Measuring and monitoring relays

CM and C5xx range

Content

Measuring and monitoring relays
CM range
Benefits and advantages

2CDC 255 078 F0b07

CM-E range: Economic

1SVR 550 851 F9400

- Only 22.5 mm wide enclosure
- Output contacts: 1 c/o contact or 1 n/o contact
- One supply voltage range
- One monitoring function
- Cost-efficient solution for OEM applications
- Preset monitoring ranges

Combination screws

Easy tightening and release of the connecting screws with pozidrive, pan- or crosshead screwdriver.

1SVC 110 000 F0506

2CDC 253 011 F0003

Safety

The "real distance" is hidden.
The clearance and the creepage distances of our products exceed international standards and substantially increase the safety of our products.

Measuring and monitoring relays
CM range
Benefits and advantages

CM-S range: Universal and multifunctional


1SVR 430 824 F 9300

- Only 22.5 mm wide enclosure
- Output contacts: 1 or 2 c/o contacts
- One supply voltage range or supplied by measuring circuit
- Setting and operation via front-face operating controls
- Adjustment of threshold values and switching hysteresis via direct reading scale
- Integrated and snap-fitted front-face marker
- Sealable transparent cover (accessory)


2CDC 253 089 F0004

Direct reading scales

Direct adjustment of the threshold values of measuring and monitoring relays without any additional calculation provides accurate time delay adjustment.

LEDs for status Indication

All actual operational states are indicated by front-face LEDs, thus simplifying commissioning and troubleshooting.

2CDC 253 014 F0003

Double-chamber cage connection terminals


2CDC 253 010 F0003

Double-chamber cage connection terminals provide connection of wires up to 2 x 2.5 mm² (2 x 14 AWG), rigid or fine-strand, with or without wire end ferrules. Potential distribution does not require additional terminals, thus saving time and money. Wiring is considerably simplified through integrated cable guides.

CM-N range: Multifunctional


1SVR 450 335 F0100

- 45 mm wide enclosure
- Output contacts: 2 c/o contacts
- Continuous voltage range (24-240 V AC/DC) or single-supply
- Setting and operation via front-face operating controls
- Adjustment of threshold values and switching hysteresis via direct reading scale
- Adjustable time delays
- Integrated and snap-fitted front-face marker label
- Sealable transparent cover (accessory)

Integrated marker label

Integrated marker labels allow the product to be marked quickly and simply.
No additional marking labels are required.

2CDC 253 064 F0006


2CDC 253 009 F0005

Sealable transparent covers

Protection against unauthorized changes of time and/or threshold values in sizes 22.5 and 45 mm wide (optionally available as an accessory).

Safety

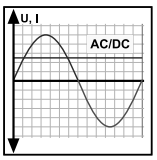
The "real distance" is hidden.
The clearance and the creepage distances of our products exceed international standards and substantially increase the safety of our products.


2CDC 253 011 F 0003

Measuring and monitoring relays
CM and C5xx range
Monitoring features and application ranges

Single-phase current and voltage monitoring

- Over- or undercurrent monitoring CM-SRS and CM-SRS.M
- Over- and undercurrent monitoring CM-SFS
- Over- or undervoltage monitoring CM-ESS and CM-ESS.M
- Over- and undervoltage monitoring CM-EFS



Current monitoring

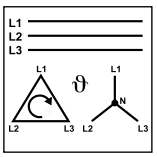
- Monitoring of motor current consumption
- Monitoring of lighting installations and heating circuits
- Monitoring of hoisting gear and transportation equipment overload
- Monitoring of locking devices, electromechanical brake gear and locked rotor

Voltage monitoring

- Speed monitoring of DC motors
- Monitoring of battery voltages and other supply networks
- Monitoring of upper and lower voltage threshold values

Three-phase monitoring

- Phase loss CM-PBE
- Over- and undervoltage CM-PVE
- Phase sequence and phase loss CM-PFE and CM-PFS
- Phase sequence and phase loss, over- and undervoltage CM-PSS.xx and CM-PVS.xx
- Phase sequence and phase loss, unbalance CM-PAS.xx
- Phase sequence and phase loss, unbalance, over- and undervoltage CM-MPS.xx and CM-MPN.xx
- Over- and undervoltage, over- and underfrequenzy CM-UFS.x

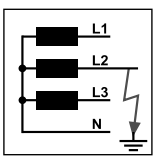


Three-phase voltage monitoring

- Voltage monitoring of mobile three-phase equipment
- Protection of personnel and installations against phase reversal
- Monitoring of the supply voltage to machines and installations
- Protection of equipment against damage caused by unstable supply voltage
- Switching to emergency or auxiliary supply
- Protection of motors against damage caused by unbalanced phase voltages and phase loss
- Automatic connection & disconnection of decentralised power stations to the grid

Insulation monitoring

CM-IWS.2 for electrically isolated AC systems, and CM-IWS.1 & CM-IWN 1 for electrically isolated AC, DC and mixed AC/DC systems.

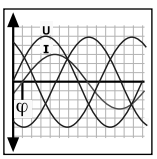


Insulation monitoring

- Monitoring of electrically isolated supply mains for insulation resistance failure
- Detection of initial faults
- Protection against earth faults

Motor load monitoring

CM-LWN monitors load states of single- and three-phase asynchronous motors.



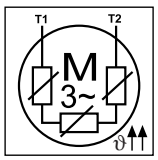
Motor load monitoring

- Detection of V-belt breaking
- Motor protection against overload
- Monitoring of filters for clogging
- Protection of pumps against dry running
- Detection of high pressure in conduit systems
- Monitoring for dulling blades in sawing and cutting machines

Measuring and monitoring relays
CM and C5xx range
Monitoring features and application ranges

Thermistor motor protection

CM-MSE, CM-MSS and CM-MSN provide full protection of motors with integrated PTC resistor sensors.



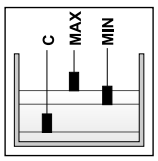
2CDC 252 029 F0004

Thermistor motor protection

- Protection of motors against thermal overload, e. g. caused by insufficient cooling, heavy load starting conditions, undersized motors, etc.

Liquid level monitoring

CM-ENE, CM-ENS and CM-ENN for control and regulation of liquid levels and ratios of mixtures of conductive fluids.

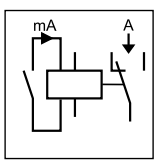


Liquid level monitoring and control

- Protection of pumps against dry running
- Protection against container overflow
- Control of liquid levels
- Detection of leaks
- Control of mixing ratios

Contact protection, sensor evaluation

The CM-KRN protects sensitive control contacts from excessive loads and can store switch positions. The CM-SIS supplies and evaluates NPN and PNP sensors.



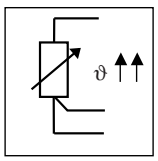
2CDC 252 031 F0004

Contact protection / sensor evaluation

- Storage of the switching states of bouncing contacts
- Amplification of the switch state information of sensitive contacts
- Supply and evaluation of NPN or PNP sensors

Temperature monitoring

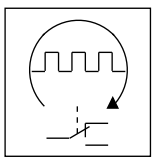
Acquisition, messaging and regulation of temperatures of solid, liquid and gaseous media in processes and machines via PT100, PT1000, KTY83, KTY 84 or NTC sensors with C510, C511, C512, C513.



Temperature monitoring

- Motor and system protection
- Control cabinet temperature monitoring
- Frost monitoring
- Temperature limits for process variables, e.g. in the packing or electroplating industry
- Control of systems and machines like heating, air-conditioning and ventilation systems, solar collectors, heat pumps or hot water supply systems
- Monitoring of servomotors with KTY sensors
- Bearing and gear oil monitoring
- Coolant monitoring

Cycle monitoring


2CDC 252 036 F0004

Cycle monitoring

- External monitoring of the correct function of programmable logic controllers (plc) and industrial pcs (ipc)

Measuring and monitoring relays
CM and C5xx range
Approvals and marks

■ existing
□ pending

Approvals		Current and voltage monitoring, single-phase							Three-phase monitoring												
		CM-SRS.1x	CM-SRS.2x	CM.SRS.M	CM-SFS.2	CM-ESS.2x	CM-ESS.M	CM-EFS.2	CM-PBE	CM-PVE	CM-PFE	CM-PFS	CM-PSS.x1	CM-PVS.x1	CM-PAS.x1	CM-MPS.x1	CM-MPS.x3	CM-MPN.52	CM-MPN.62	CM-MPN.72	CM-UFS.1	CM-UFS.2
	UL 508, CAN/CSA C22.2 No.14	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■			
	GL	□	□	□	□	□	□	□				■	■	■	■	■	■	■	■	■		
	GOST	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
	CB scheme	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
	CCC	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
	RMRS	■	■	■	■	■	■	■	■	■	■	■										
	VDE V 0126-1-1																				■	
	ENEL DK 5940 Ed. 2.2																					■
Marks																						
CE	CE	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
C-Tick	C-Tick	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		

■ existing
□ pending

Approvals		Insulation monitors for ungrounded supply mains					Motor load monitoring			Temperature monitoring					Contact protection, sensor interface							
		CM-IWS.2	CM-IWS.1	CM-IWN.1	CM-IVN		CM-LWN			C510	C511	C512	C513		CM-KRN	CM-SIS						
	UL 508, CAN/CSA C22.2 No.14	■	■	■	■		■			■	■	■	■		■	■						
	GL	□	□	□	□		■								■							
	GOST	□	□	□	□		■								■	■						
	CB scheme	□	□	□	□		■															
	CCC	□	□	□	□		■															
	RMRS						■								■	■						
Marks																						
CE	CE	■	■	■	■		■			■	■	■	■		■	■						
C-Tick	C-Tick	□	□	□	□		■									■						

■ existing
□ pending

Approvals		Cycle monitoring				Thermistor motor protection									Liquid level monitoring							
		CM-WDS				CM-MSE	CM-MSS (1)	CM-MSS (2)	CM-MSS (3)	CM-MSS (4)	CM-MSS (5)	CM-MSS (6)	CM-MSS (7)	CM-MSN	CM-ENE MIN	CM-ENE MAX	CM-ENS	CM-ENS UP/...	CM-ENN	CM-ENN UP/...		
	UL 508, CAN/CSA C22.2 No.14	■				■	■	■	■	■	□	■	■	■	■	■	■	■	■	■		
	GL						■	■	■	■	■	■	■	■			■		■			
	GOST					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
	II (2) G D, PTB 02 ATEX 3080								■	■		■	■	■								
	CB scheme					■	■	■	■	■	■	■	■		■	■	■	■	■	■		
	CCC					■	■	■	■	■	■	■	■		■	■	■	■	■	■		
	RMRS	■				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
Marks																						
CE	CE	■				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
C-Tick	C-Tick					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		

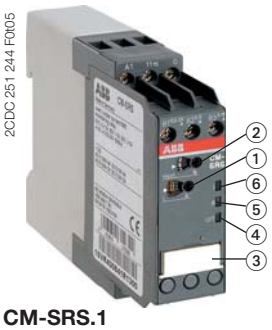
[1] Versions with safety isolation without GL approval

2CDC110004C0207

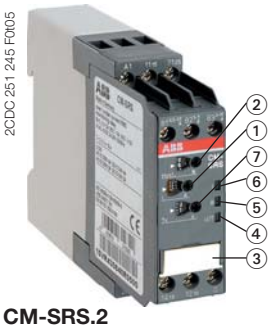
Current and voltage monitors, single-phase

Content

Current monitoring relays, single-phase AC/DC - CM-SRS.1 and CM-SRS.2
Ordering details



CM-SRS.1



CM-SRS.2

① Threshold value adjustment
② Hysteresis adjustment
③ DIP switches (see DIP switch functions)
④ U/T: green LED - control supply voltage, (timing)
⑤ R: yellow LED - relay status
⑥ I: red LED - over- / undercurrent
⑦ Adjustment of the tripping delay T_V

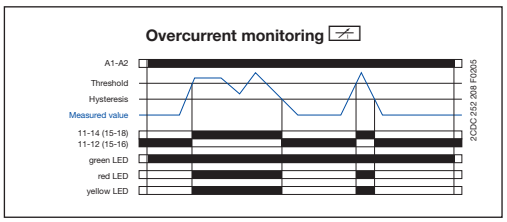
- Monitoring of DC- and AC-currents
  CM-SRS.x1: 3 mA - 1 A
  CM-SRS.x2: 0.3-15 A
- TRMS measuring principle
- One device includes 3 measuring ranges
- Over- or undercurrent monitoring configurable
- Hysteresis adjustable from 3-30 %
- **CM-SRS.2:** Tripping delay T_V adjustable 0; 0.1-30 s
- 3 supply voltage versions
- **CM-SRS.1:** 1 c/o contact
  CM-SRS.2: 2 c/o contacts
- 22.5 mm width
- 3 LEDs for status indication

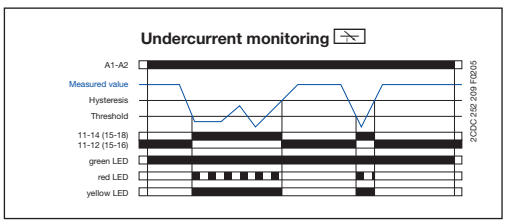
Depending on the configuration, the current monitoring relays **CM-SRS.1** and **CM-SRS.2** can be used for over- or undercurrent monitoring in single-phase AC and/or DC systems. The current to be monitored (measured value) is applied to terminals B1/B2/B3-C. The devices work according the open-circuit principle.

If the measured value exceeds resp. drops below the adjusted threshold value, the output relay(s) energize(s): on the CM-SRS.1 immediately, on the CM-SRS.2 after the set tripping delay T_V. If the measured value exceeds resp. drops below the threshold value plus resp. minus the adjusted hysteresis, the output relay(s) de-energize(s).

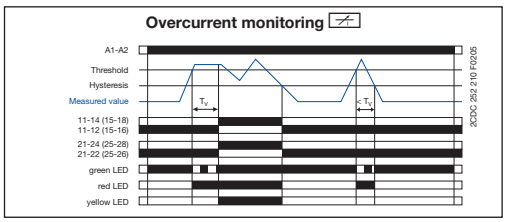
The hysteresis is adjustable within a range of 3-30 % of the threshold value.

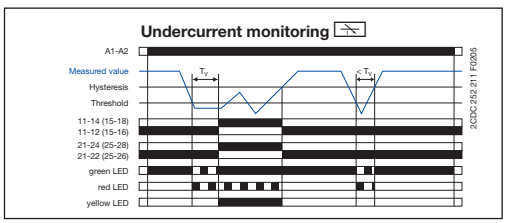
Function diagrams CM-SRS.1



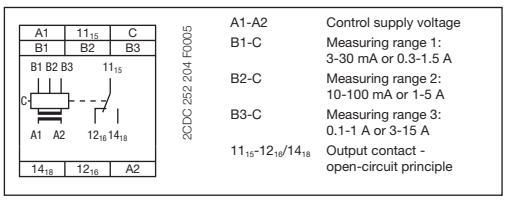


Function diagrams CM-SRS.2



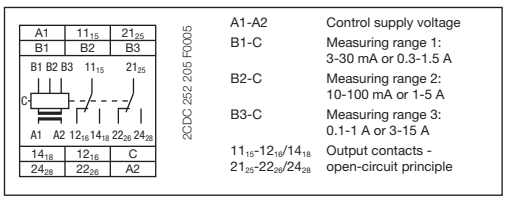


Connection diagram CM-SRS.1



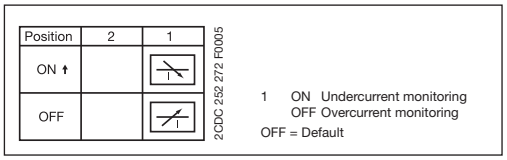
A1-A2	Control supply voltage
B1-C	Measuring range 1: 3-30 mA or 0.3-1.5 A
B2-C	Measuring range 2: 10-100 mA or 1-5 A
B3-C	Measuring range 3: 0.1-1 A or 3-15 A
11_{15}-12_{16}/14_{18}	Output contact - open-circuit principle

Connection diagram CM-SRS.2



A1-A2	Control supply voltage
B1-C	Measuring range 1: 3-30 mA or 0.3-1.5 A
B2-C	Measuring range 2: 10-100 mA or 1-5 A
B3-C	Measuring range 3: 0.1-1 A or 3-15 A
11_{15}-12_{16}/14_{18} 21_{25}-22_{26}/24_{28}	Output contacts - open-circuit principle

DIP switch functions CM-SRS.1, CM-SRS.2



1 ON Undercurrent monitoring
OFF Overcurrent monitoring
OFF = Default

Type	Control supply voltage 50/60 Hz	Tripping delay T_V	Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg / lb
Measuring ranges AC/DC: 3-30 mA; 10-100 mA; 0.1-1 A						
CM-SRS.11	24-240 V AC/DC	without	**1SVR 430 840 R0200**	1		0.12 / 0.26
	110-130 V AC		**1SVR 430 841 R0200**	1		0.15 / 0.33
	220-240 V AC		**1SVR 430 841 R1200**	1		0.15 / 0.33
Measuring ranges AC/DC: 0.3-1.5 A; 1-5 A; 3-15 A						
CM-SRS.12	24-240 V AC/DC	without	**1SVR 430 840 R0300**	1		0.12 / 0.26
	110-130 V AC		**1SVR 430 841 R0300**	1		0.15 / 0.33
	220-240 V AC		**1SVR 430 841 R1300**	1		0.15 / 0.33
Measuring ranges AC/DC: 3-30 mA; 10-100 mA; 0.1-1 A						
CM-SRS.21	24-240 V AC/DC	adjustable 0 or 0.1-30 s	**1SVR 430 840 R0400**	1		0.12 / 0.26
	110-130 V AC		**1SVR 430 841 R0400**	1		0.15 / 0.33
	220-240 V AC		**1SVR 430 841 R1400**	1		0.15 / 0.33
Measuring ranges AC/DC: 0.3-1.5 A; 1-5 A; 3-15 A						
CM-SRS.22	24-240 V AC/DC	adjustable 0 or 0.1-30 s	**1SVR 430 840 R0500**	1		0.12 / 0.26
	110-130 V AC		**1SVR 430 841 R0500**	1		0.15 / 0.33
	220-240 V AC		**1SVR 430 841 R1500**	1		0.15 / 0.33

- **Approvals and marks** 2/6
- **Technical data** 2/14
- **Technical diagrams** 2/102
- **Dimensional drawings** 2/103
- **Accessories** 2/104
- **Current transformers** 2/105

Current monitoring relays, single-phase AC/DC, multifunctional - CM-SRS.M
Ordering details

CM-SRS.M

① Threshold value adjustment
② Hysteresis adjustment
③ Adjustment of the tripping delay T_V
④ Adjustment of the start-up delay T_S
⑤ DIP switches (see DIP switch functions)
⑥ U/T: green LED - control supply voltage, timing
⑦ R: yellow LED - relay status
⑧ I: red LED - over- / undercurrent

- Monitoring of DC- and AC-currents **CM-SRS.M1:** 3 mA - 1 A **CM-SRS.M2:** 0.3-15 A
- TRMS measuring principle
- One device includes 3 measuring ranges
- Over- or undercurrent monitoring configurable
- Open- or closed circuit principle configurable
- Latching function configurable
- Hysteresis adjustable from 3-30 %
- Start-up delay T_S adjustable 0; 0.1-30 s
- Tripping delay T_V adjustable 0; 0.1-30 s
- 2 c/o contacts
- 22.5 mm width
- 3 LEDs for status indication

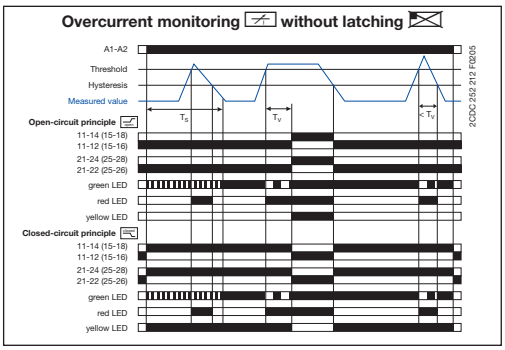
Depending on the configuration, the current monitoring relays **CM-SRS.M** can be used for over- or undercurrent monitoring in single-phase AC and/or DC systems. The current to be monitored (measured value) is applied to terminals B1/B2/B3-C. Open or closed-circuit principle are configurable.

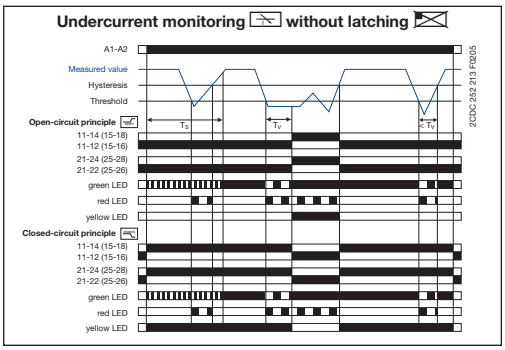
If the measured value exceeds resp. drops below the adjusted threshold value before the set start-up delay T_S is complete, the output relays do not change their actual state. If the measured value exceeds resp. drops below the adjusted threshold value when T_S is complete, the tripping delay T_V starts. If T_V is complete and the measured value is still exceeding resp. below the threshold value plus resp. minus the set hysteresis, the output relays energize / de-energize.

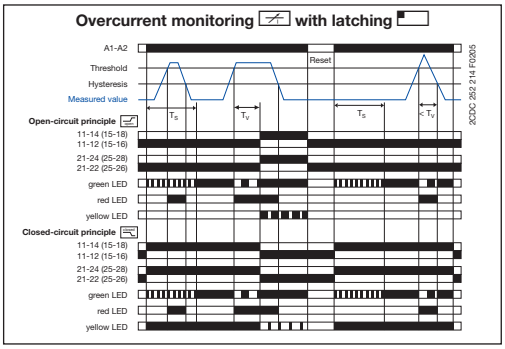
If the measured value exceeds resp. drops below the threshold value minus resp. plus the set hysteresis and the latching function is not activated, the output relays de-energize / energize. With activated latching function the output relays remain energized and de-energize only, when the supply voltage is interrupted / the output relays remain de-energized and energize only, when the supply voltage is switched off and then again switched on = Reset.

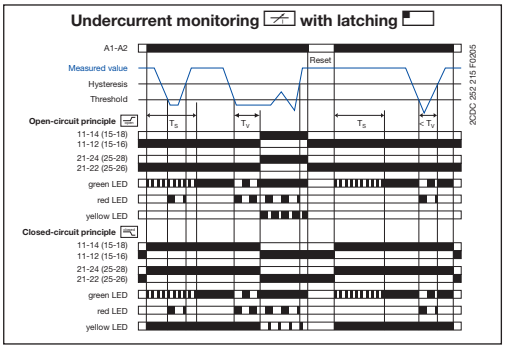
The hysteresis is adjustable within a range of 3-30 % of the threshold value.

Function diagrams CM-SRS.M

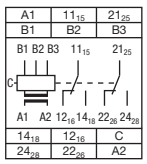






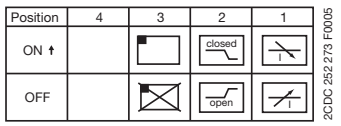


Connection diagram CM-SRS.M



A1-A2	Control supply voltage
B1-C	Measuring range 1: 3-30 mA bzw. 0.3-1.5 A
B2-C	Measuring range 2: 10-100 mA bzw. 1-5 A
B3-C	Measuring range 3: 0.1-1 A bzw. 3-15 A
11_{15}-12_{16}/14_{18} 21_{25}-22_{26}/24_{28}	Output contacts - open-or closed circuit principle

DIP switch functions CM-SRS.M

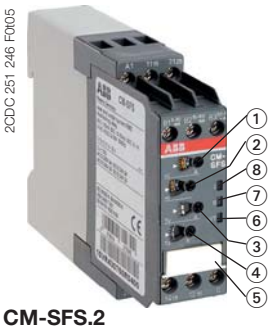


1 ON Undercurrent monitoring
OFF Overcurrent monitoring
2 ON Closed-circuit principle
OFF Open-circuit principle
3 ON Latching function activated
OFF Latching function not activated
OFF = Default

Type	Control supply voltage 50/60 Hz	Tripping delay T_V	Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg / lb
Measuring ranges AC/DC: 3-30 mA; 10-100 mA; 0,1-1 A						
CM-SRS.M1	24-240 V AC/DC	0 or 0.1-30 s	**1SVR 430 840 R0600**	1		0.12 / 0.26
Measuring ranges AC/DC: 0,3-1,5 A; 1-5 A; 3-15 A						
CM-SRS.M2	24-240 V AC/DC	0 or 0.1-30 s	**1SVR 430 840 R0700**	1		0.12 / 0.26

- **Approvals and marks** 2/6
- **Technical data** 2/14
- **Technical diagrams** 2/102
- **Dimensional drawings** 2/103
- **Accessories** 2/104
- **Current transformers** 2/105

Current monitoring relay, single-phase AC/DC, window monitoring - CM-SFS.2
Ordering details



CM-SFS.2

① Threshold value adjustment >I for overcurrent
② Threshold value adjustment <I for undercurrent
③ Adjustment of the tripping delay T_V
④ Adjustment of the start-up delay T_S
⑤ DIP switches (see DIP switch functions)
⑥ U/T: green LED - control supply voltage, timing
⑦ R: yellow LED - relay status
⑧ I: red LED - over- / undercurrent

- Monitoring of DC- and AC-currents
  CM-SFS.21: 3 mA - 1 A
  CM-SFS.22: 0.3-15 A
- TRMS measuring principle
- One device includes 3 measuring ranges
- Over- and undercurrent monitoring
- ON-or OFF-delay configurable
- Open- or closed circuit principle configurable
- Latching function configurable
- Thresholds for I_{min} and I_{max} adjustable
- Fixed hysteresis of 5 %
- Start-up delay T_S adjustable 0; 0.1-30 s
- Tripping delay T_V adjustable 0; 0.1-30 s
- 1x2 c/o contacts (common signal) or 2x1 c/o contact (separate signals for I_{min} and I_{max})
- 22.5 mm width
- 3 LEDs for status indication

The current window monitoring relays **CM-SFS.2** can be used for the simultaneous monitoring of over- (>I) and undercurrents (<I) in single-phase AC and/or DC systems. Depending on the configuration, one c/o contact each 2x1 c/o or both c/o contacts in parallel 1x2 c/o can be used for the over- and undercurrent monitoring. The current to be monitored (measured value) is applied to terminals B1/B2/B3-C. Open- or closed-circuit principle as well as an adjustable ON or OFF tripping delay are configurable.

ON-delayed current window monitoring with parallel switching c/o contacts 1x2 c/o:

If the measured value exceeds resp. drops below the adjusted threshold value before the set start-up delay T_S is complete, the output relays do not change their actual state.

If the measured value exceeds resp. drops below the adjusted threshold value when T_S is complete, the tripping delay T_V starts, when is configured. If T_V is complete and the measured value is still exceeding resp. below the threshold value minus resp. plus the fixed hysteresis (5%), the output relays energize /de-energize.

If the measured value exceeds resp. drops below the threshold value plus resp. minus the hysteresis and the latching function is not activated, the output relays de-energize / energize. With activated latching function the output relays remain energized and de-energize only, when the supply voltage is interrupted / the output relays remain de-energized and energize only, when the supply voltage is switched off and then again switched on = Reset.

OFF-delayed current window monitoring with parallel switching c/o contacts 1x2 c/o:

If the measured value exceeds resp. drops below the adjusted threshold value when the set start-up delay T_S is complete, the output relays energize / de-energize, when is configured, and remain in this position during the set tripping delay T_V.

If the measured value exceeds resp. drops below the threshold value plus resp. minus the fixed hysteresis (5%) and the latching function is not activated, the tripping delay T_V starts.

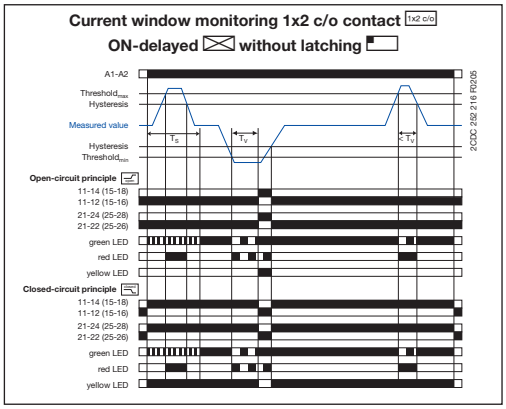
After completion of T_V, the output relays de-energize / energize, provided that the latching function is not activated. With activated latching function the output relays remain energized and de-energize only, when the supply voltage is interrupted / the output relays remain de-energized and energize only, when the supply voltage is switched off and then again switched on = Reset.

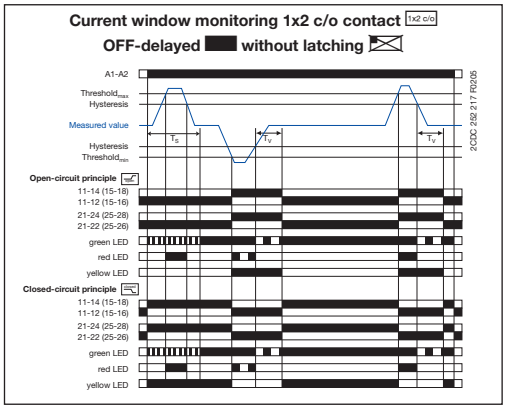
When 2x1 c/o is adjusted on the device, the functionality is equivalent to the one described above. There is only to consider that in this case, instead of both output relays, only one output relay each will be switched.

">I" = 11_{15}-12_{16}/14_{18} ; "<I" = 21_{25}-22_{26}/24_{28}

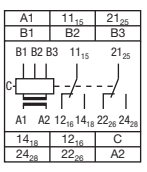
Function diagrams CM-SFS.2

Further function diagrams see data sheet.



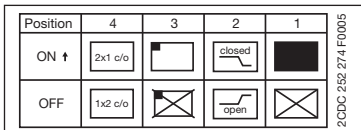


Connection diagram CM-SFS.2



A1-A2	Control supply voltage
B1-C	Measuring range 1: 3-30 mA or 0.3-1.5 A
B2-C	Measurign range 2: 10-100 mA or 1-5 A
B3-C	Measuring range 3: 0.1-1 A or 3-15 A
11_{15}-12_{16}/14_{18} 21_{25}-22_{26}/24_{28}	Output contacts - open-or closed circuit principle

DIP switch function CM-SFS.2



OFF = Default

1 ON OFF-delay / OFF ON-delay
2 ON Closed-circuit principle / OFF Open-circuit principle
3 ON Latching function activated / OFF Latching function not activated
4 ON 2x1 c/o contact / OFF 1x2 c/o contacts

Type	Control supply voltage 50/60 Hz	Tripping delay T_V	Order code	Pack.-unit piece	Price 1 piece	Weight 1 piece kg / lb
Measuring ranges AC/DC: 3-30 mA; 10-100 mA; 0.1-1 A						
CM-SFS.21	24-240 V AC/DC	0 or 0.1-30 s	**1SVR 430 760 R0400**	1		0.12 / 0.26
Measuring ranges AC/DC: 0.3-1.5 A; 1-5 A; 3-15 A						
CM-SFS.22	24-240 V AC/DC	0 or 0.1-30 s	**1SVR 430 760 R0500**	1		0.12 / 0.26

- **Approvals and marks** 2/6
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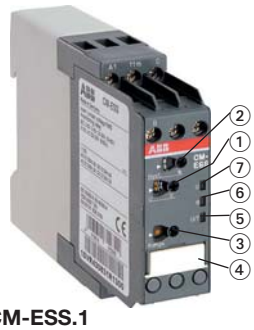
- **Accessories** 2/104
- **Current transformers** 2/105

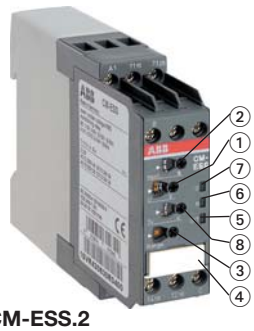
Voltage monitoring relays, single-phase AC/DC - CM-ESS.1 and CM-ESS.2
Ordering details

2CDC 251 248 F0005



CM-ESS.1

2CDC 251 249 F0005



CM-ESS.2

① Threshold value adjustment
② Hysteresis adjustment
③ Adjustment of the measuring range
④ DIP switches (see DIP switch functions)
⑤ U/T: green LED - control supply voltage, timing
⑥ R: yellow LED - relay status
⑦ U: red LED - over- / undervoltage
⑧ Adjustment of the tripping delay T_V

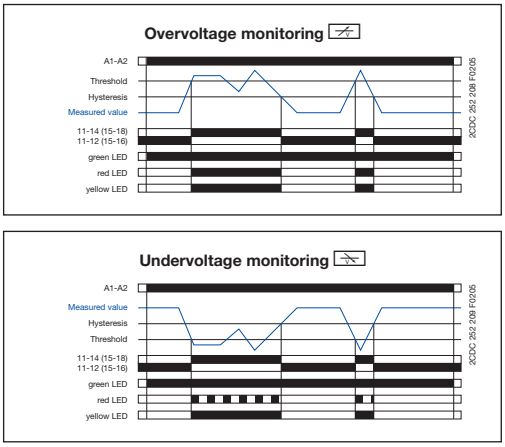
- Monitoring of DC- and AC-voltages from 3-600 V
- TRMS measuring principle
- One device includes 4 measuring ranges: 3-30 V, 6-60 V, 30-300 V, 60-600 V
- Over- or undervoltage monitoring configurable
- Hysteresis adjustable from 3-30 %
- **CM-ESS.2:** Tripping delay T_V adjustable 0; 0.1-30 s
- 3 supply voltage versions
- **CM-ESS.1:** 1 c/o contact **CM-ESS.2:** 2 c/o contacts
- 22.5 mm width
- 3 LEDs for status indication

Depending on the configuration, the voltage monitoring relays **CM-ESS.1** and **CM-ESS.2** can be used for over- or undervoltage monitoring in single-phase AC and/or DC systems. The voltage to be monitored (measured value) is applied to terminals B-C. The devices work according the open-circuit principle.

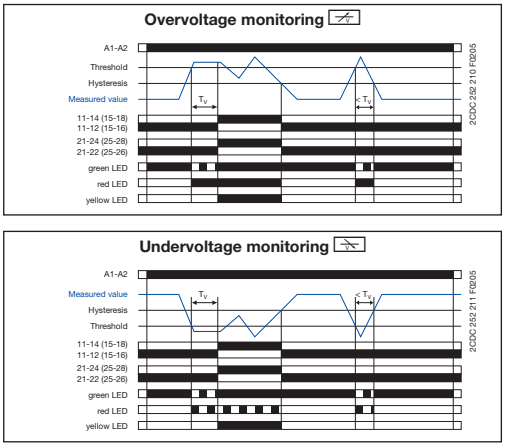
If the measured value exceeds resp. drops below the adjusted threshold value, the output relay(s) energize(s): on the CM-ESS.1 immediately, on the CM-ESS.2 after the set tripping delay T_V. If the measured value exceeds resp. drops below the threshold value plus resp. minus the adjusted hysteresis, the output relay(s) de-energize(s).

The hysteresis is adjustable within a range of 3-30 % of the threshold value.

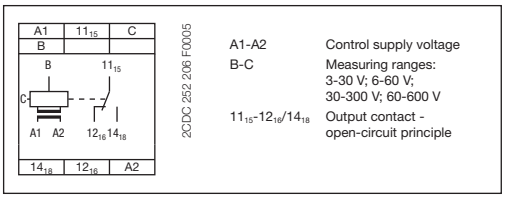
Function diagrams CM-ESS.1



Function diagrams CM-ESS.2

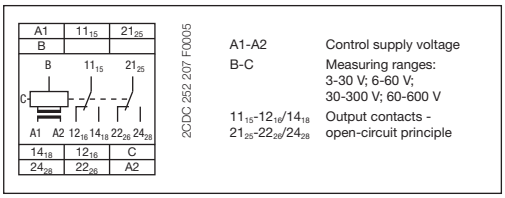


Connection diagram CM-ESS.1



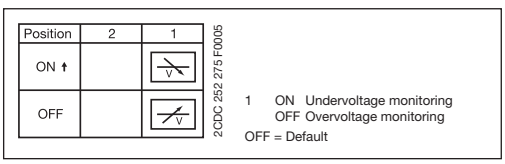
A1-A2 Control supply voltage
B-C Measuring ranges: 3-30 V; 6-60 V; 30-300 V; 60-600 V
11_{15}-12_{16}/14_{18} Output contact - open-circuit principle

Connection diagram CM-ESS.2



A1-A2 Control supply voltage
B-C Measuring ranges: 3-30 V; 6-60 V; 30-300 V; 60-600 V
11_{15}-12_{16}/14_{18} Output contacts - open-circuit principle
21_{25}-22_{26}/24_{28} open-circuit principle

DIP switch functions CM-ESS.1, CM-ESS.2



1 ON Undervoltage monitoring
OFF Overvoltage monitoring
OFF = Default

Type	Control supply voltage 50/60 Hz	Tripping delay T_V	Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg / lb
Measuring ranges AC/DC: 3-30 V; 6-60 V; 30-300 V; 60-600 V						
CM-ESS.1	24-240 V AC/DC	without	**1SVR 430 830 R0300**	1		0.12 / 0.26
	110-130 V AC		**1SVR 430 831 R0300**	1		0.15 / 0.33
	220-240 V AC		**1SVR 430 831 R1300**	1		0.15 / 0.33
CM-ESS.2	24-240 V AC/DC	adjustable 0 or 0.1-30 s	**1SVR 430 830 R0400**	1		0.12 / 0.26
	110-130 V AC		**1SVR 430 831 R0400**	1		0.15 / 0.33
	220-240 V AC		**1SVR 430 831 R1400**	1		0.15 / 0.33

- **Approvals and marks** 2/6
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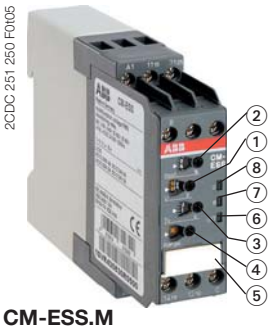
- **Accessories** 2/104
- **Technical data** 2/16
- **Dimensional drawings** 2/103

Voltage monitoring relay, single-phase AC/DC, multifunctional - CM-ESS.M
Ordering details



CM-ESS.M

① Threshold value adjustment
② Hysteresis adjustment
③ Adjustment of the tripping delay T_V
④ Adjustment of the measuring range
⑤ DIP switches (see DIP switch functions)
⑥ U/T: green LED - control supply voltage
⑦ R: yellow LED - relay status
⑧ U: red LED - over- / undervoltage

- Monitoring of DC- and AC-voltages from 3-600 V
- TRMS measuring principle
- One device includes 4 measuring ranges: 3-30 V; 6-60 V; 30-300 V; 60-600 V
- Over- or undervoltage monitoring configurable
- Open- or closed circuit principle configurable
- Latching function configurable
- Hysteresis adjustable from 3-30 %
- Tripping delay T_V adjustable 0; 0.1-30 s
- 2 c/o contacts
- 22.5 mm width
- 3 LEDs for status indication

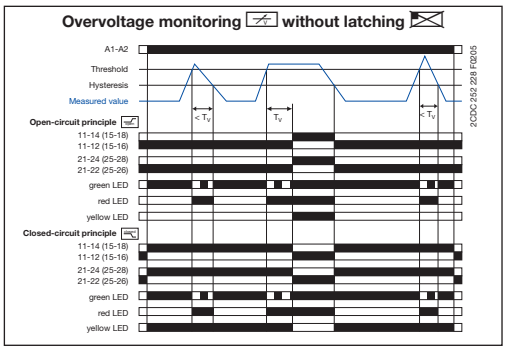
Depending on the configuration, the voltage monitoring relay **CM-ESS.M** can be used for over- or undervoltage monitoring in single-phase AC and/or DC systems. The voltage to be monitored (measured value) is applied to terminals B-C. Open or closed-circuit principle are selectable.

