

# Resistance thermometer Threaded, compact version Model TR36

WIKA data sheet TE 60.36

## Applications

- Machine building, plant and vessel construction
- Propulsion technology, hydraulics

## Special features

- Sensor range -50 ... +250 °C [-58 ... +482 °F]
- Compact design
- Electrical connection via angular connector DIN EN 175301-803 form A
- With direct sensor output (Pt100 in 2-, 3- or 4-wire connection) or integrated transmitter
- Integrated transmitter with 4 ... 20 mA output signal, individually parameterisable with free-of-charge WIKAsoft-TT PC configuration software



Threaded resistance thermometer, model TR36

## Description

Resistance thermometers of these series are used as universal thermometers for the measurement of liquid and gaseous media in the range -50 ... +250 °C [-58 ... +482 °F].

They can be used for pressures up to 140 bar [2,030 psi] with 3 mm [0.12 in] protection tube diameters, up to 270 bar [3,916 psi] with 6 mm [0.24 in] protection tube diameters, and up to 400 bar [5,801 psi] with 8 mm [0.31 in] protection tube diameters, depending on the instrument version. All electrical components are protected against splash water and designed to withstand vibration (8 g, depending on instrument version).

The TR36 resistance thermometer consists of a probe tube, which can be fixed into the process using a permanently welded threaded connection or a compression fitting. A version without process connection is also available.

The instrument version with integrated transmitter can be configured individually via the WIKAsoft-TT PC configuration software. Measuring range, dampening, error signalling per NAMUR NE 043 and TAG no. can be adjusted.

# Specifications

Measuring element		
<b>Type of measuring element</b>		
Version 4 ... 20 mA	Pt1000 (measuring current < 0.3 mA; self-heating can be ignored)	
Version Pt100	Pt100 (Messstrom 0,1 ... 1,0 mA)	
→ For detailed specifications for Pt sensors, see Technical information IN 00.17 at <a href="http://www.wika.com">www.wika.com</a> .		
<b>Connection method</b>		
Version 4 ... 20 mA	2-wire	
Version Pt100	2-wire	The lead resistance is recorded as an error in the measurement
	3-wire	With a cable length of 30 m or longer, measuring deviations can occur
	4-wire	The lead resistance can be ignored
<b>Tolerance value of the measuring element <sup>1)</sup> per IEC 60751</b>		
Version 4 ... 20 mA	Class A	
Version Pt100	<ul style="list-style-type: none"> <li>■ Class A</li> <li>■ Class B at 2-wire</li> </ul>	

Accuracy specifications (4 ... 20 mA version)	
<b>Tolerance value of the measuring element <sup>1)</sup> per IEC 60751</b>	Class A
<b>Measuring deviation of the transmitter per IEC 62828</b>	±0.25 K or 0.25 % of the set span (greater value applies)
<b>Total measuring deviation per IEC 62828 <sup>2)</sup></b>	Measuring deviation of the measuring element + transmitter
<b>Influence of ambient temperature</b>	0.1 % of the set measuring span / 10 K T <sub>a</sub>
<b>Influence of supply voltage</b>	±0.025 % of the set measuring span / V (depending on the supply voltage U <sub>B</sub> )
<b>Influence of load</b>	±0.05 % of the set measuring span / 100 Ω
<b>Linearisation</b>	Linear to temperature per IEC 60751
<b>Output error</b>	±0.1 % <sup>3)</sup> of the set measuring span
<b>Reference conditions</b>	
Ambient temperature T <sub>a</sub> ref	23 °C
Supply voltage U <sub>B</sub> ref	DC 24 V

1) Depending on the process connection, the deviation can be bigger.

2) During transient interferences (e.g. burst, surge, ESD) take into account an increased measuring deviation of up to 2.5 %.

3) ±0.2 % for start of measuring range less than 0 °C [32 °F]

## Example calculation: Total measuring deviation

(measuring range 0 ... 150 °C, load 200 Ω, supply voltage 20 V, ambient temperature 33 °C, process temperature 100 °C)

Sensor element (class A per IEC 60751: 0.15 + (0.0020(t))):	±0.350 K
Measuring deviation of the transmitter ±0.25 K:	±0.250 K
Output error ±(0.1 % of 150 K):	±0.150 K
Influence of load ±(0.05 % / 100 Ω of 150 K):	±0.150 K
Influence of supply voltage ±(0.025 % / V of 150 K):	±0.150 K
Influence of ambient temperature ±(0.1 % / 10 K T <sub>a</sub> of 150 K):	±0.150 K

