

Laboratory **Action Engineers, Vadsar Bridge (West End), Vadodara, Gujarat**

Accreditation Standard **ISO/IEC 17025: 2005**

Certificate Number **CC-2419** (In lieu of C-0776,C-0777,C-0778) Page **1 of 14**

Validity **05.12.2017 to 04.12.2019** Last Amended on **06.12.2017**

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
I.	MEASURE			
1.	DC Voltage [#]	1 mV to 100 mV 100 mV to 1000 V	0.45 % to 0.01 % 0.01 %	Using 6 ½ Digital Multimeter By Direct / Comparison Method
	DC Voltage ^{\$}	> 1 kV to 70 kV	2.2 % to 1.8 %	Using High Voltage Divider By Direct / Comparison Method
	DC Voltage [*]	> 1 kV to 100 kV	2.2 % to 1.8 %	Using High Voltage Divider By Direct / Comparison Method
2.	AC Voltage [#]	50 Hz 1 mV to 1 V 1 V to 1000 V	4.8 % to 0.12 % 0.12 %	Using 6 ½ Digital Multimeter By Direct / Comparison Method
	AC Voltage ^{\$}	> 1 kV to 50 kV	2.3 %	Using High Voltage Divider By Direct / Comparison Method
	AC Voltage [*]	> 1 kV to 100 kV	2.7 % to 2.3 %	Using High Voltage Divider By Direct / Comparison Method
3.	DC Current [#]	10 μ A to 100 μ A 100 μ A to 1 A 1 A to 10 A	0.36 % to 0.1 % 0.1 % 0.1 % to 0.2 %	Using 6 ½ Digital Multimeter By Direct / Comparison Method
		10 A to 100 A 100 A to 600 A	1.0 % to 0.68 % 0.68 % to 0.84 %	Using 6 ½ Digital Multimeter & DC Shunt By Direct / Comparison Method
4.	AC Current [#]	100 μ A to 100 mA 100 mA to 10 A	0.5 % to 0.2 % 0.2 % to 0.3 %	Using 6 ½ Digital Multimeter By Direct / Comparison Method
		10 A to 1000 A	0.52 %	Using 6 ½ Digital Multimeter & CT By Direct / Comparison Method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
5.	Low Resistance [#] (4 Wire)	0.1 m Ω to 20 Ω	0.45 % to 0.1 %	Using 6 ½ Digital Multimeter, DC Shunt (VI Method) & Low Resistance Box By Direct / Comparison Method
6.	Resistance [#] (2 Wire)	1 Ω to 100 Ω 100 Ω to 10 M Ω 10 M Ω to 100 M Ω 100 M Ω to 1 G Ω	0.7 % to 0.02 % 0.02 % to 0.05 % 0.05 % to 1.0 % 1.0 % to 3.0 %	Using 6 ½ Digital Multimeter By Direct / Comparison Method
7.	Frequency [#]	10 Hz to 1 MHz	0.07 % to 0.02 %	Using 6 ½ Digital Multimeter By Direct / Comparison Method
8.	Capacitor [#]	1 nF to 1 mF	5.5 % to 2.2 %	Using 6 ½ Digital Multimeter By Direct / Comparison Method
9.	AC Voltage Ratio [#]	50 Hz 1 to 1000	0.6 % to 0.5 %	Using 6 ½ Digital Multimeter By Direct Method
10.	AC Current Ratio [#]	50 Hz 1 to 1000	2.3 %	Using 6 ½ Digital Multimeter & CT By Direct Method
11.	AC Power [#] 1 Phase – 2 Wire / 3 Phase – 4 Wire	50 Hz 240 V 1 A to 5 A 1000 W to 3600 W 0.5 PF to UPF	1.0 % to 0.39 %	Using Energy Meter By Comparison Method
12.	AC Energy [#] 1 Phase – 2 Wire / 3 Phase – 4 Wire	50 Hz 240 V 1 A to 5 A 1000 W to 3600 W 0.5 PF to UPF	1.0 % to 0.39 %	Using Energy Meter By Comparison Method

