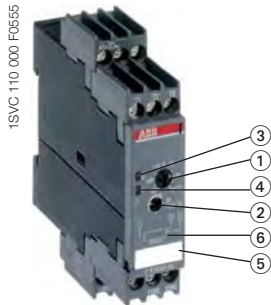


# Analog temperature monitoring relays C510 and C511

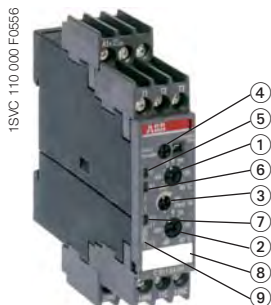
## Ordering details

2



### C510

- ① Threshold value adjustment
- ② Hysteresis adjustment
- ③ LED: control supply voltage
- ④ LED  $\varnothing$ : relay status
- ⑤ Marker label
- ⑥ Circuit diagram



### C511

- ① Threshold value 1 (tripping) adjustment
- ② Threshold value 2 (warning) adjustment
- ③ Hysteresis adjustment for threshold value 1
- ④ Selection switch for open- or closed circuit principle
- ⑤ LED: control supply voltage
- ⑥ LED  $\varnothing$ 1: relay 1 energized
- ⑦ LED  $\varnothing$ 2: relay 2 energized
- ⑧ Marker label
- ⑨ Circuit diagram

### 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
- Depending on the version, measurement ranges for -50...+50 °C / 0...+100 °C / 0...+200 °C
- no storage
- Adjustment precision  $\pm 5\%$
- 22.5 mm enclosure with 12 terminals

#### C510

- 1 threshold adjustable via absolute scale in °C
- Hysteresis adjustable from 2-20 %
- 1 n/o and 1 n/c contact
- 2 LEDs for status indication
- Closed-circuit principle

Type	Rated control supply voltage	Order code	Measuring range	Pack.-unit piece	Price 1 piece	Weight 1 piece kg / lb
------	------------------------------	------------	-----------------	------------------	---------------	------------------------

#### Monitoring function: Overtemperature

<b>C510.01-24</b>	24 V AC/DC	<b>1SAR 700 001 R0005</b>	-50...+50 °C	1		0.15/0.33
<b>C510.01-K</b>	110/230 V AC	<b>1SAR 700 001 R0006</b>	-50...+50 °C	1		0.19/0.42
<b>C510.02-24</b>	24 V AC/DC	<b>1SAR 700 002 R0005</b>	0...+100 °C	1		0.15/0.33
<b>C510.02-K</b>	110/230 V AC	<b>1SAR 700 002 R0006</b>	0...+100 °C	1		0.19/0.42
<b>C510.03-24</b>	24 V AC/DC	<b>1SAR 700 003 R0005</b>	0...+200 °C	1		0.15/0.33
<b>C510.03-K</b>	110/230 V AC	<b>1SAR 700 003 R0006</b>	0...+200 °C	1		0.19/0.42

#### Monitoring function: Undertemperature

<b>C510.11-24</b>	24 V AC/DC	<b>1SAR 700 004 R0005</b>	-50...+50 °C	1		0.15/0.33
<b>C510.11-K</b>	110/230 V AC	<b>1SAR 700 004 R0006</b>	-50...+50 °C	1		0.19/0.42
<b>C510.12-24</b>	24 V AC/DC	<b>1SAR 700 005 R0005</b>	0...+100 °C	1		0.15/0.33
<b>C510.12-K</b>	110/230 V AC	<b>1SAR 700 005 R0006</b>	0...+100 °C	1		0.19/0.42
<b>C510.13-24</b>	24 V AC/DC	<b>1SAR 700 006 R0005</b>	0...+200 °C	1		0.15/0.33
<b>C510.13-K</b>	110/230 V AC	<b>1SAR 700 006 R0006</b>	0...+200 °C	1		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 %
- Hysteresis for threshold 2 fixed 5 %
- 1 n/o and 1 c/o
- 3 LEDs for status indication
- Open- or closed-circuit principle selectable

Type	Rated control supply voltage	Order code	Measuring range	Pack.-unit piece	Price 1 piece	Weight 1 piece kg / lb
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#### Monitoring function: Overtemperature

