



**National Accreditation Board for
Testing and Calibration Laboratories**

(A Constituent Board of Quality Council of India)



CERTIFICATE OF ACCREDITATION

ROOTS METROLOGY & TESTING LABORATORY (A UNIT OF ROOTS INDUSTRIES INDIA LIMITED)

has been assessed and accredited in accordance with the standard

ISO/IEC 17025:2005

"General Requirements for the Competence of Testing & Calibration Laboratories"

for its facilities at

No.37, First main Road, SIDCO Industrial Estate, Thirumazhisai,
Chennai, Tamil Nadu

in the field of

CALIBRATION

Certificate Number CC-2201

Issue Date 22/07/2019

Valid Until 29/02/2020

This certificate remains valid for the Scope of Accreditation as specified in the annexure subject to continued satisfactory compliance to the above standard & the relevant requirements of NABL.

(To see the scope of accreditation of this laboratory, you may also visit NABL website www.nabl-india.org)

Signed for and on behalf of NABL



89076970200020000342

N. Venkateswaran
Chief Executive Officer



National Accreditation Board for Testing and Calibration Laboratories

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SCOPE OF ACCREDITATION

Laboratory Roots Metrology & Testing Laboratory (A Unit of Roots Industries India Limited), No.37, First Main Road, SIDCO Industrial Estate, Thirumazhisai, Chennai, Tamil Nadu

Accreditation Standard ISO/IEC 17025: 2005

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Validity 22.07.2019 to 29.02.2020

Last Amended on 12.09.2019

Sl.	Measurand or Reference Material/ Type of instrument or material to be calibrated or measured/ Quantity Measured / Instrument	Calibration or Measurement Method or procedure	Measurement range and additional parameters where applicable (Range and Frequency)	Calibration and Measurement Capability (CMC) (\pm)
<u>ELECTRO-TECHNICAL CALIBRATION</u>				
I.	SOURCE			
1.	DC Voltage [#]	Using Portable Calibrator (Beamex) By Direct Method	0.1 V to 12 V	0.62 % to 0.01%
2.	DC Current [#]	Using Portable Calibrator (Beamex) By Direct Method	1 mA to 25 mA	0.24% to 0.11%
3.	Resistance [#]	Using Portable Calibrator (Beamex) By Direct Method	1 Ω to 4K Ω	2.87% to 0.06%
4.	Frequency [#]	Using Portable Calibrator (Beamex) By Direct Method	5 Hz to 10 kHz	1.23% to 0.54%
5.	Temperature Simulation [#] (Indicator, Controller and Recorder)			
	RTD PT-100	Using Portable Calibrator (Beamex)	(-)200°C to 800°C	0.27°C
	K-Type Thermocouple	By Direct Method	(-)200°C to 1350°C	0.34°C
	J-Type Thermocouple		(-)200°C to 1200°C	0.24°C
	R-Type Thermocouple		(-)100°C to 400°C	0.33°C
	S-Type Thermocouple			
	E-Type Thermocouple			

S. Kunwar

Sangeeta Kunwar
Convenor

Anuja

Anuja Anand
Program Manager



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	N-Type Thermocouple B-Type Thermocouple N-Type Thermocouple B-Type Thermocouple		50°C to 1700°C 50°C to 1700°C (-)-200°C to 1000°C (-)-200°C to 1300°C 600°C to 1800°C	0.75°C 0.74°C 0.24°C 0.32°C 0.86°C
II.	MEASURE			
1.	DC Voltage [#]	Using Portable Calibrator (Beamex) By Direct Method	0.1V to 1 V 1V to 50 V	0.4 % to 0.07% 0.07% to 0.02%
2.	DC Current [#]	Using Portable Calibrator (Beamex) By Direct Method	1mA to 100 mA	0.25% to 0.02%
3.	Resistance [#]	Using Portable Calibrator (Beamex) By Direct Method	2 Ω to 4K Ω	0.52% to 0.02%
4.	Frequency [#]	Using Portable Calibrator (Beamex) By Direct Method	5Hz to 10kHz	0.17% to 0.02%
5.	Time Interval Meter / Timer / Stop Watch (Analog/ Digital) [#]	Using Digital Time Interval Meter By Comparison Method	1 s to 86400 s	0.1 s to 10.83 s

