Electronic measuring and monitoring relays

CM-range

Content

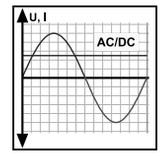
Electronic measuring and monitoring relays CM-range

Benefits and advantages, function overview

Monitoring functions

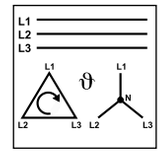
Single-phase current and voltage monitoring

CM-SRS and CM-SRN, current monitoring relays for AC and DC currents.
CM-ESS, CM-ESN and CM-EFN, for voltage monitoring.



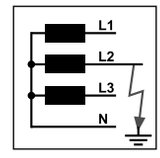
Three-phase monitoring

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



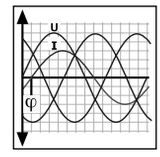
Earth-leakage / isolation monitoring

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



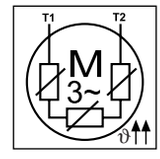
Motor load monitoring

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



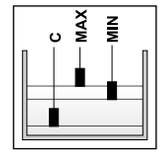
Thermistor motor protection

CM-MSE, CM-MSS and CM-MSN protect motors with integrated PTC resistor sensors from overheating.



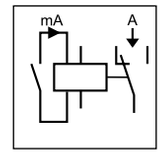
Liquid level monitoring

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



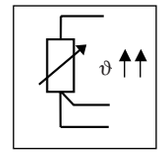
Contact protection

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.



Temperature monitoring

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



1SVC 110 000 F 0457

CM-E range

1SVR 550 851 F 9400

CM-S range

SVR 430 824 F 9300

CM-N range

1SVR 450 115 F 0100

Electronic measuring and monitoring relays CM-range

Benefits and advantages, function overview

Economy – CM-E range

- Compact, only 22.5 mm wide
- Output contacts, 1 c/o contact or 1 n/c contact (250V/4A)
- Single supply voltage range
- One control function
- Cost-efficient solution for OEM applications
- Preset monitoring ranges
- In compliance with international standards and approvals

Universal – CM-S range

- Compact, only 22.5 mm wide
- Output contacts, 1 or 2 c/o contacts (250V/4A)
- Single supply voltage range
- Setting and operation via front-face operating elements
- Setting of threshold values and switching hysteresis via calibrated dials
- Integrated and snap-fitted front-face marker
- Sealable transparent covers (accessories)
- In compliance with international standards and approvals

Multifunctional – CM-N range

- Compact, only 45 mm wide
- Output contacts, 2 c/o contacts (400V/5A)
- Multi- (24...240VAC/DC) or single supply voltage ranges
- Setting and operation via front-face operating elements
- Setting of threshold values and switching hysteresis via calibrated dials
- Adjustable delay times
- Integrated and snap-fitted front-face marker
- Sealable transparent covers (accessories)
- In compliance with international standards and approvals

Remark: 1 c/o = SPDT; 2 c/o = DPDT

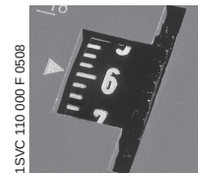
Combination screws

Combination screws used for all connections, only one tool is needed.

1SVC 110 000 F 0457

Direct reading scales

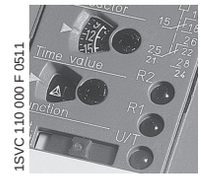
Direct setting of the delay time without any additional calculation provides maximum operation convenience.



1SVC 110 000 F 0508

Display of operational states

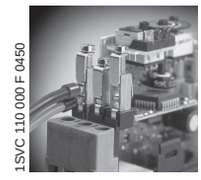
All actual operational states are displayed by front-face LEDs, thus simplifying installation and fault detection.



1SVC 110 000 F 0511

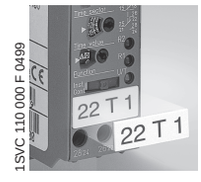
Double-chamber cage connecting terminals

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


1SVC 110 000 F 0450

Integrated markers

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



1SVC 110 000 F 0499

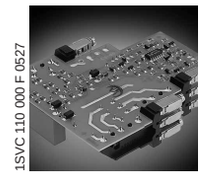
Sealable transparent covers

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


1SVC 110 000 F 0498

Safety

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


1SVC 110 000 F 0527

Electronic measuring and monitoring relays CM-range

Examples of use

Current monitoring


1SVR 430 841 F 1100

- Monitor current consumption of motors
- Monitor lighting installations and heating circuits
- Overload of hoisting gear and transportation equipment
- Monitor locking devices, driving screws onto terminal racks, and electromechanical brake gear

Voltage monitoring

- Speed monitoring of DC-motors
- Monitor battery voltages and other suppply mains
- Monitor upper and lower voltage threshold values

Three-phase voltage monitoring


1SVR 550 882 F 9500

- Monitor mobile three-phase equipment
- Protect personnel and installations against phase-reversal
- Monitor the supply of machines and installations
- Protect equipment against destruction caused by inadequate supply voltage
- Switch to emergency or auxiliary supply
- Protect motors from overheating caused by phase unbalance

Earth leakage / isolation monitoring

- Monitor electrically isolated supply mains for isolation resistance failure
- Detect initial faults
- Protect against earth leakages / insulation monitoring


1SVC 110 000 F 0528


1SVR 450 335 F 0100

Motor load monitoring

- Detect V-belt breakages
- Protect motors against overload
- Monitor filters for clogging
- Protect against dry running pumps
- Detect high pressure in conduit systems
- Monitor for dulling blades in sawing and cutting machines


1SVR 430 801 F 1100

Thermistor motor protection

- Protect motors against thermal stress, caused by:
  insufficient cooling, heavy load starting conditions, undersized motors rapid cycling, worn bearings, voltage faults, and more


1SVR 430 851 F 1100

Liquid level monitoring

- Protect pumps against dry running
- Protect against overflow
- Control liquid levels
- Detect leaks
- Control the ratios of mixtures


1SVR 450 081 F 0000

Contact protection/Sensor evaluation

- Store the switching states of bouncing contacts
- Increase switching capability of sensitive contacts
- Supply and evaluate NPN or PNP sensors

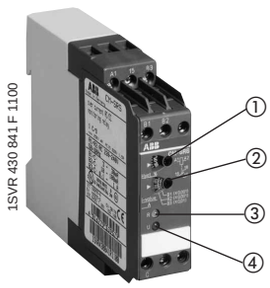
Current and voltage monitors, single phase

Content

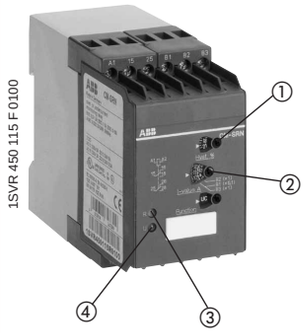
Current and voltage monitors, single phase

Current monitor, single phase AC/DC
CM-SRS, CM-SRN

Ordering details



CM-SRS



CM-SRN

① Hysteresis adjustment
② Threshold value adjustment
③ Yellow LED - relay
④ Green LED - supply voltage

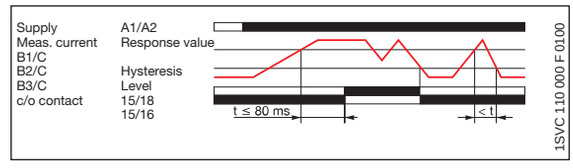
- Monitors AC or DC currents
  CM-SRS: 3 ranges 3mA-1A
  CM-SRN: 6 ranges 3mA-15A
- 3 measuring ranges covered by unit
- Switching hysteresis adjustable from 5-30%
- CM-SRS: 1c/o
  CM-SRN: 2c/o
- 2 LEDs to indicate operational status
- 3 supply voltage versions,
- Version 24-240VAC/DC with convertible undercurrent/ overcurrent monitoring
- Approvals

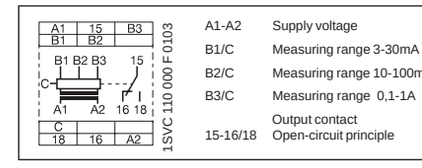
Remark: 1c/o = SPDT; 2c/o = DPDT

The current being monitored is applied to the terminals B1 or B2 or B3 and C.
The output relay energizes when the monitored current exceeds the set point.
It de-energizes when the current is below the set point within the hysteresis range.
Both current monitors are used to monitor overcurrents, the CM-SRN type in AC/DC supply version has a selection switch to select over or undercurrent function.
Hysteresis is adjustable from 5-30 % related to the response value. Measuring, output and supply circuits are electrically isolated to prevent interference. As one measuring cycle takes only 80 ms, changes in current can quickly be detected.

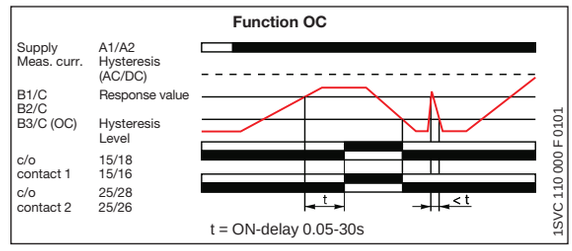
CM-SRS: Supply voltage must be applied at least 50ms before applying measuring current.
CM-SRN: Could be ordered with or without delay time. Delay on "ON" is adjustable from 0.05 to 1 second or 1.5 to 30 seconds, thus ensuring accuracy.
CM-SRS: Width 22.5 mm, output contact 1c/o
CM-SRN: Width 45 mm, output contact 2c/o

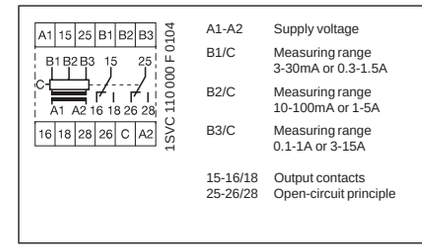
CM-SRS: 1 Function

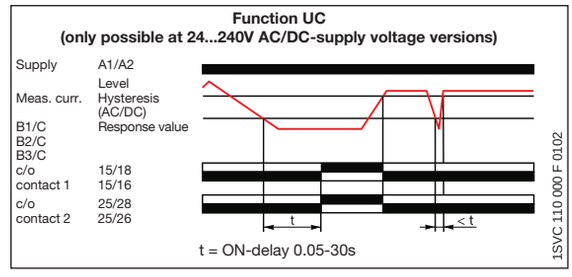




CM-SRN: 2 Functions





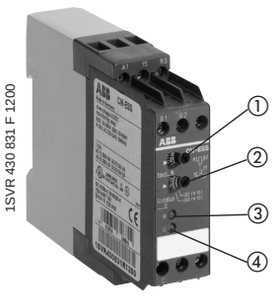


Type	Supply voltage 50/60Hz	Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg/lb
CM-SRS	24VAC	**1SVR 430 841 R 9100**	1		0.150/0.33
	110-130VAC	**1SVR 430 841 R 0100**	1		0.150/0.33
	220 -240VAC	**1SVR 430 841 R 1100**	1		0.150/0.33
Measuring ranges: 3-30mA; 10-100mA; 0.1-1A, no time delay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

• **Technical Data** 38
• **Dimensional drawings** 95
• **Accessories current transformer** 40
• **Accessories** 95

Voltage monitor single phase AC/DC
CM-ESS

Ordering details



CM-ESS

① Hysteresis adjustment
② Threshold value adjustment
③ Yellow LED - relay
④ Green LED - supply voltage

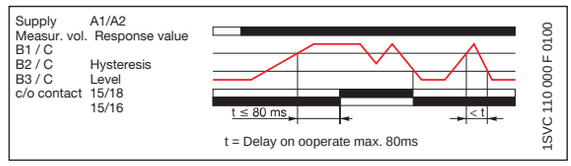
- Monitors AC or DC voltages from 50 mV to 500V in 8 ranges
- Up to 3 measuring ranges in one unit
- Switching hysteresis adjustable from 5-30%
- No time delay
- 1c/o contact
- 2 LEDs to indicate operational status
- Approvals

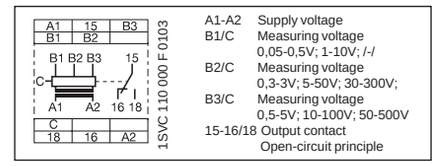
The voltage being monitored is applied to the terminals B1 or B2 or B3 and C.

The output relay energizes when the monitored voltage exceeds the set point. It de-energizes when the voltage is below the set point within the hysteresis value.

Hysteresis is adjustable from 5-30 %.
Measuring, output, and supply circuits are electrically isolated to prevent interference.
As one measuring cycle takes 80 ms, changes in voltage can quickly be detected.

1 Function





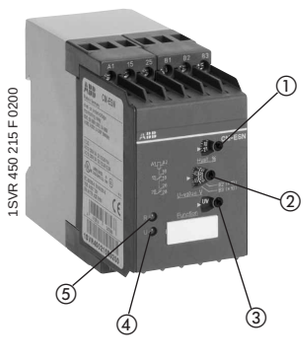
Type	Supply voltage 50/60Hz	Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg/lb
Voltage measuring ranges: 0.05-0.5V; 0.3-3V; 0.5-5V					
CM-ESS	24VAC	**1SVR 430 831 R 9000**	1		0.150/0.33
	110-130VAC	**1SVR 430 831 R 0000**	1		0.150/0.33
	220-240VAC	**1SVR 430 831 R 1000**	1		0.150/0.33
Voltage measuring ranges: 1-10V; 5-50V; 10-100V					
CM-ESS	24VAC	**1SVR 430 831 R 9100**	1		0.150/0.33
	110-130VAC	**1SVR 430 831 R 0100**	1		0.150/0.33
	220-240VAC	**1SVR 430 831 R 1100**	1		0.150/0.33
Voltage measuring ranges: /-/ ; 30-300 V; 50-500V					
CM-ESS	24VAC	**1SVR 430 831 R 9200**	1		0.150/0.33
	110-130VAC	**1SVR 430 831 R 0200**	1		0.150/0.33
	220-240VAC	**1SVR 430 831 R 1200**	1		0.150/0.33

Remark: 1 c/o = SPDT

• **Technical Data** 38
• **Dimensional drawings** 95
• **Accessories** 94

Voltage monitor, single phase AC/DC
CM-ESN

Ordering details



CM-ESN

① Hysteresis adjustment
② Threshold value adjustment
③ Selection of the function (UV/OV)
④ Green LED - supply voltage
⑤ Yellow LED - relay

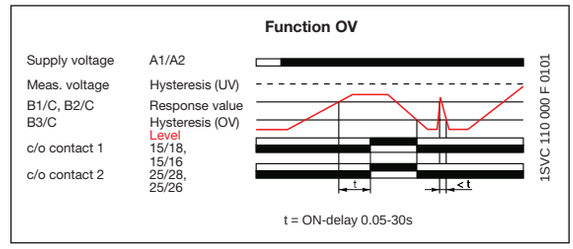
- Monitors AC or DC voltages from 50 mV to 500V in 6 ranges
- Up to 3 measuring ranges in one unit
- Convertible to overvoltage or undervoltage monitoring (For supply voltage versions 24-240VAC/DC)
- Switching hysteresis adjustable from 5-30%
- With or without delay on operate 0.05-30s
- 2c/o contacts
- 2 LEDs to indicate operational status
- Approvals

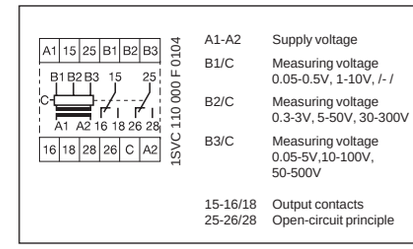
The voltage being monitored is applied to the terminals B1 or B2 or B3 and C. The unit can be set for 2 monitoring modes by a rotary switch on the front face.
The overvoltage mode (OV) means, if the monitored voltage is above the set point, the output relay will energize. The undervoltage mode (UV) means, if the monitored voltage is below the set point, the output relay will energize.

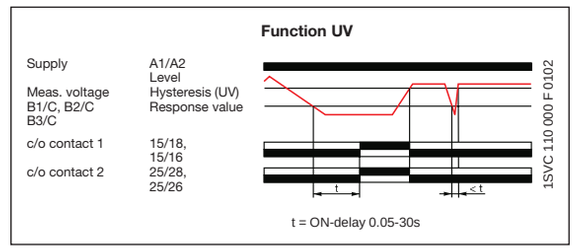
The output relay de-energizes when the monitored voltage is above or below the set hysteresis percentage. Without or with delay on operate 0.05...30 s. Hysteresis is adjustable from 5...30 %.

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

2 Functions







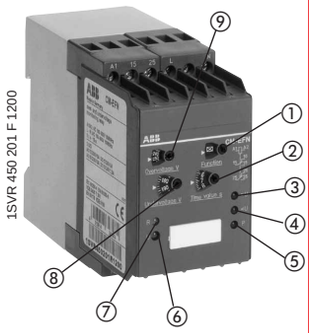
Type	Supply voltage 50/60Hz	Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg/lb
Voltage measuring ranges: 0.05-0.5V; 0.3-3V; 0.5-5V, no time delay					
CM-ESN	24-240VAC/DC	**1SVR 450 215 R 0000**	1		0.300/0.66
	110-130VAC	**1SVR 450 210 R 0000**	1		0.300/0.66
	220-240VAC	**1SVR 450 211 R 0000**	1		0.300/0.66
Voltage measuring ranges: 0.05-0.5V; 0.3-3V; 0.5-5V, with ON-delay					
CM-ESN	24-240VAC/DC	**1SVR 450 225 R 0000**	1		0.300/0.66
	110-130VAC	**1SVR 450 220 R 0000**	1		0.300/0.66
	220-240VAC	**1SVR 450 221 R 0000**	1		0.300/0.66
Voltage measuring ranges: 1-10V; 5-50V; 10-100V, no time delay					
CM-ESN	24-240VAC/DC	**1SVR 450 215 R 0100**	1		0.300/0.66
	110-130VAC	**1SVR 450 210 R 0100**	1		0.300/0.66
	220-240VAC	**1SVR 450 211 R 0100**	1		0.300/0.66
Voltage measuring ranges: 1-10V; 5-50V; 10-100V, with ON-delay					
CM-ESN	24-240VAC/DC	**1SVR 450 225 R 0100**	1		0.300/0.66
	110-130VAC	**1SVR 450 220 R 0100**	1		0.300/0.66
	220-240VAC	**1SVR 450 221 R 0100**	1		0.300/0.66
Voltage measuring ranges: /-/ ; 30-300 V; 50-500V, no time delay					
CM-ESN	24-240VAC/DC	**1SVR 450 215 R 0200**	1		0.300/0.66
	110-130VAC	**1SVR 450 210 R 0200**	1		0.300/0.66
	220-240VAC	**1SVR 450 211 R 0200**	1		0.300/0.66
Voltage measuring ranges: /-/ ; 30-300V; 50-500V, with ON-delay					
CM-ESN	24-240VAC/DC	**1SVR 450 225 R 0200**	1		0.300/0.66
	110-130VAC	**1SVR 450 220 R 0200**	1		0.300/0.66
	220-240VAC	**1SVR 450 221 R 0200**	1		0.300/0.66

Remark: 1c/o = SPDT; 2c/o = DPDT

- **Technical Data** 39
- **Dimensional drawings** 95
- **Accessories** 95

Over- and undervoltage monitor, ingle phase AC CM-EFN

Ordering details



CM-EFN

① Time function ⊠ / ■
② Time setting
③ > U,
Red LED - Overvoltage
④ < U,
Red LED - Undervoltage
⑤ P,
Red LED - Phase failure
⑥ U,
Green LED - Supply voltage
⑦ R,
Yellow LED - relay
⑧ Threshold value undervoltage
⑨ Threshold value overvoltage

- Monitors single-phase supply voltage for phase loss as well as overvoltage and undervoltage
- 2 voltage monitoring ranges: from 80-160V and from 160-300V
- 1 phase voltage section monitoring, V_{min} and V_{max} are adjustable
- 2c/o contacts
- 5 LED indicators to identify all states
- Adjustable delay on operate or on release time 0.1-10s
- Approvals

The EFN monitors single phase supply voltages for phase loss, overvoltage and undervoltage conditions. The output relay will de-energize if one of the fault conditions occurs. The nature of the fault will be indicated by an LED.

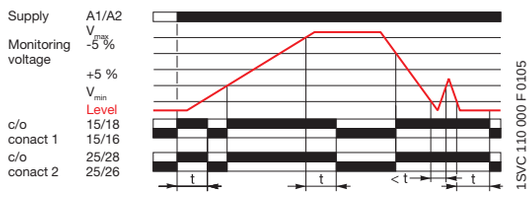
When the phase is present and monitored voltage conditions are normal, the output relay will remain in the energized state. It will de-energize once voltage exceeds the set $V_{max.}$ value or drops below the set $V_{min.}$ value. It will automatically re-energize, taking into account the factory set hysteresis of 5 %, once voltage returns in the selected voltage frame.

Time delay

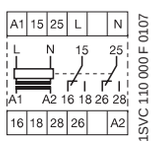
Selection switch ⊠/■ is used to set the delay time of the EFN as required by specific voltage conditions.
Switch position (⊠): Alarm tripping indicating that voltage that has exceeded or dropped below the set value will be suppressed during the set delay time. Momentary voltage fluctuations will thus not initiate alarm tripping.
Switch position (■): Alarm tripping will be instantaneous and will also be stored during the set delay time. Momentary undervoltage conditions will be recognized and, for better evaluation, prolonged by the set time.

2 Functions

ON-delay error message: Function ⊠

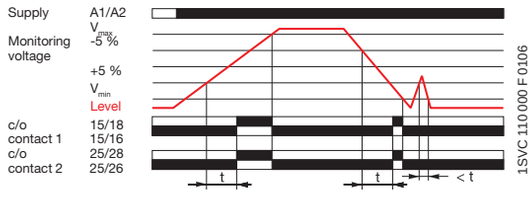


t = Delay time t only effective for over-/undervoltage monitoring



A1-A2	Supply voltage
L, N	Measuring circuit V_{min}, V_{max} adjustable V_{min} 80-160VAC V_{max} 160-300VAC
15-16/18 25-26/28	Output contacts Closed-circuit principle

Off-delay error message: Function ■



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

Type	Supply voltage 50/60Hz	Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg/lb
V_{min}: 80-120VAC 50/60Hz; V_{max} 120-160VAC 50/60Hz					
CM-EFN	80-160VAC 50/60Hz	**1SVR 450 200 R 1100**	1		0.300/0.66
V_{min}: 160-220VAC 50/60Hz; V_{max} 220-300VAC 50/60Hz					
CM-EFN	160-300VAC 50/60Hz	**1SVR 450 201 R 1200**	1		0.300/0.66

Remark: 1c/o = SPDT; 2c/o = DPDT

- **Technical Data** 39
- **Dimension drawings** 95
- **Accessories** 95

Current and voltage monitors, single phase

Technical data, standards / directives

		CM-SRS			CM-SRN					
Supply circuit										
Supply voltage - power consumption	**A1-A2**	24VAC 50/60Hz approx. 1VA			24-240VAC/DC ca. 2VA / approx. 2W					
		110-130VAC 50/60Hz approx. 1VA			110-130VAC 50/60Hz approx. 2VA					
					220-240VAC 50/60Hz approx. 2VA					
Tolerance of supply voltage		-15%...+10%								
Supply voltage frequency		50-60Hz			50-60Hz, 0-400 Hz (A1-A2 = 24-240VAC/DC)					
Duty time		100%								
Measuring circuit		**B1-C**	**B2-C**	**B3-C**	**B1-C**	**B2-C**	**B3-C**	**B1-C**	**B2-C**	**B3-C**
Function			overcurrent		over- or undercurrent					
Measuring range, threshold value min-max.		3-30mA	10-100mA	0,1-1A	3-30mA	10-100mA	0.1-1A	0.3-1.5A	1-5A	3-15A
Input resistance		33Ω	10Ω	1Ω	33Ω	10Ω	1Ω	0.06Ω	0.018Ω	0.006Ω
Pulse overload t < 1s		300mA	1A	10A	300mA	1A	10A	15A	50A	100A
Possible permanent overload		50mA	150mA	1,5A	50mA	150mA	1.5A	2A	7A	20A
Hysteresis related to adjusted value		5-30%, adjustable								
Max. voltage within measuring circuit										
Frequency of measuring circuit		DC, 50-60Hz								
Measuring cycle time max.		80ms								
Measuring error within the tolerance of supply power		≤ 0.5%								
Measuring error within temperature range		≤0.06 % / °C								
Timing circuit		without			delay of the over-, undercurrent message					
Delay on operate		-			0.05-1s, 1.5-30s, adjustable					
Timing error within the tolerance of supply power		-			≤ 0.5%					
Timing error within temperature range		-			≤ 0.06 % / °C					
Display of operational status										
Supply voltage		Green LED								
Output relay energized		Yellow LED								
Overvoltage										
Undervoltage										
Phase loss										
Output circuits		**15-16/18**			**15-16/18, 25-26/28**					
No. of contacts		1c/o			2c/o					
Operating principle [1]		open-circuit principle								
Contact material		AgCdo								
Rated voltage acc. to VDE0110, IEC947-1		250V			400 V					
Min. switching voltage										
Max. switching voltage		250VAC, 250VDC			400VAC, 400VDC					
Min. switching current										
Rated switching current acc. to										
IEC941-x AC12 (resistive)	230V	4A			5A					
IEC941-x AC15 (inductive)	230V	3A			3A					
IEC941-x DC12 (resistive)	24V	4A			5A					
IEC941-x DC13 (inductive)	24V	2A			2,5A					
Maximum mechanical life		30 x 10^6								
Maximum electrical life (to AC12, 230V, 4A)		0.1 x 10^6								
Short circuit proof, max. fuse rating	n/c contact	10A, fast operating class gL			5A, fast operating class gL					
	n/o contact	10A, fast operating class gL			5A, fast operating class gL					
General Data										
Width of enclosure		22.5mm			45mm					
Wire size		2 x 2.5mm² (2x14 AWG) stranded with wire end ferrule								
Mounting position		any								
Degree of protection enclosure / terminals		IP50 / IP20								
Operating temperature		-20°C...+60°C			-25°C...+65°C					
Storage temperature		-40°C...+85°C								
Mounting		DIN rail (EN50022)								
Mechanical shock resistance acc to IEC68-2...6		6G			10G					
Standards / directives										
Product standards										
Electromagnetic compatibility										
ESD acc. to IEC1000-4-2, EN61000-4-2										
HF radiation resistance acc. to IEC1000-4-3, EN61000-4-3										
Burst acc. to IEC1000-4-4, EN61000-4-4										
Surge acc. to IEC1000-4-5, EN61000-4-5										
HF line emission acc. to IEC1000-4-6, EN61000-4-6										
Low voltage directive										
Resistance to vibration										
Approvals		**cULus, GL, GOST**								
Isolation data										
Rated voltage acc. to VDE0110, IEC947-1 between supply-, monitoring- and output circuit		250V			400V					
Rated impulse withstand voltage to VDE0110, IEC664 -between all isolated circuits		4kV / 1.2 - 50µs								
Test voltage between all isolated circuits		2.5kV, 50Hz, 1min.								
Pollution category acc. to VDE0110, IEC664 / IEC255-5		III / C								
Overvoltage category acc. to VDE0110, IEC664 / IEC255-5		III / C								
Environmental tests acc. to IEC68-2...30		24h cycle, 55°C, 93% rel., 96h								

[1] Opened circuit principle: Output relay energizes when the adjusted threshold value is exceeded or dropped below by the measured value
Closed circuit principle: Output relay de-energizes when the adjusted threshold value is exceeded or dropped below by the measured value

Remark: 1c/o = SPDT; 2c/o = DPDT

Current and voltage monitors, single phase

Technical data, standards / directives

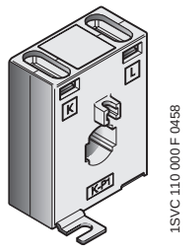
CM-ESS				CM-ESN					CM-EFN
24VAC 50/60Hz approx. 1VA				24-240VAC/DC approx. 2VA / approx. 2W					80-120VAC 50/60Hz approx. 3VA
110-130VAC 50/60Hz approx. 1VA				110-130VAC 50/60Hz approx. 2VA					90-145VAC 50/60Hz approx. 3VA
220-240VAC 50/60Hz approx. 1VA				220-240VAC 50/60Hz approx. 2VA					
				-15%...+10%					
				50-60Hz					
				100%					
B1-C	**B2-C**	**B3-C**	**B1-C**	**B2-C**	**B3-C**	**B1-C**	**B2-C**	**B3-C**	**L-N**
overvoltage				over or undervoltage					over or undervoltage
50-500 mV	0.3-3V	0.5-5V	1-10V	5-50V	10-100V	/-/	30-300V	50-500V	Umin.: 80-160VAC / Umax.:160-300VAC [2]
7.7 kΩ	46.5kΩ	77.5kΩ	19 kΩ	95kΩ	190kΩ	-	570kΩ	951kΩ	
25 V	80V	100V	120V	200V	400V	-	550V	550V	
10 V	60V	80V	100V	150V	300V	-	500V	550V	
5-30%, adjustable				5-30%, adjustable					5% fix
s.o.				s.o.					-
0 Hz, 50-60 Hz				0 Hz, 50-60Hz					50-60Hz
80 ms				80 ms					80ms
≤ 0.5%									
≤ 0.06 % / °C									
without				delay of the over, undervoltage message					delay of the error message [3]
-				0.05-1 s, 1.5-30 s, adjustable					0.1-10s, adjustable
-				≤ 0.5%					
-				≤ 0.06 % / °C					
Green LED									U, green LED
Yellow 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				2 c/o					
open-circuit principle									closed -circuit principle
AgCdo									
250 V				400 V					
250VAC, 250VDC				400VAC, 400VDC					400VAC, 400VDC
4A				115V / 230V 5 A / 5A					5A
3A				115V / 230V / 3A					3A
4A				24V / 110V 5A /					5A
2A				24V / 110V 2,5A /					2.5A
30 x 10^6									
0.1 x 10^6									
10 A fast operating class gL				5A fast operating class gL					
10 A fast operating class gL				5A fast operating class gL					
22.,5mm				45mm					45mm
2 x 2.5mm² (2x14 AWG) stranded with wire end ferrule									
any									
IP50 / IP20									
-20°C...+60°C				25°C...+65°C					
-40°C...+85°C				40°C...+85°C					
DIN rail (EN50022)									
6G				10G					
IEC255-6									
93/68/EWG									
level 3 - 6kV / 8kV									
level 3 - 10V/m									
level 3 - 2 kV / 5kHz									
level 4 - 2kV L-L									
level 3 - 10V									
93/68/EWG									
10G, f = 55 Hz, a = 0.95mm, t = 2h per level									
cULus, GL, GOST									
250V				400V					
4 kV / 1.2 - 50µs									
2.5 kV, 50Hz, 1 min.									
III / C									
III / C									
24h cycle, 55°C, 93% rel., 96h									

