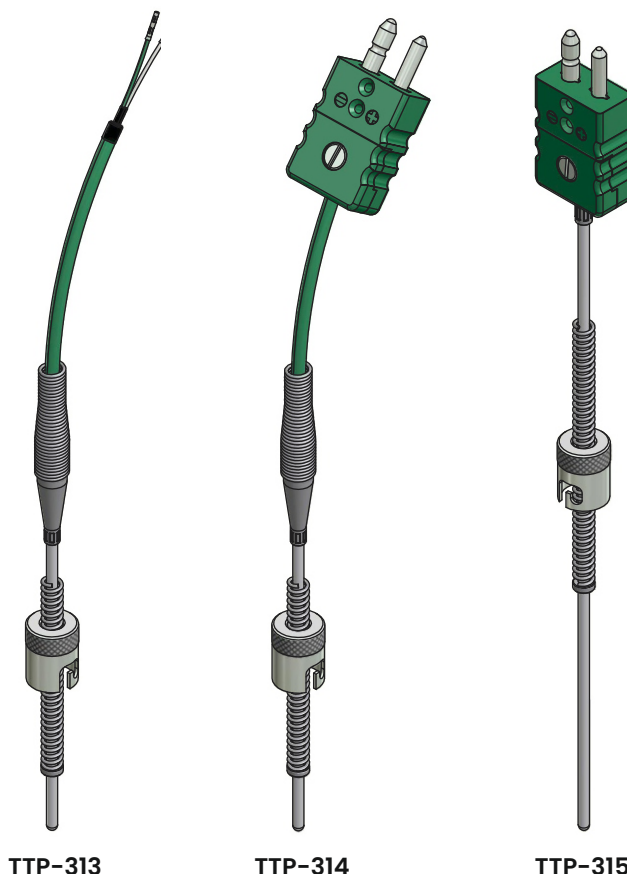


Applications

- Measuring range: -40 .. +800°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 Ø 3mm upwards) (Ø 2mm as an option)
- Short response time for temperature change
- The sensor is bendable
- Casing made of the AISI316
- Resistant to vibrations
- Thermocouple with reduced tip as an option



TTP-313

TTP-314

TTP-315

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, flexibility as well as resistance to temperature and with good electrical insulation.

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 special spring, a lock nut and a ring that can be laser-welded or delivered separate. Process connector are available: threaded, to be screwed in, or with a clip to be tightened on a pipe.

ATEX, IECEx, EAC Ex versions



Intrinsically safe and Flameproof designs are available for applications in hazardous areas. These models are provided with certificate for „intrinsically safe“ and „flameproof“ type of protection according to Directive 2014/34/UE (ATEX), IECEx scheme and EAC Ex TR-CU 012/2011 (Eurasian Economic Union).

Intrinsically safe (Exi)

Data sheet XI-TTP-313

Data sheet XI-TTP-314

Data sheet XI-TTP-315

Other versions

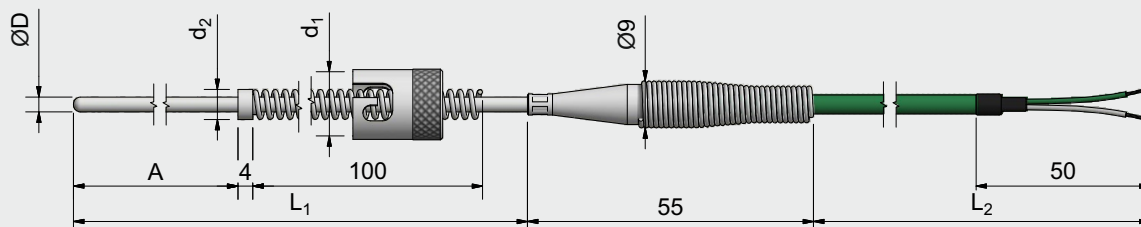
This data sheet contains only a small portion of our program of supplying sheathed thermocouples for measuring surface temperature and temperature of structural elements. Other versions can be supplied upon customer's request.

Designs

Type TTP-313

Sheathed thermocouple with a spring, a lock nut and an extension lead.