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6.	Temperature Simulation [#] (Indicator, Controller and Recorder)			
	RTD PT-100	Using Portable Calibrator (Beamex)	(-)200°C to 800°C	0.23°C
	K-Type Thermocouple	By Direct Method	(-)200°C to 1350°C	0.52°C
	J-Type Thermocouple		(-)200°C to 1150°C	0.34°C
	T-Type Thermocouple		(-)100°C to 350°C	0.33°C
	R-Type Thermocouple		5°C to 1700°C	1.0°C
	S-Type Thermocouple		5°C to 1700°C	0.94°C
	E-Type Thermocouple		(-)200°C to 950°C	0.30°C
	N-Type Thermocouple		(-)100°C to 1250°C	0.44°C
	B-Type Thermocouple		600°C to 1800°C	1.31°C

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MECHANICAL CALIBRATION

I. DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)

1.	Vernier/Dial Caliper ^s (Vernier/Digital/Dial) L.C.: 0.01 mm	Using Gauge Blocks and Long Gauge Blocks by Comparison Method	Upto 300 mm Upto 600 mm Upto 1000 mm	7.1 μ m 7.6 μ m 10.3 μ m
2.	Depth Gauge ^s (Digital/Vernier) L.C. : 0.01 mm	Using Gauge Blocks and Long Gauge Blocks by Comparison Method	Upto 300 mm Upto 600 mm	7.3 μ m 8.2 μ m
3.	Height Gauge ^s (Digital/Dial) L.C.: 0.01 mm	Using Height Measuring System by Comparison Method	Upto 600 mm Upto 1000 mm	9.0 μ m 11.1 μ m
4.	Dial Caliper Gauge ^s L.C.: 0.01 mm	Using Gauge Blocks and Long Gauge Blocks by Comparison Method	Upto 300 mm	6.2 μ m
5.	Thickness Gauge ^s (Digital/Dial) L.C.: 0.001 mm	Using Gauge Blocks by Comparison Method	Upto 25 mm	0.7 μ m

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6.	External Micrometer ^s (Mechanical/Digital) L.C.: 0.001 mm	Using Gauge Blocks and Long Gauge Blocks by Comparison Method	Upto 100 mm >100 mm to 300 mm >300 mm to 500 mm >500 mm to 1000 mm	1.1 μ m 2.4 μ m 3.3 μ m 7.2 μ m
7.	Depth Micrometer ^s L.C.: 0.001 mm	Using Gauge Blocks and Long Gauge Blocks by Comparison Method	Upto 500 mm	3.3 μ m
8.	Micrometer Setting Rod ^s	Using Universal Length Measuring System / Height Measuring System by Comparison Method	25 mm to 100 mm >100 mm to 500 mm >500 mm to 1000 mm	1.2 μ m 5.1 μ m 8.2 μ m
9.	Feeler Gauge ^s	Using Digital Micrometer by Comparison Method	Upto 1 mm	1.3 μ m
10.	Inside/Groove Micrometer ^s L.C.: 0.01 mm	Using Gauge Block and Gauge Block accessory by Comparison Method	5 mm to 100 mm	5.9 μ m
11.	Internal /Stick Micrometer ^s L.C.: 0.01 mm	Universal Length Measuring / Height Measuring System by Comparison Method	25 mm to 300 mm 300 mm to 1000 mm	5.8 μ m 9.6 μ m
12.	Snap Micrometer ^s L.C.: 0.001 mm	Using Gauge Block by Comparison Method	Upto 100 mm	2.1 μ m

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13.	Dial Bore Gauge ^s L.C.: 0.001 mm	Using Universal Length Measuring System by Comparison Method	20 mm to 500 mm Upto 1.5 mm travel	1.0 μ m
14.	Coating Thickness Foil ^s	Using Universal Length Measuring System by Comparison Method	Upto 2.0 mm	0.8 μ m
15.	Cylindrical Measuring Pins ^s (Grade "1" and Coarser)	Using Universal Length Measuring System by Comparison Method	Upto 20 mm	0.8 μ m
16.	Cylindrical Setting Master ^s (Diameter Only)	Using Universal Length Measuring System by Comparison Method	Upto 100 mm	1.1 μ m
17.	Dial Calibration Tester ^s L.C.: 0.001 mm	Using Universal Length Measuring System by Comparison Method	Upto 100 mm	1.1 μ m
18.	Depth Gauge - Hook Type ^s L.C.: 0.02 mm	Using Gauge Block by Comparison Method	Upto 300 mm	14.3 μ m


