

Laboratory Galaxy Test & Calibration Lab, B-107 & 108, 1st Floor, Ganpati Plaza
Bhiwadi, Distt. Alwar, Rajasthan

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number CC-2707

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Validity 28.05.2018 to 27.05.2020

Last Amended on -

| Sl. | Quantity Measured / Instrument | Range/Frequency | *Calibration Measurement Capability (\pm) | Remarks |
|---|--------------------------------|--|---|---|
| <u>ELECTRO-TECHNICAL CALIBRATION</u> | | | | |
| I. | SOURCE | | | |
| 1. | DC Voltage ^s | 1mV to10 mV 10 mV to 30 mV 30 mV to 30 V 30 V to1000 V | 0.75% to 0.08% 0.08% to 0.03% 0.03% to 0.01% 0.01% to 0.013% | Using Fluke 9100 MF Calibrator |
| 2. | DC Current ^s | 1 μ A to 10 μ A 10 μ A to 30 μ A 30 μ A to 300 mA 300 mA to 20 A | 1.41% to 0.15% 0.15% to 0.06% 0.06% to 0.03% 0.03% to 0.10% | Using Fluke 9100 MF Calibrator |
| 3. | AC Voltage ^s | 50 Hz to 1 kHz 10 mV to 30 mV 50 Hz 30 mV to 30 V 30 V to 1000 V | 4.48% to 0.12% 0.12% to 0.06% 0.06% to 0.08% | Using Fluke 9100 MF Calibrator |
| 4. | AC Current ^s | 50 Hz to 1 kHz 100 μ A to 300 mA 50 Hz 300 mA to 20 A 20 A to 1000 A | 0.43% to 0.2% 0.2% to 0.5% 0.29% to 0.73% | Using Fluke 9100 MF Calibrator With 10 Turn & 50 Turn Current Coil |

Ashish Kakran
Convenor

Avijit Das
Program Director

Laboratory

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|-----|--|--|--|--|
| 5 | Resistance ^s (4 Wire) | 0.001 Ω 0.01 Ω 0.1 Ω 1.0 Ω | 0.24% 0.24% 0.24% 0.24% | Using Standard Resistance Box (Fixed Value) |
| 6. | Resistance ^s (2 Wire) | 2 M Ω 20 M Ω 200 M Ω 2 G Ω 20 G Ω 1 Ω to 10 Ω 10 Ω to 40 Ω 40 Ω to 400 k Ω 400 k Ω to 40 M Ω 40 M Ω to 400 M Ω | 1.26% 1.39% 2.59% 3.01% 6.29% 2.371% to 0.286% 0.3% to 0.12% 0.12 % to 0.024% 0.024 % to 0.36% 0.36% to 0.36% | U sing Standard Resistance Box (Fixed Value) Using Fluke 9100 MF Calibrator |
| 7. | Frequency ^s (2 Wire) | 1 Hz to 1 MHz 10 MHz | 0.60% to 0.0646% 0.0058% | Using Fluke 9100 MF Calibrator |
| 8. | Capacitance ^s | 1 nF to 4 μ F 4 μ F to 10 mF | 4.17%to 2.018% 4.0% to 1.15% | Using Fluke 9100 MF Calibrator |
| 9. | AC Power ^s Frequency 45 - 65 Hz Cos ϕ :1 40 V To 600 Volt (100 mA to 20 A) 4 W to 1000 W 1 kW to 12 kW | 4 W to 12 kW | 2.0% | Using Fluke 5080 MF Calibrator |

