Thermo Est

Catalog Temperature

support you through the innovation process

Services Thermo Est
"Premium" range
"Exclusive" range
Metrology
Electronics
Heating cables
Pyrometric accessories

MORE THAN A SUPPLIER, A VALUABLE PARTNER...

Thermo Est

MORE THAN A SUPPLIER,

A VALUABLE PARTNER...

A COMPANY OF THE GROUP

Therm Group

Dear client, dear partner,

We are convinced that a company that wants to dominate the market on the long term must embrace the needs and wants of its customers. This thinking is at the heart of our company philosophy, a strategy that we experience day after day at Thermo Est.

That's why your requirements define our production and administration processes. Your wishes are incorporated in the development of new products, define our standards and at the same time constitute the maxims of our teams.

Because Thermo Est is above all a company made of a qualified staff that meets your needs, a company that is visionary and efficient in its sector.

Success is part of our DNA.

From aeronautics to metallurgy, chemistry, through research centers, energy production, automotive and agrifood Thermo Est develops its products and services for extremely diverse sectors that have their own specificities and requirements.

Our teams study and propose the most suitable installation for controlling temperature in each of our areas of intervention. Each activity reflects a solid set of values that we have grouped around our two ranges.

Premium Exclusiv

You, our partners, have our full attention,

You can trust **Thermo Est** quality products,

Your requirements are our engine,

Today and tomorrow.

Knut BURCHARD et Christian WOURMS,
General management,

Find the entirety of this catalog on: **www.thermoest.com**
In our constant effort to improve our product, Thermo Est reserves the right to modify them without notice.

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Thermo Est

Our teams at your service!

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Find all informations regarding the company, new releases, news, on our website
www.thermoest.com

SERVICE

EVOLVING ALONG WITH YOUR REQUIREMENTS

We continuously improve our products and services in a constant drive to serve you better. Our sales teams are dedicated to addressing your concerns and can respond to your most specific needs, with a continuous commitment to quality and adaptability!

EVOLVING ALONG WITH YOUR REQUIREMENTS

Thermo Est, has highly qualified technicians and engineers that meet your requirements and dedicated to adapt products and services to your specific needs. This mastery from the design to the production allows to stay at the forefront of innovation to achieve optimal performance.

EVOLVING ALONG WITH YOUR CERTIFICATION

Leading manufacturer with a COFRAC accredited laboratory, which is a guarantee of good workmanship, **Thermo Est** has the best calibration methods and uses reference instruments. Our systems offer you the guarantee of high-quality service, to support you in your efforts to further or sustain the quality standards of your company. They enable you to optimise your own production resources to manufacture more and manufacture well, and provide a means to control your energy costs.

EVOLVING ALONG WITH YOUR REQUIREMENTS

To support your requirements, **Thermo Est** is expanding globally. The company is dedicated to satisfy you, and will meet your needs with extreme thoroughness. **Thermo Est** brings you perfection at all levels.

Thermo Est PRODUCT QUALITY

With **Thermo Est**, make the right choice

Who are we?

Created in 1974 at the heart of Europe, **Thermo Est** puts its recognised experience and the most high-performance technologies at the service of its customers. **The Thermo Est industrial site designs, manufactures and sells temperature sensors, heating cables, measurement converters, combined with metrology services in laboratory or on site.**

Thanks to its teams of highly qualified technicians and engineers **Thermo Est** adapts to meet your requirements from custom-made to standard products manufactured in series.

The values of our company are based on three pillars:

- **Continuity, rigor and reliability**
- **Experience, desire to succeed and long-term vision**
- **Know, know-how**

Our fields of intervention:

From aeronautics to pharmaceuticals, through research laboratories, metallurgy, energy production, chemistry and automotive... **Thermo Est** develops its products and services for extremely diverse sectors that have their own specificities and requirements.

Thermo Est has now around a hundred employees and is active internationally.

Thermo Est turns its products into high quality standards

We are recognized as the technological innovator of an entire sector.

Our success is often associated with essential values such as robustness, rigour, reliability to reach perfection at all levels.

As part of our continuous improvement process and our permanent quest to satisfy our customer, all of our services and products bearing the brand **Thermo Est** guarantee high standards of quality, all over the world.

Contact our quality team at: **QUALITY@thermoest.com**

cofrac ETALONNAGE
Accreditation n°2-1221
Range available on www.cofrac.fr

cofrac ESSAIS
Accreditation n°1-113
Range available on www.cofrac.fr

ISO 9001

Thermo Est KNOW-HOW

The purpose of this catalog is to present the extent of our manufacturing program in temperature sensors and heating cables with mineral insulation, according to your industry. Below is a non-exhaustive list of the products that we provide. **Thermo Est** helps you make technological choices in order to strengthen security, minimize environmental impact and improve your productivity.

IRON AND STEEL METALLURGY

Thermo Est grew up thanks to the iron metallurgy in Lorraine and relies today on a long-standing expertise to propose a complete set of sensors for:

- Hot blast and gas temperature
- Refractory oven for temperature up to 1800 °C
- Transformation of alloys
- Hot processing: rolling, drawing
- Ferrous, non-ferrous foundry
- AMS 2750 heat treatment standard

AUTOMOTIVE

For almost all research and production procedures, temperature is an important factor to consider. **Thermo Est** makes taps, for measurements of temperature, pressure, flow, etc., on polyethylene, steel, cast iron and stainless steel parts and provides various sensors:

- For engine, bearing, oil, water
- For exhaust system
- Air conditioning system
- Brakes
- For radiator and heat exchanger

CHEMICALS AND PETROCHEMICALS

Thermo Est benefits from expertise in the supply of sensors adapted to **EX**plosive **AT**mospheres "**ATEX**" industrial environments to ensure the maintenance and safety of your installations.
Thermo Est offers:

- Ex "i", Ex "d", Ex "e" standard sensors (bearing, pump, atmosphere)
- Process sensors with thermowell
- Surface temperature sensors
- Multipoint Sensors
- High pressure sensors
- Heater

CEMENT MANUFACTURING

Thermo Est has developed a specific range of robust sensors with specific protective sheath validated and tested for cement plants guaranteeing optimum service life even at high temperatures with:

- Gaz temperature (Pt100Ω)
- Stack temperature for the environment (Pt100Ω)
- Engine bearing temperature (Pt100Ω)
- Cyclone sensors between +700 °C and +1000 °C
- Smoke-box sensor between +1200 °C and +1300 °C
- Multipoint sensors (flexible new design TE-MIM)
- ATEX thermowell sensors.

AERONAUTICS

The continual improvement of propulsion performance and the reduction of its environmental impact have been essential factors in the development of air transport. The pursuit of this success is at the heart of our technological endeavour.
Thermo Est offers sensors for ground testing, for on-board control:

- Intrusive measurement of engine parameters (combs and rakes)
- Brake temperature
- Ambient temperature
- Heat exchanger
- Battery temperature
- Heat flow measurement

GLASS INDUSTRY

The **Thermo Est** offering is based on an extensive experience in providing complete installations for the glass production industry including the "float" process:

- Melting furnace temperature (vault, hearth)
- Feeder submerged temperature sensor (multi-level, siphon or spout bowl)
- Furnace refractory temperature
- Tin bath temperature
- Surface temperature
- Temperature in ATEX areas

RESEARCH AND DEVELOPMENT

By improving the competitiveness of companies through product performance and differentiation, **Thermo Est** plays an important role in the innovation sector for the benefits of the industry and research centers. **Thermo Est** provide sensors for:

- Safety of nuclear installations
- Dismantling
- Fuel cell
- Technological research for the industry
- High temperature thermocouples for +2300 °C
- Renewable energies

MANUFACTURERS AND EQUIPMENT MANUFACTURERS

Thermo Est brings added value to its partners. By partnering with us, manufacturers and equipment manufacturers can significantly reduce their engineering efforts while they focus on their core business. **Thermo Est** More than a supplier, a valuable partner…
From the pre-production, to the various qualification tests up to the mass production, Thermo Est remains your partner while respecting the standards in force for:

- Train batteries
- Ventilation systems, air conditioning
- Magnetic bearings
- Speed reducers and multipliers
- Gas turbines
- Brake sensors
- Heating tools

NUCLEAR POWER

Thermo Est manufactures a variety of mineral insulated heating cables and sensors for the nuclear industry, research centres and nuclear safety authorities in France and throughout the world. In order to meet the requirements specific to this area **Thermo Est** is committed to a continuous quality approach and is applying a safety culture, develops a safety culture while capitalizing on his "**REX**" experience feedback.
Thermo Est offers:

- Teleoperable in irradiated zone
- Turbine bearing temperature
- Water, steam temperature
- Sodium level detection
- Mapping probe
- Melting pot sensor (duct and cocoon thermocouple)
- Heating bands

EVOLVING ALONG WITH YOUR REQUIREMENTS

Thermo Est with over 44 years of expertise, designs for all thermal processing industries, high precision sensors for harsh environments and uses the two fundamental principles of resistance probes and thermocouples to meet your needs.

Notions of temperature

In almost any research or industrial activity, temperature is an important factor that must be taken into consideration. Its measurement is a necessity that leads to the development of more and more precise sensors. Different operating principles are used. They are based on the variation, depending on the temperature, of certain physical properties of the materials, such as the dilation **(thermometer)**, the variation of the resistivity **(platinum resistance thermometer)**, the variation of the electromagnetic radiation of a body **(optical pyrometer)** and the thermoelectric effect **(thermocouples)**.

Our specialization:

Thermo Est offers you in its catalog resistance probes and thermocouples of type T, J, E, K, N, R, S, B and Wre…

That's why our teams analyse and propose the sensor best suited for your needs

Resistance probes

An "active" element of the temperature sensor or thermometer, the platinum resistance thermometer or Pt100 Ω at 0 °C, for example, operates on the principle of the resistance variation of platinum as a function of temperature, with respect to an electric current introduced into the thermometer. The mechanical and electrical characteristics specific to platinum (stability over a wide temperature range, good electrical resistivity and ease of linearisation), enable to obtain a predictable, steady and stable resistance/temperature ratio. The **CEI 60751** international standard defines the nominal values of platinum resistance probes and the permissible deviations from these values.

However, and by virtue of the Joule effect, the injection of a measurement current into the platinum sensitive element leads to the phenomenon of self-heating thereof. This rise in temperature, due to the passage of current in the sensor, leads to a systematic error in the measurement.

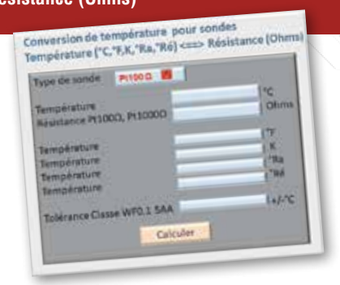
Likewise, depending on the desired accuracy, several possibilities for connecting the probe are possible: 2-wire configuration, industrial 3-wire configuration and 4-wire configuration which is the most accurate method.

There are various types of probes

The traditional technology is in the form of wire wound and sealed in a glass or ceramic support, a newer technology called "thin film" has allowed an extensive miniaturization of sensors. The probe is then in the form of a platinum film deposited on a ceramic substrate.

THERMO EST offers you on his site his measurement converter:

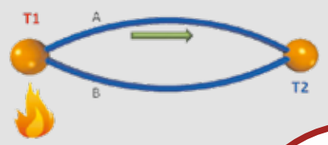
Temperature conversion for probes Temperature (°C, °F, K, °Ra, °Re) <==> Resistance (Ohms)



Thermocouples

The operating principle of thermocouples is essentially based on the **SEEBECK effect (international standard CEI.60584)**. This consists in the creation of a contact electromotive force that varies according to the temperature at the point of contact of the two metals. A thermoelectric couple is formed by two wires of different metals or metal alloys welded at one point. If the junction point of these wires is heated (measurement point), a voltage is formed at the two free ends (connection point). The two free ends are extended by compensation cables to a known temperature zone (compensation point). Thermocouples measure the temperature difference between the measuring point and the compensation point. The temperature of the compensation point must be known and constant. If the temperature of the compensation point is not constant or if it is not known, its temperature must be measured by means of a second sensor. The thermocouples can be of two different natures, either lined with a metallic sheath, or under ceramic beads.

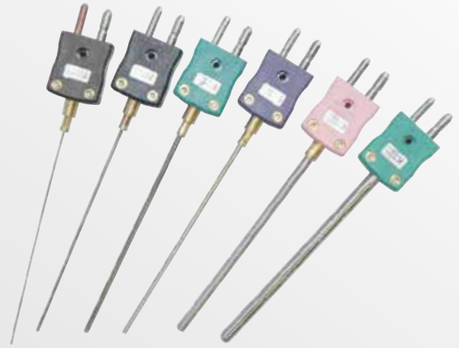
Thomas Johann Seebeck (1770–1831) is the first to highlight the fact that in a closed circuit made up of two conductors of different natures A and B, for example, a current is circulated when a difference of temperature is maintained between the two junctions. This current is due to the appearance of an **electromotive** force (f. e. m) directly related to the difference between the temperatures T1 "**hot junction**" and T2 "**welding or cold junction**" " of the two junctions.



Thermo Est offers you on his site his measurement converter:

Temperature conversion for thermocouples Temperature (°C, °F, K, °Ra, °Re) <==> Electromotive force Fem (mV)

Mineral insulated jacketed thermocouples



To meet the requirements of high-tech industries, **standard AMS 2750 D/E** for example, **Thermo Est** integrates in its group, a production of mineral insulated jacketed cables for all types of thermocouples. The thermocouples are in the form of shielded cables with mineral insulation of Ø 0.25 to 12.7 mm, of small diameter, very flexible and robust.

They are made of:

- Two wires making up the thermoelectric couple
- A highly compacted mineral insulator (eg MgO) guaranteeing the retaining of the conductors and good isolation
- A continuous metallic sheath, providing mechanical and chemical protection of the couple
- The nature of the sheath depends on your environment.

As for traditional thermocouples, at one end, the wires and sheath are welded to form the "T1" hot junction. At the other end the thermocouple is connected according to your needs to a compensation or extension cable, to a connector etc. This **Thermo Est** sensor gives thermocouples many advantages:

- Small footprint and high flexibility allowing measurement at the points the most difficult to access
- High mechanical strength
- Protection against corrosion and chemical pollution
- Short response time

The manufacturing of the cable by Thermo Est allows us to offer you:

Thermocouples of up to 20 measuring points Multipoints thermocouples type of Ø 2–12.7 mm refer to page 60

STANDARD TEMPERATURE RANGES FOR RESISTANCE PROBES OR THERMOCOUPLES

Type of resistance	Code	Temperature range
100 Ω at 0 °C	Pt 100 Ω	-200 °C / +600 °C
Type of thermocouple	**Code**	**Temperature range**
Cu - CuNi	T	-185 °C / +300 °C
Fe - CuNi	J	-40 °C / +700 °C
NiCr - CuNi	E	0 °C / +800 °C
NiCr - Nia	K	-40 °C / +1200 °C
Nicrosil - Nisil	N	-40 °C / +1200 °C
Pt - PtRh10%	S	0 °C / +1550 °C
Pt - PtRh13%	R	0 °C / +1600 °C
PtRh6% - PtRh30%	B	+100 °C / +1700 °C
WRe5% - WRe26%	C	0 °C / +2300 °C

*The above data is given for information purpose only, tests under the conditions of service are recommended.

Number of sensitive elements

Simple or duplex: simple for a sensitive element, duplex if two sensitive elements are necessary for example a redundancy requirement, a temperature indicator.

FOR SENSORS PT 100 Ω

Resistance (Ohms) as a function of temperature with coefficient: 0.00385

The standard EN 60 751 "November 1995" defines the tolerances of interchangeability as follows:

Tolerance class	Tolerance
A	0.15 + 0.002 [t] *
B	0.3 + 0.005 [t]

* [t] = absolute value of the temperature in °C without consideration of sign.

Temperature (°C)	Tolerance			
	Class A		Class B	
	(+/- °C)	(+/- Ω)	(+/- °C)	(+/- Ω)
-200	0.55	0.24	1.3	0.56
-100	0.35	0.14	0.8	0.32
0	0.15	0.06	0.3	0.12
100	0.35	0.13	0.8	0.30
200	0.55	0.20	1.3	0.48
300	0.75	0.27	1.8	0.64
400	0.95	0.33	2.3	0.79
500	1.15	0.38	2.8	0.93
600	1.35	0.43	3.3	1.06
650	1.45	0.46	3.6	1.13
700	-	-	3.8	1.17
800	-	-	4.3	1.28
850	-	-	4.6	1.34

The standard EN 60 751 "November 2008" defines the tolerances of interchangeability for resistance as follows:

Wirewound resistors		Film resistors		Value of tolerance * °C
Tolerance class	Field of validity of temperature °C	Tolerance class	Field of validity of temperature °C	
W 0.1	- 100 to + 350	F 0.1	0 to + 150	+/- (0.1 + 0.0017 [t])
W 0.15	- 100 to + 450	F 0.15	- 30 to + 300	+/- (0.15 + 0.002 [t])
W 0.3	- 196 to + 660	F 0.3	- 50 to + 500	+/- (0.3 + 0.005 [t])
W 0.6	- 196 to + 660	F 0.6	- 50 to + 600	+/- (0.6 + 0.01 [t])

* [t] = absolute value of the temperature in °C without consideration of sign

ELECTRICAL CONNECTION

2-wire configuration

It's the simplest case. The line resistances are in series with the resistance to be measured.

Three-wire configuration

This configuration requires equal resistance of the 3 wires and minimizes the systematic errors inherent to line resistors.

There are still problems of contact resistance and poor balancing of the heat drains.

4-wire configuration

Two measurements are made, which eliminates the line resistances: the balancing of the thermal drains is solved.

There are still problems of contact resistance.

FOR THERMOCOUPLES

The sensor is made up by the junction of 2 thermocouple wires, the measurement is done at the cold junction output, the latter being compensated to simulate the point at 0 °C.

The standard EN 60 548-1 "March 2014" defines the thermocouples tolerances as follows:

Type of couple thermo-electric	Tolerance values (± °C) and validity temperature limits		
	Class 1	Class 2	Class 3
	0.5 or 0.004 x [t]	1 or 0.007 5 x [t]	1 or 0.015 x [t]
Type T	-40 °C to 350 °C	-40 °C to 350 °C	-200 °C to 40 °C
	1.5 or 0.004 x [t]	2.5 or 0.007 5 x [t]	2.5 or 0.015 x [t]
Type E	-40 °C to 800 °C	-40 °C to 900 °C	-200 °C to 40 °C
Type J	-40 °C to 750 °C	-40 °C to 750 °C	-
Type K	-40 °C to 1,000 °C	-40 °C to 1,200 °C	-200 °C to 40 °C
Type N	-40 °C to 1,000 °C	-40 °C to 1,200 °C	-200 °C to 40 °C
	1 for t < 1 100 °C, [t + 0.003 x (t - 1 100)] for t > 1 100 °C	1.5 or 0.002 5 x [t]	4 or 0.005 x [t]
Type R or S	0 °C to 1.600 °C	0 °C to 1.600 °C	-
Type B	-	600 °C to 1.700 °C	600 °C to 1.700 °C
	-	0.01 x [t]	-
Type C	-	426 °C to 2.315 °C	-

The joining of the two wires at the end of the thermocouple is achieved by melting the wires under a neutral atmosphere. It is called “hot junction”.

The hot junction can be:

INSULATED FROM THE GROUND, this configuration makes it possible to protect the thermocouple and the measuring instruments from disturbances present in the measured medium.
AT THE GROUND, in this configuration it is in contact with the protective sheath, thus improving the response time of the sensor, without protecting it from disturbances.

FOR THE COMPENSATION AND EXTENSION CABLES

SYMBOLS AND COLOUR CODES

Couple		Conductors of compensation		SYMBOLES	IEC 584-3	DIN 43714	ANSI MC 96.1	BS 1843
CONDUCTORS		**Positive +**	**Negative -**					
Nickel Chromium / Nickel alloy	**K**	Chromel Nickel / Chrome	Alumel Nickel / Aluminium	KX				
		Copper	Constantan Copper / Nickel / KCB	KCB				
		Iron	Cupronickel Copper / Nickel / KCA	KCA				
Iron / Constantan	**J**	Iron	Constantan Copper / Nickel / J	JX				
Copper / Constantan	**T**	Copper	Constantan Copper / Nickel /T	TX				
10 or 13% Platinum rhodium / Platinum	**S** or **R**	Copper	Cupronickel Copper / Nickel / S	SCA				
30% rhodium platinum / 6% rhodium platinum	**B**	Cupronickel Copper / Alloy	Copper	BC				
Chromel/Constantan	**E**	Chromel Nickel / Chrome	Constantan Copper / Nickel / E	EX				
Nickel Chromium Silicon/ Nickel Silicon	**N**	Nicrosil Nickel / Chrome	Nisil Nickel / Silicium	NX				

Extension and compensation cables - tolerances and identification system according to standard NF EN 60584-3

The compensation cables are made with wires of different compositions from the thermocouple wires.
The extension cables are made with wires of the same composition.

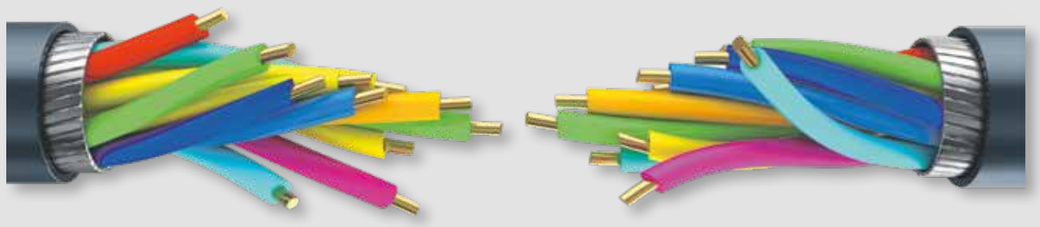
A cable comprising two copper conductors can be used with type B thermoelectric couples.

The expected additional maximum deviation in the temperature range of 0 °C to + 100 °C is 40 µV. The temperature equivalent is 3.5 °C when the measuring junction of the thermoelectric couple is 1,400 °C.

FOR TEMPERATURE LIMITS OF ISOLATORS

	Standardized chemical abbreviation or symbol	Continuous operating temperature (°C)	Operating temperature for a short period (°C)	Softening point (°C)
THERMOPLASTIC				
Polyvinyl chloride	PVC	-30 to +80 °C	100	120
High temperature polyvinyl chloride	PVC-HT	-30 to +105 °C	120	140
Polyethylene, low density PE	LDPE	-50 to +70 °C	100	100
High-density PE	HDPE	-50 to +100 °C	120	130
Polyurethane	PUR	-50 to +90 °C	100	140
Polyamide Nylon® Rilsan®	PA	-30 to +105 °C	125	140
Polypropylene	PP	-10 to +110 °C	140	160
Polyvinylidene fluoride, Kynar®	PVDF	-40 °C +135 °C	150	170
Tetrafluoroethylene, Tefzel®	ETFE	-100 °C to +150 °C	180	270
Ethylene chlorofluoroethylene Halar®	ECTFE	-100 °C to +140 °C	170	240
Fluorethylene Propylene Téflon®	FEP	-100 °C to +205 °C	230	270
Polyimide Kapton®	PI	-190 °C to 220 °C	400	500
Polytetrafluoroethylene Teflon®, Perfluoroalkoxy, Téflon®	PTFE	-190 °C / +260 °C	300	327
Perfluoroalkoxy, Téflon®	PFA	-190 °C to +260 °C	280	327
ELASTOMERS				
Silicone rubber	SIL	-60 °C to +180 °C	250	300
High temperature silicone rubber	SIL-HT	-60 °C to +230 °C	280	320
MINERAL INSULATION				
Fibreglass	SV	-60 °C to +280 °C	350	850
High temperature fibreglass	SV-HT	-60 °C to +400 °C	450	985
Nextel® ceramic fibre	FC	-60 °C to +1200 °C	1400	1800

The above data is given for information purpose only, tests under the conditions of operation are recommended.
Our technical sales advisers are at your disposal for any clarification.



OUR "PREMIUM" RANGE

An electrical temperature measurement

At each temperature range…

A **Thermo Est** solution: the **"PREMIUM"** product range includes resistance thermocouples and thermocouples, with standard DIN 43729 connection head in models A, B or C, connector or cable. This type of sensor is available in rigid or flexible version with insulated jacketed mineral cable, as well as with fixed or sliding process connection. All for ranges from -200 to +1800 °C. In each configuration an analog or digital temperature transmitter may be added to obtain the desired signal.

Define your sensor in a few steps

- Mounting type
- Diameter - useful length (rigid or flexible)
- Process fitting (welded or sliding)
- Connection head
- Type of sensitive element
- Output signal
- Temperature limits and type of application
- Atex security option: see our **EXCLUSIV** range

This range consists of:

- Screw-in resistance probes, with flange fastening
- Resistance probes with EN 175301 connector
- Ambient, outdoor, or mean temperature sensors
- Bearing temperature sensors
- Surface sensors
- Bayonet sensors
- Probes with output via cable
- Mineral insulated jacketed probes
- Screw-in thermocouples
- Straight line thermocouples under metallic sheath
- Straight line thermocouples under ceramic sheath
- Thermocouples with output via cable
- Thermocouples for the plastics industry
- Mineral insulated jacketed thermocouples
- Mechanical parts (Solid drilled thermowells)

SCREW-IN RESISTANCE PROBES WITH CONNECTION HEAD

With or without interchangeable electronic measuring

TYPE: SI6 with interchangeable measuring insert

TYPE: SI7 with direct connection

Screw-in resistance probes are mainly used for temperature measurements in liquid and gaseous media. The proven tightness of this form of assembly in case of depression or overpressure is an important choice criterion.

Mechanically welded sheath available in diameters of: 6, 8, 9 or 11 mm.

The connection head is suitable for ambient temperatures up to + 100 °C. In addition to the standard B-type TB11-6 connection head according to DIN 43 729, the models TB11-12 or TB11-16 are also available.

In the case of a higher temperature at the connection head, provide a standard extension of 145 mm between head and connector.

Measuring elements: Pt100 according to EN 60751, class B in 3-wire configuration.

This element can be interchangeable to avoid emptying of the tank.

As accessory: possibility to provide a compression fitting
In option: 2 or 4-wire configuration with one or two converters to be integrated into a mini IP 65 protection connection head.

The Pt500 Ω, Pt1000 Ω versions are possible, any length, material, connection, on request.

EXAMPLE OF DESCRIPTION:
TYPE: SI6-100, 1/2”G, PtCM3B, TB6PeM20, -50 °C to +400 °C

- Sensor Pt100 Ω at 0 °C with interchangeable measuring element
- Stainless steel protective sheath 316 L Ø 9 mm
- Effective length = 100 mm
- Fastening by welded threaded stainless steel fitting ½” G Cyl.
- Connection head type TB -11-6 in light alloy IP 54
- Cable entry via cable gland M20
- Measuring element: 1xPt100 Ω at 0 °C class B standard IEC 60751
- Three-wire configuration
- Operating temperature: -50 °C / +400 °C

CHARACTERISTICS

- For temperatures between -50 and +400 °C
- Smooth version or screw connection
- With or without extension
- Single or double resistance probe
- TB11-6, TB11-12, TB11-16 connection heads
- A measurements converter can be integrated optionally
- Mounting accessory for smooth version: sealed compression fitting

APPLICATIONS

Main areas of use:

Air conditioning, industrial refrigeration as well as the installation of heaters, the construction of furnaces and special machines (boilers, transformers, textile machine...)