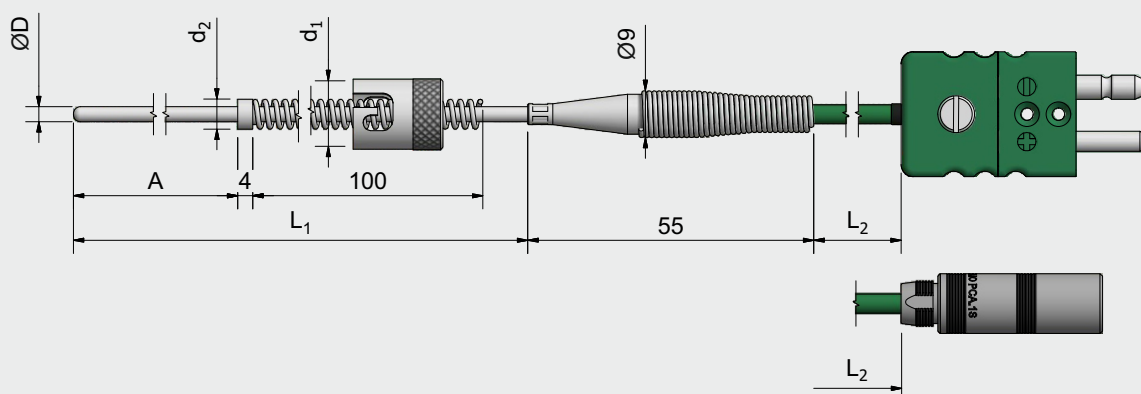
As an option it can be equipped with a threaded connector (BA) or clip connector (OZK).



Type TTP-314

Sheathed thermocouple with a spring, a lock nut, an extension lead with a standard S-020 series plug.

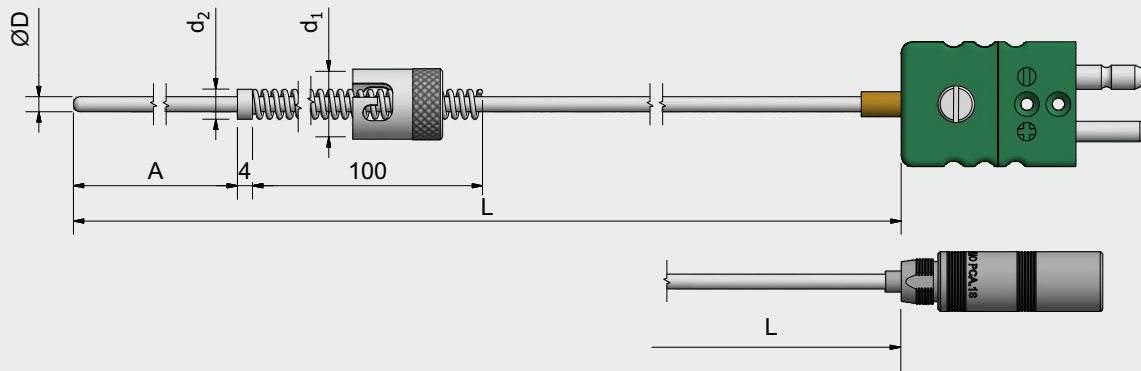
As an option it can be equipped with a threaded connector (BA) or clip connector (OZK).



