properties

Type	Input terminals flexible/rigid	Screen winding flexible/rigid	Control terminals flexible/rigid	Output terminals flexible/rigid
DS0107/2000	10/16 mm ²	10/16 mm ²	2.5/4 mm ²	10/16 mm ²
DS0107/3150	10/16 mm ²	10/16 mm ²	2.5/4 mm ²	10/16 mm ²
DS0107/4000	10/16 mm ²	10/16 mm ²	2.5/4 mm ²	10/16 mm ²
DS0107/5000	10/16 mm ²	10/16 mm ²	2.5/4 mm ²	10/16 mm ²
DS0107/6300	10/16 mm ²	10/16 mm ²	2.5/4 mm ²	16/25 mm ²
DS0107/8000	10/16 mm ²	10/16 mm ²	2.5/4 mm ²	16/25 mm ²
DS0107/10000	16/25 mm ²	16/25 mm ²	2.5/4 mm ²	16/25 mm ²

ESL0107 transformers for operating theatre lights

Single-phase isolating transformers for the supply of operating theatre lights



Device features

- Screen winding lead out for external connection
- Insulated mounting angles
- Degree of protection, IP00 (open design)
- Reinforced insulation
- Classification of insulation ta 40/E
- Connections: screw terminals
- Vector group: li0

Typical applications

- For the supply of operating theatre lights in group 2 medical locations

Standards

ESL0710 isolating transformers comply with the device standards and the regulations for installation: DIN EN 61558-1 (VDE 0570-1), IEC 61558-1 and DIN EN 61558-2-6 (VDE 0570-2-6), IEC 61558-2-6.

Further information

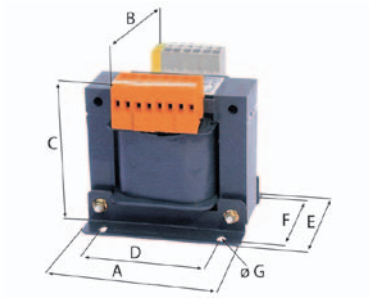
For further information refer to our product range on www.bender-de.com.

Technical data

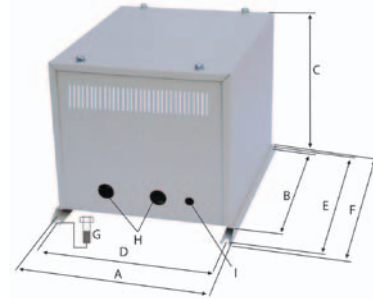
Type	ESL0107/120	ESL0107/160	ESL0107/280	ESL0107/400	ESL0107/630	ESL0107/1000
Insulation classification	ta 40/E	ta 40/E	ta 40/E	ta 40/E	ta 40/E	ta 40/E
Degree of protection/protection class	IP00/I	IP00/I	IP00/I	IP00/I	IP00/I	IP00/I
Power/voltages/currents						
Rated power	120 VA	160 VA	280 VA	400 VA	630 VA	1000 VA
Rated frequency	50...60 Hz	50...60 Hz	50...60 Hz	50...60 Hz	50...60 Hz	50...60 Hz
Rated input voltage	230 V	230 V	230 V	230 V	230 V	230 V
Rated input current	0.6 A	0.8 A	1.4 A	1.9 A	3 A	4.6 A
Rated output voltage	23...28 V	23...28 V	23...28 V	23...28 V	23...28 V	23...28 V
Rated output current	4.3 A	5.7 A	10 A	14.3 A	22.5 A	35.7 A
Inrush current / i_n	$< 15 \times I_n$	$< 15 \times I_n$	$< 15 \times I_n$	$< 15 \times I_n$	$< 15 \times I_n$	$< 15 \times I_n$
Leakage current	$\leq 5 \mu\text{A}$	$\leq 5 \mu\text{A}$	$\leq 5 \mu\text{A}$	$\leq 5 \mu\text{A}$	$\leq 5 \mu\text{A}$	$\leq 5 \mu\text{A}$
No-load input current i_0	$\leq 95 \text{ mA}$	$\leq 120 \text{ mA}$	$\leq 140 \text{ mA}$	$\leq 237 \text{ mA}$	$\leq 270 \text{ mA}$	$\leq 320 \text{ mA}$
No-load output voltage u_0	$\leq 31.7 \text{ V}$	$\leq 30.7 \text{ V}$	$\leq 30.6 \text{ V}$	$\leq 29.7 \text{ V}$	$\leq 30 \text{ V}$	$\leq 30 \text{ V}$
Short-circuit voltage u_k	$\leq 11 \%$	$\leq 8.8 \%$	$\leq 7.9 \%$	$\leq 5.3 \%$	$\leq 5 \%$	$\leq 4.3 \%$
Environmental conditions						
Ambient temperature	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C
No-load temperature rise	$\leq 17 \text{ °C}$	$\leq 20 \text{ °C}$	$\leq 18 \text{ °C}$	$\leq 26 \text{ °C}$	$\leq 23 \text{ °C}$	$\leq 26 \text{ °C}$
No-load temperature rise	$\leq 66 \text{ °C}$	$\leq 64 \text{ °C}$	$\leq 71 \text{ °C}$	$\leq 62 \text{ °C}$	$\leq 64 \text{ °C}$	$\leq 65 \text{ °C}$
Noise level (no load and full load)	$\leq 35 \text{ dB(A)}$	$\leq 35 \text{ dB(A)}$	$\leq 35 \text{ dB(A)}$	$\leq 35 \text{ dB(A)}$	$\leq 35 \text{ dB(A)}$	$\leq 35 \text{ dB(A)}$
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	2 Ω	1.2 Ω	0.6 Ω
$R_{\text{secondary}}$	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 %

Dimension diagram

Isolating transformer



Isolating transformer enclosure



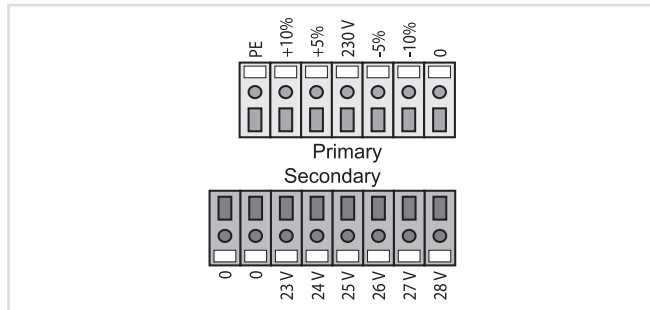
Ordering information

Dimensions (mm)							Cu weight (kg)	Weight (kg)	Type	Art. No.
A	B	C	D	E	F	G				
96	96	105	84	82	65	5.5	0.5	2.3	ESL0107/120	B 924 632
96	106	105	84	92	75	5.5	0.8	2.8	ESL0107/160	B 924 633
120	102	125	90	92	74	5.5	1	4	ESL0107/280	B 924 634
120	134	125	90	128	110	5.5	1.6	6.7	ESL0107/400	B 924 637
150	135	150	122	130	108	6.5	3	10.2	ESL0107/630	B 924 638
174	145	175	135	150	120	6.5	5.8	16.5	ESL0107/1000	B 924 639

Ordering information enclosure

Dimensions (mm)									Weight (kg)	Type	Art. No.
A	B	C	D	E	F	G	H	I			
240	280	220	220	300	320	M6	ø 29	ø 21	3.5	ESL0107-0	B 924 204

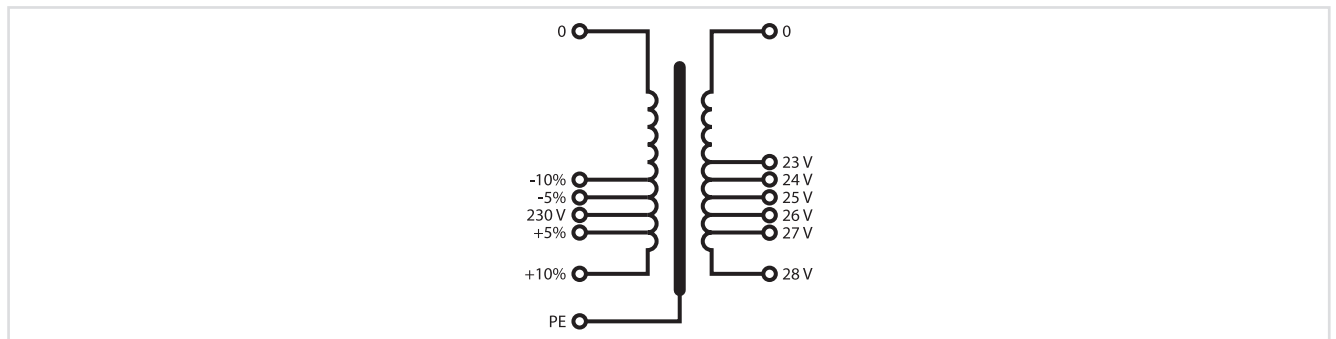
Terminal diagram



Connection properties

Type	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



RK170

Measuring converter



Device features

- Plastic enclosure for DIN rail mounting
- Zero setting 0 or 4 mA
- Electrical separation between the input and output signal

Further information

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

Typical applications

- Conversion of DC 0...400 μ A current signals into 0(4)...20 mA or 0...10 V signals
- For ISOMETER®s and RCM and RCMA residual current monitors with measurement instrument output DC 0...400 μ A

Ordering information

Supply voltage ¹⁾ U_S		Type	Art. No.
AC	DC		
19...264 V	20...297 V	RK170	B 9804 1500

¹⁾ Absolute values

Technical data

Voltage ranges

Supply voltage U_S	DC 20...297 V/AC 19...264 V
Frequency range U_S	50...120 Hz
Power consumption	≤ 3 VA

Inputs

Current input	DC 0...400 μ A
Max. permissible current	DC 4 mA
Rated input resistance	approx. 2.5 k Ω

Outputs

Outputs	two outputs with common ground
Voltage output	DC 0...10 V
Open-circuit voltage	DC 12 V
Rated burden	1 k Ω
Current output	DC 0/4...20 mA
Short-circuit current	\leq DC 50 mA short-circuit proof
Rated burden	500 Ω
Accuracy at $T_U = 23$ °C	class 0.5
Temperature coefficient	0.025 %/°C
Rated rise time T 0.9	50 ms
Dielectric strength input/output/supply	AC 2500 V

Environment

Shock resistance IEC 60068-2-27 (device in operation)	5 g/11 ms
Vibration resistance IEC 60068-2-6 (device in operation)	1 g/10...150 Hz
Vibration resistance IEC 60068-2-6 (transport)	2 g/10...150 Hz
Ambient temperature (during operation)	0...+50 °C
Ambient temperature (during storage)	-20...+70 °C
Climatic class acc. to IEC 60721-3-3	3K3

Connection

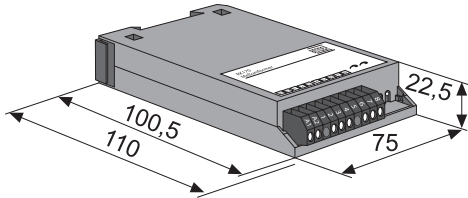
Connection type	modular terminals
Connection properties rigid/flexible	0.5...2.5 mm ² /0.14...1.5 mm ²

Other

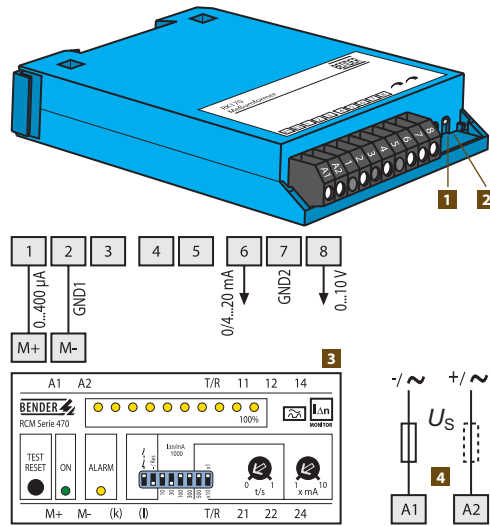
Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (IEC 60529)	IP40
Degree of protection, internal components (IEC 60529)	IP20
Dimensions	75 x 22.5 x 110 mm
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-2
Operating manual	BP109006
Weight	≤ 200 g

5.1

Dimension diagram (dimensions in mm)



Wiring diagram



1 Zero: zero setting

2 Scale: full-scale value calibration

3 Device of the RCM series

4 U_s see nameplate, 2 A slow-blow fuse recommended

AN110

Power supply unit for measuring current transformers



Typical applications

- Power supply for W...AB series measuring current transformers

Further information

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

Ordering information

Output voltage	Supply voltage U_S		Type	Art. No.
	AC	DC		
$\pm 12\text{ V}$	20...60 V	18...72 V	AN110-1	B 9405 3101
	90...264 V	100...353 V	AN110-2	B 9405 3102

Suitable system components

Type designation	Type	Page
Measuring current transformers	W...AB	221
	WXS-100	221
Connecting cables for measuring current transformers of the W...AB series	WXS-250	221
	WXS-500	221
	WXS-1000	221

Technical data

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

AN110-1:	
Rated insulation voltage	AC 100 V
Rated impulse voltage/pollution degree	2.5 kV/3
Protective separation (reinforced insulation) between	(A1, A2) - (+12 V, GND, -12 V)
Voltage test acc. to IEC 61010-1	3.3 kV

AN110-2:	
Rated insulation voltage	AC 250 V
Rated impulse voltage/pollution degree	4 kV/3
Voltage test acc. to IEC 61010-1	3.3 kV

Supply voltage

AN110-1:	
Supply voltage U_S	AC 20...60 V; DC 18...72 V*
Frequency range U_S	DC, AC 50...60 Hz
Power consumption	$\leq 30\text{ VA}$

AN110-2:	
Supply voltage U_S	AC 90...264 V; DC 100...353 V
Frequency range U_S	DC, AC 50...60 Hz
Power consumption	$\leq 30\text{ VA}$

Output power supply unit

Output voltage U_{out}	DC $\pm 12\text{ V}$, short-circuit proof
Operating range	11.5...12.5 V
Rated output	12 W*

Cable length

Recommended cable	WXS100...WXS1000 (see suitable system components)
-------------------	---

Environment/EMC

EMC	DIN EN 61000-6-3 DIN EN 61000-6-2
Operating temperature AN110-1	-25...+65 °C
Derating 50 °C or higher AN110-1	5 %/K
Operating temperature AN110-2	-25...+65 °C
Climatic class acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)
Long-time storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3M4
Transport (IEC 60721-3-2)	2M2
Long-term storage (IEC 60721-3-1)	1M3

Connection

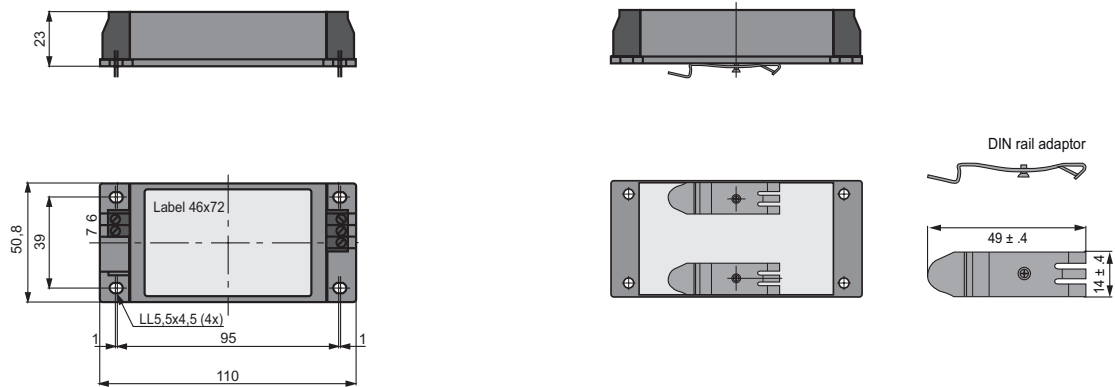
Connection	screw-type terminals
Connection	
rigid/flexible/conductor sizes	0.2...4/0.2...2.5 mm ² (AWG 24...12)
Multi-conductor connection (2 conductors of the same cross section)	
rigid/flexible	0.2...1.5 mm ²
Stripping length	8...9 mm
Tightening torque	0.5...0.6 Nm

Other

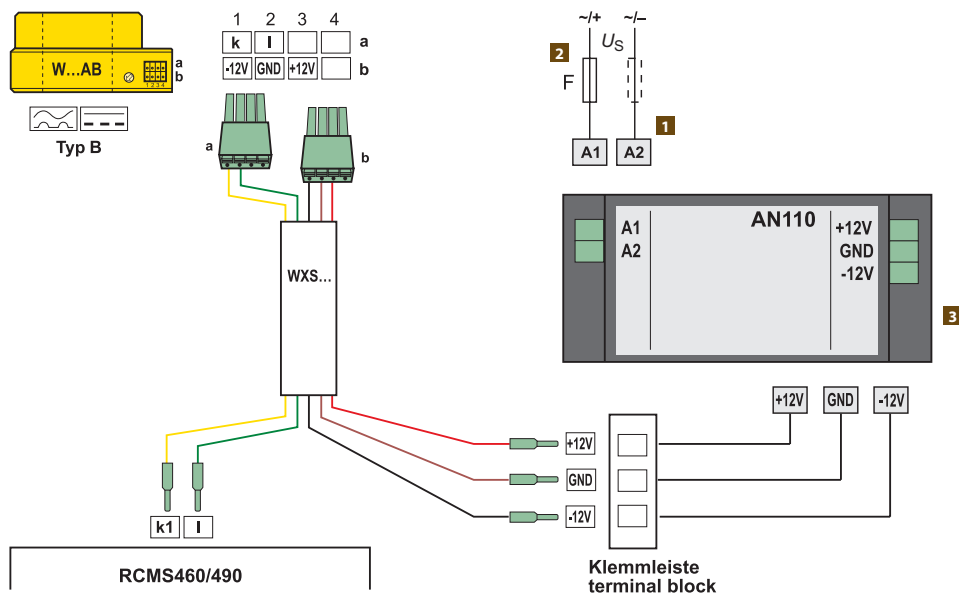
Operating mode	continuous operation
Mounting	see dimension diagram
Degree of protection, internal components (DIN EN 60529)	IP65
Degree of protection, terminals (DIN EN 60529)	IP20
Enclosure material	Polybutylenterephthalat (PBT)
Screw mounting	4 x M4
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Operating manual	TBP409021
Weight	$\leq 200\text{ g}$

* When the supply voltage is smaller than 30 V, the output power is reduced, so that only five measuring current transformers can be connected.

Dimension diagram (dimensions in mm)



Wiring diagram



- 1** Supply voltage U_S
- 2** Short-circuit protection for U_S , recommended fuses:
AN110-1: 2 A time-lag fuse recommended
AN110-2: 1A time-lag fuse recommended
- 3** Symmetrical output voltage

Colour coding for the conductors of the WXS... connecting cable
k1 = yellow, I = green, - 12 V = black, GND = brown, + 12 V = red

AN111

Power supply unit for DC 24 V supply



Device features

- Compact power supply unit to supply Bender devices with DC 24 V and max. 24 watts power consumption
- Generously dimensioned capacitors to bridge the time gap when temporary voltage fluctuations occur
- Connection L-L on the primary side

Further information

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

Typical applications

- To supply Bender devices with DC 24 V and max. 24 W power consumption

Approvals



Ordering information

Rated input voltage U_{IN}	Rated output voltage	Type	Art. No.
AC	DC		
400 V, 50/60 Hz	24 V	AN111	B 9405 3103

Technical data

Input circuit

Mains input voltage	AC 400 V
Input voltage range	+10...-10 % acc. to DIN IEC 60038
Frequency	50/60 Hz
Mains fuse	5 x 20 mm
AC 400 V	external

Output circuit

Output voltage EN 61131-2/Part 2	DC 24 V, on double terminals
Status indicator	LED green
Time-lag fuse, output	5 x 20 mm
	1.25 A
Output	24 W
Permissible continuous output current	DC 1 A
Residual ripple	< 5 %
Ambient temperature	-10...+60 °C
Output protection circuit	varistor

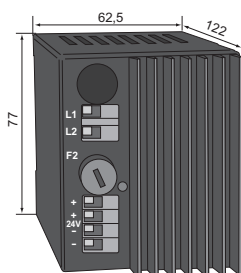
Connection

Connection	screw mounting, touch proof according to UVV (BGV A3) (German accident prevention regulation)
Connection properties	flexible max. 2.5 mm ²

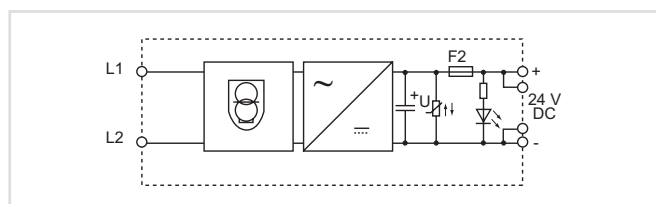
Other

Test voltage	between input and output circuit in accordance with the standard (safety transformers)
Standards	VDE 0570 Part 2-6, EN 61558-2-6, EN 61000-3-2, EN 61131-2 Part 2
CE mark	yes
Mounting	any position
DIN rail mounting acc. to	IEC 60715, TS 35 x 7.5
Degree of protection acc. to VDE 0470/EN 60529	IP20
Degree of protection acc. to IEC 536/VDE 0106 T1	prepared for protection class II
Insulation class	E
Dimensions approx.	
Length (L)	77 mm
Width (B)	62,5 mm
Installation depth (T)	122 mm
Total weight	0.95 kg

Dimension diagram (dimensions in mm)



Wiring diagram



AN410

Power supply unit for DC 24 V supply



Device features

- Primary-pulsed power supply unit for the power supply of Bender devices with a supply voltage of DC 24 V and a power consumption of max. 10 VA
- Power supply for max. 3 MK2430/max. 2 MK800 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.com.