Screw-in resistance probe	SI		6	-100	1/2”G		PtCM	3	B	TB6PeM20		-50 °C/+400 °C
Model												
SI (Stainless steel 316 L)	SI											
Version												
Simple		/										
Duplex		D										
Mounting type												
6 (Ø 9 with inter elts)			6									
7 (Ø 8 direct mounting)			7									
Type 6 with Ø 11			6D11									
9 (Ø 6 inter elts)			9									
9 (Ø 8 inter elts)			9D8									
Useful length												
(mm)				100								
Fitting / Flange												
Smooth (without)					L							
1/2”G					1/2”G							
1/2”NPT					1/2”NPT							
3/4”G					3/4”G							
3/4”NPT					3/4”NPT							
RCI 1/2”G					RCI 1/2”G							
RCI 1/2”NPT					RCI 1/2”NPT							
Extension												
Extension (TI)						TI						
Lt (mm)						145						
Sensitive element												
Pt100 (ceramic)							Pt					
Pt100 (thin layer)							PtCM					
Mounting type												
2-wire								2				
Three-wire								3				
4-wire								4				
2*two-wires								4D				
2*3 wires								6D				
2*4-wires								8D				
Tolerance												
B									B			
A									A			
1/3 Din									1/3D			
Connection head												
4-pins socket										B4		
TB 11-6 PeM20										TB6PeM20		
TB 11-12 PeM20										TB12PeM20		
TB 11-12V PeM20										TB12VPeM20		
Transmitter												
TTEH100											TTE100	
TTEH200											TTE200	
TTEH300											TTE300	
TTEH400											TTE400	
B4&TTEH100 socket											B4TTE100	
2*TTEH100											2TTE100	
Measuring range												
0–100 °C												-50 °C/+400 °C

FLANGED RESISTANCE PROBES WITH CONNECTION HEAD

With interchangeable measuring insert

TYPE SI8

Flanged resistance probes are mainly used for temperature measurements in liquid and gaseous media.

Mechanically welded sheath available in diameters of: 11, 13.5 or 15 mm

The connection head is suitable for ambient temperatures up to + 100 °C. In addition to the standard B-type TB11-6 connection head according to DIN 43 729, the models TB11-12 or TB11-16 are also available.

Standard extension of 145 mm between head and flange

Pt100 measuring element according to EN 60751, class B with 3-wire connection is inserted into the measuring element.

As accessory: possibility to provide a sliding flange

In option: 2 or 4-wire configuration with one or two converters to be integrated into a mini IP 65 protection connection head.

The Pt500 Ω, Pt1000 Ω versions are possible, any length, material, connection, on request.

EXAMPLE OF DESCRIPTION: TYPE: SI8-250, BRI DN50PN40FS, TI-145, PtCM3B, TB6PeM20, -50 °C+600 °C

- Sensor Pt100 Ω at 0 °C with interchangeable measuring element
- Stainless steel protective sheath 316 L Ø 11 mm
- Effective length = 250 mm
- Extension of 145 mm between head and flange
- Stainless steel welded flange fastening 316 L DN50 PN40 FS
- Connection head type TB -11-6 in light alloy IP 54
- Cable entry via cable gland M20
- Measuring element: 1xPt100 Ω at 0 °C class B standard IEC 60751
- Three-wire configuration
- Operating temperature: -50 °C / +600 °C

CHARACTERISTICS

- For temperatures between -50 and +600 °C
- Smooth or flanged version
- With extension
- Single or double resistance probe
- TB11-6, TB 11-12 or TB11-16 connection heads
- A measurements converter can be integrated optionally
- Mounting accessory for smooth version: sealed compression fitting

APPLICATIONS

Main areas of use:

Air conditioning, industrial refrigeration as well as the installation of heaters, the construction of ovens and special machines (boilers, transformers, textile machine...), for tanks and medium pressure ducts.

Flanged resistance probe	SI		8	-250	BRI-DN50PN40 FS	TI-145	PtCM	3	B	TB6PeM20		-50 °C/+600 °C
Model												
SI (Stainless steel 316 L)	SI											
Version												
Simple		/										
Duplex		D										
Mounting type												
8 (Ø 11 with inter elts)			8									
8 (Ø 13.5 with inter elts)			8D13.5									
8 (Ø 15 with inter elts)			8D15									
9 (Ø 8 inter elts)			9D8									
Useful length												
(mm)				250								
Fitting / Flange												
Smooth (without)					L							
Flange (BRI DNPN)					BRI-DN50PN40FS							
Sliding flange					BC							
Extension												
Extension (TI)						TI						
Lt (mm)						145						
Sensitive element												
Pt100							Pt					
Pt100 (thin layer)							PtCM					
Mounting type												
2-wire								2				
Three-wire								3				
4-wire								4				
2*two-wires								4D				
2*3 wires								6D				
2*4-wires								8D				
Tolerance												
B									B			
A									A			
1/3 Din									1/3D			
Connection head												
4-pins socket										B4		
TB 11-6 PeM20										TB6PeM20		
TB 11-12 PeM20										TB12PeM20		
TB 11-12V PeM20										TB12VPeM20		
Transmitter												
TTEH100											TTE100	
TTEH200											TTE200	
TTEH300											TTE300	
TTEH400											TTE400	
B4&TTEH100 socket											B4TTE100	
2*TTEH100											2TTE100	
Measuring range												
0–100 °C												-50 °C/+600 °C

SCREW-IN RESISTANCE PROBES

With plug-in connection according to standard EN-175301 for EOM market

TYPE SI10

Screw-in resistance probes are mainly used for temperature measurements in engines.

Mechanically welded sheath available in diameters of: 6 or 8 mm.

The plug-in connector according to standard EN 175301-803 ensures fast and safe mounting and is suitable for ambient temperatures up to + 85 °C.

Measuring elements: Pt100 according to EN 60751, class B in 3-wire configuration.

As accessory: possibility to provide a compression fitting

In option: 2 or 4-wire configuration

The Pt500 Ω, Pt1000 Ω versions are possible, any length, material, connection, on request.

EXAMPLE OF DESCRIPTION:
TYPE: SI10-50, 1/2”G, PtCM3B, COPe9, -50 °C+200 °C

- Probes, Pt100 Ω at 0 °C
- Stainless steel protective sheath 316 L Ø 6 mm
- Effective length = 50 mm
- Fastening by welded threaded stainless steel fitting ½” G Cyl.
- Plug-in connector output according to EN 175301 with IP 65 locking safety
- Cable entry via Pe 9
- Measuring element: 1xPt100 Ω at 0 °C class B standard IEC 60751
- Three-wire configuration
- Operating temperature: -50 °C / +250 °C

CHARACTERISTICS

- For temperatures between -50 and +250 °C
- Smooth version or screw connection
- With or without extension
- Fixed measuring element
- Single or double resistance probe
- Plug-in connector according to EN 175301-803

APPLICATIONS

Main areas of use:

The screw-in resistance probes
With plug-in connection have good vibration resistance and enable to measure the temperature in under pressure environments like in engines, compressors, the construction of technological facilities such as shipbuilding.

SCREW-IN RESISTANCE PROBES

With small head

TYPE SI1119

Screw-in resistance probes are mainly used for temperature measurements in environments difficult to access.

Mechanically welded sheath available in diameters of: 6 or 8 mm.

The connection head of type TC 11–15 Ø 48.5 mm is suitable for ambient temperatures up to + 85 °C. Cable input via Pe9

Measuring elements: Pt100 according to EN 60751, class B in 3-wire configuration.

As accessory: possibility to be supplied with a threaded connection or sliding flange

In option: 2 or 4-wire configuration

The Pt500 Ω, Pt1000 Ω versions are possible, any length, material, connection, on request.

EXAMPLE OF DESCRIPTION:
TYPE: SI1119-100, 1/2”G, PtCM3B, TCPe9, -50 °C to +400 °C

- Pt100 Ω probe at 0 °C with small connection head
- Stainless steel protective sheath 316 L Ø 6 mm
- Effective length = 100 mm
- Fastening by welded threaded stainless steel fitting ½” G Cyl.
- Connection head of type TC 11-15 in light alloy IP 54
- Cable entry via Pe 9
- Measuring element: 1xPt100 Ω at 0 °C class B standard IEC 60751
- Three-wire configuration
- Operating temperature: -50 °C / +400 °C

CHARACTERISTICS

- For temperatures between -50 and +400 °C
- Smooth version or screw connection
- Fixed measuring element
- With or without extensions
- Single or double resistance probe
- Small connection head CL type TB 11-15 cable entry via Pe9

APPLICATIONS

Main areas of use:

Screw-in resistance probes with small head are ideal thanks to its small footprint for any type of industry for temperature measurements in liquid and gaseous media.

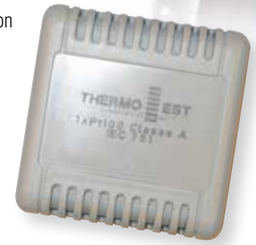
AIR CONDITIONING RESISTANCE SENSORS

Ambient and outdoor resistance sensors, Mean temperature sensors

In the standard option, a Pt100 sensor according to EN 60751, of class B in 3-wire configuration

As accessory: possibility to be supplied with a threaded connection or sliding flange

In option: 2 or 4-wire configuration



In option: with display
TYPE: TTEID7501

TYPE: SRA3

- Pt100 Ω sensor at 0 °C according to IEC 60751 class A - 2 or 3-wire configuration
- Under a plastic case perforated on the sides 75 x 75 x 30 mm
- Wall mounting
- Operating temperature: 0 °C / +50 °C

TYPE: SRA3/TTE

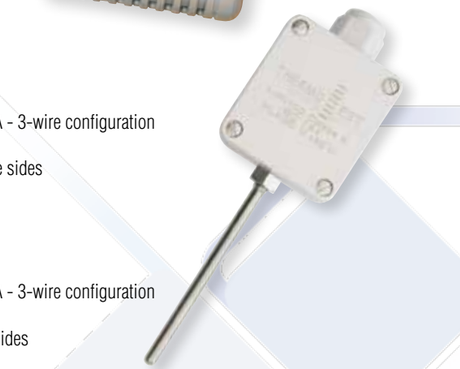
- Pt100 Ω sensor at 0 °C according to IEC 60751 class A - 3-wire configuration
- With a plastic case perforated on the sides 75 x 75 x 30 mm
- Wall mounting
- With a 4–20 mA converter for 0 °C / +50 °C

TYPE: WSR1

- Pt100 Ω sensor at 0 °C according to IEC 60751 class A - 3-wire configuration
- Under stainless steel sheath Ø 6 mm L = 90 mm
- With a 64 x 58 x 34 mm plastic casing perforated on the sides
- Wall mounting
- Operating temperature: -30 °C / +60 °C

TYPE: WSR1/TTE

- Pt100 Ω sensor at 0 °C according to IEC 60751 class A - 3-wire configuration
- Under stainless steel sheath Ø 6 mm L = 90 mm
- With a plastic case 64 x 58 x 34 mm perforated on the sides
- Wall mounting
- With a 4–20 mA converter for -30 °C / +70 °C



TYPE: SCU 6M/TTE -15 °C/+80 °C/TB12V

- Pt100 Ω sensor at 0 °C according to IEC 60751 class A of medium temperature for ventilation ducts, flexible tight sheath protection made of copper Ø 4 mm L = 6 meters radius of curvature 50 mm
- Outpur via type TB11-12 connection head IP65 light alloy
- Light alloy sliding flange mount
- With or without a 4–20 mA converter for -15 °C / +80 °C
- The models Pt 500 Ω, Pt 1000 Ω are available, for any length up to 20 meters, connection, spool available on request.

CHARACTERISTICS

- For temperatures between -40 °C and +80 °C
- Fixed measuring element
- Single or double resistance sensor for medium temperature
- Version with casing or connection head

APPLICATIONS

Main areas of use:

The resistance probes for measurements of ambient temperature are used in the field of air conditioning for measurement in premises, outside or for ventilation ducts.

BEARING RESISTANCE SENSORS

For bearing temperature measurements

TYPE: SI1130

The flanged resistance probes are mainly used for temperature measurements of bearings

Mechanically welded sheath available in diameters of: 6 or 8 mm.

The connection head is suitable for ambient temperatures up to + 100 °C. In addition to the standard B-type TB11-6 connection head according to DIN 43 729, the models TB11-12 or TB11-16 are also available.

Standard extension of 120 mm between head and connection

Measuring elements: In the standard option, a Pt100 sensor according to EN 60751, of class B in 3-wire configuration.

In option: 2 or 4-wire configuration with one or two converters to be integrated into a mini IP 65 protection connection head.

The Pt500 Ω, Pt1000 Ω versions are possible, any length, material, connection, on request.

EXAMPLE OF DESCRIPTION: TYPE: SI1130-100, M12x175, PtCM3B, TB6PeM20, -50 °C+400 °C

- Pt100 Ω probe at 0 °C with spring loaded compression fitting
- Stainless steel protective sheath 316 L Ø 6 mm
- Effective length = 95 to 105 mm
- Fixation by threaded brass fitting M12x175
- Connection head type TB -11-6 in light alloy IP 54
- Cable entry via cable gland M20
- Measuring element: 1xPt100 Ω at 0 °C class B standard IEC 60751
- Three-wire configuration
- Operating temperature: -50 °C / +400 °C

CHARACTERISTICS

- For temperatures between -50 and +400 °C
- Fixation by threaded brass fitting M12x175 mounted on spring loaded fitting
- (stroke 10 mm).
- With an extension 120 mm
- Single or double resistance probe
- TC 11-15, TB11-6, TB 11-12 or TB11-16 connection heads
- A measurements converter can be integrated optionally

APPLICATIONS

Main areas of use:

Resistance probes for measuring bearing temperatures are intended for all types of constructions of technological installations and the manufacturing of engines.

SURFACE RESISTANCE SENSORS

Silicone elastomer insulated flat sensor

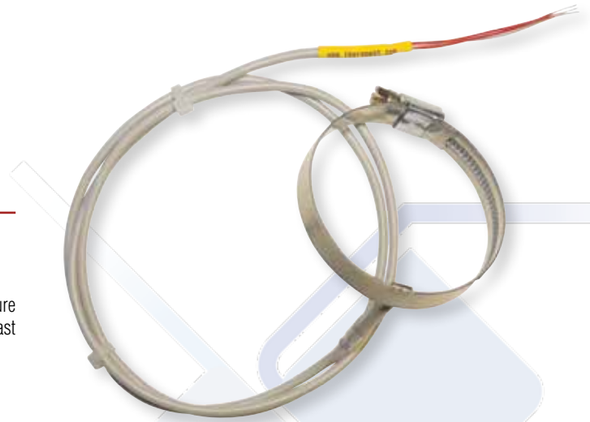
- Silicon elastomer insulated flat sensors with short response time
- Can be secured with glue
- Radius of curvature greater than or equal to 25 mm in the longitudinal direction only
- Measuring element: 1xPt100 Ω at 0 °C class B standard IEC 60751
- 4-wire configuration
- Output by 1 meter of flexible cable with 4 Teflon® insulated conductors
- Operating temperature: -20 °C / +200 °C

TYPE: SP1241, PtCM4B,-20 °C+200 °C

Dimensions: 23 x 10 mm

TYPE: SP1242, PtCM4B,-20 °C+200 °C

Dimensions: 43 x 17 mm



PIPE SURFACE TEMPERATURE RESISTANCE PROBE

TYPE: SP1245

Surface resistance sensors are primarily for carrying out temperature measurements without interfering with the fluid with a easy and fast mounting.

EXAMPLE OF DESCRIPTION: TYPE: SP1245, D6-30, PtCM3B, TS=3000, -20 °C+200 °C

- Stainless steel protective sheath Ø 6 mm tapered termination
- Brazed on the inner side of a tangent screw collar Ø 30 to 150 mm
- Measuring element: 1xPt100 Ω at 0 °C class B standard IEC 60751
- Three-wire configuration
- Output by 3 meters of flexible cable with 3 Teflon®/silicone insulated conductors
- Operating temperature: -20 °C / +200 °C

CHARACTERISTICS

- Construction allowing fixation by a stainless steel collar with a tangent screw Ø 30 to 150 mm
- No thermowell needed
- Measuring element: Pt100 according to EN 60 751, class B
- Three-wire configuration
- Insulated flexible PVC, silicone, Teflon®, fibreglass with or without braid connecting cable
- Extension cable protected by flexible armour or heat-shrinkable armour

APPLICATIONS

Main areas of use:

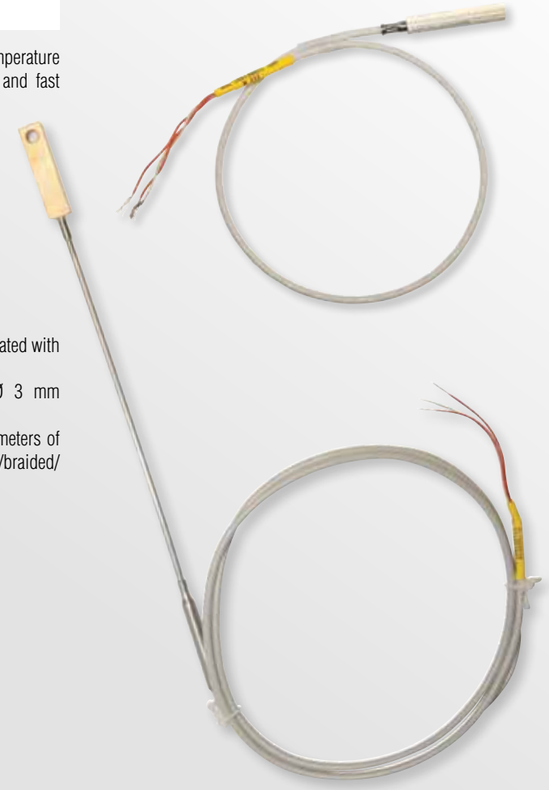
The resistance probes for measurements of surface temperatures are intended for construction of technological installations without interference with the medium, round or flat surfaces.

SURFACE RESISTANCE SENSORS

For surface temperature

In option: clamping collar

Surface resistance sensors are primarily for carrying out temperature measurements without interfering with the fluid with a easy and fast mounting.



TYPE: SP1244
EXAMPLE OF DESCRIPTION: TYPE: SP1244, P-CUØ5.5-500, PtCM3B, TDT=3000, -50 °C+400 °C

- Measuring element: 1*Pt100 Ω at 0 °C
- Mounting under sensitive copper plate: 40 x 10 x 5 mm perforated with a whole of Ø 5.5 mm
- Extension by malleable stainless steel jacketed sheath Ø 3 mm L = 500 mm
- Extension by undemountable stainless steel junction with 3 meters of flexible 3-conductor connection cables s = 0.22 mm² Teflon®/braided/ Teflon® insulation
- Extension cable protected by heat-shrinkable armour
- Operating temperature: -50 °C / +400 °C

CHARACTERISTICS

- Jacketed version with mineral insulated sheath stainless steel Ø 3 mm
- Manufactured with drilling to enable fixation by screw or by using a hose clamp for pipe versions
- No thermowell needed
- Copper or stainless steel plate version
- Measuring element: Pt100 according to EN 60751, class B
- 2-wire, 3-wire or 4-wire configuration
- Insulated flexible PVC, silicone, Teflon®, fibreglass with or without braid connecting cable
- Extension cable protected by flexible armour or heat-shrinkable armour

APPLICATIONS

Main areas of use:

Resistance probes for measurement of surface temperatures are intended for all construction of technological installations without interference with the environment, round or flat surfaces.

BAYONET RESISTANCE

Temperature sensor

The useful length can be changed by rotating the bayonet cap.
Different bayonet brackets are available.

TYPE: SP1112
EXAMPLE OF DESCRIPTION:
TYPE: SI1112, D6-20, B12.1, PtCM3B, GGD=3000, SUP-M12, +400 °C

- Pt100 Ω probe at 0 °C with bayonet fastening with connection cable
- Stainless steel protective sheath 316 L Ø 6 mm L = 20 mm
- Measuring element: 1xPt100 Ω at 0 °C class B standard IEC 60751
- Three-wire configuration
- Bayonet fastening internal Ø 12.1 mm to 2 studs mounted on a stainless steel spring Ø 6 mm L = 180 mm
- With M12x100 bayonet adaptor
- Extension via a flexible 3-conductor cable with fibreglass / fibreglass / metallic braid insulation
- Operating temperature: -50 °C / +400 °C

CHARACTERISTICS

- For temperatures between -50 and +400 °C
- Bayonet fixation with 2 pins spring loaded Ø 6 or 8 mm of 180 mm
- Good thermal conductivity by pressure on the adjustable spring
- Single or double resistance probe
- 2-wire, Three-wire configuration
- Flexible Teflon®, fibreglass metallic braid insulated connecting cable

APPLICATIONS

Main areas of use:

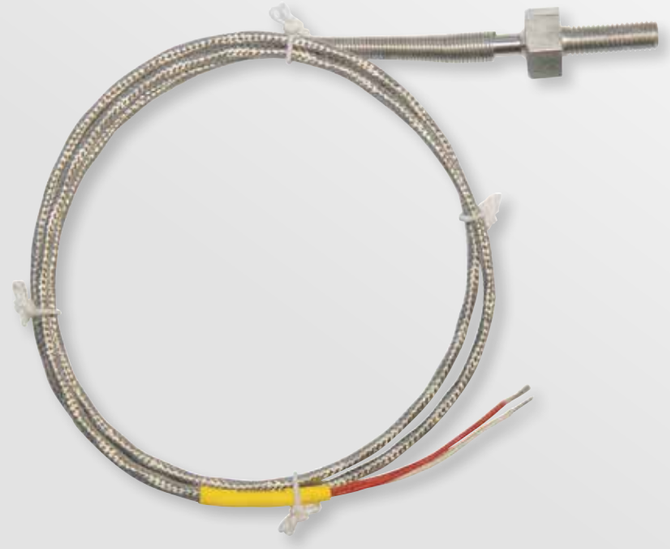
Screw-in resistance probes, with bayonet fastening are used primarily for temperature measurements in solid bodies, bearings, tools, in the plastics industry.

SCREW-IN RESISTANCE PROBES

For temperature measurements

TYPE: SP1109
EXAMPLE OF DESCRIPTION:
TYPE: SI1109, M8-25, PtCM3B, TDT=3000, -20 °C+260 °C

- Pt100 Ω probe at 0 °C with stainless steel screw fastening M8x125 L = 25 mm
- Measuring element: 1xPt100 Ω at 0 °C class B standard IEC 60751
- Three-wire configuration
- Extension with 3 conductors Teflon® / braid / teflon® flexible insulated cable
- Cable output protected by flexible armour
- Operating temperature: -50 °C / +260 °C



CHARACTERISTICS

- For temperatures between -50 and +200 °C
- Stainless steel screws fastening M8x125 L = 25 mm
- Wall mounting
- Single or double resistance probe
- 2-wire, Three-wire configuration
- Flexible Teflon®, fibreglass metallic braid insulated connecting cable

APPLICATIONS

Main areas of use:

Resistance probes with screw fastening are used mainly for temperature measurements in solid bodies, bearings, tools, in various industries.

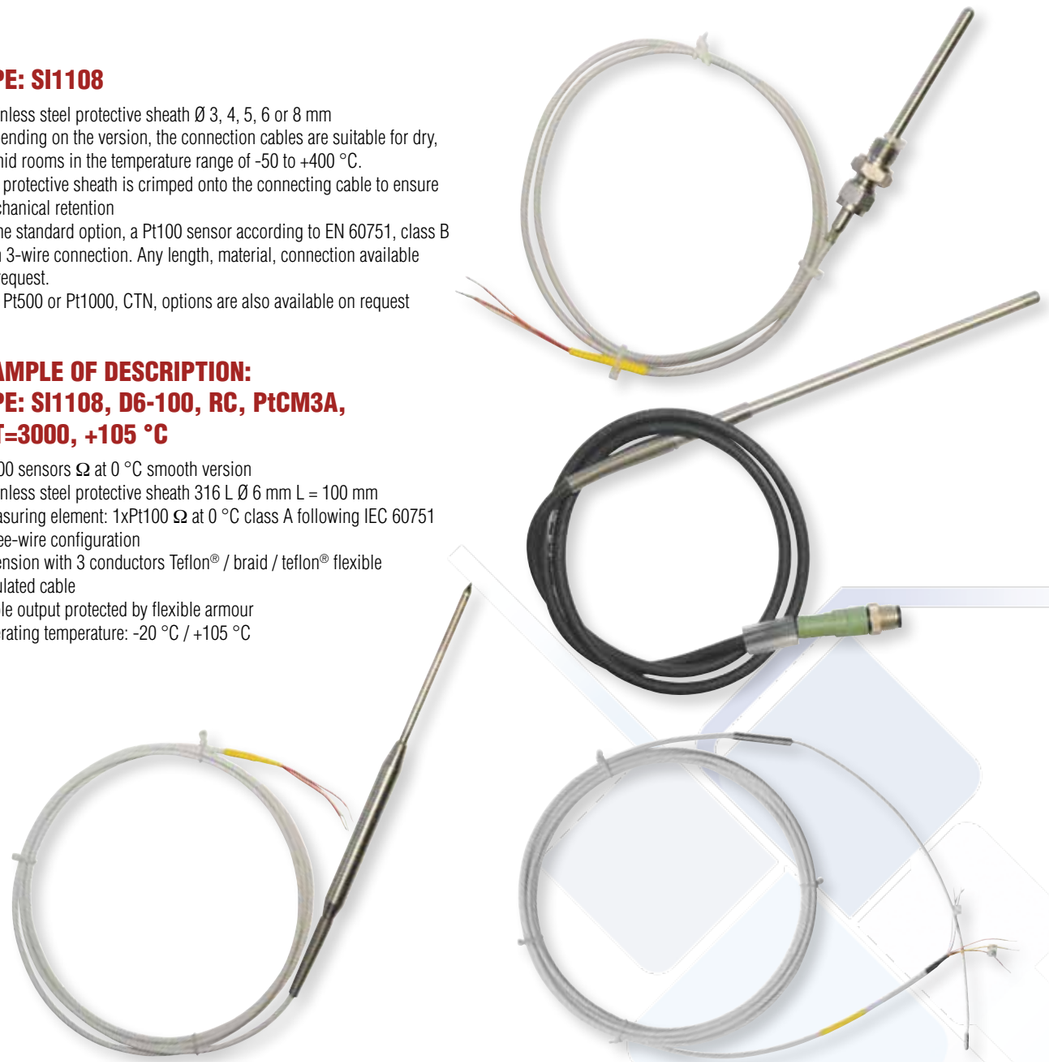
RESISTANCE SENSORS WITH CABLE OUTPUT

TYPE: SI1108

- Stainless steel protective sheath Ø 3, 4, 5, 6 or 8 mm
- Depending on the version, the connection cables are suitable for dry, humid rooms in the temperature range of -50 to +400 °C.
  The protective sheath is crimped onto the connecting cable to ensure mechanical retention
- In the standard option, a Pt100 sensor according to EN 60751, class B with 3-wire connection. Any length, material, connection available on request.
  The Pt500 or Pt1000, CTN, options are also available on request

EXAMPLE OF DESCRIPTION: TYPE: SI1108, D6-100, RC, PtCM3A, PVT=3000, +105 °C

- Pt100 sensors Ω at 0 °C smooth version
- Stainless steel protective sheath 316 L Ø 6 mm L = 100 mm
- Measuring element: 1xPt100 Ω at 0 °C class A following IEC 60751
- Three-wire configuration
- Extension with 3 conductors Teflon® / braid / teflon® flexible insulated cable
- Cable output protected by flexible armour
- Operating temperature: -20 °C / +105 °C



CHARACTERISTICS

- For temperatures between -50 and +400 °C
- Fastening by connector, swivel connector, sliding connector
- 2-wire, 3-wire or 4-wire configuration
- Insulated flexible PVC, silicone, Teflon®, fibreglass with or without braid connecting cable
- Extension cable protected by flexible armour or heat-shrinkable armour

APPLICATIONS

Main areas of use:

Cable resistance thermometers are developed for the industries of air conditioning, industrial refrigeration, installation of heaters, construction of furnaces and building materials, laboratories such as: sterilization temperature, winding temperature, oil, water or gas temperatures, surface treatment, solar energy, renewable energy, calorie counting...

