BENDER
The Power in Electrical Safety©

Product overview

ISOMETER® – Insulation monitoring devices

ISOSCAN® – Insulation fault location systems EDS

Find out today what will not happen tomorrow

Reporting critical operating states today, so that unwanted incidents such as operational interruptions, costly material damage or even physical injuries do not happen.

Safety of power supply
To ensure electrical safety for people and electrical installations in an efficient way on a long-term basis, Bender offers insulation monitoring devices for all the key industries. In particular, these devices are used anywhere where a safe power supply is an essential requirement to prevent system failures, eliminate the risk of serious or fatal injuries and to avoid material damage.

Top-level productivity and maximum safety for people and the electrical installation
With Bender insulation monitoring devices for unearthed power supplies (IT systems) you are already using the technology of tomorrow with respect to reliability, measurement methods and design. Along with precise measurement technology, the ISOMETERs® provide many functions for early detection and quality assurance with user-friendly and intuitive operation, reliable evaluation and simple communication.

Fast localisation of insulation faults
Bender insulation fault location systems enable fast localisation and elimination of insulation faults even during operation. Disconnection of the electrical installation is not required. Portable Bender solutions facilitate the use in large installations with sub-distributions.

For more than 70 years, Bender has been a name for advanced technology using the latest „Made in Germany“ measurement technology and outstanding technical expertise. Because of this, Bender offers an exceptionally long warranty period of five years.

Contents

For a high level of operational and electrical system safety: Unearthed power supply systems (IT systems)

Modern power supplies require maximum availability, safety and predictive information

Given a wide variety of production processes, continuous competitive pressure, the impact of soaring costs and operational availability around the clock, the maximum possible electrical safety for power supplies is required. Although great care has been taken during the design and implementation phases and is continued throughout the maintenance cycle,electrical installations may nevertheless be impaired by factors such as humidity, ageing, dirt, mechanical damage, to mention but a few. Undetected insulation faults can be disastrous and costly, especially when factors such as production failure, repairs, device replacement or even unplanned service work are counted.

Increasing availability - reducing costs

The key objective of any system operator must be to recognise faults at an early stage and eliminate the cause in an efficient way. To achieve this objective, a possible solution uses unearthed power supplies (IT systems) with insulation monitoring.

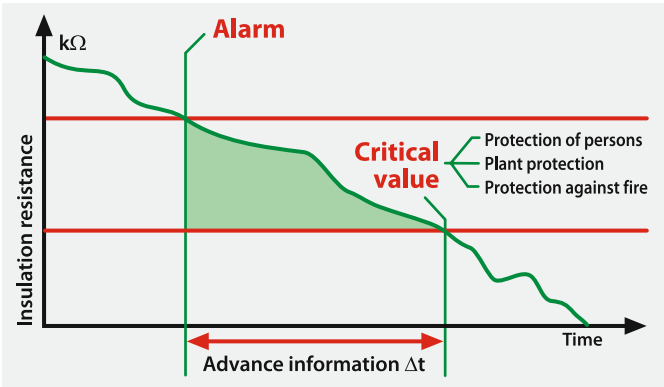
In IT systems, none of the active conductors is directly connected to earth. Therefore, on the occurrence of an insulation fault, only a small leakage current, essentially caused by system leakage capacitances, can flow.

The upstream fuse does not trip, hence continuous power supply and operation is ensured. Prompt information about possible hazards is given by the ISOMETER® which continuously monitors the insulation resistance between the system and earth.

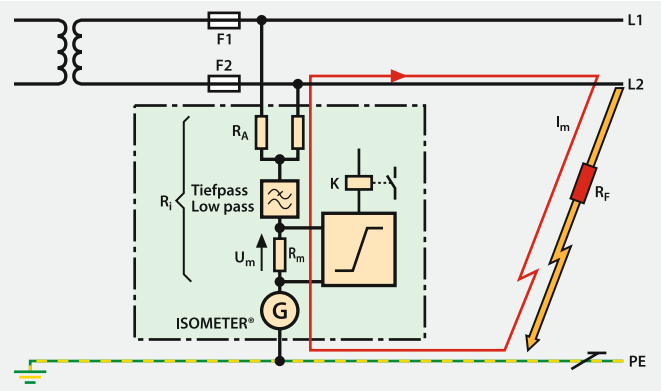
ISOMETER®: A wide variety of solutions for all types of IT systems

For the whole range of electrical power supplies, Bender provides appropriate solutions for most applications. Taking all types of system structures and loads into account, ISOMETER®s using Bender's patented measuring principles guarantee reliable evaluation of the insulation resistance for:

- Nominal system voltages AC, DC or AC/DC up to 12 kV
- System configurations 1Ph, 3Ph, disconnected loads
- System leakage capacitances up to 2000 µF
- Response values from 0.2 kΩ to 10 MΩ



Information advantage through the ISOMETER®



Principle of operation ISOMETER®

IT systems - information ahead of time

ISOMETER®s in IT systems are an effective means of damage prevention, they enable increased productivity and optimised maintenance, which in turn lead to considerable reduction in costs. Bender's wide range of products allows the implementation of individual safety solutions and safeguards your investment.

Optimised maintenance

- Recognise and signal insulation deteriorations early
- Localising faulty circuits automatically
- Optimising the planning of time and personnel resources
- Displaying information about the status of the electrical installation at a central location
- Remote diagnosis via Internet/Ethernet

Increased protection against fire

- Recognising developing insulation faults at an early stage
- Minimising arcing faults, a frequent cause of fire
- Separating areas prone to explosions and fire from the rest of the system by means of isolating transformers and monitoring them separately

Improved economic efficiency

- Avoiding expensive and unscheduled stoppages
- Reducing personnel expenses and time and costs for maintenance
- Detecting weak points in the installation
- Supporting business decisions on investments

High operational availabilty

- No interruption to operation in the event of a phase-to-earth fault
- No control malfunction in the event of insulation faults
- Electrical installations are kept at a high level of availability
- Monitoring electrical installations also during standstill

Enhanced accident prevention

- Low touch currents in small and medium-sized installations
- No malfunctions in case of earth faults in the control circuits of equipment and machines

Higher permissible earthing resistance

- Higher earthing resistances, permissible, for example, for mobile power supplies

Maximum operational safety in control and auxiliary circuits

		 ISOMETER® IR420-D4	 ISOMETER® IR125Y-4	 ISOMETER® IR425
Circuits	Control circuits	■	■	■
	Auxiliary circuits	■	■	■
	Main circuits	–	–	–
Voltage system	3(N)AC	–	–	–
	AC	■	■	■
	AC/DC	–	■	■
	DC	–	■	■
Nominal system voltage U_n		AC 0…300 V	AC 19.2…265 V, DC 19.2…308 V	AC/DC 0…300 V
Frequency range f_n		AC 42…460 Hz	DC	DC, AC 15…460 Hz
System leakage capacitance C_e µF		≤ 20	≤ 10	≤ 20
Response value	Response value R_{an} kΩ	1…200	10…200	1…200
	Alarm contacts	2 changeover contacts	1 changeover contact	2 changeover contacts
	Operating principle	N/O or N/C operation	N/C operation	N/O or N/C operation
	Response time t_{an} (at $R_F = 0.5 \times R_{an}$ and $C_e = 1$ µF)	≤ 1 s	≤ 6 s	≤ 2 s
	Start-up delay t	0…10 s	–	0…10 s
	Response delay t_{on}	0…99 s	–	0…99 s
Indication	LC display	■	–	■
	Power On LED	■	■	■
	Alarm LEDs	■	■	■
Installation	DIN rail	■	■	■
	Screw mounting	■	■	■

Ordering information

Nominal voltage U_n	Supply voltage [1] U_S	Type	Art. No.
AC 0…300 V, 42…460 Hz	AC 16…72 V, 42…460 Hz/DC 9.6…94 V	IR420-D4-1	B 7101 6409
	AC/DC 70…300 V/DC 42…460 Hz	IR420-D4-2	B 7101 6405
DC 19.2…308/AC 19.2…365 V	= U_n	IR125Y-4	B 9102 3005
AC/DC 0…300 V, 15…460 Hz	AC 16…72 V, 15…460 Hz/DC 9.6…94 V	IR425-D4-1	B 7103 6403
	AC/DC 70…300 V/DC 15…460 Hz	IR425-D4-2	B 7103 6402

Device version with screw terminals on request.

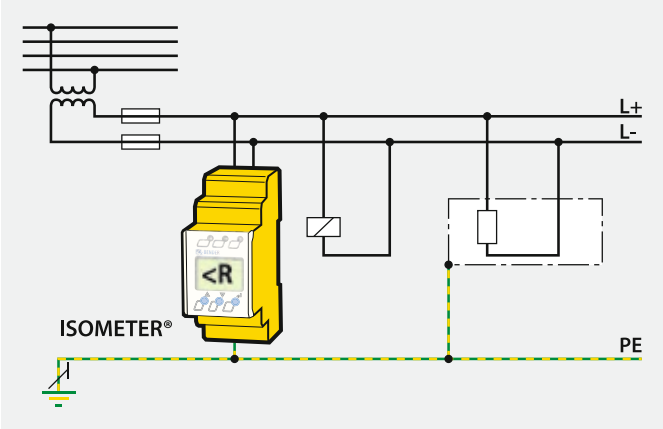
[1] Absolute values

Accessories

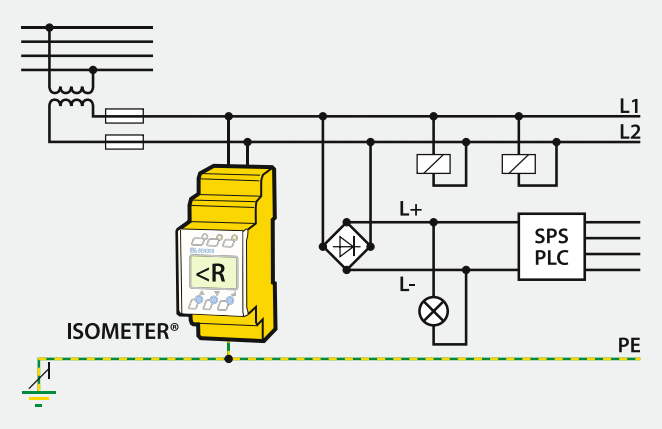
Type designation	Art. No.
Mounting clip for screw mounting (1 piece per device)	B 9806 0008

In localised areas, such as machine control systems or safety lighting where space is limited,
control and auxiliary circuits provide additional functions, such as command output, interlocking, messaging and measuring. For these circuits, particular emphasis is placed on operational reliability.

