Insulation monitoring relays for unearthed supply systems
Product group picture

2

Insulation monitoring relays for unearthed supply systems
Table of contents

Insulation monitoring relays for unearthed supply systems

Benefits and advantages 2/61
Benefits and advantages, Applications 2/62
Operating controls 2/63
Insulation monitoring in IT systems 2/64
Selection table 2/65
Ordering details 2/66
Operating state indication, Connection diagrams, DIP switches 2/67
Technical data 2/68
Technical data CM-IVN 2/71

Insulation monitoring relays for unearthed supply systems
Benefits and advantages

CM-IWS.2

CM-IWS.1

CM-IWN.1

Insulation monitoring relays for unearthed pure AC systems:

Characteristics
- For monitoring the insulation resistance of unearthed IT systems:
  up to U_n = 400 V AC
- According to IEC/EN 61557-8 "Electrical safety in low voltage distribution systems up to 1000 V AC and 1500 V DC: Equipment for testing, measuring or monitoring of protective measures – Part 8: Insulation monitoring devices for IT systems"
- Rated control supply voltage 24–240 V AC/DC
- Superimposed DC signal
- One measuring range 1–100 kΩ
- Precise adjustment of the threshold value in 1 kΩ steps
- Interrupted wire detection
- Fault storage/latching configurable by control input
- 1 c/o (SPDT) contact, closed-circuit principle
- 22.5 mm [0.89 in] width
- 3 LEDs for status indication

Insulation monitoring relays for unearthed AC, DC or mixed AC/DC systems:

Characteristics
- For monitoring the insulation resistance of unearthed IT systems up to U_n= 250 V AC and 300 V DC or U_n= 400 V AC and 600 V DC
- According to IEC/EN 61557-8 "Electrical safety in low voltage distribution systems up to 1000 V AC and 1500 V DC: Equipment for testing, measuring or monitoring of protective measures – Part 8: Insulation monitoring devices for IT systems"[1)]
- CM-IWN.4,5,6: Specifically for applications with high system leakage capacitances, for example in photovoltaic environments
- Rated control supply voltage 24-240 V AC/DC
- Prognostic measuring principle with superimposed square wave signal
- 1 or 2 measuring ranges (1-100 kΩ or 1-100 kΩ + 2-200 kΩ)
- 1 or 2 (configurable) c/o contacts[1)]
- Precise adjustmemt of the measuring value in 1 or 2 kΩ steps
- (non-volatile) fault storage, configurable latching, interrupted wire protection, open- or closed-circuit principle selectable[1)]
- 22.5 or 45 mm width
- 3 LEDs for status indication

[1)] depending on devices

Additional characteristics for CM-IWN.1,4,5,6:
- One (1 x 2 c/o) or two (2 x 1 c/o) threshold values R_{an}1/R1[1)] (final switch-off) and R_{an}2/R2[2)] (prewarning) configurable[3)]
- Precise adjustment of the threshold values in 1 kΩ steps (R1) and 2 kΩ steps (R2)
- Interrupted wire detection configurable
- Non-volatile fault storage configurable
- Open- or closed-circuit principle configurable

[1)] CM-IWN.6 does not meet the requirements of IEC/EN 61557-8 regarding the response time t_{an}.
[2)] term acc. to IEC/EN 61557-8
[3)] R2 only active with 2 x 1 c/o configuration

Insulation monitoring relays for unearthed supply systems
Benefits and advantages, Applications

Application / monitoring function CM-IWx
The CM-IWx serve to monitor insulation resistance in accordance with IEC 61557-8 in unearthed IT AC systems, IT AC sytems with galvanically connected DC circuits, or unearthed IT DC systems. The insulation resistance between system lines and system earth is measured. If this falls below the adjustable threshold values, the output relay(s) energize or de-energize. The CM-IWS.x can monitor control circuits (single-phase) and main circuits (3-phase). Supply systems with voltages U_n= 0-400 V AC (45-65 Hz), U_n=0-250 V AC (15-400 Hz) or 0-300 V DC can be directly connected. For systems with voltages above 400 V AC the insulation monitoring relay with or without the coupling unit CM-IVN can be used.

Application / monitoring function CM-IWN.x
The CM-IWN.x serves to monitor insulation resistance in accordance with IEC 61557-8 in unearthed IT AC systems, IT AC systems with galvanically connected DC circuits, or unearthed IT DC systems. The insulation resistance between system lines and system earth is measured. If this falls below the adjustable threshold values, the output relays switch into the fault state. The device can monitor control circuits (single-phase) and main circuits (3-phase). Supply systems with voltages U_n = 0-400 V AC (15-400 Hz) or 0-600 V DC can be directly connected to the measuring inputs and their insulation resistance being monitored. For systems with voltages above 400 V AC and 600 V DC the coupling unit CM-IVN can be used for the expansion of the CM-IWN.x voltage range.

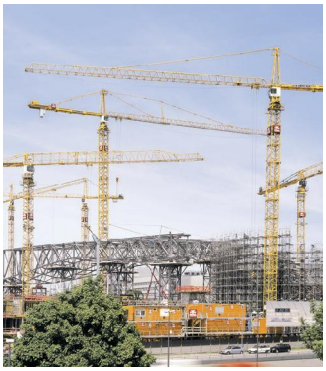
Expansion of assortment for the requirements of decentral eletrical energy sources
ABB‘s insulation monitoring relays from the CM-IWN range provide higher system leakage capacitances which are necessary especially for solar applications. This expanded product range covers the requirements of decentral eletrical sources (e.g. photovoltaic systems).
The range of system leakage capacitances is 20 - 2000 µF.

