# Thermistor motor protection relays


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# Thermistor motor protection relays

Benefits and advantages, Applications

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.

**Direct temperature measuring**

Generally, motor damages 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 the following operating conditions like:

- Heavy duty starting
- Increased switching frequency
- Single phase operation
- Phase unbalance
- High ambient temperature
- Insufficient cooling
- Breaking operation

Therefore the consequences from overheating like 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 3 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.

**Monitoring the motor**

The thermistor motor protection relay measures the resistance of the PTC sensors which reflects the internal motor temperature permanently.
If the temperature in the motor windings rises excessively and reaches the nominal response temperature (NRT), the thermistor motor protection relay detects this situation and the output relay switches off.
By doing so the motor contactor gets triggered and switches off the motor.

**CM-MSS functionality video**

**Characteristics CM-MSS (1)**

- 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
- Approvals / Marks

(1) / CE

**Characteristics 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

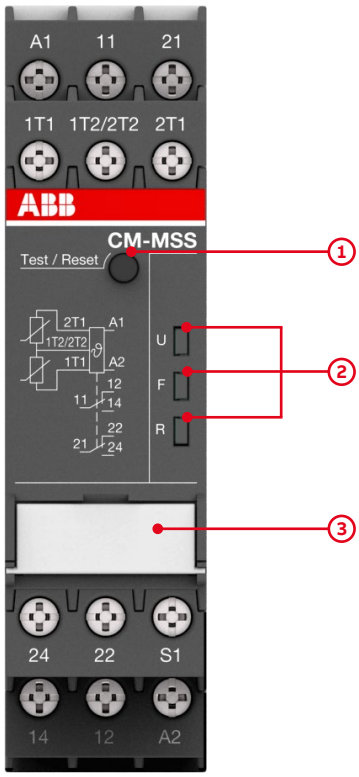
**Features (1)**

- Additional functions:
  - Dynamic interrupted wire detection
  - Short-circuit monitoring of the sensor circuit
  - Non-volatile fault storage
  - Single or sum evaluation
- Easy configuration via DIP switches
- LEDs to distinguish between different failure causes
- Screw connection technology or Easy Connect Technology available
- Test/Reset button available

(1) Depending on device the characteristics vary, for detailed overview see "Selection table CM-MSx range" on page 4.