## Measuring deviation (typical)

$$\sqrt{(0.35 \text{ K}^2 + 0.25 \text{ K}^2 + 0.15 \text{ K}^2 + 0.15 \text{ K}^2 + 0.15 \text{ K}^2 + 0.15 \text{ K}^2)}$$

$$\sqrt{(0.275 \text{ K}^2)} = 0.524 \text{ K}$$

## Measuring deviation (maximum)

$$0.35 \text{ K} + 0.25 \text{ K} + 0.15 \text{ K} + 0.15 \text{ K} + 0.15 \text{ K} + 0.15 \text{ K} = 1.2 \text{ K}$$

Measuring range	
<b>Temperature range</b>	
Version 4 ... 20 mA	Without neck tube -30 ... +150 °C [-22 ... +302 °F] With neck tube -30 ... +250 °C [-22 ... +482 °F] <sup>1)</sup>
Version Pt100	Class A Without neck tube -30 ... +150 °C [-22 ... +302 °F] With neck tube -30 ... +250 °C [-22 ... +482 °F] <sup>1)</sup>
	Class B Without neck tube -50 ... +150 °C [-58 ... +302 °F] With neck tube -50 ... +250 °C [-58 ... +482 °F] <sup>1)</sup>
<b>Unit (4 ... 20 mA version)</b>	Configurable °C, °F, K
<b>Temperature at the connector (Pt100 version)</b>	Max. 85 °C [185 °F]
<b>Measuring span (4 ... 20 mA version)</b>	Minimum 20 K, maximum 300 K

1) The temperature transmitter should therefore be protected from temperatures over 85 °C [185 °F].

Process connection	
<b>Type of process connection</b>	<ul style="list-style-type: none"> <li>■ G ¼ B</li> <li>■ G ⅜ B</li> <li>■ G ½ B</li> <li>■ ¼ NPT</li> <li>■ ½ NPT</li> <li>■ M12 x 1.5</li> <li>■ M20 x 1.5</li> </ul>
<b>Protection tube</b>	
Protection tube diameter	<ul style="list-style-type: none"> <li>■ 3 mm [0.12 in]</li> <li>■ 6 mm [0.24 in]</li> <li>■ 8 mm [0.31 in]</li> </ul>
Insertion length U <sub>1</sub>	<ul style="list-style-type: none"> <li>■ 50 mm [1.97 in]</li> <li>■ 75 mm [2.95 in] <sup>1)</sup></li> <li>■ 100 mm [3.94 in] <sup>1)</sup></li> <li>■ 120 mm [4.72 in] <sup>1)</sup></li> <li>■ 150 mm [5.91 in] <sup>1)</sup></li> <li>■ 200 mm [7.87 in] <sup>1)</sup></li> <li>■ 250 mm [9.84 in] <sup>1)</sup></li> <li>■ 300 mm [11.81 in] <sup>1)</sup></li> <li>■ 350 mm [13.78 in] <sup>1)</sup></li> <li>■ 400 mm [15.75 in] <sup>1)</sup></li> </ul> <p>Other insertion lengths on request</p>
Material (wetted)	Stainless steel 1.4571

1) Not for protection tube diameter 3 mm [0.12 in]

If the resistance thermometer is to be operated in an additional protection tube, a spring-loaded compression fitting must be used.

Output signal (4 ... 20 mA version)	
<b>Analogue output</b>	4 ... 20 mA, 2-wire
<b>Load R<sub>A</sub></b>	$R_A \leq (U_B - 10 \text{ V}) / 23 \text{ mA}$ with R <sub>A</sub> in Ω and U <sub>B</sub> in V The permissible load depends on the loop supply voltage.
<b>Load diagram</b>	

## Output signal (4 ... 20 mA version)

### Factory configuration

Measuring range	Measuring range 0 ... 150 °C [32 ... 302 °F] Other measuring ranges are adjustable
Current signals for error signalling	Configurable in accordance with NAMUR NE 043 downscale < 3.6 mA (3.5 mA) upscale > 21.0 mA (21.5 mA)
Current value for sensor short-circuit	Not configurable in accordance with NAMUR NE 043 downscale ≤ 3.6 mA (3.5 mA)

### Communication

Info data	TAG no., description and user message can be stored in transmitter
Configuration and calibration data	Permanently stored
Configuration software	WIKAsoft-TT → Configuration software (multilingual) as a download from <a href="http://www.wika.com">www.wika.com</a>

### Voltage supply

Supply voltage $U_B$	DC 10 ... 30 V
Supply voltage input	Protected against reverse polarity
Permissible residual ripple of supply voltage	10 % generated by $U_B$ < 3 % ripple of the output current

### Time response

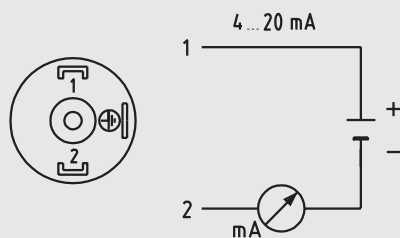
Switch-on delay, electrical	Max. 4 s (time before the first measured value)
Warm-up time	After approx. 4 minutes, the instrument will function to the specifications (accuracy) given in the data sheet.

