



Electronic measuring and monitoring relays

CM and C51x range

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Electronic measuring and monitoring relays CM range Benefits and advantages

2



2CDC 253 024 F0004

CM-E range: Economic



1SVR 550 851 F 9400

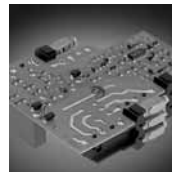
- Only 22.5 mm wide enclosure
- Output contacts: 1 c/o contact or 1 n/o contact (250 V / 4 A)
- One supply voltage range
- One monitoring function
- Cost-efficient solution for OEM applications
- Preset monitoring ranges

Combination screws

Easy tightening and release of the connecting screws by pozidrive, slotted screwdriver or screwdriver for recessed head screws.



1SVC 110 000 F 0506



2CDC 253 011 F 0003

Safety

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



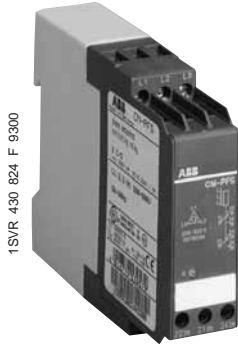
1SVC 110 000 F 0528

Electronic measuring and monitoring relays

CM range

Benefits and advantages

CM-S range: Universal



1SVR 430 824 F 9300

- Only 22.5 mm wide enclosure
- Output contacts: 1 or 2 c/o contacts (250 V / 4 A)
- One supply voltage range or supplied by measuring circuit
- Setting and operation via front-face operating elements
- Adjustment of threshold values and switching hysteresis via calibrated dials
- Integrated and snap-fitted front-face marker
- Sealable transparent covers (accessories)



1SVC 110 000 F 0510

Direct reading scales

Direct adjustment of the threshold values of measuring and monitoring relays without any additional calculation provides maximum operation convenience.

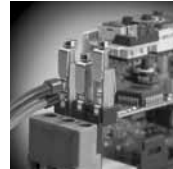
LEDs for status indication

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



1SVC 110 000 F 0511

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), solid or stranded, with or without wire end ferrules. Potential distribution does not require additional connections, thus saving time and money. Wiring is considerably simplified through integrated cable guides.

CM-N range: Multifunctional



1SVR 450 115 F 0100

- Only 45 mm wide enclosure
- Output contacts: 2 c/o contacts (400 V / 5 A)
- Continuous voltage range (24-240 V AC/DC) or single-supply
- Setting and operation via front-face operating elements
- Setting of threshold values and switching hysteresis via calibrated dials
- Adjustable delay times
- Integrated and snap-fitted front-face marker
- Sealable transparent covers (accessories)

Integrated markers

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



1SVC 110 000 F 0499



1SVC 110 000 F 0498

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 air and creepage distances of our products exceed international standards and substantially increase the safety of our products.



2CDC 253 011 F 0003

Electronic measuring and monitoring relays

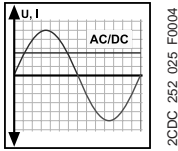
CM and C5xx range

Monitoring features and application ranges

2

Single-phase current and voltage monitoring

Current monitors for AC and DC currents CM-SRS and CM-SRN, voltage monitors CM-ESS and CM-ESN, single-phase under- and overvoltage monitor CM-EFN.



Current monitoring

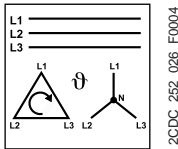
- Monitoring of motor current consumption
- Monitoring of lighting installations and heating circuits
- Monitoring of hoisting gear and transportation equipment overload
- Monitoring of locking devices, electromechanical brake gear and running into stops

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, phase sequence and phase unbalance monitoring using CM-PBE, CM-PVE, CM-PFE, CM-PFS, CM-PFN, CM-PVN, CM-ASS, CM-ASN, CM-MPS.

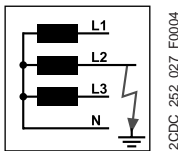


Three-phase voltage monitoring

- Voltage monitoring of mobile three-phase equipment
- Protection of personnel and installations at changes of rotation
- Monitoring of the supply for machines and installations
- Protection of equipment against destruction caused by unstable supply voltage
- Switching to emergency or auxiliary supply
- Protection of motors against damages caused by unbalanced phases

Insulation monitoring

CM-IWN-AC for electrically isolated AC networks, and CM-IWN-DC for electrically isolated DC networks.

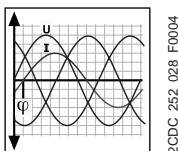


Insulation monitoring

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

Motor load monitoring

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

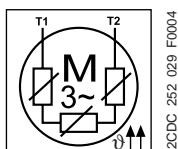


Motor load monitoring

- 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

Thermistor motor protection

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



Thermistor motor protection

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

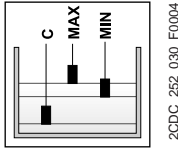
Electronic measuring and monitoring relays

CM and C5xx range

Monitoring features and application ranges

Liquid level monitoring

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



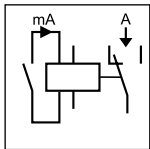
2CDC 252 030 F0004

Liquid level monitoring

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

Contact protection

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.



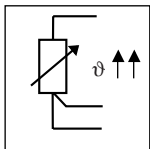
2CDC 252 031 F0004

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

Monitoring and control of temperatures in processes and machines using PT100, PT1000, KTY83/54 or NTC sensors C510, C511, C512, C513.



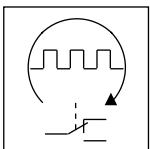
2CDC 252 032 F0004

Temperature monitoring

- Controlling of heating applications
- Controlling and regulation of panel board heating circuits
- Monitoring of motors with build in PT100 sensors
- Monitoring of generators with build in PT100 sensors
- Monitoring of transformers with build in PT100 sensors

Cycle monitor

Cycle monitor with watchdog function CM-WDS.



2CDC 252 036 F0004

Cycle monitor

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

Electronic measuring and monitoring relays

CM and C5xx range

Approvals

2

Current and voltage monitors - single-phase

Three-phase monitors

Approvals	CM-SRS	CM-SRN	CM-ESS	CM-ESN	CM-EFN		CM-PBE	CM-PVE	CM-PFE	CM-PFS	CM-PFN	CM-PVN	CM-ASS	CM-ASN	CM-MPS
UL US LISTED	■	■	■	■	■		■	■	■	■	■	■	■	■	■
	■	■	■	■	■					■	■	■	■	■	■
GOST	■	■	■	■	■		■	■	■	■	■	■	■	■	■
C-Tick	■	■	■	■	■		■	■	■	■	■	■	■	■	■

Insulation monitors

Motor load monitors

Temperature monitors

Contact protection relay, sensor interface module, cycle monitor

Approvals	CM-IWN-AC	CM-IWN-DC	C 558.01	C 558.02	C 558.03		CM-LWN		C 51x		CM-KRN	CM-SIS	CM-WDS
UL US LISTED	■	■	■	■	■		■		□		■	■	□
	■	■		■	■		■				■		
GOST	■	■					■				■	■	■
C-Tick	□	□					□		□		□	□	

Thermistor motor protection relays

Liquid level monitoring and control

Approvals	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/DOWN	CM-ENN	CM-ENN UP/DOWN
UL US LISTED	■	■	■	■	■	□	■	■	■		■	■	■	■	■	■
			■			□							■		■	
GOST	■	■	■	■	■	■	■	■	■		■	■	■	■	■	■
C-Tick	■	■	■	■	■	■	■	■	■		□	□	□	□	□	□
EX II (2) G, PTB 02 ATEX 3080				■	■	□	■	■	■							

- all devices
- pending



Content

Current monitors, single-phase: CM-SRS, CM-SRN

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Load limit curves, dimensional drawings	109
Accessories: Current transformers	48

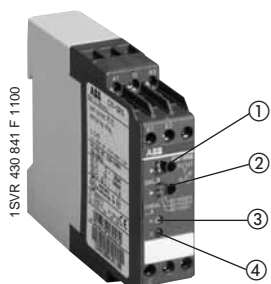
Voltage monitors, single-phase: CM-ESS, CM-ESN, CM-EFN

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Ordering details CM-EFN (under- and overvoltage monitor)	45
Technical data	47
Load limit curves, dimensional drawings	109

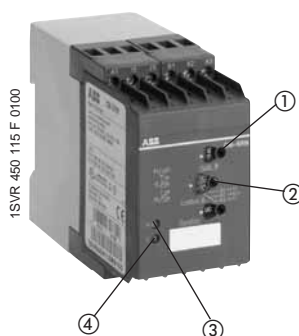
AC/DC current monitors, single-phase CM-SRS, CM-SRN

Ordering details

2



CM-SRS



CM-SRN

- ① Hysteresis adjustment
- ② Threshold value adjustment
- ③ R: yellow LED - relay status
- ④ U: green LED - supply voltage

- Monitoring of AC or DC currents
CM-SRS:
3 ranges: 3 mA - 1 A
CM-SRN:
6 ranges: 3 mA - 15 A
- 3 measuring ranges covered by one unit
- Switching hysteresis adjustable from 5 - 30 %
- 3 supply voltage versions
- 24-240 V AC/DC version with selectable undercurrent or overcurrent monitoring
- CM-SRS: 1 c/o contact
CM-SRN: 2 c/o contacts
- 2 LEDs for status indication

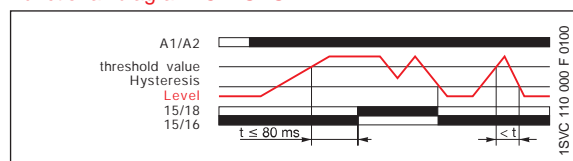
The current being monitored is applied to the terminals B1, B2 or B3 and C. The output relay energizes if the monitored current exceeds the threshold value. The relay de-energizes if the current falls below the threshold (threshold value minus hysteresis range). Both current monitors are used to monitor overcurrents, the CM-SRN type in AC/DC supply version can also be used for undercurrent monitoring.

The hysteresis range can be adjusted from 5-30 % related to the set point. The measuring, output and supply circuits are electrically isolated to prevent mutual interference. As one measuring cycle takes only 80 ms, current changes can be quickly detected.

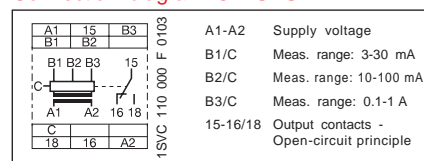
CM-SRS: Supply voltage must be applied at least 50ms before applying the measuring current. Width: 22.5 mm.

CM-SRN: Available with or without delay time. Delay on "ON" is adjustable from 0.05 - 1 s or 1.5 - 30 s, thus enabling optimum adjustment to the actual service conditions. Width: 45 mm.

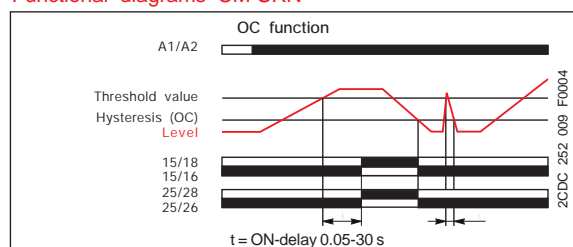
Functional diagram CM-SRS



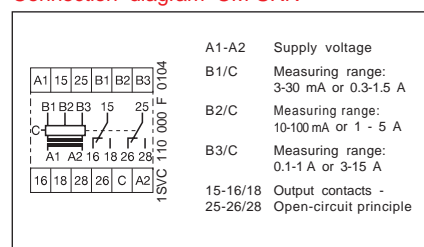
Connection diagram CM-SRS



Functional diagrams CM-SRN



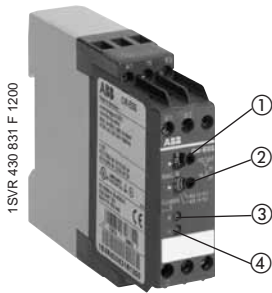
Connection diagram CM-SRN



Type	Supply voltage 50/60 Hz	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg/lb
Measuring ranges: 3-30 mA; 10-100 mA; 0.1-1 A, no time delay					
CM-SRS	24 V AC	1SVR 430 841 R 9100	1		0.150/0.33
	110-130 V AC	1SVR 430 841 R 0100	1		0.150/0.33
	220-240 V AC	1SVR 430 841 R 1100	1		0.150/0.33
Measuring ranges: 3-30 mA; 10-100 mA; 0.1-1 A, no time delay					
CM-SRN	24-240 V AC/DC	1SVR 450 115 R 0000	1		0.300/0.66
	110-130 V AC	1SVR 450 110 R 0000	1		0.300/0.66
	220-240 V AC	1SVR 450 111 R 0000	1		0.300/0.66
Measuring ranges: 0.3-1.5 A; 1-5 A; 3-15 A, no time delay					
CM-SRN	24-240 V AC/DC	1SVR 450 115 R 0100	1		0.300/0.66
	110-130 V AC	1SVR 450 110 R 0100	1		0.300/0.66
	220-240 V AC	1SVR 450 111 R 0100	1		0.300/0.66
Measuring ranges: 3-30 mA; 10-100 mA; 0.1-1 A, with ON-delay					
CM-SRN	24-240 V AC/DC	1SVR 450 125 R 0000	1		0.300/0.66
	110-130 V AC	1SVR 450 120 R 0000	1		0.300/0.66
	220-240 V AC	1SVR 450 121 R 0000	1		0.300/0.66
Measuring ranges: 0.3-1.5 A; 1-5 A; 3-15 A, with ON-delay					
CM-SRN	24-240 V AC/DC	1SVR 450 125 R 0100	1		0.300/0.66
	110-130 V AC	1SVR 450 120 R 0100	1		0.300/0.66
	220-240 V AC	1SVR 450 121 R 0100	1		0.300/0.66

• Technical data	46	• Accessories current transformers	48
• Load limit curves, dimensional drawings	107	• Accessories	109
• Approvals	40		

AC/DC voltage monitors, single-phase CM-ESS Ordering details



CM-ESS

- ① Hysteresis adjustment
- ② Threshold value adjustment
- ③ R: yellow LED - relay status
- ④ U: green LED - supply voltage

- Monitoring of AC or DC voltages from 50 mV - 500 V in 8 ranges
- Up to 3 measuring ranges covered by one unit
- Switching hysteresis adjustable from 5-30 %
- No time delay
- 1 c/o contact
- 2 LEDs for status indication

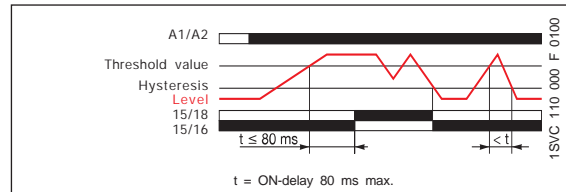
The voltage being monitored is applied to the terminals B1, B2 or B3 and C.

The output relay energizes if the monitored voltage exceeds the threshold value. It de-energizes if the voltage falls below the set hysteresis value.

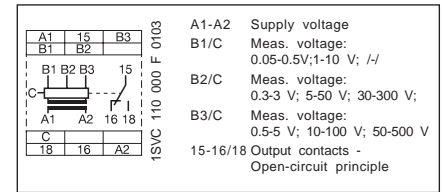
The hysteresis can be adjusted from 5-30 %.

The measuring, output and supply circuits are electrically isolated to prevent mutual interference. As one measuring cycle takes 80 ms, voltage changes can be quickly detected.

Functional diagram CM-ESS



Connection diagram CM-ESS



Type	Supply voltage 50/60 Hz	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg/lb
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Voltage measuring ranges: 0.05-0.5 V; 0.3-3 V; 0.5-5 V, AC/DC

CM-ESS	24 V AC	1SVR 430 831 R 9000	1		0.150/0.33
	110-130 V AC	1SVR 430 831 R 0000	1		0.150/0.33
	220-240 V AC	1SVR 430 831 R 1000	1		0.150/0.33

Voltage measuring ranges: 1-10 V; 5-50 V; 10-100 V, AC/DC

CM-ESS	24 V AC	1SVR 430 831 R 9100	1		0.150/0.33
	110-130 V AC	1SVR 430 831 R 0100	1		0.150/0.33
	220-240 V AC	1SVR 430 831 R 1100	1		0.150/0.33

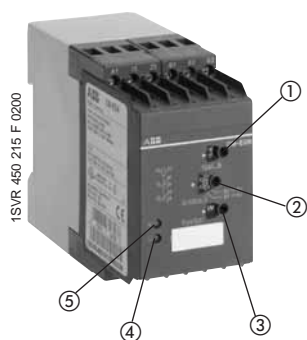
Voltage measuring ranges: -/- ; 30-300 V; 50-500 V, AC/DC

CM-ESS	24 V AC	1SVR 430 831 R 9200	1		0.150/0.33
	110-130 V AC	1SVR 430 831 R 0200	1		0.150/0.33
	220-240 V AC	1SVR 430 831 R 1200	1		0.150/0.33

AC/DC voltage monitors, single-phase CM-ESN

Ordering details

2



CM-ESN

- ① Hysteresis adjustment
- ② Threshold value adjustment
- ③ Function selection: UV/OV
- ④ U: green LED - supply voltage
- ⑤ R: yellow LED - relay status

- Monitoring of AC or DC voltages from 50 mV to 500 V in 8 ranges
- Up to 3 measuring ranges covered by one unit
- Selectable function: Undervoltage or overvoltage monitoring
- Switching hysteresis adjustable from 5-30 %
- With or without time delay from 0.05-30 s
- 2 c/o contacts
- 2 LEDs for status indication

The voltage being monitored is applied to the terminals B1 or B2 or B3 and C. The unit can be set for 2 monitoring modes by a rotary switch on the front face.

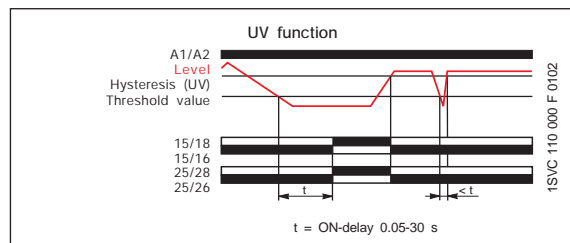
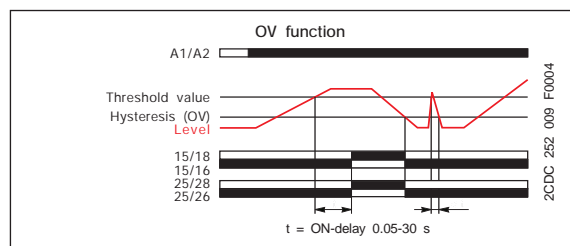
OV position: The output relay is energized if the monitored voltage exceeds the adjusted threshold voltage.

UV position: The output relay is energized if the monitored voltage falls below the adjusted threshold voltage.

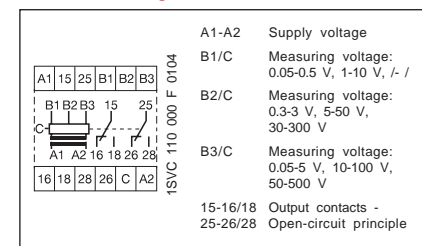
The output relay is de-energized if the monitored voltage is above or below the set hysteresis percentage. With or without time delay of 0.05...30 s. The hysteresis can be adjusted from 5...30 %.

The measuring, output and supply voltage circuits are electrically isolated to prevent mutual interference. As one measuring cycle takes only 80 ms, voltage changes can be quickly detected.

Functional diagram CM-ESN



Connection diagram CM-ESN



Type	Supply voltage 50/60 Hz	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg/lb
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Voltage measuring ranges: 0.05-0.5 V; 0.3-3 V; 0.5-5 V, no time delay					
CM-ESN	24-240 V AC/DC	1SVR 450 215 R 0000	1		0.300/0.66
	110-130 V AC	1SVR 450 210 R 0000	1		0.300/0.66
	220-240 V AC	1SVR 450 211 R 0000	1		0.300/0.66

Voltage measuring ranges: 0.05-0.5 V; 0.3-3 V; 0.5-5 V, with ON-delay					
CM-ESN	24-240 V AC/DC	1SVR 450 225 R 0000	1		0.300/0.66
	110-130 V AC	1SVR 450 220 R 0000	1		0.300/0.66
	220-240 V AC	1SVR 450 221 R 0000	1		0.300/0.66

Voltage measuring ranges: 1-10 V; 5-50 V; 10-100 V, no time delay					
CM-ESN	24-240 V AC/DC	1SVR 450 215 R 0100	1		0.300/0.66
	110-130 V AC	1SVR 450 210 R 0100	1		0.300/0.66
	220-240 V AC	1SVR 450 211 R 0100	1		0.300/0.66

Voltage measuring ranges: 1-10 V; 5-50 V; 10-100 V, with ON-delay					
CM-ESN	24-240 V AC/DC	1SVR 450 225 R 0100	1		0.300/0.66
	110-130 V AC	1SVR 450 220 R 0100	1		0.300/0.66
	220-240 V AC	1SVR 450 221 R 0100	1		0.300/0.66

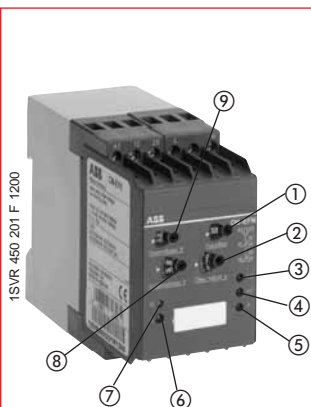
Voltage measuring ranges: /- / ; 30-300 V; 50-500 V, no time delay					
CM-ESN	24-240 V AC/DC	1SVR 450 215 R 0200	1		0.300/0.66
	110-130 V AC	1SVR 450 210 R 0200	1		0.300/0.66
	220-240 V AC	1SVR 450 211 R 0200	1		0.300/0.66

Voltage measuring ranges: /- / ; 30-300 V; 50-500 V, with ON-delay					
CM-ESN	24-240 V AC/DC	1SVR 450 225 R 0200	1		0.300/0.66
	110-130 V AC	1SVR 450 220 R 0200	1		0.300/0.66
	220-240 V AC	1SVR 450 221 R 0200	1		0.300/0.66

• Technical data	47	• Accessories	48
• Load limit curves, dimensional drawings	107	• Approvals	40

AC over- and undervoltage monitor, single-phase CM-EFN

Ordering details



CM-EFN

- ① Time function ☒ / ■
- ② Time adjustment
- ③ >U: red LED - overvoltage
- ④ <U: red LED - undervoltage
- ⑤ P: red LED - phase loss
- ⑥ U: green LED - supply voltage
- ⑦ R: yellow LED - relay status
- ⑧ Threshold value undervoltage
- ⑨ Threshold value overvoltage

- Monitoring of single-phase supply voltage for phase loss as well as overvoltage and undervoltage
- 2 voltage monitoring ranges: 80-160 V and 160-300 V
- Single-phase under- and overvoltage monitoring, adjustable V_{min} and V_{max}
- Adjustable ON- or OFF-delay 0.1-10 s
- 2 c/o contacts
- 5 LEDs for status indication

The CM-EFN monitors single phase supply voltages for phase loss as well as for overvoltage and undervoltage conditions. The output relay is de-energized if one of the fault conditions mentioned before occurs. The fault type is indicated by an LED.

The output relay is energized if the phase is present and the voltage value is correct. The relay is de-energized if the voltage exceeds the set V_{max} value or drops below the set V_{min} value. It is re-energized automatically once the voltage returns into the adjusted voltage frame taking into account the fixed hysteresis of 5 %.

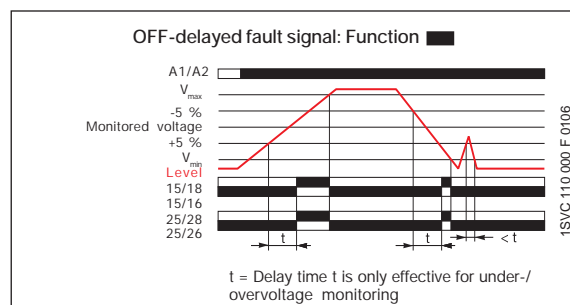
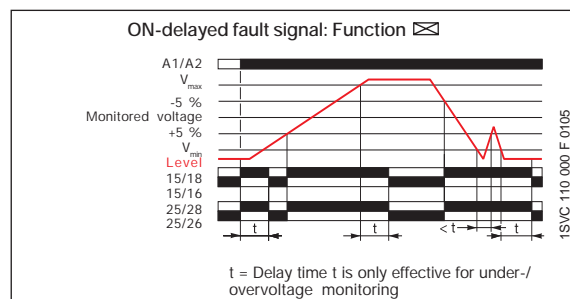
Time delay

The selection switch ☒/■ is used to set the delay time of the CM-EFN as required by the specific service conditions.

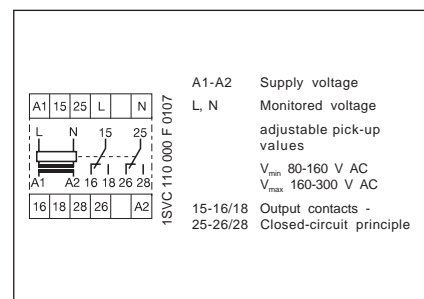
Switch position (☒): The fault signal indicating that the voltage has exceeded or dropped below the adjusted threshold values is suppressed during the set delay time. Momentary voltage fluctuations will thus not initiate alarm tripping.

Switch position (■): The fault signal is issued immediately and stored during the set time. Momentary undervoltage conditions are recognized and, for better evaluation, prolonged by the set time.

Functional diagram CM-EFN



Connection diagram CM-EFN



Type	Supply voltage 50/60 Hz	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg/lb
------	----------------------------	------------	----------------------	------------------	----------------------------

V_{min} : 80-120 V AC 50/60 Hz; V_{max} 120-160 V AC 50/60 Hz

CM-EFN	80-160 V AC 50/60 Hz	1SVR 450 200 R 1100	1		0.300/0.66
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V_{min} : 160-220 V AC 50/60 Hz; V_{max} 220-300 V AC 50/60 Hz

CM-EFN	160-300 V AC 50/60 Hz	1SVR 450 201 R 1200	1		0.300/0.66
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Current monitors, single-phase

CM-SRS, CM-SRN

Technical data

2

	CM-SRS			CM-SRN						
Supply circuit										
Supply voltage - power consumption	A1-A2	24 V AC	approx. 1 VA	24-240 V AC/DC		approx. 2 VA / approx. 2 W				
	A1-A2	110-130 V AC	approx. 1 VA	110-130 V AC		approx. 2 VA				
	A1-A2	220-240 V AC	approx. 2 VA							
Supply voltage tolerance	-15 %...+10 %									
Supply voltage frequency	50/60 Hz			50/60 Hz, for A1-A2 = 24-240 V AC/DC: 0/400 Hz						
Duty time	100 %									
Measuring circuit										
Monitoring function	overcurr.			over- or undercurrent						
Measuring range, threshold value range min.-max.	3-30 mA	10-100 mA	0.1-1 A	3-30 mA	10-100 mA	0.1-1 A	0.3-1.5 A	1-5 A	3-15 A	
Input resistance	33 Ω	10 Ω	1 Ω	33 Ω	10 Ω	1 Ω	0.06 Ω	0.018 Ω	0.006 Ω	
Pulse overload t < 1 s	300 mA	1 A	10 A	300 mA	1 A	10 A	15 A	50 A	100 A	
Possible permanent overload	50 mA	150 mA	1.5 A	50 mA	150 mA	1.5 A	2 A	7 A	20 A	
Hysteresis related to adjusted value	5-30 %, adjustable									
Max. voltage within measuring circuit	-									
Frequency of measured signal	0 Hz, 50-60 Hz									
Max. measuring cycle time	80 ms									
Measuring error within supply voltage tolerance	≤ 0.5%									
Measuring error within temperature range	≤ 0.06 % / °C									
Timing circuit										
	none			Delay of over- and undercurrent signal						
Delay time	-			0.05-1 s, 1.5-30 s, adjustable						
Timing error within supply voltage tolerance	-			≤ 0.5%						
Timing error within temperature range	-			≤ 0.06 % / °C						
Indication of operational states										
Supply voltage	U: green LED									
Output relay energized	R: yellow LED									
Overvoltage	-									
Undervoltage	-									
Phase loss	-									
Output circuits										
	15-16/18			15-16/18, 25-26/28						
Number of contacts	1 c/o contact			2 c/o contacts						
Operating principle ¹⁾	Open-circuit principle									
Contact material	AgCdo									
Rated voltage acc. to VDE 0110, IEC 60947-1	250 V			400 V						
Min. switching voltage	-									
Max. switching voltage	250 V AC, 250 V DC			400 V AC, 400 V DC						
Min. switching current	-									
Rated switching current acc. to IEC 60947-5-1	AC-12 (resistive) 230 V	4 A			5 A					
	AC-15 (inductive) 230 V	3 A			3 A					
	DC-12 (resistive) 24 V	4 A			5 A					
	DC-13 (inductive) 24 V	2 A			2.5 A					
Maximum lifetime	mechanical	30 x 10 ⁶ switching cycles								
	electrical (AC-12, 230 V, 4 A)	0.1 x 10 ⁶ switching cycles								
Short circuit proof, max. fuse rating	n/c contact	10 A fast operating class gL			5 A fast operating class gL					
	n/o contact	10 A fast operating class gL			5 A fast operating class gL					
General data										
Width of enclosure	22.5 mm			45 mm						
Conductor cross section	2 x 2.5 mm ² (2 x 14 AWG) stranded wire with wire end ferrule									
Mounting position	any									
Degree of protection enclosure / terminals	IP50 / IP20									
Operating temperature	-20 °C ... +60 °C			-25 °C ... +65 °C						
Storage temperature	-40 °C ... +85 °C									
Mounting	DIN rail (EN 50022)									
Standards										
Product standard	IEC 255-6, EN 60255-6									
EMC Directive	89/336/EEC									
Electromagnetic compatibility	acc. to EN 61000-6-2, EN 61000-6-4									
ESD acc. to IEC 61000-4-2, EN 61000-4-2	level 3 6 kV / 8 kV									
HF radiation resistance acc. to IEC 61000-4-3, EN 61000-4-3	level 3 10 V/m									
Burst acc. to IEC 61000-4-4, EN 61000-4-4	level 3 2 kV / 5 kHz									
Surge acc. to IEC 61000-4-5, EN 61000-4-5	level 3 2 kV L-L									
HF line emission acc. to IEC 61000-4-6, EN 61000-4-6	level 3 10 V									
Low Voltage Directive	73/23/EEC									
Operational reliability acc. to IEC 68-2-6	4 g			5 g						
Mechanical resistance acc. to IEC 68-2-6	6 g			10 g						
Approvals										
cULus, GL, GOST, C-Tick										
Isolation data										
Rated voltage between supply circuit, monitoring circuit and output circuit acc. to VDE 0110, IEC 60947-1	250 V			400 V						
Rated impulse withstand voltage between all isolated circuits to 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 acc. to VDE 0110, IEC 64, IEC 255-5	III / C									
Overvoltage category acc. to VDE 0110, IEC 664, IEC 255-5	III / C									
Environmental testing acc. to 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 or falls below the adjusted threshold value.

