
Thermistor motor protection relays

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Thermistor motor protection relays

Benefits and advantages



The thermistor motor protection relays of the CM-MSx range protect motors with PTC sensors against high temperature. These sensors are incorporated in the motor windings, thus measuring the motor heat directly.



Continuous operation

By using thermistor motor protection relays from ABB, the down and commissioning time can be reduced. The relay is continuously monitoring the sensor circuit to detect short-circuit or interrupted i.e. wire faults, thus contributing to maintenance and time saving in case of faults. In addition, the clear error messages of the front LEDs makes it possible to distinguish between the various fault causes.



Reliable in harsh conditions

Direct motor protection through temperature monitoring of the motor winding offers 100 % motor protection, even under the most difficult ambient conditions. The ABB thermistor motor protection relays give you access to worldwide markets and are approved by local and international standards for many applications such as industry, renewable energies, the marine sector and dangerous and explosive environments. To prove that, the CM-MSS thermistor motor protection relays are certified according to ATEX Ex II (2) G and D for environments with explosive gas or dust loads.



Easy installation

Due to the compliance with the latest standards, there is no need to make any adjustments on the device. All relays come with two different connection possibilities - screw or push-in - to make any adjustments on the installation a breeze. Thanks to direct measurement of the motor temperature, dimensioning of the thermistor motor protection relay, considering the size of the motor, is not necessary.

Thermistor motor protection relays

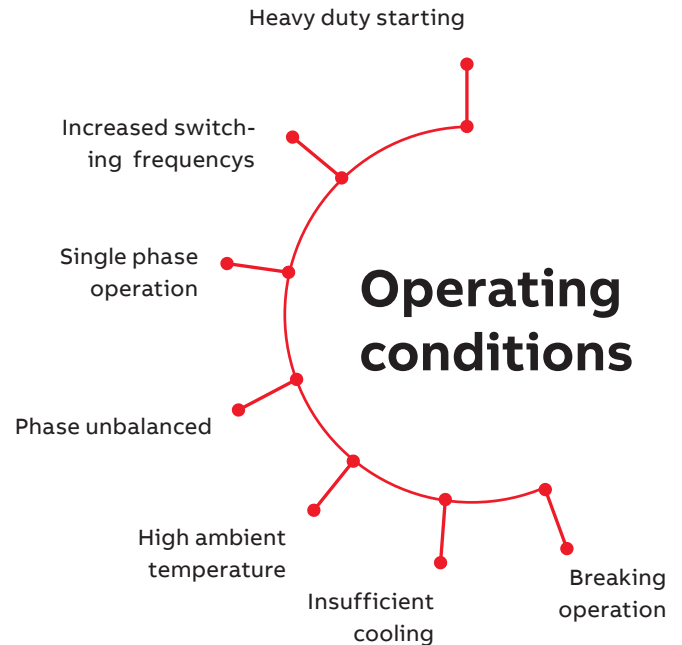
Applications



Direct temperature monitoring

Generally, motor damage caused by overload or overheating situations can be prevented in different ways. Compared to the indirect temperature measuring which monitors the motor current, the temperature inside the motor can be measured by direct temperature measuring. This enables direct control and evaluation of different operating conditions:

Therefore, the consequences from overheating, such as abrasion as well as electrical failures, can be prevented. The direct measuring principle is carried out by a combination of the thermistor motor protection relay and three PTC sensors which are installed directly in the motor by the manufacturer. Those 3 PTC sensors are placed directly at the thermal hotspots, the motor windings.



Motor protection using current- and temperature-dependent protective devices

IEC 60204 stipulates that motors must be protected from overheating at a rating of 0.5 kW and higher. The protection can be provided or executed by overload protection, overtemperature protection or current limiting. For motors with frequent starting and braking, and in environments where cooling may be impaired (e.g. by dust), it is recommended to use the overtemperature protection option in the form of a protective device coordinated with this mode of operation.

On rotor-critical motors, overtemperature detection in the stator windings can lead to delayed and hence inadequate protection. In this case, the standards stipulate additional protection, e.g. by means of an overload relay. This combination of thermistor motor protection and an overload relay is recommended for full motor protection in case of frequent starting and braking of motors, irregular intermittent duty or excessive switching frequency.

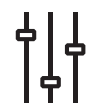


Operating mode

The thermistor motor protection relays are used to monitor the temperature of motors or generators equipped with PTC sensors type A according to the latest product standard IEC 60947-8. The sensors are built-in into the motor windings, measuring the motor heating. In case of an increase of the temperature in the motor, the resistance of the PTC sensors increases as well. If the motor heats-up excessively ($>2.83 \text{ k}\Omega$), the output relay(s) de-energize(s) and the corresponding LED displays the overtemperature. A short circuit and an interrupted wire within the sensor circuit can also be detected. A reset is only possible after cooling down of the motor ($<1.1 \text{ k}\Omega$) or after a wire interruption, or a short circuit within the sensor circuit has been removed. A reset after tripping can be done manually with the Test / Reset button, externally with a push button between S1 and 1T2/2T2, or automatically by jumpering S1-1T2/2T2.

Thermistor motor protection relays

Features



Test function

The test function is only possible when there is no fault. By pressing the front-face combined Test / Reset button, a system test routine is executed. If the function „Remote Test / Reset“ (DIP switch 4) is activated, the system test routine is also possible via control input S1-T2 (S1-1T2/2T2*).

After starting the test routine, the output relays de-energize. They remain de-energized until the Test / Reset button is pressed again or control input S1-T2 (S1-1T2/2T2*) is closed (remote reset).

Short-circuit detection

If a short circuit is detected between the two lines of a sensor circuit, the output relay(s) de-energize(s) and the LEDs will display the specific error code.

