NEW

Insulation monitors for unearthed supply systems

Overview

ABB developed a totally new range of insulation monitoring relays. With this new generation of measuring and monitoring relays of the CM range ABB consolidates its strengths in innovative control products.

The new products are in accordance to IEC/EN 61557-1 and to IEC/EN 61557-8.

That means the monitoring relays can be used directly to measure the insulation resistance in unearthed AC and DC mains with a voltage up to 690 V AC and 1000 V DC!

Furthermore the products feature a new prognostic measuring principle which decreases the measuring and response time significantly.

Standardisation background:

- EC/EN 61557-1 "Electrical safety in low voltage distribution system up to 1000 V AC and 1500 V DC – Equipment for testing, measuring or monitoring of protective measures – Part 1: General requirements"
- IEC/EN 61557-8 "Electrical safety in low voltage distribution system up to 1000 V AC and 1500 V DC – Equipment for testing, measuring or monitoring of protective measures – Part 1: Insulation monitoring devices for IT systems"

Insulation monitors for unearthed pure AC systems:

Characteristics

- For monitoring the insulation resistance of unearthed IT system: up to U_n = 400 V AC
- According to IEC/EN 61227-8 "Electrical safety in low voltage distribution systems up to 1000 V AC and 1500 V DC – Equipment for testing, measuring o der 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 contact, closed-circuit principle
- 22.5 mm [0.89 in] width
- 3 LEDs for status indication

Insulation monitors 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 61227-8 "Electrical safety in low voltage distribution systems up to 1000 V AC and 1500 V DC – Equipment for testing, measuring oder monitoring of protective measures – Part 8: Insulation monitoring devices for IT systems"
- Rated control supply voltage 24-240 V AC/DC
- Prognostic measuring principle with superimposed square wave signal
- 1 or 2 measuring ranges (1-100kΩ or 1-100 kΩ + 2-200 kOhm)[1)]
- 1 or 2 (configurable) c/o contact[1)]
- Precise adjustmemt of the measuring value in 1 or 2 kΩ steps[1)]
- (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 device

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Insulation monitors for unearthed supply systems

Insulation monitoring in IT systems

In electricity supply systems, an earthing system defines the electrical 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

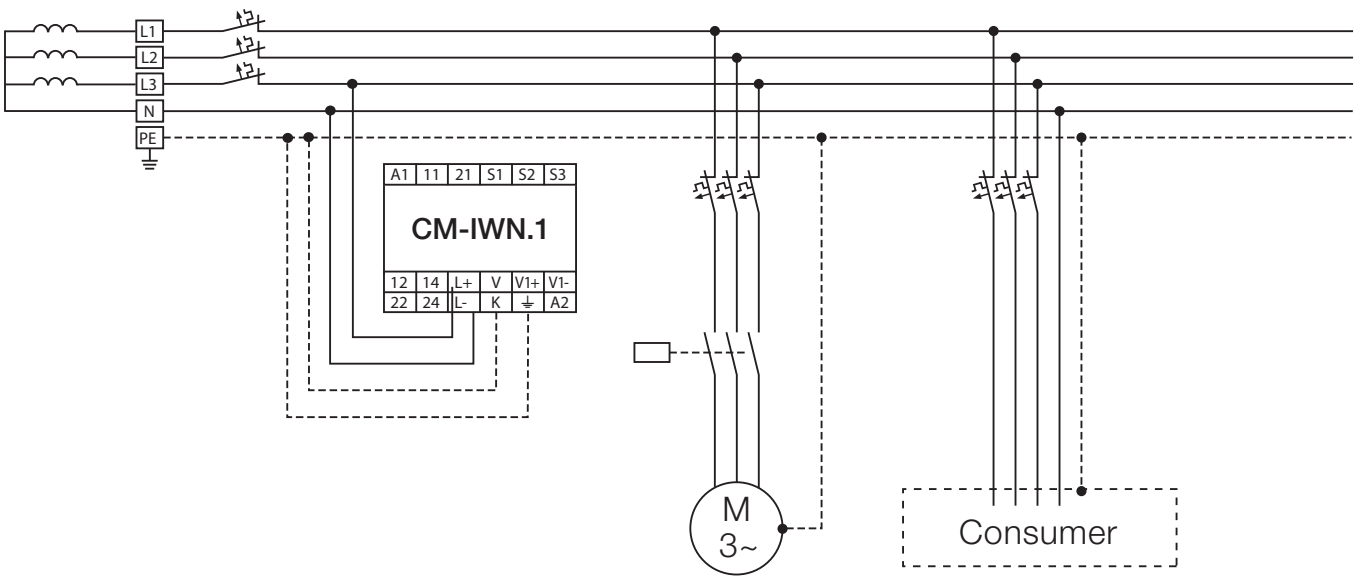
The IT system is supplied either by an isolation transformer or a voltage source, such as battery or a generator.