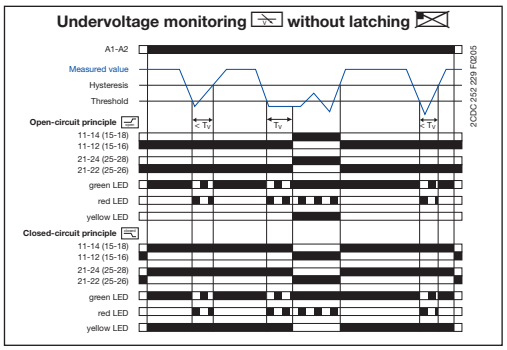
If the measured value exceeds resp. drops below the adjusted threshold value, the tripping delay T_V starts. If T_V is complete and the measured value is still exceeding resp. below the threshold value plus resp. minus the set hysteresis, the output relays energize / de-energize.

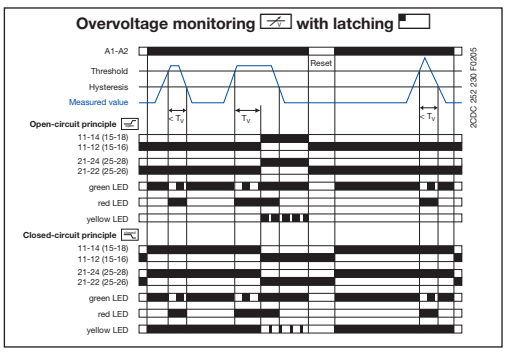
If the measured value exceeds resp. drops below the threshold value plus resp. minus the set hysteresis and the latching function is not activated, the output relays de-energize / energize. With activated latching function the output relays remain energized and de-energize only, when the supply voltage is interrupted / the output relays remain de-energized and energize only, when the supply voltage is switched off and then again switched on = Reset.

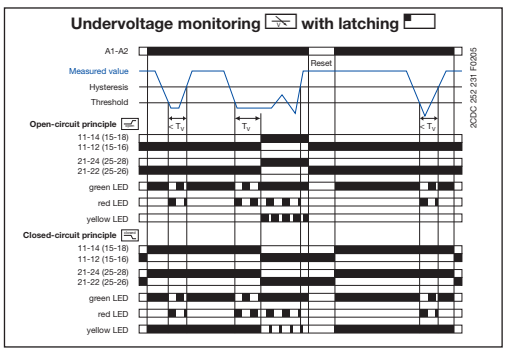
The hysteresis is adjustable within a range of 3-30 % of the threshold value.

Function diagrams CM-ESS.M

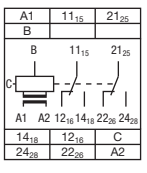






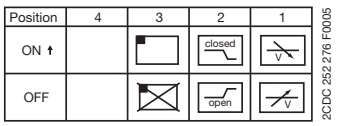


Connection diagram CM-ESS.M



A1-A2 Control supply voltage
B-C Measuring ranges: 3-30 V; 6-60 V; 30-300 V; 60-600 V
11_{15}-12_{16}/14_{18} 21_{25}-22_{26}/24_{28} Output contacts - Open- or closed circuit principle

DIP switch functions CM-ESS.M



1 ON Undervoltage monitoring
OFF Overvoltage monitoring
2 ON Closed-circuit principle
OFF Open-circuit principle
3 ON Latching function activated
OFF Latching function not activated
OFF = Default

Type	Control supply voltage 50/60 Hz	Tripping delay T_V	Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg / lb
Measuring ranges AC/DC: 3-30 V; 6-60 V; 30-300 V; 60-600 V						
CM-ESS.M	24-240 V AC/DC	0 or 0.1-30 s	**1SVR 430 830 R0500**	1		0.12 / 0.26

Voltage monitoring relay, single-phase AC/DC, window monitoring - CM-EFS.2
Ordering details

CM-EFS.2

① Threshold value adjustment >U for overvoltage
② Threshold value adjustment <U for undervoltage
③ Adjustment of the tripping delay T_V
④ Adjustment of the measuring range
⑤ DIP switches (see DIP switch functions)
⑥ U/T: green LED - control supply voltage, timing
⑦ R: yellow LED - relay status
⑧ U: red LED - over- / undervoltage

- Monitoring of DC- and AC-voltages from 3-600 V
- T RMS measuring principle
- One device includes 4 measuring ranges: 3-30 V; 6-60 V; 30-300 V; 60-600 V
- Over- and undervoltage monitoring
- ON-or OFF-delay configurable
- Open- or closed circuit principle configurable
- Latching function configurable
- Thresholds for U_{min} and U_{max} adjustable
- Fixed hysteresis of 5 %
- Tripping delay T_V adjustable 0; 0.1-30 s
- 1x2 c/o contacts (common signal) or 2x1 c/o contact (separate signals for U_{min} and U_{max})
- 22.5 mm width
- 3 LEDs for status indication

The voltage window monitoring relay **CM-EFS.2** can be used for the simultaneous monitoring of over- (>U) and undervoltages (<U) in single-phase AC and/or DC systems. Depending on the configuration, one c/o contact each 2x1 c/o or both c/o contacts in parallel 1x2 c/o can be used for the over- and undervoltage monitoring. The voltage to be monitored (measured value) is applied to terminals B-C. Open- or closed-circuit principle as well as an adjustable ON or OFF tripping delay are configurable.

ON-delayed voltage window monitoring with parallel switching c/o contacts 1x2 c/o:

If the measured value exceeds resp. drops below the adjusted threshold value, the tripping delay T_V starts, when is configured. If T_V is complete and the measured value is still exceeding resp. below the threshold value minus resp. plus the fixed hysteresis (5%), the output relays energize /de-energize .

If the measured value exceeds resp. drops below the threshold value plus resp. minus the hysteresis and the latching function is not activated , the output relays de-energize / energize . With activated latching function the output relays remain energized and de-energize only, when the supply voltage is interrupted / the output relays remain de-energized and energize only, when the supply voltage is switched off and then again switched on = Reset.

OFF-delayed voltage window monitoring with parallel switching c/o contacts 1x2 c/o:

If the measured value exceeds resp. drops below the adjusted threshold value, the output relays energize / de-energize , when is configured, and remain in this position during the set tripping delay T_V.

If the measured value exceeds resp. drops below the threshold value plus resp. minus the fixed hysteresis (5%) and the latching function is not activated , the tripping delay T_V starts.

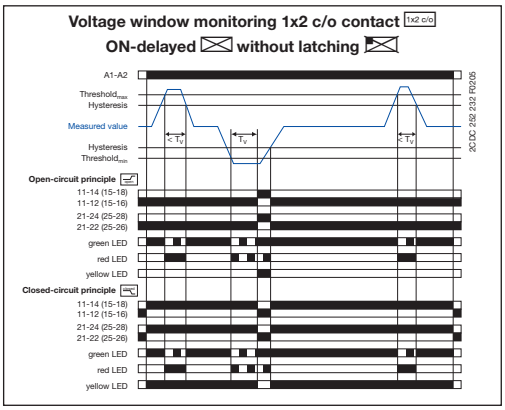
After completion of T_V, the output relays de-energize / energize , provided that the latching function is not activated . With activated latching function the output relays remain energized and de-energize only, when the supply voltage is interrupted / the output relays remain de-energized and energize only, when the supply voltage is switched off and then again switched on = Reset.

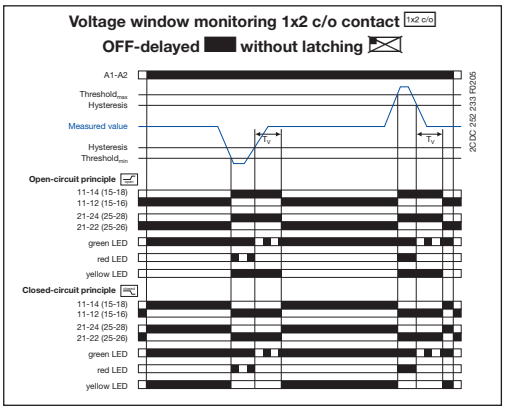
When 2x1 c/o is adjusted on the device, the functionality is equivalent to the one described above. There is only to consider that in this case, instead of both output relays, only one output relay each will be switched.

">U" = 11_{15}-12_{16}/14_{18} ; "<U" = 21_{25}-22_{26}/24_{28}

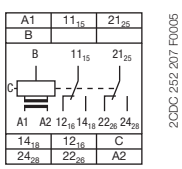
Function diagrams CM-EFS.2

Further function diagrams see data sheet.



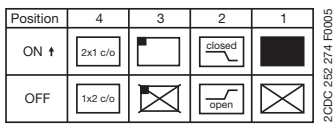


Connection diagram CM-EFS.2



A1-A2 Control Supply voltage
B-C Measuring ranges: 3-30 V; 6-60 V; 30-300 V; 60-600 V
11_{15}-12_{16}/14_{18} 21_{25}-22_{26}/24_{28} Output contacts - open- or closed circuit principle

DIP switch functions CM-EFS.2



OFF = Default

1 ON OFF-delay / OFF ON-delay
2 ON Closed-circuit principle / OFF Open-circuit principle
3 ON Latching function activated / OFF Latching function not activated
4 ON 2x1 c/o contact / OFF 1x2 c/o contacts

Type	Control supply voltage 50/60 Hz	Tripping delay T_V adjustable	Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg / lb
Measuring ranges AC/DC: 3-30 V; 6-60 V; 30-300 V; 60-600 V						
CM-EFS.2	24-240 V AC/DC	0 or 0.1-30 s	**1SVR 430 750 R0400**	1		0.12 / 0.26

Current monitoring relays, single-phase
CM-SRS.1, CM-SRS.2, CM-SRS.M and CM-SFS.2
Technical data

Type		CM-SRS.1	CM-SRS.2	CM-SRS.M	CM-SFS.2
Input circuit - Supply circuit	**A1-A2**				
Rated control supply voltage U_S	A1-A2	110-130 V AC			
	A1-A2	220-240 V AC			
	A1-A2	24-240 V AC/DC			
Rated control supply voltage U_S tolerance		-15...+10 %			
Rated frequency	AC versions	50/60 Hz			
	AC/DC versions	50/60 Hz or DC			
Current / power consumption		24 V DC	115 V AC	230 V AC	
	110-130 V AC	-	24 mA / 2.6 VA	-	
	220-240 V AC	-	-	12 mA / 2.6 VA	
	24-240 V AC/DC	30 mA / 0.75 W	17 mA / 1.9 VA	11 mA / 2.6 VA	
On-period		100 %			
Power failure buffering time		20 ms			
Transient overvoltage protection		Varistors			
Input circuit - Measuring circuit	**B1/B2/B3-C**				
Monitoring function		over- or undercurrent monitoring configurable			over- and under-current monitoring
Measuring method		True RMS measuring principle			
Measuring inputs		CM-SxS.x1			CM-SxS.x2		
	Terminal connection	B1-C	B2-C	B3-C	B1-C	B2-C	B3-C
	Measuring ranges AC/DC	3-30 mA	10-100 mA	0.1-1 A	0.3-1.5 A	1-5 A	3-15 A [2]
	Input resistance	3.3 Ω	1 Ω	0.1 Ω	0.05 Ω	0.01 Ω	0.0025 Ω
	Pulse overload capacity t < 1 s	500 mA	1 A	10 A	15 A	50 A	100 A
	Continous capacity	50 mA	150 mA	1.5 A	2 A	7 A	17 A
Threshold value(s)		adjustable within the indicated measuring range			
Setting accuracy of threshold value		10 %			
Repeat accuracy (constant parameters)		±0.07 % of full scale			
Hysteresis related to the threshold value		3-30 % adjustable			5 % fixed
Measuring signal frequency range		DC / 15 Hz - 2 kHz			
Rated measuring signal frequency range		DC / 50-60 Hz			
Maximum response time		AC: 80 ms / DC: 120 ms			
Accuracy within the control supply voltage tolerance		ΔU ≤ 0.5 %			
Accuracy within the temperature range		ΔU ≤ 0.06 % / °C			
Timing circuit					
Start-up delay T_S		none		0 or 0.1-30 s adjustable	
Tripping delay T_V		none	0 or 0.1-30 s adjustable		
Repeat accuracy (constant parameters)		±0.07 % of full scale			
Accuracy within the control supply voltage tolerance		-	Δt ≤ 0.5 %		
Accuracy within the temperature range		-	Δt ≤ 0.06 % / °C		
Indication of operational states					
Control supply voltage	U/T: green LED	⎍⎍⎍⎍: control supply voltage applied, ⎍⎍⎍⎍: start-up delay T_S active, ⎍⎍⎍⎍: tripping delay T_V active			
Measured value	I: red LED	⎍⎍⎍⎍: overcurrent, ⎍⎍⎍⎍: undercurrent			
Relay status	R: yellow LED	⎍⎍⎍⎍: relay energized, no latching function ⎍⎍⎍⎍: relay energized, active latching function ⎍⎍⎍⎍: relay de-energized, active latching function			
Output circuits		**11(15)-12(16)/14(18), 21(25)-22(26)/24(28) - Relays**			
Kind of output		1 c/o contact	2 c/o contacts		1x2 c/o contacts or 2x1 c/o contact configurable
Operating principle [1]		open-circuit principle		open- or closed-circuit principle configurable	
Contact material		AgNi			
Rated operational voltage U_e	IEC/EN 60947-1	250 V			
Minimum switching voltage / minimum switching current		24 V / 10 mA			
Maximum switching voltage / maximum switching current		250 V AC / 4 A AC			

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Current monitoring relays, single-phase
CM-SRS.1, CM-SRS.2, CM-SRS.M and CM-SFS.2
Technical data

Type			CM-SRS.1	CM-SRS.2	CM-SRS.M	CM-SFS.2
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			
	max. rated operational voltage		300 V AC			
	max. continuous thermal current at B 300		5 A			
	max. making/breaking apparent power (Make/Break) at B 300		3600/360 VA			
Mechanical lifetime			$30x10^6$ switching cycles			
Electrical lifetime (AC12, 230 V, 4 A)			$0.1x10^6$ switching cycles			
Max. fuse rating to achieve short circuit protection		n/c contact	6 A fast-acting	10 A fast-acting		6 A fast-acting
		n/o contact	10 A fast-acting			
General data						
Dimensions (W x H x D)			22.5 x 78 x 100 mm (0.89 x 3.07 x 3.94 in)			
Mounting			DIN rail (IEC/EN 60715)			
Mounting position			any			
Degree of protection		enclosure / terminals	IP50 / IP20			
Electrical connection						
Wire size	fine-strand with(out) wire end ferrule		2 x 0.75-2.5 mm^2 (2 x 18-14 AWG)			
	rigid		2 x 0.5-4 mm^2 (2 x 20-12 AWG)			
Stripping length			7 mm (0.28 in)			
Tightening torque			0.6-0.8 Nm			
Environmental data						
Ambient temperature range		operation / storage	-20...+60 °C / -40...+85 °C			
Damp heat (IEC 60068-2-30)			55 °C, 6 cycles			
Vibration (sinusoidal) (IEC/EN 60255-21-1)			Class 2			
Shock (IEC/EN 60255-21-2)			Class 2			
Isolation data						
Rated insulation voltage (VDE 0110, IEC 60947-1, IEC/EN 60255-5)		supply / measuring circuit / output	600 V			
		supply / output 1 / output 2	250 V			
Rated impulse withstand voltage U_{imp} (IEC/EN 60947-1, IEC/EN 60255-5)		supply / measuring circuit / output	6 kV 1.2/50 µs			
		supply / output 1 / output 2	4 kV 1.2/50 µs			
Pollution degree (VDE 0110, IEC 664, IEC/EN 60255-5)			3			
Overvoltage category (VDE 0110, IEC 664, IEC/EN 60255-5)			III			
Standards						
Product standard			IEC/EN 60255-6			
Low Voltage Directive			2006/95/EC			
EMC Directive			2004/108/EC			
Electromagnetic compatibility						
Interference immunity to			IEC/EN 61000-6-2			
electrostatic discharge		IEC/EN 61000-4-2	Level 3			
radiated, radio-frequency, electromagnetic field		IEC/EN 61000-4-3	Level 3			
electrical fast transient / burst		IEC/EN 61000-4-4	Level 3			
surge		IEC/EN 61000-4-5	Level 3			
conducted disturbances, induced by radio-frequency fields		IEC/EN 61000-4-6	Level 3			
Interference emission			IEC/EN 61000-6-3			
high-frequency radiated		IEC/CISPR 22; EN 55022	Class B			
high-frequency conducted		IEC/CISPR 22; EN 55022	Class B			

[1] Open-circuit principle: output relay energizes if the measured value exceeds ⊟ / falls below ⊟ the adjusted threshold value
Closed-circuit principle: output relay de-energizes if measured value exeeds ⊟ / falls below ⊟ the adjusted threshold value

[2] In case of measured currents > 10 A, lateral spacing has to be min. 10 mm

• **Approvals** 2/6

Voltage monitoring relays, single-phase
CM-ESS.1, CM-ESS.2, CM-ESS.M and CM-EFS
Technical data

Type		CM-ESS.1	CM-ESS.2	CM-ESS.M	CM-EFS.2
Input circuit - Supply circuit	**A1-A2**				
Rated control supply voltage U_S	A1-A2	110-130 V AC			
	A1-A2	220-240 V AC			
	A1-A2	24-240 V AC/DC			
Rated control supply voltage U_S tolerance		-15...+10 %			
Rated frequency	AC versions	50/60 Hz			
	AC/DC versions	50/60 Hz or DC			
Current / power consumption		24 V DC	115 V AC	230 V AC	
	110-130 V AC	-	24 mA / 2.6 VA	-	
	220-240 V AC	-	-	12 mA / 2.6 VA	
	24-240 V AC/DC	30 mA / 0.75 W	17 mA / 1.9 VA	11 mA / 2.6 VA	
On-period		100 %			
Power failure buffering time		20 ms			
Transient overvoltage protection		Varistors			
Input circuit - Measuring circuit	**B-C**				
Monitoring function		over- or undervoltage monitoring configurable			
Measuring method		True RMS measuring principle			
Measuring inputs		CM-ExS			
	Terminal connection	B-C	B-C	B-C	B-C
	Measuring range AC/DC				
	Input resistance	Ω	Ω	Ω	Ω
	Pulse overload capacity t < 1 s				
	Continous capacity				
Threshold value(s)		adjustable within the indicated measuring range			
Setting accuracy of threshold value		10 %			
Repeat accuracy (constant parameters)		±0.07 % of full scale			
Hysteresis related to the threshold value		3-30 % adjustable			5 % fixed
Measuring signal frequency range		DC / 15 Hz - 2 kHz			
Rated measuring signal frequency range		DC / 50-60 Hz			
Maximum response time		AC: 80 ms / DC: 120 ms			
Accuracy within the control supply voltage tolerance		ΔU ≤ 0.5 %			
Accuracy within the temperature range		ΔU ≤ 0.06 % / °C			
Transient overvoltage protection		Varistors			
Timing circuit					
Delay time T_V		none	0 or 0.1-30 s adjustable		
Repeat accuracy (constant parameters)		±0.07 % of full scale			
Accuracy within the control supply voltage tolerance		-	Δt ≤ 0.5 %		
Accuracy within the temperature range		-	Δt ≤ 0.06 % / °C		
Indication of operational states					
Control supply voltage	U/T: green LED	⎍: control supply voltage applied, ⎍⎍⎍: tripping delay T_V active			
Measured value	U: red LED	⎍: overvoltage, ⎍⎍⎍: undervoltage			
Relay status	R: yellow LED	⎍: relay energized, no latching function ⎍⎍⎍⎍: relay energized, active latching function ⎍⎍⎍⎍: relay de-energized, active latching function			
Output circuits		**11(15)-12(16)/14(18), 21(25)-22(26)/24(28) - Relays**			
Kind of output		1 c/o contact	2 c/o contacts		1x2 c/o contacts or 2x1 c/o contact configurable
Operating principle [1]		open-circuit principle		open- or closed-circuit principle configurable	
Contact material		AgNi			
Rated operational voltage U_e	IEC/EN 60947-1	250 V			
Minimum switching voltage / minimum switching current		24 V / 10 mA			
Maximum switching voltage / maximum switching current		250 V AC / 4 A AC			

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Voltage monitoring relays, single-phase
CM-ESS.1, CM-ESS.2, CM-ESS.M and CM-EFS
Technical data

Type			CM-ESS.1	CM-ESS.2	CM-ESS.M	CM-EFS.2
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			
	max. rated operational voltage		300 V AC			
	max. continuous thermal current at B 300		5 A			
	max. making/breaking apparent power (Make/Break) at B 300		3600/360 VA			
Mechanical lifetime			$30x10^6$ switching cycles			
Electrical lifetime (AC12, 230 V, 4 A)			$0.1x10^6$ switching cycles			
Max. fuse rating to achieve short circuit protection		n/c contact	6 A fast-acting	10 A fast-acting		6 A fast-acting
		n/o contact	10 A fast-acting			
Gerneral data						
Dimensions (W x H x D)			22.5 x 78 x 100 mm (0.89 x 3.07 x 3.94 in)			
Mounting			DIN rail (IEC/EN 60715)			
Mounting position			any			
Degree of protection		enclosure / terminals	IP50 / IP20			
Electrical connection						
Wire size	fine-strand with(out) wire end ferrule		2 x 0.75-2.5 mm^2 (2 x 18-14 AWG)			
	rigid		2 x 0.5-4 mm^2 (2 x 20-12 AWG)			
Stripping length			7 mm (0.28 in)			
Tightening torque			0.6-0.8 Nm			
Environmental data						
Ambient temperature range		operation / storage	-20...+60 °C / -40...+85 °C			
Damp heat (IEC 60068-2-30)			55 °C, 6 cycle			
Vibration (sinusoidal) (IEC/EN 60255-21-1)			Class 2			
Shock (IEC/EN 60255-21-2)			Class 2			
Isolation data						
Rated insulation voltage (VDE 0110, IEC 60947-1, IEC/EN 60255-5)		supply / measuring circuit / output	600 V			
		supply / output 1 / output 2	250 V			
Rated impulse withstand voltage U_{imp} (IEC/EN 60947-1, IEC/EN 60255-5)		supply / measuring circuit / output	6 kV 1.2/50 µs			
		supply / output 1 output 2	4 kV 1.2/50 µs			
Pollution degree (VDE 0110, IEC 664, IEC/EN 60255-5)			3			
Overvoltage category (VDE 0110, IEC 664, IEC/EN 60255-5)			III			
Standards						
Product standard			IEC/EN 60255-6			
Low Voltage Directive			2006/95/EC			
EMC Directive			2004/108/EC			
Electromagnetic compatibility						
Interference immunity to			IEC/EN 61000-6-2			
electrostatic discharge		IEC/EN 61000-4-2	Level 3			
radiated, radio-frequency, electromagnetic field		IEC/EN 61000-4-3	Level 3			
electrical fast transient / burst		IEC/EN 61000-4-4	Level 3			
surge		IEC/EN 61000-4-5	Level 3			
conducted disturbances, induced by radio-frequency fields		IEC/EN 61000-4-6	Level 3			
Interference emission			IEC/EN 61000-6-3			
high-frequency radiated		IEC/CISPR 22; EN 55022	Class B			
high-frequency conducted		IEC/CISPR 22; EN 55022	Class B			

[1] Open-circuit principle: output relay energizes if the measured value exceeds ⊘ / falls below ⊘ the adjusted threshold value
Closed-circuit principle: output relay de-energizes if measured value exeeds ⊘ / falls below ⊘ the adjusted threshold value[2]

• **Approvals** 2/6

Notes

Three-phase monitors

Content

Three-phase monitoring relays

Expanded functionality

ABB's new generation of three-phase monitoring relays feature additional functions making the application field for the devices considerably larger.

Selectable phase sequence monitoring

The phase sequence monitoring can be switched off by means of a rotary switch or a DIP switch. This enables monitoring of three-phase mains where phase sequence is not relevant for the application, for example in case of motors with forward and reverse rotation, heating applications, etc.

Automatic phase sequence correction

The automatic phase sequence correction is activated by means of a DIP switch. With activated phase sequence correction, it is ensured that for any non-fixed or portable equipment, e.g. construction machinery, the correct phase sequence is always applied to the input terminals of the load. For details regarding the wiring, please see function description / diagrams.

Structure of the type designation

CM-_ _ x.yz

x: width of enclosure

y: Control supply voltage / measuring range

1	110, 115, 120, 127 V supply systems (phase-neutral)
2	220, 230, 240 V supply systems (phase-neutral)
3	200, 208, 220, 230, 240, 257, 260 V supply systems (phase-phase)
4	440, 460 V supply systems (phase-phase)
5	480, 500 V supply systems (phase-phase)
6	575, 600 V supply systems (phase-phase)
7	660, 690 V supply systems (phase-phase)

z: Rated frequency / output circuit

1	50/60 Hz – 1x2 c/o
2	50/60 Hz – 1x2 or 2x1 c/o
3	50/60/400 Hz – 1x2 oder 2x1 c/o

NEW

CM-UFS
Grid feeding monitoring relay

The number of decentralized plants that obtain power from the sun, wind, water or biogas is increasing rapidly around the world. The use of renewable energy sources has great potential from both an environmental and an economic point of view.

Photovoltaic systems, solar-thermal systems, wind turbines and block-type thermal power stations are used. The electricity generated in these decentralized micro power stations is not simply used to meet the operator's own energy requirements. Above all, a profit is made by feeding it into the public grid at various places.

When a decentralized micro power station is connected to the grid, safe operation must be ensured at all times. This applies particularly to the function for disconnecting the plant from the grid, for instance during maintenance work. As the grid operator is usually unable to access the decentralized micro power station's control unit, this disconnection must take place automatically. Fast disconnection can only be achieved with a monitoring device that immediately recognizes when the grid is deactivated.

The new CM-UFS monitoring relay

A fast response can now be ensured using ABB's three-phase monitoring relay CM-UFS, which constantly monitors the three phases of the public mains supply. The CM-UFS detects overvoltage and undervoltage (voltage increase and decrease protection) as well as any changes in grid frequency (frequency increase and decrease protection*). Where necessary, the CM-UFS monitoring relay generates a control signal to disconnect the plant from the grid. The CM-UFS thus ensures the safe connection of decentralized power stations to the grid at all times.

The features of the CM-UFS.1

- Monitoring device for realizing an automatized grid connection as per DIN V VDE V 0126-1-1: February 2006
- Can be directly combined with ABB switchgear
- Voltage increase protection ≥ 115 % of U
- Voltage decrease protection ≤ 80 % of U_S
- Frequency increase protection > 50.2 H_z
- Frequency decrease protection < 47.5 H_z
- 10 minutes average value 110-115 % of U_S, adjustable

The features of the CM-UFS.2

- Type-tested in accordance with the "Guideline for connections to ENEL distribution network" December 2008, Ed. I
- Can be directly combined with ABB switchgear
- Voltage increase protection ≥ 120 % of U_S
- Voltage decrease protection ≤ 80 % of U_S
- Frequency increase protection > 50,3 or 51 Hz
- Frequency decrease protection < 49,7 or 49 Hz

Three-phase monitoring relays
Selection and conversion table

adjustable
fix fixed value

	CM-PBE	CM-PBE	CM-PVE	CM-PVE	CM-PFE	CM-PFS	CM-PSS.31	CM-PSS.41	CM-PVS.31	CM-PVS.41	CM-PAS.31	CM-PAS.41	CM-MPS.11	CM-MPS.21	CM-MPS.31	CM-MPS.41	CM-MPS.23	CM-MPS.43	CM-MPN.52	CM-MPN.62	CM-MPN.72
Rated control supply voltage U_s																					
Phase to Phase																					
160-300 V AC									■		■				■						
200-500 V AC						■															
208-440 V AC					■																
300-500 V AC										■		■				■		■			
320-460 V AC				■																	
350-580 V AC																			■		
380 V AC							■														
380-440 V AC		■																			
400 V AC								■													
450-720 V AC																				■	
530-820 V AC																					■
Phase to neutral																					
90-170 V AC													■								
180-280 V AC														■			■				
185-265 V AC			■																		
220-240 V AC	■																				
Rated frequency																					
50/60 Hz	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■			■	■	■
50/60/400 Hz																	■	■			
Suitable for monitoring																					
Single-phase mains [1]	■		■										■	■			■				
Three-phase mains	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Monitoring function																					
Phase failure	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Phase sequence					■	■	◌	◌	◌	◌	■	■	◌	◌	◌	◌	◌	◌	◌	◌	◌
Automatic phase sequence correction																	◌	◌	◌	◌	◌
Overvoltage			■	■			■	■	■	■			■	■	■	■	■	■	■	■	■
Undervoltage			■	■			■	■	■	■			■	■	■	■	■	■	■	■	■
Unbalance											■	■	■	■	■	■	■	■	■	■	■
Neutral [2]	■		■										■[3]	■[3]			■[3]				
Thresholds																					
Thresholds	fix	fix	fix	fix	fix	fix	fix	fix	◌	◌	◌	◌	◌	◌	◌	◌	◌	◌	◌	◌	◌
Timing function for tripping delay t_v / times																					
ON-delay						fix					◌	◌									
ON- and OFF-delay	fix	fix	fix	fix	fix																
ON- or OFF-delay (◌)							◌	◌	◌	◌			◌	◌	◌	◌	◌	◌	◌	◌	◌
Output contacts																					
n/o contacts	1	1	1	1																	
c/o contacts					1	2	2	2	2	2	2	2	2	2	2	2	2[4]	2[4]	2[4]	2[4]	2[4]
Indication of operational states																					
LED(s)	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Replacement for / conversion table																					
CM-PSS (1SVR 430 784 R2300)							■														
CM-PSS (1SVR 430 784 R3300)								■													
CM-PVS (1SVR 430 794 R1300)									■												
CM-PVS (1SVR 430 794 R3300)										■											
CM-PAS (1SVR 430 774 R1300)											■										
CM-PAS (1SVR 430 774 R3300)												■									
CM-MPS (1SVR 430 885 R1300)													■								
CM-MPS (1SVR 430 885 R3300)														■							
CM-MPS (1SVR 430 884 R1300)															■						
CM-MPS (1SVR 430 884 R3300)																■					

[1] Devices with neutral monitoring are also suitable for monitoring single-phase mains, for example control circuits. For this, all three external conductors L1, L2 and L3 have to be jumpered and connected as one single conductor. If available, phase sequence monitoring has to be deactivated and the threshold value for phase unbalance has to be set to the maximum (25 %).

[2] The external conductor voltage towards the neutral conductor is measured.

[3] Interruppted neutral monitoring

[4] Operating mode 1x2 or 2x1 c/o (SPDT) contact can be selected. (2x1 c/o contact is only possible with over- and undervoltage monitoring and is compulsory for automatic phase sequence correction).

Three-phase monitoring relays CM-PBE and CM-PVE
Ordering details

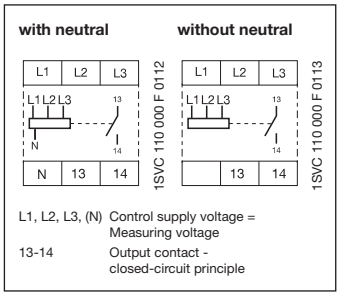
CM-PBE

① R: yellow LED - relay status

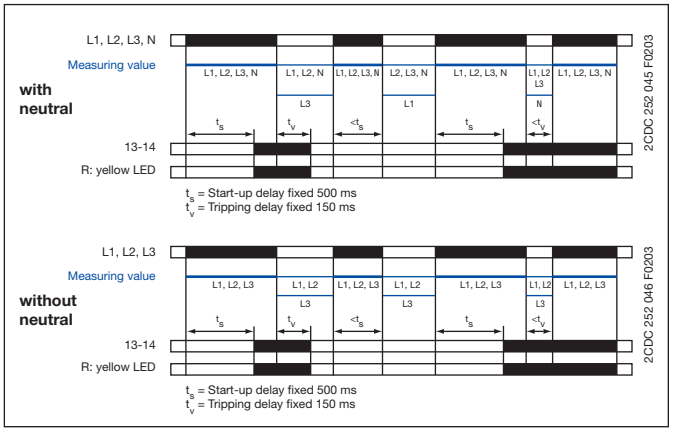
Single- and three-phase monitoring relays for phase failure detection

The **CM-PBE** is used to monitor supply voltages for phase failure (U_{meas} < 60 % x U_N). If all phases (and the neutral) are present, the output relay energizes after the start-up delay t_s is complete. If a phase failure occurs, the tripping delay t_v starts. When timing is complete, the output relay de-energizes. As soon as the voltage returns to the tolerance range, timing of t_s starts. When timing is complete, the output relay re-energizes automatically. The yellow LED glows when the output relay is energized.

Connection diagrams



Function diagrams - Three-phase monitoring



Type	Rated control supply voltage = measuring voltage	Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg / lb
With neutral monitoring					
CM-PBE	3x380-440 V AC, 220-240 V AC	**1SVR 550 881 R9400**	1		0.08 / 0.17
Without neutral monitoring					
CM-PBE	3x380-440 V AC	**1SVR 550 882 R9500**	1		0.08 / 0.17

i The version with neutral monitoring is also suitable for monitoring single-phase mains. For this, all three external conductors (L1, L2, L3) have to be jumpered and connected as one single conductor.

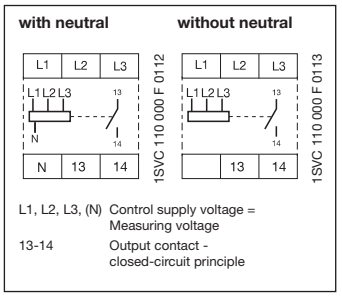
CM-PVE

① R: yellow LED - relay status

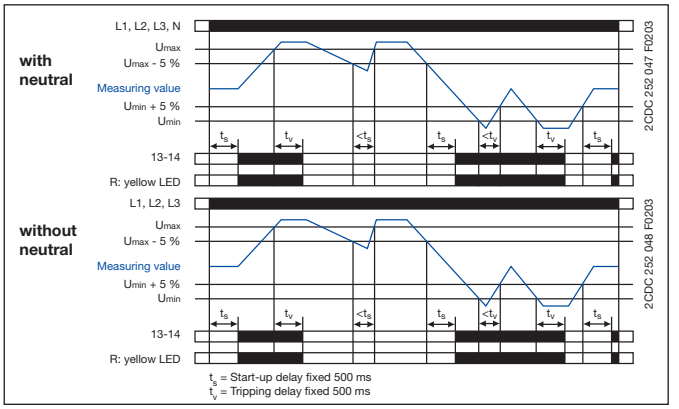
Single- and three-phase monitoring relays for over- / undervoltage and phase failure detection

The **CM-PVE** is used to monitor supply voltages for over- and undervoltage and phase failure. If all phases (and the neutral) are present with correct voltage, the output relay energizes after the start-up delay t_s is complete. If the voltage exceeds or falls below the fixed threshold value or if a phase failure occurs, the tripping delay t_v starts. When timing is complete, the output relay de-energizes. As soon as the voltage returns to the tolerance range, timing of t_s starts. When timing is complete, the output relay re-energizes automatically. The yellow LED glows when the output relay is energized.

Connection diagrams



Function diagrams - Three-phase monitoring



Type	Rated control supply voltage = measuring voltage	Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg / lb
With neutral monitoring					
CM-PVE	3x320-460 V AC, 185-265 V AC	**1SVR 550 870 R9400**	1		0.08 / 0.17
Without neutral monitoring					
CM-PVE	3x320-460 V AC	**1SVR 550 871 R9500**	1		0.08 / 0.17

i The version with neutral monitoring is also suitable for monitoring single-phase mains. For this, all three external conductors (L1, L2, L3) have to be jumpered and connected as one single conductor.

• **Technical data**..... 2/33 • **Technical diagrams** .....2/102 • **Dimensional drawings** 2/103

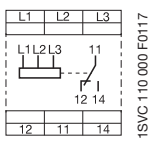
Three-phase monitoring relays CM-PFE and CM-PFS
Ordering details

① R: yellow LED - relay status

Three-phase monitoring relays for phase sequence monitoring and phase failure detection

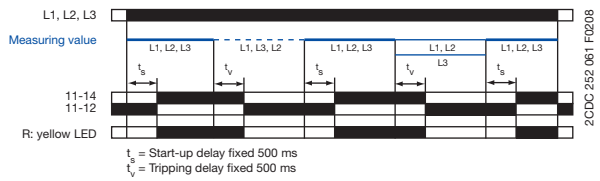
The **CM-PFE** is used to monitor three-phase mains for incorrect phase sequence and phase failure. If all phases are present with the correct phase sequence, the output relay energizes after the start-up delay t_s is complete. If a phase failure or a phase sequence error occurs, the tripping delay t_v starts. When timing is complete, the output relay de-energizes. The yellow LED glows when the output relay is energized.
In case of motors which continue running with only two phases, the CM-PFE detects phase failure if the reverse fed voltage is less than 60 % of the originally applied voltage.

Connection diagram



L1-L2-L3 Control supply voltage = Measuring voltage
11-12/14 Output contact Closed-circuit principle

Function diagram



t_s = Start-up delay fixed 500 ms
t_v = Tripping delay fixed 500 ms

For applications where a reverse fed voltage > 60% is expected, we recommend to use our three-phase monitoring relays for unbalance CM-PAS.xx.

Type	Rated control supply voltage = measuring voltage	Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg / lb
CM-PFE	3x208-440 V AC	**1SVR 550 824 R9100**	1		0.08 / 0.17

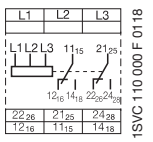
CM-PFS

① R: yellow LED - relay status
② Marker label

Three-phase monitoring relays for phase sequence monitoring and phase failure detection

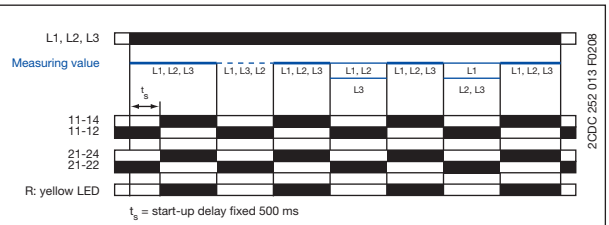
The **CM-PFS** is used to monitor three-phase mains for incorrect phase sequence and phase failure. If all phases are present with the correct phase sequence, the output relay energizes after the start-up delay t_s is complete. If a phase failure or a phase sequence error occurs, the output relay de-energizes instantaneous. The yellow LED glows when the output relay is energized.
In case of motors which continue running with only two phases, the CM-PFS detects phase failure if the reverse fed voltage is less than 60 % of the originally applied voltage.