Cable resistance thermometer	SI			1108	D6-100		RC	PtCM	3	A	PVT	=3000			105 °C
Model															
SI	SI														
Version															
Simple		/													
Duplex		D													
Mounting type															
Tube version				1108											
Tube diameter / Tube length															
3					D3										
4					D4										
5					D5										
6					D6										
8					D8										
L (mm)					100										
Flexible armour															
/							/								
Flexible armour							RC								
Heat-shrinkable							TR								
Sensitive element															
Pt100 (ceramic)								Pt							
Pt100 (thin layer)								PtCM							
Pt100 (glass)								PtV							
Pt100 (thin layer)								PtCMV							
Pt1000 (thin layer)								Pt1000CM							
Mounting type															
2-wire									2						
Three-wire									3						
4-wire									4						
2 x 2 wires									4D						
2 x 3 wires									6D						
Tolerance															
B										B					
A										A					
1/3DIN										1/3D					
Cable outlet type															
PVC											PV				
PVT (PVC/BRAID/PVC)											PVT				
TS (Teflon®/Silicone)											TS				
TT (Teflon®/Teflon®)											TT				
TDT (Teflon®/braid/Teflon®)											TDT				
GGD (Fibreglass/fibreglass/braid)											GGD				
Cable length															
(mm)												3000			
Connector															
/													/		
FFA1S (Lemo male size 1)													FFA1S		
PCA1S (Lemo female size 1)													PCA1S		
Connector/Bracket															
/															
1/4“G															
1/4“NPT															
RCI1/4“G															
RCI1/2“G															
OT (olive teflon)															
Max. Temperature															
105 °C															105 °C
200 °C															200 °C
260 °C															260 °C
400 °C															400 °C

JACKETED RESISTANCE SENSORS

To meet the requirements of high-tech industries, Thermo Est incorporated in its portfolio the manufacturing of mineral insulated jacketed cable, which enables manufacturing of products adapted to your needs, under the 321, 316 L stainless steel flexible sheath, copper or nickel wires, of low ohmic resistance are inserted in a highly compacted magnesia.

The resistance probe 1 or 2x Pt100 Ω at 0 °C according to IEC 60751 is integrated in the cable with the 2, 3 or 4-wire configuration in reverse version or with a rigid protective cover with or without a thickness adapted to withstand vibrations.

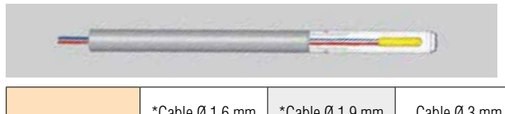
Diameter available: 1.6 – 1.9 – 3 – 4.5 and 6 mm

Cap mounting with extra thickness:

Characteristics mm	*Cable Ø 1.6 mm	*Cable Ø 1.9 mm	Cable Ø 3 mm		Cable Ø 4.5 mm		Cable Ø 6 mm	
	Cap d_1 = 1.9 mm	Cap d_1 = 2.5 mm	Cap d_1 = 3.2 mm	Cap d_1 = 4 mm	Cap d_1 = 5 mm	Cap d_1 = 6 mm	Cap d_1 = 7 mm	Cap d_1 = 8 mm

*Only with sensor with simple coiling

Cap mounting without extra thickness:



Characteristics mm	*Cable Ø 1.6 mm	*Cable Ø 1.9 mm	Cable Ø 3 mm	Cable Ø 4.5 mm	Cable Ø 6 mm
	Cap d_1 = 1.6 mm	Cap d_1 = 1.9 mm	Cap d_1 = 3 mm	Cap d_1 = 4.5 mm	Cap d_1 = 6 mm

*Only with sensor with simple coiling

Reverse mounting:

(without cover: take into account the bending zone to avoid damaging the sensing element)

CHARACTERISTICS

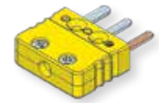
- For temperatures between -50 (-200 °C) to +600 °C
- Liquidtight and gastight
- Very good resistance to vibrations and high pressure
- High flexibility (minimum bending radius): 3 times the diameter of the sheath)
- Reduced response time
- Very long length available

APPLICATIONS

Main areas of use:

Because of their properties, jacketed resistance sensors find their application at all measurement sites where flexibility is required for installation, for example: laboratories, the chemical industry, power plants, test benches and engine manufacturers...

TERMINATIONS ACCORDING TO YOUR NEEDS:

Mo Stripped wire, Resin sealing	M3m connector compensated miniature size	B4 ceramic socket	Connector LEMO FFA
			
CODE Mo	CODE M3m	CODE B4	CODE L

JAEGER connector	Non-removable connection With Teflon® cable	Small connection head	Connection head
			
CODE J	CODE JI-TDT	CODE CL	CODE B

Different terminations are available to suit your application:

- Stripped wires - Resin sealing
- Standard size polarized pins 3-pin M3 or miniature 3-pin M3m
- B4 ceramic connection socket
- LEMO QUICK-LOK™ type connector
- JAEGER type screw lock connectors
- Non-demountable junction with extension cable with or without shielding, PVC, silicone, teflon®, fibreglass with or without metallic braid
- Small light alloy connection head of shape C type TC 11-15
- Light-alloy connection head of shape B Type TB-11-6, the types TB11-12 or TB 11-16 are also available
- As accessory: possibility to provide a stainless steel, Teflon® compression fitting

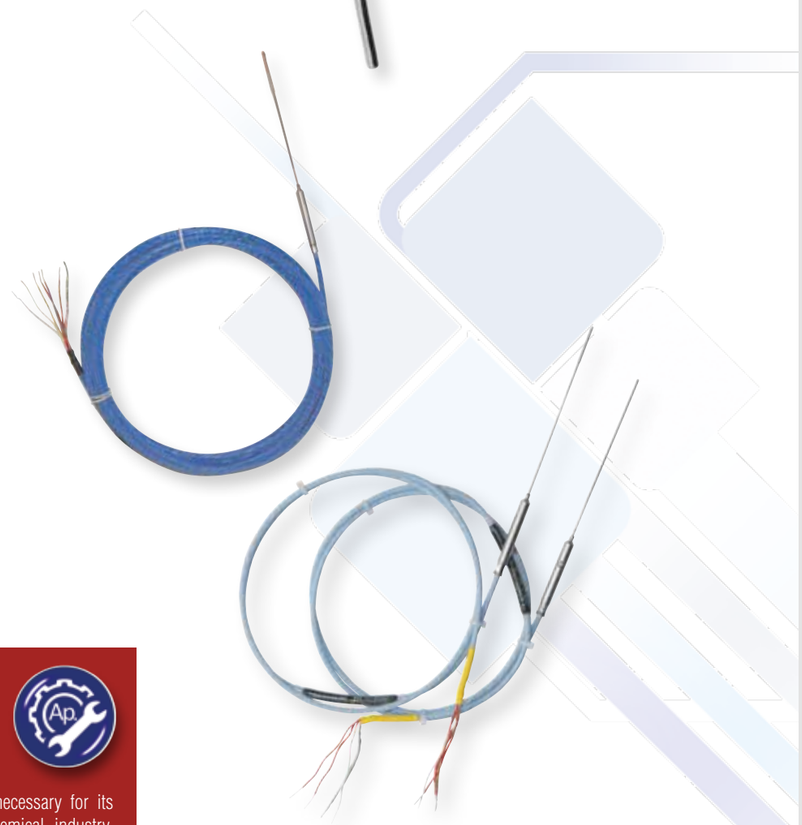
3 or 4-wire configuration with one or two converters to be integrated into a connection head.

The Pt500 Pt 1000 Ω versions are possible, any length, material, connection, and braid available on request.

JACKETED RESISTANCE SENSORS

EXAMPLE OF DESCRIPTION:
TYPE: SC330-3, L500, PtCMA, JI, RT, TDT=1000, RCI1/4"G, +200 °C

- Class A 1xPt100 Ω sensor at 0 °C according to IEC 60751 - 3-wire configuration
- With rigid protective cap Ø 3 mm
- Flexible protective sheath Ø 3 mm
- Length under junction: 500 mm
- Fastening by threaded sliding stainless steel fitting 1/4" G Cyl.
- Extension by undemountable junction with 1 meter of flexible 3-conductor connection cable s = 0.22 mm² Teflon® /braid/Teflon® insulation
- Heat-shrinkable cable outlet
- Operating temperature: -50 °C / +200 °C



APPLICATIONS

Main areas of use:

Because of their properties, jacketed resistance sensors find their application in all measurement sites where flexibility is necessary for its installation, for example: laboratories, the chemical industry, power plants, test benches and engine manufacturers...

Flexible resistance probe	SI		3		30	-3		L500	PtCM	A	JI		RT	TDT	=1000		RCI1/4"G	200 °C
Model																		
SC	SC																	
Other materials																		
Version																		
Simple		/																
Duplex		D																
Reverse		R																
Mounting type																		
2-wire copper			2															
Three-wire copper			3															
4-wire copper			4															
2*two-wires copper			4D															
2*3-wires copper			6D															
2*4-wires copper			8D															
Conductor version NI																		
NI				NI														
Jacketed sheath diameter																		
1.6					16													
1.9					19													
3					30													
4.5					45													
6					60													
Cap diameter																		
Without																		
1.6						1.6												
1.9						1.9												
3						3												
3.2						3.2												
4						4												
4.5						4.5												
5						5												
6						6												
7						7												
8						8												
Cap length																		
Cap L 25 mm (if restriction)							25											
Useful length																		
(mm)								500										
Sensitive element																		
Pt100 (ceramic)									Pt									
Pt100 (thin layer)									PtCM									
Pt100 (glass)									PtV									
Pt100 (thin glass layer)									Pt100CMV									
Pt1000 (thin layer)									Pt1000CM									
Tolerance																		
B										B								
A										A								
1/3 Din										1/3D								
Mounting type																		
4-pins socket											B4							
TC 11-15 Pe9											TCPe9							
TB 11-6 PeM20											TB6PeM20							
TB 11-12 PeM20											TB12PeM20							
JI 50 mm											JI							
PCA1S											PCA1S							
J-042953											J-042953							
M3 (3 copper pins)											M3							
M0											M0							
Junction length																		
Junction L 30 mm (if restriction)												-30						
Flexible armour																		
/													/					
Flexible armour													RC					
Heat-shrinkable													TR					
Cable outlet type																		
PVC														PV				
PVT (PVC/braid/PVC)														PVT				
TS (Teflon®/Silicone)														TS				
TDT (Teflon®/braid/Teflon®)														TDT				
GGD (Fibreglass/fibreglass/braid)														GGD				
Cable length																		
(mm)															1000			
Connector																		
/																/		
FFA1S (Lemo male size 1)																FFAQS		
PCA1S (Lemo female size 1)																PCA1S		
Fitting / Flange																		
/																	/	
1/4"G																	1/4"G	
1/4"NPT																	1/4"NPT	
RCI1/4"G																	RCI1/4"G	
OT (olive teflon)																	RCI1/4"G-OT	
RCI1/2"G																	RCI1/2"G	
Max. Temperature																		
200 °C																		200 °C
400 °C																		400 °C
600 °C																		600 °C

SCREW-IN THERMOCOUPLES WITH CONNECTION HEAD

With interchangeable measuring insert

TYPE: TI2

Screw-in thermocouples are mainly used for temperature measurements in various industries. The proven tightness of this form of assembly in case of depression or overpressure is an important choice criterion.

Mechanically welded sheath available in diameters of: 9, 11 or 13.5 mm.

The connection head is suitable for ambient temperatures up to + 100 °C. In addition to the standard B-type TB11-6 connection head according to DIN 43 729, the models TB11-12 or TB11-16 are also available.

In the case of a higher temperature at the connection head, provide a standard extension of 145 mm between head and connector.

As standard, thermocouple K according to EN 60584, class 2.

This element can be interchangeable to avoid emptying of the tank.

As accessory: possibility to provide a compression fitting

In option: duplex version with one or two converters to be integrated into a mini IP 65 protection connection head.

The T, J, N thermocouple versions are possible, any length, material, connection, flange available on request.

EXAMPLE OF DESCRIPTION:
TYPE: TI2-100, 1/2”G, TI9-145.1KC1, TB6PeM20, +400 °C

- Single thermocouple K class 1
- Stainless steel protective sheath 316 L Ø 9 mm
- Extension of 145 mm between head and connector
- Effective length = 100 mm
- Fastening by welded threaded stainless steel fitting ½” G Cyl.
- Connection head type TB -11-6 in light alloy IP 54
- Cable entry via cable gland M20
- Measuring element: 1xK "NiCr_Nia" class 1 according to IEC 60584
- Bead mounting
- Operating temperature: -50 °C / +400 °C

CHARACTERISTICS

- For temperatures between -200 and +800 °C
- Smooth version or screw connection
- With or without extension
- Available with different types of thermocouples: T, J, K, N
- Single or dual thermocouple
- TB11-6, TB11-12, TB11-16 connection heads
- A measurements converter can be integrated optionally
- Mounting accessory for smooth version: sealed compression fitting

APPLICATIONS

Main areas of use:

Construction of machinery, industrial equipment, power generation plants,
chemical industry, food industry, heating application. These thermocouples are suitable for gaseous and liquid fluids with moderate physico-chemical constraints.

Screw-in thermocouple	TI		2	-100	1/2“	TI9-145	1K	C1	TB6PeM20		400 °C
Model											
TI	TI										
Version											
Simple		/									
Duplex		D									
Mounting type											
2 (Ø 9)			2								
2 (Ø 13.5)			2D13.5								
Useful length											
(mm)				100							
Fitting / Flange											
Smooth (Without)					L						
1/2“G					1/2“G						
1/2“NPT					1/2“NPT						
3/4“G					3/4“G						
3/4“NPT					3/4“NPT						
RCI 1/2“G					RCI1/2“G						
RCI1/2“NPT					RCI1/2“NPT						
Extension											
Extension (TI)						TI					
Lt (mm)						145					
Sensitive element											
T							T				
J							J				
K Ø 1 mm							1K				
K Ø 1.6 mm							1.6K				
N							N				
Tolerance class											
1								C1			
2								C2			
Connection head											
4-pins socket									B4		
TB 11-6 PeM20									TB6PeM20		
TB 11-12 PeM20									TB12PeM20		
TB 11-12V PeM20									TB12VPeM20		
Transmitter											
TTEH200										TTE200	
TTEH300										TTE300	
TTEH400										TTE400	
2*TTEH200										2TTE200	
Measuring range											
400 °C											400 °C

FLANGED THERMOCOUPLES WITH CONNECTION HEAD

With interchangeable measuring insert

TYPE: TI2

Flanged thermocouples are mainly used for temperature measurements in various industries. The proven tightness of this form of assembly in case of depression or overpressure is an important choice criterion.

Mechanically welded sheath available in diameters of: 11, 13.5 or 15 mm.

The connection head is suitable for ambient temperatures up to + 100 °C. In addition to the standard B-type TB11-6 connection head according to DIN 43 729, the models TB11-12 or TB11-16 are also available.

As standard, thermocouple K according to EN 60584, class 2.

This element can be interchangeable to avoid emptying of the tank

As accessory: possibility to be supplied with a sliding flange

In option: duplex version with one or two converters to be integrated into a mini IP 65 protection connection head.

The T, J, N thermocouple versions are possible, any length, material, flange available on request.

EXAMPLE OF DESCRIPTION: TYPE: TI2D13.5-160, BRI DN50PN40FS, 1.6K-2, TB6PeM20, +400 °C

- Single thermocouple K class 2
- Stainless steel protective sheath 316 L Ø 13.5 mm
- Effective length = 160 mm
- Stainless steel welded flange fastening DN50 PN40 FS
- Connection head type TB -11-6 in light alloy IP 54
- Cable entry via cable gland M20
- Measuring element: 1xK "NiCr_Nia" class 2 according to IEC 60584
- Bead mounting
- Operating temperature: -50 °C / +400 °C

CHARACTERISTICS

- For temperatures between -200 and +800 °C
- Stainless steel flange fastening
- Interchangeable pearled measuring element
- Extension of 145 mm between head and connector
- Available with different thermocouples of type: T, J, K, N
- Single or dual thermocouple
- TB11-6, TB11-12, TB11-16 connection heads
- A measurements converter can be integrated optionally

APPLICATIONS

Main areas of use:

Construction of machinery, industrial equipment, power generation plants, chemical industry, food industry, heating application. These thermocouples are suitable for gaseous and liquid fluids with moderate physico-chemical constraints.

Flanged thermocouple	TI		2D13.5	-160	BRI-DN50PN40FS	TI13.5-145	1.6K	C1	TB6PeM20		400 °C
Model											
TI (Stainless steel 316 L)	TI										
Version											
Simple		/									
Duplex		D									
Mounting type											
2 (Ø 9)			2								
2 (Ø 13.5)			2D13.5								
Useful length											
(mm)				160							
Fitting / Flange											
Smooth (Without)					L						
Flange (BRI DNPN)					BRI-DN50PN40FS						
Extension											
Extension (TI)						TI					
Ø						13.5					
Lt (mm)						145					
Sensitive element											
T							T				
J							J				
K Ø 1 mm							1K				
K Ø 1.6 mm							1.6K				
K Ø 3 mm							3K				
Jacketed KINC60 Ø 6 mm							KINC60				
N							N				
Tolerance class											
1								C1			
2								C2			
Connection head											
4-pins socket									B4		
TB 11-6 PeM20									TB6PeM20		
TB 11-12 PeM20									TB12PeM20		
TB 11-12V PeM20									TB12VPeM20		
Transmitter											
TTEH200										TTE200	
TTEH300										TTE300	
TTEH400										TTE400	
2*TTEH200										2TTE200	
Measuring range											
400 °C											400 °C

STRAIGHT THERMOCOUPLES WITH METALLIC SHEATHS

For flue gas temperature measurement

TYPE: TAR3

Straight thermocouples are mainly used for temperature measurements in various industries according to DIN 50446.

Mechanically welded sheath available in diameters of: 15, 21.3 (22 mm) or 26.9 mm

The connection head TA 11-1 is suitable for ambient temperatures up to +100 °C. In addition to the standard model A connection head according to DIN 43 729, the model TA11-3 is also available.

As standard, thermocouple K according to EN 60584, class 1 or 2

The J, N thermocouple versions are possible, any length, material, connection, flange available on request.

EXAMPLE OF DESCRIPTION:
TYPE: TAR3-1000, BC, 3KC1, TA1PeM20, -50 °C+1200 °C

- Single thermocouple K class 1
- Protective steel sheath refractory chrome Ø 21.3 x 2.6 mm
- Length under head = 1 000 mm
- Oval flange cast iron fastening
- Connection head type TA -11-1 in light alloy IP 54
- Cable entry via cable gland M20
- Measuring element: 1xK "NiCr_Nia" class 1 Ø of wires 3 mm according to IEC 60584
- Bead mounting
- Operating temperature: -50 °C / +1200 °C

CHARACTERISTICS

- For temperatures between -200 and +1200 °C
- Heat resistant and chemical resistant sheath
- Smooth version, gastight connection or flange or compression fitting
- Interchangeable measuring element
- Available with different types of thermocouples: J, K, N
- Single or dual thermocouple
- TA11-1, TA 11-3 connection heads
- A measurements converter can be integrated optionally

APPLICATIONS

Main areas of use:

Industrial equipment for blast furnaces, glass oven, heat treatment oven, waste incineration furnace, power generation plants, chemical industry, food industry. These thermocouples are adapted to low pressure gaseous fluids.

Metallic thermocouple	TAR			3	-1000	BC		3K	C1	TA1PeM20		1200 °C
Model												
TAR (AISI 446 Ø 21.3)	TAR											
TAR (AISI 310 Ø 21.3)	T1AR											
Internal sheath												
PYTHAGORAS (610)		P										
ALSINT (799)		A										
Version												
Simple			/									
Duplex			D									
Mounting type												
3 (Ø 21.3 or 22 mm)				3								
3 (Ø 26.9)				3D26.9								
Useful length												
500 mm					500							
1000 mm					1000							
Fitting / Flange												
Smooth (Without)						L						
RCA 3/4"G						RCA3/4"G						
RCA 1"G						RCA1"G						
FLANGE (BRI DNPN)						BRI-DN50PN40FS						
SLIDING FLANGE						BC						
Extension												
Extension (TI)							TI					
Ø							21.3					
Lt (mm)							145					
Sensitive element												
K Ø 1.6 mm								1.6K				
K Ø 2 mm								2K				
K Ø 3 mm								3K				
N Ø 3 mm								3N				
Tolerance class												
1									C1			
2									C2			
Connection head												
TA 11-1 PeM20										TA1PeM20		
TA 11-3 PeM20										TA3PeM20		
Transmitter												
TTEH200											TTE200	
TTEH300											TTE300	
Measuring range												
0–1200 °C												0–1200 °C

STRAIGHT THERMOCOUPLES WITH CERAMIC SHEATHS

For high temperatures

TYPE: TS with porous ceramic sheath Sillimantin C530

TYPE: TP with waterproof ceramic sheath Pythagoras C610

TYPE: TA with tight ceramic sheath Alsint C799 at 99.7% Al_2O_3

Straight thermocouples are mainly used for high temperature measurements in various industries according to DIN 50446

Porous ceramic protective sheath for thermal shock absorption, tight ceramic, single sheath version Ø 7 to 15 mm or double sheath Ø 24 to 26 mm.

The connection head is suitable for ambient temperatures up to +100 °C. In addition to the standard model A connection head according to DIN 43 729, the model TA11-3 is also available.

As standard, thermocouple K, S, R or B according to EN 60584, class 1 or 2.

Any length, material, connection, flange available on request.

EXAMPLE OF DESCRIPTION:
TYPE: TSA5-500, BC, TS32-200, 0,5SC1, TA1PeM20, -50 °C+1600 °C

- Single thermocouple S class 1
- Porous ceramic outer sheath Sillimantin C530 Ø 26x18 mm
- Porous ceramic inner sheath Alsint C799 Ø 15x10 mm
- Effective length = 500 mm
- Oval flange cast iron fastening
- Connection head type TA -11-1 in light alloy IP 54
- Cable entry via cable gland M20
- Measuring element: 1xS "PtRh10%-Pt" class 1 Ø of wires 0.5 mm according to IEC 60584
- Alsint ceramic rod fastening
- Operating temperature: -50 °C / +1200 °C

CHARACTERISTICS

- For temperatures between -200 and +1800 °C
- Smooth version, gastight connection or flange or compression fitting
- Interchangeable measuring element
- Available with different types of thermocouples K, S, R or B
- Single or dual thermocouple
- TA11-1, TA 11-3 connection heads
- A measurements converter can be integrated optionally

APPLICATIONS

Main areas of use:

Industrial equipment for blast furnaces, glass oven, heat treatment oven, waste incineration furnace, power generation plants, chemical industry, food industry. These thermocouples are adapted to low pressure gaseous fluids.

Ceramic thermocouple	TS	A		5	-500	BC	TS32-200	0.5S	C2	TA1PeM20		+1600 °C
Model												
TP (610)	TP											
TS (530)	TS											
TA (799)	TA											
Double sheathing												
WITHOUT		/										
PYTHAGORAS (610)		P										
ALSINT (799)		A										
Version												
Simple			/									
Duplex			D									
Mounting type												
4 (SIMPLE SHEATHING)				4								
5 (DOUBLE)				5								
Useful length												
500 mm					500							
1000 mm					1000							
Fitting / Flange												
Smooth (Without)						L						
RCA 3/4“G						RCA3/4“G						
RCA 1“G						RCA1“G						
FLANGE (BRI DNPN)						BRI-DN50PN40FS						
SLIDING FLANGE						BC						
Extension												
Support tube							TS					
Ø							32					
Lt (mm)							200					
Sensitive element												
KØ 0.5								0.5K				
K Ø 2 mm								2K				
K Ø 3 mm								3K				
S Ø 0.35 mm								0.35				
S Ø 0.5 mm								0.5S				
R Ø 0.5 mm								0.5R				
B Ø 0.5 mm								0.5B				
Tolerance class												
1									C1			
2									C2			
Connection head												
TA 11-1 PeM20										TA1PeM20		
TA 11-3 PeM20										TA3PeM20		
Transmitter												
TTEH200											TTE200	
TTEH300											TTE300	
TTEH400											TTE400	
Measuring range												
0–1600 °C												0–1600 °C

BAYONET THERMOCOUPLES

For the plastics industry

TYPE: TI811
EXAMPLE OF DESCRIPTION:
TYPE: TI811, D6-20, B12.1, JC2, GGD=3000, SUP-M12, +400 °C

- 1xFeCo thermocouple with bayonet fastening and connection cable
- Stainless steel protective sheath 316 L Ø 6 mm L = 20 mm
- Measuring element: 1xFeCo class 2 according to IEC 60584
- Grounded hot junction
- Adjustable bayonet fastening internal Ø 12.1 mm with 2 studs mounted on a stainless steel spring Ø 6 mm L = 180 mm
- With M12x100 bayonet adaptor
- Extension via a flexible 2-conductor cable with fibreglass / fibreglass / metallic braid insulation according to standard IEC 60584
- Operating temperature: -50 °C / +400 °C

TYPE: TI813
EXAMPLE OF DESCRIPTION:
TYPE: TI813, L=30, B8.5, JC2, TDT=3000, +500 °C

- 1xFeCo thermocouple with bayonet fastening and connection cable
- Stainless steel protective sheath 321 L Ø 2 mm L = 30 mm
- Measuring element: 1xFeCo class 2 according to IEC 60584
- Grounded hot junction
- Adjustable bayonet fastening internal Ø 8.5 mm to 1 stud mounted on a stainless steel spring Ø 5 mm L = 100 mm
- Extension by 3 meters of 2 flexible conductors Teflon® / braid / teflon® 3 insulation according to standard IEC 60584
- Operating temperature: -50 °C / +500 °C

TYPE: TI814-M6
EXAMPLE OF DESCRIPTION:
TYPE: TI814, RM6, L10, JC2, JI, RC, TDT=3000, +400 °C

- Bended thermocouple 1xFeCo with screw fastening M6x100
- Bended stainless steel protective sheath 321 Ø 2 mm, useful length L =10 mm
- Measuring element: 1xFeCo class 2 according to IEC 60584
- Grounded hot junction
- Extension by 3 meters of 2 flexible conductors Teflon® / braid / teflon® 3 insulation according to standard IEC 60584
- Cable output protected by flexible armour
- Operating temperature: -50 °C / +400 °C

CHARACTERISTICS

- For temperatures up to +400 °C
- Bayonet fastening
- Good thermal conductivity by pressure of the spring
- Single or dual thermocouple
- Flexible Teflon®, fibreglass metallic braid insulated compensation cable.

