

Laboratory **NorthLab (India) Pvt. Ltd., Shop No. 1, S.V. Nagar, Perumalpattu, Veppampattu, Chennai, Tamil Nadu**

Accreditation Standard **ISO/IEC 17025: 2005**

Certificate Number **CC-2457** (In lieu of C-0646, C-0197, C-0196, C-0195) Page **1 of 34**

Validity **17.05.2018 to 16.05.2020** Last Amended on **25.07.2018**

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
<u>ELECTRO TECHNICAL CALIBRATION</u>				
I.	MEASURE			
1.	DC Voltage [#]	1 μ V to 1 mV 1 mV to 10 mV 10 mV to 100 mV 100 mV to 1000 V 1 kV to 40 kV	1.3% to 102 ppm 102 ppm to 8 ppm 8 ppm to 3 ppm 3 ppm 3.9% to 2.75%	Using DC Ref Std , Ref Divider, Kelvin Varley (KV) Divider and Null Detector Null Method Hipotronics HV Divider with indicator
2.	AC Voltage [#]	10 Hz to 1 kHz 1 mV to 100 mV 100 mV to 100 V 40 Hz to 20 kHz 100 V to 1000 V 1 kHz to 100 kHz 1 mV to 100 mV 100 mV to 100 V 100 kHz to 1 MHz 1 mV to 100 mV 100 mV to 10 V 50Hz 1kV to 28 kV 28kV to 150kV	0.16% to 280 ppm 280 ppm to 100 ppm 120 ppm 2300 ppm to 700 ppm 700 ppm to 560 ppm 0.66 % to 0.19 % 0.19 % to 0.11 % 6.5 % 3.8 %	Using AC Measurement Standard Datron 4920 by Direct / Comparison method Using Hipotronics HV Divider with indicator

Mamta Bharti
Convenor

Avijit Das
Program Manager

Laboratory NorthLab (India) Pvt. Ltd., Shop No. 1, S.V. Nagar, Perumalpattu, Veppampattu, Chennai, Tamil Nadu

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3.	DC Current [#]	1nA to 100nA 100nA to 1 μ A 1 μ A to 1 A 1 A to 20 A 20 A to 100A	1% to 79 ppm 79 ppm to 20ppm 20 ppm 20 ppm to 35 ppm 35 ppm to 500 ppm	Using Std Resistor, DC Ref Std , Reference Divider, Kelvin Varley Divider and Null Detector Direct / Comparison Method
		10Hz to 1kHz 10 μ A to 5 mA	0.16 % to 164 ppm	Using Standard Resistor, MFC 3010, 8.5 digit DMM by Direct/Substitution Method
		40 Hz to 5 kHz 5 mA to 1 A 1 A to 20 A	130 ppm to 160 ppm 160 ppm to 300 ppm	Using Primary AC Shunt Set,MFC 3010,Ref Std,Null Detector, Kelvin Varley Divider by Comparison / Substitution Method
		5 kHz to 10 kHz 5 mA to 1 A 1 A to 5 A	160 ppm 160 ppm to 320 ppm	
		50Hz 20 A to 100A	1.9% to 1.4%	Current Shunt, 8.5 DMM, V/I Method

Mamta Bharti
Convenor

Avijit Das
Program Manager

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
5.	DC Resistance [#]	100 $\mu\Omega$ to 1 m Ω 1 m Ω to 1 Ω 1 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 1 G Ω to 100 G Ω	500 ppm to 89 ppm 60 ppm to 89 ppm 89 ppm to 8 ppm 8 ppm to 15 ppm 15 ppm to 100 ppm 100 ppm to 700 ppm 700 ppm to 0.6 % 0.6 % to 2%	Using MFC 3010 Current Source, 8.5 DMM, Direct, V/I, V/R & Ratio Method Using 8.5 DMM, TeraOhm Meter, Discrete standard Resistors, Direct, V/I, V/R & Ratio Method
6.	AC Resistance [#]	1kHz 1 Ω to 10k Ω 100 kHz 100 Ω to 1 k Ω 1kHz 1 Ω to 10 k Ω in decade steps	0.083 % to 0.036 % 0.13 % to 0.6 % 190ppm	Using Standard Resistors and LCR Meter by Direct / Comparison Method Using Standard Resistors and LCR Meter by Direct Method Using LCR Meter by Direct Method
7.	Capacitance [#]	100 Hz 10pF to 1 μ F 1kHz 100pF, 1nF, 10nF, 100nF, 1 μ F 10pF to 1 μ F 1 μ F to 100mF 100kHz 10pF to 1nF	0.22 % 0.19 % to 0.032 % 0.04 % 0.04 to 0.1% 0.5%	Using LCR Meter by Direct Method Std Capacitors and LCR Meter by Comparison method Using LCR Meter by Direct Method

Mamta Bharti
Convenor

Avijit Das
Program Manager

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8.	Inductance [#]	1kHz 100 μ H to 1mH 1mH to 10H	0.5% to 0.07% 0.07% to 0.96 %	Using LCR Meter and Standard Inductors, Inductance Boxes, Direct / Comparison method
9.	DC Power [#] 1V To 1000V, 0.1A To 30A	0.1 W to 10 kW 10 kW to 30 kW	0.02% to 0.12% 0.12%	Using 8.5 Digit Multimeter & Current Shunt by Direct Method
10.	AC Power [#] Single Phase & Three Phase @50Hz, 0.25 PF To UPF 40V To 300 V 0.5A To 20A AC Energy [#] Single Phase & Three Phase @50Hz, UPF 40V To 300 V 0.5A To 70A	5 W to 6 kW 2 W to 6.3 kW	0.07% to 0.25% 0.17 to 0.25 %	Using Watt Converter, 8.5 DMM , WT 230 Power Analyzer, Direct / Comparison Method Using WT 230 Power Analyzer & Calmet Power Calibrator by Comparison Method
11.	Phase Angle [#] 50 Hz (V To V)	0-1-0 PF Lead / Lag +/- 180 deg	0.084 deg	Using Dranetz Phase Meter by Direct / Comparison Method
12.	Frequency [#]	0.1 Hz to 100 Hz 100 Hz to 1 kHz 1 kHz to 40 GHz	0.001 Hz 0.001 Hz to 0.1 Hz 0.1 Hz to 41 Hz	Using Universal Counter by Direct/Comparison Method