# Thermistor motor protection relays

## Operating controls




2CDC 253 001 F0015

**1 Test / Reset button**

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

**2 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

**3 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

### 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

## Selection table CM-MSx range

| | Order code | 1SVR550805R9300 | 1SVR550800R9300 | 1SVR550801R9300 | 1SVR740720R1400 | 1SVR730720R1400 | 1SVR740700R0100 | 1SVR730700R0100 | 1SVR740700R2100 | 1SVR730700R2100 | 1SVR740722R1400 | 1SVR730722R1400 | 1SVR740700R0200 | 1SVR730700R0200 | 1SVR740700R2200 | 1SVR730700R2200 | 1SVR740712R1400 | 1SVR730712R1400 | 1SVR740712R0200 | 1SVR730712R0200 | 1SVR740712R2200 | 1SVR730712R2200 | 1SVR740712R1200 | 1SVR730712R1200 | 1SVR740712R1300 | 1SVR730712R1300 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Type | CM-MSE | CM-MSE | CM-MSE | CM-MSS.11P | CM-MSS.11S | CM-MSS.12P | CM-MSS.12S | CM-MSS.13P | CM-MSS.13S | CM-MSS.21P | CM-MSS.21S | CM-MSS.22P | CM-MSS.22S | CM-MSS.23P | CM-MSS.23S | CM-MSS.31P | CM-MSS.31S | CM-MSS.32P | CM-MSS.32S | CM-MSS.33P | CM-MSS.33S | CM-MSS.41P | CM-MSS.41S | CM-MSS.51P | CM-MSS.51S |
| **Characteristics** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ATEX approval | | | | | ■ | ■ | | | | | ■ | ■ | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Number of sensor circuits | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| Single or accumulative evaluation | | | | | | | | | | | | | | | | | | | | | | | | | ■ | ■ |
| Number of LEDs | | | | | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| **Contacts** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 c/o (SPDT) contact | | | | | | | ■ | ■ | ■ | ■ | | | | | | | | | | | | | | | | |
| 2 c/o (SPDT) contacts | | | | | | | | | | | | | ■ | ■ | ■ | ■ | | | ■ | ■ | ■ | ■ | ■ | ■ | | |
| 1 n/o | | ■ | ■ | ■ | | | | | | | | | | | | | | | | | | | | | | |
| 1 n/c and 1 n/o | | | | | ■ | ■ | | | | | ■ | ■ | | | | | ■ | ■ | | | | | | | | |
| 2 x 1 c/o or 1 x 2 c/o contacts, configurable | | | | | | | | | | | | | | | | | | | | | | | | | ■ | ■ |
| **Reset** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Manual | | | | | | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Remote | | | | | | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Auto | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ (1) | ■ (1) | ■ (1) | ■ (1) | ■ (1) | ■ (1) | ■ (1) | ■ (1) | ■ (1) | ■ (1) | ■ (1) | ■ (1) | ■ (2) | ■ (2) |
| Test button | | | | | | | | | | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| **Functions** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Short-circuit detection | | | | | | | | | | | ■ | ■ | | | | | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| Short-circuit detection, configurable | | | | | | | | | | | | | | | | | | | | | | | ■ | ■ | ■ | ■ |
| Dynamic interrupted wire detection | | | | | ■ | ■ | | | | | ■ | ■ | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Non-volatile fault storage | | | | | ■ | ■ | | | | | ■ | ■ | | | | | ■ | ■ | | | | | | | | |
| Non-volatile fault storage, configurable | | | | | | | | | | | | | | | | | | | | | | | ■ | ■ | ■ | ■ |
| **Rated control supply voltage Us** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 24 V AC | | ■ | | | | | | | | | | | | | | | | | | | | | | | | |
| 110-130 V AC | | | ■ | | | | | | | | | | | | | | | | | | | | | | | |
| 220-240 V AC | | | | ■ | | | | | | | | | | | | | | | | | | | | | | |
| 24-240 V AC/DC | | | | | ■ | ■ | | | | | ■ | ■ | | | | | ■ | ■ | | | | | ■ | ■ | ■ | ■ |
| 24 V AC/DC | | | | | | | ■ | ■ | | | | | ■ | ■ | | | | | ■ | ■ | | | | | | |
| 110-130 V AC, 220-240 V AC | | | | | | | | | ■ | ■ | | | | | ■ | ■ | | | | | ■ | ■ | | | | |
| **Connection type** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Push-in terminals | | | | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | |
| Double-chamber cage connection terminals | | | | | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ |

(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

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 60947-8.

### CM-MSx

| Characteristics | Type | Order code | Price 1 pce | Weight (1 pce) kg (lb) |
|---|---|---|---|---|
| See "Selection table CM-MSx range" on page 4. | 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) |

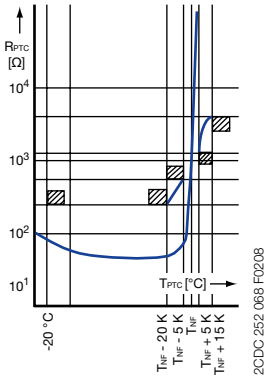
**S**: screw connection
**P**: push-in connection

**Further documentation thermistor motor protection monitoring relays on www.abb.com**

# Thermistor motor protection relays

## Ordering details - PTC temperature sensors C011


Temperature sensor characteristics




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 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. 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.

