

Thermocouple Without thermowell Model TC10-H

WIKA data sheet TE 65.08



for further approvals
see page 2

Applications

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

Special features

- Sensor ranges from -40 ... +1,200 °C (-40 ... + 2,192 °F)
- For insertion, screw-in with optional process connection
- Connection head form B or JS
- Explosion-protected versions



Fig. left: Model TC10-H with connection head BSZ

Fig. right: Model TC10-H with connection head JS

Description

Thermocouples 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, which contains the insulated internal leads, embedded within a high-density ceramic compound and is also suitable for use at higher temperatures.







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

Explosion protection (option)









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

Built-in transmitters have their own EC-type examination certificate. The permissible ambient temperature ranges of the built-in transmitters can be taken from the corresponding transmitter approval. The system operator is responsible for using suitable thermowells.

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 n ²⁾ Zone 2 gas [II 3G Ex nA IIC T1 ... T6 Gc X] Zone 22 dust [II 3D Ex tc IIIC T440 ... T80 °C Dc X] 	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 T3/T4/T5/T6] Zone 1 gas [1 Ex ib IIC T3/T4/T5/T6] Zone 20 dust [DIP A20 Ta 65 °C/Ta 95 °C/Ta 125 °C] Zone 21 dust [DIP A21 Ta 65 °C/Ta 95 °C/Ta 125 °C] 	Eurasian Economic Community
	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 ib IIC T3 ... T6 Ga/Gb] Zone 1 gas [Ex ib IIC T3 ... T6 Gb] Zone 20 dust [Ex ia IIIC T125 ... T65 °C Da] Zone 21 mounting to zone 20 dust [Ex ib IIIC T125 ... T65 °C Da/Db] Zone 21 dust [Ex ib IIIC T125 ... T65 °C Db] 	Brazil

1) Only for built-in transmitter

Logo	Description	Country
	NEPSI (option) Hazardous areas - Ex i Zone 0 gas [Ex ia IIC T3 ~ T6] Zone 1 mounting to zone 0 gas [Ex ia/ib IIC T3 ~ T6] Zone 1 gas [Ex ib IIC T3 ~ T6]	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 gas [Ex ib IIC T3 ... T6 Gb]	India
	DNOP - MakNII (option) Hazardous areas - Ex i Zone 0 gas [II 1G Ex ia IIC T3, T4, T5, T6 Ga] Zone 1 mounting to zone 0 gas [II 1/2G Ex ib IIC T3, T4, T5, T6 Ga/Gb] Zone 1 gas [II 2G Ex ia IIC T3, T4, T5, T6 Gb] Zone 20 dust [II 1D Ex ia IIIC T65, T95, T125 °C Da] Zone 21 mounting to zone 20 dust [II 1/2D Ex ib IIIC T65, T95, T125 °C Da/Db] Zone 21 dust [II 2D Ex ib IIIC T125 ... T65 °C Db]	Ukraine
	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

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

Thermocouple per IEC 60584-1 or ASTM E230

Types K, J, E, N, T (single or dual thermocouple)

Sensor types

Type	Operating temperatures of the thermocouple			
	IEC 60584-1		ASTM E230	
	Class 2	Class 1	Standard	Special
K	-40 ... +1,200 °C	-40 ... +1,000 °C	0 ... 1,260 °C	
J	-40 ... +750 °C	-40 ... +750 °C	0 ... 760 °C	
E	-40 ... +900 °C	-40 ... +800 °C	0 ... 870 °C	
N	-40 ... +1,200 °C	-40 ... +1,000 °C	0 ... 1,260 °C	
T	-40 ... +350 °C		0 ... 370 °C	

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

The actual operating temperature of the thermometer is limited both by the maximum permissible operating temperature and the diameter of the thermocouple and the sheathed cable, as well as by the maximum permissible working temperature of the thermowell material.