¹⁾ Closed-circuit principle: Output relay de-energizes if the measured value exceeds or falls below the adjusted threshold value.

Voltage monitors, single-phase

CM-ESS, CM-ESN, CM-EFN

Technical data

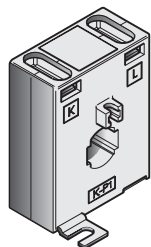
CM-ESS			CM-ESN					CM-EFN		
24 V AC	approx. 1 VA		24-240 V AC/DC approx. 2 VA / approx. 2 W					80-120 V AC	approx. 3 VA	
110-130 V AC	approx. 1 VA		110-130 V AC approx. 2 VA					90-145 V AC	approx. 3 VA	
220-240 V AC	approx. 1 VA		220-240 V AC approx. 2 VA							
-15 %...+10 %										
50/60 Hz										
100 %										
B1-C	B2-C	B3-C	B1-C	B2-C	B3-C	B1-C	B2-C	B3-C	L-N	
overvoltage			overvoltage or undervoltage						overvoltage and undervoltage	
50-500 mV	0.3-3 V	0.5-5 V	1-10 V	5-50 V	10-100V	/-/	30-300V	50-500V	V _{min.} : 80-160 V AC / V _{max.} :160-300 V AC ²⁾	
7.7 kΩ	46.5 kΩ	77.5 kΩ	19 kΩ	95 kΩ	190 kΩ	-	570 kΩ	951 kΩ		
25 V	80 V	100 V	120 V	200 V	400 V	-	550 V	550 V		
10 V	60 V	80 V	100 V	150 V	300 V	-	500 V	550 V		
5-30 %, adjustable see above			5-30 %, adjustable see above						5 % fixed setting	
0 Hz, 50/60 Hz			0 Hz, 50/60 Hz						50/60 Hz	
80 ms			80 ms						80 ms	
≤ 0.5 %										
≤ 0.06 % / °C										
none			delay of over-/undervoltage signal				delay of fault signal ³⁾			
-			0.05-1 s, 1.5-30 s, adjustable				0.1-10 s, adjustable			
-			≤ 0.5 %							
-			≤ 0.06 % / °C							
U: green LED										
R: yellow LED										
>U: red LED										
<U: red LED										
P: red LED										
15-16/18			15-16/18, 25-26/28					15-16/18, 25-26/28		
1 c/o contact								2 c/o contacts		
Open-circuit principle			AgCdo					Closed-circuit principle		
250 V								400 V		
-								-		
250 V AC, 250 V DC			400 V AC, 400 V DC					400 V AC, 400 V DC		
-								-		
4 A			5 A					5 A		
3 A			3 A					3 A		
4 A			5 A					5 A		
2 A			2.5 A					2.5 A		
30 x 10 ⁶ switching cycles										
0.1 x 10 ⁶ switching cycles										
10 A fast operating class gL			5A fast operating class gL							
10 A fast operating class gL			5A fast operating class gL							
22.5 mm			45 mm							
2 x 2.5 mm ² stranded wire with wire end ferrule										
any										
IP50 / IP20										
-20 °C...+60 °C			25 °C...+65 °C							
-40 °C...+85 °C			40 °C...+85 °C							
DIN rail (EN 50022)										
IEC 255-6, EN 60255-6										
89/336/EEC										
level 3 6 kV / 8 kV										
level 3 10 V/m										
level 3 2 kV / 5 kHz										
level 4 2 kV L-L										
level 3 10 V										
73/23/EEC										
4 g			5 g							
6 g			10 g							
cULus, GL, GOST										
250 V			400 V							
4 kV / 1.2 - 50 μs										
2.5 kV, 50 Hz, 1 min.										
III / C										
III / C										
24 h cycle time, 55 °C, 93 % rel., 96 h										

²⁾ Threshold values for overvoltage and undervoltage separately adjustable

³⁾ ON-delay or OFF-delay function selectable

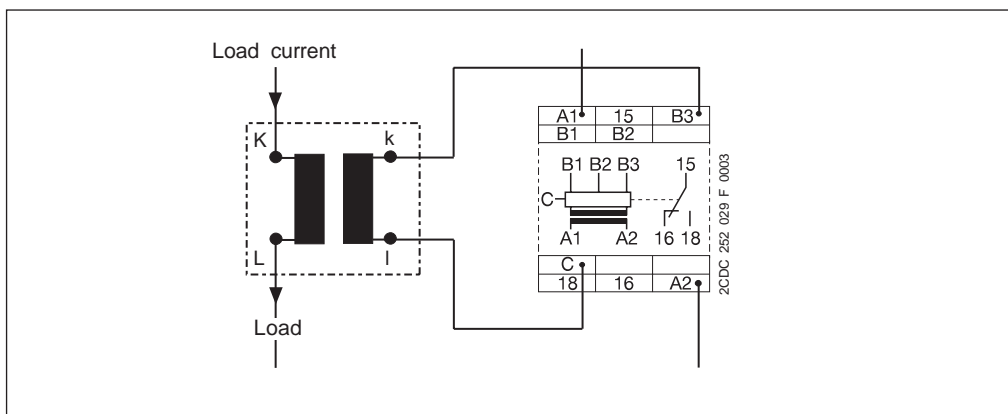


Accessories for current monitors - Current transformer Ordering details



1SVC 110 000 F 0458

Operating principle, circuit diagram



Secondary current 1 A

Type	Nominal/ primary current	Power/ class	Order code	Pack. unit pieces	Price 1 piece
	50 A	2 VA/1	E4 450 116 10	1	
	75 A	2.5 VA/1	E4 450 116 11	1	
	100 A	2.5 VA/1	E4 450 116 12	1	
	150 A	2.5 VA/1	E4 450 116 13	1	
	200 A	2.5 VA/1	E4 450 116 14	1	
	200 A	5 VA/1	E4 450 117 10	1	
	300 A	5 VA/1	E4 450 117 11	1	
	400 A	5 VA/1	E4 450 117 12	1	
	500 A	5 VA/1	E4 450 117 13	1	
	600 A	5 VA/1	E4 450 117 14	1	

Secondary current 5 A

Type	Nominal/ primary current	Power/ class	Order code	Pack. unit pieces	Price 1 piece
	50 A	2 VA/1	E4 450 116 50	1	
	75 A	2.5 VA/1	E4 450 116 51	1	
	100 A	2.5 VA/1	E4 450 116 52	1	
	150 A	5 VA/1	E4 450 116 53	1	
	200 A	5 VA/1	E4 450 116 54	1	
	200 A	5 VA/1	E4 450 117 50	1	
	300 A	5 VA/1	E4 450 117 51	1	
	400 A	5 VA/1	E4 450 117 52	1	
	500 A	5 VA/1	E4 450 117 53	1	
	600 A	5 VA/1	E4 450 117 54	1	

Content

Phase loss monitor CM-PBE, phase monitor for over- and undervoltage CM-PVE

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Phase sequence monitors CM-PFE and CM-PFS

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Phase monitors for phase sequence, phase loss, over- and undervoltage CM-PFN and CM-PVN

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Phase unbalance monitors CM-ASS, CM-ASN

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Multifunctional three-phase monitors for phase sequence, phase loss, over- and undervoltage, phase unbalance CM-MPS

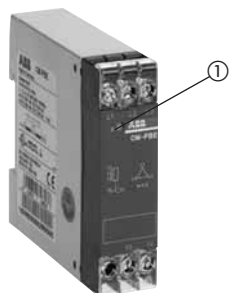
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Phase loss monitor CM-PBE

Phase monitor for over- and undervoltage CM-PVE

Ordering details

1SVR 550 882 F 9500

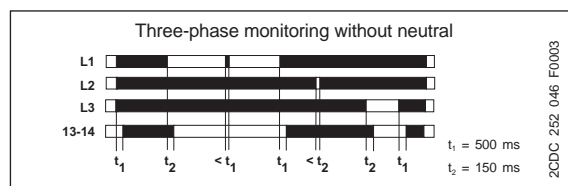
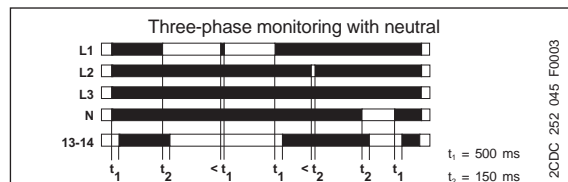


① R: yellow LED - relay status

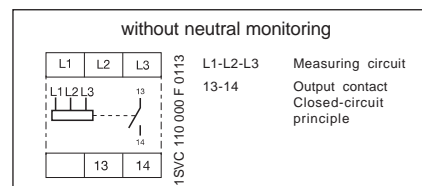
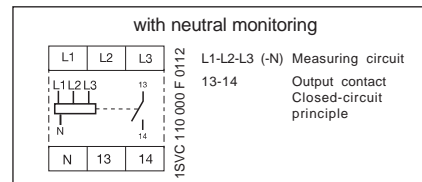
- Monitoring of three-phase and single-phase supply voltage for phase loss
- Optionally with neutral monitoring
- No phase sequence monitoring
- Voltage monitoring range:
L1-L2-L3: 3 x 380-440 V AC
L-N: 220-240 V AC
- 1 n/o contact
- LED for status indication

The **CM-PBE phase loss monitor** is used to monitor supply voltages for phase loss ($V_{meas} < 60\% \times V_{nom}$). If all three phases are present, the output relay is energized. If the above fault occurs, the output relay is de-energized and the yellow LED turns off. The relay is re-energized automatically as soon as the voltage returns to the nominal range, taking into account a fixed hysteresis. The version with neutral monitoring can also be used in single-phase networks by jumpering the three phase terminals (L1, L2, L3) and connecting only one phase.

Functional diagrams CM-PBE

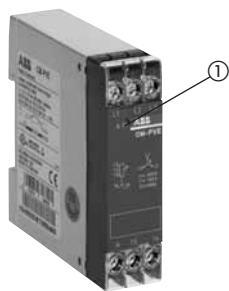


Connection diagrams CM-PBE



Type		Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg/lb
CM-PBE	with neutral monitoring	1SVR 550 881 R 9400	1		0.075/0.17
	without neutral monitoring	1SVR 550 882 R 9500	1		0.075/0.17

1SVR 550 870 F 9400



CM-PVE

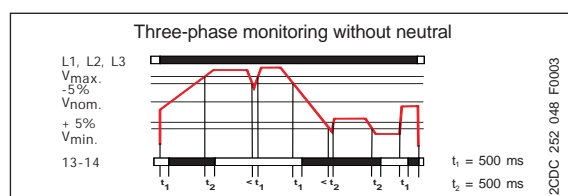
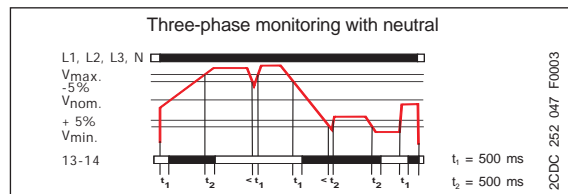
① R: yellow LED - relay status

- Monitoring of three-phase and single-phase supply voltage for overvoltage, undervoltage and phase loss
- Optionally with neutral monitoring
- No phase sequence monitoring
- Voltage monitoring range:
L1-L2-L3: 3 x 260-480 V AC
L-N: 150-275 V AC
- 1 n/o contact
- LED for status indication

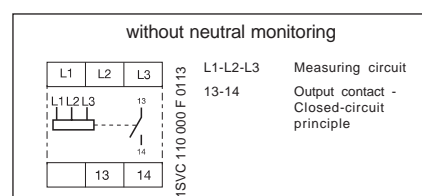
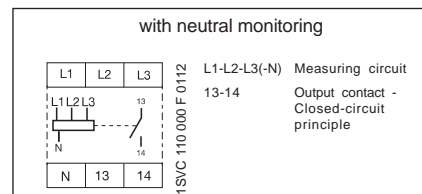
The **CM-PVE phase monitor** is used to monitor supply voltages for undervoltage, overvoltage and phase loss. If all three phases are present with correct voltage, the output relay is energized. If one of the above faults occurs, i. e. if the voltage [L-L (L-N)] exceeds the voltage value V_{max} (460 V / 265 V) or falls below the voltage value V_{min} (320 V / 185 V), the output relay is de-energized and the yellow LED turns off.

The relay is re-energized automatically as soon as the voltage returns to the tolerance range, taking into account a fixed hysteresis of 5%. The product with neutral monitoring can also be used in single-phase networks by jumpering the three phase terminals (L1, L2, L3) and connecting only one phase.

Functional diagrams CM-PVE



Connection diagram CM-PVE

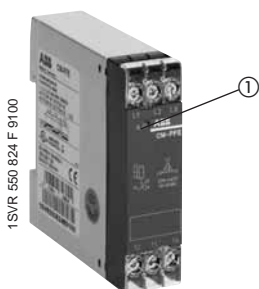


Type		Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg/lb
CM-PVE	with neutral monitoring	1SVR 550 870 R 9400	1		0.075/0.17
	without neutral monitoring	1SVR 550 871 R 9500	1		0.075/0.17

Phase sequence monitors

CM-PFE, CM-PFS

Ordering details



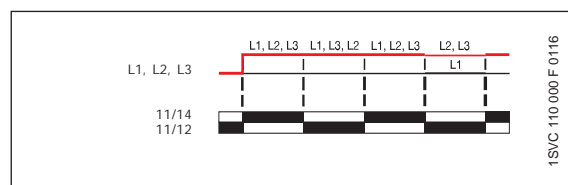
CM-PFE

① R: yellow LED - relay status

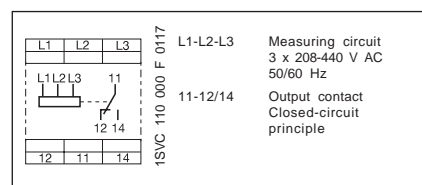
- Monitoring of three-phase supply voltage for phase sequence and phase loss
- No delay
- Continuous voltage range 3 x 208-440 V 50/60 Hz
- 1 c/o contact
- LED for status indication

The **CM-PFE phase sequence monitor** is used to monitor three-phase supply voltages for incorrect phase sequence. The output relay remains energized with correct phase sequence. It resets and the yellow LED turns off in case of incorrect phase sequence or phase loss. In case of motors which continue running with only two phases, the CM-PFE detects phase loss if the reverse feeded voltage is less than 60% of the nominal voltage. For applications where a reverse feeded voltage > 60% is expected we recommend to use our device with monitoring phase unbalance function.

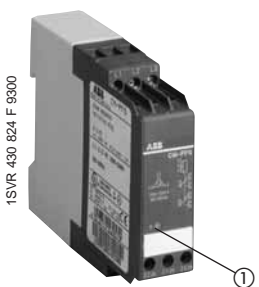
Functional diagram CM-PFE



Connection diagram CM-PFE



Type	Supply voltage = measuring voltage	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg/lb
CM-PFE	3 x 208-440 V AC 50/60 Hz	1SVR 550 824 R 9100	1		0.075/0.17



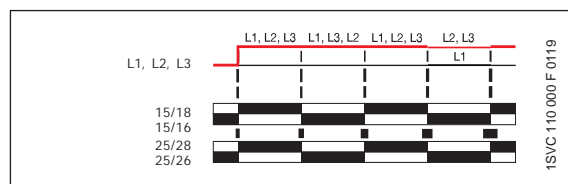
CM-PFS

① R: yellow LED - relay status

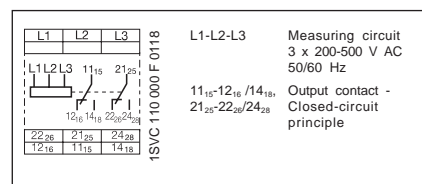
- Monitoring of three-phase supply voltage for phase sequence and phase loss
- No delay
- Continuous voltage range 3 x 200-500 V 50/60 Hz
- 2 c/o contacts
- LED for status indication

The **CM-PFS phase sequence monitor** is used to monitor three-phase supply voltages for incorrect phase sequence. The output relay is energized and the yellow LED turns on if all phases are present in the correct phase sequence (clockwise rotating field). The relay is de-energized and the yellow LED turns off in case of incorrect phase sequence or loss of one phase. In case of motors which continue running with only two phases, the CM-PFS detects phase loss if the reverse feeded voltage is less than 60% of the nominal voltage. For applications where a reverse feeded voltage > 60% is expected we recommend to use our devices with phase unbalance monitors.

Functional diagram CM-PFS



Connection diagram CM-PFS

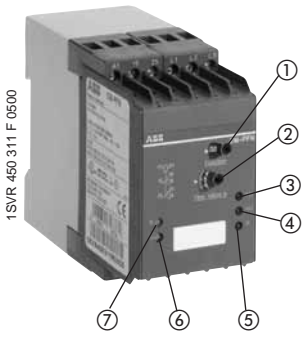


ATTENTION
If several CM-PFS units are placed side by side and the supply voltage is higher than 415 V, spacing of at least 10 mm has to be kept between the individual units.

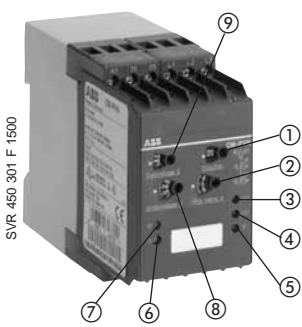
Type	Supply voltage = measuring voltage	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg/lb
CM-PFS	3 x 200-500 V AC 50/60 Hz	1SVR 430 824 R 9300	1		0.150/0.33

Phase monitors CM-PFN, CM-PVN Ordering details

2



CM-PFN



CM-PVN

- ① Time function ☒ / ■
- ② Time adjustment
- ③ >V: red LED - overvoltage
- ④ <V: red LED - undervoltage
- ⑤ P: red LED - phase loss, phase protection
- ⑥ U: green LED - supply voltage
- ⑦ R: yellow LED - relay status
- ⑧ Undervoltage threshold
- ⑨ Overvoltage threshold

- Three-phase monitoring: phase sequence, overvoltage, undervoltage
- CM-PFN: Voltage monitoring range: 0.9-1.1 V_N ($V_N = 3 \times 380 \text{ V}$ or $3 \times 400 \text{ V}$)
- CM-PVN:
 - 3 voltage monitoring ranges: 160 - 580 V
 - 3-phase over- and undervoltage monitoring: V_{min} and V_{max} adjustable
- Fixed switching hysteresis of 5 %
- Selectable On- or OFF-delay on overvoltage or undervoltage: 0.1-10 s
- 2 c/o contacts
- 5 LEDs for status indication

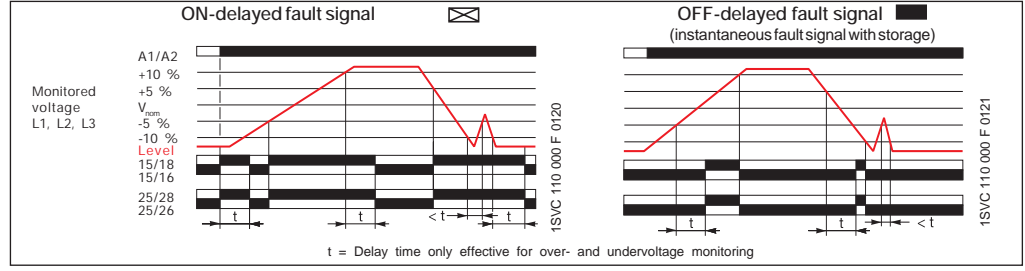
The phase monitors CM-PFN and CM-PVN are used to monitor three-phase supply voltages for incorrect phase sequence, overvoltage, undervoltage and loss of one phase. If one of the above faults occurs, the output relay is de-energized and the LEDs indicate the type of fault. In case of correct phase sequence and voltage, the output relay is energized.

CM-PFN: The output relay is de-energized if the voltage exceeds 1.1 times the rated value or falls below 0.9 times the rated value. An operate delay time or a release delay time can be set for the overvoltage and undervoltage monitoring functions. The delay time is adjusted by means of a potentiometer.

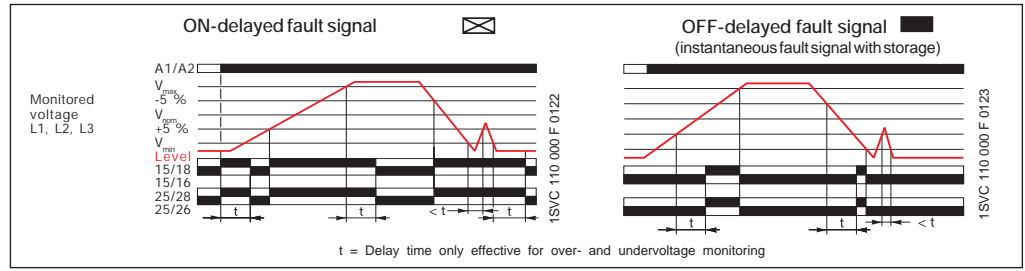
CM-PVN: The output relay is de-energized, if the voltage exceeds the rated value V_{max} or falls below V_{min} . The selector switch ☒/■ is used to select the time delay. Switch position ☒: The fault signal indicating that voltage has exceeded or dropped below the set value is suppressed for the set delay time. Switch position ■: The fault signal is issued immediately and stored for the set delay time.

Momentary undervoltage conditions are recognized and, for better evaluation, prolonged by the set time. The relay is re-energized automatically, if the voltage returns to the nominal value (or for CM-PVN if the voltage returns into the adjusted voltage frame), taking into account the fixed hysteresis of 5 %.

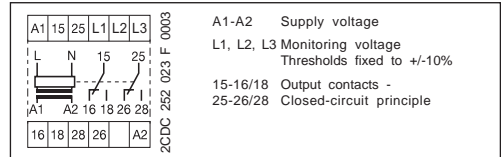
Functional diagrams CM-PFN



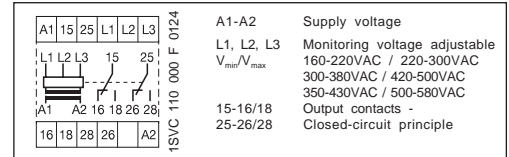
Functional diagrams CM-PVN



Connection diagram CM-PFN



Connection diagram CM-PVN



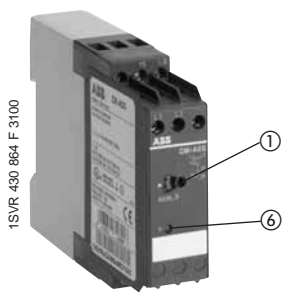
Type	Supply voltage 50/60 Hz	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg/lb
Monitoring voltage 3 x 380 V / 50 Hz					
CM-PFN	220 -240 V AC	1SVR 450 311 R 0400	1		0.300/0.66
	380-415 V AC	1SVR 450 312 R 0400	1		0.300/0.66
Monitoring voltage 3 x 400 V / 50 Hz					
CM-PFN	220-240 V AC	1SVR 450 311 R 0500	1		0.300/0.66
	380-415 V AC	1SVR 450 312 R 0500	1		0.300/0.66
Monitoring voltage: V_{min} 160-220 V AC 50/60 Hz, V_{max} 220-300 V AC 50/60 Hz					
CM-PVN	90-145 V AC	1SVR 450 300 R 1200	1		0.300/0.66
	160-300 V AC	1SVR 450 301 R 1200	1		0.300/0.66
Monitoring voltage: V_{min} 300-380 V AC 50/60 Hz, V_{max} 420-500 V AC 50/60 Hz					
CM-PVN	90-145 V AC	1SVR 450 300 R 1500	1		0.300/0.66
	160-300 V AC	1SVR 450 301 R 1500	1		0.300/0.66
	300-500 V AC	1SVR 450 302 R 1500	1		0.300/0.66
Monitoring voltage: V_{min} 350-430 V AC 50/60 Hz, V_{max} 500-580 V AC 50/60 Hz					
CM-PVN	90-145 V AC	1SVR 450 300 R 1700	1		0.300/0.66
	300-500 V AC	1SVR 450 302 R 1700	1		0.300/0.66

Further voltages on request.

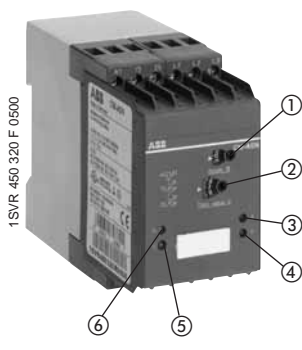
Phase unbalance monitors

CM-ASS, CM-ASN

Ordering details



CM-ASS



CM-ASN

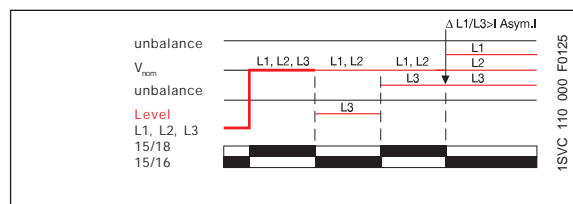
- ① Unbalance threshold
- ② Timer adjustment
- ③ A: red LED - unbalanced
- ④ P: red LED - phase loss and phase sequence fault
- ⑤ U: green LED - supply volt.
- ⑥ R: yellow LED - relay status
- CM-ASS: Fixed ON-delay of 0.5 s
- CM-ASN: Adjustable ON-delay from 0.1-10 s
- Adjustable unbalance threshold: 5-15 %
- CM-ASS: 2 supply and measuring voltage ranges of 220-240 V and 380-415 V
- CM-ASN: 5 monitored three-phase voltages
- Phase sequence detection
- CM-ASS: 1 c/o contact
- CM-ASN: 2 c/o contacts
- LED(s) for status indication

The phase monitors CM-ASS and CM-ASN are used to monitor three-phase supply voltages for phase unbalance, phase loss (even if 95 % of the phase voltage is regenerated) and phase sequence.

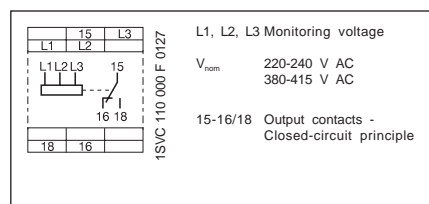
CM-ASS: The output relay is de-energized 500 ms after the adjusted phase unbalance level has been exceeded or immediately after loss of one phase. The energized yellow LED indicates an energized output relay. The switching threshold for the permissible unbalance can be adjusted between 5 and 15 %.

CM-ASN: The output relay is energized as long as the phases are balanced and the phase sequence is correct (clockwise rotating field). In case of a fault, i.e. if unbalancing exceeds the set threshold (5-15 %), the output relay is de-energized and the respective fault type is indicated by the LEDs. For the unbalance monitoring function a trip time delay of 0.1 to 10 s can be set with a potentiometer to prevent unintended tripping, e.g. in case of short unbalancing during motor starting. In case of motors which continue running with only two phases, reverse feeded voltage of more than 95% may be produced, so the output relay may possibly not de-energize despite the loss of a phase.

