Converts resistance to temperature , Cu50

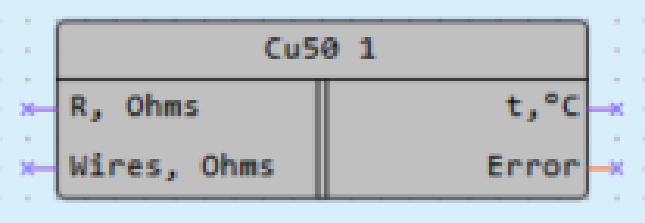

Figure 1 – Symbol

Inputs	Data type	Description	Range
R, Ohms	Float	Resistance value	39.35-92.6
Wires, Ohms	Float	Resistance value of connecting wires	*
Outputs	**Data type**	**Description**	**Range**
t, °C	float	Conversion Result	-50.0-200.0
error	int	Conversion Error: 0 – normal 1 – input impedance below range 2 – input impedance above range	0-2

*- measured when connected

Description of how the macro works

The macro allows you to:

1. When applying a variable containing a resistance value in ohms to the input, obtain the temperature value in °C at the output, in accordance with the table NSKH TSM Cu50, for W100=1.426 (α=0.00426) according to GOST 6651-2009.

2. With a significant length of connecting wires, when their resistance can introduce an error into the measurement result, it is possible to compensate for this resistance by supplying its value to the input of the R wire.

Structure of macro

The macro is an interpolation equation for a copper RTD with a temperature coefficient of resistance α = 0.00426 $°C^{-1}$. The block diagram of the macro is shown in Fig. 2

In the temperature range from -50 °C to 200 °C, the approximate inverse function, which allows calculating the temperature from the resistance of the vehicle, is as follows:

$$t = \frac{R_t/R_0 - 1}{A}.$$

Where

t – temperature at the macro outlet, °C;

Rt – resistance at the macro input, Ohm;

R0 – nominal resistance at 0 °C, Ohm;

A = $4.26 \cdot 10^{-3}$ $°C^{-1}$.

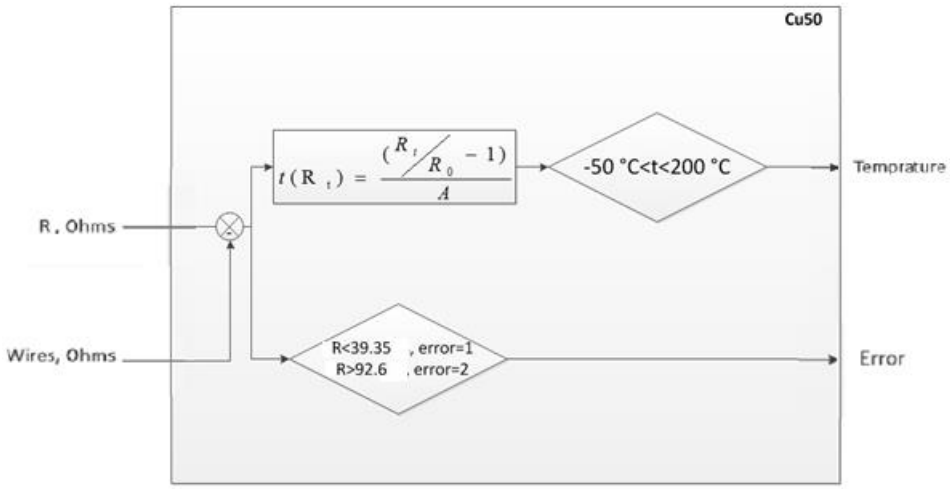

Figure 2.

Example of work

A resistance value of 76.3 Ohms is supplied to the macro input, the measured resistance of the wires connecting the thermal resistance to the analog input turned out to be equal to 5 Ohm, this value must be supplied to the input of the R wire. The macro compensates for the cable resistance and at the output we obtain a temperature value of 100 °C, which corresponds to a resistance value of 71.3 Ohms.

If the value of the input resistance supplied to the input of the macro goes beyond the resistance range of the corresponding vehicle characteristic, the macro will generate an error. If error=1, then the resistance is below the range (for example, the sensor has broken). If error=2, then the resistance is above the range (for example, the contact at the junction of the sensor leads has deteriorated). If the error value is error>0, the temperature output stores the last calculated value from the range.

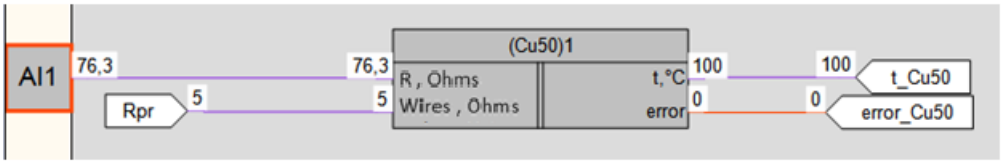

Figure 3. Example of work

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