



# Temperature Metrology

Primary, Secondary Master Sensors



**TEMPSENS**  
INSTRUMENTS

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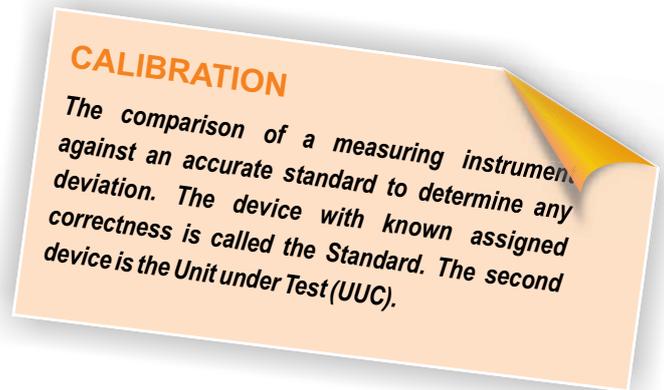
## About Us

Tempens Instruments (I) Pvt. Ltd is India's only private sector Laboratory with NABL Accreditation up to 2700°C for Thermal calibration. We ensure that our measurements are consistent with the International Standards. Tempens was formed in 1976 by four Indian Technocrats at Udaipur, Rajasthan with its first product as Thermocouples and RTDs. The company is involved into manufacturing of Thermocouples, RTDs, Thermowells, Cables, Non contact pyrometers, Heaters and Temperature Calibration Equipments, Industrial ovens etc.



## What We Do

Tempens a world renowned name in the field of Temperature sensors started their operation way back in 1976. We provide our clients "Thermal Engineering Solutions" with the most accurate calibration services for a wide temperature range. We carry out continuous efforts to improve our uncertainties and to solve measurement problems in industry and government. We play a key role ensuring international quality in product and services. We have presence in more than .....countries and production facility in India, Germany and China.



## Accurate Temperature Calibration

Calibration has many facets. It can be carried out thermally in the case of probes or electrically in the case of Instrument and it can be performed directly with certified equipment, or indirectly with traceable standards.

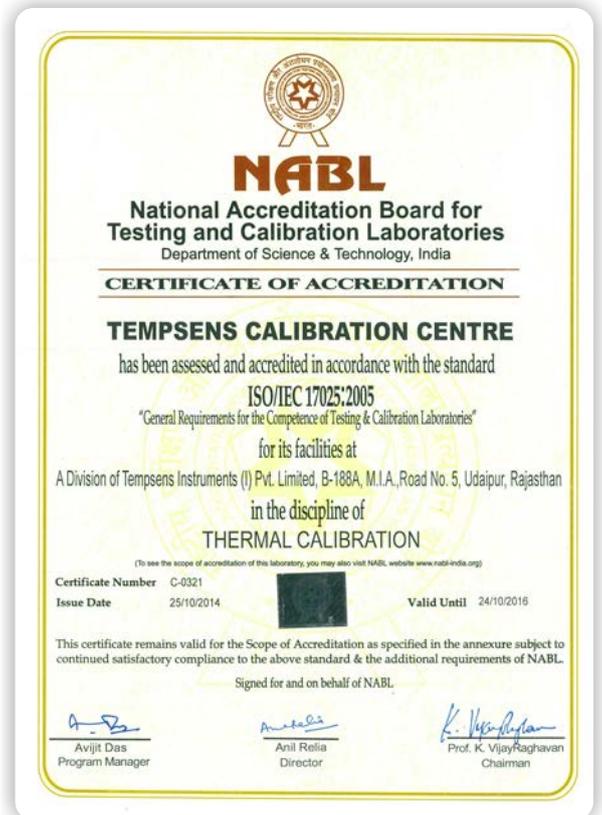
Thermal (Temperature) calibration is achieved by elevating (or depressing) the temperature sensor to a known, controlled temperature and measuring the corresponding change in its associated electrical parameter (voltage or resistance).

The accurately measured parameters compared with that of a certified reference probe; the absolute difference represents the calibration error. If the sensor is connected to a measuring instrument, the sensor and the instrument combination can be effectively calibrated by this technique.

