Laboratory	**Sophisticated Test and Instrumentation Centre (STIC), Cochin University Campus, Thrikkakara, Kochi, Kerala**		
Accreditation Standard	**ISO/IEC 17025: 2005**		
Certificate Number	**CC-2326**	**Page**	**1 of 15**
Validity	**23.11.2018 to 22.11.2020**	**Last Amended on**	**-**

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
		ELECTRO-TECHNICAL CALIBRATION		
I.	**SOURCE**			
1.	DC Voltage[$]	0.1 mV to 1 mV 1 mV to 100 mV 100 mV to 10 V 10 V to 1000 V	3.5 % to 0.36 % 0.36 % to 0.01 % 0.01 % to 0.006 % 0.006 % to 0.007 %	Using Wavetek 9100/ Fluke 5500A/Fluke 5502A by Direct Method
		100 µA to 10 mA 10 mA to 100 mA 100 mA to 1 A 1 A to 20 A	0.041 % to 0.015 % 0.015 % to 0.016 % 0.016 % to 0.055 % 0.055 % to 0.1 %	Using Wavetek 9100/ Fluke 5500A/Fluke 5502A by Direct Method
		20 A to 1000 A	0.4 % to 0.32 %	Using Wavetek 9100/ Fluke 5500A/Fluke 5502A with 10/50 Turn Current Coil
3.	AC Voltage[$]	**10 Hz to 10 kHz** 10 mV to 100 mV 100 mV to 1 V 1 V to 100 V **10 kHz to 100 kHz** 10 mV to 100 mV 100 mV to 1 V 1 V to 100 V **45 Hz to 10 kHz** 100 V to 1000 V	 0.42 % to 0.075 % 0.075 % to 0.047 % 0.047 % to 0.10 % 0.38 % to 0.48 % 0.075 % to 0.30 % 0.047 % to 0.10 % 0.063 % to 0.11 %	Using Wavetek 9100/ Fluke 5500A/Fluke 5502A by Direct Method
4.	AC Current[$]	**50 Hz to 1 kHz** 100 µA to 100 mA 100 mA to 1 A 1 A to 20 A	 0.27 % to 0.09 % 0.09 % to 0.13 % 0.13 % to 0.37 %	Using Wavetek 9100/ Fluke 5500A/Fluke 5502A by Direct Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
		1 kHz to 5 kHz 10 mA to 1 A 1 A to 20 A **50 Hz** 20 A to 1000 A	 0.53 % to 0.82 % 0.13 % to 0.77 % 0.41 % to 0.53 %	
		1 mΩ	0.49 %	
		10 mΩ	0.08 %	
		100 mΩ to 1 Ω	0.012 %	
		1 Ω to 10 Ω	0.012 %	
		10 Ω to 10 MΩ	0.011 %	
		10 MΩ to 100 MΩ	0.011 % to 0.12 %	
		100 MΩ to 1 GΩ	0.12 %	
		1 GΩ to 10 GΩ	0.12 % to 1.67 %	
6.	Frequency[$]	1 Hz to 250 MHz	0.01 % to 0.003 %	Using Wavetek 9100/ Fluke 5500A/Fluke 5502A by Direct Method
7.	Inductance[$]	**1 kHz** 1 mH to 10 H	 0.63 % to 1.34 %	Using TE1053 Inductance Box by Direct Method
8.	Capacitance[$]	**1 kHz** 10 pF to 100 µF	 1.03 % to 0.49 %	Using TE1053 Inductance Box by Direct Method
9.	DC Power[$]	10 mW to 100 mW 100 mW to 1 kW 1 kW to 18 kW	0.045 % to 0.05 % 0.05 % to 0.09 % 0.09 % to 0.1 %	Using Wavetek 9100/ Fluke 5500A/Fluke 5502A by Direct Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
10.	AC Power[$] 1Ø	**UPF, 50 Hz** 10 mW to 1 W 1 W to 10 W 10 W to 100 W 100 W to 13.8 kW	 0.18 % to 0.30 % 0.30 % to 0.26 % 0.26 % to 0.18 % 0.18 % to 0.30 %	Using Wavetek 9100/ Fluke 5500A/Fluke 5502A by Direct Method
11.	Phase Angle[$]	**50 Hz** +/- 180° 0.2 PF to 1 PF	 0.1° 0.8 % to 0.1 %	Using Wavetek 9100/ Fluke 5500A/ 5502A by Direct Method
	Oscilloscope AC/DC Voltage[$] (Amplitude)	4 mV to 40 V	3.33 % to 0.33 %	
	Time Base Accuracy	2 ns to 2 s	0.036 % to 0.028 %	
	Band Width	50 kHz to 250 MHz	3.2 % to 5.7 %	
	Temperature Simulation[$]			
	Thermocouple K-Type J-Type E-Type T-Type N-Type R-Type S-Type B-Type RTD – Pt 385, 100Ω	 (-) 200°C to 1370°C (-) 200°C to 1200°C (-) 100°C to 1000°C (-) 250°C to 400°C (-) 200°C to 1300°C 0°C to 1760°C 0°C to 1760°C 600°C to 1820°C (-) 200°C to 800°C	 0.4°C 0.3°C 0.3°C 0.2°C 0.4°C 0.8°C 1.0°C 0.9°C 0.10°C	
	Temperature Simulation[♣]			
	Thermocouple K-Type J-Type E-Type T-Type N-Type R-Type S-Type B-Type RTD – Pt 385, 100Ω	 (-) 200°C to 1370°C (-) 200°C to 1200°C (-) 100°C to 1000°C (-) 250°C to 400°C (-) 200°C to 1300°C 0°C to 1760°C 0°C to 1760°C 600°C to 1820°C (-) 200°C to 800°C	 0.4°C 0.3°C 0.3°C 0.2°C 0.4°C 0.8°C 1.0°C 0.9°C 0.10°C	