Application / monitoring function CM-IVN
The coupling unit CM-IVN is designed to extend the nominal voltage range of the insulation monitoring relay CM-IWN.1 up to 690 V AC and 1000 V DC. The coupling unit can be connected to the system to be monitored by means of the terminals VL+ and VL-. The terminal Vw has to be connected to the earth potential. The terminals L+, V1+, L-, V1-, VS and VE have to be connected to the CM-IWN.1 as shown in the connection diagrams below. Supply systems with voltages U_n = 0-690 V AC (15-400 Hz) or 0-1000 V DC can be connected.

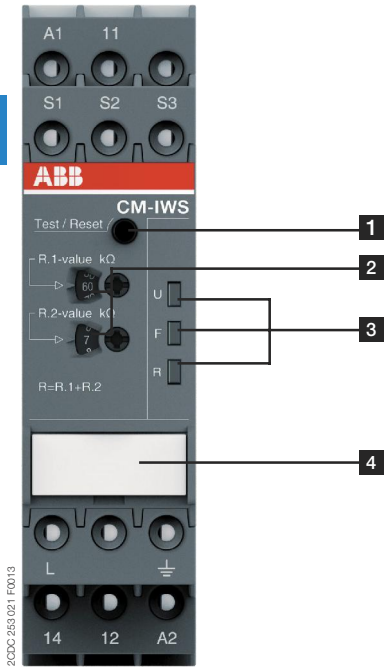
Measuring principle CM-IWS.2
A superimposed DC measuring signal is used for measurement. From the superimposed DC measuring voltage and its resultant current the value of the insulation resistance of the system to be monitored is calculated.

Measuring principle CM-IWN.x, CM-IWS.1
A pulsating measuring signal is fed into the system to be monitored and the insulation resistance is calculated. This pulsating measuring signal alters its form depending on the insulation resistance and system leakage capacitance. From this altered form the change in the insulation resistance is forecast. When the forecast insulation resistance corresponds to the insulation resistance calculated in the next measurement cycle and is smaller than the set threshold value, the output relay de-energizes. This measuring princiiple is also suitable for the detection of symmetrical insulation faults.



Insulation monitoring relays for unearthed supply systems
Operating controls



1 **Test and reset button**

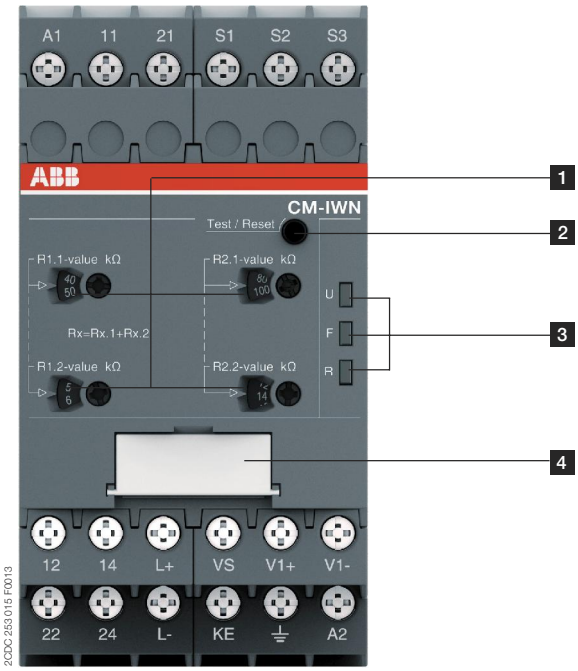
2 **Configuration and setting**

Front-face rotary switches for threshold value adjustment:
R.1 for R1 tens figures:
0, 10, 20, 30, 40, 50, 60, 70, 80, 90 kΩ in ten kΩ steps
R.2 for R1 units figures:
1, 2, 3, 4, 5, 6, 7, 8, 9, 10 kΩ in one kΩ steps

3 **Indication of operational states**

U: green LED - control supply voltage
F: red LED - fault message
R: yellow LED - relay status

4 **Marker label for devices without DIP switches**



1 **Front-face rotary switches to adjust the threshold value:**

R1.1 for R1 tens figure:
0, 10, 20, 30, 40, 50, 60, 70, 80, 90 kΩ in ten kΩ steps
R1.2 for R1 units figure:
1, 2, 3, 4, 5, 6, 7, 8, 9, 10 kΩ in one kΩ steps
R2.1 for R2 tens figure:
0, 20, 40, 60, 80, 100, 120, 140, 160, 180 kΩ in twenty kΩ steps
R2.2 for R2 units figure:
2, 4, 6, 8, 10, 12, 14, 16, 18, 20 kΩ in two kΩ steps

2 **Test and reset button**

3 **Indication of operational states**

U: green LED – control supply voltage
F1: red LED – fault message
F2: yellow LED – relay status

4 **DIP switches (see DIP switch functions)**

Insulation monitoring relays for unearthed supply systems
Insulation monitoring in IT systems

