

Operating manual TR 310 - Archive document -

1. Function

1.1 General

ZIEHL thermostats of the TR 310 series are electronic two-setpoint controllers for monitoring temperatures. The standard design of the temperature controllers model TR 310 is based on the closed-circuit current principle. The installed relays pick up with connected sensors and temperature within limits. The thermostat signals and switches when the set limit is exceeded.

Modern circuitry, reliable components such as function and routine test ensure high repeat accuracy and long service life.

TR 310 thermostats are built into a 24-pole plug-in housing:

- easy to operate and to install as directly wired to the plug base. The upper electronic part can easily be changed
- housing snapable on DIN-rail according to DIN EN 50 022 or mountable with M4 screws
- gold-coated contact springs and plugs ensure a perfect contact and a long service life.

1.2 Special Features of TR 310

Temperature controller for Pt 100 sensors according to DIN 43 760 / IEC 751

The TR 310 temperature controller monitors 3 Pt 100 sensors simultaneously.

The built-in digital display shows temperatures in a range between 0 and 200 °C. The values of the individual sensors can be switched in the display by a 4-stage rotary switch. Turned to the MAX-position, the temperature of the warmest sensor is displayed.

The analog current output (0...20 or 4...20 mA) is always supplied with the value of the warmest sensor.

When the limit of early warning or switching off is exceeded in one of the sensors the appropriate relay releases.

- 3 sensors, 2 adjustable limits, 2 relays
- Digital display, switchable for sensor 1, 2, 3 and MAX
- LED display for operation ON, trouble in measuring circuit and switching state of the relays
- Three-lines connection. Line resistance up to 3x20 Ω is compensated internally.
- At sensor break or sensor short-circuit as well as at disconnection of sensor line the relays switch off. Signalled by LED "trouble".

1.3 Application

TR 310 thermostats and Pt 100 sensors are a reliable monitoring system. For verifications at electromotors and generators the temperature characteristics and the temperature limits are an important measurable value. Possible damages by excessive temperature at machinery and equipment are effectively avoided:

- Exact temperature registration and exact switching with high repeatability
- largely insensitive to interference on measuring line

2. Electrical Data

<u>Rated operational voltage</u>	see lateral type plate
Tolerance	+ 10 ... - 10 %
Power consumption	< 8 VA
Frequency	50 - 60 Hz
ON period	100 %
<u>Relay output</u>	2 relays, co- contacts
Switching voltage	max. AC 380 V
Switching current	max. 6 A
Switching power	max. 1100 VA
Rated operational current	Ie = 2,5 A, 380 V , AC11
<u>Test conditions</u>	VDE 0660 / VDE 0160
Isolation	VDE 0110 / AC 380 V / I Group C
Transformer	VDE 0550
Permissible ambient temp.	-20 ... + 55 °C
<u>Housing</u>	design S - 24
Line connection	24 pole, 2 x 0,75 mm ² ... 1,5 mm ² per terminal
Housing protection class	IP 31
Terminal protection class	IP 20
Panel inclination	any
Mounting	snappable mounting onto DIN-rail 35 mm according to DIN 50022 or screwable assembly M4
<u>Sensor connection</u>	
Sensor	3 x Pt 100 according to DIN 43 760 / IEC 751
Sensor current	≤ 1 mA
Connection type	standard = 3 lines line resistance max. 3 x 20 Ohms
Monitoring	Sensor short - circuit (< 70 Ohms) Line short - circuit (< 70 Ohms) Sensor break (> 430 Ohms) Cable break (> 430 Ohms)
<u>Switching points</u>	2
Adjustment accuracy	approx. 3 degrees
Repetitive error	< 0,2 K
Switching state	standard: closed-circuit current principle true < set limit = relay on option: operating current true < set limit = relay off
LED Display	standard : true > set value = LED on option : true > set value = LED off
Hysteresis	≤ 2 % of span
<u>Current-output</u>	max. 300 Ω
accuracy	class 0.5
temperature influence	0.05%/°C
Weight	approx. 830 gr

3. Installation - Commissioning

- 3.1 The plug base can be mounted either with
- 35 mm mounting rail according to DIN 50 002 or
 - M4 screws

- 3.2 Wiring directly to plug base
- Connect wires as per wiring scheme
 - Plug in electronics and fix with knurled screw

