

THERMOCOUPLES RESISTANCE THERMOMETERS



GEFRAN



Thanks to forty years of experience, Gefran is the world leader in the design and production of solutions for **measuring, controlling, and driving industrial production processes**.

We have branches in 14 countries and a network of over 80 worldwide distributors.

QUALITY AND TECHNOLOGY

Gefran builds all of its thermocouples and resistance thermometers in temperature-controlled rooms at its facility in Italy.

We use top-quality raw materials for **safe and reliable sensors** in tolerance class 1 (ref.: IEC60584-2) and in tolerance classes up to 1/10 din, with precision of $\pm 0.03^{\circ}\text{C}$ at 0°C (ref. DIN43760, IEC751).

SERVICES

A team of Gefran experts works with the customer to select the ideal product for its application and to help install and configure devices.

Gefran offers a wide range of courses at different levels for the technical-commercial study of the Gefran product range as well as specific courses on demand.

In addition to foreseeing the market application needs, Gefran forms partnerships with its customers to find the best way to optimise and boost the performance of various applications.

Gefran products communicate with one another to provide integrated solutions, and can dialogue with devices by other companies thanks to compatibility with numerous fieldbuses.



APPLICATIONS



CLIMATE-CONTROLLED ROOMS



PHARMACEUTICAL INDUSTRY



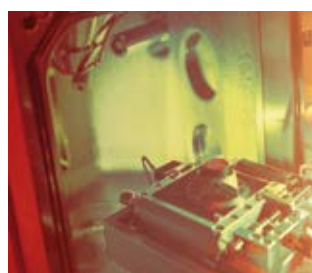
FOOD AND CANNING INDUSTRY



GLASSWORKS



STEEL INDUSTRY, FOUNDRIES,
FURNACES



FURNACES FOR ALUMINUM,
CERAMICS, HEAT TREATMENTS



INJECTION-EXTRUSION, BLOWING



CHEMICAL AND PETROCHEMICAL
INDUSTRY

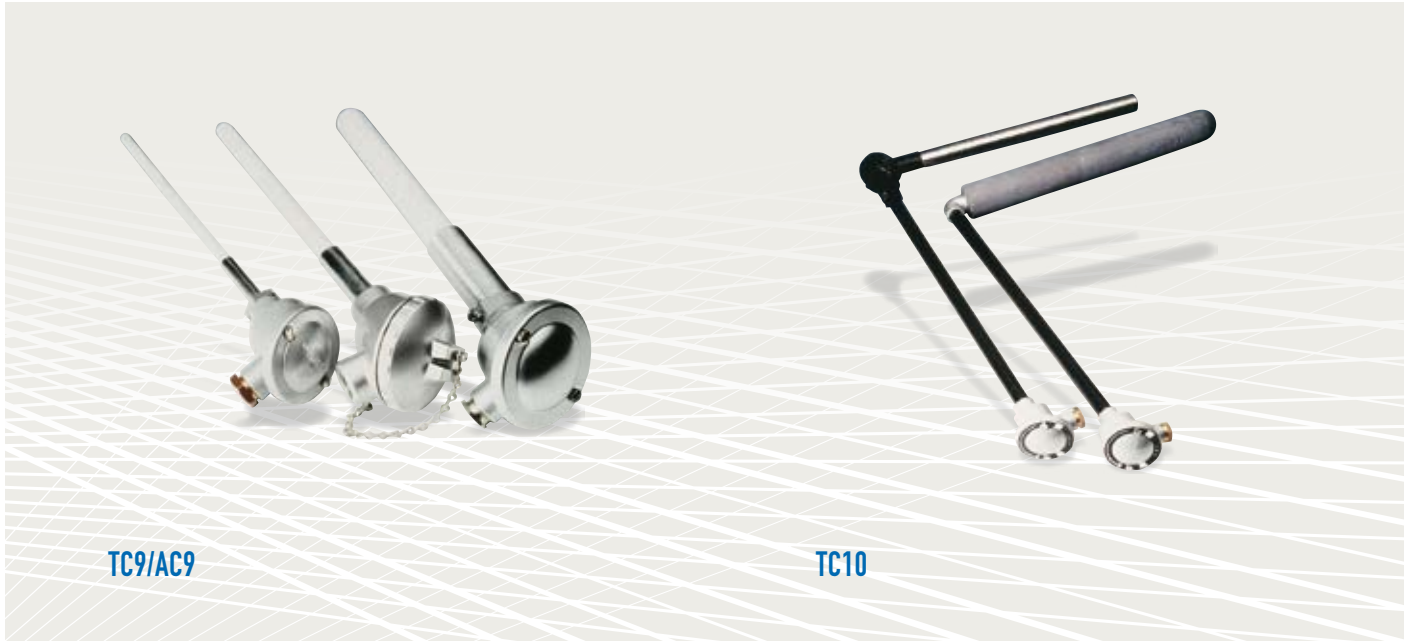


WOODWORKING



STEEL INDUSTRY AND HEAT
TREATMENT

PRESENTATION



Gefran models TC9/AC9 and TC10 thermocouples for high-temperature applications (for example: heat treatment furnaces) or for direct immersion (for example: aluminum melting furnaces)

OPERATING PRINCIPLE OF THERMOCOUPLES