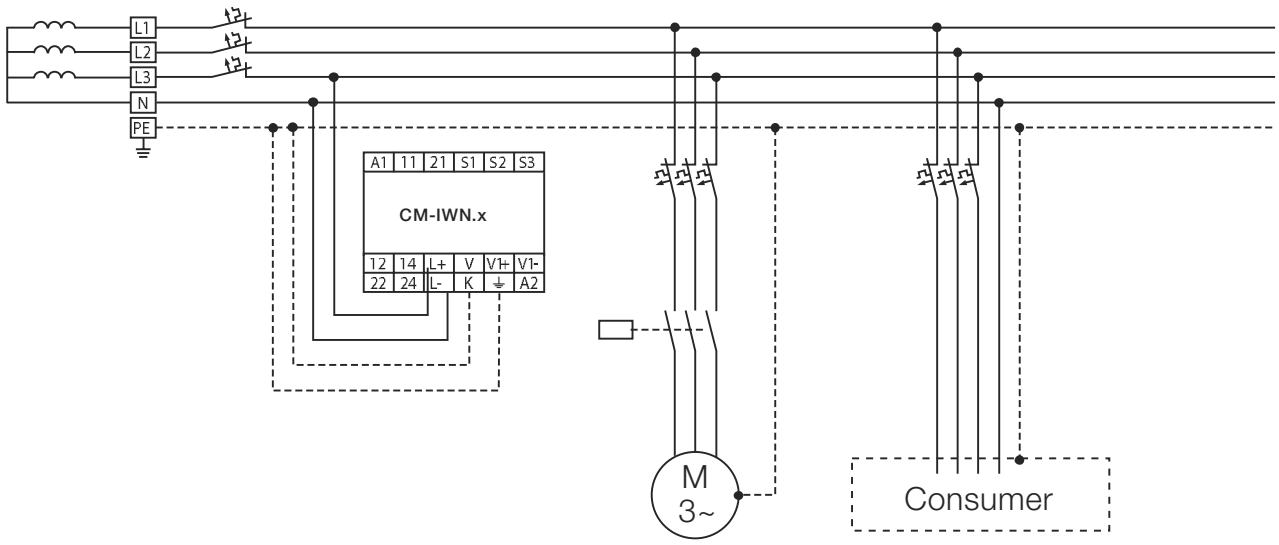
In electricity supply systems, an earthing system defines the electrial potential of the conductors relative to that of the earth's conductive surface. The choice of earthing system has implications for the safety and electromagnetic compatibility of the power supply. Note that regulations for earthing (grounding) systems vary considerably among different countries.

The international standard IEC 60364 distinguishes three families of earthing arrangements, using the two-letter codes TN, TT and IT.
The first letter indicates the connection between earth and the power-supply equipment (generator or transformer):
T: direct connection of a point with earth (Latin: terra)
I: no point is connected with earth (insulation), except perhaps via a high impendance
The second letter indicates the connection between earth and the electrical device being supplied:
T: direct connection of a point with earth
N: direct connection to neutral at the origin of installation,
which is connected to the earth

IT supply systems

The IT system is supplied either by an isolation transformer or a voltage source, such as battery or a generator.
In this system no active conductor is directly connected to earth potential. The advantage of this is that only a small fault current can flow in case of an insulation fault. This current is essentially caused by the leakage capacitance of the system.
The fuse of the system or MCB does not respond, thus maintaining the voltage supply and therefore operation even in case of a phase-to-earth fault.

The high reliability of an IT system is guaranteed thanks to continous insulation monitoring.
The insulation monitoring device recognizes insulation faults as they develop, and immediately reports that the value has fallen below the minimum. This prevents operational interruptions caused by a second more severe insulation fault.



Insulation monitoring relays for unearthed supply systems
Selection table

Order number	1SVR730670R0200	1SVR740670R0200	1SVR730660R0100	1SVR740660R0100	1SVR750660R0200	1SVR760660R0200	1SVR750660R0300	1SVR760660R0300	1SVR750660R0400	1SVR760660R0400	1SVR750660R0500	1SVR760660R0500
Type	CM-IWS.2S	CM-IWS.2P	CM-IWS.1S	CM-IWS.1P	CM-IWN.1S	CM-IWN.1P	CM-IWN.4S	CM-IWN.4P	CM-IWN.5S	CM-IWN.5P	CM-IWN.6S	CM-IWN.6P
Rated control supply voltage U_s												
24 - 240 VAC/DC	■	■	■	■	■	■	■	■	■	■	■	■
Measuring voltages												
250 V AC (L-PE)			■	■								
400 V AC (L-PE)	■	■			■	■	■	■	■	■	■	■
690 V AC (L-PE)					■[1)]	■[1)]	■[1)]	■[1)]	■[1)]	■[1)]	■[1)]	■[1)]
300 V DC (L-PE)			■	■								
600 V DC (L-PE)					■	■	■	■	■	■	■	■
1000 V DC (L-PE)					■[1)]	■[1)]	■[1)]	■[1)]	■[1)]	■[1)]	■[1)]	■[1)]
Measuring range												
1 - 100 kΩ	■	■	■	■	■	■	■	■	■	■	■	■
2 - 200 kΩ					■	■	■	■	■	■	■	■
System leakage capacitance, max.												
10 µF	■	■	■	■								
20 µF					■	■						
500 µF							■	■				
1000 µF									■	■		
2000 µF											■	■
Output												
1 c/o	■	■	■	■								
1 x 2 c/o or 2 x 1 c/o					■	■	■	■	■	■	■	■
Operating principle												
Open-circuit principle	■	■	■	■								
Open- or closed-circuit principle adjustable					■	■	■	■	■	■	■	■
Test												
Front-face button or control input	■	■	■	■	■	■	■	■	■	■	■	■
Reset												
Front-face button or control input	■	■	■	■	■	■	■	■	■	■	■	■
Fault storage / latching configurable	■	■	■	■	■	■	■	■	■	■	■	■
Non volatile storage configurable	■	■	■	■	■	■	■	■	■	■	■	■
Interrupted wire detection					■	■	■	■	■	■	■	■
Threshold values configurable	1	1	1	1	2	2	2	2	2	2	2	2
Connection type												
Push-in terminals		■		■		■		■		■		■
Double-chamber cage connection terminals	■		■		■		■		■		■	

