

Laboratory Sansel Calibration Laboratories, No. 1/46, 3rd Main Road, Ganga Nagar, Maduravoyal, Chennai, Tamil Nadu
Accreditation Standard ISO/IEC 17025: 2005
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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
<u>ELECTRO-TECHNICAL CALIBRATION</u>				
1.	SOURCE			
1.	DC Voltage [#]	1 mV to 10 mV 10 mV to 100 mV 100 mV to 10 V 10 V to 1000 V	0.47 % to 0.053 % 0.053 % to 0.011 % 0.011 % to 0.0092 % 0.0092 % to 0.0082 %	Using MPC Transmile 3050 by Direct Method
2.	DC Current [#]	10 μ A to 100 mA 100 mA to 1 A 1 A to 20 A 20 A to 100 A 100 A to 1000 A	0.26 % to 0.024 % 0.024 % to 0.068 % 0.068 % to 0.066 % 1.47 % to 0.87 % 0.87 % to 0.62 %	Using MPC Transmile 3050 by Direct Method Using MPC Transmile 3050 with Current Coil by Comparison Method
3.	DC Resistance [#] 4 Wire (Discrete Values)	10 Ω 100 Ω 0.9999712 k Ω 9.999430 k Ω 100.10880 k Ω	0.3 % 0.03 % 0.01 % 0.007 % 0.007 %	Using MPC Transmile 3050 by Direct Method
4.	DC Resistance [#] 4 Wire (Variable)	1 Ω to 4000 Ω	1.51 % to 0.07 %	Using MFC DPI 620 by Direct Method
5.	DC Resistance [#] 2 Wire (Discrete Values)	10.166 Ω 100.159 Ω 1.000134 k Ω 9.99960 k Ω 100.1088 k Ω 1 M Ω 10 M Ω 99.8160 M Ω 100 M Ω	0.3 % 0.03 % 0.01 % 0.007 % 0.007 % 0.012 % 0.069 % 0.14 % 0.82 %	Using MPC Transmile 3050 by Direct Method

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		1 GΩ 10 GΩ 100 GΩ	2.40 % 3.54 % 5.85 %	Using Decade Resistance Box by Direct Method
6.	AC Voltage #	50 Hz to 2 kHz 1 mV to 10 mV 10 mV to 100 mV 100 mV to 10 V 10 V to 100 V 100 V to 1000 V 5 kHz to 10 kHz 10 mV to 100 mV 100 mV to 10 V 10 V to 100 V 100 V to 1000 V 20 kHz 10 mV to 100 mV 100 mV to 10 V 10 V to 100 V 100 kHz 0.5 V to 1 V 1 V to 20 V	2.97 % to 0.34 % 0.34 % to 0.073 % 0.073 % to 0.068 % 0.068 % to 0.078 % 0.078 % to 0.069 % 2.31 % to 0.34 % 0.34 % to 0.13 % 0.13 % to 0.15 % 0.15 % to 0.14 % 2.32 % to 0.36 % 0.36 % to 0.16 % 0.16 % to 0.18 % 0.94 % to 0.59 % 0.59 % to 0.53 %	Using MPC Transmile 3050 by Direct Method
7.	AC Current #	50 Hz to 1 kHz 20 μA to 100 μA 100 μA to 10 mA 10 mA to 100 mA 100 mA to 1 A 1 A to 20 A 2 kHz 10 mA to 100 mA 100 mA to 1 A 1 A to 20 A	1.87 % to 0.45 % 0.45 % to 0.13 % 0.13 % 0.13 % to 0.17 % 0.17 % to 0.29 % 0.13 % 0.13 % to 0.17 % 0.17 % to 0.29 %	Using MPC Transmile 3050 by Direct Method