Thermocouples operate on the basis of the Seebeck thermoelectric effect, according to which in a circuit formed of two different metallic conductors, when the two junctions are at different temperatures, current generated by an electromotive force flows in the circuit, the quantity of which is directly proportional to the temperature difference between the two junctions.

OPERATING PRINCIPLE OF METAL RESISTANCE THERMOMETERS

The resistance of metal conductors varies with temperature. Resistance thermometers (RTs) exploit this principle to provide variations in resistance in proportion to temperature changes.

The coefficient of temperature depends on the type of metal used to make the resistance thermometer.

The material most often used is platinum, due to its high resistance to oxidation, electrical resistivity, and reproducibility in a wide variety of applications

HOW TO CHOOSE THE RIGHT SENSOR

There are many variables to consider when choosing a sensor, such as:

- **Application characteristics** (temperature range, pressure range, process fluid, potentially explosive atmosphere, need to use corrosion-proof materials, etc.)
- **Size characteristics** (external diameter of sheath, sheath material, immersion length, process connection, type of cold junction, etc.)
- **Precision class**
- **Sensor response times**

TEMPERATURE LIMITS

Temperature limits of thermocouple MgO sensitive element or ceramic insulators based on sheath thickness

WITH CERAMIC INSULATORS							WITH MGO MINERAL OXIDE					
Ø	TC6/AC6		Ø	TC8/AC8		TC9	Ø	TC1M/TC5M TC6M/AC6M TC7M		Ø	TC2/AC2	
Element	J	K	Element	J	K	K	Element	J	K	Element	J	K
5mm	480°C	980°C	16mm	690°C	1090°C	1060°C	1mm	320°C	750°C	10mm	550°C	1050°C
6mm	500°C	1000°C	3/8"	690°C	1090°C	1060°C	1,5mm	340°C	870°C	12mm	550°C	1050°C
8mm	500°C	1000°C	1/2"	760°C	1250°C	1060°C	2mm	370°C	960°C	14mm	550°C	1050°C
10mm	500°C	1000°C	3/4"	760°C	1250°C	1060°C	3mm	390°C	970°C	16mm	550°C	1050°C
12mm	600°C	1060°C					4,5mm	480°C	980°C	3/8"	550°C	1050°C
CABLE			PVC	GSC	TES	TTS	6mm	550°C	1050°C	1/2"	550°C	1050°C
STANDARD	TC1/TC3/T4F/T4A/TC5		-30°C 95°C	-60°C 200°C	-60°C 250°C	-60°C 350°C	8mm	640°C	1090°C	3/4"	550°C	1050°C

PRECISION CLASS FOR THERMOCOUPLES (REF. IEC 584-2)

