

Laboratory Hi Tech Calibration Services, No.209, VGP Nagar, Mugappair West,
 Chennai, Tamil Nadu
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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 1 mV 1 mV to 329 mV 329 mV to 1000 V	1.2 % to 0.12 % 0.12 % to 0.003 % 0.003 % to 0.002 %	Using Multiproduct Calibrator Fluke 5522A by Direct Method
2.	AC Voltage [#]	45 Hz to 1 kHz 1 mV to 3 mV 3 mV to 30 mV 30 mV to 300 mV 300 mV to 300 V 300 V to 1000 V	0.71 % to 0.3 % 0.3 % to 0.043 % 0.043 % to 0.02 % 0.02 % to 0.024 % 0.024 % to 0.04 %	Using Multiproduct Calibrator Fluke 5522A by Direct Method
3.	DC Current [#]	100 μ A to 329 μ A 329 μ A to 3.29 mA 3.29 mA to 329 mA 329 mA to 2.99 A 2.99 A to 20 A 20 A to 100 A 100 A to 1000 A	0.04 % to 0.024 % 0.024 % to 0.014 % 0.014 % 0.014 % to 0.046 % 0.046 % to 0.12 % 0.53 % to 0.32 % 0.32 % to 0.3 %	Using Multiproduct Calibrator Fluke 5522A by Direct Method Using Multiproduct Calibrator Fluke 5522A with Current Coil 5500A by Direct Method
4.	AC Current [#]	45 Hz to 1 kHz 33 μ A to 329 μ A 329 μ A to 3.29 mA 3.29 mA to 32.9 mA 32.9 mA to 329 mA 329 mA to 2.99 A 2.99 A to 20 A	0.5 % to 0.2 % 0.2 % to 0.12 % 0.12 % to 0.06 % 0.06 % 0.06 % to 0.08 % 0.08 % to 0.2 %	Using Multiproduct Calibrator Fluke 5522A by Direct Method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
		50 Hz 20 A to 100 A 100 A to 1000 A	0.87 % to 0.36 % 0.36 %	Using Multiproduct Calibrator Fluke 5522A with Current Coil 5500A by Direct Method
5.	DC Resistance [#]	0.01 Ω to 0.1 Ω 0.1 Ω to 1 Ω 1 Ω to 2 Ω 2 Ω to 300 Ω 300 Ω to 3 k Ω 3 k Ω to 300 k Ω 300 k Ω to 3 M Ω 3 M Ω to 30 M Ω 30 M Ω to 290 M Ω 290 M Ω to 1 G Ω 1 G Ω to 100 G Ω	3.89 % to 0.62 % 0.62 % to 0.07 % 0.07 % to 0.25 % 0.25 % to 0.011 % 0.011 % 0.011 % to 0.008 % 0.008 % to 0.013 % 0.013 % to 0.04 % 0.04 % to 0.4 % 0.4 % to 1.8 % 1.8 % to 6 %	Using Multiproduct Calibrator Fluke 5522A, Decade Resistance Box & Decade Meg Ohm Box by Direct Method
6.	Frequency [#]	1 Hz to 1000 Hz 1000 Hz to 100 kHz 100 kHz to 2 MHz	0.0011 % to 0.00051 % 0.00051 % to 0.00065 % 0.00065 % to 0.029 %	Using Multiproduct Calibrator Fluke 5522A by Direct Method
7.	Capacitance [#]	1 kHz 0.39 nF to 0.6 nF 0.6 nF to 1 nF 1 nF to 7 nF 7 nF to 300 nF 100 Hz 0.7 μ F to 30 μ F 30 μ F to 329 μ F	3.57 % to 2.5 % 2.5 % to 1.7 % 1.7 % to 0.5 % 0.5 % to 0.4 % 0.47 % to 0.67 % 0.67 % to 0.72 %	Using Multiproduct Calibrator Fluke 5522A by Direct Method
8.	DC Power [#]	1 V to 1000 V 1 A to 20 A 1 W to 20 kW	0.11 % to 0.14 %	Using Multiproduct Calibrator Fluke 5522A by Direct Method

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9.	AC Power 1 \emptyset [#]	50 Hz 60 V to 240 V 10 mA to 20 A \pm 0.2 to UPF (Lead/ Lag) 0.12 W to 4800 W	3 % to 0.07 %	Using Multiproduct Calibrator Fluke 5522A by Direct Method
10.	Power Factor 1 \emptyset [#]	\pm 0.2 to UPF (Lead / Lag)	0.0021 to 0.0013	Using Multiproduct Calibrator Fluke 5522A by Direct Method
	Oscilloscope [#] Amplitude (Vertical axis Deflection factor)	DC : 1.25 mV to 130 V @ 1 M Ω 1 kHz Square Wave 10 mV to 130 V @ 1 M Ω	0.75 % to 0.06 % 0.2 % to 0.12 %	
	Time base (Horizontal Axis Deflection Factor)	2 ns to 5 s	0.007 % to 0.21 %	
	Bandwidth	Up to 500 MHz	5 %	
	Temperature Simulation [#]			
	RTD Pt 100	(-)200 °C to 800 °C	0.11 °C	
	K Type Thermocouple	(-)200 °C to 1370 °C	0.2 °C	
	J Type Thermocouple	(-)200 °C to 1150 °C	0.14 °C	
	E Type Thermocouple	(-)200 °C to 950 °C	0.12 °C	
	B Type Thermocouple	600 °C to 1820 °C	0.6 °C	
	S Type Thermocouple	5 °C to 1760 °C	0.58 °C	
	R Type Thermocouple	5 °C to 1760 °C	0.53 °C	
	N Type Thermocouple	(-)100 °C to 1250 °C	0.17 °C	
	T Type Thermocouple	(-)100 °C to 350 °C	0.11 °C	

