Laboratory	**Excellent Calibration Services, Door No. 2108, 13th Main Road, Anna Nagar, Chennai, Tamil Nadu**		
Accreditation Standard	**ISO/IEC 17025: 2005**		
Certificate Number	**CC-2565**	**Page**	**1 of 18**
Validity	**07.02.2018 to 06.02.2020**	**Last Amended on**	**-**

ELECTRO TECHNICAL CALIBRATION

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
I.	**SOURCE**			
1.	DC Voltage[$]	1mV to 10mV 10mV to 100mV 100mV to 1000V	0.77% to 0.084% 0.084% to 0.014% 0.014% to 0.0077%	Using Multiproduct Calibrator Transmille 3041A by Direct Method
2.	AC Voltage[$]	**45Hz to 999Hz** 10mV to 100mV 100mV to 1000V	 0.55% to 0.13% 0.13% to 0.10%	Using Multiproduct Calibrator Transmille 3041A by Direct Method
		999Hz to 19.999kHz 10mV to 100mV 100mV to 1V 1V to 10V 10V to 100V	 1.04% to 0.27% 0.27% to 0.21% 0.21% to 0.17% 0.17% to 0.28%	
		19.999kHz to 99.999kHz 10mV to 100mV 100mV to 20V	 2.3% to 0.85% 0.85% to 1.2%	
3.	DC Current[$]	10µA to 100µA 100µA to 1A 1A to 10A 10A to 30A 30A to 1000A	0.72% to 0.092% 0.092% to 0.045% 0.045% to 0.11% 0.11% 0.60%	Using Multiproduct Calibrator Transmille 3041A & Current Coil Adapter EA001 by Direct Method

Rajeshwar Kumar
Convenor

Avijit Das
Program Director

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
4.	AC Current[$]	**45Hz to 999Hz** 10µA to 100µA 100µA to 100mA 100mA to 1A 1A to 10A **999Hz to 5kHz** 10mA to 1A **50Hz** 10A to 30A 10A to 1000A	 6.0% to 0.79% 0.79% to 0.28% 0.28% to 0.31% 0.31% to 0.73% 1.20% to 1.43% 0.23% 0.60%	Using Multiproduct Calibrator Transmille 3041A Using Current Coil Adapter EA001 by Direct Method
5.	Frequency[$]	10Hz to 10MHz 10MHz to 350MHz	0.0023% 0.0023 to 0.0035%	Using Multiproduct Calibrator Transmille 3041A by Direct Method
6.	DC Resistance[$] 4wire	1Ω 10Ω 100Ω 1kΩ 10kΩ 100kΩ	1.2% 0.14% 0.023% 0.018% 0.018% 0.017%	Using Multiproduct Calibrator Transmille 3041A by Direct Method
	2wire	1MΩ 10MΩ 100MΩ	0.031% 0.085% 1.05%	

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
	Simulated Resistance	10Ω to 100Ω 100Ω to 1kΩ 1kΩ to 10kΩ 10kΩ to 10MΩ	0.61% to 0.092% 0.092% to 0.040% 0.040% to 0.035% 0.035% to 0.036%	
7.	Capacitance[$]	**1kHz** 1nF 10nF 20nF 50nF 100nF 1µF 10µF	 0.32% 0.30% 0.30% 0.30% 0.30% 0.47% 0.70%	Using Multiproduct Calibrator Transmille 3041A by Direct Method
8.	Inductance[$]	**1kHz** 1mH 10mH 20mH 50mH 100mH 1H 10H	 0.59% 0.59% 0.59% 0.59% 0.59% 0.59% 0.59%	Using Multiproduct Calibrator Transmille 3041A by Direct Method
9.	DC Power[$]	1V to 500V / 0.1A to 20A (0.1W to 10KW)	0.21% to 0.084%	Using Multiproduct Calibrator Transmille 3041A by Direct Method
10.	AC Power[$]	**50Hz**, PF=1 12W to 4.8 kW (120V & 240V / 0.1A to 20A)	0.28% to 0.13%	Using Multiproduct Calibrator Transmille 3041A by Direct Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
11.	AC Power[$]	**50Hz**, PF=0.5 6W to 2.4 kW (120V & 240V / 0.1A to 20A)	.06% to 0.89%	Using Multiproduct Calibrator Transmille 3041A by Direct Method
12.	Temperature Simulation[$]			Using Multiproduct Calibrator Transmille 3041A & Thermocouple Simulator Adaptor EA001 by Direct Method
	RTD	(-)100°C to 800°C	0.087°C to 0.11°C	
	K-Type	(-)100°C to 1300°C	0.15°C to 0.43°C	
	J – Type	(-)100°C to 750°C	0.12°C to 0.36°C	
	T – Type	(-)100°C to 400°C	0.26°C	
	E – Type	200°C to 800°C	0.15°C	
	R – Type	500°C to 1700°C	0.63°C to 1.3°C	
	B – Type	500°C to 1800°C	0.65°C to 1.6°C	
	S – Type	500°C to 1700°C	0.91°C to 2.0°C	
	N -Type	100°C to 1300°C	0.15°C to 0.47°C	
13.	Oscilloscope[$]			Using Multiproduct Calibrator Transmille 3041A with Scope Option by Direct Method
	Amplitude	2mV/div to 50V/div (12mV to 300V)	0.51 to 0.12%	
	Time Base	5ns to 1s	0.012% to 0.11%	
	Bandwidth	50kHz to 350MHz	1.19dB	

