

## ISOMETER® isoRW685W-D

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



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Insulation monitoring device for IT AC systems  
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## Device features

- Insulation monitoring for unearthed systems AC, 3(N)AC 0...690 V, DC 0...1000 V
- Nominal system voltage can be expanded via coupling device
- Two response values that can be set separately 1 kΩ...10 MΩ
- Combination of **AMP<sup>PLUS</sup>** and other profile-dependent measuring techniques
- Continuous measurement of the capacitance, the voltage and the system frequency
- Pre-defined measuring profiles for different applications
- Automatic adaptation to system leakage capacitance
- Info button to display device settings and system settings
- Self-monitoring with automatic alarm
- Memory with real-time clock (3-day buffer) to store 1023 alarm messages with date and time
- Current or voltage output 0(4)...20 mA, 0...400 μA, 0...10 V, 2...10 V (galvanically isolated) in relation to the insulation value measured in the system
- Continuous coupling monitoring on the measuring leads
- Freely programmable digital and analogue inputs and outputs
- Two separate alarm relays with voltage-free changeover contacts
- Normally open or normally closed can be selected
- High-resolution graphic LC display
- isoGraph function for displaying the insulation resistance over time
- Remote setting of certain parameters via the Internet (option; COMTRAXX® gateway)
- Worldwide remote diagnostics via the Internet (only by service)
- RS-485 interface
- Several languages

## Product description

The ISOMETER® isoRW685W-D is an insulation monitoring device for IT systems in accordance with IEC 61557-8 for railway applications and has been specifically tested according to DIN EN 50155. It can be used universally in AC, 3(N)AC, AC/DC and DC systems. In AC systems extensive sections of the installation can also be supplied using DC (e.g. rectifiers, converters, regulated drives).

## Application

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

## Function

The insulation monitoring device isoRW685W-D continuously monitors the entire insulation resistance in an IT system during operation and triggers an alarm if the resistance drops below a response value set. For the measurement the device is connected between the IT system (unearthed system) and the protective earth conductor (PE) and a measuring current in the μA range superimposed on the distribution system; this current is measured by a microcontroller-controlled measuring circuit and evaluated. The measurement acquisition time is dependent on the measuring profiles selected, the system leakage capacitance, the insulation resistance and any system-related interference.

The response value and other parameters are set using a commissioning wizard, as well as via the various setup menus, with the aid of the buttons on the device and a high-resolution graphic LC display. The settings selected are reliably saved in non-volatile memory. Different languages can be selected for the setup menus and the messages on the display.

The device has a real time clock with the aid of which error messages and events can be saved in a history memory with time and date stamp. The settings made can be protected against unauthorised changes using a device password. For the correct function of the connection monitoring the type of system 3AC, AC or DC must be set in the device and the related terminals L1/+, L2, L3/- connected as stipulated.

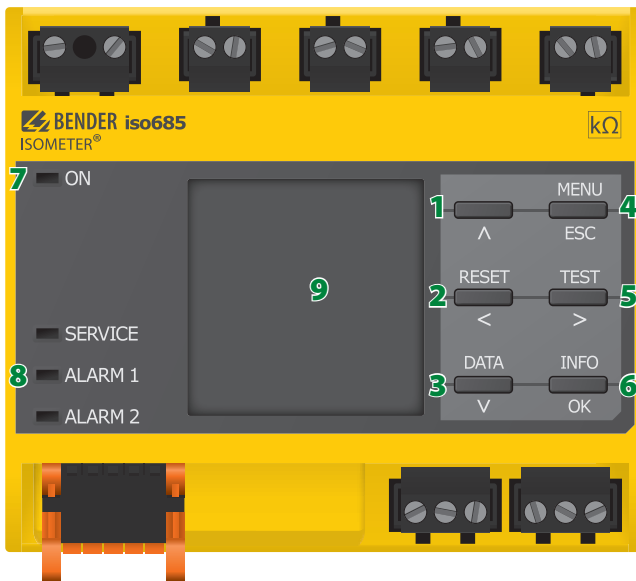
## Measuring technique

**AMP<sup>Plus</sup>** The series isoRW685W-D operates using the patented **AMP<sup>Plus</sup>** measuring technique. In this way the precise monitoring of modern power supply systems, even with extensive, directly connected DC components and high system leakage capacitances is ensured.

