

Resistance Thermometers Model TR10-E, for Additional Thermowell

WIKA Data Sheet TE 60.05



Applications

- Chemical industry
- Petrochemical industry
- Off-Shore
- Machine building, plant and tank construction
- Energy and power plant technology

Special Features

- Application ranges from -200 °C to +600 °C
- For many variants of temperature transmitters including display
- For installation in all standard thermowell designs
- Spring-loaded measuring insert (not replaceable)
- Explosion-protected versions Ex-i, Ex-n and NAMUR NE24

Description

Resistance thermometers in this series can be combined with a large number of thermowell designs. Operation without thermowell is only recommended for specific applications.

An extensive range of sensor, connection head, insertion length, neck length, connection to the thermowell etc. are available for these thermometers, so that they are suitable for all thermowell dimensions and applications.



Resistance Thermometer, Model TR10-E, for Additional Thermowell

Sensor

The sensor is located in the tip of the measuring insert, which is spring-loaded.

Sensor method of connection

- 2-wire The lead resistance of the measuring insert compounds the error.
- 3-wire With a cable length of approx. 30 m or longer measuring deviations can occur.
- 4-wire The inner lead resistance of the connecting wires is negligible.

Sensor limiting error

- Class B per DIN EN 60 751
- Class A per DIN EN 60 751 (-50 °C ... +450 °C)
- 1/3 DIN B at 0 °C

It makes no sense to combine 2-wire connection with Class A or 2-wire connection with 1/3 DIN B, because the lead resistance of the measuring insert, over-rides the higher sensor accuracy.

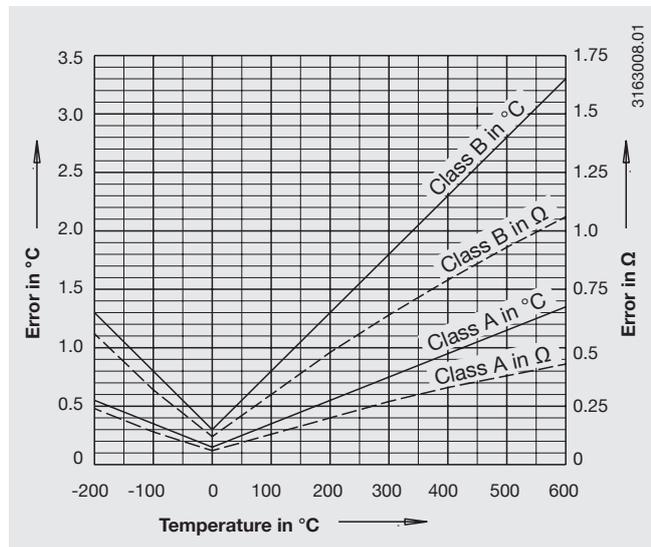
Basic values and limiting errors

Basic values and limiting errors for the platinum measuring resistors are laid down in DIN EN 60 751. The nominal value of Pt100 sensors is 100 Ω at 0 °C. The temperature coefficient α can be stated simply to be between 0 °C and 100 °C with:

$$\alpha = 3.85 \cdot 10^{-3} \text{ } ^\circ\text{C}^{-1}$$

The relationship between the temperature and the electrical resistance is described by polynomes which are defined in DIN EN 60 751. Furthermore, this standard lays down the basic values in °C stages.

