

# OEM miniature resistance thermometer

## Threaded

### Models TR31-3 and TR31-K

WIKA data sheet TE 60.31



for further approvals,  
see page 9

#### Applications

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

#### Special features

- Very compact design, high vibration resistance and fast response time
- With direct sensor output (Pt100, Pt1000 in 2-, 3- or 4-wire connection) or integrated transmitter with 4 ... 20 mA output signal
- Integrated transmitter is individually parameterisable with free-of-charge WIKAsoft-TT PC configuration software
- Sensor element with accuracy class A per IEC 60751

#### Description

Resistance thermometers of these series are used as universal thermometers for the measurement of liquid and gaseous media in the range  $-50 \dots +250 \text{ }^{\circ}\text{C}$  [ $-58 \dots +482 \text{ }^{\circ}\text{F}$ ]. For use in hazardous areas, intrinsically safe versions are available. They can be used for pressures up to 140 bar [2,030 psi] with 3 mm [0.12 in] sensor diameters and up to 270 bar [3,916 psi] with 6 mm [0.24 in] sensor diameters, depending on the instrument version. All electrical components are protected against humidity (IP67 or IP69K) and designed to withstand vibration (20 g, depending on instrument version).

The resistance thermometer is available with direct sensor output or integrated transmitter, which can be configured individually via the WIKAsoft-TT PC configuration software. Measuring range, damping, error signalling per NAMUR NE 043 and TAG no. can be adjusted.

Insertion length, process connection, sensor and connection method can each be selected for the respective application within the ordering information. The model TR31 resistance thermometer consists of a thermowell/protection tube with



**Fig. left: Resistance thermometer with M12 x 1, model TR31-3**

**Fig. centre: Resistance thermometer with directly connected cable, model TR31-K**

**Fig. right: M12 x 1 adapter to DIN EN 175301-803 angular connector**

a fixed process connection and is screwed directly into the process. The electrical connection depends on the design and is made with an M12 x 1 circular connector or via a directly connected cable. For the M12 x 1 circular connector, an adapter for electrical connection with angular connector per DIN EN 175301-803 form A is optionally available (patent, property right: 001370985). As a special feature, the miniature OEM resistance thermometer is also available in customer-specific designs.

# Specifications

Measuring element		
<b>Type of measuring element</b>		
Version 4 ... 20 mA (model TR31-x-x-TT)	Pt1000 (measuring current < 0.3 mA; self-heating can be ignored)	
Version Pt100 (model TR31-x-x-Px) / Pt1000 (model TR31-x-x-Sx)	<ul style="list-style-type: none"> <li>■ Pt100 (measuring current: 0.1 ... 1.0 mA)</li> <li>■ Pt1000 (measuring current: 0.1 ... 0.3 mA)</li> </ul>	
	→ 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 (model TR31-x-x-TT)	2-wire	
Version Pt100 (model TR31-x-x-Px) / Pt1000 (model TR31-x-x-Sx)	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 (model TR31-x-x-TT)	Class A	
Version Pt100 (model TR31-x-x-Px) / Pt1000 (model TR31-x-x-Sx)	<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
<b>Total measuring deviation per IEC 62828</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 % / V (depending on the supply voltage U <sub>B</sub> )
<b>Influence of load</b>	±0.05 % / 100 Ω
<b>Linearisation</b>	Linear to temperature per IEC 60751
<b>Output error</b>	±0.1 % <sup>2)</sup>
<b>Reference conditions</b>	
Ambient temperature T <sub>a</sub> ref	23 °C
Supply voltage U <sub>B</sub> ref	DC 12 V

- 1) Depending on the process connection, the deviation can be bigger.  
 2) ±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 16 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)

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

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

## 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 (model TR31-x-x-TT)	Without neck tube -30 ... +150 °C [-22 ... +302 °F] With neck tube -30 ... +250 °C [-22 ... +482 °F] <sup>1) 2)</sup> Version with FKM O-ring: -20 ... +125 °C [-4 ... +257 °F]
Version Pt100 (model TR31-x-x-Px) / Pt1000 (model TR31-x-x-Sx)	Class A Without neck tube -30 ... +150 °C [-22 ... +302 °F] With neck tube -30 ... +250 °C [-22 ... +482 °F] <sup>2)</sup> Version with FKM O-ring: -20 ... +125 °C [-4 ... +257 °F]
	Class B Without neck tube -50 ... +150 °C [-58 ... +302 °F] With neck tube -50 ... +250 °C [-58 ... +482 °F] <sup>2)</sup>
<b>Unit (4 ... 20 mA version)</b>	Configurable °C, °F, K
<b>Temperature at the connector (Pt100, Pt1000 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].

2) Version with mineral-insulated sheathed cable can be used up to 300 °C [572 °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> <li>■ 7/16-20 UNF-2A</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> </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> Other insertion lengths on request
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.

