

Laboratory R & D Instrument Services, #5, Natesan Nagar, 27th Street,
Alapakkam, Chennai, Tamil Nadu

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number CC-2828 (in lieu of C-0672, C-0673 & C-0674) **Page** 1 of 17

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
<u>ELECTRO-TECHNICAL CALIBRATION</u>				
I.	MEASURE			
1.	DC Voltage [#]	1 mV to 100 mV 100 mV to 1 V 1 V to 10 V 10 V to 100 V 100 V to 1000 V	0.41 % to 0.01 % 0.01 % to 0.006 % 0.006 % to 0.005 % 0.005 % to 0.006 % 0.006 %	Using Digital Multimeter 6½ Digit by Direct Method
2.	AC Voltage [#]	50 Hz to 10 kHz 10 mV to 100 mV 100 mV to 1 V 1 V to 10 V 10 V to 100 V 100 V to 750 V	0.54 % to 0.12 % 0.12 % to 0.10 % 0.10 % 0.10 % 0.10 % to 0.11 %	Using Digital Multimeter 6½ Digit by Direct Method
3.	AC Current [#]	50 Hz 100 mA to 1 A 1 A to 2 A	0.58 % to 0.17 % 0.17 % to 0.28 %	Using Digital Multimeter 6½ Digit by Direct Method
4.	DC Current [#]	0.1 mA to 1 mA 1 mA to 25 mA 25 mA to 100 mA 100 mA to 1 A 1 A to 2 A 2A to 10A	1.17 % to 0.13 % 0.13 % to 0.02 % 0.02 % to 0.06 % 0.06 % to 0.13 % 0.12 % to 0.17 % 0.17 % to 0.32 %	Using Digital Multimeter 6½ Digit, Precision Calibrator by Direct Method
5.	Resistance [#]	1 Ω to 100 Ω 100 Ω to 1 k Ω 1 k Ω to 10 k Ω 10 k Ω to 100 k Ω 100 k Ω to 1 M Ω 1 M Ω to 10 M Ω 10 M Ω to 100 M Ω	0.47 % to 0.016 % 0.016 % to 0.013 % 0.013 % to 0.013 % 0.013 % to 0.013 % 0.013 % to 0.013 % 0.013 % to 0.047 % 0.047 % to 0.94 %	Using Digital Multimeter 6½ Digit by Direct Method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
6.	Frequency #	3 Hz to 100 Hz 100 Hz to 1 kHz 1 kHz to 10 kHz 10 kHz to 100 kHz 100 kHz to 300 kHz	1.93 % to 0.06 % 0.06 % to 0.06 % 0.06 % to 0.013 % 0.013 % to 0.012 % 0.012 % to 0.012 %	Using Digital Multimeter 6½ Digit by Direct Method
7.	Time Interval #	1 s to 10 s 10 s to 100 s 100 s to 1000 s 1000 s to 2 hr 2 hr to 10 hr 10 hr to 24 hr	4.12 % to 1.23 % 1.23 % to 0.33 % 0.33 % to 0.04 % 0.04 % to 0.015 % 0.015 % to 0.018 % 0.018 % to 0.027 %	Using Timer by Comparison Method
8.	Temperature Simulation # pt-100 ($\alpha = 385$) pt-500 ($\alpha = 385$) pt-1000 ($\alpha = 385$) K – Type Thermocouple E – Type Thermocouple J – Type Thermocouple N – Type Thermocouple R – Type Thermocouple B – Type Thermocouple	(-) 200 °C to 800 °C (-) 200 °C to 630 °C (-) 200 °C to 630 °C (-) 200 °C to 0 °C 0 °C to 1360 °C (-) 240 °C to 0 °C 0 °C to 1000 °C (-) 210 °C to 700 °C 700 °C to 1200 °C (-) 200 °C to (-) 100 °C (-) 100 °C to 1300 °C 0 °C to 400 °C 400 °C to 1750 °C 600°C to 1200°C 1200°C to 1820°C	0.047 °C 0.056 °C 0.041 °C 0.21 °C 0.19 °C 0.31 °C 0.14 °C 0.18 °C 0.31 °C 0.30 °C 0.15 °C 0.55 °C 0.31 °C 0.44 °C 0.29 °C	Using Precision Calibrator by Direct Method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
	S – Type Thermocouple	0°C to 400°C 400°C to 1750°C	0.54 °C 0.34 °C	
	L – Type Thermocouple	(-) 200 °C to 800 °C 800 °C to 900 °C	0.86 °C 0.77 °C	
	U – Type Thermocouple	(-) 200 °C to 0 °C 0 °C to 400 °C	0.70 °C 0.41 °C	
	T – Type Thermocouple	(-) 240 °C to 0 °C 0 °C to 400 °C	0.42 °C 0.22 °C	
	C – Type Thermocouple	0 °C to 1000 °C 1000 °C to 2300 °C	0.46 °C 0.99 °C	
II.	SOURCE			
1.	DC Voltage #	1 mV to 10 mV 10 mV to 100 mV 100 mV to 1 V 1 V to 10 V 10 V to 100 V 100 V to 1000 V	0.37 % to 0.04 % 0.04 % to 0.007 % 0.007 % to 0.004 % 0.004 % to 0.003 % 0.003 % to 0.004 % 0.004 % to 0.004 %	Using Multi Product Calibrator by Direct Method
2.	DC Current #	100 μ A to 1 mA 1mA to 10mA 10mA to 100mA 100mA to 1A 1A to 20A 20 A to 100 A 100 A to 1000 A	0.09 % to 0.015 % 0.015 % to 0.008 % 0.008 % to 0.009 % 0.009 % to 0.014 % 0.014 % to 0.10 % 0.76 % to 0.31 % 0.31 % to 0.31 %	Using Multi Product Calibrator by Direct Method Using Multi Product Calibrator & Clamp Coil by Direct Method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
3.	AC Voltage [#]	50 Hz 20 mV to 200 mV 200 mV to 2 V 2 V to 20 V 20 V to 200 V 200 V to 700 V 700 V to 1000 V	0.45 % to 0.05 % 0.05 % to 0.04 % 0.04 % to 0.04 % 0.04 % to 0.10 % 0.10 % to 0.05 % 0.05 % to 0.10 %	Using Multi Product Calibrator by Direct Method
		1 kHz 20 mV to 200 mV 200 mV to 2 V 2 V to 20 V 20 V to 200 V 200 V to 700 V	0.30 % to 0.10 % 0.10 % to 0.08 % 0.08 % to 0.07 % 0.07 % to 0.10 % 0.10 % to 0.21 %	Using Multi Product Calibrator by Direct Method
		10 kHz 200 mV to 2 V 2 V to 20 V 20 V to 200 V 200 V to 700 V	0.10 % to 0.08 % 0.08 % to 0.07 % 0.07 % to 0.11 % 0.11 % to 0.21 %	Using Multi Product Calibrator by Direct Method
		20 kHz 200 mV to 2 V 2 V to 20 V 20 V to 200 V	0.37 % to 0.37 % 0.37 % to 0.40 % 0.40 % to 0.11 %	Using Multi Product Calibrator by Direct Method
4.	AC Current [#]	50 Hz 25 μ A to 200 μ A 200 μ A to 2 mA 2 mA to 20 mA 20 mA to 200 mA 200 mA to 2 A 2 A to 20 A	1.3 % to 0.24 % 0.24 % to 0.11 % 0.11 % to 0.11 % 0.11 % to 0.10 % 0.10 % to 0.12 % 0.12 % to 0.08 %	Using Multi Product Calibrator by Direct Method
		20 A to 100 A 100 A to 1000 A	0.76 % to 0.31% 0.31 % to 0.30 %	Using Multi Product Calibrator & Clamp Coil by Direct Method