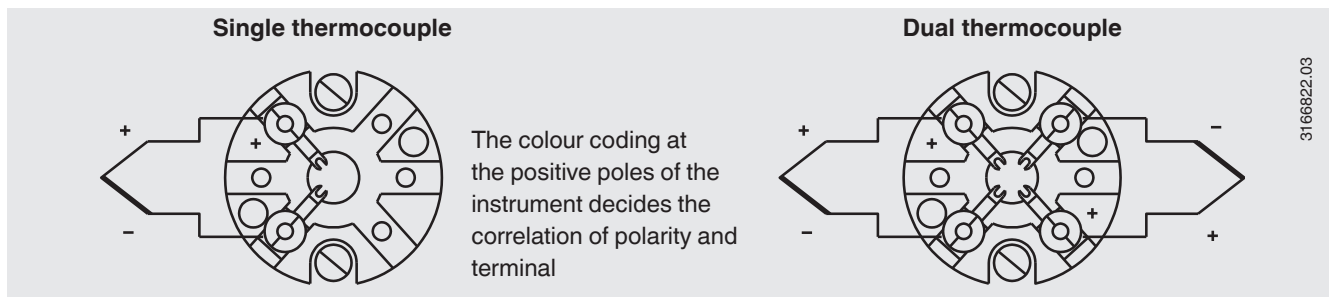
Listed models are available both as single or dual thermocouples. The thermocouple will be delivered with an ungrounded measuring point, unless explicitly specified otherwise.

For detailed specifications for thermocouples, see IEC 60584-1 or ASTM E230 and Technical information IN 00.23 at www.wika.com.

Tolerance value

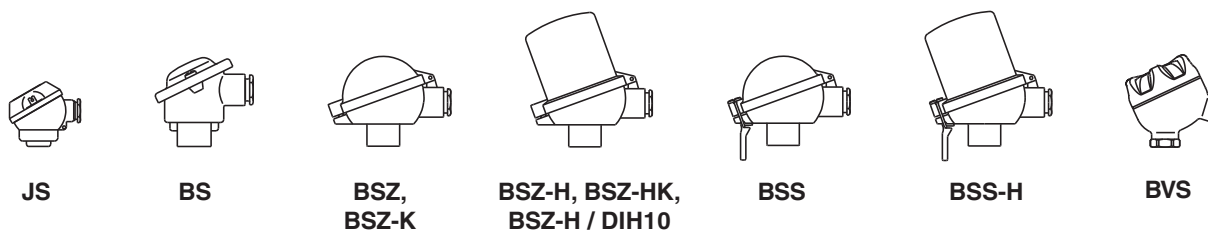
For the tolerance value of thermocouples, a cold junction temperature of 0 °C has been taken as the basis.

Electrical connection



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⁾	Cap	Surface	Connection to neck tube
JS	Aluminium	M16 x 1.5 ³⁾	IP65	Cap with 2 screws	Blue, lacquered ⁴⁾	M24 x 1.5, ½ NPT
BS	Aluminium	M20 x 1.5 or ½ NPT ³⁾	IP65, IP68	Flat cap with 2 screws	Blue, lacquered ⁴⁾	M24 x 1.5, ½ NPT
BSZ	Aluminium	M20 x 1.5 or ½ NPT ³⁾	IP65, IP68	Spherical hinged cover with cylinder head screw	Blue, lacquered ⁴⁾	M24 x 1.5, ½ NPT
BSZ-H	Aluminium	M20 x 1.5 or ½ NPT ³⁾	IP65, IP68	Raised hinged cover with cylinder head screw	Blue, lacquered ⁴⁾	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, IP68	Raised hinged cover with cylinder head screw	Blue, lacquered ⁴⁾	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 ⁴⁾	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 ⁴⁾	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 ⁴⁾	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 nA (gas) Zone 2	Ex tc (dust) Zone 22
JS	x	x	x	-	-
BS	x	x	-	-	-
BSZ	x	x	x	x	x
BSZ-H	x	x	x	x	x
BSZ-H (2x cable outlet)	x	x	x	x	x
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) The ingress protection refers to the connection head, for information on the cable glands, see page 7

2) DIH10 LED display

3) Standard (others on request)

