

Laboratory National Centre for Quality Calibration, 4, Abhishree Corporate Park,
 Iskcon-Ambli Road, Ambli, Ahmedabad, Gujarat
Accreditation Standard ISO/IEC 1025:2005
Certificate Number CC-2128 **Page** 1 of 23
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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ($\pm$)	Remarks
<u>ELECTRO TECHNICAL CALIBRATION</u>				
I.	SOURCE			
1.	DC Voltage [#]	0.1 mV to 330 mV 330 mV to 330 V 330 V to 1000 V	1.977 % to 0.01 % 0.01 % to 0.01 % 0.01 % to 0.01 %	Using Fluke Multi-Product calibrator model 5522 A / 5500 E by Direct Method
2.	DC current [#]	10 μ A to 330 μ A 330 μ A to 3.3 mA 3.3 mA to 1.0 A 1.0 to 10 A 10 to 20 A > 20 A to 1000 A	0.258 % to 0.026 % 0.026 % to 0.017 % 0.017 % to 0.05 % 0.05 % to 0.065 % 0.065 % to 0.387 % 0.387 % to 1.43 %	Using Fluke Multi-Product calibrator model 5522 A / 5500 E by Direct method Using current coil Direct method
3.	AC Voltage [#]	10 Hz to 500 kHz 1 mV to 33 mV 33 mV to 330 mV 330 mV to 3.3 V 10 Hz to 100 kHz 3.3 V to 33 V 50 Hz to 20 kHz 33 V to 330 V 50 Hz to 10 kHz 330 V to 1000 V	1.47 % to 0.114 % 0.114 % to 0.04 % 0.04 % to 0.33 % 0.156 % to 0.112 % 0.04 % to 0.03 % 0.026 % to 0.038 %	Using Fluke Multi-Product calibrator model 5522 A / 5500 E by Direct method

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4.	AC Current [#]	10 Hz to 30 kHz 30 μ A to 330 μ A 330 μ A to 330 mA 10 Hz to 10 kHz 0.33 A to 1.1 A 1.1 A to 3 A 50 Hz to 5 kHz 3 A to 11 A 11 A to 20 A 50 Hz 20 A to 1000 A	0.50 % to 0.231 % 0.231 % to 0.533 % 0.27 % to 0.22 % 0.22 % to 0.19 % 0.73 % to 0.192 % 0.192 % to 0.244 % 0.38 % to 1.26 %	Using Fluke Multi-Product calibrator model 5522 A / 5500 E by direct method Using current coil by direct method
	Resistance [#] (2 wire and 4 wire)	0.1 Ω to 330 k Ω 330 k Ω to 11 M Ω 11 M Ω to 110 M Ω	0.143 % to 0.01 % 0.01 % to 0.031 % 0.031 % to 0.61 %	
	(2 wire)	110 M Ω to 1100 M Ω	0.61 % to 1.740 %	
	Resistance / Insulation Resistance [#] (2 wire)	1 Ω to 999 M Ω 5 M Ω to 10 G Ω 10 G Ω to 1000 G Ω	0.59 % to 3.314 % 2.31 % to 2.478 % 2.321 % to 5.81 %	Using resistance decade box by direct method Using high resistance jig (Box) by direct method
	(4 wire)	10 $\mu\Omega$ to 1 Ω	6.11 % to 1.3 %	Using 4 wire Low Resistance Standards by direct method

