

Laboratory **Bansal Calibration Services, 49/39, Site – IV Industrial Area, Sahibabad, Ghaziabad, Uttar Pradesh**

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

Certificate Number **CC-2438 (in lieu of C-0951)**

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Validity **24.09.2017 to 23.09.2019**

Last Amended on **26.09.2018**

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
<u>ELECTRO-TECHNICAL CALIBRATION</u>				
I.	SOURCE			
1.	D.C. Voltage [#]	1 mV to 300 mV 300 mV to 3 V 3 V to 300 V 300 V to 1000 V	0.17 % to 0.0037 % 0.004 % to 0.0018 % 0.0018 % to 0.003 % 0.003 % to 0.0032 %	Using Fluke 5522A Multi Product Calibrator by Direct Method
		10 μ A to 300 μ A 300 μ A to 3 m A 3 m A to 300 m A 300 m A to 3 A 3 A to 20 A	0.35 % to 0.0033 % 0.0033 % to 0.019 % 0.019 % to 0.0174 % 0.0174% to 0.066 % 0.066 % to 0.5651 %	Using Fluke 5522A Multi Product Calibrator by Direct Method
		20 A to 1000 A	0.5651 % to 0.0743 %	Using Fluke 5522A Multi Product Calibrator With 50 Turn Current Coil by Direct Method
3.	A.C. Voltage [#]	50 Hz to 1 kHz 1 m V to 300 m V 300 m V to 3 V 3 V to 300 V 300 V to 1000 V	1.1327 % to 0.028 % 0.028 % 0.027 % to 0.0315 % 0.0315 % to 0.050 %	Using Fluke 5522A Multi Product Calibrator by Direct Method
		50 Hz to 1 kHz 30 μ A to 300 μ A 300 μ A to 30 m A 30 m A to 3 A 3 A to 20 A	0.7570 % to 0.2540 % 0.2540 % to 0.0770 % 0.0770 % to 0.2674 % 0.27 % to 0.04 %	Using Fluke 5522A Multi Product Calibrator by Direct Method
		20 A to 1000 A	0.04 % to 0.074 %	Using Fluke 5522A Multi Product Calibrator With 50 Turn Current Coil by Direct Method

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5.	Frequency [#]	10 Hz to 1 MHz	0.0005 % to 0.0068 %	Using Fluke 5522A Multi Product Calibrator by Direct Method
		1 m Ω to 10 m Ω 10 m Ω to 100 m Ω	1.53 % to 0.80 % 0.80 % to 0.81 %	Using Sigma Resistance Box by Direct Method
		1 Ω to 100 Ω 100 Ω to 1 M Ω 1 M Ω to 1000 M Ω	1.6078 % to 0.0285 % 0.0285 % to 0.0067 % 0.0067 % to 0.0063 %	Using Fluke 5522A Multi Product Calibrator by Direct Method
7.	DC Resistance For Insulation Tester @ 500 V [#]	100 M Ω to 200 G Ω	5.00 %	Using Sigma Resistance Box by Direct Method
	Temperature Simulation [#] (Indicator/Controller/RTD)			
	RTD PT 100 T/C J Type T/C K Type T/C E Type T/C B Type T/C N Type T/C R Type T/C S Type T/C T Type	(-) 200 $^{\circ}$ C to 800 $^{\circ}$ C (-) 200 $^{\circ}$ C to 1000 $^{\circ}$ C 0 $^{\circ}$ C to 1350 $^{\circ}$ C (-) 200 $^{\circ}$ C to 1000 $^{\circ}$ C 600 $^{\circ}$ C to 1800 $^{\circ}$ C 0 $^{\circ}$ C to 1300 $^{\circ}$ C 500 $^{\circ}$ C to 1750 $^{\circ}$ C 500 $^{\circ}$ C to 1750 $^{\circ}$ C (-) 200 $^{\circ}$ C to 390 $^{\circ}$ C	0.0802 $^{\circ}$ C to 0.40 $^{\circ}$ C 0.4359 $^{\circ}$ C to 0.3725 $^{\circ}$ C 0.2623 $^{\circ}$ C to 0.4200 $^{\circ}$ C 0.8023 $^{\circ}$ C to 0.3410 $^{\circ}$ C 0.4840 $^{\circ}$ C to 0.5312 $^{\circ}$ C 0.3093 $^{\circ}$ C to 0.4359 $^{\circ}$ C 0.5312 $^{\circ}$ C to 0.6427 $^{\circ}$ C 0.5790 $^{\circ}$ C to 0.7387 $^{\circ}$ C 0.3883 $^{\circ}$ C to 0.2312 $^{\circ}$ C	Using Fluke 5522A Multi Product Calibrator by Direct Method
9.	Capacitance [#]	@ 1 kHz 500 pF to 1 μ F @ 100 Hz 1 μ F to 100 μ F	0.03 % to 0.6 % 0.6 % to 0.8 %	Using Fluke 5522A Multi Product Calibrator by Direct Method
10.	Inductance [#]	1 kHz 10 μ H to 10 H	4.2 % to 4.7 %	Using Decade Inductance Box by Direct Method