Type TTP-315

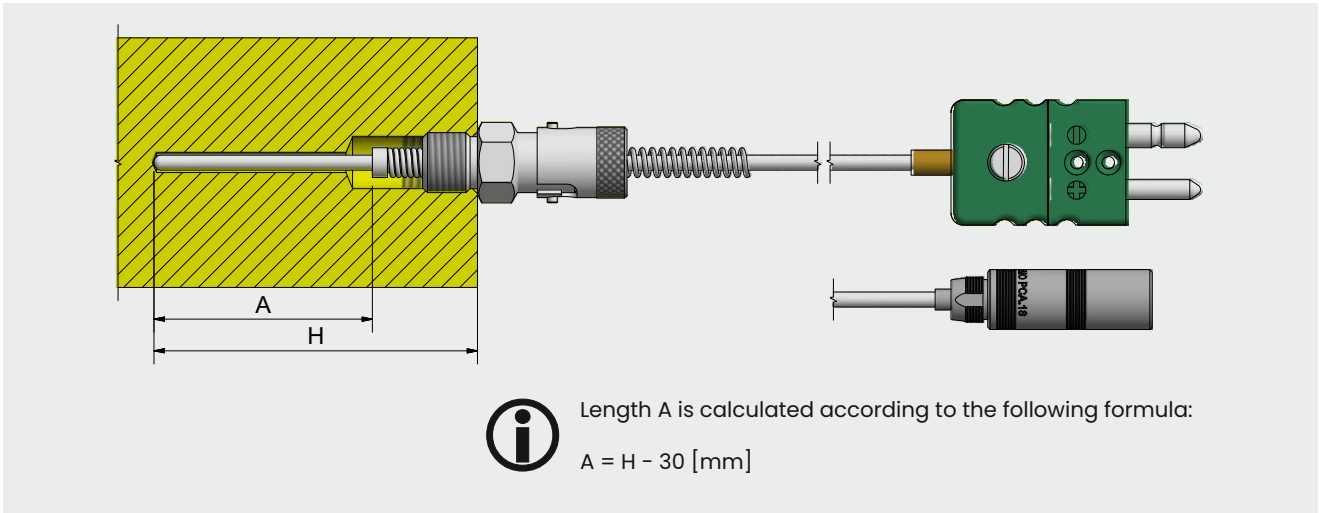
Sheathed thermocouple with a spring and a lock nut, with a standard S-020 series plug.

As an option it can be equipped with a threaded connector (BA) or clip connector (OZK).

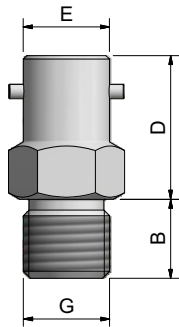


Sheath dia. ØD [mm]	Lock nut inside dia. Ød, [mm]	Welded ring dia. Ød, [mm]
3	11.3, 12	6
4.5	14.5	8

