

TEMPERATURE



We design, calculate and manufacture all the primary elements for the measurement of flow and temperature that new technologies demand, as well as glass level and magnetic indicators for medium and high-pressure applications.

Century XXI



Made in Spain



NR: ISO 9001 - 0037273



TEMPERATURE

Thermocouples and resistance thermometer are built with the most advanced technology, using designs based on mineral insulation in extruded magnesium oxide together with its metal sheath, usually made of stainless steel or any other special alloy, which offer performance that far exceeds to those of classic designs.

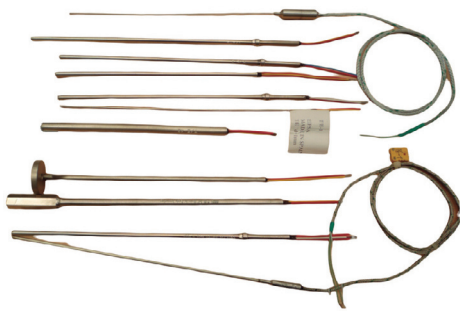
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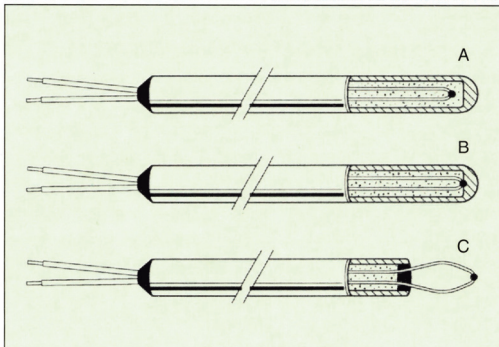
TEMPERATURE

Thermocouples

DESCRIPTION: The thermocouple is a simple, reliable and precise element consisting of a pair of conductors of dissimilar materials that together generate an electromotive force proportional to the temperature. The characteristic of electromotive force/temperature of a thermocouple depends both on the construction materials of its conductors and on the temperature to which the element is subjected.



JUNTAS CALIENTES DE TERMOPARES / THERMOCOUPLE HOT JUNCTIONS



DENOMINATION

Temperature sensor element by electromotive force.

CHARACTERISTICS

Elements with mineral insulation in magnesium oxide (MgO) extruded together with its sheath, in different stainless steels and special alloys.

- Rules of design:	IEC 60584, ANSI MC96.1 or DIN-43710, ASTM E230, ASTM E235, ATEX, IECEx.
- Materials:	Demand.
- Sizes of manufacturing:	- Ø Sheath: 0.5 - 12.7mm. - Standard and special sheath thickness. - Conductive wire gauges according to AWG. - Isolated, mass or exposed (Grounded/Ungrounded). - Other sizes to consult.

APPLICATIONS

- Nuclear industry.
- Chemical and petrochemical industry.
- Aeronautical and aerospace industry.
- Explosion-proof zones.

NOTES

- Calibrations carried out by both external and internal laboratories.
- ATEX 2014/34/EU and IECEx certification for the complete set consisting of connection head with ceramic terminal block or temperature transmitter, sensor element (Thermocouple / RTD), joint accessories and thermowell for process connection (with or without flange).

TEMPERATURE

Thermocouples

Depending on the temperature range:

Type	Range (°F)	Range (°C)	Standard Tolerances (°C)	Special Tolerances (°C)
T	32 – 700	0 – 370	±1,0 o ±0,75%	±0,5 o ±0,4%
J	32 – 1400	0 – 760	±2,2 o ±0,75%	±1,1 o ±0,4%
E	32 – 1600	0 – 870	±1,7 o ±0,5%	±1,0 o ±0,4%
K o N	32 – 2300	0 – 1260	±2,2 o ±0,75%	±1,1 o ±0,4%
R o S	32 – 2700	0 – 1480	±1,5 o ±0,25%	±0,6 o ±0,1%
B	1600 – 3100	870 – 1700	±0,5%	±0,25%

Depending on the type of junction of the conductors:

Type	Description
A	Ungrounded
B	Grounded
C	Exposed

*Not including applicable notes to this tolerance table please refer to notes in applicable international standards.



TEMPERATURE

Resistance thermometer

DESCRIPTION: The Resistance thermometer is a widely used element due to its simplicity and precision, consisting of a metal sensor (platinum, copper or nickel), whose resistance varies with temperature, and extension cables, being the whole set protected by a metal sheath. The resistance thermometer generally used are PT-100 type of platinum winding on a ceramic basis.

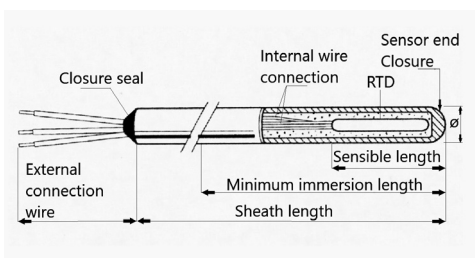


Fig. 1.- Typical industrial Platinum resistance thermometer.



DENOMINATION

Temperature sensor element by electromotive force.

CHARACTERISTICS

Manufactured using high performance sensors and extension cables insulated in magnesium oxide (MgO) extruded together with its metal sheath.