### CM-MSS accessories

| Rated response temperature TNF | Color coding | Type | Order code | Price 1 pce | 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

### Technical data

| 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 ± tolerance $T_{NF} \pm \Delta T_{NF}$ | PTC resistance R from -20 °C to $T_{NF}$ - 20 K | PTC resistance R2) at PTC temperatures of: | | |
|---|---|---|---|---|
| | | $T_{NF} - \Delta T_{NF}$ (UPTC ≤ 2.5 V) | $T_{NF} + \Delta T_{NF}$ (UPTC ≤ 2.5 V) | $T_{NF}$ + 15 K (UPTC ≤ 7.5 V) |
| 70 ±5 °C | ≤ 100 Ω | ≤ 570 Ω | ≥ 570 Ω | - |
| 80 ±5 °C | | | | |
| 90 ±5 °C | | ≤ 550 Ω | ≥ 1330 Ω | ≥ 4000 Ω |
| 100 ±5 °C | | | | |
| 110 ±5 °C | | | | |
| 120 ±5 °C | | | | |
| 130 ±5 °C | | | | |
| 140 ±5 °C | | | | |
| 150 ±5 °C | | | | |
| 160 ±5 °C | | | | |
| 170 ±7 °C | | ≤ 570 Ω | ≥ 570 Ω | - |

(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 °C and rated values, unless otherwise indicated

| **Supply circuit - Input circuit** | | **CM-MSS.x1** | **CM-MSS.x2** | **CM-MSS.x3** |
|---|---|---|---|---|
| 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" on page 4 |
| 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" on page 4 |
| 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

### General data

| | | |
|---|---|---|
| MTBF | | on request |
| Duty time | | 100 % |
| Dimensions (W x H x D) | product dimensions | 22.5 x 85.6 x 103.7 mm (0.89 x 3.37 x 4.08 in) |
| | packaging dimensions | 97 x 109 x 30 mm (3.82 x 4.29 x 1.18 in) |
| Weight | | see "Ordering details" on page 5 |
| Mounting | | DIN rail (IEC/EN 60715), snap-on mounting without any tool |
| Mounting position | | any |
| Minimum distance to other units | vertical | 10 mm (0.394 in) if switching current > 2 A |
| | 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 mm² (1 x 18-14 AWG)<br>2 x 0.5-1.5 mm² (2 x 18-16 AWG) | 2 x 0.5-1.5 mm² (2 x 18-16 AWG) |
| | rigid | 1 x 0.5-4 mm² (1 x 20-12 AWG)<br>2 x 0.5-2.5 mm² (2 x 20-14 AWG) | 2 x 0.5-1.5 mm² (2 x 20-16 AWG) |
| Stripping length | | 8 mm (0.32 in) | |
| Tightening torque | | 0.6-0.8 Nm (7.08 lb.in) | - |
| Wire end ferrule | | according to DIN 46228-1-A, DIN 46228-4-E | - |

### 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 (IEC/EN 60255-21-1) | | Class 2 |
| Shock (IEC/EN 60255-21-2) | | Class 2 |

### Isolation data

| | | |
|---|---|---|
| Rated insulation voltage $U_i$ (IEC/EN 60947-1, IEC/EN 60664-1) | 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 $U_{imp}$ (IEC/EN 60947-1, IEC/EN 60664-1) | Supply circuit / Measuring circuit (1) | 4 kV / 6 kV (CM-MSS.x2: n/a) |
| | Supply circuit / Output circuits | 4 kV / 6 kV |
| | Measuring circuit (1) / Output circuits | 4 kV / 6 kV |
| | Output circuit 1 / Output circuit 2 | 4 kV |
| Basic insulation (IEC/EN 60664-1) | 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 |
| Test voltage, routine test (IEC/EN 60255-27) | Supply circuit / Measuring circuit (1) | 2.5 kV, 50 Hz, 1 min. (CM-MSS.x2: n/a) |
| | Supply circuit / Output circuits | 2.5 kV, 50 Hz, 1 min. |
| | Measuring circuit (1) / Output circuits | 2.5 kV, 50 Hz, 1 min. |
| Test voltage, type test (IEC/EN 60255-27) | Supply circuit / Measuring circuit (1) | 6 kV / 1.2 - 50 µs (CM-MSS.x2: n/a) |
| | Supply circuit / Output circuits | 6 kV / 1.2 - 50 µs |
| | Measuring circuit (1) / Output circuits | 6 kV / 1.2 - 50 µs |
| | Output circuit 1 / Output circuit 2 | 6 kV / 1.2 - 50 µs |
| 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

