1

BENDER
The Power in Electrical Safety©

Main catalogue part 1

A-ISOMETER®

Insulation monitoring devices

Insulation fault location systems

Main catalogue part 1
Insulation monitoring devices
Edition 05.2011

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Further information on other product ranges :

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Power in

Bender – Power in electrical safety

Electrical safety is indispensable. Safe and reliable use of electricity in various sectors calls for a high degree of electrical safety. Bender, a pioneer in this field, has made a major contribution to achieve this.

International presence

With more than 500 employees, Bender has been manufacturing and supplying electrical safety products since 1946. Ten technical offices in Germany and 50 agencies and distributors on all continents make us flexible to provide close and direct dialogue with our customers.

Innovative right from the start

With the first patent in the year 1939, Dipl.-Ing. Walther Bender, the founder of the company, not only had achieved that his idea had become reality, but also the philosophy to protect people and machines against the hazards of electrical current by innovative solutions and to make the use of electric energy even safer and more economical, had been realised. Still today, the name Bender is synonymous with this philosophy.

electrical safety

Quality in all areas

Our products are subject to stringent quality guidelines during development, manufacturing and testing. Bender's quality philosophy which have consistently been pursued is reflected in internationally accepted approvals, such as ISO9001.

Fit for practical application

Benefit from our knowledge. Training is decisive for your success.

Bender offers a wide range of seminars. From standard courses to expert courses or a training tailored exactly to your personal requirements.

Visit us in the Internet:
www.bender-de.com

Service for you

You can rely on Bender technology as well as on our service and support. We can advise and assist you in a variety of ways. From planning and projection through training courses to commissioning and maintenance.

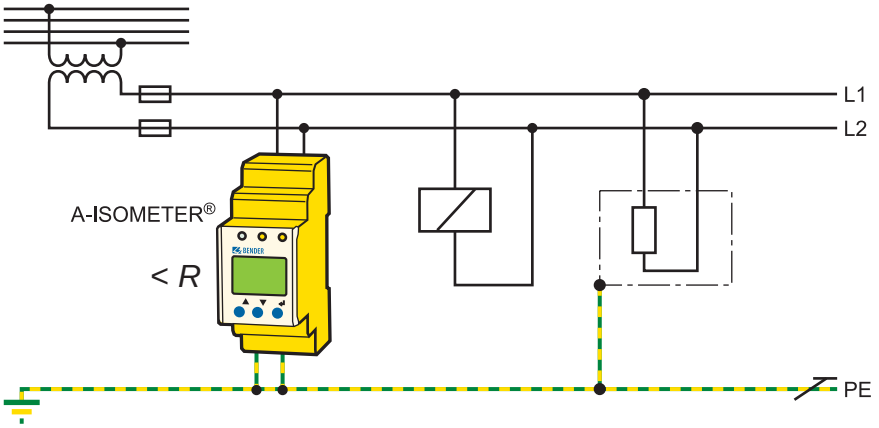
Device overview A-ISOMETER®
Control and auxiliary circuits

Control and auxiliary circuits

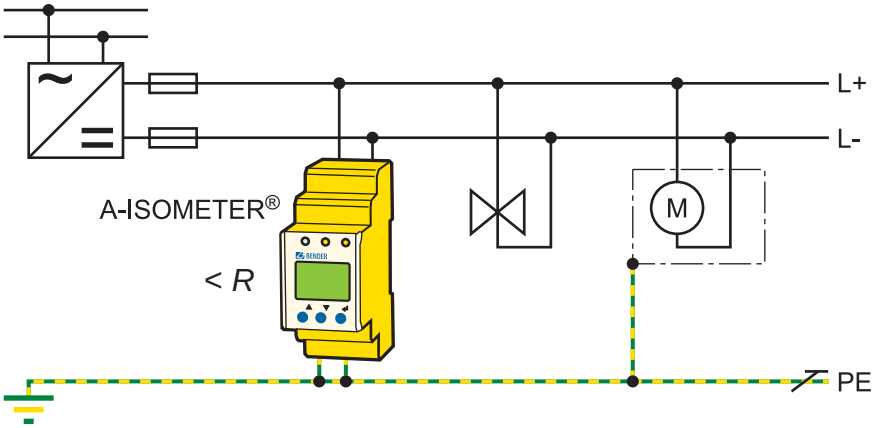
Control and auxiliary circuits are used for additional functions, such as command output, interlocking, alarm and measuring circuits.

For these circuits, particular emphasis is placed on operational reliability. Control circuits, such as machine control systems or safety lighting, are usually limited in space.

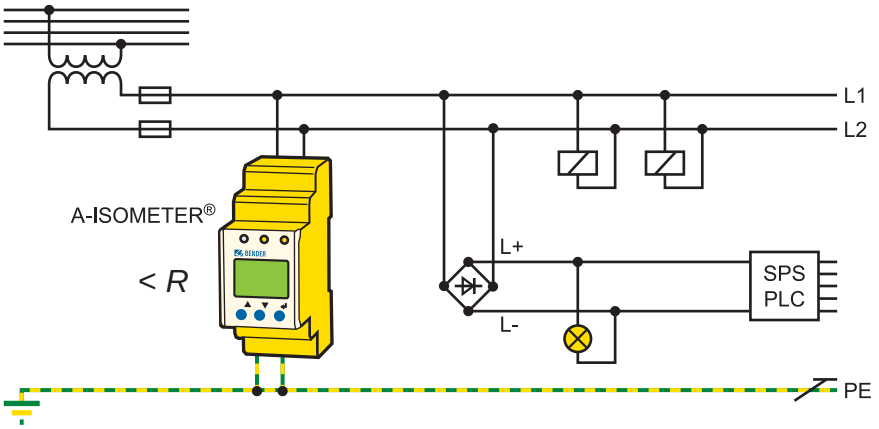
Examples of application



Control circuit AC



Control circuit DC



Control circuit AC/DC

Type
Application
Application range
Nominal voltage range U_n
Frequency range f_n
System leakage capacitance C_e
Response values/contacts
Number of response values
Response value
Alarm contacts
Mode of operation
Response time t_{an} bei $R_F = 0.5 \times R_{an}$ und $C_e = 1\ \mu F$
Start-up delay t
Response delay t_{on}
Communication
"Power On" LED
Alarm LEDs: Alarm AC, Alarm L+, Alarm L-
Alarm LED
Measured value display
General features
Measurement method
Test / reset button
Fault memory
Selective fault localisation L+ / L-
Connection monitoring

		
IR420	**IR125Y-4**	**IR425**
AC control and auxiliary circuits	DC control and auxiliary circuits	AC, DC, AC/DC control and auxiliary circuits
0…300 V	19.2…308 V	0…300 V
42…460 Hz	DC	DC, AC 15…460 Hz
≤ 20 µF	< 10 µF	≤ 20 µF
2	1	2
1…200 kΩ	10…200 kΩ	1…200 kΩ
2 x 1 changeover contact	1 changeover contact	2 x 1 changeover contact
N/O or N/C operation	N/C operation	N/O or N/C operation
≤ 2 s	≤ 6 s	≤ 2 s
0…10 s	--	0…10 s
0…99 s	--	0…99 s
×	×	×
--	--	--
Alarm 1, 2	×	Alarm 1, 2
LC display	--	LC display
DC	AMP	AMP
internal / external	internal / external (Reset)	internal / external
Measured value memory	×	Measured value memory
×	--	×
×	--	×
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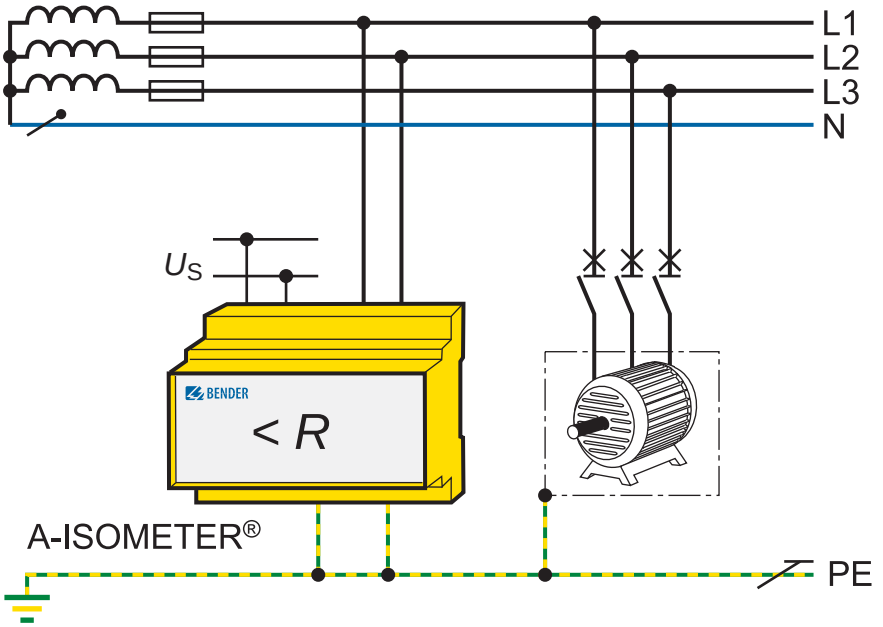
Note: For detailed information about the application and measuring principles of insulation monitoring devices and equipment for insulation fault location please refer to the brochure "Technical aspects – Main catalogue Part 1"

Device overview A-ISOMETER®
Main circuits AC, 3(N) AC

Main circuits

Main circuits provide power supply for electrical installations or buildings. These circuits include equipment for generating, converting, distributing, switching and consuming of electrical energy. There are different types of loads to be distinguished, such as pure AC loads (e.g. motors), AC/DC loads containing electronic components (e.g. converters) and pure DC loads (e.g. battery systems).

Example of application



AC main circuits with one motor

Type
Application
Application range
Nominal voltage range U_n
Frequency range f_n
System leakage capacitance C_e
Nominal voltage range U_n expandable (via coupling devices)
Response values/contacts
Number of response values
Response value
Alarm relay, main alarm
Alarm relay, prewarning
Communication
Measured value display
LED alarm
LED prewarning
General features
Measurement method
Test / reset button
Fault memory
Selective fault localisation L+ / L-
Connection monitoring

		
IR470LY	**IR470LY2-4061**	**IR470LY2-60**
Main circuits AC, 3(N) AC	Main circuits AC, 3(N) AC	Main circuits AC, 3(N) AC
0…793 V	0…793 V	0…793 V
40…460 Hz	40…460 Hz	40…460 Hz
< 20 µF	< 20 µF	< 10 µF
×	×	×
1	2	2
1…200 kΩ	10 …100 kΩ / 35 …500 kΩ	100 kΩ…1 MΩ / 500 kΩ…5 MΩ
2 changeover contacts	1 changeover contact	1 changeover contact
--	1 changeover contact	1 changeover contact
LED bar graph indicator	LED bar graph indicator	LED bar graph indicator
×	×	×
--	×	×
DC	DC	DC
internal / external	internal / external	internal / external
×	×	×
×	--	--
×	×	×
Chapter 1.4 – Page 48 - 49	**Chapter 1.4 – Page 50 - 51**	**Chapter 1.4 – Page 52 - 53**

Device overview A-ISOMETER®
Main circuits AC, 3(N)AC, DC, AC/DC

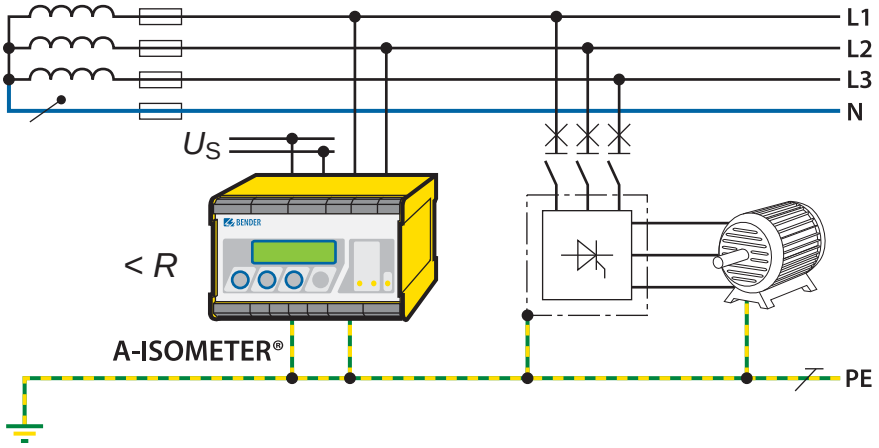
Main circuits DC

These are battery systems, solar systems or voltages generated by rectifiers, for example.

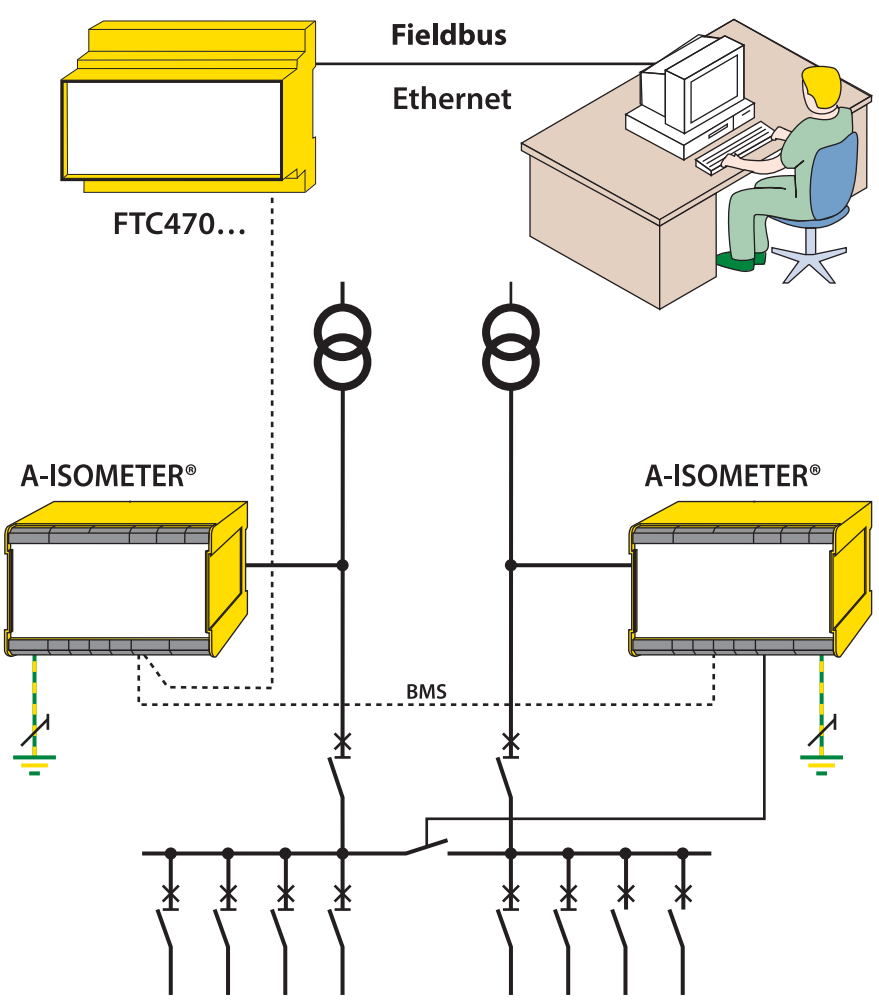
Main circuits AC/DC

AC systems with galvanically connected DC components such as converters, rectifiers or UPS systems.

Examples of application



AC / DC main circuits with variable-speed drive



Coupled IT systems

Type
Application
Application range
Nominal voltage range U_n
Frequency range f_n
System leakage capacitance C_e
Nominal voltage range U_n expandable (via coupling devices)
Application
Coupled IT systems
Response values/contacts
Number of response values
Response value
Alarm relay, alarm
Alarm relay, prewarning
Contact system fault
Communication
Measured value display
Prewarning display
RS-485 interface
Real-time clock
General features
Measurement method
Test / reset button
Fault memory
Selective fault localisation L+ / L-
Connection monitoring
History memory
Isometer disconnecting relay

			
IRDH275 (B)	**isoPV-3 mit AGH-PV-3**	**IRDH375 (B)**	**IR1575**
Main circuits AC, 3(N)AC, DC, AC/DC	Main circuits AC, AC / DC, DC	Main circuits AC, 3(N)AC, DC, AC/DC	Main circuits AC, 3(N)AC, DC, AC/DC
AC 0…793 V DC 0…650 V	AC, 3(N)AC 0…793 V, DC 0…1100 V	AC 0…793 V DC 0…650 V	AC 0…480 V DC 0…480 V
DC, AC 0.2…460 Hz	DC, 0.1…460 Hz	DC, AC 0.2…460 Hz	DC, AC 30…460 Hz
< 150 (500) µF	≤ 2000 µF	< 150 (500) µF	≤ 60 µF
×	--	×	--
B version	--	B version	--
2	2	2	2
1 kΩ…10 MΩ	0.2 kΩ…100 kΩ	1 kΩ…10 MΩ	2 kΩ…1 MΩ
1 changeover contact	1 changeover contact	1 changeover contact	1 changeover contact
1 changeover contact	1 changeover contact	1 changeover contact	1 changeover contact
--	--	1 changeover contact	--
LC display	LC display	LC display	LC display
×	×	×	×
BMS protocol (B version)	BMS protocol	BMS protocol (B version)	--
B version	×	B version	--
AMP *PLUS*	***AMP*** *PLUS*	***AMP*** *PLUS*	***AMP***
internal / external	internal / external	internal / external	internal / external
×	×	×	×
×	×	×	×
×	×	×	×
B version	×	B version	--
B version	×	B version	--
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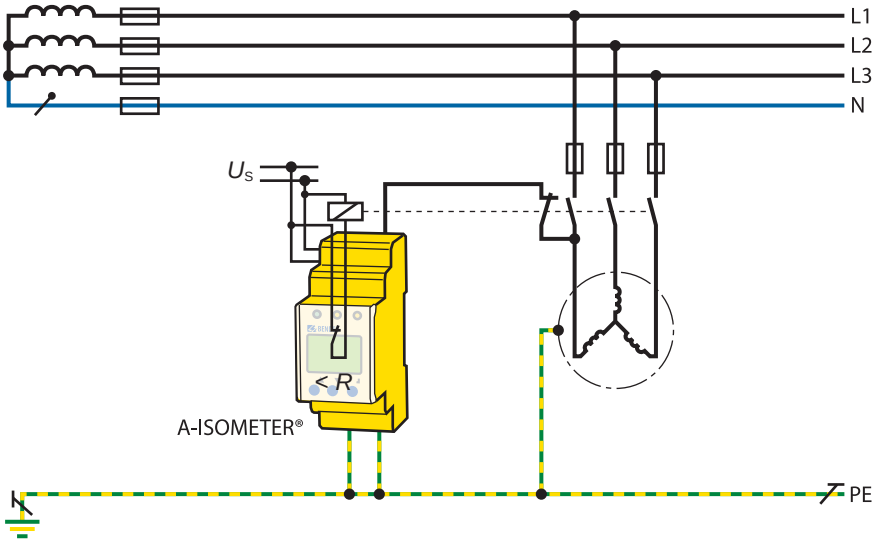
Device overview A-ISOMETER®
Special applications

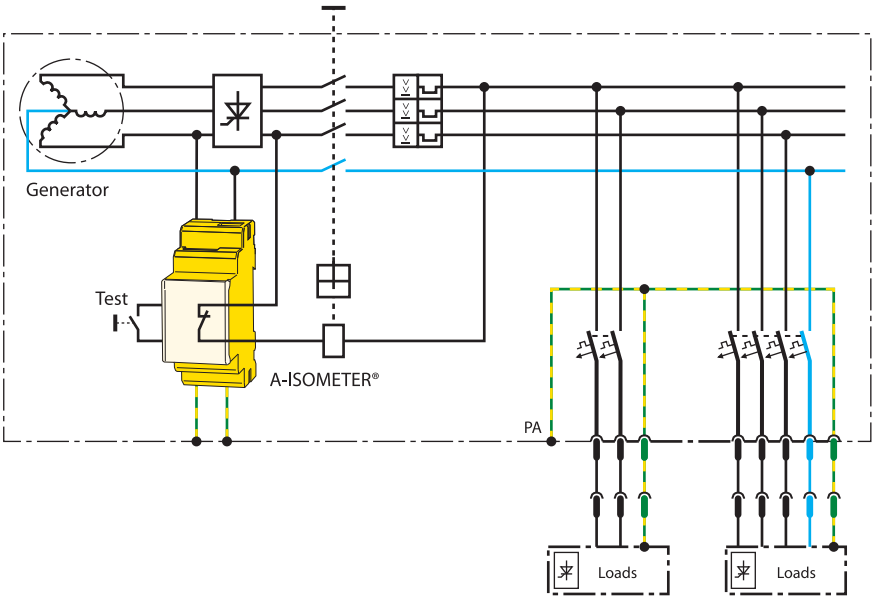
Special applications

Our product range includes a variety of products tailored to meet your specific application. Should you have any questions, please do not hesitate to contact our Technical Sales Department.

Examples of application



Monitoring of de-energised loads with IR420-D6 (offline)



Monitoring of mobile generators with IR423

Type
Application
Application range
Nominal voltage range U_n
Frequency range f_n
System leakage capacitance C_e
Nominal voltage range U_n expandable (via coupling devices)
Response values/contacts
Number of response values
Response value
Alarm relay, alarm
Alarm relay, prewarning
Communication
Measured value display
LED alarm
LED prewarning
RS-485-interface (BMS protocol)
General features
Measurement method
Test / reset button
Fault memory
Selective fault localisation L+ / L-
Connection monitoring
Load and temperature monitoring

	
IR420-D6	**IR423**
Main circuits, disconnected loads	AC main circuits mobile generators (also inverter technology)
AC 0…480 V	AC 0…300 V
AC 42…460 Hz	AC 30…460 Hz
≤ 10 µF	≤ 5 µF
≤ 7.2 kV (AGH520)	--
2	2
100 kΩ…10 MΩ	1 …200 kΩ
1 changeover contact	1 changeover contact
1 changeover contact	1 changeover contact
LC display	LC display
×	×
×	×
--	--
DC	DC (modified)
internal / external	internal / external
Measured value memory	Measured value memory
×	×
--	×
--	--
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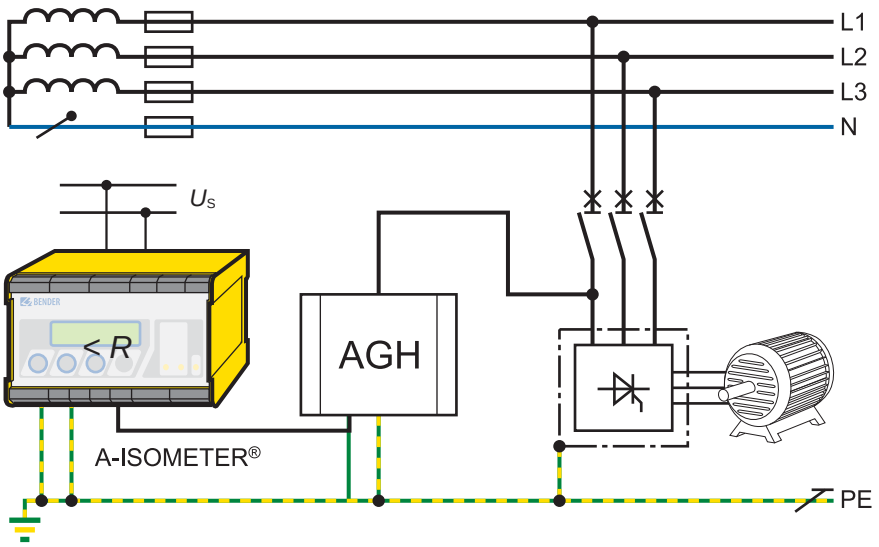
1.0

Example of application



Monitoring of medium-voltage drives with IRDH275BM-7 with coupling device AGH675S-7

= Frequency converter

Type
Application
Application range
Nominal voltage range U_n
Frequency range f_n
System leakage capacitance C_e
Nominal voltage range U_n expandable (via coupling devices)
Response values/contacts
Number of response values
Response value
Alarm relay, alarm
Alarm relay, prewarning
Communication
Measured value display
LED alarm
LED prewarning
RS-485-interface (BMS protocol)
General features
Measurement method
Test / reset button
Fault memory
Selective fault localisation L+ / L-
Connection monitoring
Load and temperature monitoring

IRDH275BM-7 with AGH675S-7

AC, DC, 3(N) AC main circuits
medium-voltage converters

0…7.2 kV with AGH675
DC, AC 0.2…460 Hz
≤ 5 µF
--

2
100 kΩ…10 MΩ
1 changeover contact
1 changeover contact

LC display
×
×
×

***AMP**PLUS*
internal / external
×
×
×
--

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Device overview
Equipment for insulation fault location

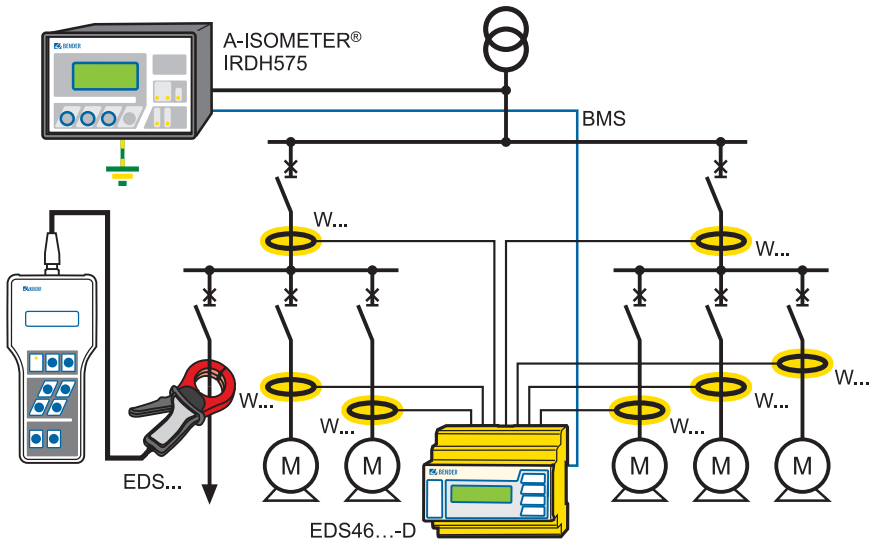
Equipment for insulation fault location EDS – The special extra for the reliability of your electrical installations

In order to achieve high availability and to avoid costly shut-down periods, it is necessary to recognize insulation faults at an early stage - before interruption to operation occurs. For this reason, unearthed systems (IT systems) with insulation monitoring are used for the power supply of essential electrical installations and loads. The A-ISOMETER® provides the necessary advance information.

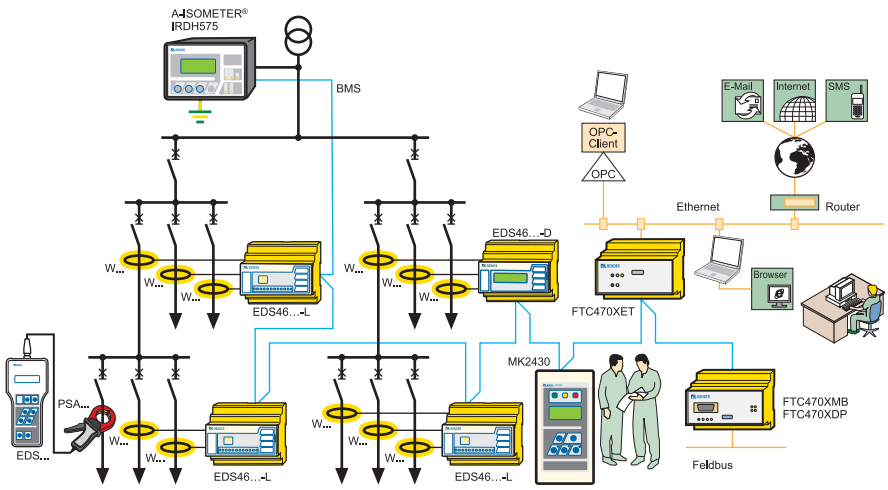
Fast localisation and elimination of insulation faults is required by IEC 60364-4-42.

The insulation fault location system is a modular system ideally suited for this task.

Examples of application



Insulation fault location – EDS basic system



Insulation fault location with communication connection

Type	
Application	
Application range	
Nominal system voltage U_n (B1)	
Nomminal system voltage U_n (B2)	
Supply voltage	
IRDH575B1-435 IRDH575B2-435 IRDH575B1-4235	
IRDH575B1-427 IRDH575B1W-4227	
Data	
Test current	
Response values	
LC display	
Alarm relay	
Interface/ protocol	
Address range	

Type	
Application	
Supply voltage	
U_S: DC 16…94 V, AC 42…460 Hz 16…72 V	
U_S: AC/DC 70…276 V AC 42…460 Hz	
Data	
LC graphical display	
7-segment display/LED indication	
Scanning time	
Response value	
Residual current indication	
Parameter setting function	
Error code indication	
Address range	
Internal clock (RTC)	
History memory	
Alarm relay "Common alarm"	
Alarm relay per channel	

IRDH575B1-4…
Main circuits Insulation monitoring and locating current injector
3AC / AC 20…575 V DC 20…575 V (B1 version) 3AC / AC 340…760 V DC 340…575 V (B2 version)
AC 88…264 V DC 77…286 V -- DC 19.2…72 V --
10 / 25 / 50 mA 1 kΩ…10 MΩ 4 x 20 characters 3 changeover contacts RS-485 (BMS) 1…30

IRDH575B1-42…
Control circuits Insulation monitoring and locating current injector
3AC / AC 20…150 V / DC 20…150 V (version IRDH575B1-4227, IRDH575B1-4235) --
AC 88…264 V DC 77…286 V -- DC 19.2…72 V --
1 / 2.5 mA 1 kΩ…10 MΩ 4 x 20 characters 3 changeover contacts RS-485 (BMS) 1…30

EDS460-D/DG…	EDS490-D	EDS460-L	EDS490-L
Main circuits, insulation fault locator			
EDS460-D-1 EDS460-DG-1*	EDS490-D-1	EDS460-L-1	EDS490-L-1
EDS460-D-2 EDS460-DG-2*	EDS490-D-2	EDS460-L-2	EDS490-L-2
×	×	--	--
--	--	×	×
< 10 s for up to 1080 measuring channels			
2…10 mA			
100 mA…10 A (EDS460-DG 20 mA…2 A)			
×	×	--	--
×	×	×	×
1…90		1…90	
×	×	--	--
×	×	--	--
2 x 1 changeover contact			
--	12 x 1 N/O contact	--	12 x 1 N/O contact
Chapter 1.7 – Page 88 -107			

EDS461-D	EDS491-D	EDS461-L	EDS491-L
Control circuits, insulation fault locator			
EDS461-D-1	EDS491-D-1	EDS461-L-1	EDS491-L-1
EDS461-D-2	EDS491-D-2	EDS461-L-2	EDS491-L-2
×	×	--	--
--	--	×	×
< 10 s for up to 1080 measuring channels			
0.2…1 mA			
10 mA…1 A			
×	×	--	--
×	×	×	×
1…90		1…90	
×	×	--	--
×	×	--	--
2 x 1 changeover contact			
--	12 x 1 N/O contact	--	12 x 1 N/O contact
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* EDS460-DG-…particularly for localising insulation faults in DC IT systems with a number of branch circuits where high system leakage capacitances are involved

Device overview
Portable equipment for insulation fault location

Type	EDS3090	EDS3091
Application	Main circuits, insulation monitoring and locating current injector	Control circuits, insulation monitoring and locating current injector
Automatic fault location	--	--
Manual fault location	×	×
System design		
Portable systems	--	--
Portable systems to supplement stationary systems	×	×
Functions		
Insulation monitoring device	various types	
Insulation fault locator	EDS190P	EDS190P
Locating current injector	--	--
Technical data		
Locating current injector	--	--
Nominal voltage AC	EDS460 / 490 system installed	EDS461 / 491 system installed
Nominal voltage DC	--	--
Locating current max.	10 / 25 mA	1 / 2.5 mA
Insulation fault locator	EDS190P	EDS190P
Sensitivity	2…10 mA	0.2…1 mA
Number of channels	1	1
Indicating device	EDS190P	EDS190P
Display	3 x 16 characters	
Note	preferred A-ISOMETER®s: IRDH275 and IRDH375	

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EDS3090PG	EDS3091PG	EDS3096PG
Main circuits, insulation monitoring and locating current injector	Control circuits, insulation monitoring and locating current injector	Main circuits, insulation monitoring and locating current injector
--	--	--
×	×	×
×	×	×
--	--	--
various types		various types
EDS190P	EDS190P	
PGH185	PGH183	PGH186
PGH185	PGH183	PGH185
AC, 3(N)AC 20…575 V, with AGE185 AC, 3(N)AC 500…790 V	AC, 3(N)AC 20…265 V	AC 0…575 V
DC 20…500 V, with AGE185 DC 400…960 V	DC 20…308 V	DC 0…504 V
10 / 25 mA	1 / 2.5 mA	10 / 25 mA
EDS190P	EDS190P	EDS165
2…10 mA	0.2…1 mA	2…10 mA
1	1	1
EDS165	EDS165-3	EDS165
3 x 16 characters		3 x 16 characters
preferred A-ISOMETER®s: IRDH275 and IRDH375		preferred A-ISOMETER®s: IRDH275 and IRDH375 can also be used in de-energised IT systems
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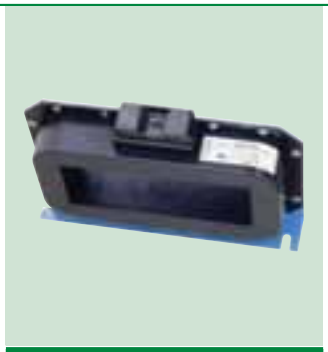
Device overview
Measuring current transformers for EDS systems

Measuring current transformer series	W…S							W…/W…-8000							W10	
Inside diameter in mm (W x H) Band length in mm	20	35	70	105	140	210	35	20	35	60	120	210	20	35	60	10	
CT type	W0-S20	W1-S35	W2-S70	W3-S105	W4-S140	W5-S210	W1-S35-8000	W20	W35	W60	W120	W210	W20-8000	W35-8000	W60-8000	W10/600 W10/600-6	W10/8000 W10/8000-6
For product series																	
EDS460	×	×	×	×	×	×	--	×	×	×	×	×	--	--	--	×	--
EDS460-DG	×	×	×	×	×	×	--	×	×	×	×	×	--	--	--	×	--
EDS490	×	×	×	×	×	×	--	×	×	×	×	×	--	--	--	×	--
EDS461	--	--	--	--	--	--	×	--	--	--	--	--	×	×	×	--	×
EDS491	--	--	--	--	--	--	×	--	--	--	--	--	×	×	×	--	×
	Chapter 1.7 – Page 120 - 121							Chapter 1.7 – Page 122 - 125								on request	

WR...	
70 x 175	115 x 305
WR70x175	WR115x305
×	×
×	×
×	×
--	--
--	--

Chapter 1.7 – Page 126 - 125



WR...S			
70 x 175	115 x 305	150 x 350	200 x 500
WR70x175S	WR115x305S	WR150x350S	WR200x500S
×	×	×	×
×	×	×	×
×	×	×	×
--	--	--	--
--	--	--	--

Chapter 1.7 – Page 128 - 129

split-core type

WS.../WS...-8000				
20 x 30	50 x 80	80 x 120	20 x 30	50 x 80
WS20x30	WS50x80	WS80x120	WS20x30-8000	WS50x80-8000
×	×	×	--	--
×	×	×	--	--
×	×	×	--	--
--	--	--	×	×
--	--	--	×	×

Chapter 1.7 – Page 130- 131

split-core type

WS...S/WS...S-8000				
50 x 80	80 x 80	80 x 160	20 x 30	50 x 80
WS50x80S	WS80x80S	WS80x160S	WS20x30S-8000	WS50x80S-8000
×	×	×	--	--
×	×	×	--	--
×	×	×	--	--
--	--	--	×	×
--	--	--	×	×

Chapter 1.7 – Page 132 - 133

Device overview supplementary equipment
Coupling devices

		
Type	**AGH150W-4**	**AGH204S**
Application	Coupling device. extension of the nominal voltage range for A-ISOMETER®s	Coupling device. extension of the nominal voltage range for A-ISOMETER®s
For device family		
IR470LY…	--	×
IRDH275 / 375	×	×
IRDH575	--	--
IREH470LY2	--	×
IRDH275BM	--	--
Voltages		
Nominal system voltage	DC 0…1760 V	AC, 3(N)AC 50…400 Hz 1650 V/0…1300 V
	Chapter 1.8.1 – Page 138	Chapter 1.8.1 – Page 139

	
AGH520S	**AGH675**
Coupling device. extension of the nominal voltage range for A-ISOMETER®s	Coupling device. extension of the nominal voltage range for A-ISOMETER®s
×	--
×	--
--	--
×	--
--	×
3(N)AC 50…400 Hz 0…7.2 kV	AC/3(N)AC/DC 0…460 Hz 0…7.2 kV
Chapter 1.8.1 – Page 140	**Chapter 1.8.1 – Page 141**

Device overview supplementary devices
Interface converters and repeaters

Type	DI-1PSM	DI-2	DI-2USB
			
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 connector	USB Type B
Cable length	≤ 1200 m	≤ 15 m	≤ 5 m
Expansion of bus devices	≤ 30	--	--
Supply voltage			
Supply voltage	AC/DC 24 V ± 20 %	DC 10…30 V	via USB with driver CD
General features			
Mounting	DIN rail	screw mounting or DIN rail mounting	--
	Chapter 1.8.2 – Page 144 - 145	Chapter 1.8.2 – Page 146	Chapter 1.8.2 – Page 147

Device overview supplementary devices
Protocol converters for standard fieldbus systems and Ethernet networks

Type	FTC470XET	FTC470XMB	FTC470XDP
Application	Protocol converter BMS-TCP/IP	Protocol converter BMS-Modbus RTU	Protocol converter BMS-PROFIBUS DP
Functions			
Protocol input	BMS	BMS	BMS
Protocol output	Ethernet (TCP/IP) OPC	Modbus RTU	PROFIBUS DP
Alarm messages	×	×	×
Meas. values	×	×	×
Device parameter setting	via PC with browser	to a limited extent (via visualisation)	to a limited extent (via visualisation)
Alarm list	via visualisation	via visualisation	via visualisation
History memory	via PC with browser	via visualisation	via visualisation
Diagrams	via visualisation	via visualisation	via visualisation
E mail notification	via PC with browser	to a limited extent (via visualisation)	to a limited extent (via visualisation)
Device tests	via PC with browser	to a limited extent (via visualisation)	to a limited extent (via visualisation)
Data logger	via PC with browser	to a limited extent (via visualisation)	to a limited extent (via visualisation)
E-mail notification	×	--	--
Axeda compatible	×	×	×
Advantech compatible	×	×	×
Active-X-Toolkit compatible	×	--	--
Client communication	Ethernet	Modbus RTU	PROFIBUS DP
Connection			
BMS	screw-type terminal	screw-type terminal	screw-type terminal
Output	RJ45	9-pin Sub-D connector	9-pin Sub-D connector
System requirements			
Computer	Standard	--	--
Operating system	version …	--	--
Browser	Internet Explorer, Opera, Firefox etc.	--	--
	Chapter 1.8.3 – Page 150 - 151	Chapter 1.8.3 – Page 152 - 153	Chapter 1.8.3 – Page 154 - 155

Visualisation = SCADA software with appropriate programming

Device overview supplementary devices
Alarm indicator and operator units

Type	MK800-11	MK800-12	Touch Panel TPC
Displays			
MEDICS® systems	×		×
RCMS Residual current monitoring	×		×
Insulation fault location systems	×		×
Mounting			
Flush-mounting	×		×
Cavity wall mounting	×		--
Cable-duct mounting	×		--
Panel mounting	×		×
Inputs/outputs			
Digital inputs (potential free)	16	--	--
N/O or N/C operation	selectable	--	--
Relay outputs	1	--	--
N/O or N/C operation	programmable		--
Common alarm	programmable		--
System fault alarm	programmable		--
Display and operating controls			
Backlit LC display	4 x 20 characters		--
Screen resolution	--		320 x 240, 800 x 600, 1024 x 768
Character height	8 mm		programmable
LEDs: normal, warning, alarm	×		programmable
Button "Buzzer mute"	×		programmable
Button "Add. text"	×		programmable
Parameter setting buttons	3		programmable
Parameter setting/text message			
Languages selectable	20		programmable
Standard display	4 x 20 characters		--
Additional text can be displayed	3 x 20 characters		--
Pre-defined standard texts	×		--
Freely configurable text messages	≤ 1000		--
History memory, maximum number of data records	≤ 1000		--
Real-time clock	×		--
Parameterisation software	TMK-Set V 3.xx (USB, BMS)		Advantech Studio
Messages/alarms, medical gases	acc. to EN475, EN737-8		--
Interfaces			
RS-485 (BMS protocol)	2 x RS-485 (BMS protocol)		--
BMS address range	Internal: 1…150, external: 1…99		--
Master redundancy, BMS internal	×		--
Master redundancy, BMS external	×		--
USB	×		×
RS-232	--		--
Ethernet (TCP/IP)	--		×
EIB	--		--
Voltage supply			
Supply voltage	AC/DC 24 V		AC/DC 24 V
Stored energy time in the event of power failure	≤ 2 s		--
	Chapter 1.8.4 – Page 158 - 163		Chapter 1.8.4 – Page 164 - 165

Device overview supplementary devices
Visualisation

Type	Axceda Wizcon
Application	SCADA software for visualisation
Appropriate gateway	FTC470XET, FTC470XMB or BMS OPC server
Technical requirements	Compatible PC ≥ 6 GHz, ≥ 256 MB RAM 500 MB storage space on the hard disk CD ROM or DVD drive Graphics card ≥ 8 MB Screen resolution ≥ 800 x 600 USB or dongle - printer connection
Operating systems	Windows 2000, XP
Scope of delivery	Demo version, development or runtime versions for 100…65000 process items, operating manual
Note	Additional services: customer-specific programming

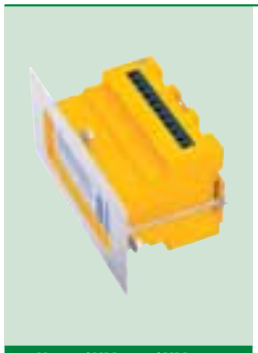
Chapter 1.8.5 – Page 168 - 169

Device overview supplementary devices
Measuring transducers

Type	RK170
Application	DC 0…400 µA 0 / 4…20 mA 0…10 V
Input	
Interface/ protocol	--
Digital inputs	--
Mode of operation	--
Voltage level	--
Analogue inputs	--
Current	DC 0…400 µA
Output	
Interface/ protocol	--
Number of relay contacts	--
Contact data	--
Mode of operation	--
Common alarm contact	--
Alarm LED	--
Current	0 / 4…20 mA
Voltage	DC 0…10 V
Note	--
	Chapter 1.8.6 – Page 172 - 173

Device overview supplementary equipment
Measuring instruments – Mounting

Type	kΩ indication	MΩ indication	kΩ indication
Application	Measuring instruments for A-ISOMETER® R_i = 120 kΩ	Measuring instruments for A-ISOMETER® R_i = 1,2 MΩ	Measuring instruments for A-ISOMETER® R_i = 120 kΩ
For device series			
IR470LY…	×	--	--
IRDH275 / 375	×	--	B version
IRDH575	--	--	×
IREH470LY2-60	--	×	--
Insulation fault location system	--	--	--
Device features			
Inputs	0…400 µA	0…400 µA	0…20 mA
	Chapter 1.8.6 – Page 174	Chapter 1.8.6 – Page 174	Chapter 1.8.6 – Page 174



Type	X470 / XM460 / XM490	X470	XM420	IP65 front plate cover
Application	Mounting frame 144 x 72 mm	Mounting parts	Mounting frame	Front plate cover IRDH375 / 575
For device series				
IR47…	×	×	--	--
IRDH375	--	--	--	×
IRDH575	--	--	--	×
EDS47…	×	×	--	--
EDS46…	×	--	--	--
EDS49…	×	--	--	--
IR42…	--	--	×	--
	Chapter 1.8.6 – Page 175	Chapter 1.8.6 – Page 175	Chapter 1.8.6 – Page 175	Chapter 1.8.6 – Page 176

A-ISOMETER® for AC systems ≤ 230 V

Chapter 1.1

A-ISOMETER® for AC systems ≤ 230 V
e.g. AC control and auxiliary circuits or contactor and relay control.

A-ISOMETER® IR420

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

A-ISOMETER® IR420

Device features

- Insulation monitoring for IT control circuits AC 0…300 V
- Two separately adjustable response values
- Preset function (automatic assignment 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, approvals and certifications

c UL us LISTED

PCT AE25

Product description

The A-ISOMETER® IR420 monitors the insulation resistance of unearthed AC control circuits (IT systems) 0…300 V. If the systems to be monitored include DC components, such as switched-mode power supplies or solenoid valves, the display and operating characteristics may be affected.

The display and response values apply to pure AC systems.

An external supply voltage allows de-energised systems to be monitored too.

Application

- AC control circuits in the industrial sector, mechanical engineering, power plants, elevators, automation systems etc.
- AC control and auxiliary circuits in accordance with IEC 60204-1: "Safety of machinery – Electrical equipment of machines, Part 1: General requirements"
- Smaller AC IT systems such as lighting systems, mobile generators

Function

The currently measured insulation resistance is indicated on the LC display. In this way any changes, for example when circuits are connected to the system, can be recognised easily. When the value falls below the preset response values, the response delay "t_{on}" starts. Once the response delay "t_{on}" has elapsed, the alarm relays "K1 / K2" switch and the alarm LEDs "AL1 / AL2" light up. Two separately adjustable response values/alarm relays allow a distinction to be made between prewarning and alarm. If the insulation resistance exceeds the release value (response value plus hysteresis), the alarm relays return to their initial position. If the fault memory is enabled, the alarm relays remain in the alarm state until the reset button is pressed or until the supply voltage is switched off. The device function can be tested using the test button. The parameterisation of the device can be carried out via the LC display or the function keys integrated in the front plate.

Connection monitoring

The connections to the system (L1 / L2) and earth (E / KE) are either automatically checked every 24 h, or by pressing the test button or when supply voltage has been connected. In case of interruption of a connecting lead, the alarm relays K1 / K2 switch, the LEDs ON // AL1 // AL2 flash and the following message appears on the display:

"E.02" indicating a fault in the connecting leads to the system,

"E.01" signals a fault in the connecting leads to PE.

After eliminating the fault, the alarm relays return to their initial position either automatically or by pressing the reset button.

Preset function

After connecting the device for the first time, the nominal system voltage is measured and the response values are set automatically.

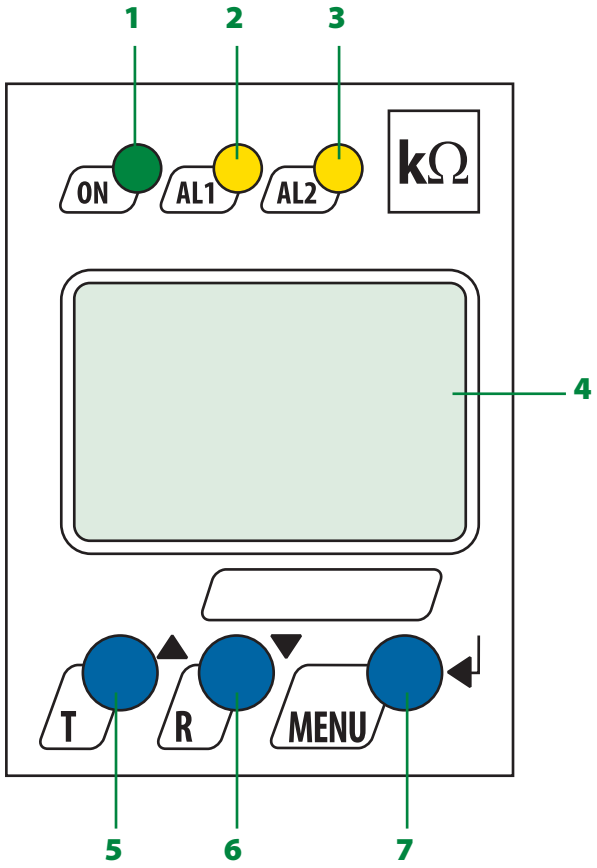
Measurement method

The A-ISOMETER® IR420 uses the measurement method "superimposed DC voltage".

Standards

The IR420 series complies with the requirements of the device standards: IEC 61557-8, ASTM F1207M-96 (2007).

Operating elements



1 - LED Power "ON", flashes in case of interruption of the connecting leads earth/ 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 earth/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 earth/KE or L1/L2).

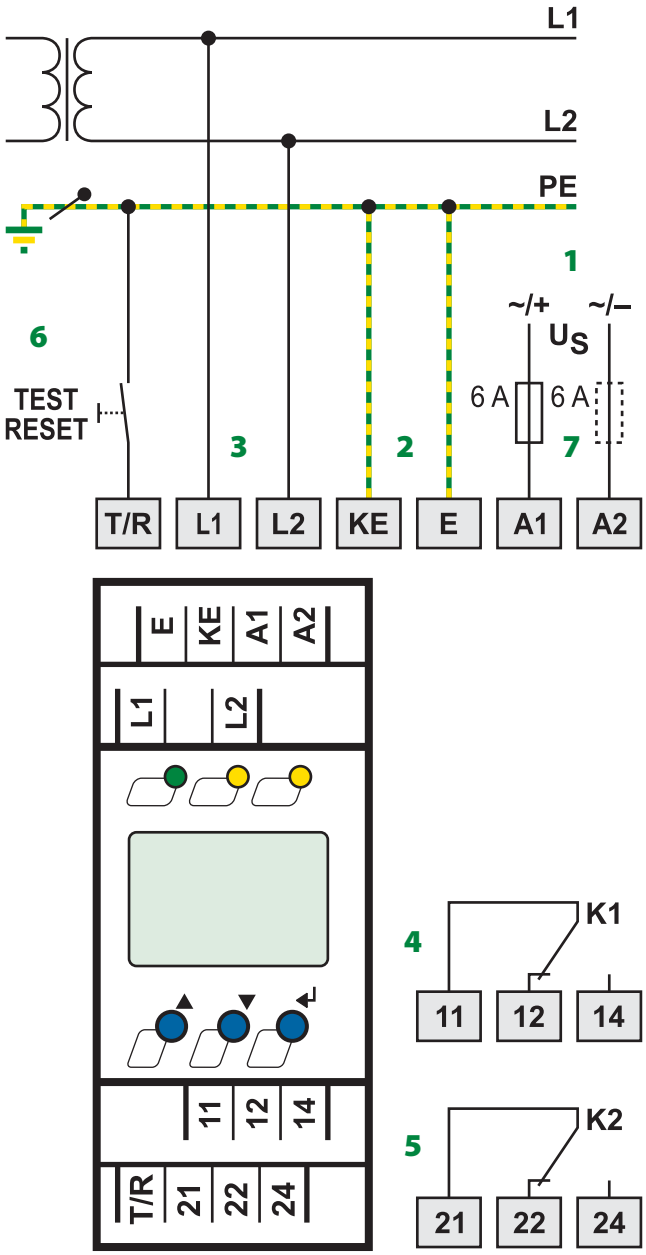
4 - LC display

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
Abwärts-Taste: Parameter change, to move down in the menu.

7 - "MENU" button: to call up the menu system.
Enter button: to confirm parameter change

Wiring diagram



1 - Supply voltage U_S (see ordering information) via fuse

2 - Separate connection of E and KE to PE

3 - Connection to 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.

1.1

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 / III
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 kΩ
Response value R_{an2} (Alarm 2)	1…200 kΩ
PreSet mode	U_n ≤ 72 V R_{an1} (Alarm 1) = 20 kΩ / R_{an2} (Alarm 2) = 10 kΩ
	U_n > 72 V R_{an1} (Alarm 1) = 46 kΩ / R_{an2} (Alarm 2) = 23 kΩ
Relative uncertainty 1 kΩ…5 kΩ / 5 kΩ…200 kΩ	± 0.5 kΩ / ± 15 %
Hysteresis	25 %

Time response

Response time t_{an} at R_F = 0.5 x R_{an} and C_e = 1 µF	≤ 1 s
Start-up delay 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 µA
Internal DC resistance R_i	≥ 62 kΩ
Impedance Z_i at 50 Hz	≥ 60 kΩ
Permissible extraneous DC voltage U_{fg}	≤ DC 300 V
Permissible system leakage capacitance	≤ 20 µF

Displays, memory

Display range, measuring value	1 kΩ…1 MΩ
Operating uncertainty 1 kΩ…5 kΩ / 5 kΩ…1 MΩ	± 0.5 kΩ / ± 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					10.000
Contact data acc. to IEC 60947-5-1					
Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-12
Rated operational voltage	230 V	230 V	220 V	110 V	24 V
Rated operational current	5 A	3 A	0.1 A	0.2 A	1 A
Minimum contact rating					1 mA at AC / DC ≥ 10 V

Environment/EMC

EMC	IEC 61326
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 type	push-wire terminal
Connection properties	
rigid	0.2…2.5 mm² / AWG 24-14
Flexible without ferrule	0.2…2.5 mm² / AWG 24-14
Flexible with ferrule	0.2…1.5 mm² / AWG 24-16
Stripping length	10 mm
Opening force	50 N
Test opening, diameter	2.1 mm

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	TBP101012
Weight	≤ 150 g

( )* = factory setting

Ordering information

Type	Nominal system voltage* U_n	Supply voltage* U_S	Response value R_{an}	System leakage capacitance C_e	Art. No.
IR420-D4-1	AC 42…460 Hz 0…300 V	DC 9.6…94 V / AC 42…460 Hz 16…72 V	1…200 kΩ	< 20 µF	B 7101 6409
IR420-D4-2	AC 42…460 Hz 0…300 V	DC 70…300 V / AC 42…460 Hz 70…300 V	1…200 kΩ	< 20 µF	B 7101 6405

Device version with screw terminals on request.
* Absolute values

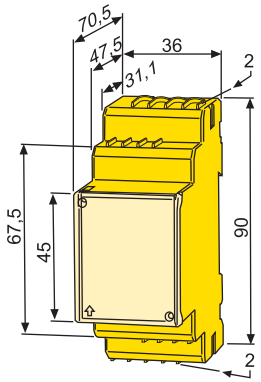
Accessories

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

Dimension diagram XM420

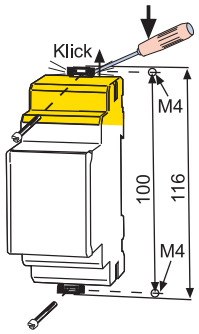
Dimensions in mm

Open the front plate cover in direction of arrow!



Screw mounting

Note: The upper mounting clip must be ordered separately (see ordering information).



A-ISOMETER® for DC systems ≤ 220 V

Chapter 1.2

A-ISOMETER® for DC systems ≤ 220 V
z. B. DC control and auxiliary circuits or smaller battery systems

A-ISOMETER® IR125Y-4

Insulation monitoring device for unearthed DC systems (IT systems)

A-ISOMETER® IR125Y-4

Device features

- Insulation monitoring for unearthed DC systems (IT systems) 19.2…308 V
- 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

Standards, approvals and certifications

AE25

Product description

The A-ISOMETER®s of the IR125Y series are designed to monitor the insulation resistance of unearthed DC control circuits (IT systems) DC 19.2…308 V. External supply voltage is not required.

