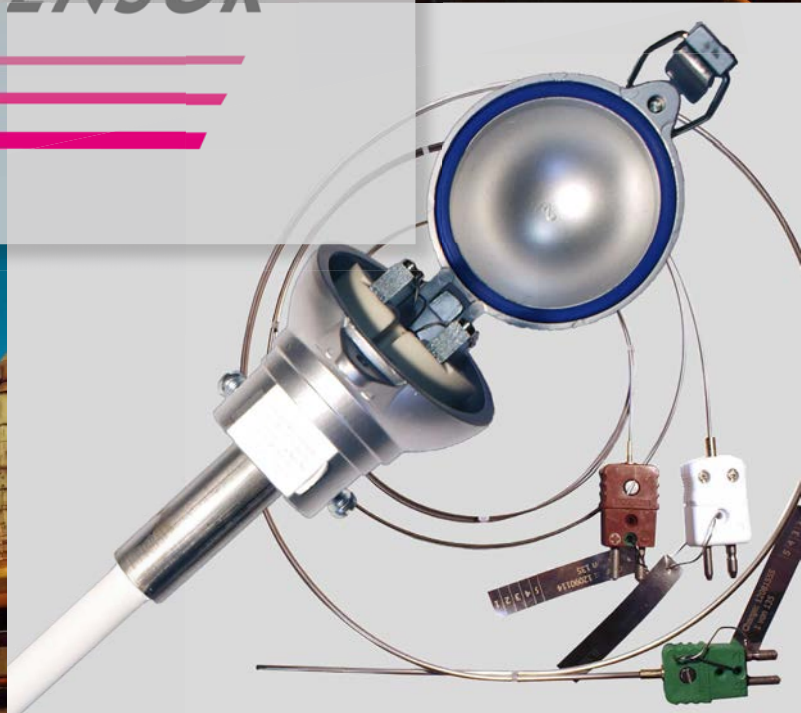




*The sensor  
makes the difference!*



# Innovative Temperature Measurement in Heat Treatment Processes



# Straight Thermocouple with metallic protection tube

## Thermocouple:

according to  
DIN EN 60584

|                                                                                   |                                               |                                                                                   |                                                |
|-----------------------------------------------------------------------------------|-----------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------|
|  | <input type="checkbox"/> Type K (NiCr-Ni)     |  | <input type="checkbox"/> Type J (Fe-CuNi)      |
|  | <input type="checkbox"/> Type N (NiCrSi-NiSi) |  | <input type="checkbox"/> Type S (Pt10Rh-Pt)    |
|  | <input type="checkbox"/> Type R (Pt13Rh-Pt)   |  | <input type="checkbox"/> Type B (Pt30Rh-Pt6Rh) |
| <input type="checkbox"/> others _____                                             |                                               |                                                                                   |                                                |

## Number of TC's:

☐ single      ☐ double      ☐ triple

## Wire Strength:

☐ 0.35 mm      ☐ 0.5 mm      ☐ 1.5 mm  
☐ 3.0 mm      ☐ others \_\_\_\_\_

## Connection Head:

|                             |                                       |                              |                               |                               |
|-----------------------------|---------------------------------------|------------------------------|-------------------------------|-------------------------------|
| <input type="checkbox"/> A  | <input type="checkbox"/> AUS          | <input type="checkbox"/> AUZ | <input type="checkbox"/> AUSH | <input type="checkbox"/> AUZH |
| <input type="checkbox"/> B  | <input type="checkbox"/> BUS          | <input type="checkbox"/> BUZ | <input type="checkbox"/> BUSH | <input type="checkbox"/> BUZH |
| <input type="checkbox"/> MA | <input type="checkbox"/> others _____ |                              |                               |                               |

## Transmitter:

☐ without transmitter  
☐ with transmitter  
please specify \_\_\_\_\_

## Flange:

☐ without  
☐ with  
please specify DN/PN \_\_\_\_\_

## Inner Protection Tube:

☐ ceramic C610      ☐ ceramic C799  
☐ without

## Protection Tube:

steel      ☐ mat.-no. 1.0305      ☐ mat.-no. 1.4571  
heat resistant steel  
☐ mat.-no. 1.4749      ☐ mat.-no. 1.4762  
☐ mat.-no. 1.4841      ☐ mat.-no. 2.4816