The useful length can be modified by rotating the bayonet cap. Bayonet brackets are available.

APPLICATIONS

Main areas of use:

Thermocouples with bayonet fastening are used for the plastics and rubber industry extrusion dies, packaging, assembly on different processes.

THERMOCOUPLES FOR PARTICULAR APPLICATIONS

For the industry

TYPE: TI810
EXAMPLE OF DESCRIPTION:
TYPE: TI810, L100, KC1, R=1/2”G, +400 °C

- Thermocouple 1xNiCr-Nia with a small connection head
- Stainless steel protective sheath 316 L Ø 6 mm L = 100 mm
- Fastening by welded threaded stainless steel fitting, ½” G
- Measuring element: 1xK class 1 according to IEC 60584
- Hot weld insulated from the ground
- Outlet via small CL-shaped connection head
- Max. operating temperature: +400 °C

TYPE: TI823
EXAMPLE OF DESCRIPTION:
TYPE: TI823, D6-100, JC2, RC, GGD=3000, +400 °C

- Thermocouple 1xFe Co with output via cable
- Stainless steel protective sheath 316 L Ø 6 mm L = 100 mm
- Without fastening connector
- Measuring element: 1xJ class 2 according to IEC 60584
- Hot weld insulated from the ground
- Outlet by 3 meters of compensation cable fibreglass/fibreglass/braid insulation
- Cable output protected by flexible armour
- Max. operating temperature: +400 °C

TYPE: TI828
EXAMPLE OF DESCRIPTION:
TYPE: TI828, D6-100, KC2, GGD=3000, +400 °C

- Thermocouple 1xNiCr-Nia with collar clamp
- Stainless steel protective sheath 316 L Ø 6 mm brazed on the outer face of a tangent screw collar Ø 30 to 150 mm
- Measuring element: 1xK class 2 according to IEC 60584
- Grounded hot junction
- Outlet by 3 meters of compensation cable fibreglass/fibreglass/braid insulation
- Max. operating temperature: +400 °C

TYPE: TI830
EXAMPLE OF DESCRIPTION:
TYPE: TI830, OD5, KC2, GGD=3000, +400 °C

- Thermocouple 1xNiCr-Nia with eyelet fastening for reduced footprint
- stainless steel eyelet, dimensions of the eyelet defined according to the thread used for maintaining it in position Ø 4.2–5.2 or 6.2 mm for example
- Measuring element: 1xK class 2 according to IEC 60584
- Grounded hot junction
- Outlet by 3 meters of compensation cable fibreglass/fibreglass/braid insulation
- Max. operating temperature: +400 °C

CHARACTERISTICS

- For temperatures up to +400 °C
- Outlet via small light alloy connection head, via cable
- Fastening by connector, by collar or by eyelet
- Single or dual thermocouple

APPLICATIONS

Main areas of use:

Thermocouples with bayonet fastening are used for the plastics and rubber industry, paper industry, packaging, surface or piping temperature sensing, mounting on different processes.

JACKETED THERMOCOUPLES

PROPERTIES AND BENEFITS:

- Sealing
- Resistance to vibrations, thermal shocks and pressures greater than 600 kg/cm²
- Very small exterior diameter
- Flexibility: the cable can be bent on a small diameter (The bending radius must be ≥ 5 times the diameter of the sheath)
- Very long length available
- The sheath can be welded or brazed directly

CHARACTERISTICS

The mineral insulated jacketed implementation of **Thermo Est** ensures universal use with ease of integration into different environments on any range of applications in strict or harsh conditions.
This type of cable is made up of:

- A continuous metallic sheath available in different diameters Ø 0.50 to 8.0 mm
- 2 or 4 thermocouple wires (single or dual), of type T, J, K, N, R/S or B
- Tolerance value: Class 2, 1 or special limit according to AMS 2750 D/E
- Compacted mineral insulation (oxide magnesia) for good insulation and high thermal conductivity, possible realization of various necking

APPLICATIONS

Main areas of use:

Because of their properties, mineral insulated jacketed thermocouples find their application on all measurement sites for example:

- Heat treatment
- Furnace
- Turbine
- Engine bearing temperature
- Conventional power plant
- Steam generator
- Diesel motor
- Nuclear reactor
- Research centers (test cells)
- Heat engine
- Semiconductor manufacturing
- Refineries/oil processing
- Food processing

The unique properties of mineral insulated jacketed cables make them particularly suitable for use in a range of industries with harsh and strict applications.

For your thermal control, choose your sensor type following 5 steps:

Step 1: Choice of the thermocouple: T, E, J, K, N, R/S, B

(Simple or Duplex “D”)
Temperature ranges depending on sensor types according to EN 60584-2.
The entire jacketed cable supply is based on the American standard AMS 2750 D/E.

Type \ Class	CLASS 1 (C1)	CLASS 2 (C2)	CLASS 3 (C3)
	Temperature ranges		
T	-40 °C to +350 °C	-40 °C to +350 °C	-200 °C to +40 °C
E	-40 °C to +800 °C	-40 °C to +800 °C	-200 °C to +40 °C
J	-40 °C to +750 °C	-40 °C to +750 °C	
K / N	-40 °C to +1000 °C	-40 °C to +1200 °C	-200 °C to +40 °C
R / S	0 °C to +1600 °C	0 °C to +1600 °C	
B	-40 °C to +1800 °C	+600 °C to +1700 °C	-600 °C to +1700 °C

Step 2: Choice of the shielding sheath type and sensor diameter

Flexible metal sheath that allows a minimum bending radius equal to 5 times the outer diameter.
Available in diameter 0.50 – 1.0 – 1.5 – 1.57 – 3.0 – 3.17 – 4.5 – 6.0 and 8.0 mm.

NATURE	TEMPERATURE (°C)	CODE
Stainless steel 304 L	800	I
Stainless steel 316 L	800	IMo
Stainless steel 310	1150	AR
Inconel 600®	1150	INC
Nicrobel®	1280	NICRo
10% rhodium platinum	1400	P

Ø mm	0.50	1.0	1.5	1.57	3.0	3.17	4.5	6.0	8.0
CODE	0.5	10	15	16	30	32	45	60	80

Step 3: Choice of hot junction and termination

The junction of the two wires of different types that make up the thermocouple is made by laser welding under a neutral atmosphere of argon U for optimum fusion of the materials, and the absence of corrosion while respecting a dimensional constant.

HOT JUNCTION	CODE	CODE
Hot weld insulated from the ground	SCI	
Grounded hot junction	SCM	
Swaged hot junction	SCR	
Exposed hot junction	SCA	

Step 4: Choice of the fastening connector

In the standard version, jacketed cable sensors are manufactured without process connections. However, it is possible to use fastening elements such as threaded connections, sliding fittings. Sliding fittings are used to ensure fast mounting and sealing of the sensor according to the process.
Various sliding fittings are available, olive stainless steel or Teflon® with metric, BSP or NPT thread.

SLIDING FITTING	Ø (mm)	THREADING	CODE
Stainless steel sliding fitting Olive stainless steel	0.5 to 8.0	M8x1 – M10x1 – ¼” G – 1/4” NPT 1/2” G – 1/2” NPT	RCI x (x = threading)
Stainless steel sliding fitting Olive Teflon®	0.5 to 8.0	M8x1 – M10x1 – ¼” G – 1/4” NPT 1/2” G – 1/2” NPT	RCI-OT-x (x = threading)

JACKETED THERMOCOUPLES

Step 5: Cold end termination

Mineral insulated jacketed thermocouples are suitable for many applications (industrial process, control equipment, test bench...).

To answer to all the needs **Thermo Est** offers various choices of termination:

- Simple
- With connector
- With cable
- With connection head

Stripped wires, Resin sealing	M3m compensated miniature size	M3 compensated standard size	Connector LEMO FFA
			
CODE Mo	CODE M3m	CODE M3	CODE L

JAEGER connector	Non-removable connection with Teflon® cable	Small connection head	Connection head
			
CODE J	CODE JI-TDT	CODE CL	CODE B

ACCESSORIES:

Available with B4 outlet socket, with TTE-H signal converter for 4–20 mA single or programmable Hart signal.
In each case, the dimensions or types of connectors are delivered with the size and the number of contacts in adequacy with your requirements with or without counter spindle.
For the "JI code" non-removable junction version, different types of compensating or extension cable are available, under PVC insulation, Teflon®, fibreglass, silicone, with or without braided shield or external metal braid.

CONTROL:

Throughout all the manufacturing process, from welding of hot junctions to the shipping of products, **Thermo Est** thermocouples undergo systematic controls that ensure the best quality of temperature measurements made by the most demanding users:

- Isolation at 50 VDC between the wires and the metallic sheath for diameters less than 1.5 mm and 500 V for larger diameters
- Electrical continuity by measuring line resistance
- Sealing by pressure test at 40 bar
- Dimensional

On request, specific tests are also carried out in our laboratory with the delivery of a declaration of conformity or a control certificate.
Calibration with or without **COFRAC** accreditation for **AMS 2750 D/E** applications

The Aerospace Material Specifications (**AMS 2750 D/E**) defines a number of rules relating to the heat treatment of metals in this aeronautical sector. **Thermo Est** carry a full range of thermocouples that meet the requirements of this standard:

- The thermocouples AMS 2750D/E makes it possible to respond to different applications
- Sensors to ensure temperature uniformity of furnaces (TUS - Temperature Uniformity Survey)
- Sensors to control the accuracy of readings (SAT - System Accuracy Test)
- Sensors for regulation, process registration
- Sensors for monitoring the temperature of the loads (sensors installed on the components)

Jacketed thermocouple	KINC		30	L500	SCI	C1	JI		-TR	-TDT	=1000	M3m	CB	RCI1/4"G	1100 °C
Model															
TI (stainless steel T 321)	TI														
JI (stainless steel J 321)	JI														
KIMo (stainless steel K 316)	KIMo														
KINC (K inconel 600®)	KINC														
NINC (N inconel 600®)	NINC														
SINC (S inconel 600®)	SINC														
SP (S PtRh10%)	SP														
Version															
Simple		/													
Duplex		D													
Jacketed sheath diameter															
0.25			025												
0.5			05												
0.8			08												
1			10												
1.5			15												
2			20												
3			30												
3.17			32												
4.5			45												
6			60												
8			80												
Useful length				L500											
L=500 mm															
Hot junctions															
SCI (isolated junction)					SCI										
SCII (common isolated junctions)					SCII										
SCM (grounded junction)					SCM										
PCA (exposed junction)					PCA										
Tolerance class															
1						C1									
2						C2									
Mounting type															
4-pins socket							B4								
TC 11-15 Pe9							TCPe9								
TB 11-6 PeM20							TB6PeM20								
TB 11-12 PeM20							TB12PeM20								
JI 50 mm							JI								
PCA1S							PCA1S								
J-042953							J-042953								
M3m (miniature male)							M3m								
M3mF (miniature female)							M3mF								
M3 (Standard male)							M3								
M3F (Standard female)							M3F								
M6HT(Standard male high temperature)							M6HT								
M6C (standard male ceramic)							M6C								
M0-20 (stripped wires on 20 mm)							M0-20								
Junction length															
Junction L 30 mm (if restriction)								-30							
Flexible armour															
/									/						
Flexible armour									RC						
Heat-shrinkable									TR						
Compensation or extension cable type															
KN (PVC)										KN					
KDK (PVC/Tresse/PVC)										KDK					
TDT (Teflon®/braid/Teflon®)										TDT					
SGD (Silicone/fibreglass/braid)										SGD					
GD (fibreglass/fibreglass/braid)										GGD					
Compensation or extension cable length															
(mm)											1000				
Cable connector															
Stripped wires															
M3m (miniature male)												M3m			
M3mF (miniature female)												M3mF			
SC-M3mF (cable clamp + female miniature)												SC-M3mF			
M3F (Standard female)												M3			
M6FHT												M6FHT			
FFA0S												FFA0S			
PCA1S												PCA1S			
Counter spindle															
CB (with counter spindle)													CB		
SCCB (with cable clamp and counter spindle)													SCCB		
Fitting / Flange															
/														/	
1/4"G														1/4"G	
1/4"NPT														1/4"NPT	
RCI1/4"G														RCI1/4"G	
OT (olive teflon)														RCI1/4"G-OT	
RCI1/2"G														RCI1/2"G	
Max. Temperature															
600 °C															600 °C
800 °C															800 °C
1000 °C															1000 °C
1200 °C															1200 °C
1400 °C															1400 °C

SOLID DRILLED THERMOWELLS

Custom made from a solid bar

DESCRIPTION:

- Hexagonal, flats, circular head with hexagon
- Screw-on version, with welded flange or screwed / welded
- Thermowell material: Stainless steel 304/304L, 361/316L, 321, 321H, 316TI, A105, Hastelloy C276, Titane, Monel, TEFLON®, with added coating of Téflon®, Halar® type, tantalum socket
- Process connector: M27x2, M33x3.5, 1/2 "G, 1/2" NPT, 3/4 "G, 3/4" NPT, 1 "G, 1" NPT, 1 "1 / 4G, 1" 1/4 NPT... or flanged version ASME / EN 1092-1 or DIN
- Connector and drilling adapted to the sensor
- Extension H (mm) and effective length U (mm) to be specified

EXAMPLE OF DESCRIPTION:
TYPE: DGBC, 316L, Ø35 1”NPT-1/2”NPT-Ø22/19x6.5, LSB350-BRI2”150LbsRF

- Screw-on flanged solid drilled thermowell
- Flat head H = 57 mm – internal thread 1/2 "NPT - drilling 6.5 mm
- Material stainless steel 316 L
- Screwed/welded flange fastening in stainless steel 316 L type 2” 150 Lbs RF
- Tapered version Ø 22 reduced to 19 mm
- LSB = 350 mm
- Max. operating temperature: +400 °C

CHARACTERISTICS

Heat resistant and chemical resistant sheath.
Machining according to international standard.

Various types of fastening:
- Weld
- Screw-on
- Welded flange fastening
- Screw-on welded flange fastening

Different shapes of thermowells available:
- Cylindrical shape
- With reduced tip
- Tapered shape

A large number of various thermowells are available. All parts are custom-made, according to client's requirements, in any dimensions. Thanks to a mass-drilled machining, this type of thermowell is the best choice for severe process environments.

APPLICATIONS

Main areas of use:

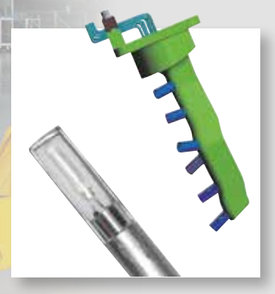
Chemical industry, technical equipment manufacturing, strict requirement processes in the field of chemistry and petrochemistry. On/Offshore. For high pressures.
Thermo Est your specialist for pyrometric sheath.

LIST OF CONTROLS PERFORMED:

- Concentricity control
- Welding penetrant testing by a COFREND II controller
- Welding penetrant testing by UV
- Internal hydraulic test
- External hydraulic test
- Radiographic inspection of welds
- Measurement of ferrite content, corrosion tests
- Positive Material Identification (PMI TEST)
- EN 10204 material certificate

OUR EXCLUSIV RANGE

An electrical temperature measurement at each temperature range...



La FRENCH FAB

Demonstrated know-how -

Extensive experience at your service

A **Thermo Est** offering: the **"EXCLUSIV"** product range. For the **Thermo Est EXCLUSIVE** range, all the stages are mastered: product development, design, commercialization up to delivery in France or world wide. Because each customer is exclusive, our teams analyses and propose the most suitable installation for controlling the temperature in each area of intervention.

Define your sensor

in a few steps:

- Mounting type
- Diameter - useful length (rigid or flexible)
- Process fitting (welded or sliding)
- Connection head
- Type of sensitive element
- Output signal
- Temperature limits and type of application…

This range consists of:

- **"TE-TAR"** high temperature sensors for various industries
- **"NEW DESIGN TE-MIM"** multipoint jacketed thermocouples
- "ATEX" Ex or IECEx sensors for chemistry–petrochemistry
- Sensors for the automotive industry
- Sensors for the aeronautics industry
- Sensors for the harsh applications

OUR HIGH TEMPERATURE TE-TAR RANGE

High temperature TE-TAR sensors for various industries

Exclusiv

Our high temperature TE-TAR range for:

- Steel industry and metallurgy
- Glass making industry
- Cement manufacturing

An electrical temperature measurement at each temperature range…

… A **Thermo Est** offering: the “HIGH TEMPERATURE” product range. In the processing of steel, glass foundries, combustion gas applications and ceramic industries, we can reach temperatures of up to 1800 °C.

High temperature applications require special temperature sensors with ceramic, platinum protective sheaths, special metal thermocouples such as platinum and rhodium. The thermowell protects the sensor from mechanical and chemical damage as well as thermal shocks caused by the process and thus increases the life of the sensor.

For thermocouples under ceramic sheathing, it is important to maintain control and preheat during the installation phase when temperatures are high to avoid thermal shocks and the possible deterioration of the ceramic sheaths. Similarly, if the temperature approaches the maximum prescribed threshold, it is recommended to mount the thermocouple vertically to avoid creep of the sheath under the mechanical action of its weight.

CHARACTERISTICS

- Long-term stable measurement thanks to sensor protection by non-porous ceramic type materials Al_2O_3
- Long life thanks to the use of innovative thermowell materials with high wear and chemicals resistance
- Reduced costs for the measuring point maintenance, improved product quality and safety of the installation
- Optimized life cycle costs with interchangeable spare parts

A PARTNER WHO ASSESSES THE DEGREE OF YOUR REQUIREMENTS

Our high temperature expertise

Thermo Est has been designing sensors for more than 44 years according to your operational requirements, your process constraints to be your partner at the heart of the demands of the iron and steel industry, metallurgy industry, glassworks industry and cement plants.

The TE-TAR exclusive range is specially designed, straight or bended versions, for high temperature with:

- Ceramic sheath
- Refractory steel protective sheath
- Reinforced protective sheath
- Rhodium-plated platinum protective sheath

Depending on the protector, thermocouples are used in neutral, reducing, oxidizing, corrosive, sulphurous, carburizing atmospheres or in fusion baths.

TE-TAR CHOICE GUIDE

Series		Designation of the protector of the series	Straight	Bended
Standard series	TAR	Metal sheath	✓	✓
	TARP	Double metal and ceramic sheathing	✓	✓
Reinforced series	TDGF	Metallic sheath solid drilled	✓	✓
	TDGFP	Metallic sheath solid drilled with ceramic sheath	✓	✓
	TMA	Metallic sheath drilled in high abrasion resistance solid	✓	✓
High temperature ceramic series	TP	Sealed ceramic sheath “Pythagoras” C610 + 1700 °C		
	TA	Sealed ceramic sheath “Alsint” C799 99.7% AL_2O_3 +1900 °C		
	TSP	Double sheathing porous ceramic sheath "Sillimantin" C530 and sealed ceramic sheath "Pythagoras" C610		
	TSA	Double sheathing porous ceramic sheath "Sillimantin" C530 and sealed ceramic sheath "Alsint" C799		
	TAA	Double sheathing sealed ceramic sheath "Alsint" C799 and sealed ceramic sheath "Alsint" C799		
Fusion series	TCRY	"Cryston" nitrided silicon carbide ceramic sheath for aluminum bath + 1600 °C	✓	✓
	TSY	"Si-Al-O-N" sheath made of aluminum nitride and alumina for casting of non-ferrous metals in particular aluminum. +1200 °C	✓	✓
	TINC Pt	Tube support inconel® extended tip PtRh10% for glass bath		
	TAA Pt	Double ceramic "Alsint" sheathing		

The TE-TAR thermocouple range covers a wide range of temperature measurement applications and a wide range of temperatures

It should be defined according to your application:

- Type of protector, choice of the series
- Choice of straight or bended shape
- Type of bead or jacket element with mineral insulation
- Thermocouple type (simple or duplex)
- Fastening type (welded flange, sliding flange, screw-on fitting…)
- IP54, IP65 connection head

Series	Conductors	Temperature °C	Tolerances	Wires Ø
J	Fe/Nickel Copper	-40 / +700 °C	2.5 °C or 0.75 % of t	1.6
K or N	Nickel Chromium / Nickel alloy	-40 °C / +1200 °C	1.5 °C or 0.75 % of t	1.6 2.0 3.0
S or R	10 % Platinum rhodium / Platinum	0 °C / +1550 °C	1.5 °C or 0.25 % of t	0.35 0.5
B	6 % rhodium platinum / 30 % rhodium platinum	+100 °C / +1800 °C	0.25 % of t	0.35 0.5

Series	Atmosphere	Max. temperature	Protection sheath
Standard series	Neutral or oxidative	800 °C	AISI 304 L
		1050 °C	AISI 316 L / AISI 310
	Shrinkable	1050 °C	AISI 446
		1100 °C	INCONEL 600®
	Sulfurous or carburizing	1050 °C	AISI 446
Reinforced series	Neutral	800 °C	PURE IRON
	Neutral or oxidative	1050 °C	AISI 316 L / AISI 446 / AISI 310
		1100 °C	INCONEL 600®
	Shrinkable	1050 °C	AISI 446
		1100 °C	INCONEL 600®
	Sulfurous or carburizing	1050 °C	AISI 446
	Corrosive	-	INCONEL 600® / AISI 310
	Shrinkable	1400 °C	CERAMIC C610
		1400 °C	DOUBLE CERAMIC S530 / C610
	Sulfurous or carburizing	1600 °C	CERAMIC C799
		1600 °C	DOUBLE CERAMIC C799
Fusion series	Aluminum, zinc tin	-	CRYSTON / SIALON / ENAMELLED CAST IRON
	Glass	-	PtRh 10 % TIP

OUR RANGE FOR THE FOOD AND PHARMACEUTIC INDUSTRY

Exclusiv

OUR RANGE OF RESISTANCE SENSORS FOR YOUR STRICT FOOD PROCESSING OPERATIONS

An electrical temperature measurement At each temperature range…

... A **Thermo Est** offering: the "FOOD PROCESSING" product range for your various installations.
Temperature is an important parameter in your industrial processes. It remains a guarantee of the quality of your production. In order to help you, **Thermo Est** has developed a wide range of temperature sensors and heating cables for the:

- Food processing industries (beverage industries, dairy industries, breweries...)
- Pharmaceutical or biological industries

Some implementation examples:

- Resistance sensor with connection head
- Resistance sensor with connection head and 4–20 mA converter
- Needle resistance sensor
- Resistance sensor with clamp fastening
- Autoclave resistance sensor
- Resistance sensor for industrial processes (storage, oven drying, soaking, heat treatment, bottling...)
- Heating system for the packaging industry with aseptic packaging systems

To consume with moderation... !

OUR EXPERTISE, STRICT APPLICATIONS…

A partner at the heart of your processes...

Thermo Est has developed a know-how for the food and pharmaceutical industry.

Attentive to its partners, **Thermo Est** participates in the development and enrichment of knowledge in all areas.

Various process connections are available to meet your requirements in the food and pharmaceutical industry.

This entire set of product is available with certificate of calibration, material certificate according to your normative requirements.

Resistance sensor for temperatures included between -50 °C and + 250 °C.

Variable protection index.

316L / 316TI stainless steel protective sheaths.

Connection head made of light alloy, with epoxy coating, in stainless steel,

Outlet by standard or stainless steel cable gland, with M12 connector.

Class A single or dual version to guarantee great accuracy.

Available with 2-wire technical converter.

Variable useful length.

Process fitting according to your specifications:

- Straight threaded fitting for example 1/2 "G
- 1/2 "G threaded fitting with sealing cone
- Solder connection or solder ball
- Threaded sliding fitting or sliding ball joint
- Clamping sleeve according to DIN 11864
- Varivent® type clamping sleeve
- Fittings according to DIN 11851
- Spherical welding sleeve
- SMS nut-cap connection...

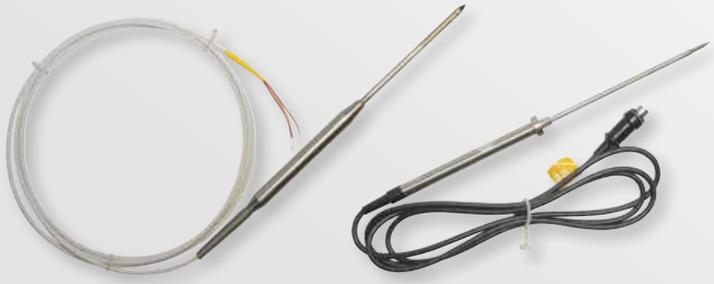
Each sensor can be delivered with a calibration certificate with or without a COFRAC accreditation.

A technical file containing your requirements will be transmitted with for example:

- Material certificate
- Pressure test
- Roughness certificate (Ra ≤ 0.8 µm)

4-wire Pt100 temperature sensor/for autoclave chamber/for the pharmaceutical industry

- Very small footprint
- Class A - measuring range (-90 °C) -50 °C to +200 °C
- Protection: IP 66 (available with autoclave test)
- Available with calibration with or without COFRAC accreditation



Our heating range example

Needle resistance sensor for use in the food industry for cooking, refining processes, food processing or preservation processes:

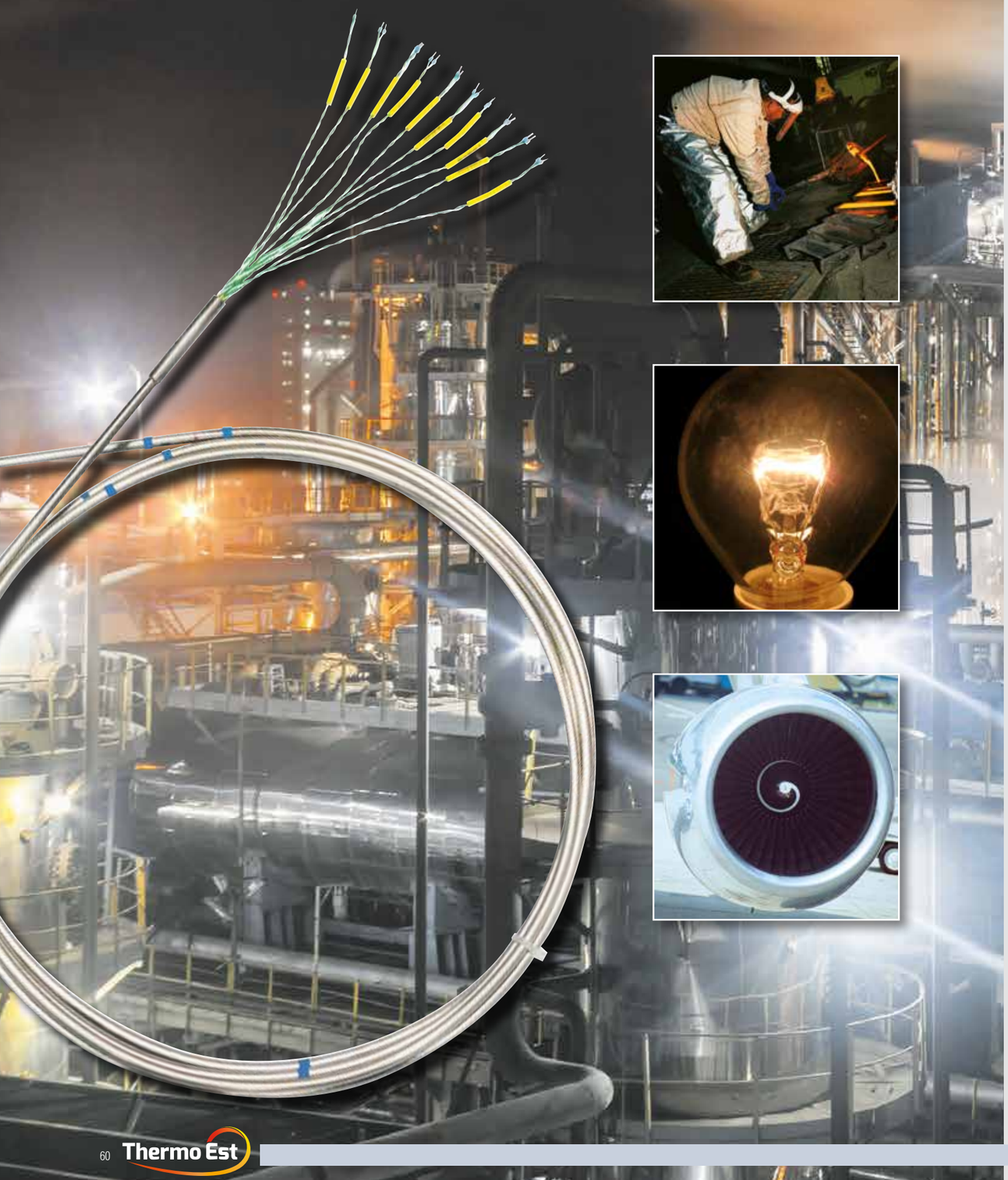
- Needle tip version
- Good mechanical strength
- Pressure resistant
- Steam resistant

System with 2 heating zones for the packaging industry with aseptic systems.

