

Laboratory Emm Tech Calibration, D-1/90, Sanjay Colony, Sector -23, Faridabad, Haryana

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number CC-2575 (In lieu of C-0347, C-0441, C-0510) **Page** 1 of 25

Validity 03.02.2018 to 02.02.2020 **Last Amended on** 22.03.2018

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
<u>ELECTRO TECHNICAL CALIBRATION</u>				
I.	MEASURE			
1.	DC Voltage [#]	1 mV to 10 mV 10 mV to 100 mV 100 mV to 1000V	0.42 % to 0.045% 0.045% to 0.0085% 0.0085%	Using Digital Multimeter 6½ (Fluke 8846A) by Direct Method
	DC High Voltage [*]	>1 kV to 35 kV	3.0 %	Using HV Probe with DMM (Fluke 80k-40) by Direct Method
2.	AC Voltage [#]	50Hz to 1kHz 1 mV to 10 mV 10 mV to 100 mV 100 mV to 1 V 1V to 1000V	4.76% to 0.54% 0.54% to 0.12% 0.12% to 0.11% 0.11%	Using Digital Multimeter 6½ (Fluke 8846A) by Direct Method
		50Hz 30V to 480V	0.025%	Using Three Phase Reference Energy Calibrator Songyang SY3102 by Direct Method
	AC High Voltage [*]	50Hz >1kV to 28kV	3.3 to 2.5%	Using HV Probe with DMM (Fluke 80k-40) by Direct Method
3.	DC Current [#]	1µA to 10µA 10µA to 100µA 100µA to 1mA 1mA to 1A 1A to 3A 3A to 10A	3.03% to 0.35% 0.35% to 0.14% 0.14% to 0.06% 0.06 to 0.08% 0.08% to 0.15% 0.15% to 0.2%	Using Digital Multimeter 6½ (Fluke 8846A) by Direct Method

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		>10 A to 100 A 100A to 750A	0.96% 0.65%	Using DC Shunt & Digital Multimeter 6½ (Fluke 8846A) by Direct Method
4.	AC Current [#]	50Hz to 1kHz 33µA to 1A 1 A to 10 A	0.66 to 0.17% 0.17% to 0.25%	Using Digital Multimeter 6½ (Fluke 8846A) by Direct Method
		50Hz 5mA to 500mA 0.5A to 120A	0.03% 0.025%	Using Three Phase Reference Energy Calibrator Songyang SY3102 by Direct Method
		50 A to 1000 A	0.6 %	Using Current Transformer & Digital Multimeter 6½(Fluke 8846A)by Direct Method
5.	Frequency [#]	10 Hz to 50Hz 50 Hz to 1000 kHz	0.06% to 0.012% 0.012%	Using Digital Multimeter 6½(Fluke 8846A) by Direct Method
6.	Inductance [#]	1kHz 100 µH to 1 H	0.5%	Using LCR Meter by Direct Method
7.	Capacitance [#]	1kHz 1nF to 1µF	0.5%	Using LCR Meter by Direct Method
8.	Resistance [#] (2 Wire)	100 kΩ to 500 kΩ 500 kΩ to 10 MΩ 10 MΩ to 100 MΩ 100 MΩ to 1GΩ	0.014% to 0.03% 0.03% to 0.05% 0.05% to 0.94% 0.94% to 1.85%	Using Digital Multimeter 6½ (Fluke 8846A) by Direct Method

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9.	Resistance [#] (4 Wire)	0.1m Ω to 1m Ω 1 m Ω to 1000 m Ω 1000m Ω to 100 Ω 100 Ω to 100 k Ω	0.66% to 0.12% 0.12% 0.12% to 0.02% 0.02%	Using Micro Ohm Meter (Motwane LR2045)& Digital Multimeter 6½ (Fluke 8846A) by Direct Method
10.	Time [#]	0.01 s to 10 s 10 s to 1000 s 1000 s to 9900 s 9900 s to 86400 s	0.0013 s 0.014 s 0.17 s 1.3 s to 2.5 s	Using Digital Timer by Direct Method
11.	Power Factor [#]	45 to 60Hz P.F 1 to 0.1(lag/lead)	0.0006(PF)	Using Three Phase Reference Energy Calibrator Songyang SY3102 by Direct Method / Comparison Method
12.	AC Power/ energy Single/ three phase Active /reactive/ Apparent [#] P.F 1 to 0.2(lag/lead)	45 to 60Hz 30V to 300V 120A to 10A 108kW/kVar to 60W/Var 10A to 0.5A 9000W/Var to 3W/Var 500mA to 5mA 450W/Var to 0.03W/Var	0.025% 0.025% to 0.034% 0.025% to 0.667%	Using Three Phase Reference Energy Calibrator Songyang SY3102 by Direct Method / Comparison Method

