

Applications

- Measuring range: -40 .. +1150°C
- General machinery and equipment design
- Measuring surface temperature and temperature of structural elements
- All branches of industry

Features

- Made of sheathed cable, insulated inside with MgO
- Small dimensions (from Ø1 mm upwards)
- Short response time for temperature change
- The sensor is bendable
- Casing made of the INCONEL® 600 steel
- Resistant to vibrations

Sheathed thermoelectric thermometers, also referred to as sheathed thermocouples, are made of metal sheathed cable in which the internal thermocouple wires are insulated from each other and from the outer sheath with magnesium oxide (MgO) powder. This provides the sensor with high vibration resistance, good electrical insulation, flexibility as well as resistance to temperature.

These sensors are designed for direct temperature measuring in places with difficult access, as well as in all places, where it is required to use flexible sensors of small diameters, high resistance to vibrations and shock, and with short response time to temperature changes.

Due to tight pressing of the insulating layer (MgO) and appropriate structure of the inner wires and the sheath, the sensors can be bent with a minimal radius of curvature of three times the outer diameter of the sheath.

The complete thermometer is equipped with a washer that can be laser-welded or delivered separate.



TTP-316

TTP-317

TTP-318

Other versions

This data sheet contains only a small portion of our program of supplying sheathed thermocouples for measuring surface temperature and temperature of structural elements.

Other versions can be supplied upon customer's request.

Sensors with connection head

Sensors with connection cable

Mineral insulated sensors

Sensors with GDM connectors

Sensors with MI2 connectors

Sensors with field transmitter

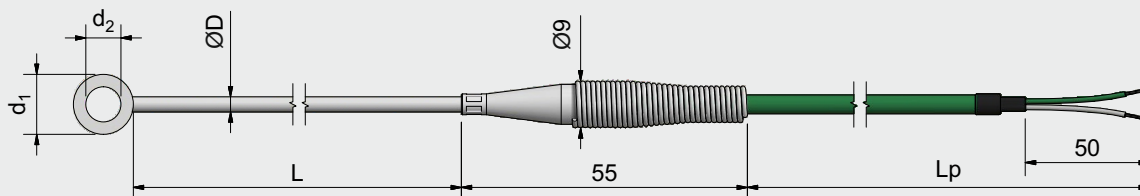
Stator RTDs

Ambient temperature sensors

Designs

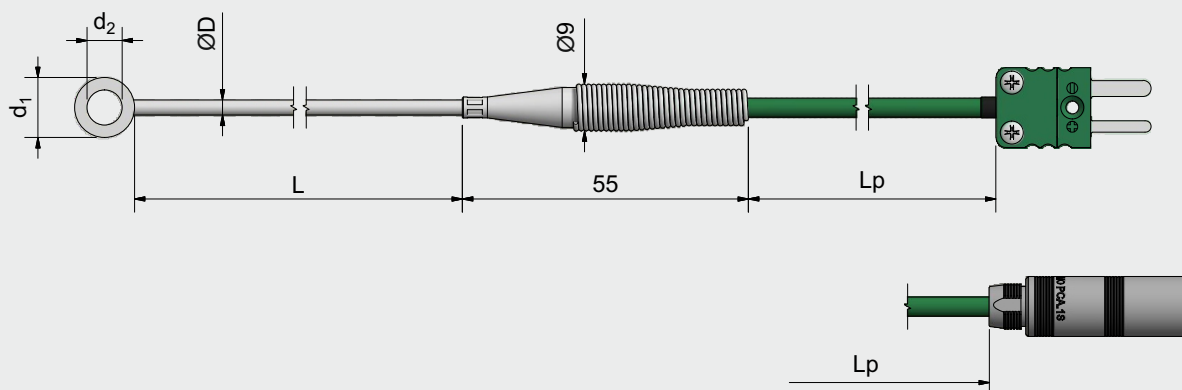
Type TTP-316

Sheathed thermocouple with a washer and an extension lead.



