MCR-SL-PT100-SP Thermostat for the PT-100

1. Description

The MCR-SL-PT-100-SP thermostat module converts the measured values of the PT-100 sensor (IEC 751/ EN 60 751) into binary alarm switching signals.

The sensor is supplied from the module with a low current. The resultant voltage drop is amplified in the module and linearized by a resistance characteristic. The switching threshold is roughly preset internally using DIP switches and then finely adjusted using a potentiometer on the front plate.

A high-quality changeover relay with gold coating is provided on the output side.

The device has an adjustable open-circuit response.

To increase the process safety, the thermostat block is equipped with electrical isolation for the sensor signal.

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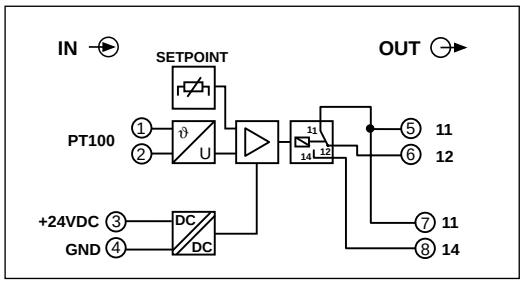
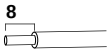
2. Technical Data



MCR-SL-PT100-SP

Thermostat for the PT100

M 3



	rigid [mm²]	flexible [mm²]	AWG	I [A]	U [V]
Connection data	0.2-2.5	0.2-2.5	24-14	*	*

Housing width 12.5 mm (0.492 in.)

Description	Type	Order No.	Pcs. / Pkt.
Thermostat, for the PT100 sensor	**MCR-SL-PT100-SP**	**28 14 94 8**	1

Technical Data

Input		
Temperature range	PT100 (IEC 751/EN 60 751): 2-wire connection method -100...+700°C (-148…1292°F)	
Sensor supply current	1 mA, approximately	
Switching Output		
Relay output	1 form C contact	
Contact material	AgSnO, hard gold-plated	
Maximum switching voltage	30 V AC / 36 V DC[1)]	(250 V AC)
Maximum switching current	50 mA[1)]	(2 A)
Switching hysteresis	Adjustable	
Error message	Red LED (short circuit/open circuit)	
Relay status indicator	Yellow LED (relay active)	
General Data		
Supply voltage	20...30 V DC	
Current consumption	< 30 mA	
Linearity error	< 0.1%	
Setting precision	< 1% (0.5%, typical)	
Temperature coefficient	< 0.01%/K (0.005%/K, typical)	
ON delay	6 ms, approximately	
OFF delay	200 ms, approximately	
Test voltage	1.5 kV AC, 50 Hz, 1 minute	
Ambient temperature range	-20°C to +65°C (-4ºF to 149ºF)	
Degree of protection	IP 20	
Connection method	Plug-in COMBICON screw-clamp terminal	
Dimensions (W x H x D)	12.5 x 99 x 114.5 mm (0.492 x 3.898 x 4.508 in.)	
Cable cross-section	0.2-2.5 mm² (AWG 24-14)	
Housing material	Polyamide PA, unarmored	

[1)] If the specified maximum values are exceeded, the gold coating will be damaged. In subsequent operation, the maximum values given in brackets will apply.

CE

Conforms to the EMC Directive 89/336/EEC and the Low Voltage Directive 73/23/EEC

EMC (Electromagnetic Compatibility)		
Noise immunity in accordance with EN 50082-2		
• Electrostatic discharge (ESD)	EN 61000-4-2	8 kV air discharge [2]
• Electromagnetic HF field Amplitude modulation Pulsed modulation	EN 61000-4-3	10 V/m [1] 10 V/m [1]
• Fast transients (burst)	EN 61000-4-4	Input/output/supply voltage 2 kV/5 kHz [2]
• Surge current load (surge)	EN 61000-4-5	Input/output: 2 kV/42 Ω [2] Supply voltage: 0.5 kV/2 Ω /12 Ω [2]
• Conducted interference	EN 61000-4-6	Input/output/supply voltage 10 V [1]
Noise emission in accordance with EN 50081-2	EN 55011	Class A

EN 61000 corresponds to IEC 1000/
EN 55011 corresponds to CISPR11

[1] Criterion A: Normal operating characteristics within the specified limits.
[2] Criterion B: Temporary adverse effects on the operating characteristics that the device corrects independently.