## Standards

The ISOMETER® isoRW685W-D series is compliant with the device standard: DIN EN 61557-8 (VDE 0413-8), DIN EN 50155

**Controls**



- 1 - "∧" button: Up, increase value
- 2 - "RESET" button: Reset messages  
"◀" button: Back, select parameter
- 3 - "DATA" button: Show data values  
"∨" button: Down, reduce value
- 4 - "MENU" button: Open device menu  
"ESC" button: Cancel, back one level
- 5 - "TEST" button: Undertake self-test  
">" button: Forward, select parameter
- 6 - "INFO" button: Display information  
"OK" button: OK, accept
- 7 - "ON" LED indicator: Operation
- 8 - "SERVICE, ALARM 1, ALARM 2" LED indicator
- 9 - LC display

**Ordering data**

Nominal system voltage range $U_n$		Supply voltage $U_s$		Type	Item no.
AC	DC	AC	DC		
0...690 V; 1...460 Hz	0...1000 V	100...240 V; 47...460 Hz	24 V, 100...240 V	isoRW685W-D	B 9106 7012W

**Accessories**

Designation	Item no.
Set of screw terminals <sup>1)</sup>	B 9106 7901
Set of spring terminals	B 9106 7902
Enclosure accessories (terminal cover, 2 mounting clips) <sup>1)</sup>	B 9106 7903

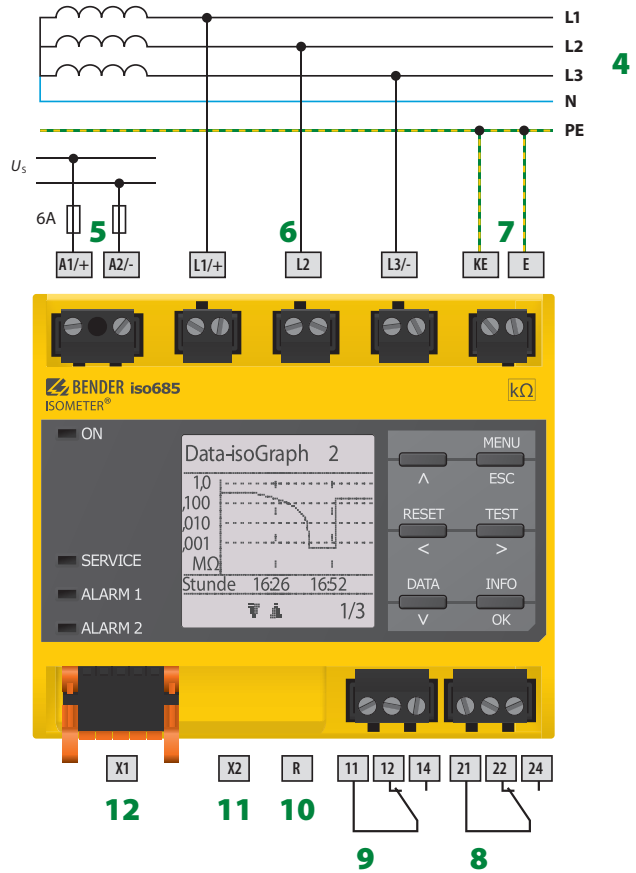
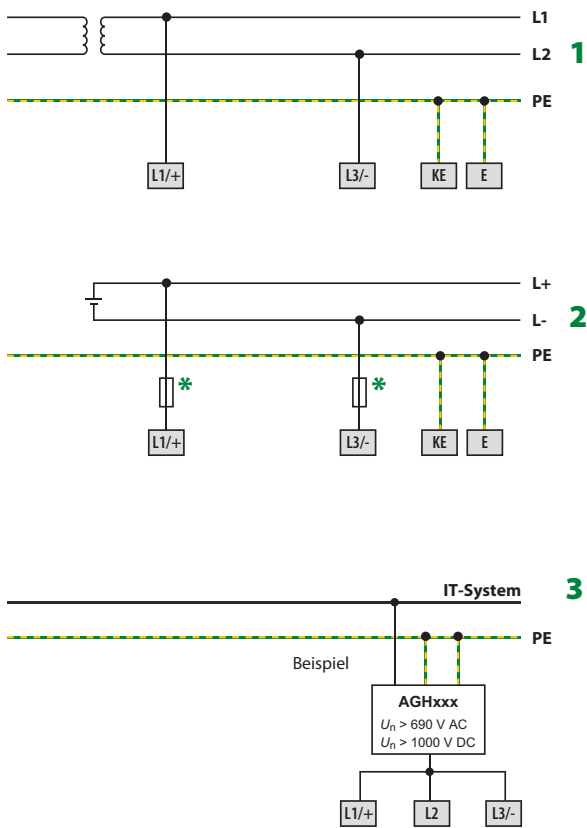
<sup>1)</sup> Included in the items supplied