# Thermistor motor protection relays

## Technical data - CM-MSS

| | | |
|---|---|---|
| **Standards** | | |
| Product standard | | EN 60947-5-1, EN 60947-8 |
| Low Voltage Directive | | 2014/35/EC |
| EMC directive | | 2014/30/EC |
| ATEX directive | | 2014/34/EC (only ATEX variants "Selection table CM-MSx range" on page 4) |
| RoHS directive | | 2011/65/EC |
| **Electromagnetic compatibility** | | |
| Interference immunity to | | IEC/EN 61000-6-1, IEC/EN 61000-6-2 |
| 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 EN 60255-1 (reference on EN 60255-26_2011) | | |
| 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<br>Power supply, asymmetric coupling: 2.5 kV peak voltage |
| Interference emissions | | IEC/EN 61000-6-3, IEC/EN 61000-6-4 |
| 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 |

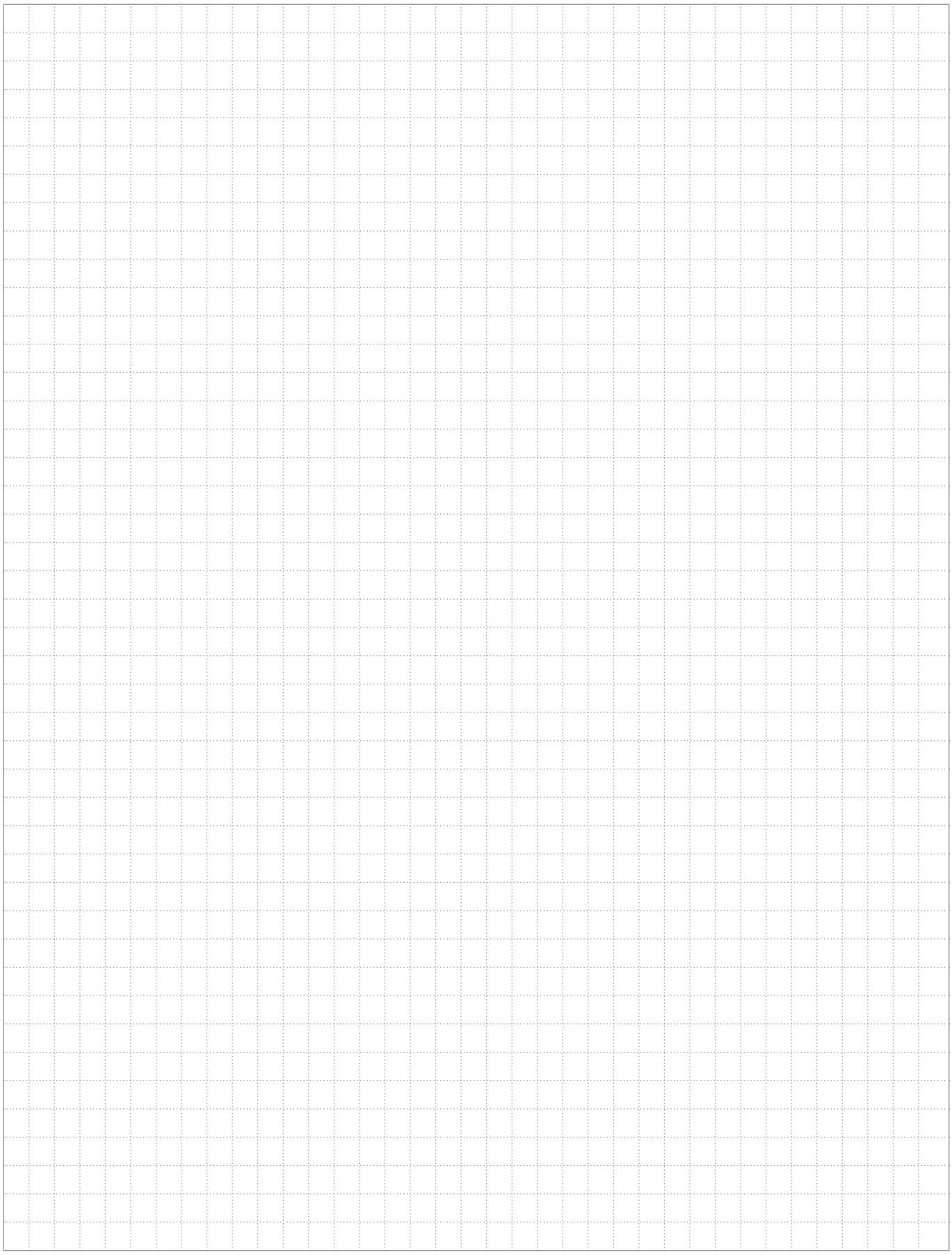
# Thermistor motor protection relays

## Technical data - CM-MSE

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

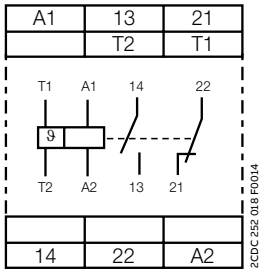
| **Supply circuit - Input circuit** | | **CM-MSE** |
|---|---|---|
| Rated control supply voltage $U_s$ power consumption | 1SVR550805R9300 | 24 V AC approx. 1.5 A |
| | 1SVR550800R9300 | 110-130 V AC approx. 1.5 A |
| | 1SVR550801R9300 | 220-240 V AC approx. 1.5 A |
| Rated control supply voltage $U_s$ 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** | | |
| Temperature threshold (relay de-energizes) | | 2.7-3.7 kΩ |
| Temperature hysteresis (relay energizes) | | 1.7-2.3 kΩ |
| 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) | | ≤1.5 kΩ |
| Maximum sensor cable length for short-circuit detection | | 2 x 100 m at 0.75 mm², 2 x 400 m at 2.5 mm² |
| Response time | | <100 ms |
| **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) |