TYPE	T	E	J	K/N	R/S	B
TOLERANCE CLASS 1 <i>Temperature range</i> <i>Tolerance</i>	-40...+125 °C ±0,5 °C	-40...+375 °C ±1,5 °C	-40...+375 °C ±1,5 °C	-40...+375 °C ±1,5 °C	0...+1100 °C ±1 °C	- -
<i>Temperature range</i> <i>Tolerance</i>	125...+350 °C ±0,004 • [t]	375...+800 °C ±0,004 • [t]	+375...+750 °C ±0,004 • [t]	+375...+1000 °C ±0,004 • [t]	+1100...+1600 °C ±[1+0,003 (t-1100)] °C	- -
TOLERANCE CLASS 2 <i>Temperature range</i> <i>Tolerance</i>	-40...+133 °C ±1 °C	-40...+333 °C ±2,5 °C	-40...+333 °C ±2,5 °C	-40...+333 °C ±2,5 °C	0...+600 °C ±1,5 °C	- -
<i>Temperature range</i> <i>Tolerance</i>	+133...+350 °C ±0,0075 • [t]	+333...+900 °C ±0,0075 • [t]	+333...+750 °C ±0,0075 • [t]	+333...+1200 °C ±0,0075 • [t]	+600...+1600 °C ±0,0025 • [t]	+600...+1700 °C ±0,0025 • [t]
TOLERANCE CLASS 3 <i>Temperature range</i> <i>Tolerance</i>	-67...+40 °C ±1 °C	-167...+40 °C ±2,5 °C	- -	-167...+40 °C ±2,5 °C	- -	+600...+800 °C +4 °C
<i>Temperature range</i> <i>Tolerance</i>	-200...-67 °C ±0,015 • [t]	-200...-167 °C ±0,015 • [t]	- -	-200...-167 °C ±0,015 • [t]	- -	800...1700 °C ±0,005 • [t]

PRECISION CLASS FOR PT 100 RESISTANCE THERMOMETERS

DIN 43760 IEC 751	B	A	-	-	-
	1 DIN	1/2 DIN	1/3 DIN	1/5 DIN	1/10 DIN
PRECISION A 0°C	± 0,3°C	± 0,15°C	± 0,1°C	± 0,06°C	± 0,03°C

SELECTION GUIDE

SENSITIVE ELEMENT	CONSTRUCTION	ELECTRICAL CONNECTION	OUTPUT TYPE	TYPE / USE	SERIES
RESISTANCE THERMOMETER	CABLE	CABLE	PT100	GENERIC	TR1
				COMPRESSION SPRING	TR5/TR5N
				GENERIC	TRD
	MgO	TERMINAL BOARD	PT100	INSERT	TRI
		CONNECTOR	PT100	GENERIC	TR7M
		CABLE	PT100	GENERIC	TR1M
				COMPRESSION SPRING	TR5M
				PENETRATION MEASUREMENT	TRPM
		HEAD	PT100	GENERIC VIBRATIONS	TR6M
				GENERIC VIBRATIONS	TR2
			4-20Ma	GENERIC VIBRATIONS	AR6M
				GENERIC VIBRATIONS	AR2
	CERAMIC INSULATORS	HEAD	PT100	GENERIC	TR6
				AMBIENT	TRA
			4-20mA	GENERIC	AR6
				AMBIENT	TRA
	MELT		PT100	EXTRUDED MELT POLYMER	TRM
THERMOCOUPLE	CABLE	CABLE	J/K	GENERIC	TC1
				TIP	TC3
				RING	T4A
				PLATE	T4P
				BAND	T4F
				COMPRESSION SPRING	TC5/TC5N
	MgO	CONNECTOR	J/K	GENERIC	TC7M
		TERMINAL BOARD	J/K	INSERT	TCI
		CABLE	J/K	GENERIC	TC1M
				COMPRESSION SPRING	TC5M
				PENETRATION MEASUREMENT	TCPM
		TERMINAL BOARD	J/K	GENERIC VIBRATIONS	TC6M
				GENERIC VIBRATIONS	TC2
			4-20mA	GENERIC VIBRATIONS	AC6M
				GENERIC VIBRATIONS	AC2
	CERAMIC INSULATORS	TERMINAL BOARD	J/K	GENERIC	TC6
				GENERIC	TC8
				HIGH TEMPERATURE	TC9
				MELTED METAL	TC10
			4-20mA	GENERIC	AC6
				GENERIC	AC8
				HIGH TEMPERATURE	AC9
	MELT		J/K	EXTRUDED MELT POLYMER	TCM