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 system's leakage capacitance.

The systems's fuse 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.



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Insulation monitors for unearthed supply systems
Selection and Conversion table




Typical applications

Benefits of ABB's new range of insulation monitoring relays:

- Extended measuring voltage range AC and DC
- All devices with wide supply voltage range
- Reduced number of references

	CM-IWS.2	CM-IWS.1	CM-IWN.1	CM-IVN
Measuring resistance range				
1 – 100 kΩ	■	■	■	
2 – 200 kΩ			■	
Measuring voltage range				
0 – 460 V AC	■		■	
0 – 287,5 V AC		■		
0 – 793,5 V AC			▬	
0 – 345 V AC		■		
0 – 690 V AC			■	
0 – 1150 V AC			▬	
Measuring frequency range				
45 – 65 Hz	■	■		
13,5 – 440 Hz			■	■
System leakage capacitance max				
10 µF	■	■		
20 µF			■	■
Rated supply voltage				
24 – 240 V AC/DC	■	■	■	

Conversion		Measuring voltage				
1SAR470020R0004	C558.01	90 – 132 V AC		■		
1SAR470020R0005	C558.01	230 V AC		■		
1SAR471020R0004	C558.02	90 – 132 V AC			■	
1SAR471020R0005	C558.02	systems > 400 V AC / 600 V AC			▬	
1SAR471020R0005	C558.02	230 V AC			■	
1SAR471020R0006	C558.02	systems > 400 V AC / 600 V AC			▬	
1SAR472020R0004	C558.03	90 – 132 V AC			■	
1SAR472020R0004	C558.03	systems > 400 V AC / 600 V AC			▬	
1SAR472020R0005	C558.03	230 V AC			■	
1SAR472020R0005	C558.03	systems > 400 V AC / 600 V AC			▬	
1SAR477000R0100	C558.10	external kΩ meter		no replacement		
1SVR450065R0000	CM-IWN-DC	24 – 240 V AC/DC		■		
1SVR450071R0000	CM-IWN-AC	110 – 130 / 220 – 240 AC/DC	■			
1SVR450075R0000	CM-IWN-AC	24 – 240 V AC/DC	■			

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Insulation monitors for unearthed supply systems

Insulation monitoring relay CM-IWS.2
For unearthed AC systems up to U_n = 400 V AC

① Test and reset button
② Status indication
U: green LED - control supply voltage
F: red LED - fault message
R: yellow LED - relay status
③ 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
④ Marker label

- 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
- Measuring principle with suerimposed DC voltage
- One measuring range 1-100 kΩ
- Precise adjustment of the threshold value in 1 kΩ steps
- Fault storage / latching configurable by control input
- 1 c/o contact, closed-circuit principle
- 22.5 mm [0.89 in] width
- 3 LEDs for status indication

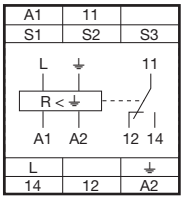
Application / monitoring function

The CM-IWS.2 serves to monitor insulation resistance in accordance with IEC 61557-8 in unearthed IT AC systems. The insulation resistance between system lines and system earth is measured.
If this falls below the adjustable threshold values, the output relay de-energizes. The device can monitor control circuits (single-phase) and main circuits (3-phase). Supply systems with voltages U_n = 0-400 V AC (45-65 Hz) can be directly connected to the measuring inputs and their insulation resistance being monitored. For systems with voltages above 400 V AC the insulation monitoring relay CM-IWN.1 with or without the coupling unit CM-IVN can be used.