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II.	MEASURE			
1.	DC Voltage [#]	0.1 mV to 1 mV 1 mV to 10 mV 10 mV to 100 mV 100 mV to 1 V 1 V to 1000 V	4 % to 0.41 % 0.41 % to 0.05 % 0.05 % to 0.009 % 0.009 % to 0.005 % 0.005 % to 0.0056 %	Using 6½ Digit Multimeter by Direct Method
2.	AC Voltage [#]	50 Hz to 1 kHz 1 mV to 10 mV 10 mV to 100 mV 100 mV to 750 V	3.6 % to 0.42 % 0.42 % to 0.1 % 0.1 %	Using 6½ Digit Multimeter by Direct Method
3.	DC Current [#]	10 μ A to 100 μ A 100 μ A to 100 mA 100 mA to 3 A 3 A to 30 A 30 A to 100 A	0.35 % to 0.09 % 0.09 % to 0.063 % 0.063 % to 0.2 % 0.15 % to 0.06 % 0.06 %	Using 6½ Digit Multimeter by Direct Method Using 6½ Digit Multimeter with Shunt by V/I Method
4.	AC Current [#]	50 Hz to 1 kHz 10 μ A to 100 μ A 100 μ A to 3 A 50 Hz to 1 kHz 3 A to 20 A 50 Hz 20 A to 30 A	0.67 % to 0.25 % 0.25 % 0.35 % 0.35 % to 0.48 %	Using 6½ Digit Multimeter by Direct Method Using 6½ Digit Multimeter with Shunt by V/I Method
5.	DC Resistance [#]	0.1 Ω to 1 Ω 1 Ω to 10 Ω 10 Ω to 100 Ω 100 Ω to 1 M Ω 1 M Ω to 10 M Ω	4.6 % to 0.47 % 0.47 % to 0.06 % 0.06 % to 0.02 % 0.02 % 0.02 % to 0.05 %	Using 6½ Digit Multimeter by Direct Method

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<u>MECHANICAL CALIBRATION</u>				
I. PRESSURE INDICATING DEVICES				
1.	Pressure -Pneumatic ^s Characterization / Calibration of Dead Weight Tester	35 mbar to 100 mbar 100 mbar to 1000 mbar 0.2 bar to 25 bar	0.0078 % rdg 0.0077 % rdg 0.0062 % rdg	Using DH Budenberg Dead Weight Tester by Cross Float method as per Euramet cg-3 (Both Effective Area & Pressure Method)
2.	Pressure - Hydraulic ^s Characterization / Calibration of Dead Weight Tester	6 bar to 60 bar 60 bar to 1200 bar	0.0087 % rdg 0.0087 % rdg	Using DH Budenberg Dead Weight Tester by Cross Float method as per Euramet cg-3 (Both Effective Area & Pressure Method)
3.	Vacuum - Pneumatic ^s Characterization / Calibration of Dead Weight Tester	(-)35 mbar to (-)1000 mbar	0.012 % rdg	Using DH Budenberg Dead Weight Tester by Cross Float method as per Euramet cg-3 (Both Effective Area & Pressure Method)
4.	Pressure-Pneumatic ^s (Pressure Gauge, Pressure Indicator, Pressure Calibrator, Pressure Controller, Pressure Transmitter, Pressure Transducer, Pressure Switch, Pressure Recorder, Magnehelic Gauge, Level Gauge, Manometer)	35 mbar to 100 mbar 100 mbar to 1000 mbar 0.25 bar to 25 bar	0.0095 % rdg 0.0075 % rdg 0.0082 % rdg	Using DH Budenberg Dead Weight Tester by Direct Method as per DKD-R6-1