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
II.	**MEASURE**			
1.	DC Voltage[$]	1mV to 10mV 10mV to 100mV 100mV to 1V 1V to 10V 10V to 1000V	0.42% to 0.047% 0.047% to 0.010% 0.010% to 0.0055% 0.0055% to 0.0047% 0.0047% to 0.0065%	Using DMM Keysight 34461A by Direct Method
2.	AC Voltage[$]	**50Hz to 1kHz** 10mV to 100mV 100mV to 750V	 0.42% to 0.11% 0.11% to 0.10%	Using DMM Keysight 34461A by Direct Method
3.	DC Current[$]	100µA to 1mA 1mA to 10mA 10mA to 100mA 100mA to 1A 1A to 10A 10A to 30A	0.088% to 0.065% 0.065% to 0.081% 0.081% to 0.064% 0.064% to 0.13% 0.13% to 0.16% 0.16% to 0.36%	Using DMM Keysight 34461A Current Shunt Agilent 34330A by Direct Method
4.	AC Current[$]	**50Hz to 1kHz** 100µA to 1mA 1mA to 10mA 10mA to 100mA 100mA to 1A 1A to 10A **50Hz** 10A to 30A	 0.17% to 0.16% 0.16% 0.16% 0.16% to 0.18% 0.18% to0.39% 0.33% to 0.46%	Using DMM Keysight 34461A Current Shunt Agilent 34330A by Direct Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
5.	Resistance[$]	1Ω to 10Ω 10Ω to 100Ω 100Ω to 1MΩ 1MΩ to 10MΩ 10MΩ to 100MΩ	0.47% to 0.058% 0.058% to 0.016% 0.016% to 0.013% 0.013% to 0.048% 0.048% to 0.94%	Using DMM Keysight 34461A by Direct Method
6.	Frequency[$]	10Hz to 350MHz	0.012%	Using Multifunction Counter HC-F1000L by Direct Method
7.	Capacitance[$]	**1kHz** 1nF to 10nF 10nF to 100nF 100nF to 1µF	 2.4% to 0.50% 0.50% to 0.51% 0.51%	Using LCR Meter DE-5000 by Direct Method
8.	Inductance[$]	**1kHz** 1mH to 10mH 10mH to 100mH 100mH to 1H 1H to 10H	 2.4% to 1.4% 1.4% to 1.0% 1.0% to 0.77% 0.77% to 1.0%	Using LCR Meter DE-5000 by Direct Method
9.	Timer[$]	5sec to 24Hrs	0.14sec to 100sec	Timer Calibrator NCC TC-01 Comparison Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
	MECHANICAL CALIBRATION			
I.	**DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)**			
1.	Calipers$ (Vernier/Dial/Digital) LC : 10 µm Φ LC : 20 µm Φ	Upto 600 mm Above 600 mm to 1000 mm Above 1000 mm to 2000 mm	12.2 µm 13.3 µm 18.3 µm	Using Caliper Checker/Gauge Blocks/Length Bars IS:3651(Part1,2&3) Using Gauge Blocks/Length Bars
2.	Depth Caliper$ (Vernier/Dial/Digital) LC : 10 µm Φ	Upto 1000 mm	11.2 µm	Using Caliper Checker/Gauge Blocks/Length Bars IS 4213
3.	Height Gauge$ (Vernier/Dial/Digital) LC : 10 µm Φ	Upto 600 mm Above 600 mm to 1000 mm	10.3 µm 12.8 µm	Using Caliper Checker IS 2921