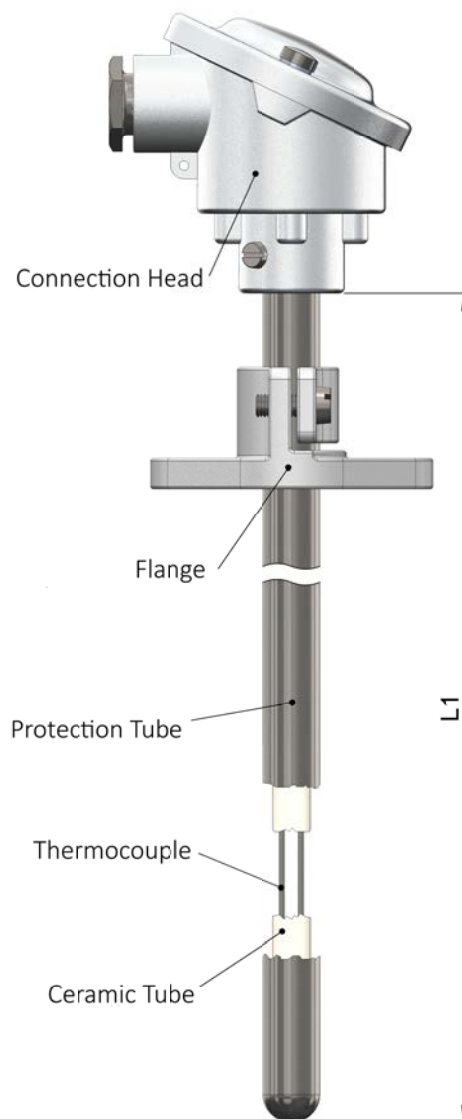
## Protection Tube Dim.:

☐ 15.0 x 2.0 mm  
☐ 22.0 x 2.0 mm  
special dimensions on request

## Nominal Length "L1": please specify \_\_\_\_\_ mm

## Accessories:

☐ gas-tight threaded sleeve



# Straight Thermocouple

## with metallic protection tube and mineral insulated measuring insert

### Thermocouple:

according to  
DIN EN 60584



☐ Type K (NiCr-Ni)



☐ Type J (Fe-CuNi)



☐ Type N (NiCrSi-NiSi)

☐ others \_\_\_\_\_

### Number of TC's:

☐ single

☐ double

☐ triple

### Measuring Insert:

☐ 3.0 mm

☐ 6.0 mm

☐ 8.0 mm

☐ others \_\_\_\_\_

### Connection Head:

☐ A

☐ AUS

☐ AUZ

☐ AUSH

☐ AUZH

☐ B

☐ BUS

☐ BUZ

☐ BUSH

☐ BUZH

☐ MA

☐ others \_\_\_\_\_

### Protection Tube:

steel

☐ mat.-no. 1.0305

☐ mat.-no. 1.4571

heat resistant steel

☐ mat.-no. 1.4749

☐ mat.-no. 1.4762

☐ mat.-no. 1.4841

☐ mat.-no. 2.4816

### Protection Tube Dim.:

☐ 15.0 x 2.0 mm

☐ 22.0 x 2.0 mm

special dimensions on request

### Inner Protection Tube:

☐ ceramic C610

☐ ceramic C799

☐ without

Nominal Length "L1": please specify \_\_\_\_\_ mm

### Accessories:

☐ gas-tight threaded sleeve

☐ flange

please specify DN/PN \_\_\_\_\_

# Straight Thermocouple with ceramic protection tube

## Thermocouple:

according to  
DIN EN 60584

|                                                                                   |                                               |                                                                                   |                                                |
|-----------------------------------------------------------------------------------|-----------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------|
|  | <input type="checkbox"/> Type K (NiCr-Ni)     |  | <input type="checkbox"/> Type J (Fe-CuNi)      |
|  | <input type="checkbox"/> Type N (NiCrSi-NiSi) |  | <input type="checkbox"/> Type S (Pt10Rh-Pt)    |
|  | <input type="checkbox"/> Type R (Pt13Rh-Pt)   |  | <input type="checkbox"/> Type B (Pt30Rh-Pt6Rh) |
| <input type="checkbox"/> others _____                                             |                                               |                                                                                   |                                                |

