

PRECISION TEMPERATURE RESISTANCE CALIBRATION



An exclusive centre for High Precision Temperature-Resistance Calibration (**PTRC**) has been established in ERTL(N), New Delhi with state-of-the-art calibration facilities including **Primary Temperature Standards** (sealed & standard size Fixed Point cells), High Precision DCC Resistance Bridge & standard resistances manned by qualified & well-trained personnel.

This metrology activity is committed to establishment, realization, development and maintenance of temperature standards as per International Temperature Scale of 1990, also known as ITS-90 and associated calibration activity traceable to National standards. ITS-90 is an approximation of Thermodynamic Scale and uses a series of **fundamental constants of nature or fixed points** and it specifies that from 13.80K to 1234.93K, temperature calibration can be verified by Standard Platinum Resistance Thermometer (SPRT), having nominal resistance varying from 0.25Ω to 25.5Ω in different designs at Triple Point of Water i.e. 0.01°C , which are used as defining instruments of Interpolation as described in ITS-90 for different temperature ranges. The temperature range for long stem SPRT is from $-189.3442^{\circ}\text{C}$ to 660.323°C as defined in the ITS-90.

Precision temperature measurement and calibration work generally requires the use of Standard Platinum Resistance Thermometer (SPRT) or PRTs. They change their characteristics with time, temperature cycling and become contaminated. A critically important aspect of applying any temperature sensor is that of traceable calibration, to ensure that all the measurements made are accurate and legally valid. The reference or working SPRTs / PRTs / RTDs are calibrated at these fixed points in the desired range, to provide high precision calibration and dissemination of standards for maintaining the traceability of measurements.

We maintain the thermal equilibrium states of pure metals i.e. Fixed Point Cells as Intrinsic Primary Standards of Temperature in the range from -38°C to 661°C , based on Long Stem Standard Platinum Resistance Thermometry. These Fixed points are realized using specified procedures in special maintenance apparatus (either a furnace or bath or cryostat) having highly stable and very low gradient working zone. A high precision resistance thermometry D.C. bridge, along with highly precise DC resistance standards, is used to measure resistance ratios at these fixed points. To ensure the degree of equivalence, this laboratory is participating in Inter-laboratory comparison programmes. All of our calibration facilities are **NABL accredited**.

CALIBRATION : Temperature (By Fixed Point Method)

ACTIVITY / PARAMETER	STANDARD / TEMPERATURE RANGE	In-HOUSE CMC
Calibration / TEMPERATURE (By Fixed Point Method)	At Triple Point of Mercury (-38.8344°C)	± 2.83 mk
	At Triple Point of Water (0.01°C)	± 2.00 mk
	At Melting Point of Gallium (29.7646°C)	± 2.10 mk
	At Freezing Point of Tin (231.928°C)	± 2.50 mk
	At Freezing Point of Zinc (419.527°C)	± 5.00 mk
	At Freezing Point of Aluminum (660.323°C)	± 7.20 mk

MAJOR PRODUCTS CALIBRATED

S. No.	Type of Sensor	Temperature Range
1.	Quartz glass sheathed , Long stem SPRT / PRT sensors *	From - 38.8344°C to 660.323°C
2.	Metal sheathed , Long stem SPRT / PRT / RTD sensors *	From - 38.8344°C to 419.527°C

- * Diameter of sensor should be ≤ 8mm.
- * Length of sensor sheath should be ≥ 380 mm.

Details of Major Facilities Available

Sl. No.	Name of Standards / Calibration Facilities	Make / Model	Range	C M C
1.	Triple Point of Mercury Cell	Isotech / 17724	- 38.8344°C	± 0.22 mk
2.	Triple Point of Water Cell	Hart Sc. / 5901	0.01°C	± 0.10 mk
3.	Melting Point of Gallium Cell	Hart Sc. / 5943	29.7646°C	± 0.10mk
4.	Freezing Point of Tin Cell	Isotech / 17669	231.928°C	± 0.60 mk
5.	Freezing Point of Zinc Cell	Isotech / 17671	419.527°C	± 0.90 mk
6.	Freezing Point of Aluminum Cell	Isotech / 17672	660.323°C	± 3.00 mk
7.	4 -Terminal Standard Resistor	Guildline / 7334	25 Ω & 100 Ω	± 1 ppm
8.	Variable Temperature Air Bath	Guildline / 5032	18°C to 50°C	± 0.01°C
9.	Precision DCC Temperature - Resistance Bridge	Guildline / 6622B	0.01Ω to 100kΩ	± 0.05 ppm
10.	Standard Platinum Resistance Thermometer, 25.5 Ω	Hart Scientific / 5681	- 190°C to 661°C	± 0.39 mk to 4.35 mk