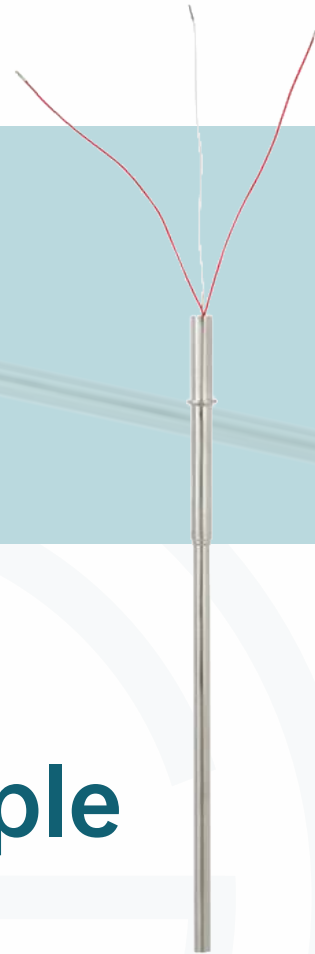


The selection is detailed on page 10

DS11

Cable Thermocouple Thermometer



Working principle

Thermocouple is the use of thermoelectric effect for temperature measurement, thermoelectric effect refers to two different components of the conductor at both ends of the synthetic circuit, when the temperature of the two joint points is not the same, it will produce electromotive force in the circuit phenomenon, the generated electromotive force is called thermoelectric potential. The end that is directly used to measure the temperature of the medium is called the working end or the measuring end, and the end that is not directly used to measure the temperature of the medium is called the cold end or the compensation end. The cold end is connected with the display instrument or other supporting instruments, and the thermoelectric potential generated by the thermocouple will be displayed on the instrument.

Product description

Cable thermocouple thermometers are particularly suitable for applications where metal probes are assembled into drilling holes (e.g. in mechanical parts) or measurement processes (i.e. for all applications without chemical aggressive media and without wear).

To install the thermometer into the sheath, the probe is pressed into the bottom of the sheath using an elastic bushing joint. This ensures that the force applied to the probe does not exceed the critical value.

Standard thermocouple thermometers do not come with process connectors, but can also be connected using fasteners such as threaded joints and movable nuts.

Product application

Install directly into the measurement process

Machine building

CARS

bearing

Pipes and containers

Functional characteristics

Sensor range $-40... +1,200^{\circ}\text{C}$ ($-40... 2,192^{\circ}\text{F}$)

Plug in, or screw in through an additional process connection

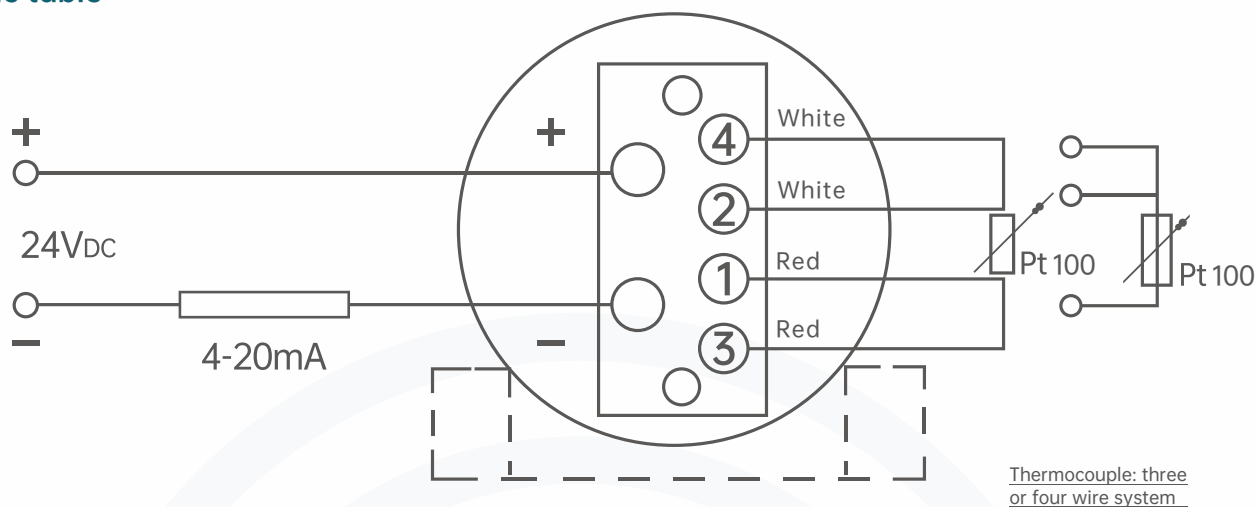
The cable protection layer can be PVC, silicone, PTFE or glass fiber

High mechanical strength

Explosion-proof type (optional)



Working principle Analytic table



Sensor

Thermocouple (according to IEC 60584-1 or ASTM E230) Types K, J, E, N and T (single or double thermocouple)

Tolerance value

For the tolerance value of the thermocouple, the cold end temperature of 0 °C has been taken as the basis.