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13.	RF Power [#]	10MHz to 50 MHz 1 μ W to 20mW (-30dBm to 13dBm) 50 MHz to 18 GHz 100pW to 1 μ W (-70dBm to -30dBm) 1 μ W to 20mW (-30dBm to 13dBm)	0.25 dB to 0.26 dB 0.47 dB to 0.43 dB 0.43 dB	Using RF Power Meter with 8482 A & 8485A Sensors by Comparison Method
14.	RF Attenuation [#]	50 MHz to 18 GHz 1dB to 60dB	0.6 dB to 2.4 dB	Using Anritsu Spectrum Analyser Comparison Method
15.	Modulation [#] A)Amplitude Modulation Carrier Frequency= 100 MHz To 1 GHz Rate = 1 kHz B)Frequency Modulation [#] Carrier Frequency= 100 MHz To 1 GHz Rate = 1 KHz	Modulation Depth 30 to 90 % Freq. Deviation 10kHz to 200 kHz	2 % to 4 % 6.2%	Using HP 8901B Modulation Analyser, Direct/Comparison Method Using HP 8901B Modulation Analyzer, Direct/Comparison Method
16.	Time Interval [#]	1 to 86400 s	0.14 s to 1.6 s	Using Timer CT6S-2P Comparison Method/ Direct Method

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Convenor

Avijit Das
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17.	Temperature Calibrators Calibration By Electrical Measurement Method# RTD K Type Thermocouple J Type Thermocouple R, S Type Thermocouple T Type Thermocouple N Type Thermocouple E Type Thermocouple C Type Thermocouple B Type Thermocouple	(-)200 °C to 800°C (-)200 °C to 1340°C (-)200 °C to 1200°C 0 °C to 1750°C (-)250 °C to 400°C (-)200 °C to 1300°C (-)250 °C to 1000°C 10 °C to 2300°C 600 °C to 1800°C	0.07°C 0.05°C 0.04 °C 0.13°C 0.04 °C 0.07°C 0.11 °C 0.4°C 0.6 °C	Using 8.5 digit DMM & MFC 3010 by Direct/Comparison Method
II.	SOURCE			
1.	DC Voltage#	1 μ V to 100 μ V 100 μ V to 10 mV 10 mV to 100 mV 100 mV to 1000 V 1 kV to 40 kV	1.3% to 102 ppm 102 ppm to 8 ppm 8 ppm to 3 ppm 3 ppm 3.9% to 2.75%	Using DC Ref Std , Ref Divider, Kelvin Varley (KV) Divider, Null Method, Null Divider, Null Detector
2.	DC Current#	100A to 1000A 1000A to 2000A	0.50% 0.5 % to 1.5%	Using MFC 3010, Current Coil, Direct Method
3.	AC Current #	50Hz 100A to 1500A	1.12 %	Using MFC 3010, Current Shunt, Current Coil, Direct Method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
4.	DC Resistance [#] Discrete Values	0.0001 Ω 0.001 Ω 0.01 Ω 0.1 Ω 1 Ω 10 Ω 100 Ω 1 k Ω 10 k Ω 100 k Ω 1 M Ω 10 M Ω 100 M Ω 1 G Ω 10 G Ω 100 G Ω 1 T Ω	50 ppm 55 ppm 40 ppm 30 ppm 6 ppm 8 ppm 8 ppm 8 ppm 8 ppm 9 ppm 15 ppm 20 ppm 100 ppm 360 ppm 0.08% 0.12% 0.16%	Using Fluke and Guideline Std Resistors, Direct Method
5.	AC Resistance [#]	1kHz 1 Ω , 10 Ω , 100 Ω , 1k Ω , 10k Ω	590ppm to 120 ppm	Using Std Resistor, Direct Method
6.	Capacitance [#]	1kHz 100pF, 1nF, 10nF, 100nF, 1 μ F	280 ppm	Using Std Capacitors, Direct Method
7.	Inductance [#]	1kHz 100 μ H 1 mH 10 mH 100 mH 1 H, 2H	0.25% 400 ppm 350 ppm 275 ppm 410 ppm	Using Standard Inductors, Direct Method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
8.	DC Power# 1V to 1000V 0.1 A to 20 A	0.3 W to 20 kW	0.03% to 0.1%	Using MFC 3010, Direct Method
9.	AC POWER# Single Phase / Three Phase 0.2 PF to UPF 40 V To 320V 0.1A To 70A	50Hz 1 W to 32kW	0.2% to 0.4%	Using MFC 3010 / Calmat Power Calibrator, Direct Method
10.	Phase Angle#	50 Hz +/- 180 deg	0.084 deg	Using Phase Standard
11.	Power Factor#	50 Hz 0.2 to 1 PF	0.013 PF	Using MFC 3010
12.	Oscilloscope# Amplitude	0.005V to 120 V	0.8% to 0.3%	Using MFC 3010 by Direct Method
	Time Marker	1ns to 5s	0.03% to 0.48%	Using Time Marker by Direct Method
	Bandwidth	10MHz to 1.2 GHz	5.9 %	Generator Using Leveled Sine wave Generator Direct Method