Variable power from 6 to 12 KW.

OUR RANGE OF TE-MIM MULTIPOINTS JACKETED THERMOCOUPLES

Your specialist in jacketed cables for extreme applications



THERMCABLE member of **THERMGROUP** was created in 2006. The initial idea was to develop in a small production unit (laboratory), customer-specific solutions in the field of mineral insulated jacketed cables for temperature measurement and heating cables. Very quickly, it turned out that the requirement was much higher.

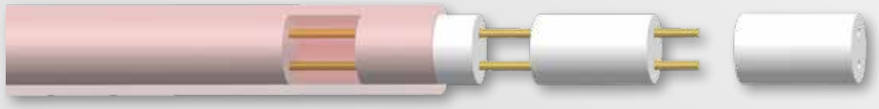
Our jacketed cables, as thermocouples, signal transmissions and heating cables are manufactured for our European and worldwide customers in accordance with the most strict quality standards (IEC 584, ASTM E230-93, BS4937/4, NFC 42-321).

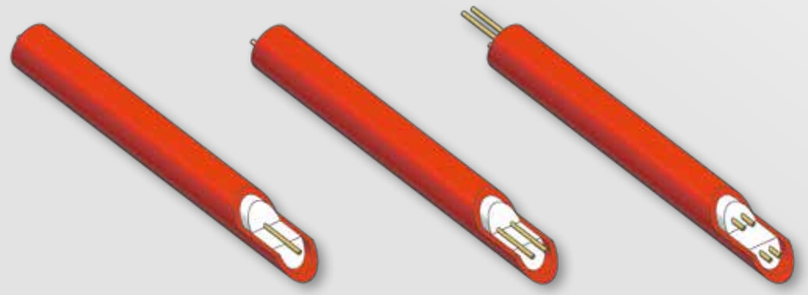
Depending on your needs, one or more conductors, well insulated with ceramic powder, can be compressed into a stainless steel, inconel, or rhodium-plated platinum sheath...

In 2007, "laboratory level" production increased at the industrial level. Since the end of 2007, **THERMCABLE** offers a complete range of jacketed cables namely, heating cables, thermocouples, connection / RTD cables for sensor and specific cables for the transmission of signals.

Our machinery equipment and production line consists of a single 20 ton drawing unit followed by a multi-stage drawing line to obtain a smaller and smaller section. We also have a stationary annealing furnace as well as ovens and concentric hammers with diameters ranging from 30 mm to 0.25 mm.

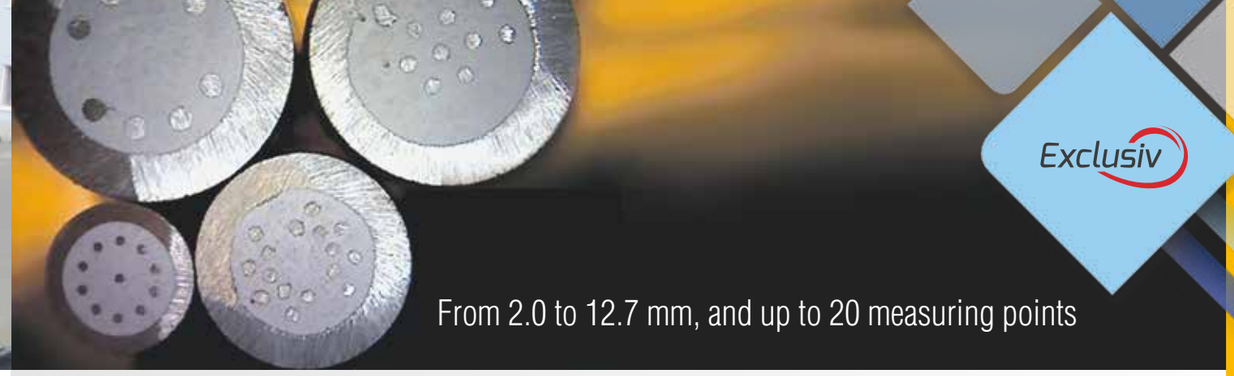
Thanks to this technology, we can offer multipoint thermocouples.





Conductors (thermocouple wires, copper wire or heating wires) are threaded into insulating tubes (usually Al_2O_3 ceramic or MgO magnesia) to be inserted into a metal sheath with the desired steel grade. The blank thus obtained is then stretched and shrunk through various annealing steps to finally reach the desired diameter.

The drawing process is more or less adapted to the nature of the conductor.



MULTIPOINT THERMOCOUPLES ARE OUR EXPERTISE

Temperature solutions include customer-specific sensors for specific environments. By designing its own mineral insulated jacketed cables, **Thermo Est** is able to offer you innovative solutions.

The wide variety of **Thermo Est** thermocouples makes it possible to find a solution for all your applications.

To highlight the technical advantages of the multipoint thermocouple under mineral insulation compared to the conventional multipoint thermocouple, you must first know the technical structure of the two versions.

For a traditional design, several individual jacketed thermocouples are grouped in a rigid stainless steel tube. This construction allows a very precise positioning and a virtually unlimited number of measuring points. The disadvantage is the longer response time by the individual insulation of each thermocouple and the rigidity of the assembly does not allow easy assembling and results in an expensive transportation cost.

Disadvantages:

- Sensor rigidity
- Cost of assembly and transport

For **Thermo Est’s**, new multipoint thermocouples, the sensors are in the form of shielded, mineral-insulated, flexible and robust cables. It should be noted that this type of thermocouple can be delivered rolled up.

CHARACTERISTICS

Advantages:

- Small footprint
- High flexibility
- Flexibility of installation
- Reduced response time
- High mechanical strength
- Protection against oxidation of thermoelectric materials
- Choosing a temperature profile

The number of measuring points varies according to the diameter.
The position of the measuring points can be chosen freely.
Variable length between 1 and 30 meters.

EXAMPLES OF FIELDS OF APPLICATION:

- Foundry industry
- Chemistry
- Petrochemistry
- Aeronautics
- Waste incinerator
- Cement manufacturing
- Storage
- Etc

LAYOUT

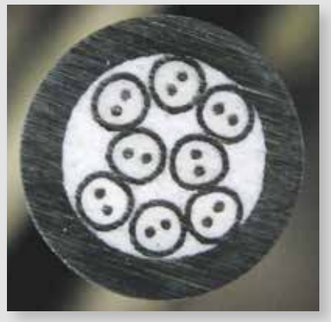
Radial
Thermocouple structure individual radially arranged.

More robust version
Extremely robust assembly with extra thickness at the sheath of the jacketed cable.

Custom version
Specific request according to your requirements.

With a central conductor
Allowing a greater number of measuring points.

To contribute to the continuous improvement of industrial processes that require temperature monitoring is one of **Thermo Est** vocations.



OUR ATEX RANGE

An electrical temperature measurement
AT each temperature range...


Ex “i”


Ex “d”


Ex “e”


Ex “nA”

… A Thermo Est solution: the ATEX product range for Explosive Atmospheres made up of resistance sensors, thermocouples.

An explosive atmosphere (ATEX) is a mixture with air, under atmospheric conditions, of flammable substances in the form of gases, vapors or dusts in which, after ignition, the combustion spreads to the entire unburned mixture.

An explosion can be avoided by acting on one of the following components:

- **Suppression of the explosive atmosphere: Ex “p”, Ex “o” and Ex “m”**
- **Suppression of the ignition source: Ex “e”, Ex “i” and Ex “nA”**
- **Non-spread of the ignition: Ex “d”**

This range consists of:

• **“e” protection mode LCIE 03 ATEX 6012**	**TYPE:** SI5, SIC5, SID5, SICD5 for sensors with head TI5, TIC5, TID5, TICD5 for thermocouples with head
• **“i” protection mode LCIE 03 ATEX 6013 X**	**TYPE:** SI16, SIC16 for sensors with head TI16, TIC16 for thermocouples with head
• **“i” protection mode LCIE 03 ATEX 6014 X**	**TYPE:** SIJI16, SICJI16 for sensors with cable TIJI16, TICJI16 for thermocouples with head
• **“d” protection mode LCIE 03 ATEX 6016 X**	**TYPE:** SIC12 for multipoint sensors with Ex "d" housing TIC12 for multipoint thermocouples with housing Ex “d”
• **“i” protection mode LCIE 03 ATEX 6018 X**	**TYPE:** SI2B16, SIC2B16, SI2C16, SIC2C16, SIBC16, SICBC16 for sensors with dual heads TI2B16, TIC2B16, TI2C16, TIC2C16, TIBC16, TICBC16 for thermocouples with cable
• **“i” protection mode LCIE 03 ATEX 6019 X**	**TYPE:** SICMT16, SICCMT16 for head resistance thermometer with converter Ex “i” TICMT16, TICCMT16 for head resistance thermometer with converter Ex “i”
• **“d” protection mode LCIE 03 ATEX 6020 X**	**TYPE:** SI14.1, SIC14.1, SI14.2, SIC14.2 for sensors with head Ex “d” TI14.1, TIC14.1, TI14.2, TIC14.2 for thermocouples with head Ex “d”
• **“i” protection mode LCIE 03 ATEX 6021 X**	**TYPE:** SI11, SICMT11, SIC11, SICCMT11 for sensors with connector TI11, TICMT11, TIC11, TICCMT11 for thermocouples with connector
• **“nA” protection mode**	**TYPE:** SI18, SIC18 for sensors with cable TI18, TIC18 for thermocouples with cable

IECEx

Ex ATEX

OUR ATEX EXPERTISE…

A partner who assesses the degree of your requirements

Thermo Est has been designing sensors for more than 44 years according to your operational requirements, your process constraints to be your partner at the heart of the demands of the chemicals and petrochemicals industry.

Our quality assurance system validated by a certifying body No. 0081 allows us to offer a wide range of products for explosive or high pressure environments for example.

Our single or double or multiple point sensors and thermocouples respect the design instructions of the European Directives ATEX in force **(Directive 2014/34/UE)**. Whether it is a **STANDARD** range of equipment or custom made with our **EXCLUSIV** range, our teams offer the most suitable installation for controlling the temperature in each of your application field.

An **Ex**plosive**AT**mosphere or **ATEX** is an atmosphere that can become explosive depending on the environmental conditions. It is a mixture of air and flammable substances in the form of gases, vapours, fog (aerosols) or dust (in suspension), which generates the formation of a combustion propagating to the entire mixture.

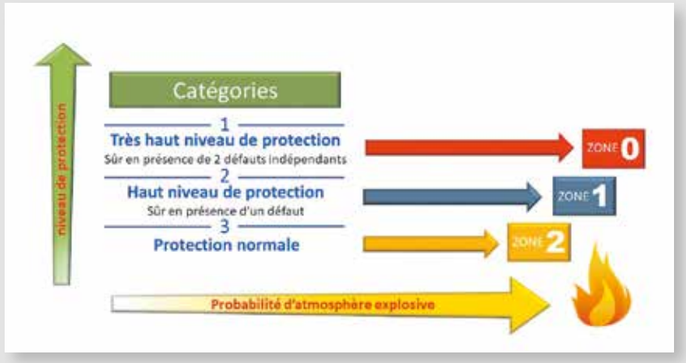
Thermo Est ATEX SENSORS “Ex i” - “Ex d” - “Ex e” or “Ex nA”

Under the authority of an **ATEX** group and a referent in charge of all **ATEX** activities, and in relation with the notified bodies, **Thermo Est** guarantees:

- Documentary control (technical files, drawings, ATR tests, instructions for use of possible components)
- Control of your order and the product up to the archiving
- The EU type certificate of conformity issued by **Thermo Est** for the conformity of the delivered product (ATEX marking of the sensor, instructions for use, EC type-approval certificate, traceability)
- The Production Quality Assurance Notification issued annually by LCIE (Central Laboratory of Electrical Industries)

Protection mode and associated diagram	Symbol Ex	Zone gaz	Zone dust	Standard	Principle
Intrinsic safety	**ia**	0-1-2	20-21-22	EN 60079	The very design of the circuit where the energy is limited to the input by a Zener barrier or a galvanic isolator makes it impossible to form arcs or electric sparks.
Explosion-proof	**d**	1-2	21-22	EN 60079	The extremely robust envelope contains the explosion inside the device. Explosion-proof joints prevent flame spread outdoors of the envelope.
Increased security	**e**	1-2	21-22	EN 60079	Components inside the enclosure shall not produce arcs, sparks or dangerous temperatures under normal conditions of use.
nA protection mode	**nA**	2	22	EN 60079	Electrical equipment that can not ignite the surrounding explosive atmosphere.

3 types of zone: 3 categories of material

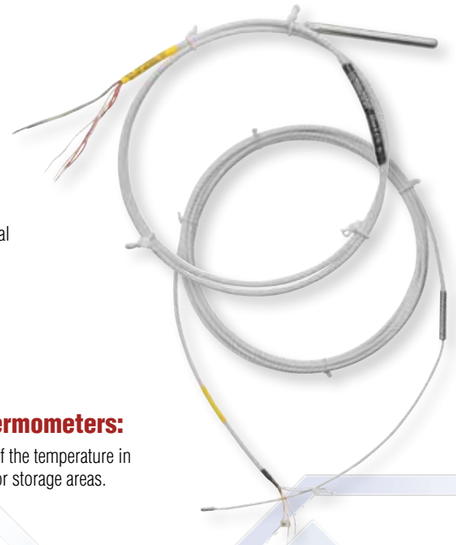


A PARTNER WHO ASSESSES THE DEGREE OF YOUR REQUIREMENTS

Overview of the ATEX temperature sensors

Thermo Est offers a full range of temperature sensors, modular thermocouples, thermowells, measuring inserts and accessories for all process industries:

- Oil and natural gas delivery
- Oil, transport and storage of natural gas
- Petrochemical industry
- Chemical industry
- Cosmetic industry
- Pharmaceutical industry
- Agri-food, beverages and tobacco industries
- Shipyards and offshore industries
- Wood processing industry
- Recycling plants and companies specializing in waste disposal
- Landfill sites
- Lacquering plants
- Purification of water
- Automotive industry
- O.E.M (Original Equipment Manufacturer)
- Nuclear plants



Bimetallic thermometers:

Direct measurement of the temperature in hard-to-reach areas for storage areas.

Solid drilled thermowells:

Custom made from a solid bar.
Screw-on version, with welded flange or screwed/welded.

OUR EXCLUSIV RANGE

Process sensors with or without thermowell:

These sensors consist of a thermowell solid drilled or mechanically welded. Fastening is ensured by a flange or boss to your piping. Usually equipped with an interchangeable measuring element to facilitate interchangeability and stoppage of the process.

Connection head: The Ex i, Ex d, Ex e head is mounted on the thermowell or on the extension tube of the temperature sensor.

Advantages:

- Protection and possibility of fitting one or two terminal blocks or one or two transmitters in the head version Std, Ex, SIL2, programmable, programmable Hart, Profibus
- Cable entry with certified cable gland
- Display (optional)

The extension tube with or without union or sleeve is the connecting piece between the connection head and the process connection/thermowell.

Advantages:

- Protects the head transmitter against the risk of overheating
- Ensures access and orientation of the connection head in the case of use on insulated pipe

The process connection is the connection between the process and the temperature sensor.

Thermo Est offers various connections according to your process:

- Custom made threaded screw fittings
- ASME/ANSI flanges, full penetration weld
- Welding fittings
- Sliding fittings

The thermowell is the component of the sensor directly in contact with the process.

Advantages:

- Increasing the life of the measuring element by protecting it against the effects of the process
- Interchangeability of the sensor without interruption of the process
- Mechanical stability against pressure and flowing

The thermowells are available in solid drilled or welded version, straight or conical version, the design depends on your process, material: 304 L, 316 L, 32 1, 316 TI, Inconel®, Hastelloy, Teflon®…

The measuring element or insert:
The measuring inserts consist of a 316 L stainless steel tube, Inconel® for example or a jacketed cable with MgO mineral insulation.

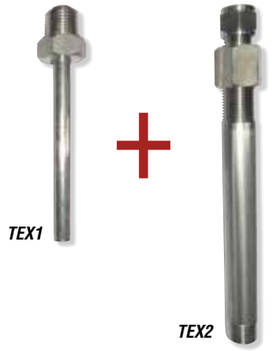
The elements are of the type Pt100 Ω according to IEC 60751 class B, A or others assembly 2, 3 or 4 wires or version thermocouple according to your temperature range. Single or double version for redundant measurements.

To ensure thermal contact with the process, the element is mounted with 2 compression springs 10 mm stroke ensuring contact at the bottom of the well.

STANDARDIZE YOUR PROCESSES WITH OUR MODULAR SENSORS

Thermo Est is specialized in finding specific solutions.
Definitions of products, tests and validations, our teams are at your side to obtain a result adapted to your situation.

**The TE-TEX modular sensor offers a new generation for maintenance.
The entire sensor takes the standards of the process sensor with:
connection head, extension and well according to your specifications.**



CHARACTERISTICS

Advantages:

- Reinforced extension
- Orientation of the head
- Adaptation to your requirements
- ATEX certification retained

MAINTENANCE

Thanks to a wide choice of process sensors, Thermo Est offers you an innovative solution:

- With standard connection head
- With EExi or EExd connection head
- With built-in display or 2” kit mounting
- Interchangeable measuring element: Pt100 Ω at 0 °C single or duplex, thermocouples J, N or K single or duplex
- With or without signal converter: 4–20 mA standard output, programmable Hart, SIL2

Option for remote mounting:

- Wall mounting
- Fastening kit 2“
- Local screen

Wall mounting

Kit 2“

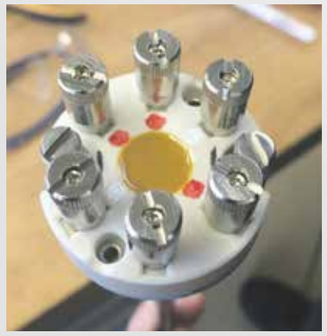
Local screen

Exclusiv

TE-TEX SENSOR

Connection heads

Free socket without wires to facilitate your wiring

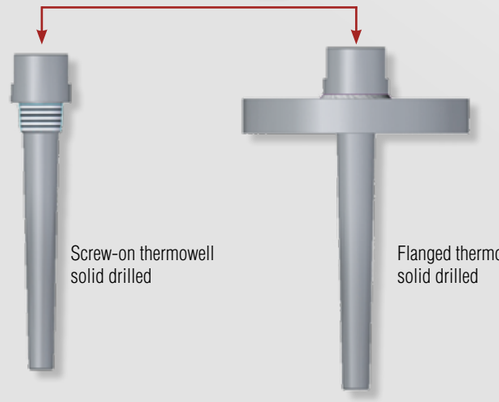


Stainless steel sleeve TEX1
Variable extension of 50 mm

Sensitive element
Ø 6 mm
With or without
4–20 mA converter

Stainless steel sleeve TEX2

Programmable converter
Standard – Hart or SIL2



Screw-on thermowell
solid drilled

Flanged thermowell
solid drilled

INNOVATION

The **TE-TEX** sensor ensures interchangeability of all ATEX brands version ia or d, to facilitate your maintenance work.

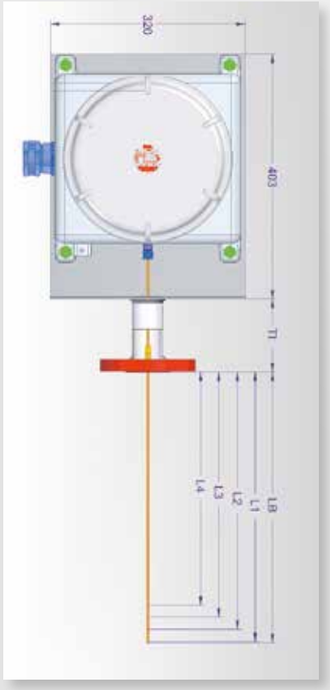
Variable extension sleeve stainless steel 50 mm standard stroke

- **TEX1** thread: G½“ - ½“ NPT- M24x1.5
- **TEX2** thread: ½ "NPT or according to your process

OUR EXCLUSIV RANGE

Our temperature solutions include customer-specific sensors designed for specific applications. For example, we are developing multi-point sensors, skin-point sensors for pipe surface measurement, Pt 100 Ω version or thermocouples.

Process conditions characterized by aggressive temperatures, flow velocity or in aggressive and corrosive products require a special design for this type of sensor. With such solutions, it is possible to measure the temperature with the reliability and precision required for various applications such as hydrodesulfurization, hydrocracking, reactors, storage tanks, process tanks and boilers.



TEMPERATURE MEASUREMENT IN PROCESS REACTORS

Multipoint sensors for reactors:

Direct mounting in the reactor or furnace, the tank.

Multipoint thermocouples are custom designed for applications in reactors of various processes.

For your application, we record a temperature profile for the control of your manufacturing process in order to carry out accurate mapping of the various stages.

The response time is an important factor, **Thermo Est** realizes multipoint thermocouples of great lengths and small diameters according to your needs with ATEX certification.

Surface temperature sensors:

Non-intrusive, they are surface temperature sensors, the sensitive element is usually mounted in a plate which follows the shape of the surface to be measured.

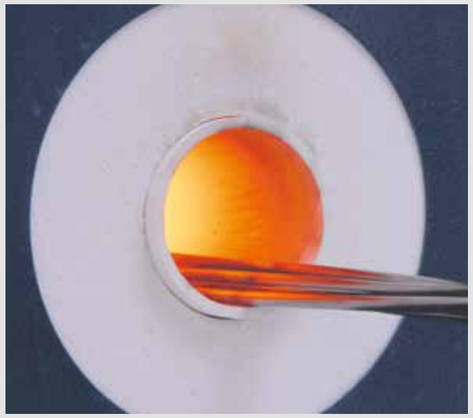
- Thermocouples type K or N
- Materials adapted to the tube (Inconel® / AISI 310 / AISI 321 / AISI 316 L...)
- Compensation loop
- Axial or radial mounting
- Welding contact plate
- With or without protection screen
- Possible in ATEX intrinsic safety "ia" or anti-reflective "d"

TECHNICAL FILE - CALIBRATION

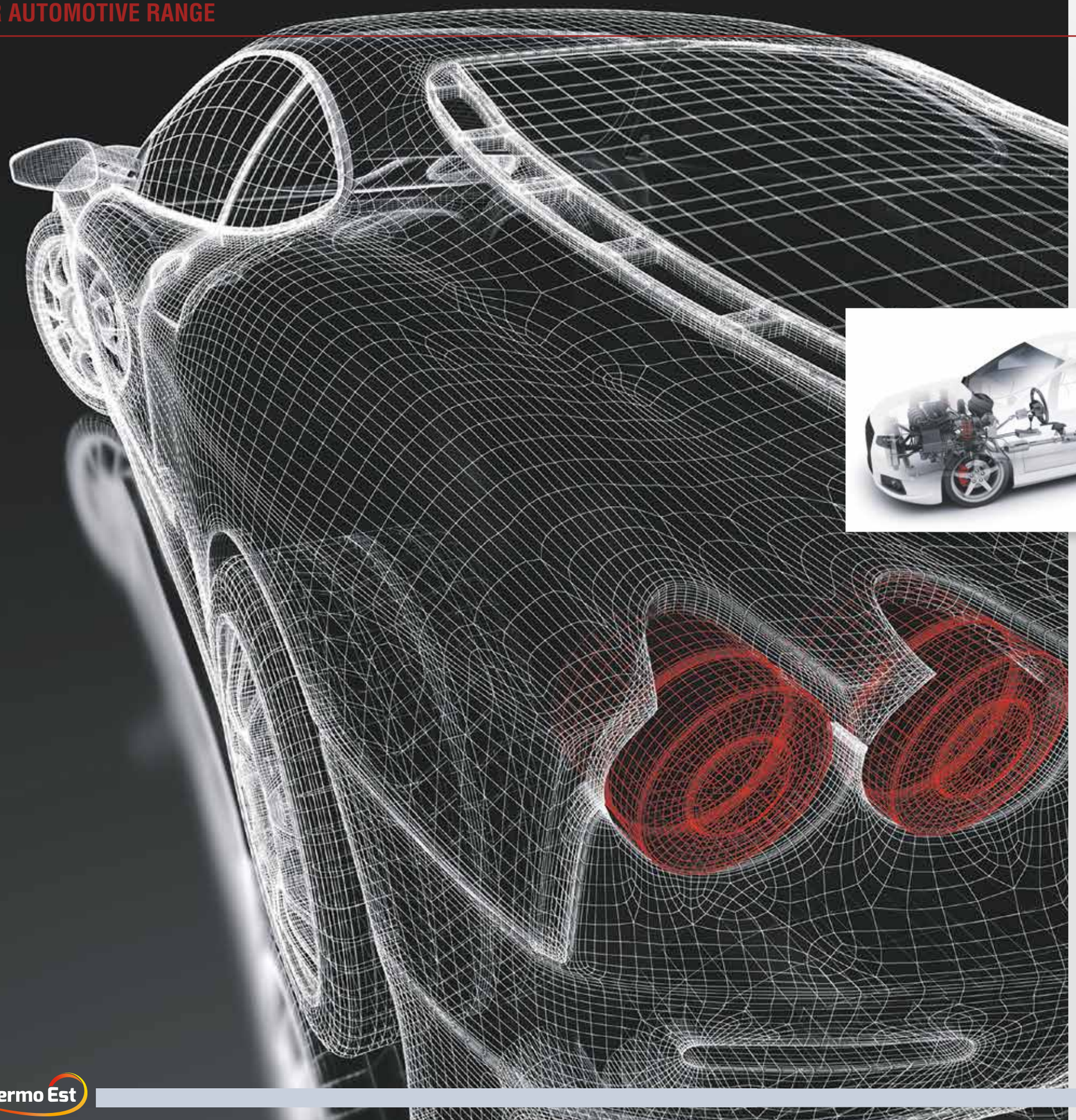
Thermo Est has been an expert in the manufacturing of temperature sensors since 1974 and has acquired recognised know-how in that field. **Thermo Est** has a very complete laboratory that allows to carry out the most severe non-destructive tests in accordance with the requirements of your specifications:

- Integrity of the sensor sheath
- Radiography
- Helium leak test
- Pressure test
- COFREND penetrant test
- Electrical and dielectric test
- Dimensional control
- PMI test
- Calibration by our COFRAC accredited laboratory

A technical file is transmitted according to your requirements including elements for your traceability (material certificate).



