

Temperature Calibration Equipments



What is Calibration

The comparison of a measuring instrument against an accurate standard to determine any deviation.

The device with known assigned correctness is called the Standard. The second device is the Unit Under Test (UUT).

Accurate Temperature Calibration

Temperature 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.

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.

Temperature Source

Dry Block Calibrator

Provides the most convenient, portable facilities for checking & calibrating industrial probes and they are usually reasonable rapid heating and cooling device. The unit consists of a special designed heating block which has located internal holes for the probes. Although the block temperature is accurately controlled, any indication provided should be used for guidance only.

As with any comparison technique a certified sensor and indicator should be used to measure the block temperature and used as a reference for the test probe. Two types of unit are available; portable units which can be taken on to plant for the on-site calibration and laboratory units to which industrial sensors are brought as required.



Stirred Liquid Bath

Provide superior thermal environment for probe immersion as no air gap exist between the probe and the medium Thermal coupling is therefore much better than the alternatives described, and the stirring results in very even heat distribution throughout the medium. Methanol is used for temperature below 0°C, water from 0 to 80°C and silicon oil for upto 250°C.



Black Body Source

Black bodies are reference sources used for testing infrared systems. They are required in industry for calibration of pyrometers, infrared line scanners or cameras. In laboratory, they are part of benches for characterization of complex optronic systems. Tempsens offers a wide range of black bodies to cover all Customer's needs.



Reference Unit

In case of accurate thermocouple measurement, it's a common practice to reference the cold junction temperature at ice point (0°C) so that copper leads may be connected to an EMF

readout device. This procedure avoids the compensation of cold junction temperature at the terminal of read out which may not be constant and the measurement may not be very accurate.



Cold Junction Compensation

By connecting any thermocouple to measurement device three dissimilar metal junction are created in the circuit: the thermocouple junction itself, or hot junction, and the junction between each lead and the measurement device, or cold junctions. These cold junction provide their own thermoelectric voltages that are proportional to the temperature at the device terminals.

A technology known as cold junction compensation is therefore used to remove this unwanted effect.

Standard Temperature Calibrator Range Representation For Contact Type

Division of contact type calibrators according to the temperature range.

	Model No.	Symbol	Stability	Temperature Range (°C)													
				-200	0	200	400	600	800	1000	1200	1400	1600	1800			
LIQUID CALIBRATOR BATH	-80/50	⊗	0.05	-80	50												
	-40/50	⊗	0.05	-40	50												
	-35/200	⊗	0.04	-35	200												
	250	⊗	0.02	50	250												
DRY BLOCK CALIBRATOR	-196/-80	⊙	0.1	-190	-80												
	-100/40	⊙	0.05	-100	40												
	-30/110	⊙	0.07	-30	110												
	-15/110	⊙	0.07	-15	110												
	120SP	⊗	0.04	0	120												
	500	⊙	0.05	50	500												
	650	⊙	0.04	50	650												
	1200	⊙	0.3	250	1200												
HIGH TEMPERATURE CALIBRATOR	1200L	⊙	0.5	300	1200												
	1500L	⊙	1.04	500	1500												
	1700L	⊙	1.5	500	1700												
AUTOCAL	-80/50 Autocal	⊗	0.05	-80	50												
	-35/200 Autocal	⊗	0.04	-35	200												
	-30/110 Autocal	⊙	0.07	-30	110												
	650 Autocal	⊙	0.04	50	650												
	1200 Autocal	⊙	0.3	250	1200												

Standard & Autocal Mode

Standard Model



Calsys 650



Calsys -30/110



Calsys -100/40

Autocal Model

Autocal is an automatic temperature calibration system for the Thermocouple and RTDs. The system consists of Temperature bath and PC software, which together contribute to the whole cycle of the auto calibration process. The system accepts 4 channels, 4 Thermocouples or 4 RTD's. The connection for these channels is through a special type of locking connector. The channel configuration can be done with an LCD display via touch screen keypad.

