

Laboratory **Global Calibration & Test Lab, S-3, Phase-II, RIICO Industrial Area, Bhiwadi, Distt. Alwar, Rajasthan**

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

Certificate Number **CC-2644** Page **1 of 13**

Validity **13.04.2018 to 12.04.2020** Last Amended on **-**

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
<u>ELECTRO-TECHNICAL CALIBRATION</u>				
1.	MEASURE			
1.	DC Voltage [§]	1 mV to 100 mV 100 mV to 10 V 10 V to 100 V 100 V to 1000 V	0.90 % to 0.04 % 0.04 % 0.04 % 0.04 %	Using Fluke 8846A 6.5 DMM By Direct/ Comparison Method
2.	DC Current [§]	1 mA to 100 mA 100 mA to 10 A	0.10 % to 0.08 % 0.08 % to 0.19 %	Using Fluke 8846A 6.5 DMM By Direct/ Comparison Method
3.	AC Voltage [§]	50 Hz 10 mV to 100 mV 100 mV to 1000 V	0.66 % to 0.12 % 0.12 % to 0.10 %	Using Fluke 8846A 6.5 DMM By Direct/ Comparison Method
4.	AC Current [§]	50 Hz 1 mA to 200 mA 200 mA to 10 A	0.19 % to 0.35 % 0.35 % to 0.25 %	Using Fluke 8846A 6.5 DMM By Direct/ Comparison Method
5.	Resistance [§] (4W – 2 W)	1 Ω to 100 Ω 100 Ω to 100 k Ω 100 k Ω to 100 M Ω 100 M Ω to 1 G Ω	0.37 % to 0.02 % 0.02 % to 0.01 % 0.01 % to 0.98 % 0.98 % to 2.44 %	Using Fluke 8846A 6.5 DMM By Comparison Method
6.	Frequency [§]	10 Hz to 1 kHz	0.58 % to 0.10 %	Using Fluke 8846A 6.5 DMM By Direct/ Comparison Method
7.	Capacitance [§]	1 kHz 1 nF to 1 μ F	0.41 %	Using Digital LCR Meter Aplab 4910 by Direct/ Comparison Method

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

Certificate Number **CC-2644**

Page **2 of 13**

Validity **13.04.2018 to 12.04.2020**

Last Amended on **-**

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8.	Inductance ^{\$}	1 kHz 1 mH to 1 H	0.41 %	Using Digital LCR Meter Aplab 4910 by Direct/ Comparison Method
9.	Time-Stop Watch [#] (Digital/Mechanical)	10 s to 1.5 Hour	1.3 s	Using Digital Timer Lee-Tron DT-103 by Comparison Method
10.	DC High Voltage [*]	1 kV to 15 kV	3.50 % to 3.96 %	Using HV Probe Fluke with 4.5 DMM Fluke by Comparison Method
11.	AC High Voltage [*]	1 kV to 25 kV	5.85 % to 5.92 %	Using HV Probe Fluke with 4.5 DMM Fluke by Comparison Method
II.	SOURCE			
1.	Resistance ^{\$} (Discrete Values) (4 W & 2 W)	0.001 Ω 0.01 Ω 0.1 Ω 1.0 Ω 10.0 Ω 100.0 Ω 1 k Ω 20 M Ω 200 M Ω 2 G Ω 20 G Ω	0.91 % 0.58 % 0.58 % 0.58 % 0.58 % 0.58 % 0.58 % 3.53 % 3.57 % 3.53 % 3.80 %	Using Standard Resistance Boxes make Sigma by Direct Method
2.	Resistance ^{\$} (Variable) (4 W & 2 W)	1 Ω to 100 Ω 100 Ω to 100 k Ω 100 k Ω to 20 M Ω 20 M Ω to 100 M Ω	0.90 % to 0.12 % 0.12 % to 0.13 % 0.13 % to 1.0 % 1.0 % to 2.83 %	Using Decade Resistance Box make Zeal by Direct Method