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
II.	**MEASURE**			
1.	DC Voltage[$]	0.1 mV to 1 mV 1 mV to 100 mV 100 mV to 1000 V	0.13 % to 0.014 % 0.014 % to 0.001 % 0.001 %	Using Fluke 8508A by Direct Method
2.	DC Current [$]	100 µA to 10 mA 10 mA to 100 mA 100 mA to 1 A 1 A to 20 A	0.003 % 0.003 % to 0.007 % 0.007 % to 0.024 % 0.024 % to 0.05 %	Using Fluke 8508A by Direct Method
		10 Hz to 1 kHz 1 mV to 100 mV 100 mV to 1 V 1 V to 100 V	 0.37 % to 0.01 % 0.01 % to 0.005 % 0.005 %	
		1 kHz to 100 kHz 1 mV to 100 mV 100 mV to 1 V 1 V to 100 V	 0.25 % to 0.03 % 0.03 % to 0.009 % 0.009 % to 0.027 %	
		100 kHz to 500 kHz 1 mV to 100 mV 100 mV to 1 V	 1.18 % to 0.06 % 0.06 % to 0.035 %	
		500 kHz to 1 MHz 5 mV to 1 V	 1.2 % to 0.12 %	
		45 Hz to 10 kHz 100 V to 1000 V	 0.007 % to 0.013 %	
		10 Hz to 50 Hz 1 mA to 1 A	 0.037 % to 0.013 %	
		50 Hz to 1 kHz 100 µA to 1 A 1 A to 10 A 10 A to 20 A	 0.06 % to 0.013 % 0.013 % to 0.016 % 0.016 % to 0.031 %	
		1 kHz to 10 kHz 10 mA to 1 A	 0.012 % to 0.014 %	

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
		1 kHz to 5 kHz 1 A to 10 A	0.014 % to 0.02 %	
		45 Hz to 5 kHz 10 A to 20 A	0.02% to 0.034%	
5.	DC Resistance $	1mΩ to 1Ω 1Ω to 10kΩ 10kΩ to 1MΩ 1 MΩ to 100MΩ 100MΩ to 1GΩ 1GΩ to 10GΩ	0.46% to 0.002% 0.002% to 0.001% 0.001% to 0.002% 0.002% to 0.01% 0.01% to 0.04% 0.04% to 0.30%	Using Fluke 8508A by Direct Method
6.	Frequency $	1 Hz to 1 GHz	0.001 %	Using Philips FC2130U by Direct Method
7.	Inductance $	**1 kHz** 1 mH to 10 H	0.1 % to 0.13 %	Using Agilent 4263B by Direct Method
8.	Capacitance $	**1 kHz** 10 pF to 100 µF	0.16 % to 0.34 %	Using Agilent 4263B by Direct Method
9.	Phase Angle $	**50 Hz** +/- 180° 0.2 PF to 1 PF	0.06 ° 0.15 % to 0.02 %	Using Clarke Hess 6000A by Direct Method
10.	RF Power$	**10MHz to 1GHz** (-) 30 dBm to 13 dBm	5.2% to 4.3%	Using Agilent E4418B & E9300H by Direct Method
		10 s to 300 s	1.04 % to 0.068 %	
		300 s to 900 s	0.068 % to 0.061 %	
		900 s to1800 s	0.061 % to 0.059 %	

