

Resistance-to-temperature converter Pt50

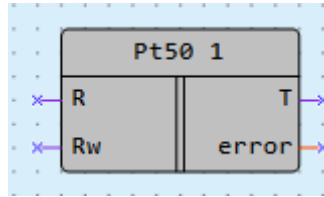


Figure 1 – Symbol

Inputs	Data type	Description	Range
R, Ohms	Float	Resistance value	9.26-195.24
Wires, Ohms	Float	Resistance value of connecting wires	*
Outputs	Data type	Description	Range
t, °C	float	Conversion Result	-200.0-850.0
error	int	Conversion Error: 0 – normal 1 – input impedance below range 2 – input impedance above range	0-2

Description of how the macro works

Resistance at the input R is converted to temperature and the calculated value is set to the output T. The calculation is carried out in accordance with IEC 60751:2008 [Pt50, W100=1.385 ($\alpha=0,00385$)].

Set the wire resistance value to the input Rw to compensate a measurement error caused by transmit-ter wires.

The macro is an interpolation equation for the platinum resistance thermometer with temperature coefficient $\alpha = 0,00385 \text{ }^{\circ}\text{C}^{-1}$.

In the temperature range from -200 ° C to 0 ° C, the function is almost inverse, so the temperature can be calculated using the resistance of the resistance thermometer:

$$t = \sum_{i=1}^4 D_i \left(\frac{R_t}{R_0} - 1 \right)^i$$

where t – Temperature at the T macro output, ° C

R_t – Resistance at the R macro input, ohm

R_0 – Nominal resistance at temperature 0 °C, ohm

D_i – constant coefficients:

$D_1 = 255,819 \text{ }^{\circ}\text{C}$

Programming environment akYtec ALP

$$D2 = 9,14550 \text{ }^{\circ}\text{C}$$

$$D3 = - 2,92363 \text{ }^{\circ}\text{C}$$

$$D4 = 1,79090 \text{ }^{\circ}\text{C}$$

In the temperature range from 0°C to 850°C, the reverse function for NSX is defined as follows:

$$t = \frac{\sqrt{A^2 - 4B(1 - \frac{R_t}{R_0})} - A}{2B}$$

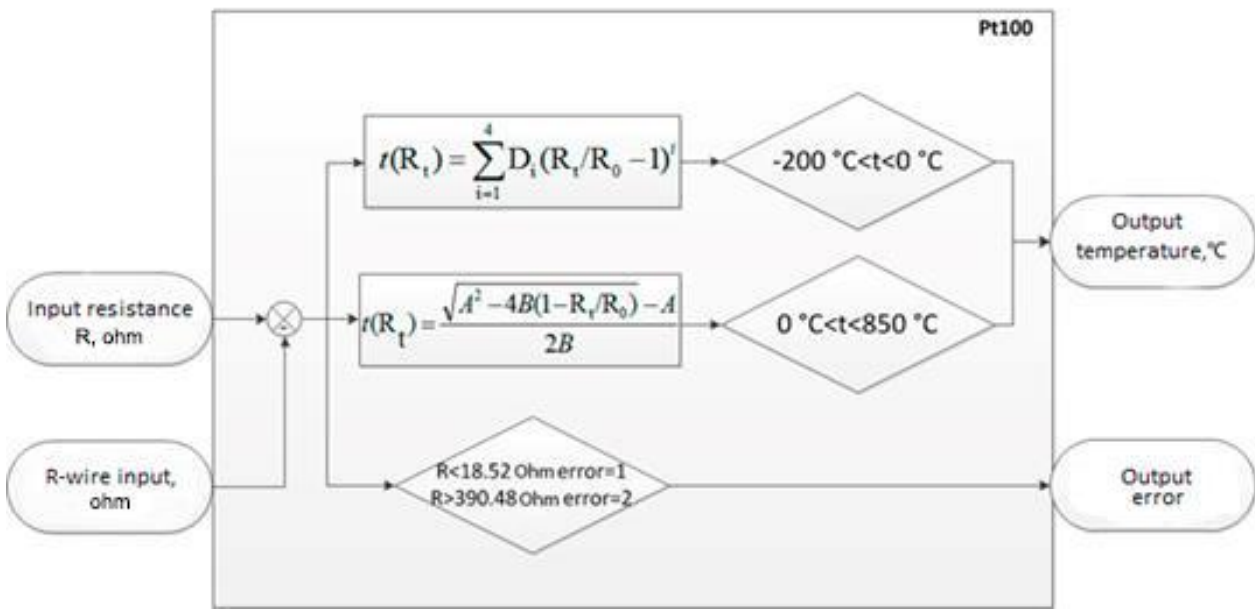
where t - Temperature at macro output, °C

R_t – Resistance at macro input, ohm

R₀ – Nominal resistance at temperature 0 °C, ohm

$$A = 3,9083 \cdot 10^{-3} \text{ }^{\circ}\text{C}^{-1}$$

$$B = -5,775 \cdot 10^{-7} \text{ }^{\circ}\text{C}^{-1}$$



Structure (function) diagram of the macro

Version	1.0
Last modification	22.04.2024.