Data sheet

Temperature monitoring relays CM-TCS

Monitoring relays for monitoring temperatures with a PT100 sensor (2- or 3-wire connection)

The temperature monitoring relays CM-TCS monitor overtemperature, undertemperature, or temperatures between two threshold values (window monitoring) with PT100 sensor. As soon as the temperature falls below or exceeds the threshold value the output relays change their positions according to the configured functionality and the front-face LEDs display the current status.

2CDC 251 002 S0010

Characteristics

- Functionality like overtemperature monitoring, undertemperature monitoring, temperature window monitoring configurable
- All configurations and adjustments by front-face operating elements
- Precise adjustment with direct reading scales
- One or two threshold values
- Hysteresis 2…20 % adjustable
- Operating temperature range -40...+60 °C
- 1 x 2 c/o or 2 x 1 c/o configurable
- Open- or closed-circuit principle configurable
- Short-circuit monitoring and interrupted wire detection
- 22.5 mm (0.89 in) width
- 3 LEDs for status indication

Approvals

	UL 508, CAN/CSA 22.2 No.14	
	GL	pending
CB	IEC/EN 60947-5-1, CB scheme	
	GB14048.5 - 2001, CCC	
	GOST	

Marks

CE CE

C-Tick

Order data

Temperature monitoring relays

Type	Rated control supply voltage	Measuring range	Order code
CM-TCS.11	24-240 V AC/DC	-50...+50 °C	1SVR 630 740 R0100
CM-TCS.12	24-240 V AC/DC	0...+100 °C	1SVR 630 740 R0200
CM-TCS.13	24-240 V AC/DC	0...+ 200 °C	1SVR 630 740 R0300
CM-TCS.21	24 V AC/DC	-50...+50 °C	1SVR 630 740 R9100
CM-TCS.22	24 V AC/DC	0...+100 °C	1SVR 630 740 R9200
CM-TCS.23	24 V AC/DC	0...+200 °C	1SVR 630 740 R9300

Accessories

Type	Description	Order code
ADP.01	Adapter for screw mounting	1SVR 430 029 R0100
MAR.02	Marker label for devices with DIP switches	1SVR 430 043 R0000
COV.01	Sealable transparent cover	1SVR 430 005 R0100

Functions

Operating controls

2CDC 251 002 S0010

1 **Adjustment of the hysteresis for threshold value ϑ1**

2 **Adjustment of the threshold value ϑ1**

3 **Indication of operational states**

U: green LED – status indication of control supply voltage

ϑ: red LED – fault message, state of measuring input

R: yellow LED – status indication of the output relays

4 **Adjustment of the hysteresis for threshold value ϑ2**

5 **Adjustment of the threshold value ϑ2**

6 **DIP switch functions / marker label**

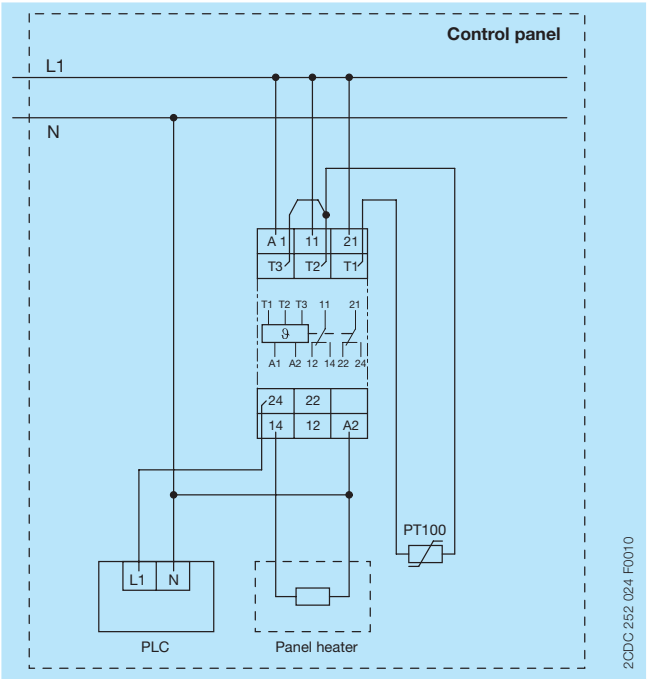
Measuring principle

The measuring principle is based on a voltage drop across a PT100 sensor, where the variation is approximately proportional to the resistance change as specified in DIN EN/IEC 60751. The temperature monitoring relay commutes the resistance value into the corresponding threshold value.

Operating mode

The sensor to be monitored is connected to terminals T1, T2, T3 in accordance to the wiring diagrams of 2-wire and 3-wire sensors. Depending on the setting, the device operates according to the open-circuit principle open – measured value falling below or exceeding the threshold value: relay energizes or closed-circuit principle closed – measured value falling below or exceeding the threshold value: relay de-energizes. All operating states are signalled by the front-face LEDs.
See table ‘LEDs, status information and fault messages’ on page 7.

