

Contents

Technical Information	03
HT00 - Free leads	06
HT10 - Standard tube	07
HT12 - Standard tube (90° bend)	08
HT20 - Pot seal	09
HT21 - Pot seal with reduced tip	10
HT25 - Open air	11
HT30 - Plug-in (clamp)	12
HT35 - Plug-in (miniature)	13
HT40 - Integrated M12 connector	14
HT41 - Integrated M12 connector with transmitter	15
HT50 - Armored cable prolongation	16
HT60 - For aggressive environments	17



What are the characteristics of RTDs with protection tube ?

Protection tubes play a crucial role by providing a robust shield for the RTD sensor, safeguarding it from potential mechanical damage, corrosive substances, high-pressure environments, and other adverse conditions that may compromise its accuracy or integrity. The primary purpose of the protection tube is to act as a physical barrier between the external environment and the delicate RTD sensor. It serves as a protective sheath, shielding the sensor from impacts, vibrations, abrasion, and other mechanical stresses that can occur during operation. This ensures the longevity and reliability of the sensors in rugged industrial settings.

We have several sizes and types of tubes.

See *“Technical data -*



Protection tube materials

For the production of tubes, stainless steel, copper and brass are often used. Due to its good characteristics such as corrosion resistance, strength (abrasion resistance) and good thermal conductivity, stainless steel (SS316) stands out as the most common material from which tubes are produced.

Tube materials:

- Stainless steel (SS316)
- Stainless steel (SS316L)
- Stainless steel (SS316Ti)
- Brass
- Aluminum
- Copper

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 °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.



Thermistors with protection tube - 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.

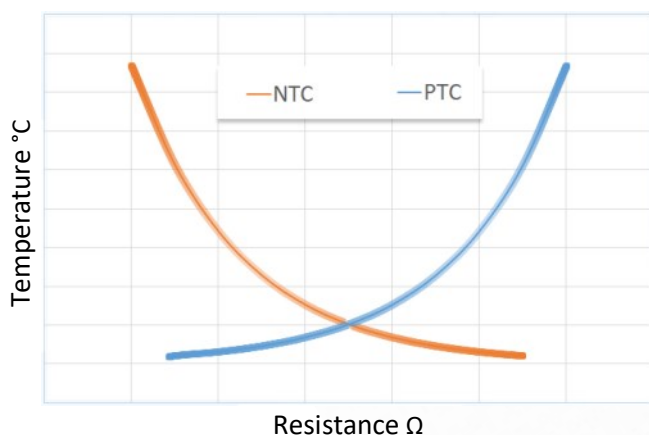
However, there is a major difference between these two types of thermistors:

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.



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





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.

Where:

Rt1 = Resistance at Temperature 1

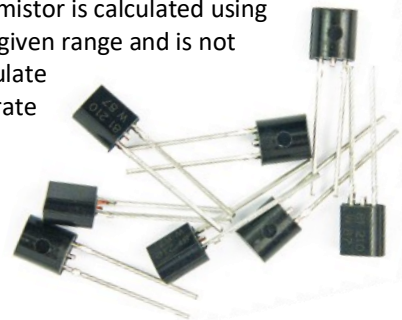
Rt2 = Resistance at Temperature 2

T1 = Temperature 1 (K)

T2= Temperature 2 in (K)

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

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 given range.



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.

