

Resistance thermometer Without thermowell Model TR10-H

WIKA data sheet TE 60.08



for further approvals
see page 2

Applications

- For direct installation into the process
- Machine building
- Motors
- Bearings
- Pipelines and vessels

Special features

- Sensor ranges from $-196 \dots +600 \text{ }^{\circ}\text{C}$ [$-320 \dots +1,112 \text{ }^{\circ}\text{F}$]
- For insertion, screw-in with optional process connection
- Connection head form B or JS
- Explosion-protected versions are available for many approval types (see page 2)

Description

Resistance thermometers without thermowell are particularly suitable for those applications in which the metal sensor tip is mounted directly into bored holes (e.g. in machine components) or directly into the process for any application with no chemically aggressive media or abrasion.

For mounting into a thermowell, a spring-loaded compression fitting should be provided, since only this can press the measuring tip into the bottom of the thermowell. Otherwise a potentially critical force could be exerted on the measuring tip. Mounting is usually made directly into the process. Fastening elements such as threaded fittings, union nuts, etc. can also be used.

The flexible part of the probe is a mineral-insulated cable (sheathed cable). It consists of a stainless steel outer sheath in which the internal lead is pressed and isolated within a high-density ceramic mass. The measuring resistor is connected directly to the internal leads of the sheathed cable and is, therefore, also suitable for use at higher temperatures.



Fig. left: Model TR10-H with connection head BSZ
Fig. right: Model TR10-H with connection head JS

Due to their flexibility and the small possible diameters, sheathed resistance thermometers can also be used in locations that are not easily accessible, since, with the exception of the sensor tip and the transition sleeve of the connection cable, the sheath can be bent to a radius of three times the diameter of the cable.

Please note:

The flexibility of the sheathed resistance thermometer must be considered, especially when the flow rates are relatively high.








Optionally we can fit analogue or digital transmitters from the WIKA range into the connection head of the TR10-H.








Explosion protection (option)

The permissible power, P_{max} , as well as the permissible ambient temperature, for the respective category can be seen on the certificate for hazardous areas or in the operating instructions.

Transmitters have own certificates for hazardous areas. The permissible ambient temperature ranges of the built-in transmitters can be taken from the corresponding transmitter operating instructions and approvals.

Approvals (explosion protection, further approvals)

Logo	Description	Country
 	EU declaration of conformity <ul style="list-style-type: none"> ■ EMC directive ¹⁾ EN 61326 emission (group 1, class B) and immunity (industrial application) ■ RoHS directive ■ ATEX directive (option) Hazardous areas <ul style="list-style-type: none"> - 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 T125 ... T65 °C Da Zone 21 mounting to zone 20 dust II 1/2D Ex ia IIIC T125 ... T65 °C Da/Db Zone 21 dust II 2D Ex ia IIIC T125 ... T65 °C Db - Ex e ²⁾ Zone 1 gas II 2G Ex eb IIC T1 ... T6 Gb ³⁾ Zone 2 gas II 3G Ex ec IIC T1 ... T6 Gc Zone 21 dust II 2D Ex tb IIIC TX °C Db ³⁾ Zone 22 dust II 3D Ex tc IIIC TX °C Dc - Ex n ²⁾ Zone 2 gas II 3G Ex nA IIC T1 ... T6 Gc X Zone 22 dust II 3D Ex tc IIIC TX °C Dc 	European Union
 	IECEx (option) - in conjunction with ATEX Hazardous areas <ul style="list-style-type: none"> - 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 T125 ... T65 °C Da Zone 21 mounting to zone 20 dust Ex ia IIIC T125 ... T65 °C Da/Db Zone 21 dust Ex ia IIIC T125 ... T65 °C Db 	International
	EAC (option) Hazardous areas <ul style="list-style-type: none"> - 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 T80 ... T440 °C Da X Zone 21 dust Ex ia IIIC T80 ... T440 °C Db X - Ex n ²⁾ Zone 2 gas 2Ex nA IIC T6 ... T1 Gc X 	Eurasian Economic Community
	Ex Ukraine (option) Hazardous areas <ul style="list-style-type: none"> - Ex i Zone 0 gas II 1G Ex ia IIC T1 ... T6 Ga Zone 1 gas II 2G Ex ia IIC T1 ... T6 Gb Zone 20 dust II 1D Ex ia IIIC T65°C Da Zone 21 dust II 2D Ex ia IIIC T65°C Db 	Ukraine
	INMETRO (option) Hazardous areas <ul style="list-style-type: none"> - Ex i Zone 0 gas Ex ia IIC T3 ... T6 Ga Zone 1 mounting to zone 0 gas Ex ia IIC T3 ... T6 Ga/Gb Zone 20 dust Ex ia IIIC T125 ... T65 °C Da Zone 21 mounting to zone 20 dust Ex ia IIIC T125 ... T65 °C Da/Db 	Brazil