In contrast to insulation monitoring devices which evaluate the shift voltage for insulation fault detection, this series uses the active AMP measurement method. This creates the possibility to detect and indicate both symmetrical and asymmetrical insulation faults.

Application

- DC control and auxiliary circuits in accordance with IEC 60204-1: "Safety of machinery – Electrical equipment of machines, Part 1: General requirements"
- Simple battery systems

Function

When the insulation resistance between the system conductors and earth falls below the set response value, the alarm relay switches and the alarm LED lights up. The fault message can be stored. The fault memory can be reset by pressing the reset button. The device function can be tested using the test button.

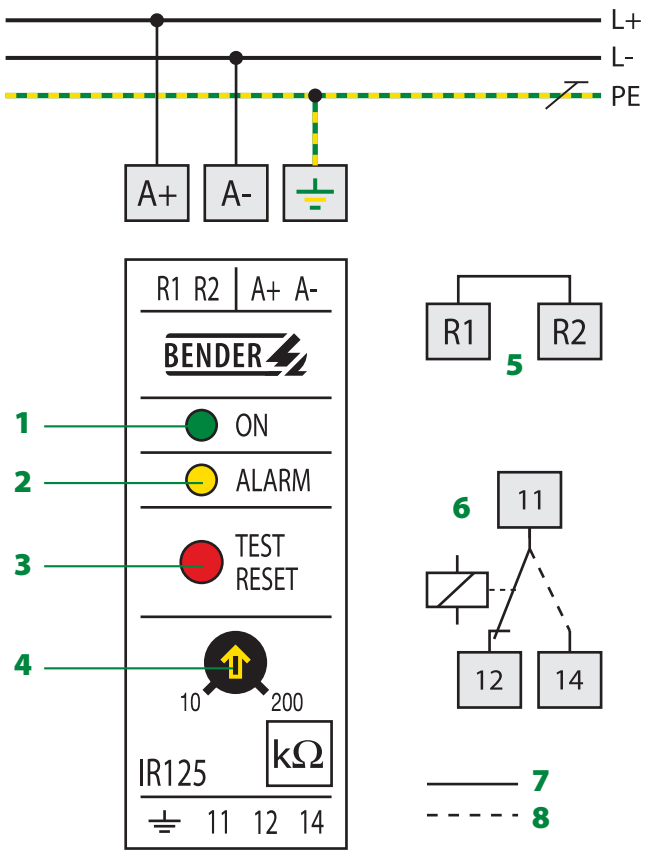
Measurement method

The IR125Y series uses a variant of the AMP measurement method.

Standards

The IR125Y type range complies with the device standards: IEC 61557-8, ASTM F1669M-96 (2007).

Wiring diagram – Operating elements



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

Response values/measuring circuits

Type	Response value R_{an}	Response time t_{an}	System leakage capacitance C_e
IR125Y-4…	10 kΩ…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

Ordering information

Type	Nominal system voltage U_n	Art. No.
IR125Y-4	DC 19.2…308 V*	B 9102 3005
Mounting plate	--	B 990 056

*Absolute value

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	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

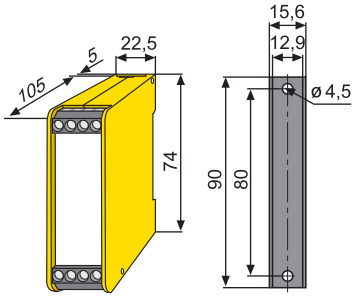
Number of switching elements	1 changeover contact
Operating principle	N/C operation
Electrical endurance, number of cycles	12000
Contact class	IIB
Rated contact voltage	AC 250 V/DC 300 V
Making capacity	AC/DC 5 A
Breaking capacity	2 A, AC 230 V, cos phi = 0.4 – 0.2 A, DC 220 V, L/R = 0.04 s

General data

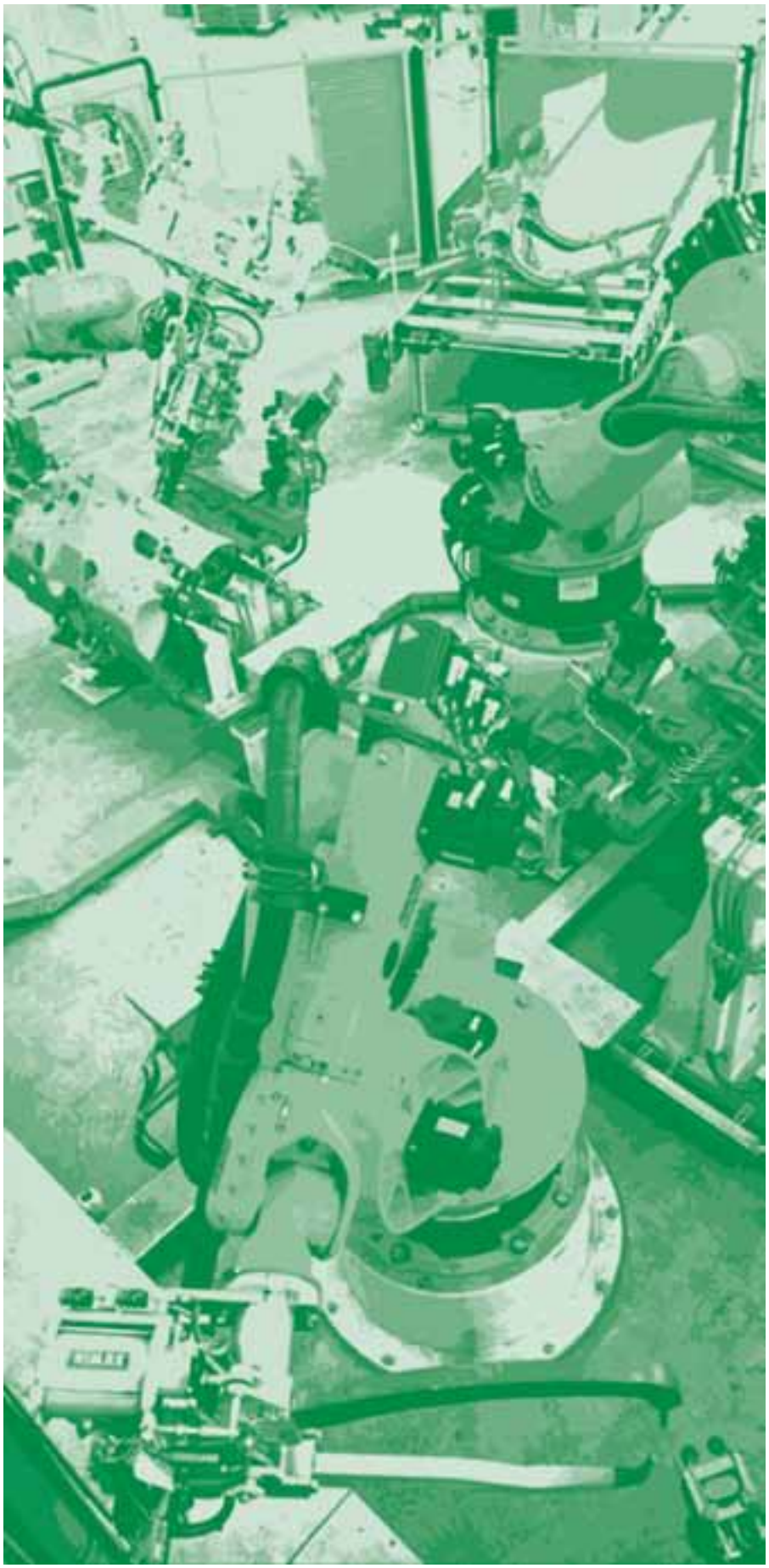
Shock resistance IEC 60068-2-27 (during operation)	15 g/11 ms
Bumping IEC 60068-2-29 (during transport)	40 g/6 ms
Vibration resistance IEC 60068-2-6 (during operation)	1 g/10…150 Hz
Vibration resistance IEC 60068-2-6 (during transport)	2 g/10…150 Hz
Ambient temperature (during operation/during storage)	- 10 °C…+ 55 °C/- 40 °C…+ 70 °C
Climatic class acc. to IEC 60721-3-3	3K5
Operating mode	continuous operation
Mounting	any position
Connection type	modular terminals
Connection properties rigid / flexible	0.2…4 mm² / 0.2…2.5 mm²
Degree of protection, internal components/terminals (IEC 60529)	IP 30/IP 20
Screw mounting	with mounting plate
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Operating manual	TBP102005
Weight approx.	130 g

Dimension diagram XM22

Dimensions in mm



A-ISOMETER® for AC, AC/DC or DC systems < 230 V



A-ISOMETER® for AC, AC/DC or DC systems < 230 V
e.g. AC control and auxiliary circuits with galvanically connected DC components.

A-ISOMETER® IR425

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

A-ISOMETER® IR425

Device features

- Insulation monitoring for control circuits AC/DC 0…300 V
- Two separately adjustable response values
- Preset function (automatic assignment 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, approvals and certifications

c UL us LISTED

AE25

Product description

The A-ISOMETER®s of the IR425 series monitor the insulation resistance of unearthed AC / DC control circuits (IT systems) 0…300 V. DC components existing in AC/DC systems do not influence the operating characteristics. An external supply voltage allows de-energised systems to be monitored too.

Application

- AC/DC control circuits in the industrial sector, mechanical engineering, power plants, elevators, automation systems etc.
- AC / DC control and auxiliary circuits acc. to IEC 60204-1: "Safety of machinery – Electrical equipment of machines, Part 1: General requirements"
- Smaller AC/DC IT systems such as lighting systems

Function

The currently measured insulation resistance is indicated on the LC display. In this way any changes, for example when circuits are connected to the system, can be recognised easily. When the value falls below the preset response values, the response delay "t_{on}" starts. Once the response delay "t_{on}" has elapsed, the alarm relays "K1 / K2" switch and the alarm LEDs "AL1 / AL2" light up. Two separately adjustable response values/alarm relays allow a distinction to be made between prewarning and alarm. If the insulation resistance exceeds the release value (response value plus hysteresis), the alarm relays return to their initial position. Insulation faults are distinguished according to AC and DC faults (indication ±). If the fault memory is enabled, the alarm relays remain in the alarm state until the reset button is pressed or until the supply voltage is switched off. The device function can be tested using the test button. The parameterisation of the device can be carried out via the LC display or the function keys integrated in the front plate.

Connection monitoring

The connections to the system (L1 / L2) and to earth (E / KE) are either automatically checked every 24 h, or by pressing the test button or when supply voltage has been connected. In case of interruption of a connecting lead, the alarm relays K1 / K2 switch, the LEDs ON // AL1 // AL2 flash and the following message appears on the display:

"E.02" signals a fault in the connecting leads to the system,

"E.01" signals a fault in the connecting leads to PE.

After eliminating the fault, the alarm relays return to their initial position either automatically or by pressing the reset button.

Preset function

After connecting the device for the first time, the nominal system voltage is measured and the response values are set automatically.

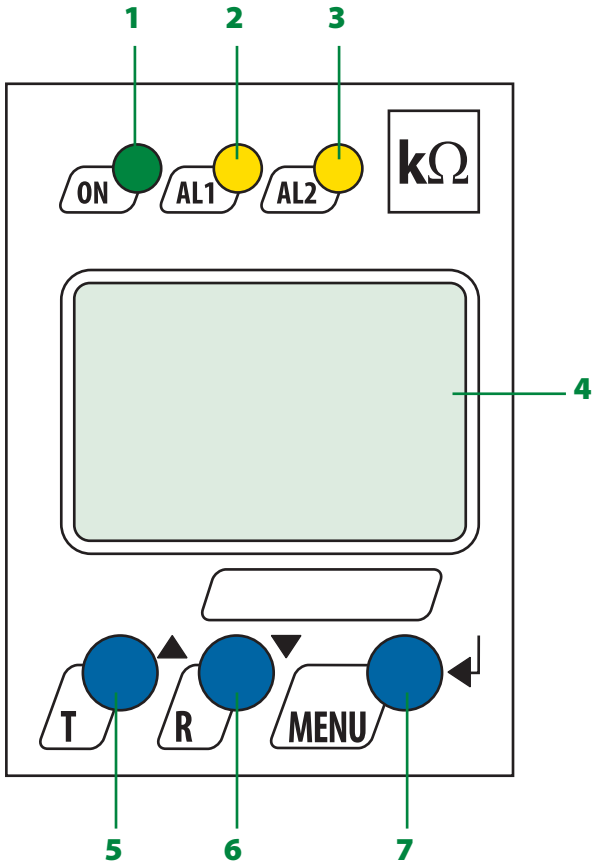
Measurement method

The A-ISOMETER® IR425 uses the AMP measuring principle.

Standards

The IR425 series complies with the requirements of the device standards: IEC 61557-8, IEC 61557-9, ASTM F1669M-96 (2007).

Operating elements



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.

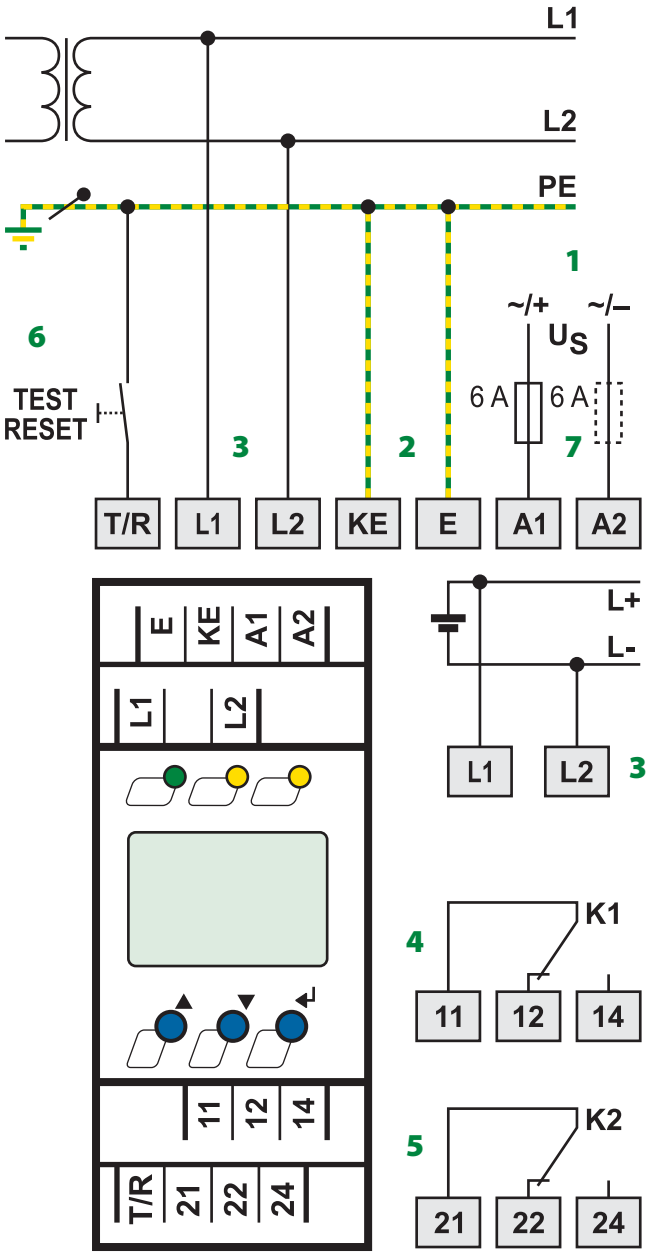
4 - LC display

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: to call up the menu system.
Enter button: to confirm parameter change

Wiring diagram



1 - Supply voltage U_S (see ordering information) via fuse

2 - Separate connection of 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 terminal L1 to L+ and L2 to L-.

4 - Alarm relay K1: Alarm 1

5 - Alarm relay K2: Alarm 2

6 - Combined external 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.

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 / III
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 kΩ
Response value R_{an2} (Alarm 2)	1…200 kΩ
Preset mode	U_n ≤ 72 V R_{an1} (Alarm 1) = 20 kΩ / R_{an2} (Alarm 2) = 10 kΩ
	U_n > 72 V R_{an1} (Alarm 1) = 46 kΩ / R_{an2} (Alarm 2) = 23 kΩ
Relative uncertainty 1 kΩ…5 kΩ / 5 kΩ…200 kΩ	± 0.5 kΩ / ± 15 %
Hysteresis	25%

Time response

Response time t_{an} at R_F = 0.5 x R_{an} and C_e = 1 µF	≤ 2 s
Start-up delay 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 µA
Internal DC resistance R_i	≥ 62 kΩ
Impedance Z_i at 50 Hz	≥ 60 kΩ
Permissible system leakage capacitance	≤ 20 µF

Displays, memory

Display range, measuring value	1 kΩ…1 MΩ
Operating uncertainty 1 kΩ…5 kΩ / 5 kΩ…1 MΩ	± 0.5 kΩ / ± 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	10.000				
Contact data acc. to IEC 60947-5-1					
Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-12
Rated operational voltage	230 V	230 V	220 V	110 V	24 V
Rated operational current	5 A	3 A	0.1 A	0.2 A	1 A
Minimum contact rating	1 mA at AC / DC ≥ 10 V				

Environment/EMC

EMC	IEC 61326
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 type	push-wire terminal
Connection properties	
rigid	0.2…2.5 mm² / AWG 24-14
flexible without ferrule	0.2…2.5 mm² / AWG 24-14
flexible with ferrule	0.2…1.5 mm² / AWG 24-16
Stripping length	10 mm
Opening force	50 N
Test opening, diameter	2.1 mm

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	TBP103005
Weight	≤ 150 g

( )* = factory setting

Ordering information

Type	Nominal system voltage* U_n	Supply voltage* U_S	Response value R_{an}	System leakage capacitance C_e	Art. No.
IR425-D4-1	DC / AC 15…460 Hz 0…300 V	DC 9.6…94 V / AC 15…460 Hz 16…72 V	1…200 kΩ	< 20 µF	B 7103 6403
IR425-D4-2	DC / AC 15…460 Hz 0…300 V	DC 70…300 V / AC 15…460 Hz 70…300 V	1…200 kΩ	< 20 µF	B 7103 6402

Device version with screw terminals on request.

* Absolute values

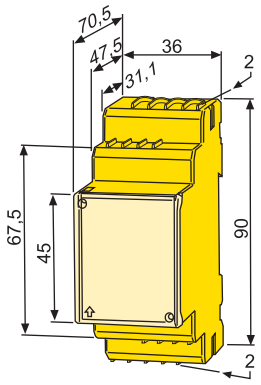
Accessories

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

Dimension diagram XM420

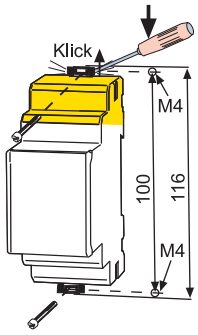
Dimensions in mm

Open the front plate cover in direction of arrow!



Screw mounting

Note: The upper mounting clip must be ordered separately (see ordering information).



A-ISOMETER® for AC systems > 230 V

Chapter 1.4

A-ISOMETER® für AC systems > 230 V
e.g. Main circuits including motors, pumps, fans and similar devices

IR470LY

Device features

- Insulation monitoring for unearthed IT AC / 3(N)AC systems 0…793 V
- 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 kΩ indication
- Combined test and reset button
- Connection external test / reset button
- Alarm relay with two potential-free changeover contacts
- N/O or N/C operation, selectable
- Fault memory behaviour, selectable

Standards, approvals and certifications

Product description

The A-ISOMETER®s of the IR470LY series monitor the insulation resistance of unearthed AC and three-phase systems (IT systems) AC / 3(N)AC 0…793 V. In combination with a coupling device, the devices can also be used for higher voltages. An external supply voltage allows de-energised systems to be monitored too.

The systems to be monitored should not contain DC components. Due to the measuring method, insulation faults downstream of directly connected rectifiers are indicated with increased response sensitivity. The set response values apply to the pure AC system only.

Application

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.

Function

When the insulation resistance between the system conductors and earth falls below the set response value, the alarm relay switches and the alarm LEDs light up. In case of interruption of the system and earth connection, the alarm LEDs flash. Different alarm LEDs AC, DC+, DC- allow to distinguish between insulation faults on the AC and the DC side. The measured value is indicated by the LED bar graph indicator or a measuring instrument that can be connected externally. In this way any changes, for example when circuits are connected to the system, can be recognised easily. The fault message can be stored. The fault memory can be reset by pressing the reset button. The device function can be tested using the test button.

Measurement method

DC

Superimposed DC voltage with inverter.

Standards

The IR470LY series complies with the requirements of the device standards: IEC 61557-8, ASTM F1669M-96 (2007).

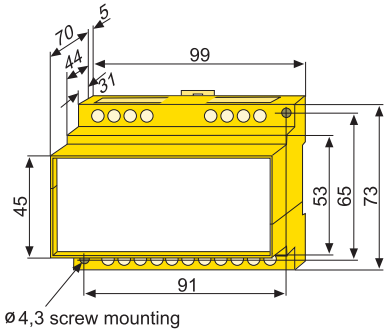
Response delay

Type	*) Response time t_{an} in the 10…200 kΩ range	*) Response time t_{an} in the 1…20 kΩ range	System leakage capacitance C_e max.
IR470LY-40…	≤ 1 s	≤ 3 s	20 µF

*) Response times acc. to IEC 61557-8 at R_F = 0.5 x R_{an} and at 1 µF system leakage capacitance.

Dimension diagram X470

Dimensions in mm



Ordering information

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

Other supply voltages on request * Absolute values

Accessories

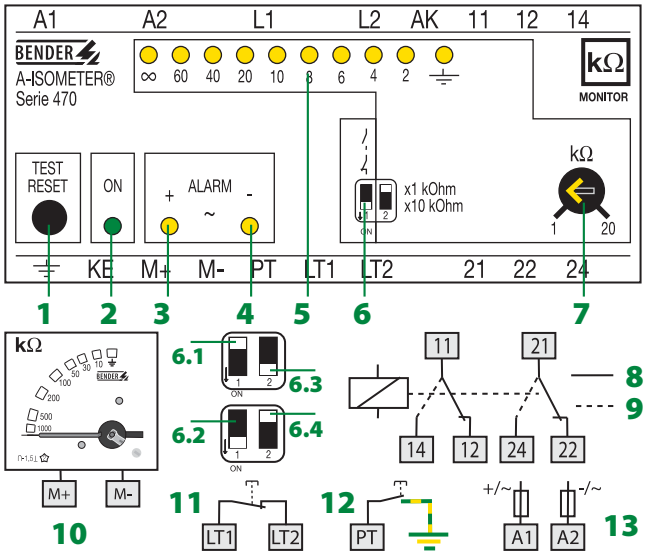
External kΩ measuring instruments

Type	Art. No.
7204-1421	B 986 763
9604-1421	B 986 764

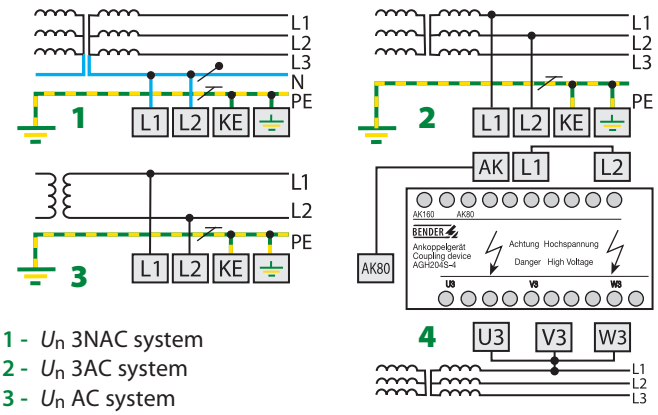
Coupling devices

Type	Nominal system voltage U_n	Art. No.
AGH204S-4	AC 0…1650 V	B 914 013
AGH520S	AC 0…7200 V	B 913 033

Wiring diagram – Front plate and system connection



1 - Combined test/reset button "TEST/RESET"; short-time pressing (< 1 s) = RESET, long-time pressing (> 1 s) = TEST
2 - LED Power "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 E / 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
6.2 - N/C operation
6.3 - x 10 kΩ
6.4 - x 1 kΩ
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.
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



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

Technical data

Insulation coordination acc. to IEC 60664-1

Rated insulation voltage	AC 630 V
Rated impulse withstand 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 kΩ…200 kΩ
Response time t_{an} at R_F = 0.5 x R_{an} and C_e = 1 µF	
10…200 kΩ range	≤ 1 s
1…10 kΩ range	≤ 3 s

Measuring circuit

Measuring voltage U_m	≤ 40 V
Measuring current I_m (at R_F = 0 Ω)	≤ 200 µA
Internal DC resistance R_i	≥ 200 kΩ
Impedance Z_i at 50 Hz	≥ 180 kΩ
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 kΩ)	0…400 µA
Load	≤ 25 kΩ

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
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)

General data

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 °C…+ 55 °C/- 40 °C…+ 70 °C
Climatic class acc. to IEC 60721-3-3	3K5
Operating mode	continuous operation
Mounting	any position
Connection type	modular terminals
Connection properties rigid / flexible	0.2…4 mm² / 0.2…2.5 mm²
Degree of protection, internal components (IEC 60529)	IP 30
Degree of protection, terminals (IEC 60529)	IP 20
Screw mounting	2 x M4
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Operating manual	TBP104001
Weight approx.	360 g

1.4

A-ISOMETER® IR470LY2-4061

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

IR470LY2-4061

Device features

- Insulation monitoring for IT AC / 3(N)AC systems 0…793 V
- 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 insulation resistance
- Connection for kΩ indication
- Combined test and reset button
- Two separate alarm relays with one changeover contact each
- N/O or N/C operation, selectable
- Fault memory behaviour, selectable

Standards, approvals and certifications

GL PG AE25 Lloyd's Register

Product description

The A-ISOMETER®s of the IR470LY2 series monitor the insulation resistance of unearthed AC and three-phase systems (IT systems) AC / 3(N)AC 0…793 V. Two separately adjustable response values and alarm relays allow to distinguish between prewarning and alarm. In combination with a coupling device the device series can be used for higher voltages.

The systems to be monitored should not contain DC components. Due to the measuring method, insulation faults downstream of directly connected rectifiers are indicated with increased response sensitivity. The set response values apply to the pure AC system only.

Application

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.

Function

When the insulation resistance between the system conductors and earth falls below the set response value, the alarm relays switch and the alarm LEDs light up. In case of interruption of the system and earth connection, the alarm LEDs flash. Two separately adjustable response values and alarm relays allow to distinguish between prewarning and alarm. The measured value is indicated by the LED bar graph indicator or an externally connectable measuring instrument. In this way any changes, for example when circuits are connected to the system, can be recognised easily. The fault messages can be stored. The fault memory can be reset by pressing the reset button. The device function can be tested using the test button.

Measurement method

DC

Superimposed DC voltage with inverter.

Standards

The IR470LY2-4061 series complies with the requirements of: IEC 61557-8, ASTM F1669M-96 (2007).

Ordering information

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

Other supply voltages on request

Accessories

External kΩ measuring instruments

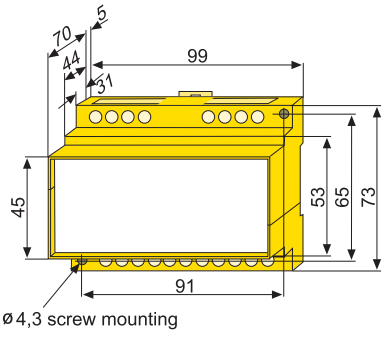
Type	Art. No.
7204-1421	B 986 763
9604-1421	B 986 764

Coupling devices

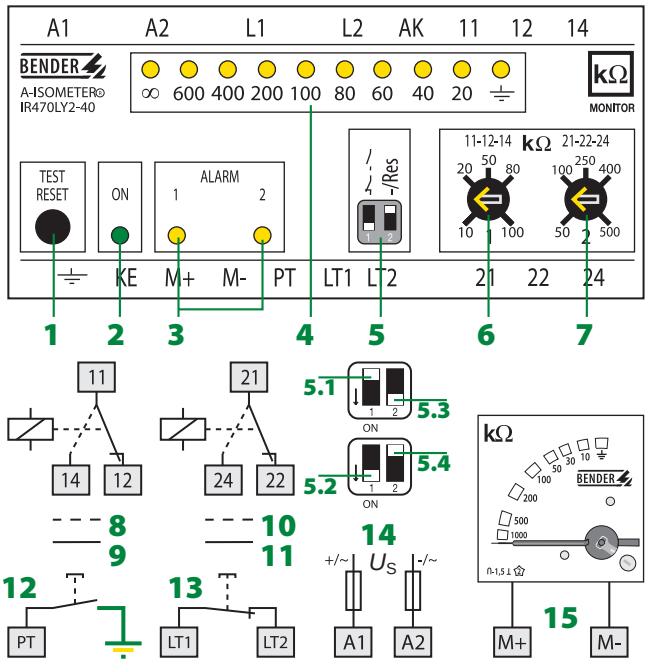
Type	Nominal system voltage U_n	Art. No.
AGH204S-4	AC 0…1650 V	B 914 013
AGH520S	AC 0…7200 V	B 913 033

Dimension diagram X470

Dimensions in mm

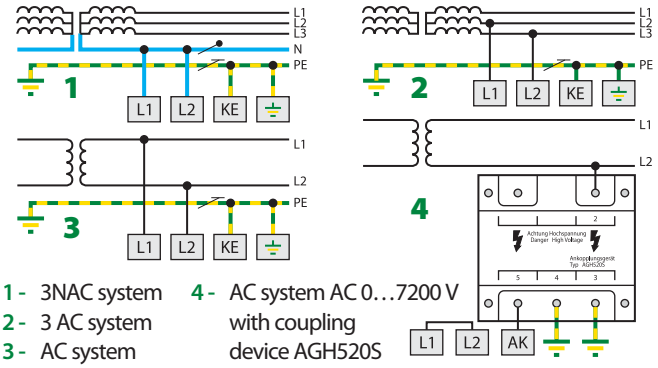


Wiring diagram – Operating elements



1 - Combined test and reset button "TEST RESET", short-time pressing (< 1 s) = RESET, long-time pressing (> 2 s) = TEST
2 - LED Power "ON"
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 E / KE or L1 / L2
4 - LED bar graph indicator
5 - Operating principle of the alarm relayFault memory
5.1 - N/O operation
5.2 - N/C operation
5.3 - without fault memory
5.4 - with fault memory
6 - Potentiometer to set the response value RALARM1
7 - Potentiometer to set the response value RALARM2
8 - Alarm relay 1: N/O operation
9 - Alarm relay 1: N/C operation
10 - Alarm relay 2: N/O operation
11 - Alarm relay 2: N/C operation
12 - External test button "PT"
13 - External reset button "LT1, LT2" or bridge for fault memory
14 - U_S see ordering information, 6 A fuse recommended
15 - External kΩ indicating instrument

Wiring diagram – system connection



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

Technical data

Insulation coordination acc. to IEC 60664-1

Rated insulation voltage	AC 630 V
Rated impulse withstand 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 kΩ…100 kΩ
Response value R_{an2} (Alarm 2)	35 kΩ…500 kΩ
Response time t_{an} at R_F = 0.5 x R_{an} and C_e = 1 µF	≤ 1 s

Measuring circuit

Measuring voltage U_m	≤ 40 V
Measuring current I_m (at R_F = 0 Ω)	≤ 200 µA
Internal DC resistance R_i	≥ 200 kΩ
Impedance Z_i at 50 Hz	≥ 180 kΩ
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 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
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)

General data

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)	- 10 °C…+ 55 °C
Ambient temperature (during storage)	- 40 °C…+ 70 °C
Climatic class acc. to IEC 60721-3-3	3K5
Operating mode	continuous operation
Mounting	any position
Connection type	modular terminals
Connection properties rigid / flexible	0.2…4 mm² / 0.2…2.5 mm²
Degree of protection, internal components (IEC 60529)	IP 30
Degree of protection, terminals (IEC 60529)	IP 20
Screw mounting	2 x M4
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Operating manual	TBP104010
Weight approx.	360 g

1.4

A-ISOMETER® IR470LY2-60...

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

IR470LY2-60

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/offline 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 insulation resistance
- Connection for kΩ indication
- Combined test and reset button
- Two separate alarm relays with one changeover contact each
- N/O or N/C operation
- Fault memory behaviour, selectable

Standards, approvals and certifications

Product description

The A-ISOMETER®s of the IR470LY series monitor the insulation resistance of unearthed AC and three-phase systems (IT systems) AC / 3(N)AC 0…793 V. The device series is particularly suitable for systems requiring a high insulation level. The device can also be used for monitoring de-energised loads. Two separately adjustable response values and alarm relays allow to distinguish between prewarning and alarm. In combination with a coupling device the device series can be used for higher voltages.

The systems to be monitored should not contain DC components. Due to the measuring method, insulation faults downstream of directly connected rectifiers are indicated with increased response sensitivity. The set response values apply to the pure AC system only.

Application

- 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

Function

When the insulation resistance between the system conductors and earth falls below the set response value, the alarm relays switch and the alarm LEDs light up. In case of interruption of the system or earth connection, the alarm LEDs flash. The measured value is indicated on the LED bar graph indicator or a measuring instrument that can be connected externally. In this way any changes, for example when circuits are connected to the system, can be recognised easily. The fault messages can be stored. The fault memory can be reset by pressing the reset button. The device function can be tested using the test button.

Measurement method

DC Superimposed DC voltage with inverter.

Standards

The IR470LY2-60 series complies with the requirements of the device standards: IEC 61557-8, ASTM F1669M-96 (2007), ASTM F1134-94 (2007).

Off-line mode

In this mode, the insulation monitoring process is automatically activated when the system voltage between the terminals L1 and L2 falls below 80 V. Only if the system voltage has fallen below this value, the device assumes that the load is de-energised. If the voltage between the terminals L1 and L2 exceeds 80 V, insulation monitoring will be automatically deactivated. This is signalled by a flashing LED ∞ of the LED line.

Ordering information

Type	Supply voltage U_S	Art. No.
IR470LY2-60	AC 230 V	B 9104 8010
IR470LY2-6013	AC 90…132 V*	B 9104 8013
IR470LY2-6015	AC 400 V	B 9104 8009
IR470LY2-6021	DC 9.6…84V*	B 9104 8014

Other supply voltages on request * Absolute values

Accessories

External kΩ measuring instruments

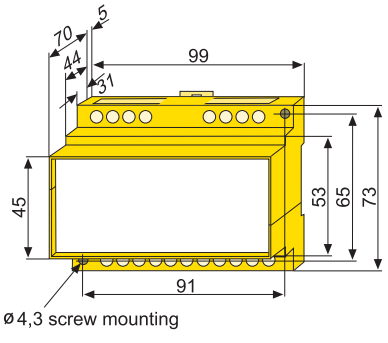
Type	Art. No.
7204-1621	B 986 763
9604-1621	B 986 764

Coupling devices

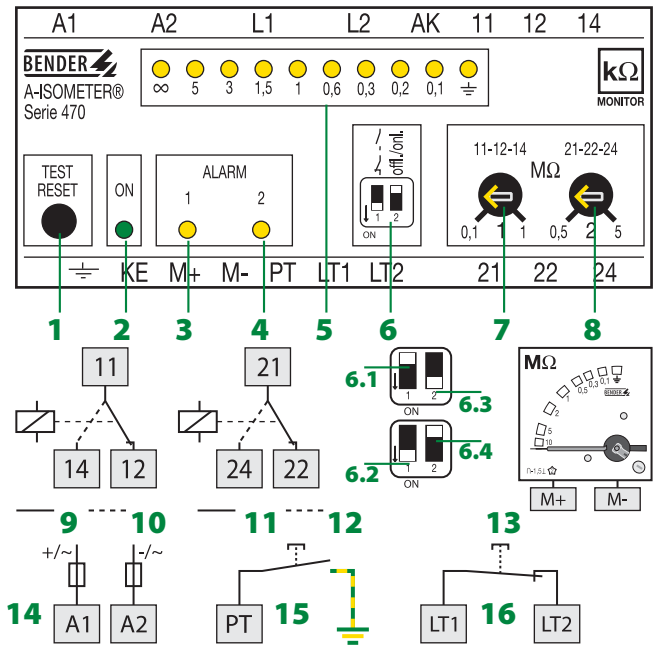
Type	Nominal system voltage U_n	Art. No.
AGH520S	AC 0…7200 V	B 913 033

Dimension diagram X470

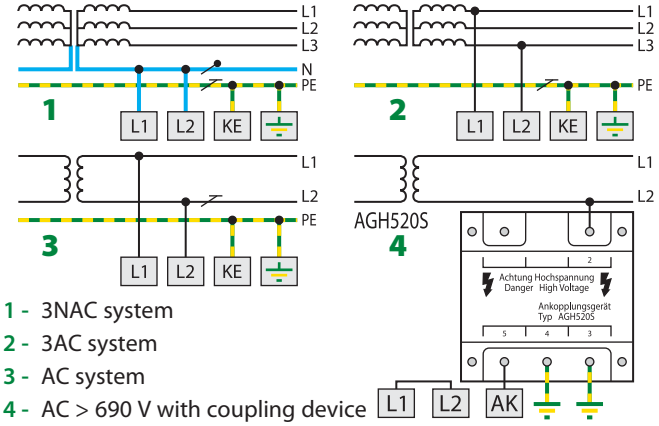
Dimensions in mm



Wiring diagram – Operating elements



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



1 - 3NAC system
2 - 3AC system
3 - AC system
4 - AC > 690 V with coupling device

Technical data

Insulation coordination acc. to IEC 60664-1

Rated insulation voltage	AC 630 V
Rated impulse withstand 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 x R_{an} and C_e = 1 µF	≤ 4 s

Measuring circuit

Measuring voltage U_m	≤ 40 V
Measuring current I_m (at R_F = 0 Ω)	≤ 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	≤ 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
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)

General data

Shock resistance IEC 60068-2-27 (during operation)	15 g/11 ms
Bumping IEC 60068-2-29 (during transport)	40 g/6 ms
Vibration resistance IEC 60068-2-6 (during operation)	1 g 10…150 Hz
Vibration resistance IEC 60068-2-6 (during transport)	2 g/10…150 Hz
Ambient temperature (during operation)	- 10 °C…+ 55 °C
Ambient temperature (during storage)	- 40 °C…+ 70 °C
Climatic class acc. to IEC 60721-3-3	3K5
Operating mode	continuous operation
Mounting	any position
Connection type	modular terminals
Connection properties rigid / flexible	0.2…4 mm² / 0.2…2.5 mm²
Degree of protection, internal components (IEC 60529)	IP 30
Degree of protection, terminals (IEC 60529)	IP 20
Screw mounting	2 x M4
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Operating manual	TBP104002
Weight approx.	360 g

1.4

A-ISOMETER® for AC, AC / DC or DC systems > 230 V

Chapter 1.5

A-ISOMETER® for AC, AC / DC or DC systems > 230 V
e.g. main circuits with variable-speed drives, frequency converters, battery systems, solar systems and the like

A-ISOMETER® IRDH275

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

A-ISOMETER® IRDH275

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
- 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 voltage-free changeover contacts
- N/O or N/C operation, selectable
- Backlit LC display
- RS-485 interface

Standards, approvals and certifications

c UL us LISTED

PCT AE25

Product description

The A-ISOMETER® of the IRDH275 series is designed to monitor the insulation resistance of unearthed main circuits (IT systems) AC, AC/DC 0…793 V resp. DC 0…650 V. The ***AMP***^{Plus} measurement method meets the particular requirements of modern power supplies which often include rectifiers, converters, thyristor-controlled DC drives and directly connected DC components. In these systems often high leakage capacitances against earth occur due to interference suppression measures. The IRDH275 automatically adapts itself to the existing system conditions.

In combination with a coupling device, the devices can also be used for higher voltages. An external supply voltage allows de-energised systems to be monitored too. For door mounting into distribution panels, refer to type IRDH375(B).

Application

- 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
- Systems including switched-mode power supplies
- IT systems including high leakage capacitances
- Coupled IT systems

Function

When the insulation resistance between the system conductors and earth falls below the set response value, the alarm relays switch and the alarm LEDs light up. Two separately adjustable alarm relays allow to distinguish between prewarning and alarm. The measured value is indicated on the LC display or an externally connectable measuring instrument. In this way any changes, for example when circuits are connected to the system, can be recognised easily. The fault message can be stored. The fault memory can be reset by pressing the reset button. By pressing the test button, the function of the device as well as the connections to system and earth can be tested. Pressing the Info button provides additional information, such as the existing system leakage capacitance or device settings.

The function of the device and the system and earth connections are continuously monitored. When a fault occurs, the system fault relay switches and the alarm LED "system fault" lights up. The parameterisation of the device can be carried out via the LC display or the function buttons integrated in the front plate.

Device version IRDH275B

Device version IRDH275B includes the following 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 A-ISOMETER®s in coupled IT systems
- Current output 0(4)…20 mA (electrically isolated)

Use in coupled IT systems

Only one A-ISOMETER® may be active when several IT systems are coupled. Isometer disconnecting relays and the control inputs F1/F2 integrated in version IRDH275B guarantee that only one A-ISOMETER® is active at any one time.

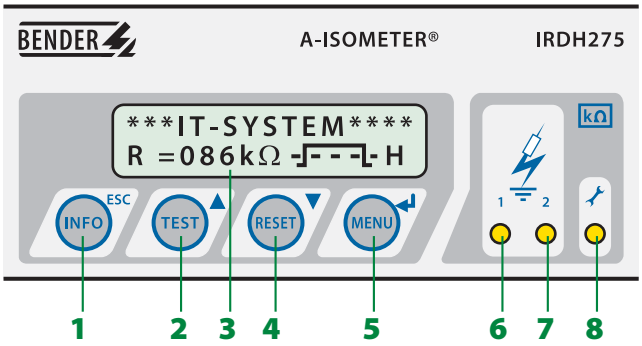
Measurement method

AMP^{Plus} The IRDH275(B) uses the patented ***AMP***^{Plus} measurement method. This measurement method allows concise monitoring of modern power supply systems, also in case of extensive, directly connected DC components and high system leakage capacitances.

Standards

The A-ISOMETER® was designed in accordance with the following standards:
IEC 61557-8, IEC 61326-2-4, IEC 60664-1, IEC 60664-3, ASTM F1669M-96 (2007), ASTM F1207M-96 (2007).

Operating elements IRDH275



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 change, scroll

3 - LC display

4 - "RESET" button: to delete alarm and fault messages
Arrow down button: parameter change, scroll

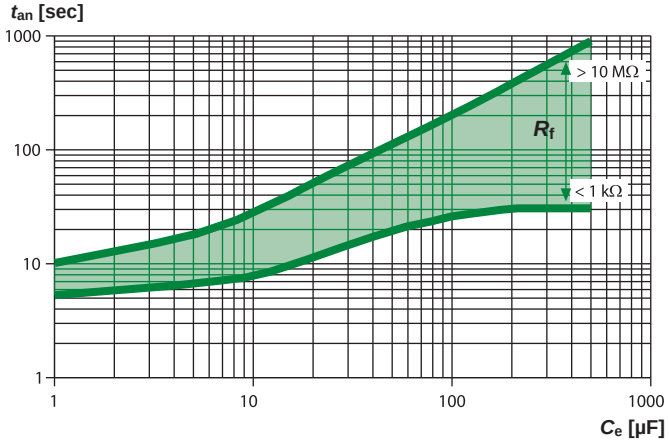
5 - "MENU" button: to activate the menu system
Enter button: to confirm parameter change

6 - Alarm LED "1" lights: insulation fault, 1st warning level reached

7 - Alarm LED "2" lights: insulation fault, 2nd warning level reached

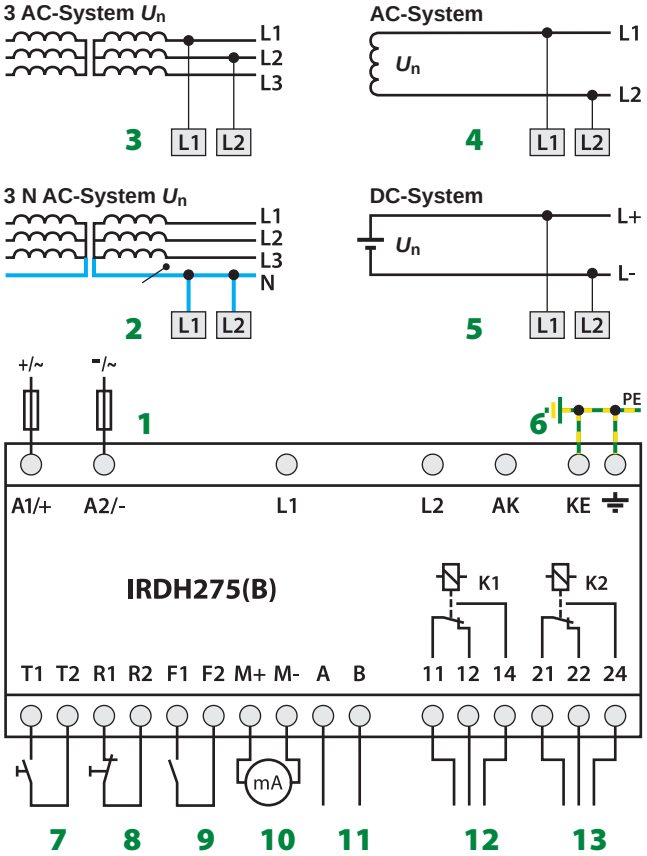
8 - LED lights up: a system fault exists

Response times



A-ISOMETER® response times in relation to the system leakage capacitances: C_e = 1…500 µF, U_n = 0…793 V / 50 Hz

Wiring diagram



1 - Supply voltage U_S (see ordering information) via 6 A fuse; 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 to the AC system to be monitored: Connect terminals L1, L2 to conductor L1, L2.

5 - Connection of the DC systems being 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 message will not be stored, provided that the 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: Currrent output, electrically isolated: 0…400 µA
IRDH275B: Currrent output, electrically isolated: 0…20 mA or 4…20 mA

11 - RS-485 interface

12 - Alarm relay: Alarm 1

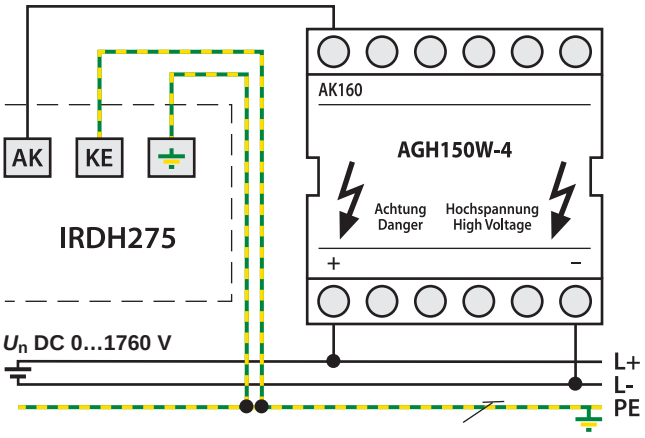
13 - Alarm relay: Alarm 2 / system

* The terminal pairs 7, 8 and 9 must be wired galvanically isolate and must not have a connection to PE!

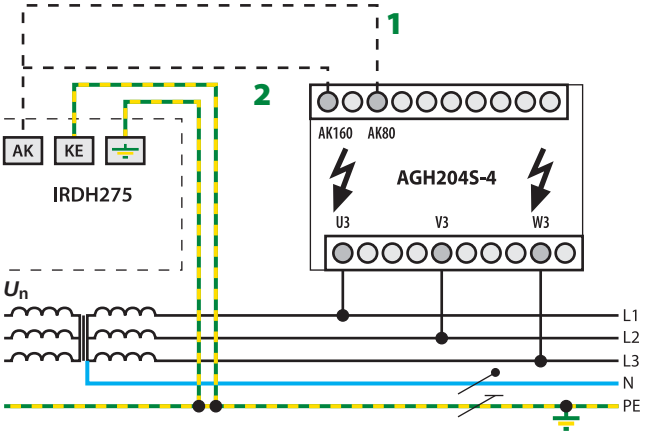
1.5

Wiring diagrams – IRDH275 connected to different types of coupling devices

A-ISOMETER® IRDH275 with coupling device AGH150W-4

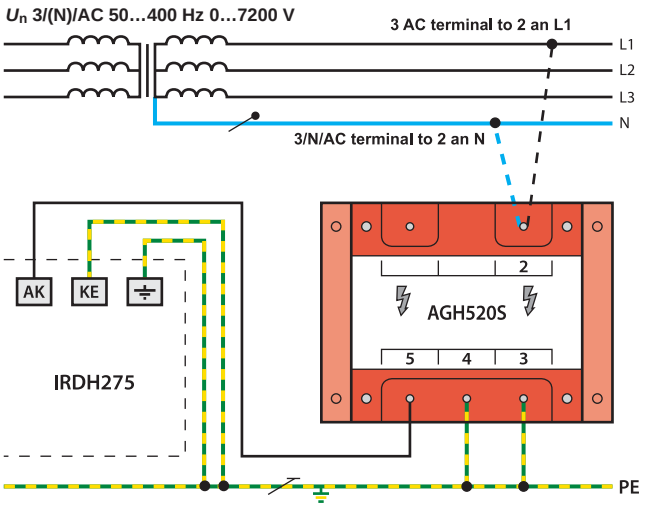


A-ISOMETER® IRDH275 with coupling device AGH204S-4



1 - without rectifier — U_n = 3AC 0…1650 V (DC max. 1000 V)
2 - with rectifier — U_n = 3AC 0…1300 V (peak voltage downstream of the rectifier or DC voltage intermediate circuit of max.1840 V)

A-ISOMETER® IRDH275 with coupling device AGH520S



Ordering information A-ISOMETER® IRDH275

Type	Nominal system voltage U_n	Supply voltage U_S	Art. No.
IRDH275-435	AC 0…793 V/ DC 0…650 V*	AC 88…264 / DC 77…286 V*	B 9106 5100
IRDH275B-435	AC 0…793 V/ DC 0…650 V*	AC 88…264 / DC 77…286 V*	B 9106 5101
IRDH275-427	AC 0…793 V/ DC 0…650 V*	DC 19.2…72 V	B 9106 5104
IRDH275B-427	AC 0…793 V/ DC 0…650 V*	DC 19.2…72 V	B 9106 5105
IRDH275-425	AC 0…793 V/ DC 0…650 V*	DC 10.2…36 V	B 9106 5108
IRDH275B-425	AC 0…793 V/ DC 0…650 V*	DC 10.2…36 V	B 9106 5109

* Absolute values

Accessories

External kΩ measuring instrument 400 µA

Type	Art. No.
7204-1421	B 986 763
9604-1421	B 986 764

External kΩ measuring instrument 20 mA

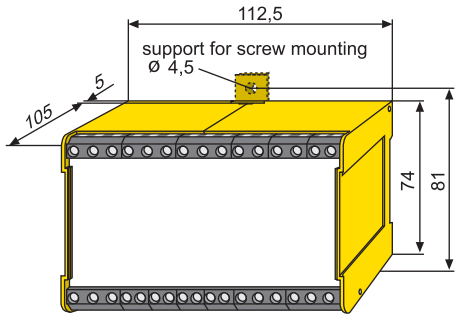
Type	Art. No.
9620-1421	B 986 841

Coupling devices

Type	Nominal system voltage U_n	Art. No.
AGH150W-4	DC 0…1760 V	B 9801 8006
AGH204S-4	AC 0…1650 (1300) V	B 914 013
AGH520S	AC 0…7200 V	B 913 033

Dimension diagram XM112

Dimensions in mm



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 kΩ…20 kΩ)	+ 2 kΩ/ + 20 %
Relative uncertainty (1 kΩ…10 kΩ)	0.2 kΩ/ + 20 %
Response time t_{an} at R_F = 0.5 x R_{an} and C_e = 1 µF	≤ 5 s
Measuring time	see characteristic curves
Hysteresis (1 kΩ…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 Ω)	≤ 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) (acc. to IEC 61557-8)	± 15 %**
Operating uncertainty (1 kΩ…20 kΩ)	± 1 kΩ / ± 15 %**
Operating uncertainty (1 MΩ…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	RS485 / ASCII-IsoData
Interface/protocol IRDH275B	RS485/BMS
Connection	terminals A/B
Cable length	≤ 1200 m
Shielded cable (shield to PE on one end)	2-core, 0.6 mm², z. B. J-Y(St)Y 2x0.6
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, 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	12 000
Contact class	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
Contact rating at DC 24 V	≥ 2 mA (50 mW)

General data

EMC	acc. to IEC 61326-2-4
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 (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 °C…+55 °C
Ambient temperature (during storage)	-40 °C…+70 °C
Climatic class acc. to IEC 60721-3-3	3K5
Operating mode	continuous operation
Mounting	display-oriented
Distance to adjacent devices	≥ 30 mm
Connection	screw-type terminals
Connection, rigid/flexible	0.2…4 mm² / 0.2…2.5 mm²
Connection, flexible with ferrule, without/with plastic sleeve	0.25…2.5 mm²
Tightening torque	0.5 Nm
Conductor sizes (AWG)	24…12
Degree of protection, internal components (IEC 60529)	IP30
Degree of protection, terminals (IEC 60529)	IP20
Type of enclosure	X112, free from halogen
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Software version IRDH275	D160 V1.4
Software version IRDH275B	D159 V1.4
Operating manual	TGH1361
Weight	approx. 510 g

Option "W"

Shock resistance acc. to IEC 60068-2-27 (device in operation)	30 g / 11 ms
Bumping IEC 60068-2-29 (during 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 °C…+ 70 °C
Ambient temperature for storage	- 40 °C…+ 85 °C
Screw mounting	2 x M4

The data labelled with an * are absolute values

** = under test conditions according to IEC 61326-2-4, the tolerances may double

A-ISOMETER® isoPV with coupling device AGH-PV

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

A-ISOMETER® isoPV

Coupling device AGH-PV

Device features

- Insulation monitoring for unearthed systems AC, AC / DC 0…793 V, DC 0…1100 V
- Two separately adjustable response values 0.2 kΩ…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
- Connection external test and reset button
- Two separate alarm relays with two voltage-free changeover contacts
- N/O or N/C operation
- Backlit LC display
- RS-485 interface
- Presetting for PV systems via menu

Product description

The A-ISOMETER® of the isoPV series is designed to monitor the insulation resistance of unearthed main circuits (IT systems) AC, AC/DC 0…793 V resp. DC 0…1100 V. Solar systems containing inverters and isolating transformers are often designed as IT systems. isoPV variants using the ***AMP***^{Plus} measurement method capable of adapting to slow voltage fluctuations meet the particular requirements of modern solar systems. Due to wide spatial distribution or EMC interference suppression methods often high leakage capacitances against earth occur in these systems. Considering this, the isoPV automatically adapts to the system conditions in order to optimise the measuring time. In particular, the requirements for permissible voltage ranges along with a low level of insulation can be met here.

Use the A-ISOMETER® isoPV in combination with the AGH-PV only. An external supply voltage allows deenergised systems to be monitored too.

Application

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

Function

When the insulation resistance between the system conductors and earth falls below the set response value, the alarm relays switch and the alarm LEDs light up. Two separately adjustable alarm relays allow to distinguish between prewarning and alarm. The measured value is indicated on the LC display or an externally connectable measuring instrument. In this way any changes, for example when circuits are connected to the system, can be recognised easily. The fault message can be stored. The fault memory can be reset by pressing the reset button. By pressing the test button, the function of the device as well as the connections to system and earth can be tested. Pressing the Info button provides additional information, such as the existing system leakage capacitance or device settings.