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5.	Pressure-Hydraulic [§] (Pressure Gauge, Pressure Indicator, Pressure Calibrator, Pressure Controller, Pressure Transmitter, Pressure Transducer, Pressure Switch, Pressure Recorder)	6 bar to 60 bar 60 bar to 1200 bar	0.0087 % rdg 0.0091 % rdg	Using DH Budenberg Dead Weight Tester by Direct Method as per DKD-R6-1
6.	Vacuum-Pneumatic [§] (Vacuum Gauge, Vacuum Indicator, Vacuum Calibrator, Vacuum Controller, Vacuum Transmitter, Vacuum Transducer, Vacuum Switch, Vacuum Recorder)	(-)35 mbar to (-)100 mbar (-)100 mbar to (-)1000 mbar	0.015 % rdg 0.012 % rdg	Using DH Budenberg Dead Weight Tester by Direct Method as per ISO 3567 & ISO 27893
7.	Absolute Pressure-Pneumatic [#] (Pressure Gauge, Pressure Indicator, Pressure Calibrator, Pressure Controller, Pressure Transmitter, Pressure Transducer, Pressure Switch, Pressure Recorder, Manometer, Barometer)	0.015 bar (abs)to 4 bar (abs)	0.35 mbar	Using Absolute Pressure Calibrator by Comparison Method as per DKD-R6-1
8.	Pressure-Pneumatic [#] (Pressure Gauge, Pressure Indicator, Pressure Calibrator, Pressure Transmitter,	(-)25 mbar to 25 mbar 0 to 0.25 bar 0 to 0.6 bar 0 to 2.5 bar 0 to 25 bar	0.021 mbar 0.065 mbar 0.11 mbar 0.23 mbar 0.0021 bar	Using Pressure Calibrator by Comparison Method as per DKD-R6-1

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	Pressure Transducer, Pressure Switch, Pressure Recorder, Magnehelic Gauge, Level Gauge, Manometer)			
9.	Pressure-Hydraulic [#] (Pressure Gauge, Pressure Indicator, Pressure Calibrator, Pressure Transmitter, Pressure Transducer, Pressure Switch, Pressure Recorder)	0 to 160 bar 0 to 400 bar 0 to 1000 bar	0.018 bar 0.046 bar 0.16 bar	Using Pressure Calibrator by Comparison Method as per DKD-R6-1
10.	Vacuum-Pneumatic [#] (Vacuum Gauge, Vacuum Indicator, Vacuum Calibrator, Vacuum Transmitter, Vacuum Transducer, Vacuum Switch, Vacuum Recorder)	(-)0.6 bar to 0 bar (-)1 bar to 0 bar	0.12 mbar 0.14 mbar	Using Pressure Calibrator by Comparison Method as per ISO 3567 & ISO 27893
II.	MOBILE FORCE MEASURING SYSTEM			
1.	Load Cell with Indicator (Tension/Compression) [§]	0.1 N to 1000 N	0.12 %	As per IS 4169 / ISO 376
2.	Push Pull Gauge, Force Gauge, Spring Balance [§]	0.1 N to 500 N 500 N to 1000 N	0.14 N 1.29 N	As per VDI / VDE 2624 Part 2.1

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3.	Tensile / Universal Testing Machine, Spring Testing Machine, Tensometer, Flexural Testing Machine* Mode: Tension	0.1 N to 100 N 100 N to 50 kN 50 kN to 500 kN	0.61 % 0.4 % 0.4 %	By Load Cell with Indicator and Newton weights As per IS 1828 Part 1 / ISO 7500 Part 1 & ASTM E4
4.	Compression / Universal Testing Machine, Spring Testing Machine, Flexural Testing Machine* Mode: Compression	2 N to 100 N 100 N to 2000 kN	0.65 % 0.4 %	By Load Cell with Indicator As per IS 1828 Part 1 / ISO 7500 Part 1 & ASTM E4
5.	Verification of Displacement Measuring System and Devices used in Material Testing Machine*	0 to 50 mm 50 mm to 200 mm 200 mm to 300 mm 300 mm to 1000 mm	0.0013 mm 0.003 mm 0.05 mm 0.15 mm	As per ASTM E 2309 by Comparison Method
6.	Verification of Speed for Material Testing Machine*	0 to 1000 mm/min	0.7 mm/min	As per ASTM E 2658 by Comparison Method
7.	Verification of Extensometer used in Uniaxial Testing Machine*	0 to 50 mm 50 mm to 200 mm 200 mm to 1000 mm	0.0011 mm 0.003 mm 0.15 mm	As per ASTM E 83 & IS 12872 / ISO 9513 by Comparison Method
8.	Verification of Impact Testing Machine (Izod & Charpy)*	Up to 450 J	0.77 %	As Per IS 3766, ISO 148, ISO 180, ISO 13802, BS 131-4, ASTM E 23, ASTM D 6110 & ASTM D 256 by Direct Method

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III.	HARDNESS TESTING MACHINES			
1.	Shore Hardness Tester / Durometer of Type A, B, C, D, E, M, O, OO, OOO, OOO-S, AM, AO, DO, C1L (Indent Length Measurement Method) [§]	0 to 100 Shore	0.27 Shore	As per ASTM D 2240 & ISO 18898
2.	Shore Hardness Tester / Durometer of Type A, B, C, D, E, M, O, OO, OOO, OOO-S, AM, AO, DO, C1L (Spring Force Measurement Method) [§]	0 to 100 Shore	0.38 Shore	As per ASTM D 2240 & ISO 18898
3.	Rubber Hardness Tester / Shore Hardness Tester of Type IRHD Pocket meter (Indent Length Measurement Method) [§]	0 to 100 IRHD	0.27 IRHD	As per ASTM D 2240 & ISO 18898
4.	Direct Verification of Rockwell Hardness Tester / Rockwell Superficial Hardness Tester* (i) Calibration of Test Force	Pre-Load 29.42 & 98.07 N	0.65 %	By Load Cell with Indicator As per ISO 6508-2, IS 1586-2 & ASTM E 18 by Direct Method