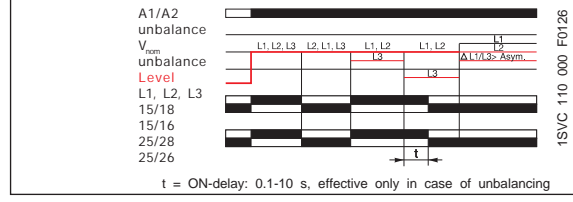
Functional diagram CM-ASS



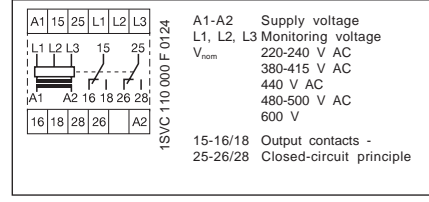
Connection diagram CM-ASS



Functional diagram CM-ASN



Connection diagram CM-ASN



Type	Supply voltage = monitoring voltage	Monitoring frequency	Order code	Pack. unit pieces	Price 1 piece	Weight 1 pc. kg/lb
CM-ASS	3 x 220-240 V AC	50 Hz	1SVR 430 864 R 1100	1		0.30/0.66
	3 x 380-415 V AC	50 Hz	1SVR 430 864 R 3100	1		0.30/0.66
	3 x 220-240 V AC	60 Hz	1SVR 430 865 R 1100	1		0.30/0.66
	3 x 380-415 V AC	60 Hz	1SVR 430 865 R 3100	1		0.30/0.66

Type	Supply voltage	Monitoring frequency	Order code	Pack. unit pieces	Price 1 piece	Weight 1 pc. kg/lb
CM-ASN	110-130 V AC	50 Hz	1SVR 450 320 R 0200	1		0.30/0.66
	220-240 V AC	50 Hz	1SVR 450 321 R 0200	1		0.30/0.66
	380-415 V AC	50 Hz	1SVR 450 322 R 0200	1		0.30/0.66
	220-240 V AC	60 Hz	1SVR 450 421 R 0200	1		0.30/0.66

Monitoring voltage: 3 x 380-415 V AC 50 Hz; 3 x 380-415 V AC 60 Hz

CM-ASN	110-130 V AC	50 Hz	1SVR 450 320 R 0500	1		0.30/0.66
	220-240 V AC	50 Hz	1SVR 450 321 R 0500	1		0.30/0.66
	380-415 V AC	50 Hz	1SVR 450 322 R 0500	1		0.30/0.66
	220-240 V AC	60 Hz	1SVR 450 422 R 0500	1		0.30/0.66

Monitoring voltage: 3 x 440 V AC 60 Hz

CM-ASN	440 V AC	60 Hz	1SVR 450 423 R 0600	1		0.30/0.66
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Monitoring voltage: 3 x 480-500 V AC 50 Hz; 3 x 480-500 V AC 60 Hz

CM-ASN	110-130 V AC	50 Hz	1SVR 450 320 R 0700	1		0.30/0.66
	220-240 V AC	50 Hz	1SVR 450 321 R 0700	1		0.30/0.66
	380-415 V AC	50 Hz	1SVR 450 322 R 0700	1		0.30/0.66
	500-550 V AC	50 Hz	1SVR 450 932 R 0100	1		0.30/0.66
	480-500 V AC	60 Hz	1SVR 450 424 R 0700	1		0.30/0.66

Monitoring voltage: 3 x 600 V AC 50 Hz

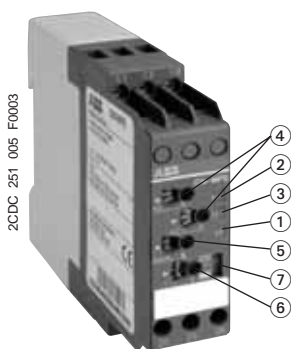
CM-ASN	600 V AC	60 Hz	1SVR 450 426 R 0800	1		0.30/0.66
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Multifunctional three-phase monitors

CM-MPS

Ordering details

2



CM-MPS

- ① R: green LED - supply voltage, relay
- ② F1: red LED - fault signal
- ③ F2: red LED - fault signal
 - Overvoltage: F1
 - Undervoltage: F2
 - Unbalance: F1 and F2 on flashes
 - Phase loss: F1 on, F2 flashes
 - Phase sequence: F1 and F2 flash alternately
- ④ Threshold adjustment V_{min}/V_{max}
- ⑤ Unbalance threshold 2-15%
- ⑥ Time adjustment 0.05-10 s
Phase sequence and phase loss are signalled without delay.
- ⑦ Slide switch for selecting the time delay function
 - ON-delay
 - OFF-delay
- Three-phase monitoring:
 - Phase sequence
 - Phase loss
 - Overvoltage
 - Undervoltage
 - Phase unbalance
- Adjustable over- and undervoltage thresholds
- Available with or without neutral monitoring
- Dual-frequency measuring input 50/60 Hz
- Powered by the measuring circuit
- 2 c/o contacts
- 3 LEDs for status indication

The CM-MPS is a multifunctional three-phase monitor. It is able to monitor all phase parameters, such as the phase sequence, phase loss, over- and undervoltage and phase unbalance. The threshold values for over- and undervoltage can be adjusted in the range of $V_{min} = 160-220$ V and $V_{max} = 220-300$ V for devices without neutral monitoring and $V_{min} = 90-220$ V and $V_{max} = 120-280$ V for devices with neutral monitoring.

The threshold value for phase unbalance can be adjusted from 2-15 %.

If one of the above faults occurs, the output relay is de-energized. The fault type is indicated by LEDs.

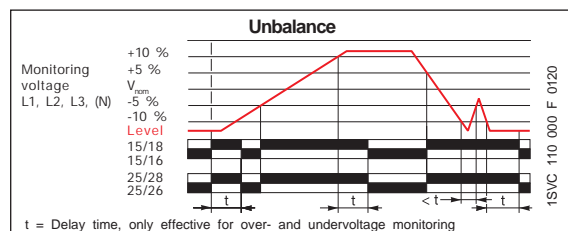
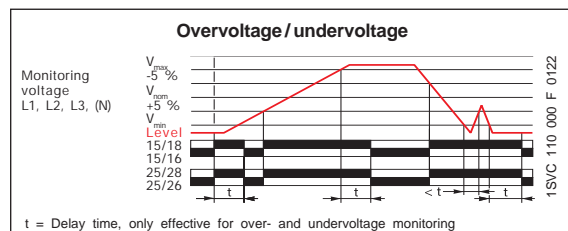
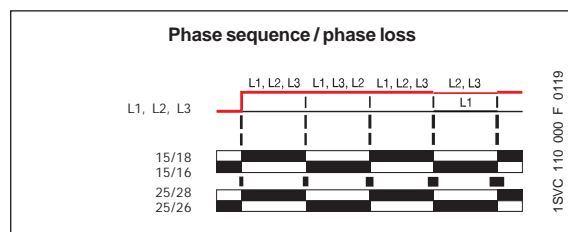
The adjustable trip delay of 0.05-10 s allows short-term suppression of fault signals thus preventing unintended tripping.

The output relay is re-energized automatically if all parameters are back within the adjusted limits.

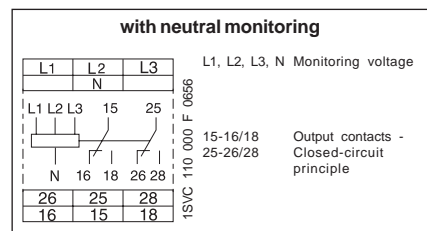
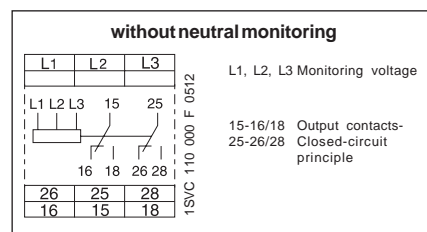
The selector switch / is used to select the time delay. Switch position : The fault signal indicating that voltage has exceeded or dropped below the set value is suppressed for the set delay time. Switch position : The fault signal is issued immediately and stored for the set delay time.

Momentary undervoltage conditions are recognized and, for better evaluation, prolonged by the set time. The relay is re-energized automatically, if the voltage returns to the nominal value (or for CM-PVN if the voltage returns into the adjusted voltage frame), taking into account the fixed hysteresis of 5 %.

Functional diagrams CM-MPS



Connection diagrams CM-MPS



Under- and overvoltage thresholds

Version without neutral monitoring		
L1-L2-L3	160-300 V	$V_{min} = 160-220$ V
L1-L2-L3	300-500 V	$V_{min} = 220-300$ V
		$V_{max} = 300-380$ V
		$V_{max} = 420-500$ V
Version with neutral monitoring		
L1-L2-L3-N	90-170 V	$V_{min} = 90-120$ V
L1-L2-L3-N	180-280 V	$V_{min} = 120-170$ V
		$V_{max} = 180-220$ V
		$V_{max} = 240-280$ V

Type	Supply voltage = monitored voltage	Monitoring frequency	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg/lb
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Without neutral monitoring

CM-MPS	160-300 V AC	50/60 Hz	1SVR 430 884 R 1300	1		0.20/0.44
	300-500 V AC	50/60 Hz	1SVR 430 884 R 3300	1		0.20/0.44

With neutral monitoring

CM-MPS	90-170 V AC	50/60 Hz	1 SVR 430 885 R 1300	1		0.20/0.44
	180-280 V AC	50/60 Hz	1 SVR 430 885 R 3300	1		0.20/0.44

Three-phase monitors CM-PBE, CM-PVE, CM-PFE

Technical data

	CM-PBE	CM-PVE	CM-PFE
Supply circuit	= meas. circuit L1-L2-L3 (-N)	= meas. circuit L -L2-L3 (-N)	= meas. circuit L1-L2-L3
Supply voltage - power consumption	supply voltage = measuring voltage		
	220-240 V AC 50/60 Hz	185-265 V AC 50/60 Hz	3x208-440VAC approx. 15VA
	380-440 V AC 50/60 Hz	320-460 V AC 50/60 Hz	
Supply voltage tolerance	-15 %...+15 %	-15 %...+10 %	-10 %...+10 %
Supply voltage frequency	50/60 Hz	50/60 Hz (-10 %...+10 %)	50/60 Hz (-10 %...+10 %)
Duty time	100 %		
Measuring circuit	L1-L2- L3-N L1 - L2 -L3	L1-L2- L3-N L1-L2-L3	L1-L2-L3
Monitoring function	phase loss		phase sequence, phase loss
Monitoring function	over- and undervoltage		
Measuring range, min.-max.	220-240 V AC 380-440 V AC	185-265 V AC 320-460 V AC	3 x 208-440 V AC
Threshold	threshold = 0.6 x V _N		
Hysteresis related to threshold value adjustment	fixed: Vmin: 185 V / 320 V; Vmax: 265 V / 460 V		
Hysteresis related to threshold value adjustment	5 % fixed (release value = 0.65 x V _N)		
Hysteresis related to threshold value adjustment	fixed: Vmin: 194 V / 336 V; Vmax: 252 V / 437 V		
Measuring voltage frequency	50/60 Hz (-10 %...+10 %)		50/60 Hz
Max. measuring cycle time	40 ms		500 ms
Meas. error within supply voltage tolerance			≤ 0.5 %
Meas. error within temperature range			≤ 0.06 % / °C
Timing circuit			
Delay time	power-up delay 500 ms (+/-20 %), fixed ON-delay 150 ms (+/-20 %)	power-up delay 500 ms (+/-20 %), fix ON-delay at over-/undervoltage 500 ms (+/-20 %)	500 ms
Indication of operational states			
Output relay energized	R: yellow LED		
Output circuits	13-14		11-12/14
Number of contacts	1 n/o contact		1 c/o contact
Operating principle ¹⁾	closed-circuit principle		
Contact material	AgCdo		
Rated voltage acc. to VDE0110, IEC947-1	250 V		
Min. switching voltage	-		
Max. switching voltage	250 V AC, 250 V DC		
Min. switching current	-		
Rated switching current	4 A		
acc. to IEC 60947-5-1	3 A		
	4 A		
	2 A		
Maximum lifetime	30 x 10 ⁶ switching cycles		
	0.1 x 10 ⁶ switching cycles		
Short circuit proof, max. fuse rating	10 A fast, operating class gL		
	10 A fast, operating class gL		
General data			
Width of enclosure	22.5 mm		
Wire size	2 x 1.5 mm ² (2 x 16 AWG) stranded wire with wire end ferrule		
Mounting position	any		
Degree of protection enclosure / terminals	IP50 / IP20		
Operating temperature	-20 °C ... +60 °C		
Storage temperature	-40 °C ... +85 °C		
Mounting	DIN rail (EN 50022)		
Standards			
Product standard	IEC 255-6, EWN 60255-6		
EMC Directive	89/336/EEC		
Electromagnetic compatibility			
acc. to EN 61000-6-2, EN 61000-6-4			
ESD acc. to IEC 61000-4-2, EN 61000-4-2	level 3 - 6 kV/ 8 kV		
HF radiation resistance			
acc. to IEC 61000-4-3, EN 61000-4-3	level 3 - 10 V/m		
Burst acc. to IEC 61000-4-4, EN 61000-4-4	level 3 - 2 kV / 5 kHz		
Surge acc. to IEC 1000-4-5, EN 61000-4-5	level 4 - 2 kV-L		
HF line emission			
acc. to IEC 1000-4-6, EN 61000-4-6	level 3 - 10 V		
Low Voltage Directive	73/23/EEC		
Operational reliability acc. to IEC 68-2-6	6 g		
Mechanical shock resistance acc. to IEC 68-2-6	10 g		
Approvals	cULus, GOST, C-Tick		
Isolation data			
Rated insulation volt. between supply, measuring and output circuits acc. to VDE0110, IEC60947-1	400 V	400 V	500 V
Rated impulse withstand voltage between all isolated circuits acc. to 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			
acc. to VDE 0110, IEC 664, IEC 255-5	III / C		
Overvoltage category			
acc. to VDE 0110, IEC 664, IEC 255-5	III / C		
Environmental testing	24 h cycle time, 55 °C, 93 % rel., 96 h		

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.

Three-phase monitors

CM-PFS, CM-PFN, CM-PVN

Technical data

2

	CM-PFS	CM-PFN	CM-PVN
Supply circuit	= measuring circuit L1-L2-L3		
Supply voltage, power consumption	supply voltage = measuring voltage 3x200-500V AC 50/60Hz approx. 15VA		110-130 V AC 50/60 Hz approx. 3 VA 220-240 V AC 50/60 Hz approx. 3 VA 380-440 V AC 50/60 Hz approx. 3 VA
Supply voltage tolerance	-15 %...+10 %		
Supply voltage frequency	50/60 Hz		
Duty time	100 %		
Measuring circuit	L1-L2-L3	L1-L2-L3	L1-L2-L3
Monitoring function	phase sequence, phase loss	over- and undervoltage, phase sequence, phase loss	over- and undervoltage, phase sequence, phase loss
Measuring range, min.-max.	3 x 200-500 V AC	3x380 V AC 50Hz, 3x400 V AC 50 Hz	160-300/300-500/350-580 V AC
Threshold	0.6 x Vnom	over- and undervoltage fixed: 0.85/1.1 x V _N	over- and undervoltage threshold adjustable
Hysteresis related to threshold value adjustment		5 % fixed (0.9/1.05 V _N)	5 % fixed
Measuring voltage frequency	50/60 Hz	50 Hz	50/60 Hz
Max. measuring cycle time	500 ms		80 ms
Meas. error within supply voltage tolerance		≤ 0.5 %	
Meas. error within temperature range		≤ 0.06 % / °C	
Timer circuit	Over- and undervoltage fault signal		
Delay time	500 ms	adjustable from 0.1-10 s ON- or OFF delay (fault signal storage)	
Timing error within supply voltage tolerance	-	≤ 5 %	
Timing error within temperature range	-	≤ 0.06 %/°C	
Indication of operational states			
Supply voltage	U: green LED		
Output relay energized	R: yellow LED		
Overvoltage / Undervoltage	-	>U: red LED / < U: red LED	
Phase loss	-	P: red LED	
Phase sequence	-	-	
Unbalance	-	-	
Output circuits	11(15)-12(16)/14(18), 21(25)-22(26)/24(28)	15-16/18, 25-26/28	
Number of contacts	2 c/o contacts		
Operating principle ¹⁾	closed-circuit principle		
Contact material	AgCdo		
Rated voltage acc. to VDE 0110, IEC 60947-1	250 V	400 V	
Min. switching voltage	-	-	
Max. switching voltage	250 V AC, 250 V DC	400 V AC, 400 V DC	
Min. switching current	-	-	
Rated switching current acc. to IEC 60947-5-1	AC-12(resistive) 230V AC-15(inductive) 230V DC-12(resistive) 24V DC-13(inductive) 24V	4 A 3 A 4 A 2 A	5 A 3 A 5 A 2.5 A
Maximum lifetime	mechanical electrical (AC2, 230V, 4A)	30 x 10 ⁶ switching cycles 0.1 x 10 ⁶ switching cycles	
Short circuit proof, max. fuse rating	n/c contact n/o contact	10 A fast, operation class gL 10 A fast, operation class gL	5 A fast, operation class gL 5 A fast, operation class gL
General data			
Width of enclosure	22.5 mm	45 mm	
Wire size	2 x 1.5mm ² (2 x 16 AWG) stranded wire with wire end ferrule		
Mounting position	any		
Degree of protection housing / terminals	IP50 / IP20		
Operating temperature	-20 °C...+60 °C	-25 °C ... +65 °C	
Storage temperature	-40 °C ... +85 °C		
Mounting	DIN rail (EN 50022)		
Standards			
Product standard	IEC 255-6, EN 60255-6		
EMC Directive	89/336/EEC		
Electromagnetic compatibility acc. to EN 61000-6-2, EN 61000-6-4			
ESD acc. to IEC 61000-4-2, EN 61000-4-2	level 3 - 6 kV / 8 kV		
HF radiation resistance acc. to IEC 61000-4-3, EN 61000-4-3	level 3 - 10 V/m		
Burst acc. to IEC 61000-4-4, EN 61000-4-4	level 3 - 2 kV / 5 kHz		
Surge acc. to IEC 1000-4-5, EN 61000-4-5	level 4 - 2 kV-L		
HF line emiss. acc. to IEC 1000-4-6, EN 61000-4-6	level 3 - 10 V		
Low Voltage Directive	73/23/EEC		
Operational reliability acc. to IEC 68-2-6	4 g	5 g	
Mechanical shock resistance acc. to IEC 68-2-6	6 g	10 g	
Approvals	cULus, GL, GOST, C-Tick		
Isolation data			
Rated insulation voltage between supply, measuring and output circuit acc. to VDE 0110, IEC 60947-1	500 V		
Rated impulse withstand voltage between all isolated circuits acc. to VDE 0110, IEC 664	4 kV / 1.2 - 50 μs		
Test voltage between all isolated circuits	2.5kV, 50Hz, 1min.		
Pollution category acc. to VDE 0110, IEC 664, IEC 255-5	III / C		
Overvoltage category acc. to VDE 0110, IEC 664, IEC 255-5	III / C		
Environmental testing acc. to IEC 68-2-30	24 h cycle time, 55 °C, 93 % rel., 96 h		

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.

Three-phase monitors

CM-ASS, CM-ASN, CM-MPS

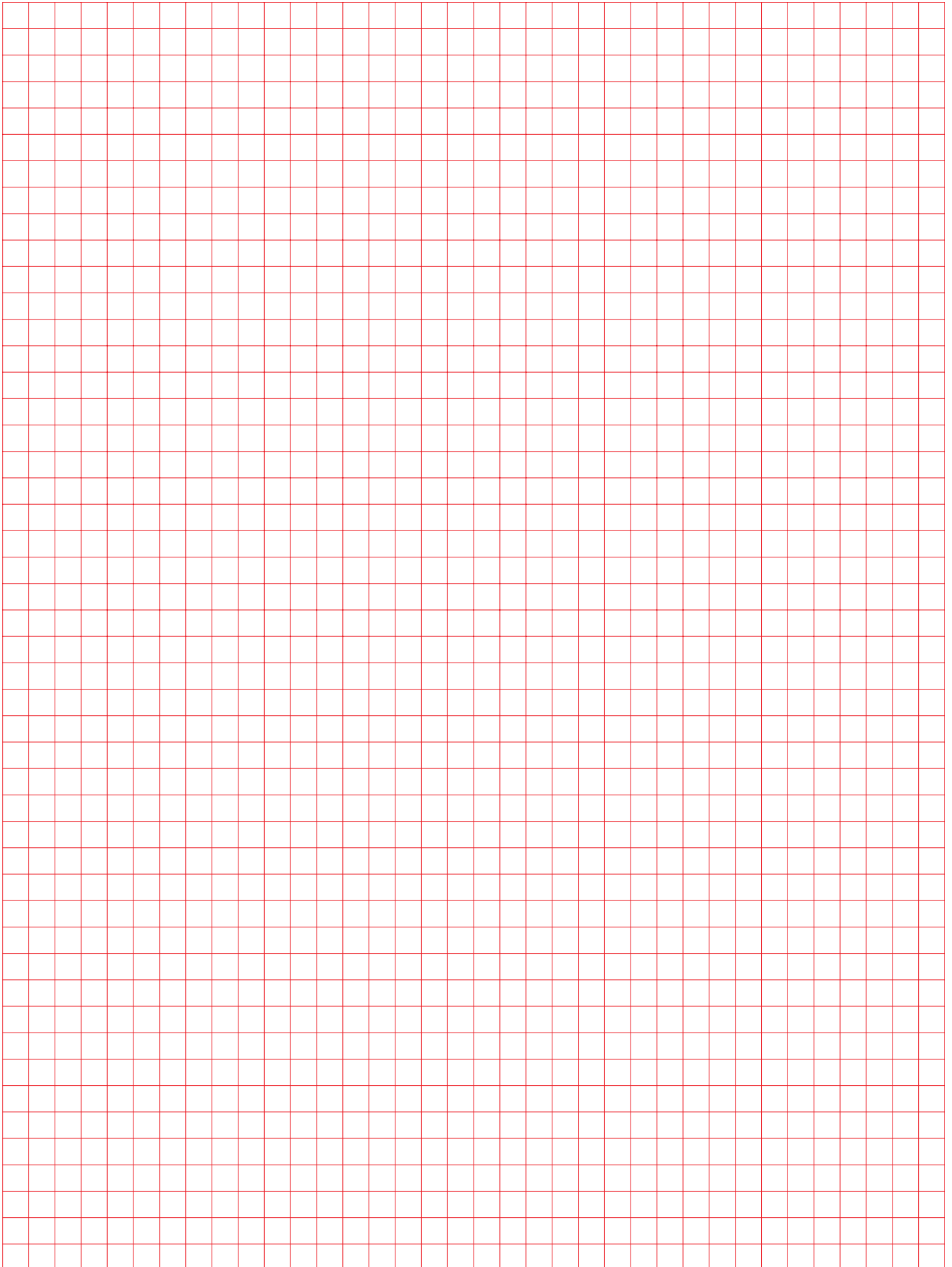
Technical data

CM-ASS	CM-ASN	CM-MPS
= measuring circuit L1-L2-L3		= measuring circuit L1-L2-L3
supply voltage = measuring voltage		
3x220-240V AC 50Hz/3x220-240V AC 60Hz approx. 2VA	110-130/220-240 V AC 50/60 Hz approx. 3 VA	160-300 V AC 50/60 Hz
3x380-440V AC 50Hz/3x380-440V AC 60Hz approx. 2VA	380-415/440/480-500 V AC 50/60 Hz approx. 3 VA	300-500 V AC 50/60 Hz
	500-550/600 V AC 50/60 Hz approx. 3 VA	
-20 %...+20 %		-15 %...+10 %
50 Hz or 60 Hz		50/60 Hz
100 %		100 %
L1-L2-L3	L1-L2-L3	L1-L2-L3
voltage unbalance, phase sequence, phase loss		over-/undervoltage, phase loss, phase sequence, unbalance
220-240 V AC or 380-415 V AC	220-240/380-415/440/ 480-500/600 V AC	160-300 V AC / 300-500 V AC / 2-15 %
5-15 %, adjustable for unbalance		over-/undervoltage threshold adjustable
		unbalance threshold adjustable
	20 % fixed	5 % fixed
	50 Hz or 60Hz	50/60 Hz
500 ms	< 100 ms	80 ms
	≤ 0.5 %	
	≤ 0.06 % / °C	
signalling of fault type unbalance	signalling of fault type over- and undervoltage, phase sequence, phase loss, unbalance	
500 ms for unbalance signalling	0.1-10 s, adjustable, ON-delayed	0.1-10 s, adjustable
	≤ 0.5 %	
	≤ 0.06 % / °C	
	U: green LED	R: green LED flashes during timing
R: yellow LED	F: red LED / F: red LED	R: green LED flashes during timing
	P: red LED	F1: red LED / F2: red LED
	F: red LED	F1 on, F2 flashes
	A: red LED	F1 and F2 flash alternately
		F1 and F2 on
15-16/18	15-16/18, 25-26/28	15-16/18, 25-26/28
1 c/o contact	closed-circuit principle	2 c/o contacts
	AgCdo	
250 V	400 V	250 V
-	-	-
250 V AC, 250 V DC	400 V AC, 400 V DC	250 V AC, 250 V DC
-	-	-
4 A	5 A	4 A
3 A	3 A	3 A
4 A	5 A	4 A
2 A	2,5 A	2 A
	30 x 10 ⁶ switching cycle	
	0.1 x 10 ⁶ switching cycle	
10 A fast, operating class gL	5 A fast, operating class gL	10 A fast, operating class gL
10 A fast, operating class gL	5 A fast, operating class gL	10 A fast, operating class gL
22.5 mm	45 mm	22.5 mm
	2 x 2.5 mm ² (2 x 14 AWG) stranded wire with wire end ferrule	
	any	
	IP50 / IP20	
-20 °C...+60 °C	-25 °C...+65 °C	-20 °C...+60 °C
	-40 °C...+85 °C	
	DIN rail (EN 50022)	
	IEC 255-6, EN 60255-6	
	89/337/EEC	
	level 3 - 6 kV / 8 kV	
	level 3 - 10 V/m	
	level 3 - 2 kV / 5 kHz	
	level 4 - 2 kV L-L	
	level 3 - 10 V	
	73/23/EEC	
4 g	5 g	4 g
6 g	10 g	6 g
cULus, GL, GOST, C-Tick	cULus, GL, GOST, C-Tick	cULus and GL (in preparation), GOST, C-Tick
	500 V	
	4 kV/1.2-50 μs	
	2.5 kV, 50 Hz, 1 min.	
	III / C	
	III / C	
	24 h cycle time, 55 °C, 93 % rel., 96 h	

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.

Notes

2





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Insulation monitoring in IT systems

Insulation monitors

2

The IT system with additional equipotential bonding and insulation monitoring equipment

The IT system is supplied either by an isolation transformer or an independent voltage source, such as a 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 system's fuse does not respond, thus maintaining the voltage supply and therefore operation even in case of a phase-to-earth fault.

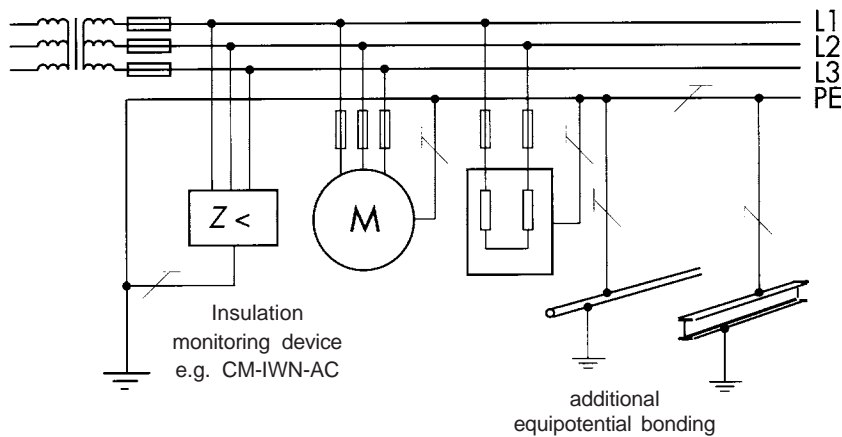
The high reliability of an IT system is guaranteed thanks to

continuous 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.

The following illustration shows the typical arrangement of an IT system.

In IT-N systems the secondary side star point of the transformer is additionally used as neutral.



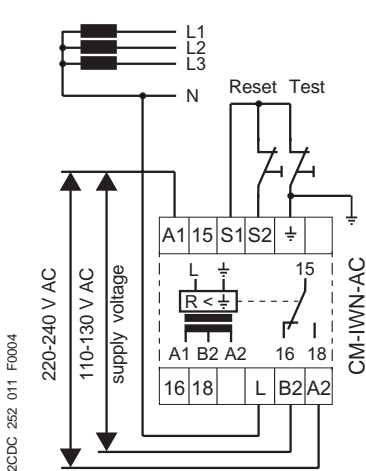
2CDC 252 028 F 0003

Application and connection examples for the CM-IWN AC in IT and IT-N systems

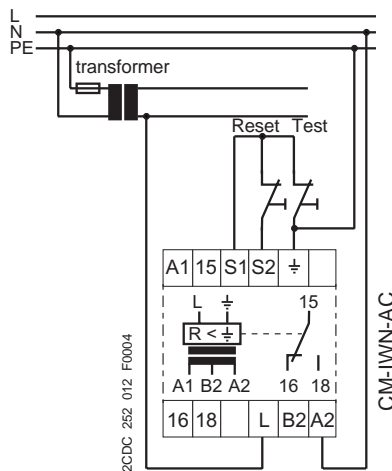
Three-phase IT-N system

Single-phase IT-N system

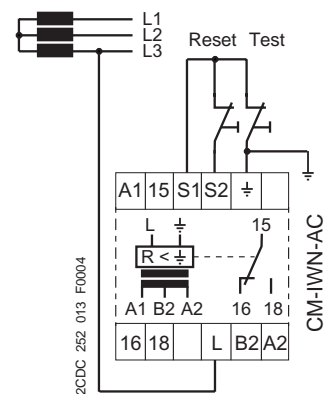
Three-phase IT system



2CDC 252 011 F0004



2CDC 252 012 F0004

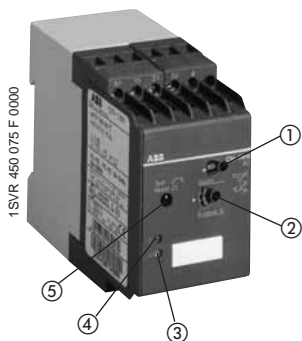


2CDC 252 013 F0004

Insulation monitors for ungrounded AC mains

CM-IWN-AC

Ordering details



CM-IWN-AC

- ① Range selector switch
- ② Response threshold
1-110 kΩ,
- ③ U: green LED -
supply voltage
- ④ F: red LED -
relay status
- ⑤ Test button: "Test - Reset"

- 2 measuring ranges from
1-110 kΩ
- Tripping storage
- Suitable for insulation
monitoring of single- and
three-phase ungrounded AC
systems
- Functional test by means of
front-mounted test button or
via remote test button
- VDE 0413/T.2
- 1 c/o contact, open-circuit
principle
- 2 LED for status indication

The CM-IWN-AC monitors the insulation resistance between ungrounded AC systems and ground potential. It is designed for insulation resistances to be monitored from 1 to 110 kΩ, divided into two ranges. The desired range is selected with a front-mounted switch. The output relay is energized and the LED lights up as soon as the insulation resistance falls below the threshold value. The relay is reset (de-energized) automatically if the measured insulation resistance exceeds 1.6 times the threshold value.