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13.	Temperature Simulation ^{\$} (Indicator/Controller, PID, Data logger, Scanner, Calibrator, Process meter & Recorder) RTD (PT-100)	(-)200°C to 600°C	0.16 °C	Using Digital Multimeter 6½/ Precision Temperature Scanner By Direct Method
	E-Type Thermocouple	(-)200 to 1000 °C	0.5 °C	Using Precision Temperature scanner 1586A/ Multi Product Calibrator (Fluke 5502A) By Direct Method
	B-Type Thermocouple	600 to 1800 °C	0.56 °C	
	J-Type Thermocouple	(-)200 to 700 °C	0.27 °C	
	K-Type Thermocouple	(-)200 to 1300 °C	0.4 °C	
	T-Type Thermocouple	(-)200 to 400 °C	0.24 °C	
	R-Type Thermocouple	200 to 1700 °C	0.57 °C	
	S-Type Thermocouple	200 to 1700 °C	0.47 °C	
	N-Type Thermocouple	(-)200 to 1300 °C	0.4 °C	
II.	SOURCE			
1.	DC Voltage [#]	1mV to 330mV 330.0mV to 1000V	0.4% to 0.008% 0.009%	Using Multi Product Calibrator (Fluke 5502A) By Direct Method
2.	AC Voltage [#]	50Hz to 1kHz 3mV to 330mV 330mV to 1000V	0.91% to 0.06% 0.06%	Using Multi Product Calibrator (Fluke 5502A) By Direct Method
		45 to 60Hz 30V to 480V	0.025%	Using Three Phase Reference Energy Calibrator Songyang SY3102 by Direct Method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ($\pm$)	Remarks
3.	DC Current [#]	1 μ A to 10 μ A 10 μ A to 330 μ A 330 μ A to 330mA 330 mA to 3.0A 3.0 A to 10.0A 10.0 A to 20A 20A to 50A 50A to 200A 200A to 1000A	2.43% to 0.25% 0.25% to 1.8% 1.8% 0.024% to 0.05% 0.05% to 0.08% 0.08% to 0.4% 0.4% to 0.7% 0.7 to 0.85% 0.85% to 0.7%	Using Multi Product Calibrator (Fluke 5502A) By Direct Method Using Multi Product Calibrator (Fluke 5502A) with Current Coil By Direct Method
4.	AC Current [#]	50Hz to 5kHz 30 μ A to 330 μ A 330 μ A to 330mA 330mA to 3.0A 3.0 A to 10.0 A 10.0 A to 20A 50Hz 20A to 200A 200A to 1000A 45 to 60Hz 5mA to 500mA 0.5A to 120A	0.58% to 0.02% 0.02% to 0.05% 0.05% to 0.07% 0.07% to 0.095% 0.085 to 0.39% 0.46% to 1.18% 1.18% to 0.7% 0.03% 0.025%	Using Multi Product Calibrator (Fluke 5502A) By Direct Method Using Multi Product Calibrator (Fluke 5502A) with Current Coil By Direct Method Using Three Phase Reference Energy Calibrator By Compression Method
5.	Frequency [#]	10Hz to 2 MHz	0.07% to 0.007%	Using Multi Product Calibrator (Fluke 5502A) By Direct Method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
6.	Inductance [#]	1kHz 100μH to 1H	0.5%	Using Std. Inductance Box & LCR Meter By Compression Method
7.	Capacitance [#]	1kHz 100pF to 1μF	0.5%	Using Std. Capacitance Box & LCR Meter By Compression Method
8.	AC Resistance [#]	1kHz 1 Ω to 100 kΩ	0.5%	Using Std. Resistance Box & LCR Meter By Compression Method
9.	DC Capacitance ^{\$}	1nF to 10nF 10nF to 110mF	1.73 % to 0.48% 0.48% to 0.6%	Using Multi Product Calibrator (Fluke 5502A) By Direct Method
10.	Resistance ^{\$}	1Ω to 10Ω 10 Ω to 330 KΩ 330 KΩ to 10.0M Ω 10.0M Ω to 330M Ω 330 MΩ to 1100MΩ	0.08% to 0.017% 0.017% to 0.014% 0.014% to 0.07% 0.07% to 0.57% 0.57% to 1.9%	Using Multi Product Calibrator (Fluke 5502A) By Direct Method
	Resistance [#] (4-wire)	0.1mΩ to 1m Ω 1 mΩ to 1000 mΩ 1000mΩ to 100 Ω 100 Ω to 100 kΩ	0.66% to 0.12% 0.12% 0.12% to 0.02% 0.02%	Using Multi Product Calibrator (Fluke 5502A), Std. Resistance Box, DC Shunt Resistance Micro Ohm Meter (Motwane LR2045) & Digital Multimeter 6½ (Fluke 8846A) Direct Method/ Comparison Method