## Number of TC's:

☐ single ☐ double ☐ triple

## Wire Strength:

☐ 0.35 mm ☐ 0.5 mm ☐ 1.5 mm  
☐ 3.0 mm ☐ others \_\_\_\_\_

## Connection Head:

|                             |                                       |                              |                               |                               |
|-----------------------------|---------------------------------------|------------------------------|-------------------------------|-------------------------------|
| <input type="checkbox"/> A  | <input type="checkbox"/> AUS          | <input type="checkbox"/> AUZ | <input type="checkbox"/> AUSH | <input type="checkbox"/> AUZH |
| <input type="checkbox"/> B  | <input type="checkbox"/> BUS          | <input type="checkbox"/> BUZ | <input type="checkbox"/> BUSH | <input type="checkbox"/> BUZH |
| <input type="checkbox"/> MA | <input type="checkbox"/> others _____ |                              |                               |                               |

## Flange:

☐ without  
☐ with  
 please specify DN/PN \_\_\_\_\_

## Supporting Tube "L2":

steel ☐ mat.-no. 1.0305 ☐ mat.-no. 1.4571  
 heat resistant steel  
☐ mat.-no. 1.4749 ☐ mat.-no. 1.4762  
☐ mat.-no. 1.4841 ☐ mat.-no. 2.4816  
 please specify \_\_\_\_\_ mm

## Inner Protection Tube:

☐ ceramic C610 ☐ ceramic C799  
☐ without

## Protection Tube:

☐ ceramic C530 ☐ ceramic C610  
☐ ceramic C799

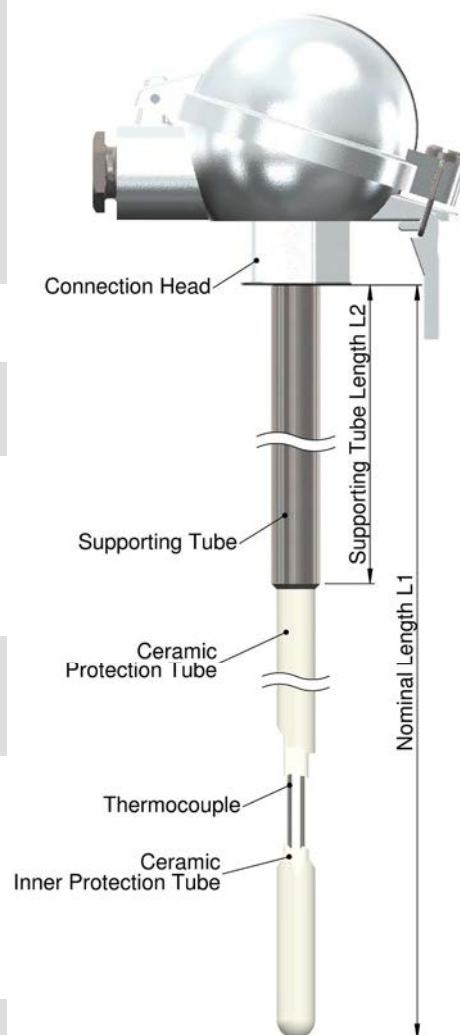
## Protection Tube Dim.:

|                                        |                                        |
|----------------------------------------|----------------------------------------|
| <input type="checkbox"/> 10.0 x 1.5 mm | <input type="checkbox"/> 10.0 x 2.0 mm |
| <input type="checkbox"/> 15.0 x 2.0 mm | <input type="checkbox"/> 15.0 x 2.5 mm |
| <input type="checkbox"/> 24.0 x 2.0 mm | <input type="checkbox"/> 24.0 x 3.0 mm |
| special dimensions on request          |                                        |

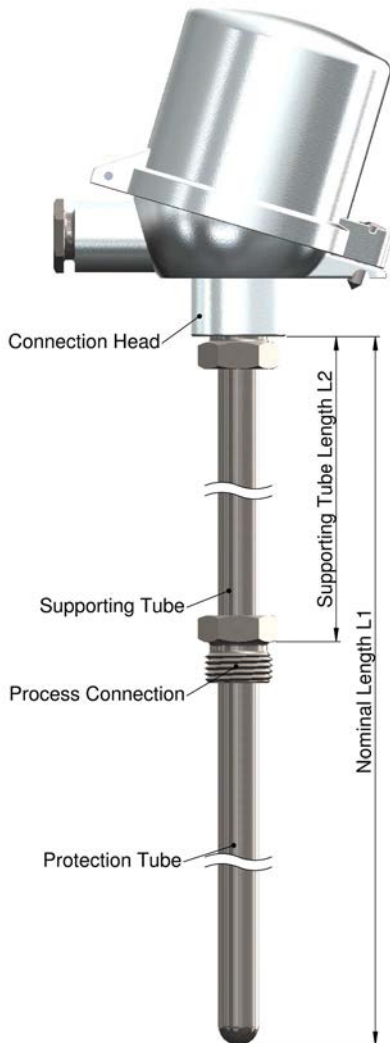
## Nominal Length "L1": please specify \_\_\_\_\_ mm