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
12.	Temperature Simulation[$]			Using Fluke 1529 (Chub E4) by Direct Method
	Thermocouple			
	K-Type	(-) 200 °C to 1370 °C	0.17 °C	
	J-Type	(-) 200 °C to 1200 °C	0.12 °C	
	E-Type	(-) 250 °C to 1000 °C	0.29 °C to 0.08 °C	
	T-Type	(-) 250 °C to 400 °C	0.13 °C to 0.12 °C	
	N-Type	(-) 200 °C to 1300 °C	0.35 °C	
	R-Type	0 °C to 1760 °C	0.58 °C	
	S-Type	0 °C to 1760 °C	0.70 °C	
	B-Type	600 °C to 1820 °C	0.71 °C to 0.69 °C	
	RTD - Pt 385, 100 ohm	(-) 200 °C to 800 °C	0.01 °C to 0.03 °C	
13.	Time Interval[♣]	10 s to 300 s 300s to 900s 900s to1800s	1.04 % to 0.068 % 0.068 % to 0.061 % 0.061 % to 0.059 %	Using Philips FC2130U Frequency Counter Wavetek 9100/Fluke 5500A/5502A by Time Totalisation Method
	Temperature Simulation[♣]			
	Thermocouple			
	K-Type	(-) 200°C to 1370°C	0.17°C	
	J-Type	(-) 200°C to 1200°C	0.13°C to 0.12°C	
	E-Type	(-) 250°C to 1000°C	0.29°C to 0.08°C	
	T-Type	(-) 250°C to 400°C	0.12°C to 0.13°C	
	N-Type	(-) 200°C to 1300°C	0.35°C	
	R-Type	0°C to 1760°C	0.58°C	
	S-Type	0°C to 1760°C	0.70°C	
	B-Type	600°C to 1820°C	0.71°C to 0.69°C	
	RTD – Pt 385, 100ohm	(-) 200°C to 800°C	0.01°C to 0.03°C	

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
	MECHANICAL CALIBRATION			
I.	**DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)**			
1.	Calipers $ LC.: 0.01 mm LC.: 0.02 mm L.C.: 0.02 mm	 0 to 300 mm 0 to 600 mm 0 to 1000 mm	 9 µm 16 µm 22 µm	Using 'K' Grade Gauge Blocks
2.	External Micrometer / Digimatic Micrometer/ Blade/Groove/Ball Micrometer $ L.C.: 0.001 mm L.C.: 0.01 mm	 0 to 100 mm 0 to 150 mm	 6 µm 15 µm	Using 'K' Grade Gauge Blocks
3.	Depth Micrometer / Digital/Analog $ L.C.: 0.01 mm	 0 to 300 mm	 6 µm	Using 'K' Grade Gauge Blocks
4.	Height Gauge Electronic / Analog $ L.C.: 0.001 mm Φ	 0 to 1000 mm	 12 µm	Using 'K' Grade Gauge Blocks
5.	Dial Gauge $ (Plunger/Lever Type)/ Bore Gauge L.C.: 0.001 mm Φ	 0 to 25 mm	 4 µm	Using 'K' Grade Gauge Blocks/Electronic Dial Calibration Tester
6.	Steel Scale $ L.C.: 0.05 mm Φ	 1 mm to 1000 mm	 0.33 mm	Using Scale & Tape Calibration Unit
7.	Measuring Tape $	1 mm to 1000 mm (Multiples of 1000)	0.40 mm $0.40\sqrt{L}$, L in m	Using Scale & Tape Calibration Unit

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
8.	Dial Thickness Gauge (Dial/Digital) [$] L.C.: 0.001 mm [Φ]	0 to 25 mm	4 µm	Using 'K' Grade Gauge Blocks
II.	**WEIGHTS**			
	Mass/Weights[$] E2 Class & 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	0.002 mg 0.002 mg 0.002 mg 0.002 mg 0.002 mg 0.002 mg 0.002 mg 0.002 mg 0.003 mg 0.003 mg 0.003 mg 0.004 mg	Using E1 Class Weights & Electronic Weighing Balance 6.1g(0.001mg) as per OIML R111-1
	E2 Class and Coarser	10 g 20 g 50 g 100 g 200 g	0.02 mg 0.02 mg 0.02 mg 0.02 mg 0.05 mg	Using E1 Class Weights & Electronic Weighing Balance 220 g (0.01 mg)
	M1 Class and Coarser	500 g 1 kg 2 kg 5 kg 10 kg 20 kg 40 kg	8.0 mg 10.0 mg 14.4 mg 14.4 mg 23.0 mg 40.0 mg 50.0 mg	Using F1 Class Weights & Mass Comparator 40Kg(10 mg)