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19.	Electronic Probe/ LVDT System [§] L.C.: 0.1 μ m	Using Universal Length Measuring System by Comparison Method	0 to 25 mm	0.7 μ m
20.	Lever Type Dial Gauge [§] L.C.: 0.001 mm L.C.: 0.01 mm	Using Universal Length Measuring System by Comparison Method	Upto 0.14 mm Upto 1.2 mm	1.0 μ m 5.9 μ m
21.	Plunger Type Dial/ Digital Gauge [§] L.C.: 0.001 mm L.C.: 0.01 mm	Using Universal Length Measuring System by Comparison Method	Upto 25 mm Upto 100 mm	1.0 μ m 5.9 μ m
22.	Micrometer Head [§] L.C.: 0.0001 mm	Using Universal Length Measuring System by Comparison Method	Upto 25 mm	1.2 μ m
23.	Pistol Caliper [§] L.C.: 0.1 mm	Using Gauge Blocks by Comparison Method	0 to 100 mm	57.9 μ m
24.	Thread Ring Gauge [§]	Using Universal Length Measuring System by Comparison Method	3 mm to 90 mm > 90 mm to 200 mm	0.9 μ m 4.3 μ m

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25.	Plain Plug Gauge ^s	Using Universal Length Measuring System by Comparison Method	Upto 100 mm > 100 mm to 400 mm	1.3 μ m 4.7 μ m
26.	Plain / Setting Ring Gauge ^s	Using Universal Length Measuring System by Comparison Method	3 mm to 100 mm >100 to 300 mm	1.8 μ m 4.7 μ m
27.	Thread Plug Gauge ^s	Using Universal Length Measuring System by Comparison Method	Upto 100 mm > 100 mm to 400 mm	1.7 μ m 4.7 μ m
28.	Snap Gauge ^s (Plain/Adjustable)	Using Gauge Block and Gauge Block accessory by Comparison Method	2 mm to 100 mm >100 mm to 300 mm	2.0 μ m 2.9 μ m
29.	Width/Gap Gauge ^s	Using Universal Length Measuring System by Comparison Method	0 to 100 mm >100 mm to 300 mm	1.0 μ m 6.0 μ m
30.	Taper Thread Plug Gauge ^s	Using Universal Length Measuring System by Comparison Method	Upto 100 mm	0.9 μ m
31.	Taper Thread Ring Gauge ^s	Using Universal Length Measuring System by Comparison Method	8 mm to 100 mm	1.8 μ m
32.	Caliper Checker ^s	Using Height Measuring System by Comparison Method	Up to 600 mm	6.6 μ m

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33.	Flush Pin Gauge ^s	Using Height Measuring System by Comparison Method	Up to 50 mm	5.91 μ m
34.	Coating Thickness Gauge ^s L.C.: 0.1 μ m L.C.: 1 μ m	Using Standard Foils by Comparison Method	Upto 20 μ m >20 μ m to 2000 μ m	0.5 μ m 1.5 μ m
II.	DIMENSION (PRECISION INSTRUMENTS)			
1.	Height Measuring System [#] L.C.: 0.1 μ m	Using Gauge Blocks and Long Gauge Blocks by Comparison Method	Upto 300 mm >300 mm to 1000 mm	4.8 μ m 7.0 μ m
2.	Length Measuring System [#] L.C.: 0.1 μ m	Using Gauge Blocks and Long Gauge Blocks by Comparison Method	Upto 100mm (absolute Scale) Upto 600 mm (Differential Scale)	0.9 μ m 1.2 μ m
3.	Surface Plate [#]	Using Precision Spirit Level by Comparison Method	3500 mm x 2600 mm	$2.3 \sqrt{\frac{W+L}{200}}$ μ m W=Width, L=Length
III.	WEIGHTS			
1.	Weights ^s (Conventional) Calibration of Weights Class F1 accuracy and Coarser	1 mg 2 mg 5 mg 10 mg 20 mg 50 mg	0.01 mg 0.01 mg 0.01 mg 0.01 mg 0.01 mg 0.01 mg	Using E2 Class Standard Weights and Electronic Weighing Balance (Readability: 0.01 mg upto 82 g / 0.1 mg above)