All models are available in AUTOCAL



Autocal -80/50



Autocal -100/40



Autocal 650



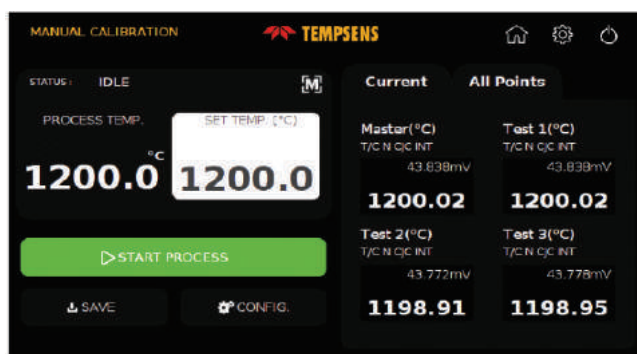
Autocal 1200

- Easy-to-read color 5 Inch LCD Display with perfect overview of actual Temp calibrator status.
- 4 Channel Calibration (4 No's Easy to use Universal input connector suitable for

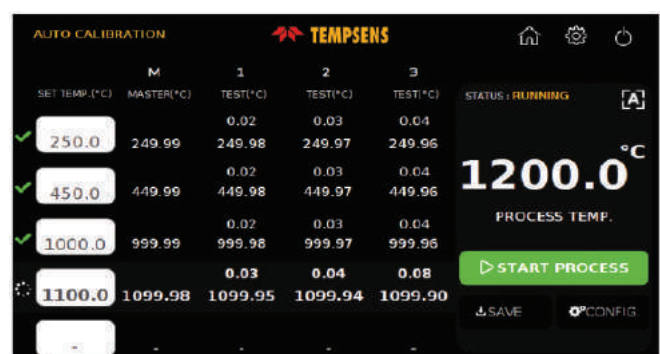
thermocouple and Rtd).

- Ethernet (LAN) Communication with CALsys 650 AUTOCAL Model for PC/Laptop Interface.
- USB Connector for Data saving (Optional)
- Temperature Range from -196°C to 1700°C

Manual Mode:



Auto Mode:



Liquid Bath

Tempsens' liquid bath temperature calibrators come in Standard and AUTOCAL models, offering an impressive temperature range from -80°C to 250°C. These liquid bath calibrators are designed to withstand continuous usage over an extended period, ensuring a remarkable lifetime that exceeds expectations.



Model	CALsys -80/-50	CALsys -40/50	CALsys -35/200	CALsys 250
Temperature Range	-80°C to 50°C	-40°C to 50°C	-35°C to 200°C	50°C to 250°C
Stability	±0.07°C	±0.07°C	±0.04°C	±0.04°C
Uniformity	±0.09°C	±0.09°C	±0.07°C	±0.06°C
Calibration Volume	90(L)x90(W)x200(D)	105(L)x105(W)x105(D)	105(L)x105(W)x105(D)	Dia 90x140 (D)
Medium	Methanol	Methanol	Methanol/Silicon Oil	Silicon Oil
Computer Interface	USB	USB	USB	USB
Power	2 kW, 230 VAC, 50/60 Hz	2 kW, 230 VAC, 50/60 Hz	2 kW, 230 VAC, 50/60 Hz	1.5 kW, 230 VAC, 50/60 Hz
Dimension (WxHxD) mm	675 x 1080 x 555	280 x 575 x 540	280 x 575 x 540	330 x 250 x 350
Weight	135 Kg	65 Kg	65 Kg	12 Kg

Dry Block

Tempsens' dry block temperature calibrators come in Standard and AUTOCAL models, offering an impressive temperature range from -196°C to 1700°C. In addition, the Metrology models provide extra precision, catering to the stringent requirements of calibration laboratories and high-precision applications. While the Lab models offer exceptional stability, ensuring reliable and consistent results for critical measurements in laboratory settings.



Model	CALsys -190/-80	CALsys -100/40	CALsys -30/110	CALsys 650	CALsys 1200
Temperature Range	-190°C to -80°C	-100°C to 40°C	-30°C to 110°C	50°C to 650°C	250°C to 1200°C
Stability	±0.1°C	±0.04°C	±0.07°C	±0.05°C	±0.3°C
Uniformity	±0.2°C	±0.05°C	±0.08°C	±0.1°C	±0.4°C
Insert Construction	Dia 25x330 (L) (2x6.5 & 2x8.5 holes) of 300 (D)	Dia 37x160 (L) (4x6.5 holes) of 150 (D)	(1x8 2x6 holes) of 120 (D)	Dia 32x150 (L) 4 holes) of 6.5 x 120 (D)	Dia 37x 180 (L) (2x6.5 & 2x8.5 holes) of 160 (D)
Computer Interface	USB	USB	USB	USB	USB
Power	300 W, 230 VAC, 50/60 Hz	350 W, 230 VAC, 50/60 Hz	500 W, 230 VAC, 50/60 Hz	1 kW, 230 VAC, 50/60 Hz	1.5 kW, 230 VAC, 50/60 Hz
Dimension (WxHxD) mm	310 x 350 x 350	545 x 245 x 350	425 x 230 x 305	195 x 355 x 265	230 x 425 x 305
Weight	15 kg	16 kg	12 kg	10 kg	12 kg

