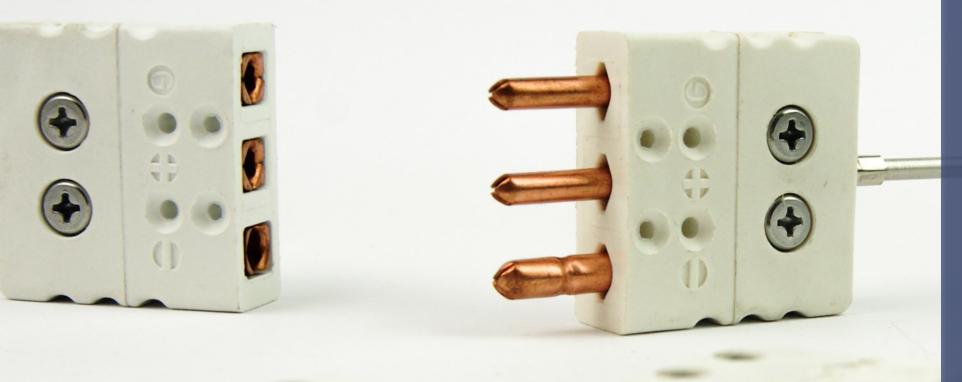
## Mineral insulated RTDs



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## Mineral insulated RTDs - Technical information



### What is an RTD sensor ?

An RTD (Resistance Temperature Detector) is a type of sensor used to measure temperature. It usually consists of a platinum material (PT100,PT500 or PT1000) which has a resistance that changes proportionally with 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

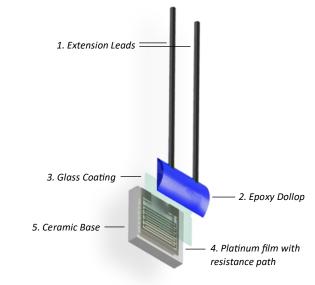
RTDs can operate in a temperature range of -200 to 850°C, making them suitable for many industrial applications.

#### Low ohmic resistance

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

### 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.

### 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.

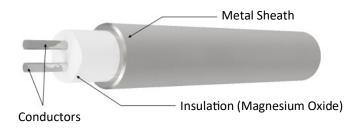
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## Mineral insulated RTDs - Technical information

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### What is a mineral insulated probe ?

Mineral insulated probes are made from mineral insulated cable. It has a metallic sheath and on the inside, the conductors are insulated with densely packed magnesium oxide (MgO).

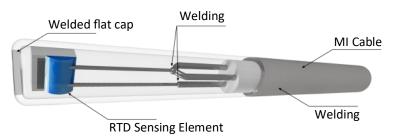


This construction bears a lot of advantages for temperature sensors. Mineral insulated probes are often referred to as sheathed temperature sensors.

### Characteristics of sheathed probes

A sheathed RTD has an extremely wide temperature range: from below -200 °C up to more than 850 °C.

Furthermore, sheathed RTDs are resistant to vibration and scratches which proves their longevity. At the same time, they are bendable. Surprisingly, they are affordable as well: MI cable costs about the same as fiberglass cable.



We manufacture MI probes in diameters from 1.5 mm up to 8mm. To ensure maximum water tightness, we make either a connector or a robust cable transition onto the probe.

### Sheath material types

When it comes to the production of mineral-insulated (MI) RTDs, two materials are commonly used for the sheath:

AISI 304L (up to 900°C)

18% Chrome 8% Nickel (Reduced carbon content). Reduced carbon content to improve weldability.

#### • AISI 316L (up to 900°C)

16% Chrome 10% Nickel 2-3% Molybdenum (Reduced carbon content). Reduced carbon content which improves corrosion resistance at low temperatures and better weldability.

## 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  $\Omega$  at 0°C, Pt500 sensor has a nominal resistance of 500  $\Omega$  at 0°C and Pt1000 sensor has a nominal resistance of 1000  $\Omega$  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.

#### 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<br>Standard | DIN4370  | Temperature<br>Range ºC | Tolerance<br>Ω at 0ºC | Tolerance <sup>o</sup> C |
|---|-----------------|----------|-------------------------|-----------------------|--------------------------|
|   | 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                 |
| 1 | W0.3            | Class B  | -196 to 660             | 100±0.12 Ω            | ±0.30 °C                 |

## Mineral insulated RTDs - Technical information

**RTDs** accessories

Temperature sensor accessories are equipment used to improve the performance of temperature measuring devices.