<b>Output signal (4 ... 20 mA version)</b>	
<b>Analogue output</b>	4 ... 20 mA, 2-wire
<b>Load <math>R_A</math></b>	$R_A \leq (U_B - 10 \text{ V}) / 23 \text{ mA}$ with $R_A$ in $\Omega$ and $U_B$ in V The permissible load depends on the loop supply voltage. For communication with the instrument, with programming unit PU-548, a max. load of 350 $\Omega$ is admissible.
<b>Load diagram</b>	<p>The load diagram is a graph with 'Load <math>R_A</math> in <math>\Omega</math>' on the vertical axis and 'Voltage <math>U_B</math> in V' on the horizontal axis. The vertical axis has tick marks at 0, 583, 833, and 1083. The horizontal axis has tick marks at 0, 10, 24, 30, and 36. A solid line starts at (10, 0) and goes up to (36, 1083). The area under this line is shaded with diagonal lines. A note points to the shaded area: 'Not for instruments with Ex version'.</p>
<b>Factory configuration</b>	
Measuring range	0 ... 150 °C [32 ... 302 °F] Other measuring ranges are adjustable
Current values for error signalling	Configurable in accordance with NAMUR NE 043 downscale $\leq 3.6 \text{ mA}$ upscale $\geq 21.0 \text{ mA}$
Current value for sensor short-circuit	Not configurable in accordance with NAMUR NE 043 downscale $\leq 3.6 \text{ mA}$
<b>Communication</b>	
Info data	TAG no., description and user message can be stored in transmitter
Configuration and calibration data	Permanently stored
Configuration software	WIKAssoft-TT → Configuration software (multilingual) as a download from <a href="http://www.wika.com">www.wika.com</a>
<b>Voltage supply</b>	
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
<b>Time response</b>	
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

- M12 x 1 circular connector (4-pin)
- Directly connected cable

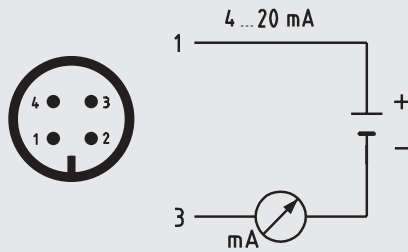
### Material

Stainless steel 1.4571

## Pin assignment

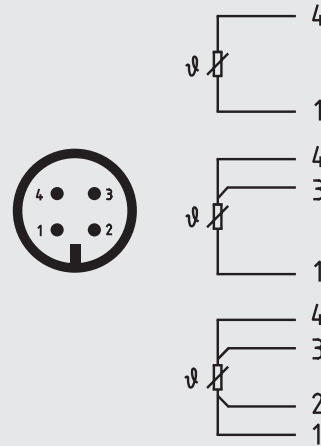
### ■ M12 x 1 circular connector (4-pin)

4 ... 20 mA output signal



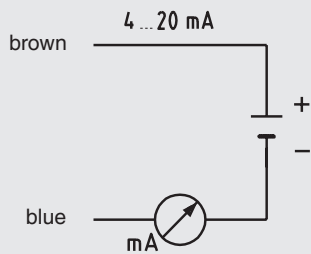
Pin	Signal	Description
1	L+	10 ... 30 V
2	VQ	not connected
3	L-	0 V
4	C	not connected