Logo	Description	Country
	CCC (option) ³⁾ Hazardous areas - Ex i Zone 0 Gas Ex ia IIC T1 ~ T6 Ga Zone 1 Gas Ex ia IIC T1 ~ T6 Gb Zone 2 Gas Ex ic IIC T1 ~ T6 Gc Zone 20 Staub Ex iaD 20 T65/T95/T125°C Zone 21 Staub Ex iaD 21 T65/T95/T125°C - Ex e ²⁾ Zone 1 Gas Ex eb IIC T1 ~ T6 Gb Zone 2 Gas Ex ec IIC T1 ~ T6 Gc - Ex n ²⁾ Zone 2 Gas Ex nA IIC T1 ~ T6 Gc	China
	KCs - KOSHA (option) Hazardous areas - Ex i Zone 0 gas Ex ia IIC T4 ... T6 Zone 1 gas Ex ib IIC T4 ... T6	South Korea
-	PESO (option) 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	India
	GOST (option) Metrology, measurement technology	Russia
	KazInMetr (option) Metrology, measurement technology	Kazakhstan
-	MTSCHS (option) Permission for commissioning	Kazakhstan
	BelGIM (option) Metrology, measurement technology	Belarus
	UkrSEPRO (option) Metrology, measurement technology	Ukraine
	Uzstandard (option) Metrology, measurement technology	Uzbekistan

1) Only for built-in transmitter

2) Not with model JS connection head (see "Connection heads")

3) Without transmitter

Instruments marked with "ia" may also be used in areas only requiring instruments marked with "ib" or "ic".
 If an instrument with "ia" marking has been used in an area with requirements in accordance with "ib" or "ic", it can no longer be operated in areas with requirements in accordance with "ia" afterwards.

Approvals and certificates, see website

Sensor

Measuring element

Pt100, Pt1000 ¹⁾ (measuring current: 0.1 ... 1.0 mA) ²⁾

Connection method	
Single elements	1 x 2-wire 1 x 3-wire 1 x 4-wire
Dual elements	2 x 2-wire 2 x 3-wire 2 x 4-wire ³⁾

Validity limits of class accuracy per EN 60751		
Class	Sensor construction	
	Wire-wound	Thin-film
Class B	-196 ... +600 °C	-50 ... +500 °C
Class A ⁴⁾	-100 ... +450 °C	-30 ... +300 °C
Class AA ⁴⁾	-50 ... +250 °C	0 ... 150 °C

1) Pt1000 only available as a thin-film measuring resistor

2) For detailed specifications for Pt100 sensors, see Technical information IN 00.17 at www.wika.com.

3) Not with 3 mm diameter

4) Not with 2-wire connection method

The table shows the temperature ranges listed in the respective standards, in which the tolerance values (class accuracies) are valid.

- The combinations of a 2-wire connection with class A or class AA are not permissible, since the lead resistance of the MI cable and the connection lead negates the higher sensor accuracy.
- When using a 3-wire connection, we recommend not to exceed a probe length, including the connection cable, of approx. 30 m.
- Longer probe/cable lengths should be designed with a 4-wire connection.