Model number	Operating temperature range of a thermocouple			
	IEC 60584-1		ASTM E230	
	2 level	1 level	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...370°C	
T	-40...+350°C		-	

The table shows the temperature ranges listed in each standard, including the effective tolerance values (grade accuracy).

The actual operating temperature range of the thermometer is limited by the maximum allowable operating temperature range, the diameter of the thermocouple, the maximum allowable operating temperature range of the MI cable and the thermocouple material.

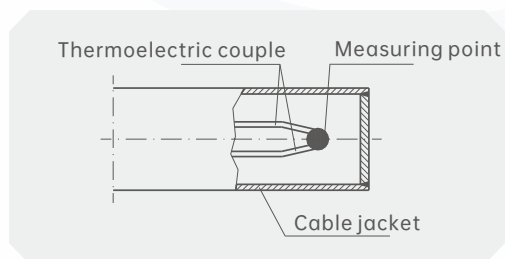
If the temperature to be measured is higher than the allowable temperature at the location of the cable filling duct, the distance between the cable filling duct locations and the critical temperature must be adjusted accordingly by extending the probe length (MI cable).

The models listed can be used as single/double thermocouples. Unless specifically specified, the thermocouple will be delivered with an insulation measuring point.

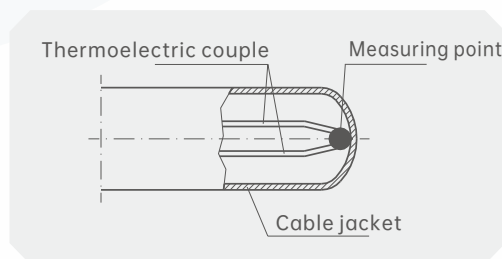
Sensor head design

When temperature measurements are made in solids, the aperture to be inserted into the probe should be within 1mm of the probe diameter.

The measuring point is not grounded



The measuring point is grounded



Cable thermocouples can be designed in two ways:

Armor design

In armored design thermocouples, the flexible part of the sensor is a mineral-insulated cable (armored cable). It consists of a stainless steel outer sheath that houses an insulated internal lead that is embedded in a high-density ceramic compound.

Armored design thermocouples - with the exception of glue catheters - have a bending radius up to 3 times the diameter of the cable sheath. This flexibility allows the sensor to be used in hard-to-reach areas.

Sheath diameter

- 0.5 mm
- 1.0 mm
- 1.5 mm
- 3.0 mm
- 4.5 mm
- 6.0 mm
- 8.0 mm

Other sizes are available on request

Sheath material

Nickel alloy: Alloy 600

Maximum temperature up to 1200°C (air)
Standard material for applications requiring special corrosion resistance at high temperatures, as well as for applications requiring resistance to stress corrosion cracking and erosion in chloride media

It has anti-corrosion effect on ammonia at any temperature and concentration

High tolerance to halogens, chlorine and hydrogen nitride

Tubular design

The metal sensor head in the tubular design has a rigid construction and therefore does not allow bending. Inside the tube, the connection cable extends near the sensor head. Therefore, cable thermocouples of tubular design can only be used below the specified temperature of the cable (see operating temperature).

Pipe diameter

- 4.0 mm
- 4.5 mm
- 6.0 mm
- 8.0 mm

Other sizes are available on request

Please note:

The flexibility of armoured thermocouples must be taken into account, especially in applications with relatively large flow rates. If the process connector is not directly attached to the cable filling duct, it must be considered a critical factor in applications where vibration or oscillating stress may occur.

Stainless steel

Maximum temperature up to 850°C (air)

It has good corrosion resistance to steam and waste gas in corrosive media and chemical media

Other materials can be provided on request

Operating temperature

If the temperature to be measured is higher than the allowable temperature at the cable, connector, or duct, the metal part of the probe must be long enough to extend beyond the hot area. It should be noted that the maximum operating temperature of the cable, filling duct or connector should not be exceeded.

Connect cables and individual wires

Any tolerable maximum temperature on the connection cable refers to the temperature specified in the connection cable. The thermocouple itself may have the ability to withstand higher temperatures.

For common connection wires, please refer to the following temperature limits:

- PVC: -20... +100 °C
- Silicone: -50... +200 °C
- PTFE: -50... +250 °C
- Glass fiber: -50... +400 °C

Glue filling catheter

The temperature of the filling tube is further limited by the filling sealant.