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11.	Insulation Resistance [#]	2M Ω 20 M Ω 100 M Ω 200M Ω 1000 M Ω	3.45% 3.45% 3.45% 4.18% 4.18%	Using HV Mega Ohm Box By Direct Method
12.	Power factor [#]	45 to 60Hz P.F 1 to 0.1(lag/lead)	0.0006(PF)	Using Three Phase Reference Energy Calibrator By Comparison Method
13.	AC Power/ energy Single/ three phase Active /reactive/ Apparent [#] P.F 1 to 0.2(lag/lead)	45 to 60Hz 30V to 300V 120A to 10A 108kW/kVar to 60W/Var 10A to 0.5A 9000W/Var to 3W/Var 500mA to 5mA 450W/Var to 0.03W/Var	0.025% 0.025% to 0.034% 0.025% to 0.667%	Using Three Phase Reference Energy Calibrator By Direct Method
14.	DC Power Single phase ^{\$}	10V to 1000V 0.1A to 20A 1W to 20 kW	0.1 to 0.25%	Using Multi Product Calibrator (Fluke 5502A) By Direct Method
15.	Oscilloscope Amplitude ^{\$} (Vertical axis Deflection factor)	1 kHz 1 M Ω 5 mV to 120 V	1%	Using Multi Product Calibrator (Fluke 5502A) By Direct Method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ($\pm$)	Remarks
16.	Time base ^{\$} (Horizontal Axis Deflection factor)	2 ns to 5 s	0.63 %	Using Multi Product Calibrator (Fluke 5502A) By Direct Method
17.	Sine / Square (DC) Bandwidth ^{\$}	50 kHz to 20 MHz 50 Ω 1 mV to 5 V 1 kHz to 300 MHz	1%	Using Multi Product Calibrator (Fluke 5502A) By Direct Method
18.	Temperature [#] (Indicator/Controller, PID, Data logger, Scanner, Calibrator, Process meter & Recorder) RTD (PT-100) RTD (PT-1000) N-Type Thermocouple J-Type Thermocouple K-Type Thermocouple T-Type Thermocouple R-Type Thermocouple S-Type Thermocouple B-Type Thermocouple E-Type Thermocouple	 (-)200°C to 630 °C (-)200°C to 600 °C (-)200 to 1300 °C (-)200 to 1200 °C (-)200 to 1300 °C (-)200 to 400 °C 0 to 1700 °C 0 to 1700 °C 0 to 1800 °C (-)200 to 1000 °C	 0.14 °C 0.07 °C 0.4 °C 0.27 °C 0.5 °C 0.24 °C 0.57 °C 0.53 °C 0.44 °C 0.5 °C	 Using Multi Product Calibrator (Fluke 5502A)/ Universal Calibrator By Direct Method Using Multi Product Calibrator (Fluke 5502A)/ Universal Calibrator By Direct Method

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<u>MECHANICAL CALIBRATION</u>				
I.	DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)			
1.	Slip Gauge Set ^{\$} (Gauge Length variation in length flatness)	0.5 mm to 10mm >10 mm to 50mm >50mm to 75mm >75mm to 100mm	0.09 μ m 0.13 μ m 0.18 μ m 0.25 μ m	Using Gauge Block Calibrator & Slip Gauge Set 'K Grade' IS 2984 & ISO 3650
2.	Measuring Pin Set ^{\$}	0.1mm to 20mm	1.0 μ m	Using Length Measuring Machine IS 11103,6311,4359
3.	Three wire Unit ^{\$}	0.17mm to 6.5mm	0.5 μ m	Using Length Measuring Machine IS 11103,6311,4359
4.	Cylindrical Setting Master ^{\$} (Diameter)	1mm to 50mm	0.5 μ m	Using Length Measuring Machine IS 11103,6311,4359
5.	Length Bar / Setting Rod/Long Slip Gauge ^{\$}	25mm to 100mm >100 mm to 200mm	1.0 μ m 2.0 μ m	Using Length Measuring Machine IS 7014,2984,4440
		>200 mm to 400mm	4.0 μ m	Using Length Measuring Machine & Long Slip Gauge IS 7014,2984,4440, ISO 3650
		>400mm to 600 mm	3.7 μ m	Using 2D Height Gauge IS 7014,2984,4440