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7.	Inductance [#]	10 μ H to 1000 mH	1.328 % to 1.162 %	Decade Inductance Box by direct method
8.	Frequency [#]	1 Hz to 2 MHz	0.014 %	Using Fluke Multi-Product calibrator model 5522 A / 5500 E by direct method
9.	Capacitance [#]	1 kHz 0.5 nF to 330 nF 100 Hz 0.33 μ F to 330 μ F 0.33 mF to 110 mF	3.09 % to 3.90 % 3.90 % to 4.128 % 4.128 % to 3.889 %	Using Fluke Multi-Product calibrator model 5522 A / 5500 E by direct method
10.	Temperature [#] Simulation Temperature Indicator / Controller / Recorder / Test Kit / Universal Calibrator / Calibrators / Multimeter Pt-100 B type C type E type J type K type L type N type R type S type T type U type	(-) 200°C to 800°C 600°C to 1820 °C 0 °C to 2316 °C (-)250°C to 1000 °C (-)210°C to 1200 °C (-)200°C to 1372 °C (-)200°C to 900 °C (-)200°C to 1300 °C 0°C to 1767 °C 0°C to 1767 °C (-)250°C to 400 °C (-)200°C to 600 °C	0.3 °C 0.53 °C 1.0 °C 0.6 °C 0.33 °C 0.5 °C 0.44 °C 0.5 °C 0.7 °C 0.57°C 0.74 °C 0.66 °C	Using Fluke Multi-Product calibrator model 5522 A / 5500 E Temperature/Electrical Calibrator model MC-2 TE (Beamax) by direct method

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12.	AC Power [#]	PF0.2 to UPF – (Lead & Lag) @ 50 Hz 1W to 20kW UPF V–1V to 1000V I–1 A to 20.5 A 0.2 (Lead / Leg) – UPF	0.13 % to 0.12 %	Using Fluke Multi–Product Calibrator Model 5522 A By Direct Method
13.	DC Power [#]	1W to 20KW V–1V to 1000V I–1 A to 20.5 A	0.031 % to 0.084 %	Using Fluke Multi–Product Calibrator Model 5522 A By Direct Method
14.	Phase Angle [#]	0 to 90° @ 50 Hz	0.125°	Using Fluke Multi–Product Calibrator Model 5522 A By Direct Method
	Oscilloscope [#]			
	Amplitude	1 MΩ Load		
		10 mV to 70 V	0.6 % to 0.2 %	
		50 Ω Load		
		10 mV to 6.6 V	0.6 % to 0.2 %	
	Time Base	5 ns to 5 s	0.29 %	
	Bandwidth	Upto 1 GHz	6 %	
16.	Energy (1 Φ and 3 Φ) [#]	50 Hz 240 V 5 A UPF – 0.5 PF (lag and Lead)	0.6 %	Using Zeal Three Phase Power Energy meter calibrator by direct method

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II.	MEASURE			
1.	DC Voltage [#]	1 mV to 10 mV 10 mV to 1000 V	0.41 % to 0.046 % 0.046 % to 0.011 %	Using 6 ½ Digital Multimeter by direct method
2.	AC Voltage [#]	50 Hz 1 mV to 10 mV 10 mV to 1000 V	4.739 % to 0.532 % 0.532 % to 0.098 %	Using 6 ½ Digital Multimeter by direct method
3.	DC Current [#]	10 μ A to 100 mA 100 mA to 1 A 1 A to 10 A	0.361 % to 0.065 % 0.065 % to 0.084 % 0.084 % to 0.192 %	Using 6 ½ Digital Multi Meter by direct method
4.	AC Current [#]	50 Hz 30 μ A to 1 A 1 A to 10 A	0.426 % to 0.169 % 0.169 % to 0.253 %	Using 6 ½ Digital Multi Meter by direct method
5.	Resistance [#]	1 Ω to 1 k Ω 1 k Ω to 10 M Ω 10 M Ω to 1 G Ω	0.359 % to 0.025 % 0.025 % to 0.059 % 0.059 % to 2.33 %	Using 6 ½ Digital Multi Meter by direct method
6.	Frequency [#]	5 Hz to 1 MHz	0.116 % to 0.015 %	Using 6 ½ Digital Multi Meter by direct method
7.	Capacitance [#]	1 nF to 1 μ F 1 μ F to 100 mF	5.197 % to 1.735 % 1.735 % to 2.123 %	Using 6 ½ Digital Multi Meter by direct method