Example of application



Control panel temperature monitoring

Overtemperature monitoring, 1 x 2 c/o contacts 1x2 c/o

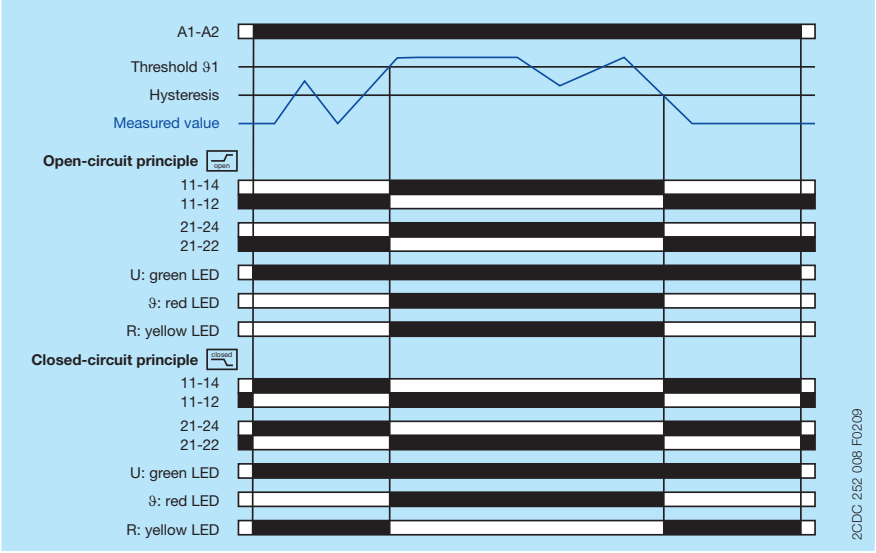
With this configuration, settings via $\vartheta 2$ have no influence on the operating function ($\vartheta 2$ disabled).

Open-circuit principle:

If the measured value is correct, the output relays remain de-energized when control supply voltage is applied. If the measured value exceeds the adjusted threshold value $\vartheta 1$, the output relays energize. If the measured value drops again below the adjusted threshold value $\vartheta 1$ minus the adjusted hysteresis, the output relays de-energize.

Closed-circuit principle:

The behavior is inverse to the one with open-circuit principle.



Overtemperature monitoring, 1 x 2 c/o contacts 1x2 c/o

Overtemperature monitoring, 2 x 1 c/o contact 2x1 c/o

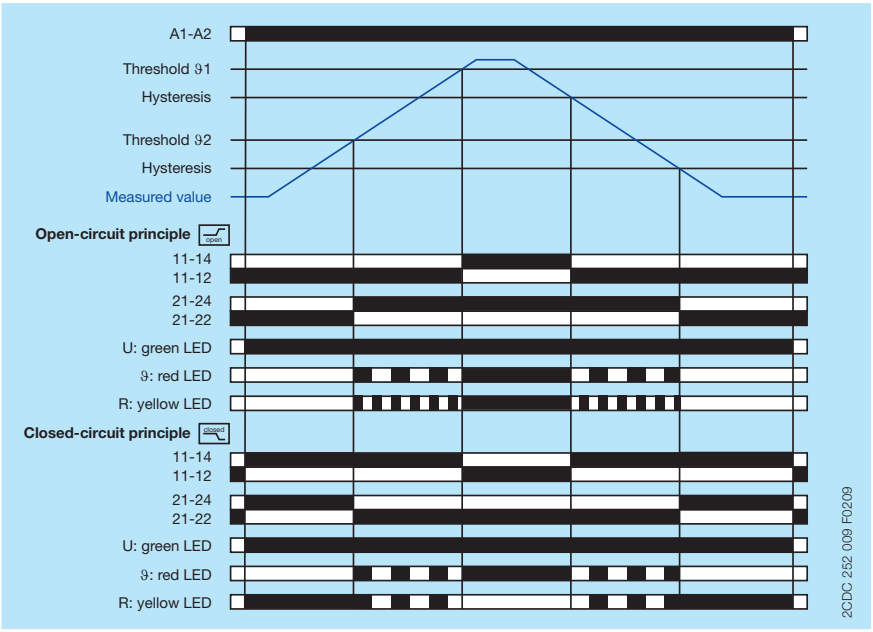
Open-circuit principle:

If the measured value is correct, the output relays remain de-energized when control supply voltage is applied. If the measured value exceeds the adjusted threshold value $\vartheta 2$, output relay R2 (prewarning) energizes. If the measured value exceeds the adjusted threshold value $\vartheta 1$, output relay R1 (final switch-off) energizes.

If the measured value drops again below the adjusted threshold value $\vartheta 1$ minus the adjusted hysteresis, output relay R1 (final switch-off) de-energizes. If the measured value drops below the adjusted threshold value $\vartheta 2$ minus the adjusted hysteresis, output relay R2 (prewarning) de-energizes.

Closed-circuit principle:

The behavior is inverse to the one with open-circuit principle.



