

Laboratory Cal-Trace Labs, #29, 6th Cross, 1st Main Police Layout, Bommasandra, Kachanayakanahalli, Jigani Hobli, Anekal Taluk, Bangalore, Karnataka

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number CC-2094

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Validity 29.12.2016 to 28.12.2018

Last Amended on 20.02.2018

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
<u>ELECTRO-TECHNICAL CALIBRATION</u>				
I.	MEASURE			
1.	DC Voltage [#]	100 mV to 1 V 1 V to 1000 V	0.08 % to 0.004 % 0.004 % to 0.006 %	Using 6½ Digit Multimeter (8846-A) by Direct Method
2.	DC Current [#]	100 µA to 1 mA 1 mA to 100 mA 100 mA to 1 A 1 A to 10 A	0.09 % to 0.064 % 0.064 % 0.064 % to 0.08 % 0.08 % to 0.18 %	Using 6½ Digit Multimeter (8846-A) by Direct Method
3.	AC Voltage [#]	10 Hz to 10 kHz 100 mV to 1 V 1 V to 1000 V	0.12 % to 0.1 % 0.1 %	Using 6½ Digit Multimeter (8846-A) by Direct Method
4.	AC Current [#]	10 Hz to 1 kHz 100 µA to 100m A 100 mA to 1 A 45 Hz to 1 kHz 1 A to 10 A	0.25 % to 0.17 % 0.17 % to 0.27 %	Using 6½ Digit Multimeter (8846-A) by Direct Method
5.	Resistance [#]	4 Wire 10 Ω to 100 Ω 4 Wire 100 Ω to 1 kΩ 4 Wire 1 kΩ to 100 KΩ 2 Wire 100 kΩ to 100 MΩ 2 Wire 100 MΩ to 1 GΩ	0.05 % to 0.02 % 0.02 % to 0.01 % 0.013 % 0.013 % to 0.94 % 0.94 % to 2.3 %	Using 6½ Digit Multimeter (8846-A) by Direct Method

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6.	Frequency [#]	10 Hz to 10 kHz 10 kHz to 1 MHz	0.13 % to 0.02 % 0.02 % to 0.012 %	Using 6½ Digit Multimeter (8846-A) by Direct Method
7.	RTD/PT100 (RTD 385) Simulation [#]	(-) 200 °C to 800 °C	0.38 °C	Using Druck DPI-620 Multi-Function Calibrator by Direct Method
8.	Thermocouples Simulation [#] K Type J Type S Type R Type T Type E Type N Type	(-) 200 °C to 1370 °C 0 °C to 1200 °C 0 °C to 1750 °C 0 °C to 1600 °C (-) 250 °C to 400 °C 0 °C to 800 °C 0 °C to 1200 °C	1.2 °C 0.44 °C 3.6 °C 3.6 °C 0.37 °C 0.32 °C 0.53 °C	Using Druck DPI-620 Multi-Function Calibrator by Direct Method
9.	Time [#]	10 Sec to 1 Hr (3600 Sec) 1 Hr (3600 Sec) to 6 Hs (21600 Sec)	12.9 % to 1.98 % 1.98 % to 0.33 %	Using Time Totaliser BY Indirect Method
II.	SOURCE			
1.	DC Voltage [#]	1 mV to 300 mV 300 mV to 30 V 30 V to 1000 V	0.18 % to 0.013 % 0.013 % to 0.002 % 0.002 % to 0.002 %	Using MultiProduct Calibrator (5522-A) by Direct Method
2.	DC Current [#]	10 µA to 320 µA 320 µA to 3 mA 3 mA to 300 mA 300 mA to 1 A 1 A to 10 A	0.25 % to 0.016 % 0.016 % to 0.015 % 0.015 % to 0.059 % 0.059 % to 0.055 % 0.055 % to 0.08 %	Using MultiProduct Calibrator (5522-A) by Direct Method

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		10 A to 1000 A	0.31%	Using MultiProduct Calibrator (5522-A) With Current Coil by Direct Method
3.	AC Voltage [#]	45 Hz to 1 kHz 1 mV to 32 mV 32 mV to 300 mV 300 mV to 30 V 30 V to 300 V 300 V to 1000 V	0.74 % to 0.06 % 0.06 % 0.06 % 0.06 % 0.04 %	Using MultiProduct Calibrator (5522-A) by Direct Method
4.	AC Current [#]	45 Hz to 1 kHz 33 μ A to 300 μ A 300 μ A to 3 mA 3 mA to 300 mA 300 mA to 1 A 1 A to 10 A 10 A to 1000 A	0.49 % to 0.21 % 0.21 % to 0.12 % 0.12 % to 0.059 % 0.059 % to 0.07 % 0.07 % to 0.14 % 0.35 %	Using MultiProduct Calibrator (5522-A) by Direct Method Using MultiProduct Calibrator (5522-A) With Current Coil by Direct Method
5.	Resistance [#]	4 Wire 10 Ω to 110 Ω 4 Wire 110 Ω to 110k Ω 4 Wire 110k Ω to 1.1M Ω 2 Wire 1M Ω to 1.1G Ω	0.06 % to 0.01 % 0.01 % 0.01 % 0.01 % to 1.8 %	Using MultiProduct Calibrator (5522-A) by Direct Method