[2] Threshold value for over- and undervoltage separately adjustable

[3] ON-delay or OFF-delay time function selectable

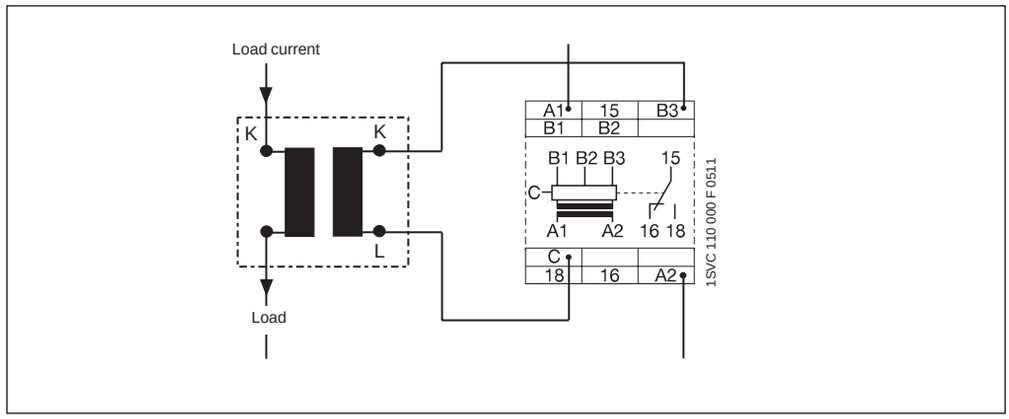
Current monitors accessories CM-CT, current transformers

Selection and ordering details



1SVC 110 000 F 0458

Operating principle / wiring diagram



1SVC 110 000 F 0511

Secondary current 1A

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

Secondary current 5A

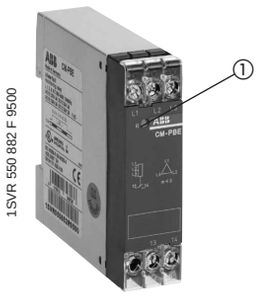
Type	Nominal/ primary current	Class	Order code	Pack. unit piece	Price 1 piece
	50A	2VA/1	**E4 450 116 50**	1	
	75A	2.5 VA/1	**E4 450 116 51**	1	
	100A	2.5 VA/1	**E4 450 116 52**	1	
	150A	5 VA/1	**E4 450 116 53**	1	
	200A	5 VA/1	**E4 450 116 54**	1	
	200A	5 VA/1	**E4 450 117 50**	1	
	300A	5 VA/1	**E4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

Three phase monitors

Content

Phase loss monitor CM-PBE
Phasemonitor for over and undervoltage CM-PVE

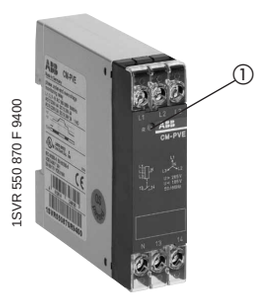
Ordering details



CM-PBE

① Yellow LED - state of relay

- Monitors three-phase supply voltage and single-phase supply voltage for phase failure
- Monitoring of neutral at option
- 1n/o contact
- Without phase sequence monitoring
- Voltage monitoring range L1-L2-L3: 3x380-440VAC L-N: 220-240VAC
- Approvals



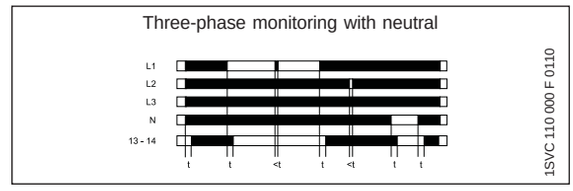
CM-PVE

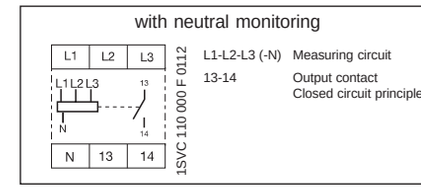
① Yellow LED - state of relay

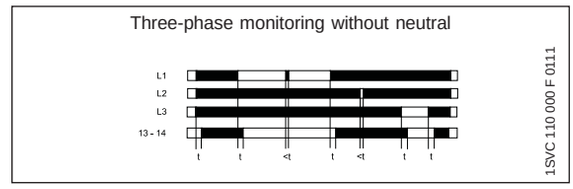
- Monitors three-phase supply voltage and single-phase supply voltage for phase loss as well as overvoltage and undervoltage
- Monitoring of neutral is an option
- Without phase sequence monitoring
- 1n/o contact
- Voltage monitoring range L1-L2-L3: 3x260-480VAC L-N: 150-275VAC
- Approvals

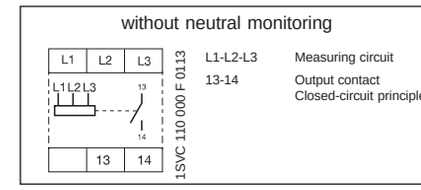
The CM-PBE monitors supply voltage for phase failure ($V_{meas.}$ <60%x V_{nom}).
If the above fault occurs the output relay de-energizes and the yellow LED turns off.
When all three phases are present, the output relay is energized. It will automatically energize as soon as the voltage returns to the nominal range, a fixed hysteresis is included.
The product with neutral monitoring can also be used in single-phase mains by jumpering the three terminals (L1, L2, L3) and connecting only one phase.

2 Functions





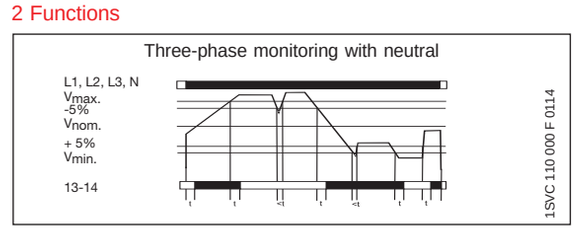


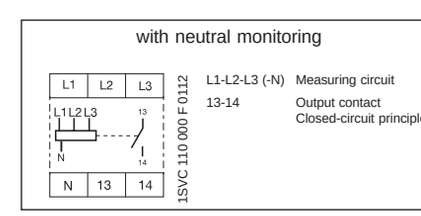


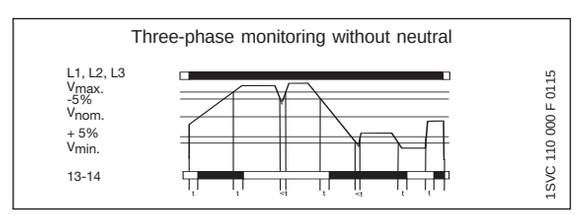
Type		Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg/lb
CM-PBE	with neutral monitoring	**1SVR 550 881 R 9400**	1		0.075/0.17
	without neutral monitoring	**1SVR 550 882 R 9500**	1		0.075/0.17

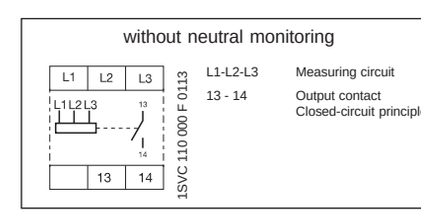
The CM-PVE monitors supply voltage for undervoltage, overvoltage and phase loss. If one of the above faults occurs, the output relay de-energizes and the yellow LED turns off. When all three phases are present, with correct voltage the output relay is energized.
If the voltage [L-L (L-N)] exceeds the voltage value V_{max} (460V/265V) or falls below the voltage value V_{min} (320V/185V) the output relay de-energizes. It will automatically energize as soon as the voltage returns to the monitoring range, a hysteresis of 5% is included. The product with neutral monitoring can also be used in single-phase mains by jumpering the three terminals (L1, L2, L3) and connecting only one phase.

2 Functions









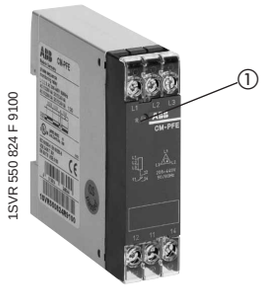
Type		Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg/lb
CM-PVE	with neutral monitoring	**1SVR 550 870 R 9400**	1		0.075/0.17
	without neutral monitoring	**1SVR 550 871 R 9500**	1		0.075/0.17

Remark: 1c/o = SPDT; 2c/o = DPDT

• **Technical data** ..... 47 • **Dimensional drawings** 95

Phase sequence monitors CM-PFE/CM-PFS

Ordering details



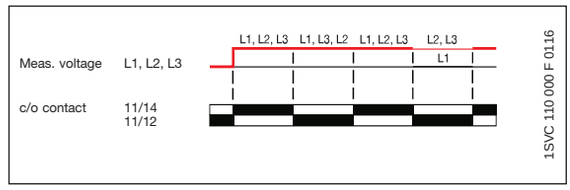
CM-PFE

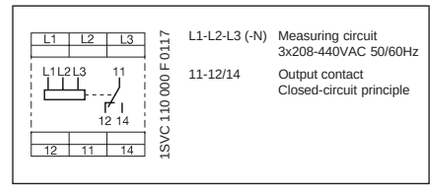
① Yellow LED - state of relay

- Monitors three-phase supply voltage for incorrect phase sequence and phase failure
- Without delay on "ON"
- 1c/o contact
- LED to indicate state of relay
- Continuous voltage range covering 3x208-440V 50/60Hz
- Approvals

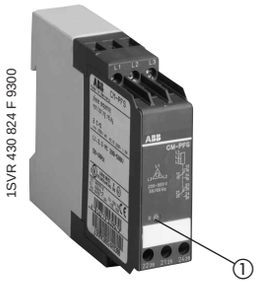
The CM-PFE monitors three-phase supply voltage for incorrect phase sequence.
The output relay remains energized with correct phase sequence.
It resets and the yellow LED turns off in the case of incorrect phase sequence or phase loss.
In case of motors running on two phases only, the CM-PFE monitors the phase loss if the re-generated is less than 60% of the nominal voltage. For applications in which a re-generated voltage < 60% is expected we recommend the phase unbalance monitor CM-ASS or CM-ASN.

1 Function





Type	Supply voltage = Measuring voltage	Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg/lb
CM-PFE	3x208-440VAC 50/60Hz	**1SVR 550 824 R 9100**	1		0.075/0.17



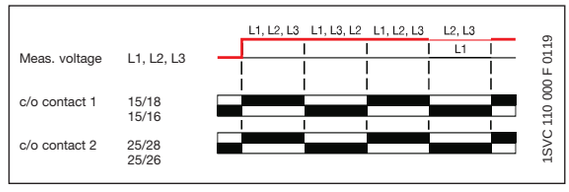
CM-PFS

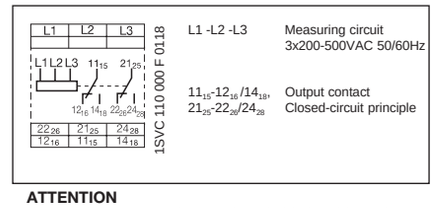
① Yellow LED - state of relay

- Monitors three-phase supply voltage for incorrect phase sequence and phase failure
- Without delay on "ON"
- 2c/o contacts
- LED to indicate state of relay
- Continuous voltage range covering 3x200-500V 50/60Hz
- Approvals

The CM-PFS monitors three-phase input power supply mains voltage for incorrect phase sequence and phase loss. The output relay remains energized with correct phase sequence.
It resets and the yellow LED turns off in the case of incorrect phase sequence or phase loss.
With motors running on two phases the CM-PFS is able to monitor regenerated voltage up to 60% of the original voltage. If the voltage is higher the output relay can not de-energize. For such application, we recommend the use of phase unbalance monitor CM-ASS or CM-ASN.

1 Function





ATTENTION
If several CM-PFS-units are placed side by side and supply voltage is higher than 415V, spacing between the individual units must be 10mm minimum.

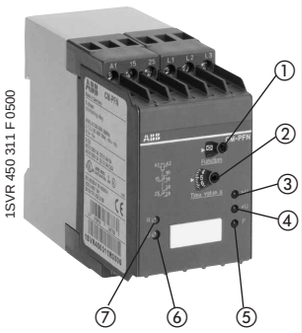
Type	Supply voltage = Measuring voltage	Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg/lb
CM-PFS	3x200-500VAC 50/60 HZ	**1SVR 430 824 R 9300**	1		0.150/0.33

Remark: 1c/o = SPDT; 2c/o = DPDT

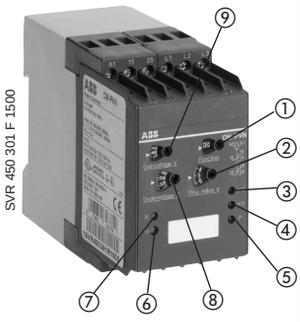
• **Technical data** ..... 47, 48 • **Dimensional drawings** ..... 95 • **Accessories** 95

3-phase monitors CM-PFN, CM-PVN

Ordering details



CM-PFN



CM-PVN

① Timing function ⊠ / ■
② Time setting
③ >U: Red LED - overvoltage
④ <U: Red LED - undervoltage
⑤ P: Red LED - phase failure
⑥ U: Green LED supply voltage
⑦ R: Yellow LED - state of relay
⑧ Threshold value undervoltage
⑨ Threshold value overvoltage

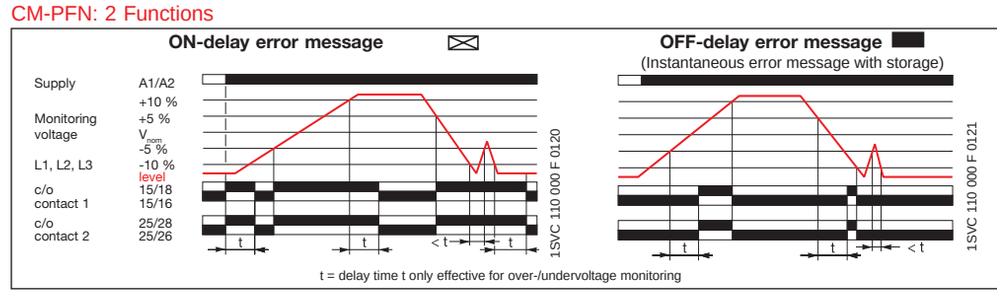
- Monitors three-phase supply voltage for incorrect phase sequence, over-, undervoltage
- CM-PFN: Voltage monitoring range: 0.9-1.1 V_N
- CM-PVN: 3 Voltage monitoring ranges: von 160-580V
- CM-PVN: 3 phases voltage section monitoring, V_{min} and V_{max} adjustable
- Fixed switching hysteresis of 5%
- Selectable delay on operate or on release of 0.1-10s on over or undervoltage
- 2c/o contacts / 5 LEDs to indicate all operational states
- 3 three-phase voltage monitoring versions: 220V, 400V, 500V
- 3 supply voltages: 110-30V, 220-240V, 380-415V
- Approvals

The CM-PFN, CM-PVN monitor the three-phase supply voltage for incorrect phase sequence, overvoltage, undervoltage, and phase loss. The output relay de-energizes if one of the above faults occurs. The LEDs indicate nature of the fault. The output relay remains energized when the correct phase sequence and voltage are present.

CM-PFN: If the voltage exceeds 1.1 times the rated value or falls below 0.9 times the rated value, the output relay will de-energize. A delay on operate or delay on release time can be set for the overvoltage and undervoltage monitoring functions. The delay time is adjusted with a potentiometer.

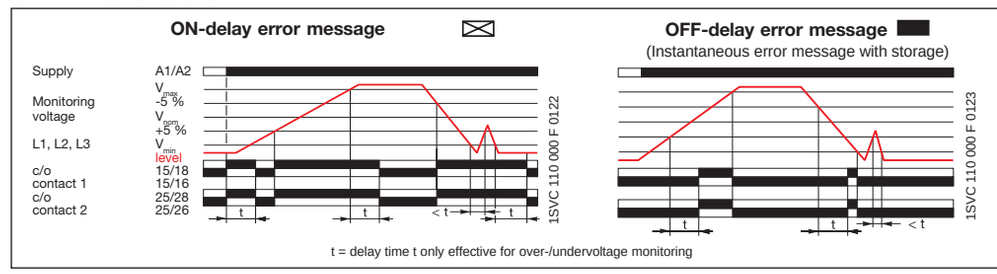
CM-PVN: If the voltage exceeds the rated value V_{max} or if it falls below V_{min}, the output relay will de-energize. Selector switch ⊠/■ is used to set the time delay. Switch position ⊠: Alarm tripping indicating that voltage that has exceeded or dropped below the set value will be suppressed during the set delay time. Momentary voltage fluctuations will thus not initiate alarm tripping. Switch position ■: Alarm tripping will be instantaneous and will also be stored during the set delay time. Momentary undervoltage conditions will be ignored. The relay will automatically energize again as soon as the voltage returns to nominal. Type CM-PVN includes a hysteresis of 5%.

CM-PFN: 2 Functions



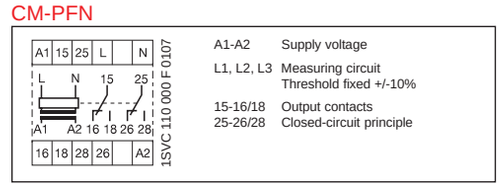
t = delay time t only effective for over-/undervoltage monitoring

CM-PVN: 2 Functions

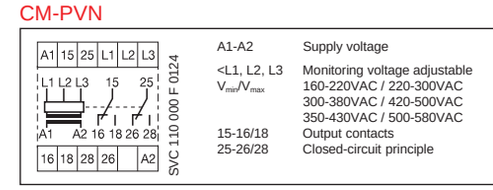


t = delay time t only effective for over-/undervoltage monitoring

CM-PFN



CM-PVN



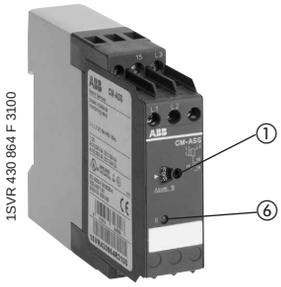
Type	Supply voltage 50/60 Hz	Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg/lb
Monitoring voltage 3 x 380V/50Hz					
CM-PFN	220 -240VAC	**1SVR 450 311 R 0400**	1		0.300/0.66
	380-415VAC	**1SVR 450 312 R 0400**	1		0.300/0.66
Monitoring voltage 3 x 400V/50Hz					
CM-PFN	110-130VAC	**1SVR 450 311 R 0500**	1		0.300/0.66
	380-240VAC	**1SVR 450 312 R 0500**	1		0.300/0.66
Monitoring voltage: V_{min} 160-220VAC 50/60Hz, V_{max} 220... 300 V AC 50/60 Hz					
CM-PVN	90-145VAC	**1SVR 450 300 R 1200**	1		0.300/0.66
	160-300VAC	**1SVR 450 3 01 R 1200**	1		0.300/0.66
Monitoring voltage: V_{min} 300-380VAC 50/60Hz, V_{max} 420-500VAC 50/60Hz					
CM-PVN	90-145VAC	**1SVR 450 300 R 1500**	1		0.300/0.66
	160-300VAC	**1SVR 450 301 R 1500**	1		0.300/0.66
	300-500VAC	**1SVR 450 302 R 1500**	1		0.300/0.66
Monitoring voltage: V_{min} 350-430VAC 50/60Hz, V_{max} 500-580 VAC 50/60Hz					
CM-PVN	90-145VAC	**1SVR 450 300 R 1700**	1		0.300/0.66
	300-500VAC	**1SVR 450 302R 1700**	1		0.300/0.66

Further voltages on request.Remark: 1 c/o = SPDT; 2 c/o = DPDT

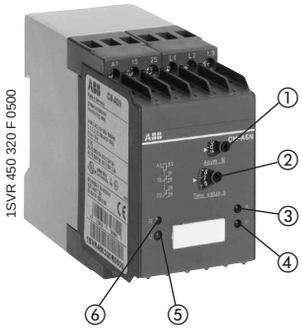
• **Technical data** ..... 48 • **Dimensional drawings** ..... 95 • **Accessories** 95

Phase unbalance monitors CM-ASS, CM-ASN

Ordering details



CM-ASS



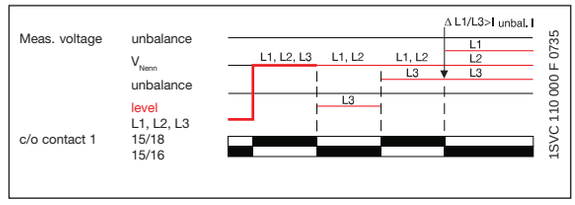
CM-ASN

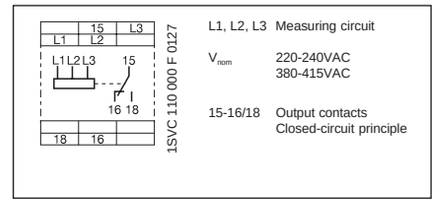
① Threshold unbalance
② Time setting
③ A: Red LED - unbalance
④ P: Red LED - phase loss and phase sequence error
⑤ V: Green LED - supply voltage
⑥ R: Yellow LED - state of relay

- CM-ASS: Fixed response delay: 0.5s
  CM-ASN: adjustable ON-delay : 0.1-10s
- Switching threshold adjustable between 5 and 15%
- CM-ASS: 1c/o contact
  CM-ASN: 2c/o contacts
- CM-ASS: LED to indicate operational status
  CM-ASN: 4 LEDs to indicate all operational states
- CM-ASS: 2 supply and measuring voltage ranges: 220-240V und 380-415V
- CM-ASN: 3 three-phase voltage ranges: 220V, 400V, 500V
- Several supply voltage versions
- Approvals

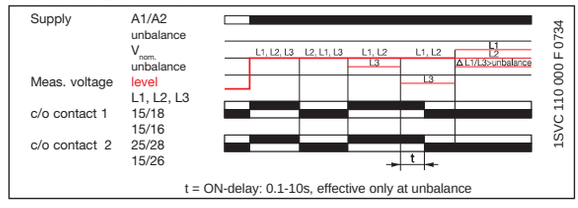
Monitors three phase supply mains for phase unbalance, phase loss, even when of 95% of the voltage is regenerated and phase sequence.
CM-ASS: The output relay de-energizes 500 ms after the set unbalance level has been exceeded or immediately after failure of one of the phases. The energized yellow LED indicates an energized output relay. The switching threshold for permissible unbalance is adjustable between 5 and 15%.
CM-ASN: In case of a fault, the output relay will de-energize. Status of the fault will be indicated by one of the LED´s. The output relay is energized as long as phases are balanced and phase sequence is correct (rotary switch right-handed polarized). It will de-energize as soon as unbalance exceeds the set threshold (adjustable between 5% and 15% unbalance).
A response time delay of 0.1s to 10s can be set on a potentiometer to prevent nuisance tripping of the relay during motor starting. Phase loss and phase sequence cause immediate tripping.
With motors running on two phases, regenerated voltage (of more than 95%) may be produced, so the output relay may not de-energize despite the loss of a phase.

CM-ASS: 1 Function

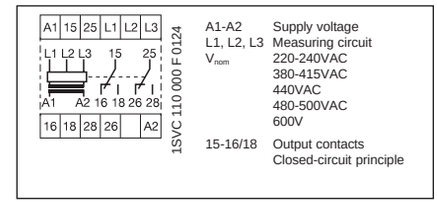




CM-ASN: 1 Function



t = ON-delay: 0.1-10s, effective only at unbalance



Type	Supply voltage = Monitoring voltage	Frequency	Order code	Pack. unit piece	Price 1 piece	Weight 1 pc. kg/lb
CM-ASS	3 x 220-240VAC	50Hz	**1SVR 430 864 R 1100**	1		0.300/0.66
	3 x 380-415VAC	50Hz	**1SVR 430 864 R 3100**	1		0.300/0.66
	3 x 220-240VAC	60Hz	**1SVR 430 865 R 1100**	1		0.300/0.66
	3 x 380-415VAC	60Hz	**1SVR 430 865 R 3100**	1		0.300/0.66

Type	Supply voltage	Frequency	Order code	Pack. unit piece	Price 1 piece	Weight 1 pc. kg/lb
Monitoring voltage: 3x220-240VAC 50Hz; 3 x 220-240VAC 60Hz						
CM-ASN	110-130VAC	50Hz	**1SVR 450 320 R 0200**	1		0.300/0.66
	220-240VAC	50Hz	**1SVR 450 321 R 0200**	1		0.300/0.66
	380-415VAC	50Hz	**1SVR 450 322 R 0200**	1		0.300/0.66
	220-240VAC	60Hz	**1SVR 450 421 R 0200**	1		0.300/0.66
Monitoring voltage: 3x380-415VAC 50Hz; 3x380-415VAC 60Hz						
CM-ASN	110-130VAC	50Hz	**1SVR 450 320 R 0500**	1		0.300/0.66
	220-240VAC	50Hz	**1SVR 450 321 R 0500**	1		0.300/0.66
	380-415VAC	50Hz	**1SVR 450 322 R 0500**	1		0.300/0.66
	220-240VAC	60Hz	**1SVR 450 422 R 0500**	1		0.300/0.66
Monitoring voltage: 3x440VAC 60Hz						
CM-ASN	440VAC	60Hz	**1SVR 450 423 R 0600**	1		0.300/0.66
Monitoring voltage: 3x480-500VAC 50Hz; 3x480-500 VAC 60Hz						
CM-ASN	110-130VAC	50Hz	**1SVR 450 320 R 0700**	1		0.300/0.66
	220-240VAC	50Hz	**1SVR 450 321 R 0700**	1		0.300/0.66
	380-415VAC	50Hz	**1SVR 450 322 R 0700**	1		0.300/0.66
	500-550VAC	50Hz	**1SVR 450 932 R 0100**	1		0.300/0.66
	480-500VAC	60Hz	**1SVR 450 424 R 0700**	1		0.300/0.66
Monitoring voltage: 3x600VAC 50Hz; 3x480-500VAC 60Hz						
CM-ASN	600VAC	60Hz	**1SVR 450 426 R 0800**	1		0.300/0.66

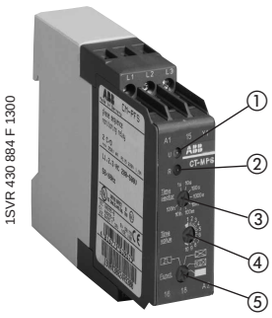
Remark: 1c/o = SPDT; 2c/o = DPDT

• **Technical data** ..... 49 • **Dimensional drawings** ..... 95 • **Accessories** 95

NEW

Multifunctional 3-phase monitor CM-MPS

Ordering details



CM-MPS

① U/R/T: Green LED - supply voltage, relay, timing
② F: Red LED - failure, different flashing frequencies, for different failures
③ Threshold value V_{min}/V_{max}
④ Threshold value for unbalance 2-15%
⑤ Time setting 0.05-10s

- Three-phase monitoring
  Phase sequence
  Phase loss
  Overvoltage
  Undervoltage
  Phase unbalance
- Adjustable over and under-voltage threshold values
  $V_{min.}$: 160-220V 50/60Hz
  300-380V 50/60Hz
  $V_{max.}$: 220-300V 50/60Hz
  420-500V 50/60Hz
- Dual frequency measuring input 50/60Hz
- Powered by 3-phase mains
- 2c/o contacts/ 2 LED indicators
- Approvals

c UL us LISTED , GL , PCT

(pending)

The CM-MPS is a multifunctional 3-phase monitor. It monitors the phase parameters, phase sequence, phase loss, over and undervoltage and phase unbalance.
The threshold values for over and undervoltage are adjustable in the range of V_{min} 160-220V and $V_{max.}$ 220-300V. The overvoltage range is V_{min} 220-300V and $V_{max.}$ 420-500V.

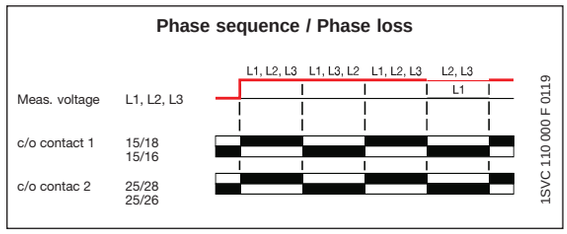
The threshold value for phase unbalance can be adjusted from 2-15%.

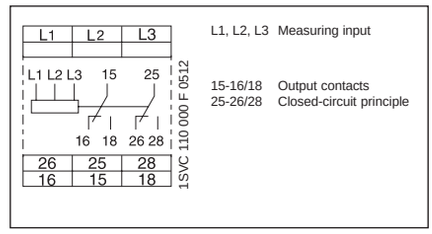
If one of the above mentioned failures occurs, the output relay de-energizes. The failure is displayed via an LED.

