

Laboratory Metrological Testing and Calibration Centre, 1303, 1st C Main, 9th Block, 2nd Stage, Nagarbhavi, Bangalore, Karnataka

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number CC-2479

Page 1 of 12

Validity 06.12.2017 to 05.12.2019

Last Amended on --

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ($\pm$)	Remarks
<u>ELECTRO TECHNICAL CALIBRATION</u>				
I.	SOURCE			
1.	DC Voltage [#]	1 μ V to 1V 1V to 1000V 1kV to 40kV	1.67 to 0.0014% 0.0014 to 0.002%	Using Multifunction Calibrator(MFC) Transmile3010 by Direct Method
2.	DC Current [#]	1 μ A to 100mA 100 μ A to 1A 1A to 30A 30A to 50A 50A to 1500A	0.1 to 0.08% 0.08 to 0.05% 0.05 to 0.1% 0.1 to 0.5% 0.4%	Using Multifunction Calibrator (MFC) Transmile3010 HP-6032A Multi work Station 50 Turn Coil By Direct Method
3.	Resistance [#]	0.1m Ω 1m Ω 10m Ω 100m Ω 1 to 10 Ω 10 to 100 Ω 100 Ω to 100M Ω 100M Ω to 1000M Ω 0.1M Ω to 100M Ω 0.1G Ω to 1G Ω 1G Ω to 10G Ω 10G Ω to 1T Ω	0.6% 0.14% 0.06% 0.02% 0.6 to 0.06% 0.06 to 0.04% 0.04 to 0.5% 0.5 to 1.2% 2.4%	Using Standard Resistance Vaiseshika 9409 ABC Transmille – 3010 (1 to 1000M Ω) (In Decade Value) DMB- 55X With 8081 8½ DMM By Direct Method

Laboratory Metrological Testing and Calibration Centre, 1303, 1st C Main, 9th Block, 2nd Stage, Nagarbhavi, Bangalore, Karnataka

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number CC-2479

Page 2 of 12

Validity 06.12.2017 to 05.12.2019

Last Amended on --

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ($\pm$)	Remarks
4.	Capacitance [#]	1kHz 1000nF to 10 μ F	0.7 to 0.9%	Using Transmille 3010
		1kHz 100pF to 1000nF	0.25%	Decade Capacitance box GR 1423A By Direct Method
5.	Inductance [#]	1kHz 1mH to 10H	0.55%	Using Transmille 3010
		1kHz 100 μ H to 1H	2.3 to 0.8%	Decade Inductance box GR 1491A By Direct Method
7.	AC Voltage HV [#]	20Hz to 100kHz 1mV to 10mV	2.39 to 0.09%	Using Transmille 3010 By Direct Method
		40Hz to 20kHz 20mV to 200V	0.08 to 0.05%	
		40Hz to 20kHz 200V to 700V	0.05 to 0.09%	
		50Hz to 1kHz 700V to 1000V	0.09 to 0.04%	
		1kV to 28kV	Recommended under measure	

Laboratory Metrological Testing and Calibration Centre, 1303, 1st C Main, 9th Block, 2nd Stage, Nagarbhavi, Bangalore, Karnataka

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number CC-2479

Page 3 of 12

Validity 06.12.2017 to 05.12.2019

Last Amended on --

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ($\pm$)	Remarks
8.	AC Current [#]	20Hz to 100kHz 10 μ A to 10mA 20Hz to 1kHz 100mA to 2A 40Hz to 1kHz 1A to 20A 40 to 60Hz 30A to 1500A	0.29 to 0.2% 0.2 to 0.12% 0.22 to 0.4% 0.4%	Using 50 Turn Current coil 3010 Transmille 3010 By Direct Method
9.	AC Power [#] 40 to 400Hz	0.3W to 30KW @1pF to 0.2pF (120V to 240V)	0.15%	Using Transmille 3010 By Direct Method
10.	Power Factor [#] 40 to 400Hz	0.2 to 1 to 0.2 Lead/Lag	0.05%	Using Transmille 3010 By Direct Method
11.	Phase Angle [#] 40 to 400Hz	0 to 90 degree	0.13%	Using Transmille 3010 By Direct Method
12.	DC Power [#]	0.3W to 30kW 200 to 1000V 0.5 to 30A	0.14%	Using Transmille 3010 By Direct Method
13.	Oscilloscope Amplitude [#] Oscilloscope Time [#]	1mV to 50V/div 1nS to 5s	1.26 to 0.012% 0.15%	Using Generator- Tek-PG- 506A Transmille – 3010 By Direct Method

