Laboratory	**Beltronics Calibration Laboratory, No. 59, Venkateshwara Layout, 6th Main, Appurao Road, Chamarajapet, Bengaluru, Karnataka**			
Accreditation Standard	**ISO/IEC 17025: 2005**			
Certificate Number	**CC-2830** ***(In lieu of C-0271, C-0849, C-1265)***	**Page**	**1 of 10**	
Validity	**28.08.2018 to 27.08.2020**	**Last Amended on**	**30.08.2018**	

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
		ELECTRO TECHNICAL CALIBRATION		
I.	**SOURCE**			
1.	DC Voltage#	1mV to 1V 1V to 1000V	0.36% to 0.01% 0.01%	Using MFC Fluke 5500 E by Direct Method
2.	AC Voltage#	**50Hz** 1mV to 1 V 1V to 10V 10V to 1000V	 2.5% to 0.044% 0.044% to 0.055% 0.055% to 0.068%	Using MFC Fluke 5500 E by Direct Method
3.	DC Current#	10µA to 100mA 100mA to 1A 1A to 10A 10A to 500A	0.6% to 0.02% 0.02% to 0.04% 0.04% to 0.075% 0.075% to 0.8%	Using MFC Fluke 5500 E with Current Coil by Direct Method
4.	AC Current#	**50Hz** 3.3mA to 100mA 100mA to 1A 1A to 10A 10A to 500A	 0.18% to 0.14% 0.14% to 0.18% 0.18% to 0.40% 0.40% to 0.95%	Using MFC Fluke 5500 E with Current Coil by Direct Method
5.	DC Resistance#	1Ω to 10kΩ 10kΩ to 100kΩ 100kΩ to 1MΩ 1MΩ to 10MΩ 10MΩ to 100MΩ 100kΩ to 10MΩ 10MΩ to 10GΩ	0.95% to 0.018% 0.018% to 0.02% 0.02% to 0.025% 0.025% to 0.076% 0.076% to 0.6% 1.15% to 1.16% 1.16% to 2.31%	Using MFC Fluke 5500 E by Direct Method Using HV Decade Mega Ohm Box by Direct Method

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Convenor

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Program Director

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
6.	Capacitance#	1nF to 10nF 10nF to 1µF 1µF to 10µF 10µF to 100µF 100µF to 300µF	1.73% to 0.7% 0. 7% to 0.41% 0.41% to 0.53% 0.53% to 0.7% 0.7% to 0.95%	Using MFC Fluke 5500 E by Direct Method
7.	Frequency#	10Hz to 1MHz 10MHz to 20GHz	0.06% to 0.0074% 0.00025% to 0.00035%	Using MFC Fluke 5500 E & Signal Generator HP 83712A by Direct Method
8.	AC Power#	**50 Hz** (120 V to 240 V & 0.1 A to 10 A) 1.2 W to 2400 W @ UPF 2.4 W to 480 W @ 0.2 Lag 6 W to 1200 W @ 0.5 Lag 9.6 W to 1920 W @ 0.8 Lead	 0.18% 1.5% 0.52% 0.22%	Using MPC Fluke 5500 A by Direct Method
9.	Power Factor#	0.2 (Lead/Lag) PF to 1 PF	0.004PF	Using MPC Fluke 5500 A by Direct Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
10.	Oscilloscope#			Using MPC Fluke 5500 A by Direct Method
	Amplitude	5mV to 33V @DC 5mVp-p to 50Vp-p @AC 1 kHz	2.95% to 0.3% 1.44% to 0.3%	
	Time	5ns to 5s	0.012% to 0.58%	
	Bandwidth	50 kHz to 200 MHz	8.62%	
11.	Temperature Simulation#			
	PT 100	(-)200°C to 600°C	0.16°C	
	K Type	(-)200°C to 1300°C	0.48°C	
	J Type	(-)200°C to 1200°C	0.33°C	
	S Type	50°C to 1700°C	0.57°C	
	R Type	50°C to 1700°C	0.67°C	
	T Type	(-)200°C to 400°C	0.75°C	
	N Type	(-)150°C to 1000°C	0.34°C	
II.	**MEASURE**			
1.	DC Voltage#	1mV to 1V 1V to 1000V	0.41% to 0.007% 0.007% to 0.0085%	Using DMM Fluke 8846 A by Direct Method
2.	AC Voltage #	1mV to 1000 V	4.65% to 0.10%	Using DMM Fluke 8846 A by Direct Method
3.	DC Current#	10µA to 100 mA 100mA to 1A 1A to 10A	0.38% to 0.064% 0.064% to 0.082% 0.082% to 0.2%	Using DMM Fluke 8846 A by Direct Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
4.	AC Current#	1mA to 1A 1 A to 10 A	0.18% to 0.18% 0.18 % to 0.25%	Using DMM Fluke 8846 A by Direct Method
5.	Resistance#	1mΩ to 10 Ω 10 Ω to 1 MΩ 1 MΩ to 10 MΩ 10MΩ to 100 MΩ 100 MΩ to 1 GΩ	0.085% to 0.05% 0.05% to 0.014% 0.014% to 0.048% 0.048 % to 0.94% 0.94 % to 2.32%	Using D.Micro Ohm Meter & DMM Fluke 8846 A by Direct Method
6.	Frequency$	10 Hz to 20 GHz	0.00032 to 0.00025%	Using MicroWave Frequency Counter HP 5350 B by Direct Method
7.	Temperature Simulation# K Type J Type S Type R Type	 (-)200°C to 1300°C (-)200°C to 1200°C 50°C to 1700°C 50°C to 1700°C	 0.47O C 0.32°C 0.55°C 0.66°C	 Using MFC Fluke 5500 E by Direct Method
8.	High Voltage♣	**DC Voltage** 2kV to 10kV **AC Voltage** **50Hz** 1kV to 10Kv	3.45% 5.83%	Using HV Probe Fluke 80K-40 by Direct Method
9.	Inductance#	**1 kHz** 100 µH to 10 H	0.54%	Using LCR Meter Aplab 4912 by Direct Method
10.	Time#	1 sec to 24 Hrs	0.007 sec to 49.9 sec	Using Beltronics 503 Time Totaliser by Direct Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
11.	RF Power[$]	10 MHz to 4 GHz (-)5 dBm to 10 dBm	0.32dBm	Using RF Power meter HP 437B with Power sensor HP 8482A