Typical applications

- To supply Bender devices with DC 24 V and maximum 10 VA power consumption

Approvals



^{*)} Approval relating to the rated input voltage U_{IN}

Ordering information

Rated input voltage U_{IN}		Rated output voltage	ABB type	Type	Art. No.
DC	AC	DC			
120...370 V	90...264 V, 47...63 Hz	24 V	CP-D 24/0.42/Art. No. 1SVR 427 041 R0000	AN410	B 9405 3103
9...35 V	–	9...35 V	CP-D RU/Art. No. 1SVR 427 049 R0000	AN420-R	B 9510 0250

Technical data

Insulation coordination acc. to IEC 60664-1

Rated impulse voltage/pollution degree	3 kV/2
Rated insulation voltage U_i input circuit/output circuit	3 kV

Input circuits

Rated input voltage U_{IN}	see ordering information
Power consumption	≤ 3 W
Inrush current	≤ 30 A, ≤ 3 ms
Stored energy time in the event of power system failure	≥ 30 ms
Typical current/power consumption	at AC 110 V: 184 mA/11.62 W 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 $60^\circ\text{C} < T_U \leq 70^\circ\text{C}$	2.5 %/K
Parallel connection option	with redundancy unit AN420-R
Protection against short-circuits/no-load	continuous protection against short-circuits/no-load

Environment/EMC

EMC immunity	acc. to EN 61000-6-2
EMC emission	acc. to EN 61000-6-3
Ambient temperature (during operation/during storage)	-25...+70 °C/-25...+85 °C
Classification of mechanical conditions acc. to IEC/EN 60068-2	

Connection

Connection	screw-type terminals
rigid, flexible (with or without ferrule)/conductor sizes	0.2...2 mm ² (AWG 24...14)
Stripping length	6 mm (0.24 inches)
Tightening torque	0.36...0.56 Nm

Standards, approvals and certifications

UL LISTED	UL 508, CAN/CSA C22.2 No. 14 ^{*)}
CUL US	UL 1310, CAN/CSA C22.2 No. 223 (Class 2 Power Supply) ^{*)}
CUL US	UL 6090, CAN/CSA C22.2 No. 60950 ^{*)}
GOST	GOST
CCC	CCC ^{*)}

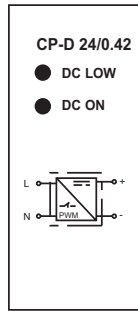
Mark

CE	CE
----	----

Other

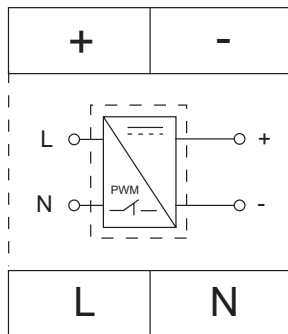
Status indicators	2 LEDs: output voltage present, output voltage low
Operating mode	continuous operation
Mounting	vertically (terminals +/- at the top)
Degree of protection, internal components (DIN EN 60529 (VDE 0470-1))	IP30
Degree of protection, terminals (DIN EN 60529 (VDE 0470-1))	IP20
Protection class	II
Minimum distance to adjacent devices vertically/horizontally	25/25 mm
Enclosure dimensions (W x H x D)	18 x 91 x 57.5 mm (0.71 x 3.58 x 2.26 inches)
DIN rail mounting acc. to	IEC 60715
Protective extra low voltage	SELV (EN 60950-1)
Weight	≤ 70 g

^{*)} Approval relating to the rated input voltage U_{IN}



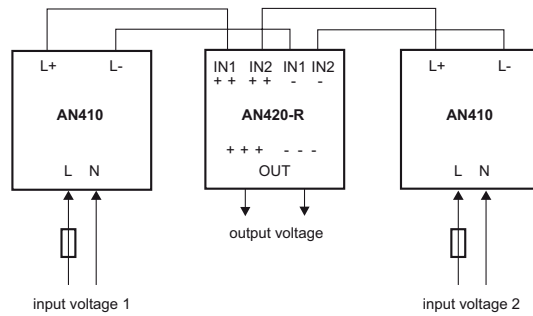
Power On LED "DC ON" lights up green signalling that voltage is available at the output of the power supply unit. LED "DC LOW" lights red signalling that the output voltage is too low.

Wiring diagram



L, N: input voltage
+, -: output voltage

Option for redundant power supply



5.1

AN420

Power supply unit for measuring current transformers



Typical applications

- Power supply for W...AB series measuring current transformers

Approvals



Further information

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

Ordering information

Supply voltage ¹⁾ U _S	Output voltage	Type	Art. No.
DC/AC	DC		
9.6...94 V, 16...72 V (42...66 Hz)	± 12 V/400 mA	AN420-1	B 7405 3099
70...276 V, 42...460 Hz	± 12 V/400 mA	AN420-2	B 7405 3100

Device version with screw terminals on request.

¹⁾ Absolute values

Accessories

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

Suitable system components

Type designation	Type	Page
Measuring current transformers	W...AB	221
	WXS-100	221
Connecting cables for measuring current transformers of the W...AB series	WXS-250	221
	WXS-500	221
	WXS-1000	221

Technical data

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

AN420-1:	
Rated insulation voltage	AC 250 V
Rated impulse voltage/pollution degree	2.5 kV/3
Protective separation (reinforced insulation) between	(A1, A2) - (+ 12 V, GND, - 12 V)
Voltage test acc. to IEC 61010-1	2.21 kV

Supply voltage

Supply voltage U _S	AC 16...72 V/DC 9.6...94 V
Frequency range U _S	DC, AC 42...66 Hz
Power consumption	≤ 30 VA

AN420-2:

Rated insulation voltage	AC 250 V
Rated impulse voltage/pollution degree	4 kV/3
Protective separation (reinforced insulation) between	(A1, A2) - (+ 12 V, GND, - 12 V)
Voltage test acc. to IEC 61010-1	2.21 kV

Supply voltage

Supply voltage U _S	AC/DC 70...276 V
Frequency range U _S	DC, AC 42...460 Hz
Power consumption	≤ 30 VA

Output power supply unit

Output voltage U _{out}	DC ± 12 V, short-circuit proof
Operating range	11.9...12.1 V
Rated output	9 W

Cable length

Recommended cable	WXS100...WXS1000 (see ordering information)
-------------------	---

Environment/EMC

EMC	IEC61204-3
Operating temperature	-25...+55 °C
Climatic class acc. to IEC 60721	
Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)
Long-time storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)
Classification of mechanical conditions IEC 60721	
Stationary use (IEC 60721-3-3)	3M4
Transport (IEC 60721-3-2)	2M2
Long-time storage (IEC 60721-3-1)	1M3

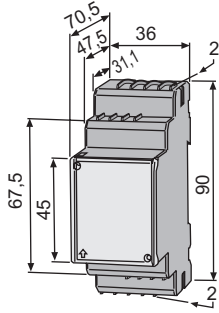
Connection

Connection type	screwless-type terminals
Connection properties	
rigid	0.2...2.5 mm ² (AWG 24...14)
flexible without ferrule	0.2...2.5 mm ² (AWG 24...14)
flexible with ferrule	0.2...1.5 mm ² (AWG 24...16)
Stripping length	10 mm
Opening force	50 N
Test opening, diameter	2.1 mm

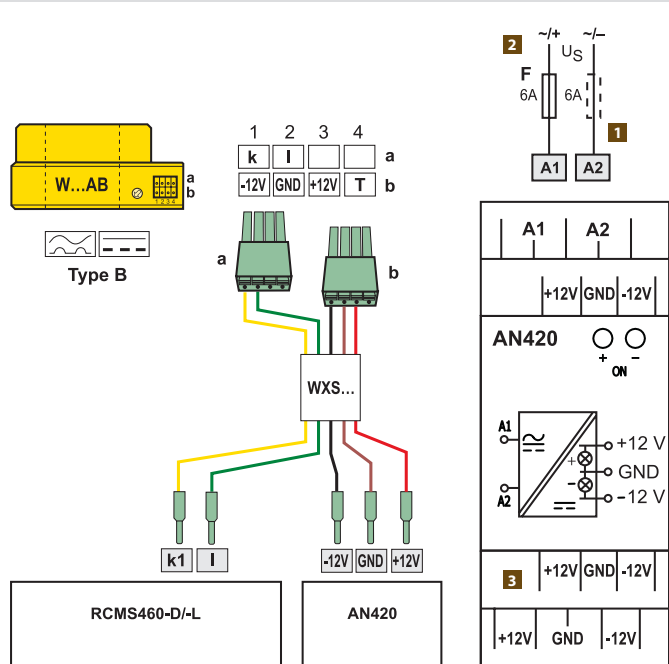
Other

Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (IEC 60529)	IP30
Degree of protection, terminals (IEC 60529)	IP30
Enclosure material	polycarbonate
Screw mounting	2 x M4 with mounting clip
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Operating Manual	BP409017
Weight	≤ 140 g

Dimension diagram (dimensions in mm)



Wiring diagram



- 1 Supply voltage U_S
- 2 Short-circuit protection for U_S , 6 A fuse recommended
- 3 Symmetrical output voltage

Colour coding for the conductors of the WXS... connecting cable

k1 = yellow, I = green, - 12 V = black, GND = brown, + 12 V = red

5.1

AN450

Power supply unit



Typical applications

- Supply of Bender devices - with AC 20 V and a power consumption of maximum 9 VA

Approvals



Device features

- Power supply unit for the supply of Bender devices with AC 20 V and a power consumption of maximum 9 VA
- Supply of 3 MK2430/1 MK800 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) and IEC 61558-1.

Further information

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

Ordering information

Output voltage	Supply voltage U_s	Type	Art. No.
AC	AC		
20 V, 50...60 Hz	230 V, 50...60 Hz	AN450	B 924 201
	127 V, 50...60 Hz	AN450-133	B 924 203

Technical data

Insulation coordination acc. to IEC 60664-1

Rated insulation voltage	AC 250 V
Rated impulse withstand voltage/pollution degree	4 kV/3

Supply voltage

Supply voltage U_s	see ordering information
Frequency range U_s	see ordering information
Operating range U_s	0.85...1.1 x U_e
Power consumption	≤ 9 VA
Output voltage	AC 20 V, 50...60 Hz
Rated output	≤ 9 VA
Secondary protection	PTC resistors

Environment/EMC

EMC immunity	IEC 61000-6-2
EMC emission	IEC 61000-6-3
Classification of climatic conditions acc. to IEC 60721	
Stationary use	3K5
Transport	2K3
Long-time storage	1K4
Ambient temperature, operation	-10...+55 °C
Classification of mechanical conditions acc. to IEC 60721	
Stationary use/transport/long-time storage	3M4/2M2/1M3

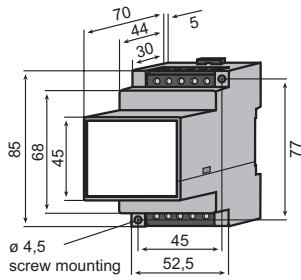
Connection

Connection	screw-type terminals
Connection properties	
rigid/flexible/conductor sizes	0.2...4/0.2...2.5 mm ² (AWG 22...12)
flexible with ferrule, without/with plastic sleeve	0.25...2 mm ²
Stripping length	8 mm
Tightening torque	0.5 Nm

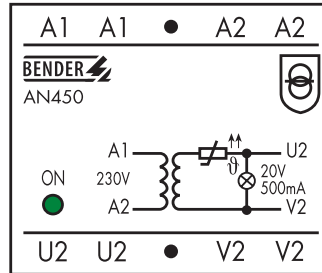
Other

Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components DIN EN 60529 (VDE 0470-1)	IP30
Degree of protection, terminals (DIN EN 60529 (VDE 0470-1))	IP20
Type of enclosure	X440
Screw mounting	2 x M4
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94V-0
Operating manual	BP203003
Weight	≤ 400 g

Dimension diagram (dimensions in mm)

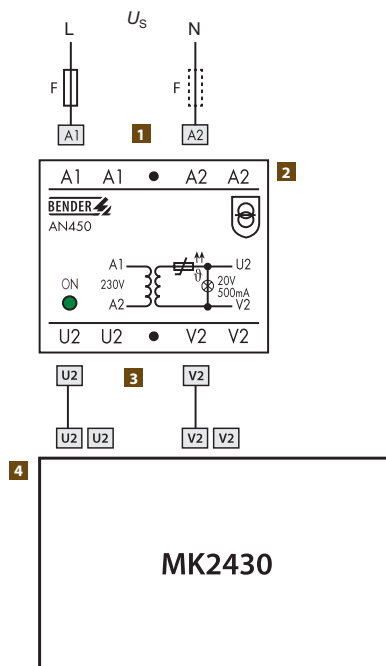


Displays and controls



Operation LED (green) "ON" lights, when the device is in operating state.

Wiring diagram



1 A1, A2 = supply voltage U_s ; F = short circuit protection

2 Power supply unit AN450

3 U2, V2 = output voltage

4 Alarm indicator and test combination

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.com.

Typical applications

- The analogue measuring instruments of the 96.../72... series for indication of measured values from Bender devices utilising an appropriate output

Ordering information

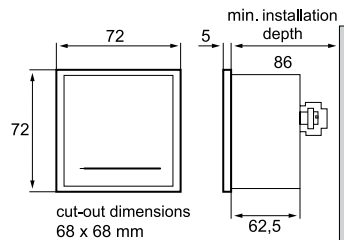
Suitable ISOMETER®/RCM	Input current	Dimensions	Type	Art. No.
IR470LY-4..., IRDH275/375	0...400 µA	72 x 72 mm	7204-1421	B 986 763
		96 x 96 mm	7204S-1421	B 986 804
IRDH275B/375B/575	0...20 mA	96 x 96 mm	9604-1421	B 986 764
			9604S-1421	B 986 784
IR470LY2-6...	0...400 µA	96 x 96 mm	9620-1421	B 986 841
			9620S-1421	B 986 842
IRDH275B/375B/575	0...20 mA	72 x 72 mm	9604-1621	B 986 782
			7220-1421	B 986 844
			7220S-1421	B 986 848

Technical data

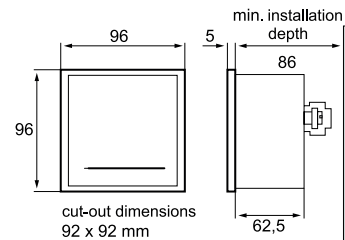
Test voltage	3 kV	Protection class acc. to DIN 40050	
Accuracy class acc. to DIN 43780	1.5	Enclosure	IP52
Normal position	vertical +5°	Terminals	IP00
Temperature range	-25...+40 °C	Terminals with contact protection	

Dimension diagram (dimensions in mm)

7204/7220



9604/9620



DI-1DL

Interface repeater for RS-485 bus extension



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 85...260 V, AC 50...60 Hz

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

Further information

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

Ordering information

Supply voltage U_s	Type	Art. No.
AC		
85...260 V, 50...60 Hz	DI-1DL	B 9501 2047

Technical data

Supply voltage

Supply voltage U_s	AC 85...260 V, 50...60 Hz
Power consumption	0.1 A/7 W

Interfaces

BMS

Interface/protocol	2 x RS-485/BMS
Baud rate	dynamic
Cable length	≤ 1200 m
Cable (twisted in pairs, one end of shield connected to PE)	recommended: J-Y(St)Y min. 2 x 0.8
Data direction switchover	automatically
Cascading option	yes
Number of bus devices:	31 additional bus devices per repeater, cascading allows a virtually unrestricted number of connections
Integrated terminating resistor adjustable by a switch or externally	—
Device address, BMS bus	—
Alarm LEDs	activity indication: direction, faults (green) internal operating voltage (red)

Environment

Operating temperature	0...+70 °C
-----------------------	------------

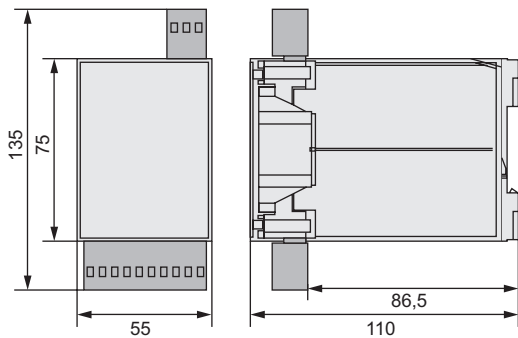
Connection

Connection	push-wire/plug-in terminals
------------	-----------------------------

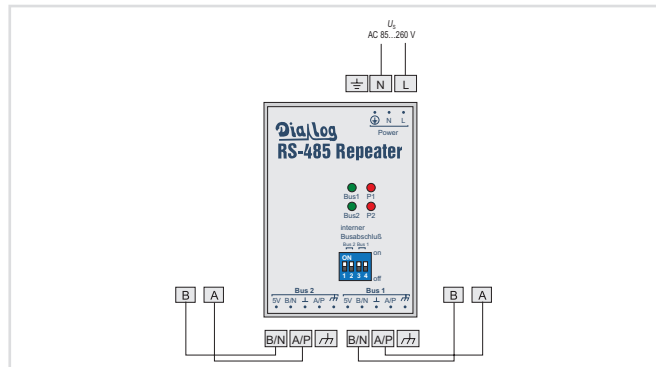
Other

Operating mode	continuous operation
Mounting	any position
Enclosure	for standard DIN rail 32 mm (approx. 110 x 75 x 55)
Operating manual	DiaLog RS-485 repeater type CN-2-1
Weight approx.	90 g

Dimension diagram (dimensions in mm)



Wiring diagram



Note:

Take the BMS bus termination into account: When the terminating resistors are switched on with the DIP switches, additional resistors will be connected. Address 1 of the BMS bus makes these resistors available. Since only one resistor is required for each bus segment, it is recommended to use only external resistors in the bus segment where the device with address 1 is located.

DI-2

RS-232/RS-485 interface converter



Approvals



Device features

- Plastic enclosure for DIN rail mounting
- Electrical separation between the input and output circuit
- Supply voltage DC 10...30 V

Typical applications

- Conversion of RS-232 signals into RS-485 signals
- Parameterisation of alarm indicator and operator panels (MK800, MK2430) with RS-485 interface via PC with RS-232 interface using software

Further information

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

Ordering information

Supply voltage ¹⁾ U _S	Type	Art. No.
DC	DI-2	B 9501 2022
10...30V		

¹⁾ Absolute values

Technical data

Insulation coordination acc. to IEC 60664-1

Rated voltage	
Rated impulse voltage/pollution degree	3 kV/3

Supply voltage

Supply voltage U _S	see ordering information
Power consumption	≤ 2.2 W

Interfaces

BMS

Interface/protocol	1 x RS-485/-
Baud rate	9.6...115.2 kbit/s
Cable length	≤ 1200 m
Cable (twisted in pairs, one end of shield connected to PE)	recommended: J-Y(St)Y min. 2 x 0.8
Mode	-
Connection	DATA + (A), DATA - (B)
Terminating resistor	120 Ω (0.25 W)
Device address, BMS bus	-
Serial interface	1 x RS-232
Alarm LEDs	ON

Environment/EMC

EMC immunity/EMC emission	EN 61000-6-2/EN 61000-6-4
Classification of climatic conditions acc. to IEC 60721	
Stationary use	3K5
Transport	2K3
Long-time storage	1K4
Ambient temperature, operation	-10...+55 °C
Classification of mechanical conditions acc. to IEC 60721	
Stationary use	3M4
Transport	2M2
Long-time storage	1M3

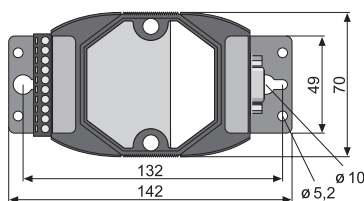
Connection

Connection	screw-type terminals
Connection rigid/flexible/conductor sizes	0.5...2.5 mm ² (AWG 22...12)

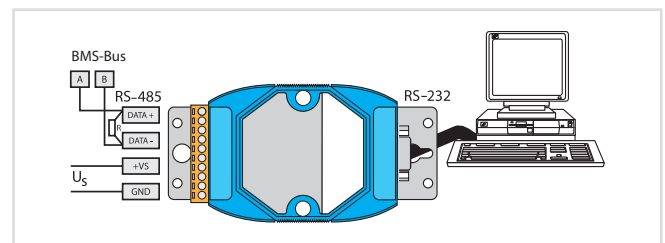
Other

Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (IEC 60529)	IP30
Degree of protection, terminals (IEC 60529)	IP30
Screw mounting	2 x M3
DIN rail mounting acc. to	IEC 60715
Operating manual	TBP109010
Weight	≤ 160 g

Dimension diagram (dimensions in mm)



Wiring diagram



DI-2 for the integration of a personal computer utilising an RS-232 interface into a BMS network.

Note:

Terminate both ends of the BMS bus with 120 Ω resistors (R)

DI-2USB

Interface converter USB to RS-485



Device features

- Plastic enclosure
- Electrical separation between the input and output circuit
- Power supply via USB port
- USB cable and driver CD included in the scope of delivery

Further information

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

Typical applications

- Conversion of USB interface into RS-485 interface
- Parameterisation of alarm indicator and operator panels (MK800, MK2430) with RS-485 interface, by means of software via PC with USB interface

Ordering information

Supply voltage	Type	Art. No.
supplied by USB port, no additional power supply required	DI-2USB	B 9501 2045

Technical data

Insulation coordination acc. to IEC 60664-1

Rated voltage	
Rated impulse voltage/pollution degree	3 kV/3

Supply voltage

Supply voltage U_s	see ordering information
Power consumption	95 mVA

Interfaces

BMS

Interface/protocol	1 x RS-485/-
Baud rate	9.6...115.2 kbit/s
Cable length	≤ 1200 m
Cable (twisted in pairs, one end of shield connected to PE)	recommended: J-Y(St)Y min. 2 x 0.8
Mode	-
Connection	A, B
Integrated terminating resistors, selectable via jumper, factory setting	terminating resistors included
Device address, BMS bus	-
Serial interface	1 x USB
Alarm LEDs	ON (yellow), R x Data (green), T x Data (red)

Environment/EMC

EMC immunity/EMC emission	EN 61000-6-2/EN 61000-6-4
Classification of climatic conditions acc. to IEC 60721	
Stationary use	3K5
Transport	2K3
Long-time storage	1K4
Ambient temperature, operation	-10...+55 °C
Classification of mechanical conditions acc. to IEC 60721	
Stationary use	3M4
Transport	2M2
Long-time storage	1M3

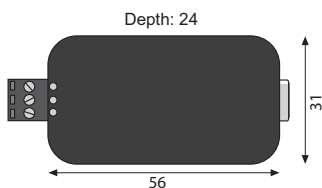
Connection

Connection	screw-type terminals/USB plug Type B
Connection rigid/flexible/conductor sizes	0.5...2.5 mm ² (AWG 22...12)

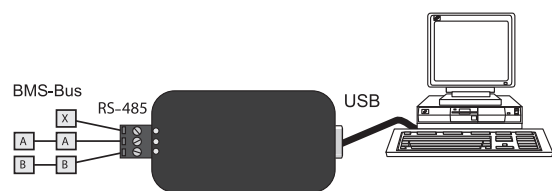
Other

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
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

COMTRAXX® COM460IP

BMS-Ethernet-Gateway



Typical applications

- Commissioning and diagnostics of BMS bus systems
- Optimum presentation and visualisation of device and system statuses supported by silverlight functions in the web browser
- Adapted system overview according to individual system description
- Selective notification to various user groups in the event of alarms
- The use of professional visualisation programs permits conversion of BMS data to Modbus/TCP protocols
- Observing and analysing communication-capable Bender products, such as RCMS, EDS and MEDICS® systems
- Simple and fast parameterisation of BMS systems, storage and documentation of settings

Approvals



(applied for 24 V)



Device features

- Modular, expandable gateway between BMS bus and TCP/IP
- Gateway between BMS bus and Ethernet
- Range of functions customisable through options
- Remote access via LAN, WAN or Internet

Device versions

Basic device

- Presentation of BMS data via a standard web browser with Silverlight plug-in
- Indication of current measured values, operational and alarm messages
- Time synchronisation for all BMS bus devices
- Integrated Ethernet switch: 2 x RJ45, 10/100 Mbit/s
- LCD for simple address setting
- Operation optionally via the internal or external BMS bus
- Modbus/TCP data access to BMS addresses 1...10 of the first internal BMS bus
- Password-protected device menu

Optional package A – Individual messages

- Assignment of individual texts for devices and measuring points (channels)
- E-mail notifications to different user groups in the event of alarms and system faults
- Monitoring for device failure
- Report function saves measured values and settings. Saved settings can be compared with the current settings made on the COM460IP.