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8.	Temperature [#] Simulation Temperature Calibrators / Test Kit / Universal Calibrator / Multimeter Pt-100	(-)200 to 800 °C	0.28 °C	Using 6 ½ Digital Multi Meter and Electrical Calibrator model MC-2 TE Beamax by direct method
	B type C type E type J type K type L type N type R type S type T type U type	600 to 1820 °C, 0 to 2316 °C (-)250 to 1000 °C (-)210 to 1200 °C (-)200 to 1372 °C (-)200 to 900 °C (-)200 to 1300 °C 0 to 1767 °C 0 to 1767 °C (-)250 to 400 °C (-)200 to 600 °C	0.54 °C 1.02 °C 0.63 °C 0.37 °C 0.52 °C 0.47 °C 0.53 °C 0.65 °C 0.59 °C 0.75 °C 0.68 °C	Using Fluke Multi-Product calibrator model 5522 A/5500 A & Temperature / Electrical Calibrator model MC-2 TE Beamax by direct method
9.	Energy [#] 1 Φ and 3 Φ	50 Hz 240 V 5 A UPF – 0.5 PF (Lag/Lead)	0.31 % to 0.36 %	Using Accucheck with CT on Site Energy meter calibrator by direct method
10.	AC High Voltage [#]	50 Hz 1 kV to 27 kV	6.1 %	Using HV Probe with Multimeter by direct method

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11.	DC High Voltage [#]	1 kV to 5 kV	6.10 % to 1.22 %	Using HV Probe with Multimeter by direct method
12.	AC High Voltage ^{\$}	50 Hz 1 kV to 5 kV	6.92 %	Using HV Probe with Multimeter by direct method
13.	Time [#] (Timer, Stop watch etc.)	5 s to 3600 s 3600 s to 24 hr	0.193 s to 1.62 s 1.62 s to 17.34 s	By using Master Stop watch by direct method

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<u>MECHANICAL CALIBRATION</u>				
I.	DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)			
1.	Caliper ^s (Vernier / Dial / Electronics) L.C. 0.01 mm	0 to 300 mm	7.93 μ m	Using Slip Gauge Set, Slip Gauge Set Accessories, Digital External Micrometer And Internal Microchecker
		0 to 600 mm	9.5 μ m	Using Slip Gauge Set, Digital External Micrometer And Length Bars
		0 to 1000 mm	12.13 μ m	Using Slip Gauge Set, Digital External Micrometer And Length Bars
2.	Dial Indicator ^s (Lever / Plunger) L.C. 0.001 mm	0 to 25 mm	1.60 μ m	Using Dial Calibration Tester / Length Measuring Machine
	L.C. 0.01 mm	0 to 50 mm	1.62 μ m	Using Length Measuring Machine

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3.	Internal Micrometer ^{\$} (Stick Type) L.C. 0.01 mm	25 mm travel (Head) 1000 mm (Extension rod)	9.8 μ m	Using LMM based / Internal Microchecker
4.	External Micrometer ^{\$} L.C. 0.001 mm L.C. 0.01 mm	0 to 150 mm 150 mm to 600 mm	1.52 μ m 9.46 μ m	Using slip gauge set, length bars, optical parallel and optical flat
5.	Depth Micrometer ^{\$} L.C. 0.01 mm	0 to 300 mm	9.07 μ m	Using Depth Micro checker, Surface Plate and slip gauge set
6.	Micrometer Head ^{\$}	Up to 100 mm	1.3 μ m	Using LMM
7.	Micrometer setting Rod Flat ended / Round ended ^{\$}	Up to 600 mm	6.4 μ m	Using Slip Gauge Set, Electronic Probe With DRO And Granite Comparator
8.	Measuring Scale / Taper Scale ^{\$}	0 to 2000 mm	176.6 μ m	Using Tape And Scale Calibrator
9.	Measuring Tape ^{\$}	Up to 50 m	134 x $\sqrt{L}$ μ m L in meter	Using Tape And Scale Calibrator
10.	Circumference / Pi Tape ^{\$}	Up to 50 m	134 x $\sqrt{L}$ μ m L in meter	Using Tape And Scale Calibrator

