

# Continuous monitoring of unearthed power supplies

Reporting critical operating states today to avoid unwanted events, such as interruptions to operation, costly damage to property or even physical injuries.

## Safe power supply

To ensure electrical safety for man and machine in an efficient way on a long-term basis, Bender offers insulation monitoring devices for all 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 avoid damage to property.

## Top-level productivity and maximum safety for man and machine

With Bender insulation monitoring devices for unearthed power supplies (IT systems) you are already using state-of-the-art technology in terms of reliability, measurement methods and design. Along with precise measurement technology, the

ISOMETER®s provide many functions for early detection and quality assurance with user-friendly and intuitive operation, reliable evaluation and diverse communication possibilities.

## Fast localisation of insulation faults

Bender insulation fault location systems enable fast localisation and elimination of insulation faults even during operation. Disconnection of the system 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. In the light of the above, Bender offers an exceptionally long warranty period of five years.

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# 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 the wide variety of production processes, continuous competitive pressure, the impact of soaring costs and operational availability around the clock, the maximum possible level of electrical safety for power supplies is required. Even with careful planning, execution and maintenance, 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.

## The aim: reduce costs – increase availability

The aim of every plant operator should be to detect malfunctions at an early stage and eliminate the causes economically in order to achieve optimal system and operational safety and ultimately reduce costs significantly. To achieve this objective, a possible solution is the use of unearthed power supplies (IT systems) with insulation monitoring.

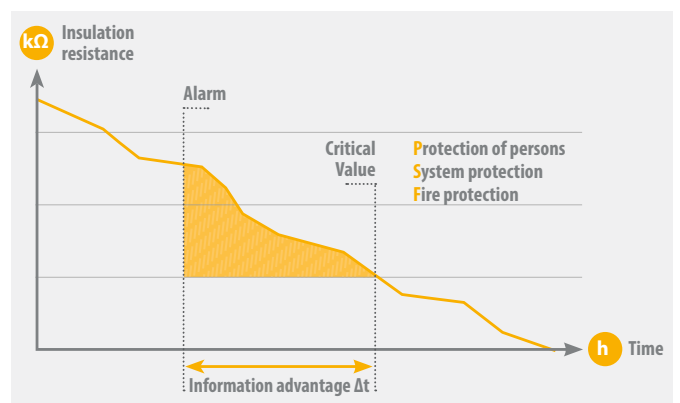
In IT systems, none of the active conductors is directly connected to earth. Therefore, on the occurrence of an insulation fault, only a small leakage current, essentially caused by system leakage capacitances, can flow.

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.

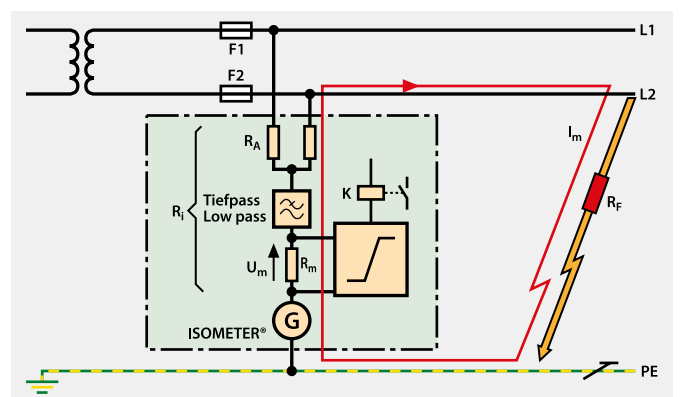
## ISOMETER®: a wide variety of solutions for all types of IT systems

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 15.5 kV
- System types 1ph, 3ph, deenergised loads
- System leakage capacitances up to 3000  $\mu\text{F}$
- Response values in various device variants from 10  $\Omega$  to 3 G $\Omega$



Information advantage through the ISOMETER®



Operating principle 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

- Early detection and reporting of insulation deterioration
- Automatic localisation of faulty current paths
- Optimised use of time and staff resources
- Central information regarding system status
- Remote diagnosis via Internet/Ethernet



### Increased fire protection

- Early detection of gradually developing insulation faults
- Minimising fault arcs as a common cause of fire
- Separating areas prone to explosions and fire from the rest of the system via isolating transformers and monitoring these areas separately



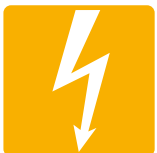
### Improved economic efficiency

- Avoiding expensive and unplanned system shutdowns
- Reducing time and staff expenses for maintenance
- Detecting weak points in systems
- Supporting investment decisions



### Increased operational reliability

- No interruption to operation at the first fault
- No control malfunction in the event of insulation faults
- Electrical installations are kept at a high level of availability
- Monitoring electrical installations and loads even when not in operation



### Enhanced accident prevention

- Low touch currents in small and medium-sized installations
- No malfunction in control systems of installations and machines due to an earth fault



### Higher earthing resistances

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

# High system availability in main circuits



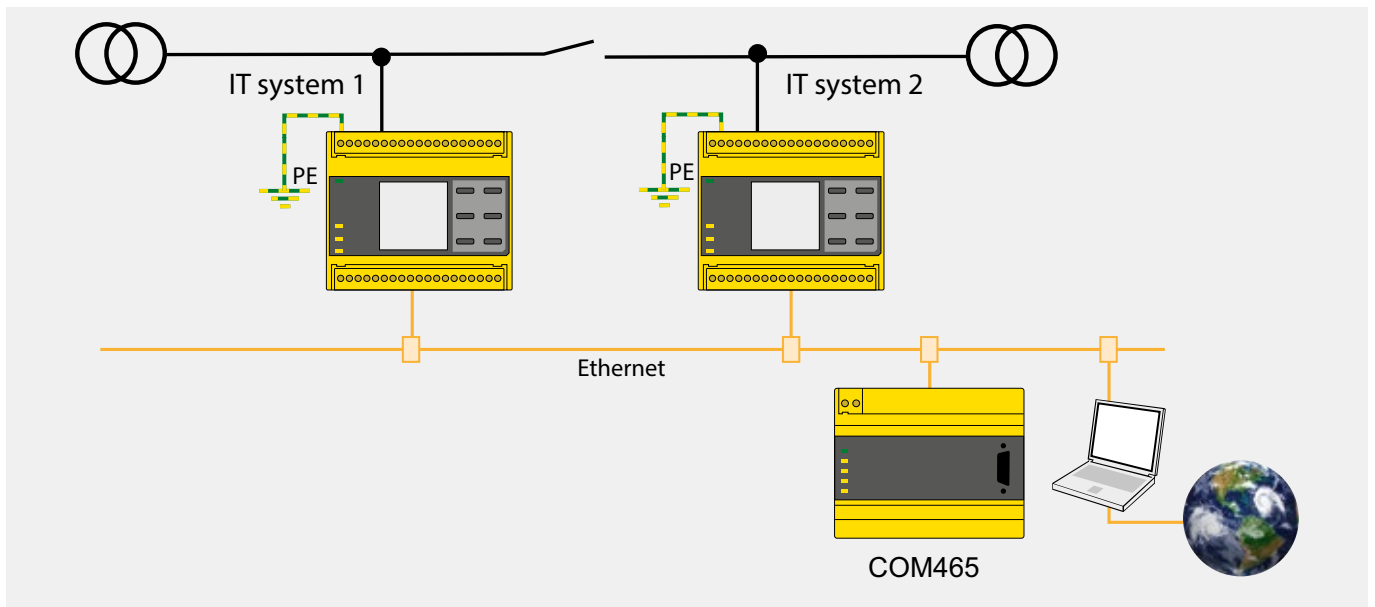
Special applications					Quick response to combined resistance and offset voltage measurement	Deenergised loads/frequency converters	High-resistance insulation measurement
Circuits	Control circuits	■	■	■	■	■	■
	Auxiliary circuits	■	■	■	■	■	■
	Main circuits	■	■	■	■	■	■
Voltage system	3(N)AC	■	■	■	■	■	■
	AC	■	■	■	■	■	■
	AC/DC	■	■	■	■	■	■
	DC	■	■	■	–	■	■
Nominal system voltage $U_n$		AC, 3(N)AC 0...690 V, DC 0...1000 V	AC, 3(N)AC 0...690 V, DC 0...1000 V	AC, 3(N)AC 0...690 V, DC 0...1000 V	AC, 3(N)AC 0...690 V (60 Hz)	AC 0...690 V, DC 0...1000 V	AC 0...1000 V, 3AC 0...690 V, DC 0...1300 V
Tolerance of $U_n$		+15 %	+15 %	+15 %	+15 %	–	+15 %
System leakage capacitance $C_e$ $\mu$ F		$\leq 1000$	$\leq 1000$	$\leq 1000$	$\leq 1000$	$\leq 1000$	$\leq 1000$
Response value $R_{an}$ k $\Omega$		1...10000	1...10000	1...10000	1...10000	1...10000	1...3000000
Coupled systems		–	■	■	–	–	■
Locating current injector for insulation fault location		–	–	■	–	–	–
Mounting	DIN rail	■	■	■	■	■	■
	Screw mounting	■	■	■	■	■	■
	Panel mounting/wall fastening	■	■	■	–	–	■
Interface	Web server	■	■	■	■	■	■
	Modbus	TCP/RTU	TCP/RTU	TCP/RTU	TCP	TCP	TCP
	BCOM	■	■	■	■	■	■
	BS	■	■	■	■	■	■
	isoData	■	■	■	–	–	■

### Ordering information

Supply voltage $U_s$	Nominal system voltage $U_n$	Panel mounting	Option "W" <sup>1)</sup>	Type	Art. No.
AC 24...240 V; 50...400 Hz/ DC 24...240 V	AC, 3(N)AC 0...690 V; 1...460 Hz/ DC 0...1000 V	-	-	iso685-D	B91067010
		-	-40...+70 °C, 3K23, 3M12	iso685W-D <sup>1)</sup>	B91067010W
		■	-	iso685-S + FP200	B91067210
		■	-40...+70 °C, 3K23, 3M12	iso685W-S + FP200W <sup>1)</sup>	B91067210W
		-	-	iso685-D-B	B91067020
		-	-40...+70 °C, 3K23, 3M12	iso685W-D-B <sup>1)</sup>	B91067020W
	AC, 3(N)AC 0...690 V (60 Hz) AC 0...690 V, DC 0...1000 V	■	-	iso685-S-B + FP200	B91067220
		■	-40...+70 °C, 3K23, 3M12	iso685W-S-B + FP200W <sup>1)</sup>	B91067220W
		-	-	iso685-D-P	B91067030
		-	-40...+70 °C, 3K23, 3M12	iso685W-D-P <sup>1)</sup>	B91067030W
		■	-	iso685-S-P + FP200	B91067230
		■	-40...+70 °C, 3K23, 3M12	iso685W-S-P + FP200W <sup>1)</sup>	B91067230W
AC 0...1000 V, 3AC 0...690 V, DC 0...1300 V	-	-	isoNAV685-D	B91067014	
	-	-	isoNAV685-D-B	B91067024	
		-	-40...+70 °C, 3K23, 3M12	isoHR685W-D-I-B <sup>1)</sup>	B91067025W
		■	-40...+70 °C, 3K23, 3M12	isoHR685W-S-I-B + FP200W <sup>1)</sup>	B91067225W

<sup>1)</sup> Increased shock and vibration resistance 3K23 and 3M12.