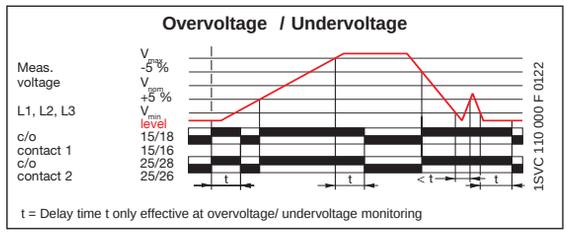
The adjustable trip delay prevents nuisance tripping.

If all parameters are within the adjusted limits, the output relay is energized.

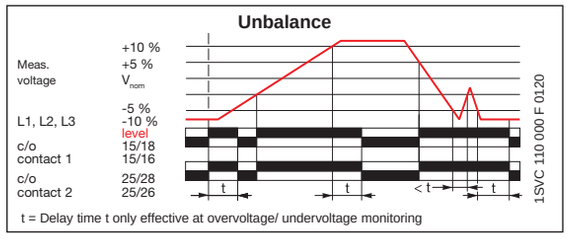
5 Functions







t = Delay time t only effective at overvoltage/ undervoltage monitoring



t = Delay time t only effective at overvoltage/ undervoltage monitoring

Type	Supply voltage = Monitoring voltage	Frequency	Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg/lb
CM-MPS	160-300VAC	50/60Hz	**1SVR 430 884 R 1300**	1		0.200/0.44
	300-500VAC	50/60Hz	**1SVR 430 884 R 3300**	1		0.200/0.44

Remark: 1 c/o = SPDT; 2 c/o = DPDT

• **Technical Data** ..... 49 • **Dimension drawings** ..... 95 • **Accessories** 95

3-phase monitors

Technical data and standards / directives

	CM-PBE	CM-PVE	CM-PFE
Input circuit	**= Meas. circuit L1-L2-L3 (-N)**	**= Meas. circuit L -L2-L3 (-N)**	**=Meas. circuit L1-L2-L3**
Supply voltage - power consumption		Supply voltage = Measuring voltage	
	220-240VAC 50/60Hz	185-265VAC 50/60Hz	3x208-440VAC approx. 15VA
	380-440VAC 50/60Hz	320-460VAC 50/60Hz	
Tolerance of the supply voltage	-15%...+15%	-15%...+10%	-10%...+10%
Supply voltage frequency	50-60Hz	50-60Hz (-10%...+10%)	50-60Hz (-10%...+10%)
Duty cycle	100%		
Measuring circuit	**L1-L2- L3-N L1 - L2 -L3**	**L1-L2- L3-N L1-L2-L3**	**L1-L2-L3**
Monitoring function	Phase loss	Over / undervoltage	Phase seq., Phase loss
Measuring range, min-max.	220-240VAC 380-440VAC	185-265VAC 320-460VAC	3x208-440VAC
Threshold	threshold = 0,6 x Vnom	fix: Vmin: 185V/320V; Vmax: 265V/460V	0.6xVnom
Hysteresis related to threshold value	5% fix (Rückschaltw. = 0.65xVnom)	fix: Vmin: 194V/336V; Vmax: 252V/437V	
Frequency of measuring voltage	50-60Hz (-10%...+10%)	50-60Hz (-10%...+10%)	50-60Hz
Measuring cycle time max.	40 ms	80ms	500ms
Meas. error within the tolerance of supply power			≤ 0.5%
Meas. error within the temperature range		≤ 0.06% / °C	
Time circuit			
Delay time	OFF-delay 500ms (+/-20%), fix ON-delay 100ms (+/-20%)	OFF-delay 500ms (+/-20%), fix ON-delay at V_{min}/V_{max} 500ms (+/-20%)	500ms
Display of operating status			
Supply voltage			
Output relay energized	R, yellow LED		
Over/ undervoltage			
Phase loss, phase sequence, unbalance			
Output circuits	**13-14**		**11-12/14**
No. of contacts	1 n/o contact		1 c/o contact
Operating principle [1]	closed-circuit principle		
Contact material	AgCdo		
Rated voltage acc. to VDE0110, IEC947-1	250V		
Switching voltage min.			
Switching voltage max.	250VAC, 250VDC		
Switching current min.			
Rated switching current acc. to IEC941-x AC12 (resistive) 230V	4A		
IEC941-x AC15 (inductive) 230V	3A		
IEC941-x DC12 (resistive) 24V	4A		
IEC941-x DC13 (inductive) 24V	2A		
Max. mechanical life	$30x10^6$		
Max. electrical life (acc. to AC12, 230V, 4A)	$0.1x10^6$		
Short circuit proof, max. fuse rating n/c contact			10A fast, operating class gL
n/o contact	10A fast, operating class gL		
General Data			
Width of enclosure	22.5mm		
Wire size	2x1.5mm² (2x16 AWG) stranded with wire end ferrule		
Installation position	any		
Degree of protection enclosure / terminals	IP50 / IP20		
Operating temperature	-20°C...+60°C		
Storage temperature	-40°C...+85°C		
Mounting	DIN rail (EN50022)		
Mechanical shock resistance acc. to IEC68-2...6	10G		
Standards			
Product standard	IEC255-6		
Electromagnetic compatibility	93/68/EWG		
EMC-tests acc. to EN50082-2			
ESD acc. to IEC1000-4-2, EN61000-4-2	level 3 - 6kV/8kV		
HF-radiation resistance acc. to IEC1000-4-3, EN61000-4-3	level 3 - 10V/m		
Burst acc. to IEC1000-4-4, EN61000-4-4	level 3 - 2kV/5 kHz		
Surge acc. to IEC1000-4-5, EN61000-4-5	level 4 - 2kVL-L		
HF-line emission acc. to IEC1000-4-6, EN61000-4-6	level 3 - 10V		
Low voltage directive	93/68/EWG		
Resistance to vibration	10G, f = 55Hz, a = 0.95mm, t = 2h per level		
Approvals	**cULus, GOST**		
Isolation data			
Rated insulation voltage to VDE0110, IEC947-1 between supply-, measuring- and output circuit	400V	400V	500V
Rated impulse withstand voltage to VDE0110, IEC664 -between all isolated circuits	4kV / 1.2 - 50µs		
Test voltage between all isolated circuits	2.5kV, 50Hz, 1min.		
Pollution category acc. to VDE0110, IEC664 / IEC255-5	III / C		
Overvoltage category acc. to VDE0110, IEC664 / IEC255-5	III / C		
Environmental tests acc. to IEC68-2...30	24h cycle, 55°C, 93% rel., 96h		

[1] Open-circuit principle: Output relay energizes when the adjusted threshold value is exceeded or dropped below the measured value
Closed-circuit principle: Output relay de-energizes when the adjusted threshold value is exceeded or dropped below the measured value

Remark: 1c/o = SPDT; 2c/o = DPDT

3-phase monitors

Technical data, standards / directives

	CM-PFS	CM-PFN	CM-PVN
Input circuit	**= Meas. circuit L1-L2-L3**		
Supply voltage - power consumption	Supply voltage = Meas. voltage		
	3x208-440VAC 50/60Hz approx. 15VA	110-130VAC 50/6 0Hz approx. 3VA	90-145VAC approx. 3VA
		220-240VAC 50/6 0Hz approx. 3VA	160-300VAC approx. 3VA
		380-440VAC 50/6 0Hz approx. 3VA	
Tolerance of the supply voltage	-15%...+10%		
Supply voltage frequency	50-60Hz		
Duty cycle	100%		
Measuring circuit	**L1 - L2 -L3**	**L1-L2-L3**	**L1-L2-L3**
Monitoring function	Phase sequence, phase loss	Over / undervoltage, phasen sequence, phase loss	
Measuring range, min-max.	3x200-500VAC	3x380VAC 50Hz, 3x400VAC 50Hz	160-300/300-500/350-580VAC
Threshold	0.6 x V_{nom}	over and undervoltage-fix,0.85/1.1xV_{nom}	over and undervoltage tripping point adjustable
Hysteresis related to threshold value		5% fix (0.9/1.05 V_{nom})	5% fix
Frequency of measuring voltage	50-60Hz	50Hz	50-60Hz
Measuring cycle time max.	500ms	80ms	
Meas. error within the tolerance of supply power	≤ 0.5%		
Meas. error within the temperature range	≤ 0.06 % / °C		
Time circuit		Error message of over and undervoltage	
Delay time	500ms	0.1-10s, adjustable, ON-delay or OFF-delay (failure storage)	
Timing error within the tolerance of supply voltage	-	≤5%	
Timing error within temperature range	-	≤0.06%/°C	
Display of operating status			
Supply voltage	U, green LED		
Output relay energized	R, yellow LED		
Overvoltage	> U, red LED		
Undervoltage	< U, red LED		
Phase loss	P, red LED		
Phase sequence			
Unbalance			
Output circuits	**11(15)-12(16)/14(18), 21(25)-22(26)/24(28)**	**15-16/18, 25-26/28**	
No. of contacts	2 c/o contacts		
Operating principle [1]	closed circuit principle		
Contact material	AgCdo		
Rated voltage acc. to VDE0110, IEC947-1	250V	400V	
Switching voltage min.			
Switching voltage max.	250VAC, 250VDC	400VAC, 400VDC	
Switching current min.			
Rated switching current acc. to IEC941-x AC12 (resistive) 230V	4A	5A	
IEC941-x AC15 (inductive) 230V	3A	3A	
IEC941-x DC12 (resistive) 24V	4A	5A	
IEC941-x DC13 (inductive) 24V	2A	2.5A	
Max. mechanical life	30 x 10^6		
Max. electrical life (acc. to AC12, 230V, 4A)	0.1 x 10^6		
Short circuit proof, n/c contact	10A fast, operation class gL	5A fast, operation class gL	
max. fuse rating n/o contact	10A fast, operation class gL	5A fast, operation class gL	
General Data			
Width of enclosure	22.5mm	45mm	
Wire size	2 x 1.5mm² (2 x 16 AWG) stranded with wire end ferrule		
Installation position	any		
Degree of protection housing / terminals	IP50 / IP20		
Operating temperature	-20°C...+60°C	-25°C...+65°C	
Storage temperature	-40°C...+85°C		
Mounting	DIN rail (EN50022)		
Mechanical shock resistance acc. to IEC68-2...6	6G	10G	
Standards			
Product standard	IEC255-6		
Electromagnetic compatibility	93/68/EWG		
EMC-tests acc. to EN50082-2	level 3 - 6kV/8kV		
HF radiation resistance acc. to IEC1000-4-3, EN61000-4-3	level 3 - 10V/m		
Burst acc. to IEC1000-4-4, EN61000-4-4	level 3 - 2kV/5kHz		
Surge acc. to IEC1000-4-5, EN61000-4-5	level 4 - 2kVL-L		
HF line emission acc. to IEC1000-4-6, EN61000-4-6	level 3 - 10V		
Low voltage directive	93/68/EWG		
Resistance to vibration	10G, f = 55Hz, a = 0.95mm, t = 2h per level		
Approvals	**cULus, GL, GOST**		
Isolation data			
Rated insulation voltage to VDE0110, IEC947-1 between supply-, measuring- and output circuit	500V		
Rated impulse withstand voltage to VDE0110, IEC664 -between all isolated circuits	4 kV / 1.2 - 50µs		
Test voltage between all isolated circuits	2.5 kV, 50Hz, 1min.		
Pollution category acc. to VDE0110, IEC664 / IEC255-5	III / C		
Overvoltage category acc. to VDE0110, IEC664 / IEC255-5	III / C		
Environmental tests acc. to IEC68-2...30	24h cycle, 55°C, 93% rel., 96h		

[1] Open circuit principle: Output relay energizes when the adjusted threshold value is exceeded or dropped below the measured value
Closed circuit principle: Output relay de-energizes when the adjusted threshold value is exceeded or dropped below the measured value

Remark: 1c/o = SPDT; 2c/o = DPDT

3-phase monitors

Technical data, standards / directives

CM-ASS	CM-ASN	CM-MPS
= Meas. circuit L1-L2-L3		**= Meas. circuit L1-L2-L3**
Supply voltage = Measuring voltage		
3x220-240VAC 50Hz /3x220-240VAC 60Hz approx. 2VA	110-130/220-240VAC 50/60Hz approx. 3VA	160-300VAC 50/60Hz
3x380-440VAC 50Hz/3x380-440VAC 60Hz approx. 2VA	380-415/440/480-500VAC 50/60Hz approx. 3VA	300-500VAC 50/60Hz
	500-550/600VAC 50/60Hz approx. 3VA	
-20%...+20%	-15%...+10%	
50Hz or 60Hz	50-60Hz	
100%	100%	
L1-L2-L3	**L1-L2-L3**	**L1-L2-L3**
voltage unbalance, phase sequence, phase loss		over and undervoltage/ph. loss/ph. seq./ph. unbalance
220-240VAC or 380-415VAC	220-240/380-415/440/ 480-500/600VAC	160-300VAC/300-500VAC / 2-15%
5-15% adjustable for unbalance		adjustable over and undervoltage threshold value adjustable unbalance
fix, 20%		fix, 5%
50 oder 60Hz		50-60Hz
500ms	< 100ms	80ms
≤ 0,5%		
≤ 0.06 % / °C		
Error message of phase unbalance	Error message of over and undervoltage, phase loss, phase sequence, phase unbalance	
500ms for error message of phase unbalance	0.1-10s, adjustable, ON-delay	0.1-10s, adjustable
≤ 0.5%		
≤ 0.06% / °C		
	U, green LED	U/R/T, green LED flashing while timing
R, yellow LED		U/R/T, green LED flashing while timing
	F, red LED	
	F, red LED	
	P, red LED	F, red LED
	F, red LED	
	A, red LED	F, red LED
15-16/18	**15-16/18, 25-26/28**	**15-16/18, 25-26/28**
1c/o	2c/o	
closed-circuit principle		
AgCdo		
250V	400V	250V
250 V AC, 250 V DC	400VAC, 400VDC	250VAC, 250VDC
4A	5A	4A
3A	3A	3A
4A	5A	4A
2A	2.5A	2A
30 x 10^6	30 x 10^6	30 x 10^6
0,1 x 10^6	0,1 x 10^6	0,1 x 10^6
10A fast, operating class gL	5A fast, operating class gL	10A fast, operating class gL
10A fast, operating class gL	5A fast, operating class gL	10A fast, operating class gL
22.5 mm	45mm	22.5mm
2x2,5mm² (2x14AWG) stranded with wire end ferrule		
any		
IP50 / IP20		
-20°C...+60°C	-25°C...+65°C	
-40°C...+85°C		
DIN rail (EN50022)		
6G	10G	6G
IEC255-6		
93/68/EWG		
level 3-6kV/8 kV		
level 3 - 10V/m		
level 3 - 2kV / 5 kHz		
level 4 - 2kV L-L		
level 3 - 10V		
93/68/EWG		
10G, f = 55Hz, a = 0.95mm, t = 2h per level		
cULus, GL, GOST	**cULus, GL, GOST**	**cULus, GL** (pending)**, GOST**
500V		
4 kV/1.2-50µs		
2.5 kV, 50Hz, 1min.		
III / C		
III / C		
24h cycle, 55°C, 93% rel., 96h		

[1] Open-circuit principle: Output relay energizes when the adjusted threshold value is exceeded or below the measured value
Closed-circuit principle: Output relay de-energizes when the adjusted threshold vlaue is exceeded or below the measured value
Remark: 1c/o = SPDT; 2c/o = DPDT

Notes

Isolation resistance and earth-leakage monitor

Content

Isolation monitoring in IT-systems
Isolation monitoring device / Earth-leakage monitor

The IT system with additional equipotential bonding and isolation monitoring equipment

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

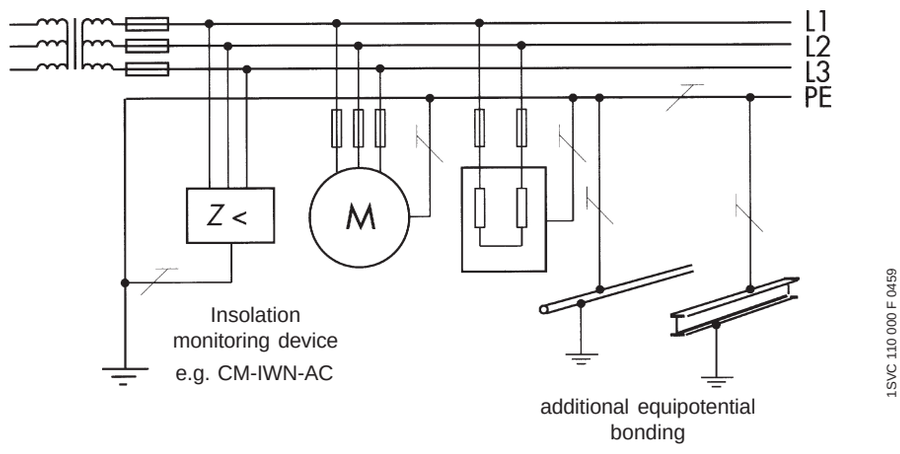
In this system no active conductor is directly connected to earth ground.The advantage of this is that only a small fault current can flow in the event of an insulation fault. This current is essentially caused by the system's leakage capacitance.

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

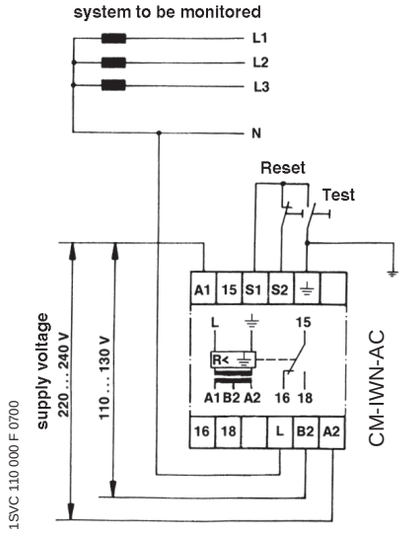
The insulation monitoring device recognizes insulation faults as they develop, and reports that the value has fallen below the minimum immediately. This prevents an interuption of power set point caused by a second more severe insulation fault.

The following illustration shows the typical arrangement of an IT system.
In IT-N systems additionally the secundary side star point of the transformer is used as neutral.

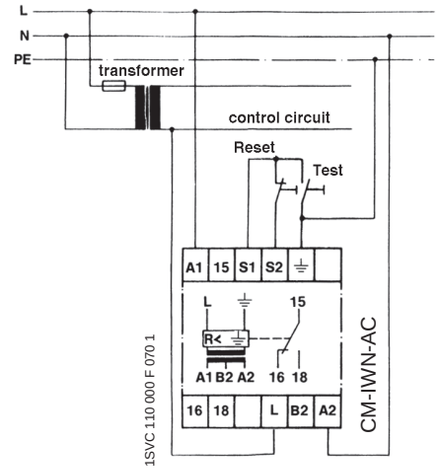


Application and connection examples CM-IWN AC in IT- and IT-N systems

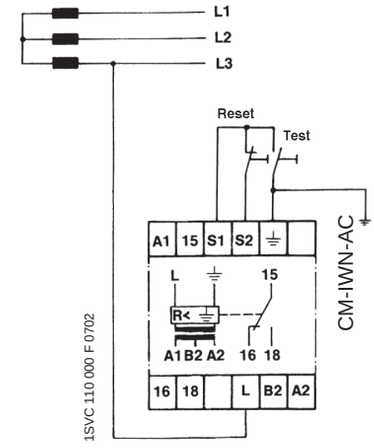
three-phase IT-N system



single-phase IT-N system



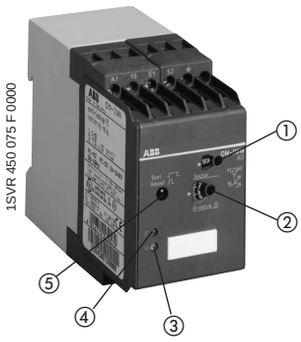
three-phase IT- system



PE = earth ground conductor

Isolation resistance and earth-leakage monitor CM-IWN-AC

Ordering details



CM-IWN-AC

① Selector switch
② Response value 1-110kΩ,
③ Green LED - supply voltage
④ Red LED - state of relay
⑤ Button "Test" - Reset

- 2 measuring ranges from 1-110kΩ
- Manual reset feature
- Suitable for insulation monitoring of single phase or three phase mains
- Performance check with front mounted test button or remote test button
- 1c/o contact/ opened circuit principle
- Error display by LED
- LED to indicate supply voltage ON
- Acc. to VDE 0413 part 2
- Approvals

The CM-IWN-AC is designed for an insulation resistance range of 1...110 kΩ in 2 ranges. The desired range - 1...11 kΩ and 10...110 kΩ - is set with a front mounted switch.
The setting range switch helps to adapt the IWN to most application requirements.
The output relay energizes and the yellow LED lights up as soon as insulation resistance is 0.9x of the set response value and resets as soon as insulation resistance exceeds 1.6 times the response value.

Test

An insulation fault can be simulated with the front mounted "Test" button.
A remote test button can be connected via terminals S1-⏚ . Tripping is caused by opening a n/c contact.

Function

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 supply voltage circuits.
The CM-IWN-AC monitors insulation resistance between ungrounded AC supply voltages and grounded conductors. A superposed DC measuring voltage is used for measurement.

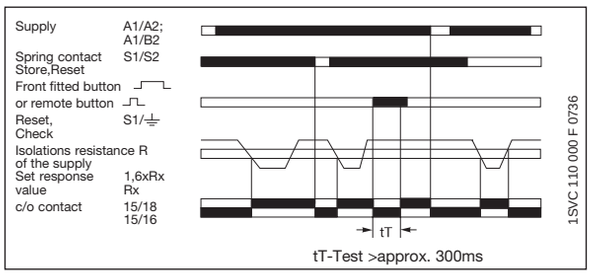
Error storage

The tripped state can be stored by connecting terminals S1, S2. Remote reset can be added by connecting a push-button (n/c contact) in series with S1 and S2: pressing the button resets the unit.

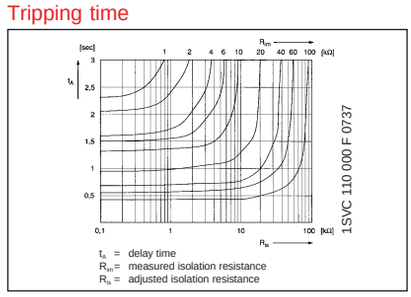
Attention

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

1 Function



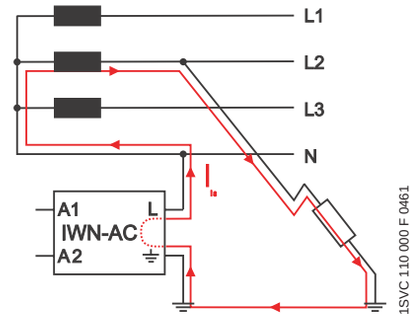
Tripping time



Type	Supply voltage	Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg/lb
CM-IWN-AC	24-240VAC/DC	1**SVR 450 075 R 0000**	1		0.300/0.66
	110-130V, 220-240VAC	**1SVR 450 071 R 0000**	1		0.300/0.66

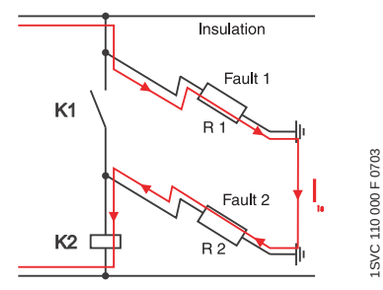
Operating principle

The voltage is supplied via terminals A1-A2 (A1-B2). This can be the voltage supplied from the mains to be monitored. The CM-IWN superimposes a phase or neutral (if available) on a DC-voltage between terminals L and ⏚ . In case of a fault the resistance of the mains to earth decreases. The resulting earth-leakage current flow is sensed by the unit. When the earth-leakage current exceeds the set response value, the output relay energizes with delay (see characteristic) and the red "fault" LED lights.



Examples of use

The earth-leakage monitor CM-IWN-AC is mainly used in industrial applications with electrically isolated AC-mains for the measurement of a first isolation fault.
Thus the installation is protected from incorrect operation caused by an eventual second isolation fault.
Both resistances R1 and R2 correspond to two subsequent isolation faults (see drawing). When K1 opens, current continues to flow through R1,⏚, and R2 and K2 will remain energized.
This incorrect operation may lead to a considerable damage to the installation or the operator.

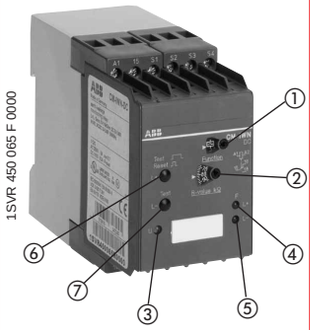


Remark: 1c/o = SPDT; 2c/o = DPDT

• **Technical data** ..... 58 • **Dimensional drawings** ..... 95 • **Accessories** 95

Isolation resistance and earth-leakage monitor CM-IWN-DC

Ordering details



CM-IWN-DC

① Selector switch opened or closed circuit principle
② Response value 10-110kΩ,
③ Green LED - supply voltage
④ Red LED - Error L+
⑤ Red LED - Error L
⑥ Button "Test" - Reset
⑦ Button "Test" L-

- Monitors insulation resistance in ungrounded pure DC supply voltage from 24-220VDC
- Adjustable measuring range from 10-110 kΩ
- Display of ground fault by 2 LED, F L+, L-
- Front-face selection switch for opened circuit or closed circuit principle
- Front-face as well as external test-reset feature
- 1c/o contact
- Approvals

The CM-IWN-DC is designed for insulation resistance monitoring in ungrounded, pure DC supply voltage with or without filtering.
Because of its electrical isolation between the supply and the measuring circuit, it can be used with an external auxiliary voltage, or the supply voltage to be monitored.
An isolation resistance fault is evaluated separately for L+ or L- and is displayed by an LED. A balanced resistance fault can not be detected. The response value is adjustable in a range from 10-110 kΩ.
If the isolation resistance decreases below the set response value, the relay will energize and the error LED will light.

Test

An isolation fault can be simulated with the front mounted "Test" button. The output relay will energize after the test button is pressed. A remote test button for L+ can be connected via terminals S1- S3 (S4-S3 for L-).

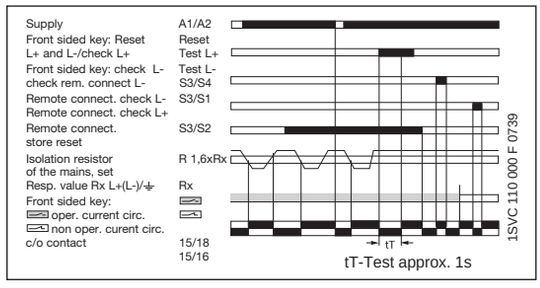
Application

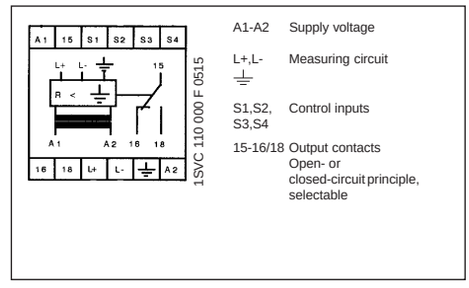
The CM-IWN-DC is used to monitor DC auxiliary circuits that are electrically isolated from primary supply voltage circuits, as well as plants powered by batteries.

Fault storage

The tripped state can be stored by connecting terminals S2-S3. Remote reset can be realized by connecting a push-button (n/c contact) in series with S2 and S3: pressing the button resets the unit.

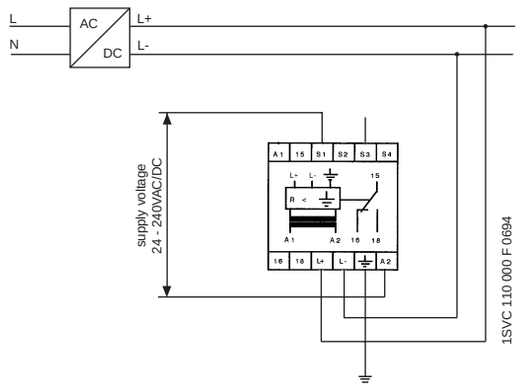
1 Function





Type	Supply voltage	**Order code**	Pack. unit piece	**Price** 1 piece	Weight 1 piece kg/lb
CM-IWN-DC	24-240VAC/DC	**1SVR 450 065 R 0000**	1		0.300/0.66

Application and connection example



Remark: 1c/o = SPDT; 2c/o = DPDT

• **Technical data** ..... 58 • **Dimensional drawings** ..... 95 • **Accessories** 95

Isolation resistance and earth leakage monitor C 558.01

Technical data, ordering details

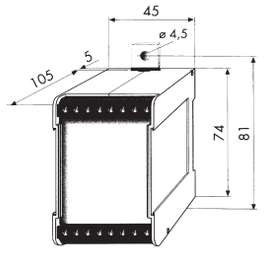
Enclosure width 45mm

1SAR 470 020 F 0005

C558.01

- Isolation monitoring of IT-AC-, DC- and AC/DC systems
- Voltage ranges up to AC 300V and DC 300V
- Automatic adaptation to the conditions of the supply mains
- Connection monitoring
- Adjustable response value 1Ω-200 kΩ
- Power ON and alarm LED's with fault localization
- Combined test and reset switch
- 2c/o contacts
- Open- or closed-circuit principle, selectable
- Fault memory, selectable
- Sealable enclosure
- Approvals

mounting on rail
DIN EN 50 022



1SVC 110 000 F 0524

Isolation monitoring device for IT AC systems with DC components and for IT DC 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.