## Electrical connection

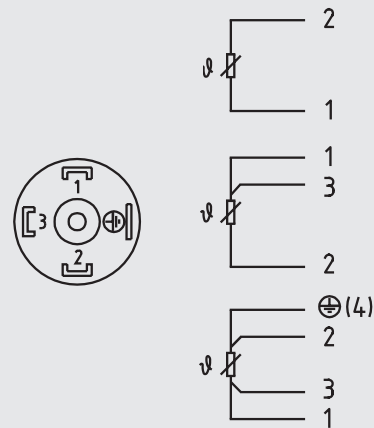
Connection type	Angular connector DIN EN 175301-803 form A for cables with 6 ... 8 mm [0.24 ... 0.31 in] diameter, cross-section max. 1.5 mm <sup>2</sup>
Material	
Case material of the connector	PA
Flat gasket	VMQ

## Pin assignment

Output signal 4 ... 20 mA  
Angular connector DIN EN 175301-803



With direct sensor output  
Angular connector DIN EN 175301-803




Operating conditions	
Ambient temperature range	-40 ... +85 °C [-40 ... +185 °F]
Storage temperature range	-40 ... +85 °C [-40 ... +185 °F]
Climate class per IEC 60654-1	Cx (-40 ... +85 °C [-40 ... +185 °F], 5 ... 95 % r. h.)
Maximum permissible humidity, condensation	100 % r. h., condensation allowed
Maximum operating pressure <sup>1) 2)</sup>	
For protection tube diameter 3 mm [0.12 in]	140 bar [2,030 psi]
For protection tube diameter 6 mm [0.24 in]	270 bar [3,916 psi]
For protection tube diameter 8 mm [0.31 in]	400 bar [5,801 psi]
Salt fog	IEC 60068-2-11
Vibration resistance per IEC 60751	10 ... 2,000 Hz, 8 g <sup>1)</sup>
Shock resistance per IEC 60068-2-27	50 g, 6 ms, 3 axes, 3 directions, three times per direction
Ingress protection (IP code)	IP65 per IEC/EN 60529
	The stated ingress protection only applies when plugged in using line connectors that have the appropriate ingress protection.
Weight	Approx. 0.2 ... 0.7 kg [0.44 ... 1.54 lbs] - depending on version

1) Dependent on the instrument version

2) Reduced operating pressure when using a compression fitting: Stainless steel = max. 100 bar [1,450 psi] / PTFE = max. 8 bar [116 psi]

## Approvals

Logo	Description	Region
	<b>EU declaration of conformity</b>	European Union
	EMC directive <sup>1)</sup>	
	DIN EN 55011 (CISPR11): Emission (group 1, class B) DIN EN 61326-1, DIN EN 61326-2-3: immunity (industrial application)	
	RoHS directive	

1) During transient interferences (e.g. burst, surge, ESD) take into account an increased measuring deviation of up to 2.5 %.

## Certificates (option)

Certification type	Measurement accuracy	Material certificate
2.2 test report	x	x
3.1 inspection certificate	x	x
DAkkS calibration certificate	x	-

The different certifications can be combined with each other.