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13.	Time #	1 ms to 2 hr	0.1 ms to 4.2 s	Using 6 ½ Digital Multimeter & Time Interval Meter By Direct / Comparison Method
14.	Temperature Simulation# (Temperature Indicator / Controller / Recorder / Calibrator / Scanner / Logger) RTD J - Type Thermocouple K - Type Thermocouple R - Type Thermocouple S - Type Thermocouple B - Type Thermocouple T - Type Thermocouple E - Type Thermocouple N - Type Thermocouple	(-)100 to 600 °C (-)100 to 900 °C (-)100 to 1300 °C 0 to 1600 °C 0 to 1600 °C 300 to 1600 °C (-)200 to 400 °C (-)200 to 1000 °C (-)200 to 1300 °C	0.4 °C 0.2 °C 0.2 °C 1.1 °C 1.1 °C 0.8 °C 0.8 °C 0.2 °C 0.2 °C	Using 6 ½ Digital Multimeter By Direct / Comparison Method
II.	SOURCE			
1.	Resistance # (For Insulation Tester)	1 GΩ to 300 GΩ	1.4 % to 5.1 %	Using Resistance Box (Discrete Values) By Direct Method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
<u>MECHANICAL CALIBRATION</u>				
1.	DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)			
1.	Calipers [§] (Digital / Dial / Vernier) L.C. 10 μ m	Up to 1000 mm	11.6 μ m	Using Caliper Checker & Gauge Block Set
2.	Depth Gauges [§] (Digital / Dial / Vernier) L.C. 10 μ m	Up to 450 mm	19.7 μ m	Using Caliper Checker & Gauge Block Set
3.	Height Gauges [§] (Digital / Dial / Vernier) L.C. 10 μ m	Up to 1000 mm	11.1 μ m	Using Caliper Checker & Gauge Block Set
4.	External Micrometer [§] (All Types) L.C. 1 μ m	Up to 25 mm > 25 mm to 100 mm > 100 mm to 1000 mm	0.8 μ m 2.6 μ m 9.7 μ m	Using Micrometer Checker & Gauge Block Set
5.	Internal Micrometer [§] (2 Points) L.C. 10 μ m	Up to 500 mm > 500 mm to 1000 mm	7.8 μ m 11.0 μ m	Using Gauge Block Set & Accessories

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
6.	Inside Dial Caliper ^{\$} L.C. 10 μ m	Up to 75 mm	7.3 μ m	Using Gauge Block Set & Accessories
7.	Depth Micrometer ^{\$} L.C. 1 μ m	Up to 100 mm > 100 mm to 300 mm	7.5 μ m 9.5 μ m	Using Gauge Block Set & Accessories
8.	Micrometer Head ^{\$} L.C. 1 μ m	Up to 25 mm	1.2 μ m	Using Gauge Block Set & Comparator Stand
9.	Dial / Digital Indicator ^{\$} (Plunger Type) L.C. 1 μ m L.C. 10 μ m	Up to 25 mm Up to 50 mm	1.2 μ m 10.2 μ m	Using Dial Gauge Tester, Gauge Block Set & Comparator Stand
10.	Digital Indicator With Probe ^{\$} L.C. 0.1 μ m L.C. 1 μ m	Up to 200 μ m Up to 2000 μ m	1.3 μ m 1.4 μ m	Using Gauge Block Set & Comparator Stand
11.	Lever Type Dial Gauge ^{\$} L.C. 1 μ m L.C. 10 μ m	Up to 0.2 mm Up to 0.8 mm	1.1 μ m 10.0 μ m	Using Dial Gauge Tester, Gauge Block Set & Comparator Stand
12.	Bore Gauge ^{\$} (2-Point , Transmission Accuracy Only)	Up to 2 mm	8.4 μ m	Using Dial Gauge Tester
13.	Pistol Caliper / Outside Dial Caliper ^{\$} L.C. 10 μ m	Up to 50 mm	9.1 μ m	Using Gauge Block Set & Accessories

