Technical Information
TLSC2 thermocouple sensor

Assembly with flexible tails and quick disconnect plugs and jacks

Fixed insert, adjustable compression fitting

Application

Thermocouple sensor for industrial applications. The thermometer comprises of various diameter fixed inserts with either flexible tails, a quick disconnect plug or a combination of the two. The hot junction can be either "grounded" or "ungrounded" from the sheath.

To be installed into a thermowell or directly into the process by means of an adjustable compression fitting. They can also be used in all applications where small immersion lengths are needed.
These assemblies are very useful in measuring temperatures in the ferrochrome industry, where lengths in excess of 15 meters are required and where molten metal splashing occurs.

Your benefits

- Various types of thermocouples: Type J (Fe-CuNi), type K (NiCr-Ni), type N (NiCrSi-NiSi) or type T (Cu-CuNi)
- Sheath material SS316, SS310 or INCONEL 600
- Customized immersion length

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Performance characteristics

Measuring range

Input	Designation	Measuring range limits
Thermocouples (TC) - flying leads - as per ASTM E230-03	Type J (Fe-CuNi) Type K (NiCr-Ni) Type N (NiCr-NiSi) Type T (Cu-CuNi)	-210 to +760 °C (-346 to +1400 °F) -270 to +1100 °C (-454 to +2012 °F)[1)] -270 to +1100 °C (-454 to +2012 °F)[1)] -270 to +400 °C (-454 to +725 °F)

1) Limited by jacket material of insert

Accuracy

Permissible deviation limits of thermoelectric voltages from standard characteristic for thermocouples		
Standard	**Type**	**Special tolerance, the larger respective value applies**
ASTM E230-03/ANSI MC96.1	J (Fe-CuNi)	±1.1 K or ±0.004 |t| (0 to 760 °C)
	K (NiCr-Ni) N (NiCr-NiSi)	±1.1 K or ±0.004 |t| (0 to 1260 °C)
	T (Cu-CuNi)	±0.5 K or ±0.004 |t| (0 to 370 °C)