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	(ii) Calibration of Depth Measuring System	Test Load 147.1 to 1471 N 0 to 0.3 mm 0.3 to 0.8 mm	0.65 % 0.001 mm 0.002 mm	
5.	Direct Verification of Micro Vickers / Vickers / Knoop Hardness Tester* (i) Calibration of Test Force (ii) Calibration of Diameter Measuring System	Test Load 0.1 to 49.03 N 49.03 to 490.3 N 0 to 2 mm	0.85 % 0.65 % 0.004 mm	By Load Cell with Indicator As per ISO 6507-2, IS 1501-2, IS 1754, ISO 4545-2, IS 6885-2 & ASTM E 384 by Direct Method
6.	Direct Verification of Brinell Hardness Tester* (i) Calibration of Test Force (ii) Calibration of Diameter Measuring System	Test Load 980.7 N to 29.42 kN 0 to 7 mm	0.65 % 0.004 mm	By Load Cell with Indicator As per ISO 6506-2, IS 1500-2 & ASTM E 10 by Direct Method
IV.	DENSITY & VISCOSITY			
1.	Density Hydrometer / Brix Hydrometer / Baume Hydrometer / Twaddle Hydrometer/ Specific Gravity Hydrometer / Lactometer / Alcoholmeter ^s	0.6 to 2 g/ml	0.0002 g/ml	By Electronic Weighing Balance of readability 0.1 mg and known liquid density as Per NIST SP 250-78 by Hydrostatic Weighing Method

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2.	Density of Liquid [§]	600 to 1800 kg/m ³	0.065 %	By Electronic Weighing Balance of readability 0.1 mg and known liquid density As per OIML G 14 by Gravimetric Method
3.	Density of Solid [§]	500 to 15000 kg/m ³	0.065 %	By Electronic Weighing Balance of readability 0.1 mg and known liquid density As per OIML G 14 & OIML R 111-1 by Hydrostatic Weighing Method
4.	Viscosity Cup, Ford Cup, DIN Cup, ISO Cup, Shell Cup, Zahn Cup, Dip Cup, Flow Cup. (Orifice Dia : 1 mm to 6 mm) [§]	Up to 1800 cSt	1.7 %	Using Standard Viscosity Solutions
5.	Rotational / Krebs Viscometer [§]	Up to 60 x 10 ⁶ cP	1.3 %	Using Standard Viscosity Solutions
6.	Saybolt Furol Viscometer [§]	147 SFS	1 %	Using Standard Viscosity Solutions
V.	ACCELERATION AND SPEED			
1.	Non Contact Tachometer, Stroboscope, RPM / Speed (Indicator / Meter / Source) [§]	10 RPM to 30 RPM 30 RPM to 1000 RPM 1000 RPM to 10000 RPM 10000 RPM to 40000 RPM	0.53 RPM 0.1 RPM 0.8 RPM 1.5 RPM	Using Digital Tachometer

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		40000 RPM to 90000 RPM	2.6 RPM	
2.	Contact Tachometer [§]	10 RPM to 30 RPM 30 RPM to 1000 RPM 1000 RPM to 15000 RPM	0.22 RPM 0.22 RPM 2.6 RPM	Using Digital Tachometer
3.	Centrifuge, RPM / Speed (Indicator / Meter / Source)*	10 RPM to 30 RPM 30 RPM to 1000 RPM 1000 RPM to 10000 RPM 10000 RPM to 30000 RPM	0.53 RPM 0.1 RPM 0.8 RPM 1.5 RPM	Using Digital Tachometer
VI.	ACOUSTICS			
1.	Sound Level Meter [§]	94 dB & 114 dB @ 1 kHz	0.26 dB	Using Sound Level Calibrator
VII.	WEIGHTS			
1.	Accuracy Class F1 and Coarser [§]	1 mg 2 mg 5 mg 10 mg 20 mg 50 mg 100 mg 200 mg 500 mg	0.01 mg 0.01 mg 0.01 mg 0.01 mg 0.01 mg 0.01 mg 0.02 mg 0.02 mg 0.02 mg	Using E1 Class Standard Weights and Electronic Balance (Readability 0.01 / 0.1 mg) as per OIML R111
2.	Accuracy Class E2 and Coarser [§]	1 g 2 g 5 g 10 g 20 g	0.02 mg 0.02 mg 0.03 mg 0.03 mg 0.03 mg	Using E1 Class Standard Weights and Electronic Balance (Readability 0.01 / 0.1 mg) as per

