

Laboratory	Dimensions, #128, 19th Cross, 8th Main, CHBS Layout, Vijayanagar, Bangalore, Karnataka		
Accreditation Standard	ISO/IEC 17025:2005		
Discipline	Electro-Technical Calibration	Issue Date	21.07.2015
Certificate Number	C-0537	Valid Until	20.07.2017
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Quantity Measured/ Instrument	Range / Frequency	*Calibration Measurement Capability ($\pm$)	Remarks
MEASURE			
1. DC VOLTAGE[#]	1 mV to 100 mV	0.43 % to 0.008 %	Using 6 ½ Digit Multimeter 8846A by Direct Method
	100 mV to 1 V	0.008 % to 0.004 %	
	1 V to 1000 V	0.004 % to 0.006 %	
	1 kV to 15 kV	2.35 %	Using HV Probe with DMM
	1 kV to 37 kV	2.60 %	
2. DC CURRENT[#]	100 μ A to 1 mA	0.09 % to 0.06 %	Using 6 ½ Digit Multimeter 8846A by Direct Method
	1 mA to 100 mA	0.06 % to 0.08 %	
	100 mA to 1 A	0.08 %	
	1 A to 10 A	0.08 % to 0.20 %	
3. AC VOLTAGE[#]	45 Hz to 10 kHz		Using 6 ½ Digit Multimeter 8846A by Direct Method
	100 mV to 1 V	0.12 % to 0.1 %	
	1 V to 1000 V	0.1 %	
	50 Hz		
	1 kV to 15 kV	6.30 %	
4. AC CURRENT[#]	10 Hz to 1 kHz		Using 6 ½ Digit Multimeter 8846A by Direct Method
	100 μ A to 1 A	0.17 %	
	1 A to 10 A	0.17 % to 0.25 %	
5. RESISTANCE[#]	1 Ω to 10 Ω	0.48 % to 0.05 %	Using 6 ½ Digit Multimeter 8846A by Direct Method
	10 Ω to 100 Ω	0.05 % to 0.02 %	
	100 Ω to 1 M Ω	0.02 % to 0.01 %	
	1 M Ω to 10 M Ω	0.01 % to 0.05 %	
	10 M Ω to 100 M Ω	0.05 % to 0.1 %	
	100 M Ω to 1 G Ω	2.32 %	

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	Quantity Measured/ Instrument	Range / Frequency	*Calibration Measurement Capability ($\pm$)	Remarks
6.	CAPACITANCE[#]	1 kHz 10 nF to 100 nF 100nF to 1 μ F	2.00 % 2.00 %	Using LCR meterESCORT ELC 3133 A
7.	INDUCTANCE[#]	1 kHz 1 mH to 10 H	0.25 % to 0.10 %	Using LCR meter ESCORT ELC 3133 A
8.	FREQUENCY[#]	10 Hz to 10 kHz 10 kHz to 1 MHz 1 MHz to 600 MHz	0.0012 % 0.0012 % 0.0012 %	Using Counter PM 6669 by Direct Method
9.	TIME INTERVAL[#]	1 s to 10 s 10 s to 100 s 100 s to 3600 s 3600 s to 9000 s	0.012 s to 0.0014 s 0.0014 s to 0.07 s 0.07 s to 5.2 s 5.2 s to 5.26 s	Using Time Totaliser TT412 by Direct Method
10.	TEMPERATURE SIMULATON[#]			
	RTD / PT 100 (RTD 385)	10 Ω to 400 Ω {(-) 200 $^{\circ}$ C to 600 $^{\circ}$ C}	0.104 $^{\circ}$ C to 0.16 $^{\circ}$ C	Using 6 $\frac{1}{2}$ Digit Multimeter 8846A by Direct Method
	RTD / PT 1kΩ (RTD 385)	180 Ω to 4 k Ω {(-)200 $^{\circ}$ C to 630 $^{\circ}$ C}	0.035 Ω to 0.000508 k Ω	
	THERMOCOUPLES K TYPE	(-) 200 $^{\circ}$ C to 1372 $^{\circ}$ C	0.10 $^{\circ}$ C to 0.17 $^{\circ}$ C	Using 6 $\frac{1}{2}$ Digit Multimeter 8846A by Direct Method
	J TYPE	(-) 210 $^{\circ}$ C to 1200 $^{\circ}$ C	0.08 $^{\circ}$ C to 0.14 $^{\circ}$ C	
	S TYPE	0 $^{\circ}$ C to 1767 $^{\circ}$ C	0.81 $^{\circ}$ C to 0.98 $^{\circ}$ C	
	R TYPE	0 $^{\circ}$ C to 1767 $^{\circ}$ C	0.81 $^{\circ}$ C to 1.02 $^{\circ}$ C	
	T TYPE	(-) 250 $^{\circ}$ C to 400 $^{\circ}$ C	0.1 $^{\circ}$ C to 0.13 $^{\circ}$ C	
	E TYPE	(-) 250 $^{\circ}$ C to 1000 $^{\circ}$ C	0.07 $^{\circ}$ C to 0.13 $^{\circ}$ C	