Dynamic interrupted wire detection

During the operation, the device is permanently monitoring the measuring circuit. If the resistance in the measuring circuit rises, the device distinguishes if there is an overtemperature or an interrupted wire.



Fault storage , **reset function**

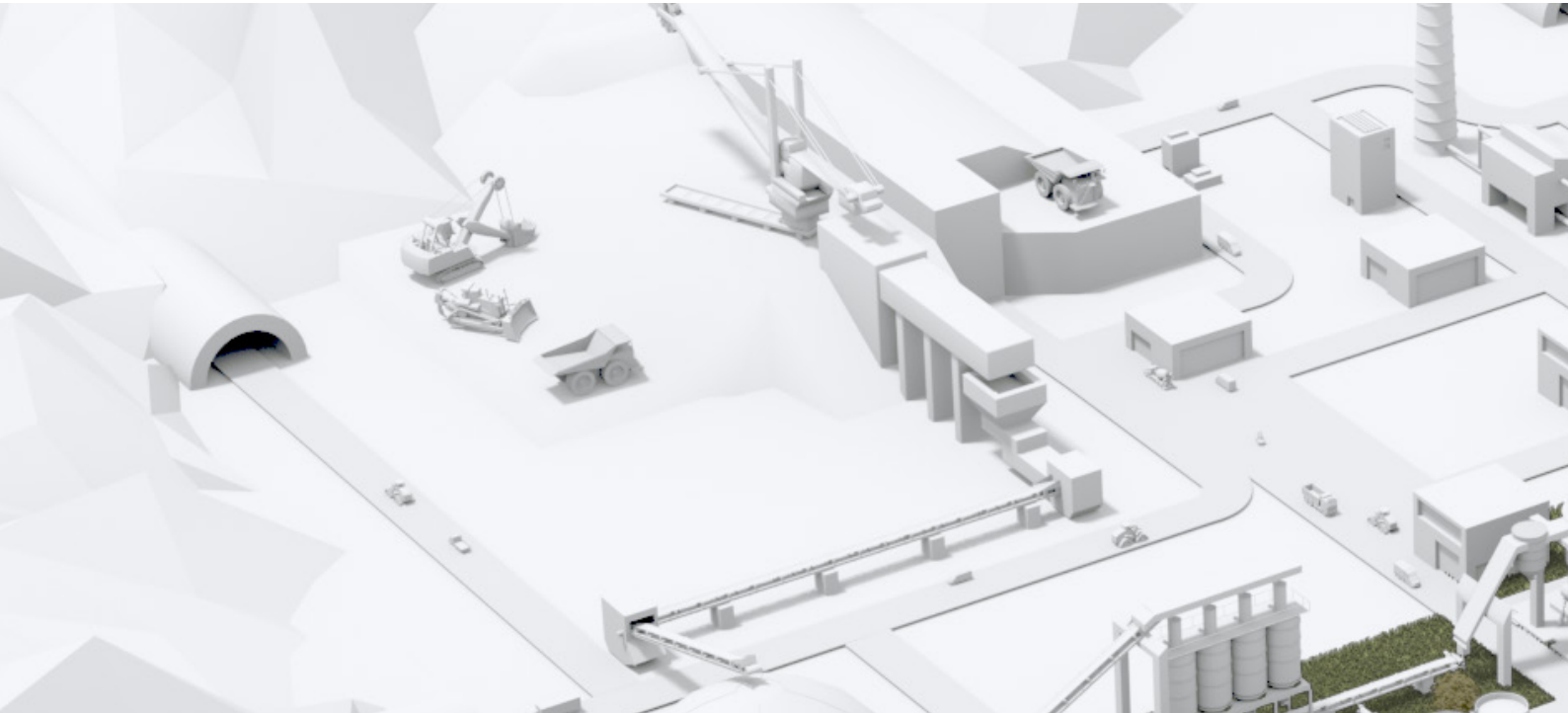
The fault storage is designed as non-volatile (remanent). This means that after switch-off and return of the control supply voltage the device returns to the state it was prior to the switch-off. If there was no fault prior to the interruption of the control supply voltage, the device restarts automatically after re-applying control supply voltage.

If there was a fault prior to the interruption, reset can be reset manually by the Test / Reset button or externally by remote reset between S1-T2 (S1-1T2/2T2*).

With deactivated fault storage, reset can be made manually by the Test / Reset button, automatically by jumpering S1-T2 (S1-1T2/2T2*) or externally by remote reset between S1-T2 (S1-1T2/2T2*). Depending on the configuration of DIP switch 1, there are several possibilities to reset the device as shown in the picture.

DIP switch 1		
	1.) Front 2.) Remote 3.) A1-A2	1.) Front 2.) Remote
	1.) Front 2.) A1-A2	1.) Front
	1.) Auto-Reset	

*CM-MSS.51



Thermistor motor protection relays

Features



Single and accumulative evaluation

Single evaluation 2x1 c/o

If a fault occurs in the measuring circuit 1, output relay 1 (11-12/14) de-energizes. If a fault occurs in the measuring circuit 2, output relay 2 (21-22/24) de-energizes.

Accumulative evaluation 1x2 c/o

In case of a fault in one of the two measuring circuits, both output relays de-energize synchronously.

Bimetallic switches

In some applications, bimetallic switches - such as Klixon - are used as sensors instead of PTC temperature sensors. Bimetallic switches are temperature and current dependent, normally closed contacts, and are available for different temperature ranges. Since bimetallic switches have almost no resistance below their opening temperature, short-circuit detection is not possible when bimetallic switches are used.



ATEX certification

Suitably selected and adjusted devices are necessary for the safe operation of explosion-protected motors. Only the sensor line is conducted into the explosive atmosphere. The motor protection relay itself must be installed outside the potentially explosive atmospheres.