- Rules of design:	IEC 60751, ASTM E780, ASTM E1137, ATEX, IECEx.
- Materials:	Demand.
- Sizes of manufacturing:	<ul style="list-style-type: none"> - Ø sheath: 3 - 8mm. - Standard and special sheath thickness. - Cable gauges drivers according to AWG. - Other sizes to consult.

APPLICATIONS

- Nuclear industry.
- Chemical and petrochemical industry.
- Aeronautical and aerospace industry.
- Areas classified ATEX 2014/34/EU and IECEx with explosion-proof protection and intrinsic safety.
- Renewable Energy Industry.

NOTES

- Calibrations performed by both laboratories externally and internally in our Calibration laboratory.
- ATEX 2014/34/EU and IECEx certification for the complete set consisting of connection head with ceramic terminal block or Temperature transmitter, sensor element (Thermocouple/ RTD), joining accessories and external protection sheath for process connection (with or without flange).



TEMPERATURE

Resistance Thermometer

Common types:

Type	Coefficient a	0°C Value	°C Range	Uncertainties
Pt-100	0,00385	100Ω	-200 - 850	Class A: $\pm(0,15+0,002 t)$ °C
				Class B: $\pm(0,30+0,005 t)$ °C

Specifications:

Resistance thermometer are generally manufactured with PT -100 type bulbs of platinum winding encapsulated in ceramic base, which offer greater performance than the stratified or film types that do not withstand high temperatures.

Resistance thermometer are distinguished by their tolerances of measurement precision, as well as by the temperature range of use, being able to be single or double to 3 wires, 4 threads, 6 threads.

In the manufacturing process, special executions have been developed to make these sensors resistant to vibrations.

Precision:

This depends on both the type of resistance used, as well as the operating temperature. The following table summarizes the main ones.

Tolerance Class	Temperature Range °C		Tolerance Values °C
	Wire Wound Resistor	Estratificada y Film	
AA	-50—250	0—150	$\pm(0,1+0,0017 t)$
A	-100—450	-30—300	$\pm(0,15+0,002 t)$
B	-196—600	-50—500	$\pm(0,3+0,005 t)$
C	-196—600	-50—600	$\pm(0,6+0,01 t)$

$|t|$ = módulo de temperatura en °C sin señal

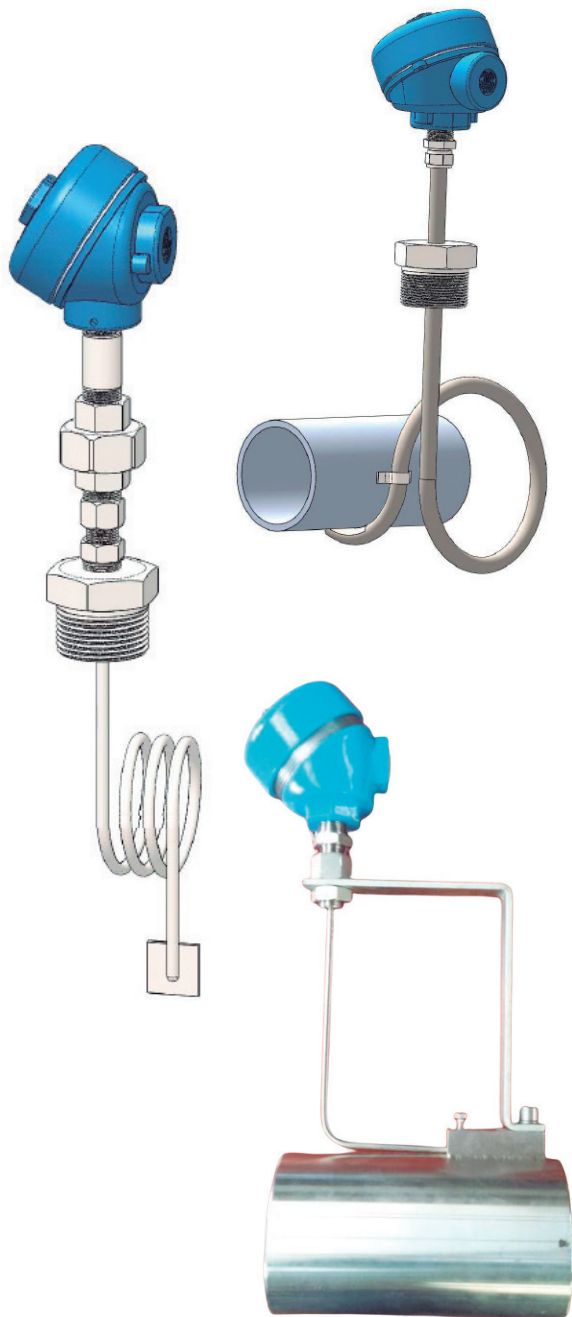
IEC 60751 STANDARD



TEMPERATURE

Skin-Point

DESCRIPTION: Depending on the temperature value to be measured, both thermocouples and resistance thermometer can be used in the measurement of surface temperature in furnaces, boilers or heaters, as well as in pipes. As a measuring element, thermocouple and resistance thermometer can be used, being thermocouple the most common.



DENOMINATION

Surface temperature measuring element, resistance thermometer and thermocouples.