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Convenor

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|-----|---|--|--|---|
| 10. | DC Power ^s Cos ϕ :1 40 V to 600 Volt (100 mA to 20 A) 4 W to 1000 W 1 kW to 12 kW | 4 W to 12 KW | 0.9% | Using Fluke 5080 MF Calibrator By Direct Method |
| 11. | Power Factor ^s Frequency 50 Hz | 0.1 to 1 (Lag/Lead) | 1.9 % | Using Fluke 5080 MF Calibrator By Direct Method |
| 12. | Temperature Simulation Temperature Indicator/Controller/ Recorder ^s RTD Type "J" Type Thermocouple "K" Type Thermocouple "T" Type Thermocouple "R" Type Thermocouple "S" Type Thermocouple | (-)200 °C to 800 °C (-)200 °C to 1200 °C (-)200 °C to 1300 °C (-)200 °C to 400 °C 0 °C to 1700 °C 0 °C to 1700 °C | 0.28°C to 0.56 °C 0.31°C to 1.0 °C 0.31°C to 1.0 °C 0.32 °C to 0.7 °C 0.40°C to 1.2 °C 0.40°C to 1.2 °C | Using Fluke 9100 MF Calibrator By Direct Method |
| 13. | DC Voltage* | 1mV to10 mV 10 mV to30 mV 30 mV to 30 V 30 V to1000 V | 1.30% to 0.14% 0.14% to 0.06% 0.06% to 0.12% 0.12% to 0.016% | Using Fluke 5080 MF Calibrator By Direct Method |
| 14. | DC Current* | 1 μ A to 10 μ A 10 μ A to 30 μ A 30 μ A to 300 mA 300 mA to 20 A | 11.6% to 1.25% 1.25% to 0.47% 0.47% to 0.07% 0.07% to 0.10% | Using Fluke 5080 MF Calibrator By Direct Method |

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| 15. | AC Voltage* | 50 Hz to 1kHz 10 mV to 30 mV 30 mV to 30 V 30 V to 1000 V | 1.08% to 0.61% 0.61% to 0.124% 0.124% to 184% | Using Fluke 5080 MF Calibrator By Direct Method |
| 16. | AC Current* | 50 Hz to 1kHz 100 μ A to 300 mA 300 mA to 20 A | 1.6% to 0.30% 0.30% to 0.8% | Using Fluke 5080 MF Calibrator By Direct Method |
| 17. | Resistance* (2 Wire) | 1 Ω to 10 Ω 10 Ω to 40 Ω 40 Ω to 400 k Ω 400 k Ω to 190 M Ω | 1.5% to 0.18% 0.18% to 0.06% 0.06% to 0.049% 0.049% to 1.155% | Using Fluke 5080 MF Calibrator By Direct Method |
| 18. | Frequency* | 45 Hz to 1000 Hz | 0.02% to 0.01% | Using Fluke 5080 MF Calibrator By Direct Method |
| 19. | AC Power* Frequency 45 - 65 Hz Cos ϕ :1 40 V to 600 Volt (100 mA to 20 A) 4 W to 1000 W 1 kW to 12 kW | 4 W to 12 KW | 2.0% | Using Fluke 5080 MF Calibrator |
| 20. | DC Power* Cos ϕ :1 40 V to 600 Volt (100 mA to 20 A) 4 W to 1000 W 1 kW to 12 kW | 4 W to 12 KW | 0.9% | Using Fluke 5080 MF Calibrator By Direct Method |

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|-----|---|---|--|---|
| 21. | Power Factor* | 45 to 60hz 0.1 to 1 (Lag/Lead) | 1.9 % | Using Fluke 5080 MF Calibrator |
| 22. | Temperature Simulation Temperature Indicator/Controller/Recorder* RTD Type "J" Type Thermocouple "K" Type Thermocouple "T" Type Thermocouple "R" Type Thermocouple "S" Type Thermocouple | (-)-200 °C to 800 °C (-)-200 °C to 1200 °C (-)-200 °C to 1300 °C (-)-200 °C to 400 °C 0 °C to 1700°C 0 °C to 1700 °C | 0.77°C to 0.76 °C 0.8°C to 2.0 °C 0.8°C to 2.0 °C 0.8°C to 2.0 °C 0.9°C to 2.2 °C 0.9°C to 2.2 °C | Using Fluke 725 Calibrator By Direct Method |
| II. | MEASURE | | | |
| 1. | DC Voltage ^s | 1 mV to 100 mV 100 mV to 10 V 10 V to 1000 V | 0.86% to 0.08% 0.08% to 0.007% 0.007% to 0.019% | Using 6½ Fluke Multimeter By Comparison Method |
| 2. | DC Current ^s | 1 µA to 20 µA 20 µA to 200 mA 200 mA to 10 A | 3.007% to 0.205% 0.205% to 0.071% 0.071%to 0.21% | Using 6½ Fluke Multimeter By Comparison Method |
| 3. | AC Voltage ^s | 50 Hz 1 mVto 100 mV 100 mV to 1000 V | 4.7% to 0.12% 0.12% to 0.11% | Using 6½ Fluke Multimeter By Comparison Method |
| 4. | AC Current ^s | 50 Hz 10 µA to 2 mA 2 mA to 200 mA 200 mA to 10 A | 0.59% to 0.35% 0.35% to 0.35% 0.35% to 0.25% | Using 6½ Fluke Multimeter By Comparison Method |