- Industrial control systems
- Automotive industry
- Machine control systems
- Control systems in power plants and power supply companies
- Computer systems
- Mobile generators
- Elevator controls
- Lighting and battery systems

Measuring principle

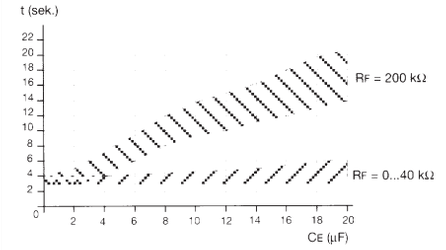
The C 558.01 operates with a variant of a pulse measuring principle. This measuring principle ensures reliable monitoring of modern control voltage systems. The frequency range of the system to be monitored may extend from15-400Hz.

Standards

The C 558.01 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 must be observed!

Measuring time

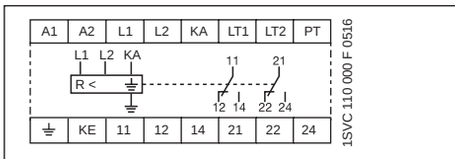


C_E = System leakage capacitance
R_F = Insulation fault
t = Measuring time

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 resp. L1/L2	o	o	x

o = flashing
x = continuous indication



1SVC 110 000 F 0516

A1-A2	Supply voltage
L1-L2-K	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 value and measuring circuit

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

[1] Response times at 1 µF system leakage capacitance
[2] DC internal resistance/Impedance

Type	Supply voltage V_c V	**Order code**	Pack. unit piece	**Price** 1 piece	Weight 1 piece kg/lb
C 558.01	230VAC	**1SAR 470 020 R 0005**	1		0.350/0.77
C 558.01	90-132VAC	**1SAR 470 020 R 0004**	1		0.350/0.77

Remark: 1c/o = SPDT; 2c/o = DPDT

Isolation resistance and earth-leakage monitor C558.02

Technical data, ordering details

Enclosure width 90 mm

C 558.02

- Isolation monitoring device of IT-AC and 3 AC syst ems up to 793V
- Adjustable response value 1Ω–200kΩ
- Power ON and alarm LEDs with fault localization
- Combined test and reset button
- Connection monitoring
- 2c/o
- Opened or closed circuit principle, selectable
- Fault memory, selectable
- Running point LED display
- Sealable enclosure
- An external meter can be connected
- Approvals

Isolation monitor for IT AC systems

The classical power supply system is a pure AC system. It neither contains converters nor DC components. The leakage capacitance is relatively low, i.e. it usually is below 1µF, sometimes slightly above this value. The C558.02 can be used to monitor these systems, up to 793V.
For setting the response value you can use from two response ranges, either 1-20kΩ or 10-200kΩ.

Application in modern power supply systems

- AC and 3 AC systems without DC components
- Motor drives without converters
- Building installation
- Simple machine drives
- Generating sets, mobile generators
- Power supply for public arenas
- Lighting systems
- Air cooling and air conditioning systems

Measuring principle

Superimposed DC voltage with reversing stage.

Standards

The C 558.02 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 must be observed!

Setting the adjustment range

Changing the setting range from x1kΩ / x10kΩ, automatically changes the indication of the kΩ values on the LED bar graph indicator:

Setting range x1kΩ: Meter scale point x1kΩ.

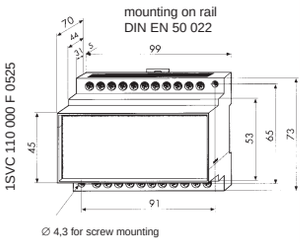
Setting range x10kΩ: Meter scale point has to be multiplied by 10.

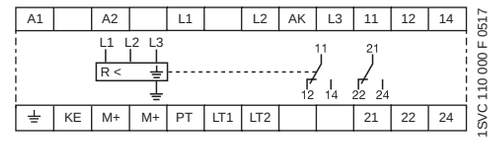
Response delay

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

*) Response times acc. to IEC 61557-8 at R_F=0,5xR_{an} and at 1µF system leakage capacitance.

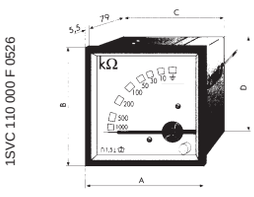
C 558.02





A1-A2	Supply voltage
L1-L2-K	Measuring input
KE, ⏚	PE-connection, earth ground
M+-M-	External measuring instruments
PT	External test button
LT1-LT2	External rset button or bridge for fault storage
11-12/14	c/o contacts
21-22/24	Open- or closed-circuits principle, selectable

C 558.10



Typ	Supply Voltage V_c	**Order code**	Pack.-Unit piece	**Price** 1 piece	Weight 1 piece kg/lb
C 558.02	230VAC	**1SAR 471 020 R 0005**	1		0.350/0.77
C 558.02	90-132VAC	**1SAR 471 020 R 0004**	1		0.350/0.77

Accessories (external kΩ-Measuring instruments)

C 558.10		**1SAR 477 000 R 0100**	1		0.200/0.44

Remark: 1c/o = SPDT; 2c/o = DPDT

Isolation resistance and earth-leakage monitor C 558.03

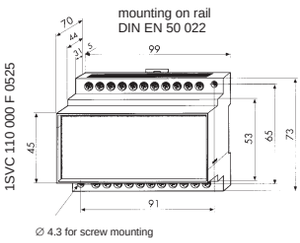
Technical data, ordering details

Enclosure width 90mm

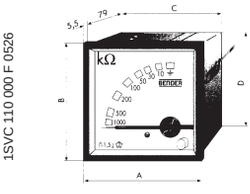
C558.03

- Insulation monitoring of IT-AC, DC and AC/DC systems
- Connection monitoring
- Alarm or system fault indication selectable
- AMP measuring method (EP logon)
- Automatic adaptation to the power system
- Infinitely adjustable response value 2 to 50kΩ or 20 to 500kΩ
- Power-ON LED, alarm LED and kΩ running point LED display
- Combined test and reset switch
- 2c/o contacts
- opened or closed circuit principle, adjustable
- Fault memory, selectable
- Running point LED display
- Sealable housing VDE 0106 T 101
- Environmental conditions comply with EN 50155
- Approvals

C 558.03



C 558.10



Isolation monitor for IT AC systems with DC components and for IT DC systems

The C 558.03 monitors the insulation resistance of IT systems (ungrounded systems) up to AC 690V or DC 400V. It can be universally used in a.c., d.c. or non-uniform power systems.
Interference suppression and capacitances of up to 20µF to earth which are caused by lengthy supply lines have no influence on the measurement.
The integrated AMP measuring method ensures the 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 for power stations and utility companies
- Computer networks
- Mobile generators
- Elevator control systems
- Lighting systems

Measuring principle

Superimposed DC voltage with reversing stage.

Standards

The C 558.03 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 must be observed!

Fault indications

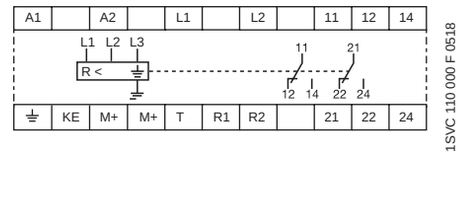
Indication	Alarm LEDs +	Alarm LEDs -	Alarm relay
ALARM AC fault	x	x	x
ALARM DC fault (L+)	x		x
ALARM DC fault (L-)		x	x
Interupption L1/L2 or KE	o	o	x

o = flashing
x = continuous indication

Response delay

Type	*) Response time in the range of 10-200kΩ	*) Response time in the range of 1-20kΩ	Max. system leakage capacitance
C 558.03	< 1s	< 3s	20µF

*) Response times acc. to IEC 61557-8 bei R_F=0,5xR_{an} and at 1 µF system leakage capacitance.



A1-A2	Supply voltage
L1-L2-K	Measuring input
IKE, ⏚	PE-earth ground
M+-M-	External measuring instruments
T	External Test Button
R1-R2	External reset or jumper for failure storage
11-12/14	c/o contacts
21-22/24	Open- or closed-circuits principle, selectable

Type	Supply Voltage V_c	**Order code**	Pack. Unit piece	**Price** 1 piece	Weight 1 piece kg/lb
C 558.03	230VAC	**1SAR 472 020 R 0005**	1		0.350/0.77
C 558.03	90-132VAC	**1SAR 472 020 R 0004**	1		0.350/0.77

Accessories (external kΩ-Measuring instruments)

C 558.10		**1SAR 477 000 R 0100**	1		0.200/0.44

Remark: 1c/o = SPDT; 2c/o = DPDT

Isolation resistance and Earth leakage monitors

Technical data and standards / directives

		CM-IWN-AC	CM-IWN-DC
Input circuit			
Supply voltage - power consumption			
24-240VAC/DC	**A1-A2**	approx. 8VA/2W	approx. 8VA/2W
110-130VAC	**A1-B2**	approx. 3VA	
220-240VAC	**A1-A2**	approx. 3VA	
Tolerance of the supply voltage		-15%...+10%	
Supply voltage frequency AC/DC		15-400Hz or DC	
Supply voltage frequency AC		50-60Hz	
Duty cycle		100%	
Measuring circuit			
Monitoring function		isolation monitoring resistive	
		isolated AC mains	isolated DC mains
Measuring range, threshold value min-max.		1-11kΩ, 10-110kΩ	10-110kΩ
Internal resistance min.		57kΩ	
AC current internal resistance min.		100kΩ	
DC current internal resistance min.		100kΩ	
Test resistance		820Ω	
Max. isolation voltage (L-PE)		415VAC	300VDC
Measuring DC voltage max.		30VDC	24-240VDC
Cable length for delete- check button max.		10m	
Delay time		see page ordering details	<1s at isolation, <0.9x response value
Display of operating status			
Supply voltage		green LED	green LED
Isolation fault		red LED / output relay energized	error L+ red LED, error L- red LED
Output circuits		**15-16/18**	
No. of contacts		1c/o contact	
Operational principle [1]		open-circuit principle	open- or closed-circuit principle, selectable
Contact material		AgCdO	
Rated voltage acc. to VDE0110, IEC664-1, IEC947-1		250V	
Switching voltage min.			
Switching voltage max.		400VAC, 300VDC	
Switching current min.			
Utilzation categories acc. to IEC60947-5-1, EN60947-5-1			
Rated switching current AC12 (resistive)	230V	5A	
Rated switching current AC15 (inductive)	230V	3A	
Rated switching current DC12 (resistive)	24V	5A	
Rated switching current DC13 (inductive)	24V	2A	
Max. mechanical life		30×10^6	
Max. electrical life (acc. to AC12, 230V, 4A)		0.1×10^6	
Short circuit proof, max. fuse rating	n/c contact	4A fast, operating class gL	
	n/o contact	6A fast, operating class gL	
General Data			
Width of enclosure		45mm	
Wire size		2x2.5mm² (2x14 AWG) stranded with wire end ferrule	
Weight		approx. 300g	
Mounting position		any	
Degree of protection housing / terminals		IP50 / IP20	
Operating temperature		-25°C...+65°C	
Storage temperature		-40°C...+85°C	
Mounting		DIN rail (EN50022)	
Standards / directives			
Product standard		IEC60255-6, EN60255-6	
Electromagnetic compatibility		89/336 EWG, 91/263 EWG, 92/31 EWG, 93/68 EWG, 93/67 EWG	
EMC-tests acc. to EN50082-2			
ESD acc. to IEC61000-4-2, EN61000-4-2		level 3 - 6kV/8kV	
HF radiation resistance acc. to IEC61000-4-3, EN61000-4-3		level 3 - 10 (3)V/m	
Burst acc. to IEC61000-4-4, EN61000-4-4		level 3 - 2(1)kV / 5kHz	
Surge acc. to IEC61000-4-5, EN61000-4-5		level 3 - 2(1)kV L-L	
HF line emission acc. to IEC61000-4-6, EN61000-4-6		level 3 - 10(3)V	
Low voltage directive		93/68/EWG	
Vibration resistance acc. to IEC 68-2-6 Fc		mechanical resistance 10G, f = 55Hz, a = 0.95mm, t = 2h per level	
Operating safety		4G	
Environmental tests acc. to IEC68-2-30 Db		24h cycle, 55°C, 93% rel., 96h	
Approvals		**cULus, GL, GOST**	
Isolation data			
Rating acc. to HD625.1 S1, VDE0110, IEC664-1, IEC60255-5			
Rated isolation voltage between supply, meas. and output circuits		250V	
Rated impulse withstand voltage between all isolated circuits		4kV / 1.2 - 50µs	
Test voltage between all isolated circuits		2.5kV, 50Hz, 1 min.	
Pollution category		3	
Overvoltage category		3	

[1] Open-circuit principle: Output relay energizes when the set threshold value is exceeded or passes below the measured value
Closed-circuit principle: Output relay de-energizes when the set threshold value is exceeded or passes below the measured value

Remark: 1c/o = SPDT; 2c/o = DPDT

Motor load monitor CM-LWN

Content

Motor load monitor CM-LWN

Motor load monitor

Examples of use

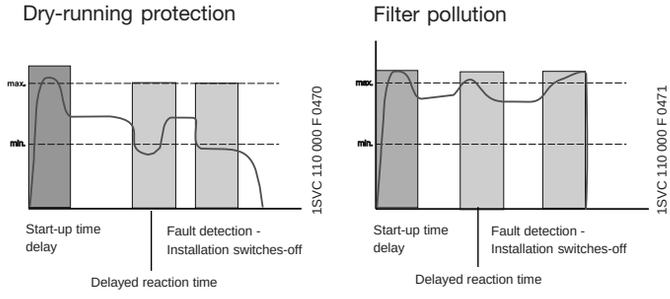
The motor load monitor monitors load states of single and three-phase asynchronous motors.
The evaluation of the phase angle between current and voltage, allows a very precise monitoring of the load states.

Compared to the 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 sensor for its own load status.

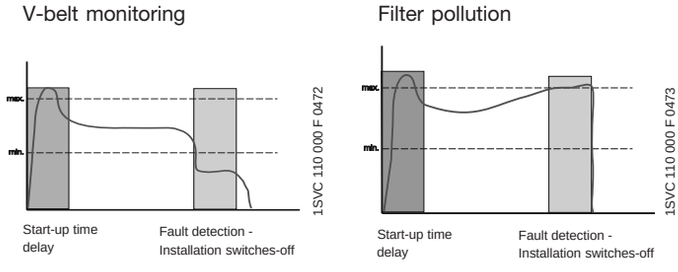
Main applications

- **Pump monitoring**
  - Dry-running protection (underload)
  - Closed valves (overload)
  - Pipe break (overload)
- **Heating, air-conditioning, ventilation**
  - Monitoring of the degree of pollution of filters
  - 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**
  - Overload of means of transportation
  - Clamping of belts (overload)
  - Material accumulation in spiral conveyors (overload)
  - Lifting platforms
- **Machine installation**
  - Wear of tools, e.g. worn disks of circular saws, etc. (overload)
  - Tool breakages (underload)
  - V-belt drives (breakage-underload)

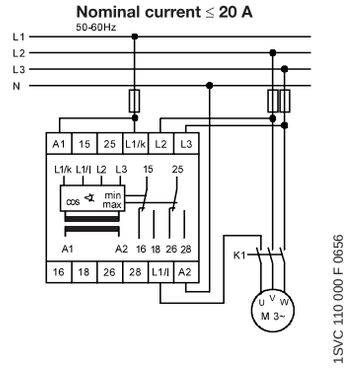
Pump control

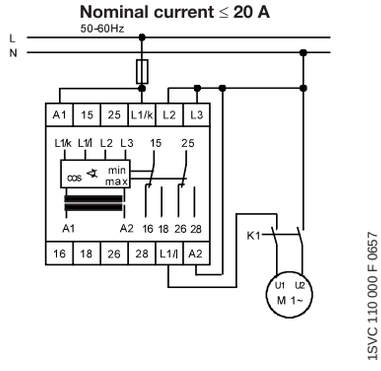


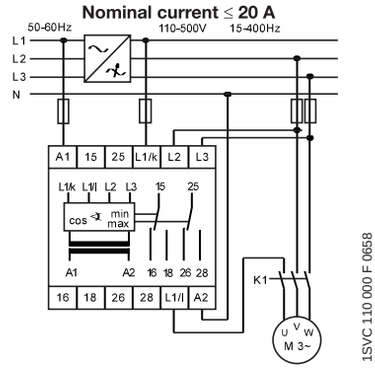
Ventilator monitoring



Examples of wiring



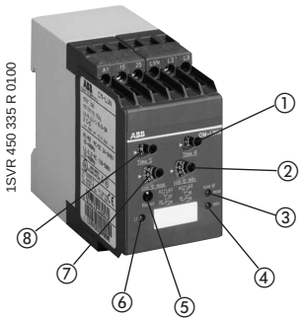




• **Accessories current transformers** 40

Motor load monitor CM-LWN

Ordering details



CM-LWN

① Reaction delay "Time R"
② Threshold limit for "cos φ min"
③ Red LED - cos φ max. exceeded
④ Red LED - cos φ min. below
⑤ Reset button
⑥ Green LED -Supply voltage
⑦ Threshold limit for "cosφ max"
⑧ Starting-up delay adjustable "Time S"

- Monitors status of inductive loads
- Sector monitoring cosφ min and cosφ max in one unit
- 2c/o contacts/ closed-circuit principle
- Starting-up delay adjustable from 0.3-30s
- Direct measuring up to 20A
- Reaction delay adjustable from 0.2-2s
- 1 or 3-phase monitoring
- 3 LEDs to display all operational states
- Approvals

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

The primary application is to monitor asynchronous motors (squirrel cage), having single or 3-phase power supplies, under varying load conditions. The measuring principle is based on the evaluation of the phase difference (φ) between voltage and current in a single phase (power factor).

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

Threshold limits for cos φ max and cos φ min may be set using the LWN monitoring relay.
If either set limit has been reached, an LED lights and the relay will de-energize.
When cos φ again falls within acceptable limits, the relay will revert to its operational state and the LED will resume a steady flashing mode.

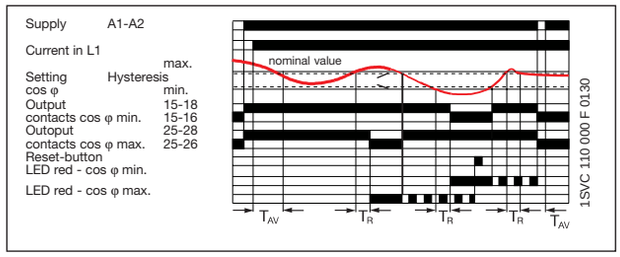
This message can be deleted by the reset button or by switching off the supply.
A time delay (Time S) of 0.3 to 30 secs. can be set for the starting-up of the motor.

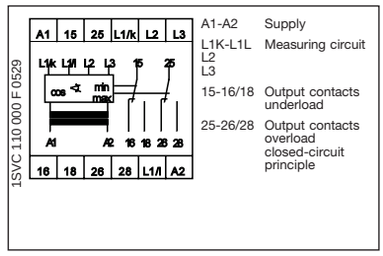
It is also possible to set a reaction delay time (Time R) of 0.2 to 2 secs. for the operating state, to suppress unavoidable load peak-to-peak values.

To guarantee the correct operation of the reaction delay time (Time R), the set value for cos φ max. must be greater than the cos φ min. plus the hysteresis.

The displays for overload and low load must not be active simultaneously. Because supply and measuring circuits are electrically isolated internally, the LWN can be used with different supply voltages.

1 Function





Type	Supply voltage	Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg/lb
Current ranges: 0,05-5A;					
CM-LWN	24-240VAC/DC	**1SVR 450 335 R 0000**	1		0.300/0.66
	110-130VAC	**1SVR 450 330 R 0000**	1		0.300/0.66
	220-240VAC	**1SVR 450 331 R 0000**	1		0.300/0.66
	380- 440VAC	**1SVR 450 332 R 0000**	1		0.300/0.66
	480-500VAC	**1SVR 450 334 R 0000**	1		0.300/0.66
Current ranges: 2-20A;					
CM-LWN	24-240VAC/DC	**1SVR 450 335 R 0100**	1		0.300/0.66
	110-130VAC	**1SVR 450 330 R 0100**	1		0.300/0.66
	220-240VAC	**1SVR 450 331 R 0100**	1		0.300/0.66
	380-440VAC	**1SVR 450 332 R 0100**	1		0.300/0.66
	480-500VAC	**1SVR 450 334 R 0100**	1		0.300/0.66

Remark: 1c/o = SPDT; 2c/o = DPDT

• **Technical data** ..... 62 • **Dimensional drawings** ..... 95 • **Accesories** 95

Motor load monitor CM-LWN

Technical data and standards / directives

		CM-LWN
Input circuit		
Supply voltage power consumption		
24-240VAC/DC	**A1-A2**	approx. 8.4VA/W
110-130VAC	**A1-A2**	approx. 3.6VA
220-240VAC	**A1-A2**	approx. 3.6VA
380-440VAC	**A1-A2**	approx. 3.6VA
480-500VAC	**A1-A2**	approx. 3.6VA
Tolerance of the supply voltage		-15%...+10%
Supply voltage frequency AC version		50-60Hz
Supply voltage frequency AC/DC version		15-400Hz or DC
Duty cycle		100%
Measuring circuit		**L1l-L1k-L2-L3**
Monitoring function		Load monitoring by evaluating the phase difference between current and voltage
Voltage range L1k-L2-L3		110-500VAC single- or three-phase
Current range L1l-L1k		version 0.5-5A version 2-20A
Overload current input		25A for 3s 100A for 3s
Threshold value		cosPhi min and cosPhi max adjustable 0-1
Hysteresis (referring to the Phi-angle in°)		4°
Frequency of measuring voltage		15-400Hz
Measuring cyle time max.		300ms
Time circuit		Display of over and undervoltage fault
Start up time (time S)		0.3-30s adjustable
Reaction time (time R)		0.2-2s adjustable
Timing error within the tolerance of supply voltage		≤ 0.5%
Timing error within temperature range		≤ 0.06% / °C
Display of operational status		
Supply voltage		U, green LED
cos Phi min decreaved		min, red LED
cos Phi max exceeded		max, red LED
Output circuits		**15-16/18, 25-26/28**
No. of contacts		2 x 1c/o
Operating principle[1)]		closed-circuit principle
Contact material		AgCdO
Rated voltage acc. to VDE0110, IEC664-1, IEC947-1		250V
Switching voltage max.		400VAC, 300VDC
Rated switching current AC12 (resistive)	230V	4A
Rated switching current AC15 (inductive)	230V	3A
Rated switching current DC12 (resistive)	24V	4A
Rated switching current DC13 (inductive)	24V	2A
Max. mechanical life		30 x 10^6
Max. electrical life(acc. to AC12, 230V, 4A)		0.1 x 10^6
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		45mm
wire size		2 x 2.5mm² (2x14AWG) stranded with wire end ferrule
Installation position		any
Degree of protection housing/ terminals		IP50 / IP20
Operating temperature		-25°C...+65°C
Storage temperature		-40°C...+85°C
Mounting		DIN rail (EN50022)
Standards / directives		
Product standard		IEC60255-6, EN60255-6
Electromagnetic compatibility		89/336 EWG, 91/263 EWG, 92/31 EWG, 93/68 EWG, 93/67 EWG
EMV-tests acc. to EN50082-2		
ESD acc. to IEC61000-4-2, EN61000-4-2		Level 3 - 6kV/8 kV
HF-radiation resistance acc. to IEC61000-4-3, EN61000-4-3		Level 3 - 10V/m
Burst acc. to IEC61000-4-4, EN61000-4-4		Level 3 - 2kV/5kHz
Surge acc. to IEC1000-4-5, EN61000-4-5		Level 4 - 2kV L-L
HF line emission acc. to IEC61000-4-6, EN61000-4-6		Level 3 - 10V
Low voltage directive		93/68/EWG
Vibration resistance acc. to IEC 68-2-6 Fc		mechanical resistance 10G, f = 55Hz, a = 0.95 mm, t = 2h per level
Operating safety		4G
Climatic test acc. to IEC68-2-30 Db		24h cycle, 55°C, 93% rel., 96h
Approvals		**cULus, GL, GOST**
Isolation data		
Rated HD625.1 S1, VDE0110, IEC664-1, IEC60255-5 Rated insulation voltage between supply- , measuring- and output circuit		250V, 400V, 500V per version
Rated impulse withstand voltage between all isolated circuits		4kV/1.2 - 50µs
Test voltage between all isolated circuits		2.5kV, 50Hz, 1min.
Pollution category		3
Overvoltage cateory		3

Remark: 1c/o = SPDT

Thermistor motor protection relays

Content

Thermistor motor protection relays

Benefits and advantages
Selection table

Operating principle and examples of use of the thermistor motor protection relays

The Thermistor motor protection relays control motors fitted with PTC resistor sensors. The temperature sensors are incorporated in the starter windings and measure directly the motor heating. Direct control is guaranteed under the following operating conditions:

- heavy duty,
- high switching frequency,
- single-phasing,
- high ambient temperature
- insufficient cooling
- breaking a motor
- unbalance

The relay is independent of the motor rated current and the method of starting.
The PTC resistor sensors are connected in series with the terminals Ta and Tb (resp. Ta and Tbx, without short circuit detection). The number of PTC resistor sensors is limited by the sum of the PTC sensor resistors of the individual resistors.
RG = R1 + R2 + RN ≤ 1.5 kΩ.

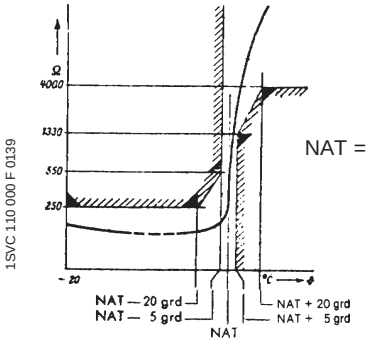
Under normal operating conditions the resistance value is below the response value.
If only one of the PTC resistors heats up excessively, the output relay de-energizes.
After cooling down the output relay energizes automatically, if autoreset is configured.
Devices with hand (push button on front) or remote reset configuration must be controlled on the control input with the required signal.

Further application possibilities:

Temperature monitoring of equipment fitted with PTC resistor sensors, e.g.:

- Machine roller bearings
- Hot-air ventilators
- Oil
- Air
- Heating installations

Resistance characteristic
of one temperature sensor to DIN 44 081.