## Accessories:

☐ gas-tight threaded sleeve  
☐ vacuum flange KF  
☐ measuring insert vacuum-sealed



# Mineral Insulated Thermocouple screw-in Thermocouple



## Thermocouple:

according to  
DIN EN 60584



☐ Type K (NiCr-Ni)



☐ Type J (Fe-CuNi)



☐ Type N (NiCrSi-NiSi) ☐ others \_\_\_\_\_

## Number of TC's:

☐ single

☐ double

☐ triple

## Measuring Insert:

☐ 1.5 mm

☐ 1.6 mm

☐ 2.0 mm

☐ 3.0 mm

☐ 3.2 mm

☐ 4.8 mm

☐ 6.0 mm

☐ 8.0 mm

☐ others \_\_\_\_\_

## Connection Head:

☐ A

☐ AUS

☐ AUZ

☐ AUSH

☐ AUZH

☐ B

☐ BUS

☐ BUZ

☐ BUSH

☐ BUZH

☐ MA

☐ others \_\_\_\_\_

## Transmitter:

☐ without transmitter

☐ with transmitter

please specify \_\_\_\_\_

## Probe Diameter:

☐ 3.0 mm

☐ 3.2 mm

☐ 4.8 mm

☐ 6.0 mm

☐ 6.4 mm

☐ 8.0 mm

☐ others \_\_\_\_\_

## Supporting Tube "L2": steel

☐ mat.-no. 1.0305

☐ mat.-no. 1.4571

please specify \_\_\_\_\_ mm

## Protection Tube:

☐ without

☐ with

steel ☐ mat.-no. 1.0305

☐ mat.-no. 1.4571

heat resistant steel

☐ mat.-no. 1.4749

☐ mat.-no. 1.4762

☐ mat.-no. 1.4841

☐ mat.-no. 2.4816

protective tube dimensions:

☐ 9.0 x 1.0 mm

☐ 11.0 x 1.0 mm

☐ 11.0 x 2.0 mm

☐ 15.0 x 2.0 mm

☐ 22.0 x 2.0 mm

☐ others \_\_\_\_\_

**Nominal Length "L1":** please specify \_\_\_\_\_ mm

## Termination:

ceramic pedestal with sheath terminals

## Process Connection:

please specify thread type/length \_\_\_\_\_

☐ head connection, probe length "A" \_\_\_\_\_

☐ neck connection, please specify nominal length  
"L1" and supporting tube "L2"

# Mineral Insulated Thermocouple bendable execution

## Thermocouple:

according to  
DIN EN 60584



☐ Type K (NiCr-Ni)



☐ Type J (Fe-CuNi)



☐ Type T (Cu-CuNi)



☐ Type N (NiCrSi-NiSi)

☐ others \_\_\_\_\_

## Number of TC's:

☐ single ☐ double

## Hot Junction:

☐ insulated ☐ not insulated ☐ exposed

## Probe Diameter:

☐ 0.15 mm (only Type K) ☐ 0.25 mm (only Type K)  
☐ 0.5 mm (only Type K, J and N) ☐ 1.0 mm  
☐ 1.5 mm ☐ 2.0 mm ☐ 3.0 mm  
☐ 4.8 mm ☐ 6.0 mm ☐ 6.4 mm  
☐ others \_\_\_\_\_  
☐ swaged (only possible for certain diameters)  
 Ø D1 \_\_\_\_\_ mm Ø D2 \_\_\_\_\_ mm  
 L \_\_\_\_\_ mm