Example of montage TTP-315 sheathed thermocouple with BA threaded connector

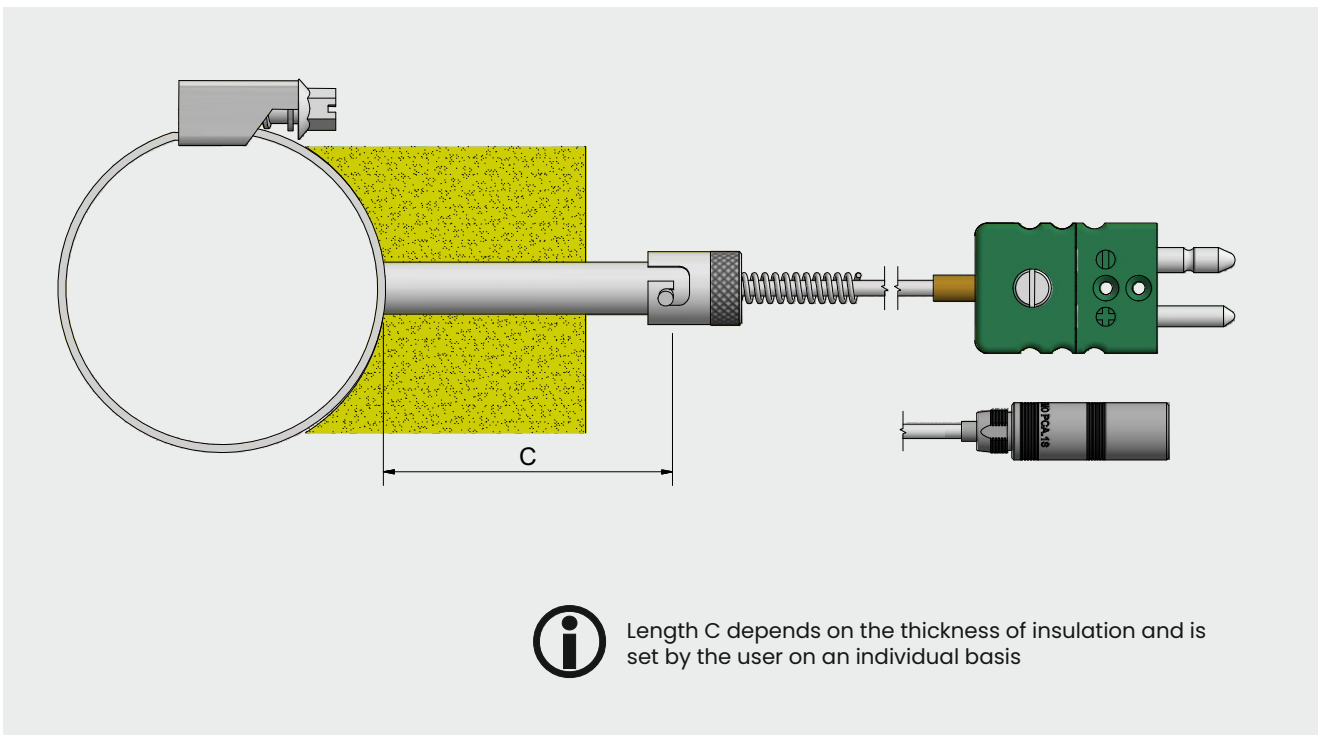


BA threaded connector



Connector type	Thread G	Dimension B [mm]	Dimension D [mm]	Diameter E [mm]
BA-M8x1-(E)	M8x1	10	13	13
BA-M10x1-(E)	M10x1	10	13	13
BA-M12x1-(E)	M12x1	10	13	13
BA-G1/8"-(E)	G1/8"	8	13	13
BA-1/8"NPT-(E)	1/8" NPT	11	13	13

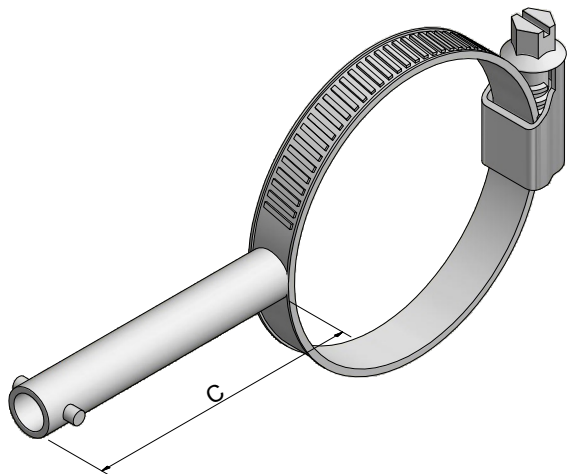
Example of montage of TTP-315 sheathed thermocouple with OZK clip connector



OZK clip connector

Clip connectors made of stainless steel are perfect for mounting bayonet thermocouples (with a lock nut) to steam pipes, process pipes and heat pipes, where it is required to measure temperature at different points of the process. The ending of the thermocouple directly touches the pipe, which allows for direct measuring. Process does not need to be stopped for the thermocouple to be installed. The connection is easy to install and the thermocouple is mounted with a single tightening. Fixing extension allows to use the device with insulations of any thickness.

Clip connectors can be used to fit the device on $\varnothing 16$ up to $\varnothing 140$ mm pipes. We deliver larger clips upon customer's request.



Connector type	Working diameter range [mm]
OZK-16..27-C	16 - 27
OZK-20..32-C	20 - 32
OZK-25..40-C	25 - 40
OZK-32..50-C	32 - 50
OZK-40..60-C	40 - 60
OZK-50..70-C	50 - 70
OZK-60..80-C	60 - 80
OZK-70..90-C	70 - 90
OZK-80..100-C	80 - 100
OZK-90..110-C	90 - 110
OZK-100..120-C	100 - 120
OZK-110..130-C	110 - 130
OZK-120..140-C	120 - 140

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.

Typ 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

Typ K (NiCr-Ni), Typ 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 / Extension cables

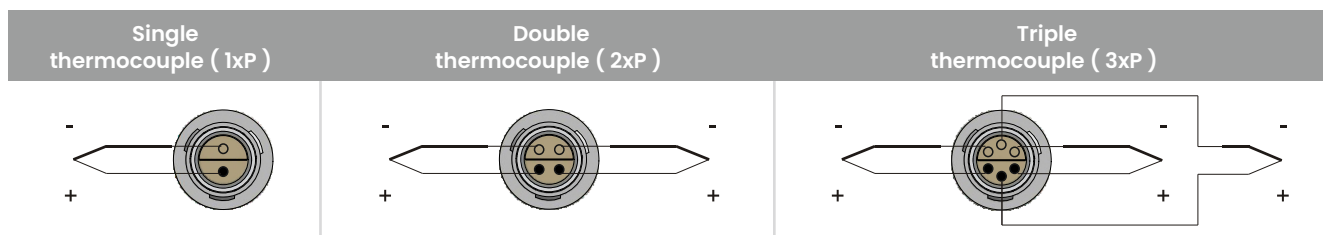
Colour designation of compensation / thermocouple cables according to IEC 584-3

