

Penetration temperature sensors



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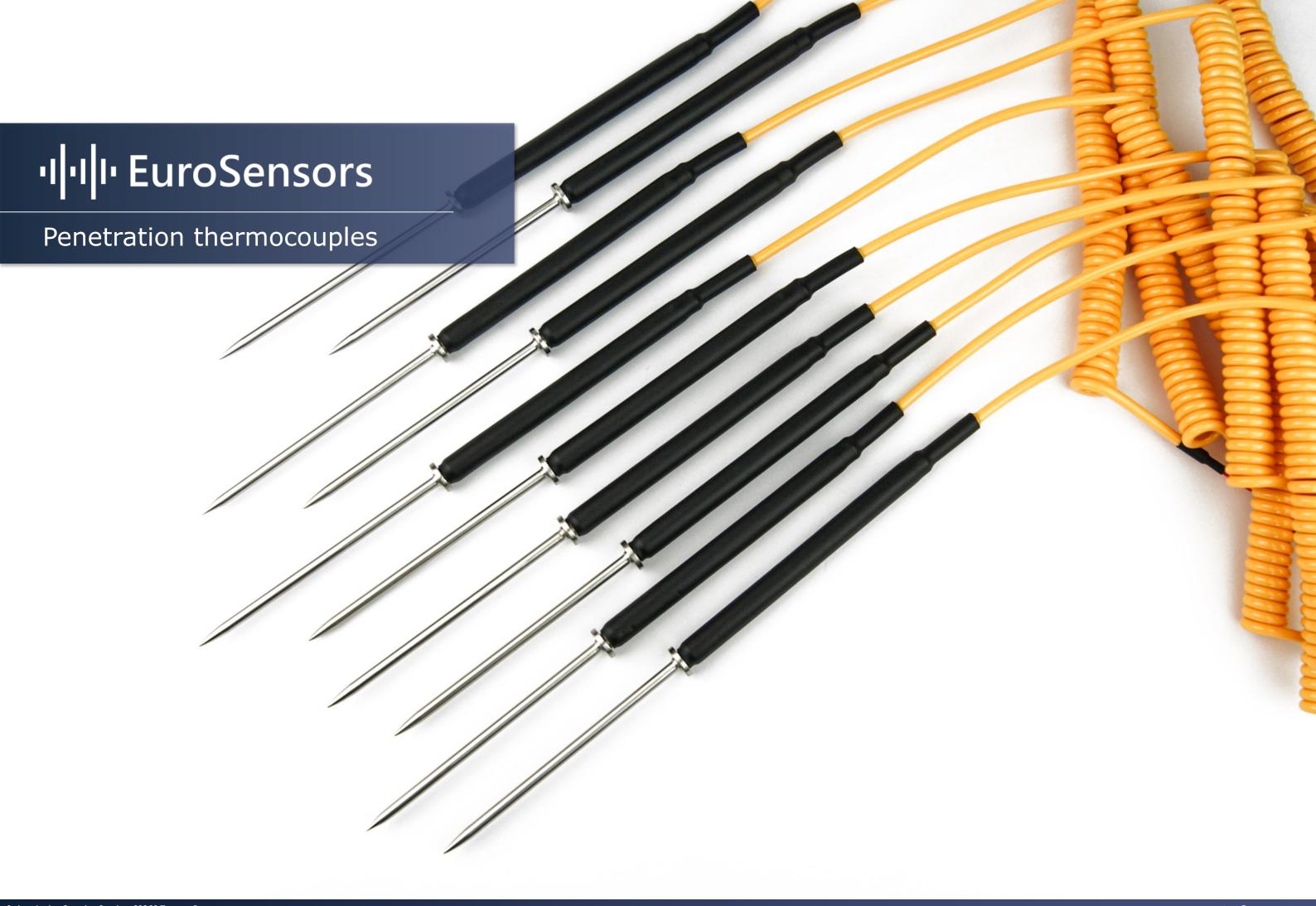
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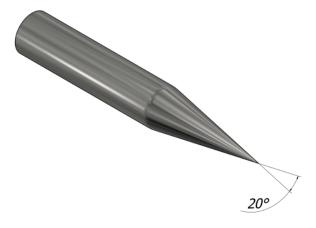


Penetration thermocouples - Technical information



What are the characteristics of penetration thermocouples?

What sets penetration thermocouples apart is their ability to measure the internal temperature of objects with pinpoint accuracy. Penetration probes are slender, pointed sensors designed for insertion into materials such as food, liquids, or even soil.



Here are some key applications where they prove invaluable:

Food safety and culinary arts: In the culinary world, achieving the perfect level of doneness and ensuring food safety go hand in hand. Penetration probes allow chefs and food inspectors to measure the core temperature of dishes, ensuring they are both delicious and safe to eat.

Industrial processes: From chemical reactions to metallurgical processes, knowing the temperature within materials or substances is crucial. Penetration probes provide real-time insights into the temperature profiles of these processes, aiding in quality control and optimization.

Medical applications: In the healthcare sector, penetration probes are used for patient monitoring, particularly during surgeries where monitoring body temperature accurately is vital for patient safety.

Environmental research: Environmental scientists utilize penetration probes to measure soil temperature accurately, helping them understand the impact of temperature variations on ecosystems.

Thermocouple classes

Classes of thermocouples have certain tolerance values and temperature limits of validity. The most common classes are class 1 and class 2.

With **class 1** you get more precise measurement values while **class 2** provides a wider tolerance values.

Types of thermocouples

Thermocouples are adapted to specific applications depending on the temperature range to be measured, the accuracy required and the environment in which they will be used. They are differentiated by letters (Type K, J, N, T, etc....) which correspond to the presence of materials that can measure a certain temperature range.

The most commonly used is the type K which is capable of measuring temperatures from –40°C to +1200°C. It is made from a chrome and an aluminum wire.

Type K NiCr-NiAl (NiCr-Ni)

Type N NiCrSi-NiSi

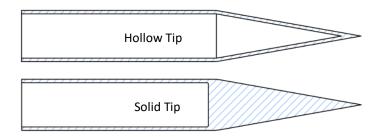
Type J Fe-CuNi

Type T Cu-Cuni

Note that connector colors vary by standard and country. Check the "International Color Codes applied to temperature measuring engineering" page 235

Types of penetration probes

There are two types of penetration probes: with hollow tip and solid tip. Hollow tip probes provides a faster response while solid tip probe is used in places where it is required to break through harder materials



Curly cable

Due to the frequent movement of the cable while using penetration probes, there is an option to put a curly cable that will ensure a easier and more comfortable way of use.



TP01 – Penetration thermocouples Standard



50	
LC	L. L
Ordering information 1. Thermocouple: Type K Type N Type J Type T Type E Type R Type S Type B Other:	9. Connector: Miniature
2. Class: Class 1 Class 2	10. Connector temperature: 200°C 350°C 650°C
3. Needle diameter Ø: (material Stainless steel 316L)	Cable clamp Custom ID label Without Additional: Application: Operating temperature (min/max):
5. Junction type: Ungrounded Grounded	Type of environment: Accessories: See the part "Accessories"
6. Cable prolongation: PVC (105°C) Silicone (180°C) Teflon (260°C) Fiberglass (400°C) Other:	Quantity: Note:
7. Cable length LC (mm): 8. Crimp protection:	
Spring Heat shrink sleeve Without	



TP02 – Penetration thermocouples Standard (90° bend)



50 LC	Ø
Ordering information	
1. Thermocouple: Type K Type N Type J Type T Type E Type R Type S Type B Other:	9. Connector: Miniature Miniature Standard Standard Withou Plug Socket Plug Socket
2. Class:	10. Connector temperature: □ 200°C □ 350°C □ 650°C
Class 1 Class 2	11. Option:
3. Needle diameter Ø: (material Stainless steel 316L)	☐ Cable clamp ☐ Custom ID label ☐ Without
☐ Ø3 mm ☐ Ø4 mm ☐ Ø5 mm	Additional:
☐ Ø6 mm ☐ Other:	Application:
4. Needle lengths (mm):	Operating temperature (min/max):
L1 L2	Type of environment:
5. Junction type:	Accessories: See the part "Accessories"
☐ Ungrounded ☐ Grounded	Quantity:
6. Cable prolongation: PVC (105°C) Silicone (180°C) Teflon (260°C) Fiberglass (400°C) Other:	Note:
7. Cable length LC (mm):	
8. Crimp protection: Spring Heat shrink sleeve Without	
How to order?	गुग



TP11 – Penetration thermocouples Metal handle



50	L
Ordering information	*Handle material Stainless steel 3
Ordering information	
1. Thermocouple: ☐ Type K ☐ Type N ☐ Type J ☐ Type T ☐ Type E ☐ Type R ☐ Type S ☐ Type B ☐ Other:	9. Connector: Miniature Miniature Standard Standard Without Plug Socket Plug Socket Plug Socket
2. Class:	10. Connector temperature: 200°C 350°C 650°C
Class 1 Class 2	11. Option: Cable clamp Custom ID label Without
3. Needle diameter Ø: (material Stainless steel 316L) □ Ø3 mm □ Ø4 mm □ Ø5 mm	Additional:
	Application:
4. Needle length L (mm):	Operating temperature (min/max):
5. Junction type:	Type of environment:
Ungrounded Grounded	Accessories: See the part "Accessories"
6. Cable prolongation:	Quantity:
☐ PVC (105°C) ☐ Silicone (180°C) ☐ Teflon (260°C)	Note:
☐ Fiberglass (400°C) ☐ Other:	
7. Cable length LC (mm):	
8. Crimp protection: Spring Heat shrink sleeve Without	



TP12 – Penetration thermocouples Metal handle (90° bend)