Optional package B – Modbus/TCP expansion

- COM460IP can be operated in the internal or external BMS bus.
- More BMS addresses can be displayed via the Modbus/TCP server when used in the external BMS bus, up to 98 *150 BMS devices can be monitored (98 BMS devices external, 150 BMS devices internal)
- Up to 150 BMS devices can be operated on the internal bus
- From an external application (e.g. visualisation software) commands can be sent to BMS devices. The menu item "Modbus control commands" provides Modbus control commands for selected BMS commands. These commands can be copied to the clipboard of the PC and then included in the programming for the external application.

Optional package C – Parameter setting

- Fast, simple parameter setting of BMS devices using the web browser
- BMS devices, other than COM460IP, can only be parameterised when the gateway is operated on the internal BMS bus
- Report function saves measured values and settings of BMS devices when the gateway is operated on the internal BMS bus. Saved settings can be compared with the current settings and can be reloaded.

Optional package D – Visualisation

- Fast and simple visualisation without any programming. For example, measured values or alarms can be arranged on a floor plan and visualised.
- Displaying an overview the contents of which takes up more than one page. Jump to another view page and back to the overview page.

Further information

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

Ordering information

Supply voltage/ frequency range U_s			Power consumption	Application	Type	Optional package (software license)	Art. No.
AC/DC	DC	AC					
76...276 V, 42...460 Hz ¹⁾	–	–	5...40 VA/3.8 W	BMS-Ethernet-Gateway (basic device)	COM460IP	–	B 9506 1010
–	16...94 V	16...72 V, 50...60 Hz	≤ 4 VA	BMS-Ethernet-Gateway (basic device) 24 V	COM460IP-24V	–	B 9506 1020
–	–	–	–	Individual texts for devices/channels, e-mail in the event of an alarm	–	*Optional package A:	B 7506 1011
–	–	–	–	Modbus/TCP server with max. 14700 BMS nodes	–	Optional package B	B 7506 1012
–	–	–	–	Parameter setting for BMS devices	–	Optional package C:	B 7506 1013
–	–	–	–	Visualisation of BMS devices	–	Optional package D:	B 7506 1014

¹⁾ Absolute values

Technical data

Insulation coordination acc. to IEC 60664-1

Rated insulation voltage	AC 250 V
Rated impulse voltage/pollution degree	4 kV/3

Supply voltage

Supply voltage U_s	see ordering information
Frequency range U_s	see ordering information
Power consumption	see ordering information

Displays, memory

Display	four lines, backlit, for operating data and device menu
LEDs:	
2 x Ethernet ETH1, ETH2 act/link	lights when connected to the network, flashes during data transmission
ALARM	internal device error
COM	data traffic BMS bus
ON	operation indicator
Memory card for special device functions (micro SD card)	2 GB
E-mail configurations (option A only) and device failure monitoring	max. 250 entries
Individual texts (option A only)	max. 1200 texts with 100 characters each

Interfaces

BMS bus (internal/external):	
Interface/protocol	RS-485/BMS internal or BMS external (BMS internal)*
Operating mode	master/slave (slave)*
Baudrate BMS (internal/external)	9.6 kbit/s/57.6 kbit/s
Cable length	≤ 1200 m
Cable (twisted in pairs, one end of shield connected to PE)	recommended: J-Y(St)Y min. 2 x 0.8
Connection, BMS internal/external	terminals A, B
Terminating resistor	120 Ω (0.25 W)
Device address, BMS bus external/internal	1...99 (2)*
Ethernet:	
Connection	2 x RJ45
Data rate	10/100 Mbit/s, autodetect
DHCP	on/off (on)*
t_{off} (DHCP)	5...60 s (30 s)*
IP address	nnn.nnn.nnn.nnn (192.168.0.254)*
Netmask	nnn.nnn.nnn.nnn (255.255.0.0)*
Protocols (depending on the option selected)	TCP/IP, Modbus/TCP, DHCP, SMTP, NTP

Environment/EMC

EMC	EN 61326-1
Classification of climatic conditions acc. to IEC 60721:	
Stationary use	3K5
Transport	2K3
Long-term storage	1K4
Operating temperature	-10...+55 °C
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use	3M4
Transport	2M2
Long-term storage	1M3

Connection

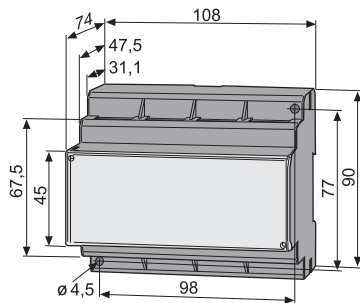
Connection	screw-type terminals
Connection	
rigid/flexible	0.2...4/0.2...2.5 mm ² (AWG 24...12)
Multi-conductor connection (2 conductors with the same cross section)	
rigid/flexible	0.2...1.5 mm ²
Stripping length	8...9 mm
Tightening torque	0.5...0.6 Nm

Other

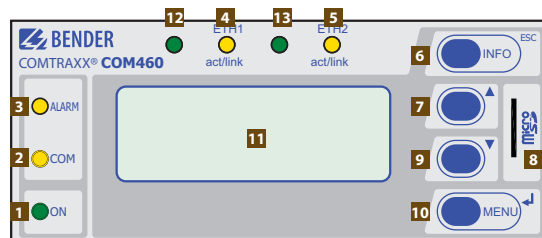
Operating mode	continuous operation
Mounting	display oriented
Degree of protection, internal components (IEC 60529)	IP30
Degree of protection, terminals (IEC 60529)	IP20
Type of enclosure	X460
Screw mounting	2 x M4
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94V-0
Software version	D271 V2.5x D278 V2.5x
Weight	≤ 310 g

(*) = factory setting

Dimension diagram (dimensions in mm)

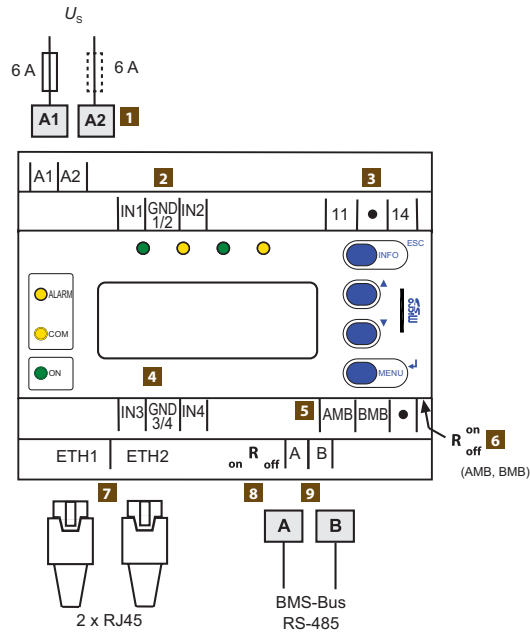


Displays and controls



- | | |
|--|---|
| <p>1 "ON" LED lights when supply voltage is applied</p> <p>2 "COM" LED lights when the gateway is responding to BMS requests</p> <p>3 "ALARM" LED lights when an internal device error occurs</p> <p>4 LED "ETH1 act/link" flashes when data is being transmitted</p> <p>5 LED "ETH2 act/link" flashes when data is being transmitted</p> <p>6 "INFO" button to query the COM460IP for device-specific information
ESC To exit the menu function without changing parameters</p> <p>7 "▲" button: to move up in the menu, to increase the parameter value</p> | <p>8 Micro-SD card</p> <p>9 "▼" button: to move down in the menu, to decrease values</p> <p>10 "MENU" button for starting and exiting the menu
"↵" button to confirm parameter change</p> <p>11 LC display for standard and menu mode</p> <p>12 no function (reserve)</p> <p>13 no function (reserve)</p> |
|--|---|

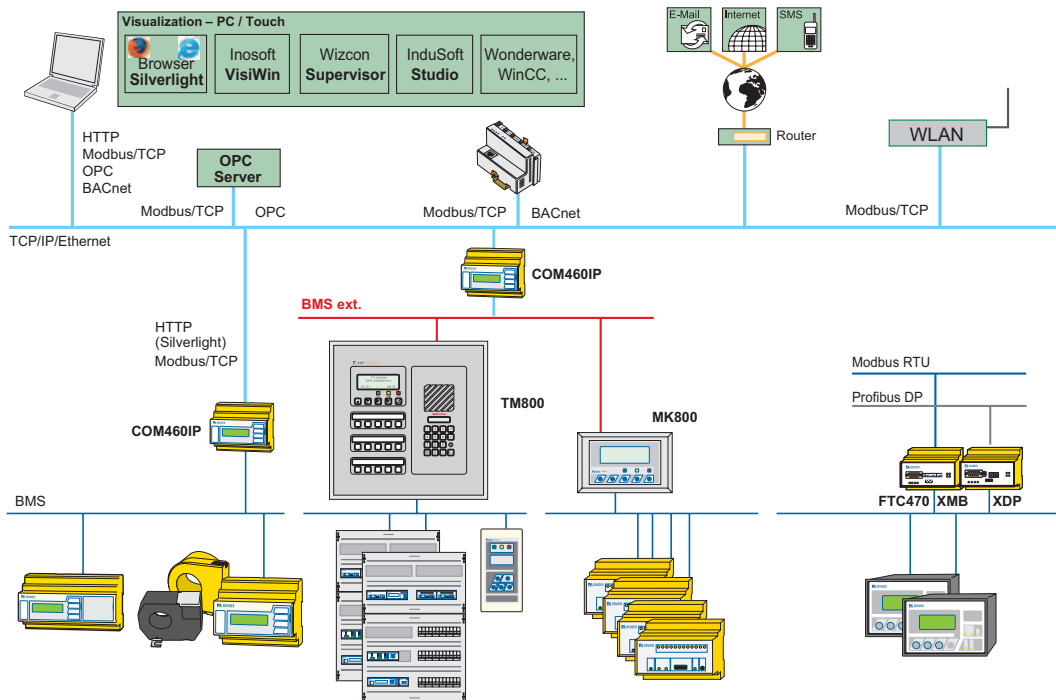
Wiring diagram



- 1** Connection to the supply voltage, 6 A fuse recommended, IT systems require two fuses. For UL and CSA applications, it is mandatory to use 5 A fuses
- 2** Currently has no function (digital inputs)
- 3** Currently has no function (alarm relay K1)
- 4** Currently has no function (digital inputs)
- 5** Currently has no function
- 6** Currently has no function

- 7** Two connections to: a personal computer or to the local network (Hub, Switch, Router); Connection with a CAT5 cable; internal Layer-2-Switch with cable autodetect
- 8** Connection BMS bus (internal or external) with shielded cable (e.g. J-Y(St)Y 2x0.8)
- 9** Switch for BMS bus termination. When the device is installed at the end of the bus, set the terminating switch to "on"

Application example – BMS system integration



COMTRAXX® COM461MT

BMS-Ethernet-Gateway



Device features

- Setting of the IP address, BMS address and time/date using Standard web browser
- Time synchronisation for all BMS bus devices
- Integrated Ethernet switch: 2 x RJ45, 10/100 Mbit/s
- Can be operated on the internal BMS bus
- Modbus/TCP data access to the internal BMS bus, max. 150 BMS devices
- Commands can be sent from an external application (e.g. visualisation software) to BMS devices and measured values read.

Typical applications

- The use of professional visualisation programs by converting the BMS data to the Modbus/TCP protocol
- Observing and analysing Bender products that support communication, such as RCMS, EDS and MEDICS® systems

Further information

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

Ordering information

Supply voltage/ frequency range U_s	Supply voltage/ frequency range U_s For UL application		Power consumption	Type	Art. No.
	AC/DC	AC			
76...276 V ¹⁾ , 42...460 Hz	76...250 V, 25...60 mA, 42...460 Hz	76...250 V, 6...21 mA	≤ 6,5 VA	COM461MT	B 9506 1021

¹⁾ Absolute values

Technical Data

Insulation coordination acc. to IEC 60664-1

Rated insulation voltage	AC 250 V
Rated impulse voltage/pollution degree	4 kV/3

Supply voltage

Supply voltage U_s	see ordering information
Frequency range U_s	see ordering information
Power consumption	see ordering information

LED indicators

2 x Ethernet ETH1, ETH2 act/link	lights when connected to the network, flashes during data transmission
ON	operation indicator

Interfaces

BMS bus internal:

Interface/protocol	RS-485/BMS bus internal
Operating mode	master/slave (slave)*
Baud rate BMS internal	9.6 kbit/s
Cable length	≤ 1200 m
Cable (twisted pair, shielded, shield connected to PE on one side)	recommended: J-Y(St)Y 2x0.8
Connection, BMS internal	terminals A, B
Terminating resistor	120 Ω (0.25 W)
Device address, BMS bus internal	1...99 (2)*

Ethernet:

Connection	2 x RJ45
Data rate	10/100 Mbit/s, autodetect
IP address	nnn.nnn.nnn.nnn (192.168.0.254)*
Netmask	nnn.nnn.nnn.nnn (255.255.0.0)*
Protocols	TCP/IP, Modbus/TCP, NTP

General data

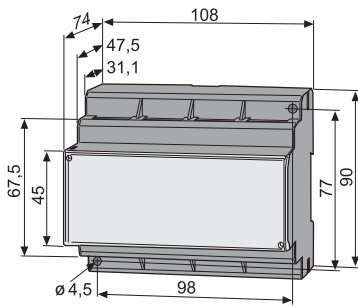
EMC	EN 61326-1
Classification of climatic conditions acc. to IEC 60721:	
Stationary use	3K5
Transport	2K3
Long-term storage	1K4
Operating temperature	-10...+55 °C
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use	3M4
Transport	2M2
Long-term storage	1M3
Operating mode	continuous operation
Mounting	display oriented

Connection

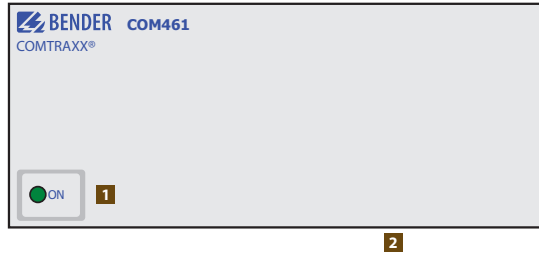
Connection	screw-type terminals
Connection properties:	
Rigid/flexible	0.2...4/0.2...2.5 mm ² (AWG 24...12)
Multi-conductor connection (2 conductors with the same cross section):	
rigid/flexible	0.2...1.5 0.2...1.5 mm ²
Stripping length	8...9 mm
Tightening torque	0.5...0.6 Nm
Degree of protection, internal components (IEC 60529)	IP30
Degree of protection, terminals (IEC 60529)	IP20
Type of enclosure	X460
Screw mounting	2 x M4
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94V-0
Software version	D402 V1.0x
Weight	≤ 310 g

()* = factory setting

Dimension diagram (dimensions in mm)



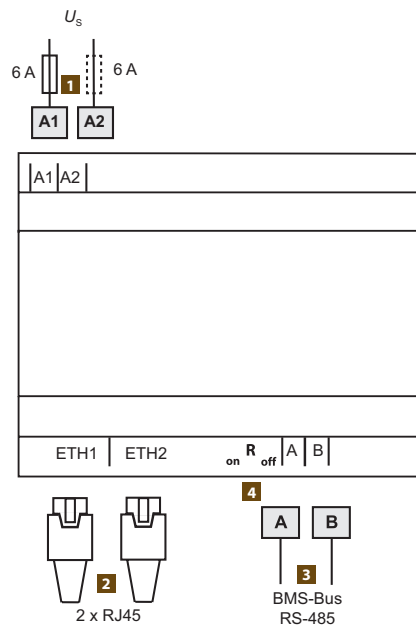
Operating elements



1 "ON" LED lights when supply voltage is applied

2 $R_{on/off}$ (beside terminals A, B)
Switch for terminating the BMS bus. When the device is installed at the end of the bus, set the terminating switch to "on".

Wiring diagram



- 1** Connection to the supply voltage, 6 A fuse recommended, two-pole fuses should be used on IT systems. For UL and CSA applications, it is mandatory to use 5 A fuses.
- 2** Two connections for connection to a personal computer or connection to the local network (hub, switch, router); Connection using a CAT5 cable; internal Layer-2-Switch with cable autodetect.

- 3** Connection to the internal BMS bus with shielded cable (e.g. J-Y(St)Y 2x0.8)
- 4** Switch for BMS bus termination. When the device is installed at the end of the bus, set the terminating switch to "on".

FTC470XMB

Protocol converter to interface the BMS bus with Modbus/RTU



Device features

- Modbus/RTU interface for communication with higher-level systems (building management systems or visualisation software)

Typical applications

- Transmitting all BMS data to Modbus/RTU
- Displaying Bender data on Modbus/RTU-compatible software
- Reactions on the Modbus/RTU side to BMS events
- Control of BMS systems via Modbus/RTU
- Connection to Modbus/RTU-compatible building services management systems
- Reactions on the BMS side to events on the Modbus/RTU side

Further information

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

Approvals



Ordering information

Supply voltage ¹⁾ U _S	Type	Art. No.
AC/DC	FTC470XMB	B 9506 1002
85...276 V		

¹⁾ Absolute value

Technical data

Insulation coordination acc. to IEC 60664-1

Rated insulation voltage	AC 250 V
Rated impulse voltage/pollution degree	4 kV/3

Supply voltage

Supply voltage U _S	see ordering information
Frequency range U _S	AC 50...400 Hz, DC
Power consumption	≤ 12 VA

Interfaces

BMS

Interface/protocol	RS-485/BMS (internal)
Baud rate	9.6 kbit/s
Cable length	≤ 1200 m
Cable (twisted in pairs, one end of shield connected to PE)	recommended: J-Y(St)Y min. 2 x 0.8
Mode	Master/Slave
Connection	terminals A/B
Terminating resistor	120 Ω (0.25 W)
Device address, BMS bus	DIP switch 1...30
Alarm LEDs	ON/ALARM/FAULT/BMS

Modbus

Interface/protocol	RS-485/Modbus/RTU
Mode	Modbus/RTU slave
Connection	9-pin SUB-D
Alarm LEDs	ACTIVE/BF (bus error)/DIAG/RUN
Baud rate	1.2...57.6 kbit/s
Terminating resistor	DIP switch
Address assignment Modbus/RTU	DIP switches 1...127

Environment/EMC

EMC immunity	EN 61000-6-2
EMC emission	EN 61000-6-4
Classification of climatic conditions acc. to IEC 60721	
Stationary use	3K5
Transport	2K3
Long-time storage	1K4
Operating temperature	-10...+55 °C
Classification of mechanical conditions acc. to IEC 60721	
Stationary use	3M4
Transport	2M2
Long-time storage	1M3

Connection

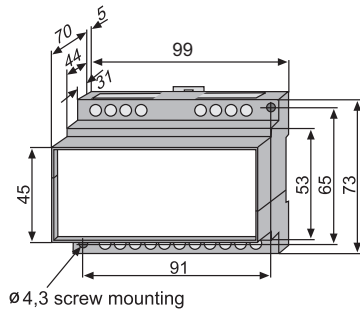
Connection	screw-type terminals
Connection properties	
rigid/flexible/conductor sizes	0.2...4/0.2...2.5 mm ² (AWG 22...12)
flexible with ferrule, without/with plastic sleeve	0.25...2 mm ²
Stripping length	8 mm
Tightening torque	0.5 Nm

Other

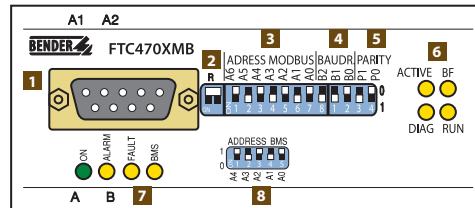
Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (IEC 60529)	IP30
Degree of protection, terminals (IEC 60529)	IP30
Type of enclosure	X470
Screw mounting	2 x M4
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Operating manual	TGH1367
Weight	≤ 360 g

5.2

Dimension diagram (dimensions in mm)

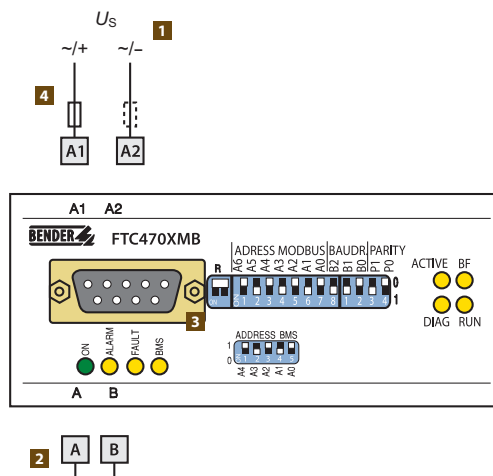


Displays and controls



- | | |
|--|---|
| <ul style="list-style-type: none"> 1 Socket for Modbus/RTU cable: 9-pin SUB-D 2 Micro switch for Modbus/RTU termination: "ON" = terminating resistor activated 3 DIP switches for binary addressing of Modbus/RTU: 1...127 4 DIP switches for binary baud rate setting of Modbus/RTU: 1200...57600 bit/s | <ul style="list-style-type: none"> 5 DIP switches for binary parity setting of Modbus/RTU: none/even/odd 6 Modbus/RTU status indication 7 BMS bus status indication 8 DIP switches for binary BMS bus address setting: 1...30 |
|--|---|

Wiring diagram



- | | |
|--|---|
| <ul style="list-style-type: none"> 1 Supply voltage $U_s = AC/DC 85...276 V$ 2 Connection BMS bus | <ul style="list-style-type: none"> 3 Modbus/RTU 9-pin SUB-D 4 U_s see ordering information, 6 A fuse recommended |
|--|---|

FTC470XDP

Protocol converter to interface the BMS bus to the PROFIBUS DP



Device features

- PROFIBUS DP interface for communication with higher-level systems (building management systems or visualisation software)

Typical applications

- Conversion of BMS data into PROFIBUS DP data
- Querying and setting communication-capable Bender devices, such as RCMS, EDS and MEDICS® systems
- Transmitting all BMS data to PROFIBUS DP
- Displaying Bender data on PROFIBUS-capable software
- Reactions on the PROFIBUS side to BMS events
- Connection to PROFIBUS-capable building services management systems
- Reactions on the BMS side to events on the PROFIBUS DP side

Approvals



Further information

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

Ordering information

Supply voltage ¹⁾ U _S	Type	Art. No.
AC/DC		
85...276 V	FTC470XDP	B 9506 1000

¹⁾ Absolute value

Technical data

Insulation coordination acc. to IEC 60664-1

Rated insulation voltage	AC 250 V
Rated impulse voltage/pollution degree	4 kV/3

Supply voltage

Supply voltage U _S	see ordering information
Frequency range U _S	AC 50...400 Hz, DC
Power consumption	≤ 12 VA

Interfaces

BMS

Interface/protocol	RS-485/BMS (internal)
Baud rate	9.6 kbit/s
Cable length	≤ 1200 m
Cable (twisted in pairs, one end of shield connected to PE)	recommended: J-Y(St)Y min. 2 x 0.8
Mode	master/slave
Connection	terminals A/B
Terminating resistor	120 Ω (0.25 W)
Device address, BMS bus	DIP switch 1...30
Alarm LEDs	ON/ALARM/FAULT/BMS

PROFIBUS DP

Interface/protocol	RS-485/PROFIBUS DP
Mode	PROFIBUS DP slave
Connection	9-pin SUB-D
Alarm LEDs	Run/DIAG/BF (bus error)
Baud rate	9.6 kbit/s...12 Mbit/s automatic recognition
Terminating resistor	DIP switch
Address assignment PROFIBUS DP	rotary switch, 1...99

