Miniature resistance thermometer
Threaded, explosion-protected version
Model TR34

for further approvals, see page 8

Applications

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

Special features

- Intrinsically safe Ex i version, 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

Fig. left: Resistance thermometer, model TR34
Fig. right: M12 x 1 adapter to DIN EN 175301-803 angular connector

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]. The instruments are intrinsically safe and suitable for use in hazardous areas.

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 TR34 resistance thermometer consists of a protection tube with a fixed process connection and is screwed directly into the process. The electrical connection is made via an M12 x 1 circular connector. An adapter for electrical connection with angular connector per DIN EN 175301-803 is optionally available (patent, industrial property right: 001370985).

Data sheets showing similar products and accessories:
Threaded resistance thermometer; model TR33; see data sheet TE 60.33
OEM threaded thermometer with plug connection; model TF35; see data sheet TE 67.10

Specifications

Measuring element		
Type of measuring element		
Version 4 ... 20 mA (model TR34-x-TT)	Pt1000 (measuring current < 0.3 mA; self-heating can be ignored)	
Version Pt100 (model TR34-x-Px) / Pt1000 (model TR34-x-Sx)	■ Pt100 (measuring current: 0.1 ... 1.0 mA) ■ Pt1000 (measuring current: 0.1 ... 0.3 mA)	
	→ For detailed specifications for Pt sensors, see Technical information IN 00.17 at www.wika.com.	
Connection method		
Version 4 ... 20 mA (model TR34-x-TT)	2-wire	
Version Pt100 (model TR34-x-Px) / Pt1000 (model TR34-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
Tolerance value of the measuring element [1] per IEC 60751		
Version 4 ... 20 mA (model TR34-x-TT)	Class A	
Version Pt100 (model TR34-x-Px) / Pt1000 (model TR34-x-Sx)	■ Class A ■ Class B at 2-wire	

Accuracy specifications (4 ... 20 mA version)	
Tolerance value of the measuring element [1] per IEC 60751	Class A
Measuring deviation of the transmitter per IEC 62828	±0.25 K
Total measuring deviation per IEC 62828	Measuring deviation of the measuring element + transmitter
Influence of ambient temperature	0.1 % of the set measuring span / 10 K T_a
Influence of supply voltage	±0.025 % / V (depending on the supply voltage U_B)
Influence of load	±0.05 % / 100 Ω
Linearisation	Linear to temperature per IEC 60751
Output error	±0.1 % [2]
Reference conditions	
Ambient temperature T_a ref	23 °C
Supply voltage U_B 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_a of 150 K): ±0.150 K

Measuring deviation (typical)
sqrt (0.35 K^2 + 0.25 K^2 + 0.15 K^2 + 0.15 K^2 + 0.15 K^2+ 0.15 K^2)
sqrt (0.275 K^2) = 0.524 K

Measuring deviation (maximum)
0.35 K + 0.25 K + 0.15 K + 0.15 K + 0.15 K + 0.15 K = 1.2 K

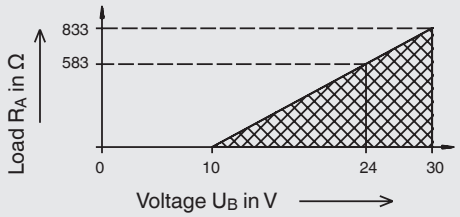
Measuring range		
Temperature range		
Version 4 ... 20 mA (model TR34-x-TT)	Without neck tube -30 ... +150 °C [-22 ... +302 °F] With neck tube -30 ... +250 °C [-22 ... +482 °F] 1) Version with FKM O-ring: -20 ... +125 °C [-4 ... +257 °F]	
Version Pt100 (model TR34-x-Px) / Pt1000 (model TR34-x-Sx)	Class A	Without neck tube -30 ... +150 °C [-22 ... +302 °F] With neck tube -30 ... +250 °C [-22 ... +482 °F] 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]
Unit (4 ... 20 mA version)	Configurable °C, °F, K	
Temperature at the connector (Pt100, Pt1000 version)	Max. 85 °C [185 °F]	
Measuring span (4 ... 20 mA version)	Minimum 20 K, maximum 300 K	