[1)] With coupling unit CM-IVN	screw version	CM-IVN.S: 1SVR750669R9400
	push-in version	CM-IVN.P: 1SVR760669R9400

Insulation monitoring relays for unearthed supply systems
Ordering details

CM-IWS.2

Description

The high reliability of an IT system is guaranteed thanks to continuous insulation monitoring. An insulation monitoring device recognizes insulation faults as they develop, and immediately reports that the value has fallen below the minimum. This prevents operational interruption caused by a second, more severe insulation fault.
ABB developed a totally new range of insulation monitors for AC, DC or mixed AC/DC IT Systems up to 690 V AC or 1000 V DC. With only 4 devices most standard applications can be served. Additionally a version for solar applications with increased earth leakage capacitance has been added.

CM-IWS.1

CM-IWN.1

CM-IVN

Ordering details

Rated control supply voltage = measuring voltage	Nominal voltage U_n of the distribution system to be monitored	System leakage capacitance, max.	Adjustment range of the specified response value R_{an} (threshold)	Type	Order code	Price 1 pce	Weight (1 pce) kg (lb)
24-240 V AC/DC	0-250 V AC / 0-300 V DC	10 µF	1-100 kΩ	CM-IWS.1S	1SVR730660R0100		0.148 (0.326)
				CM-IWS.1P	1SVR740660R0100		0.137 (0.302)
24-240 V AC/DC	0-400 V AC	10 µF	1-100 kΩ	CM-IWS.2S	1SVR730670R0200		0.141 (0.311)
				CM-IWS.2P	1SVR740670R0200		0.130 (0.287)
24-240 V AC/DC	0-400 V AC / 0-600 V DC	20 µF	1-100 kΩ 2-200 kΩ (activated / de-activated by DIP-switch)	CM-IWN.1S	1SVR750660R0200		0.241 (0.531)
				CM-IWN.1P	1SVR760660R0200		0.217 (0.478)
24-240 V AC/DC	0-400 V AC / 0-600 V DC	500 µF		CM-IWN.4S	1SVR750660R0300		0.241 (0.531)
				CM-IWN.4P	1SVR760660R0300		0.217 (0.478)
24-240 V AC/DC	0-400 V AC / 0-600 V DC	1000 µF		CM-IWN.5S	1SVR750660R0400		0.241 (0.531)
				CM-IWN.5P	1SVR760660R0400		0.217 (0.478)
24-240 V AC/DC	0-400 V AC / 0-600 V DC	2000 µF		CM-IWN.6S	1SVR750660R0500		0.241 (0.531)
				CM-IWN.6P	1SVR760660R0500		0.217 (0.478)

Ordering details - Coupling unit

Rated control supply voltage = measuring voltage	Nominal voltage U_n of the distribution system to be monitored	Type	Order code	Price 1 pce	Weight (1 pce) kg (lb)
Passive device, no control supply voltage needed	0-690 V AC / 0-1000 V DC	CM-IVN.S	1SVR750669R9400		0.179 (0.395)
		CM-IVN.P	1SVR760669R9400		0.165 (0.364)

S: screw connection
P: push-in / easy connect

Insulation monitoring relays for unearthed supply systems
Operating state indication, Connection diagrams, DIP switches

LEDs, status information and fault messages CM-IWN.x

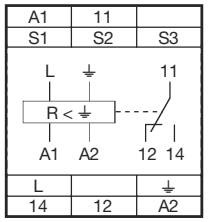
Operational state	LED U (green)	LED F (red)	LED R (yellow)
Start-up	⎍⎍⎍	OFF	OFF
No fault	⎍⎺⎺⎺	OFF	1)
Prewarning	⎍⎺⎺⎺	⎍⎍⎍	⎍⎍⎍
Insulation fault (below threshold value)	⎍⎺⎺⎺	⎍⎺⎺⎺	1)
KE/⏚ wire interruption	⎍⎺⎺⎺	⎍⎍⎍	1)
L+/L- wire interruption during system start-up / test function	⎍⎍⎍ / ⎍⎍⎍	⎍_⎍	1)
System leakage capacitance too high / invalid measurement result	⎍⎺⎺⎺	⎍_⎍	1)
Internal system fault	1)	⎍⎍⎍	1)
Setting fault [2]	⎍⎍⎍	⎍⎍⎍	⎍⎍⎍
Test function	⎍⎍⎍	OFF	1)
No fault after fault storage [3]	⎍⎺⎺⎺	4)	⎍⎍⎍

LEDs, status information and fault messages CM-IWS.x

Operational state	LED U (green)	LED F (red)	LED R (yellow)
Start-up	⎍⎍⎍	OFF	OFF
No fault	⎍⎺⎺⎺	OFF	⎍⎺⎺⎺
Insulation fault (below threshold value)	⎍⎺⎺⎺	⎍⎺⎺⎺	OFF
Invalid measuring result	⎍⎺⎺⎺	⎍_⎍	OFF
KE/⏚ wire interruption (only CM-IWS.[1])	⎍⎺⎺⎺	⎍⎍⎍	OFF
CM-IWS.1: System leakage capacitance too high / invalid measurement result	⎍⎍⎍	⎍⎍⎍	OFF
CM-IWS.2: Invalid measurement result	⎍⎺⎺⎺	⎍_⎍	OFF
Internal system fault	OFF	⎍⎍⎍	OFF
Test function	⎍⎍⎍	OFF	OFF
No fault after fault storage [3]	⎍⎺⎺⎺	4)	⎍⎍⎍