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Avijit Das
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| | | 50 A to 1000 A | 1.24% to 1.16 % | Using 1730 Fluke Energy Logger By Comparison Method |
| 5. | Resistance [§] (4 Wire) | 1 mΩ to 10 mΩ 10 mΩ to 100 mΩ 100 MΩ to 1 Ω | 1.3% to 0.9% 0.9% to 0.6% 0.6% to 0.2% | Using Micro Ohm Meter By Comparison Method |
| | (2 Wire) | 1 Ω to 100 Ω 100 Ω to 100 KΩ 100 KΩ to 10 MΩ 10 MΩ to 1000 MΩ | 0.96% to 0.09% 0.09% to 0.08% 0.08% to 0.17% 0.17% to 2.3% | Using 6½ Fluke Multimeter By Comparison Method |
| 6. | Frequency [§] | 10 Hz to 1 MHz | 0.12 % to 0.01% | Using 6½ Fluke Multimeter By Comparison Method |
| 7. | Capacitance [§] | 1 kHz 100 Pf to 100 µf | 0.29% to 0.29 % | Using LCR Meter By Comparison Method |
| 8. | Inductance [§] | 1 kHz 100 µh to 10 H | 0.45% to 0.45% | Using LCR Meter By Comparison Method |
| 9. | Stop Watch [§] (Digital/ Mechanical) | 10 Sec to 24 Hours | 0.010 s to 111.4 Sec. | Using Time Totalizer By Comparison Method |
| 10. | Temperature Simulation Temperature Indicator/Controller/ Recorder [§] RTD Type "J" Type Thermocouple | (-)200 °C to 800 °C (-)200 °C to 1200 °C | 0.29°C to 0.6 °C 0.48°C to 1.0 °C | Using Fluke 1586 Temp. Scanner By Direct Method |

Ashish Kakran
Convenor

Avijit Das
Program Director

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| | "K" Type Thermocouple "T" Type Thermocouple "R" Type Thermocouple "S" Type Thermocouple | (-200 °C to 1300 °C (-200 °C to 400 °C 0 °C to 1700 °C 0 °C to 1700 °C | 0.48°C to 1.0 °C 0.50°C to 0.8 °C 0.60°C to 1.4 °C 0.60°C to 1.4 °C | |
| 11. | High Voltage* AC/DC | 1 kV to 35 kV Dc 1 kV to 27 kV Ac | 2.90% to 2.89% 6.28% to 6.27% | Using High Voltage Probe & DMM 4 ^{1/2} By Direct Method |
| 12. | Timer* | 10 Sec to 24 Hours | 0.010 s to 111.4 Sec. | Using Time Totalizer By Comparison Method |
| 13. | All DPM* (Related To Pressure/RPM/ Humidity/Weighing (0-20 Ma DC) | 1 mA to 20 mA | 0.07% to 0.08% | Using Fluke 725 Calibrator By Direct Method |
| 14. | All DPM* (Related To Pressure/RPM/ Humidity/Weighing (0-10 V Dc) | 10 mV to 10 V | 0.15% to 0.06% | Using Fluke 725 Calibrator By Direct Method |
| 15. | Power / Energy* 1 ϕ ,3 ϕ Pf 0.5 (Lag/Lead) Frequency 45-65 Hz | Voltage 50 V to 500 V Current 0.1 A To 1000 A Active Power 36 Kw AC Energy 30 KWH | 0.1% 0.1% 0.7% 2.17% | Using Energy Logger Fluke1730 By Comparison/Direct Method |
| | 1 ϕ ,3 ϕ Upf Frequency 45-65 Hz | Active Power 72 Kw Reactive Power 72 Kw Appr. Power 72 Kw | 0.7% 0.7% 0.7% | Using Energy Logger Fluke1730 By Comparison/Direct Method |