Laboratory Metrological Testing and Calibration Centre, 1303, 1st C Main, 9th Block, 2nd Stage, Nagarbhavi, Bangalore, Karnataka

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number CC-2479

Page 4 of 12

Validity 06.12.2017 to 05.12.2019

Last Amended on --

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ($\pm$)	Remarks
14.	Frequency [#]	1Hz to 100kHz	1.3PPM	Using Transmille3010 Hi – Frequency option
		100kHz to 40GHz	6PPM to 20PPM	Signal Generator SMB 100A, R&S By Direct Method
15.	Temperature [#] (Simulation) K - Type J - Type T - Type R - Type S - Type N - Type B-Type E- Type PT-100	(-)140 °C to 1340 °C (-)180 °C to 750 °C (-)200 °C to 400 °C (-)100°C to 1700 °C (-)100 °C to 1700 °C (-)270°C to 1300 °C (-)0°C to +1800 °C (-)0 °C to 800 °C (-)100 °C to 800°C	0.40°C 0.36°C 0.36°C 0.7°C 0.7°C 0.47°C 0.9°C 0.92°C 0.1°C	Using Transmille 3010T/C By Direct Method Using RTD PT 100 By Direct Method
16.	Microwave power Level [#]	100kHz to 40GHz (-)60dBm to 16dBm	9%	Using Signal generator SMB 100A,R&S By Direct Method
17.	RF Attenuation [#]	(-)120dB to 10dB 500MHz (-)120dB to 10dB 40GHz	0.98% to 1.88%	Using Signal Generator SMB 100A Power Meter&RF Attenuation By Direct Method
18.	Band width [#]	5MHz to 600MHz	1.68%	Using Transmille 3010 50kHz By Direct Method

Laboratory Metrological Testing and Calibration Centre, 1303, 1st C Main, 9th Block, 2nd Stage, Nagarbhavi, Bangalore, Karnataka

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number CC-2479

Page 5 of 12

Validity 06.12.2017 to 05.12.2019

Last Amended on --

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ($\pm$)	Remarks
19.	Band width [#]	100kHz 600MHz to 32GHz	0.38dB	Using Signal generator SMB 100A,R&S Refer @100kHz Micro FC 5350B& RF power Meter By Direct Method
II.	MEASURE			
1.	DC Voltage [#]	1 μ V to 1mV 1mV to 100mV 100mV to 1000V 1 to 40 kV	0.9 to 0.02% 0.02 to 0.0009% 0.0009 to 1% 2%	Using Transmille – 8081 Agilent 8 ½ DMM- 345BA H.V.PROBE HVP-40K By Direct Method
2.	DC Current [#]	1nA to 100 μ A 100 μ A to 1A 1A to 30A 30A to 50A	0.09% to 0.04% 0.04% to 0.02% 0.02% to 0.06% 0.06% to 0.4%	Using 8 ½DMM Transmille/ Agilent -T - 8081/3458A Vaiseshika 10m Ω Res with 8½DMM By Direct Method
3.	Resistance [#]	0.001 Ω to 1 Ω 1 Ω to 100M Ω 100M Ω to 1G Ω 1G Ω to 100G Ω 100G Ω to 1T Ω	0.7% to 0.05% 0.05% to 0.09% 0.09% to 1.4% 1.4% 1.4%	Using Agilent-8½ DMM 3458A T-8081DMM By Direct Method

Laboratory Metrological Testing and Calibration Centre, 1303, 1st C Main, 9th Block, 2nd Stage, Nagarbhavi, Bangalore, Karnataka

