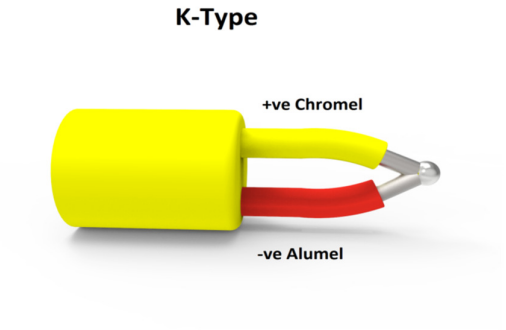
TYPE K THERMOCOUPLE

Introduction:-

Type K Thermocouple provides widest operating temperature range. It consist of positive leg which is non-magnetic and negative leg which is magnetic.In K Type Thermocouple traditional base metal is used due to which it can work at high temperature and can provide widest operating temperature range. One of the constituent metal in K Type Thermocouple is



Nickel, which is magnetic in nature.
The characteristic shown by K Type Thermocouple is that they undergo a deviation in output when magnetic material reaches its Curie Point, at around 185 °C. K Type thermocouple work very well in oxidizing atmosphere at temperatures up to 1260°C (2300°F) and its tolerance class is ± 1.5 K between -40 and 375 °C.

THERMOCOUPLE CONDUCTOR COMBINATION TYPE	INTERNATIONAL COLOUR CODE TO IEC 5843:1989	AMERICAN TO ANSI/MC96.1	JAPANESE TO JIS C 1610-1981
K			

Why To prefer K Type Thermocouple:-

- One of the major advantage of K type thermocouple over other thermocouple's is it can function in rugged environmental condition & in various atmospheres.
- It has integrated composition of Chromel and Alumel wires has a range of -270 °C to 1260 °C and an output of -6.4 to 54.9 mV over maximum temperature range.
- Also known as general purpose thermocouple due to its wide range of temperature.
- Type K has longer life than Type J as in Type J Fe (iron) wire oxidizes rapidly, especially at higher temperature.
- They are inexpensive.
- Have a fast response time.
- Small in size and are reliable.

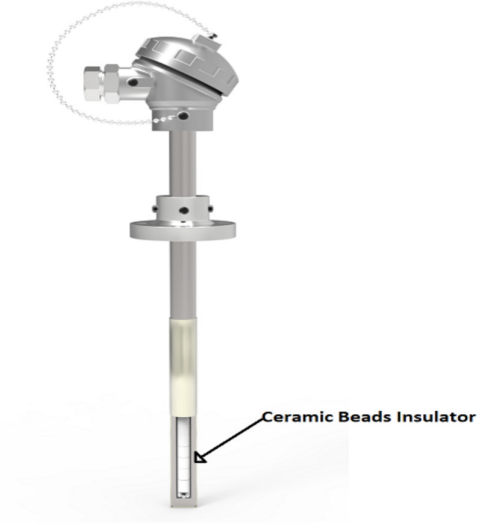
- Generally used at temperatures above 540 degrees C.

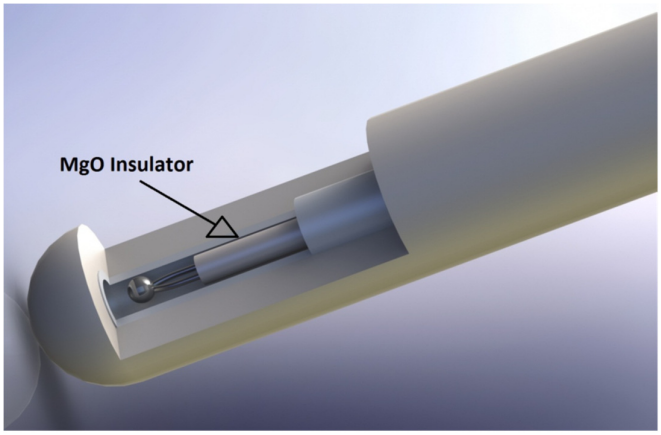
Composition:-

In K Type Thermocouple positive leg is composed of 90% nickel, 10%chromium and a negative leg is composed of 95% nickel, 2% aluminum, 2% manganese and 1% silicon. These are the most common general purpose thermocouple with a sensitivity of approx 41µV/°C.

Type K Insulation Material:-

In Type K Thermocouple mainly two type of insulation is used firstly Ceramic beads insulation is used as it is a lightweight insulating product. It is made from high purity alumino-silicate materials. It has low thermal mass which means that it does not retain heat, low thermal conductivity and is an extremely effective insulation material as it can withstand high temperature of 1260 °C so it it best suited material for Type K thermocouple.
Secondly compacted mineral insulation and outer metal sheath (MgO) is used. Magnesium Oxide has a high dielectric strength, responds quickly to temperature changes and is very durable. It has typical Composition of the Standard Quality MgO (97%) and the High Purity MgO and AI2O3.
Magnesium Oxide insulation is recommended for K Type thermocouple when Thermocouple are to be immersed in liquids, high moisture, corrosive gases or high pressures. The thermocouple can be formed to reach otherwise inaccessible areas.





