

**Laboratory** Khushi Calibration Laboratory, MCF-7329, 33 Ft. Road, Sanjay Colony, Sec-23, Faridabad, Haryana

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

**Certificate Number** CC-2379 (in lieu of C-0970, C-0971 & C-1274)

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**Validity** 23.09.2017 to 22.09.2019

**Last Amended on** 26.12.2017

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ( $\pm$ )	Remarks
<b><u>ELECTRO-TECHNICAL CALIBRATION</u></b>				
<b>I.</b>	<b>MEASURE</b>			
1.	DC Voltage <sup>§</sup>	10 mV to 100 mV 100 mV to 10 V 10 V to 1000 V	1 % to 0.08 % 0.08 % 0.08 %	Using Dig. Multimeter 6 ½ Digits Fluke (8845A) By Direct / Comparison Method
2.	AC Voltage <sup>§</sup>	<b>50 Hz</b> 10 mV to 100 mV 100 mV to 100 V 100 V to 750 V	2 % to 0.22 % 0.22 % to 0.4 % 0.4 % to 0.5 %	Using Dig. Multimeter 6 ½ Digits Fluke (8845A) By Direct / Comparison Method
3.	DC Current <sup>§</sup>	100 $\mu$ A to 100 mA 100 mA to 8 A 10 A to 800 A	1 % to 0.7 % 0.7 % to 0.5 % 0.2 % to 0.6 %	Using Dig. Multimeter 6 ½ Digits Fluke (8845A) Direct / Comparison Method
4.	AC Current <sup>§</sup>	<b>50 Hz</b> 1 mA to 100 mA 100 mA to 8 A 10 A to 800 A	0.9 % to 0.6 % 0.6 % to 0.85 % 0.84 % to 1.3 %	Using Dig. Multimeter 6 ½ Digits Fluke(8845A)/ Current Coil(CT-100UH) By Direct / Comparison Method
5.	Resistance <sup>§</sup>			
	4Wire	1 m $\Omega$ to 100 m $\Omega$ 1 $\Omega$ to 10 $\Omega$	3.0 % to 0.94 % 0.94 %	Using Dig. Multimeter 6 ½ Digits Fluke (8845A)/ Micro Ohm Meter (114209)/ IR Tester (HDT-2061) By Direct / Comparison Method
	2Wire	10 $\Omega$ to 100 $\Omega$ 100 $\Omega$ to 100 k $\Omega$ 100 k $\Omega$ to 1.0 M $\Omega$ 1.0 M $\Omega$ to 10 M $\Omega$ 10 M $\Omega$ to 100 M $\Omega$	0.16 % to 0.1% 0.1 % to 0.16 % 0.16 % 0.16 % 0.16 % to 2.0 %	

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6.	Frequency <sup>§</sup>	50 Hz to 300 kHz	0.06 % to 0.15 %	Using Dig. Multimeter 6 ½ Digits Fluke (8845A) By Direct/Comparison Method
7.	Digital Timer / Stop Watch <sup>§</sup>	10 sec to 1 min 1 min to 60 min 1 hr to 24 hr	0.2 sec to 2.2 sec 2.2 sec to 5.2 sec 6 sec	Using Dig. Time Interval Meter (003419) Dig. Stop Watch (396) By Direct/Comparison Method
8.	AC High Voltage*	<b>50 Hz</b> 1 kV to 25 kV  10 kV to 70 kV	6.0 %  6 %	Using High Voltage Probe with 3½ Dig. DMM (PR-28A) by By Direct/ Comparison Method  Using High Voltage Probe indicator (REX) By Direct/ Comparison Method
9.	DC High Voltage*	1 kV to 8 kV	2.5 %	Using High Voltage Probe with 3½ Dig. DMM (PR-28A) By Direct/ Comparison Method
10.	Energy Meter* (Single Phase/ Three Phase)	230V/450 V 1A to 5 A 0.5 to U.P.F	0.26 %	Using Energy Meter Calibrator (EM6400) By Direct /Comparison Method

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<b>II.</b>	<b>SOURCE</b>			
<b>1.</b>	Resistance <sup>§</sup> 4Wire  2Wire	1 m $\Omega$ 10 m $\Omega$ 100 m $\Omega$ 1 $\Omega$ 10 $\Omega$  2 M $\Omega$ 20 M $\Omega$ 200 M $\Omega$ 2 G $\Omega$ 20 G $\Omega$	1.0 % 0.65 % 0.65 % 0.7 % 0.65 %  2.0 % 2.0 % 2.6 % 3.55 % 6.3 %	Using SRB-(431) By Direct Method  Using DMM(8845A) + SRB 853 (SR-5A) By Direct Method
<b>2.</b>	Frequency <sup>§</sup>	3 Hz to 3 MHz	1.25 % to 0.45 %	Using Function Generator/ Aplab (FG3MD) by Direct Method
	Temperature Simulation <sup>#</sup> (Indicator/Controller/Recorder/Scanner)			
	RTD (PT-100)	(-) 200 $^{\circ}$ C to 800 $^{\circ}$ C	0.84 $^{\circ}$ C	Using Universal Calibrator (Uni-cal 3001 M) By Direct Method
	Thermocouple 'J' Type	25 $^{\circ}$ C to 750 $^{\circ}$ C	1.0 $^{\circ}$ C	
	'S' Type	300 $^{\circ}$ C to 1700 $^{\circ}$ C	1.8 $^{\circ}$ C	
	'K' Type	25 $^{\circ}$ C to 1300 $^{\circ}$ C	1.30 $^{\circ}$ C	
	'R' Type	300 $^{\circ}$ C to 1700 $^{\circ}$ C	1.81 $^{\circ}$ C	
<b>4.</b>	Capacitance <sup>§</sup>	<b>1 kHz</b> 1 nF to 1 $\mu$ F 1 $\mu$ F to 7 $\mu$ F	1.6 % 1.7 %	Using LCR Meter (H003CTE0309140) By Direct/Comparison Method