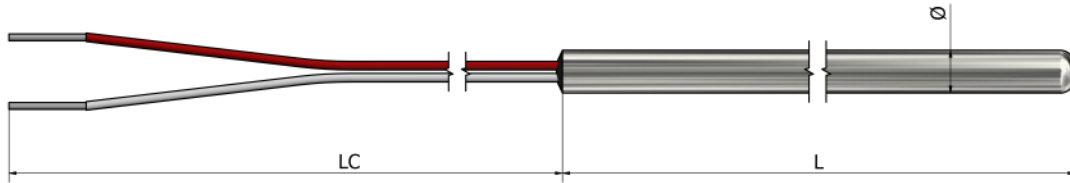
Types of thermistors

Type	Resistance	Beta value	Temperature
PTC KTY81/121	990 Ω at 25 $^{\circ}$ C	/	T $^{\circ}$ (-55/+150 $^{\circ}$ C)
NTC	3,3k Ω at 100 $^{\circ}$ C	$\beta=3970$	T $^{\circ}$ (-40/+200 $^{\circ}$ C)
NTC	10k Ω at 25 $^{\circ}$ C	$\beta=3977$	T $^{\circ}$ (-40/+125 $^{\circ}$ C)
NTC	10k Ω at 25 $^{\circ}$ C	$\beta=3435$	T $^{\circ}$ (-40/+150 $^{\circ}$ C)
NTC	20k Ω at 25 $^{\circ}$ C	$\beta=4260$	T $^{\circ}$ (-40/+125 $^{\circ}$ C)



HT00 – Thermistors with protection tube

Free leads



Ordering information

1. Element type:

- PTC KTY 81/110 (-40°C / +150°C)
- PTC KTY 81/121 (-40°C / +150°C)
- 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:
(NTC / PTC , T° (min / max) , β value , tolerance)

2. Wiring configuration: (number of wires)

- 2
- Other:

3. Tube dimensions (mm): (material Stainless steel 316L)

L _____ Ø _____

4. Free leads length LC (mm):

Additional:

Application:

Operating temperature (min/max):

Type of environment:

Accessories:
See the part "Accessories"

Quantity:

Note:

How to order?

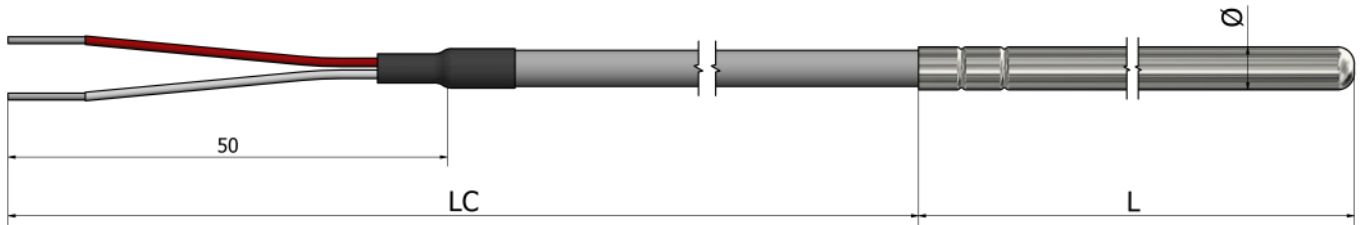


Choose the desired characteristics of your sensor by marking the checkboxes and by filling up the text. You can provide sketches, images, personal notes, special requirements or any important data. For additional questions and assistance, feel free to contact us.



HT10 – Thermistors with protection tube

Standard tube



Ordering information

1. Element type:

- PTC KTY 81/110 (-40°C / +150°C)
- PTC KTY 81/121 (-40°C / +150°C)
- 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:
(NTC / PTC , T° (min / max) , β value, tolerance)

Additional:

Application:

Operating temperature (min/max):

Type of environment:

Accessories:
See the part "Accessories"

Quantity:

Note:

2. Wiring configuration: (number of wires)

- 2
- Other:

3. Tube dimensions: (material *Stainless steel 316L*)

- Ø3 x 50 mm
- Ø4 x 40 mm
- Ø5 x 50 mm
- Ø6 x 50 mm
- Other:

4. Cable prolongation:

- PVC (105°C)
- Silicone (180°C)
- Teflon (260°C)
- Fiberglass (400°C)
- Other:

5. Cable length LC (mm):

6. Crimp protection:

- Spring
- Heat shrink sleeve
- Without

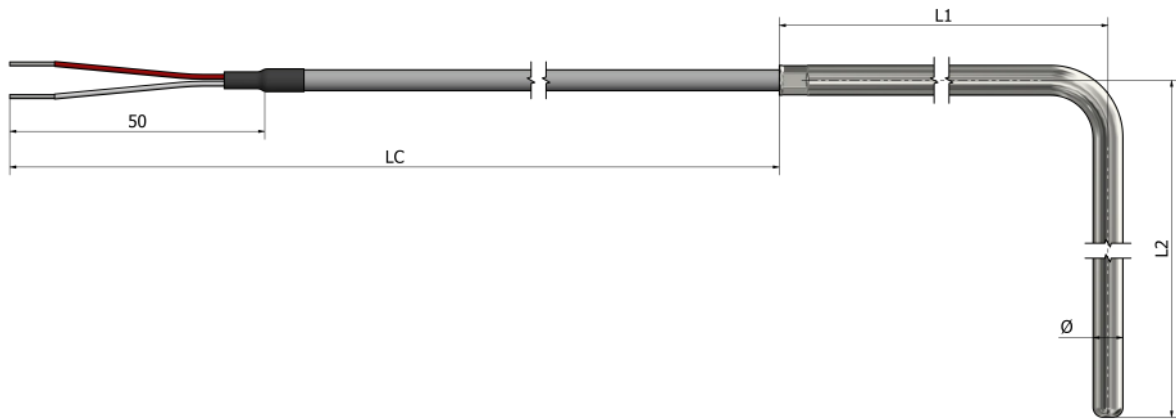
How to order?

Choose the desired characteristics of your sensor by marking the checkboxes and by filling up the text. You can provide sketches, images, personal notes, special requirements or any important data. For additional questions and assistance, feel free to contact us.



HT12 – Thermistors with protection tube

Standard tube (90° bend)



Ordering information

1. Element type:

- PTC KTY 81/110 (-40°C / +150°C)
- PTC KTY 81/121 (-40°C / +150°C)
- 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:
(NTC / PTC , T° (min / max) , β value , tolerance)

Additional:

Application:

Operating temperature (min/max):

Type of environment:

Accessories:
See the part "Accessories"

Quantity:

Note:

2. Wiring configuration: (number of wires)

- 2
- Other:

3. Tube dimensions (mm): (material Stainless steel 316L)

L1 _____ L2 _____ Ø _____

4. Cable prolongation:

- PVC (105°C)
- Silicone (180°C)
- Teflon (260°C)
- Fiberglass (400°C)
- Other:

5. Cable length LC (mm):

6. Crimp protection:

- Spring
- Heat shrink sleeve
- Without

How to order?

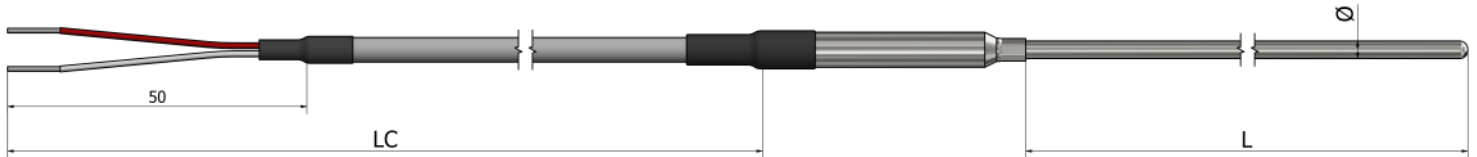


Choose the desired characteristics of your sensor by marking the checkboxes and by filling up the text. You can provide sketches, images, personal notes, special requirements or any important data. For additional questions and assistance, feel free to contact us.



HT20 – Thermistors with protection tube

Pot seal



Ordering information

1. Element type:

- PTC KTY 81/110 (-40°C / +150°C)
- PTC KTY 81/121 (-40°C / +150°C)
- 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:
(NTC / PTC , T° (min / max) , β value , tolerance)

Additional:

Application:

Operating temperature (min/max):

Type of environment:

Accessories:
See the part "Accessories"

Quantity:

Note:

2. Wiring configuration: (number of wires)

- 2
- Other:

3. Tube dimensions (mm): (material Stainless steel 316L)

L _____ Ø _____

4. Cable prolongation:

- PVC (105°C)
- Silicone (180°C)
- Teflon (260°C)
- Fiberglass (400°C)
- Other:

5. Cable length LC (mm):

6. Crimp protection:

- Spring
- Heat shrink sleeve
- Without

How to order?