Measuring principle

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.

Connection diagram



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

Operating state indication

LEDs, status information and fault messages

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
Internal system fault	OFF	⎍⎍⎍	OFF
Test function	⎍⎍⎍	OFF	OFF
No fault after fault storage[1]	⎍	[2]	⎍⎍⎍

[1] 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.
[2] Depending on the fault.

Operating mode

The system to be monitored is connected to terminal L. The earth potential is connected to terminal ⏚. The device operates according to the closed-circuit principle (fault state: relay de-energized). Once the control supply voltage has been applied the insulation monitoring relay runs through a system test routine. The system is diagnosed and the settings are tested. If no internal or external faults are found after this test routine is completed, the output relay energizes. If the measured value drops below the set threshold value, the output relay de-energizes. If the measured value exceeds the threshold value plus hysteresis, the output relay re-energizes. All operating states are signalled by the front-face LEDs. See table "LEDs, status information and fault messages".

Test function

The test function is only possible when there is no fault.
By pressing the front-face combined test/reset button a system test routine is executed. The output relay remains de-energized as long as the test/reset button is pressed, the control contact S1-S3 is closed or the test functions are processed. The test function can be activated either with the front-face combined test/reset button or with a remote test button connected.

Fault storage, reset function and remote reset

The output relay remains de-energized and only energizes after the combined test/reset button is pressed or after the remote reset (terminals S2-S3) is activated, and when the insulation resistance is higher than the set threshold value plus hysteresis.

Configuration and settings
Rotary switches R.1 and R.2 (treshold value)

By means of two separate 10 position rotary switches with direct reading scales, the threshold value for the insulation resistance R_F of the systems to be monitored can be adjusted.
With the R.1 rotary switch the tens figure is set and with the R.2 rotary switch the units figure is set. The set threshold value is then the addition of the two values. For example, R1.1 set to 70 and R1.2 set to 8 leads to a threshold value for R1 of 78 kΩ.

Order data

Type	Nominal voltage U_n of the distribution system to be monitored	Rated control supply voltage	Order code	Pack. unit piece	Price 1 piece
CM-IWS.2	0-400 V AC	24-240 V AC/DC	**1SVR 630 670 R0200**	1	

NEW

Insulation monitors for unearthed supply systems

CM-IWS.1 for unearthed AC, DC and mixed AC/DC systems up to U_n = 250 V AC and 300 V DC

① Test and reset button
② Status indication
U: green LED - control supply voltage
F: red LED - fault message
R: yellow LED - relay status
③ 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
④ Marker label

- For monitoring the insulation resistance of unearthed IT systems up to U_n = 250 V AC and 300 V DC
- According to IEC/EN 61557-8 "Electrical safety in low voltage distribution systems up to 1000 V a.c. and 1500 V d.c. – Equipment for testing, measuring or monitoring of protective measures – Part 8: Insulation monitoring devices for IT systems"
- Rated control supply voltage 24-240 V AC/DC
- Prognostic measuring principle with superimposed square wave 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

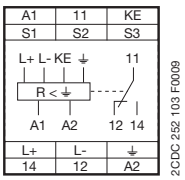
Application / monitoring function

The CM-IWS.1 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 value, the output relay de-energizes. The device can monitor control circuits (single-phase) and main circuits (3-phase). Supply systems with voltages U_n = 0-250 V AC (15-400 Hz) or 0-300 V DC can be directly connected to the measuring inputs and their insulation resistance being monitored. For systems with voltages above 250 V AC and 300 V DC the insulation monitoring relay CM-IWN.1 with or without the coupling unit CM-IVN can be used.

Measuring principle

A pulsating measuring signal is fed into the system to be monitored and the insulation resistance 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 principle is also suitable for the detection of symmetrical insulation faults.

Connection diagram



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
11-12/14	Output relay, closed-circuit principle

Operating state indication
LEDs, status information and fault messages

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

[1] 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.
[2] Depending on the fault.