Ashish Kakran
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Avijit Das
Program Director

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|-----|--|---------------------|---|--|
| 16. | Power Factor* Frequency 45-65 Hz | 0.1 To 1 (Lag/Lead) | 0.917% | Using Energy Logger Fluke1730 By Comparison/Direct Method |

MECHANICAL CALIBRATION

| | | | | |
|----|--|---------------|--------------|--|
| 1. | Vernier Caliper/ Dial/Electronic L.C. : 0.01 mm | 0 to 600 mm | 16.6 μ m | Using Caliper Checker Comparison Method |
| 2. | Depth Caliper Vernier/Digital/Dial L.C. : 0.01 mm | 0 to 150 mm | 8.4 μ m | Using Gauge Block Set Comparison Method |
| 3. | Height Gauge Vernier/Digital/Dial L.C. : 0.01 mm | 0 to 600 mm | 15.1 μ m | Using Caliper Checker Comparison Method |
| 4. | External Micrometer Vernier/Digital/Dial L.C. : 0.001 mm | 0 to 100 mm | 1.8 μ m | Using Gauge Block Set Comparison Method |
| 5. | Micrometer Setting Standard | 25mm to 75 mm | 3.3 μ m | Using Gauge Block Set Comparison Method |

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|-----|--|-----------------------------|---|--|
| 6. | Inside Micrometer Stick Micrometer (2 Points) Basic Travel Of Micrometer L.C. : 0.01 mm | Up to 100 mm | 3.3 μ m | Using Gauge Block Set Comparison Method |
| | Overall Length Accuracy With Extension Rod L.C. : 0.01 mm | 50 mm to 600 mm | 10.5 μ m | Using Caliper Checker Comparison Method |
| 7. | Depth Micrometer L.C. : 0.01 mm | 0 to 25m | 2.0 μ m | Using Gauge Block Set Comparison Method |
| 8. | Plunger Dial L.C. : 0.01 mm | 0 to 25 mm | 1.9 μ m | Using Electronic Dial Calibration Tester Comparison Method |
| 9. | Lever Dial L.C. : 0.001 mm L.C. : 0.01 mm | 0 to 0.14 mm 0 to 0.8 mm | 1.8 μ m 6.0 μ m | Using Electronic Dial Calibration Tester Comparison Method |
| | Bore Gauge (For Transmission Error) L.C. : 0.001 mm | 0 to 1 mm | 3.4 μ m | Using Electronic Dial Calibration Tester Comparison Method |

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|-----|--|-----------------|---|---|
| 11. | Plain Plug Gauge | 1mm to 100 mm | 3.2 μ m | Using Gauge Block Set, Comparator Stand With Dial Gauge Comparison Method |
| 12. | Snap Gauge | 3 mm to 100 mm | 1.0 μ m | Using Gauge Block Set, Comparison Method |
| 13. | Feeler Gauge/ Thickness Foils | Up to 1 mm | 2.4 μ m | Using Digital Micrometer, Comparison Method |
| 14. | Dial Thickness Gauge L.C : 0.001 mm | 0 to 25 mm | 6.6 μ m | Using Gauge Block Set, Comparison Method |
| 15. | Bevel Protector L.C : 5 min | 0 to 90 ° | 4.5 min | Using Angle Gauge Set, Surface Plate Comparison Method |
| 16. | Combination Set LC : 1° | 0 to 180 ° | 35 min | Using Angle Gauge Set, Surface Plate Comparison Method |
| 17. | Coating Thickness Gauge | Up to 1 mm | 2.0 μ m | Using Thickness Foils, Comparison Method |
| 18. | Pistol Caliper LC : 0.001 mm | Up to 100 mm | 67 μ m | Using Gauge Block Set, Comparison Method |