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
14.	Digital / Dial Thickness Gauge [§] L.C. 1 μ m L.C. 10 μ m	Up to 12 mm Up to 25 mm	1.2 μ m 7.0 μ m	Using Gauge Block Set
15.	Steel Scale [§] L.C. 0.5 mm	Up to 1000 mm	197.0 μ m	Using Scale & Tape Measuring Equipment with Travelling Microscope
16.	Measuring Tape / Pie Tape [§]	Measuring Tape: Up to 100 mtrs. Pie Tape: Up to 10 mtrs.	$197 \sqrt{\frac{L}{1000}}$ μ m L in mm	Using Scale & Tape Measuring Equipment with Travelling Microscope
17.	Bevel Protractor [§] L.C. 5 Minutes	0° - 90° - 0°	3.13 Minutes of Arc	Using Angle Gauge Block Set
18.	Combination Set / Angle Protractor [§] L.C. 1 Degree	0° - 180°	35 Minutes of Arc	Using Angle Gauge Block Set
19.	Coating Thickness Gauge [§] L.C. 0.1 μ m L.C. 1 μ m L.C. 10 μ m	Up to 100 μ m 100 μ m to 1500 μ m 1 mm to 12 mm	3.3 μ m 4.6 μ m 13.6 μ m	Using Standard Foils
20.	Plain Plug Gauge [§]	Up to 150 mm	6.3 μ m	Using Digital Indicator, Gauge Block Set & Comparator Stand
21.	Plain Ring Gauge [§]	Up to 150 mm	4.4 μ m	Using Digital Indicator, Gauge Block Set & 3 Point Mechanical Comparator

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
22.	Plain Snap Gauge ^s	3 mm to 100 mm	3.6 μ m	Using Gauge Block Set
23.	Micrometer Setting Rod / Standard Thickness Block ^s	Up to 100 mm > 100 mm to 300 mm > 300 mm to 600 mm > 600 mm to 1000 mm	3.6 μ m 7.0 μ m 8.5 μ m 11.5 μ m	Using Digital Indicator, Gauge Block Set & Comparator Stand
24.	Dial Gauge Calibrator ^s L.C. 1 μ m	Up to 25 mm	2.1 μ m	Using Digital Indicator & Gauge Block Set
25.	Feeler Gauge ^s	0.03 mm to 1 mm	2.0 μ m	Using Digital Indicator & Gauge Block Set
26.	Master Foil Of Coating Thickness Gauge ^s	Up to 12 mm	3.0 μ m	Using Digital Indicator & Gauge Block Set
27.	Pin Gauge ^s	1 mm to 10 mm	2.0 μ m	Using Digital Indicator & Gauge Block Set
28.	Taper Bore Gauge ^s (Scale Type) L.C. 0.1 mm	Up to 25 mm	3.0 μ m	Using Digital Outside Micrometer
29.	Test Sieve ^s	5 mm to 20 mm	20 μ m	Using Travelling Microscope with Dial Gauge & Digital Caliper

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
II.	DIMENSION (PRECISION INSTRUMENTS)			
1.	Profile Projector / Vision Measuring Machine / Measuring Microscope Linear X, Y Axis Angular Magnification*	Up to 10 mm 0° to 180° Up to 100 X	9.5 μ m 1 Minute of Arc 1 %	Using Glass Scale, Gauge Block, Angle Gauge & Digital Caliper
III.	PRESSURE INDICATING DEVICES			
1.	Pressure Dial / Digital Pressure Gauge / Transmitter / Switch / Recorder / Magnehelic Gauge/ Manometer#	Pneumatic 0 to 240 Pa 0 to 100 mbar 0 to 340 mbar 0 to 1 bar 0 to 7 bar Hydraulic 0 to 1 bar 0 to 7 bar 0 to 35 bar 0 to 100 bar 0 to 350 bar 0 to 700 bar 0 to 1000 bar	2 Pa 2.350 mbar 4.000 mbar 0.004 bar 0.005 bar 0.004 bar 0.005 bar 0.028 bar 0.065 bar 0.21 bar 0.43 bar 4.59 bar	Using Digital Manometer, Pressure Gauges, Pneumatic & Hydraulic Pump
2.	Vacuum Dial / Digital Vacuum Gauge / Transmitter / Switch / Recorder / Magnehelic Gauge/ Manometer#	Pneumatic -240 Pa to 0 Pa -1 to 0 bar	2 Pa 0.005 bar	Using Digital Manometer, Vacuum Gauges & Pneumatic Pump

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IV.	TORQUE GENERATING DEVICES			
1.	Torque Wrench ^s	5 Nm to 20 Nm 20 Nm to 200 Nm 200 Nm to 2000 Nm	1.91 % 1.45 % 1.48 %	Using Digital Torque Calibration System with Transducers
V.	WEIGHTS			
1.	Weights ^s Accuracy Class F2 & 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	0.02 mg 0.02 mg 0.02 mg 0.02 mg 0.02 mg 0.02 mg 0.02 mg 0.02 mg 0.02 mg 0.028 mg 0.028 mg 0.03 mg 0.03 mg 0.03 mg 0.036 mg 0.10 mg 0.10 mg	Using weight of accuracy class E2 & Digital Balance up to 80/200 g readability 0.01/0.1 mg by ABBA weighing cycles as per OIML R 111-1