Overtemperature monitoring, 2 x 1 c/o contact 2x1 c/o

Undertemperature monitoring, 1 x 2 c/o contacts 1x2 c/o

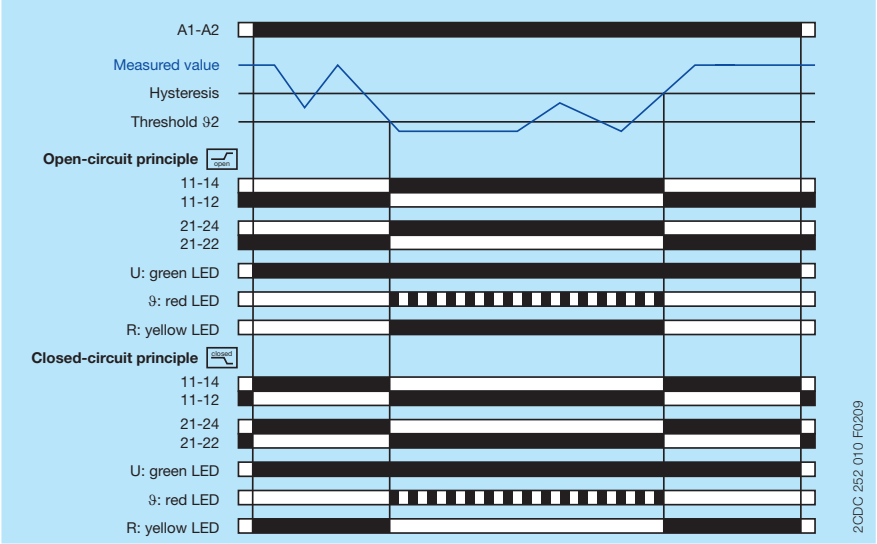
With this configuration, settings via $\vartheta 1$ have no influence on the operating function ($\vartheta 1$ disabled).

Open-circuit principle:

If the measured value is correct, the output relays remain de-energized when control supply voltage is applied. If the measured value drops below the adjusted threshold value $\vartheta 2$, the output relays energize. If the measured value exceeds again the adjusted threshold value $\vartheta 2$ plus the adjusted hysteresis, the output relays de-energize.

Closed-circuit principle:

The behavior is inverse to the one with open-circuit principle.



Undertemperature monitoring, 1 x 2 c/o contacts 1x2 c/o

Undertemperature monitoring, 2 x 1 c/o contact 2x1 c/o

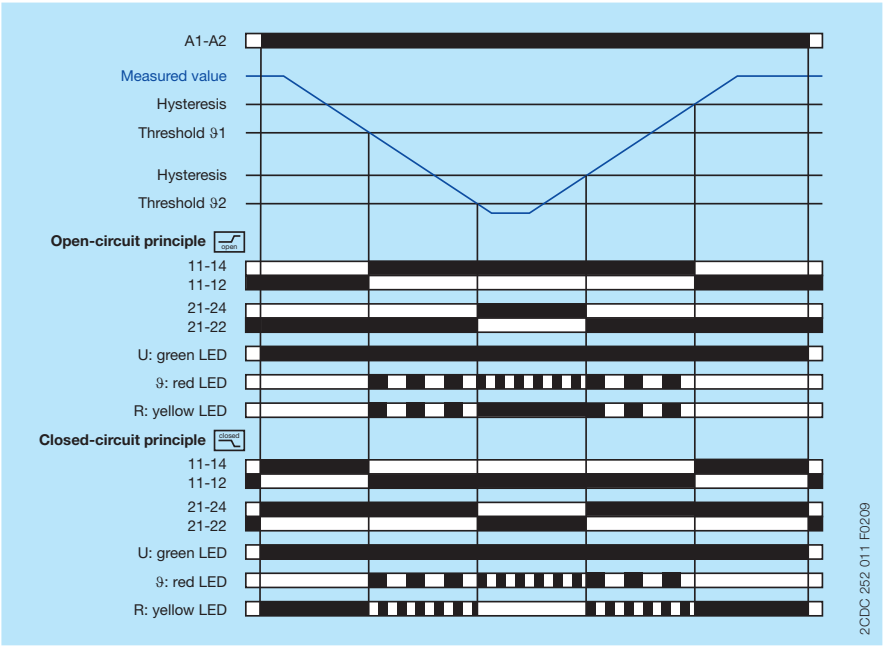
Open-circuit principle:

If the measured value is correct, the output relays remain de-energized when control supply voltage is applied. If the measured value drops below the adjusted threshold value $\vartheta 1$, output relay R1 (prewarning) energizes. If the measured value drops below the adjusted threshold value $\vartheta 2$, output relay R2 (final switch-off) energizes.

If the measured value exceeds again the adjusted threshold value $\vartheta 2$ plus the adjusted hysteresis, output relay R2 (final switch-off) de-energizes. If the measured value exceeds the adjusted threshold value $\vartheta 1$ plus the adjusted hysteresis, output relay R1 (prewarning) de-energizes.

Closed-circuit principle:

The behavior is inverse to the one with open-circuit principle.