Test

An earth-leakage fault can be simulated using the front-mounted "Test" button. A remote test button can be connected via the terminals S1- \perp . Tripping is caused by closing a n/o contact.

Operation

The CM-IWN-AC is used to monitor the insulation resistance of single-phase or three-phase AC supply voltages. It is primarily used to monitor auxiliary circuits that are electrically isolated from ground. The CM-IWN-AC monitors the insulation resistance between ungrounded AC supply voltages and the protective earth conductors. A superimposed DC measuring voltage is used for measurement.

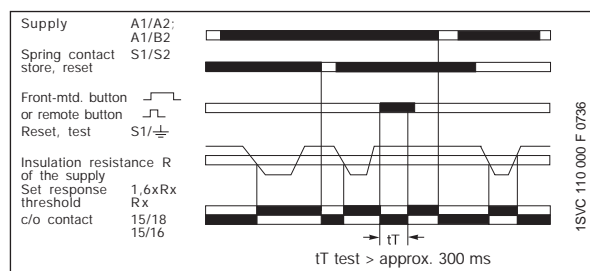
Fault storage

By jumpering the terminals S1 and S2, fault tripping can be stored. Remote reset can be implemented by connecting a pushbutton to S1 and S2. Pressing the button then resets storage of the tripped state.

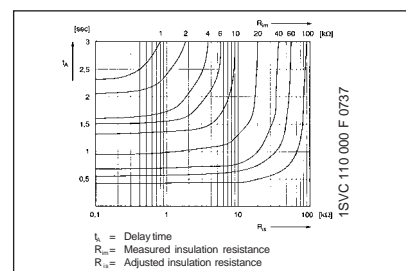
Attention

The CM-IWN-AC is designed for AC supply voltages. Rectifiers, that are connected in series, should be electrically isolated from the measuring relay.

Functional diagram CM-IWN-AC



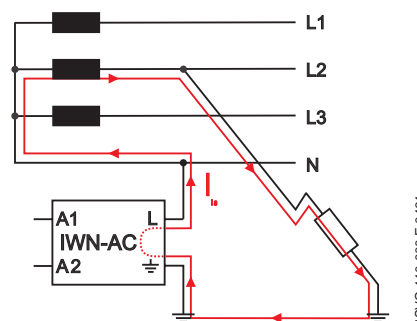
Tripping time



Type	Supply voltage	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg/lb
CM-IWN-AC	24-240 V AC/DC	1SVR 450 075 R 0000	1		0.30/0.66
	110-130 V, 220-240 V AC	1SVR 450 071 R 0000	1		0.30/0.66

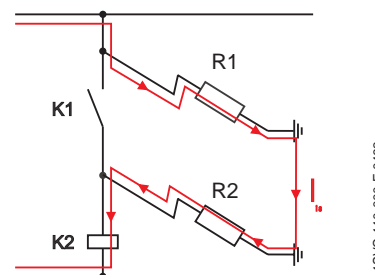
Operating principle

The supply voltage is feeded via terminals A1-A2 (A1-B2). This can be the voltage supplied from the system to be monitored. The CM-IWN superimposes DC-voltage on the system to be monitored via the terminals L and \perp (one phase or, if available, the neutral). In case of earth-leakage the resistance of the system against earth potential changes. The resulting earth-leakage current overcomes the insulation resistance. If this earth-leakage current exceeds the adjusted response threshold, the output relay is energized with delay (see characteristic) and the red "fault" LED lights up.



Fields of application

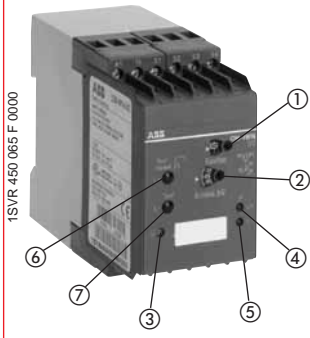
The insulation resistance monitor CM-IWN-AC is mainly used in industrial applications with electrically insulated AC systems for the measurement of an occurring first isolation fault. This can prevent the installation from incorrect operation caused by a possible second isolation fault. The resistances R1 and R2 correspond to two subsequent isolated faults (see drawing). In this case, the resistances are connected in series related to earth potential which would prevent contactor K2 from being de-energized (fault!) although auxiliary contact K1 is open. This incorrect operation may cause considerable faults within the installation.



Insulation monitor for ungrounded DC mains CM-IWN-DC

Ordering details

2



CM-IWN-DC

- ① Selector switch for open- or closed circuit principle
- ② Response threshold 1-110 kΩ,
- ③ U: green LED - supply voltage
- ④ L+: red LED - fault insulation resistance
- ⑤ L-: red LED - fault insulation resistance
- ⑥ Test button: "Test - Reset"
- ⑦ Test button: "Test - L-"

- Insulation resistance monitoring in ungrounded pure DC systems from 24-240 V DC
- Continuously adjustable measuring range 10-110 kΩ
- Front-mounted selector switch for open- or closed-circuit principle
- Front-side and external test-reset feature
- 1 c/o contact
- 3 LEDs for status indication

The CM-IWN-DC is designed for insulation resistance monitoring in ungrounded, pure DC supply systems with or without filtering. Due to its electrical isolation between the supply circuit and the measuring circuit, it can be supplied either by an external auxiliary voltage or by the supply voltage to be monitored. Insulation resistance faults are evaluated separately for L+ or L- and displayed by LEDs. Due to its measuring principle, the CM-IWN-DC is not able to detect balanced earth-leakage faults. The response threshold is adjustable in a range from 10-110 kΩ. If the insulation resistance falls below the set response threshold, the relay is energized and the error LED lights up.

Test

An insulation fault can be simulated using the "Test" button. If the test button is pressed, the output relay is energized. A remote test button for L+ can be connected via terminals S1-S3 (S4-S3 for L-).

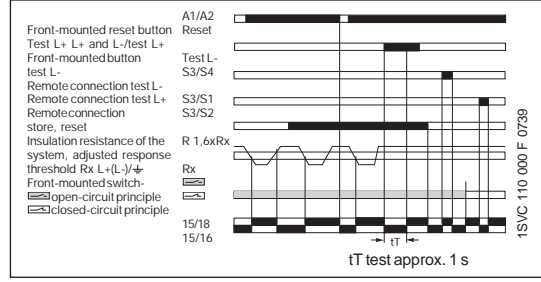
Fields of application

The CM-IWN-DC is mainly used to monitor DC auxiliary circuits that are electrically isolated from primary supply voltage circuits as well as installations powered by batteries.

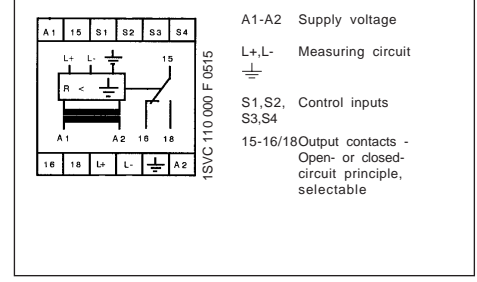
Fault storage

By jumpering the terminals S2-S3, fault tripping can be stored. Remote reset can be implemented by connecting a pushbutton to S2 and S3. Pressing the button then resets storage of the tripped state.

Functional diagram CM-IWN-DC

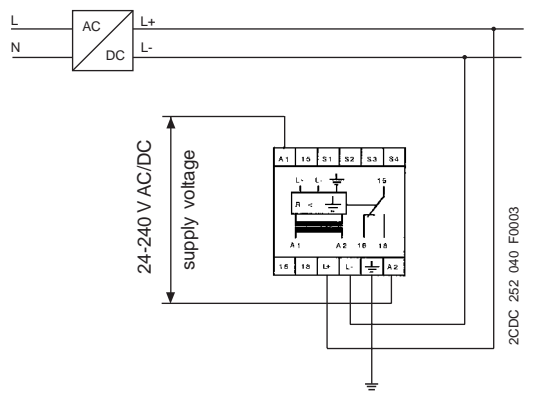


Connection diagram CM-IWN-DC



Type	Supply voltage	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg/lb
CM-IWN-DC	24-240 V AC/DC	1SVR 450 065 R 0000	1		0.30/0.66

Application and connection example



Insulation monitors for ungrounded mixed AC/DC systems

C 558.01

Ordering details

2

Enclosure width 45 mm

1 SAR 470 020 F 0005



C558.01

- Insulation monitoring of AC, DC and AC/DC IT systems
- Voltage ranges up to 300 V AC and 300 V DC
- Automatic adaptation to the supply system conditions
- Connection monitoring
- Adjustable response threshold 10 - 200 kΩ
- Combined test and reset button
- Selection between open- and closed-circuit principle
- Fault storage selectable
- Sealable enclosure
- 2 c/o contacts
- 3 LEDs for status indication

Insulation monitoring device for AC IT systems with DC components and for DC IT systems

Modern control voltage systems frequently contain DC components and high system leakage capacitances due to interference suppression arrangements. These circumstances must be taken into account when selecting the insulation monitoring device.

The C558.01 guarantees reliable insulation monitoring of modern systems. Pure AC systems, pure DC systems as well as AC/DC systems can be monitored.

Fields of application

- Industrial control systems
- Automation systems
- Machine control systems
- Control systems in power plants and power supply companies
- Computer networks
- Mobile generators
- Elevator control systems
- Lighting systems

Measuring principle

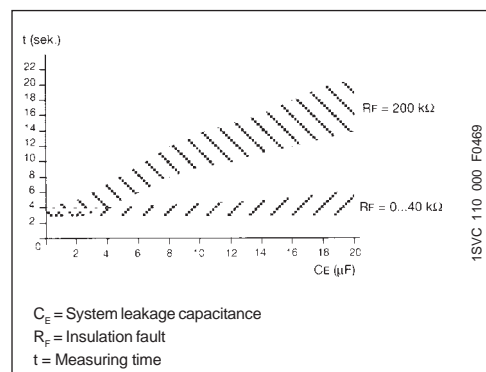
The C558.01 operates with a variant of a pulse measuring principle. This measuring principle ensures reliable monitoring of modern control voltage systems. The frequency range of the system to be monitored may extend from 15-400 Hz.

Standards

The C558.01 complies with the standards DIN 57413 T8 / VDE 0413 T8, IEC 61557-8, EN 61557-8 and ASTM F1669M-96.

When installing the device, the safety instructions supplied with the equipment have to be observed!

Measuring time

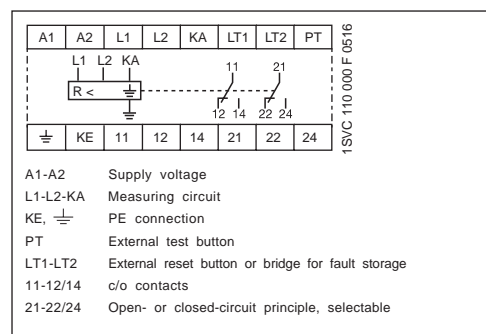


Fault indications

Indication	Alarm LED		Alarm relay
	+	-	
AC fault	x	x	x
DC fault L+	x		x
DC fault L-		x	x
Interruption ⊥/KE or L1/L2	o	o	x

o = flashing
x = continuously on

Connection digram C558.01



Response values and measuring circuit

Type	Response value R_{on}	Response time ¹⁾	Meas. voltage	Meas. current	Internal resistance ²⁾	Nom. system voltage
C 558.01	10-200 kΩ	5 s	13 V	0.1 mA	120/94 kΩ	DC and AC 0 - 300 V and 15-400 Hz 0-300 V

¹⁾ Response times at 1 µF system leakage capacitance
²⁾ DC internal resistance / impedance

Type	Supply voltage V_c	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg/lb
C 558.01	230 V AC	1SAR 470 020 R 0005	1		0.40/0.88
C 558.01	90-132 V AC	1SAR 470 020 R 0004	1		0.40/0.88

Insulation monitors for ungrounded AC systems

C 558.02

Ordering details

2

Enclosure width 99 mm



C 558.02

- Insulation monitoring of ungrounded single-phase and three-phase AC IT systems up to 793 V
- Adjustable threshold 1 - 200 kΩ
- Combined test and reset button
- Connection monitoring
- Selection between open- and closed-circuit principle
- Fault storage selectable
- Sealable enclosure
- Connection of external meter possible
- 2 c/o contacts
- LED bar graph indicator
- LEDs for status indication

Insulation monitor for AC IT systems

The standard power supply system is a pure AC system. It neither contains converters nor DC components. The leakage capacitance is relatively low, i.e. usually it is below 1µF, sometimes slightly above this value.

The C558.02 can be used to monitor such systems with voltages of up to 793 V. The response threshold can be adjusted in a wide range, selectable from 1-20 kΩ or 10-200 kΩ.

Field of application

- Single-phase and three-phase AC systems without DC components
- Uncontrolled motor drives
- Building installation
- Simple machine drives
- Generating sets, mobile generators
- Power supply for public arenas
- Lighting systems
- Air ventilation and air conditioning systems

Measuring principle

Superimposed DC voltage with reversing stage.

Selecting the adjustment range

Changing the setting range from x 1 kΩ to x 10 kΩ, automatically changes the indication of the kΩ values on the LED bar graph indicator:

Range x 1 kΩ: Meter scale point x 1 kΩ.

Range x 10 kΩ: Meter scale point has to be multiplied by 10.

Standards

The C558.02 complies with the standards DIN 57413 Bl.2 / VDE 0413 T2, IEC 61557-8, EN 61557-8 and ASTM F1207-89.

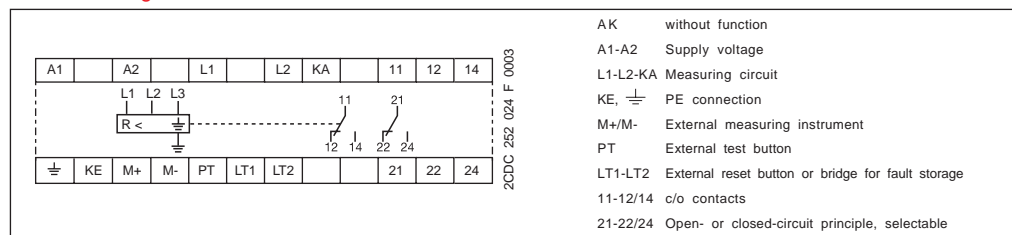
When installing the device, the safety instructions supplied with the equipment have to be observed!

Response delay

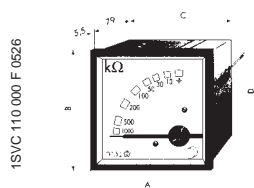
Type	*) Response time in the range of 10-200 kΩ	*) Response time in the range of 1-20 kΩ	Max. system leakage capacitance
C 558.02	< 1 s	< 3 s	20 µF

*) Response times acc. to IEC 61557-8 at $R_F = 0.5 \times R_{an}$ and 1 µF system leakage capacitance.

Connection digram C 558.02



C 558.10



Type	Supply voltage V_c	Order code	Pack unit pieces	Price 1 piece	Weight 1 piece kg/lb
C 558.02	230 V AC	1SAR 471 020 R 0005	1		0.35/0.77
C 558.02	90-132 V AC	1SAR 471 020 R 0004	1		0.35/0.77

Accessories (external kΩ meter)

C 558.10	1SAR 477 000 R 0100	1	0.20/0.44
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Insulation monitors for ungrounded AC and DC systems

C 558.03

Ordering details

Enclosure width 99 mm



C558.03

- Insulation monitoring of AC, DC and AC/DC IT systems
- Connection monitoring
- Alarm or system fault indication selectable
- AMP measuring method (applied for EP)
- Automatic adaptation to the power system
- 2 continuously adjustable response thresholds 2-50 kΩ and 20-500 kΩ
- Combined test and reset button
- Selection between open- and closed-circuit principle
- Fault storage selectable
- Sealable enclosure acc. to VDE 0106 T 101
- Environmental conditions comply with EN 50155
- 2 x 1 c/o contact
- LED bar graph indicator
- LEDs for status indication

Insulation monitor for AC and DC IT systems

The C558.03 monitors the insulation resistance of IT systems (ungrounded systems) with voltages of up to 690 V AC or 400 V DC. It can be universally used in AC, DC or mixed power systems. Measurement is not influenced by interference suppression measures and capacitances of up to 20μF to earth which are caused by long supply lines. The implemented AMP measuring method guarantees reliable insulation monitoring even in power systems with fixed frequency converters (output and input frequency are static).

Application in modern control voltage systems

- Industrial control systems
- Automation systems
- Machine control systems
- Control systems in power plants and power supply companies
- Computer networks
- Mobile generators
- Elevator control systems
- Lighting systems

Measuring principle

Superimposed DC voltage with reversing stage.

Fault indications

Indication	Alarm LED		Alarm relay
	+	-	
ALARM Insulation fault AC	x	x	x
ALARM Insulation fault DC (L+)	x		x
ALARM Insulation fault DC (L-)		x	x
Interruption L1/L2 or KE	o	o	x

o = flashing
x = continuously on

Standards

The C558.03 complies with the standards DIN 57413 Bl.2 / VDE 0413 T2, IEC 61557-8, EN 61557-8 and ASTM F1207-89.

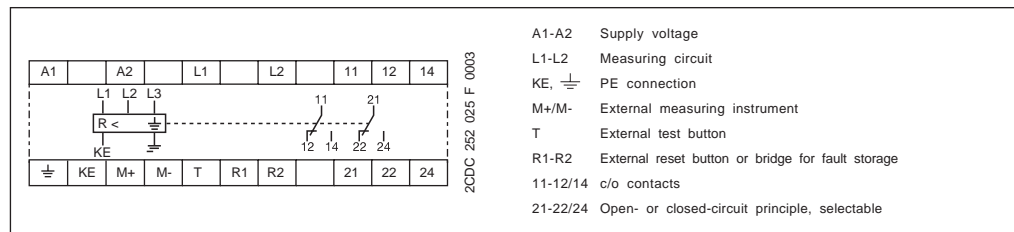
When installing the device, the safety instructions supplied with the equipment have to be observed!

Response delay

Type	*) Response time in the range of 2-6 kΩ	*) Response time in the range of 6-500 kΩ	Max. system leakage capacitance
C 558.03	< 8-35 s	< 8-12 s	50 μF

*) Response times acc. to IEC 61557-8 at $R_F = 0.5 \times R_{an}$ and 1 μF system leakage capacitance.

Connection diagram C 558.03



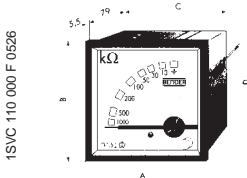
Type	Supply voltage V_c	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg/lb
C 558.03	230 V AC	1SAR 472 020 R 0005	1		0.40/0.88
C 558.03	90-132 V AC	1SAR 472 020 R 0004	1		0.40/0.88

Accessories (external kΩ meter)

C 558.10		1SAR 477 000 R 0100	1		0.20/0.44
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• Technical data 67 • Dimensional drawings 68

C 558.10



Insulation monitors

CM-IWN-AC, CM-IWN-DC

Technical data

2

		CM-IWN-AC	CM-IWN-DC
Supply circuit			
Supply voltage - power consumption	24-240 V AC/DC A1-A2	approx. 8 VA / 2 W	approx. 8 VA / 2 W
	110-130 V AC A1-B2	approx. 3 VA	
	220-240 V AC A1-A2	approx. 3 VA	
Supply voltage tolerance		-15 %...+10 %	
Supply voltage frequency AC/DC version		15-400 Hz or DC	
Supply voltage frequency AC version		50-60 Hz	
Duty time		100 %	
Measuring circuit			
Monitoring function		Insulation monitoring within electrically isolated...	
		AC systems	DC systems
Measuring range, threshold value	min-max.	1-11 kΩ, 10-110 kΩ	10-110 kΩ
Internal resistance	min.	57 kΩ	
AC internal resistance	min.	100 kΩ	
DC internal resistance	min.	100 kΩ	
Test resistance		820 Ω	
Isolation voltage (L-PE)	max.	415 V AC	300 V DC
Measuring DC voltage	max.	30 V DC	24-240 V DC
Cable length for reset-test button	max.	10 m	
Delay time		refer to ordering details page	<1 s if insulation <0.9 x response threshold
Indication of operational states			
Supply voltage		U: green LED	
Insulation fault		F: red LED - output relay energized	L+: red LED, L-: red LED
Output circuits			
		15-16/18	
Number of contacts		1 c/o contact	
Operational principle ¹⁾		open-circuit principle	open- or closed-circuit principle selectable
Contact material		AgCdO	
Rated voltage	acc. to VDE 0110, IEC 664-1, IEC 60947-1	250 V	
Min. switching voltage		-	
Max. switching voltage		400 V AC, 300 V DC	
Min. switching current		-	
Rated switching current acc. to IEC 60947-5-1, EN 60947-5-1	AC-12 (resistive) 230 V	5 A	
	AC-15 (inductive) 230 V	3 A	
	DC-12 (resistive) 24 V	5 A	
	DC-13 (inductive) 24 V	2 A	
Maximum lifetime	mechanical	30 x 10 ⁶ switching cycles	
	electrical (AC-12, 230 V, 4 A)	0.1 x 10 ⁶ switching cycles	
Short circuit proof,	n/c contact	4 A fast, operating class gL	
max. fuse rating	n/o contact	6 A fast, operating class gL	
General data			
Width of enclosure		45 mm	
Wire size		2 x 2.5 mm ² (2 x14 AWG) stranded wire with wire end ferrule	
Weight		approx. 300 g	
Mounting position		any	
Degree of protection housing / terminals		IP50 / IP20	
Operating temperature		-25 °C ... +65 °C	
Storage temperature		-40 °C ... +85 °C	
Mounting		DIN rail (EN 50022)	
Standards			
Product standards		IEC 255-6, EN 60255-6	
EMC Directives		89/336/EEC, 91/263/EEC, 92/31/EEC, 93/68/EEC, 93/67/EEC	
Electromagnetic compatibility	acc. to EN 61000-6-2, EN 61000-6-4		
ESD	acc. to IEC 61000-4-2, EN 61000-4-2	level 3	6 kV / 8 kV
HF radiation resistance	acc. to IEC 61000-4-3, EN 61000-4-3	level 3	10(3)V/m
Burst	acc. to IEC 61000-4-4, EN 61000-4-4	level 3	2(1) kV / 5 kHz
Surge	acc. to IEC 1000-4-5, EN 61000-4-5	level 3	2(1) kV L-L
HF line emission	acc. to IEC 1000-4-6, EN 61000-4-6	level 3	10(3) V
Low Voltage Directive		73/23/EEC	
Operational reliability	acc. to IEC 68-2-6	5 g	
Mechanical resistance	acc. to IEC 68-2-6	10 g	
Environmental testing	acc. to IEC 68-2-30	24 h cycle time, 55 °C, 93 % rel., 96 h	
Approvals			
C-Tick (under preparation), cULus, GL, GOST			
Isolation data			
Rating acc. to HD 625.1 S1, VDE 0110, IEC 664-1, IEC 60255-5		250 V	
Rated insulation voltage between supply, meas. and output circuits		4 kV / 1.2 - 50 μs	
Rated impulse withstand voltage between all isolated circuits		2.5 kV, 50 Hz, 1 min.	
Test voltage between all isolated circuits		2.5 kV, 50 Hz, 1 min.	
Pollution category		III	
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.

Insulation monitors

C 558

Technical data

		C 558.01	C 558.02	C 558.03
Supply circuit				
Supply voltage - power consumption	115 V AC A1-A2 230 V AC A1-A2	3 VA 3 VA	3 VA 3 VA	3 VA 3 VA
Supply voltage tolerance		-20...+15 %	-20...+15 %	-20...+15 %
Supply voltage frequency		15-400 Hz	50-400 Hz	15-400 Hz
Duty time		100 %	100 %	100 %
Measuring circuit				
Monitoring function		Insulation monitoring within electrically isolated ... AC and DC supply systems		
Measuring range, threshold value	min-max.	10-200 kΩ	1-200 kΩ	2-500 kΩ
AC internal resistance	min.	94 kΩ	180 kΩ	180 kΩ
DC internal resistance	min.	120 kΩ	200 kΩ	200 kΩ
Test resistance		-	-	-
Insulation voltage (L-PE)	max.	290 V DC, 300 V AC	690 V	630 V
Measuring voltage / current	max.	13 V / 0.47 mA	40 V / max. 200 μA	20 V / 100 μA
Cable length for reset-test button LT1-LT2	max.	-	-	-
Delay time	max.	5 s	1 s / 3 s	8-35 s
Indication of operational states				
Supply voltage		ON: green LED		
Isolation fault (IEC 1557-8, EN 60557-8, ASTM F-25.10.11)		"+": red LED, "-": red LED		
Output circuits				
Number of contacts		2 c/o contacts	2 c/o contacts	2 c/o contacts
Operational principle ¹⁾		open- or closed-circuit principle selectable		
Contact material		-	-	-
Rated voltage	acc. to VDE 0110, IEC 664-1, IEC 60947-1	250 V AC / 300 V DC		
Min. switching voltage		-	-	-
Max. switching voltage		-	-	-
Min. switching current		-	-	-
Rated switching current	AC-12 (resistive) 230 V	5 A		
acc. to IEC 60947-5-1, EN 60947-5-1	AC-15 (inductive) 230 V	2 A		
	DC-12 (resistive) 24 V	5 A		
	DC-13 (inductive) 24 V	0.2 A		
Maximum lifetime	mechanical	-	-	-
	electrical (AC-12, 230 V, 4 A)	1.2 x10 ⁴ switching cycles		
Short circuit proof,	n/c contact	-	-	-
max. fuse rating	n/o contact	-	-	-
General data				
Width of enclosure		45 mm	99 mm	99 mm
Wire size		0.2-4 mm ² solid wire, 0.2-2.5 mm ² stranded wire with wire end ferrule		
Weight	approx.	350 g	400 g	350 g
Mounting position		any		
Degree of protection housing / terminals		IP 30 / IP 20		
Operating temperature		-10 °C ... +55 °C		
Storage temperature		-40 °C ... +70 °C		
Mounting		DIN rail (EN 50022)		
Standards				
Product standard				
EMC Directive		89/336/EEC		
Electromagnetic compatibility	acc. to EN 61000-6-2, EN 61000-6-4			
ESD	acc. to IEC 61000-4-2, EN 61000-4-2	level 3 6 kV / 8 kV		
HF radiation resistance	acc. to IEC 61000-4-3	level 3 10(3) V/m		
Burst	acc. to IEC 61000-4-4, EN 61000-4-4	level 3 2(1) kV / 5 kHz		
Surge	acc. to IEC 1000-4-5, EN 61000-4-5	level 2		
HF line emission	acc. to IEC 1000-4-6, EN 61000-4-6	level 3 10(3) V		
Low Voltage Directive		73/23/EEC		
Vibration resistance	acc. to IEC 68-2-6	10-150 Hz / 0.15 mmm - 2 g		
Operational reliability	(IEC 68-2-27, IEC 68-2-29)			
Environmental testing	acc. to IEC 68-2-30			
Approvals				
		cULus	cULus, GL	
Isolation sdata				
Rating	acc. to HD 625.1 S1, VDE 0110, IEC 664-1, IEC 60255-5			
Rated insulation voltage between supply, meas. and output circuits		250 V	690 V	630 V
Rated impulse withstand voltage between all isolated circuits		4 kV / 1.2-50 μs	6 kV / 1.2-50 μs	6 kV / 1.2-50 μs
Test voltage between all isolated circuits		2 kV	3 kV	3 kV
Pollution category		III		
Overvoltage category		-	-	-

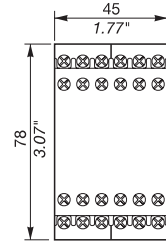
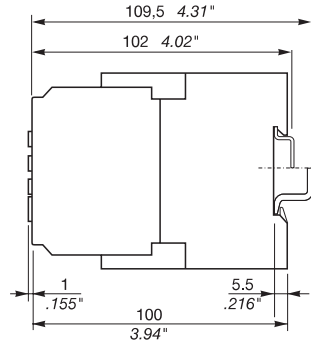
¹⁾ Open-circuit principle: Output relay is energized if the measured value exceeds/drops below the adjusted threshold.
 Closed-circuit principle: Output relay is de-energized if the measured value exceeds/drops below the adjusted threshold.