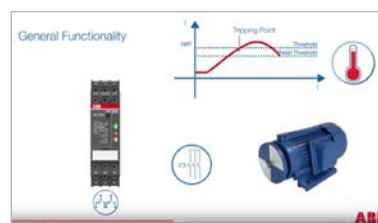
Marking:



II (2) G
II (2) D



CM-MSS functionality video



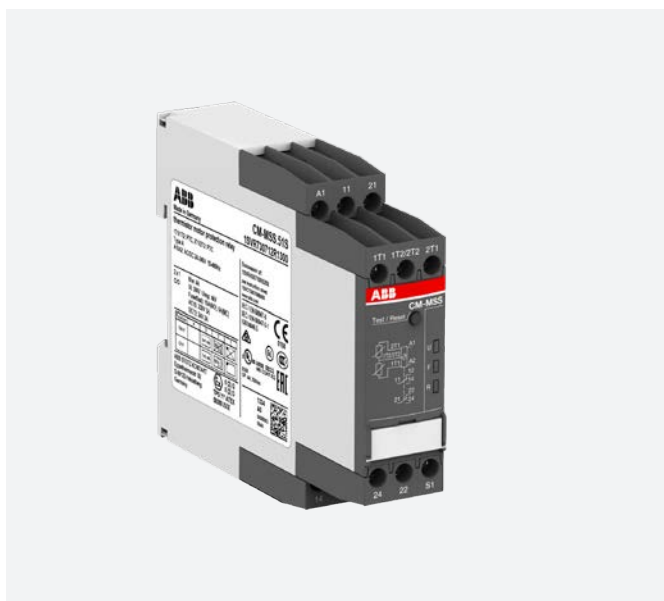
Thermistor motor protection relays

Offer overview



CM-MSE

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



CM-MSS¹⁾

- Different types of contacts available
 - 1 x 2 c/o (SPDT) contacts
 - 2 x 1 c/o (SPDT) contact
 - 1 n/o and 1 n/c contact
- 1 or 2 measuring circuits
- Different types of reset functions
 - Automatic
 - Manual
 - Remote
- Rated control supply voltages
 - 24 V AC/DC
 - 24-240 V AC/DC
 - 110-130 V AC, 220-240 V AC
- Various approvals and marks

⁽¹⁾ Depending on device the characteristics vary, for detailed overview see "Selection table" on page 189.



Thermistor motor protection relays

Operating controls



Test / Reset button

Test - only possible if/when the relay doesn't show any fault.

Reset - only possible if measured value < switch-on resistance



Marker label / DIP switches (depending on device) e.g.

Single evaluation 2 x 1 c/o (SPDT) contact

Accumulative evaluation 1 x 2 c/o (SPDT) contacts

Short-circuit detection de-activated

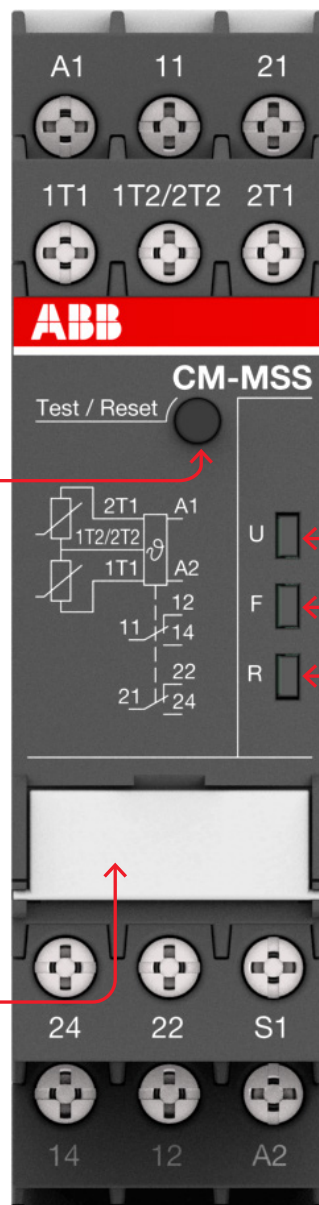
Short-circuit detection activated

Non-volatile fault storage activated

Non-volatile fault storage de-activated

Remote Reset

Remote Test/Reset



Indication of operational states with LEDs

U: green LED - Status indication of control supply voltage

Control supply voltage applied

F: red LED - Fault message

R: yellow LED - Status indication of the output relay

For detailed status and failure analysis, please see "LEDs, status information and fault messages".

- 1) For automatic reset, connect terminals S1 to T2.
- 2) For automatic reset, connect Terminals S1 to 1T2/2T2.

Thermistor motor protection relays

Ordering details



CM-MSS.12S



CM-MSS.41S



CM-MSS.51S

Description

The thermistor motor protection relay CM-MSS monitors the winding temperature and thus protects the motor from overheating, overload and insufficient cooling in accordance to the product standard IEC/EN 60947-8.

