Electronic measuring and monitoring relays

CM and C5xx range

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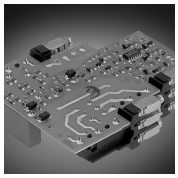
Electronic measuring and monitoring relays
CM range
Benefits and advantages

CM-E range: Economic

- 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.

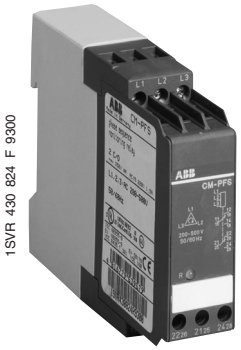


Safety

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

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 cover (accessory)

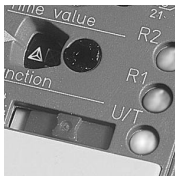
1SVC 110 000 F 0510

Direct reading scales

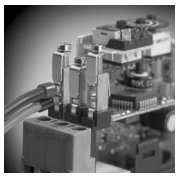
Direct adjustment of the threshold values of measuring and monitoring relays without any additional calculation provides maximum operation convenience.

LEDs for status Indication

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



1SVC 110 000 F 0511



2CDC 253 010 F0003

Double-chamber cage connection terminals

Double-chamber cage connection terminals pro-vide 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

- 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 cover (accessory)

Integrated markers

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

1SVC 110 000 F 0499

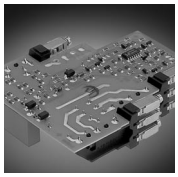
1SVC 110 000 F 0498

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

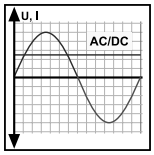


2CDC 253 011 F 0003

Electronic measuring and monitoring relays CM and C5xx range
Monitoring features and application ranges

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

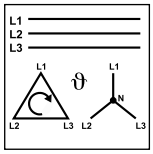
- Monitoring of motor current consumption
- Monitoring of lighting installations and heating circuits
- Monitoring of hoisting gear and transportation equipment overload
- Monitoring of locking devices, electromechanical brake gear and running into stops

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 loss
  CM-PBE
- Over- and undervoltage
  CM-PVE
- Phase sequence and phase loss
  CM-PFE and CM-PFS
- Phase sequence and phase loss, over- and undervoltage
  CM-PSS, CM-PVS, CM-PFN and CM-PVN
- Phase sequence and phase loss, unbalance
  CM-PAS, CM-ASS and CM-ASN
- Phase sequence and phase loss, unbalance, over- and undervoltage
  CM-MPS

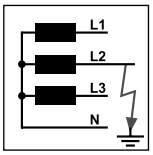


Three-phase voltage monitoring

- 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.

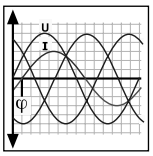


Insulation monitoring

- 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.

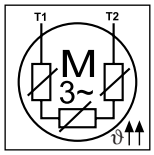


Motor load monitoring

- 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.

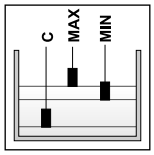


Thermistor motor protection

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

Liquid level monitoring

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

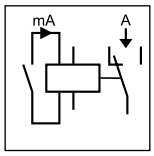


Liquid level monitoring

- 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.

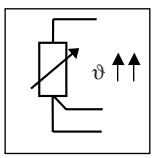


Contact protection / sensor evaluation

- 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.

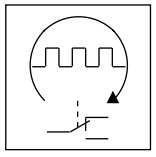


Temperature monitoring

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

Cycle monitor

Cycle monitor with watchdog function CM-WDS.



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 and marks

■ existing
□ pending

Current und 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	CM-PSS	CM-PAS	CM-PVS
cULus LISTED	■	■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	■
GL	■	■	■	■	■						■	■	■	■	■	■	■	■	■
GOST	■	■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	■
	□	□	□	□	□			□	□	□	□	□	□	□	□	□	□	□	□
Marks																			
CE	■	■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	■
C-Tick	■	■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	■

■ existing
□ pending

Insulation monitors for ungrounded supply mains

Motor load monitors

Temperature monitors

Contact protection, 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	
cULus LISTED	■	■	■	■				■			□			■	■			□	
GL	■	■						■						■					
GOST	■	■						■						■	■			■	
	□	□						□						□	□			□	
Marks																			
CE	■	■	■	■	■			■			■			■	■			■	
C-Tick	■	■						■			□			■	■				

■ existing
□ pending

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-ENEMIN	CM-ENEMAX	CM-ENS	CM-ENSUP/DOWN	CM-ENN	CM-ENNUP/DOWN		
cULus LISTED	■	■	■	■	■	□	■	■	■			■	■	■	■	■	■		
GL		■	■	■	■	■	■	■	■					■		■			
GOST	■	■	■	■	■	■	■	■	■			■	■	■	■	■	■		
Ex II (2) G, PTB 02 ATEX 3080				■	■	□	■	■	■										
	□	□	□	□	□	□	□	□	□			□	□	□	□	□	□		
Marks																			
CE	■	■	■	■	■	■	■	■	■			■	■	■	■	■	■		
C-Tick	■	■	■	■	■	■	■	■	■			■	■	■	■	■	■		

Current and voltage monitors single-phase

Content

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

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

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Ordering details CM-EFN (under- and overvoltage monitor) 43
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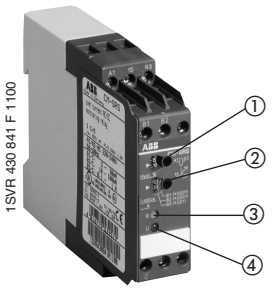
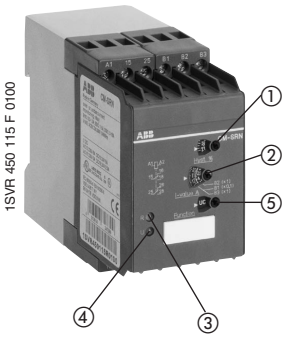
AC/DC current monitors, single-phase
CM-SRS, CM-SRN
Ordering details



CM-SRS



CM-SRN

① Hysteresis adjustment
② Threshold value adjustment
③ R: yellow LED - relay status
④ U: green LED - supply voltage
⑤ Function selection: Over-/ undercurrent (OC/UC)

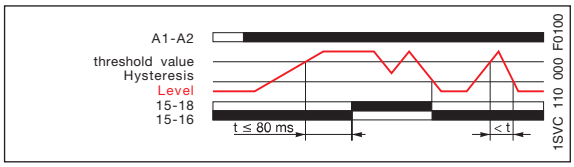
- Monitoring of AC or DC currents
  CM-SRS:
  3 ranges: 3 mA - 1 A
  CM-SRN:
  6 ranges: 3 mA - 15 A
- 3 measuring ranges covered by one unit
- Switching hysteresis adjustable from 5 - 30 %
- 3 supply voltage versions
- 24-240 V AC/DC version with selectable undercurrent or overcurrent monitoring
- CM-SRS: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

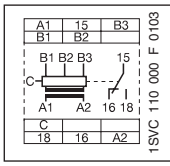
CM-SRS: Supply voltage must be applied at least 50ms before applying the measuring current. Width: 22.5 mm.

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.

Function diagram CM-SRS

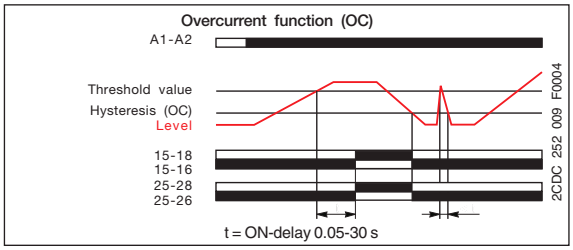


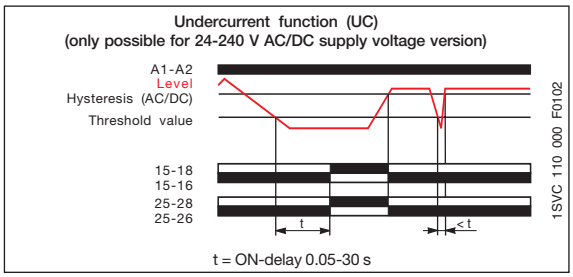
Connection diagram CM-SRS



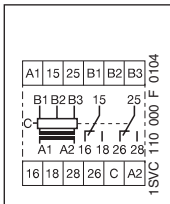
A1-A2	Supply voltage
B1-C	Meas. range: 3-30 mA
B2-C	Meas. range: 10-100 mA
B3-C	Meas. range: 0.1-1 A
15-16/18	Output contacts - Open-circuit principle

Function diagrams CM-SRN





Connection diagram CM-SRN



A1-A2	Supply voltage
B1-C	Measuring range: 3-30 mA or 0.3-1.5 A
B2-C	Measuring range: 10-100 mA or 1 - 5 A
B3-C	Measuring range: 0.1-1 A or 3-15 A
15-16/18 25-26/28	Output contacts - Open-circuit principle

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 R9100**	1		0.150/0.33
	110-130 V AC	**1SVR 430 841 R0100**	1		0.150/0.33
	220 -240 V AC	**1SVR 430 841 R1100**	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 R0000**	1		0.300/0.66
	110 -130 V AC	**1SVR 450 110 R0000**	1		0.300/0.66
	220-240 V AC	**1SVR 450 111 R0000**	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 R0100**	1		0.300/0.66
	110-130 V AC	**1SVR 450 110 R0100**	1		0.300/0.66
	220-240 V AC	**1SVR 450 111 R0100**	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 R0000**	1		0.300/0.66
	110-130 V AC	**1SVR 450 120 R0000**	1		0.300/0.66
	220-240 V AC	**1SVR 450 121 R0000**	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 R0100**	1		0.300/0.66
	110-130 V AC	**1SVR 450 120 R0100**	1		0.300/0.66
	220-240 V AC	**1SVR 450 121 R0100**	1		0.300/0.66

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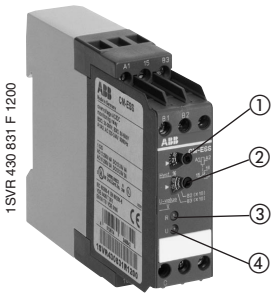
AC/DC voltage monitors, single-phase
CM-ESS
Ordering details



CM-ESS

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

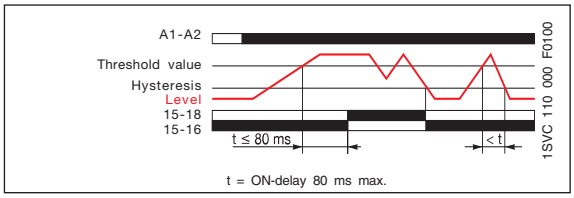
- Monitoring of AC or DC voltages from 50 mV - 500 V in 8 ranges
- Up to 3 measuring ranges coverd by one unit
- Switching hysteresis adjustable from 5-30 %
- No time delay
- 1 c/o contact
- 2 LEDs for status indication

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

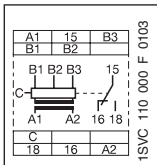
The output relay energizes if the monitored voltage exceeds the threshold value. It de-energizes if the voltage falls below the set hysteresis value.

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.

Function diagram CM-ESS



Connection diagram CM-ESS



A1-A2 Supply voltage
B1-C Meas. voltage: 0.05-0.5V;1-10 V; /-/
B2-C Meas. voltage: 0.3-3 V; 5-50 V; 30-300 V;
B3-C Meas. voltage: 0.5-5 V; 10-100 V; 50-500 V
15-16/18 Output contacts - Open-circuit principle

Type	Supply voltage 50/60 Hz	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg/lb
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 R9000**	1		0.150/0.33
	110-130 V AC	**1SVR 430 831 R0000**	1		0.150/0.33
	220-240 V AC	**1SVR 430 831 R1000**	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 R9100**	1		0.150/0.33
	110-130 V AC	**1SVR 430 831 R0100**	1		0.150/0.33
	220-240 V AC	**1SVR 430 831 R1100**	1		0.150/0.33
Voltage measuring ranges: /-/ ; 30-300 V; 50-500 V, AC/DC					
CM-ESS	24 V AC	**1SVR 430 831 R9200**	1		0.150/0.33
	110-130 V AC	**1SVR 430 831 R0200**	1		0.150/0.33
	220-240 V AC	**1SVR 430 831 R1200**	1		0.150/0.33

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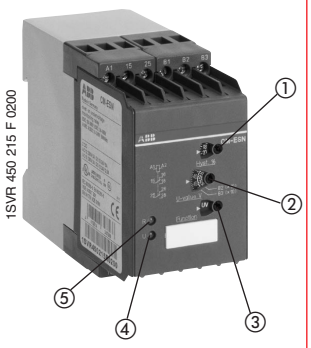
AC/DC voltage monitors, single-phase
CM-ESN
Ordering details



CM-ESN

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

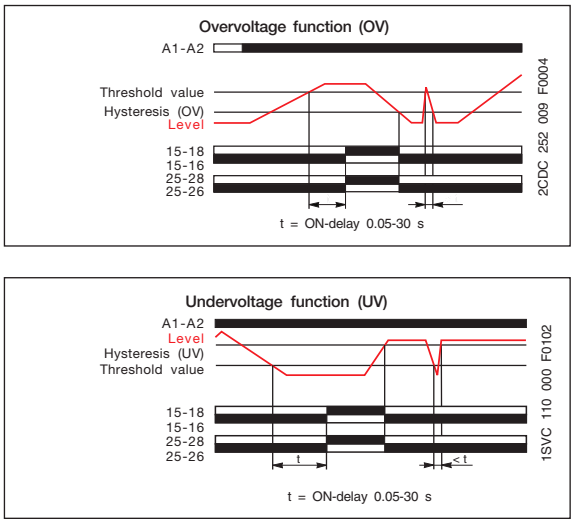
- Monitoring of AC or DC voltages from 50 mV to 500 V in 8 ranges
- Up to 3 measuring ranges covered by one unit
- Selectable function: Undervoltage or overvoltage monitoring
- Switching hysteresis adjustable from 5-30 %
- With or without time delay from 0.05-30 s
- 2 c/o contacts
- 2 LEDs for status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

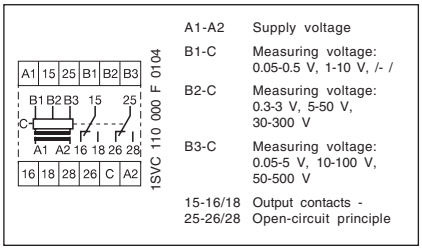
The output relay is de-energized if the monitored voltage is above or below the set hysteresis percentage. With or without time delay of 0.05...30 s. The hysteresis can be adjusted from 5...30 %.

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.

Function 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
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 R0000**	1		0.300/0.66
	110-130 V AC	**1SVR 450 210 R0000**	1		0.300/0.66
	220-240 V AC	**1SVR 450 211 R0000**	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 R0000**	1		0.300/0.66
	110-130 V AC	**1SVR 450 220 R0000**	1		0.300/0.66
	220-240 V AC	**1SVR 450 221 R0000**	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 R0100**	1		0.300/0.66
	110-130 V AC	**1SVR 450 210 R0100**	1		0.300/0.66
	220-240 V AC	**1SVR 450 211 R0100**	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 R0100**	1		0.300/0.66
	110-130 V AC	**1SVR 450 220 R0100**	1		0.300/0.66
	220-240 V AC	**1SVR 450 221 R0100**	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 R0200**	1		0.300/0.66
	110-130 V AC	**1SVR 450 210 R0200**	1		0.300/0.66
	220-240 V AC	**1SVR 450 211 R0200**	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 R0200**	1		0.300/0.66
	110-130 V AC	**1SVR 450 220 R0200**	1		0.300/0.66
	220-240 V AC	**1SVR 450 221 R0200**	1		0.300/0.66

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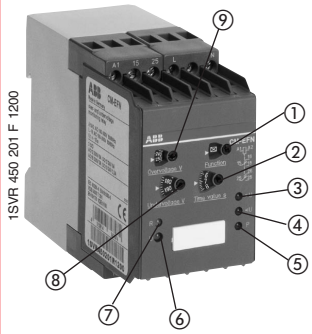
AC over- and undervoltage monitor, single-phase CM-EFN
Ordering details



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

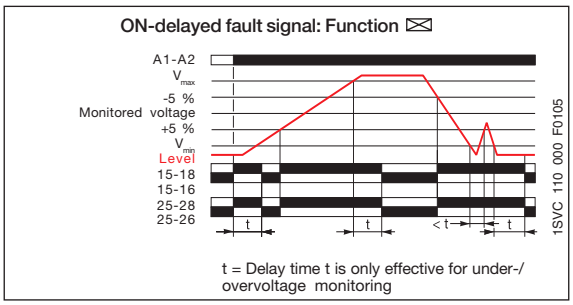
The CM-EFN monitors single phase supply voltages for phase loss as well as for overvoltage and undervoltage conditions. The output relay is de-energized if one of the fault conditions mentioned before occurs. The fault type is indicated by an LED.

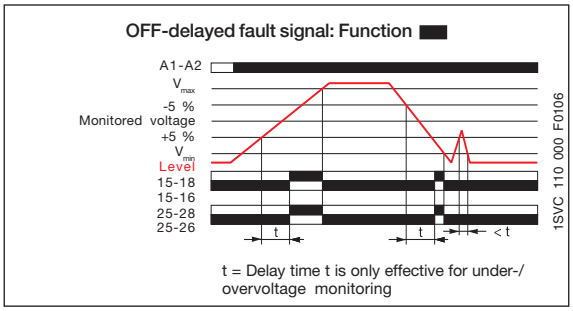
The output relay is energized if the phase is present and the voltage value is correct. The relay is de-energized if the voltage exceeds the set $V_{max.}$ value or drops below the set $V_{min.}$ value. It is re-energized automatically once the voltage returns into the adjusted voltage frame taking into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

Time delay

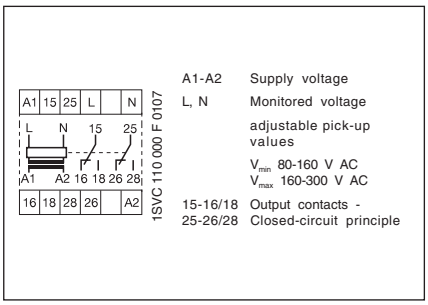
The selection switch ⊠/■ is used to set the delay time of the CM-EFN as required by the specific service conditions.
Switch position (⊠): The fault signal indicating that the voltage has exceeded or dropped below the adjusted threshold values is suppressed during the set delay time. Momentary voltage 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.

Function 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 R1100**	1		0.300/0.66
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 R1200**	1		0.300/0.66

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Current monitors, single-phase
CM-SRS, CM-SRN
Technical data

		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		**B1-C**	**B2-C**	**B3-C**	**B1-C**	**B2-C**	**B3-C**	**B1-C**	**B2-C**	**B3-C**
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 mm² (2 x 14 AWG) stranded wire with wire end ferrule								
Mounting position		any								
Degree of protection enclosure / terminals		IP50 / IP20								
Operating temperature		-20...+60 °C			-25...+65 °C					
Storage temperature		-40...+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 / marks		**cULus, GL and GOST, CCC (pending) / CE and 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 / Vmax.: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				5-30 %, adjustable					5 % fixed setting
see above				see above					-
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									Closed-circuit principle
AgCdo									
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 (2x14 AWG) stranded wire with wire end ferrule									
any									
IP50 / IP20									
-20...+60 °C				-25...+65 °C					
-40...+85 °C				-40...+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 and GOST, CCC (pending) / CE and C-Tick									
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

Notes

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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**Three-phase monitors for phase sequence, phase loss, over- and undervoltage
CM-PSS, CM-PVS, CM-PFN and CM-PVN**

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**Three-phase monitors for phase sequence, phase loss and unbalance
CM-PAS, CM-ASS, CM-ASN**

Ordering details 51
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**Multifunctional three-phase monitors for phase sequence, phase loss,
over- and undervoltage and unbalance CM-MPS**

Ordering details 52
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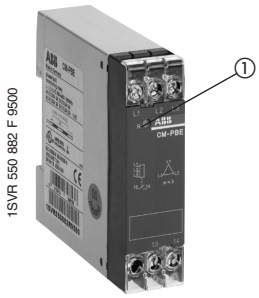
Phase loss monitor CM-PBE
Phase monitor for over- and undervoltage CM-PVE
Ordering details



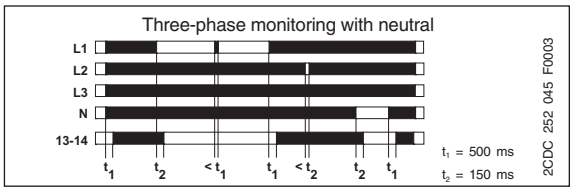
CM-PBE

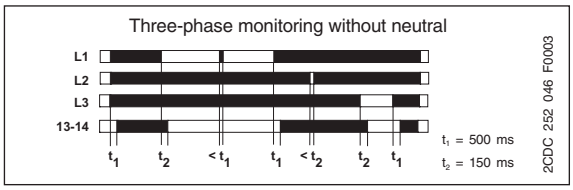
① R: yellow LED - relay

- Three- and single-phase monitoring:
  - Phase loss
- No phase sequence monitoring
- Measuring range:
  L1-L2-L3: 3 x 380-440 V AC
  L-N: 220-240 V AC
- Available with or without neutral monitoring
- 1 n/o contact
- 1 LED for status indication

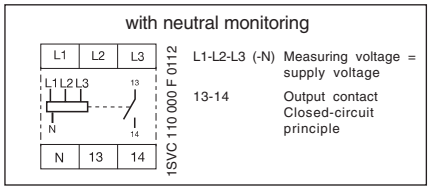
The **CM-PBE phase loss monitor** is used to monitor supply voltages for phase loss (V_{meas} < 60 % x V_{nom}). If all three phases are present, the output relay is energized. If the above fault occurs, the output relay is de-energized and the yellow LED turns off. The relay is re-energized automatically 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.