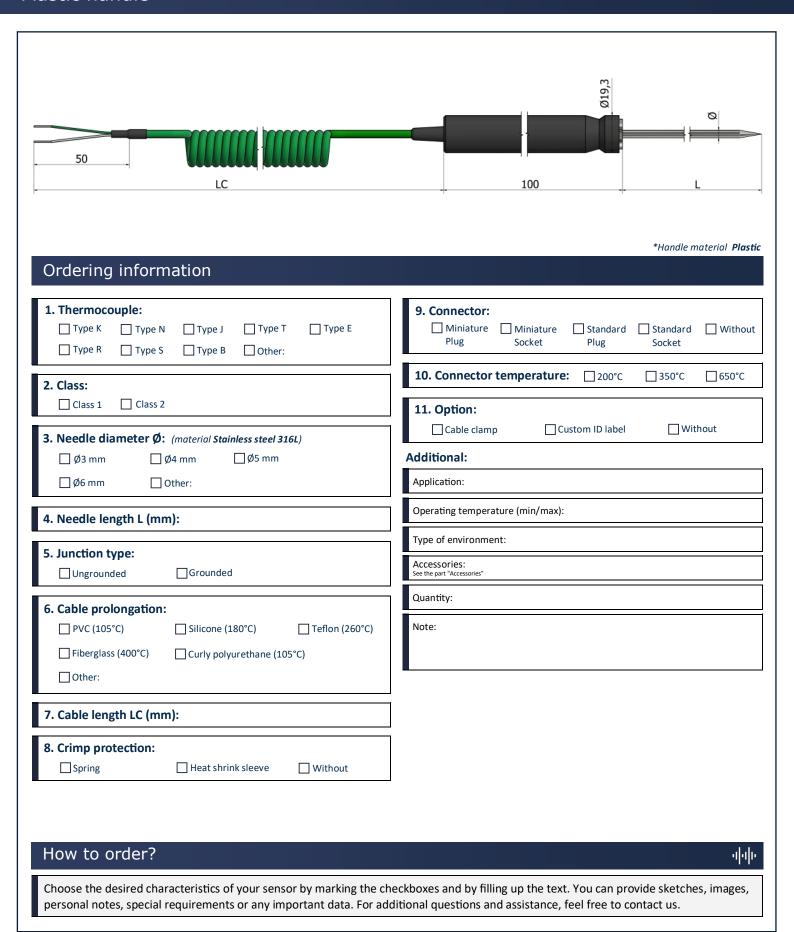


	110
. 50 . LC	*Handle material Stainless steel 3:
Ordering information	
1. Thermocouple: ☐ Type K ☐ Type N ☐ Type J ☐ Type T ☐ Type E ☐ Type R ☐ Type S ☐ Type B ☐ Other:	9. Connector: Miniature
2. Class:	10. Connector temperature: 200°C 350°C 650°C
Class 1 Class 2	11. Option:
3. Needle diameter Ø: (material Stainless steel 316L)	Cable clamp Custom ID label Without
□ Ø3 mm □ Ø4 mm □ Ø5 mm	Additional:
☐ Ø6 mm ☐ Other:	Application: Operating temperature (min/max):
4. Needle length L (mm):	Type of environment:
5. Junction type: Ungrounded Grounded	Accessories: See the part "Accessories"
6. Cable prolongation:	Quantity:
☐ PVC (105°C) ☐ Silicone (180°C) ☐ Teflon (260°C) ☐ Fiberglass (400°C) ☐ Other:	Note:
7. Cable length LC (mm):	
8. Crimp protection: Spring Heat shrink sleeve Without	
How to order?	ग



TP13 – Penetration thermocouples Plastic handle

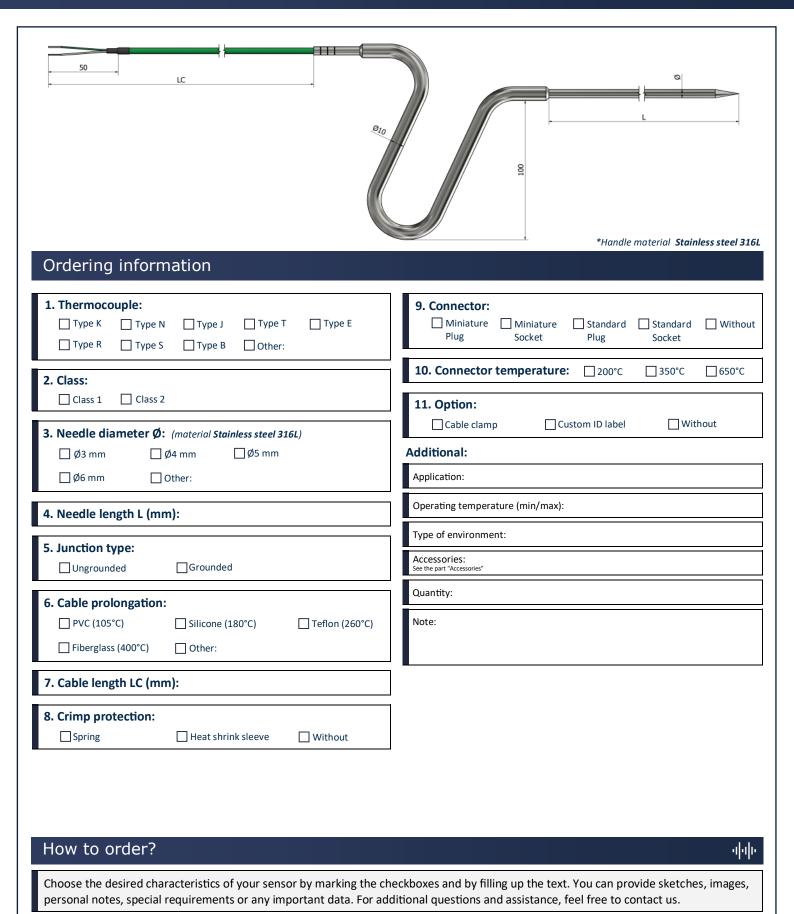






TP20 – Penetration thermocouples Ergonomic handle







TP31 – Penetration thermocouples Armored cable prolongation



50 LP	
Ordering information	*Handle material Stainless steel 3 *Armored cable material Stainless steel 3
1. Thermocouple: ☐ Type K ☐ Type N ☐ Type J ☐ Type T ☐ Type E ☐ Type R ☐ Type S ☐ Type B ☐ Other:	9. Connector: Miniature
2. Class: Class 1 Class 2	10. Connector temperature: \[\text{200°C} \] 350°C \[\text{650°C} \] 11. Option: \[\text{Cable clamp} \] \[\text{Custom ID label} \] \[\text{Without} \]
3. Needle diameter Ø: (material Stainless steel 316L)	Additional:
□ Ø6 mm □ Other:	Application:
4. Needle length L (mm):	Operating temperature (min/max):
5. Junction type:	Type of environment:
Ungrounded Grounded	Accessories: See the part "Accessories"
6. Cable prolongation:	Quantity:
☐ PVC (105°C) ☐ Silicone (180°C) ☐ Teflon (260°C) ☐ Fiberglass (400°C) ☐ Other:	Note:
7. Cable lengths (mm): LC LP	
8. Crimp protection: Spring Heat shrink sleeve Without	



TP32 – Penetration thermocouples Armored cable prolongation (90° bend)

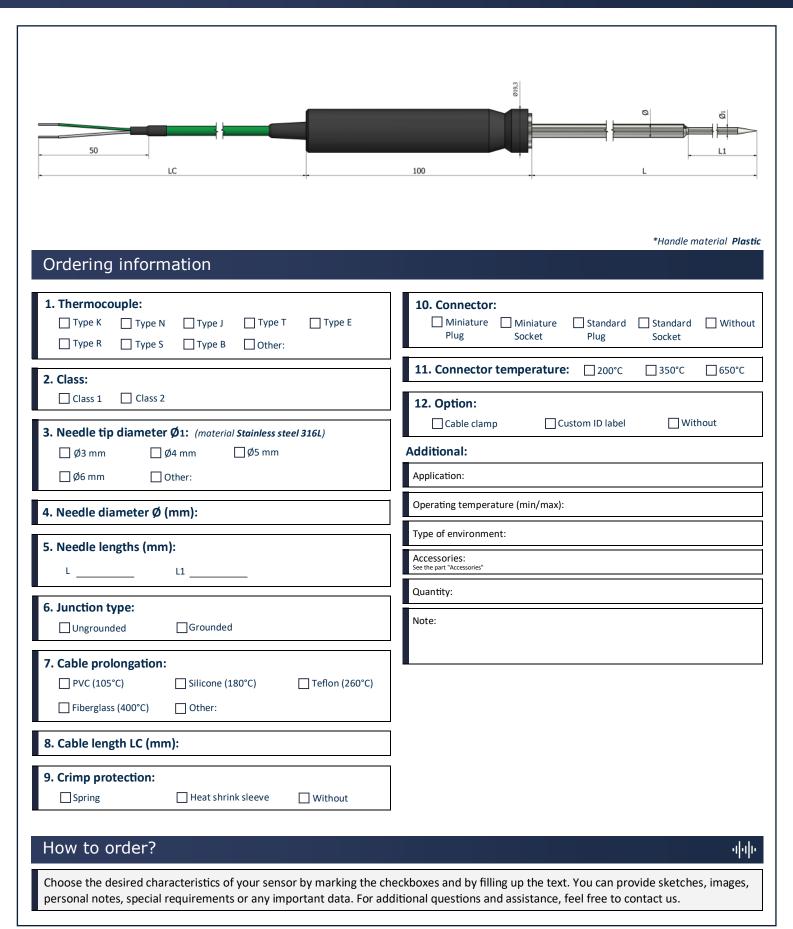


50 LP	*Handle material Stainless steel 3160 *Armored cable material Stainless steel 304
Ordering information 1. Thermocouple: Type K Type N Type J Type T Type E Type R Type S Type B Other:	9. Connector: Miniature
2. Class: Class 1 Class 2	10. Connector temperature: 200°C 350°C 650°C 11. Option:
3. Needle diameter Ø: (material Stainless steel 316L)	Cable clamp Custom ID label Without Additional: Application: Operating temperature (min/max):
5. Junction type: Ungrounded Grounded	Type of environment: Accessories: See the part "Accessories"
6. Cable prolongation: PVC (105°C) Silicone (180°C) Teflon (260°C) Fiberglass (400°C) Other:	Quantity: Note:
7. Cable lengths (mm): LC LP	
8. Crimp protection: Spring Heat shrink sleeve Without	
How to order?	վախ



TP40 – Penetration thermocouples Reduced tip







TP41 – Penetration thermocouples Miniature



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. 50	LC	1,		30				
-	<u>tt</u>		•	•	· • Handle mater	ial Stainles :	s steel 316L wit	h rubber co
Ordering informa	ntion							
1. Thermocouple: ☐ Type K ☐ Type N ☐ Type R ☐ Type S	☐ Type J ☐ Type T☐ Type B☐ Other:	☐ Туре E		liniature 🔲 N	/liniature ocket] Standard Plug	Standard Socket	☐ Witho
2. Class:			10. Co	nnector tem	perature:	□ 200°C	☐ 350°C	☐ 650°C
Class 1 Class 2			11. Op			15 1-11		h t
3. Needle diameter Ø: (<i>t</i> ☐ Ø1,5 mm ☐ Ø2		6L)	Addition	able clamp	Custo	om ID label	Wit	nout
☐ Other:	111111		Application					
4. Needle length L (mm)			Operating	g temperature (min/max):			
5. Junction type:			Type of e	nvironment:				
	Grounded		Accessor See the part "A					
6. Cable prolongation:			Quantity					
	Silicone (180°C)	☐ Teflon (260°C)	Note:					
7. Cable length LC (mm):	:							
8. Crimp protection:	☐ Heat shrink sleeve	☐ Without						