Insulation monitors

Dimensional drawings

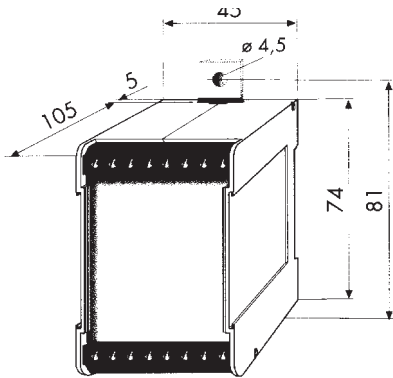
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CM-IWN

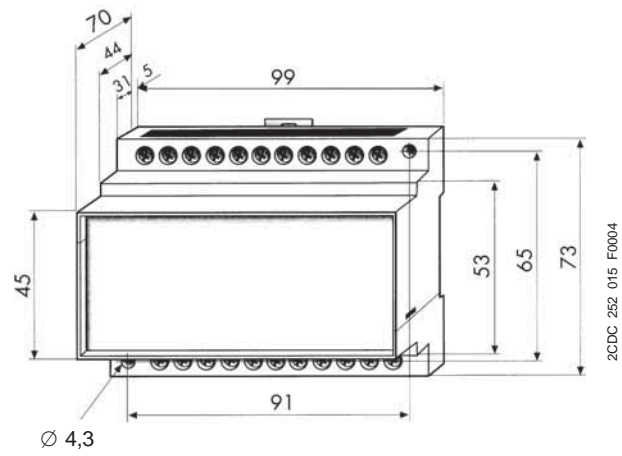


1SVC 110 000 F 0177

C558.01



C558.02, C558.03





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Motor load monitors CM-LWN

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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), $\cos \varphi$ 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)

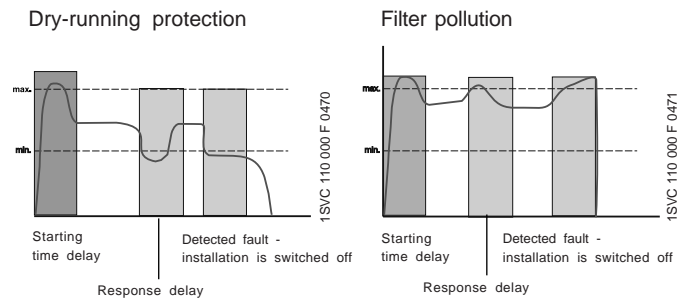
■ Transport/Conveyance

- Congested conveyor belts (overload)
- Jamming of belts (overload)
- Material accumulation in spiral conveyors (overload)
- Lifting platforms

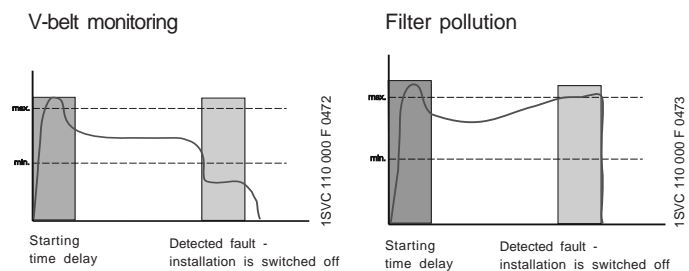
■ Machine installation

- Wear of tools, e.g. worn saw blades in circular saws, etc. (overload)
- Tool breakage (underload)
- V-belt drives (breakage underload)

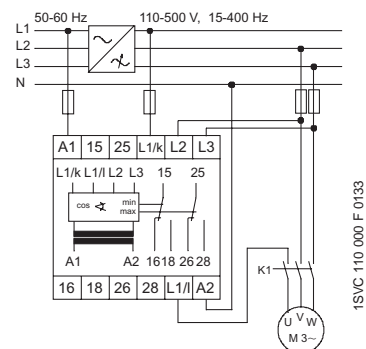
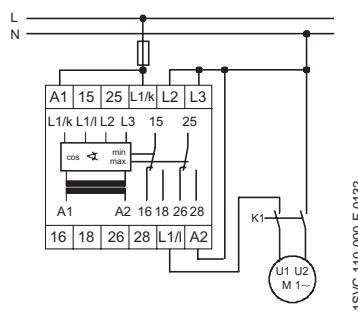
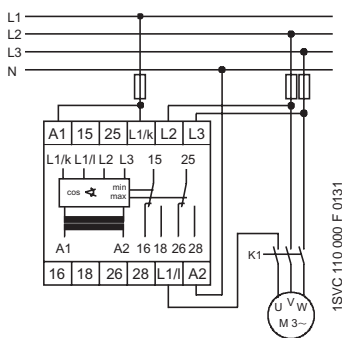
Pump control



Ventilator monitoring



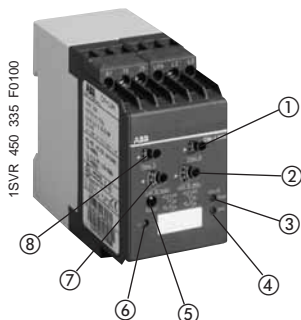
Wiring examples (for motor currents ≤ 20 A)



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 - supply voltage
- ⑦ Threshold for load limit "cos ϕ max."
- ⑧ Starting delay "Time S"

- 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, an LED lights up and the relay is de-energized.

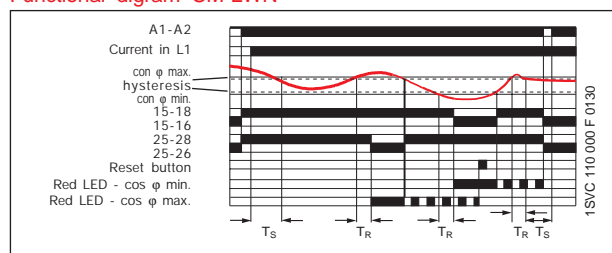
If cos ϕ returns to the acceptable limits (taking into account the hysteresis), the relay is reset to its original state and the LED flashes permanently to indicate the occurrence of the trip event. This message can be deleted using the reset button or by switching off the supply.

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.

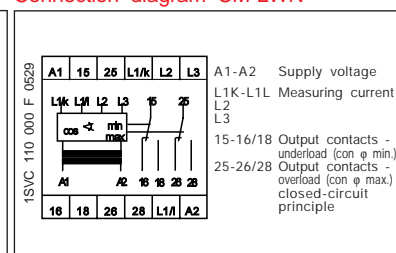
To guarantee correct operation of the response delay (Time R), the adjusted value for cos ϕ max. has to be higher than the value for cos ϕ min. plus the hysteresis. Consequently, the overload and underload indication must not be active at the same time.

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.

Functional digram CM-LWN



Connection diagram CM-LWN



Type	Supply voltage	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg/lb
Current ranges: 0.05-5 A;					
CM-LWN	24-240 V AC/DC	1SVR 450 335 R 0000	1		0.30/0.66
	110-130 V AC	1SVR 450 330 R 0000	1		0.30/0.66
	220-240 V AC	1SVR 450 331 R 0000	1		0.30/0.66
	380- 440 V AC	1SVR 450 332 R 0000	1		0.30/0.66
	480-500 V AC	1SVR 450 334 R 0000	1		0.30/0.66
Current ranges: 2-20 A;					
CM-LWN	24-240 V AC/DC	1SVR 450 335 R 0100	1		0.30/0.66
	110-130 V AC	1SVR 450 330 R 0100	1		0.30/0.66
	220-240 V AC	1SVR 450 331 R 0100	1		0.30/0.66
	380-440 V AC	1SVR 450 332 R 0100	1		0.30/0.66
	480-500 V AC	1SVR 450 334 R 0100	1		0.30/0.66

Motor load monitor CM-LWN Technical data

2

		CM-LWN
Supply circuit		
Supply voltage - 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
Supply voltage tolerance		-15 %...+10 %
Supply voltage frequency AC version		50-60 Hz
Supply voltage frequency AC/DC version		15-400 Hz or DC
Duty time		100 %
Measuring circuit		
Monitoring function		Load monitoring by phase shift evaluation between current and voltage
Voltage range L1k-L2-L3		110-500 V AC single-phase or three-phase
Current range L1-L1k		0.5-5 A version 2-20 A version
Permissible overload of current input		25 A for 3 s 100 A for 3 s
Threshold		$\cos \varphi_{\min}$ and $\cos \varphi_{\max}$ adjustable from 0 to 1
Hysteresis (related to phase angle φ in °)		4°
Frequency of measuring voltage		15-400 Hz
Max. measuring cycle 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
Timing error within supply voltage tolerance		≤ 0.5 %
Timing error within temperature range		≤ 0.06 % / °C
Indication of operational states		
Supply voltage		U: green LED
below $\cos \Phi$ min		$\cos \varphi$ min: red LED
$\cos \Phi$ max exceeded		$\cos \varphi$ max: red LED
Output circuits		
		15-16/18, 25-26/28
Number of contacts		2 x 1 change-over contact
Operational principle ¹⁾		closed-circuit principle
Contact material		AgCdO
Rated voltage acc. to VDE0110, IEC664-1, IEC947-1		250 V
Max. switching voltage		400 V AC, 300 V DC
Rated switching current acc. to IEC 60947-5-1	AC-12 (resistive) 230 V	4 A
	AC-15 (inductive) 230 V	3 A
	DC-12 (resistive) 24 V	4 A
	DC-13 (inductive) 24 V	2 A
Maximum lifetime	mechanical	30 x 10 ⁶ switching cycles
	electrical (AC-12, 230 V, 4 A)	0.1 x 10 ⁶ switching cycles
Short circuit proof, max. fuse rating	n/c contact	4 A fast operation class gL
	n/o contact	6 A fast operation class gL
General data		
Width of enclosure		45 mm
Wire size		2 x 2.5 mm ² (2 x 14 AWG) stranded wire with wire end ferrule
Mounting position		any
Degree of protection housing/ terminals		IP50 / IP20
Operating temperature		-25 °C ... +65 °C
Storage temperature		-40 °C ... +85 °C
Mounting		DIN rail (EN 50022)
Standards		
Product standard		IEC 255-6, EN 60255-6
EMC Directive		89/336/EEC, 91/263/EEC, 92/31/EEC, 93/68/EEC, 93/67/EEC
Electromagnetic compatibility acc. to EN 61000-6-2, EN 61000-6-4		
ESD acc. to IEC 61000-4-2, EN 61000-4-2		level 3 6 kV / 8 kV
HF radiation resistance acc. to IEC 61000-4-3, EN 61000-4-3		level 3 10 V/m
Burst acc. to IEC 61000-4-4, EN 61000-4-4		level 3 2 kV / 5 kHz
Surge acc. to IEC 1000-4-5, EN 61000-4-5		level 4 2 kV L-L
HF line emission acc. to IEC 1000-4-6, EN 61000-4-6		level 3 10 V
Low Voltage Directive		73/23/EEC
Operational reliability acc. to IEC 68-2-6		5 g
Mechanical resistance acc. to IEC 68-2-6		10 g
Environmental testing acc. to IEC68-2-30		24 h cycle time, 55 °C, 93 % rel., 96 h
Approvals		
		C-Tick (under preparation), cULus, GL, GOST
Isolation data		
Rating acc. to 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 μ s
Test voltage between all isolated circuits		2.5 kV, 50 Hz, 1 min.
Pollution category		III
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.



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Thermistor motor protection relays

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 Ta and Tb (or Ta and Tbx without short-circuit detection). The number of possible PTC sensors per measuring circuit is limited by the sum of the individual PTC sensor resistances.

$$R_G = R_1 + R_2 + R_N \leq 1.5 \text{ k}\Omega$$

Under normal operating conditions the resistance is below the response threshold. If only one of the PTC resistors heats up excessively, the output relay is de-energized.

If the autoreset function is configured, the output relay is re-energized 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.

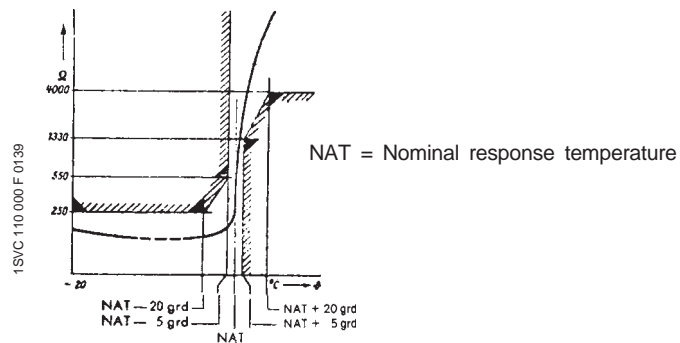
Further applications:

Temperature monitoring of equipment with PTC sensors integrated, such as

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

2

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



Product overview: Thermistor motor protection relays

NEW

Type	CM-MSE	CM-MSS	CM-MSS	CM-MSS	CM-MSS	CM-MSS	CM-MSS	CM-MSS	CM-MSS	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⁾	• ²⁾
Operation/Reset										
Auto reset	•	•	•	•	• ²⁾	• ²⁾	• ²⁾	• ²⁾	• ²⁾	• ²⁾
Manual reset	-	-	•	•	•	•	•	•	•	•
Remote reset	-	-	•	•	•	•	•	•	•	•
Test button	-	-	-	•	•	•	•	•	•	•
Output contacts										
Operational principle	closed-circuit principle									
Number / type	1 n/o	1 c/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 connection terminals S1-T2

Thermistor motor protection relays

CM-MSE, CM-MSS

Ordering details

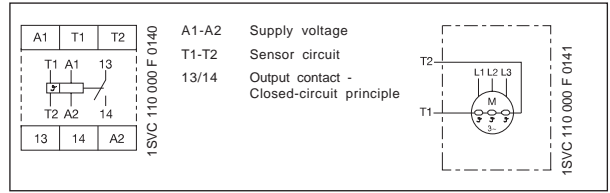
2CDC 251 012 F 0003



CM-MSE

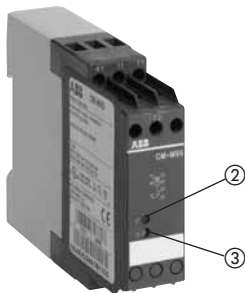
CM-MSE

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



Type	Supply voltage	Order code	Pack. unit pieces	Price 1 piece	Weight 1 pc. kg/lb
CM-MSE	24 V AC	1SVR 550 805 R 9300	1		0.11/0.242
	110-130 V AC	1SVR 550 800 R 9300	1		0.11/0.242
	220-240 V AC	1SVR 550 801 R 9300	1		0.11/0.242

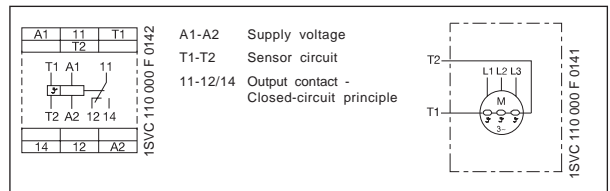
1SVR 430 801 F 1100



CM-MSS, 1 c/o contact with automatic reset

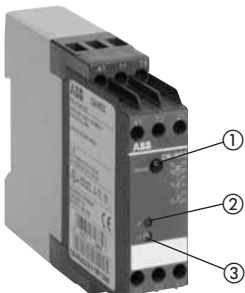
CM-MSS, 1c/o contact with automatic reset

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



Type	Supply voltage	Order code	Pack. unit pieces	Price 1 piece	Weight 1 pc. kg/lb
CM-MSS (1)	24 V AC/DC	1SVR 430 800 R 9100	1		0.15/0.33
	220-240 V AC	1SVR 430 801 R 1100	1		0.15/0.33

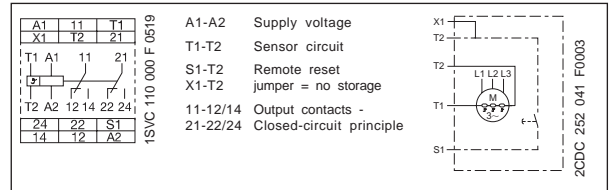
1SVR 430 811 F 1300



CM-MSS, 2 c/o contacts with reset button

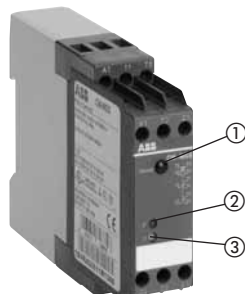
CM-MSS, 2 c/o contacts with reset button

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



Type	Supply voltage ¹⁾ not electrically isolated	Order code	Pack. unit pieces	Price 1 piece	Weight 1 pc. kg/lb
CM-MSS (2)	24 V AC/DC ¹⁾	1SVR 430 810 R 9300	1		0.15/0.33
	24 V AC	1SVR 430 811 R 9300	1		0.15/0.33
	110-130 V AC	1SVR 430 811 R 0300	1		0.15/0.33
	220-240 V AC	1SVR 430 811 R 1300	1		0.15/0.33

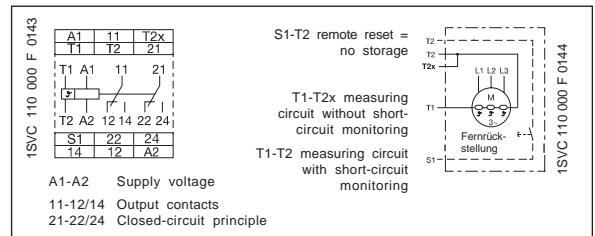
1SVR 430 811 F 1300



CM-MSS, 2 c/o contacts with configurable short-circuit monitoring

CM-MSS, 2 c/o contacts with reset button and short-circuit monitoring configurable

- Fault storage can be switched off
- Storage reset button
- Remote reset
- Short-circuit monitoring of the sensor circuit configurable
- 2 c/o contacts
- 2 LEDs for status indication
- ATEX approved Ex II (2) G, PTB 02 ATEX 3080



Type	Supply voltage	Order code	Pack. unit pieces	Price 1 piece	Weight 1 pc. kg/lb
CM-MSS (3)	24 V AC/DC	1SVR 430 710 R 9300	1		0.15/0.33
	110-130 V AC	1SVR 430 711 R 0300	1		0.15/0.33
	220-240 V AC	1SVR 430 711 R 1300	1		0.15/0.33
	380-440 V AC	1SVR 430 711 R 2300	1		0.15/0.33

- ① Reset
- ② F: red LED - fault tripping
- ③ U: green LED - supply voltage

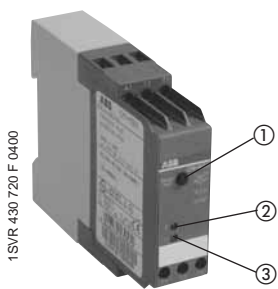
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2

Thermistor motor protection relay CM-MSS

Ordering details

2



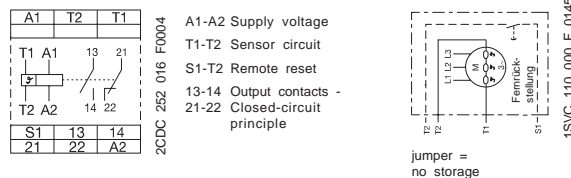
CM-MSS, 1-channel

- ① Reset / Test button
- ② F: red LED - fault tripping
- ③ U: green LED - supply voltage

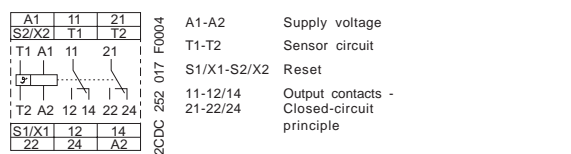
CM-MSS, 1-channel

- Short-circuit monitoring of the sensor circuit
- Continuous voltage range: 24-240 V AC/DC
- Non-volatile storage in case of fault selectable
- Storage reset and test button
- Remote reset
- Automatic reset configurable
- Output contacts: 1 n/c and 1 n/o or 2 c/o
- 2 LEDs for status indication
- CM-MSS (4): ATEX approved Ex II (2) G, PTB 02 ATEX 3080
- CM-MSS (5): ATEX approval (pending)

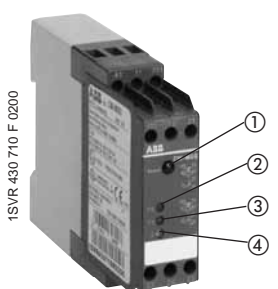
Connection diagram CM-MSS, 1-channel, 1 n/c, 1 n/o



Connection diagram CM-MSS, 1-channel, 2 c/o



Type	Supply voltage	Order number	Pack. unit pieces	Price 1 piece	Weight 1 pc. kg/lb
CM-MSS (4) 1-channel 1n/c, 1n/o	24-240 V AC/DC	1SVR 430 720 R 0400	1		0.15/0.33
NEW CM-MSS (5) 1-channel 2c/o	24-240 V AC/DC	1SVR 430 720 R 0300	1		x

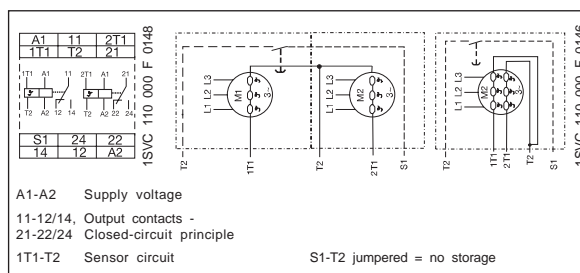


CM-MSS, 2-channel

- ① Reset / Test button
- ② to ③ F1-F2: red LED - fault tripping 1 to 2
- ④ U: green LED - supply voltage

CM-MSS, 2-channel, single evaluation

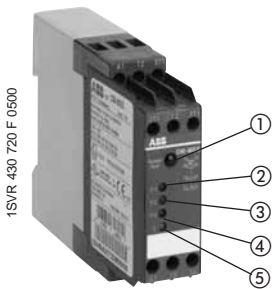
- Short-circuit monitoring for the sensor circuits
- Wide supply voltage range: 24-240 V AC/DC
- 2 separate sensor circuits for monitoring of two motors or one motor with 2 sensor circuits (prewarning and final switch off)
- Storage reset and test button
- Automatic reset configurable
- Output contacts: 2 x 1 c/o
- 3 LEDs for status indication
- ATEX approved Ex II (2) G, PTB 02 ATEX 3080



Type	Supply voltage	Order code	Pack. unit pieces	Price 1 piece	Weight 1 pc. kg/lb
CM-MSS (6)	24-240 V AC/DC	1SVR 430 710 R 0200	1		0.15/0.33

• Technical data	79	• Dimensional drawings	109
• Accessories: PTC sensor	78	• Accessories	109

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



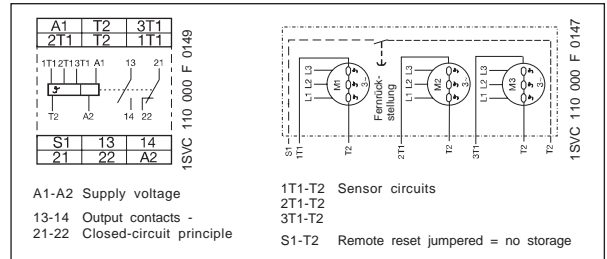
CM-MSS, 3 sensor circuits

- ① Reset / Test button
- ② to ④ F1-F3: red LED - fault tripping 1 to 3
- ⑤ U: green LED - supply voltage

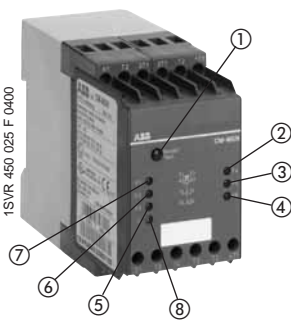
CM-MSS, 3 sensor circuits, accumulative evaluation

- Short-circuit monitoring for the sensor circuits
- Continuous supply voltage range 24-240 V AC/DC
- Non-volatile storage configurable
- Remote reset
- Automatic reset configurable
- Storage reset and test button
- Output contacts: 1 n/c, 1 n/o
- 4 LEDs for status indication
- ATEX approved

⊕ II (2) G, PTB 02 ATEX 3080



Type	Supply voltage	Order code	Pack. unit pieces	Price 1 piece	Weight 1 pc. kg/lb
CM-MSS (7)	24-240 V AC/DC	15VR 430 720 R 0500	1		0.15/0.33



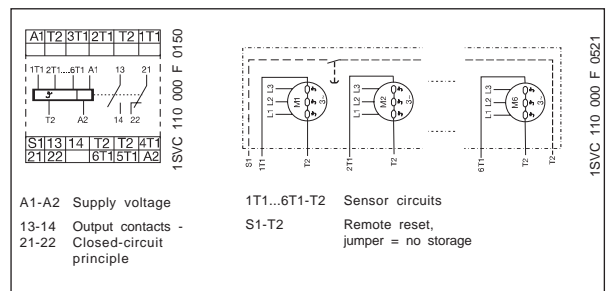
CM-MSN, 6 sensor circuits

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

CM-MSN, 6 sensor circuits, accumulative evaluation

- Short-circuit monitoring of the sensor circuit
- Continuous voltage range: 24-240 V AC/DC
- Non-volatile storage configurable
- Remote reset
- Automatic reset configurable
- Storage reset and test button
- Output contacts: 1 n/c, 1 n/o
- 7 LEDs for status indication
- ATEX approved

⊕ II (2) G, PTB 02 ATEX 3080



Type	Supply voltage	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg/lb
CM-MSN	24-240 V AC/DC	15VR 450 025 R 0100	1		0.23/0.506

• Technical data	79	• Dimensional drawings	109
• Accessories: PTC sensor	78	• Accessories	109

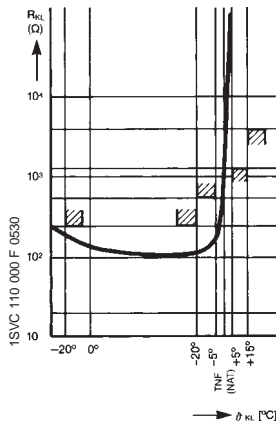


Thermistor motor protection

PTC temperature sensors C 011

Ordering details, technical data

Temperature sensor characteristic



General information

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 Publication 34-11
- 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 660 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 control units can also be used with PTC temperature sensors of other manufacturers which comply with DIN 44 081 and DIN 44 082.

Technical data

Characteristic data	Sensor type C 011
Cold-state resistance	50 -150 Ω at 25 °C
Warm-state resistance ± 5 up to 6 K of nom. temperature, TNF (NAT)	10 000 Ω
Thermal time constant, sensor open ¹⁾	2.5 - 3.5 s
Short-circuit current density	50 A/mm ² max.
Max. permitted voltage at the sensor terminals	2.5 V max.
Permitted ambient temperature	short-term + 275 °C continuously + 175 °C

¹⁾ Not embedded in windings.

Type	Rated temp. °C	Color coding	Order code	Pack. unit pieces	Price per pack	Weight 1 piece kg/lb
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Temperature sensor C 011, standard version acc. to DIN 44081

C 011- 70	70	white-brown	GHC 011 0003 R 0001	3		0.02/0.044
C 011- 80	80	white-white	GHC 011 0003 R 0002	3		0.02/0.044
C 011- 90	90	green-green	GHC 011 0003 R 0003	3		0.02/0.044
C 011-100	100	red-red	GHC 011 0003 R 0004	3		0.02/0.044
C 011-110	110	brown-brown	GHC 011 0003 R 0005	3		0.02/0.044
C 011-120	120	gray-gray	GHC 011 0003 R 0006	3		0.02/0.044
C 011-130	130	blue-blue	GHC 011 0003 R 0007	3		0.02/0.044
C 011-140	140	white-blue	GHC 011 0003 R 0011	3		0.02/0.044
C 011-150	150	black-black	GHC 011 0003 R 0008	3		0.02/0.044
C 011-160	160	blue-red	GHC 011 0003 R 0009	3		0.02/0.044
C 011-170	170	white-green	GHC 011 0003 R 0010	3		0.02/0.044

Triple temperature sensor C 011-3

C 011-3-150	150	black-black	GHC 011 0033 R 0008	1		0.05/0.11
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1SVC 110 000 F 0531