Additional monitoring functions

The CM-IWS.1 cyclically monitors the measuring circuit connections ⏚ and KE for wire interruption. In case of a wire interruption in one of the connections, the output relay de-engergizes. In addition, the unearthed AC-, DC- or AC/DC system is monitored for inadmissible system leakage capacitance. If the system leakage capacitance is too high, the output relay de-energizes.

Configuration and settings
Rotary switches R.1 and R.2 (treshold value)

By means of two separate 10 position rotary switches with direct reading scales, the threshold value for the insulation resistance R_F of the systems to be monitored can be adjusted. With the R.1 rotary switch the tens figure is set and with the R.2 rotary switch the units figure is set. The set threshold value is then the addition of the two values. For example, R1.1 set to 70 and R1.2 set to 8 leads to a threshold value for R1 of 78 kΩ.

Operating mode

The system to be monitored is connected to terminals L+ and L-. The earth potential is connected to terminals ⏚ and KE. The device operates according to the closed-circuit principle (fault state: relay de-energized). Once the control supply voltage has been applied the insulation monitoring relay runs through a system test routine. The system is diagnosed and the settings are tested. If no internal or external faults are found after this test routine is completed, the output relay energizes. If the measured value drops below the set threshold value, the output relay de-energizes. If the measured value exceeds the threshold value plus hysteresis, the output relay re-energizes. All operating states are signalled by the front-face LEDs. See table "LEDs, status information and fault messages".

Test function

The test function is only possible when there is no fault. By pressing the front-face combined test/reset button a system test routine is executed. The output relay remains deenergized as long as the test/reset button is pressed, the control contact S1-S3 is closed or the test functions are processed. The test function can be activated either with the front-face combined test/reset button or with a remote test button connected.

Fault storage, reset function and remote reset

The output relay remains de-energized and only energizes after the combined test/reset button is pressed or after the remote reset (terminals S2-S3) is activated, and when the insulation resistance is higher than the set threshold value plus hysteresis.

Order data

Type	Nominal voltage U_n of the distribution system to be monitored	Rated control supply voltage	Order code	Pack. unit piece	Price 1 piece
CM-IWS.1	0-250 V AC / 0-300 V DC	24-240 V AC/DC	**1SVR 630 660 R0100**	1	

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Insulation monitors for unearthed supply systems

CM-IWN.1 for unearthed AC, DC and mixed AC/DC systems up to U_n = 400 V AC and 600 V DC

① Configuration and setting 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 kW in ten kW steps
R1.2 for R1 units figure: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 kW in one kW steps
R2.1 for R2 20 figure: 0, 20, 40, 60, 80, 100, 120, 140, 160, 180 kW in ten kW steps
R2.2 for R2 units figure: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20 kW in two kW steps

② Test and reset button

③ Status indication
U: green LED - control supply voltage
F: red LED - fault message
R: yellow LED - relay status

④ Function selection and marker label
See "DIP switches"

- For monitoring the insulation resistance of unearthed IT systems up to U_n = 400 V AC and 600 V DC
- Rated control supply voltage 24-240 V AC/DC
- Prognostic measuring principle with superimposed square wave signal
- Two measuring ranges 1-100 kW and 2-200 kΩ
- One (1 x 2 c/o) or two (2 x 1 c/o) threshold values Ran1/R11) (final switch-off) and Ran2/R21) (prewarning) configurable
- 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
- 3 LEDs for status indication
- 45 mm [1.77 in] width

[1] term. acc. to IEC/EN 61557-8
[2] R2 only active with 2 x 1 c/o configuration

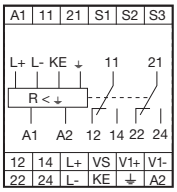
Application / monitoring function

The CM-IWN.1 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.1 voltage range.

Measuring principle

A pulsating measuring signal is fed into the system to be monitored and the insulation resistance 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 relays are activated or deactivated, depending on the device configuration. This measuring principle is also suitable for the detection of symmetrical insulation faults.

