

CZAKI THERMO-PRODUCT

ul. 19 Kwietnia 58
05-090 Raszyn-Rybie
tel. 0227202302
fax. 0227202305
www.czaki.pl
handlowy@czaki.pl

R-201 TEMPERATURE CONTROLLER USER'S MANUAL

Application

The R-201 is a microprocessor based temperature controller with quasi proportional algorithm. The instrument can be mounted into a control panel. The R-201 is manufactured in two versions: for thermocouple and for RTD's sensor (3-wire). When the R-201 works with thermocouple sensor, the cold junction temperature is compensated automatically. The R-201 temperature controller is equipped with relay contacts available at the output terminals.

The user can adjust following parameters:

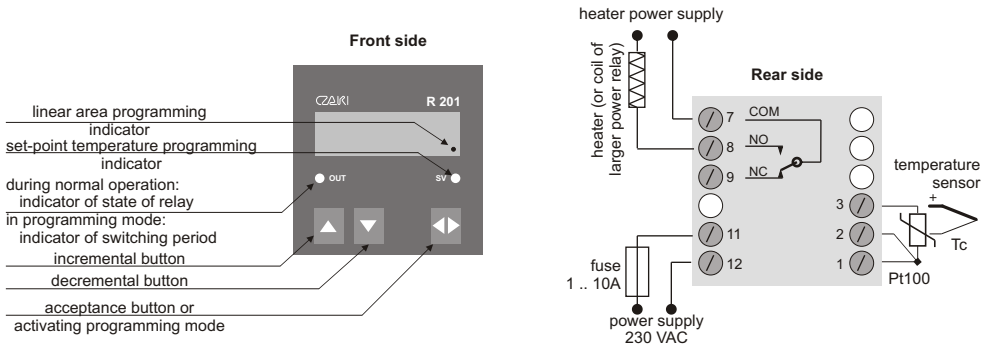
- set-point value
- width of linear area
- relay switching period

Specifications

| Variant | Set point temperature range | Sensor |
|---------------|-----------------------------|------------------|
| R-201-Pt100/1 | 0.0 .. +199.9 °C | Pt100 |
| R-201-Pt100 | 0 .. +800 °C | Pt100 |
| R-201-J | 0 .. +700 °C | Fe-CuNi (J) |
| R-201-K | 0 .. +1200 °C | NiCr-NiAl (K) |
| R-201-N | 0 .. +1300 °C | NiCrSi-NiSi (N) |
| R-201-B | +400 .. +1800 °C | PtRh30-PtRh6 (B) |
| R-201-S | +200 .. +1600 °C | PtRh10-Pt (S) |
| R-201-R | +200 .. +1600 °C | PtRh13-Pt (R) |

| | |
|--|---|
| Accuracy of measurement (for ambient temperature 23 °C ± 5°C) | 0.25% of set point temperature range ±1 digit |
| Width of linear area | 1 .. 50% of set point temperature range |
| relay switching period | 2 .. 255 seconds |
| Output | electromechanical relay, 5A, 250 VAC |
| Display | LED 10 mm, red |
| Power supply | 230VAC, 50Hz, 2VA |
| Housing Front side | IP40 |
| Terminals | IP30 |
| Ambient temperature | 0 .. +45 °C |
| Dimensions (height x width x depth)/weight | 48 x 48 x 115 mm / ca. 200g |
| Window for mounting (height x width) | 45.5 x 45.5 mm |

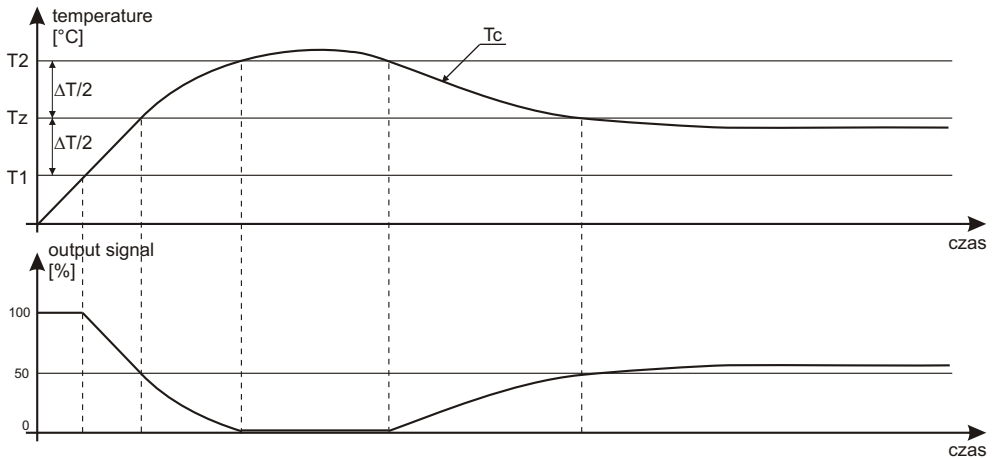
Fig.1 Front panel layout and terminals connections.