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		5 kHz 10 mA to 100 mA 100 mA to 200 mA 10 kHz 20 mA to 100 mA 100 mA to 200 mA 50 Hz 20 A to 100 A 100 A to 1000 A	0.20 % 0.2 % to 0.16 % 0.16 % to 0.19 % 0.19 % to 0.17 % 1.47 % to 0.87 % 0.87 % to 0.63 %	Using MPC Transmile 3050 with Current Coil by Comparison Method
8.	Frequency [#]	1 Hz to 100 Hz 100 Hz to 10 MHz	0.06 % to 0.006 % 0.006 % to 0.002 %	Using MPC Transmile 3050 by Direct Method
9.	Capacitance [#]	1 kHz 10 nF 20 nF 50 nF 100 nF 1 µF	0.47 % 0.47 % 0.47 % 0.47 % 0.70 %	Using MPC Transmile 3050 by Direct Method
10.	Temperature By Simulation Method [#]			
	RTD	(-)200 °C to 200 °C 200 °C to 600 °C 600 °C to 850 °C	0.17 °C 0.29 °C 0.40 °C	Using Multi Function Calibrator UC 12 by Direct Method
	Thermocouple			
	B Type	450 °C to 1800 °C	0.58 °C	
	R Type	100 °C to 1750 °C	0.58 °C	
	S Type	100 °C to 1750 °C	0.58 °C	
	N Type	(-)200 °C to 1300 °C	0.35 °C	
	T Type	(-)200 °C to 400 °C	0.35 °C	
	K Type	(-)200 °C to 1350 °C	0.35 °C	
	E Type	(-)200 °C to 1000 °C	0.35 °C	
	J Type	(-)200 °C to 1200 °C	0.35 °C	

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II.	MEASURE			
1.	DC Voltage #	1 mV to 10 V 10 V to 1000 V	0.48 % to 0.005 % 0.005 % to 0.007 %	Using DMM 6½ Keithley 2100 by Direct Method
2.	DC High Voltage *	1 kV to 30 kV	2.2 % to 2.94 %	Using High Voltage Probe HVP40 with DMM by Direct Method
3.	DC Current #	0.1 mA to 1 mA 1 mA to 100 mA 100 mA to 2.7 A 2.7 A to 20 A	2.97 % to 0.35 % 0.35 % to 0.07 % 0.07 % to 0.20 % 0.42 % to 0.26 %	Using DMM 6½ Keithley 2100 by Direct Method Using DMM 6½ with Shunt by V/R Method
4.	DC Resistance #	1 Ω to 10 Ω 10 Ω to 1 k Ω 1 k Ω to 100 k Ω 100 k Ω to 100 M Ω	0.83 % to 0.07 % 0.07 % to 0.02 % 0.020 % 0.02 % to 1.17 %	Using DMM 6½ Keithley 2100 by Direct Method
5.	AC Voltage #	20 Hz 10 mV to 100 mV 100 mV to 20 V 50 Hz to 1 kHz 10 mV to 100 mV 100 mV to 100 V 100 V to 750 V 5 kHz to 10 kHz 10 mV to 100 mV 100 mV to 10 V 10 V to 100 V	0.679 % to 0.15 % 0.15 % to 0.33 % 0.68 % to 0.15 % 0.15 % to 0.14 % 0.14 % 0.68 % to 0.15 % 0.15 % to 0.14 % 0.14 %	Using DMM 6½ Keithley 2100 by Direct Method

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6.	AC High Voltage *	50 Hz 1 kV to 25 kV	6.3 %	Using High Voltage Probe HVP40 with DMM by Direct Method
7.	AC Current #	50 Hz to 1 kHz 0.1 A to 2.7 A	0.76 % to 0.33 %	Using DMM 6 $\frac{1}{2}$ Keithley 2100 by Direct Method
		50 Hz to 1 kHz 2.7 A to 20 A	2.48 % to 0.65 %	Using DMM 6 $\frac{1}{2}$ with Shunt by V/R Method
8.	Frequency #	1 Hz to 50 kHz	0.62 % to 0.003 %	Using MFC DPI 620 by Direct Method
		3 Hz to 300 kHz	0.12 % to 0.012 %	Using DMM 6 $\frac{1}{2}$ Keithley 2100 by Direct Method
9.	Temperature Measurement By Simulation Method #			
	RTD	(-)200 °C to 850 °C	0.02 °C	Using Precision Thermometer Millik by Direct Method
	Thermocouple			
	B Type	600 °C to 1800 °C	0.2 °C	
	R Type	100 °C to 1750 °C	0.2 °C	
	S Type	100 °C to 1750 °C	0.2 °C	
	N Type	(-)200 °C to 1300 °C	0.14 °C	
	T Type	(-)200 °C to 400 °C	0.1 °C	
	K Type	(-)200 °C to 1350 °C	0.1 °C	
	E Type	(-)200 °C to 1000 °C	0.08 °C	
	J Type	(-)200 °C to 1200 °C	0.085 °C	
10.	Time Interval # (Digital Timer, Stop Watch, Analog Timer)	1s to 3600 s 3600 s to 36000 s 36000 s to 86400 s	0.09 s to 0.54 s 0.54 s to 4.38 s 4.38 s to 10.37 s	Using timer CT6 Y by Comparison Method