Thermistor motor protection relays

CM-MSE, CM-MSS, CM-MSN

Technical data

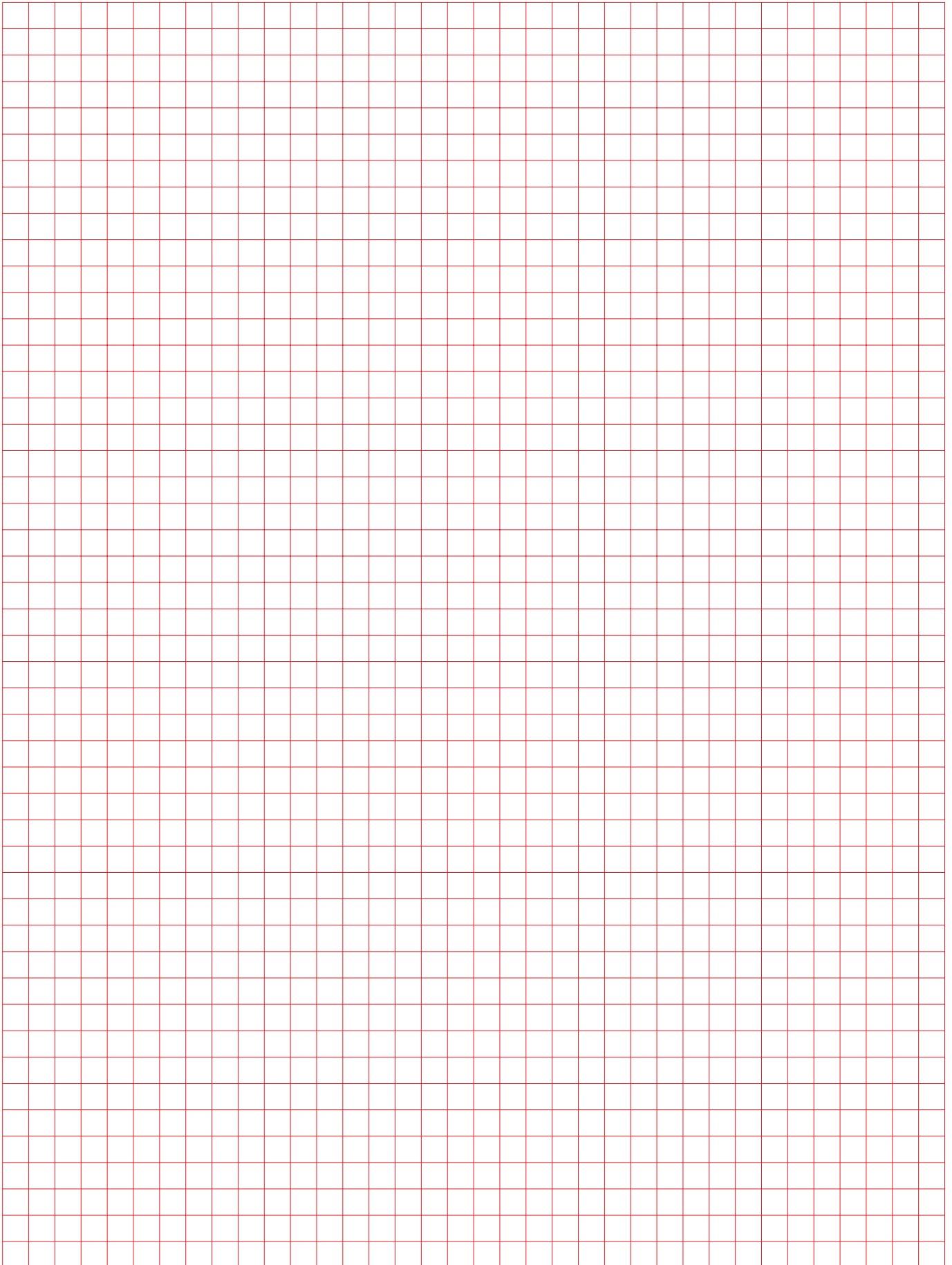
		CM-MSE, CM-MSS, CM-MSN		
Input circuit				
Supply voltage - power consumption	A1-A2	24 V AC	approx. 1.5 VA	
	A1-A2	24 V AC/DC	approx. 1.1 VA / 0.6 W	
	A1-A2	110-130 V AC	approx. 1.5 VA	
	A1-A2	220-240 V AC	approx. 1.5 VA	
	A1-A2	380-440 V AC	approx. 1.7 VA	
	A1-A2	24-240 V AC/DC	approx. 1.4-1.7 W / approx. 3.5-5.7 VA	
Supply voltage tolerance	-15 %...+10 %			
Supply voltage frequency	AC: 50-60 Hz, versions 24-240 V AC/DC: 15-400 Hz			
Duty time	100 %			
Measuring circuit				
T1-T2/T2x, 1Ta...1Tb-T2				
Monitoring function	temperature monitoring by means of PTC sensors			
Number of sensor circuits	1, 2, 3 or 6, refer to ordering details			
Short-circuit monitoring	refer to ordering details			
Non-volatile storage	refer to ordering details			
Test function	refer to ordering details			
Sensor circuit				
Temperature switch-off resistance (relay de-energizes)	CM-MSE: 2.7-3.7 k Ω , (3050 \pm 550 Ω ²⁾)		3.6 k Ω \pm 5 %	
Temperature switch-on resistance (relay energizes)	CM-MSE: 1.7-2.3 k Ω , (1900 \pm 400 Ω ²⁾)		1.6 k Ω \pm 5 %	
Short-circuit switch-off resistance (relay de-energizes)	<20 Ω			
Short-circuit switch-on resistance (relay energizes)	>40 Ω			
Max. total resistance of sensors connected in series (cold states)	\leq 1.5 k Ω			
Max. cable length for short-circuit detection	2 x 100 m at 0.75 mm ² , 2 x 400 m at 2.5 mm ²			
Response time	<100 ms			
Control circuit for storage and hysteresis function				
Remote reset	S1-T2	n/o contact		
Max. no-load voltage	approx. 25 V, 5.5 V (24-240 V AC/DC versions)			
Max. cable length	\leq 50 m, 100-200 m if shielded			
Indication of operational states				
Supply voltage	U: green LED			
Fault tripping	F: red LED			
Output circuits				
11-12/14, 21-22/24, 13-14, 21-22				
Number of contacts	1 n/o, 1 c/o, 2 c/o, 1 n/c + 1 n/o			
Operational principle	closed-circuit principle (output relay is de-energized if the measured value exceeds/drops below the adjusted threshold)			
Contact material	AgCdO			
Rated voltage acc. to VDE0110, IEC664-1, IEC947-1	250 V			
Max. switching voltage	250 V			
Rated switching current	AC-12 (resistive)	230 V	4 A	
acc. to IEC 60947-5-1	AC-15 (inductive)	230 V	3 A	
	DC-12 (resistive)	24 V	4 A	
	DC-13 (inductive)	24 V	2 A (1.5 A - n/c contact ¹⁾)	
Maximum lifetime	mechanical	30 (10 ¹¹) x 10 ⁶ switching cycles		
	electrical (AC-12, 230 V, 4 A)	0.1 x 10 ⁶ switching cycles		
Short circuit proof,	n/c contact	2 A (4 A ¹⁾) fast, operation class gL		
max. fuse rating	n/o contact	10 A (6 A ¹⁾) fast, operation class gL		
General data				
Enclosure width	CM-MSE: 22.5 mm	CM-MSS: 22.5 mm	CM-MSN: 45 mm	
Wire size (stranded wires with wire end ferrule)	CM-MSE: 2x1.5mm ² (16AWG)	CM-MSS: 2x2.5mm ² (14AWG)	CM-MSN: 2x2.5mm ² (14WG)	
Weight	CM-MSE: approx. 110 g	CM-MSS: approx. 150 g	CM-MSN: approx. 150 g	
Mounting position	any			
Degree of protection: housing / terminals	IP50 / IP20			
Operating temperature	CM-MSE: -20 °C ... +60 °C	CM-MSS: -20 °C ... +60 °C	CM-MSN: -25 °C ... +65 °C	
Storage temperature	-40 °C...+80 °C			
Mounting	DIN rail (EN 50022)			
Standards				
Product standard	IEC 255-6, EN 60255-5			
EMC Directive	89/336/EEC, 91/263/EEC, 92/31/EEC, 93/68/EEC, 93/67/EEC			
Electromagnetic compatibility acc. to EN 61000-6-2, EN 61000-6-4				
ESD acc. to IEC 61000-4-2, EN 61000-4-2			level 3	6 kV / 8 kV
HF radiation resistance acc. to IEC 61000-4-3, EN 61000-4-3			level 3	10 V/m
Burst acc. to IEC 61000-4-4, EN 61000-4-4			level 3	2 kV / 5 kHz
Surge acc. to IEC 1000-4-5, EN 61000-4-5			level 3/4	1/2 kV
HF line emission acc. to IEC 1000-4-6, EN 61000-4-6			level 3	10 V
Low Voltage Directive	73/23/EEC			
Operational reliability acc. to IEC 68-2-6	CM-MSE: 6 g	CM-MSS: 4 g	CM-MSN: 5 g	
Resistance to vibration acc. to IEC 68-2-6	CM-MSE: 10 g	CM-MSS: 6 g	CM-MSN: 10 g	
Environmental testing	acc. to IEC 68-2-30			
	24 h cycle time, 55 °C, 93 % rel., 96 h			
Approvals				
partly cULus, GL in parts, ATEX in parts, GOST, C-Tick				
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 μ s			
Test voltage between all isolated circuits	2.5 kV, 50 Hz, 1 min.			
Pollution category	III			
Overvoltage category	III			

¹⁾ 1SVR 430 710 R 0200, 1SVR 430 8xx R xxxx

²⁾ 1SVR 430 810 R 9300, 1SVR 430 800 R 9100

Notes

2





Temperature monitoring relays C51x range

for PT100/1000, KTY83/84 and
NTC sensors

Content

Temperature monitoring relays C51x range

Benefits and advantages	82
Ordering details	83
Functional diagrams, circuit diagrams	84
Technical data	85
Dimensional drawings	109

Temperature monitoring relays

C51x for PT100/1000, KTY83/84 and NTC sensors

Benefits and advantages



1 SVC 110 000 F 0555

C510: 1 threshold



1 SVC 110 000 F 0556

C511: 2 thresholds



1 SVC 110 000 F 0557

C512: 2 thresholds
1 sensor

C513: 2 thresholds
1-3 sensors

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).

Analog tripping devices...

- Sensor types: PT100.
- Measuring principle for 2-wire 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°C - +50°C / 0°C - 100°C / 0°C - 200°C.
- Potentiometer for temperature limits and hysteresis adjustment between 2-20 %.
- Closed-circuit principle.
- Slim 22.5 mm enclosure with 12 terminals.

...with one threshold:

- Supply voltage 24 V AC/DC or 110/230 V AC .
- LED indication for supply voltage and relay status.
- 1 n/o and 1 n/c contact.

...with two thresholds:

- Additional potentiometer for J2 (hysteresis for 2nd threshold value is 5% of the meas. range).
- Supply voltage 24-240 V AC/DC or 24 V AC/DC.
- LED indication of supply voltage and both relay states.
- Closed-circuit or open-circuit principle selectable.
- 1 n/o and 1 n/c contact.

Digital tripping devices

- High-end temperature monitor for 1 or 1-3 sensor circuits.
- Multifunctional digital display and three LEDs (for threshold values and ready).
- Sensor type selectable.
- Over- or undertemperature monitoring or range monitoring function.

- Open-circuit or closed-circuit principle selectable.
- Hysteresis for both threshold values (1 to 99 K)
- Storage function selectable via external signal (Y1/Y2).
- 1 n/o contact and 2 c/o contacts.
- Adjustable time delay of 0-999 s.
- Wire-break and short-circuit detection using a dedicated signalling contact (1 n/o contact).
- Non-volatile storage of parameter settings.
- 45 mm wide enclosure with 24 terminals.
- Measuring principle for 2-wire and 3-wire sensors.
- Electrical isolation (except 24 V AC/DC devices).
- 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.

Benefit

- Version for evaluation of 1 to 3 sensors in a single device available, e.g. for multiple monitoring within an installation or for motor protection.
- Extremely simple operation without any complicated menus.
- Graduated product range; suitable devices for every application.
- High-end tripping devices with digital display - suitable for a wide temperature range and for various sensor types.
- Adjustable hysteresis.
- Quick fault diagnostic by short-circuit and wire-break detection.
- Wide voltage range power supply units reduce the number of required part versions.
- Easy-to-program two- or three-position control.

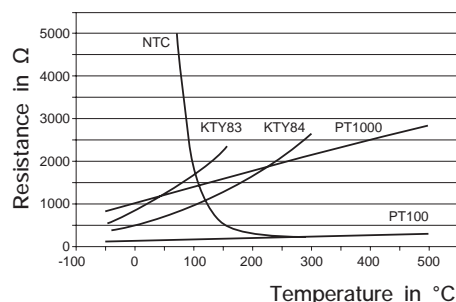
Fields of application

The C51x temperature monitoring relays can be used almost anywhere to prevent that the temperature exceeds or drops below a given limit, e.g. for monitoring of adjusted temperature limits and output of alarm messages for:

- Motor and system protection.
- Control cabinet temperature monitoring.
- Frost monitoring.
- Temperature limits for process variables, e.g. in the packaging 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.

Characteristic curves of resistance sensors



1 SVC 110 000 F 0190

Temperature monitoring relays C51x, accessories Ordering details

Type	Order code	Sensor	Description	Monitoring function	Measuring range	Contact elements	Indications	Control supply voltage	Price 1 piece
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C510, analog adjustable, 1 threshold, 22.5 mm wide

In analog adjustable devices all of the settings are adjusted with a knob. A threshold and a hysteresis of 2 - 20% can be set. This product series has been developed for applications where an adjustment precision of $\pm 5\%$ is sufficient.

C510.01-24	1SAR 700 001 R 0005	PT100	1 threshold, closed-circuit principle, no storage	Over-temperature	- 50 to + 50 °C	1 n/o + 1 n/c	2 LEDs	24 V AC/DC	
C510.01-K	1SAR 700 001 R 0006				110/230 V AC				
C510.02-24	1SAR 700 002 R 0005				0 to + 100 °C			24 V AC/DC	
C510.02-K	1SAR 700 002 R 0006				110/230 V AC				
C510.03-24	1SAR 700 003 R 0005				0 bis + 200 °C			24 V AC/DC	
C510.03-K	1SAR 700 003 R 0006						110/230 V AC		
C510.11-24	1SAR 700 004 R 0005	PT100	1 threshold, closed-circuit principle, no storage	Under-temperature	- 50 to + 50 °C	1 n/o + 1 n/c	2 LEDs	24 V AC/DC	
C510.11-K	1SAR 700 004 R 0006				110/230 V AC				
C510.12-24	1SAR 700 005 R 0005				0 to + 100 °C			24 V AC/DC	
C510.12-K	1SAR 700 005 R 0006				110/230 V AC				
C510.13-24	1SAR 700 006 R 0005				0 to + 200 °C			24 V AC/DC	
C510.13-K	1SAR 700 006 R 0006						110/230 V AC		

C511, analog adjustable, 2 thresholds (warning and switch-off), 22.5 mm wide

In analog adjustable devices with two thresholds all of the settings are adjusted with a knob. Two thresholds and a hysteresis of 2 - 20% can be set. The hysteresis acts on threshold 1. For the second threshold a hysteresis of 5% applies. This product series has been developed for simple applications where an adjustment precision of $\pm 5\%$ is sufficient.

C511.01-24	1SAR 700 011 R 0005	PT100	2 thresholds, open-circuit or closed-circuit principle selectable, no storage	Over-temperature	- 50 to + 50 °C	1 n/o + 1 n/c	3 LEDs	24 V AC/DC	
C511.01-W	1SAR 700 011 R 0010				24-240 V AC/DC				
C511.02-24	1SAR 700 012 R 0005				0 to + 100 °C			24 V AC/DC	
C511.02-W	1SAR 700 012 R 0010				24-240 V AC/DC				
C511.03-24	1SAR 700 013 R 0005				0 to + 200 °C			24 V AC/DC	
C511.03-W	1SAR 700 013 R 0010						24-240 V AC/DC		
C511.11-24	1SAR 700 014 R 0005	PT100	2 thresholds, open-circuit or closed-circuit principle selectable, no storage	Under-temperature	- 50 to + 50 °C	1 n/o + 1 n/c	3 LEDs	24 V AC/DC	
C511.11-W	1SAR 700 014 R 0010				24-240 V AC/DC				
C511.12-24	1SAR 700 015 R 0005				0 to + 100 °C			24 V AC/DC	
C511.12-W	1SAR 700 015 R 0010				24-240 V AC/DC				
C511.13-24	1SAR 700 016 R 0005				0 to + 200 °C			24 V AC/DC	
C511.13-W	1SAR 700 016 R 0010						24-240 V AC/DC		

C512, C513, digitally adjustable, 2 thresholds, 45 mm wide

The three-digit LED display always displays the current temperature. Sensor monitoring is provided by a dedicated relay with one n/o contact which reports a sensor failure or short-circuit. In programming mode the relay is switched off. Digitally adjustable temperature monitoring relays are particularly easy to operate.

The following parameters can be adjusted:

- Sensor type: PT100/1000, KTY 83/84, NTC-B57227-K333-A1
- Up to three sensors (C513-W)
- 2 thresholds, ϑ_1 , ϑ_2
- 1 hysteresis; acts on both thresholds
- 1 delay time; acts on both thresholds
- Open-circuit or closed-circuit principle selectable
- Monitoring function: Over-/under-temperature or range monitoring
- Storage function can be selected by external bridge

C512-24	1SAR 700 100 R 0005	PT100/ 1000 KTY 83/84; NTC ¹⁾	1 sensor, storage / no storage	Over-temperature, under-temperature, range monitoring	- 50 to + 500 °C	1 c/o + 1 c/o + 1 n/o	3 LEDs + digital display	24 V AC/DC	
C512-W	1SAR 700 100 R 0010							24-240 V AC/DC	
C513-W	1SAR 700 110 R 0010		1 to 3 sensors storage / no storage					24-240 V AC/DC	

Limitation depending on the selected sensor type

Depending on the sensor type, the measuring range of digital devices is limited as follows:

Type	Measuring range °C
PT100	- 50 to + 500
PT1000	- 50 to + 500
KTY 83	- 50 to + 175
KTY 84	- 40 to + 300
NTC ¹⁾	+ 80 to + 160

1) NTC, type Siemens Matsushita B 57272-4333-A1 - 100 °C: 1.8 k Ω ; 25 °C: 32.762 k Ω

Accessories

Replaceable cover marking for digital devices

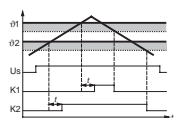
Type		Ordercode	Price 1 piece
C512-D	1 sensor	German	1SAR 700 101 R 0100
C512-E		English	1SAR 700 102 R 0100
C513-D	1 to 3 sensors	German	1SAR 700 111 R 0100
C513-E		English	1SAR 700 112 R 0100

Temperature monitoring relays C51x for PT100/1000, KTY83/84 and NTC sensors Functional diagrams / circuit diagrams

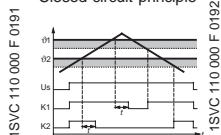
Functions

Overtemperature

Open-circuit principle

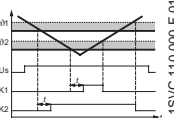


Closed-circuit principle

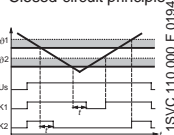


Undertemperature

Open-circuit principle



Closed-circuit principle

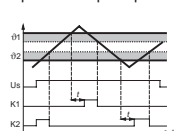


Functional principle with storage function,

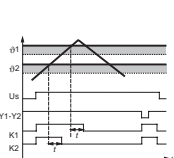
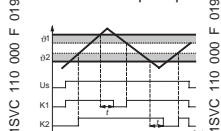
using overtemperature with closed-circuit principle as an example

Range monitoring

Open-circuit principle



Closed-circuit principle

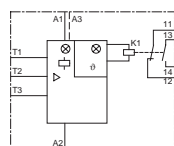


— absolute limit
 ■ hysteresis
 hysteresis

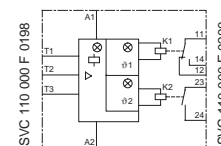
Circuit diagrams

Connection examples

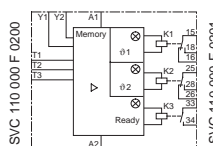
C510



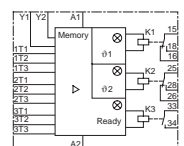
C511



C512



C513



General marking of the devices

A1, A2, A3 Supply voltage connections
 K1, K2, K3 Output relay

Marking for C510/C511

LED: "Supply voltage present"
 ϑ1 = LED: "Relay 1 energized"
 ϑ2 = LED: "Relay 2 energized"
 T1-T3 = Sensor connection

Marking for C512

ϑ1 = LED: "Relay 1 energized"
 ϑ2 = LED: "Relay 2 energized"
 Ready = LED: "Device operative"
 T1-T3 = Sensor connection
 Y1/Y2 = Connection for storage bridge

Marking for C513

ϑ1 = LED: "Relay 1 energized"
 ϑ2 = LED: "Relay 2 energized"

Digital tripping devices

Once the temperature has reached the set threshold of ϑ1, output relay K1 changes its switching state after the set time delay t has elapsed (K2 reacts in the same way for ϑ2).

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 ϑ1, 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 ϑ2.

Once the temperature has reached the set threshold of ϑ1, output relay K1 changes its switching state after the set time t has elapsed. (K2 reacts in the same way at ϑ2).

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.

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.

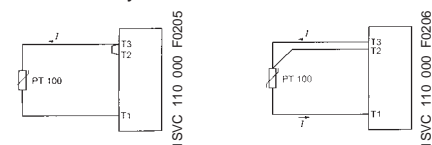
Temperature error depending on the line length and conductor cross section for PT100 sensors at an ambient temperature of 20 °C (in K)

Line length in mm	Conductor cross section mm ²			
	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

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 monitoring relays

C51x for PT100/1000, KTY83/84 and NTC sensors

Technical data

Type		C510	C511	C512/C513
Sensor type		PT100	PT100	PT100, PT1000 KTY83, KTY84, NTC
General data				
Enclosure width		22.5 mm		45 mm
Operating range of supply voltage		0.85 V - 1.1 V x V _S		
Rated power consumption		< 2 W/VA		< 4
Auxiliary circuit				
Contact elements		1 n/o + 1 n/c	1 c/o + 1 n/o	1 c/o + 1 c/o + 1 n/o
Rated operating currents I _e	AC-15 230 V DC-13 24 V DC-13 240 V	3 A 1 A 0.1 A		
Fusing DIAZED		4 A, operating class gL/gG		
Electrical lifetime	AC-15 at 3 A	1 x 10 ⁵ switching cycles		
Mechanical lifetime		30 x 10 ⁶ switching cycles		
Tripping device				
Measuring precision at an ambient temperature of 20°C (T20)		typically < ± 5 % of full-scale value		< ±2 K ± 1 digit
Reference junction precision		—	—	—
Deviation caused by ambient temperature in % of the measuring range		< 2 %	< 2 %	0.05 °C per K deviation from T20
Measuring cycle				500ms
Hysteresis settings	for temperature 1 for temperature 2	2 to 20 % of full-scale value 5% of full-scale value		1 to 99 kelvin for both values
Sensor circuit				
Typical sensor current	PT100 PT1000 / KTY83 / KTY84 / NTC	1 mA typically 0.2 mA typically	1 mA typically 0.2 mA typically	1 mA typically 0.2 mA typically
Wire-break detection		no		yes ¹⁾
Short-circuit detection		no		yes
3-wire connection		yes ²⁾	yes ²⁾	yes ²⁾
Enclosure				
Permissible ambient temperature		– 25 °C ... 60 °C		
Permissible storage temperature		– 40 °C ... 80 °C		
Mounting position		any		
Protection class	acc. to EN 60529	terminals: IP20; cover: IP40		
Rated insulation voltage V _i	(pollution degree 3)	300 V AC		
Wire size	solid-wire	1 x 4 mm ² (1 x 12 AWG), 2 x 2.5 mm ² (2 x 14 AWG)		
	stranded wire with wire end ferrule	1 x 2.5 mm ² (1 x 14 AWG), 2 x 1.5 mm ² (2 x 16 AWG)		
Vibration resistance	acc. to IEC 68-2-6	5 to 26 Hz / 0.75 mm		
Shock resistance	acc. to IEC 68-2-27	15 g		

1) Not for NTC (B57227-K333-A1) (100°C: 1.8 kW; 25 °C: 32. 762 kW)

2) 2-wire connection of sensors with terminals T2 and T3 bridged.

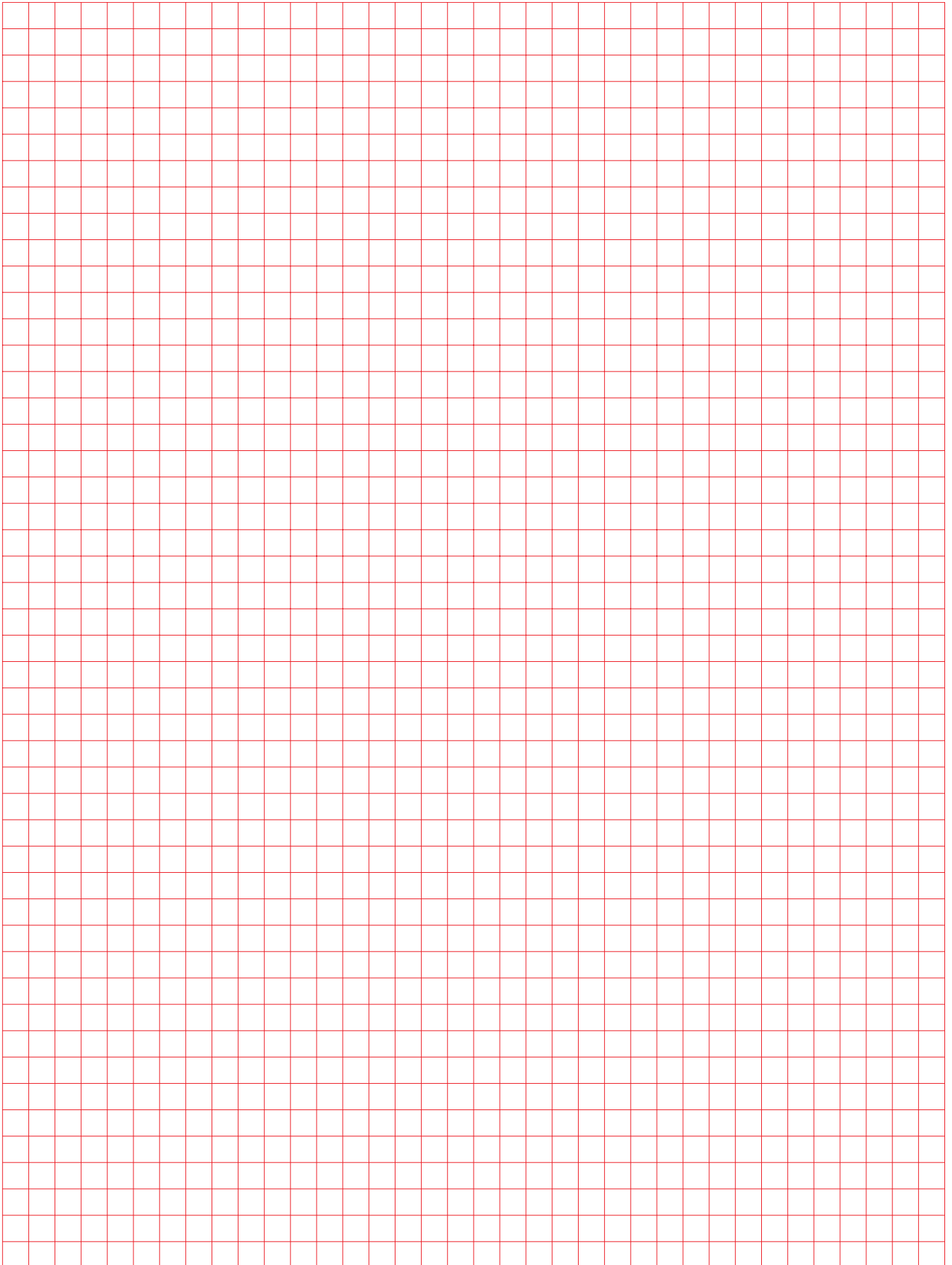
Standards

- IEC 60 721-3-3 "Environmental Conditions"
- IEC 947-5-1 "Low-Voltage Switching Devices"
- EN 50 081-2 "RFI Emissions Technical Standards (Industry)"
- EN 61 000-6-2 "RFI Emissions Technical Standards (Industry)"
- DIN EN 50 042 "Connection Marking for Terminals"
- UL/CSA pending
- C-Tick pending



Notes

2





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Liquid level relays

CM-ENE MIN, CM-ENE MAX

Ordering details

2



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

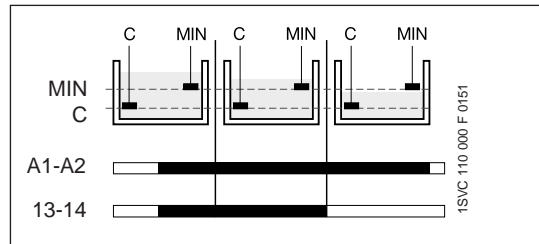
The liquid level relays CM-ENE MIN and CM-ENE MAX are used to monitor levels of conductive liquids, for example in pump control systems for dry-running or overflow monitoring.

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

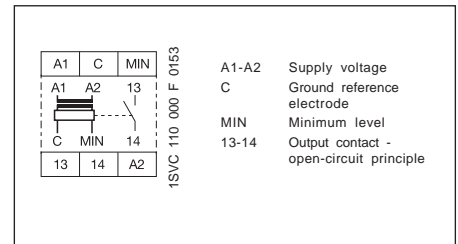
If the supply voltage is applied to A1-A2 and the electrodes are wet, the output relay of the CM-ENE MIN is energized and the output relay of the CM-ENE MAX is de-energized.

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.

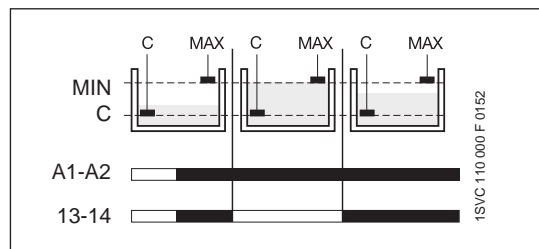
Functional diagram CM-ENE MIN



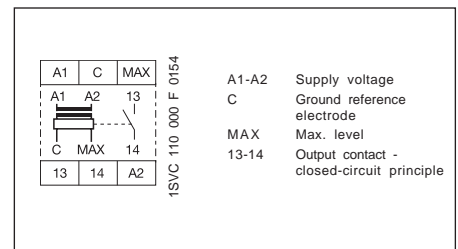
Connection diagram CM-ENE MIN



Functional diagram CM-ENE MAX



Connection diagram CM-ENE MAX



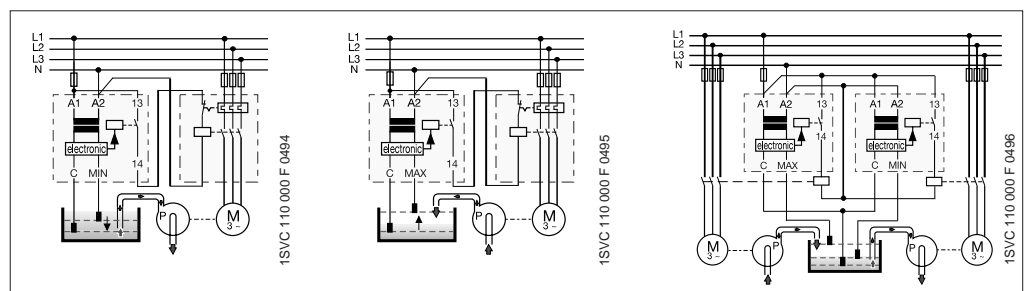
If a metal tank is used, the ground reference electrode C is not required. In this case the cable can be connected directly to the metal surface of the tank.

Application examples

CM-ENE MIN

CM-ENE MAX

CM-ENE MIN und CM-ENE MAX



Suitable for

spring water
drinking water
sea water
sewage

acids, bases
liquid fertilizers
milk, beer, coffee
non-concentrated alcohol
...

Not suitable for

chemically pure water
fuel
oils
explosive areas (liquid gas)

ethylene glycol
concentrated alcohol
paraffin
lacquers
...