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11.	Digital Extensometer [#] L.C. 0.001 mm	0 to 2 mm	6.54 μ m	Using Dial Calibration Tester
	Gauge Length [#]	25 mm & 50 mm	25.80 μ m	Using Electronic Caliper
12.	Bore Gauge \$ L.C. 0.01 mm	Up to 2 mm	4.1 μ m	Using Dial Calibration Tester / Length Measuring Machine
13.	Height Gauge [#] L.C. 0.0001 mm	0 to 600 mm	8.4 μ m	Using Surface Plate, Slip Gauge Set And Length Bars
14.	Height Gauge \$ L.C. 0.01 mm L.C.0.02 mm	0 to 600 mm 0 to 1000 mm	10.8 μ m 19.0 μ m	Using Surface Plate, Slip Gauge Set And Length Bars
15.	Depth Gauge \$ (Vernier / Dial / Electronics)	0 to 300 mm L.C. 0.01 mm	9.22 μ m	Using Depth Micro Checker, Surface Plate And Slip Gauge Set
16.	Profile Projector [#] Linear Dimensions Angle Measurement Magnification	0 to 200 mm (X–Y) 0 to 360 ° 10X to 100 X	32.0 μ m 7.1 ° 0.41 % of magnification accuracy	Using Glass Scale / Angle Graticules / Electronic Caliper
17.	Microscope [#]	0 to 10 mm Magnification : 10X to 1000 X	0.40 %	Using Slip Gauge Set, Glass Scale And Micrometer Eye Piece

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18.	Dial Calibration Tester [#]	0 to 25 mm	1.0 μ m	Using Slip Gauge Set And Electronic Probe
19.	Surface Plate [#] (Flatness)	3000 x 2000 mm	0.99 x $\sqrt{L+W}$ /100 μ m (L and W in mm)	Using Electronic Level And Spirit Level
		Up to 300 mm	4.0 μ m	Using Electronic Probe Or Slip Gauge Set And Surface Plate
		Up to 1000 mm	8.1 μ m 10.6 μ m	Using slip gauge set and Surface plate
21.	Engineering Square ^{\$} – Perpendicularity – Parallelism – Flatness	Up to 300 mm	8.8 μ m 9.0 μ m 7.0 μ m	Using Master Cylinder, slip gauge set and surface plate
22.	V–Block ^{\$} – Symmetricity – Parallelism – Squareness – Matching Tolerance	150 mm x 150 mm x 150 mm	8.6 μ m 8.6 μ m 8.6 μ m 8.6 μ m	Surface Plate, Cylindrical Mandrel, Electronic Probe With DRO, Master Cylinder And Slip Gauge Set
23.	Bevel Protector ^{\$} L.C. 1' ^Φ	0 to 360 °	0.57' of Arc 34' of Arc	Using Slip Gauge, Angle Gauges And Surface Plate Using Profile Projector
24.	Sine Bar ^{\$} Angular Measurement Parallelism	Up to 300 mm	19.6 Sec. 4.4 μ m	Using Angle Gauge Set, Surface Plate, Electronic Probe And Slip Gauge Set Based On IS 5359

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25.	Combination Set ^{\$}	0 to 180 °	57' of Arc 34' of Arc	Using Angle Gauge Set, Surface Plate, Electronic Probe And Slip Gauge Set Using Profile Projector
26.	Engineer's Spirit ^{\$} Level (Flatness, Parallelism, Squireness And Sensitivity) L.C. 0.01, 0.02 and 0.05 mm/m	Base size up to 300 mm	7.58 μ m/m 9.04 μ m/m 16.04 μ m/m	Using Electronic Level, Slip Gauge Set, Master Cylinder, Electronic Probe, Tilting Table And Surface Plate
27.	Plain Plug Gauge ^{\$}	Up to 100 mm >100 mm to 200 mm	1.2 μ m 3.0 μ m	Using LMM And Setting Disc
28.	Plain Ring Gauge ^{\$}	3.0 mm to 200 mm	2.0 μ m	Using LMM And Master Setting Ring Gauge
29.	Pin Gauge / Measuring Pin / Thread Measuring Pin ^{\$}	0 to 25 mm	1.2 μ m	Using LMM
30.	Snap Gauge / Gap Gauge ^{\$}	200 mm to 300 mm 5 mm to 200 mm	5.6 μ m 2.7 μ m	Using Slip Gauges Using LMM