Pt100 and Pt1000 output signal



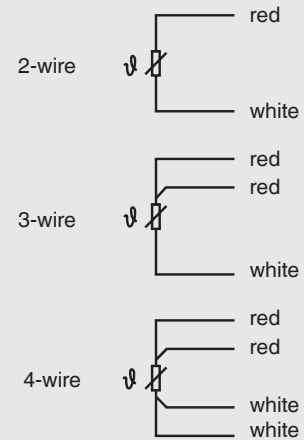
### ■ Directly connected cable

4 ... 20 mA output signal



Pin	Signal	Description
<b>Brown</b>	L+	10 ... 30 V
<b>Blue</b>	L-	0 V

Pt100 and Pt1000 output signal



Operating conditions		
<b>Ambient temperature range</b>		
M12 x 1 circular connector (model TR31-3-x-xx)	4 ... 20 mA version	-40 ... +85 °C [-40 ... +185 °F] Version with FKM O-ring: -20 °C [-4 °F]
	Pt100 / Pt1000 version	-50 ... +85 °C [-58 ... +185 °F] Version with FKM O-ring: -20 °C [-4 °F]
Directly connected cable (model TR31-K-x-xx)	-20 ... +80 °C [-4 ... +176 °F]	
<b>Storage temperature range</b>		
M12 x 1 circular connector (model TR31-3-x-xx)	-40 ... +85 °C [-40 ... +185 °F] Version with FKM O-ring: -20 °C [-4 °F]	
Directly connected cable (model TR31-K-x-xx)	-20 ... +80 °C [-4 ... +176 °F]	
<b>Climate class per IEC 60654-1</b>		
M12 x 1 circular connector (model TR31-3-x-xx)	4 ... 20 mA version	Cx (-40 ... +85 °C [-40 ... +185 °F], 5 ... 95 % r. h.) Version with FKM O-ring: -20 °C [-4 °F]
	Pt100 / Pt1000 version	Cx (-50 ... +85 °C [-58 ... +185 °F], 5 ... 95 % r. h.) Version with FKM O-ring: -20 °C [-4 °F]
Directly connected cable (model TR31-K-x-xx)	Cx (-20 ... +80 °C [-4 ... +176 °F], 5 ... 95 % r. h.) Version with FKM O-ring: -20 °C [-4 °F]	
<b>Maximum permissible humidity, condensation</b>	100 % r. h., condensation allowed	
<b>Maximum operating pressure <sup>1) 2)</sup></b>		
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]	
<b>Salt mist</b>	IEC 60068-2-11	
<b>Vibration resistance per IEC 60751</b>	10 ... 2,000 Hz, 20 g <sup>1)</sup>	
<b>Shock resistance per IEC 60068-2-27</b>	50 g, 6 ms, 3 axes, 3 directions, three times per direction	
<b>Conditions for outdoor use (only applies to UL approval)</b>	<ul style="list-style-type: none"> <li>■ The instrument is suitable for applications with pollution degree 3.</li> <li>■ The power supply must be suitable for operation above 2,000 m should the temperature transmitter be used at this altitude.</li> <li>■ The instrument shall be installed in locations sheltered from the weather.</li> <li>■ The instrument shall be installed sun/UV irradiation protected.</li> </ul>	
<b>Material</b>	Stainless steel	
<b>Ingress protection (IP code)</b>		
Case with connected connector or directly connected cable <sup>3)</sup>	<ul style="list-style-type: none"> <li>■ IP67 per IEC/EN 60529</li> <li>■ IP69 per IEC/EN 60529</li> <li>■ IP69K per ISO 20653</li> </ul>	
	The stated ingress protection only applies when plugged in using line connectors that have the appropriate ingress protection.	
Coupler connector, not connected	IP67 per IEC/EN 60529	
<b>Weight</b>	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]

3) Not tested with UL

## Further specifications for explosion-protected version (optional)

### Thermometer with transmitter and 4 ... 20 mA output signal (model TR31-x-x-TT)

Marking:

Hazardous gas atmosphere	Temperature class	Ambient temperature range ( $T_a$ )	Maximum surface temperature ( $T_{max}$ ) at the tip of the probe or protection tube
II 1G Ex ia IIC T1 - T6 Ga II 1/2G Ex ia IIC T1 - T6 Ga/Gb II 2G Ex ia IIC T1 - T6 Gb	T6	-40 ... +45 °C	$T_M$ (medium temperature) + self-heating (15 K) Pay attention to the special conditions for safe use.
	T5	-40 ... +60 °C	
	T4	-40 ... +85 °C	
	T3	-40 ... +85 °C	
	T2	-40 ... +85 °C	
	T1	-40 ... +85 °C	

Hazardous dust/air atmospheres	Power $P_i$	Ambient temperature range ( $T_a$ )	Maximum surface temperature ( $T_{max}$ ) at the tip of the probe or protection tube
II 1D Ex ia IIIC T135 °C Da II 1/2D Ex ia IIIC T135 °C Da/Db II 2D Ex ia IIIC T135 °C Db	750 mW	-40 ... +40 °C	$T_M$ (medium temperature) + self-heating (15 K) Pay attention to the special conditions for safe use.
	650 mW	-40 ... +70 °C	
	550 mW	-40 ... +85 °C	

Safety-related maximum values for the current loop circuit (+ and - connections):

Parameters	Hazardous gas atmosphere	Hazardous dust/air atmospheres
Terminals	+ / -	+ / -
Voltage $U_i$	DC 30 V	DC 30 V
Current $I_i$	120 mA	120 mA
Power $P_i$	800 mW	750/650/550 mW
Effective internal capacitance $C_i$	29.7 nF	29.7 nF
Effective internal inductance $L_i$	Negligible	Negligible
Maximum self-heating at the probe or protection tube tip	15 K	15 K

**Thermometer with direct sensor output with Pt100 (model TR31-x-x-Px) or Pt1000 (model TR31-x-x-Sx)**

Marking:

Marking	Temperature class	Ambient temperature range ( $T_a$ )	Maximum surface temperature ( $T_{max}$ ) at the tip of the probe or protection tube
II 1G Ex ia IIC T1 - T6 Ga II 1/2G Ex ia IIC T1 - T6 Ga/Gb II 2G Ex ia IIC T1 - T6 Gb	T6	-50 ... +80 °C	T <sub>M</sub> (medium temperature) + self-heating Pay attention to the special conditions for safe use.
	T5	-50 ... +85 °C	
	T4	-50 ... +85 °C	
	T3	-50 ... +85 °C	
	T2	-50 ... +85 °C	
	T1	-50 ... +85 °C	