TP50 – Penetration thermocouples T shape



	*Handle material Stainless steel 316
Ordering information	
1. Thermocouple: ☐ Type K ☐ Type N ☐ Type J ☐ Type T ☐ Type E ☐ Type R ☐ Type S ☐ Type B ☐ Other:	9. Connector: Miniature Miniature Standard Standard Without Plug Socket Plug Socket
2. Class:	10. Connector temperature: ☐ 200°C ☐ 350°C ☐ 650°C
Class 1 Class 2	11. Option:
3. Needle diameter Ø: (material Stainless steel 316L)	☐ Cable clamp ☐ Custom ID label ☐ Without
☐ Ø3 mm	Additional:
☐ Ø6 mm ☐ Other:	Application:
4. Needle length L (mm):	Operating temperature (min/max):
5. Junction type:	Type of environment:
☐Ungrounded ☐Grounded	Accessories: See the part "Accessories"
6. Cable prolongation:	Quantity:
☐ PVC (105°C) ☐ Silicone (180°C) ☐ Teflon (260°C)	Note:
☐ Fiberglass (400°C) ☐ Other:	
7. Cable length LC (mm):	
8. Crimp protection:]
☐ Spring ☐ Heat shrink sleeve ☐ Without	



TP51 – Penetration thermocouples T shape with thread

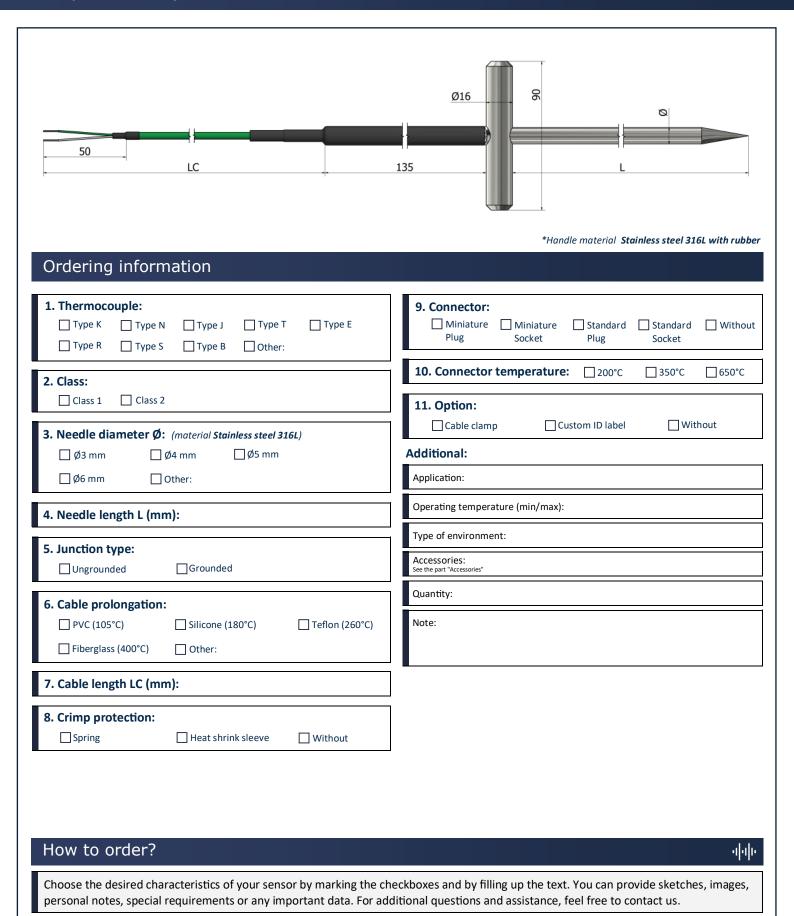


Ordering information	*Handle material Stainless steel 316
1. Thermocouple: ☐ Type K ☐ Type N ☐ Type J ☐ Type T ☐ Type E ☐ Type R ☐ Type S ☐ Type B ☐ Other:	9. Connector: Miniature
2. Class: Class 1 Class 2	10. Connector temperature: 200°C 350°C 650°C 11. Option:
3. Needle diameter Ø: (material Stainless steel 316L) ☐ Ø3 mm ☐ Ø4 mm ☐ Ø5 mm ☐ Ø6 mm ☐ Other:	Cable clamp Custom ID label Without Additional: Application: Operating temperature (min/max):
4. Needle length L (mm): 5. Junction type: Ungrounded Grounded	Type of environment: Accessories: See the part "Accessories"
6. Cable prolongation: PVC (105°C) Silicone (180°C) Teflon (260°C) Fiberglass (400°C) Other:	Quantity: Note:
7. Cable length LC (mm):	
8. Crimp protection: Spring Heat shrink sleeve Without	
How to order?	սիվի



TP60 – Penetration thermocouples T shape for compost

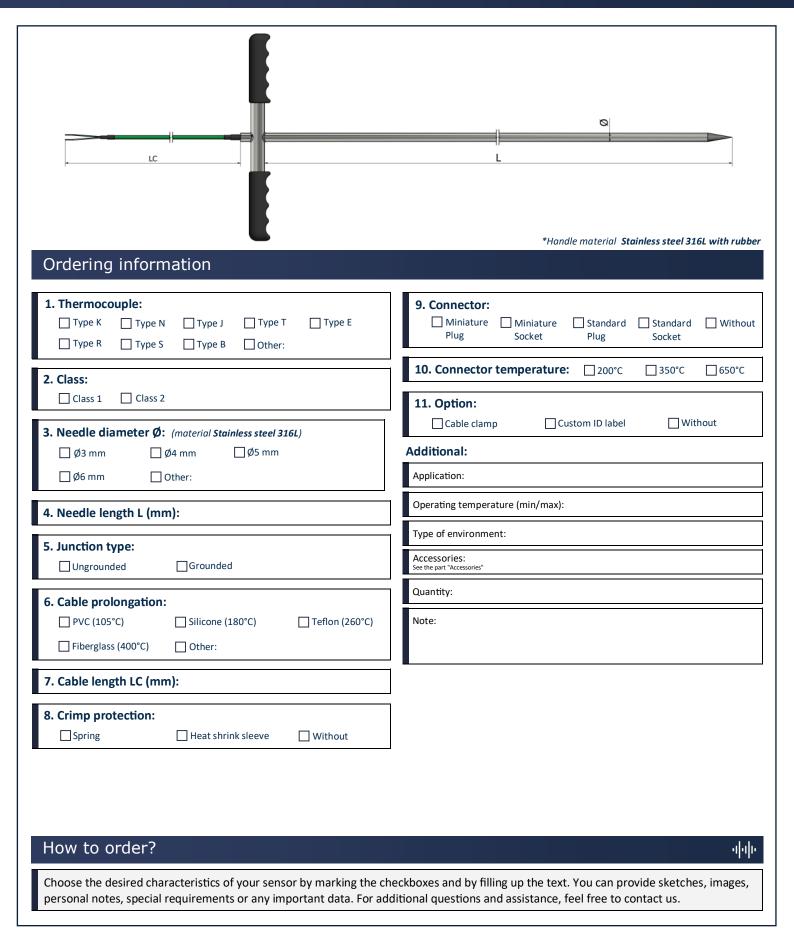






TP61 – Penetration thermocouples Robust T shape for compost





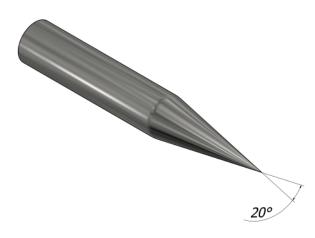


Penetration RTDs - Technical information



What are the characteristics of penetration RTDs?

What sets penetration RTDs apart is their ability to measure the internal temperature of objects with pinpoint accuracy. Penetration probes are slender, pointed sensors designed for insertion into materials such as food, liquids, or even soil.



Here are some key applications where they prove invaluable:

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Industrial processes: From chemical reactions to metallurgical processes, knowing the temperature within materials or substances is crucial. Penetration probes provide real-time insights into the temperature profiles of these processes, aiding in quality control and optimization.

Medical applications: In the healthcare sector, penetration probes are used for patient monitoring, particularly during surgeries where monitoring body temperature accurately is vital for patient safety.

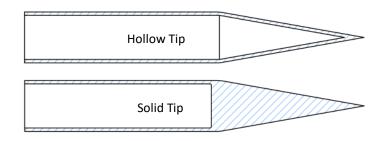
Environmental research: Environmental scientists utilize penetration probes to measure soil temperature accurately, helping them understand the impact of temperature variations on ecosystems.

Curly cable

Due to the frequent movement of the cable while using penetration probes, there is a option to put a curly cable that will ensure a easier and more comfortable way of use.

Types of penetration probes

There are two types of penetration probes with hollow tip and solid tip. Hollow tip probes provides a faster response while solid tip probe is used in places where it is required to break through harder materials



What is an RTD sensor?

An RTD (Resistance Temperature Detector) is a type of sensor used to measure temperature. RTDs are used for accurate, stable and reliable temperature measurements in generally high temperature ranges.

RTDs advantages

RTDs have several advantages over other types of temperature sensors:

High precision

RTDs have high temperature sensitivity, typically in the range of 0.1 to 0.2% per $^{\circ}$ C, allowing for accurate temperature measurement.

Long term stability

RTDs have long-term stability and longer life than thermistors, making them more reliable for long-term applications.

Wide operating temperature range

RTDs can operate in a temperature range of -200 to +850°C, making them suitable for many industrial applications.

Low ohmic resistance

RTDs have a low ohmic resistance compared to thermistors, which makes them easier to use with electronic circuits.

How does an RTD work?

An RTD (variable temperature resistor) is a sensor that measures temperature using the variation of the electrical resistance of a conductive material. RTDs are usually made from platinum, gold or nickel. The operating principle of RTDs is based on Ohm's law of electrical resistance, which establishes a relationship between the electrical resistance of a conductor and its temperature. According to this law, the electrical resistance of a conductor generally increases when its temperature increases.

Penetration RTDs - Technical information



What is a PT probe?

A PT (Platinum Resistance Thermometer) is a type of temperature sensor that uses a temperature deflection resistor (RTD) to measure temperature. It is based on the principle that the electrical resistance of a conductive material increases when its temperature increases.

Understanding the naming of Pt100, PT500 and PT1000 sensors

First of all, "Pt" is the chemical symbol for platinum because platinum is the basic material for making the measuring element. The naming conventions of P100, PT500, and PT1000 sensors are closely tied to the nominal resistance values they exhibit at 0°C. P100 sensor has a nominal resistance of 100 Ω at 0°C, Pt500 sensor has a nominal resistance of 500 Ω at 0°C and Pt1000 sensor has a nominal resistance of 1000 Ω at 0°C. Understanding the meaning behind these designations allows us to discern their specific characteristics and applications. Whether you require a standard PT100 sensor or a higher resistance variant like PT500 or PT1000, these RTD sensors provide reliable and accurate temperature measurements in a wide range of industries and applications.

Pt-s wiring configurations

The cable has certain resistance which adds to the RTD resistance. Thus, the total resistance is the sum of the RTD resistance and the lead wire resistance. This causes more voltage drop across the RTD measurement system and as a result causes inaccuracy in measurement. This is the reason why we use 2 wire, 3 wire, and 4 wire RTD configurations.