4) RAL 5022

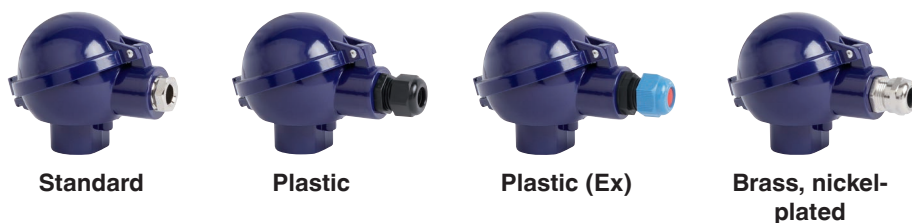
Connection head with digital display (option)



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
Standard cable entry ¹⁾	M20 x 1.5 or ½ NPT
Plastic cable gland (cable Ø 6 ... 10 mm) ¹⁾	M20 x 1.5 or ½ NPT
Nickel-plated brass cable gland (cable Ø 6 ... 12 mm)	M20 x 1.5 or ½ NPT

Cable entry	Colour	Ingress protection (max.)	Min./max. ambient temperature	Explosion protection				
				without	Ex i (gas) Zone 0, 1, 2	Ex i (dust) Zone 20, 21, 22	Ex nA (gas) Zone 2	Ex tc (dust) Zone 22
Standard cable entry ¹⁾	Blank	IP65	-40 ... +80 °C	x	x	-	-	-
Plastic cable gland ¹⁾	Black or grey	IP66, IP68	-40 ... +80 °C	x	-	-	-	-
Plastic cable gland, Ex e ¹⁾	Light blue	IP66, IP68	-20 ... +80 °C (standard) -40 ... +70 °C (option)	x	x	x	-	-
Plastic cable gland, Ex e ¹⁾	Black	IP66, IP68	-20 ... +80 °C (standard) -40 ... +70 °C (option)	x	-	-	x	x
Nickel-plated brass cable gland	Blank	IP66, IP68	-60 ²⁾ / -40 ... +80 °C	x	-	-	-	-
Nickel-plated brass cable gland, Ex e	Blank	IP66, IP68	-60 ²⁾ / -40 ... +80 °C	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

Ingress protection

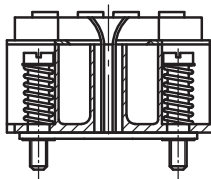
to IP65, IP68 per IEC/EN 60529 under the following conditions:

- 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

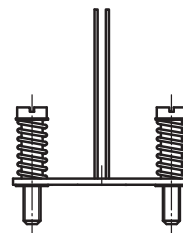
Transmitter

Mounting onto the terminal plate

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



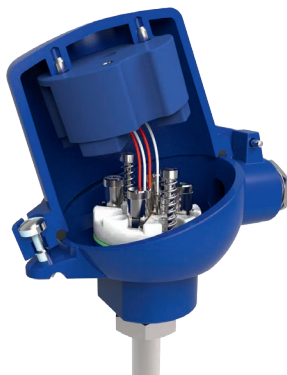
Terminal plate with mounted transmitter
(here: Model T32)



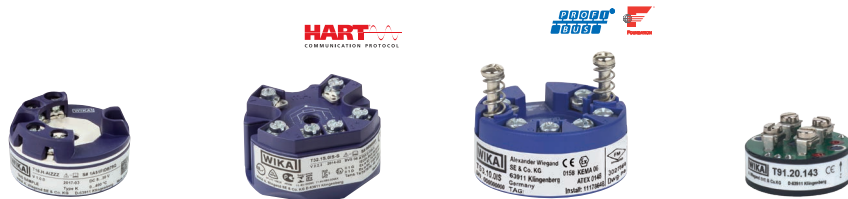
Terminal plate prepared for transmitter
mounting

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, FOUNDATION™ Fieldbus and PROFIBUS® PA				
Transmitter (selectable versions)	Model T16	Model T32	Model T53	Model T91.20
Data sheet	TE 16.01	TE 32.04	TE 53.01	TE 91.01
Output				
■ 4 ... 20 mA	x	x		x
■ HART® protocol		x		
■ FOUNDATION™ Fieldbus and PROFIBUS® PA			x	
Input				
■ Thermocouples IEC 60584-1	K, J, E, N, T	K, J, E, N, T	K, J, E, N, T	K, J, T
Explosion protection	Optional	Optional	Standard	-

Possible mounting positions for transmitters

Connection head	T16	T32	T53	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 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.