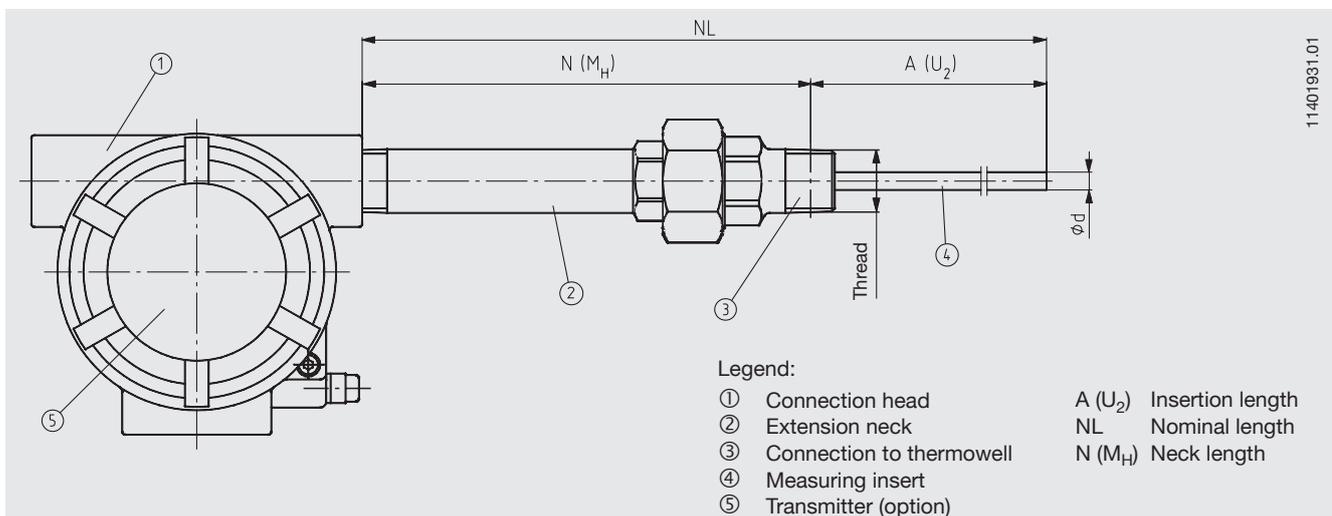
| Temperature (ITS 90) °C | Basic value Ω | Limiting error DIN EN 60 751 | | | |
|-------------------------|---------------|------------------------------|--------|---------|--------|
| | | Class A | | Class B | |
| °C | Ω | °C | Ω | °C | Ω |
| -200 | 18.52 | ± 0.55 | ± 0.24 | ± 1.30 | ± 0.56 |
| -100 | 60.26 | ± 0.35 | ± 0.14 | ± 0.80 | ± 0.32 |
| -50 | 80.31 | ± 0.25 | ± 0.10 | ± 0.55 | ± 0.22 |
| 0 | 100.00 | ± 0.15 | ± 0.06 | ± 0.30 | ± 0.12 |
| 50 | 119.40 | ± 0.25 | ± 0.10 | ± 0.55 | ± 0.21 |
| 100 | 138.51 | ± 0.35 | ± 0.13 | ± 0.80 | ± 0.30 |
| 200 | 175.86 | ± 0.55 | ± 0.20 | ± 1.30 | ± 0.48 |
| 300 | 212.05 | ± 0.75 | ± 0.27 | ± 1.80 | ± 0.64 |
| 400 | 247.09 | ± 0.95 | ± 0.33 | ± 2.30 | ± 0.79 |
| 500 | 280.98 | ± 1.15 | ± 0.38 | ± 2.80 | ± 0.93 |
| 600 | 313.71 | ± 1.35 | ± 0.43 | ± 3.30 | ± 1.06 |



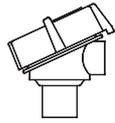
| Class | Limiting error in °C |
|-------|--|
| A | $0.15 + 0.002 \cdot t $ ¹⁾ |
| B | $0.3 + 0.005 \cdot t $ |

1) |t| is the value of the temperature in °C without consideration of the sign

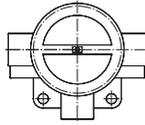
TR10-E components



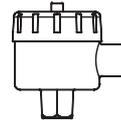
Connection head



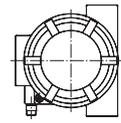
1000/4000



5000/6000



7000/8000



a. A.

| Model | Material | Cable entry | Ingress protection | Cap | Surface finish |
|-----------|-----------------|---------------------------|--------------------|-------------|-----------------------------|
| 1000/4000 | Aluminium | ½ NPT, ¾ NPT or M20 x 1.5 | IP 65 | Screw cover | blue, painted ¹⁾ |
| | Stainless steel | ½ NPT, ¾ NPT or M20 x 1.5 | IP 65 | Screw cover | blank |
| 5000/6000 | Aluminium | ½ NPT, ¾ NPT or M20 x 1.5 | IP 65 | Screw cover | blue, painted ¹⁾ |
| 7000/8000 | Aluminium | ½ NPT, ¾ NPT or M20 x 1.5 | IP 65 | Screw cover | blue, painted ¹⁾ |
| | Stainless steel | ½ NPT, ¾ NPT or M20 x 1.5 | IP 65 | Screw cover | blank |

1) RAL5022, polyester paint saltwater-proof

Measuring insert

The measuring insert is made of a vibration-resistant sheathed measuring cable (MI cable). The diameter of the measuring insert shall be approx. 1 mm smaller than the hole diameter of the thermowell.