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6.	Capacitance [#]	300 pF to 1 nF @ 1kHz 1 nF to 30uF @ 1 kHz 10.9 uF to 100 uF@ 100 Hz	4.5 % to 1.8 % 1.8 % to 0.45 % 0.4 % to 0.57 %	Using MultiProduct Calibrator (5522-A) by Direct Method
7.	Frequency [#]	1 Hz to 100 Hz 100 Hz to 1 kHz 1 kHz to 100 kHz 100 kHz to 1 MHz	0.067 % to 0.02 % 0.02 % to 0.001 % 0.001 % 0.001 %	Using MultiProduct Calibrator (5522-A) by Direct Method
8.	AC Power [#] 1- ϕ @50Hz PF=1	120/240 V 100 mA to 10 A 12 W to 2.4 kW	2 % to 0.15 %	Using MultiProduct Calibrator (5522-A) by Direct Method
9.	RTD/PT100 (RTD 385) [#] Thermocouples K-Type J-Type S-Type R-Type T-Type E-Type N-Type	10 Ω to 400 Ω (-) 200 °C to 800 °C (-) 200 °C to 1370 °C (-) 210 °C to 1200 °C 0 °C to 1750 °C 0 °C to 1750 °C (-) 200 °C to 400 °C (-) 200 °C to 1000 °C (-) 200 °C to 1300 °C	0.27 °C 0.46 °C 0.31 °C 0.55 °C 0.66 °C 0.73 °C 0.58 °C 0.26 °C	Using MultiProduct Calibrator (5522-A) by Direct Method Using MultiProduct Calibrator (5522-A) by Direct Method

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<u>MECHANICAL CALIBRATION</u>				
I.	PRESSURE INDICATING DEVICES			
1.	Pressure Gauges [#] (Hydraulic)	0 to 700 bar	0.12 % of rdg	Using Digital Reference Pressure Gauge Fluke 2700G By Comparison Method as per DKD-R 6-1
2.	Pressure Gauge [#] (Pneumatic)	0 to 20 bar	0.48 % of rdg	Using Digital Reference Pressure Gauge Fluke 700RG07 By Comparison Method as per DKD-R 6-1
3.	Vacuum Gauge [#] (Pneumatic)	(-) 0.8 bar to 0 bar	0.90 % of rdg	Using Digital Reference Pressure Gauge Fluke 700RG07 By Comparison Method as per DKD-R 6-2 & ISO 3567-2011

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<u>THERMAL CALIBRATION</u>				
I.	TEMPERATURE			
1.	Temperature Sensors (RTD, Thermocouples, Thermistors with / without Indicator) [#]	(-) 196 °C	0.33 °C	Using PRT, 6½ Digit Multimeter, Thermometer Readout, LN2 Comparator, by Comparison method
		(-) 80 °C	0.32 °C	Using PRT, 6½ Digit Multimeter, Thermometer Readout, Dry Ice - Methanol Bath, by Comparison method
		(-) 25 °C to 150 °C	0.62 °C	Using PRT, 6½ Digit Multimeter, Temperature Readout, Dry Temperature bath by Comparison method
		150 °C to 600 °C	1.10 °C	Using PRT, S Type Thermocouple, 6½ Digit Multimeter, Thermometer Readout, Dry Block Calibrator, by Comparison method
		600 °C to 1200 °C	2.78 °C	Using S Type Thermocouple, 6½ Digit Multimeter, Thermometer Readout, Dry Block furnace, by Comparison method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ($\pm$)	Remarks
2.	Temperature indicators of Temperature Baths / Ovens/Liquid Nitrogen Ice Buckets [#]	(-) 196 °C & (-) 80 °C	0.35 °C	Using PRT, Thermometer Readout, Single Position Calibration
		(-) 25 °C to 150 °C	0.65 °C	Using PRT, S Type Thermocouple, Thermometer Readout Single Position Calibration.
		150 °C to 600 °C	1.10 °C	Using PRT, S Type Thermocouple, Thermometer Readout Single Position Calibration
		600 °C to 1200 °C	2.8 °C	Using PRT, S Type Thermocouple, Thermometer Readout Single Position Calibration
3.	Temperature Sensors (RTD, Thermocouples, Thermistors with / without Indicators) [#]	(-) 196 °C	0.38 °C	Using PRT, Thermometer Readout with LN2 Comparator Single Point Calibration
		(-) 80 °C	0.33 °C	Using PRT, Thermometer Readout with Methanol Bath, By Comparison Method.
		(-) 25 °C to 150 °C	0.64 °C	Using PRT sensor, Thermometer Readout, Dry Temperature bath, By Comparison Method.

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		150 °C to 600 °C	0.80 °C	Using PRT sensor, Thermometer Readout, Dry Block calibrator, By Comparison Method.
		600 °C to 1200 °C	2.34 °C	Using S type Thermocouple, Thermometer Readout, Dry Block Furnace, By Comparison Method
4.	Temperature indicators of Ovens/Temperature Baths/Dry Blocks/Liquid Nitrogen Ice Bucks [#]	(-) 196 °C, (-) 80 °C & (-) 25 °C	0.64 °C	Using PRT sensor, Thermometer Readout, By Single Point Calibration
		(-) 25 °C to 600 °C	0.79 °C	Using PRT sensor, Thermometer Readout, By Single Point Calibration
		600 °C to 1200 °C	2.33 °C	Using PRT Sensor, S Type Thermocouple, Thermometer Readout, By Single Position Calibration

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5.	Calibration of ovens, Deep Freezers, Refrigerators, Rapid Temperature Cycling Chambers & Furnaces*	(-) 80 °C to 250 °C 250 °C to 1200 °C	0.71 °C 2.34 °C	Using Nine RTD sensors (Minimum) with (Minimum) with Data Acquisition system, By Multi Position Calibration

* Measurement Capability is expressed as an uncertainty ($\pm$) at a confidence probability of 95%

*Only for Site Calibration

The laboratory is also capable for site calibration however, the uncertainty at site depends on the prevailing actual environmental conditions and master equipment used.

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