Filling sealant temperature range: -40... +150 °C
Optional: 250 °C (other models can be provided according to user requirements)

Special low temperature version temperature range: -60... +120 °C²⁾

Coupler

Where optional connectors are installed, the maximum permissible temperature at the connector is:

- Lemosa: -55... +250 °C
- Binder: -40... +85 °C

Glue filling catheter

The connection between the sensor metal parts and the connecting cable or bare wire must not be immersed in the process medium and must not be bent. Do not fix the movable sleeve on the filling duct.

Size T indicates the length of the glue filling tube

Standard	Size T ¹⁾ (mm)	Glue filling catheter Ø (mm)
Probe Ø = filling tube Ø	n/a	Probe equal
Ø2... 4.5mm (with pressed filling tube)	45	6
Ø6 mm (With pressed glue filling catheter)	45	7
Ø6 mm (With pressed glue filling catheter)	45	8
Ø8 mm (With pressed glue filling catheter)	45	10

1) For the 2 x 4 wire sensor connection, the length of the glue tube is generally 60 mm

Glue filling catheter

The connection between the sensor metal parts and the connecting cable or bare wire must not be immersed in the process medium and must not be bent. Do not fix the movable sleeve on the filling duct.

The filling duct with operating temperature < -40°C is designed as follows

Standard	Size T (mm)	Filling tube Ø (mm)
Probe Ø = filling tube Ø	n/a	Probe equal
Ø2... 4.5mm (with pressed filling tube)	60	8
Ø6 mm (with pressed glue tube)	60	8
Ø8 mm (with pressed glue tube) ⁶⁾	60	10

Class of protection

Connecting cable

Cables are available in a variety of insulating materials to meet the application requirements of specific environmental conditions.

Both ends of the cable have been pretreated (for direct connection). You can also configure connectors at both ends of the cable.

Connecting cable (standard)

Thermocouple (adaptable to sensor size)

Cross-sectional area: min. 0.22 mm²

Number of thermocouples: depends on connection method

Insulation material: PVC, silicone, PTFE or glass fiber

Shielding layer (optional) : Shielding layer is recommended when connecting transmitters

Cable-type thermocouples have a housing protection rating of up to IP65 (depending on cable sheathing material and number of wires). After special design, it is also available with IP67 enclosure protection. Leads with glass fiber sheathed should not be used in explosion-proof products.

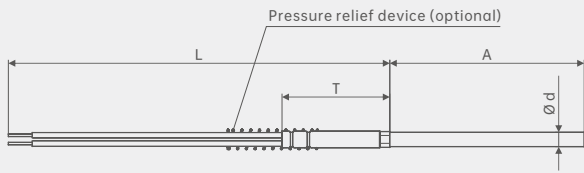
Need for connection

According to the electrical connection characteristics, cable thermocouples can be divided into the following types:

- Loose lines lead out
- Cable connection
- With connector
- Bare wire connection

Dimension A indicates the depth of insertion during measurement. Dimension W indicates the length of the connecting wire. L is the length of the individual wire. Size T indicates the glue filling catheter (if any). T consists of length W or L

Scatter extraction



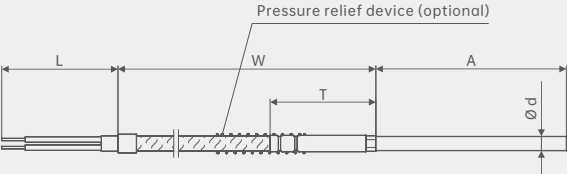
Scatter extraction

The cable length is 150mm, other lengths can also be provided according to user requirements, thermocouple wire Ø0.5mm, compensation cable type depends on the sensor type, PTFE insulation, cable logarithm depends on the number of sensors, bare wire end, other models can be provided according to user requirements

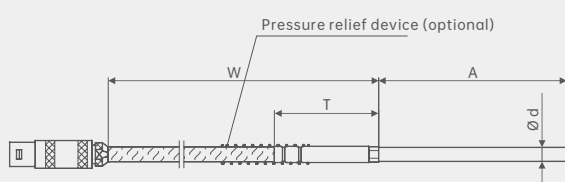
Cable connection

Cable connection

The cable and probe are permanently connected together and the cable length meets the user's specifications. Compensation cable, 0.22mm² leads, compensation cable type depends on sensor type, number of wires depends on the number of sensors, bare wire end.



Assemble connectors on connecting cables



Pressure relief device (optional)

W

T

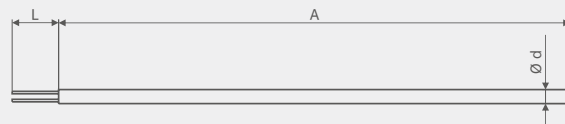
A

Ød

Assemble connectors on connecting cables

Optional connectors on flexible wires.