### Application example



# Maximum operational safety in control and auxiliary circuits



Circuits	Control circuits	■	■	■
	Main circuits	–	–	–
Voltage system	3(N)AC	■	–	–
	AC	■	■	■
	AC/DC	■	–	■
	DC	■	–	■
Nominal system voltage $U_n$		3(N)AC, AC 0...415 V/DC 0...400 V	AC 0...300 V	AC/DC 0...300 V
Frequency range $f_n$		DC 42...460 Hz	AC 42...460 Hz	DC, AC 15...460 Hz
System leakage capacitance $C_e$		$\leq 25 \mu\text{F}$	$\leq 20 \mu\text{F}$	$\leq 20 \mu\text{F}$
Response value	Response value $R_{an}$	5...1000 k $\Omega$	1...200 k $\Omega$	1...200 k $\Omega$
	Alarm contacts	1 changeover contact	2 changeover contacts	2 changeover contacts
	Operating principle	N/O or N/C operation	N/O or N/C operation	N/O or N/C operation
	Response time $t_{an}$ (at $R_f = 0.5 \times R_{an}$ and $C_e = 1 \mu\text{F}$ )	$\leq 6 \text{ s}$	$\leq 1 \text{ s}$	$\leq 2 \text{ s}$
	Start-up delay $t$	0...1800 s	0...10 s	0...10 s
	Response delay $t_{on}$	0...1800 s	0...99 s	0...99 s
Indication	LC display	–	■	■
	Operation LED	■	■	■
	Alarm LEDs	■	■	■
Mounting	DIN rail	■	■	■
	Screw mounting	■	■	■

## Ordering information

Nominal voltage $U_n$	Supply voltage $U_s$ , <sup>1)</sup>	Type	Art. No.	
			Screw-type terminal	Push-wire terminal
3(N)AC, AC 0...415 V / DC 0...400 V / AC/DC 100...240 V	DC 24 V (unearthed) AC/DC 70...276 V	iso415R-24	–	B71602000
		iso415R-2	–	B71603000
AC 0...300 V, 42...460 Hz	AC 16...72 V, 42...460 Hz/DC 9.6...94 V AC/DC 70...300 V/DC 42...460 Hz	IR420-D4-1	B91016409	B71016409
		IR420-D4-2	B91016405	B71016405
AC/DC 0...300 V, 15...460 Hz	AC 16...72 V, 15...460 Hz/DC 9.6...94 V AC/DC 70...300 V/DC 15...460 Hz	IR425-D4-1	B91036403	B71036403
		IR425-D4-2	B91036402	B71036402

<sup>1)</sup> Absolute values

## Accessories (only for IR42x)

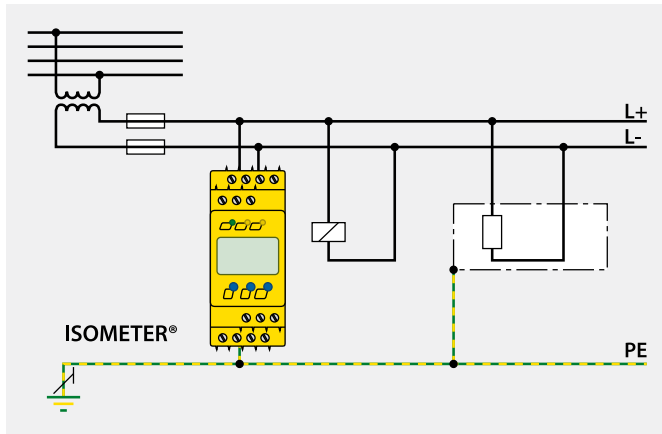
Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B98060008



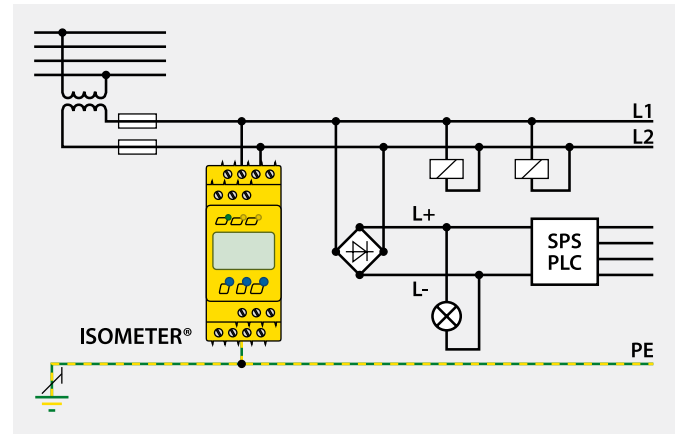


In localised areas, such as machine control systems or safety lighting where space is limited, control and auxiliary circuits provide additional functions, e.g. command output, interlocking, signalling and measuring. Operational reliability is the main focus of these circuits.

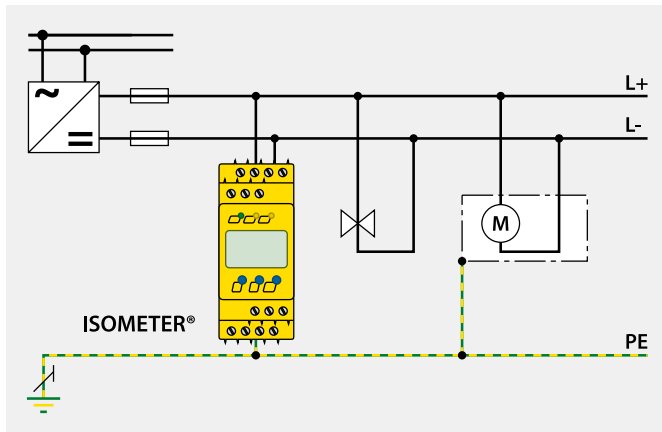
### Application examples



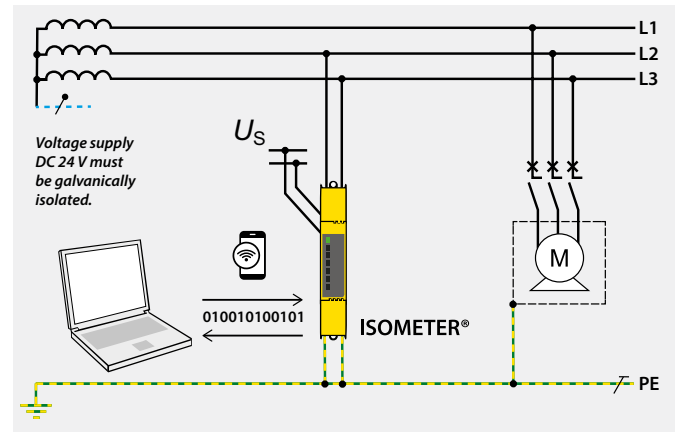
AC control circuit with IR420



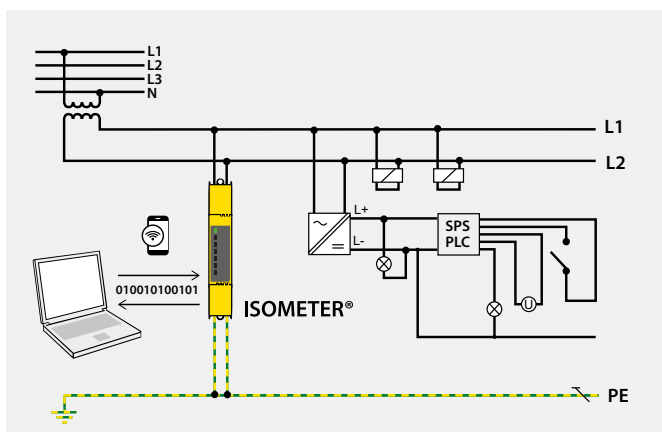
AC/DC control circuit with IR425



DC control circuit with IR425



AC control circuit with iso415R-24



AC/DC control circuit with iso415R-2

# High system availability in main circuits



Circuits	Control circuits	–	–	–	–
	Main circuits	■	■	■	■
Voltage system	3(N)AC	–	–	–	–
	AC	■	■	■	■
	AC/DC	■	■	■	■
	DC	■	■	■	■
Nominal system voltage $U_n$		AC 0...1000 V, DC 0...1500 V	AC 0...1000 V, DC 0...1500 V	AC 0...2000 V, DC 0...3000 V	AC 0...690 V, DC 0...690 V
Tolerance of $U_n$		+10 %, +6 %	+10 %, +5 %	+10 %, +5 %	+10 % +5 %
System leakage capacitance $C_e$ $\mu$ F		$\leq 500$	$\leq 2000$	$\leq 2000$	$\leq 2000$
Response value $R_{an}$ k $\Omega$		200...1000	200...1000	200...1000	20...100
Coupled systems		■	■	■	■
Mounting	DIN rail	–	–	–	–
	Screw mounting	■	■	■	■
Interface	Modbus	–	RTU	RTU	RTU
	BMS	■	■	■	■
	isoData	–	–	–	–

## Ordering information

Supply voltage $U_s$ <sup>1)</sup>	Response value range	Nominal voltage $U_n$	Version	Type	Art. No.
DC 18...30 V	200 $\Omega$ ...1 M $\Omega$	AC 0...1000 V/DC 0...1500 V	–	iso1685P-425	B91065801
		AC 0...1000 V/DC 0...1500 V	–	iso1685DP-425	B91065802
		AC 0...2000 V/DC 0...3000 V	–	isoHV1685D-425	B91065805
		AC 0...690 V/DC 0...690 V	–	isoLR1685DP-325	B91065803
AC 100...240 V, 47...63 Hz/ DC 24...240 V	11...500 k $\Omega$	AC, 3(N)AC 0...1000 V	Serial interface	isoHV425-D4-4 with AGH422	B71036501
				isoHV425W-D4-4 with AGH422W	B71036501W
			Analogue output	isoHV425-D4M-4 with AGH422	B71036503
				isoHV425W-D4M-4 with AGH422W	B71036503W

<sup>1)</sup> Absolute values

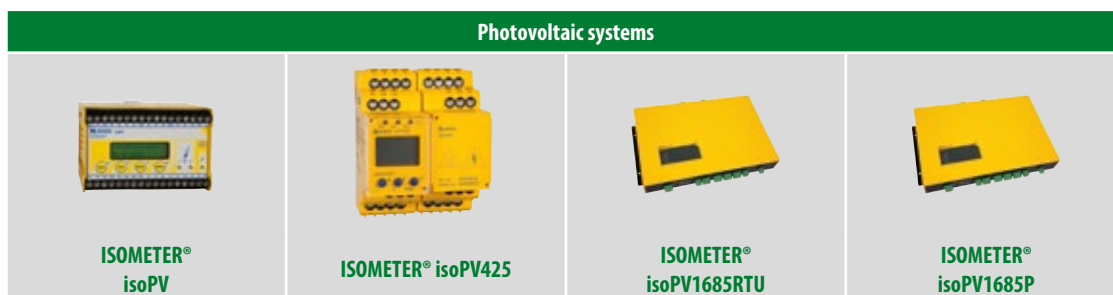


**ISOMETER®**  
**isoHV425**

Main circuits provide the power supply for electrical installations or buildings. These circuits include equipment for generating, converting, distributing, switching and consuming electrical energy. A distinction should be made between the following loads: pure AC loads (e.g. motors), AC/DC loads containing electronic components (e.g. converters) and pure DC loads (e.g. battery systems).