NAT = rated response temperature

Product overview: Thermistor motor protection

Type	CM-MSE	CM-MSS	CM-MSS	CM-MSS	CM-MSS	CM-MSS	CM-MSS	CM-MSN
Function								
Measuring range								
Number of sensor circuits	1	1	1	1	1	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)
Manual reset	-	-	•	•	•	•	•	•
Remote reset	-	-	•	•	•	•	•	•
Test button	-	-	-	•	•	•	•	•
Output contacts								
Principle of operation	closed-circuit principle							
Number / Type	1n/o	1c/o	2c/o	2c/o	1n/o + 1n/c	1c/o per sensor circuit	1n/o +1n/c total evaluation	1 n/o + 1n/c total evaluation
Width	22.5 mm							45 mm
Supply voltages and Order code								
24ACV	**1SVR 550 805 R 9300**		**1SVR 430 811 R 9300**					
24VAC/DC		**1SVR 430 800 R 9100**	**1SVR 430 810 R 9300**	**1SVR 430 710 R 9300**				
110-130VAC	**1SVR 550 800 R 9300**		**1SVR 430 811 R 0300**	**1SVR 430 711 R 0300**				
220-240VAC	**1SVR 550 801 R 9300**	**1SVR 430 801 R 1100**	**1SVR 430 811 R 1300**	**1SVR 430 711 R 1300**				
380-415VAC				**1SVR 430 711 R 2300**				
24-240VAC/DC					**1SVR 430 720 R 0400**	**1SVR 430 710 R 0200**	**1SVR 430 720 R 0500**	**1SVR 450 025 R 0100**

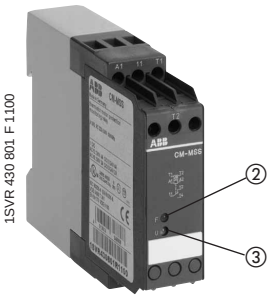
1) Configurable via terminals
2) Auto reset configurable by a permanent link (jumber) by connection terminals S1-T2

Remark: 1c/o = SPDT; 2c/o = DPDT

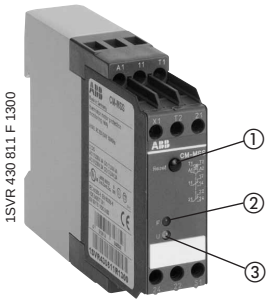
Thermistor motor protection relays CM-MSE, CM-MSS

Ordering details

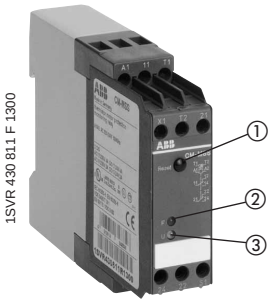
CM-MSE



CM-MSS, Automatic reset



CM-MSS, 2 c/o



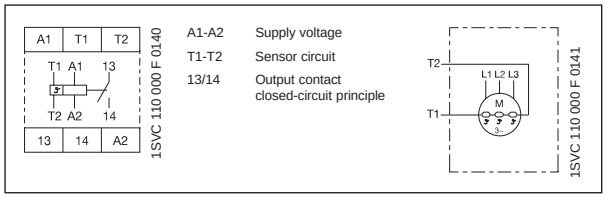
CM-MSS 2 c/o with config. short circuit monitoring

① Reset
② Red LED - fault tripping
③ Green LED - supply voltage

Remark: 1c/o = SPDT; 2c/o = DPDT

CM-MSE

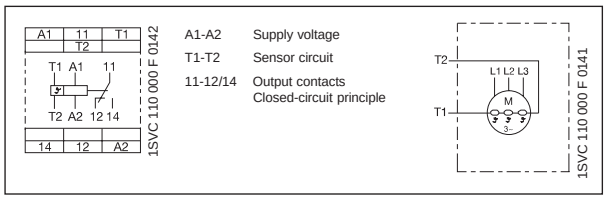
- Automatic reset
- Several sensors can be connected (max. 6 sensors in series)
- Control of bimetals
- 1n/o
- Excellent cost / performance ratio
- Approval c UL us LISTED, PG



Type	Supply voltage	Order number	Pack. unit piece	Price 1 piece	Weight 1 pc. kg/lb
CM-MSE	24 VAC	**1SVR 550 805 R 9300**	1		0.110/0.242
	110-130VAC	**1SVR 550 800 R 9300**	1		0.110/0.242
	220-240VAC	**1SVR 550 801 R 9300**	1		0.110/0.242

CM-MSS, automatic reset

- Automatic reset
- Several sensors can be connected
- 1c/o, 2 LEDs
- Control of bimetals
- Approval c UL us LISTED, PG

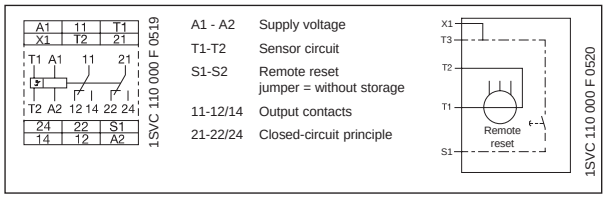


Type	Supply voltage	Order number	Pack. unit piece	Price 1 piece	Weight 1 pc. kg/lb
CM-MSS	24 VAC/DC	**1SVR 430 800 R 9100**	1		0.150/0.33
	220-240VAC	**1SVR 430 801 R 1100**	1		0.150/0.33

CM-MSS, 2 c/o with reset button[1)]

- Storage resettable
- Reset button
- Remote reset
- 2c/o, 2 LEDs
- Approvals c UL us LISTED, GL, PTB, PG

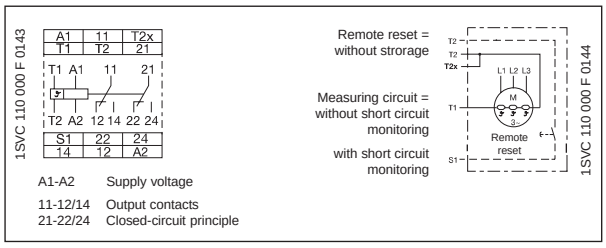
until 06/2003



Type	Supply voltage	Order code	Pack. unit piece	Price 1 piece	Weight 1 pc. kg/lb
CM-MSS	24VAC/DC[1)]	**1SVR 430 810 R 9300**	1		0.150/0.33
	24VAC	**1SVR 430 811 R 9300**	1		0.150/0.33
	110-130VAC	**1SVR 430 811 R 0300**	1		0.150/0.33
	220-240VAC	**1SVR 430 811 R 1300**	1		0.150/0.33

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

- Storage resettable
- Storage reset button
- Remote reset capability
- 2c/o, 2 LEDs
- Short circuit monitoring of the sensor cable
- Approvals
  Ex II (2) G, PTB 02 ATEX 3080, c UL us LISTED, PG

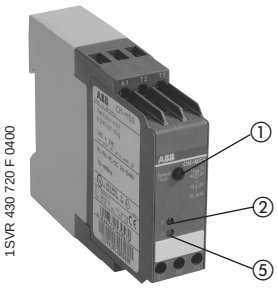


Type	Supply voltage	Order code	Pack.-unit piece	Price 1 piece	Weight 1 pc. kg/lb
CM-MSS	24 VAC/DC	**1SVR 430 710 R 9300**	1		0.150/0.33
	110-130VAC	**1SVR 430 711 R 0300**	1		0.150/0.33
	220-240VAC	**1SVR 430 711 R 1300**	1		0.150/0.33
	380-415 VAC	**1SVR 430 711 R 2300**	1		0.150/0.33

- **Technical data** 69
- **Accessories PTC resistor sensor** 68
- **Dimensional drawings** 95
- **Accessories** 95

Thermistor motor protection relays CM-MSS 24-240VAC/DC, 2-channel, 3 sensor circuits

Ordering details

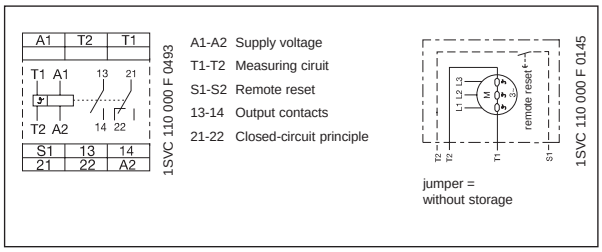


CM-MSS, 24-240VAC/DC

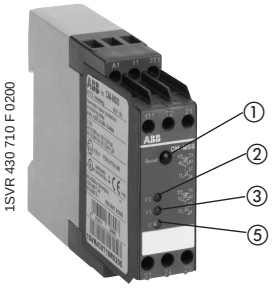
CM-MSS 24-240AC/DC

- Short circuit monitoring of the sensor circuit
- Continuous supply voltage range 24-240VAC/DC
- Configurable non-volatile storage in case of failure
- Storage resettable and test button
- Remote reset button
- Automatic reset configurable
- 2 output contacts 1n/c 1n/o, 2 LEDs
- Approvals

II (2) G, PTB 02 ATEX 3080,



Type	Supply voltage	Order code	Pack. unit piece	Price 1 piece	Weight 1 pc. kg/lb
CM-MSS 24-240AC/DC	24-240VAC/DC	**1SVR 430 720 R 0400**	1		0.150/0.33

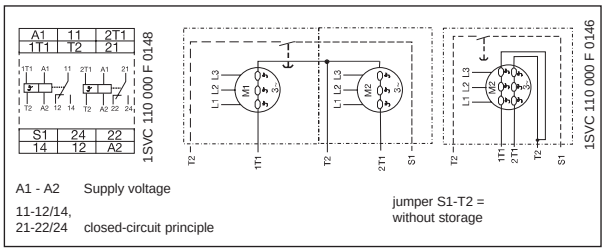


CM-MSS, 2-channel

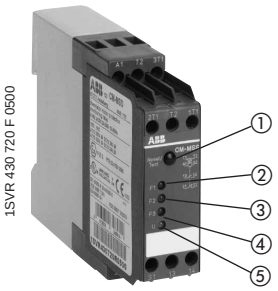
CM-MSS 2-channel, single evaluation

- Short circuit monitoring of the sensor circuit
- Continuous supply voltage range 24-240VAC/DC
- 2 separate sensor circuits to monitor two motors, or to monitor one motor with 2 sensor circuits (prewarning and final switch off)
- Storage resetable and test button
- Automatic reset configurable
- 2c/o, 3 LEDs
- Approvals

II (2) G, PTB 02 ATEX 3080,



Type	Supply voltage	Order code	Pack. unit piece	Price 1 piece	Weight 1 pc. kg/lb
CM-MSS 2-channel	24-240VAC/DC	**1SVR 430 710 R 0200**	1		0.150/0.33

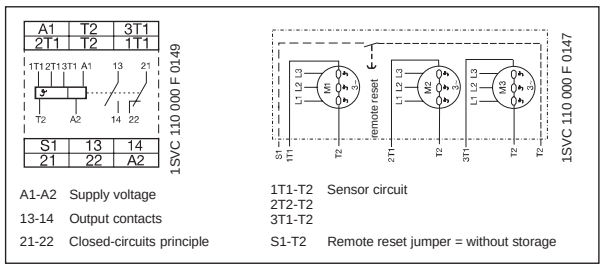


CM-MSS, 3 sensor circuits

CM-MSS 3-sensor circuits, total evaluation

- Short circuit monitoring of the sensor circuit
- Continuous supply voltage range 24-240VAC/DC
- Configurable non-volatile storage
- Remote reset
- Automatic reset configurable
- Storage resetable and test button
- 2 output contacts 1n/c, 1n/o,
- 4 LEDs
- Approvals

II (2) G, PTB 02 AT EX 3080,



Type	Supply voltage	Order code	Pack. unit piece	Price 1 piece	Weight 1 pc. kg/lb
CM-MSS 3 sensor circuits	24-240VAC/DC	**1SVR 430 720 R 0500**	1		0.150/0.33

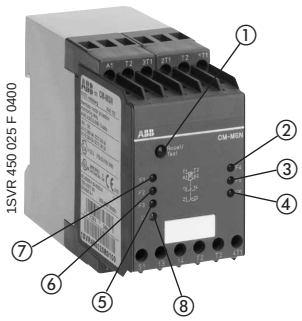
① Reset / Test button
② Red LED - fault tripping F1
③ Red LED - fault tripping F2
④ Red LED - fault tripping F3
⑤ Green LED - Supply voltage

Remark: 1c/o = SPDT; 2c/o = DPDT

- **Technical data** 69
- **Accessories PTC resistor sensor** 68
- **Dimensional drawing** 95
- **Accessories** 95

Thermistor motor protection relay CM-MSN 6 sensor circuits

Ordering details

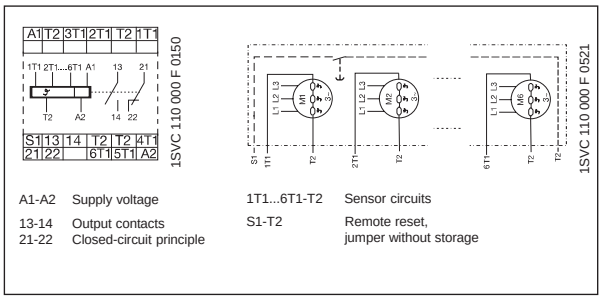


CM-MSN, 6 sensor circuits

① Reset / Test button
② up to ⑦ Red LED fault tripping F1 to F6
⑧ Green LED - supply voltage - U

- Total evaluation of up to 6 sensor circuits
- Short circuit monitoring of the sensor circuit
- Continuous supply voltage range 24-240VAC/DC
- Configurable non-volatile storage in case of failure
- Remote reset
- Automatic reset configurable
- Storage resettable and test button
- 2 output contacts 1n/c + 1n/o, 7 LEDs
- Approvals

II (2) G, PTB 02 ATEX 3080, c UL us LISTED, PG



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

1T1...6T1-T2 Sensor circuits
S1-T2 Remote reset, jumper without storage

Type	Supply voltage	Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg/lb
CM-MSN	24-240VAC/DC	**1SVR 450 025 R 0100**	1		0.230/0.506

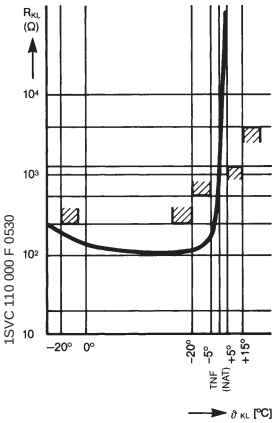
Remark: 1 c/o = SPDT; 2 c/o = DPDT

- **Technical data** 69
- **Accessories PTC resistor sensor** 68
- **Dimensional drawing** 95
- **Accessories** 95

Thermistor motor protection
PTC resistor sensor C 011

General information, technical data, ordering details

Characteristic of the temperature sensor



General information

The PTC thermistor temperature sensors (temperature, dependent with positive temperature coefficient) must be selected by the manufacturer of the motors depending on:

- the motor insulation class IEC Publication 34-11
- the motor utilization category
- the special characteristics of the motor, such as conductor cross-sections of the windings, permissible overload factor etc.
- special conditions prescibed by the user, such as permissible ambient temperature, risks resulting from locked rotor, extent of permitted overloading etc.

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

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

The sensors are suitable for embedding in motor windings with rated operating voltages of up to 660 VAC.
Conductor length: 500 mm per sensor.

A 14 V DV varistor can be connected in parallel to protect the sensors from overvoltages. Because of their characteristics, the control units can be used with thermistor sensors of other manufacturers to DIN 44 081 and DIN 44 082.

Technical data

Characteristics	Sensor type C 011
Cold state resistance	50 -150Ω at 25°C
Warm state resistance ± 5 to 6 K of rated temperature, TNF (NAT)	10 000Ω
Thermal time constant sensor open [1]	2.5 - 3.5s
Short circuit current density	max. 50A/mm²
Max. permitted voltage at sensor terminals	max. 2.5V
Permitted ambient temperature	
• short-term	+ 275°C
• continuous	+ 175°C

[1] not embedded in windings.

Temperature sensor type C _ _ _

Type	Rated temperature ° C	Color coding	Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg/oz
Temperature sensor type C 011, normal version to DIN 44081						
C 011- 70	70	white-brown	**GHC 011 0003 R 0001**	3		0.002/0.072
C 011- 80	80	white-white	**GHC 011 0003 R 0002**	3		0.002/0.072
C 011- 90	90	green-green	**GHC 011 0003 R 0003**	3		0.002/0.072
C 011-100	100	red-red	**GHC 011 0003 R 0004**	3		0.002/0.072
C 011-110	110	brown-brown	**GHC 011 0003 R 0005**	3		0.002/0.072
C 011-120	120	grey-grey	**GHC 011 0003 R 0006**	3		0.002/0.072
C 011-130	130	blue-blue	**GHC 011 0003 R 0007**	3		0.002/0.072
C 011-140	140	white-blue	**GHC 011 0003 R 0011**	3		0.002/0.072
C 011-150	150	black-black	**GHC 011 0003 R 0008**	3		0.002/0.072
C 011-160	160	blue-red	**GHC 011 0003 R 0009**	3		0.002/0.072
C 011-170	170	white-green	**GHC 011 0003 R 0010**	3		0.002/0.072
Triple-temperature sensor type C 013						
C 0113-150	150	black-black	**GHC 011 0033 R 0008**	1		0.006/0.218

Thermistor motor protection relays CM range

Technical data and standards

		CM-MSE, CM-MSS, CM-MSN
Input circuit		
Supply voltage - power consumption:		
24VAC	**A1-A2**	approx. 1.5VA
24VAC/DC	**A1-A2**	approx. 1.1VA/0.6W
110-130VAC	**A1-A2**	approx. 1.5VA
220-240VAC	**A1-A2**	approx. 1.5VA
380-440VAC	**A1-A2**	approx. 1.7VA
24-240VAC/DC	**A1-A2**	approx. 1.4-1.7W / approx. 3.5-5.7VA
Tolerance of supply voltage		-15%...+10%
Supply voltage frequency		AC: 50-60Hz AC/DC: 15-400Hz
Duty cycle		100%
Measuring circuit		**T1-T2/T2x, 1Ta...1Tb-T2**
Monitoring function		Temperature control with PTC sensors
Number of sensor circuits		1, 2, 3 or 6, see ordering details
Short circuits detection		see ordering details
Non volatile storage		see ordering details
Test function		see ordering details
Sensor circuit		
Temperature switch off resistance (relay de-energizes)		3.6kOhm +/-5%, CM-MSE: 2.7-3.7kOhm, (3050+/-550Ohm[3])
Temperature switch on resistance (relay energizes)		1.6kOhm +/-5%, CM-MSE: 1.7-2.3kOhm, (1900+/-400Ohm[3])
Short circuit switch off resistance (relay de-energizes)		<20Ohm
Short circuit switch on resistance (relay energizes)		>40Ohm
Max. total resistance in cold states		<=1.5kOhm
Max. cable length for short circuit detection		2x100m at 0.75mm², 2x400m at 2.5mm²
Reaction time		<100ms
Control circuit for storage and hysteresis function		
Remote reset **S1-T2**		n/c contact
Max. no load voltage		approx. 25V, 5.5V (24-240VAC/DC versions)
Max. cable length		<=50m, 100-200m shielded
Display of operational status		
Supply voltage		U - Green LED
Fault tripping		F - Red LED
Output circuits		**11-12/14, 21-22/24, 13-14, 21-22**
Number of contacts		1n/o, 1c/o, 2c/o, 1n/c + 1c/o
Opened circuits principle [1]		closed-circuit principle
Contact material		AgCdO
Rated voltage acc. to VDE0110, IEC664-1, IEC947-1		250 V
Rated switching voltage max.		250V
Rated switching current AC12 (resistive) 230V		4A
Rated switching current AC15 (inductive) 230V		3A
Rated switching current DC12 (resistive) 24V		4A
Rated switching current DC13 (inductive) 24V		2A (1.5A - n/c[2])
Maximum mechanical life		30 (10 [2]) x 10⁶
Maximum electrical life (acc. to AC12, 230V, 4A)		0.1 x 10⁶
Short circuit proof, max. fuse rating	n/c	2A (4A[2]) fast, operation class gL
	n/o	10A (6A[2]) fast, operation class gL
General data		
Enclosure width		22.5mm / 45mm CM-MSN
Wire size		2 x 2.5mm² (2 x 14 AWG) stranded with wire end ferrule, CM-MSE: 2x1.5mm² (2 x 16 AWG)
Weight		approx 150g/0.33lb, CM-MSE: approx. 110g/0.24lb
Mounting position		any
Degree of protection: housing / terminals		IP50 / IP20
Operating temperature		-20°C...+60°C, CM-MSN: -25°C...+65°C
Storage temperature		-40°C...+80°C
Mounting		DIN rail (EN50022)
Standards / directives		
Product standard		IEC255-6, VDE0660 T302, T303, EN60947-5-1
Electromagnetic compatibility		89/336 EWG, 91/263 EWG, 92/31 EWG, 93/68 EWG, 93/67 EWG
ESD acc. to IEC61000-4-2, EN61000-4-2		Level 3 - 6 kV / 8 kV
HF- radiation resistance acc. to IEC61000-4-3, EN61000-4-3		Level 3 - 10 V/m
Burst acc.to IEC61000-4-4, EN61000-4-4		Level 3 - 2 kV / 5 kHz
Surge acc. to IEC61000-4-5, EN61000-4-5		Level 3/4 - 1/2 kV
HF line emmision acc. to IEC61000-4-6, EN61000-4-6		Level 3 - 10 V
Low voltage directive		93/68/EWG
Operating safety		4G
Resistance to vibration		10G, f = 55Hz, a = 0.95 mm, t = 2h per level
Environmental tests acc. to IEC68-2-30 Db		24h Zyklus, 55°C, 93% rel., 96h
Approvals		**cULus, part. GL, part. ATEX, GOST**
Isolation data		
Rated insulation between supply-, measuring- a. output circuit		250V
Rated impulse withstand voltage between all isolated circuits		4kV / 1.2 - 50µs
Test voltage between all isolated circuits		2.5kV, 50Hz, 1min.
Pollution category		3
Overvoltage category		3

[2] 1SVR 430 710 R 0200 [3] 1SVR 430 810 R 9300, 1SVR 430 800 R 9100
1SVR 430 8xx R xxxx

Remark: 1c/o = SPDT; 2c/o = DPDT

Notes

Temperature monitoring relays C510

for PT100/1000, KTY83/84 and NTC

Content

Temperature monitoring relays C510 for PT100/1000, KTY83/84 and NTC

C510, 1 threshold value

C511, 2 threshold value

C 512 2 thresholds 1 sensor

C 513 2 thresholds 1-3 sensors

Overview

The C51x temperature monitoring relays can be used for the measurement of temperatures in solid, liquid and gaseous media. The temperature is detected by the sensor in the medium, evaluated by the device and monitored to determine whether it lies within an operating range (window function) or has risen above or fallen below this range. The family is composed of analog-adjustable devices with one or two thresholds and digital devices. The output relay switches on or off depending on the temperature and the set points (selectable open- or closed-circuit principle).

Analog tripping devices

- Sensor types: PT100.
- Measuring concept for 2- and 3-wire sensors.
- Electrical isolation between the sensors and the power supply (except 24VAC/DC devices).
- Separate design for the crossing of the upper or lower threshold.
- Measurement ranges for - 50°C to + 50°C / 0°C-100°C / 0°C-200°C.
- Adjustable threshold value for temperature and hysteresis of 2-20%.
- Closed-circuit principle.
- Small 22.5mm enclosure with 12 terminals.

With one threshold value

- Power supply 24VAC/DC or 110/230VAC.
- Display via LED for power supply and relay status.
- 1 n/o and 1 n/c contact.

With two threshold values

- Additional settable threshold for second value (hysteresis for the 2nd threshold amounts to 5% of the measuring range).
- Power supply 24-240VAC/DC or 24VAC/DC.
- LED display for power supply and both relay states.
- Open-or closed-circuit principle selectable.
- 1 n/o contact and a 1c/c contact.

Digital tripping devices

- High-end temperature monitor for 1 or 1-3 sensors.
- Multi-functional digital display and three LEDs (for threshold values and ready).
- Settable sensor types.
- Selectable over or under temperature measuring or window function.
- Selectable open- or closed-circuit principle.
- Hysteresis for both threshold values (1 to 99K).
- Memory function selectable via external (Y1/Y2).
- 1n/o contact and 2c/o contacts.
- Settable time delay of 0-999s.
- Detection of signal loss and short circuits with a dedicated signaling contact (1n/o).
- Non-volatile storage of the setting parameters.
- 45 mm enclosure with 24 terminals.
- Measuring principle for 2 wire and 3 wire sensors.
- Electrical isolation (except 24VAC/DC devices).
- In the 3-sensor version the status of the single sensors is displayed if there is a rise above or drop below the threshold. You must determine which one of the connected sensors has exceeded or dropped below either one or both of the threshold values.

Use

- Options for the evaluation of 1 to 3 sensors in a single device, e.g. for multiple monitoring of a system or for motor protection.
- Extremely simple adjustment without any complicated menus.
- Graduated product range; the right device for every application.
- High-end tripping devices with digital display – settable for a wide temperature range and for various sensor types.
- Settable hysteresis.
- Quick error diagnostics through the detection of short circuits and breaking of the sensor wire.
- Wide-voltage range power supply units reduce the number of part numbers.
- Easy-to-program 2 or 3-point control.

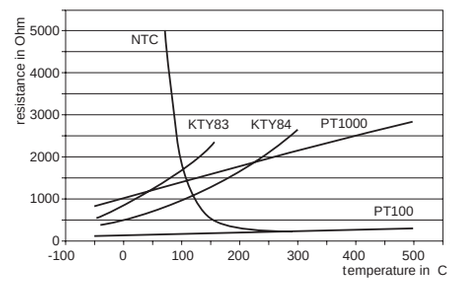
Field of application

The C51x temperature monitoring relays can be used almost anywhere to prevent that the temperature rises or drops below a given threshold, e.g.: monitoring of set temperature limits and the output of an alarm message for:

- Motor and system protection
- Panelboard temperature monitoring
- Frost monitoring.
- Temperature limits for process variables in the packaging or electroplating industries
- 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
- Monitoring of coolants

Remark: 1c/o = SPDT; 2c/o = DPDT

Resistance sensors - Characteristic curves



• **Technical data** ..... 75 • **Dimensional drawings** 95

Temperature monitoring relays C510 for PT100/1000, KTY83/84, NTC

Ordering details

Type	Order code	Sensor	Description	Monitoring function	Measuring range	Contact elements	Displays	Control supply voltage	Price 1 piece
Analog setting, 1 threshold value, overall width 22.5 mm									
In analog devices all of the settings are adjusted with a front face knob. A threshold value and a hysteresis of 2 - 20% can be set. This product series was developed for application requiring a setting precision of ± 5%.									
C510.01-24	**1SAR 700 001 R0005**	PT100	1 threshold value, closed-circuit principle, non-latching	Upper threshold	- 50 to + 50 °C	1n/o + 1n/c	2 LEDs	24VAC/DC 110/230VAC	
C510.01-K	**1SAR 700 001 R0006**								
C510.02-24	**1SAR 700 002 R0005**				0 to + 100 °C			24VAC/DC 110/230VAC	
C510.02-K	**1SAR 700 002 R0006**								
C510.03-24	**1SAR 700 003 R0005**				0 to + 200 °C			24VAC/DC 110/230VAC	
C510.03-K	**1SAR 700 003 R0006**								
C510.11-24	**1SAR 700 004 R0005**	PT100	1 threshold value, closed-circuit principle, non-latching	Lower threshold	- 50 to + 50 °C	1n/o + 1n/c	2 LEDs	24VAC/DC 110/230VAC	
C510.11-K	**1SAR 700 004 R0006**								
C510.12-24	**1SAR 700 005 R0005**				0 to + 100 °C			24VAC/DC 110/230VAC	
C510.12-K	**1SAR 700 005 R0006**								
C510.13-24	**1SAR 700 006 R0005**				0 to + 200 °C			24VAC/DC 110/230VAC	
C510.13-K	**1SAR 700 006 R0006**								
Analog setting, 2 threshold values, overall width 22.5 mm (warning and switch-off)									
In analog devices with two threshold values all of the settings are carried out by means of a knob. A threshold value and a hysteresis of 2 - 20% can be set. The hysteresis acts on threshold value 1. As regards threshold value 2, a hysteresis of 5% is applied. This product series was developed for simple applications requiring a setting precision of ± 5%.									
C511.01-24	**1SAR 700 011 R0005**	PT100	2 thresh. values, open- or closed-circuit principle selectable non-latching	Upper threshold	- 50 to + 50 °C	1n/o + 1c/o	3 LEDs	24VAC/DC 24-240VAC/DC	
C511.01-W	**1SAR 700 011 R0010**								
C511.02-24	**1SAR 700 012 R0005**				0 to + 100 °C			24VAC/DC 24-240VAC/DC	
C511.02-W	**1SAR 700 012 R0010**								
C511.03-24	**1SAR 700 013 R0005**				0 to + 200 °C			24VAC/DC 24-240VAC/DC	
C511.03-W	**1SAR 700 013 R0010**								
C511.11-24	**1SAR 700 014 R0005**	PT100	2 thresh.values, open-or closed-circuit principle selectable non-latching	Lower threshold	- 50 to + 50 °C	1n/o + 1c/o	3 LEDs	24VAC/DC 24-240VAC/DC	
C511.11-W	**1SAR 700 014 R0010**								
C511.12-24	**1SAR 700 015 R0005**				0 to + 100 °C			24VAC/DC 24-240VAC/DC	
C511.12-W	**1SAR 700 015 R0010**								
C511.13-24	**1SAR 700 016 R0005**				0 to + 200 °C			24VAC/DC 24-240VAC/DC	
C511.13-W	**1SAR 700 016 R0010**								
Digital setting, 2 threshold values, overall width 45 mm									
The 3-digit LED display always shows the current temperature. Sensor monitoring is provided through a dedicated relay with a 1n/o contact that reports a sensor failure or short circuit. In programming mode the relay is switched off. Digital temperature monitoring relays are user friendly.									
C512-24	**1SAR 700 100 R0005**	PT100/ 1000 KTY 83/84; NTC[1)]	1 sensor, latching/ non-latching	Upper/ lower threshold/ windows function, selectable	- 50 to + 500°C	1c/o+ 1c/o+ 1n/o	3 LEDs + digital display	24VAC/DC 24-240VAC/DC	
C512-W	**1SAR 700 100 R0010**								
C513-W	**1SAR 700 110 R0010**		1 to 3 sensors latching/ non-latching					24-240VAC/DC	

The following parameters are settable:

- Sensor type, PT100/1000, KTY 83/84, NTC-B57227-K333-A1
- Up to three sensors (C513-W)
- 2 threshold values, ϑ1, ϑ2
- 1 hysteresis; acts on boths threshold values
- 1 delay time, acts on both threshold values
- Opened or closed circuit principle selectable
- Function, max./min. threshold limit or window monitoring
- Memory function possible through external jumpers

Limitation of the selected sensor type

Depending on the sensor type, the measuring range of the 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

Remark: 1c/o = SPDT; 2c/o = DPDT

Accessories

Varying cover marking for digital devices

Type			Order code	Price 1 piece
C512-D	1 sensor	German	**1SAR 700 101 R0100**	
C512-E		English	**1SAR 700 102 R0100**	
C513-D	1 to 3 sensors	German	**1SAR 700 111 R0100**	
C513-E		English	**1SAR 700 112 R0100**	

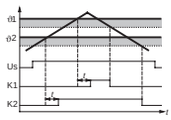
Temperature monitoring relays C510 for PT100/1000, KTY83/84, NTC

Function diagrams / Circuit diagrams

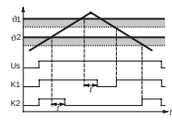
Function diagrams

Overtemperature

open-circuit principle

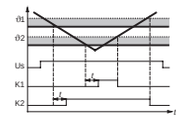


closed-circuit principle

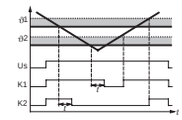


Undertemperature

open-circuit principle



closed-circuit principle

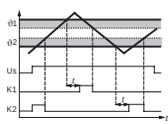


Function principle with memory function

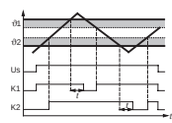
Example of overtemperature, closed circuit current principle

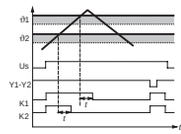
Window monitoring

open-circuit principle



closed-circuit principle





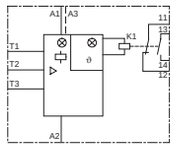
absolute limit

hysteresis range

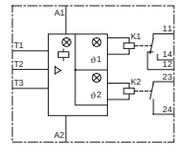
Circuit diagrams

Connection examples

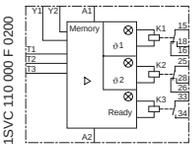
C510



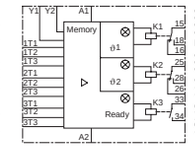
C511



C512



C513



General marking

A1, A2, A3 Power supply connections
K1, K2, K3 Output relays

Marking for C510/C511

LED: "Power supply"
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: "Power supply"
T1-T3 = Sensor connection
Y1/Y2 = Memory jumper connection

Marking for C513

ϑ1 = LED: "Relay 1 energized"
ϑ2 = LED: "Relay 2 energized"
Ready = LED: "Power supply"
1T1 -1T3 = Sensor connection 1
2T1 - 2T3= Sensor connection 2
3T1 - 3T3= Sensor connection 3
Y1/Y2 = Memory jumper connection

ATTENTION!