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

Process connection	
Type of process connection	■ G ¼ B ■ G ⅜ B ■ G ½ B ■ ¼ NPT ■ ½ NPT ■ M12 x 1.5 ■ M20 x 1.5 ■ 7/16-20 UNF-2A
Protection tube	
Protection tube diameter	■ 3 mm [0.12 in] ■ 6 mm [0.24 in]
Insertion length U_1	■ 50 mm [1.97 in] ■ 75 mm [2.95 in] 1) ■ 100 mm [3.94 in] 1) ■ 120 mm [4.72 in] 1) ■ 150 mm [5.91 in] 1) ■ 200 mm [7.87 in] 1) ■ 250 mm [9.84 in] 1) ■ 300 mm [11.81 in] 1) ■ 350 mm [13.78 in] 1) ■ 400 mm [15.75 in] 1)
	Other insertion lengths on request
Material (wetted)	Stainless steel 1.4571

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

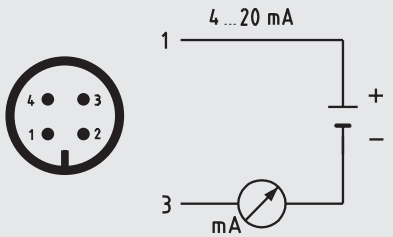
If the resistance thermometer is to be operated in an additional protection tube, a spring-loaded compression fitting must be used.

Output signal (4 ... 20 mA version)	
Analogue output	4 ... 20 mA, 2-wire
Load R_A	$R_A \leq (U_B - 10\ V) / 23\ mA$ with R_A in Ω 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 Ω is admissible.
Load diagram	
Factory configuration	
Measuring range	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 ≤ 3.6 mA upscale ≥ 21.0 mA
Current value for sensor short-circuit	Not configurable in accordance with NAMUR NE 043 downscale ≤ 3.6 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 www.wika.com
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.
Sensor current	< 0.3 mA (self-heating can be ignored)

Electrical connection	
Connection type	M12 x 1 circular connector (4-pin)
Material	Stainless steel 1.4571

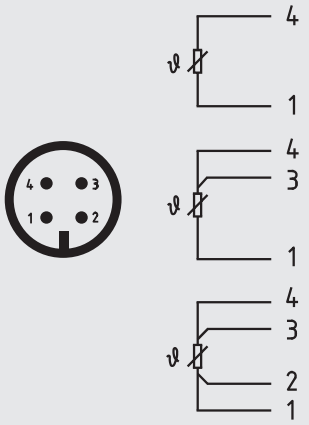
Pin assignment

Output signal 4 ... 20 mA
M12 x 1 circular connector (4-pin)



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

Output signal Pt100 or Pt1000 sensor
M12 x 1 circular connector (4-pin)



Operating conditions	
Ambient temperature range	
Version 4 ... 20 mA (model TR34-x-TT)	-40 ... +85 °C [-40 ... +185 °F] Version with FKM O-ring: -20 °C [-4 °F]
Version Pt100 (model TR34-x-Px) / Pt1000 (model TR34-x-Sx)	-50 ... +85 °C [-58 ... +185 °F] Version with FKM O-ring: -20 °C [-4 °F]
Storage temperature range	-40 ... +85 °C [-40 ... +185 °F] Version with FKM O-ring: -20 °C [-4 °F]
Climate class per IEC 60654-1	
Version 4 ... 20 mA (model TR34-x-TT)	Cx (-40 ... +85 °C [-40 ... +185 °F], 5 ... 95 % r. h.) Version with FKM O-ring: -20 °C [-4 °F]
Version Pt100 (model TR34-x-Px) / Pt1000 (model TR34-x-Sx)	Cx (-50 ... +85 °C [-58 ... +185 °F], 5 ... 95 % r. h.) Version with FKM O-ring: -20 °C [-4 °F]
Maximum permissible humidity, condensation	100 % r. h., condensation allowed
Maximum operating pressure [1) 2)]	
With sensor diameter 3 mm [0.12 in]	140 bar [2,030 psi]
With sensor diameter 6 mm [0.24 in]	270 bar [3,916 psi]
Salt fog	IEC 60068-2-11
Vibration resistance per IEC 60751	10 ... 2,000 Hz, 20 g [1)]
Shock resistance per IEC 60068-2-27	50 g, 6 ms, 3 axes, 3 directions, three times per direction
Ingress protection (IP code)	
Case with connected connector	■ IP67 per IEC/EN 60529 ■ IP69 per IEC/EN 60529 ■ IP69K per ISO 20653 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
Weight	Approx. 0.2 ... 0.7 kg [0.44 ... 1.54 lbs] - depending on version
Material	Stainless steel

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]