OUR AUTOMOTIVE RANGE



An electrical temperature measurement at each temperature range…

… A **Thermo Est** solution: the "automotive" product range for your test benches includes resistance probes, thermocouples, extensions, as well as instrumentation services for parts of your supply for validation of prototypes or parts series.
To meet the needs of the automotive sector, **Thermo Est** has to be particularly polyvalent. Under many quality standards, manufacturers and laboratories are required to use validated measurement and test equipment. **Thermo Est** can help you meet those requirements.

Thermo Est makes taps, for measurements of temperature, pressure, flow, etc., on polyethylene, steel, cast iron and stainless steel parts and provides various sensors for:

- Engines
- Bearings
- Oil
- Glycol engine cooling
- Exhaust
- Surface
- Air conditioning system
- Brakes
- Extension cable for data logger
- Fastening connector
- Radiant heating

OUR AUTOMOTIVE EXPERTISE…

A partner who assesses the degree of your requirements

Thermo Est uses the expertise it has developed since its inception in the automotive industry. The sensors offered are mainly designed for test benches.

Thermo Est offers innovative solutions in Pt100 Ω temperature sensor and thermocouple, specific wiring extension but also mineral insulation heating cable for development, design and testing.

Connector extension 1 to x pairs

This element is used in the automotive industry, for example for test vehicles. Thermocouples can be easily connected. In case of problems, the defective element can be exchanged without much effort.
The temperature measurement points are very often difficult to access. Example cooling tubes, flue gas, oil pans...
All thermocouples are grouped together on the extension cable.
Standard: version 1 to 10 pairs with cables from 1.5 meters to 6 meters mounting with compensated connectors miniature series type T or K according to IEC standard.

Type: M6mF/TDT-K-1500/M6mM
- For 1 pair TC K L = 1 500 mm

CHARACTERISTICS

Advantages:
- Very low strength on each cable
- Small footprint for a simplified connection on the acquisition

Thermocouples jacketed with miniature connector

- Thermocouple type: 1xT, 1xJ, 1xK
- Insulated grounded hot junction
- Stainless steel or Inconel 600® jacketed sheath
- Male miniature connector output according to IEC standard "green"
- Variable diameter: 0.25 – 0.5 – 1.0 – 1.5 – 2 and 3 mm
- Operating temperature: -40 °C to +1000 °C
- In standard type K

Type: KINC025/SCI/C1/M6m/1/500
Type K – Inconel 600® sheaths Ø 0.25 mm male miniature connector, class 1 Ln = 500 mm
Ø 0.25 mm Ln = 500 mm

Type: KINC05/SCI/C1/M6m/1/500/+1000 °C
Ø 0.5 mm Ln = 500 mm

Type: KINC10/SCI/C1/M6m/1/500/+1000 °C
Ø 1.0 mm Ln = 500 mm

Type: KINC15/SCI/C1/M6m/1/500/+1000 °C
Ø 1.5 mm Ln = 500 mm

Jacketed thermocouples with non-removable junction

- Thermocouple type: 1xT, 1xJ, 1xK
- Insulated grounded hot junction
- Stainless steel or Inconel 600® jacketed sheath
- Releasable junction output with 3 meters of insulated extension cable Teflon® / braid / Teflon® with or without male miniature connector according to IEC standard "green"
- Variable diameter: 0.5 – 1.0 – 1.5 – 2 and 3 mm
- Operating temperature: -40 °C to +1000 °C
- In standard type K

Type: KINC30/SCI/C1/JJI-TR-TDT=3000/+1000 °C
Type K - Inconel 600® sheath Ø 3.0 mm junction output with 3 meters extension cable according to IEC class 1 standard Ln = 500 mm

CHARACTERISTICS

Advantages:
- Sealed, resistance to vibrations, thermal shocks and pressures greater than 600 kg/cm². Reduced outside diameter for fast response time
- Flexibility: the cable can be bent with a small radius (5 times the external diameter). Very great lengths available

APPLICATIONS

Terminations according to your needs
- **Thermo Est** can integrate all types of sensors of temperature
- Our skills also include machining, TIG welding, laser welding, vacuum brazing and gluing
- For instrumentation of crankcases, cylinder heads, exhaust manifolds, brakes, pistons, cylinders, injector or connecting rod...

Exclusiv

FROM YOUR IDEAS…

TO THE DESIGN, CUSTOMIZATION, PRODUCTION

Our services go even further:

Thermo Est has been an expert in the manufacturing of temperature sensors since 1974 and has acquired recognised know-how in that field. Today, we also offer complete thermal solutions for temperature measurement and heating solutions with:

- Pt 100 sensors and thermocouples
- Mineral insulated heating cables
- Precision mechanical engineering
- Engineering and engineering solutions
- Thermal simulation
- Development using 3D drawings
- Flame brazing
- Vacuum brazing
- Laser, TIG, orbital TIG welding
- Technical ceramics, connectors
- Expertise
- Testing
- Laboratory and on-site metrology services

La FRENCH FAB

Our goal:
High performance

Take-off with Thermo Est

Therm Group

Group | In brief

Therm Group is an international high technology group, each member of which dedicated to the manufacturing of temperature sensors and heating cables.
Therm Group **is made up of 8 companies,** and enjoys a leading position in its markets. In order to guarantee quality, **Therm Group** is committed to innovation, continual improvement and high performance.

OUR EXPERTISE AERONAUTICS

A partner who can help you get your projects off the ground...

For over 44 years, **Thermo Est** has been designing sensors with high engineering requirements for the aerospace industry.

They are designed and manufactured in France and are being used in several aeronautics developments.

We are not just suppliers, but partners for your projects!

Our requirements are focussed on your concerns.

We are committed to finding the best solutions that are fully suited to your requirements. Our company has a human dimension, with the agility to adapt its competencies. **Thermo Est** develops staff across the world, and every employee studies and offers our most suitable products and services for controlling temperature in each of your areas of work.

PREMIUM RANGE

For your tests and thermal treatments

Thanks to the synergy put in place within the group, **Thermo Est** offers jacketed cables to specifications, which comply with the requirements of AMS 2750 aerospace standards. The cables are available in different diameters and will give your sensors guaranteed high performance and traceability for tests or specific thermal treatment processes.

Our thermocouples play an indispensable role in compliance with the requirements of standards, in types T, J, K, E, N, R, S, B, C or D, and are available in different lengths, materials and diameters.

AMS 2750 calibrated thermocouples

“EXCLUSIVE” RANGE

Instrumentation by:

- Pressure tube
- Resistance probes of small sizes
- Thermocouples jacketed version with mineral insulation or flexible Teflon® / Kapton® cable
- With or without reduced tip

Resistance probes

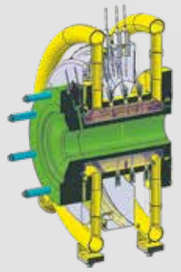
Rakes or combs for test benches

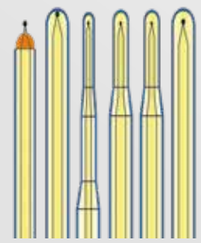
Mechanical equipment:

Thanks to our leading edge manufacturing plant, **Thermo Est** can carry out all the engineering work for making armatures, fittings, nozzles, solid-bored thermowells, etc.

FOR GROUND TESTS...

The continual improvement of propulsion performance and the reduction of its environmental impact have been essential factors in the development of air transport. The continuation of that success is the main focus of the technological efforts of **Thermo Est.**





Instrumented rakes are intrusive measuring devices designed to acquire the pressure and temperature parameters of aircraft engines. When placed on the engine during development test phases, they make it possible to characterise the performance of the different stages.

As a manufacturer of rakes, **Thermo Est** takes part in designing them and takes charge of all the operations for making them, including thermal treatment, machining, special vacuum brazing, instrumentation and calibration.

The know-how developed with the inspection resources dedicated to this activity enables us to particularly guarantee accurate positioning of the instrumentation in each nozzle.

To serve the aerospace industry, **Thermo Est** offers thermocouples for measuring thermal flows or cooling circuits for motor testing.

Holding is provided by a metal assembly, thanks to the development of +1050 °C high-temperature brazing for Ø 0.5 mm thermocouples.

FOR ON-BOARD CONTROL…

Brake temperature sensors

Braking is one of the vital functions of an aircraft, it is necessary in case of emergency to be able to stop the aircraft. Our sensor gives permission to retract the landing gear and can operate at extreme temperatures above +1000 °C.

AEROSPACE APPLICATIONS

Ambient temperature sensor

The ambient temperature inside commercial aircraft ranges from 18 °C to 25 °C, whereas the outside temperature at the cruising altitude is about -50 °C.
Thermo Est offers accurate resistance probes that make it possible to measure and regulate the ambient temperature so as to keep passengers comfortable.

- Sensor for heat exchangers
- Battery temperature
- Gas or fluid
- Harness
- Resistance probes
- Thermocouples

FOR TESTING AND QUALIFICATION…

Thermo Est has a very complete laboratory that allows it to carry out the most stringent inspections according to customers’ requirements.

Non-destructive or destructive testing with:

- Integrity of the sheath of the thermocouple or resistance probe
- Radiography
- Helium leak test
- Steam pressure test
- Electrical and dielectric testing
- Calibration
- Response time
- Welds UV penetrant testing
- Breakdown voltage
- Metallographic section
- Vibration tests etc.

Thermo Est manufactures and inspects its products in absolute compliance with applicable international standards.

Exclusiv

FOR YOUR HEATING APPLICATIONS…

Shielded heating cables with mineral insulation are characterised by their sturdiness, long life and adaptability to extreme conditions. **Thermo Est** is making its own jacketed cables, and can supply heating cables according to your specifications.

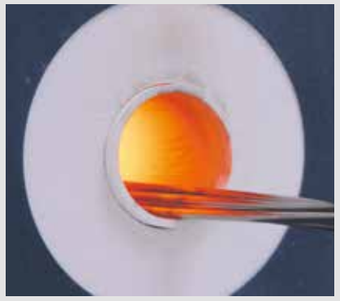
General specifications:

- With integrated cold terminations for a constant diameter
- With or without reduced tip
- Multizone
- Heating cable diameters from 0.50 to 5.0 mm
- Various sheath alloys such as stainless steel or Inconel®
- Variable power voltage: 28 V, 115 or 220 VAC
- High insulation resistance
- Dielectric testing at 1500 V

Example of applications:

- Heating tools
- Heating panels
- Radiant heating
- Heating collar…

FOR YOUR CALIBRATION NEEDS…



FOR YOUR CALIBRATION NEEDS…

Laboratory metrology:

cofrac ETALONNAGE
Accreditation n°2-1221
Range available on www.cofrac.fr

Leading manufacturer with a COFRAC accredited laboratory, which is a guarantee of good workmanship, **Thermo Est** has the best calibration methods and uses reference instruments.

- For contact thermometers

On-site metrology services:

cofrac ESSAIS
Accreditation n°1-113
Range available on www.cofrac.fr

To better satisfy our customers, our on-site metrologists travel to your premises to provide a variety of services such as calibrating installations, characterising and verifying thermostatic enclosures etc., with or without COFRAC accreditation.

Inspection services:

Thermo Est provides you with the combined expertise of a metrology laboratory and a temperature sensor manufacturer, in the form of advice, training and assistance. That dual competency enables us to propose concrete and suitable training.

NUCLEAR EXTREME APPLICATIONS

OUR NUCLEAR POWER RANGE

An electrical temperature measurement at each temperature range…

... A **Thermo Est** solution: the ATEX product range for Explosive Atmospheres is made up of resistance probes, thermocouples.

Thermo Est develops its products and services for extremely diverse sectors that have their own specificities and requirements. **Thermo Est** realizes temperature sensors or heating devices by analyzing specifications and mastering very strict and complex standards. **Thermo Est**'s engineers and technicians are equipped with high technology equipment, modern infrastructures, a structured design office and master the processes of: laser, numerical controls, orbital TIG, radiography, macrography, vibrations...

In synergy with the client, **Thermo Est** respects the imposed processes, in a permanent attention of the requirements of security and safety of the persons and installations, its site is engaged in a permanent quality approach.

Some implementation examples:

- Expertise and specific achievements for research centers of development and innovation
- Aging study
- Realization and follow-up of qualifications of materials according to nuclear references
- Probes for secondary and auxiliary circuits (measurements on piping (water, steam), ambient measurement, or measurement in ATEX zone)
- Probes for motor pump bearing temperature measurement
- Probes and instrumentation for cooling pool qualification
- Sodium test facility instrumentation
- Sodium leak detector
- Teleoperable in irradiated zone
- Melting pot sensor (duct and cocoon thermocouple)
- Transmission signal cables and K1 qualified "Serious accident" connectors according to RCC-E
- Solid drilled thermowells according to ASME code and DESP compliant
- Anti-condensation heater cap
- Heating collar
- Heating panel for testing

OUR EXPERTISE, STRICT APPLICATIONS…

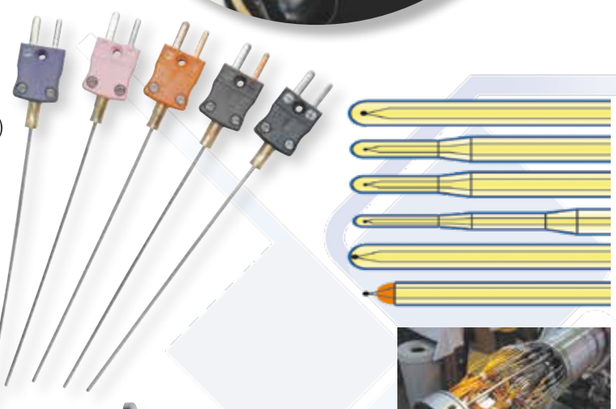
A partner at the heart of the extreme...

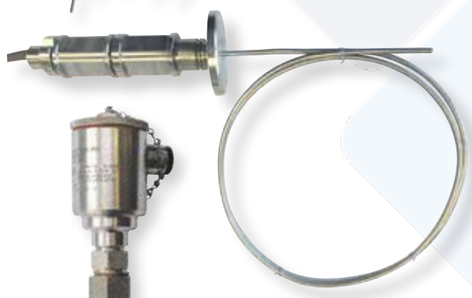
Thermo Est has developed know-how recognized by researchers and manufacturers in the field of temperature measurement. Listening to its partners, **Thermo Est** participates in the development and improvement of knowledge in all fields of metallurgy, fluids, gases, where the best measurement of temperature is essential.

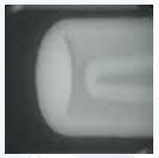
Thanks to their experience, **Thermo Est**'s engineers have mastered all the welding and soldering processes that are the pillars of the manufacturing quality of the temperature sensors. The rigor in the choice of materials and their transformation as well as a rigorous control are the factors of the international notoriety of **Thermo Est**.

nuclear expertise from France

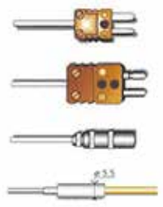
- Teleoperable in irradiated zone
- Motor bearing, pump housing temperature
- Water, steam temperature
- Sodium level detection
- Pool temperature
- Mapping probe
- Melting pot sensor (duct and cocoon thermocouple)
- Heating collars
- Mineral insulated heating cables







Outlet type



Type S, R, B, C or D high-temperature thermocouples

Known for their versatility as temperature sensors, thermocouples are manufactured in a variety of styles. **Thermo Est** thermocouples in high-temperature metal sheaths are used in applications where standard thermocouples are not suitable because of the excessively high temperature.

These thermocouples are made from highly pure materials, assembled by micro-welding in a neutral atmosphere, and their design has evolved over the years.

The couples used are of the S, R, B, C or D type and are made with platinum wires with varying rhodium percentages or tungsten/rhenium wires.

Standard insulation is of the MgO (magnesium oxide) type, also available with BeO (beryllium oxide), HfO_2 (hafnium oxide), and Al_2O_3 (aluminium oxide).

A flexible or rigid metal sheath protects the thermocouple, sheath of molybdenum, tantalum, tungsten and rhodium-plated platinum type.

Qualified to resist with extreme conditions:
(Nuclear safety: irradiation, earthquake, steam, high temperature)

- Respect of strict and complex standards
- Performance and technicality in extreme conditions
- Rigorous constitution of qualification files "RFF"
- Permanent attention to the safety of people and installations

Verification means:

- Calibrations - fixed points
- Stress calculations according to ASME PTC 19.3
- Insulation
- Line resistance
- Dielectric test
- Response time
- COFREND LT helium test
- Penetrant testing
- PMI material testing
- Leak test
- Pressure test
- Tensile testing
- Vibrations, shocks, earthquakes
- Cobalt radiation
- Icing

YOUR PARTNER IN METROLOGY

An accurate temperature measurement Each requirement need its calibration method…

... A **Thermo Est** solution: good metrology is metrology that is controlled, operational and adapted. **Thermo Est**, has expertise in the area of temperature, and will offer you support and advice to make your metrology an efficient process for the quality of your products and services.

Whatever your sector of activity,

Thermo Est offers service excellence culture for:

- The combined expertise of a metrology laboratory and a temperature sensor manufacturer
- Optimizing your means of production to produce more and better along with control of your energy costs
- Advice and technical assistance
- A control and qualification of your prototypes, products or equipment

Define your sensor in a few steps:

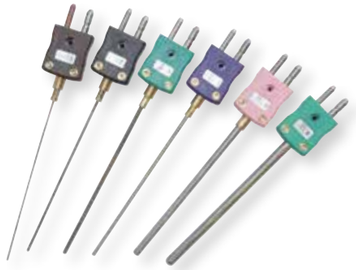
- Laboratory and on-site metrology services
- Factory calibration or with COFRAC accreditation
- Calibration points subject to your requirement

This range consists of:

- Calibration according to AMS 2750 D/E
- Laboratory metrology for contact thermometers
- Metrology for optical pyrometers
- On-site metrology services
- Advice, instrumentation and assistance

METROLOGY IS WHAT WE DO

MANUFACTURING IN ACCORDANCE WITH AMS 2750 E



Thermo Est offers a whole range of jacketed cables suitable for temperature measurement during thermal treatment.

The thermocouple coils are calibrated in accordance with US standard **AMS 2750 E**. The calibration results are indicated in the verification report. The material characteristics are stated in a certificate in accordance with **EN 10204-3.1** with, for example, the type of conductor, purity of the MgO insulation.

Various documents can be delivered by Thermo Est:

- A declaration of conformity showing compliance with the use of sensors and guaranteeing their traceability
- For the user: an individual tracking record can be provided with the calibration values of the coils
- Additional calibration adapted to your operating points is also possible; that metrology service is provided according to your specifications in our laboratory

Our trade is metrology, our value is quality and our reward is your satisfaction. For that **Thermo Est** provides the entirety of the services related to our solutions and also offers the qualification of your facilities as part of SAT and TUS controls.

LABORATORY METROLOGY FOR CONTACT THERMOMETERS

Leading manufacturer with a **COFRAC** accredited laboratory, which is a guarantee of good workmanship, **Thermo Est** has the best calibration methods and uses reference instruments. Our systems offer you the guarantee of high-quality service, to support you in your efforts to further or sustain the quality standards of your company.

They enable you to optimise your own production resources to manufacture more and manufacture well, and provide a means to control your energy costs.

Thermo Est offers a variety of services, including:

- COFRAC accredited temperature sensor calibration for thermometer couples or platinum resistance probes with or without converters, program No. 2-1221 measurement chains, methods using comparison and fixed points.
- Factory calibration (with COFRAC traceability) for temperature and hygrometry
- COFRAC calibration for electric simulation (indicators, generators, measurement systems, recorders etc.)

Specificity of a COFRAC calibration:

- Globally accepted (EA) calibration and methods implemented, including the staff skills
- Compliance with the requirements of the standard NF EN ISO/IEC 17025 (2017)
- Traceability to national standards is provided through the issue of a COFRAC certificate.

Temperatures covered by the COFRAC accreditation
-80 °C to +1310 °C

METROLOGY FOR OPTICAL PYROMETERS

Pyrometers are temperature measurement instruments that use the principle of infrared temperature measurement.
The exclusive **Thermo Est** service is comprehensive with laboratory and on-site services.

That service consists in:

- Verifying the functionality of pyrometers (power supply, output signal etc.)
- Calibration in the laboratory
- Calibration of black bodies
- Determination of emissivity
- Adjustment

ON-SITE METROLOGY SERVICES

The measurement equipment enables the optimisation of inspection resources aimed at manufacturing more and manufacturing well, and keeping costs under control.

To better satisfy customers, our "on-site" metrologists travel to your premises for a variety of services such as:

- Calibration of your installations
- Characterization and verification services of thermostatic chambers covered by the COFRAC accreditation under No. 1-1113 (according to FDX 15 140 (2013))
- Verification of your heat treatment facilities

The interventions can involve all types of installation (controlled atmosphere furnaces, vacuum furnaces, freezers, autoclaves, stoves etc...)

Characterization of enclosures covered by the COFRAC accreditation No. 1-1113, range available on www.cofrac.fr, from -80 °C to + 250 °C.
Calibration and covered temperature characterization COFRAC accredited -80 °C to + 1500 °C or directly on process up to +1500 °C.

Other areas of testing and characterisation may be considered; the verifications are carried out with operating modes similar to laboratory metrology, with the use of specific reference instruments dedicated to the site.

CONSULTANCY, INSTRUMENTATION AND ASSISTANCE

Consultancy:

Thermo Est provides you with the combined expertise of a metrology laboratory and a temperature sensor manufacturer. That dual background will allow you to achieve the standards of excellence you want to reach.

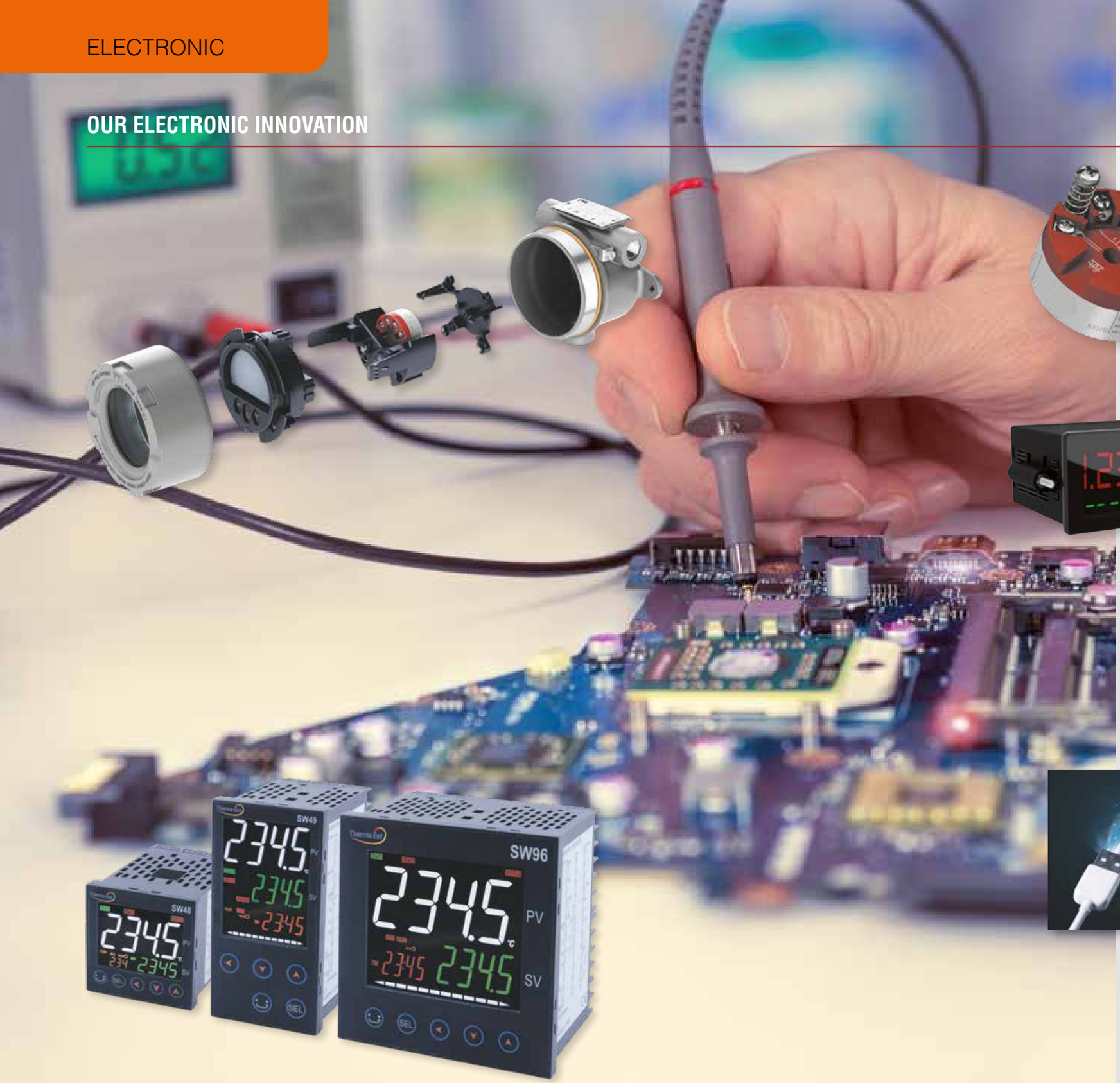
Instrumentation

Thermo Est intervenes on your installations to modify your measurements of temperature or installation of heating cables. Instrumentation is provided by trained personnel who are very familiar with the composition of the products and the installations on which they work.

Assistance

Thermo Est is available to allow you to ensure a good installation of sensors or heating cables on your installations. The staff ensures that you take into account all the risks associated with setting up our products in sensitive areas. The skills of our staff will guarantee safe starting up, in accordance with your schedule.

OUR ELECTRONIC INNOVATION



An electrical temperature measurement, With each requirement, its converter....

... A **Thermo Est** solution: these field temperature transmitters are designed for universal use in the construction of machines and plants, and also in the process industry. They offer high precision and excellent protection from electromagnetic influences (EMI). They are adapted to the market and enable to meet requirements in all the applications.

The **TTEH100 to 400** models are configurable by PC or HART® protocol with a wide variety of configuration tools available on the market.

The **TTE R or DSTE R** models reinvent the conversion and measurement transmission with their detachable DIN RAIL bases.
Their advanced technologies make it possible to display exceptional performances.