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ($\pm$)	Remarks
6.	Gauge Block Calibrator [#] L.C.: 0.01 μ m	0.5mm to 100mm	0.12 μ m	Using Slip Gauge Set (11 PC's) Eura met CG-2
7.	Electronic Probe with DRO ^{\$} L.C.: 0.0001 mm ϕ	0 to 10mm >10mm to 25mm >25mm to 50mm	0.2 μ m 0.3 μ m 0.5 μ m	Using Slip Gauge Set
8.	Dial Calibration Tester / Micrometer Head ^{\$} L.C 0.0001mm ϕ	0 to 50mm	4.5 μ m	Using Slip Gauge Set, Dial Indicator IS 9483
9.	Caliper Checker ^{\$}	0 to 600mm	2.9+5.3 $\sqrt{L}$ μ m, where 'L' is Length in mtr.	Using 2D Height Gauge
10.	Height Master ^{\$} L.C.: 0.002 mm ϕ	0 to 300mm	1+L/100 μ m, where 'L' is Length in mm	Using 2D Height Gauge IS 13907
11.	Length Measuring Machine [#] (Single Axis) L.C.: 0.0001 mm ϕ	0 to 100 mm >100 mm to 300 mm	0.5 μ m 2.5 μ m	Using Slip Gauge Set Slip Gauge Set & Long Slip Gauge 200mm
12.	Metal Gauge for Flakiness Index ^{\$}	4.89mm to 100mm	20.3 μ m	Using Profile projector IS 2386 (part 1) Direct Method

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13.	Profile Projector [#] L.C.: 0.001 mm ϕ L.C.: 1" ϕ	Linear 0 to 200mm Angle 360° Magnification	10.03 μ m 18.7" 0.05%	Using Glass Scale & Angle Gauge Set Digimatic Caliper
14.	Filler Gauge ^{\$}	Up to 1mm	1.07 μ m	Using Length Measuring Machine IS 3179
15.	Standard Foil ^{\$}	0.01 to 2mm	0.5	Using Length Measuring Machine IS 3179
16.	Radius Gauge ^{\$}	0.5 to 25mm	10.94 μ m	Using Profile Projector IS 5273
17.	Thread Pitch Gauge ^{\$}	0.1 to 6mm	5.5 μ m	Using Profile Projector IS 4211
18.	Angular scale Angle Measurement Industrial Angle Gauge ^{\$}	0-360°	15"	Using Profile Projector IS 6231
19.	Surface Plate [#] (Flatness Measurement) Comparator Stand [#] (Flatness Measurement)	6000 x 4000mm 300 x 300 mm	$1.0\sqrt{L+W}$ μ m 125 Where 'L' Length & 'W' Width is in mm	Using Electronic Level IS 12937, 2285, 7327
20.	Straight Edge [#] (Straightness Measurement)	Up to 2000mm	4.0 μ m/m	Using Electronic Level IS 2220, 5268
21.	Inclinometer ^{\$} L.C.: 0.1° ϕ	Upto $\pm 45^\circ$	4.5'	Using Slip Gauge Set & Sine Bar

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22.	Precision Level / Sprit Level ^{\$} Sensitivity 10 μ m/m ^{ϕ}	up to 300mm Base Length	13.19 μ m/m	Using Electronic Level IS 5706
23.	Test Sieve ^{\$} (Aperture Size, Wire dia & Aperture pitch size)	32 μ m to 10mm 10mm to 150mm	8.04 μ m 25.0 μ m	Using Profile Projector / Digimatic Caliper IS 460 (PART-1,2&3)
24.	Angle Plate/ Box Angle Plate/ Right Angle [#] (Parallelism, Flatness & Squareness)	Upto 400mm	12.5 μ m	Using Slip Gauge Set, Dial Indicator & Granite Square IS 6232, 2554, 6973, 6985, 2103
25.	V-Block [#] (Squareness, Parallelism, Flatness & Symmetricity)	Upto 200mm (Squareness, Parallelism, Parallelism of V, Symmetricity)	4.84 μ m 4.5 μ m 4.0 μ m 4.5 μ m	Using Granite Square, Test Mandrel & Dial Indicator, slip gauge set IS 2949
26.	Test Mandrel ^{\$} (Diameter)	0.5mm to 50mm Length Upto 300mm	1.0 μ m	Using Length Measuring Machine IS 2063 & ISO 230-1
27.	Spline Plug Gauge ^{\$} (Dimension over Two Pins)	1 to 100mm	1.5 μ m	Using Length Measuring Machine IS 4966 (PART-2)
28.	Spline Ring Gauge ^{\$} (Dimension Between Two Pins)	10 to 100mm	2.5 μ m	Using Slip Gauge Set IS 4966 (PART-1)