Marking	Power $P_i$	Ambient temperature range ( $T_a$ )	Maximum surface temperature ( $T_{max}$ ) at the tip of the probe or protection tube
II 1D Ex ia IIIC T135 °C Da II 1/2D Ex ia IIIC T135 °C Da/Db II 2D Ex ia IIIC T135 °C Db	750 mW	-50 ... +40 °C	T <sub>M</sub> (medium temperature) + self-heating Pay attention to the special conditions for safe use.
	650 mW	-50 ... +70 °C	
	550 mW	-50 ... +85 °C	

Safety-related maximum values for the current loop circuit (connections in accordance with pin assignment 1 - 4):








Parameters	Gas applications	Dust applications
Terminals	1 - 4	1 - 4
Voltage $U_i$	DC 30 V	DC 30 V
Current $I_i$	550 mA	250 mA
Power $P_i$	1,500 mW	750/650/550 mW
Effective internal capacitance $C_i$	Negligible	Negligible
Effective internal inductance $L_i$	Negligible	Negligible
Maximum self-heating at the probe or protection tube tip	( $R_{th}$ ) = 335 K/W	( $R_{th}$ ) = 335 K/W






## Approvals

Logo	Description	Region
	<b>EU declaration of conformity</b>	European Union
	EMC directive <sup>1)</sup>	
	EN 61326 emission (group 1, class B) and immunity (industrial application)	
	RoHS directive	

### Optional approvals

Logo	Description	Region
	<b>EU declaration of conformity</b>	European Union
	ATEX directive Hazardous areas - Ex i Zone 0 gas II 1G Ex ia IIC T1 ... T6 Ga Zone 1 mounting to zone 0 gas II 1/2G Ex ia IIC T1 ... T6 Ga/Gb Zone 1 gas II 2G Ex ia IIC T1 ... T6 Gb Zone 20 dust II 1D Ex ia IIIC T135 °C Da Zone 21 mounting to zone 20 dust II 1/2D Ex ia IIIC T135 °C Da/Db Zone 21 dust II 2D Ex ia IIIC T135 °C Db	
	<b>IECEx - in combination with ATEX</b>	International
	Hazardous areas - Ex i Zone 0 gas Ex ia IIC T1 ... T6 Ga Zone 1 mounting to zone 0 gas Ex ia IIC T1 ... T6 Ga/Gb Zone 1 gas Ex ia IIC T1 ... T6 Gb Zone 20 dust Ex ia IIIC T135 °C Da Zone 21 mounting to zone 20 dust Ex ia IIIC T135 °C Da/Db Zone 21 dust Ex ia IIIC T135 °C Db	
	<b>CSA</b>	USA and Canada
	Safety (e.g. electr. safety, overpressure, ...) Hazardous areas Division 1 or 2 gas CL I, DIV 1 or 2, GP A, B, C, D, T1 ... T6 Zone 0 or 1 gas CL I, zone 0 or 1, IIC Ex/AEx ia IIC T1 ... T6 Ga Division 1 or 2 dust CL II / III, DIV 1 or 2, GP E, F, G, T1 ... T6 / 135 °C Zone 20 or 21 dust CL II / III, zone 20 or 21, Ex/AEx ia IIIC T135 °C Da	
	<b>UL (only for instrument version without explosion protection)</b> Safety (e.g. electr. safety, overpressure, ...)	USA and Canada
	<b>EAC</b>	Eurasian Economic Community
	EMC directive <sup>1)</sup> Hazardous areas - Ex i Zone 0 gas 0 Ex ia IIC T6...T1 Ga X Zone 1 gas 1 Ex ia IIC T6...T1 Gb X Zone 20 dust Ex ia IIIC T135 °C Da X Zone 21 dust Ex ia IIIC T135 °C Db X	
	<b>Ex Ukraine</b>	Ukraine
	Hazardous areas - Ex i Zone 0 gas II 1G Ex ia IIC T6 ... T1 Ga Zone 1 mounting to zone 0 gas II 1/2G Ex ia IIC T6 ... T1 Ga/Gb Zone 1 gas II 2G Ex ia IIC T6 ... T1 Gb Zone 20 dust II 1D Ex ia IIIC T135 °C Da Zone 21 mounting to zone 20 dust II 1/2D Ex ia IIIC T135 °C Da/Db Zone 21 dust II 2D Ex ia IIIC T135 °C Db	
	<b>CCC</b>	China
	Hazardous areas - Ex i Zone 1 gas Ex ia IIC T3 ... T6 Gb Zone 1 mounting to zone 0 gas Ex ia IIC T3 ... T6 Ga/Gb - Ex n Zone 2 gas Ex nA IIC T1 ... T6	

Logo	Description	Region
	<b>PAC Russia</b> Metrology, measurement technology	Russia
	<b>PAC Kazakhstan</b> Metrology, measurement technology	Kazakhstan
-	<b>MChS</b> Permission for commissioning	Kazakhstan
-	<b>PAC Ukraine</b> Metrology, measurement technology	Ukraine
	<b>PAC Uzbekistan</b> Metrology, measurement technology	Uzbekistan

1) Only for built-in transmitter

## Certificates (option)

Certification type	Measurement accuracy	Material certificate
<b>2.2 test report</b>	x	x
<b>3.1 inspection certificate</b>	x	x
<b>DAkkS calibration certificate</b>	x	-

The different certifications can be combined with each other.