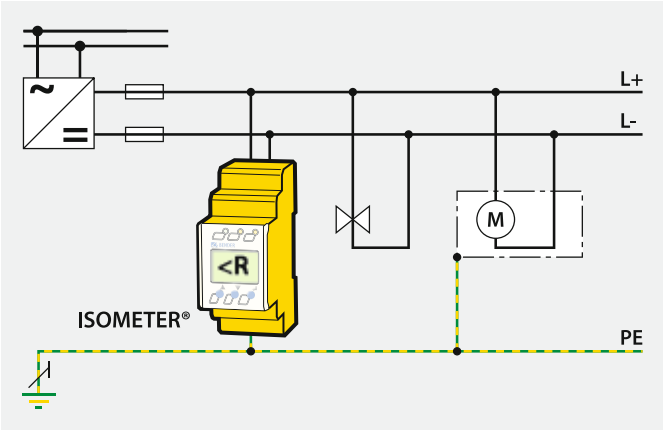
Example applications



AC control circuit with IR420

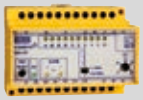
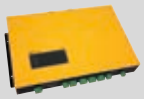


AC/DC control circuit with IR425



DC control circuit with IR425

High system availability in main circuits

		 ISOMETER® IR470LY	 ISOMETER® IR470LY2-4061	 ISOMETER® iso685	 ISOMETER® iso1685P-425	 ISOMETER® IRDH275(B)	 ISOMETER® IRDH375(B)	 ISOMETER® IR1575
Circuits	Control circuits	–	–	■	■	–	–	–
	Auxiliary circuits	–	–	■	■	–	–	–
	Main circuits	■	■	■	■	■	■	■
Voltage system	3(N)AC	■	■	■	–	■	■	■
	AC	■	■	■	■	■	■	■
	AC/DC	–	–	■	■	■	■	■
	DC	–	–	■	■	■	■	■
Nominal system voltage U_n		AC, 3(N)AC 0…793 V [1]	AC, 3(N)AC 0…793 V [1]	AC, 3(N)AC 0…793 V, DC 0…1150 V [1]	AC 0…1000 V, DC 0…1500 V	AC, 3(N)AC 0…793 V DC 0…650 V [1]	AC, 3(N)AC 0…793 V DC 0…650 V [1]	AC, 3(N)AC 0…480 V DC 0…480 V
Frequency range f_n		AC 40…460 Hz	AC 40…460 Hz	DC, AC 1…460 Hz	DC 0.1…460 Hz	DC, AC 0.2…460 Hz	DC, AC 0.2…460 Hz	DC, AC 30…460 Hz
System leakage capacitance C_e µF		≤ 20	≤ 20	≤ 1000	≤ 500 µF	≤ 500	≤ 500	≤ 60
Nominal voltage range U_n expandable (via coupling devices)		AGH204S-4/AGH520S	AGH204S-4/AGH520S	AGH150W-4/ AGH204S-4/AGH520S/ AGH676S-4	–	AGH150W-4/ AGH204S-4/AGH520S/ AGH676S-4	AGH150W-4/ AGH204S-4/AGH520S/ AGH676S-4	–
Response value R_{an} kΩ		1…200	10…100 35…500	1…10000	200…1000	1…10000	1…10000	2…1000
Communi-cation	LC display	–	–	■	–	■	■	■
	Prewarning display	■	■	■	■	■	■	■
	RS-485 interface	–	–	■	■	■	■	–
Installation	DIN rail	■	■	■	–	■	–	–
	Screw mounting	■	■	■	■	■	■	–
	Panel mounting/wall fastening	–	–	–	–	–	■	■

Ordering information

Nominal voltage U_n	Supply voltage U_S	Type	Art. No.
AC 0…793 V [1]	AC 230 V	IR470LY-40	B 9104 8007
	AC 24 V	IR470LY-4011	B 9104 8012
	AC 42 V	IR470LY-4012	B 9104 8002
	AC 90…132 V [1]	IR470LY-4013	B 9104 8011
	AC 400 V	IR470LY-4015	B 9104 8008
	AC 500 V	IR470LY-4016	B 9104 8018
	AC 690 V	IR470LY-4017	B 9104 8017
	AC 440 V	IR470LY-4018	B 9104 8024
	DC 9.6…84 V [1]	IR470LY-4021	B 9104 8006
	DC 77…286 V [1]	IR470LY-4023	B 9104 8026
	AC 230 V	IR470LY2-4061	B 9104 8052
AC 0…793 V [1] / DC 0…1150 V [1]	AC/DC 100…240 V	iso685-D	B 9106 7010
AC 0…1000 V, DC 0…1500 V	AC/DC 18…30 V	iso1685P	B 9106 5801

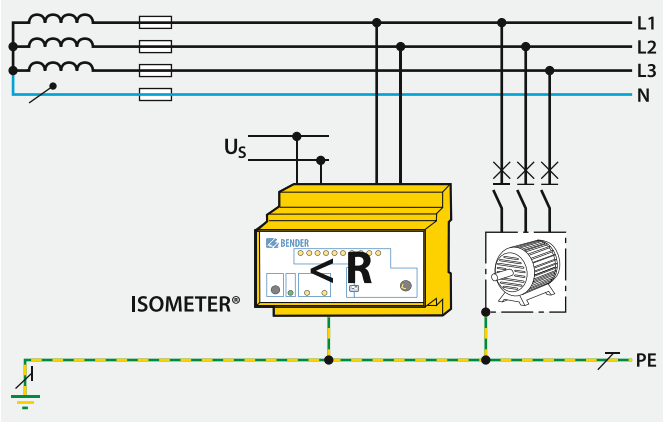
Nominal voltage U_n	Supply voltage U_S	Type	Art. No.
AC 0…793 V [1] / DC 0…650 V [1]	AC 88…264 V, DC 77…286 V	IRDH275-435 [2] [3]	B 9106 5100
	DC 19.2…72 V	IRDH275-427 [3]	B 9106 5104
	DC 10.2…36 V	IRDH275-425 [3]	B 9106 5108
	AC 88…264 V, DC 77…286 V	IRDH275B-435 [2] [3]	B 9106 5101
	DC 19.2…72 V	IRDH275B-427 [3]	B 9106 5105
	DC 10.2…36 V	IRDH275B-425 [3]	B 9106 5109
	AC 88…264 V, DC 77…286 V	IRDH375-435 [2] [3]	B 9106 5000
	DC 19.2…72 V	IRDH375-427 [3]	B 9106 5002
	AC 88…264 V, DC 77…286 V	IRDH375B-435 [2] [3]	B 9106 5004
	DC 19.2…72 V	IRDH375B-427 [3]	B 9106 5006
AC 0…480/ DC 0…480	AC 88…264 V, AC 340…460 V/ DC 77…286 V	IR1575-435 [3]	B 9106 4000
	AC 16…72 V, DC 10.2…84 V	IR1575-434	B 9106 4003

[1] Absolute values [2] Device versions with GOST certificate available.

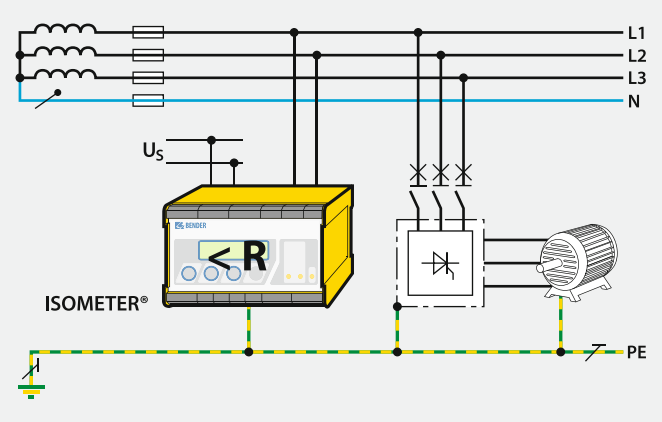
[3] Device version "Option-W" with increased shock and vibration resistance: Indicated by the letter "W" at the end of the order number.

Main circuits provide the power supply for electrical installations or buildings. These circuits include equipment for generating, converting, distributing, switching and consuming electrical energy. From the user's point of view, different types of loads should be distinguished between: pure AC loads (e.g. motors), AC/DC loads containing electronic components (e.g. converters) and pure DC loads (e.g. battery systems).