| Contact material | | AgCdO |
| Rated voltage | VDE 0110, IEC 664-1, IEC 60947-1 | 250 V |
| Maximum switching voltage | | 250 V |
| 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 | n/c contact | 10 A fast-acting |
| protection | n/o contact | 10 A 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) |
| Duty time | | 100 % |
| Weight | | approx. 0.11 kg (0.24 lb) |
| Mounting position | | any |
| Degree of protection | housing / terminals | IP50 / IP20 |
| Ambient temperature range | operation | -20...+60 °C |
| | storage | -40...+85 °C |
| Mounting | | DIN rail (IEC/EN 60715) |
| **Electrical connection** | | |
| Wire size | fine strand with wire end ferrule | 2 x 1.5 mm² (2 x 16 AWG) |
| | fine strand without wire end ferrule | 2 x 0.75-1.5 mm² (2 x 18-16 AWG) |
| | rigid | 2 x 1-1.5 mm² (2 x 18-16 AWG) |
| Stripping length | | 2 x 0.75-1.5 mm² (2 x 18-16 AWG) |
| Tightening torque | | 0.6-0.8 Nm (5.31-7.08 lb.in) |
| **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 | Level 3 (6 kV / 8 kV) |
| radiated, radio-frequency, electromagnetic field | IEC/EN 61000-4-3 | Level 3 (10 V/m) |
| electrical fast transient /burst | IEC/EN 61000-4-4 | Level 3 (2 kV / 5 kHz) |
| surge | IEC/EN 61000-4-5 | Level 3/4 (1/2 kV) |
| conducted disturbances, induced by radio-frequency fields | IEC/EN 61000-4-6 | Level 3 (10 V) |
| Operational reliability (IEC 68-2-6) | | 6 g |
| Resistance to vibration (IEC 68-2-6) | | 10 g |
| Environmental testing (IEC 68-2-30) | | 24 h cycle time, 55 °C, 93 % rel., 96 h |
| **Electromagnetic compatibility** | | |
| 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 |

# Notes



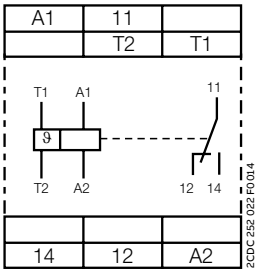
# Thermistor motor protection relays
## Connection diagrams