<b>C511.01-24</b>	24 V AC/DC	<b>1SAR 700 011 R0005</b>	-50...+50 °C	1		0.17/0.37
<b>C511.01-W</b>	24-240 V AC/DC	<b>1SAR 700 011 R0010</b>	-50...+50 °C	1		0.18/0.40
<b>C511.02-24</b>	24 V AC/DC	<b>1SAR 700 012 R0005</b>	0...+100 °C	1		0.17/0.37
<b>C511.02-W</b>	24-240 V AC/DC	<b>1SAR 700 012 R0010</b>	0...+100 °C	1		0.18/0.40
<b>C511.03-24</b>	24 V AC/DC	<b>1SAR 700 013 R0005</b>	0...+200 °C	1		0.17/0.37
<b>C511.03-W</b>	24-240 V AC/DC	<b>1SAR 700 013 R0010</b>	0...+200 °C	1		0.18/0.40

#### Monitoring function: Undertemperature

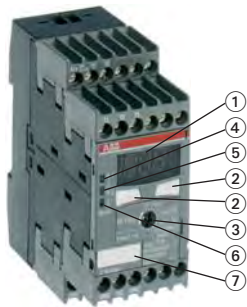
<b>C511.11-24</b>	24 V AC/DC	<b>1SAR 700 014 R0005</b>	-50...+50 °C	1		0.17/0.37
<b>C511.11-W</b>	24-240 V AC/DC	<b>1SAR 700 014 R0010</b>	-50...+50 °C	1		0.18/0.40
<b>C511.12-24</b>	24 V AC/DC	<b>1SAR 700 015 R0005</b>	0...+100 °C	1		0.17/0.37
<b>C511.12-W</b>	24-240 V AC/DC	<b>1SAR 700 015 R0010</b>	0...+100 °C	1		0.18/0.40
<b>C511.13-24</b>	24 V AC/DC	<b>1SAR 700 016 R0005</b>	0...+200 °C	1		0.17/0.37
<b>C511.13-W</b>	24-240 V AC/DC	<b>1SAR 700 016 R0010</b>	0...+200 °C	1		0.18/0.40

• Function diagrams ..... 2/78 • Technical data ..... 2/80 • Dimensional drawings ..... 2/103

# Digital temperature monitoring relays C512 and C513

## Ordering details

1SVC 110 000 F0657



### C512, C513

- ① Display
- ② Adjustment button
- ③ Menu selection switch
- ④ LED  $\varnothing$ 1:  
Threshold value 1
- ⑤ LED  $\varnothing$ 2:  
Threshold value 1
- ⑥ LED Ready:  
device in function
- ⑦ Marker label

### Digital tripping devices - C512 und C513

- Adjustable sensor types: PT100, PT1000, KTY83, KTY84, NTC-B57227-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
- Storage function selectable via external signal (Y1-Y2)
- Non-volatile storage of parameter settings
- 1 n/o (for wire-break and short-circuit detection) and 2 c/o
- Multifunctional digital display
- 3 LEDs for status indication
- Open- or closed-circuit principle selectable
- 45 mm wide enclosure with 24 terminals

### C512

- Temperature monitor for 1 sensor circuit

Type	Rated control supply voltage	Order code	Measuring range	Pack.-unit piece	Price 1 piece	Weight 1 piece k g / lb
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### Monitoring function: Over- and undertemperature, range monitoring function

<b>C512-24</b>	24 V AC/DC	<b>1SAR 700 100 R0005</b>	-50...+500 °C *)	1		0.32/0.71
<b>C512-W</b>	24-240 V AC/DC	<b>1SAR 700 100 R0010</b>	-50...+500 °C *)	1		0.33/0.73

### C513

- Temperature monitor for 1-3 sensor circuits
- In the 3-sensor version the status of the single sensors is displayed if the temperature exceeds or falls below the threshold.

This way it can be easily determined which one of the connected sensors has exceeded or dropped below either one or both threshold values.

Type	Rated control supply voltage	Order code	Measuring range	Pack.-unit piece	Price 1 piece	Weight 1 piece kg / lb
------	------------------------------	------------	-----------------	------------------	---------------	------------------------

### Monitoring function: Over- and undertemperature, range monitoring function

<b>C513-W</b>	24-240 V AC/DC	<b>1SAR 700 110 R0010</b>	-50...+500 °C *)	1		0.34/0.75
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### Accessories - Replaceable cover marking for digital devices

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

\*) The measuring range depends on the used sensor type:

- PT100: -50...+500 °C
  - PT1000: -50...+500 °C
  - NTC: +80...+160 °C
  - KTY83: -50...+175 °C
  - KTY84: -40...+300 °C
- (Typ Siemens Matsushita B57272-A333-A1 - 100 °C: 1,8 k $\Omega$ , 25 °C: 32,762 k $\Omega$ )

# Temperature monitoring relays

## C51x range

### Overview, functional description and diagrams

2

## 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  $v_1$ , 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  $v_2$ .