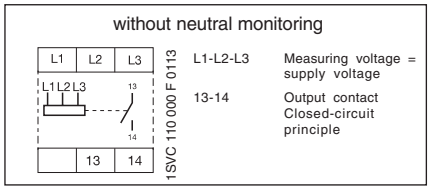
Function diagrams CM-PBE



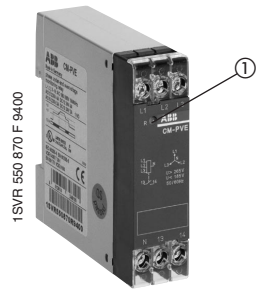


Connection diagrams CM-PBE





Type		Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg/lb
CM-PBE	with neutral monitoring	1SVR 550 881 R9400	1		0.075/0.17
	without neutral monitoring	1SVR 550 882 R9500	1		0.075/0.17



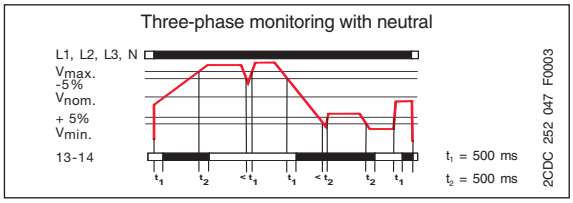
CM-PVE

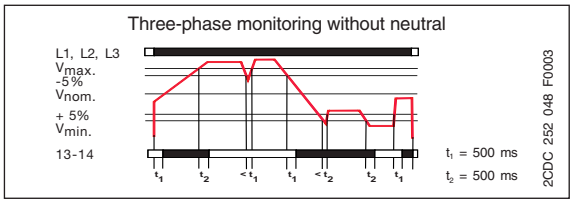
① R: yellow LED - relay

- Three- and single-phase monitoring:
  - Phase loss
  - Over-/ undervoltage
- No phase sequence monitoring
- Measuring range:
  L1-L2-L3: 3 x 320-460 V AC
  L-N: 185-265 V AC
- Available with or without neutral monitoring
- 1 n/o contact
- 1 LED for status indication

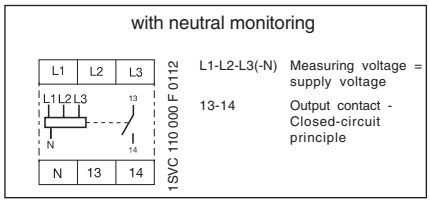
The **CM-PVE phase monitor** is used to monitor supply voltages for undervoltage, overvoltage and phase loss. If all three phases are present with correct voltage, the output relay is energized. If one of the above faults occurs, i. e. if the voltage [L-L (L-N)] exceeds the voltage value V_{max} (460 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.

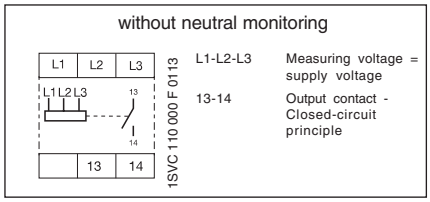
Function diagrams CM-PVE





Connection diagram CM-PVE

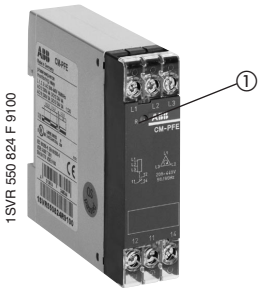




Type		Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg/lb
CM-PVE	with neutral monitoring	1SVR 550 870 R9400	1		0.075/0.17
	without neutral monitoring	1SVR 550 871 R9500	1		0.075/0.17

• Technical data ..... 56 • Dimensional drawing 111

Phase sequence monitors
CM-PFE, CM-PFS
Ordering details



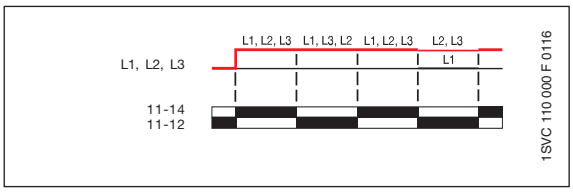
CM-PFE

① R: yellow LED - relay status

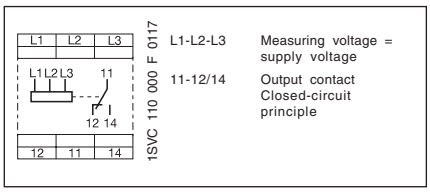
- Monitoring of three-phase supply voltage for phase sequence and phase loss
- No delay
- Continuous voltage range 3 x 208-440 V 50/60 Hz
- 1 c/o contact
- LED for status indication

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 three-phase monitor for unbalance CM-PAS.

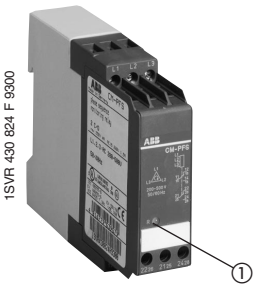
Function diagram CM-PFE



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 R9100	1		0.075/0.17



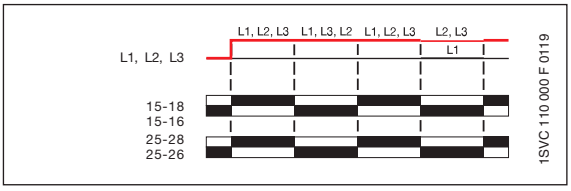
CM-PFS

① R: yellow LED - relay status

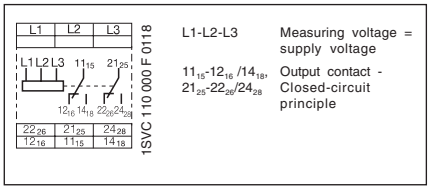
- Monitoring of three-phase supply voltage for phase sequence and phase loss
- No delay
- Continuous voltage range 3 x 200-500 V 50/60 Hz
- 2 c/o contacts
- LED for status indication

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 three-phase monitor for unbalance CM-PAS

Function diagram CM-PFS



Connection diagramCM-PFS



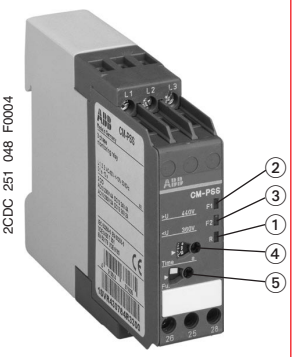
ATTENTION
If several CM-PFS units are placed side by side and the supply voltage is higher than 415 V, spacing of at least 10 mm has to be kept between the individual units.

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 R9300	1		0.150/0.33

• Technical data ..... 56,57 • Dimensional drawings ..... 111 • Accessories 111

NEW

Three-phase monitors for over- and undervoltage CM-PSS
Ordering details



CM-PSS

① R: green LED - supply voltage, relay

② F1: red LED - fault signal

③ F2: red LED - fault signal

- Overvoltage: F1
- Undervoltage: F2
- Phase loss: F1 on, F2 flashes
- Phase sequence: F1 and F2 flash alternately

④ Time adjustment 0.1-10 s
Phase sequence and phase loss are signalled without delay.

⑤ Rotary switch for selecting the time delay function

⊠ ON-delay

■ OFF-delay

- Three-phase monitoring:
  - Phase sequence
  - Phase loss
  - Overvoltage
  - Undervoltgae
- Switching thresholds ±10 % of rated voltage
- Adjustable ON- and OFF-delay
- Dual-frequency measuring input 50/60 Hz
- Powered by the measuring circuit
- 2 c/o contacts
- 3 LEDs for status indication

The **CM-PSS** is a three-phase monitor. It is able to monitor the phase parameters phase sequence, phase loss, over- and undervoltage.
If all three phases are present with correct voltage, the output relays are energized.
If the voltage to be monitored exceeds or falls below the fixed threshold value, the output relays are de-energized undelayed or delayed (0.1-10 s), depending on the set time delay.
The fault signal can be suppressed or, for better evaluation, stored for the settable delay time of 0.1 to 10 s.

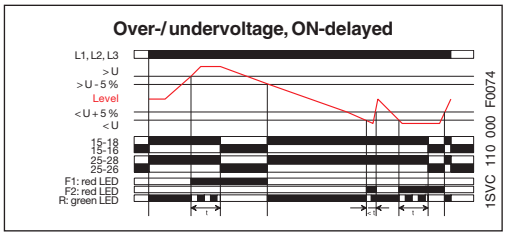
The rotary switch ⊠ / ■ is used to select the delay time function.

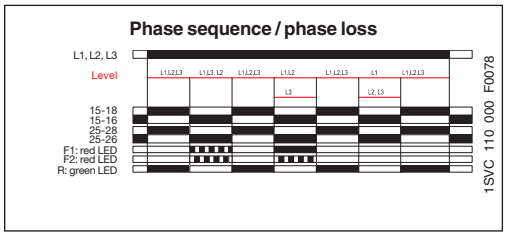
Switch position ⊠ : In case of a fault, the de-energizing of the output relays and the respective fault signal are suppressed for the set delay time.

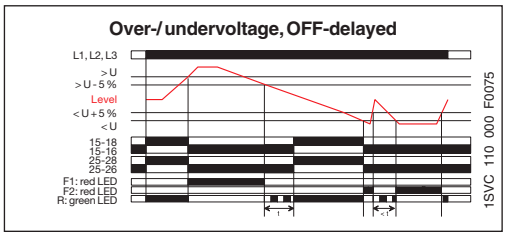
Switch position ■ : In case of a fault, the output relays de-energize immediately and a fault signal is issued and stored for the set delay time. This way, also momentary undervoltage conditions are recognized.

The fault type is indicated by LEDs.
The output relays re-energize automatically, instantaneously or with delay (0.1-10 s), depending on the set time delay, as soon as the voltage returns to the tolerance range, taking into account a fixed hysteresis of 5%.
Phase sequence and phase loss are indicated and reset without time delay.

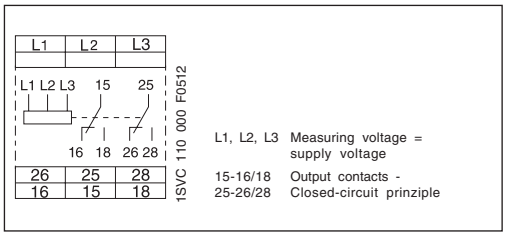
Function diagram CM-PSS







Connection diagram CM-PSS

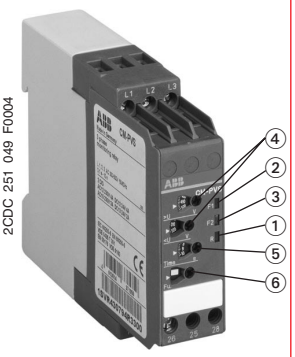


Type	Measuring voltage = supply voltage	Measuring frequency	Order code	Pack. unit piecees	Price 1 piece	Weight 1 piece kg/lb
CM-PSS	380 V AC 400 V AC	50/60 Hz 50/60 Hz	**1SVR 430 784 R2300** **1SVR 430 784 R3300**	1 1		0.130/0.286 0.130/0.286

• Technical data ..... 59 • Dimensional drawings ..... 111 • Accessories 111
• Data sheet 2CDC 112 050 D02**

NEW

Three-phase monitors for over- and undervoltage CM-PVS
Ordering details



CM-PVS

① R: green LED - supply voltage, relay

② F1: red LED - fault signal

③ F2: red LED - fault signal
- Overvoltage: F1
- Under voltage: F2
- Phase loss: F1 on, F2 flashes
- Phase sequence: F1 and F2 flash alternately

④ Threshold adjustment V_{min}/V_{max}

⑤ Time adjustment 0.1-10 s

Phase sequence and phase loss are signalled without delay.

⑥ Rotary switch for selecting the time delay function

ON-delayed

OFF-delayed

- Three-phase monitoring:
  - Phase sequence
  - Phase loss
  - Overvoltage
  - Undervoltage
- Adjustabble:
  - Over- and undervoltage threshold
  - ON- and OFF-delay
- Dual frequency measuring input 50/60 Hz
- Powered by the measuring circuit
- 2 c/o contacts
- 3 LEDs for status indication

The **CM-PVS** is a three-phase monitor. It is able to monitor the phase parameters phase sequence, phase loss, over- and undervoltage.
The threshold values for over- and undervoltage are adjustable (see table).
If all three phases are present with correct voltage, the output relays are energized.
If the voltage to be monitored exceeds or falls below the set threshold value, the output relays are de-energized undelayed or delayed (0.1-10 s), depending on the set time delay.
The fault signal can be suppressed or, for better evaluation, stored for the settable delay time of 0.1 to 10 s.

The rotary switch ⊠ / ■ is used to select the delay time function.

Switch position ⊠ : In case of a fault, the de-energizing of the output relays and the respective fault signal are suppressed for the set delay time.

Switch position ■ : In case of a fault, the output relays de-energize immediately and a fault signal is issued and stored for the set delay time. This way, also momentary undervoltage conditions are recognized.

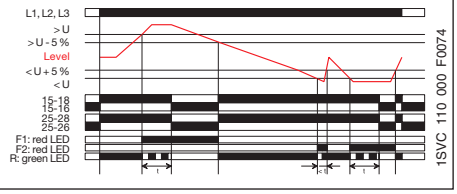
The fault type is indicated by LEDs.
The output relays re-energize automatically, instantaneously or with delay (0.1-10 s), depending on the set time delay, as soon as the voltage returns to the tolerance range, taking into account a fixed hysteresis of 5%.
Phase sequence and phase loss are indicated and reset without time delay.

Function diagram CM-PVS

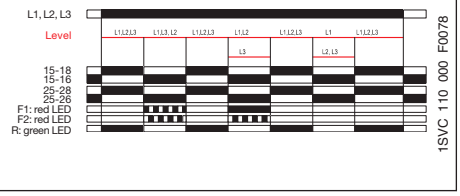
Thresholds for over- and undervoltage

L1-L2-L3	160-300 V	U_{min} = 160-220 V U_{max} = 220-300 V
L1-L2-L3	300-500 V	U_{min} = 300-380 V U_{max} = 420-500 V

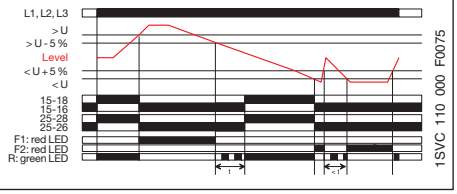
Over-/and undervoltage, ON-delayed



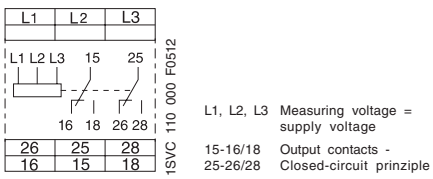
Phase sequence / phase loss



Over-/undervoltage, OFF-delayed



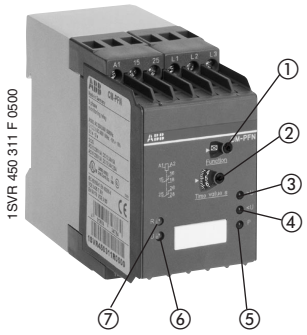
Connection diagram CM-PVS



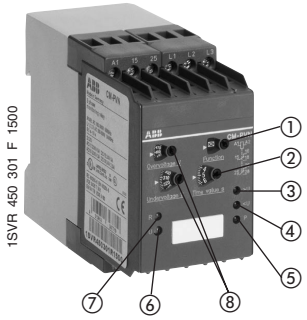
Type	Measuring voltage = supply voltage	Measuring frequency	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg/lb
CM-PVS	160-300 V AC	50/60 Hz	1SVR 430 794 R1300	1		0.130/0.286
	300-500 V AC	50/60 Hz	1SVR 430 794 R3300	1		0.130/0.286

• Technical data ..... 59 • Dimensional drawings ..... 111 • Accessories 111
• Data sheet 2CDC 112 048 D02**

Three-phase monitors for over- and undervoltage CM-PFN, CM-PVN
Ordering details



CM-PFN



CM-PVN

① Time function ⊠ / ■

② Time adjustment 0.1-10 s
Phase loss and phase sequence are signaled without delay.

③ >V: red LED - overvoltage

④ <V: red LED - undervoltage

⑤ P: red LED - phase loss, phase sequence

⑥ U: green LED - supply voltage

⑦ R: yellow LED - relay

⑧ Threshold adjustment V_{min} / V_{max}

- Three-phase monitoring:
  - phase sequence
  - phase loss
  - over-/ undervoltage
- 2 c/o contacts
- 5 LEDs for status indication

CM-PFN

- Measuring range: 0.9-1.1 V_N (V_N = 3 x 380 V or 3 x 400 V)

CM-PVN:

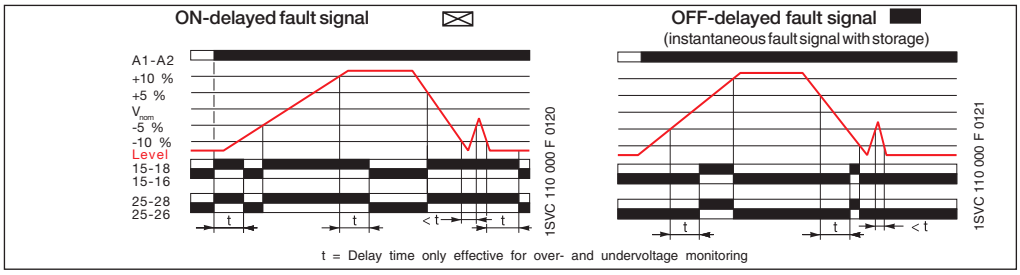
- 3 measuring ranges from 160-580 V
- Adjustable:
  - Over- / undervoltage thresholds
  - ON- and OFF delay
- Fixed switching hysteresis of 5 %

The three-phase monitors CM-**PFN** and **CM-PVN** are used to monitor three-phase supply voltages for incorrect phase sequence, phase loss, over- and undervoltage. 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.

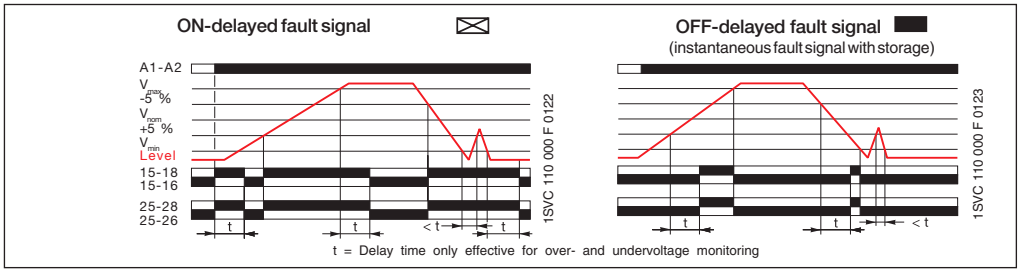
CM-PVN: The output relay is de-energized, if the voltage exceeds the rated value V_{max} or falls below V_{min}. The selector switch ⊠/■ is used to select the time delay. Switch position ⊠: The fault signal indicating that voltage has exceeded or dropped below the set value is suppressed for the set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

Function diagrams CM-PFN



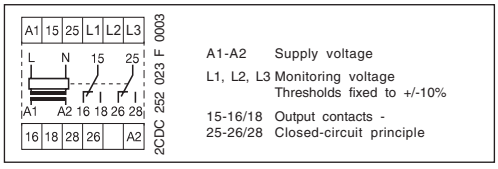
t = Delay time only effective for over- and undervoltage monitoring

Function diagrams CM-PVN

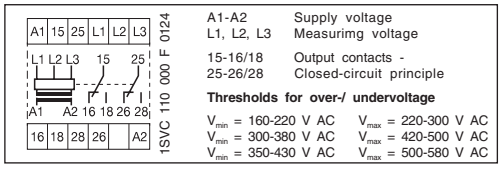


t = Delay time only effective for over- and undervoltage monitoring

Connection diagram CM-PFN



Connection diagram CM-PFN



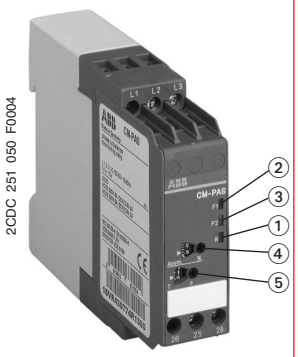
Type	Supply voltage 50/60 Hz	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg/lb
Measuring voltage 3 x 380 V / 50 Hz					
CM-PFN	220 -240 V AC	1SVR 450 311 R0400	1		0.300/0.66
	380-415 V AC	1SVR 450 312 R0400	1		0.300/0.66
Measuring voltage 3 x 400 V / 50 Hz					
CM-PFN	220-240 V AC	1SVR 450 311 R0500	1		0.300/0.66
	380-415 V AC	1SVR 450 312 R0500	1		0.300/0.66
Measuring 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 R1200	1		0.300/0.66
	160-300 V AC	1SVR 450 301 R1200	1		0.300/0.66
Measuring 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 R1500	1		0.300/0.66
	160-300 V AC	1SVR 450 301 R1500	1		0.300/0.66
	300-500 V AC	1SVR 450 302 R1500	1		0.300/0.66
Measuring 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 R1700	1		0.300/0.66
	300-500 V AC	1SVR 450 302 R1700	1		0.300/0.66

Further voltages on request.