Undertemperature monitoring, 2 x 1 c/o contact 2x1 c/o

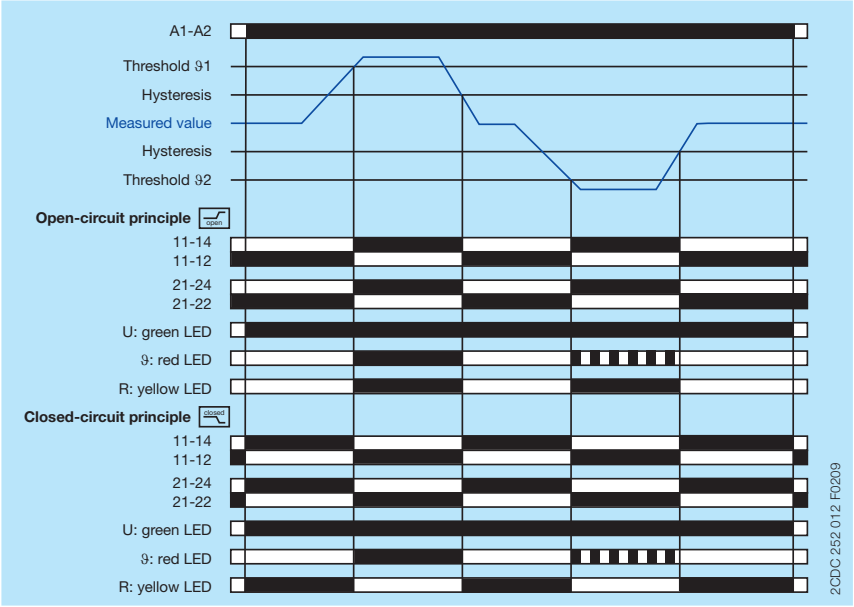
Temperature window monitoring, 1 x 2 c/o contacts 1x2 c/o

Open-circuit principle:

If the measured value is correct, the output relays remain de-energized when control supply voltage is applied. If the measured value exceeds the adjusted threshold value $\vartheta 1$ or drops below the adjusted threshold value $\vartheta 2$, the output relays energize. If the measured value drops again below the adjusted threshold value $\vartheta 1$ minus the adjusted hysteresis or exceeds again the adjusted threshold value $\vartheta 2$ plus the adjusted hysteresis, the output relays de-energize.

Closed-circuit principle:

The behavior is inverse to the one with open-circuit principle.



Temperature window monitoring, 1 x 2 c/o contacts 1x2 c/o

Temperature window monitoring, 2 x 1 c/o contact 2x1 c/o

Open-circuit principle:

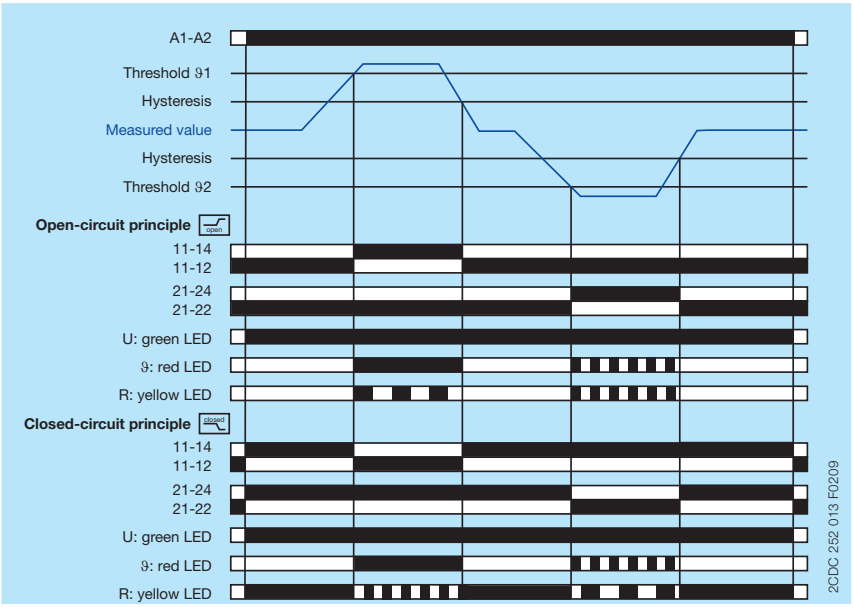
If the measured value is correct, the output relays remain de-energized when control supply voltage is applied.

If the measured value exceeds the adjusted threshold value $\vartheta 1$ or drops below the adjusted threshold value $\vartheta 2$, output relay R1 ($> \vartheta 1$) or R2 ($< \vartheta 2$) respectively energizes.

If the measured value drops again below the adjusted threshold value $\vartheta 1$ minus the adjusted hysteresis or exceeds again the adjusted threshold value $\vartheta 2$ plus the adjusted hysteresis, output relay R1 ($>\vartheta 1$) or R2 ($< \vartheta 2$) respectively de-energizes.

Closed-circuit principle:

The behavior is inverse to the one with open-circuit principle.



Temperature window monitoring, 2 x 1 c/o contact 2x1 c/o

Additional monitoring functions

Regardless of the selected configuration, the device is monitoring its measuring circuit for interrupted wires or short-circuits.

Overtemperature monitoring

Open-circuit principle:

If a short-circuit is detected, the output relays energize whereas in case of an interrupted wire the relays remain de-energized.

Closed-circuit principle:

The behavior is inverse to the one with open-circuit principle.

Undertemperature monitoring

Open-circuit principle:

If a short-circuit is detected, the output relays de-energize whereas in case of an interrupted wire the relays energize.

Closed-circuit principle:

The behavior is inverse to the one with open-circuit principle.

Temperature window monitoring, 1 x 2 c/o contacts 1x2 c/o

Open-circuit principle:

If a short-circuit or an interrupted wire are detected, the output relays energize.

Closed-circuit principle:

The behavior is inverse to the one with open-circuit principle.

