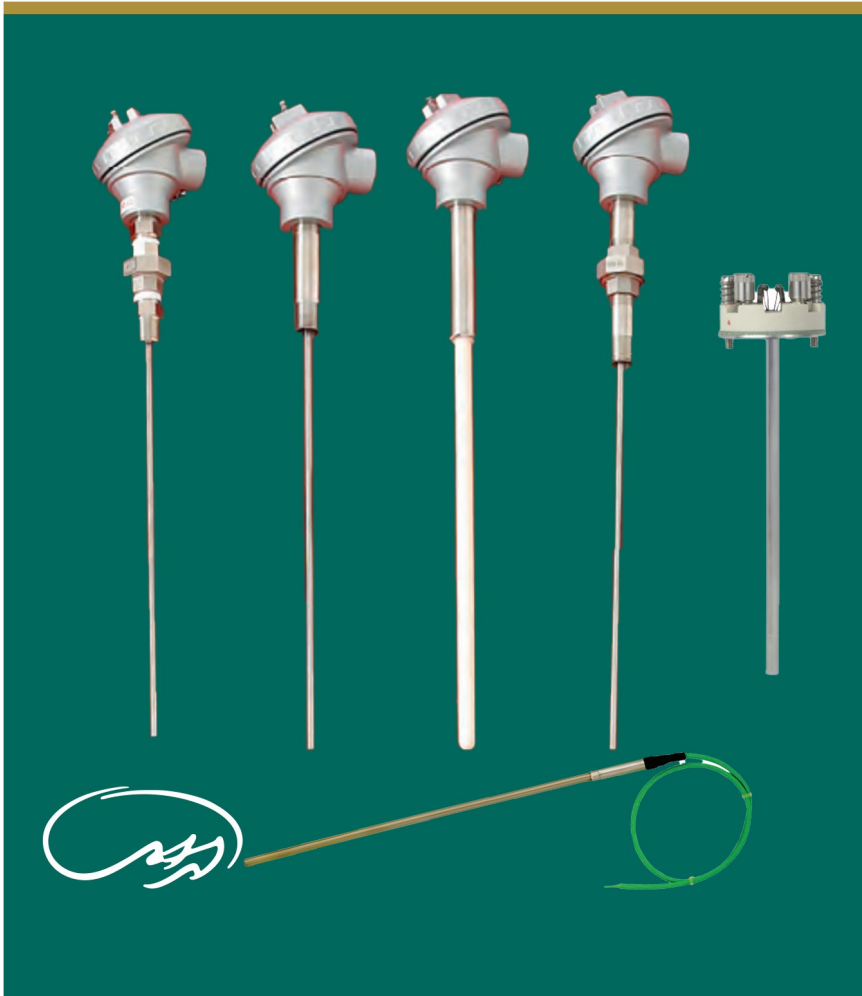




TEMPERATURE MEASURING WITH TERMO SENSOR



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Introduction

Aramak temperature measurement sensors are available for light to heavy duty applications, high pressures, high temperatures ; as well as meeting many general service industry needs.

Temperature sensors are selected on the basis of pressure, temperature, flow, vibration and corrosion parameters. The “K” type thermocouple and “RTD” resistive (PT100) types are generally the costly and most versatile ones. Also available are customized temperature measurement sensors for unique applications. Selection of proper temperature measurement sensor is a critical job to most applications. To configure an ARAMAK temperature measurement sensor part number follow the “Ordering Code Information” section.

Sensor Selection

Higher temperatures are measured with thermocouples. Different types thermocouples can be used depending on the process requirements. Available types are L, J, K, N, S, and B. The respective voltage series and limiting deviations are standardized according to DIN EN 60584 and DIN 43710 standards. Compensating cables or thermal cables must be used for connecting the sensor to the measuring device. The different parts of thermocouple wire (sheath and stranded wire) are color coded according to the types. Applications above 800 °C require the use of protection fittings made of heat-resistant steel or ceramic. See below table for selection and EMF. In many industrial applications temperature is measured with RTD temperature. Platinum is widely used as the resistance material because it guarantees high measuring accuracy and long-term stability. The temperature-dependent electrical resistance, which increases with rising temperature; functions as the measured value here.

This is referred to as a positive temperature coefficient (PTC). The most widely used nominal values are Pt100, Pt500, and Pt1000. The various nominal values, temperature-dependent output characteristic, and tolerances are specified in DIN EN 60751. If extended transmission paths need to be covered, a transmitter in the terminal head with an output of 4 to 20 mA is generally recommended.