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
VI.	WEIGHING SCALE AND BALANCE			
1.	Weighing Balance* Electronic Weighing Balance of Class I and Coarser d=0.01 mg and Coarser d=0.1 mg and Coarser Electronic Weighing Balance of Class II and Coarser d=10 mg and Coarser d=0.1 g and Coarser d=1 g and Coarser d=1 g and Coarser	0 to 80 g > 80 to 200 g > 200 to 600 g > 600 g to 3 kg > 3 to 6 kg > 6 to 20 kg	0.032 mg 0.084 mg 7.00 mg 0.3 g 0.60 g 1.20 g	Using Standard Weights of accuracy class E2 as per OIML R-76-1 Using Standard Weights of accuracy class E2 & F2 as per OIML R-76-1
VII.	VOLUME			
1.	Micropipette [§] (Piston Type) Glass Pipettes (Graduated / Non Graduated) / Glass Burette Measuring Cylinder/ Volumetric Flask / Conical Flask / Beaker	10 μ l to 100 μ l >100 μ l to 1000 μ l 1 ml to 50 ml 1 ml to 100 ml	0.20 μ l 0.60 μ l 10.0 μ l 10.0 μ l	Using Digital Balance up to 80/200 g readability 0.01/0.1 mg & distilled water of known density by gravimetric method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
V.	ACCELERATION & SPEED			
1.	RPM Meter / Tachometer / Stroboscope Contact Type [#]	10 to 1000 RPM 1000 to 5000 RPM	3 RPM 19 RPM	Using Multi-Function Calibrator, Frequency Meter & Stroboscope
	Non Contact Type	5 to 1000 RPM 1000 to 90000 RPM	3 RPM 19 RPM	
VI.	ACCOUSTICS			
1.	Sound Level Meter [#]	1 kHz 94 dB & 114 dB	0.55 dB	Using Sound Level Calibrator

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
<u>THERMAL CALIBRATION</u>				
I.	TEMPERATURE			
1.	Temperature Sensor With Or Without Indicator / Controller / Scanner / Transmitter / Data Logger / Temperature Switch / Dial Thermometer / Digital Thermometer / Temperature Gauge / Dial Temperature Gauge / Recorder [#]	(-)35°C to 50°C 50°C to 250°C 250°C to 600°C 600°C to 1000°C	0.27 °C 0.60 °C 1.80 °C 1.80 °C	Using R-Thermocouple RTD- PT 100 with Indicator, , Liquid Bath & Dry Block Furnace -By Comparison Method
2.	Liquid In Glass Thermometer [#]	(-)35°C to 250°C	0.84 °C	Using RTD-PT100 with Indicator & Liquid Bath By Comparison Method
3.	Infrared Thermometer / Pyrometer / Thermal Image Camera [#]	30°C to 400°C 400°C to 600°C	0.60 °C 1.73 °C	Using R-Thermocouple RTD-PT100, with Indicator, Black Body Source By Comparison Method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
4.	Temperature Indicator Of Liquid Bath / Freezer / Oven / Dry Block Temperature Calibrator / Incubator / Furnace/ Temperature Chamber [#]	(-)60°C to 250°C 250°C to 1000°C	0.81 °C 1.83 °C	Using R-Thermocouple RTD-PT100 with Indicator, By Direct Method
5.	Thermo-Hygrometer / Temperature Sensor With Indicator / Controller / Transmitter / Data Logger / Recorder [#]	10°C to 50°C @ 50 %RH	0.82 °C	Using Digital Temperature Indicator with Probe & Humidity Chamber By Comparison Method
II.	SPECIFIC HEAT AND HUMIDITY			
1.	Thermo-Hygrometer / Humidity Sensor With Indicator / Controller / Transmitter / Data Logger / Recorder [#]	30 % to 90 % RH @ 25 °C	2.64 % RH	Using Digital Humidity Indicator with Probe & Humidity Chamber By Comparison Method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
2.	Humidity Indicator Of Humidity Chamber / Generator / Calibrator / Transmitter [#]	30 % to 90 % RH @ 25 °C	2.64 % RH	Using Digital Humidity Indicator with Probe By 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.

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