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		1 kHz 25 μ A to 200 μ A 200 μ A to 2 mA 2 mA to 20 mA 20 mA to 200 mA 200 mA to 2 A	2.5 % to 1.4 % 1.4 % to 0.7 % 0.7 % to 0.5 % 0.5 % to 0.5 % 0.5 % to 0.6 %	Using Multi Product Calibrator by Direct Method
5.	Frequency #	10 Hz to 100 Hz 100 Hz to 1 kHz 1 kHz to 10 kHz 10 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz to 1 MHz 1 MHz to 10 MHz	0.006 % to 0.003 % 0.003 % to 0.002 % 0.002 % to 0.002 % 0.002 % to 0.002 % 0.002 % to 0.002 % 0.002 % to 0.06 % 0.06 % to 0.06 %	Using Multi Product Calibrator by Direct Method
6.	Capacitance #	1 kHz 1 nF 10 nF 20 nF 50 nF 100 nF 1 μ F 10 μ F	0.68 % 0.44 % 0.55 % 0.43 % 0.43 % 0.56 % 0.77 %	Using Multi Product Calibrator by Direct Method
7.	Resistance #	0.1 Ω to 1 Ω 1 Ω to 10 Ω 10 Ω to 10 k Ω 10 k Ω to 100 k Ω 100 k Ω to 1 M Ω 1 M Ω to 10 M Ω 10 M Ω to 100 M Ω 100 M Ω to 1 G Ω	0.95 % to 0.11 % 0.11 % to 0.06 % 0.06 % to 0.06 % 0.06 % to 0.06 % 0.06 % to 2.31 % 2.31 % to 2.31 % 2.31 % to 2.31 % 2.31 % to 2.62 %	Using High Precision DRB and High Stability DRB by Direct Method