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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 & Vacuum Gauge Pressure (Hydraulic) Gauge / Transducer / Transmitter / Recorder / Logger / Calibrator / Modules / Switches / Manometers [§]	7 bar to 55 bar	0.027 % rdg	Using DH-BUDENBERG 580HX
		55 bar to 1000 bar	0.035 % rdg	Using DH-BUDENBERG 580HX
		1000 bar to 2068 bar	12.82 bar	High Pressure Transmitter (Omega)
		2068 bar to 4130 bar	30.98 bar	High Pressure Transmitter (Omega)
2.	Gauge Pressure (Pneumatic) Gauge / Transducer / Transmitter / Recorder / Logger / Calibrator / Modules / Switches/ Manometers [§]	0 to 1 bar	0.0014 bar	Using Digital Indicators Pressurements T3500/1
		1 bar to 35 bar	0.031 %rdg	
3.	Differential Pressure (Pneumatic) Gauge / Transducer / Transmitter / Recorder / Logger / Calibrator / Modules / Switches / Magnehelic Gauges / Manometers [§]	0 mbar to 5 mbar	0.00881 mbar	Using Microtector S.No MM01476 Microtector S.No MM010637 Fluke Pressure module 700P03
		0 mbar to 68 mbar	0.38 mbar	
		0 mbar to 350 mbar	0.42 mbar	

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
4.	Absolute Pressure Gauge / Transducer / Transmitter / Recorder /Logger / Calibrator / Modules / Switches /Barometer ^s	0.2 bar Abs. to 2 bar Abs	0.003 bar	Using Pressure calibrator 2811072 2B, Pneumatic Dead Weight Tester
5.	Vacuum Gauge / Transducer / Transmitter / Recorder /Logger / Calibrator / Modules / Switches [#]	-0.98 bar to 0 bar	0.0013 bar	Using Digital Indicator
6.	Pressure & Vacuum Pressure (Pneumatic) Gauge / Transducer / Transmitter / Recorder /Logger / Calibrator / Modules / Switches / / Manometers [*]	0 to 20 bar 20 bar to 30 bar	0.03 bar 0.058 bar	Using Druck Calibrator Leo-2 Digital Pressure Gauge
7.	Differential Pressure (Pneumatic) Gauge / Transducer / Transmitter / Recorder /Logger / Calibrator / Modules / Switches /Magnehelic Gauges / Manometers [*]	0 mbar to 2.5 mbar 2.5 mbar to10 mbar 10 mbar to 68 mbar 68 mbar to 350 mbar	0.005 mbar 0.005 mbar 0.38 mbar 0.42 mbar	Using Digital Manometer Digital Manometer Digital Manometer Fluke Pressure module 700P03

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Convenor

Avijit Das
Program Manager

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8.	Absolute Pressure Gauge / Transducer / Transmitter / Recorder /Logger / Calibrator / Modules / Switches*	0.2 bar Abs to 2 bar Abs	0.003 bar	Using Pressure calibrator 2811072 2B
9.	Pressure (Hydraulic) Gauge / Transducer / Transmitter / Recorder /Logger / Calibrator / Modules / Switches*	0.7 bar to 690 bar 690 bar to 1000 bar	0.414 bar 1.21 bar	Using Fluke Pressure module 700P07 Druck Digital Pressure Gauge
II. Pressure Balance or Dead Weight Tester				
1.	Hydraulic Pressure-Cross Floating of Dead Weight Tester ^s	7 bar to 55 bar 55 bar to 1000 bar	0.015 %rdg 0.018% rdg	Using DH-BUDENBERG 580 HX,EA CG-3
III. TORQUE GENERATING DEVICES				
1.	Torque Wrenches / Drivers / Meters / Multipliers ^s Type 1 : Class A,B,C,D,E Type 2 : Class A,B,C,D,E,F,G	0.1 Nm to 1 Nm 1 Nm to 12.5 Nm 10 Nm to 150 Nm 150 Nm to 1350 Nm 1350 Nm to 3000 Nm	1.7 % 1.1 % 1.3 % 1.3% 0.58%	Using Norbar Static Transducer & T TT
IV. MOBILE FORCE MEASURING SYSTEM				
1.	Push Pull Gauge / Tension Gauge ^s	1 N to 2500 N	0.62 % rdg	Using SS Push pull Weights with Hanger

Mamta Bharti
Convenor

Avijit Das
Program Manager

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V.	DUROMETER			
1.	Hardness Tester [§] Shore A Shore D	0 to 100 % Shore A 0 to 100 % Shore D	1 % 0.8 %	Using SS shore A weights SS shore D weights
VI.	UTM, TENSION CREEP AND TORSION TESTING MACHINE			
1.	Verification Of Digital Static Uni-Axial Testing Machine* Compression Tension	50 N to 1000 kN 50 N to 100 kN	0.50 % of rdg 0.51 % of rdg	Using Load Cell With Indicator
VII.	ACCELERATION AND SPEED			
1.	Speed [§] (Contact Type) Tachometers	100 RPM to 500 RPM 500 RPM to 10000 RPM	2.0% of rdg. 0.21 % of rdg	Using Digital Tachometer (SANAS TR-45-01/ 45-02)
2.	Speed (Non-Contact Type) Tachometers / Stroboscope / RPM Indicator With Sensor [§]	10 RPM to 40 RPM 40 RPM to 1000 RPM 1000 RPM to 99980 RPM	2.4 % of rdg 1.8 % of rdg 0.2 % of rdg	Usng Optical Tachometer (SANAS TR-45-01 /45-02)
3.	Speed (Non-Contact Type) Centrifuges / RPM Test Rigs / Stirrers / RPM Indicators*	30 RPM to 500 RPM 500 RPM To 20000 RPM	2.0 % of rdg. 0.2 % of rdg	Using Optical Tachometer (SANAS TR-45-01 /45-02)