Metal probe

Material: Stainless steel

Diameter: 2, 3, 6 or 8 mm

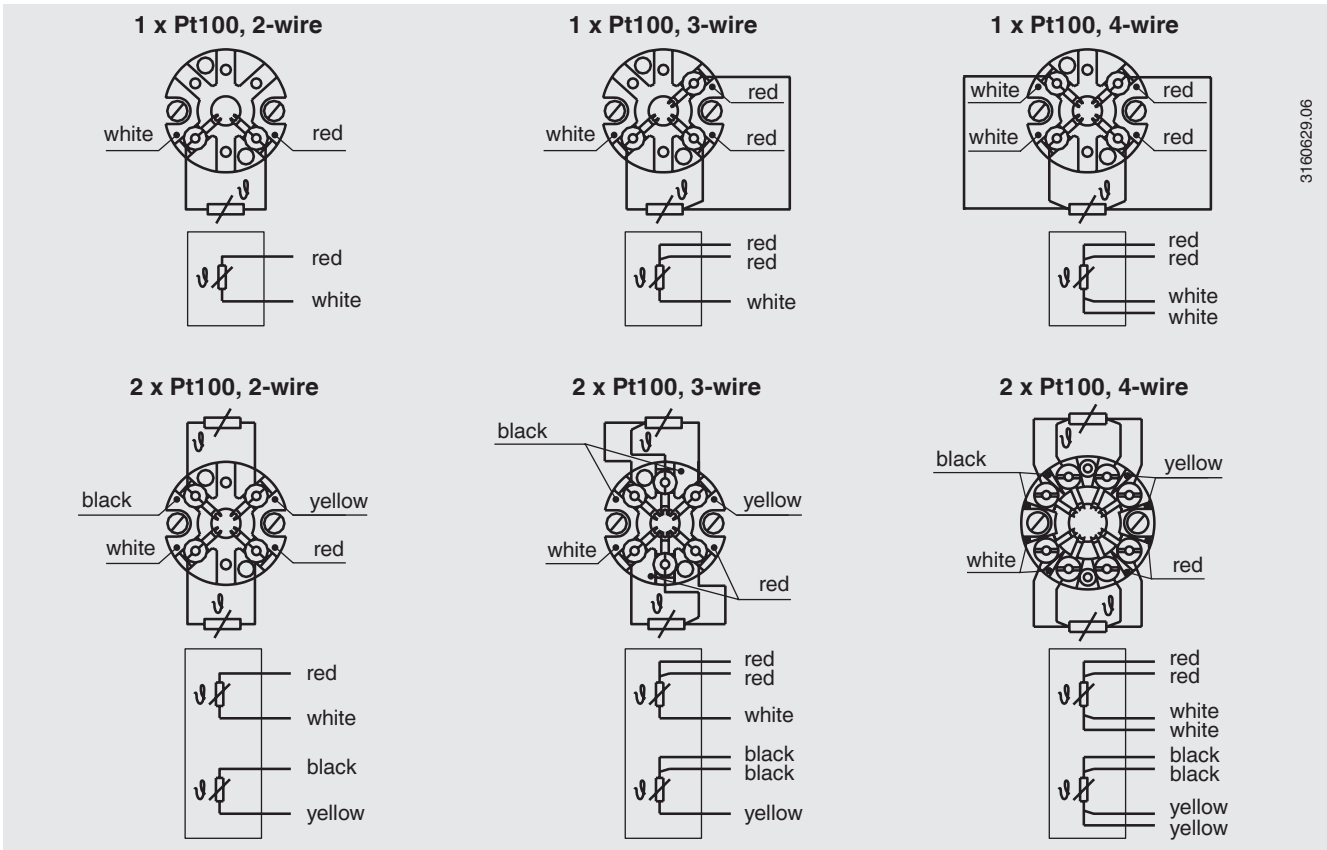
Length: selectable

Regardless of the design, the first 60 mm of the sensor tip must not be bent.

For temperature measurement in a solid body, the diameter of the bore into which the probe should be inserted, should be no more than 1 mm larger than the probe diameter.

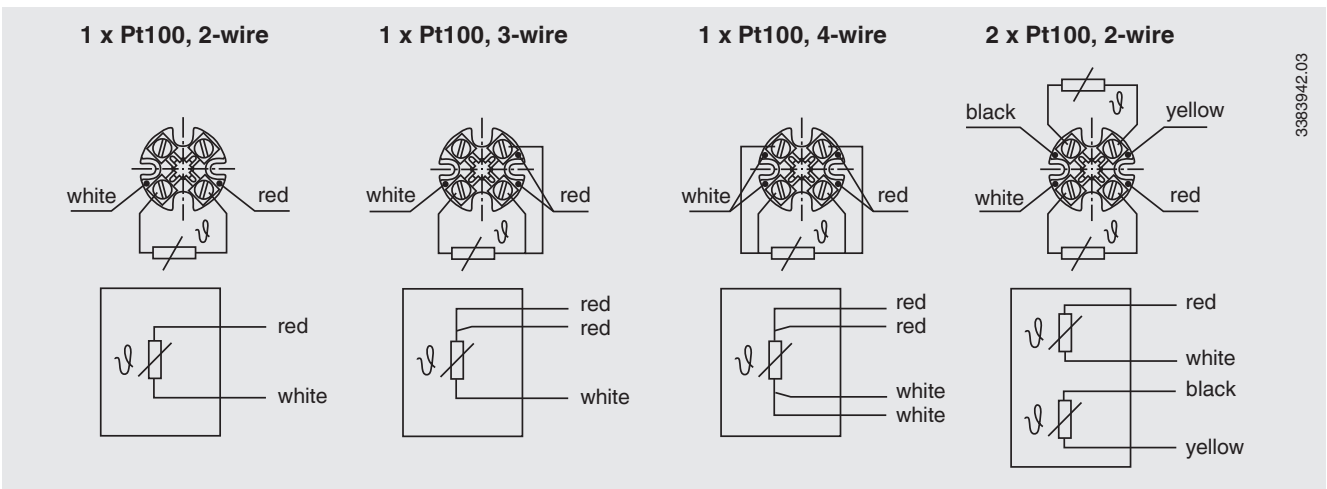
Electrical connection (colour code per IEC/EN 60751)

■ Connection head form B



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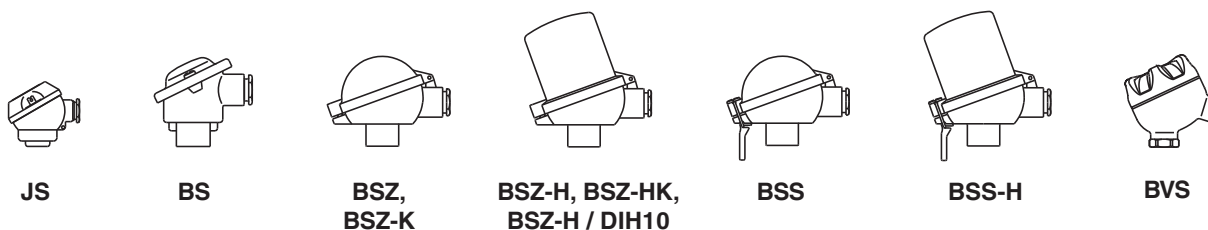
■ Connection head model JS



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For the electrical connections of built-in temperature transmitters see the corresponding data sheets or operating instructions.

