R 58®

Postal address: RECKMANN GMBH · PO Box 60 01 64 · 58137 Hagen (Germany)
Telephone: (02331) 3501-0 / Fax:-70 / E-mail: info@reckmann.de / service@reckmann.de

Installation and operating instructions for resistance thermometers

1. General notes concerning operation

1.1 Design

Our R15 series resistance thermometers (WTH) are designed for use in low and medium temperature ranges. According to customer requirements and the materials used, the designs are built in accordance with or similar to DIN 43735 and DIN EN 60751 for a measuring range between -50°C and 600°C, in a special design as well between -196 °C and 850 °C. Please always pay attention to the operating temperature on the rating plate. As standard, our resistance thermometers are equipped with 1 or 2 sensors (PT100).

1.2 Important factors to note

Resistance thermometers should only be installed by trained and authorized staff. Operational safety essentially depends on proper installation and use. Resistance thermometers are specially designed for measuring temperatures and only work in connection with specially adapted evaluation units such as regulators, graphical recorders, measurement transducers etc.. Resistance thermometers are so-called touching sensors. The necessary conduction of the medium / temperature to be measured to the sensor takes place via a touching contact to the medium. Before starting any work, staff need to have carefully read and understood these instructions. A basic requirement for safe working practice is to make sure you have received all the safety notes and operating instructions as stated in these instructions. In addition the relevant local accident prevention rules apply as well as the general safety provisions outlining where the equipment can be used.

1.3 Limitation of liability

All information and notes in these instructions have been put together taking into account the applicable standards and rules, the state of technical progress as well the findings and experience we have gathered over time. The manufacturer does not assume any liability for damage due to

- non-compliance with these instructions
- usage other than that specified
- usage by staff who have not been trained
- unauthorised modifications
- technical changes
- the use of non-approved spare parts

The actual scope of delivery can differ from the explanations and representations described here in the case of special designs, where the customer has made use of additional ordering options (customized orders) in the case of the latest technical developments (technical changes). The obligations agreed in the supply contract, the general terms and conditions, the manufacturer’s delivery conditions and the applicable statutory rules and regulations which apply when the contract is concluded all apply.

1.4 Copyright protection

1.5 Customer service

Our customer support team is available to provide technical information. For contact details, please refer to page 1. In addition, our staff are always interested in finding out new information and user experiences which arise from use of the equipment and which could be of use in improving our products.

2. Installation and operation

2.1 Carrying out tests before installation

Users need to make sure that our R15 series resistance thermometers are checked for mechanical damage and/or transport damage, i.e.:

- No damage to the outer sheath of the resistance thermometer, the protective armature or the connecting conductors
- That the minimum bending radii (for this, see chapter 2.2) have been adhered to.

2.2 Installing the resistance thermometers

The processing connection of the resistance thermometer must correspond with the processing connection of the system.
When installing the resistance thermometer (mostly in the case of designs without a protective armature) with a clamp connection, the terminal nut is tightened manually until the arrester is clearly felt and then, using a spanner which fits the width across the flat, fully tightened by ¼ of a turn in the case of PTFE female support rings and 1 ¾ turns in the case of a (VA) stainless steel tapered ring.
In order to avoid cracks and/or joining / changes in the outer sheath or sensor, rapid temperature change at > 250°C should be avoided among resistance thermometers.
In the case of resistance thermometers with mineral insulated sheath conductors, we use sheath materials which correspond to the technical standard DIN EN 61515. These sheath conductors can be curved without damaging the technical characteristics, wherein the bending radius has to be larger than 5 times the outer diameter of the sheath conductor. In the case of small outer diameters, the inner wires are very thin and as such, result in a high loop resistance (falsification of the measurement value as a result of additional resistance to the PT100 sensor). In such cases, particular care must be taken to ensure that the PT100 sensor is operated in at least in a three wire circuit and preferably in a four wire circuit. The same naturally applies in the case of the use of Cu connection conductors.
The exchangeability of resistance thermometers is assured in the case of standardised sensors.
In order to keep measurement errors through thermal conduction as small as possible, the tip of the resistance thermometer should be dipped as deep as possible in the medium to be measured.
The recommended minimum insertion depth for resistance thermometer is 6 - 8 x the diameter of the protective tube in fluids and 10 - 15 x the diameter of the protective tube in air/gases.
If an insufficient insertion depth is provided in vertically fitted, small diameter pipelines, the resistance thermometers should be installed at an angle or in a pipe elbow (in each case against the direction of flow).