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<u>MECHANICAL CALIBRATION</u>				
1.	DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)			
1.	Calipers [§] L.C.: 0.01 mm	Upto 600 mm	11.10 μ m	Using Caliper Checker & Gauge Blocks as per IS 3651 (Part 1 & 2)
2.	External Micrometer [§] L.C.: 0.001 mm L.C.: 0.01 mm	Upto 200 mm >200 mm to 300 mm	3.50 μ m 6.00 μ m	Using Gauge Blocks as per IS 2967
3.	Plunger Dial Gauge [§] L.C.: 0.001 mm	Upto 25 mm	2.60 μ m	Using Dial Calibration Tester / Gauge Blocks as per IS 2092
4.	Lever Type Dial Gauge [§] L.C.: 0.001 mm L.C.: 0.01 mm	0 to 0.14 mm 0 to 0.8 mm	2.60 μ m 4.30 μ m	Using Dial Calibration Tester as per IS 11498
5.	Bore Gauge [§] (Only Transmission Error)	Upto 1.2 mm	3.00 μ m	Using Dial Calibration Tester as per JIS B 7515
6.	Height Gauges [§] L.C.: 0.01 mm	Upto 600 mm	11.30 μ m	Using Dial Calibration Checker / Gauge Blocks as per IS 2921
7.	Depth Micro Meter [§] L.C.: 0.001 mm	Upto 300 mm	3.90 μ m	Using Gauge Blocks by Comparison Method
8.	Depth Gauges [§] L.C.: 0.01 mm	Upto 300 mm	5.90 μ m	Using Gauge Blocks as per IS 4213

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9.	Thickness Gauge ^s (Dial / Digital) L.C.: 0.001 mm	0 to 25 mm	0.62 μ m	Using Gauge Blocks as per IS 14271
10.	Snap Gauge ^s	>3 mm to 100 mm	0.70 μ m	Using Gauge Blocks as per IS 3455
11.	Internal Micrometer ^s L.C.: 0.01 mm	>50 mm to 300 mm	7.30 μ m	Using Gauge Blocks & Gauge Block Accessories Set as per IS 2966
12.	Feeler Gauge ^s	Upto 2 mm	2.40 μ m	Using External Micrometer as per IS 3179
13.	Width Gauge ^s	>0.5 mm to 20 mm	2.03 μ m	Using Dial Comparator, Dial Comparator Stand & Gauge Block Set by Comparison Method
14.	Dial Caliper Gauge ^s (Int/Ext) L.C.: 0.01 mm	2.5 mm to 100 mm	6.70 μ m	Using Gauge Block by Comparison Method
15.	Micro Meter Setting Stand ^s	Upto 200 mm >200 mm to 300 mm	3.40 μ m 4.40 μ m	Using Gauge Blocks and Digital Comparator by Comparison Method
16.	Plain Plug Gauge ^s	3 mm to 100 mm	1.2 μ m	Using Gauge Blocks and Digital Plunger Dial as per IS 3455
17.	Pistol Caliper ^s L.C.: 0.05 mm L.C.: 0.1 mm	Upto 50 mm >50 mm to 100 mm	29.10 μ m 57.90 μ m	Using Gauge Blocks by Comparison Method