Bare wire design



L

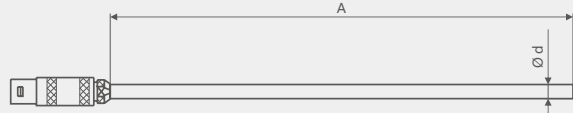
A

Ød

Bare wire design

The inner lead of a mineral insulated cable extension.
 L = 20 mm (standard)
 Bare wire length can be determined according to user requirements. These exposed inner leads are made of solid wire and are therefore not suitable for long distance deployment.

The connector is mounted directly to the probe



A

Ød

The connector is mounted directly to the probe

These designs are based on the bare wire design. The connector is mounted directly onto the metal probe.

Process connector for straight probes

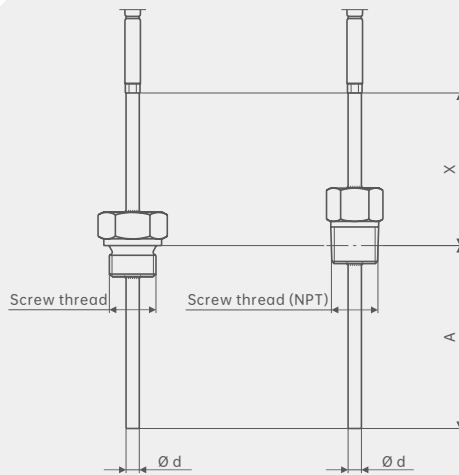
Process connectors can be selected for cable thermocouples. Dimension A indicates the depth of insertion during measurement.

In order to minimize the heat dissipation error of the threaded connection, the insertion depth A should be at least 25mm. The position of the threaded connection is specified by size X and is independent of the connection type.

Please note:

- For straight threads (e.g. G1/2), size refers to the seal that is threaded at the closest point in the measurement process
- For conical threads (such as NPT), the measuring plane is located almost in the center of the thread

Process connectors fix threaded connections/threads



Fixed threaded connections/threads

For mounting probes into threaded joints with internal threads.

Insert depth A: consistent with user specifications

Material: Stainless steel, other materials can also be provided according to user's request

The probe must be rotated to screw it into the measurement process. Therefore, the mechanical installation must be carried out before the electrical connection is completed.

Process connector movable sleeve

Movable sleeve

Can be used to easily adjust the required insertion depth at the installation position. Since the movable sleeve can be adjusted on the probe, dimensions A and X refer to the values at the time of delivery. The length of the movable sleeve determines the minimum length X to be approximately 40 mm.

Material: Stainless steel

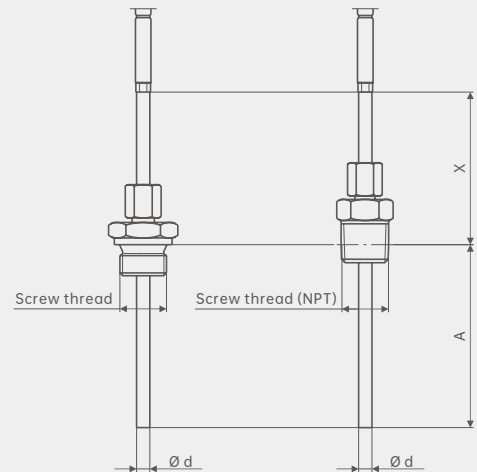
Ring material: stainless steel or PTFE

Stainless steel collar can only be adjusted once; Once unscrewed, it can no longer slide along the sheath.

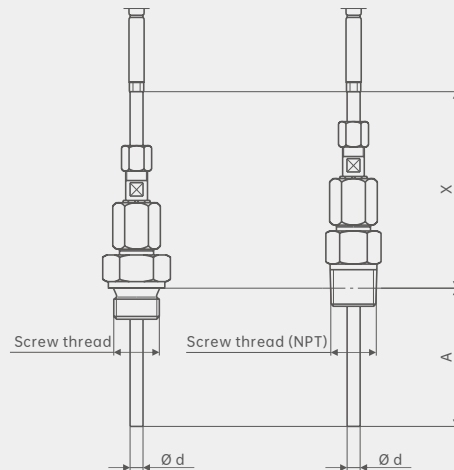
- The maximum temperature of the process connector is 500°C
- Maximum pressure load 4 MPa

The PTFE sheath can be adjusted multiple times, and can be repeatedly slid along the sheath after being unscrewed.

- The maximum temperature of process connectors is 150°C
 - Use under pressure free conditions
- For armored thermocouples with a diameter of 2mm, only PTFE sleeves are allowed.



Process connector flexible sleeve



Flexible sleeve

It can be used to easily adjust the desired insertion depth in the mounting position while maintaining the pre-stressed spring.

Since the movable sleeve can be adjusted on the probe, dimensions A and X refer to the values at the time of delivery. The length of the movable sleeve determines the minimum length X to be approximately 80mm.