Specification

Resistance temperature detector

The use of a mineral insulated cable and special sensors, including the installation, makes the vibration resistance of all industrial thermometers very high.

The peak-to-peak acceleration values of 30 m/sec. (3g) for frequencies between 10 and 500 Hz (already defined in accordance with standard IEC 60751 for increased requirements) are exceeded by all industrial temperature sensors. The optimally suitable combination of measuring range, diameter, accuracy, and vibration resistance can be taken from the following table.

Accuracy classes of measurement resistors in accordance with IEC 60751

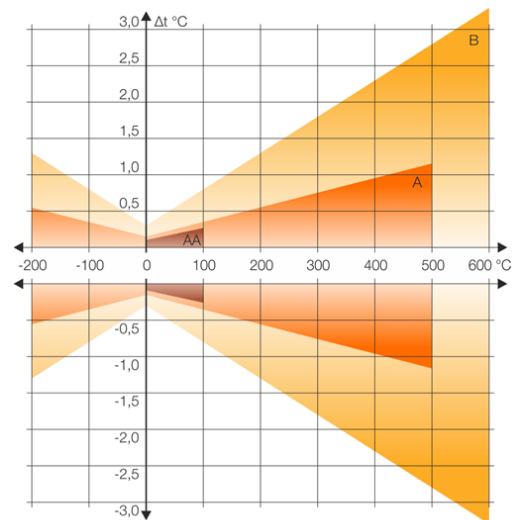
Both thin film resistors and wire wound resistors in accordance with IEC 60751 can be used across the entire range of application (also with increased accuracy class AA or class A). Subsequently, only the accuracy class of the temperature range used can remain valid.

Example: A sensor of class AA is used at 290 °C (554 °F). After this albeit brief application, class A applies for this sensor.

Thin film resistor (TF) – Base design

	Meas. range	Vibration resistance
Class B	–50 to 400 °C (–58 to 752 °F)	100 m/sec ² (10g) at 10 to 500 Hz
Class A	–30 to 300 °C (–22 to 572 °F)	
Class AA	0 to 100 °C (32 to 212 °F)	

	Single sensor			Double sensor		
	2-W	3-W	4-W	2-W	3-W	4-W
3.0 mm, class B	•	•	•			
3.0 mm, class A		•	•			
4.5 mm, class B	•	•	•			
4.5 mm, class A		•	•			
6.0 mm, class B	•	•	•	•	•	•
6.0 mm, class A		•	•		•	•
6.0 mm, class AA		•	•		•	•