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N TYPE	(-) 200 °C to 1300 °C	0.15 °C to 0.24 °C	
B TYPE	600 °C to 1820 °C	0.78 °C to 0.4 °C	
<u>SOURCE</u>			
1. DC VOLTAGE^{\$}	1 mV to 320 mV 320 mV to 1000 V	0.35 % to 0.008 % 0.008 % to 0.07 %	Using Multiproduct Calibrator 5500 A by Direct Method
2. DC CURRENT^{\$}	320 μ A to 3.2 mA 3.2 mA to 320 mA 320 mA to 2.1 A 2.1 A to 10 A 10 A to 900 A	0.033 % 0.033 % to 0.02 % 0.02 % to 0.037 % 0.037 % to 0.08 % 0.640 % to 0.40 %	Using Multiproduct Calibrator 5500 A by Direct Method Using Universal Calibration System with Current Coil by Direct Method
3. AC VOLTAGE^{\$}	45 Hz to 10 kHz 1 mV to 30 mV 30 mV to 300 mV 300 mV to 30 V 30 V to 300 V 300 V to 1000 V	2.75 % to 0.25 % 0.25 % to 0.35 % 0.35 % to 0.22 % 0.22 % to 0.10 % 0.10 % to 0.30 %	Using Multiproduct Calibrator 5500 A by Direct Method
4. AC CURRENT^{\$}	10Hz to 1kHz 320 μ A to 3.2 mA 3.2 mA to 320 mA 2.1 A to 10 A 20A to 900 A	0.25 % to 0.12 % 0.12 % to 0.150 % 0.25 % to 0.12 % 0.6 %	Using Multiproduct Calibrator 5500 A by Direct Method

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5. RESISTANCE ^{\$}	1 m Ω to 10 m Ω 10 m Ω to 100 m Ω 100 m Ω to 1 Ω 1 Ω to 40 Ω 40 Ω to 400 Ω 400 Ω to 40 k Ω 40 k Ω to 400 k Ω 400 k Ω to 4 M Ω 4 M Ω to 40 M Ω 40 M Ω to 300 M Ω 400 M Ω to 1000 M Ω 1 G Ω to 10 G Ω	0.12 % to 0.09 % 0.09 % to 0.10 % 0.10 % to 0.12 % 0.12 % to 0.50 % 0.50 % to 0.03 % 0.03 % 0.03 % to 0.06 % 0.06 % to 0.10 % 0.10 % to 0.60 % 0.60 % 1.16 % 1.20 %	Using Standard Resistors, Multiproduct Calibrator by Direct Method
6. CAPACITANCE ^{\$}	1 kHz 0.5 nF to 1 nF 1 nF to 30 nF 30 nF to 300 nF 300 nF to 1.09 μ F 1.09 μ F to 300 μ F	3.20 % to 2.0 % 2.0 % to 0.80 % 0.80 % to 0.70 % 0.70 % to 0.40 % 0.40 % to 1.10 %	Using Multiproduct Calibrator 5500 A by Direct Method
7. INDUCTANCE ^{\$}	1 kHz 1 mH to 10 H	0.62 %	Using Decade Inductance Box by Direct Method
8. AC POWER [#] 1 $\emptyset$ @ 50Hz & PF 1	120 V to 240 V 10 mA to 10 A (1.2 W to 2.4 kW)	0.25 %	Using Multiproduct Calibrator 5500 A by Direct Method
9. DC POWER [#]	1 V to 1000 V 0.5 A to 10 A (0.5 W to 10 kW)	0.20 %	Using Multiproduct Calibrator 5500 A by Direct Method
10. FREQUENCY ^{\$}	120 Hz to 1 kHz 1 kHz to 100 kHz 1 MHz to 10 MHz 10 MHz to 600 MHz	0.003 % to 0.007 % 0.007 % to 0.003 % 0.013 % 0.013 % to 0.004 ppm	Using Multiproduct Calibrator 5500 A by Direct Method