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 materials

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 Ø7.3 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 Ø4.3	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]



Thermocouples with reduced tip

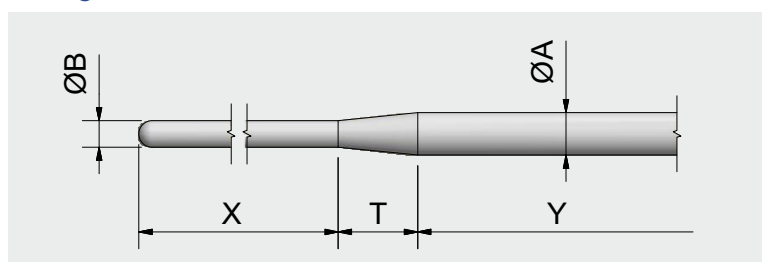
Features

- Big, solid thermocouple sheath diameter combine with small thermal weight of reduced tip ensures quick response time and great mechanical resistance of thermocouple.
- Tip reducing process increases thermocouple sheath durability through strengthening structure of insulating MgO grain
- Available with thermocouple types K, T, J, N, E, R, S with length from couple millimeters up to 200 meters or even more - depends on thermocouple

Dimensions limits

	Min.	Max.
ØA	-	6 mm
ØB	0.5 mm	-
X	10 mm	900 mm
Y	-	up to full coil length

Design



Standard tip diameters „B” [mm]

ØB															
5.20	4.78	4.65	4.50	4.15	4.00	3.70	3.40	3.30	3.175	3.00	2.70	2.43	2.19	2.00	1.80
1.80	1.62	1.60	1.50	1.45	1.32	1.20	1.09	1.00	0.90	0.80	0.72	0.65	0.59	0.54	0.50

Approximate length of reducing section „T” [mm]

		ØA						
		6	4.5	3	2	1.5	1	0.5
ØB	6	-	-	-	-	-	-	-
	4.5	6	-	-	-	-	-	-
	3	12	6	-	-	-	-	-
	2	16	10	4	-	-	-	-
	1.5	18	12	6	2	-	-	-
	1	20	14	8	4	2	-	-
	0.5	-	-	-	6	4	2	-

Available sheath materials and thermocouple types

	Pyrosil-D	Inconel 600 (2.4816)	AISI310 (1.4841)	AISI316 (1.4401)	AISI321 (1.4541)	AISI304 (1.4301)
N (NiCrSi-NiSi)	✓	✓				
K (NiCr-NiAl)	✓	✓	✓	✓	✓	✓
T (Cu-CuNi)				✓	✓	✓
E (NiCr-CuNi)				✓	✓	✓
J (Fe-CuNi)				✓	✓	✓

✓ : available

Ordering code

TTP - 313 - 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	
		3	Ø 3.0 mm
		4.5	Ø 4.5 mm
4	<input type="text"/>	Lenght A	
		25	25 mm
		55	55 mm
		xxx	other, please specify
5	<input type="text"/>	Lenght L1	
		200	200 mm
		300	300 mm
		500	500 mm
		xxx	other, please specify
6	<input type="text"/>	Cable lenght L2	
		2000	2000 mm
		5000	5000 mm
		8000	8000 mm
		xxx	other, please specify
7	<input type="text"/>	Inside diameter d, of bayonet cap	
		11.3	Ø 11.3 mm
		12	Ø 12 mm
		14.5	Ø 14.5 mm
8	<input type="text"/>	Tolerance	
		1	Class 1 acc. to PN-EN 60584-1
		2	Class 2 acc. 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 brad / 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-313-K-I-3-50-300-5000-12-1-SLSL

Sheathed sensor 1xK, with spring and bayonet cap, AISI316 sheath material, sheath diameter Ø3.0 mm, class 1 acc. to PN-EN 60584-2, junction isolated, lenght L1=300mm, cable lenght L2=5000 mm, bayonet cap with hole diameter Ø12 mm, cable insulation silicone / silicone.