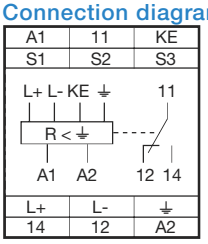
[1] Depending on the configuration.
[2] Possible faulty setting: The threshold value for final switch-off is set at a higher value than the threshold value for prewarning
[3] The device has triggered after an insulation fault. The fault has been stored and the insulation resistance has returned to a higher value than the threshold value plus hysteresis.
[4] Depending on the fault

Connection diagram CM-IWS.2



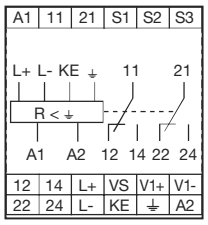
A1-A2	Control supply voltage
S1-S3	Remote test
S2-S3	Remote reset
L	Measuring circuit/input, system connection
⏚	Measuring circuit/input, earth connections
11-12/14	Output relay, closed-circuit principle

Connection diagram CM-IWS.1



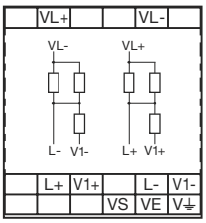
A1-A2	Control supply voltage
S1-S3	Remote test
S2-S3	Remote reset
L+, L–	Measuring circuit/input, system connection
⏚, KE	Measuring circuit/input, earth connections
1-12/14	Output relay, closed-circuit principle

Connection diagram CM-IWN.1, 4, 5, 6



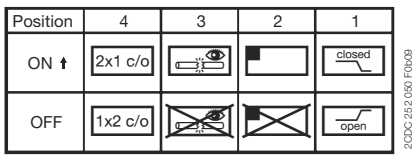
A1-A2	Control supply voltage
S1-S3	Remote test
S2-S3	Remote reset
L+, L–	Measuring circuit/input, system connection
⏚, KE	Measuring circuit/input, earth connections
VS, V1+, V1	Connections for the coupling unit (if used)
11-12/14	Output relay 1, open- or closed-circuit principle
21-22/24	Output relay 2, open- or closed-circuit principle

Connection diagram CM-IVN



VE	Connection to CM-IWN.x - ⏚
VS	Connection to CM-IWN.x - VS
L+	Connection to CM-IWN.x - L+
V1+	Connection to CM-IWN.x - V1+
L-	Connection to CM-IWN.x - L-
V1-	Connection to CM-IWN.x - V1-
VL+	Measuring circuit / Measuring input
VL-	Connection to the system Measuring circuit / Measuring input
V⏚	Connection to earth

DIP switches of CM-IWN.1, 4, 5, 6



	ON	OFF (default)
DIP switch 1 Operating principle of the output relays	Closed-circuit principle If closed-circuit principle is selected, the output relays de-energize in case a fault is occuring. In non-fault state the relays are energized.	Open-circuit principle If open-circuit principle is selected, the output relays energize in case a fault is occuring. In non-fault state the relays are de-energized.
DIP switch 2 Non-volatile fault storage	Fault storage activated (latching) If the fault storage function is activated, the output relays remain in tripped position until a reset is done either by the front-face button or by the remote reset connection S2-S3. This function is non-volatile.	Fault storage de-activated (non latching) If the fault storage function is de-activated, the output relays switch back to their original position as soon as the insulation fault no longer exists.
DIP switch 3 Interrupted wire detection	Interrupted wire detection activated With this configuration, the CM-IWN.1 monitoring relays the wires connected to + and KE for interruptions.	Interrupted wire detection de-activated With this configuration the interrupted wire detection is de-activated.
DIP switch 4 2 x 1 c/o, 1 x 2 c/o	2 x 1 c/o (SPDT) contact If operating principle 2 x 1 c/o contact is selected, the output relay R1 (11-12/14) reacts to threshold value R1 (final switch-off) and the output relay R2 (21-22/24) reacts to threshold value R2 (prewarning)	1 x 2 c/o (SPDT) contacts If operating principle 1 x 2 c/o contacts is selected, both output relays R1 (11-12/14) and R2 (21-22/24) react synchronously to threshold value R1. Settings of the threshold value R2 have no effect on the operation.