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8.	Temperature Simulation [#]			
	pt-100 ($\alpha = 385$)	(-) 200 °C to 800 °C	0.09 °C	Using Multi Product Calibrator by Direct Method
	pt-500 ($\alpha = 385$)	(-) 200 °C to 630 °C	0.20 °C	
	pt-1000 ($\alpha = 385$)	(-) 200 °C to 630 °C	0.10 °C	
	K – Type Thermocouple	(-) 200 °C to 1360 °C	0.20 °C	Using Precision Calibrator by Direct Method
	E – Type Thermocouple	(-) 250 °C to 1000 °C	0.30 °C	
	J – Type Thermocouple	(-) 210 °C to 1200 °C	0.17 °C	
	T – Type Thermocouple	(-) 250 °C to 400 °C	0.43 °C	
	N – Type Thermocouple	(-) 200 °C to 1300 °C	0.30 °C	
	R – Type Thermocouple	0 °C to 1750 °C	0.54 °C	
	B – Type Thermocouple	600 °C to 1820 °C	0.42 °C	
	S – Type Thermocouple	0 °C to 1750 °C	0.53 °C	
	L – Type Thermocouple	(-) 200 °C to 900 °C	0.77 °C	
	U – Type Thermocouple	(-) 240 °C to 400 °C	0.91 °C	
	C – Type Thermocouple	0 °C to 2300 °C	0.99 °C	

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
<u>MECHANICAL CALIBRATION</u>				
I. PRESSURE INDICATING DEVICES				
1.	Pressure (Pneumatic) Analog/ Digital, Industrial Pressure Gauges, Transducers, Transmitters, Indicating Transmitters, Indicators, Controllers, Recorders, Data Loggers, Switches, Manometers, Calibrators, Modules ^{\$}	0.2 bar to 35 bar	0.011 % rdg	Using Pneumatic DWT by Direct Method as per DKD R-6-1
2.	Pressure (Hydraulic) Analog/ Digital, Industrial Pressure Gauges, Transducers, Transmitters, Indicating Transmitters, Indicators, Controllers, Recorders, Data Loggers, Switches, Calibrators, Modules ^{\$}	1 bar to 40 bar 20 bar to 1200 bar 1200 bar to 1400 bar	0.011 % rdg 0.013 % rdg 0.055 % rdg	Using Hydraulic DWT by Direct Method as per DKD R-6-1 Using Digital Pressure Indicator by Comparison Method as per DKD R-6-1