Further specifications for explosion-protected version

Thermometer with transmitter and 4 ... 20 mA output signal (model TR34-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 TR34-x-Px) and Pt1000 (model TR34-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_M (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_M (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
CE	**EU declaration of conformity**	European Union
	EMC directive [1)] EN 61326 emission (group 1, class B) and immunity (industrial application)	
	RoHS directive	
Ex	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	

Optional approvals

Logo	Description	Region
IEC IECEx	**IECEx - in combination with ATEX** 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	International
cSAus	**CSA**	USA and Canada
	Safety (e.g. electr. safety, overpressure, ...)	
	Hazardous areas - Ex i (for Canada) Division 1 gas — CL I, DIV 1, GP A, B, C, D, T1 ... T6 Division 2 gas — CL I, DIV 2, GP A, B, C, D, T1 ... T6 Division 1 dust — CL II / III, DIV 1, GP E, F, G, T135 °C Division 2 dust — CL II / III, DIV 2, GP E, F, G, T135 °C Zone 0 gas — Ex ia IIC T1 … T6 Ga Zone 1 gas — Ex ia IIC T1 … T6 Gb Zone 20 dust — Ex ia IIIC T135 °C Da Zone 21 dust — Ex ia IIIC T135 °C Db - Ex i (for USA) Division 1 gas — CL I, DIV 1, GP A, B, C, D, T1 ... T6 Division 2 gas — CL I, DIV 2, GP A, B, C, D, T1 ... T6 Division 1 dust — CL II / III, DIV 1, GP E, F, G, T135 °C Division 2 dust — CL II / III, DIV 2, GP E, F, G, T135 °C Zone 0 gas — CL I, zone 0, IIC AEX ia T1 ... T6 Ga Zone 1 gas — CL I, zone 1, IIC AEX ia T1 ... T6 Gb Zone 20 dust — CL II, zone 20, IIIC AEX ia T135 °C Da Zone 21 dust — CL II, zone 21, IIIC AEX ia T135 °C Db	
EAC Ex	**EAC**	Eurasian Economic Community
	EMC directive [1)]	
	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 135 °C Da X Zone 21 dust — Ex ia IIIC 135 °C Db X	

Logo	Description		Region
	Ex Ukraine Hazardous areas - Ex i Zone 1 gas Zone 0 gas Zone 21 dust Zone 20 dust - Ex n Zone 2 gas	 Ex ia IIC T1 ... T6 Gb Ex ia IIC T3 ... T6 Ga Ex ia IIIC T125 ... T65 °C Db Ex ia IIIC T125 ... T65 °C Da Ex nA IIC T1 ... T6	Ukraine
	CCC [1] Hazardous areas - Ex i Zone 1 gas Zone 1 mounting to zone 0 gas - Ex n Zone 2 gas	 Ex ia IIC T3 ... T6 Gb Ex ia IIC T3 ... T6 Ga/Gb Ex nA IIC T1 ... T6	China
	DNOP - MakNII Mining		Ukraine
	PAC Russia Metrology, measurement technology		Russia
	PAC Kazakhstan Metrology, measurement technology		Kazakhstan
-	**MChS** Permission for commissioning		Kazakhstan
	PAC Belarus Metrology, measurement technology		Belarus
-	**PAC Ukraine** Metrology, measurement technology		Ukraine
	PAC Uzbekistan Metrology, measurement technology		Uzbekistan

1) Only for built-in transmitter

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.

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.