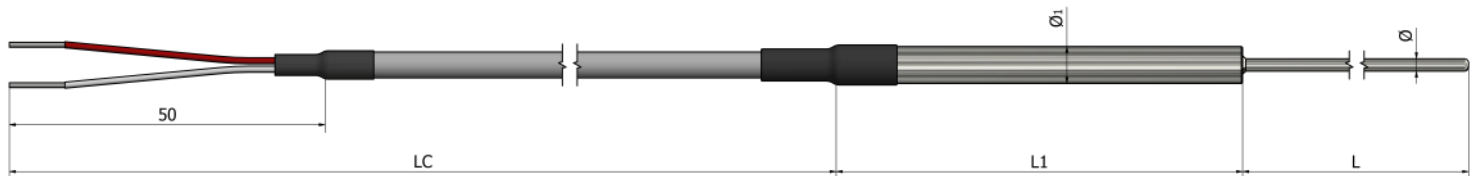


Choose the desired characteristics of your sensor by marking the checkboxes and by filling up the text. You can provide sketches, images, personal notes, special requirements or any important data. For additional questions and assistance, feel free to contact us.



HT21 – Thermistors with protection tube

Pot seal with reduced tip



Ordering information

1. Element type:

- PTC KTY 81/110 (-40°C / +150°C)
- PTC KTY 81/121 (-40°C / +150°C)
- 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:
(NTC / PTC , T° (min / max) , β value , tolerance)

Additional:

Application:

Operating temperature (min/max):

Type of environment:

Accessories:
See the part "Accessories"

Quantity:

Note:

2. Wiring configuration: (number of wires)

- 2
- Other:

3. Tube dimensions L and Ø (mm): (material *Stainless steel 316L*)

L _____ Ø _____

4. Tube dimensions L1 and Ø1 (mm): (material *Stainless steel 316L*)

L1 _____ Ø1 _____

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?

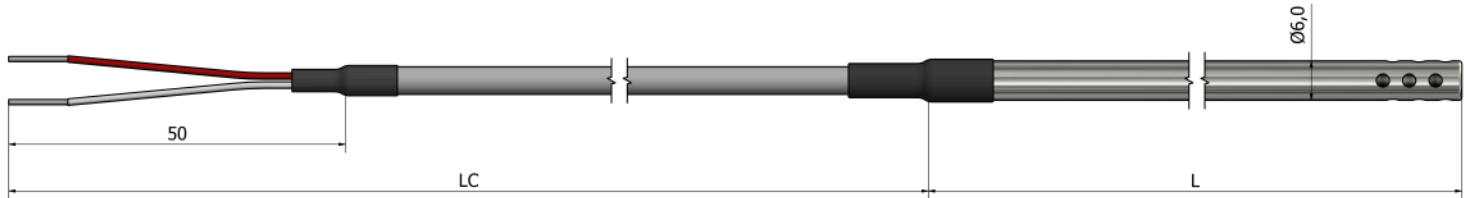


Choose the desired characteristics of your sensor by marking the checkboxes and by filling up the text. You can provide sketches, images, personal notes, special requirements or any important data. For additional questions and assistance, feel free to contact us.



HT25 – Thermistors with protection tube

Open air



*Tube material **Stainless steel 316L**

Ordering information

1. Element type:

- PTC KTY 81/110 (-40°C / +150°C)
- PTC KTY 81/121 (-40°C / +150°C)
- 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:
(NTC / PTC , T° (min / max) , β value , tolerance)

2. Wiring configuration: (number of wires)

- 2
- Other:

3. Tube length L (mm):

4. Cable prolongation:

- PVC (105°C)
- Silicone (180°C)
- Teflon (260°C)
- Fiberglass (400°C)
- Other:

5. Cable length LC (mm):

6. Crimp protection:

- Spring
- Heat shrink sleeve
- Without

Additional:

Application:

Operating temperature (min/max):

Type of environment:

Accessories:
See the part "Accessories"

Quantity:

Note:

How to order?

Choose the desired characteristics of your sensor by marking the checkboxes and by filling up the text. You can provide sketches, images, personal notes, special requirements or any important data. For additional questions and assistance, feel free to contact us.