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31.	Taper Plug Gauge ^{\$}	Up to 100 mm >100 mm to 200 mm	2.4 μ m 2.6 μ m	Using LMM And Master Setting Disc
32.	Taper Ring Gauge ^{\$}	3.0 mm to 100 mm >100 mm to 200 mm	1.6 μ m 2.0 μ m	Using LMM And Master Setting Ring Gauge
33.	Thread Plug Gauge ^{\$} (For Major, Effective and Minor Diameter)	Up to 200 mm	2.8 μ m	Using Three wire pin set and Length measuring machine
34.	Thread Ring Gauge ^{\$} (Major & Effective Dia)	4.0 mm to 100 mm >100 mm to 200 mm	1.8 μ m 1.8 μ m	Using LMM and Master Setting Ring Gauge
35.	Thread Pitch Gauge ^{\$}	0.4 to 7.0 mm	6.9 μ m	Using Profile Projector
36.	Radius Gauge ^{\$}	0.5 to 50 mm	61.1 μ m	Using Profile Projector
37.	Test Sieve ^{\$}	25 μ m to 5 mm 5 mm to 125 mm	6.7 μ m 30.5 μ m	Using Profile Projector & Electronic caliper
38.	Thickness Gauge ^{\$} L.C. 0.001 mm L.C. 0.01 mm	0 to 5 mm 0 to 50 mm	1.4 μ m 7.0 μ m	Using Slip Gauge Set
39.	Ultrasonic thickness gauge ^{\$}	0 to 300 mm	105 μ m	Using Slip Gauge Set
40.	Feeler Gauge ^{\$}	0.01mm to 5 mm	1.7 μ m	Using LMM
41.	Angle Stips ^{\$}	0 to 360 °	5.3' of Arc	Using Profile Projector

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42.	Angle Protractor ^{\$}	0 to 180 °	49' of Arc	Using Profile Projector
43.	Coating Thickness Gauge ^{\$}	Up to 2000 μ m	5.9 μ m	Using Standard Foils
44.	Standard Foils ^{\$}	Up to 5000 μ m	1.7 μ m	Using LMM
45.	Tape And Scale Calibrator ^{\$}	Up to 1000 mm	15.3 μ m	Using slip gauge set and Length bar
46.	Linear probe / LVDT [#] L.C. 0.1 μ m	0 to 2 mm	1.1 μ m	Using Granite Comparator, Slip Gauge And Length Bar
		0 to 25 mm	1.1 μ m	Using Slip Gauge Set
47.	Taper Thread Plug Gauge ^{\$} (Major & Effective Dia)	Up to 100 mm >100 mm to 200 mm	1.7 μ m 3.7 μ m	Using LMM And Master Setting Disc
48.	Taper Thread Ring Gauge ^{\$}	4mm to 100 mm >100mm to 200 mm	1.4 μ m 2.2 μ m	Using LMM And Master Setting Ring Gauge
49.	Inside Dial Caliper Gauge ^{\$}	Up to 100 mm	6.8 μ m	Using Slip Gauge Set And Slip Gauge Set Accessories
50.	Pistol Caliper ^{\$} L.C. 0.05 mm	Up to 80 mm	61 μ m	Using Slip Gauge
51.	Master Block For Ultrasonic Thickness Gauge ^{\$}	Up to 10 mm	3.8 μ m	Using External Micrometer / Slip Gauge / Comparator / Probe