It is important to choose quality sensor accessories to ensure optimal performance and long-term reliability.

Our accessories are made of strong and resistant materials to guarantee maximum durability.

Eurosensors offers a wide selection of temperature sensor accessories to meet your specific needs.

Accessories include: thermocouple cables for reliable and accurate data transmission, compression fittings for easy installation, thermowells to protect sensors from mechanical damage, terminal heads for easy access to sensors, transmitters for networked data transmission, and ceramic terminal blocks for electrical isolation.

### How to choose your accessory ?

It is important to choose the right type of cable, fitting, thermowell, terminal head, connector and transmitter to ensure that your temperature sensor operates reliably and accurately. **The compression fitting** must match the type of sensor you are using. It must also be compatible with the sensor diameter and location thread.

**The thermowell** protects the sensor from mechanical damage and high temperatures. It must be selected according to the operating temperature and the required mechanical strength.

**The connection head** must be compatible with the type of cable and the application. It must also be able to withstand the temperatures and environment in which it will be used.

**The connector** can be diverse, due to the non-standardization of RTD sensors. Our company can make all the connectors you need according to your request

**The RTD transmitter** must be compatible with the type of sensor used and must be able to convert the signal to a standard electrical signal.

**The ceramic terminal block** is used to attach electrical cables to a control box. It must be compatible with the type of cable used and resistant to high temperatures.

### 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.

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#### Terminal heads

Many alternative types of terminal head are available to meet the requirements of various applications. Variations exist in size, material, accommodation, resistance to media, resistance to fire or even explosion and in other parameters. Common types are shown below but there are many special variants available to meet particular requirements.



Terminal block located in a "head" allow for the connection of extension wires. Various materials are used for screw or solder terminations including copper, plated brass and, for the best performance in the case of thermocouples, thermoelement alloys. The various head styles cater for a wide variety of probe diameters and cable entries.

#### Additional accessories

For more detailed information see "Accessories".



## PM00 – Mineral insulated RTDs Stripped

| L1  | L  |
|---|--|
| Ordering information  |  |
| 1. Element type:  | Additional:  |
| □ Pt 100 □ Pt 500 □ Pt 1000 □ Other:  | Application:   |
|   | Operating temperature (min/max):<br>Type of environment: |
| 2. Element class:   | Accessories:   |
|   | See the part "Accessories" Quantity:                     |
| <b>3. Number of elements:</b>   |  |
| <b>4. Wiring configuration:</b> (number of wires per element)   | Note:  |
| 5. Sheath length L (mm):  |  |
| 6. Sheath diameter Ø: (Ø 1,5 et 2 mm only for one element x1) ☐ 1,5 mm ☐ 3 mm ☐ 4,5 mm ☐ 6 mm ☐ 8 mm ☐ Other: |  |
| 7. Sheath material:   |  |
| 8. Stripping length L1 (mm):  | 7  |

### How to order?

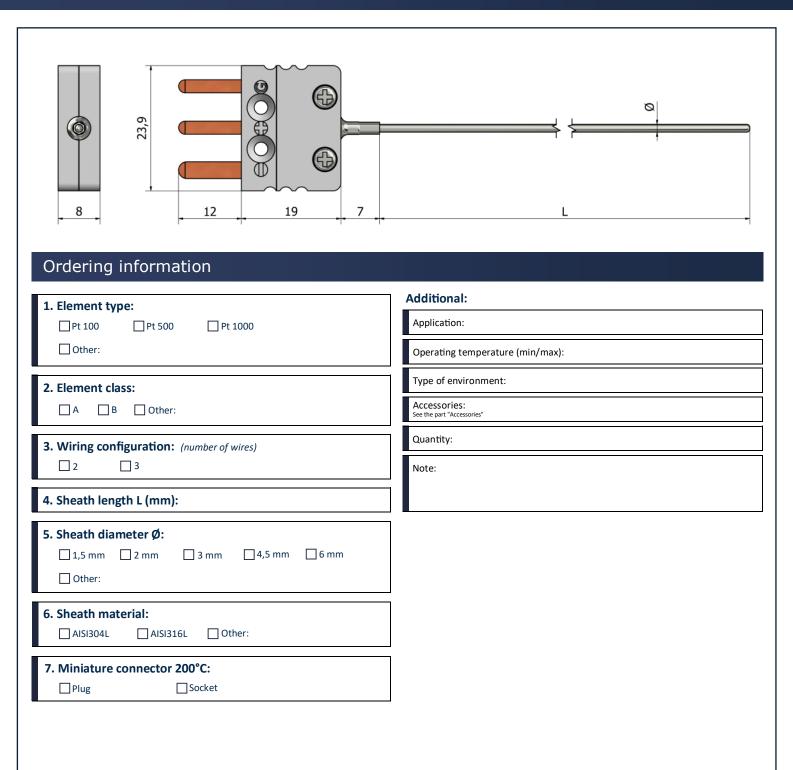
Choose the desired characteristics of your sensor by marking the checkboxes and by filling up the text. You can provide sketches, images, personal notes, special requirements or any important data. For additional questions and assistance, feel free to contact us.