RTD connectors

Due to the lack of standardization in RTD connectors, our company takes pride in its ability to produce a wide range of RTD connectors. We understand that different industries and applications have unique requirements when it comes to temperature measurement, and that includes the connectors used. With our expertise and advanced manufacturing capabilities, we have the flexibility to design and produce various types of RTD connectors.



Pt-s classes

Tolerances of RTD sensors can be tailored to customer specifics and thus manufactured to different tolerances. The higher the tolerance the smaller the margin of error relative to lower tolerances.

A system where these tolerances are classified is helpful for the end user and helps the interchangeability of these sensors. The IEC system is seen as the standard for the industry although there are other standards and other tolerance classes.

IEC Standard	DIN4370	Temperature Range ºC	Tolerance Ω at 0ºC	Tolerance ºC
W0.03	1/10 DIN	-100 to 350	100±0.012 Ω	±0.03 °C
/	1/5 DIN	-100 to 350	100±0.024 Ω	±0.06 °C
W0.1	1/3 DIN	-100 to 350	100±0.04 Ω	±0.10 °C
W0.15	Class A	-100 to 450	100±0.06 Ω	±0.15 °C
W0.3	Class B	-196 to 660	100±0.12 Ω	±0.30 °C

Global cable insulation characteristics

	PVC	Silicone	Teflon	Fiberglass
Abrasion resistance	Very good	Fair	Good	Fair
Chemical resistance	Very good	Poor	Excellent	Good
Moisture resistance	Good	Good	Excellent	Poor
Fire resistance	Good	Good	Excellent	Excellent



PP01 – Penetration RTDs Standard



50 LC	L
Ordering information	Additional:
1. Element type: ☐ Pt 100 ☐ Pt 500 ☐ Pt 1000	Application:
☐ Other:	Operating temperature (min/max):
2. Element class:	Type of environment:
☐ A ☐ B ☐ Other:	Accessories: See the part "Accessories"
3. Number of sensor elements:	Quantity:
4. Wiring configuration: (number of wires per element)	Note:
5. Needle diameter Ø: (material Stainless steel 316L) ☐ Ø3 mm ☐ Ø4 mm ☐ Ø5 mm ☐ Ø6 mm ☐ Other:	
6. Needle length L (mm):	
7. Cable prolongation: PVC (105°C) Silicone (180°C) Teflon (260°C) Fiberglass (400°C) Other:	
8. Cable length LC (mm):	
9. Crimp protection: Spring Heat shrink sleeve Without	
How to order?	નોન



PP02 – Penetration RTDs Standard (90° bend)



50 LC	
Ordering information	
1. Element type:	Additional:
□ Pt 100 □ Pt 500 □ Pt 1000	Application:
Other:	Operating temperature (min/max):
2. Element class:	Type of environment:
☐ A ☐ B ☐ Other:	Accessories: See the part "Accessories"
3. Number of sensor elements: \(\times x1 \) \(\times x2 \)	Quantity:
4. Wiring configuration: (number of wires per element) 2	Note:
6. Needle lengths L (mm):	
L1 L2	
7. Cable prolongation: PVC (105°C) Silicone (180°C) Teflon (260°C) Fiberglass (400°C) Other:	
8. Cable length LC (mm):	
9. Crimp protection: Spring Heat shrink sleeve Without	
How to order?	व



PP11 – Penetration RTDs Metal handle



	88
50 LC	L
	*Handle material Stainless steel 3
Ordering information	
1. Element type:	Additional:
☐ Pt 100 ☐ Pt 500 ☐ Pt 1000 ☐ Other: ☐ Other:	Application:
	Operating temperature (min/max): Type of environment:
2. Element class: A B Other:	Accessories:
	See the part "Accessories" Quantity:
3. Number of sensor elements: \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	Note:
5. Needle diameter Ø: (material Stainless steel 316L) ☐ Ø3 mm ☐ Ø4 mm ☐ Ø5 mm ☐ Ø6 mm ☐ Other:	
6. Needle length L (mm):]
7. Cable prolongation: PVC (105°C) Silicone (180°C) Teflon (260°C) Fiberglass (400°C) Other:	
8. Cable length LC (mm):	
9. Crimp protection: Spring Heat shrink sleeve Without	



PP12 – Penetration RTDs Metal handle (90° bend)

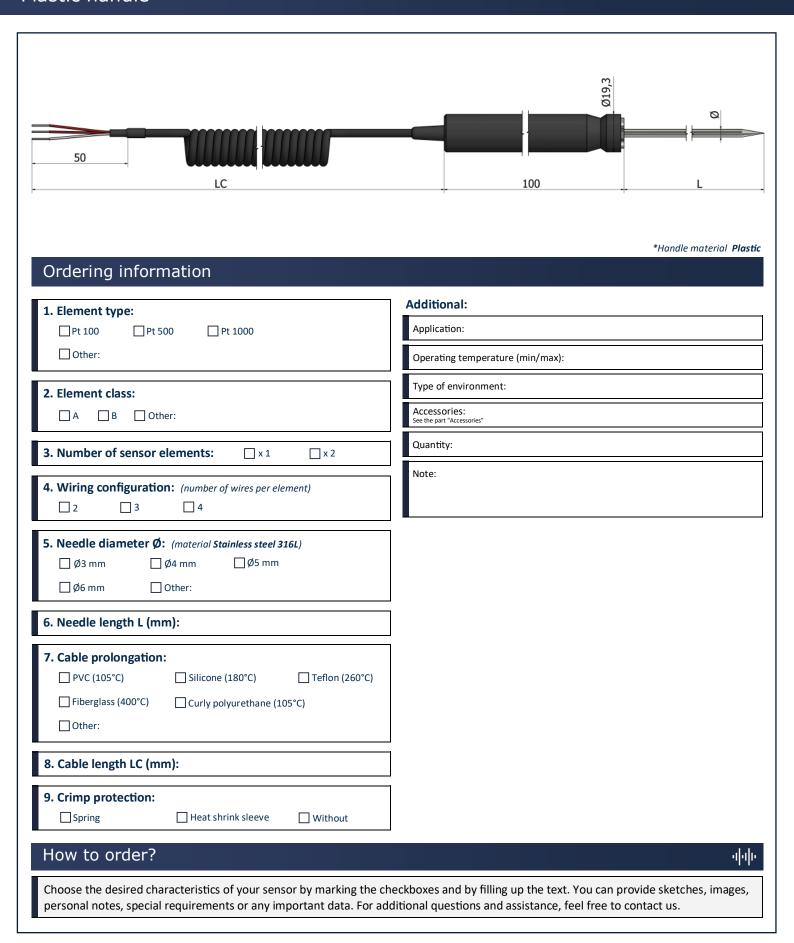


LC	*Handle material Stainless steel 31
Ordering information	
1. Element type:	Additional:
☐ Pt 100 ☐ Pt 500 ☐ Pt 1000	Application:
☐ Other:	Operating temperature (min/max):
2. Element class:	Type of environment:
☐ A ☐ B ☐ Other:	Accessories: See the part "Accessories"
3. Number of sensor elements: \begin{array}{c cccc} x1 & x2 &	Quantity:
4. Wiring configuration: (number of wires per element) ☐ 2 ☐ 3 ☐ 4	Note:
5. Needle diameter Ø: (material Stainless steel 316L)	
6. Needle length L (mm):	
7. Cable prolongation: PVC (105°C) Silicone (180°C) Teflon (260) Fiberglass (400°C) Other:)°C)
8. Cable length LC (mm):	
9. Crimp protection: Spring Heat shrink sleeve Without	
How to order?	ग्रीव



PP13 – Penetration RTDs Plastic handle

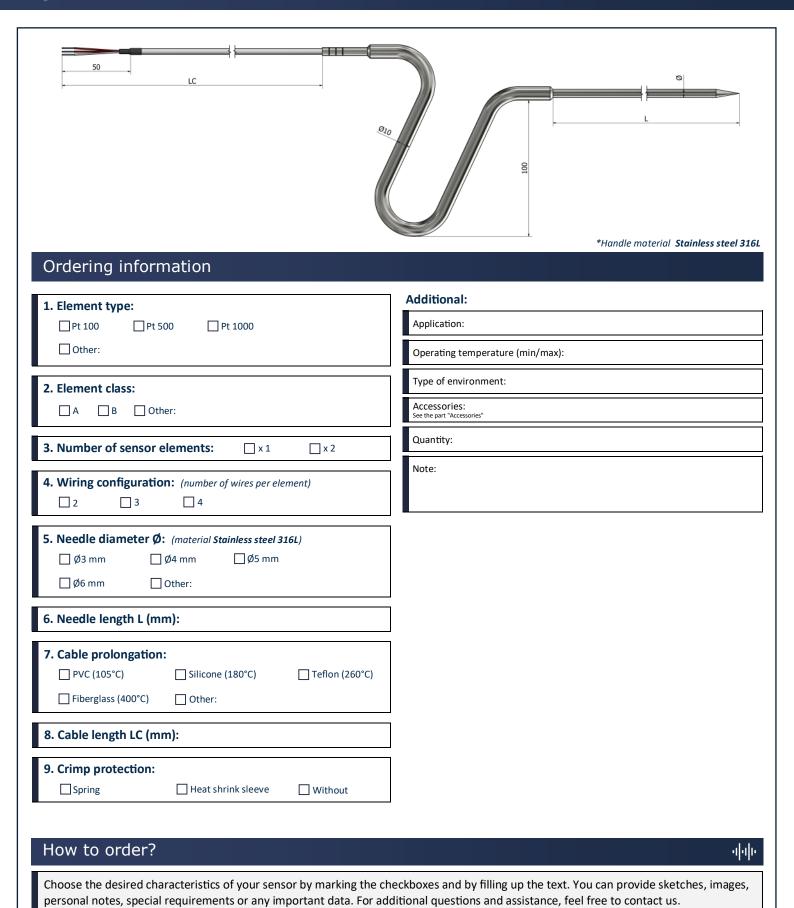






PP20 – Penetration RTDs Ergonomic handle







PP31 – Penetration RTDs Armored cable prolongation



50 LP	
Ordering information	*Handle material Stainless steel 31 *Armored cable material Stainless steel 3 0
1. Element type: Pt 100 Pt 500 Pt 1000 Other:	Additional: Application: Operating temperature (min/max):
2. Element class: A B Other:	Type of environment: Accessories: See the part "Accessories"
3. Number of sensor elements:	Quantity: Note:
5. Needle diameter Ø: (material Stainless steel 316L) ☐ Ø3 mm ☐ Ø4 mm ☐ Ø5 mm ☐ Ø6 mm ☐ Other:	
6. Needle length L (mm):	
7. Cable prolongation: PVC (105°C) Silicone (180°C) Teflon (260°C) Fiberglass (400°C) Other:	
8. Cable lengths (mm): LC LP	
9. Crimp protection: Spring Heat shrink sleeve Without	
How to order?	व्यव



PP32 – Penetration RTDs Armored cable prolongation (90° bend)



Ordering information	*Handle material Stainless steel 3161 *Armored cable material Stainless steel 304
1. Element type: Pt 100	Additional: Application: Operating temperature (min/max):
2. Element class: A B Other:	Type of environment: Accessories: See the part "Accessories"
3. Number of sensor elements: \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	Quantity: Note:
☐ Ø6 mm ☐ Other: 6. Needle length L (mm):	
7. Cable prolongation: PVC (105°C) Silicone (180°C) Teflon (260°C) Fiberglass (400°C) Other:	
8. Cable lengths (mm): LC LP	
9. Crimp protection: Spring Heat shrink sleeve Without	
How to order? Choose the desired characteristics of your sensor by marking the characteristics of your sensor by	heckboxes and by filling up the text. You can provide sketches, images, idditional questions and assistance, feel free to contact us.