Connection diagram



L1-L2-L3 Control supply voltage = Measuring voltage
11_{15}-12_{16}/14_{18}, 21_{25}-22_{26}/24_{28} Output contact - Closed-circuit principle

Function diagram



t_s = start-up delay fixed 500 ms

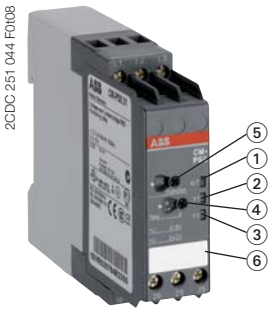
ATTENTION
If several CM-PFS units are placed side by side and the control supply voltage is higher than 415 V, spacing of at least 10 mm has to be kept between the individual units.

For applications where a reverse fed voltage > 60% is expected, we recommend to use our three-phase monitoring relays for unbalance CM-PAS.xx.

Type	Rated control supply voltage = measuring voltage	Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg / lb
CM-PFS	3x200-500 V AC	**1SVR 430 824 R9300**	1		0.15 / 0.33

• **Technical data**..... 2/33
• **Technical diagrams** ..... 2/102 • **Dimensional drawings** .....2/103 • **Accessories** 2/104

Three-phase monitoring relays CM-PSS.x1 and CM-PVS.x1
Ordering details



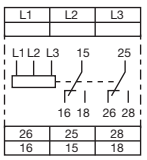
CM-PSS.x1

① R/T: yellow LED - relay status, timing
② F1: red LED - fault message
③ F2: red LED - fault message
④ Adjustment of the tripping delay t_v
⑤ Function selection (see rotary switch "Function")
⑥ Marker label

Three-phase monitoring relays for over- and undervoltage with fixed threshold values ± 10 %

The **CM-PSS.31** and the **CM-PSS.41** are monitoring relays for three-phase mains. They monitor the phase parameters phase sequence, phase failure, over- and undervoltage. The threshold values for over- and undervoltage are fixed.

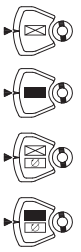
Connection diagram



2CDC 252 037 F0b08

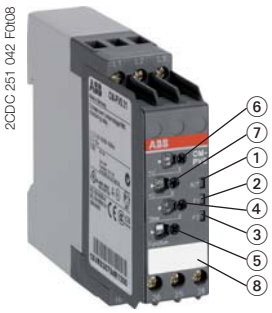
L1, L2, L3 Control supply voltage = measuring voltage
15-16/18 Output contacts - closed-circuit principle
25-26/28 Output contacts - closed-circuit principle

Rotary switch "Function"



ON-delay with phase sequence monitoring
OFF-delay with phase sequence monitoring
ON-delay without phase sequence monitoring
OFF-delay without phase sequence monitoring

Type	Rated control supply voltage = measuring voltage	Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg / lb
CM-PSS.31	3x380 V AC	**1SVR 630 784 R2300**	1		0.13 / 0.29
CM-PSS.41	3x400 V AC	**1SVR 630 784 R3300**	1		0.13 / 0.29



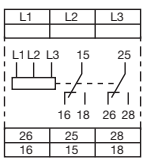
CM-PVS.x1

① R/T: yellow LED - relay status, timing
② F1: red LED - fault message
③ F2: red LED - fault message
④ Adjustment of the tripping delay t_v
⑤ Function selection (see rotary switch "Function")
⑥ Adjustment of the threshold value for overvoltage
⑦ Adjustment of the threshold value for undervoltage
⑧ Marker label

Three-phase monitoring relays for over- and undervoltage with adjustable threshold values

The **CM-PVS.31** and the **CM-PVS.41** are monitoring relays for three-phase mains. They monitor the phase parameters phase sequence, phase failure, over- and undervoltage. The threshold values for over- and undervoltage are adjustable.

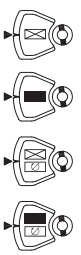
Connection diagram



2CDC 252 037 F0b08

L1, L2, L3 Control supply voltage = measuring voltage
15-16/18 Output contacts - closed-circuit principle
25-26/28 Output contacts - closed-circuit principle

Rotary switch "Function"

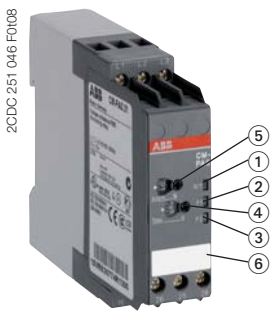


ON-delay with phase sequence monitoring
OFF-delay with phase sequence monitoring
ON-delay without phase sequence monitoring
OFF-delay without phase sequence monitoring

Type	Rated control supply voltage = measuring voltage	Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg / lb
CM-PVS.31	3x160-300 V AC	**1SVR 630 794 R1300**	1		0.13 / 0.29
CM-PVS.41	3x300-500 V AC	**1SVR 630 794 R3300**	1		0.13 / 0.29

• **Conversion table** 2/21
• **Technical diagrams** 2/102
• **Function diagrams** 2/28
• **Dimensional drawings** 2/103
• **Technical data** 2/35
• **Accessories** 2/104

Three-phase monitoring relays CM-PAS.x1 and CM-MPS.x1
Ordering details



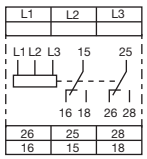
CM-PAS.x1

① R/T: yellow LED - relay status, timing
② F1: red LED - fault message
③ F2: red LED - fault message
④ Adjustment of the tripping delay t_v
⑤ Adjustment of the threshold value for phase unbalance
⑥ Marker label

Three-phase monitoring relays for phase unbalance

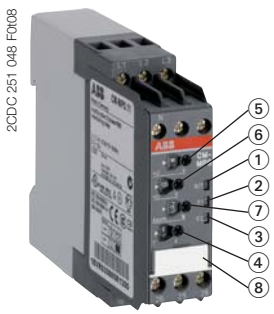
The **CM-PAS.31** and the **CM-PAS.41** are monitoring relays for three-phase mains. They monitor the phase parameters phase sequence, phase failure and phase unbalance. The threshold value for phase unbalance is adjustable.

Connection diagram



L1, L2, L3 Control supply voltage = measuring voltage
15-16/18 Output contacts - closed-circuit principle
25-26/28 closed-circuit principle

Type	Rated control supply voltage = measuring voltage	Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg / lb
CM-PAS.31	3x160-300 V AC	**1SVR 630 774 R1300**	1		0.13 / 0.29
CM-PAS.41	3x300-500 V AC	**1SVR 630 774 R3300**	1		0.13 / 0.29



CM-MPS.x1

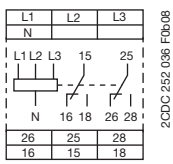
① R/T: yellow LED - relay status, timing
② F1: red LED - fault message
③ F2: red LED - fault message
④ Adjustment of the tripping delay t_v
⑤ Adjustment of the threshold value for overvoltage
⑥ Adjustment of the threshold value for undervoltage
⑦ Adjustment of the threshold value for phase unbalance
⑧ Function selection (see DIP switch functions) / Marker label

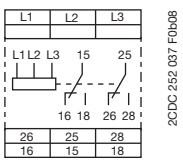
Multifunctional three-phase monitoring relays

The **CM-MPS.x1** are multifunctional monitoring relays for three-phase mains. They monitor the phase parameters phase sequence, phase failure, over- and undervoltage and phase unbalance. CM-MPS.11 and CM-MPS.21 also monitor the neutral for interruption. The threshold values for over- and undervoltage and phase unbalance are adjustable.

CM-MPS.11 and CM-MPS.21 are also suitable for monitoring single-phase mains. For this, all three external conductors (L1, L2, L3) have to be jumpered and connected as one single conductor. Phase sequence monitoring has to be deactivated and the threshold value for phase unbalance has to be set to the maximum (25 %).

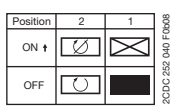
Connection diagram





L1, L2, L3, (N) Control supply voltage = measuring voltage
15-16/18 Output contacts - closed-circuit principle
25-26/28 closed-circuit principle

DIP switch functions



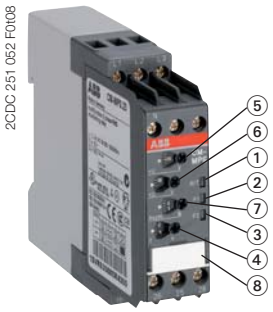
1 Timing function
ON ON-delayed
OFF OFF-delayed

2 Phase sequence monitoring
ON deactivated
OFF activated

Type	Rated control supply voltage = measuring voltage	Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg / lb
With interrupted neutral monitoring					
CM-MPS.11	3x90-170 V AC	**1SVR 630 885 R1300**	1		0.13 / 0.29
CM-MPS.21	3x180-280 V AC	**1SVR 630 885 R3300**	1		0.13 / 0.29
Without interrupted neutral monitoring					
CM-MPS.31	3x160-300 V AC	**1SVR 630 884 R1300**	1		0.13 / 0.29
CM-MPS.41	3x300-500 V AC	**1SVR 630 884 R3300**	1		0.13 / 0.29

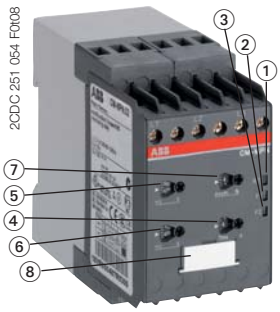
• **Conversion table** 2/21
• **Technical diagrams** 2/102
• **Function diagrams** 2/28
• **Dimensional drawings** 2/103
• **Technical data** ..... 2/35 and 2/37
• **Accessories** 2/104

Three-phase monitoring relays CM-MPS.x3 and CM-MPN.x2
Ordering details



CM-MPS.x3

① R/T: yellow LED - relay status, timing
② F1: red LED - fault message
③ F2: red LED - fault message
④ Adjustment of the tripping delay t_v
⑤ Adjustment of the threshold value for overvoltage
⑥ Adjustment of the threshold value for undervoltage
⑦ Adjustment of the threshold value for phase unbalance
⑧ Function selection (see DIP switch functions) / Marker label



CM-MPN.x2

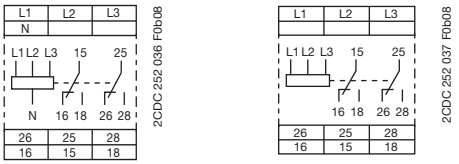
① R/T: yellow LED - relay status, timing
② F1: red LED - fault message
③ F2: red LED - fault message
④ Adjustment of the tripping delay t_v
⑤ Adjustment of the threshold value for overvoltage
⑥ Adjustment of the threshold value for undervoltage
⑦ Adjustment of the threshold value for phase unbalance
⑧ Function selection (see DIP switch functions) / Marker label

Multifunctional three-phase monitoring relays, automatic phase sequence correction and separate monitoring of over- and undervoltage (window monitoring) configurable

The **CM-MPS.x3** are multifunctional monitoring relays for three-phase mains. They monitor the phase parameters phase sequence, phase failure, over- and undervoltage and phase unbalance.
CM-MPS.23 also monitors the neutral for interruption. The threshold values for over- and undervoltage and phase unbalance are adjustable.

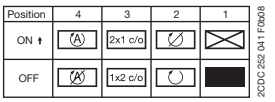
The devices can be used for mains with a frequency of 45-440 Hz.
CM-MPS.23 is also suitable for monitoring single-phase mains. For this, all three external conductors (L1, L2, L3) have to be jumpered and connected as one single conductor. Phase sequence monitoring has to be deactivated and the threshold value for phase unbalance has to be set to the maximum (25 %).

Connection diagram



L1, L2, L3, (N) Control supply voltage = measuring voltage
15-16/18 Output contacts -
25-26/28 closed-circuit principle

DIP switch functions



1 Timing function
ON ON-delayed
OFF OFF-delayed

2 Phase sequence monitoring
ON deactivated
OFF activated

3 Operating principle of output
ON 2x1 c/o contact
OFF 1x2 c/o contacts

4 Phase sequence correction
ON activated
OFF deactivated

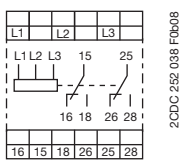
[1] Output relay R1 is responsive to overvoltage, output relay R2 is responsive to undervoltage. In case of other faults, both output relays react synchronously.

Type	Rated control supply voltage = measuring voltage	Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg / lb
With interrupted neutral monitoring					
CM-MPS.23	3x180-280 V AC	**1SVR 630 885 R4300**	1		0.13 / 0.29
Without interrupted neutral monitoring					
CM-MPS.43	3x300-500 V AC	**1SVR 630 884 R4300**	1		0.13 / 0.29

Multifunctional three-phase monitoring relays, automatic phase sequence correction and separate monitoring of over- and undervoltage (window monitoring) configurable

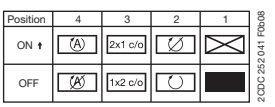
The **CM-MPN.52**, **CM-MPN.62** and **CM-MPN.72** are multifunctional monitoring relays for three-phase mains. They monitor the phase parameters phase sequence, phase failure, over- and undervoltage and phase unbalance.The threshold values for over- and undervoltage and phase unbalance are adjustable.

Connection diagram



L1, L2, L3 Control supply voltage = measuring voltage
15-16/18 Output contacts -
25-26/28 closed-circuit principle

DIP switch functions



1 Timing function
ON ON-delayed
OFF OFF-delayed

2 Phase sequence monitoring
ON deactivated
OFF activated

3 Operating principle of output
ON 2x1 c/o contact
OFF 1x2 c/o contacts

4 Phase sequence correction
ON activated
OFF deactivated

[1] Output relay R1 is responsive to overvoltage, output relay R2 is responsive to undervoltage. In case of other faults, both output relays react synchronously.

Type	Rated control supply voltage = measuring voltage	Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg / lb
CM-MPN.52	3x350-580 V AC	**1SVR 650 487 R8300**	1		0.13 / 0.29
CM-MPN.62	3x450-720 V AC	**1SVR 650 488 R8300**	1		0.13 / 0.29
CM-MPN.72	3x530-820 V AC	**1SVR 650 489 R8300**	1		0.13 / 0.29

• **Conversion table** **2**/ 21
• **Technical diagrams** **2**/102
• **Function diagrams** **2**/ 24
• **Dimensional drawing** **2**/103
• **Technical data** **2**/ 39
• **Accessories** **2**/104

NEW

Three-phase monitoring relays CM-UFS

Ordering details

CM-UFS.1

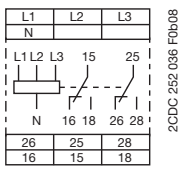
① R/T: yellow LED - relay status, timing
② F1: red LED - fault message
③ F2: red LED - fault message
④ Adjustment of the threshold value for the 10 minutes average value
⑤ Selection of neutral conductor, connected or not
⑥ Marker label

Application

The CM-UFS.1 is a monitoring relay for feeding in three-phase mains. The device is connected between decentral electrical energy source such as photovoltaic systems, wind turbines, block-type thermal power stations, and the public grid. In case the public grid is disconnected due to any reason, for instance during maintance work, the CM-UFS.1 recognizes this powerless situation. Then, in conjunction with a switching device, the CM-UFS.1 disconnects the decentral electrical energy source from the public grid. The device detects overvoltage and undervoltage (voltage increase and decrease protection) as well as any changes in grid frequency (frequency increase and decrease protection) in accordance with DIN V VDE V 0126-1-1. The connection of the neutral conductor is configurable. The threshold value for the 10 minutes average value is adjustable. The CM-UFS.1 is also suitable for monitoring single-phase mains. For this, all three external conductors (L1, L2, L3) have to be jumpered and connected as one single conductor.

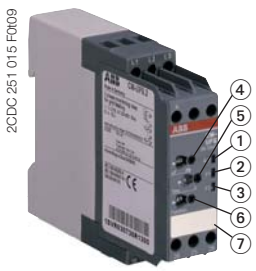
- Monitoring of three-phase mains for grid feeding
- Type-tested in accordance with DIN V VDE V 0126-1-1: February 2006
- Neutral conductor connection configurable
- Can also be used to monitor single-phase mains
- Threshold value for the 10 minutes average value adjustable (110-115% of U_s)
- Start-up delay t_{S1} prior to first grid connection and after a short-term interruption, 30 s fixed
- Restart delay t_{S2}, 30 s fixed
- Powered by the measuring circuit
- True RMS measuring principle
- 2 c/o (SPDT) contacts
- 3 LEDs for status indication

Connection diagram



L1, L2, L3, N Control supply voltage = Measuring voltage
15-16/18 Output contacts -
25-26/28 closed-circuit principle

Type	Rated control supply voltage = measuring voltage	Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg / lb
CM-UFS.1	3 x 400 V AC (L-L) / 230 V AC (L-N)	**1SVR 630 736 R0300**	1		0.14 / 0.31



CM-UFS.2

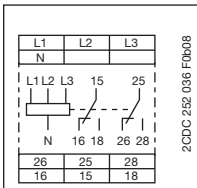
① R/T: yellow LED - relay status, timing
② F1: red LED - fault message
③ F2: red LED - fault message
④ Selection of the frequency threshold values
⑤ Adjustment of the restart delay tS2
⑥ Selection of neutral conductor, connected or not
⑦ Marker label

Application

The CM-UFS.2 is a monitoring relay for feeding in three-phase mains. The device is connected between decentral electrical energy source such as photovoltaic systems, wind turbines, block-type thermal power stations, and the public grid. In case the public grid is disconnected due to any reason, for instance during maintance work, the CM-UFS.2 recognizes this powerless situation. Then, in conjunction with a switching device, the CM-UFS.2 disconnects the decentral electrical energy source from the public grid. The device detects overvoltage and undervoltage (voltage increase and decrease protection) as well as any changes in grid frequency (frequency increase and decrease protection) in accordance with the Guideline for connections ENEL distribution network, December 2008, Ed. I. The connection of the neutral conductor and the frequency threshold values are configurable. The CM-UFS.2 is also suitable for monitoring single-phase mains. For this, all three external conductors (L1, L2, L3) have to be jumpered and connected as one single conductor.

- Monitoring of three-phase mains for grid feeding
- Type-tested in accordance with the Guideline for connections to ENEL distribution network, December 2008, Ed. I
- Neutral conductor connection configurable
- Can also be used to monitor single-phase mains
- Frequency threshold values configurable (± 0.3 Hz / ± 1Hz)
- Start-up delay tS1 prior to first grid connection and after a short-term interruption, 1 s fixed
- Restart delay tS2, adjustable (0 s; 0.1-30 s)
- Powered by the measuring circuit
- True RMS measuring principle
- 2 c/o (SPDT) contacts
- 3 LEDs for status indication

Connection diagram



L1, L2, L3, N Control supply voltage = Measuring voltage
15-16/18 Output contacts -
25-26/28 closed-circuit principle

Type	Rated control supply voltage = measuring voltage	Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg / lb
CM-UFS.2	3 x 400 V AC (L-L) / 230 V AC (L-N)	**1SVR 630 736 R1300**	1		0.14 / 0.31

• **Function diagrams CM-UFS.1**... **2**/31
• **TTechnical data** **2**/41
• **Function diagrams CM-UFS.2** ..**2**/ 32
• **Dimensional drawing** **2**/103
• **Accessories** **2**/104

Phase sequence and phase failure monitoring
CM-PSS.xx, CM-PVS.xx, CM.PAS.xx, CM-MPS.xx, CM-MPN.xx

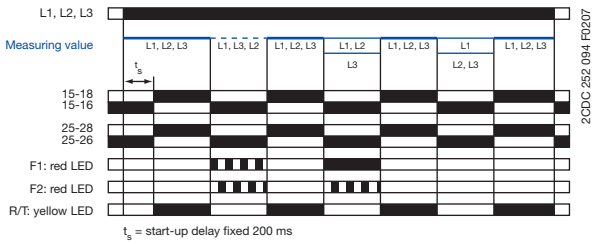
Applying control supply voltage begins the fixed start-up delay t_S. When t_S is complete and all phases are present with correct voltage, the output relays energize and the yellow LED R/T glows.

Phase sequence monitoring

If phase sequence monitoring is activated, the output relays de-energize as soon as a phase sequence error occurs. The fault is displayed by alternated flashing of the LEDs F1 and F2. The output relays re-energize automatically as soon as the phase sequence is correct again.

Phase failure monitoring

The output relays de-energize instantaneous if a phase failure occurs. The fault is indicated by lightning of LED F1 and flashing of LED F2. The output relays re-energize automatically as soon as the voltage returns to the tolerance range.



t_s = start-up delay fixed 200 ms

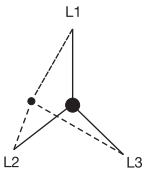
Interrupted neutral monitoring
CM-MPS.11, CM-MPS.21, CM-MPS.23

The interruption of the neutral in the main to be monitored is detected by means of phase unbalance evaluation.

Determined by the system, in case of unloaded neutral, i.e. symmetrical load between all three phases, it may happen that an interruption of the neutral will not be detected.

If the star point is displaced by asymmetrical load in the three-phase main, an interrupted neutral will be detected.

Displacement of the star point



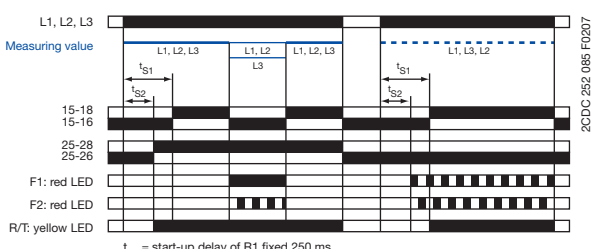
Automatic phase sequence correction
CM-MPS.x3, CM-MPN.x2

This function can be selected only if phase sequence monitoring is activated ↻ and operating mode 2x1 c/o (SPDT) contact 1x2 c/o is selected.

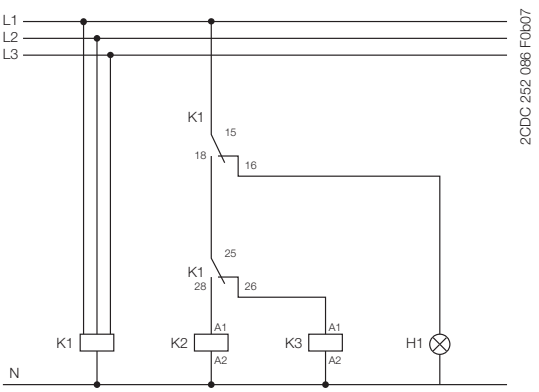
Applying control supply voltage begins the fixed start-up delay t_{S1}. When t_{S1} is complete and all phases are present with correct voltage, output relay R1 energizes. Output relay R2 energizes when the fixed start-up delay t_{S2} is complete and all phases are present with correct phase sequence. Output relay R2 remains de-energized if the phase sequence is incorrect.

If the voltage to be monitored exceeds or falls below the set threshold values for phase unbalance, over- or undervoltage or if a phase failure occurs, output relay R1 de-energizes and the LEDs F1 and F2 indicate the fault.

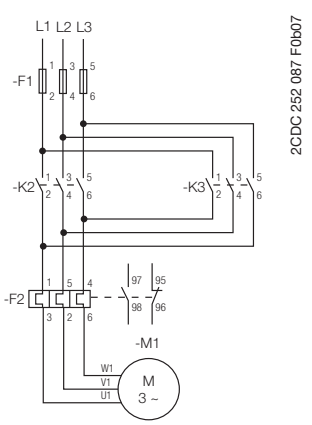
Output relay R2 is responsive only to a false phase sequence. In conjunction with a reversing contactor combination, this enables an automatic correction of the rotation direction. See circuit diagrams on the right.



t_{S1} = start-up delay of R1 fixed 250 ms
t_{S2} = start-up delay of R2 fixed 200 ms



Control circuit diagram (K1 = CM-MPS.xx or CM-MPN.xx)



Power circuit diagram

Over- and undervoltage monitoring 1x2 c/o

CM-PSS.xx[1], CM-PVS.xx[2], CM-MPS.xx[2], CM-MPN.xx[2]

Applying control supply voltage begins the fixed start-up delay t_S. When t_S is complete and all phases are present with correct voltage and with correct phase sequence, the output relays energize and the yellow LED R/T glows.

Type of tripping delay = ON-delay

If the voltage to be monitored exceeds or falls below the fixed[1] or set[2] threshold value, the output relays de-energize after the set tripping delay t_V is complete. The LED R/T flashes during timing and turns off as soon as the output relays de-energize.

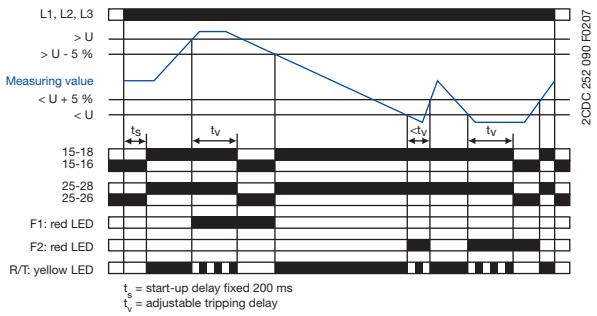
The output relays re-energize automatically as soon as the voltage returns to the tolerance range, taking into account a fixed hysteresis of 5 % and the LED R/T glows.

Type of tripping delay = OFF-delay

If the voltage to be monitored exceeds or falls below the fixed[1] or set[2] threshold value, the output relays de-energize instantaneously and the LED R/T turns off.

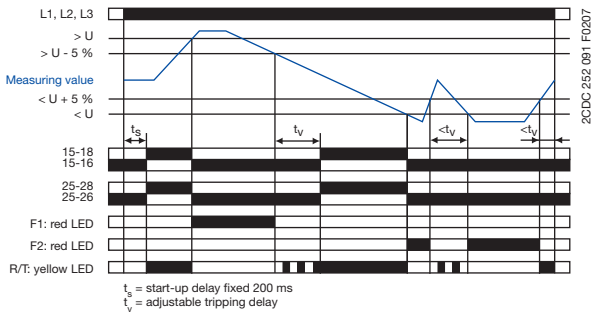
As soon as the voltage returns to the tolerance range, taking into account a fixed hysteresis of 5 %, the output relays re-energize automatically after the set tripping delay t_V is complete. The LED R/T flashes during timing and turns steady when timing is complete.

ON-delay ⊠, 1x2 c/o contacts 1x2 c/o



ts = start-up delay fixed 200 ms
tv = adjustable tripping delay

OFF-delay ■, 1x2 c/o contacts 1x2 c/o



ts = start-up delay fixed 200 ms
tv = adjustable tripping delay

Over- and undervoltage monitoring 2x1 c/o

CM-MPS.x3, CM-MPN.x2

Applying control supply voltage begins the fixed start-up delay t_S. When t_S is complete and all phases are present with correct voltage and with correct phase sequence, the output relays energize. The yellow LED R/T glows as long as at least one output relay is energized.

Type of tripping delay = ON-delay

If the voltage to be monitored exceeds or falls below the set threshold value, output relay R1 (overvoltage) or output relay R2 (undervoltage) de-energizes after the set tripping delay t_V is complete. The LED R/T flashes during timing.

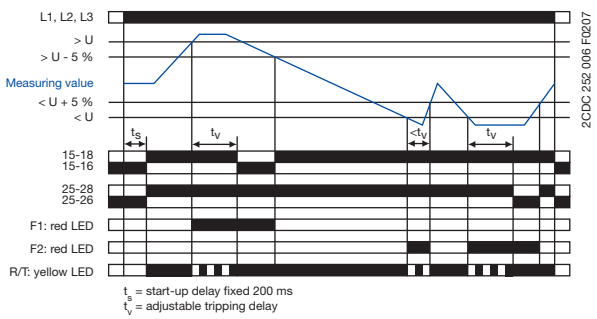
The corresponding output relay re-energizes automatically as soon as the voltage returns to the tolerance range, taking into account a fixed hysteresis of 5 %.

Type of tripping delay = OFF-delay

If the voltage to be monitored exceeds or falls below the set threshold value, output relay R1 (overvoltage) or output relay R2 (undervoltage) de-energizes instantaneously.

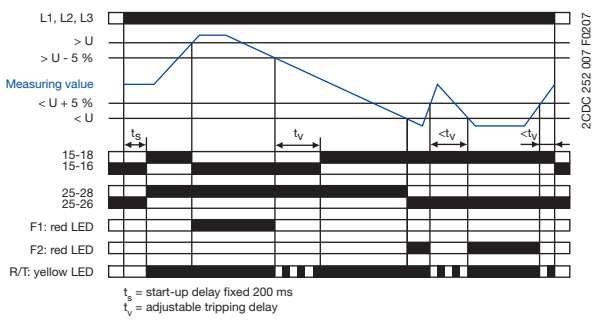
As soon as the voltage returns to the tolerance range, taking into account a fixed hysteresis of 5 %, the corresponding output relay re-energizes automatically after the set tripping delay t_V is complete. The LED R/T flashes during timing.

ON-delay ⊠, 2x1 c/o contact 2x1 c/o



ts = start-up delay fixed 200 ms
tv = adjustable tripping delay

ON-delay ■, 2x1 c/o contact 2x1 c/o



ts = start-up delay fixed 200 ms
tv = adjustable tripping delay

2

Phase unbalance monitoring
CM-PAS.xx, CM-MPS.xx, CM-MPN.xx

Applying control supply voltage begins the fixed start-up delay t_S. When t_S is complete and all phases are present with correct voltage and with correct phase sequence, the output relays energize and the yellow LED R/T glows.

Type of tripping delay = ON-delay

If the voltage to be monitored exceeds or falls below the set phase unbalance threshold value, the output relays de-energize after the set tripping delay t_V is complete. The LED R/T flashes during timing and turns off as soon as the output relays de-energize.

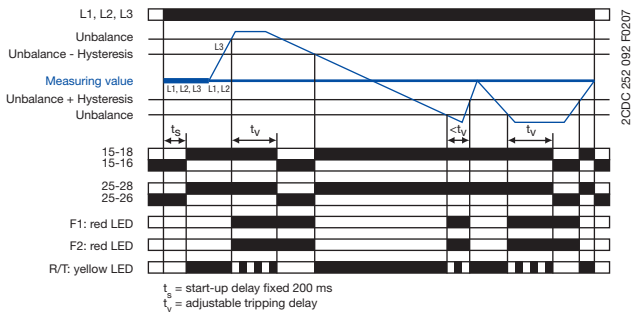
The output relays re-energize automatically as soon as the voltage returns to the tolerance range, taking into account a fixed hysteresis of 20 % and the LED R/T glows.

Type of tripping delay = OFF-delay

If the voltage to be monitored exceeds or falls below the set phase unbalance threshold value, the output relays de-energize instantaneously and the LED R/T turns off.

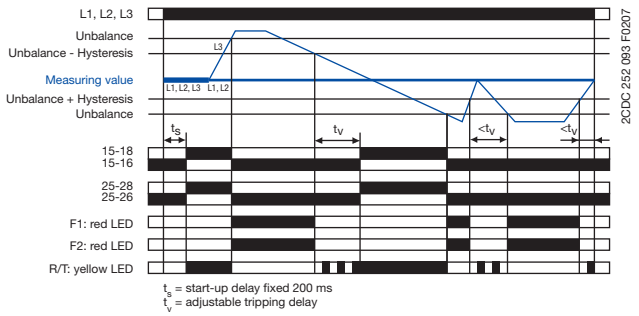
As soon as the voltage returns to the tolerance range, taking into account a fixed hysteresis of 20 %, the output relays re-energize automatically after the set tripping delay t_V is complete. The LED R/T flashes during timing and turns steady when timing is complete.

ON-delay ⊠



t_s = start-up delay fixed 200 ms
t_v = adjustable tripping delay

OFF-delay ■



t_s = start-up delay fixed 200 ms
t_v = adjustable tripping delay

LED functions
CM-PSS.xx, CM-PSV.xx, CM-PAS.xx, CM-MPS.xx, CM-MPN.xx

Function	R/T: yellow LED	F1: red LED	F2: red LED
Control supply voltage applied, output relay energized	⎍	-	-
Tripping delay t_V active	⎍⎍	-	-
Phase failure	-	⎍	⎍⎍
Phase sequence	-	⎍⎍ alternating	
Overvoltage	-	⎍	-
Undervoltage	-	-	⎍
Phase unbalance	-	⎍	⎍
Interruption of the neutral	-	⎍	⎍⎍
Adjustment error [1]	⎍⎍	⎍⎍	⎍⎍

[1] Possible misadjustments of the front-face operating controls:
Overlapping of the threshold values: An overlapping of the threshold values is given, if the threshold value for overvoltage is set to a smaller value than the threshold value for undervoltage.
DIP switch 3 = OFF and DIP switch 4 = ON: Automatic phase sequence correction is activated and selected operating mode is 1x2 c/o contacts
DIP switch 2 and 4 = ON: Phase sequence detection is deactivated and the automatic phase sequence correction is actived

Type of tripping delay
CM-PSS.xx, CM-PSV.xx, CM-PAS.xx, CM-MPS.xx, CM-MPN.xx

The type of tripping delay ⊠ / ■ can be adjusted via a rotary (CM-PxS.xx) or a DIP switch (CM-MPx.xx).

Switch position ON-delay ⊠:
In case of a fault, the de-energizing of the output relays and the respective fault message are suppressed for the adjusted tripping delay t_V.

Switch position OFF-delay ■:
In case of a fault, the output relays de-energize instantaneously and a fault message is displayed and stored for the length of the adjusted tripping delay t_V. Thereby, also momentary undervoltage conditions are recognized.

NEW

Grid feeding monitoring relays CM-UFS.1

Function description / -diagrams

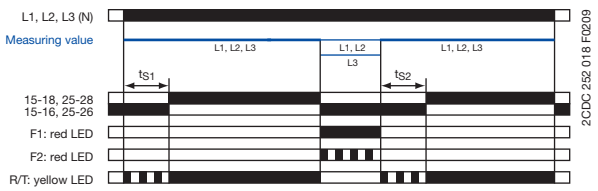
Function of the yellow LED

The yellow LED is flashing during timing and turns steady as soon as the output relays are energized.

Phase failure monitoring

Applying control supply voltage begins the fixed start-up delay t_{S1}. When t_{S1} is complete and all phases are present with correct voltage and frequency, the output relays energize. They de-energize instantaneously if a phase failure occurs. The fault is indicated by LEDs.

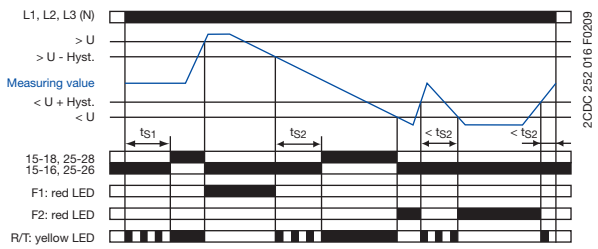
As soon as all 3 phases are present again, the output relays re-energize automatically after the fixed restart delay t_{S2} is complete.



t_{S1} = Start-up delay prior to first grid connection and after a short-term interruption, 30 s fixed
t_{S2} = Restart delay, 30 s fixed

Over- and undervoltage monitoring

Applying control supply voltage begins the fixed start-up delay t_{S1}. When t_{S1} is complete and all phases are present with correct voltage and frequency, the output relays energize. If the voltage to be monitored exceeds or falls below the fixed threshold value, the output relays de-energize instantaneously. The fault type is indicated by LEDs. As soon as the voltage returns to the tolerance range, taking into account a fixed hysteresis of 5 %, the output relays re-energize after the fixed restart delay t_{S2} is complete.

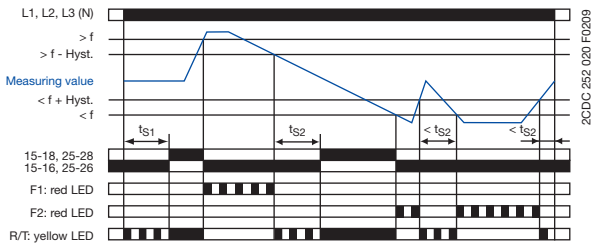


t_{S1} = Start-up delay prior to first grid connection and after a short-term interruption, 30 s fixed
t_{S2} = Restart delay, 30 s fixed

Over- and underfrequency monitoring

Applying control supply voltage begins the fixed start-up delay t_{S1}. When t_{S1} is complete and all phases are present with correct voltage and frequency, the output relays energize.

If the frequency to be monitored exceeds or falls below the fixed threshold value, the output relays deenergize instantaneously. The fault type is indicated by LEDs.
As soon as the frequency returns to the tolerance range, taking into account a fixed hysteresis, the output relays re-energize after the fixed restart delay t_{S2} is complete.



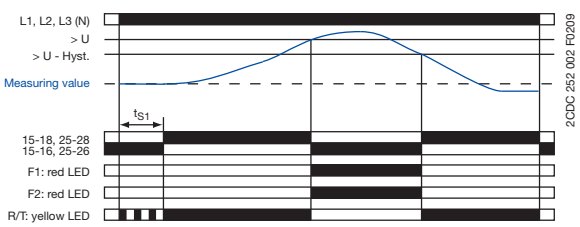
t_{S1} = Start-up delay prior to first grid connection and after a short-term interruption, 30 s fixed
t_{S2} = Restart delay, 30 s fixed

10 minutes average value monitoring

Applying control supply voltage begins the fixed start-up delay t_{S1}. When t_{S1} is complete and all phases are present with correct voltage and frequency, the output relays energize.

The voltages of the individual phases are measured over a period of 10 minutes and the average value is calculated. If the 10 minutes average value of a phase exceeds the set threshold value, the output relays de-energize instantaneously. The fault is indicated by LEDs.

As soon as the 10 minutes average value drops again below the set threshold value, the output relays re-energize instantaneously.



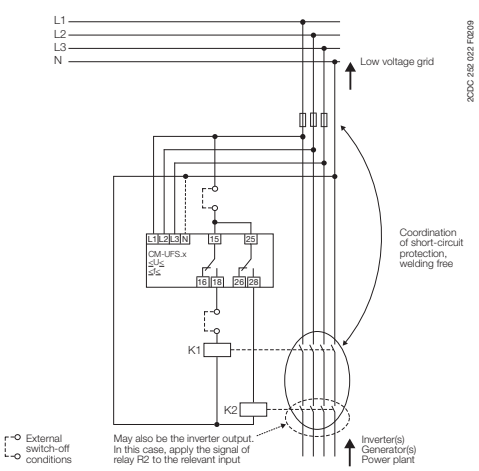
t_{S1} = Start-up delay prior to first grid connection and after a short-term interruption, 30 s fixed

Function diagram legend

Control supply voltage not applied / Output contact open / LED off
Control supply voltage applied / Output contact closed / LED glowing

LEDs

Function	R/T: yellow LED	F1: red LED	F2: red LED
Output relay energized	⎍	-	-
Delay active	⎍⎍	-	-
Overvoltage	-	⎍	-
Undervoltage	-	-	⎍
Overfrequency	-	⎍⎍	-
Underfrequency	-	-	⎍⎍
Exceedance of the average value	-	⎍	⎍
Phase failure	-	⎍	⎍⎍



Automatized grid connection instead of a permanently accessible switching point with a disconnection function

NEW

Grid feeding monitoring relays CM-UFS.2

Function description / -diagrams

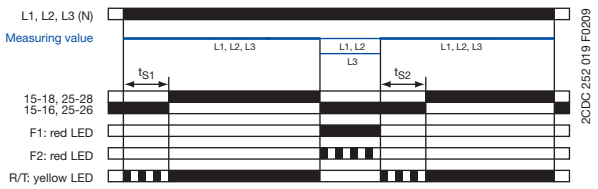
Function of the yellow LED

The yellow LED is flashing during timing and turns steady as soon as the output relays are energized.