Environment/EMC

EMC immunity	EN 61000-6-2
EMC emission	EN 61000-6-4
Classification of climatic conditions acc. to IEC 60721	
Stationary use	3K5
Transport	2K3
Long-time storage	1K4
Operating temperature	-10...+55 °C
Classification of mechanical conditions acc. to IEC 60721	
Stationary use	3M4
Transport	2M2
Long-time storage	1M3

Connection

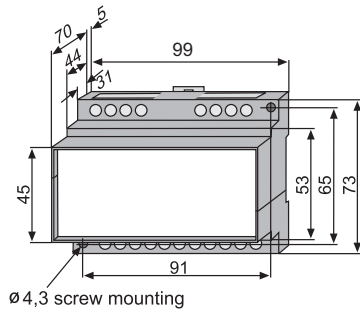
Connection	screw-type terminals
Connection properties	
rigid/flexible/conductor sizes	0.2...4/0.2...2.5 mm ² (AWG 22...12)
flexible with ferrule, without/with plastic sleeve	0.25...2 mm ²
Stripping length	8 mm
Tightening torque	0.5 Nm

Other

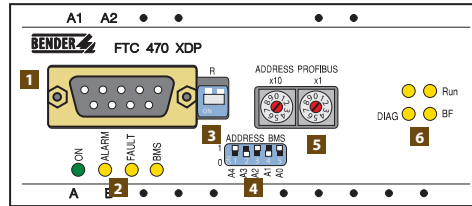
Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (IEC 60529)	IP30
Degree of protection, terminals (IEC 60529)	IP30
Type of enclosure	X470
Screw mounting	2 x M4
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Operating manual	TGH1358
Weight	≤ 360 g

5.2

Dimension diagram (dimensions in mm)

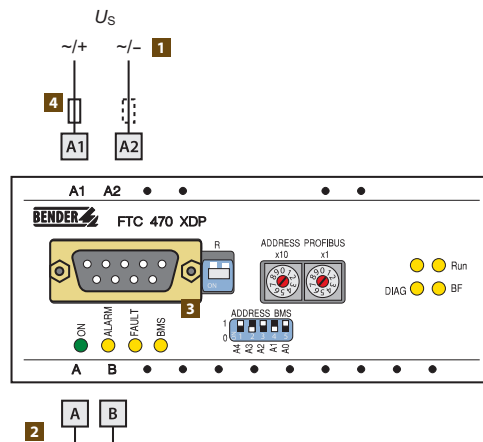


Displays and controls



- | | |
|---|---|
| <ul style="list-style-type: none"> 1 Socket for PROFIBUS cable: 9-pin SUB-D 2 BMS bus status indication 3 Micro switch for PROFIBUS DP termination: "ON" = terminating resistor activated | <ul style="list-style-type: none"> 4 Switch for BMS bus address setting: 1...30 5 Rotary switch for PROFIBUS DP address setting: 1...99 6 PROFIBUS DP status indication |
|---|---|

Wiring diagram



- | | |
|--|---|
| <ul style="list-style-type: none"> 1 Supply voltage $U_s = AC/DC 85...276 V$ 2 Connection BMS bus | <ul style="list-style-type: none"> 3 Modbus/RTU 9-pin SUB-D 4 U_s see ordering information, 6 A fuse recommended |
|--|---|

COMTRAXX® CP700

Condition Monitor for Bender BMS devices and universal measuring devices



Typical applications

- Clear information about device and system statuses via 7-inch touch screen
- Specific system overview according to individual system description
- Display und visualisation of device and system statuses via web browser
- Selective e-mail notification to various user groups in the event of alarms
- Support of professional visualisation programs
- Observing and analysing of Bender products with communication capabilities (universal measuring devices, RCMS, Isometer, EDS systems)
- Parameter setting for devices, storing, documentation and restoring of parameters in a clear and practice-oriented manner
- Remote diagnosis, remote maintenance

Device features

- Condition Monitor for Bender BMS devices and universal measuring devices
- 7" TFT WVGA Color Display
- Analogue resistive touch screen
- Small mounting depth
- Fanless operation
- Integrated gateway to Ethernet (TCP/IP), 10/100/1000 Mbit/s
- Remote access via LAN, WAN or Internet
- Can be operated on the internal BMS bus

Device characteristics

Basic device

- Display of currently measured values, operating and alarm messages from Bender BMS devices and Bender universal measuring devices on the touch screen
- Remote indication of data from Bender BMS devices and Bender universal measuring devices using a standard web browser with Silverlight plug-in
- Time synchronisation for all BMS bus devices and Bender universal measuring devices
- Easy address setting via touch screen
- Password-protected device menu

Individual texts

- Assignment of individual texts for devices and measuring points (channels) and alarms
- E-mail notifications to different user groups according to a time controlled schedule in the event of alarms and system faults
- Monitoring for device failure

Modbus/TCP

- Uniform access to all Bender devices assigned to the CP700 via the integrated Modbus/TCP server (max. 247 devices)
- Bender BMS devices can be controlled by an external application (e.g. visualisation or SPS) via Modbus/TCP
- Support of professional visualisation programs by the Modbus/TCP protocol

Parameter setting

- Fast, simple parameter setting of BMS devices using the PC's web browser.
- Report function saves measured values and settings. Saved settings can be compared with the current settings and can be reloaded.

Visualisation

- Fast and easy visualisation on a personal computer without previous knowledge of computer programming. Measured values or alarms can be arranged in front of a graphic (system diagram, room plan) and displayed
- Multipage documents supported

Further information

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

Ordering information

Supply voltage/frequency range U_s	Power consumption	Type	Art. No.
DC			
24V/± 25 %	24 W	CP700	B 9506 1030

5.2

Technical data

Insulation coordination acc. to IEC 60664-1

Rated insulation voltage	AC 250 V
Rated impulse voltage/pollution degree	4 kV/3

Supply voltage

Supply voltage U_s	see ordering information
Frequency range U_s	see ordering information
Power consumption	see ordering information

Displays, memory

Display	7" TFT WVGA Color
LEDs	Power, CF, Link, Run, Master/Slave
Button	Power, Reset
Buzzer	yes
Memory card for special device functions (CF card)	4 GB
E-mail configuration and device failure monitoring	max. 250 entries
Individual texts	max. 1200 texts with 100 characters each
Devices that can be displayed	max. 247

Interfaces

BMS bus:

Interface/protocol	RS-485/BMS internal
Operating mode (max. one CP700 per bus)	master/slave (slave)*
Device address, BMS bus	1...99 (2)*
Baud rate BMS	9.6 kbit/s

Modbus/RTU:

Interface/protocol	RS-485/Modbus/RTU
Operating mode	master
Baud rate Modbus/RTU	1.2 kbit/s ... 57.6 kbit/s

Cable length	≤ 1200 m
Cable (twisted pairs, shielded, shield connected to PE on one side)	recommended: J-Y(St)Y min. 2x0.8
Connection, BMS	terminals A, B
Connection, Modbus/RTU	terminals D+, D-
Terminating resistor	120 Ω (0.25 W)

Ethernet:

Connection	RJ45
Data rate	10/100/1000 Mbit/s, autodetect
DHCP	on/off (on)*
t_{off} (DHCP)	5...60 s (30 s)*
IP address	nnn.nnn.nnn.nnn (192.168.0.254)*
Netmask	nnn.nnn.nnn.nnn (255.255.0.0)*
Protocols	TCP/IP, Modbus/TCP, DHCP, SMTP, NTP

Additional interface protocols connection to SCADA systems and/or PLC via OPC, BACnet or other protocols on request

Environment/EMC

EMC	EN 61326-1
Classification of climatic conditions acc. to IEC 60721:	
Stationary use	3K5
Transport	2K3
Long-term storage	1K4
Operating temperature	0...+55 °C
Ventilation	fanless
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use	3M4
Transport	2M2
Long-term storage	1M3

Connection

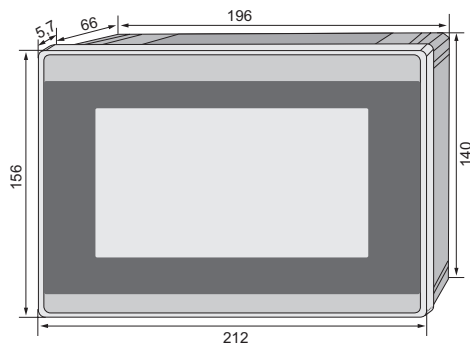
Connection	plug connectors
------------	-----------------

General data

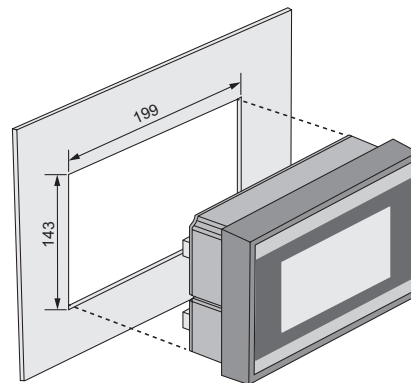
Operating mode	continuous operation
Mounting	display oriented
Degree of protection, on the front (IEC 60529)	IP65
Degree of protection, on the rear (IEC 60529)	IP20
Type of enclosure	panel mounting
Control panel cut-out	199x143 mm
Screw mounting	with mounting brackets
Flammability class	UL94V-0
Weight	≤ 1200 g

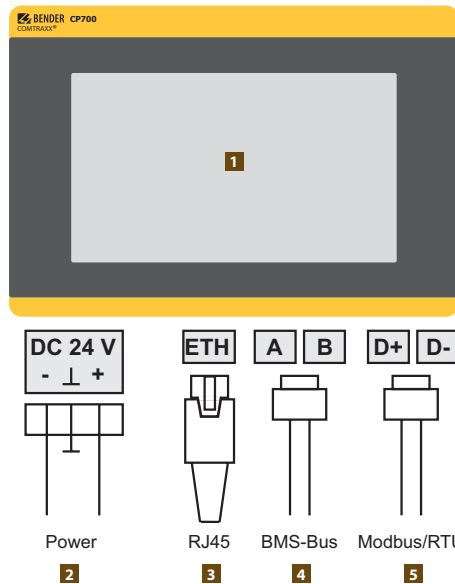
()* = factory setting

Dimension diagram (dimensions in mm)



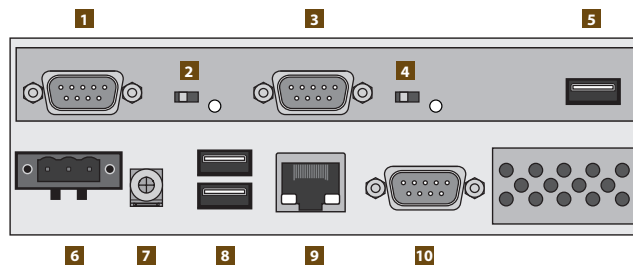
Control panel cut-out (dimensions in mm)





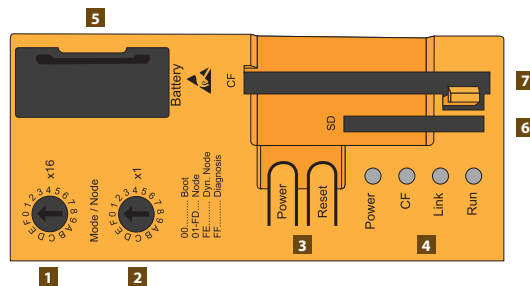
- 1** LC display with touch screen for standard and menu mode
- 2** Connection to supply voltage, DC 24 V
- 3** RJ45 connection for connection to personal computer resp. to the local network
- 4** Connection BMS bus (cable included in the scope of delivery)
- 5** Connection Modbus/RTU (cable included in the scope of delivery)

Interfaces



- 1** Interface Modbus/RTU
- 2** Switch and LED master/slave for interface Modbus/RTU
- 3** BMS bus (Bender measuring device interface)
- 4** Switch and LED master/slave for BMS bus
- 5** USB interface, without function
- 6** Connection of supply voltage, DC 24 V
- 7** Functional earth
- 8** USB interfaces, without function
- 9** Ethernet 10/100/1000, port for connection to the personal computer resp. to the local network (hub, switch, router)
- 10** RS-232 interface, without function

Rear cover

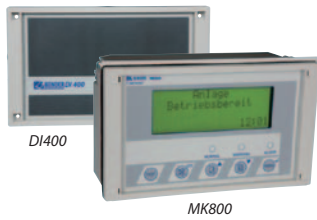


- 1** Mode/node switch x16
- 2** Mode/node switch x1
- 3** Buttons: Power, Reset
- 4** LEDs: Power, CF, Link, Run
- 5** Battery
- 6** SD memory card slot
- 7** Compact flash card slot

5.2

COMTRAXX® MK800 (DI400)

Alarm indicator and test combination with LCD



DI400

MK800

Typical applications

MK800

- 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

DI400

- Expansion module for Bender monitoring systems exchanging data via the BMS bus

Device features

- Display of operating status, warning and alarm messages from Bender monitoring systems
- Backlit clear LC text display (4 x 20 characters, 8 mm)
- Additional text to be displayed, if required.
- A set of LEDs, red, yellow and green, allowing warning and alarm messages to be indicated in an order of priority
- Predefined standard texts in 21 languages
- 1000 freely programmable message texts
- Easy parameter setting with PC (USB interface) or menu
- Memory with real-time clock to store 1000 warning and alarm messages with date and time stamp
- 16 digital inputs (option)
- One programmable relay (option)
- Five large function buttons
- Versions available for flush and surface mounting as well as for mounting into cavity walls or for door mounting
- Non-reflecting, multicoloured foil
- Smooth surfaces without openings to meet the hygiene requirements for medical locations

Standards

The MK800 alarm indicator and test combination meets the requirements for installation: DIN VDE 0100-710 (VDE 0100 Part 710) and IEC 60364-7-710.

Further information

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

Approvals

MK800



Ordering information

Enclosure	Indication	Digital inputs/relay outputs	Type	Art. No.
Flush-mounting enclosure	LCD	16/1	MK800-11	B 9510 0100
	3 LEDs	–	MK800-12	B 9510 0101
Surface mounting	LCD	16/1	MK800A-11	B 9510 0102
	3 LEDs	–	MK800A-12	B 9510 0103
Surface mounting, front door	LCD	16/1	MK800AF-11	B 9510 0104
	3 LEDs	–	MK800AF-12	B 9510 0105
Built-in type without enclosure	LCD	16/1	MK800E-11	B 9510 0106
	3 LEDs	–	MK800E-12	B 9510 0107
Surface mounting	3 LEDs	16/1	DI400-11	B 9510 0113
		–	DI400-12	B 9510 0114

Accessories

Type designation	Type	Art. No.
Parameterisation software	TMK-SET V3.xx	as Internet download
Flush-mounting enclosure for MK800	UP800	B 9510 0110
Bezel frame silver for MK800	BR800-1	B 9510 0111
Bezel frame white for MK800	BR800-2	B 9510 0112

Suitable system components

Type designation	Type	Page
Power supply unit	AN410	251

Technical data

Insulation coordination acc. to IEC 60664-1

Rated insulation voltage	AC 250 V
Rated impulse withstand voltage/pollution degree	4 kV/3

Supply voltage

Supply voltage U_s	AC/DC 24 V
Frequency range U_s	AC 40...60 Hz, DC
Operating range U_s	AC 18...28 V/DC 18...30 V
Power consumption	≤ 5 VA

Displays and LEDs

Four-line display, (MK800 only)	4 x 20 characters
Standard message texts in	21 languages
Alarm addresses configurable	250
Programmable text messages	1000
History memory (messages)	1000
Standard text message	3 x 20 characters
Additional text message (press button to access)	3 x 20 characters
Indication LEDs (three different colours)	NORMAL (green) WARNING (yellow) ALARM (red)

Menu texts	German/ English
Buttons	5 (Isometer test, buzzer mute, additional text, scroll, menu)

Buzzer

Buzzer message	can be acknowledged, with new value operation
Buzzer interval	configurable
Buzzer frequency	configurable
Buzzer repetition	configurable

Inputs (MK800-11/DI400-11 only)

Digital inputs	16 (IN1...IN16)
Galvanically isolated	
Control of digital inputs via voltage-free contacts/ extraneous voltage	
Operating principle: N/O, N/C operation, off, selectable for each input	
Factory setting	off
Voltage range (high)	AC/DC 10...30 V
Voltage range (low)	AC/DC 0...2 V

Interface internal/external

Interface/protocol	2 x RS-485/BMS
Baud rate internal/external (default setting)	9.6 kbit/s/57.6 kbit/s
Cable length	≤ 1200 m
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
Device address, BMS bus internal/external	1(...150)/1...99
Factory setting device address internal/external	1 (master)

Programming

Interfaces	RS-485/BMS/USB
Software TMK-SET	V 4.0 or higher
Factory setting password query	activated

Cable length when the power supply for the MK800 is taken from AN450

0.28 mm ²	50 m
0.5 mm ²	90 m
0.75 mm ²	150 m
1.5 mm ²	250 m
2.5 mm ²	400 m

Colours

MK800

Front foil	RAL 7035 (light grey); RAL 7040 (basalt grey)
Marking	RAL 5005 (ultramarine blue)
Front plate	RAL 7035 (light grey)

DI400

Front foil	RAL 7035 (light grey)/RAL 7012 (basalt grey)
Marking buttons	RAL 5002 (ultramarine blue), lettering: RAL 7035 (light grey)
Front plate	RAL 7035 (light grey)

Switching elements (MK800-11/DI400-11 only)

Number	1
Operating principle	N/C or N/O operation (programmable)
Electrical endurance, number of cycles	10000
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	5 A 3 A 1 A
Minimum contact rating	1 mA at AC/DC > 10 V

Environment/EMC

EMC immunity	IEC 61000-6-2
EMC emission	IEC 61000-6-3
Operating temperature	-5...+55 °C
Classification of climatic conditions acc. to IEC 60721	
Stationary use	3K5
Transport	2K3
Storage	1K4
Classification of mechanical conditions acc. to IEC 60721	
Stationary use	3M4
Transport	2M2
Storage	1M3

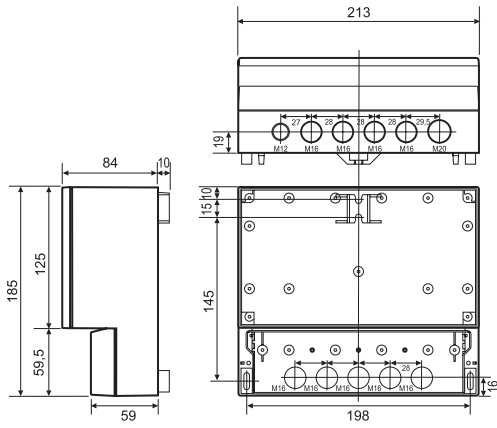
Connection

Connection pluggable screw terminals	
Connection properties (supply voltage, BMS bus)	
rigid/flexible/conductor sizes	0.2...2.5 mm ² (AWG 24...12)
flexible with ferrule without/with plastic sleeve	0.25...2.5 mm ²
Connection properties (inputs)	
rigid/flexible/conductor sizes	0.08...1.5 mm ² (AWG 28...16)
flexible with ferrule without/with plastic sleeve	0.25...1.5/0.25...0.5 mm ²
Stripping length	7 mm
Tightening torque	0.5...0.6 Nm

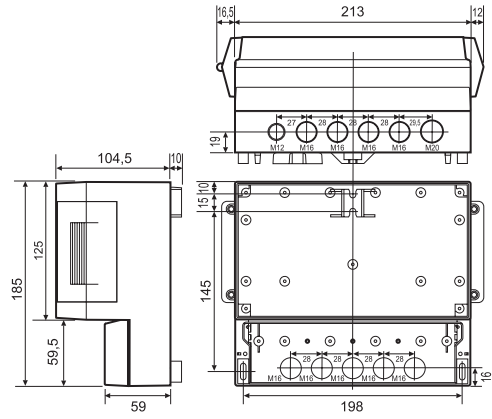
Other

Operating mode	continuous operation
Mounting	display-oriented
Degree of protection, internal components (IEC 60529)	IP50
Degree of protection, terminals (IEC 60529)	IP30
Flammability class	UL94 V-0
Operating manual	TGH1408
Weight	
Flush-mounting/cavity wall (MK800)	< 950 g
Surface-mounting (MK800A/DI400)	< 880 g
Surface-mounting (MK800AF)	< 1150 g

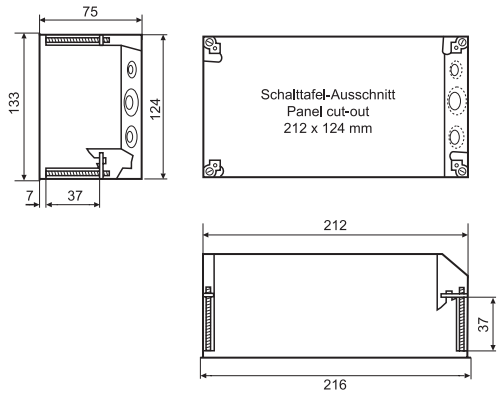
MK800A-11/MK800A-12/DI400-11/DI400-12, surface-mounting



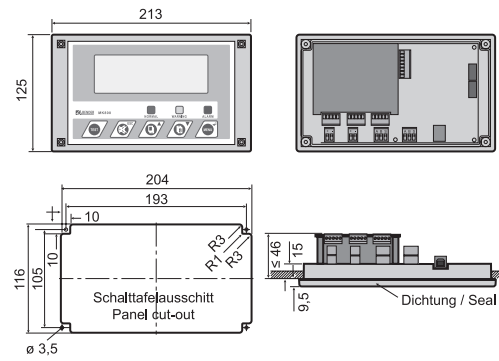
MK800AF-11/MK800AF-12, surface-mounting with door



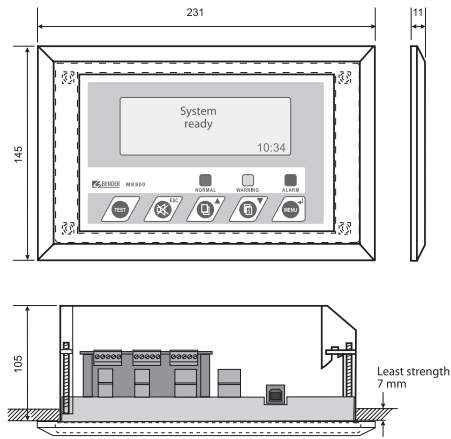
Flush-mounting enclosure UP800

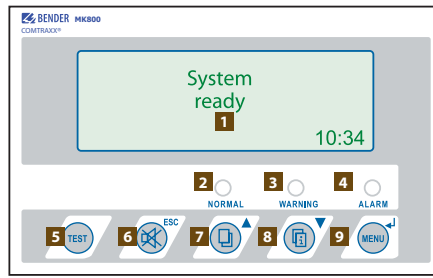


MK800-11/MK800-12, example: door mounting



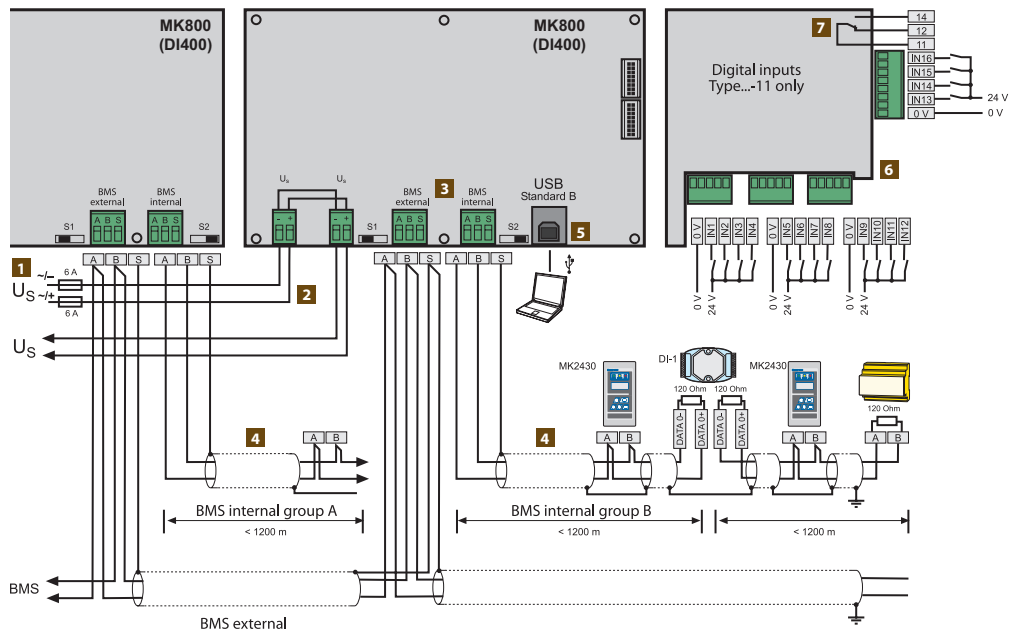
MK800-11/MK800-12 with bezel frame BR800 and flush-mounting enclosure UP800, example: cavity wall mounting





- 1** LCD: to display operating, warning and alarm messages
- 2** LED "NORMAL": Power On indicator
- 3** LED "WARNING": Warning messages
- 4** LED "ALARM": Alarm messages
- 5** Test button "TEST": to activate the test for connected and assigned insulation monitoring devices
- 6** "Mute" button: in operating mode: to mute the buzzer. In menu mode: ESC function
- 7** "Scroll" button: In operating mode: to scroll messages. In menu mode: up
- 8** "Add. text" button: In operating mode: additional text. In menu mode: down
- 9** "MENU" button: In operating mode: to call up the menu mode. In menu mode: enter function

Wiring diagram



- 1** Supply voltage U_s
- 2** Looped through connection for supply voltage (e.g. for control voltage relay contacts)
- 3** Switch S1, S2 for BMS bus termination (terminating resistor 120 Ω)
- 4** Wiring between the MK800 and BMS-capable devices
- 5** USB connection for programming purposes
- 6** Digital inputs
The digital inputs may controlled either via potential-free contacts or voltage signals.
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 ... IN16.
- 7** Programmable contact for device errors, ISOMETER® test, device failure, common alarm message

5.2

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

Standards

The MK2430 alarm indicator and test combination meets the requirements for installation: DIN VDE 0100-710 (VDE 0100 Part 710) and IEC 60364-7-710.