Material: Stainless steel

Ring material: stainless steel

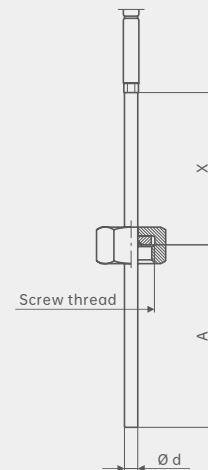
Stainless steel collar can only be adjusted once; Once unscrewed, it can no longer slide along the sheath.

No pressure load should be applied to the movable sleeve.

Process connector movable nut

Movable nut

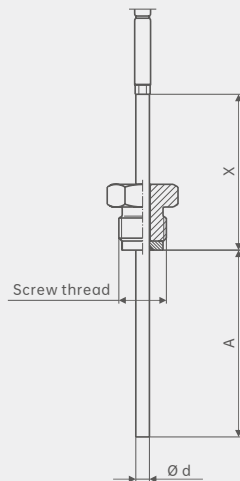
For mounting probes into threaded joints with external threads. The probe and thread rotate opposite each other, so the order of mechanical and electrical installation does not matter. This option is not recommended for NPT threads. Insert depth A: consistent with user specifications. Material: Stainless steel, other materials can also be provided according to user's request



Process connector external nut

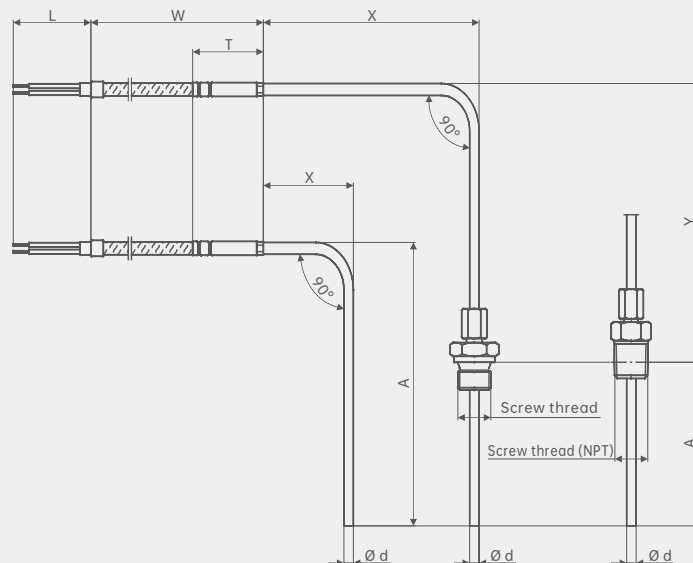
Outer nut

For mounting probes into threaded joints with internal threads. The probe and thread rotate opposite each other, so the order of mechanical and electrical installation does not matter. This option is not recommended for NPT threads. Insert depth A: consistent with user specifications. Material: Stainless steel, other materials can also be provided according to user's request



Angle probe

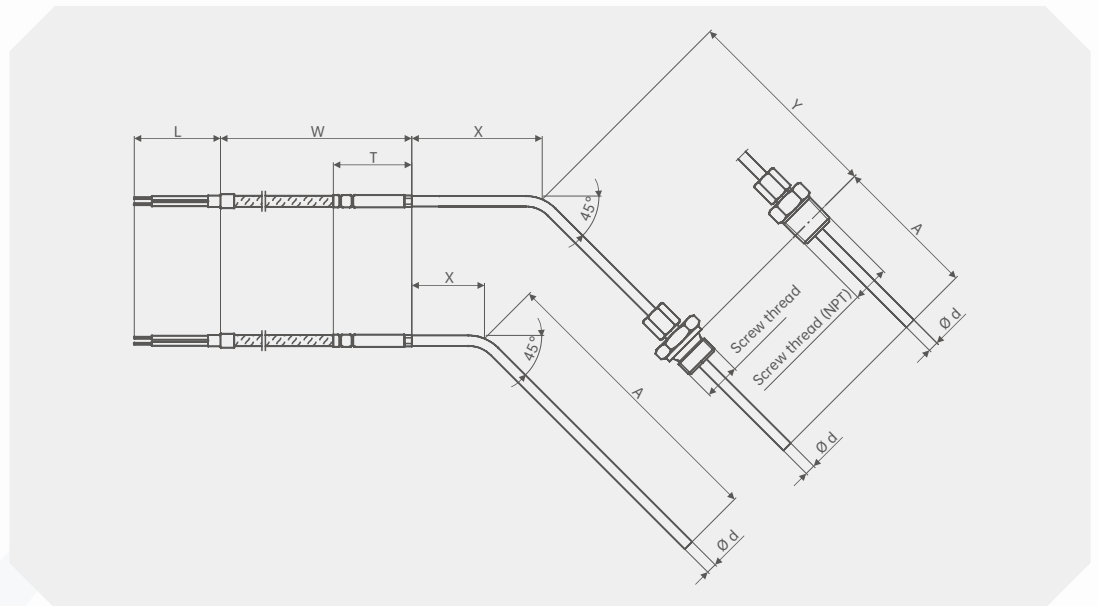
Cable-type thermocouples made of armored cables are available in prefabricated shapes. In this case, other dimensions are needed to indicate the corner position. Size X indicates the distance between the corner and the lower edge of the filling tube. Dimension A always indicates the depth of insertion of the probe, as well as the area inside the measurement process.