Mamta Bharti
Convenor

Avijit Das
Program Manager

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VIII.	ACOUSTICS			
1.	Sound Level Meter [§]	1 kHz 70 dBA To 130 dBA	1.1 % of rdg	Using Sound Level Calibrator as per OIML R58
2.	Vibration [§] Amplitude And Vibration Vibration Meters	80 Hz And 100 Hz Acceleration 10 m/s ² Velocity 15.6 mm/s Displacement 0.025 mm	2.8 % of rdg 2.9 % of rdg 4.9 % of rdg	Using Digital Vibration Meter as per ISO 16063-21
IX.	WEIGHTS			
1.	Mass [§] (E1 Class weights and Coarser)	1 mg 2 mg 5 mg 10 mg 20 mg 50 mg 100 mg 200 mg 500 mg 1 g 2 g 5 g 10 g 20 g 50 g 100 g 200 g 500 g 1 kg	0.0012 mg 0.0012 mg 0.0012 mg 0.0012 mg 0.0012 mg 0.0012 mg 0.0012 mg 0.0013 mg 0.0021 mg 0.0032 mg 0.0038 mg 0.005 mg 0.02 mg 0.02 mg 0.02 mg 0.04 mg 0.04 mg 0.1 mg 0.25 mg	Using E1 class standard weights 1mg – 2 kg and Balances used : 2 g / 0.1 μ g & 5 g / 1 μ g & Mass comparator 1.02 kg / 0.01 mg

Mamta Bharti
Convenor

Avijit Das
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	F1 Class weights and Coarser	2 kg	2 mg	Using E1 class weights & Balance of d : 1 mg
		5 kg	0.01g	Using E2 class weights & Balance of d : 10 mg
	M1 Class weights and Coarser	10 kg	0.1g	Using F1 class weights & Balance of d : 0.1 g
		20 kg	0.2 g	Using F1 class weights & Balance of d : 0.1 g
	M2 Class weights and Coarser	50 kg	2 g	Using F1 & F2 class weights & Balance of d : 2 g
X.	WEIGHING SCALE AND BALANCE			
1.	Electronic Weighing Balance*			
	$d \geq 0.0001$ mg	1mg to 2 g	0.004mg	Using E1 class standard weights (1 mg - 2 kg)
	$d \geq 0.001$ mg	1mg to 5 g	0.005 mg	Using E1 class standard weights 1 mg - 2 kg
	$d \geq 0.01$ mg	1 mg to 80 g	0.07 mg	Using E1 class standard weights 1 mg - 2 kg
	$d \geq 0.1$ mg	10 mg to 320 g	0.3 mg	Using E1 class standard weights 1 mg - 2 kg

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	$d \geq 1$ mg	200 mg to 2 kg	2 mg	Using E1 class standard weights 1 mg - 2 kg
	$d \geq 10$ mg	500 mg to 6 kg	19 mg	Using E2 class & F1 class standard weights
	$d \geq 0.1$ g	2 g to 25 kg	0.3 g	Using E2 class & F1 class standard weights
	$d \geq 2$ g	50 g to 60 kg	2 g	Using F2 & M1 class standard weights
	$d \geq 5$ g	250 g to 150 kg	7 g	Using F2 & M1 class standard weights
	$d \geq 20$ g	500 g to 300 kg	20 g	Using F2 & M1 class standard weights
	$d \geq 100$ g	2 kg to 2000 kg	200 g	Using F2 & M1 class standard weights
XI.	VOLUME			
		0.1 μ l to 1 μ l 1 μ l to 10 μ l 10 μ l to 100 μ l	0.01 μ l 0.03 μ l 0.3 μ l	Using Weighing balance with d : 0.0001 mg & 0.001 mg and distilled water based on Gravimetric Method as per ISO 8655-6
		100 μ l to 1000 μ l	0.33 μ l	Using Weighing balance with d : 0.01 mg and distilled water, Gravimetric Method as per ISO 8655-6

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Convenor

Avijit Das
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		1 ml to 10 ml	11.6 μ l	Using Weighing balance with d : 0.0001 mg & 0.001 mg and distilled water based on Gravimetric Method as per ISO 8655-6
		0.1ml to 1 ml	0.66 μ L	Weighing balance with d : 0.01 mg, Distilled water and Standard weights based on Gravimetric Method as per ISO 4787
		1 ml to 50 ml	5.12 μ l	Weighing balance with d : 0.01/0.1 mg, Distilled water and Standard weights based on Gravimetric Method as per ISO 4787
		50 ml to 200 ml	20 μ L	Weighing balance with d : 0.01/0.1 mg, Distilled water and Standard weights based on Gravimetric Method as per ISO 4787
		200 ml to 1000 ml	1 ml	Weighing balance with d : 0.001 g & D: 0.01g, Distilled water and Standard weights, Gravimetric Method as per ISO 4787
		1000 ml to 5000 ml	14.52 ml	Weighing balance with d : 0.001 g & D: 0.01g Distilled water and Standard weights, Gravimetric Method as per ISO 4787
		5L to 50 L	50 ml	Weighing balance with d : 2g, Distilled water based on Gravimetric Method as per ISO 4787

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Convenor

Avijit Das
Program Manager

Laboratory NorthLab (India) Pvt. Ltd., Shop No. 1, S.V. Nagar, Perumalpattu, Veppampattu, Chennai, Tamil Nadu