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number CC-2479

Page 6 of 12

Validity 06.12.2017 to 05.12.2019

Last Amended on --

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ($\pm$)	Remarks
4.	Capacitance [#]	1kHz to 1MHz 100pF to 100 μ F	0.09%	Using LCR Hi – Tester Hioki3532 By Direct Method
5.	Inductance [#]	1kHz 100 μ H to 10H	0.5%	Using LCR Hi – Tester Hioki3532 By Direct Method
6.	AC Voltage [#]	10Hz to 1kHz 1mV to 100mV 100mv to 1000V	3.5% to 0.03% 0.03% to 0.04%	Using Agilent to 8½ DMMto3458A T - 8081 DMM High Voltage Probe HVP – 40 40 to 1kHz By Direct Method
		1kHz to 20kHz 1mV to 100mv 1v to 1000V	2.3% to 0.05% 0.05% to 0.12%	
		20kHz to 100kHz 1mV to 100mV 100mV to 10V	1.3% to 0.5% 0.5%	
		1kV to 28kV	8.6%	
7.	AC Current [#]	10Hz to 10kHz 10 μ A to 100 μ A 100 μ A to 100mA 100mA to 30A	0.76% to 0.14% 0.14% to 0.24% 0.24% to 0.29%	Using Transmille 3010 By Direct Method
8.	RF Power Level [#]	+13dBm to -60 dBm 10MHz to 50 MHz +15dBm to -60dBm 50MHz to 40GHz	0.35dBm -0.39dB	Using Micro wave Freq& power level function Generator & Signal Generator By Direct Method

Laboratory Metrological Testing and Calibration Centre, 1303, 1st C Main, 9th Block, 2nd Stage, Nagarbhavi, Bangalore, Karnataka

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number CC-2479

Page 7 of 12

Validity 06.12.2017 to 05.12.2019

Last Amended on --

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ($\pm$)	Remarks
9.	RF Attenuation [#]	10MHz to 40GHz 1dB to 60dB	0.38dB	Using 10GHz to 40GHz By Direct Method
10.	VSWR [#]	10MHz to 40GHz 1.05 to 2	0.02% to 0.044%	Using SIGNAL GENERATOR/ZVNA -40GHz by Direct Method
11.	Frequency [#]	0.1Hz to 1Hz 1Hz to 33GHz	1% to 0.21% 0.006% to 0.0014%	Using Frequency counter-PM669 Frequency counter- FC121/ MW Freq counter/5350B By Direct Method
12.	Temperature [#] K Type Thermocouple J T R S N B E PT-100	(-)140 to 1340°C (-)180 to 1200°C (-)250 to 400°C (-)50 to 1760°C 0 to 1760°C (-)270 to 1300°C 0 to 1820°C 0 to 800°C (-)200 to 800°C	0.20°C 0.20°C 0.20°C 0.30°C 0.30°C 0.10°C 0.70°C 0.15°C 0.15°C	Using DMM 8081 By Direct Method Using RTD PT 100 By Direct Method
13.	DC Power [#]	1 V to 1000 V 0.1A to 30A 0.1watt to 30kW	0.14%	Using Transmille 8081DMM By Direct Method

Laboratory Metrological Testing and Calibration Centre, 1303, 1st C Main, 9th Block, 2nd Stage, Nagarbhavi, Bangalore, Karnataka

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number CC-2479

Page 8 of 12

Validity 06.12.2017 to 05.12.2019

Last Amended on --

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ($\pm$)	Remarks
14.	AC Power [#]	120 V to 240V Vac 50Hz 0.3W to 30kW	NOT RECOMMENDED	Using YOKOGAWA WT210 By Direct Method
15.	Time interval [#]	1sec to 9000sec 9000sec to 86400sec	0.00082 to 0.52sec 0.52sec to 0.02sec	Using Digital timer By Direct Method
16.	Amplitude Modulation [#]	10MHz to 1.3GHz (10 to 80%)	5.98 to 6.11%	Using Signal Generator SMB100A,R&S By Direct Method
17.	Frequency Modulation [#]	300Hz to 1.3GHz	2.8 to 10%	Using Signal generator SMB 100A, R&S By Direct Method

Mohit Kaushik
Convenor

Avijit Das
Program Director

Laboratory Metrological Testing and Calibration Centre, 1303, 1st C Main, 9th Block, 2nd Stage, Nagarbhavi, Bangalore, Karnataka

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number CC-2479

Page 9 of 12

Validity 06.12.2017 to 05.12.2019

Last Amended on --

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ($\pm$)	Remarks
<u>MECHANICAL CALIBRATION</u>				
I.	PRESSURE INDICATING DEVICES			
1.	Pneumatic -Pressure Dial /Digital Pressure Gauges and Calibrators, pressure Transmitters, Pressure Switches [#]	0 to 10 bar	1.21%rdg	Using Digital Pressure Calibrator by Comparison Method as per (DKD-R-6-1)
2.	Hydraulic - Pressure Dial /Digital Pressure Gauges and Calibrators, Pressure Transmitters, Pressure Switches [#]	0 to 200bar >200 bar to 700 bar	0.23% rdg 0.09% rdg	Using Digital Pressure Calibrator by Comparison Method as per (DKD-R-6-1)
3.	Vacuum- Dial/ Digital Vacuum gauges /Indicators and calibrators [#]	(-)0.8 to 0bar	1.03% rdg	Using Digital Vacuum indicator by Comparison Method as per (DKD-R-6-1)
II.	ACCELERATION & SPEED			
1.	RPM ^{\$} contact type Non Contact Type	100 to 8000 RPM 100 to 90000 RPM	1.75 RPM to 0.77 RPM 6.5 RPM to 20 RPM	Using Calibrated Digital Tachometer along with a Tacho-generator which has provision contact and non contact type adopter by Comparison Method