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18.	Thread Measuring Wires ^s	1 mm to 6.35mm	0.90 μ m	Using Gauge Blocks and Digital Comparator as per IS 6311
19.	Measuring Pin ^s	0.5 mm to 25mm	1.02 μ m	Using Gauge Blocks and Digital Comparator as per IS 11103
II.	PRESSURE INDICATING DEVICES			
1.	Pressure (Hydraulic) Pressure Gauges, Pressure Calibrators, Pressure Switches, Pressure Transmitters, Indicators [#]	0 bar to 200 bar	0.012 bar	Using Digital Pressure Calibrator of Uncertainty: 0.0101 bar By Comparison Method as per DKD R-6-1
		0 bar to 1000 bar	0.09 bar	Using Digital Pressure Calibrator of Uncertainty: 0.055 bar By Comparison Method as per DKD R-6-1
2.	Pressure (Pneumatic) Pressure Gauges, Pressure Calibrators, Pressure Switches, Pressure Transmitters, Indicators, Manometers [#]	0.1 bar to 2 bar	0.00009 bar	Using Digital Pressure Calibrator of Uncertainty:0.000063 bar By Comparison Method as per DKD R-6-1
		1 bar to 35 bar	0.0015 bar	Using Digital Pressure Calibrator of Uncertainty:0.00117 bar By Comparison Method as per DKD R-6-1

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
3.	Vacuum Vacuum Gauges , Vacuum Calibrators , Vacuum Switches , Vacuum Transmitters, Vacuum Indicators [#]	(-) 0.1 bar to (-)0.9 bar	0.00012 bar	Using Digital Pressure Calibrator of Uncertainty:0.000091 bar as per ISO 3567 and ISO 27893
		(-) 0.1 bar to (-) 0.997 bar	0.0002 bar	Using Digital Pressure Calibrator of Uncertainty:0.00016 bar as per ISO 3567 and ISO 27893
4.	Pressure(Absolute) Absolute Gauges, Barometers, Manometers ^{\$}	0.6 bar to 3 bar (Abs)	0.00012 bar	Using Digital Pressure Calibrator of Uncertainty:0.000103 bar By Comparison Method as per DKD R-6-1
5.	Low Pressure Gauges, Transducer, Transmitter, Manometers [#]	\pm 25 mbar	0.012 mbar	Using Digital Pressure Calibrator of Uncertainty:0.003 mbar By Comparison Method as per DKD R-6-1
		\pm 200 mbar	0.09 mbar	Using Digital Pressure Calibrator of Uncertainty:0.062 mbar By Comparison Method as per DKD R-6-1
III.	ACCOUSTIC			
1.	Sound ^{\$}	30 dB to 130 dB	0.21 dB	Using Sound Level Calibrator @94 dB & 114 dB @1 kHz as per OIML R 58

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IV.	WEIGHTS			
1.	Mass ^g	1 mg 2 mg 5 mg 10 mg 20 mg 50 mg 100 mg 200 mg 500 mg 1 g 2 g 5 g	0.002 mg 0.002 mg 0.002 mg 0.002 mg 0.002 mg 0.002 mg 0.002 mg 0.002 mg 0.002 mg 0.003 mg 0.003 mg 0.004 mg	Using E1 Class Weights & Mass Comparator (Readability : 1 μ g) Calibration of Weights of Class E2 Accuracy and Coarser as per OIML R 111
		10 g 20 g 50 g 100 g	0.015 mg 0.025 mg 0.028 mg 0.028 mg	Using E1 Class Weights & Mass Comparator (Readability : 0.01 mg) Calibration of Weights of Class E2 Accuracy And Coarser as per OIML R 111
		200 g	0.1 mg	Using E1 Class Weights & Mass Comparator (Readability : 0.1 mg) Calibration of Weights of Class E2 Accuracy and Coarser as per OIML R 111
		500 g 1 kg	2.9 mg 3.7 mg	Using F1 Class Weights & Mass Comparator Readability : 0.001 g Calibration of Weights of Class F2 Accuracy and Coarser as per OIML R 111