When using resistance sensors with two-wire connections a jumper must be inserted between T2 and T3.

Digital tripping devices

Once the temperature has reached the set threshold value of ϑ1, the output relay K1 energizes or de-energizes (depending on the selected mode open- or closed circuit principle) status after the set time delay t (K2 reacts in the same way at ϑ2).

Analog tripping devices

When the set threshold value is reached, the output relay K1 energizes or de-energizes. In devices with 2 threshold values relay K2 reacts when the second set threshold value is reached.
A time delay cannot be set ($t = 0$).
The relays return to their original status immediately if the temperature reaches the set hysteresis value.

Once the temperature has reached the upper threshold value of ϑ1, output relay K1 changes its switching status after the set time t.
The relays return to their original status immediately if the temperature reaches the set hysteresis value.
K2 reacts similarly at the lower threshold value of ϑ2.

Once the temperature has reached the set threshold value of ϑ1, the output relay K1 transfers after the set time *t*.
(K2 reacts in the same way at ϑ2).

The relays return to their original status if the temperature dropps below the set hysteresis value and the Y1-Y2 connection is interrupted.

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 setting the tripping device.

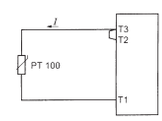
A jumper must be connected between terminal T2 and T3.
The following table can be used when using a PT100 to determine temperature errors along the length of the wire.

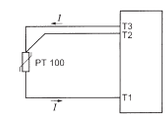
Temperature error depending on the wire length and cross-section with PT100 sensors and an ambient temperature of 20°C, in K

Wire length in mm	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. The tripping device can hence calculate and take into account the wire resistance automatically.





Wire error

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

Temperature monitoring relays C510 for PT100/1000, KTY83/84, NTC

Technical data

General data

Type			C510	C511	C512/C513
Sensor type			PT100	PT100	PT100; 1000; KTY83/84; NTC
Enclosure width			22.5mm		45
Operating range of supply voltage			0.85V-1.1V x U_S		
Rated power consumption			< 2W/VA		< 4
Auxiliary circuit					
Contact elements			1n/o + 1n/c	1c/o + 1n/o	1c/o + 1c/o + 1n/o
Rated operating currents I_e					
AC 15 at 230V, 50Hz			3A		
DC 13 at 24V			1A		
DC 13 at 240V			0.1A		
Fuse DIAZED					
Operating class		gL/gG	4A		
Electrical life time	AC 15 at 3 A		100,000		
Mechanical time life					
Mechanical switching operations			30 x 10^6		
Tripping device					
Measuring precision at an ambient temperature of 20°C (T20)			typ. < ± 5% from the full-scale value		< ± 2K ± 1 digit
Reference junction precision			—	—	—
Ambient temperature deviations					0.05 °C per K
in % of the measuring range			< 2%	< 2%	deviation from T20
Measuring cycle				500ms	
Hysteresis settings					
for temperature 1			2 to 20% of the full-scale value		1 to 99 Kelvin,
for temperature 2			5% of the full-scale value		for both values
Sensor circuit					
Standard sensor current					
PT100			standard 1mA	standard 1mA	standard 1mA
PT1000 / KTY83 / KTY84 / NTC			standard 0.2mA	standard 0.2mA	standard 0.2mA
Open sensor detection			No		Yes [1]
Short circuit detection			No		Yes
3-wire line connection			Yes [2]	Yes [2]	Yes [2]
Enclosure					
Environmental influences					
Permissible ambient temperature			– 25°C to 60°C		
Permissible storage temperature			– 40°C to 80°C		
Mounting position			any		
Protection class as per EN 60529			Terminals: IP20; cover: IP40		
Rated insulation voltage U_i					
(Pollution degree 3)			300VAC		
Wire sizes					
Threaded terminal			M 3.5 (Standard size 2 flat-bladed screwdriver and Pozidriv 2)		
– single-wire		mm^2	1 x (0.5 to 4) / 2 x (0.5 to 2.5)		
– stranded, with wire end ferrule		mm^2	1 x (0.5 to 2.5) / 2 x (0.5 to 1.5)		
– AWG wires, single-wire or stranded		AWG	2 x (20 to 14)		
– Breakaway torque		Nm	0.8 to 1.2		
Vibration resistance			5 to 26Hz/0.75mm		
Shock Resistance IEC 68-2-27			15g		

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

2) 2-wire terminal of the resistance sensors with jumper between T2 and T3.

Standards / directives

- 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 under preparation

Remark: 1c/o = SPDT; 2c/o = DPDT

Notes

Liquid level monitoring and control

Content

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

Ordering details

CM-ENE-MIN

CM-ENE-MAX

① Yellow LED - State of r elay

- Monitors pump systems for dry running (ENE MIN) and overflow (ENE MAX)
- Connection possibility of 2 electrodes C and MIN/MAX
- 1n/o:
  opened-circuit principle - ENE MIN
  closed-circuit principle ENE MAX
- 3 supply voltage versions
- Optimal price/performance ratio
- Approvals

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

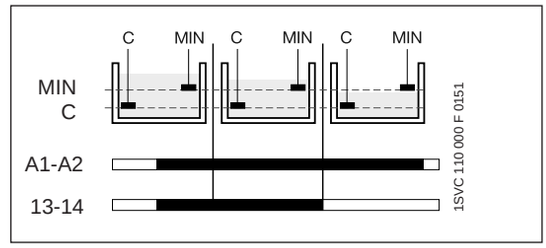
The measuring principle is based on change in resistance that is sensed by single-pole electrodes after having been wetted. The single-pole electrodes (see section Accessories) are connected to terminals C and MIN or MAX.

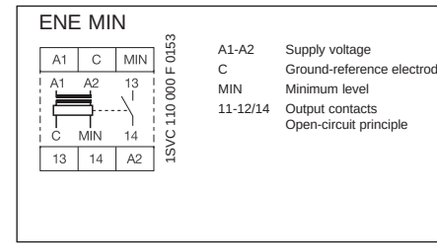
When the supply voltage is applied to A1-A2 and the electrodes are wetted, the output relay of the CM-ENE MIN is energized and the output relay of the CM-ENE MAX is de-energized.

When the electrodes of the CM-ENE MIN are no longer wetted the output relay will be de-energized.

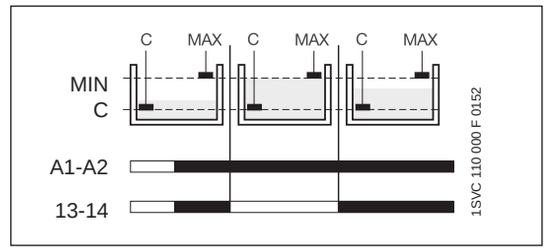
When those of the CM-ENE MAX are no longer wetted the output relay energizes

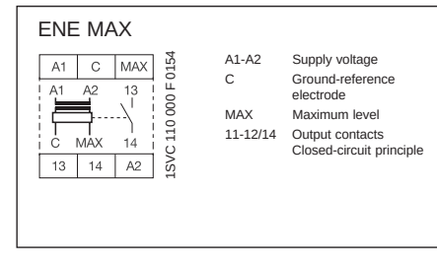
Function ENE MIN





Function ENE MAX





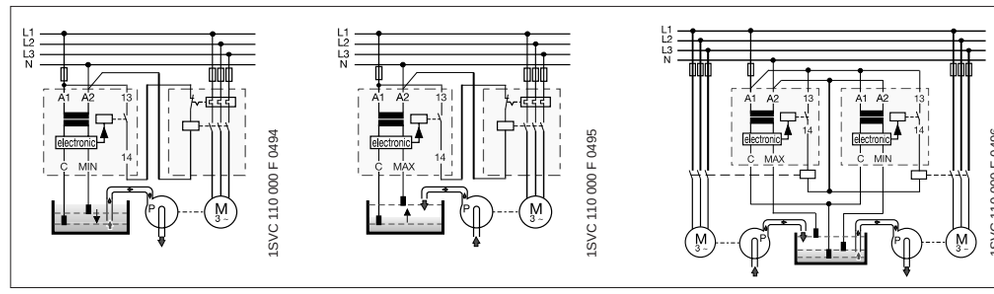
When using a metal tank the electrode C is not required. The cable can be connected directly to the metallic surface of the tank.

Example application

ENE MIN / drain

ENE MAX / fill

ENE MIN and ENE MAX



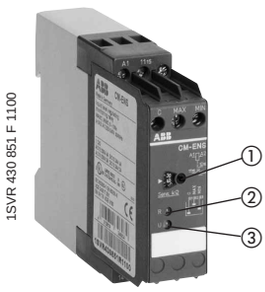
suitable		not suitable	
Well water	Acids, bases	Chemically pure water	Ethylene glycol
Drinking water	Liquid fertilizers	Fuel	High-percentage alcohol
Sea water	Milk, beer, coffee	Oils	Paraffins
Waste water	Low-percentage alcohol	Explosive liquids	Lacquers
	...		...

Type	Supply voltage	Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg/lb
CM-ENE-MIN	24 VAC	**1SVR 550 855 R 9300**	1		0.150/0.33
	110-130VAC	**1SVR 550 850 R 9300**	1		0.150/0.33
	220-240VAC	**1SVR 550 851 R 9300**	1		0.150/0.33
CM-ENE-MAX	24 VAC	**1SVR 550 855 R 9400**	1		0.150/0.33
	110-130VAC	**1SVR 550 850 R 9400**	1		0.150/0.33
	220-240VAC	**1SVR 550 851 R 9400**	1		0.150/0.33

• **Accessories** ..... 83 • **Technical data** ..... 84 • **Dimensional drawings** 95

Liquid level relay CM-ENS

Ordering details



CM-ENS

① "Sens." (Sensitivity) Setting potentiometer Response sensitivity

② Yellow- LED operational states

③ Green LED - supply voltage

- Monitors and controls levels of liquids (when emptying or filling tanks)
- Monitors and controls ratios of mixtures (conductivity of liquids)
- Response sensitivity 5-100kΩ
- 4 supply voltage versions from 24-415VAC
- 1c/o
- LEDs to indicate operational states
- VDE approved version with safe isolation acc. to VDE 0160
- Approvals

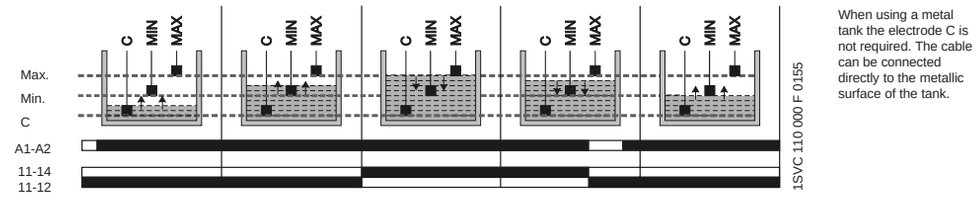
The CM-ENS monitors levels of conductive liquids and fluids, and is used for liquid level control in pump systems.They can be used for fill or drain applications.

It is also suitable for monitoring conductivity of liquids. The measuring prinicple is based on a change in resistance that is sensed by single-pole electrodes. When the supply voltage is applied to the terminals A1, A2 the output relay de-energizes.

The probes must be connected to C, MAX, MIN. The output relay energizes when the liquid exceeds the maximum level (C and MAX wet) and de-energizes when it is below the minimum level (MAX and MIN dry).

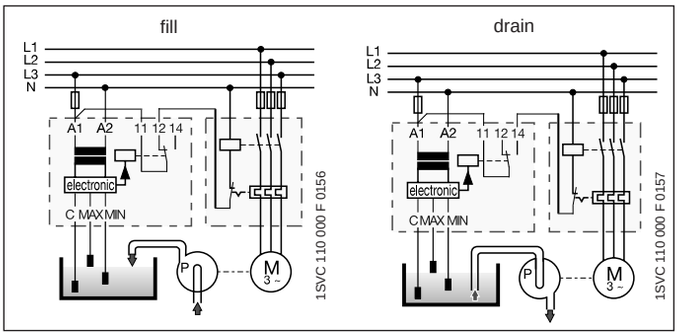
Based on the measuring circuit there will be an operating delay of approx. 250 ms at maximum sensitivity. Different levels in one tank can be controlled by up to 5 CM-ENS without interfering with each other.

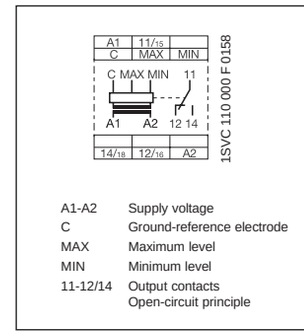
Functional diagram



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

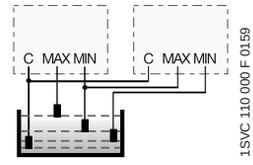
Example application





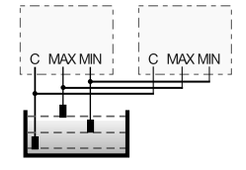
A1-A2	Supply voltage
C	Ground-reference electrode
MAX	Maximum level
MIN	Minimum level
11-12/14	Output contacts Open-circuit principle

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



Redundancy
A redundant liquid level monitoring or control can be realized by connecting the electrodes to two units.

This makes the application much safer.



suitable		not suitable	
Well water	Acids, bases	Chemically pure water	Ethylene glycol
Drinking water	Liquid fertilizers	Fuel	High-percentage alcohol
Sea water	Milk, beer, coffee	Oils	Paraffins
Waste water	Low-percentage alcohol	Explosive liquids	Lacquers
	...		...

Type	Supply voltage	Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg/lb
CM-ENS	24VAC	**1SVR 430 851 R 9100**	1		0.150/0.33
	110-130VAC	**1SVR 430 851 R 0100**	1		0.150/0.33
	220-240VAC	**1SVR 430 851 R 1100**	1		0.150/0.33
	380-415VAC	**1SVR 430 851 R 2100**	1		0.150/0.33
	220-240VAC[1)]	**1SVR 430 851 R 1300**	1		0.150/0.33

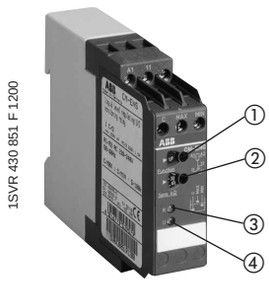
Remark: 1c/o = SPDT; 2c/o = DPDT

• **Accessories** ..... 83 • **Technical data** ..... 85 • **Dimensional drawings** 95

[1)] Version with safety isolation acc. to VDE 0160

Liquid level relay CM-ENS UP/DOWN

Ordering details



CM-ENS UP/DOWN

① "Func." Function selector switch
"UP"- fill
"DOWN" - drain

② "Sens." Sensitivity potentiometer
Response sensitivity

③ Yellow LED - operational states

④ Green LED - supply voltage

- Monitors and controls levels of conductive liquids
- Selectable functions- filling or emptying
- Adjustable response sensitivity 5-100kΩ
- 1c/o
- LEDs to indicate all operational states
- Approvals

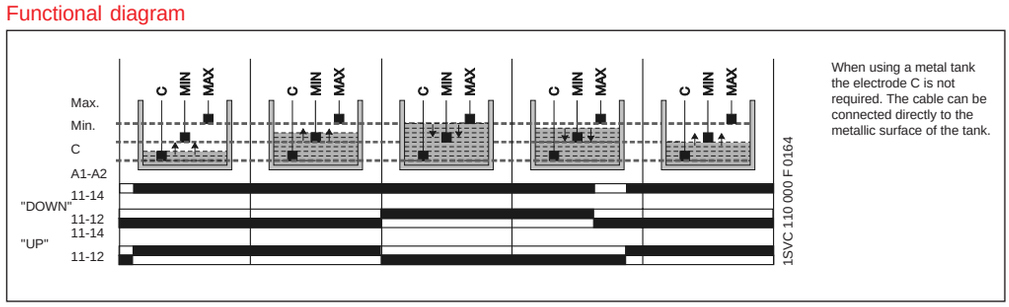
The CM-ENS UP/DOWN monitors levels of conductive liquids and fluids, and is used for liquid level control in pump systems. The measuring principle is based on a change in resistance that is sensed by single-pole electrodes.

The output relay functions fill (UP) or drain (DOWN) are set by a front-face selector switch.
On function "UP" the output relay energizes until the electrode MAX is wet.
It de-energizes and will again energize when electrode MIN is no longer wet.

On function "DOWN" the output relay will energize as soon as the electrode MAX is wet.
It remains energized until the liquid level has dropped below the electrode MIN.

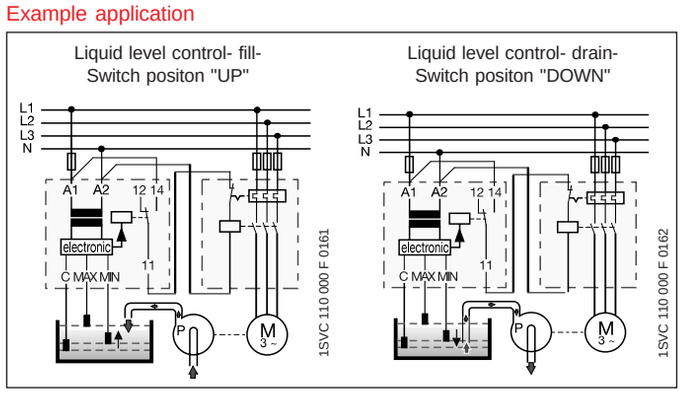
The electrodes can be connected to more than one CM-ENS unit, without interference.

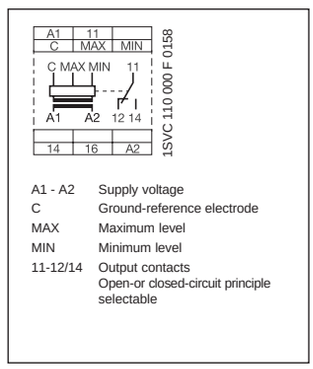
Functional diagram



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

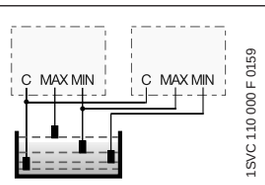
Example application





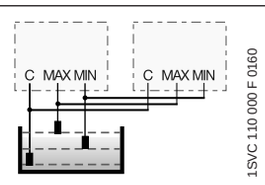
A1 - A2	Supply voltage
C	Ground-reference electrode
MAX	Maximum level
MIN	Minimum level
11-12/14	Output contacts Open-or closed-circuit principle selectable

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



Redundancy
A redundant liquid level monitoring or control can be realized by connecting the electrodes to two units.

This makes the application much safer.



suitable		not suitable	
Well water	Acids, bases	Chemically pure water	Ethylene glycol
Drinking water	Liquid fertilizers	Fuel	High-percentage alcohol
Sea water	Milk, beer, coffee	Oils	Paraffins
Waste water	Low-percentage alcohol	Explosive fluids	Lacquers
	...		...

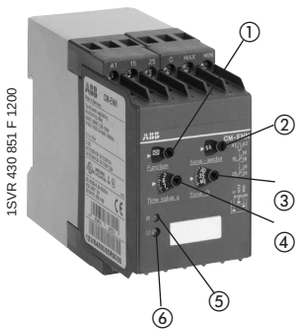
Type	Supply voltage	Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg/lb
CM-ENS UP/DOWN	24VAC	**1SVR 430 851 R 9200**	1		0.150/0.33
	110-130VAC	**1SVR 430 851 R 0200**	1		0.150/0.33
	220-240VAC	**1SVR 430 851 R 1200**	1		0.150/0.33

Remark: 1c/o = SPDT; 2c/o = DPDT

• **Accessories** ..... 83 • **Technical data** ..... 85 • **Dimensional drawings** 95

Liquid level relay CM-ENN

Ordering details



CM-ENN

① "Function" selection switch time function
- ⊠ = ON delay
- ■ = OFF delay

② "Sens. -sector" selector switch measuring range

③ "Sens. " Sensitivity potentiometer - response sensitivity

④ "Time values" fine adjustment of time delay

⑤ Yellow LED - operational states

⑥ Green LED - supply voltage

- Monitors and controls levels of liquids (when draining or filling tanks)
- Monitors and controls ratios of mixtures (conductivity of liquids)
- 3 response sensitivities from 250Ω-500kΩ in one unit
- 5 supply voltage versions from 24VAC/DC-415VAC
- Choice of ON or OFF delay from 0.1-10s
- 2c/o
- 2 LEDs to indicate operational states
- Approvals

c UL us LISTED , GL , PG

The CM-ENN monitors levels of conductive liquids and is used to control pump systems. It can be used to protect submersible tanks from running dry, and to prevent overflowing of tanks.

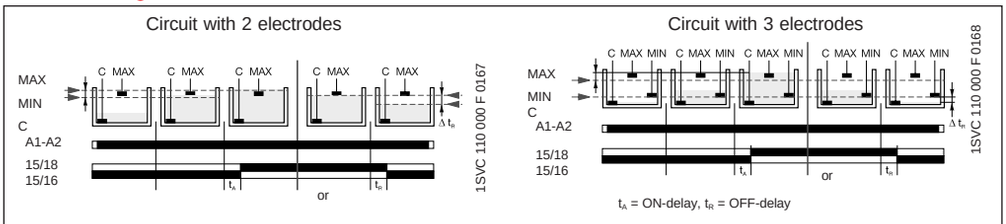
It is also suitable for monitoring conductivity of liquids.The measuring principle is based on change in resistance that is sensed by single pole electrodes (wet or dry).

In place of electrodes, other sensors or transducers can be used if they are capable of sensing changes in resistance. Measuring, output and supply circuits are electrically isolated for potential separation and to prevent electrical interference.

Due to the integrated delay on operate or on release, it is possible to build up time-dependent liquid controls using two electrodes (C, MAX).

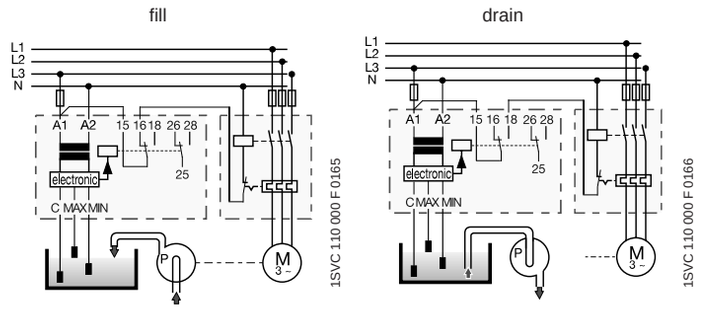
Different liquid levels in one tank can be controlled by up to 5 CM-ENN (AC-version) without mutual interference.

Functional diagrams



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

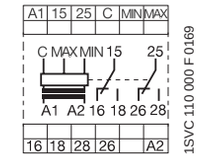
Examples of application



When starting up set both potentiometers (Response sensitivity = R-value and delay on operate = time value) to the minimum value (S) and select 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, set a higher value (sector) and proceed as before.
Check if the relay de-energizes properly as soon as the electrodes C and MIN are no longer wet.
The maximum electrode level is exceeded by delay on operate (TA = 0.1...10 s).

Taking the level beyond the minimum electrode level MIN is achieved by delay on release (TR = 0.1...10 s), e.g., emptying of tanks.



A1-A2	Supply voltage
C	Ground-reference electrode
MIN	Minimum level electrode
11-12/14	Output contacts Open-circuit principle

Type	Supply voltage	**Order code**	Pack. unit piece	**Price** 1 piece	Weight 1 piece kg/lb
CM-ENN	24-240VAC/DC	**1SVR 450 055 R 0000**	1		0.300/0.66
	24VAC	**1SVR 450 059 R 0000**	1		0.300/0.66
	110-130VAC	**1SVR 450 050 R 0000**	1		0.300/0.66
	220-240VAC	**1SVR 450 051 R 0000**	1		0.300/0.66
	380-415VAC	**1SVR 450 052 R 0000**	1		0.300/0.66

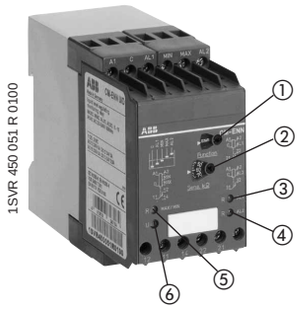
Response sensitivity	**Electrode current max.**	**Cable capacity max.**	**Cable length max.**	
250Ω-5kΩ	8mA	200nF	1000m	
2.5kΩ-50kΩ	2mA	20nF	100m	
25kΩ-500kΩ	0.5mA	4nF	20m	

Remark: 1c/o = SPDT; 2c/o = DPDT

• **Accessories** ..... 83 • **Technical data** ..... 85 • **Dimensional drawings** 95

Liquid level relay CM-ENN UP/DOWN

Liquid level control with two alarm contacts
Ordering details



CM-ENN UP/DOWN

① "Func." Function selector switch
"UP"- fill
"DOWN" - drain

② "Sens." Sensitivity potentiometer - Response sensitivity

③ Yellow LED - operational state AL1

④ Yellow LED - operational state AL2

⑤ Yellow LED - operational state MIN/MAX

⑥ Green LED - supply voltage

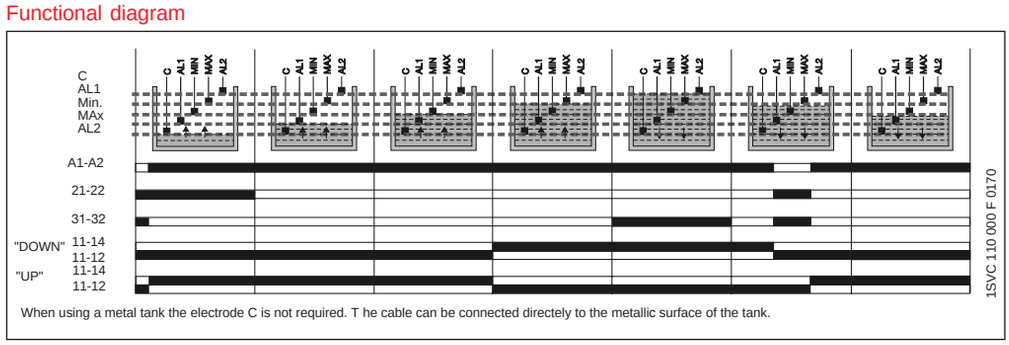
- Liquid level relay with 5 electrode inputs
- Level control with integrated overflow and dry-running alarm protection
- Settable response sensitivity
- 1c/o contact and 2n/c contacts as alarm output
- 4 LEDs to indicate operational states
- Approvals

The CM-ENN UP/DOWN monitors levels of conductive liquids, and is used for liquid level control in pump systems.

The measuring principle is based on a change in resistance, sensed by single-pole electrodes.
The function of the output relay11-12/14 is set by a selector switch on the front of the unit to fill "UP" or drain "DOWN".
On function "UP" the output relay is energized until electrode MAX is wet.
It de-energizes and will again energize, when electrode MIN is no longer wet.
On function "DOWN" the output relay energizes as soon as electrode MAX has been wet.

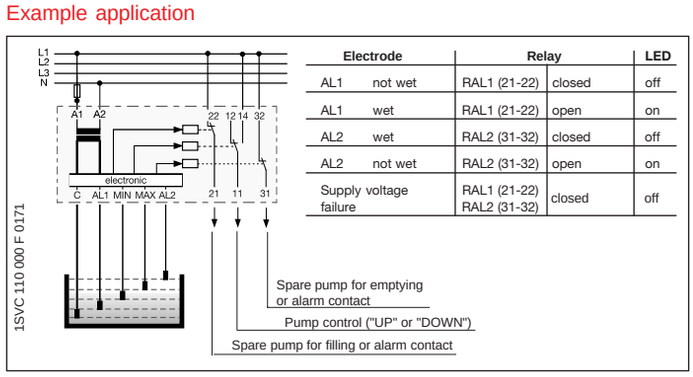
It remains energized until the liquid level has dropped below electrode MIN.
When the two electrode inputs AL1 and AL2 are wet, the corresponding output relays RAL1 (21-22) and RAL2 (31-32) are energized/de-energized. When RAL1 (21-22) is wet, AL1 opens. When RAL2 (31-32) is wet, AL2 closes.
Therefore, in addition to the filling levels MAX and MIN two additional alarm outputs, for exceeding or dropping below the normal level can be used.

Functional diagram

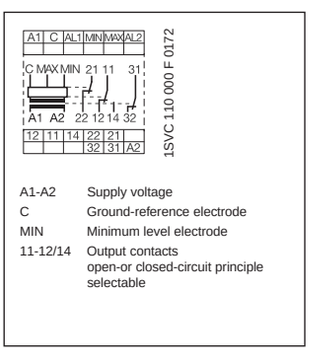


When using a metal tank the electrode C is not required. T he cable can be connected directely to the metallic surface of the tank.