The function of the device and the system and earth connections are continuously monitored. When a fault occurs, the system fault relay switches and the alarm LED "system fault" lights up. The parameterisation of the device can be carried out via the LC display or the function buttons integrated in the front plate.

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 data exchange with other Bender devices
- Isometer disconnecting relays for the operation of several A-ISOMETER®s in coupled IT systems
- Current output 0(4)…20 mA (electrically isolated)

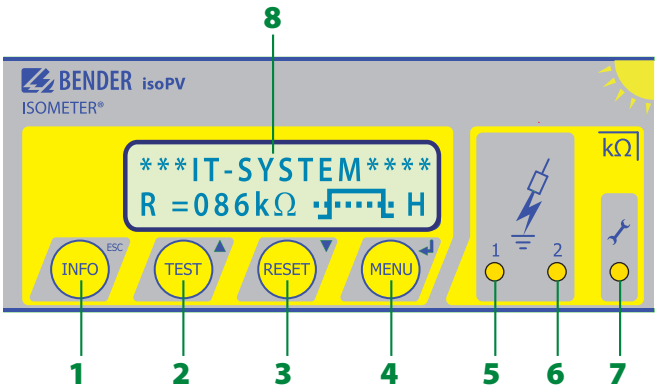
Use in coupled IT systems

Isometer disconnecting relays and the control inputs F1/F2 integrated in the insulation monitoring device make them suitable for coupled IT systems too, and guarantees that only one A-ISOMETER® is active at any one time.

Measurement method

AMP^{Plus} The isoPV uses the patented ***AMP***^{Plus} measurement method. This measuring method allows concise monitoring of modern power supply systems, also in case of extensive, directly connected DC components and high system leakage capacitances.

Control elements isoPV



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 parameter change, to move down in the menu

4 - "MENU" button: to call up the menu system. Enter button: to confirm parameter change

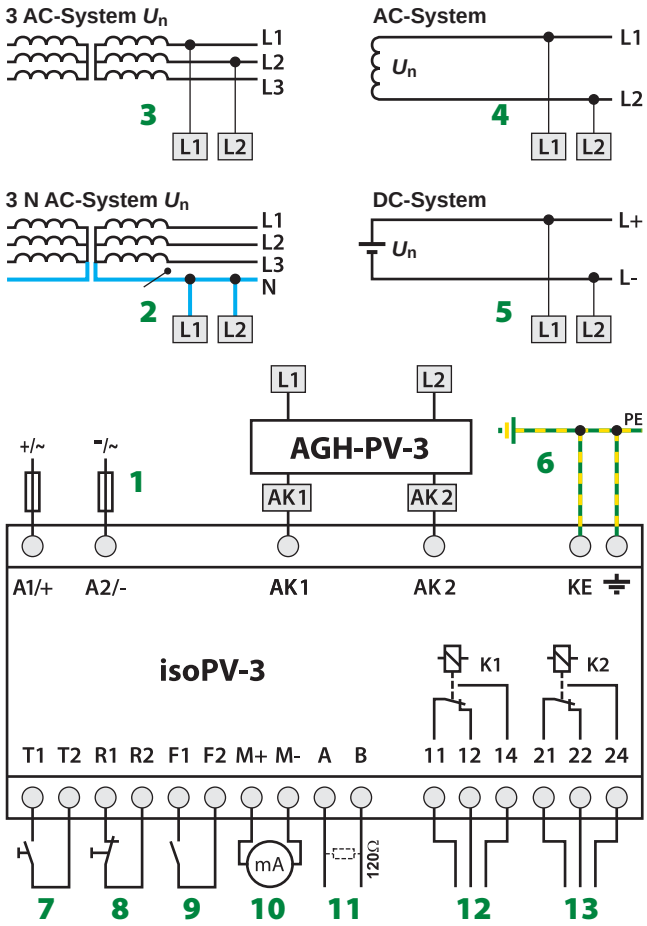
5 - Alarm LED "1" lights: insulation fault, first warning level reached

6 - Alarm LED "2" lights: insulation fault, second warning level reached.

7 - LED device error lights: isoPV faulty

8 - Two-line display for standard and menu mode

Wiring diagram



1 - Supply voltage US (see nameplate) via 6 A fuse; For UL and CSA applications, the use of 5 A fuses is mandatory.

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 E ⏚ 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

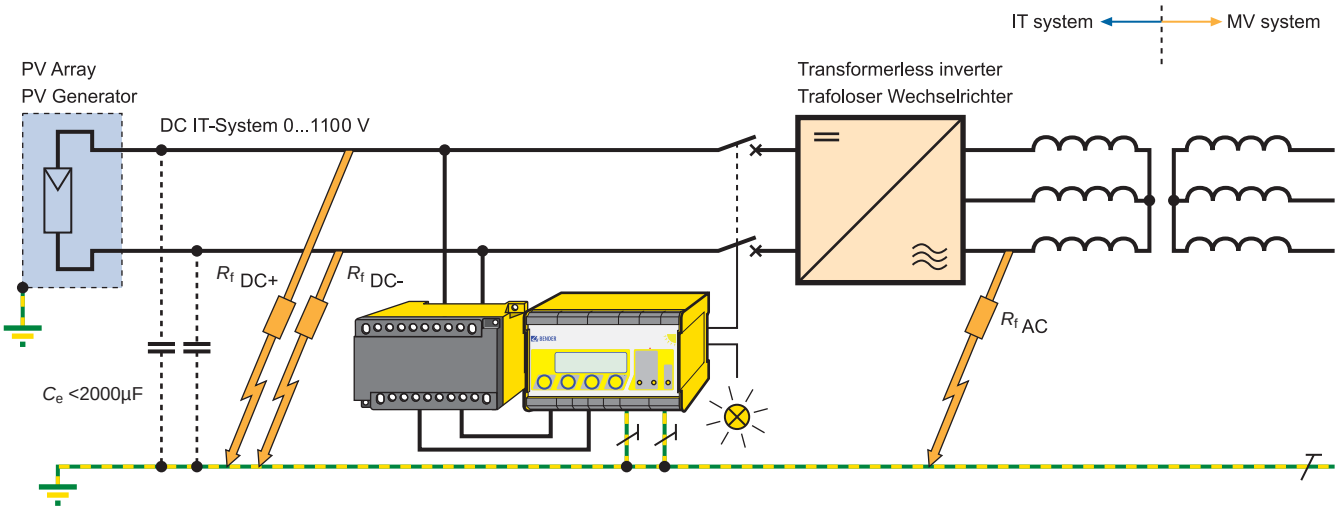
11 - Serial interface RS-485 (termination with a 120 Ω resistor)

12 - Alarm relay 1; available changeover contacts.

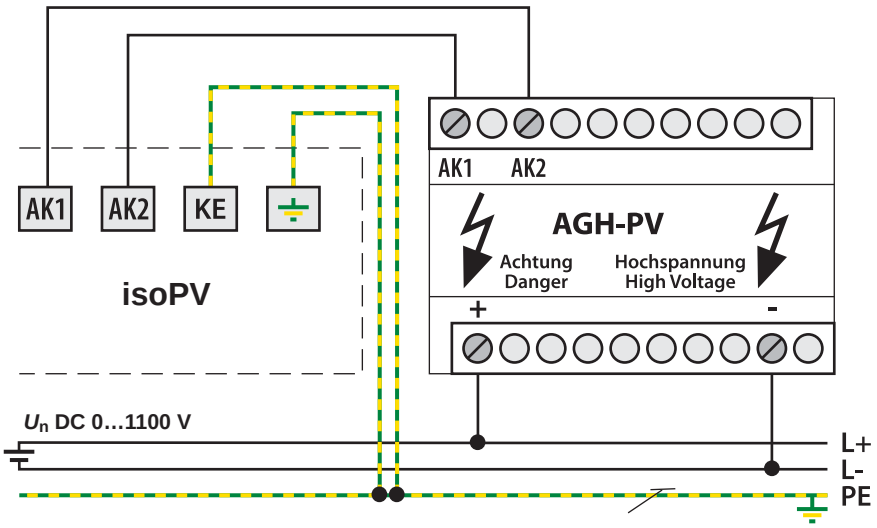
13 - Alarm relay 2 (device error relay); available changeover contacts.

Wiring diagram

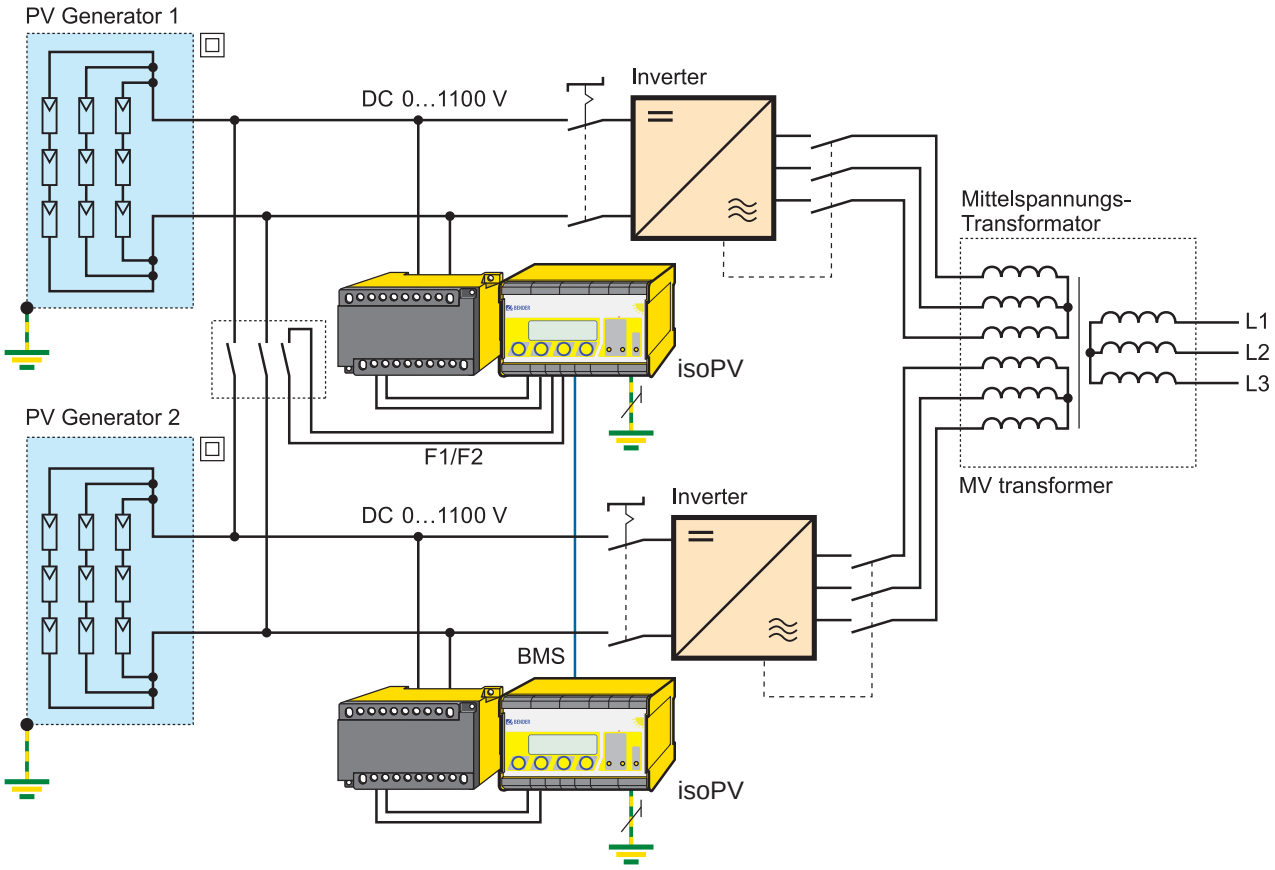
PV generator unearthed (IT system) with nominal voltage ≤ DC 1100 V and A-ISOMETER® isoPV with coupling device AGH-PV

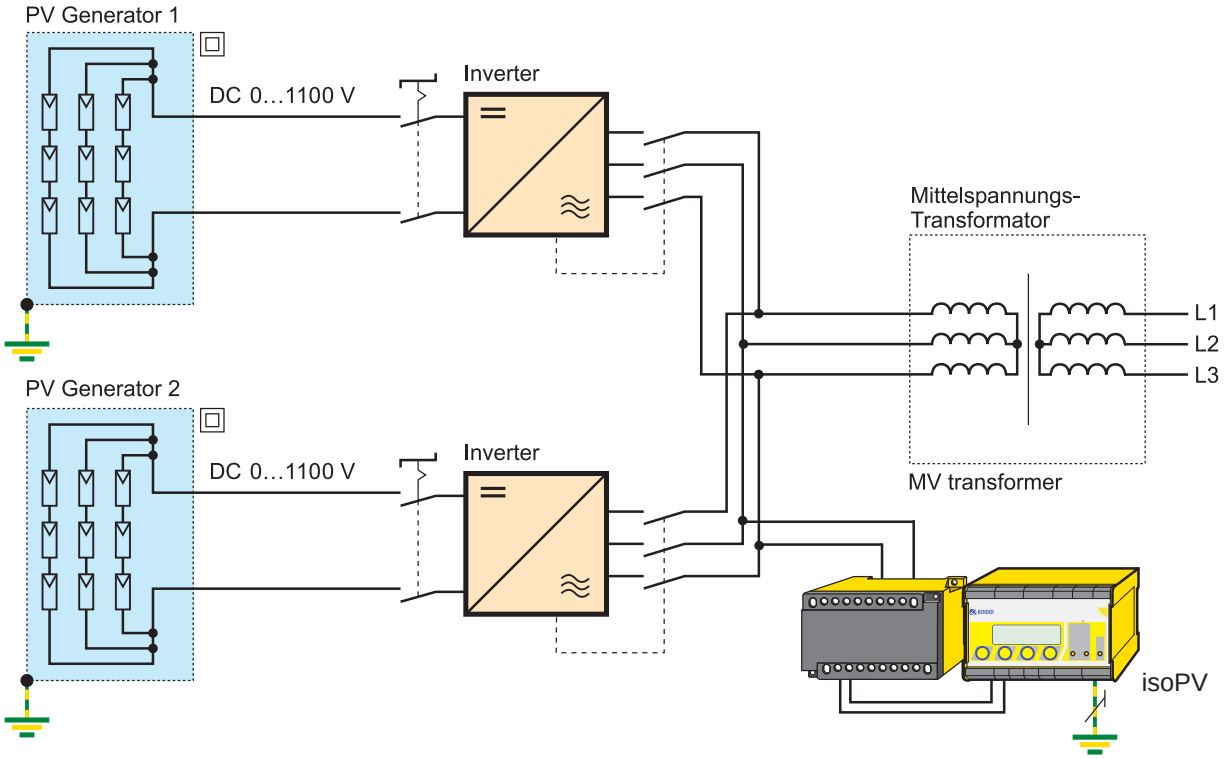


Wiring diagram – isoPV with coupling device AGH-PV



Several PV generators unearthed (IT system) with nominal voltage ≤ DC 1100 V as a coupled system and A-ISOMETER® isoPV with coupling device AGH-PV





Technical data A-ISOMETER® isoPV

Insulation coordination acc. to IEC 60664-1

Rated insulation voltage for isoPV-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)	
Dielectric test acc. to IEC 61010-1	3.536 kV
Rated insulation voltage	AC 250 V
Rated impulse voltage/pollution degree	4 kV / III
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-PV
isoPV-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
isoPV-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 kΩ…100 kΩ) (in accordance with IEC 61557-8)	±15 %
Relative uncertainty (0.2 kΩ…7 kΩ)	±1 kΩ
Response time t_{an}	see table TGH1454 starting from page 39
Hysteresis	25 %, +1 kΩ

Measuring circuit

Measuring voltage U_m (peak value)	± 50 V
Measuring current I_m (at $R_F = 0$ Ω)	≤ 1.5 mA
Internal DC resistance DC R_i	≥ 35 kΩ
Impedance Z_i at 50 Hz	≥ 35 kΩ
Permissible extraneous DC voltage U_{fg}	≤ DC 1100 V
Max. 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 kΩ…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 mm², z. B. J-Y(St)Y 2x0.6
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	N/C operation n.c. / N/O operation n.o. (N/O operation n.o.)*				
Contact data acc. to IEC 60947-5-1:					
Utilisation category	AC 13	AC 14	DC-12	DC-12	DC-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 °C…+65 °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 fixing with accessories B990056	3M7
for DIN rail mounting	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 mm² / 0.2…2.5 mm²
Connection flexible with connector sleeve, without/with plastic sleeve	0.25…2.5 mm²
Tightening torque	0.5 Nm
Conductor sizes (AWG)	24…12
Cable length between isoPV and AGH-PV	≤ 0.5 m

Other

Operating mode	continuous operation
Mounting	display oriented
Distance to adjacent devices	≥ 30 mm
Degree of protection, internal components (IEC 60529)	IP30
Degree of protection, terminals (IEC 60529)	IP20
Type of enclosure	X112, free from halogen
DIN rail mounting	IEC 60715
Screw mounting by means of support	2 x M4
Flammability class	UL94 V-0
Software version	D351 V2.0
Weight	< 510 g

( )* = factory setting

The values marked with** are absolute values

Technical data coupling device AGH-PV

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
Operating temperature	-25 °C…+65 °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

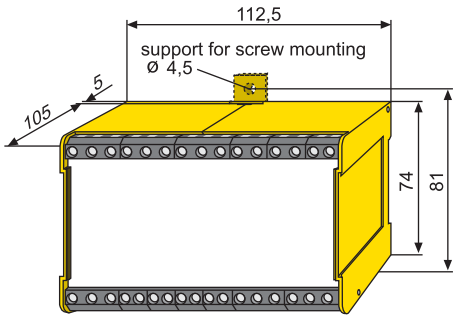
Connection	screw-type terminals
Connection, rigid/flexible	0.2…4 mm² / 0.2…2.5 mm²
Connection flexible with connector sleeve, without/with plastic sleeve	0.25…2.5 mm²
Tightening torque	0.5 Nm
Conductor sizes (AWG)	24…12
Cable length between isoPV and AGH-PV	≤ 0.5 m

Other

Operating mode	continuous operation
Mounting	cooling slots must be ventilated vertically!
Distance to adjacent devices	≥ 30 mm
Degree of protection, internal components (IEC 60529)	IP30
Degree of protection, terminals (IEC 60529)	IP20
Type of enclosure	X112, free from halogen
DIN rail mounting	IEC 60715
Screw fixing	2 x M4
Flammability class	UL94 V-0
Weight	< 230 g

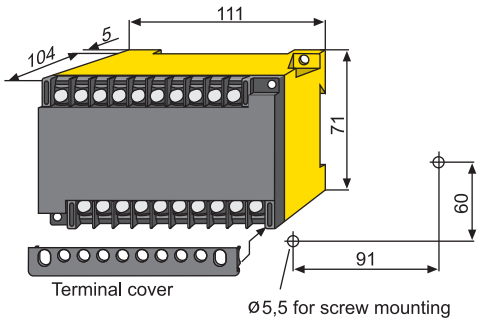
Dimension diagram XM112 – A-ISOMETER® isoPV

Dimensions in mm



Dimension diagram X200 – coupling device AGH-PV

Dimensions in mm



Ordering information

Type	Nominal system voltage U_n	Supply voltage U_S	Art. No.
isoPV-327 mit AGH-PV	3(N)AC 0…793 V / DC 0…1100 V	DC 19.2…72 V	B 9106 5132W
consisting of:			
isoPV-327			B 9106 5130W
AGH-PV			B 9803 9020W
isoPV-335 mit AGH-PV	3(N)AC 0…793 V / DC 0…1100 V	AC 88…264 / DC 77…286 V	B 9106 5133W
consisting of:			
isoPV-335			B 9106 5131W
AGH-PV			B 9803 9020W

Devices are delivered in sets.

Accessories

External kΩ measuring instrument 20 mA

Type	Art. No.
9620-1421	B 986 841

1.5

A-ISOMETER® IRDH375

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

A-ISOMETER® IRDH375

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
- AMPPlus 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 voltage-free changeover contacts
- N/O or N/C operation, selectable
- Alarm relay for system fault (N/C operation)
- Backlit LC display
- RS-485 interface
- Plug-in terminals

Standards, approvals and certifications

c UL us LISTED

PCT AE25

Product description

The A-ISOMETER® of the IRDH375(B) series is designed to monitor the insulation resistance of unearthed main circuits (IT systems) AC, AC/DC 0…793 V resp. DC 0…650 V. The ***AMP***^{Plus} measurement method meets the particular requirements of modern power supplies which often include rectifiers, converters, thyristor-controlled DC drives and directly connected DC components. In these systems often high leakage capacitances against earth occur due to interference suppression measures. The IRDH375(B) automatically adapts itself to the existing system conditions.

In combination with a coupling device, the devices can also be used for higher voltages. An external supply voltage allows de-energised systems to be monitored too.

Application

- 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
- Systems including switched-mode power supplies
- IT systems including high leakage capacitances
- Coupled IT systems

Function

When the insulation resistance between the system conductors and earth falls below the set response value, the alarm relays switch and the alarm LEDs light up. Two separately adjustable alarm relays allow to distinguish between prewarning and alarm. The measured value is indicated on the LC display or an externally connectable measuring instrument. In this way any changes, for example when circuits are connected to the system, can be recognised easily. The fault message can be stored. The fault memory can be reset by pressing the reset button. By pressing the test button, the function of the device as well as the connections to system and earth can be tested. Pressing the Info button provides additional information, such as the existing system leakage capacitance or device settings.

The function of the device and the earth connections are monitored. When a fault occurs, the system fault relay switches and the alarm LED "system fault" lights up. The parameterisation of the device can be carried out via the LC display or the function buttons integrated in the front plate.

Device version IRDH375B

Device version IRDH375B includes the following 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 A-ISOMETER®s in coupled IT systems
- Current output 0(4)…20 mA

Use in coupled IT systems

Only one A-ISOMETER® may be active when several IT systems are coupled. Isometer disconnecting relays and the control inputs F1/F2 integrated in version IRDH275B guarantee that only one A-ISOMETER® is active at any one time.

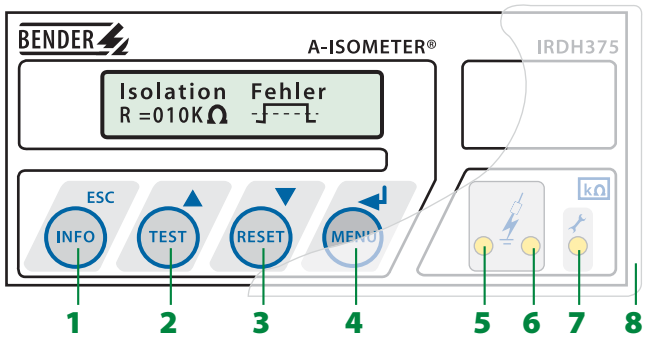
Measurement method

AMPPlus The IRDH375(B) uses the patented ***AMP***^{Plus} measurement method. This measurement method allows concise monitoring of modern power supply systems, also in case of extensive, directly connected DC components and high system leakage capacitances.

Standards

The A-ISOMETER® was designed in accordance with the following standards:
IEC 61557-8, IEC 61326-2-4, IEC 60664-1, IEC 60664-3, ASTM F1669M-96 (2007), ASTM F1207M-96 (2007).

Operating elements



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 change, 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 change

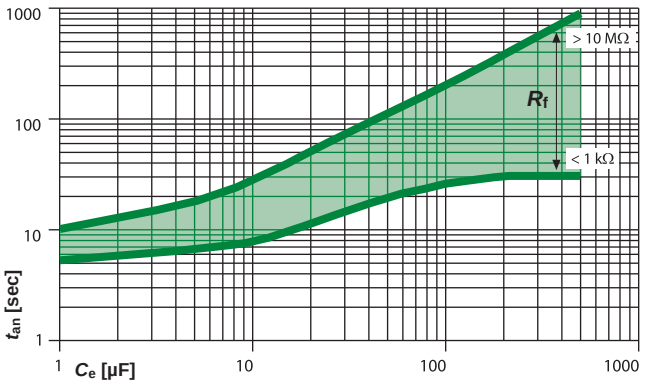
5 - Alarm LED 1, yellow, lights when the value falls below the set response value R_{ALARM1}

6 - Alarm LED 2, yellow, when the value falls below the set response value R_{ALARM2}

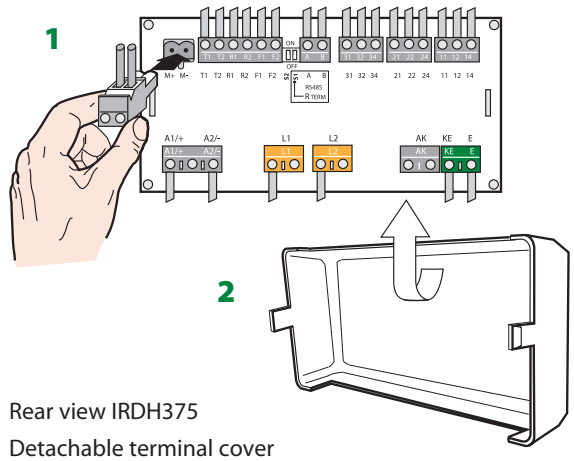
7 - Alarm LED, yellow, lights in case of fault in the connecting leads to the system or to earth, or in case of system fault

8 - Transparent front plate cover (accessory)

Response times



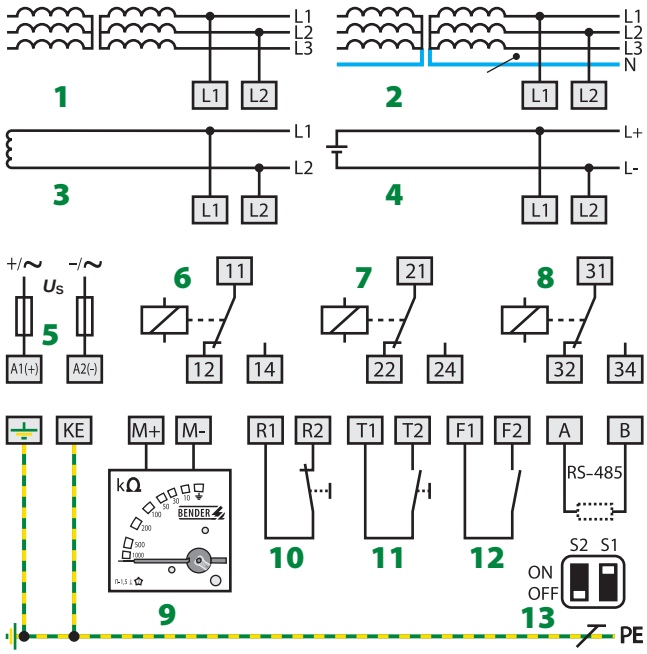
Wiring diagram – rear view



1 - Rear view IRDH375

2 - Detachable terminal cover

Wiring diagram



1 - 3AC system

2 - 3NAC system

3 - AC system

4 - DC system

5 - Supply voltage U_S (see ordering information) via 6 A fuse; for UL and CSA applications, it is mandatory to use 5 A fuses.

6 - Alarm relay R_{ALARM1}

7 - Alarm relay R_{ALARM2}

8 - Alarm relay system fault

9 - External kΩ indication 0…400 µA or current output 0(4)…20 mA (option).

*10 - External reset button (N/C contact or wire jumper) when the terminals R1/R2 are open, the fault message will not be stored, provided that the memory has not been activated via the operating menu.

*11 - External test button, if required

*12 - STANDBY by means of the function input F1, F2:
When the contact is closed, insulation measurement does not take place; system disconnection

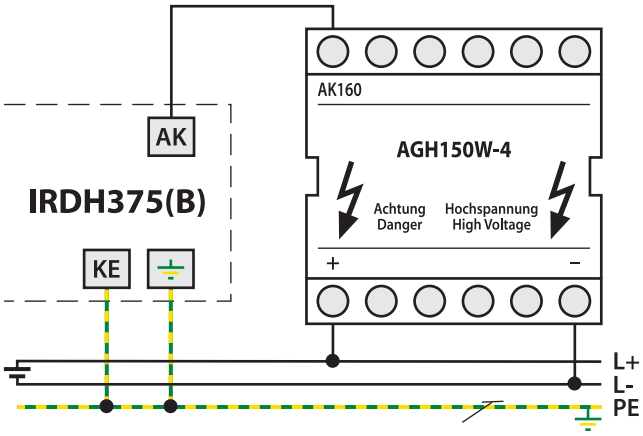
13 - DIP switch, S1 "ON"- RS-485 terminated (120 Ω on), S2 - unassigned

* The terminal pairs 10, 11 and 12 must be wired galvanically isolate and must not have a connection to PE!

1.5

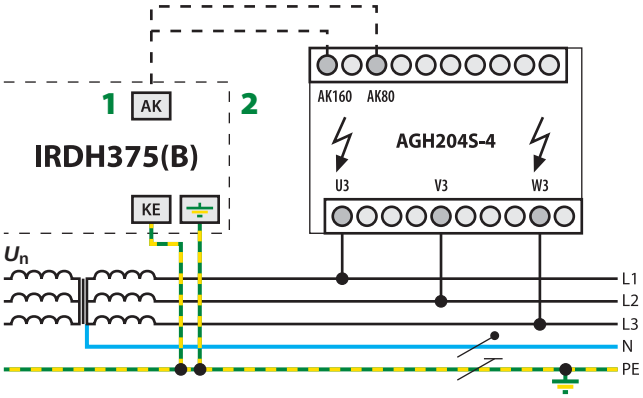
Wiring diagrams – IRDH375 connected to different types of coupling devices

A-ISOMETER® IRDH375 with coupling device AGH150W-4



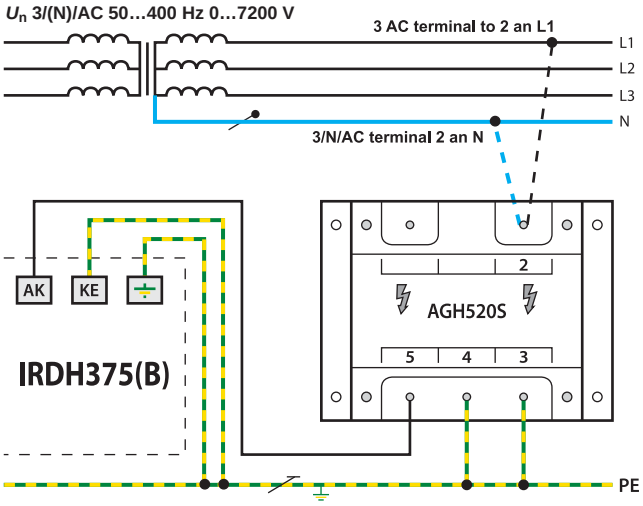
U_n DC 0…1760 V

A-ISOMETER® IRDH375 with coupling device AGH204S-4



1 - without rectifier U_n = 3AC 0…1650 V
2 - with rectifier U_n = 3AC 0…1300 V
(rectifier or DC voltage intermediate circuit max. DC 1840 V)

A-ISOMETER® IRDH375 with coupling device AGH520S



Ordering information

Type	Nominal system voltage U_n	Supply voltage U_S	Art. No.
IRDH375-435	AC 0…793 V/ DC 0…650 V*	AC 88…264 V/ DC 77…286 V*	B 9106 5000
IRDH375-427	AC 0…793 V/ DC 0…650 V*	DC 19.2…72V*	B 9106 5002
IRDH375B-435	AC 0…793 V/ DC 0…650 V*	AC 88…264 V/ DC 77…286 V*	B 9106 5004
IRDH375B-427	AC 0…793 V/ DC 0…650 V*	DC 19.2…72V*	B 9106 5006

* Absolute values

Accessories

External kΩ measuring instruments (400 µA)

Type	SKMP *2)	Art. No.
7204-1421	120 kΩ	B 986 763
9604-1421	120 kΩ	B 986 764

*2) SKMP = scale centre point

External kΩ measuring instrument 20 mA

Type	Art. No.
9620-1421	B 986 841

Transparent front plate cover IP65

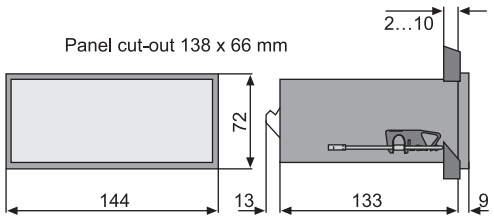
Type	Art. No.
144 x 72	B 9806 0005

Coupling devices

Type	Nominal system voltage U_n	Art. No.
AGH150W-4	DC 0…1760 V	B 9801 8006
AGH204S-4	AC 0…1300 V / 0…1650 V	B 914 013
AGH520S	AC 0…7200 V	B 913 033

Dimension diagram X300

Dimensions in mm



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 Ω…1 MΩ) (acc. to IEC 61557-8)	± 15 %
Relative uncertainty (1 kΩ…20 kΩ+2 kΩ / +20 %	
Realtive uncertainty (1 MΩ…10 MΩ)	0.2 MΩ / +20 %
Response time t_{an} at $R_F = 0.5 \times R_{an}$ and $C_e = 1$ µF	≤ 5 s
Measuring time	see characteristic curves
Hysteresis (1 kΩ…10 kΩ)	+2 kΩ
Hysteresis (10 kΩ…10 MΩ)	25 %

Measuring circuit

Measuring voltage U_m	≤ 40 V
Measuring current I_m (at $R_F = 0$ Ω)	≤ 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	≤ 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 kΩ…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 IRDH375	RS-485 / BMS
Connection	terminals A/B
Cable length	≤ 1200 m
Recommended cable (shielded, shield on one side connected to PE)	min. J-Y(St)Y 2x0.6
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	12 000
Contact class	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
Contact rating at DC 24 V	≥ 2 mA (50 mW)

General data

EMC	acc. to IEC 61326-2-4
Shock resistance acc. to 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 °C…+55 °C
Ambient temperature (during storage)	-40 °C…+70 °C
Climatic class acc. to IEC 60721-3-3	3K5
Operating mode	continuous operation
Mounting	display-oriented
Distance to adjacent devices	≥ 30 mm
Connection	screw-type terminals
Connection, rigid/flexible	0.2…4 mm² / 0.2…2.5 mm²
Connection, flexible with ferrule, without/with plastic sleeve	0.25…2.5 mm²
Conductor sizes (AWG)	24…12
Degree of protection, internal components (IEC 60529)	IP30
Degree of protection, terminals (IEC 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	approx. 510 g

Option "W"

Shock resistance IEC 60068-2-27 (during operation)	30 g/11 ms
Bumping IEC 60068-2-29 (during 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 °C…+70 °C
Ambient temperature for storage	-40 °C…+85 °C
Screw mounting	2 x M4

The data labelled with an * are absolute values

** = under test conditions according to IEC 61326-2-4, the tolerances may double

A-ISOMETER® IR1575

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

A-ISOMETER® IR1575

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, approvals and certifications

AE25

Product description

The A-ISOMETER® of the IR1575 series monitor the insulation resistance of unearthed main circuits (IT systems) AC, 3(N)AC 0…480 V resp. DC 0… 480 V.

The AMP measurement method allows the Isometers to be used in systems with directly connected DC components. Taking the system leakage capacitances into account, the IR1575 automatically adapts itself to the existing system conditions in order to optimise the measuring time. An external supply voltage allows de-energised systems to be monitored too.

Please note that the frequency range of the IR1575 is limited to DC, 30…420 Hz. For use in systems containing variable-speed drives, we recommend to use the IRDH275/375 version.

Application

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

Function

When the insulation resistance between the system conductors and earth falls below the set response value, the alarm relays switch and the alarm LEDs light up. Two separately adjustable response values/alarm relays allow a distinction to be made between prewarning and alarm. The measured value is indicated on the LC display. The fault message can be stored. The fault memory can be reset by pressing the reset button. By pressing the test button, the function of the device as well as the connections to system and earth can be tested. When a fault occurs during this test, it will be signalled by alarm relay K2. The parameterisation of the device can be carried out via the LC display or the function buttons integrated in the front plate.

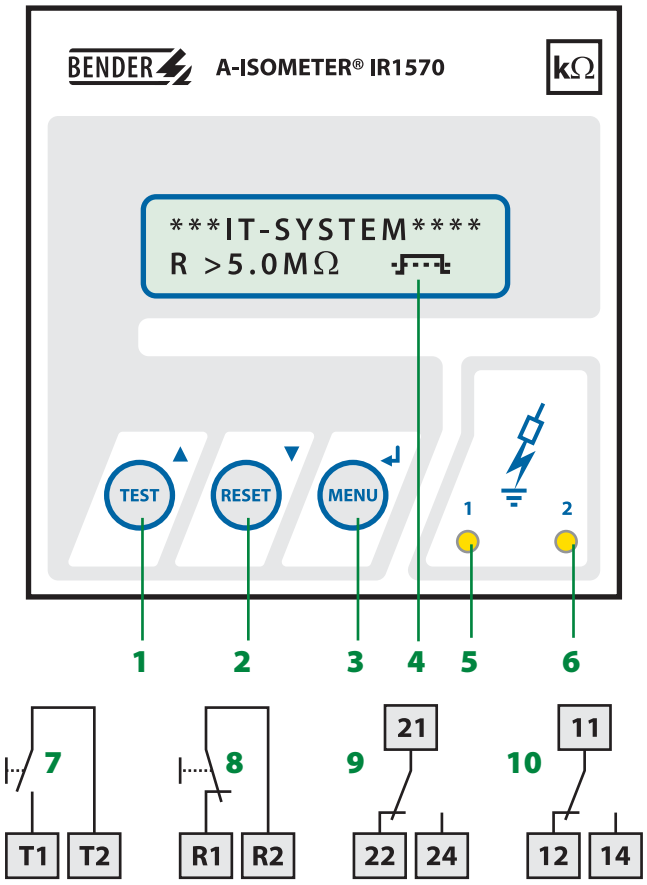
Measurement method

The A-ISOMETER®s of the IR1575 use the AMP measurement method.

Standards

The A-ISOMETER® was designed in accordance with the following standards:
IEC 61557-8, IEC 61326-2-4, IEC 60664-1, IEC 60664-3, ASTM F1669M-96 (2007), ASTM F1207M-96 (2007).

Wiring diagram – Operating elements



1 - "TEST" button: to call up the self test
Arrow up button: parameter change, scroll

2 - "RESET" button: to delete alarm and fault messages
Arrow down button: parameter change, scroll

3 - "MENU" button: to call up the menu system
Enter button: to confirm parameter change

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.

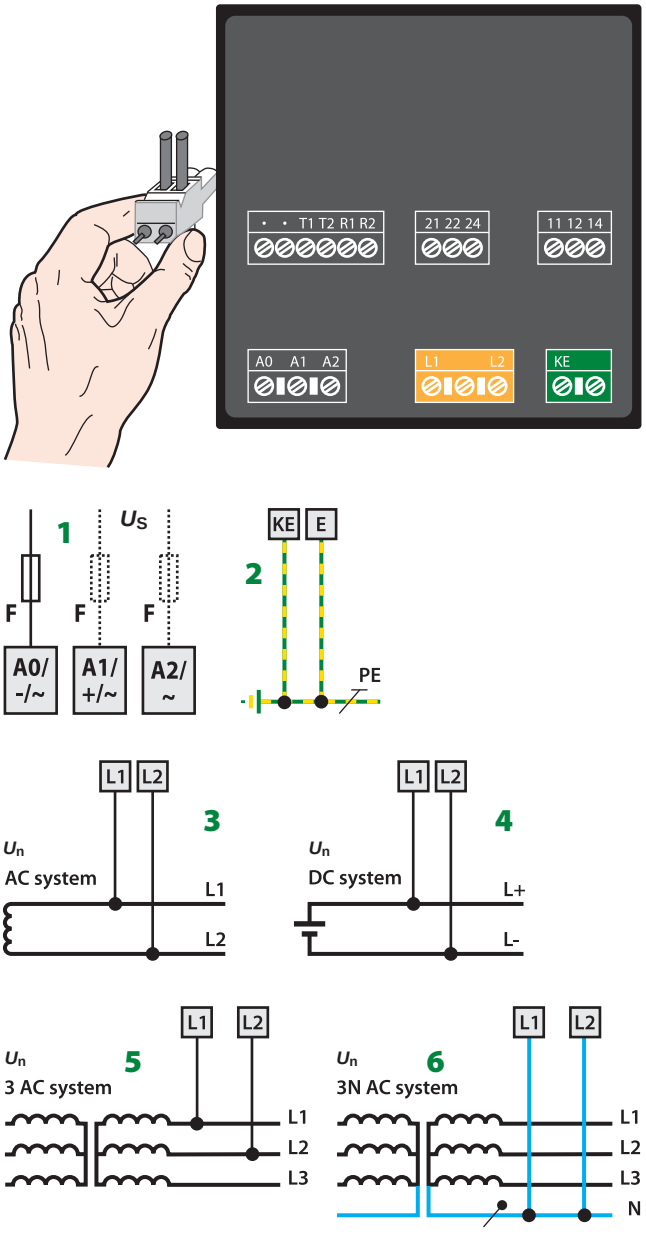
7 - External test button "T1/T2" (N/O contact)

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 – Mains 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 to the AC system to be monitored:
connect terminals L1, L2 to conductor L1, L2.

4 - Connection to the DC system to be monitored:
Connect terminal L1 to conductor L+, terminal L2 to conductor L-

5,6 - 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.

1.5

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 kΩ…1 MΩ
Response value R_{an2} (Alarm 2)	2 kΩ…1 MΩ
Relative uncertainty	0…+ 20 % / min. + 2 kΩ
Response time t_{an} at $R_F = 0.5$ x R_{an} and $C_e = 1$ µF	≤ 5 s
Measuring time	see characteristic curve
Hysteresis	25%

Measuring circuit

Measuring voltage U_m	± 20 V
Measuring current I_m (at $R_F = 0$ Ω)	≤ 170 µA
Internal DC resistance R_i	≥ 119 kΩ
Impedance Z_i at 50 Hz	≥ 14 kΩ
Permissible extraneous DC voltage U_{fg}	≤ DC 680 V
Permissible system leakage capacitance	≤ 60 µF

Displays

Display	backlit LC display
Characters (number of characters, height)	2 x 16 (4.5 mm)
Display range, measuring value	1 kΩ…5 MΩ
Operating uncertainty (1 kΩ…10 kΩ)	± 1 kΩ
Operating uncertainty (10 kΩ…5 MΩ)	± 10 %

Outputs

Test and reset button	internal/external

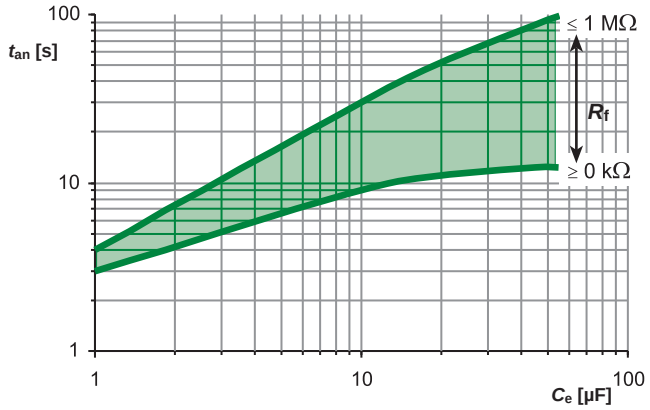
Switching elements

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
Rated contact voltage	AC 250 V/DC 300 V
Making capacity	AC/DC 5A
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)

General data

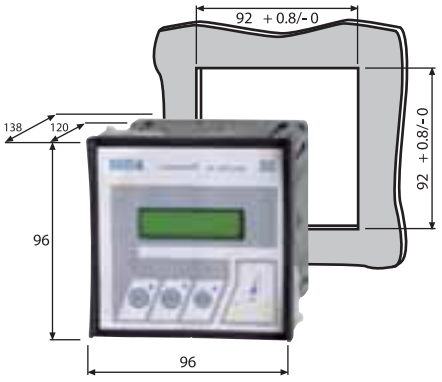
Shock resistance IEC 60068-2-27 (during operation)	15 g/11 ms
Bumping IEC 60068-2-29 (during transport)	40 g/6 ms
Vibration resistance IEC 60068-2-6 (during operation)	1 g/10…150 Hz
Vibration resistance IEC 60068-2-6 (during transport)	2 g/10…150 Hz
Ambient temperature (during operation)	- 10 °C…+ 55 °C
Ambient temperature (during storage)	- 40 °C…+ 70 °C
Climatic class acc. to IEC 60721-3-3	3K5
Operating mode	continuous operation
Mounting position	display-oriented
Connection	plug-in terminals
Connection properties	
rigid / flexible	0.2…4 / 0.2…2.5 mm²
flexible with ferrules without / with plastic collar	0.25…2.5 mm²
Conductor sizes (AWG)	24-12
Tightening torque	0.5…0.6 Nm (4.3…5.3 lb-in)
Degree of protection, internal components (IEC 60529)	IP 30
Degree of protection, terminals (IEC 60529)	IP 20
Mounting	panel mounting
Flammability class	UL94 V-2
Operating manual	TGH1370
Weight	≤ 400 g

Measuring time



Dimension diagram

Dimensions in mm

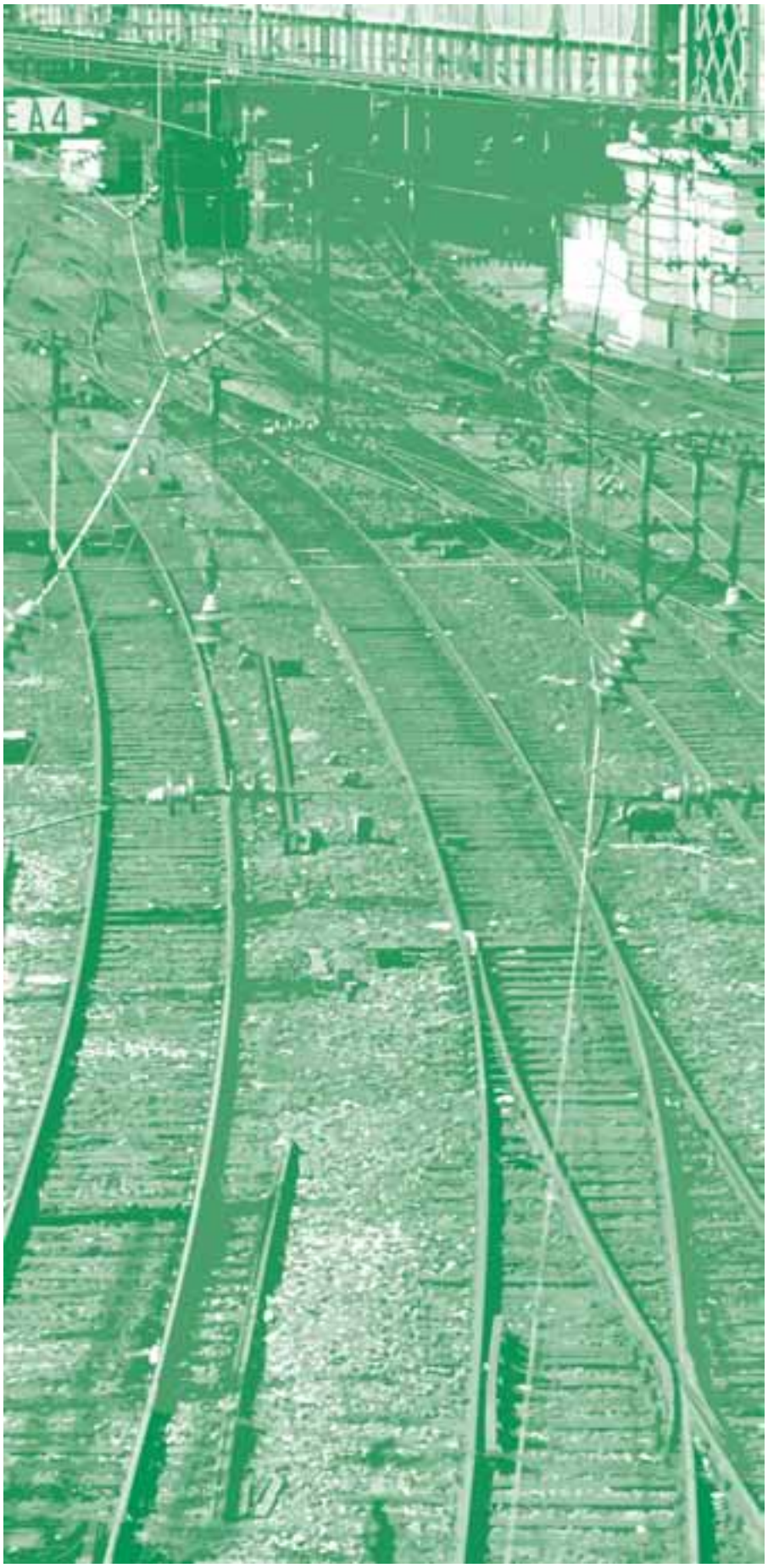


Ordering information

Type	Supply voltage U_S	Art. No.
IR1575-435	AC 88…264 V / DC 77…286 V / AC 340…460 V	B 9106 4000
IR1575W-435		B 9106 4000W

Special applications

Chapter 1.6



A-ISOMETER® for special applications
e.g. generators, medical locations or de-energised loads

A-ISOMETER® IR420-D6

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

A-ISOMETER® IR420-D6

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 values100 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)

Standards, approvals and certifications

c UL us LISTED

AE25

Product description

The offline monitor of the IR420-D6 series monitors the insulation resistance of de-energised loads. These loads, usually temporarily operated or de-energised most of the time, e.g. fire extinguisher pumps, slide valve drives, elevator motors, emergency power generators etc., are supplied from TN, TT or IT systems. During the shut-down periods, however, humidity or other effects may cause insulation faults in the wiring or the loads which may go undetected. Switching the device on may then lead to the tripping of the protective device or may even result in motor fires and the device cannot be operated. In combination with a coupling device, the devices can also be used for higher voltages.

Application

- 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.

Function

When the insulation resistance between the system conductors and earth falls below the set response value, the alarm relays switch and the alarm LEDs light up. The measured value is indicated on the internal LC display. In this way any changes, for example when circuits are connected to the system, can be recognised easily. The fault memory can be reset by pressing the reset button. The device function can be tested using the test button. Two separately adjustable response values with one alarm relay each allow prewarning already in case of very high-resistance insulation faults. When the lower response level is reached, an interlocking function will be activated and the connection of a defective load can be prevented.

The insulation resistance is measured via the output L1 or via a contact to the system being monitored. The contact is controlled via the external contact element K3. With the contact in closed position, the system is de-energised and the insulation resistance is being measured. If the system or load is in operation, K3 opens the contact and insulation monitoring is deactivated. Make sure that the main switch disconnects all poles. To ensure that the measuring voltage can be superimposed onto the system, a low-resistance connection must exist between all line conductors (e.g. by motor windings).

Note: If the IR420-D6 is operated via a coupling device, the auxiliary contact (N/C contact) of K3 between the A-ISOMETER® and the coupling device need not to be designed for the nominal voltage of the system. A rated contact voltage of AC 230 V will be sufficient here.

Measurement method

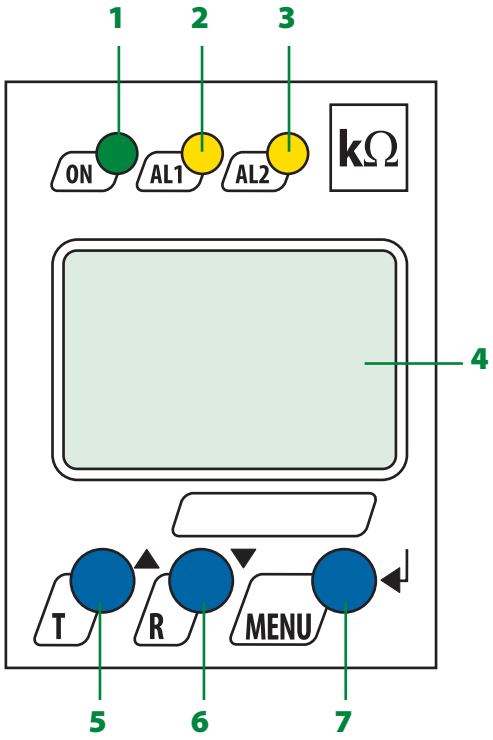
DC

Superimposed DC voltage with inverter.

Standards

The A-ISOMETER® was designed in accordance with the following standards:
IEC 61557-8, IEC 61326-2-4, IEC 60664-1, IEC 60664-3, ASTM F1669M-96 (2007), ASTM F1207M-96 (2007).

Operating elements



1 - LED Power "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 earth/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 earth/KE

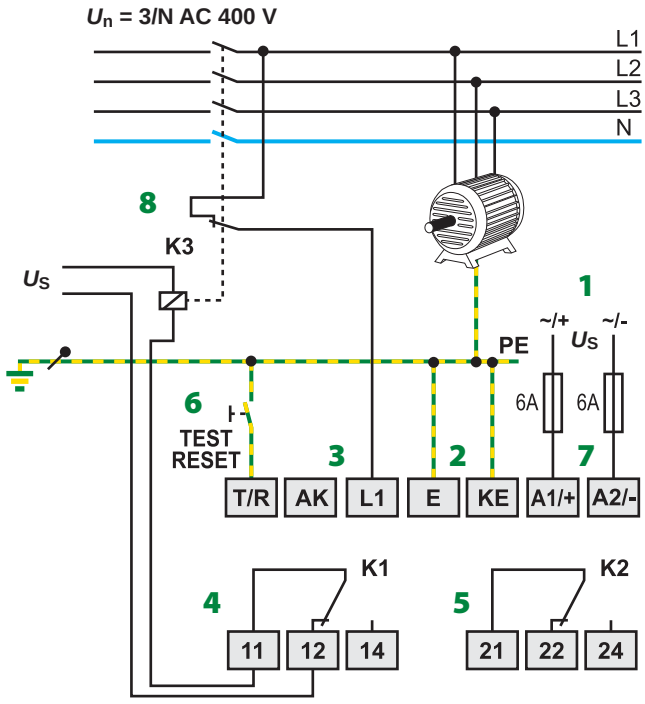
4 - LC display

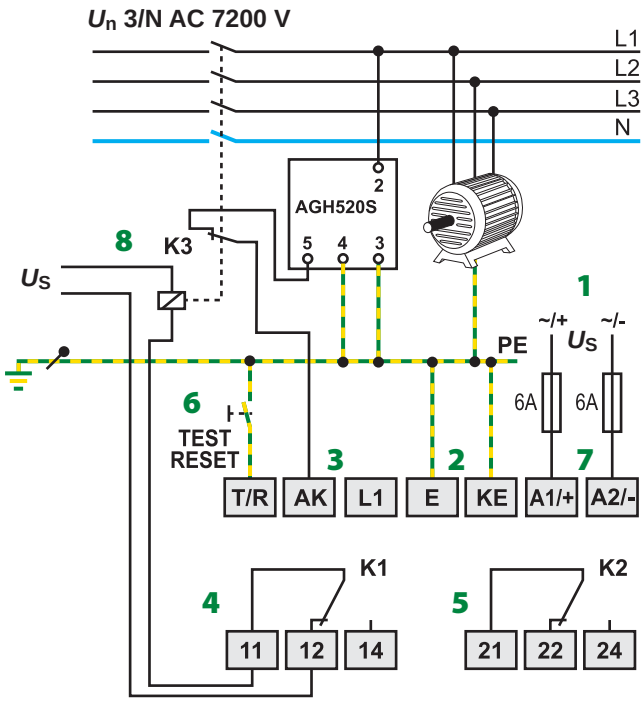
5 - Test button "T": to call up the self test.
Arrow up button: parameter change, to move up in the menu

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 change

Wiring diagrams (examples)





1 - Supply voltage U_S (see ordering information) via fuse

2 - Separate connection of E and KE to PE

3 - Connection to the AC system to be monitored

4 - Alarm relay "K1": Alarm 1

5 - Alarm relay "K2": Alarm 2

6 - Combined test and reset button
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

1.6

Technical data

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

Rated insulation voltage	400 V
Rated impulse voltage/pollution degree	4 kV / III
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	offline
without AGH	nominal contact voltage of the N/C contact of K3 (switch-on contactor)
with AGH520S	AC 50…400 Hz, 0…7200 V

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 x R_{an} and C_e = 1 µF	≤ 4 s
Start-up delay 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)	≤ 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	≤ 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 / N/O operation (N/O operation)*
Electrical service life, number of cycles					10.000
Contact data acc. to IEC 60947-5-1					
Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-12
Rated operational voltage	230 V	230 V	220 V	110 V	24 V
Rated operational current	5 A	3 A	0.1 A	0.2 A	1 A
Minimum contact rating					1 mA at AC / DC > 10 V

Environment/EMC

EMC	IEC 61326
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 type	push-wire terminal
Connection properties	
rigid	0.2…2.5 mm² / AWG 24-14
Flexible without ferrule	0.2…2.5 mm² / AWG 24-14
Flexible with ferrule	0.2…1.5 mm² / AWG 24-16
Stripping length	10 mm
Opening force	50 N
Test opening, diameter	2.1 mm

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	TBP101014
Weight	≤ 150 g

( )* = factory setting

Ordering information

Type	Supply voltage* U_S	Response value R_{an}	System leakage capacitance C_e	Art. No.
IR420-D6-1	DC 9.6…94 V / AC 42…460 Hz 16…72 V	100 kΩ…10 MΩ	≤ 10 µF	B 7101 6415
IR420-D6-2	DC 70…300 V / AC 42…460 Hz 70…300 V	100 kΩ…10 MΩ	≤ 10 µF	B 7101 6407

Device version with screw terminals on request.
* Absolute values

Accessories

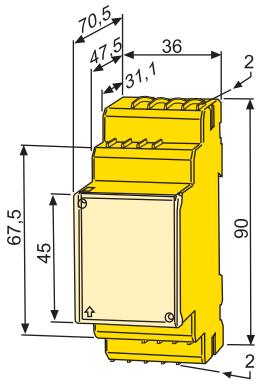
Type	Nominal system voltage* U_n	Art. No.
AGH520S	AC 50…400 Hz 0…7200 V	B 913 033

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

Dimension diagram XM420

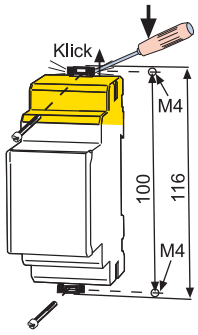
Dimensions in mm

Open the front plate cover in direction of arrow!