CHARACTERISTICS

Built with MgO insulation and sheaths in main austenitic materials including some refractory, they are able to measure in situations of direct incidence of flame.

- Rules of design:	IEC 60584, ANSI MC96.1 or DIN-43710, ASTM E230, ASTM E235, IEC 60751, ASTM E780, ASTM E1137, ATEX, IECEx.
- Materials:	On demand.
- Sizes of manufacturing:	<ul style="list-style-type: none"> - \varnothing sheath: 0.5 - 12.7mm. - Standard and special sheath thicknesses. - Gauges of the conductive wires according to AWG. - Other sizes on request.

APPLICATIONS

- Nuclear industry.
- Chemical and petrochemical industry.
- Aeronautical and aerospace industry.
- Explosion-proof zones.
- Renewable energy industry.

NOTES

- Calibrations performed by both laboratories externally and internally in our Calibration laboratory.

TEMPERATURE

Skin-Point

Common types of Skin-Point:

- V-pad type.
- Washer-pad type.
- Weld-pad type.

Thermocouple depending on the temperature range:

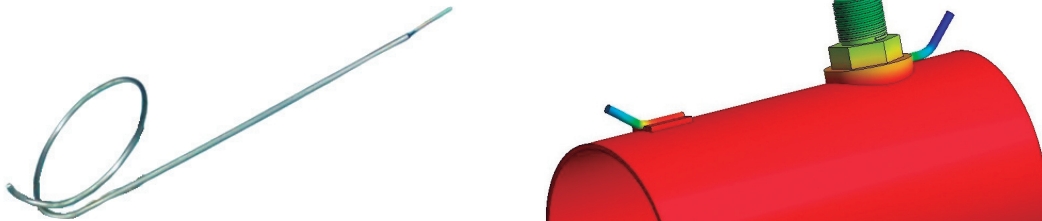
Type	Range (°F)	Range (°C)	Standard Tolerances (°C)	Special Tolerances (°C)
T	32 – 700	0 – 370	±1,0 o ±0,75%	±0,5 o ±0,4%
J	32 – 1400	0 – 760	±2,2 o ±0,75%	±1,1 o ±0,4%
E	32 – 1600	0 – 870	±1,7 o ±0,5%	±1,0 o ±0,4%
K o N	32 – 2300	0 – 1260	±2,2 o ±0,75%	±1,1 o ±0,4%

Thermocouple depending on the type of junction of the conductors:

Type	Description
A	Ungrounded
B	Grounded
C	Exposed

In the manufacturing process, solutions have been implemented to make these sensors resistant to high vibrations.

*Not including applicable notes to this tolerance table please refer to notes in applicable international standards.



TEMPERATURE

Thermowell

DESCRIPTION: Since in many applications it is not practical or possible to directly expose temperature sensors to the process fluid, it is therefore necessary to install thermowells. Thermowells are the mechanical barrier that protects the sensor, to maintain the transmission / indication of the generated signal, at all times, and must withstand the same operating conditions including the conditions that it generates and the useful life of the element to which it is associated.



DENOMINATION

Thermowells in drilled bar.

CHARACTERISTICS

- Rules of design:	ASME PTC 19.3, API RP 551, ATEX, IECEx.
- Materials:	- On request. - Ceramics for interior of furnaces. - Plastic or metal coatings for extremely corrosive environments and abrasive fluids.
- Sizes of manufacturing:	½" – 3" Maximum length 1500 mm

APPLICATIONS

- Nuclear industry.
- Chemical and petrochemical industry.
- Aeronautical and aerospace industry.
- Corrosive environments.
- Renewable energy industry.
- Areas classified ATEX 2014/34/EU and IECEx with explosion protection mode and intrinsic safety.

NOTES

- **Maximum operating temperature:** According to flanges rating, tube thickness and materials.
- ATEX 2014/34/EU and IECEx certification for the complete set consisting of connection head with ceramic terminal block or temperature transmitter, sensor element (Thermocouple / RTD), joint accessories and thermowell for process connection (with or without flange).
- **Maximum operating pressure:** According to flanges rating, tube thickness and materials.



TEMPERATURE

Thermowell

Common types:

Connection Type	Style	Execution
Flanged	Tapered	Full welded
Van Stone	Cylindrical	
Threaded	Stepped	Forged
Welded	Helical	

¹ For more details see specific catalog.

Forged Thermowells improve the ability of materials to fatigue from vibrations. Non-destructive testing carried out both by external laboratories and internally in our test laboratory.

Explosive atmosphere certifications available for complete sensor equipment, thermowell, and connection head or transmitter. ATEX 2014/34/EU and IECEx certification for the complete set consisting of connection head with ceramic terminal block or temperature transmitter, sensor element (Thermocouple/RTD), joint accessories and thermowell for process connection (with or without flange).



TEMPERATURE

Helical forged thermowell - VORTICRACK®

DESCRIPTION: Due to the increase in process conditions, this execution has become necessary in the industry, which produces a decrease in certain frequencies of detachment of the vortices, as well as in the energy of the same.

They are the mechanical barrier that protects the sensor, to maintain the transmission / indication of the generated signal, at all times, and must withstand the same operating conditions including the conditions that it generates and the useful life of the element to which it is associated.



