

CM-E Range

Thermistor motor protection



Thermistor motor protection



Thermistor motor protection relays

Benefits and advantages

Selection table

Operating principle and fields of application for thermistor motor protection relays

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

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

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

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

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

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

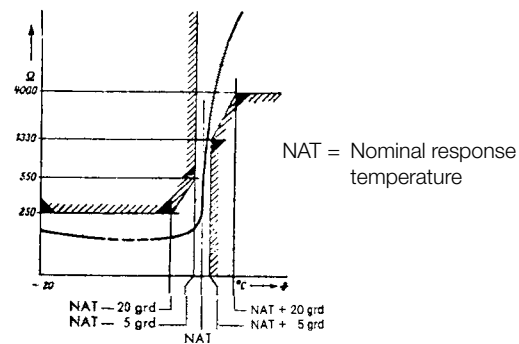
Further applications:

Temperature monitoring of equipment with PTC sensors integrated, such as

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

Resistance characteristic

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



Selection table thermistor motor protection relays

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

1) configurable via terminals

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

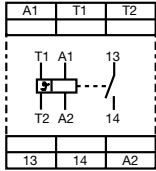
Thermistor motor protection relays

Product overview

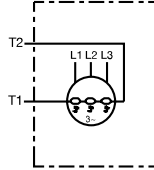
Measuring &
monitoring relays
CM Range

CM-MSE

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

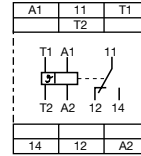


A1-A2 Rated control supply voltage
T1-T2 Sensor circuit
13-14 Output contact - Closed-circuit principle

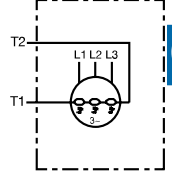


CM-MSS (1), 1 c/o contact

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

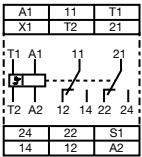


A1-A2 Rated control supply voltage
T1-T2 Sensor circuit
11-12/14 Output contact - Closed-circuit principle

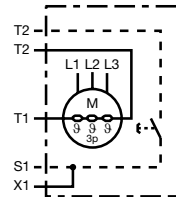


CM-MSS (2), 2 c/o contacts

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

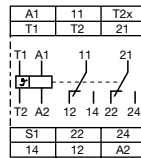


A1-A2 Rated control supply voltage
T1-T2 Sensor circuit
S1-T2 Remote reset jumper = no storage
11-12/14 Output contacts - Closed-circuit principle
21-22/24

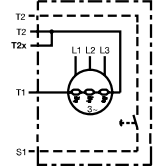


CM-MSS (3), 2 c/o contacts, short-circuit monitoring configurable

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



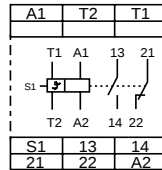
A1-A2 Rated control supply voltage
S1-T2 Remote reset jumper = without storage
T1-T2x measuring circuit without short-circuit monitoring
T1-T2 measuring circuit with short-circuit monitoring
11-12/14 Output contacts - Closed-circuit principle
21-22/24



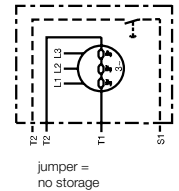
CM-MSS (4) + CM-MSS (5), 1-channel

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

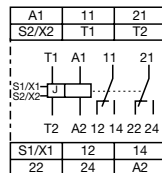
CM-MSS (4)



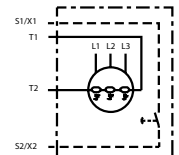
A1-A2 Rated control supply voltage
T1-T2 Sensor circuit
S1-T2 Remote reset
13-14 Output contacts - Closed-circuit principle
21-22



CM-MSS (5)

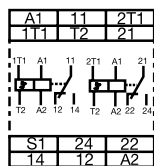


A1-A2 Rated control supply voltage
T1-T2 Sensor circuit
S1/X1-S2/X2 Reset
11-12/14 Output contacts - Closed-circuit principle
21-22/24

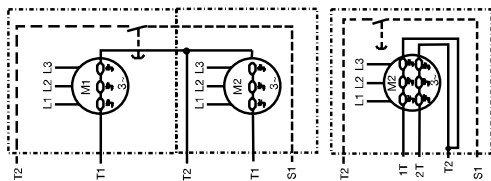


CM-MSS (6), 2-channel, single evaluation

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



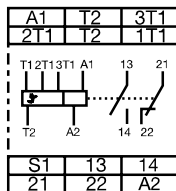
A1-A2	Rated control supply voltage
11-12/14, 21-22/24	Output contacts - Closed-circuit principle
1T1-T2 2T1-T2	Sensor circuit