Ordering details

CM-MSx

Characteristics	Type	Order code	Weight (1 pc) kg (lb)
See selection table	CM-MSE	1SVR550805R9300	0.11 (0.24)
	CM-MSE	1SVR550800R9300	0.11 (0.24)
	CM-MSE	1SVR550801R9300	0.11 (0.24)
	CM-MSS.11P	1SVR740720R1400	0.119 (0.263)
	CM-MSS.11S	1SVR730720R1400	0.127 (0.280)
	CM-MSS.12P	1SVR740700R0100	0.105 (0.231)
	CM-MSS.12S	1SVR730700R0100	0.113 (0.249)
	CM-MSS.13P	1SVR740700R2100	0.147 (0.324)
	CM-MSS.13S	1SVR730700R2100	0.155 (0.342)
	CM-MSS.21P	1SVR740722R1400	0.118 (0.260)
	CM-MSS.21S	1SVR730722R1400	0.126 (0.278)
	CM-MSS.22P	1SVR740700R0200	0.121 (0.267)
	CM-MSS.22S	1SVR730700R0200	0.132 (0.291)
	CM-MSS.23P	1SVR740700R2200	0.163 (0.359)
	CM-MSS.23S	1SVR730700R2200	0.174 (0.384)
	CM-MSS.31P	1SVR740712R1400	0.120 (0.265)
	CM-MSS.31S	1SVR730712R1400	0.128 (0.282)
	CM-MSS.32P	1SVR740712R0200	0.120 (0.265)
	CM-MSS.32S	1SVR730712R0200	0.130 (0.287)
	CM-MSS.33P	1SVR740712R2200	0.162 (0.357)
	CM-MSS.33S	1SVR730712R2200	0.172 (0.379)
	CM-MSS.41P	1SVR740712R1200	0.130 (0.287)
	CM-MSS.41S	1SVR730712R1200	0.141 (0.311)
	CM-MSS.51P	1SVR740712R1300	0.135 (0.298)
	CM-MSS.51S	1SVR730712R1300	0.145 (0.320)

S: screw connection
P: push-in connection

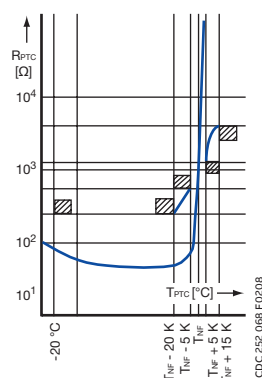
Thermistor motor protection relays

Ordering details - PTC temperature sensors C011



Temperature sensor example

15VC 110 000 F0531



Temperature sensor characteristics

Description

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

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

One temperature sensor must be embedded in each phase winding. For instance, in case of three-phase squirrel cage motors, three sensors are embedded in the stator windings. For pole-changing motors with one winding (Dahlander connection), three sensors are also required. Pole-changing motors with two windings, however, require six sensors. If an additional warning is required before the motor is switched off, separate sensors for a correspondingly lower temperature must be embedded in the winding. They have to be connected to a second control unit.

The sensors are suitable for embedding in motor windings with rated operating voltages of up to 600 V AC. Conductor length: 500 mm per sensor. A 14 V varistor can be connected in parallel to protect the sensors from overvoltage. Due to their characteristics, the thermistor motor protection relays can also be used with PTC temperature sensors of other manufacturers which comply with DIN 44 081 and DIN 44 082.

Ordering details

CM-MSS accessories

Rated response temperature T_{NF}	Color coding	Type	Order code	Weight (1 pc) kg (lb)
70 °C	white-brown	C011-70 ¹⁾	GHC0110003R0001	0.02 (0.044)
80 °C	white-white	C011-80 ¹⁾	GHC0110003R0002	0.02 (0.044)
90 °C	green-green	C011-90 ¹⁾	GHC0110003R0003	0.02 (0.044)
100 °C	red-red	C011-100 ¹⁾	GHC0110003R0004	0.02 (0.044)
110 °C	brown-brown	C011-110 ¹⁾	GHC0110003R0005	0.02 (0.044)
120 °C	gray-gray	C011-120 ¹⁾	GHC0110003R0006	0.02 (0.044)
130 °C	blue-blue	C011-130 ¹⁾	GHC0110003R0007	0.02 (0.044)
140 °C	white-blue	C011-140 ¹⁾	GHC0110003R0011	0.02 (0.044)
150 °C	black-black	C011-150 ¹⁾	GHC0110003R0008	0.02 (0.044)
160 °C	blue-red	C011-160 ¹⁾	GHC0110003R0009	0.02 (0.044)
170 °C	white-green	C011-170 ¹⁾	GHC0110003R0010	0.02 (0.044)
150 °C	black-black	C011-3-150 ²⁾	GHC0110033R0008	0.05 (0.11)

1) Temperature sensor C011, standard version acc. to DIN 44081

2) Triple temperature sensor C011-3

Thermistor motor protection relays

Technical data - PTC temperature sensors C011

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

Rated response temperature $\pm$ tolerance $T_{NF} \pm \Delta T_{NF}$	PTC resistance R from -20 °C to $T_{NF} - 20$ K	PTC resistance R ²⁾ at PTC temperatures of:		
		$T_{NF} - i T_{NF}$ (UPTC ≤ 2.5 V)	$T_{NF} + i T_{NF}$ (UPTC ≤ 2.5 V)	$T_{NF} + 15$ K (UPTC ≤ 7.5 V)
70 ± 5 °C	$\leq 100 \Omega$	$\leq 570 \Omega$	$\geq 570 \Omega$	-
80 ± 5 °C				
90 ± 5 °C		$\leq 550 \Omega$	$\geq 1330 \Omega$	$\geq 4000 \Omega$
100 ± 5 °C				
110 ± 5 °C				
120 ± 5 °C				
130 ± 5 °C				
140 ± 5 °C				
150 ± 5 °C				
160 ± 5 °C				
170 ± 7 °C		$\leq 570 \Omega$	$\geq 570 \Omega$	-

1) Not embedded in windings.

2) For triple temperature sensor take values x 3.

