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Analog temperature monitoring relays
C510 and C511
Ordering details

Analog tripping devices - C510 and C511
Sensor types: PT100
Measuring principle for 2- and 3-wire sensors
Electrical isolation between the sensors and
the power supply (except for 24 V AC/DC
devices)
Separate design for the crossing of the upper
or lower threshold

C510
1 threshold adjustable via absolute scale in °C
Hysteresis adjustable from
2-20 %

Ordering details

- Function diagrams ..................... 2/78
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C510
Threshold value adjustment
Hysteresis adjustment
LED: control supply voltage
LED Ø: relay status
Marker label
Circuit diagram

Type | Rated control supply voltage | Order code | Measuring range | Pack.- unit piece | Price 1 piece | Weight 1 piece kg / lb
--- | --- | --- | --- | --- | --- | ---
C510.01-24 | 24 V AC/DC | 1SAR 700 001 R0005 | -50...+50 °C | 1 | 0.15/0.33 | 0.19/0.42
C510.01-K | 110/230 V AC | 1SAR 700 001 R0006 | -50...+50 °C | 1 | 0.15/0.33 | 0.19/0.42
C510.02-24 | 24 V AC/DC | 1SAR 700 002 R0005 | 0...+100 °C | 1 | 0.15/0.33 | 0.19/0.42
C510.02-K | 110/230 V AC | 1SAR 700 002 R0006 | 0...+100 °C | 1 | 0.15/0.33 | 0.19/0.42
C510.03-24 | 24 V AC/DC | 1SAR 700 003 R0005 | 0...+200 °C | 1 | 0.15/0.33 | 0.19/0.42
C510.03-K | 110/230 V AC | 1SAR 700 003 R0006 | 0...+200 °C | 1 | 0.15/0.33 | 0.19/0.42

C511
2 thresholds (warning and switch-off)
adjustable via absolute scale in °C
Hysteresis for threshold 1 adjustable from
2-20 %

Type | Rated control supply voltage | Order code | Measuring range | Pack.- unit piece | Price 1 piece | Weight 1 piece kg / lb
--- | --- | --- | --- | --- | --- | ---
C511.01-24 | 24 V AC/DC | 1SAR 700 011 R0005 | -50...+50 °C | 1 | 0.15/0.33 | 0.19/0.42
C511.01-K | 110/230 V AC | 1SAR 700 011 R0010 | -50...+50 °C | 1 | 0.15/0.33 | 0.19/0.42
C511.02-24 | 24 V AC/DC | 1SAR 700 012 R0005 | 0...+100 °C | 1 | 0.15/0.33 | 0.19/0.42
C511.02-W | 24-240 V AC/DC | 1SAR 700 012 R0010 | 0...+100 °C | 1 | 0.15/0.33 | 0.19/0.42
C511.03-24 | 24 V AC/DC | 1SAR 700 013 R0005 | 0...+200 °C | 1 | 0.15/0.33 | 0.19/0.42
C511.03-W | 24-240 V AC/DC | 1SAR 700 013 R0100 | 0...+200 °C | 1 | 0.15/0.33 | 0.19/0.42

C511.11-24 | 24 V AC/DC | 1SAR 700 014 R0005 | -50...+50 °C | 1 | 0.15/0.33 | 0.19/0.42
C511.11-K | 110/230 V AC | 1SAR 700 014 R0100 | -50...+50 °C | 1 | 0.15/0.33 | 0.19/0.42
C511.12-24 | 24 V AC/DC | 1SAR 700 015 R0005 | 0...+100 °C | 1 | 0.15/0.33 | 0.19/0.42
C511.12-W | 24-240 V AC/DC | 1SAR 700 015 R0100 | 0...+100 °C | 1 | 0.15/0.33 | 0.19/0.42
C511.13-24 | 24 V AC/DC | 1SAR 700 016 R0005 | 0...+200 °C | 1 | 0.15/0.33 | 0.19/0.42
C511.13-W | 24-240 V AC/DC | 1SAR 700 016 R0100 | 0...+200 °C | 1 | 0.15/0.33 | 0.19/0.42