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		50 g 100 g 200 g	0.03 mg 0.1 mg 0.1 mg	OIML R111
3.	Accuracy Class F1 and Coarser [§]	500 g 1 kg	1 mg 1 mg	Using E1 & E2 Class Standard Weights and Electronic Balance (Readability 1 mg) as per OIML R111
4.	Accuracy Class F2 and Coarser [§]	2 kg 5 kg 10 kg 20 kg	8 mg 10 mg 100 mg 100 mg	Using E2 Class Standard Weights and Electronic Balance (Readability 0.01 / 0.1 g) as per OIML R111
5.	Accuracy Class M1 and Coarser [§]	50 kg	1 g	Using F2 Class Standard Weights and Electronic Balance (Readability 1 g) as per OIML R111
VIII.	WEIGHING SCALE AND BALANCE			
1.	Weighing Scale And Balance* Readability 0.001 mg Readability 0.01 mg Readability 1 mg Readability 10 mg Readability 0.1 g Readability 1 g Readability 5 g Readability 10 g Readability 50 g	Up to 21 g Up to 220 g Up to 1 kg Up to 6.2 kg Up to 22 kg Up to 60 kg Up to 100 kg Up to 300 kg Up to 600 kg	0.015 mg 0.08 mg 1 mg 10 mg 0.1 g 1 g 5 g 10 g 50 g	Using E1 Class Standard Weights (Up to 1 kg), E2 Class Standard Weights (Up to 22 kg), E2 & F1 Class Standard Weights (Up to 60 kg), E2, F1 & F2 Class Standard Weights (Up to 300 kg), F1, F2 & M1 Class Standard Weights (Up to 600 kg) as per OIML R 76

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IX.	VOLUME			
1.	Micro Pipette ^s	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	0.07 μ l 0.4 μ l 0.4 μ l 0.64 μ l	Using Electronic Balance with Distilled Water by Gravimetric Method as per ISO 8655 Part 6
2.	Pipette ^s	0.1 ml to 1 ml 1 ml to 50 ml 50 ml to 100 ml	0.67 μ l 3.2 μ l 6.5 μ l	Using Electronic Balance with Distilled Water by Gravimetric Method as per ISO 4787
3.	Burette, Separating Funnel ^s	1 ml to 10 ml 10 ml to 50 ml 50 ml to 100 ml	0.84 μ l 4.0 μ l 6.0 μ l	Using Electronic Balance with Distilled Water by Gravimetric Method as per ISO 4787
4.	Standard Flask, Conical Flask, Beaker ^s	1 ml to 10 ml 10 ml to 50 ml 50 ml to 500 ml 500 ml to 1000 ml 1000 ml to 5000 ml	2.2 μ l 5.7 μ l 0.04 ml 0.07 ml 0.3 ml	Using Electronic Balance with Distilled Water by Gravimetric Method as per ISO 4787
5.	Measuring Cylinder, Measuring Jar, Pycnometer, Specific Gravity Bottle / Cup, Le-Chatlier Flask, Weight per Litre Cup ^s	1 ml to 100 ml 100 ml to 1000 ml 1000 ml to 5000 ml 5000 ml to 10000 ml	0.06 ml 0.13 ml 0.51 ml 1.7 ml	Using Electronic Balance with Distilled Water by Gravimetric Method as per ISO 4787

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6.	Measuring Jar [§]	10000 ml to 20000 ml 20000 ml to 50000 ml	1.7 ml 5 ml	Using Electronic Balance with Distilled Water by Gravimetric Method as per ISO 4787
7.	Bulk Density Cylinder [§]	3000 ml to 30000 ml	4 ml	Using Electronic Balance with Distilled Water by Gravimetric Method as per ISO 4787
X.	DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)			
1.	External Micrometer [§] L.C : 0.001 mm L.C : 0.01 mm	0 to 200 mm 200 mm to 500 mm 500 mm to 1000 mm	1.9 μ m 5.9 μ m 10.8 μ m	Using Mic Check Set, Slip Gauge Set, Optical Flat, Long Gauge Block and Length Bar Set by Comparison Method
2.	Depth Micrometer [§] L.C : 0.001 mm L.C : 0.01 mm	0 to 150 mm 150 mm to 300 mm	3.7 μ m 6.8 μ m	Using Mic Check Set, Slip Gauge Set, Long Gauge Block and Length Bar Set by Comparison Method
3.	Vernier Caliper [§] L.C : 0.01 mm	0 to 1000 mm	15 μ m	Using Caliper Checker, Slip Gauge Set and Length Bar Set by Comparison Method
4.	Vernier Caliper [#] L.C : 0.02 mm	0 to 2000 mm	24.4 μ m	Using Caliper Checker, and Length Bar Set by Comparison Method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
5.	Vernier Depth Gauge/Depth Vernier ^s L.C : 0.01 mm	0 to 600 mm	9.8 μ m	Using Slip Gauge Set and Long Gauge Block Set and Length Bar Set by Comparison Method
6.	Height Gauge ^s L.C : 0.01 mm	0 to 1000 mm	14.5 μ m	Using Caliper Checker, Slip Gauge Set and Length Bar Set by Comparison Method
7.	Plunger Dial Gauge ^s L.C : 0.001 mm L.C : 0.01 mm	0 to 50 mm >50 mm to 100 mm	3.4 μ m 5.1 μ m	Using Dial Calibration Tester and Slip Gauge Set by Comparison Method
8.	Digital Dial Gauge ^s L.C : 0.001 mm	0 to 50 mm	3.4 μ m	Using Slip Gauge Set by Comparison Method
9.	Lever Dial Gauge ^s L.C : 0.001 mm	0 to 2 mm	1.5 μ m	Using Dial Calibration Tester by Comparison Method
10.	Bore Dial Gauge ^s For Transmission	0 to 2 mm	3.1 μ m	Using Dial Calibration Tester by Comparison Method
11.	Dial /Digital Thickness Gauge ^s L.C : 0.001 mm	0 to 25 mm	2.3 μ m	Using Slip Gauge Set and Standard Foils by Comparison Method
12.	Dial Thickness Gauge ^s L.C : 0.1 mm	0 to 75 mm	39.3 μ m	Using Slip Gauge Set by Comparison Method
13.	Pistol Caliper ^s L.C : 0.1 mm	0 to 100 mm	43.6 μ m	Using Slip Gauge Set by Comparison Method