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52.	Standard Wire Gauge \$	0.190 to 8.0 mm	6.9 μ m	Using Profile Projector
II.	ACCELERATION AND SPEED			
1.	RPM Meter / Tachometer\$ (Contact)	1 to 12000 RPM	3.1 RPM	Using Master Tachometer and RPM Source
2.	RPM Meter / Tachometer \$ (Non-contact)	10 to 99,999 RPM	16.17 RPM	Using Master Tachometer and RPM Source
3.	Centrifuge / RPM Measurement #	0 to 30000 RPM	3.5 RPM	Using Master Tachometer
III.	ACOUSTIC			
1.	Sound Level Meter\$	1kHz 94 dB and 114 dB	0.47 dB	Using Acoustic calibrator
IV.	UTM, TENSION CREEP AND TORSION TESTING MACHINE			
1.	Uniaxial Static Testing Machines* Compression	50 N to 100 kN	0.99 %	Using Force proving instruments (Load cell with indicator) based on IS 1828 –1
2.	Uniaxial Static Testing Machines* (Class-1) Compression	100 kN to 3000 kN	0.70 %	Using Force proving instruments of Class 1 (Load cell with indicator) based on IS 1828 –1:
3.	Uniaxial Static Testing Machines* Tension	0.5 kN to 100 kN	1.48 %	Using Force proving instruments (Load cell with indicator) based on IS 1828 –1

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V.	TORQUE GENERATING DEVICES			
1.	Torque Wrench / Torque Meter ^{\$} (Type I, Class B,C,D,E / Type II, Class A,B,D,E)	1 Nm to 5 Nm 5 Nm to 20 Nm 10 Nm to 100 Nm 100 Nm to 500 Nm 500 Nm to 2000 Nm	3.09 % rdg 2.63 % rdg 2.58 % rdg 2.42 % rdg 2.79 % rdg	Using Torque Transducers With Indicators Of Various Capacities Based On IS/ISO 6789:2003
VI.	WEIGHTS			
1.	Weights / Mass ^{\$} (E2 and coarser up to 200 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 10 g 20 g 50 g 100 g 200 g	0.002 mg 0.002 mg 0.002 mg 0.002 mg 0.002 mg 0.002 mg 0.003 mg 0.003 mg 0.003 mg 0.004 mg 0.006 mg 0.006 mg 0.008 mg 0.01 mg 0.02 mg 0.05 mg 0.05 mg	Using E1 Class Standard Weights and Precision Balance of Readability: 0.001 mg up to 22 g and Readability: 0.01 mg up to 200 g by substitution method of Weighing and "ABBA" Weighing Cycle Procedure based on OIML R 111 (2004)
2.	F1 class & coarser 500 g to 10 kg	500 g 1 kg 2 kg 5 kg 10 kg	1 mg 2 mg 10 mg 20 mg 20 mg	
3.	20 kg - Calibration of F2 class & coarser	20 kg	40 mg	

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4.	50 kg - Calibration of M2 class & coarser	50 kg	2 g	Using M1 class weights and balance of d : 1 g As per OIML R-111 by substitution Method
VII.	WEIGHING SCALE AND BALANCE			
	Weighing Balance [#] (Class 1 and coarser) d $\geq$ 0.001 mg d $\geq$ 0.01 mg	1 mg to 20 g 1 mg to 200 g	0.009 mg 0.050 mg	Using E1 class standard weights 1 mg - 200 g as per OIML R-76
	Class 2 and coarser d $\geq$ 0.1 mg d $\geq$ 1 mg d $\geq$ 1 g	100 mg to 2 kg 100 g to 10 kg 50 g to 50 kg	2 mg 6 mg 2 g	Using E2 Class weights 500 g - 10 kg & F1 class weights 20 kg as per OIML R-76
	Class 3 and coarser d $\geq$ 10 g	500 g to 300 kg	10 g	Using M1 class weights upto 300 kg as per OIML R-76
2.	Spring Balance ^{\$} d = 1 g	1 kg to 100 kg	300 g	Using F1 & M1 class weights
VIII.	PRESSURE INDICATING DEVICE			
1.	Hydraulic Pressure Gauge Pressure Gauge ^{\$} (Dial / Digital) and Recorder / Pressure transducer	4 bar to 50 bar >50 bar to 1000 bar.	0.08 % rdg 0.08 % rdg	Using Dead Weight Tester with two piston-cylinder assemblies based on DKD-R-6-1