Calibration has many facets. It can be carried out thermally in the case of probes or electrically in the case of Instrument and it can be performed directly with certified equipment, or indirectly with traceable standards

A typical general purpose system comprises of a thermal reference (stable temperature source), a certified reference probe with its certificate, a precision electronic digital thermometer, bridge or digital voltmeter.

Tempens offers a range of master temperature sensors comprising of SPRT's PRT's of thermocouple with accredited certificate.



## Product Index

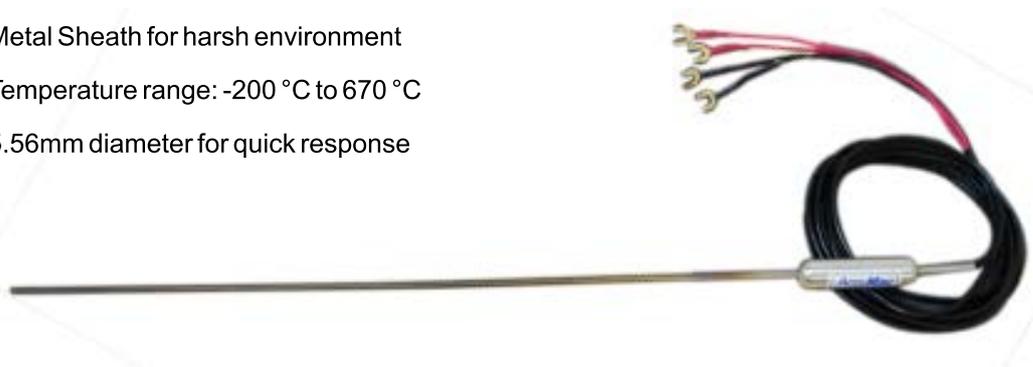
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## 1.1 Main Application

Am1880 Standard Platinum Resistance Thermometers (SPRT) interpolates temperature in the range from -200°C to 670°C on the International Temperature Scale of 1990 (ITS-90). The sensing element and sensor support adopt a “Bird-Cage” design and they are protected inside a platinum capsule. Compared to the traditional coil winding method, the “Bird-Cage” handles mechanical shocks much better at the same time allows for high purity platinum wire to be wound strain-free. The platinum capsule protects the sensing element from contaminations at high temperature.

## 1.2 Main Features

- Bird-Cage design to make it mechanical shocks resistant
- Platinum Capsule to protect sensor from high temperature contaminations
- Metal Sheath for harsh environment
- Temperature range: -200 °C to 670 °C
- 5.56mm diameter for quick response



## 1.3 Specifications

Temperature Range	-200°C to 670°C
Rtpw	Nominal 25.5 Ω
Resistance Ratio	W(Ga)≥1.11807, W(Hg)≤0.844235
Drift at 0.01°C*	ΔR(0.01°C) <0.006 °C/year, 0.003°C/year typical
Repeatability	<0.001 °C
Thermal Shock	<0.001 °C after 10 times thermal cycles from minimum to maximum temperatures
Self-heating	<0.0015 °C at 1 mA current
Measurement Current	1 mA
Sensor Length	42 mm
Insulation Resistance	>1000 MΩ at room temperature
Sheath Material	Inconel
Dimension	5.56 mm (OD) X 500 mm (L)
External Leads	Insulated copper wire, 4 leads, 2.5 meters
Termination	Gold-plated Spade
Handle Dimension	21mm (OD) X 80 mm (L)
Carrying Case	Included

## 1.1 Main Application

SPRT are used to interpolate temperature in the range from  $-189.3442^{\circ}\text{C}$  to  $660.323^{\circ}\text{C}$  on the International Temperature Scale of 1990 (ITS-90). They are widely used as standard or reference thermometers to calibrate other thermometers and to measure temperature precisely in primary and secondary laboratories. AM1950 and AM1960 SPRTs are the crown jewels of AccuMac temperature probes. It takes decades of scientific expertise and original craftsmanship to create these world class products. They feature a very low drift rate. AM1950 has a temperature range from  $-200^{\circ}\text{C}$  to  $500^{\circ}\text{C}$ . AM1960 covers range from  $-200^{\circ}\text{C}$  to  $670^{\circ}\text{C}$ .