Further information

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

Ordering information

Enclosure	Digital inputs/ relay output	BMS bus	Type	Art. No.
Flush-mounting	12/1	■	MK2430-11	B 9510 0031
	–	■	MK2430-12	B 9510 0032
Surface mounting	12/1	■	MK2430A-11	B 9510 0035
	–	■	MK2430A-12	B 9510 0036

Accessories

Type designation	Type	Art. No.
Parameterisation software	TMK-SET	as Internet download
MK2430-mounting kit, complete		B 9510 1000

Suitable system components

Type designation	Type	Page
Power supply unit	AN410	251

Technical data

Insulation coordination acc. to IEC 60664-1

Rated insulation voltage	AC 250 V
Rated impulse withstand voltage/pollution degree	4 kV/3

Supply voltage

Supply voltage U_s	AC/DC 24 V
Frequency range U_s	0/40...60 Hz
Operating range U_s	AC 18...28/DC 18...30 V
Power consumption	≤ 3 VA
Voltage failure without reset	≤ 15 s

Displays and LEDs

Display, characters	four lines, 4 x 20 characters
Standard message texts in	20 languages
Alarm addresses configurable	150
Programmable text messages	200
History memory (messages)	250
Standard text message	3 x 20 characters
Additional text message (press button to access)	3 x 20 characters
Alarm LEDs (three different colours)	NORMAL (green), WARNING (yellow), ALARM (red)
Menu texts	German/English
Buttons	5 (Isometer test, buzzer mute, additional text, scroll, menu)

Buzzer

Buzzer message	can be acknowledged, with new value operation
Buzzer interval	configurable
Buzzer frequency	configurable
Buzzer repetition	configurable

Inputs (MK2430...-11 only)

Digital inputs	12 (IN1...IN12)
Galvanic separation	yes
Activation of the digital inputs	via potential-free contacts/extraneous voltage
Operating principle	N/O or N/C operation individually selectable for each input
Factory setting	N/O operation
Voltage range (high)	AC/DC 10...30 V
Voltage range (low)	AC/DC 0...2 V
Cable	recommended: J-Y(St)Y min. n x 0.8
Cable length	≤ 500 m
Interfaces	
Interfaces	RS-485 and USB (V2.0/V1.1)

Technical data for the RS-485 interface:

Protocol	BMS
Baud rate	9.6 kbit/s
Cable length	≤ 1200 m
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
Device address, BMS bus	DIP switch 1...150
Factory setting device address	1 (master)

Programming

Interfaces	RS-485 or USB (V2.0/V1.1), USB cable: Type A plug on type B plug
Software	TMK-SET, V 4.0 or higher
Factory setting password	activated

Max. cable length in case of power supply of 1/2/3 MK24... from one AN450

0.28 mm ² (e.g. J-Y(St)Y n x 0.6)	160/40/- m
0.5 mm ² (e.g. J-Y(St)Y n x 0.8)	250/70/- m
0.75 mm ²	400/100/- m
1.5 mm ²	800/210/10 m
2.5 mm ²	1300/360/20 m

Max. cable length in case of power supply of 1/2/3 MK24... from one AN410

0.28 mm ² (e.g. J-Y(St)Y n x 0.6)	300/150/100 m
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
1.5 mm ²	1500/750/500 m
2.5 mm ²	2500/1200/750 m

Colours

Front foil	RAL 7035 (light grey); RAL 7040 (basalt grey)
Marking	RAL 5005 (ultramarine blue)
Front plate	RAL 7035 (light grey)

Switching elements (MK2430...-11 only)

Number	1 changeover contact
Function	programmable
Operating principle	N/C or N/O operation (programmable)
Electrical endurance, number of cycles	10000
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	5 A 3 A 1 A
Minimum contact rating	1 mA at AC/DC > 10 V

Environment/EMC

EMC immunity	EN 61000-6-2
EMC emission	EN 61000-6-3
Classification of climatic conditions acc. to IEC 60721:	
Stationary use	3K5
Transport	2K3
Long-term storage	1K4
Operating temperature	-5...+55 °C
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use	3M4
Transport	2M2
Long-term storage	1M3

Connection

Connection	pluggable screw terminals
------------	---------------------------

Connection properties (supply voltage, BMS bus):

Connection of single conductors	
rigid/flexible/conductor sizes	0.2...2.5 mm ² (AWG 24...12)
flexible with ferrule without/with plastic sleeve	0.25...2.5 mm ²
Multi-conductor connection (2 conductors of the same cross section)	
rigid/flexible	0.2...1/0.2...1.5 mm ²
flexible with ferrule without plastic sleeve	0.25...1 mm ²
flexible with TWIN ferrules with plastic sleeve	0.5...1.5 mm ²

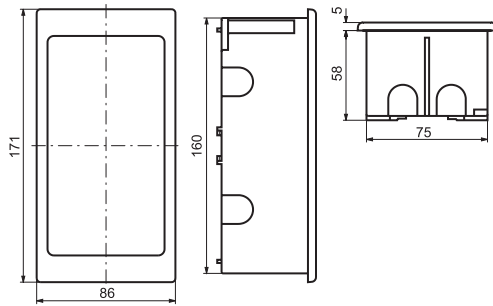
Connection properties (inputs):

Connection of single conductors	
rigid/flexible/conductor sizes	0.08...1.5 mm ² (AWG 28...16)
flexible with ferrule without/with plastic sleeve	0.25...1.5/0.25...0.5 mm ²
Multi-conductor connection (2 conductors with the same cross section):	
rigid/flexible	0.08...0.5 mm ²
flexible with ferrules without plastic sleeve	0.25...0.34 mm ²
flexible with TWIN ferrule with plastic sleeve	0.5 mm ²
Stripping length	7 mm
Tightening torque	0.5...0.6 Nm

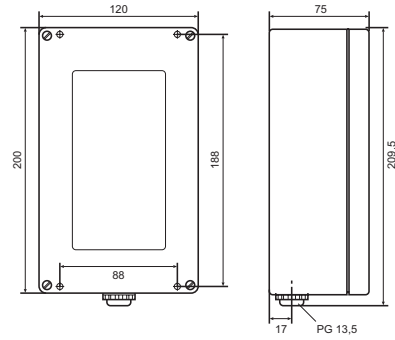
Other

Operating mode	continuous operation
Mounting	display-oriented
Degree of protection, internal components (DIN EN 60529)	IP50 (surface-mounting type: IP54)
Degree of protection, terminals (IEC 60529)	IP20
Flammability class	UL94V-0
Weight	flush mounting ≤ 210 g, surface mounting ≤ 400 g

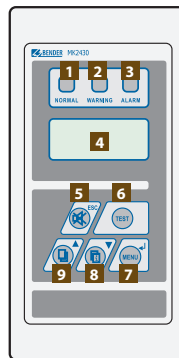
Flush-mounting type



Surface-mounting type

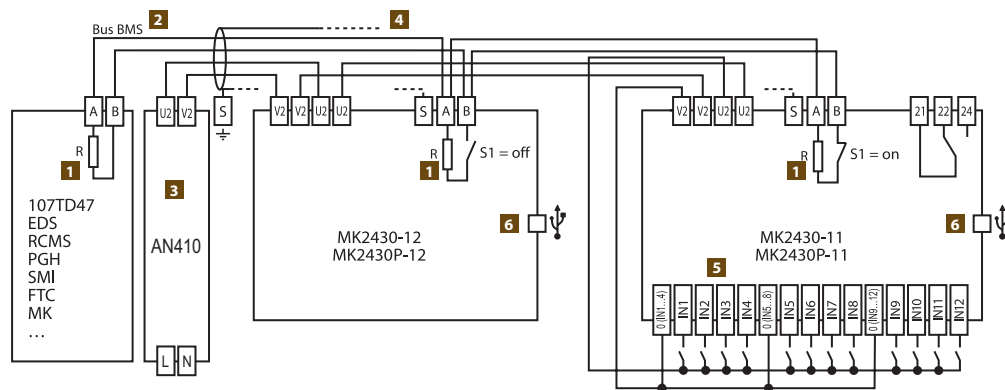


Displays and controls



- | | |
|---|--|
| <ul style="list-style-type: none"> 1 LED "NORMAL": operating mode display 2 LED "WARNING": Warning messages 3 LED "ALARM": Alarm messages 4 LCD: Display of operating and alarm messages 5 Mute button
In operating mode: to mute the buzzer
In menu mode: ESC function 6 "TEST" button: to activate the test for connected and assigned insulation monitoring devices. | <ul style="list-style-type: none"> 7 "MENU" button
In operating mode: to call up the menu mode.
In menu mode: Enter function 8 Additional text button
In operating mode: additional text
In menu mode: Down button 9 Scroll button
In operating mode: to scroll messages
In menu mode: Up button |
|---|--|

Wiring diagram



- | | |
|--|--|
| <ul style="list-style-type: none"> 1 Terminating resistor BMS bus (120 Ω) 2 Connection BMS bus 3 Power supply unit incorporated in the MEDICS® module, sufficient for supplying power to maximum three MK2430 4 Cable between MEDICS® module and MK2430
When the MK2430 is supplied by the AN450 power supply unit in the MEDICS® modules, the permissible cable lengths and cable cross sections have to be considered. | <ul style="list-style-type: none"> 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 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. 6 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 COM460IP 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
- Customer-specific programming of the visualisation solution using a high-performance software
- On-site setting and testing of the visualisation

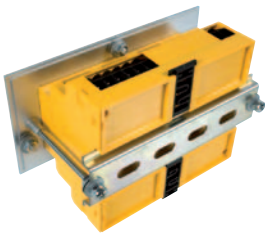
Your advantages:

- Continuous overview of the system at any place
- Faults can be detected easily and hence remedied faster
- Correlations can be recognised and faults can be avoided in the future

Further information

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

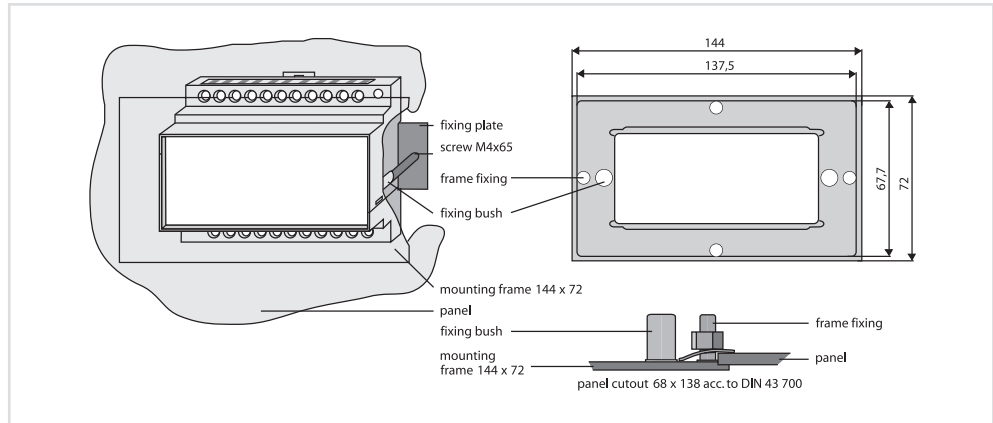
Enclosure mounting



Type	Art. No.
X470 Mounting frame	B 990 991
XM460 Mounting frame	B 990 995
XM490 Mounting frame	B 990 996

Mounting frame for installing enclosures into control panels with standard cutout

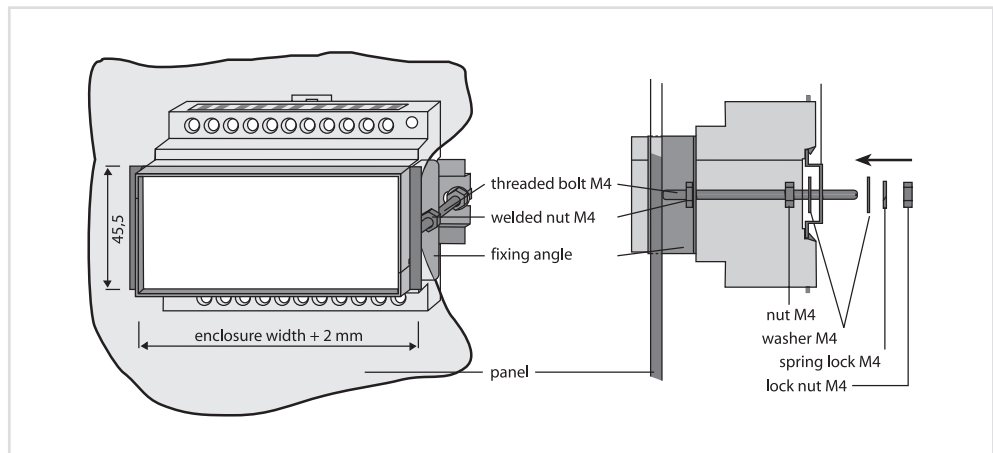
For mounting X470/XM460 enclosures into panels with 144 x 72 mm cutout, made of silver anodised aluminium. Suitable for the 470 and 460 series, e.g. IR470, EDS470, RCMS470, RCMS460 and EDS460 devices.
 For mounting XM490 enclosures into panel cutouts of 198 x 72 mm. Suitable for 490 series devices, e.g. RCMS490, EDS490/491. Dimensions are given in mm.



Type	Art. No.
X450 Fixing set	B 990 992
X460 Fixing set	B 990 993
X470 Fixing set	B 990 990

Fixing set for enclosure mounting into panels with 45 mm cutout

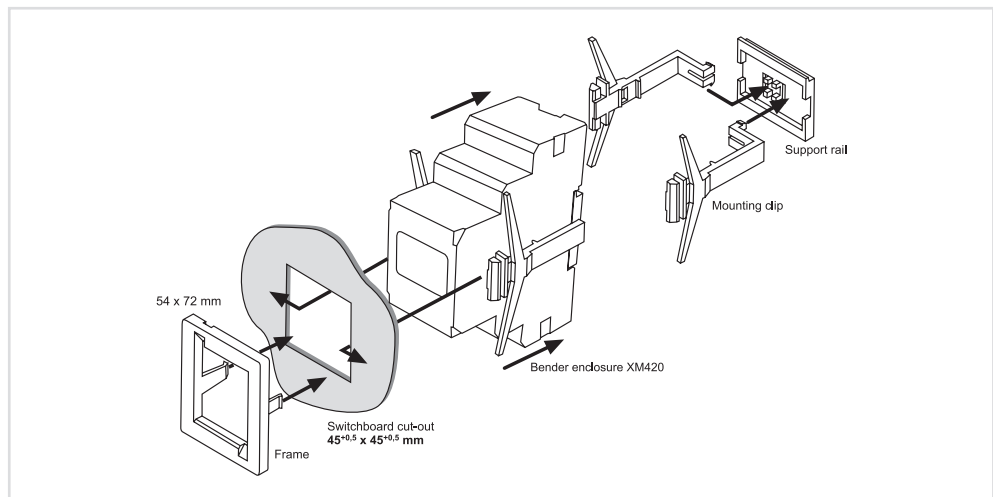
For mounting X440, X460, X470 enclosures into 45 mm panel cutouts, made of stainless steel. Suitable for all 470 series devices, e.g. RCM470, RCMA470. Dimensions are given in mm.



Type	Art. No.
XM420 Mounting frame	B 990 994

XM420 mounting frame for mounting enclosures into panels

For mounting XM420 enclosures into panels. Suitable for all XM420 series devices, e.g. RCM420, RCMA420, RCMA423.

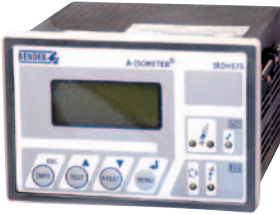


5.3

Front plate cover for protection class IP65



Front plate cover IRDH375



Front plate cover IRDH575

Typical applications

Transparent front plate cover for use in harsh environmental conditions and for increasing the degree of protection (IP65), suitable for devices of the IRDH375/575 series.

Ordering information

Suitable for	Type	Art. No.
IRDH375	Front plate cover 144 x 72 mm	B 9806 0005
IRDH575	Front plate cover 144 x 96 mm	B 9806 0007

Insulation monitoring devices

ISOMETER®



7



1

Equipment for insulation fault location

ISOSCAN®



85



2

Measuring and monitoring relays

LINETRAXX®

Power Quality and Energy Measurement

LINETRAXX®



121



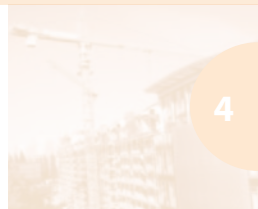
3

Residual current monitoring systems

LINETRAXX®



175



4

System components

Coupling devices

Measuring current transformers

Transformers

Measuring transducers

Power supply units

Measuring instruments

Interface converters

Interface repeaters

COMTRAXX® Gateways

COMTRAXX® Alarm indicator and test combinations

COMTRAXX® condition monitors

Visualisation



203



5

Switching equipment

ATICS® transfer switching and monitoring devices



285



6

Test systems

UNIMET® Safety analyser

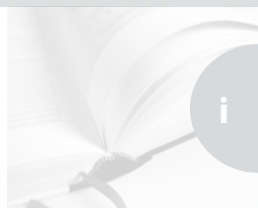
Annex

Standards and guidelines applied
Alphabetical list of devices

Technical terms
Service & project management



315



i



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
by clear menu structure and user guidance

Correct information at the correct time
by clear messages via an illuminated graphic display and via bus

Safe manual changeover during service
by 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 wirings
by integrated design

Completely pluggable

Efficient

Small space required

Tests according to the regulations without interruption of the power supply

Easy integration into existing installations

6.1

Device overview ATICS® switchover and monitoring devices



Page		288	291
Application		unearthed safety power supplies	Safety power supplies
Rated insulation voltage		2-pole: 250 V	2-pole: 250 V 4-pole: 400 V
Voltages	Nominal system voltage U_n	AC 230 V (AC 160...276 V)	2-pole: AC 230 V 4-pole: 3N AC 400/230 V
	Frequency range	48...62 Hz	48...62 Hz
Insulation monitoring Measuring range		10 k Ω ...1 M Ω	
Insulation monitoring Response value R_{an1}		50...500 k Ω	
Digital inputs/relays		1/1	4/4
Interface/protocol		RS-485/BMS	RS-485/BMS
Connection	Pluggable screw terminals	■	■ (up to 125 A)
	screw terminals		■ (160 A)
Installation	DIN rail	■	■
	Screw mounting	4 x M5	6 x M5

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

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) e.g. for Group 2 medical locations in compliance with IEC 60364-7-710:2002/DIN VDE 0100-710 (VDE 0100-710)
- The integration of both the switching elements and the IT system monitoring electronics in one compact device provides increased safety and availability
- All-in-one: Integration of switch disconnecter, control and monitoring electronics for unearthed safety power supplies
- Solutions for any application

Convenient installation and commissioning

- Saves time and money

Safe operation

- Switch disconnecter contacts of robust design
- 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 ATICS-...-ISO series complies with the requirements of the device standards: DIN VDE 0100-710 (VDE 0100-710)/IEC 60364-7-710, functional safety in accordance with EN 61508 (SIL 2), DIN EN 60947-6-1; VDE 0660-114/IEC 60947-6-1

Further information

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

Ordering information

Rated operational current I_e	Type	Art. No.
AC		
63 A	ATICS-2-63A-ISO	B 9205 7202
80 A	ATICS-2-80A-ISO	B 9205 7203

Accessories

Type designation	Rated operational current I_e	Type	Art. No.
	AC		
Bypass switch kit	63 A	ATICS-BP-63A-SET	B 9205 7252
	80 A	ATICS-BP-80A-SET	B 9205 7253

Suitable system components

Type designation	Type	Page
Insulation fault locator	EDS151	104

Technical data

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

Overtoltage category	III
Rated insulation voltage	250 V
Supply voltage U_s	from the system being monitored

Power section/switching elements

Nominal system voltage U_n (operating range)	AC 230 V (AC 160...276 V)
Frequency range f_n	48...62 Hz

IT system monitoring

Insulation monitoring

Measuring range	10 k Ω ...1 M Ω
Response value R_{an1} (ALARM 1)	50...500 k Ω

Load current monitoring (IT system transformer)

Measuring range I_L (TRMS)	10...110 % of the response value
Response value adjustable	5...(50) 100 A (1 A steps)