Accreditation Standard ISO/IEC 17025: 2005

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
XII.	DENSITY AND VISCOSITY			
1.	Density Hydrometers [§]	0.6 g/ml to 2.0 g/ml	0.0005 g/ml	Using Analytical weighing balance and appropriate liquid
XIII.	DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)			
1.	Caliper [§] (Digital/ Dial/ Vernier) L.C 0.01 mm L.C 0.01 mm L.C 0.01 mm L.C 0.02 mm	0 to 300 mm 300 mm to 600 mm 600 mm to 1000 mm 1000 mm to 3000 mm	6.9 μ m 13.0 μ m 15.0 μ m 35.0 μ m	Using Gauge Blocks Long Gauge Blocks
2.	Height Gauge [§] (Digital /Dial / Vernier) L.C 0.01 mm	0 mm to 300 mm 300 mm to 600 mm 600 mm to 1000 mm	6.0 μ m 6.5 μ m 13.0 μ m	Using Gauge Blocks Long Slip Gauge
3.	Depth Gauge [§] (Digital / Dial/Vernier) L.C 0.01 mm	0 to 600 mm 600 mm to 1000 mm	8.7 μ m 17.0 μ m	Using Gauge Blocks Long Slip Gauge
4.	Micrometer [§] (Digital / External) LC : 0.001 mm LC : 0.001 mm	0 mm to 50 mm 50 mm to 100 mm	1.1 μ m 3.3 μ m	Using Gauge Blocks Long Slip Gauge

Mamta Bharti
Convenor

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	LC : 0.01 mm	100 mm to 300 mm 300 mm to 600 mm 600 mm to 1200 mm 1200 mm to 1800 mm	7.3 μ m 7.3 μ m 14.0 μ m 20.0 μ m	
5.	Micrometer Setting Standards ^{\$}	25 mm to 100 mm 100 mm to 600 mm 600 mm to 1200 mm 1200 mm to 1750 mm	5.9 μ m 12.1 μ m 14.0 μ m 18.0 μ m	Using Gauge Blocks Long Slip Gauges
6.	Micrometer Head ^{\$} (Digital / External) LC:0.001 mm	0 mm to 50 mm 50 mm to 100 mm	2.0 μ m 2.0 μ m	Using ULM
7.	Pitch Micrometer ^{\$} LC:0.001mm LC: 0.01 mm	0 mm to 100 mm 0 mm to 300 mm	1.4 μ m 7.0 μ m	Using Gauge Blocks Long Slip Gauges
8.	Groove Micrometer ^{\$} LC:0.01mm	0 mm to 100 mm	6.0 μ m	Using Gauge Blocks
9.	Holtest /Three Point Micrometer ^{\$} L.C. 0.001 mm	6 to 120 mm	6.5 μ m	Using Set of Ring Gauges
10.	Depth Micrometer ^{\$} (Digital / Dial / External ^{\$} L.C. 0.001 mm	0 mm to 150 mm 150 mm to 300 mm	2.0 μ m 5.0 μ m	Using Gauge Blocks Long Slip Gauges

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
11.	Inside Micrometer [§] (Stick / Tubler Type) L. C.: 0.01 mm	63 mm to 1000 mm	10.0 μ m	Using Gauge Blocks Long Slip Gauges Lever Dial Gauge
12.	Inside Micrometer [§] (Caliper Type) L. C.: 0.001 mm L. C.: 0.01 mm	5 mm to 50 mm 5 mm to 300 mm	1.0 μ m 7.0 μ m	Using Gauge Blocks Long Slip Gauges
13.	Dial Gauge [§] (Plunger Type) L. C.: 0.001 mm L. C.: 0.01 mm	0 to 5 mm 0 to 100 mm	1.8 μ m 6.0 μ m	Using ULM
14.	Comparator Stand [§]	150 mm X 150 mm	2.0 μ m	Using Electronic Probe With Indicator
15.	Thickness Gauge / Digital/Dial [§] L.C.:0.001mm L. C.: 0.01mm	0 mm to 1 mm 0 mm to 25 mm	1.0 μ m 8.0 μ m	Using Gauge Block
16.	Lever Dial Gauges [§] L.C. :0.001mm L. C.: 0.002mm L. C.: 0.01mm	0 mm to 0.14 mm 0 mm to 0.6 mm 0 mm to 3.0 mm	2.0 μ m 2.2 μ m 6.0 μ m	Using ULM
17.	Bore Gauge [§] (Transmission Error Only) LC:0.001mm	1 mm	4.2 μ m	Using Calibration Tester/Dial Gauge

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
18.	Metric Steel Scale [§] L.C.:0.5mm/1.0mm	0 mm to 3000 mm	27 x sqrt (L) μ m L in m	Using Tape & Scale Calibrator
19.	Measuring Tape [§] L.C.:0.1mm L.C.:1.0mm	0 to 5.5 m 0 to 100 m	28 x sqrt (L) μ m where L in m 28 x sqrt (L) μ m where L in m	Using Tape & Scale Calibrator
20.	Pie Tape [§]	Dia 60 to 3100mm & Circumference Dia 60 to 9740 mm	28 x sqrt (L) μ m L in m	Using Tape & Scale Calibrator
21.	Taper Scale [§] L.C.:0.05mm	1 mm to 45 mm	17.0 μ m	Using Profile Projector
22.	Bevel Protractor / Combination Set / Protractor [§] L.C.:5 mins	0° - 90° - 0°	4 min of arc	Using Angle Gauges
23.	Digital Protractor / Inclinometer [§] L.C.:0.01 Deg	0° - 90° - 0°	1 min arc	Using Angle Gauges
24.	Coating Thickness Gauge [§] L.C.:0.001mm	0 to 2 mm	8.0 μ m	Using Electrometer Foils
25.	Foils [§]	0 to 8 mm	0.6 μ m	Using ULM