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3.	Vacuum Analog/ Digital, Industrial Vacuum Gauges, Transducers, Transmitters, Indicating Transmitters, Indicators, Controllers, Recorders, Data Loggers, Switches, Manometers, Calibrators, Modules ^s	(-) 30 mbar to (-) 1000 mbar	0.022 % rdg	Using Pneumatic DWT by Direct Method as per DKD R-6-1
4.	Differential Pressure Gauges Magnehelic / Photohelic Gauge, Differential Pressure Indicators/ Controllers / Transmitters/ Switches ^s	(\pm) 10 mbar (\pm) 200 mbar	0.25 % rdg 0.030 % rdg	Using Digital Pressure Controller by Comparison Method as per DKD R-6-1
5.	Absolute Pressure Analog/ Digital, Industrial Pressure Gauges, Transducers, Transmitters, Indicating Transmitters, Indicators, Controllers, Recorders, Data Loggers, Switches, Manometers, Calibrators, Modules ^s	0.15 bar to 2 bar (abs)	0.90 mbar	Using Absolute Pressure Calibrator by Direct Method as per DKD R-6- 1

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6.	Pressure (Pneumatic) Analog/Digital, Industrial Pressure Gauges, Transducers, Transmitters, Indicating Transmitters, Indicators, Controllers, Recorders, Data Loggers, Switches, Manometers, Calibrators, Modules*	0 to 35 bar	0.033 % rdg	Using Pressure Calibrator by Comparison Method as per DKD R-6-1
7.	Pressure (Hydraulic) Analog/Digital, Industrial Pressure Gauges, Transducers, Transmitters, Indicating Transmitters, Indicators, Controllers, Recorders, Data Loggers, Switches, Calibrators, Modules*	0 to 700 bar 700 bar to 1400 bar	0.037 % rdg 0.67 % rdg	Using Pressure Calibrator by Comparison Method as per DKD R-6-1
8.	Vacuum Analog/Digital, Industrial Vacuum Gauges, Transducers, Transmitters, Indicating Transmitters, Indicators,	0 to (-)1000 mbar	0.081 % rdg	Using Pressure Calibrator by Comparison Method as per DKD R-6-1

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
	Controllers, Recorders, Data Loggers, Switches, Manometers, Calibrators, Modules*			
9.	Differential Pressure Gauges Magnehelic / Photohelic Gauge, Differential Pressure Indicators/ Controllers/ Transmitters/ Switches*	(\pm) 200 mbar	0.076 % rdg	Using Digital Manometer by Comparison Method as per DKD R-6-1
II.	DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)			
1.	Calipers (Vernier / Dial / Electronic) [§] L.C.: 0.01 mm	0 to 600 mm	10.8 μ m	Using Caliper checker as per IS: 3651
2.	Height Gauges (Vernier / Dial / Electronic) [§] L.C.: 0.01 mm	0 to 600 mm	11.5 μ m	Using Caliper checker as per IS: 2921
3.	Depth Gauges (Vernier / Dial / Electronic) [§] L.C.: 0.01 mm	0 to 300 mm	10.1 μ m	Using Gauge blocks as per IS: 4213
4.	External Micrometer [§] L.C.: 0.001 mm L.C.: 0.01 mm	0 to 100 mm 0 to 300 mm	2.9 μ m 8.0 μ m	Using Gauge Blocks and Long Gauge Blocks as per IS: 2967