–
■
■
■
■
■
■
with AGH422 AC 0...1000 V, DC 0...1000 V
+10 %
≤ 150
11...500
–
■
■
RTU
■
■

# Detecting faults at an early stage in special applications



Circuits	Control circuits	–	–	–	–
	Main circuits	■	■	■	■
Voltage system	3(N)AC	■	–	–	–
	AC	■	■	–	–
	AC/DC	■	■	–	–
	DC	■	■	■	■
Nominal system voltage $U_n$		via AGH-PV 3(N)AC 0...793 V DC 0...1000 V	DC 0...1000 V, AC 0...690 V, 15...460 Hz	DC 0...1500 V	DC 0...1500 V
Tolerance of $U_n$		+ 10 %	+ 15 %	+ 6 %	+ 6 %
System leakage capacitance $C_e$ $\mu$ F		$\leq 2000$	$\leq 500$	$\leq 2000$	$\leq 2000$
Response value $R_{an}$ k $\Omega$		0,2...100	1...990	0,2...990	0,2...990
Mounting	DIN rail	■	■	–	–
	Screw mounting	■	■	■	■
Interface	Modbus	–	RTU	RTU	–
	BMS	■	■	■	■
	isoData	–	■	–	–

## Ordering information

Nominal system voltage $U_n$	Supply voltage $U_s$ <sup>1)</sup>	Type	Art. No.
AC 0...793 V/DC 0...1100 V	DC 19.2...72 V	<b>isoPV-327 + AGH-PV</b> consisting of: isoPV-327 (B91065130W), AGH-PV (B98039020W)	<b>B91065132W</b>
AC 0...793 V/DC 0...1100 V	AC 88...264 V/DC 77...286 V	<b>isoPV-335 + AGH-PV</b> consisting of: isoPV-335 (B91065131W), AGH-PV (B98039020W)	<b>B91065133W</b>
AC 0...690 V/DC 0...1000 V	AC 100...240 V, 47...63 Hz/ DC 24...240 V	<b>isoPV425-D4-2 with AGH420</b>	<b>B71036303<sup>2)</sup></b>
DC 0...1500 V	DC 18...30 V	<b>isoPV1685RTU-425</b>	<b>B91065603</b>
		<b>isoPV1685P-425</b>	<b>B91065604</b>

<sup>1)</sup> Absolute values

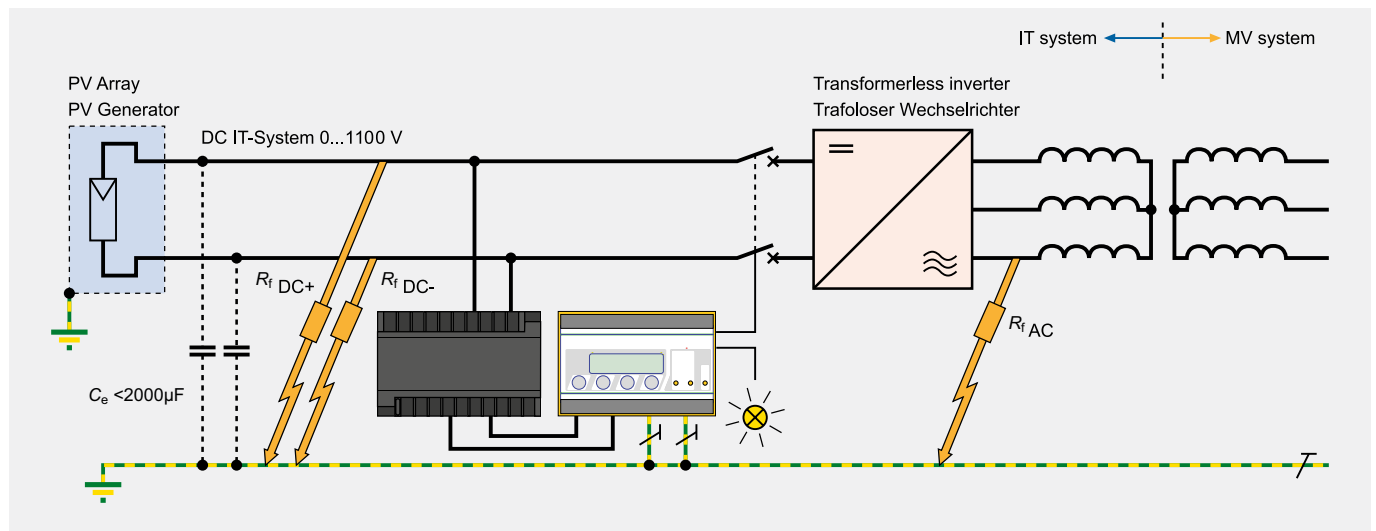
<sup>2)</sup> Device version with screw-type terminals on request

Our product range includes a large number of products tailored to special applications, such as ISOMETER®s for low-resistance DC systems, systems containing AC/DC medium-voltage converters up to 15.5 kV, mobile generators or deenergised loads. Please contact our technical sales department for further information.

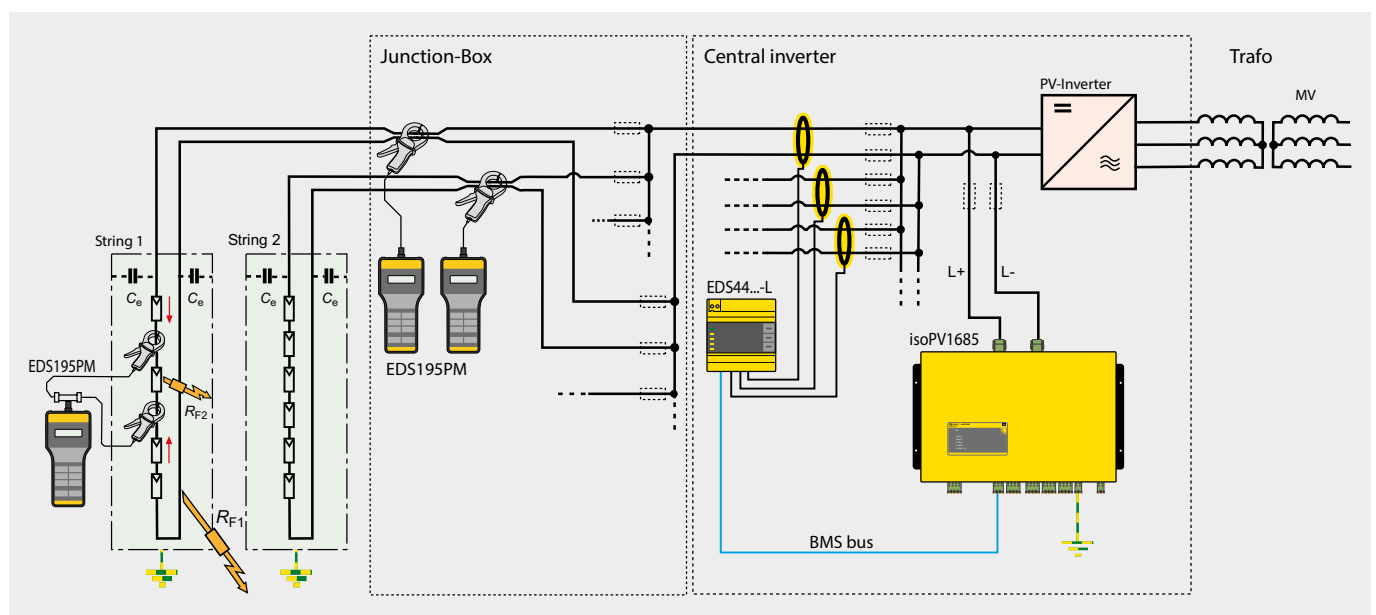
### Standard-compliant solutions for

- Photovoltaic systems
- Installations with a low-resistance insulation level
- Deenergised loads
- Mobile generators
- Railway, rolling stock

### Application examples







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



Principle of a photovoltaic system with insulation monitoring and manual/automatic insulation fault location

# Special applications

Insulated elevating work platforms	AC, DC or AC/DC medium voltage systems	Installations with a low-resistance insulation level	Deenergised loads
			
<b>ISOMETER®</b> isoHR1685DW	<b>ISOMETER®</b> IRDH275BM-7	<b>ISOMETER®</b> isoLR275	<b>ISOMETER®</b> IR420-D6



<b>Main circuits</b>		■	■	■	■
<b>Voltage system</b>	3(N)AC	–	■	■	■
	AC	■	–	■	■
	AC/DC	■	■	■	–
	DC	■	■	■	–
<b>Nominal system voltage <math>U_n</math></b>		AC 0...1000 V, DC 0...1500 V	AC, 3(N)AC, DC 0...15.5 kV (absolute)	via AGH-LR 3(N)AC 0...690 V DC 0...1000 V	AC 0...400 V
<b>Tolerance <math>U_n</math></b>		+10 %, +5%	+15 %	+15 % +10 %	–
<b>System leakage capacitance <math>C_e</math> <math>\mu</math>F</b>		$\leq 1$	$\leq 5$	$\leq 500$	$\leq 10$
<b>Response value <math>R_{an}</math> k<math>\Omega</math></b>		100...1000	100...10000	0.2...100	100...10000
<b>Coupled systems</b>		■	–	–	–
<b>Mounting</b>	DIN rail	–	■	■	■
	Screw mounting	■	■	■	■
<b>Interface</b>	Modbus	RTU	–	–	–
	BMS	■	■	■	–
	isoData	–	–	–	–

## Ordering information

Nominal system voltage $U_n$	Supply voltage $U_s$ <sup>1)</sup>	Type	Art. No.
AC 0...1000 V/DC 0...1500 V	DC 18...30 V	<b>isoHR1685DW-925</b>	<b>B91065806W</b>
–	AC 19.2...72 V	<b>IRDH275BM-7</b>	<b>B91065120</b>
AC 0...793 V/DC 0...1100 V	DC 19.2...72 V	<b>isoLR275-327 + AGH-LR-3</b> consisting of: isoLR275-327 (B91065700W), AGH-LR-3 (B98039022W)	<b>B91065702W</b>
	AC 88...264 V/DC 77...286 V	<b>isoLR275-335 + AGH-LR-3</b> consisting of: isoLR275-335 (B91065701W), AGH-LR-3 (B98039022W)	<b>B91065703W</b>
–	AC 16...72 V, 42...460 Hz/DC 9.6...94 V	<b>IR420-D6-1</b>	<b>B71016415<sup>2)</sup></b>
	AC 70...300 V, 42...460 Hz/DC 70...300 V	<b>IR420-D6-2</b>	<b>B71016407<sup>2)</sup></b>
AC 24...240 V, 47...63 Hz/DC 24...240 V	AC 12...120 V	<b>IR420-D64-2</b>	<b>B71016408<sup>2)</sup></b>
	AC/DC 0...400 V, 15...460 Hz	<b>isoUG425-D4-4</b>	<b>B71036320</b>
		<b>isoES425-D4-4</b>	<b>B71037020</b>