Screw mounting

Note: The upper mounting clip must be ordered separately (see ordering information).



A-ISOMETER® IR423

Insulation monitoring device for mobile generators

A-ISOMETER® IR423

Device features

- Insulation monitoring for mobile generators AC 0…300 V
- Protection by electrical separation with insulation monitoring and disconnection
- W version 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, approvals and certifications

c UL us LISTED

AE25

Product description

The A-ISOMETER® of the IR423 series monitors the insulation resistance R_F of an unearthed AC system of 0…300 V to earth that is supplied by a mobile generator. The IR423 is suitable for AC systems with operating frequencies ≥ 30 Hz as well as for AC systems with directly connected DC circuits. The maximum permissible system leakage capacitance C_{emax} is 5 µF.

Application

- IEC 60364-7-717: Low-voltage electrical installations, Part 7-717: Requirements for special installations or locations – Mobile or transportable units.
- GW 308 "Mobile auxiliary power generators on pipeline site" (Mobile Stromerzeuger für Rohrleitungsbaustellen) 8 / 00 (DVGW)

Function

The currently measured insulation resistance is indicated on the LC display. In this way, any changes, for example, when circuits of loads are connected to the system, can be recognised easily. When the value falls below the preset response values, the response delay "t_{on}" starts. Once the response delay "t_{on}" has elapsed, the alarm relays "K1 / K2" switch and the alarm LEDs "AL1 / AL2" light up. Two separately adjustable response values/alarm relays allow a distinction to be made between prewarning and alarm. If the insulation resistance exceeds the release value (response value plus hysteresis), the alarm relays return to their initial position. If the fault memory is enabled, the alarm relays remain in the alarm state until the reset button is pressed or until the supply voltage is switched off. The device function can be tested using the test button. The parameterisation of the device can be carried out via the LC display or the function keys integrated in the front plate.

Connection monitoring

The connections to the system (L1 / L2) and earth (E / KE) are either automatically checked every 1 h, or by pressing the test button or when supply voltage is applied. In case of interruption of a connecting lead, the alarm relays K1 / K2 switch, the LEDs ON // AL1 // AL2 flash and the following message appears on the display:

"E.02" signals a fault in the connecting leads to the system,

"E.01" signals a fault in the connecting leads to PE.

After eliminating the fault, the alarm relays return to their initial position either automatically or by pressing the reset button.

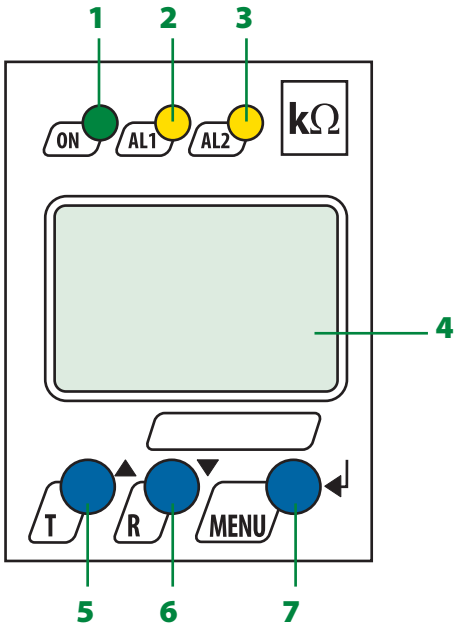
Measurement method

The A-ISOMETER® of the IR423 series uses a modified measurement method specially suited for mobile power generators (also for inverter technology).

Standards

The A-ISOMETER® was designed in accordance with the following standards:
IEC 61557-8, IEC 61326-2-4, IEC 60664-1, IEC 60664-3, ASTM F1669M-96 (2007), ASTM F1207M-96 (2007).

Operating elements



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.

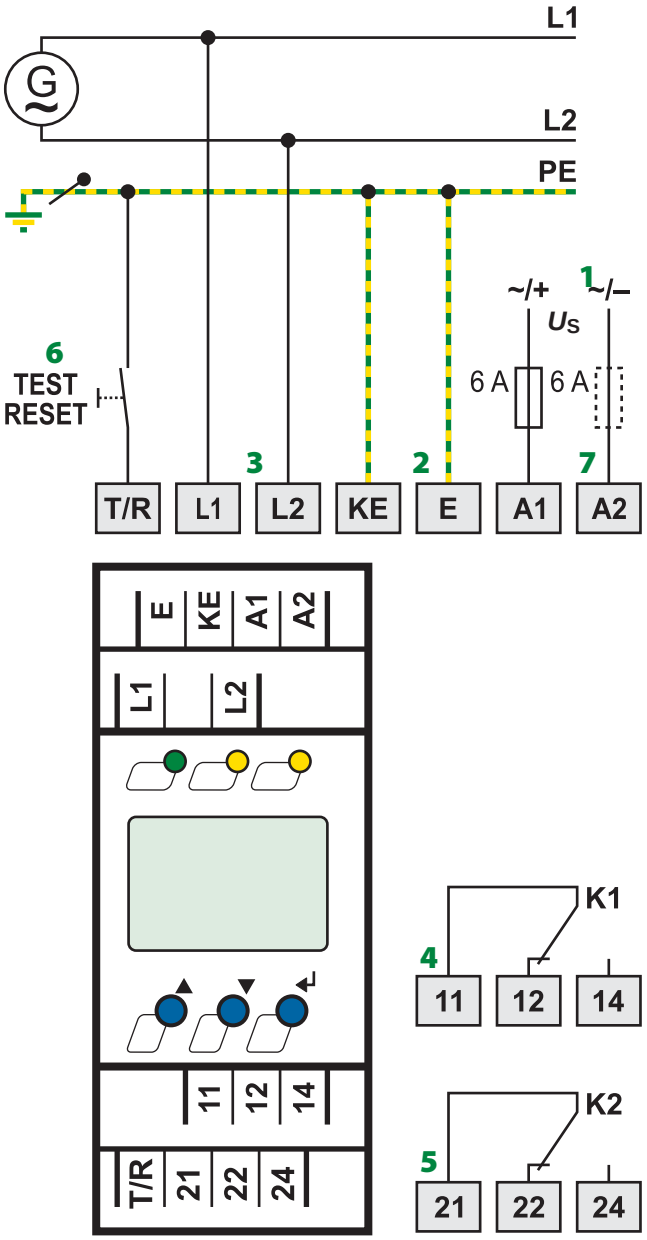
4 - LC display

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: to call up the menu system.
Enter button: to confirm parameter change

Wiring diagram



1 - Supply voltage U_S (see ordering information) via fuse

2 - Separate connection of E and KE to PE

3 - Connection to the AC system to be monitored:
AC: Connect terminals L1, L2 to the conductors L1, L2

4 - Alarm relay K1: Alarm 1

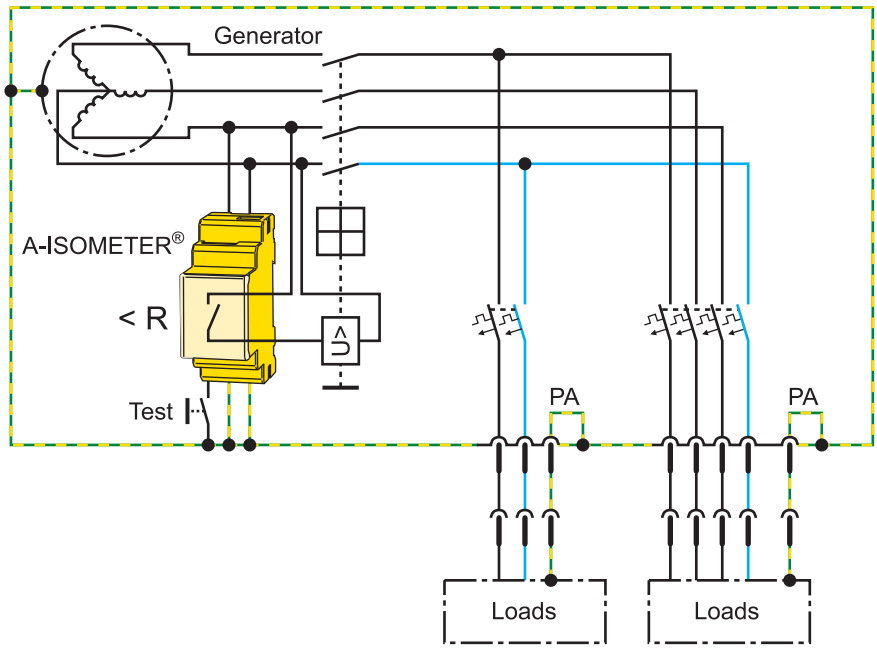
5 - Alarm relay K2: Alarm 2

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

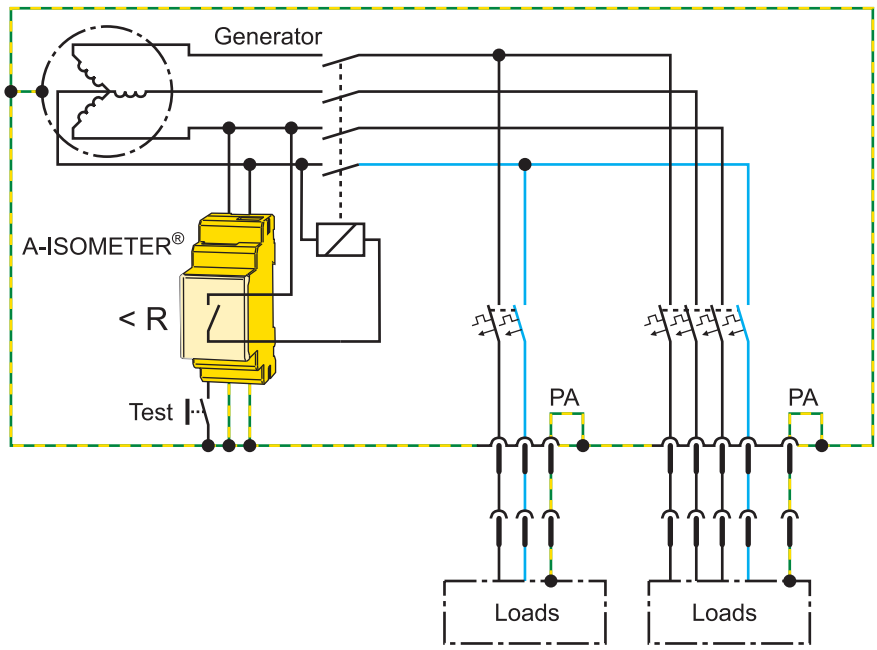
7 - Line protection by a fuse in accordance with IEC 60364-4-43 (6 A fuse recommended). In case of supply (A1/A2) from an IT system, both lines have to be protected by a fuse.

Examples of application

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



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

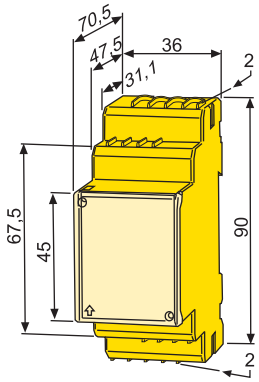


Setting of K1/K2 for contactor: N/C operation (n.c.), fault memory setting: ON

Dimension diagram XM420

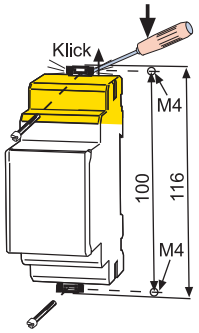
Dimensions in mm

Open the front plate cover in direction of arrow!



Screw mounting

Note: The upper mounting clip must be ordered separately (see ordering information).



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

Time response

Response time t_{an} at $R_F = 0.5 \times R_{an}$ and $C_e = 1$ µF	≤ 1 s
Start-up delay 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 µA
Internal DC resistance R_i	≥ 62 kΩ
Impedance Z_i at 50 Hz	≥ 60 kΩ
Permissible extraneous DC voltage U_{fg}	≤ DC 300 V
Permissible system leakage capacitance C_e	≤ 5 µF

Displays, memory

Display range, measured value	1 kΩ…1 MΩ
Operating uncertainty 1 Ω…5 kΩ / 5 kΩ…1 MΩ	± 0.5kΩ / ± 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	10.000

Contact data acc. to IEC 60947-5-1					
Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-12
Rated operational voltage	230 V	230 V	220 V	110 V	24 V
Rated operational current	5 A	3 A	0.1 A	0.2 A	1 A

Contact rating	1 mA at AC/DC ≥ 10 V

Environment/EMC

EMC	IEC 61326-2-4
Operating temperature	- 40 °C…+ 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 mm² / AWG 24-14
flexible without ferrule	0.2…2.5 mm² / AWG 24-14
flexible with ferrule	0.2…1.5 mm² / AWG 24-16
Stripping length	10 mm
Opening force	50 N
Test opening, diameter	2.1 mm

Other

Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components /terminal (IEC 60529)	IP30 / IP20
Enclosure material	polycarbonate
DIN rail mounting acc. to	IEC 60715
Screw mounting	2 x M4 with mounting clip
Operating manual	BP101013
Weight	≤ 150 g

( )* = factory setting

1.6

Ordering information

Type	Nominal system voltage* U_n	Supply voltage* U_S	Art. No.
IR423D4-1	AC 0…300 V 30…460 Hz	AC 16…72 V 30…460 Hz, DC 9.6…94 V	B 7101 6304
IR423D4-2	AC 0…300 V 30…460 Hz	AC/DC 70…300 V 30…460 Hz	B 7101 6305
IR423-D4W-1	AC 30…460 Hz 0…300 V	DC 9.6…94 V / AC 30…460 Hz 16…72 V	B 7101 6304W
IR423-D4W-2	AC 30…460 Hz 0…300 V	DC / AC 30…460 Hz 70…300 V	B 7101 6305W

Device version with screw terminals on request. * Absolute values

Accessories

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

A-ISOMETER® IRDH275BM-7

with coupling device AGH675-7

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

A-ISOMETER® IRDH275BM-7

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} measuring principle (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 voltage-free changeover contacts
- N/O or N/C operation
- Backlit two-line LC display
- Remote setting of specific parameters via Internet (option; FTC470XET required)
- With Option "W": Increased shock and vibration resistance for use in ships, in rolling stock and in seismic regions

Standards, approvals and certifications

c UL us LISTED

AE25

Product description

The device combination A-ISOMETER® IRDH275BM-7 and the coupling device AGH675S-7 is designed to monitor the insulation resistance of unearthed medium voltage systems (IT systems). It is suitable for universal use in 3AC, combined AC/DC and DC systems. AC systems may include extensive DC-supplied loads. The AMPPlus measurement method meets the particular requirements of modern power supplies which often include rectifiers, converters, thyristor-controlled DC drives and directly connected DC components. Taking the system leakage capacitances into account, the IRDH275BM-7 automatically adapts itself to the existing system conditions in order to optimise the measuring time.

Application

- 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

Function

When the insulation resistance between the system conductors and earth falls below the set response value, the alarm relays switch and the alarm LEDs light up. Two separately adjustable alarm relays allow to distinguish between prewarning and alarm. The measured value is indicated on the LC display or an externally connectable measuring instrument. The fault message can be stored. The fault memory can be reset by pressing the reset button. By pressing the test button, the function of the device as well as the connections to earth can be tested. Pressing the Info button provides additional information, such as the existing system leakage capacitance or device settings. The function of the earth connections are monitored. When a fault occurs, the system fault relay switches and the alarm LED "system fault" lights up.

The parameterisation of the device can be carried out via the LC display or the function buttons integrated in the front plate.

In addition, the device features:

- 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
- Current output 0(4)…20 mA (electrically isolated)

Measurement method

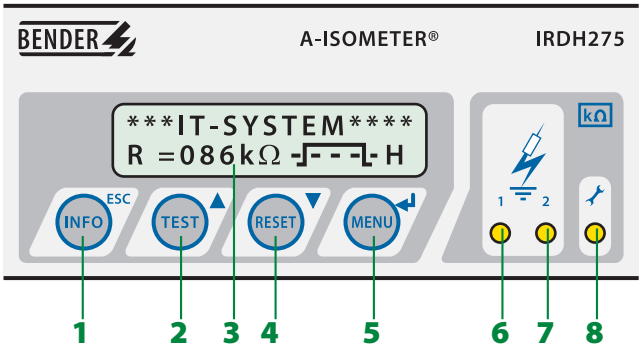
AMP^{Plus} The IRDH275BM-7 series uses the patented ***AMP***^{Plus} measurement method (see broshure "Technical aspects – Main catalogue Part 1").

This measuring method allows concise monitoring of modern power supply systems, also in case of extensive, directly connected DC components and high system leakage capacitances.

Standards

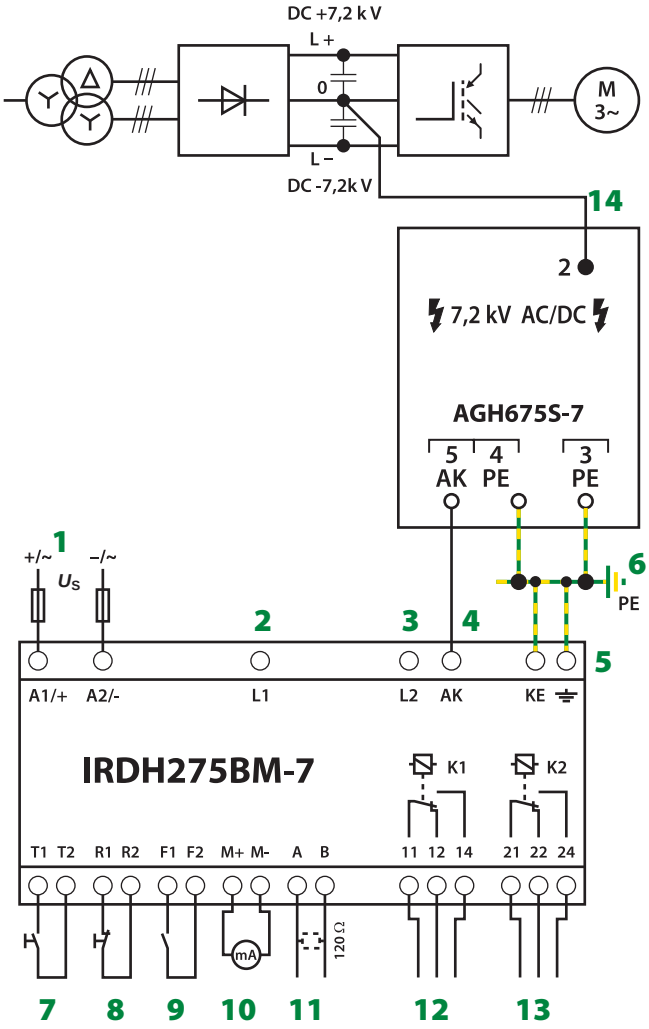
The A-ISOMETER® was designed in accordance with the following standards:
IEC 61557-8, IEC 61326-2-4, IEC 60664-1, IEC 60664-3, ASTM F1669M-96 (2007), ASTM F1207M-96 (2007).

Operating elements



1 - "INFO" button: to query standard information 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 - Two-line display for standard and menu mode
4 - "RESET" button: to delete stored insulation fault alarms parameter change, to move down in the menu
5 - "MENU" button: to call up the menu system.
Enter button: to confirm parameter change
6 - Alarm LED "1" lights:
insulation fault, first warning level reached.
7 - Alarm LED "2" lights:
insulation fault, second warning level reached.
8 - System fault LED lights: IRDH275 or earth terminal defective

Wiring diagram – mains connection/example



1 - Supply voltage U_S (see ordering information)
6 A fuse recommended
2,3 - Terminals L1, L2 are not wired!
4 - Connection to the coupling device AGH675S-7:
Connect terminal AK with terminal 5 of the coupling device.
5 - Separate connection of E and KE to PE
6 - Separate connection of the terminals 3 and 4 of the AGH675S-7 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 mode using 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 2 (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.

Technical data

Insulation coordination acc. to IEC 61800-5-1

Rated voltage with AGH675S-7	AC 7.2 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 Ω)	≤ 21 µA
Internal DC resistance R_i	≥ 2.4 MΩ
Impedance Z_i at 50 Hz	≥ 2.4 MΩ
Permissible system leakage capacitance C_e	≤ 5 µF
Factory setting	2 µF

Displays

Display, illuminated	two-line display
Characteristics (number)	2 x 16
Display range, measuring 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)	04…20 mA (≤ 500 Ω)
Accuracy current output (100 kΩ…10 MΩ)	± 10 %, ±100 kΩ

Serial interface

Interface / protocol IRDH275B	RS-485 / BMS
Connection	terminals A/B
Cable length	≤ 1200 m
Recommended cable (shielded, shield on one side connected to PE)	J-Y(St)Y 2x0.6
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
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)

General data

Shock resistance acc. to 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/during storage)	10 °C…+ 55 °C/40 °C…+ 70 °C
Climatic class acc. to IEC 60721-3-3	3K5
Operating mode	continuous operation
Mounting	display-oriented
Connection	screw-type terminals
Technical data IRDH275BM-7 with AGH675S-7	TGH1395/01.2006
Connection, rigid/flexible	0.2…4 mm² / 0.2…2.5 mm²
Connection, flexible with ferrule, without/with plastic sleeve	0.25…2.5 mm²
Conductor sizes (AWG)	24…12
Degree of protection, internal components /terminal (IEC 60529)	IP30 / IP20
Type of enclosure	X112, free from halogen
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Operating manual	TGH1395
Weight	approx. 510 g

Option "W"

Shock resistance IEC 60068-2-27 (during operation)	30 g/11 ms
Bumping IEC 60068-2-29 (during 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/during storage)	- 10 °C…+ 55 °C/- 40 °C…+ 85 °C
Screw mounting	2 x M4

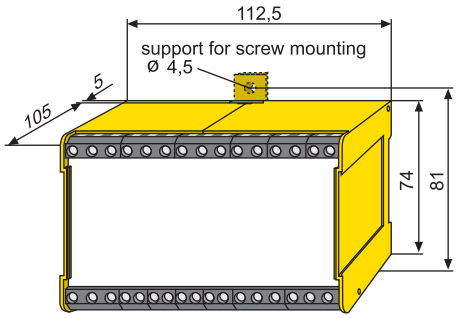
Values marked with * are absolute values

Ordering information				
Type	**Nominal system voltage**	**Supply voltage**	**Cable length**	**Art. No.**
IRDH275BM-7	--	DC 19.2…72 V	--	B 9106 5120
AGH675S-7-2000	AC 0…460 Hz / DC 0…7.2 kV	--	2000 mm	B 913 054
AGH675S-7-500	AC 0…460 Hz / DC 0…7.2 kV	--	500 mm	B 913 056

Accessories – External kΩ measuring instruments (20 mA)		
Type	**SKMP *2**	**Art. No.**
9620-1721	2.8 MΩ	B 986 849

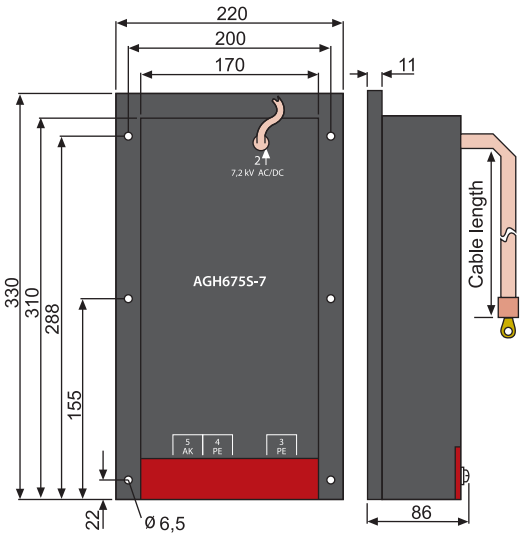
Dimension diagram XM112

Dimensions in mm



Dimension diagram AGH675S-7

Dimensions in mm

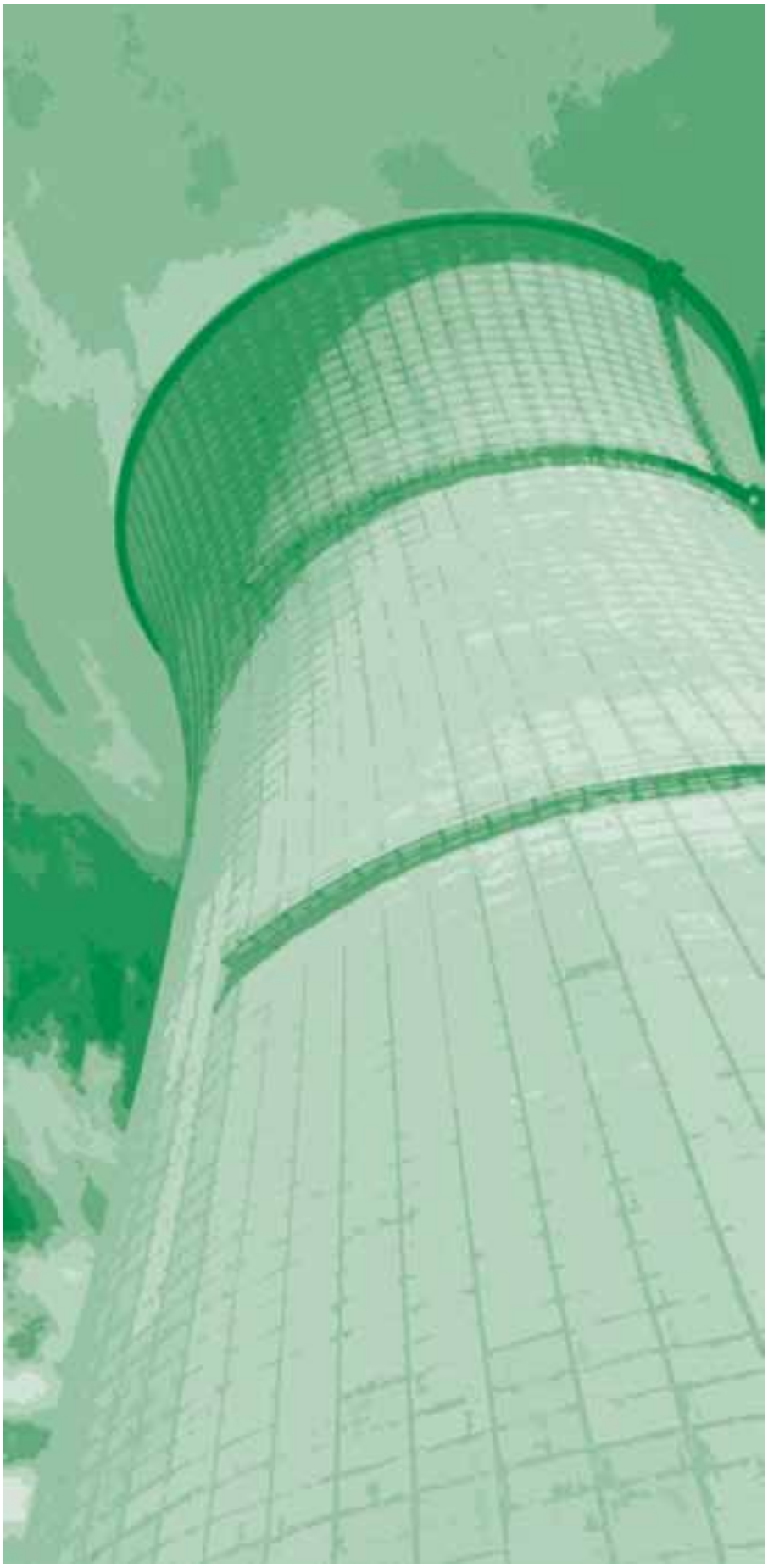


1.6

A-ISOMETER® for insulation fault location
Equipment for insulation fault location
Device components

Chapter 1.7

Equipment for insulation fault location (EDS systems) for stationary and portable applications



A-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

A-ISOMETER® IRDH575

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, system disconnection and 04…20mA current output
- Can be extended to an insulation fault location system for 1080 circuits
- Adjustable locating current for insulation fault location
- Appropriate for EDS4… insulation fault locators
- AMP measurement method

Standards, approvals and certifications

RoHS

c UL us LISTED

AE25

Product description

The A-ISOMETER® of the IRDH575 series monitors the insulation resistance of unearthed power supplies (IT systems). It is suitable for universal use in 3(N)AC, AC/DC and DC systems. AC systems may include extensive DC-supplied loads, such as converters or thyristor-controlled DC drives. The IRDH575 in combination with EDS4… series insulation fault locators and the appropriate measuring current transformers is designed to set up the respective equipment for insulation fault location.

Function insulation monitoring

When the insulation resistance between the system conductors and earth falls below the set response value, the alarm relays switch and the alarm LEDs light up. Two separately adjustable alarm relays (N/C or N/O operation) allow a distinction to be made between "prewarning" and "alarm". The measured value is indicated on the LC display or an externally connectable measuring instrument. In this way any changes, for example when circuits are connected to the system, can be recognised easily. The fault message can be stored. The fault memory can be reset by pressing the internal or external reset button. By pressing the test button, the function of the device as well as the connections to system and earth can be tested. Pressing the Info key provides additional information, such as the existing system leakage capacitance or device settings.

Function insulation fault location

Insulation fault location is carried out with EDS4… series insulation fault locators and the respective measuring current transformers. When the IRDH575 detects an insulation fault, the insulation fault location process is started automatically or manually. The IRDH575 generates a locating current the amplitude of which is dependent on the existing system voltage and the insulation fault. When low-resistance insulation faults occur, the locating current is limited by the IRDH575. This limit value can be set via an appropriate menu. The locating current pulse flows from the IRDH575 via the live parts, taking the shortest path to the location of the insulation fault. From there, it flows via the insulation fault and the PE back to the IRDH575. This locating current pulse is then detected by the measuring current transformers located in the insulation fault path, and is evaluated by the EDS… insulation fault locators. When the locating current in the measuring current transformer exceeds the response value, the associated alarm LED at the EDS47… lights up indicating the faulty subcircuit. This information is also indicated on the LC display of the IRDH575. By assigning the measuring current transformers to the respective circuit, the point of fault can easily be detected.

Additional functions

99 alarm messages with date and time can be stored in the data memory of the IRDH575. The device also includes Isometer disconnecting relays when several A-ISOMETER®s are operated in (coupled) IT systems. An integrated RS-485 interface (BMS protocol) allows information exchange with other Bender devices.

Via the 0 / 4-20mA interface details about the insulation resistance can be transferred to higher-level control systems.

The function of the IRDH575 is continuously monitored. When a system fault occurs, the associated alarm LED lights up and the respective alarm relay switches.

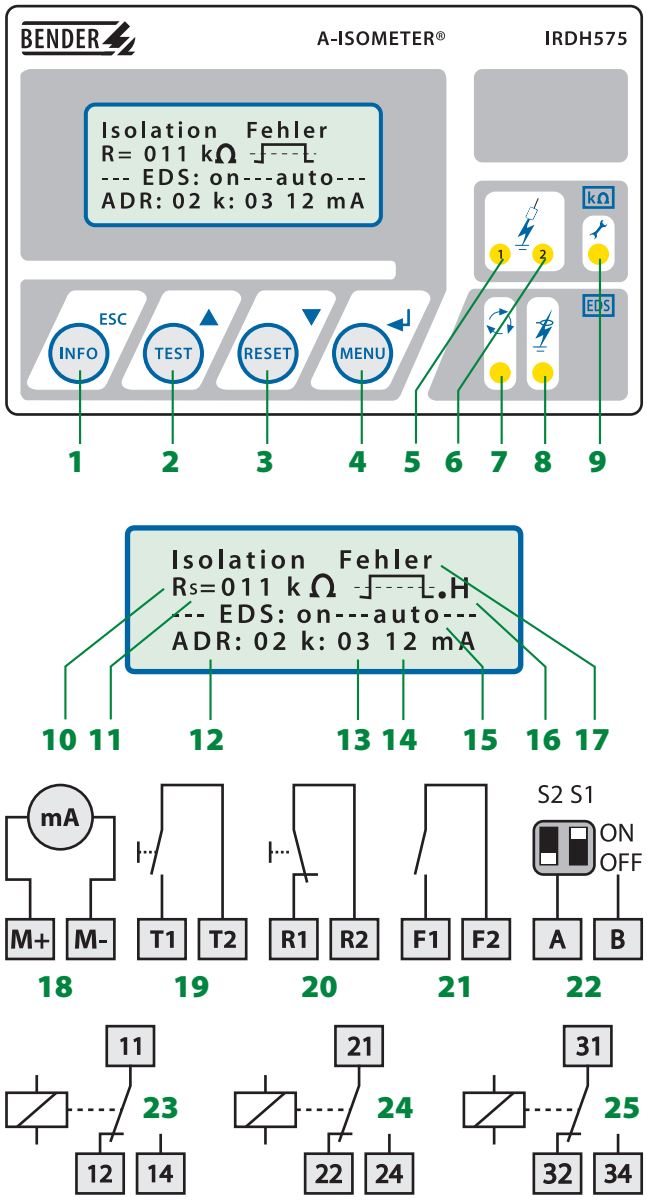
System design

Basically, an EDS system consists of an IRDH575 and one or several EDS4… insulation fault locators with the associated measuring current transformers. Information exchange between the EDS4… and the IRDH575 takes place via a time and cost-saving RS-485 interface. Such a system may include up to 90 EDS4… so that a total of 1080 circuits can be monitored.

Standards

The A-ISOMETER® was designed in accordance with the following standards:
IEC 61557-8, IEC 61326-2-4, IEC 60664-1, IEC 60664-3, IEC 61557-9,
ASTM F1669M-96 (2007), ASTM F1207M-96 (2007).

Wiring diagram – Operating elements



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 change, 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 change

5 - Alarm LED "1" lights: Insulation fault,
first warning level Alarm 1 reached

6 - Alarm LED "2" lights: Insulation fault,
first warning level Alarm 2 reached

7 - EDS LED lights: Insulation fault location process started

8 - EDS alarm LED lights: Insulation fault detected

9 - LED lights up: system fault

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 active EDS46…
(indication when a fault has been detected)

13 - Channel monitored by EDS4…
(indication when a fault has been detected)

14 - Locating current in mA or µA
(indication when a fault has been detected)

15 - EDS is running in the AUTO mode. Further modes are: on, off, pos: address and channel of the EDS can be predefined (in Master mode only). 1 cycle: when the channels are tested 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 - Messages in plain text

18 - Current output 0…20 mA or 4…20 mA

**19 - External test button "T1/T2" (N/O contact)

**20 - External reset button (N/C contact or wire jumper), when the terminals are open, the fault message will not be stored, provided that the memory has not been activated via the operating menu.

**21 - STANDBY, contact closed = no measurement; no alarm; system disconnection

22 - RS-485 termination (120 Ω) with micro switch S1 and connection BMS bus; S1 = ON = BMS bus terminated, S2 = unassigned

23 - Alarm relay: Alarm 1 (A-ISOMETER®)

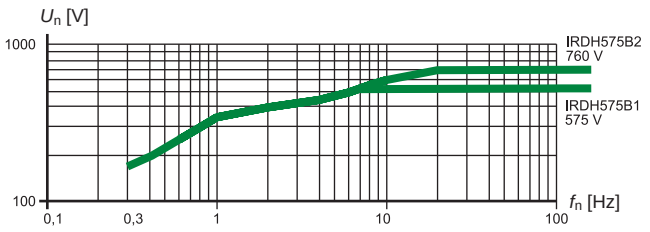
24 - Alarm relay: Alarm 2 (A-ISOMETER®)

25 - Alarm relay: System fault and EDS alarm (Adr.:1)

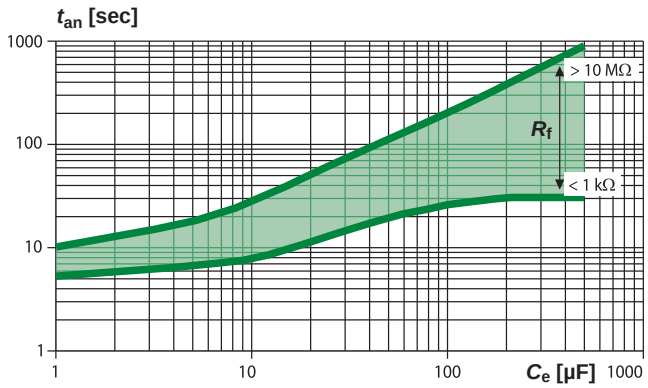
* The terminal pairs 19, 20 and 21 must be wired galvanically isolate and must not have a connection to PE!

1.7

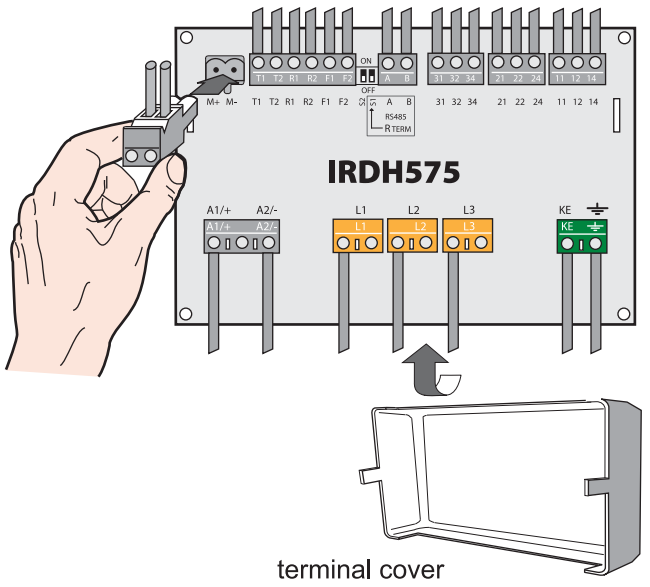
Characteristic curve – Max. AC voltage between system and earth in the frequency range < 50 Hz



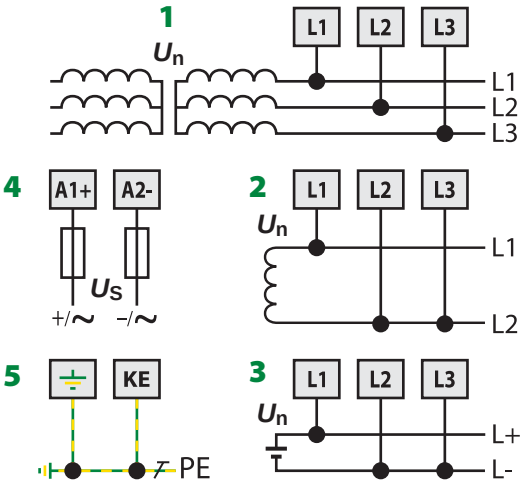
Characteristic curve response times



Wiring diagram – rear view

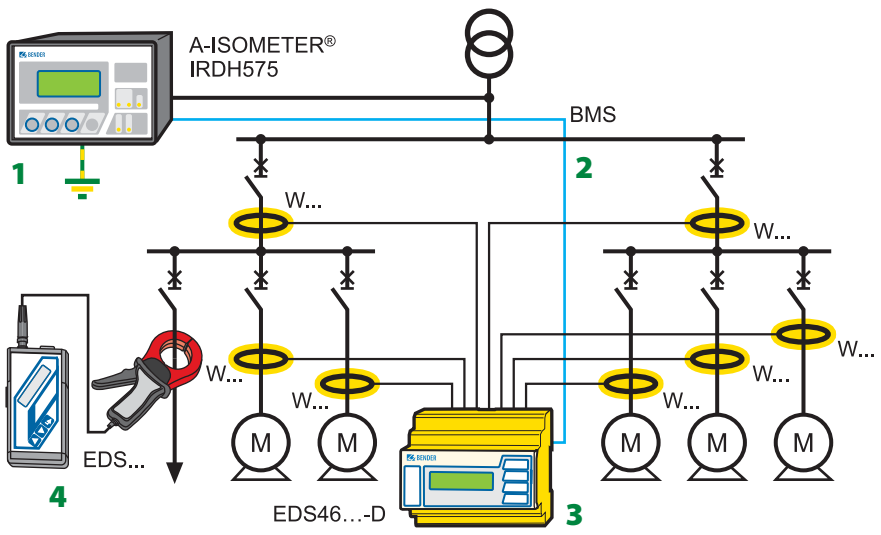


Wiring diagram – system connection



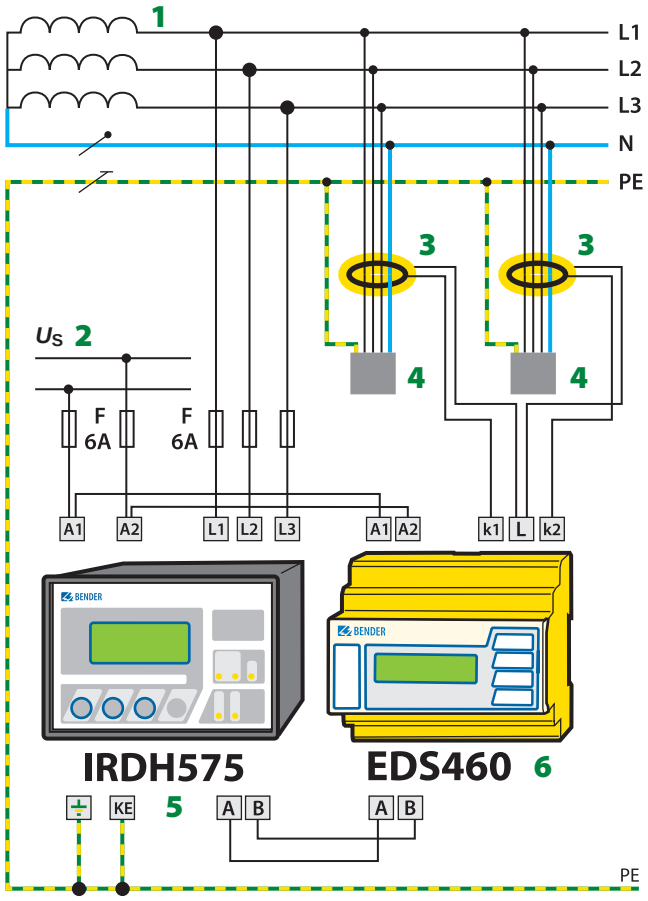
1 - Mains connection 3AC
2 - Mains connection AC
3 - Mains connection DC
4 - U_S see ordering information, 6 A fuse recommended
Note: Supply voltage U_S in the IT system requires two fuses
5 - PE connection

System structure – Example



1 - A-ISOMETER® IRDH575
2 - RS-485/BMS protocol
3 - EDS460 / EDS461
4 - EDS3060 / EDS3360

Typical circuit EDS460 insulation fault location system with IRDH575



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

1 - 3AC / 3NAC / DC 20…575 V resp. 3AC / 3NAC / DC 340…760 V

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

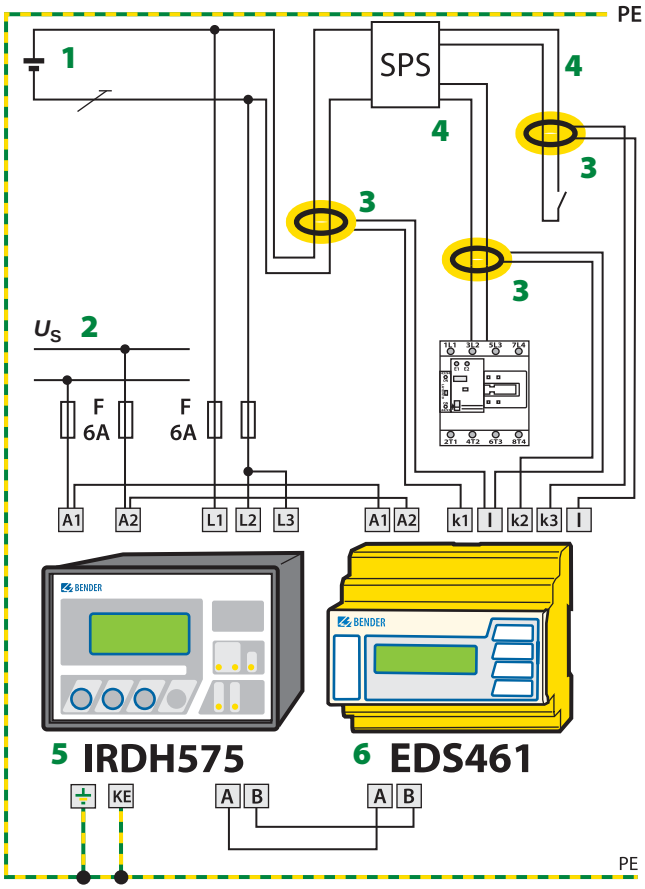
3 - Measuring current transformers W…

4 - Outgoing circuits to the loads

5 - A-ISOMETER® IRDH575

6 - Insulation fault locator EDS460

Typical circuit EDS461 insulation fault location system with IRDH575



1 - AC 20…265V / DC 20 V…308 V

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

3 - Measuring current transformer W…/8000

4 - Outgoing circuits PLC: inputs and outputs

5 - A-ISOMETER® IRDH575

6 - Insulation fault locator EDS461

Design of an insulation fault location system with EDS461

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

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 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 kΩ…20 kΩ)	+2 kΩ / +20
Realtive uncertainty (1 MΩ…10 MΩ)	0.2 MΩ / +20 %
Measuring time	see characteristic curves
Hysteresis (1 kΩ…10 kΩ)	+2 kΩ
Hysteresis (10 kΩ…10 MΩ)	25 %

Measuring circuit

Measuring voltage U_m	≤ 40 V
Measuring voltage U_m (IRDH575B1-4227)	≤ 10 V
Measuring current I_m (at R_F = 0Ω)	≤ 220 µA
Internal DC resistance R_i	≥ 180 kΩ
Impedance Z_i at 50 Hz	≥ 180 kΩ
Permissible extraneous DC voltage U_{fg} (variant B1)	≤ DC 810 V
Permissible extraneous DC voltage U_{fg} (variant B2)	≤ DC 1060 V
System leakage capacitance C_e	500 µF
Factory setting C_e	150 µF

Measuring circuit for insulation fault location (EDS)

Locating current I_p DC	1/2.5/10/25/50 mA
Test cycle/idle time	2 s / 4 s

Displays

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

Outputs/Inputs

Test / reset button	internal/external
Current output for measuring instrument SKMP (scale centre point = 120 k):	
Current output IRDH575 (max. load)	0/4…20 mA (≤ 500 Ω)
Accuracy current output (1 kΩ…1 MΩ)	±10 %, ± 1 kΩ
Serial interface	
Interface / protocol	RS-485 / BMS
Max. cable length	≤ 1200 m
Recommended cable (shielded, shield connected to PE at one end)	J-Y(St) Y 2x0.6
Terminating resistor	120 Ω (0.5 W)

Switching elements

Switching components	3 changeover contacts: K1 (Alarm 1), K2 (Alarm2), 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
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)

General data

EMC	acc. to IEC 61326-2-4
Shock resistance IEC 60068-2-27 (device in operation)	15 g / 11 ms
Bumping IEC 60068-2-29 (during transport)	40 g / 6 ms
Vibration resistance IEC 60068-2-6 (during operation)	1 g / 10…150 Hz
Vibration resistance IEC 60068-2-6 (during transport)	2 g / 10…150 Hz
Ambient temperature (during operation)	-10 °C…+55 °C
Ambient temperature (during storage)	-40 °C…+70 °C
Climatic class acc. to IEC 60721-3-3	3K5
Operating mode	continuous operation
Mounting	display-oriented
Distance to adjacent devices	≥ 30 mm
Connection	screw-type terminals
Connection, rigid/flexible	0.2…4 mm² / 0.2…2.5 mm²
Connection, flexible with ferrule, without/with plastic sleeve	0.25…2.5 mm²
Conductor sizes (AWG)	24…12
Degree of protection, internal components (IEC 60529)	IP30
Degree of protection, terminals (IEC 60529)	IP20
Degree of protection, in case of door mounting (IEC 60529)	IP40
Degree of protection, for door mounting with panel sealing (IEC 60529)	IP42
Degree of protection, for mounting the transparent front plate cover (IEC 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 °C…+ 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 °C…+ 85 °C

The data labelled with an * are absolute values

** = under test conditions according to IEC 61326-2-4, the tolerances may double

Ordering information			
Type	**Nominal system voltage U_n**	**Supply voltage U_S**	**Art. No.**
IRDH575B1-427	AC/DC 20…575 V	DC 19.2…72 V	B 9106 5502
IRDH575B1-435	3(N)AC / DC 20…575 V*	AC 88…264 V/ DC 77…286 V*	B 913 054
IRDH575B1-4227**	3(N)AC / DC 20…150 V*	DC 19.2…72V*	B 9106 5505
IRDH575B1-4235	AC/DC 20…150 V	AC 88…264 V / DC 77…286 V	B 9106 5504
IRDH575B2-435	3(N)AC 340…760 V DC 340…575 V*	AC 88…264 V/ DC 77…286 V*	B 9106 5503

* absolute values

** measuring voltage U_m 10 V, version -4227

Accessories		
Protection against dust and moisture		
Type	**Dimensions**	**Art. No.**
Panel sealing, degree of protection IP42	144 x 96 mm	B 9806 0006
Transparent cover, degree of protection IP65	144 x 96 mm	B 9806 0007

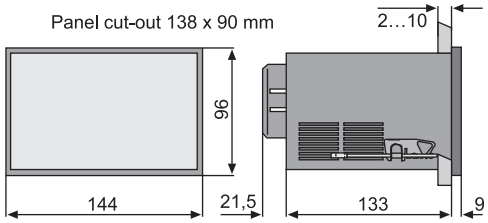
Adaptor for rail mounting	
Type	**Art. No.**
Adaptor for rail mounting	B 9806 0010

The adaptor allows fast mounting of the IRDH575 on a DIN rail according to IEC 60715.

Measuring instruments			
Type	**Measuring range**	**Dimensions**	**Art. No.**
9620-1421	0…20 mA	96 x 96 mm	B 986 841
9620S-1421	0…20 mA	96 x 96 mm	B 986 842

Dimension diagram X500

Dimensions in mm



1.7

Insulation fault locators EDS460/490 – EDS461/491

Insulation fault locator EDS460-L

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

Standards, approvals and certifications

c UL us LISTED AE25

Product description

The insulation fault locators EDS460/490 in combination with the A-ISOMETER® IRDH575 or the locating current injector PGH are applied for localising insulation faults in unearthed systems (IT systems). The locating current signals generated by the insulation monitoring device IRDH575 or the locating current injector PGH are detected by measuring current transformers and evaluated by the insulation fault locators. Up to 12 measuring current transformers can be connected to one EDS460 / 490. A total of 90 EDS insulation fault locators can be connected via one RS-485 interface (BMS protocol). Hence, up to 1080 circuits can be monitored. The maximum scanning time is …10 s, see TGH1394.

Application

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

Function

Insulation fault location is started manually or automatically via the A-ISOMETER® IRDH575 or the PGH. Once started, the insulation fault locator EDS simultaneously scans all measuring current transformers (channels). If several EDS exist, these devices are also scanned simultaneously.

When the locating current detected by a measuring current transformer exceeds the set response value, the alarm LED 2 lights up, the common alarm relay switches and the faulty circuit is indicated as plain text on the graphical display. Version EDS…L indicates faulty outgoing circuits via alarm LEDs. The connection between the measuring current transformer and the insulation fault locator is continuously monitored. In the event of wire interruption, the alarm LED 1 lights up and the alarm relay switches.

With the fault memory activated, the alarm messages of the individual channels remains stored until the reset button is pressed or until a reset command is given via the RS-485 interface. When the fault memory is deactivated, the alarm message remains stored until the insulation fault is eliminated.

History memory in EDS460/461-D/EDS490/491-D

The device utilises a history memory for failsafe storing of up to 300 measured values/events (date, time, channel, event code, measured value), so that all data about an outgoing circuit or an area can be traced back at any time (what happend when).

AC residual current measurement

EDS insulation fault locators can also be used for the indication of AC residual currents in unearthed power supplies (IT systems). This is essential when also AC residual currents are to be localised in the circuits.

Device variants

EDS460-D

Device version EDS460-DG features a backlit graphical display where information can be displayed in various ways. This version is applied when detailed information about all devices in the switchboard cabinet, connected to the bus, are to be displayed locally. This device is capable of assigning parameters to all devices connected to the BMS bus and displaying all measurement details. Several EDS460-DG devices can be used in one system.

EDS460-L

Device version EDS490D/EDS490L utilises a two-digit 7-segment display where the address of this device is displayed within the BMS bus. Various error codes are displayed too. The alarm LEDs indicate in which measuring channel the response value has been exceeded. Parameter setting is only possible via an EDS…D, an A-ISOMETER® IRDH575, the alarm and test combination MK2430 or the protocol converter FTC470XET.

EDS490-D/EDS490-L

In comparison to the device version described before, EDS490-D / EDS490-L feature a galvanically isolated alarm contact (N/O contact), for example, to trigger a circuit breaker in this subcircuit when a response value has been exceeded.