Connection diagram



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

Operating state indication

LEDs, status information and fault messages

Operational state	LED U (green)	LED F (red)	LED R (yellow)
Start-up		OFF	OFF
No fault		OFF	
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]	

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

Additional monitoring functions

When interrupted wire detection is activated, the CM-IWN.1 automatically controls the system/measuring circuit connections L+ and L- when the system starts up. This can be repeated at any time by activating the test function.
The CM-IWN.1 cyclically monitors the measuring circuit connections ⏚ and KE for wire interruption. In case of a wire interruption in one of the connections, the output relays switch to the fault state.
In addition, the unearthed AC-, DC- or AC/DC system is monitored for inadmissible system leakage capacitance. If the system leakage capacitance is too high, the output relays switch to the fault state.
Also incorrect settings that could cause a faulty function of the device are monitored. When the device detects such an incorrect setting, the output relays switch to the fault state.

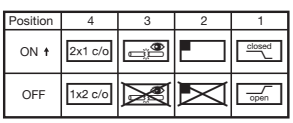
Configuration 1 x 2 c/o contacts (final switch-off)

With this configuration the settings for the threshold value for prewarning (R2) have no influence on the operating function. If the measured value drops below the set threshold value, the output relays switch into the fault state. If the measured value exceeds the threshold value plus hysteresis, the output relays switch back into their original state.

Configuration 2 x 1 c/o contact (prewarning and final switch-off)

If the measured value drops below the set threshold value for prewarning the second output relay 21-22/24 switches. If the measured value drops below the threshold value for final switch-off, the first output relay 11-12/14 switches. If the measured value exceeds the threshold value for final switch-off plus hysteresis, the first output relay 11-12/14 switches back into its original state. If the measured value exceeds the threshold value for prewarning plus hysteresis, also the second output relay 21-22/24 switches back to its original state.

DIP switches



	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 monitors 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.

Order data

Type	Nominal voltage U_n of the distribution system to be monitored	Rated control supply voltage	Order code	Pack. unit piece	Price 1 piece
CM-IWN.1	0-400 V AC / 0-600 V DC	24-240 V AC/DC	**1SVR 650 660 R0200**	1	

NEW

Insulation monitors for unearthed supply systems

CM-IVN for expansion of the insulation monitoring relay CM-IWN.1 measuring range up to U_n = 690 V AC and 1000 V DC

2CDC 251 081 S0009

- Expansion of the nominal voltage range of the insulation monitoring relay CM-IWN.1 for monitoring the insulation resistance of unearthed IT systems up to 690 V AC and 1000 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"
- Passive device, no supply voltage needed
- 45 mm [1.77 in] width

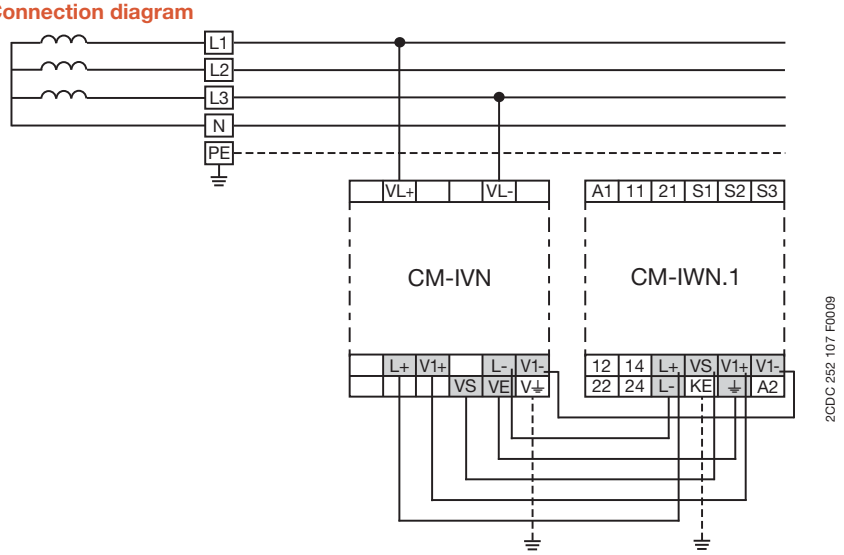
Application / monitoring function

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 $V_{\perp}$ 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

With CM-IWN.1 a pulsating measuring signal is fed into the system to be monitored and the insulation resistance 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 relays are activated or deactivated, depending on the device configuration. This measuring principle is also suitable for the detection of symmetrical insulation faults.