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2.	Hydraulic Pressure Gauge Pressure Gauge (Dial / Digital) And Recorder / Pressure Transducer / Transmitter / Safety Valve / Pressure Switch [#]	0 to 1400 bar	0.25 % rdg	Using Master Digital Pressure Gauge and Pressure Comparator based on DKD-R-6-1
3.	Pneumatic Pressure [#] Positive Pressure : Magnahilic Gauge / Manometer / Differential Pressure Gauge / Transmitter	0 to 200 mbar >200 mbar to 2000 mbar	0.3 mbar 1.4 mbar	Using Master Digital Pressure Gauge and Pressure Comparator based on DKD-R-6-1 Using Master Digital Pressure Gauge and Pressure Comparator based on DKD-R-6-1
4.	Pneumatic Pressure [#] Positive Pressure : Pressure Gauge (Dial / Digital) And Recorder / Pressure Transducer / Safety Valve / Transmitter	> 2 bar to 140 bar	0.66 %rdg	Using Master Digital Pressure Gauge and Pressure Comparator based on DKD-R-6-1
5.	Vacuum [#] Vacuum Gauge (Dial / Digital) And Recorder / Pressure Transducer / Transmitter	(-) 700 to 0 mmHg	0.8 mmHg	Using Master Vacuum gauge and Vacuum Comparator based on DKD-R-6-1

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IX.	VOLUME			
1.	Micro Pipette ^{\$}	$1\ \mu\text{l} < V \leq 10\ \mu\text{l}$ $10\ \mu\text{l} < V \leq 100\ \mu\text{l}$ $100\ \mu\text{l} < V \leq 1\ \text{ml}$ $1\ \text{ml} < V \leq 5\ \text{ml}$ $5\ \text{ml} < V \leq 10\ \text{ml}$	0.09 μl 0.09 μl 1.30 μl 1.09 μl 9.77 μl	Using weighing balance of d : 0.001 mg & d : 0.01 mg, Distilled water Calibration of Micro pipettes based on Gravimetric Method as per ISO 8655
2.	Volume Glassware \$ (Pipette, Burette, Measuring cylinder, Volumetric flask & Bottle Top Dispenser)	$1\ \text{ml} \leq V < 100\ \text{ml}$ $100\ \text{ml} \leq V < 1000\ \text{ml}$ $1000\ \text{ml} \leq V < 2000\ \text{ml}$ $2000\ \text{ml} \leq V < 4000\ \text{ml}$	24 μl 24 μl 0.5 ml 1 ml	Using Weighing balance with d : 0.01 mg, d : 1 mg, d : 10 mg respectively & distilled water Calibration of Glassware based on Gravimetric method as per ISO 4787
X.	DENSITY AND VISCOSITY			
1.	Density Hydrometer \$ (Density, Specific Gravity, Baume)	0.6 g/ml to 2 g/ml 0 to 70 ° Be	0.15 % 0.40 %	Using Precision balance, Sinkers and appropriate liquid Calibration of Hydrometers by Cuckow's Method as per NIST SP 250-78

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ($\pm$)	Remarks
<u>THERMAL CALIBRATION</u>				
I.	TEMPERATURE			
1.	RTD / Thermocouple With Or Without Indicator / Recorder / Controller, Digital Thermometer, Temperature Gauge, Transducer, Transmitter \$	(-) 80 °C to 50 °C	0.39 °C	Using RTD Sensor with 6 ½ DMM with temperature bath by comparison method
2.	Liquid In Glass Thermometer \$	(-) 80 °C to 50 °C 50 °C to 250 °C	0.39 °C 0.69 °C	Using RTD Sensor with 6 ½ DMM, Low Temperature bath and Oil bath by comparison method
3.	Temperature For Non Contact Type Infrared Thermometer / Thermal Imaging Camera / Pyrometer\$	50 °C to 100 °C 100 °C to 500 °C 500 °C to 1200 °C	3.2 °C 4.5 °C 4.7 °C	Using High Stability Black Body Furnace and Non-Contact on-line pyrometer / Infrared thermometer by Comparison Method
4.	RTD / Thermocouple With Or Without Indicator / Recorder / Controller, Digital Thermometer, Temperature Gauge, Transducer, Transmitter #	50 °C to 250 °C	0.60 °C	Using RTD Sensor with 6 ½ DMM with Oil bath by Comparison Method