Type	Supply voltage	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg/lb
CM-ENE MIN	24 V AC	1SVR 550 855 R 9500	1		0.15/0.33
	110-130 V AC	1SVR 550 850 R 9500	1		0.15/0.33
	220-240 V AC	1SVR 550 851 R 9500	1		0.15/0.33
CM-ENE MAX	24 V AC	1SVR 550 855 R 9400	1		0.15/0.33
	110-130 V AC	1SVR 550 850 R 9400	1		0.15/0.33
	220-240 V AC	1SVR 550 851 R 9400	1		0.15/0.33

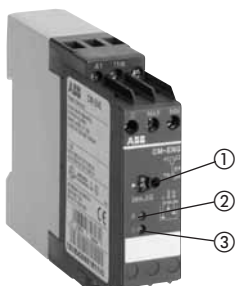
Liquid level relays

CM-ENS

Ordering details



1SVR 430 851 F 1100



CM-ENS

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

- 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
- VDE approved version with safe isolation acc. to VDE 0160
- 1 c/o contact
- 2 LEDs for status indication

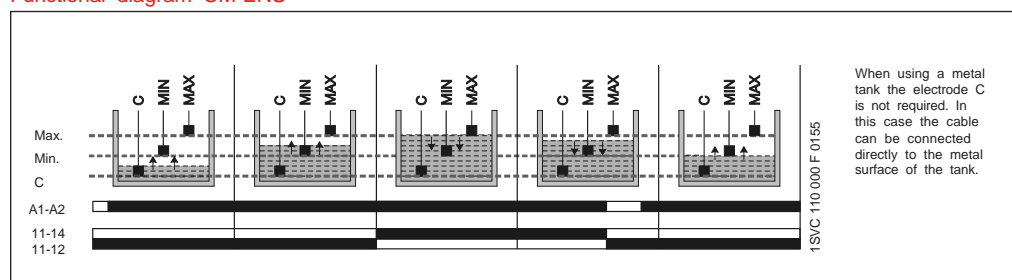
The CM-ENS monitors levels of conductive liquids and is used for example for liquid level control in pump systems. It can be used for filling or draining tanks for example.

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.

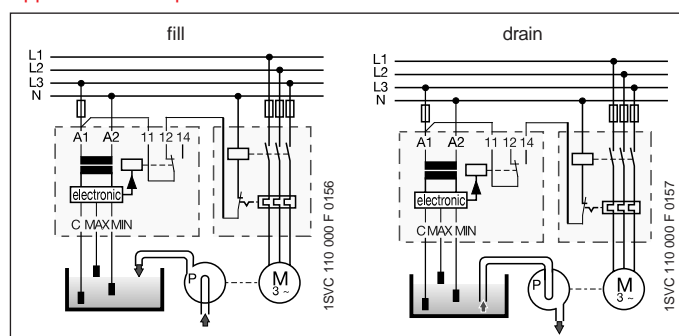
The output relay energizes if the liquid exceeds the maximum level (C and MAX wet) and de-energizes if the liquid level is below the minimum level (MAX and MIN dry).

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.

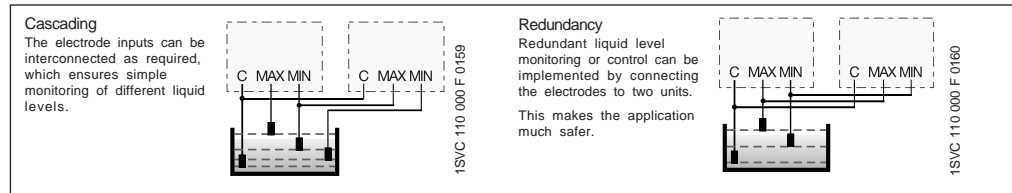
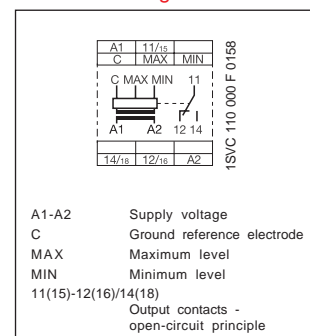
Functional diagram CM-ENS



Application examples



Connection diagram CM-ENS



Suitable for

spring water
drinking water
sea water
sewage

acids, bases
liquid fertilizers
milk, beer, coffee
non-concentrated alcohol
...

Not suitable for

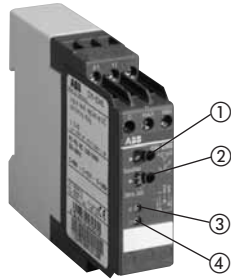
chemically pure water
fuel
oils
explosive areas (liquid gas)

ethylene glycol
concentrated alcohol
paraffin
lacquers
...

Type	Supply voltage	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg/lb
CM-ENS	24 V AC	1SVR 430 851 R 9100	1		0.15/0.33
	110-130 V AC	1SVR 430 851 R 0100	1		0.15/0.33
	220-240 V AC	1SVR 430 851 R 1100	1		0.15/0.33
	380-415 V AC	1SVR 430 851 R 2100	1		0.15/0.33
	220-240 V AC ¹⁾	1SVR 430 851 R 1300	1		0.15/0.33

¹⁾ Version with safety isolation acc. to VDE 0160, 1 n/o, 1 n/c

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 - supply voltage

- Monitoring and control of liquid levels
- Selectable function "fill" or "drain"
- Adjustable response sensitivity 5-100 kΩ
- 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.

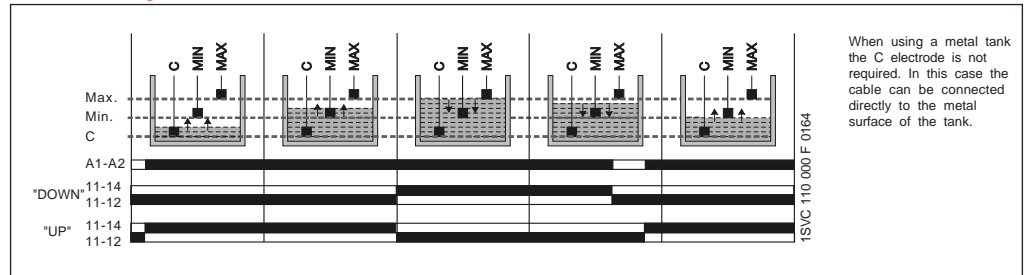
The output relay functions fill (UP) or drain (DOWN) can be selected on a front-face selector switch.

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.

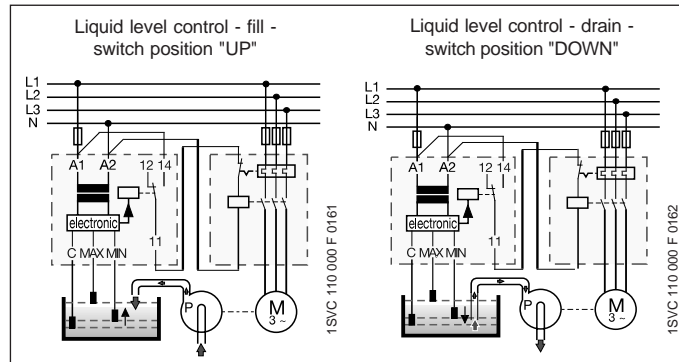
If the "DOWN" function is selected, the output relay is energized as soon as the MAX electrode becomes wet. It remains energized until the liquid level has dropped below the MIN electrode.

The electrodes can be connected to more than one CM-ENS unit without interference.

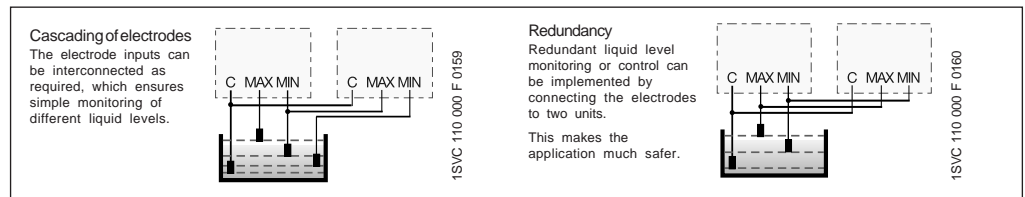
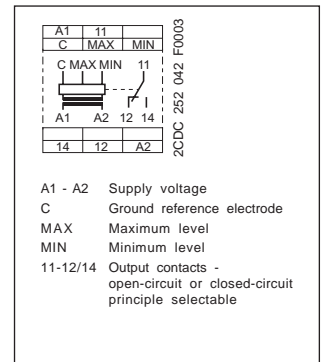
Functional diagram CM-ENS UP/DOWN



Application examples



Connection diagram CM-ENS UP/DOWN



Suitable for

spring water
drinking water
sea water
sewage

acids, bases
liquid fertilizers
milk, beer, coffee
non-concentrated alcohol
...

Not suitable for

chemically pure water
fuel
oils
explosive areas (liquid gas)

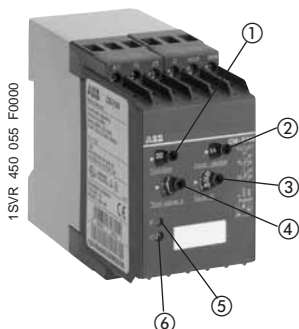
ethylene glycol
concentrated alcohol
paraffin
lacquers
...

Type	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 R 9200	1		0.15/0.33
	110-130 V AC	1SVR 430 851 R 0200	1		0.15/0.33
	220-240 V AC	1SVR 430 851 R 1200	1		0.15/0.33

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 - supply voltage

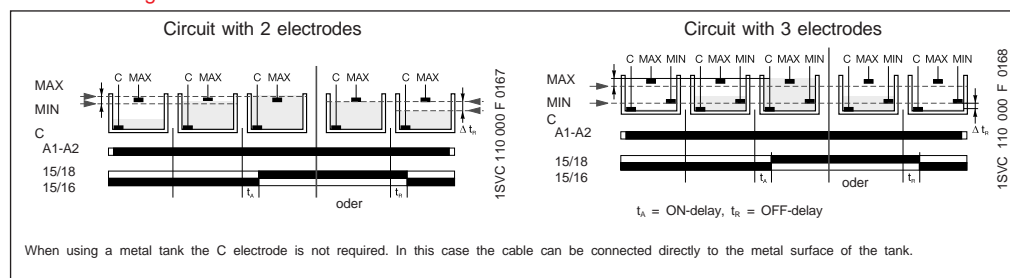
- Monitoring and control of liquid levels (when emptying or filling liquids in tanks)
- Monitoring and control of mixture ratios (conductivity of liquids)
- 3 response sensitivities from 250 Ω - 500 kΩ in one unit
- 5 supply voltage versions 24 V AC/DC - 415 V AC
- Selectable ON- or OFF-delay 0.1-10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

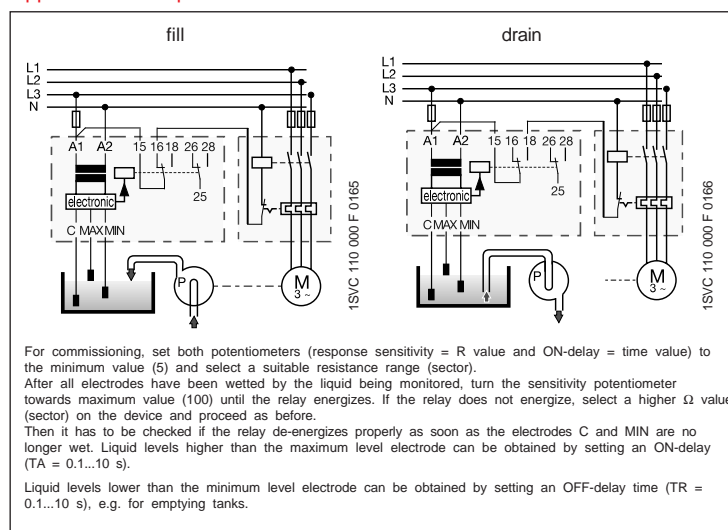
Instead of electrodes, other sensors or transducers can also be used if their output quantities are different resistance values. The measuring, output and supply circuits are electrically isolated for potential separation and to prevent electrical interference.

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.

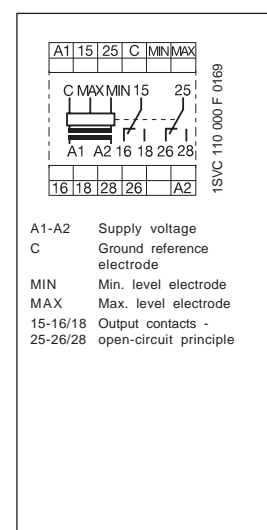
Functional diagrams CM-ENN



Application examples



Connection diagram CM-ENN



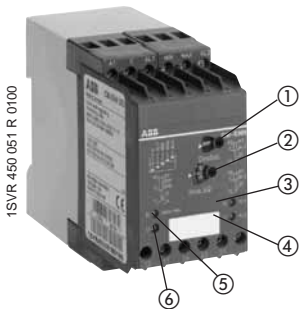
Type	Supply voltage	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg/lb
CM-ENN	24-240 V AC/DC	1SVR 450 055 R 0000	1		0.30/0.66
	24 V AC	1SVR 450 059 R 0000	1		0.30/0.66
	110-130 V AC	1SVR 450 050 R 0000	1		0.30/0.66
	220-240 V AC	1SVR 450 051 R 0000	1		0.30/0.66
	380-415 V AC	1SVR 450 052 R 0000	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 kΩ - 50 kΩ	2 mA	20 nF	100 m
25 kΩ - 500 kΩ	0,5 mA	4 nF	20 m

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

Ordering details

2



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 - supply voltage

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

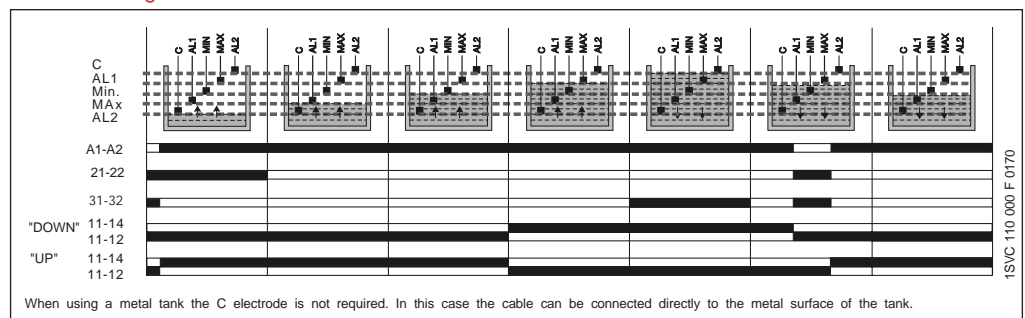
The CM-ENN UP/DOWN monitors levels of conductive liquids and media and is used e.g. for liquid level control in pump systems. The measuring principle is based on the resistance change sensed by single-pole electrodes.

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.

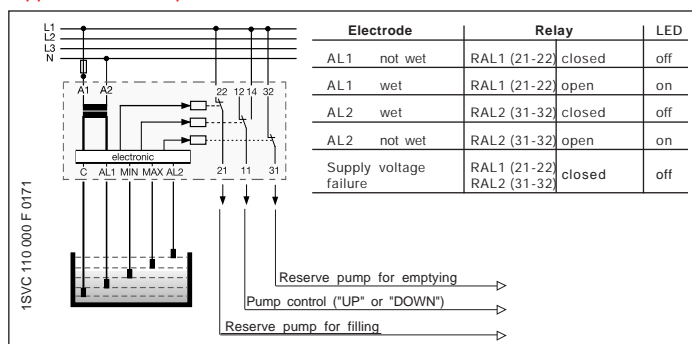
If the "DOWN" function is selected, the output relay is energized as soon as the MAX electrode becomes wet. It remains energized until the liquid level has dropped below the MIN electrode.

The electrode inputs AL1 and AL2 energize/de-energize the corresponding 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.

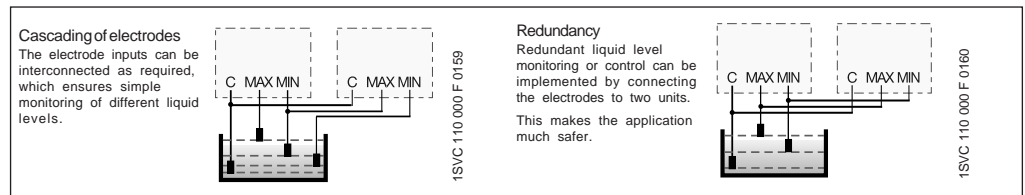
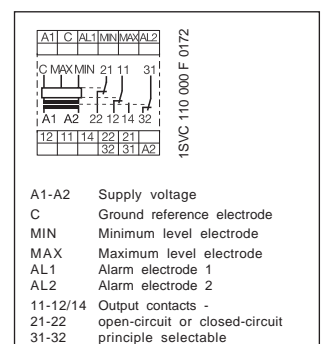
Functional diagram CM-ENN UP/DOWN



Application example



Connection diagram CM-ENN UP/DOWN



Suitable for

spring water
drinking water
sea water
sewage

acids, bases
liquid fertilizers
milk, beer, coffee
non-concentrated alcohol
...

Not suitable for

chemically pure water
fuel
oils
explosive areas (liquid gas)

ethylene glycol
concentrated alcohol
paraffin
lacquers
...

Type	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 R 0100	1		0.15/0.33
	110-130 V AC	1SVR 450 050 R 0100	1		0.15/0.33
	220-240 V AC	1SVR 450 051 R 0100	1		0.15/0.33
	380-415 V AC	1SVR 450 052 R 0100	1		0.15/0.33

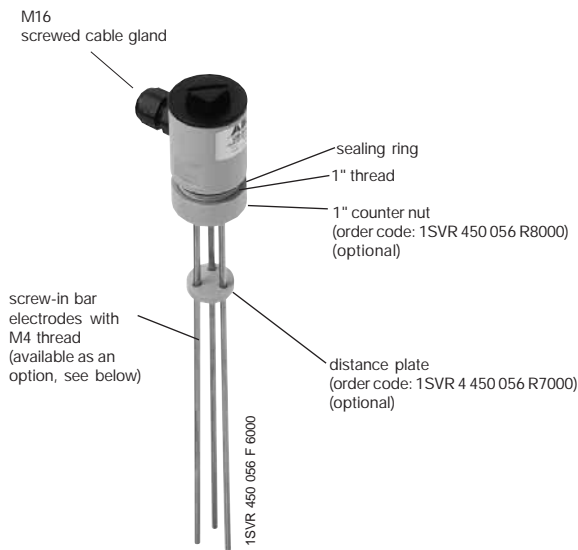
Liquid level relays -Accessories

Electrodes

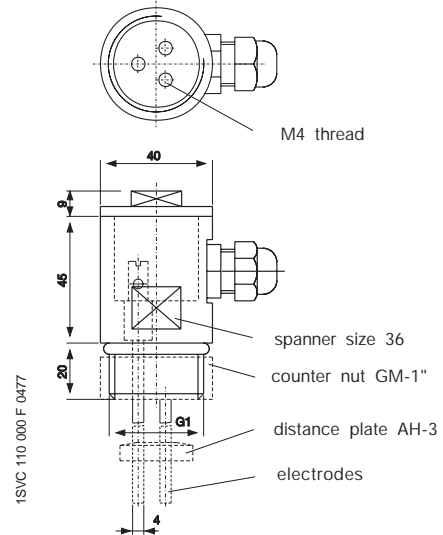
Ordering details, dimensional drawings

Compact support KH-3 for 3 bar electrodes

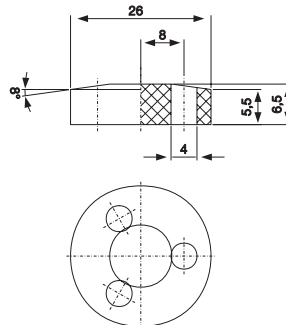
- Ideally suited for use with liquid level relays CM-ENS and CM-ENN
- Wire connection by screw terminals
- Pull relief by M16 screwed cable glands
- Temperature range up to 90 °C
- Food safe material (PPH)
- Screw-in electrodes (M4 thread)
- Distance plate (AH-3) and locking nut (GM-1) optionally available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



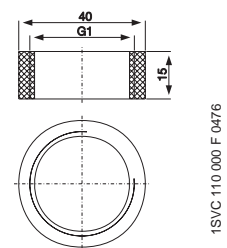
Compact support KH-3



Distance plate AH-3



Counter nut GM-1



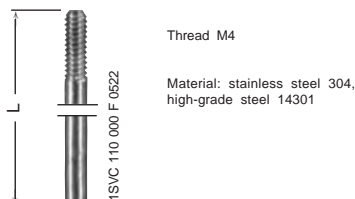
Technical data compact support

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)

(Dimensions in mm)

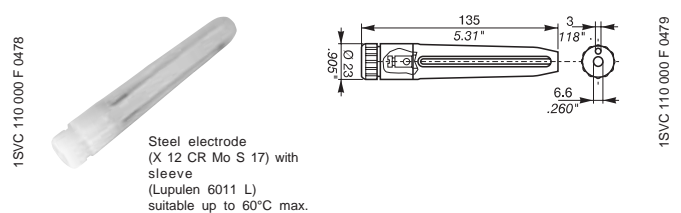
Type		Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg/lb
CM-KH-3	Compact support for 3 bar electrodes	1SVR 450 056 R 6000	1		0.060/0.132
CM-AH-3	Distance plate for 3 bar electrodes	1SVR 450 056 R 7000	1		0.060/0.132
CM-GM-1	Counter nut for 1" thread	1SVR 450 056 R 8000	1		0.060/0.132

Screw-in bar electrodes for compact support KH-3



Length mm	Order code	Pack. unit pieces	Price 1 piece	Weight 1 pc. kg/lb
300	1SVR 450 056 R 0000	1		0.080/0.176
600	1SVR 450 056 R 0100	1		0.080/0.176
1000	1SVR 450 056 R 0200	1		0.080/0.176

Suspension electrode



Type	Order code	Pack. unit pieces	Price 1 piece	Weight 1 pc. kg/lb
	1SVR 402 902 R 0000	1		0.080/0.176

Liquid level monitoring and control

CM-ENE MIN, CM-ENE MAX

Technical data

2

		CM-ENE MIN, CM-ENE MAX	
Supply circuit			
Supply voltage - 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
	A1-A2	380-415 V AC	-
	A1-A2	24-240 V AC/DC	-
Supply voltage tolerance			-15 %...+15 %
Supply voltage frequency			50-60 Hz
Duty time			100 %
Measuring circuit		MIN-C, MAX-C	
Monitoring function		CM-ENE MIN: dry-running protection, CM-ENE MAX: overflow protection	
Response sensitivity		0-100 k Ω , not adjustable	
Max. electrode voltage		30 V AC	
Max. electrode current		1.5 mA	
Electrode supply line	max. cable capacity	3 nF	
	max. cable length	30 m	
Response delay		approx. 200 ms	
Timing circuit			
Delay time		-	
Indication of operational states			
Supply voltage		-	
Output relay energized		R: yellow LED	
CM-ENN UP/DOWN alarm relay AL1		-	
CM-ENN UP/DOWN alarm relay AL2		-	
Output circuits		13-14	
Number of contacts		1 n/o contact	
Operational principle	open-circuit principle ¹⁾	CM-ENE MIN	
	closed circuit principle ¹⁾	CM-ENE MAX	
Contact material		AgCdo	
Rated voltage	acc. to VDE 0110, IEC 60947-1	250 V	
Min. switching voltage		-	
Max. switching voltage		250 V	
Min. switching current		-	
Rated operating current acc. to IEC 60947-5-1	AC-12 (resistive) 230 V	4 A	
	AC-15 (inductive) 230 V	3 A	
	DC-12 (resistive) 24 V	4 A	
	DC-13 (inductive) 24 V	2 A	
Maximum lifetime	mechanical	30 x 10 ⁶ switching cycles	
	electrical (AC-12, 230V, 4A)	0.3 x 10 ⁶ switching cycles	
Short circuit proof, maximum fuse rating	n/c contact	-	
	c/o contact	10 A fast, operating class gL	
General data			
Enclosure width		22.5 mm	
Wire size		2 x 1.5 mm ² (2 x 16 AWG) stranded wire with wire-end ferrule	
Mounting position		any	
Degree of protection: housing/ terminals		IP50 / IP20	
Operating temperature		-20 °C ... +60 °C	
Storage temperature		-40 °C ... +85 °C	
Mounting		DIN rail (EN 50022)	
Standards			
Product standard		IEC 255-6, EN 60255-6	
EMC Directive		89/336/EEC	
Electromagnetic compatibility	acc. to EN 61000-6-2, EN 61000-6-4		
ESD	acc. to IEC 61000-4-2, EN 61000-4-2	level 3	6 kV / 8 kV
HF radiation resistance	acc. to IEC 61000-4-3, EN 61000-4-3	level 3	10 V/m
Burst	acc. to IEC 61000-4-4, EN 61000-4-4	level 3	2 kV / 5 kHz
Surge	acc. to IEC 1000-4-5, EN 61000-4-5	level 4	2 kV L-L
HF line emission	acc. to IEC 1000-4-6, EN 61000-4-6	level 3	10 V
Low Voltage Directive		73/23/EEC	
Resistance to vibration	acc. to 68-2-6	6 g	
Mechanical resistance	acc. to IEC68-2-6	10 g	
Approvals		C-Tick (under preparation), cULus, GOST	
Isolation data			
Rat. insulation volt. betw. supply, meas. & output circuit	acc. to VDE 0110, IEC 60947	250 V	
Rated impulse withstand voltage between all isolated circuits	acc. to VDE 0110, IEC 664	4 kV / 1.2-50 μ s	
		2.5 kV, 50 Hz, 1 min.	
Test voltage between all isolated circuits		2.5 kV, 50 Hz, 1 min.	
Pollution category	acc. to VDE 0110, IEC 664, IEC 255-5	III / C	
Overvoltage category	acc. to VDE 0110, IEC 664, IEC 255-5	III / C	
Environmental testing	acc. to IEC 68-2-30	24 h cycle time, 55 °C, 93 % rel., 96 h	

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.

Liquid level monitoring and control

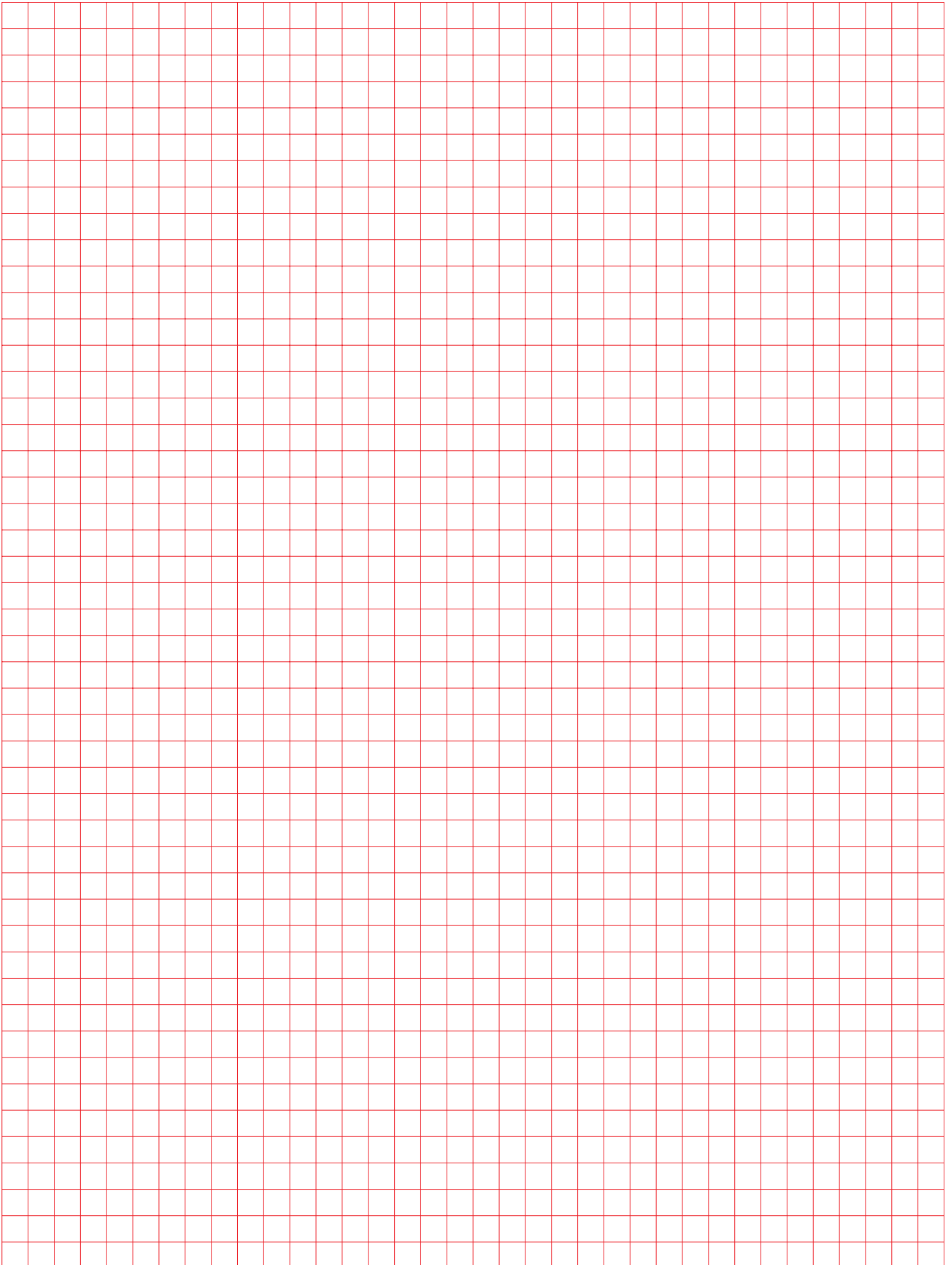
CM-ENS, CM-ENN

Technical data

CM-ENS, CM-ENS UP/DOWN, CM-ENN UP/DOWN	CM-ENN
approx. 1.5 VA, CM-ENN UP/DOWN approx. 4 VA	
approx. 1.5 VA, CM-ENN UP/DOWN approx. 4 VA	approx. 2.5 VA
approx. 1.5 VA, CM-ENN UP/DOWN approx. 4 VA	approx. 3 VA
approx. 1.5 VA, CM-ENN UP/DOWN approx. 4 VA	approx. 4 VA
	approx. 2 VAW
-15 %...+10 %	-15 %...+10 %
50-60 Hz	50-60 Hz or DC
100 %	100 %
MAX-MIN-C	MAX-MIN-C
liquid level control	
5-100 kΩ, adjustable	250 Ω - 500 kΩ, adjustable
30 V AC	20 V AC
1 mA	
10 nF	
100 m	
approx. 250 ms	
	0.1-10 s, adjustable, ON- or OFF-delay
U: green LED	U: green LED
R MAX/MIN: yellow LED	R: yellow LED
R AL1: yellow LED	-
R AL2: yellow LED	-
11-12/14, 21-22, 31-32	15-16/18, 25-26/28
1 c/o contact, CM-ENN UP/DOWN: 1 c/o + 2 n/c contacts	2 c/o contacts
CM-ENS, CM-ENS UP/DOWN, CM-ENN UP/DOWN	CM-ENN
CM-ENS UP/DOWN, CM-ENN UP/DOWN	-
AgCdo	AgCdo
250 V	400 V
250 V	400 V
4 A	5 A
3 A	3 A
4 A	5 A
2 A	2.5 A
30 x 10 ⁶ switching cycles	30 x 10 ⁶ switching cycles
0.3 x 10 ⁶ switching cycles	0.1 x 10 ⁶ switching cycles
10 A fast, operating class gL	5 A fast, operating class gL
10 A fast, operating class gL	5 A fast, operating class gL
22.5 mm, CM-ENN UP/DOWN 45mm	45 mm
2 x 2.5 mm ² (2 x AWG 14) stranded wire with wire end ferrule	2 x 2.5 mm ² (2 x AWG 14) stranded wire with wire end ferrule
any	any
IP50 / IP20	IP50 / IP20
-20 °C...+60 °C	-25 °C...+65 °C
-40 °C...+85 °C	-40 °C...+85 °C
DIN rail (EN50022)	DIN rail (EN50022)
IEC255-6	IEC255-6
89/336/EEC	89/336/EEC
level 3 6 kV / 8kV	level 3 6 kV / 8 kV
level 3 10 V/m	level 3 10 V/m
level 3 2 kV / 5 kHz	level 3 2 kV / 5 kHz
level 4 2 kV L-L	level 4 2 kV L-L
level 3 10 V	level 3 10 V
73/23/EEC	73/23/EEC
4 g	5 g
6 g	10 g
C-Tick (under preparation), cULus, GL (CM-ENS), VDE (CM-ENS version with safe isolation), GOST	C-Tick (under preparation), cULus, GL, GOST
250 V	500 V
4 kV / 1.2 - 50 μs	4 kV / 1.2-50 μs
2.5 kV, 50 Hz, 1 min.	2.5 kV, 50 Hz, 1 min.
III / C	III / C
III / C	III / C
24 h cycle time, 55 °C, 93 % rel., 96 h	24 h cycle time, 55 °C, 93 % rel., 96 h

Notes

2





Content

Contact protection relays CM-KRN

Ordering details	98
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Dimensional drawings	109

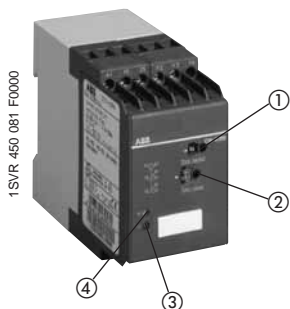
Sensor interface relay CM-SIS

Ordering details	99
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Contact protection relay CM-KRN

Ordering details

2



CM-KRN

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

- 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 action or without. Bounce time of control contacts can be bypassed by the adjustable response delay time.