DENOMINATION

Forged thermowell with Helical finish.

CHARACTERISTICS

- Rules of design:	ASME PTC 19.3, API RP 551, ATEX, IECEx. Stress calculations are based on the ASME PTC 19.3 standard as well as the simulation of finite models for both the frequency and structural models.
- Materials:	On request.
- Sizes of manufacturing:	½" – 3" Maximum length 1500 mm.

APPLICATIONS

- Nuclear industry.
- Chemical and petrochemical industry.
- Aeronautical and aerospace industry.
- Corrosive environments.
- Renewable energy industry.
- Areas classified ATEX 2014/34/EU and IECEx with explosion protection mode and intrinsic safety.

NOTES

- **Maximum operating temperature:** According to the flanges rating, tube thickness and materials.
- ATEX 2014/34/EU and IECEx certification for the complete set consisting of connection heads with ceramic terminal block or temperature transmitter sensor element (Thermocouple/RTD), joint accessories and thermowell for process connection (with or without flange).
- **Maximum operating pressure:** According to the flanges rating, tube thickness and materials.



TEMPERATURE

Helical forged thermowell - VORTICRACK®

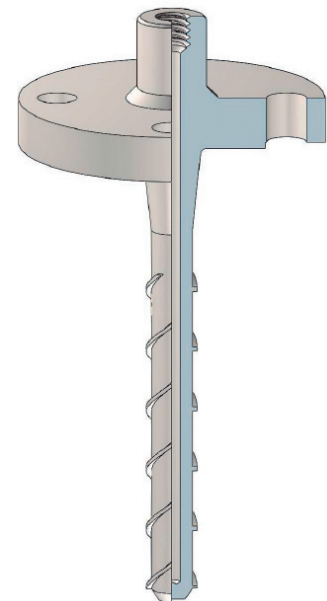
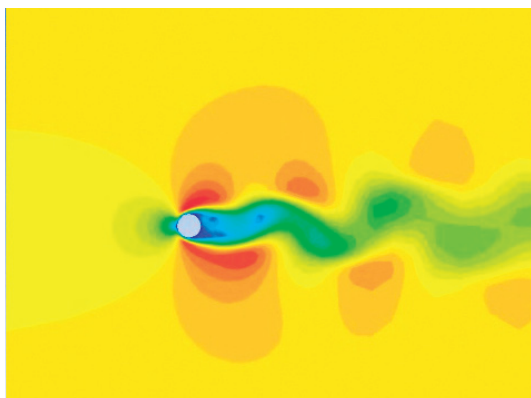
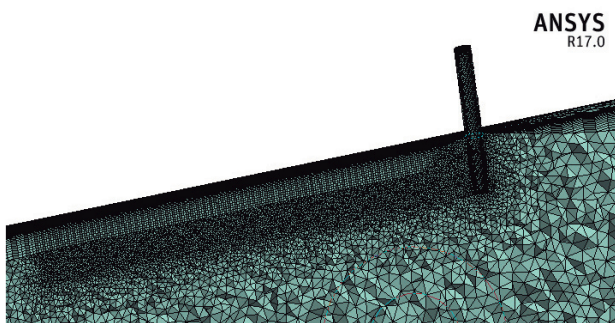
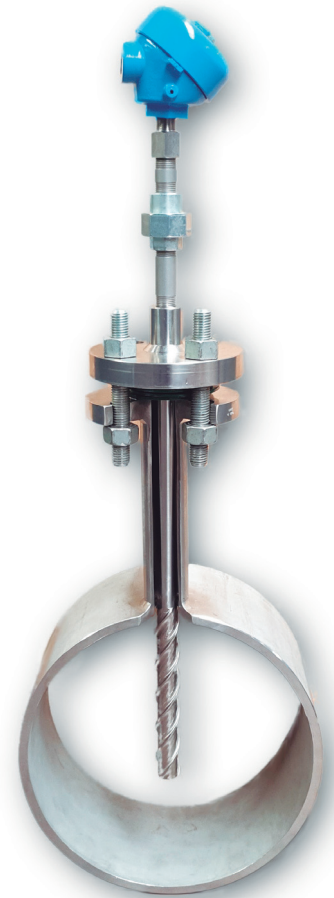
Usual types:

Connection Type
Flanged
Van Stone
Threaded
Welded

In the flanged version the execution is forged, eliminating the residual stresses due to welding.

Non-destructive testing carried out both by external laboratories and internally in our test laboratory.

ATEX 2014/34/EU and IECEx certification for the complete set consisting of connection head with ceramic terminal block or temperature transmitter, sensor element (Thermocouple/RTD), joint accessories and thermowell for process connection (with or without flange).



TEMPERATURE

Connection heads

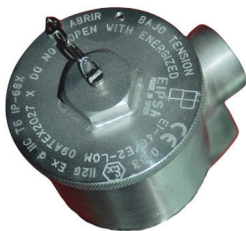
DESCRIPTION: Connection heads that can have ceramic terminal block elements or electronic temperature transmitters.

Depending on the electrical classification of the area where it will be located and the material required, there are three models PATENTED BY EIPSA certified and accredited for use in areas classified ATEX 2014/34/UE and IECEx with explosion protection mode and intrinsic safety: EI-45, EI-46 and EI-47.