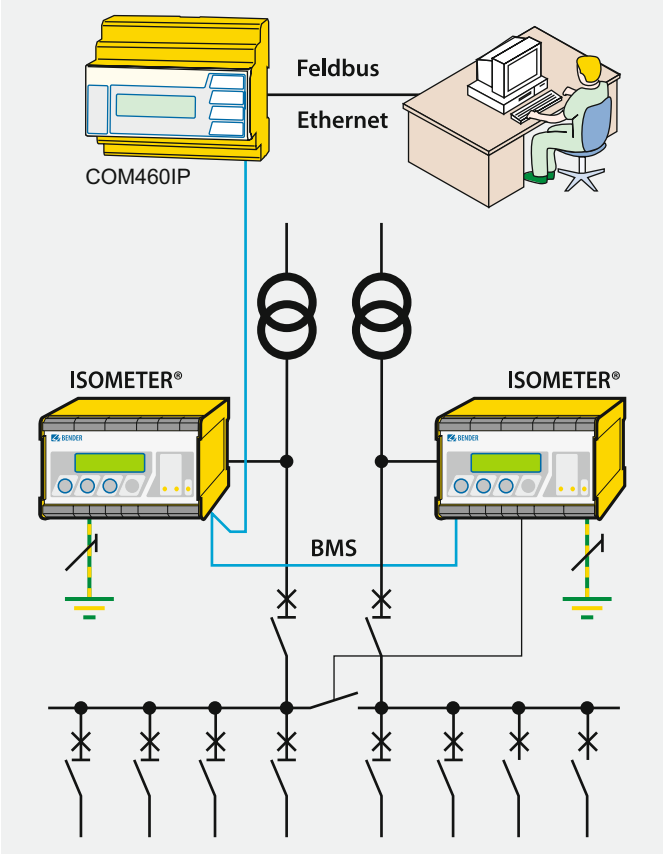
Example applications



AC main circuits with one motor

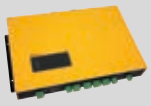
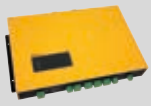


AC/DC main circuits with a variable-speed drive



Coupled IT systems

Recognising faults at an early stage in specific applications

		AC, DC or AC/DC medium voltage systems	Medical locations		Photovoltaic			
								
		ISOMETER® IRDH275BM-7	ISOMETER® IR427	ISOMETER® 107TD47	ISOMETER® isoPV	ISOMETER® isoPV425	ISOMETER® isoPV1685	ISOMETER® isoPV1685PFR
Circuits	Control circuits	–	–	–	–	–	–	–
	Auxiliary circuits	–	–	–	–	–	–	–
	Main circuits	■	■	■	■	■	■	■
Voltage system	3(N)AC	■		■	■	–	–	–
	AC	–	■	■	■	■	–	–
	AC/DC	■	–	–	■	■	–	–
	DC	■	–	–	■	■	■	■
Nominal system voltage U_n		AC, 3(N)AC/DC 0…7.2 kV	AC 70…264 V [1]	AC 230 V AC 127 V	via AGH-PV 3(N)AC 0…793 V DC 0…1100 V [1]	DC 0…1100 V, AC 0…793 V [1]	DC 0…1500 V	DC 0…1500 V
Frequency range f_n		DC, AC 0.2…460 Hz	AC 47…63 Hz	AC 50…60 Hz	via AGH-PV DC, 10…460 Hz	via AGH420 DC, 10…460 Hz	via AGH420 DC, 10…460 Hz	via AGH420 DC, 10…460 Hz
System leakage capacitance C_e µF		≤ 5	≤ 5	≤ 5	≤ 2000	≤ 500	≤ 2000	≤ 2000
Response value R_{an} kΩ		100…10000	50…500	50…500	0.2…100	1…490	0.2…1000	0.2…1000
Indication	LC display	■	■	■	■	■	–	–
	Power On LED	■	■	–	–	■	■	■
	Alarm LEDs	■	■	■	■	■	■	■
Installation	DIN rail	■	■	■	■	■	–	–
	Screw mounting	■	■	■	■	■	■	■

Ordering information

Nominal system voltage U_n	Supply voltage [1] U_S	Type	Art. No.
–	AC 19.2…72 V	**IRDH275BM-7**	**B 9106 5120**
AC 70…264 V, 42…460 Hz	AC 70…264 V, 42…460 Hz	**IR427-2**	**B 7207 5300**[2]
AC 230 V, 50…60 Hz	AC 230 V, 50…60 Hz	**107TD47**	**B 9201 6003**
AC 127 V, 50…60 Hz	AC 127 V, 50…60 Hz	**107TD47-133**	**B 9201 6004**
AC 0…793 V, DC 0…1100 V	DC 19.2…72 V	**isoPV-327 + AGH-PV** consisting of: isoPV-327 (B 9106 5130W), AGH-PV (B 9803 9020W)	**B 9106 5132W**
AC 0…793 V, DC 0…1100 V	AC 88…264 V, DC 77…286 V	**isoPV-335 + AGH-PV** consisting of: isoPV-335 (B 9106 5131W), AGH-PV (B 9803 9020W)	**B 9106 5133W**
AC 0…690 V, DC 0…1000 V	AC 100…240 V, 47…63 Hz/DC 24…240 V	**isoPV425-D4-2 with AGH420**	**B 7103 6303**[2]
DC 0…1500 V	DC 18…30 V	**isoPV1685-425**	**B 9106 5603**
DC 0…1500 V	DC 18…30 V	**isoPV1685PFR-425**	**B 9106 5600**

[1] Absolute values

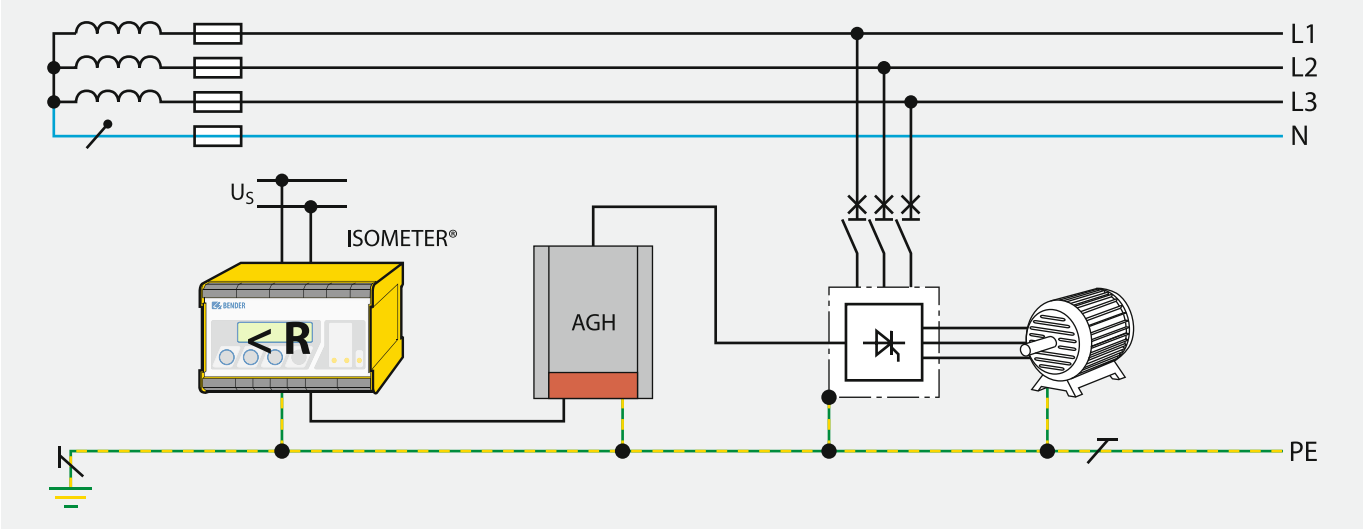
[2] Device version with screw terminals on request.

Our product range includes a variety of products, such as ISOMETER®s for low-resistance DC systems, systems containing AC/DC medium-voltage converters up to 12 kV, mobile generators or disconnected loads. Should you have any questions, please do not hesitate to contact our Technical Sales Department.

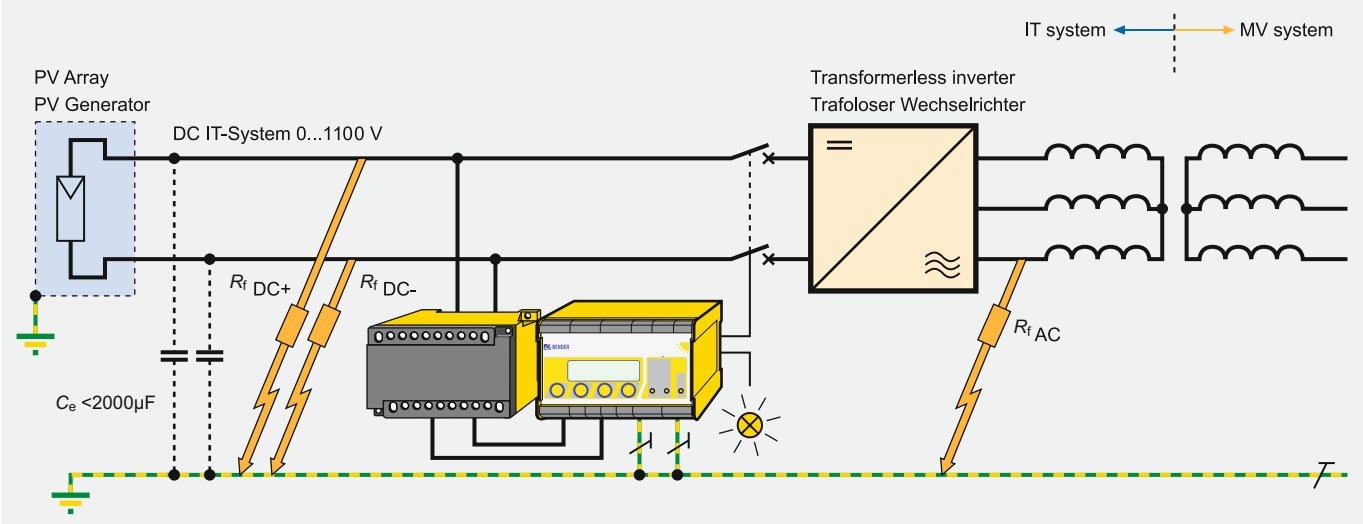
Standard-compliant solutions for

- Medical locations
- Photovoltaic
- Installations with a low level of insulation
- Disconnected loads
- Mobile generators
- Electric mobility
- Railway, rolling stock

Example applications

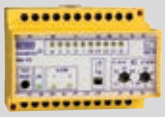
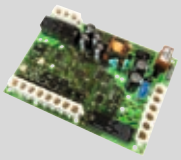