2.3 Electrical connection

Contact between the resistance thermometer and the evaluation units should only take place with a appropriately shielded Cu data line in accordance with DIN EN 50525 or similar.

The following points should be considered when selecting and laying the contact conduct:

- The insulation materials used must be resistant to the thermal, mechanical and chemical stresses which arise at the place of use.
- All conductors on the contact points must: feature bare metal, be free from corrosion, moisture, dirt and be capable of forming perfectly connected electrical contacts.
- In order to avoid electromagnetic disturbance, all lines should be 0.5 m away and / or run at right angles to the energy conducts. Likewise, electromagnetic disturbance can be avoided through the use of conducts with a static shield and twin stranded wires.
- According to the current ATEX guidelines, measurement conductors and conductors carrying voltage have to be laid in a way which spatially separates them (separate cable channels) of when connecting Ex - approved temperature sensors (for further information, see our special operating instructions for explosion protected temperature sensors).
- The risk of ‘spurious thermal voltage’ through the formation of interim elements can be avoided by keeping the temperature of the contact points stable (normal terminals, no thermal material).

2.4 Temperature measuring transducer in the connection head

By using an electronic temperature measuring transducer in the connection head (according to the actual design) of the resistance temperature it is possible to reduce the effort needed to perform the electrical installation (only two inner conductors are needed in the case of long conductor paths, 4 - 20 mA Signal is less sensitive to electromagnetic disturbances).
The electrical connection of the measuring transducer must take place in accordance with the enclosed operating instructions published by the measuring transducer manufacturer.
With the installation of a head measuring transducer, users must make sure that the temperature of the connection head does not exceed the max. operating temperature of the measuring transducer.

3. Maintenance and testing of the resistance thermometer

3.1 Maintenance recommendations

Users should test the resistance thermometer and the measurement circuit at regular intervals (depending on the respective usage conditions):

- Visual check of the protective tube or the resistance thermometer sheath for mechanical wear and tear / damage caused by chemicals
- A test should be carried out to check temperature drift by making a comparison with a calibrated comparable element (connection base with a ‘verifier’ is required)
- A check should be made with regard to soiling/moisture by taking an insulation measurement
- A check should be made for mechanical and chemical changes to the electrical installation and its contact elements (terminal base, connection terminals, transition sleeve)

3.2 Initial error analysis

In order to test the function of a resistance thermometer temperature measurement circuit, you require a meter with an Ohm measurement range, an insulation meter with a testing voltage of 60 - 100 V DC and a calibrator for PT resistance values which corresponds to DIN EN 60751.

A resistance thermometer is OK if, at room temperature:

- When heating the measuring tip (by means of a lighter, Bunsen burner or similar) of the resistance thermometer, the mV – voltage rises slowly corresponding to the PT100 sensor resistance table (simple functional test for resistance thermometers).
  For each of the following ohm values, the standardised resistance (in accordance with DIN EN 60751) at 20 °C is:
  107.79 Ohm in the case of 20 °C, 111.67 Ohm in the case of 30 °C, 115.54 Ohm in the case of 40 °C, 119.40 Ohm in the case of 50 °C, 123.24 Ohm in the case of 60 °C, 127.08 Ohm in the case of 70 °C, 130.90 Ohm in the case of 80 °C, 134.71 Ohm in the case 90 °C and 138.51 Ohm in the case of 100 °C.
- The insulation resistance is $R_{Iso} \geq 100$ MΩ x m.

By connecting a calibrator instead of the resistance thermometer it is easy to check the connected measuring circuit for its function and/or disconnection.

4. Examples of designs and fixing arrangements