Connection head



Model	Material	Cable entry thread size	Ingress protection (max.) ¹⁾ IEC/EN 60529	Cap	Surface	Connection to neck tube
JS	Aluminium	M16 x 1.5 ³⁾	IP65	Cover with 2 screws	Blue, lacquered ⁵⁾	M24 x 1.5, ½ NPT
BS	Aluminium	M20 x 1.5 or ½ NPT ³⁾	IP65 ⁴⁾	Flat cap with 2 screws	Blue, lacquered ⁵⁾	M24 x 1.5, ½ NPT
BSZ	Aluminium	M20 x 1.5 or ½ NPT ³⁾	IP65 ⁴⁾	Spherical hinged cover with cylinder head screw	Blue, lacquered ⁵⁾	M24 x 1.5, ½ NPT
BSZ-H	Aluminium	M20 x 1.5 or ½ NPT ³⁾	IP65 ⁴⁾	Raised hinged cover with cylinder head screw	Blue, lacquered ⁵⁾	M24 x 1.5, ½ NPT
BSZ-H (2x cable outlet)	Aluminium	2 x M20 x 1.5 or 2 x ½ NPT ³⁾	IP65 ⁴⁾	Raised hinged cover with cylinder head screw	Blue, lacquered ⁵⁾	M24 x 1.5
BSZ-H / DIH10 ²⁾	Aluminium	M20 x 1.5 or ½ NPT ³⁾	IP65	Raised hinged cover with cylinder head screw	Blue, lacquered ⁵⁾	M24 x 1.5, ½ NPT
BSS	Aluminium	M20 x 1.5 or ½ NPT ³⁾	IP65	Spherical hinged cover with clamping lever	Blue, lacquered ⁵⁾	M24 x 1.5, ½ NPT
BSS-H	Aluminium	M20 x 1.5 or ½ NPT ³⁾	IP65	Raised hinged cover with clamping lever	Blue, lacquered ⁵⁾	M24 x 1.5, ½ NPT
BVS	Stainless steel	M20 x 1.5 ³⁾	IP65	Precision-cast screw-on lid	Blank, electropolished	M24 x 1.5
BSZ-K	Plastic	M20 x 1.5 or ½ NPT ³⁾	IP65	Spherical hinged cover with cylinder head screw	Black	M24 x 1.5
BSZ-HK	Plastic	M20 x 1.5 or ½ NPT ³⁾	IP65	Raised hinged cover with cylinder head screw	Black	M24 x 1.5

Model	Explosion protection					
	Without	Ex i (gas) Zone 0, 1, 2	Ex i (dust) Zone 20, 21, 22	Ex e (gas) Zone 1, 2	Ex t (dust) Zone 21, 22	Ex nA (gas) Zone 2
JS	x	x	x	-	-	-
BS	x	x	x	-	-	-
BSZ	x	x	x	x ⁶⁾	x ⁶⁾	x ⁷⁾
BSZ-H	x	x	x	x ⁶⁾	x ⁶⁾	x ⁷⁾
BSZ-H (2x cable outlet)	x	x	x	x ⁶⁾	x ⁶⁾	x ⁷⁾
BSZ-H / DIH10 ²⁾	x	x	-	-	-	-
BSS	x	x	-	-	-	-
BSS-H	x	x	-	-	-	-
BVS	x	x	-	-	-	-
BSZ-K	x	x	-	-	-	-
BSZ-HK	x	x	-	-	-	-

1) IP ingress protection of the connection head. The IP ingress protections of the complete instrument TR10-H must not inevitably correspond to the connection head.

2) LED display DIH10

3) Standard (others on request)

4) Ingress protections, which describe temporary or lasting submersion, available on request

5) RAL 5022

6) Only ATEX and CCC

7) Only ATEX, CCC and EAC

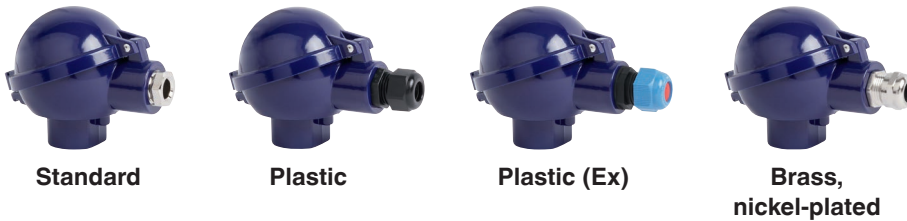
Connection head with digital display (option)



Connection head BSZ-H with LED display model DIH10
see data sheet AC 80.11

To operate the digital displays, a transmitter with a 4 ... 20 mA output is always required.