Monitoring of medium-voltage drives with IRDH275… and coupling device AGH675S-7



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

Specific applications

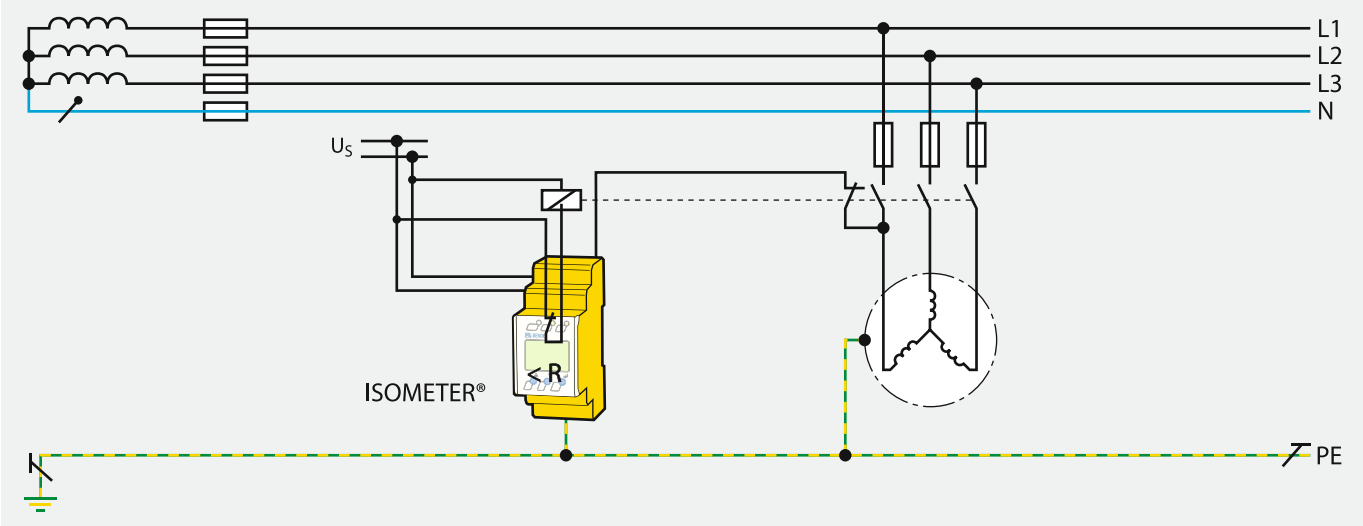
		Installations with a low level of insulation	Disconnected loads		Mobile generators	
						
		ISOMETER® isoLR275	ISOMETER® IR470LY2-60	ISOMETER® IR420-D6	ISOMETER® IR423	ISOMETER® IR123
Circuits	Control circuits	–	–	–	–	–
	Auxiliary circuits	–	–	–	–	–
	Main circuits	■	■	■	■	■
Voltage system	3(N)AC	■	■	■	–	–
	AC	■	■	■	■	■
	AC/DC	■	–	–	–	–
	DC	■	–	■	–	–
Nominal system voltage U_n		via AGH-LR 3(N)AC 0…793 V DC 0…1100 V [1]	AC, 3(N)AC 0…793 V [1]	Offline	AC 0…300 V	AC 100…300 V
Frequency range f_n		via AGH-LR DC, 10…460 Hz	AC 40…460 Hz	via AGH520S, AGH676S-4	AC 30…460 Hz	AC 22…460 Hz
System leakage capacitance C_e µF		≤ 500	≤ 10	≤ 10	≤ 5	≤ 1
Response value R_{an} kΩ		0.2…100	10…1000 500…5000	100…10000	1…200	46/23
Indication	LC display	■	–	■	■	–
	Power On LED	–	■	■	■	–
	Alarm LEDs	■	■	■	■	–
Installation	DIN rail	■	■	■	■	–
	Screw mounting	■	■	■	■	■

Ordering information

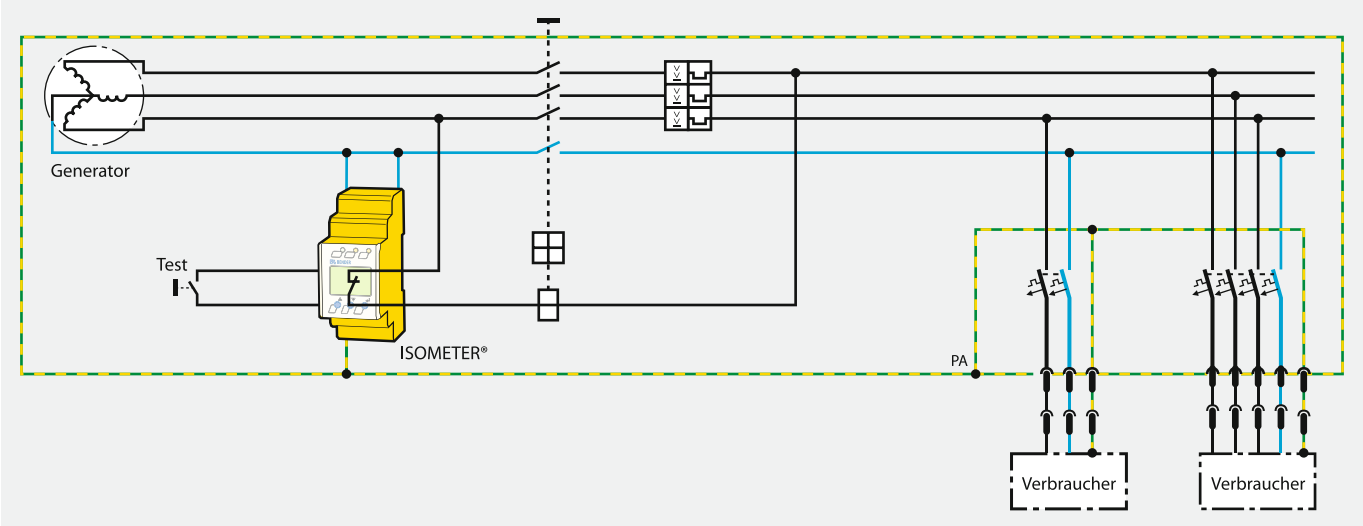
Nominal system voltage U_n	Supply voltage U_S [1]	Type	Art. No.
AC 0…793 V, DC 0…1100 V	DC 19.2…72 V	**isoLR275-327 + AGH-LR-3** consisting of: isoLR275-327 (B 9106 5700W), AGH-LR-3 (B 9803 9022W)	**B 9106 5702W**
	AC 88…264 V, DC 77…286 V	**isoLR275-335 + AGH-LR-3** consisting of: isoLR275-335 (B 9106 5701W), AGH-LR-3 (B 9803 9022W)	**B 9106 5703W**
AC 0…793 V	AC 230 V	**IR470LY2-60**	**B 9104 8010**
	AC 90…132 V [1]	**IR470LY2-6013**	**B 9104 8013**
	AC 400 V	**IR470LY2-6015**	**B 9104 8009**
	DC 9.6…84 V [1]	**IR470LY2-6021**	**B 9104 8014**
–	AC 16…72 V, 42…460 Hz/DC 9.6…94 V	**IR420-D6-1**	**B 7101 6415**
	AC 70…300 V, 42…460 Hz/DC 70…300 V	**IR420-D6-2**	**B 7101 6407**
		IR420-D64-2	**B 7101 6408**
AC 0…300 V	AC 16…72 V, 30…460 Hz/DC 9.6…94 V	**IR423-D4-1**	**B 7101 6304**
	AC/DC 70…300 V, 30…460 Hz	**IR423-D4-2**	**B 7101 6305**
	AC 16…72 V, 30…460 Hz/DC 9.6…94 V	**IR423-D4W-1**	**B 7101 6304W**
	AC/DC 70…300 V, 30…460 Hz	**IR423-D4W-2**	**B 7101 6305W**
AC 100…300 V, 22…460 Hz	$U_S = U_n$	**IR123P-4-2**	**B 9101 6308**

[1] Absolute values

Example applications



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



Monitoring of mobile generators with IR423

Specific applications

		Electric mobility		Railway, rolling stock
				
		ISOMETER® IR155	ISOMETER® isoEV425	ISOMETER® isoRW425
Circuits	Control circuits	–	–	–
	Auxiliary circuits	–	–	–
	Main circuits	■	■	■
Voltage system	3(N)AC	–	–	–
	AC	–	–	■
	AC/DC	–	–	■
	DC	■	■	■
Nominal system voltage U_n		DC 0…1000 V	DC 0…1100 V AC 0…793V [1]	AC/DC 0…500 V
Frequency range f_n		–	AC 15…460 Hz	DC, 10…460 Hz
System leakage capacitance C_e µF		≤ 1	≤ 5	≤ 300
Response value R_{an} kΩ		100…10000	10…990	1…990
Indication	LC display	–	■	■
	Power On LED	–	■	■
	Alarm LEDs	–	■	■
Installation	DIN rail	–	■	■
	Screw mounting	■	■	■

Ordering information

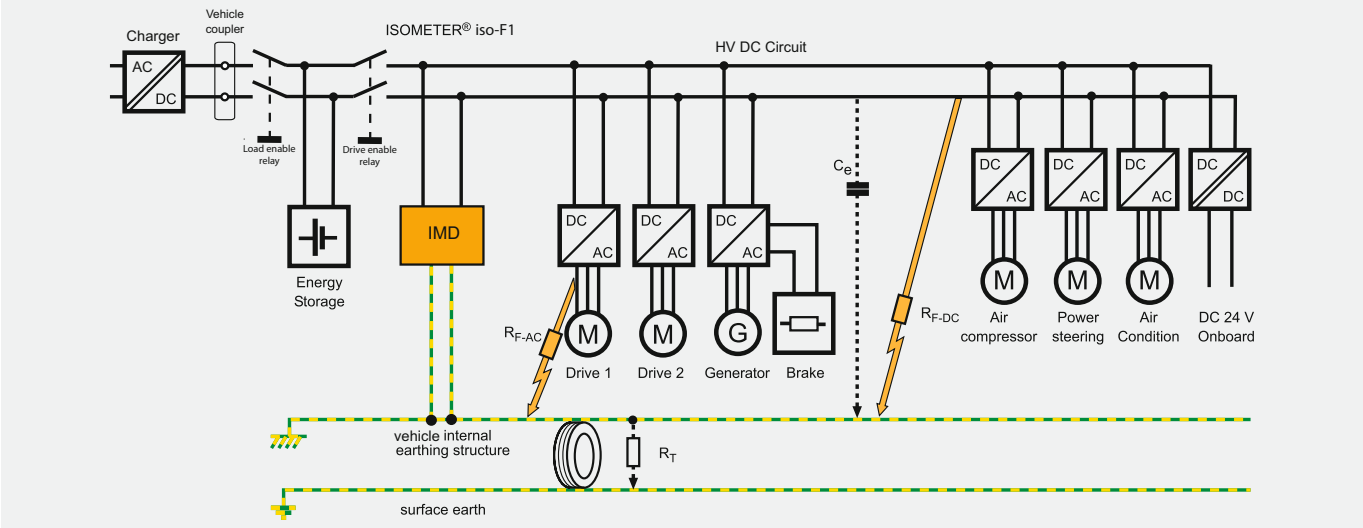
Nominal system voltage U_n	Supply voltage [1] U_S	Type	Art. No.
AC 0…1000 V, DC 0…1000 V	DC 10…36 V	IR155-3203	B 9106 8138V4
		IR155-3204	B 9106 8139V4
		IR155-3203	B 9106 8138CV4[3]
		IR155-3204	B 9106 8139CV4[3]
AC 0…793 V, 15…460 Hz/DC 0…1100 V	AC 100…240 V, 47…63 Hz/DC 24…240 V	isoEV425-D4 with AGH420	B 7103 6401[2]
AC/DC 0…400 V	AC 100…240 V, 47…63 Hz/DC 24…240 V	isoRW425-D4W-4	B 7103 7000W[2]