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### PM10 – Mineral insulated RTDs Miniature connector termination

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#### How to order?

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## PM12 – Mineral insulated RTDs Standard connector termination

| 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:<br>See the part "Accessories" |
| 3. Wiring configuration: (number of wires)   | Quantity:                                  |
| 2 3  | Note:                                      |
| 4. Sheath length L (mm):   |  |
| <b>5. Sheath diameter Ø:</b><br>☐ 1,5 mm ☐ 2 mm ☐ 3 mm ☐ 4,5 mm ☐ 6 mm<br>☐ Other: |  |
| 6. Sheath material:  |  |
| 7. Standard connector 200°C:   |  |
|  |  |

#### How to order?

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## PM14 – Mineral insulated RTDs LEMO connector

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| Ordering information  1. Element type: Pt 100 Pt 500 Pt 1000 Other:   | Additional:<br>Application:<br>Operating temperature (min/max):        |
|---|--|
| <ul> <li>2. Element class:</li> <li>A B Other:</li> <li>3. Wiring configuration: (number of wires)</li> </ul>   | Type of environment: Accessories: See the part "Accessories" Quantity: |
| □ 2       □ 3       □ 4         4. Sheath length L (mm):  | Note:  |
| 5. Sheath diameter Ø:<br>☐ 1,5 mm ☐ 2 mm ☐ 3 mm ☐ 4,5 mm ☐ 6 mm<br>☐ Other:   |  |
| <ul> <li>6. Sheath material:</li> <li>AISI304L AISI316L Other:</li> </ul> 7. LEMO connector type:   |  |
| Socket  Socke |  |

### How to order?

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## PM20 – Mineral insulated RTDs Cable prolongation

| 50<br>LC   |   |
|--|---|
| Ordering information   |   |
| <b>1. Element type:</b> Pt 100       Pt 500         Other:   | 10. Crimp protection:         Spring         Heat shrink sleeve         Without |
| 2. Element class:  | Application:  |
| A B Other:   | Operating temperature (min/max):  |
| <b>3. Number of elements:</b>  | Type of environment:  |
| 4. Wiring configuration: (number of wires per element)   | Accessories:<br>See the part "Accessories"                                      |
|  | Quantity:   |
| 5. Sheath length L (mm):   | Note:   |
| 6. Sheath diameter Ø: (Ø 1,5 and 2 mm only for one element x1)<br>☐ 1,5 mm ☐ 2 mm ☐ 3 mm ☐ 4,5 mm ☐ 6 mm<br>☐ Other: |   |
| 7. Sheath material:  |   |
| 8. Cable prolongation:         PVC (105°C)       Silicone (180°C)         Fiberglass (400°C)       Other:            |   |
| 9. Cable length LC (mm):   |   |
|  |   |
| How to order?  | ոիդիս   |
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## PM21 – Mineral insulated RTDs Cable prolongation with connector