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		100 mg 200 mg 500 mg 1 g 2 g 5 g 10 g 20 g 50 g 100 g 200 g	0.01 mg 0.01 mg 0.01 mg 0.02 mg 0.02 mg 0.02 mg 0.02 mg 0.02 mg 0.02 mg 0.2 mg 0.2 mg	
IV.	WEIGHING SCALE AND BALANCE			
1.	Electronic Weighting Balance # d=0.01 mg d=0.1 mg	1 mg to 80 g 10 mg to 200 g	0.05 mg 0.1 mg	Using Standard Weights (E2 Class) & Calibration of Electronic Weighing Balance of Class I and Coarser as per OIML R-76-1
2.	Electronic Weighting Balance # d = 10 mg d = 1 g d = 10 g	Using Standard Weights M1 Class & Calibration of Electronic Weighing Balance of Class III and Coarser as per OIML R 76	0.5 g to 600 g >20 g to 10 kg >500g to 200 kg	10 mg 1 g 10g


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3.	Hydrometers ^{\$}	Using Hydrometer of resolution : 0.0005 g/ml and Appropriate liquid by Comparison Method as per Archimedes Principle based on IS 3104	0.600 g/ml to 1.600 g/ml	0.0012 g/m
V. PRESSURE INDICATING DEVICES				
1.	Dial & Digital Vacuum Gauges, Transducers/ Transmitters, Switches [#]	Using Standard Digital Vacuum Calibrator by Comparison Method as per DKD-R-6-2	(-) 0.90 bar to 0 bar	0.0012 bar
2.	Pneumatic - Dial & Digital Pressure Gauges, Pressure Switches, Pressure Transmitters [#]	Using Standard Digital Pressure Calibrator by Comparison Method as per DKD-R-6-1	0 to 20 bar	0.003 bar
3.	Hydraulic :- Dial & Digital Pressure Gauges, Pressure Transmitters [#]	Using Standard Digital Pressure Calibrator with external sensor by Comparison Method as per DKD-R-6-1	0 to 700 bar	0.13 bar
4.	Low Pressure (Pneumatic) (Magnetic Gauges, Manometer, Low Pressure/Vacuum Gauges, Calibrators) [#]	Using Standard Digital Pressure calibrator by Comparison Method as per DKD-R-6-1/2	(-) 900 mbar to 0 mbar	0.61 mbar
			0 to 700 mbar	0.12 mbar


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5.	Low Pressure (Pneumatic) (Maghnelic Gauges, Manometer, Barometer, Low Pressure Gauges/Vacuum, Calibrators, Pressure Transmitter, Differential Pressure Gauge) [#]	Using Standard Digital Pressure Gauge by Comparison Method as per DKD-R-6-1/2	(-) 0.95 bar to 2 bar	0.80 mbar
6.	Absolute Pressure (Pneumatic) (Absolute Pressure Gauges/Barometers / Manometers) [#]	Using Standard Digital Barometer by Comparison Method as per OIML-R-97	300 mbar to 1100 mbar	0.68 mbar
VI.	ACOUSTICS			
1.	Sound Level Meter ^{\$}	Using Sound Level Calibrator By Direct Method as per IS 15575 / OIML-R-58	94 dB & 114 dB	0.52 dB
VII.	ACCELERATION & SPEED			
1.	Mechanical /Digital Tachometers/ Centrifuge/RPM Indicators / Stirrers [#] (Non Contact Type)	Using Digital Tachometer By Comparison Method	100 rpm to 90,000 rpm	1.53% to 0.06%


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2.	Mechanical / Digital Tachometers # (Contact Type)	Using Digital Tachometer By Comparison Method	100 rpm to 10000 rpm	2.20% to 0.08%
VIII.	DUROMETERS			
1.	Durometers / Shore Hardness Tester ^s Shore A Shore D	Using Shore Hardness Tester Calibrator As per ASTM D2240-05	20 Shore A to 90 Shore A 20 Shore D to 90 Shore D	1.34 Shore A 1.37 Shore A
XI.	FORCE PROVING INSTRUMENTS			
1	Universal Testing Machine (in Compression mode) Compression Testing Machine (CTM)*	Using Master Load Cell As per IS 1828(Part -1)/ ISO 7500	100 N to 1kN 1 kN to 10kN 10 kN to 100 kN 100 kN to 500kN	0.30% 0.12% 0.08% 0.10%
2	Universal Testing Machine (in Tension mode) Tensile Testing Machine(TTM)*	Using Master Load Cell As per IS 1828(Part -1)/ ISO 7500	100 N to 1kN 1 kN to 10kN 10 kN to 100 kN 100 kN to 500kN	0.30% 0.12% 0.08% 0.10%