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		2 kg 5 kg 10 kg	10 mg 12.4 mg 0.032 g	Using F1 Class Weights & Mass Comparator Readability:0.01 g Calibration of Weights of Class F2 Accuracy and Coarser as per OIML R 111
		20 kg	0.12 g	Using F1 Class Weights & Mass Comparator Readability :0.1 g Calibration of Weights of Class F2 Accuracy and Coarser as per OIML R 111
		50 kg	1.02 g	Using F2 Class Weights & Mass Comparator Readability : 1 g Calibration of Weights of Class M1 Accuracy and Coarser as per OIML R 111
V.	WEIGHING SCALE AND BALANCE			
1.	Mass*	Upto 5 g Readability :0.001 mg	0.005 mg	Using E1 Class Weights & Calibration of Electronic Weighing Balance of Class I and Coarser as per OIML R 76-1
		Upto 20 g Readability: 0.001 mg	0.008 mg	
		Upto 100 g / 220 g Readability:0.01 mg / 0.1 mg	0.05 mg	

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		Upto 1 kg Readability :1 mg	0.002 g	Using F1 Class Weights & Calibration of Electronic Weighing Balance of Class II and Coarser as per OIML R 76-1
		Upto 10 kg Readability :10 mg	0.02 g	
		Upto 20 kg Readability :0.1 g	0.1 g	
		Upto 50 kg Readability : 1 g	1 g	
		Upto 200 kg Readability : 10 g	10 g	
		Upto 300 kg Readability : 20 g	20 g	Using M1 Class weights & Calibration of Electronic Weighing Balance of Class III and Coarser as per OIML R 76-1
VI.	VOLUME			
1.	Micro Pipette ^s (Piston Operated)	1 μ l to 10 μ l >10 μ l to 50 μ l >50 μ l to 100 μ l >100 μ l to 1000 μ l >1 ml to 10 ml	0.05 μ l 0.10 μ l 0.10 μ l 0.10 μ l 0.7 μ l	Using Weighing Balance with Resolution d = 0.001 mg & d=0.01 mg Gravimetric Method as per ISO 8655 Part -6

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2.	Pipette & Burette [§]	1 ml to 10 ml >10 ml to 100 ml	1.03 μ l 2.5 μ l	Using Weighing Balance with Resolution d = 0.01 mg as per IS 4787
3.	Measuring Cylinder & Volumetric Flask [§]	>100 ml to 500 ml >500 ml to 2000 ml >2000 ml to 5000 ml	0.01 ml 0.22 ml 0.23 ml	Using Weighing Balance with Resolution d = 0.1 mg, d = 1 mg and d = 10 mg as per IS 4787
VII.	ACCELERATION AND SPEED			
1.	RPM Contact Tachometer, RPM / Speed Indicator [§]	100 rpm to 1000 rpm >1000 rpm to 9950 rpm	0.83 % to 0.18 % rdg 0.18 % to 0.023 % rdg	Using Digital Tachometer, RPM Source Comparison by SANAS Method
2.	RPM Non Contact Tachometer, RPM / Speed Indicator [§]	12 rpm to 30 rpm 30 rpm to 1000 rpm 1000 rpm to 10000 rpm 10000 rpm to 60000 rpm 60000 rpm to 99950 rpm	1.40 % to 0.51 % rdg 0.51 % to 0.08 % rdg 0.08 % to 0.020 % rdg 0.020 % to 0.012 % rdg 0.012 % rdg	Using Digital Tachometer, RPM Source Comparison by SANAS Method
3.	RPM Measurement Contact [*]	100 rpm to 1000 rpm >1000 rpm to 9950 rpm	0.90 % to 0.22 % rdg 0.22 % to 0.04 % rdg	Using Digital Tachometer Comparison by SANAS Method
4.	RPM Measurement Non Contact [*]	12 rpm to 100 rpm 100 rpm to 1000 rpm 1000 rpm to 10000 rpm 10000 rpm to 60000 rpm 60000 rpm to 90000 rpm	1.80 % to 0.25 % rdg 0.25 % to 0.20 % rdg 0.20 % to 0.07 % rdg 0.07 % to 0.06 % rdg 0.06 % rdg	Using Digital Tachometer Comparison by SANAS Method