PP40 – Penetration RTDs Reduced tip



50 LC	100 L
Ordering information	*Handle material Pla
1. Element type: Pt 100 Pt 500 Pt 1000 Other:	10. Crimp protection: Spring Heat shrink sleeve Without Additional:
2. Element class:	Application:
☐ A ☐ B ☐ Other:	Operating temperature (min/max):
3. Number of sensor elements: \[\times x 1 \] \[\times x 2	Type of environment: Accessories:
4. Wiring configuration: (number of wires per element)	See the part "Accessories" Quantity:
5. Needle tip diameter Ø1: (material Stainless steel 316L)	Note:
6. Needle diameter Ø (mm):	
7. Needle lengths (mm):	
8. Cable prolongation: PVC (105°C) Silicone (180°C) Teflon (260°C) Fiberglass (400°C) Other:	
9. Cable length LC (mm):	
How to order?	·II·



PP41 – Penetration RTDs Miniature



	Ø10 S
Ordering information	*Handle material Stainless steel 316L with rubber c o
1. Element type:	Additional:
□ Pt 100 □ Pt 500 □ Pt 1000 □ Other: □	Application:
□ Outer.	Operating temperature (min/max):
2. Element class:	Type of environment: Accessories:
A B Other:	See the part "Accessories"
3. Number of sensor elements: \[\times x 1 \] \[\times x 2	Quantity:
4. Wiring configuration: (number of wires per element) □ 2 □ 3 □ 4	Note:
5. Needle diameter Ø: (material Stainless steel 316L)	
6. Needle length L (mm):	
7. Cable prolongation: PVC (105°C) Silicone (180°C) Teflon (260°C)	
Fiberglass (400°C) Other:]
8. Cable length LC (mm):]
9. Crimp protection: ☐ Spring ☐ Heat shrink sleeve ☐ Without	

personal notes, special requirements or any important data. For additional questions and assistance, feel free to contact us.



PP50 – Penetration RTDs T shape



LC LC	*Handle material Stainless steel 3:
Ordering information	
1. Element type:	Additional:
☐ Pt 100 ☐ Pt 500 ☐ Pt 1000	Application:
Other:	Operating temperature (min/max):
2. Element class:	Type of environment:
A B Other:	Accessories: See the part "Accessories"
3. Number of sensor elements: \[\times x 1 \] \[\times x 2	Quantity:
4. Wiring configuration: (number of wires per element) ☐ 2 ☐ 3 ☐ 4	Note:
5. Needle diameter Ø: (material Stainless steel 316L)	
6. Needle length L (mm):	
7. Cable prolongation: PVC (105°C) Silicone (180°C) Teflon (260°C) Fiberglass (400°C) Other:	
8. Cable length LC (mm):	
9. Crimp protection: Spring Heat shrink sleeve Without	
How to order?	ग्री



PP51 – Penetration RTDs T shape with thread

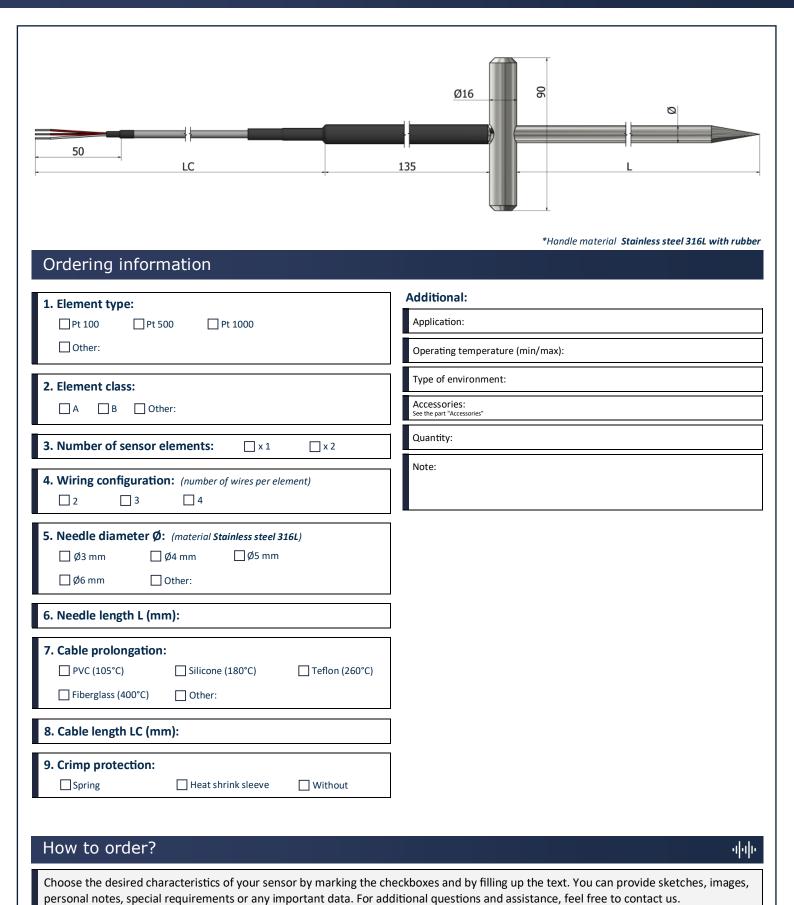


	*Handle material Stainless steel 3.
Ordering information	
1. Element type:	Additional:
☐ Pt 100 ☐ Pt 500 ☐ Pt 1000	Application:
Other:	Operating temperature (min/max):
2. Element class:	Type of environment:
☐ A ☐ B ☐ Other:	Accessories: See the part "Accessories"
3. Number of sensor elements: \[\times x 1 \] \[\times x 2	Quantity:
4. Wiring configuration: (number of wires per element) ☐ 2 ☐ 3 ☐ 4	Note:
5. Needle diameter Ø: (material Stainless steel 316L) ☐ Ø3 mm ☐ Ø4 mm ☐ Ø5 mm ☐ Ø6 mm ☐ Other:	
6. Needle length L (mm):]
7. Cable prolongation: PVC (105°C) Silicone (180°C) Teflon (260°C) Fiberglass (400°C) Other:	
8. Cable length LC (mm):]
9. Crimp protection: Spring Heat shrink sleeve Without	
How to order?	्रा-



PP60 – Penetration RTDs T shape for compost







PP61 – Penetration RTDs Robust T shape for compost



Ordering information	*Handle material Stainless steel 316L with rubber hand
Ordering information	Additional:
Telement type:	Application:
Other:	Operating temperature (min/max):
2. Element class:	Type of environment:
A B Other:	Accessories: See the part "Accessories"
3. Number of sensor elements:	Quantity:
4. Wiring configuration: (number of wires per element) ☐ 2 ☐ 3 ☐ 4	Note:
5. Needle diameter Ø: (material Stainless steel 316L) Ø3 mm Ø4 mm Ø5 mm Ø6 mm Other:	
6. Needle length L (mm):	
7. Cable prolongation: PVC (105°C) Silicone (180°C) Teflon (260°C) Fiberglass (400°C) Other:	
8. Cable length LC (mm):	
9. Crimp protection: Spring Heat shrink sleeve Without	
How to order? Choose the desired characteristics of your sensor by marking the ch	اراً باراً

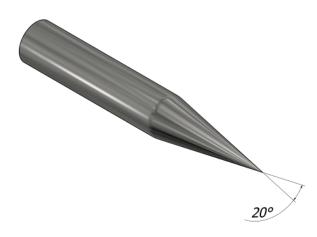


Penetration thermistors - Technical information



What are the characteristics of penetration thermistors ?

What sets penetration thermistors apart is their ability to measure the internal temperature of objects with pinpoint accuracy. Penetration probes are slender, pointed sensors designed for insertion into materials such as food, liquids, or even soil.



Here are some key applications where they prove invaluable:

Food safety and culinary arts: In the culinary world, achieving the perfect level of doneness and ensuring food safety go hand in hand. Penetration probes allow chefs and food inspectors to measure the core temperature of dishes, ensuring they are both delicious and safe to eat.

Industrial processes: From chemical reactions to metallurgical processes, knowing the temperature within materials or substances is crucial. Penetration probes provide real-time insights into the temperature profiles of these processes, aiding in quality control and optimization.

Medical applications: In the healthcare sector, penetration probes are used for patient monitoring, particularly during surgeries where monitoring body temperature accurately is vital for patient safety.

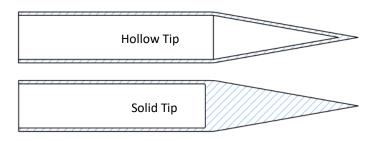
Environmental research: Environmental scientists utilize penetration probes to measure soil temperature accurately, helping them understand the impact of temperature variations on ecosystems.

Curly cable

Due to the frequent movement
of the cable while using
penetration probes,
there is a option
to put a curly cable
that will ensure
a easier and more
comfortable way of use.

Types of penetration probes

There are two types of penetration probes with hollow tip and solid tip. Hollow tip probes provides a faster response while solid tip probe is used in places where it is required to break through harder materials



What is an RTD sensor?

An RTD (Resistance Temperature Detector) is a type of sensor used to measure temperature. RTDs are used for accurate, stable and reliable temperature measurements in generally high temperature ranges.

RTDs advantages

RTDs have several advantages over other types of temperature sensors:

High precision

RTDs have high temperature sensitivity, typically in the range of 0.1% to 0.2% per $^{\circ}$ C, allowing for accurate temperature measurement.

Long term stability

RTDs have long-term stability and longer life than thermistors, making them more reliable for long-term applications.

Wide operating temperature range

RTDs can operate in a temperature range of -200 to +850°C, making them suitable for many industrial applications.

Low ohmic resistance

RTDs have a low ohmic resistance compared to thermistors, which makes them easier to use with electronic circuits.

How does an RTD work?

An RTD is a sensor that measures temperature using the variation of the electrical resistance of a conductive material. RTDs are usually made from platinum, gold or nickel. The operating principle of RTDs is based on Ohm's law of electrical resistance, which establishes a relationship between the electrical resistance of a conductor and its temperature.