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
III.	**WEIGHING SCALE AND BALANCE**			
	Electronic Weighing Balance♣			
	Class I & coarser	0 to 6.1 g (Readability 0.001 mg) 6 g to 220 g (Readability 0.01 mg)	0.008 mg 0.06 mg	Using E1 Class Standard Weights as per OIML R76-1
	Class II & coarser	5 kg to 40 kg (Readability 0.01 g)	0.07 g	Using F1 Class Standard Weights as per OIML R76-1
2.	GSM Tester♣	10 mg to 140 g (Readability 0.01 g)	8.6 mg	Using E1 Class Standard Weights as per Procedure BCP
IV.	**VOLUME**			
	Volumetric Measures $			
	Glass Pipette & Burette	0.1 ml to 250 ml	0.024 ml	Using Electronic weighing balance 220g (Readability 0.01mg) as per ISO 4787
		1 µl to 5µl	0.08 µl	
		5 µl to 50 µl	0.10 µl	
		20 µl to 200 µl	0.10 µl	
		200 µl to 1000 µl	0.17 µl	
		1000 µl to 5000 µl	0.20 µl	
	Volumetric Flask & Measuring Cylinder	0.1 ml to 10 ml 10 ml to 250 ml 250 ml to 2000 ml	0.02 ml 0.02 ml 0.04 ml	Using Electronic Weighing Balance 220g (Readability 0.01mg) & 40kg(Readability 10mg) as per ISO 4787

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
V.	**PRESSURE INDICATING DEVICES**			
1.	Pneumatic Pressure (Digital / Analog Pressure Gauges, Portable Calibrators, Compound Gauges, Pressure Transmitters with Indicator, Transducers, Pressure Switches, Relief Valves) $	0 to 20 bar	0.20% of rdg	Using Budenberg Pressure Calibrator as per DKD-R-6-1
2.	Vacuum (Digital / Analog Vacuum Gauges, Transmitters With Indicator, Portable Calibrators, Transducers, Pressure Switches, Relief Valves) $	0 to (-) 0.94 bar	0.002 bar	Using Budenberg Pressure Calibrator as per DKD-R-6-2
3.	Hydraulic Pressure (Digital / Analog Pressure Gauges, Pressure Transmitters with Indicator, Transducers, Pressure Switches, Relief Valves) ♣	0 to 10 bar 10 bar to 200 bar 200 bar to 400 bar	1.2 % of rdg 0.42 % of rdg 0.07 % of rdg	Using Budenberg Pressure Calibrator as per DKD-R-6-1
4.	Pneumatic Pressure (Digital / Analog Pressure Gauges, Pressure	0 to 20 bar	0.28% of rdg	Using Budenberg Pressure Calibrator as per DKD-R-6-1

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
	Transmitters with Indicator, Transducers, Compound Gauges, Pressure Switches) ♣			
5.	Vacuum (Digital / Analog Vacuum Gauges, Transmitters with Indicator, Transducers) ♣	0 to (-) 0.94 bar	0.002 bar	Using Budenberg Pressure Calibrator as per DKD-R-6-2.
VI.	**ACCERELRATION AND SPEED**			
1.	Speed (rpm) Digital/ Analog Tachometer (Non Contact Type) $	60 rpm to 25000 rpm	3 rpm	Using Wave form Generator as per SANAS-TR-45
2.	Speed (rpm) Tachometer/ Centrifuge/Magnetic Stirrer, Motor, Flash Point Apparatus (Contact Type) $	60 rpm to 20000 rpm	3 rpm	Using Non contact Tachometer as per SANAS-TR-45
3.	Speed (rpm) Centrifuge/Magnetic Stirrer, Motor, Flash Point Apparatus, Triple Roll Mill, Mixer, High Speed Motor♣	60 rpm to 20000 rpm	2.5 rpm	Using Non contact Tachometer as per SANAS-TR-45