Phase failure monitoring

Applying control supply voltage begins the fixed start-up delay t_{S1}. When t_{S1} is complete and all phases are present with correct voltage and frequency, the output relays energize. They de-energize instantaneously if a phase failure occurs. The fault is indicated by LEDs.

As soon as all 3 phases are present again, the output relays re-energize automatically after the set restart delay t_{S2} is complete.

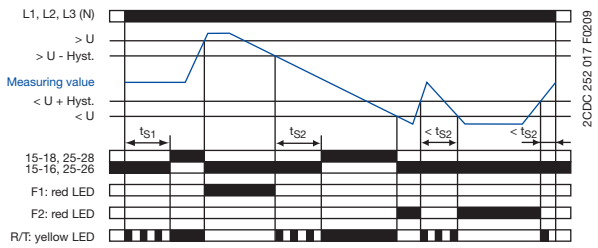


t_{S1} = Start-up delay prior to first grid connection and after a short-time interruption, 1 s fixed
t_{S2} = Restart-up delay, adjustable

Over- and undervoltage monitoring

Applying control supply voltage begins the fixed start-up delay t_{S1}. When t_{S1} is complete and all phases are present with correct voltage and frequency, the output relays energize.

If the voltage to be monitored exceeds or falls below the fixed threshold value, the output relays de-energize instantaneously. The fault type is indicated by LEDs. As soon as the voltage returns to the tolerance range, taking into account a fixed hysteresis of 5 %, the output relays re-energize after the set restart delay t_{S2} is complete.

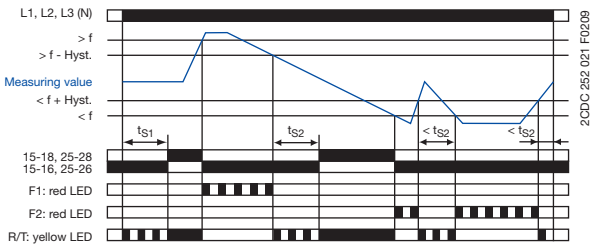


t_{S1} = Start-up delay prior to first grid connection and after a short-time interruption, 1 s fixed
t_{S2} = Restart-up delay, adjustable

Over- and underfrequency monitoring

Applying control supply voltage begins the fixed start-up delay t_{S1}. When t_{S1} is complete and all phases are present with correct voltage and frequency, the output relays energize.

If the frequency to be monitored exceeds or falls below the fixed threshold value, the output relays deenergize instantaneously. The fault type is indicated by LEDs. As soon as the frequency returns to the tolerance range, taking into account a fixed hysteresis, the output relays re-energize after the set restart delay t_{S2} is complete.



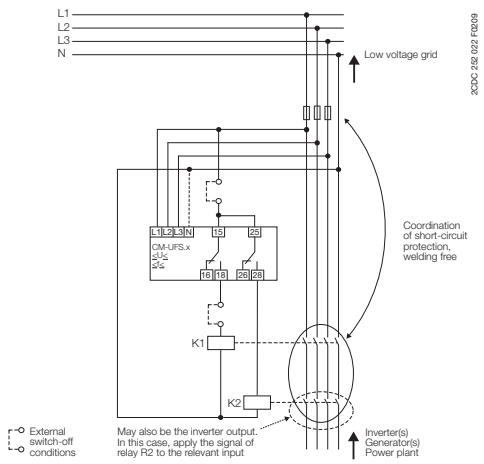
t_{S1} = Start-up delay prior to first grid connection and after a short-time interruption, 1 s fixed
t_{S2} = Restart-up delay, adjustable

Function diagram legend

Control supply voltage not applied / Output contact open / LED off
Control supply voltage applied / Output contact closed / LED glowing

LED Funktionen

Function	R/T: yellow LED	F1: red LED	F2: red LED
Output relay energized	⎍	-	-
Delay active	⎍⎍	-	-
Overvoltage	-	⎍	-
Undervoltage	-	-	⎍
Overfrequency	-	⎍⎍	-
Underfrequency	-	-	⎍⎍
Phase failure	-	⎍	⎍⎍



Automatized grid connection instead of a permanently accessible switching point with a disconnection function

Three-phase monitoring relays CM-PBE, CM-PVE, CM-PFE and CM-PFS
Technical data

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

Type		**CM-PBE** [1]	**CM-PBE**	**CM-PVE** [1]	**CM-PVE**	**CM-PFE**	**CM-PFS**
Supply circuit = measuring circuit		**L1-L2-L3-N**	**L1-L2-L3**	**L1-L2-L3-N**	**L1-L2-L3**	**L1-L2-L3**	
Rated control supply voltage U_S = measuring voltage		3x380-440 V AC, 220-240 V AC	3x380-440 V AC	3x320-460 V AC, 185-265 V AC	3x320-460 V AC	3x208-440 V AC	3x200-500 V AC
Power consumption						approx. 15 VA	
Rated control supply voltage U_S tolerance		-15...+15 %		-15...+10 %		-10...+10 %	-15...+10 %
Rated frequency		50/60 Hz		50/60 Hz (-10...+10 %)			50/60 Hz
Duty time		100 %					
Measuring circuit		**L1-L2-L3-N**	**L1-L2-L3**	**L1-L2-L3-N**	**L1-L2-L3**	**L1-L2-L3**	
Monitoring functions	phase failure	■	■	■	■	■	■
	phase sequence	-	-	-	-	■	■
	over- / undervoltage	-	-	■	■	-	-
	neutral	■	-	■	-	-	-
Measuring ranges		3x380-440 V AC, 220-240 V AC	3x380-440 V AC	3x320-460 V AC, 185-265 V AC	3x320-460 V AC	3x208-440 V AC	3x200-500 V AC
Thresholds	U_{min}	0.6 x U_N		fixed 185 V / 320 V	fixed 320 V	0.6 x U_N	
	U_{max}			fixed 265 V / 460 V	fixed 460 V		
Hysteresis related to the threshold value		fixed 5 % (release value = 0.65 x U_N)		fixed 5 %			
Measuring voltage frequency		50/60 Hz (-10 %...+10 %)				50/60 Hz	
Response time		40 ms		80 ms		500 ms	
Accuracy within the rated control supply voltage tolerance						ΔU ≤ 0.5 %	
Accuracy within the temperature range				ΔU ≤ 0.06 % / °C			
Timing circuit							
Start-up delay t_S		fixed 500 ms (±20 %)				fixed 500 ms	
Tripping t_V		fixed 150 ms (±20 %)		at over-/undervoltage fixed 500 ms (±20 %)		fixed 500 ms	-
Indication of operational states							
Relay status	R: yellow LED	⌠⌉ Output relay energized					
Output circuits		**13-14**				**11-12/14**	**11(15)-12(16)/14(18), 21(25)-22(26)/24(28)**
Kind of output		1 n/o contact				1 c/o contact	2 c/o contacts
Operating principle [2]		closed-circuit principle					
Contact material		AgCdO					AgNi
Rated operational voltage U_e	IEC/EN 60947-1	250 V					
Minimum switching voltage / Minimum switching current		- / -					
Maximum switching voltage		250 V AC, 250 V DC					
Rated operational current I_e (IEC/EN 60947-5-1)	AC12 (resistive) 230 V	4 A					
	AC15 (inductive) 230 V	3 A					
	DC12 (resistive) 24 V	4 A					
	DC13 (inductive) 24 V	2 A					
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	10 A fast-acting					4 A fast-acting
	n/o contact	10 A fast-acting					6 A fast-acting
AC rating (UL 508)	Utilization category (Control Circuit Rating Code)	B 300					
	max. rated operational voltage	300 V AC					
	max. continuous thermal current at B 300	5 A					
	max. making/breaking apparent power at B 300	3600/360 VA					
General data							
Dimensions (W x H x D)		22.5 x 78 x 78.5 mm (0.89 x 3.07 x 3.09 in)					22.5 x 78 x 100 mm (0.89 x 3.07 x 3.94 inch)
Mounting position		any					
Degree of protection	enclosure / terminals	IP50 / IP20					
Mounting		DIN rail (IEC/EN 60715)					

Three-phase monitoring relays
CM-PBE, CM-PVE, CM-PFE and CM-PFS
Technical data

Type	CM-PBE [1]	CM-PBE	CM-PVE [1]	CM-PVE	CM-PFE	CM-PFS
Electrical connection						
Wire size fine-strand with wire end ferrule	2 x 0.75-1.5 mm² (2 x 18-16 AWG)					2 x 0.75-2.5 mm² (2 x 18-14 AWG)
fine-strand without wire end ferrule	2 x 1-1.5 mm² (2 x 18-16 AWG)					2 x 0.75-2.5 mm² (2 x 18-14 AWG)
rigid	2 x 0.75-1.5 mm² (2 x 18-16 AWG)					2 x 0.5-4mm² (2 x 20-12 AWG)
Stripping length	10 mm (0.39 in)					7 mm (0.28 in)
Tightening torque	0.6-0.8 Nm					
Environmental data						
Ambient temperature range operation / storage	-20..+60 °C / -40...+85 °C					
Environmental testing (IEC 68-2-30)	24 h cycle time, 55 °C, 93 % rel., 96 h					
Operational reliability (IEC 68-2-6)	6 g					4 g
Mechanical resistance (IEC 68-2-6)	10 g					6 g
Isolation data						
Rated insulation volt. between supply, measuring and output circuits (VDE 0110, IEC 60947-1)	400 V				500 V	
Rated impulse withstand voltage U_{imp} between all isolated circuits (VDE 0110, IEC 664)	4 kV / 1.2 - 50 µs					
Test voltage between all isolated circuits	2.5 kV, 50 Hz, 1 min.					
Pollution category (VDE 0110, IEC/EN 60664, IEC 255-5)	3					
Overvoltage category (VDE 0110, IEC/EN 60664, IEC 255-5)	III					
Standards						
Product standard	IEC 255-6, EN 60255-6					
Low Voltage Directive	2006/95/EC					
EMC Directive	2004/108/EC					
Electromagnetic compatibility						
Interference immunity to	EN 61000-6-2					
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					
electrical fast transient / burst IEC/EN 61000-4-4	Level 3 - 2 kV / 5 kHz					
surge IEC/EN 61000-4-5	Level 4 - 2 kVL-L					
conducted disturbances, induced by radio-frequency fields IEC/EN 61000-4-6	Level 3 - 10 V					
Interference emission	EN 61000-6-4					

[1] Device with neutral monitoring: The external conductor voltage towards the neutral conductor is measured.
[2] Closed-circuit principle: Output relay is de-energized if the measured value exceeds/drops below the adjusted threshold.

• **Approvals** **2**/6

Three-phase monitoring relays CM-PSS.xx, CM-PVS.xx and CM-PAS.xx
Technical data

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

Type			CM-PSS.31	CM-PSS.41	CM-PVS.31	CM-PVS.41	CM-PAS.31	CM-PAS.41
Input circuit = Measuring circuit			**L1, L2, L3**					
Rated control supply voltage U_S = measuring voltage			3x380 V AC	3x400 V AC	3x160-300 V AC	3x300-500 V AC	3x160-300 V AC	3x300-500 V AC
Rated control supply voltage U_S tolerance			-15...+10 %					
Rated frequency			50/60 Hz					
Frequency range			45-65 Hz					
Typical current / power consumption			25 mA / 18 VA (380 V AC)	25 mA / 18 VA (400 V AC)	25 mA / 10 VA (230 V AC)	25 mA / 18 VA (400 V AC)	25 mA / 10 VA (230 V AC)	25 mA / 18 VA (400 V AC)
Measuring circuit			**L1, L2, L3**					
Monitoring functions		Phase failure	■	■	■	■	■	■
		Phase sequence	can be switched off				■	■
		Automatic phase sequence correction	-	-	-	-	-	-
		Over- / undervoltage	■	■	■	■	-	-
		Phase unbalance	-	-	-	-	■	■
		Neutral	-	-	-	-	-	-
Measuring range		Overvoltage	3x418 V AC	3x440 V AC	3x220-300 V AC	3x420-500 V AC	-	-
		Undervoltage	3x342 V AC	3x360 V AC	3x160-230 V AC	3x300-380 V AC	-	-
		Phase unbalance	-	-	-	-	2-25 % of average of phase voltages	
Thresholds		Overvoltage	fixed		adjust. within meas. range		-	-
		Undervoltage	fixed		adjust. within meas. range		-	-
		Phase unbalance (switch-off value)	-	-	-	-	adjust. within meas. range	
Hysteresis related to the threshold value		Over- / undervoltage	fixed 5 %				-	
		Phase unbalance	-	-	-	-	fixed 20 %	
Rated frequency of the measuring signal			50/60 Hz					
Frequency range of the measuring signal			45-65 Hz					
Maximum measuring cycle time			100 ms					
Accuracy within the rated control supply voltage tolerance			$\Delta U \leq 0.5$ %					
Accuracy within the temperature range			$\Delta U \leq 0.06$ % / °C					
Measuring method			True RMS					
Timing circuit								
Start-up delay t_S			fixed 200 ms					
Tripping delay t_V			ON- or OFF-delay 0; 0.1-30 s adjustable				ON- delay 0; 0.1-30 s adjustable	
Accuracy within the rated control supply voltage tolerance			$\Delta t \leq 0.5$ %					
Accuracy within the temperature range			$\Delta t \leq 0.06$ % / °C					
Indication of operational states			Details see function description / -diagrams					
Output circuits			**15-16/18, 25-26/28**					
Kind of output			2x1 c/o contacts (Relays)					
Operating principle [1]			closed-circuit principle					
Contact material			AgNi alloy, Cd free					
Rated operational voltage U_e	IEC/EN 60947-1		250 V					
Minimum switching power			24 V / 10 mA					
Maximum switching voltage			see load limit curve					
Rated operational current I_e (IEC/EN 60947-5-1)	AC12 (resistive) 230 V		4 A					
	AC15 (inductive) 230 V		3 A					
	DC12 (resistive) 24 V		4 A					
	DC13 (inductive) 24 V		2 A					
AC rating (UL 508)		Utilization category (Control Circuit Rating Code)	B 300					
		max. rated operational voltage	300 V AC					
		max. continuous thermal current at B 300	5 A					
		max. making/breaking apparent power at B 300	3600/360 VA					

Three-phase monitoring relays CM-PSS.xx, CM-PVS.xx and CM-PAS.xx
Technical data

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

Type			CM-PSS.31	CM-PSS.41	CM-PVS.31	CM-PVS.41	CM-PAS.31	CM-PAS.41
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	6 A fast-acting					
		n/o contact	10 A fast-acting					
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)					
Weight			0.13 kg (0.29 lb)					
Mounting			DIN rail (IEC/EN 60715), snap-on mounting without any tool					
Mounting position			any					
Minimum distance to other units		horizontal / vertical	none / none					
Degree of protection		enclosure / terminals	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					
Environmental data								
Ambient temperature ranges		operation / storage	-25...+60 °C / -40...+85 °C					
Damp heat (IEC 60068-2-30)			55 °C, 6 cycles					
Climatic category			3K3					
Vibration (sinusoidal) (IEC/EN 60255-21-1)			Class 2					
Shock (IEC/EN 60255-21-2)			Class 2					
Isolation data								
Rated insulation voltage U_i	input circuit / output circuit		600 V					
	output circuit 1 / output circuit 2		300 V					
Rated impulse withstand voltage U_{imp} (VDE 0110, IEC/EN 60664)		input circuit	6 kV; 1.2/50 µs					
		output circuit	4 kV; 1.2/50 µs					
Test voltage between all isolated circuits (type test)			2.5 kV, 50 Hz, 1 s					
Basis isolation	input circuit / output circuit		600 V					
Protective separation (VDE 0106 part 101 and 101/A, IEC/EN 61140)		input circuit / output circuit	-					
Pollution degree (VDE 0110, IEC/EN 60664, UL 508)			3					
Overvoltage category (VDE 0110, IEC 60664, UL 508)			III					
Standards								
Product standard			IEC/EN 60255-6, EN 50178					
Low Voltage Directive			2006/95/EG					
EMC directive			2004/108/EG					
RoHS directive			2002/95/EG					
Electromagnetic compatibility								
Interference immunity to			EN 61000-6-1, EN 61000-6-2					
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)					
electrical fast transient / burst		IEC/EN 61000-4-4	Level 3 (2 kV / 2 kHz)					
surge		IEC/EN 61000-4-5	Level 4 (2 kV L-L)					
conducted disturbances, induced by radio-frequency fields		IEC/EN 61000-4-6	Level 3 (10 V)					
harmonics and interharmonics		IEC/EN 61000-4-13	Class 3					
Interference emission			EN 61000-6-3, EN 61000-6-4					
high-frequency radiated		IEC/CISPR 22, EN 50022	Class B					
high-frequency conducted		IEC/CISPR 22, EN 50022	Class B					

[1] Closed-circuit principle: Output relay(s) de-energize(s) if measured value exceeds or falls below the adjusted threshold value

• **Approvals** **2**/6

Three-phase monitoring relays
CM-MPS.x1
Technical data

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

Type			CM-MPS.11	CM-MPS.21	CM-MPS.31	CM-MPS.41
Input circuit = Measuring circuit			**L1, L2, L3, N**		**L1, L2, L3**	
Rated control supply voltage U_S = measuring voltage			3x90-170 V AC	3x180-280 V AC	3x160-300 V AC	3x300-500 V AC
Rated control supply voltage U_S tolerance			-15...+10 %			
Rated frequency			50/60 Hz			
Frequency range			45-65 Hz			
Typical current / power consumption			25 mA / 10 VA (115 V AC)	25 mA / 18 VA (230 V AC)	25 mA / 10 VA (230 V AC)	25 mA / 18 VA (400 V AC)
Measuring circuit			**L1, L2, L3, N**		**L1, L2, L3**	
Monitoring functions		Phase failure	■	■	■	■
		Phase sequence	can be switched off			
		Automatic phase sequence correction	-	-	-	-
		Over- / undervoltage	■	■	■	■
		Phase unbalance	■	■	■	■
		Interrupted neutral	■	■	-	-
Measuring range		Overvoltage	3x120-170 V AC	3x240-280 V AC	3x220-300 V AC	3x420-500 V AC
		Undervoltage	3x90-130 V AC	3x180-220 V AC	3x160-230 V AC	3x300-380 V AC
		Phase unbalance	2-25 % of average of phase voltages			
Thresholds		Overvoltage	adjustable within measuring range			
		Undervoltage	adjustable within measuring range			
		Phase unbalance (switch-off value)	adjustable within measuring range			
Hysteresis related to the threshold value		Over- / undervoltage	fixed 5 %			
		Phase unbalance	fixed 20 %			
Rated frequency of the measuring signal			50/60 Hz			
Frequency range of the measuring signal			45-65 Hz			
Maximum measuring cycle time			100 ms			
Accuracy within the rated control supply voltage tolerance			$\Delta U \leq 0.5$ %			
Accuracy within the temperature range			$\Delta U \leq 0.06$ % / °C			
Measuring method			True RMS			
Timing circuit						
Start-up delay t_S			fixed 200 ms			
Tripping delay t_V			ON- or OFF-delay 0; 0.1-30 s adjustable			
Accuracy within the rated control supply voltage tolerance			$\Delta t \leq 0.5$ %			
Accuracy within the temperature range			$\Delta t \leq 0.06$ % / °C			
Indication of operational states			Details see function description / -diagrams			
Output circuits			**15-16/18, 25-26/28**			
Kind of output			1x2 c/o contacts (Relays)			
Operating principle [1]			closed-circuit principle			
Contact material			AgNi alloy, Cd free			
Rated operational voltage U_e		IEC/EN 60947-1	250 V			
Minimum switching power			24 V / 10 mA			
Maximum switching voltage			see load limit curve			
Rated operational current I_e (IEC/EN 60947-5-1)		AC12 (resistive) 230 V	4 A			
		AC15 (inductive) 230 V	3 A			
		DC12 (resistive) 24 V	4 A			
		DC13 (inductive) 24 V	2 A			
AC rating (UL 508)		Utilization category (Control Circuit Rating Code)	B 300			
		max. rated operational voltage	300 V AC			
		max. continuous thermal current at B 300	5 A			
		max. making/breaking apparent power at B 300	3600/360 VA			

Three-phase monitoring relays
CM-MPS.x1
Technical data

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

Type			CM-MPS.11	CM-MPS.21	CM-MPS.31	CM-MPS.41
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	6 A fast-acting			
		n/o contact	10 A fast-acting			
General data						
Duty time			100 %			
Repeat accuracy (constant paramaters)			< ±0.2 %			
Dimensions (W x H x D)			22.5 x 78 x 100 mm (0.89 x 3.07 x 3.94 in)			
Weight			0.14 kg (0.31 lb)		0.13 kg (0.29 lb)	
Mounting			DIN rail (IEC/EN 60715), snap-on mounting without any tool			
Mounting position			any			
Minimum distance to other units		horizontal / vertical	none / none			
Degree of protection		enclosure / terminals	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			
Environmental data						
Ambient temperature ranges		operation / storage	-25...+60 °C / -40...+85 °C			
Damp heat (IEC 60068-2-30)			55 °C, 6 cycles			
Climatic category			3K3			
Vibration (sinusoidal) (IEC/EN 60255-21-1)			Class 2			
Shock (IEC/EN 60255-21-2)			Class 2			
Isolation data						
Rated insulation voltage U_i	input circuit / output circuit		600 V			
	output circuit 1 / output circuit 2		300 V			
Rated impulse withstand voltage U_{imp} (VDE 0110, IEC/EN 60664)		input circuit	6 kV; 1.2/50 µs			
		output circuit	4 kV; 1.2/50 µs			
Test voltage between all isolated circuits (type test)			2.5 kV, 50 Hz, 1 s			
Basis isolation	input circuit / output circuit		600 V			
Protective separation (VDE 0106 part 101 and 101/A, IEC/EN 61140)		input circuit / output circuit	yes		-	
Pollution degree (VDE 0110, IEC/EN 60664, UL 508)			3			
Overvoltage category (VDE 0110, IEC 60664, UL 508)			III			
Standards						
Product standard			IEC/EN 60255-6, EN 50178			
Low Voltage Directive			2006/95/EG			
EMC directive			2004/108/EG			
RoHS directive			2002/95/EG			
Electromagnetic compatibility						
Interference immunity to			EN 61000-6-1, EN 61000-6-2			
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)			
electrical fast transient / burst		IEC/EN 61000-4-4	Level 3 (2 kV / 2 kHz)			
surge		IEC/EN 61000-4-5	Level 4 (2 kV L-N)		Level 4 (2 kV L-L)	
conducted disturbances, induced by radio-frequency fields		IEC/EN 61000-4-6	Level 3 (10 V)			
harmonics and interharmonics		IEC/EN 61000-4-13	Class 3			
Interference emission			EN 61000-6-3, EN 61000-6-4			
high-frequency radiated		IEC/CISPR 22, EN 50022	Class B			
high-frequency conducted		IEC/CISPR 22, EN 50022	Class B			

[1] Closed-circuit principle: Output relay(s) de-energize(s) if measured value exceeds or falls below the adjusted threshold value

• **Approvals** **2**/6

Three-phase monitoring relays CM-MPS.x3 and CM-MPN.x2
Technical data

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

Type			CM-MPS.23	CM-MPS.43	CM-MPN.52	CM-MPN.62	CM-MPN.72
Input circuit = Measuring circuit			**L1, L2, L3, N**	**L1, L2, L3**			
Rated control supply voltage U_S = measuring voltage			3x180-280 V AC	3x300-500 V AC	3x350-580 V AC	3x450-720 V AC	3x530-820 V AC
Rated control supply voltage U_S tolerance			-15...+10 %				
Rated frequency			50/60/400 Hz		50/60 Hz		
Frequency range			45-440 Hz		45-65 Hz		
Typical current / power consumption			5 mA / 4 VA (230 V AC)	5 mA / 4 VA (400 V AC)	29 mA / 41 VA (480 V AC)	29 mA / 52 VA (600 V AC)	29 mA / 59 VA (690 V AC)
Measuring circuit			**L1, L2, L3, N**	**L1, L2, L3**			
Monitoring functions		Phase failure	■	■	■	■	■
		Phase sequence	can be switched off				
		Automatic phase sequence correction	configurable				
		Over- / undervoltage	■	■	■	■	■
		Phase unbalance	■	■	■	■	■
		Interrupted neutral	■	-	-	-	-
Measuring range		Overvoltage	3x240-280 V AC	3x420-500 V AC	3x480-580 V AC	3x600-720 V AC	3x690-820 V AC
		Undervoltage	3x180-220 V AC	3x300-380 V AC	3x350-460 V AC	3x450-570 V AC	3x530-660 V AC
		Phase unbalance	2-25 % of average of phase voltages				
Thresholds		Overvoltage	adjustable within measuring range				
		Undervoltage	adjustable within measuring range				
		Phase unbalance (switch-off value)	adjustable within measuring range				
Hysteresis related to the threshold value		Over- / undervoltage	fixed 5 %				
		Phase unbalance	fixed 20 %				
Rated frequency of the measuring signal			50/60/400 Hz		50/60 Hz		
Frequency range of the measuring signal			45-440 Hz		45-65 Hz		
Maximum measuring cycle time			100 ms				
Accuracy within the rated control supply voltage tolerance			$\Delta U \leq 0.5$ %				
Accuracy within the temperature range			$\Delta U \leq 0.06$ % / °C				
Measuring method			True RMS				
Timing circuit							
Start-up delay t_S and t_{S2}			fixed 200 ms				
Start-up delay t_{S1}			fixed 250 ms				
Tripping delay t_V			ON- or OFF-delay 0; 0.1-30 s adjustable			ON-delay 0; 0.1-30 s adjustable	
Accuracy within the rated control supply voltage tolerance			$\Delta t \leq 0.5$ %				
Accuracy within the temperature range			$\Delta t \leq 0.06$ % / °C				
Indication of operational states			Details see function description / -diagrams				
Output circuits			**15-16/18, 25-26/28**				
Kind of output			2x1 or 1x2 c/o contacts configurable (Relays)				
Operating principle [1]			closed-circuit principle				
Contact material			AgNi alloy, Cd free				
Rated operational voltage U_e		IEC/EN 60947-1	250 V				
Minimum switching power			24 V / 10 mA				
Maximum switching voltage			see load limit curve				
Rated operational current I_e (IEC/EN 60947-5-1)		AC12 (resistive) 230 V	4 A				
		AC15 (inductive) 230 V	3 A				
		DC12 (resistive) 24 V	4 A				
		DC13 (inductive) 24 V	2 A				
AC rating (UL 508)		Utilization category (Control Circuit Rating Code)	B 300				
		max. rated operational voltage	300 V AC				
		max. continuous thermal current at B 300	5 A				
		max. making/breaking apparent power at B 300	3600/360 VA				

Three-phase monitoring relays CM-MPS.x3 and CM-MPN.x2
Technical data

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

Type		CM-MPS.23	CM-MPS.43	CM-MPN.52	CM-MPN.62	CM-MPN.72
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	6 A fast-acting		10 A fast-acting		
	n/o contact	10 A fast-acting				
General data						
Duty time		100 %				
Repeat accuracy (constant paramaters)		< ±0.2 %				
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		0.14 kg (0.31 lb)	0.13 kg (0.29 lb)	0.22 kg (0.49 lb)		
Mounting		DIN rail (IEC/EN 60715), snap-on mounting without any tool				
Mounting position		any				
Minimum distance to other units	horizontal / vertical	none / none				
Degree of protection	enclosure / terminals	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				
Environmental data						
Ambient temperature ranges	operation / storage	-25...+60 °C / -40...+85 °C				
Damp heat (IEC 60068-2-30)		55 °C, 6 cycles				
Climatic category		3K3				
Vibration (sinusoidal) (IEC/EN 60255-21-1)		Class 2				
Shock (IEC/EN 60255-21-2)		Class 2				
Isolation data						
Rated insulation voltage U_i	input circuit / output circuit	600 V		1000 V		
	output circuit 1 / output circuit 2	300 V				
Rated impulse withstand voltage U_{imp} (VDE 0110, IEC/EN 60664)	input circuit	6 kV; 1.2/50 µs		8 kV; 1.2/50 µs		
	output circuit	4 kV; 1.2/50 µs				
Test voltage (type test) between	isolated output circuits	2.5 kV, 50 Hz, 1 s				
	input circuit and isolated output circuits	2.5 kV, 50 Hz, 1 s		4 kV, 50 Hz, 1 s		
Basis isolation	input circuit / output circuit	600 V		1000 V		
Protective separation (VDE 0106 part 101 and 101/A, IEC/EN 61140)	input circuit / output circuit	-				
Pollution degree (VDE 0110, IEC/EN 60664, UL 508)		3				
Overvoltage category (VDE 0110, IEC 60664, UL 508)		III				
Standards						
Product standard		IEC/EN 60255-6, EN 50178				
Low Voltage Directive		2006/95/EG				
EMC directive		2004/108/EG				
RoHS directive		2002/95/EG				
Electromagnetic compatibility						
Interference immunity to		EN 61000-6-1, EN 61000-6-2				
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)				
electrical fast transient / burst	IEC/EN 61000-4-4	Level 3 (2 kV / 2 kHz)				
surge	IEC/EN 61000-4-5	Level 4 (2 kV L-N)	Level 4 (2 kV L-L)			
conducted disturbances, induced by radio-frequency fields	IEC/EN 61000-4-6	Level 3 (10 V)				
harmonics and interharmonics	IEC/EN 61000-4-13	Class 3				
Interference emission		EN 61000-6-3, EN 61000-6-4				
high-frequency radiated	IEC/CISPR 22, EN 50022	Class B				
high-frequency conducted	IEC/CISPR 22, EN 50022	Class B				

[1] Closed-circuit principle: Output relay(s) de-energize(s) if measured value exceeds or falls below the adjusted threshold value

• **Approvals** **2**/6

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NEW

Grid feeding monitoring relays CM-UFS.x
Technical data

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

Type			**CM-UFS.1**		**CM-UFS.2**	
Input circuit - Measuring circuit			**L1, L2, L3**	**L-N**	**L1, L2, L3**	**L-N**
Rated control supply voltage U_S = measuring voltage			3 x 400 V AC	3 x 230 V AC	3 x 400 V AC	3 x 230 V AC
Rated control supply voltage tolerance U_S			-20...+20 %			
Control supply voltage range			3 x 300-500 V AC	3 x 180-280 V AC	3 x 300-500 V AC	3 x 180-280 V AC
Rated frequency			50 Hz			
Frequency range			45-55 Hz			
Typical current / power consumption			23 mA / 16 VA			
Power failure buffering time			min. 20 ms			
Input circuit - measuring circuit			**L1, L2, L3**	**L-N**	**L1, L2, L3**	**L-N**
Monitoring functions		Phase failure	■			
		Over-/ undervoltage	■			
		Over-/ underfrequency	■			
		10 minutes average value	■		–	
Measuring range		Voltage range	3 x 320-460 V AC	3 x 184-264,5 V AC	3 x 320-480 V AC	3 x 184-276 V AC
		Frequency range	45-55 Hz			
Thresholds		Overvoltage	fix, 115 % of U_s		fix, 120 % of U_s	
		Undervoltage	fix, 80 % of U_s		fix, 80 % of U_s	
		Overfrequency	fix, 50,2 Hz		50,3 or 51 Hz, configurable	
		Underfrequency	fix, 47,5 Hz		49,7 or 49 Hz, configurable	
		10 minutes average value	adjustable, 110-115 % of U_s		–	
Hysteresis related to the threshold value		Over-/ undervoltage	fix 5 %			
		Over-/ underfrequency	fix 20 mHz			
Rated frequency of the measuring signal			50 Hz			
Frequency range of the measuring signal			45-55 Hz			
Maximum measuring cycle time			50 ms			
Maximum reaction time (time between fault detection and change of switching status of the relay)		Over-/ undervoltage	< 120 ms			
		Over-/ underfrequency	< 100 ms			
		10 minutes average value	without delay		–	
Accuracy within the rated control supply voltage tolerance			ΔU ≤ 0,5 %			
Accuracy within the temperature range			ΔU ≤ 0,06 % / °C			
Measuring method			True RMS			
Timing circuit						
Start-up delay t_{S1} prior to grid connection after a short interruption			fix, 30 s		fix, 1 s	
Restart delay t_{S2}			fix, 30 s		adjustable, 0 s; 0,1 – 30 s	
Accuracy within the rated control supply voltage tolerance			Δt ≤ 0,5 %			
Accuracy within the temperature range			Δt ≤ 0,06 % / °C			
Indication of operational states			1 yellow LED, 2 red LEDs Details see operation mode and function description/diagrams			
Output circuits			**15-16/18, 25-26/28**			
Kind of output			Relais, 1 x 2 changeover			
Operation principle [1]			closed-circuit principle			
Contact material			AgNi alloy, Cd free			
Rated operational voltage U_e (IEC/EN 60947-1)			250 V			
Minimum switching voltage / switching current			24 V / 10 mA			
Maximum switching voltage / switching current			see load limit curve			
Rated operational current I_e (IEC/EN 60947-5-1)		AC12 (resistive) 230 V	4 A			
		AC15 (inductive) 230 V	3 A			
		DC12 (resistive) 24 V	4 A			
		DC13 (inductive) 24 V	2 A			
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	6 A fast-acting			
		n/o contact	10 A fast-acting			

[1] Closed-circuit principle: Output relay(s) de-energize(s) if measured value exceeds or falls below the adjusted threshold value

NEW

Grid feeding monitoring relays CM-UFS.x
Technical data

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

Type			CM-UFS.1	CM-UFS.2
General data				
Duty time			100 %	
Repeat accuracy (constant parameters)			< ± 0,5 %	
Dimensions (W x H x D)			22,5 x 78 x 100 mm (0,89 x 3,07 x 3,94 in)	
Weight			0,14 kg (0,31 lb)	
Mounting			DIN-Rail (EN 60715), snap-on mounting without any tool	
Mounting position			any	
Minimum distance to other units			not necessary	
Degree of protection		enclosure / terminals	IP50 / IP20	
Electrical connection				
Wire size	fine-strand with/without 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 in.lb)	
Environmental data				
Ambient temperature range		operation / storage	-25...+60 °C / -40...+85 °C	
Damp heat, cyclic (IEC/EN 60068-2-30)			2 x 12 h cycle, 55 °C, 95 % RH	
Climatic category (IEC/EN 60721-3-1)			3K3	
Vibration (sinusoidal) (IEC/EN 60255-21-1)			Class 2	
Shock (IEC/EN 60255-21-2)			Class 2	
Isolation data				
Rated impulse withstand voltage U_i	input circuit / output circuit		600 V	
	output circuit 1 / output circuit 2		300 V	
Rated impulse withstand voltage U_{imp} (VDE 0110, IEC/EN 60664)		input circuit	6 kV; 1,2/50 µs	
		output circuit	4 kV; 1,2/50 µs	
Test voltage between all isolated circuits (type test)			2,5 kV, 50 Hz, 1 s	
Basis isolation		input circuit / output circuit	600 V	
Protective separation (VDE 0160 Part 101 and 101/A, IEC/EN 61140)		input circuit / output circuit	yes	
Pollution degree (VDE 0110, IEC/EN 60664, UL 508)			3	
Overvoltage category (VDE 0110, IEC 60664, UL 508)			III	
Standards				
Product standard			IEC/EN 60255-6, DIN V VDE V 0126-1-1: February 2006	Type-tested in accordance with the "Guideline for Connections to ENEL distribution network" December 2008, Ed. I
Further standards			EN 50178, EN 61727	
Low Voltage Directive			2006/95/EG	
EMV-Directive			2004/108/EG	
RoHS-Directive			2002/95/EG	
Electromagnetic compatibility				
Interference immunity to			IEC/EN 61000-6-1, IEC/EN 61000-6-2	
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)	
electrical fast transient / burst		IEC/EN 61000-4-4	Level 3 (2 kV / 2 kHz)	
surge		IEC/EN 61000-4-5	Level 4 (2 kV L-L, L-N)	
conducted disturbances, induced by radio-frequency fields		IEC/EN 61000-4-6	Level 3 (10 V)	
harmonics and interharmonics		IEC/EN 61000-4-13	Class 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	

[1] Closed-circuit principle: Output relay(s) de-energize(s) if measured value exceeds or falls below the adjusted threshold value

• **Approvals** 2/6

Insulation monitors for unearthed supply systems

NEW

Content

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

NEW

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

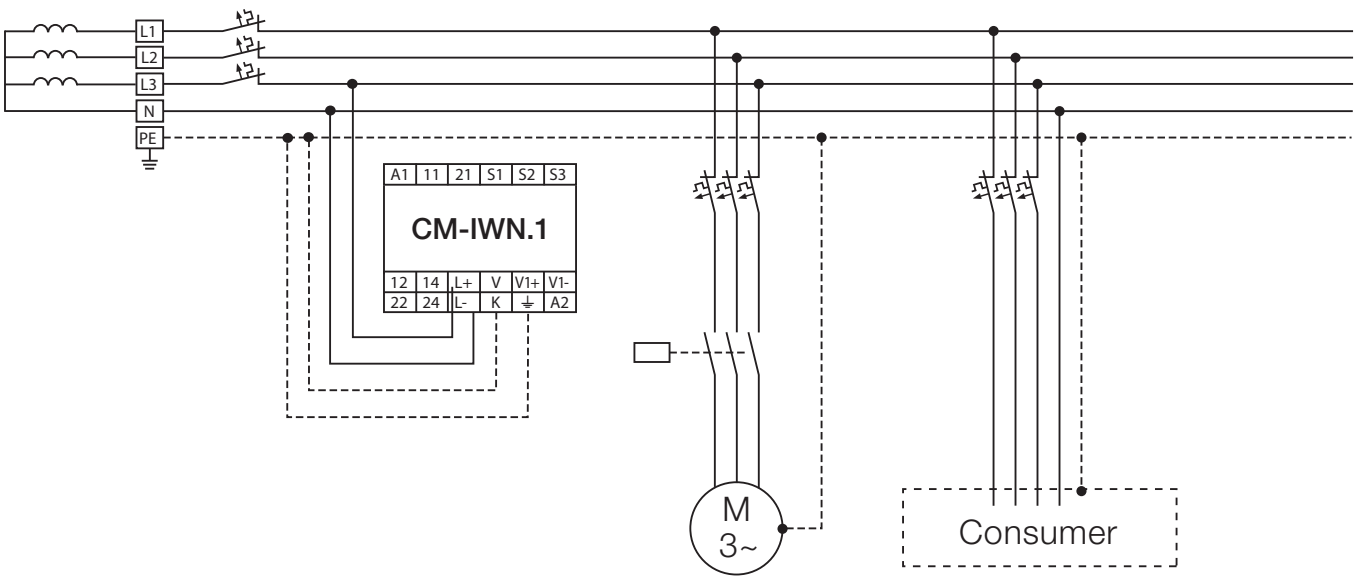
The IT system is supplied either by an isolation transformer or a voltage source, such as battery or a generator.