• Technical data ..... 57 • Dimensional drawings ..... 111 • Accessories 111

NEW

Three-phase monitors for unbalance
CM-PAS
Ordering details



CM-PAS

① R: green LED - supply voltage, relay

② F1: red LED - fault signal

③ F2: red LED - fault signal
- Unbalance: F1 and F2 on
- Phase loss: F1 on, F2 flashes
- Phase sequence: F1 and F2 alternately flashing

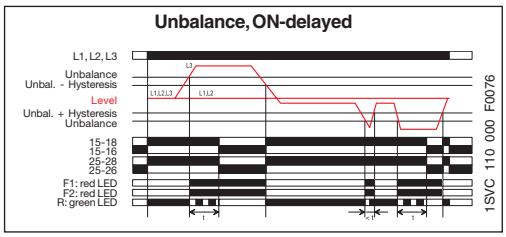
④ Threshold adjustment phase unbalance 2-15 %

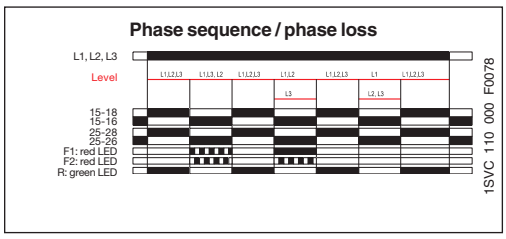
⑤ Time adjustment 0.1-10 s
Phase sequence and phase loss are signalled without delay.

- Three-phase monitoring:
  - Phase sequence
  - Phase loss
  - Unbalance
- Adjustable:
  - unbalance threshold
  - ON-delay
- Dual-frequency measuring input 50/60 Hz
- Powered by the measuring circuit
- 2 c/o contacts
- 3 LEDs for status indication

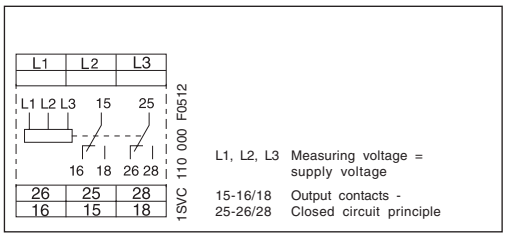
The **CM-PAS** is a three-phase monitor. It is able to monitor the phase parameters phase sequence, phase loss and phase unbalance.
If all three phases are present with correct voltage, the output relay is energized.
The output relays are de-energized delayed (0.1-10 s), if the phase unbalance of the phases to be monitored exceeds the set unbalance threshold value. This enables a short-term suppression of fault signals or, for better evaluation, a storage of the fault signal.
The fault type is indicated by LEDs.
The output relays re-energize undelayed, as soon as the voltage returns to the tolerance range, taking into account a fixed hysteresis of 20%.
Phase sequence and phase loss are indicated and reset without time delay.

Function diagram CM-PAS





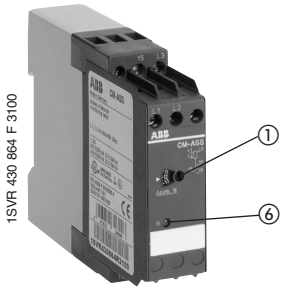
Connection diagram CM-PAS



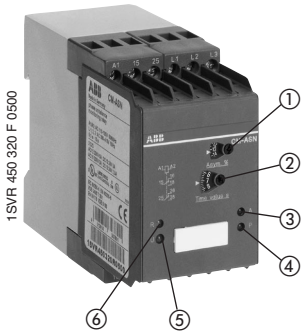
Type	Measuring voltage = supply voltage	Measuring frequency	Order code	Pack. unit piecees	Price 1 piece	Weight 1 piece kg/lb
CM-PAS	160-300 V AC 300-500 V AC	50/60 Hz 50/60 Hz	**1SVR 430 774 R1300** **1SVR 430 774 R3300**	1 1		0.130/0.286 0.130/0.286

• Technical data ..... 59 • Dimensional drawings ..... 111 • Accessories 111
• Data sheet 2CDC 112 049 D02**

Three-phase monitors for unbalance
CM-ASS, CM-ASN
Ordering details



CM-ASS



CM-ASN

① Unbalance threshold 5-15 %
② Timer adjustment 0.1-10 s
③ A: red LED - unbalanced
④ P: red LED - phase loss and phase sequence fault
⑤ U: green LED - supply voltage
⑥ R: yellow LED - relay

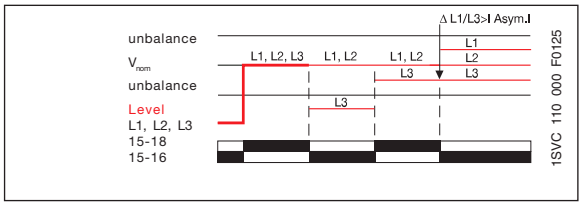
- Three-phase monitoring:
  - Phase sequence
  - Phase loss
  - Unbalance
- Adjustable unbalance threshold

CM-ASS:
- Fixed ON-delay time of 0.5 s
- 2 supply and measuring voltage ranges of 220-240 V and 380-415 V
- 1 c/o contact
- 1 LED for status indication

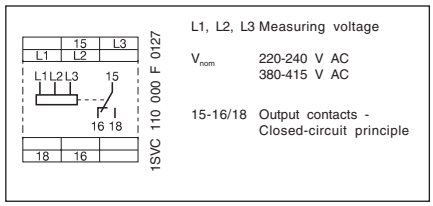
CM-ASN:
- Adjustable ON-delay time
- 5 monitored three-phase voltages
- 2 c/o contacts
- 2 LEDs for status indication

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.

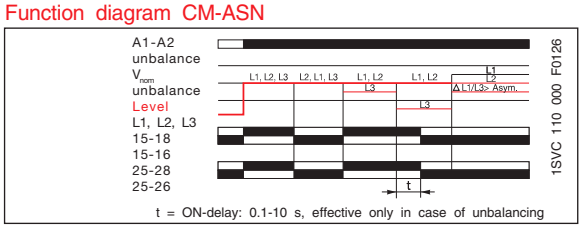
Function diagram CM-ASS



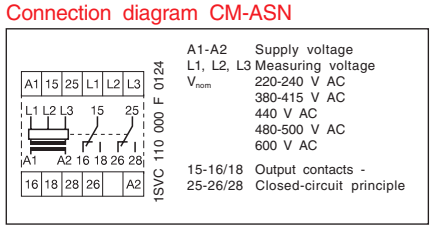
Connection diagram CM-ASS



Function diagram CM-ASN



Connection diagram CM-ASN



Type	Measuring voltage = supply voltage	Measuring 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 R1100**	1		0.30/0.66
	3 x 380-415 V AC	50 Hz	**1SVR 430 864 R3100**	1		0.30/0.66
	3 x 220-240 V AC	60 Hz	**1SVR 430 865 R1100**	1		0.30/0.66
	3 x 380-415 V AC	60 Hz	**1SVR 430 865 R3100**	1		0.30/0.66

Type	Supply voltage	Measuring frequency	Order code	Pack. unit pieces	Price 1 piece	Weight 1 pc. kg/lb
Measuring voltage: 3 x 220-240 V AC 50 Hz; 3 x 220-240 V AC 60 Hz						
CM-ASN	110-130 V AC	50 Hz	**1SVR 450 320 R0200**	1		0.30/0.66
	220-240 V AC	50 Hz	**1SVR 450 321 R0200**	1		0.30/0.66
	380-415 V AC	50 Hz	**1SVR 450 322 R0200**	1		0.30/0.66
	220-240 V AC	60 Hz	**1SVR 450 421 R0200**	1		0.30/0.66
Measuring 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 R0500**	1		0.30/0.66
	220-240 V AC	50 Hz	**1SVR 450 321 R0500**	1		0.30/0.66
	380-415 V AC	50 Hz	**1SVR 450 322 R0500**	1		0.30/0.66
	220-240 V AC	60 Hz	**1SVR 450 422 R0500**	1		0.30/0.66
Measuring voltage: 3 x 440 V AC 60 Hz						
CM-ASN	440 V AC	60 Hz	**1SVR 450 423 R0600**	1		0.30/0.66
Measuring 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 R0700**	1		0.30/0.66
	220-240 V AC	50 Hz	**1SVR 450 321 R0700**	1		0.30/0.66
	380-415 V AC	50 Hz	**1SVR 450 322 R0700**	1		0.30/0.66
	500-550 V AC	50 Hz	**1SVR 450 932 R0100**	1		0.30/0.66
	480-500 V AC	60 Hz	**1SVR 450 424 R0700**	1		0.30/0.66
Measuring voltage: 3 x 600 V AC 50 Hz						
CM-ASN	600 V AC	60 Hz	**1SVR 450 426 R0800**	1		0.30/0.66

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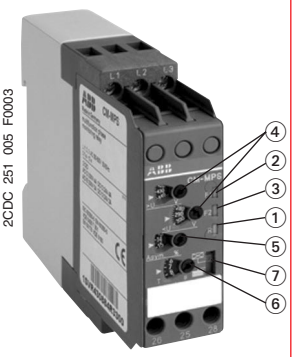
Multifunctional three-phase monitors CM-MPS
Ordering details



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
- 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 0.1-10 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 three-phase monitor. It is able to monitor the phase parameters phase sequence, phase loss, over- and undervoltage and phase unbalance.

The threshold values for over- and undervoltage are adjustable (see table).
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 fault signal can be suppressed or, for better evaluation, stored for the settable delay time of 0.1 to 10 s.

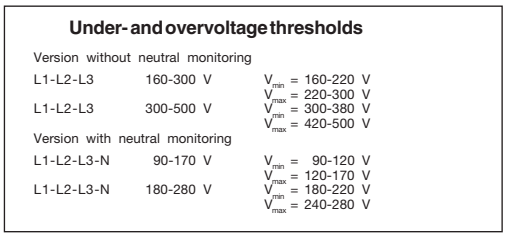
The slide switch ⊠ / ■ is used to select the delay time function.

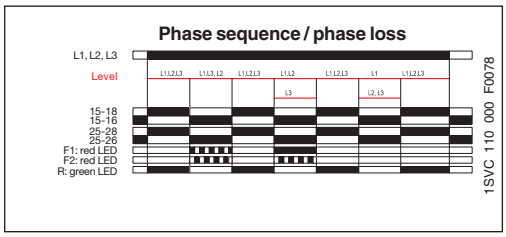
Switch position ⊠ : In case of a fault, the de-energizing of the output relays and the respective fault signal are suppressed for the set delay time.

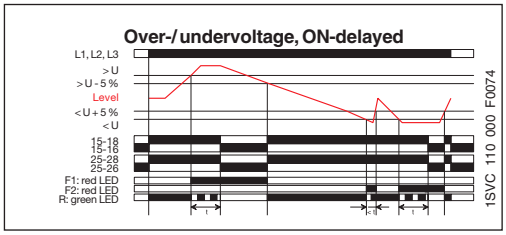
Switch position ■ : In case of a fault, the output relays de-energize immediately and a fault signal is issued and stored for the set delay time. This way, also momentary undervoltage conditions are recognized.

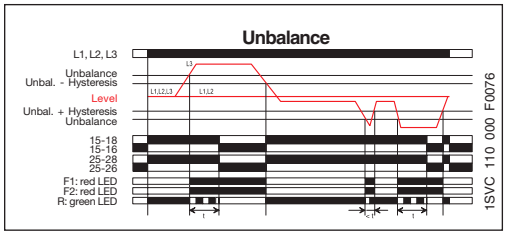
The output relay is re-energized automatically if all parameters are back within the adjusted limits.

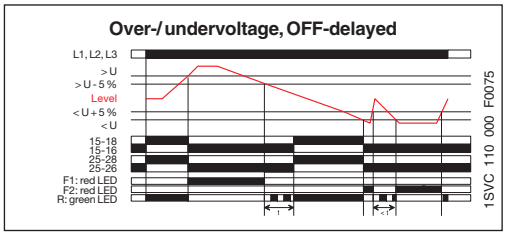
Function diagrams CM-MPS

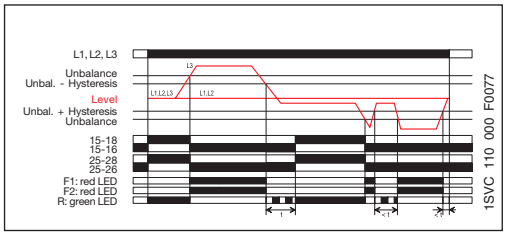




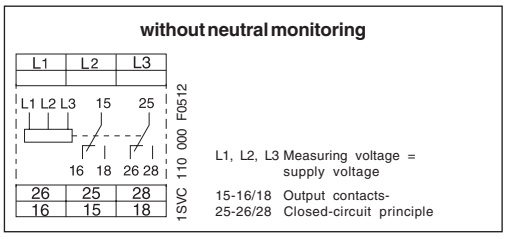


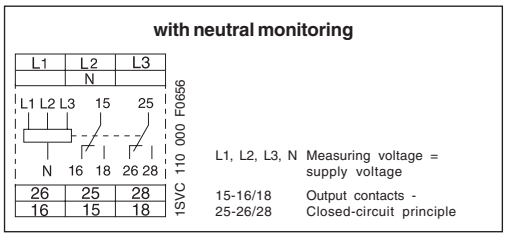






Connection diagrams CM-MPS





Type	Measuring voltage = supply voltage	Measuring frequency	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg/lb
Without neutral monitoring						
CM-MPS	160-300 V AC	50/60 Hz	1SVR 430 884 R1300	1		0.20/0.44
	300-500 V AC	50/60 Hz	1SVR 430 884 R3300	1		0.20/0.44
With neutral monitoring						
CM-MPS	90-170 V AC	50/60 Hz	1SVR 430 885 R1300	1		0.20/0.44
	180-280 V AC	50/60 Hz	1SVR 430 885 R3300	1		0.20/0.44

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• Data sheet 2CDC 112 046 D02**

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

	CM-PBE	CM-PVE	CM-PFE
Supply circuit = measuring circuit	**L1-L2-L3 (-N)**	**L -L2-L3 (-N)**	**L1-L2-L3**
Supply voltage = measuring voltage	220-240 V AC 50/60 Hz	185-265 V AC 50/60 Hz	3 x 208-440 V AC approx. 15 VA
- power consumption	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 functions	phase loss	over- and undervoltage	phase sequence, phase loss
Measuring ranges	220-240 V AC 380-440 V AC	185-265 V AC 320-460 V AC	3 x 208-440 V AC
Thresholds	threshold = 0,6 x V_N	fixed: Vmin: 185 V / 320 V; Vmax: 265 V / 460 V	0.6 x V_N
Hysteresis related to the threshold value	5 % fixed (release value = 0.65 x V_N)	fixed: Vmin: 194 V / 336 V; Vmax: 252 V / 437 V	
Measuring voltage frequency	50/60 Hz (-10 %...+10 %)	50/60 Hz (-10 %...+10 %)	50/60 Hz
Maximum measuring cycle time	40 ms	80 ms	500 ms
Measuring error within supply voltage tolerance			≤ 0.5 %
Measuring 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 VDE 0110, IEC 947-1	250 V		
Min. switching voltage	-	-	-
Max. switching voltage	250 V AC, 250 V DC		
Min. 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 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		
n/o contact	10 A fast, operating class gL		
General data			
Width of enclosure	22.5 mm / 0.885 in		
Wire size stranded with wire end ferrule	2 x 1.5 mm^2 / 2 x 16 AWG		
Mounting position	any		
Degree of protection enclosure / terminals	IP50 / IP20		
Operating temperature	-20...+60 °C		
Storage temperature	-40...+85 °C		
Mounting	DIN rail (EN 50022)		
Standards			
Product standard	IEC 255-6, EN 60255-6		
Low Voltage Directive	73/23/EEC		
EMC Directive	89/336/EEC		
Electromagnetic compatibility			
Interference immunity acc. to EN 61000-6-2			
electrostatic discharge (ESD) acc. to IEC61000-4-2, EN 61000-4-2	level 3 - 6 kV/ 8 kV		
electromagnetic field acc. to IEC 61000-4-3, EN 61000-4-3	level 3 - 10 V/m		
fast transients (Burst) acc. to IEC 61000-4-4, EN 61000-4-4	level 3 - 2 kV / 5 kHz		
powerful impulses (Surge) acc. to IEC 1000-4-5, EN 61000-4-5	level 4 - 2 kVL-L		
HF line emission acc. to IEC 1000-4-6, EN 61000-4-6	level 3 - 10 V		
Interference emission acc. to EN 61000-6-4			
Operational reliability acc to. IEC 68-2-6	6 g		
Mechanical resistance acc. to IEC 68-2-6	10 g		
Approvals / marks	**cULus and GOST; CCC (pending) / CE and C-Tick**		
Isolation data			
Rated insulation volt. between supply, measuring and output circuits acc. to VDE 0110, IEC 60947-1	400 V	400 V	500 V
Impulse voltage resistance 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		
Overvoltage category acc. to VDE 0110, IEC 664, IEC 255-5	III		
Environmental testing acc. to IEC68-2-30	24 h cycle time, 55 °C, 93 % rel., 96 h		

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

	CM-PFS	CM-PFN	CM-PVN
Supply circuit	**= measuring circuit L1-L2-L3**	**A1-A2**	**A1-A2**
Supply voltage - power consumption	supply voltage = monitoring voltage	220-240 V AC 50/60 Hz aprox. 3 VA	90-145 V AC approx. 3 VA
	3 x 200-500 V AC 50/60 Hz approx. 15 VA	380-415 V AC 50/60 Hz approx. 3 VA	160-300 V AC approx. 3 VA
			300-500 V AC 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 functions	phase sequence, phase loss	over- and undervoltage, phase sequence, phase loss	
Measuring ranges	3 x 200-500 V AC	3 x 380 V AC 50 Hz, 3 x 400 V AC 50 Hz	160-300/300-500/350-580 V AC
Thresholds	0.6 x Vnom	over- and undervoltage fixed: 0.85/1.1 x V_N	over- and undervoltage threshold adjustable
Hysteresis related to the threshold value		5 % fixed (0.9/1.05 V_N)	5 % fixed
Measuring voltage frequency	50/60 Hz	50 Hz	50/60 Hz
Maximum measuring cycle time	500 ms	80 ms	
Measuring error within supply voltage tolerance	≤ 0.5 %		
Measuring error within temperature range	≤ 0.06 % / °C		
Timing 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	
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	AgNi	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	4 A	5 A	
AC-15 (inductive) 230V	3 A	3 A	
DC-12 (resistive) 24V	4 A	5 A	
DC-13 (inductive) 24V	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, n/c contact	10 A fast, operation class gL	5 A fast, operation class gL	
max. fuse rating n/o contact	10 A fast, operation class gL	5 A fast, operation class gL	
General data			
Width of enclosure	22.5 mm / 0.885 in	45 mm / 1.77 in	
Wire size stranded with wire end ferrule	2 x 1.5mm² / 2 x 16 AWG		
Mounting position	any		
Degree of protection enclosure / terminals	IP50 / IP20		
Operating temperature	-20...+60 °C	-25...+65 °C	
Storage temperature	-40...+85 °C		
Mounting	DIN rail (EN 50022)		
Standards			
Product standard	IEC 255-6, EN 60255-6		
Low Voltage Directive	73/23/EEC		
EMC Directive	89/336/EEC		
Electromagnetic compatibility			
Interference emission acc. to EN 61000-6-2			
electrostatic discharge (ESD) acc. to IEC 61000-4-2, EN 61000-4-2	level 3 - 6 kV / 8 kV		
electromagnetic field acc. to IEC 61000-4-3, EN 61000-4-3	level 3 - 10 V/m		
fast transients (Burst) acc. to IEC 61000-4-4, EN 61000-4-4	level 3 - 2 kV / 5 kHz		
powerful impulses (Surge) acc. to IEC 1000-4-5, EN 61000-4-5	level 4 - 2 kVL-L		
HF line emissission acc. to IEC 1000-4-6, EN 61000-4-6	level 3 - 10 V		
Interference emission acc. to EN 61000-6-4			
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 / marks	**cULus, GL and GOST; CCC (pending) / CE and C-Tick**		
Isolation data			
Rated insulation voltage between supply, measuring and output circuit acc. to VDE 0110, IEC 60947-1	500 V		
Impulse voltage resistance 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		
Overvoltage category acc. to VDE 0110, IEC 664, IEC 255-5	III		
Environmental testing acc. to IEC 68-2-30	24 h cycle, 55 °C, 93 % rel., 96 h		