Mohit Kaushik
Convenor

Avijit Das
Program Director

Laboratory Metrological Testing and Calibration Centre, 1303, 1st C Main, 9th Block, 2nd Stage, Nagarbhavi, Bangalore, Karnataka

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number CC-2479

Page 10 of 12

Validity 06.12.2017 to 05.12.2019

Last Amended on --

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ($\pm$)	Remarks
III.	ACOUSTICS			
1.	Sound Level Meter ^{\$}	94 dB & 114 dBA	1.2 dBA at 1kHz	Using Sound level Calibrator along with Meter by Comparison Method

Mohit Kaushik
Convenor

Avijit Das
Program Director

Laboratory Metrological Testing and Calibration Centre, 1303, 1st C Main, 9th Block, 2nd Stage, Nagarbhavi, Bangalore, Karnataka
Accreditation Standard ISO/IEC 17025: 2005
Certificate Number CC-2479 **Page** 11 of 12
Validity 06.12.2017 to 05.12.2019 **Last Amended on** --

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ($\pm$)	Remarks
<u>THERMAL CALIBRATION</u>				
I.	TEMPERATURE			
1.	RTD/Thermocouples With & Without Indicators ^{\$}	(-)80°C to 25°C	0.4°C	Using STD RTD-4Wire With 8½ DMM& SUB ZERO Bath by Comparison Method
2.	RTD/Thermocouples - With & Without Indicators/ Temperature Gauges [#]	(-)30°C to 100°C	0.5°C	Using STD RTD-4Wire With 8½DMM& Dry Well Bath by Comparison Method
3.	RTD/Thermocouples - With & Without Indicators/ Temperature Gauges [#]	100°C to 550°C	1.0°C	Using STD RTD-4Wire With 8½DMM& Dry Well Bath by Comparison Method
4.	Temperature Calibrator/bath ^{\$} (single point)	(-)80°C to 550°C	1.0°C	UsingSTD-4Wire With 8½DMM& Dry Well Bath by Direct Method
5.	IR Thermometer/ Pyrometer ^{\$}	50°C to 500°C 500°C to 1200°C	5.0°C 9.0°C	Using STD IR Thermometer With Black body Calibrator by Comparison Method
6.	Temp Chambers/ bath/ Freezer/Oven/ Autoclave [*] (9 points)	(-)80°C to 250°C	1.5°C	Using Paperless Recorder/VR- 18 with 4 WIRE RTD SENSORS by Comparison Method

Laboratory Metrological Testing and Calibration Centre, 1303, 1st C Main, 9th Block, 2nd Stage, Nagarbhavi, Bangalore, Karnataka

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number CC-2479 **Page** 12 of 12

Validity 06.12.2017 to 05.12.2019 **Last Amended on** --

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ($\pm$)	Remarks
7.	Temperature Calibrator/Bath* (single point)	(-)80°C to 600°C	1.0°C	Using SSPRT-4wire with 8½ DMM by Direct Method
II.	SPECIFIC HEAT AND HUMIDITY			
1.	Analog/Digital Hygrometers Temperature–Humidity Indicators Thermo Hygrographs Recorders Humidity Sensors/Data Loggers Temperature/ Humidity Transmitters ^{\$}	20% to 95% RH @ 25°C 10 °C to 55°C @50% RH	1.9%RH 0.7°C	Using RTD/ Humidity Sensors with Paperless Recorder & Humidity & Temperature Generator By Comparison Method
2.	Environmental/ Climatic/ Humidity Chambers - 3 point*	10% to 95% RH @ 10°C to 55°C	2.0% RH	Using Paperless Recorder/VR-18 With Rotronics Temp/Humidity sensor-Hc2-S3by Direct Method

* 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.

Mohit Kaushik
Convenor

Avijit Das
Program Director