Angle probe

If threaded connections are used on Angle probes, dimension Y indicates the distance between the center of the bend and the measurement plane of the threaded connection.

A fixed threaded connection is not recommended because a wide range of swings is required to screw the angular probe into the measurement process.

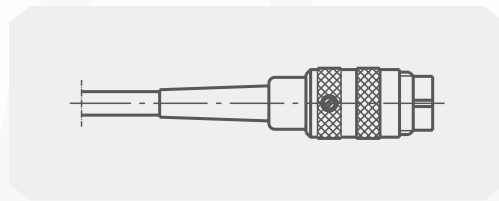


Connector (optional)

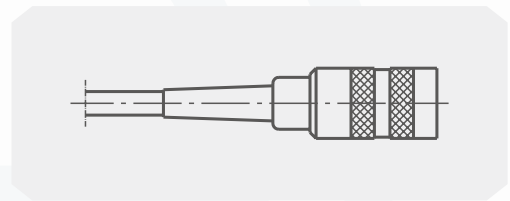
Cable thermocouples are available with pre-installed connectors.

Users can choose from the following options:

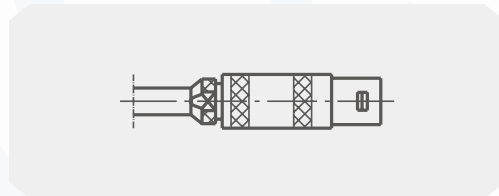
Binder Screw in plug (outside)



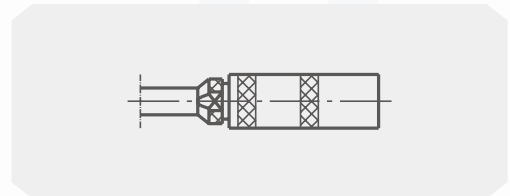
Binder Screw in the plug (inside)



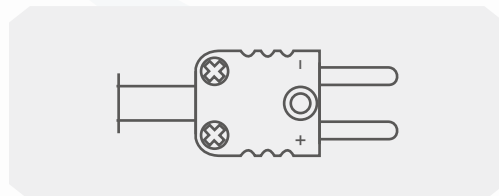
Lemosa 1S Connector (outside)
Lemosa 2S Connector (Outside)



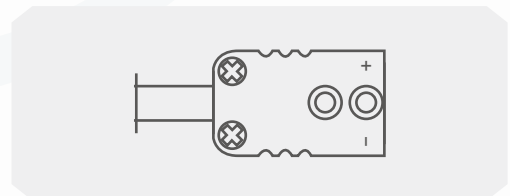
Lemosa 1S Free socket (inside)
Lemosa 2S Free Socket (inside)



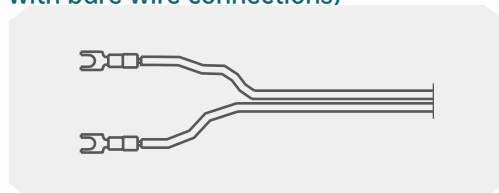
Standard 2-pin thermocouple connector (outside)
Standard 2-pin thermocouple connector (outside)



Standard 2-pin thermocouple socket (inside)
Micro 2-pin thermocouple socket (inside)



Flat connector (not applicable to products with bare wire connections)



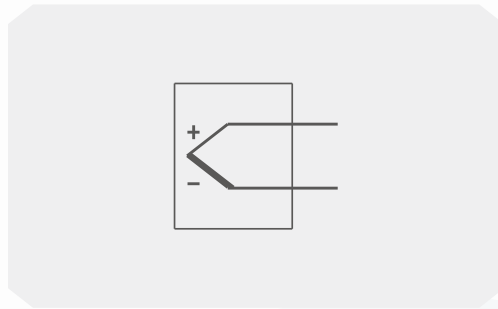
Other types (sizes) of connectors can also be selected according to demand.