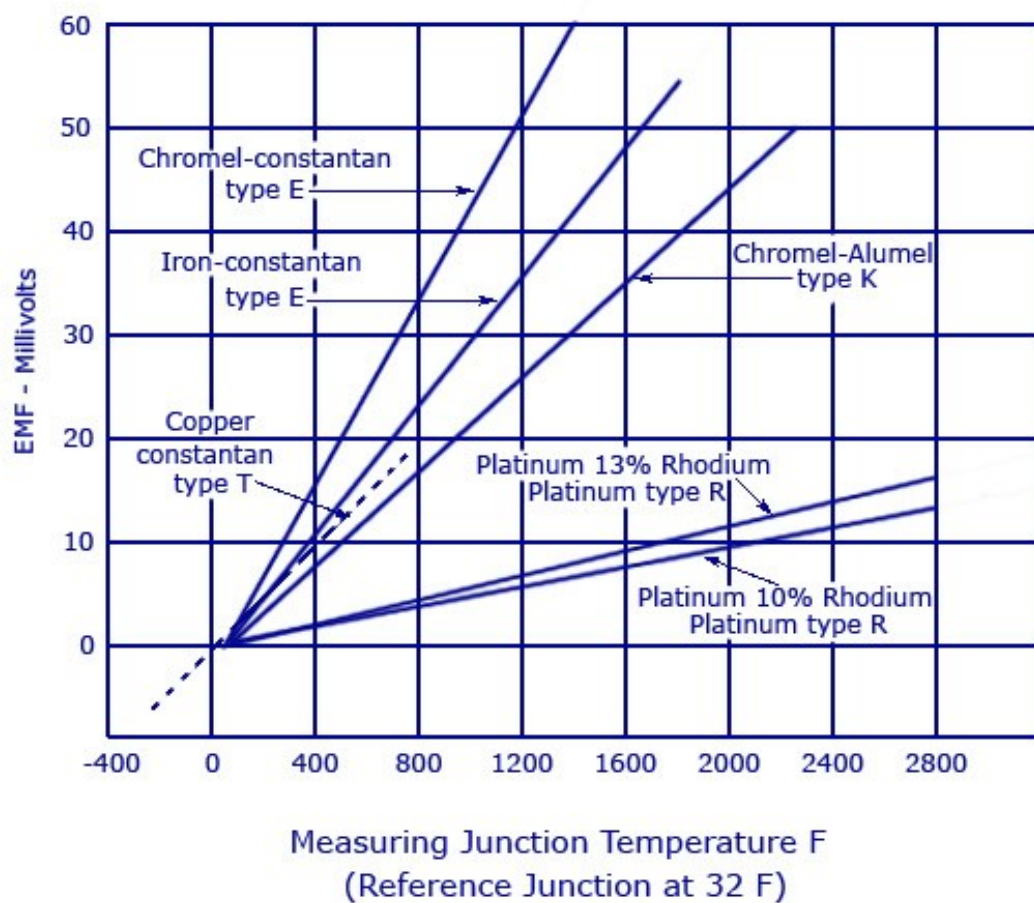
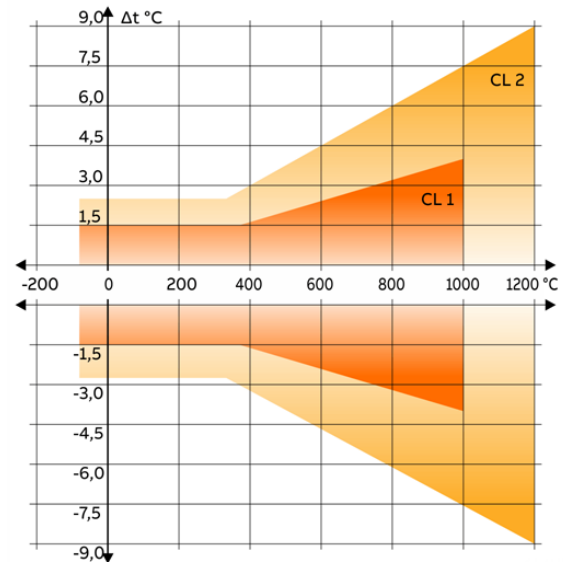


Specification

Thermocouples

The accuracy class of the thermocouples are in accordance with the IEC60584 international Standard.

Higher temperatures are measured with thermocouples. Different thermocouples can be used depending on the requirements. Available types are L, J, K, N, S, and B. The respective voltage series and limiting deviations are standardized according to DIN EN 60584 and DIN 43710. Compensating cables or thermal cables must be used for the connection. The different lines (sheath and stranded wire) are color coded according to the type. Applications above 800 °C require the use of protection fittings made of heat-resistant steel or ceramic. See below table for selection and EMF.





Installation

The Thermometer after being installed on thermowell can be mounted on the wall of pipes or vessels or other plant parts that require temperature measurement.

The interface components for the process connection and the related gaskets are not normally provided with the sensors and must be purchased by the customer.

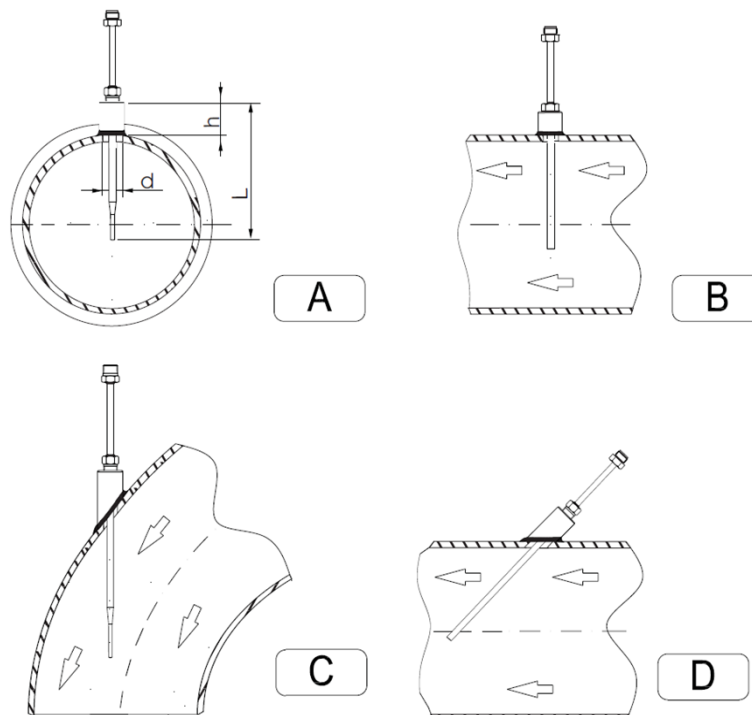
Immersion length may influence the accuracy of the measurement. If the immersion length is too low, an error may be generated in the temperature recorded due to the lower temperature of the process fluid near to the walls and heat transfer, which takes place through the sensor stem. The incidence of such an error can be relevant if there is a large difference between the process temperature and ambient temperature. In order to avoid this source of inaccuracy, the