Insulation monitoring relays for unearthed supply systems
Technical data

Data at T_a = 25 °C and rated values, unless otherwise indicated

			CM-IWS.2	CM-IWS.1	CM-IWN.1, 4, 5, 6
Input circuit - Supply circuit				A1 - A2	
Rated control supply voltage U_s			24-240 V AC/DC		
Rated control supply voltage tolerance			-15...+10 %		
Typical current / power consumption		24 V DC	30 mA / 0.7 VA	35 mA / 0.9 VA	55 mA / 1.3 VA
		115 V AC	12 mA / 1.4 VA	17 mA / 2.0 VA	20 mA / 2.3 VA
		230 V AC	12 mA / 2.8 VA	14 mA / 3.2 VA	15 mA / 3.5 VA
Rated frequency f_s			DC or 15-400 Hz		
Frequency range AC			13.5-440 Hz		
Power failure buffering time		min.	20 ms		
Input circuit - Measuring circuit			L, ⏚	L+, L-, ⏚, KE	L+, L-, ⏚, KE
Monitoring function			insulation resistance monitoring of IT systems (IEC/EN 61557-8)		
Measuring principle			superimposed DC voltage	prognostic measuring principle with superimposed square wave signal	
Nominal voltage U_n of the distribution system to be monitored			0-400 V AC	0-250 V AC / 0-300 V DC	0-400 V AC / 0-600 V DC
Voltage range of the distribution system to be monitored			0-460 V AC (tolerance +15 %)	0-287.5 V AC / 0-345 V DC (tolerance +15 %)	0-460 V AC / 0-690 V DC (tolerance +15 %)
Rated frequency f_N of the distribution system to be monitored			50-60 Hz	DC or 15-400 Hz	DC or 15-400 Hz
System leakage capacitance C_e		max.	10 µF		CM-IWN.1: 20 µF CM-IWN.4: 500 µF CM-IWN.5 1000 µF CM-IWN.6: 2000 µF
Tolerance of the rated frequency f_N			45-65 Hz	13.5-440 Hz	13.5-440 Hz
Extraneous DC voltage U_{fg} (when connected to an AC system)		max.	none	290 V DC	460 V DC
Number of possible response / threshold values			1		2
Adjustment range of the specified response value R_{an} (threshold)		min.-max.	1-100 Ω		–
		min.-max. R1	–		1-100 kΩ
		min.-max. R2	–		2-200 kΩ (activated / de-activated by DIP-switch)
Adjustment resolution			1 kΩ		
		R1	1 kΩ		1 kΩ
		R2	–		2 kΩ
Tolerance of the adjusted threshold value / Relative percentage uncertainty A at -5...+45 °C, U_n = 0-115 %, U_s = 85-110 %, f_N, f_s, C_e = 1µF		at 1-10 kΩ R_F	±0.5 kΩ		–
		at 10-100 kΩ R_F	±6 %		–
		at 1-15 kΩ R_F	–		±1 kΩ*
		at 15-200 kΩ R_F	–		±8 %
Hysteresis related to the threshold value			25 %; min. 2 kΩ		
Internal impedance Z_i		at 50 Hz	135 kΩ	100 kΩ	155 kΩ
Internal DC resistance R_i			185 kΩ	115 kΩ	185 kΩ
Measuring voltage U_m			15 V	22 V	24 V
Tolerance of measuring voltage U_m			+10 %		
Measuring current I_m		max.	0.1 mA	0.3 mA	0.15 mA
Response time t_{an}					
	pure AC system	0.5 x R_{an} and C_e = 1 µF	max. 10 s		
	DC system or AC system with connected rectifiers		–	max. 15 s	
Repeat accuracy (constant parameters)			< 0.1 % of full scale		
Accuracy of R_a (measured value) within the rated control supply voltage tolerance			< 0.05 % of full scale		
Accuracy of R_a (measured value) within the operation temperature range		at 1-10 kΩ R_F	5 Ω / K		
		at 10-100 kΩ R_F	0.05 % / K		–
		at 10-200 kΩ R_F	–		0.05 % / K
Transient overvoltage protection (⏚ - terminal)			Z-diode	avalanche diode	
Input circuit - Control circuits				S1 - S2 - S3	
Control inputs - volt free		S1-S3	remote test		
		S2-S3	remote reset		
Maximum switching current in the control circuit			1 mA		
Maximum cable length to the control inputs			50 m - 100 pF/m [164 ft - 30.5 pF/ft]		
Minimum control pulse length			150 ms		
No-load voltage at the control input			≤ 24 V ± 5 %	≤ 24 V DC	
Indication of operational states					
Control supply voltage			LED U (green)		
Fault message			LED F (red)		
Relay status			LED R (yellow)		

*in combination with CM-IVN ±1.5 kΩ

Insulation monitoring relays for unearthed supply systems
Technical data

2

		CM-IWS.2	CM-IWS.1	CM-IWN.1, 4, 5, 6
Output circuits				
Kind of output		relay, 1 c/o (SPDT) contact		2 x 1 or 1 x 2 c/o (SPDT) contacts configurable
Operating principle		closed-circuit principle [1]		open- or closed circuit principle [1] configurable
Contact material		AgNi alloy, Cd free		
Rated voltage (VDE 0110, IEC 60947-1)		250 V AC / 300 V DC		
Min. switching voltage / Min. switching current		24 V / 10 mA		
Max. switching voltage / Max. switching current		see data sheet		
Rated operational current I_e (IEC/EN 60947-5-1)	AC-12 (resistive) at 230 V	4 A		
	AC-15 (inductive) at 230 V	3 A		
	DC-12 (resistive) at 24 V	4 A		
	DC-13 (inductive) at 24 V	2 A		
AC rating (UL 508)	Utilization category (Control Circuit Rating Code)	B 300, pilot duty general purpose (250 V, 4 A, cos ϕ 0.75)		
	max. rated operational voltage	250 V AC		
	max. continuous thermal current at B 300	4 A		
	max. making/breaking apparent power at B 300	3600/360 VA		
Mechanical lifetime		30 x 10^6 switching cycles		
Electrical lifetime (AC-12, 230 V, 4 A)		0.1 x 10^6 switching cycles		
Max. fuse rating to achieve short-circuit protection	n/c contact	6 A fast-acting		
	n/o contact	10 A fast-acting		
Conventional thermal current I_{th} (IEC/EN 60947-1)		4 A		
General data				
Duty time		100 %		
Dimensions (W x H x D)				
	product dimension	22.5 x 85.6 x 103.7 mm (0.89 x 3.37 x 4.08 in)		45 x 85.6 x 103.7 mm (0.89 x 3.37 x 4.08 in)
	packaging dimenesion	97 x 109 x 30 mm (3.82 x 4.29 x 1.18 in)		97 x 109 x 30 mm (3.82 x 4.29 x 1.18 in)
Weight	net weight	CM-IWS.2P: 0.130 kg (0.287 lb) CM-IWS.2S: 0.141 kg (0.311 lb)	CM-IWS.1P: 0.137 kg (0.302 lb) CM-IWS.1S: 0.148 kg (0.326 lb)	CM-IWN.xP: 0.217 kg (0.478 lb) CM-IWN.xS: 0.241 kg (0.531 lb)
	gross weight	CM-IWS.2P: 0.155 kg (0.342 lb) CM-IWS.2S: 0.166 kg (0.366 lb)	CM-IWS.1P: 0.162 kg (0.357 lb) CM-IWS.1S: 0.173 kg (0.381 lb)	CM-IWN.xP: 0.246 kg (0.542 lb) CM-IWN.xS: 0.270 kg (0.595 lb)
Mounting		DIN rail (IEC/EN 60715), snap-on mounting without any tool		
Mounting position		any		
Minimum distance to other units	vertical	not necessary		
	horizontal	10 mm (0.39 in) at U_n > 240 V	not necessary	10 mm (0.39 in) at U_n > 400 V
Material of housing		UL 94 V-0		
Degree of protection	housing / terminal	IP50 / IP20		