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
	MECHANICAL CALIBRATION			
I.	**PRESSURE INDICATING DEVICES**			
1.	Pneumatic Digital& Analog Pressure Gauge#	0 to 20 bar	0.063 bar	Using Digital Pressure Gauge& Pressure Comparator by Comparison Method
2.	Vacuum Digital & Analog Pressure Gauge#	0 to (-)0.85 bar	0.034 bar	Using Digital Pressure Gauge& Pressure Comparator by Comparison Method
3.	Hydraulic Digital & Analog Pressure Gauge#	0 to 400 bar	0.82 bar	Using Digital Pressure Gauge& Pressure Comparator by Comparison Method
4.	Hydraulic Digital & Analog Pressure Gauge#	0 to 700 bar	1.242 bar	Using Digital Pressure Gauge& Pressure Comparator by Comparison Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
II.	**ACCELERATION AND SPEED**			
1.	Speed rpm, Tachometer			
	Contact Type#	100 rpm to1000 rpm 1000 rpm to 4500 rpm	2.0 rpm 2.4 rpm	Using Contact Tachometer With Tacho Calibrator (rpm generator) by Direct/ Comparison Method
	Non-Contact Type#	100 rpm to10000 rpm 10000 rpm to 49500 rpm	1.4 rpm 13.33 rpm	Using Contact Tachometer With Tacho Calibrator (rpm generator) by Direct/ Comparison Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
		THERMAL CALIBRATION		
I.	**TEMPERATURE**			
1.	All type of Sensor(RTD/TC) with or without Temperature Indicator Digital Thermometer, Temperature Gauge[$]	(-)40°C to 50°C 50°C to 600°C	0.19°C 0.28°C	Using SSPRT with Indicator, Digital Thermometer (Yudian) & Liquid/Dry baths by Comparison Method
2.	All type of Sensor(RTD/TC) with or without Temperature Indicator Digital Thermometer, Temperature Gauge[$]	600°C to 1200°C	1.62°C	Using "S" Type Thermocouple with Indicator, Digital Thermometer (Yudian) & Dry baths by Comparison Method
3.	Glass Thermometer[$]	(-)10°C to 50°C 50°C to 180°C	0.24°C 0.63°C	Using SSPRT with Indicator, Digital Thermometer (Yudian) & Liquid baths by Comparison Method
4.	Temperature Indicator of Oil Bath, Low/High Temperature bath & Dry well Bath[$]	40°C to 50°C 50°C to 600°C 600°C to 1200°C	0.41°C 1.71°C 2.63°C	Using SSPRT & S Type Thermocouple with Indicator by Comparison Method
5.	Specify Heat & Humidity Hygrometer[$]	10% to 95% @25±4°C	1.7%	Using Temperature & Humidity with Indicator & RH calibrator by Comparison Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
6.	IR Thermometer[$]	50°C to 500°C	2.66°C	Using IR Thermometer & Black body furnace by Comparison Method
7.	All type of Sensor(RTD/TC) with or without Temperature Indicator Digital Thermometer, Temperature gauge[♣]	25°C to 50°C 50°C to 600°C 600°C to 1200°C	0.37°C 0.41°C 1.69°C	Using SSPRT with Indicator, Digital Thermometer (Yudian) & Liquid/Dry baths by Comparison Method
8.	Temperature Indicator of Oil Bath, oven, Furnace, Autoclave (for all non-medical devices) Low/High Temperature bath & Dry well Bath[♣]	(-)40°C to 50°C 50°C to 600°C 600°C to 1200°C	0.62°C 2.04°C 2.86°C	Using SSPRT & S Type Thermocouple with Indicator by Comparison Method
9.	Oven, Furnace, Autoclave (for all non-medical devices) 5 Positions Volume:- Up to 3ft[♣]	(-)40°C to 350°C	1.48°C	Using(05nos) RTD sensors with paperless data Recorder by Comparison Method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
II.	**SPECIFIC HEAT AND HUMIDITY**			
1.	Indicator of Humidity chamber♣	10% to 95% @25±4°C	4.69%	Using Temperature & Humidity with Indicator by Comparison Method

*** 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.

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Program Director