HT30 – Thermistors with protection tube

Plug-in (clamp)



Ordering information

1. Element type:

- PTC KTY 81/110 (-40°C / +150°C)
- PTC KTY 81/121 (-40°C / +150°C)
- 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:
(NTC / PTC , T° (min / max) , β value , tolerance)

Additional:

Application:

Operating temperature (min/max):

Type of environment:

Accessories:
See the part "Accessories"

Quantity:

Note:

2. Wiring configuration: (number of wires)

- 2
- Other:

3. Tube dimensions (mm): (material Stainless steel 316L)

L _____ Ø _____

4. Cable prolongation:

- PVC (105°C)
- Silicone (180°C)
- Teflon (260°C)
- Fiberglass (400°C)
- Other:

5. Cable length LC (mm):

6. Crimp protection:

- Spring
- Heat shrink sleeve
- Without

How to order?

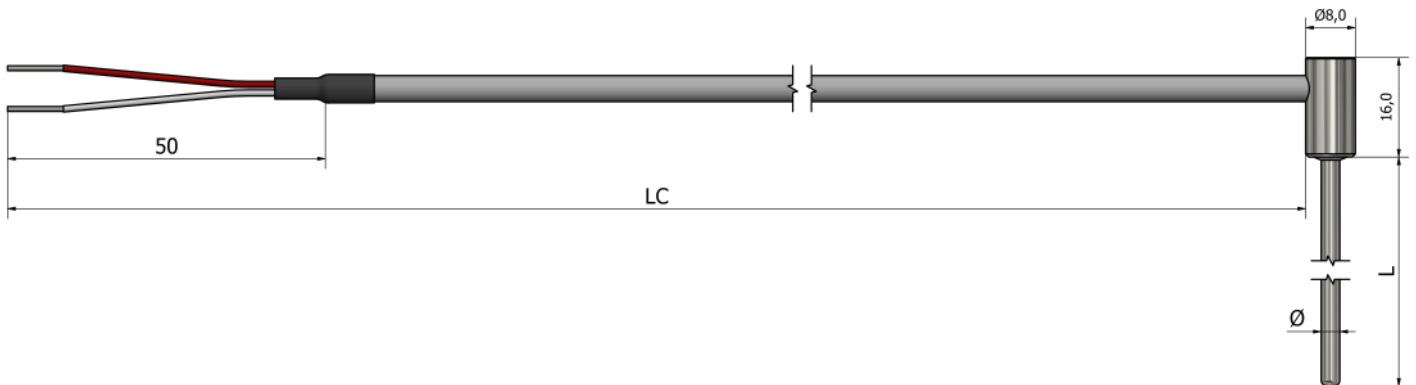


Choose the desired characteristics of your sensor by marking the checkboxes and by filling up the text. You can provide sketches, images, personal notes, special requirements or any important data. For additional questions and assistance, feel free to contact us.



HT35 – Thermistors with protection tube

Plug-in (miniature)



Ordering information

1. Element type:

- PTC KTY 81/110 (-40°C / +150°C)
- PTC KTY 81/121 (-40°C / +150°C)
- 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:
(NTC / PTC , T° (min / max) , β value , tolerance)

Additional:

Application:

Operating temperature (min/max):

Type of environment:

Accessories:
See the part "Accessories"

Quantity:

Note:

2. Wiring configuration: (number of wires)

- 2
- Other:

3. Tube dimensions (mm): (material Stainless steel 316L)

L _____ Ø _____

4. Cable prolongation:

- PVC (105°C)
- Silicone (180°C)
- Teflon (260°C)
- Fiberglass (400°C)
- Other:

5. Cable length LC (mm):

6. Crimp protection:

- Spring
- Heat shrink sleeve
- Without

How to order?