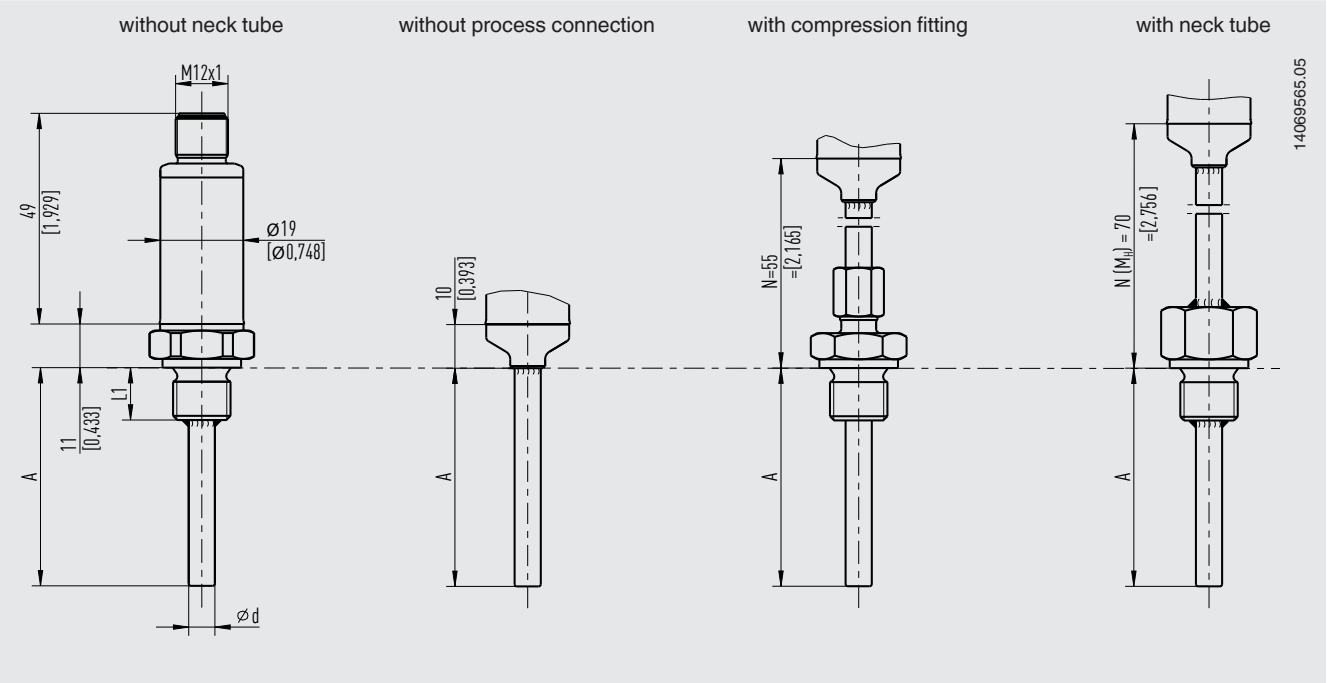
For approvals and certificates, see website

Patents, property rights

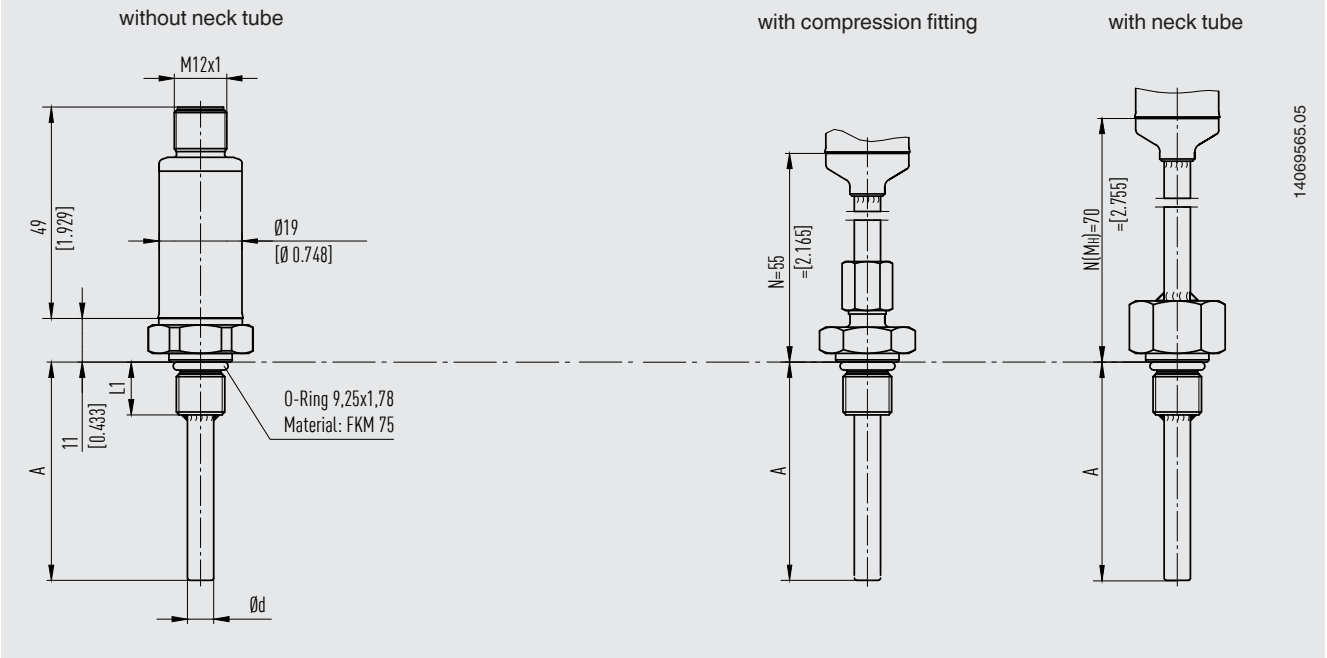
M12 x 1 adapter to DIN EN 175301-803 angular connector (001370985)