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.



NEW

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

Conversion			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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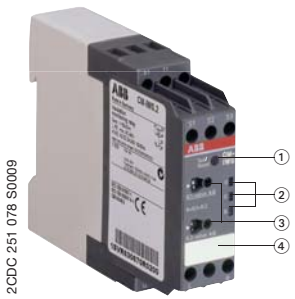
NEW

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

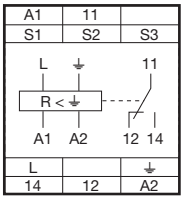
Application / monitoring function

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

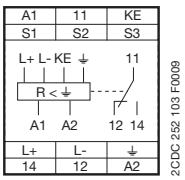
Application / monitoring function

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	

NEW

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

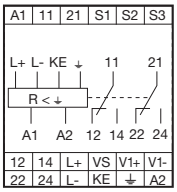
Application / monitoring function

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.

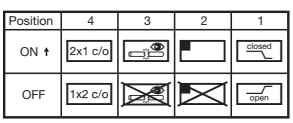
Configuration 1 x 2 c/o contacts (final switch-off)

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

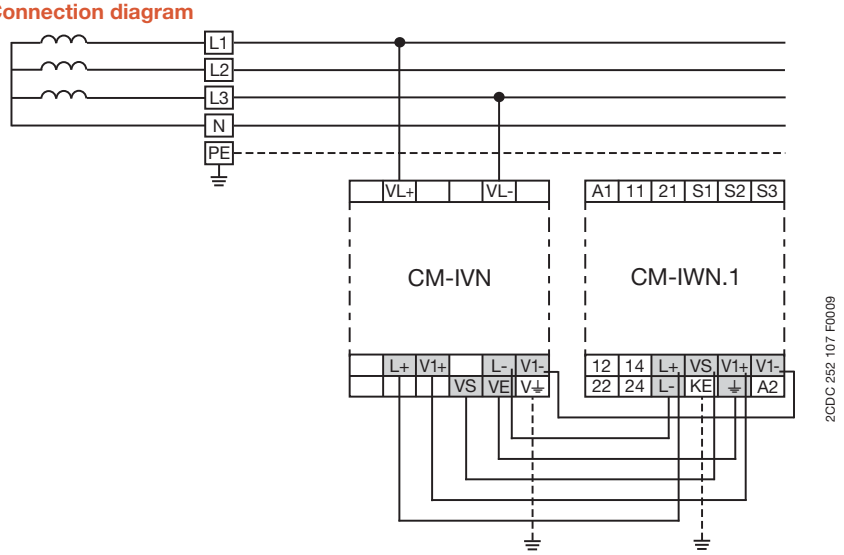
Application / monitoring function

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 $V_{⏚}$ 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



2CDC 252 107 F0009

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+	$V_{⏚}$	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

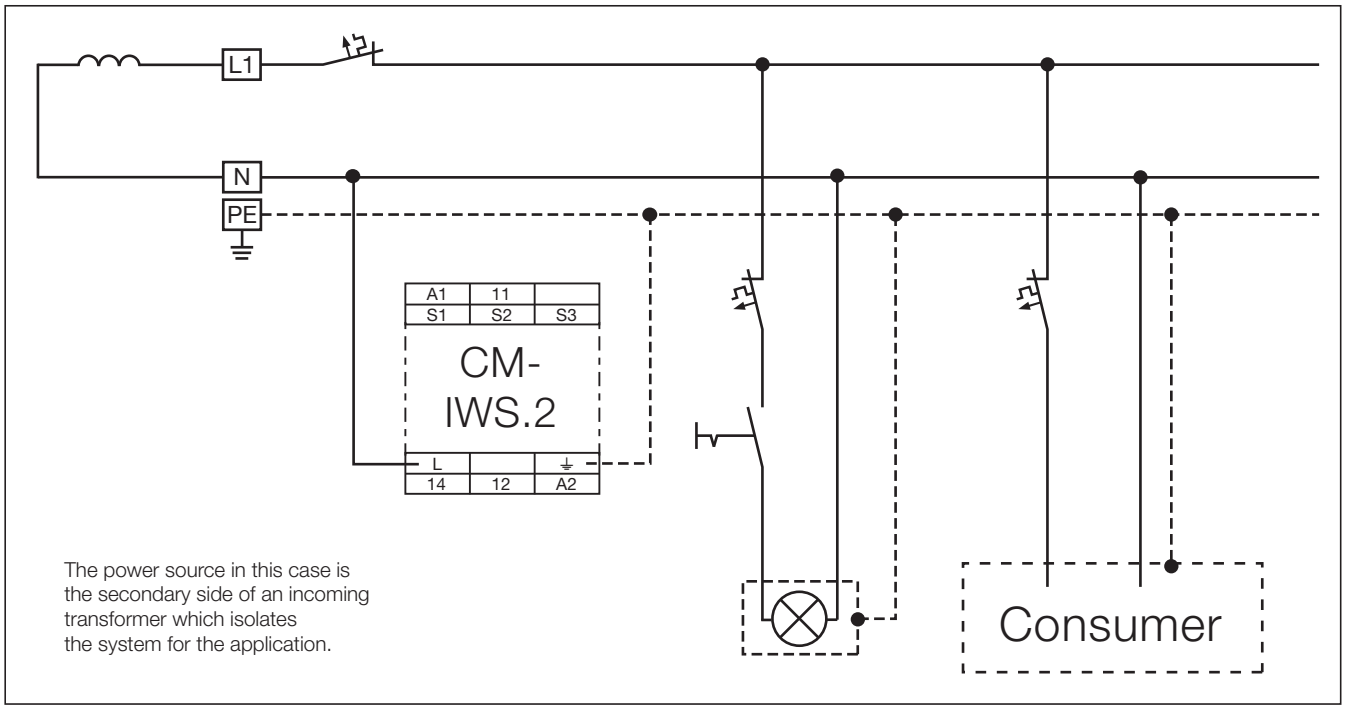
Input circuits		
Input circuit - Measuring circuit		**VL+, VL-, V⏚**
Function		expansion of the nominal voltage range of the insulation monitoring relay CM-IWN.1 to 690 V AC or 1000 V DC, max. length of connection cable 40 cm
Measuring principle		see CM-IWN.1
Nominal voltage U_n of the distribution system 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

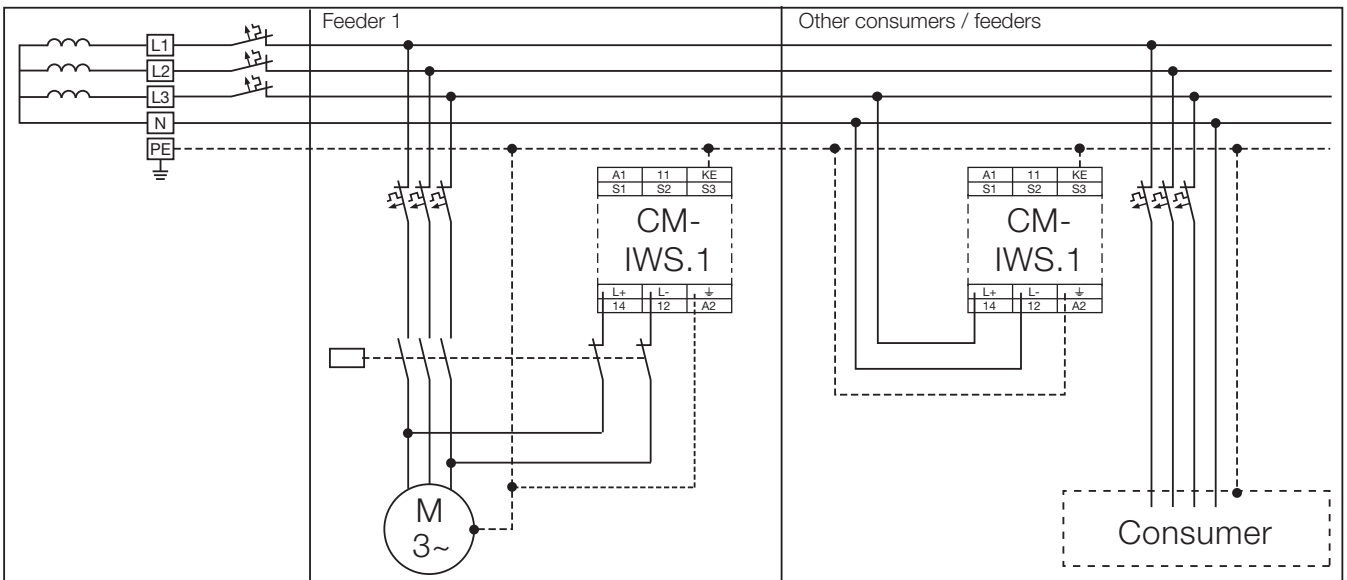
Application example CM-IWS.2



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

2CDC 252 011 F0210

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.

2CDC 252 014 F0210

Notes

Motor load monitors

Content

Motor load monitors
Fields of application

The motor load monitor monitors the load states of single-phase and three-phase asynchronous motors.
The evaluation of the phase angle between current and voltage allows a very precise monitoring of the load states.

Compared with other conventional measuring principles (e.g. pressure transducers, current measurement), cos φ monitoring is a more precise and economical alternative. The motor is used as a sensor for its own load status.

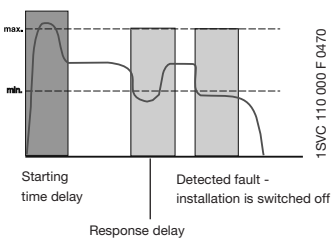
2

Main applications

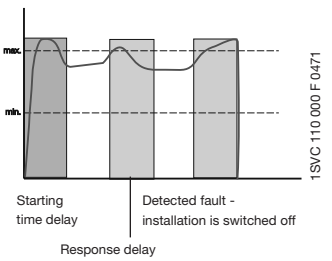
- Pump monitoring
  - Dry-running protection (underload)
  - Closed valves (overload)
  - Pipe break (overload)
- Heating, air-conditioning, ventilation
  - Monitoring of filter pollution
  - V-belt breakage (underload)
  - Closed shutters/valves (overload)
  - Air ventilating volume
- Agitating machines
  - High consistency within the tank (overload)
  - Pollution of the tank (overload)
- Transport/Conveyance
  - Congested conveyor belts (overload)
  - Jamming of belts (overload)
  - Material accumulation in spiral conveyors (overload)
  - Lifting platforms
- Machine installation
  - Wear of tools, e.g. worn saw blades in circular saws, etc. (overload)
  - Tool breakage (underload)
  - V-belt drives (breakage underload)

Pump control

Dry-running protection

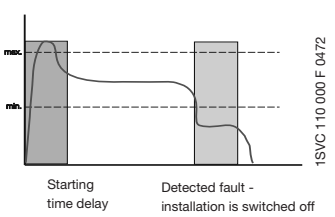


Filter pollution

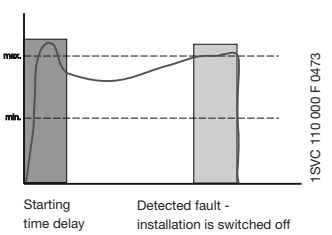


Ventilator monitoring

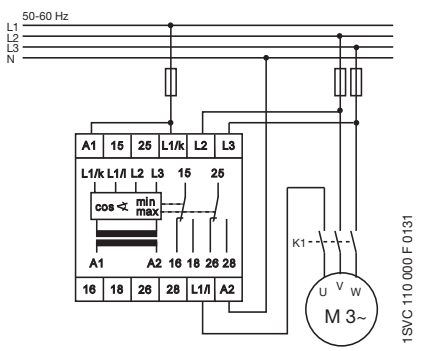
V-belt monitoring

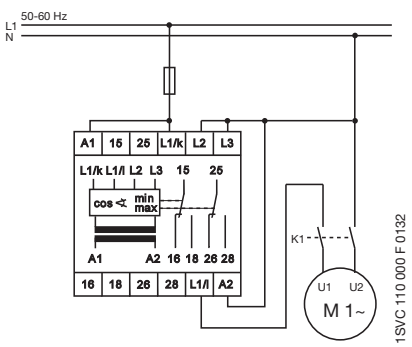


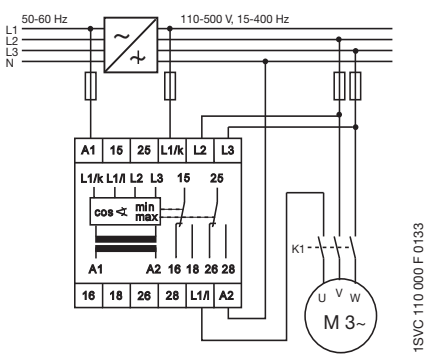
Filter pollution

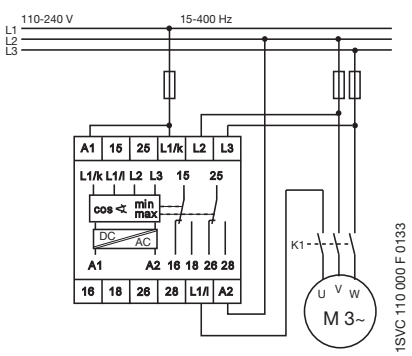


Wiring examples (for motor currents ≤ 20 A)

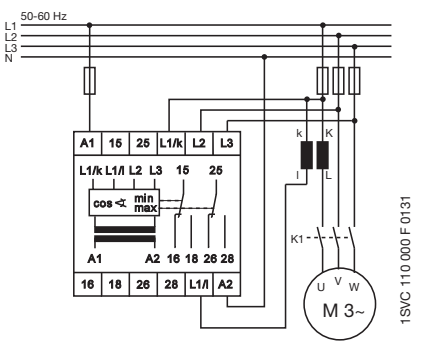


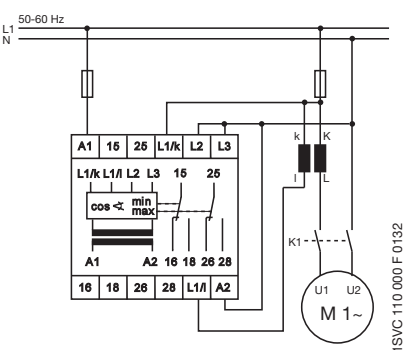






Wiring examples (for motor currents ≥ 20 A)

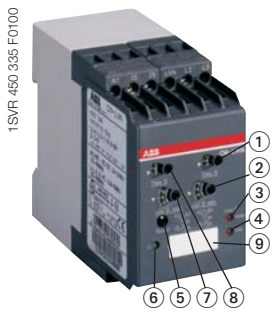




• **Current transformers** 2/105

2CDC110004C0207

Motor load monitors
CM-LWN
Ordering details



CM-LWN

① Response delay "Time R"
② Threshold for load limit "cos φ_{min}"
③ cos φ_{max}: red LED - cos φ_{max} exceeded
④ cos φ_{min}: red LED - below cos φ_{min}
⑤ Reset button
⑥ U: green LED - Control supply voltage
⑦ Threshold for load limit "cos φ_{max}"
⑧ Starting delay "Time S"
⑨ Marker label

- Load status monitoring for asynchronous motors
- Under- and overload monitoring cos φ_{min} and cos φ_{max} in one unit
- Adjustable starting delay 0.3-30 s
- Direct measurement of currents up to 20 A
- Adjustable response time delay 0.2-2 s
- Single-phase or three-phase monitoring
- 2 x 1 c/o contact, closed-circuit principle
- 3 LEDs for status indication

The **CM-LWN** module monitors the load status of inductive loads.

The primary application is the monitoring of single- or three-phase asynchronous motors (squirrel cage) under varying load conditions. The measuring principle is based on the evaluation of the phase shift (φ) between the voltage and the current in one phase.

The phase difference is nearly inversely proportional to the load. Therefore, cos φ, measured relatively from 0 to 1, measures the relationship of effective power to apparent power. A value towards 0 indicates low load and a value towards 1 indicates high load.

Threshold values can be set individually for cos φ_{max} and cos φ_{min} If the set threshold value is reached, a LED lights up and the relay is de-energized.

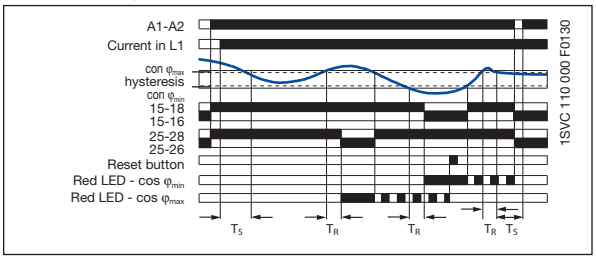
If cos φ returns to the acceptable limits (taking into account the hysteresis), the relay is reset to its original state and the LED flashes permanently to indicate the occurrence of the trip event. This message can be deleted using the reset button or by switching off the supply.

A time delay (Time S) of 0.3 to 30 s can be set for the starting phase of the motor. It is also possible to set a response delay time (Time R) of 0.2 to 2 s to suppress unwanted tripping due to unavoidable short load changes during normal operation.

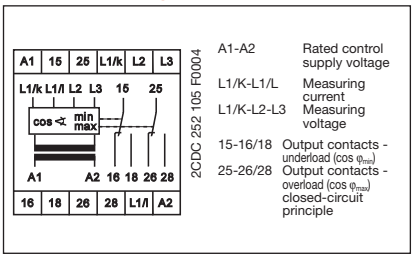
To guarantee correct operation of the response delay (Time R), the adjusted value for cos φ_{max} has to be higher than the value for cos φ_{min} plus the hysteresis. Consequently, the overload and underload indication must not be active at the same time.

Due to the internal electrical isolation of the supply circuit and the measuring circuit, it is also possible to use the device in systems with different supply voltages.

Function diagram CM-LWN



Connection diagram CM-LWN



Type	Rated control supply voltage	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg / lb
Current range: 0.5-5 A					
CM-LWN	24-240 V AC/DC	**1SVR 450 335 R0000**	1		0.30 / 0.66
	110-130 V AC	**1SVR 450 330 R0000**	1		0.30 / 0.66
	220-240 V AC	**1SVR 450 331 R0000**	1		0.30 / 0.66
	380- 440 V AC	**1SVR 450 332 R0000**	1		0.30 / 0.66
	480-500 V AC	**1SVR 450 334 R0000**	1		0.30 / 0.66
Current range: 2-20 A					
CM-LWN	24-240 V AC/DC	**1SVR 450 335 R0100**	1		0.30 / 0.66
	110-130 V AC	**1SVR 450 330 R0100**	1		0.30 / 0.66
	220-240 V AC	**1SVR 450 331 R0100**	1		0.30 / 0.66
	380-440 V AC	**1SVR 450 332 R0100**	1		0.30 / 0.66
	480-500 V AC	**1SVR 450 334 R0100**	1		0.30 / 0.66

• **Technical data** 2/62
• **Accessories** 2/104
• **Technical diagrams** 2/102
• **Current transformers** 2/105
• **Dimensional drawings** 2/103

Motor load monitors
CM-LWN
Technical data

Type			CM-LWN	
Input circuit - Supply circuit			**A1-A2**	
Rated control supply voltage U_S - power consumption		**A1-A2**	24-240 V AC/DC	approx. 8.4 VA/W
		A1-A2	110-130 V AC	approx. 3.6 VA
		A1-A2	220-240 V AC	approx. 3.6 VA
		A1-A2	380-440 V AC	approx. 3.6 VA
		A1-A2	480-500 V AC	approx. 3.6 VA
Rated control supply voltage U_S tolerance			-15 %...+10 %	
Rated frequency		AC versions	50-60 Hz	
		AC/DC versions	15-400 Hz or DC	
Duty time			100 %	
Measuring circuit			**L1/L-L1/K-L2-L3**	
Monitoring function			Motor load monitoring by cos φ	
Voltage range		L1/K-L2-L3	110-500 V AC single-phase or three-phase	
Current range		L1/L-L1/K	0.5-5 A version	2-20 A version
Permissible overload of current input			25 A for 3 s	100 A for 3 s
Thresholds			$\cos \varphi_{min}$ and $\cos \varphi_{max}$ adjustable from 0 to 1	
Hysteresis (related to phase angle φ in °)			4°	
Frequency of measuring voltage			15-400 Hz	
Response time			300 ms	
Timing circuits			**indication of over- and undervoltage fault**	
Start-up time (Time S)			0.3-30 s, adjustable	
Response delay (Time R)			0.2-2 s, adjustable	
Accuracy within the rated control supply voltage tolerance			$\Delta t \leq 0.5$ %	
Accuracy within the temperature range			$\Delta t \leq 0.06$ % / °C	
Indication of operational states				
Control supply voltage			U: green LED	
below $\cos \varphi_{min}$			$\cos \varphi_{min}$: red LED	
$\cos \varphi_{max}$ exceeded			$\cos \varphi_{max}$: red LED	
Output circuits			**15-16/18, 25-26/28**	
Kind of output			2 x 1 c/o contact	
Operational principle [1]			closed-circuit principle	
Contact material			AgCdO	
Rated voltage (VDE 0110, IEC 664-1, IEC 947-1)			250 V	
Max. switching voltage			400 V AC, 300 V DC	
Rated operational current I_e (IEC/EN 60947-1)		AC12 (resistive) 230 V	4 A	
		AC15 (inductive) 230 V	3 A	
		DC12 (resistive) 24 V	4 A	
		DC13 (inductive) 24 V	2 A	
AC rating (UL 508)		Utilization category (Control Circuit Rating Code)	B 300	
		max. rated operational voltage	300 V AC	
		max. continuous thermal current at B 300	5 A	
		max. making/breaking apparent power at B 300	3600/360 VA	
Mechanical lifetime			30 x 10^6 switching cycles	
Electrical lifetime		at AC12, 230 V, 4 A	0.1 x 10^6 switching cycles	
Max. fuse rating to achieve short circuit protection		n/c / n/o contact	10 A fast-acting / 10 A fast-acting	
General data				
Dimensions (W x H x D)			45 mm x 78 mm x 100 mm (1.77 inch x 3.07 inch x 3.94 inch)	
Mounting position			any	
Degree of protection		enclosure / terminals	IP50 / IP20	
Ambient temperature range		operation / storage	-25...+65 °C / -40...+85 °C	
Mounting			DIN rail (IEC/EN 60715)	
Electrical connection				
Wire size		fine-strand with wire end ferrule	2 x 2.5 mm^2 (2 x 14 AWG)	
Standards				
Product standard			IEC 255-6, EN 60255-6	
Low Voltage Directive			2006/95/EC	
EMC Directive			2004/108/EC, 91/263/EEC, 92/31/EEC, 93/68/EEC, 93/67/EEC	
Electromagnetic compatibility			EN 61000-6-2, EN 61000-6-4	
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)	
electrical fast transient / burst		IEC/EN 61000-4-4	Level 3 (2 kV / 5 kHz)	
surge		IEC/EN 61000-4-5	Level 4 (2 kV L-L)	
conducted disturbances, induced by radio-frequency fields		IEC/EN 61000-4-6	Level 3 (10 V)	
Operational reliability (IEC 68-2-6)			5 g	
Mechanical resistance (IEC 68-2-6)			10 g	
Environmental testing (IEC 68-2-30)			24 h cycle time, 55 °C, 93 % rel., 96 h	
Isolation data				
Rating (HD 625.1 S1, VDE 0110, IEC 664-1, IEC 60255-5)				
Rated insulation voltage between supply- , measuring- and output circuit			250 V, 400 V, 500 V depending on the version	
Rated impulse withstand voltage between all isolated circuits			4 kV / 1.2 - 50 µs	
Test voltage between all isolated circuits			2,5 kV, 50 Hz, 1 min.	
Pollution category			3	
Overvoltage category			III	

[1] Open-circuit principle: Output relay is energized if the measured value exceeds/drops below the adjusted threshold.
Closed-circuit principle: Output relay is de-energized if the measured value exceeds/drops below the adjusted threshold.

• **Approvals** 2/6

2CDC110004C0207

Motor control and protection

UMC100-FBP

NEW

Content

NEW

Motor control and protection
UMC100-FBP

UMC100-FBP is a flexible, modular and expandable motor management system for constant-speed low-voltage range motors.
It's most important tasks include motor protection, prevention of plant standstills and the reduction of down time. This is made possible by early information relating to possible motor problems which avoids unplanned plant standstills. Even if a motor trips, quick diagnosis of the cause of the fault serves to reduce downtime.

UMC100-FBP combines in a very compact unit:

Motor protection
- Overload, blocked rotor, low/high current
- Phase failure, unbalance, phase sequence
- Earth-leakage
- Thermistor protection
- One single version covers the rated motor current from 24 mA to 63 A

Motor control
- Integrated and easy to parametrize starter functions like direct, reversing, stardelta
- Free programmable logic for special, application-specific control functions
- Expansion modules for more or special I/Os

Motor diagnostics
- Quick and comprehensive access to all data via control station, fieldbus and operator panel

Communication
- Communication-neutral basic device
- Freely selectable fieldbus protocol with FieldBusPlug

Typical applications
- oil & gas
- cement
- paper
- mining
- steel
- chemical industry
- water supply and distribution
- food and beverage

Further information

UMC & FBP Catalogue	2CDC 190 022 D0201
UMC & FBP Brochure	2CDC 135 011 B0201

NEW

Motor control and protection
UMC100-FBP

Basic device UMC100-FBP

Main power	
Voltage	max 1000 V AC
Frequency	45 to 65 Hz
Rated motor current	0.24 to 63 A, without accessories
	Greater currents with transformer
Transformer diameter	11 mm (max 25 mm2)
Tripping classes	5, 10, 20, 30, 40 in accordance with EN/IEC 60947-4-1
Short-circuit protection	Separate fuse on network side

Control unit	
Supply voltage	24 V DC
Reverse polarity protection	yes
Inputs	6 digital inputs 24 V DC
	1 PTC input
Outputs	3 relay outputs relay
	1 digital output transistor
Interfaces	1 for ABB FieldBusPlug
	1 for UMC100-PAN control station
	1 for expansion module
Parametric assignment	via fieldbus, control station and / or software
Addressing	Control station or addressing set
LEDs	3 LEDs: green, yellow, red

Environment and mechanical data	
Fastening	on DIN busbar (EN50022-35) or with 4 screws x M4
Dimensions (W x H x D)	70 x 105 x 110 mm (incl. FieldBusPlug and control panel)
Weight	0.39 kg
Terminal cross-section	max. 2.5 mm² or 2 x 1.5 mm²

Expansion modules DX111 / DX122

A DX111/122 expansion module can be connected per UMC100-FBP via a simple two-wire line
Application also possible via simple parametric assignment (without programming), e.g. for error messages and warnings

Supply voltage		24 V DC
Inputs	DX111	8 digital inputs 24 V DC
	DX122	8 digital inputs 110/230 V AC
Outputs		4 relay outputs relay 1 analogue output, 0/4 to 20 mA / 0 to 10 V configurable
Fastening		on DIN busbar (EN50022-35)
Dimensions (W x H x D)		45 x 77 x 100 mm (without terminal block)

Control panel UMC100-PAN

Installation on the device or on the switching cabinet door
Graphics-enabled and backlit display, 3 LEDs for status indication
Freely configurable error messages
Multilingual: German, English, French, Italian, Portuguese, Spanish

Notes

Thermistor motor protection relays

Content

Thermistor motor protection relays CM-MSE, CM-MSS, CM-MSN
Benefits and advantages, Selection table

Operating principle and fields of application for thermistor motor protection relays

The CM range of thermistor motor protection relays are used to control motors equipped with PTC temperature sensors. The PTC temperature sensors are incorporated in the motor windings to measure the motor heating. This enables direct control and evaluation of the following operating conditions:

- heavy duty starting
- increased switching frequency
- single-phase operation
- high ambient temperature
- insufficient cooling
- break operation
- unbalance

The relay is independent of the rated motor current, the insulation class and the method of starting.

The PTC sensors are connected in series to the terminals T_a and T_b (or T_a and T_{bx} without short-circuit detection). The number of possible PTC sensors per measuring circuit is limited by the sum of the individual PTC sensor resistances: $R_G = R_1 + R_2 + R_N \leq 1.5\ k\Omega$.

Under normal operating conditions the resistance is below the response threshold. If only one of the PTC resistors heats up excessively, the output relay de-energizes. If the autoreset function is configured, the output relay energizes automatically after cooling down.

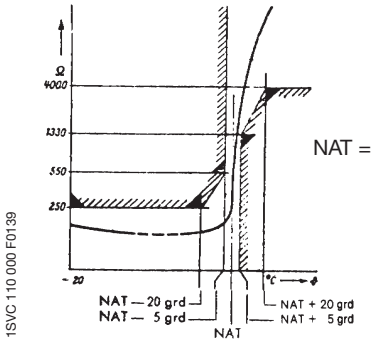
Devices with manual (pushbutton on front-side) or remote reset configuration have to be controlled via the control input by the required signal.

Further applications:

Temperature monitoring of equipment with PTC sensors integrated, such as

- machine rolling bearings,
- hot-air ventilators,
- oil,
- air,
- heating installations, etc.

Resistance characteristic
for one single temperature sensor acc. to DIN 44 081.



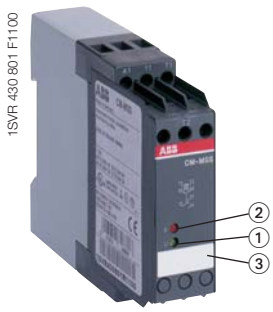
Selection table thermistor motor protection relays

Type	CM-MSE	CM-MSS (1)	CM-MSS (2)	CM-MSS (3)	CM-MSS (4)	CM-MSS (5)	CM-MSS (6)	CM-MSS (7)	CM-MSN
Function									
Measuring range									
Number of sensor circuits	1	1	1	1	1	1	2	3	6
Wire break monitoring	●	●	●	●	●	●	●	●	●
Short-circuit detection	–	–	–	● 1)	●	●	●	●	●
Non-volatile fault storage	–	–	–	–	● 2)	● 2)	–	● 2)	● 2)
Operation/Reset									
Auto reset	●	●	●	●	● 2)	● 2)	● 2)	● 2)	● 2)
Manual reset	–	–	●	●	●	●	●	●	●
Remote reset	–	–	●	●	●	●	●	●	●
Test button	–	–	–	–	●	●	●	●	●
Output contacts									
Operational principle	closed-circuit principle								
Number / type	1 c/o	1 n/o	2 c/o	2 c/o	1 n/o + 1 n/c	2 c/o	1 c/o per sensor circuit	1 n/o + 1 n/c accumulative evaluation	1 n/o + 1 n/c accumulative evaluation
Width of enclosure	22.5 mm								45 mm
Supply voltages and order codes									
24 V AC	**1SVR550805R9300**		**1SVR430811R9300**						
24 V AC/DC		**1SVR430800R9100**	**1SVR430810R9300**	**1SVR430710R9300**					
110-130 V AC	**1SVR550800R9300**		**1SVR430811R0300**	**1SVR430711R0300**					
220-240 V AC	**1SVR550801R9300**	**1SVR430801R1100**	**1SVR430811R1300**	**1SVR430711R1300**					
380-440 V AC				**1SVR430711R2300**					
24-240 V AC/DC					**1SVR430720R0400**	**1SVR430720R0300**	**1SVR430710R0200**	**1SVR430720R0500**	**1SVR450025R0100**

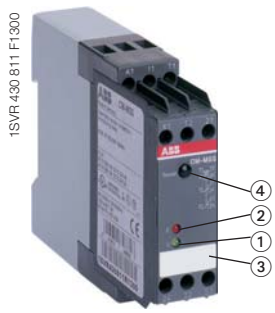
1) configurable via terminals
2) Auto reset without non-volatile fault storage configurable by permanent jumpering of connecting terminals S1-T2 or S1/X1-S2/X2

Thermistor motor protection relays CM-MSE, CM-MSS
Ordering details

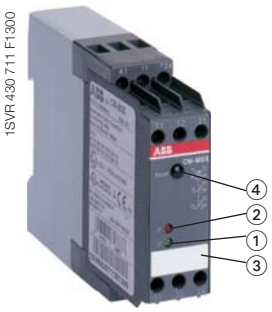
CM-MSE



CM-MSS (1)



CM-MSS (2)

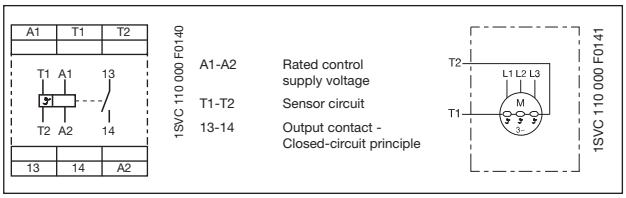


CM-MSS (3)

① F: red LED - fault tripping
② U: green LED - control supply voltage
③ Marker label
④ Reset button

CM-MSE

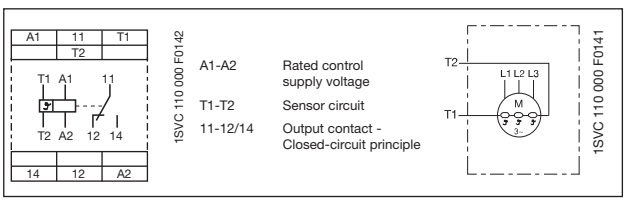
- Auto reset
- Connection of several sensors (max. 6 sensors conn. in series)
- Monitoring of bimetals
- 1 n/o contact
- Excellent cost / performance ratio



Type	Rated control supply voltage	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg / lb
CM-MSE	24 V AC	**1SVR 550 805 R9300**	1		0.11 / 0.24
	110-130 V AC	**1SVR 550 800 R9300**	1		0.11 / 0.24
	220-240 V AC	**1SVR 550 801 R9300**	1		0.11 / 0.24

CM-MSS (1), 1 c/o contact

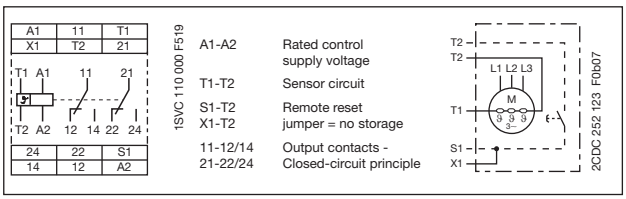
- Auto reset
- Connection of several sensors
- Monitoring of bimetals
- 1 c/o contact
- 2 LEDs for status indication



Type	Rated control supply voltage	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg / lb
CM-MSS (1)	24 V AC/DC [1]	**1SVR 430 800 R9100**	1		0.15 / 0.33
	220-240 V AC	**1SVR 430 801 R1100**	1		0.15 / 0.33

CM-MSS (2), 2 c/o contacts

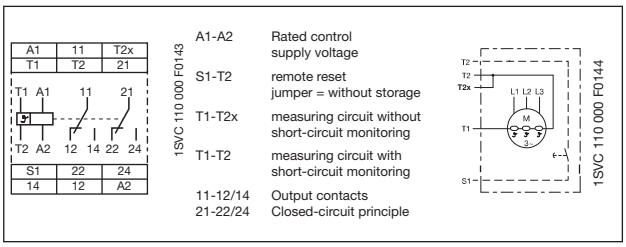
- Fault storage can be switched off
- Auto reset configurable
- Reset button
- Remote reset
- Monitoring of bimetals
- 2 c/o contacts
- 2 LEDs for status indication



Type	Rated control supply voltage	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg / lb
CM-MSS (2)	24 V AC/DC [1]	**1SVR 430 810 R9300**	1		0.15 / 0.33
	24 V AC	**1SVR 430 811 R9300**	1		0.15 / 0.33
	110-130 V AC	**1SVR 430 811 R0300**	1		0.15 / 0.33
	220-240 V AC	**1SVR 430 811 R1300**	1		0.15 / 0.33

CM-MSS (3), 2 c/o contacts, short-circuit monitoring configurable

- Fault storage can be switched off
- Auto reset configurable
- Reset button
- Remote reset
- Monitoring of bimetals
- Short-circuit monitoring of the sensor circuit configurable
- 2 c/o contacts
- 2 LEDs for status indication

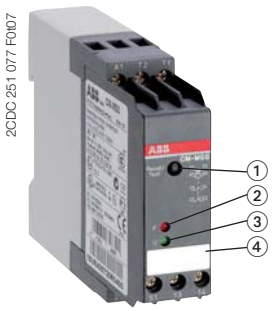


Type	Rated control supply voltage	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg / lb
CM-MSS (3)	24 V AC/DC [1]	**1SVR 430 710 R9300**	1		0.15 / 0.33
	110-130 V AC	**1SVR 430 711 R0300**	1		0.15 / 0.33
	220-240 V AC	**1SVR 430 711 R1300**	1		0.15 / 0.33
	380-440 V AC	**1SVR 430 711 R2300**	1		0.15 / 0.33

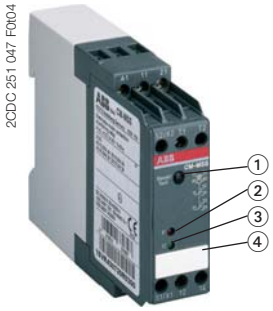
[1] not electrically isolated

- **Accessories: PTC sensors** 2/72
- **Technical diagrams** 2/102
- **Technical data** 2/73
- **Dimensional drawings** 2/103
- **Accessories** 2/104

Thermistor motor protection relays CM-MSS
Ordering details

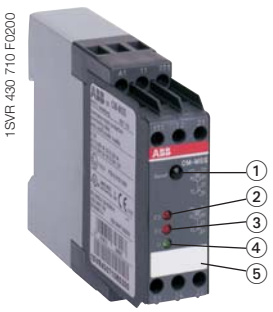


CM-MSS (4)



CM-MSS (5)

① Reset / test button
② F: red LED - fault tripping
③ U: green LED - control supply voltage
④ Marker label



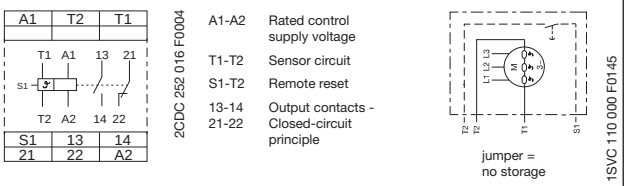
CM-MSS (6)

① Reset button
② to ③ F1-F2: red LED - fault tripping 1 to 2
④ U: green LED - control supply voltage
⑤ Marker label

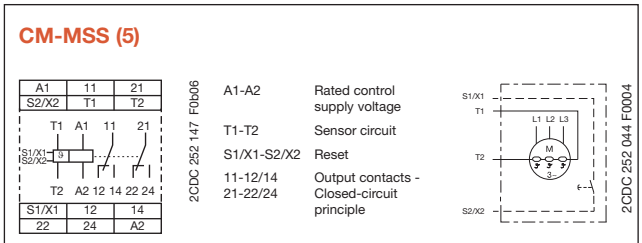
CM-MSS (4) + CM-MSS (5), 1-channel

- Short-circuit monitoring of the sensor circuit
- Wide supply voltage range: 24-240 V AC/DC
- Non-volatile fault storage selectable
- Reset and test button
- Remote reset
- Auto reset configurable
- Output contacts: 1 n/c and 1 n/o or 2 c/o contacts
- 2 LEDs for status indication