Temperature window monitoring, 2 x 1 c/o contact 2x1 c/o

Open-circuit principle:

If a short-circuit is detected, output relay R1 remains de-energized whereas R2 energizes. In case of an interrupted wire the behavior of both relays is inverse.

Closed-circuit principle:

The behavior is inverse to the one with open-circuit principle.

Indication of operational states

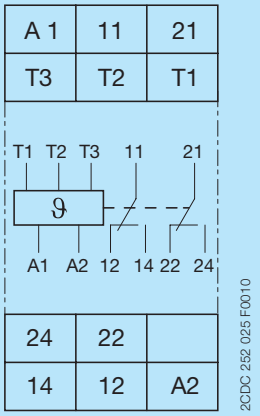
LEDs, status information and fault messages

Operational state	U: green LED	ϑ: red LED	R: yellow LED
Power supply missing	OFF	OFF	OFF
No fault	⎍	OFF	-- [1]
Short-circuit		⎍⎍⎍	
Wire interruptions		⎍⎍⎍	
Below threshold ϑ1	⎍	⎍⎍	-- [1]
Below threshold ϑ2	⎍	⎍⎍⎍	-- [1]
Above threshold ϑ1	⎍	⎍	-- [1]
Above threshold ϑ2	⎍	⎍⎍	-- [1]
Setting fault[2]	⎍⎍	⎍⎍	⎍⎍

[1] Depending on the configuration (see function diagrams)

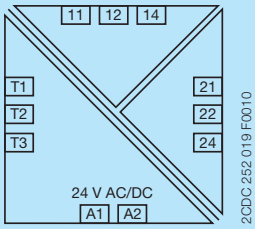
[2] Possible faulty setting: The threshold value for final switch-off is set at a higher value than the threshold value for prewarning.

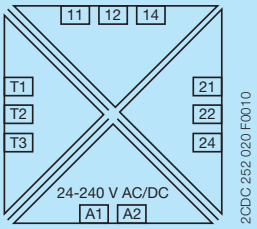
Electrical connection



A1-A2	Control supply voltage
11-12/14	Output relay R1
21-22/24	Output relay R2
T1,T2,T3	Measuring input, connection PT100

Connection diagram

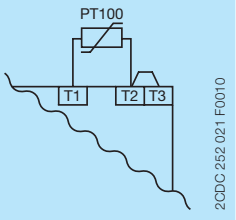




Electrical isolation

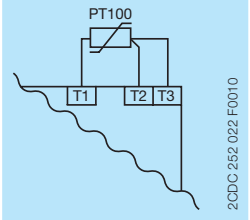
Protective separation according to VDE 0106 part 101 and part 101/A1; IEC/EN 61140; IEC/EN 50178

Wiring diagrams



Connection of a 2-wire sensor

Note: When connecting a 2-wire sensor, jumper the terminals T2 and T3



Connection of a 3-wire sensor

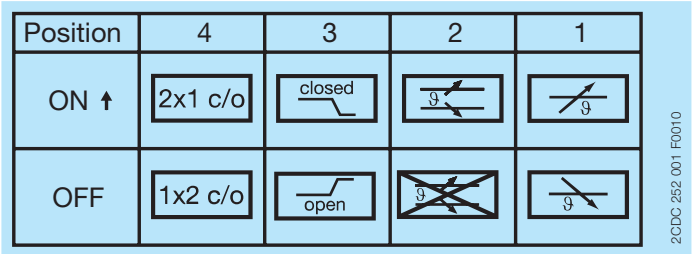
Configuration and settings

Adjustment potentiometers Hyst.(ϑ1), ϑ1, Hyst.(ϑ2), ϑ2:

By means of four separate adjustment potentiometers with direct reading scales, the hysteresis values as percentage of the assigned thresholds as well as their temperature values in degree Celsius can be adjusted.

Type	Hyst.(ϑ1) and Hyst.(ϑ1) potentiometer adjustment range	ϑ1 and ϑ2 potentiometer adjustment range
CM-TCS.11	2...20 %	-50...+50 °C
CM-TCS.12	2...20 %	0...100 °C
CM-TCS.13	2...20 %	0...200 °C
CM-TCS.21	2...20 %	-50...+50 °C
CM-TCS.22	2...20 %	0...100 °C
CM-TCS.23	2...20 %	0...200 °C

DIP switches



	ON	OFF (default)
DIP switch 1 Monitoring principle	Overtemperature monitoring If overtemperature monitoring is selected, the CM-TCS recognizes temperatures above the selected threshold and trips the output relay according to the selected operating principle.	Undertemperature monitoring If undertemperature monitoring is selected, the CM-TCS recognizes temperatures below the selected threshold and trips the output relay according to the selected operating principle.
DIP switch 2 Temperature window monitoring	Temperature window monitoring activated If temperature window monitoring is selected, the CM-TCS monitors over- and undertemperature. If temperature window monitoring is activated, DIP switch 1 is disabled.	Temperature window monitoring de-activated Temperature window monitoring is de-selected.
DIP switch 3 Operating principle of the output relays	Closed-circuit principle If closed-circuit principle is selected, the output relays are energized. They de-energize if a fault is occuring.	Open-circuit principle If open-circuit principle is selected, the output relays are de-energized. They energize if a fault is occuring.
DIP switch 4 2 x 1 c/o contact, 1 x 2 c/o contacts	2 x 1 c/o (SPDT) contact If operating principle 2 x 1 c/o contact is selected, the output relay R1 (11-12/14) reacts to threshold value ϑ1 and the output relay R2 (21-22/24) reacts to threshold value ϑ2.	1 x 2 c/o (SPDT) contacts If operating principle 1 x 2 c/o contacts is selected, both output relays R1 (11-12/14) and R2 (21-22/24) react synchronously to one threshold value. Overtemperature monitoring: Settings of the threshold value ϑ2 have no effect on the operation. Undertemperature monitoring: Settings of the threshold values ϑ2 have no effect on the operation.