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
4.	Electronic Height Gauge[#] (1D/2D) Resn:0.1 µm [Φ]	Upto 300 mm Above300 mm to 600 mm Above600 mm to 1000 mm	2.8 µm 4.8 µm 5.0 µm	Using Gauge Blocks/Length Bars IS 2921
5.	External Micrometer[$] (Analog & Digital) LC:1 µm [Φ]	Upto 200 mm Above 200 to 300 mm Above 300 to 600 mm Above 600 to 1000 mm	2.0 µm 2.4 µm 3.4 µm 5.2 µm	Using Gauge Blocks/Length Bars IS 2967
6.	Depth Micrometer[$] (Analog & Digital) LC:1 µm [Φ]	Upto 300 mm Above 300 to 600 mm	0.9 µm 2.8 µm	Using Gauge Blocks/Length Bars IS 6468
7.	Internal Stick Micrometer[$] LC:1 µm [Φ]	5 mm to 200 mm Above 200 mm to 1500 mm	2.0 µm 5.8 µm	Using Gauge Blocks/Length Bars / Gauge Block Accessories IS 2966
	LC:10 µm [Φ]	Above 1500 mm to 2500 mm	22.5 µm	
8.	Plunger Dial Gauge[$] (Analog & Digital) LC:1 µm [Φ]	Upto 100 mm	1.0 µm	Using Length Measuring Machine IS2092

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
9.	Lever Type Dial Gauge[$] (Analog & Digital) LC:1 µm	Upto 3 mm	0.9 µm	Using Length Measuring Machine IS 11498
10.	Bore Gauge[$] (Analog & Digital) (Transmission Only) LC:1 µm [Φ]	Dia Range: Ø6-500 mm Probing Range: Upto 2 mm	0.7 µm	Using Length Measuring Machine JIS B 7515
11.	Groove Dial [$] Gauge(External) LC:5 µm [Φ]	0 to 100 mm	4.5 µm	Using Gauge Blocks
12.	Groove Dial [$] Gauge(Internal) LC:5 µm [Φ]	5 mm to 100 mm	4.5 µm	Using Gauge Blocks / Gauge Block Accessories
13.	Pistol Caliper [$] LC:100 µm [Φ]	0 to 100 mm	65.3 µm	Using Gauge Blocks
14.	Dial Thickness Gauge [$] LC:1 µm [Φ]	Upto 100 mm	1.1 µm	Using Gauge Blocks IS 2092
15.	Snap Gauge [$] (Fixed / Adjustable)	2.5 mm to 100 mm Above 100 mm to 200 mm	1.2 µm 1.9 µm	Using Gauge Blocks / Long Gauge Blocks IS 3455

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
		Above 200 mm to 300 mm Above 300 mm to 600 mm	2.2 µm 4.0 µm	
16.	Plain / Setting Plug Gauges [$]	0.5 mm Ø 100 mm Above Ø 100 mm to 200 mm Above Ø 200 mm to 300 mm	1.8 µm 2.8µm 3.2 µm	Using Electronic Micro Indicator / Gauge Blocks IS 3455
17.	Cylindrical Measuring Pin / Thread Measuring Wire [$]	Ø 0.5 mm to 20 mm	1.5 µm	Using Electronic Micro Indicator / Gauge Blocks IS 11103, IS 6311
18.	Cylindrical Setting Master [$]	Ø 1 to 100 mm Above Ø 100 to 200 mm	1.7 µm 2.7 µm	Using Gauge Blocks / Long Gauge Blocks / Electronic Micro Indicator IS 4349
19.	Feeler Gauge [$]	0.03 mm to 1 mm	2.5 µm	Using Electronic Micro Indicator IS 3179
20.	Limit Gauges [$] (Flush Pin Gauge / Width Gauge / CD Gauge / Height Setting Master)	Upto 100 mm Above Ø 100 to 500 mm	3.7 µm 7.0 µm	Using Gauge Blocks / Long Gauge Blocks / Electronic Micro Indicator / Height Gauge Linear Height Gauge
21.	Thread Plug Gauge [$]	Ø 3 to 100 mm	3.2 µm	Using Floating Carriage Dia. Measuring M/c(FCDM) IS 2334, IS 4218