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| Ordering information  1. Element type: Pt 100 Pt 500 Pt 1000 Other:                                      | <b>10. Connector:</b> Miniature       Miniature         Plug       Socket         Other: |
|--|--|
| 2. Element class:  | <b>11. Option:</b> □ Cable clamp       □ Custom ID label       □ Without                 |
| <b>3. Wiring configuration:</b> (number of wires)  | Additional:<br>Application:  |
| 4. Sheath length L (mm):   | Operating temperature (min/max):   |
| 5. Sheath diameter Ø:<br>□ 1,5 mm □ 2 mm □ 3 mm □ 4,5 mm □ 6 mm<br>□ Other:                              | Type of environment:<br>Accessories:<br>See the part "Accessories"<br>Quantity:          |
| 6. Sheath material:  | Note:  |
| <b>7. Cable prolongation:</b> PVC (105°C)       Silicone (180°C)         Fiberglass (400°C)       Other: |  |
| 8. Cable length LC (mm):   | ]  |
| 9. Crimp protection:   | ]  |
| How to order?  | սի   |

## PM30 – Mineral insulated RTDs Reduced tip

|  | ă a   |
|--|---|
|  |   |
| Ordering information  1. Element type: Pt 100 Pt 500 Pt 1000 Other:  | 8. Cable prolongation:         PVC (105°C)       Silicone (180°C)         Fiberglass (400°C)       Other: |
| 2. Element class:  | 9. Cable length LC (mm):<br>10. Crimp protection:   |
| <b>3. Number of elements:</b>  | Spring Heat shrink sleeve Without   |
| <b>4. Wiring configuration:</b> (number of wires per element)  | <b>11. Connector:</b> Miniature       Miniature         Plug       Socket         Plug       Socket       |
| 5. Sheath length L (mm):   | Without Other:  |
| 6. Sheath diameter Ø: (Ø 1,5 and 2 mm only for one element x1)<br>□ 1,5 mm □ 2 mm □ 3 mm □ 4,5 mm □ 6 mm<br>□ Other: | 12. Option:         Cable clamp       Custom ID label         Without                                     |
| 5. Sheath length L1 (mm):  | Application:  |
| <b>6. Sheath diameter Ø1:</b> (requirement Ø1 > Ø)   | Operating temperature (min/max):  |
| 6 mm Other:  | Type of environment:  |
| 7. Sheath material:  | Accessories:<br>See the part "Accessories"  |
|  | Quantity: Note:   |
| How to order?  | վվո   |
| Choose the desired characteristics of your sensor by marking the che   |   |

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

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

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## PM40 – Mineral insulated RTDs Cable prolongation with fixed threaded fitting

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| 50<br>LC  | *Thread material Stainless steel (304 / 304L / 316 / 3   |
|---|--|
| Ordering information  1. Element type:  Pt 100 Pt 500 Pt 1000  Other:   | <b>10. Crimp protection:</b> Spring         Heat shrink sleeve         Without   |
| 2. Element class:   | <b>11. Connector:</b> Miniature       Miniature         Plug       Socket         Plug       Socket         Without       Other:       |
| 3. Number of elements:  | 12. Option:         Cable clamp       Custom ID label         Without         13. Thread:  |
| <ul> <li>5. Sheath length L or L1(mm):</li> <li>6. Sheath diameter Ø: (Ø 1,5 and 2 mm only for one element x1) <ul> <li>1,5 mm</li> <li>2 mm</li> <li>3 mm</li> <li>4,5 mm</li> <li>6 mm</li> </ul> </li> <li>Other:</li> </ul> | □ 1/2" BSPP       □ 1/4" BSPP       □ 1/4" BSPT       □ M10         □ 1/2" NPT       □ Other:         Additional:         Application: |
| 7. Sheath material:   | Operating temperature (min/max):<br>Type of environment:   |
| 8. Cable prolongation:         PVC (105°C)         Silicone (180°C)         Fiberglass (400°C)    Other:  | Accessories:<br>See the part "Accessories"<br>Quantity:<br>Note:   |
| 9. Cable length LC (mm):  |  |

## PM53 – Mineral insulated RTDs Bayonet

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\*Bayonet cap Nickel-plated brass

