

Resistance thermometers

Operating instructions

1. Applications

Resistance thermometers of the types mentioned below are temperature measurement instruments which are primarily used in the industrial sector in equipment and plant. The working temperatures can be up to 600 °C depending on the design.

Resistance thermometers are passive components and therefore always require an auxiliary power supply (low voltage). A device for displaying, evaluating and processing measurement values is also always required. This sensitive element uses the temperature response properties of platinum. The changing electrical resistance value serves as a gauge of the temperature. The relationship between resistance and temperature is defined in standard DIN EN 60751. The same applies to the permissible measurement value deviations (errors).

2. Assembly and disassembly

Resistance thermometers can be connected to the measurement object in a variety of ways (equipment, plant, pipes, operating rooms, vehicles, etc.).

Types of resistance thermometers and process connections/attachment hardware

	Meas. value transmission
Room-resistance thermometer, mounted e.g. using screws in dry rooms	External line which can be attached in terminal box
Prick resistance thermometer for bulk goods	External line which can be attached in connection head
Marine cable resistance thermometer for screwing with clamp fitting or additional protective tubes	External line which can be attached in connection head
Universal resistance thermometer without attachment hardware. Clamp fitting or flange possible	External line which can be attached in connection head
Combined sensor resistance thermometer with fixed contact thermometer, without attachment hardware. Use of clamp fitting or flange possible	External line which can be attached in connection head
Screw-in resistance thermometer	External line which can be attached in connection head
Room-resistance thermometer for all rooms	External line which can be attached in plastic terminal box
Room-resistance thermometer for all rooms	External line which can be attached in aluminium terminal box
Screw-in resistance thermometer with fixed thread	External line which can be attached in connection head
With high-pressure protective tube for welding	External line which can be attached in connection head

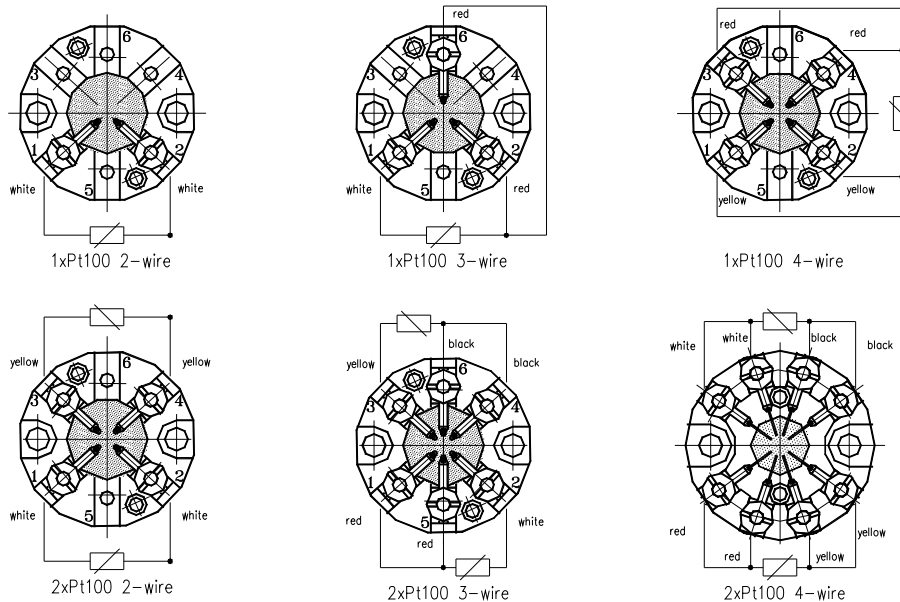
Attachment hardware	Meas. value transmission
Marine cable resistance thermometer with additional protective tube for welding	Fixed line (cable) which can be attached in external terminal box
Marine cable resistance thermometer with thread	Fixed line (cable) which can be attached in external terminal box
Resistance measuring insert, can be supplemented by protective tube and connection heads	External line which can be attached to the terminal block
Simple resistance thermometer, can be supplemented by protective tube or adjustable thread joint	External line which can be attached in head
Screw-in resistance thermometer without neck tube	External line which can be attached in connection head
Screw-in resistance thermometer without neck tube, with connection head (shape F)	External line which can be attached in connection head
Flange resistance thermometer, flange size as desired	External line which can be attached in connection head
Small screw-in resistance thermometer	External line which can be attached in housing
Resistance thermometer for the food industry	External line which can be attached in connection head
Small screw-in resistance thermometer with connector	External line which can be attached in connector
Small screw-in resistance thermometer with connector and built-in transmitter	External line which can be attached in connector, output 4-20 mA
Small screw-in resistance thermometer with connector and built-in switch transmitter	External line which can be attached in connector, switch contact operates at temperature specified at time of order
Small screw-in resistance thermometer with connector and built-in transmitter	External line which can be attached in connector, output 0-10 V
Room-resistance thermometer for dry rooms with transmitter (output 4-20 mA)	External line which can be attached in housing
Room-resistance thermometer for dry rooms with transmitter (output 0-10 V)	External line which can be attached in housing