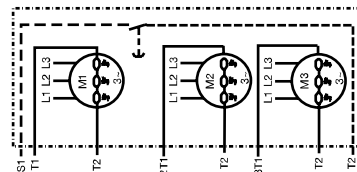
S1-T2 jumpered = no storage

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

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



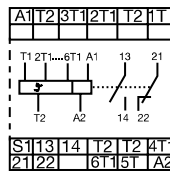
A1-A2	Rated control supply voltage
13-14	Output contacts -
21-22	Closed-circuit principle



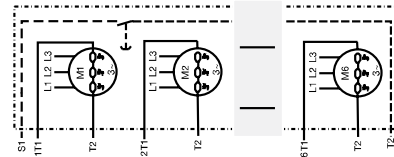
1T1-T2	Sensor circuits
2T1-T2	
3T1-T2	
S1-T2	Remote reset jumpered = no storage

CM-MSN, 6 sensor circuits, accumulative evaluation

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



A1-A2	Rated control supply voltage
13-14	Output contacts -
21-22	Closed-circuit principle



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

Thermistor motor protection relays

Ordering details

Description

The thermistor motor protection relays CM-MSE, CM-MSS and CM-MSN are used to control motors equipped with PTC temperature sensors. The PTC temperature sensors are incorporated in the motor windings to measure the motor heating. This enables direct control and evaluation of various operating conditions. Depending on the products also ATEX approvals for use in hazardous areas are available.

ABB also offers PTC temperature sensors C011 (according to DIN 44081) which are suitable for embedding in motor windings.

Ordering details

Rated control supply voltage = measuring voltage	Reference code	Catalog number	Weight (1 pce) kg (lb)
24 V AC	CM-MSE	1SVR550805R9300	0.11 (0.24)
110-130 V AC		1SVR550800R9300	0.11 (0.24)
220-240 V AC		1SVR550801R9300	0.11 (0.24)
24 V AC/DC ¹⁾	CM-MSS (1)	1SVR430800R9100	0.15 (0.33)
220-240 V AC		1SVR430801R1100	0.15 (0.33)
24 V AC/DC ¹⁾	CM-MSS (2)	1SVR430810R9300	0.15 (0.33)
24 V AC		1SVR430811R9300	0.15 (0.33)
110-130 V AC		1SVR430811R0300	0.15 (0.33)
220-240 V AC	CM-MSS (3)	1SVR430811R1300	0.15 (0.33)
24 V AC/DC ¹⁾		1SVR430710R9300	0.15 (0.33)
110-130 V AC		1SVR430711R0300	0.15 (0.33)
220-240 V AC	CM-MSS (3)	1SVR430711R1300	0.15 (0.33)
380-440 V AC		1SVR430711R2300	0.15 (0.33)
24-240 V AC/DC	CM-MSS (4) ²⁾	1SVR430720R0400	0.15 (0.33)
	CM-MSS (5) ³⁾	1SVR430720R0300	0.15 (0.33)
	CM-MSS (6)	1SVR430710R0200	0.15 (0.33)
	CM-MSS (7)	1SVR430720R0500	0.15 (0.33)
	CM-MSN	1SVR450025R0100	0.23 (0.51)

¹⁾ Not electrically isolated

²⁾ CM-MSS (4): 1-channel 1 n/c, 1 n/o

³⁾ CM-MSS (5): 1-channel 2 c/o



CM-MSE



CM-MSS (5)



CM-MSN

Thermistor motor protection relays

Ordering details

PTC temperature sensors C011

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), 3 sensors are also sufficient. Pole-changing motors with two windings, however, require 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 6 sensors.