Thermistor motor protection relays

Technical data - CM-MSS

Data at $T_a = 25\text{ °C}$ and rated values, unless otherwise indicated

Type		CM-MSS.x1	CM-MSS.x2	CM-MSS.x3
Supply circuit - Input circuit				
Rated control supply voltage U _s	A1-A2	24-240 V AC/DC	24 V AC/DC	220-240 V AC
	A2-A3	-	-	110-130 V AC
Rated control supply voltage U _s tolerance		-15...+10 %		
Rated frequency		15-400 Hz	50-60 Hz	
Electrical insulation between supply circuit and measuring circuit		yes	no	yes
Power failure buffering time		20 ms		
Supply circuit - Measuring circuit / Sensor circuit				
Number of circuits		1 (CM-MSS.51: 2)		
Sensor type		PTC type A (DIN/EN 44081, DIN/EN 44082)		
Max. total resistance of sensors connected in series, cold state		< 750 Ω		
Overtemperature monitoring	switch-off resistance (relay de-energizes)	2.83 kΩ ± 1% (CM-MSS.12 /.13 /.22 /.23: 2.7 kΩ ± 5%)		
	switch-on resistance (relay energizes)	1.1 kΩ ± 1% (CM-MSS.12 /.13 /.22 /.23: 1.2 kΩ ± 5%)		
Maximum voltage in sensor circuit	1.33 kW	2.5 V		
	4 kW	3.7 V		
	∞ kW	5.5 V		
Maximum current in sensor circuit		3.7 mA		
Maximum sensor cable length		2 x 100 m at 0.75 mm², 2 x 400 m at 2.5 mm²		
Accuracy within the rated control supply voltage tolerance		0.50 % (CM-MSS.12 /.13 /.22 /.23: 5 %)		
Accuracy within the temperature range		0.01 %/K (CM-MSS.12 /.13 /.22 /.23: 0.5 %/K)		
Repeat accuracy (constant parameters)		on request		
Reaction time of the safety function		< 100 ms		
Hardware fault tolerance (HFT)		0		
Control circuit				
Control function		see "Selection table CM-MSx range"		
Maximum no-load voltage		5.5 V		
Max. current		0.6 mA (CM-MSS.12 /.13 /.22 /.23: 1.2 mA)		
Maximum cable length		2 x 100 m at 0.75 mm², 2 x 400 m at 2.5 mm²		
Indication of operational states				
Control supply voltage	U	LED green		
Relay status	R	LED yellow		
Fault message	F	LED red		
Output circuit				
Kind of output		see "Selection table CM-MSx range"		
Operating principle		closed-circuit principle		
Contact material		AgNi alloy, Cd free		
Rated operational voltage U _e (IEC/EN 60947-1)		250 V AC		
Minimum switching voltage / Minimum switching current		24 V / 10 mA		
Maximum switching voltage / Maximum switching current		see data sheet		
Rated operating current I _e (IEC/EN 60947-5-1)	AC-12 (resistive) at 230 V	4 A		
	AC-15 (inductive) at 230 V	3 A		
	DC-12 (resistive) at 24 V	4 A		
	DC-13 (inductive) at 24 V	2 A		
AC Rating (UL 508)	utilization category (Control Circuit Rating Code)	B 300		
	maximum rated operational voltage	300 V AC		
	maximum continuous thermal current at B 300	5 A		
	maximum making/breaking apparent power at B 300	3600/360 VA		
	general purpose rating	250 V AC - 4 A		
Mechanical lifetime		30 x 10 ⁶ switching cycles		
Electrical lifetime	at AC12, 230 V AC, 4 A	0.1 x 10 ⁶ switching cycles		
Maximum fuse rating to achieve short-circuit protection	n/c contact	10 A fast-acting (CM-MSS.12, CM-MSS.13, CM-MSS.51: 6 A)		
	n/o contact	10 A fast-acting		

Thermistor motor protection relays

Technical data - CM-MSS

Type	CM-MSS.x1	CM-MSS.x2	CM-MSS.x3
General data			
MTBF	on request		
Duty time	100 %		
Dimensions	see "Dimensional drawings"		
Mounting	DIN rail (IEC/EN 60715), snap-on mounting without any tool		
Mounting position	any		
Minimum distance to other units	vertical / horizontal	10 mm (0.394 in) if switching current > 2 A	
Material of housing	UL 94 V-0		
Degree of protection	housing	IP50	
	terminals	IP20	
Electrical connection		Screw connection technology	Easy Connect Technology (push-in)
Connection capacity	fine-strand with(out) wire end ferrule	1 x 0.5-2.5 mm ² (1 x 18-14 AWG) 2 x 0.5-1.5 mm ² (2 x 18-16 AWG)	2 x 0.5-1.5 mm ² (2 x 18-16 AWG)
	rigid	1 x 0.5-4 mm ² (1 x 20-12 AWG) 2 x 0.5-2.5 mm ² (2 x 20-14 AWG)	2 x 0.5-1.5 mm ² (2 x 20-16 AWG)
Stripping length	8 mm (0.32 in)		
Tightening torque	0.6-0.8 Nm (7.08 lb.in)		-
Environmental data			
Ambient temperature ranges	operation	-25...+60 °C (-13...+140 °F)	
	storage	-40...+85 °C (-40...+185 °F)	
Damp heat, cyclic (IEC/EN 60068-2-30)	6 x 24 h cycle, 55 °C, 95 % RH		
Climatic class (IEC/EN 60721-3-3)	3K5 (no condensation, no ice formation)		
Vibration, sinusoidal	5-13.2 Hz: ±1 mm; 13.2-100 Hz: 0.7 g		
Shock	Class 2		
Isolation data			
Rated insulation voltage U _i	Supply circuit / Measuring circuit ⁽¹⁾	300 V AC (CM-MSS.x2: n/a)	
	Supply circuit / Output circuits	300 V AC	
	Measuring circuit (1) / Output circuits	300 V AC	
	Output circuit 1 / Output circuit 2	300 V AC	
Rated impulse withstand voltage U _{imp}	Supply circuit / Measuring circuit ⁽¹⁾	4 kV (CM-MSS.x2: n/a)	
	Supply circuit / Output circuits	4 kV	
	Measuring circuit (1) / Output circuits	4 kV	
	Output circuit 1 / Output circuit 2	4 kV	
Basic insulation	Supply circuit / Measuring circuit ⁽¹⁾	600 V AC (CM-MSS.x2: n/a)	
	Supply circuit / Output circuits	600 V AC	
	Measuring circuit (1) / Output circuits	600 V AC	
	Output circuit 1 / Output circuit 2	300 V AC	
Protective separation (IEC/EN 61140, EN 50178)	Supply circuit / Measuring circuit ⁽¹⁾	yes, up to 300 V	
	Supply circuit / Output circuits	yes (CM-MSS.x2: n/a)	
	Measuring circuit (1) / Output circuits	yes	
	Output circuit 1 / Output circuit 2	no	
Pollution degree (IEC/EN 60664-1)	3		
Overvoltage category (IEC/EN 60664-1)	III		
⁽¹⁾ Potential of measuring circuit = Potential of control circuit			
Standards			
Product standard	EN 60947-5-1, EN 60947-8		
Low Voltage Directive	2014/35/EU		
EMC directive	2014/30/EU		
ATEX directive	2014/34/EU (only ATEX variants, see "Selection table CM-MSx range")		
RoHS directive	2011/65/EU		

