

## Resistance thermometers

### *Operating instruction*

#### 1. Application

Resistance thermometers can preferentially be used in industrial rooms, devices and plants with temperatures up to 600°C depending on the type.

These are passive components and they therefore always need a junction for auxiliary power (electrical low voltage). Beyond you need a device for the measurement and the evaluation of the measured values. The temperature dependence of the material platinum forms the basis for the temperature measurement. The resistance value indicates the temperature and their change. The dependence between resistance and temperature is fixed in the standard DIN EN 60751.

Same applies to the permissible measured value deviation (errors) and the working temperature

#### 2. Assembly and disassembly

Resistance thermometers can be used with different means of fastening to connect it with the object, which is to be measured (devices, plants, pipings and others). The following table gives some indications.

#### Types of resistance thermometers – fastening and transmission of measured values

type	description and fastening	transmission of measured values
308	room resistance thermometer for dry air, fastening with screws	external cable, connectable inside the housing
320	resistance thermometer for penetration into hay- and strawstacks	external cable, connectable inside the connecting head
325	cable resistance thermometer for screwing-in with additional protective tube and adjustable thread joint	external cable, connectable inside the connecting head
340	universal resistance thermometer without means of fastening, adjustable thread joint or flange can be added extra	external cable, connectable inside the connecting head
342	combination of resistance and glass thermometer for screwing-in	external cable, connectable inside the connecting head
348	resistance thermometers for screwing-in with mounting boss or cap nut	external cable, connectable inside the connecting head
350	room resistance thermometer for all rooms, fastening with screws	external cable, connectable inside the plastic housing
351	room resistance thermometer for all rooms, fastening with screws	external cable, connectable inside the aluminium housing
354	screwing-in resistance thermometer with fixed thread	external cable, connectable inside the connecting head
357	Resistance thermometer with high pressure protective tube for welding in	external cable, connectable inside the connecting head
358	cable resistance thermometer with additional protective tube for welding in	fixed cable
359	cable resistance thermometer with thread	fixed cable

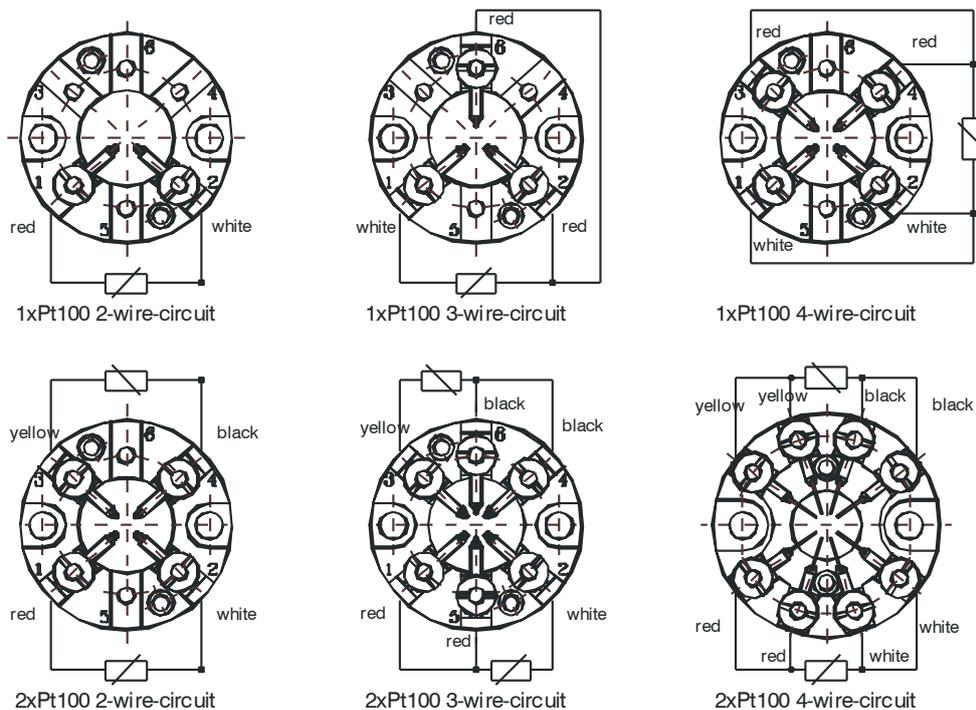
type	description and fastening	transmission of measured values
360	resistance thermometer measuring insert, protective tube and connecting head can be added extra	external cable, connectable on the ceramical base
361	resistance thermometer measuring insert with connecting head, protective tube and clamp thread joint can be added extra	external cable, connectable inside the connecting head
370	resistance thermometer measuring insert in sheathed design, protective tube and connection head can be added extra	external cable, connectable on the ceramical base
371	average thermometer	external cable, connectable inside the connecting head
372	screwing-in resistance thermometer without neck tube	external cable, connectable inside the connecting head
373	screwing-in resistance thermometer without neck tube with connection head form F	external cable, connectable inside the connecting head
374	resistance thermometer with flange, flange size after your order	external cable, connectable inside the connecting head
380	small resistance thermometer for screwing-in	external cable, connectable inside the housing
388	resistance thermometer in sheathed design with free ends	external cable, connectable on the free ends
394	resistance thermometer in sheathed design with sleeve and cable	fixed cable
405	small resistance thermometer for screwing-in with connector	external cable, connectable at the connector
406	small resistance thermometer for screwing-in with connector and integrated transmitter	external cable, connectable at the connector, output signal 4-20 mA
407	small resistance thermometer for screwing-in with connector and integrated switch transmitter, (switching temperature after your order)	external cable, connectable at the connector
408	small resistance thermometer for screwing-in with connector and integrated transmitter	external cable, connectable at the connector, output signal 0-10 V
409	small resistance thermometer for screwing-in with M12-plug and integrated transmitter	external cable, connectable at the plug, output signal 4-20 mA
412	small resistance thermometer for screwing-in with M12-plug	external cable, connectable at the plug
416	spring mounted resistance thermometer for surface measurements with magnet, plain surface	external cable, connectable inside the housing
417	spring mounted resistance thermometer for surface measurements with magnet, curved surface	external cable, connectable inside the housing
418	spring mounted resistance thermometer for surface measurements with magnet, closed aluminium housing	external cable, connectable inside the housing
443	room resistance thermometer for dry air with transmitter, output signal 4-20 mA	external cable, connectable inside the housing
444	room resistance thermometer for dry air with transmitter, output signal 0-10 V	external cable, connectable inside the housing