Operation

The R-201 controller performs proportional control algorithm. The controller uses pulse width modulation (PWM). The output signal can take any value between 0% and 100% duty cycle. It means that an output relay is switched once per the user-defined period during the normal operation. The figure 2 shows relation between the measured temperature and the duty cycle (that is the output signal). The symbol ΔT denotes the user-defined parameter *width of linear area*, and T_z denotes the parameter *set-point value*. If the measured temperature T_c is less than $T_z - \Delta T/2$, the duty cycle is 100% (the output relay is turned-on all the time). Analogically, if $T_c > T_z + \Delta T/2$, the output relay is permanently off. When $T_c = T_z$, the duty cycle is 50% (it means that the heater operates at half power).

Fig.2 Example of temperature controlling.



Example

In this example R-201-J will be described. Let the set-point temperature range be 0 .. 700 $^{\circ}\text{C}$.

Parameters: set-point temperature T_z : 350 $^{\circ}\text{C}$; linear area 4%; $\Delta T = 0.04 \cdot 700 \text{ }^{\circ}\text{C} = 28 \text{ }^{\circ}\text{C}$

$T_1 = 350 \text{ }^{\circ}\text{C} - 14 \text{ }^{\circ}\text{C} = 336 \text{ }^{\circ}\text{C}$


$T_2 = 350 \text{ }^{\circ}\text{C} + 14 \text{ }^{\circ}\text{C} = 364 \text{ }^{\circ}\text{C}$

Set-point temperature T_z programming

Press and hold the button  for about 1 second.

When the LED SV lights up, the instrument enters into programming mode of set-point temperature. Now the display shows the value of set-point temperature T_z in °C.



The user can change the set-point temperature with buttons  or .

In order to accept the new value, the button  should be pressed down.

The display shows current temperature of the sensor now.

Linear area width ΔT programming

Press and hold the button  for about 3 seconds.

When the dot lights up in the display (see Fig. 1), the controller enters into programming linear area mode. Now the display shows the value of linear area width that is expressed as percentage of the set-point temperature range. The user can change the linear area with buttons  or .

In order to accept the new value, the button  has to be pressed down.

The display shows current temperature of the sensor now.

Relay switching period programming

Press and hold the button  for about 8 seconds.


When the LED OUT lights up, the instrument enters into programming mode of switching period.


Now the display shows the value of the switching period in seconds.


The user can change the value of the parameter with buttons  or .

Then the button  should be pressed down.

Messages

 this message appears when the power supply is connected; it indicates that microprocessor loads parameters from non-volatile memory; the message disappears in 10 seconds and the controller starts displaying actual temperature of the sensor (T_c).

 this message indicates damage of the sensor or temperature of the sensor is out of range

 this message appears when the ambient temperature is too high; in this case the parameters of the controller cannot be saved in non-volatile memory; when this message appears, the controller should be immediately disconnected from the power supply

Mounting procedure

The controller should be mounted in a panel using an attached mounting bracket.

Fig. 1 shows connection diagram. It is recommended to use shielded cable to connect the input sensor. For thermocouple sensor proper compensating cable (preferable shielded) has to be used. If a shielded cable is used, the shield should be connected at one point only. Don't run input wires together with power cables. The output relay and the power supply should be connected using copper cables.

Contents of package

The package consists of the temperature controller with mounting bracket, this user's manual, and in the case of controller working with platinum sensor Pt100, a testing resistor.

Cautions

Never exceed the current and voltage limits for the output relay (5A, 250 VAC).
The power supply circuit should contain quick-acting fuse 1 .. 10A (Fig. 1).
Never exceed the ambient temperature of the unit.

Maintenance

The controller doesn't require any maintenance.
In the case of failure please contact Commercial Department of CZAKI THERMO-PRODUCT.

Default settings

Set-point temperature: 100 °C, linear area: 1%, switching period: 10 seconds.

Testing

In the case of controller working with platinum sensor Pt100: instead of the sensor connect the testing resistor. The controller should display the temperature corresponding to its resistance.

In the case of controller working with thermocouple: short the terminals of the input sensor. The controller should display the ambient temperature.

R-201

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|-------------------------|--------------------------|
| <i>Serial Number:</i> | <i>Quality Check</i> |
| <i>Date of Purchase</i> | <i>Place of Purchase</i> |