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Laboratory Global Calibration & Test Lab, S-3, Phase-II, RIICO Industrial Area,
 Bhiwadi, Distt. Alwar, Rajasthan
Accreditation Standard ISO/IEC 17025: 2005
Certificate Number CC-2644 **Page** 3 of 13
Validity 13.04.2018 to 12.04.2020 **Last Amended on** -

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
3.	DC High Current [§]	10 A to 800 A	1.53 % to 0.51 %	Using Zeal Calibrator with 100 Turn Coils by Direct Method
4.	AC High Current [§]	10 A to 800 A	1.53 % to 0.51 %	Using Zeal Calibrator with 100 Turn Coils by Direct Method
5.	Temperature Simulation [#] RTD Thermocouple (J/K/R/T/S/E/B/N)	(-) 200 °C to 600 °C (-) 200 °C to 1700 °C	0.20 °C to 0.32 °C 0.37 °C to 1.27 °C	Using Masibus MC-12 Multifunction Calibrator by Direct Method

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

Certificate Number **CC-2644** Page **4 of 13**

Validity **13.04.2018 to 12.04.2020** Last Amended on **-**

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<u>MECHANICAL CALIBRATION</u>				
1.	DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)			
1.	Vernier Caliper [§] L.C.: 0.01 mm L.C.: 0.01 mm L.C.: 0.01 mm	0 to 300 mm 0 to 600 mm 0 to 1000 mm	10.4 μ m 15.0 μ m 21.0 μ m	Using Gauge Block Set Gr-0 & Caliper Checker
2.	External Micrometer [§] L.C.: 0.001 mm	0 to 25 mm	1.2 μ m	Using Gauge Block Set Gr-0
	L.C.: 0.001 mm	25 mm to 100 mm	2.2 μ m	Using Steel Setting Rod, Gauge Block Set Gr-0
	L.C.: 0.001 mm	100 mm to 600 mm	13.0 μ m	Using Caliper Checker with Attachment
3.	Internal Micrometer [§] L.C.: 0.001 mm	15 mm to 300 mm	8.0 μ m	Using Gauge Block Set Gr-0, Gauge Block Accessories
	L.C.: 0.001 mm	15 mm to 600 mm	13.9 μ m	Using Caliper Checker with Attachment
4.	Depth Micrometer [§] L.C.: 0.001 mm L.C.: 0.01 mm	0 to 25 mm 0 to 200 mm	2.0 μ m 7.0 μ m	Using Gauge Block Set Gr-0, Surface Plate
5.	Depth Gauge / Depth Caliper [§] L.C.: 0.01 mm L.C.: 0.02 mm	0 to 200 mm 0 to 200 mm	7.0 μ m 13.1 μ m	Using Gauge Block Set Gr-0, Surface Plate

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Accreditation Standard ISO/IEC 17025: 2005

Certificate Number CC-2644

Page 5 of 13

Validity 13.04.2018 to 12.04.2020

Last Amended on -

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
6.	Dial Thickness Gauge [§] L.C.: 0.01 mm	0 to 25 mm	6.0 μ m	Using Gauge Block Set Gr-0
7.	Height Gauge / Height Gauge Attachment [§] L.C.: 0.01 mm L.C.: 0.01 mm L.C.: 0.01 mm	0 to 300 mm 0 to 600 mm 0 to 1000 mm	15.0 μ m 14.1 μ m 24.0 μ m	Using Gauge Block Set, Puppy Dial, Caliper Checker, Surface Plate
8.	Plain Plug Gauge / Air Plug Gauge / Flush Pin Gauge [§]	\varnothing 1 mm to \varnothing 25 mm	1.6 μ m	Using Digital Micrometer
		\varnothing 25 mm to \varnothing 100 mm	4.2 μ m	Using Dial Indicator with Comparator Stand
9.	Snap Gauge / Gap Gauge [§]	1 mm to 100 mm	2.5 μ m	Using Gauge Block Set Gr-0
10.	Feeler Gauge [§]	0.05 mm to 1 mm	1.5 μ m	Using Digital Micrometer
11.	Angle Protector / Bevel Protector [§] L.C.: 5'	0 to 90°	2.9'	Using Angle Gauge Set & Surface Plate
12.	Standard Thickness Foil [§]	0.01 mm to 5 mm	1.4 μ m	Using Digital Micrometer
13.	Plunger Type Dial Gauge / Dial Indicator [§] L.C.: 0.001 mm L.C.: 0.01 mm	0 to 25 mm	2.6 μ m	Using Gauge Block Set Gr-0 & Comparator Stand
		0 to 50 mm	6.3 μ m	
14.	Lever Type Gauge / Puppy Dial [§] L.C.: 0.001 mm L.C.: 0.01 mm	0 to 1.00 mm	2.8 μ m	Using Gauge Block Set Gr-0, Comparator Stand & Puppy Dial
		0 to 1.00 mm	6.3 μ m	