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Avijit Das
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| 19. | V Block Parallelism, Flatness, Symmetricity | Up to 150 mm | 18.3 μ m | Using Gauge Block Set, Straight Mandrel Comparison Method |
| II. | PRESSURE INDICATING DEVICES | | | |
| 1. | Manometer/ Magnehelic Gauge [#] | 0 to 2.5 Mbar 2.5 to 100 Mbar | 0.103 mbar 1.66 mbar | Using Digital Manometer By Comparison method based on DKD-R-6-1 &2 |
| 2. | Vacuum Gauge, Dial, Digital, Vacuum Transmitter/Switch/ Transducer With Or Without Indicator [#] | (-)0.92 to 0 Bar | 0.01 bar | Using Digital Pressure Gauge By Comparison method based on DKD-R-6-1 &2 |
| 3. | Pressure Gauge, Dial, Digital, Pressure Transmitter/Switch/ Transducer With Or Without Indicator [#] | 0 to 4 Bar | 0.01 bar | Using Digital Pressure Gauge By Comparison method based on DKD-R-6-1 &2 |
| 4. | Pressure Gauge, Dial, Digital, Pressure Transmitter/Switch/ Transducer With Or Without Indicator [#] | 0 to 30 Bar | 0.11 bar | Using Digital Pressure Gauge By Comparison method based on DKD-R-6-1 &2 |
| 5. | Pressure Gauge, Dial, Digital, Pressure Transmitter/Switch/ Transducer With Or Without Indicator [#] | 0 to 700 Bar | 1.65 bar | Using Digital Pressure Gauge By Comparison method based on DKD-R-6-1 &2 |
| III. | SPEED & ACCELERATION | | | |
| 1. | Digital/Analogue Tachometer & RPM | Contact 100 to 3000 RPM | 0.48 % | Using Digital |

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Convenor

Avijit Das
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| | Meter, Rpm Indicator RPM Meter Of Centrifuge# (Contact & Non Contact) | Non Contact 3000 to 50000 Rpm | 0.83 % | Tachometer& RPM Source By Comparison method based |

| IV. | ACOUSTIC | | | |
|-----|--|--|--|---|
| 1. | Digital/Analogue Sound Level Meter [§] | 94 Db 114 Db | 2.65 db 2.71 db | Using Sound Calibrator by Direct Method |
| V. | WEIGHTS | | | |
| 1. | Mass Class M1 & Coarser [§] | 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 | 0.022 mg 0.022 mg 0.022 mg 0.022 mg 0.024 mg 0.022 mg 0.022 mg 0.067 mg 0.089 mg 0.111 mg 0.133 mg 0.133 mg 0.133 mg 0.133 mg 0.133 mg 0.22 mg 1.19 mg | Using Standard Weights Class F1 & Weighing Balance LC :0.01/0.1 mg) as per OIML R-111 |

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Convenor

Avijit Das
Program Director

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| | Class M2 & Coarser ^b | 500 g 1000 g | 8.5 mg 14 mg | Using Standard Weights Class M1 & Weighing Balance LC :0.1 mg) as per OIMLR-111 |
| | | 2 kg 5 kg | 32 mg 86 mg | Using Standard Weights Class M1 & Weighing Balance LC :0.001 g) as per OIML R-111 |
| VI. | WEIGHING SCALE & BALANCE | | | |
| 1. | Weighing Scale (Class II And Coarser) Readability = 0.1 mg And Coarser* | 1 mg to 200 g | 0.5 mg | Using Standard Weights Class F1 as per OIML R-76-1 7 |
| | Class III And Coarser* Readability = 500 mg Readability = 2 G | >200 g to 5 kg >5 kg to 40 kg | 0.65 mg 1.45 mg | Using Standard Weights Class M1 as per OIML R-76-1 7 |
| | Class IV And Coarser* Readability = 20 g | >40 kg to 200 kg | 19.3 g | Using Standard Weights Class M1 as per OIML R-76-1 7 |