Cable entry



The figures show examples of connection heads.

Cable entry	Cable entry thread size	Min./max. ambient temperature
Standard cable entry ¹⁾	M20 x 1.5 or ½ NPT	-40 ... +80 °C
Plastic cable gland (cable Ø 6 ... 10 mm) ¹⁾	M20 x 1.5 or ½ NPT	-40 ... +80 °C
Plastic cable gland (cable Ø 6 ... 10 mm), Ex e ¹⁾	M20 x 1.5 or ½ NPT	-20 ... +80 °C (standard) -40 ... +70 °C (option)
Nickel-plated brass cable gland (cable Ø 6 ... 12 mm)	M20 x 1.5 or ½ NPT	-60 ²⁾ / -40 ... +80 °C

Cable entry	Colour	Ingress protection (max.) ³⁾ IEC/EN 60529	Explosion protection					
			without	Ex i (gas) Zone 0, 1, 2	Ex i (dust) Zone 20, 21, 22	Ex e (gas) Zone 1, 2	Ex t (dust) Zone 21, 22	Ex nA (gas) Zone 2
Standard cable entry ¹⁾	Blank	IP65	x	x	-	-	-	-
Plastic cable gland ¹⁾	Black or grey	IP66 ⁴⁾	x	x	-	-	-	-
Plastic cable gland, Ex e ¹⁾	Light blue	IP66 ⁴⁾	x	x	x	-	-	-
Plastic cable gland, Ex e ¹⁾	Black	IP66 ⁴⁾	x	x	x	x	x	x
Nickel-plated brass cable gland	Blank	IP66 ⁴⁾	x	x	x	-	-	-
Nickel-plated brass cable gland, Ex e	Blank	IP66 ⁴⁾	x	x	x	x	x	x

1) Not available for BVS connection head

2) Special version on request (only available with selected approvals), other temperatures on request

3) IP ingress protection of the connection head. The IP ingress protections of the cable entry must not inevitably correspond to the IP ingress protections of the complete instrument TR10-H.

4) Ingress protections, which describe temporary or lasting submersion, available on request

Ingress protection per IEC/EN 60529

Degrees of protection against solid foreign bodies (defined by the first index number)

First index number	Degree of protection / short description	Test parameter
5	Dust-protected	per IEC/EN 60529
6	Dust-tight	per IEC/EN 60529

Degrees of protection against water (defined by the second index number)

Second index number	Degree of protection / short description	Test parameter
4	Protected against splash water	per IEC/EN 60529
5	Protected against water jets	per IEC/EN 60529
6	Protected against strong water jets	per IEC/EN 60529
7 ¹⁾	Protected against the effects of temporary immersion in water	per IEC/EN 60529
8 ¹⁾	Protected against the effects of continuous immersion in water	by agreement

1) Ingress protections, describing temporary or permanent immersion, on request

Standard ingress protection of model TR10-H is IP65.

The stated degrees of protection apply under the following conditions:

- Use of a suitable cable gland
- Use of a cable cross-section appropriate for the gland or select the appropriate cable gland for the available cable
- Adhere to the tightening torques for all threaded connections

Transmitter

Mounting on the terminal plate

With mounting on the terminal plate, the transmitter replaces the terminal block.

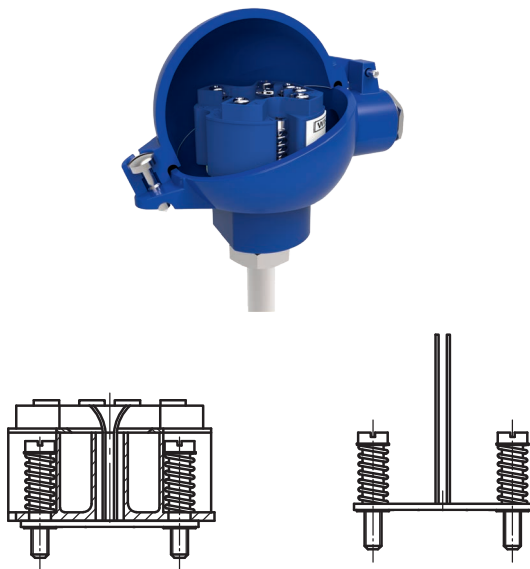
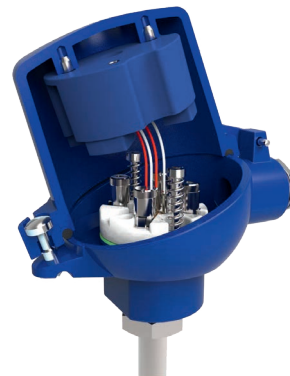


Fig. left: Terminal plate with mounted transmitter (here: model T32)
Fig. right: Terminal plate prepared for transmitter mounting

Mounted within the cap of the connection head

Mounting the transmitter in the cap of the connection head is preferable to mounting it on the terminal plate. With this type of mounting, for one, a better thermal insulation is ensured, and in addition, exchange and mounting for servicing is simplified.