## 1.2 Main Features

- Affordable Standard Platinum Resistance Thermometer (SPRT)
- Extremely low drift rate
- Temperature range :  $-200^{\circ}\text{C}$  to  $670^{\circ}\text{C}$



## 1.3 Specifications

Temperature Range	1950 : $-200^{\circ}\text{C}$ to $500^{\circ}\text{C}$ , 1960 : $-200^{\circ}\text{C}$ to $670^{\circ}\text{C}$
Rtpw	Nominal $25\ \Omega$
Resistance Ratio	$W(\text{Ga}) \geq 1.11807$ $W(\text{Hg}) \leq 0.844235$
Drift at $0.01^{\circ}\text{C}^*$	1950 $\Delta R(0.01^{\circ}\text{C}) < 0.002^{\circ}\text{C}/100$ hours at $500^{\circ}\text{C}$ $\Delta R(0.01^{\circ}\text{C}) < 0.004^{\circ}\text{C}/\text{year}$ 1960 $\Delta R(0.01^{\circ}\text{C}) < 0.003^{\circ}\text{C}/100$ hours at $670^{\circ}\text{C}$
Repeatability	$\pm 0.001^{\circ}\text{C}$
Thermal Shock	$\pm 0.001^{\circ}\text{C}$ after 10 times thermal cycles from minimum to maximum temperatures
Self-heating	$0.0015^{\circ}\text{C}$ at 1mA current
Measurement Current	1 mA
Sensor Length	42mm
Insulation Resistance	$> 1000\ \text{M}\Omega$ at room temperature
Sheath Material	Fused-Quartz
Dimension	1950 : 7 mm (OD) X 480 mm (L) 1960 : 7 mm (OD) X 500 mm (L)
External Leads	Insulated copper wire, 4 leads, 2.5 meters
Termination	Gold-Plated Spade
Handle Dimension	21mm (OD) X 80 mm (L)
Calibration (Optional)	5 Fixed Point Calibration at Tempsens NABL Accredited Lab with ITS 90 Constants and Resistance Vs Temperature Chart in $1^{\circ}\text{C}$ increment

## 1.1 Main Application

Standard Platinum Resistance Thermometers (SPRTs) are common used to interpolate temperature in the range from -189.3442°C to 660.323°C on the International Temperature Scale of 1990 (ITS-90). They are widely used as standard or reference thermometers to calibrate other thermometers and to measure temperature precisely in primary and secondary laboratories. AM1850 and AM1860 SPRTs are the crown jewels of AccuMac temperature probes. It takes decades of scientific expertise and original craftsmanship to create these world class products. They feature a very low drift rate. AM1850 has a temperature range from -200°C to 500°C. AM1860 covers range from -200°C to 670°C. They are widely used as reference thermometer at drywell block calibrator and temperature bath.

## 1.2 Key Features

- Metal sheathed
- Great reference thermometer for dry block calibrators
- Temperature range : -200°C to 670°



## 1.3 Specifications

Temperature Range	1850 : -200°C to 500°C, 1860 : -200°C to 670°C
Rtpw	Nominal 25 Ω or nominal 100 Ω
Resistance Ratio	W(Ga) $\geq$ 1.11807 W(Hg) $\leq$ 0.844235
Drift at 0.01°C*	1850 $\Delta R(0.01^\circ\text{C}) < 0.002^\circ\text{C}/100$ hours at 500°C $\Delta R(0.01^\circ\text{C}) < 0.008^\circ\text{C}/\text{year}$ 1860 $\Delta R(0.01^\circ\text{C}) < 0.003^\circ\text{C}/100$ hours at 670°C $\Delta R(0.01^\circ\text{C}) < 0.01^\circ\text{C}/\text{year}$
Repeatability	$\pm 0.0015^\circ\text{C}$
Thermal Shock	$\pm 0.0015^\circ\text{C}$ after 10 times thermal cycles from minimum to maximum temperatures
Self-heating	0.0015°C at 1mA current
Measurement Current	1 mA
Sensor Length	42 mm
Insulation Resistance	>1000 MΩ at room temperature
Sheath Material	Inconel
Dimension	1850 : 6.35 mm (OD) X 480 mm (L) 1860 : 6.35 mm (OD) X 500 mm (L)
External Leads	Insulated copper wire, 4 leads, 2.5 meters
Termination	Gold-plated Spade
Handle Dimension	21mm (OD) X 80 mm (L)
Calibration (Optional)	5 Fixed Point Calibration at Tempsens NABL Accredited Lab with ITS 90 Constants and Resistance Vs Temperature Chart in 1°C increment