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11.	AC Power [#] (Active Power)	50 Hz 10 V to 600 V 100 m A to 20 A 1W to 12 k W (UPF,0.5 Lead & Lag)	0.2 % to 0.5 %	Using Fluke 5522A Multi Product Calibrator by Direct Method
12.	Power Factor [#]	0.20 PF to 1.00 PF (Lead & Lag)	0.008 PF	Using Fluke 5522A Multi Product Calibrator by Direct Method
13.	DC Power [#]	10 V to 1000 V 100 m A to 20 A 1W to 20 k W	1.11 % to 0.3 %	Using Fluke 5522A Multi Product Calibrator by Direct Method
II.	MEASURE			
1.	D.C. Voltage [#]	1 mV to 100 mV 100 mV to 10 V 10 V to 1000 V	0.5672 % to 0.0115 % 0.0115 % to 0.0047 % 0.005 % to 0.008 %	Using Fluke 8846A Digital Multimeter by Direct / Comparison Method
2.	D.C. Current [#]	10 μ A to 10 mA 10 mA to 1 A 1 A to 10 A	0.49 % 0.49 % to 0.11 % 0.1121 % to 0.253 %	Using Fluke 8846A Digital Multimeter by Direct / Comparison Method
3.	A.C. Voltage [#]	50 Hz to 1 kHz 10 mV to 100 mV 100 mV to 1000 V	0.74 % to 0.16 % 0.16 % to 0.144 %	Using Fluke 8846A Digital Multimeter by Direct / Comparison Method
4.	A.C. Current [#]	50 Hz to 1 kHz 100 μ A to 100 mA 100 mA to 1 A 1 A to 10 A	0.144 % to 0.23 % 0.23 % 0.23 % to 0.34 %	Using Fluke 8846A Digital Multimeter by Direct / Comparison Method

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		10A to 1000 A	0.34 % to 1.7 %	Fluke 1730 logger with I Flex
5.	Frequency [#]	10 Hz to 1 MHz	0.0742 % to 0.0170 %	Using Fluke 8846A Digital Multimeter by Direct / Comparison Method
		1 mΩ to 10 mΩ 10 mΩ to 100 mΩ	0.9 % to 0.75 % 0.75 % to 1.66 %	Using Digital Micro ohm Meter by Direct / Comparison Method
		1 Ω to 10 Ω 10 Ω to 100 Ω 100 Ω to 10 kΩ 10 kΩ to 1 MΩ 1 MΩ to 100 MΩ 100 MΩ to 1000 MΩ	0.5 % to 0.06 % 0.06 % to 0.024 % 0.024 % to 0.018 % 0.018 % 0.018 % to 1.3 % 1.3 % to 3.22 %	Using Fluke 8846A Digital Multimeter by Direct / Comparison Method
7.	Digital Timer/Stop Watch [#]	10 Sec. to 600 Sec. 600 Sec. to 90 min. 90 min. to 24 hrs.	0.42 Sec. 0.42 Sec. 0.42 Sec. to 0.75 Sec.	Using Digital Stop Watch by Comparison Method
8.	AC High Voltage*	1 kV to 25 kV	8.0 %	Using Fluke 80K 40 HV Probe with DMM by Direct Method
9.	DC High Voltage*	1 kV to 30 kV	1.6 % to 5.0 %	Using Fluke 80K 40 HV Probe with DMM by Direct Method
10.	Energy [#]	1 Phase & 3 Phase 50 Hz UPF to ±0.5 100 V to 240 V 0.5 A to 250 A 50 W to 60 kW	1.5 % to 2.7 %	Using Fluke 1730 Energy Logger by Direct/ Comparison Method