**Matching system components**

Designation	Type	Item no.
Possible measuring instruments SKMP <sup>1)</sup> : 28 kΩ, 120 kΩ Currents: 0...400 μA, 0...20 mA	7204-1421	B 986 763
	9604-1421	B 986 764
	9620-1421	B 986 841
Coupling devices	AGH150W-4	B 9801 8006
	AGH204S-4	B 914 013
	AGH520S	B 913 033
	AGH676S-4	B 913 055

<sup>1)</sup> SKMP = centre of the scale

**Connection diagram**



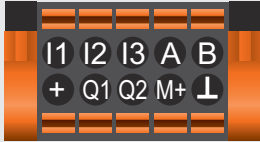
- 1 - Connection to an AC system  $U_n$
- 2 - Connection to a DC system  $U_n$
- 3 - Connection to an IT system using a coupling device
- 4 - Connection to a 3(N)AC system
- 5 - Supply voltage  $U_s$  (see nameplate) via fuse 6 A
- 6 - Connection to the IT system to be monitored (L1/+, L2, L3/-)
- 7 - Separate connection KE, E to PE

- 8 - (K1) Alarm relay 1, available changeover contacts
- 9 - (K2) Alarm relay 2, available changeover contacts
- 10 - Resistor R that can be activated for RS-485 bus termination
- 11 - Ethernet interface, connection for the Ethernet interface can only be used by Bender service
- 12 - Digital interface
- \* - F 6 A for systems > 690 V

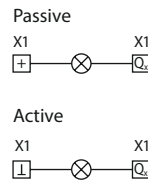
**Note**

For coupling the terminals L1/+ and L3/- to the IT system to be monitored  $\leq 690$  V as per DIN VDE 0100-430 a protective device for short-circuit protection does not have to be used for the power supply connection if the wire or cable is designed such that the risk of a short-circuit is minimal (recommendation: cable laying protected against short circuits and earth faults).

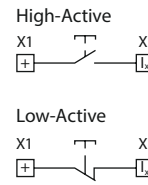
### Digital interface X1

Digital interface	Terminal	Colour
 <p>X1</p>	I1	Input 1
	I2	Input 2
	I3	Input 3
	A	RS-485 A
	B	RS-485 B
	+	+24V
	Q1	Output 1
	Q2	Output 2
	M+	Analogue output
	⊥	Earth