Example application

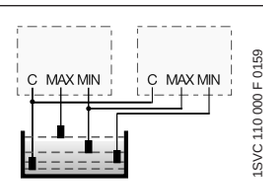


Electrode		Relay		LED
AL1	not wet	RAL1 (21-22)	closed	off
AL1	wet	RAL1 (21-22)	open	on
AL2	wet	RAL2 (31-32)	closed	off
AL2	not wet	RAL2 (31-32)	open	on
Supply voltage failure		RAL1 (21-22) RAL2 (31-32)	closed	off



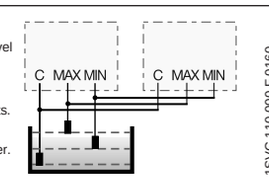
A1-A2	Supply voltage
C	Ground-reference electrode
MIN	Minimum level electrode
11-12/14	Output contacts open-or closed-circuit principle selectable

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



Redundancy
A redundant liquid level monitoring or control can be realized by connecting the electrodes to two units.

This makes the application much safer.



suitable		not suitable	
Well water	Acids, bases	Chemically pure water	Ethylene glycol
Drinking water	Liquid fertilizers	Fuel	High-percentage alcohol
Sea water	Milk, beer, coffee	Oils	Paraffins
Waste water	Low-percentage alcohol	Explosive liquids	Lacquers
	...		...

Type	Supply voltage	Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg/lb
CM-ENN UP/DOWN	24VAC	**1SVR 450 059 R 0100**	1		0.150/0.33
	110-130VAC	**1SVR 450 050 R 0100**	1		0.150/0.33
	220-240VAC	**1SVR 450 051 R 0100**	1		0.150/0.33
	380-415VAC	**1SVR 450 052 R 0100**	1		0.150/0.33

Remark: 1c/o = SPDT; 2c/o = DPDT

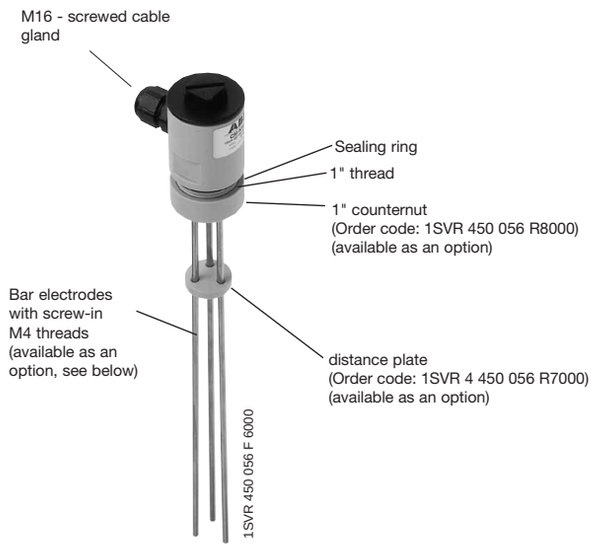
• **Accessories** ..... 83 • **Technical data** ..... 85 • **Dimensional drawings** 95

Liquid level relay

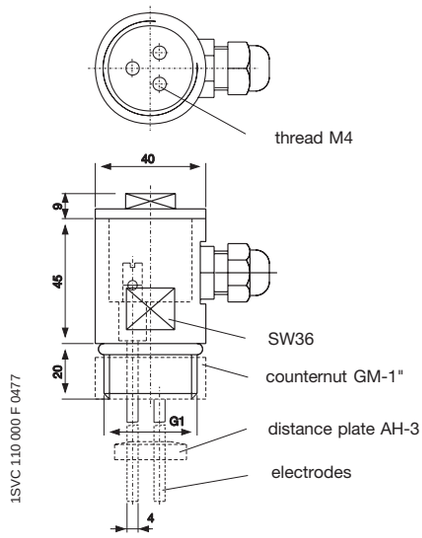
Accessories, ordering details, dimensional drawings

Compact support KH-3, for 3 bar electrodes

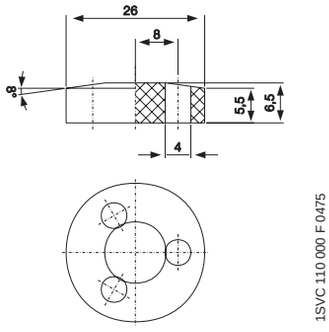
- Ideally suited for use with liquid level relays CM-ENS and CM-ENN
- Wire connection by screw terminals
- Pull relief by M16 screwed cable glands
- Temperature range up to 90°C
- Food Service Equip. (PPH)
- Screw-in electrodes (M4 thread)
- Distance plate (AH-3) and counternut (GM-1) optionally as an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



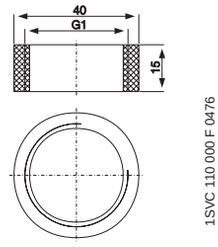
Compact support KH-3



Distance plate AH-3



Counternut GM-1



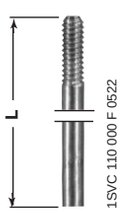
Technical data - Compact support

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

(dimensons in mm)

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

Screw-in bar electrodes for compact support KH-3



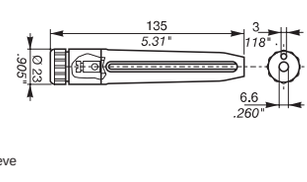
Thread M4

Material: stainless steel 304, high grade steel 14301

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

Suspension electrode

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



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

Liquid level relays

Technical data and standards / directives

			CM-ENE
Input circuit			
Supply voltage - power consumption:			
24VAC		**A1-A2**	approx. 1.5VA
110-130VAC		**A1-A2**	approx. 1.2VA
220-240VAC		**A1-A2**	approx. 1.4VA
380-415VAC		**A1-A2**	
24-240VAC/DC		**A1-A2**	
Tolernace of supply voltage			-15%...+15%
Supply voltage frequency			50-60Hz
Duty cycle			100%
Measuring circuits			**MIN-C, MAX-C**
Monitoring function			CM-ENE MIN: dry running protection, CM-ENE MAX: overflow protection
Response sensitivity			0-100kΩ, not adjustable
Electrode voltage max.			30VAC
Electrode current max.			1.5mA
Electrode supply line:	Cable capacity max.		3nF
	Cable length max.		30m
Delay on operate			approx. 200ms
Time circuits			
Time delay			
Display of operating status			
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			1n/o
opened-circuit principle [1)]			CM-ENE MIN: open-circuit principle CM-ENE MAX: closed-circuit principle
Contact material			AgCdo
Rated voltage acc. to VDE0110, IEC947-1			250V
Min. switching voltage			
Max. switching voltage			250V
Min. switching current			
Rated operating current acc. to IEC941-x AC12 (resistive)	230V		4A
Rated operating current acc. to IEC941-x AC15 (inductive)	230V		3A
Rated operating current acc. to IEC941-x DC12 (resistive)	24V		4A
Rated operating current acc. to IEC941-x DC13 (inductive)	24V		2A
Maximum mechanical ife			$30x10^6$
Maximum electrical life (acc. to AC12, 230V, 4A)			$0.3x10^6$
Short circuit proof, maximum fuse rating	n/c		
	n/o		10A fast, operating class gL
General data			
Enclosure width			22.5mm
Cable size			2 x 1.5mm² (2 x 16 AWG) stranded with wire end ferrule
Mounting posisiton			any
Degree of protection: housing/ terminals			IP50 / IP20
Operating temperature			-20°C...+60°C
Storage temperature			-40°C...+80°C
Mounting			DIN rail (EN50022)
Mechanical shock resistance IEC68-2-6			10G
Standards / directives			
Product standard			IEC255-6
Electromagnetic compatibility			93/68/EWG
EMC-tests acc. to EN50082-2			
ESD acc. to IEC1000-4-2, EN61000-4-2			Level 3 - 6kV/8 kV
HF-radiation resistance acc. to IEC1000-4-3, EN61000-4-3			Level 3 -10V/m
Burst acc. toIEC1000-4-4, EN61000-4-4			Level 3 - 2kV/5kHz
Surge acc. to IEC1000-4-5, EN61000-4-5			Level 4 - 2kV L-L
HF-line emission acc. to IEC1000-4-6, EN61000-4-6			Level 3 - 10V
Low voltage directive			93/68/EWG
Resistance to vibration			10G, f = 55Hz, a = 0.95mm, t = 2h per level
Approvals			**cULus, GOST**
Isolations data			
Rated isolation voltage to VDE0110, IEC947-between supply, measuring an output circuit			250V
Rated impulse withstand voltage to VDE0110, IEC664 -between all isolated circuits			4 kV/1.2-50µs
Test voltage between all isolated cicuits			2.5kV, 50Hz, 1min.
Pollution category acc.to VDE0110, IEC664 / IEC255-5			III / C
Overvoltage category acc. to VDE0110, IEC664 / IEC255-5			III / C
Environmental tests acc. to IEC68-2-30			24h cycle, 55°C, 93% rel., 96h

Open-circuit principle: Output relay energizes when the resistance exceeds (passes below) the set value
Closed-circuit principle: Output relay de-energizes when the resistance exceeds (passes below) the set value

Liquid level relays

Technical data and standards / directives

CM-ENS, CM ENS UP/DOWN, CM-ENN UP/DOWN	CM-ENN
approx. 1.5VA, CM-ENN UP/DOWN approx. 4VA	
approx. 1.5VA, CM-ENN UP/DOWN approx. 4VA	approx. 2.5VA
approx. 1.5VA, CM-ENN UP/DOWN approx. 4VA	approx. 3VA
approx. 1.5VA, CM-ENN UP/DOWN approx. 4VA	approx. 4VA
	approx. 2VA/W
-15%...+10%	-15%...+10%
50-60Hz	50-60Hz or DC
100%	100%
MAX-MIN-C	**MAX-MIN-C**
liquid-level control	liquid-level control
5-100kΩ, adjustable	250Ω-500kΩ, adjustable
30VAC	20VAC
1mA	
10nF	
100m	
approx. 250ms	
	0.1-10 s, adjustable, ON delay, 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**
1c/o, CM-ENN UP/DOWN: 1c/o + 2 n/c	2c/o CM-ENS: open-circuit principle
CM-ENS/ENN UP/DOWN: closed-circuit principle	open-circuit principle
AgCdo	AgCdo
250 V	400 V
250V	400V
4A	5A
3A	3A
4A	5A
2A	2,5A
30 x 10^6	30x10^6
0.3 x 10^6	0.1x10^6
10 A fast, operating class gL	5 A fast, operating class gL
10 A fast, operating class gL	5 A fast, operating class gL
22.5mm, CM-ENN UP/DOWN 45mm	45 mm
2 x 2.5mm^2 (2 x 14 AWG) stranded with wire end ferrule	2 x 2.5mm^2 (2 x 14 AWG) stranded with wire end ferrule
any	any
IP50 / IP20	IP50 / IP20
-20°C...+60°C	-25°C...+65°C
-40°C...+85°C	-40°C...+85°C
DIN rail (EN50022)	DIN rail (EN50022)
6G	10G
IEC255-6	IEC255-6
93/68/EWG	93/68/EWG
Level 3-6 kV/8kV	Level 3 - 6 kV/8 kV
Level 3-10V/m	Level 3 -10V/m
Level 3- 2kV/5kHz	Level 3 - 2 kV/5 kHz
Level 4-2kV L-L	Level 4 - 2kV L-L
Level 3-10V	Level 3 -10 V
93/68/EWG	93/68/EWG
10G, f = 55Hz, a = 0.95mm, t = 2h per level	10G, f = 55Hz, a = 0.95mm, t = 2h per level
cULus, GL (CM-ENS), VDE (CM-ENS version with safe isolation), GOST	**cULus, GL, GOST**
250V	500V
4 kV/1.2 - 50µs	4 kV/1.2-50µs
2.5 kV, 50Hz, 1min.	2.5kV, 50Hz, 1min.
III / C	III / C
III / C	III / C
24h cycle, 55°C, 93% rel., 96h	24h cycle, 55°C, 93% rel., 96h

Remark: 1c/o = SPDT; 2c/o = DPDT

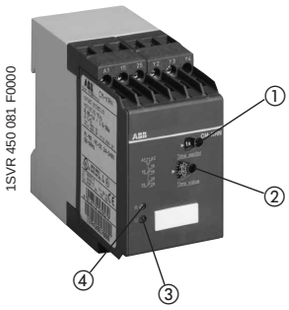
Notes

Contact protection relay and Sensor interface relay

Content

Contact protection relay CM-KRN

Ordering details



CM-KRN

① Selector switch for time range
② Response delay
③ Green LED-supply voltage
④ Yellow LED - Relay state

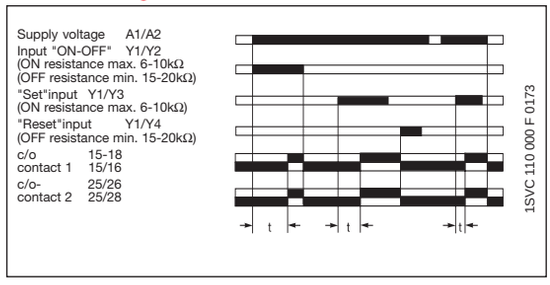
- Protects sensitive control contacts
- Response delay adjustable from 0.05-30s
- Acts as two-position switch
- Stores switch positions
- 2c/o
- 2 LEDs for supply voltage and relay state
- Electrically isolated circuits
- Approvals

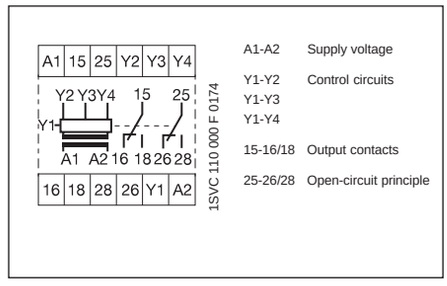
The CM-KRN protects sensitive control contacts from excessive loads. It can be used with latching action or without. Bounce time of control contacts can be bypassed by the adjustable response delay time.

Used without latching action
The contact to be protected is connected to terminals Y1 and Y2.

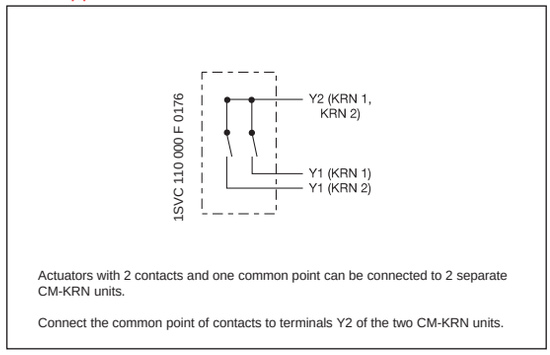
Used with latching action
The output relay energizes after contact Y1-Y3 has been closed for 20 ms minimum. It remains energized until contact Y1-Y4 closes. Switch positions are stored.

Functional diagram





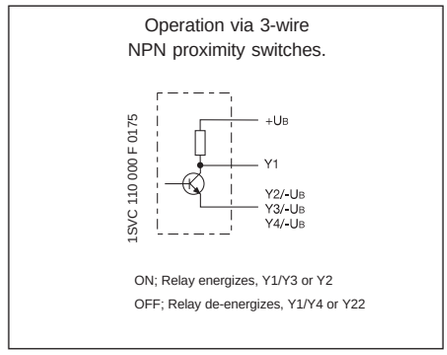
Use, Application



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 NPN proximity switches.



ON; Relay energizes, Y1/Y3 or Y2
OFF; Relay de-energizes, Y1/Y4 or Y22

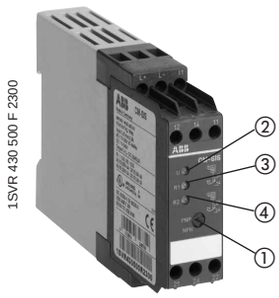
Type	Supply voltage 50-60 Hz	Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg/lb
with time delay 0.05-30s					
CM-KRN	24 VAC	**1SVR 450 089 R 0000**	1		0.300/0.66
	110-130VAC	**1SVR 450 080 R 0000**	1		0.300/0.66
	220-240VAC	**1SVR 450 081 R 0000**	1		0.300/0.66
	380-415VAC	**1SVR 450 082 R 0000**	1		0.300/0.66
without time delay					
CM-KRN	24 VAC	**1SVR 450 099 R 0000**	1		0.300/0.66
	110-130VAC	**1SVR 450 090 R 0000**	1		0.300/0.66
	220-240VAC	**1SVR 450 091 R 0000**	1		0.300/0.66

Remark: 1c/o = SPDT; 2c/o = DPDT

• **Technical data** ..... 90 • **Dimensional drawings** ..... 95 • **Accessories** 95

Sensor interface relay CM-SIS

Ordering details



CM-SIS

① Rotary switch, selection of the sensor type
② GreenLED - supply voltage
③ Red LED - relay state R1
④ Red LED - relay state R2

- High efficency
- Low heating
- Wide range of supply voltage
- Constant output voltage 24VDC
- Safe isolation acc. to EN 50178 (VDE 0160)
- Short circuit and overload proof
- Fuse input
- Approval

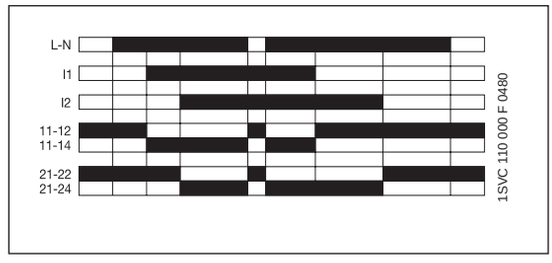
The CM-SIS supplies power for 2- or 3-wire sensors, NPN or PNP, and monitors their switching signals. Two types of sensors, type PNP or NPN can be connected. Selection is done via front-face rotary switch. The CM-SIS supplies the connected sensors with 24VDC (L+, L-), the maximum power supply current is 0.5 A.

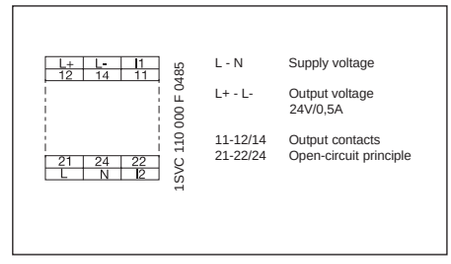
The input supply circuit, the sensor inputs, and the 24VDC supply outputs are electrically isolated. To ensure maximum safety when using these sensors, we have included the principle of safe isolation. Each sensor input signal energizes the corresponding output relay. The relay energizes as soon as a threshold current is exceeded at input I1 or I2. A sensor's leakage current of up to 8mA does cause false operation.

The threshold value is about 9 mA. When 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 mains.

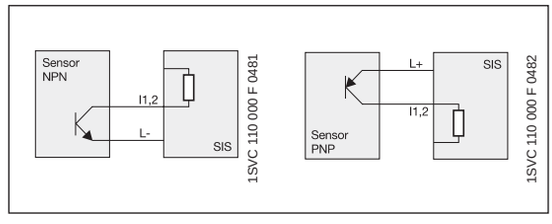
CM-SIS is also suitable for other applications.
It is also possible to directly connect PTC or NTC resistors or dry contacts instead of PNP or NPN sensors.

Function

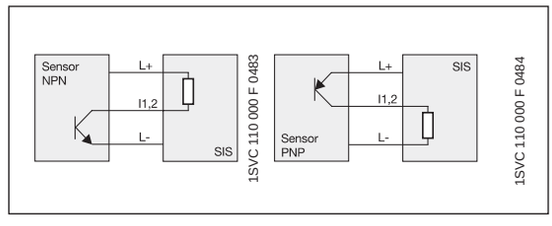




Connection of 2-wire sensors



Connection of 3-wire sensors



Type	Supply voltage	Order code	Pack. unit piece	Price 1 piece	Weight 1 piece kg/lb
CM-SIS	110-240VAC/105-260VDC	**1SVR 430 500 R 2300**	1		0.220/0.48

Remark: 1 c/o = SPDT; 2 c/o = DPDT

• **Technical data** ..... 91 • **Dimensional drawings** ..... 95 • **Accessories** 95

Contact protection relay CM-KRN

Technical data

Input circuit		
Supply voltage - power consumption	**A1-A2**	24VAC - approx. 3.5VA
	A1-A2	110-130VAC - approx. 3.5VA
	A1-A2	220-240VAC - approx. 3.5VA
	A1-A2	380-415VAC - approx. 3.5VA
Tolerance of supply voltage		-15% ... +10%
Supply voltage frequency		50-60Hz
Duty cycle		100%
Time circuit		
Delay on operate time		0.05-1s, 1.5-30s
Delay on release time max.		50ms
Contact time for storage min. (CM-KRN without AV)		20ms
Measuring circuit/ control circuit	**Y1...Y4**	
Control contacts	contact protection - no latching	Y1, Y2
	contact protection - latching	Y1, Y3, Y4
Switching resistance	Y1-Y2 closing max.	6-10kΩ
	Y1-Y2 opening min.	15-20kΩ
	Y1-Y3 closing max.	6-10kΩ
	Y1-Y4 opening max.	15-20kΩ
No-load voltage	**(Y1, Y2) (Y1, Y3, Y4)**	≤10VDC
Switching resistance		≤ 3mA
Voltage of control input		≤ ± 30V (Contact voltage)
Display of operating inputs		
Supply voltage		green LED
1st output relay energized		yellow LED
Output circuit	**15-16/18, 25-26/28**	Relay, 2c/o, open-circuit principle
Rated voltage VDE 0110, IEC 947-1		400V
Rated switching voltage		400VAC
Rated switching current	AC 12 (resistive)	5A (at 230V)
Rated switching current	AC 15 (inductive)	3A (at 230V)
Rated switching current	DC 12 (resistive)	5A (at 24V)
Rated switching current	DC 13 (inductive)	2.5A (at 24V)
Maximum mechanical life		30 x 10^6 operations
Maximum electrical life(acc. to AC 12/230V/5A)		0.1 x 10^6 operations
Short circuit proof, maximum fuse rating		5A / fast, operating class gL
General data		
Rated impulse withstand voltage V_{imp}		4kV
Operating temperature		-25°C ... +65°C
Storage temperature		-40°C ... +85°C
Mounting position		any
Mounting to DIN-rail (EN 50022)		Snap on mounting /Screw mounting by adapter
Cable size stranded with wire end ferrule		2 x 2.5mm² (2 x 14 AWG)

Remark: 1c/o = SPDT; 2c/o = DPDT

Sensor interface relay CM-SIS

Technical data

Input			
Supply voltage	**L-N**	AC DC	110-240VAC (-15 % ... +10%) 110-240V (max. 105-260VDC)
Frequency, AC supply			47-440 Hz
Output load time with input voltage drop out			min. 10 ms at 100% load
Input current at nominal load			0.35A max./ 0.27A at 115VAC / 0.14A at 230VAC
Inrush current at 25° C (≤ 2 ms)			33A
Internal input fuse			800mA slow
Output			
Output voltage	L+ L-		24V DC ± 3%
Output current / output power			0.5A / 12W max.
Residual ripple			max. 100mVss
Input voltage regulation			max. ± 0.5%
Deviation of output with static load change			max. ± 0.5%
Deviation of output with dynamic load change10-90 %			max. 5%
Short circuit protection			overvoltage switch off with automatic restart
Overload protection			excess temperature and overcurrent switch off
Reset after thermal overload			automatically after having cooled down
Sensor input			
Sensor type connection possibilities			2 or 3 wire connection, by front-face switch, reversible to NPN or PNP
Input resistor			approx. 2.5kΩ
Input threshold value for relays R1, 2			$V_{Emitter-collector}$ < 2.3V (I1.2 > 9mA)
Maximum switching frequency			approx. 20Hz
Output circuit	**11-12/14, 21-22/24**		2 relays, 1 c/o contact each, open-circuit principle
Rated voltage			250V
Switching voltage max.			250VAC
Rated switching current	AC 12 (resistive)		4A (at 230V)
Rated switching current	AC 15 (inductive)		3A (at 230V)
Rated switching current	DC 12 (resistive)		4A (at 24V)
Rated switching current	DC 13 (inductive)		2A at 24V)
Maximum mechanical life			10 x 10^6 operations
Maximum electrical life			0.1 x 10^6 operations
Short circuit proof, maximum fuse rating			6A n/o contact, 4A n/c contact / fast, operating class gL
Standards / directives			
Electrical safety standards			IEC 255-5 /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
Voltage withstand input <- > output			2.5kVAC, 3kVAC type test
Clearance and creepage distances			overvoltage category 2, degree of pollution 2
Electromagnetic immunity (EMC) acc. to EN 50082-2:			
ESD:			EN 61000-4-2 level 3 - 6/8 kV
HF fields:			EN 61000-4-3 level 3 - 10V/m
Burst:			EN 61000-4-4 level 4 - 4kV
Surge:			EN 61000-4-5 inst. class 3, 2kV
Conducted RF:			EN 61000-4-6 level 3 - 10V
Electromagnetic compatibility (EMC) acc. to EN 50081-2			radiated noise EN 55011, class B
Input current harmonics			no limit
General data			
Efficiency at nominal load			approx. 84% (at 230VAC)
Status indication			green LED, Output voltage OK
Operating temperature			0° ... +55°C
Storage temperature			-25° ... +75°C
Terminals			screw terminals, 2 x 14AWG (2 x 2.5 mm^2)
Dimensions (W x H x D)			22.5mm x 78mm x 120mm (0.89 x 3.07 x 4.72")
Mounting			normal position: horizontal onto DIN-rail
Spacing to other modules			left side 1cm, vertical distance 5cm

Remark: 1 c/o = SPDT; 2 c/o = DPDT

Notes

Technical data
CM ranges

Content

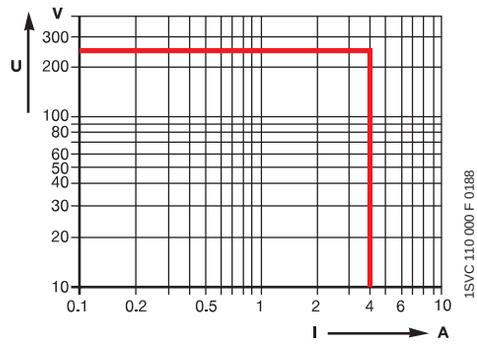
Monitor relays CM range

Load limit curves

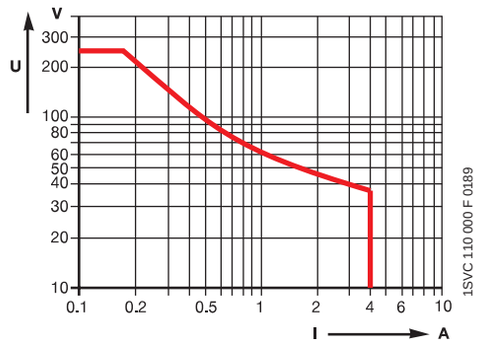
Load limit curves

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

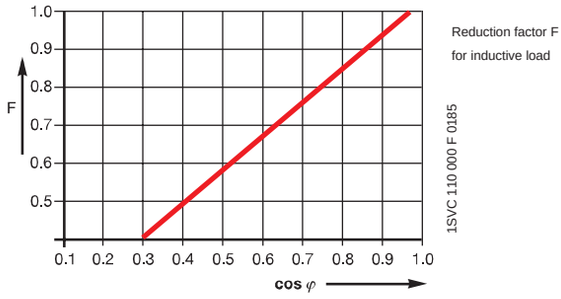
AC-load (resistive)



DC-load (resistive)

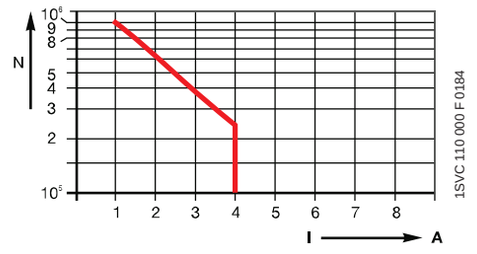


Reduction factor for inductive AC-load



Reduction factor F
for inductive load

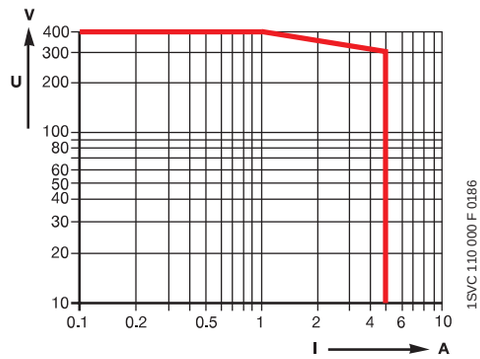
Contact life



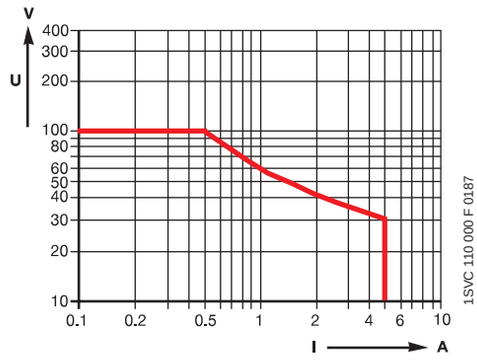
Contact life/
number of operations N
220V 50Hz 1AC
360 operations/h

CM-N (45 mm)

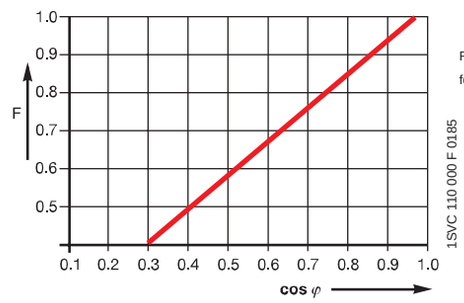
AC-load (resistive)



DC-load (resistive)