CM-MSS (4)



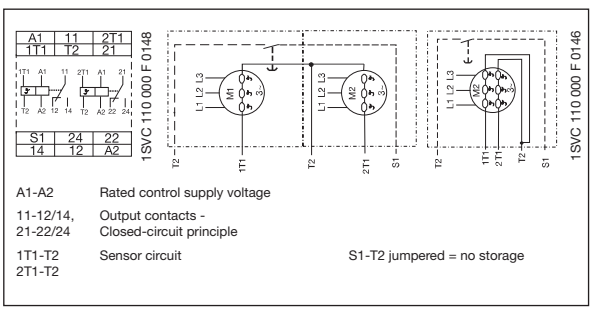
CM-MSS (5)



Type	Rated control supply voltage	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg / lb
CM-MSS (4) 1-channel 1n/c, 1n/o	24-240 V AC/DC	**1SVR 430 720 R0400**	1		0.15 / 0.33
CM-MSS (5) 1-channel 2 c/o	24-240 V AC/DC	**1SVR 430 720 R0300**	1		0.15 / 0.33

CM-MSS (6), 2-channel, single evaluation

- Short-circuit monitoring for the sensor circuits
- Wide supply voltage range: 24-240 V AC/DC
- 2 separate sensor circuits for monitoring of two motors or one motor with 2 sensor circuits (prewarning and final switch off)
- Reset button
- Auto reset configurable
- Output contacts: 2 x 1 c/o contact
- 3 LEDs for status indication



Type	Rated control supply voltage	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg / lb
CM-MSS (6)	24-240 V AC/DC	**1SVR 430 710 R0200**	1		0.15 / 0.33

• **Accessories: PTC sensors** 2/72
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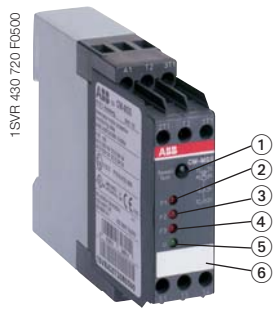
• **Dimensional drawings** 2/103
• **Accessories** 2/104

Thermistor motor protection relays CM-MSS, CM-MSN
Ordering details

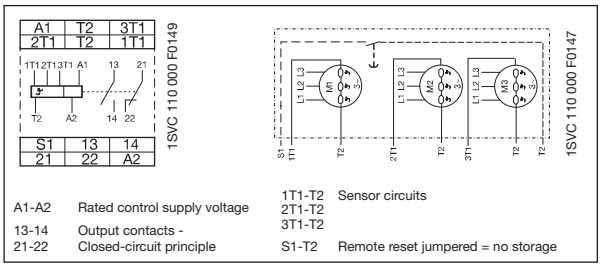


CM-MSS (7)

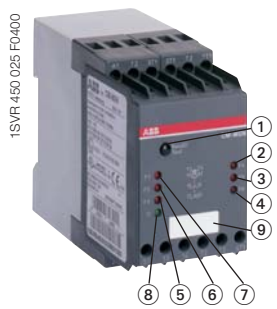
① Reset / test button
② to ④
F1-F3: red LED - fault tripping 1 to 3
⑤ U: green LED - control supply voltage
⑥ Marker label

CM-MSS (7), 3 sensor circuits, accumulative evaluation

- Short-circuit monitoring for the sensor circuits
- Wide supply voltage range 24-240 V AC/DC
- Non-volatile fault storage configurable
- Remote reset
- Auto reset configurable
- Reset and test button
- Output contacts: 1 n/c and 1 n/o contact
- 4 LEDs for status indication



Type	Rated control supply voltage	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg / lb
CM-MSS (7)	24-240 V AC/DC	**1SVR 430 720 R0500**	1		0.15 / 0.33

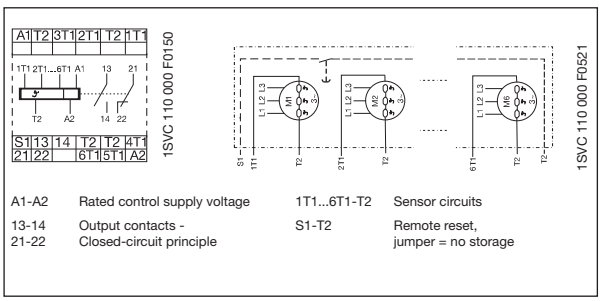


CM-MSN

① Reset / Test button
② to ⑦
F1-F6: red LED - fault tripping F1 to F6
⑧ U: green LED - control supply voltage
⑨ Marker label

CM-MSN, 6 sensor circuits, accumulative evaluation

- Short-circuit monitoring of the sensor circuit
- Wide supply voltage range: 24-240 V AC/DC
- Non-volatile fault storage configurable
- Remote reset
- Auto reset configurable
- Reset and test button
- Output contacts: 1 n/c, 1 n/o contact
- 7 LEDs for status indication



Type	Rated control supply voltage	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg / lb
CM-MSN	24-240 V AC/DC	**1SVR 450 025 R0100**	1		0.23 / 0.51

accumulative evaluation = if any input exeeds the threshold, the output relay will trip

• **Accessories: PTC sensors** 2/72
• **Technical diagrams** 2/102
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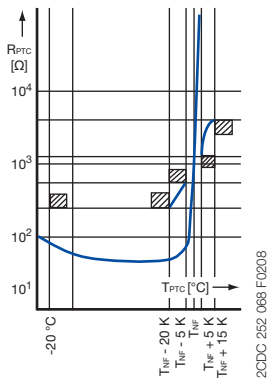
• **Accessories** 2/104

Thermistor motor protection
PTC temperature sensors C011
Ordering details, technical data

Temperature sensor characteristic



The PTC temperature sensors (temperature-dependent with positive temperature coefficient) are selected by the manufacturer of the motor depending on:

- the motor insulation class according to IEC/EN 60034-11,
- the special characteristics of the motor, such as the conductor cross-section of the windings, the permissible overload factor etc.
- special conditions prescribed by the user, such as the permissible ambient temperature, risks resulting from locked rotor, extent of permitted overload etc.

One temperature sensor must be embedded in each phase winding. For instance, in case of three-phase squirrel cage motors, three sensors are embedded in the stator windings. For pole-changing motors with one winding (Dahlander connection), 3 sensors are also sufficient. Pole-changing motors with two windings, however, require 6 sensors.

If an additional warning is required before the motor is switched off, separate sensors for a correspondingly lower temperature must be embedded in the winding. They have to be connected to a second control unit.

The sensors are suitable for embedding in motor windings with rated operating voltages of up to 600 V AC.
Conductor length: 500 mm per sensor.

A 14 V varistor can be connected in parallel to protect the sensors from overvoltage.

Due to their characteristics, the thermistor motor protection relays can also be used with PTC temperature sensors of other manufacturers which comply with DIN 44 081 and DIN 44 082.

Type	Rated response temperature T_{NF}	Color coding	Order code	Pack. unit set	Price 1 set	Weight 1 piece kg / lb
Temperature sensor C011, standard version acc. to DIN 44081						
1 set = 3 pieces						
C011-70	70 °C	white-brown	**GHC 011 0003 R0001**	1		0.02/0.044
C011-80	80 °C	white-white	**GHC 011 0003 R0002**	1		0.02/0.044
C011-90	90 °C	green-green	**GHC 011 0003 R0003**	1		0.02/0.044
C011-100	100 °C	red-red	**GHC 011 0003 R0004**	1		0.02/0.044
C011-110	110 °C	brown-brown	**GHC 011 0003 R0005**	1		0.02/0.044
C011-120	120 °C	gray-gray	**GHC 011 0003 R0006**	1		0.02/0.044
C011-130	130 °C	blue-blue	**GHC 011 0003 R0007**	1		0.02/0.044
C011-140	140 °C	white-blue	**GHC 011 0003 R0011**	1		0.02/0.044
C011-150	150 °C	black-black	**GHC 011 0003 R0008**	1		0.02/0.044
C011-160	160 °C	blue-red	**GHC 011 0003 R0009**	1		0.02/0.044
C011-170	170 °C	white-green	**GHC 011 0003 R0010**	1		0.02/0.044

Type	Rated response temperature T_{NF}	Color coding	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg / lb
Triple temperature sensor C011-3						
C011-3-150	150 °C	black-black	**GHC 011 0033 R0008**	1		0.05/0.11

Technical data

Characteristic data	Sensor type C011
Cold-state resistance	50 -100 Ω at 25 °C
Warm-state resistance ± 5 up to 6 K of rated response temperature T_{NF}	10 000 Ω
Thermal time constant, sensor open [1]	< 5 s
Permitted ambient temperature	+180 °C

Rated response temperature ± tolerance $T_{NF} \pm \Delta T_{NF}$	PTC resistance R from -20 °C to T_{NF} - 20 K	PTC resistance R at PTC temperatures of:		
		$T_{NF} - \Delta T_{NF}$ ($U_{PTC} \leq 2.5$ V)	$T_{NF} + \Delta T_{NF}$ ($U_{PTC} \leq 2.5$ V)	$T_{NF} + 15$ K ($U_{PTC} \leq 7.5$ V)
70 ±5 °C	≤ 100 Ω	≤ 570 Ω	≥ 570 Ω	-
80 ±5 °C				
90 ±5 °C		≤ 550 Ω	≥ 1330 Ω	≥ 4000 Ω
100 ±5 °C				
110 ±5 °C				
120 ±5 °C				
130 ±5 °C				
140 ±5 °C				
150 ±5 °C				
160 ±5 °C				
170 ±7 °C		≤ 570 Ω	≥ 570 Ω	-

[1] Not embedded in windings.

[2] For triple temperature sensor take values x 3.

Thermistor motor protection relays CM-MSE, CM-MSS, CM-MSN
Technical data

Type			CM-MSE	CM-MSS	CM-MSN
Input circuit					
Rated control supply voltage U_S - power consumption	**A1-A2**		24 V AC	approx. 1.5 VA	
	A1-A2		24 V AC/DC	approx. 1.1 VA / 0.6 W	
	A1-A2		110-130 V AC	approx. 1.5 VA	
	A1-A2		220-240 V AC	approx. 1.5 VA	
	A1-A2		380-440 V AC	approx. 1.7 VA	
	A1-A2		24-240 V AC/DC	approx. 1.4-1.7 W / approx. 3.5-5.7 VA	
Rated control supply voltage U_S tolerance			-15 % ... +10 %		
Rated frequency			AC: 50-60 Hz / 24-240 V AC/DC versions: 15-400 Hz		
Duty time			100 %		
Measuring circuit			**T1-T2**	**T1-T2/T2x, 1T1...6T1-T2**	**1T1...6T1-T2**
Monitoring function			temperature monitoring by means of PTC sensors		
Number of senor circuits			1	1, 2 oder 3 (see order. details)	6
Short-circuit monitoring			-	see ordering details	yes
Non-volatile fault storage			-	see ordering details	configurable
Test function			-	see ordering details	yes
Sensor circuit					
Temperature threshold (relay de-energizes)			2.7-3.7 kΩ	CM-MSS (1+2): 3050±550 Ω CM-MSS (3-7): 3.6 kΩ ±5 %	3.6 kΩ ±5 %
Temperature hysteresis (relay energizes)			1.7-2.3 kΩ	CM-MSS (1+2): 1900±400 Ω CM-MSS (3-7): 1.6 kΩ ±5 %	1.6 kΩ ±5 %
Short circuit threshold (relay de-energizes)			<20 Ω		
Short circuit hysteresis (relay energizes)			>40 Ω		
Maximum total resistance of sensors connected in series (cold state)			≤1.5 kΩ		
Maximum sensor cable length for short-circuit detection			2 x 100 m at 0.75 mm², 2 x 400 m at 2.5 mm²		
Response time			<100 ms		
Control circuit for storage and hysteresis function					
Remote reset	**S1-T2 or S1/X1-S2/X2**		-	n/o contact	
Maximum no-load voltage			-	approx. 25 V, 24-240 V; AC/DC versions: 5.5 V	
Maximum cable length			-	≤ 50 m, 100-200 m if shielded	
Indication of operational states					
Control supply voltage		U: green LED	-	⌠‾‾‾‾‾⌡: control supply voltage applied	
Fault indication		F: red LED	-	⌠‾‾‾‾‾⌡: output relay de-energized	
Output circuits			**13-14**	**11-12/14, 21-22/24, 13-14, 21-22**	**13-14, 21-22**
Kind of output			1 n/o contact	CM-MSS (1): 1 c/o contact CM-MSS (2,3,5): 2 c/o contacts CM-MSS (4, 7): 1 n/o + 1 n/c CM-MSS (6): 2x1 c/o contact	1 n/o + 1 n/c contact
Operational principle			closed-circuit principle (output relay de-energizes if the measured value exceeds/drops below the adjusted threshold)		
Contact material			AgCdO	CM-MSS (1+2+6): AgCdO CM-MSS (3+4+5+7): AgNi	AgNi
Rated voltage	(VDE 0110, IEC 664-1, IEC 60947-1)		250 V		
Maximum switching voltage			250 V		
Rated operational current I_e (IEC/EN 60947-5-1)	AC12 (resistive)	230 V	4 A		
	AC15 (inductive)	230 V	3 A		
	DC12 (resistive)	24 V	4 A		
	DC13 (inductive)	24 V	2 A (1.5 A - n/c contact[1])		
AC rating (UL 508)	Utilization category (Control Circuit Rating Code)		B 300		
	max. rated operational voltage		300 V AC		
	max. continuous thermal current at B 300		5 A		
	max. making/breaking apparent power at B 300		3600/360 VA		
Mechanical lifetime			30 (10 [1]) 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	10 A fast-acting	4 A (10 A[1]) fast-acting	10 A fast-acting
		n/o contact	10 A fast-acting	6 A (10 A[1]) fast-acting	10 A fast-acting
General data					
Dimensions (W x H X D)			22.5 x 78 x 78.5 mm (0.89 x 3.07 x 3.09 in)	22.5 x 78 x 100 mm (0.89 x 3.07 x 3.94 in)	45 x 78 x 100 mm (1.77 x 3.07 x 3.94 in)
Weight			approx. 0.11 kg (0.24 lb)	approx. 0.15 kg (0.33 lb)	approx. 0.23 kg (0.51 lb)
Mounting position			any		
Degree of protection		enclosure / terminals	IP50 / IP20		
Ambient temperature range		operation	-20...+60 °C		-25...+65 °C
		storage	-40...+85 °C		
Mounting			DIN rail (IEC/EN 60715)		

[1] 1SVR 430 710 R 0200, 1SVR 430 8xx R xxxx

Thermistor motor protection relays CM-MSE, CM-MSS, CM-MSN
Technical data

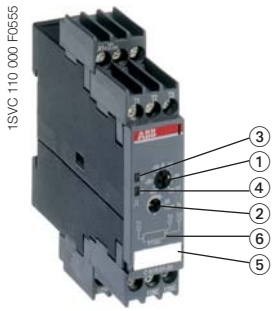
Type		CM-MSE	CM-MSS	CM-MSN
Electrical connection				
Wire size	fine strand with wire end ferrule	2 x 1.5 mm² (2 x 16 AWG)	2 x 2.5 mm² (2 x 14 AWG)	
	fine strand without wire end ferrule	2 x 0.75-1.5 mm² (2 x 18-16 AWG)	2 x 0.75-2.5 mm² (2 x 18-14 AWG)	
	rigid	2 x 1-1.5 mm² (2 x 18-16 AWG)	2 x 0.75-2.5 mm² (2 x 18-14 AWG)	
Stripping length		2 x 0.75-1.5 mm² (2 x 18-16 AWG)	2 x 0.5-4 mm² (2 x 20-12 AWG)	
Tightening torque		10 mm (0.39 inch)	7 mm (0.28 inch)	
Standards				
Product standard		IEC 255-6, EN 60255-6		
Low Voltage Directive		2006/95/EC		
EMC Directive		2004/108/EC, 91/263/EEC, 92/31/EEC, 93/68/EEC, 93/67/EEC		
Electromagnetic compatibility		EN 61000-6-2, EN 61000-6-4		
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)		
electrical fast transient / burst	IEC/EN 61000-4-4	Level 3 (2 kV / 5 kHz)		
surge	IEC/EN 61000-4-5	Level 3/4 (1/2 kV)		
conducted disturbances, induced by radio-frequency fields	IEC/EN 61000-4-6	Level 3 (10 V)		
Operational reliability (IEC 68-2-6)		6 g	4 g	5 g
Resistance to vibration (IEC 68-2-6)		10 g	6 g	10 g
Environmental testing (IEC 68-2-30)		24 h cycle time, 55 °C, 93 % rel., 96 h		
Isolation data				
Rated voltage between supply, measuring and output circuit		250 V		
Rated impulse withstand voltage between all isolated circuits		4 kV / 1.2 - 50 µs		
Test voltage between all isolated circuits		2.5 kV, 50 Hz, 1 min.		
Pollution degree		3		
Overvoltage category		III		

• **Approvals** 2/6

Temperature monitors for PT100, PT1000, KTY83, KTY84 and NTC sensors

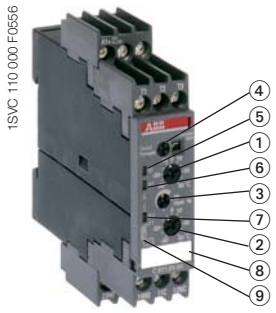
Content

Analog temperature monitoring relays C510 and C511
Ordering details



C510

① Threshold value adjustment
② Hysteresis adjustment
③ LED: control supply voltage
④ LED ϑ: relay status
⑤ Marker label
⑥ Circuit diagram



C511

① Threshold value 1 (tripping) adjustment
② Threshold value 2 (warning) adjustment
③ Hysteresis adjustment for threshold value 1
④ Selection switch for open- or closed circuit principle
⑤ LED: control supply voltage
⑥ LED ϑ1: relay 1 energized
⑦ LED ϑ2: relay 2 energized
⑧ Marker label
⑨ Circuit diagram

Analog tripping devices - C510 and C511

- Sensor types: PT100
- Measuring principle for 2- and 3-wire sensors
- Electrical isolation between the sensors and the power supply (except for 24 V AC/DC devices)
- Separate design for the crossing of the upper or lower threshold
- Depending on the version, measurement ranges for -50...+50 °C / 0...+100 °C / 0...+200 °C
- no storage
- Adjustment precision ± 5 %
- 22.5 mm enclosure with 12 terminals

C510

- 1 threshold ajdustable via absolute scale in °C
- Hysteresis adjustable from 2-20 %
- 1 n/o and 1 n/c contact
- 2 LEDs for status indication
- Closed-circuit principle

Type	Rated control supply voltage	Order code	Measuring range	Pack.-unit piece	Price 1 piece	Weight 1 piece kg / lb
Monitoring function: Overtemperature						
C510.01-24	24 V AC/DC	**1SAR 700 001 R0005**	-50...+50 °C	1		0.15/0.33
C510.01-K	110/230 V AC	**1SAR 700 001 R0006**	-50...+50 °C	1		0.19/0.42
C510.02-24	24 V AC/DC	**1SAR 700 002 R0005**	0...+100 °C	1		0.15/0.33
C510.02-K	110/230 V AC	**1SAR 700 002 R0006**	0...+100 °C	1		0.19/0.42
C510.03-24	24 V AC/DC	**1SAR 700 003 R0005**	0...+200 °C	1		0.15/0.33
C510.03-K	110/230 V AC	**1SAR 700 003 R0006**	0...+200 °C	1		0.19/0.42
Monitoring function: Undertemperature						
C510.11-24	24 V AC/DC	**1SAR 700 004 R0005**	-50...+50 °C	1		0.15/0.33
C510.11-K	110/230 V AC	**1SAR 700 004 R0006**	-50...+50 °C	1		0.19/0.42
C510.12-24	24 V AC/DC	**1SAR 700 005 R0005**	0...+100 °C	1		0.15/0.33
C510.12-K	110/230 V AC	**1SAR 700 005 R0006**	0...+100 °C	1		0.19/0.42
C510.13-24	24 V AC/DC	**1SAR 700 006 R0005**	0...+200 °C	1		0.15/0.33
C510.13-K	110/230 V AC	**1SAR 700 006 R0006**	0...+200 °C	1		0.19/0.42

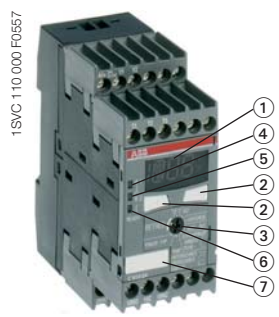
C511

- 2 thresholds (warning and switch-off) adjustable via absolute scale in °C
- Hysteresis for threshold 1 adjustable from 2-20 %
- Hysteresis for threshold 2 fixed 5 %
- 1 n/o and 1 c/o
- 3 LEDs for status indication
- Open- or closed-circuit principle selectable

Type	Rated control supply voltage	Order code	Measuring range	Pack.-unit piece	Price 1 piece	Weight 1 piece kg / lb
Monitoring function: Overtemperature						
C511.01-24	24 V AC/DC	**1SAR 700 011 R0005**	-50...+50 °C	1		0.17/0.37
C511.01-W	24-240 V AC/DC	**1SAR 700 011 R0010**	-50...+50 °C	1		0.18/0.40
C511.02-24	24 V AC/DC	**1SAR 700 012 R0005**	0...+100 °C	1		0.17/0.37
C511.02-W	24-240 V AC/DC	**1SAR 700 012 R0010**	0...+100 °C	1		0.18/0.40
C511.03-24	24 V AC/DC	**1SAR 700 013 R0005**	0...+200 °C	1		0.17/0.37
C511.03-W	24-240 V AC/DC	**1SAR 700 013 R0010**	0...+200 °C	1		0.18/0.40
Monitoring function: Undertemperature						
C511.11-24	24 V AC/DC	**1SAR 700 014 R0005**	-50...+50 °C	1		0.17/0.37
C511.11-W	24-240 V AC/DC	**1SAR 700 014 R0010**	-50...+50 °C	1		0.18/0.40
C511.12-24	24 V AC/DC	**1SAR 700 015 R0005**	0...+100 °C	1		0.17/0.37
C511.12-W	24-240 V AC/DC	**1SAR 700 015 R0010**	0...+100 °C	1		0.18/0.40
C511.13-24	24 V AC/DC	**1SAR 700 016 R0005**	0...+200 °C	1		0.17/0.37
C511.13-W	24-240 V AC/DC	**1SAR 700 016 R0010**	0...+200 °C	1		0.18/0.40

• **Function diagrams** ..... 2/78 • **Technical data** ..... 2/80 • **Dimensional drawings** 2/103

Digital temperature monitoring relays C512 and C513
Ordering details



C512, C513

① Display
② Adjustment button
③ Menu selection switch
④ LED ϑ1: Threshold value 1
⑤ LED ϑ2: Threshold value 1
⑥ LED Ready: device in function
⑦ Marker label

Digital tripping devices - C512 und C513

- Adjustable sensor types: PT100, PT1000, KTY83, KTY84, NTC-B57227-K333-A1
- Measuring principle for 2-wire and 3-wire sensors
- Electrical isolation (except 24 V AC/DC devices)
- Adjustable over-, undertemperature monitoring or range monitoring function
- 2 thresholds
- Hysteresis for both thresholds (1-99 Kelvin)
- Adjustable time delay from 0-999 s affects to both thresholds
- Storage function selectable via external signal (Y1-Y2)
- Non-volatile storage of parameter settings
- 1 n/o (for wire-break and short-circuit detection) and 2 c/o
- Multifunctional digital display
- 3 LEDs for status indication
- Open- or closed-circuit principle selectable
- 45 mm wide enclosure with 24 terminals

C512

- Temperature monitor for 1 sensor circuit

Type	Rated control supply voltage	Order code	Measuring range	Pack.-unit piece	Price 1 piece	Weight 1 piece k g /lb
Monitoring function: Over- and undertemperature, range monitoring function						
C512-24	24 V AC/DC	**1SAR 700 100 R0005**	-50...+500 °C *)	1		0.32/0.71
C512-W	24-240 V AC/DC	**1SAR 700 100 R0010**	-50...+500 °C *)	1		0.33/0.73

C513

- Temperature monitor for 1-3 sensor circuits
- In the 3-sensor version the status of the single sensors is displayed if the temperature exceeds or falls below the threshold.

This way it can be easily determined which one of the connected sensors has exceeded or dropped below either one or both threshold values.

Type	Rated control supply voltage	Order code	Measuring range	Pack.-unit piece	Price 1 piece	Weight 1 piece kg / lb
Monitoring function: Over- and undertemperature, range monitoring function						
C513-W	24-240 V AC/DC	**1SAR 700 110 R0010**	-50...+500 °C *)	1		0.34/0.75

Accessories - Replaceable cover marking for digital devices

Type	use for	Order code	Language	Pack.-unit piece	Price 1 piece	Weight 1 piece kg / lb
C512-D	C512	**1SAR 700 101 R0100**	German	5		
C512-E	C512	**1SAR 700 102 R0100**	English	5		
C513-D	C513	**1SAR 700 111 R0100**	German	5		
C513-E	C513	**1SAR 700 112 R0100**	English	5		

*) The measuring range depends on the used sensor type:

- PT100: -50...+500 °C
- PT1000: -50...+500 °C
- NTC: +80...+160 °C
  (Typ Siemens Matsushita B57272-A333-A1 - 100 °C: 1,8 kΩ, 25 °C: 32,762 kΩ)
- KTY83: -50...+175 °C
- KTY84: -40...+300 °C

• **Function diagrams** ..... 2/78 • **Technical data** .....2/80 • **Dimensional drawings** 2/103

Temperature monitoring relays
C51x range
Overview, functional description and diagrams

Overview

The C51x temperature monitoring relays can be used for temperature measurement in solid, liquid and gaseous media.

The temperature is acquired by the sensor in the medium, evaluated by the device and monitored to determine whether it is within an operating range (range monitoring function) or has exceeded or fallen below a threshold.

The family is composed of analog adjustable devices with one or two thresholds, and digital devices which are a good alternative especially in the low-end range.

The output relay switches on or off at the thresholds, depending on the configured functionality (open- or closed-circuit principle selectable).

Functional description

Analog tripping devices

Once the temperature has reached the set threshold, output relay K1 changes its switching state. In devices with 2 thresholds relay K2 reacts correspondingly if the second threshold is reached.
No time delay can be set (t = 0).

The relays immediately return to their original switching state if the temperature reaches the set hysteresis value.

Once the temperature has reached the upper threshold of υ1, output relay K1 changes its switching state after the set time t.
The relay immediately returns to its original switching state if the temperature reaches the set hysteresis value.
K2 reacts correspondingly at the lower threshold value of υ2.

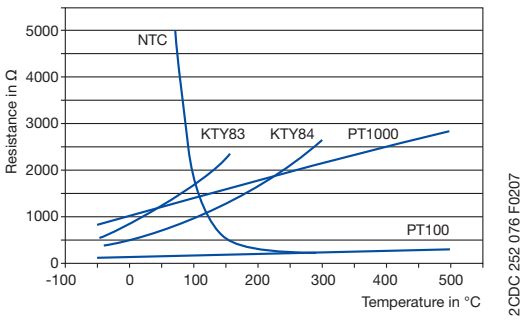
Once the temperature has reached the set threshold of υ1, output relay K1 changes its switching state after the set time t has elapsed. (K2 reacts in the same way at υ2).

The relays return to their original state if the temperature drops below the set hysteresis value and the connection Y1-Y2 is interrupted for a short time.

Digital tripping devices

Once the temperature has reached the set threshold of υ1, output relay K1 changes its switching state after the set time delay t has elapsed (K2 reacts in the same way for υ2).

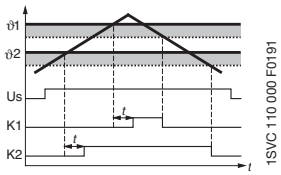
Characteristic curves of resistance sensors



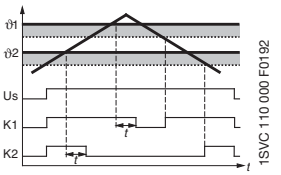
Function diagrams

Overtemperature

Open-circuit principle

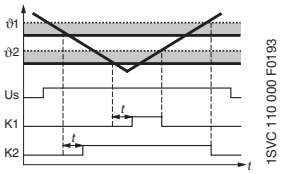


Closed-circuit principle

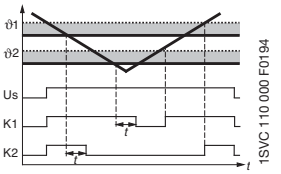


Undertemperature

Open-circuit principle

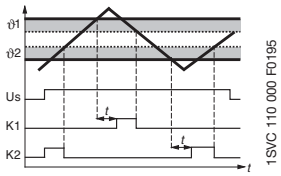


Closed-circuit principle

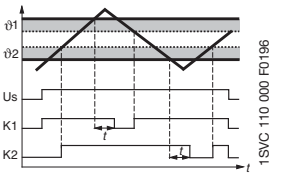


Range monitoring (only digital devices)

Open-circuit principle

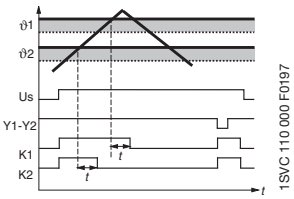


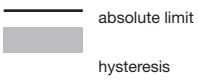
Closed-circuit principle



Function principle with storage function

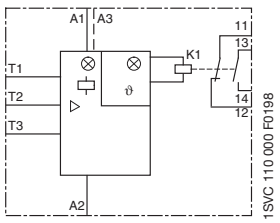
using overtemperature with closed-circuit principle as an example





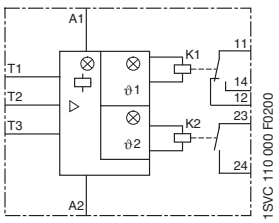
Temperature monitoring relays
C51x range
Connection diagrams, connection of resistance thermometer sensors

Connection diagrams



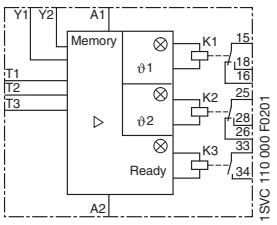
C510

A1/A3-A2	Rated control suppy voltage
11-12	Output contacts
13-14	
T1-T3	Sensor connection



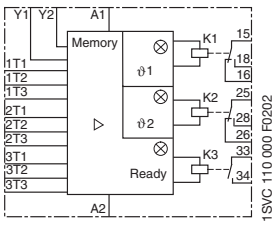
C511

A1-A2	Rated control suppy voltage
11-12/14	Output contacts
23-24	
T1-T3	Sensor connection



C512

A1-A2	Rated control suppy voltage
15-16/18	Output contacts
25-26/28	
33-34	
T1-T3	Sensor connection
Y1-Y2	Connection for storage bridge



C513

A1-A2	Rated control suppy voltage
15-16/18	Output contacts
25-26/28	
33-34	
1T1-1T3	Sensor connection 1
2T1-2T3	Sensor connection 2
3T1-3T3	Sensor connection 3
Y1-Y2	Connection for storage bridge

Connection of resistance thermometer sensors

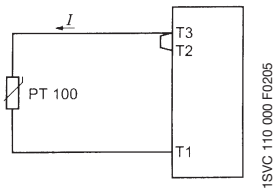
2-wire measurement

When using 2-wire temperature sensors the sensor resistance and the wire resistance are added together.

The resulting systematic errors must be taken into account when adjusting the tripping device.

A jumper must be connected between the terminals T2 and T3.

The following table can be used for PT100 sensors to determine the temperature errors caused by the line length.



ATTENTION!

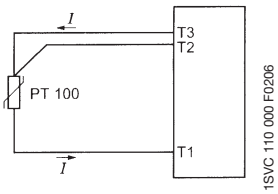
When using resistance sensors with two-wire connection a bridge must be inserted between terminals T2 and T3.

3-wire measurement

To minimize the influence of the wire resistance, a three-wire connection is usually used.

By means of the additional wire two measuring circuits are created.

One of these two circuits is used for reference. This way, the tripping device can calculate and take into account the wire resistance automatically.



Error caused by the line

The error resulting from the line resistance amounts to approx. 2.5 Kelvin/Ohm. If the resistance of the line is not known and it is not possible to measure it, the error caused by the line can be estimated using the following table.

Temperature error

(depending on the line length and conductor cross section for PT100 sensors at an ambient temperature of 20 °C, in K)

Line length in m	Wire size mm²			
	0.50	0.75	1	1.5
0	0.0	0.0	0.0	0.0
10	1.8	1.2	0.9	0.6
25	4.5	3.0	2.3	1.5
50	9.0	6.0	4.5	3.0
75	13.6	9.0	6.8	4.5
100	18.1	12.1	9.0	6.0
200	36.3	24.2	18.1	12.1
500	91.6	60.8	45.5	30.2

Temperature monitoring relays
C51x range
Technical data

Type			C510	C511	C512	C513
Input circuit						
Rated control supply voltage U_S		A1-A2	24 V AC/DC			-
		A1-A2	230 V AC	24-240 V AC/DC		
		A3-A2	110 V AC	-		
Power consumption		AC	< 4 VA		< 7 VA	
		DC	< 2 W		< 4 W	
Rated control supply voltage U_S tolerance			-15...+10 %			
Rated frequency		AC	50/60 Hz			
Sensor circuit						
Sensor type			PT100		PT100, PT1000, KTY83, KTY84, NTC	
Sensor current		PT100	typ. 1 mA			
		PT1000, KTY83, KTY84, NTC	-		typ. 0.2 mA	
Wire-break detection			no		yes (not for NTC)	
Short-circuit detection			no		yes	
3-wire connection			yes (2-wire connection of sensors with terminals T2 and T3 bridged)			
Measuring circuit						
Setting accuracy at T_a = 20 °C (T_{20})			typ. < ± 5 % of full-scale value		< ±2 K ± 1digit	
Accuracy within the temperature range			< 2 %		0.05 °C / °C deviation from T_{20}	
Response time			-		500 ms	
Hysteresis settings		temperature 1	2-20 % of full-scale value		1-99 kelvin	
		temperature 2	-	5 % of full-scale value	1-99 kelvin	
Tripping delay			-		0-999 s	
Output circuit						
Kind of output			1 n/o + 1 n/c	1 c/o + 1 n/o	2 c/o + 1n/o	2 c/o + 1 n/o
Rated operating current I_e (IEC/EN 60947-1-5)	AC12	(resistive) 230 V	3 A			
	AC15	(inductive) 230 V	3 A			
	DC12	(resistive) 24 V	1 A			
	DC13	(inductive) 24 V	0.1 A			
Mechanical lifetime			3 x 10^6 switching cycles		30 x 10^6 switching cycles	
Electrical lifetime (AC15 at 3 A)			0.1 x 10^5 switching cycles			
Max. fuse rating to achieve short circuit protection			4 A, operating class gL/gG			
General data						
Dimensions (W x H x D)			22.5 x 101.6 x 86 mm (0.89 x 4 x 3.39 in)		45 x 105.9 x 86 mm (1.77 x 4.17 x 3.39 in)	
Tightening torque			0.8-1.2 Nm			
Mounting position			any			
Degree of protection	enclosure / terminals		IP 40 / IP 20			
Ambient temperature range		operation	-25...+60 °C			
		storage	-40...+80 °C			
Mounting			DIN rail (IEC/EN 60715)			
Electrical connection						
Wire size		rigid	1 x 4 mm² (1 x 12 AWG), 2 x 2.5 mm² (2 x 14 AWG)			
		fine-strand with wire end ferrule	1 x 2.5 mm² (1 x 14 AWG), 2 x 1.5 mm² (2 x 16 AWG)			
Standards						
Environmental conditions			IEC 60721-3-3			
Low Voltage Directive			IEC 60947-5-1, VDE 0660			
Electromagnetic compatibility	Interference immunity		EN 61000-6-2			
	Interference emission		EN 61000-6-4			
Vibration resistance (IEC 68-2-6)			5-26 Hz / 0.75 mm			
Shock resistance (IEC 68-2-27)			15 g / 11 ms			
Isolation data						
Rated insulation voltage			300 V AC			
Pollution degree			3			

• **Approvals** 2/6

Liquid level monitors and controls

Content

Liquid level relays
CM-ENE MIN, CM-ENE MAX
Ordering details

CM-ENE MIN

CM-ENE MAX

① R: yellow LED - relay status

- Monitoring of pump systems for dry running (ENE MIN) and overflow (ENE MAX)
- Connection of 2 electrodes possible at C and MIN/MAX
- 3 supply voltage versions
- Optimal price/performance ratio
- 1 n/o contact: Open-circuit principle for CM-ENE MIN
- Closed-circuit principle for CM-ENE MAX
- LED for status indication

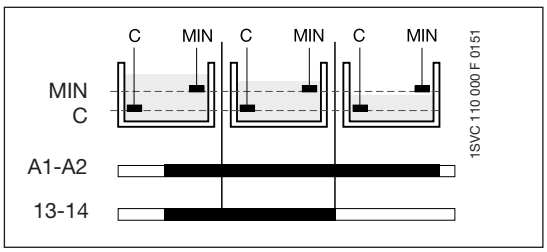
The liquid level relays CM-ENE MIN and CM-ENE MAX are used to monitor levels of conductive liquids, for example in pump control systems for dry-running or overflow monitoring.

The measuring principle is based on the occurring resistance change when moisting single-pole electrodes. The single-pole electrodes (see also section Accessories) are connected to the terminals C and MIN or MAX.

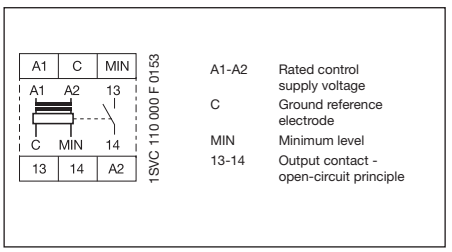
If the supply voltage is applied to A1-A2 and the electrodes are wet, the output relay of the CM-ENE MIN is energized and the output relay of the CM-ENE MAX is de-energized.

The output relay of the CM-ENE MIN de-energizes if the electrodes are no longer wet. The output relay of the CM-ENE MAX energizes if the electrodes are no longer wet.