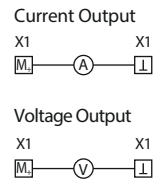
#### Digital Outputs



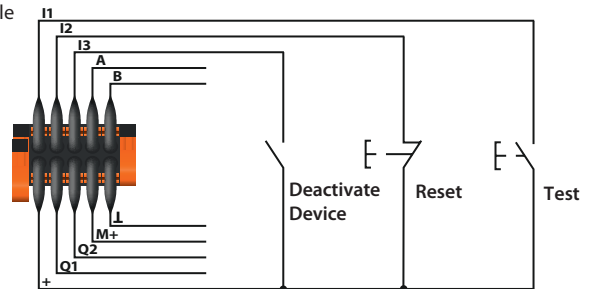
#### Digital Inputs



#### Analog Output



#### Example



### Connection to X1



Caution

#### Risk of damage due to incorrect connection!

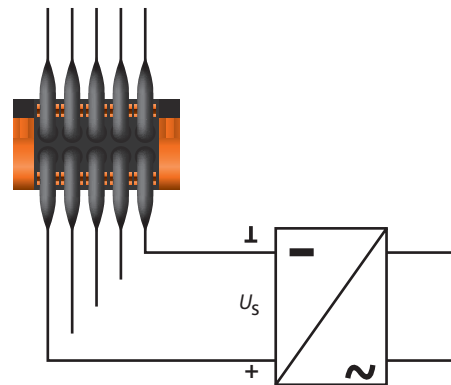
The device may be damaged if the device is connected to a supply voltage via the X1 interface and via A1/+, A2/- simultaneously. Do not connect the device to different supply voltages via X1 and A1/+, A2/- simultaneously.



Caution

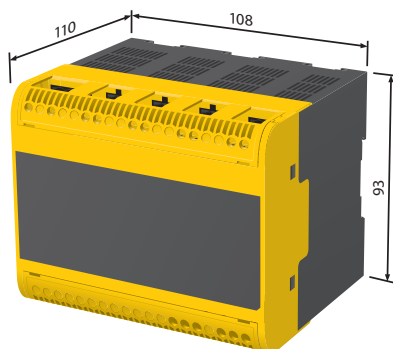
#### Risk of damage due to incorrect nominal voltage!

If the device is supplied with power via the X1 interface, the nominal voltage must be an industrial 24 V, as otherwise the device may be damaged. Only connect the device to a nominal voltage of 24 V via the X1 interface.



### Dimension diagram

Dimensions in mm



## Technical data

### Insulation coordination

Rated insulation voltage (IEC 60664-1)	1000 V
Rated impulse voltage (IEC 60664-1)	8 kV
Overvoltage category	III
Pollution degree ( $U_n < 690$ V)	3
Pollution degree ( $U_n < 1000$ V)	2
Safe separation (reinforced insulation) between (A1, A2) - (11, 12, 14) - (21, 22, 24) - [(L1/+, L2, L3/-), (E, KE), (X1, X2)]	
Voltage test, routine test (IEC 61010-1)	4.3 kV

### Supply voltage

#### Supply via A1/+, A2/-:

Supply voltage range $U_S$	AC/DC 100...240 V
Tolerance on $U_S$	AC -15...+10 % DC -15...+15 %
Frequency range on $U_S$	DC, 47...460 Hz
Power consumption typical 50 Hz (460 Hz)	5.7 W/20 VA (7.9 W/45.5 VA)

#### Supply via X1:

Supply voltage $U_S$	DC 24 V
Tolerance on $U_S$	DC -20...+25 %

### Monitored IT system

Nominal system voltage range $U_n$	AC 0...690 V DC 0...1000 V
Tolerance on $U_n$	AC/DC +15 %
Frequency range on $U_n$	DC, 1...460 Hz

### Response values

Response value $R_{an1}$ (Alarm 1)	1 k $\Omega$ ...10 M $\Omega$ (40 k $\Omega$ )*
Response value $R_{an2}$ (Alarm 2)	1 k $\Omega$ ...10 M $\Omega$ (10 k $\Omega$ )*
Relative uncertainty (according to IEC 61557-8)	profile-dependent, $\pm 15$ %, at least $\pm 1$ k $\Omega$
Hysteresis	25 %, at least 1 k $\Omega$