Gaps of more than 0.5 mm between thermowell and measuring insert will have a negative effect on the heat transfer, and they will result in an unfavourable response behaviour of the thermometer.

When fitting the measuring insert with a thermowell, it is very important to determine the correct insertion length (= thermowell length with bottom thicknesses of ≤ 5.5 mm). In this connection the fact that the measuring insert is spring-loaded (spring travel: max. 19 mm) has to be taken into account in order to ensure that the measuring insert presses against the bottom of the thermowell.

Extension neck

The extension neck is screwed to the connection head or to the case.

Connection to head: ½ NPT, M20 x 1.5 or M24 x 1.5

The length of the extension neck depends on the application. The extension neck generally serves for bridging insulation. In many applications it is also used as a part cooling element between connection head and medium in order to protect any head mount transmitters from high medium temperatures.

Standard material of the extension neck is stainless steel.

Transmitter (option)

As an option, analogue or digital transmitters of the WIKA programme can be installed in the TR10-E connection head.

A certification adaptation of the installed transmitter to the explosion protection of the sensor is necessary.

| Model | Description | Explosion protection | Data sheet |
|-------|---|----------------------|------------|
| T19 | Analogue transmitter, configurable | without | TE 19.03 |
| T24 | Analogue transmitter, PC-configurable | optional | TE 24.01 |
| T12 | Digital transmitter, PC-configurable | optional | TE 12.03 |
| T32 | Digital transmitter, HART protocol | optional | TE 32.03 |
| T53 | Digital transmitter FOUNDATION Fieldbus and PROFIBUS PA | standard | TE 53.01 |

Further transmitters on request.

Explosion protection

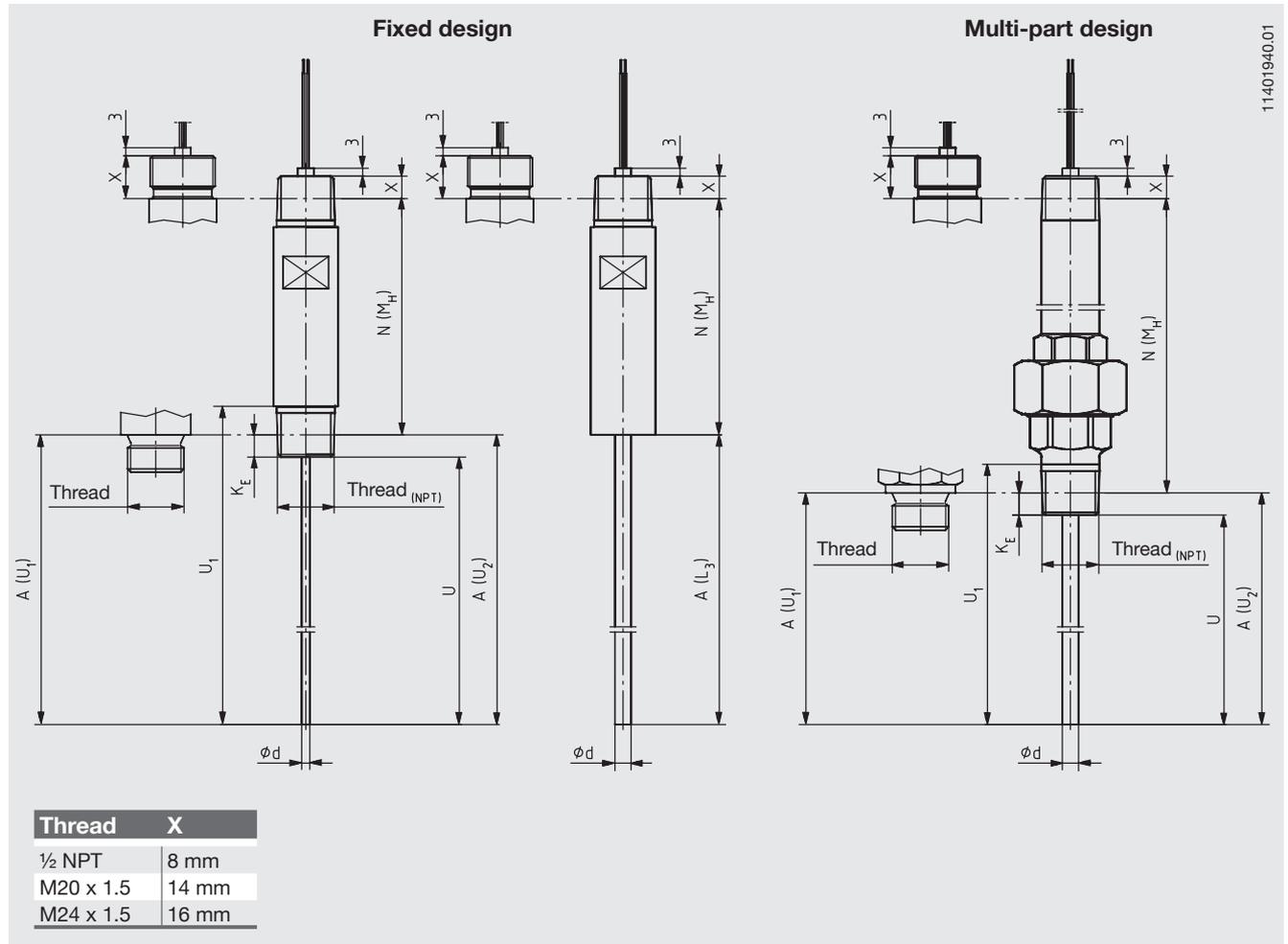
Resistance thermometers from the TR10-E series are available with a prototype test certificate for the type of protection "intrinsic safety".