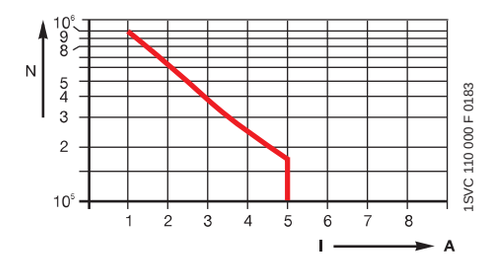


Reduction factor for inductive AC-load



Reduction factor F
for inductive load

Contact life

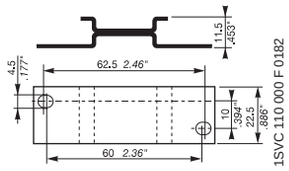


Contact life/
number of operations N
220V 50Hz 1AC
360 operations/h

Montioring relays CM range

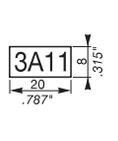
Accessories and dimensional drawings

Accessories



Adapter for screw mounting

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

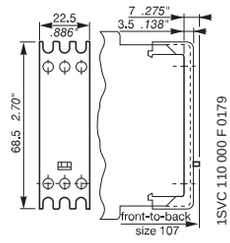


Marker

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

CM-S

22.5mm

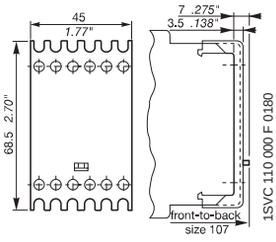


Sealable cover

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

CM-N

45mm

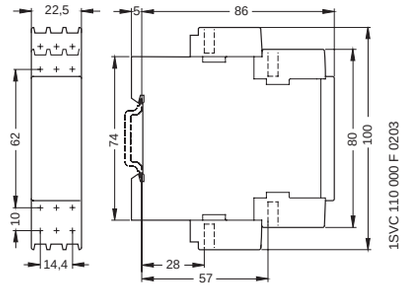


Dimensional drawings

Temperature monitoring relays

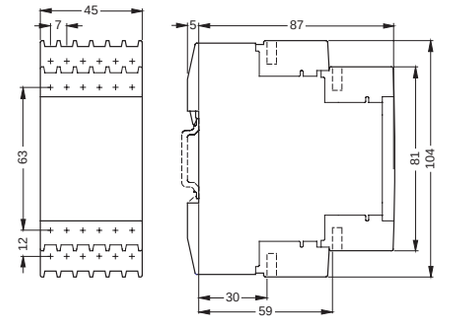
C510 / C511

22.5mm



C512/C513

45mm



Monitoring relays CM range

CM-S

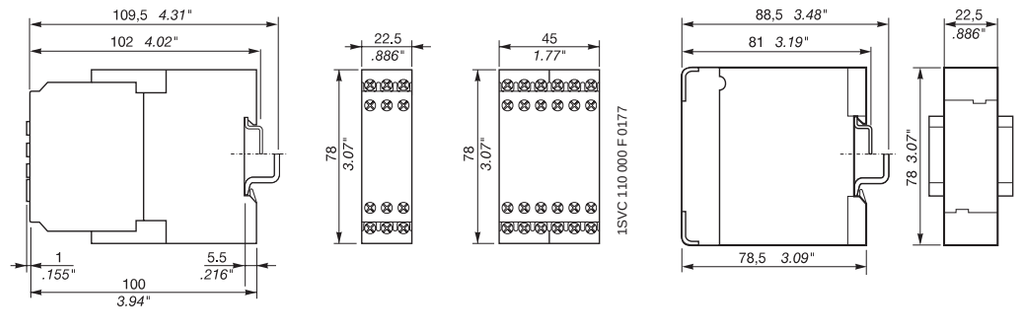
22.5mm

CM-N

45.5mm

CM-E

22.5mm



Monitoring relays

Conversion table C55x → CM range (discontinued)

Old order code C 55x	Type	Desrciption Output contacts	Supply voltage	mm		New order code	Type	Description Output contacts	Supply voltage	mm
current monitors AC and DC, over or undercurrent monitoring, on delay 1-20s, relay delay,1-3s					->	current monitor AC and DC, overcurrent monitoring				
1SAR 411 010 R 0001	C 551.01	3 ranges, 0.002-0.5A AC/DC	24VDC	22.5		1SVR 430 841 R 9100	CM-SRS	3 rangrs 0.003-1AAC/DC	24VAC	22.5
1SAR 411 010 R 0002	C 551.01	1c/o, open-circuit principle	24VAC			1SVR 430 841 R 0100	CM-SRS	1c/o, open-circuit principle	110-130VAC	
1SAR 411 010 R 0003	C 551.01		48VAC			1SVR 430 841 R 1100	CM-SRS		220-240VAC	
1SAR 411 010 R 0004	C 551.01		120VAC							
1SAR 411 010 R 0005	C 551.01		230VAC							
1SAR 412 010 R 0001	C 551.02	3 ranges 0.1-10 A AC/DC	24VDC	22.5		1SVR 450 115 R 0000	CM-SRN	3 ranges 0.003-1AAC/DC	24-240VAC/DC1)	45.0
1SAR 412 010 R 0002	C 551.02	1c/o, open-circuit principle	24VAC			1SVR 450 110 R 0000	CM-SRN	2c/o, open-circuit principle	110-130VAC	
1SAR 412 010 R 0003	C 551.02		48VAC			1SVR 450 111 R 0000	CM-SRN		220-240VAC	
1SAR 412 010 R 0004	C 551.02		120VAC			1SVR 450 115 R 0100	CM-SRN	3 ranges 0.3-15A AC/DC	24-240VAC/DC1)	
1SAR 412 010 R 0005	C 551.02		230VAC			1SVR 450 110 R 0100	CM-SRN	2c/o, open-circuit principle	110-130VAC	
						1SVR 450 111 R 0100	CM-SRN		220-240VAC	
						1SVR 450 125 R 0000	CM-SRN	3 ranges 0.003-1A AC/DC	24-240VAC/DC1)	
						1SVR 450 120 R 0000	CM-SRN	2c/o, open-circuit principle	110-130VAC	
						1SVR 450 121 R 0000	CM-SRN	relay delay 0.05-30s	220-240VAC	
						1SVR 450 125 R 0100	CM-SRN	3 ranges 0.3-15AAC/DC	24-240VAC/DC1)	
						1SVR 450 120 R 0100	CM-SRN	2c/o, open-circuit principle	110-130VAC	
						1SVR 450 121 R 0100	CM-SRN	relay delay 0.05-30s	220-240VAC	
		SRS und SRN: Supply voltage: A1-A2 Measuring-circuits: B1/B2/B3-C Output relays: 15-16/18; 25-26/28								
		C 551: Supply voltage: A1-A2 Measuring-circuits: E1/E2/E3-M Output relays: 11-12/14								
						1) selectable over or under current monitoring				
Voltage monitors single phase, AC and DC, over or undervoltage monitoring, on delay. 1-20s, relay delay 0.1-3s					->	voltage monitors single phase AC and DC				
1SAR 421 010 R 0001	C 552.01	3 ranges 0.2-60VAC/DC	24VDC	22.5		1SVR 430 831 R 9000	CM-ESS	over voltage monitoring	24VAC	22.5
1SAR 421 010 R 0002	C 552.01	1c/o, open-circuit principle	24VAC			1SVR 430 831 R 0000	CM-ESS	3 ranges 50mV-5VAC/DC	110-130VAC	
1SAR 421 010 R 0004	C 552.01		120VAC			1SVR 430 831 R 1000	CM-ESS	1c/o, open-circuit principle	220-240VAC	
1SAR 421 010 R 0005	C 552.01		230VAC			1SVR 430 831 R 9100	CM-ESS	over voltage monitoring	24VAC	
1SAR 422 010 R 0001	C 552.02	3 ranges 10-600VAC/DC	24VDC	22.5		1SVR 430 831 R 0100	CM-ESS	3 ranges 1V-100VAC/DC	110-130VAC	
1SAR 422 010 R 0002	C 552.02	1c/o, open-circuit principle	24VAC			1SVR 430 831 R 1100	CM-ESS	1c/o, open-circuit principle	220-240VAC	
1SAR 422 010 R 0004	C 552.02		120VAC			1SVR 430 831 R 9200	CM-ESS	over voltage monitoring	24V AC	
1SAR 422 010 R 0005	C 552.02		230VAC			1SVR 430 831 R 0200	CM-ESS	3 ranges 30V-500VAC/DC	110-130V AC	
						1SVR 430 831 R 1200	CM-ESS	1c/o, open-circuit principle	220-240V AC	
						1SVR 450 215 R 0000	CM-ESN	over or undervoltage monitoring	24-240V AC/DC	45.0
						1SVR 450 210 R 0000	CM-ESN	3 ranges 50mV-5VAC/DC	110-130VAC	
						1SVR 450 211 R 0000	CM-ESN	2c/o, open-circuit principle	220-240VAC	
						1SVR 450 215 R 0100	CM-ESN	over or undervoltage monitoring	24-240VAC/DC	
						1SVR 450 210 R 0100	CM-ESN	3 ranges 1V-100VAC/DC	110-130VAC	
						1SVR 450 211 R 0100	CM-ESN	2c/o, open-circuit principle	220-240VAC	
						1SVR 450 215 R 0200	CM-ESN	over or undervoltage monitoring	24-240VAC/DC	
						1SVR 450 210 R 0200	CM-ESN	3 ranges 30V-500VAC/DC	110-130VAC	
						1SVR 450 211 R 0200	CM-ESN	2c/o, open-circuit principle	220-240VAC	
						1SVR 450 225 R 0000	CM-ESN	over or undervoltage monitoring	24-240 VAC/DC	
						1SVR 450 220 R 0000	CM-ESN	3 ranges 50mV-5VAC/DC	110-130VAC	
						1SVR 450 221 R 0000	CM-ESN	2c/o, open-circuit principle relay delay 0.05-30s	220-240VAC	
						1SVR 450 225 R 0100	CM-ESN	over or undervoltage monitoring	24-240VAC/DC	
						1SVR 450 220 R 0100	CM-ESN	3 ranges 1V-100VAC/DC	110-130VAC	
						1SVR 450 221 R 0100	CM-ESN	2c/o, open-circuit principle relay delay 0.05-30s	220-240VAC	
						1SVR 450 225 R 0200	CM-ESN	over or undervoltage monitoring	24-240VAC/DC	
						1SVR 450 220 R 0200	CM-ESN	3 ranges 30V-500VAC/DC	110-130 VAC	
						1SVR 450 221 R 0200	CM-ESN	2c/o, open-circuit principle relay delay 0.05-30s	220-240 VAC	
Voltage monitor AC and DC, over and undervoltage Umin und Umax, adjustable relay delay 0.1-3s					->	line voltage monitor AC 50/60Hz, Umin und Umax , adjustable relay delay 0.1-10s				
1SAR 425 010 R 0008	C 553	1c/o, closed -circuit principle from measuring	20-80VAC/DC	22.5		1SVR 450 200 R 1100	CM-EFN	80-160V 50/60Hz 2c/o, closed-circuit principle	80-160 VAC	45.0
1SAR 425 010 R 0009	C 553		65-260VAC/DC			1SVR 450 201 R 1200	CM-EFN	160-300V 50/60Hz	160-300 VAC	
3 phase monitor, phase loss, phase sequence					->	3 phase monitor, phase loss, phase sequence				
1SAR 430 010 R 0010	C 554	3x200-500VAC 50/60Hz 2c/o, closed-circuit principle from measuring		22.5		1SVR 430 824 R 9300	CM-PFS	2c/o, closed-circuit prin. from measuring	3x200-500VAC 50/60Hz	22.5
3 phase monitors, phase loss, phase sequence, undervoltage (0.7 x Unom), relay delay 0.1-10s					->	3 phase monitor, phase loss, phase sequence, over and undervoltage, (fixed 0.9xUnom and 1.1xUnom), adjustable delay on operate or delay on relase 0.1-10s				
1SAR 432 020 R 0005	C 557.01	3x230VAC 50/60Hz 2c/o, closed-circuit principle from measuring		45.0		1SVR 450 311 R 0400	CM-PFN	3 x 380V 50Hz 2c/o, closed-circuit principle	220-240VAC	45.0
1SAR 432 020 R 0012	C 557.01	3x380VAC 50/60Hz 2c/o, closed-circuit principle from measuring				1SVR 450 312 R 0400	CM-PFN	3 x 380V 50Hz 2c/o, closed-circuit principle	380-415VAC	
1SAR 432 020 R 0006	C 557.01	3x400VAC 50/60Hz 2c/o, closed-circuit principle from measuring				1SVR 450 310 R 0500	CM-PFN	3 x 400V 50Hz 2c/o, closed-circuit principle	110-130VAC	
1SAR 432 020 R 0013	C 557.01	3x415VAC 50/60Hz 2c/o, closed-circuit principle from measuring				1SVR 450 311 R 0500	CM-PFN	3 x 400V 50Hz 2c/o, closed-circuit principle	220-240VAC	
1SAR 432 020 R 0014	C 557.01	3x440VAC 50/60Hz 2c/o, closed-circuit principle from measuring				1SVR 450 312 R 0500	CM-PFN	3 x 400V 50Hz 2c/o, closed-circuit principle	380-415VAC	
1SAR 432 020 R 0015	C 557.01	3x480VAC 50/60Hz 2c/o, closed-circuit principle from measuring								
1SAR 432 020 R 0016	C 557.01	3x575VAC 50/60Hz 2c/o, closed-circuit principle from measuring								
						CM-PFN: additional overvoltage monitoring measuring-circuits: L1, L2, L3 output contacts: 15-16/18, 25-26/28				
						C 557: measuring-circuits: L1, L2, L3 output contacts: 11-12/14, 21-22/24				
						Remark: 1c/o = SPDT; 2c/o = DPDT				

Monitoring relays

Conversion table C55x → CM range (discontinued)

Old order code C55x	Type	Description Output contacts	Supply voltage	mm		New order code	Type	Description Output contacts	Supply voltage	mm
3 phase monitor, phase loss, over voltage and undervoltage, (Umin. and Umax. adjustable), relay delay 0.1-10s					->	3 phases monitor, phase loss, phase sequence, over voltage and undervoltage (Umin. und Umax. adjustable)				
1SAR 450 010 R 0006	**C 556.01**	3 phases + neutral 2c/o closed-circuit principle from measuring		45.0		**1SVR 450 300 R 1200**	**CM-PVN**	3 x 160-300V 50/60Hz 2c/o closed-circuit principle delay on operate or delay on relase adjustable 0.1-10s	90-145VAC	45.0
1SAR 451 010 R 0006	**C 556.02**	3 phases 2c/o closed-circuit principle from measuring				**1SVR 450 300 R 1500**	**CM-PVN**	3x300-500V 50/60Hz 2c/o closed-circuit principle delay on operate or delay on relase adjustable 0.1-10s	90-145VAC	
						1SVR 450 300 R 1700	**CM-PVN**	3x350-580V 50/60Hz 2c/o closed-circuit principle delay on operate or delay on relase adjustable 0.1-10s	90-145VAC	
						1SVR 450 301 R 1200	**CM-PVN**	3x160-300V 50/60Hz 2c/o closed-circuit principle delay on operate or delay on relase adjustable 0.1-10s	160-300VAC	
						1SVR 450 301 R 1500	**CM-PVN**	3x300-500V 50/60Hz 2c/o closed-circuit principle delay on operate or delay on relase adjustable 0.1-10s	160-300VAC	
						1SVR 450 302 R 1500	**CM-PVN**	3 x 300-500V50/60Hz 2c/o closed-circuit principle delay on operate or delay on relase adjustable 0.1-10s	300-500VAC	
						1SVR 450 302 R 1700	**CM-PVN**	3 x 350-580V 50/60Hz 2c/o closed-circuit principle delay on operate or delay on relase adjustable 0.1-10s	300-500VAC	

CM-PVN monitors additional phase sequence.
Neutral could be monitored by supplying the device via phase and neutral.

3-phase monitor, phase loss, phase sequence, phase unbalance (5-15%), relay delay 0.2-10s					->	3-phase monitor, phase loss, phase sequence, phase unbalance (5-15%),				
1SAR 431 010 R 0005	**C 557/1W**	3x230V 50/60Hz 1c/o closed-circuit principle from measuring		45.0		**1SVR 430 864 R 1100**	**CM-ASS**	3x220-240VAC 50Hz 1c/o closed-circuit principle	from measuring	22.5
1SAR 431 010 R 0006	**C 557/1W**	3x400V 50/60Hz 1c/o closed-circuit principle from measuring				**1SVR 430 864 R 3100**	**CM-ASS**	3x380-415VAC 50Hz 1c/o closed-circuit principle	from measuring	
1SAR 431 020 R 0005	**C 557/2W**	3x230V 50/60Hz 2c/o closed-circuit principle from measuring				**1SVR 430 865 R 1100**	**CM-ASS**	3x220-240VAC 60Hz 1c/o closed-circuit principle	from measuring	
1SAR 431 010 R 0006	**C 557/2W**	3x400V 50/60Hz 2c/o closed-circuit principle from measuring				**1SVR 430 865 R 3100**	**CM-ASS**	3x380-415VAC 60Hz 1c/o closed-circuit principle	from measuring	
						1SVR 450 320 R 0200	**CM-ASN**	3x220-240VAC 50Hz 2c/o closed-circuit principle relay delay 0.1-10s	110-130VAC	45.0
						1SVR 450 320 R 0500	**CM-ASN**	3x380-415VAC 50Hz 2c/o closed-circuit principle relay delay 0.1-10s	110-130VAC	
						1SVR 450 320 R 0700	**CM-ASN**	3x480-500VAC 50Hz 2c/o closed-circuit principle relay delay 0.1-10s	110-130VAC	
						1SVR 450 321 R 0200	**CM-ASN**	3x220-240VAC 50Hz 2c/o closed-circuit principle relay delay 0.1-10s	220-240VAC	
						1SVR 450 321 R 0500	**CM-ASN**	3x380-415VAC 50Hz 2c/o closed-circuit principle relay delay 0.1-10s	220-240VAC	
						1SVR 450 321 R 0700	**CM-ASN**	3x480-500VAC 50Hz 2c/o closed-circuit principle relay delay 0.1-10s	220-240VAC	
						1SVR 450 322 R 0200	**CM-ASN**	3 x 220-240VAC 50Hz 2c/o closed-circuit principle relay delay 0.1-10s	380-415VAC	
						1SVR 450 322 R 0500	**CM-ASN**	3 x 380-415VAC 50Hz 2c/o closed-circuit principle relay delay 0.1-10s	380-415VAC	
						1SVR 450 322 R 0700	**CM-ASN**	3 x 480-500VAC 50Hz 2c/o closed-circuit principle relay delay 0.1-10s	380-415VAC	
						1SVR 450 421 R 0200	**CM-ASN**	3 x 220-240VAC 60Hz 2c/o closed-circuit principle relay delay 0.1-10s	220-240VAC	
						1SVR 450 422 R 0500	**CM-ASN**	3 x 380-415VAC 60Hz 2c/o closed-circuit principle relay delay 0.1-10s	380-415VAC	
						1SVR 450 423 R 0600	**CM-ASN**	3 x 440VAC 60Hz 2c/o closed-circuit principle relay delay 0.1-10s	440VAC	
						1SVR 450 424 R 0700	**CM-ASN**	3 x 480-500VAC 60Hz 2c/o closed-circuit principle relay delay 0.1-10s	480-500VAC	
						1SVR 450 932 R 0100	**CM-ASN**	3 x 480-500VAC 50Hz 2c/o closed-circuit principle relay delay 0.1-10s	500-550VAC	
						1SVR 450 426 R 0800	**CM-ASN**	3 x 600VAC 60Hz 2c/o closed-circuit principle relay delay 0.1-10s	600VAC	

CM-ASS: Measuring-circuit: L1, L2, L3
Output contacts: 15-16/18,
15 on upper terminal level

C 557: Measuring-circuit: L1, L2, L3
Output contacts: 11-12/14 on lower level

CM-ASN: Supply voltage: A1-A2
Measuring-circuit: L1, L2, L3
Output contacts: 15-16/18, 25-26/28
15 and 25 upper level

C 557: Measuring-circuit: L1, L2, L3
Output contacts11-12/14, 21-22/24
on lower level

Remark: 1c/o = SPDT; 2c/o = DPDT

Monitoring relays

Conversion table C55x → CM range (discontinued)

Old order code C55x	Type	Description Output contacts	Supply voltage	mm		New order code	Type	Description Output contacts	Supply voltage	mm
Liquid level monitor for 3 probes					->	**Liquid level monitor for 3 probes**				
1SAR 440 010 R 0002	**C 555**	5-10kΩ, adjustable 1c/o, closed-circuit principle	24VAC	22.5		**1SVR 430 851 R 9200**	**CM-ENS UP/DOWN**	5-10kΩ, adjustable 1c/o, closed-circuit principle	24VAC	22.5
1SAR 440 010 R 0003	**C 555**	5-10kΩ, adjustable 1c/o, closed-circuit principle	48VAC			**1SVR 430 851 R 0200**	**CM-ENS UP/DOWN**	35-10kΩ, adjustable 1c/o, closed-circuit principle	110-130VAC	
1SAR 440 010 R 0004	**C 555**	5-10kΩ, adjustable 1c/o, closed-circuit principle	120VAC			**1SVR 430 851 R 1200**	**CM-ENS UP/DOWN**	35-10kΩ, adjustable 1c/o, closed-circuit principle	220-240VAC	
1SAR 440 010 R 0005	**C 555**	5-10kΩ, adjustable 1c/o, closed-circuit principle	230VAC							
Cos-Phi-monitoring relay (for monitoring load states) of 1 phase or 3 phase motors					->	**Cos-Phi-monitoring relay (for monitoring load states) of 1 phase or 3 phase motors**				
1SAR 460 010 R 0005	**C 559**	up to 10A/230VAC 1c/o, for overload 1c/o, for underload closed-circuit principle Start up: 0.2-20s, relay delay 0.3-3s from measuring		45.0		**1SVR 450 335 R 0000**	**CM-LWN**	0.5-5A/110-500VAC 1c/o for over-,1c/o for underload closed-circuit principle/start up time adjust. relay delay adjustable	24-240VAC/DC	45.0
1SAR 460 010 R 0006	**C 559**	up to 10A/400VAC 1c/o, for overload 1c/o, for underload closed-circuit principle Start up: 0.2-20s, relay delay 0.3-3s from measuring				**1SVR 450 330 R 0000**	**CM-LWN**	0.5-5A/110-500VAC 1c/o for over-,1c/o for underload closed-circuit principle/start up time adjust. relay delay adjustable	110-130VAC	
1SAR 460 010 R 0014	**C 559**	up to10A/440VAC 1c/o, for overload 1c/o, for underload closed-circuit principle Start up: 0.2-20s, relay delay 0.3-3s from measuring				**1SVR 450 331 R 0000**	**CM-LWN**	0.5-5A/110-500VAC 1c/o for over-,1c/o for underload closed-circuit principle/start up time adjust. relay delay adjustable	220-240VAC	
1SAR 460 010 R 0015	**C 559**	up to10A/480VAC 1c/o, for overload 1c/o, for underload closed-circuit principle Start up: 0.2-20s, relay delay 0.3-3s from measuring				**1SVR 450 332 R 0000**	**CM-LWN**	0.5-5A/110-500VAC 1c/o for over-,1c/o for underload closed-circuit principle/start up time adjust. relay delay adjustable	380-440VAC	
1SAR 460 010 R 0016	**C 559**	up to10A/575VAC 1c/o, for overload 1c/o, for underload closed-circuit principle Start up: 0.2-20s, relay delay 0.3-3s from measuring				**1SVR 450 334 R 0000**	**CM-LWN**	0.5-5A/110-500VAC 1c/o for over-,1c/o for underload closed-circuit principle/start up time adjust. relay delay adjustable	480-500VAC	
						1SVR 450 335 R 0100	**CM-LWN**	2-20A/110-500VAC 1c/o for over-,1c/o for underload closed-circuit principle/start up time adjust. relay delay adjustable	24-240VAC/DC	45.0
						1SVR 450 330 R 0100	**CM-LWN**	2-20A/110-500VAC 1c/o for over-,1c/o for underload closed-circuit principle/start up time adjust. relay delay adjustable	110-130VAC	
						1SVR 450 331 R 0100	**CM-LWN**	2-20A/110-500VAC 1c/o for over-,1c/o for underload closed-circuit principle/start up time adjust. relay delay adjustable	220-240VAC	
						1SVR 450 332 R 0100	**CM-LWN**	2-20A/110-500VAC 1c/o for over-,1c/o for underload closed-circuit principle/start up time adjust. relay delay adjustable	380-440VAC	
						1SVR 450 334 R 0100	**CM-LWN**	2-20A/110-500VAC 1c/o for over-,1c/o for underload closed-circuit principle/start up time adjust. relay delay adjustable	480-500VAC	

CM-LWN: Supply and measuring voltage seperate measuring-circuits up to 20 A

C 559: Is supplied from the measuring-circuit

Thermistor motor protection relays		circuits/reset/test/ short-circuits monitoring/ non voltaile storage			->	Thermistor motor protection relays		circuits/reset/test/ short-circuits monitoring/ non voltaile storage		
1SAR 600 001 R 0005	**C 505.01**	1/auto/no/no/no 1c/o (11=A1)	24VDC	22.5		**1SVR550805R9300**	**CM-MSE**	1/auto/no/no/no, 1n/o	24VAC	
1SAR 600 001 R 0001	**C 505.01**	1/auto/no/no/no 1c/o (11=A1)	110-120VAC			**1SVR550800R9300**	**CM-MSE**	1/auto/no/no/no, 1n/o	110-130VAC	22.5
1SAR 600 001 R 0002	**C 505.01**	1/auto/no /no/no 1c/o (11=A1)	220-240VAC			**1SVR550801R9300**	**CM-MSE**	1/auto/no/no/no, 1n/o	220-240VAC	
1SAR 600 011 R 0005	**C 505.02**	1/auto/no/no/no 1n/o + 1n/c	24VDC	22.5		**1SVR430800R9100**	**CM-MSS**	1/auto/no/no/no, 1c/o	24 VAC/DC	
1SAR 600 011 R 0001	**C 505.02**	1/auto/no/no/no 1n/o + 1n/c	110-120VAC			**1SVR430801R1100**	**CM-MSS**	1/auto/no/no/no, 1c/o	220-240VAC	22.5
1SAR 600 011 R 0002	**C 505.02**	1/auto/no/no/no 1n/o + 1n/c	220-240VAC							
1SAR 600 011 R 0010	**C 505.02**	1/auto/no/no/no 1n/o + 1n/c	24-240VAC/DC							
1SAR 600 111 R 0005	**C 506.03**	1/man/yes/no/no 1n/o + 1n/c	24VDC	22.5		**1SVR430710R9300**	**CM-MSS**	1/conf./y./conf./no, 2c/o	24VAC/DC	
						1SVR430810R9300	**CM-MSS**	1/conf./yes/no/no, 2c/o	24VAC/DC	
						1SVR430811R0300	**CM-MSS**	1/conf./yes/no/no, 2c/o	24VAC	
1SAR600111R0006	**C506.03**	1/man/yes/no/no1n/o + 1n/c	110-120VAC 220-240VAC			**1SVR430811R9300**	**CM-MSS**	1/conf./yes/no/no, 2c/o	110-130VAC	22.5
1SAR600120R0006	**C506.03**	1/man/yes/no/no 2n/o	110-120VAC 220-240VAC			**1SVR430711R0300**	**CM-MSS**	1/conf./yes/conf./no, 2c/o	110-130VAC	
						1SVR430711R1300	**CM-MSS**	1/conf./y./conf./no, 2c/o	220-240VAC	
						1SVR430811R1300	**CM-MSS**	1/conf./yes/no/no, 2c/o	220-240VAC	
						1SVR430711R2300	**CM-MSS**	1/conf./y./conf./no, 2c/o	380-415VAC	
1SAR600211R0005	**C506.02**	1/conf./yes/no/yes 1n/o + 1n/c	24VDC	22.5		With non voltaile storage: 1SVR 430 720 R 0004; Without non voltaile storage: 1SVR 430 810 R9300 With non voltaile storage: 1SVR 430 720 R 0400; Without non voltaile storage: 1SVR 430 811 R 0300 or 1SVR 430 811 R 1300				
1SAR600211R0006	**C506.02**	1/conf./yes/no/yes 11n/o + 1n/c	110-120VAC 220-240VAC							
1SAR600302R0005	**C506.12**	1/conf./yes/yes/yes 2c/o	24V DC			**1SVR430720R0400**	**CM-MSS**	1/conf./yes/yes/conf. 1n/o + 1n/c	24-240VAC/DC	22.5
1SAR600302R0010	**C506.12**	1/conf./yes/yes/yes 2c/o	24-240VAC/DC							
1SAR600402R0010	**C506.15**	1/conf./y./y./y. 2c/o bist.	24-240VAC/DC	22.5						
1SAR600511R0010	**C506.22**	2/conf./y./n./y.11n/o + 1n/c	24-240VAC/DC	22.5		**1SVR430710R0200**	**CM-MSS**	2/conf./yes/yes/no 2x 1c/o	24-240VAC/DC	22.5
						1SVR430720R0500	**CM-MSS**	3/conf./yes/yes/conf. 1n/o + 1n/c	24-240VAC/DC	22.5
1SAR600612R0010	**C506.62**	6/conf./y./n./y.1n/o + 1n/c	24-240V AC/DC	45.0		**1SVR450025R0100**	**CM-MSN**	3/conf./yes/yes/conf. 1n/o + 1n/c	24-240VAC/DC	45.0

Remark: 1c/o = SPDT; 2c/o = DPDT