### Time behaviour

Response time $t_{an}$ at $R_f = 0.5 \times R_{an}$ ( $R_{an} = 10$ k $\Omega$ ) and $C_e = 1$ $\mu$ F according to IEC 61557-8	profile-dependent, typ. 4 s (see diagrams)
Response delay $T_{start}$	0...120 s (0 s)*

### Measuring circuit

Measuring voltage $U_m$	profile-dependent, $\pm 10$ V, $\pm 50$ V
Measuring current $I_m$	$\leq 403$ $\mu$ A
Internal resistance $R_i, Z_i$	$\geq 124$ k $\Omega$
Permissible external DC voltage $U_{fg}$	$\leq 1200$ V
Permissible system leakage capacitance $C_e$	profile-dependent, 0...1000 $\mu$ F

### Measurement ranges

Measuring range $f_n$	10...460 Hz
Tolerance measurement of $f_n$	$\pm 1$ % $\pm 0.1$ Hz
Voltage range measurement of $f_n$	AC 25...690 V
Measuring range $U_n$ (without external coupler)	AC 25...690 V DC 25...1000 V
Voltage range measurement of $U_n$	AC/DC $> 10$ V
Tolerance measurement of $U_n$	$\pm 5$ % $\pm 5$ V
Measuring range $C_e$	0...1000 $\mu$ F
Tolerance measurement of $C_e$	$\pm 10$ % $\pm 10$ $\mu$ F
Frequency range measurement of $C_e$	DC, 30...460 Hz
Min. insulation resistance measurement of $C_e$	Dependent on profile and type of coupling, typ. $> 10$ k $\Omega$

### Display

Display	Graphic display 127 x 127 pixels, 40 x 40 mm
Display range measured value	0.1 k $\Omega$ ...20 M $\Omega$

### LEDs:

ON (Operation LED)	Green
SERVICE	Yellow
ALARM 1	Yellow
ALARM 2	Yellow

### Digital inputs

Number	3
Mode of operation, configurable	Active high, active low
Functions	None, test, reset, start measurement, deactivate device
Voltage	Low DC -3...5 V, high DC 11...32 V

### Digital outputs

Number	2
Mode of operation, configurable	Active, passive
Functions	None, alarm 1, alarm 2, connection fault, alarm DC-, alarm DC+, symmetrical insulation fault, device fault, collective alarm, measurement complete, device inactive
Voltage	Passive DC 0...32 V, active DC 0/19.2...32 V
Max. current internal total X1	Max. 200 mA
Max. current external per channel	Max. 1 A

### Analogue output

Number	1
Mode of operation	Linear, midscale 28 k $\Omega$ /120 k $\Omega$
Functions	Insulation value, DC offset
Current, voltage	0...20 mA ( $< 600$ $\Omega$ ), 4...20 mA ( $< 600$ $\Omega$ ), 0...400 $\mu$ A ( $< 4$ k $\Omega$ ), 0...10 V ( $> 1$ k $\Omega$ ), 2...10 V ( $> 1$ k $\Omega$ )
Tolerance	$\pm 20$ %

### Interfaces

#### Fieldbus:

Interface/protocol	Telnet/HTTP
Data rate	10/100 Mbit/s, autodetect
Cable length	$\leq 100$ m
Connection	RJ45
IP address	DHCP/manual* 192.168.0.5*
Subnet mask	255.255.255.0*
Function	Service interface

#### Sensor bus:

Interface/protocol	RS-485/BMS
Data rate	9.6 kbauds/s
Cable length	$\leq 1200$ m
Cable (twisted pair, shield connected to PE at one end)	Recommended: J-Y(St)Y min. 2x0.8
Connection	Terminals X1.A, X1.B
Terminating resistor	120 $\Omega$ , can be activated internally
Device address, BMS bus	1...90 (3)*