Connection diagram



VE	Connection to CM-IWN.1 - ⏚	V1-	Connection to CM-IWN.1 - V1-
VS	Connection to CM-IWN.1 - VS	VL+, VL-	Measuring circuit / Measuring input Connection to the system
L+	Connection to CM-IWN.1 - L+	$V_{\perp}$	Measuring circuit / Measuring input Connection to earth
V1+	Connection to CM-IWN.1 - V1+		
L-	Connection to CM-IWN.1 - L-		

Coupling unit

Type	Nominal voltage U_n of the distribution system to be monitored	Rated control supply voltage	Order code	Pack. unit piece	Price 1 piece
CM-IVN	0-690 V AC / 0-1000 V DC	Passive device, no control supply voltage needed	**1SVR 650 669 R9400**	1	

NEW

Insulation monitors for unearthed supply systems
CM-IWS.2, CM-IWS.1 and CM-IWN.1
Technical data

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

		CM-IWS.2	CM-IWS.1	CM-IWN.1
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	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
Tolerance of the rated frequency f_N		45-65 Hz	13.5-440 Hz	13.5-440 Hz
System leakage capacitance C_e	max.	10 µF		20 µF
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 kΩ		–
	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		

*in combination with CM-IVN ±1.5 kΩ

NEW

Insulation monitors for unearthed supply systems

CM-IWS.2, CM-IWS.1 and CM-IWN.1

Technical data

		CM-IWS.2	CM-IWS.1	CM-IWN.1
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 over voltage protection (⏚ - terminal)		Z-diode	avalanche diode	
Input circuit - Control circuits		**S1 - S2 - S3**		
Control inputs - volt free	S1-S3 S2-S3	remote test 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	
User interface				
Indication of operational states				
Control supply voltage		LED U (green)*		
Fault message		LED F (red)*		
Relay status		LED R (yellow)*		
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)	AC12 (resistive) at 230 V	4 A		
	AC15 (inductive) at 230 V	3 A		
	DC12 (resistive) at 24 V	4 A		
	DC13 (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 (AC12, 230 V, 4 A)		0.1 x 10^6 switching cycles		
Max. fuse rating to achieve short-circuit protection	n/c contact n/o contact	6 A fast-acting 10 A fast-acting		
Conventional thermal current I_{th} (IEC/EN 60947-1)		4 A		

1) Closed-circuit principle: Output relay(s) de-energize(s) if measured value falls below the adjusted threshold value R_{an}

NEW

Insulation monitors for unearthed supply systems

CM-IWS.2, CM-IWS.1 and CM-IWN.1

Technical data

		CM-IWS.2	CM-IWS.1	CM-IWN.1
General data				
Duty time		100 %		
Dimensions (W x H x D)		22.5 x 78 x 100 mm [0.89 x 3.07 x 3.94 in]		45 x 78 x 100 mm [1.78 x 3.07 x 3.94 in]
Weight	gross weight, with packaging and instruction sheet	0.149 kg [0.328 lb]	0.163 kg [0.359 lb]	0.258 kg [0.569 lb]
	net weight	0.127 kg [0.280 lb]	0.133 kg [0.293 lb]	0.231 kg [0.509 lb]
Mounting		DIN rail (EN 60715), snap-on mounting without any tool		
Mounting position		any		
Minimum distance to other units	vertical	not necessary		
	horizontal	10 mm [0.4 in] at U_n > 240 V	not necessary	10 mm [0.4 in] at U_n > 400 V
Degree of protection	enclosure / terminal	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]		
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)	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, UL 508)		3		
Overvoltage category (IEC/EN 60664-1, VDE 0110-1, UL 508)		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		

NEW

Insulation monitors for unearthed supply systems

CM-IWS.2, CM-IWS.1 and CM-IWN.1

Technical data

		CM-IWS.2	CM-IWS.1	CM-IWN.1
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 61557-8, IEC/EN 60255-6		
Other standards		EN 50178		
Low Voltage Directive		2006/95/EC		
EMC Directive		2004/108/EC		
RoHS Directive		2002/95/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		