Threshold value adjustment
Hysteresis adjustment
LED: control supply voltage
LED Ø: relay status
Marker label
Circuit diagram

Threshold value 1
(tripping) adjustment
Threshold value 2
(warning) adjustment
Hysteresis adjustment for threshold value 1
Selection switch for open-
or closed circuit principle
LED: control supply voltage
LED Ø1: relay 1 energized
LED Ø2: relay 2 energized
Marker label
Circuit diagram
Digital temperature monitoring relays
C512 and C513
Ordering details

Digital tripping devices - C512 und C513

- Adjustable sensor types: PT100, PT1000, KTY83, KTY84, NTC-B57272-K333-A1
- Measuring principle for 2-wire and 3-wire sensors
- Electrical isolation (except 24 V AC/DC devices)
- Adjustable over-, undertemperature monitoring or range monitoring function
- 2 thresholds
- Hysteresis for both thresholds (1-99 Kelvin)
- Adjustable time delay from 0-999 s affects to both thresholds

C512
- Temperature monitor for 1 sensor circuit

<table>
<thead>
<tr>
<th>Type</th>
<th>Rated control supply voltage</th>
<th>Order code</th>
<th>Measuring range</th>
<th>Pack.- unit piece</th>
<th>Price 1 piece</th>
<th>Weight 1 piece kg / lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>C512-24</td>
<td>24 V AC/DC</td>
<td>1SAR 700 100 R0005</td>
<td>-50...+500 °C *)</td>
<td>1</td>
<td>0.32</td>
<td>0.71</td>
</tr>
<tr>
<td>C512-W</td>
<td>24-240 V AC/DC</td>
<td>1SAR 700 100 R0010</td>
<td>-50...+500 °C *)</td>
<td>1</td>
<td>0.33</td>
<td>0.73</td>
</tr>
</tbody>
</table>

C513
- Temperature monitor for 1-3 sensor circuits

<table>
<thead>
<tr>
<th>Type</th>
<th>Rated control supply voltage</th>
<th>Order code</th>
<th>Measuring range</th>
<th>Pack.- unit piece</th>
<th>Price 1 piece</th>
<th>Weight 1 piece kg / lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>C513-W</td>
<td>24-240 V AC/DC</td>
<td>1SAR 700 110 R0010</td>
<td>-50...+500 °C *)</td>
<td>1</td>
<td>0.34</td>
<td>0.75</td>
</tr>
</tbody>
</table>

Accessories - Replaceable cover marking for digital devices

<table>
<thead>
<tr>
<th>Type</th>
<th>use for</th>
<th>Order code</th>
<th>Language</th>
<th>Pack.- unit piece</th>
<th>Price 1 piece</th>
<th>Weight 1 piece kg / lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>C512-D</td>
<td>C512</td>
<td>1SAR 700 101 R0100</td>
<td>German</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C512-E</td>
<td>C512</td>
<td>1SAR 700 102 R0100</td>
<td>English</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C513-D</td>
<td>C513</td>
<td>1SAR 700 111 R0100</td>
<td>German</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C513-E</td>
<td>C513</td>
<td>1SAR 700 112 R0100</td>
<td>German</td>
<td>5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*) The measuring range depends on the used sensor type:
- PT100: -50...+500 °C  KTY83: -50...+175 °C
- PT1000: -50...+500 °C  KTY84: -40...+300 °C
- NTC: +80...+160 °C
- (Typ Siemens Matsushita B57272-A333-A1 – 100 °C: 1.8 k , 25 °C: 32.762 k )

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- Dimensional drawings ............ 2/103
Overview
The C51x temperature monitoring relays can be used for temperature measurement in solid, liquid and gaseous media. The temperature is acquired by the sensor in the medium, evaluated by the device and monitored to determine whether it is within an operating range (range monitoring function) or has exceeded or fallen below a threshold.