With transmitter or ceramic block of connections or with local INDICATION LCD.



Model: EI-47



Model: EI-46



Model: EI-45



Model: IP-68



Transmitter 7501

DENOMINATION

Connection head.

CHARACTERISTICS

Durability, ATEX certification, IECEx, IP 68, dimensions compatible with DIN A, DIN B.

- Rules of design:	ATEX, IECEx, UNE-EN 60529, DIN.
- Materials:	Stainless steel, aluminum or cast iron.
- Sizes of manufacturing:	Input and output connections 1/2" NPT-F, 3/4" NPT-F, and metrics.

APPLICATIONS

- Nuclear industry.
- Chemical and petrochemical industry.
- Aeronautical and aerospace industry.
- Areas classified ATEX 2014/34/EU and IECEx with explosion protection mode and intrinsic safety.
- For use in complete sets of temperature measurement with thermowell or skin-point type.

NOTES

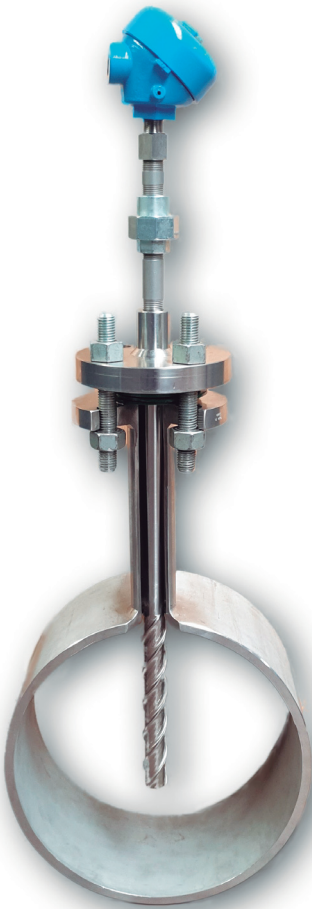
- **Maximum operating temperature:** According to the flanges rating, tube thickness and materials.
- **Maximum operating pressure:** According to the flanges rating, tube thickness and materials.



DIRECTIVES

Certification of complex assembly under ATEX/IECEx directive

HISTORY: Under the tutelage of certified laboratories and our quality team, seeking to adapt the manufacture of our complete temperature sets to the needs of the industry. EIPSA has had since 1991 the certification of our complete sets intended for use in Potentially Explosive Atmospheres, updating to the new ATEX directive 94/9/EC since 2003, and later to the ATEX Directive 2014/34/EU, as well as the international standard IECEx since 2016.



DESCRIPTION

- Our company is ISO 9001:2015 certified by Lloyd's Register, and is audited and accredited by the Notified European Organization n°0163 Official Laboratory J.M. Madariaga (LOM) as Manufacturers of Equipment, Components or Protection Systems, for use in Potentially Explosive Atmospheres in accordance with the ATEX Directive 2014/34/EU with notification number LOM 03ATEX9150, as well as, under the international standard IECEx (Quality Assessment Report) with document number ES/LOM/QAR 16.0001 by the Official Laboratory J.M. Madariaga (LOM) acting as Notification Body (ExCB).
- These certificates are valid for complete temperature sets that are composed of:
 - Head of connections, with ceramic terminal block or electronic temperature transmitter.
 - EIPSA standard mounting connections that allows the action of the compression spring (Spring Load) on the sensor element, not on the block of connections.
 - Joining accessories.
 - Sensor element type Thermocouple or RTD.
 - Thermowell for process connection (with or without flange).
- See specific tabs of the sets for more information.

Approved Set Certifications

ATEX:

LOM 03ATEX 2088X/CE0163 II2G Ex d IIC T6 Gb.
 LOM 03ATEX 2118X/CE0163 II2G Ex d IIC T6 Gb.
 LOM 04ATEX 2156X/CE0163 II2G Ex ia IIC T6 Ga.
 LOM 09ATEX 2027X/CE0163 II2G Ex d IIC T6 Gb.
 LOM 13ATEX 2039X/CE0163 II2G Ex d IIC T6 Gb.
 LOM 13ATEX 2040X/CE0163 II1G Ex ia IIC T6 Ga.

IECEx:

IECEx LOM 16.0001X/ Ex db IIC T6...T1 Gb.
 IECEx LOM 16.0001X/ Ex ia IIC T6...T1 Ga.
 IECEx LOM 21.0005X/ Ex db IIC T6...T1 Gb.