## Semi Standard PRT (SSPRT)

### 1.1 Main Application

SSPRT provides an affordable alternative for precision temperature measurement and calibration in labs & fields. Metal Sheathed Semi Standard Platinum Resistance Thermometer are widely used as a reference to calibrate various temperature probes, particularly in secondary calibration laboratories.

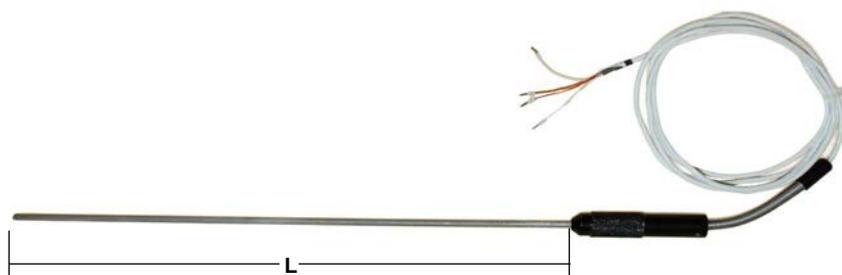
### 1.2 Main Features

- Low Drift
- Cost effective
- Temperature range :- 200°C to 670°C

SSPRT is constructed with a 6 mm outer diameter metal sheath of high durability. Inside the sheath, the sensing element is protected to shield the sensor from contamination by free floating metal ions found within metal environment at high temperatures.

The electrical configuration is a four wire current potential hookup to eliminate effect of lead wire resistance.

A special powder mixture is filled into the sensor capsule to support the element wire to protect the element from mechanical shocks. The element is housed in a special protective Assembly to ensure minimum drift over long term use.



**Ex. Ordering Code :** Model - Dia - Length - Extension Cable Length  
**SSPRT - 6.0 - 450 - 1.5**

### 1.3 Specifications

Model	SSPRT
Make	Tempsens
Resistance at 0°C	100 ±1Ω
Temperature Coefficient	0.00385 Ω/ Ω/°C
Temperature Range	-200 °C to 670°C
Sheath Material	Inconel 600
Drift	±30m°C at 0°C after 100 hours at 660°C
Dimension	(6.0 mm X 450 mm)
Extension leads	1.5 mtr. long teflon Insulated silver plated copper cable with gold plated spade
Short Term Stability	0.01°C
Handle Dimension	15 mm (OD) X 100 mm( L)
Calibration (Optional)	5 Fixed Point Calibration at Tempsens NABL Accredited Lab with ITS 90 Constants and Resistance Vs Temperature Chart in 1°C increment

# High Accuracy PRT

## 1.1 Main Application

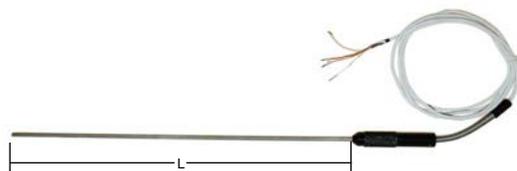
High accuracy Platinum Resistance Thermometer (PRT) is an interpolating instrument converting temperature to resistance. It works together with readout device to measure temperature or change of temperature. It has wide applications for dry-wells or temperature baths.

## 1.2 Main Features

- High accuracy : Refer specification
- Temperature range : Refer specification
- Durable and shock resistance

## 1.3 Calibrations

It is recommended to calibrate this PRT annually over the full temperature range in between annual calibrations, user can check the drift rate by comparing Rtpw against the last Calibration results. Refer to specifications section for normal drift rate.