The minimum length (metal part of the probe or the length of the probe below the process connection) for carrying out a measurement accuracy test 3.1 or DAkkS is 100 mm [3.94 in].

Calibration of shorter lengths on request.

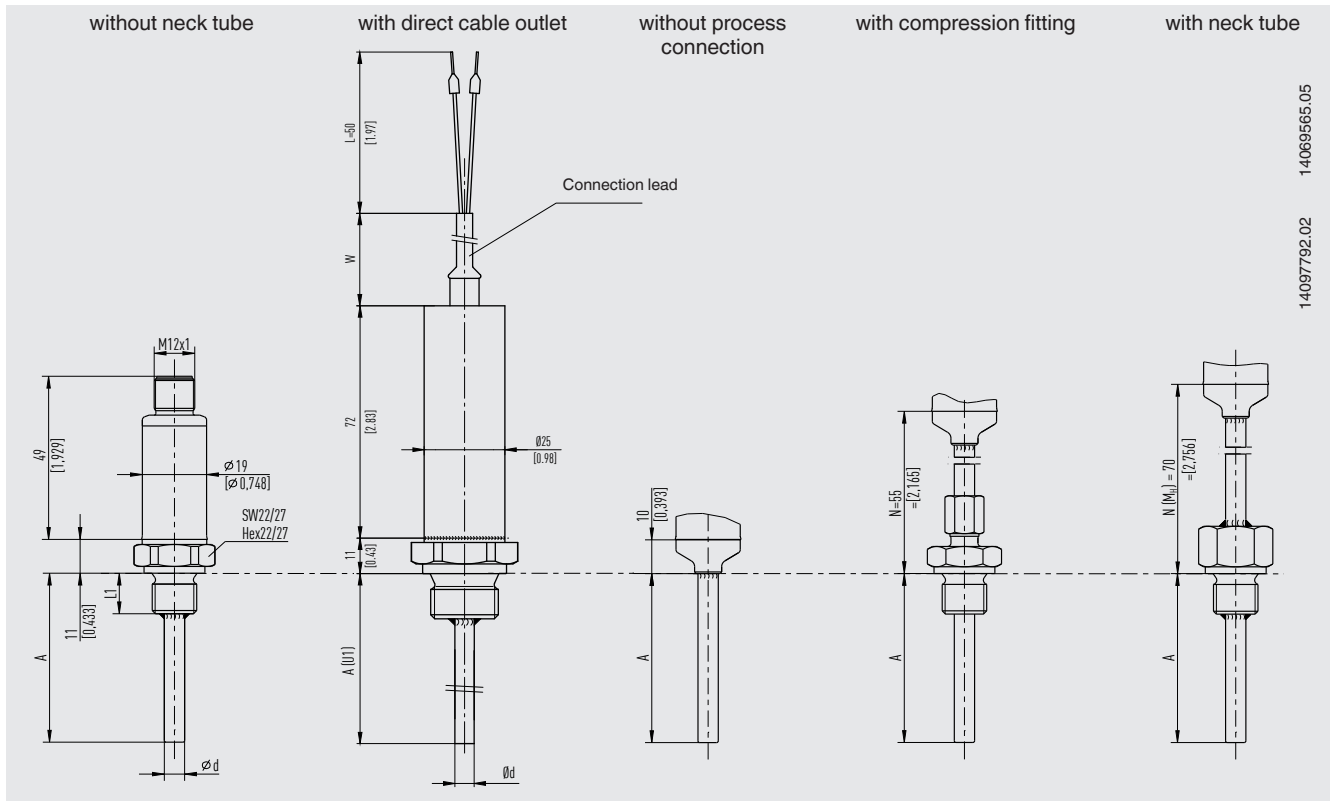
→ Approvals and certificates, see website

## Patents, property rights

M12 x 1 adapter to DIN EN 175301-803 angular connector (001370985)