**CM-MSS.11, CM-MSS.21**



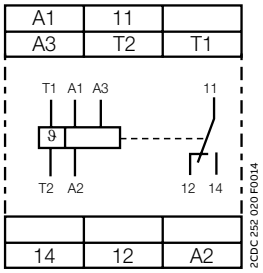

| | |
|---|---|
| A1 – A2 | Control supply voltage |
| 13 – 14 | n/o contact |
| 21 – 22 | n/c contact |
| T1 – T2 | Measuring circuit |

**CM-MSS.12**



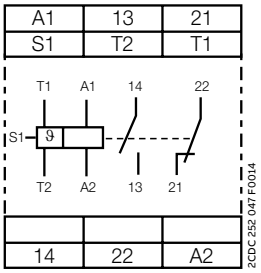

| | |
|---|---|
| A1 – A2 | Control supply voltage |
| 11 – 12/14 | c/o contact |
| T1 – T2 | Measuring circuit |

**CM-MSS.13**



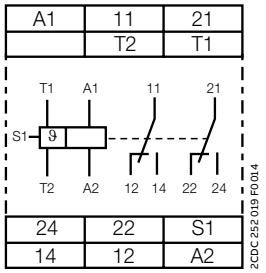

| | |
|---|---|
| A1 – A2 | Control supply voltage 220-240 V AC |
| A2 – A3 | Control supply voltage 110-130 V AC |
| 11 – 12/14 | c/o contact |
| T1 – T2 | Measuring circuit |

**CM-MSS.31**



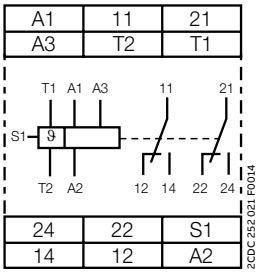

| | |
|---|---|
| A1 – A2 | Control supply voltage |
| 13 – 14 | n/o contact |
| 21 – 22 | n/c contact |
| S1 – T2 | Automatic reset (jumpered) |
| T1 – T2 | Measuring circuit |

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



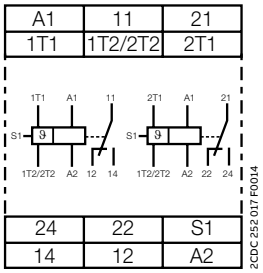

| | |
|---|---|
| A1 – A2 | Control supply voltage 24 V AC/DC |
| 11 – 12/14 | 1st c/o (SPDT) contact |
| 21 – 22/24 | 2nd c/o (SPDT) contact |
| S1 – T2 | Automatic reset (jumpered) |
| T1 – T2 | Measuring circuit |

**CM-MSS.23, CM-MSS.33**



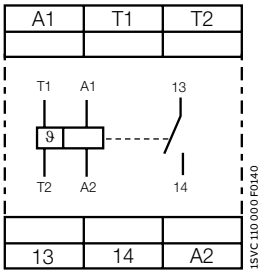

| | |
|---|---|
| A1 – A2 | Control supply voltage 220-240 V AC |
| A2 – A3 | Control supply voltage 110-130 V AC |
| 11 – 12/14 | 1st c/o (SPDT) contact |
| 21 – 22/24 | 2nd c/o (SPDT) contact |
| S1 – T2 | Automatic reset (jumpered) |
| T1 – T2 | Measuring circuit |

**CM-MSS.51**




| | |
|---|---|
| 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 (jumpered) |
| 1T1 – 1T2/2T2 | Measuring circuit 1 |
| 2T1 – 1T2/2T2 | Measuring circuit 2 |

**CM-MSE**

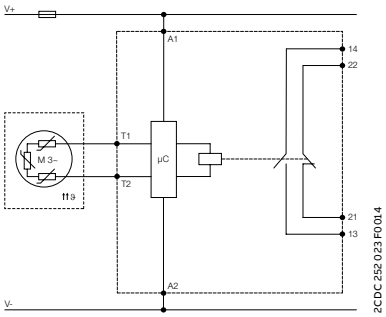



| | |
|---|---|
| A1 – A2 | Control supply voltage 24 V AC |
| T1-T2 | Sensor circuit |
| 13-14 | Output contact - Closed circuit principle |