Transmitter models



Output signal 4 ... 20 mA, HART® protocol			
Transmitter (selectable versions)	Model T15	Model T32	Model T91.20
Data sheet	TE 15.01	TE 32.04	TE 91.01
Output			
4 ... 20 mA	x	x	x
HART® protocol	-	x	-
Connection method			
1 x 2-wire, 3-wire or 4-wire	x	x	x
Measuring current	< 0.2 mA	< 0.3 mA	0.8 ... 1 mA
Explosion protection	Optional	Optional	-

Possible mounting positions for transmitters

Connection head	T15	T32	T91.20
JS	-	-	○
BS	○	-	-
BSZ, BSZ-K	○	○	-
BSZ-H, BSZ-HK	●	●	-
BSZ-H (2x cable outlet)	●	●	-
BSZ-H / DIH10	○	○	-
BSS	○	○	-
BSS-H	●	●	-
BVS	○	○	-

○ Mounted instead of terminal block ● Mounted within the cap of the connection head – Mounting not possible

The mounting of a transmitter on the terminal plate is possible with all the connection heads listed here. The fitting of a transmitter in the (screw) cap of a connection head is not possible.

Mounting of 2 transmitters on request.

For a correct determination of the overall measuring deviation, the sensor and transmitter measuring deviations must be added.

Functional safety (option) with temperature transmitter model T32



In safety-critical applications, the entire measuring chain must be taken into consideration in terms of the safety parameters. The SIL classification allows the assessment of the risk reduction reached by the safety installations.

Selected TR10-H resistance thermometers, in combination with a suitable temperature transmitter (e.g. model T32.1S, TÜV certified SIL version for protection systems developed

in accordance with IEC 61508), are suitable as sensors for safety functions to SIL 2.

For detailed specifications, see Technical information IN 00.19 at www.wika.com.

Process connections

The TR10-H sheathed resistance thermometers can be fitted optionally with the process connections shown below. The insertion length A (U_1 or U_2) can be customised. The neck length N (M_H) depends on the type of process connection specified.

To minimise heat dissipation errors via the threaded connection, the insertion length, A , should be at least 25 mm long. The position of the threaded connection is specified by the dimension N (M_H), and is not dependent on the connection type.

■ Without process connection

This version is designed mainly for mounting in one of the available compression fittings. All heads of the size form B and KN can be used.

The neck length N (M_H) here is only the height of the hexagon at the top of the thermowell.
 N (M_H) is always 10 mm.

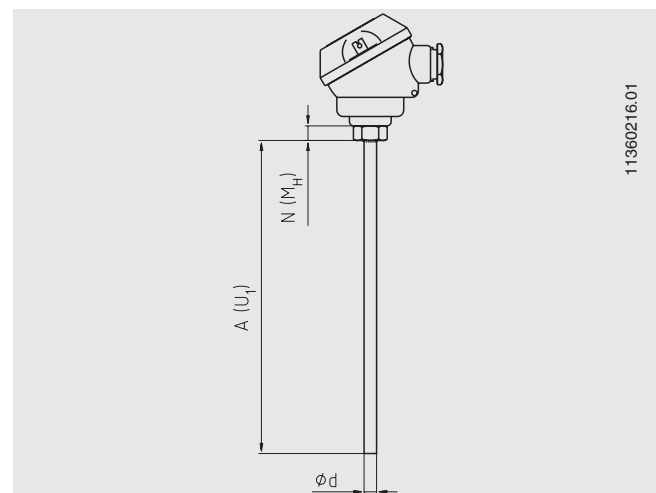
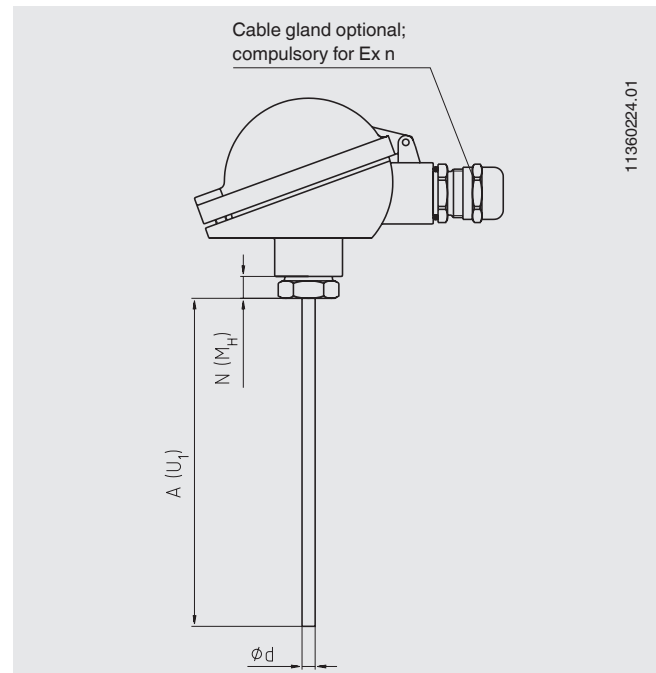
■ Without process connection (miniature version)