High Temperature Furnace

Tempsens' offers extreme high temperature calibration in an easy to use laboratory application, making them ideal for the calibration of high temperature thermocouple.



Model	CALsys 1200 L	CALsys 1500 L	CALsys 1700 L
Temperature Range	300°C to 1200°C	500°C to 1500°C	500°C to 1700°C
Stability	±0.35°C	±1.0°C	±1.5°C
Uniformity	±0.4°C	±1.2°C	±1.9°C
Insert Construction	Dia 37x240 (L) (2x6.5 & 2x8.5 holes) of 160 (D)mm	Dia 37x245 (D) (2x6.5 holes) of 150 (D)mm	Dia 37x240(L),(2x6.5 & 2x8.5 Holes) of 185(D)mm
Computer Interface	USB	USB	USB
Power	2 kW, 230 VAC, 50/60 Hz	3 kW, 230 VAC, 50/60 Hz	4 kW, 230 VAC, 50/60 Hz
Diamansion (WxHxD) mm	310 x 350 x 350	545 x 245 x 350	425 x 230 x 305
Weight	55 kg	55 kg	75 kg

Reference Master Sensor

Accurate Master Temperature Sensors in various configuration are available with Calibration certificate from our ISO 17025 Accredited Laboratory



Models	Type S	Type K	SSPRT	TPRT110
Temperature Range	0 to 1500 °C	0 to 1200 °C	-200 °C to 670°C	-80°C to 400°C
Element Type	S(Pt10%Rh/Pt)	NI-CR-SI/N	PT 100	PT 100
No. of Element	Simplex	Simplex	Simplex	Simplex
Sheath Material	Alumina (99.7 % pure Al ₂ O ₃)	Inconel 600	Inconel 600	SS-316
Sheath Length	450mm	450mm	450mm	450mm
Extension Cable	1.5 mtr. Long Teflon insulated cable with male/female miniature connector	1.5 mtr. Long Teflon insulated cable with male/female miniature connector	1.5 mtr. long Teflon Insulated silver plated copper cable with flying leads	1.5 mtr. long Teflon Insulated silver plated copper cable with flying leads
Sheath Diameter	6 mm	6 mm	6 mm	6 mm
Calibration	at 5 points at Tempsens NABL Accredited Lab	at 5 points at Tempsens NABL Accredited Lab	5 Fixed Point Calibration	at 5 points at Tempsens NABL Accredited Lab
Accuracy	Special Class (0.6 °C or 0.1 % of temperature whichever is greater)	Special Class (1.1°C or 0.4% of temperature whichever is greater)	Drift ±30m°C at 0°C after 100 Hrs. at 670°C	±0.03°C at 0°C (1/10 Din)

Reference Master Sensor

Accurate Master Temperature Sensors in various configuration are available with Calibration certificate from our ISO 17025 Accredited Laboratory



Model	TPRT 105	TPRT 103	TPRT 100
Temperature Range	-38°C to 250°C	-80°C to 300°C	-80°C to 400°C
Element Type	PT 100	PT 100	PT 100
No. of Element	Simplex	Simplex	Simplex
Sheath Material	SS316	SS316	SS316
Sheath Length	450 mm	450 mm	450 mm
Extension Cable	1.5 Mtr. Long teflon Insulated silver plated copper cable with flying leads	1.5 Mtr. Long teflon Insulated silver plated copper cable with flying leads	1.5 Mtr. Long teflon Insulated silver plated copper cable with flying leads
Sheath Diameter	6 mm	6 mm	6 mm
Calibration	at 5 points at Tempsens NABL Accredited Lab	at 5 points at Tempsens NABL Accredited Lab	at 5 points at Tempsens NABL Accredited Lab
Accuracy	±0.06°C at 0°C (1/5 Din)	±0.10°C at 0°C (1/3 Din)	±0.15°C at 0°C (Class A)