Electrical connection

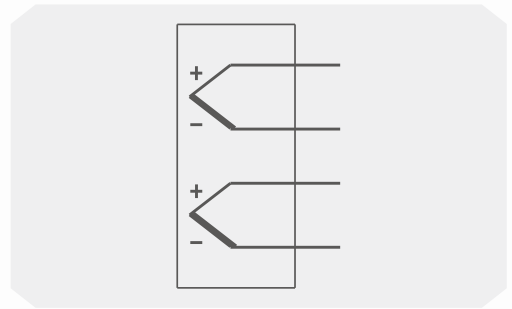
Cable

See table for line end marks

Single thermocouple



Double thermocouple

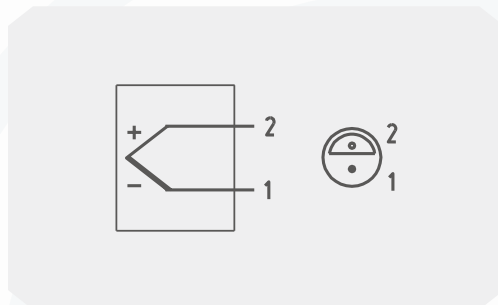


Lemosa connector (The cable end is an external connector)

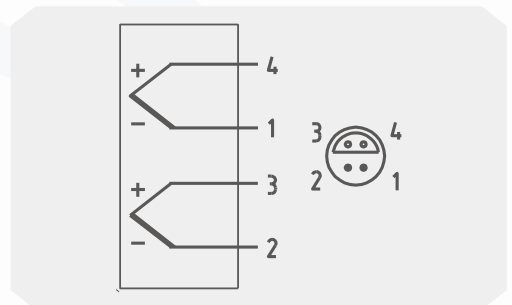
Maximum permissible temperature range:
-55... +250 °C



Single thermocouple

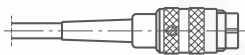


Double thermocouple

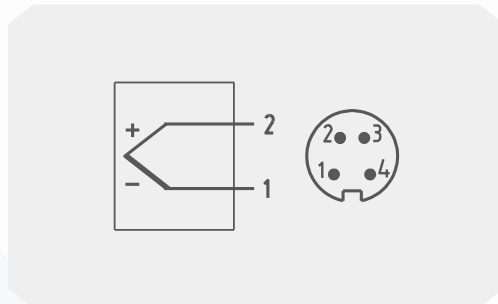


Binder connector cable ends with external connector (screw-in plug)

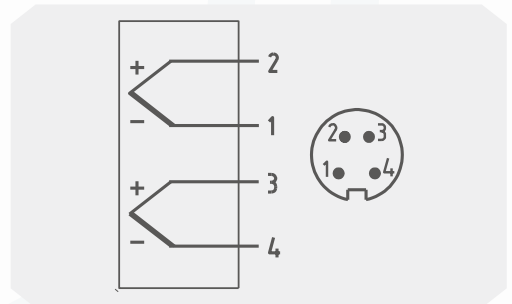
Maximum permissible temperature range:
-40 ... +85 °C



Single thermocouple

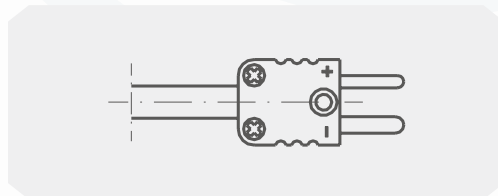


Double thermocouple



Thermocouple joint

The positive and negative terminals are marked.
A double thermocouple requires the use of two thermocouple connectors.



Other connector and pin assignments are also available upon user request.

Cable color code

Sensor type	Standard	Positive electrode	Negative electrode
K	IEC 60584	green	white
J	IEC 60584	black	white
E	IEC 60584	purple	white
T	IEC 60584	brown	white
N	IEC 60584	pink	white

DS11-Selection composition

Selection example
Threaded type **DS11**

1	B	2	E	3	G	4	J	5	M	6	O	7	S	8	V	9	Y	10	0-400	11	E	12	G	13	R
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	----	-------	----	---	----	---	----	---

1.Selection description	A	All-in-one transmitter
	B	Threaded casing
	C	Intrinsically safe explosion-proof type
	D	Flameproof type
	Z	Cable type
	T()	Other types
2.Threaded connection	E	Sliding thread
	F	Fixed thread
3.Insert probe design	G	Fixed installation
	H	Spring fixed terminal block (replaceable insert)
4.Junction box	I	Aluminum
	J	Stainless steel
	K	Digital temperature display
	T()	Other types of junction boxes
5.Electrical interface	L	1/2NPT
	M	M20×1.5
	T()	Other electrical interfaces
6.Wiring block/sensor	N	Crastin Terminal block
	O	Ceramic connection block
	P	S10 (4-20mA transmitter)
	Q	S20 (HART transmitter)
	R	S30 (Fieldbus transmitter)
7.Wire system	S	Single 3-wire system
	O	Double branch 6-wire system
	T()	Other wire system
8.Dimension of thread connection	U	1/2NPT
	V	G1/2
	W	M20×1.5
	T()	Other threaded connection sizes
9.Thermocouple element	X	K (NiCr-Ni)
	Y	E (NiCr-CuNi)
	Z	N (NiCrSi-NiSi)
	J	J (Fe-CuNi)
	P	J (T-CuNi)
	T()	Other measuring elements
10.Temperature range(°C)	A	-200...+1260
	T()	Other measured temperatures