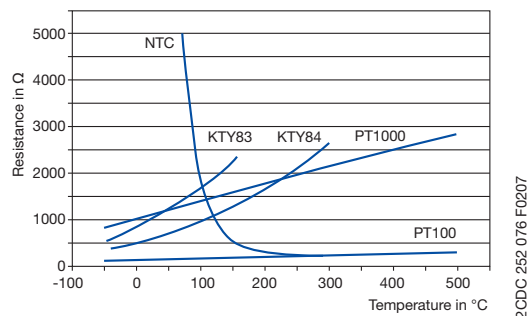
Once the temperature has reached the set threshold of  $v_1$ , output relay K1 changes its switching state after the set time  $t$  has elapsed. (K2 reacts in the same way at  $v_2$ ).

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  $v_1$ , output relay K1 changes its switching state after the set time delay  $t$  has elapsed (K2 reacts in the same way for  $v_2$ ).

## Characteristic curves of resistance sensors



2CDC 252 076 F0207

The family is composed of analog adjustable devices with one or two thresholds, and digital devices which are a good alternative especially in the low-end range.

The output relay switches on or off at the thresholds, depending on the configured functionality (open- or closed-circuit principle selectable).

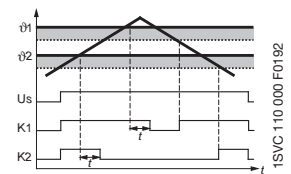
## Function diagrams

### Overtemperature

Open-circuit principle

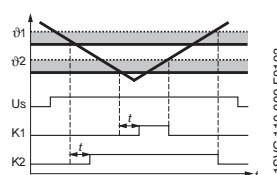


Closed-circuit principle

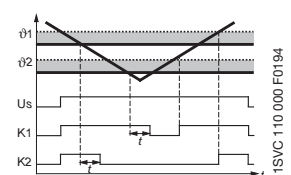


### Undertemperature

Open-circuit principle

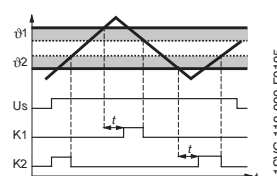


Closed-circuit principle

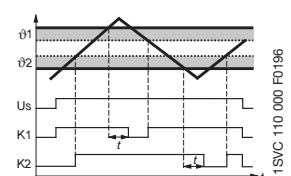


### Range monitoring (only digital devices)

Open-circuit principle

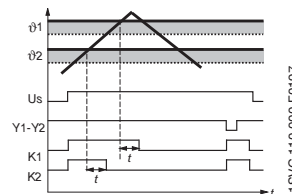


Closed-circuit principle



### Function principle with storage function

using overtemperature with closed-circuit principle as an example

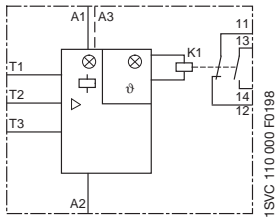


— absolute limit  
 ■ hysteresis  
 ..... hysteresis

# Temperature monitoring relays C51x range

Connection diagrams, connection of resistance thermometer sensors

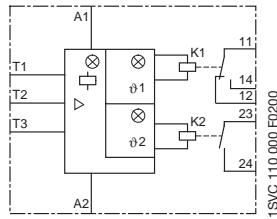
## Connection diagrams



1SVC 110 000 FO198

### C510

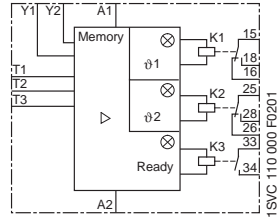
- A1/A3-A2 Rated control supply voltage
- 11-12 Output contacts
- 13-14
- T1-T3 Sensor connection



1SVC 110 000 FO200

### C511

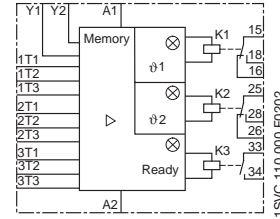
- A1-A2 Rated control supply voltage
- 11-12/14 Output contacts
- 23-24
- T1-T3 Sensor connection



1SVC 110 000 FO201

### C512

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



1SVC 110 000 FO202

### C513

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

## Connection of resistance thermometer sensors

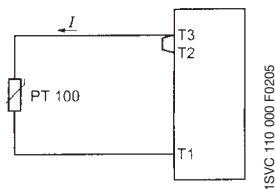
### 2-wire measurement

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.



1SVC 110 000 FO205

### ATTENTION!

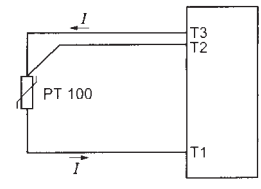
When using resistance sensors with two-wire connection a bridge must be inserted between terminals T2 and T3.