thermowell should have a small diameter and the immersion length (L) should be, if possible, at least 80 to 100 mm.

For pipes with a small section, it is necessary to make sure that the tip of the probe reaches or slightly exceeds, if possible, the axis line of the duct (see fig. A & B). Insulation of the outer part of the sensor reduces the effect produced by a low immersion length. Another solution may be a tilted installation (see fig. C & D). For use in the food industry, it is best to follow the rule $h \leq d/2$.

With regard to corrosion, the base material of the wetted parts (SS 316L/1.4404, SS 316Ti/1.4571, Hastelloy C) can tolerate the common corrosive media right up to even the highest temperatures.

For further information on specific applications, please contact the ARAMAK Customer Services.



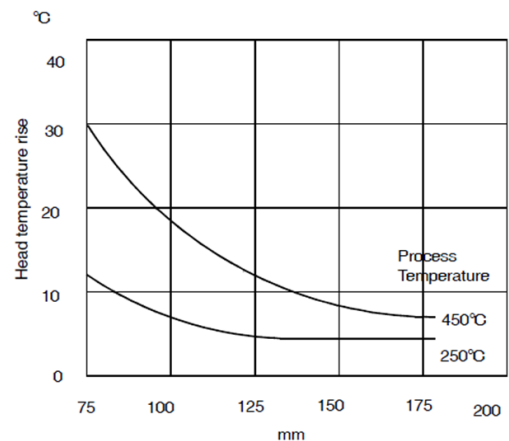


Terminals Head

A thermometer terminal head is recommended to protect the connection between the thermocouple and the extension wire. In alternative a 2-wire transmitter can be mounted on the head. The head also permits easy replacement of the thermometer. The most widely used connection heads are constructed in light metal, usually aluminum, according DIN 43729 type B.

All terminal heads are provided for connection to the thermowell and have a cable gland with gasket. The maximum ambient temperature for head is 80°C up to 130°C with appropriate gaskets.

The curves in the figure are used to get an indication how big is the rise of temperature in the head, given the process temperature is above local ambient temperature.



Cable entry

All terminal heads are provided for connection to the sensor and have a cable gland with gasket. The maximum ambient temperature for head is 80°C up to 130°C with appropriate gaskets.

The cable entry with gasket type is shown below.



Standard



Plastic



Brass,
nickel-plated



Stainless steel



Junction box,
M12 x 1 (4-pin)



Thermocouple Protection

CERAMIC PROTECTION SHEATHS

Temperature Controls available from the stock have a large range of ceramic sheaths. Ceramics are the most economical impervious material for use as a protection sheath for thermocouples. They are gas tight and suitable for use to 1400 Deg C. Alumina ceramics have an Alumina content of 99.7% and are best suited for use with noble metal thermocouples. Rubalit sheaths offer a high working temperature to 1700 Deg C and resist chemical attack. Sizes available from stock are in 1000 & 1500 mm Lengths .

6mm OD	4mm ID	Sheath COE
8mm OD	5mm ID	Sheath COE
10mm OD	7mm ID	Sheath COE
12mm OD	8mm ID	Sheath COE
15mm OD	10mm ID	Sheath COE
17mm OD	13mm ID	Sheath COE
20mm OD	15mm ID	Sheath COE
25mm OD	18mm ID	Sheath COE



HEXOLOY PROTECTION SHEATHS

Hexoloy is a sintered silicon carbide sheath and is ideal as a high performance thermowell or thermocouple protection sheath. Hexoloy is the hardest commercially available material and provides a wide range of superior properties.