Operating conditions

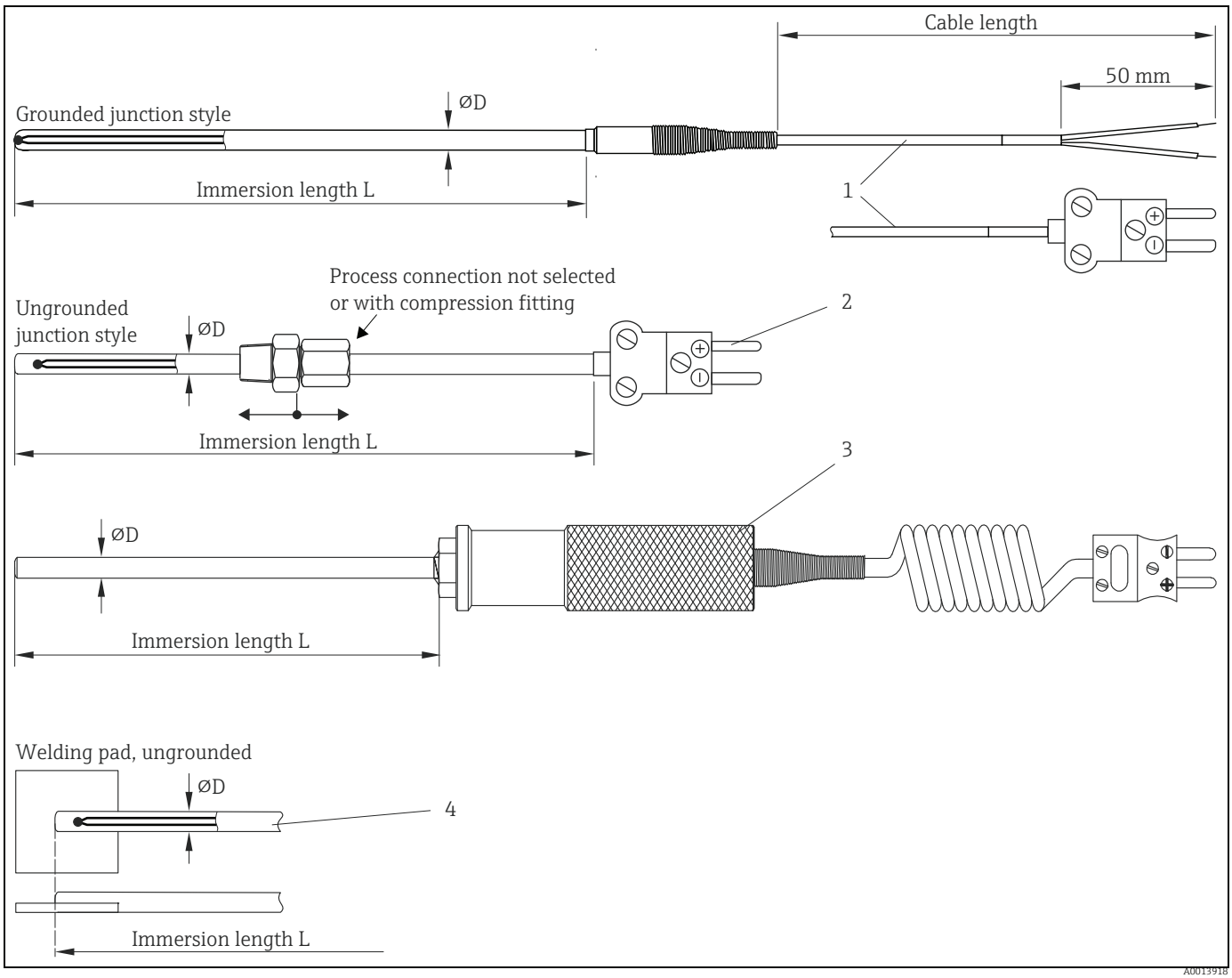
Ambient temperature

depends on the used cable type and connector type

Cable type	Temperature in °C (°F)	Connector type	Temperature in °C (°F)
PVC	max. 80 °C (176 °F)	Miniature plug	max. 90 °C (194 °F)
Fiberglass	max. 482 °C (900 °F)	Standard plug	max. 204 °C (400 °F)
Teflon	max. 204 °C (400 °F)	-	-

Design, dimensions

Immersion length L and cable length in mm	Sheath diameter ØD in mm	Sheath Material	Process connection
100, 150, 200, 250, 300 or free selectable	3, 6, 9.5	SS316, SS310, Inconel600	**Compression fitting:** 1/8" NPT, ¼" NPT, 3/8" NPT, ½" NPT, G½" (BSPP) Material: SS316 or brass
	4.5, 8	SS316	

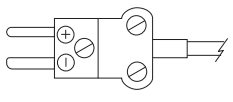
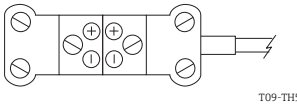
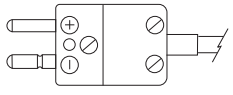
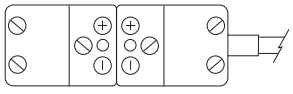


Design of the thermometer

Termination: Cable with insulation stripped 50 mm or with mini/standard connectors (1). Mini/standard connectors directly attached to sheath (2) or handle with retractable cable/mini connector (3). Ungrounded welding pad (25 x 25 x 3 mm) as option (4).

Connector style

Type of connectors, standard and miniature plugs

B = Mini plug with flat pins	 T09-TH5156xx-04-xx-XX-ae-004
C = Mini plug with flat pins + female jack	 T09-TH5156xx-04-xx-XX-ae-005
D = Standard large plug with round pins	 T09-TH5156xx-04-xx-XX-ae-006
E = Standard large plug with round pins + female jack	 T09-TH5156xx-04-xx-XX-ae-007

Thermocouple color codes per ASTM E230

Thermocouple wire colors as per ASTM E230	Plug & Jack[1)]
Type J: white (+), red (-)	Black
Type K: yellow (+), red (-)	Yellow
Type N: orange (+), red (-)	Orange
Type T: blue (+), red (-)	Blue