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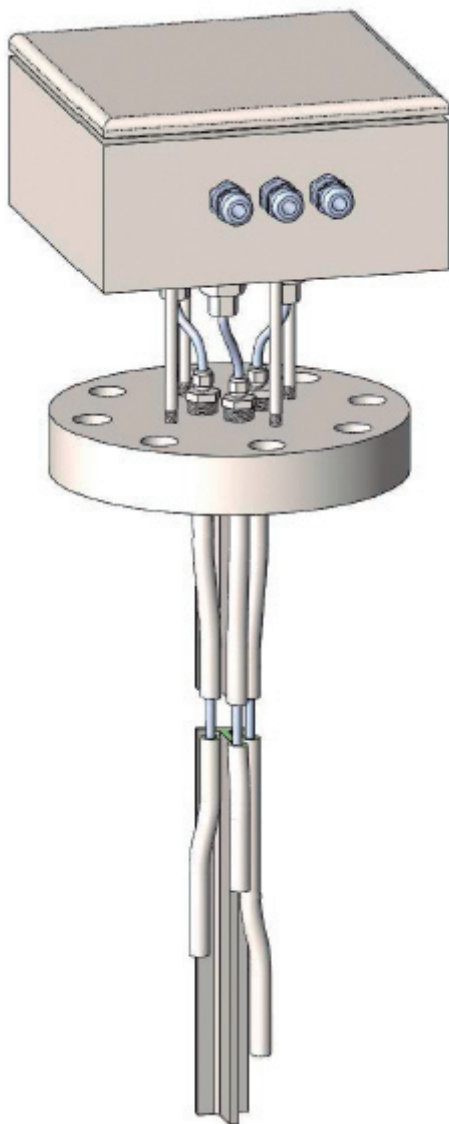
TEMPERATURE

Multiple Temperature Measurement Sets (T-Type)

DESCRIPTION: There are special applications where the temperature is required to be measured at different points using only a process connection.

The new industrial processes, mainly in the chemical and petrochemical industries, make these designs more sophisticated requiring from sensor elements with very small diameters (micro thermocouples) or constructions with thermowells and specific bending radius to adapt to new reactor designs.

The use of the central T-shaped support gives it the necessary rigidity for vertical measurement at different heights both in tanks and in reactors.



DENOMINATION

Internal temperature measurement element in reactors and tanks.

CHARACTERISTICS

- Rules of design:	IEC 60584, ANSI MC96.1 or DIN-43710, ASTM E230, ASTM E235, IEC 60751, ASTM E780, ASTM E1137
- Materials:	Austenitic materials and special alloys.
- Sizes of manufacturing:	According to specification or application.

APPLICATIONS

- Temperature measurement in tanks and reactors.
- Nuclear industry.
- Chemical and petrochemical industry.
- Aeronautical and aerospace industry.
- Renewable energy industry.

NOTES

- **Maximum operating temperature:** According to the flanges rating, tube thickness and materials.
- **Maximum operating pressure:** According to the flanges rating, tube thickness and materials.

TEMPERATURE
Multiple Temperature Measurement Sets (T-Type)
Thermocouple depending on the temperature range:

Type	Range (°F)	Range (°C)	Standard Tolerances (°C)	Special Tolerances (°C)
T	32 – 700	0 – 370	±1,0 o ±0,75%	±0,5 o ±0,4%
J	32 – 1400	0 – 760	±2,2 o ±0,75%	±1,1 o ±0,4%
E	32 – 1600	0 – 870	±1,7 o ±0,5%	±1,0 o ±0,4%
K o N	32 – 2300	0 – 1260	±2,2 o ±0,75%	±1,1 o ±0,4%

Thermocouple depending on the type of junction of the conductors:

Type	Description
A	Ungrounded
B	Grounded
C	Exposed

In the manufacturing process, solutions have been implemented to make these sensors resistant to high vibrations.

Accessories such as transmitter anchor rails and temperature transmitters are supplied upon request.

*Not including applicable notes to this tolerance table please refer to notes in applicable international standards.



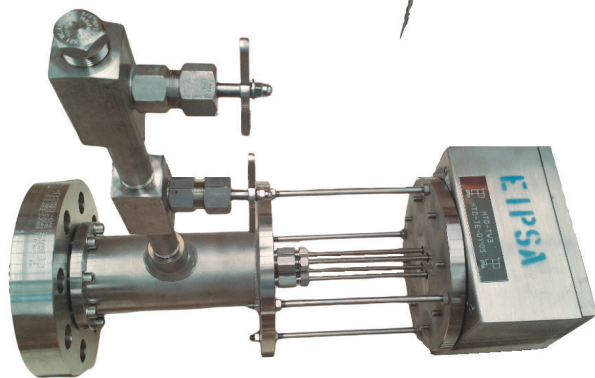
TEMPERATURE

Multiple Perimeter Temperature Measurement Sets

DESCRIPTION: There are special applications where the temperature is required to be measured at different points using only a process connection.

The new industrial processes, mainly in the chemical and petrochemical industries, make these designs more sophisticated requiring from sensor elements with very small diameters (micro thermocouples) or constructions with thermowell and specific bending radius to adapt to new reactor designs.

Lacking a thermowell or protective tube and being manufactured using sensor elements with flexible sheath make them suitable for perimeter measurement inside reactors where accuracy in the measurement of the temperature variable is critical for the control and efficiency of the process.



DENOMINATION

Internal temperature measurement element in reactors and tanks.

CHARACTERISTICS

- Rules of design:	IEC 60584, ANSI MC96.1 or DIN-43710, ASTM E230, ASTM E235, IEC 60751, ASTM E780, ASTM E1137
- Materials:	Austenitic materials and special alloys.
- Sizes of manufacturing:	According to specification or application.