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
22.	Taper Thread Plug Gauge [$]	Ø 3 to 100 mm	3.2 µm	Using Floating Carriage Dia. Measuring M/c(FCDM) ANSI/ASME B1.20.1
23.	Coating Thickness Gauge [$] LC:0.1 µm [Φ]	Upto 3 mm	2.3 µm	Using Standard Foil IS 6012
24.	Master Foils [$]	10 µm to 2 mm	1.7 µm	Using Electronic Micro Indicator
25.	Dial Calibration Tester [$] LC:0.2 µm [Φ]	Upto 25 mm	1.7 µm	Using Electronic Micro Indicator
26.	Plain Ring Gauges [$]	Ø 3 to 100 mm Above Ø 100 to 200 mm	1.0 µm 2.1 µm	Using Length Measuring Machine(LMM) / Master Ring Gauge IS 3455 & IS 3485
27.	Thread Ring Gauge [$]	Ø 3 to 100 mm Above Ø 100 to 200 mm	1.0 µm 2.3 µm	Using Length Measuring Machine(LMM) IS 2334 & IS 4218
28.	Floating Carriage Dia. Measuring Micrometer(FCDM) [$] LC:0.2 µm	Upto 100 mm	1.7 µm	Using Cylindrical Setting Master / Electronic Micro Indicator NPL-MOY/SCMI/9

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
29.	Caliper Checker / Height Master / Check Master $	Upto 600 mm	6.7 µm	Using Gauge Blocks/ Long Gauge Blocks / Height Gauge Linear Height Gauge
30.	Micrometer Setting Master $	12.5 mm to 700 mm	7.0 µm	Using Gauge Blocks / Lever Dial Gauge
31.	V-Block / Parallel Block / Raiser Block $ (Parallelism & Symmetry)	Upto 300 mm	5.8 µm	Using Linear Height Gauge Height Gauge / Test Mandrel IS 2949
32.	Comparator Stand $ (Flatness of Base)	300X300 mm	2.3 µm	Using Electronic Micro Indicator IS 7599
33.	Engineering Square / Try Square / Angle Plate $	Upto 600 mm	5.1 µm	Using Linear Height Gauge Height Gauge IS 2103 & IS 6923
34.	Micrometer Head $ LC:0.2 µm	Upto 25 mm	1.7µm	Using Gauge Blocks / Electronic Probe IS 9483
35.	Electronic Micro $ Indicator / LVDT Resn: 0.1 µm Φ	Upto 50 mm	0.5 µm	Using Gauge Blocks

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
36.	Bevel Protractor / [$] Combination Set LC: 5 Arc Min [Φ]	Upto 360°	5.8 Arc Min	Using Sine Bar / Gauge Blocks IS 5812 & 4239
37.	Three Pin Internal [$] Micrometer LC:1 µm [Φ]	Ø 6 to 100 mm	3.4 µm	Using Master Ring Gauges
38.	Measuring Scale[$] LC:0.5 mm [Φ]	Upto 2000 mm	$30\sqrt{(L/1000)}$µm L in mms	Using Scale / Tape Calibrator IS1481
39.	Measuring Tape / Pie Tape[$] LC:1 mm [Φ]	Upto 50 Metres	$40\sqrt{(L/1000)}$µm L in mms	Using Scale / Tape Calibrator IS 1269
40.	Surface Plate[#] (Granite / Cast Iron)	3000 mm X 3000 mm	$2.2\ \sqrt{(W+L)/100}$ µm W=Width, L=Length W,L in mms	Using Spirit Level IS 7327 & IS 12937
41.	Bench Centre[♣]	Centre Height Upto 300 mm Admit between centres: 300 mm	4.7 µm	Using Mandrel & Dial Indicator IS 5980