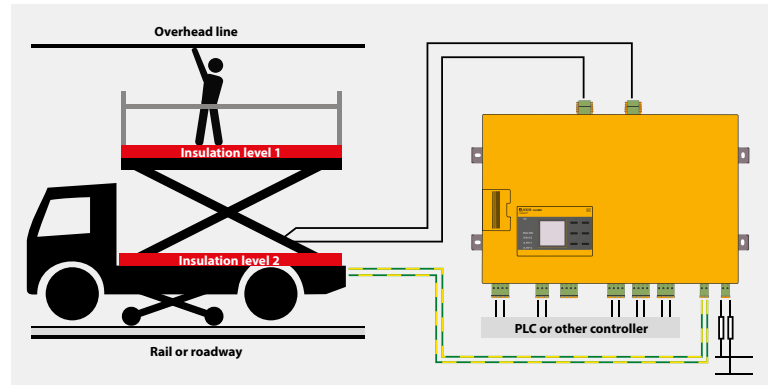
<sup>1)</sup> Absolute values

<sup>2)</sup> Device version with screw-type terminals on request

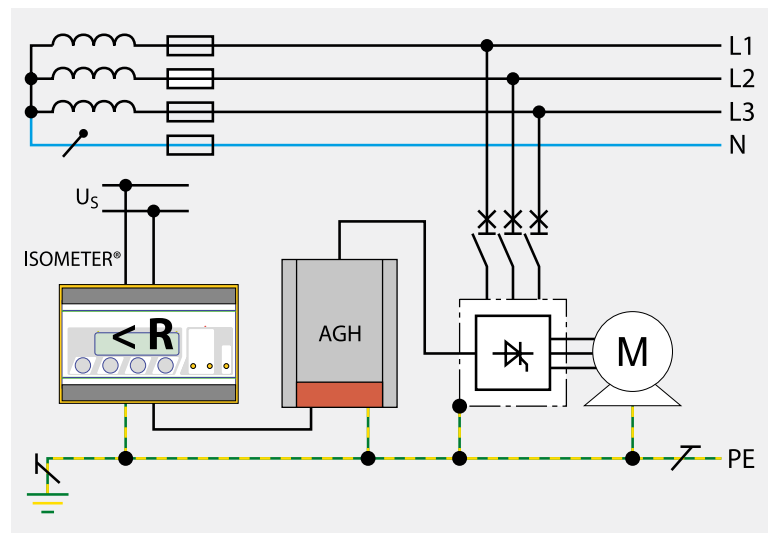
Unearthed DC systems	Energy storage VDE-AR-E 2510-2
	
<b>ISOMETER® isoUG425</b>	<b>ISOMETER® isoES425</b>

■	■
-	-
-	■
-	■
■	■
DC 12...120 V	3 (N)AC, AC 0...400 V, DC 0...400 V
+20 %	+25 %
≤ 50	≤ 100
2...100	2...990
-	-
■	■
■	■
RTU	-
■	■
■	■

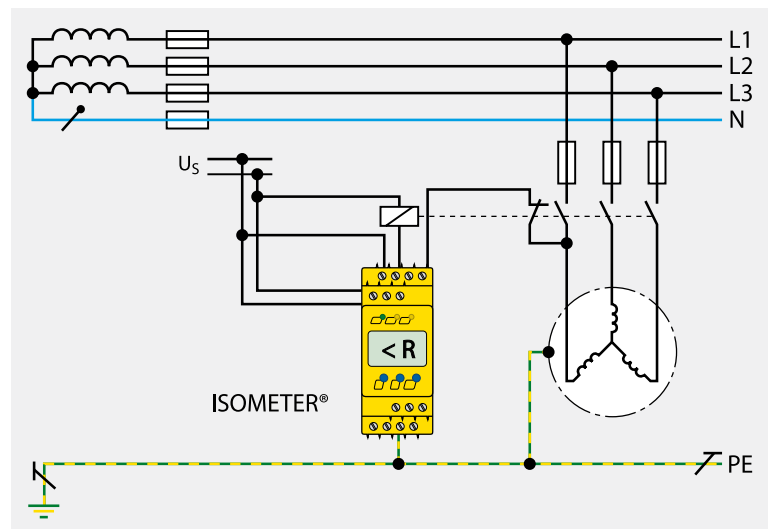
### Application example



Continuous monitoring of the insulation levels of overhead catenary maintenance vehicles with isoHR1685DW






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



Monitoring of deenergised loads with IR420-D6 (offline)

# Special applications

Portable generators		Generators acc. to standard DIN VDE 0100-551
		
<b>ISOMETER® IR423</b>	<b>ISOMETER® IR123P</b>	<b>ISOMETER® isoGEN423</b>

Main circuits				
Voltage system	3(N)AC	–	–	■
	AC	■	■	■
	AC/DC	–	–	■
	DC	–	–	■
Nominal system voltage $U_n$		AC 0...250 V	AC 100...250 V	3(N)AC, AC 0...400 V, DC 0...400 V
Tolerance $U_n$		+ 20 %	+ 20 %	+25 %
System leakage capacitance $C_e$ $\mu$ F		$\leq 5$	$\leq 1$	$\leq 5$
Response value $R_{an}$ k $\Omega$		1...200	46/23	5...200
System isolation function		–	–	■
Mounting	DIN rail	■	–	■
	Screw mounting	■	■	■
Interface	Modbus	–	–	RTU
	BMS	–	–	■
	isoData	–	–	■

## Ordering information

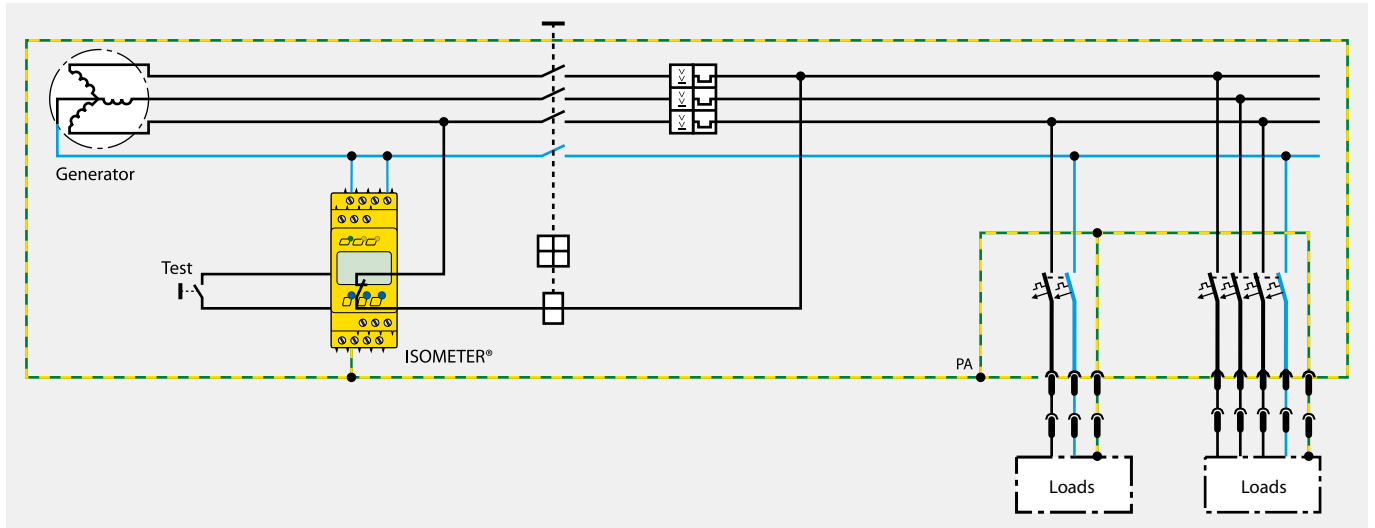
Nominal system voltage $U_n$	Supply voltage $U_s$ <sup>1)</sup>	Type	Art. No.
AC 0...300 V	AC 16...72 V, 30...460 Hz/ DC 9.6...94 V	<b>IR423-D4-1</b>	<b>B71016304<sup>2)</sup></b>
	AC/DC 70...300 V, 30...460 Hz	<b>IR423-D4-2</b>	<b>B71016305<sup>2)</sup></b>
	AC 16...72 V, 30...460 Hz/ DC 9.6...94 V	<b>IR423-D4W-1</b>	<b>B71016304W<sup>2)</sup></b>
	AC/DC 70...300 V, 30...460 Hz	<b>IR423-D4W-2</b>	<b>B71016305W<sup>2)</sup></b>
AC 100...300 V, 22...460 Hz	$U_s = U_n$	<b>IR123P-4-2</b>	<b>B91016308</b>
AC 24...240 V, 47...63 Hz/ DC 24...240 V	AC 12...120 V	<b>isoUG425-D4-4</b>	<b>B71036320</b>
	AC/DC 0...400 V, 15...460 Hz	<b>isoES425-D4-4</b>	<b>B71037020</b>
AC 100...240 V/ DC 24...240 V	3(N)AC, AC 0...400 V/DC 0...400 V	<b>isoGEN423-D4-4</b>	<b>B71036325</b>

<sup>1)</sup> Absolute values

<sup>2)</sup> Device version with screw terminals on request



## Application example



Monitoring of mobile generators with isoGEN423

# Special applications



<b>Circuits</b>	Control circuits	–	■	■
	Auxiliary circuits	–	■	■
	Main circuits	■	■	■
<b>Voltage system</b>	3(N)AC	■	■	■
	AC	■	■	■
	AC/DC	■	■	■
	DC	■	■	■
<b>Nominal system voltage <math>U_n</math></b>		AC/DC 0...440 V	AC, 3(N)AC 0...690 V, DC 0...1000 V	AC, 3(N)AC 0...690 V, DC 0...1000 V
<b>Tolerance <math>U_n</math></b>		+ 15 %	+15 %	+15 %
<b>System leakage capacitance <math>C_e</math> <math>\mu</math>F</b>		$\leq 300$	$\leq 1000$	$\leq 1000$
<b>Response value <math>R_{an}</math> k<math>\Omega</math></b>		1...990	1...10000	1...10000
<b>System isolation function</b>		–	–	■
<b>Mounting</b>	DIN rail	■	■	■
	Screw mounting	■	■	■
<b>Interface</b>	Web server	–	■	■
	Modbus	RTU	TCP/RTU	TCP/RTU
	BCOM	–	■	■
	BS	–	■	■
	BMS	■	–	–
	isoData	■	■	■