The devices comply with the requirements of the directive 94/9/EG (ATEX), for gases and dust. Manufacturer's declarations according to NAMUR NE24 are also possible.

The classification / suitability of the instrument (permissible power $P_{max.}$, minimum neck length and permissible ambient temperature) for the respective category can be seen on the type examination certificate and in the operating instructions.

Connection to thermowell

Many possible designs ensure that the resistance thermometer, Model TR10-E, can be combined with almost all thermowells. The most common designs of connection are shown in the following drawings. Others are available on request.



Possible combinations of measuring insert diameter, number sensor and sensor method of connection

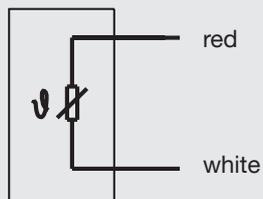
| Measuring insert \varnothing in mm | Sensor / method of connection 1 x Pt100 | | | Sensor / method of connection 2 x Pt100 | | |
|--------------------------------------|---|--------|--------|---|--------|--------|
| | 2-wire | 3-wire | 4-wire | 2-wire | 3-wire | 4-wire |
| 3 | x | x | x | x | x | - |
| 6 | x | x | x | x | x | x |

Possible thread sizes of the male thread at the extension neck

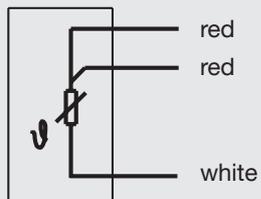
| Thread to the thermowell | Thread to the head |
|--------------------------|--------------------|
| G 1/2 B | 1/2 NPT |
| G 3/4 B | M20 x 1.5 |
| M14 x 1.5 | M24 x 1.5 |
| M18 x 1.5 | |
| 1/2 NPT | |
| 3/4 NPT | |

Electrical connection

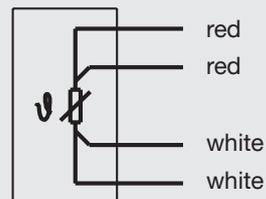
1 x Pt100, 2-wire



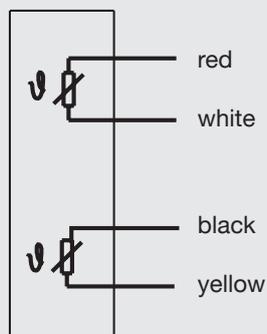
1 x Pt100, 3-wire



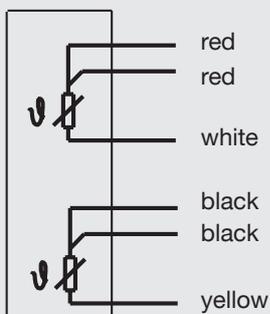
1 x Pt100, 4-wire



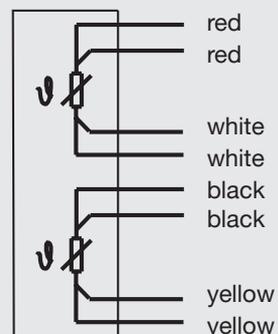
2 x Pt100, 2-wire



2 x Pt100, 3-wire



2 x Pt100, 4-wire



Modifications may take place and materials specified may be replaced by others without prior notice.
Specifications and dimensions given in this leaflet represent the state of engineering at the time of printing.