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

Three-phase monitors for unbalance
CM-ASS, CM-ASN
Technical data

2

Type			CM-ASS	CM-ASN
Input circuit			**= measuing circuit L1-L2-L3**	**A1-A2**
Supply voltage			3x220-240 V AC	110-130/220-240 V AC
			3x380-415 V AC	380-415/480-500 V AC
				500-550/600 V AC
Power consumption			3 VA	2 VA
Supply voltage tolerance			-20...+20 %	-15...+10 %
Supply voltage frequency			50 Hz or 60 Hz	
Duty time			100 %	
Measuring circuit		**L1-L2-L3**		
Monitoring functions	phase loss, phase sequence		yes	yes
	unbalance		yes	yes
Measuring ranges			220-240 V AC or 380-415 V AC	220-240/380-415/480-500/600 V AC
Thresholds	unbalance		5-15 %	
Hysteresis related to the threshold value			fixed, 20 %	
Measuring voltage frequency			50 Hz or 60 Hz	
Maximum measuring cycle time			500 ms	< 100 ms
Measuring error within the supply voltage tolerance			≤ 0.5 %	
Measuring error within the temperature range			≤ 0.06 % / °C	
Timing circuit				
Delay time for unbalance signal			500 ms	0.1-10 s adjustable (ON-delayed)
Timing error within the supply voltage tolerance			≤ 0,5 %	
Timing error withng the termperture range			≤ 0,06 % / °C	
Indication of operational states			**U: green LED, R: yellow LED, F, P, A: red LED**	
Supply voltage		U	no	yes
Output relay energized		R	yes	yes
Phase loss		P	no	yes
Phase sequence		F	no	yes
Overvoltage		F	no	yes
Undervoltage		F	no	yes
Unbalance		A	no	yes
Output circuits			**15-16/18**	**15-16/18, 25-26/28**
Number of contacts			1 c/o contact (relay)	2 c/o contacts (relays)
Operating principle (in case of fault the output relays de-energize)			closed-circuit principle	
Contact material			AgCdO	
Rated voltage	acc. to VDE 0110, IEC 60947-1		250 V	400 V
Minimum switching voltage				
Maximum switching voltage			250 V AC, 250 V DC	400 V AC, 400 V DC
Rated operating current	AC-12 (resistive)	230 V	4 A	5 A
acc. to IEC 60947-5-1	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 life time	mechanical		30 x 10^6 switching cycle	
	electrical (AC-12, 230 V, 4 A)		0.1 x 10^6 switching cycle	
Short circuit proof,	n/c contact		10 A fast, operation class gL	5 A fast, operation class gL
maximum fuse rating	n/o contact		10 A fast, operation class gL	5 A fast, operation class gL
General data				
Width of enclosure			22.5 mm / 0.885 in	45 mm / 1.77 in
Wire size	stranded with wire end ferrule		2 x 2.5 mm^2 / 2 x 14 AWG	
Mounting position			any	
Degree of protection	enclosure / terminals		IP 50 / IP 20	
Temperature range	operation		-20...+60 °C	-25...+65 °C
	storage		-40...+85 °C	
Monting			DIN rail (EN 50022)	
Standards				
Product standard			IEC 255-6, EN 60255-6	
Low Voltage Directive			73/23/EEC	
EMC Directive			89/336/EEC	
Electromagnetic compatibility				
Interference immunity	acc. to EN 61000-6-2			
electrostatic discharge (ESD)	acc. to IEC 61000-4-2, EN 61000-4-2		6 kV / 8 kV	
electromagnetic field	acc. to IEC 61000-4-3, EN 61000-4-3		10 V/m	
fast transients (Burst)	acc. to IEC 61000-4-4, EN 61000-4-4		2 kV / 5 kHz	
powerful impulses (Surge)	acc. to IEC 1000-4-5, EN 61000-4-5		2 kV L-L	
HF line emission	acc. to IEC 1000-4-6, EN 61000-4-6		10 V	
Operational reliability	acc. to IEC 68-2-6		4 g	5 g
Mechanical resistance	acc. to IEC 68-2-6		6 g	10 g
Environmental testing	acc. to IEC 68-2-30		24 h cycle, 55 °C, 93 % rel. 96 h	
Approvals / marks			**cULus, GL and GOST; CCC (pending) / CE and C-Tick**	
Isolation data				
Rated insulation voltage between input and output	acc. to VDE 0110, IEC 60947-1		500 V	
Impulse voltage resistance U_{imp} between all isolated circuits			4 kV / 1.2-50 µs	
Test voltage between all isotated circuits			2.5 kV, 50 Hz, 1 min	
Pollution degree	acc. to VDE 0110, IEC 664, IEC 255-5		III	
Overvoltage category	acc. to VDE 0110, IEC 664, IEC 255-5		III	

Multi- and singlefunction three-phase monitors CM-MPS, CM-PSS, CM-PAS, CM-PVS
Technical data

Type				CM-MPS	CM-PSS	CM-PAS	CM-PVS
Input circuit (= Measuring circuit)			**L1, L2, L3, (N)**				
Supply voltage	L1, L2, L3	without neutral	①	160-300 V AC	380 V AC	160-300 V AC	160-300 V AC
		monitoring	②	300-500 V AC	400 V AC	300-500 V AC	300-500 V AC
	L1, L2, L3, N	with neutral	③	90-170 V AC	-	-	-
		monitoring	④	180-280 V AC	-	-	-
Power consumption				20 VA			
Supply voltage tolerance				-15...+10 %			
Supply voltage frequency				50/60 Hz			
Supply voltage frequency tolerance				±10 %			
Duty time				100 %			
Measuring circuit			**L1, L2, L3, (N)**				
Monitoring functions		phase loss, phase sequence		yes	yes	yes	yes
		over-/ undervoltage		yes	yes	no	yes
		unbalance		yes	no	yes	no
Measuring range	overvoltage	without neutral	①	220-300 V	418 V	-	220-300 V
		monitoring	②	420-500 V	440 V	-	420-500 V
		with neutral	③	120-170 V	-	-	-
		monitoring	④	240-280 V	-	-	-
	undervoltage	without neutral	①	160-220 V	342 V	-	160-220 V
		monitoring	②	300-380 V	360 V	-	300-380 V
		with neutral	③	90-120 V	-	-	-
		monitoring	④	180-220 V	-	-	-
	unbalance		①-④	2-15 % [1]	-	2-15 % [1]	-
Thresholds	over-/ undervoltage			adjustable	fixed	-	adjustable
	unbalance	switch-off value		adjustable	-	adjustable	-
		switch-on value		fixed	-	fixed	-
Hysteresis related to the threshold value		over-/ under voltage		fix 5 %	fix 5 %	-	fix 5 %
		unbalance		fix 20 % [2]	-	fix 20 % [2]	-
Measuring voltage frequency				50/60 Hz ±10 %			
Maximum measuring cycle time				50 ms			
Measuring error within the supply voltage tolerance				≤ 0.5 %			
Measuring error within the temperature range				≤ 0.06 % / °C			
Timing circuit							
ON-delay time				200 ms	200 ms	200 ms	200 ms
Delay time (ON- or OFF-delay)				0.1-10 s adjustable			
Tolerance of the adjusted delay time				-	-	±10 %	±10 %
Timing error within the supply voltage tolerance				≤ 0.5 %			
Timing error within the temperature range				≤ 0.06 % / °C			
Indication of operational states			**R: green LED, F1, F2: red LED**				
Supply voltage		R on		yes	yes	yes	yes
Output relay energized		R flashes while timing		yes	yes	yes	yes
Phase loss		F1 on, F2 flashes		yes	yes	yes	yes
Phase sequence		F1 and F2 alternately flashing		yes	yes	yes	yes
Overvoltage		F1 on		yes	yes	no	yes
Undervoltage		F2 on		yes	yes	no	yes
Unbalance		F1 and F2 on		yes	no	yes	no

[1] of average of phase voltages

[2] of adjusted switch-off value

Multi- and singlefunction three-phase monitors CM-MPS, CM-PSS, CM-PAS, CM-PVS
Technical data (continued)

2

Type			CM-MPS	CM-PSS	CM-PAS	CM-PVS
Output circuits		**15-16/18, 25-26/28**				
Number of contacts			2 c/o contacts (relays)			
Operating principle (in case of fault the output relays de-energize)			closed-circuit principle			
Contact material			AgNi			
Rated voltage	acc. to VDE 0110, IEC 60947-1		250 V			
Minimum switching power			24 V / 10 mA			
Maximum switching voltage			250 V AC, 250 V DC			
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 life time	mechanical		30 x 10^6 switching cycle			
	electrical (AC-12, 230 V, 4 A)		0.1 x 10^6 switching cycle			
Short circuit proof, maximum fuse rating	n/c contact		10 A fast, operation class gL			
	n/o contact		10 A fast, operation class gL			
General data						
Width of enclosure			22.5 mm / 0.885 in			
Weight			0.14 kg / 0.31 lb	0.13 kg / 0.29 lb		
Wire size	stranded with wire end ferrule		2 x 2.5 mm^2 / 2 x 14 AWG			
Mounting position			any			
Degree of protection	enclosure		IP 50			
	terminals		IP 20			
Temperature range	operation		-20...+60 °C			
	storage		-40...+85 °C			
Mounting			DIN rail (EN 50022)			
Standards						
Product standard			IEC 255-6, EN 60255-6			
Low Voltage Directive			73/23/EEC			
EMC Directive			89/336/EEC			
Electromagnetic compatibility						
Interference immunity	acc. to EN 61000-6-2					
electrostatic discharge (ESD)	acc. to IEC 61000-4-2, EN 61000-4-2		6 kV / 8 kV			
electromagnetic field	acc. to IEC 61000-4-3, EN 61000-4-3		10 V/m			
fast transients (Burst)	acc. to IEC 61000-4-4, EN 61000-4-4		2 kV / 5 kHz			
powerful impulses (Surge)	acc. to IEC 1000-4-5, EN 61000-4-5		2 kV symmetrical			
HF line emission	acc. to IEC 1000-4-6, EN 61000-4-6		10 V			
Interference emission	acc. to EN 61000-6-4					
Operational reliability	nach IEC 68-2-6		4 g			
Mechanical resistance	nach IEC 68-2-6		6 g			
Environmental testing	nach IEC 68-2-30		24 h cycle, 55 °C, 93 % rel. 96 h			
Approvals / marks						
Approvals			cULus, GL and GOST, CCC (pending)			
Marks			CE and C-Tick			
Isolation data						
Rated insulation voltage between input and output	acc. to VDE 0110, IEC 60947-1		600 V			
Impulse volltage resistance U_{imp}	measuring circuit		6 kV			
	output circuit		4 kV			
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			
Overvoltage category	acc. to VDE 0110, IEC 664, IEC 255-5		III			

Insulation monitors for ungrounded supply mains

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Insulation monitoring in IT systems
Insulation monitors

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.

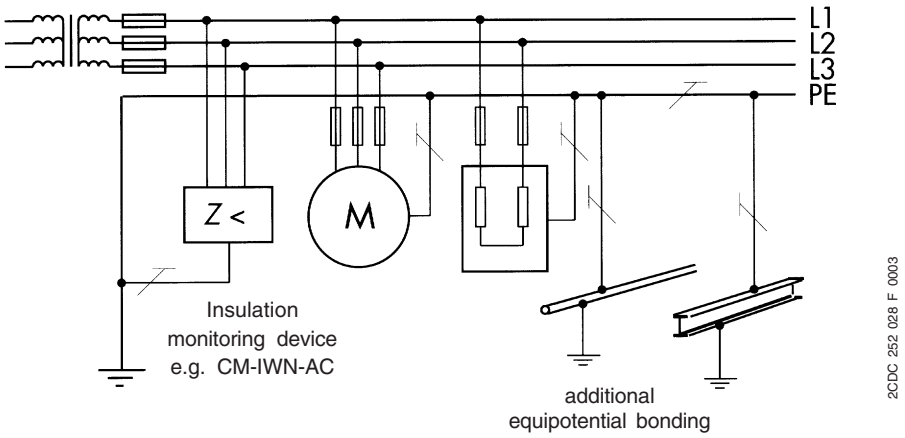
In this system no active conductor is directly connected to earth potential.The advantage of this is that only a small fault current can flow in case of an insulation fault. This current is essentially caused by the system's leakage capacitance.

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 reliabilitity of an IT system is guaranteed thanks to continuous insulation monitoring.

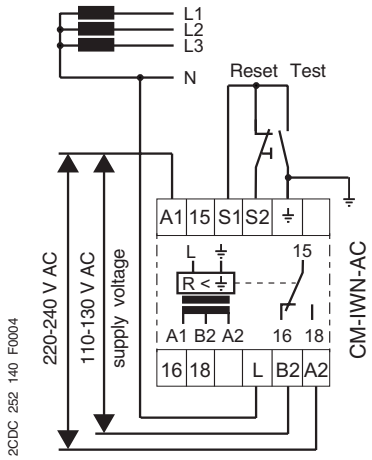
The insulation monitoring device recognizes insulation faults as they develop, and immediately reports that the value has fallen below the minimum. This prevents operational interruptions caused by a second more severe insulation fault.

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.

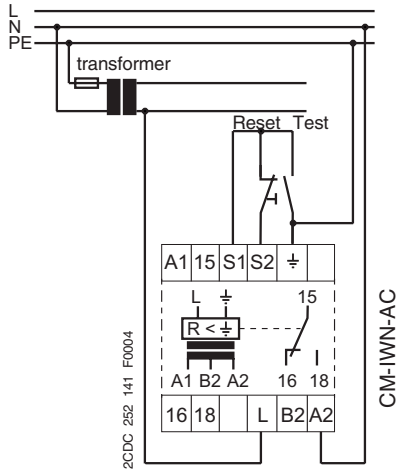


Application and connection examples for the CM-IWN AC in IT and IT-N systems

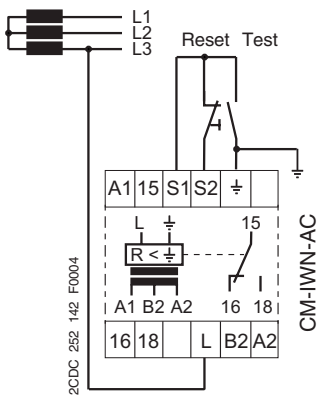
Three-phase IT-N system



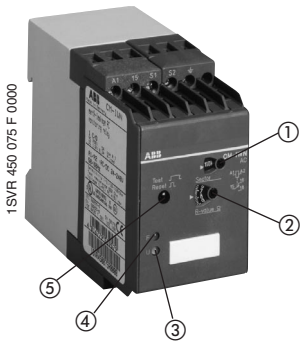
Single-phase IT-N system



Three-phase IT system



Insulation monitors for ungrounded AC mains
CM-IWN-AC
Ordering details

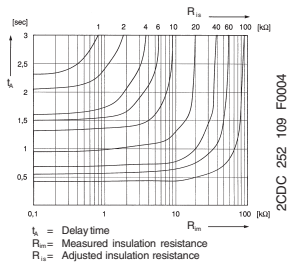


CM-IWN-AC

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-face test button or via remote test button
- VDE 0413/T.2
- 1 c/o contact, open-circuit principle
- 2 LED for status indication

Tripping time



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.

The CM-IWN-AC 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 R_x falls below the threshold value. The relay is reset (de-energized) automatically if the measured insulation resistance exceeds 1.6 times the threshold value.

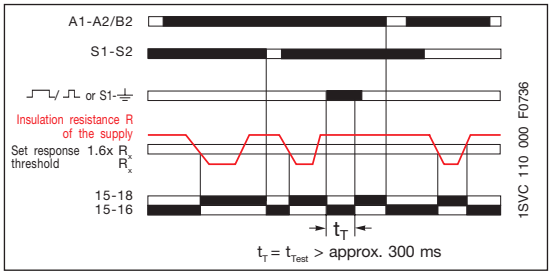
An earth-leakage fault can be simulated using the front-mounted "Test" button. A remote test button can be connected via the terminals S1- ⏚. Tripping is caused by closing a n/o contact.

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

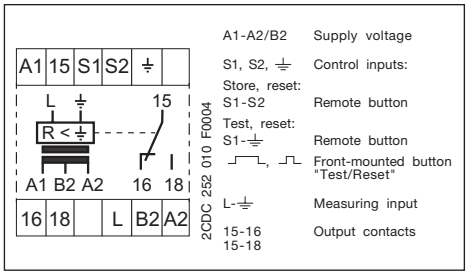
Attention!

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

Function diagram CM-IWN-AC



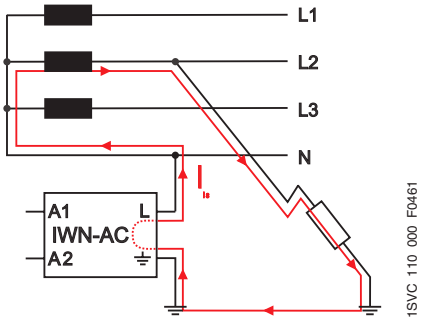
Connection diagram CM-IWN-AC



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 R0000**	1		0.30/0.66
	110-130 V, 220-240 V AC	**1SVR 450 071 R0000**	1		0.30/0.66

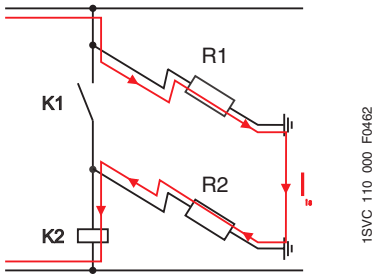
Operating principle

The supply voltage is feeded via terminals A1-A2/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 ⏚ (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.



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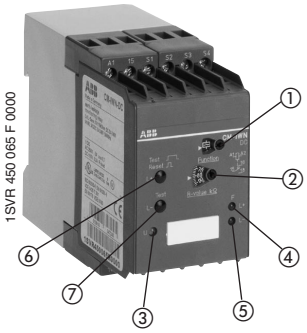
Insulation monitor for ungrounded DC mains
CM-IWN-DC
Ordering details



CM-IWN-DC

① Selector switch
- open circuit principle
- 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 L+/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-face selector switch for open- or closed-circuit principle
- Front-face 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. 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.

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.

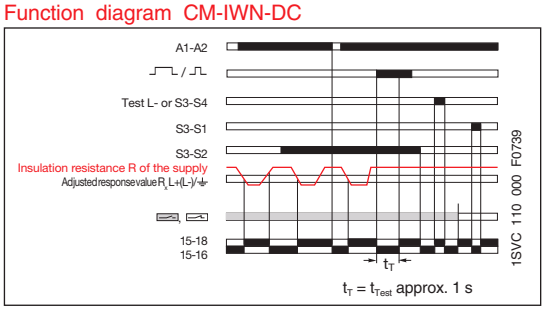
The response threshold is adjustable in a range from 10-110 kΩ. If the insulation resistance falls below the set response threshold, the relay is energized and the error LED lights up.

Front-face test button "Test L-": insulation fault can be simulated, pressing the test button = output relay will trip (energize, de-energize)

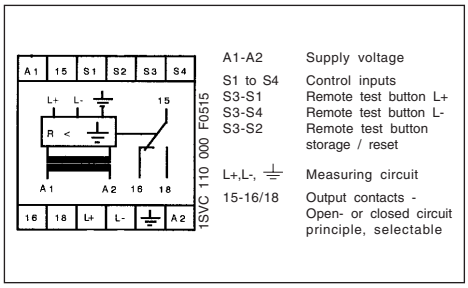
Front-face test button "Test ⎍ /Reset ⎍ L+": Pressed < 1 s = Test L+, Pressed > 1 s = Reset L+ and L-

Connection S2-S3: jumper = fault tripping is stored, button with n/o contact = remote reset, pressing the button resets storage of the tripped state

Function diagram CM-IWN-DC

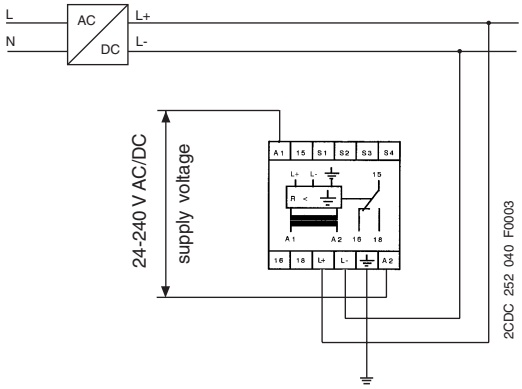


Connection digram CM-IWN-DC



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 R0000	1		0.30/0.66

Application and connection example



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Insulation monitors for ungrounded mixed AC/DC systems
C 558.01
Ordering details

Enclosure width 45 mm

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

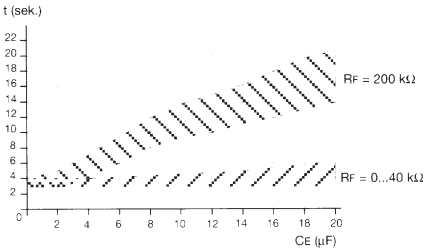
The C558.01 operates with a variant of a pulse measuring principle. This measuring principle ensures reliable monitoring of modern control voltage systems. The frequency range of the system to be monitored may extend from 15-400 Hz.