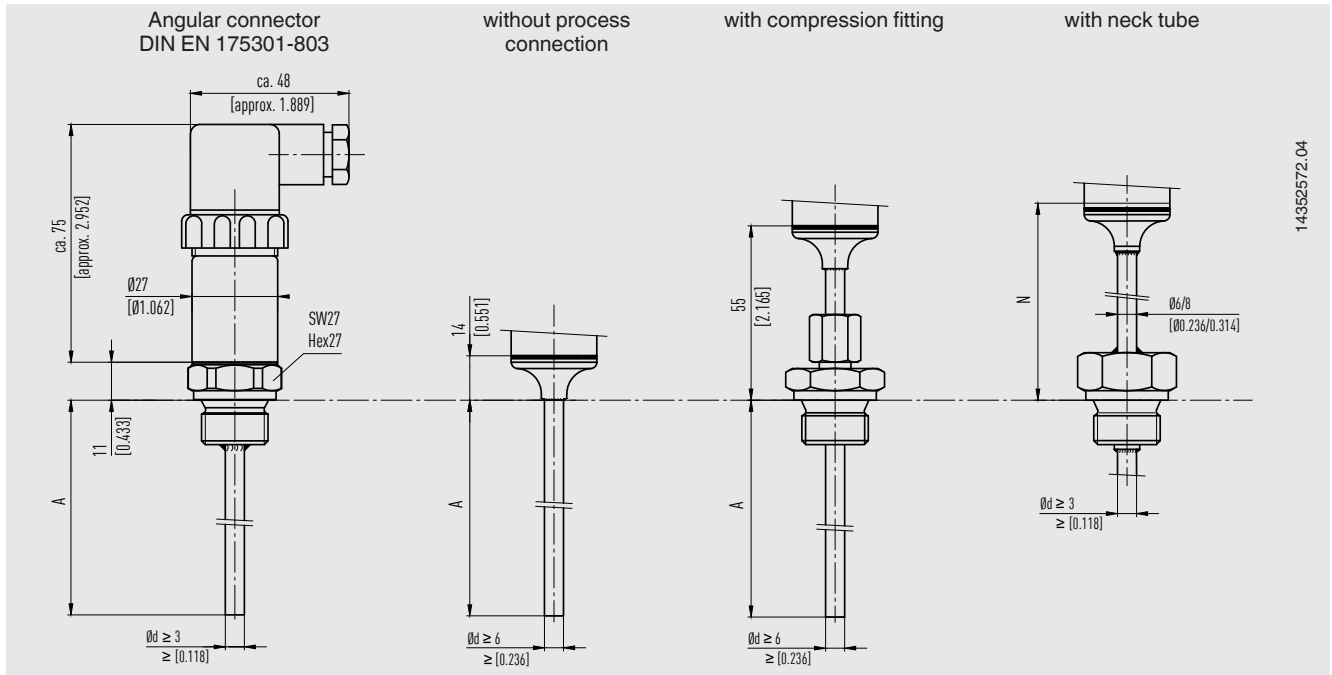
For calibration, the measuring insert is removed from the thermometer. The minimum length (metal part of the probe) for carrying out a 3.1 measurement accuracy test or DAkkS is 100 mm [3.94 in].

Calibration of shorter lengths on request.

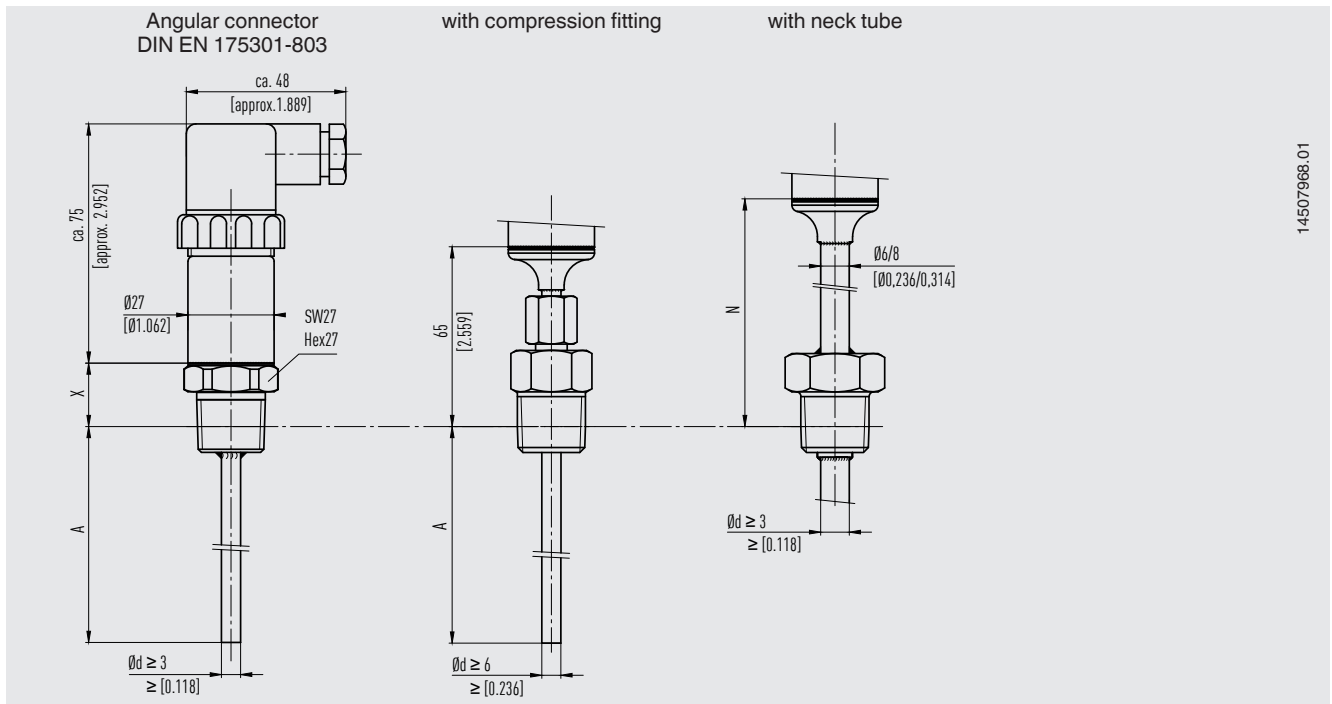
→ Approvals and certificates, see website