According to this law, the electrical resistance of a conductor generally increases when its temperature increases.

Penetration thermistors - Technical information



What is a thermistor?

A thermistor is an electrical component that changes its resistance according to temperature. It consists of a conductive material that is wrapped in an insulating material. As the temperature increases, the resistance of the conductive material decreases (NTC), or increases (PTC), which can be detected and measured.

What are the two types of thermistor?

NTC (*Negative Temperature Coefficient*) are made of a conductive material based on transition metals and are used to measure temperatures up to 300 °C.

PTC (*Positive Temperature Coefficient*) are made of a conductive material based on polymer or ceramic and are used to measure temperatures up to 200 °C.

What is the difference between an NTC and a PTC?

NTCs and PTCs are both thermistors, i.e. temperature sensors that change resistance depending on the temperature.

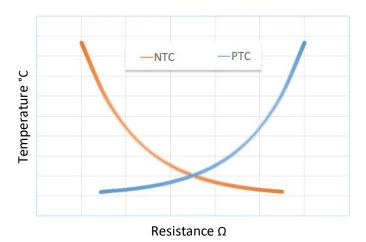
However, there is a major difference between these two types of thermistors:

NTC thermistors

NTCs have a resistance that decreases as the temperature increases. They are commonly used in thermostats and temperature control devices to measure room temperature.

PTC thermistors

PTCs have a resistance that increases as the temperature rises. They are commonly used in thermostatic fuses and overcurrent protection devices to shut off power in the event of overheating.



Thermistor wiring configurations

The cable has certain resistance which adds to the RTD resistance. Thus, the total resistance is the sum of the RTD resistance and the lead wire resistance. This causes more voltage drop across the RTD measurement system and as a result causes inaccuracy in measurement. This is the reason why we use 2 wire, 3 wire, and 4 wire RTD configurations.

Thermistor connectors

Due to the lack of standardization in RTD connectors, our company takes pride in its ability to produce a wide range of RTD connectors. We understand that different industries and applications have unique requirements when it comes to temperature measurement, and that includes the connectors used. With our expertise and advanced manufacturing capabilities, we have the flexibility to design and produce various types of RTD connectors.



Global cable insulation characteristics

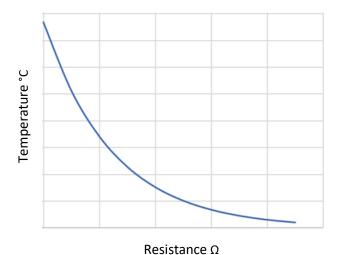
	PVC	Silicone	Teflon	Fiberglass
Abrasion resistance	Very good	Fair	Good	Fair
Chemical resistance	Very good	Poor	Excellent	Good
Moisture resistance	Good	Good	Excellent	Poor
Fire resistance	Good	Good	Excellent	Excellent

Penetration thermistors - Technical information

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The β beta value

A thermistor's " β " value, or beta value, is an indication of the shape of the curve representing the relationship between resistance and temperature of an NTC thermistor. Calculating the beta value is a vital step in the component selection process as it gives the characteristic at a given temperature vs the resistance for a specific application.



NTC thermistors are non-linear resistors that alter their resistance characteristics with temperature. Simply put, as temperature increases the thermistor's resistance decreases.

The manner in which the resistance of a thermistor decreases is related to a constant known in the thermistor industry as beta (β). Beta is measured in degrees Kelvin (K) and is computed based on the formulation given below.

Where:

given range.

Rt1 = Resistance at Temperature 1

Rt2 = Resistance at Temperature 2

T1 = Temperature 1 (K)

T2= Temperature 2 in (K)

$$\beta = \frac{\ln(\frac{R_{T1}}{R_{T2}})}{(\frac{1}{T_1} - \frac{1}{T_2})}$$

The beta value of an NTC Thermistor is calculated using only two temperatures over a given range and is not the most accurate way to calculate the R vs. T curve. A more accurate method is to use the Steinhart and Hart method, which uses three temperatures over a

Types of thermistors

			1	ļ				
4					Туре	Resistance	Beta value	Temperature
		1	,	1	PTC KTY81/121	990Ω at 25°C	/	T° (-55/+150°C)
					NTC	3,3kΩ at 100°C	β=3970	T° (-40/+200°C)
					NTC	10kΩ at 25°C	β=3977	T° (-40/+125°C)
					NTC	10kΩ at 25°C	β=3435	T° (-40/+150°C)
					NTC	20kΩ at 25°C	β=4260	T° (-40/+125°C)
	3							



HP01 – Penetration thermistors Standard



50 LC	L		
Ordering information	Additional:		
1. Element type: ☐ PTC KTY 81/110 (-40°C / +150°C)	Application:		
☐ PTC KTY 81/121 (-40°C / +150°C)	Operating temperature (min/max):		
\square NTC 10kΩ at 25°C β3977 (-40°C / +125°C) \square NTC 20kΩ at 25°C β4260 (-40°C / +125°C)	Type of environment:		
□ NTC 3,3kΩ at 100°C β3970 (-40°C / +200°C)	Accessories: See the part "Accessories"		
Other: (NTC/PTC, T° (min/max), β value, tolerance)	Quantity:		
2. Wiring configuration: (number of wires)	Note:		
3. Needle diameter Ø: (material Stainless steel 316L) ☐ Ø3 mm ☐ Ø4 mm ☐ Ø5 mm ☐ Ø6 mm ☐ Other:			
4. Needle length L (mm):			
5. Cable prolongation: PVC (105°C) Silicone (180°C) Teflon (260°C) Fiberglass (400°C) Other:			
6. Cable length LC (mm):			
7. Crimp protection: Spring Heat shrink sleeve Without			
How to order?	ग्र		

8 chemin des Grandes Combes 69360 Ternay, France +33 472 669 234

Choose the desired characteristics of your sensor by marking the checkboxes and by filling up the text. You can provide sketches, images,



HP02 – Penetration thermistors Standard (90° bend)

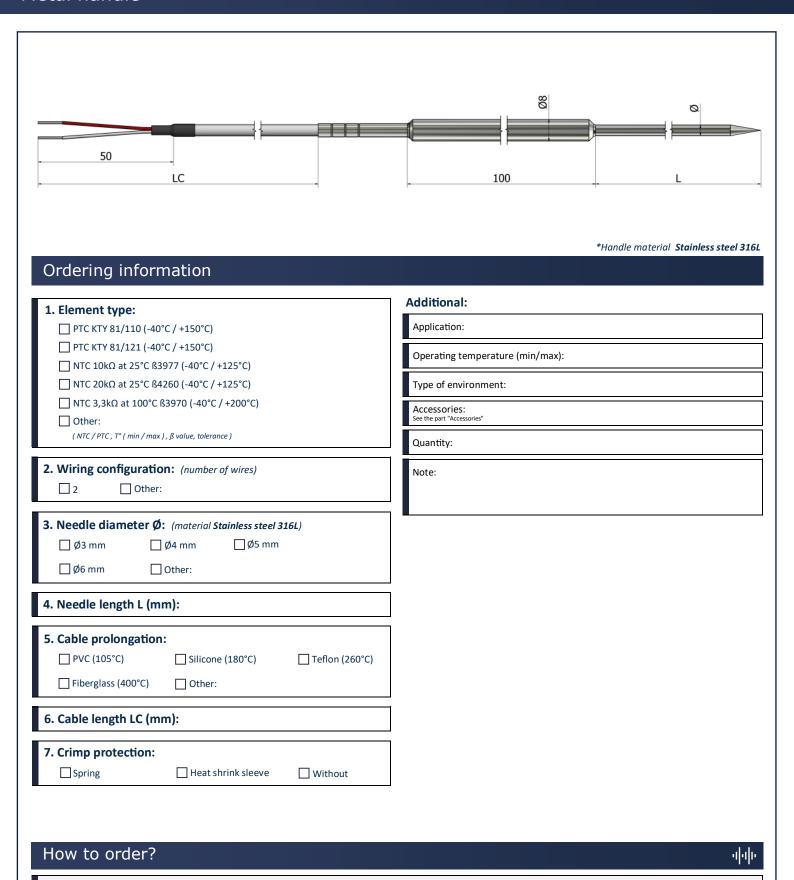


Ordering information	DI DE LE CONTROL		
1. Element type:	Additional:		
☐ PTC KTY 81/110 (-40°C / +150°C)	Application:		
☐ PTC KTY 81/121 (-40°C / +150°C) ☐ NTC 10kΩ at 25°C β3977 (-40°C / +125°C)	Operating temperature (min/max):		
☐ NTC 20kΩ at 25°C β4260 (-40°C / +125°C)	Type of environment:		
☐ NTC 3,3kΩ at 100°C ß3970 (-40°C / +200°C) ☐ Other:	Accessories: See the part "Accessories"		
Utile: . (NTC/PTC, T° (min/max), β value, tolerance)	Quantity:		
2. Wiring configuration: (number of wires) 2 Other:	Note:		
3. Needle diameter Ø: (material Stainless steel 316L)			
4. Needle lengths (mm):			
L1 L2			
5. Cable prolongation: PVC (105°C) Silicone (180°C) Teflon (260°C) Fiberglass (400°C) Other:			
6. Cable length LC (mm):]		
7. Crimp protection: Spring Heat shrink sleeve Without			
How to order? Choose the desired characteristics of your sensor by marking the ch	ااباً الله والمرابعة heckboxes and by filling up the text. You can provide sketches, images,		



HP11 – Penetration thermistors Metal handle





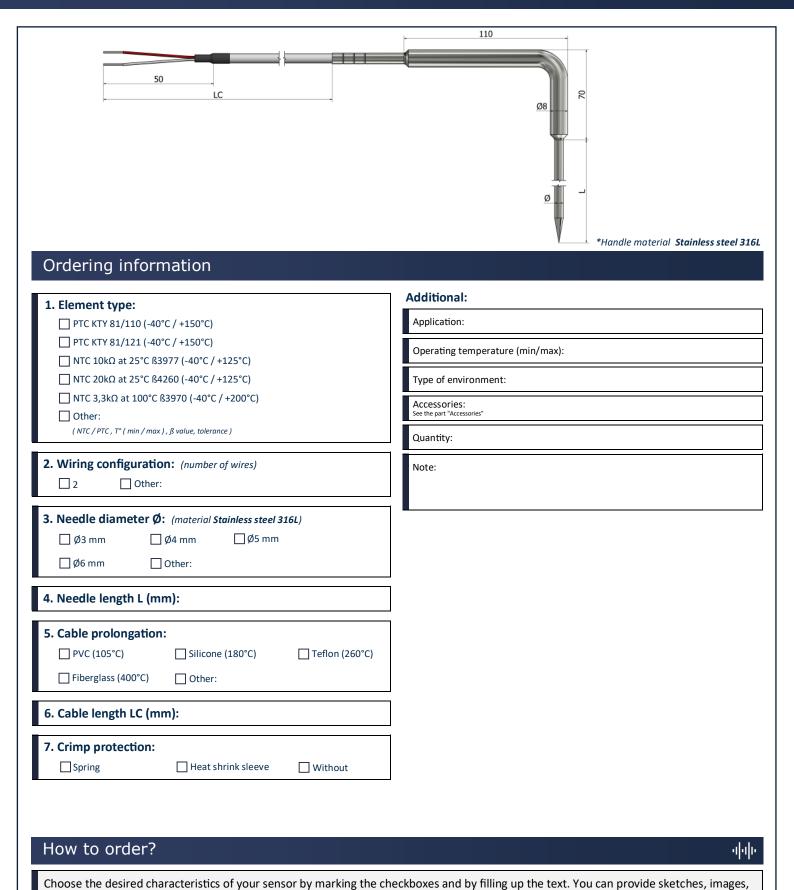
8 chemin des Grandes Combes 69360 Ternay, France +33 472 669 234