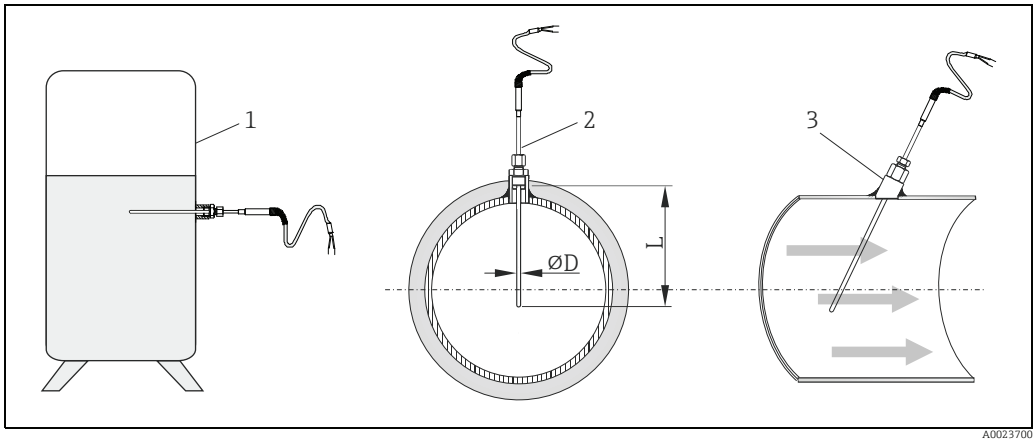
1) References for Plug & Jack Color Codes are based on ASTM E1129 / E 1129M - 98, Standard Specification of Thermocouple connectors and ASTM E1684, Standard Specification for Miniature Thermocouple Connectors.

Installation conditions

Orientation

No restrictions.

Installation instructions



Installation examples

1: Installation in a tank
2: For pipes with a small cross-section, the sensor tip must reach to the piping axis or a little farther (=L)
3: Tilted installation

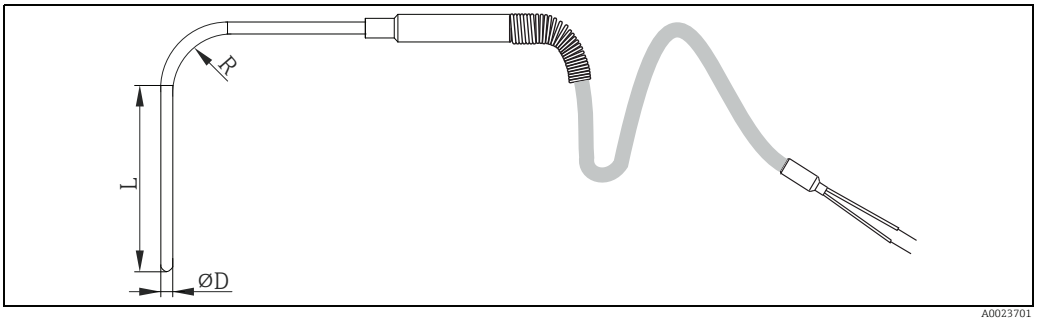
The immersion length of the thermometer can influence the accuracy. If the immersion length is insufficient, heat dissipation via the process connection and the container wall can cause measurement errors. For installation in a pipe, therefore, the recommended immersion length ideally corresponds to half of the pipe diameter (see Figure 'Installation examples', Pos. B).

- Installation possibilities: Pipes, tanks or other plant components
- The immersion length for the bendable version should correspond to at least about ten times the cable sensor diameter (ØD); for the non-bendable version with insulated sensor wires it should correspond to at least about thirty times the cable sensor diameter.
  Example: Diameter 3 mm (0.12 in) x 30 = 90 mm (3.54 in). A standard insertion length of > 60 mm (2.36 in) is recommended for the bendable version and > 180 mm (7.1 in) for the non-bendable version.

For pipes with small diameters, sometimes only small thermometer immersion lengths are possible. Improvements can be achieved by inserting the thermometer at a tilted installation (see figure 'Installation examples', item 3). To determine the necessary immersion lengths, the parameters of the thermometer and of the process to be measured must always be taken into consideration (e.g. flow velocity, process pressure).