APPLICATIONS

- Temperature measurement in tanks and reactors.
- Nuclear industry.
- Chemical and petrochemical industry.
- Aeronautical and aerospace industry.
- Renewable energy industry.

NOTES

- Maximum operating temperature: According to the flanges rating, tube thickness and materials.
- Maximum operating pressure: According to the flanges rating, tube thickness and materials.

TEMPERATURE
Multiple Perimeter Temperature Measurement Sets
Thermocouple depending on the temperature range:

Type	Range (°F)	Range (°C)	Standard Tolerances (°C)	Special Tolerances (°C)
T	32 – 700	0 – 370	±1,0 o ±0,75%	±0,5 o ±0,4%
J	32 – 1400	0 – 760	±2,2 o ±0,75%	±1,1 o ±0,4%
E	32 – 1600	0 – 870	±1,7 o ±0,5%	±1,0 o ±0,4%
K o N	32 – 2300	0 – 1260	±2,2 o ±0,75%	±1,1 o ±0,4%

Thermocouple depending on the type of junction of the conductors:

Type	Description
A	Ungrounded
B	Grounded
C	Exposed

In the manufacturing process, solutions have been implemented to make these sensors resistant to high vibrations.

Accessories such as transmitter anchor rails and temperature transmitters are supplied upon request.

*Not including applicable notes to this tolerance table please refer to notes in applicable international standards.

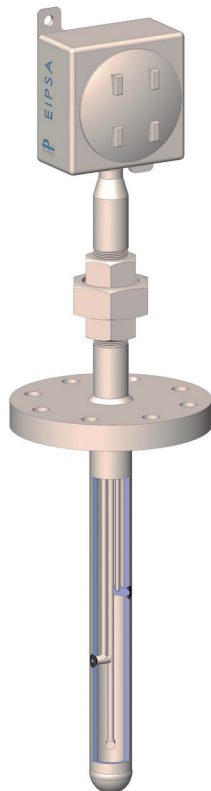


TEMPERATURE

Multiple Welded Contact Temperature Measurement Sets

DESCRIPTION: There are special applications where the temperature is required to be measured at different points using only a process connection.

The new industrial processes, mainly in the chemical and petrochemical industries, make these designs more sophisticated requiring from sensor elements with very small diameters (micro thermocouples) or constructions with thermowell and specific bending radius to adapt to new reactor designs.



DENOMINATION

Internal temperature measurement element in reactors and tanks.

CHARACTERISTICS

- Rules of design:	IEC 60584, ANSI MC96.1 or DIN-43710, ASTM E230, ASTM E235, IEC 60751, ASTM E780, ASTM E1137
- Materials:	Austenitic materials and special alloys.
- Sizes of manufacturing:	According to specification or application.

APPLICATIONS

- Temperature measurement in tanks and reactors.
- Nuclear industry.
- Chemical and petrochemical industry.
- Aeronautical and aerospace industry.
- Renewable energy industry.

NOTES

- **Maximum operating temperature:** According to the flanges rating, tube thickness and materials.
- **Maximum operating pressure:** According to the flanges rating, tube thickness and materials.

TEMPERATURE
Multiple Welded Contact Temperature Measurement Sets
Thermocouple depending on the temperature range:

Type	Range (°F)	Range (°C)	Standard Tolerances (°C)	Special Tolerances (°C)
T	32 – 700	0 – 370	±1,0 o ±0,75%	±0,5 o ±0,4%
J	32 – 1400	0 – 760	±2,2 o ±0,75%	±1,1 o ±0,4%
E	32 – 1600	0 – 870	±1,7 o ±0,5%	±1,0 o ±0,4%
K o N	32 – 2300	0 – 1260	±2,2 o ±0,75%	±1,1 o ±0,4%

Thermocouple depending on the type of junction of the conductors:

Type	Description
A	Ungrounded
B	Grounded
C	Exposed

In the manufacturing process, solutions have been implemented to make these sensors resistant to high vibrations.

Accessories such as transmitter anchor rails and temperature transmitters are supplied upon request.

*Not including applicable notes to this tolerance table please refer to notes in applicable international standards.



TEMPERATURE

Multiple unprotected temperature measurement sets

DESCRIPTION: There are special applications where the temperature is required to be measured at different points using only a process connection.

The new industrial processes, mainly in the chemical and petrochemical industries, make these designs more sophisticated requiring from sensor elements with very small diameters (micro thermocouples) or constructions with thermowell and specific bending radius to adapt to new reactor designs.

Designed for measurement both vertically and horizontally inside reactors and tanks, they adapt to the needs of the end user either by the need to reach specific measurement points, from an entry point and without interfering with the internals of the equipment where they are installed.



DENOMINATION

Internal temperature measurement element in reactors and tanks.

CARACTERÍSTICAS

- Rules of design:	IEC 60584, ANSI MC96.1 or DIN-43710, ASTM E230, ASTM E235, IEC 60751, ASTM E780, ASTM E1137
- Materials:	Austenitic materials and special alloys.
- Sizes of manufacturing:	According to specification or application.

APPLICATIONS

- Temperature measurement in tanks and reactors.
- Nuclear industry.
- Chemical and petrochemical industry.
- Aeronautical and aerospace industry.
- Renewable energy industry.