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



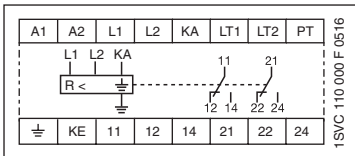
C_E = System leakage capacitance
R_F = Insulation fault
t = Measuring time

Fault indications

Indication	Alarm LED +	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 diagram C558.01



A1-A2	Supply voltage
L1-L2-KA	Measuring circuit
KE, ⏚	PE connection
PT	External test button
LT1-LT2	External reset button or bridge for fault storage
11-12/14	c/o contacts
21-22/24	Open- or closed-circuit principle, selectable

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 0 - 300 V AC 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	Weigt 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

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Insulation monitors for ungrounded AC systems
C 558.02
Ordering details

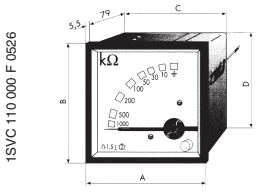
2

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

C 558.10



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.

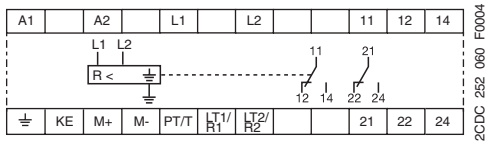
When installing the device, the safety instructions supplied with the equipment have to be observed!

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 x R_{an} and 1 µF system leakage capacitance.

Connection diagram C 558.02



AK	without function
A1-A2	Supply voltage
L1-L2-KA	Measuring circuit
KE, ⏚	PE connection
M+/M-	External measuring instrument
PT	External test button
LT1-LT2	External reset button or bridge for fault storage
11-12/14	c/o contacts
21-22/24	Open- or closed-circuit principle, selectable

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 R0005	1		0.35/0.77
C 558.02	90-132 V AC	1SAR 471 020 R0004	1		0.35/0.77

Accessories (external kΩ meter)

C 558.10		1SAR 477 000 R0100	1		0.20/0.44

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Insulation monitors for ungrounded AC and DC systems
C 558.03
Ordering details

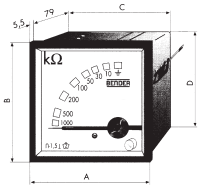
Enclosure width 99 mm

1SAR 472 020 F 0005

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

C 558.10



1SVC 110 000 F 0526

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.

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!

Fault indications

Indication	Alarm LED +	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

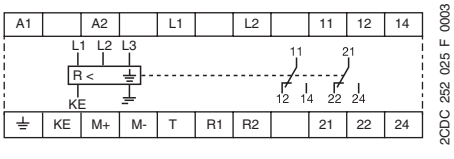
o = flashing
x = continuously on

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 x R_{an} and 1 µF system leakage capacitance.

Connection diagram C 558.03



2CDC 252 025 F 0003

A1-A2	Supply voltage
L1-L2	Measuring circuit
KE, ⏚	PE connection
M+/M-	External measuring instrument
T	External test button
R1-R2	External reset button or bridge for fault storage
11-12/14	c/o contacts
21-22/24	Open- or closed-circuit principle, selectable

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 R0005	1		0.40/0.88
C 558.03	90-132 V AC	1SAR 472 020 R0004	1		0.40/0.88

Accessories (external kΩ meter)

C 558.10		1SAR 477 000 R0100	1		0.20/0.44

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Insulation monitors
CM-IWN-AC, CM-IWN-DC
Technical data

			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	AC-12 (resistive)	230 V	5 A	
acc. to IEC 60947-5-1, EN 60947-5-1	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 mm² (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...+65 °C	
Storage temperature			-40...+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 / Marks			**cULus, GL and GOST; CCC (pending) / CE and C-Tick**	
Isolation data				
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	
Rated impulse withstand voltage between all isolated circuits			4 kV / 1.2 - 50 µs	
Test voltage between all isolated circuits			2.5 kV, 50 Hz, 1 min.	
Pollution category			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.

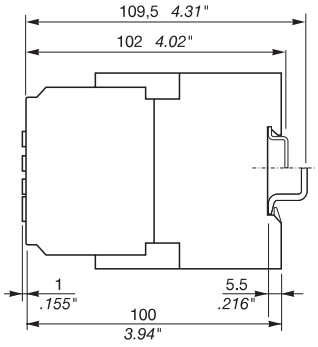
Insulation monitors
C 558
Technical data

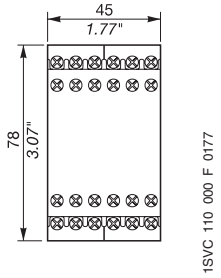
			C 558.01	C 558.02	C 558.03
Supply circuit					
Supply voltage - power consumption	115 V AC	**A1-A2**	3 VA	3 VA	3 VA
	230 V AC	**A1-A2**	3 VA	3 VA	3 VA
Supply voltage tolerance			-20...+15 %	-20...+15 %	-20...+15 %
Supply voltage frequency			15-400 Hz	50-400 Hz	15-400 Hz
Duty time			100 %	100 %	100 %
Measuring circuit					
Monitoring function			Insulation monitoring within electrically isolated ...		
			AC and DC supply systems	AC supply systems	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...+55 °C		
Storage temperature			-40...+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, 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 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 / Marks			**cULus / CE**	**cULus / CE**	**- / CE**
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.

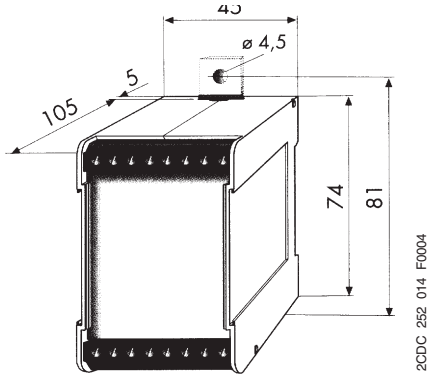
Insulation monitors
Dimensional drawings

CM-IWN

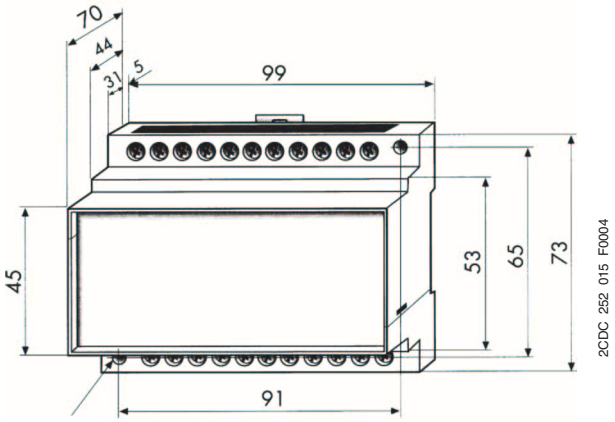




C558.01



C558.02, C558.03



∅ 4,3
for screw mounting

Content

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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.

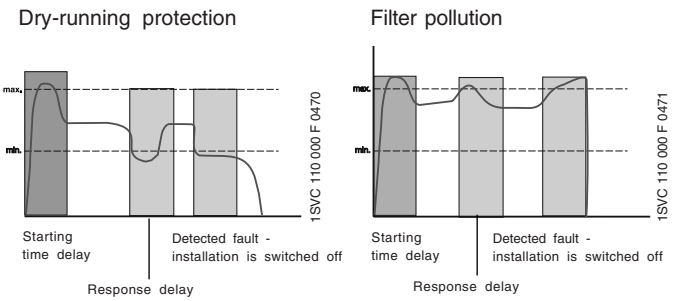
Compared with other conventional measuring principles (e.g. pressure transducers, current measurement), cos φ monitoring is a more precise and economical alternative. The motor is used as a sensor for its own load status.

2

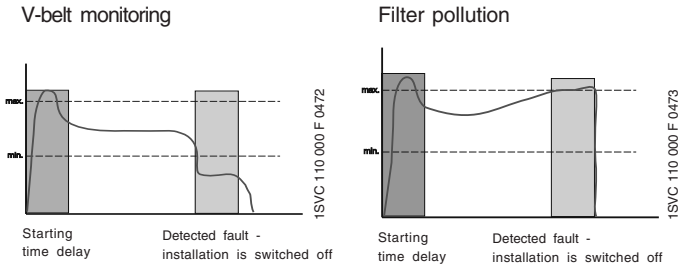
Main applications

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

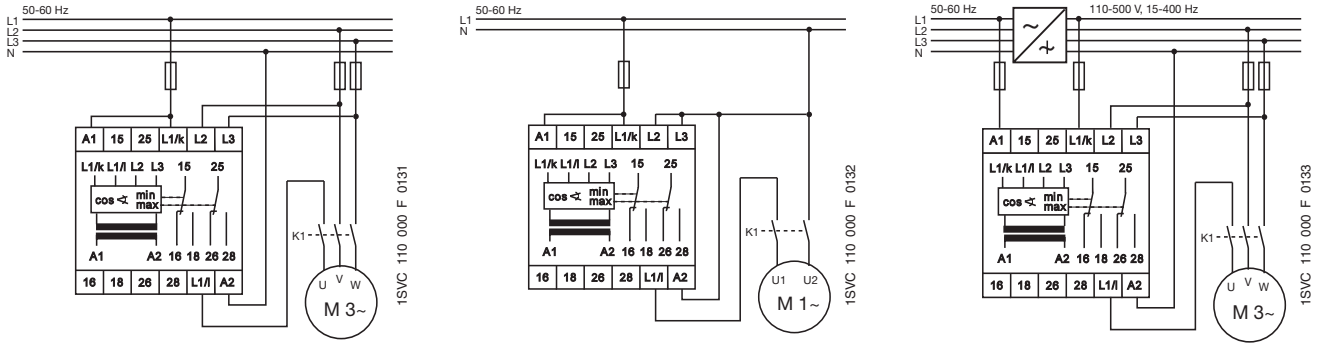
Pump control



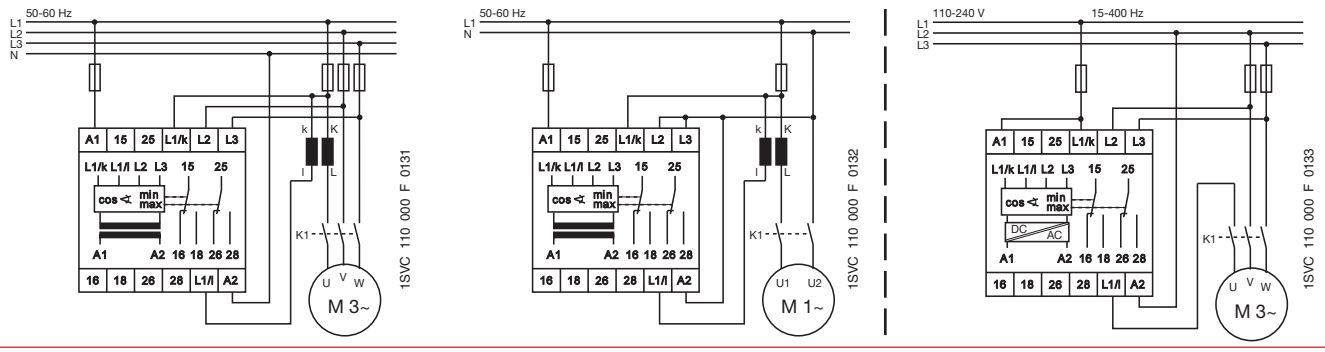
Ventilator monitoring



Wiring examples (for motor currents ≤ 20 A)



Wiring examples (for motor currents ≥ 20 A)



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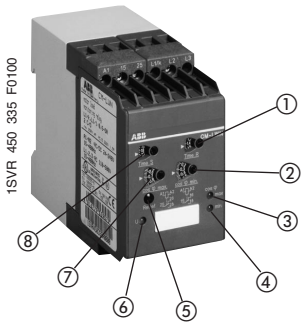
Motor load monitors
CM-LWN
Ordering details



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 cosφ min. and cosφ 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.

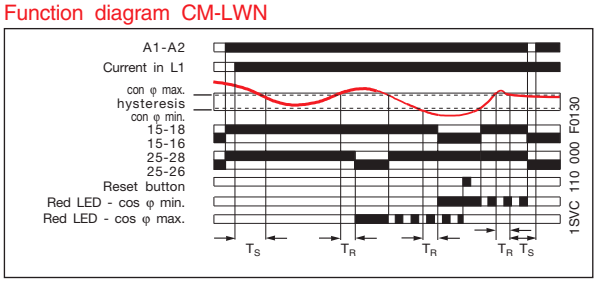
Threshold values can be set individually for cos φ max and cos φ min. If the set threshold value is reached, an LED lights up and the relay is de-energized.
If cos φ returns to the acceptable limits (taking into account the hysteresis), the relay is reset to its original state and the LED flashes permanently 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.

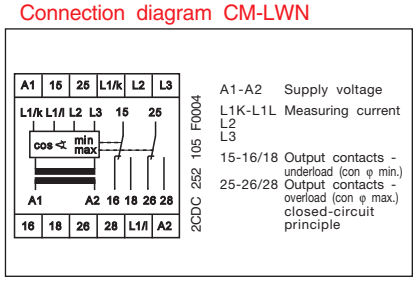
To guarantee correct operation of the response delay (Time R), the adjusted value for cos φ max. has to be higher than the value for cos φ min. plus the hysteresis. Consequently, the overload and underload indication must not be active at the same time.

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.

Function diagram CM-LWN



Connection diagram CM-LWN



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

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Motor load monitor
CM-LWN
Technical data

		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		**L1l-L1k-L2-L3**
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 L1l-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 φ_{min} and cos φ_{max} adjustable from 0 to 1
Hysteresis (related to phase angle φ in °)		4°
Frequency of measuring voltage		15-400 Hz
Max. measuring cyle 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 φ min: red LED
cos Phi max exceeded		cos φ 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 mm² (2 x 14 AWG) stranded wire with wire end ferrule
Mounting position		any
Degree of protection housing/ terminals		IP50 / IP20
Operating temperature		-25...+65 °C
Storage temperature		-40...+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 / Marks		**cULus, GL and GOST; CCC (pending) / CE und C-Tick**
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 µs
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.

Thermistor motor protection relays

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Thermistor motor protection relays
Benefits and advantages
Selection table

2

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

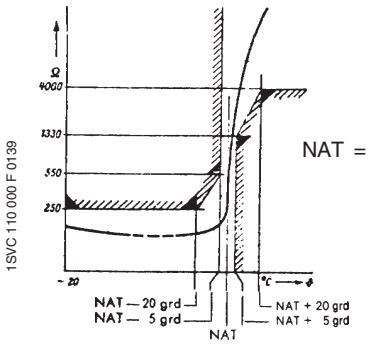
The relay is independent of the rated motor current, the insulation class and the method of starting.
The PTC sensors are connected in series to the terminals Ta and Tb (or Ta and Tbx without short-circuit detection). The number of possible PTC sensors per measuring circuit is limited by the sum of the individual PTC sensor resistances.

RG = R1 + R2 + RN ≤ 1.5 kΩ.
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.

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



NAT = Nominal response temperature

Product overview: Thermistor motor protection relays

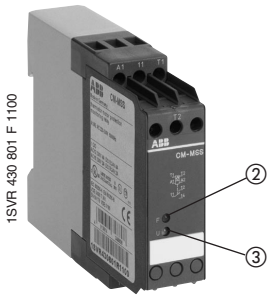
NEW

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

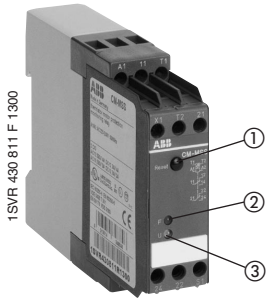
1) configurable via terminals
2) Auto reset without non-volatile fault storage configurable by permanent jumpering of connecting terminals S1-T2 or S1/X1-S2/X2

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

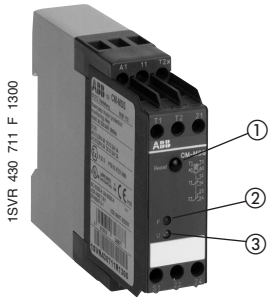
CM-MSE



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



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

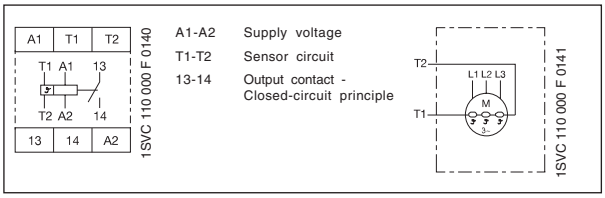


CM-MSS (3),
2 c/o contacts
with configurable short-circuit monitoring

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

CM-MSE

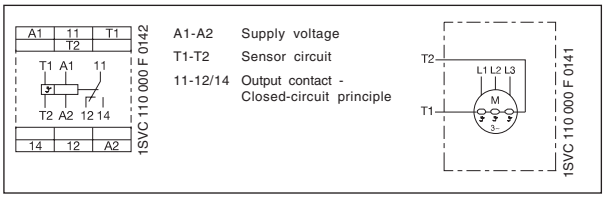
- Automatic reset
- Connection of several sensors (max. 6 sensors conn. in series)
- Monitoring of bimetals
- 1 n/o contact
- Excellent cost / performance ratio



Type	Supply voltage	Order code	Pack. unit pieces	Price 1 piece	Weight 1 pc. kg/lb
CM-MSE	24 V AC	1SVR 550 805 R9300	1		0.11/0.242
	110-130 V AC	1SVR 550 800 R9300	1		0.11/0.242
	220-240 V AC	1SVR 550 801 R9300	1		0.11/0.242

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

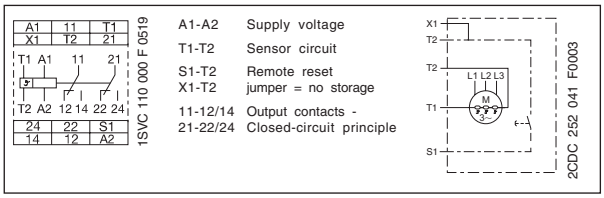
- Automatic reset
- Connection of several sensors
- Monitoring of bimetals
- 1 c/o contact
- 2 LEDs for status indication



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 R9100	1		0.15/0.33
	220-240 V AC	1SVR 430 801 R1100	1		0.15/0.33

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

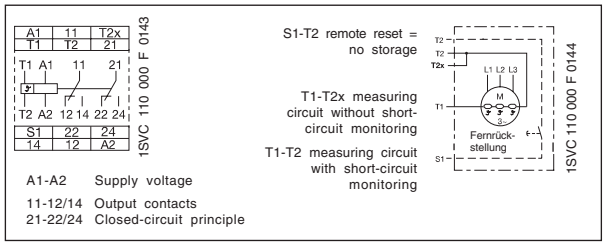
- Fault storage can be switched off
- Reset button
- Remote reset
- 2 c/o contacts
- 2 LEDs for status indication



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 R9300	1		0.15/0.33
	24 V AC	1SVR 430 811 R9300	1		0.15/0.33
	110-130 V AC	1SVR 430 811 R0300	1		0.15/0.33
	220-240 V AC	1SVR 430 811 R1300	1		0.15/0.33

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

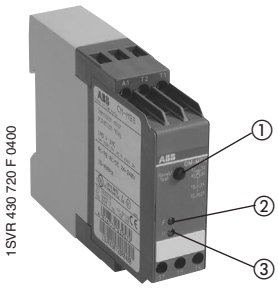
- Fault storage can be switched off
- Reset button
- Remote reset
- Short-circuit monitoring of the sensor circuit configurable
- 2 c/o contacts
- 2 LEDs for status indication
- ATEX approved ⟨Ex⟩ II (2) G, PTB 02 ATEX 3080



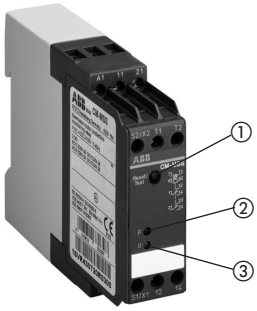
Type	Supply voltage	Order code	Pack. unit pieces	Price 1 piece	Weight 1 pc. kg/lb
CM-MSS (3)	24 V AC/DC	1SVR 430 710 R9300	1		0.15/0.33
	110-130 V AC	1SVR 430 711 R0300	1		0.15/0.33
	220-240 V AC	1SVR 430 711 R1300	1		0.15/0.33
	380-440 V AC	1SVR 430 711 R2300	1		0.15/0.33

- Technical data 81
- Accessories: PTC sensors 80
- Dimensional drawings 111
- Accessories 111

Thermistor motor protection relay CM-MSS
Ordering details

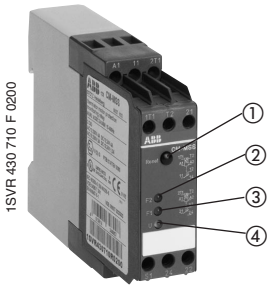


CM-MSS (4), 1-channel, 1 n/c, 1 n/o



CM-MSS (5), 1-channel, 2 c/o

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



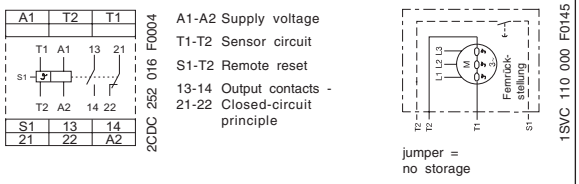
CM-MSS (6), 2-channel

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

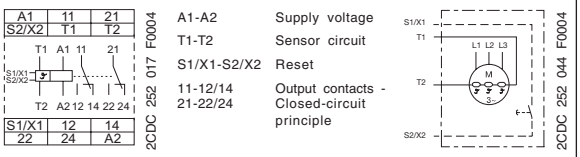
CM-MSS (4) + (5), 1-channel

- Short-circuit monitoring of the sensor circuit
- Continuous voltage range: 24-240 V AC/DC
- Non-volatile storage in case of fault selectable
- 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 (4), 1-channel, 1 n/c, 1 n/o