Class A: Industrial application, without special installation measures

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1 Housing cover, can be removed to set the DIP switches

2 Plug-in screw-clamp terminals

3 Potentiometer for finely adjusting the switching point

4 Red LED: open circuit and short circuit indicator

5 Yellow LED: Status indicator for the relay

6 Metal lock for fastening on the DIN rail

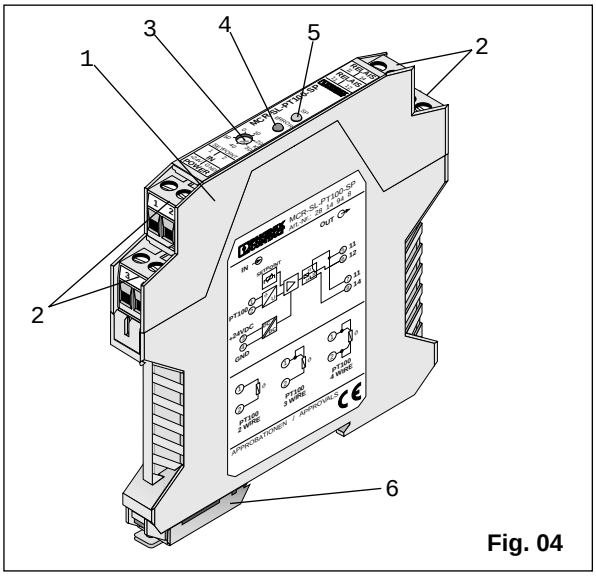

Fig. 04

3. Connection of 2-, 3-, and 4-Wire Sensors

a) 2-Wire Connection (Fig. 05)

The cable resistance of the forward and return conductor directly affects the measuring result: $R = R_T + 2 \times R_L$.

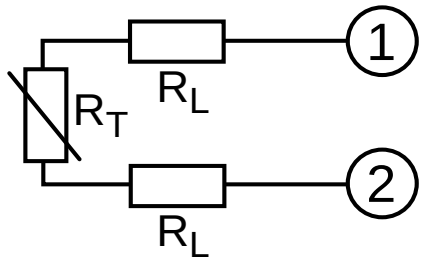

Fig. 05

b) 3-Wire Connection (Fig. 06)

The parallel connection of a cable resistor reduces the line fault from 2 x RL to 1.5 x RL. The measuring result is: $R = R_T + 1.5 \times R_L$.

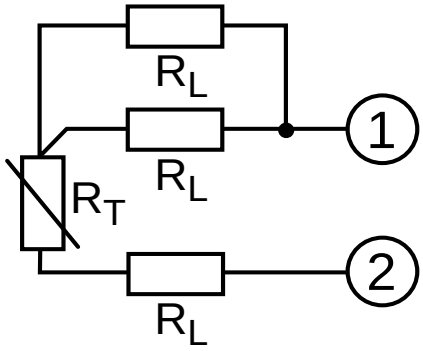

Fig. 06

c) 4-Wire Connection (Fig. 07)

The use of a 4-wire connection reduces the line fault to a minimum: $R = R_T + R_L$.

Example: The effect of the conductor cross-section and the cable length on the temperature error:

Basis:

$$R_L = \frac{l}{\gamma * A} \qquad \gamma = 56 \frac{m}{\Omega * mm^2} \qquad PT100 = 0.385 \frac{\Omega}{K}$$

1) A = 1.0 mm² (17
l = 10 m [32.81 } 2 x R_L = 357 mΩ = 0.93 K (temperature error)

2) A = 1.5 mm² (16
l = 10 m [32.81 } 2 x R_L = 238 mΩ = 0.60 K (temperature error)