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14.	LVDT Probe/ Electronic Probe with Indicator# L.C : 0.001 mm	0 to 50 mm >50 mm to 600 mm	1.5 μ m 6.7 μ m	Using Slip Gauge Set and Length Bar Set by Comparison Method
15.	Coating Thickness Gauge ^s L.C : 0.1 μ m L.C : 0.01 mm	0 to 2 mm 2 mm to 6 mm 6 mm to 10 mm	3.5 μ m 29.7 μ m 32.1 μ m	Using Standard Foils by Comparison Method
16.	Taper Scale ^s L.C : 0.1 mm	1 mm to 150 mm	8.81 μ m	Using Profile Projector by Comparison Method
17.	Measuring Scale ^s	0 to 3 m	$33\sqrt{L}/1000 \mu$ m Where L in mm	Using Scale and Tape Calibrator by Comparison Method
18.	Measuring Tape ^s	0 to 100 m	$421\sqrt{L}/1000 \mu$ m Where L in mm	Using Scale and Tape Calibrator by Comparison Method
19.	PI Tape ^s	0 to 1 m >1 m to 5 m	21 μ m $21\sqrt{L}/1000 \mu$ m Where L in mm	Using Scale and Tape Calibrator by Comparison Method
20.	Dial Calibration Tester/Micrometer Head ^s L.C : 0.2 μ m	0 to 25 mm	1.1 μ m	Using Digital Comparator by Comparison Method
21.	Micrometer Setting Rod / Length Bar ^s	25 mm to 275 mm 275 mm to 975 mm	6.3 μ m 8.8 μ m	Using Slip Gauge Set, Digital Comparator, Long Gauge Block Set and Length Bar by Comparison Method

