

Laboratory Mukesh A. Patel Technical Consultancy & Civil Engineering
Laboratory, Plot No. E-217, Electronics Estate, G.I.D. C. Sector 26,
Gandhinagar, Gujarat

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number CC-2062

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Validity 28.11.2018 to 27.11.2020

Last Amended on 21.01.2019

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ($\pm$)	Remarks
<u>ELECTRO TECHNICAL CALIBRATION</u>				
I.	SOURCE			
1.	Temperature [#] Simulation Temperature Indicator / Controller / Recorder / Test Kit / Universal Calibrator Pt-100 B type E type J type K type R type S type T type	(-) 200°C to 850°C 600°C to 1750 °C (-) 200°C to 1000 °C (-) 200°C to 1200 °C (-) 200°C to 1370 °C 0°C to 1750 °C 0°C to 1750 °C (-) 200°C to 400 °C	0.65 °C 2.38 °C 0.86 °C 0.61 °C 0.79 °C 1.18 °C 1.31°C 0.95 °C	Using Universal Calibrator 3001 M and 6½ DMM by direct method
2.	DC Voltage [#]	100 mV to 1 V 1 V to 10 V 10 V to 100 V 100 V to 1000 V	0.023 % to 0.017 % 0.017 % to 0.014 % 0.014 % 0.014 %	Using 6½ DMM Agilent 34410A (Zeal MFC 5½ Digital Source) by Comparison Method
3.	DC current [#]	0.1 mA to 1 mA 1 mA to 10 mA 10 mA to 100 mA 100 mA to 1 A 1 to 3 A 5 A to 10 A	0.09 % 0.09 % to 0.21 % 0.21 % to 0.57 % 0.57 % to 0.58 % 0.58 % to 0.28 % 0.78 % to 0.39 %	Using 6½ DMM Agilent 34410A (Zeal MFC 5½ Digital Source) by Comparison Method

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4.	AC Voltage	50 Hz 100 mV to 1 V 1 V to 10 V 10 V to 100 V 100 V to 750 V	0.58 % to 0.35 % 0.35 % to 0.17 % 0.17 % 0.17 % to 0.11 %	Using 6½ DMM Agilent 34410A (Zeal MFC 5½ Digital Source) by Comparison Method
5.	AC Current [#]	50 Hz 0.1 mA to 1 mA 1 mA to 10 mA 10 mA to 100 mA 100 mA to 1 A 1 A to 3 A 5 A to 10 A	0.28 % to 0.60 % 0.60 % to 0.56 % 0.56 % 0.56 % to 0.60 % 0.26 % to 0.28 % 0.77 %	Using 6½ DMM Agilent 34410A (Zeal MFC 5½ Digital Source) by Comparison Method
6.	DC Resistance [#] (2 wire and 4 wire)	1 Ω to 10 k Ω 10 Ω to 100 Ω 100 Ω to 1 k Ω 1 k Ω to 10 k Ω 10 k Ω to 100 k Ω 100 k Ω to 1 M Ω 1 M Ω to 10 M Ω 10 M Ω to 100 M Ω 100 M Ω to 900 M Ω	1.64 % to 0.59 % 0.59 % 0.59 % 0.58 % 0.58 % 0.58 % 0.58 % 0.58 % to 1.30 % 1.29 % to 3.03 %	Using resistance decade box by direct method
7.	Frequency [#]	45 Hz to 1000 Hz	0.07 % to 0.17 %	Using 6½ DMM Agilent 34410A (Zeal MFC 5½ Digital Source) by Comparison Method
8.	DC Current ^{\$}	100 A to 1000 A	11.22 %	Using Zeal MFC 5½ with Current Coil by Direct method

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9.	AC Current ^s	50 Hz 100 A to 1000 A	11.82 %	Using Zeal MFC 5½ with Current Coil by Direct method
I.	MEASURE			
1.	DC Voltage ^s	100mV to 1 V 1 V to 10 V 10 V to 100 V 100 V to 1000 V	1.977% 0.017% 0.026% 0.016%	Using 6½ DMM Agilent 34410 A by Direct Method
2.	AC Voltage ^s	50 Hz 100mV to 1 V 1 V to 10 V 10 V to 100 V 100 V to 750 V	0.42% 0.35% 0.33% 0.11%	Using 6½ DMM Agilent 34410 A by Direct Method
3.	DC Current ^s	100 µA to 1 mA 1 mA to 10 mA 10 mA to 100 mA 100 mA to 1 A 1 A to 3 A 5 A to 10 A	0.65% 0.095% 0.22% 0.56% 3.92% 1.05%	Using 6½ DMM Agilent 34410 A by Direct Method
4.	AC Current ^s	50 Hz 100 µA to 1 mA 1 mA to 10 mA 10 mA to 100 mA 100 mA to 1 A 1 A to 3 A 5 A to 10 A	1.08 % 0.79 % 0.79 % 0.79 % 0.33 % 1.42 %	Using 6½ DMM Agilent 34410 A by Direct Method

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5.	DC Resistance ^s	100 Ω to 1 k Ω 1 k Ω to 10 k Ω 10 k Ω to 100 k Ω 100k Ω to 1 M Ω 1 M Ω to 10 M Ω 10 M Ω to 100 M Ω 100 M Ω to 1 G Ω	0.16 % 0.15 % 0.144 % 0.144 % 1.19 % 1.12 % 10.41 %	Using 6½ DMM Agilent 34410 A by Direct Method
6.	Frequency ^s	45 Hz to 1000 Hz	0.13 % to 0.02 %	Using 6½ DMM Agilent 34410 A by Direct Method