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29.	Chamfer Gauge ^{\$} Diameter Angle Length	2.5 to 50mm 0 to 360° 0.1 to 100mm	1.0 μ m 6" 5.5 μ m	Using Length Measuring Machine & Profile Projector
30.	Sine Bar ^{\$} (Angle, Centre distance between rollers, Parallelism) & Sine Center ^{\$} (Angle & Parallelism)	0 to 300mm	5" 6.0 μ m	Using Slip Gauge Set, Angle Gauge set, Dial Test Indicator, 2D Height Gauge IS 5359
31.	Caliper ^{\$} (Vernier/Dial/Digital, Error external jaw, internal jaw and depth, parallelism of external and internal jaws) L.C. 0.01mm ^{ϕ}	0 to 600mm >600 to 1500mm	 6.6+8.7 $\sqrt{L}$ μ m, where 'L' is Length in mtr. 8.5+9 $\sqrt{L}$ μ m, where 'L' is Length in mtr.	Using Slip Gauge Set, Caliper Checker & Long Slip Gauges IS 3651(part-1,11,111) & JIS B7507
32.	External Micrometer ^{\$} (Mech/Digital) (Screw Error & Error in length of each extension) L.C 0.001mm ^{ϕ} L.C 0.01mm	0 to 100mm >100 mm to 150mm >150mm to 300mm >300mm to 600mm >600mm to 1000mm	1.0 μ m 1.3 μ m 4.2 μ m 9.5 μ m 18.0 μ m	Using Slip Gauge Set & Long Slip Gauges IS 2967 & JIS B 7502

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33.	Height Gauge [#] (Vernier/Dial/Digital) (Parallelism of scriber to base) L.C. 0.01mm ^φ	0 to 600mm >600 mm to 1000mm	(5 + 6.8 $\sqrt{L}$) μ m (6 + 6.8 $\sqrt{L}$) μ m Where 'L' Length is in mtr.	Using Slip Gauge Set, Caliper Checker, Dial test Indicator & Long Slip Gauges IS 2921 & JIS B7517
34.	2D Height Gauge / Linear Height Gauge [#] L.C. 0.0001 ^φ	0 to 600mm	2.5 μ m	Using Slip Gauge Set, Caliper Checker IS 13907
35.	Internal Micrometer ^{\$} (Screw Error & Error in length of each extension) L.C 0.001mm ^φ	5mm to 200mm >200mm to 400mm	2.0 μ m 4.3 μ m	Using Length Measuring Machine & Long Slip Gauge IS 2966
	L.C 0.01mm	>400mm to 600 mm	6.2 μ m	2D Height Gauge
36.	Depth Micrometer ^{\$} (Mech/Digital) (Screw Error & Error in length of each extension) L.C 0.001mm ^φ	0 to 300mm	3.0 μ m	Using Slip Gauge Set Grade-0 & Slip Gauge Set Grade-K JIS B7544 & BS 6468

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37.	Depth Caliper ^{\$} (Vernier/Dial/Digital) L.C 0.01mm ^{ϕ}	0 to 300mm	7.84 μ m	Using Slip Gauge Set Grade-0 & Slip Gauge Set Grade-K IS 4213 & JIS B7518
38.	Dial Indicator ^{\$} (Dial / Digital) (Hysteresis repeatability accuracy) L.C 0.0001mm ^{ϕ} L.C 0.001mm ^{ϕ}	0 to 25mm 0 to 50mm >50 mm to 100mm	0.8 μ m 1.0 μ m 1.2 μ m	Using Length Measuring Machine IS 2092 & JIS B7503
39.	Dial Test Indicator ^{\$} (Hysteresis repeatability accuracy) L.C 0.001mm ^{ϕ}	0 to 2.0mm	0.5 μ m	Using Length Measuring Machine IS 11498 & JIS B7533
40.	Dial Bore Gauge ^{\$} L.C 0.001mm ^{$\phi$}	0 to 1mm Travel	0.5 μ m	Using Length Measuring Machine JIS 7515
41.	Dial Thickness Gauge/ OD Caliper ^{\$} L.C. 0.001mm ^{$\phi$} L.C. 0.01mm ^{$\phi$}	0 to 5mm 0 to 100mm	1.0 μ m 6.0 μ m	Using Slip Gauge Set IS 2092 & JIS B7503