DS11-Selection composition

Selection example
Threaded type **DS11**

1 B 2 E 3 G 4 J 5 M 6 O 7 S 8 V 9 Y 10 0-400 11 E 12 G 13 R

11.Rod diameter (mm)	B	3mm
	C	4mm
	D	5mm
	E	6mm
	F	8mm
	G	10mm
12.Rod length (mm)	G	50
	H	100
	I	150
	J	200
	K	250
	L	300
	M	350
	N	400
	O	450
	P	500
T()	Other lengths	
13.Probe rod material	R	304SS
	S	316L
	T()	Other materials
14.Safety certification	Y	Intrinsic safety
	Z	Flameproof
	N	There is no
15.Additional order information	X	Additional information
	N	There is no

Instructions:

Indicates that DS11 thermocouple is a thermometer with threaded sleeve, threaded connection mode is sliding thread, probe rod design is fixed installation, connection box material is stainless steel, electrical interface M20*1.5, sensor is ceramic connection block, single three-wire system, thread specification G1/2, thermocouple element is E (NiCr-CuNi), Temperature range 0... 400°C, probe diameter 6mm, insert depth length 50mm, probe material 304SS, item 14/15 in the table is not required.



DS11-Selection composition

Selection example Flange connection type **DS11** **B** **E** **G** **J** **M** **O** **S** **A** **E** **N** **A** **N** **0-400**

1 2 3 4 5 6 7 8 9 10 11 12 13

1.Selection description	A	All-in-one transmitter
	B	Flange casing
	C	Intrinsically safe explosion-proof type
	D	Flameproof type
	T()	Other types
2.Flange connection	E	20592 Standard flange
	F	ANSI Standard flange
3.Insert probe design	G	Fixed installation
	H	Spring fixed terminal block (replaceable insert)
4.Junction box	I	Aluminum
	J	Stainless steel
	K	With digital temperature display
	T()	Other types of junction boxes
5.Electrical interface	L	1/2NPT
	M	M20×1.5
	T()	Other electrical interfaces
6.Wiring block/sensor	N	Crastin Terminal block
	O	Ceramic connection block
	P	S10 (4-20mA transmitter)
	Q	S20 (HART transmitter)
	R	S30 (Fieldbus transmitter)
7.Wire system	S	Single 3-wire system
	P	Double branch 6-wire system
	T()	Other wire system
8.Flange connection size	A	DN25
	B	DN50
	C	DN80
	D	DN100
	E	ANSI 1"
	F	ANSI 2"
	G	ANSI 3"
	H	ANSI 4"
	T()	Other flange types
9.Thermocouple element	K	K (NiCr-Ni)
	E	E (NiCr-CuNi)
	N	N (NiCrSi-NiSi)
	F	J (Fe-CuNi)
	O	J (T-CuNi)
	T()	Other measuring elements

DS11-Selection composition

Selection example
Flange connection type **DS11** **B** **E** **G** **J** **M** **O** **S** **A** **E** **N** **A** **N** **0-400**

1 2 3 4 5 6 7 8 9 10 11 12 13

11.Rod length (mm)	A	50
	B	100
	C	150
	D	200
	E	250
	F	300
	G	350
	H	400
	I	450
	J	500
T()	Other lengths	
12.Rod diameter	K	3mm
	L	4mm
	M	5mm
	N	6mm
	O	8mm
	P	10mm
13.Temperature range (°C)	F	-200...+1260
	T()	Other measured temperatures
14.Safety certification	S	Intrinsic safety
	R	flameproof
	N	There is no
15.Additional order information	X	Additional information
	N	There is no

Instructions:

Indicates that the DS11 thermocouple is a thermometer with flange sleeve, the connection mode is 20592 standard flange, the probe rod is designed to be fixed installation, the connection box is stainless steel, the electrical interface is M20*1.5, the sensor is ceramic connection block, the single three-wire system, the flange is DN25, the thermocouple element is E (NiCr-CuNi), and the connection box is stainless steel. The probe rod material is 304SS, the length of the probe rod is 50mm, the diameter of the probe rod is 6mm, and the temperature range is 0... 400 °C: Item 14/15 in the table is optional.

Product certification

Compliance and approval; Rodwig thermometers meet key standards and certifications for process measurement technology; Thus guaranteeing the highest reliability in such Settings;