Technical data

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

Input circuit

Type		CM-TCS.11/12/13	CM-TCS.21/22/23
Supply circuit		**A1-A2**	
Rated control supply voltage U_s		24-240 V AC/DC	24 V AC/DC
Rated control supply voltage U_s tolerance		-15...+10 %	
Typical current / power consumption	24 V DC	33 mA / 0.8 VA	18 mA / 0.45 VA
	115 V AC	12.5 mA / 1.5 VA	n/a
	230 V AC	13 mA / 2.9 VA	n/a
Rated frequency	DC	n/a	n/a
	AC	15-400 Hz	50-60 Hz
Frequency range	AC	13.5-440 Hz	45-65 Hz
Power failure buffering time	min.	20 ms	

Measuring circuit		T1,T2,T3
Sensor type		PT100
Connection of the sensor	2-wire	yes, jumper between T2-T3
	3-wire	yes, use terminal T1, T2, T3
Monitoring function		overtemperature, undertemperature or window monitoring
Threshold values adjustable within the measuring range	CM-TCS.x1	-50…+50 °C
	CM-TCS.x2	0…+100 °C
	CM-TCS.x3	0…+200 °C
Number of possible thresholds		2
Tolerance of the adjusted threshold value		typ. ±5 % of the range end value
Hysteresis related to the threshold value		2-20 % of threshold value, min. 1 °C
Measuring principle		continuous current
Typical current in the sensor circuit		0.8 mA
Maximum current in sensor circuit		0.9 mA
Maximum voltage in sensor circuit		n/a
Interrupted wire detection		yes, indicated via LED status
Short-circuit detection		yes, indicated via LED status
Accuracy within the rated control supply voltage tolerance		< 0.2 °C / or < 0.01 %/K
Accuracy within the temperature range		< 0.2 °C / or < 0.01 %/K
Repeat accuracy (constant parameters)		< 0.2 % of full scale
Maximum measuring cycle		320 ms

Indication of operational states

Control supply voltage	U	LED green
Measured value	ϑ	LED red
Relay status R1, R2	R	LED yellow

Details see table ‘LEDs, status information and fault messages’ on page 7.

Operating elements and controls

Adjustment of the threshold value ϑ1		adjustment potentiometer
Adjustment of the hysteresis for threshold value ϑ1		adjustment potentiometer
Adjustment of the threshold value ϑ2		adjustment potentiometer
Adjustment of the hysteresis for threshold value ϑ2		adjustment potentiometer
Configuration of	DIP switch 1	overtemperature monitoring, undertemperature monitoring
	DIP switch 2	temperature window monitoring
	DIP switch 3	operating principle of the output relays
	DIP switch 4	2 x 1 c/o contact, 1 x 2 c/o contacts

Output circuits

Kind of output	11-12/14	1st relay
	21-22/24	2nd relay
		2 x 1 or 1 x 2 c/o (SPDT) contacts configurable
Operating principle[1)]		open- or closed-circuit principle configurable
Contact material		AgNi alloy, Cd free
Rated voltage (VDE 0110, IEC 60947-1)		250 V AC / 300 V DC
Minimum switching voltage / Minimum switching current		24 V / 10 mA
Maximum switching voltage / Maximum switching current		See 'Load limit curves' on page 12
Rated operational current I_e (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 (inductive) at 24 V	2 A
AC rating (UL 508)	utilization category (Control Circuit Rating Code)	B 300, pilot duty general purpose (250 V, 4 A, cos φ 0.75)
	maximum rated operational voltage	250 V AC
	maximum continuous thermal current at B 300	4 A
	maximum making/breaking apparent power at B 300	3600/360 VA
Mechanical lifetime		30 x 10^6 switching cycles
Electrical lifetime (AC12, 230 V, 4 A)		0.1 x 10^6 switching cycles
Maximum fuse rating to achieve short-circuit protection	n/c contact	6 A fast-acting
	n/o contact	10 A fast-acting
Conventional thermal current I_{th} acc. IEC/EN 60947-1		4 A

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

General data

		CM-TCS.11/12/13	CM-TCS.21/22/23
MTBF		on request	
Duty time		100 %	
Dimensions (W x H x D)	product dimensions	22.5 x 78 x 100 mm (0.89 x 3.07 x 3.94 in)	
	packaging dimensions	81 x 106 x 26 mm (3.19 x 4.13 x 1.02 in)	
Weight	net weight	0.141 kg (0.310 lb)	0.127 kg (0.281 lb)
	gross weight	0.166 kg (0.336 lb)	0.153 kg (0.367 lb)
Mounting		DIN rail (IEC/EN 60715), snap-on mounting without any tool	
Mounting position		any	
Minimum distance to other units	vertical	not necessary	
	horizontal	not necessary	
Degree of protection	housing / terminal	IP50 / IP20	

