Thermocouple Element :- Elements used in all Tempsens assemblies are made from using high precision calibrated thermocouple wires with class 1 accuracy. Tempsens ensures all thermocouples supplied in a single project with the same batch of element and with the same accuracy to avoid any temperature deviation. Measuring Junctions are made with highly skilled workmanship and each measuring junction is traceable in form of photograph in computer. In high temperature noble metal thermocouples R, S & B are the most used element world wide below are the technical specifications these element.

Type S : Pt vs. Pt 10 Rh

This combination is one of the most common and widely used noble metal thermocouple. The accuracy of S type element is excellent through out the range, this element has excellent mechanical and chemical properties. This combination is suitable for oxidizing atmosphere, but not suitable for reducing atmosphere.

Recommended temperature range
400°C to 1650°C continuously

Accuracy Level
Standard : ± 1.5°C or ±0.25%
Special : ± 0.6°C or ±0.1%

Size available: 0.30mm to 1mm diameter.

Type R : Pt vs. Pt 13 Rh

This combination is very similar to S type element with slight higher thermoelectric output (mV), all other properties and recommendations are same for S type.

Recommended temperature range
400°C to 1650°C continuously

Accuracy Level
Standard : ± 1.5°C or ±0.25%
Special : ± 0.6°C or ±0.1%

Size available: 0.30mm to 1mm diameter.

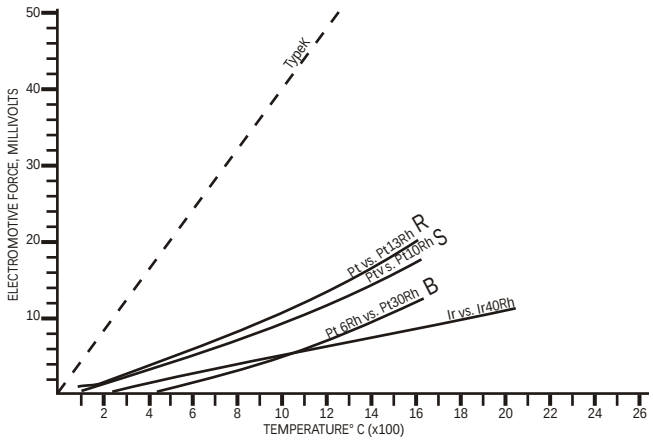
Type B : Pt 6 Rh vs. Pt 30 Rh

This combination is used for higher temperature application where S & R type elements are showing accelerated drift or physical degradation. Thermoelectric output of B type is lower than other two combinations.

Recommended temperature range
400°C to 1750°C continuously

Accuracy Level
Standard : ± 0.5%
Special : though special class is not available but higher accuracy are available on request.

Size available: 0.30mm to 1mm diameter.



Thermocouples Junction Configurations

Thimbles :- In all Glass Immersion Thermocouples we use special hardened platinum alloys. The stress rupture strength of these hardened material is even better than Pt-10%Rh alloy, this can be checked with below table:-

	Density g/cm^3	Melting Point or solidus Temperature °C	Vickers hardness	Stress repture strength (100 h / 1400°C) N/mm^2	(100h / 1600°C) N/mm^2
Pt	21.4	1772	45	< 1	-
Pt-10Rh	19.9	1840	95	5	2.8
Pt (Hardened)	21.3	1772	72	25	-
Pt-5Au (Hardened)	21.3	1675	115	5	-
Pt-10Rh (Hardened)	19.9	1840	150	40	17.0

Ceramic Protection Sheaths & Insulating Tubes

All thermocouple assemblies produced at Tempsens are with high purity alumina protection sheaths and insulating tubes. These tubes called as sintered recrystallised alumina tube with minimum alumina content of 99.7%. Excellent stability under very high temperature is an essential and a prominent property of ceramic materials. Ceramic tubes have definite advantages in comparison to other various metals. The maximum application temperature depends on the material. The application temperature is also influenced by the tube geometry, the diameter, the wall thickness and the method of application. Ceramic tubes have high mechanical wear resistance. This is especially important for the long term stability of products. Technical parameters of recrystallised alumina tubes are as under:-

Properties	Recrsytallised Alumina Tube
Al_2O_3-content	99.7%
Color	Yellow/ivory
Specific gravity	3.85
Water absorption	0
Flexural strength	360
Max. temp. use*	1.700°C
Thermal conductivity	28
Thermal expansion linear coefficient	
20-100 °C	5.4
20-200 °C	6.5
20-600 °C	7.7
20-1.000 °C	8.5
Volume resistivity	
200 °C	10^{15}
400 °C	10^{13}
600 °C	10^{11}
Temperature stability	good/satis.
Chemical resistivity	very good
Te value **	1.000

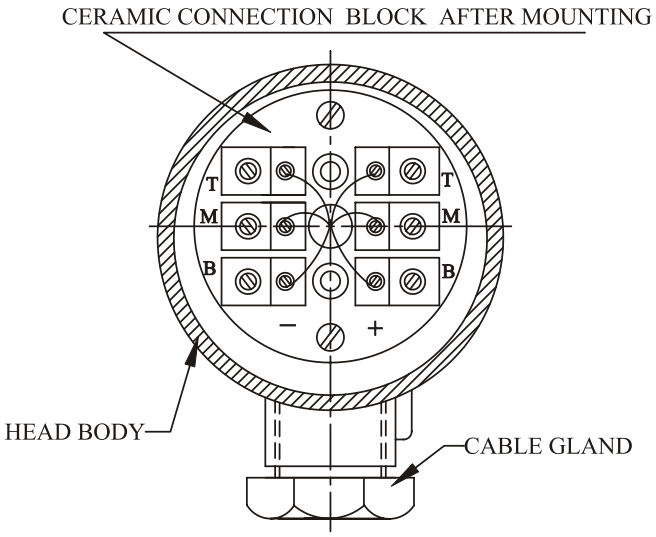
Holding Tube

We have selection of holding tubes in different metals and sizes depending on application and temperatures, most used material in holding tubes are Inconel-600 / 800, SS310 & SS316. Diameter of holding tube will depend on the size of outer protection tube.

Looking to the importance of all above critical components we are extremely careful for the quality of all components as it is really important to ensure stable & repeatable results for our supplied thermocouples.

Cable & Connectors

In all our thimbled and ceramic sheathed Glass thermocouples, we use high temperature ceramic fiber insulated cable from connection head to quick disconnecting connector, the connectors used are from world repute manufactures. Tempsens uses special strain relief spring in all cables.



Color Coding In Trilevel :

Type	Color - Code		
R	Top (T)	(-) WHITE	(+) GREEN
	Middle (M)	(-) BROWN	(+) GREEN
	Bottom (B)	(-)RED	(+) GREEN
S	Top (T)	(-) WHITE	(+) BLUE
	Middle (M)	(-) BROWN	(+) BLUE
	Bottom (B)	(-)RED	(+) BLUE
B	Top (T)	(-) WHITE	(+) BLACK
	Middle (M)	(-) BROWN	(+) BLACK
	Bottom (B)	(-)RED	(+) BLACK

Connection Head :

At Tempsens we have different type of heads i.e. hinged type, screwed cover, threaded cap. Material of connection head can be aluminum or SS, heads are available in double cable entry and single cable entry.