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
26.	Ultrasonic Thickness Gauge [§] L.C:0.01mm L.C.:0.1mm	0 to 100 mm 100 mm to 300 mm	7.2 μ m 79.0 μ m	Using Gauge Blocks
27.	Vee Block [§] (Flatness, Parallelism Symmetricity)	450 mm (L) X 150 mm X 150 mm	3.0 μ m 6.0 μ m 6.0 μ m	Using Cylindrical Mandrel
28.	Caliper Gauge [§] (Dial / Digital) LC:0.005mm LC:0.01mm LC:0.05mm	2.5 mm to 17.5 mm 17.5 mm to 100 mm 100 mm to 120 mm	5.0 μ m 8.0 μ m 30.0 μ m	Using Setting Ring Gauges
29.	Cylindrical Pins [§]	0.5 mm to 20 mm	2.0 μ m	Using ULM
30.	Plain Plug Gauge [§]	3 mm to 50 mm 50 mm to 100 mm 100 mm to 300 mm	3.0 μ m 3.0 μ m 6.2 μ m	Using ULM
31.	Cylindrical Setting Master [§]	3 mm to 50 mm 50 mm to 100 mm 100 mm to 200 mm 200 mm to 300 mm	2.0 μ m 3.0 μ m 4.0 μ m 5.0 μ m	Using ULM
32.	Plain And Master Ring Gauge [§]	3 mm to 50 mm 50 mm to 100 mm 100 mm to 300 mm	3.0 μ m 3.0 μ m 6.2 μ m	Using ULM
33.	Thread Plug Gauge [§]	2.5 mm to 50 mm 50mm to 100mm 100mm to 300mm	2.3 μ m 3.3 μ m 7.3 μ m	Using ULM

Mamta Bharti
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34.	Thread Ring Gauges [§]	M2 to M50 M50 to M100 M100 to M300	2.5 μ m 3.1 μ m 8.3 μ m	Using ULM
35.	Taper Plug Gauge [§]	3 mm to 50 mm 50 mm to 100 mm 100 mm to 300 mm	2.1 μ m 3.0 μ m 6.2 μ m	Using ULM
36.	Taper Thread Plug Gauge [§]	M 3 to M50 M50 to M100 M100 to M300	2.7 μ m 3.0 μ m 7.3 μ m	Using ULM
37.	Feeler Gauge [§]	0.05mm to 2 mm	0.8 μ m	Using ULM
38.	Gap / Snap Gauge [§]	2 mm to 50 mm 50 mm to 100 mm 100 mm to 300 mm	2.0 μ m 3.0 μ m 7.0 μ m	Using ULM Gauge
39.	Limit Gauges Height, Depth, Length, Diameter, Radius, Angle [§]	0 to 300 mm 0 to 360 Deg	6.0 μ m 2.4 min of arc	Using Gauge Blocks Profile Projector
40.	Radius Gauge [§]	0.4 mm to 25 mm	4.3 μ m	Using Profile Projector
41.	Pitch Gauge [§]	0.35 mm to 7 mm	4.8 μ m	Using Profile Projector
42.	Test Sieves [§]	0.02 mm to 125 mm	15.0 μ m	Using Profile Projector & Vernier Caliper
43.	Engineer's Square [§]	Upto 450mm	15.0 μ m	Using CMM

Mamta Bharti
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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
44.	Sine Bar [§] (Angularity)	Upto 250mm	10' of arc	Using Angle Gauges Gauge Block And Electronic Probe With DMM
45.	Height Master [§] LC:0.001mm	5 mm to 310 mm	3.0 μ m	Using Gauge Block Long Slip Gauge Electronic Probe
46.	Riser Block [§]	0 to 300 mm 0 to 600 mm	2.0 μ m 4.0 μ m	Using Gauge Block Long Slip Gauge Block Set
47.	Depth Microchecker [§]	0 to 300 mm	2.9 μ m	Using Gauge Block Long Slip Gauge
48.	Thread Measuring Cylinder [§]	0.17 mm to 6.35 mm	0.8 μ m	Using ULM
49.	2 D Linear Height [§] Measuring System L.C. 0.0001 mm	0 to 300mm 300 mm to 600 mm	4.0 μ m 6.5 μ m	Using Gauge Blocks Long Slip Gauges
50.	Digital Indicator/LVDT/ Electronic Probe [§] L.C. 0.0001mm L.C. 0.0001mm L.C. 0.001mm	0 to 2 mm 0 to 100 mm 0 to 150 mm	0.3 μ m 0.5 μ m 1.5 μ m	Using ULM Gauge Block Long Slip Gauge Block
51.	Surface Plate [§]	200 mm X 200 mm to 3000 mm X 3500 mm	1.95 x sqrt (L+B)/200 μ m (L and B are in mm)	Using Electronic Spirit Level

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
52.	Straight Edge Straightness Of Working Faces Parallelism Of Working Faces [§]	Upto 1500 mm	5.0 μ m	Using Surface Plate Dial Indicator Electronic Spirit Level
53.	Gauge Block Accessories [§] Flatness Parallelism Length L.C.: Upto 250mm	Upto 250 mm	1.0 μ m	Using Gauge Block Electronic Probe
54.	Hegman Gauge [§]	Upto 1 mm	2.0 μ m	Using Electronic Probe
XIV.	DIMENSION (PRECISION INSTRUMENTS)			
1.	Spirit Level [§] LC:10.0 μ m/m	Upto 300 (Base)	6.0 μ m/m	Using Electronic Spirit Level
2.	Ocular / Graticule [§]	Angle : 360 Deg Linear : 25 mm	2.3 min 16.0 μ m	Using Profile Projector
3.	Surface Roughness Specimen [§]	0.2 μ m to 40 μ m Ra	8.0 %	Using Roughness Standard
4.	Caliper Checker [§]	0 to 300 mm 0 to 600 mm 0 to 1000 mm	5.0 μ m 7.0 μ m 9.1 μ m	Using Gauge Block Long Slip Gauge Electronic Probe