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
		THERMAL CALIBRATION		
I.	**TEMPERATURE**			
1.	Resistance Thermometers / Thermocouples / Thermistors with/ without Temperature Indicators, Temperature Gauges, Digital Thermometers, Temperature Indicator with Sensor of Calibrators, Baths, Incubators (for Non-Medical Applications), Refrigerators, Deep Freezer, Furnaces, Ovens, Chambers etc.[$]	(-) 80 °C to 0 °C 0 to 200 °C 200 °C to 400 °C 400 °C to 660 °C	0.05 °C 0.03 °C 0.14 °C 0.21 °C	Using SPRT / STC, Liquid Bath / Ice Bath / Dry Block Furnace and DMM by Comparison Method
2.	Liquid-in-Glass Thermometers[$]	(-) 80 °C to 200 °C	0.07 °C	Using SPRT / Liquid Bath / Ice Bath / and DMM by Comparison Method
3.	Resistance Thermometers / Thermocouples with/without Indicators, Digital Thermometers, Temperature Indicator with	660 °C to 1200 °C	1.62 °C	Using Standard S-type Thermocouple, Dry Block Furnace and DMM by Comparison Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
	Sensor of Calibrators, Furnaces etc.$			
4.	Calibration of Liquid Baths, Dry Blocks, Ovens, Incubators (for Non-Medical Applications), Chambers, Furnaces etc.$	(-) 80 °C to 50 °C 50 °C to 250 °C	0.4 °C 1.2 °C	Using Multi Position Calibration with PRTs / N Type TC, DMM Mapping method
5.	Thermo – Hygro Meters, RH / Temperature Indicator With Sensor etc. $	10 °C to 50 °C @ 40 % RH	0.20 °C	Using Humidity/ Temperature Generator, PRT, DMM by Comparison method
6.	Resistance Thermometers / Thermocouples / Thermistors with/ without Temperature Indicators, Temperature Gauges, Digital Thermometers, Temperature Indicator with Sensor of Calibrators, Baths, Incubators (for Non-Medical Applications), Refrigerators, Deep Freezer, Furnaces, Ovens, Chambers etc.♣	(-) 80 °C to 0 °C 0 to 200 °C 200 °C to 400 °C 400 °C to 660 °C	0.05 °C 0.03 °C 0.14 °C 0.21 °C	Using SPRT / STC, Liquid Bath / Ice Bath / Dry Block Furnace and DMM by Comparison Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
7.	Liquid-in-Glass Thermometers♣	(-) 80 °C to 200 °C	0.07 °C	Using SPRT / Liquid Bath / Ice Bath / and DMM by Comparison Method
8.	Resistance Thermometers / Thermocouples with/without Indicators, Digital Thermometers, Temperature Indicator with Sensor of Calibrators, Furnaces etc.♣	660 °C to 1200 °C	1.62 °C	Using Standard S-type Thermocouple, Dry Block Furnace and DMM by Comparison method
9.	Calibration of Liquid Baths, Dry Blocks, Ovens, Incubators (for Non-Medical Applications), Chambers, Furnaces etc. ♣	(-) 80 °C to 50 °C 50 °C to 250 °C 250 °C to 600 °C 600 °C to 900 °C 900 °C to 1200 °C	0.4 °C 1.2 °C 1.8 °C 3.5 °C 4.0 °C	Using PRTs / N Type TC. Multi Position Calibration, DMM by Mapping method
II.	**SPECIFIC HEAT & HUMIDITY**			
1.	RH Indicators, Digital / Analog Hygrometers, Thermo - Hygro Meters, RH Indicator with Sensor etc.$	30 % to 90 % (in the temperature range 25 ±5°C)	3.8 %	Using Humidity/ Temperature Generator, PRTs (Wet & Dry Method), DMM by Comparison Method

Laboratory	**Sophisticated Test and Instrumentation Centre (STIC), Cochin University Campus, Thrikkakara, Kochi, Kerala**		
Accreditation Standard	**ISO/IEC 17025: 2005**		
Certificate Number	**CC-2326**	**Page**	**15 of 15**
Validity	**23.11.2018 to 22.11.2020**	**Last Amended on**	**-**

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
2.	Relative Humidity Indicator of Chamber[♣]	30 % to 95 % (in the temperature range 25±5°C	2.6 %	Using PRTs (Wet & Dry method), DMM by Comparison Method

*** Measurement Capability is expressed as an uncertainty (±) at a confidence probability of 95%**
[$] Only in Permanent Laboratory
[♣] Only for Site Calibration
[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.

Mohit Kaushik
Convenor

Avijit Das
Program Manager