Measuring Instruments

CALSYS C-4004 (High Accuracy Digital Thermometer)



- High Stability of Temperature measurement.
- High Accuracy of RTD Measurement (0.01°C)
- High Accuracy of Thermocouple Measurement (0.1°C)
- High Resolution
- 2 Measuring inputs
- 10 Thermocouple (B, C, D, E, J, K, N, R, S, T)
- 6 RTD's (PT-10, PT-50, PT-100, PT-200, PT-500, PT-1000)

Meters

TEMPMET 08 - Thermocouple & RTD



TEMPMET 09 - Thermocouple & RTD




Inputs	B, C, D, E, J, K, N, R, S, T
	Pt100, Pt50, Pt10, Pt200, Pt500, Pt1000
Resolution	RTD - 0.01°C, T/C - 0.01°C
Accuracy	RTD - 0.3°C

Inputs	B, C, D, E, J, K, N, R, S, T
	Pt100, Pt50, Pt10, Pt200, Pt500, Pt1000
Resolution	T/C - 0.001°C, RTD - 0.001°C
Accuracy	RTD - 0.05°C, T/C - 0.3°C

Standard Temperature Calibrator Range Representation For Non-contact Type

Division of non-contact type calibrators according to the temperature range.

				Temperature Range (°C)																		
		Model No.	Symbol	Stability																		
SURFACE BLACK BODY	LBBCH	#	0.01	-40	110																	
	LBBH	#	0.1	50	500																	
	LBBDCH	#	0.01	-20	80																	
CAVITY BLACK BODY	1200 BB	#	0.5	300	1200																	
	1500 BB	#	0.5	500	1500																	
	1700 BB	#	1.5	500	1700																	
	FASTcal	#	1.0	600	3000																	

Extended Area Black Body

Tempsens' blackbodies offer an impressive temperature range from -40°C to 3000°C. In addition, the Metrology models provide extra precision, catering to the stringent requirements of calibration laboratories and high-precision applications. While the Lab models offer exceptional stability, ensuring reliable and consistent results for critical measurements in laboratory settings.



Model	LBBCH SP.	LBBCH	LBBH	LBBCH DUAL
Temperature Range	-40°C to 100°C	0°C to 110°C	50°C to 500°C	-20°C to 500°C
Stability	±0.1°C	±0.01°C	±0.1°C	±0.01°C at 50°C
Uniformity	±0.2°C at 50°C	±0.1°C at 50°C	±2 at 400°C	±0.1 at 50°C
Emissivity	0.98 (± 0.02)	0.98 (± 0.02)	0.98 (± 0.02)	0.98 (± 0.02)
Emissive Area	Upto 300 x 300 mm ²	Upto 300 x 300 mm ²	Upto 300 x 300 mm ²	50 x 50 mm ²
Power	2 kW, 230 VAC, 50/60 Hz	1 kW, 230 VAC, 50/60 Hz	2 kW, 230 VAC, 50/60 Hz	1.5 kW, 230 VAC, 50/60 Hz

High Temperature Black Body

Tempsens' blackbodies offer an impressive temperature range from -40°C to 3000°C. In addition, the Metrology models provide extra precision, catering to the stringent requirements of calibration laboratories and high-precision applications. While the Lab models offer exceptional stability, ensuring reliable and consistent results for critical measurements in laboratory settings.



Model	CALsys 1200 BB	CALsys 1500 BB	CALsys 1700 BB	FASTcal 3000
Temperature Range	300°C to 1200°C	500°C to 1500°C	500°C to 1700°C	600°C to 3000°C
Stability	±0.5°C	±0.5°C	±1.5°C	±1.0°C
Emissivity	0.98 (± 0.02)	0.98 (± 0.02)	0.98 (± 0.02)	0.98 (± 0.02)
Calibration Area (mm)	Dia 40x85 (Depth)	Dia 40x85 (Depth)	Dia 29x235 (Depth)	Dia 25 x Depth 127 Graphite Cavity
Emissive Area	Upto 300 x 300 mm ²	Upto 300 x 300 mm ²	Upto 300 x 300 mm ²	50 x 50 mm ²
Computer Interface	RS232/USB	RS232/USB	RS232/USB	RS232/USB
Power	2 kW, 230 VAC, 50/60 Hz	3 kW, 230 VAC, 50/60 Hz	4 kW, 230 VAC, 50/60 Hz	60 kW, 380 VAC, 50/60 Hz
Dimension	590 x 450 x 530	590 x 450 x 530	700 x 500 x 550	1880 x 900 x 1205
Weight	55 kg	55 kg	75 kg	755 kg