Choose the desired characteristics of your sensor by marking the checkboxes and by filling up the text. You can provide sketches, images,



HP12 – Penetration thermistors Metal handle (90° bend)

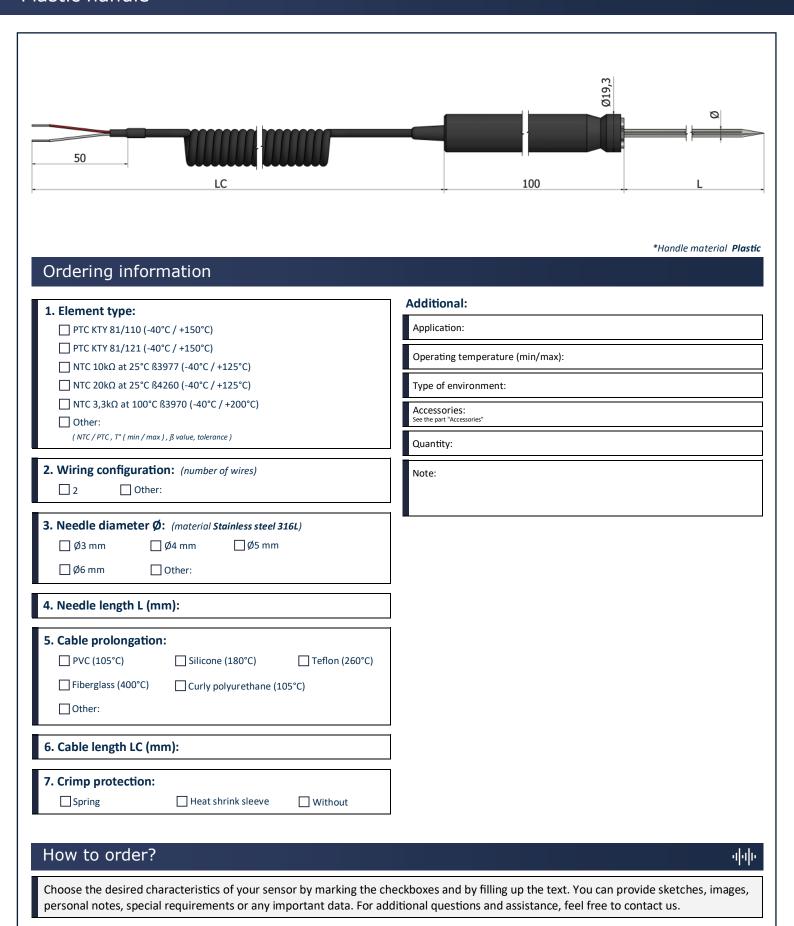






HP13 – Penetration thermistors Plastic handle

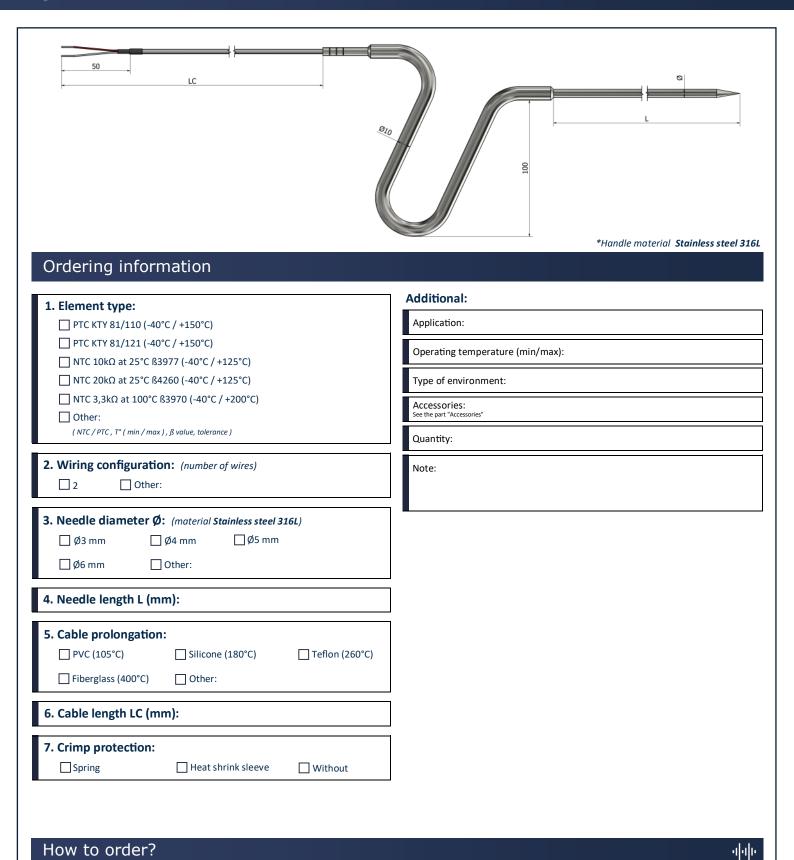






HP20 – Penetration thermistors Ergonomic handle





8 chemin des Grandes Combes 69360 Ternay, France +33 472 669 234

Choose the desired characteristics of your sensor by marking the checkboxes and by filling up the text. You can provide sketches, images,



HP31 – Penetration thermistors Armored cable prolongation

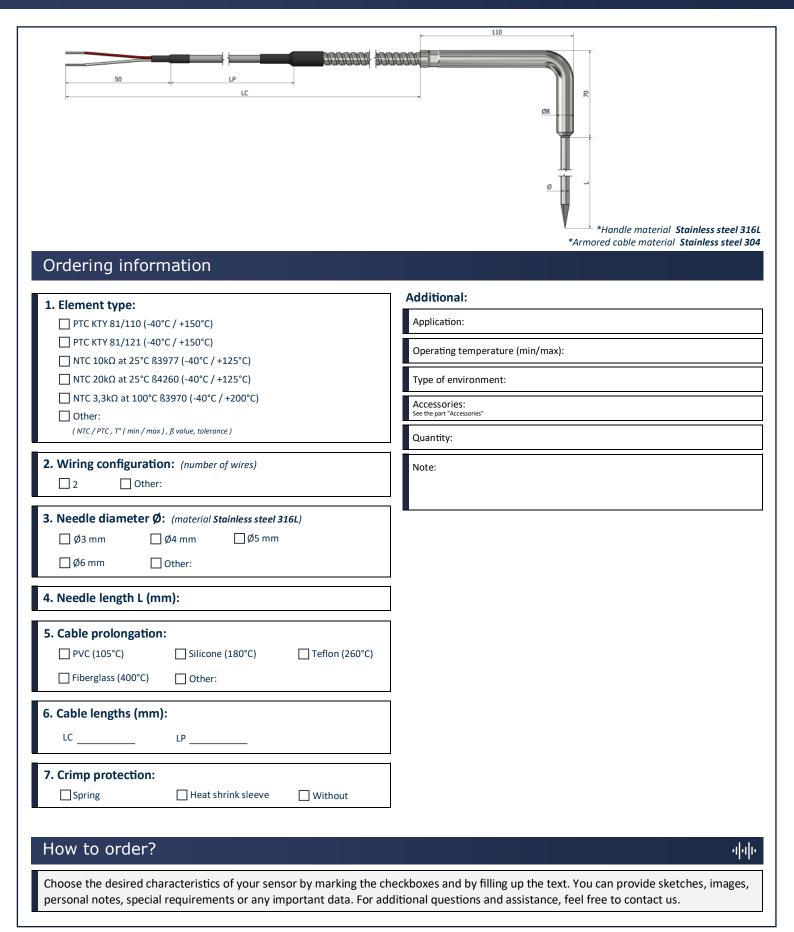


50	LP				
	LC		<u> </u>		
Ordering informat	ion		*Handle material Stainless stee *Armored cable material Stainless ste		
Element type:	.011		Additional:		
☐ PTC KTY 81/110 (-40°C / +:	150°C)		Application:		
☐ PTC KTY 81/121 (-40°C / +:			Operating temperature (min/max):		
\square NTC 10kΩ at 25°C β3977 (- \square NTC 20kΩ at 25°C β4260 (-			Type of environment: Accessories: See the part "Accessories"		
□ NTC 3,3kΩ at 100°C β3970	(-40°C / +200°C)				
Other: (NTC/PTC, T° (min/max), β value, tolerance)			Quantity:		
2. Wiring configuration: (number of wires)			Note:		
B. Needle diameter Ø: (ma	ım	16L)			
l. Needle length L (mm):					
	Silicone (180°C) Other:	☐ Teflon (260°C)			
. Cable lengths (mm):					
Crimp protection:	Heat shrink sleeve	Without			