		Screw connection technology	Easy Connect Technology (Push-in)
Electrical connection			
Wire size	fine-strand with(out) wire end ferrule	1 x 0.5-2.5 mm² (1 x 20-14 AWG) 2 x 0.5-1.5 mm² (2 x 20-16 AWG)	2 x 0.5-1.5 mm² (2 x 20-16 AWG)
	rigid	1 x 0.5-4 mm² (1 x 20-12 AWG) 2 x 0.5-2.5 mm² (2 x 20-14 AWG)	2 x 0.5-1.5 mm² (2 x 20-16 AWG)
Stripping length		8 mm (0.32 in)	
Tightening torque		0.6-0.8 Nm (5.31-7.08 lb.in)	
Environmental data			
Ambient temperature ranges	operation / storage / transport	-25...+60 °C/-40...+85 °C/-40...+85 °C	
Climatic category	IEC/EN 60721-3-3	3K5 (no condensation, no ice formation)	
Damp heat, cyclic	IEC/EN 60068-2-30	6 x 24 h cycle, 55 °C, 95 % RH	
Vibration, sinusoidal	IEC/EN 60255-21-1	Class 2	
Shock, half-sine	IEC/EN 60255-21-2	Class 2	

[1] Closed-circuit principle: Output relay(s) de-energize(s) if a fault is occuring
Open-circuit principle: Output relay(s) energize(s) if a fault is occuring

Insulation monitoring relays for unearthed supply systems
Technical data

		CM-IWS.2	CM-IWS.1	CM-IWN.1, 4, 5, 6
Isolation data				
Rated impulse withstand voltage U_{imp} between all isolated circuits (IEC/EN 60947-1, IEC/EN 60664-1, VDE 0110-1)	supply / measuring circuit	6 kV		
	supply / output circuit	6 kV		
	measuring / output circuit	6 kV		
	output 1 / output circuit 2			4 kV
Pollution degree (IEC/EN 60664-1, VDE 0110-1)		3		
Overvoltage category (IEC/EN 60664-1, VDE 0110-1)		III		
Rated insulation voltage U_i (IEC/EN 60947-1, IEC/EN 60664-1, VDE 0110-1)	supply / measuring circuit	400 V	300 V	600 V
	supply / output circuit	300 V		
	supply / measuring circuit	400 V	300 V	600 V
	output 1 / output circuit 2	-	-	300 V
Basis isolation for rated control supply voltage (IEC/EN 60664-1, VDE 0110-1)	supply / measuring circuit	400 V AC / 300 V DC	250 V AC / 300 V DC	400 V AC / 600 V DC
	supply / output circuit	250 V AC / 300 V DC		
	measuring / output circuit	400 V AC / 300 V DC	250 V AC / 300 V DC	400 V AC / 600 V DC
	output 1 / output 2	250 V AC / 300 V DC		
Protective separation (IEC/EN 61140)	supply / output circuit	250 V AC / 250 V DC		
	supply / measuring circuit	250 V AC / 250 V DC		
	measuring / output circuit	250 V AC / 250 V DC		
Test voltage between all isolated circuits, routine test (IEC/EN 60255-5, IEC/EN 61010-1)	supply / output circuit	2.32 kV, 50 Hz, 2 s		
	supply / measuring circuit	2.32 kV, 50 Hz, 2 s		
	measuring / output circuit	2.2 kV, 50 Hz, 1 s		2.53 kV, 50 Hz, 1 s
Standards				
Product standard		IEC/EN 61557-1, IEC/EN 61557-8, IEC/EN 60255-1, EN 50178		
Other standards		EN 50178		
Low Voltage Directive		2006/95/EC		
EMC Directive		2004/108/EC		
RoHS Directive		2011/65/EC		
Electromagnetic compability				
Interference immunity to		IEC/EN 61000-6-1, IEC/EN 61000-6-2, IEC/EN 61326-2-4		
electrostatic discharge	IEC/EN 61000-4-2	Level 3, 6 kV / 8 kV		
radiated, radio-frequency, electromagnetic field	IEC/EN 61000-4-3	Level 3, 10 V/m (1 GHz) / 3 V/m (2 GHz) / 1 V/m (2.7 GHz)		
electrical fast transient/burst	IEC/EN 61000-4-4	Level 3, 2 kV / 5 kHz		
surge	IEC/EN 61000-4-5	Level 3, installation class 3, supply circuit and measuring circuit 1 kV L-L, 2 kV L-earth		
conducted disturbances, induced by radio-frequency fields	IEC/EN 61000-4-6	Level 3, 10 V		
voltage dips, short interruptions and voltage variations	IEC/EN 61000-4-11	Class 3		
harmonics and interharmonics	IEC/EN 61000-4-13	Class 3		
Interference emissions		IEC/EN 61000-6-3, IEC/EN 61000-6-4		
high-frequency radiated	IEC/CISPR 22, EN 55022	Class B		
high-frequency conducted	IEC/CISPR 22, EN 55022	Class B		