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

Ordering details

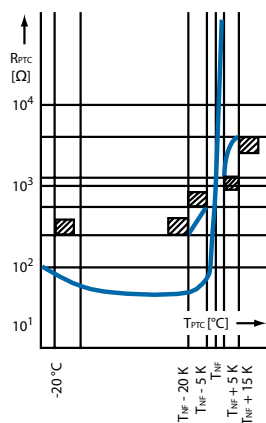
Rated response temperature T_{NF}	Color Coding	Reference code	Catalog number	Weight (1 pce) kg (lb)
70 °C	white-brown	C011-70 ¹⁾	GHC0110003R0001	0.02 (0.044)
80 °C	white-white	C011-80 ¹⁾	GHC0110003R0002	0.02 (0.044)
90 °C	green-green	C011-90 ¹⁾	GHC0110003R0003	0.02 (0.044)
100 °C	red-red	C011-100 ¹⁾	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

Temperature sensor characteristics

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Thermistor motor protection relays

Technical information

PTC temperature sensors C011

Measuring &
monitoring relays
CM Range

Technical data

Characteristic data

Cold-state resistance	Sensor type C011 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 w tolerance TNF w iTNF	PTC resistance R from -20 °C to TNF - 20 K	PTC resistance R at PTC temperatures of:		
		TNF - iTNF (UPTC m 2.5 V)	TNF + iTNF (UPTC m 2.5 V)	TNF + 15 K (UPTC m 7.5 V)
70 ± 5 °C	$\leq 100 \Omega$	$\leq 570 \Omega$	$\geq 570 \Omega$	-
80 ± 5 °C		$\leq 550 \Omega$	$\geq 1330 \Omega$	$\geq 4000 \Omega$
90 ± 5 °C				
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

Type	CM-MSE	CM-MSS	CM-MSN
Input circuit			
Rated control supply voltage U_s	A1-A2	24 V AC approx. 1.5 VA	
power consumption	A1-A2	24 V AC/DC approx. 1.1 VA / 0.6 W	
	A1-A2	110-130 V AC approx. 1.5 VA	
	A1-A2	220-240 V AC approx. 1.5 VA	
	A1-A2	380-440 V AC approx. 1.7 VA	
	A1-A2	24-240 V AC/DC approx. 1.4-1.7 W / approx. 3.5-5.7 VA	
Rated control supply voltage U_s tolerance		-15 % ... +10 %	
Rated frequency		AC: 50-60 Hz / 24-240 V AC/DC versions: 15-400 Hz	
Duty time		100 %	
6 Measuring circuit	T1-T2	T1-T2/T2x, 1T1...6T1-T2	1T1...6T1-T2
Monitoring function		temperature monitoring by means of PTC sensors	
Number of sensor circuits	1	1, 2 oder 3 (see order details)	6
Short-circuit monitoring	-	see ordering details	yes
Non-volatile fault storage	-	see ordering details	configurable
Test function	-	see ordering details	yes
Sensor circuit			
Temperature threshold (relay de-energizes)	2.7-3.7 k Ω	CM-MSS (1+2): 3050 $\pm$ 550 Ω	3.6 k Ω $\pm$ 5 %
		CM-MSS (3-7): 3.6 k Ω $\pm$ 5 %	
Temperature hysteresis (relay energizes)	1.7-2.3 k Ω	CM-MSS (1+2): 1900 $\pm$ 400 Ω	1.6 k Ω $\pm$ 5 %
		CM-MSS (3-7): 1.6 k Ω $\pm$ 5 %	
Short-circuit threshold (relay de-energizes)		<18 Ω	
Short-circuit hysteresis (relay energizes)		>45 Ω	
Maximum total resistance of sensors connected in series (cold state)		$\leq$ 1.5 k Ω	
Maximum sensor cable length for short-circuit detection		2 x 100 m at 0.75 mm ² ; 2 x 400 m at 2.5 mm ²	
Response time		<100 ms	
Control circuit for storage and hysteresis function			
Remote reset	S1-T2 or S1/X1-S2/X2	-	n/o contact
Maximum no-load voltage		-	approx. 25 V, 24-240 V; AC/DC versions: 5.5 V
Maximum cable length		-	$\leq$ 50 m, 100-200 m if shielded
Indication of operational states			
Control supply voltage	U: green LED	-	 : control supply voltage applied
Fault indication	F: red LED	-	 : output relay de-energized
Output circuits	13-14	11-12/14, 21-22/24, 13-14, 21-22	13-14, 21-22
Kind of output	1 n/o contact	CM-MSS (1): 1 c/o contact CM-MSS (2,3,5): 2 c/o contacts CM-MSS (4, 7): 1 n/o + 1 n/c CM-MSS (6): 2x1 c/o contact	1 n/o + 1 n/c contact
Operational principle		closed-circuit principle (output relay de-energizes if the measured value exceeds/drops below the adjusted threshold)	
Contact material	AgCdO	CM-MSS (1+2+6): AgCdO CM-MSS (3+4+5+7): AgNi	AgNi
Rated voltage (VDE 0110, IEC 664-1, IEC 60947-1)		250 V	
Maximum switching voltage		250 V	
Rated operational current I_o (IEC/EN 60947-5-1)	AC12 (resistive) at 230 V	4 A	
	AC15 (inductive) at 230 V	3 A	
	DC12 (resistive) at 24 V	4 A	
	DC13 (resistive) at 24 V	2 A (1.5 A - n/c contact ¹⁾)	
AC rating (UL 508)	Utilization category (Control Circuit Rating Code)		
	max. rated operational voltage	300 V AC	
	max. continuous thermal current at B 300	5 A	
	max. making/breaking apparent power at B300	3600/360 VA	
Mechanical lifetime		30 (10 ⁹) x 10 ⁹ switching cycles	
Electrical lifetime (AC12, 230 V, 4 A)		0.1 x 10 ⁶ switching cycles	
Max. fuse rating to achieve short-circuit protection	n/c contact	10 A fast-acting	10 A fast-acting
	n/o contact	10 A fast-acting	10 A fast-acting
		4 A (10 A ¹⁾) fast-acting	
		6 A (10 A ¹⁾) fast-acting	
General data			
Dimensions (W x H x D)	22.5 x 78 x 78.5 mm (0.89 x 3.07 x 3.09 in)	22.5 x 78 x 100 mm (0.89 x 3.07 x 3.94 in)	45 x 78 x 100 mm (1.77 x 3.07 x 3.94 in)
Weight	approx. 0.11 kg (0.24 lb)	approx. 0.15 kg (0.33 lb)	approx. 0.23 kg (0.51 lb)
Mounting position		any	
Degree of protection	housing / terminals	IP50 / IP20	
Ambient temperature range	operation	-20...+60 °C	-25...+65 °C
	storage	-40...+85 °C	
Mounting		DIN rail (IEC/EN 60715)	