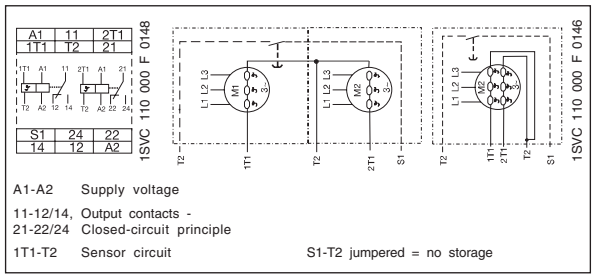
Connection diagram CM-MSS (5), 1-channel, 2 c/o



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 R0400	1		0.15/0.33
NEW CM-MSS (5) 1-channel 2 c/o	24-240 V AC/DC	1SVR 430 720 R0300	1		0.15/0.33

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

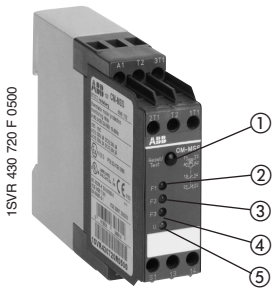
- Short-circuit monitoring for the sensor circuits
- Wide supply voltage range: 24-240 V AC/DC
- 2 separate sensor circuits for monitoring of two motors or one motor with 2 sensor circuits (prewarning and final switch off)
- Reset and test button
- Automatic reset configurable
- Output contacts: 2 x 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 R0200	1		0.15/0.33

- Technical data 81
- Accessories: PTC sensor 80
- Dimensional drwaings 111
- Accessories 111

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



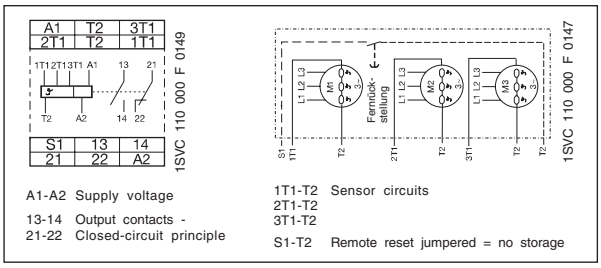
CM-MSS (7), 3 sensor circuits

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

CM-MSS (7), 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
- Reset and test button
- Output contacts: 1 n/c, 1 n/o
- 4 LEDs for status indication
- ATEX approved

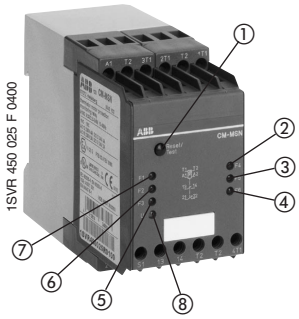
  ⟨Ex⟩ II (2) G, PTB 02 ATEX 3080



A1-A2 Supply voltage
13-14 Output contacts -
21-22 Closed-circuit principle

1T1-T2 Sensor circuits
2T1-T2
3T1-T2
S1-T2 Remote reset jumpered = no storage

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



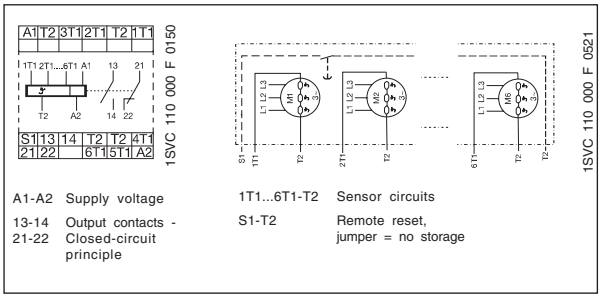
CM-MSN, 6 sensor circuits

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
- Reset and test button
- Output contacts: 1 n/c, 1 n/o
- 7 LEDs for status indication
- ATEX approved

  ⟨Ex⟩ II (2) G, PTB 02 ATEX 3080



A1-A2 Supply voltage
13-14 Output contacts -
21-22 Closed-circuit principle

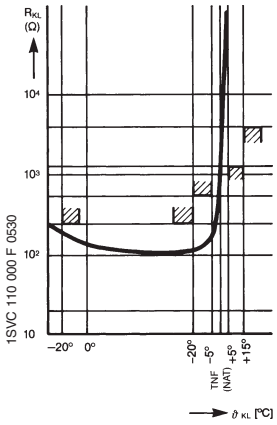
1T1...6T1-T2 Sensor circuits
S1-T2 Remote reset, jumper = no storage

Type	Supply voltage	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg/lb
CM-MSN	24-240 V AC/DC	1SVR 450 025 R0100	1		0.23/0.506

• Technical data 81
• Accessories: PTC sensor 80
• Dimensional drwaings 111
• Accessories 111

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/mm² 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.

1SVC 110 000 F 0531

Type	Rated temp. ° C	Color coding	Order code	Pack. unit pieces	Price per pack	Weight 1 piece kg/lb
Temperature sensor C 011, standard version acc. to DIN 44081						
C 011- 70	70	white-brown	GHC 011 0003 R0001	3		0.02/0.044
C 011- 80	80	white-white	GHC 011 0003 R0002	3		0.02/0.044
C 011- 90	90	green-green	GHC 011 0003 R0003	3		0.02/0.044
C 011-100	100	red-red	GHC 011 0003 R0004	3		0.02/0.044
C 011-110	110	brown-brown	GHC 011 0003 R0005	3		0.02/0.044
C 011-120	120	gray-gray	GHC 011 0003 R0006	3		0.02/0.044
C 011-130	130	blue-blue	GHC 011 0003 R0007	3		0.02/0.044
C 011-140	140	white-blue	GHC 011 0003 R0011	3		0.02/0.044
C 011-150	150	black-black	GHC 011 0003 R0008	3		0.02/0.044
C 011-160	160	blue-red	GHC 011 0003 R0009	3		0.02/0.044
C 011-170	170	white-green	GHC 011 0003 R0010	3		0.02/0.044
Triple temperature sensor C 011-3						
C 011-3-150	150	black-black	GHC 011 0033 R0008	1		0.05/0.11

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, 24-240 V AC/DC versions: 15-400 Hz		
Duty time			100 %		
Measuring sensor 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 fault 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 kΩ	CM-MSS (1+2): 3050±550 Ω	CM-MSS (3-7), CM-MSN: 3,6 kΩ ±5 %
Temperature switch-on resistance (relay energizes)			CM-MSE: 1,7-2,3 kΩ	CM-MSS (1+2): 1900±400 Ω	CM-MSS (3-7), CM-MSN: 1,6 kΩ ±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)			≤1.5 kΩ		
Max. sensor cable length for short-circuit detection			2 x 100 m at 0.75 mm², 2 x 400 m at 2.5 mm²		
Response time			<100 ms		
Control circuit for storage and hysteresis function					
Remote reset	**S1-T2 or S1/X1-S2-X2**		n/o contact		
Max. no-load voltage			approx. 25 V, 24-240 V AC/DC versions: 5.5 V		
Max. cable length			≤50 m, 100-200 m if shielded		
Indication of operational states					
Supply voltage			U: green LED		
Fault output relay de-energized			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			CM-MSE, CM-MSS (1+2+6): AgCdO		CM-MSS (3+4+5+7), CM-MSN: AgNi
Rated voltage acc. to VDE0110, IEC664-1, IEC947-1			250 V		
Max. switching voltage			250 V		
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 (1.5 A - n/c contact[1)])		
Maximum lifetime	mechanical		30 (10 [1)]) x 10⁶ switching cycles		
	electrical (AC-12, 230 V, 4 A)		0.1 x 10⁶ switching cycles		
Short circuit proof, max. fuse rating	n/c contact		2 A (4 A[1)]) fast, operation class gL		
	n/o contact		10 A (6 A[1)]) fast, operation class gL		
General data					
Width of enclosure			CM-MSE: 22.5 mm	CM-MSS: 22.5 mm	CM-MSN: 45 mm
Wire size (stranded wires with wire end ferrule)			CM-MSE: 2x1.5mm² (16AWG)	CM-MSS: 2x2.5mm² (14AWG)	CM-MSN: 2x2.5mm² (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		
Temperature range	operation		CM-MSE: -20...+60 °C	CM-MSS: -20...+60 °C	CM-MSN: -25...+65 °C
	storage		-40...+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				
electrostactic discharge (ESD)	acc. to IEC/EN 61000-4-2		level 3	6 kV / 8 kV	
electromagnetic field	acc. to IEC/EN 61000-4-3		level 3	10 V/m	
fast transients (Burst)	acc. to IEC/EN 61000-4-4		level 3	2 kV / 5 kHz	
powerful impulses (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 / Marks			**see table of approvals on page ...**		
Isolation data					
Rated voltage between supply, measuring and output circuit			250 V		
Rated impulse withstand voltage between all isolated circuits			4 kV / 1.2 - 50 µs		
Test voltage between all isolated circuits			2.5 kV, 50 Hz, 1 min.		
Pollution degree			III		
Overvoltage category			III		

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

Notes

Temperature monitoring relays C51x range

for PT100/1000, KTY83/84 and NTC sensors

Content

Temperature monitoring relays C51x range

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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 suppy voltage and relay status.
- 1 n/o and 1 n/c contact.

...with two thresholds:

- Additional potentiomenter 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 suppy 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

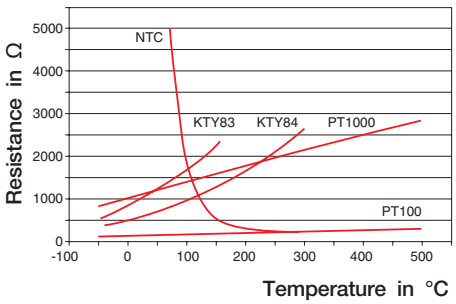
- Version for evaluation of 1 to 3 sensors in a single device available, e.g. for multiple monitoring within an installation or for motor protection.
- Extremely simple operation without any complicated menus.
- Graduated product range; suitable devices for every application.
- High-end tripping devices 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



1SVC 110 000 F0190

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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
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 ± 5 % is sufficient.									
C510.01-24 C510.01-K	1SAR 700 001 R 0005 1SAR 700 001 R 0006	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 110/230 V AC	
C510.02-24 C510.02-K	1SAR 700 002 R 0005 1SAR 700 002 R 0006				0 to + 100 °C			24 V AC/DC 110/230 V AC	
C510.03-24 C510.03-K	1SAR 700 003 R 0005 1SAR 700 003 R 0006				0 bis + 200 °C			24 V AC/DC 110/230 V AC	
C510.11-24 C510.11-K	1SAR 700 004 R 0005 1SAR 700 004 R 0006	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 110/230 V AC	
C510.12-24 C510.12-K	1SAR 700 005 R 0005 1SAR 700 005 R 0006				0 to + 100 °C			24 V AC/DC 110/230 V AC	
C510.13-24 C510.13-K	1SAR 700 006 R 0005 1SAR 700 006 R 0006				0 to + 200 °C			24 V AC/DC 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 ± 5 % is sufficient.									
C511.01-24 C511.01-W	1SAR 700 011 R 0005 1SAR 700 011 R 0010	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 24-240 V AC/DC	
C511.02-24 C511.02-W	1SAR 700 012 R 0005 1SAR 700 012 R 0010				0 to + 100 °C			24 V AC/DC 24-240 V AC/DC	
C511.03-24 C511.03-W	1SAR 700 013 R 0005 1SAR 700 013 R 0010				0 to + 200 °C			24 V AC/DC 24-240 V AC/DC	
C511.11-24 C511.11-W	1SAR 700 014 R 0005 1SAR 700 014 R 0010	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 24-240 V AC/DC	
C511.12-24 C511.12-W	1SAR 700 015 R 0005 1SAR 700 015 R 0010				0 to + 100 °C			24 V AC/DC 24-240 V AC/DC	
C511.13-24 C511.13-W	1SAR 700 016 R 0005 1SAR 700 016 R 0010				0 to + 200 °C			24 V AC/DC 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, $\vartheta 1$, $\vartheta 2$ • 1 hysteresis; acts on both thresholds • 1 delay time; acts on both thresholds • Open-circuit or closed-circuit principle selectable • Monitoring function: Over-/undertemperature or range monitoring • Storage function can be selected by external bridge									
C512-24 C512-W	1SAR 700 100 R 0005 1SAR 700 100 R 0010	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 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 kΩ; 25 °C: 32.762 kΩ

Accessories

Replaceable cover marking for digital devices

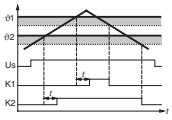
Type			Order code	Price 1 piece
C512-D	1 sensor	German	1SAR 700 101 R 0100	
C512-E		English	1SAR 700 102 R 0100	
C513-D	1 to 3 sensors	German	1SAR 700 111 R 0100	
C513-E		English	1SAR 700 112 R 0100	

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

Functions

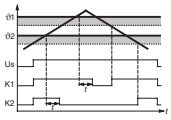
Overtemperature

Open-circuit principle



1SVC 110 000 F0191

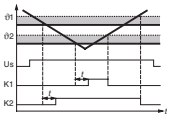
Closed-circuit principle



1SVC 110 000 F0192

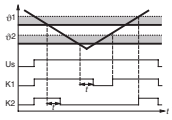
Undertemperature

Open-circuit principle



1SVC 110 000 F0193

Closed-circuit principle



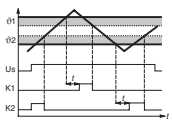
1SVC 110 000 F0194

Function principle with storage function,

using overtemperature with closed-circuit principle as an example

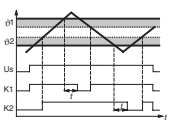
Range monitoring

Open-circuit principle

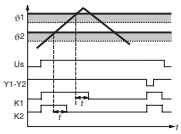


1SVC 110 000 F0195

Closed-circuit principle



1SVC 110 000 F0196



1SVC 110 000 F0197

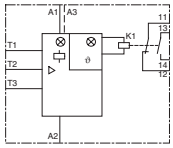
absolute limit

hysteresis

Circuit diagrams

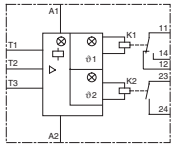
Connection examples

C510



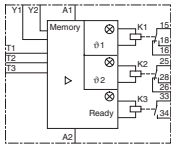
1SVC 110 000 F0198

C511



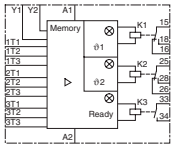
1SVC 110 000 F0200

C512



1SVC 110 000 F0201

C513



1SVC 110 000 F0202

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"
Ready = LED: "Device operative"
1T1 -1T3 = Connection of sensor 1
2T1 - 2T3 = Connection of sensor 2
3T1 - 3T3 = Connection of sensor 3
Y1/Y2 = Connection of bridge for memory function

ATTENTION!

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

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.

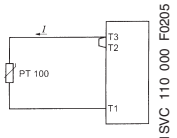
A jumper must be connected between the terminals T2 and T3.
The following table can be used for PT100 sensors to determine the temperature errors caused by the line length.

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

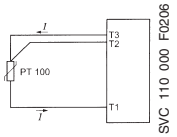
Line length in mm	Conductor cross section mm² 0.50	0.75	1	1.5
0	0.0	0.0	0.0	0.0
10	1.8	1.2	0.9	0.6
25	4.5	3.0	2.3	1.5
50	9.0	6.0	4.5	3.0
75	13.6	9.0	6.8	4.5
100	18.1	12.1	9.0	6.0
200	36.3	24.2	18.1	12.1
500	91.6	60.8	45.5	30.2

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.



1SVC 110 000 F0205



1SVC 110 000 F0206

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 + 1n/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 ± 1digit
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...+60 °C		
Permissible storage temperature		-40...+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 mm² (1 x 12 AWG), 2 x 2.5 mm² (2 x 14 AWG)		
	stranded wire with wire end ferrule	1 x 2.5 mm² (1 x 14 AWG), 2 x 1.5 mm² (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

Liquid level monitoring and control

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

CM-ENE MIN

CM-ENE MAX

① R: yellow LED - relay status

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

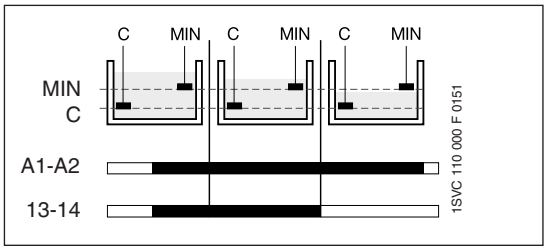
The liquid level relays CM-ENE MIN and CM-ENE MAX are used to monitor levels of conductive liquids, for example in pump control systems for dry-running or overflow monitoring.

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

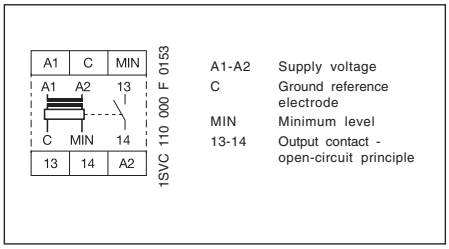
If the supply voltage is applied to A1-A2 and the electrodes are wet, the output relay of the CM-ENE MIN is energized and the output relay of the CM-ENE MAX is de-energized.

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

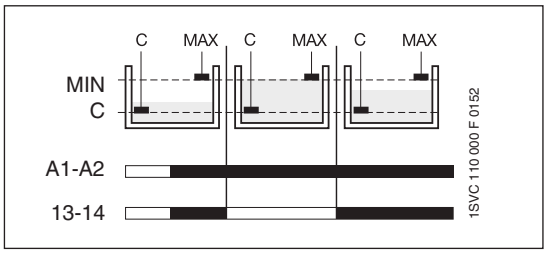
Function diagram CM-ENE MIN



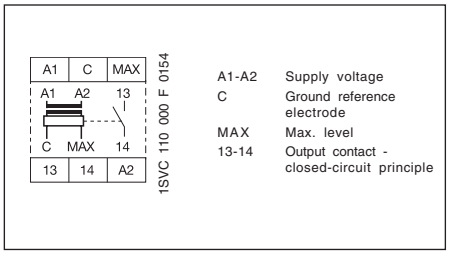
Connection diagram CM-ENE MIN



Function diagram CM-ENE MAX



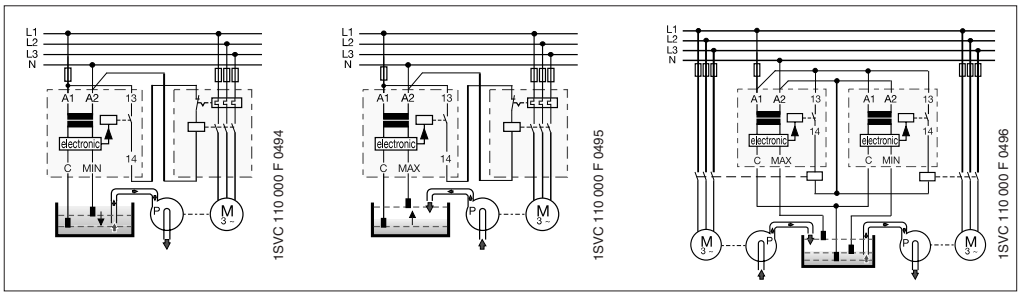
Connection diagram CM-ENE MAX



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

Application examples

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



Suitable for

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 R9500	1		0.15/0.33
	110-130 V AC	1SVR 550 850 R9500	1		0.15/0.33
	220-240 V AC	1SVR 550 851 R9500	1		0.15/0.33
CM-ENE MAX	24 V AC	1SVR 550 855 R9400	1		0.15/0.33
	110-130 V AC	1SVR 550 850 R9400	1		0.15/0.33
	220-240 V AC	1SVR 550 851 R9400	1		0.15/0.33

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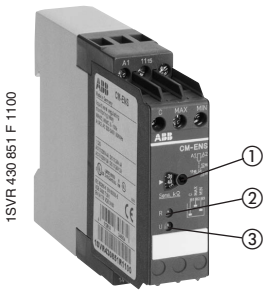
Liquid level relays
CM-ENS
Ordering details



CM-ENS

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

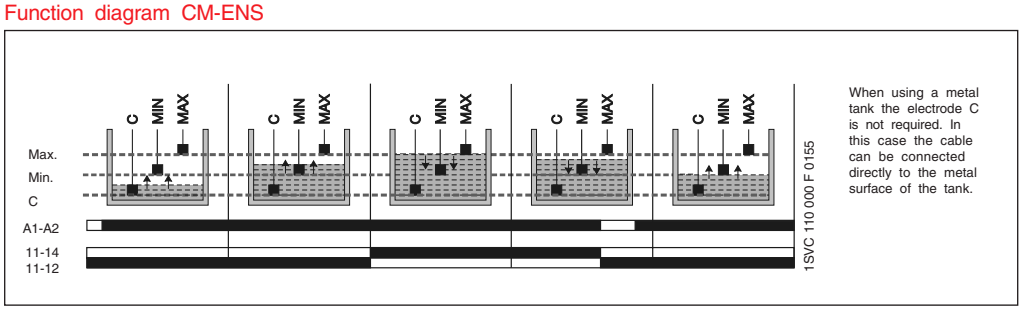
The CM-ENS monitors levels of conductive liquids and is used for example for liquid level control in pump systems. It can be used for filling or draining tanks for example.