Attachment hardware	Meas. value transmission
Cable sensor without attachment hardware, can be supplemented by adjustable thread joint	Fixed line (cable) which can be attached in switching cabinet
Cable sensor with anti-kink spring without attachment hardware, can be supplemented by adjustable thread joint	Fixed line (cable) which can be attached in switching cabinet
Cable sensor with cable connecting sleeve	Fixed line (cable) which can be attached in switching cabinet
Cable sensor for screwing in	Fixed line (cable) which can be attached in switching cabinet
Cable sensor with fixed thread	Fixed line (cable) which, for example, can be attached in switching cabinet
Cable sensor with adjustable thread joint	Fixed line (cable) which, for example, can be attached in switching cabinet
Angle cable sensor with adjustable thread joint	Fixed line (cable) which, for example, can be attached in switching cabinet
Cable sensor with union nut	Fixed line (cable) which, for example, can be attached in switching cabinet
Cable sensor with bayonet cap	Fixed line (cable) which, for example, can be attached in switching cabinet
Cable sensor with protective case with square cross section for surface attachment	Fixed line (cable) which, for example, can be attached in switching cabinet
Cable sensor with guy-tape attachment for surface measurement	Fixed line (cable) which, for example, can be attached in switching cabinet
Cable sensor with grip for piercing	Fixed line (cable) which, for example, can be attached in switching cabinet

IMPORTANT

When disassembling resistance thermometers which come into contact with high media pressures when installed, the relevant parts of the system must be depressurised.

Connection diagram for resistance thermometers



Display with schematic block for head sensor
 Colour display for cable sensors
 Schematic display of resistances applies to Pt sensor element

3. Putting into operation

After establishing the process connection and connecting the terminals in the connector or connecting the wires of the connecting cable with the contact points of a measurement value processing instrument using suitable measurement lines, the resistance thermometer is ready for use. To achieve the required level of protection, it must be ensured that connectors, connection heads and switching cabinets are carefully closed.

Configurations whose electrical connection parameters correspond to those of the resistance thermometer must be used to connect the measurement value evaluation unit with the resistance thermometer. To be precise, this relates to the following:

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

4. Maintenance and resolving faults

Resistance thermometers do not require servicing. In the case of a defect with the measuring insert, it must be returned to the manufacturer to remedy the fault.

If any faults are a result of corrosive wear to the protective fittings, the entire resistance thermometer must be replaced. To do this, it must be ensured that there is no excess pressure in the relevant parts of the system.

5. Electrical parameters

To prevent self-heating and resultant measurement errors, resistance thermometers should be operated with very low rms currents $\leq 3\text{mA}$. If, nevertheless, higher measurement currents are used, no overheating which affects the safety of the system will occur. However, depending on the heat transfer conditions between the protective tube and measuring medium, they affect the accuracy of the measurement result.

If higher measurement currents are essential, pulsating operation should be used to reduce the extent of self-heating. The effects of self-heating are in the range of $1/10\text{ }^{\circ}\text{C}$ and are also strongly determined by the extent to which heat is transferred to the measurement object, i.e. false measurements do not occur when performing measurement in a flowing liquid such as water.

The safety thresholds are as follows:

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

6. Operating pressures and surface temperatures

All temperature sensors with a connection head are designed for operating pressures up to 16 bar without the need for any special instructions. Higher pressure levels must be discussed with the manufacturer. In the case of cable sensors, pressure loads must be discussed with the manufacturer.

Elevated surface temperatures cannot be caused by temperature sensors during either operation or breakdown.

7. Transport

Resistance thermometers contain ceramic components. For this reason, they must be handled with care during transport and installation.

Further information can be found in the product information sheets.