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42.	Bevel / Angle Protector/Combination Set ^{\$} (Angle) L.C. 1' (min) ϕ L.C. 5' (min) ϕ	0 to 180° to 0	1.0' 3.0'	Using Angle Gauge Set IS 4239, 5812
43.	Dial Snap Gauge / Indicating Micrometer ^{\$} L.C. 0.001mm ϕ	0 to 100mm	1.3 μ m	Using Slip Gauge Set IS 14271 & JIS B7520
44.	Steel Scale ^{\$} L.C.:0.5mm ϕ	0 to 1000 mm	42 μ m	Using Scale & Tape Calibrator IS 1481
45.	Measuring Tape /Pie Tape ^{\$} L.C.: 1mm ϕ	0 to 50meter	60 $\sqrt{L}$ μ m Where 'L' Length is in meter	Using Scale & Tape Calibrator IS 1269 (Part-1,11)
46.	Plain Plug Gauge / Setting Plug Gauge ^{\$} (Diameter)	0.1 mm to 100mm >100mm to 200mm >200mm to 400mm	2.0 μ m 2.0 μ m 4.5 μ m	Using Length Measuring Machine & Long Slip Gauge IS 3455 & IS 919 IS 6137,6244 & IS 6246
47.	Plain Ring Gauge / Setting Ring Gauge ^{\$} (Diameter at 4 positions)	3 mm to 150mm >150 mm to 200mm >200 mm to 350mm	2.0 μ m 3.0 μ m 5.0 μ m	Using Length Measuring Machine, Master Ring Gauges IS 3485, 3455, 919, 7876

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ($\pm$)	Remarks
48.	Flush Pin Gauge/Width Gauge ^{\$}	0.1 mm to 200mm	2.9 μ m	Using Length Measuring Machine IS 3455,919
49.	Snap Gauge ^{\$}	3mm to 150mm >150 mm to 400mm	2.65 μ m 5.0 μ m	Using Slip Gauge Set IS 3455 & IS 919
50.	Thread Plug Gauge / W.C.P ^{\$} (Effective Diameter, Major Diameter)	1mm to 100mm	2.0 μ m	Using Length Measuring Machine & Three Wire Unit IS 2334, 4218,6311
51.	Thread Ring Gauge / W.C.R ^{\$} (Effective Diameter, Minor Diameter)	3.5 mm to 100mm	2.5 μ m	Using Length Measuring Machine, Master Ring Gauge IS 2334,4218,6311
52.	Bench Center [#] (Parallelism &Coaxiality Measurement)	Upto 500mm	6.0 μ m	Using Test Mandrel & Dial Indicator IS 5980
53.	Coating Thickness Gauge ^{\$}	0.01mm to 1mm	3.6 μ m	Using Master Foil
II.	DIMENSION (PRECISION INSTRUMENTS)			
1.	Verification of Extensometers calibrator ^{\$}	0 to 5 mm	0.5 μ m	Using Slip Gauge set IS 12872: 2012 (Part – II) Indirect Method
2.	Extensometers [#] Travel of Extensometer Gauge Length	0- 2 mm 0– 50 mm	8.0 μ m 5.0 μ m	Dial Gauge of 0.0001 mm least count with fixture Profile Projector based on IS 12872/ISO 9513: 2012

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ($\pm$)	Remarks
III.	WEIGHTS			
1.	Mass ^{\$} (Calibration of Weights)	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	0.02 mg 0.02mg 0.02 mg 0.02 mg 0.02 mg 0.02 mg 0.02 mg 0.02 mg 0.02 mg 0.02 mg 0.02 mg 0.02 mg 0.02 mg 0.03mg 0.03mg 0.05mg 0.10mg 0.15mg	Using E2 class weights & Precision Balances (80g/200g readability 0.01/0.1mg) As as per OIML R 111-1: 2004 Calibration of weights of F2 class and coarser
		500 g 1 kg 2 kg 5 kg 10 kg 20 kg 50 kg	0.01g 0.01g 0.1g 0.1g 0.1g 0.1g 1.6g	Using F1 class weights & Precision Balances (1Kg readability 0.01g, 6kg Readability 0.1g, 20Kg readability 0.1g, 50Kg Readability 0.001 kg) Calibration of weights of M1 class and coarser. Calibration of weights of M2 class and coarser