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11.	AC Power [#]	At 50 Hz (UPF to +/- 0.5) 100 V to 600 V 10 A to 1000 A 1 kW to 600 kW	3.2 % to 2.0 %	Using Fluke 1730 Energy Logger by Direct/ Comparison Method
12.	Power Factor [#]	0.2 PF to 1 PF (Lead & Lag)	0.0069 PF	Using Fluke 1730 Energy Logger by Direct/ Comparison Method
13.	Capacitance [#]	1 kHz 1 nF to 1µF	0.7 % to 0.43 %	Using LCR Meter by Direct/Comparison Method
14.	Inductance [#]	At 1 kHz 10 µH to 10 H	0.61 % to 0.53 %	Using LCR Meter by Direct /Comparison Method
	Temperature (Simulator/Calibrator) [#]			
	RTD PT 100	(-) 200 °C to 800 °C	0.011 °C to 0.04 °C	Using Digital Multimeter 6½ & Fluke Temperature Scanner by Direct Method
	T/C J Type	(-) 200 °C to 1000 °C	0.33 °C to 0.21 °C	
	T/C K Type	0 °C to 1350 °C	0.45 °C to 0.23 °C	
	T/C E Type	(-) 200 °C to 1000 °C	0.28 °C to 0.14 °C	
	T/C B Type	600 °C to 1800 °C	1.09 °C to 0.61 °C	
	T/C N Type	0 °C to 1300 °C	0.25 °C to 0.32 °C	
	T/C R Type	500 °C to 1750 °C	0.53 °C to 0.55 °C	
	T/C S Type	500 °C to 1750 °C	0.59 °C to 0.62 °C	
	T/C T Type	(-) 200 °C to 390 °C	0.44 °C to 0.14 °C	

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<u>MECHANICAL CALIBRATION</u>				
1.	DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)			
1.	Caliper ^s Vernier/Dial/ Electronic L.C.: 0.01 mm	Up to 600 mm	13.3 μ m	Using Caliper Checker, Gauge Block by Comparison Method
2.	Height Gauge ^s Vernier / Dial / Electronic L.C.: 0.01 mm	Up to 600 mm	13.7 μ m	Using Caliper Checker, Gauge Block by Comparison Method
3.	Depth Gauge ^s Vernier / Dial / Electronic L.C.: 0.01 mm	Up to 300 mm	8.8 μ m	Using Depth Micro Checker by Comparison Method
4.	External Micrometer ^s (Analog/Digital) L.C.: 0.001 mm L.C.: 0.01 mm	Up to 100 mm 100 mm to 500 mm	2.0 μ m 6.9 μ m	Using Gauge Block Set, Long Gauge Block by Comparison Method
5.	Internal Micrometer/ Stick Micrometer ^s (Tow Point) Analog/Digital	Up to 500 mm	5.0 μ m	Using ULMM, Gauge Block Set, Gauge Block Accessories by Comparison Method
6.	Depth Micrometer ^s (Analog / Digital) L.C.: 0.01 mm	Up to 300 mm	4.7 μ m	Using Gauge Block Set, Depth Micro Checker, Surface Plate by Comparison Method

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7.	Bevel Angle Protractor / Inclinometer [§] L.C.: 5 min.	0° to 90°0'	4 min.	Using Angle Gauge Set by Comparison Method
8.	Combination Set / Angle Protractor [§] L.C.: 1°	0° to 180°	35 min.	Using Angle Gauge Set by Comparison Method
9.	Inside Dial Caliper [§]	5 mm to 75 mm	11 μ m	Using Gauge Block Set, Gauge Block Accessories by Comparison Method
10.	Plunger Type Dial Gauge [§] L.C.: 0.001 mm	Up to 25 mm	1.6 μ m	Using ULMM, Gauge Block Set by Comparison Method
11.	Lever Type Dial Gauge [§] L.C.: 0.001 mm L.C.: 0.002 mm L.C.: 0.01 mm	0 to 0.14 mm 0 to 0.2 mm 0 to 1 mm	1.6 μ m 1.9 μ m 3.3 μ m	Using ULMM by Comparison Method
12.	Dial Bore Gauge (Transmission Mechanism) [§] L.C.: 0.001 mm	Up to 2 mm	4.2 μ m	Using ULMM by Comparison Method
13.	Dial Thickness Gauge [§] L.C.: 0.01 mm	Up to 25 mm	5.0 μ m	Using Gauge Block Set by Comparison Method
14.	Ultrasonic Thickness Gauge [§] L.C.: 0.1 mm	Up to 200 mm	71 μ m	Using Steel Gauge Block Set by Comparison Method