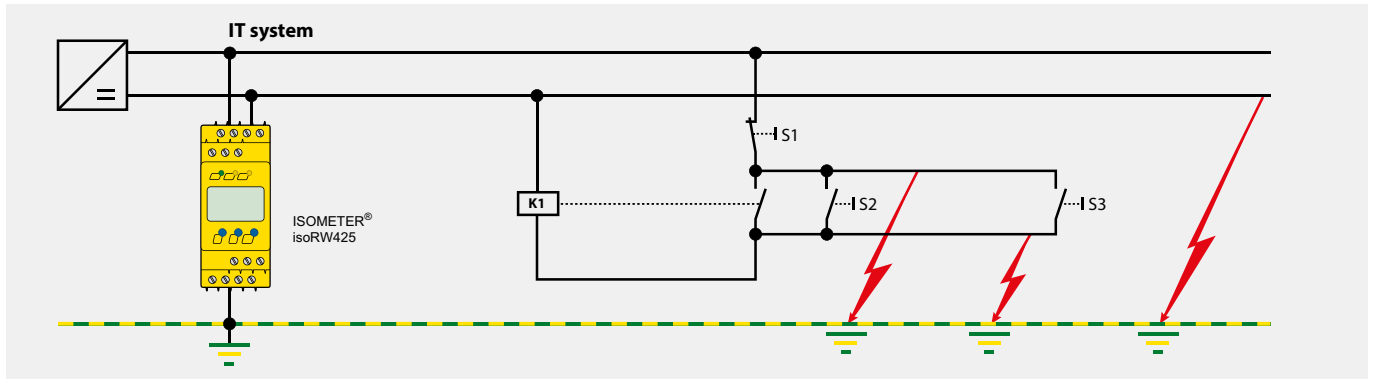
## Ordering information

Supply voltage $U_s$ <sup>1)</sup>	Nominal system voltage $U_n$	System leakage capacitance $C_e$	Type	Art. No.
AC 100...240 V/ DC 24...240 V	3(N)AC, AC/DC 0...440 V	$< 300 \mu$ F	isoRW425-D4W-4	B71037000W <sup>2)</sup>
AC 24...240 V, 50...400 Hz/DC 24...240 V	AC 0...690 V, 1...460 Hz/DC 0...1000 V	$\leq 1000 \mu$ F	isoRW685W-D	B91067012W
AC 24...240 V, 50...400 Hz/DC 24...240 V	AC 0...690 V, 0,1...460 Hz/DC 0...1000 V	$\leq 1000 \mu$ F	isoRW685W-D-B	B91067022W

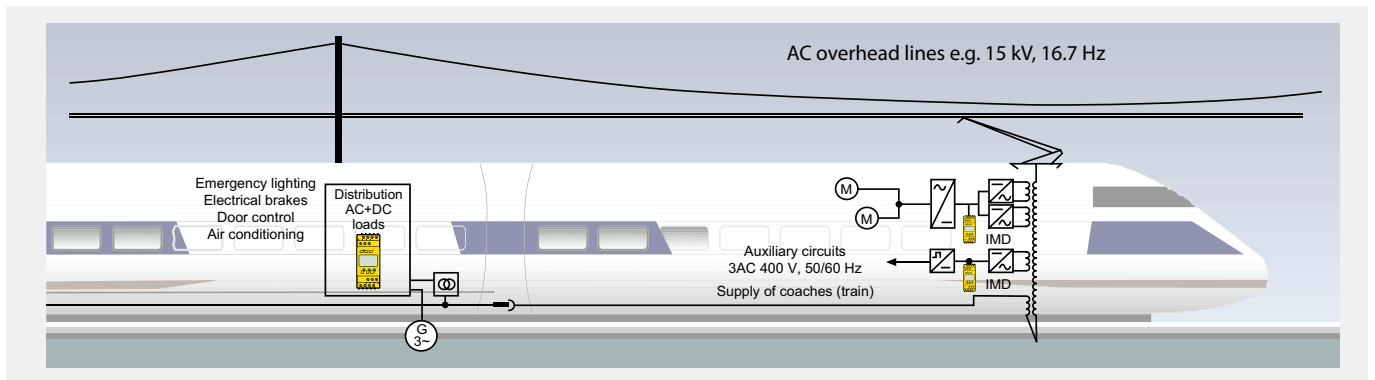
<sup>1)</sup> Absolute values

<sup>2)</sup> Device version with screw terminals on request

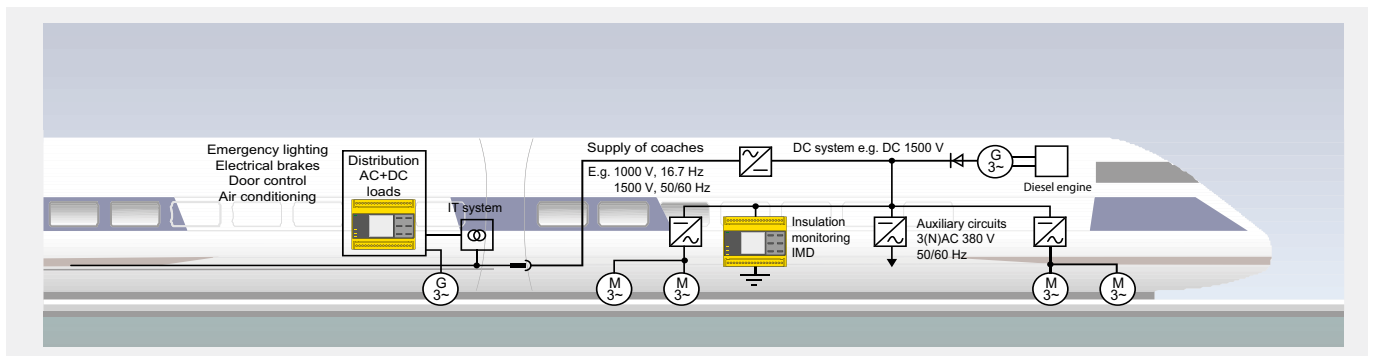
**Application examples**



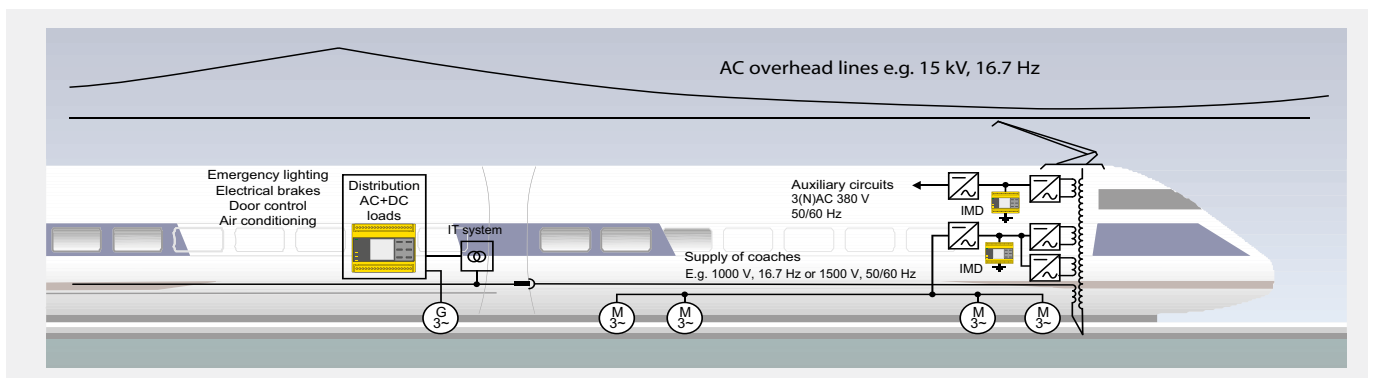
Monitoring of the complete IT system  $\leq 400\text{ V}$  with isoRW425



Universal use of the isoRW425 for IT systems  $\leq 400\text{ V}$

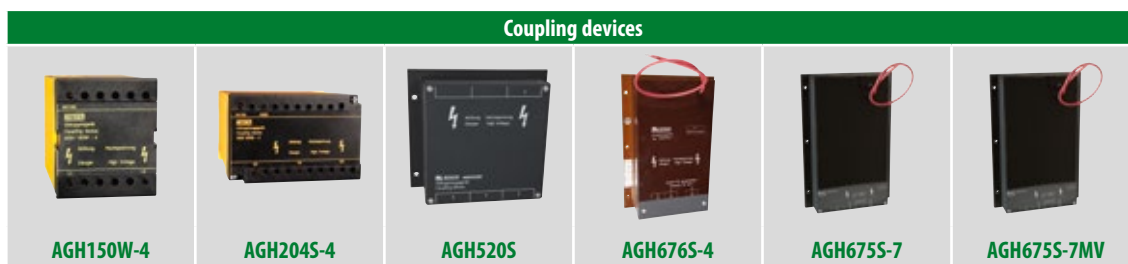


Universal use of the isoRW685 for IT systems  $> 400\text{ V}$



Universal use of the isoRW685 for IT systems  $> 400\text{ V}$

# Accessories



Application		Nominal voltage extension for ISOMETER®s					
Nominal system voltage $U_n$		AC 0...1150 V, DC 0...1760 V	AC 0...1300 V/ AC 0...1650 V	AC/3(N)AC 0...7200 V	AC/3(N)AC 0...12000 V	AC, 3(N)AC, DC 0...7200 V	AC, 3(N)AC, DC 0...15500 V
For device family	IRDH275BM-7	-	-	-	-	■	■
	IR420-D64	-	-	-	■	-	-
	iso685-D	■	■	■	■	-	-
	iso685-S	■	■	■	■	-	-

## Ordering information

Nominal system voltage $U_s$	Type	Art. No.
AC 0...1150 V/DC 0...1760 V	<b>AGH150W-4</b>	<b>B98018006</b>
AC 0...1650 V/0...1300 V	<b>AGH204S-4</b>	<b>B914013</b>
3(N)AC 0...7200 V	<b>AGH520S</b>	<b>B913033</b>
AC, 3(N)AC, DC 0...7.2 kV, 0...460 Hz	<b>AGH675S-7-500</b>	<b>B913060</b>
	<b>AGH675S-7-2000</b>	<b>B913061</b>
AC, 3(N)AC, DC 0...15.5 kV, 0...460 Hz	<b>AGH675S-7MV15-500</b>	<b>B913058</b>
AC/3(N)AC 0...12 kV, 50...460 Hz	<b>AGH676S-4</b>	<b>B913055</b>

### Measuring instruments



7204



7220



9604



9620

<b>Input current</b>	0...400 $\mu$ A	0...20 mA	0...400 $\mu$ A	0...20 mA
<b>Dimensions (mm)</b>	72 x 72	72 x 72	96 x 96	96 x 96
<b>For device family iso685...</b>	■	■	■	■

### Ordering information

Scale	Input current	Dimensions	Midscale point (SKMP)	Type	Art. No.
Sector	0...400 $\mu$ A	72 x 72 mm	120 k $\Omega$	7204-1421	B986763
				7204S-1421	B986804
		96 x 96 mm	120 k $\Omega$	9604-1421	B986764
				9604S-1421	B986784
	0...20 mA	96 x 96 mm	120 k $\Omega$	9620-1421	B986841
				9620S-1421	B986842
	0...400 $\mu$ A	96 x 96 mm	1.2 M $\Omega$	9604-1621	B986782
	0...20 mA	72 x 72 mm	120 k $\Omega$	7220-1421	B986844
				7220S-1421	B986848