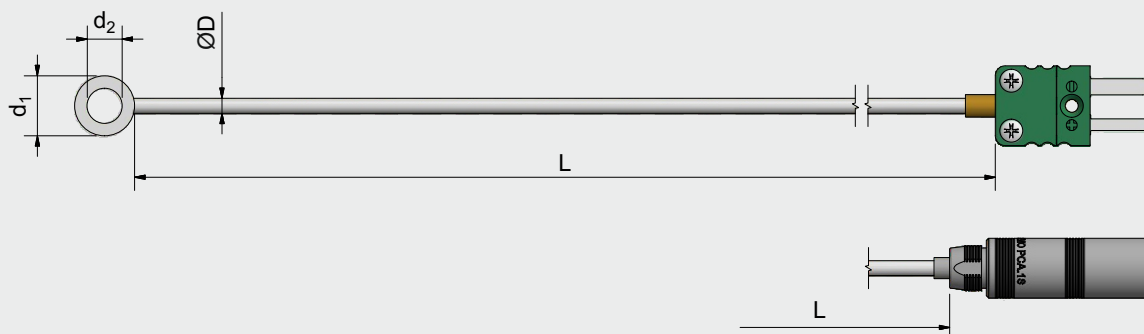
Type TTP-317

Sheathed thermocouple with a washer and an extension lead with an S-010 series mini-plug. As an option it can be equipped with a different kind of connection.

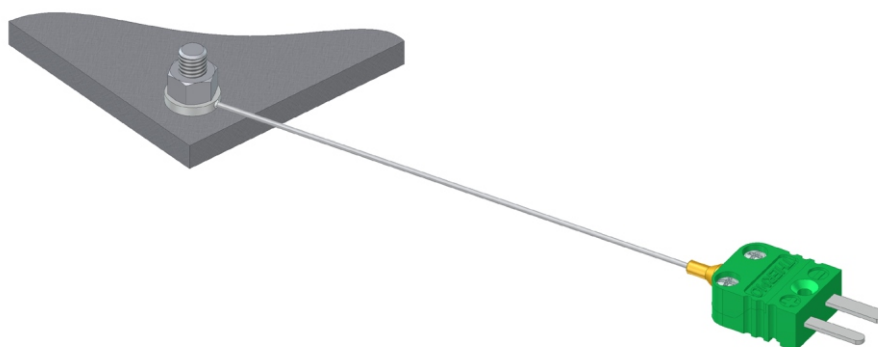


Type TTP-318

Sheathed thermocouple with a washer with an S-010 series mini-plug. As an option, it can be equipped with a different kind of connection..



An example of mounting of a type TTP-318 sheathed thermocouple



Washer materials

Washers are laser-welded to the thermocouple sheath. It allows for seamless connection of material in order to prevent breaks at the welding point. Washer materials are selected by the user, depending on the area of operation of the sensor.

Washer material	Maximum temperature
Copper	+400°C
Stainless steel	+800°C
INCONEL® 600	+1150°C

Thermoelectric characteristics of type J, K, N thermocouples according to PN-EN 60584 / IEC 584

Temperature		°C	100	200	300	400	500	600	700
Basic value	Type J	mV	5.27	10.78	16.33	21.85	27.39	33.10	39.13
	Type K	mV	4.10	8.14	12.21	16.40	20.64	24.91	29.13
	Type N	mV	2.77	5.91	9.34	12.97	16.75	20.61	24.53
Tolerance	Class 1	°C	±1.5	±1.5	±1.5	±1.6	±2.0	±2.4	±2.8
	Class 2	°C	±2.5	±2.5	±2.5	±3.0	±3.7	±4.5	±5.2

Tolerance

The PN-EN 60584 Standard defines the formulas for calculating acceptable measure tolerance. More information available in the general thermoelectric thermometer sheet.