0

L2

#### Ordering information

| <b>1. Element type:</b> Pt 100       Pt 500         Other:  | 8. Connector:<br>Miniature Miniature Standard Standard<br>Plug Socket Plug Socket<br>Without Other: |
|---|---|
| <b>2. Element class:</b>  | Additional:<br>Application:   |
| <b>3. Wiring configuration:</b> (number of wires)   | Operating temperature (min/max):<br>Type of environment:  |
| 4. Sheath lengths L1, L2, L3 (mm):         L1       L2  | Accessories:<br>See the part "Accessories"<br>Quantity:   |
| 5. Sheath diameter Ø:<br>3 mm 4,5 mm 6 mm<br>Other:   | Note:   |
| 6. Sheath material:   |   |
| 7. Bayonet cap Øin: (to suit sheath Ø mm)<br>☐ 10,3 mm (3 mm) ☐ 12,4 mm (4,5 mm) ☐ 14,5 mm (6 mm)<br>☐ Other: |   |

L3

ğ

L1

#### How to order?

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## PM60 – Mineral insulated RTDs Disk plate insert

|  | L<br>*Disc plate material Stainless steel 304L                     |
|--|--|
| Ordering information 1. Element type:  | Additional:  |
| □ Pt 100 □ Pt 500 □ Pt 1000 □ Other:   | Application: Operating temperature (min/max):                      |
| 2. Element class:  | Type of environment:<br>Accessories:<br>See the part "Accessories" |
| <b>3. Number of elements:</b> $\Box \times 1$ $\Box \times 2$  | Quantity:  |
| <b>4. Wiring configuration:</b> (number of wires per element)  | Note:  |
| 5. Sheath length L (mm):   | ]  |
| 6. Sheath diameter Ø: (Ø 1,5 and 2 mm only for one element x1)<br>□ 1,5 mm □ 3 mm □ 4,5 mm □ 6 mm □ 8 mm<br>□ Other: |  |
| 7. Sheath material:  |  |
|  | -  |

#### How to order?

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## PM61 – Mineral insulated RTDs Insert with terminal block (spring loaded)

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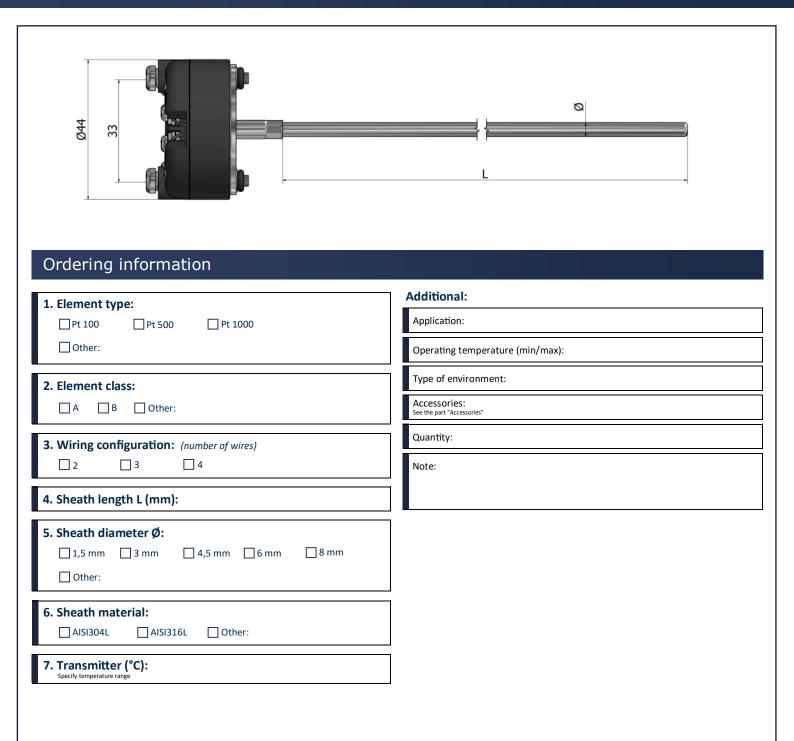
| Ordering information   |  |
|--|--|
| <b>1. Element type:</b> Pt 100       Pt 500         Other:   | Additional:<br>Application:<br>Operating temperature (min/max):    |
| <b>2. Element class:</b>   | Type of environment:<br>Accessories:<br>See the part "Accessories" |
| <b>3. Number of elements:</b>  | Quantity:  |
| <b>4. Wiring configuration:</b> (number of wires per element)         2       3                                      | Note:  |
| 5. Sheath length L (mm):   |  |
| 6. Sheath diameter Ø: (Ø 1,5 and 2 mm only for one element x1)<br>□ 1,5 mm □ 3 mm □ 4,5 mm □ 6 mm □ 8 mm<br>□ Other: |  |
| 7. Sheath material:  |  |

### How to order?

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### PM62 – Mineral insulated RTDs Insert with transmitter (spring loaded)

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#### How to order?