EDS461-D/-L and EDS491-D/-L

In comparison to the device versions described above, these versions provide a higher response sensitivity. They are preferrably used in control circuits or in medical locations up to AC 230 (DC 220) V.

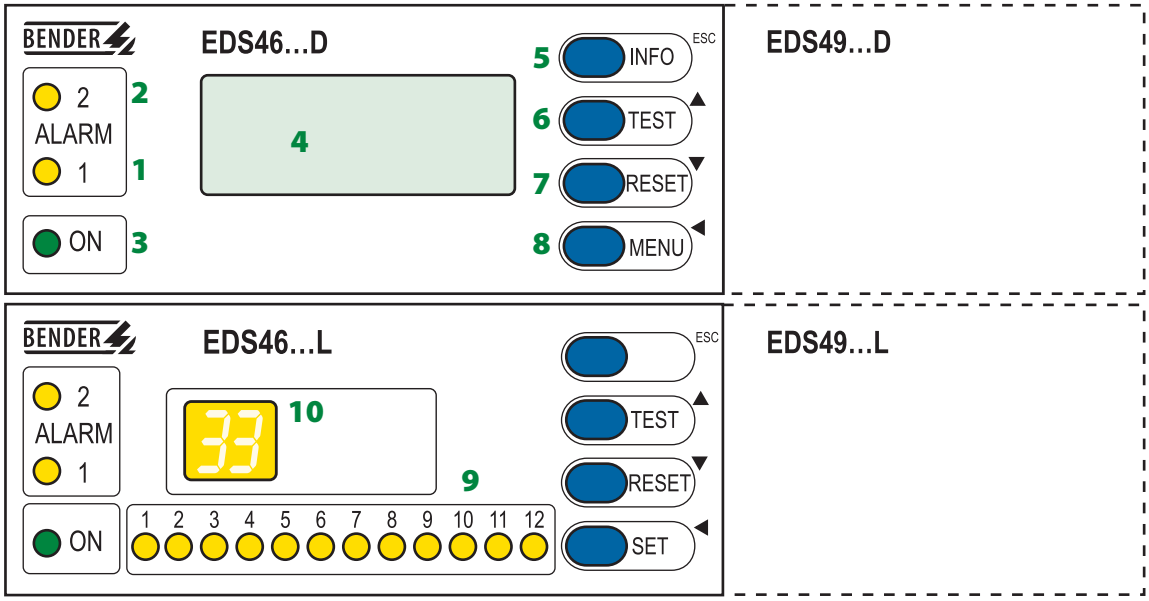
Standards

The device was designed according to the following standards: IEC 61557-8, IEC 61326-2-4, IEC 60664-1, IEC 60664-3, IEC 61557-9, ASTM F1669M-96 (2007), ASTM F1207M-96 (2007).

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 EDS461: 0.2…1 mA		EDS490: 2…10 mA EDS491: 0.2…1 mA	
Residual current indication	EDS460: 100 mA…10 A EDS461: 10 mA…1 A		EDS490: 100 mA…10 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	

Wiring diagram – Operating elements EDS46…-D/-L und EDS49…-D/-L



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 change, scroll

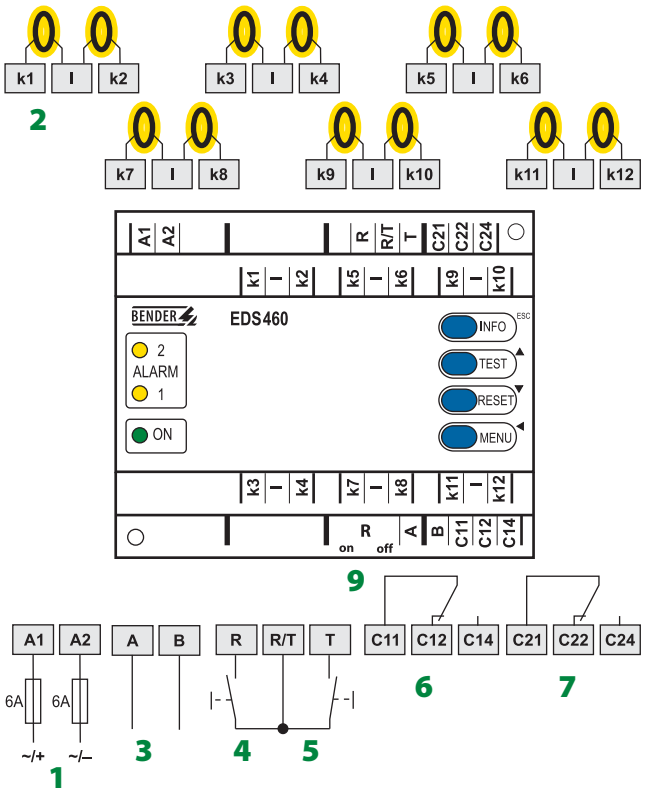
7 - "RESET" button: to acknowledge insulation and fault messages
Arrow down button: parameter change, scroll

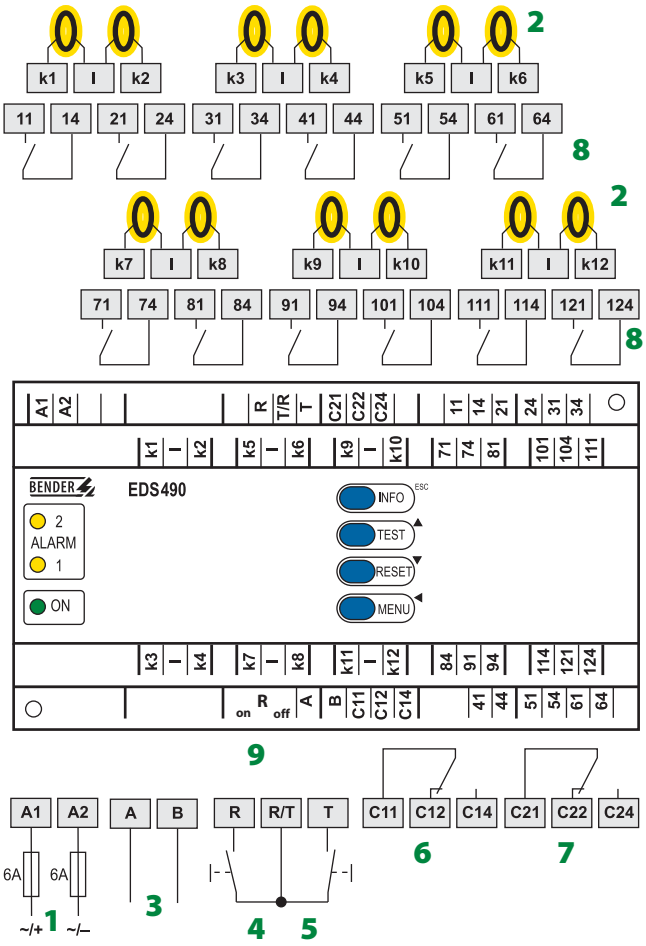
8 - "MENU" button: EDS…-D: to toggle between the standard display, menu and alarm indication
EDS…-L: to set the BMS address
Enter button: to confirm parameter change

9 - Alarm LEDs "1…12", light up if an insulation fault has been detected in the relevant channel.

10 - Digital indication for device address and error codes (parameter setting (EDS460/490-D only).

Wiring diagram – Mains connection EDS460/461-D/-L and EDS490/491-D/-L





1 - Supply voltage U_S, see ordering information, 6 A fuse recommended. Two fuses are required for IT systems.

2 - Connection measuring current transformers k1…k12

3 - Serial interface RS-485

4 - External reset button "R/T" (N/O contact)*

5 - External test button "R/T" (N/O contact)*

6 - Alarm relay 1

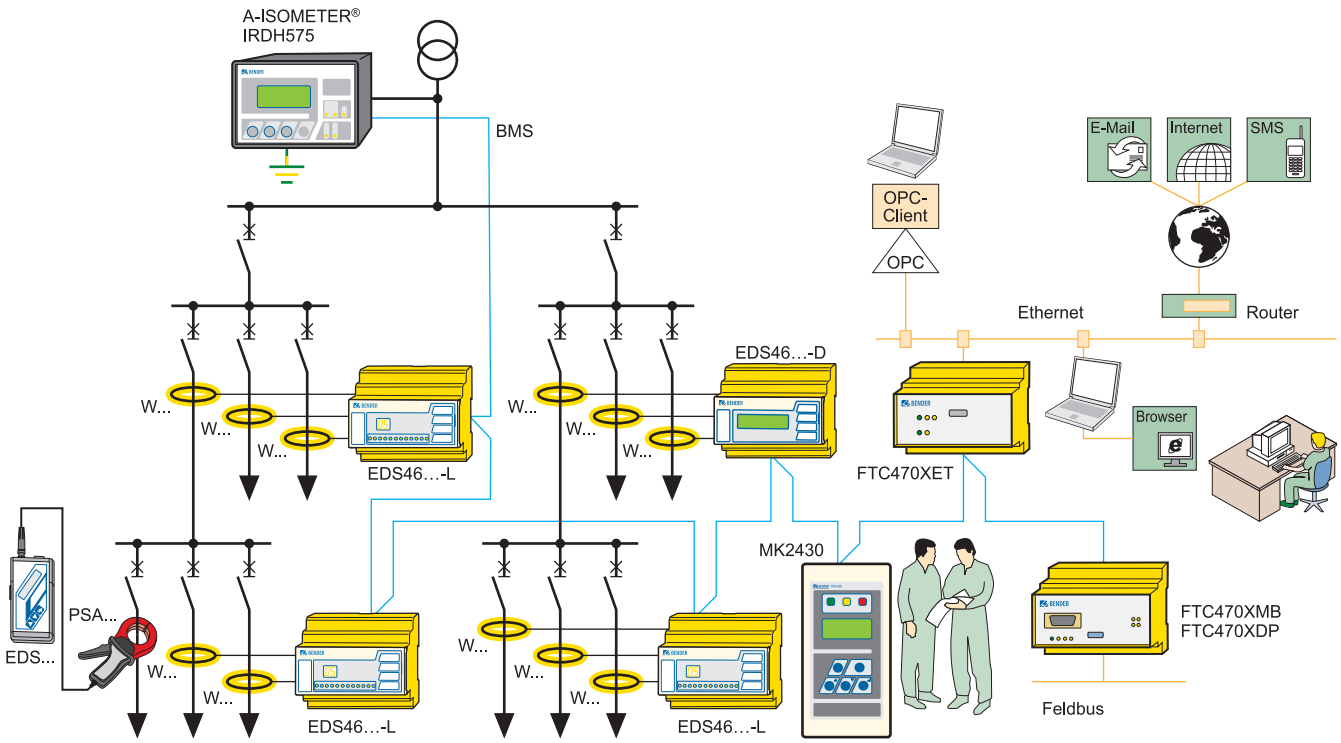
7 - Alarm relay 2

8 - Alarm relay: one N/O contact per channel (EDS490/491 only)

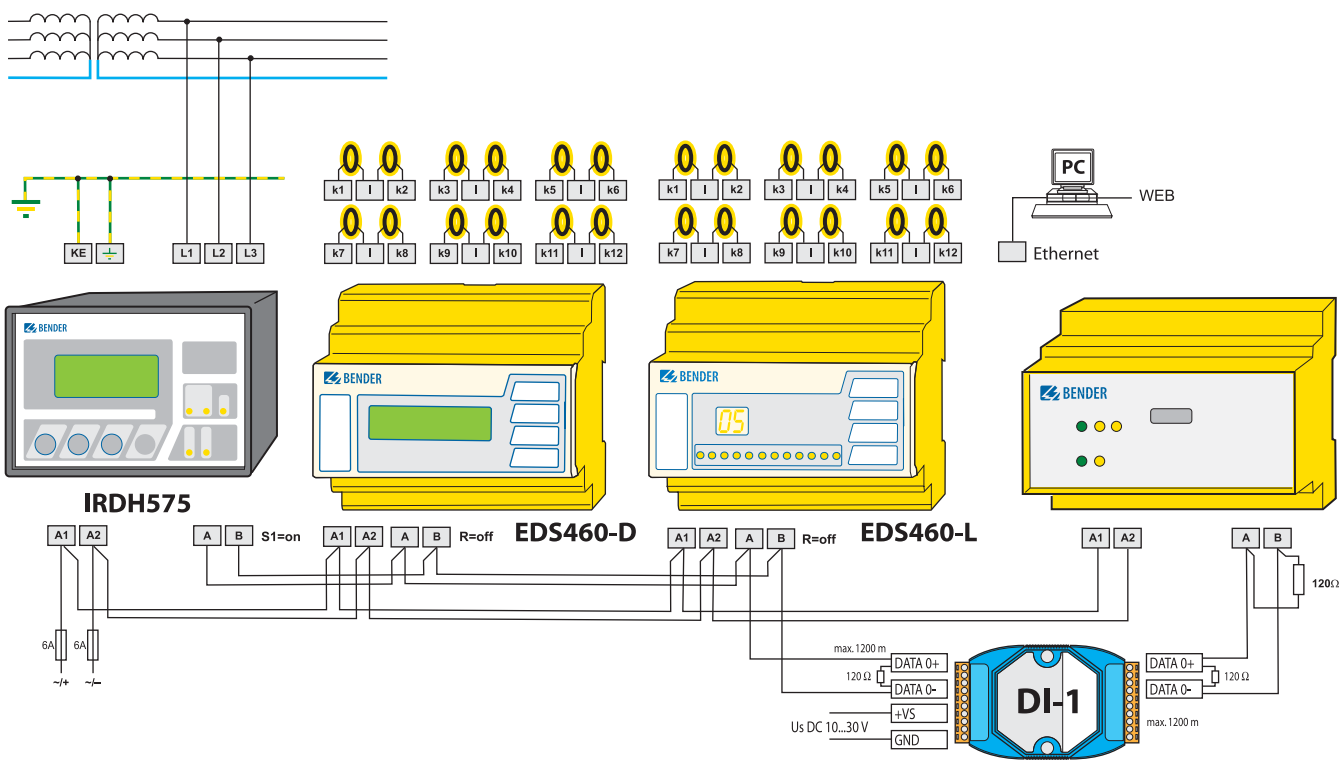
9 - "$R_{on\,/\,off}$": Termination of the serial RS-485 interface (A/B) with 120 Ω

* The external test/reset buttons of several devices must not be connected to one another.

Example for system set-up



Example for system set-up



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.

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 / III
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 / III
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 42…460 Hz 16…72 V

Rated insulation voltage	AC 100 V
Rated impulse voltage/pollution degree	2.5 kV / III
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 / III
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 / III
Protective separation (reinforced insulation) between	(C11, C12, C14) - (C21, C22, C24) - (11, 14, 21, 24, 31, 34) - (41, 44, 51, 54, 61, 64) - (71,74) - (81,84) - (91,94) - (101,104) - (111,114) - (121,124)
Voltage test acc. to IEC 61010-1	3.536 kV

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	2…10 mA (EDS460/EDS490) 0.2…1 mA (EDS461/EDS491)
Rated frequency	DC, AC 50 / 60 / 400 Hz
Measuring range EDS function	1,5…50 mA (EDS460/EDS490) 0.15…5 mA (EDS461/EDS491)
Measuring range RCM function	100 mA…10 A (EDS460/EDS490) 10 mA…1 A (EDS461/EDS491)
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 / EDS490) ca. 14…30 s (EDS461 / EDS491)

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 / 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
Recommended cable (shielded, shield connected to PE on one side)	min. J-Y(St)Y 2x0.8
Terminating resistor	120 Ω (0.25 W) connectable via DIP switch
Device address, BMS bus	1…90 (2)*

EDS - measuring current transformer connection

Single wire ≥ 0.75 mm²	0…1 m
Single wire, twisted ≥ 0.75 mm²	1…10 m
Shielded cable ≥ 0.5 mm²	10…40 m
Recommended cable (shielded, shield on one side connected to l-conductor , not connected to earth)	min. J-Y(St)Y 2x0.8

Switching elements

Number	2 relays with one changeover contact each (EDS46.) 2 relays with one changeover contact each , 12 relays with one N/O contact each (EDS49.)				
Operating principle	NC / N/O operation (N/O operation)*				
Electrical endurance, number of cycles	10.000				
Contact data acc. to IEC 60947-5-1					
Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-12
Rated operational voltage	230 V	230 V	24 V	110 V	220 V
Rated operational current (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 °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 screw-type terminals

Connection properties:	
rigid/flexible/conductor sizes	0.2…4 / 0.2…2.5 mm² (AWG 24…12)
Multi-conductor connection (2 conductors with the same cross section):	
rigid/flexible	0.2…1.5 / 0.2…1.5 mm²
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 (IEC 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

Ordering information

Type	Supply voltage U_S*	Response value	Art. No.
EDS460-D-1	AC 42…460 Hz 16…72 V / DC 16…94 V	2…10 mA	B 9108 0001
EDS460-D-2	AC/DC 70…276 V, AC 42…460 Hz	2…10 mA	B 9108 0002
EDS460-L-1	AC 42…460 Hz 16…72 V / DC 16…94 V	2…10 mA	B 9108 0003
EDS460-L-2	AC/DC 70…276 V, AC 42…460 Hz	2…10 mA	B 9108 0004
EDS461-D-1	AC 42…460 Hz 16…72 V / DC 16…94 V	0.2…1 mA	B 9108 0005
EDS461-D-2	AC/DC 70…276 V, AC 425…460 Hz	0.2…1 mA	B 9108 0006
EDS461-L-1	AC 42…460 Hz 16…72 V / DC 16…94 V	0.2…1 mA	B 9108 0007
EDS461-L-2	AC/DC 70…276 V, AC 42…460 Hz	0.2…1 mA	B 9108 0008
EDS490-D-1	AC 42…460 Hz 16…72 V / DC 16…94 V	2…10 mA	B 9108 0009
EDS490-D-2	AC/DC 70…276 V, AC 42…460 Hz	2…10 mA	B 9108 0010
EDS490-L-1	AC 42…460 Hz 16…72 V / DC 16…94 V	2…10 mA	B 9108 0011
EDS490-L-2	AC/DC 70…276 V, AC 42…460 Hz	2…10 mA	B 9108 0012
EDS491-D-1	AC 42…460 Hz 16…72 V / DC 16…94 V	0.2…1 mA	B 9108 0013
EDS491-D-2	AC/DC 70…276 V, AC 42…460 Hz	0.2…1 mA	B 9108 0014
EDS491-L-1	AC 42…460 Hz 16…72 V / DC 16…94 V	0.2…1 mA	B 9108 0015
EDS491-L-2	AC/DC 70…276 V, AC 42…460 Hz	0.2…1 mA	B 9108 0016

Accessories

Type	Supply voltage U_S*	Art. No.
DI-1PSM (RS-485 interface repeater)	AC / DC 24 V ± 20 %	B 9501 2044
DI-2USB (interface converter RS-485/USB)	supplied by USB interface	B 9501 2045
AN471 (power supply unit for DI-1 or DI-2)	AC 230 V 50/60 Hz /AC, DC 20 V	B 924 189
Snap-on mounting W20…/35…		B 9808 0501
Snap-on mounting W60…		B 9808 0502

Repeaters and interface converters

Type	Supply voltage U_S*	Art. No.
FTC470XDP	DC 85…276 V / AC 50…400 Hz 85…276 V	B 9506 1000
FTC470XMB	DC 85…276 V / AC 50…400 Hz 85…276 V	B 9506 1002
FTC470XET	DC 85…276 V / AC 50…400 Hz 85…276 V	B 9506 1001

* Absolute values

Measuring current transformers for EDS460/490

Type	Internal diameter/mm	Type of construction	Art. No.
W20	20	circular	B 9808 0003
W35	35	circular	B 9808 0010
W60	60	circular	B 9808 0018
W120	120	circular	B 9808 0028
W210	210	circular	B 9808 0034
WR70x175	70 x 175	rectangular	B 9808 0609
WR115x305	115 x 305	rectangular	B 9808 0610
WS20x30	20 x 30	split-core type	B 9808 0601
WS50x80	50 x 80	split-core type	B 9808 0603
WS80x80	80 x 80	split-core type	B 9808 0605
WS80x120	80 x 120	split-core type	B 9808 0606
WS80x160	80 x 160	split-core type	B 9808 0608

Alternative measuring current transformers from the Bender range

Type	Internal diameter/mm	Type of construction	Art. No.
W10/600	10	circular	B 911 761
W0-S20	20	circular	B 911 787
W1-S35	35	circular	B 911 731
W2-S70	70	circular	B 911 732
W3-S105	105	circular	B 911 733
W4-S140	140	circular	B 911 734
W5-S210	210	circular	B 911 735
WR 70x175S	70x175	rectangular	B 911 738
WR 115x305S	115x305	rectangular	B 911 739
WR 150x350S	150x350	rectangular	B 911 740
WR 200x500S	200x500	rectangular	B 911 763
WS 50x80S	50x80	split-core type	B 911 741
WS 80x80S	80x80	split-core type	B 911 742
WS 80x120S	80x120	split-core type	B 911 743
WS 80x160S	80x160	split-core type	B 911 755

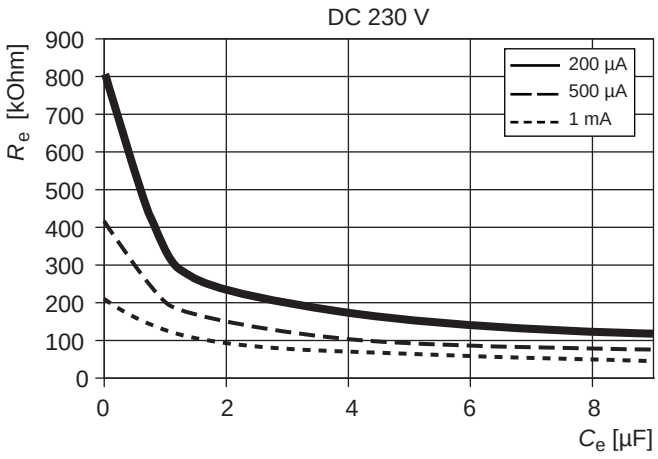
Measuring current transformers for EDS461/491

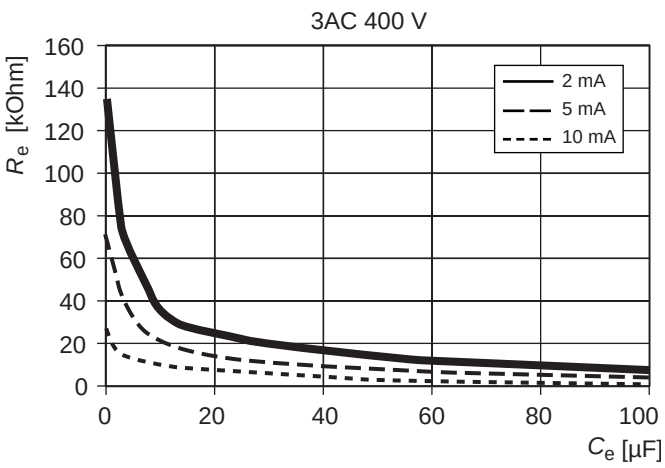
Type	Internal diameter/mm	Type of construction	Art. No.
W20-8000	20	circular	B 9808 0009
W35-8000	35	circular	B 9808 0017
W60-8000	60	circular	B 9808 0027
WS20x30-8000	20 x 30	split-core type	B 9808 0602
WS50x80-8000	50 x 80	split-core type	B 9808 0604

Alternative measuring current transformers from the Bender range

Type	Internal diameter/mm	Type of construction	Art. No.
W10/8000	10	circular	B 911 759
W1-35/8000	35	circular	B 911 756
WS20x30/8000	20 x 30	split-core type	B 911 764
WS50x80/8000	50 x 80	split-core type	B 911 757
W10/8000-6	10	circular, 6x	B 911 900

Response sensitivity in relation to the system capacitance





Explanatory notes on the response sensitivity

The value of the maximum response sensitivity decreases in relation to the system leakage capacitance. The following maximum response values can be reached:
30 Ω / V with a system voltage of max. 20000 µFV
(product of the nominal voltage and system leakage capacitance)

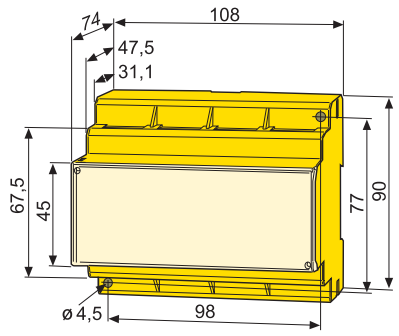
Example: system voltage 230 V

20000 µFV / 230 V = 87 µF
230 V x 30 Ω/V = 6.9 kΩ minimum response value at 87 µF system leakage capacitance

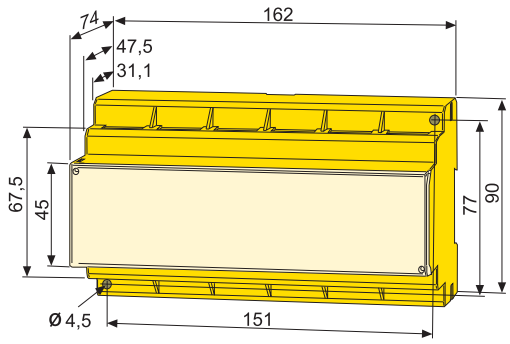
Dimension diagrams XM460 and XM490

Dimensions in mm

EDS46…-D/-L – XM460



EDS49…-D/-L – XM490



1.7

Insulation fault locator EDS460-DG

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

Insulation fault locator EDS460-DG

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

Standards, approvals and certifications

Product description

The insulation fault locators EDS460-DG in combination with the A-ISOMETER® IRDH575 or the locating current injector PGH are applied for localising insulation faults in unearthed systems (IT systems). The locating current signals generated by the insulation monitoring device IRDH575 or the locating current injector PGH are detected by measuring current transformers and evaluated by the insulation fault locators. Up to 12 measuring current transformers can be connected to one EDS460-DG. If more than 12 branch circuits are to be monitored, up to 90 EDS insulation fault locators can be connected via an RS-485 interface (BMS protocol), thereby 1080 branch circuits can be monitored. The maximum scanning time is approx. 4…10 s, see TGH1429. This device version is particularly suitable for systems involving high system leakage capacitances (20000 µFV, see characteristics in the chapter "Technical data").

Application

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

Function

Insulation fault location is started manually or automatically via the IRDH575 A-ISOMETER® or the PGH. Once started, the insulation fault locator EDS simultaneously scans all measuring current transformers (channels). If several EDS exist, these devices are also scanned simultaneously.

When the locating current detected by a measuring current transformer exceeds the set response value, the alarm LED 2 lights up, the common alarm relay switches and the faulty circuit is indicated as plain text on the graphical display. The connection between the measuring current transformer and the insulation fault locator is continuously monitored. In the event of wire interruption, the alarm LED 1 lights up and the alarm relay switches.

With the fault memory activated, the alarm messages of the individual channels remains stored until the reset button is pressed or until a reset command is given via the RS-485 interface. When the fault memory is deactivated, the alarm message remains stored until the insulation fault is eliminated.

History memory

The device utilises a history memory for failsafe storing of up to 300 measured values/events (date, time, channel, event code, measured value), so that all data about an outgoing circuit or an area can be traced back at any time (what happend when).

AC residual current measurement

EDS insulation fault locators can also be used for the indication of AC residual currents in unearthed power supplies (IT systems). This is essential when also AC residual currents are to be localised in the circuits. AC residual currents can be caused by charging rectifiers or converters connected to DC IT systems.

Device variants

EDS460-DG

Device version EDS460-DG features a backlit graphical display where information can be displayed in various ways. This version is applied when detailed information about all devices in the switchboard cabinet, connected to the bus, are to be displayed locally. This device is capable of assigning parameters to all devices connected to the BMS bus and displaying all measurement details. Several EDS460-DG devices can be used in one system.

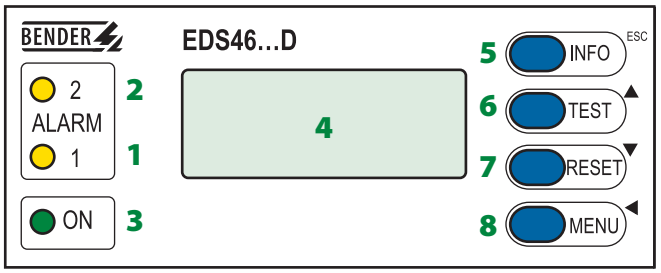
Standards

The device was designed according to the following standards:
IEC 61557-8, IEC 61326-2-4, IEC 60664-1, IEC 60664-3, IEC 61557-9,
ASTM F1669M-96 (2007), ASTM F1207M-96 (2007).

Overview of device types

Distinctive device features	EDS460-DG
Response value	EDS460: 2…10 mA
Residual current indication	EDS460: 20 mA…2 A
Backlit graphics LC display	×
Parameter setting function	×
Error code indication	×
Address range	1…90
Internal clock	×
History memory	×
Alarm contact "Common alarm" for all channels	2 x 1 changeover contact
Enclosure	XM460

Wiring diagram – operating elements EDS460-DG



1 - LED "ALARM 1" lights up in case of the following system faults:
- 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)

2 - LED "Alarm 2" lights up when an insulation fault is detected on a channel (EDS function)

3 - LED Power "ON"

4 - LC graphical display

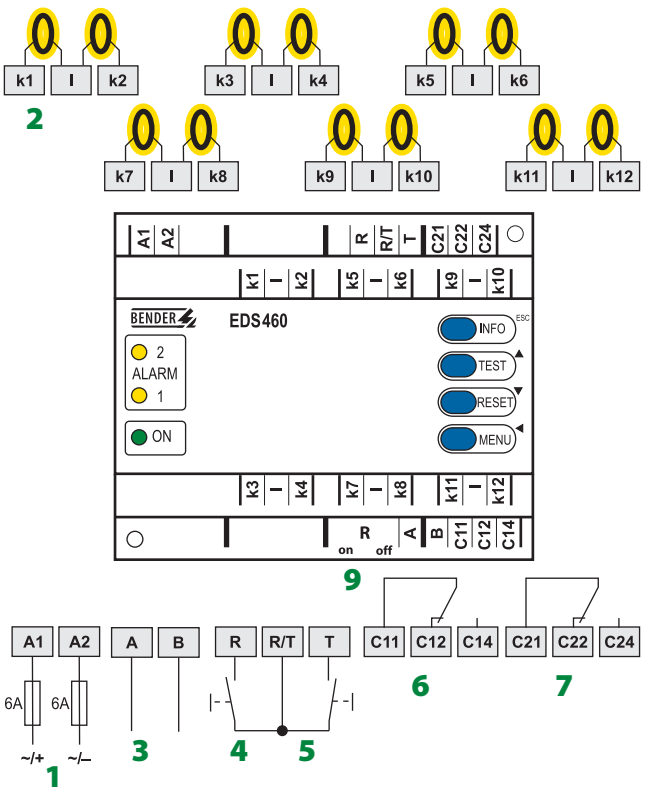
5 - "INFO" button: to query standard information
ESC button: back to menu function

6 - "TEST" button: to call up the self test
Arrow up button: parameter change, scroll

7 - "RESET" button: to acknowledge insulation and fault messages
Arrow down button: parameter change, scroll

8 - "MENU" button: to toggle between the standard display, menu and alarm display
Enter button: to confirm parameter change

Wiring diagram – system connection EDS460-DG



1 - Supply voltage U_S, see ordering information, 6 A fuse recommended. Two fuses are required for IT systems.

2 - Connection measuring current transformers k1…k12

3 - Serial interface RS-485

4 - External reset button "R/T" (N/O contact)*

5 - External test button "R/T" (N/O contact)*

6 - Alarm relay 1

7 - Alarm relay 2

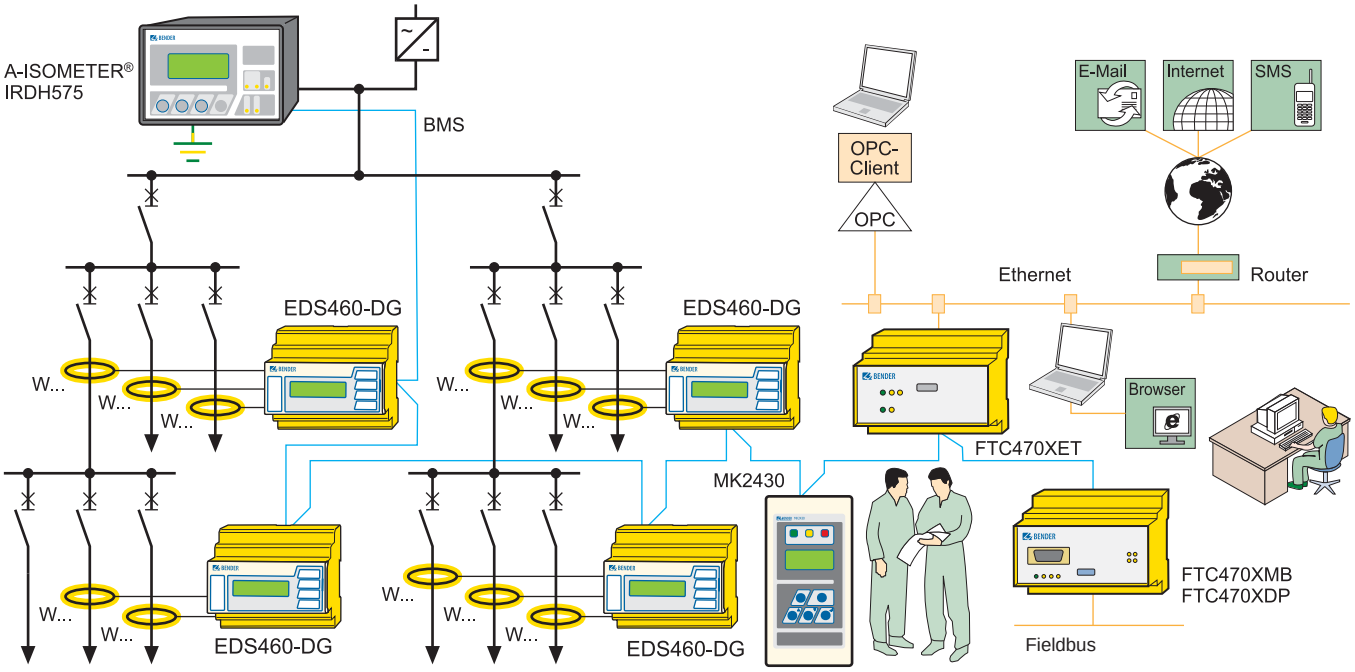
8 - Alarm relay: One N/O contact per channel (EDS490/491 only)

9 - "$R_{on\,/\,off}$": Termination of the serial RS-485 interface (A/B) with 120 Ω

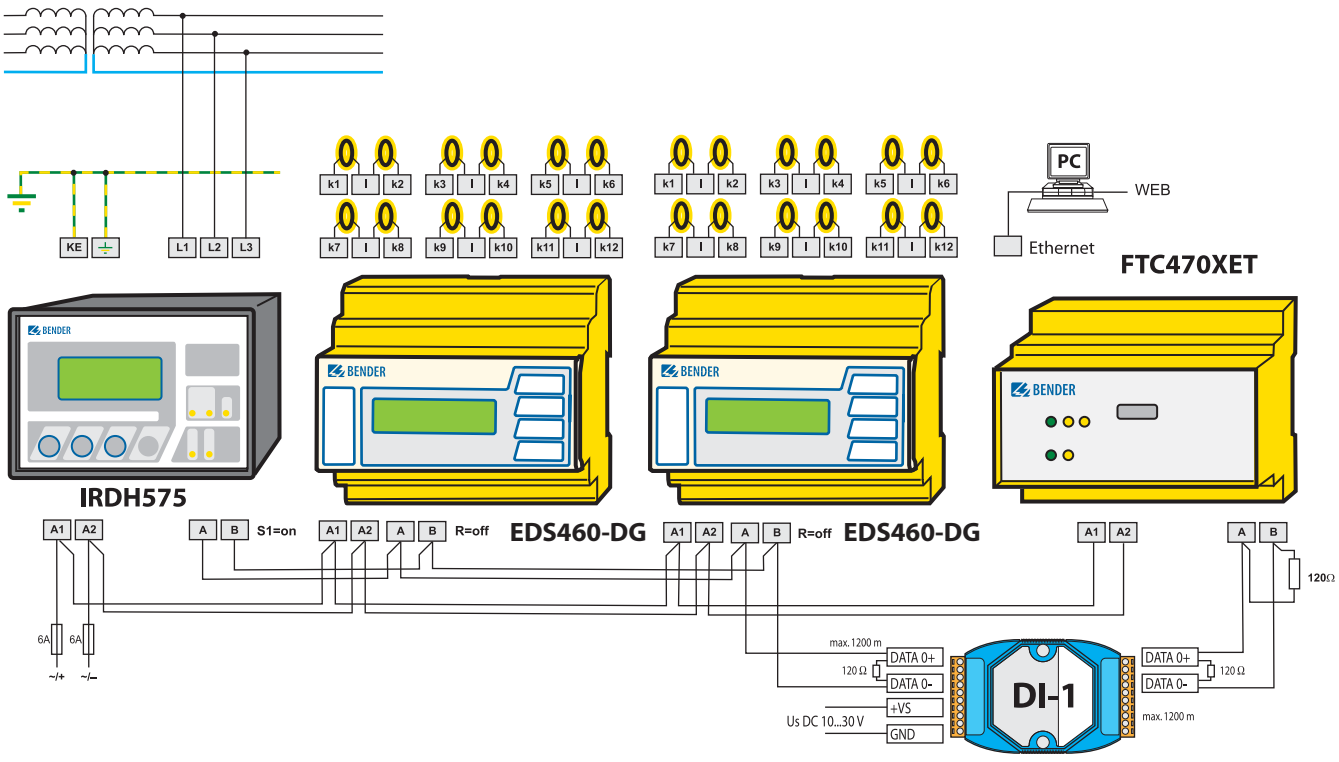
* The external test/reset buttons of several devices must not be connected to one another.

1.7

Example for system set-up



Example for system set-up



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.

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 / III
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 / III
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

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)*
Nominal frequency	50/ 60 /400 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_{on}	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
Recommended cable (shielded, shield connected to PE on one side)	min. J-Y(St)Y 2x0.8
Terminating resistor	120 Ω (0.25 W) connectable via DIP switch
Device address, BMS bus	1…90 (2)*

EDS - measuring current transformer connection

Single wire ≥ 0.75 mm²	0…1 m
Single wire, twisted ≥ 0.75 mm²	1…10 m
Shielded cable ≥ 0.5 mm²	10…40 m
Recommended cable (shielded, shield on one side connected to l-conductor , not connected to earth)	min. J-Y(St)Y 2x0.8

Switching elements

Number	2 relays, each with 1 changeover contact				
Operating principle	NC / N/O operation (N/O operation)*				
Electrical endurance, number of cycles	10.000				
Contact data acc. to IEC 60947-5-1					
Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-12
Rated operational voltage	230 V	230 V	24 V	110 V	220 V
Rated operational current (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
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 screw-type terminals

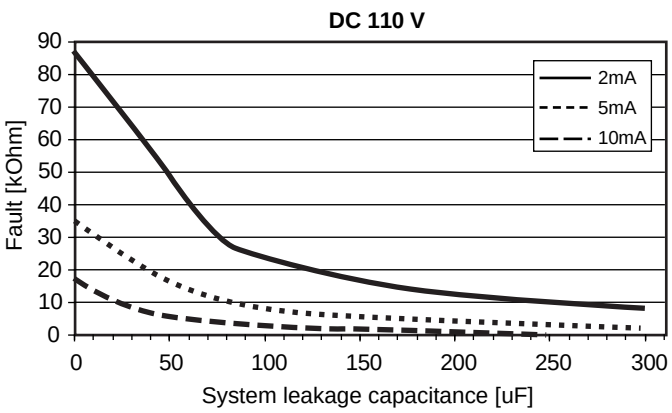
Connection properties:	
rigid/flexible/conductor sizes	0.2…4 / 0.2…2.5 mm² (AWG 24…12)
Multi-conductor connection (2 conductors with the same cross section):	
rigid/flexible	0.2…1.5 / 0.2…1.5 mm²
Stripping length	8…9 mm
Tightening torque	0.5…0.6 Nm

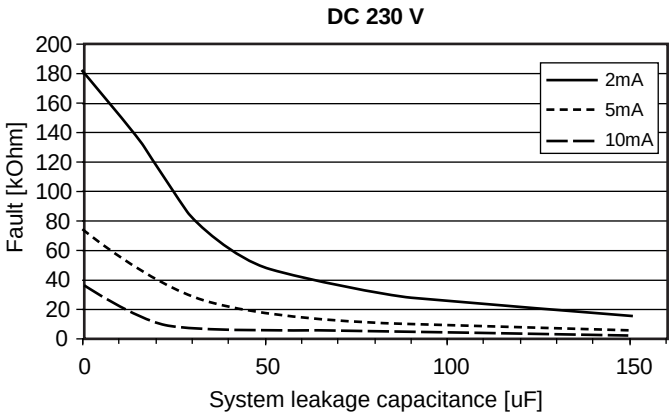
Other

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

( )* factory setting

Response sensitivity in relation to the system capacitance





Explanatory notes on the response sensitivity

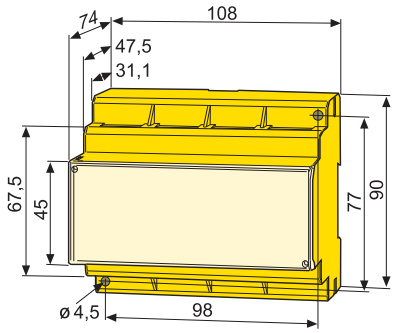
The value of the maximum response sensitivity decreases in relation to the system leakage capacitance. The EDS460 DG reaches the following maximum response values:
100 Ω / V with a system voltage of max. 20000 µFV
(product of the nominal voltage and system leakage capacitance)

Example: system voltage 230 V

20000 µFV / 230 V = 87 µF
230 V x 100 Ω / V = 23 kΩ minimum response value at 87 µF system leakage capacitance

Dimension diagrams XM460

Dimensions in mm



Standards

Observe the applicable national and international standards. The EDS460-DG type range complies with the device standards:

- IEC 60364-4-41: Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock
- IEC 61557-9: Electrical safety in low voltage distribution systems up to 1000 V a.c. and 1500 V d.c. – Equipment for testing, measuring or monitoring of protective measures – Part 9: Equipment for insulation fault location in IT systems

Ordering information

Type	Supply voltage U_S*	Response value	Art. No.
EDS460-DG-1	AC 42…460 Hz 16…72 V / DC 16…94 V	2…10 mA	B 9108 0018
EDS460-DG-2	AC/DC 70…276 V, AC 42…460 Hz	2…10 mA	B 9108 0019
EDS460-DGW-1	AC 42…460 Hz 16…72 V / DC 16…94 V	2…10 mA	B 9108 0018W
EDS460-DGW-1	AC/DC 70…276 V, AC 42…460 Hz	2…10 mA	B 9108 0019W

EDS460-DGW… version for optimum protection against climatic and mechanical stress.

Accessories

Type	Supply voltage U_S*	Art. No.
DI-1PSM (RS-485 interface repeater)	AC / DC 24 V ± 20 %	B 9501 2044
DI-2USB (interface converter RS-485/USB)	supplied by USB interface	B 9501 2045
AN471 (power supply unit for DI-1 or DI-2)	AC 230 V 50/60 Hz /AC, DC 20 V	B 924 189
Snap-on mounting W20…/35…		B 9808 0501
Snap-on mounting W60…		B 9808 0502

Repeaters and interface converters

Type	Supply voltage U_S*	Art. No.
FTC470XDP	DC 85…276 V / AC 50…400 Hz 85…276 V	B 9506 1000
FTC470XMB	DC 85…276 V / AC 50…400 Hz 85…276 V	B 9506 1002
FTC470XET	DC 85…276 V / AC 50…400 Hz 85…276 V	B 9506 1001

* Absolute values

Measuring current transformers

Type	Internal diameter/mm	Type of construction	Art. No.
W20	20	circular	B 9808 0003
W35	35	circular	B 9808 0010
W60	60	circular	B 9808 0018
W120	120	circular	B 9808 0028
W210	210	circular	B 9808 0034
WR70x175	70 x 175	rectangular	B 9808 0609
WR115x305	115 x 305	rectangular	B 9808 0610
WS20x30	20 x 30	split-core type	B 9808 0601
WS50x80	50 x 80	split-core type	B 9808 0603
WS80x80	80 x 80	split-core type	B 9808 0605
WS80x120	80 x 120	split-core type	B 9808 0606
WS80x160	80 x 160	split-core type	B 9808 0608

Alternative measuring current transformers from the Bender range

Type	Internal diameter/mm	Type of construction	Art. No.
W10/600	10	circular	B 911 761
W0-S20	20	circular	B 911 787
W1-S35	35	circular	B 911 731
W2-S70	70	circular	B 911 732
W3-S105	105	circular	B 911 733
W4-S140	140	circular	B 911 734
W5-S210	210	circular	B 911 735
WR 70x175S	70x175	rectangular	B 911 738
WR 115x305S	115x305	rectangular	B 911 739
WR 150x350S	150x350	rectangular	B 911 740
WR 200x500S	200x500	rectangular	B 911 763
WS 50x80S	50x80	split-core type	B 911 741
WS 80x80S	80x80	split-core type	B 911 742
WS 80x120S	80x120	split-core type	B 911 743
WS 80x160S	80x160	split-core type	B 911 755

Locating current injector PGH471 / PGH473

for existing installations with an integrated insulation monitoring device

Locating current injector PGH471

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

Standards, approvals and certifications

PGH471:

PGH473:

Product description

The locating current injector PGH47… generates a locating current signal for insulation fault location. The variants differ in the value of the maximum permissible locating current. It is intended to be used in systems incorporating an insulation monitoring device.

Application

Locating current injector for insulation fault location systems
PGH471: IT main circuits – PGH473: IT control circuits

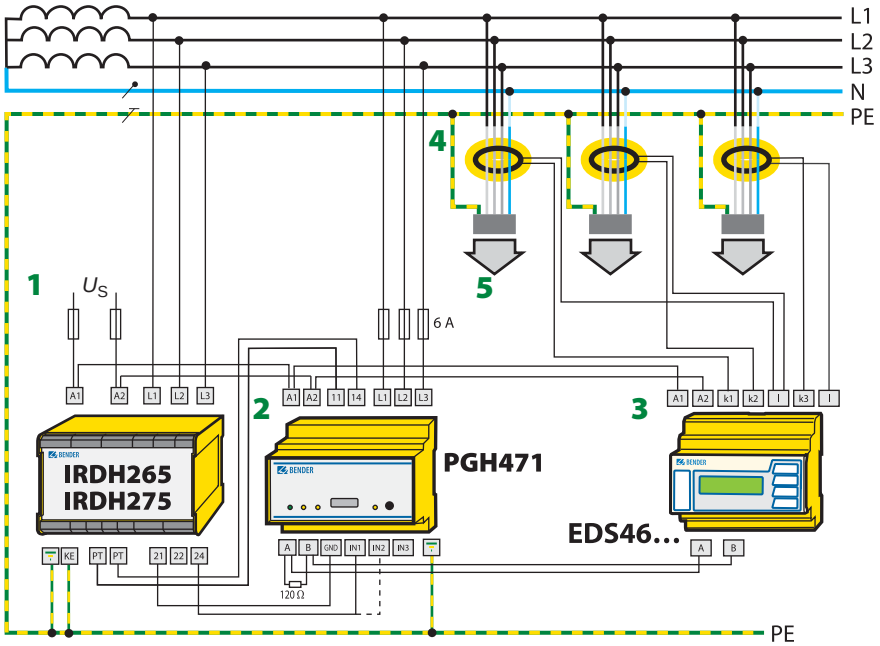
Function

The PGH47… locating current injector generates a test current signal which depends on the existing system voltage. Insulation fault location can be started either for one pass or continuously depending on the input chosen. With the test current activated, the alarm LEDs indicate the positive or negative test cycle in each case.

Standards

The locating current injector was designed according to the following standards:
IEC 61557-8, IEC 61326-2-4, IEC 60664-1, IEC 60664-3, IEC 61557-9, ASTM F1669M-96 (2007), ASTM F1207M-96 (2007).

Locating current injector PGH471 / PGH473 in the EDS46… system



1 - A-ISOMETER® IRDH265 / IRDH275
2 - Locating current injector PGH471
3 - Insulation fault locator EDS46…
4 - Measuring current transformer
5 - Outgoing circuits to the loads

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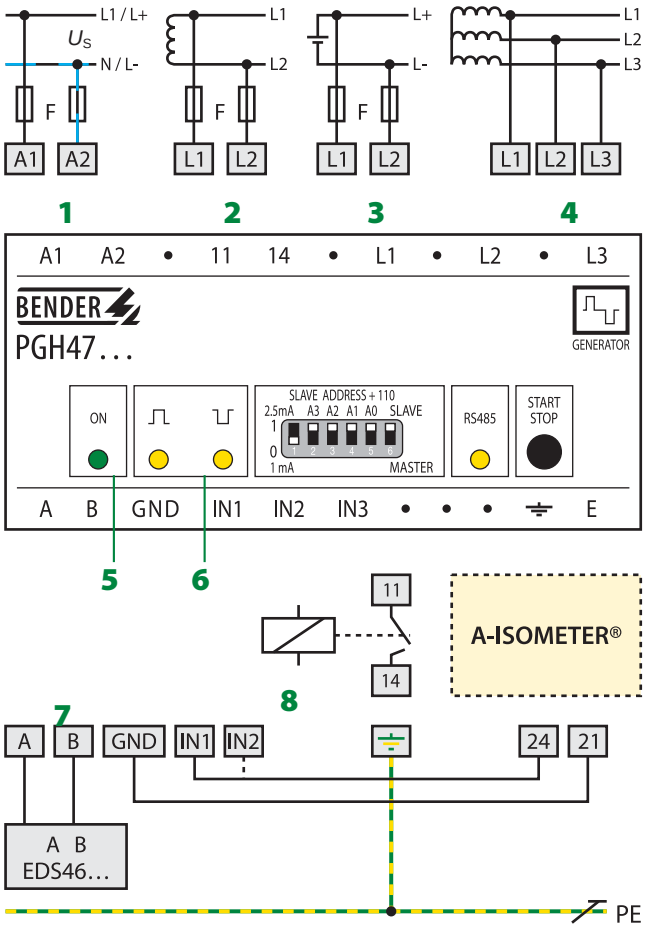
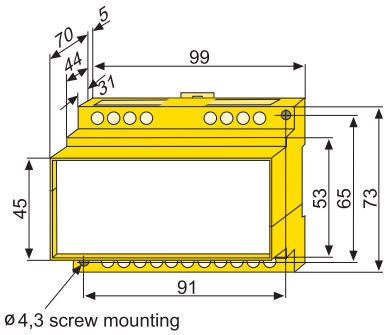
Wiring diagram



1 - U_S see nameplate, 6 A fuse recommended.
Note: Supply voltage U_S in the IT system requires two fuses.
2 - IT system AC
3 - IT system DC
4 - IT system 3AC
5 - Power On LED
6 - LEDs clock pulse
7 - Connection BMS bus
8 - Alarm relay

Dimension diagram X470

Dimensions in mm



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 45…400 Hz, 20…265 V / DC 20…308 V
Nominal system voltage U_n PGH471	AC, 3(N)AC 45…400 Hz, 20…575 V / DC 20…500 V
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/pause	2 s/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

General data

Shock resistance IEC 60068-2-27 (during operation)	15 g/10 ms
Bumping IEC 60068-2-29 (during 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 °C…+ 55 °C
Ambient temperature (during storage)	- 40 °C…+ 70 °C
Climatic class acc. to IEC 60721-3-3	3K5
Operating mode	continuous operation
Mounting	any position
Connection type	modular terminals
Connection properties rigid / flexible	0.2…4 mm² / 0.2…2.5 mm²
Degree of protection, internal components (IEC 60529)	IP 30
Degree of protection, terminals (IEC 60529)	IP 20
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

Ordering information

Type	Supply voltage U_S	Nominal system voltage U_n	BMS bus address range	Art. No.
PGH471	AC 230 V	AC 20…575 V/ DC 20… 504 V*	111…119	B 9501 8004
PGH471-13	AC 90…132 V*	AC 20…575 V/ DC 20… 504 V*	111…119	B 9501 8005
PGH471-21	DC 10.5…80 V*	AC 20…575 V/ DC 20… 504 V*	111…119	B 9501 8006
PGH471-23	DC 77…286V*	AC 20…575 V/ DC 20… 504 V*	111…119	B 9501 8007
PGH471E	AC 230 V	AC 20…575 V/ DC 20… 504 V*	121…150	B 9501 8008
PGH473	AC 230 V	AC 20…265 V/ DC 20…308 V*	111…119	B 9501 8009
PGH473-13	AC 90…132 V*	AC 20…265 V/ DC 20…308 V*	111…119	B 9501 8010
PGH473-21	DC 10.5…80 V*	AC 20…265 V/ DC 20…308 V*	111…119	B 9501 8011
PGH473E	AC 230 V	AC 20…265 V/ DC 20…308 V*	121…150	B 9501 8015
PGH473E-21	DC 10,5…80 V*	AC 20…265 V/ DC 20…308 V*	121…150	B 9501 8016

* Absolute values

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EDS30...

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

EDS30...

Device features

- Portable insulation fault location systems for IT systems AC 42…460 Hz 0…790 V / DC 0…960 V 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)

Insulation fault locator EDS190P

- Backlit LC display, 3 x 16 characters
- Measuring clamps 20 / 52 mm included in the scope of delivery
- Supplied by an 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

Product description

The EDS30… is a portable insulation fault location system designed to locate insulation faults in unearthed systems (IT systems). All essential components are housed in a robust aluminium case which is convenient to carry.

Application

IT systems ***without*** a permanently installed insulation fault location system

- **EDS3090PG**
  for main circuits up to AC 42…460 Hz 20…575 V, DC 20…504 V with AGE185 up to AC 42…460 Hz 500…790 V, DC 400…960 V
- **EDS3091PG**
  for control circuits up to AC 42…460 Hz 20…265 V, DC 20…308 V
- **EDS3092PG**
  with PGH185: for main circuits up to AC 42…460 Hz 20…575 V, DC 20…504 V
  with AGE185: for main circuits up to AC 42…460 Hz 500…790 V, DC 400…960 V
  with PGH183: for control circuits up to AC 42…460 Hz 20…265 V, DC 20…308 V
- **EDS3096PG**
  for main circuits in IT systems up to AC 42…460 Hz 0…575 V, DC 20…504 V, with all poles disconnected

IT systems ***with*** a permanently installed insulation fault location system

- **EDS3090**
  for main circuits with a permanently installed insulation fault location system EDS460 / 490
- **EDS3091**
  for control circuits with a permanently installed insulation fault location system EDS460 / 491

Function

Locating current injector PGH18…

The PGH18… generates a defined locating current signal. The locating current generated in this manner depends on the value of the present insulation fault and the system voltage.

- Depending on the switch position of the PGH185 or PGH186, the locating current is limited to a maximum of 25 mA or 10 mA.
- The PGH183 limits the locating current to a maximum of 2.5 mA or 1 mA respectively.

In de-energised IT systems or in IT systems with a system voltage of < 50 V, the PGH186 drives the locating current generated by an integrated voltage source (DC 50 V). In IT systems with a system voltage of > 50 V, the system voltage itself drives the locating current.