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
II.	**ACCELERATION AND SPEED**			
1.	Tachometer[$] (Non Contact)	100 rpm to 95000 rpm	1.95% to 0.12%	Using Digital Tachometer with RPM Source SANAS TR 45-1 / by Comparison Method
	Tachometer (Contact)	100 rpm to 6000 rpm	0.3% to 0.03%	
2.	Centrifuge / RPM Source[♣]	100 rpm to 95000 rpm	2.03% to 0.12%	Using Digital Tachometer SANAS TR 45-1 / By Direct Method
III.	**ACOUSTICS**			
1.	Sound Level Meter[$]	94 dB & 114 dB	0.54 dB	Using Sound Level Calibrator IS 15575 by Direct Method
IV.	**WEIGHING SCALE AND BALANCE**			
1.	Weighing Balance[♣] Readability:			
	10 mg	0 to 200 g	3.57 mg	Using F1 Class Standard Weights OIML R 76-1 by Comparison Method
	10 mg	>200 g to 700 g	3.95 mg	
	100 mg	>700g to 3 kg	15 mg	
	1g	>3 kg to 30 kg	0.31 g	
	50g	>30kg to 200 kg	15.6 g	Using M1 Class Weights OIML R 76-1 by Comparison Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
V.	**PRESSURE INDICATING DEVICES**			
1.	Magnehelic Gauge/Manometer/ Differential Pressure transmitter/Low Pressure Gauges/Indicator♣	0 Pa to 49033.25 Pa -49033.25 Pa to 0 Pa	9.81 Pa 11.18 Pa	Using Digital Manometer As per DKD R6-1 by Comparison Method
2.	Vacuum Vacuum Gauge/ Transducer/ Transmitter/ Recorder/Logger/ Indicator/Manometer♣	(-)95000 Pa to 0 Pa	580 Pa	Using Pressure Calibrator DKD R6-1/Comparison Method
3.	Pressure(Pneumatic) Pressure Gauge(Analog, Digital)/Transducer/ Transmitter/Recorder / Logger/Indicator/ Manometer♣	0 to 2000 000 Pa	670 Pa	Using Pressure Calibrator DKD R6-1/Comparison Method
4.	Pressure(Hydraulic) Pressure Gauge(Analog, Digital)/Transducer/ Transmitter/Recorder / Logger/Indicator/ Manometer♣	0 to 70 000 000 Pa	13000 Pa	Using Pressure Calibrator DKD R6-1/Comparison Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
		THERMAL CALIBRATION		
I.	**TEMPERATURE**			
1.	RTDs / Thermocouples / Temperature Indicators / Controllers with or without Sensors / Temperature Gauges / Data Loggers with Temperature Sensors / Temperature Indicator of Hygrometers / Humidity Indicators / Temperature Baths / Dry Block Calibrators[$]	(-) 10°C to 50°C 50°C to 450°C 450°C to 1200°C	0.58°C 2.69°C 3.18°C	Using Standard Master RTD – Pt 100 / 6.5 Digit Digital Multimeter – 4 Wire Measurements Standard Master N – Type Thermocouple / Multifunction Handy Calibrator / Portable Dry Block Calibrator by Comparison Method
2.	Analog Digital Hygrometers / Digital Temperature & Humidity Indicators with or without Probes Thermo Hygrographs Temperature Humidity Sensors / Probes[$]	10% Rh to 95% Rh @30°C 5°C to 60°C	1.8 % Rh 0.87°C	Using Standard Reference Precision Digital Temperature / Humidity Meter with Probe / Digital Thermo Hygrometer / Humidity Chamber with built in Digital Temperature / Humidity Controller / Indicator by Comparison Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
3.	RTDs / Thermocouples / Temperature Indicators with or Without Sensor / Temperature Gauges♣	(-)10 to 50°C 50 to 450°C 450 to 1200°C	1.51°C 3.07°C 3.23°C	Using Standard Master RTD – Pt 100 / 6.5 Digit Digital Multimeter – 4 Wire Measurements Standard Master N – Type Thermocouple / Multifunction Handy Calibrator / Portable Dry Block Calibrator by Comparison Method
4.	Temperature Baths / Freezers / Refrigerators / Incubators / Chambers / Oven / Furnace♣	(-)10 to 50°C 50 to 450°C 450 to 1200°C	1.51°C 3.07°C 3.23°C	Using Standard Master RTD – Pt 100 / 6.5 Digit Digital Multimeter – 4 Wire Measurements Standard Master N – Type Thermocouple / Multifunction Handy Calibrator / Portable Dry Block Calibrator by Comparison Method
II.	**SPECIFIC HEAT AND HUMIDITY**			
1.	Analog / Digital Hygrometers / Digital Temperature & Humidity Indicators with or Without Probes / Thermo Hygrographs With or Without Temperature Humidity Sensors / Data Loggers / Transmitters♣	10% Rh to 95% Rh @30°C 5°C to 60°C	2.5 % Rh 0.88°C	Using Standard Reference Precision Digital Temperature / Humidity Meter with Probe / Thermo Hygrometer by Comparison Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
2.	Humidity Chambers Environmental / Climatic Chamber♣	10% Rh to 95% Rh @30°C 5°C to 60°C	2.5 % Rh 0.88°C	Using Standard Reference Precision Digital Temperature / Humidity Meter with Probe /Thermo Hygrometer by Comparison Method Single Position Calibration (at Measuring Location in DUC)

*** Measurement Capability is expressed as an uncertainty (±) 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.
Φ Laboratory can also calibrate instruments/devices of coarser resolution / least count within the accredited range using same reference standard/ master equipment under the scope of accreditation.