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### PM70 – Mineral insulated RTDs Connection head

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| Ordering information  |  |
|---|--|
|   | Additional:                                |
| <b>1. Element type:</b>   | Application:                               |
| Other:  | Operating temperature (min/max):           |
| 2. Element class:   | Type of environment:                       |
| A B Other:  | Accessories:<br>See the part "Accessories" |
| <b>3. Number of elements:</b> $\Box \times 1 \qquad \Box \times 2$  | Quantity:                                  |
| <b>4. Wiring configuration:</b> (number of wires per element)   | Note:                                      |
| 5. Sheath length L (mm):  |  |
| <ul> <li>6. Sheath diameter Ø: (Ø 1,5 and 2 mm only for one element x1)</li> <li>□ 1,5 mm □ 3 mm □ 4,5 mm □ 6 mm □ 8 mm</li> <li>□ Other:</li> <li>7. Sheath material:</li> </ul> |  |
| AISI304L AISI316L Other:  |  |
| 8. Connection head:       (see the part "Accessories")         Type B       Type DAN       Type M         Type Ex       Type NS       Other:                                      |  |
| 9. Mounting:<br>Wires Terminal block Transmitter (°C):<br>Specify temperature range   |  |

### How to order?

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## PM71 – Mineral insulated RTDs Connection head with fixed threaded fitting

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|  | LI<br>L<br>L<br>*Thread material <b>Stainless steel (304 / 304L / 316 / 316L</b> |
|--|--|
| Ordering information   |  |
| <b>1. Element type:</b> Pt 100       Pt 500         Other:   | <b>10. Thread:</b> 1/2" BSPP       1/4" BSPP         1/2" NPT       Other:       |
| 2. Element class:  | Additional:<br>Application:  |
|  | Operating temperature (min/max):   |
| <b>3. Number of elements:</b> $\Box \times 1 \qquad \Box \times 2$   | Type of environment:   |
| <b>4. Wiring configuration:</b> (number of wires per element)  | Accessories:<br>See the part "Accessories"                                       |
| 5. Sheath length L or L1 (mm):   | Quantity:  |
| 6. Sheath diameter Ø: (Ø 1,5 and 2 mm only for one element x1) ☐ 1,5 mm ☐ 3 mm ☐ 4,5 mm ☐ 6 mm ☐ 8 mm ☐ Other: | Note:  |
| Other:  AISI304L AISI316L Other:   |  |
| 8. Connection head: (see the part "Accessories")       Type B     Type DAN       Type Ex     Type NS           |  |
| 9. Mounting:<br>Wires Terminal block Transmitter (°C):<br>Specify temperature range                            |  |

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## PM73 – Mineral insulated RTDs Connection head (spring loaded)

|   | L2<br>L1<br>*Thread material Stainless steel (304 / 304L / 316 / 316L)     |
|---|--|
| Ordering information  1. Element type: Pt 100 Pt 500 Pt 1000 Other:   | 9. Mounting:   |
| 2. Element class:   | <b>10. Thread:</b> 1/2" BSPP       1/4" BSPP         1/2" NPT       Other: |
| <b>3. Number of elements:</b> $\Box \times 1$ $\Box \times 2$   | Additional:<br>Application:  |
| <b>4. Wiring configuration:</b> (number of wires per element)   | Operating temperature (min/max):   |
| 5. Sheath lengths L1, L2, L3 (mm):  | Type of environment:<br>Accessories:<br>See the part "Accessories"         |
|   | Quantity:  |
| 6. Sheath diameter Ø: (Ø 1,5 and 2 mm only for one element x1)<br>□ 1,5 mm □ 3 mm □ 4,5 mm □ 6 mm □ 8 mm<br>□ Other:                                | Note:  |
| 7. Sheath material:   |  |
| 8. Connection head: (see the part "Accessories")         Type B       Type DAN       Type M       Type N         Type Ex       Type NS       Other: |  |

### How to order?

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