Insulation monitoring relays for unearthed supply systems
Technical data CM-IVN

Input circuit - Measuring circuit		VL+, VL-, V⏚
Function		expansion of the nominal voltage range of the insulation monitoring relay CM-IWN to 690 V AC or 1000 V DC, max. length of connection cable 40 cm
Measuring principle		see CM-IWN
Nominal voltage U_n of the distribution system to be monitored		0-690 V AC / 0-1000 V DC
Voltage range of the distribution system to be monitored		0-793.5 V AC / 0-1150 V DC (tolerance +15 %)
Rated frequency f_N of the distribution system to be monitored		DC or 15-400 Hz
Tolerance of the rated frequency f_N		13.5-440 Hz
System leakage capacitance C_e	max.	identical to that of the insulation monitoring relay used
Extraneous DC voltage U_{fg} (when connected to an AC system)	max.	793.5 V DC
Tolerance of the adjusted threshold value / Relative percentage uncertainty A at -5...+ 45 °C, U_n = 0-115 %, U_s = 85-110 %, f_N, f_e, C_e = 1 µF	at 1-15 kΩ R_F	±1.5 kΩ
	at 15-200 kΩ R_F	±8 %
Internal impedance Z_i	at 50 Hz	195 kΩ
Internal DC resistance R_i		200 kΩ
Measuring voltage U_m		24 V
Tolerance of measuring voltage U_m		+10 %
Measuring current I_m		0.15 mA
General data		
MTBF		on request
Duty time		100 %
Dimensions (W x H x D)		45 x 78 x 100 mm (1.78 x 3.07 x 3.94 in)
Weight	gross weight	0.200 kg (0.441 lb)
	net weight	0.169 kg (0.373 lb)
Mounting		DIN rail (IEC/EN 60715), snap-on mounting without any tool
Mounting position		any
Minimum distance to other units	vertical	not necessary
	horizontal	10 mm (0.39 in) at U_n > 600 V
Degree of protection		IP50 / IP20
Electrical connection		
Wire size	fine-strand with(out) wire end ferrule	2 x 0.75-2.5 mm² (2 x 18-14 AWG)
	rigid	2 x 0.5-4 mm² (2 x 20-12 AWG)
Stripping length		7 mm (0.28 in)
Tightening torque		0.6-0.8 Nm (5.31-7.08 lb.in)
Max. length of connection cable to CM-IWN		40 cm
Environmental data		
Ambient temperature ranges	operation / storage / transport	-25...+60 °C / -40...+85 °C / -40...+85 °C
Climatic category	IEC/EN 60721-3-3	3K5 (no condensation, no ice formation)
Damp heat, cyclic	IEC/EN 60068-2-30	6 x 24 h cycle, 55 °C, 95 % RH
Vibration, sinusoidal	IEC/EN 60255-21-1	Class 2
Shock, half-sine	IEC/EN 60255-21-2	Class 2
Isolation data		
Rated impulse withstand voltage U_{imp} between all isolated circuits (IEC/EN 60947-1, IEC/EN 60664-1,VDE 0110-1)	input circuit / PE	8 kV
Pollution degree (IEC/EN 60664-1, VDE 0110-1)		3
Overvoltage category (IEC/EN 60664-1, VDE 0110-1)		III
Rated insulation voltage U_i (IEC/EN 60947-1, IEC/EN 60664-1,VDE 0110-1)	input circuit / PE	1000 V
Test voltage between all isolated circuits, routine test (IEC/EN 60255-5, IEC/EN 61010-1)	input circuit / PE	3.3 kV, 50 Hz, 1 s
Standards		
Product standard		IEC/EN 61557-1, IEC/EN 61557-8, IEC/EN 60255-1, EN 50178
Other standards		EN 50178
Low Voltage Directive		2006/95/EC
EMC Directive		2004/108/EC
RoHS Directive		2011/65/EC
Electromagnetic compability		
Interference immunity to		IEC/EN 61000-6-1, IEC/EN 61000-6-2, IEC/EN 61326-2-4
electrostatic discharge	IEC/EN 61000-4-2	Level 3, 6 kV / 8 kV
radiated, radio-frequency, electromagnetic field	IEC/EN 61000-4-3	Level 3, 10 V/m (1 GHz) / 3 V/m (2 GHz) / 1 V/m (2.7 GHz)
electrical fast transient/burst	IEC/EN 61000-4-4	Level 3, 2 kV / 5 kHz
surge	IEC/EN 61000-4-5	Level 3, installation class 3, supply circuit and measuring circuit 1 kV L-L, 2 kV L-earth
conducted disturbances, induced by radio-frequency fields	IEC/EN 61000-4-6	Level 3, 10 V
voltage dips, short interruptions and voltage variations	IEC/EN 61000-4-11	Level 3
harmonics and interharmonics	IEC/EN 61000-4-13	Level 3
Interference emission		IEC/EN 61000-6-3, IEC/EN 61000-6-4
high-frequency radiated	IEC/CISPR 22, EN 50022	Class B
high-frequency conducted	IEC/CISPR 22, EN 50022	Class B

Insulation monitoring relays for unearthed supply systems
Notes