## Probe Length "A":

please specify \_\_\_\_\_ mm

## Sheath Material:

standard Inconel 600 (mat.-no. 2.4816)  
☐ others \_\_\_\_\_

## Transition Sleeve:

standard stainless steel; diameter x length: 4.0 x 30.0 mm  
☐ others \_\_\_\_\_

## Lead Wire:

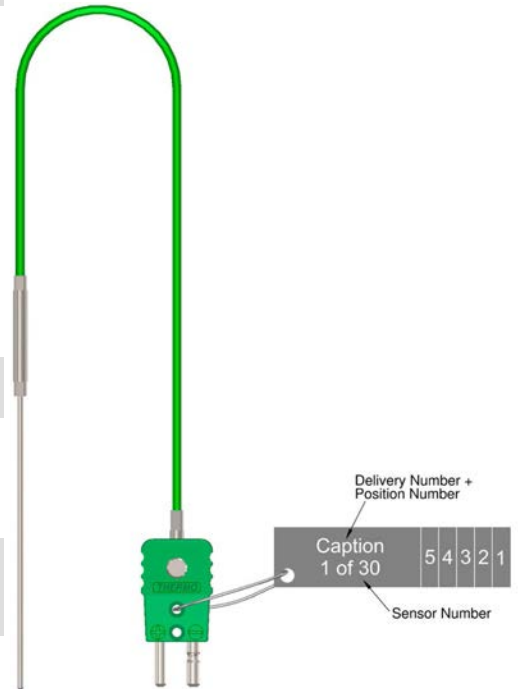
flexible thermocouple wire, individually and overall  
 insulated with  
☐ silicone, Ø approx. 3.8 mm (-50 °C - 180 °C)  
☐ teflon, Ø approx. 2.35 mm x 1.45 mm  
 (-100 °C - 205 °C, for a short time up to 230 °C)  
☐ fiberglass, Ø approx. 2,1 mm x 1,3 mm (400 °C,  
 for a short time up to 500 °C)  
☐ others \_\_\_\_\_

## Wire Length "B":

please specify \_\_\_\_\_ mm

## Termination:

☐ standard plug ☐ standard jack  
☐ miniature plug ☐ miniature jack  
☐ micro plug ☐ micro jack  
☐ ht standard plug ☐ ht standard jack  
☐ ht miniature plug ☐ ht miniature jack  
☐ Lemo plug ☐ Lemo jack  
☐ size 0 (max. probe diameter 3.2 mm)  
☐ size 1 (max. probe diameter 6.0 mm)  
☐ size 2 (max. probe diameter 6.4 mm)  
☐ bare ends ☐ others \_\_\_\_\_



# Angled Thermocouple

## Thermocouple:

according to  
DIN EN 60584



☐ Type K (NiCr-Ni)



☐ Type J (Fe-CuNi)



☐ Type N (NiCrSi-NiSi)



☐ Type S (Pt10Rh-Pt)



☐ Type R (Pt13Rh-Pt)



☐ Type B (Pt30Rh-Pt6Rh)

☐ others \_\_\_\_\_

## Number of TC's:

☐ single

☐ double

☐ triple

## Wire Strength:

☐ 0.35 mm

☐ 0.5 mm

☐ 1.5 mm

☐ 3.0 mm

☐ others \_\_\_\_\_

## Connection Head:

☐ A

☐ AUS

☐ AUZ

☐ AUSH

☐ AUZH

☐ B

☐ BUS

☐ BUZ

☐ BUSH

☐ BUZH

☐ MA

☐ others \_\_\_\_\_

## Execution:

☐ screwed

☐ bent

☐ welded

## Protection Tube:

☐ steel enameled (20.0 x 2.0 mm)

☐ pure iron (22.0 x 5.0 mm)

☐ SL25 (30.0 x 9.0 mm, swaged to 24.0 mm)

☐ graphite (40.0 x 11.0 mm)

☐ titan (18.0 x 1.5 mm)

☐ cast iron (30.0 x 6.0 mm)

☐ 1.0305 (15.0/22.0 x 2.0 mm)

☐ 1.4571 (15.0/22.0 x 2.0 mm)

☐ 1.4762 (15.0/22.0 x 2.0 mm)

☐ 1.4841 (15.0/22.0 x 2.0 mm)