NOTES

- **Maximum operating temperature:** According to the flanges rating, tube thickness and materials.
- **Maximum operating pressure:** According to the flanges rating, tube thickness and materials.

TEMPERATURE
Multiple unprotected temperature measurement sets
Thermocouple depending on the temperature range:

Type	Range (°F)	Range (°C)	Standard Tolerances (°C)	Special Tolerances (°C)
T	32 – 700	0 – 370	±1,0 o ±0,75%	±0,5 o ±0,4%
J	32 – 1400	0 – 760	±2,2 o ±0,75%	±1,1 o ±0,4%
E	32 – 1600	0 – 870	±1,7 o ±0,5%	±1,0 o ±0,4%
K o N	32 – 2300	0 – 1260	±2,2 o ±0,75%	±1,1 o ±0,4%

Thermocouple depending on the type of junction of the conductors:

Type	Description
A	Ungrounded
B	Grounded
C	Exposed

In the manufacturing process, solutions have been implemented to make these sensors resistant to high vibrations.

Accessories such as transmitter anchor rails and temperature transmitters are supplied upon request.

*Not including applicable notes to this tolerance table please refer to notes in applicable international standards.



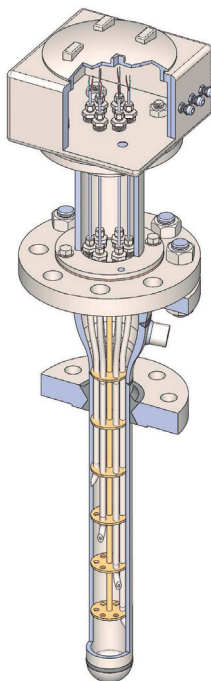
TEMPERATURE

Multiple Vertical Temperature Measurement Sets

DESCRIPTION: There are special applications where the temperature is required to be measured at different points using only a process connection.

The new industrial processes, mainly in the chemical and petrochemical industries, make these designs more sophisticated requiring from sensor elements with very small diameters (micro thermocouples) or constructions with thermowell and specific bending radius to adapt to new reactor designs.

The protective sheath confers the necessary rigidity for vertical measurement at different heights both in tanks and in reactors as well as the possibility of measuring the internal pressure that allows to know the state of the equipment without the need for its disassembly.



DENOMINATION

Internal temperature measurement element in reactors and tanks.

CHARACTERISTICS

- Rules of design:	IEC 60584, ANSI MC96.1 or DIN-43710, ASTM E230, ASTM E235, IEC 60751, ASTM E780, ASTM E1137
- Materials:	Austenitic materials and special alloys.
- Sizes of manufacturing:	According to specification or application.

APPLICATIONS

- Temperature measurement in tanks and reactors.
- Nuclear industry.
- Chemical and petrochemical industry.
- Aeronautical and aerospace industry.
- Renewable energy industry.

NOTES

- Maximum operating temperature: According to the flanges rating, tube thickness and materials.
- Maximum operating pressure: According to the flanges rating, tube thickness and materials.

TEMPERATURE
Multiple Vertical Temperature Measurement Sets
Thermocouple depending on the temperature range:

Type	Range (°F)	Range (°C)	Standard Tolerances (°C)	Special Tolerances (°C)
T	32 – 700	0 – 370	±1,0 o ±0,75%	±0,5 o ±0,4%
J	32 – 1400	0 – 760	±2,2 o ±0,75%	±1,1 o ±0,4%
E	32 – 1600	0 – 870	±1,7 o ±0,5%	±1,0 o ±0,4%
K o N	32 – 2300	0 – 1260	±2,2 o ±0,75%	±1,1 o ±0,4%

Thermocouple depending on the type of junction of the conductors:

Type	Description
A	Ungrounded
B	Grounded
C	Exposed

In the manufacturing process, solutions have been implemented to make these sensors resistant to high vibrations.

Accessories such as transmitter anchor rails and temperature transmitters are supplied upon request.

*Not including applicable notes to this tolerance table please refer to notes in applicable international standards.



TEMPERATURE

Bimetallic thermometers

DESCRIPTION: Visual temperature measurement element by contraction or expansion of 2 different metals that can be spirally wound, in helical shape and mounted or assembled in thermowells. Depending on the execution, length or process conditions and temperature, they can be inert gas. The equipment is hermetically sealed, has safety glass, it is possible to adjust it to zero on the outside as well as orient it.



DENOMINATION

Bimetallic thermometer, with a full orientation and with adjustable zeroing on the outside.

CHARACTERISTICS

- Design standards	EN 13190
- Materials:	AISI 316SS, AISI 304SS, Safety Glass. Other materials to consult.
- Sizes of manufacturing:	Dial 4" (100 mm) / 5" (125 mm). Temperature ranges: Up to 500 °C. Øsensor: 6 mm, 8 mm, 9.5 mm. Sensor length: Up to 1000 mm. Capillary length: Up to 20000 mm.
- Accuracy:	Cl.1 according to EN13190.

APPLICATIONS

- Nuclear industry.
- Chemical and petrochemical industry.
- Aeronautical and aerospace industry.
- Renewable energy industries.

NOTES

- Degrees Centigrade or Degrees Farenheit.
- Anti-parallax dial.





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