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<u>THERMAL CALIBRATION</u>				
1.	TEMPERATURE			
1.	Liquid in Glass Thermometer ^s	(-) 80 °C to 250 °C	0.6 °C	Using PRT, Liquid Bath and Precision Thermometer Millik by Comparison Method
2.	RTD / TC/ Temperature Indicator with Sensor / Temperature Gauges, Temperature Transmitter with Sensor ^s	(-) 80 °C to (-) 30 °C	0.16 °C	Using PRT, Thermocouples (S- Type), Liquid Bath, Dry Block Calibrator and Precision Thermometer Millik by Comparison Method
3.	RTD / TC/ Temperature Indicator with Sensor / Temperature Gauges, Temperature Transmitter with Sensor [#]	(-) 30 °C to 300 °C 300 °C to 600 °C 600 °C to 1000 °C 1000 °C to 1200 °C	0.14 °C 0.16 °C 1.8 °C 2.9 °C	Using PRT, Thermocouples (S- Type), Liquid Bath, Dry Block Calibrator and Precision Thermometer Millik by Comparison Method
4.	RTD / TC/ Temperature Indicator with Sensor / Temperature Gauges, Temperature Transmitter with Sensor ^s	1200 °C to 1500 °C	3.2 °C	Using PRT, Thermocouples (S- Type), Liquid Bath, Dry Block Calibrator and Precision Thermometer Millik by Comparison Method

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5.	Temperature Baths, Liquid Bath, Dry Block Calibrator, Low Temperature Bath [#]	(-) 80 °C to (-) 30 °C (-) 30 °C to 300 °C 300 °C to 600 °C 600 °C to 1000 °C 1000 °C to 1200 °C 1200 °C to 1500 °C	0.17 °C 0.14 °C 0.19 °C 2.02 °C 2.93 °C 3.18 °C	Using PRT, Thermocouples and Precision Thermometer Millik by Comparison Method
6.	Non Contact Pyrometer, IR Thermometer, Non Contact Temperature Transmitter [#]	0 °C to 100 °C 100 °C to 500 °C 500 °C to 1200 °C 1200 °C to 1500 °C	1.7 °C 2.6 °C 2.8 °C 3.0 °C	Using Standard Non Contact IR Pyrometer, Block Body Source by Comparison Method
7.	Cold Room , Freezer Deep Freezer, Temperature Chamber, Oven, Hot Air Oven, Furnace, Liquid Bath, Muffle Furnace [*]	(-)80 °C to 250 °C 250 °C to 600 °C 600 °C to 1200 °C	0.37 °C 1.05 °C 2.4 °C	Using Standard RTD and Multifunction Calibrator / Centre Sensor of Multipoint Calibration is Taken for Single Point Calibration by Comparison Method
8.	Freezer Deep, Freezer, Oven, Hot Air Oven, Liquid Bath, Muffle Furnace Temperature Chamber (Single / Multi Point) [*]	(-)80 °C to 250 °C 250 °C to 600 °C 600 °C to 1200 °C	0.52 °C 1.28 °C 2.98 °C	Using Standard RTD / TC and Data Logger by Comparison Method
II.	SPECIFIC HEAT AND HUMIDITY			
1.	Relative Humidity/ Temperature Analog /Digital Hygrometer, Digital	10 % to 95 % RH@ 27.4 °C	0.77 % RH	Using Digital Temperature / Humidity Indicator (HP 22), Humidity

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
	Temp/Humidity Indicator , Thermo Hygrographs, Data Loggers, Transmitters, Humidity & Temperature Sensors [§]	5 °C to 60 °C @ 50.8 % RH	0.24 °C	Chamber, PRT, Precision Thermometer Millik by comparison Method
2.	Indicator of Temperature & Humidity Chamber , Environmental Chamber, Climatic Chamber, Humidity Generator, Humidity Source [†]	10 % to 95 % RH 10 °C to 60 °C	1.24 % RH 0.31 °C	Using Digital Temperature /Humidity Indicator with Sensor by comparison Method
3.	Humidity / Temperature Chamber, Environmental Chamber, Climatic Chamber, Humidity Generator, Humidity Source (Single / Multi Point) [†]	10 % to 95 % RH 10 °C to 60 °C	1.28 % RH 0.42 °C	Using Data Logger with Temperature /Humidity Sensor by 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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Convenor

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