Type J (Fe-CuNi)

Class	Temperature range	Tolerance
1	-40 °C .. +375 °C	± 1.5 °C
	+375 °C .. +750 °C	± 0.0040 x t
2	-40 °C .. +333 °C	± 2.5 °C
	+333 °C .. +750 °C	± 0.0075 x t

Type K (NiCr-Ni), Type N (NiCrSi-NiSi)


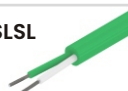




Class	Temperature range	Tolerance
1	-40 °C .. +375 °C	± 1.5 °C
	+375 °C .. +1000 °C	± 0.0040 x t
2	-40 °C .. +333 °C	± 2.5 °C
	+333 °C .. +1200 °C	± 0.0075 x t

Compensation / Thermocouple cables

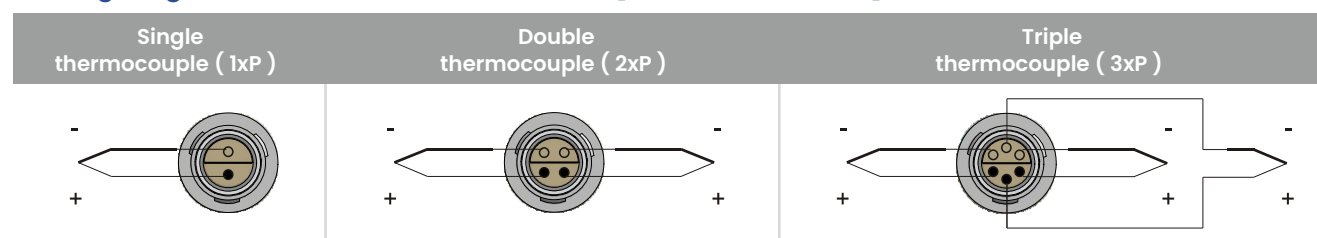
Colour designation of compensation / thermocouple cables according to IEC 584-3

Thermocouple type	Material for compensating or extension cable					Colour code		Sheath
	Type	Positive	Negative	Code	Positive	Negative	Positive	
T	Cu	CuNi	TX	Cu	CuNi	brown	white	brown
E	NiCr	CuNi	EX	NiCr	CuNi	violet	white	violet
J	Fe	CuNi	JX	Fe	CuNi	black	white	black
K	NiCr	Ni	KX	NiCr	Ni	green	white	green
K	NiCr	Ni	KCA	Fe	CuNi	green	white	green
N	NiCrSi	NiSi	NX	NiCrSi	NiSi	pink	white	pink
N	NiCrSi	NiSi	NC	E-Cu	CuNiMn	pink	white	pink
R / S	Pt13/10Rh	Pt	RCA/SCA	E-Cu	CuNiMn	orange	white	orange
B	Pt30Rh	Pt6Rh	BC	CuMn	E-Cu	gray	white	gray

Standard insulation types

Designation	No. of cores / cross section	Outer dia.	Maximal temp.	Construction	Applications
JJ 	2 x 0.22 mm ² 2 x 1.50 mm ² 4 x 1.50 mm ²	Ø 3.6 Ø 7.3 Ø 7.8	105°C	insulat.: PVC sheath: PVC	humid rooms, weak acids, resistant for oils, gasoline, permanent installation.
SLSL 	2 x 0.22 mm ² 4 x 0.22 mm ²	Ø 3.8 Ø 4.3	180°C	insulat.: Silicone sheath: Silicone	humid rooms, weak acids, resistant for oils, gasoline, mobile installation.
TPSL 	4 x 0.22 mm ²	Ø 4.5	180°C	insulat. FEP screen: Cu braid sheath: Silicone	humid rooms, weak acids, resistant for oils, gasoline, mobile installation, suitable for computer systems, resistant to electromagnetic disturbances
TT 	2 x 0.22 mm ² 2 x 0.50 mm ² 2 x 0.75 mm ² 4 x 0.75 mm ²	1.9 x 2.3 2.0 x 3.5 2.4 x 4.2 Ø 5.1	200°C	insulat.: FEP sheath: FEP	humid rooms, acids and alkalines, resistant for oils, gasoline, partially mobile installation.
TCuT 	4 x 0.22 mm ² 4 x 0.50 mm ² 6 x 0.50 mm ² 6 x 0.75 mm ²	Ø 3.5 Ø 4.2 Ø 5.1 Ø 6.0	200°C	insulat.: FEP screen: Cu braid sheath: FEP	humid rooms, acids, resistant for oils, gasoline, mobile installation, suitable for computer systems, resistant to electromagnetic disturbances.
GLGLP 	2 x 0.22 mm ²	Ø 3.8	400°C	insulat.: fibreglass sheath: fibreglass braid: steel	dry rooms, resistant for high temperatures and mechanical duty