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ($\pm$)	Remarks
IV.	WEIGHING SCALE AND BALANCE			
1.	Balance [#]			
	Readability 0.01mg or Coarser Readability 0.1mg or Coarser	1mg to 1g >1 to 50g >50 to 80g >80 to 200g	0.3mg	Using E2 class weights. Calibration of weighing balance as per OIML R 76-1
	Readability 1mg or Coarser	>200 to 1000g	0.02g	Using F1 class weights. Calibration of weighing balance as per OIML R 76-1
	Readability 0.01g or Coarser	>1kg to 5kg	0.5g	Using F1 class weights. Calibration of weighing balance as per OIML R76-1
	Readability 0.5g or Coarser	>5kg to 20kg	1.0g	Using F1 class weights. Calibration of weighing balance as per OIML R76-1
	Readability 1g or Coarser	>20kg to 50kg	2.5g	Using F1 class weights. Calibration of weighing balance as per OIML R76-1
	Readability 10 g or Coarser	>50 kg to 100kg >100 kg to 300kg	27g 30g	Using F1 & M1 class weights. Calibration of weighing balance as per OIML R76-1

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ($\pm$)	Remarks
V.	VOLUME			
1.	Volumetric Glassware ^{\$}	1ml $\leq V \leq$ 10ml 10ml $< V <$ 1000ml 1000ml $\leq V \leq$ 10000ml	0.09 μ l 0.1ml 1.5ml	Using standard weights, Distilled Water and balances Gravimetric Method Based on ISO 4787
2.	Micro Pipette ^{\$}	10 μ l $< V \leq$ 100 μ l 100 μ l $< V \leq$ 1000 μ l	0.09 μ l 0.09 μ l	Using standard weights, Distilled Water and balances (suitable at 27°C) Based on ISO 8655
VI.	PRESSURE INDICATING DEVICES			
1.	Pressure [#] (Gauges / Transmitter/ Transducer)	0 to 700 bar	0.22 %	Using Digital Pressure gauges Universal Calibrator DKD-R6-1 By Comparison method
2.	Magnehelic Gauge / Differential Pressure / Manometer [#]	0 to 250 Pa >250 to 1000Pa >1000 to 2000Pa	0.25% rdg 9.0 Pa 4.0 Pa	Using Digital Pressure Calibrator DKD-R6-1 By Comparison method
3.	Vacuum [#] (Gauge / Transmitter/ Transducer)	0 to (-)0.98 bar	0.8 % rdg	Using Digital Pressure gauge Universal Calibrator DKD-R6-1 By Comparison method
VII.	ACCOUSTICS			
1.	Sound Level Meter [#] (At 94 & 114 dB)	94 dB 114 dB	2.0 dB	Using Sound level calibrator By Comparison method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ($\pm$)	Remarks
VIII.	ACCELERATION & SPEED			
1.	Tachometer ^{\$} (Contact)	40 to 500rpm >500 to 3000rpm	0.45% rdg 0.35% rdg	Using Digital Tachometer & Source By Comparison method
2.	Non-Contact Tachometer Stroboscope / RPM Source /(Source)/ Vibrating M/c / Abrasion Testing M/c / Centrifuge, Washing & Drying M/c [#] (indicator/Source)	45 to 26000rpm >26000 to 50000rpm	2.0% to 0.33% rdg 0.27% rdg	Using Digital Tachometer & Source By Comparison method with using motorized source with strip
IX.	TORQUE GENERATING DEVICES			
1.	Torque Wrench ^{\$} (Type I/Class B,C,D,E) (Type II/class A,B,D,E)	0.5 Nm to 500 Nm	0.75 %rdg	Using Torque Transducer & Indicator with Torque wrench Calibrator, IS/ISO 6789:2003
X.	HARDNESS TESTING MACHINES			
1.	Rubber Hardness Tester for Spring Force ^{\$}	0 to 100 Shore-A	0.9 Shore A	Using Digital Balance and fixture Based on ASTM D 2240/ ISO 18898
2.	Rubber Hardness Tester for Indention depth ^{\$}	0 to 100 Shore-A	0.24 Shore A	Using micrometer head Based on ASTM D 2240/ ISO 18898