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5.	RTD / Thermocouple with or without Indicator / Recorder / Controller, Digital Thermometer, Temperature Gauge, Transducer, Transmitter #	250 °C to 1200 °C	3.9 °C	Using "S" type thermocouple with 6 ½ DMM and dry block furnace by comparison method
6.	Temperature Indicator with sensor of Freezer, Incubator, Oven, Environmental chamber / rooms #	(-)80 to 100 °C	0.71 °C	Using RTD Sensor with 6 ½ DMM Single Point Calibration (at measuring location in DUC)
7.	Temperature Indicator With Sensor Of Oven, Furnace, Chamber #	100 °C to 250 °C	0.33 °C	Using RTD sensor with 6 ½ DMM Single Point Calibration (at measuring location in DUC)
8.	Temperature Indicator With Sensor Of Oven, Furnace, Chamber #	250 °C to 1200 °C	3.6 °C	Using "S" type thermocouples with 6 ½ DMM Single Point Calibration (at measuring location in DUC)
9.	Calibration Of Freezer, Incubator, Environmental Chambers (Oven, Furnace Etc.) And Room #	(-)40 °C to 100 °C	3.7 °C	Using RTD Sensors (Minimum nine) with data logger Multi position calibration

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10.	Calibration Of Oven, Chambers, Furnaces [#]	100 °C to 250 °C	4.0 °C	Using RTD Sensors and K type thermocouples (Minimum nine) with data logger Multi position calibration
11.	Data Logger With Inbuilt Temperature Sensor [#] (Wireless Type)	(-) 25 °C to 50 °C	0.64 °C	Using RTD sensor with 6 ½ DMM and temperature and humidity calibrator by comparison calibration
		(-) 80 °C to 50 °C 50 °C to 250 °C	0.18 °C 0.22 °C	Using RTD sensor with 6 ½ DMM Single position calibration at measuring location in DUC
		250 °C to 1200 °C	2.6 °C	Using "S" type thermocouple with 6 ½ DMM Single position calibration at measuring location in DUC
13.	Furnaces [*]	250 °C to 1200 °C	6.4 °C	Using "K" type thermocouples (Minimum nine) with data logger Multi position calibration
14	Black Body Furnaces [*]	50°C to 500 °C 500°C to 1200 °C	3.8 °C 3.9 °C	Using Non-Contact On-Line Pyrometer / Infrared Thermometer Single Position Calibration at Measuring Location In DUC

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II.	SPECIFIC HEAT AND HUMIDITY			
		10 % Rh to 95 % Rh At 25 °C	2.3 % Rh At 25 °C	
		0 °C to 50 °C At 50 % Rh	0.79 °C At 50 % Rh	
2.	Temperature And Humidity Chamber / Environmental Chamber *	10 % Rh to 95 % Rh At 25 °C	10.4 % Rh At 25 °C	Using Temperature And Humidity Data Loggers (Minimum Nine) Multi Position Calibration
3.	Thermo—Hygrometer, Data Logger, Humidity Transmitter, Thermometer, Humidity Meter With Sensor, Humidity Transducer #	10 % Rh to 95 % Rh At 25 °C 10 °C to 50 °C At 50 % Rh	2.30 % Rh @ 25 °C 0.79 °C @ 50 % Rh	Using Temperature And Humidity Indicator With Sensor And Humidity Generator With Chamber And Temperature And Humidity Calibrator By Comparison Calibration

* 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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