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

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

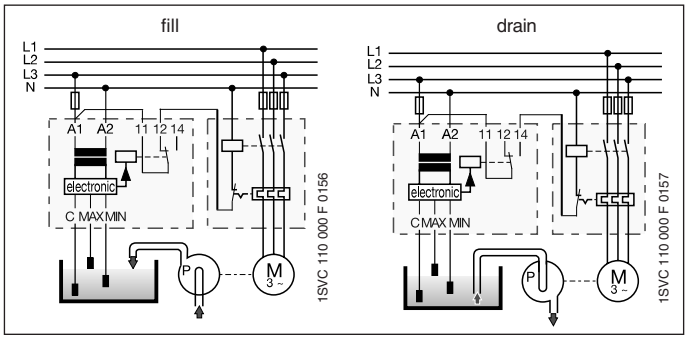
Based on the measuring circuit there will be a response delay of approx. 250 ms at maximum sensitivity. Different levels in one tank can be controlled by up to 5 CM-ENS without interfering with each other.

Function diagram CM-ENS

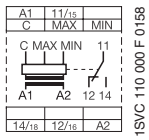


When using a metal tank the electrode C is not required. In this case the cable can be connected directly to the metal surface of the tank.

Application examples

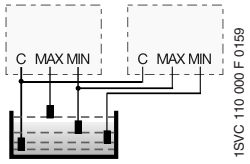


Connection diagram CM-ENS



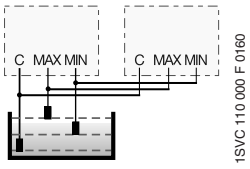
A1-A2	Supply voltage
C	Ground reference electrode
MAX	Maximum level
MIN	Minimum level
11(15)-12(16)/14(18)	Output contacts - open-circuit principle

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



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

This makes the application much safer.



Suitable for

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 R9100	1		0.15/0.33
	110-130 V AC	1SVR 430 851 R0100	1		0.15/0.33
	220-240 V AC	1SVR 430 851 R1100	1		0.15/0.33
	380-415 V AC	1SVR 430 851 R2100	1		0.15/0.33
	220-240 V AC[1)]	1SVR 430 851 R1300	1		0.15/0.33

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

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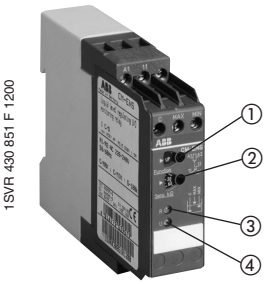
Liquid level relays
CM-ENS UP/DOWN
Ordering details



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.

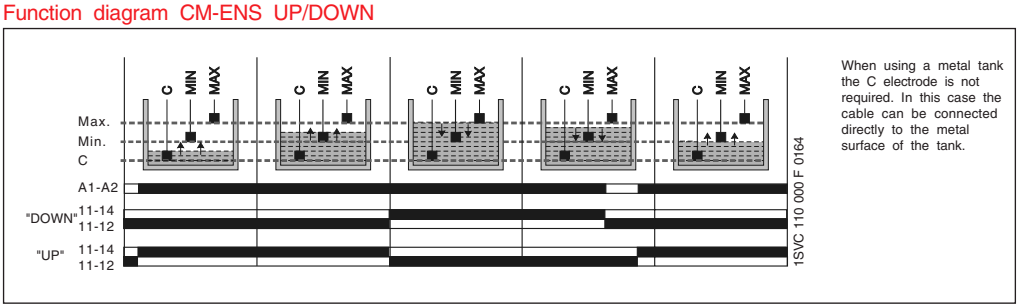
The output relay functions fill (UP) or drain (DOWN) can be selected on a front-face selector switch.

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.

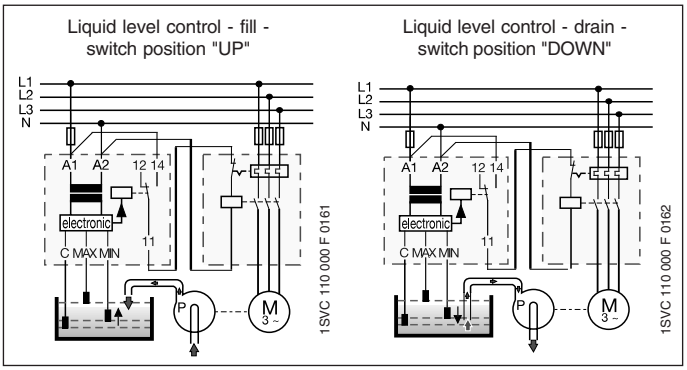
The electrodes can be connected to more than one CM-ENS unit without interference.

Function diagram CM-ENS UP/DOWN

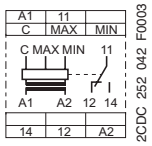


When using a metal tank the C electrode is not required. In this case the cable can be connected directly to the metal surface of the tank.

Application examples

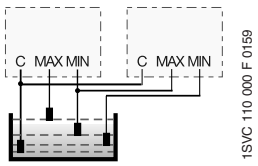


Connection diagram CM-ENS UP/DOWN



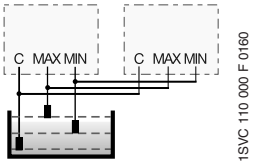
A1 - A2	Supply voltage
C	Ground reference electrode
MAX	Maximum level
MIN	Minimum level
11-12/14	Output contacts - open-circuit or closed-circuit principle selectable

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



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

This makes the application much safer.



Suitable for

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 R9200	1		0.15/0.33
	110-130 V AC	1SVR 430 851 R0200	1		0.15/0.33
	220-240 V AC	1SVR 430 851 R1200	1		0.15/0.33

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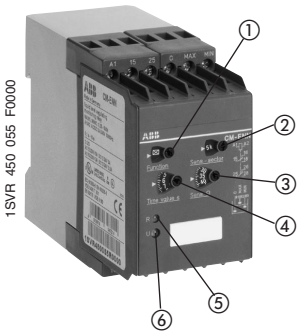
Liquid level relays
CM-ENN
Ordering details



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

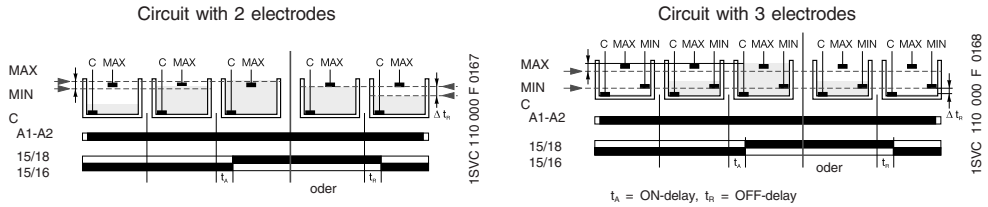
- Monitoring and control of liquid levels (when emptying or filling liquids in tanks)
- Monitoring and control of mixture ratios (conductivity of liquids)
- 3 response sensitivities from 250 Ω - 500 kΩ in one unit
- 5 supply voltage versions 24 V AC/DC - 415 V AC
- Selectable ON- or OFF-delay 0.1-10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

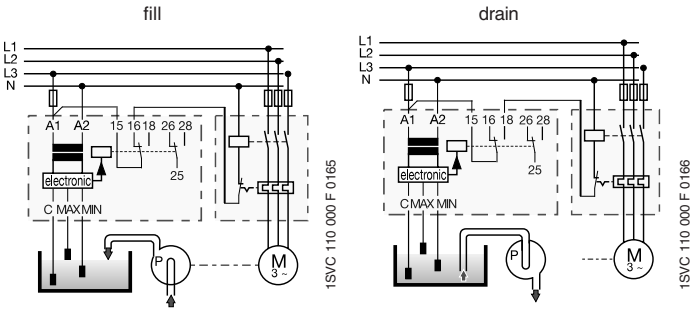
Function diagrams CM-ENN



t_A = ON-delay, t_R = OFF-delay

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

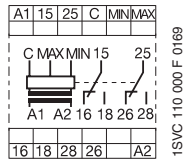
Application examples



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

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

Connection diagram CM-ENN



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

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 R0000	1		0.30/0.66
	24 V AC	1SVR 450 059 R0000	1		0.30/0.66
	110-130 V AC	1SVR 450 050 R0000	1		0.30/0.66
	220-240 V AC	1SVR 450 051 R0000	1		0.30/0.66
	380-415 V AC	1SVR 450 052 R0000	1		0.30/0.66

Response sensitivity	Max. electrode current	Max. cable capacity	Max. cable length	
250 Ω - 5 kΩ	8 mA	200 nF	1000 m	
2,5 kΩ - 50 kΩ	2 mA	20 nF	100 m	
25 kΩ - 500 kΩ	0,5 mA	4 nF	20 m	

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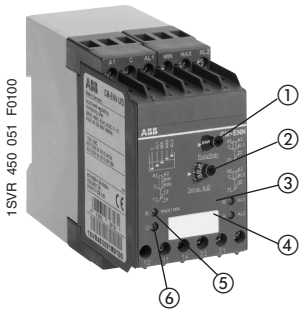
Liquid level relays - Liquid level control with two alarm outputs
CM-ENN UP/DOWN
Ordering details



CM-ENN UP/DOWN

① "Func." - function selector switch:
"UP"- fill
"DOWN" - drain

② "Sens." - sensitivity potentiometer for adjusting the response sensitivity

③ R AL1: yellow LED - relay status AL1

④ R AL2: yellow LED - relay status AL2

⑤ R: MIN/MAX: yellow LED - relay status MIN/MAX

⑥ U: green LED - 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

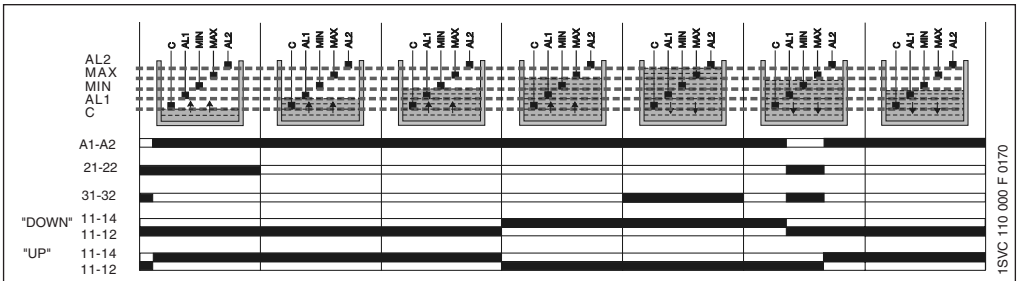
The CM-ENN UP/DOWN monitors levels of conductive liquids and media and is used e.g. for liquid level control in pump systems. The measuring principle is based on the resistance change sensed by single-pole electrodes.

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.

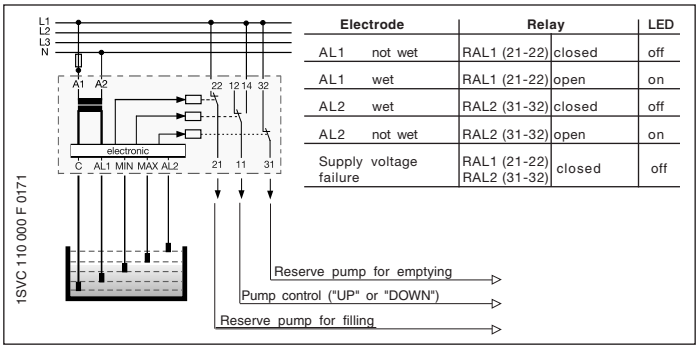
The electrode inputs AL1 and AL2 energize/de-energize the correspopnding output relays RAL1 (21-22) and RAL2 (31-32). AL1 opens if contact RAL1 (21-22) is wet. AL2 closes if contact RAL2 (31-32) is wet. This way, two additional alarm outputs for exceeding or dropping below the normal level can be implemented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

Function diagram CM-ENN UP/DOWN



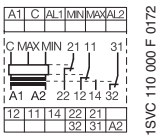
When using a metal tank the C electrode is not required. In this case the cable can be connected directly to the metal surface of the tank.

Application example



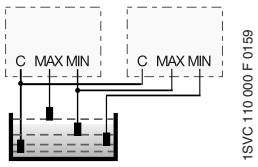
Electrode		Relay		LED
AL1	not wet	RAL1 (21-22)	closed	off
AL1	wet	RAL1 (21-22)	open	on
AL2	wet	RAL2 (31-32)	closed	off
AL2	not wet	RAL2 (31-32)	open	on
Supply voltage failure		RAL1 (21-22) RAL2 (31-32)	closed	off

Connection diagram CM-ENN UP/DOWN



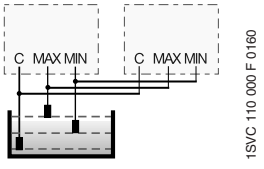
A1-A2	Supply voltage
C	Ground reference electrode
MIN	Minimum level electrode
MAX	Maximum level electrode
AL1	Alarm electrode 1
AL2	Alarm electrode 2
11-12/14	Output contacts -
21-22	open-circuit or closed-circuit
31-32	principle selectable

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



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

This makes the application much safer.



Suitable for

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 R0100	1		0.15/0.33
	110-130 V AC	1SVR 450 050 R0100	1		0.15/0.33
	220-240 V AC	1SVR 450 051 R0100	1		0.15/0.33
	380-415 V AC	1SVR 450 052 R0100	1		0.15/0.33

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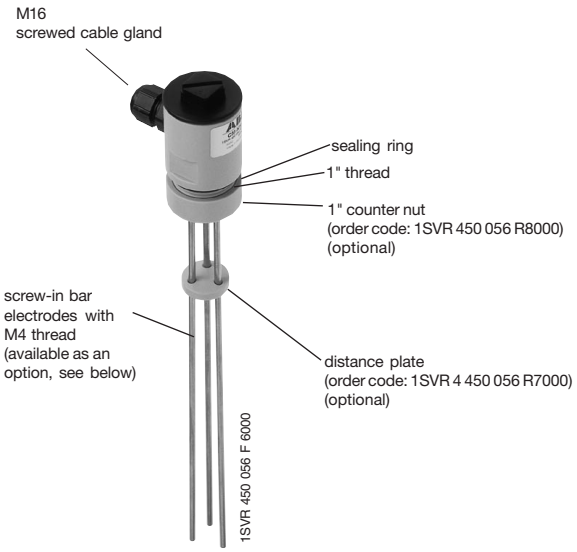
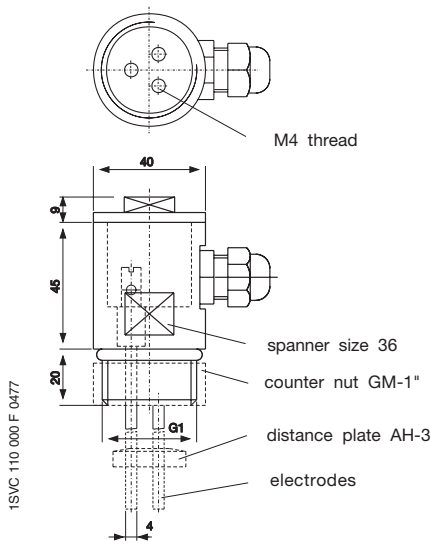
Liquid level relays -Accessories
Electrodes
Ordering details, dimensional drawings

Compact support KH-3 for 3 bar electrodes

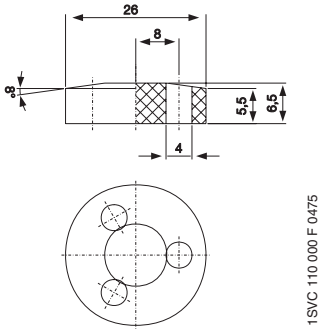
- Ideally suited for use with liquid level relays CM-ENS and CM-ENN
- Wire connection by screw terminals
- Pull relief by M16 screwed cable glands
- Temperature range up to 90 °C
- Food safe material (PPH)
- Screw-in electrodes (M4 thread)
- Distance plate (AH-3) and locking nut (GM-1) optionally available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



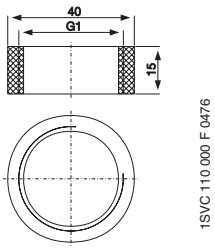
Compact support KH-3



Distance plate AH-3



Counter nut GM-1



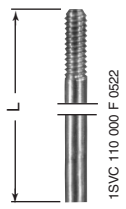
Technical data compact support

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 R6000**	1		0.060/0.132
CM-AH-3	Distance plate for 3 bar electrodes	**1SVR 450 056 R7000**	1		0.060/0.132
CM-GM-1	Counter nut for 1" thread	**1SVR 450 056 R8000**	1		0.060/0.132

Screw-in bar electrodes for compact support KH-3



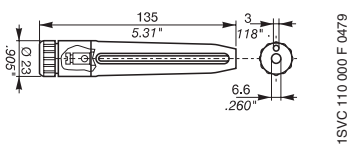
Thread M4

Material: stainless steel 304, high-grade steel 14301

Length mm	Order code	Pack. unit pieces	Price 1 piece	Weight 1 pc. kg/lb
300	**1SVR 450 056 R0000**	1		0.080/0.176
600	**1SVR 450 056 R0100**	1		0.080/0.176
1000	**1SVR 450 056 R0200**	1		0.080/0.176

Suspension electrode

Steel electrode (X 12 CR Mo S 17) with sleeve (Lupulen 6011 L) suitable up to 60°C max.



Type	Order code	Pack. unit pieces	Price 1 piece	Weight 1 pc. kg/lb
	1SVR 402 902 R0000	1		0.080/0.176

Liquid level monitoring and control
CM-ENE MIN, CM-ENE MAX
Technical data

			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 kΩ, 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 mm² (2 x 16 AWG) stranded wire with wire-end ferrule
Mounting position			any
Degree of protection: housing/ terminals			IP50 / IP20
Operating temperature			-20...+60 °C
Storage temperature			-40...+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 / Marks			**cULus and GOST; CCC (pending) / CE and C-Tick**
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 VDE0 110, IEC 664		4 kV / 1.2-50 µs
Test voltage between all isolated circuits			2.5 kV, 50 Hz, 1 min.
Pollution category	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-ENS UP/DOWN, CM-ENN, CM-ENN UP/DOWN
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 VA/W
-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
CM-ENS, CM-ENS UP/DOWN: -20...+60 °C, CM-ENN UP/DOWN: -25...+65 °C	-25...+65 °C
-40...+85 °C	-40...+85 °C
DIN rail (EN50022)	DIN rail (EN50022)
IEC 255-6, EN 60255-6	IEC 255-6, EN 60255-6
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 4 g 5 g	5 g
6 g 6 g 10 g	10 g
cULus, GL (CM-ENS), GOST, and [1]; CCC (pending) / CE and C-Tick	**cULus, GL and GOST; CCC (pending) / CE and C-Tick**
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

[1] VDE (CM-ENS Version with safety isolation)

Notes

Contact protection relays, Sensor interface module

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Sensor interface module CM-SIS

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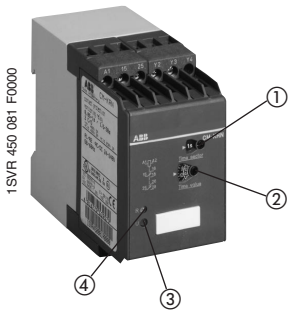
Contact protection relay CM-KRN
Ordering details



CM-KRN

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

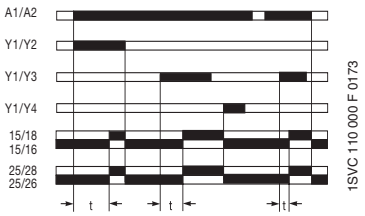
- Protects and reduces load from sensitive control contacts
- Adjustable ON-delay 0.05-30 s
- Acts as two-position switch
- Stores switch positions
- Electrically isolated circuits
- 2 c/o contacts
- 2 LEDs for status indication

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.

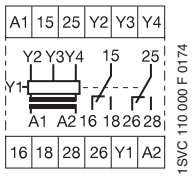
Use for contact protection
The contact to be protected is connected to terminals Y1 and Y2.

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.