## Technical specifications (continued)

### Switch elements

Switch elements	2 changeover contacts				
Mode of operation	N/C operation* or N/O operation				
Contact 11-12-14	None, alarm 1, alarm 2, connection fault, alarm DC-, alarm DC+, symmetrical insulation fault, device fault, common alarm, measurement complete, device inactive				
Contact 21-22-24	None, alarm 1, alarm 2, connection fault, alarm DC-, alarm DC+, symmetrical insulation fault, device fault, collective alarm, measurement complete, device inactive				
Electrical service life at rated conditions	10,000 switching cycles				
Contact data acc. to IEC 60947-5-1:					
Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-12
Rated operational voltage	230 V	230 V	24 V	110 V	220 V
Rated operational current	5 A	3 A	1 A	0.2 A	0.1 A
Rated insulation voltage ≤ 2000 m above sea level					250 V
Rated insulation voltage ≤ 3000 m above sea level					160 V
Minimum contact rating	1 mA at AC/DC ≥ 10 V				

### Environment / EMC

EMC	IEC 61326-2-4; EN 50121-3-2; EN 50121-4**				
Ambient temperatures:					
Operation	-40...+70 °C				
Transport	-40...+85 °C				
Storage	-25...+70 °C				
Climatic classes acc. to IEC 60721:					
Stationary use (IEC 60721-3-3)	3K7				
Transport (IEC 60721-3-2)	2K3				
Long-term storage (IEC 60721-3-1)	1K4				
Classification of mechanical conditions acc. to IEC 60721:					
Stationary use (IEC 60721-3-3)	3M7				
Transport (IEC 60721-3-2)	2M2				
Long-term storage (IEC 60721-3-1)	1M3				
Area of usage	≤ 3000 m above sea level				

### Connection

Connection type	Plug-in screw or spring terminal
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### Screw terminals:

Tightening torque	0.5...0.6 Nm (5...7 lb-in)
Conductor sizes	AWG 24...12
Stripped length	7 mm
Rigid/flexible	0.2...2.5 mm <sup>2</sup>
Flexible with ferrule with / without plastic sleeve	0.25...2.5 mm <sup>2</sup>
Multiple conductor rigid	0.2...1 mm <sup>2</sup>
Multiple conductor flexible	0.2...1.5 mm <sup>2</sup>
Multiple conductor flexible with ferrule without plastic sleeve	0.25...1 mm <sup>2</sup>
Multiple conductor flexible with TWIN ferrule with plastic sleeve	0.5...1.5 mm <sup>2</sup>

### Spring terminals:

Conductor sizes	AWG 24...12
Stripped length	10 mm
Rigid/flexible	0.2...2.5 mm <sup>2</sup>
Flexible with ferrule with/without plastic sleeve	0.25...2.5 mm <sup>2</sup>
Multiple conductor flexible with TWIN ferrule with plastic sleeve	0.5...1.5 mm <sup>2</sup>

### Spring terminals X1:

Conductor sizes	AWG 24...16
Stripped length	10 mm
Rigid/stranded	0.2...1.5 mm <sup>2</sup>
Stranded with ferrule without plastic sleeve	0.25...1.5 mm <sup>2</sup>
Stranded with plastic sleeve	0.25...0.75 mm <sup>2</sup>

### Other

Operating mode	Continuous operation
Mounting position	Display-orientated, air must pass through cooling slots vertically
Degree of protection, internal components	IP40
Degree of protection, terminals	IP20
Snap-on mounting on a DIN rail	IEC 60715
Screw fixing	3 x M4 with mounting clip
Enclosure material	Polycarbonate
Flammability class	V-0
Dimensions (W x H x D)	108 x 93 x 110 mm
Documentation number	D00178
Weight	≤ 450 g

( )\* = Factory setting

( )\*\* = The serial interface (RS-485) can be considered a highly symmetrical pair



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