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
5.	Dial Calibration Tester [§] LC:0.0001mm	0 to 25 mm	1.5 μ m	Using Gauge Block
6.	Gauge Blocks [§]	0 to 25 mm 25 mm to 50 mm 50 mm to 100 mm	0.14 μ m 0.2 μ m 0.3 μ m	Using Gauge Block Calibrator Gauge Block
7.	Long Slip Gauge [§] (Grade 0, 1 & 2)	100 mm to 500 mm 500 mm to 1000 mm	2.1 μ m 3.5 μ m	Using Long Slip Gauge Electronic Probe
8.	Granite Square [§] Flatness Squarness L.C.:0.0001mm	Upto 500 mm	5.4 + (L/175) μ m where L in mm	Using Co-Ordinate Measuring Machine
9.	Test Mandrel / Concentricity Gauge / Master Cylinders / Taper Mandrel [§] A. Variation In Diameter B. Total Runout L.C.:0.0001mm	Upto 500 mm	5.15 + (L/175) μ m Where L in mm	Using Co-Ordinate Measuring Machine

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Convenor

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Program Manager

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
10.	Engineers Parallel / Parallel Bar ^s A. Thickness And Width B. Variation In Thickness C. Parallelism D. Equality Of Pairs L.C.:0.0001mm	Upto 500 mm	5.15 + (L/175) μ m Where L in mm	Using Co-Ordinate Measuring Machine
11.	Angle Gauge ^s Error In Angle	Upto 90 Deg	1 mins	Using Co-Ordinate Measuring Machine
12.	Length Bar / Height Block ^s Gauge Length Variation In Length	Upto 500 mm	5.5 + (L/175) μ m Where L in mm	Using Co-Ordinate Measuring Machine
13.	Weld Fillet Gauge ^s Radius Linear Angle	Upto 200 mm	4.19 μ m, 2.7 min of arc	Using Profile Projector
14.	Diameter / Plain Ring Gauges ^s Diameter	Upto 500 mm	5.2 + (L/175) μ m Where L in mm	Using Co-Ordinate Measuring Machine
15.	Master Sphere ^s Circularity Diameter	Upto 50 mm	5.2 + (L/175) μ m Where L in mm	Using Co-Ordinate Measuring Machine

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Convenor

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Program Manager

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
16.	Taki Meter / Graffie / Template ^s A. Length B. Flatness C. Diameter D. Angle E. Parallelism F. Radius	Upto 500 mm	5.85+ (L/175) μ m Where L in mm	Using Co-Ordinate Measuring Machine
17.	Gauge Block Calibrator* L.C.:0.00001mm	0.5 mm to 100 mm	0.12 μ m	Using Set of 11 Gauge Block/Pair of 'K' Grade
18.	2 D Height Gauge* (Digital/Dial Vernier) L.C.:0.0001mm	0 to 600 mm	10.0 μ m	Using Long Slip Gauges
19.	Profile Projector / Video Measuring Machine* Linear L.C.:0.001mm Angle Magnification	300 mm X 200 mm 360 ° Upto 100 X	5.7 μ m 2.3 min of arc 3.41 %	Using Glass Scale\ Angle Gauges Gauge Block "Grade 0"
20.	Microscope Linear, LC:0.001mm Magnification*	300 mm X 200 mm Upto 100 X	5.7 μ m 2.9 %	Using Glass Scale Gauge Block "Grade 0"
21.	Surface Plate*	200 mm X 200 mm to 3000 mm X 3500 mm	1.95 x sqrt (L+B)/200 μ m, where L & B in mm	Using Electronic Spirit Level

Mamta Bharti
Convenor

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
22.	Universal Length Measuring Machine*	Up to 100 mm 100 mm to 300 mm	$(0.5 + 0.5 L) \mu\text{m}$ Where L in m $2.3 \mu\text{m}$	Using Gauge Block "Grade K" Long Slip Gauge Block
23.	Tape & Scale Calibrator* LC:0.001mm	0 to 1000 mm	$(4+8.1 L) \mu\text{m}$ Where L in m	Using Gauge Block "Grade K" Long Slip Gauge Block
24.	Digital Indicator/LVDT/ Electronic Probe* L.C.0.0001mm L.C.0.0001mm L.C.0.001mm	0 to 2 mm 0 to 100 mm 0 to 150 mm	$0.3 \mu\text{m}$ $0.5 \mu\text{m}$ $1.5 \mu\text{m}$	Using ULM Gauge Block Long Slip Gauge Block
25.	Bench Centre* Parallelism Co-axiality	Upto to 300 mm	$10.0 \mu\text{m}$	Using Master Mandral Digital Indicator
26.	Extensometer*	0 to 150 mm	$5.0 \mu\text{m}$	Using Gauge Block Electronic Probe

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Avijit Das
Program Manager

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
<u>THERMAL CALIBRATION</u>				
I.	TEMPERATURE			
1.	RTD Sensor With / Without Indicator, Thermocouple Sensor With/Without Indicator, Thermistor Sensor With / Without Indicator, Glass Thermometer, Temperature Baths, Ovens, Furnaces, Freezers, Capillary Thermometers, Bi-Metallic Thermometers, Data Loggers, Recorders, Temperature Switch, Temperature Transmitter ^s	(-) 80°C to 50°C 0°C $>50^{\circ}\text{C}$ to 250°C	0.39°C 0.02°C 0.39°C	Using Liquid Bath/Std PRT(5626)/DMM3457A Using Ice Point Std PRT(5626)/DMM3457A Using Liquid Bath/Std PRT(5626)/DMM3457A