Electrical connection

		A1, A2, 11, 12, 14, 21, 22, 24	T1, T2, T3
Wire size	fine-strand with(out) wire end ferrule	2 x 0.75-2.5 mm² (2 x 18-14 AWG)	1 x 0.2-2.5 mm² (1 x 24-14 AWG)
	rigid	2 x 0.5-4 mm² (2 x 20-12 AWG)	1 x 0.2-4 mm² (1 x 24-12 AWG)
Stripping length		7 mm (0.28 in)	7 mm (0.28 in)
Tightening torque		0.6-0.8 Nm (5.31-7.08 lb.in)	0.5 (4.43 lb.in)

Environmental data

Ambient temperature ranges	operation	-40...+60 °C
	storage	-40...+85 °C
	transport	-40...+85 °C
Climatic category	IEC/EN 60721-3-3	3K5 (no condensation, no ice formation)
Damp heat, cyclic	IEC/EN 60068-2-30	6 x 24 h cycle, 55 °C, 95 % RH
Vibration, sinusoidal	IEC/EN 60255-21-1	Class 2
Shock	IEC/EN 60255-21-2	Class 2

Isolation data

		CM-TCS.11/12/13	CM-TCS.21/22/23
Rated impulse withstand voltage U_{imp} between all isolated circuits (IEC/EN 60947-1, IEC/EN 60664-1, VDE 0110-1)	supply circuit / measuring circuit	4 kV	n/a
	supply circuit / output circuits	4 kV	4 kV
	measuring circuit / output circuits	4 kV	4 kV
	output circuit 1 / output circuit 2	4 kV	4 kV
Pollution degree (IEC/EN 60664-1, VDE 0110-1)		3	
Overvoltage category (IEC/EN 60664-1, VDE 0110-1)		III	
Rated insulation voltage U_i (IEC/EN 60947-1, IEC/EN 60664-1, VDE 0110-1)	supply circuit / measuring circuit	300 V	n/a
	supply circuit / output circuits	300 V	300 V
	measuring circuit / output circuits	300 V	300 V
	output circuit 1 / output circuit 2	300 V	300 V
Basis isolation for rated control supply voltage (IEC/EN 60664-1, VDE 0110-1)	supply circuit / measuring circuit	250 V AC / 300 V DC	n/a
	supply circuit / output circuits	250 V AC / 300 V DC	250 V AC / 300 V DC
	measuring circuit / output circuits	250 V AC / 300 V DC	250 V AC / 300 V DC
	output circuit 1 / output circuit 2	250 V AC / 300 V DC	250 V AC / 300 V DC
Protective separation (IEC/EN 61140, IEC/EN 50178)	supply circuit / measuring circuit	250 V AC / 250 V DC	n/a
	supply circuit / output circuits	250 V AC / 300 V DC	250 V AC / 250 V DC
	measuring circuit / output circuits	250 V AC / 300 V DC	250 V AC / 250 V DC
Test voltage between all isolated circuits, routine test (IEC/EN 60255-5, IEC/EN 61010-1)	supply circuit / measuring circuit	2.0 kV, 50 Hz, 1 s	n/a
	supply circuit / output circuits	2.0 kV, 50 Hz, 1 s	2.0 kV, 50 Hz, 1 s
	measuring circuit / output circuits	2.0 kV, 50 Hz, 1 s	2.0 kV, 50 Hz, 1 s
Test voltage between all isolated circuits, type test (IEC/EN 60255-5)	supply circuit / measuring circuit	4.0 kV, 50 Hz, 1 s	n/a
	supply circuit / output circuits	4.0 kV, 50 Hz, 1 s	4.0 kV, 50 Hz, 1 s
	measuring circuit / output circuits	4.0 kV, 50 Hz, 1 s	4.0 kV, 50 Hz, 1 s

Standards

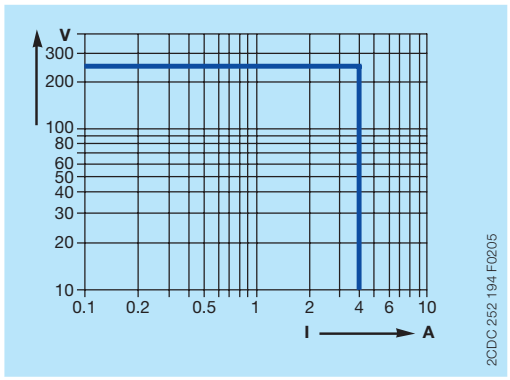
Product standard	IEC/EN 60255-6: 2008
Other standards	EN 50178, IEC/EN 60204
Low Voltage Directive	2006/95/EC
EMC Directive	2004/108/EC
RoHS Directive	2002/95/EC