Each converter or threshold detector has:

- A graphical screen display
- A joystick that makes it a user-friendly, easily programmable device "software available on our site"
- Front panel USB jack that allows easy programming via PC

Define your converter in a few steps:

- Mounting and programing type
- 2-wire or 4-wires technique
- Input type
- Output signal
- With or without relay
- Option: front panel display

This range consists of:

- 2-wire head mounting technical converters
- 2-wire DIN rail mounting technical converters
- 4-wire universal rail mounting technical converters
- Threshold relays
- Panel indicator format 96 x 48

HEAD CONVERTER

The **TTEH series 5300 or 5400** converters are designed for temperature and process measurements in industrial environments. They condition and convert the signals from the sensors into a 4–20 mA current.
One or two-channel version programmable via PC or Hart5® / Hart7® or Profibus PA protocol.

The input stage, according to the model, allows the connection of the following sensors and signals:

- Resistance thermometer (2, 3 or 4 wires)
- Thermocouples, resistance sensors, mV and mA via shunt
- Power supply via the 4–20 mA measuring loop
- Compact size for mounting at the top of DIN B probe Ø 44 mm or SLIM version (all stainless steel) Ø 18 mm with M12 connection
- With or without galvanic isolation
- PC-configurable digital version
- Version configurable via Hart® protocol®
- PROFIBUS PA® version
- Version according to directive 94/9/CE (ATEX) - EExia IICT6
- Version Gost
- Version SIL 2 according to IEC 61508

DIN RAIL CONVERTER

The **TTER 3000 series** converters: economical range, equipped with patented technologies.
3101 or 3102: TC converters or "economic" Pt100
3111 or 3112: TC or high performance Pt100 converters
3113: Hart® temperature converter®
3114: multifunction converters
3331: temperature converter loop powered
3333: Pt100 temperature converter loop powered
3337: Hart® temperature converter loop powered

The input stage, depending on the model, allows the connection of the following sensors and signals:

- Resistance thermometer (2, 3 or 4 wires)
- Thermocouples, resistance sensors, mV and mA via shunt
- Power supply via the 4–20 mA measuring loop
- Compact size for easy DIN rail mounting
- With galvanic isolation
- PC-configurable digital version
- Version configurable via Hart® protocol®
- Version according to directive 94/9/CE (ATEX) - EExia IICT6
- Version SIL 2 according to IEC 61508

UNIVERSAL CONVERTER

The **TTE R 420 D2** transmitter is a true piece of technology combining performance and versatility:

- Extremely small device with user-friendly graphical LCD display
- Universal input
- Sensor supply
- Outputs: current / voltage
- Triple galvanic isolation - 2 relays / 1RT 500 mA - 250 Vac
- Detachable connector
- Universal power supply 80–256 Vac / 20–240 Vdc

TTE R 420 D2 is programmable by joystick or via the interface **TTE R 400** via our **TTELOG** software available for free download on our website.

UNIVERSAL CONVERTER DETACHABLE MODEL

Leading-edge technology allows the **TTE R 5210 U1** to have excellent performance.

Specific configurations:

- 1 thermocouple or current input - 1 analog output - 2 relay outputs
- 2 thermocouple or current inputs - 2 relay outputs
- (Relay 1RT - 2A / 250 Vac)
- Its dual input design allows the TTE R 5210 U1 to perform differential measurements
- The converter can be swapped hot from its connection base. DIN rail mounting base is available in 1-way
- The power supply is universal, with 80–256 VAC to 20–240 VDC

TTE R5210 U1 is programmable by joystick or via our TTELOG software available for free download on our website.

UNIVERSAL CONVERTER DETACHABLE MODEL

The **TTE R 5150 U1** measurement converter reinvents measurement conversion and transmission.

- Outstanding performance thanks to state-of-the-art technology
- Backlit graphic display
- Universal input
- Sensor supply
- Input and output configurations to answer all types of applications
- Triple galvanic isolation - 1 relay / 1RT 2A - 250 Vac
- The converter can be swapped hot from its base
- 4 or 8-channel connectors
- Reduced wiring thanks to the internal distribution of the power supply and the RS 485 connection on the 4 and 8-way board
- Universal power supply 80–256 Vac / 20–240 Vdc

TTE R 5150 U1 is programmable by joystick or via our **TTELOG** software available for free download on our website.

THRESHOLD RELAYS

The **DSTE R 5250 U0** threshold detector makes it possible to define an input variable from various types of sensors to control one or two independent alarm thresholds.

- Backlit graphic display
- Universal input
- Threshold, hysteresis and delay settings
- Triple galvanic isolation - 1 RT relay / 2A - 250 Vac and
- Relay T / 2A - 250 Vac
- The converter can be swapped hot from its 1, 4 or 8 way board
- Reduced wiring thanks to the internal distribution of the power supply and the RS 485 connection on the 4 and 8-way board
- Universal power supply 80–256 Vac / 20–240 Vdc

DSTE R 5250 U0 is programmable by joystick or via our **TTELOG** software available for free download on our website.

INDICATOR

The new **ITE B 6200 U1** incorporates a 32-bit microprocessor offering even more performance.

- IP 65 flush mounted digital panel 96 x 48 format with two-color display for analog and digital signal transmission
- Universal input
- Sensor supply
- Input and output configurations to answer all types of applications
- Threshold, hysteresis and delay settings
- Triple galvanic isolation - 2 relay / 1RT - 2A - 250 Vac
- Detachable connector
- Universal power supply 80–256 Vac / 20–240 Vdc

ITE B 6200 U1 is programmable by 4 buttons located on the front panel of the device or via our **TTELOG** software available for free download on our website.

INDICATORS

IDEAL-P - ALL-IN-ONE

The **IDEAL-P** display in standard 96x48 format offers all the features your process requires. Its simple implementation, its universal power supply and its advantageous cost will make the **IDEAL-P** your favorite display.

MEASUREMENT

- Process (±10V, ±200V, ±20mA)
- Temperature (Pt100, TC J-K-T-N)
- Resolution ±15 bits
- 20 readings per second
- Sensor power supply

1 RELAY ALARM

- SPDT 8A @ 250Vac
- Max / Min / MaxMin
- Hysteresis / Delay
- Fail safe mode
- 4–20mA alarm generator: Entry / Exit / Difference

4–20mA OUTPUT

- Resolution 13 bits
- Response time 20Hz
- 4–20 mA I/O: Direct / Inverse Curve
- Setpoint generator 4–20mA: Dimmer / Programming

COMMON SPECIFICATIONS

- Format 96 x 48 (1/8 DIN)
- Display 4 digits (±9999)
- White LED
- Universal Power Supply: 20–265 Vac/Vdc
- Configuration locking by software

MICRA - TRICOLORE MULTIFUNCTION

The **MICRA** series is the ultimate multifunction. Its tricolor GREEN, ORANGE, RED LED display allows to indicate the measurement state or to differentiate the type of measurement by the color. Its concept of modular and scalable outputs offers various control possibilities. Analogue and digital communication forwarding.

MICRA-M

- Process (10V, 20mA)
- Potentiometer
- Temperature (Pt100, TC J,K,T)
- Load cell (mV/V)

MICRA-E

- Ammeter: AC (TRMS) / DC
- Voltmeter: AC (TRMS) / DC

MICRA-D

- Frequency meter
- Tachometer
- Totalizer
- Counter
- Chronometer

MICRA-X

- ASCII and MODBUS repeater
- RS485

MICRA-NE

- MODBUS TCP repeater
- ETHERNET

PICA - ECONOMIC

The **PICA**, display, by its simplicity, offers one of the most used indicators. Its 48x24 compact size, its versatility and its price make it an ideal product for any type of panel, box or cabinet mounting.

Thermo Est also offers a complete set of thermometers that are portable. Our thermometers are used for simple and precise temperature determination in many industries (laboratory, heating or air conditioning, chemistry). In many cases, depending on your needs, the measurement chains (device + probe) can be delivered with a calibration certificate with or without a COFRAC accreditation.

(*) Picture shown for illustration purpose only

PID REGULATORS

TEMPERATURE OR PROCESS

SYROS - MULTIPURPOSE REGULATORS

SYROS series controllers are ideal instruments for temperature control even in processes where stability is critical, thanks to internal algorithms that improve the behaviour of the control loop. By their large number of available options and their interconnection possibilities, they become true universal control and regulation equipment.

GENERAL CHARACTERISTICS SW SERIES

- The largest color LCD screen on the market
- Sampling rate: 50 ms
- Processing rate: 100 ms
- Universal input
- Minimum footprint: 58 mm deep
- Multidrop master function (option)
- Power supply 100–240VAC / 24VDC-VAC

The SW series comes in 3 standard formats:

- SW96 (96 x 96 x 58 mm)
- SW49 (48 x 96 x 58 mm)
- SW48 (48 x 48 x 58 mm)

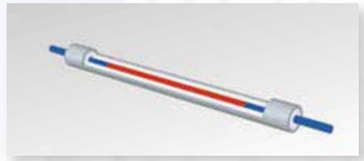
Wide variety of input/output signals:

- Universal PV measurement input (resistance probe, thermocouple, voltage/current)
- Remote setpoint input (option)
- Current transformer input (option)
- Motorized valve position input (option)
- Control output (relay contact, SSR/SSC control, current/voltage) and optionally (regulation with motorized valve, analog copying (current/voltage), heating element shutdown, operating time alarm, etc.)

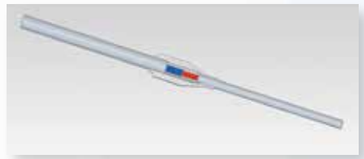
Wide array of regulation methods: (with auto-setting):

- ON/OFF control
- PID
- Fuzzy logic
- 2-degrees-of-freedom PID
- Self-adaptive
- Setpoint generator
- Hot/cold (option)
- Motorized valve (option), etc.

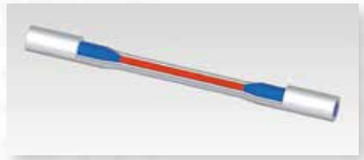
MINERAL INSULATED HEATING CABLES



- Heating cables with cold ends for a constant diameter

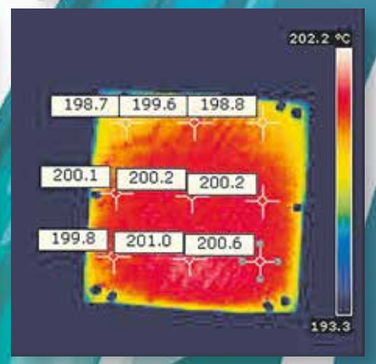


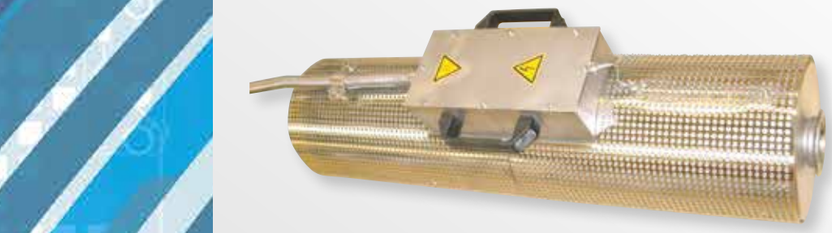
- Heating cables with laser or solder brazed junction



- Bi-conductor heating cables with cold ends

- Heating cables with reduced tip and integrated cold ends





How to choose your Thermo Est heating element?

For your heating applications

Electric heating is one of the first applications of electricity.

Over the last century, thousands of heating problems have been solved using powers ranging from a few watts to some megawatts.

Although the principles used are always the same, the needs and solutions chosen differ significantly.

A heat exchange only occurs when there is a temperature difference between two opposing bodies.

With electric heating, this transfer takes place only at the point of energy dissipation or very close to it.

Thermal transfer is always a combination of 3 phenomena:

- **Conduction**
- **Convection**
- **Radiation**

When heating solids, it is essentially the conduction that plays a role, whereas in a liquid, heating begins by conduction and then continues by convection. In a gaseous media, it is difficult to speak of conduction: the heat transfer is mainly carried out by convection. Although still present, the radiation depends largely on the temperature level. Under vacuum conditions it is often the only way to transmit heat.

These three phenomena therefore play a role in the thermal exchanges. But the part of each of them depends on the particular conditions specific to each device.

In such cases, Thermo Est offers appropriate solutions for:

- Heating from cryogenic temperatures to over 1000 °C
- Heating with low or very high power (a few watts to several tens of kilowatts)
- Utilisation in air, under vacuum or under pressure and in any corrosive environment compatible with our jacketed sheaths with mineral insulation
- Application requiring high reliability components, components with metal-ceramic bond, various mechanical parts
- Mechanical parts: plates (stainless steel, inconel, aluminum, titanium), fittings, sealed passages...

OUR EXPERTISE IN HEATED CABLE...

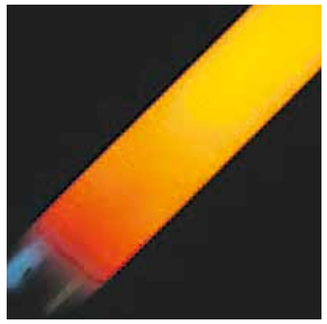
At the heart of the extreme, your heating solutions...

It is with the desire to always better satisfy you that **Thermo Est** develops heating solutions.

The solution is shielded heating cables with mineral insulation.

Shielded heating cables with mineral insulation are characterised by their sturdiness, long life and adaptability to extreme conditions.

Thermo Est is making its own jacketed cables, and can supply heating cables according to your specifications.



EXCLUSIV RANGE:

Construction of heating cables with mineral insulation:

CONDUCTOR FOR THE HOT SECTION:
- 80/20 NiCr core, pure Ni or Balco®
- Ø of the core according to the desired linear resistance
- Double NiCr core 80/20, Ni

CONDUCTOR FOR THE COLD SECTION:
Copper conductor

INSULATION:
"MgO" magnesia mineral insulation highly compacted

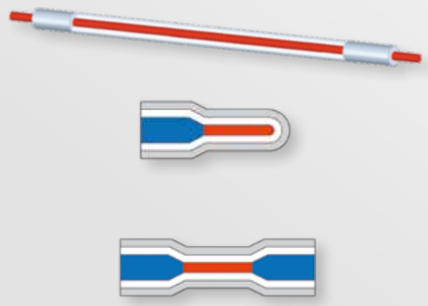
OUTER SHEATH:
- Diameter from 0.5 mm to 5.0 mm
- Variable power voltage: 28 V, 115 V, 220 V or 400 VAC for example
- High insulation resistance
- Dielectric testing at 1500 V

For temperatures up to +600 °C: stainless steel AISI 321, 316 L...
This type of sheath is resistant to corrosion in steam and gas environments. Use for a continuous temperature max of + 800 °C for applications in the chemical industry, food, automotive, research and development as well as nuclear energy.

For temperatures up to +1000 °C: Inconel 600®
This type of sheath has a good resistance to corrosion in an oxidizing atmosphere up to +1000 °C. Resistant to corrosion and low electrochemical corrosion. In the oxidizing atmosphere usable up to 1150 °C. Not recommended in a sulphurous atmosphere above 500 °C for high temperature applications in the chemical industry, food, automotive, research and development and for nuclear energy.

3 TYPES OF IMPLEMENTATION:

CONSTRUCTION AT THE HOT PART:

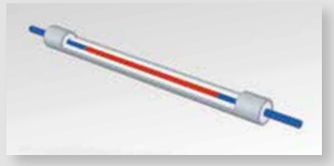


Raw version (sold by the meter)
Single or dual wire conductor cable.

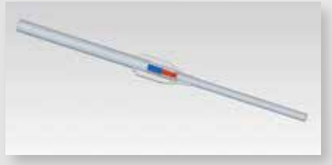
Reduced tip version
On single-wire or two-wire cable, depending on the shrink diameter, can increase the power by a factor of 2 to 4.
Length according to your specifications.

Version reduced at the middle
This type of cable is available with a reduced section on the hot cable or reduced section on the hot cable with integrated cold terminations. Depending on the reduction diameter, can increase the power by a factor of 2.
Length according to your specifications.

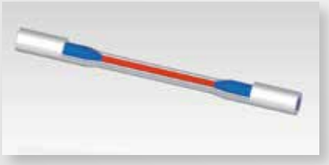
HEATING CABLES WITH COLD ENDS:



- **Heating cables with cold ends for a constant diameter**



- **Heating cables with laser or solder brazed junction**



- **Heating cables with reduced tip and integrated cold ends**

- **Bi-conductor heating cables with cold ends**

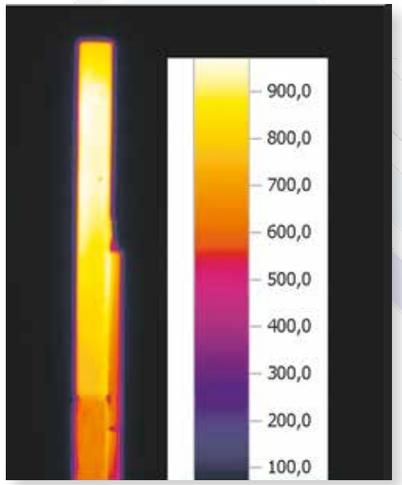
TERMS OF USE:
Shielded mineral insulated heating cables can be used in many environments due to their robustness and adaptability to extreme conditions.
They can for example be used under vacuum.

HOW TO CHOOSE YOUR HEATING CABLE...

Power/Voltage matrix for **Thermo Est** heating cables with integrated cold ends.
This matrix is given for information purpose only and requires verification of the power in relation to your need and the actual application.

Codification	Technical data			Power in Watt														
Material of the sheath Inconel600 / Stainless steel	ø mm	Hot part mm	Linear resistance Ohm at 20 °C	25	50	75	100	150	200	350	500	750	1000	1250	1500	1750	2000	3500
				Voltage in Volt														
S-H-I-1.0-250	1.0	250	3.1	9	12	15	18											
S-H-I-1.0-500	1.0	500	6.2		18	22	25	30	35									
S-H-VA4-1.0-750	1.0	750	9.3			28	30	38	45						max. 600 °C			
S-H-I-1.0-1000	1.0	1000	12.5			30	35	45	50	65								
S-H-VA4-1.0-1500	1.0	1500	18.6				45	55	60	80	95				max. 600 °C			
S-H-I-1.0-2000	1.0	2000	25.0				50	60	70	95	110	135						
S-H-I-1.5-500	1.5	500	2.8		12	15	18	20	24									
S-H-I-1.5-1000	1.5	1000	5.5			20	24	28	33	45	50							
S-H-VA4-1.5-1500	1.5	1500	8.3				28	35	40	55	65	80			max. 600 °C			
S-H-I-1.0-2000	1.5	2000	11.0					40	48	60	75	90						
S-H-VA4-1.5-3000	1.5	3000	16.5						60	75	90	110	130		max. 600 °C			
S-H-I-1.5-4000	1.5	4000	22.0							90	105	130	150					
S-H-I-1.5-6000	1.5	6000	33.0							110	130	160	180					
S-H-I-2.0-500	2.0	500	1.6				12	15	18	24								
S-H-I-2.0-1000	2.0	1000	3.1				18	22	24	33	40							
S-H-VA4-2.0-1500	2.0	1500	4.7				22	27	30	40	48	60	70		max. 600 °C			
S-H-I-2.0-2000	2.0	2000	6.2				24	30	36	48	56	70	80	90				
S-H-VA4-2.0-3000	2.0	3000	9.3	max. 600 °C					45	60	70	80	100	110	120			
S-H-I-2.0-4000	2.0	4000	12.5							70	80	100	110	125	140	150		
S-H-VA4-2.0-5000	2.0	5000	15.5	max. 600 °C							90	110	125	140	150	165	175	
S-H-I-2.0-6000	2.0	6000	18.6								95	120	140	150	165	180	190	
S-H-VA4-2.0-8000	2.0	8000	25.0	max. 600 °C								140	160	180	195	210	220	
S-H-I-3.0-5000	3.0	5000	7.0								60	70	85	95	100	110	120	
S-H-I-3.0-8000	3.0	8000	11.2									90	105	120	130	140	150	
S-H-I-3.0-10000	3.0	10000	14.0										120	130	145	155	165	220

< +600 °C Simple mounting in winding and fastening with metal strips or similar
> +600 °C Assembly with a very good heat transfer (e. g caulked in a groove)
Max. +1000 °C Assembly with ideal heat transfer (HT soldering) for Inconel 600® sheath



COLD TERMINATIONS:

A mineral insulated cable (MI) consists of a hygroscopic insulating material (MgO, Al_2O_3, SiO_2) between the core and the metal sheath.
Heating cables therefore require a good sealing of the ends.

Thermo Est offers various types of cold output:

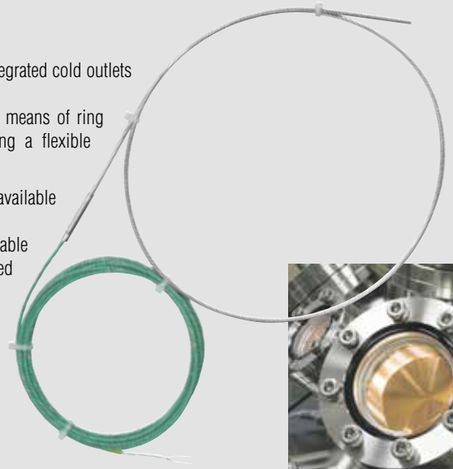
- **Mo type addition of a sealing resin on the cable**
  (this assembly is fragile, the wire is to be handled with caution)
- **Type Kx "metal-ceramic connector"**
  For connection of the MI cable especially at high temperature and under vacuum, the metal-ceramic composite components are of great importance especially when used at high temperatures and in vacuum applications.
  Maximum temperature + 400 °C continuously (+ 550 °C peak)
- **DS type "undetachable junction"**
  For ambient temperatures up to + 200 °C. (air with slight depression or overpressure). The connection can be made using a junction with waterproof resin. This operation must be carried out in our premises.
  Ø 4 to 8 mm L = 30 to 50 mm.
  Output by flexible cables, section according to the power, with or without ground terminal.
  With connection on junction box connection M20x1.5 for example.
  Length according to your specifications.

FASTENING FITTING:

All **Thermo Est** heating cables can be sold with integrated cold outlets or with outlets with sealed weld junctions.
This execution allows to exit closed enclosures by means of ring fitting or brazing on a flange and then connecting a flexible conductor to the cold outlet.

Other connections, bulkhead fitting, metal strip are available on request.
To ensure regulation **Thermo Est** offers the most suitable jacketed thermocouple, diameter, length, outlet adapted to your application.

Thermo Est guarantees a quality service and puts its skills at your disposal with the realization of 2D/3D drawings at all stages of your project.



EXAMPLES OF APPLICATIONS FOR YOUR HEATING TOOLS…

From complex application to industrial production, **Thermo Est** designs the heating solution adapted to your needs.
From a few milliwatts to a few kilowatts and for temperatures up to +1000 °C with shielded heating cables with mineral insulation, small diameter, very flexible and robust.

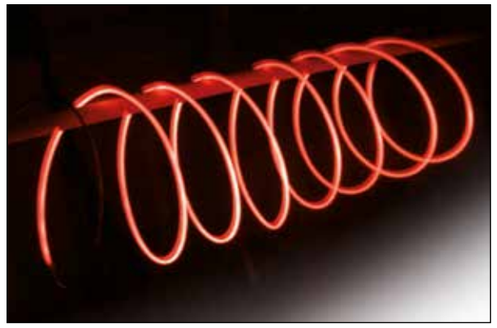
Our assembly means of jacketed cables are variable depending on the desired heating power. The higher the temperature, the better the heat transfer should be. All our **Thermo Est** cables can be wound, built-in or brazed depending on their nature to adapt to all types of mounting.

Coding example for Thermo Est requests:

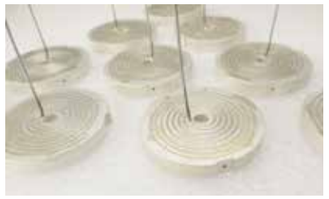
1 - I - NC - 0,63 - 4.3 - 5000 - 2x - DL - 1 - I - Cu - 0,007 - 4.9 - 2000 - 2x - D - T - 2.5 mm² - 1 m

Example: single wire heating cable

- Sheath: "I" (Inconel 600®)
- Core: NiCr 80/20, line resistance: 0,63 Ω/m
- Sheath diameter 4.3 mm, hot part length LC = 5000 mm Two laser welded junctions 2x DL
- Cold parts sheath "I" (Inconel600®), copper conductor, line resistance 0.007 Ω/m
- Sheath diameter 4.9 mm, cold part length LF = 2000 mm
- Electrical termination: 2x D by non-removable junctions with insulated copper wire Teflon® L cable = 1 meter - s = 2.5 mm²
- P=3840W +/- 10% under 110 V

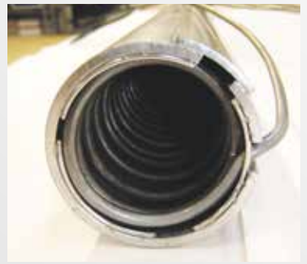


Heating cables with integrated cold ends for a constant diameter



Heating power <100 W/m or up to 3 W/cm²

No direct contact with the jacketed cable is required for low temperatures, so it is sufficient to secure the jacketed cable with spot-welded metal strips.

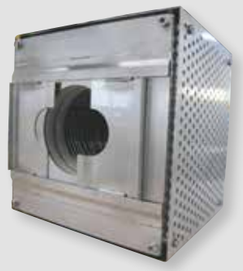


Heating power <300 W/m or up to 6 W/cm²

For higher temperatures up to +600 °C, it is important that the jacketed cable is applied over the entire length with a very good thermal contact between two plates, brazed or placed in grooves.

Heating power from 300 W/m up to 1 KW/m or > 6 W/cm²

For very high temperatures, optimal heat transfer must be done over the entire length and surface. It is ideal if the jacketed cable is placed in grooves then brazed under vacuum or sealed directly into a mechanical part.



PYROMETRIC ACCESSORIES

We supply the spare parts used in the composition of our sensors

Sensitive Element

The elements are available in coiled ceramic coating, coiled glass coating, thin film coating or for average temperature measurement.

Connection cables for temperature probe

The cables are available with different PVC, Teflon®, silicone, fibreglass insulation with or without braided shield. The number of conductors varies according to the 2, 3, 4 wire assembly.

Compensation cables or extension cables for thermocouples

For **compensation cables**, the strands of the cores are made of "Substitution Material" alloys. This also means that the thermoelectric properties in the permissible temperature range (generally 0 °C to + 200 °C) are identical to the thermoelectric properties of the respective thermocouple. They are designated according to the standard

IEC 584, by the letter "C" placed after the letter code of the thermocouple (for example "KC").
For the **extension cables**, the conductors have the same nominal structure as the respective thermocouple according to IEC EN 60584-3 and are designated by the letter "X" after the letter code of the thermocouple type (e. g "KX").

Naked or isolated thermocouple wires

Used directly for the manufacturing of thermocouple, they are also available in insulated PVC sheath, glass fiber, fiberglass, Teflon® or ceramic fiber depending on the desired temperature of use.

Connection heads or connection sockets

Our range of connection heads is very large. We can offer you spare parts of all connection heads in accordance with your environment.

Insulators and ceramic sheaths

Of "Pythagoras" C610 type with excellent resistance to chemical attacks of gases free of hydrofluoric acid. For temperature up to +1700 °C. Of "Alsint" C799 type content of Al_2O_3 99.7 %. Excellent thermal conductivity. Excellent resistance to hydrofluoric gases, alkaline vapors, and molten metal oxides. For temperatures up to +1900 °C.