Dimensions in mm

Process connection with parallel threads (or without process connection)

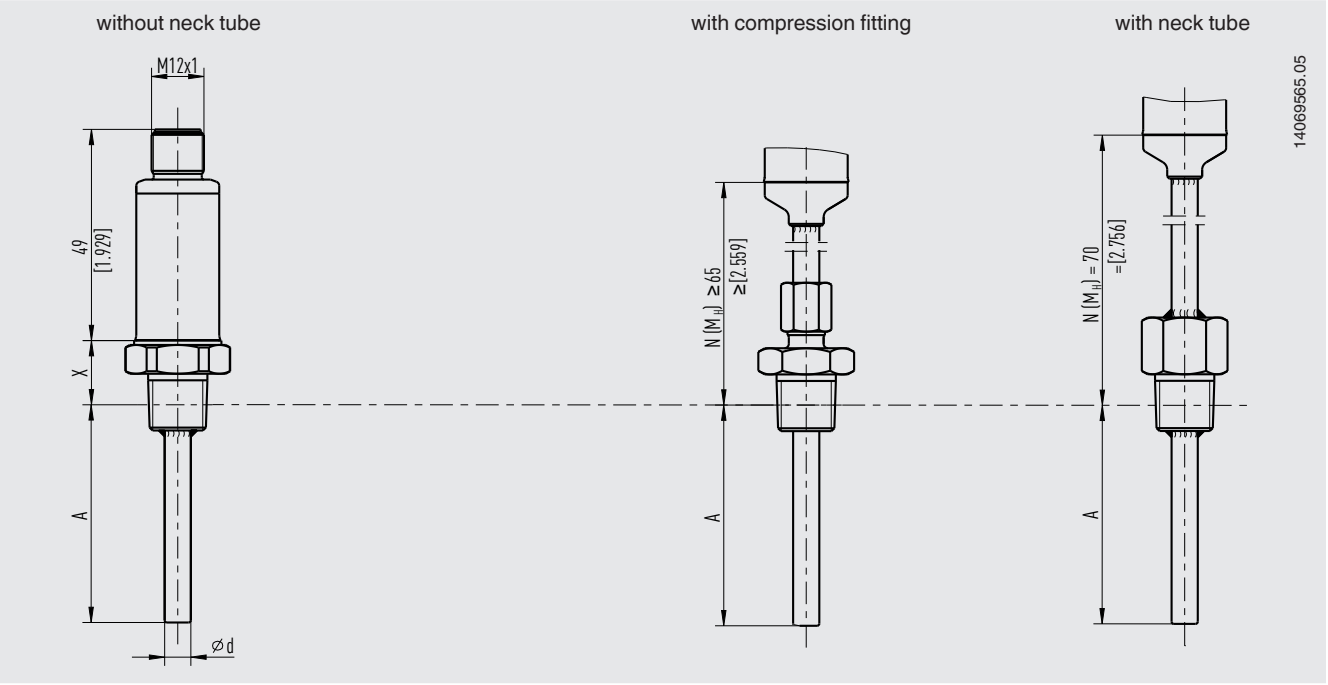


Process connection with parallel thread (7/16-20 UNF-2A) and O-ring



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

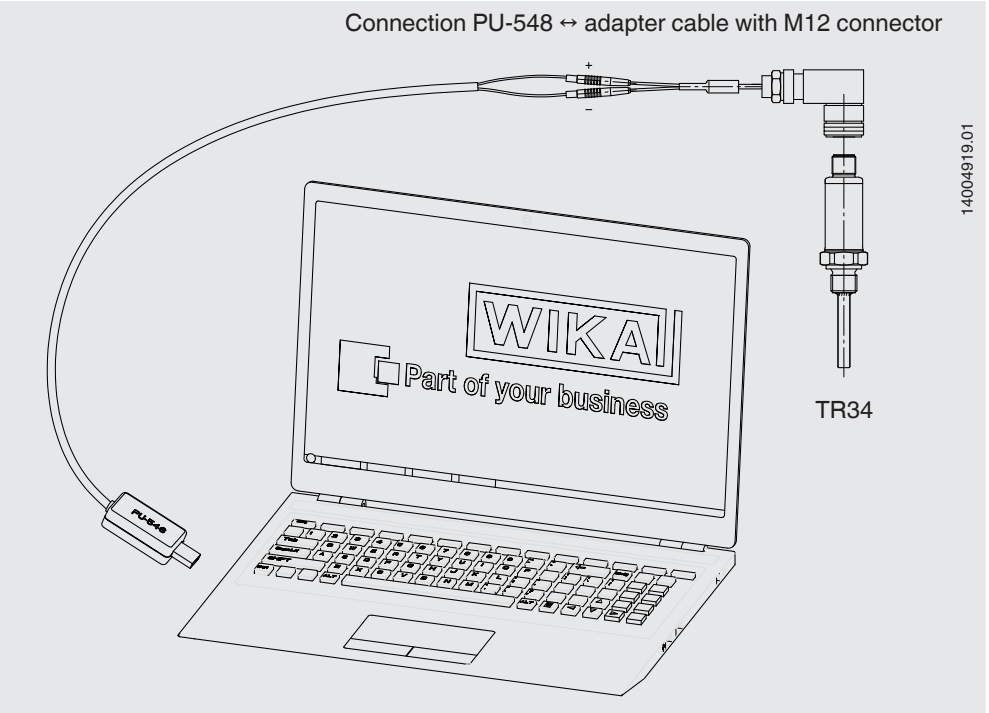


At a process temperature of > 150 °C [302 °F], a neck length N (M_H) of 70 mm [2.76 in] is necessary, otherwise N (M_H) selectable (55 [2.17 in], 65 [2.56 in] or 70 mm [2.76 in]).

Legend:

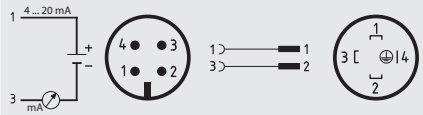
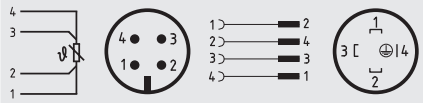
A	Insertion length	Ød	Sensor diameter
L1	Thread length	X	Height process connection
N (M_H)	Neck length		1/4 NPT = 15 mm [0.59 in]
			1/2 NPT = 19 mm [0.75 in]

Connecting the PU-548 programming unit



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

Accessories

Model	Description	Order no.
 **Programming unit Model PU-548**	■ Easy to use ■ LED status display ■ Compact design ■ No further voltage supply needed, neither for the programming unit nor for the transmitter (replaces programming unit model PU-448)	14231581
 **Adapter cable M12 to PU-548**	Adapter cable for the connection of a model TR34 resistance thermometer to the model PU-548 programming unit	14003193
 **M12 x 1 transmitter adapter to DIN EN 175301-803 angular connector** (yellow female connector element)	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 data sheet AC 80.17 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 **M12 x 1 connector** **Angular