Insulation fault locator EDS190P

The insulation fault locator EDS190P provides the following measuring functions:

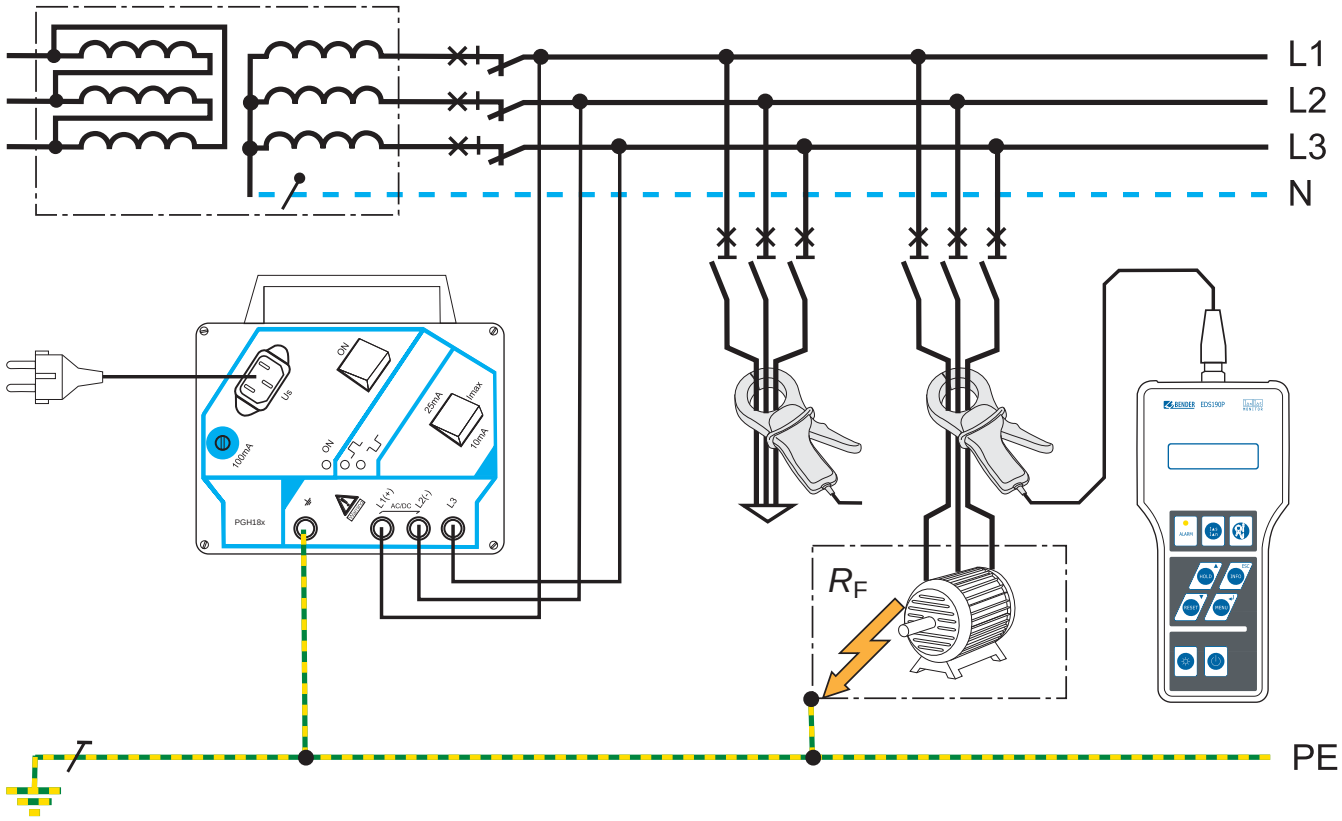
- Insulation fault location $I_{\Delta S}$ (EDS mode) for use in IT AC or DC systems. The response value is determined by the sensitivity of the EDS190P insulation fault locator. In DC, AC and 3AC IT systems, this is an arithmetic average value that can be set according to an arithmetic average value. System interferences and excessively high system leakage capacitances may have a negative influence on the accuracy
  - within the portable EDS309…insulation fault location system or
  - within a permanently installed insulation fault locator EDS46… / 49…
- residual current measurement $I_{\Delta n}$ (RCM mode) for use in TN or TT AC systems. The response range for the alarm message is 10 mA…10 A.

Displays

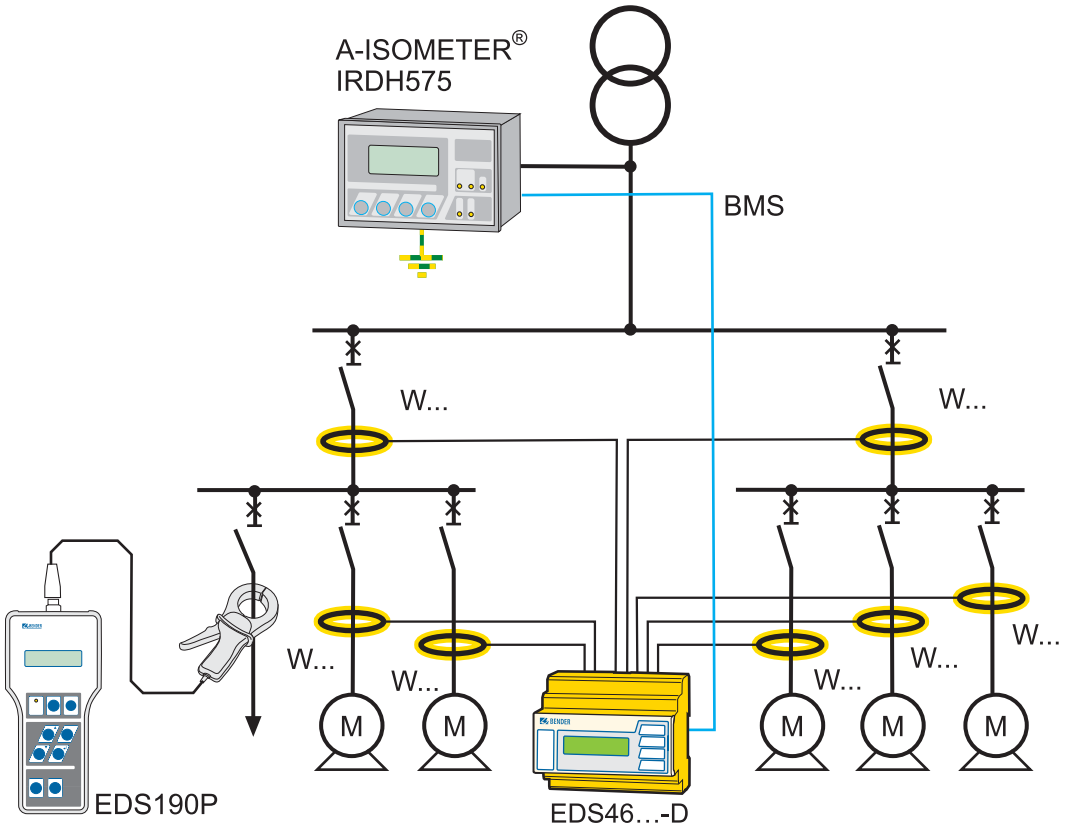
The LC display indicates the measured residual current, the type of the connected measuring clamp resp. measuring current transformer, the accumulator capacity, the activation of the alarm memory, the activation of the buzzer, and the set nominal frequency.

Standards

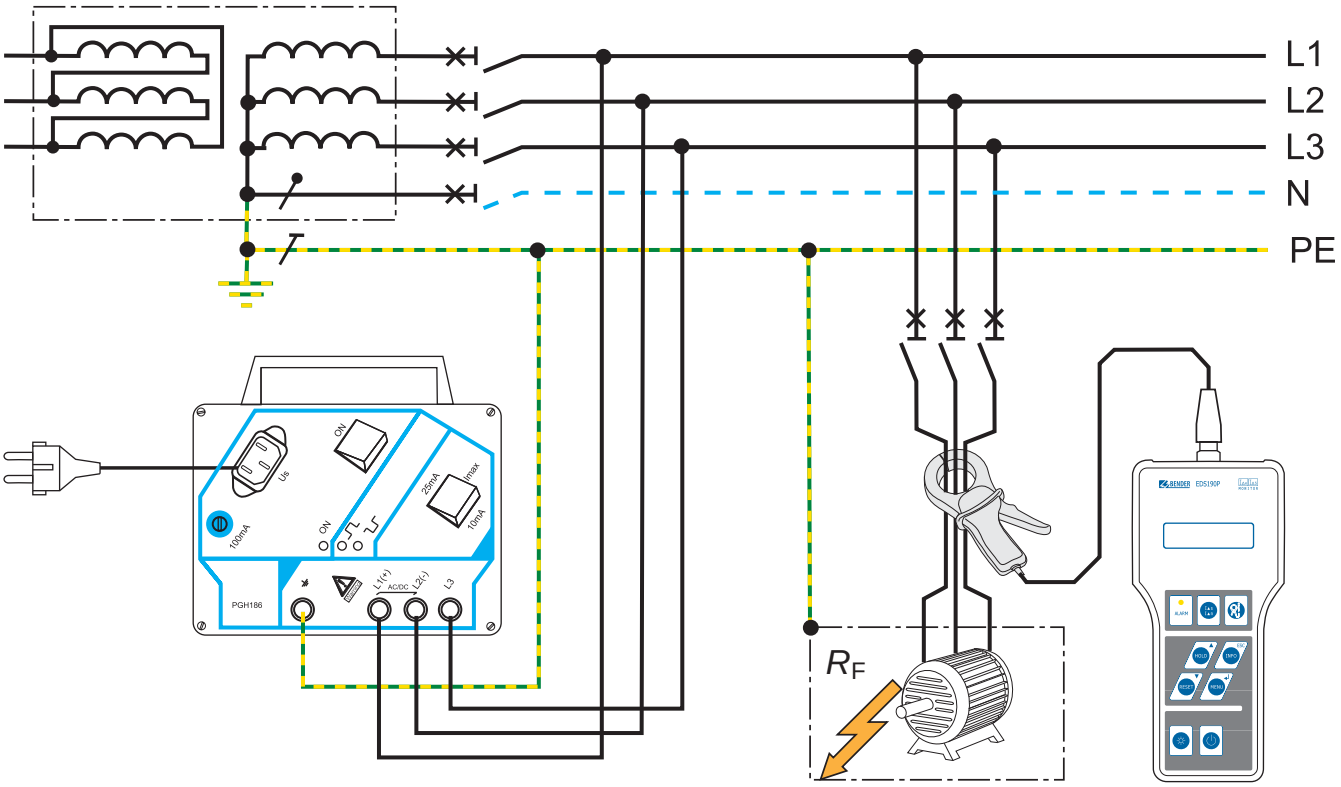
The A-ISOMETER® was designed in accordance with the following standards:
IEC 61557-8, IEC 61326-2-4, IEC 60664-1, IEC 60664-3, IEC 61557-9, ASTM F1669M-96 (2007), ASTM F1207M-96 (2007).



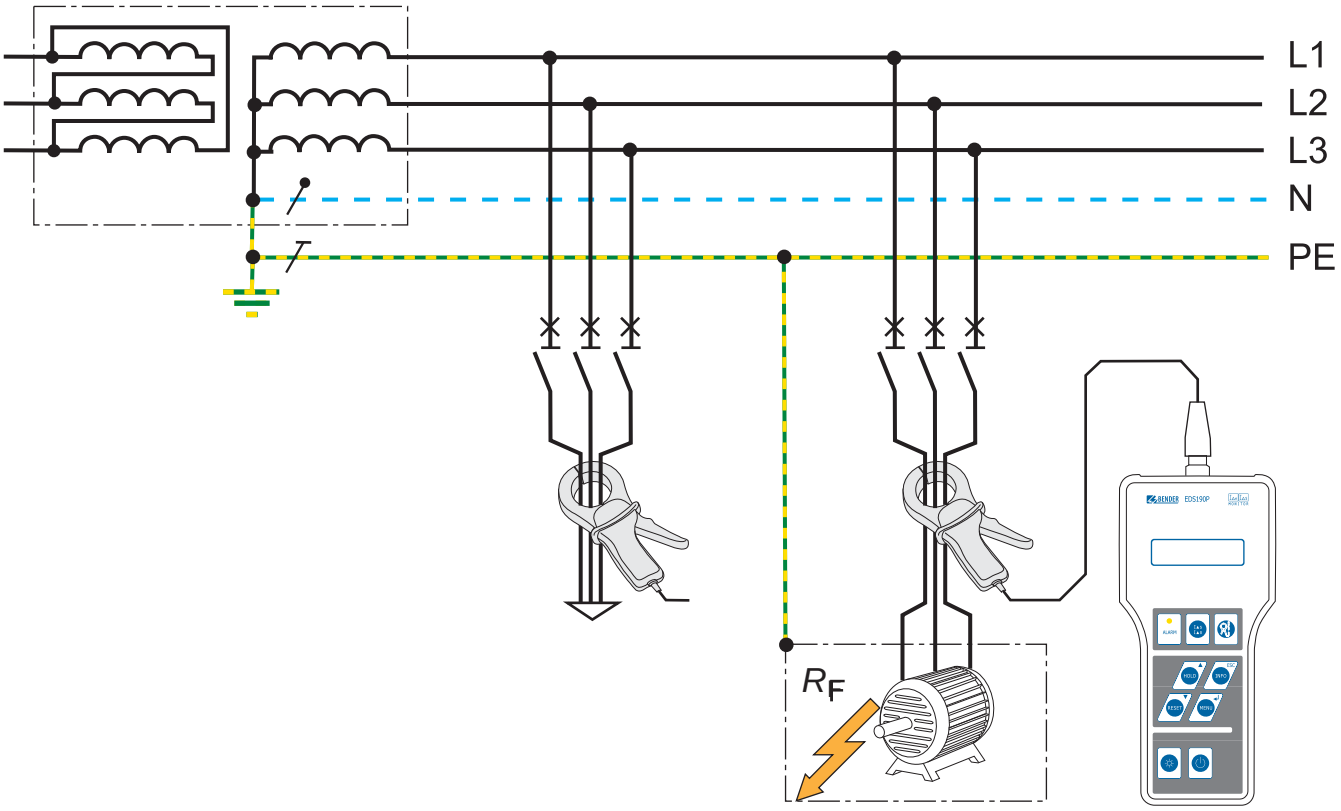
Application example: **Insulation fault location system EDS3090 / 3091PG for use in unearthed systems (IT systems) without a permanently installed insulation fault location system**



Application example: **Insulation fault location system EDS3090 / 3091PG in unearthed systems (IT systems) with a permanently installed insulation fault location system**



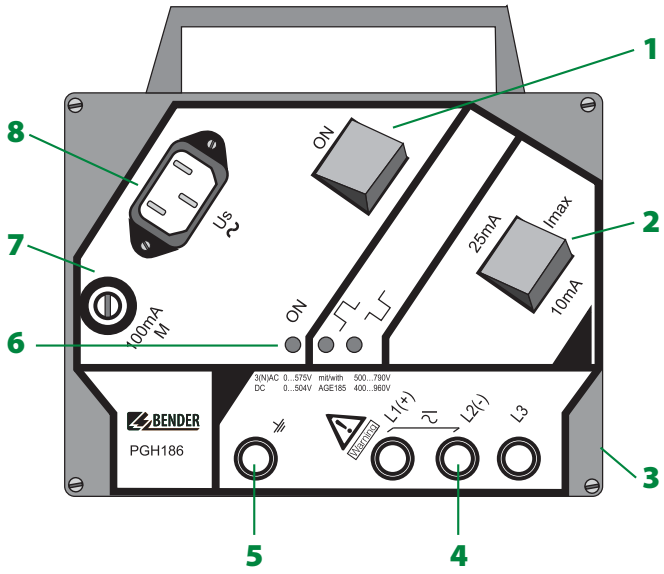
Application example: Insulation fault location system EDS3096PG in de-energised systems (IT systems) (Note: TN-S system with all poles disconnected)



Application example: Residual current measurement with EDS309… in earthed systems (TN-S systems)

Operating elements of the PGH18…

1 - "On/off switch "ON" to activate the locating current
2 - Selector switch to select 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
6 - LED indicators:
Power On LED "ON"
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 connection

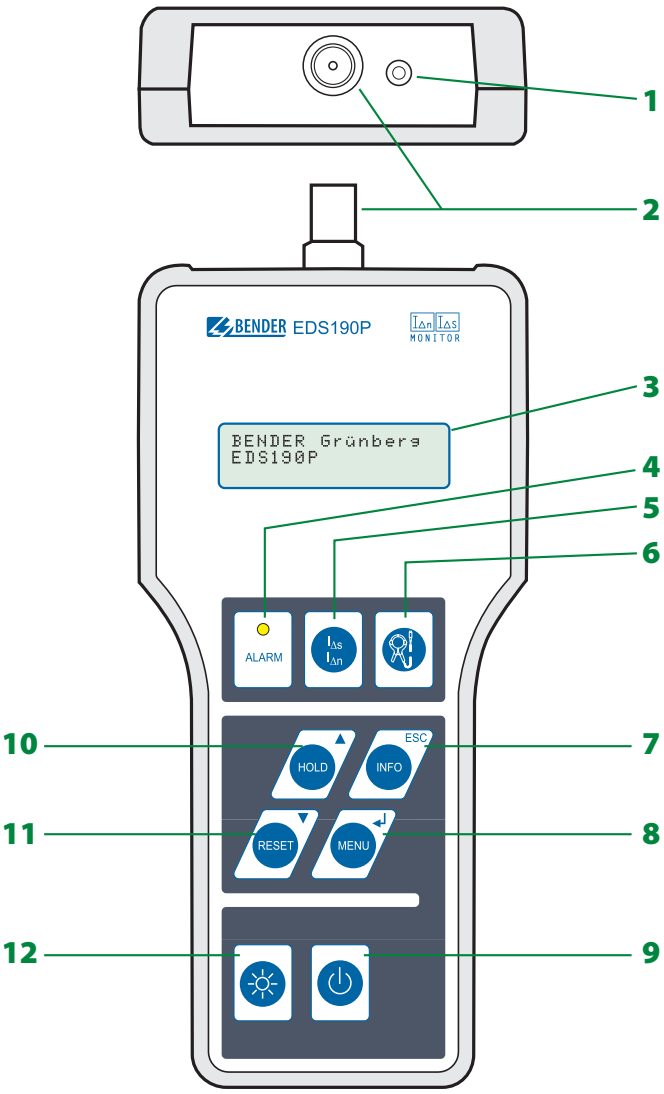


Display and operating elements of the EDS190P

1 - Connection for external power supply unit DC 6 V
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

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 switch
10 - "HOLD" button
to store the currently indicated measured value
Arrow up button: parameter change, scroll
11 - "RESET" button
fault memory acknowledgement
Arrow down button: parameter change, scroll
12 - Illumination button:
to switch on the display lighting



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Technical data EDS309…system

The technical data listed in this chapter apply to the components: PGH18…, EDS190P, AGH185.

Environment/EMC

EMC	IEC 61326-2-4
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)
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

Other

Operating mode	continuous operation
Position of normal use	any
Operating manual	TGH1420
Weight approx.	≤ 7000 g (8500 g incl. PSA3165) EDS3092 ≤ 9000 g
Dimensions W x H x D	160 x 148 x 81 mm

Technical data PGH18…

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

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

Nominal system voltage U_n

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

Measuring voltage U_m

PGH186	DC 50 V

Supply voltage

Supply voltage U_S	AC 50…60 Hz 230 V
Operating range of U_S	0.85…1.15 x U_S
Supply voltage U_S version -13	AC 50…60 Hz 90…132 V
Power consumption	≤ 3 VA

Locating current

PGH185/186

Max. locating current, selectable	10 / 25 mA

PGH183

Max. locating current, selectable	1 / 2.5 mA

PGH183/185/186

Clock pulse	2 s
Idle time	4 s

Other

Degree of protection, internal components IEC 60529	IP40
Enclosure material	ABS plastic
Flammability class	UL94 V-0
Weight	≤ 700 g
Dimensions W x H x D	430 x 340 x 155 mm

Technical data EDS190P

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

Supply voltage

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	42…2000 Hz

Main circuit

Measuring clamps	PSA3020, PSA3052, PSA3165
Response value, adjustable	2…10 mA (5 mA)*
Relative uncertainty	± 30 % / ± 2 mA of the reference value

Control circuit:

Measuring clamps	PSA3320, PSA3352
Response value, adjustable	0.2…1 mA (0.5 mA)*
Relative uncertainty	± 30 % / ± 0.1 mA of the reference value

Measuring circuit residual current

with measuring clamps	PSA3320, PSA3352
Measuring range	2 mA … 2 A (crest factor up to 3)
Response value, adjustable	5 mA…1 A
with measuring clamps	PSA3020, PSA3052, PSA3165
Measuring range	5 mA … 10 A (crest factor up to 3)
Response value, adjustable	10 mA…10 A
Frequency range	42…2000 Hz
Relative uncertainty	0…- 35 %
Operating uncertainty	± 17.5 %
Hysteresis	20 %
Harmonics, adjustable	2.-9. harmonics

Connection

Type of connection measuring clamp	BNC plug
Power supply unit	DC 6 V

Displays

LCD	3 x 16 characters
LED	Alarm

Other

Degree of protection, internal components IEC 60529	IP40
Protection class acc. to IEC 60947-1, IEC 60947-1	Class III
Enclosure material	ABS plastic
Flammability class	UL94 V-0
Operating manual	TGH1420
Weight	≤ 400 g
Software version	D316 V1.0
Operating manual	TGH1420
Dimensions W x H x D	84 x 197 x 30 mm

( )* = Factory settings

Technical data measuring clamps

Electrical safety

Pollution degree	2
Installation category	III
Operating voltage	600 V
Nominal insulation voltage	AC 600 V CAT III bzw. AC 300 V CAT IV

Other

Degree of protection, internal components IEC 60529		IP40
Protection class acc. to IEC 60947-1, IEC 60947-1		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 PSA3052 / 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 / III
Nominal system voltage U_n	3AC/AC 42…460 Hz, 500…790 V, DC 400…960 V

Other

Degree of protection, internal components IEC 60529	IP30
Type of connection/cable:	safety plug with green-yellow connecting wire 1 mm²
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

Ordering information

Type	Scope of delivery				Supply voltage	Nominal voltage	Art. No.
	Insulation fault locator	Locating current injector	Measuring clamps 20 mm	Measuring clamps 52 mm			
EDS3090	EDS190P		PSA3020	PSA3052		AC 42…460 Hz, 20…575 V und DC 20…504 V	B 9108 2026
EDS3090PG	EDS190P	PGH185	PSA3020	PSA3052	AC 50…60 Hz, 230 V	AC 42…460 Hz, 20…575 V und DC 20…504 V	B 9108 2021
EDS3090PG-13	EDS190P	PGH185-13	PSA3020	PSA3052	AC 50…60 Hz, 90…132 V	AC 42…460 Hz, 20…575 V und DC 20…504 V	B 9108 2022
EDS3096PG	EDS190P	PGH186	PSA3020	PSA3052	AC 50…60 Hz, 230 V	AC 42…460 Hz, 0…575 V und DC 0…504 V	B 9108 2025
EDS3096PG-13	EDS190P	PGH186-13	PSA3020	PSA3052	AC 50…60 Hz, 90…132 V	AC 42…460 Hz, 0…575 V und DC 0…504 V	B 9108 2029
EDS3091	EDS190P		PSA3320	PSA3352		AC 42…460 Hz, 20…265 V und DC 20…308 V	B 9108 2027
EDS3091PG	EDS190P	PGH183	PSA3320	PSA3352	AC 50…60 Hz, 230 V	AC 42…460 Hz, 20…265 V und DC 20…308 V	B 9108 2023
EDS3091PG-13	EDS190P	PGH183-13	PSA3320	PSA3352	AC 50…60 Hz, 90…132 V	AC 42…460 Hz, 20…265 V und DC 20…308 V	B 9108 2024
EDS3092PG		PGH183	PSA3320	PSA3352	AC 50…60 Hz, 230 V	AC 42…460 Hz, 20…265 V und DC 20…308 V	B 9108 2030
		PGH185	PSA3020	PSA3052	AC 50…60 Hz, 230 V	AC 42…460 Hz, 20…575 V und DC 20…504 V	

Optional accessories

PSA3165	Measuring clamp 115 mm for EDS3090… and EDS3096…		B 980 852
AGE185	Coupling device to extend the voltage range of the PGH185/186	AC 42…460 Hz 500…790 V, DC 400…960 V	B 980 305
EDS165-SET	Accessories for fault location in diode-decoupled systems		B 9108 2007

1.7

Standards

Observe the applicable national and international standards.
The EDS309… series meets the requirements of the following standards for the erection of electrical installations:

- IEC 60364-4-41
  Low-voltage electrical installations - Part 4-41: Protection for safety – Protection against electric shock

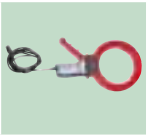
The EDS309… type range complies with the device standards:

- IEC 61557-9: Electrical safety in low voltage distribution systems up to 1000 V a.c. and 1500 V d.c. – Equipment for testing, measuring or monitoring of protective measures – Part 9: Equipment for insulation fault location in IT systems
- IEC 61010-1:2010
  Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements.

Device selection for IT systems with a permanently installed insulation fault location system

System configuration	AC, DC, AC / DC (mixed systems)	AC, DC, AC / DC (mixed systems)
Application range	Main circuits	Control circuits
Function	Insulation monitoring device A-ISOMETER® / locating current injector PGH	
		
Nominal system voltage U_n (B1)	3AC / AC 20…575 V DC 20…504 V	3 AC / AC 20…150 V DC 20…150 V
Nomminal system voltage U_n (B2)	3AC / AC 340…760 V DC 340…575 V	--
U_S DC 19.2-72 V	IRDH575B1-427	IRDH575B1-4227
U_S AC 88-264 V DC 77-286 V	IRDH575B1-435	IRDH575B1-4235
U_S AC 88-264 V DC 77-286 V	IRDH575B2-435	--
Test current	10 / 25 / 50 mA	1 / 2.5 mA
Response values	1 kΩ …. 10 MΩ	1 kΩ …. 10 MΩ
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	EDS190P
	
LC display	3 x 16 characters
Locating current max.	1 … 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, EDS190P, PSA3020, PSA3052, power supply unit	Aluminium case, EDS190P, PSA3020, PSA3052, power supply unit	Aluminium case, EDS190P, PSA3320, PSA3352, power supply unit

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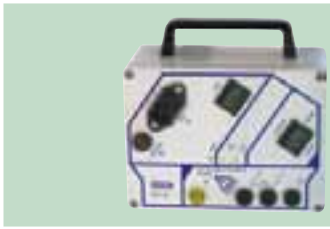
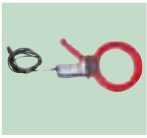
Device selection for IT systems without a permanently installed insulation fault location system

Application	Main circuit		Control circuit
	energised	offline	energised
Function	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	10 / 25 mA	10 / 25 mA	1 / 2.5 mA

Insulation fault locator	
Type	EDS190P
	
LC display	3 x 16 characters
Locating current max.	1 … 50 mA
Response value	0.2 … 1 / 2…10 mA selectable

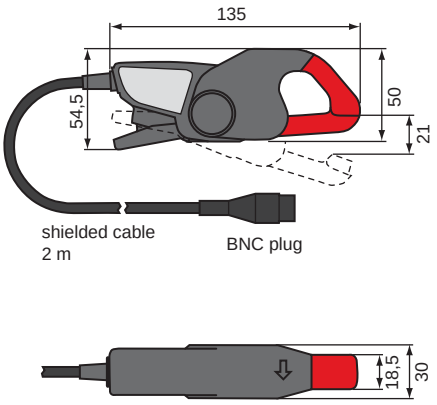
Measuring clamps					
Type	PSA3020	PSA3052	PSA3165 (optional)	PSA3320	PSA3352
					
20 mm	×			×	
52 mm		×			×
115 mm			×		

Complete system			
Type	EDS3090PG (-13)	EDS3096PG (-13)	EDS3091PG (-13)
	EDS3090PG for U_S = AC50…60 Hz 230 V EDS3090-13 for U_S= AC 50…60 Hz 90…132 V	EDS3096PG for U_S= AC 50…60 Hz 230 V EDS3096PG-13 for U_S = AC 50…60 Hz 90…132 V	EDS3091PG for U_S=AC 50…60 Hz 230 V EDS3091PG-13 for U_S=AC 50…60 Hz 90…132V
Comprising	Aluminium case, PGH185, EDS190, PSA3020, PSA3052, power supply unit, cable set	Aluminium case, PGH186, EDS190, PSA3020, PSA3052, power supply unit, cable set	Aluminium case, PGH183, EDS190, PSA3320, PSA3352, power supply unit, cable set
Type	EDS3092PG		
Comprising	Aluminium case, PGH185, EDS190, PSA3020, PSA3052, power supply unit, cable set		Aluminium case, PGH183, EDS190, PSA3320, PSA3352, power supply unit, cable set

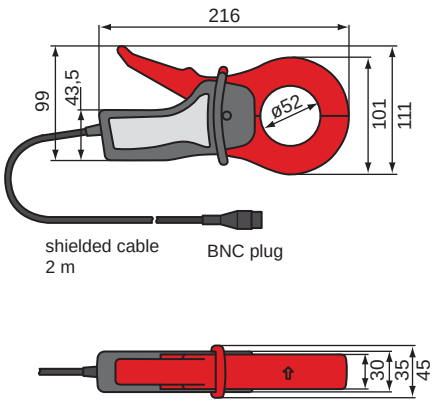
Accessories	
Type	AGE185
	
Extension	AC45…400 Hz, 500…790 V
Nominal voltage range	DC400…960 V

1.7

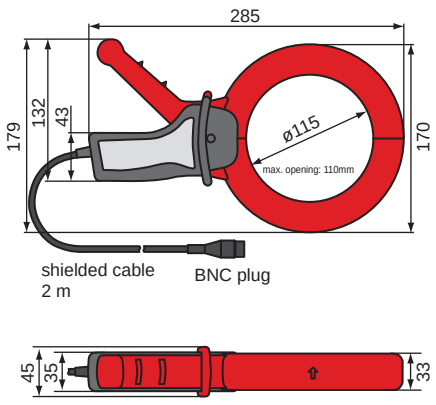
Dimension diagram PSA3020/3320



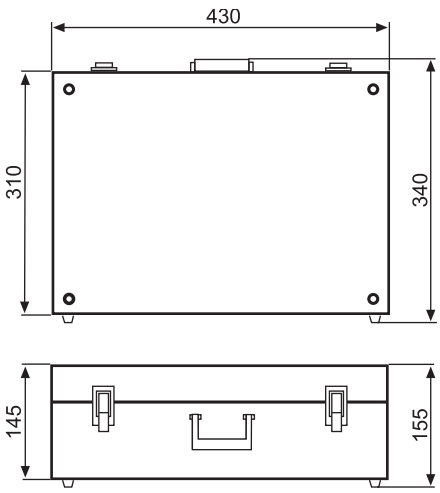
Dimension diagram PSA3052/3352



Dimension diagram PSA3165



Dimension diagram aluminium case



1.7

Measuring current transformers
W0-S20…W5-S210
W10 / 600

Measuring current transformers W10 / 600

Measuring current transformers W0-S20

Measuring current transformers W1-S35

Product description

The highly sensitive W0-S20…W5-S210 series measuring current transformers convert residual currents up to 100 A into evaluable RCM or EDS signals. The CTs are connected to the respective evaluator by two wires. Depending on the connecting lead used, the distance between the CT and the evaluator may be up to 40 m.

Care should be taken that all current-carrying conductors are passed through the CT and that these conductors are not shielded.

Never route a PE conductor through the measuring current transformer!

Application

- for residual current monitors (RCM)
- for residual current monitoring systems (RCMS)

Standards

W0-S20…W5-S210 series measuring current transformers comply with the device standard: IEC 60044-1

Standards, approvals and certifications

GL c UL us LISTED PCT AE25

1.7

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_{isol}	3 kV

Measuring circuit

Rated transformation ratio	600 / 1
Rated burden	180 Ω(18 Ω at 100 A)
Phase displacement	< 4°
Rated primary current	≤ 10 A (100 A)
Rated primary current	≥ 10 mA
Nominal power	50 mVA
Rated frequency	15…400 Hz
Internal resistance	5…8 Ω
Secondary overvoltage protection	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

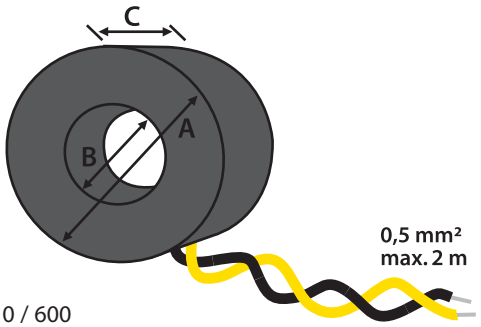
General data

Standard	IEC 60044-1
Shock resistance IEC 60068-2-27 (device in operation)	15 g / 11 ms
Bumping IEC 60068-2-29 (during transport)	40 g/6 ms
Virbation 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 °C…+ 50 °C/- 40 °C…+ 70 °C
Climatic class acc. to IEC 60721-3-3	3K5
Operating mode	continuous operation
Mounting	any position
Connection	screw-type terminals
Connection	
rigid / flexible	0.2…4 / 0.2…2.5 mm²
flexible with ferrules with / without plastic sleeve	0.25…2.5 mm²
Conductor sizes	(AWG) 24-12
Connection to the evaluator	
single wire ≥ 0.75 mm²	0…1 m
single wire, twisted ≥ 0.75 mm²	0…10 m
shielded cable ≥ 0.6 mm²	0…40 m
Recommended cable (shielded, shield connected to PE on one side)	min. J-Y(St)Y 2x0.6
Degree of protection, internal components / terminals (IEC 60529)	IP40 / IP20
Screw mounting	M5
Flammability class	UL94 V-0
Operating manual	TBP409009

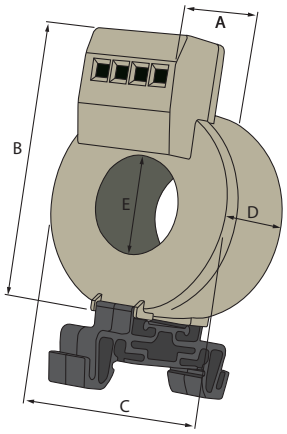
Ordering information

Type	Certifications			Internal diameter (mm)	Art. No.
	UL	GL	GOST		
W10/600	--	--	--	ø 10 mm	B 911 761
W0-S20	×	×	×	ø 20 mm	B 911 787
W1-S35	×	×	×	ø 35 mm	B 911 731
W2-S70	×	×	×	ø 70 mm	B 911 732
W3-S105	×	×	×	ø 105 mm	B 911 733
W4-S140	×	×	×	ø 140 mm	B 911 734
W5-S210	×	×	×	ø 210 mm	B 911 735

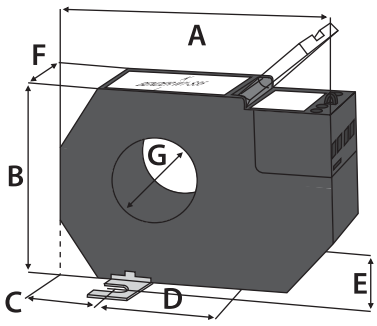
Dimensions (mm) and weights (g)



Type W10 / 600



Type W0-S20



Type W1-S35…W5-S210

Type	A	B	C	D	E	F	G	H	Weight
W10/600	ø 37	ø 10	18	--	--	--	--	--	85 g
W0-S20	32.4	60	ø 46	23.2	ø 20	--	--	--	70 g
W1-S35	100	79	26	48.5	33	46	ø 35	--	250 g
W2-S70	130	110	32	66	33	46	ø 70	--	380 g
W3-S105	170	146	38	94	33	46	ø 105	--	700 g
W4-S140	220	196	48.5	123	33	46	ø 140	--	1500 g
W5-S210	299	284	69	161	33	46	ø 210	--	2500 g

1.7

Measuring current transformers of the W... series
Measuring current transformers of the W...-8000 series

W60 – W60-8000 measuring current transformers

W20 – W20-8000 mounted on DIN rail

Device features

W... measuring current transformers

- For RCMS460/490 series residual current monitoring systems
- For RCM420, RCM460 and RCM470 series residual current monitors
- For EDS470, EDS460 / 490 series insulation fault locators

W...-8000 measuring current transformers

- for EDS473(E)-12, EDS474(E)-12, EDS461 and EDS491 series insulation fault locators

Standards, approvals and certifications

AE25

Product description

The highly sensitive W… and W…-8000 series measuring current transformers convert AC currents into evaluable measurement signals, in combination with RCM resp. RCMS series residual current monitors and evaluators.

In addition, the measuring current transformers can be used in combination with insulation fault location systems (EDS) for IT systems. They are designed to measure the locating current generated by a PGH locating current injector or an A-ISOMETER® IRDH. In combination with EDS series insulation fault locators the test current is converted into evaluable signals.

Connection to the respective devices is via a two-wire cable.

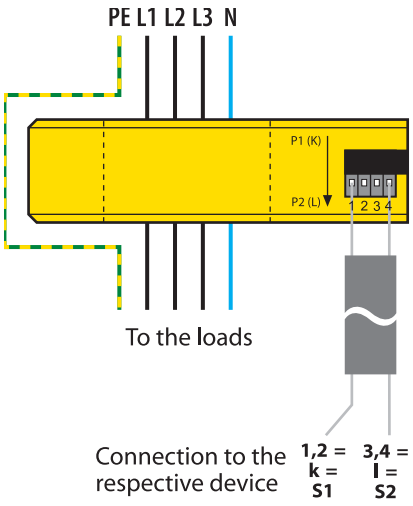
Standards

WS… and WS…-8000 series measuring current transformers comply with the device standard: IEC 60044-1.

Installation instructions

- Make sure that all live conductors are routed through the measuring current transformer
- Do not route shielded conductors through the measuring current transformer
- Never route a PE conductor through the measuring current transformer!

Wiring diagram



W... measuring current transformers
Connection to the respective RCMS series residual current monitoring system, RCM series residual current monitor or to an EDS series insulation fault location system.

W...-8000 measuring current transformers
Connection to the respective EDS473(E)-12, EDS474(E)-12, EDS461 and/or EDS491 series insulation fault locator.

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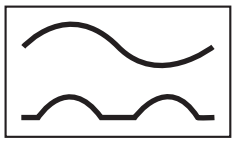


Technical data

Insulation coordination acc. to IEC 60664-1

Rated insulation voltage	800 V
Rated impulse voltage/pollution degree	8 kV / III

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	≤ 180 Ω*
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 x I_{cth} = 2.4 kA / 1 s
Rated dynamic current I_{dyn}	2.5 x I_{th} = 6.0 kA / 40 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 x I_{cth} = 0.36 kA / 1 s
Rated dynamic current I_{dyn}	2.5 x I_{th} = 0.9 kA / 40 ms

Environment

Operating temperature	-25 °C…+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 terminals
rigid/flexible/conductor sizes	0.08…2.5 / 0.08…2.5 mm² / 28…12 AWG
Stripping length	8…9 mm

Connection EDS, RCM(S) measuring current transformers

Single wire ≥ 0.75 mm²	0…1 m
Single wire, twisted ≥ 0.75 mm²	0…10 m
Shielded cable ≥ 0.5 mm²	0…40 m
Recommended cable	
(shielded, shield on one side connected to l-conductor, not connected to earth)	min. J-Y(St)Y 2x0.8

Other

Degree of protection, internal components (IEC 60529)	IP40
Degree of protection, terminals (IEC 60529)	IP 20
Screw mounting	M5 with mounting brackets
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.

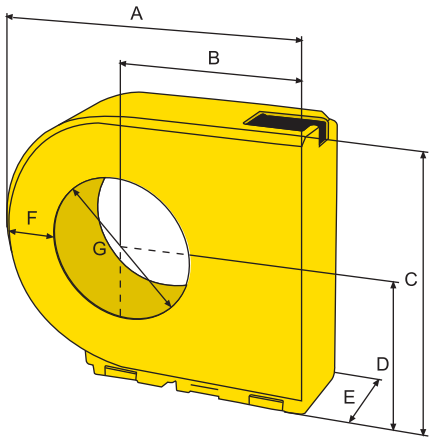
Ordering information

Type	Internal diameter	Mounting		Art. No.
		DIN rail	Mounting brackets	
W20	20 mm	×	×	B 9808 0003
W35	35 mm	×	×	B 9808 0010
W60	60 mm	×	×	B 9808 0018
W120	120 mm	--	×	B 9808 0028
W210	210 mm	--	×	B 9808 0034
W20-8000*	20 mm	×	×	B 9808 0009
W35-8000*	35 mm	×	×	B 9808 0017
W60-8000*	60 mm	×	×	B 9808 0027

Accessories

Type	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

Dimension diagram



Dimensions

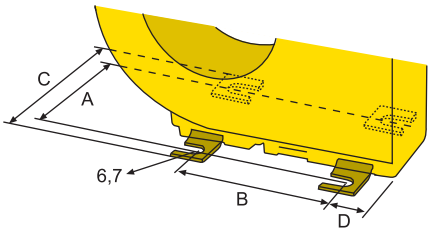
Type	A	B	C	D	E	F	G	Weight
W20	76.4	50	56.3	29.8	30	16.4	ø 20	≤ 0.13 kg
W35	99.5	62	79.2	41.7	30	20	ø 35	≤ 0.175 kg
W60	135	79	116.4	60.4	37	24	ø 60	≤ 0.315 kg
W120	210	116.5	191.5	98	37	33.5	ø 120	≤ 0.96 kg
W210	323	173	304.5	154.5	45	45	ø 210	≤ 2.9 kg
W20-8000*	76.4	50	56.3	29.8	30	16.4	ø 20	≤ 0.15 kg
W35-8000*	99.5	62	79.2	41.7	30	20	ø 35	≤ 0.205 kg
W60-8000*	135	79	116.4	60.4	37	24	ø 60	≤ 0.355 kg

Dimensions in mm

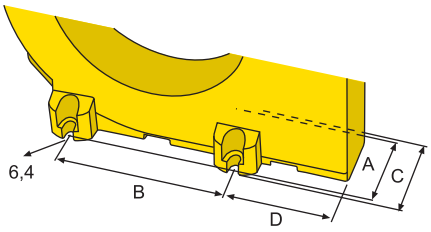
* For EDS461/491 and EDS473/474 series insulation fault locators

Mounting details

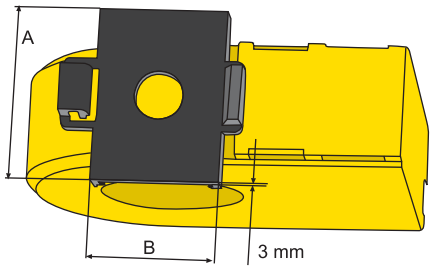
Screw mounting with mounting brackets: W20, W35, W60 and W20-8000, W35-8000, W60-8000

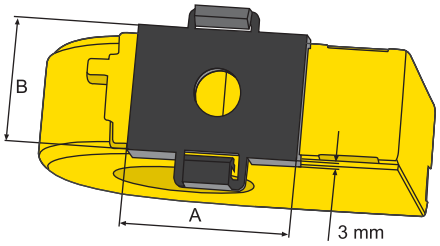


Screw mounting: W120, W210



Snap-on mounting on DIN rail: for vertical or horizontal mounting: W20, W35, W60 und W20-8000, W35-8000, W60-8000





Dimensions screw mounting				
Type	**A**	**B**	**C**	**D**
W20/W20-8000 (fixing with two mounting brackets, diagonally)	47	31.4	63	18.6
W35 / W35-8000 (fixing with two mounting brackets, diagonally)	47	49.8	63	12.1
W60 / W60-8000 (fixing with four mounting brackets)	54	66	70	17.7
W120 screw mounting	51	103	60.6	65
W210 screw mounting	59	180	68.6	83

Dimensions in mm

Dimensions snap-on mounting		
Type	**A**	**B**
W20 / W20-8000	43.5	32
W35 / W35-8000	43.5	32
W60 / W60-8000	50	39

Dimensions in mm

Selection list								
Type	**RCM420**	**RCM470**	**RCMS460/490**	**EDS460/490**	**EDS461/491**	**EDS470**	**EDS473**	**EDS474**
W20	×	×	×	×	--	×	--	--
W35	×	×	×	×	--	×	--	--
W60	×	×	×	×	--	×	--	--
W120	×	×	×	×	--	×	--	--
W210	×	×	×	×	--	×	--	--
W20-8000	--	--	--	--	×	--	×	×
W35-8000	--	--	--	--	×	--	×	×
W60-8000	--	--	--	--	×	--	×	×

Measuring current transformers of the WR... series

WR115x305 measuring current transformer

Device features

- For RCMS460/490 series residual current monitoring systems
- For RCM420, RCM460 and RCM470 series residual current monitors
- For EDS460 / 490 and EDS470 series insulation fault locators

Standards, approvals and certifications

AE25

Product description

The highly sensitive WR… series measuring current transformers of rectangular type convert AC currents into evaluable measurement signals, in combination with RCM and RCMS series residual current monitors and evaluators.

In addition, the measuring current transformers can be used in combination with insulation fault location systems (EDS) for IT systems. They are designed to measure the locating current generated by a PGH locating current injector or an A-ISOMETER® IRDH. In combination with EDS series insulation fault locators the test current is converted into evaluable signals.

Connection to the respective devices is via a two-wire cable.

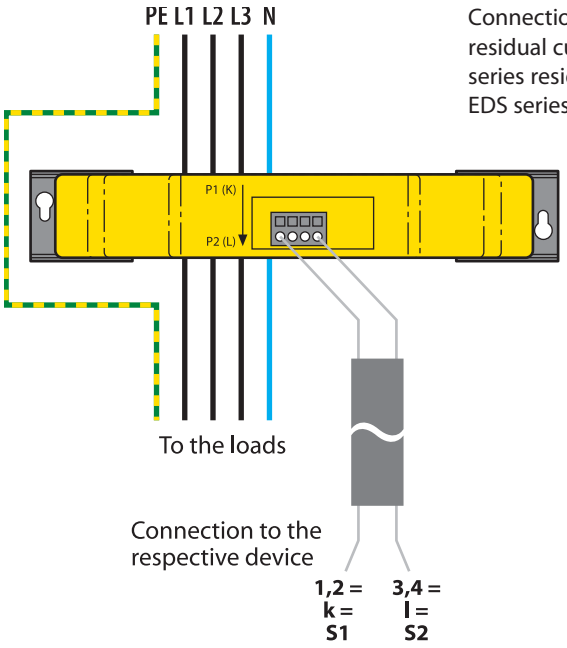
Standards

WR… series measuring current transformers comply with the device standard: IEC 60044-1.

Installation instructions

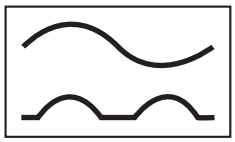
- Make sure that all live conductors are routed through the measuring current transformer
- Do not route shielded conductors through the measuring current transformer
- Never route a PE conductor through the measuring current transformer!

Wiring diagram



Connection to the respective RCMS series residual current monitoring system, RCM series residual current monitor or to an EDS series insulation fault location system.

1.7



Technical data

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

Rated insulation voltage	800 V
Rated impulse voltage/pollution degree	8 kV / III

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	≤ 180 Ω*
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 x I_{cth} = 2.4 kA / 1 s
Rated dynamic current I_{dyn}	2.5 x I_{th} = 6.0 kA / 40 ms

Environment

Operating temperature	-25 °C…+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 terminals
rigid/flexible/conductor sizes	0.08…2.5 / 0.08…2.5 mm² / 28…12 AWG
Stripping length	8…9 mm
Connection EDS, RCM(S) measuring current transformers	
Single wire ≥ 0.75 mm²	0…1 m
Single wire, twisted ≥ 0.75 mm²	0…10 m
Shielded cable ≥ 0.5 mm²	0…40 m
Recommended cable	
(shielded, shield on one side connected to L-conductor , not connected to earth)	J-Y (St) Y min. 2x0.8

Other

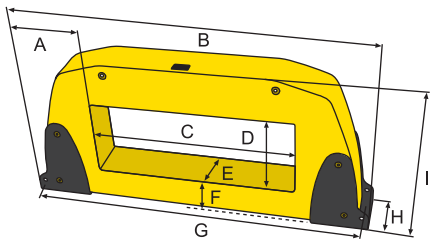
Degree of protection, internal components (IEC 60529)	IP40
Degree of protection, terminals (IEC 60529)	IP 20
Screw mounting	M5 with mounting brackets
Flammability class	UL94 V-0
Operating manual	TBP409014
Approvals and certifications	UL under development, GOST

* The rated burden may vary depending on the respective device data sheet.

Ordering information

Type	Internal dimensions	Mounting brackets	Art. No.
WR70x175	70 x 175 mm	×	B 9808 0609
WR115x305	115 x 305 mm	×	B 9808 0610

Dimension diagram

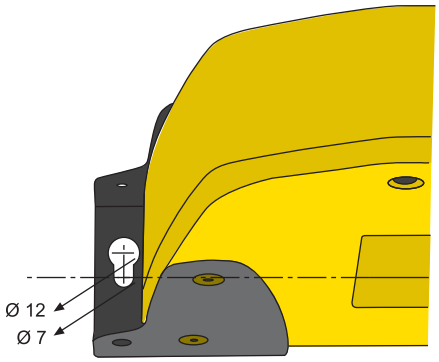


Dimensions

Type	A	B	C	D	E	F	G	H	I	Weight
WR70x175	90.75	357.5	176	71	56.5	51.5	337.5	61	190	2.96 kg
WR115x305	110	526	306	116	67	53	506	72.5	242.5	5.56 kg

Dimensions in mm

Mounting



Selection list

Type	RCM420	RCM470	RCMS460 RCMS490	EDS460 EDS490	EDS470
WR70x175	×	×	×	×	×
WR115x305	×	×	×	×	×

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Measuring current transformers WR70x175S...WR200x500S

Measuring current transformers WR70x175S

Measuring current transformers WR200x500S

Device features

- For RCMS460/490 series residual current monitoring systems
- For RCM420, RCM460 and RCM470 series residual current monitors
- For EDS460 / 490 and EDS470 series insulation fault locators

Approvals and certifications

Product description

The highly sensitive WR70x175S…WR200x500S series measuring current transformers of rectangular type convert AC currents into evaluable measurement signals, in combination with RCM and RCMS series residual current monitors and evaluators.

In addition, the measuring current transformers can be used in combination with insulation fault location systems (EDS) for IT systems. They are designed to measure the locating current generated by a PGH locating current injector or an A-ISOMETER® IRDH. In combination with EDS series insulation fault locators the test current is converted into evaluable signals.

Connection to the respective devices is via a two-wire cable.

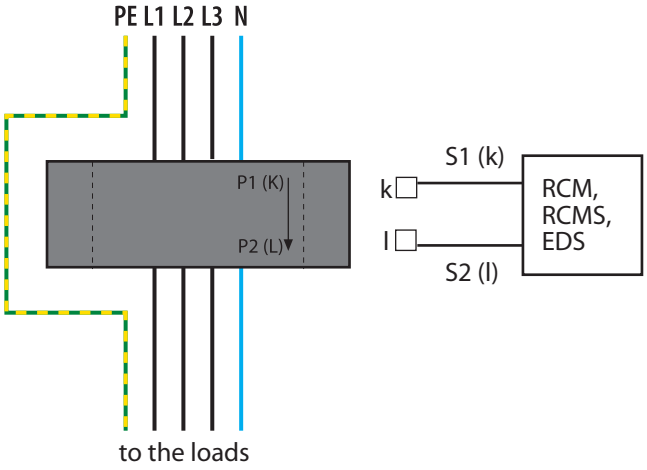
Standards

WR70x175S…WR200x500S series measuring current transformers comply with the device standard: IEC 60044-1.

Installation instructions

- Make sure that all live conductors are routed through the measuring current transformer
- Do not route shielded conductors through the measuring current transformer
- Never route a PE conductor through the measuring current transformer!

Wiring diagram



1.7

Technical data WR70x175S…WR200x500S

Insulation coordination acc. to IEC 60044-1

Highest system voltage for electrical equipment U_m	AC 720 V
Rated impulse withstand voltage U_{isol}	3 kV

Measuring circuit

Rated transformation ratio	600 / 1
Rated burden	180 Ω
Rated primary current	≤ 10 A (100 A)
Rated primary current	≥ 10 mA
Nominal power	50 mVA
Rated frequency	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

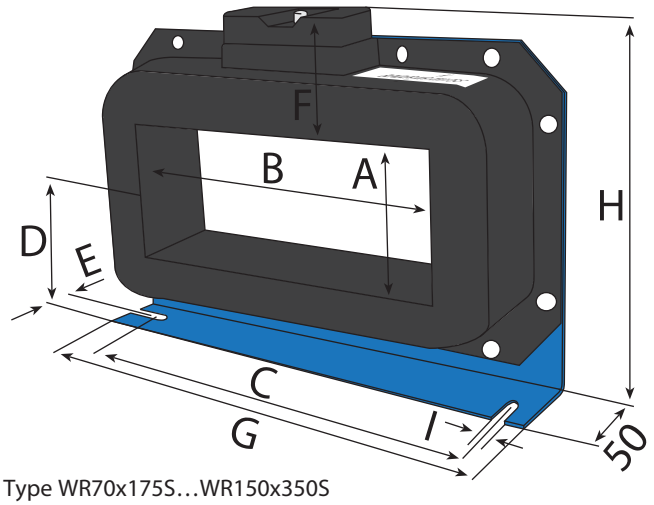
General data

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 °C…+ 50 °C
Ambient temperature (during storage)	- 40 °C…+ 70 °C
Climatic class acc. to IEC 60721-3-3	3K5
Operating mode	continuous operation
Mounting	any position
Connection	screw-type terminals
Connection	
rigid / flexible	0.2…4 / 0.2…2.5 mm²
flexible with ferrules with / without plastic sleeve	0.25…2.5 mm²
Conductor sizes (AWG)	24-12
Connection to the evaluator	
single wire ≥ 0.75 mm²	0…1 m
single wire, twisted ≥ 0.75 mm²	0…10 m
shielded cable ≥ 0.6 mm²	0…40 m
recommended cable (shielded, shield on one side connected to PE)	min. J-Y(St)Y 2x0.6
Degree of protection, internal components (IEC 60529)	IP40
Degree of protection, terminals (IEC 60529)	IP20
Screw mounting	M5
Flammability class	UL94 V-0
Operating manual	TBP409004

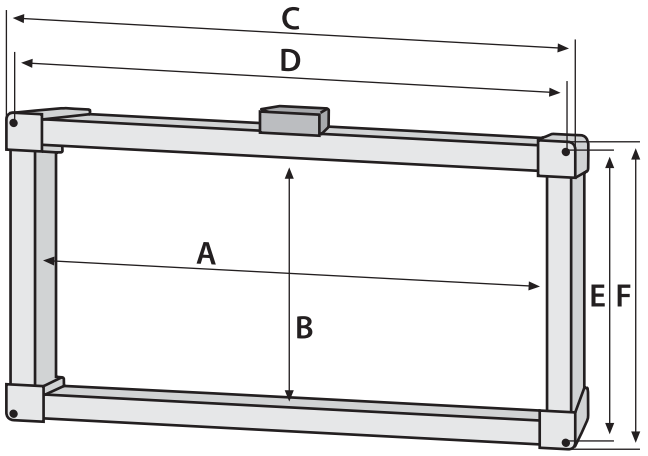
Ordering information

Type	Certifications		Internal diameter (mm)	Art. No.
	UL	GL		
WR70x175S	×	×	70 x 175	B 911 738
WR115x305S	×	×	115 x 305	B 911 739
WR150x350S	×	--	150 x 350	B 911 740
WR200x500S	--	--	200 x 500	B 911 763

Dimensions (mm) and weights (g)



Type WR70x175S…WR150x350S



Type WR200x500S

Type	A	B	C	D	E	F	G	H	I	Weight
WR70x175S	70	175	225	85	22	46	261	176	7.5	2900 g
WR115x305S	115	305	360	116	25	55	402	240	8	6300 g
WR150x350S	150	350	415	140	28	55	460	285	8	8250 g
WR200x500S	500	200	585	568.5	268.5	285	--	--	--	9000 g

Measuring current transformers of the WS... series
Measuring current transformers of the WS...-8000 series

WS50x80 series
measuring current transformers
WS50x80-8000 series
measuring current transformers

WS50x80 series,
split-core type measuring current transformers
WS50x80-8000 series
split-core type measuring current transformers

Device features

WS... series measuring current transformer

- For RCMS460/490 series residual current monitoring systems
- For RCM420, RCM460 and RCM470 series residual current monitors
- For EDS470, EDS460 / 490 series insulation fault locators

WS...-8000 measuring current transformer

- for EDS473(E)-12, EDS474(E)-12, EDS461 and EDS491 series insulation fault locators

Standards, approvals and certifications

Product description

WS… and WS…-8000 series split-core type measuring current transformers can be opened using the interlock knob to enclose the conductors to be monitored. That allows easy retrofitting in existing installations.