TC = Thermocouple TR = Resistance Thermometer A = Amplified thermocouple or resistance thermometer
M = Mineral oxide (MgO) thermocouple or resistance thermometer

ACCESSORIES / WELLS

STAINLESS STEEL OR BRASS PRESSURE FITTINGS



SIGNAL AMPLIFIERS 4÷20MA AND FOR PT100 RESISTANCE THERMOMETER



SIGNAL AMPLIFIERS PROGRAMMABLE FROM PC



ELECTRICAL CONNECTOR HEADS



DIN B



EEx-d



DIN A



BUZ-H



DIN BUS

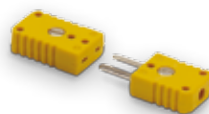


DIN J

STANDARD COMPENSATED CONNECTORS



MIGNON COMPENSATED CONNECTORS



LEMO CONNECTORS



DIN BAR ADAPTOR



TDP DISPLAY



WELLS



TWB1
Thermowell from
cylindrical bar stock



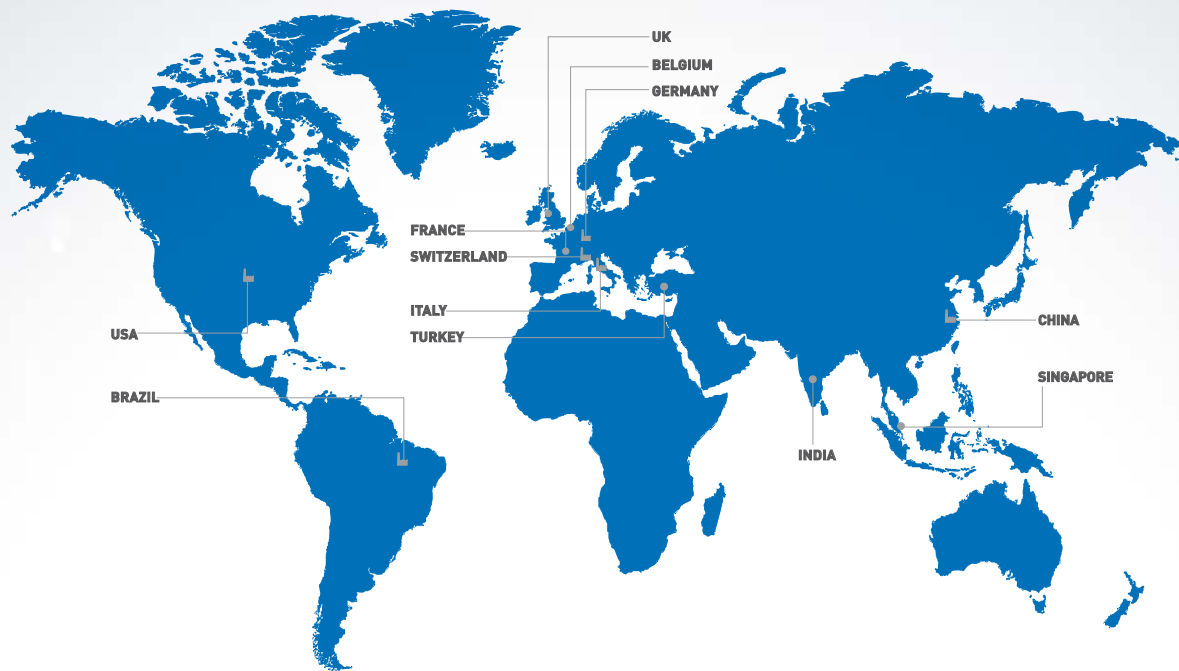
TWT1
Thermowell from
cylindrical pipe stock



TWB2
Flanged thermowell from
cylindrical bar stock



TWT2
Flanged thermowell from
cylindrical pipe stock



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