Thermistor motor protection relays

Technical data - CM-MSS

Type	CM-MSS.x1	CM-MSS.x2	CM-MSS.x3
Electromagnetic compatibility			
Interference immunity to		IEC/EN 61000-6-2, IEC/EN 60947-8	
electrostatic discharge	IEC/EN 61000-4-2	Level 3, 6 kV contact discharge, 8 kV air discharge	
radiated, radio-frequency, electromagnetic field	IEC/EN 61000-4-3	Level 3, 10 V/m (1 GHz), 3 V/m (2 GHz), 1 V/m (2.7 GHz)	
electrical fast transient / burst	IEC/EN 61000-4-4	Level 3, 2 kV / 5 kHz	
surge	IEC/EN 61000-4-5	Level 3, Installation class 3, supply circuit and measuring circuit 1 kV L-L, 2 kV L-N	
conducted disturbances, induced by radio-frequency fields	IEC/EN 61000-4-6	Level 3, 0.15-80 MHz, 10 V, 80 % AM (1kHz)	
voltage dips, short interruptions and voltage variations	IEC/EN 61000-4-11	Class 3	
harmonics and interharmonics	IEC/EN 61000-4-13	Class 3	
Additional interference immunity according to product standard IEC/EN 60255-1 (reference on IEC/EN 60255-26)			
radiated, radio-frequency, electromagnetic field	IEC/EN 61000-4-3	10 V/m (80 MHz - 3 GHz)	
conducted disturbances, induced by radio-frequency fields	IEC/EN 61000-4-6	10 V at stated frequencies	
damped oscillatory waves	IEC/EN 61000-4-18	Signal lines, symmetric coupling: 1 kV peak voltage Power supply, asymmetric coupling: 2.5 kV peak voltage	
Interference emissions		IEC/EN 61000-6-3	
high-frequency radiated	IEC/CISPR 22, EN 55022	Class B	
high-frequency conducted	IEC/CISPR 22, EN 55022	Class B	
high-frequency radiated	Germanischer Lloyd	increased requirements in the emergency call frequency band	

Thermistor motor protection relays

Technical data - CM-MSE

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

Type		CM-MSE
Supply circuit - Input circuit		
Rated control supply voltage U _s power consumption	1SVR550805R9300	24 V AC approx. 1.5 A
	1SVR550800R9300	110-130 V AC approx. 1.5 A
	1SVR550801R9300	220-240 V AC approx. 1.5 A
Rated control supply voltage U _s tolerance		-15...+10 %
Rated frequency		50-60 Hz
Measuring circuit		
Monitoring function	T1-T2	temperature monitoring by means of PTC sensors
Number of sensor circuits		1
Sensor circuit		
Sensor type		PTC type A (DIN/EN 44081, DIN/EN 44082)
Max. total resistance of sensors connected in series, cold state		≤1.0 kΩ
Overtemperature monitoring	switch-off resistance (relay de-energizes)	2.0-3.0 kΩ
	switch-on resistance (relay energizes)	1.2-1.65 kΩ
Maximum voltage in sensor circuit	4 kΩ	5 V
	∞ kΩ	15 V
Maximum current in sensor circuit		2 mA
Maximum sensor cable length		2 x 100 m at 0.75 mm ² , 2 x 400 m at 2.5 mm ²
Reaction time		<100 ms
Output circuit		
Kind of output	13-14	1 n/o contact
Operational principle		closed-circuit principle (output relay de-energizes if the measured value exceeds/drops below the adjusted threshold)
Maximum switching voltage		250 V
Rated operating voltage U _e and rated operating current I _e	AC-12 (resistive) at 230 V	4 A
	AC-15 (inductive) at 230 V	3 A
	DC-12 (resistive) at 24 V	4 A
	DC-13 (inductive) at 24 V	2 A
AC Rating (UL 508)	utilization category (Control Circuit Rating Code)	B 300
	maximum rated operational voltage	300 V AC
	maximum continuous thermal current at B 300	5 A
	maximum making/breaking apparent power at B 300	3600/360 VA
	general purpose rating	250 V AC - 4 A
Mechanical lifetime		30 x 10 ⁶ switching cycles
Electrical lifetime	at AC12, 230 V AC, 4 A	0.1 x 10 ⁶ switching cycles
Maximum fuse rating to achieve short-circuit protection	n/c contact	10 A fast-acting
	n/o contact	10 A fast-acting
General data		
Dimensions		see "dimensional drawings"
Duty cycle		100 %
Mounting		DIN rail (IEC/EN 60715)
Mounting position		any
Degree of protection	housing / terminals	IP50 / IP20
Electrical connection		
Connecting capacity	fine strand with wire end ferrule	2 x 1.5 mm ² (2 x 16 AWG)
	fine strand without wire end ferrule	2 x 0.75-1.5 mm ² (2 x 18-16 AWG)
	rigid	2 x 1-1.5 mm ² (2 x 18-16 AWG)
Stripping length		2 x 0.75-1.5 mm ² (2 x 18-16 AWG)
Tightening torque		0.6-0.8 Nm (5.31-7.08 lb.in)
Environmental data		
Ambient temperature ranges	Operation	-20...+60 °C
	Storage	-40...+85 °C
Damp heat	IEC/EN 60068-2-30	40 °C, 93 % RH, 4 days
Vibration withstand	IEC/EN 60062-2-6	10-57 Hz: 0.075 mm; 57-150 Hz: 1 g