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

Thermistor motor protection relays

Technical data

Measuring &
monitoring relays
CM Range

Type		CM-MSE	CM-MSS	CM-MSN
Electrical connection				
Wire size	fine strand with wire end ferrule	2 x 1.5 mm ² (2 x 16 AWG)	2 x 2.5 mm ² (2 x 14 AWG)	
		2 x 0.75-1.5 mm ² (2 x 18-16 AWG)	2 x 0.75-2.5 mm ² (2 x 18-14 AWG)	
	fine strand without wire end ferrule	2 x 1-1.5 mm ² (2 x 18-16 AWG)	2 x 0.75-2.5 mm ² (2 x 18-14 AWG)	
Stripping length	rigid	2 x 0.75-1.5 mm ² (2 x 18-16 AWG)	2 x 0.5-4 mm ² (2 x 20-12 AWG)	
		10 mm (0.39 inch)	7 mm (0.28 inch)	
Tightening torque				
Standards				
Product standard		IEC 255-6, EN 60255-6		
Low Voltage Directive		2006/95/EC		
EMC Directive		2004/108/EC, 91/263/EEC, 92/31/EEC, 93/68/EEC, 93/67/EEC		
Electromagnetic compatibility				
electrostatic discharge	IEC/EN 61000-4-2	EN 61000-6-2, EN 61000-6-4		
radiated, radio-frequency, electromagnetic field	IEC/EN 61000-4-3	Level 3 (6 kV / 8 kV)		
electrical fast transient /burst	IEC/EN 61000-4-4	Level 3 (10 V/m)		
surge	IEC/EN 61000-4-5	Level 3 (2 kV / 5 kHz)		
conducted disturbances, induced by radio-frequency fields	IEC/EN 61000-4-6	Level 3/4 (1/2 kV)		
Operational reliability (IEC 68-2-6)		6 g	4 g	5 g
Resistance to vibration (IEC 68-2-6)		10 g	6 g	10 g
Environmental testing (IEC 68-2-30)		24 h cycle time, 55 °C, 93 % rel., 96 h		
Isolation data				
Rated voltage between supply, measuring and output circuit		250 V		
Rated impulse withstand voltage between all isolated circuits		4 kV / 1.2 - 50 µs		
Test voltage between all isolated circuits		2.5 kV, 50 Hz, 1 min.		
Pollution degree		3		
Overvoltage category		III		