This version is designed mainly for mounting in one of the available compression fittings. Only connection heads of the JS design can be used.

The neck length N (M_H) here is only the height of the hexagon at the top of the thermowell.
 N (M_H) is always 7 mm.

Please note:

- For parallel threads (e.g. G ½) the dimensioning always refers to the sealing collar of the threaded connector nearest the process.
- For tapered threads (e.g. NPT) the measurement plane is located approx. in the centre of the thread.



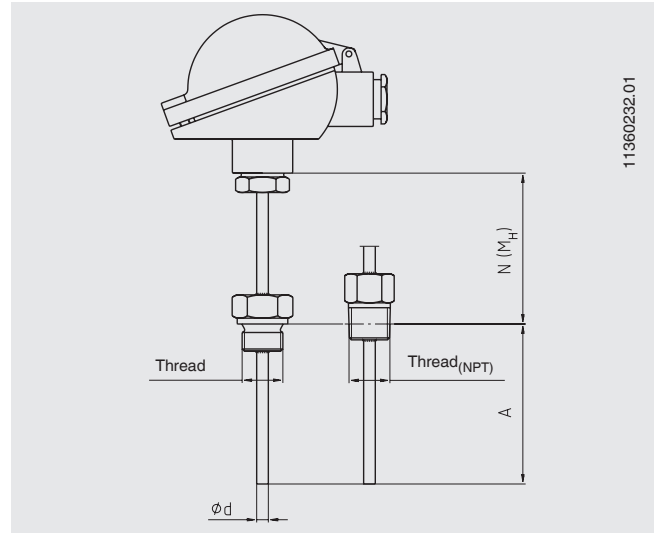
■ **Protruded fixed threaded connection**

This version is used for the mounting of thermometers into threaded couplings with female threads.

Insertion length A: In accordance with customer specification

Material: Stainless steel, others on request

The probe must be rotated in order to screw it into the process. Therefore, this design must first be mounted mechanically and it can then be electrically connected.



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■ **Compression fitting**

This version allows simple adjustment to the required insertion length at the mounting point.

Since the compression fitting is movable on the probe, the A and N (M_H) dimensions define the as-delivered condition. The length of the compression fitting determines the smallest possible neck length N (M_H) of approx. 40 mm.

Material: Stainless steel

Ferrule material: Stainless steel or PTFE

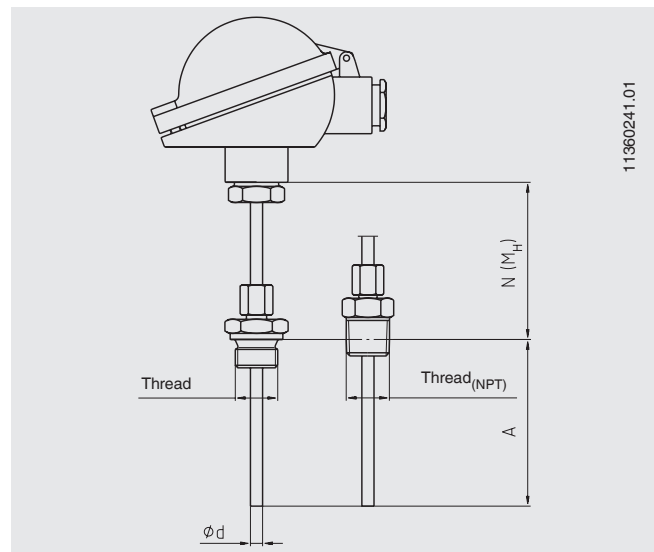
Stainless steel ferrules can be adjusted once; once they have been unscrewed, sliding along the sheath is no longer possible.

- Max. temperature at process connection 500 °C (unpressurised)
- Max. pressure load 20 bar (at max. 150 °C, Ø 6 mm)

PTFE ferrules can be adjusted several times, after unscrewing, repeated sliding along the sheath is still possible.

- Max. temperature at process connection 150 °C
- For use without pressure

For sheathed resistance thermometers with a Ø of 2 mm, only PTFE ferrules are approved.