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<u>THERMAL CALIBRATION</u>				
I.	TEMPERATURE			
1.	Liquid-In-Glass Thermometers [§]	Using 4-Wire RTD Sensor & Portable Calibrator with Liquid Temperature Bath by Comparison Method	(-)80°C to 50 °C 50 °C to 250 °C	0.72°C 0.79°C
2.	RTD's, Thermocouple With & Without Controllers, Temperature Indicator With Sensor, Recorders With Probes, Data Logger With Sensor, Digital Thermometers With Sensor, Temperature Gauges, Temperature Transmitter, Switch, Temperature Transducer [#]	Using PRT Sensor, 4-Wire RTD Sensor & Portable Calibrator with Low Temperature Bath by Comparison Method S-type Thermocouple, Portable Calibrator with Dry Block Temperature Calibrators by Comparison Method	(-) 80 °C to 50 °C 50 °C to 250 °C 250°C to 1200 °C	0.39°C 0.47°C 1.87°C
3.	Oven, Incubator, Furnace, Deep Freezer, Refrigerator, Water Bath, Low Temperature Bath, Dry Block Furnace, Dry Block Calibrators,	Using 4-Wire RTD Sensor with Portable Calibrator by Comparison Method S-type Thermocouple with Portable Calibrator by Comparison Method	(-) 80 °C to 250 °C 250 °C to 1200 °C	0.70°C 1.60°C


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	Autoclaves [#] (Single Point)			
4.	Non-Contact Type Thermometer (Infrared Thermometer / Digital Pyrometer) [#]	Using Infrared Thermometer & Black Body Source By comparison method	50 °C to 500 °C	1.50°C
5.	Temperature By Spatial Mapping Thermal Chamber/ Furnace/ Oven/ Incubator/ Water Bath/ Refrigerator/ Deep Freezer, Autoclave [*]	Using RTD (Pt 100) & N-Type Thermocouple with Paperless Recorder by Comparison Method	(-) 80 °C to 250 °C 250 °C to 1200 °C	2.61°C 3.24°C
II.	SPECIFIC HEAT AND HUMIDITY			
1.	Thermo-Hygrometers (Analog/Digital), Humidity Indicator, Humidity Sensors, Humidity Data Loggers, Humidity Transmitters ^{\$}	Using Digital Temp. & Humidity Indicator with Sensor, Temp. & Humidity Generator by Comparison method	20% RH to 95 % RH @25°C 10 °C to 50 °C @50%RH	1.50% RH 0.43°C

S. Kumtar

Sangeeta Kunwar
Convenor

Anuja

Anuja Anand
Program Manager



National Accreditation Board for Testing and Calibration Laboratories

(A Constituent Board of Quality Council of India)



SCOPE OF ACCREDITATION

Laboratory Roots Metrology & Testing Laboratory (A Unit of Roots Industries India Limited), No.37, First Main Road, SIDCO Industrial Estate, Thirumazhisai, Chennai, Tamil Nadu

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number CC-2201

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Sl.	Measurand or Reference Material/ Type of instrument or material to be calibrated or measured/ Quantity Measured / Instrument	Calibration or Measurement Method or procedure	Measurement range and additional parameters where applicable (Range and Frequency)	Calibration and Measurement Capability (CMC) (\pm)
2.	Humidity & Temperature Indicator Of Environmental Chamber/ Temperature & Humidity Indicators (Digital / Analog)/ Humidity Sensor With Indicator/Controller/ Data Logger/ Recorder* Humidity Sensor With Indicator/Controller/ Data Logger/ Recorder*	Using Digital Temp & Humidity Indicator with Sensor by Comparison method	20% RH to 95% RH @20 °C to 50 °C	1.68% RH 0.43°C

* 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.

Sangeeta Kunwar
Convenor

Anuja Anand
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