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<u>MECHANICAL CALIBRATION</u>				
I.	DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)			
1.	External Micrometer ^{\$} L.C. 0.001 mm	0 to 150 mm	4.8 μ m	Using Slip Gauge Set And Long Slip Gauges by Comparison Method
2.	Micrometer Setting Rods ^{\$}	25 mm to 200 mm	12.80 μ m	Using Slip Gauge Set And Long Slip Gauges And Comparator Stand, Granite Surface Plate
3.	Calipers ^{\$} L.C. 0.01 mm	0 to 600 mm	11.80 μ m	Using Slip Gauge Set And Long Slip Gauges And Internal Caliper Checker by Comparison Method
4.	Height Gauge ^{\$} L.C. 0.02 mm	0 to 600 mm	16.80 μ m	Using Slip Gauge Set And Long Slip Gauges by Comparison Method
5.	Depth Caliper Gauge ^{\$} L.C. 0.01 mm	Up to 300 mm	14.5 μ m	Using Slip Gauge Set And Long Slip Gauges And Internal Caliper Checker by Comparison Method
6.	Depth Micrometer ^{\$} L.C. 0.01 mm	0 to 300 mm	7.0 μ m	Using Slip Gauge Set and Long Slip Gauges and Surface plate by Comparison Method

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7.	Dial Indicator ^{\$} L.C. 0.01 mm	0 to 25 mm	3.80 μ m	Using Dial Calibration Tester by Comparison Method
8.	Bore Gauge ^{\$} with dial 0.01 (For Transmission mechanism up to 1 mm throw)	Up to 1 mm	5.40 μ m	Using Dial Calibration Tester by Comparison Method
9.	Feeler Gauge ^{\$}	0.01 mm to 1 mm	2.90 μ m	Using Digimatic Micrometer by Comparison Method
10.	Test Sieves ^{\$}	63 μ m to 5 mm and 5 to 125 mm	33 μ m 34 μ m	Using Profile Projector And Digital Caliper by Comparison Method
11.	Bevel Protractor ^{\$} L.C. 1°	0 to 360°	40'	Using Angle gauge set by Comparison Method
II.	ACOUSTICS			
1.	Sound Level Meter ^{\$} @1 kHz	94 dB and 114 dB	1.89 dB 1.97 dB	Using Sound Level Calibrator by direct method
III.	ACCELERATION AND SPEED			
1.	RPM [#] Tachometer (Contact type)	50 RPM to 10000 RPM	28 RPM	Using Digital Tachometer by Comparison Method
2.	RPM [#] Tachometer	20 RPM to 30000 RPM	28 RPM	Using Digital Tachometer by Comparison Method

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	(Non Contact Type)			
IV.	UTM, TENSION CREEP AND TORSION TESTING MACHINE			
1.	Uniaxial Testing Machine (Class II) like Compression Testing Machine, Load Testing Machine, Load Testing Machine in Compression Mode [#]	20 kN to 500 kN 200 kN to 2000 kN	1.17 % rdg. 0.81 % rdg.	Using Proving Ring / Load Cell Compression mode based on IS 1828 Part-1:2015.
V.	WEIGHING SCALE AND BALANCE			
1.	Weighing Balance [#]			
	d = 1 mg d = 1 mg	0 to 100 g > 100 g to 200 g	0.07 mg 2.23 mg	Using Standard Weights Of E ₂ Class by comparison method as per OIML R 76
	d = 1 mg and coarser d = 10 mg and coarser d = 150 mg and coarser d = 100 mg and coarser d = 1 g and coarser	> 200 g to 500 g > 500 g to 1 kg > 1 kg to 5 kg > 5 kg to 10 kg > 10 kg to 30 kg	14.4 mg 37.0 mg 116.37 mg 0.34 g 1.91 g	Using Standard Weights Of F ₁ Class by comparison method as per OIML R 76

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VI.	PRESSURE INDICATING DEVICES			
1.	Hydraulic Pressure ^s (Dial Pressure Gauges, Digital Pressure Gauges)	0 to 700 bar	0.32 % rdg.	Using Digital Pressure Gauge with Reference to a Calibrated Pressure Calibrator as per DKD-R-6-1 by direct method.
2.	Pneumatic Pressure ^s (Dial Pressure Gauges, Digital Pressure Gauges)	0 to 25 bar	0.7 % rdg.	Using Digital Pressure Gauge with Reference to a Calibrated Pressure Calibrator as per DKD-R-6-1 by direct method.

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<u>THERMAL CALIBRATION</u>				
I.	TEMPERATURE			
1.	RTD /Thermocouple With Indicator / Without Indicator ^{\$}	(-) 30 °C to 50 °C 30 °C to 400 °C	2.5 °C 3.95 °C	Using 4½ Digital Multimeter, PRT and liquid temperature bath by Direct/Comparison Method Using 4½ Digital Multimeter, PRT and temperature bath by Direct/Comparison Method
2.	Temperature Gauge (Analog / Digital) Without Indicator And Thermocouple ^{\$}	250 °C to 1200 °C	3.95 °C	Using 4½ Digital Multimeter , R & S Type Thermocouple and Dry Block Furnace by Direct/Comparison Method
3.	Glass Thermometer ^{\$}	(-) 10 °C to 50 °C	2.6 °C	Using 4½ Digital Digit Multimeter , PRT and liquid temperature bath by Direct/Comparison Method
4.	Oven / Muffle Furnace [#] (Single Point)	400 °C to 1200 °C	8.98 °C	Using 4½ Digital Multimeter , R & S Type Thermocouple and Dry Block Furnace by Direct/Comparison Method

* Measurement Capability is expressed as an uncertainty ($\pm$) at a confidence probability of 95%

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^sOnly 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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