Functional description

Analog tripping devices
Once the temperature has reached the set threshold, output relay K1 changes its switching state. In devices with 2 thresholds relay K2 reacts correspondingly if the second threshold is reached.
No time delay can be set (t = 0).
The relays immediately return to their original switching state if the temperature reaches the set hysteresis value.
Once the temperature has reached the upper threshold of $\nu_1$, output relay K1 changes its switching state after the set time t. The relay immediately returns to its original switching state if the temperature reaches the set hysteresis value.
K2 reacts correspondingly at the lower threshold value of $\nu_2$.
Once the temperature has reached the set threshold of $\nu_1$, output relay K1 changes its switching state after the set time t has elapsed. (K2 reacts in the same way for $\nu_2$).
The relays return to their original state if the temperature drops below the set hysteresis value and the connection Y1-Y2 is interrupted for a short time.

Digital tripping devices
Once the temperature has reached the set threshold of $\nu_1$, output relay K1 changes its switching state after the set time delay t has elapsed (K2 reacts in the same way for $\nu_2$).

Characteristic curves of resistance sensors

Function diagrams

Overtemperature
Open-circuit principle
Closed-circuit principle

Undertemperature
Open-circuit principle
Closed-circuit principle

Range monitoring (only digital devices)
Open-circuit principle
Closed-circuit principle

Function principle with storage function
using overtemperature with closed-circuit principle as an example
Temperature monitoring relays
C51x range
Connection diagrams, connection of resistance thermometer sensors

Connection diagrams

C510
A1/A3-A2 Rated control supply voltage
11-12 Output contacts
13-14 Sensor connection
T1-T3 Sensor connection

C511
A1-A2 Rated control supply voltage
11-12/14 Output contacts
T1-T3 Sensor connection

C512
A1-A2 Rated control supply voltage
15-16/18 Output contacts
25-26/28 Sensor connection
33-34 T1-T3 Sensor connection
Y1-Y2 Connection for storage bridge

C513
A1-A2 Rated control supply voltage
15-16/18 Output contacts
25-26/28 Sensor connection
33-34 T1-T3 Sensor connection 1
3T1-3T3 Sensor connection 2
Y1-Y2 Connection for storage bridge

Connection of resistance thermometer sensors

2-wire measurement
When using 2-wire temperature sensors the sensor resistance and the wire resistance are added together. The resulting systematic errors must be taken into account when adjusting the tripping device. A jumper must be connected between the terminals T2 and T3. The following table can be used for PT100 sensors to determine the temperature errors caused by the line length.

**ATTENTION!**
When using resistance sensors with two-wire connection a bridge must be inserted between terminals T2 and T3.

Error caused by the line
The error resulting from the line resistance amounts to approx. 2.5 Kelvin/Ohm. If the resistance of the line is not known and it is not possible to measure it, the error caused by the line can be estimated using the following table.

**Temperature error**
(depending on the line length and conductor cross section for PT100 sensors at an ambient temperature of 20 °C, in K)

<table>
<thead>
<tr>
<th>Line length in m</th>
<th>Wire size mm²</th>
<th>0.50</th>
<th>0.75</th>
<th>1</th>
<th>1.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>1.8</td>
<td>1.2</td>
<td>0.9</td>
<td>0.6</td>
</tr>
<tr>
<td>25</td>
<td></td>
<td>4.5</td>
<td>3.0</td>
<td>2.3</td>
<td>1.5</td>
</tr>
<tr>
<td>50</td>
<td></td>
<td>9.0</td>
<td>6.0</td>
<td>4.5</td>
<td>3.0</td>
</tr>
<tr>
<td>75</td>
<td></td>
<td>13.6</td>
<td>9.0</td>
<td>6.8</td>
<td>4.5</td>
</tr>
<tr>
<td>100</td>
<td></td>
<td>18.1</td>
<td>12.1</td>
<td>9.0</td>
<td>6.0</td>
</tr>
<tr>
<td>200</td>
<td></td>
<td>36.3</td>
<td>24.2</td>
<td>18.1</td>
<td>12.1</td>
</tr>
<tr>
<td>500</td>
<td></td>
<td>91.6</td>
<td>60.8</td>
<td>45.5</td>
<td>30.2</td>
</tr>
</tbody>
</table>
## Temperature monitoring relays C51x range