## 1.4 Ordering Code

Model	Dia*	Length*	Extension cable length*
TPRT(XXX)	(X.X) mm	(XXX) mm	(XX) Mtr.
110 105 103 100	6.0 4.5	450	1.5

Example : TPRT110-6.0-450-1.5

\* Can be provided as per customer requirement

## 1.5 Specifications

Make	Tempsens			
Resistance at 0°C	Nominal 100 Ω			
Temperature Coefficient	0.00385 Ω/ Ω/ °C			
Sheath Material	SS-316			
Dimension	(6.0 mm X 450 mm)			
Extension leads	1.5 mtr. long teflon Insulated silver plated copper cable with flying leads			
Handle Dimension	15 mm (OD) X 100 mm( L)			
Calibration Standatd	at 5 points at Tempsens NABL Accredited Lab			
Short Term Stability	0.01°C	0.01°C	0.02°C	0.02°C
Temperature Range	-38 to 250°C(1/10 Din)	-38 to 250°C(1/5 Din)	-80 to 300°C(1/3 Din)	-80 to 400°C(Class A)
Model	TPRT 110	TPRT 105	TPRT 103	TPRT 100
Drift	± 0.03°C at 0°C after 100 hours at 250°C	± 0.05°C at 0°C after 100 hours at 250°C	± 0.07°C at 0°C after 100 hours at 250°C	± 0.10°C at 0°C after 100 hours at 250°C
Accuracy	±0.04°C at -38°C ±0.03°C at -0°C ±0.08°C at 100°C ±0.13°C at 200°C ±0.155°C at 250°C	±0.10°C at - 38°C ±0.06°C at 0°C ±0.16°C at 100°C ±0.26°C at 200°C ±0.31°C at 250°C	±0.23°C at -80°C ±0.10°C at -0°C ±0.27°C at 100°C ±0.43°C at 200°C ±0.60°C at 300°C	±0.31°C at -80°C ±0.15°C at 0°C ±0.35°C at 100°C ±0.65°C at 250°C ±0.95°C at 400°C

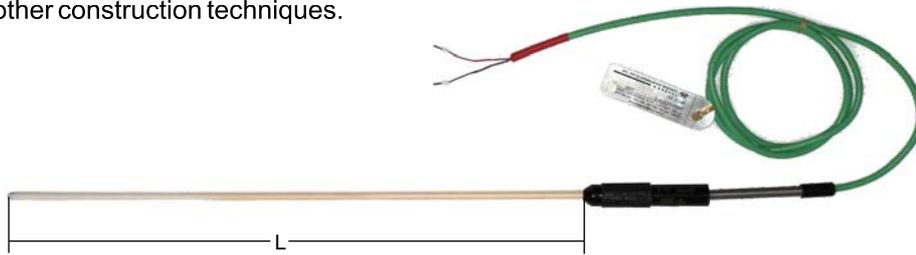
# Nobel Metal Master Thermocouples

## 1.1 Main Application

Tempsens offers special Reference thermocouples for high temperatures upto 1500°C for highly accurate temperature measurement. These Thermocouples are offered in platinum / Rhodium (type R, S or B) elements with a high purity Alumina insulations and sheath materials.

Thermocouples employing platinum in combination with platinum-rhodium alloys have been found to be the most reproducible of all the various types. They are resistant to oxidation in air and, because of their high melting points, can be used at very high temperatures. The best-known member of this group is the Type S (Pt10Rh/Pt) or Type R (Pt13Rh/Pt). It was long considered more accurate and has probably been studied more than any other thermocouple.

The performance of Type R or Type S thermocouple depends strongly on the annealing process, materials used, and other construction techniques.



## 1.2 Ordering Code

Model	Dia*	Length*	Extension cable length*
TTC(X)	(X.X) mm	(XXX) mm	(XX) Mtr.
R S	6.0	450	1.5

Example : TTCS-6.0-450-1.5

\* Can be provided as per customer requirement

## 1.3 Specifications

Make	Tempsens	
No. of Element	Simplex	
Temperature Range	0 to 1500 °C	
Sheath Material	Alumina ( 99.7 % pure Al <sub>2</sub> O <sub>3</sub> )	
Sheath length	450 mm	
Extension Cable	1.5 mtr. Long Teflon insulated cable with male/female miniature connector	
Sheath Dia	06 mm	
Handle Dimension	15 mm (OD) X 100 mm( L)	
Calibration	at 5 points at Tempsens NABL Accredited Lab	
Accuracy	Special Class (0.6 °C or 0.1 % of temperature whichever is greater)	
Model	TTCS	TTCR
Type	S(Pt10%Rh/Pt)	R(Pt13%Rh/Pt)