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15.	Micrometer Head [§] L.C.: 0.001 mm	0 to 25 mm	2.6 μ m	Using ULMM by Comparison Method
16.	Thickness Foil [§]	Up to 2 mm	1.4 μ m	Using ULMM by Direct Method
17.	Feeler Gauge [§]	Up to 1 mm	1.4 μ m	Using ULMM by Direct Method
18.	Radius Gauge [§]	0.6 mm to 25 mm	10 μ m	Using Profile Projector by Direct Method
19.	Thread Pitch Gauge [§]	0.4 mm to 6 mm	10 μ m	Using Profile Projector by Direct Method
20.	Cylindrical Measuring Pin [§]	Up to 20 mm	1.4 μ m	Using ULMM by Direct Method
21.	Thread Measuring Wire [§]	0.17 mm to 6.35 mm	1.4 μ m	Using ULMM by Direct Method
22.	Micrometer Setting Standard/Length Bar [§]	Up to 475 mm	7.2 μ m	Using ULMM, Gauge Block, Length Bar, Optical Flat by Comparison Method
23.	Measuring Scale/ Steel Scale/Taper Scale/Ruler [§]	Up to 1000 mm	125 μ m	Using Scale & Tape Calibration Machine by Direct Method
24.	Measuring Tape [§]	Up to 50 meter	125 \sqrt{L} /1000 L is in mm	Using Scale & Tape Calibration Machine by Direct Method
25.	Test Sieves [§] 1. Aperature Size	0 to 0.5 mm	4.2 μ m	Using VMM by Direct Method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
		0.5 mm to 125 mm	13.1 μ m	Using Digital Caliper by Direct Method
26.	V Block ^s Parallelism, Symmetricity, Squareness	Up to 150 mm	6.0 μ m	Using Test Mandrel, Dial Gauge, Surface Plate, Cylindrical Square by Comparison Method
27.	Engineering Square/ Tri Square/ Right Angle Grade-1, 2,3 ^s 1. Parallelism of Blade Edge 2. Squareness of External Square 3. Squareness of Internal Square	Up to 600 mm	7.6 μ m	Using Ele. Level Meter, Surface Plate, Dial Gauge, Gauge Block Set, Cylindrical Square by Comparison Method
28.	Straight Edge ^s 1. Straightness of Working face 2. Parallelism of Working face Grade 0, 1, 2	Up to 2000 mm x 2000 mm	8.3 μ m//mtr	Using Surface Plate, Dial Gauge, Gauge Block Set, Ele. Level Meter, by Comparison Method
29.	Angle Plate/Precision Angle Plate ^s Flatness of Working Face Parallelism of Opposite Face & Edge Squareness of Working face	Up to 300 mm	2.0 μ m 2.0 μ m 3.5 μ m	Using Ele. Level Meter, Surface Plate, Screw Jack, Dial Gauge, Cylindrical Square, Gauge Block Set by Comparison Method
30.	Comparator Stand Flatness of Working Table ^s	Up to 400X400 mm	7.0 μ m	Using Gauge Block Set, Dial Gauge, Optical Flat, Ele. Level Meter,

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
				Surface Plate by Comparison Method
31.	Plain Plug Gauge / O.D. Master / Width Gauge [§]	Up to 100 mm	1.7 μ m	Using ULMM by Comparison Method
32.	Snap Gauge [§]	3 mm to 150 mm	3.1 μ m	Using Gauge Block Set, by Comparison Method
33.	Plain Ring Gauge [§]	4 mm to 100 mm	1.7 μ m	Using ULMM by Comparison Method
34.	Parallel Thread Plug Gauge/Wear Check Plug Gauge [§]	2 mm to 100 mm	2.3 μ m	Using ULMM, Thread Measuring Wire by Comparison Method
35.	Parallel Thread Ring Gauge/ Wear Check Ring Gauge [§]	2 mm to 100 mm	2.0 μ m	Using ULMM by Comparison Method
36.	Wire Gauge [§]	0 to 10 mm	3.5 μ m	Using VMM by Direct Method
37.	Profile Projector [#]	Linear -Up to 300 mm / L.C.- 0.001 mm Angular- Up to 360 Deg. Magnification-5X, 10X, 20X, 50X, 100X	5.7 μ m 7 Sec. 0.50 %	Using Glass Scale, Angle Gauge, Gauge Block Set, Digital Caliper by Comparison Method
38.	Metallurgical Microscope [#]	Magnification-5X, 10X, 20X, 40X, 50X, 60X, 80X,100X	0.50 % for Magnification	Using Glass Scale, Eye Piece by Comparison Method
39.	Tool Maker Microscope [#] (Travelling Only)	Linear measurement -X, Y = 25X25 mm	4.3 μ m for Axis Movement	Using Glass Scale, Eye Piece by Comparison Method