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11. OSCILLOSCOPE[#]	1 kHz		Using Oscilloscope
AMPLITUDE	1 mV to 5.99 mV	0.66 % to 0.2 %	Calibrator 5820 A by
SQUARE WAVE	6 mV to 130 V	0.2 % to 0.1 %	Direct Method
TIME BASE	2 ns to 20 ms	0.005 % to 0.029 %	
(HORIZONTAL)	20 ms to 200 ms	0.029 % to 0.042 %	
	200 ms to 5 s	0.042 % to 0.0012 %	
BANDWIDTH^{\$}	50 kHz to 100 MHz	5.83 %	
12. Temperature Simulation[#]			
RTD / PT 100	10 Ω to 400 Ω	0.05 $^{\circ}\text{C}$ to 0.42 $^{\circ}\text{C}$	Using Multiproduct
(RTD 385)	{(-) 200 $^{\circ}\text{C}$ to 800 $^{\circ}\text{C}$ }		Calibrator 5500 A by
			Direct Method
RTD / PT 1000	180 Ω to 4 k Ω	0.088 Ω to 0.000413 k Ω	
(RTD 385)	{(-) 200 $^{\circ}\text{C}$ to 630 $^{\circ}\text{C}$ }		
Thermocouples			
K type	(-) 200 $^{\circ}\text{C}$ to 1372 $^{\circ}\text{C}$	0.08 $^{\circ}\text{C}$ to 0.19 $^{\circ}\text{C}$	
J type	(-) 210 $^{\circ}\text{C}$ to 1200 $^{\circ}\text{C}$	0.06 $^{\circ}\text{C}$ to 0.17 $^{\circ}\text{C}$	
S type	0 $^{\circ}\text{C}$ to 1767 $^{\circ}\text{C}$	0.69 $^{\circ}\text{C}$ to 0.95 $^{\circ}\text{C}$	
R type	0 $^{\circ}\text{C}$ to 1767 $^{\circ}\text{C}$	0.69 $^{\circ}\text{C}$ to 0.99 $^{\circ}\text{C}$	
T type	(-) 250 $^{\circ}\text{C}$ to 400 $^{\circ}\text{C}$	0.08 $^{\circ}\text{C}$ to 0.13 $^{\circ}\text{C}$	
E type	(-) 250 $^{\circ}\text{C}$ to 1000 $^{\circ}\text{C}$	0.05 $^{\circ}\text{C}$ to 0.15 $^{\circ}\text{C}$	
N type	(-) 200 $^{\circ}\text{C}$ to 1300 $^{\circ}\text{C}$	0.12 $^{\circ}\text{C}$ to 0.26 $^{\circ}\text{C}$	
B- type	600 $^{\circ}\text{C}$ to 1820 $^{\circ}\text{C}$	0.61 $^{\circ}\text{C}$ to 0.42 $^{\circ}\text{C}$	

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13. POWER FACTOR[‡]	0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0	1.49 % 0.99 % 0.58 % 0.48 % 0.40 % 0.30 % 0.23 % 0.19 % 0.19 %	Using Multiproduct Calibrator 5500 A by Direct Method
14. DC VOLTAGE[*]	1 mV to 320 mV 320 mV to 1000 V	0.50 % to 0.008 % 0.008 % to 0.070 %	Using Universal Calibration System 9100 by Direct Method
15. DC CURRENT[*]	300 μ A to 3.2 mA 3.2 mA to 320 mA 320 mA to 2.1 A 2.1 A to 10A 10 A to 20A 10 A to 900 A	0.03 % 0.03 % to 0.022 % 0.022 % to 0.080 % 0.080 % 0.080 % to 0.30 % 0.064 % to 0.40 %	Using Universal Calibration System 9100 by Direct Method With Current Coil
16. AC VOLTAGE[*]	10 Hz to 10 kHz 2 mV to 30 mV 30 mV to 300 mV 30 V to 300 V 320 V to 1000 V	2.70 % to 0.25 % 0.25 % to 0.08 % 0.22 % to 0.1 % 0.1 % to 0.07 %	Using Universal Calibration System 9100 by Direct Method
17. AC CURRENT[*]	40 Hz to 10 kHz 320 μ A to 3.2 mA 3.2 mA to 320 mA 2.1 to 10 A 10 A to 20 A 20 to 900 A	0.50 % to 0.13 % 0.13 % 0.30 % 0.30 % to 0.43 % 0.60 % to 0.52 %	Using Universal Calibration System 9100 by Direct Method With Current Coil

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18. RESISTANCE*	1 m Ω to 10 m Ω 10 m Ω to 100 m Ω 100 m Ω to 1 Ω 1 Ω to 40 Ω 40 Ω to 400 Ω 400 Ω to 40 k Ω 40 k Ω to 400 k Ω 400 k Ω to 4 M Ω 4 M Ω to 40 M Ω 40 M Ω to 300 M Ω 400 M Ω to 1000 M Ω 1 G Ω to 10 G Ω	0.12 % to 0.09 % 0.09 % to 0.02 % 0.02 % 0.02 % to 0.5 % 0.5 % to 0.02 % 0.02 % 0.02 % 0.02 % to 0.03 % 0.03 % to 0.09 % 0.09 % to 0.42 % 1.16 % to 1.13 % 1.13 %	Using Standard Resistors, Universal Calibration System by Direct Method
19. CAPACITANCE*	1 kHz 3 nF to 30 nF 30 nF to 300 nF 300 nF to 1.09 μ F 1.09 μ F to 300 μ F	1.73 % to 0.7 % 0.7 % 0.7 % to 1.1 % 1.1 % to 1.40 %	Using Universal Calibration System by Direct Method
20. INDUCTANCE*	1 kHz 1 mH to 10 H	0.60 %	Using Decade Inductance Box by Direct Method
21. FREQUENCY*	120 Hz to 1 kHz 1 kHz to 100 kHz 1 MHz to 10 MHz 10 MHz to 600 MHz	0.003 % to 0.007 % 0.007 % to 0.003 % 0.003 % 0.003 % to 0.004 ppm	Using Universal Calibration System & Oscilloscope Calibrator 5820A by direct method

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

§ Only in Permanent Laboratory

* 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.