[1] Absolute values

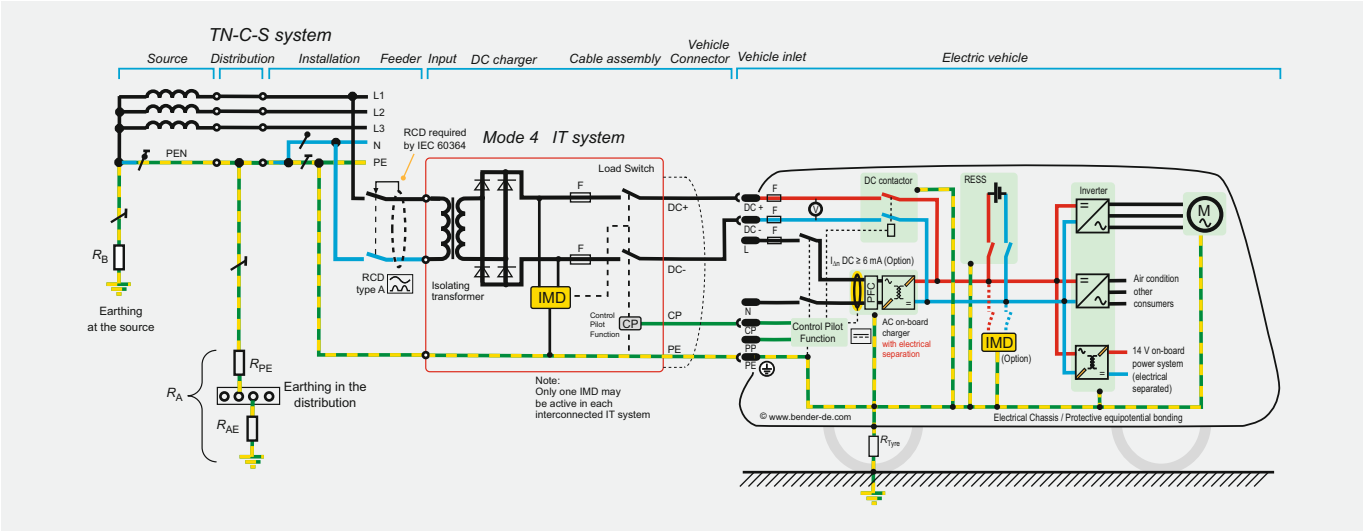
[2] Device version with screw terminal on request.

[3] Custom setting possible

Example applications



Monitoring of unearthed DC drive systems in electric vehicles with IR155



Monitoring of unearthed DC circuits for charging electric vehicles with isoEV425

Accessories

		Coupling devices					
		 AGH150W-4	 AGH204S-4	 AGH520S	 AGH675S-7	 AGH676S-4	 AGH675S-7MV15
Application		Extension of the nominal voltage range for ISOMETER®s					
Nominal system voltage U_n		AC 0…1150 V, DC 0…1760 V	AC 0…1300 V / AC 0…1650 V	AC/3(N)AC 0...7,2 kV	AC/3(N)AC/DC 0...7,2 kV	AC/3(N)AC 0…12 kV	AC, 3(N)AC, DC 0…15,5 kV
Device family	**IR470LY…**	–	■	■	–	–	–
	IRDH275/375	■	■	■	–	■	–
	IRDH275BM-7	–	–	–	■	–	■
	IR420-D64	–	–	–	–	■	–

Nominal system voltage U_S	Type	Art. No.
AC 0…1150 V/DC 0…1760 V	**AGH150W-4**	**B 9801 8006**
AC 0…1650 V/0…1300 V	**AGH204S-4**	**B 914 013**
3(N)AC 0…7200 V	**AGH520S**	**B 913 033**
AC, 3(N)AC, DC 0…7,2 kV, 0…460 Hz	**AGH675S-7-500**	**B 913 056**
	AGH675S-7-2000	**B 913 054**
AC/ 3(N)AC 0…12 kV, 50…460 Hz	**AGH676S-4**	**B 913 055**
AC, 3(N)AC, DC 0…15,5 kV, 0…460 Hz	**AGH675S-7MV15-500**	**B 913 058**

		Gateways				
		 COMTRAXX® COM460IP	 COMTRAXX® COM461MT	 COMTRAXX® COM462RTU	 FTC470XDP	 COMTRAXX® CP700
Application		BMS-Ethernet-Gateway	BMS-Ethernet-Gateway	BMS-Modbus/RTU-Gateway	BMS-PROFIBUS DP-Gateway	Condition Monitor/Gateway
Functions	**Protocol input**	BMS	BMS	BMS	BMS	BMS, Modbus/RTU/TCP
	Protocol output	Ethernet, Modbus/TCP	Ethernet, Modbus/TCP	Modbus/RTU	PROFIBUS DP	Ethernet, Modbus/TCP
	Indication	LCD/LED	LED	LCD/LED	LED	7" colour LCD
	Alarm messages	■ [1, 2)]	■	■	■	■ [1, 2, 3)]
	Measured values	■ [1, 2)]	■	■	■	■ [1, 2, 3)]
	Device parameter setting	■ [1)]	–	■ [4)]	■ [4)]	■ [1)]
	Alarm list	■ [1)]	–	–	–	■ [1, 3)]
	History memory	■ [1)]	–	–	–	■ [1)]
	Diagrams	■ [1)]	–	–	–	■ [1, 3)]
	Visualisation	■ [1)]	–	–	–	■ [1)]
	E-mail notification	■ [1)]	–	–	–	■ [1)]
	Device tests	■ [1, 2)]	■	■	■	■ [1, 2)]
	Data logger	■ [1)]	–	–	–	■ [1)]
Connection	**BMS**	screw-type terminal	screw-type terminal	screw-type terminal	screw-type terminal	pluggable screw terminals
	Output	RJ 45	RJ 45	screw-type terminal	9-pin SUB-D	RJ 45
System requirements	**Supply voltage U_S**	AC/DC 76…276 V AC 16…72 V, DC 16…94 V	AC/DC 76…276 V	AC / DC 76…276 V	AC/DC 85…276 V	DC 24 V
	Browser	Internet Explorer, Opera, Firefox etc. with Silverlight plugin	Internet Explorer, Opera, Firefox etc.	–	–	Internet Explorer, Opera, Firefox etc. with Silverlight plugin

Ordering information

Supply voltage/frequency range U_S	Supply voltage/frequency range U_S for UL applications	Power consumption	Type	Art. No.
AC/DC 76…276 V [5)], 42…460 Hz	AC 76…250 V, 40…150 mA, 42…460 Hz/ DC 76…250 V, 10…35 mA	5…40 VA, 3.8 W	**COM460IP**	**B 9506 1010**
AC 16…72 V, 50…60 Hz/DC 16…94 V	AC 16…72 V, 80…200 mA, 50…60 Hz/ DC 16…94 V, 20…120 mA	≤ 4 VA	**COM460IP-24V**	**B 9506 1020**
AC/DC 76…276 V [5)], 42…460 Hz	AC 76…250 V, 25…60 mA, 42…460 Hz/ DC 76…250 V, 6…21 mA	3.5…40 VA, 2.4 W	**COM461MT**	**B 9506 1021**
AC/DC 76…276 V [5)], 42…460 Hz	AC 76…250 V, 40…150 mA, 42…460 Hz/ DC 76…250 V, 10…35 mA	3.5…40 VA, 2.4 W	**COM462RTU**	**B 9506 1022**
AC/DC 85…276 V	–	–	**FTC470XDP**	**B 9506 1000**
DC 24 V/± 25 %	–	typ. 11 W, max. 26 W	**CP700** [6)]	**B 9506 1030**

[1)] Available functions on the web server – Accessible by means of a PC using a browser
[2)] Available via protocol
[3)] On the device's own LC display
[4)] Limited device parameter setting
[5)] Absolute values
[6)] Device version with GOST certificate available.