Calfast

Quick And Easy To Carry Temperature Calibrator For On-site Calibration



Model	Calfast 120 (For RTD & Thermocouple)	Calfast 350 (For RTD & Thermocouple)	Calfast BB (For Pyrometer & Thermal Imager)
Temperature Range	-10°C to 125°C	50°C to 350°C	50°C to 400°C
Stability	±0.05°C	±0.05°C	±0.1°C
Uniformity	±0.01°C	±0.02°C	±0.02°C
Heating Time	10 Minutes	15 Minutes	15 Minutes
Computer Interface	USB	USB	USB
Power	500 W, 230 VAC, 50/60 Hz	500 W, 230 VAC, 50/60 Hz	500 W, 230 VAC, 50/60 Hz
Dimension (HxWxD) mm	110 x 120 x 170	80 x 120 x 170	120 x 200 x 180
Weight	2 kg	1.5 kg	1.5 kg

CALIBRATION SERVICES

Tempsens Calibration Center is an independent unit of Tempsens instruments (I) Pvt. Ltd, having laboratories at Udaipur, Vadodara & Bangalore. It is accredited for wide range of temperature calibration services.

It is the only private sector Laboratory in the country with accredited Fixed Point Temperature calibration Facilities. The lab has highly stable calibration furnaces, measuring instruments and accurate master sensors traceable to National and International Standards.

The calibration center functions as per ISO 17025 / NABL standards. Calibration of contact type sensors can be made in temperature range of -196°C to 1600°C and Calibration of non contact type sensors can be made in temperature range 0°C to 2900°C. Further the laboratory is accredited for onsite temperature calibration.

The lab offer both at Lab & On-Site Calibration of Furnace/Bath from -80°C to 1600°C and Black Body Calibration from 50°C to 1700°C.

Furnace/Chamber Calibration (TUS) with multiple sensors from -80°C to 1200°C is also in the scope of the lab.

IN HOUSE CALIBRATION FACILITY

Quality Measured / Instruments	Temperature Range	Calibration & Measurement Capability
Contact Type RTD, Thermocouples Thermometers	-196°C	0.05°C
	-80 to -38°C	0.03°C
	-38°C to 0°C	0.03°C
	>0°C to 140°C	0.04°C
	>140°C to 250°C	0.04°C
	>250°C to 650°C	0.12°C
	>650°C to 1200°C	1.30°C
>1200°C to 1600°C	2.60°C	
Non Contact Type Pyrometer	0°C to 250°C	1.5°C
	>250°C to 500°C	2.4°C
	>500°C to 1500°C	2.5°C
	>1500°C to 1700°C	3.2°C
	>1700°C to 2900°C	4.0°C
Heat Flux Meter	25 kW/m ² (2.57 mV) to 75 kW/m ² (7.57nv)	0.08mV