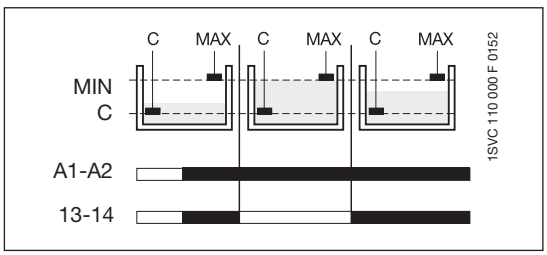
Function diagram CM-ENE MIN



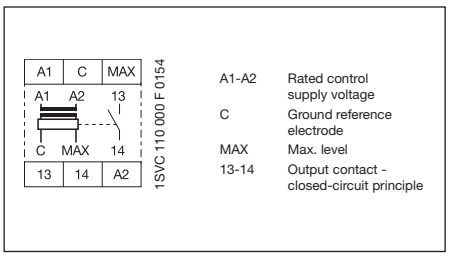
Connection diagram CM-ENE MIN



Function diagram CM-ENE MAX



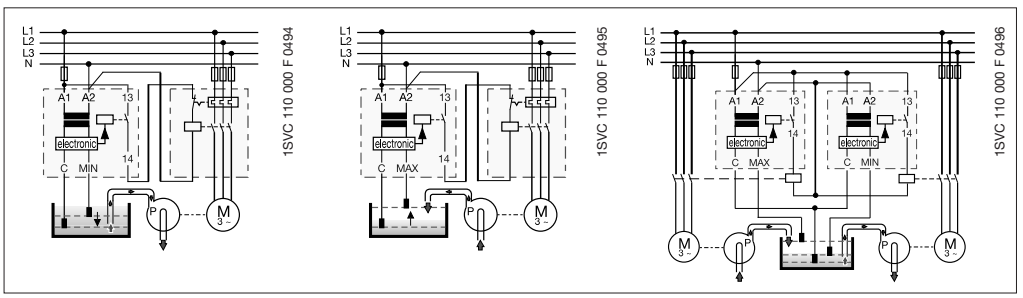
Connection diagram CM-ENE MAX



If a metal tank is used, the ground reference electrode C is not required. In this case the cable can be connected directly to the metal surface of the tank.

Application examples

CM-ENE MIN | CM-ENE MAX | CM-ENE MIN und CM-ENE MAX



Suitable for		Not suitable for	
spring water	acids, bases	chemically pure water	ethylene glycol
drinking water	liquid fertilizers	fuel	concentrated alcohol
sea water	milk, beer, coffee	oils	paraffin
sewage	non-concentrated alcohol	explosive areas (liquid gas)	lacquers

Type	Rated control supply voltage	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg / lb
CM-ENE MIN	24 V AC	**1SVR 550 855 R9500**	1		0.15 / 0.33
	110-130 V AC	**1SVR 550 850 R9500**	1		0.15 / 0.33
	220-240 V AC	**1SVR 550 851 R9500**	1		0.15 / 0.33
CM-ENE MAX	24 V AC	**1SVR 550 855 R9400**	1		0.15 / 0.33
	110-130 V AC	**1SVR 550 850 R9400**	1		0.15 / 0.33
	220-240 V AC	**1SVR 550 851 R9400**	1		0.15 / 0.33

• **Accessories**..... 2/87 and 2/104 • **Technical data**.....2/88 • **Dimensional drawings** 2/103

Liquid level relays
CM-ENS
Ordering details

CM-ENS

① "Sens." - sensitivity potentiometer for adjusting the response sensitivity
② R: yellow LED - relay status
③ U: green LED - control supply voltage
④ Marker label

- Monitoring and control of liquid levels (when draining or filling liquids in tanks)
- Monitoring and control of mixture ratios (conductivity of liquids)
- Adjustable response sensitivity 5-100 kΩ
- 4 supply voltage versions 24 - 415 V AC
- Version with protective separation acc. to VDE 0160
- Cascadable
- 1 c/o contact or 1 n/o and 1 n/c contact
- 2 LEDs for status indication

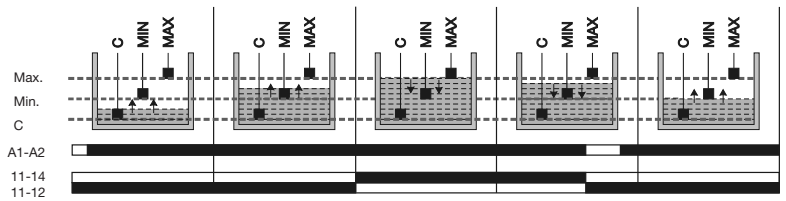
The CM-ENS monitors levels of conductive liquids and is used for example for liquid level control in pump systems. It can be used for filling or draining tanks for example.

It is also suitable for monitoring the conductivity of liquids. The measuring principle is based on the resistance change sensed by single-pole electrodes. After the supply voltage is applied to the terminals A1 and A2, the output relay is de-energized. The probes must be connected to C, MAX, MIN.

The output relay energizes if the liquid exceeds the maximum level (C and MAX wet) and de-energizes if the liquid level is below the minimum level (MAX and MIN dry).

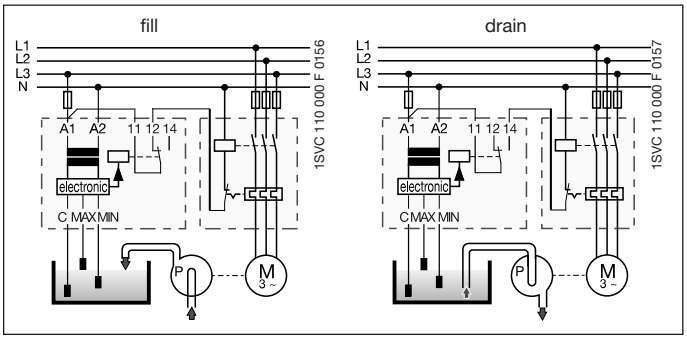
Based on the measuring circuit there will be a response delay of approx. 250 ms at maximum sensitivity. Different levels in one tank can be controlled by up to 5 CM-ENS without interfering with each other.

Function diagram CM-ENS

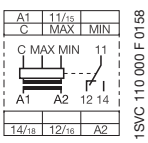


When using a metal tank the electrode C is not required. In this case the cable can be connected directly to the metal surface of the tank.

Application examples

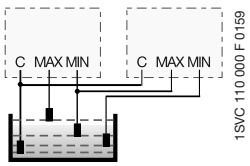


Connection diagram CM-ENS



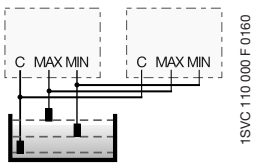
A1-A2	Rated control supply voltage
C	Ground reference electrode
MAX	Maximum level
MIN	Minimum level
11(15)-12(16)/14(18)	Output contacts - open-circuit principle

Cascading
The electrode inputs can be interconnected as required, which ensures simple monitoring of different liquid levels.



Redundancy
Redundant liquid level monitoring or control can be implemented by connecting the electrodes to two units.

This makes the application much safer.

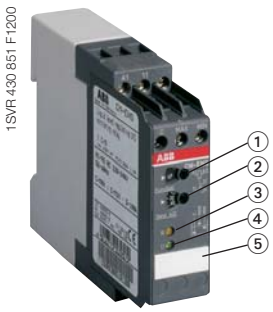


Suitable for		Not suitable for	
spring water	acids, bases	chemically pure water	ethylene glycol
drinking water	liquid fertilizers	fuel	concentrated alcohol
sea water	milk, beer, coffee	oils	paraffin
sewage	non-concentrated alcohol	explosive areas (liquid gas)	lacquers

Type	Rated control supply voltage	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg / lb
CM-ENS	24 V AC	**1SVR 430 851 R9100**	1		0.15 / 0.33
	110-130 V AC	**1SVR 430 851 R0100**	1		0.15 / 0.33
	220-240 V AC	**1SVR 430 851 R1100**	1		0.15 / 0.33
	380-415 V AC	**1SVR 430 851 R2100**	1		0.15 / 0.33
Version with protective separation acc. to VDE 0160, 1 n/o, 1 n/c					
CM-ENS	220-240 V AC	**1SVR 430 851 R1300**	1		0.15 / 0.33

• **Accessories** ..... 2/87 and 2/104
• **Technical data** 2/89
• **Technical diagrams** 2/102
• **Dimensional drawings** 2/103

Liquid level relays
CM-ENS UP/DOWN
Ordering details



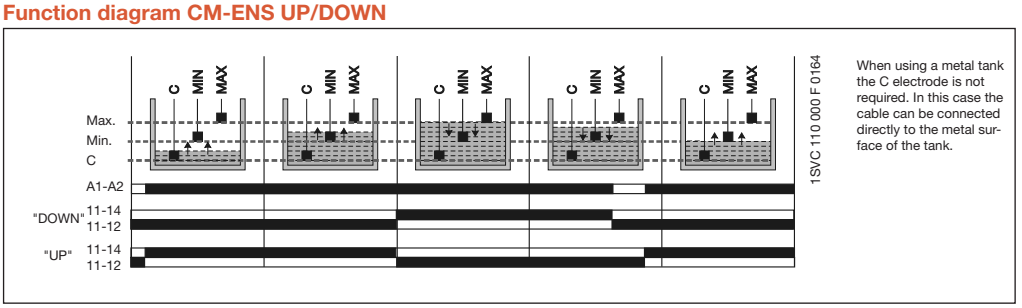
CM-ENS UP/DOWN

① "Func." - function selector switch:
"UP"- fill
"DOWN" - drain
② "Sens." - sensitivity potentiometer for adjusting the response sensitivity
③ R: yellow LED - relay status
④ U: green LED - control supply voltage
⑤ Marker label

- Monitoring and control of liquid levels
- Selectable function "fill" or "drain"
- Adjustable response sensitivity 5-100 kΩ
- Cascadable
- 1 c/o contact
- 2 LEDs for status indication

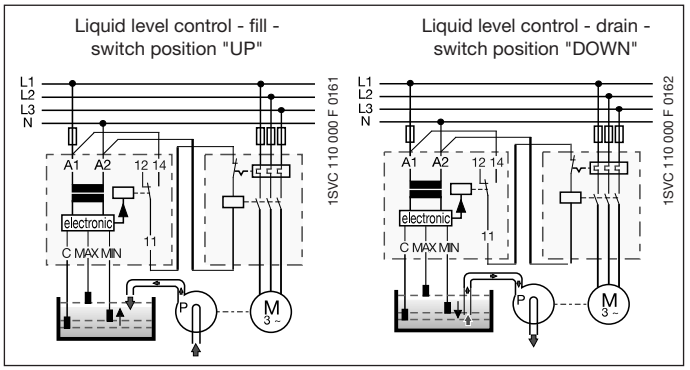
The CM-ENS UP/DOWN monitors levels of conductive liquids and other media, and is used e.g. for liquid level control in pump systems.
The measuring principle is based on the resistance change sensed by single-pole electrodes.
The output relay functions fill (UP) or drain (DOWN) can be selected on a front-face selector switch.
If the "UP" function is selected, the output relay is energized until the MAX electrode becomes wet. Then it is de-energized and not re-energized until the MIN electrode becomes dry.
If the "DOWN" function is selected, the output relay is energized as soon as the MAX electrode becomes wet. It remains energized until the liquid level has dropped below the MIN electrode.
The electrodes can be connected to more than one CM-ENS unit without interference.

Function diagram CM-ENS UP/DOWN

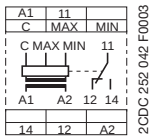


When using a metal tank the C electrode is not required. In this case the cable can be connected directly to the metal surface of the tank.

Application examples

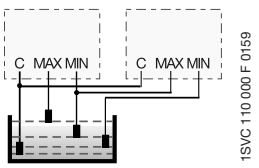


Connection diagram CM-ENS UP/DOWN

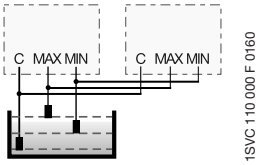


A1 - A2	Rated control supply voltage
C	Ground reference electrode
MAX	Maximum level
MIN	Minimum level
11-12/14	Output contacts - open-circuit or closed-circuit principle selectable

Cascading of electrodes
The electrode inputs can be interconnected as required, which ensures simple monitoring of different liquid levels.



Redundancy
Redundant liquid level monitoring or control can be implemented by connecting the electrodes to two units.
This makes the application much safer.

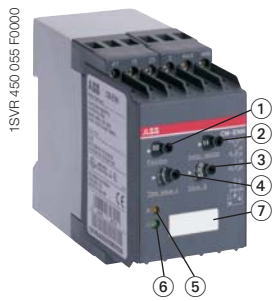


Suitable for		Not suitable for	
spring water	acids, bases	chemically pure water	ethylene glycol
drinking water	liquid fertilizers	fuel	concentrated alcohol
sea water	milk, beer, coffee	oils	paraffin
sewage	non-concentrated alcohol	explosive areas (liquid gas)	lacquers

Type	Rated control supply voltage	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg / lb
CM-ENS UP/DOWN	24 V AC	**1SVR 430 851 R9200**	1		0.15/0.33
	110-130 V AC	**1SVR 430 851 R0200**	1		0.15/0.33
	220-240 V AC	**1SVR 430 851 R1200**	1		0.15/0.33

• **Accessories** ..... 2/87 and 2/104
• **Technical diagrams** 2/102
• **Technical data** 2/89
• **Dimensional drawings** 2/103

Liquid level relays
CM-ENN
Ordering details



CM-ENN

① "Function" - time function selector switch:
- ⊠ ON-delay
- ■ OFF-delay

② "Sens.-sector" - measuring range selector switch

③ "Sens. " - sensitivity potentiometer for adjusting the response sensitivity

④ "Time value" - fine adjustment of time delay

⑤ R: yellow LED - relay status

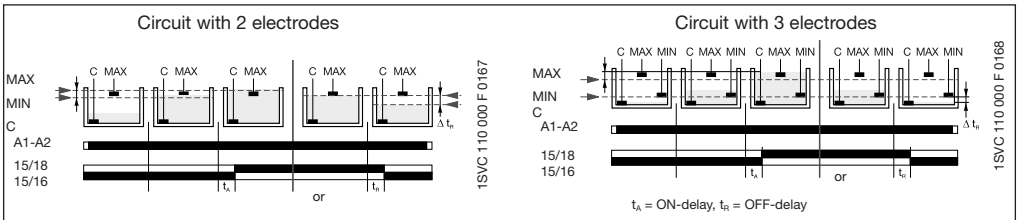
⑥ U: green LED - control supply voltage

⑦ Marker label

- Monitoring and control of liquid levels (when emptying or filling liquids in tanks)
- Monitoring and control of mixture ratios (conductivity of liquids)
- 3 response sensitivities from 250 Ω - 500 kΩ in one unit
- 5 supply voltage versions 24 V AC/DC - 415 V AC
- Selectable ON- or OFF-delay 0.1-10 s
- 2 c/o contacts
- 2 LEDs for status indication

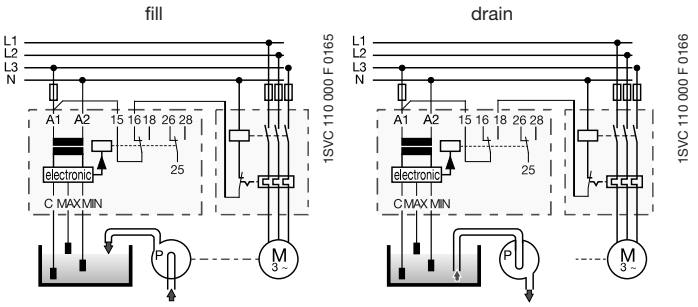
The CM-ENN monitors levels of conductive liquids and is used for example for liquid level monitoring in pump control systems, for dry-running protection of submersible pumps or overflow monitoring of tanks. It is also suitable for conductivity monitoring of liquids.
The measuring principle is based on the resistance change sensed by single-pole electrodes (wet or dry). Instead of electrodes, other sensors or transducers can also be used if their output quantities are different resistance values. The measuring, output and supply circuits are electrically isolated for potential separation and to prevent electrical interference.
Due to the integrated ON- or OFF-delay, it is possible to set up time-dependent liquid controls using only two electrodes (C, MAX). Different liquid levels in one tank can be controlled by up to 5 CM-ENN (AC version) without mutual interference.

Function diagrams CM-ENN



When using a metal tank the C electrode is not required. In this case the cable can be connected directly to the metal surface of the tank.

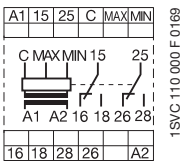
Application examples



For commissioning, set both potentiometers (response sensitivity = R value and ON-delay = time value) to the minimum value (5) and select a suitable resistance range (sector).
After all electrodes have been wetted by the liquid being monitored, turn the sensitivity potentiometer towards maximum value (100) until the relay energizes. If the relay does not energize, select a higher Ω value (sector) on the device and proceed as before.
Then it has to be checked if the relay de-energizes properly as soon as the electrodes C and MIN are no longer wet. Liquid levels higher than the maximum level electrode can be obtained by setting an ON-delay (TA = 0.1...10 s).

Liquid levels lower than the minimum level electrode can be obtained by setting an OFF-delay time (TR = 0.1...10 s), e.g. for emptying tanks.

Connection diagram CM-ENN



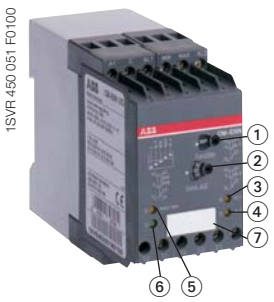
A1-A2	Rated control supply voltage
C	Ground reference electrode
MIN	Min. level electrode
MAX	Max. level electrode
15-16/18 25-26/28	Output contacts - open-circuit principle

Typ	Rated control supply voltage	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg / lb
CM-ENN	24-240 V AC/DC	**1SVR 450 055 R0000**	1		0.30 / 0.66
	24 V AC	**1SVR 450 059 R0000**	1		0.30 / 0.66
	110-130 V AC	**1SVR 450 050 R0000**	1		0.30 / 0.66
	220-240 V AC	**1SVR 450 051 R0000**	1		0.30 / 0.66
	380-415 V AC	**1SVR 450 052 R0000**	1		0.30 / 0.66

Response sensitivity	Max. electrode current	Max. cable capacity	Max. cable length	
250 Ω - 5 kΩ	8 mA	200 nF	1000 m	
2.5-50 kΩ	2 mA	20 nF	100 m	
25-500 kΩ	0.5 mA	4 nF	20 m	

- **Accessories** ..... 2/87 and 2/104
- **Technical diagrams** 2/102
- **Technical data** 2/90
- **Dimensional drawings** 2/103

Liquid level relays - Liquid level control with two alarm outputs - CM-ENN UP/DOWN
Ordering details



CM-ENN UP/DOWN

① "Func." - function selector switch:
"UP"- fill
"DOWN" - drain
② "Sens." - sensitivity potentiometer for adjusting the response sensitivity
③ R AL1: yellow LED - relay status AL1
④ R AL2: yellow LED - relay status AL2
⑤ R: MIN/MAX: yellow LED - relay status MIN/MAX
⑥ U: green LED - control supply voltage
⑦ Marker label

- Liquid level relay with 5 electrode inputs
- Level control with integrated overflow and dry-running protection
- Adjustable response sensitivity 5-100 kΩ
- Cascadable
- 1 c/o contact and 2 n/c contacts as alarm outputs
- 4 LEDs for status indication

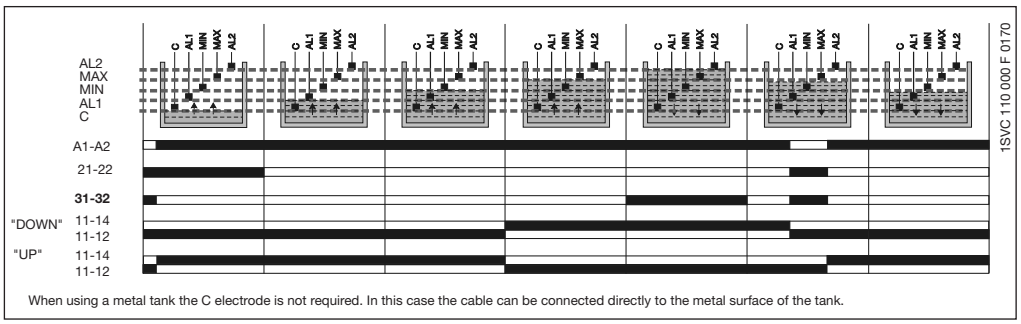
The CM-ENN UP/DOWN monitors levels of conductive liquids and media and is used e.g. for liquid level control in pump systems. The measuring principle is based on the resistance change sensed by single-pole electrodes.

The function of the output relay 11-12/14 can be selected by a selector switch on the front of the unit to fill "UP" or drain "DOWN". If the "UP" function is selected, the output relay is energized until the MAX electrode becomes wet. Then it is de-energized and not re-energized until the MIN electrode becomes dry.

If the "DOWN" function is selected, the output relay is energized as soon as the MAX electrode becomes wet. It remains energized until the liquid level has dropped below the MIN electrode.

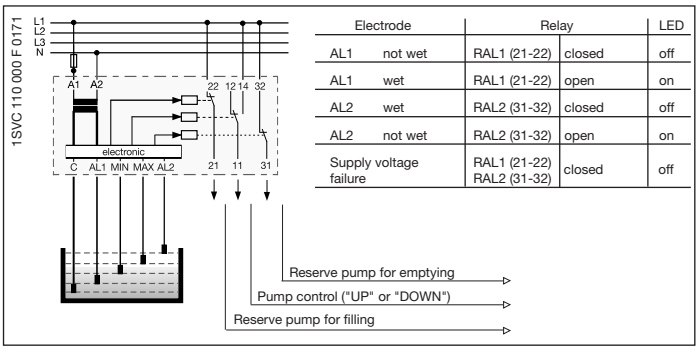
The electrode inputs AL1 and AL2 energize/de-energize the correspopnding output relays RAL1 (21-22) and RAL2 (31-32). AL1 opens if contact RAL1 (21-22) is wet. AL2 closes if contact RAL2 (31-32) is wet. This way, two additional alarm outputs for exceeding or dropping below the normal level can be implemented in addition to the filling levels MAX and MIN.

Function diagram CM-ENN UP/DOWN



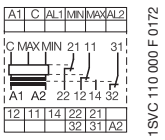
When using a metal tank the C electrode is not required. In this case the cable can be connected directly to the metal surface of the tank.

Application example



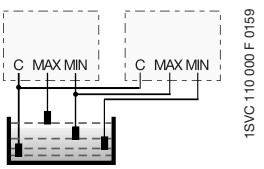
Electrode		Relay		LED
AL1	not wet	RAL1 (21-22)	closed	off
AL1	wet	RAL1 (21-22)	open	on
AL2	wet	RAL2 (31-32)	closed	off
AL2	not wet	RAL2 (31-32)	open	on
Supply voltage failure		RAL1 (21-22) RAL2 (31-32)	closed	off

Connection diagram CM-ENN UP/DOWN



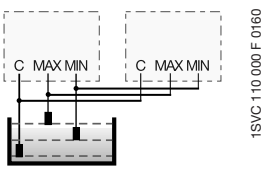
A1-A2	Rated control supply voltage
C	Ground reference electrode
MIN	Minimum level electrode
MAX	Maximum level electrode
AL1	Alarm electrode 1
AL2	Alarm electrode 2
11-12/14	Output contacts -
21-22	open-circuit or closed-circuit
31-32	principle selectable

Cascading of electrodes
The electrode inputs can be interconnected as required, which ensures simple monitoring of different liquid levels.



Redundancy
Redundant liquid level monitoring or control can be implemented by connecting the electrodes to two units.

This makes the application much safer.



Suitable for		Not suitable for	
spring water	acids, bases	chemically pure water	ethylene glycol
drinking water	liquid fertilizers	fuel	concentrated alcohol
sea water	milk, beer, coffee	oils	paraffin
sewage	non-concentrated alcohol	explosive areas (liquid gas)	lacquers

Type	Rated control supply voltage	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg / lb
CM-ENN UP/DOWN	24 V AC	**1SVR 450 059 R0100**	1		0.15 / 0.33
	110-130 V AC	**1SVR 450 050 R0100**	1		0.15 / 0.33
	220-240 V AC	**1SVR 450 051 R0100**	1		0.15 / 0.33
	380-415 V AC	**1SVR 450 052 R0100**	1		0.15 / 0.33

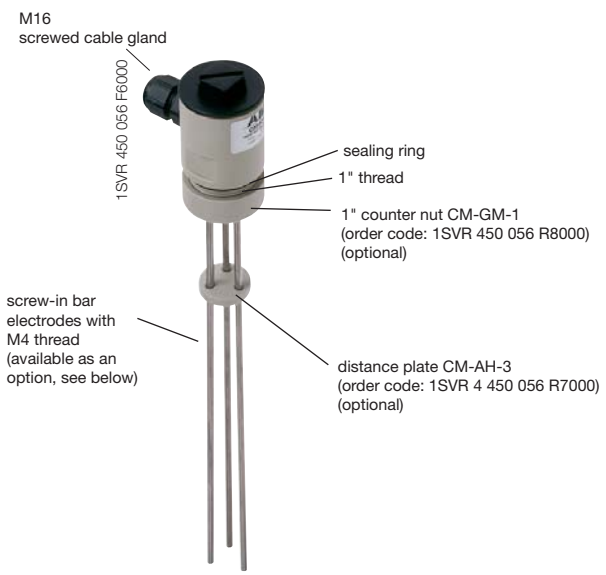
• **Accessories** .....2/87 and 2/104
• **Technical diagrams** 2/102
• **Technical data** 2/89
• **Dimensional drawings** 2/103

Liquid level relays - Accessories
Electrodes
Ordering details, dimensional drawings

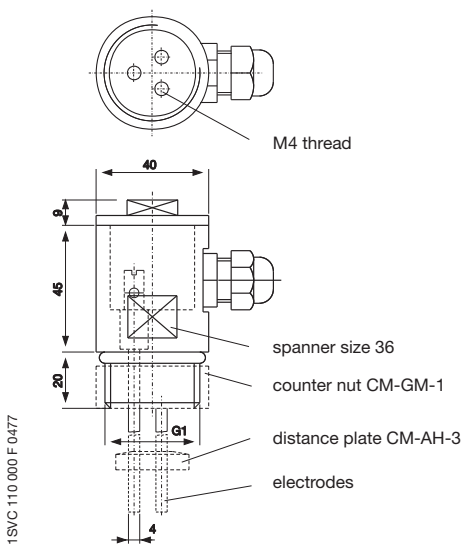
Compact support CM-KH-3 for 3 bar electrodes

Dimensions in mm

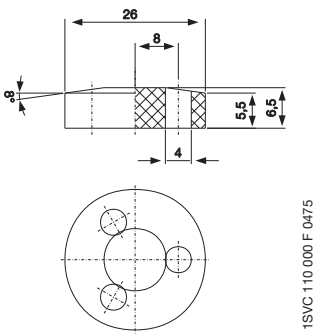
- Ideally suited for use with liquid level relays CM-ENS and CM-ENN
- Wire connection by screw terminals
- Pull relief by M16 screwed cable glands
- Temperature range up to 90 °C
- Food safe material (PPH)
- Screw-in electrodes (M4 thread)
- Distance plate (CM-AH-3) and locking nut (CM-GM-1) optionally available as an accessory



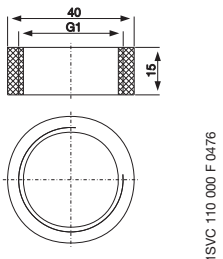
Compact support CM-KH-3



Distance plate CM-AH-3



Counter nut CM-GM-1

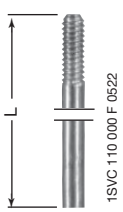


Technical data compact support

Type of mounting:	G 1" thread
Mounting position:	any
Enclosure material:	PPH
Sealing:	NBR 70
Temperature range:	90 °C max.
Pressure:	10 bar max. (60 °C)

Type	Description	Order code	Pack. unit 1 piece	Price 1 piece	Weight 1 piece kg / lb
CM-KH-3	Compact support for 3 bar electrodes	**1SVR 450 056 R6000**	1		0.06 / 0.132
CM-AH-3	Distance plate for 3 bar electrodes	**1SVR 450 056 R7000**	1		0.06 / 0.132
CM-GM-1	Counter nut for 1" thread	**1SVR 450 056 R8000**	1		0.06 / 0.132

Screw-in bar electrodes for compact support CM-KH-3

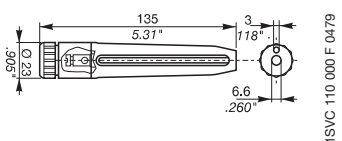


Thread M4

Material: stainless steel 304, high-grade steel 14301

Suspension electrode CM-HE

Steel electrode
(X14CrMoS17) with sleeve
(Lupulen 6011 L)
suitable up to 60°C max.



During project engineering the compatibility of the electrode material with the medium to be supervised is to be examined!

Type	Length	Order code	Pack. unit 1 piece	Price 1 piece	Weight 1 piece kg / lb
CM-SE-300	300 mm	**1SVR 450 056 R0000**	1		0.08 /0.176
CM-SE-600	600 mm	**1SVR 450 056 R0100**	1		0.08 /0.176
CM-SE-1000	1000 mm	**1SVR 450 056 R0200**	1		0.08 /0.176
CM-HE	-	**1SVR 402 902 R0000**	1		0.08 /0.176

Liquid level relays
CM-ENE MIN, CM-ENE MAX
Technical data

Type			CM-ENE MIN	CM-ENE MAX
Supply circuit				
Rated control supply voltage U_S - power consumption		**A1-A2**	24 V AC	approx. 1.5 VA
		A1-A2	110-130 V AC	approx. 1.2 VA
		A1-A2	220-240 V AC	approx. 1.4 VA
Rated control supply voltage U_S tolerance			-15...+15 %	
Rated frequency			50-60 Hz	
Duty time			100 %	
Measuring circuit			**MIN-C, MAX-C**	
Monitoring function			dry-running protection	overflow protection
Response sensitivity			0-100 kΩ, not adjustable	
Maximum electrode voltage			30 V AC	
Maximum electrode current			1.5 mA	
Electrode supply line		max. cable capacity	3 nF	
		max. cable length	30 m	
Timing circuit				
Time delay			-	
Tripping delay			fixed approx. 200 ms	
Indication of operational states				
Output relay energized			R: yellow LED	
Output circuits			**13-14**	
Kind of output			1 n/o contact	
Operational principle [1]			open-circuit principle	closed-circuit principle
Contact material			AgCdo	
Rated operational voltage U_e		(IEC/EN 60947-1)	250 V	
Mininimum switching voltage / minimum switching current			- / -	
Maximum switching voltage			250 V	
Rated operational current I_e (IEC/EN 60947-5-1)		AC12 (resistive) 230 V	4 A	
		AC15 (inductive) 230 V	3 A	
		DC12 (resistive) 24 V	4 A	
		DC13 (inductive) 24 V	2 A	
AC rating (UL 508)	Utilization category (Control Circuit Rating Code)		B 300	
	max. rated operational voltage		300 V AC	
	max. continuous thermal current at B 300		5 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)			0.3 x 10^6 switching cycles	
Max. fuse rating to achieve short circuit protection		n/c contact	-	
		n/o contact	10 A fast-acting	
General data				
Dimensions (W x H x D)			22.5 x 78 x 78.5 mm (0.89 x 3.07 x 3.09 in)	
Mounting position			any	
Degree of protection		enclosure / terminals	IP50 / IP20	
Ambient temperature range		operation / storage	-20...+60 °C / -40...+85 °C	
Mounting			DIN rail (IEC/EN 60715)	
Electrical connection				
Wire size	fine-strand with wire-end ferrule		2 x 0.75-1.5 mm² (2 x 18-16 AWG)	
	fine-strand without wire-end ferrule		2 x 1-1.5 mm² (2 x 18-16 AWG)	
	rigid		2 x 0.75-1.5 mm² (2 x 18-16 AWG)	
Stripping length			10 mm (0.39 inch)	
Tightening torque			0.6-0.8 Nm	
Standards				
Product standard			IEC 255-6, EN 60255-6	
Low Voltage Directive			2006/95/EC	
EMC Directive			2004/108/EC	
Electromagnetic compatibility			EN 61000-6-2, EN 61000-6-4	
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)	
electrical fast transient / burst		IEC/EN 61000-4-4	Level 3 (2 kV / 5 kHz)	
surge		IEC/EN 61000-4-5	Level 4 (2 kV L-L)	
conducted disturbances, induced by radio-frequency fields		IEC/EN 61000-4-6	Level 3 (10 V)	
Resistance to vibration (IEC 68-2-6)			6 g	
Mechanical resistance (IEC 68-2-6)			10 g	
Isolation data				
Rat. insulation volt. betw. supply, meas. & output circuit (VDE 0110, IEC 60947)			250 V	
Rated impulse withstand voltage between all isolated circuits (VDE0 110, IEC 664)			4 kV / 1.2-50 µs	
Test voltage between all isolated circuits			2.5 kV, 50 Hz, 1 min.	
Pollution category (VDE 0110, IEC 664, IEC 255-5)			3 / C	
Overvoltage category (VDE 0110, IEC 664, IEC 255-5)			III / C	
Environmental testing (IEC 68-2-30)			24 h cycle time, 55 °C, 93 % rel., 96 h	

[1] Open-circuit principle: Output relay energizes if the measured value exceeds/drops below the adjusted threshold.
Closed-circuit principle: Output relay de-energizes if the measured value exceeds/drops below the adjusted threshold.

• **Approvals** 2/6

2CDC110004C0207

Liquid level relays
CM-ENS, CM-ENS UP/DOWN
Technical data

Type			CM-ENS	CM ENS UP/DOWN
Supply circuit				
Rated control supply voltage U_S - power consumption		**A1-A2**	24 V AC	24 V AC
		A1-A2	110-130 V AC approx. 1.5 VA	110-130 V AC approx. 4 VA
		A1-A2	220-240 V AC approx. 1.5 VA	220-240 V AC approx. 4 VA
		A1-A2	380-415 V AC approx. 1.5 VA	
Rated control supply voltage U_S tolerance			-15...+10 %	
Rated frequency			50-60 Hz	
Duty time			100 %	
Measuring circuit			**MAX-MIN-C**	
Monitoring function			liquid level control	
Response sensitivity			5-100 kΩ, adjustable	
Maximum electrode voltage			30 V AC	
Maximum electrode current			1 mA	
Electrode supply line		max. cable capacity	10 nF	
		max. cable length	100 m	
Timing circuit				
Time delay			-	
Tripping delay			approx. 250 ms	
Indication of operational states				
Control supply voltage			U: green LED	
Output relay energized			R MAX/MIN: yellow LED	
Alarm relay AL1			-	R AL1: yellow LED
Alarm relay AL2			-	R AL2: yellow LED
Output circuits			**11-12/14, 21-22, 31-32**	
Kind of output			1 c/o contact, 1 n/o + 1 n/c contact [2]	
Operational principle [1]			open-circuit principle	open- and closed-circuit principle
Contact material			AgCdo	
Rated operational voltage U_e		(IEC/EN 60947-1)	250 V	
Minimum switching voltage / minimum switching current			- / -	
Maximum switching voltage			250 V	
Rated operational current I_e (IEC/EN 60947-5-1)	AC12 (resistive)	230 V	4 A	
	AC15 (inductive)	230 V	3 A	
	DC12 (resistive)	24 V	4 A	
	DC13 (inductive)	24 V	2 A	
AC rating (UL 508)	Utilization category (Control Circuit Rating Code)		B 300	
	max. rated operational voltage		300 V AC	
	max. continuous thermal current at B 300		5 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)			0.3 x 10^6 switching cycles	
Max. fuse rating to achieve short circuit protection		n/c / n/o contact	10 A (4 A [2]) fast-act. / 10 A (6 A [2]) fast-act.	10 A fast-acting / 10 A fast-acting
General data				
Dimensions (W X H X D)			22.5 x 70 x 100 mm (0.89 x 3.07 x 3.94 in)	
Mounting position			any	
Degree of protection		enclosure / terminals	IP50 / IP20	
Ambient temperature range		operation / storage	-20...+60 °C / -40...+85 °C	
Mounting			DIN rail (IEC/EN 60715)	
Electrical connection				
Wire size		fine-strand with wire end ferrule	2 x 2.5 mm² (2 x 14 AWG)	
Standards				
Product standard			IEC 255-6, EN 60255-6	
Low Voltage Directive			2006/95/EG	
EMC Directive			2004/108/EG	
Electromagnetic compatibility			-	
electrostatic discharge		IEC/EN 61000-4-2	Level 3 (6 kV / 8kV)	
radiated, radio-frequency, electromagnetic field		IEC/EN 61000-4-3	Level 3 (10 V/m)	
electrical fast transient / burst		IEC/EN 61000-4-4	Level 3 (2 kV / 5 kHz)	
surge		IEC/EN 61000-4-5	Level 4 (2 kV L-L)	
conducted disturbances, induced by radio-frequency fields		IEC/EN 61000-4-6	Level 3 (10 V)	
Resistance to vibration (IEC 68-2-6)			4 g	
Mechanical resistance (IEC 68-2-6)			6 g	
Isolation data				
Rated insulation voltage between supply, measuring and output circuit (VDE 0110, IEC 60947)			250 V	
Rated impulse withstand voltage between all isolated circuits (VDE0 110, IEC 664)			4 kV / 1.2 - 50 µs	
Test voltage between all isolated circuits			2,5 kV, 50 Hz, 1 min.	
Pollution category (VDE 0110, IEC 664, IEC 255-5)			3 / C	
Overvoltage category (VDE 0110, IEC 664, IEC 255-5)			III / C	
Environmental testing (IEC 68-2-30)			24 h cycle time, 55 °C, 93 % rel., 96 h	

[1] Open-circuit principle: Output relay energizes if the measured value exceeds/drops below the adjusted threshold.
Closed-circuit principle: Output relay de-energizes if the measured value exceeds/drops below the adjusted threshold.