☐ others \_\_\_\_\_

## Protection Tube Length:

☐ 500.0 mm

☐ 710.0 mm

☐ 1000.0 mm

special dimensions on request

## Supporting Tube:

☐ without

steel ☐ M.-No. 1.4571

☐ M.-No. 1.0305

heat resistant steel

☐ M.-No. 1.4762

☐ M.-No. 1.4841

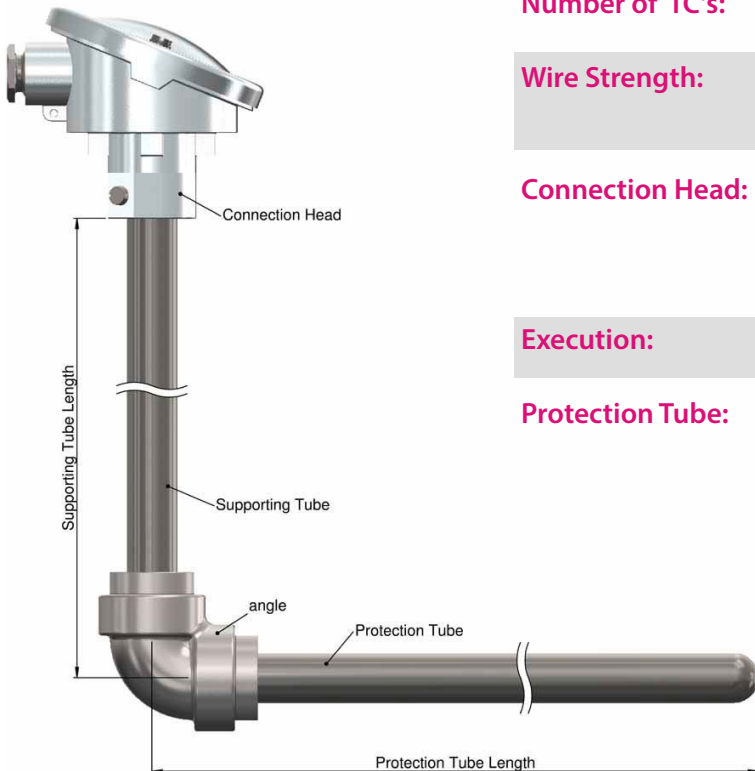
## Supporting Tube Length: please specify \_\_\_\_\_ mm

## Inner Protection Tube:

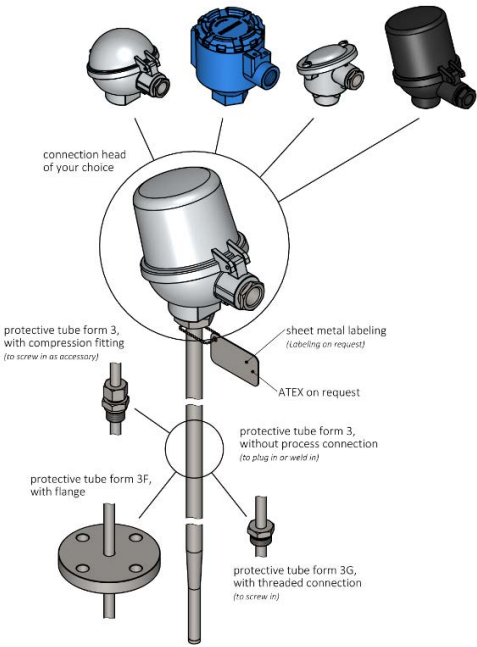
☐ Ceramic C610

☐ Ceramic C799

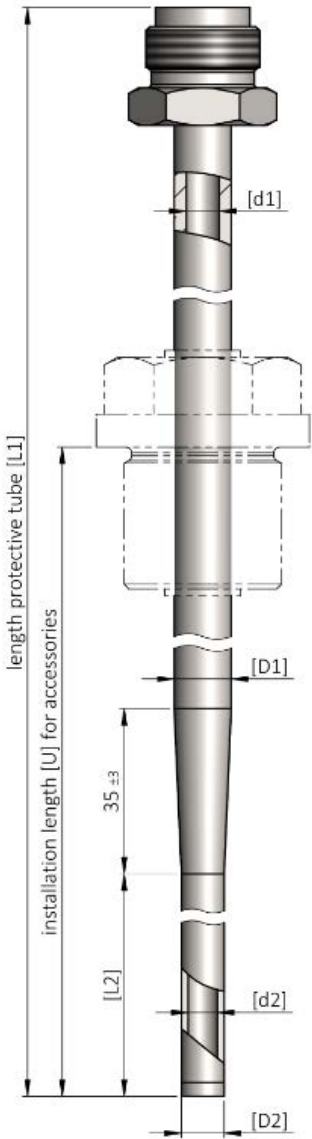
☐ without



# Tapered thermowells



For our thermowells, which are manufactured in-house with German precision and highest quality standards at our modern headquarters in Werne, we offer customized solutions that are flexibly adapted to our customers' needs. Optionally, the thermowells can be supplied with or without temperature sensors. Our product range is complemented by our high-quality tapered thermowells for thermocouples and resistance sensors according to DIN 43772. A variety of connection options, such as compression fittings, flanges or threaded connections, are available to meet individual requirements.