Function diagram CM-KRN



Connection diagram CM-KRN

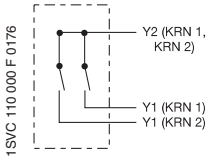


A1-A2 Supply voltage

Control circuits:
Y1-Y2 "On-Off" input (max. switch-on resistance 6-10 kΩ, min. switch-off resistance 15-20 kΩ)
Y1-Y3 "Set" input (max. switch-on resistance 6-10 kΩ)
Y1-Y4 "Reset" input (max. switch-off resistance 15-20 kΩ)

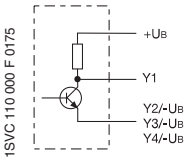
15-16/18 Output contacts - open-circuit principle
25-26/28

Use, applications



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

Operation via 3-wire proximity sensors NPN



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

Type	Supply voltage 50-60 Hz	Order code	Pack. unit pieces	Price 1 piece	Weight 1 piece kg/lb
with timing circuit 0.05-30 s					
CM-KRN	24 V AC	**1SVR 450 089 R0000**	1		0.300/0.66
	110-130 V AC	**1SVR 450 080 R0000**	1		0.300/0.66
	220-240 V AC	**1SVR 450 081 R0000**	1		0.300/0.66
	380-415 V AC	**1SVR 450 082 R0000**	1		0.300/0.66
without timing circuit					
CM-KRN	24 V AC	**1SVR 450 099 R0000**	1		0.300/0.66
	110-130 V AC	**1SVR 450 090 R0000**	1		0.300/0.66
	220-240 V AC	**1SVR 450 091 R0000**	1		0.300/0.66

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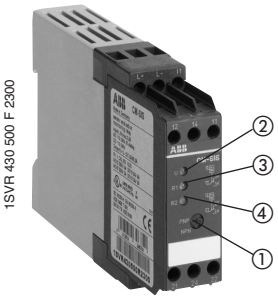
Sensor interface module
CM-SIS
Ordering details



CM-SIS

① Rotary switch for 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 rotary switch.

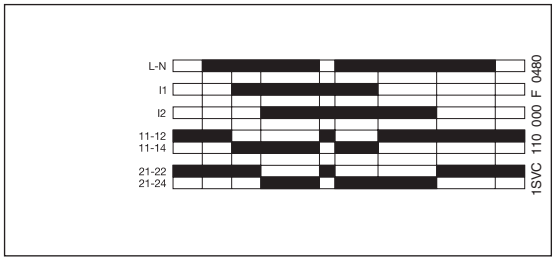
The CM-SIS (terminals L+, L-) supplies the connected sensors with voltage (24 V DC), the maximum power supply current is 0.5 A. The supply voltage and the sensor inputs are electrically isolated from the supply circuit. To ensure maximum safety when using these sensors, the principle of safe isolation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

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

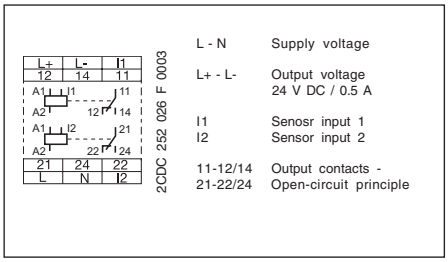
The wide-range supply voltage input of CM-SIS allows its application in nearly all supply systems.

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

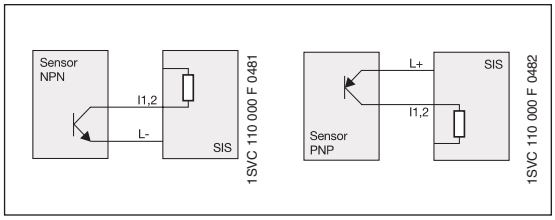
Function diagram CM-SIS



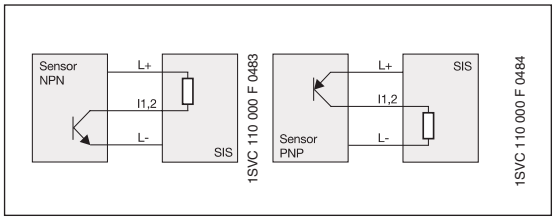
Connection diagram CM-SIS



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 R2300**	1		0.22/0.48

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Contact protection relay
CM-KRN
Technical data

Type			CM-KRN
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	AC-12 (resistive)	230 V	5 A
acc. to IEC 60947-5-1	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			
Width of enclosure			45 mm
Wire size			2 x 2,5 mm² (2 x 14 AWG) stranded with wire end ferrule
Mounting position			any
Degree of protection	Terminals / Enclosure		IP 50 / IP 20
Temperature range	Operation		-25...+65 °C
	Storage		-40...+85 °C
Mounting			DIN rail (EN 50022)
Standards			
Product standard			IEC 255-6, EN 60255-6
Low Voltage Directive			73/23/EEC
EMC Directive			89/336/EEC
Electromagnetic compatibility			
Interference immunity			
electrostatic discharge (ESD)	acc. to IEC/EN 61000-4-2		6 kV / 8 kV
electromagnetic field	acc. to IEC/EN 61000-4-3		10 V/m
fast transients (Burst)	acc. to IEC/EN 61000-4-4		2 kV / 5 kHz
powerful impulses (Surge)	acc. to IEC/EN 61000-4-5		2 kV symmetrical
HF line emission	acc. to IEC/EN 61000-4-6		10 V
Approvals / Marks			
Approvals			cULus, GL and GOST; CCC (pending)
Marks			CE and C-Tick
Isolation data			
Rated insulation voltage	acc. to IEC 60947-1		400 V
Rated impulse withstand voltage V_{imp}			4 kV
Pollution category	acc. to IEC 255-5, IEC 664		III
Overvoltage category	acc. to IEC 255-5, IEC 664		III

Sensor interface module
CM-SIS
Technical data

Type			CM-SIS
Inputcircuit			
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 circuit			
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 kW
Input threshold value for relays R1, 2			$V_{emitter-collector}$ < 2,3 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
Status indication			
Output voltage			LED green
General data			
Efficiency at nominal load			approx. 84 % (at 230 V AC)
Temperature range		Operation	0...+55 °C
		Storage	-25...+75 °C
Wire size			2 x 2,5 mm^2 (2 x 14 AWG)
Width of enclosure			22,5 mm
Mounting position			horizontally mounted on DIN rail
Clearances to other modules			left-hand side 1 cm, vertical distance 5 cm
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
Electromagnetic compatibility			
Interference immunity	acc. to EN 61000-6-2		
electrostatic discharge (ESD)	acc. to EN 61000-4-2		level 3 - 6/8 kV
electromagnetic field	acc. to EN 61000-4-3		level 3 - 10 V/m
fast transients (Burst)	acc. to EN 61000-4-4		level 4 - 4 kV
powerful impulses (Surge)	acc. to EN 61000-4-5		inst. class 3 - 2 kV
HF line emission	acc. to EN 61000-4-6		level 3 - 10 V
Interference emission	acc. to EN 50081-2		radiated noise EN 55011, class B
Input current harmonics			no limitation
Approvals / Marks			
Approvals			cULus und GOST; CCC (pending)
Marks			CE and C-Tick
Isolation data			
Insulation testing			2.5 kV AC (routine test), 3 kV AC (type test)
Clearance and creepage distances			overvoltage category 2, degree of pollution 2

Notes

Cycle monitor with watchdog function

Content

NEW Cycle monitor with watchdog function CM-WDS

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Technical data 107
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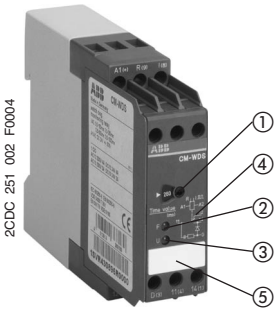
Cycle monitor with watchdog function CM-WDS
Ordering details



CM-WDS

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

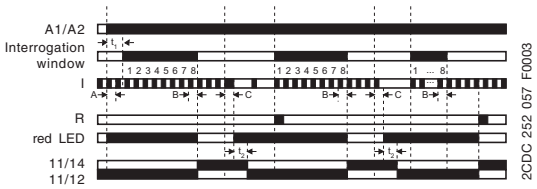
- Cycle monitor for monitoring the function of programmable logic controllers or industrial pcs
- 4 selectable cycle monitoring time ranges from 0.5 to 1000 ms
- 24 V DC supply
- 1 c/o contact
- 2 LEDs for status indication

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 setted by means of the front-face selector switch "time value (ms)".

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

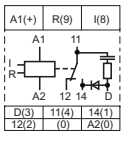
In case the monitoring time is too short or too long, this can be adjusted by a modified programming of the plc/ips or by modified setting of the monitoring time "time value (ms)".
A fault recognized and stored with the CM-WDS can be reset by an H-impulse (0-1-transition) on the reset input "R(9)", so that the cycle monitoring is again released. The reset impulse can be generated by means of a reset button or by suitable programming of the controller (plc/ipc).

Funktion diagram CM-WDS



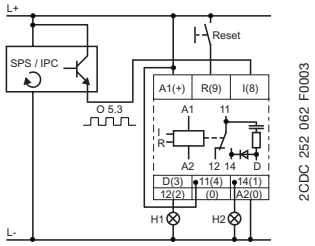
A = Cycle monitor
B = Cycle is correct, no cycle error
C = Cycle failure 1: pulse > monitoring window
Cycle failure 2: pulse stays out
t_1 = 300 ms
t_2 = 260 ms

Connection diagram CM-WDS



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

Example of application - circuit diagram



Application

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

Type	Supply voltage	Order code	Packing unit piece		Weight piece kg
NEW CM-WDS	24 V DC	1SVR 430 896 R0000	1		0.150

• Technical data 107
• Accessories 111
• Dimensional drawings 111
• Data sheet 2CDC 112 003 D02**

Cycle monitor with watchdog function
CM-WDS
Technical data

Type			CM-WDS
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			I
Monitoring function			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 mm² (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...+60 °C
		storage	-40...+85 °C
Mounting			DIN rail (EN 50022)

Cycle monitor with watchdog function
CM-WDS
Technical data (continued)

2

Type			CM-WDS
Standards /directives			
Product standard			IEC 255-6, EN 60255-6
Low Voltage Directive			73/23/EEC
EMC Directive			89/336/EEC
Electromagnetic compartibility			
Interference immunity	acc. to EN 61000-6-2		
electrostatic discharge (ESD)	acc. to IEC/EN 61000-4-2	level 3	6 kV / 8 kV
electromagnetic field	acc. to IEC/EN 61000-4-3	level 3	10 V/m
fast transients (Burst)	acc. to IEC/EN 61000-4-4	level 3	2 kV / 5 kHz
powerful impulses (Surge)	acc. to IEC/EN 61000-4-5	level 3	2 kV L-L
HF line emission	acc. to IEC/EN 61000-4-6	level 3	10 V
Interference emission	acc. to EN 61000-6-4		
Operational reliability	acc. to IEC 68-2-6		4 g
Mechanical shock resistance	acc. to IEC 68-2-6		6 g
Approvals / Marks			
Approvals			cULus and CCC (pending), GL
Marks			CE
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 µs
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

Technical data, accessories, current transformers

Content

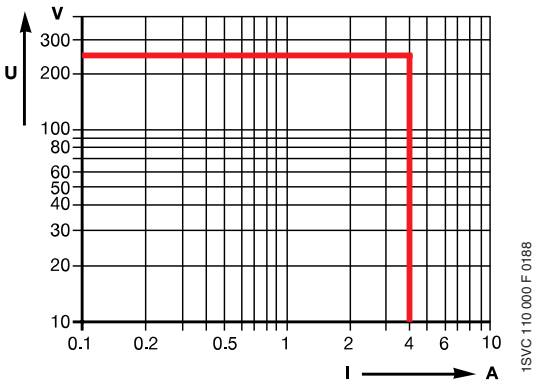
Load limit curves 110
Accessories 111
Dimensional drawings 111
Current transformer 112

Measuring and monitoring relays
CM range
Load limit curves

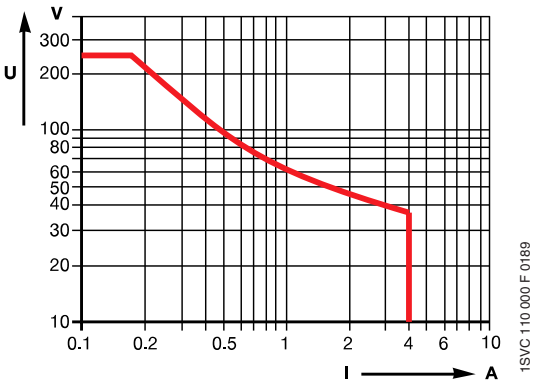
Load limit curves

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

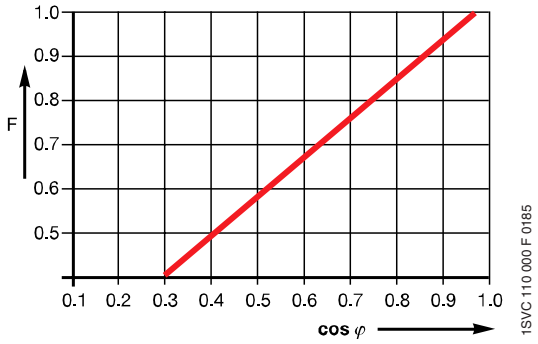
AC load (resistive)



DC load (resistive)

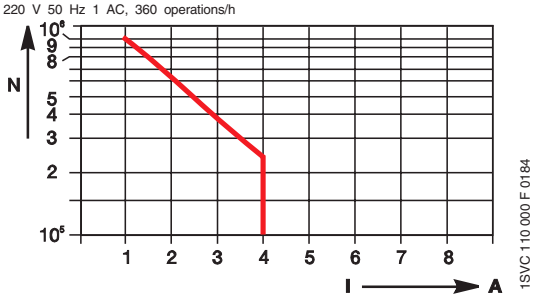


Reduction factor F for inductive AC load



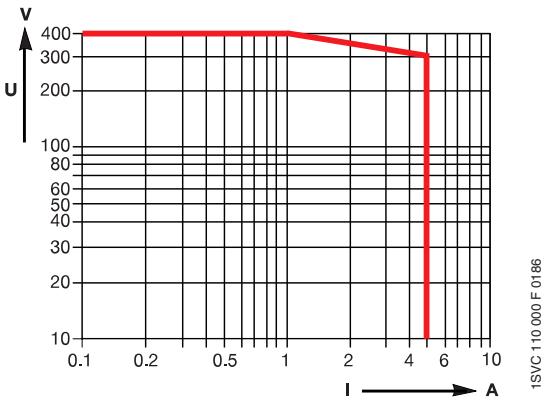
Contact lifetime / number of operations N

220 V 50 Hz 1 AC, 360 operations/h

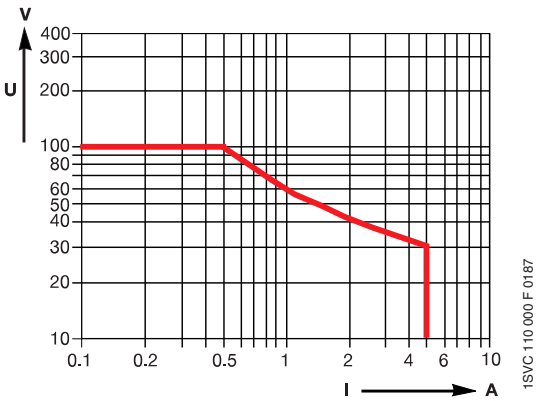


CM-N (45 mm) range

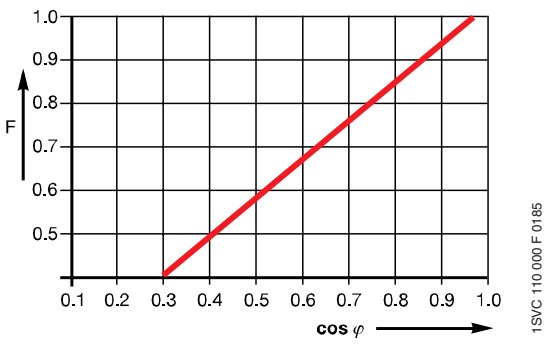
AC load (resistive)



DC load (resistive)

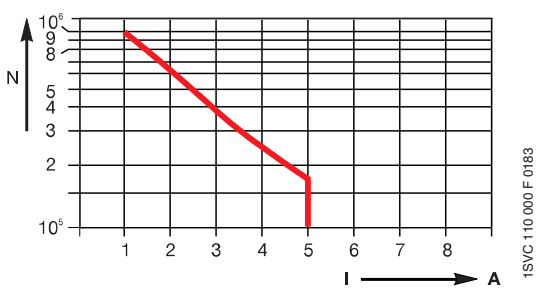


Reduction factor F for inductive AC load

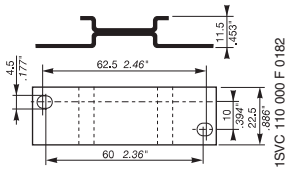


Contact lifetime / number of operations N

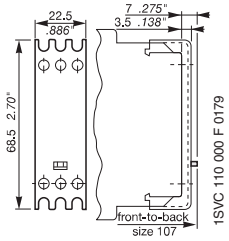
220 V 50 Hz 1 AC, 360 operations/h



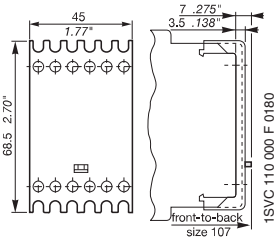
Measuring and monitoring relays CM and C51x
Accessories and dimensional drawings



Cover for CM-S
22.5 mm



Cover for CM-N
45 mm



Accessories

Adapter for screw mounting

for type	Width in mm	Order code	Pack. unit pieces	Price 1 piece
CM-S	22.5	1SVR 430 029 R0100	1	
CM-N	45.0	1SVR 440 029 R0100	1	

Marker

for type		Order code	Pack. unit pieces	Price 1 piece
CM-S, CM-N		1SVR 366 017 R0100	1	

Sealable cover

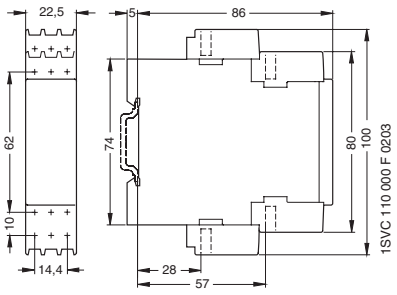
for type	Width in mm	Order code	Pack. unit pieces	Price 1 piece
CM-S	22.5	1SVR 430 005 R0100	1	
CM-N	45.0	1SVR 440 005 R0100	1	

Dimensional drawings

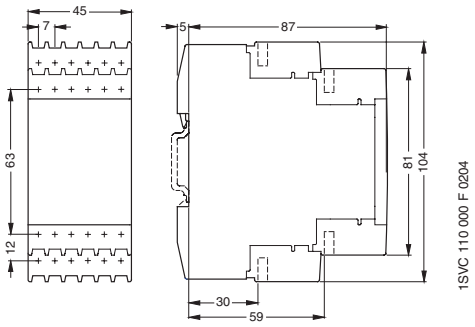
Dimensions in mm

Temperature monitoring relays C51x range

C510 / C511
22.5 mm



C512/C513
45 mm

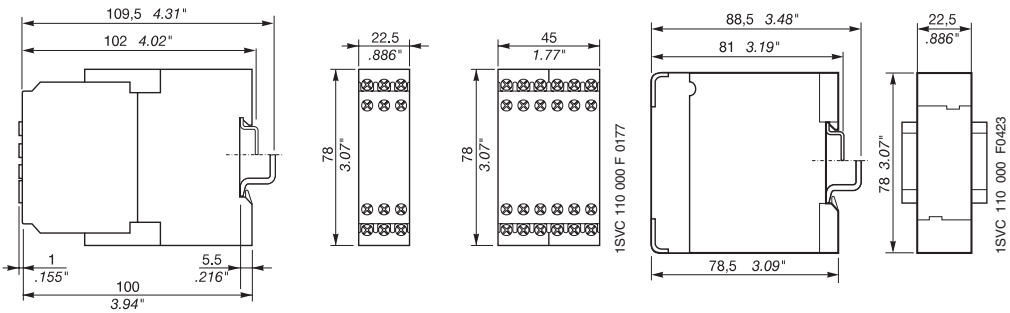


Measuring and monitoring relays CM range

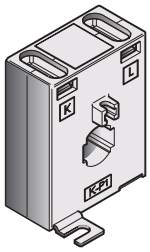
CM-S
22.5 mm

CM-N
45.5 mm

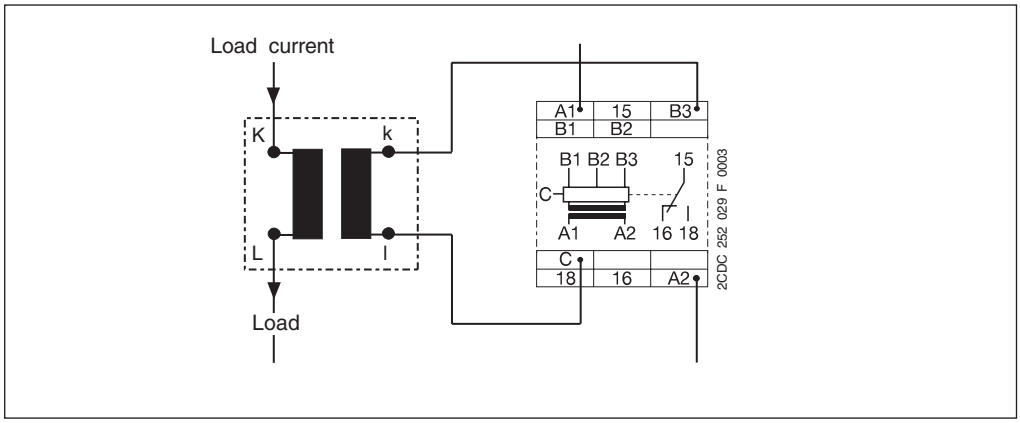
CM-E
22.5 mm



Accessories for current monitors - Current transformer
Ordering details



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	