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Accreditation Standard ISO/IEC 17025: 2005

Certificate Number CC-2644 **Page** 6 of 13

Validity 13.04.2018 to 12.04.2020 **Last Amended on** -

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
15.	Bore Gauge ^s (1 mm Displacement only)	10 mm to 100 mm	3.6 μ m	Using Gauge Block Set, Gauge Block Accessory
		100 mm to 400 mm	10.0 μ m	Using Caliper Checker with Attachment
16.	V-Block ^s Parallelism Flatness Symmetry	Up to 100 mm x 300 mm	2.9 μ m 2.9 μ m 3.2 μ m	Using Height Gauge, Puppy Dial, Measuring Cylinder, Surface Plate
17.	Comparator Stand ^s (Base Flatness only)	200 mm x 200 mm	3.2 μ m	Using Lever Dial
		200 mm x 500 mm	$1.9 \sqrt{\frac{L+W}{150}}$ μ m L & W in mm	Using Electronic Level
18.	Coating Thickness Gauge ^s L.C.: 0.001 mm	0 to 1250 μ m	1.9 μ m	Using Standard Foil & Digital Micrometer
19.	Radius Gauge / Radius Chart ^s	0.5 mm to 100 mm	12.3 μ m	Using Profile Projector
20.	Combination Set ^s L.C.: 30'	0 to 180°	35'	Using Angle Gauge Set, Surface Plate
21.	Thread Pitch Gauge ^s (Pitch and Flank Angle)	0.1 mm to 100 mm 60°, 55°	8.15 μ m 1'30"	Using Profile Projector
22.	Test Sieve ^s (Aperture Size)	10 μ m to 10 mm	7.3 μ m	Using Profile Projector
		10 mm to 100 mm	15 μ m	Using Vernier Caliper

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Laboratory Global Calibration & Test Lab, S-3, Phase-II, RIICO Industrial Area, Bhiwadi, Distt. Alwar, Rajasthan
Accreditation Standard ISO/IEC 17025: 2005
Certificate Number CC-2644 **Page** 7 of 13
Validity 13.04.2018 to 12.04.2020 **Last Amended on** -

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23.	Ultrasonic Thickness Gauge ^{\$} L.C.: 0.01/0.1 mm	0 to 100 mm	4.2 μ m	Using Gauge Block Set
24.	Dial Calibration Tester ^{\$} L.C.: 0.001 mm	0 to 25 mm	2.8 μ m	Using Gauge Block Set & Dial Indicator
25.	Taper Scale ^{\$} L.C.: 0.1 mm	0 to 15 mm	60.0 μ m	Using Profile Projector
26.	Welding Gauge ^{\$}			Using Profile Projector
	Angle	0 to 90°	2.3'	
	Scale	0 to 100 mm	578 μ m	
27.	Surface Plate [#]	2500 x 4000 mm	$1.0 \sqrt{\frac{L+W}{150}}$ μ m L & W in mm	Using Electronic Level & Measuring Tape
28.	Straight Edge [#] (Width more than 20 mm)	300 mm to 2000 mm Width	$3.5 \sqrt{\frac{L}{150}}$ μ m L is in mm	Using Electronic Level
29.	Profile Projector [#]			Using Gauge Block Set, Glass Scale, Angle Gauge & Vernier Caliper
	Linear L.C.: 0.001 mm	0 to 300 mm	2.1 μ m	
	Angular L.C.: 1"	0 to 360°	16 Sec	
	Magnification	Width	1.8 %	
30.	2D Height Gauge [#] L.C.: 0.01 mm	0 to 600 mm	15 μ m	Using Caliper Checker & Gauge Block Set