- High Temperature Strength to 1900 °C
- Excellent Thermal Shock Resistance
- Universal Corrosion resistance
- High thermal conductivity equal to stainless steel and 5 times that of alumina
- Exceptional Wear Resistance— 50 % Harder than Tungsten Carbide



SIALON PROTECTION SHEATHS

Sialon Thermocouple protection sheaths are a silicon nitride based high quality ceramic offering superior performance in molten aluminum with direct temperature sensing in the metal. Sialon offers

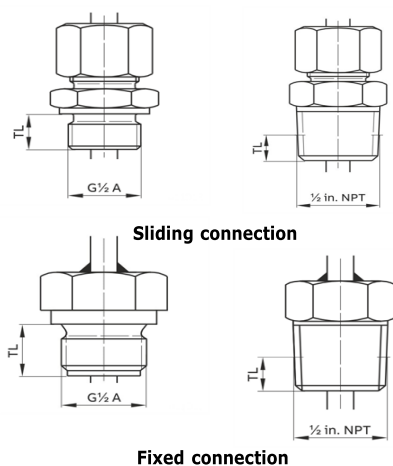
- Non wetting to Aluminum and it's alloys
- Excellent thermal shock resistance
- Low maintenance
- Constant temperature monitoring





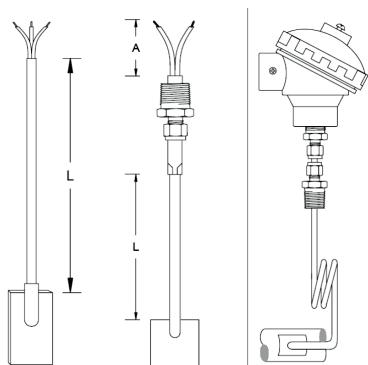
Sensor Type & Connection

Process Connection

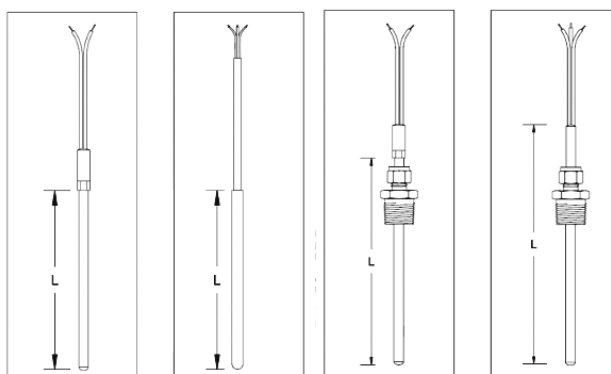


Design	Material	Thread	Mineral insulated
Fixed connection	Stainless steel	M8 x 1	
		G 1/4 A	
		G 1/2 A	
		1/4 in NPT	
		1/2 in NPT	
Sliding connection	Stainless steel	M8 x 1	
		G 1/4 A	
		G 1/2 A	
		1/4 in NPT	
		1/2 in NPT	

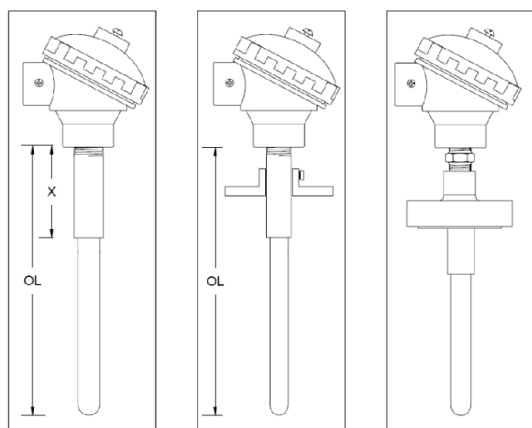
Skin Type Sensor



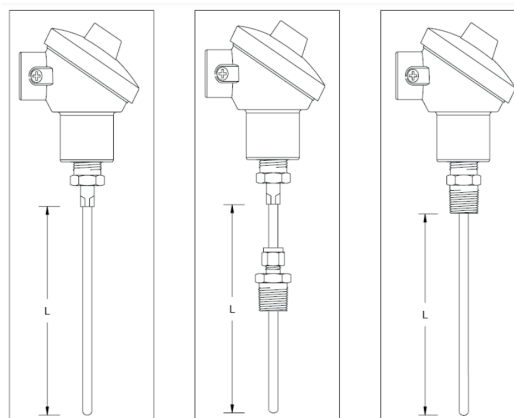
Wired RTD & TC Sensor



Furnace & high Temperature



Complete RTD & TC





Ordering Code Information

[Please check the order code in our website. \(Click here\)](#)



Contact us

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