Wiring diagrams, LEMO® socket connectors [Size: 0S, 1S, 2S, 3S]



Ordering code

TTP - 316 - 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9

1	<input type="text"/>	Thermocouple type	
		J	Type J (Fe-CuNi)
		K	Type K (NiCr-Ni)
		xxx	other, please specify
2	<input type="text"/>	Multiplicity	
		I	Single
		II	Double
		III	Triple
3	<input type="text"/>	Sheath diameter D	
		1	Ø 1.0 mm
		1.5	Ø 1.5 mm
		2	Ø 2.0 mm
		3	Ø 3.0 mm
4	<input type="text"/>	Ring pad - Outer diameter d₁ / Inner diameter d₂	
		8/4.2	Ø 8 / Ø 4.2 mm
		14/10.2	Ø 14 / Ø 10.2 mm
		xxx	other, please specify
5	<input type="text"/>	Ring pad material	
		M	Copper
		S	Stainless steel
		I	INCONEL® 600
6	<input type="text"/>	Length L	
		200	200 mm
		300	300 mm
		500	500 mm
		xxx	other, please specify
7	<input type="text"/>	Cable length L_p	
		2000	2000 mm
		5000	5000 mm
		8000	8000 mm
		xxx	other, please specify
8	<input type="text"/>	Tolerance	
		1	Class 1 acc. to PN-EN 60584-1
		2	Class 2 acc. to PN-EN 60584-1
9	<input type="text"/>	Cable insulation	
		JJ	PVC / PVC (up to +105°C)
		SLSL	Silicone / Silicone (up to +180°C)
		TPSL	Teflon® FEP / Cu braid / Silikon (up to +180°C)
		TT	Teflon® FEP / Teflon® FEP (up to +200°C)
		TCuT	Teflon® FEP / Cu braid / Teflon® FEP (up to +200°C)
		GLGLP	Fibreglass / Fibreglass / Galvanized steel braid (up to +400°C)

Example

TTP-316-K-I-1-8/4.2-M-100-5000-1-SLSL

Sheathed sensor 1xK, with copper ring pad Ø8/Ø4.2 mm, INCONEL® 600 sheath material, sheath diameter Ø1.0 mm, class 1 acc. PN-EN 60584-2, junction isolated, length L=300mm, cable length L_p=5000 mm, cable insulation silicone / silicone.

TTP-316-K-II-3-14/10.2-S-200-8000-GLGLP

Sheathed sensor 2xK, with stainless steel ring pad Ø14/Ø10.2 mm, INCONEL® 600 sheath material, sheath diameter Ø3.0 mm, class 1 acc. PN-EN 60584-2, junction isolated, length L=200mm, cable length L_p=8000 mm, cable insulation fibreglass / fibreglass / galvanized steel braid.