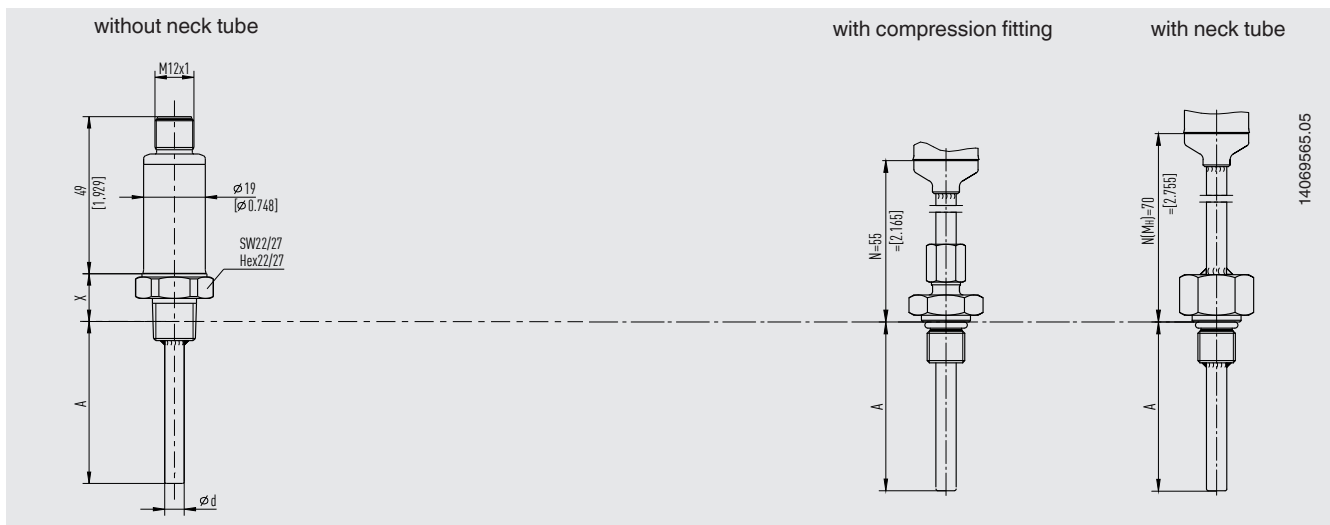
# Dimensions in mm [in]

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



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14097792.02

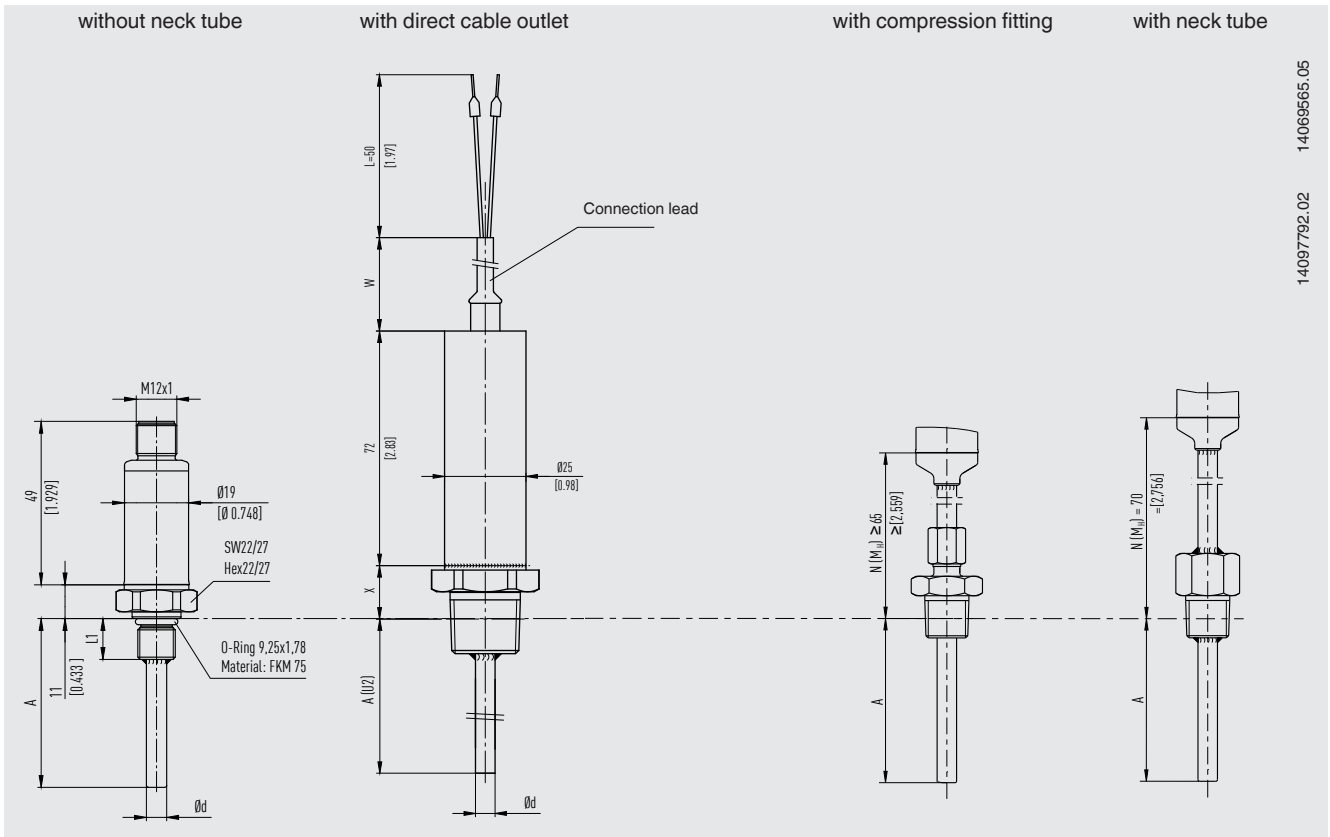
## Process connection with parallel thread (7/16-20 UNF-2A) and O-ring