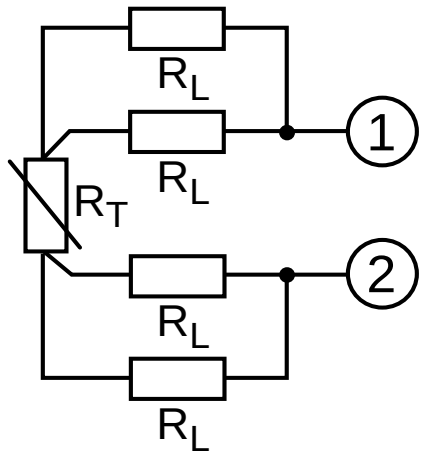

Fig. 07

4. Configuration

4.1. Opening the Device

The locked housing cover is released on both sides using a screwdriver 1 . The housing cover and electronics can only be pulled out about 3 cm (1.181 in.) 2 .

Ensure you take sufficient measures against electrostatic discharge

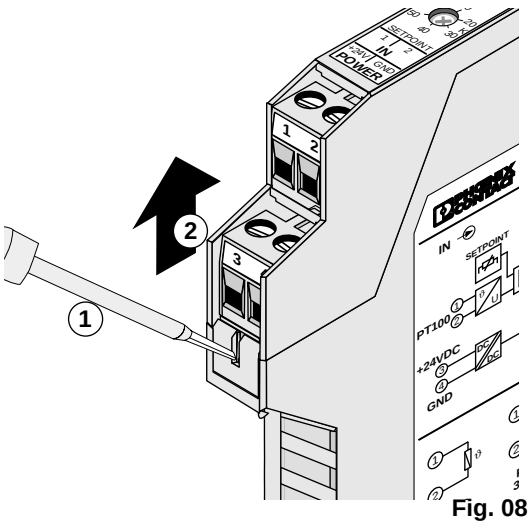

Fig. 08

4.2. Setting

The PT100 thermostat module is configured using eight internal DIP switches and a potentiometer mounted on the front plate of the housing.

The fields in the left column of the following table can be used to mark the selected temperature range, the switching hysteresis, and the open-circuit and short-circuit response. The label on the side of the module can also be used for this.

First of all, the switching is preset roughly using DIP switches S1 to S4. They are used to define the switching point within the specified temperature ranges (see the table on the right "Setpoint °C"/Fig. 09):

		DIP Switch			
	Setpoint °C	**S1**	**S2**	**S3**	**S4**
	650…700	OFF	OFF	OFF	OFF
	600…650	OFF	OFF	OFF	**ON**
	550…600	OFF	OFF	**ON**	OFF
	500…550	OFF	OFF	**ON**	**ON**
	450…500	OFF	**ON**	OFF	OFF
	400…450	OFF	**ON**	OFF	**ON**
	350…400	OFF	**ON**	**ON**	OFF
	300…350	OFF	**ON**	**ON**	**ON**
	250…300	**ON**	OFF	OFF	OFF
	200…250	**ON**	OFF	OFF	**ON**
	150…200	**ON**	OFF	**ON**	OFF
	100…150	**ON**	OFF	**ON**	**ON**
	50…100	**ON**	**ON**	OFF	OFF
	0… 50	**ON**	**ON**	OFF	**ON**
	- 50… 0	**ON**	**ON**	**ON**	OFF
	-100…-50	**ON**	**ON**	**ON**	**ON**

Fig. 09

To avoid the frequent switching of the relay output during minimum temperature fluctuations, a hysteresis can be specified for the desired switching point using DIP switches S5 and S6 (see the table on the right "Hysteresis"/Fig. 10):

		DIP Switch	
	Hysteresis	**S5**	**S6**
	0.5 K	OFF	OFF
	2.0 K	OFF	**ON**
	3.0 K	**ON**	OFF
	5.0 K	**ON**	**ON**

In the event of an open circuit on the sensor line or a short circuit in the input circuit, the switching output can change to a defined state (see the table on the right "Open circuit/short circuit"/Fig. 10):

			DIP Switch	
	PT100 Open Circuit	**PT100 Short Circuit**	**S7**	**S8**
	Relay ON	Relay OFF	OFF	OFF
	Relay ON	Relay ON	OFF	**ON**
	Relay OFF	Relay OFF	**ON**	OFF

Fig. 10