Temperature monitoring (IT system transformer)

PTC resistors acc. to DIN 44081	max. 6 in series
---------------------------------	------------------

Displays and data memory

Display (languages DE, EN, FR)	graphic display
History memory	500 data records
Data logger	500 data records/channel
Config. logger	300 data records
Test logger	100 data records
Service logger	100 data records

Input

Digital inputs	1
Function selectable	switching back interlocking function, manual/automatic mode, bypass operation, functional test, changeover for the preferred supply, alarm input for operating theatre lights, alarm input for other electrical equipment

Output

Switching element	1 potential-free changeover contact
Operating principle adjustable	N/O or N/C operation
Function selectable	alarm or operating message/common alarm message/generator start-up

BMS interface

Interface/protocol	RS-485/BMS
--------------------	------------

Environment/EMC

EMC	IEC 61326-1/IEC 61326-2-4
Operating temperature	-25...+55 °C
Degree of protection	IP20

Terminals

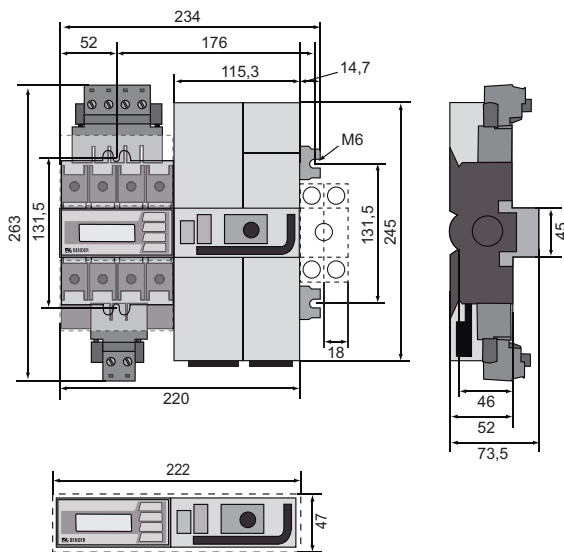
Power section

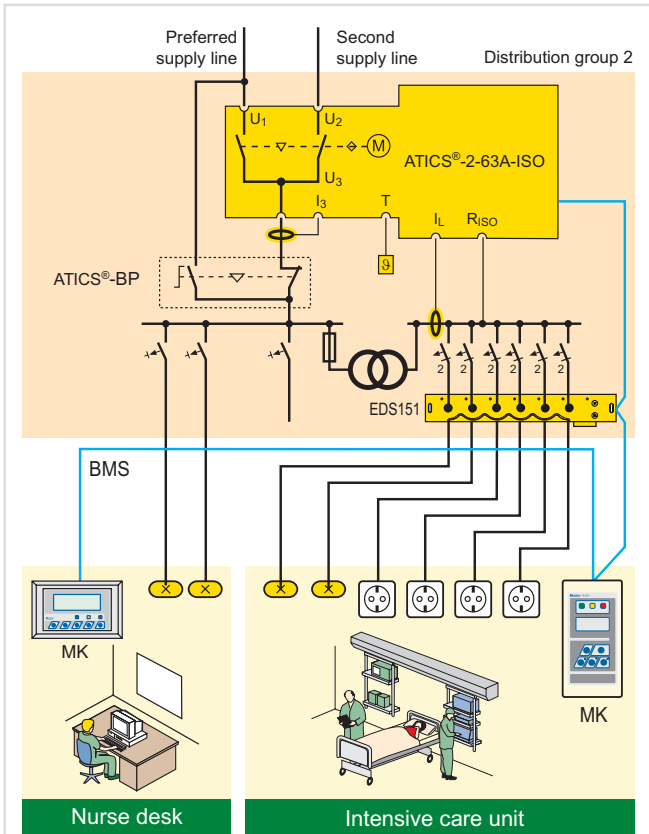
Connection	pluggable screw terminals
rigid max.	35 mm ²
flexible max.	25 mm ²

Other

Operating mode	continuous operation
DIN rail mounting	according to IEC 60715
Screw mounting	4 x M5
Weight	approx. 4500 g
Scope of delivery	ATICS® incl. STW2 and STW3 measuring current transformers, bridge, connector and terminal cover

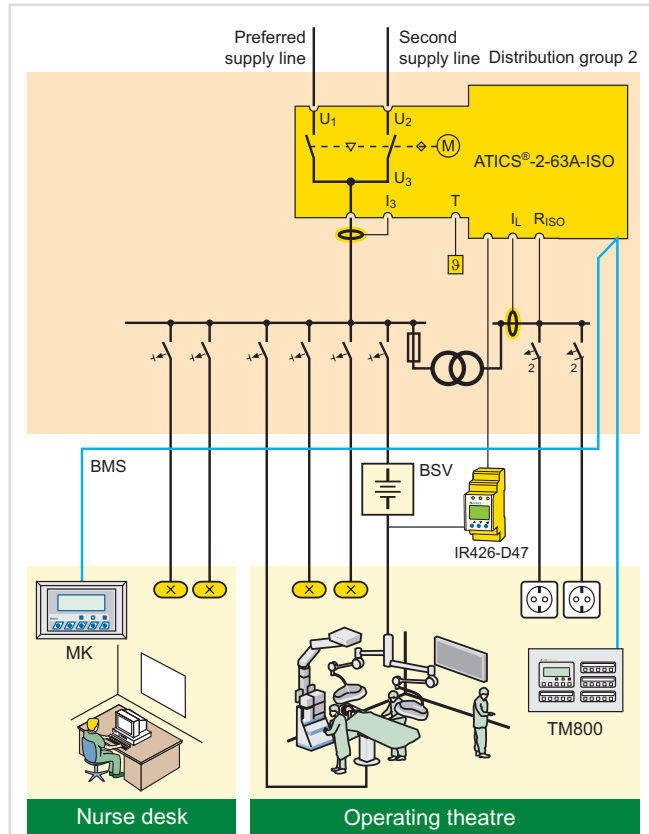
Dimension diagram (dimensions in mm)





Example intensive care unit

- ATICS-2-63A-ISO: Automatic changeover between the preferred and the redundant line while monitoring the medical IT system with transformer load and temperature monitoring
- EDS151: Insulation fault locator for fast insulation fault location (recommended)
- ATICS-BP: Bypass switch for uninterrupted test/maintenance (recommended)
- MK2430/MK800/TM800: Alarm at at least two points for functional safety



Example application operating theatre

- ATICS-2-63A-ISO: Automatic changeover between the preferred and the redundant line while monitoring the medical IT system with transformer load and temperature
- IR426-D47: Monitoring the operating theatre light IT system (optional)
- MK2430/MK800/TM800: Alarm at at least two points for functional safety

ATICS®-...-DIO

Automatic transfer switching devices for safety power supplies



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 disconnecter and control electronics
- Compact design
- Solutions for any application

Convenient installation and commissioning

- Saves time and money

Safe operation

- Switch disconnecter 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 ATICS-...-DIO series complies with the requirements of the device standards: DIN VDE 0100-710 (VDE 0100-710)/IEC 60364-7-710, functional safety in accordance with EN 61508 (SIL 2), DIN EN 60947-6-1; VDE 0660-114/IEC 60947-6-1

Further information

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

Ordering information

Version	Rated operational current I_e	Scope of delivery	Type	Art. No.
	AC			
2-pole	63 A	1 x STW3, bridge, connectors, terminal cover	ATICS-2-63A-DIO	B 9205 7212
	80 A	1 x STW3, bridge, connectors, terminal cover	ATICS-2-80A-DIO	B 9205 7213
4-pole	80 A	3 x STW3, bridge, connectors, terminal cover	ATICS-4-80A-DIO	B 9205 7222
	125 A	3 x STW4, bridge, connectors, terminal cover	ATICS-4-125A-DIO	B 9205 7223
	160 A	3 x STW4, bridge, terminal cover	ATICS-4-160A-DIO	B 9205 7224

Accessories

Type designation	Rated operational current I_e	Scope of delivery	Type	Art. No.
	AC			
Bypass switch set	63 A	Bridge, terminal cover, auxiliary contacts, LEDs green/red	ATICS-BP-3-63A-SET	B 9205 7252
	80 A	Bridge, terminal cover, auxiliary contacts, LEDs green/red	ATICS-BP-3-80A-SET	B 9205 7253

6.1

Technical data

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

Overtoltage category	III
Rated operational voltage U_e (operating range)	230 V (AC 160...276 V)
Rated insulation voltage ATICS®-2-DIO/ATICS®-4-DIO	250/400 V
Supply voltage U_s	from the system being monitored

Power section/switching elements

Nominal system voltage U_n 2-pole	AC 230 V
4-pole	3NAC 400/230 V
Frequency range f_n	48...62 Hz

Displays and data memory

Display (languages DE, EN, FR)	graphic display
History memory	500 data records
Data logger	500 data records/channel
Config. logger	300 data records
Test logger	100 data records
Service logger	100 data records

Input

Digital inputs	4
Function selectable	switching back interlocking function, manual/automatic mode, bypass mode, functional test, changeover to the preferred line, alarm input for operating theatre lights, alarm input for other technical equipment

Output

Switching elements	1 potential-free changeover contact/3 potential-free N/O contacts
Operating principle adjustable	N/O or N/C operation
Function selectable	alarm or operating message/common alarm message/generator start-up

BMS interface

Interface/protocol	RS-485/BMS
--------------------	------------

Environment/EMC

Operating temperature	-25...+55 °C
EMC	IEC 61326-1
Degree of protection	IP20

Terminals

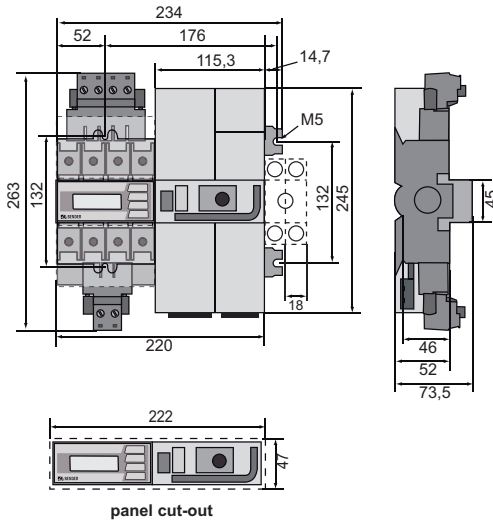
Power unit	up to 125 A	160 A
Connection	pluggable screw terminals	screw-type terminals
rigid max.	35 mm ²	70 mm ²
flexible max.	25 mm ²	50 mm ²

Other

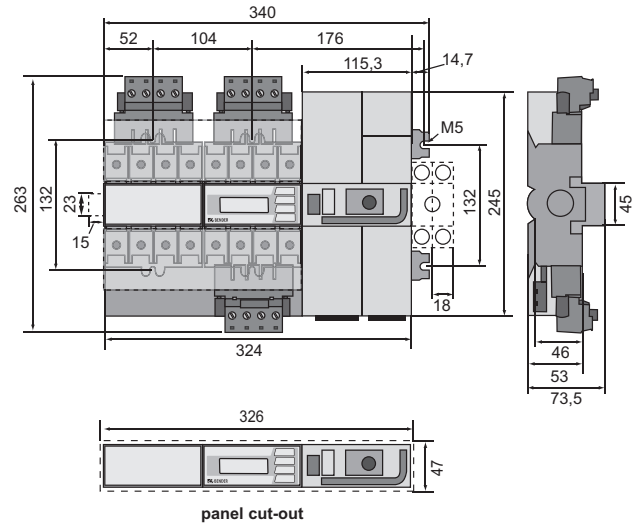
Operating mode	continuous operation
DIN rail mounting	according to IEC 60715
Screw mounting	
2-pole	4 x M5
4-pole	6 x M5
Weight	
2-pole	approx. 4500 g
4-pole	approx. 5700 g
Scope of delivery	see ordering information

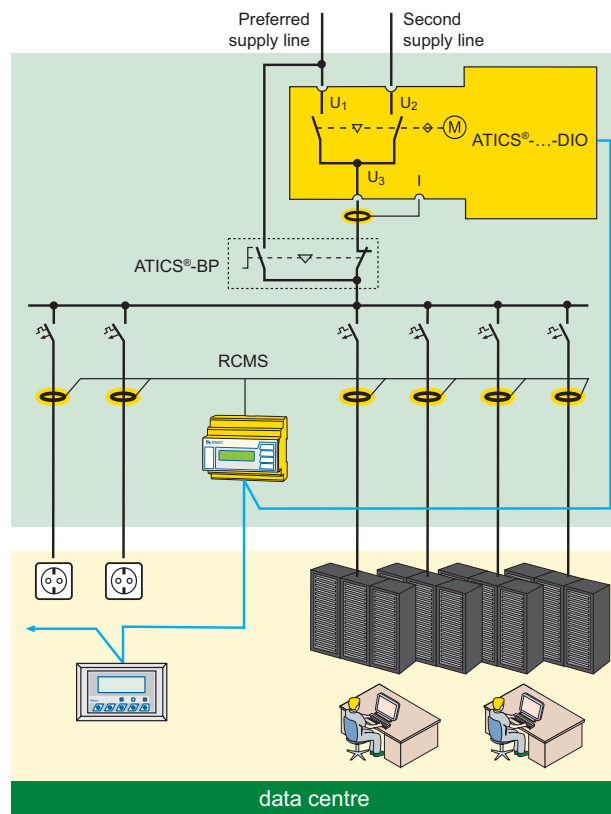
Dimension diagrams (dimensions in mm)

2-pole



4-pole





Example application computing centre

- ATICS®-...-DIO: Changeover between the preferred and the redundant line
- MK2430/MK800/TM800: Alarm at at least two points for functional safety



Safety Analyser

For over 25 years, the “Bender Tester” has been a well-known 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



Page		296	299	303
Application	Electrical equipment	■	■	■
	Electric hospital and care beds	■	■	■
	Medical electrical equipment	■ ¹⁾	■	■
Voltages	Supply voltage U_S	AC 230 V	AC 230 V	AC 100...120 V, AC 220...240 V
	Voltage measurement Measuring range	AC 90...264 V	AC 90...264 V	AC 90...264 V
	Load current measurement	0.01...16 A	0.01...16 A	0.01...16 A
Test sequence	manual	■	■	■
	semi-automatic			■
	automatic	■	■	■
Data exchange		UNIData300	UNIData300/400	UNIMET® 800ST Control Center

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

Die UNIMET® 300 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

Further information

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

Ordering information

Supply voltage U_s	Version	Type	Art. No.
AC			
230 V	Standard	UNIMET® 300ST	B 9602 3000
	CH	UNIMET® 300ST	B 9602 3001

Suitable system components

Type designation	Variant	Type	Art No.	Page
Adapter	German Schuko	VK701-6	B 9602 0067	–
	Non-heating appliances	VK701-7	B 9602 0066	–
	Adapter kit 16 A for DS32A	VK701-8	B 9602 0097	–
Interface cable	–	RS-232/RS-232	B 9601 2012	–
Test probe	–	Test probe	B 928 748	–
Test terminal	–	Test terminal	B 928 741	–
Barcode scanner	–	PS/2	B 9602 0082	–
Converter	–	USB1.1 RS-232 converter	B 9602 0086	–
Flex keyboard	–	Flex keyboard	B 9602 0093	–
Three-phase adapter	–	DS32A	B 9602 0098	308
		DS32DCT	B 9602 0100	–

Technical data

Supply voltage	AC 230 V \pm 10 %
Frequency range	45...65 Hz
Power consumption	max. 50 VA
Maximum load current	16 A
Max. connectable load at 230 V	3700 VA
Protection class	II
Ambient temperature	0...50 °C
Storage temperature	-10...+70 °C
Degree of protection	IP20

Testing of PE resistance

Test voltage	approx. 5 V, system frequency
Short-circuit current	> 2 A
Measuring range	0.001...29.999 Ω
Measuring accuracy	0.001...1.0 Ω : \pm 2.5% of MV \pm 2 digits 1.001...29.999 Ω : \pm 5% of MV \pm 2 digits

Leakage current, differential measurement method

Measuring range	0.02...19.99 mA
Measuring accuracy	\pm 5 % of MV \pm 5 digits

Leakage current, direct measurement

Measuring range	0.001...19.999 mA
Measuring accuracy	0.001...19.999 mA: \pm 5 % of MV \pm 2 digits

Equipment leakage current -Alternative method

Measuring range	0.001...19.999 mA
Measuring accuracy	0.001...9.999 mA: \pm 5 % of MV \pm 2 digits 10.000...19.999 mA: \pm 7 % of MV \pm 2 digits

Test voltage (Equipment leakage current measurement – alternative method)

approx. system voltage, system frequency

Test current max. 3.5 mA

Insulation resistance

Test voltage	approx. DC 500 V
Max. test current	2.5 mA
Measuring range	0.01...199.99 M Ω
Measuring accuracy	0.01...99.99 M Ω : \pm 5 % of MV \pm 2 digits 100.00...199.99 M Ω : \pm 10 % of MV \pm 2 digits

Load current measurement

Measuring range	0.01 A to 16 A
Measuring accuracy	\pm 2.5 % of MV, \pm 3 digits

Voltage measurement

Measuring range	90...264 V
Measuring accuracy	\pm 2.5 % of MV, \pm 2 digits

Apparent power

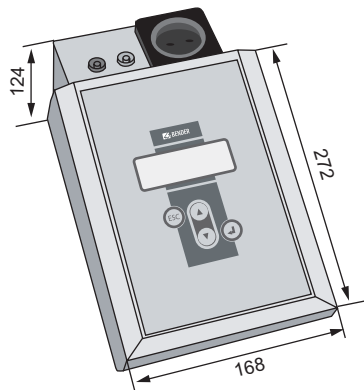
Measuring range	5...3700 VA
Measuring accuracy	\pm 5 % of MV, \pm 5 digits

Other

Dimensions (without bag)	ca. 168 x 272 x 124 mm (W x D x H)
Weight (without accessories or bag)	approx. 2.2 kg
Calibration interval	36 months

of MV = of measured value

Dimension diagram (dimensions in mm)

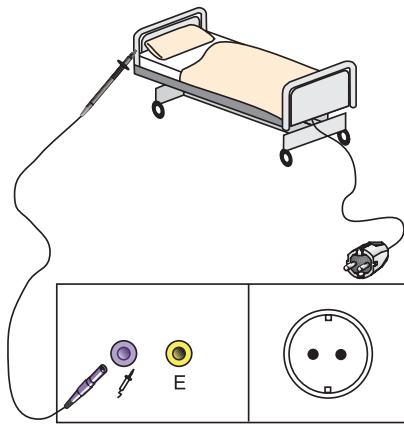




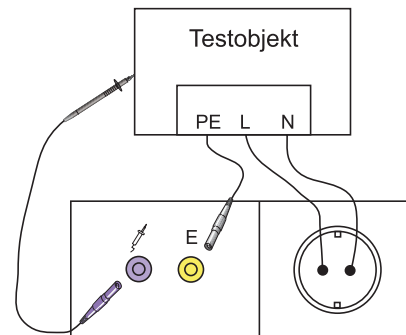
- 1 Function buttons
- 2 Backlit LCD for displaying the user menu and the measurement results. Four lines of 20 characters each.
- 3 Permanently attached power cable for connection to the supply voltage.
- 4 Sockets
 - violet: Connection for test probe for testing exposed parts of the device under test.
 - 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
- 6 Durable plastic enclosure, with pushbuttons for safe storage in the carrying bag.
- 7 Power switch with thermo-magnetic circuit-breaker
- 8 Interfaces
 - 9-pole RS-232 interface, galvanically isolated, for connection to a personal computer
 - Centronics interface for connection to a printer
 - PS/2 port for connection to an external standard keyboard and a barcode reading wand or scanner.

Wiring diagrams

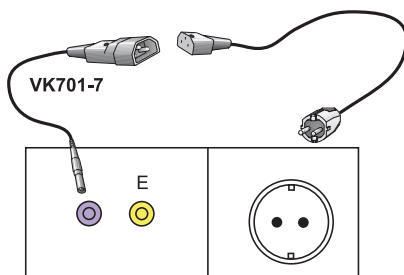


Connection of hospital and care beds and electrical equipment with plug-in connector.

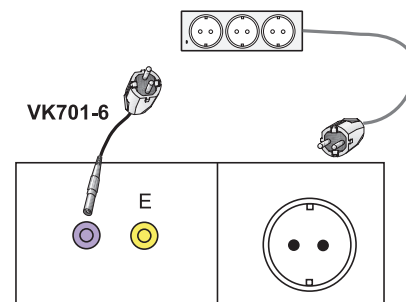


For connecting single-phase permanently installed equipment to the test system

- Disconnect the device
- Disconnect the connection to the supply voltage



Testing of extension cables
– Connection of connecting and extension cords



Testing of extension cables
– Connection of connecting and extension cords

UNIMET® 400ST

Test system for medical electrical equipment, electrical hospital and care beds and electrical equipment



Device features

- Easy operation and handling
- Automatic and manual test procedure
- Data input via keyboard or barcode scanner
- Visual inspection, functional testing and electrical testing
- 4mm socket for testing applied parts
- 600 data records can be stored
- Data exchange and storage via UNIData 300/400
- Compatible with common application programs such as visual FM, MT Data and Fundamed

Typical applications

- Safe testing of medical electrical equipment with patient connections, hospital and care beds and electrical equipment.

Standards

The UNIMET® 400 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.com.