WS… und WS…-8000 series measuring current transformers are highly sensitive measuring current transformers of split-core type which in combination with RCM and RCMS series residual current monitors and evaluators convert AC currents into evaluable measurement signals.

In addition, the measuring current transformers can be used in combination with insulation fault location systems (EDS) for IT systems. They are designed to measure the locating current generated by a PGH locating current injector or an A-ISOMETER® IRDH. In combination with EDS series insulation fault locators the test current is converted into evaluable signals.

Connection to the respective devices is via a two-wire cable.

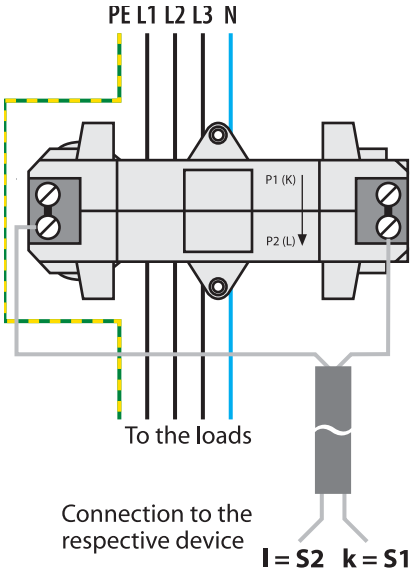
Standards

WS… and WS…-8000 series measuring current transformers comply with the device standard: IEC 60044-1.

Installation instructions

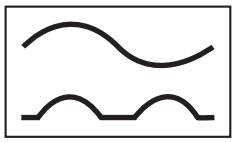
- Make sure that all live conductors are routed through the measuring current transformer
- Do not route shielded conductors through the measuring current transformer
- Never route a PE conductor through the measuring current transformer!

Wiring diagram



WS... series measuring current transformer
Connection to the respective RCMS series residual current monitoring system, RCM series residual current monitor or to an EDS series insulation fault location systems.

WS...-8000 measuring current transformer
Connection to the respective insulation fault locator EDS473(E)-12, EDS474(E)-12, EDS461 and/or EDS491.



Technical data

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

Rated insulation voltage	800 V
Rated impulse voltage/pollution degree	8 kV / III

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	≤ 180 Ω*
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 x I_{cth} = 2.4 kA / 1 s
Rated dynamic current I_{dyn}	2.5 x I_{th} = 6.0 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 x I_{cth} = 0.36 kA / 1 s
Rated dynamic current I_{dyn}	2.5 x I_{th} = 0.9 kA / 40 ms

Environment

Operating temperature	-25 °C…+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
rigid/flexible/conductor sizes	0.08…2.5 / 0.08…2.5 mm² / 28…12 AWG
Stripping length	8…9 mm

Connection EDS, RCM(S) measuring current transformers

Single wire ≥ 0.75 mm²	0…1 m
Single wire, twisted ≥ 0.75 mm²	0…10 m
Shielded cable ≥ 0.5 mm²	0…40 m
Recommended cable (shielded, shield on one side connected to L-conductor, not connected to earth)	J-Y (St) Y min. 2x0.8

Other

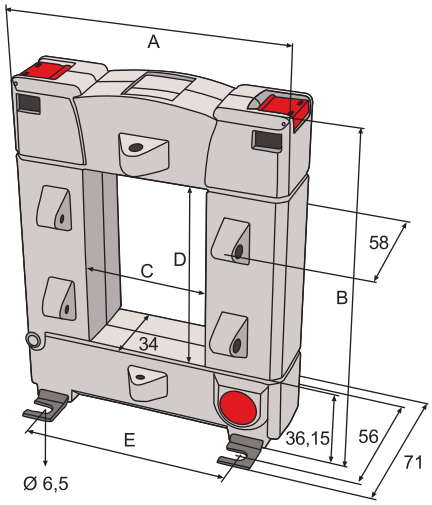
Degree of protection, internal components (IEC 60529)	IP40
Degree of protection, terminals (IEC 60529)	IP 20
Screw mounting	M5 with mounting brackets
Flammability class	UL94 V-0
Operating manual WS…	TBP409015
Operating manual WS…-8000	TBP108018
Approvals and certifications	UL under development, GOST

* The rated burden may vary depending on the respective device data sheet.

Ordering information

Type	Internal dimensions	Mounting brackets	Art. No.
WS20x30	20 x 30 mm	×	B 9808 0601
WS50x80	50 x 80 mm	×	B 9808 0603
WS80x120	80 x 120 mm	×	B 9808 0606
WS20x30-8000*	20 x 30 mm	×	B 9808 0602
WS50x80-8000*	50 x 80 mm	×	B 9808 0604

Dimension diagram



Dimensions

Type	A	B	C	D	E	Weight
WS20x30	93	106.15	23	33	64	≤ 0.6 kg
WS50x80	125	158.15	55	85	96	≤ 1.04 kg
WS80x120	155	198.15	85	125	126	≤ 1.4 kg
WS20x30-8000*	93	106.15	33	33	64	≤ 0.63 kg
WS50x80-8000*	125	158.15	85	85	96	≤ 1.08 kg

Dimensions in mm

Selection list

Type	RCM420	RCM470	RCMS460 RCMS490	RCMS470	EDS460 EDS490	EDS461 EDS491	EDS470	EDS473	EDS474
WS20x30	×	×	×	×	×	--	×	--	--
WS50x80	×	×	×	×	×	--	×	--	--
WS80x120	×	×	×	×	×	--	×	--	--
WS20x30-8000*	--	--	--	--	--	×	--	×	×
WS50x80-8000*	--	--	--	--	--	×	--	×	×

* For EDS461/491 and EDS473/474 series insulation fault locators

1.7

Measuring current transformers of the WS50x80S...WS80x160S series, split-core type

Measuring current transformers WS50x80S

Measuring current transformers WS80x160S

Product description

The highly sensitive split-core-type WS… series measuring current transformers convert residual currents of 10 mA…100 A into evaluable RCM or EDS signals and can be retrofitted to existing electrical installations where disconnection must be prevented. The CTs are connected to the respective evaluator by two wires. Depending on the connecting lead used, the distance between the CT and the evaluator may be up to 40 m.

Make sure that all live conductors are routed through the measuring current transformer and that these conductors are not shielded.

Never route a PE conductor through the measuring current transformer!

Application

- for residual current monitors (RCM)
- for residual current monitoring systems (RCMS)

Standards

WS… series measuring current transformers comply with the device standard:
IEC 60044-1

Standards, approvals and certifications

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_{isol}	3 kV

Measuring circuit

Rated transformation ratio	600 / 1
Rated burden	180 Ω
Rated primary current	≤ 10 A (100 A)
Rated primary current	≥ 10 mA
Nominal power	50 mVA
Rated frequency	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

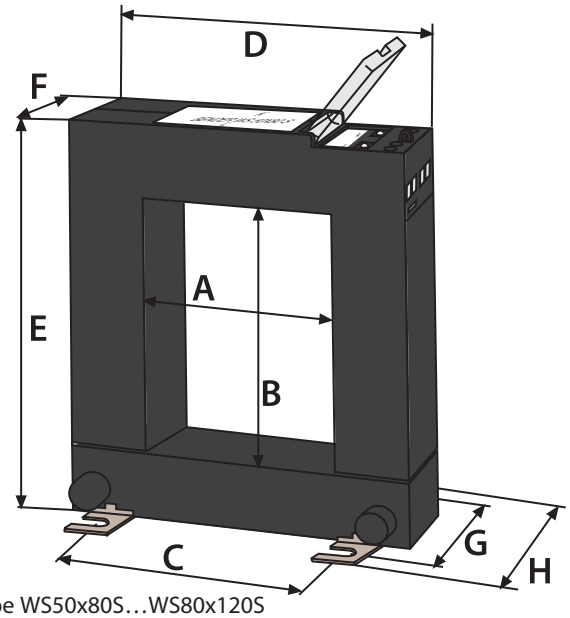
General data

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 °C…+ 50 °C
Ambient temperature (during storage)	- 40 °C…+ 70 °C
Climatic class acc. to IEC 60721-3-3	3K5
Operating mode	continuous operation
Mounting	any position
Connection	screw-type terminals
Connection	
rigid / flexible	0.2…4 / 0.2…2.5 mm²
flexible with ferrules with / without plastic sleeve	0.25…2.5 mm²
Conductor sizes (AWG)	24-12
Connection to the evaluator	
single wire ≥ 0.75 mm²	0…1 m
single wire, twisted ≥ 0.75 mm²	0…10 m
shielded cable ≥ 0.6 mm²	0…40 m
recommended cable (shielded, shield on one side connected to PE)	min. J-Y(St)Y 2x0.6
Degree of protection, internal components (IEC 60529)	IP40
Degree of protection, terminals (IEC 60529)	IP 20
Screw mounting	M5
Flammability class	UL94 V-0
Operating manual	TBP409005

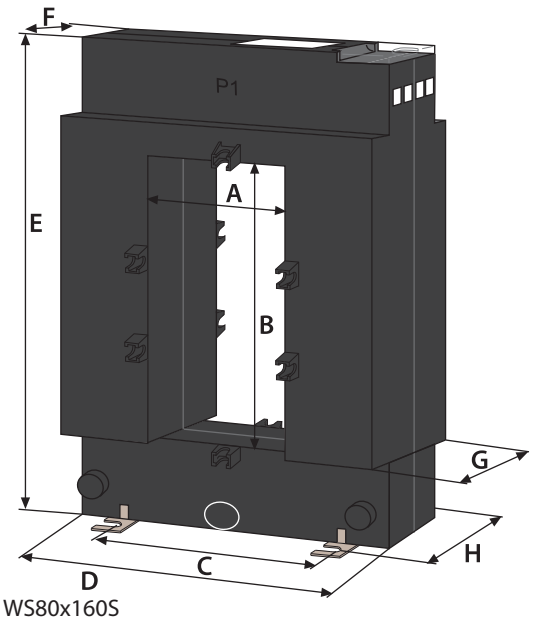
Ordering information

Type	Certifications		Internal diameter (mm)	Art. No.
	UL	GL		
WS50x80S	×	×	50 x 80	B 911 741
WS80x80S	×	×	80 x 80	B 911 742
WS80x120S	×	×	80 x 120	B 911 743
WS80x160S	--	--	80 x 160	B 911 755

Dimensions (mm) and weights (g)



Type WS50x80S…WS80x120S



Type WS80x160S

Type	A	B	C	D	E	F	G	H	Weight
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

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Measuring current transformer selection list

The outside diameters of cables and conductors and the appropriate measuring current transformers are listed in the table below. Please note that the outside diameters are approximate values only. In case of doubt select a measuring current transformer of the next larger outside diameter.

Wire cross section mm2	NYM	NYY	NYCY/ NYCWY	H07RN-F	NSSHÖU	Recommended measuring current transformer diameter	
	ø	ø	ø	ø	ø	circular	rectangular/ split-core type
3 x 1.5	10	11	13	12.5	15	20 mm	20x30
3 x 2.5	11	13	14	14.5	16.5	20 mm	20x30
3 x 4	12.5	15	16	16	20	20 mm	20x30
3 x 6	14	16	17	20	22	20 / 35 mm	20x30
3 x 10	17	19	18	25.5	--	20 / 35 mm	20x30
3 x 16	20	21	21	29	--	35 mm	20x30
4 x 1.5	10.5	13	14	13.5	16	35 mm	20x30
4 x 2.	12	14	15	15.5	19	35 mm	20x30
4 x 4	14	16	17	18	21.5	35 mm	20x30
4 x 6	15	17	18	22	23	35 mm	S20x30
4 x 10	18	20	20	23	27.5	35 mm	20x30
4 x 16	23	23	23	32	32	35 mm	50x80
4 x 25	27.5	27	28	37	39	35 / 60 mm	50x80
4 x 35	31	30	29	42	42.5	35 / 60 mm	50x80
4 x 50	--	35	34	48	49	60 mm	50x80
4 x 70	--	40	37	54	--	60 mm	80x80
4 x 95	--	45	42	60	--	60 / 105 / 120 mm	80x80
4 x 120	50	47	65.5	--	--	60 / 105 / 120 mm	80x80
4 x 150	53	52	--	--	--	60 mm	80x80
4 x 185	60	60	--	--	--	60 / 105 / 120 mm	80x80
4 x 240	71	70	--	--	--	105 / 120 mm	80x80
5 x 1.5	11	13.5	15	15	17	20 mm	20x30
5 x 2.5	15	17	17	20	--	20 / 35 mm	20x30
5 x 4	15	16.5	18	19	23	20 / 35 mm	20x30
5 x 6	18	19	20	24	26.5	20 / 35 mm	S50x80
5 x 10	20	21	--	30	30	35 mm	50x80
5 x 16	24	23	--	35	34	35 / 60 mm	50x80
5 x 25	31	--	--	41	42	35 / 60 mm	50x80

Note:: Never route the PE conductor through the measuring current transformer!

Table of different measuring current transformer series for comparison

Inside diameter	Type series "yellow"		Type series "black"		Selection of equipment types	
	Type	Art. No.	Type	Art. No.	EDS	
					EDS460 / 490, EDS460-DG	EDS461/491
Standard version circular type						
10	--	--	W10/600-6	B 911 901	×	--
10	--	--	W10/600	B 911 761	×	--
15	--	--	W0-S20	B 911 787	×	--
20	W20	B 9808 0003	--	--	×	--
35	W35	B 9808 0010	W1-S35	B 911 731	×	--
60	W60	B 9808 0018	--	--	×	--
70	--	--	WS-S70	B 911 731	×	--
105	--	--	W3-S105	B 911 732	×	--
120	W120	B 9808 0028	--	--	×	--
140	--	--	W4-S140	B 911 734	×	--
210	W210	B 9808 0034	W5-S210	B 911 735	×	--
Standard version circular type (…/8000)						
10	--	--	W10/8000-6	B 911 900	--	×
10	--	--	W10/8000	B 911 901	--	×
20	W20-8000	B 9808 0009	--	--	--	×
35	W35-8000	B 9808 0017	W1-S35/8000	B 911 756	--	×
60	W60-8000	B 9808 0027	--	--	--	×
Rectangular/split-core type						
20x30	WS20x30	B 9808 0601	--	--	×	--
50x80	WS50x80	B 9808 0603	WS50x80S	B 911 741	×	--
80x80	--	--	WS80x80S	B 911 742	×	--
80x120	--	--	WS80x120S	B 911 743	×	--
80x160	WS80x160	B 9808 0606	WS80x160S	B 911 755	×	--
Rectangular, split-core type (…/8000)						
20x30	WS20x30-8000	B 9808 0602	WS20x30/8000	B 911 764	--	×
50x80	WS50x80-8000	B 9808 0604	WS50x80/8000	B 911 757	--	×
Rectangular-type						
70x175	WR70x175	B 9808 0609	WR70x175S	B 911 738	×	--
115x305	WR115x305	B 9808 0610	WR115x305S	B 911 739	×	--
150x350	--	--	WR150x350S	B 911 740	×	--
200x500	--	--	WR200x500	B 911 763	×	--

Accessories
Coupling devices

Chapter 1.8.1

Coupling devices to extend the nominal voltage range of A-ISOMETER®s

Coupling device AGH150W-4

Coupling device AGH150W-4

Technical data

Insulation coordination acc. to IEC 60664-1

Rated insulation voltage	DC 1600 V
Rated impulse withstand voltage/pollution degree	12 kV/3

Voltage ranges

Nominal system voltage U_n	DC 0…1760 V

General data

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 °C…+ 55 °C
Ambient temperature (during storage)	- 40 °C…+ 70 °C
Climatic class acc. to IEC 60721-3-3	3K5
Operating mode	continuous operation
Mounting	any position
Connection	flat terminals
Connection properties rigid / flexible	0.2…4 mm² / 0.2…2.5 mm²
Degree of protection, internal components (IEC 60529)	IP 30
Degree of protection, terminals (IEC 60529)	IP 20
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Operating manual	BP109001
Weight approx.	900 g

Ordering information

Type	Nominal system voltage U_n	Art. No.
AGH150W-4	DC 1760 V	B 9801 8006

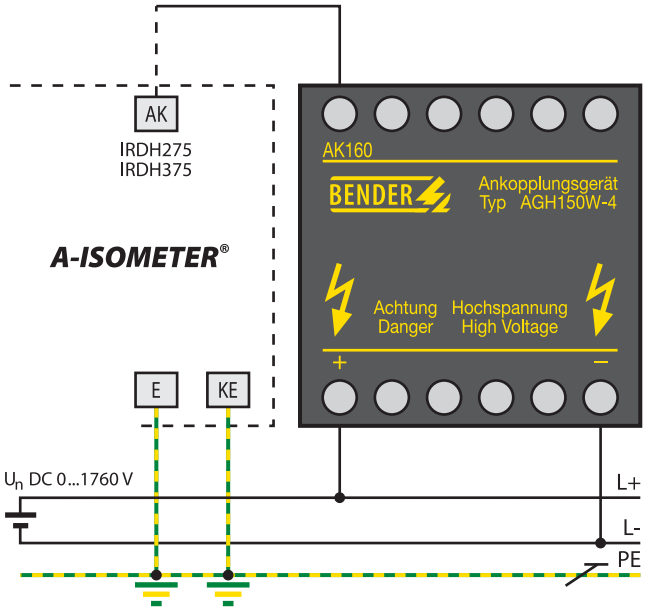
Product description

The AGH150W-4 coupling device is designed to extend the nominal voltage range of the A-ISOMETER® IRDH265-4/IRDH365-4/IRDH1065B-4 series to DC 0…1760 V. The coupling device is connected to the system being monitored by two poles and connected to the terminal AK of the A-ISOMETER® by means of the terminal AK160.

Standards, approvals and certifications

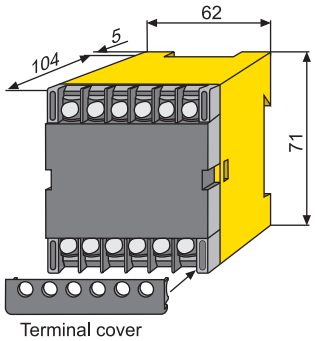
c UL us LISTED

Wiring diagram



Dimension diagram X150

Dimensions in mm



1.8.1

Product description

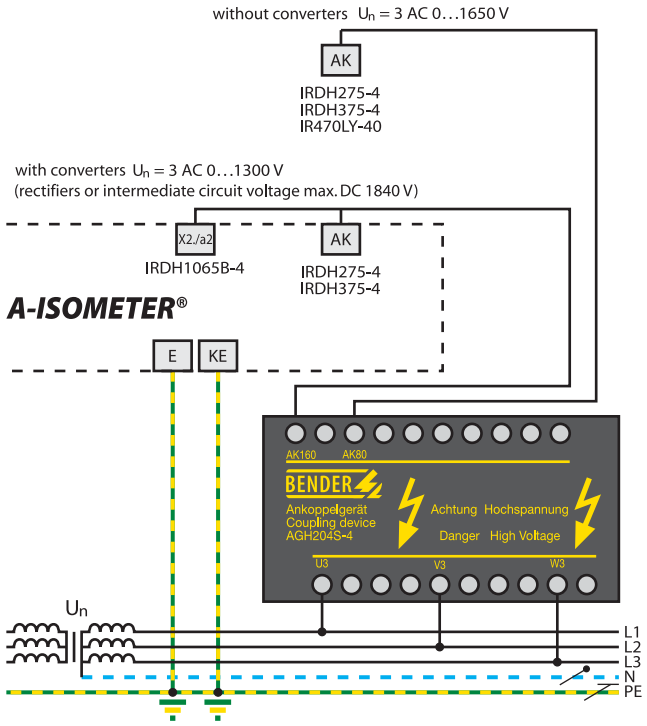
The coupling device AGH204S-4 is designed to extend the nominal voltage range of the A-ISOMETER® series described in the wiring diagram below to AC, 3(N)AC 50…400 Hz, 0…16500…1300 V. The coupling device is connected to the system to be monitored according to the wiring diagram and connected to the terminal AK of the A-ISOMETER® by means of terminal AK… .

Standards, approvals and certifications

c UL us LISTED

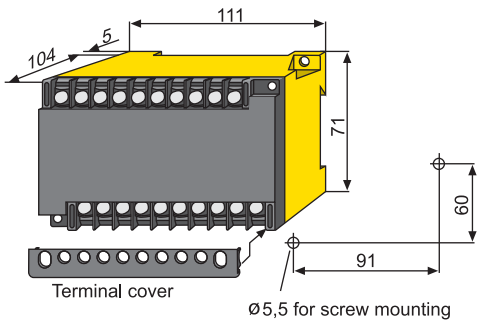
AE25

Wiring diagram



Dimension diagram X200

Dimensions in mm



Coupling device AGH204S-4

Technical data

Insulation coordination acc. to IEC 60664-1

Rated insulation voltage	AC 1500 V
Rated impulse withstand voltage/pollution degree	12 kV/3

Voltage ranges

Nominal system voltage U_n	AC, 3(N)AC 50…400 Hz 1650 V/0…1300 V

General data

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 °C…+ 55 °C
Ambient temperature (during storage)	- 40 °C…+ 70 °C
Climatic class acc. to IEC 60721-3-3	3K5
Operating mode	continuous operation
Mounting	any position
Connection	flat terminals
Connection properties rigid / flexible	0.2…4 mm² / 0.2…2.5 mm²
Degree of protection, internal components (IEC 60529)	IP 30
Degree of protection, terminals (IEC 60529)	IP 20
Screw mounting	2 x M4
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Operating manual	BP109002
Weight approx.	1350 g

Ordering information

Type	Nominal system voltage U_n	Art. No.
AGH204S-4	AC 0…1650 V / 0…1300	B 914 013

1.8.1

Coupling device AGH520S

Coupling device AGH520S

Technical data

Insulation coordination acc. to IEC 60664-1

Rated insulation voltage	AC 6.3 V
Rated impulse withstand voltage/pollution degree	17 kV/3

Voltage ranges

Netznennspannung U_n	3(N)AC 0…7200 V
Nominal frequency f_n	50…400 Hz

General data

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 °C…+ 55 °C
Ambient temperature (during storage)	- 40 °C…+ 70 °C
Climatic class acc. to IEC 60721-3-3	3K5
Operating mode	continuous operation
Mounting	any position
Connection	screw-type terminals
Degree of protection, internal components (IEC 60529)	IP 64
Degree of protection, terminals (IEC 60529)	IP 20
Type of enclosure	resin-encapsulated block
Screw mounting	4 x M5
Flammability class	UL94 V-0
Operating manual	BP109003
Weight approx.	4500 g

Ordering information

Type	Nominal system voltage U_n	Art. No.
AGH520S	3(N)AC 0…7200 V	B 913 033

Product description

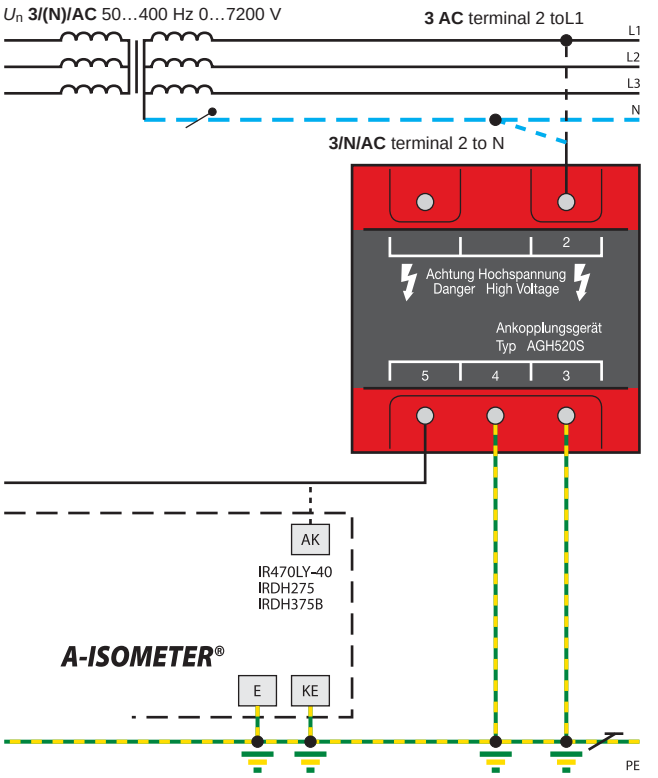
The coupling device AGH520S is designed to extend the nominal voltage range of the A-ISOMETER® series described in the wiring diagram below to (3)AC 50…400 Hz, 0…7200 V. The coupling device is connected to the system to be monitored by one pole and connected to the terminal AK of the A-ISOMETER® by means of the terminal 5.

Standards, approvals and certifications

c UL us LISTED

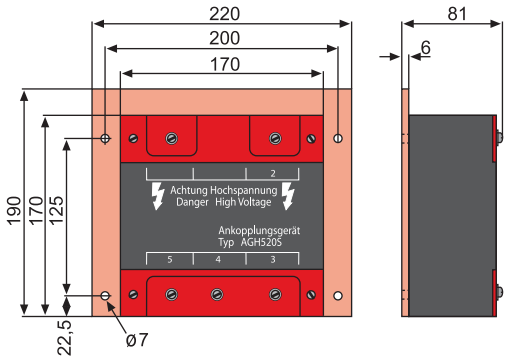
AE25

Wiring diagram



Dimension diagram

Dimensions in mm



1.8.1

Product description

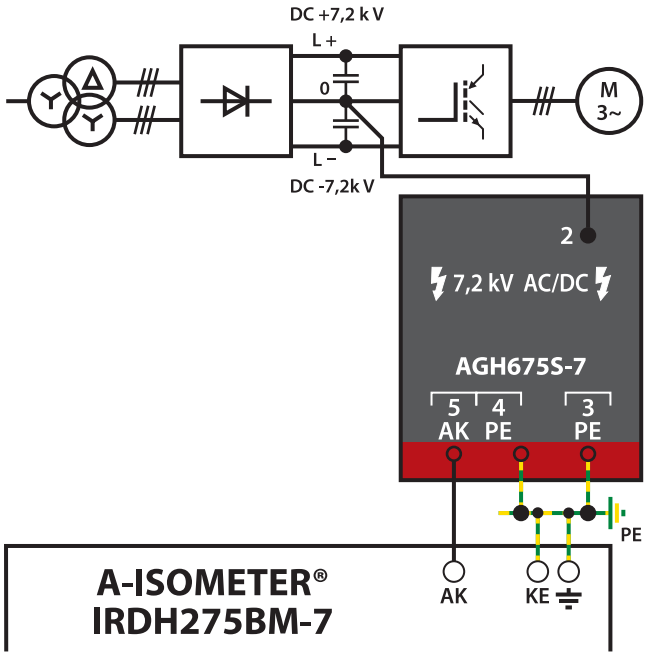
The coupling device AGH675S-7 is designed to extend the nominal voltage range of the A-ISOMETER® IRDH275BM-7 to AC/ 0…7.2 kV. The coupling device is connected to the system to be monitored by one pole and connected to the terminal AK of the A-ISOMETER® by means of the terminal 5.

Standards, approvals and certifications

c UL us LISTED

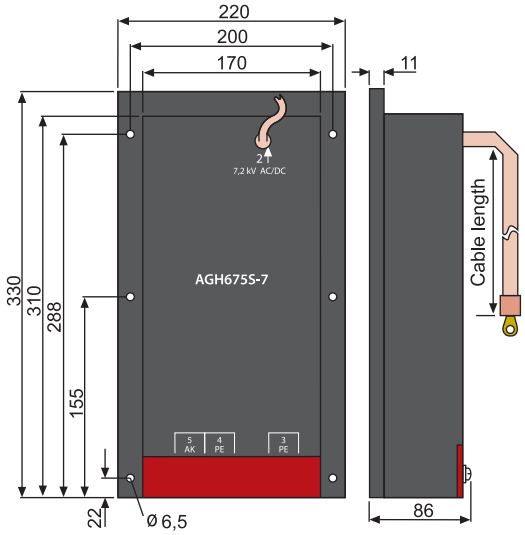
AE25

Wiring diagram (example)



Dimension diagram AGH675S-7

Dimensions in mm



Coupling device AGH675S-7

Technical data

Insulation coordination based on IEC 61800-5-1

Rated insulation voltage	AC 7.2 V

Voltage test based on IEC 61800-5-1

Type test	
Voltage impulse test	AC 80 kV
AC voltage test	AC 40 kV
Partial discharge test	14 kVeff
Routine test:	
AC voltage test, rate of increase < 2 kV/s	AC 40 kV

Voltage ranges

Nominal system voltage U_n	AC/3(N)AC/DC 0…7.2 kV
Nominal frequency f_n	0…460 Hz

General data

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 °C…+55 °C
Ambient temperature for storage	-40 °C…+70 °C
Climatic class acc. to IEC 60721-3-3	3K5
Operating mode	continuous operation
Mounting	any position
Connection medium voltage	high-voltage cable (encapsulated on the device side)
Connection terminals 3, 4, 5	screw-type terminals
Connection, rigid/flexible	0.2…4 mm² / 0.2…2.5 mm²
Connection, flexible with ferrule	0.25…2.5 mm²
Degreee of protection, internal components (IEC 60529)	IP64
Degree of protection, terminals (IEC 60529)	IP20
Type of enclosure	resin-encapsulated block
Screw mounting	M5
Flammability class	UL94 V-0
Operating manual	TGH1395 (IRDH275BM-7)
Weight	approx. 5.1 kg

Ordering information

Type	Nominal system voltage U_n	Cable length	Art. No.
AGH675S-7-2000	AC / DC 0…7.2 kV 0…460 Hz	2000 mm	B 913 054
AGH675S-7-500	AC / DC 0…7.2 kV 0…460 Hz	500 mm	B 913 056

1.8.1

Accessories
Protocol converters

Chapter 1.8.2

Protocol converters are used to convert predefined interface variations to different interface variations.

RS-485 interface repeater DI-1PSM

Repeater for RS-485 bus extension

RS-485 interface repeater DI-1PSM

Device features

- Plastic enclosure for DIN rail mounting
- Adjustable baud rate
- Galvanic separation between the input and output circuit and the power supply
- Supply voltage AC / DC 24 V ± 20 %

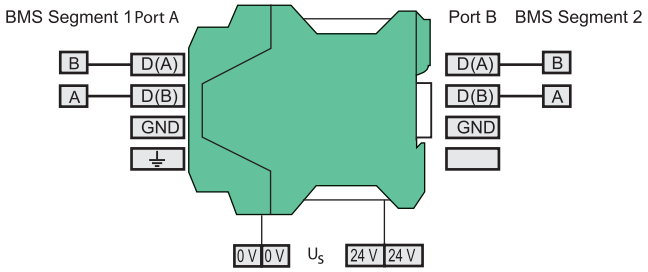
Product description

The RS-485 interface repeater DI-1PSM is designed for signal amplification on the RS-485 interface (BMS bus). This is required when the network distance exceeds a length of 1200 m and when more than 32 bus nodes exist.

Application

- 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 32
- Protection against spikes by galvanic separation between the input and output circuit and the power supply

Wiring diagram



Note:

- BMS bus termination is required

Technical data

Insulation coordination acc. to IEC 60664-1

Rated voltage	
Rated impulse withstand voltage/pollution degree	2 kV/3

Supply voltage

Supply voltage U_S	see ordering information
Power consumption	90 mVA

Interfaces

BMS

Interface / protocol	2 x RS-485 / BMS
Baud rate adjustable via DIP switch	4.8…1500 kbit/s
Cable length	≤ 1200 m
Recommended cable (shielded, shield connected to PE on one side)	min. J-Y(St)Y 2x0.6
Operating mode	half-duplex
Change of data direction	automatic data direction control
Cascading capability	9 (4.8…93.75 kbit / s)
Terminating resistor, selectable via DIP switch	220 Ω
Device address, BMS bus	--
Alarm LEDs	ON (green), R x D (green), T x D (yellow)

General data

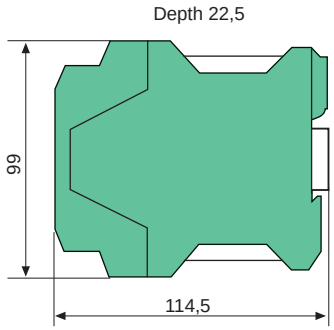
EMC immunity	EN 61000-6-2
EMC emission	EN 50081-1
Classification of climatic conditions acc. to IEC 60721	
Stationary use	3K5
Transport	2K3
Long-time storage	1K4
Operating temperature	0 °C…+55 °C
Classification of mechanical conditions acc. to IEC 60721	
Stationary use	3M4
Transport	2M2
Long-time storage	1M3
Operating mode	continuous operation
Mounting	any position
Connection	screw-type terminals
Connection rigid /flexible / conductor sizes	0.2…2.5 mm² / AWG 24…12
Degree of protection, internal components (IEC 60529)	IP30
Degree of protection, terminals (IEC 60529)	IP20
DIN rail mounting acc. to	IEC 60715
Operating manual	TBP501012
Weight	≤ 130 g

Ordering information

Type	Supply voltage U_S	Art. No.
DI-1PSM	AC/DC 24 V ± 20 %	B 9501 2044

Dimension diagram DI-1PSM

Dimensions in mm



1.8.2

Interface converter DI-2

Interface converter DI-2USB

Device features

- Plastic enclosure for DIN rail mounting
- Electrical separation between the input and output circuit
- Supply voltage DC 10…30 V

Product description

The DI-2 converter is designed for the connection of personal computers and workstations utilising an RS-232 interface with Bender devices utilising an RS-485 interface. The hardware and software of the computers need not to be changed. A typical application is the connection of a personal computer to a BMS network.

Application

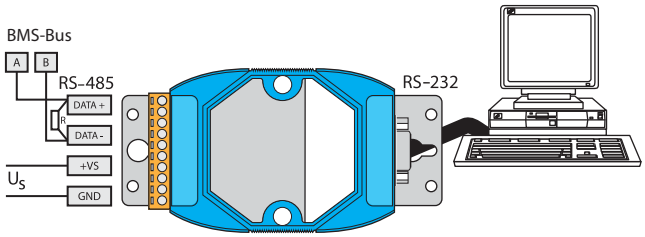
- RS-232 signals are converted into RS-485 signals
- Parameterisation of alarm indicator and operator panels (MK800, MK2430) with RS-485 interface via PC with RS-232 interface using software

Function

Many PCs and work stations are equipped with serial RS-232 interfaces. The interface converter DI-2 is designed to connect these devices via an RS-232 interface to the BMS bus using the RS-485 standard. The connected devices are protected against spikes by galvanic separation between the input and output circuit. Additional internal measures protect the device against voltage spikes.

Standards, approvals and certifications

Wiring diagram (example)



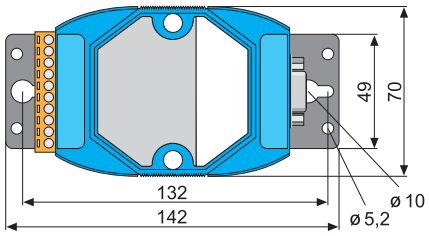
DI-2 for the integration of a personal computer utilising an RS-232 interface into a BMS network.

Note:

- Terminate both ends of the BMS bus with 120 Ω resistors (R).

Dimension diagram DI-2

Dimensions in mm



Ordering information

Type	Supply voltage U_S	Art. No.
DI-2	DC 10…30 V*	B 9501 2022

* 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
Recommended cable (shielded, shield connected to PE on one side)	min. J-Y(St)Y 2x0.6
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

General data

EMC immunity / EMC emission	EN 61000-6-2 / EN 61000-6-4
Classification of climatic conditions acc. to IEC 60721	
Stationary use / transport / long-time storage	3K5 / 2K3 / 1K4
Ambient temperature, operation	- 10 °C…+ 55 °C
Classification of mechanical conditions acc. to IEC 60721	
Stationary use / Transport / Long-time storage	3M4 / 2M2 / 1M3
Operating mode	continuous operation
Mounting	any position
Connection	screw-type terminals
Connection rigid /flexible / conductor sizes	0.5…2.5 mm² / AWG 22…12
Degree of protection, internal components /terminal (IEC 60529)	IP 30 / IP 20
Screw mounting	2 x M3
DIN rail mounting acc. to	IEC 60715
Operating manual	TBP109010
Weight	≤ 160 g

1.8.2

Interface converter DI-2USB

Interface converter DI-2USB

Device features

- Plastic enclosure
- Electrical separation between the input and output circuit
- Power supply via USB port
- USB cable and driver CD -CD included in the scope of delivery

Product description

The DI-2USB interface converter is designed for connecting PCs and work stations via the USB interface to Bender devices utilising an RS-485 interface. The hardware and software of the computers need not to be changed. A personal computer can be connected to a BMS network via the DI-2USB converter, for example.

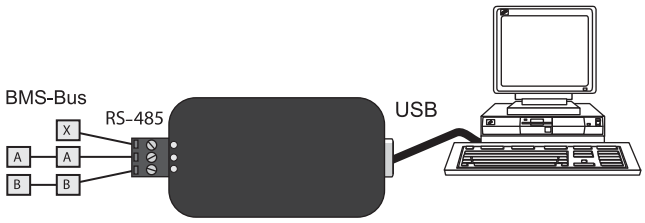
Application

- Conversion of USB interface into RS-485 interface
- Parameterisation of alarm indicator and operator panels (MK800, MK2430) utilising an RS-485 interface via PC utilising a USB interface by means of software

Function

Many PCs and work stations are equipped with USB interfaces. The DI-2USB interface converter is designed to connect these devices via a USB interface to the BMS bus using the RS-485 standard. The connected devices are protected against spikes by galvanic separation between the input and output circuit. Additional internal measures protect the device against voltage spikes. Driver for Windows 98, ME, 2000, XP, Linux (Kernel 2.4.18 and higher).

Wiring diagram (example)



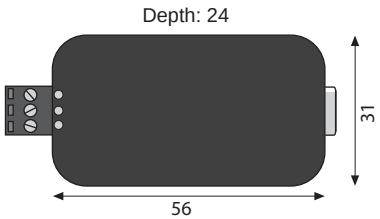
DI-2USB for the integration of a personal computer utilising a USB interface into a BMS network.

Note:

- BMS bus termination is required

Dimension diagram DI-2

Dimensions in mm



Ordering information

Type	Supply voltage	Art. No.
DI-2USB	supplied by USB port, no additional power supply required	B 9501 2045

*Absolute value

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
Recommended cable (shielded, shield connected to PE on one side)	min. J-Y(St)Y 2x0.6
Mode	--
Connection	A, B
Integrated terminating resistors, selectable via jumper, factory setting	terminating resistors included
Device address, BMS bus	--
Serial interface	1 x USB
Indication LEDs	ON (yellow) Data (green), T x Data (red)

General data

EMC immunity / EMC emission	EN 61000-6-2 / EN 61000-6-4
Classification of climatic conditions acc. to IEC 60721	
Stationary use / transport / long-time storage	3K5 / 2K3 / 1K4
Ambient temperature, operation	- 10 °C…+ 55 °C
Classification of mechanical conditions acc. to IEC 60721	
Stationary use / Transport / Long-time storage	3M4 / 2M2 / 1M3
Operating mode	continuous operation
Mounting	any position
Connection	screw-type terminals/USB plug Type B
Connection rigid /f lexible / conductor sizes	0.5…2.5 mm² / AWG 22…12
Screw mounting	2 x M3
DIN rail mounting acc. to	IEC 60715
Operating manual	manual of third-party manufacturer
Weight	≤ 25 g

Accessories
Protocol converters for standard fieldbus systems and Ethernet networks

Chapter 1.8.3

The FTC series protocol converters allow easy connection of Bender monitoring systems utilising a BMS bus to standard fieldbus systems.

Protocol converter FTC470XET

Protocol converter to interface the BMS bus with TCP IP via Ethernet

FTC470XET

Device features

- Display of BMS data via standard web browser
- Fast, simple parameterisation of Bender system settings in a central location
- Display of current operating and alarm messages and measured values
- Detailed information at a glance
- Display of historical data
- Useful data logger function
- OPC interface for communication with higher-level systems (building management systems or visualisation software)
- Easy installation and commissioning
- E-mail notification in case of alarm and system faults
- Remote maintenance and remote diagnosis per LAN, WAN or Internet
- Independent of hard and software

Product description

The protocol converter FTC470XET is designed to be used as Ethernet gateway with web server. The FTC470XET converts data from the BMS bus into TCP/IP protocol (Ethernet). In this way, data from BMS systems can be displayed on a personal computer via a web browser. Additional software need not to be installed.

Application

- Conversion of BMS data into TCP/IP protocol (Ethernet)
- Querying and setting Bender devices with communication possibilities, such as RCMS, EDS and MEDICS® systems
- Data transmission to building services management systems and visualisation systems via an integrated OPC interface.

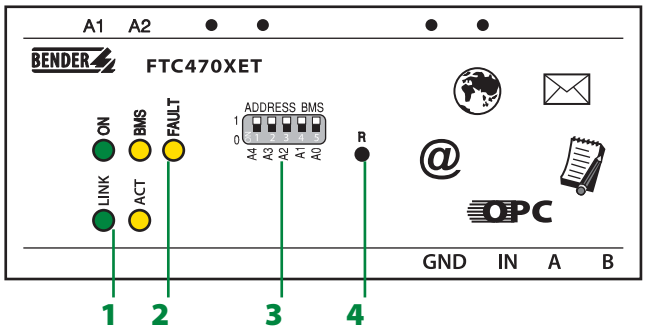
Function

The protocol converter FTC470XET can be integrated into existing EDP systems like a personal computer. After entering an IP address and connection to the network and to a BMS system, a standard web browser (e.g. Internet Explorer, Netscape Navigator) of a personal computer allows access to the entire data of a BMS system. In this way, all important measuring data of the system are directly available. The parameterisation of the Bender systems is protected by a password.

Standards, approvals and certifications

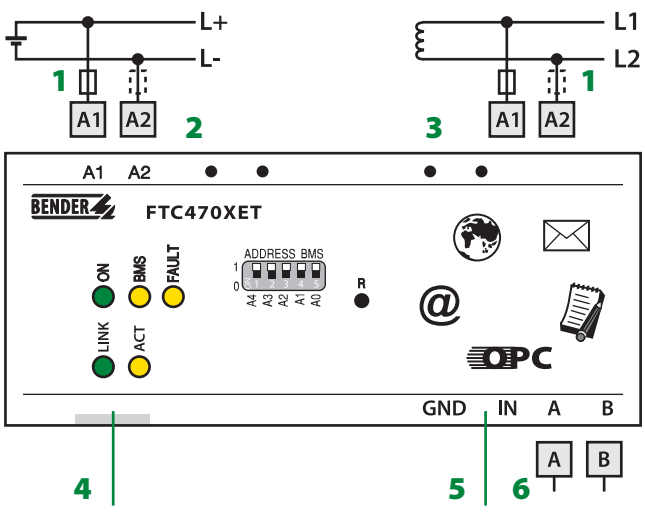
AE25

Operating elements



1 - Ethernet status indication "LINK"
2 - BMS bus status indication "FAULT"
3 - DIP switches for binary BMS bus address setting: 1…30
4 - Reset button "R"

Wiring diagram



1 - U_S see ordering information, 6 A fuse recommended
2 - System U_S = DC 85…276 V
3 - System U_S = AC 85…276 V
4 - Ethernet connection RJ45
5 - Digital input to restore factory settings
6 - BMS bus connection

1.8.3

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	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
Recommended cable (shielded, shield connected to PE on one side)	min. J-Y(St)Y 2x0.6
Modus	Master / Slave
Connection	terminals A/B
Terminating resistor	120 Ω (0.25 W)
Device address, BMS bus	DIP switch 1…30
Indication LEDs	ON/FAULT/BMS
Factory setting, device address	1

Ethernet

Interface/protocol	Ethernet 10-base-T/TCP/IP
Connection	RJ45
Baud rate	10 Mbit/s
Alarm LEDs	Link/Act

General data

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 °C…+55 °C
Classification of mechanical conditions acc. to IEC 60721	
Stationary use	3M4
Transport	2M2
Long-time storage	1M3
Operating mode	continuous operation
Mounting	any position
Connection	screw-type terminals
Connection properties	
rigid/flexible/conductor sizes	0.2…4 / 0.2…2.5 mm² /AWG 22-12
flexible with ferrule, without/with plastic sleeve	0.25…2 mm²
Stripping length	8 mm
Tightening torque	0.5 Nm
Degree of protection, internal components (IEC 60529)	IP30
Degree of protection, terminals (IEC 60529)	IP20
Type of enclosure / dimension diagram	X470
Screw mounting	2 x M4
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Operating manual	TGH1375
Weight	≤ 400 g

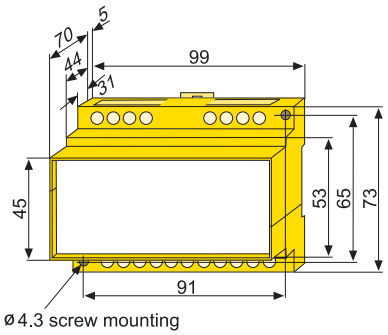
Ordering information

Type	Supply voltage U_S	Art. No.
FTC470XET	AC / DC 85…276 V*	B 9506 1001

*Absolute value

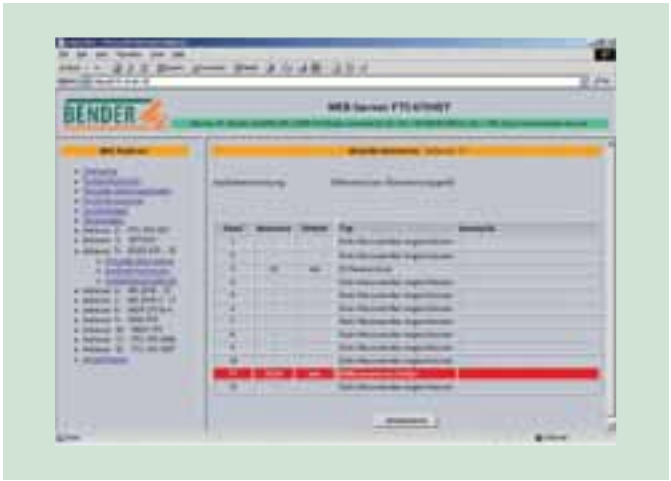
Dimension diagram X470

Dimensions in mm

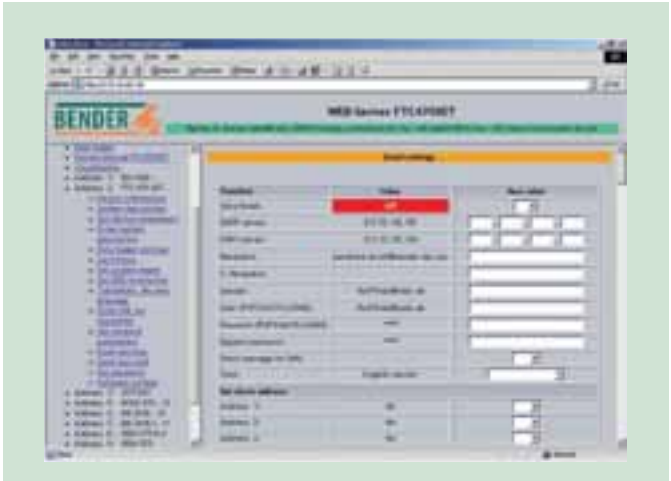


Visualisation of BMS data

FTC470XET display: currently measured values of a BMS device



FTC470XET display: E-mail function setting



1.8.3

Protocol converter FTC470XMB

Protocol converter to interface the BMS bus with Modbus RTU

FTC470XMB

Device features

- Modbus-RTU interface for communication with higher-level systems (building management systems or visualisation software)

Product description

The protocol converter FTC470XMB is designed to transmit data from the BMS bus to the Modbus RTU and vice versa. In this way, information from communication-capable Bender products, such as EDS, RCMS or MEDICS® systems can be integrated into a Modbus RTU system. Programming and adaptations on the Modbus RTU side have to be carried out by the user. In mode 1, up to 10 BMS-compatible Bender devices can be displayed with one FTC470XMB.

Application

- 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

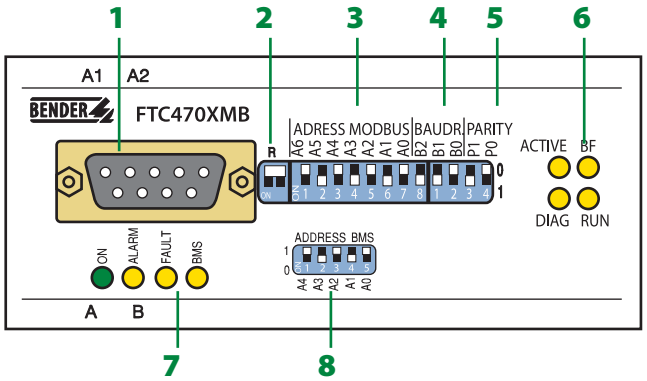
Function

The protocol converter FTC470XMB is incorporated into the Modbus RTU network as a slave and in a BMS system either as a master or a slave. The Modbus RTU master, e.g. a personal computer utilising a Modbus RTU interface or a PLC must be programmed in a way that the protocol converter is capable of triggering the respective requests and getting the replies. For appropriate programming, the user is required to have a thorough Modbus RTU knowledge. The entire command syntax is a component of the FTC470XMB operating manual.

Standards, approvals and certifications

AE25

Operating elements



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

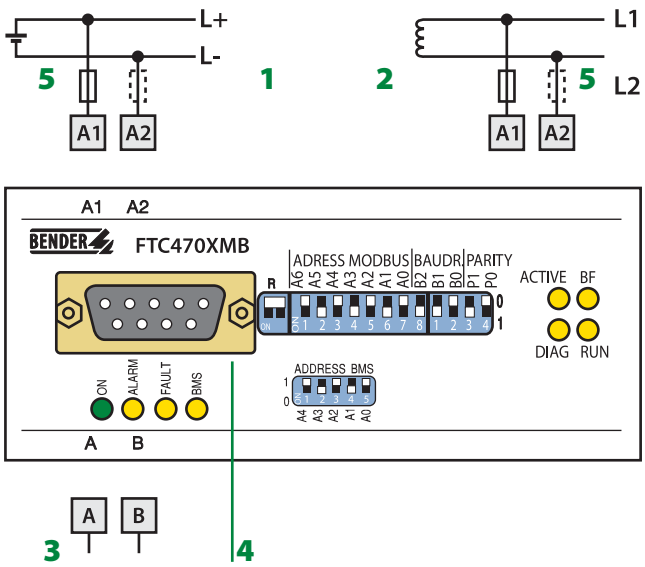
5 - DIP switches for binary parity setting of Modbus RTU: none/even/odd

6 - Modbus RTU status indication

7 - BMS bus status indication

8 - DIP switches for binary BMS bus address setting: 1…30

Wiring diagram



1 - System connection U_S = DC 85…276 V

2 - System connection U_S = AC 85…276 V

3 - BMS bus connection

4 - Modbus-RTU 9-pin SUB-D

5 - U_S see ordering information, 6 A fuse recommended)

1.8.3

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	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
Recommended cable (shielded, shield connected to PE on one side)	min. J-Y(St)Y 2x0.6
Modus	Master / Slave
Connection	terminals A/B
Terminating resistor	120 Ω (0.25 W)
Device address, BMS bus	DIP switch 1…30
Indication LEDs	ON / Alarm / FAULT / BMS

Modbus

Interface / protocol	RS-485 / Modbus RTU
Mode	Modbus RTU slave
Connection	9-pin SUB-D
Indication LEDs	Active/bus error/Diag/Run
Baud rate	1.2…57.6 kbit/s
Terminating resistor	DIP switch
Address assignment Modbus RTU	DIP switches 1…127

General data

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 °C…+55 °C
Classification of mechanical conditions acc. to IEC 60721	
Stationary use	3M4
Transport	2M2
Long-time storage	1M3
Operating mode	continuous operation
Mounting	any position
Connection	screw-type terminals
Connection properties	
rigid/flexible/conductor sizes	0.2…4 / 0.2…2.5 mm² / AWG 22-12
flexible with ferrule, without/with plastic sleeve	0.25…2 mm²
Stripping length	8 mm
Tightening torque	0.5 Nm
Degree of protection, internal components (IEC 60529)	IP30
Degree of protection, terminals (IEC 60529)	IP20
Type of enclosure / dimension diagram	X470
Screw mounting	2 x M4
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Operating manual	TGH1367
Weight	≤ 360 g

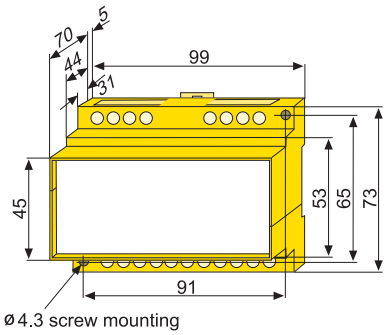
Ordering information

Type	Supply voltage U_S	Art. No.
FTC470XMB	AC / DC 85…276 V*	B 9506 1002

*Absolute value

Dimension diagram X470

Dimensions in mm



1.8.3

Protocol converter FTC470XDP

Protocol converter to interface the BMS bus to the PROFIBUS DP

FTC470XDP

Device features

- PROFIBUS-DP interface for communication with higher-level systems (building management systems or visualisation software)

Product description

The protocol converter FTC470XDP is designed to transmit data from the BMS bus to the PROFIBUS DP and vice versa. In this way, information from communication-capable Bender products, such as EDS, RCMS or MEDICS® systems can be integrated into a PROFIBUS DP system. Programming or adaptations on the PROFIBUS DP side have to be carried out by the user.