## PTRH Master Thermocouples with Cold Junction Compensation

### 1.1 Main Application

Tempens offers special Reference thermocouples for high temperatures upto 1500°C for highly accurate temperature measurement. These Thermocouples are offered in platinum / Rhodium (type R, S or B) elements with a high purity Alumina insulations and sheath materials.

The Cold junction compensation probe provides much accurate temperature measurement possibilities. The cold junction probe is inserted into Ice water mixture. This is necessary for precision measurement.



### 1.2 Ordering Code

Model	Dia*	Length*	Extension cable length*
TTC(X)CJC	(X.X) mm	(XXX) mm	(XX) Mtr.
R S	6.0	450	1.5

Example : TTCSCJC-6.0-450-1.5

\* Can be provided as per customer requirement

### 1.3 Specifications

Make	Tempens	
No. of Element	Simplex	
Temperature Range	0 to 1500 °C	
Sheath Material	Alumina ( 99.7 % pure Al <sub>2</sub> O <sub>3</sub> )	
Cold Junction Sheath	Stainless Steel Dia : 4.5 mm , Length : 250 mm	
Sheath length	450 mm	
Extension Cable	1.5 mtr. Long Teflon insulated cable with flying leads	
Sheath Dia	06 mm	
Handle Dimension	15 mm (OD) X 100 mm( L)	
Calibration	at 5 points at Tempens NABL Accredited Lab	
Accuracy	Special Class (0.6 °C or 0.1% of temperature whichever is greater)	
Model	TTCRCJC	TTCSCJC
Type	R(Pt13%Rh/Pt)	R(Pt10%Rh/Pt)

## Secondary Thermocouple

### 1.1 Main Application

K type and N type Thermocouple is mainly use in Industries as a secondary master sensor. It works together with readout device to measure Temperature or change of temperature.

It has wide applications for dry-wells or temperature baths.

### 1.2 Main Features

- Good accuracy : 0.4% of reading at 1.1°C of temperature, whichever is higher
- Temperature range : 0°C to 1200°C

### 1.3 Calibrations

It is recommended to calibrate this Thermocouple annually over the full temperature range.



### 1.4 Ordering Code

Model	Dia*	Length*	Extension cable length*
TTC(X)	(X.X) mm	(XXX) mm	(XX) Mtr.
K N	6.0	400	1.5

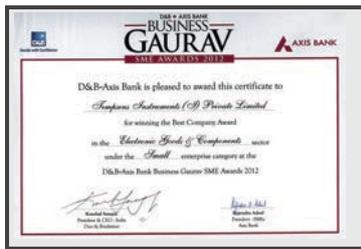
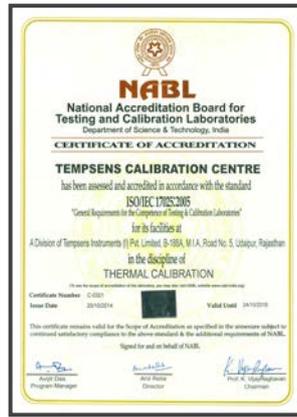
Example : TTCK-6.0-400-1.5

\* Can be provided as per customer requirement

### 1.5 Specifications

Make	Tempsens	
No. of Element	Simplex	
Temperature Range	0 to 1200 °C	
Sheath Material	Inconel 600	
Sheath length	400 mm	
Extension Cable	1.5 mtr. Long Teflon insulated cable with male female miniature connector	
Sheath Dia	06 mm	
Handle Dimension	15 mm (OD) X 100 mm( L)	
Calibration	at 5 points at Tempsens NABL Accredited Lab	
Accuracy	Special Class (1.1°C or 0.4% of temperature whichever is greater)	
Model	TTCK	TTCN
Type	CR/AL K Type	NI-CR-SI/N Type

# CERTIFICATES



# THERMAL ENGINEERING SOLUTIONS



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