Accessories

		Measuring instruments			
					
		7204	7220	9604	9620
Input current		0…400 µA	0…20 mA	0…400 µA	0…20 mA
Dimensions (mm)		72 x 72	72 x 72	96 x 96	96 x 96
Device family	IR470LY…	■	–	■	–
	IR470LY2-6…	–	–	■	–
	IRDH275/375	■	–	■	–
	IRDH275B/375B	–	■	■	■
	IRDH575	–	■	■	■

Ordering information

Scale	Input current	Dimensions	Midscale (SKMP)	Type	Art. No.
Division	0…400 µA	72 x 72 mm	120 kΩ	7204-1421	B 986 763
				7204S-1421	B 986 804
		96 x 96 mm	120 kΩ	9604-1421	B 986 764
				9604S-1421	B 986 784
	0…20 mA	96 x 96 mm	120 kΩ	9620-1421	B 986 841
				9620S-1421	B 986 842
	0…400 µA	96 x 96 mm	1.2 MΩ	9604-1621	B 986 782
	0…20 mA	72 x 72 mm	120 kΩ	7220-1421	B 986 844
				7220S-1421	B 986 848

Insulation fault location system EDS

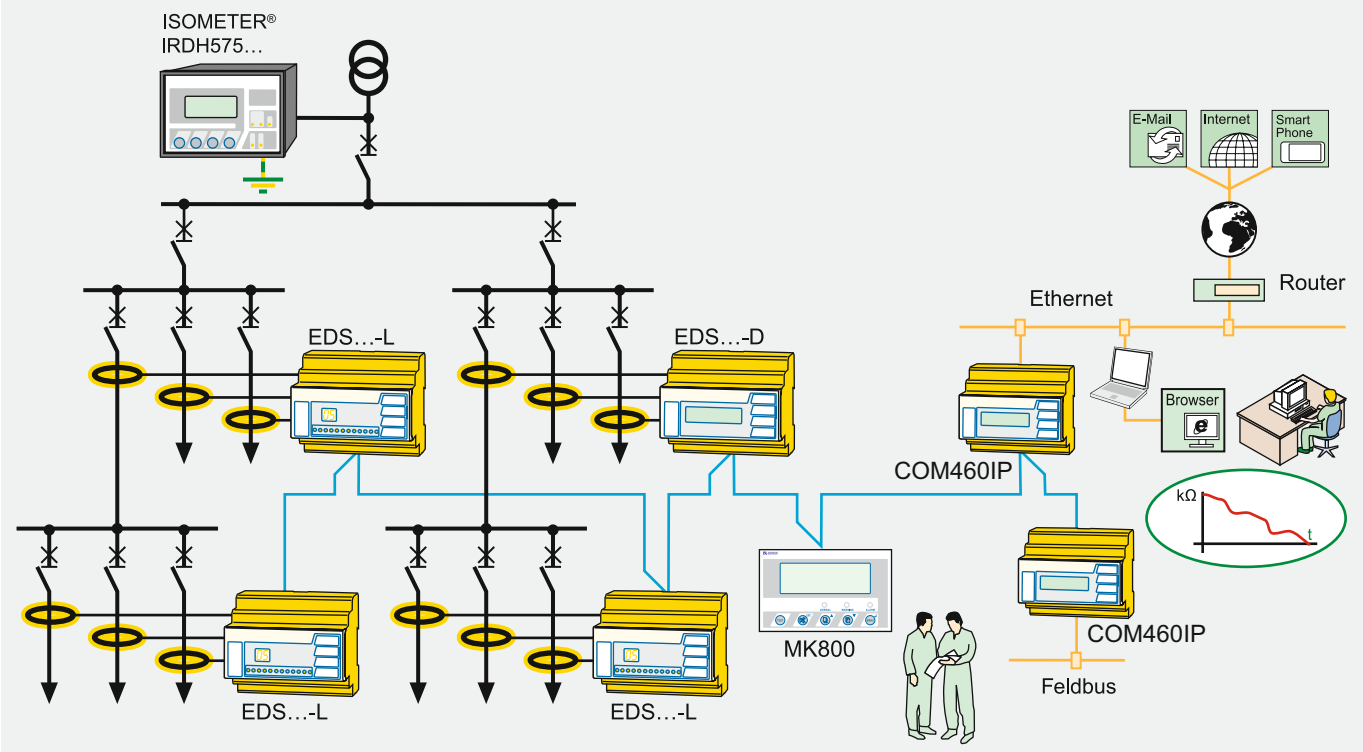
Fast localisation of insulation faults
Fast localisation and elimination of insulation faults is required by DIN VDE 0100-410 (VDE 0100-410):. The IRDH575 in combination with the EDS system is a modular system to solve this problem. The application areas for EDS systems are highly diverse.

They are operated/used for **main and control circuits** in, for example:

- Power stations
- Hospitals
- Shipbuilding
- Traffic engineering
- Industrial plants
- Paper industry
- Oil and natural gas industry
- Mining, open-cast mining
- Rolling mills
- Mechanical engineering

Advantages of an insulation fault location system EDS

- Disconnection of the electrical installation is not required, insulation fault location takes place during operation
- Fast localisation of faulty circuits
- Information about the location of the fault is centrally displayed
- Combination with portable insulation fault location systems EDS3090/3090PG and EDS3091/3091PG
- Reduced maintenance and repair costs



Application example

Insulation monitoring devices ISOMETER® with locating current injectors

ISOMETER® IRDH575

ISOMETER® isoMED427P

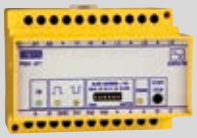
Application		Main circuit	Control circuit	Medical locations
Nominal system voltage U_n		**U_n (B1)** 3AC/AC 20…575 V DC 20…575 V (B1 version)	**U_n (B1)** 3AC/AC 20…150 V/DC 20…150 V (version IRDH575B1-4227, IRDH575B1-4235)	**U_n max** AC 70…264 V
		U_n (B2) 3AC/AC 340…760 V DC 340…575 V (B2 version)	**U_n (B2)** –	
Supply voltage U_S		AC 88…264 V DC 77…286 V (version IRDH575B1-435, IRDH575B2-435, IRDH575B1-4235)	AC 88…264 V DC 77…286 V (version IRDH575B1-435, IRDH575B2-435, IRDH575B1-4235)	$U_s = U_n$
		DC 19,2…72 V (version IRDH575B1-427, IRDH575B1W-4227)	DC 19,2…72 V (version IRDH575B1-427, IRDH575B1W-4227)	
Locating current		10/25/50 mA	1/2,5 mA	1 mA
Response values		1 kΩ…10 MΩ	1 kΩ…10 MΩ	50…500 kΩ
LC display		4 x 20 characters	4 x 20 characters	■
Alarm relay		3 changeover contacts	3 changeover contacts	1 changeover contact
Interface/protocol		RS-485 (BMS)	RS-485 (BMS)	RS-485 (BMS)
Address range		1…30	1…30	2…90
Installation	DIN rail	–	–	■
	Screw mounting	–	–	■
	Panel mounting/wall fastening	■	■	–

Ordering information

Nominal system voltage U_n		Supply voltage U_S	Type[4]	Art. No.
AC 20…575 V	DC 20…575 V	DC 19,2…72 V	IRDH575B1-427[2]	B 9106 5502
		AC 88…264 V/DC 77…286 V	IRDH575B1-435	B 9106 5500
AC 20…150 V	DC 20…150 V	DC 19,2…72 V	IRDH575B1-4227[1]	B 9106 5505
		AC 88…264 V/DC 77…286 V	IRDH575B1-4235	B 9106 5504
AC 340…760 V	DC 340…575 V	DC 19,2…72 V	IRDH575B2-427	B 9106 5506
		AC 88…264 V/DC 77…286 V	IRDH575B2-435	B 9106 5503
AC 70…264 V, 42…460 Hz		$= U_n$	isoMED427P-2	B 7207 5301

[1] Measuring voltage U_m 10 V for version -4227 for use in control circuits.
[2] Device version with GOST certificate available.
[3] Absolute values
[4] Device „Option-W“ with increased shock and vibration resistance : Indicated by the letter „W“ at the end of the order number.

Locating current injectors for existing installations in combination with an existing insulation monitoring device

		 ISOSCAN® PGH471	 ISOSCAN® PGH473	 ISOSCAN® PGH474
Application		Stationary	Stationary	Stationary (med. locations)
Circuits	**Control circuits**	–	■	–
	Main circuits	■	–	■
Voltage system	**3(N)AC**	■	■	■
	AC	■	■	■
	AC/DC	–	–	–
	DC	■	■	■
Nominal voltage U_n max		AC, 3(N)AC 20…575 V DC 20…500 V	AC, 3(N)AC 20…265 V DC 20…308 V	AC, 3(N)AC 20…265 V DC 20…308 V
System leakage capacitance C_e µF		–	–	–
Response value R_{an} kΩ		–	–	–
Installation	**DIN rail**	■	■	■
	Screw mounting	■	■	■
	Panel mounting/wall fastening	–	–	–

Ordering information

Circuits	Locating current	BMS bus address range	Supply voltage U_S AC	Type	Art. No.
Main circuit	25/10 mA	111…119	AC 230 V	PGH471	B 9501 8004
			AC 90…132 V[1)]	PGH471-13	B 9501 8005
			DC 10.5…80 V[1)]	PGH471-21	B 9501 8006
			DC 77…286 V[1)]	PGH471-23	B 9501 8007
		121…150	AC 230 V	PGH471E	B 9501 8008
Main circuit, med. locations	1 mA	111…119	AC 230 V	PGH474	B 9501 8012
		121…150	AC 230 V	PGH474E	B 9501 8013
Control circuit	2.5/1 mA	111…119	AC 230 V	PGH473	B 9501 8009
			AC 90…132 V[1)]	PGH473-13	B 9501 8010
			DC 10.5…80 V[1)]	PGH473-21	B 9501 8011

[1)] Absolute values

Insulation fault locators ISOSCAN®




Type	EDS460-D/DG[1]…	EDS461-D…	EDS490-D…	EDS491-D…	EDS460-L…	EDS461-L…	EDS490-L…	EDS491-L…
Main circuit	■	–	■	–	■	–	■	–
Control circuit	–	■	–	■	–	■	–	■
U_S: DC 16…94 V, AC 16…72 V, 42…460 Hz	EDS460-D-1 EDS460-DG-1 [1]	EDS461-L-1	EDS490-D-1	EDS490-L-1	EDS460-L-1	EDS461-L-1	EDS490-L-1	EDS491-L-1
U_S: AC/DC 70…276 V AC 42…460 Hz	EDS460-D-2 EDS460-DG-2 [1]	EDS461-L-2	EDS490-D-2	EDS490-L-2	EDS460-L-2	EDS461-L-2	EDS490-L-2	EDS491-L-2
Scanning time	< 10 s for up to 1080 measuring channels							
Response value	2…10 mA	0.2…1 mA	2…10 mA	0.2…1 mA	2…10 mA	0.2…1 mA	2…10 mA	0.2…1 mA
Residual current indication	100 mA…10 A [1]	10 mA…1 A	100 mA…10 A	10 mA…1 A	100 mA…10 A	10 mA…1 A	100 mA…10 A	10 mA…1 A
Parameter setting function	■				–			
Indication	LC graphical display				7-segment display/LED indication			
Error code indication	■							
Number of measuring channels	12							
Address range	1…90							
Internal clock (RTC)	■				–			
History memory	■				–			
Alarm relay "Common alarm"	2 x 1 changeover contact							
Alarm relay per channel	–		12 x 1 N/O contact		–		12 x 1 N/O contact	