ATTENTION

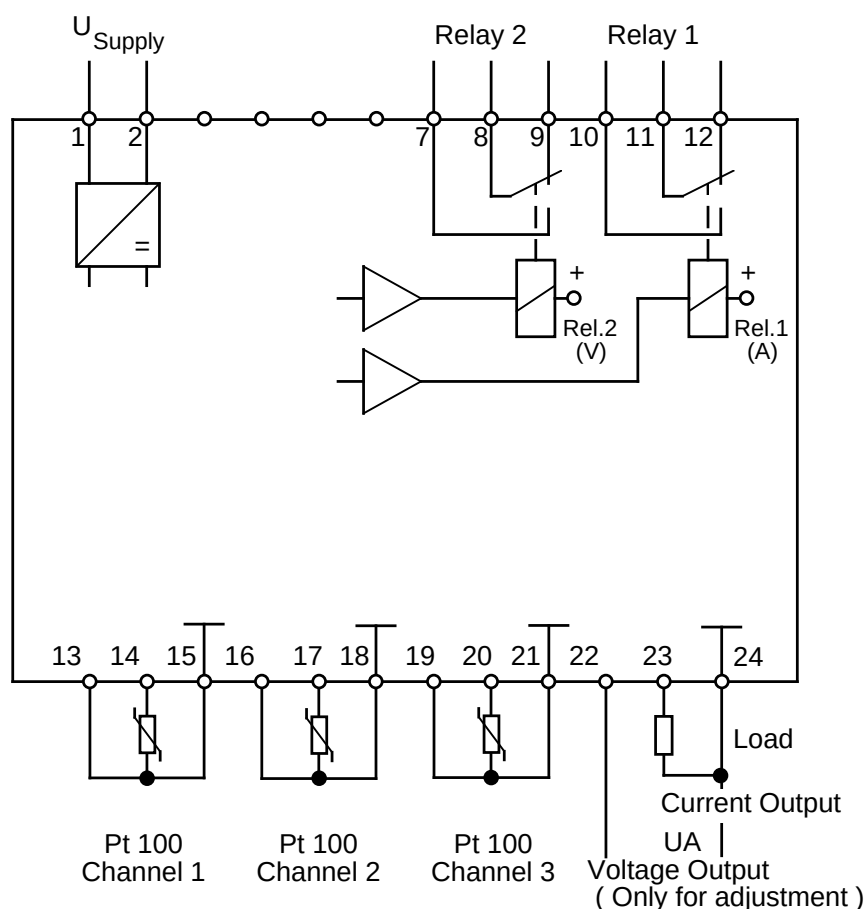
Before switching on thermostat make sure that the operational voltage U_s of the lateral type plate and the mains voltage connected to the thermostat are the same.

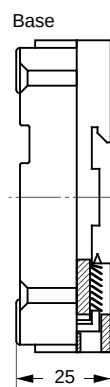
- 3.3 Commission the thermostat as follows
- Connect Pt 100 sensors . Switch on mains voltage
 - At correct state, green LED's light up. All red LED's off, contacts 7 - 8 and 10 - 11 closed. (Relays picked up).
 - Set limits with screwdriver to desired values, e.g. limit 1 for warning, limit 2 for switching off.
 - Relays release when set temperature is exceeded, the relevant LED light's up.

If the thermostat does not switch check whether

- sensor is correctly connected
- sensor temperature is higher than limit
- sensor temperature is higher than measuring range (see resistance table Pt 100)

Wiring scheme :





Characteristic Temperature - Resistance Diagram for Pt 100 sensors

°C	0	10	20	30	40	50	60	70	80	90	Ω / °C
0	100,00	103,90	107,79	111,67	115,54	119,40	123,24	127,07	130,89	134,70	0,385
100	138,50	142,29	146,06	149,82	153,58	157,31	161,04	164,76	168,64	172,16	0,373
200	175,84	179,51	183,17	186,82	190,45	194,07	197,69	201,29	204,88	208,45	0,362
300	212,02	215,57	219,12	222,65	226,17	229,67	233,17	236,65	240,13	243,59	0,35
400	247,04	250,48	253,90	257,32	260,72	264,11	267,49	270,86	274,22	277,56	0,339
500	280,90	284,22	287,53	290,83	294,11	297,39	300,65	303,91	307,15	210,38	0,327
600	313,59	316,80	319,99	323,18	326,35	329,51	332,66	335,79	338,92	342,03	0,315
700	345,13	348,22	351,30	354,37	357,42	360,47	363,50	366,52	369,53	372,52	0,304
800	375,51	378,48	381,45	384,40	387,34	390,26					0,295

The resistance R_t at a certain temperature can be figured out by the following function.

$$R_t = R_0 (1 + At + Bt^2)$$
$$R_0 = \text{resistance at temperature } 0\text{ }^{\circ}\text{C}$$
$$R_t = \text{resistance at temperature } t\text{ }(^{\circ}\text{C})$$
$$A = 0,390802 \cdot 10^{-2} \text{ (Grd)}^{-1}$$
$$B = 0,580195 \cdot 10^{-6} \text{ (Grd)}^{-2}$$

Thus any intermediate value can mathematically exactly be terminated, e.g.

$$t = 761,24\text{ }^{\circ}\text{C}$$
$$R = 100 (1 + 761,24 \cdot A + 5,794863 \cdot 10^5 \cdot B)$$
$$= 100 (1 + 2,974941 - 0,336215) = 363,87\text{ }\Omega$$