CC-2840
Udaipur Lab



CL-105
Vadodara Lab



CL-109
Bangalore Lab



LK-345-IDN
Indonesia Lab



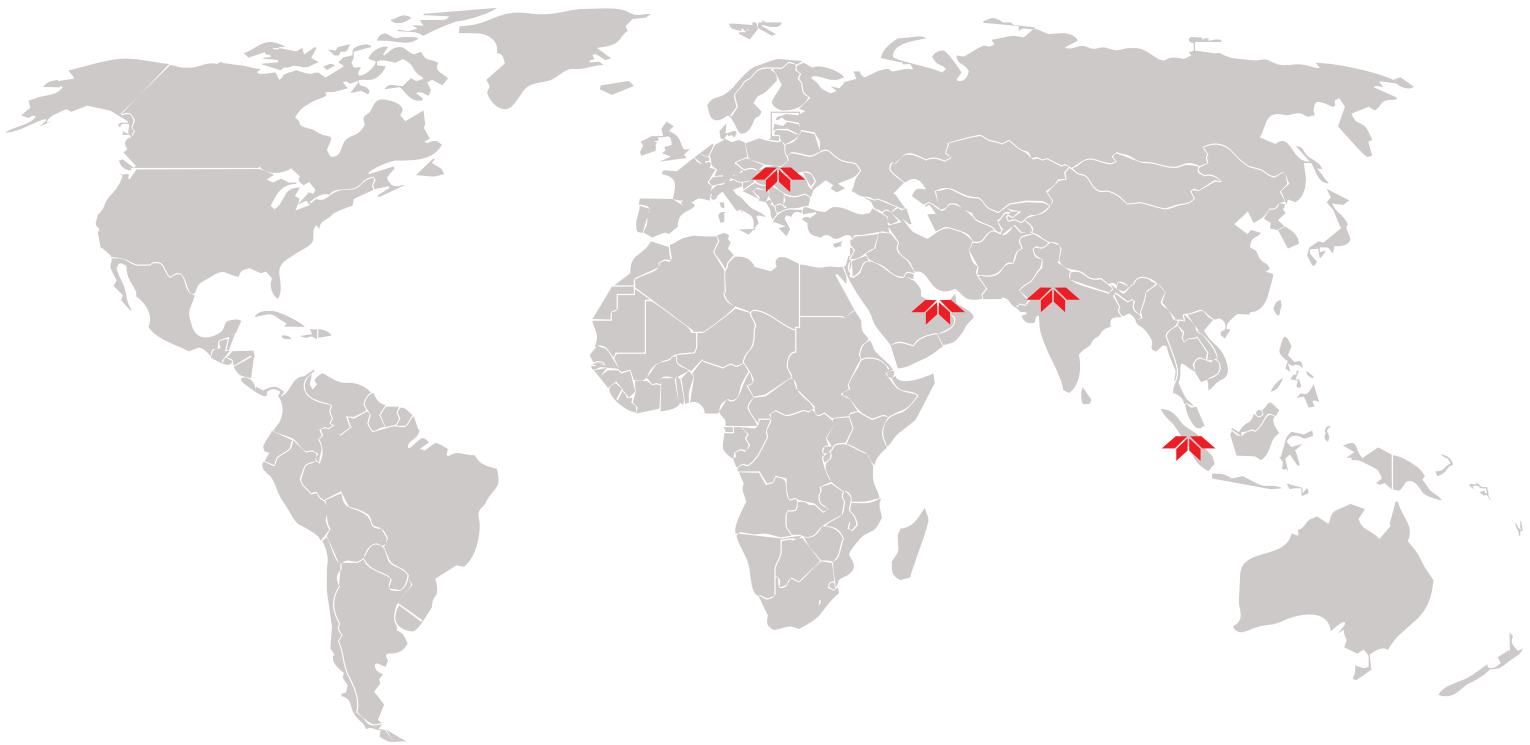
FIXED POINT CALIBRATION FACILITIES

Quality Measured/ Instruments	Temperature Range	Calibration & Measurement Capability
Calibration of SPRT/PRTS/ thermocouple etc.	Triple Point of Water (0.01°C) Melting Point of Gallium (29.7646°C) Freezing Point of Tin (231.928°C) Freezing Point of Zinc (419.527°C) Freezing Point of Aluminum (660.323°C)	0.0038°C 0.0065°C 0.0065°C 0.0071°C 0.0075°C
Calibration of Thermocouple at Secondary Fixed Point	Melting Point of Gold(1064.18 °C)	0.72°C
	Melting Point of Palladium(1554.8 °C)	0.83°C

ON SITE CALIBRATION FACILITY

Quality Measured/ Instruments	Temperature Range	Calibration & Measurement Capability
Contact type RTD. Thermocouples Thermometers	-25°C to 0°C	0.07°C
	>0°C to 140°C	0.04°C
	>140°C to 250°C	0.09°C
	>250°C to 650°C	0.12°C
Non Contact Type Pyrometer	>650°C to 1200°C	1.30°C
	0°C to 250°C	1.50°C
Non Contact Type Pyrometer	>250°C to 500°C	2.40°C
	>500°C to 1200°C	2.5°C
Multipoint Position Calibration of Chamber, Oven, Furnaces (Thermal Mapping(TUS))	-80°C to 200°C	2.8°C
	>200°C to 1200°C	4.1°C

THERMAL & CABLE SOLUTIONS



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