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22.	Plain Plug Gauge ^s	1 mm to 110 mm 110 mm to 200 mm	1.75 μ m 3.4 μ m	Using Digital Comparator, Slip Gauge Set and Long Gauge Block by Comparison Method
23.	Width Gauge ^s	0.5 mm to 10 mm	3.0 μ m	Using Digital Micrometer by Comparison Method
24.	Cylindrical Measuring Pin / Pin Gauge / Thread Measuring Wire ^s	0.17 mm to 25 mm	0.7 μ m	Using Slip Gauge Set and Digital Comparator by Comparison Method
25.	Snap Gauge ^s	2 to 200 mm	2.1 μ m	Using Slip Gauge Set by Comparison Method
26.	Feeler Gauge ^s	0.03 mm to 2 mm	3.5 μ m	Using Digital Micrometer by Comparison Method
27.	Radius Gauge ^s	0.6 mm to 25 mm	8.6 μ m	Using Profile Projector by Comparison Method
28.	Pitch Gauge ^s	0.4 mm to 7 mm Angle : 0 to 60 °	9.2 μ m 5.1 min of arc	Using Profile Projector by Comparison Method
29.	Weld Gauge ^s	0 to 60 mm Angle : 0 to 90 °	8.74 μ m 3 min of arc	Using Profile Projector by Comparison Method
30.	Weld Fillet Gauge ^s	0 to 25 mm	10.07 μ m	Using Profile Projector by Comparison Method
31.	Standard Foils ^s	0.01 mm to 10 mm	1.34 μ m	Using Digital Comparator with Electronic Probe by Comparison Method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
32.	Hegmann Gauge [§]	0 to 100 μ m	2.44 μ m	Using Digital Plunger Dial Gauge by Comparison Method
33.	Wet / Dry Film Applicator [§]	0 to 600 μ m	8.68 μ m	Using Profile Projector by Comparison Method
34.	Test Sieves [§]	0.032 mm to 100 mm >100 mm to 200 mm	4.2 μ m 28 μ m	Using Profile Projector and Digital Caliper by Comparison Method
35.	Elongation Gauge [§]	14.7 mm to 81 mm	16.26 μ m	Using Digital Caliper by Comparison Method
36.	Flakiness Gauge [§]	4.89 to 33.9 mm	6.98 μ m	Using Profile Projector by Comparison Method
37.	Penetrometer [§] L.C : 0.1 mm	0 to 40 mm	65.3 μ m	Using Slip Gauge set by Comparison Method
38.	Wire Gauge [§]	0 to 10 mm	9.02 μ m	Using Profile Projector by Comparison Method
39.	Caliper Checker [§]	0 to 600 mm	6.64 μ m	Using Slip Gauge Set, Length Bar Set and Lever Dial Gauge by Comparison Method
40.	Depth Indent Measurement Device for Hardness Tester [§] L.C : 0.2 μ m	0 to 25 mm	3.02 μ m	Using Digital Comparator by Comparison Method
41.	Scale and Tape Calibrator [§]	0 to 1000 mm	10.2 μ m	Using Slip Gauge Set, Length Bar Set and Lever Dial Gauge by Comparison Method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
42.	Ultrasonic Thickness Gauge ^s	0 to 200 mm	65.4 μ m	Using Slip Gauge and Long Gauge Block Set by Comparison Method
43.	Groove Dial Gauge & Dial Caliper Gauge (Internal / External) ^s	5 mm to 150 mm	5 μ m	Using Slip Gauge Set and Slip Gauge Accessories Set by Comparison Method
44.	Pitch Micrometer ^s For Linear For Angular	0 to 50 mm 50 to 60 °	0.95 μ m 2.8 min of arc	Using MIC check Set, Slip Gauge Set and Profile Projector by Comparison Method
45.	Cylindrical Setting Master ^s	3 mm to 200 mm	2.37 μ m	Using Digital Comparator, Slip Gauge Set and Long gauge Block by Comparison Method
46.	Comparator Stand ^s	250 mm X 250 mm	4.0 μ m	Using Optical Flat and Lever Dial Gauge by Comparison Method
47.	Internal Micrometer ^s (Stick Type) L.C : 0.01 mm	13 mm to 300 mm	5.0 μ m	Using Slip Gauge Accessories Set, Slip Gauge Set and Long Gauge Block by Comparison Method
48.	Proximity Sensor ^s L.C : 0.01 mm	0 to 1000 mm	11 μ m	Using Length Bar Set and Slip Gauge Set by Comparison Method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
49.	Thread Plug Gauge [§]	2 mm to 100 mm	4.12 μ m	Using FCDMM, Cylindrical Setting Master and Thread Measuring wires by Comparison Method
50.	Taper Thread Plug Gauge [§]	2 mm to 100 mm	6 μ m	Using FCDMM and Thread Measuring wires by Comparison Method
51.	Bevel Protractor / Combination Set [§]	0 to 360 °	4.34 min of arc	Using Profile Projector by Comparison Method
52.	Profile Projector / Microscope / Video Measuring Machine [#]	Linear : 300 x 200 mm Angular : 0 to 360° Magnification	2.8 μ m 0.4 min of arc 0.3 %	Using Glass Scale and Angular Graticules by Comparison Method
53.	Surface Plate / Table [*]	1000 mm X 2000 mm	$2.3\sqrt{(L+W)}/100 \mu$ m Where L & W are in mm	Using Precision Spirit Level by Comparison Method
54.	2D / Electronic Height Gauge [*] L.C : 0.001 mm	0 to 600 mm	6.16 μ m	Using Length Bar Set & Slip Gauge Set by Comparison Method
55.	Gauge Block Accessories Set [§]	Up to 500 mm	1.4 μ m	Using Slip Gauge Set, Optical Flat and Digital Comparator by Comparison Method
56.	Test Mandrel [§]	Dia : Up to 50 mm Length : 20 to 150 mm Run Out	1.4 μ m 5.5 μ m	Using Slip Gauge Set, Digital Comparator, FCDMM and Lever Dial Gauge by Comparison Method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
57.	Cube Mould [§]	Linear : Up to 150 mm Angular : 0 to 90 °	20.3 μ m 0.18 °	Using Digital Caliper and Level by Comparison Method
58.	Flush Pin Gauge [§]	Up to 200 mm	3.0 μ m	Using Slip Gauge Set and Digital Comparator by Comparison Method
59.	Height Master / Height Micrometer [§] L.C : 0.001 mm	Up to 310 mm	4.5 μ m	Using Slip Gauge Set, Length Bar Set and Lever Dial Gauge by Comparison Method
60.	Spline Ring Gauge [§]	Up to 120 mm	4.4 μ m	Using Profile Projector / Slip Gauge Set and Measuring Pin by Comparison Method
61.	Electronic Level / Spirit Level [§] L.C : 0.001 mm/m L.C : 0.01 mm/m	\pm 2 mm/m \pm 20 mm/m	5.1 μ m/m 18.93 μ m/m	Using Electronic Level and Robust Tilting Table by Comparison Method
62.	Industrial Gauges - Plain Work Piece [§]	Dia : 0.5 mm to 150 mm Length : 45 μ m to 200 mm Angle: 0 to 360°	5.7 μ m 5.7 μ m 3.7 min of arc	Using Profile Projector by Comparison Method
63.	Straight Edge [#]	Up to 5000 mm	$2.3\sqrt{L}/150\mu$ m Where L in mm	Using Electronic Level by Comparison Method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
<u>OPTICAL CALIBRATION</u>				
I.	ILLUMINATION			
1.	Lux / Light Meter ^s	100 to 10000 lx	2.7 %	Using Light Chamber and Lux Meter by Comparison Method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
<u>THERMAL CALIBRATION</u>				
I.	TEMPERATURE			
1.	IR Thermometer, Non-Contact Thermometer, Pyrometer [#]	50 °C to 500 °C	2 °C	Using Black Body Source and IR Thermometer by Comparison Method
2.	Glass Thermometer ^{\$}	(-) 80 °C to 50 °C	0.28 °C	Using Liquid Bath and SSPRT with 6½ Digit Multimeter by Comparison Method
3.	Glass Thermometer [#]	50 °C to 250 °C	0.21 °C	Using Liquid Bath and SSPRT with 6½ Digit Multimeter by Comparison Method
4.	Thermometer, RTD Sensor, Thermocouple, Temperature Indicator / Controller / Transmitter / Recorder with Sensor ^{\$}	(-)196 °C	0.1 °C	Using SSPRT with 6½ Digit Multimeter Temperature Source: Liquid N ₂ Apparatus by Comparison Method
5.	Thermometer, RTD Sensor, Thermocouple, Temperature Indicator / Controller / Transmitter / Recorder with Sensor, Temperature Gauge ^{\$}	(-) 80 °C to 50 °C	0.17 °C	Using Liquid Bath and SSPRT with 6½ Digit Multimeter by Comparison Method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
6.	Thermometer, RTD Sensor, Thermocouple, Temperature Indicator / Controller / Transmitter / Recorder with Sensor, Temperature Gauge [#]	(-) 30 °C to 250 °C 250 °C to 660 °C 660 °C to 1200 °C	0.17 °C 0.34 °C 1.63 °C	Using Liquid Bath, Dry Block Calibrator, SSPRT, R - Type Thermocouple and 6½ Digit Multimeter by Comparison Method
7.	Temperature Bath, Liquid Bath, Dry Block Calibrator [#]	(-) 80 °C to 250 °C 250 °C to 660 °C 660 °C to 1200 °C 1200 °C to 1500 °C	0.2 °C 0.34 °C 1.63 °C 3.75 °C	Using SSPRT, R - Type Thermocouple and 6½ Digit Multimeter by Comparison Method
8.	Black Body Source [#]	50 °C to 500 °C	2 °C	Using IR Thermometer by Comparison Method
9.	Temperature Indicator / Recorder / Controller with Sensor of Deep Freezer, Freezer, Incubator (for Non-Medical Applications), Autoclave (for Non-Medical Applications), Chamber, Water Bath, Hot Air Oven, Furnace*	(-) 90 °C to 400 °C 400 °C to 1200 °C 1200 °C to 1500 °C	0.18 °C 1.49 °C 3.71 °C	Using RTD Sensor, R - Type Thermocouple and 6 ½ Digit Multimeter (Single Position Calibration)
10.	Deep Freezer, Freezer, Incubator (for Non-Medical Applications), Autoclave	(-) 80 °C to 100 °C 100 °C to 500 °C 500 °C to 1200 °C	1.85 °C 1.85 °C 4.07 °C	Using RTD Sensors and N - Type Thermocouples with Data Logger (Multi Position Calibration)