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5.	Internal Micrometer ^s (Stick Type) L.C.: 0.01 mm	50 to 250 mm	5.2 μ m	Using Gauge Blocks and Gauge Block Accessories as per IS: 2966
6.	Depth Micrometer ^s L.C.: 0.01 mm	0 to 300 mm	6.1 μ m	Using Gauge Blocks as per IS: 2967
7.	Plunger Dial Gauge ^s L.C.: 0.001 mm L.C.: 0.01 mm	0 to 25 mm 0 to 50 mm	2.4 μ m 2.5 μ m	Using Gauge Blocks and Electronic Dial Calibration Tester as per IS: 2092
8.	Lever Dial Gauge ^s L.C.: 0.01 mm	Upto 2 mm	2.3 μ m	Using Electronic Dial Calibration Tester as per IS: 11498
9.	Bore Dial Gauge ^s (Only Transmission Error) L.C.: 0.001 mm	1.2 mm	4.4 μ m	Using Electronic Dial Calibration Tester
10.	Dial Thickness Gauge ^s L.C.: 0.01 mm	0 to 10 mm	2.9 μ m	Using Gauge Blocks as per IS: 2092
11.	Feeler Gauge ^s	0.05 mm to 1 mm	3.1 μ m	Using Digital Micrometer as per IS: 3179
12.	Plain Plug Gauge ^s	Upto 100 mm	4.10 μ m	Using Gauge Blocks and Electronic Dial Calibration Tester as per IS: 3455
13.	Plain Snap/ Gap Gauge ^s	2.5 mm to 100 mm	1.5 μ m	Using Gauge Blocks and as per IS: 3455

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
14.	Micrometer Setting Standard ^{\$}	25 mm to 200 mm 200 mm to 300 mm	5.4 μ m 5.9 μ m	Using Gauge Blocks and Electronic Dial Calibration Tester
15.	Slip Gauge Accessories (Measuring Jaw-Nominal Size, Parallelism & Flatness) ^{\$}	1 mm to 25 mm	3.9 μ m	Using Gauge Blocks, Electronic Dial Calibration Tester and Optical Flat as per IS: 4440
III.	ACCELERATION AND SPEED			
1.	Non-Contact Tachometer [#]	10 rpm to 100 rpm >100 rpm to 1000 rpm >1000 rpm to 30000 rpm >30000 rpm to 60000 rpm	0.54 rpm 6.2 rpm 29 rpm 80 rpm	Using Standard Tachometer by Comparison Method
2.	Contact Tachometer [#]	100 rpm to 3000 rpm	19 rpm	Using Standard Tachometer by Comparison Method
3.	RPM Indicator [*]	10 rpm to 3000 rpm	6.8 rpm	Using Standard Tachometer by Comparison Method
IV.	WEIGHTS			
1.	Mass (F1 Class Weights and Coarser) ^{\$}	1 mg 2 mg 5 mg 10 mg 20 mg 50 mg 100 mg 200 mg	0.010 mg 0.0093 mg 0.0095 mg 0.0099 mg 0.0099 mg 0.0094 mg 0.0096 mg 0.0093 mg	Using Standard Weights of E2 class and Weighing Balance with Readability 0.01 mg/0.1 mg by ABBA Method as per OIML R-111-1

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		500 mg 1 g 2 g 5 g 10 g 20 g 50 g 100 g 200 g	0.0098 mg 0.014 mg 0.014 mg 0.014 mg 0.014 mg 0.015 mg 0.089 mg 0.098 mg 0.14 mg	
V.	WEIGHING SCALE AND BALANCE			
1.	Weighing Balance * d : 0.1 mg d : 1 mg d : 10 mg d : 100 mg d : 500 mg d : 1 g d : 10 g d : 20 / 50 g	0 to 42 g >42 g to 210 g >210 g to 620 g >620 g to 6.2 kg >6.2 kg to 22 kg >22 kg to 52 kg >52 kg to 100 kg >100 kg to 300 kg	0.040 mg 0.32 mg 3.7 mg 14 mg 58 mg 0.63 g 5.8 g 32 g	Using Standard Weights of E2 Class as per OIML R-76 Using Standard Weights of E2 & F1 Class as per OIML R-76 Using Standard Weights of F1 & F2 Class as per OIML R-76 Using Standard Weights of F2 & M1 Class as per OIML R-76
VI.	VOLUME			
1.	Micropipette ^s	10 μ l to 100 μ l 100 μ l to 1000 μ l 1 ml to 10 ml	0.060 μ l 0.16 μ l 2.7 μ l	Using Weighing Balance with Readability 0.01 mg/0.1 mg by Gravimetric Method as per ISO 8655-6