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

Certificate Number **CC-2644**

Page **8 of 13**

Validity **13.04.2018 to 12.04.2020**

Last Amended on **-**

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31.	Tool Maker Microscope [#] Linear scale L.C.: 0.001 mm	0 to 200 mm	0.6 μ m	Using Gauge Block Set Gr-0
32.	Air Gauge Unit [#] L.C.: 0.001 MM	\pm 40 μ m	1.75 μ m	Using Setting Ring & Plug Gauge Set
II.	ACCELERATION & SPEED			
1.	RPM [#] (Non-Contact Type)	100 rpm to 19000 rpm	2.0 % to 0.11 %	Using Digital Tachometer by Direct & Comparison Method
III.	ACOUSTICS			
1.	Sound Level Meter [§] L.C.: - 0.1 dB	94 dB 114 dB	1.6 dB 1.7 dB	Using Sound Level Calibrator Make-Lutron Model SC-942 by Direct Method
IV.	PRESSURE INDICATING DEVICES			
1.	Hydraulic Pressure Industrial Pressure Gauge/ Transducer with Indicator [#]	0 to 700 bar	0.48 bar	Using Digital Pressure Gauge GCTL/MI-16 by Comparison Method based on DKD-R-6-1
2.	Pneumatic Pressure Industrial Pressure Gauge/ Transducer with Indicator [#]	0 to 16 bar	0.02 bar	Using Digital Pressure Gauge GCTL/MI-17 by Comparison Method based on DKD-R-6-1
3.	Negative Pressure Industrial Pressure Gauge/ Transducer with Indicator [#]	(-) 0.9 bar to 0 bar	0.02 bar	Using Digital Pressure Gauge GCTL/MI-17 by Comparison Method based on DKD-R-6-1

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

Certificate Number **CC-2644** Page **9 of 13**

Validity **13.04.2018 to 12.04.2020** Last Amended on **-**

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4.	Differential Pressure Magnehelic Gauge / Manometer [#]	0 to 100 mbar	0.14 mbar	Using Digital Manometer GCTL/MI-26 by Comparison Method based on DKD-R-6-1
V.	WEIGHTS			
1.	Conventional Mass ^{\$} M1 Class & Coarser	10 mg	0.03 mg	Using Standard Weights of F1 Class & Weighing Balance of Readability = 0.01 mg Procedure based on OIML-R-111 (2004) Substitution Method of Weighing and ABBA Weighing Cycle
		20 mg	0.04 mg	
		50 mg	0.04 mg	
100 mg	0.05 mg			
200 mg	0.07 mg			
500 mg	0.07 mg			
1 g	0.07 mg			
2 g	0.09 mg			
5 g	0.13 mg			
10 g	0.13 mg			
		20 g	0.13 mg	
		50 g	0.16 mg	
		100 g	0.3 mg	Using F1 Class Weights & Weighing Balance of Readability = 0.1 mg
		200 g	0.6 mg	
2.	Conventional Mass ^{\$} M2 Class & Coarser	500 g	0.01 g	Using M1 Class Weights & Weighing Balance of Readability = 0.001 g
		1 kg	0.02 g	
		2 kg	0.04 g	Using M1 Class Weights & Weighing Balance of Readability = 0.01 g
		5 kg	0.14 g	
10 kg	0.17 g			
		20 kg	1.36 g	Using M1 Class Weights & Weighing Balance of Readability = 1 g

Laboratory Global Calibration & Test Lab, S-3, Phase-II, RIICO Industrial Area, Bhiwadi, Distt. Alwar, Rajasthan
Accreditation Standard ISO/IEC 17025: 2005
Certificate Number CC-2644 **Page** 10 of 13
Validity 13.04.2018 to 12.04.2020 **Last Amended on** -