Process connections

The TC10-H sheathed thermocouples 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 the process connection selected.

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.

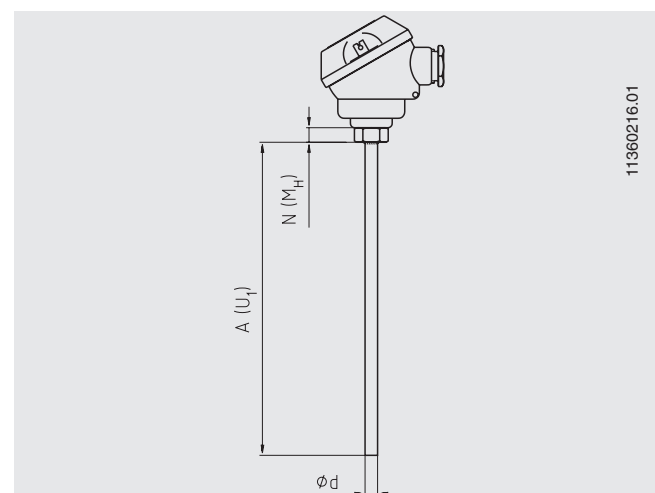
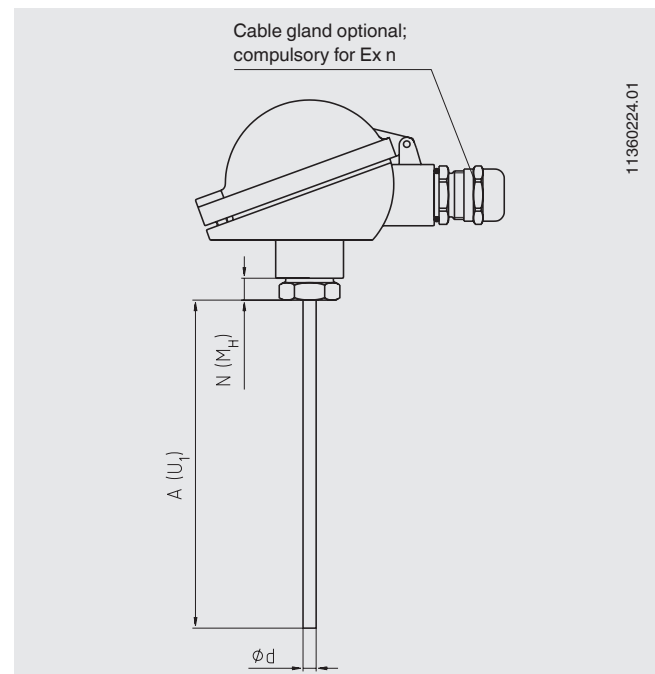
■ Without process connection (miniature version)

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.



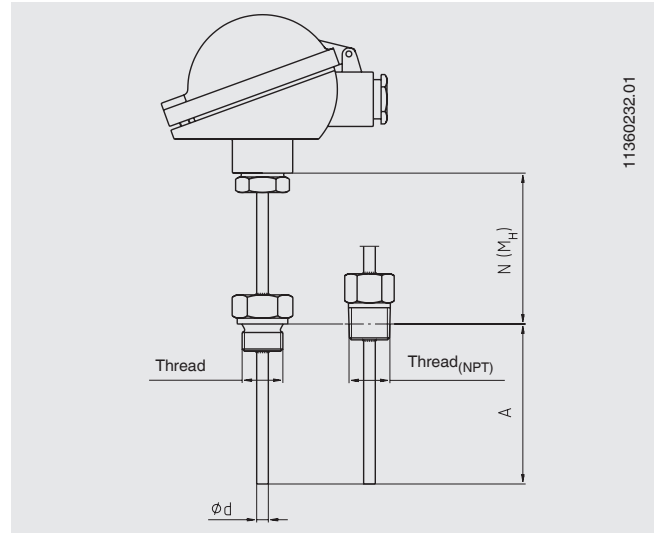
■ Protruded fixed thread

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.