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2.	Glasswares (Pipette/Burette / Standard Flask / Conical Flask / Beaker / Measuring Cylinder / Measuring Jar) ^{\$}	1 ml to 10 ml 10 ml to 20 ml 20 ml to 50 ml 50 ml to 100 ml	1.29 μ l 1.3 μ l 3.2 μ l 6.4 μ l	Using Weighing Balance with Readability 0.01 mg/0.1 mg by Gravimetric Method as per ISO 4787

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<u>THERMAL CALIBRATION</u>				
I.	TEMPERATURE			
1.	Glass Thermometer [§]	(-) 80 °C to 0 °C >0 °C to 90 °C >90 °C to 250 °C	0.32 °C 0.16 °C 0.34 °C	Using Standard RTD, Liquid Bath and Digital Multimeter by Comparison Method
2.	RTD's, Thermistors, Thermocouples, Temperature Gauges, Digital Thermometers, Temperature Indicator with Sensors, Temperature Switches, Temperature Transmitter [#]	(-) 80 °C to 50 °C >50 °C to 650 °C >650 °C to 1200 °C	0.16 °C 0.18 °C 0.99 °C	Using Standard RTD, Thermocouple, Liquid Bath, Dry Block Calibrator, Precision Process Calibrator and Digital Multimeter by Comparison Method
3.	Temperature Indicator of Bath, Dry Block Calibrator [#]	(-) 80 °C to 50 °C >50 °C to 650 °C >650 °C to 1200 °C	0.16 °C 0.20 °C 1.1 °C	Using Standard RTD, Thermocouple, Precision Process Calibrator and Digital Multimeter by Comparison Method
4.	Non-Contact Thermometer, IR Thermometer, Pyrometer [§]	50 °C to 100 °C >100 °C to 300 °C >300 °C to 500 °C	0.36 °C 0.41 °C 0.57 °C	Using Standard IR Thermometer and Black Body Source by Comparison Method
5.	Black Body Source [§]	50 °C to 500 °C	0.57 °C	Using Standard IR Thermometer by Comparison Method

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6.	Temperature Indicator/Controller/ Recorder with Sensor Freezer, Oven, Incubator (for Non-Medical Applications), Furnace, Bath, Environmental Chamber, Autoclave (for Non-Medical Applications) (Single Position Calibration) *	(-) 80 °C to 50 °C >50 °C to 650 °C >650 °C to 1200 °C	0.16 °C 0.32 °C 1.85 °C	Using Standard RTD, Thermocouple, Precision Process Calibrator and Digital Multimeter by Comparison Method
7.	Temperature by Spatial Mapping Freezer, Ovens, Incubator (for Non-Medical Applications), Furnace, Bath, Environmental Chamber and Temperature Enclosures *	(-) 25 °C to 50 °C >50 °C to 250 °C >250 °C to 1000 °C >1000 °C to 1200 °C	1.65 °C 2.67 °C 3.40 °C 4.43 °C	Using Master Thermocouple and Paperless Graphic Recorder by Spatial Mapping – Comparison Method
II.	SPECIFIC HEAT & HUMIDITY			
1.	Analog/Digital Thermo Hygrometers/ Thermo Hygrographs/ Humidity Sensors / Data Loggers/ Transmitters ^s	20 % RH to 90 % RH @ 25 °C 10 °C to 50 °C	1.60 % RH 0.33 °C	Using Standard Humidity Indicator with Sensor, Humidity Chamber by Comparison Method

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Accreditation Standard ISO/IEC 17025: 2005

Certificate Number CC-2828 (in lieu of C-0672, C-0673 & C-0674) **Page** 17 of 17

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
2.	Humidity Indicator/ Controller/Recorder with Sensor of Humidity Chamber, Environmental Chamber (Single Position Calibration)*	20 % RH to 90 % RH @ 25 °C	1.34 % RH	Using Standard Humidity Indicator with Sensor by Comparison Method
3.	Humidity by Spatial Mapping Environmental Chamber and Humidity Enclosures*	20 % RH to 90 % RH @ 25 °C	3.5 % RH	Using Humidity Data Logger With Sensor by Spatial Mapping – Comparison 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.

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