Temperature Range:-

To find appropriate range of thermocouple we should use appropriate wire because different wires measure various temperature ranges. Of the four major thermocouple types, type K covers the widest range :-

- Thermocouple grade wire, –454 to 2,300F (–270 to 1260**°C**)
- Extension wire, 32 to 392F (0 to 200**°C)**

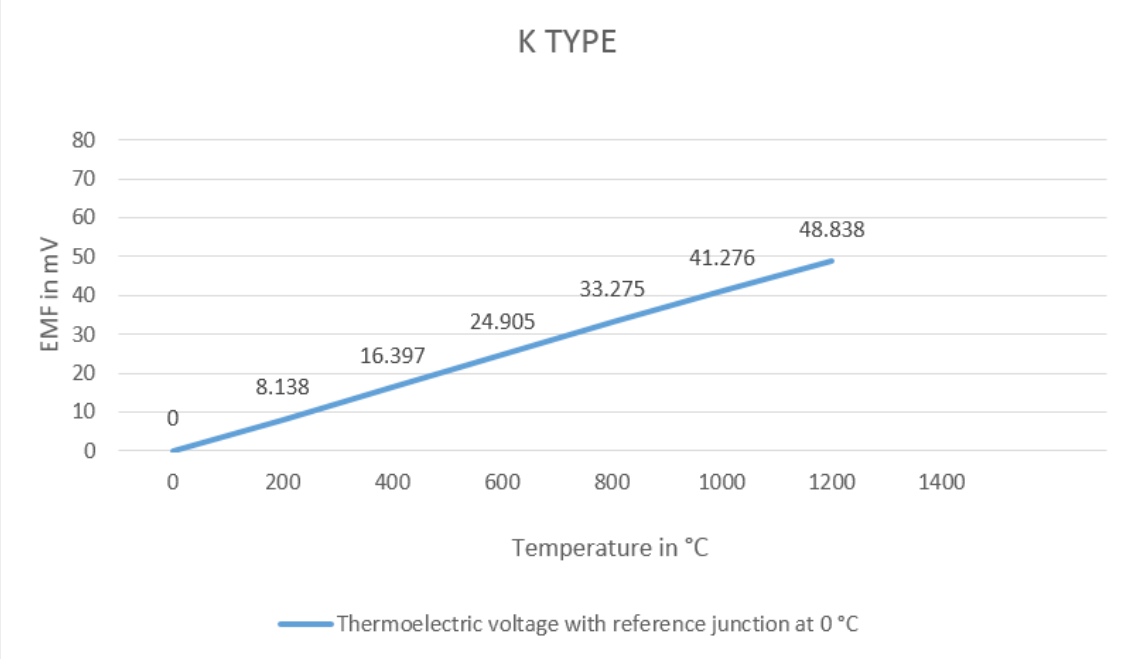
Accuracy (whichever is greater):

- Standard: +/- 2.2**°C** or +/- .75%
- *Special Limits of Error: +/- 1.1***°C** *or 0.4%*

Tolerance Class:-

Type	Temperature range (°C)				Tolerance class (°C)	
	Continuous		Short-term		One	Two
	Low	High	Low	High		
K	0	+1100	−180	+1300	−40 – 375: ±1.5 375 – 1000: ±0.004×*T*	−40 – 333: ±2.5 333 – 1200: ±0.0075×*T*

EMF Vs Temperature Graph for K Type Thermocouple:-



Pros And Cons:-

Pros

- To measure temperature it provide good linearity of emf.
- It provide good resistance aganist oxidation below 1000 °C (1600°F).
- Highly stable output.

- Comparitively cost effective than other thermocouple.

Cons

- Not suitable for reducing atmosphere but can withstand metallic vapor.
- Aging of the emf characteristic, when compared to noble metal thermocouples (B, R, and S).
- Not suitable for vacuum applications due to vaporization of chromium in the positive element.
- **Green-Rot**is phenomenon may occur due to low oxygen level for the thermocouples which are used between 815°C to 1040°C (1500°F to 1900°F).
- Type K thermocouples should not be used in Sulphuric environment since both elements will rapidly corrode and the negative element will eventually fail mechanically due to becoming brittle.

Uses:-

They are mostly used for applications at temperatures above 550 °C up to the maximum working pressure of the thermocouple.

- They are used in many industries like Steel & Iron to monitor temperature & chemistry through out the steel making process.
- Used for testing temperatures associated with process plants e.g. chemical production and petroleum refineries
- Used for Testing of heating appliance safety.
- Type K is commonly used in nuclear applications because of its relative radiation hardness.