connector** 	14069503
 **M12 x 1 Pt adapter to DIN EN 175301-803 angular connector** (black female connector element)	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 data sheet AC 80.17 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 **M12 x 1 connector** **Angular connector** 	14061115
 **Angular connector**	Per DIN EN 175301-803 form A	11427567
 **Sealing for angular connector**	For use with angular connector DIN EN 175301-803-A EPDM, brown	11437902

Model		Description		Order no.
-	**M12 connection cable**	Cable socket straight, 4-pin, ingress protection IP67 Temperature range -20 ... +80 °C [-4 ... +176 °F]	Cable length 2 m [6.56 ft]	14086880
			Cable length 5 m [16.40 ft]	14086883
		Angled socket, 4-pin, ingress protection IP67 Temperature range -20 ... +80 °C [-4 ... +176 °F]	Cable length 2 m [6.56 ft]	14086889
			Cable length 5 m [16.40 ft]	14086891
-	**M12 connector**	Female angled, 4-pin, ingress protection IP67 Screw connection for conductor cross-section 0.25 … 0.75 mm² [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]		14136815

Ordering information

Model / Explosion protection / Output signal / Transmitter temperature unit / Process temperature / Transmitter initial value / Transmitter end value / Process connection / Sensor diameter / Insertion length A (U_1) or A (U_2) / Neck length N (M_H) / Accessories / Certificates

WIKA Alexander Wiegand SE & Co. KG
Alexander-Wiegand-Straße 30
63911 Klingenberg/Germany
Tel. +49 9372 132-0
Fax +49 9372 132-406
info@wika.de
www.wika.de