TTP-313-K-II-3-70-200-3000-12-1-SLSL + OZK-40-60-100mm

Sheathed sensor 2xK, with spring and bayonet cap, AISI316 sheath material, sheath diameter Ø3.0 mm, class 1 acc. to PN-EN 60584-2, junctions isolated, lenght L1=200mm, cable lenght L2=3000 mm, bayonet cap with hole diameter Ø12 mm, cable insulation silicone / silicone. OZK clip connector for diameter Ø40-60 mm, lenght C=100 mm.

Ordering code

TTP - 314 - - - - - - - - - - -

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	
		3	Ø 3.0 mm
	4.5	Ø 4.5 mm	
4	<input type="text"/>	Lenght A	
		25	25 mm
		55	55 mm
	xxx	other, please specify	
5	<input type="text"/>	Lenght L1	
		200	200 mm
		300	300 mm
		500	500 mm
	xxx	other, please specify	
6	<input type="text"/>	Cable lenght L2	
		2000	2000 mm
		5000	5000 mm
		8000	8000 mm
	xxx	other, please specify	
7	<input type="text"/>	Inside diameter d, of bayonet cap	
		11.3	Ø 11.3 mm
		12	Ø 12 mm
	14.5	Ø 14.5 mm	
8	<input type="text"/>	Tolerance	
		1	Class 1 acc. to PN-EN 60584-1
	2	Class 2 acc. 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 brad / 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)	
10	<input type="text"/>	Connector	
		0	free end conductors of connection cable
		1	S-010, miniature plug
		2	S-020, standard plug
	3	LEMO I.S, LEMO connector	

Example

TTP-314-K-I-3-50-300-5000-12-1-SLSL-2

Sheathed sensor 1xK, with spring and bayonet cap, AISI316 sheath material, sheath diameter Ø3.0 mm, class 1 acc. to PN-EN 60584-2, junction isolated, lenght L1=300mm, cable lenght L2=5000 mm ended with S-020 plug, bayonet cap with hole diameter Ø12 mm, cable insulation silicone / silicone.

TTP-314-K-II-3-70-200-3000-12-1-SLSL-2 + OZK-40-60-100mm

Sheathed sensor 2xK, with spring and bayonet cap, AISI316 sheath material, sheath diameter Ø3.0 mm, class 1 acc. to PN-EN 60584-2, junctions isolated, lenght L1=200mm, cable lenght L2=3000 mm ended with S-020 plug, bayonet cap with hole diameter Ø12 mm, cable insulation silicone / silicone. OZK clip connector for diameter Ø40-60 mm, lenght C=100 mm.

Ordering code

TTP - 315 - 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8

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	
		3	Ø 3.0 mm
		4.5	Ø 4.5 mm
4	<input type="text"/>	Lenght A	
		25	25 mm
		55	55 mm
	xxx	other, please specify	
5	<input type="text"/>	Lenght L1	
		200	200 mm
		300	300 mm
		500	500 mm
	xxx	other, please specify	
6	<input type="text"/>	Inside diameter d, of bayonet cap	
		11.3	Ø 11.3 mm
		12	Ø 12 mm
	14.5	Ø 14.5 mm	
7	<input type="text"/>	Tolerance	
		1	Class 1 acc. to PN-EN 60584-1
	2	Class 2 acc. PN-EN 60584-1	
8	<input type="text"/>	Connector	
		0	free end conductors of connection cable
		1	S-010, miniature plug
		2	S-020, standard plug
	3	LEMO 1.S, LEMO connector	

Example

TTP-315-K-I-3-50-300-12-1-2

Sheathed sensor 1xK, with spring and bayonet cap, AISI316 sheath material, sheath diameter Ø3.0 mm, class 1 acc. to PN-EN 60584-2, junction isolated, lenght L1=300mm, ended with S-020 plug, bayonet cap with hole diameter Ø12 mm.

TTP-315-K-II-3-70-200-12-1-2 + OZK-40-60-100mm

Sheathed sensor 2xK, with spring and bayonet cap, AISI316 sheath material, sheath diameter Ø3.0 mm, class 1 acc. to PN-EN 60584-2, junctions isolated, lenght L1=200mm, ended with S-020 plug, bayonet cap with hole diameter Ø12 mm. OZK clip connector for diameter Ø40-60 mm, lenght C=100 mm.