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Avijit Das
Program Manager

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2.	RTD Sensor With / Without Indicator, Thermocouple Sensor With/Without Indicator, Thermistor Sensor With / Without Indicator, Temperature Baths, Ovens, Furnaces, Freezers, Capillary Thermometers, Bi-Metallic Thermometers, Data Loggers, Recorders, Temperature Switch, Temperature Transmitter ^s	(-)20°C to 35°C 0°C >35°C to 200°C >200°C to 300°C >300°C to 650°C >650°C to 1000°C >1000°C to 1200°C	0.14 °C 0.02 °C 0.07 °C 0.16 °C 0.39 °C 1.6 °C 2.6°C	Using Dry Block Calibrator/STD. PRT(5626)/DMM3457A Using Ice Point & PRT(5626)/DMM3457A TC/DMM3457A Using Fluke Liquid Bath/std PRT(5626)/DMM3457A Using Dry Block Calibrator/std Type-S TC/DMM3457A Using Dry Block Calibrator/STD Type-S
3.	Infrared Thermometers ^s	0 °C 50°C to 200°C >200°C to 400°C >400°C to 1200°C	0.14 °C 1.8°C 2.8°C 3.5 °C	Using Ice Point Using Infrared Thermometer (Raytek) / Black Body Calibrator (Hart) Using Infrared Thermometer (Raytek) / Black Body Calibrator (Nagman)

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Convenor

Avijit Das
Program Manager

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4.	RTD Sensor With / Without Indicator, Thermocouple Sensor With/Without Indicator, Thermistor Sensor With/Without Indicator, Glass Thermometer, Temperature Baths, Ovens, Furnaces, Freezers, Capillary Thermometers, Bi-Metallic Thermometers, Data Loggers , Records , Temperature Switch, Temperature Transmitter*	(-)20°C to 35°C	0.14 °C	Using Liquid Bath/Std PRT(5626) / DMM 3457A
		>35°C to 200°C	0.07°C	Using Liquid Bath/Std PRT(5626) / DMM 3457A
		>200°C to 300°C	0.16°C	Using Liquid Bath/Std PRT(5626) / DMM 3457A
		>300°C to 650 °C	0.45°C	Using Liquid Bath/Std PRT(5626) / DMM 3457A By using Dry Block
		> 650°C to 1000 °C	1.9°C	Using Calibrator/Std Type-S TC / DMM
		>1000°C to 1200 °C	2.9°C	Using Dry Block Calibrator/Std Type-S TC / DMM
5.	Temperature Indicator With Sensor Of Baths, Freezers, Ovens, Furnaces And Temperature Enclosures*	(-)80°C to 400°C	0.39°C	Using Liquid Bath/Std PRT(5626) / DMM3457A
		>400°C to 1000°C	2.2°C	Using Dry Block Calibrator/Std Type-S TC / DMM
		>1000°C to 1200°C	2.9°C	

Mamta Bharti
Convenor

Avijit Das
Program Manager

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
6.	Temperature By Spatial Mapping Freezer, Ovens / Furnace, Bath, Environmental Chamber And Temperature Enclosures*	(-)80°C to 200°C >200°C to 1000°C >1000°C to 1200°C	2.6 °C 4.3 °C 5.9 °C	Using Keithley Data Logger and RTDs(KE2700) Using Keithley Data Logger and Thermocouples(KE2700)
II.	SPECIFIC HEAT & HUMIDITY			
1.	Humidity Digital/Analog Thermo Hygrometers, Thermohygrographs, Digital / Analog Hygrometer, Hygrographs, Humidity Sensors, Data Logger And Transmitter ^s	0.5%R.H @ 23 °C 5,10,11.3,20%R.H @ 23 °C 35%R.H @ 23 °C 50, 65 %R.H @ 23 °C 75,80,95 %R.H @ 23 °C 30%R.H to 95 % R.H	0.35 % RH 1.3 % RH 1.3 % RH 1.5 % RH 1.8 % RH 2.3% RH	Using Humidity Standard Solution by Direct Method Using Rotronic Humidity Probe with Humidity Chamber by Comparison Method
2.	Humidity Chamber Environmental Chamber*	10%RH to 95 % RH	1.9 % RH	Using Humidity Probe with Indicator

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Avijit Das
Program Manager

Laboratory NorthLab (India) Pvt. Ltd., Shop No. 1, S.V. Nagar, Perumalpattu, Veppampattu, Chennai, Tamil Nadu

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
3.	Humidity By Spatial Mapping Humidity Chamber Environmental Chamber*	10 % RH to 95 % RH	4.1 % RH	Using Humidity Probe with Indicator and Temperature Sensor with data logger

Mamta Bharti
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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
<u>FLUID FLOW CALIBRATION</u>				
I.	FLUID FLOW MEASUREMENT			
1.	Air Flow [§] A. Digital Air Flow Meters B. Rotameters C. Mass Flow Meter	0.1 slpm to 1 slpm 1 slpm to 6 slpm 6 slpm to 50 slpm 50 slpm to 100 slpm	3.2 % of rdg 1.2 % of rdg 0.5 % of rdg 1.1 % of rdg	Using Flow Calibrator
2.	Air Flow* A. Digital Air Flow Meters B. Rotameters C. Mass Flow Meter	0.1 slpm to 1 slpm 1 slpm to 6 slpm 6 slpm to 50 slpm 50 slpm to 100 slpm	3.5 % of rdg 1.3 % of rdg 0.6 % of rdg 1.2 % of rdg	Using Flow Calibrator

* 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.

Mamta Bharti
Convenor

Avijit Das
Program Manager