[1] EDS460-DG-… particularly for localising insulation faults in DC IT systems with a number of branch circuits with high system leakage capacitances. Residual current indication: 20 mA…2 A

Ordering information

Circuits	Measuring range		Alarm relay per channel	Supply voltage[2] U_S	Indication	Type	Art. No.
	EDS function	RCM function					
Control circuit	0.2…5 mA	10 mA…1 A	–	AC 16…72 V, 42…460 Hz/ DC 16…94 V	LC graphical display	EDS461-D-1	B 9108 0005
					7-segment display/LED indication	EDS461-L-1	B 9108 0007
				AC/DC 70…276 V, AC 42…460 Hz	LC graphical display	EDS461-D-2	B 9108 0006
					7-segment display/LED indication	EDS461-L-2	B 9108 0008
			12 x 1 N/O contact	AC 16…72 V, 42…460 Hz/DC 16…94 V	LC graphical display	EDS491-D-1	B 9108 0013
					7-segment display/LED indication	EDS491-L-1	B 9108 0015
				AC/DC 70…276 V, AC 42…460 Hz	LC graphical display	EDS491-D-2	B 9108 0014
					7-segment display/LED indication	EDS491-L-2	B 9108 0016
Main circuit	2…50 mA	100 mA…10 A	–	AC 16…72 V, 42…460 Hz/DC 16…94 V	LC graphical display	EDS460-D-1	B 9108 0001
					7-segment display/LED indication	EDS460-L-1	B 9108 0003
				AC/DC 70…276 V, AC 42…460 Hz	LC graphical display	EDS460-D-2	B 9108 0002
					7-segment display/LED indication	EDS460-L-2	B 9108 0004
			12 x 1 N/O contact	AC 16…72 V, 42…460 Hz/DC 16…94 V	LC graphical display	EDS490-D-1	B 9108 0009
					7-segment display/LED indication	EDS490-L-1	B 9108 0011
				AC/DC 70…276 V, AC 42…460 Hz	LC graphical display	EDS490-D-2	B 9108 0010
					7-segment display/LED indication	EDS490-L-2	B 9108 0012
		100 mA…2 A	–	AC 16…72 V, 42…460 Hz/DC 16…94 V	LC graphical display	EDS460-DG-1[3][4]	B 9108 0018
				AC/DC 70…276 V, AC 42…460 Hz	LC graphical display	EDS460-DG-2[3][4]	B 9108 0019

[2] Absolute values [3] Device version with GOST certificate available.
[4] Device version "Option-W": with increased shock and vibration resistance.

Measuring current transformers on request

Insulation fault locators ISOSCAN®
with integrated measuring current transformers

Type		ISOSCAN® EDS150	ISOSCAN® EDS151
Application		Stationary	Stationary, Medical locations
Main circuit		■	–
Control circuit		–	■
Voltage system	3(N)AC	–	–
	AC	■	■
	AC/DC	■	■
	DC	■	■
Nominal voltage U_n max		–	–
System leakage capacitance C_e µF		acc. to characteristic curve	acc. to characteristic curve
Response value R_{an} kΩ		acc. to characteristic curve	acc. to characteristic curve
Installation	DIN rail	–	–
	Screw mounting	■	■
	Panel mounting/wall fastening	–	–

Ordering information

Circuits	Measuring range	Response value		Supply voltage [1] U_S	Type	Art. No.
		EDS function	RCM function			
Control circuit	0.5…2.5 mA	0.5 mA	1 A	AC 17…24 V, 50…60 Hz/ DC 14…28 V	EDS151	B 9108 0101
Main circuit	5…25 mA	5 mA	10 A		EDS150	B 9108 0103

[1] Absolute values

Portable equipment for insulation fault location

	Locating current injector PGH		
			
Application	**Main circuit**		**Control circuit**
	energised	**offline**	**energised**
Nominal system voltage U_n	3AC, AC 20…575 V DC 20…504 V	3AC, AC 0…575 V DC 0…504 V	AC 20…265 V, DC 20…308 V
U_S AC 230 V	PGH185	PGH186	PGH183
U_S AC 90…132 V	PGH185-13	PGH186-13	PGH183-13
Locating current I_L max.	10/25 mA	10/25 mA	1/2.5 mA

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

	Measuring clamps				
					
Type	**PSA3020**	**PSA3052**	**PSA3165 (optional)**	**PSA3320**	**PSA3352**
20 mm	■	–	–	■	–
52 mm	–	■	–	–	■
115 mm	–	–	■	–	–

	Complete systems	
		
Type	**EDS3090**	**EDS3091**
Application range	Main circuits	Control circuits

EDS309… components																	
			EDS195P with accessories					PGH18… with accessories for							Measuring clamps			
Device type	Aluminium case with carrying strap	Operating manual	Insulation fault locator	Terminal connector 4 mm	Adapter BNC/4 mm plug for transformers	Adapter BNC-PS2 for WF transformers, optional	Plug-in power supply unit for EDS195P	Locating current injector	Power supply cable for PGH18…	Safety measuring lead, black	Safety measuring lead, green/yellow	Safety claw grip, black	Safety claw grip, green/yellow	Coupling device, optional (EDS3096PV only: included with delivery)	Measuring clamps 20 mm	Measuring clamps 52 mm	Measuring clamps 115 mm, optional	EDS set, optional
EDS3090	1	1	EDS195P	1	1	1	1	–	–	–	–	–	–	–	PSA3020	PSA3052	PSA3165	1
EDS3090PG	1	1	EDS195P	1	1	1	1	PGH185	1	3	1	3	1	AGE185	PSA3020	PSA3052	PSA3165	1
EDS3090PG-13	1	1	EDS195P	1	1	1	1	PGH185-13	1	3	1	3	1	AGE185	PSA3020	PSA3052	PSA3165	1
EDS3091	1	1	EDS195P	1	1	1	1	–	–	–	–	–	–	–	PSA3320	PSA3352	–	1
EDS3091PG	1	1	EDS195P	1	1	1	1	PGH183	1	3	1	3	1	–	PSA3320	PSA3352	–	1
EDS3091PG-13	1	1	EDS195P	1	1	1	1	PGH183-13	1	3	1	3	1	–	PSA3320	PSA3352	–	1
EDS3092PG	1	1	EDS195P	1	1	1	1	PGH183 PGH185	2	6	2	6	2	–	PSA3320 PSA3020	PSA3352 PSA3052	–	1
EDS3096PG	1	1	EDS195P	1	1	1	1	PGH186	1	3	1	3	1	AGE185	PSA3020	PSA3052	PSA3165	1
EDS3096PG-13	1	1	EDS195P	1	1	1	1	PGH186-13	1	3	1	3	1	AGE185	PSA3020	PSA3052	PSA3165	1
EDS3096PV	1	1	EDS195P	–	–	–	1	PGH186	1	3	1	3	1	AGE185	–	2 x PSA3052	–	–

Ordering information

Main circuits		Control circuits		Nominal voltage U_n	Supply voltage U_S	Type	Art. No.
with EDS	without EDS	with EDS	without EDS				
EDS460/490	–	–	–	AC 20…575 V, 42…460 Hz/DC 20…504 V	–	**EDS3090**	**B 9108 2026**
–	■	–	–	AC 20…575 V, 42…460 Hz/DC 20…504 V	AC 230 V, 50…60 Hz	**EDS3090PG**	**B 9108 2021**
					AC 90…132 V, 50…60 Hz	**EDS3090PG-13**	**B 9108 2022**
				AC 0…575 V, 42…460 Hz/DC 0…504 V	AC 230 V, 50…60 Hz	**EDS3096PG**	**B 9108 2025**
					AC 90…132 V, 50…60 Hz	**EDS3096PG-13**	**B 9108 2029**
–	–	EDS461/491	–	AC 20…265 V, 42…460 Hz/DC 20…308 V	–	**EDS3091**	**B 9108 2027**
–	–	–	■	AC 20…265 V, 42…460 Hz/DC 20…308 V	AC 230 V, 50…60 Hz	**EDS3091PG**	**B 9108 2023**
					AC 90…132 V, 50…60 Hz	**EDS3091PG-13**	**B 9108 2024**
–	■	–	■	AC 20…265 V, 42…460 Hz/DC 20…308 V	AC 230 V, 50…60 Hz	**EDS3092PG**	**B 9108 2030**
–	■	–	■	AC 20…575 V, 42…460 Hz/DC 20…504 V	AC 230 V, 50…60 Hz		
–	■	–	–	AC 20…575 V, 42…460 Hz/DC 20…504 V	–	**EDS3096PV**	**B 9108 2031**