HP32 – Penetration thermistors Armored cable prolongation







HP40 – Penetration thermistors Reduced tip

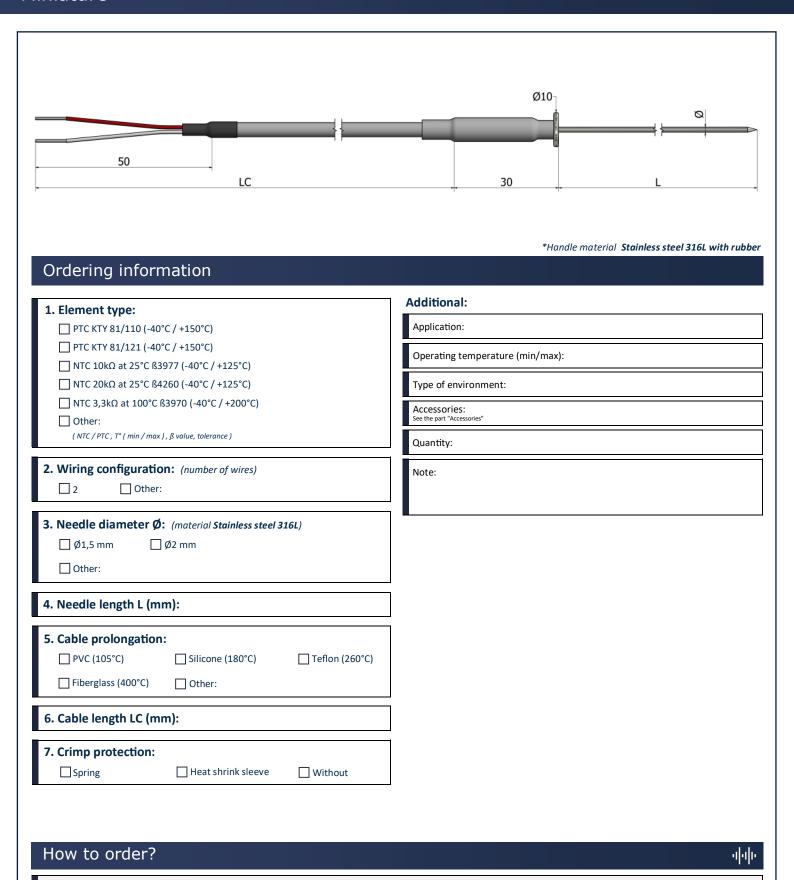


50 LC	100 E
Ordering information	*Handle material Pla s
1. Element type: PTC KTY 81/110 (-40°C / +150°C) PTC KTY 81/121 (-40°C / +150°C)	8. Crimp protection: Spring Heat shrink sleeve Without Additional:
□ NTC 10kΩ at 25°C β3977 (-40°C / +125°C) □ NTC 20kΩ at 25°C β4260 (-40°C / +125°C) □ NTC 3,3kΩ at 100°C β3970 (-40°C / +200°C) □ Other:	Application: Operating temperature (min/max):
2. Wiring configuration: (number of wires) 2. Under the configuration of wires)	Type of environment: Accessories: See the part "Accessories" Quantity:
3. Needle tip diameter Ø1: (material Stainless steel 316L) ☐ Ø3 mm ☐ Ø4 mm ☐ Ø5 mm ☐ Ø6 mm ☐ Other:	Note:
4. Needle diameter Ø (mm):	
5. Needle lengths (mm):	
6. Cable prolongation: PVC (105°C) Silicone (180°C) Teflon (260°C) Fiberglass (400°C) Other:	
7. Cable length LC (mm):	
How to order?	ग ग



HP41 – Penetration thermistors Miniature



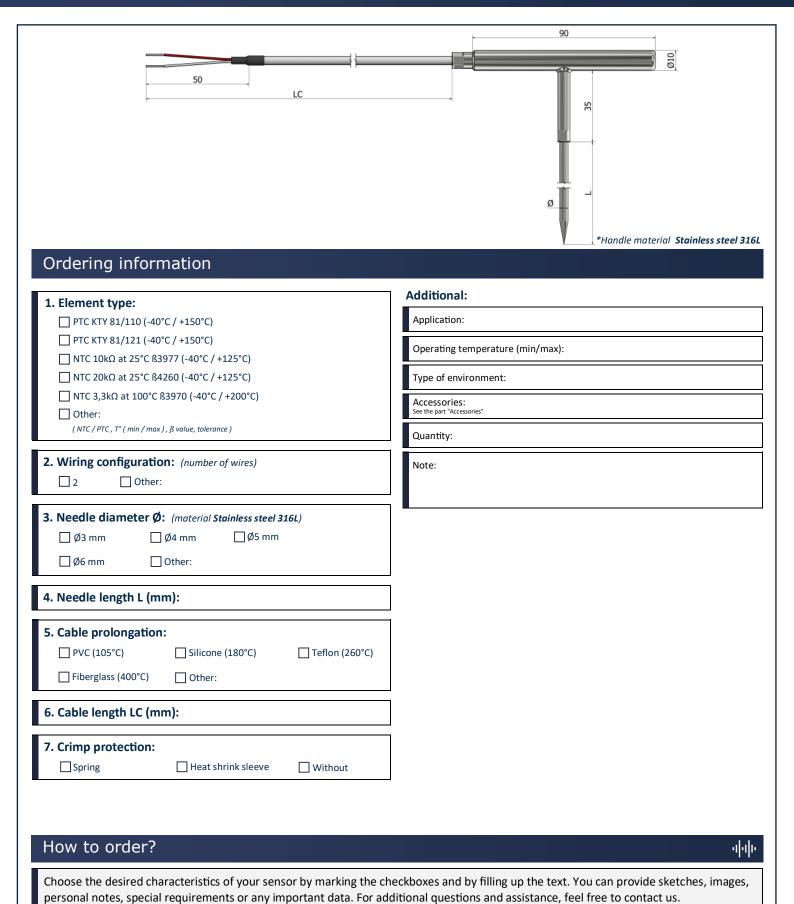


Choose the desired characteristics of your sensor by marking the checkboxes and by filling up the text. You can provide sketches, images,



HP50 – Penetration thermistors T shape

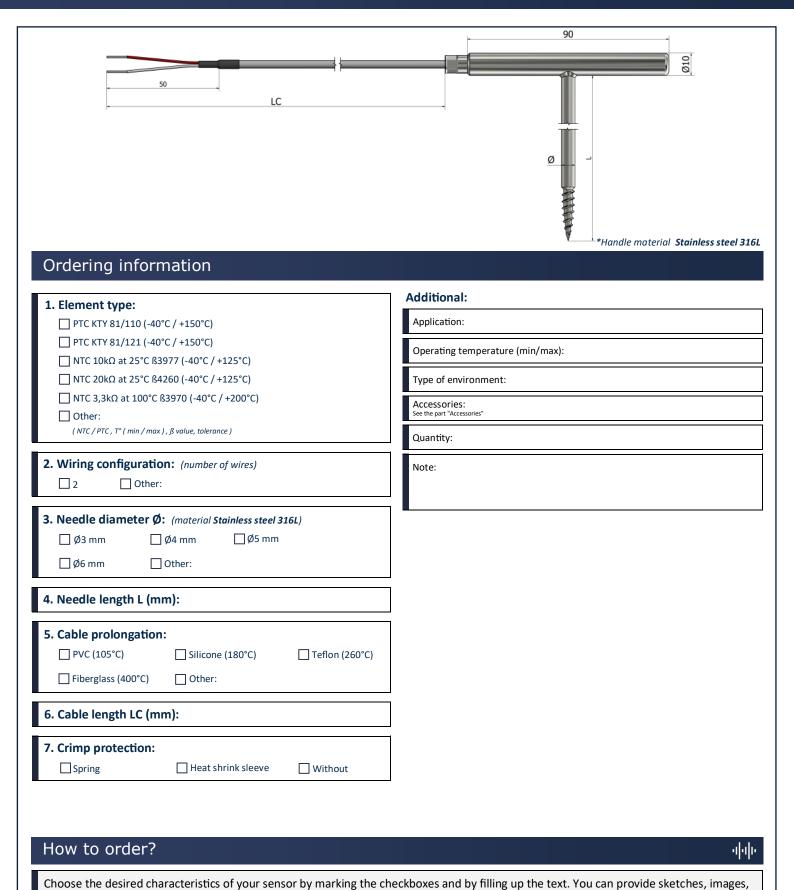






HP51 – Penetration thermistors T shape with thread

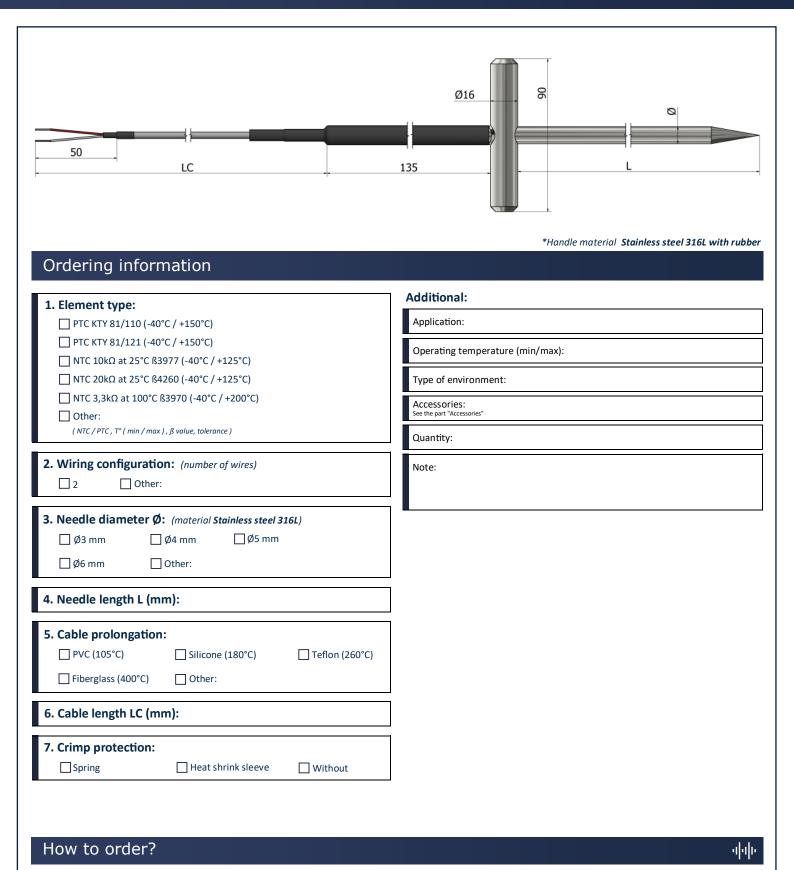






HP60 – Penetration thermistors T shape for compost





Choose the desired characteristics of your sensor by marking the checkboxes and by filling up the text. You can provide sketches, images,



HP61 – Penetration thermistors Robust T shape for compost



	N N N N N N N N N N N N N N N N N N N		
Ordering information	*Handle material Stainless steel 316L with rubber ho		
1. Element type:	Additional:		
☐ PTC KTY 81/110 (-40°C / +150°C) ☐ PTC KTY 81/121 (-40°C / +150°C)	Application:		
\square NTC 10k Ω at 25°C ß3977 (-40°C / +125°C)	Operating temperature (min/max):		
\square NTC 20kΩ at 25°C ß4260 (-40°C / +125°C) \square NTC 3,3kΩ at 100°C ß3970 (-40°C / +200°C)	Type of environment: Accessories: See the part "Accessories"		
Other:			
(NTC / PTC , T° (min / max) , β value, tolerance)	Quantity:		
2. Wiring configuration: (number of wires) 2 Other:	Note:		
3. Needle diameter Ø: (material Stainless steel 316L) ☐ Ø3 mm ☐ Ø4 mm ☐ Ø5 mm ☐ Ø6 mm ☐ Other:			
4. Needle length L (mm):]		
5. Cable prolongation: Teflon (260°C) PVC (105°C) Silicone (180°C) Teflon (260°C) Fiberglass (400°C) Other:			
6. Cable length LC (mm):]		
7. Crimp protection: Spring Heat shrink sleeve Without			
How to order?	ग्री		