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
	(for Non-Medical Applications), Chamber, Water Bath, Hot Air Oven, Furnace*			
II.	SPECIFIC HEAT AND HUMIDITY			
1.	Humidity Indicator, Humidity Transmitter, Thermo Hygrometer, Humidity Sensor / Probe (Relative Humidity) [§]	20 %RH to 95 %RH @ 20 °C to 50 °C	1.44 %RH	Using Temperature & Humidity Generator and Temperature & Humidity Indicator with Sensor by Comparison Method
2.	Humidity Indicator, Humidity Transmitter, Thermo Hygrometer, Humidity Sensor / Probe, Temperature Indicator with Internal Sensor (Temperature) [§]	5 °C to 50 °C @ 50 %RH	0.18 °C	Using Temperature & Humidity Generator and RTD Sensor with 6½ Digit Multimeter by Comparison Method
3.	Humidity Indicator / Controller with Sensor of Humidity Chamber, Environmental Chamber, Climatic Chamber*	20 %RH to 95 %RH @ 20 °C to 50 °C	1.44 %RH	Using Temperature and Humidity Data Logger (Single Position Calibration)

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4.	Humidity Chamber, Environmental Chamber, Climatic Chamber*	20 %RH to 95 %RH @ 20 °C to 50 °C	2.4 %RH	Using Temperature and Humidity Data Logger (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.

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