# Accessories



Application		Condition Monitor / gateway	Condition Monitor / PROFIBUS gateway	Condition Monitor / gateway	Condition Monitor / gateway
Functions	Protocol input	BMS / BCOM / Modbus RTU/TCP	BMS / BCOM / Modbus RTU/TCP	isoData / Modbus TCP	BMS (internal) / BCOM / Modbus RTU/TCP
	Protocol output	Ethernet / Modbus RTU/TCP / SNMP	Ethernet / Modbus TCP / SNMP / PROFIBUS DP	Ethernet / Modbus TCP / OPC-UA	Ethernet / Modbus RTU/TCP / SNMP
	Display	LED	LED	LED	Display sizes: 7" or 15.6"
	Alarm messages	■ 1,2)	■ 1,2)	■ 1,2)	■ 1,2,3)
	Measured values	■ 1,2)	■ 1,2)	■ 1,2)	■ 1,2,3)
	Device parameter settings	■ 1)	■ 1)	■ 1)	■ 1,3)
	Alarm list	■ 1)	■ 1)	■ 1)	■ 1,3)
	History memory	■ 1)	■ 1)	■ 1)	■ 1,3)
	Diagrams	■ 1)	■ 1)	■ 1)	■ 1,3)
	Visualisation	■ 1)	■ 1)	■ 1)	■ 1,3)
	E-mail notification	■ 1,4)	■ 1,4)	■ 1,4)	■ 1,4)
	Device tests	■ 1,2)	■ 1,2)	■ 1,2)	■ 1,2,3)
	PEM... and energy meter support	■ 1)	■ 1)	■ 1)	■ 1)
	SNMP	■ 1)	■ 1)	■ 1)	■ 1)
Data logger	■ 1)	■ 1)	■ 1)	■ 1)	
Connection	BMS	Screw-type terminal	Screw-type terminal	–	Screw-type terminal
	Modbus RTU	Screw-type terminal	Screw-type terminal	–	Screw-type terminal
	isoData	–	–	Screw-type terminal	–
	Output	RJ45	RJ45, Sub-D 9-pole	RJ45	RJ45
System requirements	Supply voltage $U_s$	AC/DC 24...240 V	AC/DC 24...240 V	AC/DC 24...240 V	DC 24 V
	Browser	Edge, Chrome, Firefox etc.	Edge, Chrome, Firefox etc.	Edge, Chrome, Firefox etc.	Edge, Chrome, Firefox etc.

<sup>1)</sup> Available functions on the web server – accessible by means of a PC with a browser

<sup>2)</sup> Available via the protocol

<sup>3)</sup> On the device-internal LC display

<sup>4)</sup> TLS/SSL support

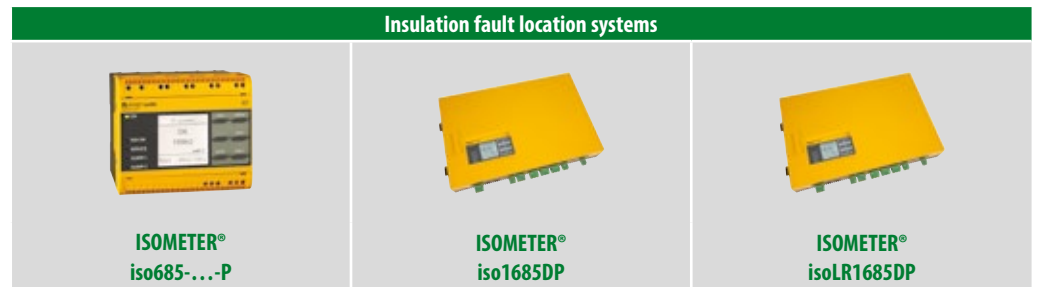
## Ordering information

Supply voltage/frequency range $U_s$	Power consumption	Type	Art. No.
AC/DC 24...240 V, 50...60 Hz	$\leq 6.5 \text{ VA}, \leq 4 \text{ W}$	<b>COM465IP-230V</b>	<b>B95061065</b>
AC/DC 24...240 V, 50...60 Hz	$\leq 6.5 \text{ VA}, \leq 4 \text{ W}$	<b>COM465DP-230V</b>	<b>B95061060</b>
AC/DC 24...240 V, 50...60 Hz	$\leq 6.5 \text{ VA}/\leq 4 \text{ W}$	<b>COM465ID-230V</b>	<b>B95061070</b>
DC 24	$\leq 15 \text{ W}$	<b>CP907-I</b>	<b>B95061031</b>
AC 100...240 V	$\leq 30 \text{ W}$	<b>CP915-I (white)</b>	<b>B95061033</b>
		<b>CP915-I (grey)</b>	<b>B95061034</b>

## Function modules for COM465IP and COM465DP

Application	Function module (software licence)	Art. No.
Individual text messages for all devices/channels, device failure monitoring, e-mail in case of an alarm, device documentation	<b>Function module A</b>	<b>B75061011</b>
Data is transmitted via Modbus TCP and Modbus RTU, SNMP server with trap function	<b>Function module B</b>	<b>B75061012</b>
Parameter setting of all integrated devices, device backups	<b>Function module C</b>	<b>B75061013</b>
Visualisation application	<b>Function module D</b>	<b>B75061014</b>
Virtual devices	<b>Function module E</b>	<b>B75061015</b>
Integration of third-party devices	<b>Function module F</b>	<b>B75061016</b>

# ISOMETER® insulation monitoring devices with locating current injector for insulation fault location



Circuits	Control circuits	<input type="checkbox"/>	–	–
	Auxiliary circuits	<input type="checkbox"/>	–	–
	Main circuits	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Voltage system	3(N)AC	<input type="checkbox"/>	–	–
	AC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	AC/DC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	DC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nominal system voltage $U_n$		AC, 3(N)AC 0...690 V, DC 0...1000 V	AC 0...1000 V, DC 0...1500 V	AC 0...690 V, DC 0...690 V
Tolerance of $U_n$		+ 15 %	+10 %, +5%	+10 %, +5%
System leakage capacitance $C_e$ $\mu$ F		$\leq 1000$	$\leq 2000$	$\leq 2000$
Response value $R_{an}$ k $\Omega$		1...10000 k $\Omega$	200 $\Omega$ ...1 M $\Omega$	20 $\Omega$ ...100 k $\Omega$
Coupled systems		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Locating current injector for insulation fault location		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mounting	DIN rail	<input type="checkbox"/>	–	–
	Screw mounting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Panel mounting/ wall fastening	<input type="checkbox"/>	–	–
Interface	Web server	<input type="checkbox"/>	–	–
	Modbus	TCP	RTU	RTU
	BCOM	<input type="checkbox"/>	–	–
	BS	<input type="checkbox"/>	–	–
	BMS	–	<input type="checkbox"/>	<input type="checkbox"/>

## Ordering information

Supply voltage $U_s$	Nominal system voltage $U_n$	Type	Art. No.
AC 100...240 V; 47...460 Hz / DC 24 V, 100...240 V	AC, 3(N)AC 0...690 V, DC 0...1000 V	iso685-D-P <sup>1)</sup>	B91067030
		iso685-S-P + FP200 <sup>1)</sup>	B91067230
DC 18...30 V	AC 0...1000 V/DC 0...1500 V	iso1685DP-425	B91065802
	AC 0...690 V/DC 0...690 V	isoLR1685DP-325	B91065803

<sup>1)</sup> Device variant "option W" with increased shock and vibration resistance: indicated by the letter "W" at the end of the order number.



# EDS insulation fault location systems

## Fast localisation of insulation faults

Fast localisation and elimination of insulation faults is required by DIN VDE 0100-410 (VDE 0100-410). The iso685-...-P in combination with the EDS system is a modular system to solve this problem. The application areas for EDS systems are highly diverse.

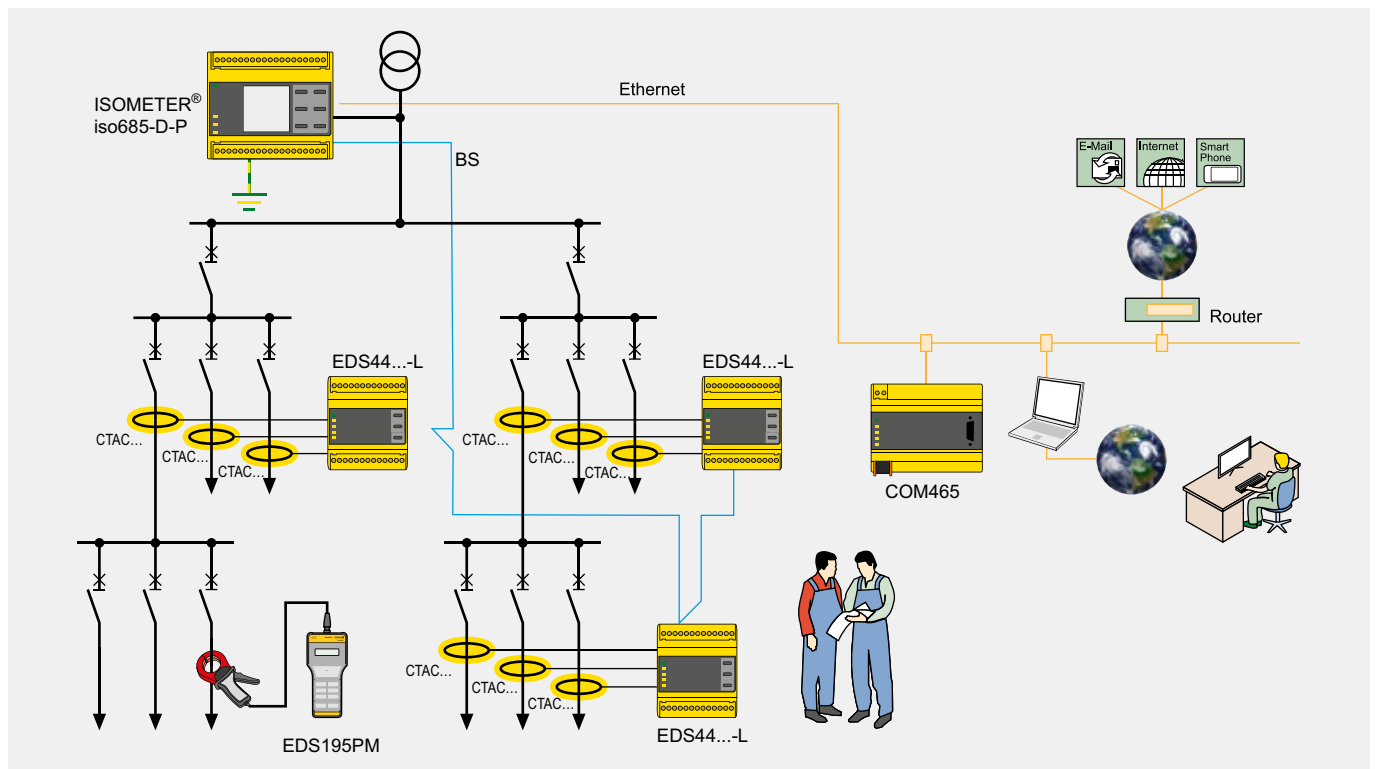
They are operated/used for **main and control circuits** e.g. in:

- Power plants
  - Shipbuilding
  - Traffic engineering
  - Industrial plants
  - Paper industry
  - Oil and natural gas industry
  - Mining, open-cast mining
  - Rolling mills
  - Mechanical engineering
- and many other areas.