Use for contact protection

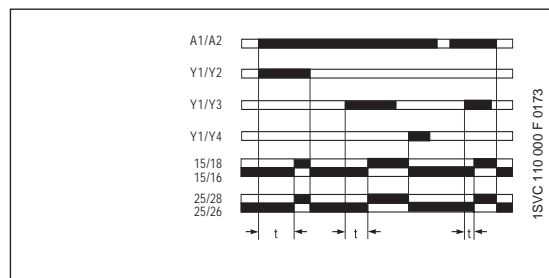
The contact to be protected is connected to terminals Y1 and Y2.

Use for contact protection with latching action

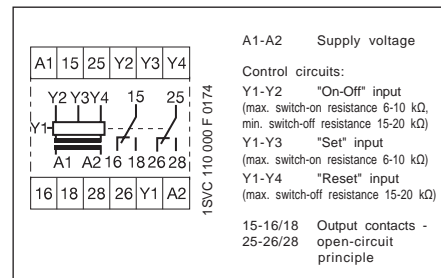
The output relay energizes after contact Y1-Y3 has been closed for at least 20 ms. It remains energized until contact Y1-Y4 closes. The switching positions are stored.

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.

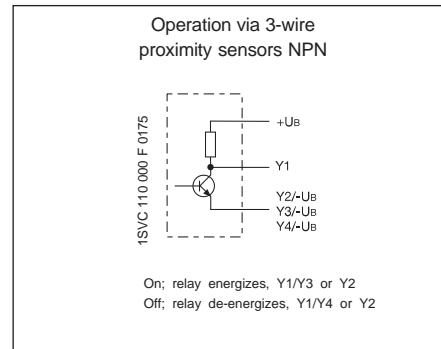
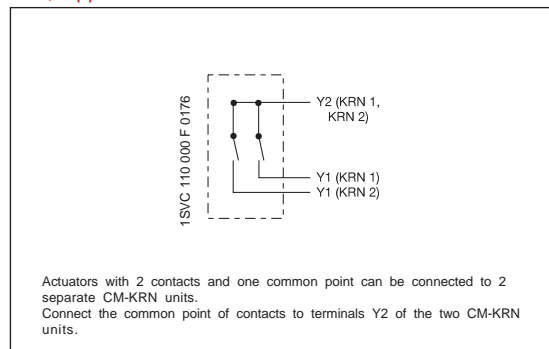
Functional diagram CM-KRN



Connection diagram CM-KRN



Use, applications



Type	Supply voltage 50-60 Hz	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg/lb
------	----------------------------	------------	-------------------------	------------------	----------------------------

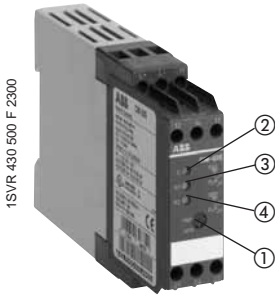
with timer 0.05-30 s

CM-KRN	24 V AC	1SVR 450 089 R 0000	1		0.300/0.66
	110-130 V AC	1SVR 450 080 R 0000	1		0.300/0.66
	220-240 V AC	1SVR 450 081 R 0000	1		0.300/0.66
	380-415 V AC	1SVR 450 082 R 0000	1		0.300/0.66

without timer

CM-KRN	24 V AC	1SVR 450 099 R 0000	1		0.300/0.66
	110-130 V AC	1SVR 450 090 R 0000	1		0.300/0.66
	220-240 V AC	1SVR 450 091 R 0000	1		0.300/0.66

Sensor interface module CM-SIS Ordering details



CM-SIS

- ① Rotary switch, sensor type selection
- ② U: green LED - supply voltage
- ③ R1: red LED - relay status R1
- ④ R2: red LED - relay status R2

- 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 selection switch.

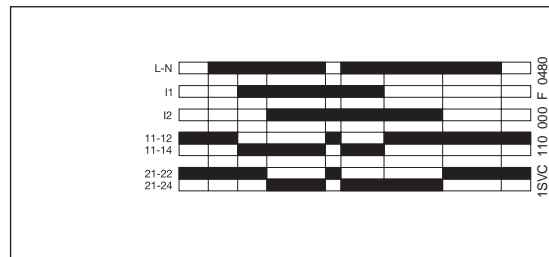
The CM-SIS (terminals L+, L-) supplies the connected sensors with voltage (24 V DC), the maximum power supply current is 0.5 A. The supply voltage and the sensor inputs are electrically isolated from the supply circuit. To ensure maximum safety when using these sensors, the principle of safe isolation 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 8mA 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.

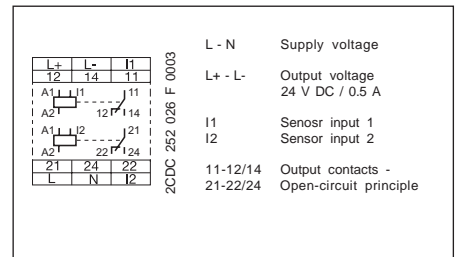
The wide-range supply voltage input of CM-SIS allows its application in nearly all supply systems.

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.

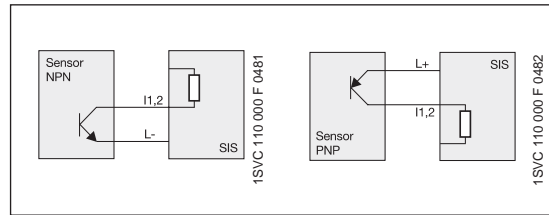
Functional diagram CM-SIS



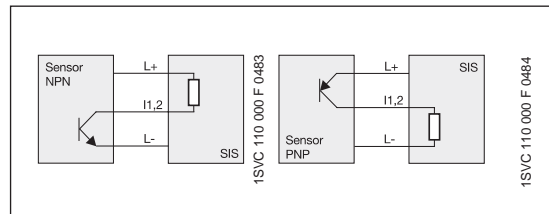
Connection diagram CM-SIS



Connection of 2-wire sensors



Connection of 3-wire sensors



Type	Supply voltage	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 R 2300	1		0.22/0.48

Contact protection relay

CM-KRN

Technical data

2

Supply circuit		
Supply voltage, power consumption	A1-A2	24 V AC - 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
Supply voltage tolerance		-15 % ... +10 %
Supply voltage frequency		50...60 Hz
Duty time		100 %
Timing circuit		
ON-delay time		0.05-1 s, 1.5-30 s
OFF-delay time		50 ms
Min. contact time for latching (CM-KRN without ON-delay)		20 ms
Measuring circuit / contact circuit Y1...Y4		
Control contacts	contact protection without latching	Y1, Y2
	contact protection with latching	Y1, Y3, Y4
Switching resistance	Y1-Y2 for closing, max.	6-10 kΩ
	Y1-Y2 for opening, min.	15-20 kΩ
	Y1-Y3 for closing, max.	6-10 kΩ
	Y1-Y4 for opening, max.	15-20 kΩ
No-load voltage	(Y1, Y2) (Y1, Y3, Y4)	≤ 10 V DC
Switching current		≤ 3 mA
Continuous voltage sustaining capability of control input		≤ ±30 V (contact voltage)
Indication of operational states		
Supply voltage		U: green LED
1st output relay energized		R: yellow LED
Output circuit 15-16/18, 25-26/28 Relay, 2 c/o contacts, open-circuit principle		
Rated voltage acc. to VDE 0110, IEC 947-1		400 V
Rated switching voltage		400 V AC
Rated switching current acc. to IEC 60947-5-1	AC-12 (resistive) 230 V	5 A
	AC-15 (inductive) 230 V	3 A
	DC-12 (resistive) 24 V	5 A
	DC-13 (inductive) 24 V	2.5 A
Maximum lifetime	mechanical	30 x 10 ⁶ switching cycles
	electrical (AC-12, 230 V, 5 A)	0.1 x 10 ⁶ switching cycles
Short-circuit proof, maximum fuse rating		5 A / fast, operating class gL
General data		
Rated impulse withstand voltage V _{imp}		4 kV
Operating temperature		-25 °C ... +65 °C
Storage temperature		-40 °C ... +85 °C
Mounting position		any
Mounting on DIN rail (EN 50022)		snap-on mounting / screw mounting with adapter
Wire size		2 x 2.5 mm ² (2 x 14 AWG) stranded with wire end ferrule

Sensor interface module

CM-SIS

Technical data

2

Input		
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
Input current at nominal load		0.35 A max. / 0.27 A at 115 V AC / 0.14 A at 230 V AC
Inrush current at 25°C (≤ 2 ms)		33 A
Internal input fuse		800 mA slow-acting
Output		
Output voltage	L+ L-	24 V DC ± 3%
Output current / output power		0.5 A / 12 W max.
Residual ripple		100 mVpp max.
Input voltage regulation		± 0.5 % max.
Deviation of output with static load change		± 0.5 % max.
Deviation of output with dyn. load change 10-90 %		5 % max.
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 input		
Sensor type connection possibilities		2- or 3-wire connection, NPN or PNP selectable by front-face switch
Input resistance		approx. 2.5 kΩ
Input threshold value for relays R1, 2		$V_{emitter-collector} < 2,3 \text{ V}$ (I1, 2 > 8 mA)
Maximum switching frequency		approx. 20 Hz
Output circuit		
	11-12/14, 21-22/24	2 relays, 1 c/o contact each, open-circuit principle
Rated voltage		250 V
Max. switching voltage		250 V AC
Rated switching current	AC-12 (resistive) 230 V	4 A
acc. to IEC 60947-5-1	AC-15 (inductive) 230 V	3 A
	DC-12 (resistive) 24 V	4 A
	DC-13 (inductive) 24 V	2 A
Maximum lifetime	mechanical	10 x 10 ⁶ switching cycles
	electrical	0.1 x 10 ⁶ switching cycles
Short-circuit proof, maximum fuse rating		6 A n/o contact, 2 A n/c contact / fast, operating class gL
Standards		
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
Insulation testing		2.5 kV AC routine test, 3 kV AC type test
Clearance and creepage distances		overvoltage category 2, degree of pollution 2
Electromagnetic compatibility	acc. to EN 61000-6-2	
ESD	acc. to EN 61000-4-2	level 3 - 6/8 kV
HF radiation	acc. to EN 61000-4-3	level 3 - 10 V/m
Burst	acc. to EN 61000-4-4	level 4 - 4 kV
Surge	acc. to EN 61000-4-5	inst. class 3, 2 kV
HF emission	acc. to EN 61000-4-6	level 3 - 10 V
Emitted interferences	acc. to EN 50081-2	radiated noise EN 55011, class B
Input current harmonics		no limitation
General data		
Efficiency at nominal load		approx. 84 % (at 230 V AC)
Operational status indication		green LED, output voltage OK
Operating temperature		0 ° ... +55 °C
Storage temperature		-25 ° ... +75 °C
Wire size		screw terminals, 2 x 14 AWG (2 x 2.5 mm ²)
Dimensions (W x H x D)		22.5 mm x 78 mm x 120 mm (0.89 x 3.07 x 4.72")
Mounting position		normal mounting position: horizontally mounted on DIN rail
Clearances to other modules		left-hand side 1 cm, vertical distance 5 cm

Notes

2

A large grid of red lines for taking notes, consisting of 20 columns and 30 rows of small squares.



Cycle monitor with watchdog function

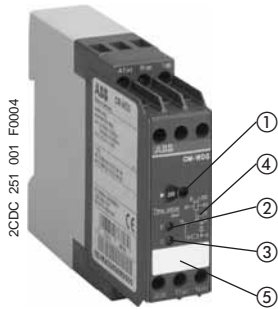
Content

NEW Cycle monitor with watchdog function CM-WDS	
Ordering details	104
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Cycle monitor with watchdog function CM-WDS

Ordering details

2



CM-WDS

- ① Setting the lower threshold value of cycle monitoring time
 - ② F: red LED - cycle error
 - ③ U: green LED - 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

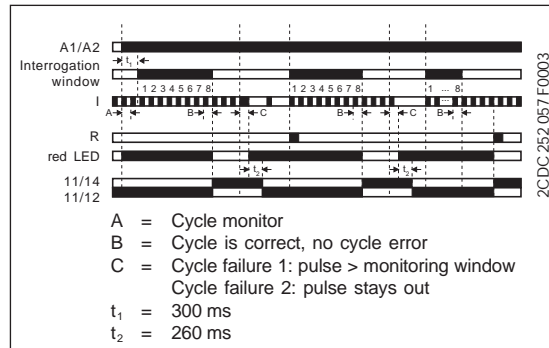
The cycle monitor CM-WDS (watchdog) observes if a regularly intermittent pulse is applied to its pulse input "I". It is, for example, possible to connect the output of a programmable logic controller (plc), which is set and reset regularly (e. g. once each cycle). The connected cycle pulse must be generated 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 set 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 switched out.

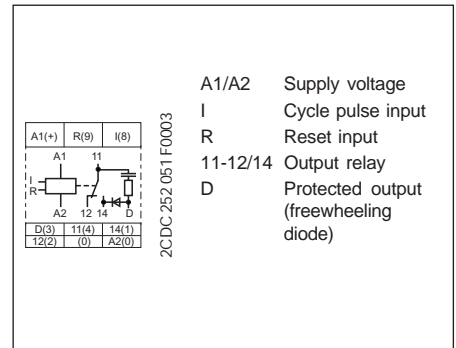
In case the monitoring time is too short or too long, this can be adjusted by a modified programming of the plc/ips or by modified setting of the monitoring time "time value (ms)".

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).

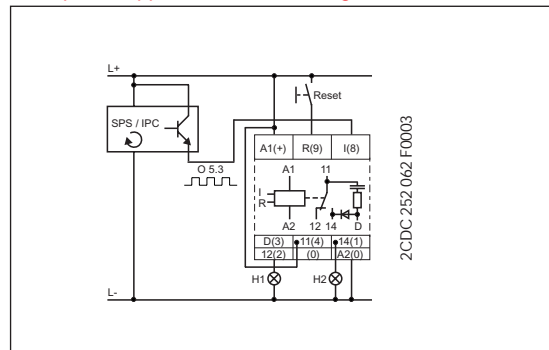
Funktional diagram CM-WDS



Connection diagram CM-WDS



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	Supply voltage	Order code
NEW CM-WDS	24 V DC	1SVR 430 896 R0000

Cycle monitor with watchdog function

CM-WDS

Technical data

Input circuit		
Supply voltage - power consumption	A1-A2	24 V DC approx. 1 W
Tolerance of the supply voltage		-30 % - +30 %
Duty time		100 %
Measuring circuit		
Monitoring function		I cycle monitoring
Input voltage		24 V DC
Input current		approx. 5 mA
Setting range of cycle monitoring time		0.5-150 ms
		0.5-260 ms
		0.5-500 ms
		0.5-1000 ms
Cycle duration of one pulse		approx. 0.5-1000 ms
Measuring cycle at switching ON		2.2-10 s
Measuring error within the supply voltage tolerance		≤ 0.5 %
Measuring error within the temperature range		≤ 0.06 % / °C
Timing circuit		
ON-delay time		approx. 2.2-10 s
Delay on release time		approx. 260 ms
Indication of operational states		
Supply voltage		U: green LED
Output relay de-energized / cycle error		F: red LED
Output circuit		
		11-12/14
Number of contacts		1 c/o
Operating principle (output relay de-energizes if cycle error)		Closed-circuit principle
Contact material		AgCdo
Rated voltage	acc. to VDE 0110, IEC 60947-1	250 V
Minimum switching voltage		
Maximum switching voltage		250 V AC, 250 V DC
Minimum switching current		
Rated switching current acc. to IEC 60947-5-1	AC-12 (resistive) 230 V	4 A
	AC-15 (inductive) 230 V	3 A
	DC-12 (resistive) 24 V	4 A
	DC-13 (inductive) 24 V	2 A
Maximum life	mechanical	10 x 10 ⁶ switching cycles
	electrical (AC-12, 230 V, 4 A)	0.1 x 10 ⁶ switching cycles
Short-circuit proof, maximum fuse rating	n/c	10 A fast operating class gL
	n/o	10 A fast operating class gL
General data		
Width of the enclosure		22.5 mm
Wire size		2 x 2.5 mm ² (2 x 14 AWG) stranded with wire end ferrules
Mounting position		any
Degree of protection	enclosure / terminals	IP 50 / IP 20
Temperature range	operation	-20 °C ... +60 °C
	storage	-40 °C ... +85 °C
Mounting		DIN rail (EN 50022)

Cycle monitor with watchdog function CM-WDS

Technical data (continued)

Standards /directives			
Product standard		IEC 255-6, EN 60255-6	
EMC Directive		89/336/EEC	
EMC-test	acc. to EN 61000-6-2		
	acc. to EN 61000-6-4		
ESD	acc. to IEC 61000-4-2, EN 61000-4-2	level 3	6 kV / 8 kV
HF radiation resistance	acc. to IEC 61000-4-3, EN 61000-4-3	level 3	10 V/m
Burst	acc. to IEC 61000-4-4, EN 61000-4-4	level 3	2 kV / 5 kHz
Surge	acc. to IEC 61000-4-5, EN 61000-4-5	level 3	2 kV L-L
HF line emission	acc. to IEC 61000-4-6, EN 61000-4-6	level 3	10 V
Low Voltage Directive		73/23/EEC	
Operational reliability	acc. to IEC 68-2-6	4 g	
Mechanical shock resistance	acc. to IEC 68-2-6	6 Gg	
Isolation data			
Rated insulation voltage between supply-, control- and output circuit	acc. to VDE 0110, IEC 60947-1	250 V	
Rated impulse withstand between all isolated circuits	acc. to VDE 0110, IEC 664	4 kV / 1.2-50 μ s	
Test voltage between all isolated circuits		2.5 kV, 50 Hz, 1 min	
Pollution degree	acc. to VDE 0110, IEC 664, IEC 255-5	III/C	
Overvoltage category	acc. to VDE 0110, IEC 664, IEC 255-5	III	
Environmental tests	acc. to IEC 68-2-30	24 h cycle, 55 °C, 93 % rel. 96 h	

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Content

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Measuring and monitoring relays

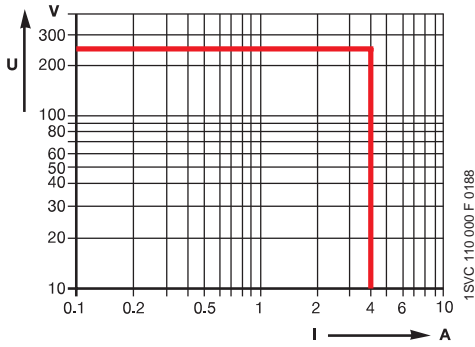
CM range

Load limit curves

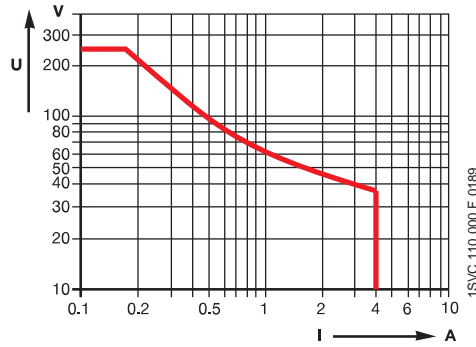
Load limit curves

CM-S (22.5 mm) and CM-E (22.5 mm) range

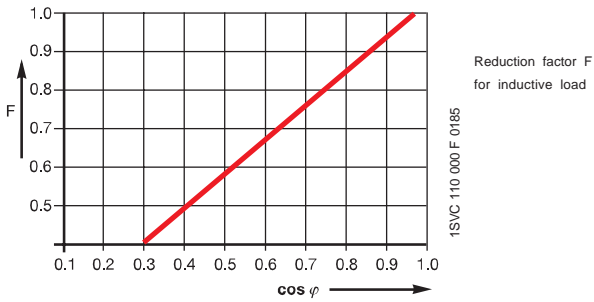
AC load (resistive)



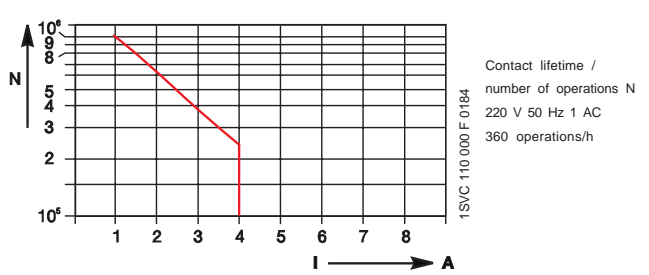
DC load (resistive)



Reduction factor for inductive AC load

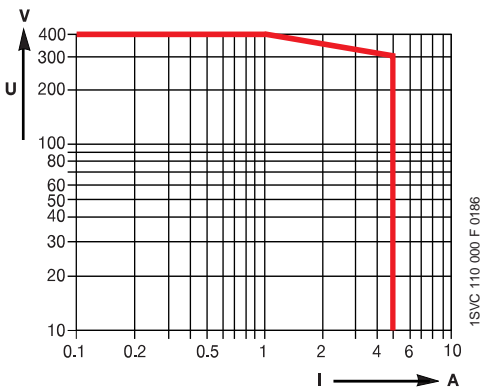


Contact lifetime

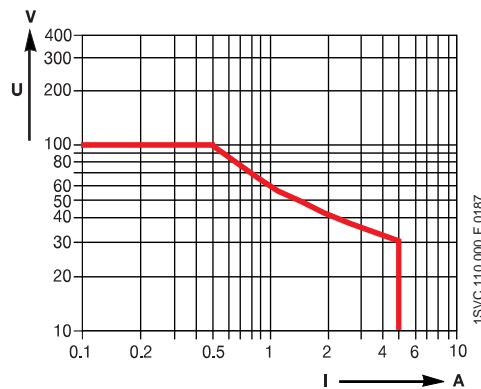


CM-N (45 mm) range

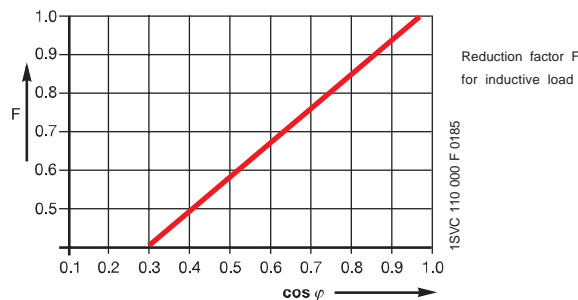
AC load (resistive)



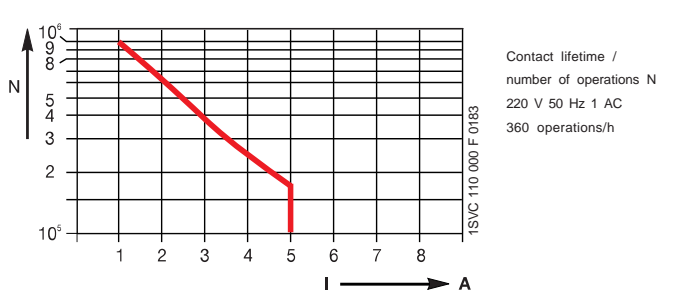
DC load (resistive)



Reduction factor for inductive AC load



Contact lifetime



Measuring and monitoring relays CM and C51x Accessories and dimensional drawings

Accessories

Adapter for screw mounting

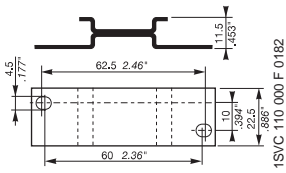
Width in mm	Order code	Pack. unit pieces	Price 1 piece
22.5	1SVR 430 029 R 0100	1	
45.0	1SVR 440 029 R 0100	1	

Marker

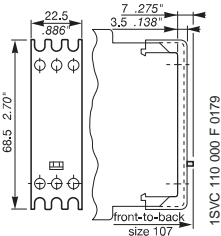
Order code	Pack. unit pieces	Price 1 piece
1SVR 366 017 R 0100	1	

Sealable cover

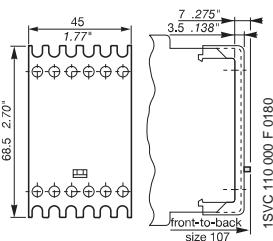
Width in mm	Order code	Pack. unit pieces	Price 1 piece
22.5	1SVR 430 005 R 0100	1	
45.0	1SVR 440 005 R 0100	1	



Cover for CM-S
22.5 mm



Cover for CM-N
45 mm

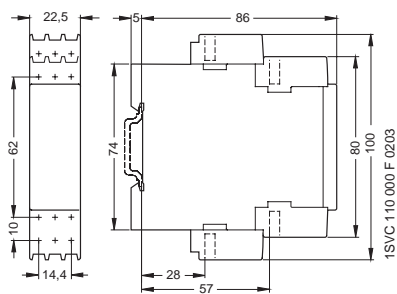


Dimensional drawings

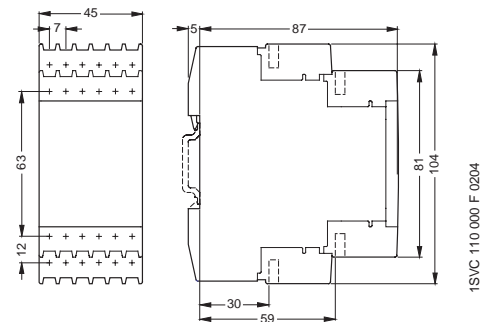
Dimensions in mm

Temperature monitoring relays C51x range

C510 / C511
22.5 mm

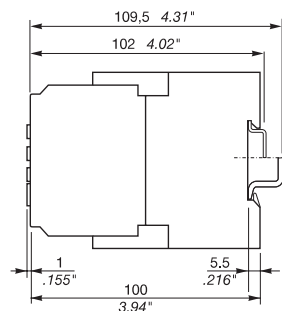


C512/C513
45 mm

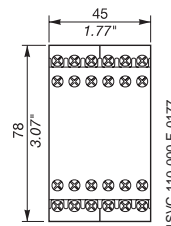


Measuring and monitoring relays CM range

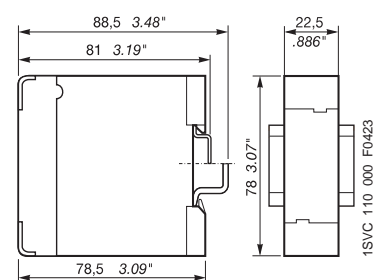
CM-S
22.5 mm



CM-N
45.5 mm



CM-E
22.5 mm



Notes

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