Ordering code

TTP - 317 - - - - - - - - - -

1	<input type="text"/>	Thermocouple type	
		J	Type J (Fe-CuNi)
		K	Type K (NiCr-Ni)
	xxx	other, please specify	
2	<input type="text"/>	Multiplicity	
		I	Single
		II	Double
	III	Triple	
3	<input type="text"/>	Sheath diameter D	
		1	Ø 1.0 mm
		1.5	Ø 1.5 mm
		2	Ø 2.0 mm
	3	Ø 3.0 mm	
4	<input type="text"/>	Ring pad - Outer diameter d₁ / Inner diameter d₂	
		8/4.2	Ø 8 / Ø 4.2 mm
		14/10.2	Ø 14 / Ø 10.2 mm
	xxx	other, please specify	
5	<input type="text"/>	Ring pad material	
		M	Copper
		S	Stainless steel
	I	INCONEL® 600	
6	<input type="text"/>	Length L	
		200	200 mm
		300	300 mm
		500	500 mm
	xxx	other, please specify	
7	<input type="text"/>	Cable length L_p	
		2000	2000 mm
		5000	5000 mm
		8000	8000 mm
	xxx	other, please specify	
8	<input type="text"/>	Tolerance	
		1	Class 1 acc. to PN-EN 60584-1
	2	Class 2 acc. to PN-EN 60584-1	
9	<input type="text"/>	Cable insulation	
		JJ	PVC / PVC (up to +105°C)
		SLSL	Silicone / Silicone (up to +180°C)
		TPSL	Teflon® FEP / Cu braid / Silikon (up to +180°C)
		TT	Teflon® FEP / Teflon® FEP (up to +200°C)
		TCuT	Teflon® FEP / Cu braid / Teflon® FEP (up to +200°C)
	GLGLP	Fibreglass / Fibreglass / Galvanized steel braid (up to +400°C)	

Example

TTP-317-K-I-1-8/4.2-M-100-5000-1-SLSL

Sheathed sensor 1xK, with copper ring pad Ø8/Ø4.2 mm, INCONEL® 600 sheath material, sheath diameter Ø1.0 mm, class 1 acc. PN-EN 60584-2, junction isolated, length L=300mm, cable length L_p=5000 mm, cable insulation silicone / silicone, ended with S-020 miniature plug.

TTP-317-K-II-3-14/10.2-S-200-8000-GLGLP

Sheathed sensor 2xK, with stainless steel ring pad Ø14/Ø10.2 mm, INCONEL® 600 sheath material, sheath diameter Ø3.0 mm, class 1 acc. PN-EN 60584-2, junction isolated, length L=200mm, cable length L_p=8000 mm, cable insulation fibreglass / fibreglass / galvanized steel braid, ended with S-020 miniature plug.

Ordering code

TTP - 318 - - - - - - -

1	<input type="text"/>	Thermocouple type	
		J	Type J (Fe-CuNi)
		K	Type K (NiCr-Ni)
2	<input type="text"/>	Multiplicity	
		I	Single
		II	Double
3	<input type="text"/>	Sheath diameter D	
		1	Ø 1.0 mm
		1.5	Ø 1.5 mm
		2	Ø 2.0 mm
4	<input type="text"/>	Ring pad - Outer diameter d₁ / Inner diameter d₂	
		8/4.2	Ø 8 / Ø 4.2 mm
		14/10.2	Ø 14 / Ø 10.2 mm
		xxx	other, please specify
5	<input type="text"/>	Ring pad material	
		M	Copper
		S	Stainless steel
6	<input type="text"/>	Length L	
		200	200 mm
		300	300 mm
		500	500 mm
7	<input type="text"/>	Tolerance	
		1	Class 1 acc. to PN-EN 60584-1
		2	Class 2 acc. to PN-EN 60584-1

Example

TTP-318-K-I-1-8/4.2-M-200-1

Sheathed sensor 1xK, with copper ring pad Ø8/Ø4.2 mm, INCONEL® 600 sheath material, sheath diameter Ø1.0 mm, class 1 acc. PN-EN 60584-2, junction isolated, length L=300mm, ended with S-020 miniature plug.

TTP-318-K-II-3-14/10.2-S-200-1

Sheathed sensor 2xK, with stainless steel ring pad Ø14/Ø10.2 mm, INCONEL® 600 sheath material, sheath diameter Ø3.0 mm, class 1 acc. PN-EN 60584-2, junction isolated, length L=200mm, ended with S-020 miniature plug.