### Technical data

<table>
<thead>
<tr>
<th>Type</th>
<th>C510</th>
<th>C511</th>
<th>C512</th>
<th>C513</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input circuit</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated control supply voltage</td>
<td>24 V AC/DC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power consumption</td>
<td>&lt; 4 VA</td>
<td>&lt; 7 VA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated control supply voltage</td>
<td>230 V AC</td>
<td>24-240 V AC/DC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated frequency</td>
<td>50/60 Hz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sensor circuit</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensor type</td>
<td>PT100, PT1000, KTY83, KTY84, NTC</td>
<td>PT100, PT1000, KTY83, KTY84, NTC, PT1000</td>
<td>PT1000, KTY83, KTY84, NTC</td>
<td>PT1000, KTY83, KTY84, NTC</td>
</tr>
<tr>
<td>Sensor current</td>
<td>typ. 1 mA</td>
<td>typ. 0.2 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wire-break detection</td>
<td>no</td>
<td>yes (not for NTC)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short-circuit detection</td>
<td>no</td>
<td>yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-wire connection</td>
<td>yes (2-wire connection of sensors with terminals T2 and T3 bridged)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Measuring circuit</strong></td>
<td>typ. &lt; ± 5 % of full-scale value</td>
<td>&lt; ±2 K ± 1digit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Setting accuracy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accuracy within the temperature range</td>
<td>&lt; 2 %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response time</td>
<td>500 ms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hysteresis settings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature 1</td>
<td>2-20 % of full-scale value</td>
<td>1-99 kelvin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature 2</td>
<td>-</td>
<td>5 % of full-scale value</td>
<td>1-99 kelvin</td>
<td></td>
</tr>
<tr>
<td>Tripping delay</td>
<td>-</td>
<td>0-999 s</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Output circuit</strong></td>
<td>1 n/o + 1 n/c</td>
<td>1 c/o + 1 n/o</td>
<td>2 c/o + 1 n/o</td>
<td>2 c/o + 1 n/o</td>
</tr>
<tr>
<td>Rated operating current</td>
<td>AC12 (resistive) 230 V</td>
<td>AC15 (inductive) 230 V</td>
<td>DC12 (resistive) 24 V</td>
<td>DC13 (inductive) 24 V</td>
</tr>
<tr>
<td>(IEC/EN 60947-1-5)</td>
<td>3 A</td>
<td>1 A</td>
<td>0.1 A</td>
<td></td>
</tr>
<tr>
<td>Mechanical lifetime</td>
<td>3 x 10^6 switching cycles</td>
<td>30 x 10^6 switching cycles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical lifetime (AC15 at 3 A)</td>
<td>0.1 x 10^6 switching cycles</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. fuse rating to achieve short circuit protection</td>
<td>4 A, operating class gL/gG</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>General data</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimensions (W x H x D)</td>
<td>22.5 x 101.6 x 86 mm (0.89 x 4 x 3.39 in)</td>
<td>45 x 105.9 x 86 mm (1.77 x 4.17 x 3.39 in)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tightening torque</td>
<td>0.8-1.2 Nm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mounting position</td>
<td>any</td>
<td>any</td>
<td>any</td>
<td>any</td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IP 40 / IP 20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient temperature range</td>
<td>-25...+60 °C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage</td>
<td>-40...+80 °C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mounting</td>
<td>DIN rail (IEC/EN 60715)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Electrical connection</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wire size</td>
<td>rigid</td>
<td>1 x 4 mm² (1 x 12 AWG), 2 x 2.5 mm² (2 x 14 AWG)</td>
<td>1 x 2.5 mm² (1 x 14 AWG), 2 x 1.5 mm² (2 x 16 AWG)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>fine-strand with wire end ferrule</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Standards</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental conditions</td>
<td>IEC 60721-3-3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Voltage Directive</td>
<td>IEC 60947-5-1, VDE 0660</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electromagnetic compatibility</td>
<td>EN 61000-6-2</td>
<td>EN 61000-6-4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interference immunity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electromagnetic interference emission</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vibration resistance (IEC 68-2-6)</td>
<td>5-26 Hz / 0.75 mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shock resistance (IEC 68-2-27)</td>
<td>15 g / 11 ms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Isolation data</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated insulation voltage</td>
<td>300 V AC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pollution degree</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Approvals

- ABB Electronic Products and Relays C51x Technical data

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