14069565.05

The FKM O-ring must be protected from temperatures lower than -20 °C [-4 °F] and higher than 125 °C [257 °F].

## Process connection with tapered thread



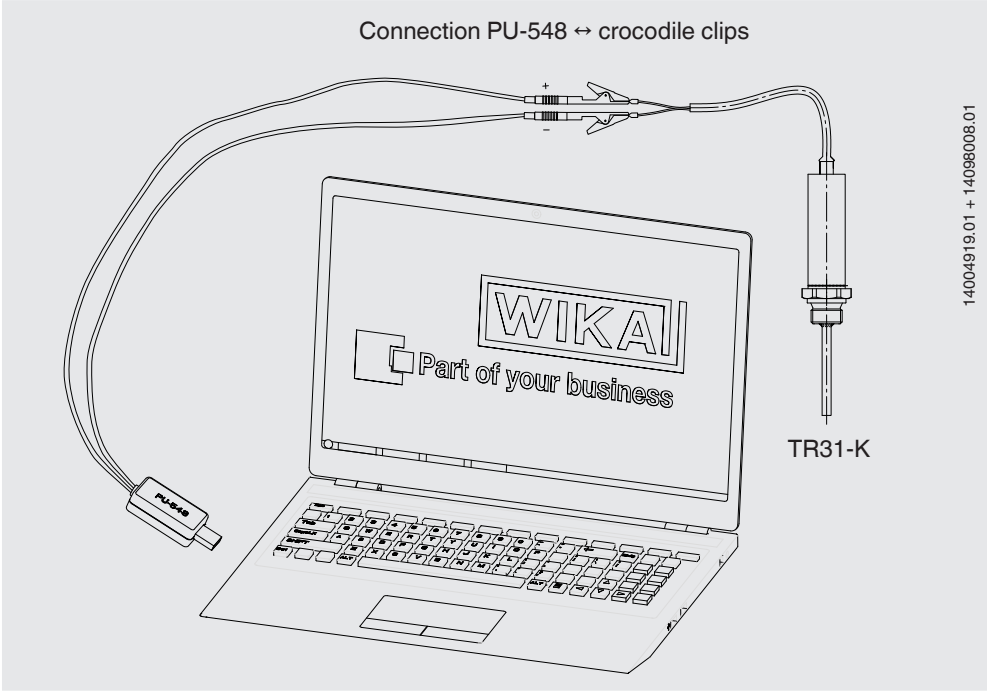
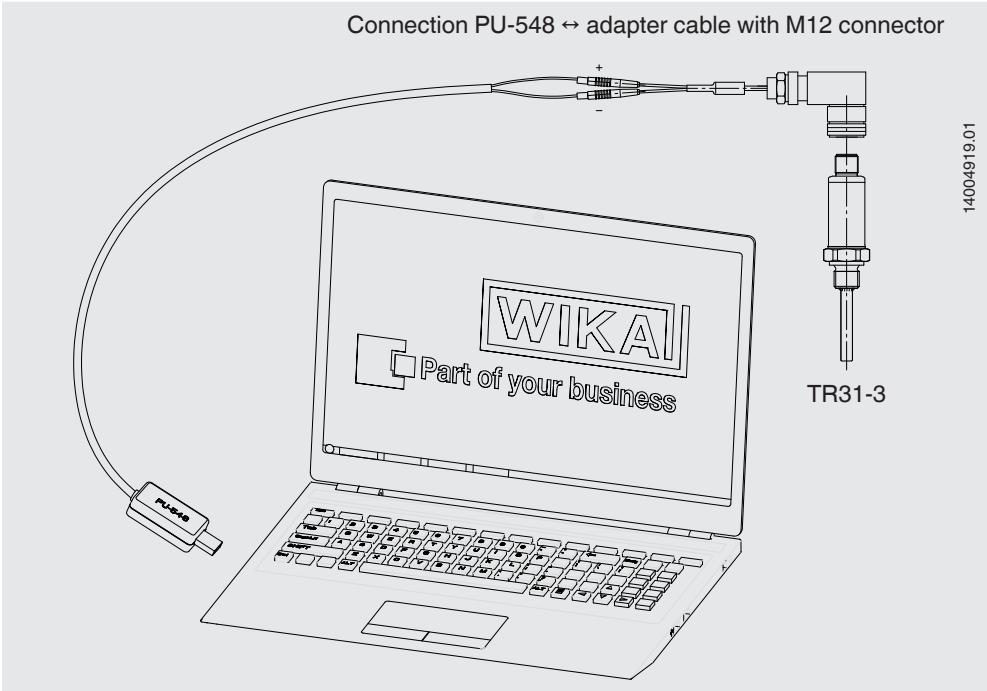
14087792.02 14069565.05