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VI.	WEIGHING SCALE AND BALANCE			
1.	Weighing Balance*			
	d = 0.1 mg (Class I)	Up to 220 g	0.0003 g	Using F1 Class Weights OIML-R-76
	d = 10 mg (Class II)	Up to 1000 g	0.02 g	Using F1 & M1 Class Weights OIML-R-76
	d = 100 mg (Class III)	Up to 10 kg	0.16 g	Using M1 Class Weights OIML-R-76
	d = 10 g (Class IV)	>10 kg to 150 kg >150 kg to 200 kg	7.4 g 12 g	Using M1 Class Weights OIML-R-76
VII.	VOLUME			
1.	Micropipettes [§]	>10 μ l to 100 μ l	2.0 μ l	Using Semi Micro Balance of L.C.-0.01 mg & Distilled Water as per ISO 8655-6
		>100 μ l to 1000 μ l	2.0 μ l	
2.	Pipettes/Burettes/Beakers [§]	0.1 ml to 50 ml	0.02 ml	Using Semi Micro Balance of L.C.-0.1 mg & Distilled Water as per ISO 4787-2010
		50 ml to 100 ml	0.06 ml	
3.	Measuring Cylinder, Beaker, Flask, Graduated Bucket [§]	100 ml to 800 ml	0.32 ml	Using Precision Balance of L.C.-0.001 g & Distilled Water as per ISO 4787-2010
		800 ml to 8000 ml	18.6 ml	Using Precision Balance of L.C.-0.01 g & Distilled Water as per ISO 4787-2010

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 Bhiwadi, Distt. Alwar, Rajasthan
Accreditation Standard ISO/IEC 17025: 2005
Certificate Number CC-2644 **Page** 11 of 13
Validity 13.04.2018 to 12.04.2020 **Last Amended on** -

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		8000 ml to 20000 ml	21.4 ml	Using Precision Balance of L.C.-1 g & Distilled Water as per ISO 4787-2010

Laboratory Global Calibration & Test Lab, S-3, Phase-II, RIICO Industrial Area, Bhiwadi, Distt. Alwar, Rajasthan
Accreditation Standard ISO/IEC 17025: 2005
Certificate Number CC-2644 **Page** 12 of 13
Validity 13.04.2018 to 12.04.2020 **Last Amended on** -

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<u>THERMAL CALIBRATION</u>				
1.	TEMPERATURE			
1.	RTD's, Thermocouple with & without Indicator / Controller /Recorder / Data Logger, Temperature Gauges, Liquid in Glass Thermometers, Digital Thermometer, Temperature Transmitter#	(-) 40 °C to 50 °C	0.20 °C	Using 4-Wire RTD Sensor with 6.5 DMM & Low Temperature Bath by Comparison Method
		50 °C to 250 °C	0.34 °C	Using 4-Wire RTD Sensor with 6.5 DMM & Silicon Oil Bath by Comparison Method
2.	Thermocouple with & without Indicator / Controller/Recorder / Data Logger / Temperature Transmitter#	250 °C to 1200 °C	2.52 °C	Using 'S' type Thermocouple with 6.5 DMM & Dry Block Bath by Comparison Method
3.	Temperature Indicator with Sensor of Thermal Equipment's (Liquid Baths, Dry Block Furnace, Freezers, Oven, Environment Chamber, Incubator, BOD Incubator etc.)#	(-) 40 °C to 250 °C	1.31 °C	Using 4-Wire RTD Sensor with 6.5 DMM (Single Position Calibration)
		250 °C to 1200 °C	2.41 °C	Using 'S' type Thermocouple with 6.5 DMM (Single Position Calibration)

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Accreditation Standard ISO/IEC 17025: 2005
Certificate Number CC-2644 **Page** 13 of 13
Validity 13.04.2018 to 12.04.2020 **Last Amended on** -

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4.	Liquid Baths, Dry Block Furnace, Freezers, Oven, Environment Chamber, Incubator, BOD Incubator, All Types of Furnaces*	(-) 40 °C to 250 °C	2.54 °C	Using PRT Sensors with Scanner (Multi Position Calibration)
		250 °C to 1200 °C	4.38 °C	Using T/C Sensors with Scanner (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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