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
3.	Rockwell Hardness Testing Machine*	HRA HRB HRC	0.72 HRA 1.18 HRBW 0.72 HRC	Using Standard Hardness Block, IS 1586-2: 2012 Indirect Method
4.	Brinell Hardness Testing Machine *	HBW 2.5/187.5 HBW 5/750 HBW 10/3000	2.20 % 2.50 % 1.75 %	Using Standard Hardness Block, IS 1500-2: 2013 Indirect Method
5.	Vickers Hardness Testing Machine *	HV 1 HV 5 HV 10 HV 30	2.60 % 2.20 % 1.85 % 1.95 %	Using Standard Hardness Block, IS 1501-2: 2013 Indirect Method
XI.	MOBILE FORCE MEASURING SYSTEM			
1.	Push Pull Gauge ^{\$}	10 N to 100 N 20 N to 500 N	0.30 N 1.08 N	Fixture, Frame, Hangers and Newtonian weights Based on VDI/VDE 2624-2.1/ NABL 122-08
XII.	UTM, TENSION CREEP AND TORSION TESTING MACHINE			
1.	Uniaxial Testing Machine Compression* Tension*	20 KN to 2000 KN 2N to 50KN	0.55% 0.67%	Using Force proving Instrument of Class 1 Or better, IS 1828:2015 (Part-1) for class 1 or coarser testing machine

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
<u>THERMAL CALIBRATION</u>				
I.	TEMPERATURE			
1.	RTD'S, Thermocouples, With or Without Controller/ Indicator/Data logger /Recorder, Temperature Transmitter, Temperature Gauge, Glass Thermometer Digital Thermometer #	(-)197°C (-)80°C to 50 °C 50°C to 250 °C	0.10°C 0.11°C 0.14°C	Using 6½ Digital Multimeter Precision Temperature scanner with SSPRT & Liquid Bath, Liquid Nitrogen Crystat By Comparison Method
2.	RTD/Thermocouples, With or without Controller/ Indicator/Data logger /Recorder, Temperature Transmitter, Digital Thermometer #	250°C to 600 °C 600°C to 800 °C 800°C to 1200 °C	0.25°C 1.95°C 2.44°C	Using 6½ Digital Multimeter, Precision Temperature scanner with SSPRT & Dry Block Baths Digital Temperature Indicator with S-Type TC & Dry Block Furnaces By Comparison Method
3.	Non-Contact Type Thermometer\$ (Infrared Thermometer / Digital Pyrometer)	50°C to 600°C 600°C to 1200 °C	3.3°C 4.9°C	Using Digital Pyrometer Black Body Furnace By Comparison Method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ($\pm$)	Remarks
4.	Temperature Indicator with sensor of Liquid Bath, Oven, GC Oven, Dry Block furnace, Refrigerator, Auto clave, Incubator, Environmental Chamber [#]	(-)195.7°C (-)80°C to 600 °C	0.08°C 0.15°C	Using Precision Temperature scanner with SSPRT, PT100X1, Simplex-4 Wire, 1/10 Din RTD With Indicator Single Position calibration (at measuring location in DUC)
5.	Temperature Indicator with sensor of Dry Block Furnace/ Muffle Furnace [#]	600°C to 800 °C 800°C to 1200 °C	1.95°C 2.5°C	Using Digital Temperature Indicator with S-Type TC Single Position calibration (at measuring location in DUC)
6.	Temperature indicator with sensor of Black Body Furnace [#]	0°C to 600°C 600°C to 1200 °C	3.3°C 4.4°C	Using Digital Pyrometer Single Position calibration (at measuring location in DUC)
7.	Environment Chamber, Furnaces, Freezers, Oven, Vacuum Oven, Cold/ Hot Room, , Aging Oven [#]	-80°C to 50 °C 50°C to 300 °C	0.8°C 1.1°C	Using Precision Temperature scanner with RTDs Multi position Calibration
8.	Dry Block Furnace/ Muffle Furnace [#]	300°C to 600 °C 600°C to 1200 °C	3.6°C 5.5°C	Using Data Logger with Thermocouple Multi position Calibration
9	Industrial Furnace [*]	300°C to 600 °C 600°C to 1200 °C	3.6°C 5.5°C	Using Data Logger with Thermocouple Multi position Calibration

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II.	SPECIFIC HEAT & HUMIDITY			
1.	Digital /Analog Hygrometer, RH sensor with Indicator/ Controller / Data logger / Recorder ^{\$}	10%RH to 95%RH @ $\cong$ 25°C	1.0%RH	Using Digital RH Indicator with Sensor, Humidity Generator & Chamber By Comparison Method
2.	Humidity indicator with sensor of Humidity Calibrator/Generator/ Chamber [#]	10%RH to 95%RH @ $\cong$ 25°C	0.82%RH	Using Digital RH Indicator with Sensor Single position calibration (At measuring location in DUC)
3.	Humidity Chamber, Environment Chamber [*]	15%RH to 95%RH @ $\cong$ 25°C	1.91%RH	Using Wireless Data Loggers with inbuilt sensor Multi Position 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.

[¶] Laboratory can also calibrate instruments/devices of coarser resolution / least count within the accredited range using same reference standard/ master equipment under the scope of accreditation.

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