Ordering information

Supply voltage U_s	Version	Type	Art. No.
AC			
230 V	Standard	UNIMET® 400ST	B 9602 4000
	CH	UNIMET® 400ST	B 9602 4001

Suitable system components

Type designation	Variant	Type	Art. No.	Page
PatBox	–	PatBox	B 9602 0096	
Adapter	German Schuko	VK701-6	B 9602 0067	–
	Non-heating appliances	VK701-7	B 9602 0066	–
	Adapter kit 16 A for DS32A	VK701-8	B 9602 0097	–
Interface cable	–	RS-232/RS-232	B 9601 2012	–
Test probe	–	Test probe	B 928 748	–
Test terminal	–	Test terminal	B 928 741	–
Barcode scanner	–	PS/2	B 9602 0082	–
Converter	–	USB1.1 RS-232 converter	B 9602 0086	–
Flex keyboard	–	Flex keyboard	B 9602 0093	–
Three-phase adapter	–	DS32A	B 96020098	308
		DS32DCT	B 9602 0100	–

Technical data

Supply voltage	AC 230 V \pm 10 %
Frequency range	45...65 Hz
Power consumption	max. 50 VA
Maximum load current	16 A
Max. connectable load at 230 V	3700 VA
Protection class	II
Ambient temperature	0...50 °C
Storage temperature	-10...+70 °C
Degree of protection	IP20

Testing of PE resistance

Test voltage	approx. 5 V, system frequency
Short-circuit current	> 2 A
Measuring range	0.001...29.999 Ω
Measuring accuracy	0.001...1.0 Ω : \pm 2.5% of MV \pm 2 digits 1.001...29.999 Ω : \pm 5% of MV \pm 2 digits

Leakage current, differential measuring method

Measuring range	0.02 mA...19.99 mA
Measuring accuracy	\pm 5% of MV \pm 5 digits

Leakage current, direct measurement

Measuring range	0.001...19.999 mA
Measuring accuracy	0.001...19.999 mA: \pm 5% of MV \pm 2 digits

Equipment leakage current -alternative method

Measuring range	0.001...19.999 mA
Measuring accuracy	0.001...9.999 mA: \pm 5% of MV \pm 2 digits 10.000...19.999 mA: \pm 7% of MV \pm 2 digits

Test voltage (Equipment leakage current measurement – alternative method)	approx. system voltage, system frequency
Test current	max. 3.5 mA

Insulation resistance

Test voltage	approx. DC 500 V
Max. test current	2.5 mA
Measuring range	0.01...199.99 M Ω
Measuring accuracy	0.01...99.99 M Ω : \pm 5% of MV \pm 2 digits 100.00...199.99 M Ω : \pm 10% of MV \pm 2 digits

Load current measurement

Measuring range	0.01...16 A
Measuring accuracy	\pm 2.5% of MV, \pm 3 digits

Voltage measurement

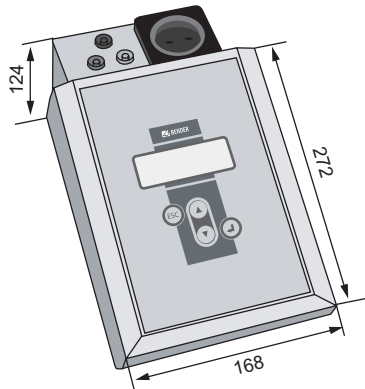
Measuring range	90...264 V
Measuring accuracy	\pm 2.5% of MV, \pm 2 digits
Apparent power	5...3700 VA
Measuring range	5...3700 VA
Measuring accuracy	\pm 5% of MV, \pm 5 digits

Other

Dimensions (without bag)	ca. 168 x 272 x 124 mm (W x D x H)
Weight (without accessories or bag)	approx. 2.2 kg
Calibration interval	36 months

of MV = of measured value

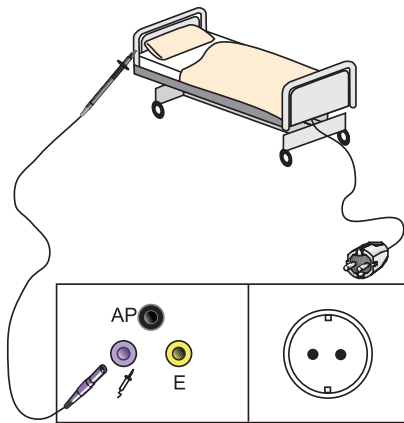
Dimension diagram (dimensions in mm)



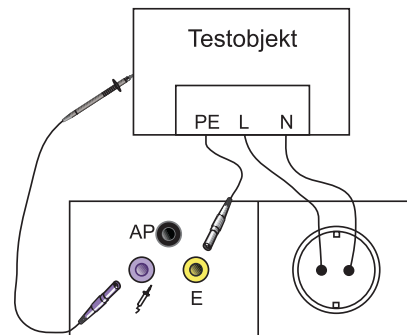


- 1** Function buttons
- 2** Backlit LCD for displaying the user menu and the measurement results. Four lines of 20 characters each.
- 3** Permanently attached power cable for connection to the supply voltage.
- 4** Sockets
 - black(AP): for testing applied parts
 - violet: Connection for test probe for testing exposed parts of the device under test.
 - yellow (E): for a second test lead when the low-resistance continuity of the PE conductor is to be measured between two points (e.g., on single-phase, permanently connected devices or extension cables).
- 5** Test socket: This is where the DUT's power supply cable is plugged in
- 6** Durable plastic enclosure, with pushbuttons for safe storage in the carrying bag.
- 7** 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

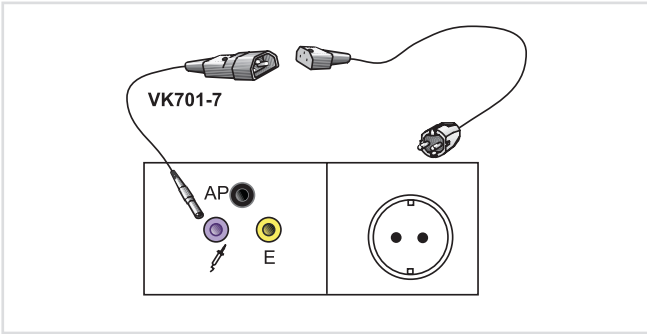


Connection of hospital and care beds and electrical equipment with plug-in connector.

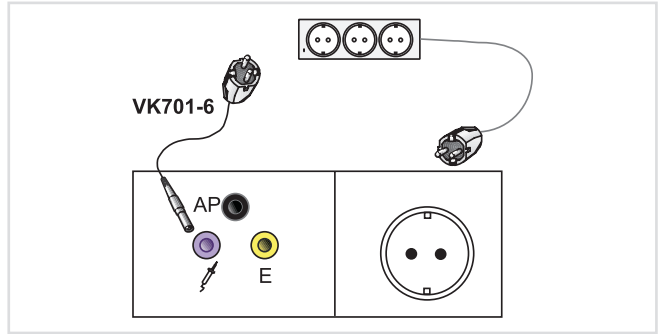


For connecting single-phase permanently installed equipment to the test system

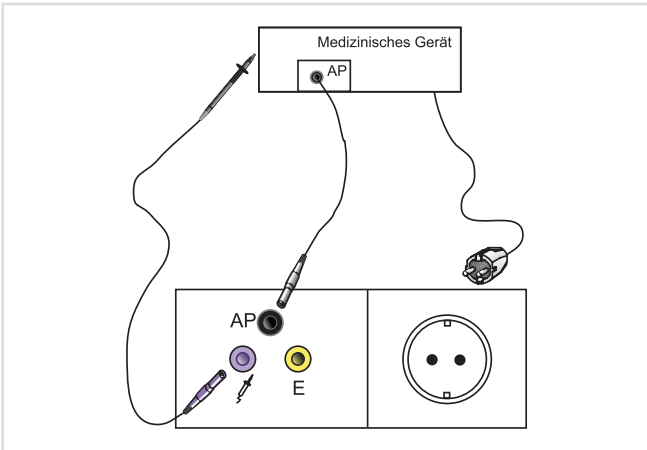
- Disconnect the device
- Disconnect the connection to the supply voltage



Testing of extension cables
 – Connection of connecting and extension cords



Testing of extension cables
 – Connection of connecting and extension cords



Connection of medical electrical equipment with plug-in connector

UNIMET® 800ST

Test system for medical electrical equipment



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

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).

Standards

The UNIMET® 800 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.com.

Ordering information

Nominal voltage range	Maximum load current	Version	Type	Art. No.
AC				
100...120 V and 220...240 V	16 A	Standard (German)	UNIMET® 800ST	B 9602 8010
		GB/GB	UNIMET® 800ST	B 9602 8014
	13 A	B/B	UNIMET® 800ST	B 9602 8017
		US/US	UNIMET® 800ST	B 9602 8018
	10 A	CH	UNIMET® 800ST	B 9602 8016

Suitable system components

Type designation	Variant	Type	Art No.	Page
Adapter	German Schuko	VK701-6	B 9602 0067	–
	Non-heating appliances	VK701-7	B 9602 0066	–
	Adapter kit 16 A for DS32A	VK701-8	B 9602 0097	310
Cable	for connecting the test system with a PC, 9-pole, female-female (Null modem cable)	RS-232/RS-232 interface cable	B 9601 2012	–
	Measuring lead, 150 cm, 4 mm connector	Cable 150 cm	B 928 703	–
Test probe	Test probe active (with switch)	TP800	B 9602 0080	–
	3 m measuring lead with black test probe	–	B 928 748	–
Test terminal	black	–	B 928 741	–
Printer	Ink jet, A4	–	B 960 20081	–
Touchscreen pen	–	Stylus pen	B 928 749	–
Barcode scanner	for the UNIMET800ST (PS/2 connection)	–	B 9602 0082	–
Flex keyboard	for the UNIMET800ST (USB connection)	–	B 9602 0093	–
Test kit	various adapters for connecting medical electrical equipment to test systems	PK3	B 9602 0004	–
Test box	for testing test systems	TB3	B 9602 0025	311
Three-phase adapter	for testing three-phase devices during operation	DS32A	B 9602 0098	308
External power source 25 A	for standard-compliant protective earth resistance measurements (only in conjunction with UNIMET® 800ST)	EPS800	B 9602 8050	306

Technical data

Nominal voltage range	AC 100...120 V/± 10 %, AC 220...240 V/± 10 %
Frequency range	48...62 Hz
Power consumption	max. 100 VA
Maximum output current	see ordering information
Protection class	II

Testing of PE resistance

Measuring range	0.001... 29.999 Ω
Measuring current	max. AC 8 A
Measuring voltage	max. AC 8 V
Intrinsic uncertainty	0.001...1.000 Ω: ± 2.5 % v. M. ± 5 digits 1.001...29.999 Ω: ± 5 % v. M. ± 5 digits
Operating uncertainty	0.001...1.000 Ω: ± 5 % v. M. ± 10 digits 1.001...29.999 Ω: ± 7.5 % v. M. ± 10 digits

Insulation resistance

Measuring range	0.01...199.99 MΩ
Messspannung	max. DC 550 V
Measuring current	max. 2.5 mA
Intrinsic uncertainty	0.01...99.99 MΩ: ± 5 % v. M. ± 2 digits 100.00...199.99 MΩ: ± 10 % v. M. ± 2 digits
Operating uncertainty	0.01...99.99 MΩ: ± 7.5 % v. M. ± 4 digits 100.00...199.99 MΩ: ± 10 % v. M. ± 4 digits

Equipment leakage current - alternative method

Measuring range	0.001...19.999 mA
Measuring voltage	max. AC 250 V
Measuring current	max. 3 mA
Intrinsic uncertainty	± 5 % v. M. ± 5 digits
Operating uncertainty	± 7.5 % v. M. ± 10 digits

Leakage current, differential measurement method

Measuring range	0.02...19.99 mA
Intrinsic uncertainty	± 5 % v. M. ± 2 digits
Operating uncertainty	± 7.5 % v. M. ± 4 digits
Frequency response	40...100 kHz ± 3 dB

Leakage current, direct measurement

Measuring range	0.001...19.999 mA
Intrinsic uncertainty	± 5 % v. M. ± 2 digits
Operating uncertainty	± 7.5 % v. M. ± 4 digits
Frequency response	up to 100 kHz ± 3 dB

Voltage measurement

Measuring range	AC 90...264 V
Frequency range	48...62 Hz
Intrinsic uncertainty	± 2.5 % v. M. ± 3 digits

Load current measurement

Measuring range	0.005...16 A
Frequency range	48...62 Hz
Intrinsic uncertainty	± 2.5 % v. M. ± 3 digits

Apparent power

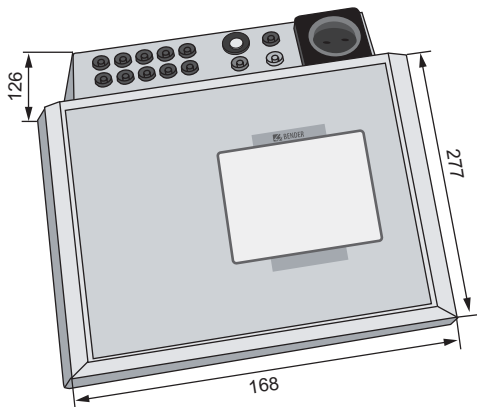
Measuring range	5...3600 VA
Frequency range	48...62 Hz
Intrinsic uncertainty	± 5 % v. M. ± 3 digits

Other

EMC	IEC 61326-1
Ambient temperature	0...+40 °C
Storage temperature	-10...+70 °C
Relative humidity (up to 31 °C)	max. 80 %
Relative humidity (> 31...40 °C)	decreasing linearly, 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)
Weight (without accessories or bag)	approx. 3.5 kg
Calibration interval	36 months

of MV = of measured value

Dimension diagram (dimensions in mm)



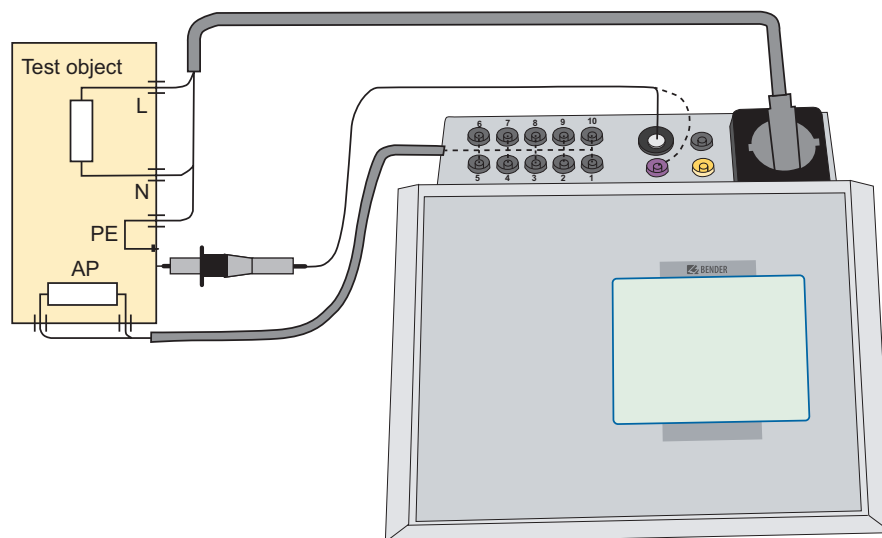


- 1** Touchscreen for operator control and indication. For this purpose, a stylus is included in the scope of supply.
- 2** Durable plastic enclosure, with pushbuttons for safe storage in the carrying bag.
- 3** 10 sockets (1...10) for the connection of patient electrodes.
- 4** Measuring terminals
 - [B] (violet) for the connection of the single-pole test probe supplied with the product.
 - [A] for active test probe TP800 with pushbutton (option).
 - Socket [C] for equipotential bonding (e.g. connection for 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.
- 6** Connection to the supply voltage and power switch with thermo-magnetic circuit-breaker.
- 7** Connection for the external 25 A power source EPS800.

Note: The plug clicks into place and is secured against being pulled out accidentally.

The plug can only be removed after pushing the movable grip back.
- 8** Interfaces:
 - PS/2 connection for external keyboard
 - RS-485 serial interface for Bender Service
 - 9-pole RS-232 interface, galvanically isolated, for connection to a personal computer
 - USB interface for connection to a printer, a USB stick, an external keyboard or a barcode scanner (2 x host) and a PC (1 x device, for Bender Service only)
 - Ethernet network connection (optional)

Wiring diagram



EPS800

External power source 25 A for UNIMET® 800ST



Device features

- To be used in conjunction with the appropriate UNIMET® 800ST

Standards

The EPS800 series carries out tests in compliance with the device standard: IEC 60601-1

Further information

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

Typical applications

- External 25 A power source for standard-compliant protective earth resistance measurement

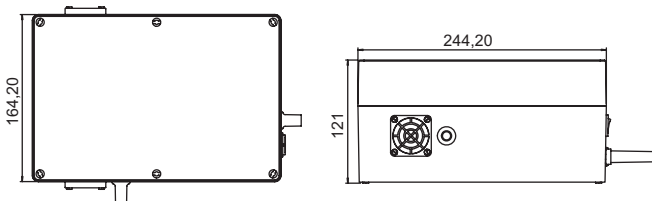
Ordering information

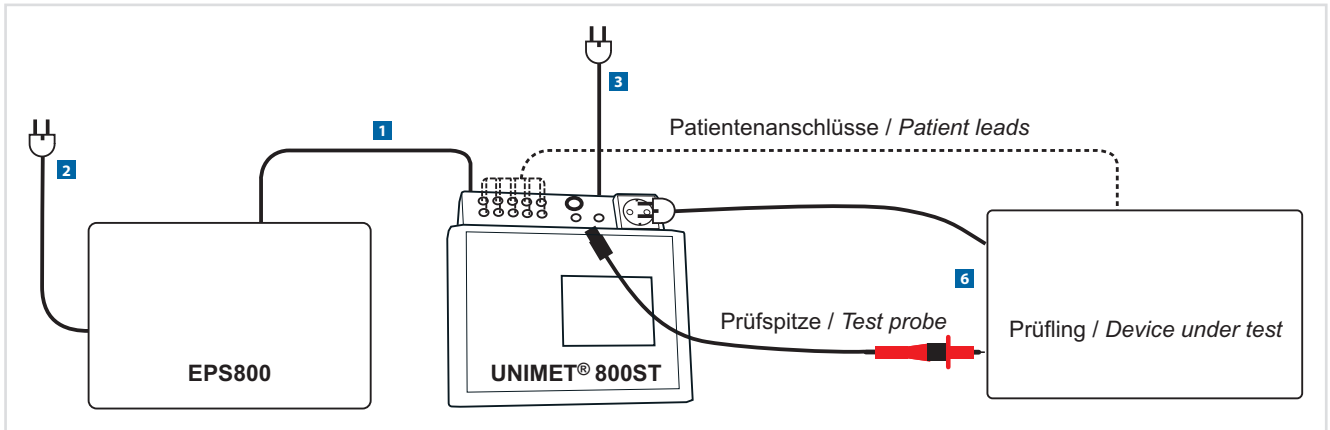
Version	for UNIMET® 800ST Art. No.	Type	Art. No.
Standard (German)	B 9602 8010	EPS800	B 9602 8050
GB	B 9602 8014	EPS800	B 9602 8054
CH	B 9602 8016	EPS800	B 9602 8056
B	B 9602 8017	EPS800	B 9602 8057
US	B 9602 8018	EPS800	B 9602 8058

Technical data

Nominal voltage	AC 207...253 V, 48 ... 62 Hz	Other	
Power consumption	400 VA	EMC	IEC 61326-1
Measuring current	AC 25 A ± 10 % (0 ... 0.3 Ω)	Ambient temperature	0 ... +40 °C
Output power	230 VA	Storage temperature	-10 ... +70 °C
Operating mode	continuous operation	Relative humidity (up to 31 °C)	max. 80 %
Protection class	II	Relative humidity (> 31 ... 40 °C)	decreasing linearly, max. 50 % condensation must be avoided
Micro-fuse	5 x 20 mm, fast 5 A/250 V	Height above sea level	max. 2000 m
		Degree of protection	IP20
		Dimensions	ca. 244 x 164 x 120 mm (W x D x H)
		Weight	≤ 4 kg

Dimension diagram (dimensions in mm)





- 1** Insert the control cable of the EPS800 into the “EPS800” connector socket on the rear of the UNIMET® 800ST.
 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 to the power socket.
- 4** Switch on the power switch of the UNIMET® 800ST.
- 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.

DS32A

3AC three-phase adapter with differential current measurement



Device features

- To be used in conjunction with an UNIMET test system

Standards

The DS32A series carries out tests in compliance with the device standard: DIN VDE 0701-0702, DIN EN 62353

Further information

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

Typical applications

- Three-phase adapter for testing medical electrical three-phase devices during operation

Ordering information

Type	Art. No.
DS32A	B 9602 0098

Technical data

Electrical safety

Protection class	I acc. to IEC 61010-1/EN 601010-1/VDE 0411-1
Pollution degree	2
Measurement category	CAT II
Test voltage	1,69 kV
Current carrying capacity	32 A/6 h three-phase current
EMC	EN 61326-1

Differential current

Measuring range	AC 0.02...20 mA
Intrinsic uncertainty	5 % v. M. ± 50 µA

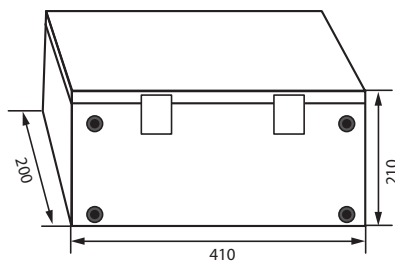
Supply voltage

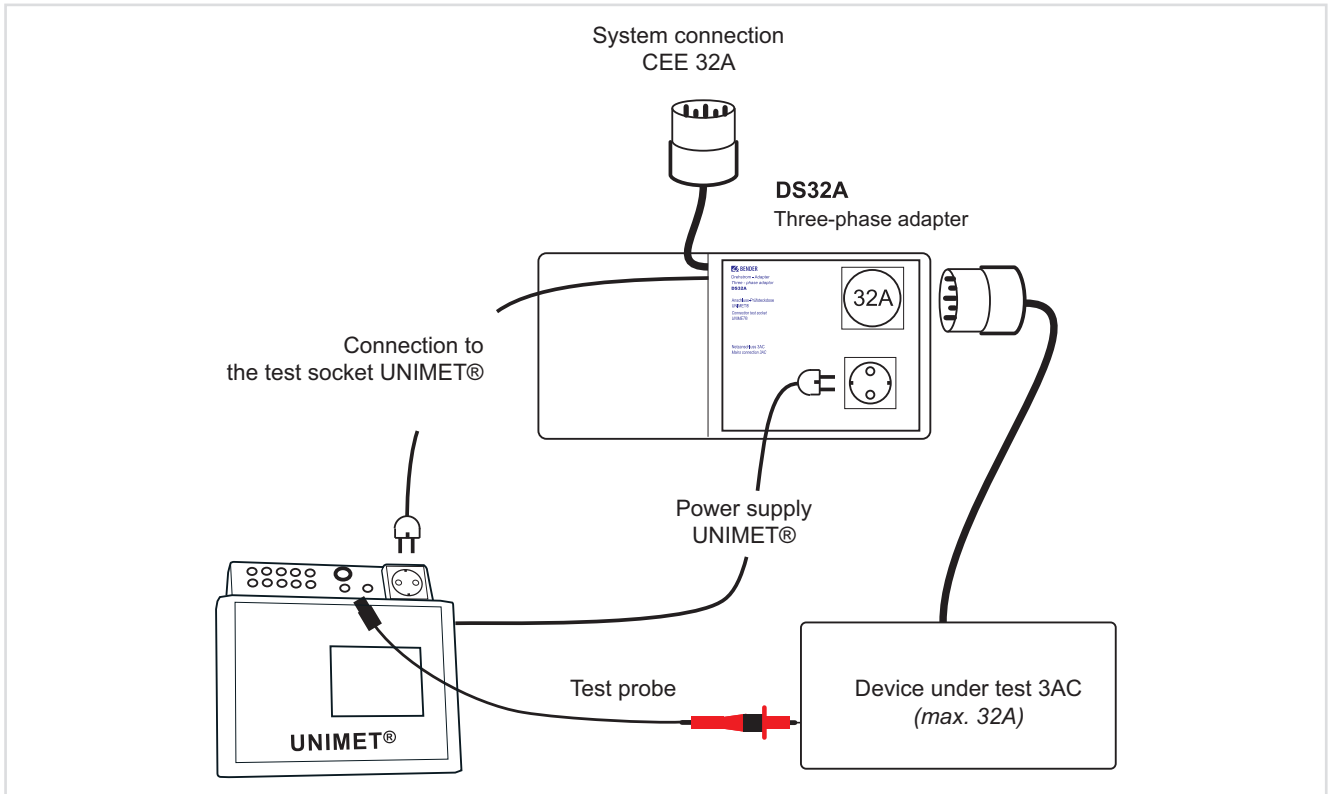
Supply voltage U_s	3AC 400 V ±10%
Frequency range U_s	50...60 Hz
Power consumption	approx. 18 VA
Load current max.	32 A