Bendable cable sensor

Cable sensors with a MgO sheathed cable are bendable, taking into account the minimum dimensions specified in the table.



Bending radius R

R > 15 mm (0.6 in) for ØD = 3 mm (0.12 in), L ≥ 25 mm (1 in)
R > 30 mm (1.2 in) for ØD = 6 mm (0.24 in), L ≥ 65 mm (2.56 in)

Certificates and approvals

Material certification

The material certificate 3.1 (according to EN 10204) can be selected separately in the product configuration.

Test report and calibration

The "Factory calibration" is carried out according to an internal procedure in a laboratory of Endress+Hauser accredited by SANAS (South African National Accreditation System). All temperature calibrations, upon selection in the product configuration, are done according to the following standards: IEC 751, 2; IEC 60751, ASTM E220, ASTM E644 and ITS90.
In the case of thermometers without a replaceable insert, the entire thermometer - from the process connection to the tip of the thermometer - is calibrated.

PER (Pressure Equipment Regulation)

The assembly has no pressurised volumes and thus is not subject to the conformity assessment requirements of the Pressure Equipment Regulation when operating within the published product specifications.

Reasons: The definitions of pressure-bearing equipment as per sections 4.1.1 and 4.3.2 of the directive SANS 347:2012 determine that:

- The products are classified as pressure accessories and are designed and manufactured in accordance with sound engineering practice (SEP) in order to ensure safe use.
- This declaration does not apply if the product is used as a critical component in a safety system. In this case, the product must be assessed in line with the same category or higher than the equipment they protect (section 4.3.3).

Accessories

Various accessories, which can be ordered with the device or subsequently from Endress+Hauser, are available for the device. Detailed information on the order code in question is available from your local Endress+Hauser sales center or on the product page of the Endress+Hauser website: **www.endress.com**.

Service-specific accessories

Accessories	Description
Applicator	Software for selecting and sizing Endress+Hauser measuring devices: ▪ Calculation of all the necessary data for identifying the optimum measuring device: e.g. pressure loss, accuracy or process connections ▪ Graphic illustration of the calculation results Administration, documentation and access to all project-related data and parameters over the entire life cycle of a project. Applicator is available: ▪ Via the Internet: https://wapps.endress.com/applicator ▪ On CD-ROM for local PC installation.
Konfigurator$^{+temperature}$	Software for selecting and configuring the product depending on the measuring task, supported by graphics. Includes a comprehensive knowledge database and calculation tools: ▪ For temperature competence ▪ Quick and easy design and sizing of temperature measuring points ▪ Ideal measuring point design and sizing to suit the processes and needs of a wide range of industries The Konfigurator is available: On request from your Endress+Hauser sales office on a CD-ROM for local PC installation.
W@M	Life cycle management for your plant W@M supports you with a wide range of software applications over the entire process: from planning and procurement, to the installation, commissioning and operation of the measuring devices. All the relevant device information, such as the device status, spare parts and device-specific documentation, is available for every device over the entire life cycle. The application already contains the data of your Endress+Hauser device. Endress +Hauser also takes care of maintaining and updating the data records. W@M is available: ▪ Via the Internet: www.endress.com/lifecyclemanagement ▪ On CD-ROM for local PC installation.
FieldCare	FDT-based plant asset management tool from Endress+Hauser. It can configure all smart field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition.  For details see operating instructions BA00027S and BA00059S

Ordering information

Detailed ordering information is available from the following sources:

- In the Product Configurator on the Endress+Hauser website:
  www.endress.com → Select country → Instruments → Select device → Product page function:
  Configure this product
- From your Endress+Hauser Sales Center:
  www.endress.com/worldwide

Product Configurator - the tool for individual product configuration

- Up-to-the-minute configuration data
- Depending on the device: Direct input of information specific to measuring point, such as measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic creation of the order code and its breakdown in PDF or Excel output format
- Ability to order directly in the Endress+Hauser Online Shop

www.addresses.endress.com

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