### 3-wire measurement

To minimize the influence of the wire resistance, a three-wire connection is usually used.

By means of the additional wire two measuring circuits are created.

One of these two circuits is used for reference. This way, the tripping device can calculate and take into account the wire resistance automatically.



1SVC 110 000 FO206

### 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)

Line length in m	Wire size mm <sup>2</sup>			
	0.50	0.75	1	1.5
0	0.0	0.0	0.0	0.0
10	1.8	1.2	0.9	0.6
25	4.5	3.0	2.3	1.5
50	9.0	6.0	4.5	3.0
75	13.6	9.0	6.8	4.5
100	18.1	12.1	9.0	6.0
200	36.3	24.2	18.1	12.1
500	91.6	60.8	45.5	30.2

# Temperature monitoring relays

## C51x range

### Technical data

2

Type		C510	C511	C512	C513
<b>Input circuit</b>					
Rated control supply voltage	A1-A2	24 V AC/DC			-
U <sub>s</sub>	A1-A2	230 V AC	24-240 V AC/DC		
	A3-A2	110 V AC	-		
Power consumption	AC	< 4 VA		< 7 VA	
	DC	< 2 W		< 4 W	
Rated control supply voltage U <sub>s</sub> tolerance		-15...+10 %			
Rated frequency	AC	50/60 Hz			
<b>Sensor circuit</b>					
Sensor type		PT100		PT100, PT1000, KTY83, KTY84, NTC	
Sensor current	PT100	typ. 1 mA			
	PT1000, KTY83, KTY84, NTC	-		typ. 0.2 mA	
Wire-break detection		no		yes (not for NTC)	
Short-circuit detection		no		yes	
3-wire connection		yes (2-wire connection of sensors with terminals T2 and T3 bridged)			
<b>Measuring circuit</b>					
Setting accuracy at T <sub>a</sub> = 20 °C (T <sub>20</sub> )		typ. < ± 5 % of full-scale value		< ±2 K ± 1 digit	
Accuracy within the temperature range		< 2 %		0.05 °C / °C deviation from T <sub>20</sub>	
Response time		-		500 ms	
Hysteresis settings	temperature 1	2-20 % of full-scale value		1-99 kelvin	
	temperature 2	-	5 % of full-scale value	1-99 kelvin	
Tripping delay		-		0-999 s	
<b>Output circuit</b>					
Kind of output		1 n/o + 1 n/c	1 c/o + 1 n/o	2 c/o + 1n/o	2 c/o + 1 n/o
Rated operating current I <sub>e</sub> (IEC/EN 60947-1-5)	AC12 (resistive) 230 V				
	AC15 (inductive) 230 V	3 A			
	DC12 (resistive) 24 V	1 A			
	DC13 (inductive) 24 V	0.1 A			
Mechanical lifetime		3 x 10 <sup>6</sup> switching cycles		30 x 10 <sup>6</sup> switching cycles	
Electrical lifetime (AC15 at 3 A)		0.1 x 10 <sup>6</sup> switching cycles			
Max. fuse rating to achieve short circuit protection		4 A, operating class gL/gG			
<b>General data</b>					
Dimensions (W x H x D)		22.5 x 101.6 x 86 mm (0.89 x 4 x 3.39 in)		45 x 105.9 x 86 mm (1.77 x 4.17 x 3.39 in)	
Tightening torque		0.8-1.2 Nm			
Mounting position		any			
Degree of protection enclosure / terminals		IP 40 / IP 20			
Ambient temperature range	operation	-25...+60 °C			
	storage	-40...+80 °C			
Mounting		DIN rail (IEC/EN 60715)			
<b>Electrical connection</b>					
Wire size	rigid	1 x 4 mm <sup>2</sup> (1 x 12 AWG), 2 x 2.5 mm <sup>2</sup> (2 x 14 AWG)			
	fine-strand with wire end ferrule	1 x 2.5 mm <sup>2</sup> (1 x 14 AWG), 2 x 1.5 mm <sup>2</sup> (2 x 16 AWG)			
<b>Standards</b>					
Environmental conditions		IEC 60721-3-3			
Low Voltage Directive		IEC 60947-5-1, VDE 0660			
Electromagnetic compatibility	Interference immunity	EN 61000-6-2			
	Interference emission	EN 61000-6-4			
Vibration resistance (IEC 68-2-6)		5-26 Hz / 0.75 mm			
Shock resistance (IEC 68-2-27)		15 g / 11 ms			
<b>Isolation data</b>					
Rated insulation voltage		300 V AC			
Pollution degree		3			