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40.	Stereo Zoom Microscope [#]	Magnification-8X to 80X, Eyepiece 10X	0.50 % for Magnification	Using Glass Scale, Eye Piece by Comparison Method
41.	Vision Measurement Machine [#] Linear Angular Measurement	300 mm X 200 mm X 200 mm Up to 360 Degree	5.6 µm 7 Sec.	Using Gauge Block Set, Glass Scale, Angle Gauge by Comparison Method
42.	Length Measuring Machine [#] L.C.: 0.0001 mm	Up to 100 mm	1.3 µm	Using Gauge Block Set, Optical Flat by Comparison Method
43.	Vertical Single Axis Measuring Machine [#] L.C.: 0.0001 mm	Up to 600 mm	11.9 µm	Using Caliper Checker, Gauge Block Set, Length Bar by Comparison Method
44.	Surface Plate [#]	Up to 3 Meter x 3 Meter	$0.92\sqrt{L+W}/125$ L & W is in mm	Using Electronic Level Meter by Direct Method
II.	PRESSURE INDICATING DEVICES			
1.	Pressure Gauge [#] (Digital Analog)	0 to 7 bar 0 to 70 bar 0 to 700 bar	0.17 bar 0.37 bar 0.55 bar	Using Digital Pressure Gauge with Hydraulic Comparator Pump (Water Based) Based on DKD-R6-1
III.	HARDNESS TESTING MACHINE			
1.	Verification of Rockwell Hardness Testing Machine [#]	HRBW HRC	1.79 HRBW 1.30 HRC	Using Standard Block as per IS: 1586-2:2012 Indirect Method
2.	Verification of Vickers Hardness Testing Machine [#]	HV 0.5 HV1 HV10	3.21 % 3.0 % 2.0 %	Using Standard Block as per IS: 1501-2:2013 Indirect Method

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3.	Verification of Brinell Hardness Testing Machine [#]	HBW 2.5/187.5 HBW 5/750 HBW 10/3000	1.68 % 1.33 % 1.29 %	Using Standard Block as per IS: 1500-2:2013 Indirect Method

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<u>THERMAL CALIBRATION</u>				
I.	TEMPERATURE			
1.	RTD / Thermocouple, with or without Indicator /Data Logger/Temperature Scanner / Temperature Recorder/ Temperature Transmeter/ Digital Thermometer [#]	(-) 30 °C to 125 °C	0.27 °C	Using SSPRT & Precision Scanner, Liquid Bath by Comparison Method
2.	Glass Thermometer/ Dial Temperature Gauge [#]	(-) 30 °C to 125 °C	0.55 °C	Using SSPRT & Precision Scanner, Liquid Bath by Comparison Method
3.	RTD/Thermocouple, with or without Indicator /Data Logger/ Temperature Scanner/ Temperature Recorder/ Temperature Transmeter/ Digital Thermometer [#]	125 °C to 500 °C 500 °C to 800 °C 800 °C to 1200 °C	0.60 °C 1.98 °C 2.76 °C	Using SSPRT & S-Type Thermocouple with Precision Scanner, Dry Block Calibrator by Comparison Method
4.	Temperature Indicator with Sensor of Freezers, Oven, Environment Chamber, Incubator	(-) 50°C to 600°C 600°C to 1200°C	0.74°C 2.82°C	Using SSPRT & S-Type Thermocouple with Precision Scanner by Comparison Method Single Position

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	(for Non-Medical Applications), Liquid Bath, Dry Block Furnace, Tray, Dryer, DHS, Autoclave (for Non-Medical Applications) #			Calibration (At Measuring Location in DUC)
5.	Calibration of Freezers, Oven, Chamber, Incubator (for Non-Medical Applications), Liquid Bath, Furnace*	(-) 30 °C to 400 °C	4.6 °C	Using RTD (Minimum 9 Nos.) with Precision Scanner (Multi Position Calibration)
6.	Calibration of Oven, Chamber, Furnace*	400 °C to 1000 °C	7.0 °C	Using N Type Thermocouple (Minimum 9 Nos.) with Precision 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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