Application

- Converting BMS data into PROFIBUS DP data
- Querying and setting Bender devices with communication possibilities, such as RCMS, EDS and MEDICS® systems
- Transmitting all BMS data to PROFIBUS DP
- Displaying Bender data on PROFIBUS-compatible software
- Reactions on the PROFIBUS side to BMS events
- Connection to PROFIBUS-compatible building services management systems
- Reactions on the BMS side to events on the PROFIBUS DP side

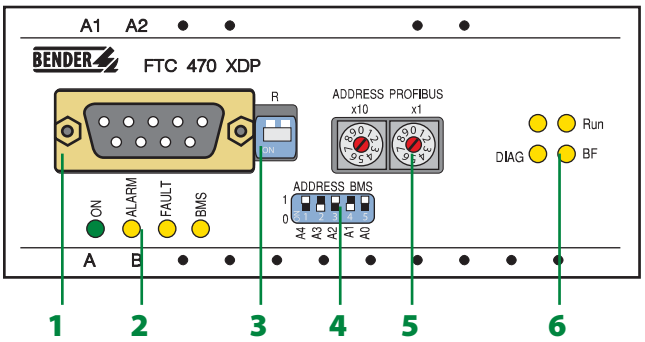
Function

The protocol converter FTC470XDP is incorporated into the PROFIBUS DP system as a slave and into a BMS system either as a master or a slave. The PROFIBUS DP master, e.g. a personal computer utilising a PROFIBUS card or a PLC must be programmed in a way that the protocol converter is capable of triggering the respective requests and getting replies. For appropriate programming, the user is required to have a thorough PROFIBUS DP knowledge. The necessary documentation together with the entire command syntax is a component of the FTC470XDP manual.

Standards, approvals and certifications

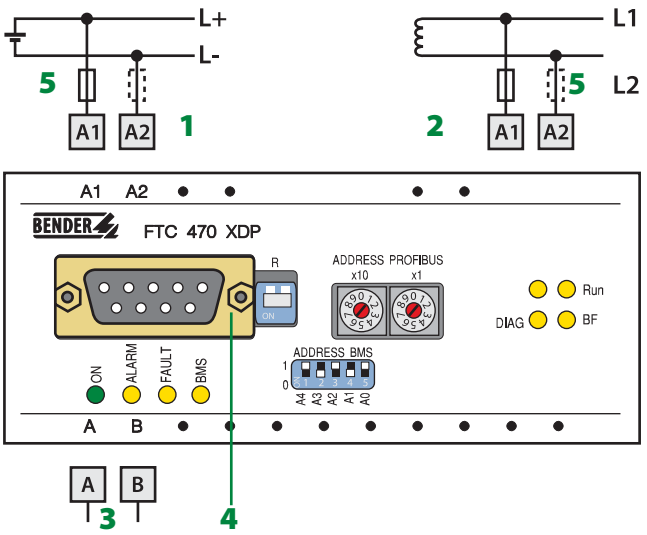
AE25

Operating elements



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
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



1 - System connection U_S = DC 85…276 V
2 - System connection U_S = AC 85…276 V
3 - BMS bus connection
4 - PROFIBUS DP 9-pin SUB-D
5 - U_S, see ordering information, 6 A fuse recommended

1.8.3

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	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
Recommended cable (shielded, shield connected to PE on one side)	min. J-Y(St)Y 2x0.6
Modus	Master / Slave
Connection	terminals A/B
Terminating resistor	120 Ω (0.25 W)
Device address, BMS bus	DIP switch 1…30
Indication LEDs	ON / Alarm / FAULT / BMS

PROFIBUS DP

Interface / protocol	RS-485 / PROFIBUS-DP
Mode	PROFIBUS DP slave
Connection	9-pin SUB-D
Indication LEDs	Run / Diag / 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

General data

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 °C…+55 °C
Classification of mechanical conditions acc. to IEC 60721	
Stationary use	3M4
Transport	2M2
Long-time storage	1M3
Operating mode	continuous operation
Mounting	any position
Connection	screw-type terminals
Connection properties	
rigid/flexible/conductor sizes	0.2…4 / 0.2…2.5 mm² / AWG 22-12
flexible with ferrule, without/with plastic sleeve	0.25…2 mm²
Stripping length	8 mm
Tightening torque	0.5 Nm
Degree of protection, internal components (IEC 60529)	IP30
Degree of protection, terminals (IEC 60529)	IP20
Type of enclosure / dimension diagram	X470
Screw mounting	2 x M4
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Operating manual	TGH1358
Weight	≤ 360 g

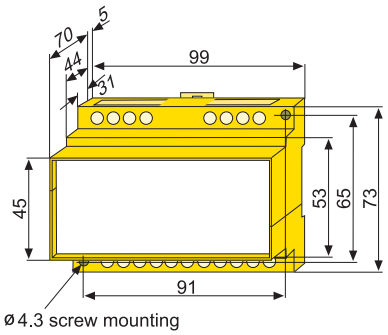
Ordering information

Type	Supply voltage U_S	Art No.
FTC470XDP	AC / DC 85…276 V*	B 9506 1000

*Absolute value

Dimension diagram X470

Dimensions in mm



1.8.3

Accessories
Alarm indicator and operator units

Chapter 1.8.4

Bender alarm indicator and operator units are used for on-site indication of operating status and alarm messages from Bender monitoring systems via LC display or a graphical display.

Remote alarm indicator and test combination MK800

Remote alarm indicator and test combination for Bender monitoring systems with BMS bus capability

MK800-… with surface-mounting enclosure

Device features

- Display of operating, 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 messages to be indicated in an order of priority
- 80 predefined standard texts in 20 languages
- 1000 freely programmable message texts
- Easy parameter setting with PC (USB interfaces) 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, approvals and certifications

Product description

The universal MK800 remote alarm indicator and test combination is used for

- indication and visualisation of operating status and alarm messages
- central operation and parameter setting of BMS bus devices
- indication and visualisation of operating status and alarm messages
- displaying measured values and setting of response values for monitoring purposes

from Bender monitoring systems with BMS-bus capability, such as MEDICS®, RCMS or EDS. The MK800 is available for flush and surface mounting. The flush-mounting version is suitable for cavity wall or door mounting. The appropriate cover frames are available in different colours.

Function

On its backlit display, the MK800 displays messages from all BMS-bus devices assigned via alarm addresses. As well as being used as a standalone indicator, the MK800 also supports parallel indication. In the event of an alarm message, the yellow warning LED or the red alarm LED lights up and the message appears on the LC display in plain text format. An additional text button allows three additional text lines to be displayed to each alarm message (for example, instructions what to do). At the same time, there is an audible signal the frequency and interval of which can be set accordingly to distinguish different alarms. The audible alarm is acknowledgeable and sounds again once a configurable period of time has elapsed. If a second message is received whilst the first is still pending, the audible signal will sound again and the messages will flash up alternately on the LC display.

The MK800 provides a test button to check the operation of an assigned A-ISOMETER® 107TD47 or IRDH. The test is carried out sequentially and evaluated automatically. A message is indicated only on that MK800 the test button of which was pressed - in this way other areas will not be disturbed.

The MK800 can be used as a master device in all BMS systems.

Display/ operating elements

The MK800 backlit LC text display features four lines of 20 characters (8 mm high). It supplies medical and technical personnel with information that is always clear and unambiguous, in order to help them to make decisions. Every alarm message comprises three lines which appear spontaneously and three additional lines which can be displayed at the touch of a button. This additional text provides further information, e.g. instructions what to do in this case of fault. The fourth line contains status information, such as number of messages, test procedures or menu information.

Three LEDs in different colours are located below the text display which allow to distinguish between warning and alarm messages.

Five illuminated large buttons are available for operating the MK800. These buttons provide the following functions:

- Acknowledgement of acoustic alarms
- Functional test of assigned ISOMETER®
- Lamp test
- Scrolling alarm textes and messages
- MK800 parameter setting

Parameter setting

The memory of the MK800 provides 80 predefined alarm texts in 20 languages, therefore parameters can easily be set via the function buttons of the MK800. That means, a personal computer is not required for commissioning.

The intuitive, user-friendly TMK-Set PC software also allows individual texts to be programmed and assigned to 1000 individual messages via USB interface or the external BMS bus. A warning or alarm LED as well as an acoustic signal can be assigned to each message.

History memory

Warning and alarm messages with date and time stamp are automatically stored in the memory as well as analogue values with maximum and minimum values. This guarantees reproducibility at all times. Up to 1000 messages are stored. The data of the history memory can be displayed directly on the MK800.

The history memory can be read out via the TMK-History software which also provides clear data analysis.

Digital inputs/ relay output (option MK800-11)

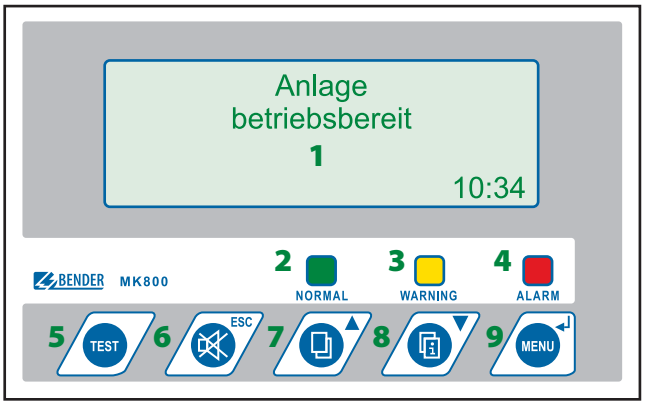
16 digital inputs are available allowing messages from third-party systems to be displayed. The digital inputs are designed for voltages of AC/DC 0…30 V, in practice these inputs are controlled by potential-free contacts. The logic of these inputs can be set as required.

For test functions, device errors, device failure or common alarms, a programmable relay is available.

Standards

The MK800 alarm indicator and test combination meets the requirements for installation: IEC 60364-7-710.

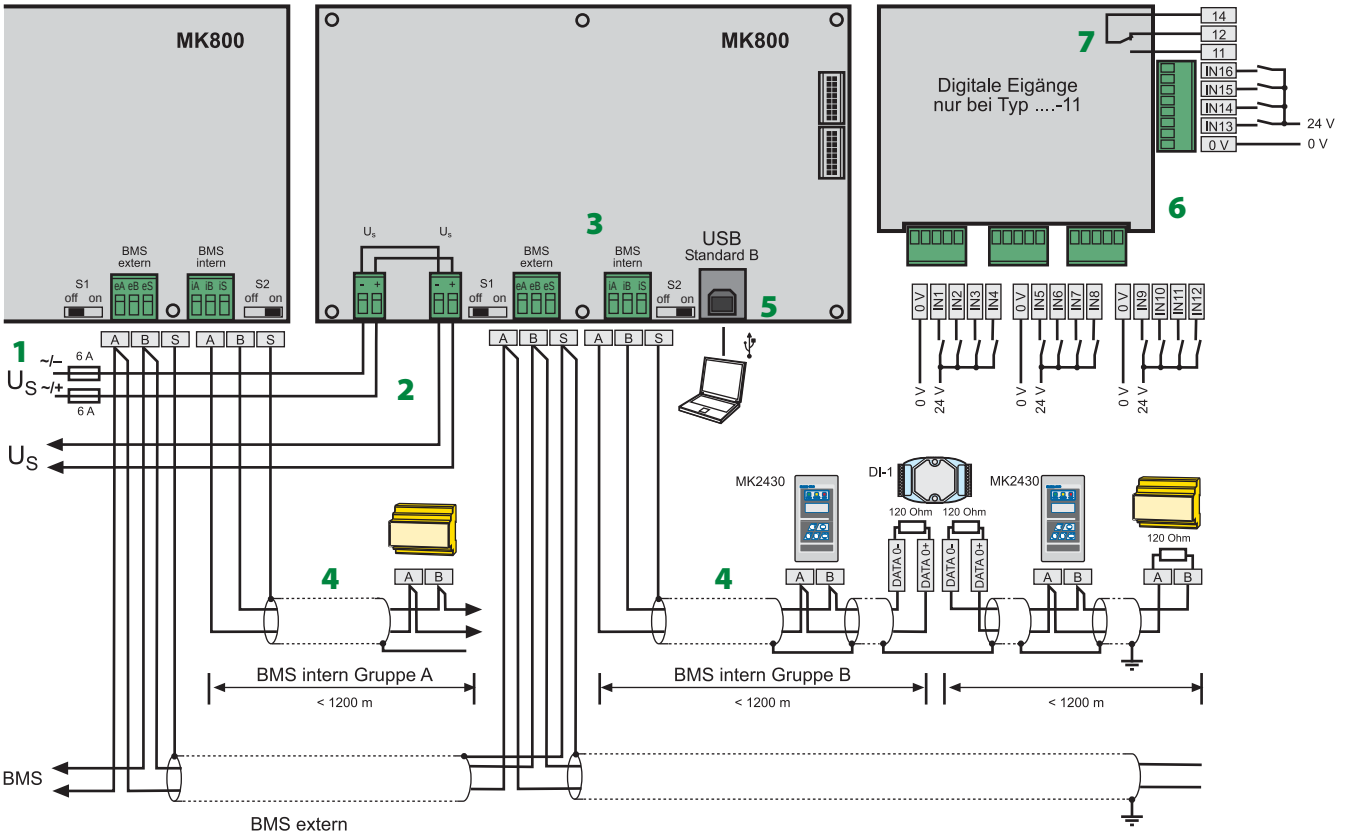
Operating and display elements



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 - Buzzer mute: 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 - Additional 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

1.8.4

Wiring diagram



1 - Supply voltage U_S

2 - Looped through connection for supply voltage (e.g. for control voltage, relay contacts)

3 - Switches S1, S2 for BMS bus termination (terminating resistor 120 Ω)

4 - Wiring between the MK800 and devices with BMS-bus capability

5 - USB connection for programming

6 - Digital inputs
The digital inputs either have to be activated via potential free contacts or via 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

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	AC / DC 24 V
Frequency range U_S	AC 40…60 Hz / DC
Operating range U_S	AC 18…28 / DC 18…30 V
Power consumption	≤ 5 VA

Displays and LEDs

Display, characters, four lines	4 x 20 characters
Standard message texts in	20 languages
Alarm addresses	< 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, adoption of characteristics of new value
Buzzer interval	configurable
Buzzer frequency	configurable
Buzzer repetition	configurable

Inputs (option) (MK800-11 only)

Digital inputs	16 (IN1…IN16)
Galvanically isolated	
Control of digital inputs via voltage-free contacts/ extraneous voltage	
Operating principle N / O or N / C operation / Off can be selected 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 kBi t/ s / 57.6 kbit / s
Cable length	≤ 1200 m
Recommended cable (shielded, shield connected to PE on one side)	min. J-Y(St)Y 2x0.6
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)/1 (master)

Programming

Interfaces	RS-485 / BMS / USB
Software TMK-SET	V 3.0 and higher
Factory setting password query	activated

Cable length when the power supply for the MK800 is taken from AN450

0.28 mm²	50 m
0.5 mm²	90 m
0.75 mm²	150 m
1.5 mm²	250 m
2.5 mm²	400 m

Colours

Front foil	RAL 7035 (light grey) / RAL 7012 (basalt grey)
Marking buttons	RAL 5002 (ultramarine blue): RAL 7035 (light grey)
Front plate	RAL 7035 (light grey)

Switching elements

Number	1 (MK800-11 only)
Operating principle	N/C or N/O operation (programmable)
Electrical endurance, number of cycles	10.000
Contact data acc. to IEC 60947-5-1	
Utilisation category	AC-13 AC-14 DC-12
Rated operational voltage	24 V 24 V 24 V
Rated operational current	5 A 3 A 1 A
Minimum contact rating	1 mA at AC / DC > 10 V

General data

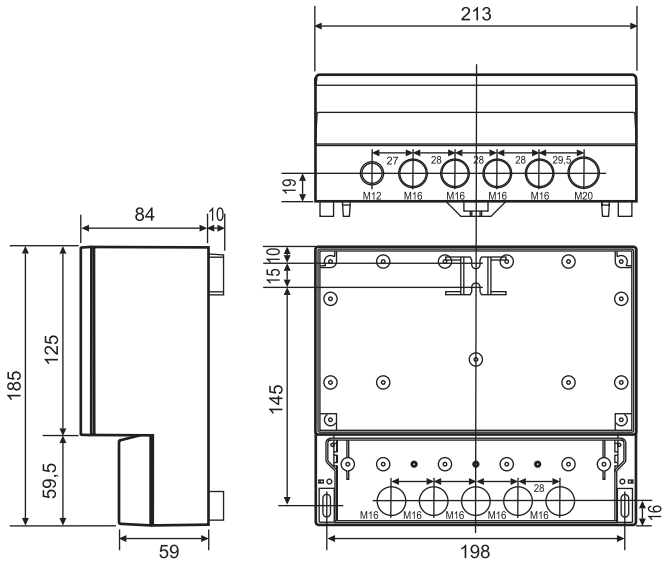
EMC immunity	EN 61000-6-2
EMC emission	EN 61000-6-4
Operating temperature	- 5…+ 55 °C
Classification of climatic conditions acc. to IEC 60721	
Stationary use	3K5
Transport	2K3
Storage	1K4
Classification of mechanical conditions acc. to IEC 60721	
Stationary use	3M4
Transport	2M2
Storage	1M3
Operating mode	continuous operation
Mounting	display-oriented
Connection	plug-in terminals
Connection properties (supply voltage, BMS bus)	
rigid / flexible / conductor sizes	0.2…2.5 / 0.2…2.5 mm²/ AWG 24-12
flexible with ferrule without/with plastic sleeve	0.25…2.5 / 0.25…2.5 mm²
Connection properties (inputs)	
rigid / flexible / conductor sizes	0.08…1.5 / 0.08…1.5 mm²/ AWG 28-16
flexible with ferrule without / with plastic sleeve	0.25…1.5 / 0.25…0.5 mm²
Stripping length	7 mm
Tightening torque	0.5…0.6 Nm
Degree of protection, internal components (IEC 60529)	IP50
Degree of protection, terminals (IEC 60529)	IP20
Flammability class	UL94 V-0
Operating manual	TGH1408
Weight	
Flush-mounting (MK800)	< 950 g
Surface mounting (MK800A)	< 880 g
Surface mounting (MK800AF)	< 1150 g

1.8.4

Ordering information			
Type	**Digital inputs**	**Enclosure**	**Art. No.**
MK800-11	16	Flush-mounting enclosure	B 9510 0100
MK800-12	--	Flush-mounting enclosure	B 9510 0101
MK800A-11	16	Surface mounting	B 9510 0102
MK800A-12	--	Surface mounting	B 9510 0103
MK800AF-11	16	Surface mounting, front door	B 9510 0104
MK800AF-12	--	Surface mounting, front door	B 9510 0105
MK800E-11	16	Built-in type device without enclosure	B 9510 0106
MK800E-12	--	Built-in type device without enclosure	B 9510 0107
UP800	--	Flush-mounting enclosure for MK800	B 9510 0110
BR800-1	--	Bezel frame silver for MK800	B 9510 0111
BR800-2	--	Bezel frame white for MK800	B 9510 0112
TMK-SET V3.xx	Software	as download or CD	B 9602 0087

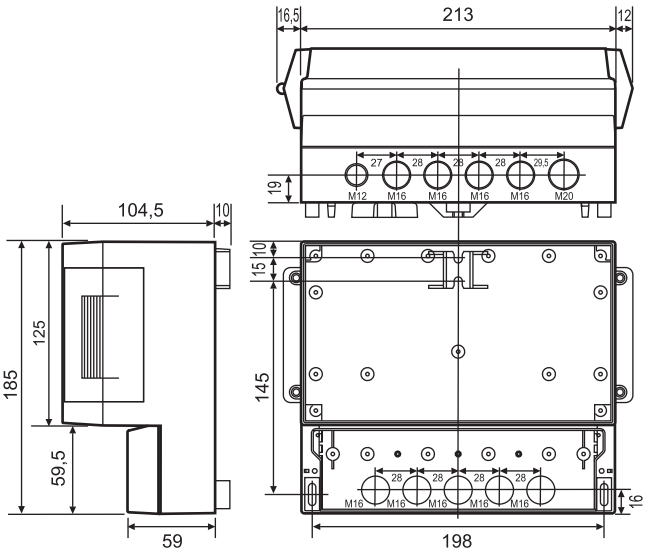
Dimension diagram MK800A-11 / MK800A-12, surface mounting enclosure

Dimensions in mm



Dimension diagram MK800AF-11 / MK800AF-12, surface mounting enclosure with door

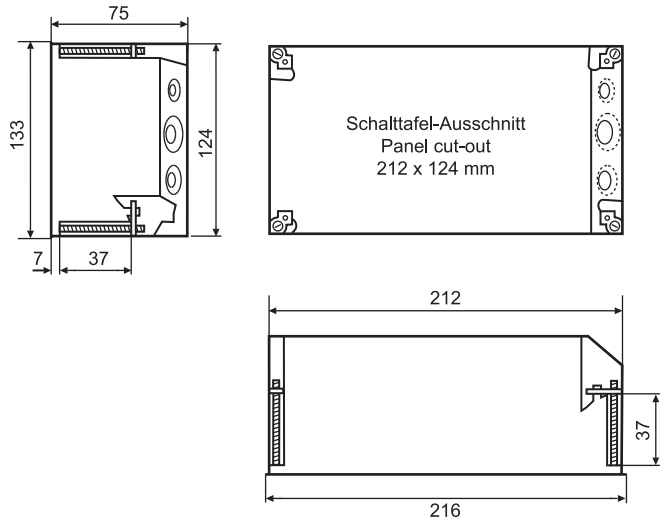
Dimensions in mm



1.8.4

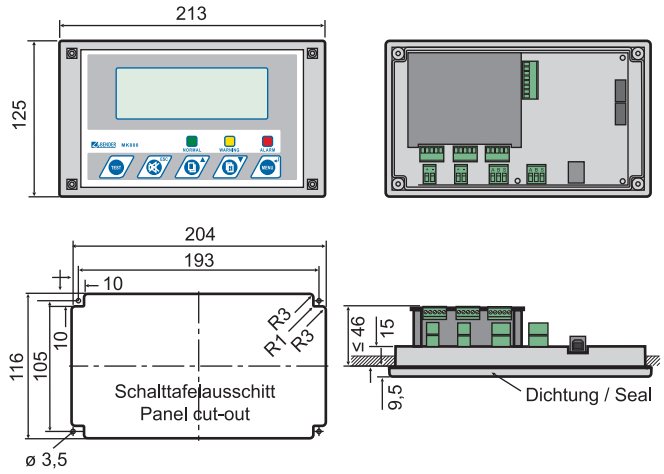
Dimension diagram flush-mounting enclosure UP800

Dimensions in mm



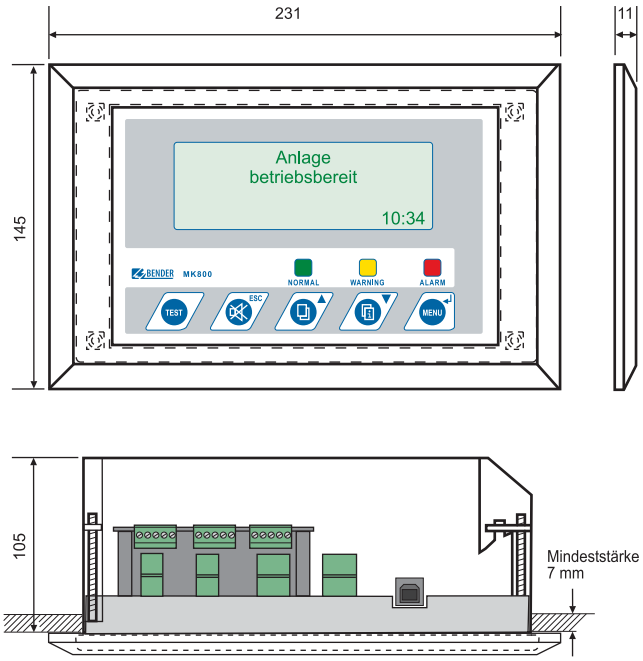
Dimension diagram MK800-11 / MK800-12, example: door mounting

Dimensions in mm



Dimension diagram MK800-11 / MK800-12 with bezel frame BR800 and UP800 flush-mounting enclosure, example: cavity wall mounting

Dimensions in mm



1.8.4

Touch Panel TPC

for the visualisation of Bender systems

Touch Panel TPC

Device features

- The Touch PC allows easy visualisation of Bender monitoring systems
- Application-specific data representation
- Different unit sizes
- Fanless cooling system
- IP65-compliant front plate
- Flat and compact design (max. 50 mm)
- Offer of service: programming

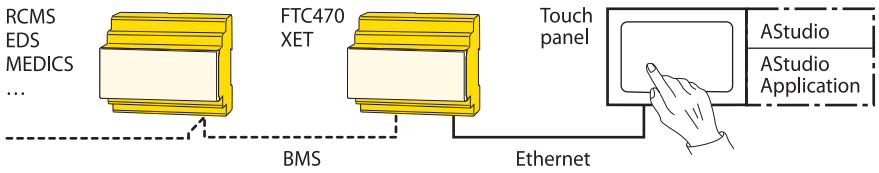
Product description

Data from Bender systems with BMS interface can be visualised by means of the Touch Panel. Bender favours the use of Advantech Touch Panels. These PCs are equipped with a resistive touch screen and are available in screen sizes of 5.7", 12" and 15". The 5.7" version is based on the Windows CE operating system. Larger screen sizes are optionally equipped with Windows CE or Windows 2000. All Touch PCs provide an Ethernet adapter, serial interfaces and a runtime version of the visualisation software Advantech Studio.

Communication structure

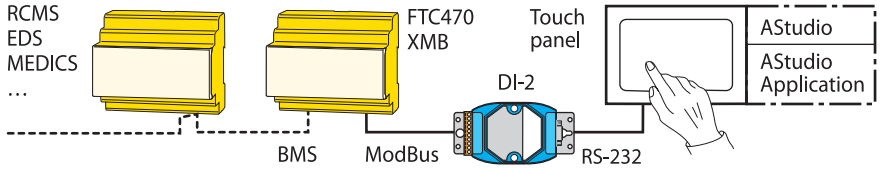
There are several ways of exchanging data between Bender systems and Touch PCs.

a) Protocol converter / web server FTC470XET



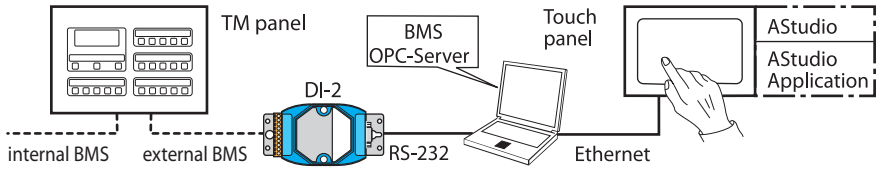
Alarms and measured values from Bender systems are passed to the internal OPC server which makes them available as OPC items. The software AStudio installed on the Touch PC contains an OPC client which receives the data from the OPC server. The graphics module AStudio allows plant-specific data representation.

b) Protocol converter FTC470XMB



Alarms and measured values from Bender systems are converted into a Modbus RTU protocol and are stored in the registers of the FTC470XMB. In this way, one FTC470XMB can display data of 10 BMS compatible Bender devices. The software AStudio incorporated in the Touch PC contains a Modbus RTU driver which, as a master, is capable of reading out data from the respective registers of the FTC470XMB. The graphics module AStudio allows plant-specific data representation. The protocol converter DI-2 is used for RS-485/ RS-232 conversion.

c) BMS OPC server



The BMS OPC server is installed on a PC as software and conneccted to the Bender system via the DI-2 interface converter. Controlled by a configuration file, the OPC server only provides alarms from the external bus of the Bender system as OPC items. The software AStudio installed on the Touch PC contains an OPC client which receives the data from the OPC server. The graphics module AStudio allows plant-specific data representation.

Note: The BMS OPC server can directly be installed on a Touch PC based on Windows 2000 operating system; a separate PC is not required.

Programming of visualisation

Your Bender system will only become "visible" when a plant-specific application has been created. This application is created on a computer using a development version of Advantech Studio. Bender offers the service to create a plant-specific application. A Runtime version of the visualisation software Advantech Studio is required (included in the scope of delivery) to run the visualization on the Touch PC. Depending on the BMS system to be visualised, you can determine the number of application tags required for your Bender system. Typical are versions of 512, 1500 or 4000 tags. Contact your Bender adviser to determine the appropriate number of application tags.

Programming check list

The visualisation of a Bender system is not offered as a standard product with a specified scope of performance and price, it must be specifically configured to meet the needs of the individual application. During the projecting stage of visualisation, the Bender service department will assist you starting from the first planning to the creation of a customer-specific application. The most important questions to be answered:

- Internal or external BMS bus
- Number and type of all connected BMS-capable Bender devices
- Bender device address assignment
- Selection of the appropriate gateway
- Gateway configuration
- Determination of the number of application tags required
- Selection of the Touch PC (5.7",12 or 15") and the appropriate operating system
- Selection of the AStudio Runtime version based on the number of application tags
- Determination of suitable additional components, such as hubs or switches and cables
- Design of an application-specific representation

Product overview

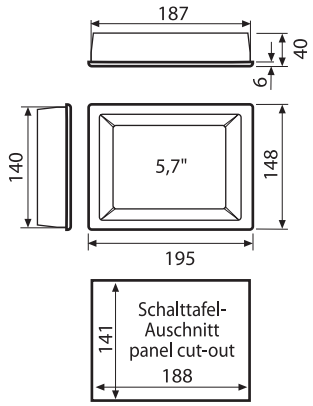
Type	Size	Resolution
TPC-60S	5.7"	QVGA color STN LCD
TPC-1260T	12.1"	SVGA TFT LCD
TPC-1560	15"	XGA TFT LCD
AStudio Runtime		512 tags
AStudio Runtime		1500 tags
AStudio Runtime		4000 tags

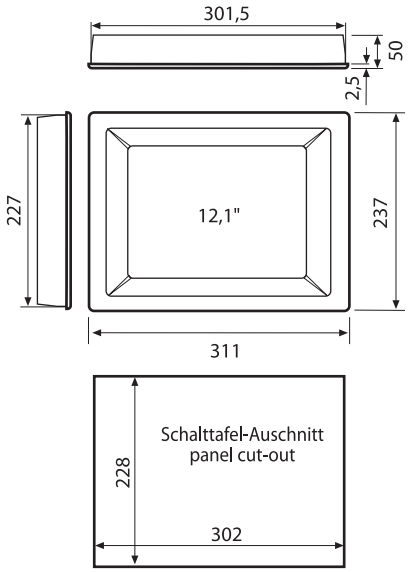
Technical data

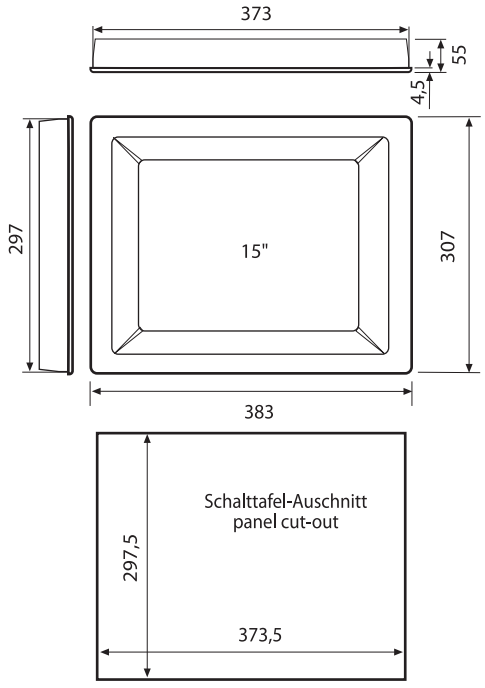
	TPC-60S	TPC-1260T	TPC-1560T
Display size	5.7"	12.1"	15"
Colours	256	256	256
Resolution	320 x 240	800 x 600	1024 x 768
Interfaces	3 serial ports	4 serial ports	3 serial ports
	1 RS-232	1 configurable	1 configurable
		RS-422 / 485	RS-422 / 485
	14-pin RS-232		
	1 RS-485	1 parallel port	1 parallel port
	1 Ethernet port	1 Ethernet port	1 Ethernet port
	(10 / 100Base-T)	(10 / 100Base-T)	(10 / 100Base-T)
	2 USB ports	2 USB ports	2 USB ports
		2 PS/2 ports	2 PS/2 ports
Weight	0.8 kg	2.2 kg	3.8 kg
Ambient temperature	0…+50 C°	0…+50 C°	0…+50 C°
Supply voltage	DC 24V, 0.5 A	DC 24 V, 0.8 A	DC 24 V, 2 A

Dimension diagrams

Dimensions in mm







1.8.4

Accessories
Visualisation

Chapter 1.8.5

There are several ways to visualise data from Bender monitoring systems. There is a wide range of visualisation tools ranging from comprehensive SCADA software to visualisation via a standard web browser.

Axeda Supervisor

Software for the visualisation of data from Bender systems

Axeda Supervisor

Device features

- Easy representation of Bender monitoring systems on standard computers (PC)
- Application-specific graphic visualisation
- Presentation in website format
- Extensive alarm handling
- Alarm lists, history memory, diagrams
- Customer-specific programming services

Product description

Axeda Supervisor is a powerful software for the visualisation of Bender systems utilising a BMS interface via gateways on a standard PC. For this purpose, the computers are equipped with a runtime version of the Axeda Supervisor software. Suitable gateways are FTC470XET, FTC470XMB and the BMS OPC server. Axeda Supervisor runs under the operating systems Windows NT, Windows 2000 und Windows XP Professional.

There are different versions of Axeda Supervisor available:

- Demo version
- System Integrator Kit with a two-hour development time
- Development versions for 100, 300, 500, 2000,10000 and 65000 tags
- Runtime versions for 100, 300, 500, 2000,10000 and 65000 tags

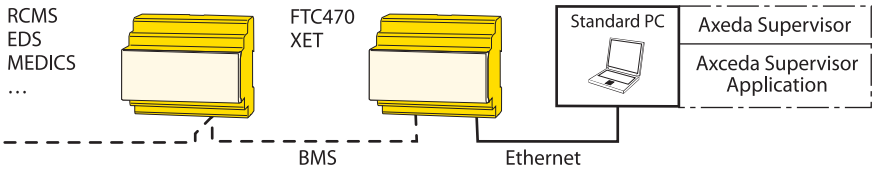
The version is determined via a dongle for USB or the parallel port.

It can also be run on a Touch Panel.

Communication structure

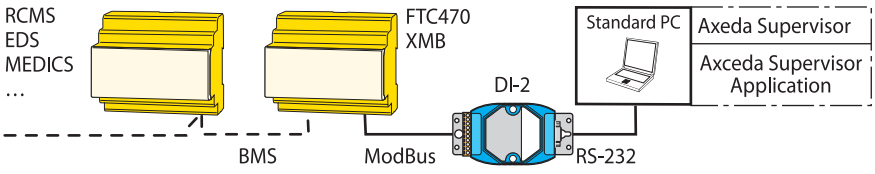
Suitable data sources are Bender gateways FTC470XET, FTC470XMB and the BMS OPC server.

FTC470XET:
Alarms and measured values from Bender systems are passed to the internal OPC server which makes them available as OPC items. The software Axeda Supervisor installed on the PC contains an OPC client which receives the data from the OPC server. The graphics module of Axeda Supervisor allows application-specific data representation.

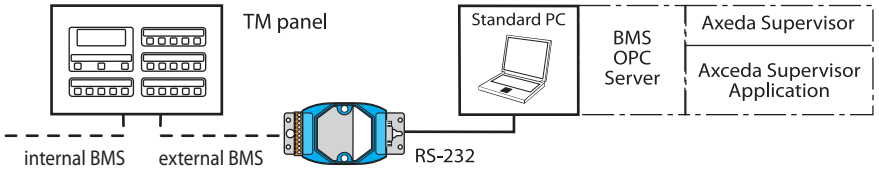


FTC470XMB:
Alarms and measured values from Bender systems are converted into a Modbus RTU protocol and are stored in the registers of the FTC470XMB. In this way, one FTC470XMB can display data of 10 BMS-capable Bender devices.

The software Axeda Supervisor installed on the PC contains a Modbus RTU driver which, as a Modbus master, is capable of reading out data from the respective registers of the FTC470XMB. The graphics module of Axeda Supervisor allows application-specific data representation.



BMS OPC server:
The BMS OPC server is installed on a PC as software and connected to the Bender system via the DI-2 interface converter. Controlled by a configuration file, the OPC server only provides alarms from the external bus of the Bender system as OPC items. The software Axeda Supervisor installed on the PC contains an OPC client which receives the data from the OPC server. The graphics module of Axeda Supervisor allows application-specific data representation.



1.8.5

Programming check list

The visualisation of a Bender system is not offered as a standard product with a specified scope of performance and price. However, for each case, application-specific configuration is required.

During the projecting stage of visualisation, the Bender service department will assist you starting from the first planning to the creation of a customer-specific application. The most important questions to be answered:

- Internal or external BMS bus
- Number and type of all connected BMS-capable Bender devices
- Bender device address assignment
- Selection of the appropriate gateway
- Gateway configuration
- Determination of the number of application tags required
- Selection of the PC and the appropriate operating system
- Selection of the Axeda Supervisor version based on the number of application tags
- Determination of suitable additional components, such as hubs or switches and cables
- Design of an application-specific representation
- Price calculation

Product overview	
Type	
Axeda	Demo version
Axeda	System Integrator Kit with a two-hour development time
Axeda development versions	
100 tags	
300 tags	
500 tags	
2000 tags	
10000 tags	
65000 tags	
Axeda Runtime versions	
100 tags	
300 tags	
500 tags	
2000 tags	
10000 tags	
65000 tags	
Scope of delivery:	CD, Dongle
System requirements:	Windows 2000, XP
	• Intel or compatible processor providing at least 1 GHz clock frequency
	• At least 256 MB RAM
	• 500 MB of free hard disk space
	• CD Rom or DVD drive
	• Graphics card providing a storage space of 8 MB at least
	• Screen resolution of 800 x 600 pixels or higher
	• USB or printer connection for the dongle

Typical display

1.8.5

Accessories
Measuring transducers– Measuring instruments – Mounting kits

Chapter 1.8.6

Measuring transducer RK170

Measuring transducer RK170

Device features

- Plastic enclosure for DIN rail mounting
- Zero setting 0 or 4 mA
- Electrical separation between the input and output signal

Product description

The measuring transducer RK170 is designed to convert current signals of measuring instrument outputs of A-ISOMETER®s (0…400 µA) and residual current monitors (RCM, RCMA) into standard current signals 0(4)…20 mA or into voltage signals (0…10 V). These currents and voltages are usually required in process technology.

Application

- Conversion of DC 0…400 µA current signals into 0(4)…20 mA or 0…10 V signals
- For A-ISOMETER®s and residual current monitors RCM, RCMA with measuring instrument output of DC 0…400 µA

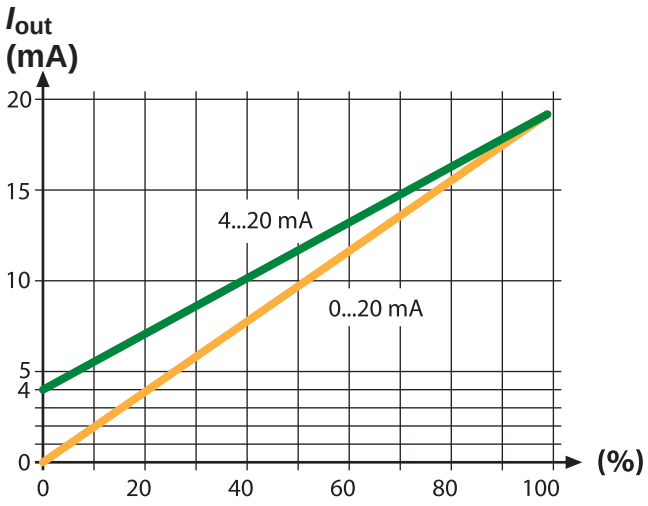
RK170 adjustments

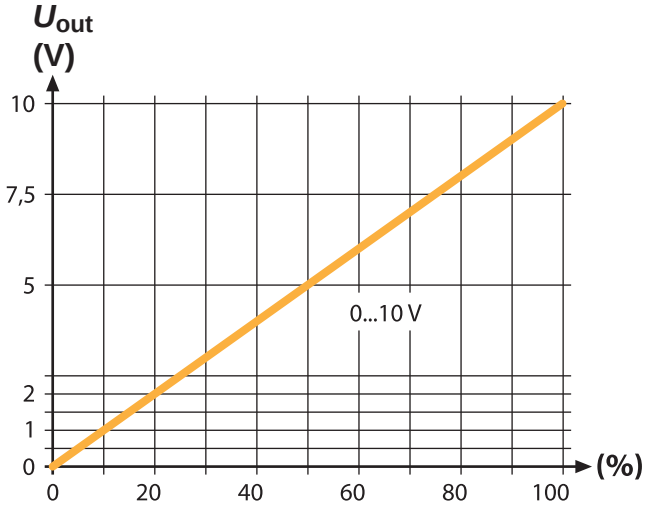
The signals at the outputs 0(4)…20 mA and 0…10 V are simultaneously available and their own nominal load must not be exceeded.

Setting the zero and the full-scale value will have an effect on both outputs. Hence, optimum adjustment is only possible for one output at a time.

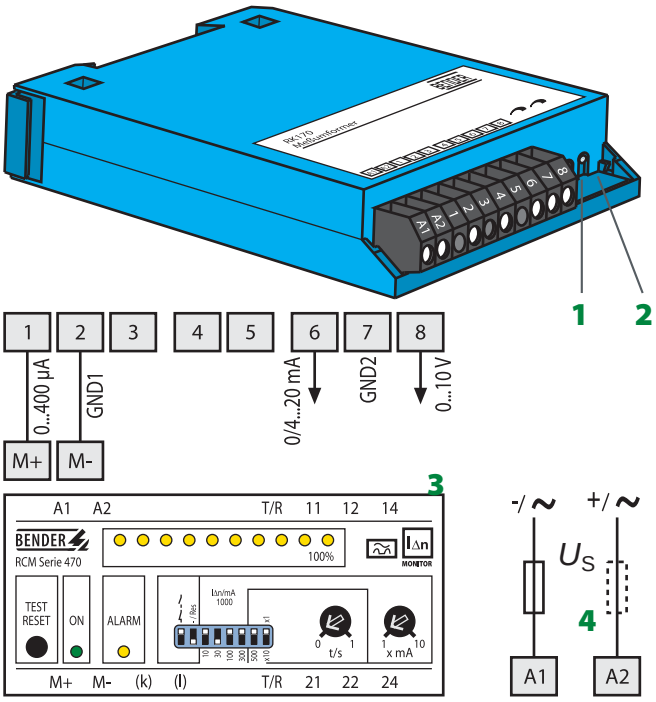
The measuring transducer RK170 is factory-set to an input signal of DC 0…400 µA providing a galvanically isolated output signal of 0…20 mA or 0…10 V. When an output signal of 4…20 mA is required or the measuring transducer RK170 is to be adjusted for other reasons, the adjustment can be carried out using the trimmers "Zero" and "Scale".

Characteristic curve





Wiring diagram



1 - Zero: zero setting
2 - Scale: full-scale value calibration
3 - RCM series device
4 - U_S see nameplate, 2 A slow-blow fuse recommended

Ordering information

Type	Supply voltage U_S	Art. No.
RK170	AC 19…264 V* / DC 20…297 V*	B 9804 1500

*Absolute value

1.8.6

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 µA
Max. permissible current	DC 4 mA
Rated input resistance	approx. 2.5 kΩ

Outputs

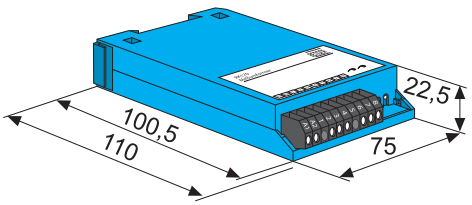
Outputs	two outputs with common ground
Voltage output	DC 0 … 10 V
Open-circuit voltage	DC 12 V
Rated burden	1 kΩ
Current output	DC 0 / 4…20 mA
Short-circuit current	≤ DC 50 mA short-circuit proof
Rated burden	500 Ω
Accuracy at T_u = 23 °C	class 0.5
Temperature coefficient	0.025 % / °C
Rated rise time T 0.9	50 ms
Dielectric strength input/output/supply	AC 2500 V

General data

Shock resistance IEC 60068-2-27 (during 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 °C…+50 °C
Ambient temperature (during storage)	-20 °C…+70 °C
Climatic class acc. to IEC 60721-3-3	3K3
Operating mode	continuous operation
Mounting	any position
Connection type	modular terminals
Connection properties rigid / flexible	0.5…2.5 mm² / 0.14…1.5 mm²
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

Type of enclosure/dimension diagram

Dimensions in mm



1.8.6

Measuring instruments 9604 / 7204 / 7220 / 9620

Measuring instruments 9604 / 7204 / 9620

Measuring instruments 9604-4241

Device features

- Dimensions: 72 x 72 mm (7204) or 96 x 96 mm (9604 / 9620)
- Version S for increased shock and vibration resistance
- Scale background: white, imprint: black

Product description

The analogue measuring instruments of the 9604 7204 series are designed for indication of measured values from Bender devices equipped with the appropriate current output.

Measuring instruments for A-ISOMETER®

The respective internal resistance of the insulation monitoring device has to be considered. The internal resistance must be equal to the scale centre point (e.g. 120 kΩ). The instruments utilize either a division scale or a scale with a segment display.

"Standard" version

The enclosures are made of polycarbonate, which is self-extinguishing and of non-melting material (according to UL94 V-0). For space-saving arrangement, several instruments can be installed close together without spacers. Connection is made via hexagon head bolts with spring-loaded terminal bolts. The terminals of the enclosure are protected against accidental contact.

"S" version

The measuring instruments of the "S" series are designed to meet the requirements of harsh environmental conditions, e.g. for use on ships.

Ordering information and A-ISOMETER®/RCM assignment

Type	Input current	Dimensions	Suitable for A-ISOMETER® / RCM	Art. No.
7204-1421	0…400 µA	72 x 72 mm	IR470LY-4…, IRD1007L-4…, IRDH275 / 375	B 986 763
9604-1421	0…400 µA	96 x 96 mm	IR470LY-4…, IRD1007L-4…, IRDH275 / 375	B 986 764
7204S-1421	0…400 µA	72 x 72 mm	IR470LY-4…, IRD1007L-4…, IRDH275 / 375	B 986 804
9604S-1421	0…400 µA	96 x 96 mm	IR470LY-4…, IRD1007L-4…, IRDH275 / 375	B 986 784
9620-1421	0…20 mA	96 x 96 mm	IRDH275B/375B/575	B 986 841
9620S-1421	0…20 mA	96 x 96 mm	IRDH275B/375B/575	B 986 842
9604-1621	0…400 µA	96 x 96 mm	IR470LY2-6…	B 986 782
9604-4241	0…400 µA	96 x 96 mm	RCM470 / RCMA470	B 986 807
7220-1421	0…20 mA	72 x 72 mm	IRDH275B/375B/575	B 986 844
7220S-1421	0…20 mA	72 x 72 mm	IRDH275B/375B/575	B 986 848

Technical data

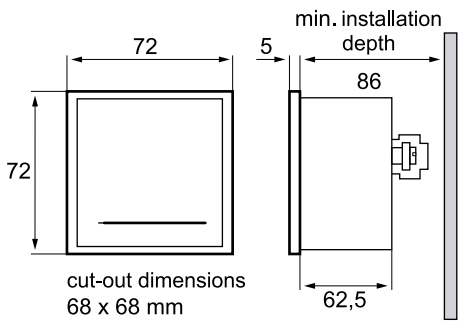
Test voltage	3 kV
Accuracy class acc. to DIN 43780	1.5
Normal position	vertical + 5 degree
Temperature range	- 25…+ 40 °C

Protection class acc. to DIN 40050

Enclosure	IP52
Terminals	IP00
Terminals with contact protection	IP20

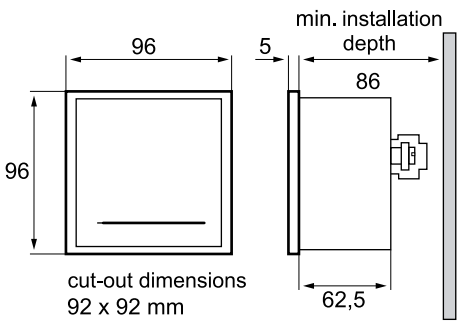
Type of enclosure / dimension diagram measuring instrument 7204 / 7220

Dimensions in mm



Type of enclosure / dimension diagram measuring instrument 9604 / 9620

Dimensions in mm



1.8.6

Enclosure mounting

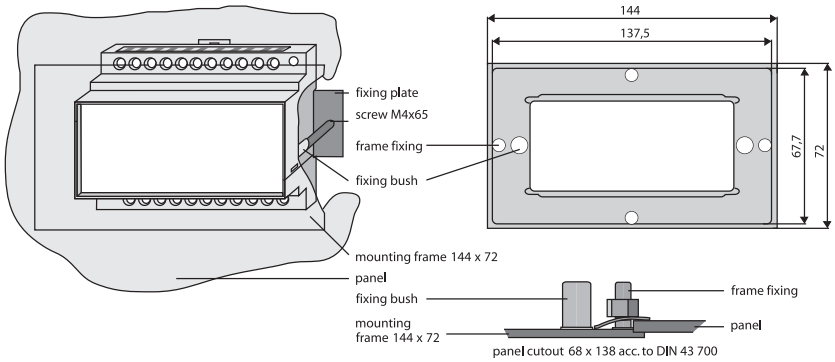
Mounting frame

Ordering information	
Type	**Art. No.**
X470 Mounting frame	B 990 991
XM460 Mounting frame	B 990 995
XM490 Mounting frame	B 990 996

Mounting frame for enclosure fixing into 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 dand EDS460 devices.

For mounting XM490 enclosures into panel cutouts of 198 x 72 mm. Suitable for 490 series device, e.g. RCMS490, EDS490/491. Dimensions are given in mm.

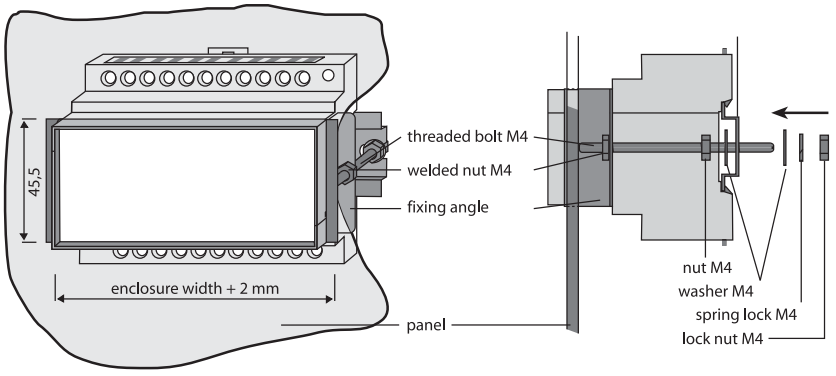


Fixing set

Ordering information	
Type	**Art. No.**
X450 Fixing set	B 990 992
X460 Fxing 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 in mm

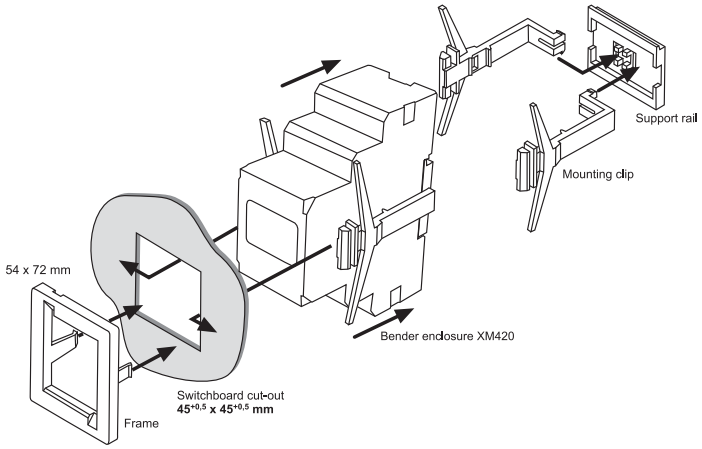


XM420 Mounting frame

Ordering information	
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.



1.8.6

Front plate cover

Front plate cover IRDH375

Front plate cover IRDH575

Front plate cover IP65

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

Type	Suitable for	Art. No.
Front plate cover 144 x 72 mm	IRDH375	B 9806 0005
Front plate cover 144 x 96 mm	IRDH575	B 9806 0007

Applied product standards and guidelines
Service and project planning

Annex

Applied product standards and guidelines

Device family		International (IEC)	European (EN)	National standards (DIN VDE / DIN EN)	Others
Insulation monitoring devices and coupling devices (A-ISOMETER® and AKG)		IEC 61557-8: 2007-05	EN 61557-8: 2007	DIN EN 61557-8 (VDE 0413-8): 2007-12	ASTM F1207M-96 (2007) (for AC) ASTM F1669M-96 (2007) (for AC, AC / DC, DC) ASTM F1134-94 (2007) (for offline monitor)
	EMC	IEC 61326-1: 2005-12 IEC 61326-2-4: 2006-06	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	
	EMC	IEC 61326-1: 2005-12 IEC 61326-2-4: 2006-06	EN 61326-1: 2006 EN 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: 2009-05	EN 62020: 1998 and EN 62020 / A1: 2005 EN 60947-2: 2006	DIN EN 62020 (VDE0663): 2005-11 DIN EN 60947-2 (VDE 0660-101): 2010-04	
Measuring and monitoring relays		IEC 61010-1: 2010-06	EN 61010-1: 2010	DIN EN 61010-1 (VDE 0411-1): 2009-06	
	EMC	IEC 61326-1: 2005-12	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): 2009-06	
	EMC	IEC 61326-1: 2005-12	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: 2002-10 IEC 60721-3-3 Corrig. 1: 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: 2002-10	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 standard edition provided are current up to the time of publishing this catalogue.

Technical terms

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.
Response sensitivity	Value of the evaluating current or insulation resistance at which the evaluator responds under specified conditions.
Response value R_a	Value of the insulation resistance at which the device responds under specified conditions.
Response time t_{an}	Time required by an insulation monitoring device to respond under specified conditions.
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.
Touch voltage U_t	Voltage between conductive parts when touched simultaneously by a person or an animal.
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.
Direct contact	Electric contact of persons or animals with live parts.
Insulation fault location system	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.
Electric shock	Physiological effect resulting from an electric current through a human or animal body.
Earth leakage current	Current flowing from the live parts of the installation to earth in the absence of an insulation fault.
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 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.
Earth fault	Occurrence of an accidental conductive path between a live conductor and the Earth.
Fault current I_Δ	Current which flows across a given point of fault resulting from an insulation fault.
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).
Total earthing resistance R_A	The resistance between the main earthing terminal and the earth.
Internal DC resistance R_i	Resistance of the insulation monitoring device between the terminals to the system being monitored and earth.
Indirect contact	Electric contact of persons or animals with exposed-conductive parts which have become live under fault conditions.
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.
Rated contact voltage	Voltage for which a relay contact is rated to open and close under specified conditions.
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.
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.
Measuring voltage U_m	Voltage present at the measuring terminals during the measurement.
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.
Nominal frequency f_n	Frequency for which the measuring equipment is intended to be used and designed.
Nominal current I_n	Current of the measuring equipment under nominal conditions.
System leakage capacitance C_e	Maximum permissible value of the 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.
Equipotential bonding	Provision of electrical connections between conductive parts, intended to achieve equipotentiality.
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.
Protective conductor PE	Conductor provided for purposes of safety for example protection against electric shock.
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.
Origin (of the electrical installation)	Point at which electric energy is delivered to the electrical installation.
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.
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.

Service & Project planning

Service & Support

Planning & Concept	Selection of Devices & Project Scheduling	Commissioning	Operation & Maintenance	Expansion & Modernization
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