Electromagnetic compatibility

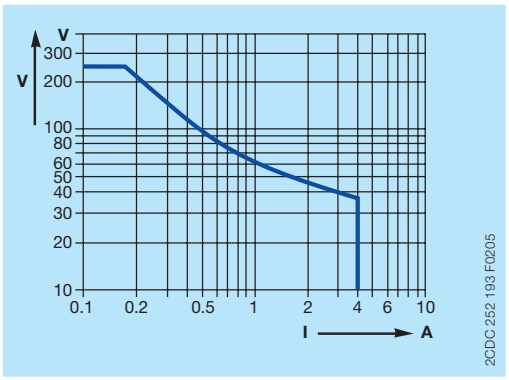
Interference immunity to		IEC/EN 61000-6-1 IEC/EN 61000-6-2 IEC/EN 61326-2-4
electrostatic discharge	IEC/EN 61000-4-2	Level 3, 6 kV / 8 kV
radiated, radio-frequency, electromagnetic field	IEC/EN 61000-4-3	Level 3, 10 V/m (1 GHz) / 3 V/m (2 GHz) / 1 V/m (2.7 GHz)
electrical fast transient/burst	IEC/EN 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-earth
conducted disturbances, induced by radio-frequency fields	IEC/EN 61000-4-6	Level 3, 10 V
voltage dips, short interruptions and voltage variations	IEC/EN 61000-4-11	Level 3
harmonics and interharmonics	IEC/EN 61000-4-13	Level 3
Interference emission		EN 61000-6-3, EN 61000-6-4
high-frequency radiated	IEC/CISPR 22, EN 55022	Class B
high-frequency conducted	IEC/CISPR 22, EN 55022	Class B

Technical diagrams

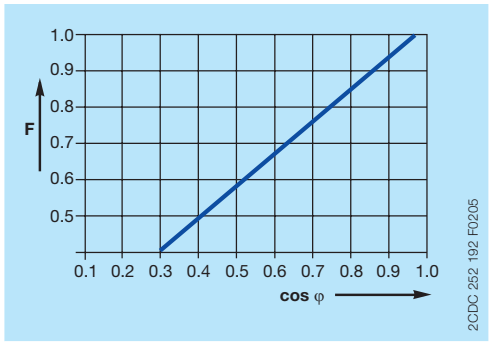
Load limit curves



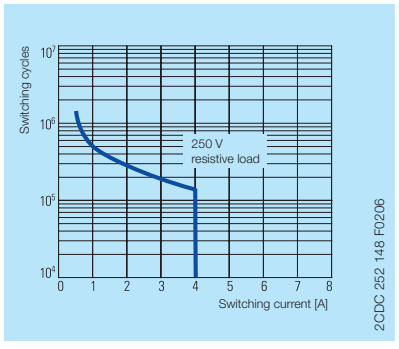
AC load (resistive)



DC load (resistive)



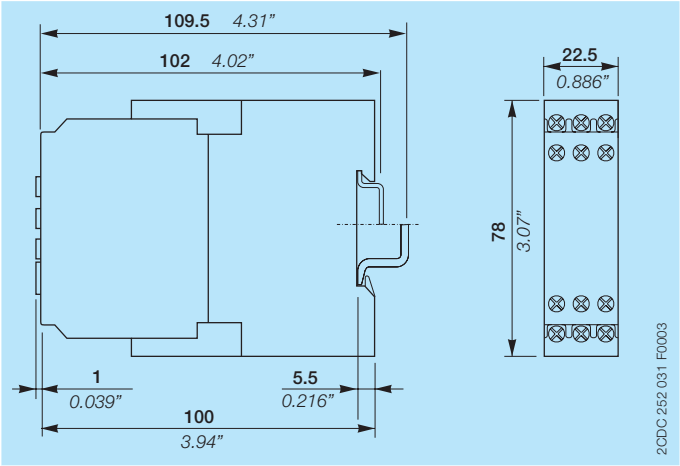
Derating factor F at inductive AC load



Contact lifetime

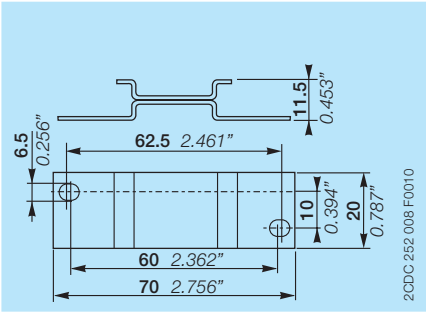
Dimensions

in **mm** and *inches*

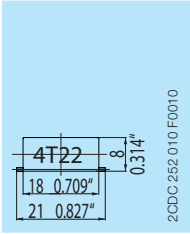


CM-TCS - Temperature monitoring relay

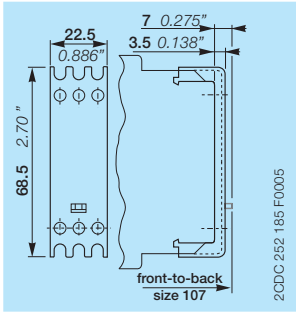
Accessories



ADP.01 - Adapter for screw mounting



MAR.02 - Marker label



COV.01 - Sealable transparent cover

Further Documentation

Document title	Document type	Document number
Electronic Products and Relays	Technical catalogue	2CDC 110 004 C020x
CM-TCS.11/12/13/21/22/23	Instruction sheet	1SVC 630 560 M0000

You can find the documentation on the internet at www.abb.com/lowvoltage -> Control Products -> Electronic Relays and Controls -> Temperature Monitors

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