type	description and fastening	transmission of measured values
K1W	cable sensor without means of fastening, clamp thread joint or spiral spring can be added extra	fixed cable
K4W	cable sensor for screwing-in, spiral spring can be added extra	fixed cable
K5W	cable sensor with fixed thread, spiral spring can be added extra	fixed cable
K6W	cable sensor with adjustable thread joint, spiral spring can be added extra	fixed cable
K7W	angle cable sensor with adjustable thread joint, spiral spring can be added extra	fixed cable
K8W	cable sensor with cap nut, spiral spring can be added extra	fixed cable
K9W	cable sensor with bayonet cap	fixed cable
K10W	cable sensor with square protective tube for fastening on surfaces, spiral spring can be added extra	fixed cable
K11W	cable sensor with clamping band for fastening on surfaces, spiral spring can be added extra	fixed cable
K12W	cable sensor with handle for penetration, spiral spring can be added extra	fixed cable
K13W	cable sensor in moulded housing	fixed cable

**ATTENTION**

Before you can start the assembly or disassembly you must discharge the positive pressure of concerned machines or plants.

Connection diagram for resistance thermometers with ceramic base for connection head  
(schematic diagramm of platinum resistors)



Colour coding for cable sensors (depends on type of cable e.g. Teflon-Silicone)

1xPt100 2-wire-circuit	red/white
1xPt100 3- wire-circuit	red+ red/white
1xPt100 4- wire-circuit	red+ red/white +white
2xPt100 2- wire-circuit	1 red/white and 2 red/white

### 3. Start-up

The resistance thermometer is able to work after making the connection to the process by screwing in, welding in and others in dependence of the type, and the connection between the terminals clamps and the contacts of the evaluation device by suitable measurement wires. In order to ensure the degree of protection it is necessary to close the cover of the connection head, connector or housing carefully.

The electrical parameters of the evaluation device must agree with those of the resistance thermometer. In detail are these:

- type and number of sensor elements
- Nominal ( $R_0$ ) and temperature coefficient value
- internal circuit with 2-, 3- or 4 wires

### 4. Maintenance and repair

Resistance thermometers work maintenance-free. On disturbances of the interior structure the measurement insert is to send back to the manufacturer for repairing. If disturbances are to be due to the corrosive wear of the protection tube, the whole resistance thermometer has to be changed.

Concerned plant components are to be made positive pressure-free.

### 5. Electrical characteristics

In order to avoid self-heating and associated faulty measurements it is advisable to operate resistance thermometers with small root-mean-square current  $\odot$  3 mA. In the case of using larger measurement current arise no safety-relevant risks for the plant by the self-heating. But they affect in dependence to the heat transient conditions from the protective tube to the measurement medium the correctness of the result of measurement. If higher measurement currents are absolutely necessary they should be used pulse-operated to the sinking of the self-heating. The effects of self-heating lie in the range of  $1/10^\circ\text{C}$  and are strongly dependent on the thermal coupling factor to the object, which is measured. That means, during the measurement for instance in a flowing liquid such as water it does not come to faulty measurements since the developing heat is better removed than for example in standing air.

The safety-relevant limit values are:

$$\begin{aligned} U_i &= 15 \text{ V} \\ I_i &= 50 \text{ mA} \\ P_i &= 200 \text{ mW} \end{aligned}$$

### 6. Employment pressures and surface temperatures

All thermocouples with connection head and without special references can stand an operating pressure til 16 bar. Higher pressures must be agreed with the manufacturer. Pressure load on cable sensors must be agreed with the manufacturer too.

Increased surfaced temperatures cannot be caused by the temperature probes in normal operations and in damage occurrence.

### 7. Transport

Resistance thermometers contain ceramical components. Therefore they must be treated carefully on transport and installation. For further informationen please use data sheets of special types.