## Advantages of EDS insulation fault location systems

- 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



# ISOSCAN® insulation fault locators

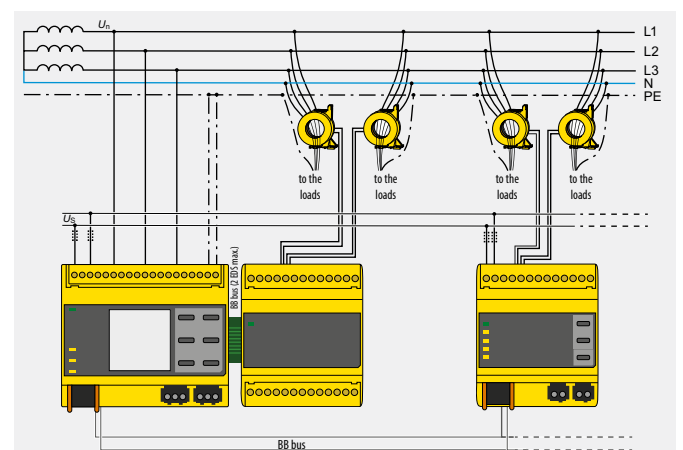


Special applications		–	–	–	–	High-resistance insulation faults for high system leakage capacitance and low locating current value	Use with flexible CTAF strap current transformers
Circuits	Control circuits	–	–	■	■	■	–
	Main circuits	■	■	–	–	–	■
Voltage system	3(N)AC	■	■	–	–	–	–
	AC	■	■	■	■	■	■
	AC/DC	■	■	■	■	■	■
	DC	■	■	■	■	■	■
Nominal voltage $U_n$ max		see locating current injector (e.g. iso685-D-P)	see locating current injector (e.g. iso685-D-P)	AC 20...276 V, DC 20...308 V	AC 20...276 V, DC 20...308 V	AC 20...276 V, DC 20...308 V	see locating current injector (e.g. iso685-D-P)
System leakage capacitance $C_e$ $\mu$ F		acc. to characteristic curve	acc. to characteristic curve	acc. to characteristic curve	acc. to characteristic curve	acc. to characteristic curve	acc. to characteristic curve
Response value $R_{an}$ k $\Omega$		acc. to characteristic curve	acc. to characteristic curve	acc. to characteristic curve	acc. to characteristic curve	acc. to characteristic curve	acc. to characteristic curve
LED display		–	■	–	■	■	■
Mounting	DIN rail	■	■	■	■	■	■
	Screw mounting	■	■	■	■	■	■
Interface		BB	BS	BB	BS	BS	BS

## Ordering information

Supply voltage $U_s$	Response value	LED display	Type	Art. No.
AC/DC 24...240 V	2...10 mA	–	EDS440-S-1	B91080201
		■	EDS440-L-4	B91080202
	0.2...1 mA	–	EDS441-S	B91080204
		■	EDS441-L-4	B91080205
		■	EDS441-LAB-4	B91080207
		■	EDS441-LAF-4	B91080209

## Application example



iso685, EDS440-S and EDS440-L

# ISOSCAN® insulation fault locators with integrated current transformer



<b>Application</b>		stationary	stationary
<b>Main circuit</b>		■	–
<b>Control circuit</b>		–	■
<b>Voltage system</b>	3(N)AC	–	–
	AC	■	■
	AC/DC	■	■
	DC	■	■
<b>Nominal voltage <math>U_n</math> max</b>		–	–
<b>System leakage capacitance <math>C_e</math> <math>\mu</math>F</b>		acc. to characteristic curve	acc. to characteristic curve
<b>Response value <math>R_{an}</math> <math>k\Omega</math></b>		acc. to characteristic curve	acc. to characteristic curve
<b>Mounting</b>	DIN rail	–	–
	Screw mounting	■	■

## Ordering information

Circuits	Measuring range	Response value		Supply voltage $U_s$ <sup>1)</sup>	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	B91080101
Main circuit	5...25 mA	5 mA	10 A		EDS150	B91080103

<sup>1)</sup> Absolute values

# Portable equipment for insulation fault location

## Locating current injector



Type	PGH185	PGH186	PGH183
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	EDS195PM
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	-	-	■	-	-

## Strap current transformers



Type	CTAF500	CTAF1000
Strap 500 mm	■	-
Strap 1000 mm	-	■

### Complete systems



Type	EDS3090	EDS3091
Application area	Main circuits	Control circuits

### EDS309... components

Device type	Aluminium case with carrying strap	Operating manual	EDS195PM with accessories				PGH18... with accessories for						Measuring clamps					
			Insulation fault locator	Terminal connector to 4 mm	Adapter BNC/4mm plug for current transformer	Adapter BNC-PS2 for WF current transformer, optional	Plug-in power supply unit for EDS195PM	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 (for EDS3096PV only: included in the scope of delivery)	Measuring clamps 20 mm	Measuring clamps 52 mm	Measuring clamps 115 mm, optional	EDS set, optional
EDS3090	1	1	EDS195PM	1	1	1	1	–	–	–	–	–	–	PSA3020	PSA3052	PSA3165	1	
EDS3090PG	1	1	EDS195PM	1	1	1	1	PGH185	1	3	1	3	1	AGE185	PSA3020	PSA3052	PSA3165	1
EDS3090PG-13	1	1	EDS195PM	1	1	1	1	PGH185-13	1	3	1	3	1	AGE185	PSA3020	PSA3052	PSA3165	1
EDS3091	1	1	EDS195PM	1	1	1	1	–	–	–	–	–	–	PSA3320	PSA3352	–	1	
EDS3091PG	1	1	EDS195PM	1	1	1	1	PGH183	1	3	1	3	1	–	PSA3320	PSA3352	–	1
EDS3091PG-13	1	1	EDS195PM	1	1	1	1	PGH183-13	1	3	1	3	1	–	PSA3320	PSA3352	–	1
EDS3092PG	1	1	EDS195PM	1	1	1	1	PGH183 PGH185	2	6	2	6	2	–	PSA3320 PSA3020	PSA3352 PSA3052	–	1
EDS3096PG	1	1	EDS195PM	1	1	1	1	PGH186	1	3	1	3	1	AGE185	PSA3020	PSA3052	PSA3165	1
EDS3096PG-13	1	1	EDS195PM	1	1	1	1	PGH186-13	1	3	1	3	1	AGE185	PSA3020	PSA3052	PSA3165	1
EDS3096PV	1	1	EDS195PM	–	–	–	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				
EDS440	–	–	–	AC 20...575 V, 42...460 Hz/DC 20...504 V	–	EDS3090	B91082026
–	■	–	–	AC 20...575 V, 42...460 Hz/DC 20...504 V	AC 230 V, 50...60 Hz	EDS3090PG	B91082021
–	–	–	–	AC 0...575 V, 42...460 Hz/DC 0...504 V	AC 90...132 V, 50...60 Hz	EDS3090PG-13	B91082022
–	–	EDS441	–	AC 20...265 V, 42...460 Hz/DC 20...308 V	AC 230 V, 50...60 Hz	EDS3096PG	B91082025
–	–	–	–	AC 20...265 V, 42...460 Hz/DC 20...308 V	AC 90...132 V, 50...60 Hz	EDS3096PG-13	B91082029
–	–	–	–	AC 20...265 V, 42...460 Hz/DC 20...308 V	–	EDS3091	B91082027
–	■	–	■	AC 20...575 V, 42...460 Hz/DC 20...504 V	AC 230 V, 50...60 Hz	EDS3091PG	B91082023
–	■	–	■	AC 20...575 V, 42...460 Hz/DC 20...504 V	AC 90...132 V, 50...60 Hz	EDS3091PG-13	B91082024
–	■	–	–	AC 20...265 V, 42...460 Hz/DC 20...308 V	AC 230 V, 50...60 Hz	EDS3092PG	B91082030
–	■	–	–	AC 20...575 V, 42...460 Hz/DC 20...504 V	AC 230 V, 50...60 Hz	EDS3096PV	B91082031

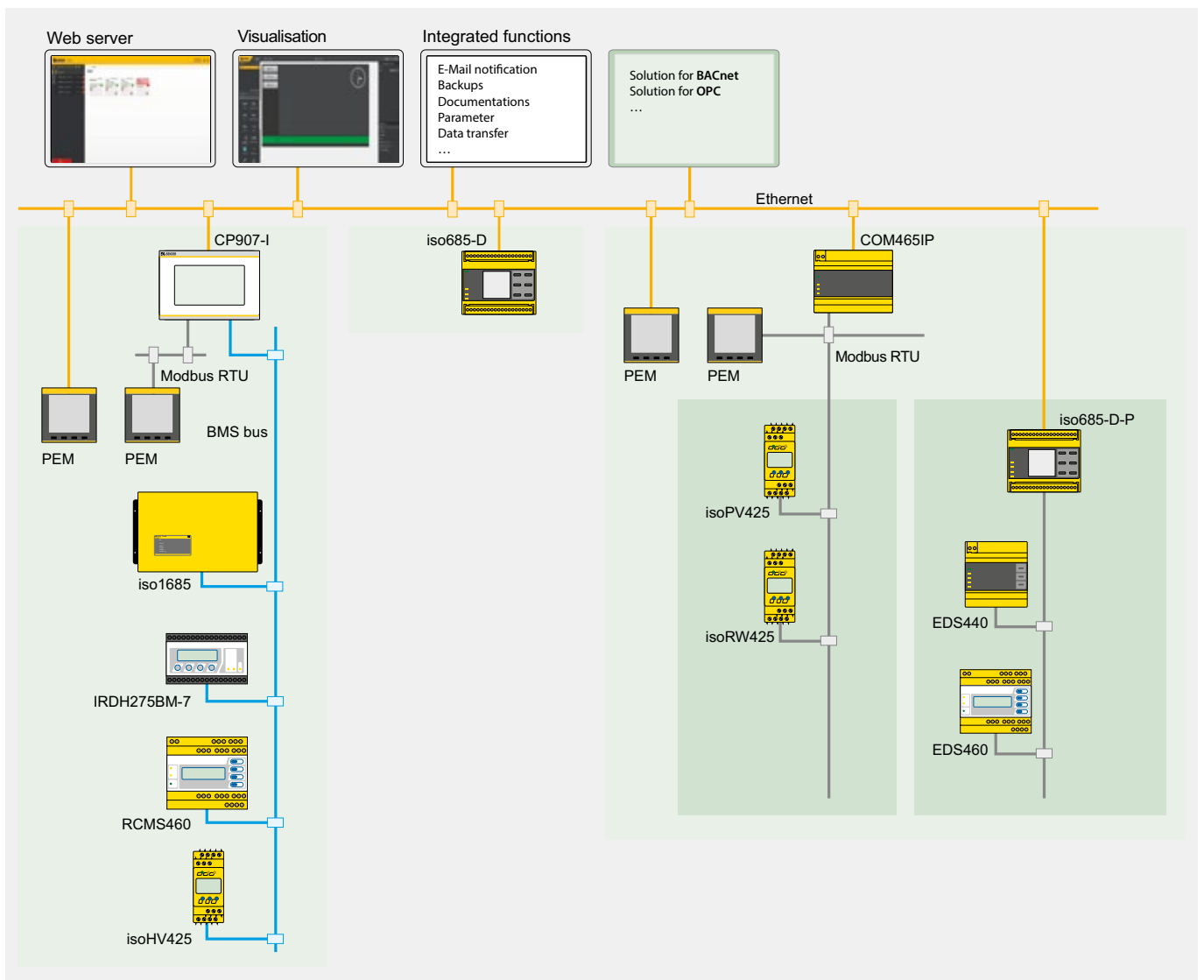
# Bender monitoring systems – seamless communication

## Modern communication

Due to the fact that increasing demands are placed on communication capability, data transparency and flexibility, the use of modern field bus and network technologies has become a must in the field of automation of electrical installations. For example, operating, alarm and fault messages via web or network 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-mail to the mobile phones or laptops of service personnel. Early information about the location and cause of a fault as early allows 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 field bus 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.