## Length

|                                                        | Protective tube<br>(length max.<br>1000mm) | rejuvenation<br>(max.<br>100 mm) | Measuring insert<br>length | Installation<br>length form 3G | Installation length<br>form 3F |
|--------------------------------------------------------|--------------------------------------------|----------------------------------|----------------------------|--------------------------------|--------------------------------|
| <b>Standardised<br/>version</b><br>(acc. to DIN 43772) | 307 mm                                     |                                  | 315 mm                     | 160 mm                         | 225 mm                         |
|                                                        | 367 mm                                     | 50 mm                            | 375 mm                     | 220 mm                         | 285 mm                         |
|                                                        | 427 mm                                     |                                  | 435 mm                     | 280 mm                         | 345 mm                         |

## Diameter

|                                                    | diameter<br>Tube outside | diameter<br>Tube inside | diameter<br>tapering | diameter<br>Tube inside<br>over the tapered length |
|----------------------------------------------------|--------------------------|-------------------------|----------------------|----------------------------------------------------|
| <b>Standardised<br/>version(acc. to DIN 43772)</b> | Ø 12 mm                  | Ø 9 mm                  | Ø 7 mm               | Ø 6,1 (+0,1) mm                                    |
| further version                                    | Ø 14 mm                  | Ø 11 mm                 | Ø 9 mm               | Ø 8,1 (+0,1) mm                                    |
| possible on request                                | Ø 5- 45 mm               | on request              | on request           | on request                                         |

## Compression Fitting



**Body Material:** stainless steel

**Process Connection:** please specify thread \_\_\_\_\_

**Thread Runout:** ☐ undercut ☐ conical

**Bore Diameter:** please specify \_\_\_\_\_

**Ferrule Material:** ☐ stainless steel ☐ teflon ☐ ceramic

**Ferrule Type:**

|                          | Form                                                                                 | Bore Diameter                   |                                 |                                 |
|--------------------------|--------------------------------------------------------------------------------------|---------------------------------|---------------------------------|---------------------------------|
| <input type="checkbox"/> |  V1 | <input type="checkbox"/> 0.6 mm | <input type="checkbox"/> 1.1 mm | <input type="checkbox"/> 1.6 mm |
|                          |                                                                                      | <input type="checkbox"/> 0.6 mm | <input type="checkbox"/> 1.1 mm | <input type="checkbox"/> 1.6 mm |
| <input type="checkbox"/> |  V2 | <input type="checkbox"/> 2.1 mm | <input type="checkbox"/> 3.1 mm | <input type="checkbox"/> 3.3 mm |
|                          |                                                                                      | <input type="checkbox"/> 3.4 mm | <input type="checkbox"/> 3.6 mm | <input type="checkbox"/> 4.1 mm |
|                          |                                                                                      | <input type="checkbox"/> 4.6 mm |                                 |                                 |
| <input type="checkbox"/> |  V3 | <input type="checkbox"/> 3.3 mm | <input type="checkbox"/> 4.1 mm | <input type="checkbox"/> 4.6 mm |
|                          |                                                                                      | <input type="checkbox"/> 4.9 mm | <input type="checkbox"/> 5.1 mm | <input type="checkbox"/> 6.1 mm |
| <input type="checkbox"/> | others _____                                                                         |                                 |                                 |                                 |

## International Colour Coding

| Code letter | Material<br>+ -  | DIN IEC 584                                                                         | Temperature Range  |
|-------------|------------------|-------------------------------------------------------------------------------------|--------------------|
| Type J      | Fe - CuNi        |  | -40 °C .. 750 °C   |
| Type K      | NiCr - NiAl      |  | -40 °C .. 1.000 °C |
| Type N      | NiCrSi - NiSi    |  | -40 °C .. 1.000 °C |
| Type T      | Cu - CuNi        |  | -40 °C .. 350 °C   |
| Type E      | NiCr - CuNi      |  | -40 °C .. 800 °C   |
| Type R      | Pt13%Rh - Pt     |  | 0 °C .. 1.600 °C   |
| Type S      | Pt10%Rh - Pt     |  | 0 °C .. 1.600 °C   |
| Type B      | Pt30%Rh - Pt6%Rh |  | 600 °C .. 1.700 °C |

# Thermocouple Connectors



## För a good connection with a secure signal

Connectors provide a simple and reliable way to connect components with thermocouple material. They are used wherever sensors are to be connected, extended or replaced.