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■ **Spring-loaded compression fitting**

This version allows easy adjustment to the desired mounting length at the mounting point, while at the same time sustaining the spring pre-tension

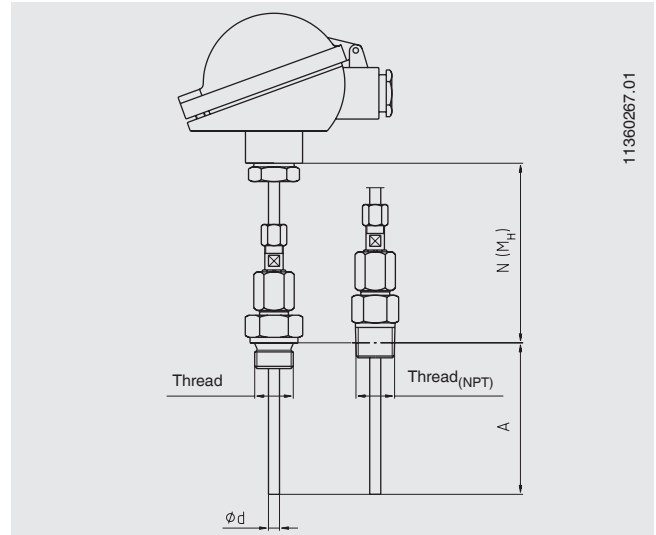
Since the compression fitting is movable on the probe, the A and N (M_H) dimensions define the as-delivered condition. The length of the compression fitting determines the smallest possible neck length N (M_H) of approx. 100 mm.

Material: Stainless steel

Ferrule material: Stainless steel

Stainless steel ferrules can be adjusted once; once they have been unscrewed, sliding along the sheath is no longer possible.

- Max. temperature at process connection 150 °C
- For use without pressure



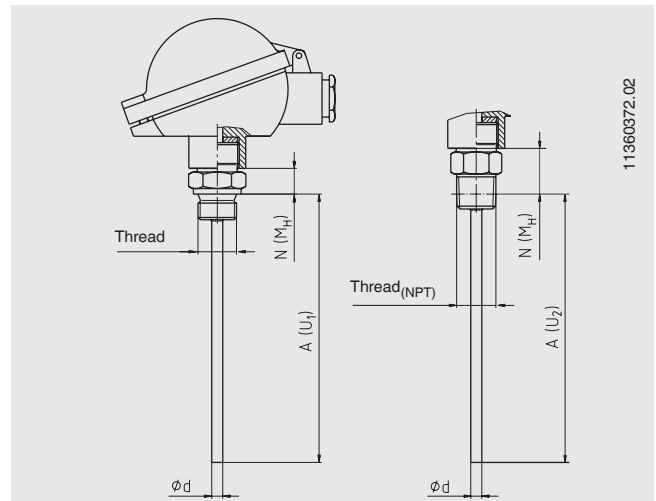
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■ **Double threaded hex bushing**

Using a double-sided threaded nipple, the thermometer can be screwed directly into the process. In this case the permissible temperature ranges must be observed.

The neck length, N (M_H), for parallel threads depends on the height of the hexagon. This is 13 mm.

The neck length, N (M_H), of NPT threads not only includes the hexagon height but also half of the thread height. This gives us a neck length, N (M_H), of approx. 25 mm.



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Operating conditions

Mechanical requirements

Version	
Standard	6 g peak-to-peak, wire-wound measuring resistor or thin film
Option	Vibration-resistant sensor tip, max. 20 g peak-to-peak, thin-film measuring resistor
	Highly vibration-resistant sensor tip, max. 50 g peak-to-peak, thin-film measuring resistor

The information on the vibration resistance refers to the tip of the measuring insert.

For detailed specifications for vibration resistance of Pt100 sensors, see Technical information IN 00.17 at www.wika.com.

Certificates (option)

Certification type	Measurement accuracy	Material certificate
2.2 test report	x	x
3.1 inspection certificate	x	x
DKD/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 DKD/DAkkS is 100 mm. Calibration of shorter lengths on request.

Ordering information

Model / Explosion protection / Connection head / Cable outlet or connection head / Terminal block, transmitter / Process connection / Measuring element / Connection method / Temperature range / Probe diameter / Insertion length / Neck length / Certificates / Options

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The specifications given in this document represent the state of engineering at the time of publishing.
We reserve the right to make modifications to the specifications and materials.

Maximum working temperatures

The maximum temperatures for this thermometer are limited by different parameters:

■ Sensor

The temperature measuring range is limited by the sensor itself. Depending on the accuracy class and operating conditions the optimum can be chosen.

Outside of the defined measuring range the measurement is no longer accurate and the sensor can be damaged.

■ Connection head

Permissible ambient temperature of the connection head: 80 °C

■ Working temperature

If the temperature to be measured is higher than the permissible temperature at the connection head, the metal part of the sensor must be long enough to be outside of the hot zone.

■ Ambient and storage temperature

-40 ... +80 °C

Other ambient and storage temperatures on request