**COM465IP**

Condition monitor with an integrated gateway for the connection of Bender devices to Ethernet TCP/IP networks



**CP9...-I**

Condition Monitor with an integrated gateway and touch screen for the connection of Bender devices to Ethernet-TCP/IP networks



**CP9xx**

Control Panel – alarm indicator and operator panel for medical locations and other areas.

# Retrofit

## Untested devices and installations pose a safety risk

### Is your installation still state-of-the-art?

Even the most modern electrotechnical systems are not immune to the effects of time. Whether it is decreasing operational reliability, changing legal conditions or rising energy costs: Adapting to the current state of the art is indispensable. Typically, products for power quality monitoring and fault location are retrofitted.

### Risk assessment according to the German Ordinance on Industrial Safety and Health (BetrSichV): Does your currently installed monitoring system detect symmetrical and asymmetrical insulation faults?

Symmetrical and asymmetrical insulation faults represent a high risk potential. With Bender insulation monitors, your systems are continuously monitored, insulation faults are detected and reported. Bender insulation monitors comply with IEC 61557-8.

Let us check your electrical installations and provide you with suggestions for the next steps.

### Bender provides flexible solutions for retrofitting projects

Modern monitoring methods can also be integrated in old systems even during ongoing operation. Retrofitting is possible via devices such as divisible transformers, whereby the transformers are not even required to be shut down nor must cable installations be disconnected.

### Successor devices from Bender can easily replace old devices.

#### Your advantages

- Well prepared for the standards of tomorrow
- Compliance with legal requirements
- Increased availability
- Update to the latest safety standard
- Cut costs and reduce energy consumption
- Ensure spare parts supply in the long term

### Systematic and efficient modernisation at a low cost!





# POWERSCOUT®

## Recognising connections – optimising maintenance

Moisture, deterioration, dirt, mechanical damage or faults due to the impact of current, voltage and temperature cause malfunctions in every electrical installation. The web-based software solution POWERSCOUT® helps you detect malfunctions at an early stage and eliminate the causes in an economically reasonable way. This guarantees high installation and operational safety and reduces costs.

### Analysis – as individual as your system– as simple as possible

Predictive maintenance prevents downtimes, reduces costs and staff deployment. POWERSCOUT® informs you about the condition of your electrical installation at all times, since the meaningful visualisations with flexible dashboards can be retrieved via any display device: smart phone, laptop, computer. On request, POWERSCOUT® sends you graphically processed reports at specified intervals.

### Continuous monitoring instead of random tests

Manual data acquisition is time consuming, error-prone and only provides random results. POWERSCOUT® gives you an insight into the entire data of your installation at any time, since all measured values are automatically and continuously saved. Your data is stored reliably and remains available for years.

### Basis for periodic verification

The automated POWERSCOUT® report on residual currents forms the basis for measuring without switch-off by means of periodic verification. In order to maintain the correct status for electrical installations and stationary electrical equipment, periodic verification must be carried out.

This can be ensured, for example, by means of continuous monitoring of the installation carried out by qualified personnel. In this case, it would be smart to rely on continuous monitoring with multi-channel residual current monitoring systems (RCMS) and an evaluation (CP9...-I) adapted to the system. The automatic POWERSCOUT® reports based on this monitoring enable the qualified person in charge to adjust the time limits for the insulation test within the context of periodic verification.

### Analysis

- Continuously recording insulation values
- Recognising connections and optimising maintenance
- Cross-system evaluation possibilities
- Access from any place
- Supporting investment decisions

### Predictive maintenance

- Higher availability
- Continuous monitoring
- Early detection of gradually developing insulation faults
- Early detection and reporting of short-time insulation degradation
- Less costs incurred due to unexpected malfunctions and shutdowns

### Reports

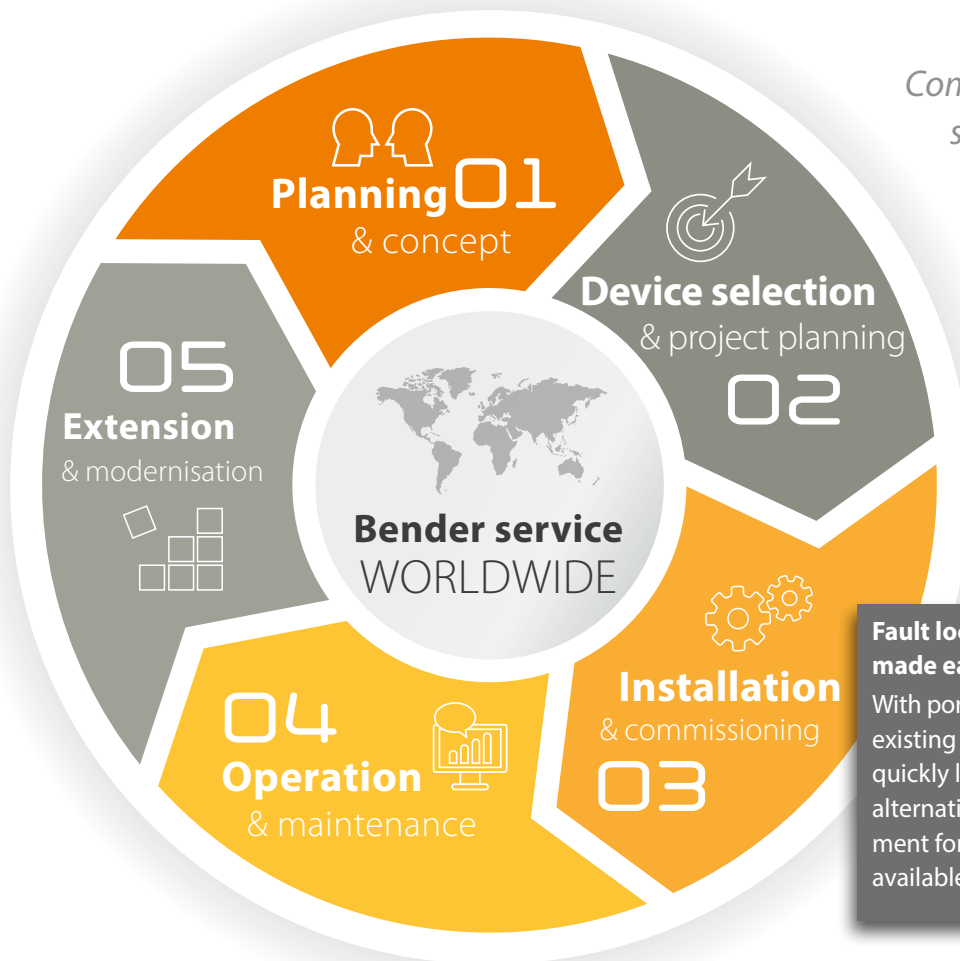
- Historical comparisons
- Safe storage of measured values
- Event and alarm statistics

Web-based software solution  
POWERSCOUT®



# Support during all stages

Comprehensive service for your installation: remote, by phone, on site



*Competent service for maximum safety and high availability of your installation*



### Fault location – made easy

With portable fault location systems, existing insulation faults can be quickly located. They are the best alternative if no stationary equipment for insulation fault location is available.

**From planning to modernisation** – Our extensive know-how is at your disposal during all project phases.

**Furthermore, with our first-class service we guarantee maximum safety for your electrical installations.**

We offer services ranging from support over telephone to repairs and on-site service – with modern measuring devices and competent employees.

### Secure yourself:

- High availability of your installation thanks to fast reaction to fault messages
- Increased profitability of your capital expenditure (CapEx) via optimised maintenance processes
- Targeted operating expenditure (OpEx) due to less downtimes and shorter service visits
- Support for your prospective system monitoring and regular tests of your system/power quality/monitoring devices
- Automatic control, analysis, correction, new settings/updates
- Competent assistance with setting changes and updates

### Bender Remote Assist

Bender Remote Assist offers you support via remote access, high-quality service and advice for your challenging task consisting in ensuring consistent high safety in your systems.

Many service visits, fault clearance but also analyses and controls can be carried out remotely – without the expenses of time and money that an on-site visit of a technician implies.

This fast, efficient help and advice by our expert network allows the highest possible availability of your system.

# Bender. So that your world is safer.

Our world is networked on a global scale; it is digital, mobile and highly automated – whether in manufacturing industry, inside or outside buildings, in operating theatres and power stations, in trains, underwater or underground: it never stands still and it is more dependent than ever on a reliable and, above all, safe electrical power supply.

And exactly that is our mission: we make electricity safe. With our technologies, we ensure that electricity is permanently available and guarantee faultless protection against the hazards of electric shock. We protect buildings, plants and devices and therefore your investments and plans. But what we primarily protect are the lives of the people who are involved with electricity.



**Mechanical and plant engineering**



**Oil, gas**



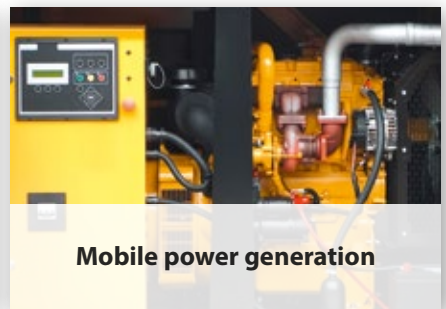
**Renewable energy**



**Healthcare**



**Public power supply network**



**Mobile power generation**



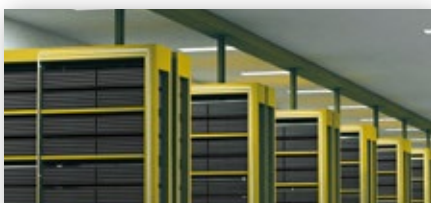
**Ships and ports**



**Railway**



**eMobility**



**Data centres**



**Mining**



**Battery energy storage systems (BESS)**



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