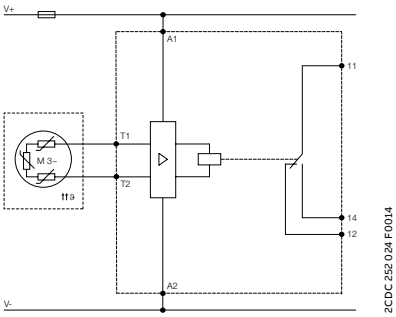
# Thermistor motor protection relays

## Circuit diagram

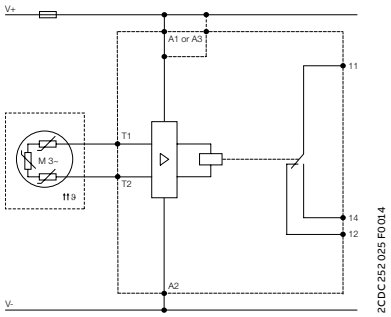
**CM-MSS.11, CM-MSS.21**



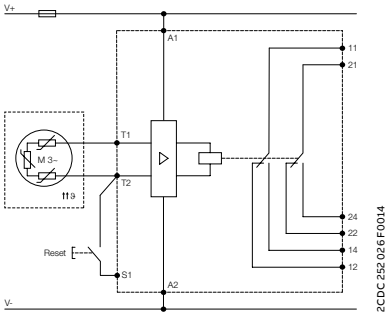

**CM-MSS.12**



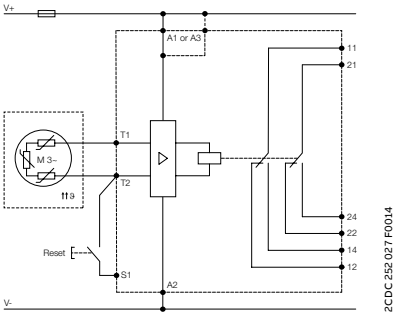

**CM-MSS.13**



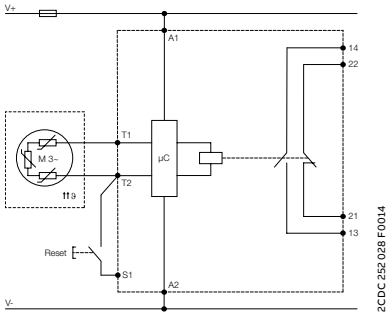

**CM-MSS.22**



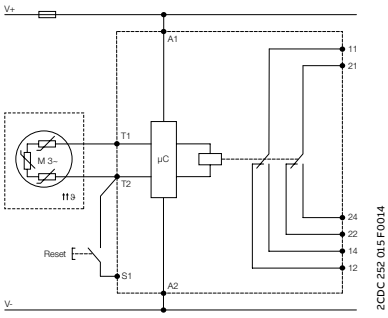

**CM-MSS.23**



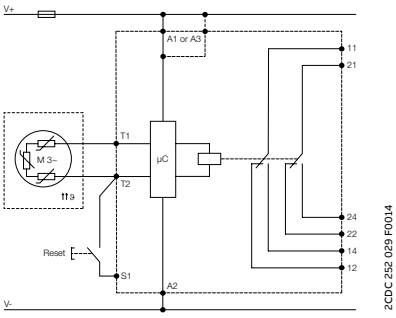

**CM-MSS.31**



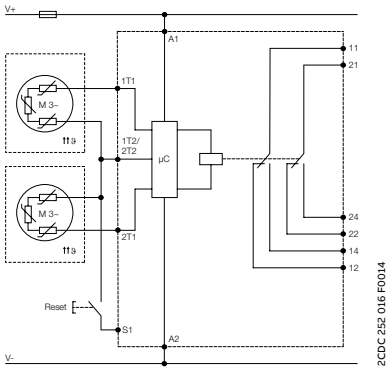

**CM-MSS.32, CM-MSS.41**




**CM-MSS.33**




**CM-MSS.51**




**CM-MSE**