[2] 1SVR 430 851 R1300 (version with safe isolation)

• **Approvals** 2/6

Liquid level relays
CM-ENN UP/DOWN, CM-ENN
Technical data

Type			CM-ENN UP/DOWN	CM-ENN		
Supply circuit						
Rated control supply voltage U_S - power consumption	**A1-A2**		24 V AC	24 V AC		
	A1-A2		110-130 V AC approx. 1.5 VA	110-130 V AC approx. 2.5 VA		
	A1-A2		220-240 V AC approx. 1.5 VA	220-240 V AC approx. 3 VA		
	A1-A2		380-415 V AC approx. 1.5 VA	380-415 V ACapprox. 4 VA		
	A1-A2			24-240 V AC/DC approx. 2 VA/W		
Rated control supply voltage U_S tolerance			-15...+10 %			
Rated frequency			50-60 Hz	50-60 Hz oder DC		
Duty time			100 %			
Measuring circuit			**MAX-MIN-C**			
Monitoring function			liquid level control			
Response sensitivity			adjustable 5-100 kΩ	adjustable		
				250 Ω - 5 kΩ	2.5-50 kΩ	25-500 kΩ
Maximum electrode voltage			30 V AC	20 V AC		
Maximum electrode current			1 mA	8 mA	2 mA	0.5 mA
Electrode supply line		max. cable capacity	10 nF	200 nF	20 nF	4 nF
		max. cable length	100 m	1000 m	100 m	20 m
Timing circuit						
Time delay			-	0.1-10 s, adjustable, ON- or OFF-delay		
Tripping delay			approx. 250 ms	-		
Indication of operational states						
Control supply voltage			U: green LED			
Output relay energized			R MAX/MIN: yellow LED	R: yellow LED		
Output circuits			**11-12/14, 21-22, 31-32**	**15-16/18, 25-26/28**		
Kind of output			1 c/o + 2 n/c contacts	2 c/o contacts		
Operational principle [1]			open-circuit principle	open- and closed-circuit principle		
Contact material			AgCdo			
Rated operational voltage U_e	(IEC/EN 60947-1)		250 V	400 V		
Minimum switching voltage / minimum switching current			- / -			
Maximum switching voltage			250 V	400 V		
Rated operational current I_e (IEC/EN 60947-5-1)	AC12 (resistive)	230 V	4 A	5 A		
	AC15 (inductive)	230 V	3 A			
	DC12 (resistive)	24 V	4 A	5 A		
	DC13 (inductive)	24 V	2 A	2.5 A		
AC rating (UL 508)	Utilization category (Control Circuit Rating Code)		B 300			
	max. rated operational voltage		300 V AC			
	max. continuous thermal current at B 300		5 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)			0.3 x 10^6 switching cycles	0.1 x 10^6 switching cycles		
Max. fuse rating to achieve short circuit protection	n/c / n/o contact		4 A fast-acting / 6 A fast-acting			
General data						
Diemensions (W X H X D)			45 x 78 x 100 mm (1.77 x 3.07 x 3.94 in)			
Mounting position			any			
Degree of protection	enclosure / terminals		IP50 / IP20			
Ambient temperature range	operation / storage		-25...+65 °C / -40...+85 °C			
Mounting			DIN rail (IEC/EN 60715)			
Electrical connection						
Wire size	fine-strand with wire end ferrule		2 x 2.5 mm² (2 x 14 AWG)			
Standards						
Product standard			IEC 255-6, EN 60255-6			
Low Voltage Directive			2006/95/EG			
EMC Directive			2004/108/EG			
Electromagnetic compatibility			-			
electrostatic discharge	IEC/EN 61000-4-2		Level 3 (6 kV / 8kV)			
radiated, radio-frequency, electromagnetic field	IEC/EN 61000-4-3		Level 3 (10 V/m)			
electrical fast transient / burst	IEC/EN 61000-4-4		Level 3 (2 kV / 5 kHz)			
surge	IEC/EN 61000-4-5		Level 4 (2 kV L-L)			
conducted disturbances, induced by radio-frequency fields	IEC/EN 61000-4-6		Level 3 (10 V)			
Resistance to vibration (IEC 68-2-6)			5 g			
Mechanical resistance (IEC 68-2-6)			10 g			
Isolation data						
Rated insulation voltage between supply, measuring and output circuit (VDE 0110, IEC 60947)			250 V	500 V		
Rated impulse withstand voltage between all isolated circuits (VDE0 110, IEC 664)			4 kV / 1.2 - 50 µs			
Test voltage between all isolated circuits			2,5 kV, 50 Hz, 1 min.			
Pollution category (VDE 0110, IEC 664, IEC 255-5)			3 / C			
Overvoltage category (VDE 0110, IEC 664, IEC 255-5)			III / C			
Environmental testing (IEC 68-2-30)			24 h cycle time, 55 °C, 93 % rel., 96 h			

[1] Open-circuit principle: Output relay energizes if the measured value exceeds/drops below the adjusted threshold.
Closed-circuit principle: Output relay de-energizes if the measured value exceeds/drops below the adjusted threshold.

• **Approvals** 2/6

2CDC110004C0207

Contact protection relays
Sensor interface relay

Content

Contact protection relay CM-KRN
Ordering details

CM-KRN

① Time range selector switch
② Response (ON-)delay
③ U: green LED - control supply voltage
④ R: yellow LED - relay status
⑤ Marker label

- Protects and reduces load from sensitive control contacts
- Adjustable ON-delay 0.05-30 s
- Acts as two-position switch
- Stores switch positions
- Electrically isolated circuits
- 2 c/o contacts
- 2 LEDs for status indication

The CM-KRN protects sensitive control contacts from excessive load. It can be used with latching function or without. Bounce time of control contacts can be bypassed by the adjustable response delay time.

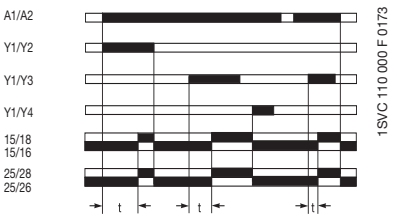
Use for contact protection

The contact to be protected is connected to terminals Y1 and Y2.

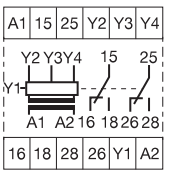
Use for contact protection with latching capacity

The output relay energizes after contact Y1-Y3 has been closed for at least 20 ms. It remains energized until contact Y1-Y4 closes. The switching positions are stored.
The relay is suitable for load reduction purposes for devices with minimum and maximum contacts.
The CM-KRN can be operated via 3-wire proximity sensors for switching of higher power. The supply circuit, the control circuit and the output circuit are electrically isolated against each other.

Function diagram CM-KRN



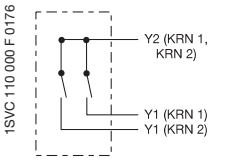
Connection diagram CM-KRN



A1-A2 Rated control supply voltage

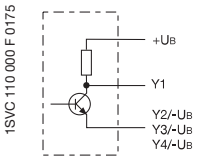
Measuring circuits:
Y1-Y2 "On-Off" input (max. switch-on resistance 6-10 kΩ, min. switch-off resistance 15-20 kΩ)
Y1-Y3 "Set" input (max. switch-on resistance 6-10 kΩ)
Y1-Y4 "Reset" input (max. switch-off resistance 15-20 kΩ)
15-16/18 Output contacts - open-circuit principle
25-26/28 open-circuit principle

Use, applications



Actuators with 2 contacts and one common point can be connected to 2 separate CM-KRN units.
Connect the common point of contacts to terminals Y2 of the two CM-KRN units.

Operation via 3-wire proximity sensors NPN



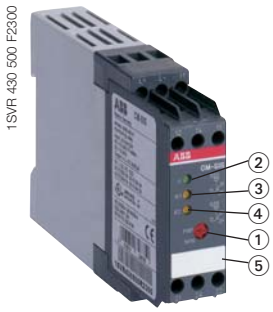
On; relay energizes, Y1/Y3 or Y2
Off; relay de-energizes, Y1/Y4 or Y2

Type	Rated control supply voltage 50-60 Hz	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg / lb
with timing circuit 0.05-30 s					
CM-KRN	24 V AC	**1SVR 450 089 R0000**	1		0.30 / 0.66
	110-130 V AC	**1SVR 450 080 R0000**	1		0.30 / 0.66
	220-240 V AC	**1SVR 450 081 R0000**	1		0.30 / 0.66
	380-415 V AC	**1SVR 450 082 R0000**	1		0.30 / 0.66
without timing circuit					
CM-KRN	24 V AC	**1SVR 450 099 R0000**	1		0.30 / 0.66
	110-130 V AC	**1SVR 450 090 R0000**	1		0.30 / 0.66
	220-240 V AC	**1SVR 450 091 R0000**	1		0.30 / 0.66
	24 V AC/DC [1]	**1SVR 450 099 R1000**	1		0.30 / 0.66

[1] not electrically isolated

• **Technical data**..... 2/94 • **Technical diagrams**.....2/102 • **Dimensional drawings**..... 2/103
• **Accessories** 2/104

Sensor interface relay
CM-SIS
Ordering details



CM-SIS

① Rotary switch for sensor type selection
② U: green LED - control supply voltage
③ R1: red LED - relay status R1
④ R2: red LED - relay status R2
⑤ Marker label

- High efficiency
- Low heating
- Wide range of supply voltage
- Constant output voltage 24 V DC
- Safe isolation acc. to EN 50178 (VDE 0160)
- Short-circuit and overload proof
- Input protected by internal fuse
- 2 x 1 c/o contact
- 3 LEDs for status indication

The CM-SIS is used to supply 2- or 3-wire NPN or PNP sensors with power and to evaluate their switching signals. Two sensors of the types NPN or PNP can be connected simultaneously. Selection is done via the front-face rotary switch.

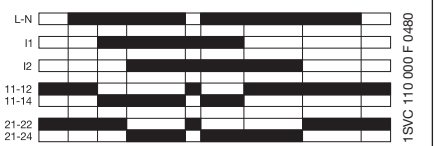
The CM-SIS (terminals L+, L-) supplies the connected sensors with voltage (24 V DC), the maximum power supply current is 0.5 A. The supply voltage and the sensor inputs are electrically isolated from the supply circuit. To ensure maximum safety when using these sensors, the principle of safe isolation has been included.

Each sensor input signal energizes the corresponding output relay without delay. The relay is energized as soon as a threshold current is exceeded at input I1 or I2. Sensor leakage currents of up to 8 mA don't affect the evaluation. The threshold value is about 9 mA. If the threshold value at input I1 or I2 is exceeded the corresponding relay R1 or R2 energizes and the corresponding LED lights up.

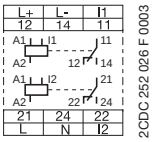
The wide-range supply voltage input of CM-SIS allows its application in nearly all supply systems.

The CM-SIS is also suitable for other applications, for example it is also possible to connect PTC or NTC resistors instead of PNP or NPN sensors or to operate the SIS directly by switching contacts.

Function diagram CM-SIS

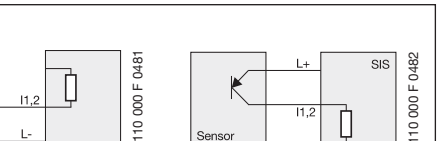


Connection diagram CM-SIS

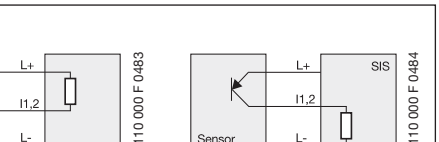


L - N Rated control supply voltage
I1 Sensor input 1
I2 Sensor input 2
L+ - L- Output voltage 24 V DC / 0.5 A
11-12/14 Output contacts -
21-22/24 Open-circuit principle

Connection of 2-wire sensors



Connection of 3-wire sensors



Type	Rated control supply voltage 50-60 Hz	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg / lb
CM-SIS	110-240 V AC / 105-260 V DC	**1SVR 430 500 R2300**	1		0.22 / 0.48

• **Technical data**..... 2/95 • **Technical diagrams**.....2/102 • **Dimensional drawings**..... 2/103
• **Accessories** 2/104

Contact protection relay
CM-KRN
Technical data

Type			CM-KRN	
Supply circuit			**A1-A2**	
Rated control supply voltage U_S - power consumption		A1-A2	24 V AC	- approx. 3.5 VA
		A1-A2	24 V AC/DC	- approx. 3.5 VA
		A1-A2	110-130 V AC	- approx. 3,5 VA
		A1-A2	220-240 V AC	- approx. 3.5 VA
		A1-A2	380-415 V AC	- approx. 3.5 VA
Rated control supply voltage U_S tolerance			-15...+10 %	
Rated frequency			50-60 Hz	
Duty time			100 %	
Timing circuit				
ON-delay time			0.05-1 s, 1.5-30 s	
OFF-delay time			max. 50 ms	
Measuring circuit / contact circuit			**Y1-Y2/Y3/Y4**	
Measuring input	contact protection without latching		Y1-Y2	
	contact protection with latching		Y1-Y3/Y4	
Threshold	Y1-Y2/Y3		6-10 kΩ	
Threshold-Hysteresis	Y1-Y2/Y4		15-20 kΩ	
No-load voltage at the measuring input			≤ 10 V DC	
Contact time for latching (CM-KRN without timing circuit)			min. 20 ms	
Switching current at the measuring input			3 mA	
Maximum applied voltage at the measuring input			≤ ±30 V (contact voltage)	
Indication of operational states				
Control supply voltage	U: green LED		⎍: control supply voltage applied	
Relay status	R: yellow LED		⎍: output relay energized	
Output circuit			**15-16/18, 25-26/28**	
Kind of output			relay, 2 c/o contacts	
Operating principle [1]			open-circuit principle	
Rated operational voltage (VDE 0110, IEC 60947-5-1)			400 V	
Rated switching voltage			400 V AC	
Rated operational current I_e (IEC/EN 60947-5-1)		AC12 (resistive) 230 V	5 A	
		AC15 (inductive) 230 V	3 A	
		DC12 (resistive) 24 V	5 A	
		DC13 (inductive) 24 V	2.5 A	
AC rating (UL 508)	Utilization category (Control Circuit Rating Code)		B 300	
	max. rated operational voltage		300 V AC	
	max. continuous thermal current at B 300		5 A	
	max. making/breaking apparent power at B 300		3600/360 VA	
Mechanical lifetime			30 x 10^6 switching cycles	
Electrical lifeteime (AC12, 230 V, 5 A)			0.1 x 10^6 switching cycles	
Max. fuse rating to achieve short circuit protection		n/c / n/o contact	10 A fast-acting / 10 A fast-acting	
General data				
Dimensions (W x H x D)			45 x 78 x 100 mm (1.77 x 3.07 x 3.94 in)	
Mounting position			any	
Degree of protection		enclosure / terminals	IP20 / IP50	
Ambient temperature range		operation / storage	-25...+65 °C / -40...+85 °C	
Mounting			DIN rail (IEC/EN 60715)	
Electrical connection				
Wire size	fine-strand with wire end ferrule		2 x 2.5 mm² (2 x 14 AWG)	
Standards				
Product standard			IEC 255-6, EN 60255-6	
Low Voltage Directive			2006/95/EC	
EMC Directive			2004/108/EC	
Electromagnetic compatibility				
Interference immunity				
electrostatic discharge		IEC/EN 61000-4-2	6 kV / 8 kV	
radiated, radio-frequency, electromagnetic field		IEC/EN 61000-4-3	10 V/m	
electrical fast transient / burst		IEC/EN 61000-4-4	2 kV / 5 kHz	
surge		IEC/EN 61000-4-5	2 kV symmetrical	
conducted disturbances, induced by radio-frequency fields		IEC/EN 61000-4-6	10 V	
Isolation data				
Rated insulation voltage (IEC 60947-1)			400 V	
Rated impulse withstand voltage U_{imp} (IEC 644-6)			4 kV	
Pollution category (IEC 255-5, IEC 664)			3	
Overvoltage category (IEC 255-5, IEC 664)			III	

[1] Open-circuit principle: Output relay is energized if the measured value exceeds/drops below the adjusted threshold.

• **Approvals** 2/6

Sensor interface relay
CM-SIS
Technical data

Type			CM-SIS
Input circuit			
Supply voltage	L-N	AC	110-240 V AC (-15...+10 %)
		DC	110-240 V (max. 105-260 V DC)
Frequency, AC supply			47-440 Hz
Supply voltage failure bridging time			10 ms min. at 100 % load
Current consumption		max.	0.35 A
		at 115 V AC	0.27 A
		at 230 V AC	0.14 A
Inrush current at 25°C (≤ 2 ms)			33 A
Internal input fuse			800 mA slow-acting
Measuring circuit			**L+, L- / I1, I2**
Sensor voltage		L+ L-	24 V DC ± 3%
Sensor current / power			max. 0.5 A / 12 W
Residual ripple			max. 100 mV_{pp}
Deviation with		load change statical	max. ± 0.5 %
		load change dynamical 10-90 %	max. .5 %
		change of the input voltage	max. ± 0.5 %
Short-circuit protection			overcurrent switch-off with automatic restart
Overload protection			excess temperature and overcurrent switch-off
Reset after thermal overload switch-off			automatic reset after cooling down
Sensor type connection possibilities		I1, I2	2- or 3-wire connection, NPN or PNP selectable by front-face switch
Input resistance			approx. 2.5 kΩ
Threshold value for relays R1, R2			$U_{emitter\text{-}collector}$ < 2,3 V (I1, I2 > 8 mA)
Maximum switching frequency			approx. 20 Hz
Output circuit			**11-12/14, 21-22/24**
Kind of output			2 relays, 1 c/o contact each
Operating principle [1]			open-circuit principle
Rated operational voltage			250 V
Maximum switching voltage			250 V AC
Rated operational current I_e (IEC/EN 60947-5-1)		AC12 (resistive) 230 V	4 A
		AC15 (inductive) 230 V	3 A
		DC12 (resistive) 24 V	4 A
		DC13 (inductive) 24 V	2 A
AC rating (UL 508)		Utilization category (Control Circuit Rating Code)	B 300
		max. rated operational voltage	300 V AC
		max. continuous thermal current at B 300	5 A
		max. making/breaking apparent power at B 300	3600/360 VA
Mechanical lifetime			10 x 10^6 switching cycles
Electrical lifetime			0.1 x 10^6 switching cycles
Max. fuse rating to achieve short circuit protection		n/c / n/o contact	6 A fast-acting / 10 A fast-acting
Indication of operational states			
Control supply voltage		U: green LED	⎍: control supply voltage applied
Relay status R1		R1: yellow LED	⎍: threshold value at input I1 exceeded
Relay status R2		R2: yellow LED	⎍: threshold value at input I2 exceeded
General data			
Efficiency at rated load			approx. 84 % (at 230 V AC)
Ambient temperature range		operation / storage	0...+55 °C / -25...+75 °C
Dimensions (W x H x D)			22.5 x 78 x 100 mm (0.89 x 3.07 x 3.94 in)
Mounting position			horizontally
Mounting			DIN rail (IEC/EN 60715)
Minimum distance to other units			left-hand side 10 mm (0.39 in), vertical distance 50 m (1.97 in)
Electrical connection			
Wire size			2 x 2,5 mm^2 (2 x 14 AWG)
Standards			
Product standard			IEC 255-6, EN 60255-6
Electrical safety			IEC(EN) 60255-5, EN 50178 (VDE 0160), EN60950, UL 508, CSA 22.2
Galvanic isolation			safe isolation between L+,L-, I1,I2, and L,N,11,12,14,21,22,24

• **Approvals** 2/6

Sensor interface module CM-SIS
Technical data

Type		CM-SIS
Electromagnetic compatibility		
Interference immunity		EN 61000-6-2
electrostatic discharge	IEC/EN 61000-4-2	Level 3 (6 / 8 kV)
radiated, radio-frequency, electromagnetic field	IEC/EN 61000-4-3	Level 3 (10 V/m)
electrical fast transient / burst	IEC/EN 61000-4-4	Level 4 (4 kV)
surge	IEC/EN 61000-4-5	Inst. class 3 (2 kV)
conducted disturbances, induced by radio-frequency fields	IEC/EN 61000-4-6	Level 3 (10 V)
Interference emission	EN 50081-2	radiated noise EN 55011, class B
Input current harmonics		no limitation
Isolation data		
Insulation testing		2.5 kV AC (routine test), 3 kV AC (type test)
Degree of pollution		2
Overvoltage category		II

[1] Open-circuit principle: Output relay is energized if the measured value exceeds/drops below the adjusted threshold.

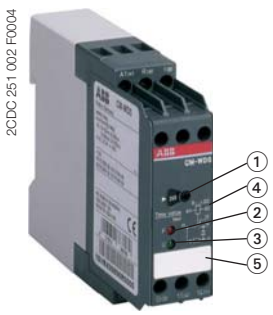
• **Approvals** 2/6

2CDC110004C0207

Cycle monitor with watchdog function

Content

Cycle monitoring relay with watchdog function CM-WDS
Ordering details



CM-WDS

① Setting the lower threshold value of cycle monitoring time
② F: red LED - cycle error
③ U: green LED - control supply voltage
④ Wiring diagram
⑤ Marker label

- Cycle monitor for monitoring the function of programmable logic controllers or industrial pcs
- 4 selectable cycle monitoring time ranges from 0.5 to 1000 ms
- 24 V DC supply
- 1 c/o contact
- 2 LEDs for status indication

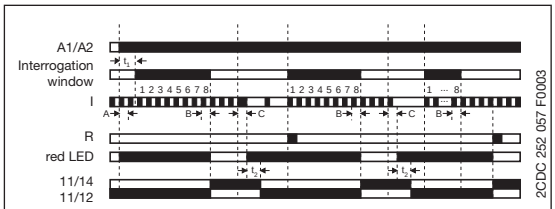
The cycle monitoring relay CM-WDS (watchdog) observes if a regularly intermittent pulse is applied to its pulse input "I". It is, for example, possible to connect the output of a programmable logic controller (plc), which is set and reset regularly (e. g. once each cycle). The connected cycle pulse must be generated by suitable programming of the plc/ipc. Now, the CM-WDS monitors if the cycle time of the plc/ipc program is smaller than the cycle monitoring time setted by means of the front-face selector switch "time value (ms)".

The output relay 11-12/14 of the CM-WDS energizes and the red LED is switched off, if there are minimum 8 successive regular pulses on input "I". When the pulse signal stays out or is not regular, the output relay de-energizes and the red LED is illuminated.

In case the monitoring time is too short or too long, this can be adjusted by a modified programming of the plc/ips or by modified setting of the monitoring time "time value (ms)".

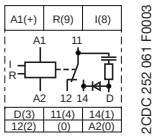
A fault recognized and stored with the CM-WDS can be reset by an H-impulse (0-1-transition) on the reset input "R(9)", so that the cycle monitoring is again released. The reset impulse can be generated by means of a reset button or by suitable programming of the controller (plc/ipc).

Funktion diagram CM-WDS



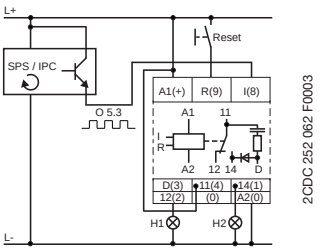
A = Cycle monitor
B = Cycle is correct, no cycle error
C = Cycle failure 1: pulse > monitoring window
Cycle failure 2: pulse stays out
t_1 = 300 ms
t_2 = 260 ms

Connection diagram CM-WDS



A1/A2	Rated control supply voltage
I	Cycle pulse input
R	Reset input
11-12/14	Output relay
D	Protected output (freewheeling diode)

Example of application - circuit diagram



Application

The CM-WDS is designed for the external monitoring of the correct function of programmable logic controllers (plc) and industrial pcs (ipc).

Type	Rated control supply voltage	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg / lb
CM-WDS	24 V DC	**1SVR 430 896 R0000**	1		0.15 / 0.33

• **Technical data**..... 2/99
• **Technical diagrams** ..... 2/102 • **Dimensional drawings** .....2/103 • **Accessories**..... 2/104

Cycle monitoring relay with watchdog function CM-WDS
Technical data

Type			CM-WDS
Input circuit			**A1-A2**
Rated control supply voltage U_S - power consumption		A1-A2	24 V DC - approx. 1 W
Tolerance of the rated control supply voltage U_S			-30 % - +30 %
Duty time			100 %
Measuring circuit			**I**
Monitoring function			cycle monitoring
Measuring voltage			24 V DC
Current consumption at the measuring input			approx. 5 mA
Setting range of cycle monitoring time			selectable: 0.5-150 ms, 0.5-260 ms, 0.5-500 ms, 0.5-1000 ms
Response time			approx. 0.5-1000 ms
Accuracy within the supply voltage tolerance			$\Delta U \leq 0.5$ %
Accuracy within the temperature range			$\Delta U \leq 0.06$ % / °C
Timing circuit			
ON-delay			approx. 2.2-10 s
Tripping delay			approx. 260 ms
Indication of operational states			
Control supply voltage			U: green LED
Output relay de-energized / cycle error			F: red LED
Output circuit			**11-12/14**
Kind of output			1 c/o
Operating principle [1]			Closed-circuit principle
Contact material			AgCdo
Rated operational voltage U_e		IEC/EN 60947-1	250 V
Minimum switching voltage / Minimum switching current			
Maximum switching voltage			250 V AC, 250 V DC
Rated operational current I_e (IEC/EN 60947-5-1)	AC12 (resistive) 230 V		4 A
	AC15 (inductive) 230 V		3 A
	DC12 (resistive) 24 V		4 A
	DC13 (inductive) 24 V		2 A
AC rating (UL 508)	Utilization category (Control Circuit Rating Code)		B 300
	max. rated operational voltage		300 V AC
	max. continuous thermal current at B 300		5 A
	max. making/breaking apparent power at B 300		3600/360 VA
Mechanical lifetime			10 x 10^6 switching cycles
Electrical lifeteime (AC12, 230 V, 4 A)			0.1 x 10^6 switching cycles
Max. fuse rating to achieve short circuit protection		n/c / n/o contacts	10 A fast-acting / 10 A fast-acting
General data			
Dimensions (W x H x D)			22.5 x 78 x 100 mm (0.89 x 3.07 x 3.94 in)
Mounting position			any
Degree of protection		enclosure / terminals	IP50 / IP20
Ambient temperature range		operation / storage	-20...+60 °C / -40...+85 °C
Mounting			DIN rail (IEC/EN 60715)
Electrical connection			
Wire size		fine-strand with wire end ferrule	2 x 2.5 mm^2 (2 x 14 AWG)
Standards			
Product standard			IEC 255-6, EN 60255-6
Low Voltage Directive			2006/95/EC
EMC Directive			2004/108/EC
Operational reliability (IEC 68-2-6)			4 g
Mechanical shock resistance (IEC 68-2-6)			6 g
Electromagnetic compatibility			
Interference immunity to			EN 61000-6-2
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)
electrical fast transient / burst		IEC/EN 61000-4-4	Level 3 (2 kV / 5 kHz)
surge		IEC/EN 61000-4-5	Level 3 (2 kV L-L)
conducted disturbances, induced by radio-frequency fields		IEC/EN 61000-4-6	Level 3 (10 V)
Interference emission			EN 61000-6-4

• **Approvals** 2/6

Isolation data	
Rated insulation voltage between supply-, control- and output circuit (VDE 0110, IEC 60947-1)	250 V
Rated impulse withstand between all isolated circuits (VDE 0110, IEC 664)	4 kV / 1.2-50 µs
Test voltage between all isolated circuits	2.5 kV, 50 Hz, 1 min
Pollution degree (VDE 0110, IEC 664, IEC 255-5)	3/C
Overvoltage category (VDE 0110, IEC 664, IEC 255-5)	III
Environmental tests (IEC 68-2-30)	24 h cycle, 55 °C, 93 % rel. 96 h

[1] Closed-circuit principle: Output relay de-energizes if a cycle error occurs

• **Approvals** 2/6

General technical data, Accessories, Current transformers

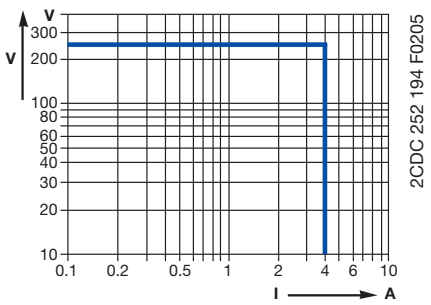
Content

Measuring and monitoring relays
CM range
Technical diagrams

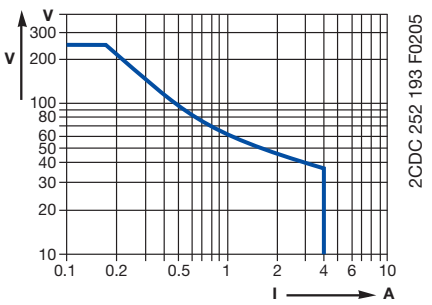
Load limit curves

CM-S (22.5 mm), CM-E (22.5 mm)

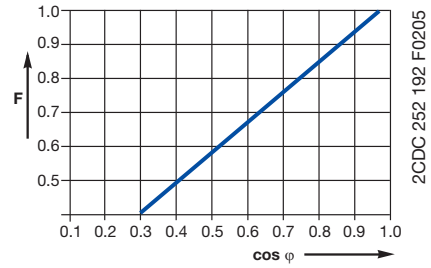
AC load (resistive)



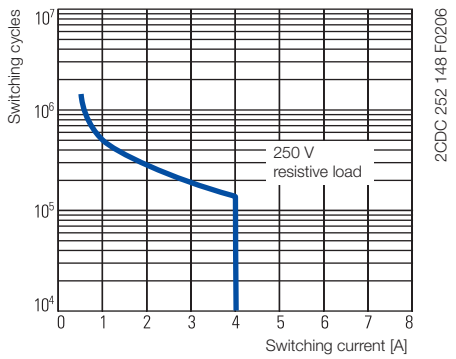
DC load (resistive)



Derating factor F for inductive AC load

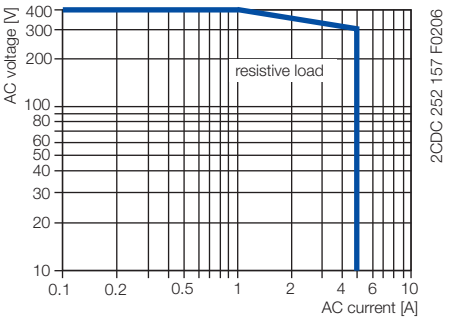


Contact lifetime

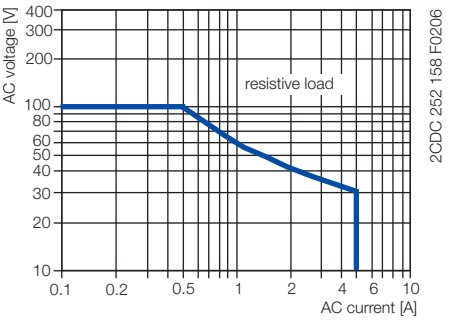


CM-N (45 mm)

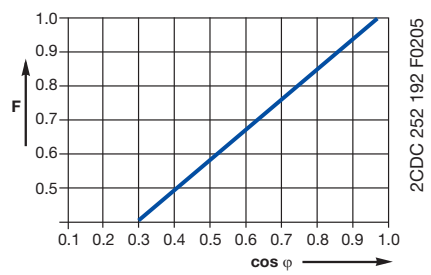
AC load (resistive)



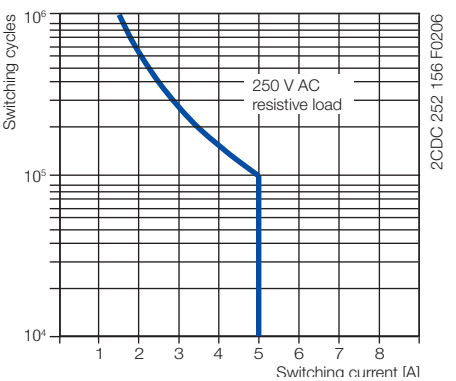
DC load (resistive)



Derating factor F for inductive AC load



Contact lifetime



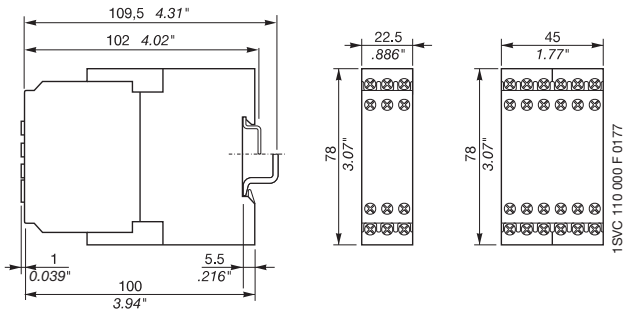
Dimensional drawings

Dimensions in mm

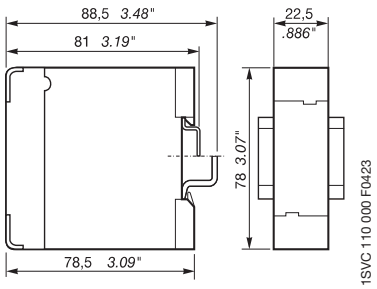
Measuring and monitoring relays CM range

CM-S
22.5 mm

CM-N
45 mm

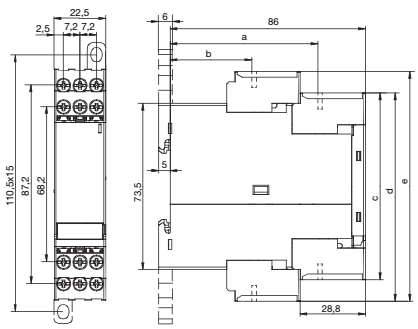


CM-E
22.5 mm



Temperature monitoring relays C51x range

C510 / C511
22.5 mm

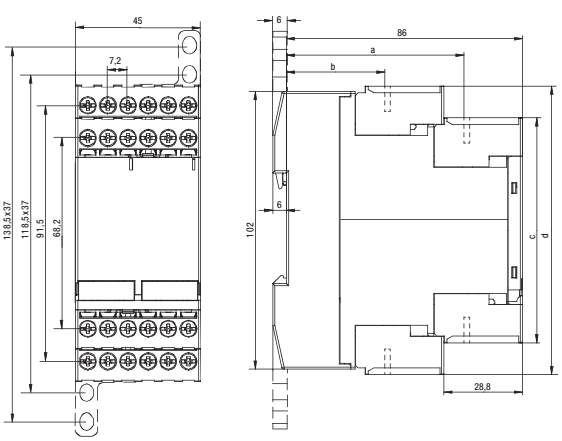


	C510, C511
Ø 5 ... 6 mm / PZ2	0,8 ... 1,2 Nm 7 ... 10.3 lb·in
10	1 x 0,5 ... 4,0 mm² 2 x 0,5 ... 2,5 mm²
10	2 x 0,5 ... 1,5 mm² 1 x 0,5 ... 2,5 mm²
10	—
AWG	2 x 20 ... 14

2CDC 252 287 F0005

	a	b	c	d	e
C510, C511	65	36	82,6	92,2	101,6

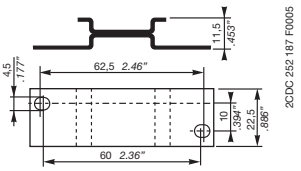
C512/C513
45 mm



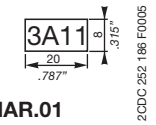
	C512 C513
Ø 5 ... 6 mm / PZ2	0,8 ... 1,2 Nm 7 ... 10.3 lb·in
10	1 x 0,5 ... 4,0 mm² 2 x 0,5 ... 2,5 mm²
10	2 x 0,5 ... 1,5 mm² 1 x 0,5 ... 2,5 mm²
10	—
AWG	2 x 20 ... 14

2CDC 252 288 F0005

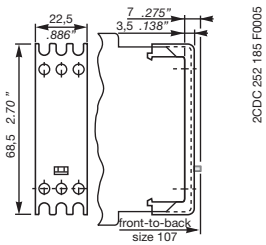
	a	b	c	d
C512, C513	65	36	82,6	105,9



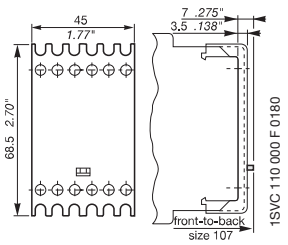
ADP.01



MAR.01



Sealable cover COV.01



Sealable cover COV.02

Accessories

Adapter for screw mounting

Type	for type	Width in mm	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece g / oz
ADP.01	CM-S	22.5	**1SVR 430 029 R0100**	1		18.4/0.65
ADP.02	CM-N	45.0	**1SVR 440 029 R0100**	1		36.7/1.30

Marker label

Type	for type	for devices	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece g / oz
MAR.01	CM-S, CM-N	without DIP switches	**1SVR 366 017 R0100**	10		0.19/0.007
MAR.02	CM-S, CM-N	with DIP switches	**1SVR 430 043 R0000**	10		0.13/0.005

Sealable transparent cover

Type	for type	Width in mm	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece g / oz
COV.01	CM-S	22.5	**1SVR 430 005 R0100**	1		5.2/0.18
COV.02	CM-N	45.0	**1SVR 440 005 R0100**	1		7.7/0.27

CM-CT

CM-CT
with mounted accessories

CM-CT-A
mounted on DIN rail

Plug-in current transformers CM-CT

- Without primary conductor though with foot angle, insulating protective cap and bar fastening screws
- Primary / rated current from 50 A to 600 A
- Secondary current of 1 A or 5 A
- Class 1

Secondary current 1 A

Type	Rated / primary current	Burden / class	Order code	Pack. unit pieces	Price 1 piece
CM-CT 50/1	50 A	1 VA / 1	**1SVR 450 116 R1000**	1	
CM-CT 75/1	75 A	1.5 VA / 1	**1SVR 450 116 R1100**	1	
CM-CT 100/1	100 A	2.5 VA / 1	**1SVR 450 116 R1200**	1	
CM-CT 150/1	150 A	2.5 VA / 1	**1SVR 450 116 R1300**	1	
CM-CT 200/1	200 A	2.5 VA / 1	**1SVR 450 116 R1400**	1	
CM-CT 300/1	300 A	5 VA / 1	**1SVR 450 117 R1100**	1	
CM-CT 400/1	400 A	5 VA / 1	**1SVR 450 117 R1200**	1	
CM-CT 500/1	500 A	5 VA / 1	**1SVR 450 117 R1300**	1	
CM-CT 600/1	600 A	5 VA / 1	**1SVR 450 117 R1400**	1	

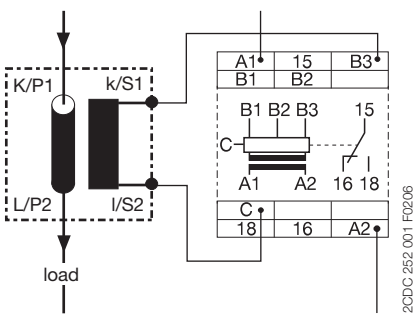
Secondary current 5 A

Type	Rated / primary current	Burden / class	Order code	Pack. unit pieces	Price 1 piece
CM-CT 50/5	50 A	1 VA / 1	**1SVR 450 116 R5000**	1	
CM-CT 75/5	75 A	1.5 VA / 1	**1SVR 450 116 R5100**	1	
CM-CT 100/5	100 A	2.5 VA / 1	**1SVR 450 116 R5200**	1	
CM-CT 150/5	150 A	2.5 VA / 1	**1SVR 450 116 R5300**	1	
CM-CT 200/5	200 A	5 VA / 1	**1SVR 450 116 R5400**	1	
CM-CT 300/5	300 A	5 VA / 1	**1SVR 450 117 R5100**	1	
CM-CT 400/5	400 A	5 VA / 1	**1SVR 450 117 R5200**	1	
CM-CT 500/5	500 A	5 VA / 1	**1SVR 450 117 R5300**	1	
CM-CT 600/5	600 A	5 VA / 1	**1SVR 450 117 R5400**	1	

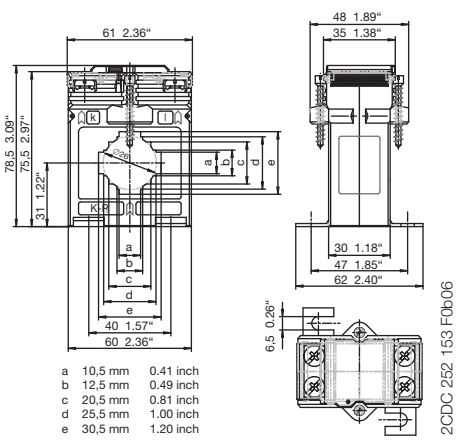
Accessories

Type	Description	Order code	Pack. unit pieces	Price 1 piece
CM-CT-A	Snap-on fastener for DIN rail mounting of CM-CT	**1SVR 450 118 R1000**	10	

Operating principle / circuit diagram



Dimensional drawing



Notes