## Dimensions in mm [in]

### Process connection with parallel threads (or without process connection)



### Process connection with tapered thread

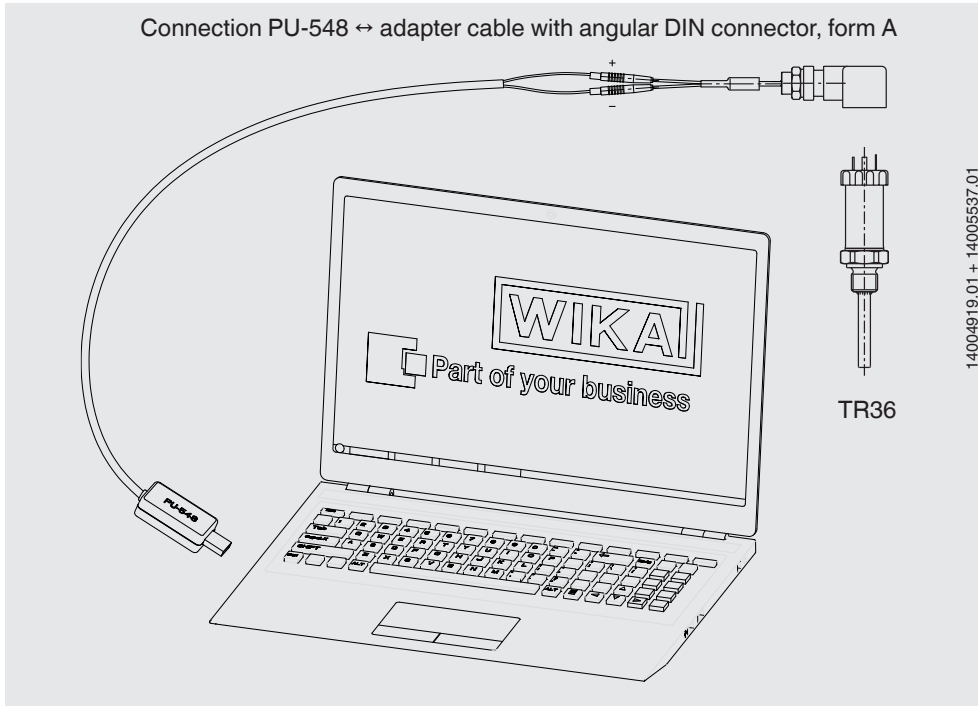


At a process temperature of  $> 150\text{ }^{\circ}\text{C}$  [ $302\text{ }^{\circ}\text{F}$ ], a neck tube length N of 70 mm [2.76 in] is necessary.

#### Legend:


- A Insertion length
- N Neck tube length (70 mm [2.76 in])
- $\varnothing d$  Protection tube diameter
- X Height process connection  
1/4 NPT = 15 mm [0.59 in]  
1/2 NPT = 19 mm [0.75 in]

## Connecting the PU-548 programming unit



(predecessor, programming unit model PU-448, also compatible)

## Accessories

Model	Description	Order number	
 <b>Programming unit Model PU-548</b>	<ul style="list-style-type: none"> <li>■ Easy to use</li> <li>■ LED status display</li> <li>■ Compact design</li> <li>■ No further voltage supply needed, neither for the programming unit nor for the transmitter</li> </ul> <p>(replaces programming unit model PU-448)</p>	14231581	
-	<b>Adapter cable DIN angular connector to PU-548</b>	Adapter cable DIN angular connector for the connection of a resistance thermometer with a DIN EN 175301-803 angular connector form A to the model PU-548 programming unit	14005324

## Ordering information

Model / Output signal / Transmitter temperature unit / Process temperature / Transmitter initial value / Transmitter end value / Process connection / Protection tube diameter / Insertion length A (U<sub>1</sub>) or A (U<sub>2</sub>) / Neck length N (M<sub>H</sub>) / Accessories / Certificates

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