■ 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

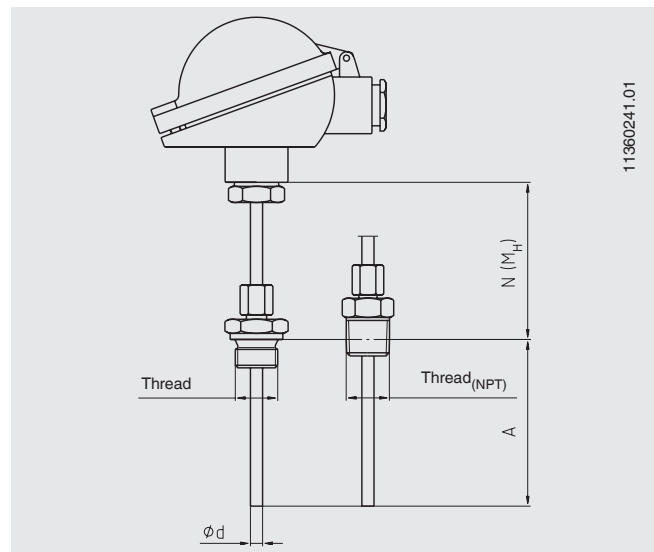
Stainless steel ferrules can be adjusted once; once they have been unscrewed, sliding along the sheath is no longer possible.

- Max. temperature at process connection 500 °C
- Max. pressure load 40 bar

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

- Max. temperature at process connection 150 °C
- Max. pressure load 25 bar

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



■ **Spring-loaded compression fitting**

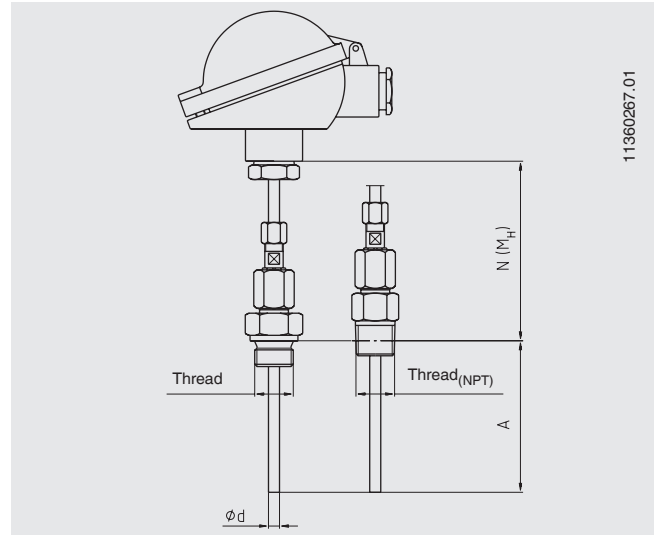
This version allows easy adjustment to the desired insertion length at the mounting point, while at the same time sustaining the spring pre-tension

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. 80 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 500 °C
- Pressure load is not provided for



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■ **Spring-loaded compression fitting, can work with pressures up to max. 8 bar**

allows easy adjustment to the desired insertion length at the mounting point, while at the same time maintaining the spring pre-tension, intended for use with hydraulic oil