Thermistor motor protection relays

Technical data - CM-MSE

Type		CM-MSE
Isolation data		
Rated insulation voltage U_i	supply, measuring / output circuit	250 V
Rated impulse withstand voltage U_{imp}	between all isolated circuits	4 kV / 1.2 - 50 μ s
Pollution degree		3
Overvoltage category		III
Standards / Directives		
Standards		IEC/EN 60947-5-1, IEC/EN 60947-8
Low Voltage Directive		2014/35/EU
EMC Directive		2014/30/EU
RoHS Directive		2011/65/EU
Electromagnetic compatibility		
Interference immunity to		IEC/EN 61000-6-2, IEC/EN 60947-8
electrostatic discharge	IEC/EN 61000-4-2	Level 3, 6 kV contact discharge, 8 kV air discharge
radiated, radio-frequency, electromagnetic field	IEC/EN 61000-4-3	Level 3, 10 V/m (1 GHz), 3 V/m (2 GHz), 1 V/m (2.7 GHz)
electrical fast transient /burst	IEC/EN 61000-4-4	Level 3, 2 kV / 5 kHz
surge	IEC/EN 61000-4-5	Level 3, installation class 3, supply circuit and measuring circuit 1 kV L-L, 2 kV L-N
conducted disturbances, induced by radio-frequency fields	IEC/EN 61000-4-6	Level 3, 0.15-80 MHz, 10 V, 80 % AM (1kHz)
Interference emission		IEC/EN 61000-6-3
high-frequency radiated	IEC/CISPR 22, EN 55022	Class B
high-frequency conducted	IEC/CISPR 22, EN 55022	Class B

Thermistor motor protection relays

Technical data

LEDs, status information and fault messages

CM-MSS

Operational state	U: green LED	F: red LED	R: yellow LED
Absence of control supply voltage	OFF	OFF	OFF
Internal fault ²⁾	OFF		
Internal fault ²⁾			
Control supply voltage not within the tolerance range			OFF
Short circuit			OFF
Interrupted wire			OFF
Measuring circuit 2: Overtemperature			OFF
Measuring circuit 1: Overtemperature			OFF
Fault rectified but not confirmed		- ¹⁾	
Test function		OFF	OFF
Change of configuration not confirmed		OFF	
No fault		OFF	

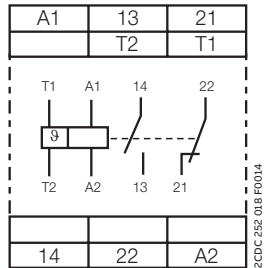
1) Depending on the fault with the highest priority
2) Restart the device. If after restart the same fault is indicated, replace the device.

Thermistor motor protection relays

Technical diagrams

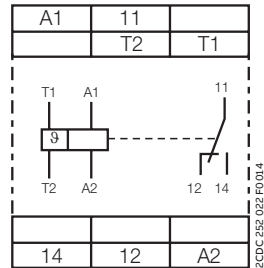
Connection diagrams

CM-MSS.11x, CM-MSS.21x



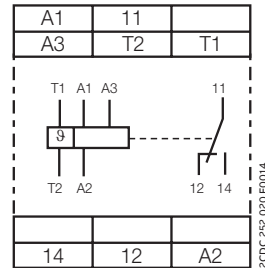
A1 – A2	Control supply voltage
13 – 14	n/o contact
21 – 22	n/c contact
T1 – T2	Measuring circuit

CM-MSS.12x



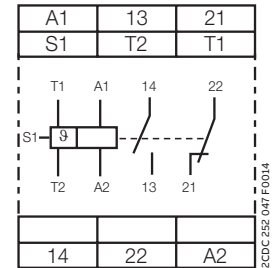
A1 – A2	Control supply voltage
11 – 12/14	c/o contact
T1 – T2	Measuring circuit

CM-MSS.13x



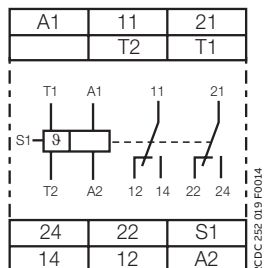
A1 – A2	Control supply voltage 220-240 V AC
A2 – A3	Control supply voltage 110-130 V AC
11 – 12/14	c/o contact
T1 – T2	Measuring circuit

CM-MSS.31x



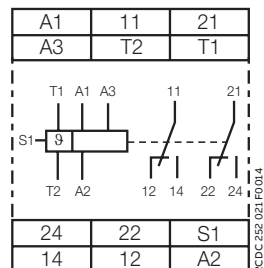
A1 – A2	Control supply voltage
13 – 14	n/o contact
21 – 22	n/c contact
S1 – T2	Automatic reset (jumped)
T1 – T2	Measuring circuit

CM-MSS.22x, CM-MSS.32x, CM-MSS.41x



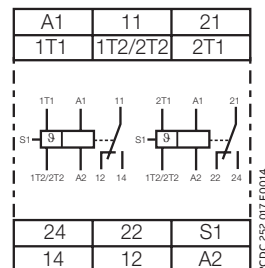
A1 – A2	Control supply voltage 24 V AC/DC
11 – 12/14	1st c/o (SPDT) contact
21 – 22/24	2nd c/o (SPDT) contact
S1 – T2	Automatic reset (jumped)
T1 – T2	Measuring circuit