### Quality Made in Germany

Thermo Sensor is one of the few companies worldwide that maintains its own range of connectors. The genuine transmission of the measurement signals is guaranteed by the exclusive use of class 1 thermocouple materials.

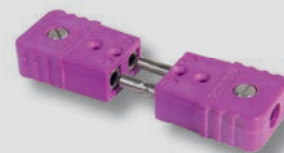
Characterized by different colours, the connectors meet the relevant national and international standards, such as IEC, DIN and ANSI.

### Many different versions

Our connectors are suitable for temperatures up to +220 °C, short-term up to +250 °C, and are available in a wide variety of designs and dimensions. Polarity markings are shown on all housings, which together with the reverse polarity protection of the contacts, guarantee a secure and correct connection.

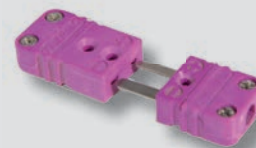
### Standard Connectors

for robust handling and particularly demanding applications.



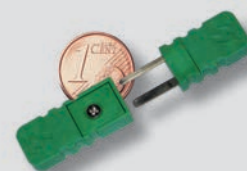
### Miniature Connectors

universally applicable in almost all industrial areas.



### Micro Connectors

for particularly small assembly spaces and sensitive areas.



# Properties and fields of application of different metallic protection tubes acc. to DIN EN 50446:2007-04

## Resistance of metal protection tubes to contact with gases

| Material No. | Use in air up to °C | Gases containing sulphur |           | Resistance to Nitrogen-containing, low-oxygen gases | carburisation | field of application                                                                  |
|--------------|---------------------|--------------------------|-----------|-----------------------------------------------------|---------------|---------------------------------------------------------------------------------------|
|              |                     | oxidizing                | reducing  |                                                     |               |                                                                                       |
| 1.0305       | 550                 | low                      | low       | medium                                              | low           | Tempering furnaces                                                                    |
| 1.4571       | 800                 | low                      | low       | medium                                              | medium        | Chemically corrosive vapours, excluding hydrochloric acid and sulphur dioxide vapours |
| 1.4762       | 1.200               | very high                | very high | low                                                 | medium        | Annealing or hardening furnaces with gases containing sulphur and carbon              |
| 1.4749       | 1.150               | very high                | very high | low                                                 | medium        |                                                                                       |
| 1.4841       | 1.150               | very low                 | very low  | high                                                | low           | Ovens with nitrogen-containing, low-oxygen gases                                      |
| 1.4876       | 1.100               | low                      | low       | high                                                | very high     |                                                                                       |

acc. to DIN EN 50446:2007-04

## Material for use in molten metals

### Application area

### Material No.

|                                |                |        |
|--------------------------------|----------------|--------|
| Aluminium                      | up to 700 °C   | 1.4841 |
| Magnesium                      |                | 1.1003 |
| Aluminium containing magnesium |                |        |
| Bearing metal                  | up to 600 °C   | 1.0305 |
| Lead                           | up to 700 °C   | 1.0305 |
|                                |                | 1.4841 |
|                                |                | 2.4867 |
| Zinc                           | up to 480 °C   | 1.0305 |
|                                |                | 1.4749 |
|                                |                | 1.4762 |
|                                | up to 600 °C   | 1.1003 |
| Tin                            | up to 650 °C   | 1.0305 |
| Copper                         | up to 1.250 °C | 1.4762 |
| Copper-zinc alloy              | up to 900 °C   | 1.4841 |

acc. to DIN EN 50446:2007-04



# Thermo Sensor GmbH

customer oriented • innovative • flexible

Please contact us. We will be happy to assist you!

For more than 30 years, our name has stood for high-quality products for all areas of temperature, measurement and control technology. At our location in Werne (NRW) we develop and produce temperature sensors in standard, special and explosion-proof designs as well as numerous accessories for temperature measurement, which come into operation worldwide on all continents.

Our wide product range, our extensive stock of raw parts and our efficient organisational structure have a great influence on our flexibility: short delivery times and demand-oriented, customer-specific production are not contradictory for us. A delivery within 5 days is not a rarity - it is our standard!

Since 1996 Thermo Sensor has been continuously certified according to the respective valid quality management standard; currently according to ISO 9001:2015. Since 2021 we are also certified according to ISO 14001:2015 (environmental management system).

State-of-the-art manufacturing processes, combined with the specialist knowledge of our employees, are the cornerstone for a product quality that meets the highest demands. No matter how complex your measuring task seems - make your problem our challenge!

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