NEW

Insulation monitors for unearthed supply systems
CM-IVN
Technical data

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

Input circuits		
Input circuit - Measuring circuit		**VL+, VL-, V⏚**
Function		expansion of the nominal voltage range of the insulation monitoring relay CM-IWN.1 to 690 V AC or 1000 V DC, max. length of connection cable 40 cm
Measuring principle		see CM-IWN.1
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.	20 µF
Extraneous DC voltage U_{ig} (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_s, C_e = 1µF	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
Input circuits		
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, with packaging and instruction sheet	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 [0.4 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.1		40 cm

NEW

Insulation monitors for unearthed supply systems
CM-IVN
Technical data

Environmental data		
Ambient temperature ranges	operation	-25...+60 °C
	storage	-40...+85 °C
	transport	-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, UL 508)		3
Overvoltage category (IEC/EN 60664-1, VDE 0110-1, UL 508)		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 61557-8, IEC/EN 60255-6
Other standards		EN 50178
Low Voltage Directive		2006/95/EC
EMC Directive		2004/108/EC
RoHS Directive		2002/95/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

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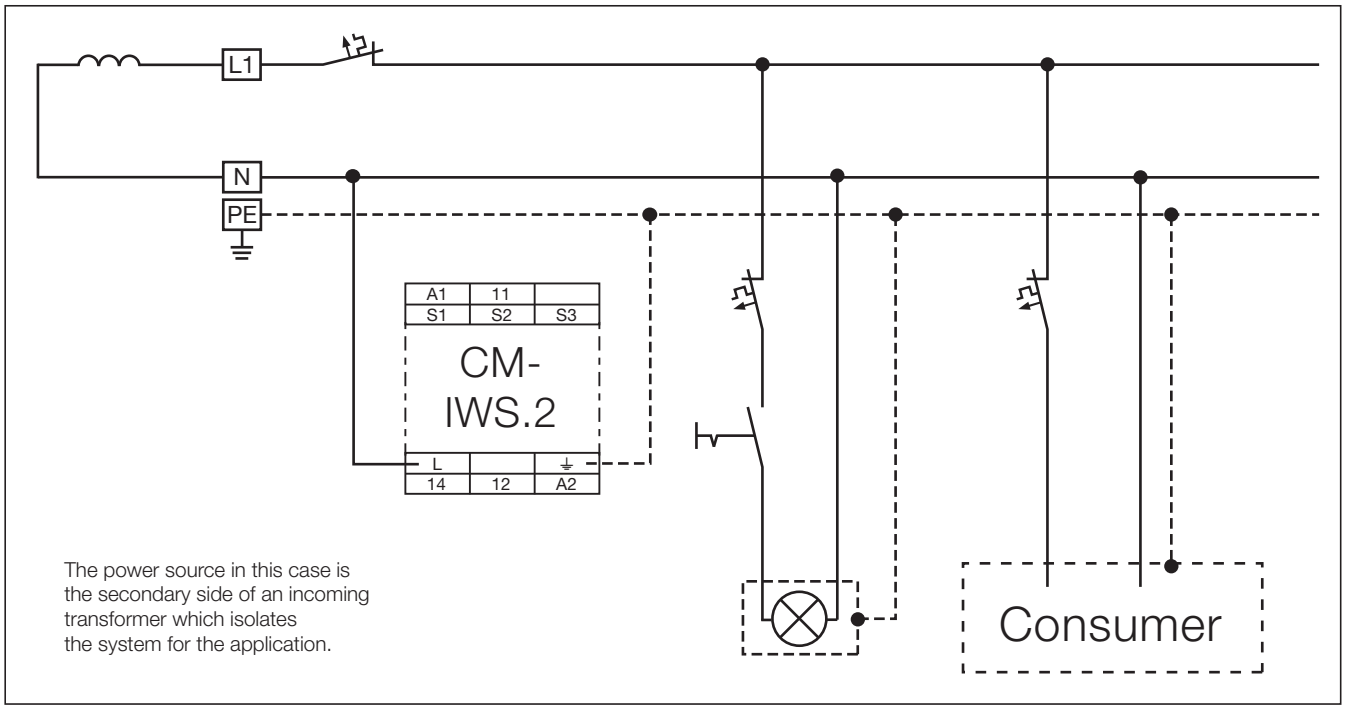
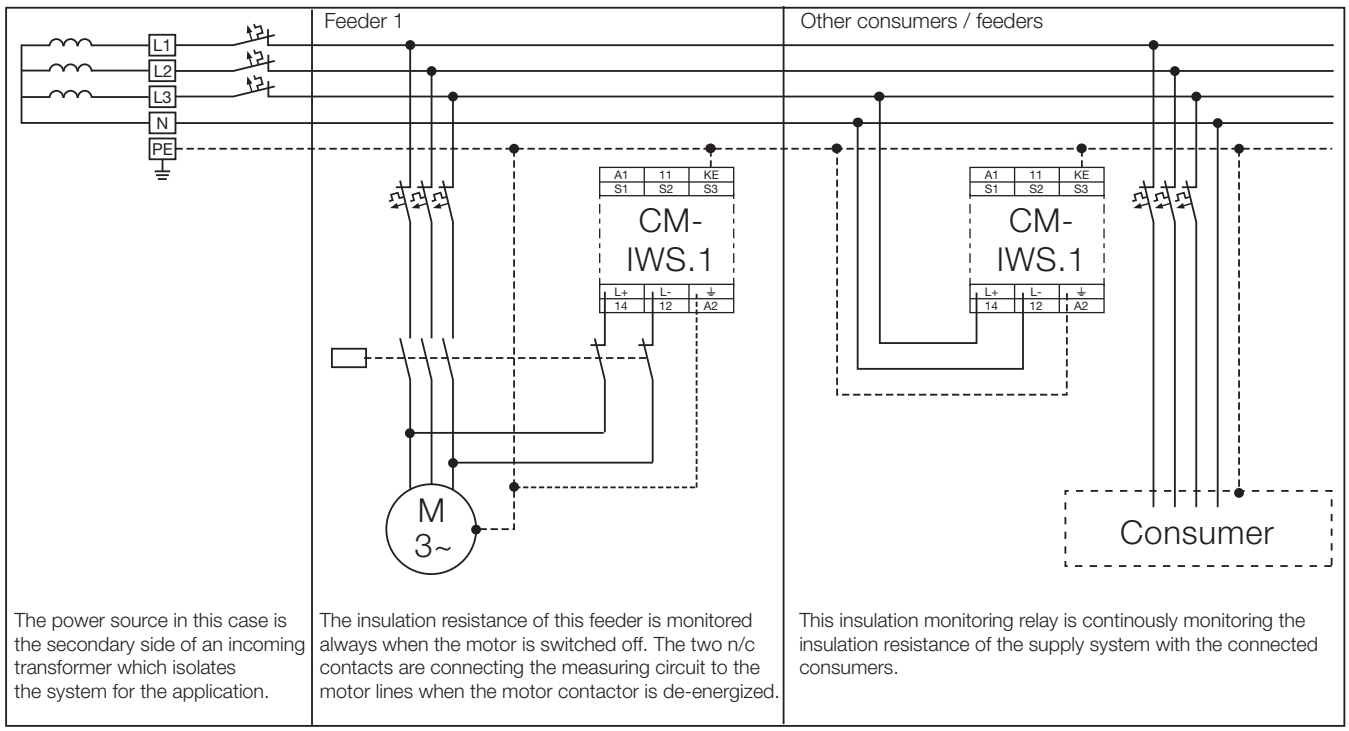
Insulation monitors for unearthed supply systems
Application examples

Application example CM-IWS.2



The power source in this case is the secondary side of an incoming transformer which isolates the system for the application.

Application example CM-IWS.1



The power source in this case is the secondary side of an incoming transformer which isolates the system for the application.

The insulation resistance of this feeder is monitored always when the motor is switched off. The two n/c contacts are connecting the measuring circuit to the motor lines when the motor contactor is de-energized.

This insulation monitoring relay is continously monitoring the insulation resistance of the supply system with the connected consumers.