CM-MSS.23x, CM-MSS.33x



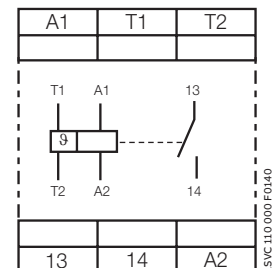
A1 – A2	Control supply voltage 220-240 V AC
A2 – A3	Control supply voltage 110-130 V AC
11 – 12/14	1st c/o (SPDT) contact
21 – 22/24	2nd c/o (SPDT) contact
S1 – T2	Automatic reset (jumped)
T1 – T2	Measuring circuit

CM-MSS.51x



A1 – A2	Control supply voltage 220-240 V AC
11 – 12/14	1st c/o (SPDT) contact
21 – 22/24	2nd c/o (SPDT) contact
S1 – 1T2/2T2	Automatic reset (jumped)
1T1 – 1T2/2T2	Measuring circuit 1
2T1 – 1T2/2T2	Measuring circuit 2

CM-MSE



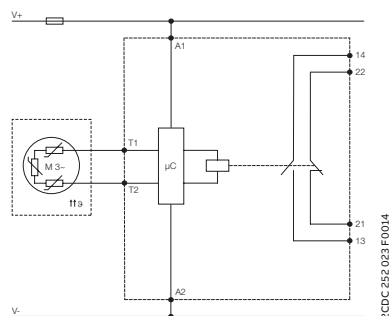
A1 – A2	Control supply voltage 24 V AC
T1-T2	Sensor circuit
13-14	Output contact - Closed circuit principle

Thermistor motor protection relays

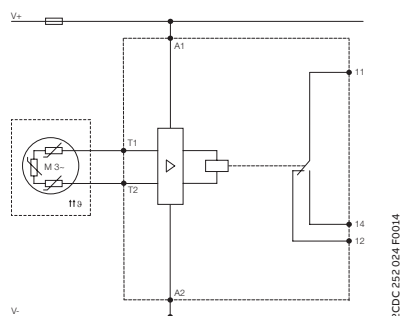
Technical diagrams

Circuit diagrams

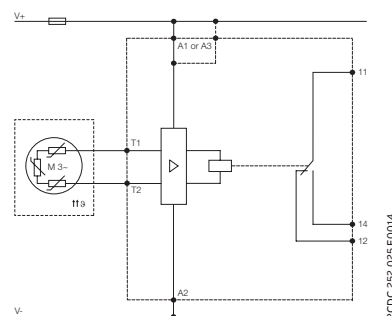
CM-MSS.11x, CM-MSS.21x



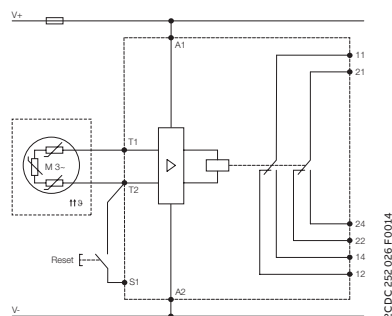
CM-MSS.12x



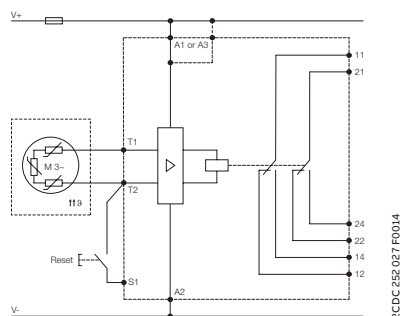
CM-MSS.13x



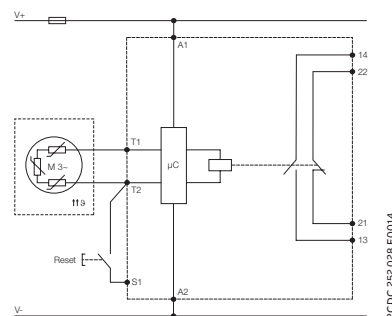
CM-MSS.22x



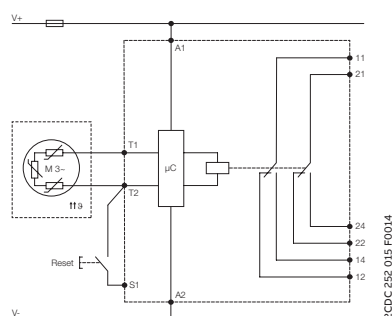
CM-MSS.23x



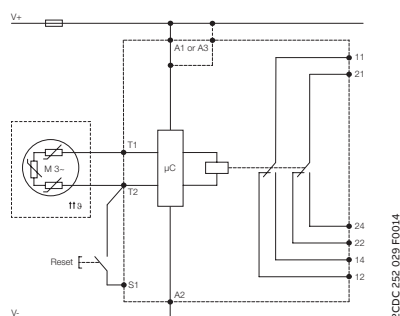
CM-MSS.31x



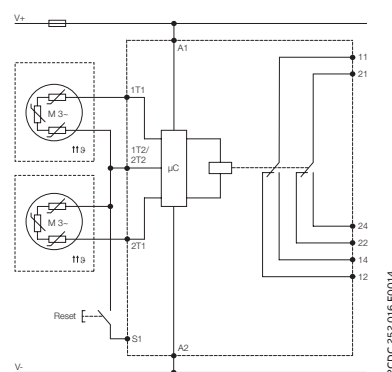
CM-MSS.32x, CM-MSS.41x



CM-MSS.33x



CM-MSS.51x



CM-MSE