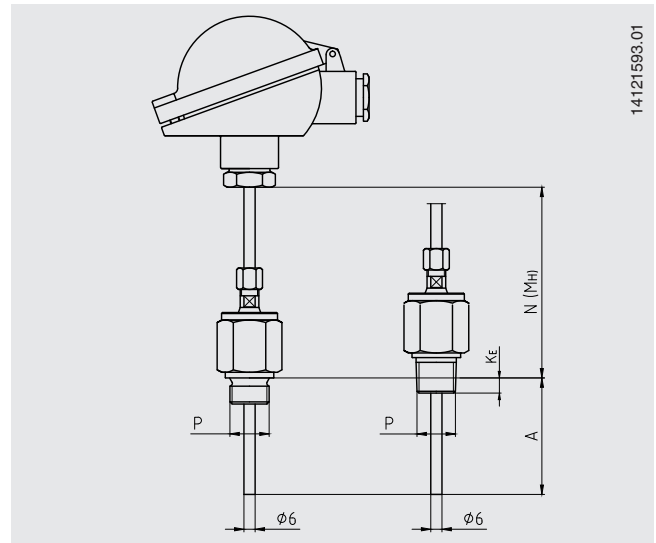
Since the compression fitting is movable on the probe, the A and N (M_H) dimensions define the as-delivered condition. The length of the compression fitting determines the smallest possible neck length N (M_H) of approx. 80 mm.

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.

- Permissible temperature at process connection -30 ... +100 °C

A pressure load on the spring-loaded compression fitting is permissible up to a max. 8 bar.



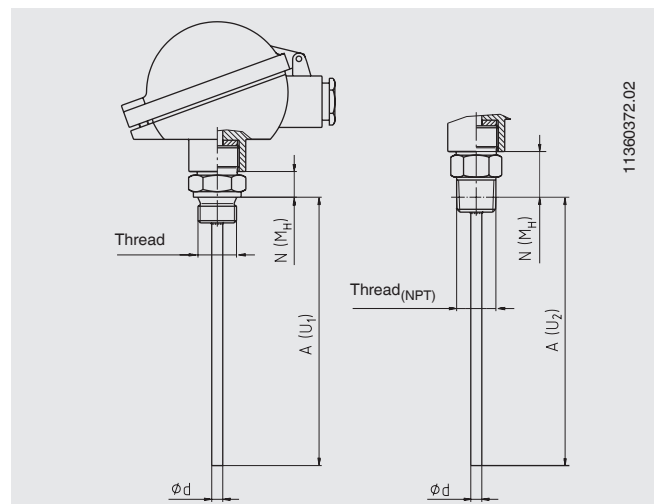
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■ **Double threaded hex bushing**

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.

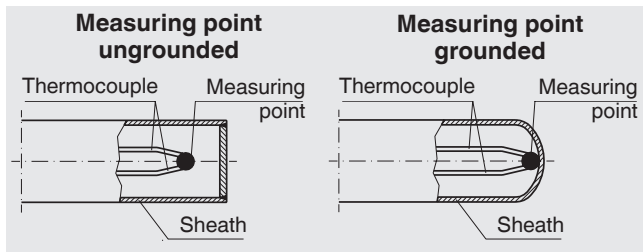
The neck length, N (M_H), for parallel threads depends on the height of the hexagon. This is 13 mm.

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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Probe tip designs



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.

Sheathed thermocouples may be flexed with a radius 3-times of the sheath diameter.

Sheath diameter:

- 3.0 mm
- 4.5 mm
- 6.0 mm
- 8.0 mm

Others on request

Please note:

The flexibility of the sheathed thermocouple must be considered, especially when the flow rates are relatively high. Designs in which the process connection is not located directly at the connection head should be considered critical in applications where vibratory or oscillating stresses occur.

Sheath material

- Ni alloy: Alloy 600
 - up to 1,200 °C (air)
 - standard material for applications which require specific corrosion-resistant properties under exposure to high temperatures, resistant to induced stress corrosion cracking and pitting corrosion in media containing chloride
 - resistant to corrosion caused by aqueous ammonia in all temperatures and concentrations
 - highly resistant to halogens, chlorine, hydrogen chloride
- Stainless steel
 - up to 850 °C (air)
 - good resistance against aggressive media and also against vapour and combustion gases in chemical media

Others on request

Operating conditions

Ambient and storage temperature

-40 ... +80 °C

Other ambient and storage temperatures on request

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.

Ordering information

Model / Explosion protection / Connection head / Cable outlet / Terminal block, transmitter / Version of the threaded connection / Measuring element / Temperature range / Probe diameter / Materials / Thread size / Neck length / Insertion length / Certificates / Options

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