At a process temperature of  $> 150\text{ °C}$  [ $302\text{ °F}$ ], a neck length  $N (M_H)$  of 70 mm [2.76 in] is necessary, otherwise  $N (M_H)$  selectable (55 mm [2.17 in], 65 mm [2.56 in] or 70 mm [2.76 in]).

### Legend:

- A ( $U_1$ ) Insertion length (parallel thread)
- A ( $U_2$ ) Insertion length (tapered thread)
- N ( $M_H$ ) Neck length
- Ød Sensor diameter
- W Length of the directly connected cable
- L Length of the free stranded wires
- 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	Special features	Order no.
 <p><b>Programming unit Model PU-548</b></p>	<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
 <p><b>Adapter cable M12 to PU-548</b></p>	Adapter cable for the connection of a model TR31 resistance thermometer to the model PU-548 programming unit	14003193
 <p><b>M12 x 1 transmitter adapter to DIN EN 175301-803 angular connector</b> (yellow female connector element)</p>	<p>Adapter for the connection of a resistance thermometer with a DIN EN 175301-803 angular connector form A with a 4 ... 20 mA output signal → see data sheet AC 80.17</p> <p>Case: PA Ambient temperature: -40 ... +115 °C [-40 ... +239 °F] Union nut: Zinc die-cast Contacts: Copper-zinc alloy, tin-plated Dielectric strength: 500 V Ingress protection: IP65</p> <p><b>M12 x 1 connector</b>      <b>Angular connector</b></p> 	14069503
 <p><b>M12 x 1 Pt adapter to DIN EN 175301-803 angular connector</b> (black female connector element)</p>	<p>Adapter for the connection of the resistance thermometer with a DIN EN 175301-803 form A angular connector with direct resistance output signal → see data sheet AC 80.17</p> <p>Case: PA Ambient temperature: -40 ... +115 °C [-40 ... +239 °F] Union nut: Zinc die-cast Contacts: Copper-zinc alloy, tin-plated Dielectric strength: 500 V Ingress protection: IP65</p> <p><b>M12 x 1 connector</b>      <b>Angular connector</b></p> 	14061115
 <p><b>Angular connector</b></p>	Per DIN EN 175301-803 form A	11427567
 <p><b>Sealing for angular connector</b></p>	For use with angular connector DIN EN 175301-803-A EPDM, brown	11437902

Model	Special features	Order no.	
- <b>M12 connection cable</b>	Cable socket straight, 4-pin, ingress protection IP67 Temperature range -20 ... +80 °C [-4 ... +176 °F] For hazardous areas	Cable length 2 m [6.56 ft]	14086880
		Cable length 5 m [16.40 ft]	14086883
	Cable socket straight, 4-pin, ingress protection IP69K, hygienic design Union nut made of stainless steel Temperature range -40 ... +80 °C [-40 ... +176 °F] Not for hazardous areas	Cable length 3 m [9.84 ft]	14137167
		Cable length 5 m [16.40 ft]	14137168
	Angled socket, 4-pin, ingress protection IP67 Temperature range -20 ... +80 °C [-4 ... +176 °F] For hazardous areas	Cable length 2 m [6.56 ft]	14086889
		Cable length 5 m [16.40 ft]	14086891
	Angled socket, 4-pin, ingress protection IP69K, hygienic design Union nut made of stainless steel Temperature range -40 ... +80 °C [-40 ... +176 °F] Not for hazardous areas	Cable length 3 m [9.84 ft]	14137169
		Cable length 5 m [16.40 ft]	14137170
	- <b>M12 connector</b>	Female angled, 4-pin, ingress protection IP67 Screw connection for conductor cross-section 0.25 ... 0.75 mm <sup>2</sup> [24 ... 18 AWG] Cable gland Pg7, outside diameter of cable 4 ... 6 mm [0.16 ... 0.24 in] Temperature range -40 ... +80 °C [-40 ... +176 °F] Suitable for hazardous areas	14136815

### Ordering information

Model / Design / Output signal / Transmitter temperature unit / Process temperature / Transmitter initial value / Transmitter end value / Process connection / Sensor 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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