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THERMAL CALIBRATION

| I. TEMPERATURE | | | | |
|-----------------------|---|-----------------|---------|---|
| 1. | Temperature, Transmitter, RTDS, Thermocouple With Or Without Indicator/Controller / Data Logger/ Recorder, Temperature Gauge, Digital Thermometer [#] | -196 °C | 0.20 °C | Using PRT with Data Scanner & Liquid Nitrogen Bath By Comparison Method |
| 2. | Temperature, Transmitter, Rtds, Thermocouple With Or Without Indicator/Controller / Data Logger/ Recorder, Temperature Gauge, Digital Thermometer, Glass Thermometer [#] | -35 °C to 50 °C | 0.31 °C | Using PRT with Data Scanner Low Temperature Bath by Comparison Method |

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| 3. | Temperature, Transmitter, Rtds, Thermocouple With Or Without Indicator/Controller / Data Logger/ Recorder, Temperature Gauge , Digital Thermometer, Glass Thermometer [#] | 50 °C to 250 °C | 0.29 °C | Using PRT with Data Scanner & Oil Bath By Comparison Method |
| 4. | Temperature, Transmitter, RTDS, Thermocouple With Or Without Indicator/Controller / Data Logger/ Recorder, Temperature Gauge , Digital Thermometer [#] | 250 °C to 400 °C | 0.88 °C | Using PRT with Data Scanner & Dry Block Furnace By Comparison Method |
| 5. | Temperature, Transmitter, RTDS, Thermocouple With Or Without Indicator/Controller / Data Logger/ Recorder, Temperature Gauge , Digital Thermometer [#] | 400 °C to 1200 °C | 2.8 °C | Using S Type Thermocouple With Data Scanner & Dry Block Furnace By Comparison Method |
| 6. | Temperature Indicator With Sensor Of Liquid Nitrogen Bath [*] | -196 °C | 0.3 °C | Using PRT With Data Scanner Single Position Calibration (At measuring Location in DUC) |

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| 7. | Temperature Indicator With Sensor Of Freezer, Oven, Environment, Chambers, Incubator, Liquid Bath, Dry Block Furnace* | -80 °C to 400 °C | 0.88 °C | Using PRT With Data Scanner Single Position Calibration (At measuring Location in DUC) |
| 8. | Temperature Indicator With Sensor Of Furnace, Muffle Furnace, Dry Block Furnace* | 400 °C to 1200 °C | 2.8 °C | Using S Type Thermocouple With Data Scanner Single Position Calibration (At measuring Location in DUC) |
| 9. | Calibration Of Freezer, Ovens, Environment Chamber, Incubator* | -30 °C to 250 °C | 2.4 °C | Using RTD Sensors (Minimum Nine) With Data Logger Multi Position Calibration |
| 10. | Calibration Of Industrial Furnace/, Muffle Furnace Etc* | 250 °C to 1200 °C | 4.4 °C | Using K-Type Thermocouple (Minimum Nine) Data Logger Multi Position Calibration |
| II. | SPECIFIC HEAT AND HUMIDITY | | | |

Ashish Kakran
Convenor

Avijit Das
Program Director

Laboratory Galaxy Test & Calibration Lab, B-107 & 108, 1st Floor, Ganpati Plaza
Bhiwadi, Distt. Alwar, Rajasthan

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number CC-2707

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Validity 28.05.2018 to 27.05.2020

Last Amended on -

| Sl. | Quantity Measured / Instrument | Range/Frequency | *Calibration Measurement Capability (\pm) | Remarks |
|-----|---|--|---|--|
| 1. | Digital / Analogue Hygrometer, Rh Sensor With Controller/ Indicator/Recorder/ Data Logger ^{\$} | 30 % RH to 85% RH @ -25 ^o C | 0.82% RH | Using RH Indicator & RH Generator Cum Chamber BY Comparison Calibration |
| 2. | Humidity Sensor Of Industrial Environment Chamber/ Humidity Chamber [*] | 30 % RH to 85% RH @ -25 ^o C | 1.82% RH | With RH Indicator Single Position Calibration (At measuring Location in DUC) |
| 3. | Calibration Of Environment Chamber, Humidity Chamber [*] | 30 % RH to 85% RH @ -25 ^o C | 3.9 %RH | Using Wireless Humidity/ Temp. Data logger. (Minimum Nine) Multiposition 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.

Ashish Kakran
Convenor

Avijit Das
Program Director