Standard or miniature series compensated sensors connector

The range of connectors specific to temperature measurements is very wide. We can offer you spare parts all the existing connectors, or offer you equivalences thanks to our expertise in the field of temperature measurement.

Metal-ceramic connectors for heating cables with mineral insulation

For connection of the jacketed cable especially at high temperature and under vacuum, the metal-ceramic composite components are of great importance especially when used at high temperatures and in vacuum applications. Maximum temperature +400 °C continuously (+550 °C at peak).

Solid drilled thermowells and mechanically welded thermowells, custom made

The know-how of **Thermo Est** is recognized for the production of pyrometric sheaths. All our parts are custom made and meet the standards in force. They are available with different certificates or tests according to your specifications (material certificate, PMI test, penetrant testing, hydraulic test for example).

Sliding flanged fittings

Sliding cast iron flanges for mounting on metal sheaths Ø 15, Ø 22 or 32 mm.

Tapping weld-fitting, bayonet support bases

Tapping consisting of weld-fitting sleeves with material on request.

Sealed sliding fittings made of steel, stainless steel, brass, teflon®

The sliding fitting is made up of 3 or 4 parts and allows a tight fixing of the sensors. Initially the connection slides on the sensor sheath and after adjusting the effective length of the sensor, just tighten the top cap and the olive is permanently crimped. For several adjustments we will use the Teflon® olive.

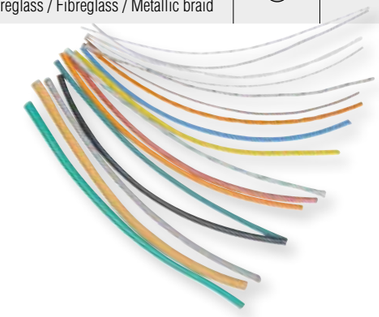
Digital thermometers and portable indicators

Digital thermometers are available for connecting our Pt100 probes, thermocouples. In order to ensure an accurate measurement, **Thermo Est** is able to offer you a complete and calibrated measurement chain according to your needs. Good metrology is metrology that is controlled, operational and suitable. **Thermo Est**, has expertise in the area of temperature, and will offer you support and advice to make your metrology an efficient process for the quality of your products.

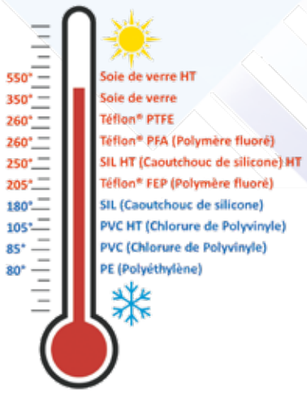
PYROMETRIC ACCESSORIES:

COMPENSATION AND EXTENSION CABLES

Cables for Thermocouples				FOR THERMOCOUPLES					
	According to standards IEC 584-3			T	J	K		N	S
				TX symbol	JX symbol	KX symbol	KCB symbol	NX symbol	SCB symbol
				Class 2	Class 2	Class 1	Class 2	Class 1	Class 2
	Dimensions external mm	Section mm²	Temperatures of operation	+ / -	+ / -	+ / -	+ / -	+ / -	+ / -
PVC/PVC	4	0.25	-20 +80 °C	L2KT	L2KF	-	L2KN	-	L2KP
				451201	452201	-	453201	-	455201
PVC / Copper braid / PVC	4.2	0.22	-20 +85 °C	L2KDKT	L2KDKF	L2KDKN	L2KDKNV	L2KDKNc	L2KDKP
				451212	452212	453213	453212	-	455212
PVC/PVC	5x7	1.34	-20 +80 °C	-	L2KF/15	-	L2KN/15	-	L2KP/15
				-	452701	-	453701	-	455701
Teflon / Copper braid / Teflon®	3.5	0.22	-40 +250 °C	L2TDTT	L2TDTF	L2TDTN	-	L2TDTNc	L2TDTP
				-	452272	453272	-	-	455272
Teflon / Silicone	3.8	0.22	-40 +200 °C	-	L2TSF	L2TSN	-	-	-
				-	452222	453223	-	-	-
Silicone / Silicone	8	1.34	-40 +200 °C	-	L2SF	-	L2SN	-	L2SP
				-	452681	-	453681	-	455681
Silicone / Fibreglass/ Metallic braid	6x8.5	1.34	-40 +200 °C	-	L2SGDF	-	L2SGDN	-	L2SGDP
				-	452641	-	453641	-	455641
Fibreglass / Fibreglass / Metallic braid	4	0.5	-40 +200 °C	-	L2GDF	-	L2GDN	-	-
				-	452331	-	453331	-	-



Compensation cable
Extension cable
PT100 connection cable
Instrumentation cable



On request: Multipair cables

Cable according to your specifications

THERMOCOUPLE WIRES AND CONNECTING CABLES

Naked thermocouple wires of type: T J K N S B Wer...

Fe	Cu	CuNI	NI	NICr	Pt	PtRh 10%	PtRh 30%	PtRh 6%	PtRh 13%	Pt
Ø mm										
0.5	0.5	0.5	0.5	0.5	-	-	-	-	-	-
1	1	1	1	1	0.35	0.35	0.35	0.35	0.35	0.35
1.38	1.38	1.38	1.38	1.38	-	-	-	-	-	-
1.6	1.6	1.6	1.6	1.6	0.50	0.50	0.50	0.50	0.50	0.50
2	2	2	2	2	-	-	-	-	-	-
3	3	3	3	3	-	-	-	-	-	-

Insulated thermocouple wires of type: T J K...

Wires Ø			Teflon® / Teflon® Max Temp.: +250 °C		Fibreglass / Fibreglass Max Temp.: +400 °C		Ceramic fiber / Ceramic fiber Max Temp.: +1200 °C	
mm	Dimensions mm	Type	Dimensions mm	Type	Dimensions mm	Type	Dimensions mm	Type
0.1			0.5 x 0.8	TF01 (TJK)	-	-	-	-
0.2			1.1 x 1.7	TF02 (TJK)	1 x 1.5	SV02 (TJK)	-	-
0.3			-	-	1.2 x 2.3	SV03 (TJK)	-	-
0.5	2.5 x 3.5	PV05 (TJK)	1.5 x 2.5	TF05 (TJK)	1.4 x 2.4	SV05 (TJK)	-	FC 05 (K)
0.8			-	-	2.6 x 4.3	SV08 (JK)	3.5 x 5	FC 08 (K)
1			-	-	2.2 x 3.5	SV10 (J)	-	-

Connecting cables for resistance probes

Insulation	2 conductors stranded			3 conductors stranded			4 conductors stranded		
	S mm²	Ø ext. mm	Type	S mm²	Ø ext. mm	Type	S mm²	Ø ext. mm	Type
PVC/PVC	0.25	4	PV2	0.25	4.0	PV3	0.25	4.5	PV4
PVC/braid/PVC	0.25	4.5	PVT2	0.25	4.8	PVT3	0.25	5	PVT4
Silicone / Silicone	-	-	SIL2/0,25	-	-	-	-	-	-
Silicone / Silicone	0.75	5.7	SIL2	0.75	6.6	SIL3	0.75	7.5	SIL4
Teflon® / Teflon®	-	-	TEF2	0.22	2.7	TEF3	0.22	3	TEF4
Téflon® / Braid / Téflon®	0.22	3	TEFT2	0.22	3.2	TEFT3	0.22	4	TEFT4
Fibreglass / Fibreglass	0.5	4	SVT2	0.5	4.1	SVT3	0.22	4	SVT4
Metallic braid.	-	-	-	-	-	-	-	-	-
Téflon® / Fibreglass / Braid	-	-	-	-	-	-	-	-	-
Téflon® / Silicone	0.22	4	TS2	0.22	4	TS3	0.22	4.3	TS4

On request:

Other diameters and types of insulation on request

PYROMETRIC ACCESSORIES:

Connection heads

Light alloy

- FORM A
- TYPE TA 11-1

Light alloy

- FORM A
- TYPE TA 11-3

Light alloy

- FORM A
- TYPE TA 11-16

Light alloy

- FORM B
- TYPE TB11- 6

Light alloy

- FORM B
- TYPE TB 11-12

Light alloy

- FORM B
- TYPE TB 11-16

Stainless steel 321

- FORM B
- TYPE TB 11-18

PVC

- FORM B
- TYPE TB 11-13

Light alloy

- FORM C
- TYPE TC 11-15

Light alloy

- FORM B
- TYPE Ex “e” TB 11-12

Light alloy

- FORM B 2Pe
- TYPE Ex “e” TB 11-12

Light alloy

- FORM B 1 or 2Pe
- TYPE Ex “d” XD-AD

Thermo Est offers a very complete range of connection heads in light alloy <6% Mg, in stainless steel, PVC in standard version or for explosive atmosphere (ATEX) for adaptation to your environment.

Available for connection according to your process

- With or without epoxy coating
- With one or two cable entries
- Protection IP 54 to IP 67

Connection sockets

Ceramic

- FORM B 2 to 8 plots
- TYPE SB 640 / SB 641
  SB 642 / SB 643

Ceramic

- FORM A 2 to 4 studs
- TYPE SA 321 / SA 341
  Precious metals

Ceramic

- FORM A 2 to 4 studs
- TYPE SA 331 / SA 351
  TC T, J, K and N

Ceramic

- FORM C 2 to 4 studs
- TYPE SC 040 / SC 041
  SC 042

Various ceramic sockets are available, form B from 2 to 8 pins, form A for standard thermocouples T, J, K, N or precious metals S, B version 2 or 4 pins.

Connection flanges - sliding fittings

Cast iron flange

- TYPE BC011 / BC021
  BC031
- Ø 15, Ø 22, Ø 32 mm

Cast iron counter flange

- TYPE CBC562 / CBC563
  CBC564
- Ø 15, Ø 22, Ø 32 mm

Stainless steel sliding fitting

- TYPE RC 216 / RC 426
- Ø 15, Ø 22 mm

Welding bosses

- TYPE BSI 1/2“ G
  Stainless steel 304, 316 L...

For quick connection of temperature sensors a wide range of sliding flanges or sliding steel fittings are available, as well as welding bosses.

Sealed sliding fittings

Stainless steel Olive stainless steel

- SLIDING FITTING
- Olive stainless steel
- TYPE RCI

Stainless steel Olive Teflon®

- SLIDING FITTING
- Olive Teflon®
- TYPE RCI-OT

Mineral insulated jacketed cables

Jacketed cables

- ON REQUEST
- STAINLESS STEEL, INCONEL 600®

Various sliding fittings are available with a stainless steel or teflon® sealing ring for Ø 1 to 9 mm - Metric, gas or NPT thread.

PYROMETRIC ACCESSORIES:

Ceramic or metallic protective sheaths - insulators

Metallic sheath

- SOLID DRILLED OR WELDED TYPE

Ceramic sheath

- POROUS OR TIGHT SHEATH

Insulator

- ISOLATORS OR CERAMIC RODS

Examples of ceramic sheaths:

Sillimantin 60 – Type C530, porous ceramic according to DIN VDE 0335.
For temperatures up to +1650 °C.
No reactions with the heating elements. This material is used successfully in laboratories and industrial furnaces.

Cryston CN 789A – "Nitrided Bonded Silicon Carbide" for use in abrasive media and non-ferrous alloy baths.
For temperatures up to +1600 °C.

Pytharoras C 610 – Sealed ceramic according to DIN VDE 0335.
For temperatures up to +1600 °C
Excellent resistance to chemical attacks of hydrofluoric acid-free gases for normal use in ovens.
Pythagoras sheaths have good thermal shock resistance and good mechanical resistance.

Alsint C 799 – Sealed ceramic according to DIN VDE 0335.
For temperatures up to +1800 °C.
Material for furnace construction with 99.7% Al_2O_3.
Excellent resistance to chemical attacks of hydrogen gas and other reducing gases at high temperatures.
Low lining thickness: resistance to thermal shock.

Halsic-I – Reinfiltrated silicon carbide.
Good resistance to oxidation.
For temperatures up to +1350 °C.
Resistance to corrosion of acids and alkaline solutions.

Sialon – Advanced ceramics due to partial vitrification between Silicon Nitride, Yttrium, Aluminum Oxide and Nitrided Aluminum to form Si-Al-O-N.
For temperatures up to +1250 °C.
An almost unlimited lifetime in aluminum baths, several months in cuprous baths.
Non-wetting – no pollution of the bath.

Metal Ceramic Grade LT1 - High abrasion resistance, composed of chromium and alumina, two compatible materials with high characteristics at high temperatures.
For operating temperature up to + 1550 °C.
Applications: ferrous alloy baths, copper, brass, zinc.

Standard Series compensated connectors

Thermoplastic

- STANDARD MALE
- FULL PINS
- TYPE M3-K

Thermoplastic

- STANDARD FEMALE
- TYPE M3F-K

Stainless steel

- CABLE CLAMP STD
- TYPE SC

Thermoplastic

- BUILT-IN RECTANGULAR STD CONNECTOR

For all types of thermocouples: T, J, K, N, R/S or B
Maximum operating temperature: +200 °C (at peak +220 °C)
"High temperature" series: phenolic +450 °C or ceramic +650 °C
Available in three pins, other standards or color codes
Panels for standard bases available on request

Compensated connectors miniature flat pin series

Thermoplastic

- MINIATURE MALE FLAT PINS
- TYPE M3m-K

Thermoplastic

- MINIATURE FEMALE
- TYPE M3mF-K

Stainless steel

- CABLE CLAMP MINI SCM

Thermoplastic

- BUILT-IN RECTANGUAIRE MINI CONNECTOR

For all types of thermocouples: T, J, K, N, R/S and B
Maximum operating temperature: +200 °C (at peak +220 °C)
"High temperature" series: phenolic +450 °C or ceramic +650 °C
Available in three pins, other standards or color codes
Panels for miniature bases available on request

Compensated connectors miniature series

Thermoplastic

- DOMINO FOR THERMOCOUPLE

Light alloy

- CONNECTORS TYPE LEMO MALE / FEMALE

Light alloy/nickel

- CONNECTORS TYPE JAEGER MALE / FEMALE

FOR COMPLETE CONTROL OF THE PROCESS CHAIN

Checklist to define your temperature sensor

Applications:

❑ Siderurgy/Metallurgy ❑ Automotive ❑ Glass making ❑ Aeronautics
❑ Cement manufacturing ❑ Research and development ❑ Nuclear power ❑ Chemical/Petrochemical
❑ Others: .....

Process parameters:

Terms of use: ❑ Atmosphere: ❑ Vacuum (HV/UHV): ❑ Pressure:
❑ Others:

Media: ❑ Solid ❑ Liquid ❑ Gaz Type
❑ Static ❑ Turbulence

Temperature: Ambient Industrial processes

Sensor type: Precision:

Simple version: Duplex version:

Mounting type:

Temperature: Ambient Industrial processes

Protection sheath, material: ❑ Stainless Steel ❑ Titanium ❑ Refractory stainless steel ❑ Tantalum ❑ Inconel 600®

Dimensions: Diameter Length

Extension between head and coupling: diameter and length: .....

Connection or mounting flange: .....

Type of measurement element: .....

Output signal: .....

Accessories: .....

Legal instructions:

Standards/Consulting: ❑ Yes ❑ No Which

Certificate: ❑ Manufacturer's certificate ❑ DC Other

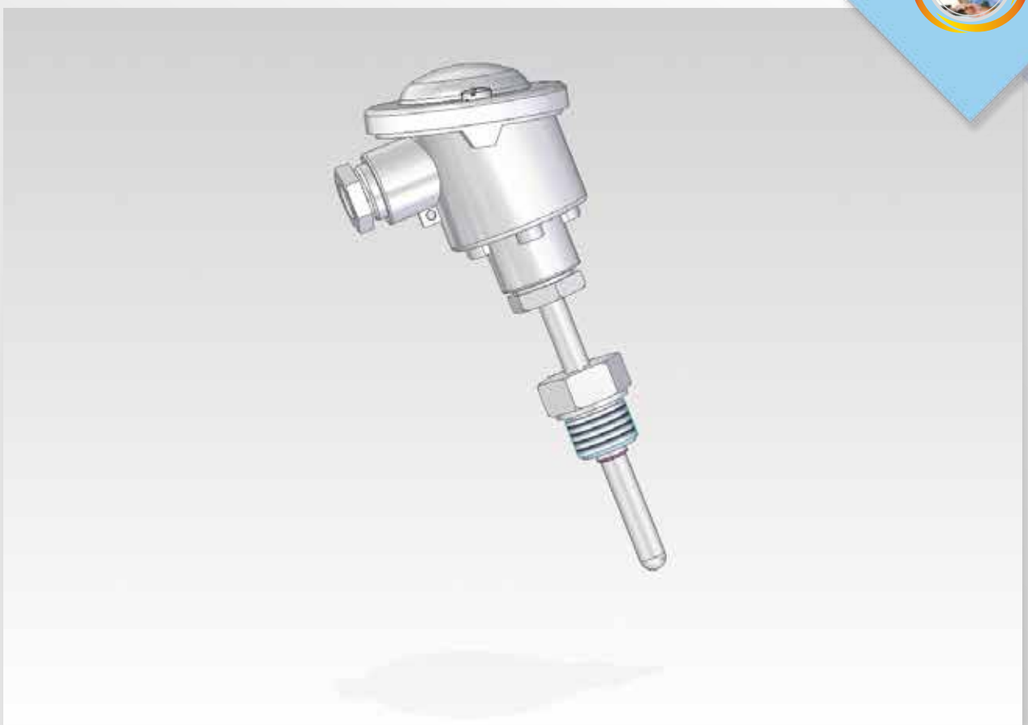
Drawing/Plan: ❑ Thermo Est ❑ Customer

Tests:

Final inspection: ❑ Thermo Est ❑ Custom
❑ Other

Design: ❑ Thermo Est ❑ Supply of material by the client

Your diagram / miscellaneous:



Coding example for a Thermo Est temperature sensor:

- **Resistance probe 1* Pt 100 Ω at 0 °C**
- **Type: SI6-100.1/2"G-TI-145, PtCM3B, TB6PeM20, -50 °C/+400 °C**
- 316 L stainless steel protective sheath - **Ø 9 mm**
- Fastening by threaded welded stainless steel connector R= ½ "G
- Extension of 145 mm between head and connector
- Connection head - type TB 11-6 in light alloy IP 54
- Cable entry via cable gland M20
- Interchangeable measuring element: 1 x Pt100 Ω at 0 °C with thin layer according to IEC 60751
- Class B - 3-wire connection with stainless steel sheath Ø 6 mm
- **Effective length = 100 mm**
- Operating temperature: -50 °C / + 400 °C

FOR COMPLETE CONTROL OF THE PROCESS CHAIN

Checklist to define your heater application

Applications:

❑ Heating panel ❑ Heating bars ❑ Heating tubes
❑ Radiation ❑ Vaporizers / Ovens
❑ Others: .....

Process parameters:

Terms of use: ❑ Gaz: ❑ Vacuum (HV/UHV): ❑ Pressure:
❑ Others:

Media: ❑ Solid ❑ Liquid ❑ Gaz Type
❑ Static ❑ Turbulence

Temperature: Begining °C End °C Industrial processes
Internal environment External environment
Uniformity +/- °C

Time: Heating time Cooling time

Dimensions and materials:

Material: ❑ Stainless steel ❑ Inconel ❑ Aluminium
❑ Copper ❑ Others:
❑ Titanium

Dimensions: ❑ L ❑ l ❑ H ❑ Ø

Condition: ❑ Surface Quality ❑ Flatness ❑ Flatness in operation
❑ Surface Treatment

Drawing(s): Customer supply ❑ No ❑ Yes

Power source:

Material: ❑ 230V AC/DC ❑ 400V AC/DC ❑ Other

Regulation: ❑ Two points ❑ PID ❑ Other

Control: ❑ Relay ❑ Impulse group ❑ Phase angle
❑ Other

Manufacturer: ❑ Thermo Est ❑ Client

Legal instructions:

Standards / Guidelines: ❑ Yes ❑ No Which

Certificate: ❑ Material certificate ❑ DC ❑ Other

Technical file: ❑ Thermo Est ❑ Client

Tests:

Final test: ❑ Thermo Est ❑ Specific

Certificats: ❑ Manufacturer's Certificate ❑ Specifications
❑ Other

Design: ❑ Thermo Est ❑ Supply of material by the client

Coding example for Thermo Est heating cable:

- **Single-wire heating cable laser-welded cold junction with ground terminal**
- **Type: 1 - I - NC - 0,63 - 4.3 - 5000 - 2x - DL - 1 - I - Cu - 0,007 - 4.9 - 2000 - 2x - D - T - 2.5 mm² - 1 m**
- Single wire heating cable
- Sheath: “I” (Inconel 600®)
- Core: NiCr 80/20, line resistance: 0,63 Ω/m
- Sheath diameter 4.3 mm, hot part length LC = 5.000 mm two laser welded junctions 2x DL
- Cold parts sheath "I" (Inconel600®), copper conductor, line resistance 0.007 Ω/m
- Sheath diameter 4.9 mm, cold part length LF = 1000 mm
- Electrical termination: 2x D by non-removable junctions with Teflon® insulated copper wire
- L cable =1 meter – s=2.5 mm²
- P=3840W +/- 10% under 110 V

GLOSSARY

Technical terms used in temperature metrology

Adjusting operation:
An operation aimed at bringing a measuring instrument into a state of functioning that is suitable for its use.

Compensation cable:
A compensation cable is a substitution cable, it consists of different conductors than those of the thermocouple, but the characteristics are such that the error remains low.

Extension cable:
This cable consists of conductors of the same nature as the elements of the thermocouple.

Measuring chain:
All the elements needed to know the value or the development of the parameters of a physical system.

Mineral insulated jacketed cables:
Cable for jacketed probes, thermocouples but also for heating cables, the wires are insulated by a highly compacted mineral powder of magnesia MgO or alumina type Al_2O_3.

Black body:
The black body is an ideal object that absorbs all the electromagnetic energy it receives, without reflecting and transmitting any of it.

Dielectric:
The dielectric tests are implemented in the industry for the control of products, devices or equipment of a very great diversity. Their purpose is either the study of high voltage withstand properties and the insulation of insulating materials, or the verification of compliance with the safety standards of electromechanical and electronic components or equipment.

Fahrenheit scale:
Temperature scale still used. Fahrenheit degrees refer to a point on the temperature scale.
32 °F = ice point, 212 °F = boiling point of water.

Celsius scale:
Most common temperature scale. Degrees Celsius means a point in the temperature scale 0 °C = ice point, 100 °C = boiling point of water.

Standard:
Materialised measurement, measuring device, reference material or measuring system to define, carry out, maintain or reproduce a unit or one or several values on a scale that can be used for reference.

Calibration:
An operation that allows you to determine the values of the differences of a measuring device or a measuring system in relation to the calibrated values.

Measuring accuracy:
Concordance between the results of the measuring and a true value of the measurand.

Instrument accuracy:
Ability of a measuring instrument to give answers near to a true value.

Fidelity:
Ability of a measuring instrument to give very similar indications during the repeated application of the same measurand under the same measuring conditions.

Measurement uncertainty:
Parameter associated with the result of a measurement operation that characterises the dispersion of the values obtained.

Accuracy:
Ability of a measuring instrument to give answers near to a true value.

Applicable standards for electrical equipment for potentially explosive atmospheres:
EN 50014: general rules
EN 50018: security "d" explosion-proof enclosure
EN 50019: security "e" increased safety
EN 50020: security "i" intrinsic safety

Applicable standards for metrology:
ISO 17025 (release 2017) : General stipulations concerning the competence of calibration and testing laboratories.
NF X 07-001 standard: international vocabulary for general terms of metrology.

Applicable standards for thermoelectric couples:
EN 60584-1: part 1 - "thermoelectric couples" reference tables
EN 60584-2: part 2 - "thermoelectric couples" tolerances
EN 60584-3: part 3 - extension and compensation cables - tolerances and identification system
EN 61515: thermoelectric cables and couples mineral insulation said "jacketed"

Applicable standards for resistance probes:
EN 60751 "November 2008": Industrial platinum resistance thermometers and platinum thermometric sensors or EN 60 751 standard "November 1995"

Repeatability:
Closeness of the concordance between the successive measuring results of the same measurand, all the measuring carried out under the same measuring conditions.

Isolation resistance:
Measured electrical resistance between any component of the electrical circuit and the sheath at ambient temperature or at elevated temperatures and at a specified measurement voltage (continuous or alternating).

Platinum resistance:
Resistance consisting of a platinum wire or film having defined electrical characteristics, encapsulated in an insulator (usually glass or ceramic), designed to be assembled in a resistance thermometer or an integrated circuit.

Resolution:
The smallest difference of a display device that can be significantly detected.

Resistance probe:
Temperature sensor with platinum-type element 100 Ω at 0 °C, available in ceramic coating, glass coating or thin film type.

Cold junction (reference junction):
Junction whose known temperature serves as a reference for measuring a thermocouple.
(Theoretically - in laboratory 0 °C, on site to be measured).

Hot junction (measuring junction):
Junction at the point of measurement, the most usual from ground insulated hot junction but also available with a hot junction to the ground.

Thermal response time:
The time it takes for a sensor to respond to a specified percentage of a temperature step change. To specify the response time, it is necessary to declare the response percentage, usually $t_{0,9}$, $t_{0,5}$, $T_{0,1}$, that give time for 90%, 50% or

10% of the answer. The test medium and its flow conditions must be specified (usually circulating water and/or airflow).

Thermocouple:
Electrical circuit composed of two conductors of different natures. The thermocouple generates a voltage that depends on the temperatures to which the hot and cold junctions are subjected.

Platinum resistance thermometer:
Temperature-sensitive device, consisting of one or more sensitive platinum resistors with a protective sheath, internal connection wires and external terminals to enable the connection of electrical measuring instruments. Mounting means and connection heads may be included. Separate protective tubes or thermowells are not included.

Traceability:
The traceability of the connection determines the ability of a measurement result to be linked to appropriate standards by the intermediary of an uninterrupted comparison chain.

Verification:
Calibration, the result of which is expressed in terms of compliance or non-compliance with a requirement.

NOTES

NOTES

THERMO EST'S SERVICES

MORE THAN A SUPPLIER, A VALUABLE PARTNER…

SUPPORT AND PROXIMITY:

Offering innovative products is not everything, we must also think about the service and customer support!

Choosing Thermo Est means to choose:

- Customer service
- Continuous innovation
- A privileged and exclusive partnership
- A dynamic and accessible team, listening to and serving its customers, from the quotation to the order
- An international presence that is carried out with the values that drive the men and women of Thermo Est every day

INNOVATIVE SOLUTIONS FOR:

Temperature measurement

- Temperature sensors (resistance probes, thermocouples) PREMIUM and EXCLUSIV range for extreme applications

Metrology

- Laboratory and on-site metrology services

Heating solutions

- Mineral insulated jacketed cables
- Custom heating elements

Services

- Tests - qualifications (non-destructive or destructive tests)
- Instrumentation of carters, cylinder heads, exhausts collectors, temperature rake and pressure custom heating devices





Do not hesitate to contact **Thermo Est**

SRC@thermoest.com

Our commitments:

A key concern and priority for **Thermo Est**, is customer satisfaction. After over 44 years' experience,**Thermo Est** is proud to offer products with high quality standards, close relations with customers and responsiveness to reinforce the service offered.

This service is at your disposal to meet your needs with a constant concern for quality and adaptability.

Thermo Est

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