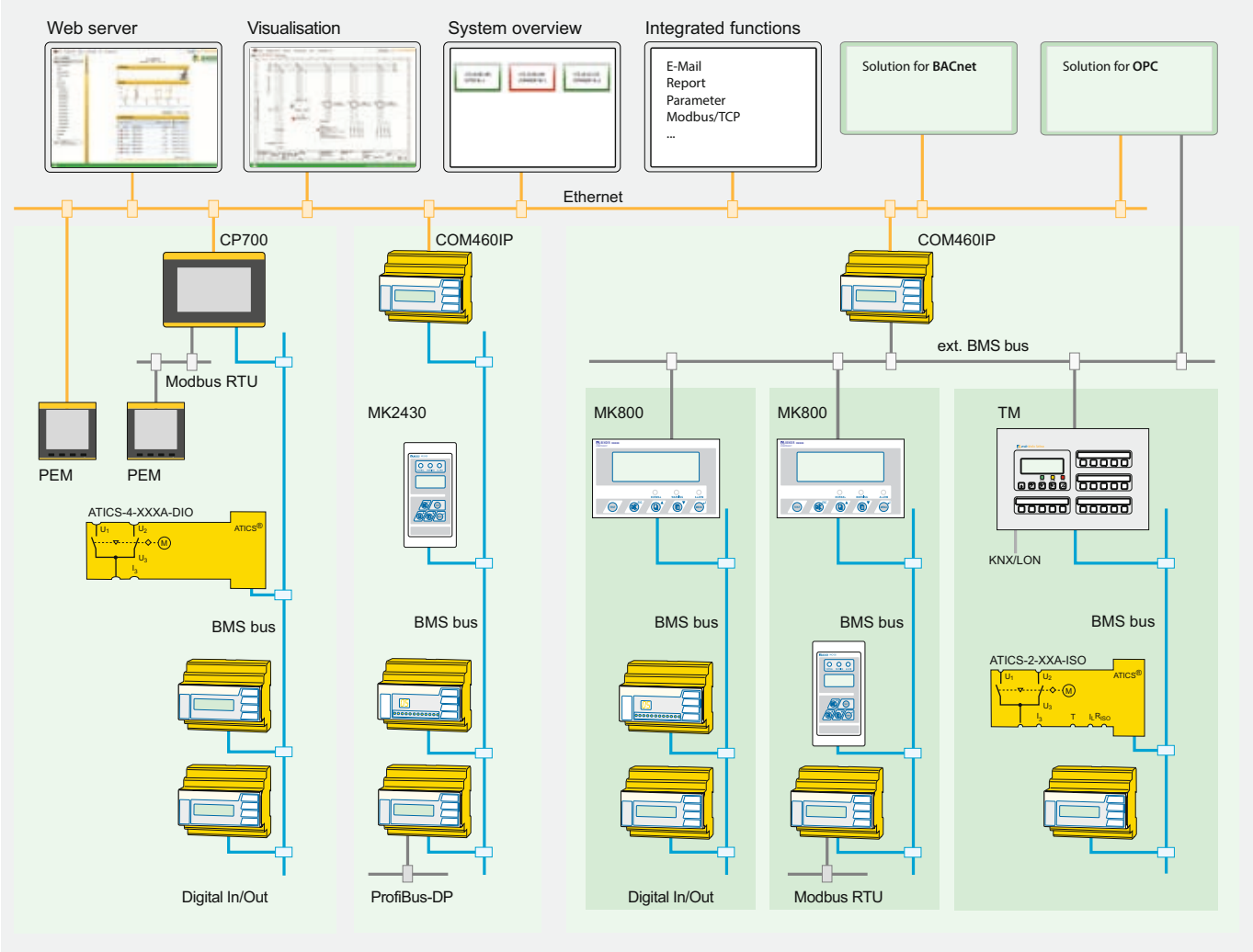
Bender monitoring systems seamless communication

Modern communication

Due to the fact that increasing demands are placed on communication capability, data transparency and flexibility, the use of modern fieldbus and network technologies has become a must. Hence, operating, warning and fault messages via the Web or the network, for example, substantially contribute to increasing the transparency of power supply systems, and also allow a fast reaction to critical operating states. In addition, important messages can be transferred via SMS or e-mails to the mobile phones or laptops of service personnel. Early information about the location and cause of a fault allow time and cost-efficient deployment of service personnel and can avoid equipment failure or damage to expensive devices.

Electrical Safety Management

The term "Electrical Safety management" means that Bender provides coherent solutions for the electrical safety of power supplies in all areas. Carefully matched products and systems with innovative measuring techniques, communication solutions for the visualisation of data from Bender monitoring systems as well as easy connection to fieldbus systems and to SCADA systems (Supervisory Control and Data Acquisition) provide the maximum possible safety, economic efficiency and transparency. The range of products is completed by comprehensive services, which extend right through the whole service life of the products.



COM460IP
BMS-Ethernet-Gateway that is used to convert data from the Bender-BMS bus into TCP/IP protocols.

COM462RTU
The BMS-Modbus/RTU gateway COM462RTU contains a Modbus/RTU slave that converts BMS data for a Modbus master.

CP700
Condition Monitor for Bender BMS devices and universal measuring devices.

MK800
Universal alarm indicator and test combination for optical and acoustic signalling of alarm messages from BMS capable Bender monitoring systems.

MK2430
Universal alarm indicator and test combination for optical and acoustic signalling of alarm messages from BMS capable Bender monitoring systems.

IT systems – used worldwide

For all IT systems (unearthed systems) the standard IEC 60364-4-41:2005-12 „Protection for Safety - Protection against electric shock" applies. According to chapter 411.6.3.1 an Insulation Monitoring Device (IMD) shall be provided to indicate a first insulation fault by an audible and/or visual signal in all cases where an IT system is used for reasons of continuity of supply. Additionally it is recommended that the first fault should be eliminated with the shortest practicable delay. In practice this can be realized e.g by an Insulation Fault Location Systems (IFLS) according to IEC 61557-9:2009.

Area of application	Application field	Typical device	Standards and regulations
General – Electrical Installations	Main Circuits	**iso685,IRDH275, IRDH375, IRDH575, EDS460, EDS3090**	IEC 60364-4-41:2005, modified -Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock, EN 50178:1997 Electronic equipment for use in power installations , IEC 62103:2003 Electronic equipment for use in power installations, IEC 61800 series Adjustable speed electrical power drive systems
	Auxiliary and (Control circuits)	**IR420, IR425, iso685, EDS461, EDS3091**	IEC 60364-5-55:2011/A1:2012 (Clause 557), HD 60364-5-557:2013 Low-voltage electrical installations – Part 5-557: Selection and erection of electrical equipment - Auxiliary circuits
	Verification	**iso685, IRDH275,IRDH375, IRDH575**	IEC 60364-6:2006-02 ,Low voltage electrical installations – verification,
Energy and Utilities	Auxiliary circuits	**IR420, IR423, IR425, iso685**	IEC 60364-4-41:2005, modified Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock
			HD 60364-5-557:2013 Low-voltage electrical installations – Part 5-557: Selection and erection of electrical equipment - Auxiliary circuits
Renewable Energies	Wind turbines	**IR425, iso685, IRDH575, EDS460**	IEC 61400-1:2005 + A1: 2010 Wind turbines – Part 1: Design requirements, IEC 61400-2:2006 Wind turbines – Part 2: Design requirements for small wind turbines
	Photovoltaic	**isoPV, isoPV425, isoPV1685, EDS460, EDS3096PV**	IEC 60364-7-712:2002-05 Part 7-712: Requirements for special installations or locations - Solar photovoltaic (PV) power supply
Manufacturing	Resistance welding		IEC 62135-1:2008); Resistance welding equipment – Part 1: Safety requirements for design, manufacture and installation
	(Production) Machinery, Cranes	**iso685, IRDH275, IRDH375, IRDH575, EDS460, EDS3090, isoLR275, iso1685PFR**	IEC 60204-1: 2005-10 Safety of machinery Electrical equipment of machines – Part 1: General requirements, IEC 60204-32: 2008-03 Safety of machinery Electrical equipment of machines – Part 32: Requirements for hoisting machines, IEC 60204-33:2009, modified Safety of machinery – Electrical equipment of machines – Part 33: Requirements for semiconductor fabrication equipment
Medical applications	Group 2 locations	**isoMED427P, 107TD47, IR426-D47, EDS461**	IEC 60364-7-710:2002-11 Electrical installations of buildings – Part 7-710: Requirements for special installations or locations – Medical locations
Data Center	Power Supplies	**isoRW425**	ETSI EN 301 605 V1.1.1 (2013-10) Environmental Engineering (EE); Earthing and bonding of 400 VDC data and telecom (ICT) equipment
E-Mobility	Electric vehicle	**IR155-3203, IR155-3204, IR155-4203, IR155-4204, iso165C**	ISO6469
	Charging	**isoEV425, IR155-3210, IR155-4210**	IEC 61851-23:2014 Electric vehicle conductive charging system – Part 23: DC electric vehicle charging station
Oil, Gas, Mining, Ships	Ships	**iso685, IRDH275, IRDH375, IRDH575, EDS460, EDS3090**	IEC 60092-. . . . series Electrical installations in ships . . . .
	Offshore	**Iso685, IRDH275, IRDH375, IRDH575, EDS460, EDS461, EDS3090**	IEC 61892-. . . . series Mobile and fixed offshore units – electrical installations
Railway	Fixed installations	**IR125, IR470, IRDH265, IRDH365, IRDH275, IRDH575, EDS460**	EN 50122-1:2011 + A1:2011 Railway applications – Fixed installations – Electrical safety, earthing and the return circuit – Part 1: Protective provisions against electric shock, EN 50122-2:2010 Railway applications – Fixed installations – Electrical safety, earthing and the return circuit – Part 2: Provisions against the effects of stray currents caused by d.c. traction systems, CLC/TS 50562:2011 Railway applications – Fixed installations – Process, measures and demonstration of safety for electric traction systems
	Rolling stock	**isoRW685, isoRW425**	EN 50155:2007 Railway applications – Electronic equipment used on rolling stock, EN 50153:2014 Railway applications – Rolling stock – Protective provisions relating to electrical hazards
IMD, IFLS	Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. – Equipment for testing, measuring or monitoring of protective measures	**IMD's, IRDH575, EDS460, EDS461, EDS150, EDS151, EDS3090, EDS3091**	IEC 61557-8:2007 + Corrigendum 2007-05 – Part 8: Insulation monitoring devices for IT systems , IEC 61557-9:2009 – Part 9: Equipment for insulation fault location in IT systems IEC, 61557-15:2014 – Part 15: Functional safety requirements for insulation monitoring devices in IT systems

Support at all stages

All-round service for your installation: Remote, by phone, on-site

Competent service for maximum safety and high availability of your installation

Regular seminars for

- **user-oriented approaches to solutions**
- **practical implementation**
- **knowledge of the latest standards**

In the training centre Gruenberg or a location near you.

From planning to modernisation – Our know-how and our expertise is at your disposal in all project phases.

Furthermore, our first-class service ensures you the maximum safety for your electrical installations.
The service we offer range from telephone support through repairs to on-site service – with state-of-the-art measuring devices and professional employees.

Many service activities, fault clearance, but also analysis and inspections, can be carried out by remote maintenance – no technician needs to be on-site, saving you time and money.

Convincing benefits:

- High availability of your installation by responding faster to fault messages
- Automatic control, analysis, correction, readjustments/updates are possible
- Competent assistance on changing settings and with updates
- Regular checking of your installations/power quality/monitoring devices
- Significant cost reduction by reduced downtimes and shorter service times

Bender – your contact for electrical safety

www.bender.de

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