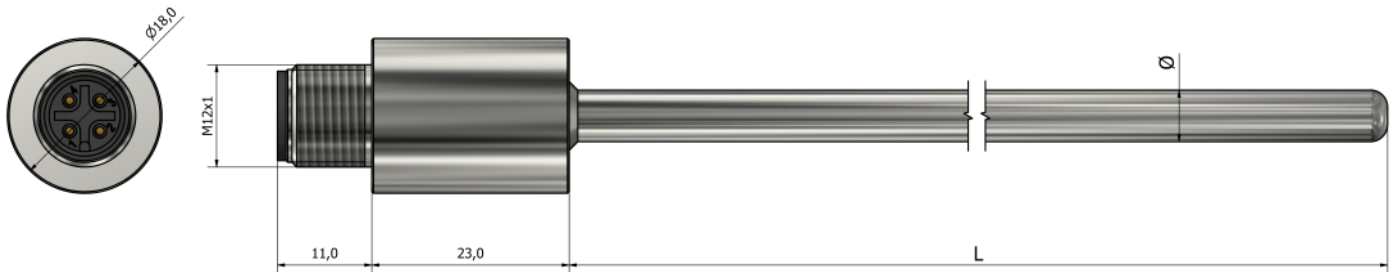


Choose the desired characteristics of your sensor by marking the checkboxes and by filling up the text. You can provide sketches, images, personal notes, special requirements or any important data. For additional questions and assistance, feel free to contact us.



HT40 – Thermistors with protection tube

Integrated M12 connector



Ordering information

1. Element type:

- PTC KTY 81/110 (-40°C / +150°C)
- PTC KTY 81/121 (-40°C / +150°C)
- 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:
(NTC / PTC , T° (min / max) , β value , tolerance)

2. Wiring configuration: (number of wires)

- 2
- Other:

3. Tube dimensions (mm): (material Stainless steel 316L)

L _____ Ø _____

Additional:

Application:

Operating temperature (min/max):

Type of environment:

Accessories:
See the part "Accessories"

Quantity:

Note:

How to order?

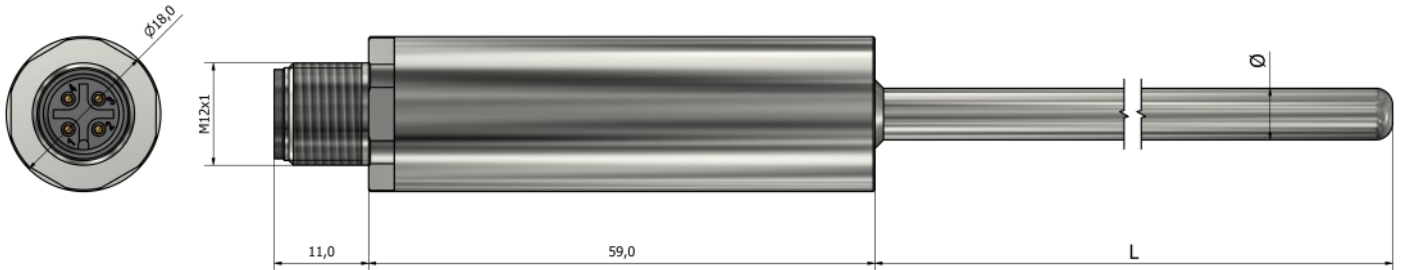


Choose the desired characteristics of your sensor by marking the checkboxes and by filling up the text. You can provide sketches, images, personal notes, special requirements or any important data. For additional questions and assistance, feel free to contact us.



HT41 – Thermistors with protection tube

Integrated M12 connector with transmitter



Ordering information

1. Element type:

- PTC KTY 81/110 (-40°C / +150°C)
- PTC KTY 81/121 (-40°C / +150°C)
- 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:
(NTC / PTC , T° (min / max) , β value , tolerance)

Additional:

Application:

Operating temperature (min/max):

Type of environment:

Accessories:
See the part "Accessories"

Quantity:

Note:

2. Wiring configuration: (number of wires)

- 2
- Other:

3. Tube dimensions (mm): (material *Stainless steel 316L*)

L _____ Ø _____

4. Transmitter (°C):

Specify temperature range

How to order?