Environmental conditions

Storage temperature	-10...+70 °C
Operating temperature	0...+50 °C
Degree of protection	IP20
Dimensions	405 x 210 x 200 mm (width x height x depth)
Weight	8.9 kg
Height above sea level	max. 2000 m
Operating mode	not suitable for continuous operation

Dimension diagram (dimensions in mm)





VK701-8

Adapter kit 16 A for DS32A



Device features

- To be used in conjunction with the three-phase adapter DS32A

Further information

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

Typical applications

- for the measurement of 16-A-three-phase devices in conjunction with the three-phase adapter DS32A

Ordering information

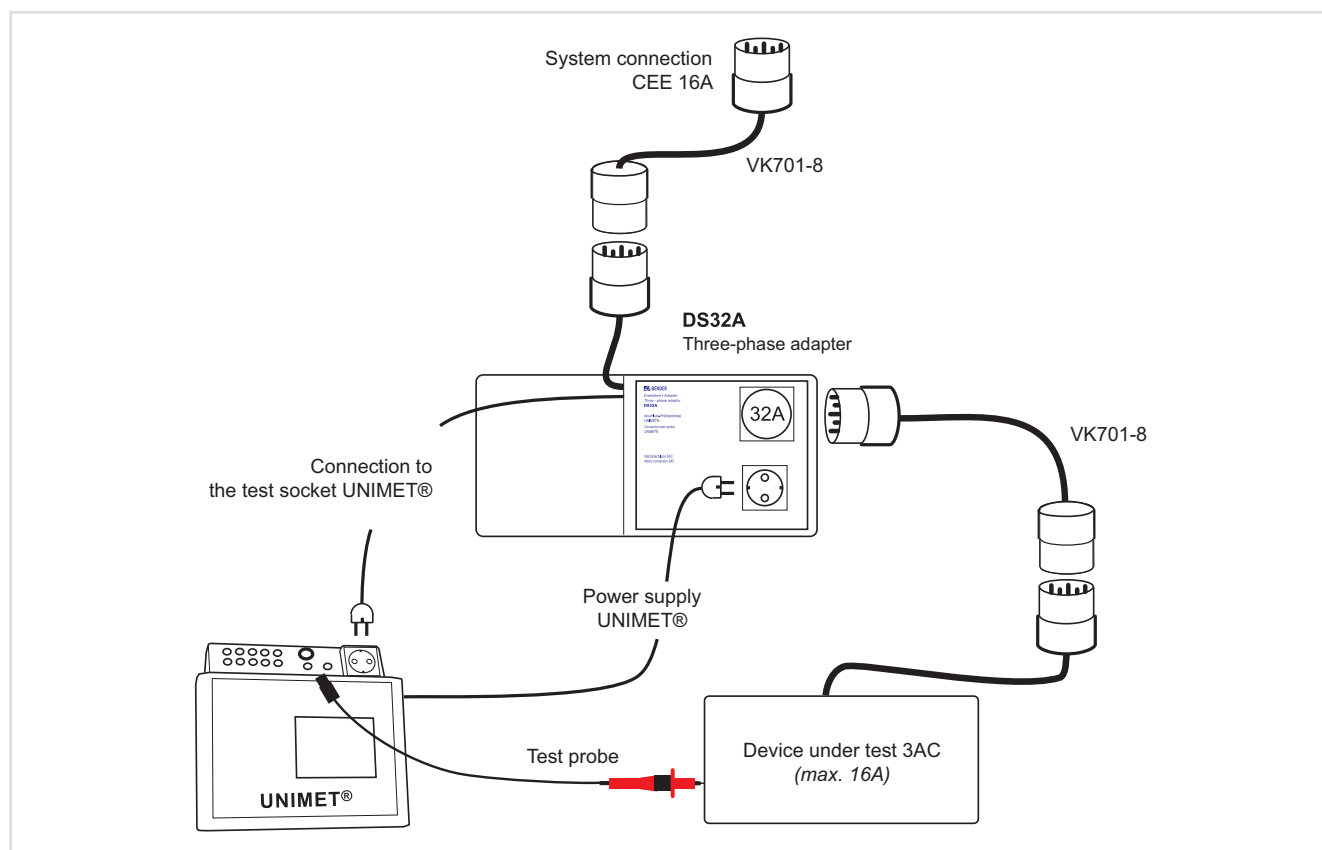
Type	Art. No.
VK701-8	B 9602 0097

Technical data

Nominal voltage

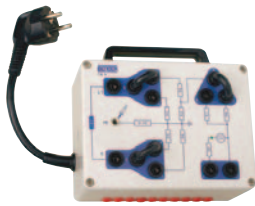
Nominal voltage	3AC 400 V
Max. current	16 A

Wiring diagram



TB3

Test box



Device features

- Test box for UNIMET® 800ST
- 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.com.

Typical applications

- Testing the measured values of safety testers
- Comprehensive system self test

Ordering information

Version	Type	Art. No.
Standard (German)	TB3 test box	B 9602 0025
CH	TB3 test box	B 9602 0055

Technical data

Insulation coordination acc. to IEC 60664-1

Rated insulation voltage	AC 250 V
Rated impulse voltage/pollution degree	4 kV/3

Voltage ranges

Nominal system voltage U_n	100...240 V
Rated frequency f_n	AC 48...62 Hz
Output voltage U_{12}	7.39 V ($\pm 2.5\%$)
Max. power consumption	35 VA at 50 Hz, 230 V

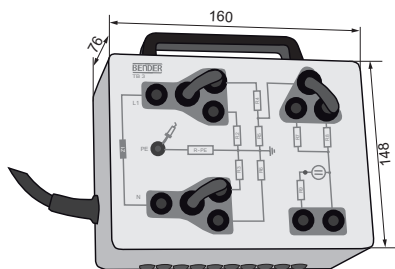
Evaluation of tolerance values

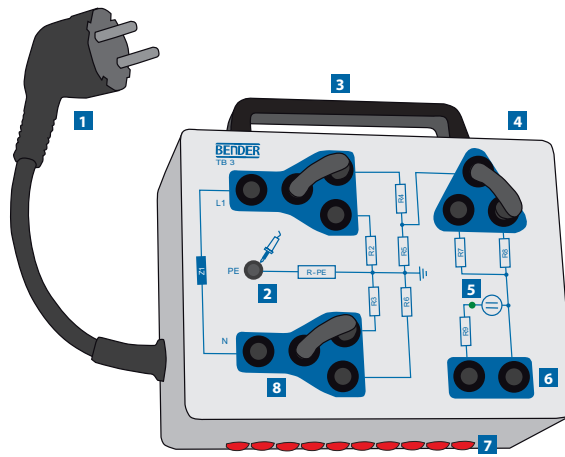
Precalculation	110 %
Tolerance	10 %
Built-in resistors	
R - MD (safety tester)	1000 Ω
R - PE	0.233 Ω
R3	25 000 Ω
R4	1 000 000 Ω
R5	1 500 000 Ω
R6	100 000 000 Ω
R7	1 000 000 Ω
R8	100 000 Ω
R9	130 000 Ω

Other

Ambient temperature (during operation)	0...+50 °C
Ambient temperature (during storage)	-10...+70 °C
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	

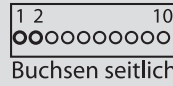
Dimension diagram (dimensions in mm)





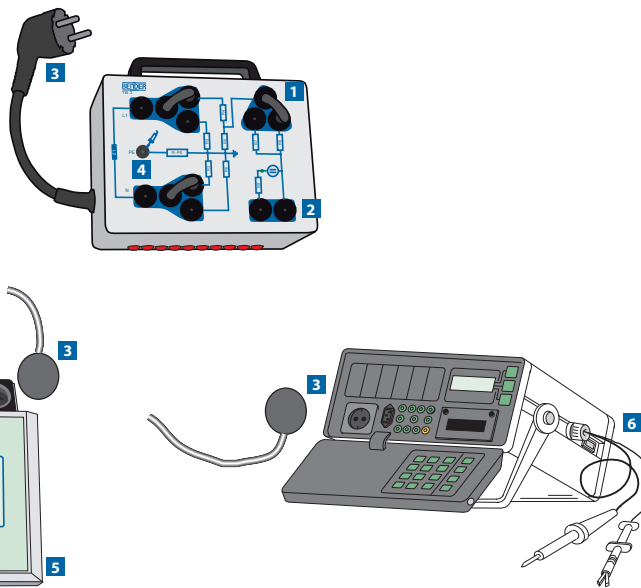
- 1** Mains plug; only to be used for the test socket of the safety tester
- 2** Socket for the connection of the test probe
- 3** Carrying handle
- 4** Enclosure, magnetic adhesive stripes allow simple fixing to the safety tester μ P601
- 5** LED lights when voltage is applied at the mains plug
- 6** Sockets for the patient connections 1 and 2 of the safety tester

- 7** The sockets 1 and 2 at the side of the test box TB3 are internally connected to the sockets on the front. The sockets 3...10 can be used to test the patient connections 3...10 at the safety tester (patient auxiliary current measurement). The measured values differ from the values documented in the table "tolerance values".



- 8** Jumpers allow simulation of different test situations

Connections



- 1** Jumpers. Insert the jumpers in such a way that the following sockets are connected:

μ P601	UNIMET® 800ST
a-b	a-b
d-e	d-f
h-i	h-i

- 2** Connect the patient sockets 1 and 2 of the safety tester (at UNIMET® 800ST socket 2 only) to the respective socket of the test box TB3.

- 3** Insert the mains plug of TB3 into the test socket of the safety tester, as illustrated. Please observe the plug-in direction.
 - at UNIMET® 800ST, insert the supply cable from the top
 - at μ P-Sicherheitstester, insert supply cable from below
 In case of wrong plug-in direction test results will become unusable.
- 4** Contact the test probe of the safety tester with the socket PE of TB3
- 5** UNIMET® 800ST test system
- 6** μ P601 safety tester

6.2

Insulation monitoring devices

ISOMETER®



7



1

Equipment for insulation fault location

ISOSCAN®



85



2

Measuring and monitoring relays

LINETRAXX®

Power Quality and Energy Measurement

LINETRAXX®



121



3

Residual current monitoring systems

LINETRAXX®



175



4

System components

Coupling devices

Measuring current transformers

Transformers

Measuring transducers

Power supply units

Measuring instruments

Interface converters

Interface repeaters

COMTRAXX® Gateways

COMTRAXX® Alarm indicator and test combinations

COMTRAXX® condition monitors

Visualisation



203



5

Switching equipment

ATICS® transfer switching and monitoring devices



285



6

Test systems

UNIMET® Safety analyser

Annex

Standards and guidelines applied
Alphabetical list of devices

Technical terms
Service & project management



285



i

Applied product standards and guidelines

Device families	International (IEC)	Europe (EN)	National standards (DIN VDE/DIN EN)	Others
Insulation monitoring devices and coupling devices (ISOMETER® und AKGs)	IEC 61557-8:2007-05	EN 61557-8:2007	DIN EN 61557-8 (VDE 0413 Part 8):2007-12	ASTM F 1207M-96(2007) (for AC) ASTM F 1669M-96(2007) (for AC, AC/DC, DC) ASTM F 1134-94(2007) (for offline monitor)
	E M C IEC 61326-2-4:2012-07	EN 61326-1:2006	DIN EN 61326-1 (VDE 0843-20-1):2006-10	
Insulation fault location systems (EDS)	IEC 61557-9: 2009-01	EN 61557-9:2009	DIN EN 61557-9 (VDE 0413-9):2009-11	
	E M C IEC 61326-2-4:2012-07	EN 61326-1: 2006EN 61326-2-4:2006	DIN EN 61326-1 (VDE 0843-20-1):2006-10 DIN EN 61326-2-4 (VDE 0843-20-2-4):2007-05	
Residual current monitors and residual current monitoring systems (RCM, RCMS, RCMA)	IEC 62020:2003-11 and according to IEC 60947-2 Annex M:2009-05	EN 62020:1998 and EN 62020/A1:2005 EN 60947-2:2006	DIN EN 62020 (VDE 0663):2005-11 DIN EN 60947-2 (VDE 0660-101):2010-04 Annex M	
Measuring and monitoring relays	IEC 61010-1:2010-06	EN 61010-1:2010	DIN EN 61010-1 (VDE 0411-1):2011-07	
	EMC IEC 61326-1:2012-07	EN 61326-1:2006	DIN EN 61326-1 (VDE 0843-20-1):2006-10	
Power supply units, energy backup, communication modules (FTCs) and the like, alarm indicator and test combinations (MK), operator and indicator panels	IEC 61010-1:2010-06	EN 61010-1:2010	DIN EN 61010-1 (VDE 0411-1):2011-07	
	E M C IEC 61326-1:2012-07	EN 61326-1:2006	DIN EN 61326-1 (VDE 0843-20-1):2006-10	
Pertains to all devices				
Insulation coordination	IEC 60664-1:2007-04 IEC 60664-3:2003-02	EN 60664-1:2007 EN 60664-3:2003	DIN EN 60664-1 (VDE0110-1):2008-01 DIN EN 60664-3 (VDE0110-3):2010-10	
Classification of climatic conditions	IEC 60721-3-1:1997-02 IEC 60721-3-2:1997-03 IEC 60721-3-3:2008-06	EN 60721-3-1:1997 EN 60721-3-2:1997 EN 60721-3-3:1995 and EN 60721-3-3/ A2:1997		
Classification of mechanical conditions	IEC 60721-3-1:1997-02 IEC 60721-3-2:1997-03 IEC 60721-3-3:2008-06	EN 60721-3-1:1997 EN 60721-3-2:1997 EN 60721-3-3:1995 and EN 60721-3-3/ A2:1997		
Classification of degrees of protection	IEC 60529:2001-02	EN 60529:1991 and EN 60529/A1:2000	DIN EN 60529 (VDE 0470-1):2000-09	

The edition of the standards listed above corresponds to the catalogue's latest date of issue.

Technical terms

Alarm state	Alarm state indicates that the residual current in the installation monitored has exceeded the preset level of the RCM.
Direct contact	Electric contact of persons or animals with live parts.
Earth	Part of the Earth which is in electric contact with an earth electrode and the electric potential of which is not necessarily equal to zero.
Earth electrode	Conductive part, which may be embedded in a specific conductive medium, e.g. concrete or caoke, in electric contact with the Earth.
Earth fault	Occurrence of an accidental conductive path between a live conductor and the Earth.
Earth fault current	Current flowing to earth due to an insulation fault.
Earth leakage current	Current flowing from the live parts of the installation to earth in the absence of an insulation fault.
Effect of the supply voltage	Effect influencing the functioning of measuring equipment and, consequently, the measured value produced by it.
Effects of the distribution system voltage	Effect influencing the operation and, consequently, the measured value produced by it.
Electric shock	Physiological effect resulting from an electric current through a human or animal body.
Equipment for insulation fault location	Device or combination of devices used for insulation fault location in IT systems. The insulation fault location system is used in addition to an insulation monitoring device. It injects a locating current between the electrical system and earth and locates insulation faults.
Equipotential bonding	Provision of electrical connections between conductive parts, intended to achieve equipotentiality.
Exposed-conductive part	Conductive part of equipment which can be touched and which is not normally live, but which can become live when basic insulation fails.
Extraneous conductive part	Conductive part not forming part of the electrical installation and liable to introduce an electric potential, generally the electric potential of a local earth.
Extraneous DC voltage U_{fg}	DC voltage occurring in AC systems between the AC conductors and earth (derived from DC parts).
Extraneous voltage	Voltage to which the measuring equipment can be subjected by external influences. This is not required for the operation of the measuring equipment, but can interfere with its operation.
Fault current I_{Δ}	Current which flows across a given point of fault resulting from an insulation fault.
Fault voltage (U_f)	Voltage appearing under fault conditions between exposed conductive and/or extraneous conductive parts and earth.
Fiducial value	A clearly specified value to which reference is made in order to define the fiducial error.
Indirect contact	Electric contact of persons or animals with exposed-conductive parts which have become live under fault conditions.
Influence quantity	A quantity which is not the subject of the measurement, but which influences the value of the measured quantity, or the indication of measuring equipment.
Insulation fault	A defect in the insulation of an equipment which can result either in an abnormal current through this insulation or in a disruptive discharge.
Insulation fault locator	Device or part of device for the location of the insulation fault.
Insulation monitoring device	Equipment which permanently monitors and indicate the insulation resistance of an electrical installation or a section of it in unearthed IT AC systems. The equipment is intended to signal a drop in insulation resistance below a minimum limit, so that the cause of the reduction can be found before a second fault occurs resulting in an unwanted disconnection of the electrical installation.
Insulation resistance R_f	Resistance in the system being monitored, including the resistance of all the connected appliances to earth.

Internal DC resistance R_i	Resistance of the insulation monitoring device between the terminals to the system being monitored and earth.
Internal impedance Z_i	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 (U_{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 (U_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.
Pulsating 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_{Δ}	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 (U_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 (U_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 (U_o)	<p>a) In distribution systems with an earthed neutral point, the voltage between a phase conductor and the earthed neutral point.</p> <p>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.</p>

Short forms of residual current protective devices

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 Schutzzumfang 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 for household and similar uses
SRCD	ortsfeste FI- bzw. DI-Schutzeinrichtung in Steckdosenausführung	fixed socket-outlets residual current protective device

Alphabetical list of devices

	Type	Type designation	Catalogue page
	107TD47	INSULATION MONITORING DEVICE	44
	7204	MEASURING INSTRUMENT	257
	7220		257
	9604		257
	9620		257
AGE	AGE185	COUPLING DEVICE	118
AGH	AGH150W-4		212
	AGH204S-4		213
	AGH520S		214
	AGH675S-7		215
AN	AN110	POWER SUPPLY UNITS	248
	AN111		250
	AN410		251
	AN420		253
	AN450		255
ATICS	ATICS-...-DIO	SWITCHOVER AND MONITORING	291
	ATICS-...-ISO	MODULE	288
CMD	CMD420	CURRENT RELAY	147
	CMD421		147
CME	CME420	CURRENT RELAY	144
CMS	CMS460-D	LOAD CURRENT EVALUATOR	150
CP	CP700	CONDITION MONITOR	270
COM	COM460IP	BMS-ETHERNET-GATEWAY	261
	COM461M		264
DI	DI-1DL	INTERFACE CONVERTER/	258
	DI-2	-REPEATER	259
	DI-2USB		260
	DI400	PROTOCOL CONVERTER	273
DS	DS0710	THREE-PHASE ISOLATING TRANSFORMER	241
	DS32A	THREE-PHASE ADAPTER	308
EDS	EDS150	INSULATION FAULT LOCATOR	104
	EDS151		104
	EDS30...		110
	EDS460-D		95
	EDS460-DG		100
	EDS461-D		95
	EDS490-D		95
	EDS491-D		95
EPS	EPS800	EXTERNAL POWER SOURCE	306
ES	ES710	SINGLE-PHASE ISOLATING TRANSFORMER	238
ESL	ESL0107	OPERATING THEATRE LUMINAIRES TRANSFORMER	244

	Type	Type designation	Catalogue page
FTC	FTC470XDP	DATA COUPLERPROFIBUS DP EN50170	268
	FTC470XMB	DATA COUPLER Modbus/RTU	266
GM	GM420	LOOP MONITOR	155
IR	IR123	INSULATION MONITORING DEVICE	71
	IR125Y-4		15
	IR155-3203		73
	IR155-3204		73
	IR1575		37
	IR420-D4		12
	IR420-D6		65
	IR423		68
	IR425		17
	IR427		40
	IR470LY		20
	IR470LY2-4061		23
	IR470LY2-60		62
IRDH	IRDH275	INSULATION MONITORING DEVICE	26
	IRDH275B		26
	IRDH275BM-7		30
	IRDH375		33
	IRDH375B		33
	IRDH575		88
iso	isoEV425	INSULATION MONITORING DEVICE	77
	isoLR275		59
	isoMED427P		92
	isoPV + AGH-PV		48
	isoPV425		56
	isoPV485		53
	isoRW425		81
MK	MK2430	ALARM INDICATOR AND	277
	MK800	TEST COMBINATION	273
PEM	PEM330	POWER QUALITY	164
	PEM333		164
	PEM533		167
	PEM555		170
	PEM575		170
PGH	PGH471	LOCATING CURRENT INJECTOR	107
	PGH473		107
RCM	RCM420	RESIDUAL CURRENT	178
RCMA	RCMA420	RESIDUAL CURRENT	181
	RCMA423	MONITOR	184
RCMB	RCMB20-500-01	RESIDUAL CURRENT	195
	RCMB35-35-01	MONITORING MODULE	198
	RCMB35-500-01		195
RCMS	RCMS460-D	RESIDUAL CURRENT	187
	RCMS460-L	MONITOR	187
	RCMS490-D		187
	RCMS490-L		187

continue page Alphabetical list of devices

	Type	Type designation	Catalogue page
RK	RK170	MEASURING TRANSDUCER	246
RM	RM475	LOOP MONITOR	158
SB	SB146	FAULT VOLTAGE MONITOR	160
TB	TB3	TESTBOX	311
UNIMET	UNIMET® 300	TEST SYSTEM	296
	UNIMET® 400		299
	UNIMET® 800		303
VK	VK701-8	ADAPTER KIT	310
VMD	VMD420	VOLTAGE RELAY 3ph 3(N)AC	130
	VMD421H		133
	VMD423		136
	VMD423-H		136
	VMD460		140
VME	VME420	VOLTAGE RELAY 1ph AC/DC	124
	VME421H		127

	Type	Type designation	Catalogue page
W	W0-S20...W5-S210	MEASURING CURRENT TRANSFORMER	216
	W10/600		216
	W...		218
	W...-8000		218
	W...AB		221
WF	WF...	MEASURING CURRENT TRANSFORMER FLEXIBLE	232
WR	WR...	MEASURING CURRENT TRANSFORMER	224
	WR70x175S(P)...WR200x500S(P)		226
WS	WS...	MEASURING CURRENT TRANSFORMER	228
	WS...-8000		228
	WS50x80s...WS80x160S		230

Service & Support				
Planning & concept	Selection of devices & project scheduling	Installation & commissioning	Operation & maintenance	Expansion & Modernisation
From support to customised solutions <ul style="list-style-type: none"> Detailed as-is analysis Technical support for products and systems Application assistance Seminars, training and presentations 	From the selection of the device to project scheduling <ul style="list-style-type: none"> Selection of the appropriate components and systems Working out a detailed solution Assistance in tender invitations and project awarding 	From installation to final inspection <ul style="list-style-type: none"> Installation check Parameter settings and adjustments Test run and final inspection Operator instruction/training 	From maintenance to repair <ul style="list-style-type: none"> Repair/ troubleshooting Maintenance, repairs, spare parts Maintenance/repair works 	From expansion to modernisation <ul style="list-style-type: none"> Technical advice on the improvement and modernisation Planning and implementation of retrofitting Optimisation of installations and installation sections

In more than 60 countries, your local Bender technician provides technical support for all our products and systems.

- When safety is concerned in project planning
- Optimum assistance facilitates implementation
- High plant availability and productivity

Technical Support – Field Service

Please contact your local dealer or refer to: www.bender-de.com





Bender GmbH & Co KG

P.O. Box 1161 • 35301 Grünberg • Germany

Londorfer Straße 65 • 35305 Grünberg • Germany

Tel.: +49 6401 807-0 • Fax: +49 6401 807-259

E-Mail: info@bender-de.com • www.bender-de.com



BENDER Group