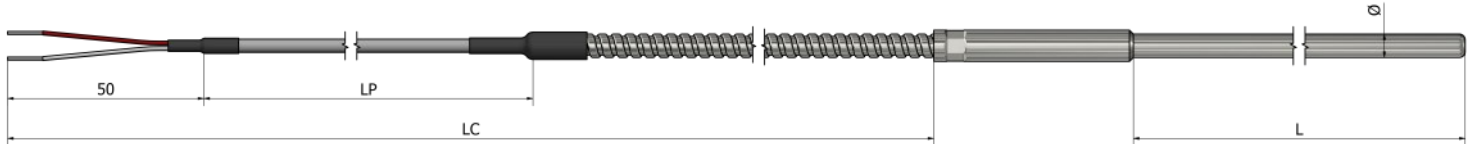


Choose the desired characteristics of your sensor by marking the checkboxes and by filling up the text. You can provide sketches, images, personal notes, special requirements or any important data. For additional questions and assistance, feel free to contact us.



HT50 – Thermistors with protection tube

Armored cable prolongation



*Armored cable material **Stainless steel 304**

Ordering information

1. Element type:

- PTC KTY 81/110 (-40°C / +150°C)
- PTC KTY 81/121 (-40°C / +150°C)
- 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:
(NTC / PTC , T° (min / max) , β value , tolerance)

Additional:

Application:

Operating temperature (min/max):

Type of environment:

Accessories:
See the part "Accessories"

Quantity:

Note:

2. Wiring configuration: (number of wires)

- 2
- Other:

3. Tube dimensions (mm): (material **Stainless steel 316L**)

L _____ Ø _____

4. Cable prolongation:

- PVC (105°C)
- Silicone (180°C)
- Teflon (260°C)
- Fiberglass (400°C)
- Other:

5. Cable length LC (mm):

6. Bare cable length LP (mm):

7. Crimp protection:

- Spring
- Heat shrink sleeve
- Without

How to order?

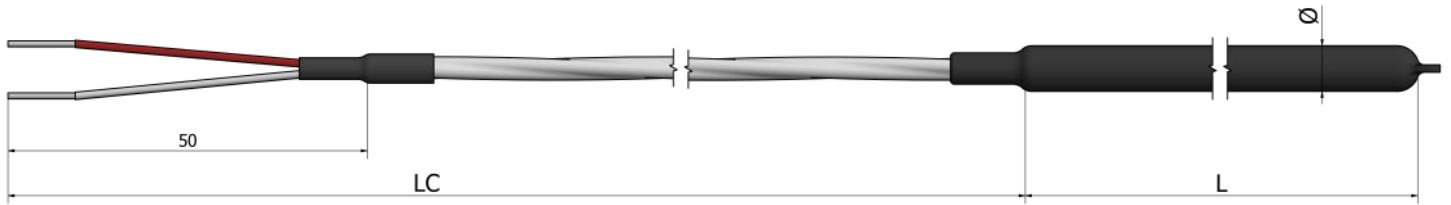


Choose the desired characteristics of your sensor by marking the checkboxes and by filling up the text. You can provide sketches, images, personal notes, special requirements or any important data. For additional questions and assistance, feel free to contact us.



HT60 – Thermistors with protection tube

For aggressive environments (with PTFE protection up to 250°C)



*Protection material **PTFE**

Ordering information

1. Element type:

- PTC KTY 81/110 (-40°C / +150°C)
- PTC KTY 81/121 (-40°C / +150°C)
- 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:
(NTC / PTC , T° (min / max) , β value , tolerance)

Additional:

Application:

Operating temperature (min/max):

Type of environment:

Accessories:
See the part "Accessories"

Quantity:

Note:

2. Wiring configuration: (number of wires)

- 2
- Other:

3. Tube dimensions (mm): (material SS 316L with PTFE protection)

L _____ Ø _____

4. Cable prolongation:

- PVC (105°C)
- Silicone (180°C)
- Teflon (260°C)
- Fiberglass (400°C)
- Other:

5. Cable length LC (mm):

How to order?



Choose the desired characteristics of your sensor by marking the checkboxes and by filling up the text. You can provide sketches, images, personal notes, special requirements or any important data. For additional questions and assistance, feel free to contact us.