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5.	Inductance <sup>s</sup>	1 kHz 130 $\mu$ H to 1 mH 1 mH to 10 mH 10 mH to 800 mH	1.2 % 1.2 % 1.2 %	Using LCR Meter H003CTE0309140) By Direct/Comparison Method
6.	Energy Meter <sup>s</sup> (Single Phase/ Three Phase)	230V/450 V 1A to 5 A 0.5 to U.P.F	0.59 % to 0.24 %	Using Energy Meter Calibrator (EM6400) By Direct/Comparison Method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ( $\pm$ )	Remarks
<b><u>MECHANICAL CALIBRATION</u></b>				
<b>I.</b>	<b>DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)</b>			
1.	Vernier/Dial/Digital Caliper <sup>§</sup> L.C.: 0.01	Up to 600 mm	14.6 $\mu$ m	Using Caliper Checker & Slip Gauge
2.	External Micrometer <sup>§</sup> L.C. : 0.001 mm	0 to 100 mm >100 mm to 300 mm	0.89 $\mu$ m 8.32 $\mu$ m	Using Slip Gauge Set
3.	Inner Gauge Micrometer / Internal Micrometer (Stick Micrometer) <sup>§</sup> L.C.: 0.001 mm <sup>Ⓟ</sup>	50 mm to 300 mm	10.8 $\mu$ m	Using Slip Gauge Set & Gauge Block Accessories
4.	Dial Indicator <sup>§</sup> (Plunger Type) L.C= 0.001 mm <sup>Ⓟ</sup>	0 to 1 mm 0 to 100 mm	1.07 $\mu$ m 5.8 $\mu$ m	Using ULM
5.	Height Gauge/ Electronic Height Gauge/2D Height Gauge <sup>§</sup> (Dig./Dial/Vernier) L.C.: 0.001mm <sup>Ⓟ</sup>	0 to 600 mm	5.8 $\mu$ m	Using Caliper Checker & Surface Plate
6.	Dial Indicator <sup>§</sup> (Lever Type) L.C.: 0.001 mm	Up to 1 mm	1.80 $\mu$ m	Using ULM

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7.	Feeler Gauge <sup>§</sup>	0.01 mm to 1 mm	2.0 $\mu$ m	Using ULM
8.	Snap Gauge/Dial Snap Gauge <sup>§</sup> (Only Parallelism)	5 mm to 100 mm	5.0 $\mu$ m	Using Slip Gauge Set & Dial Indicator (Plunger Type)
9.	Plain Plug Gauge/ Air Plug Gauge/ Width Gauge/ Master Plug Gauge <sup>§</sup>	3 mm to 100 mm 100 mm to 200 mm	1.80 $\mu$ m 2.9 $\mu$ m	Using ULM
10.	Steel Scale/Scale <sup>§</sup>	Up to 1000 mm	119.0 $\mu$ m	Using Tape & Scale Measuring Machine
11.	Bevel Protector <sup>§</sup> L.C.: 5'	0 to 180°	5.4'	Using Angle Gauge Set
12.	Combination Set/ Angle Protector <sup>§</sup> L.C.: 1°	0 to 180°	42'	Using Angle Gauge Set
13.	Radius Gauge <sup>§</sup>	0 to 25 mm	50.0 $\mu$ m	Using Profile Projector
14.	Test Sieve <sup>§</sup> Aperature Size	0.032 mm to 10 mm	8.0 $\mu$ m	Using Profile Projector
15.	Dial Thickness Gauge/Pistol Caliper <sup>§</sup> L.C.: 0.001mm <sup>φ</sup>	0 to 1 mm 0 to 25 mm	1.31 $\mu$ m 7.60 $\mu$ m	Using Slip Gauge Set
16.	Bore Gauge <sup>§</sup> L.C.: .001 mm (Transmission Only)	0 to 2 mm	3.3 $\mu$ m	Using ULM & Dial Indicator Plunger Type

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ( $\pm$ )	Remarks
17.	Coating Thickness Gauge <sup>§</sup> L.C.: 0.1 $\mu$ m L.C.: 1 $\mu$ m	10 $\mu$ m to 100 $\mu$ m 10 $\mu$ m to 1000 $\mu$ m	2.8 $\mu$ m 18.8 $\mu$ m	Using Std. Foils
18.	Depth Gauge / Vernier Depth Gauge <sup>§</sup> L.C.: 0.01 mm	0 to 300 mm	12.2 $\mu$ m	Using Slip Gauge Set
19.	Thread Plug Gauge/ WCP <sup>§</sup> (Pitch Dia Only)	4 mm to 100 mm	1.65 $\mu$ m	Using Three Wire Unit Set & ULM
20.	Thread Ring Gauge/ WCR <sup>§</sup> (Pitch Dia. Only)	4 mm to 100 mm	2.70 $\mu$ m	Using ULM
21.	Micrometer Setting Rod /Length Bar <sup>§</sup>	25 mm to 100 mm > 100 mm to 300 mm	1.31 $\mu$ m 2.70 $\mu$ m	Using ULM
22.	Master Ring Gauge/ Air Ring Gauge/ Plain Ring Gauge <sup>§</sup>	3 mm to 100 mm	2.30 $\mu$ m	Using ULM
23.	Three Wire Unit Set <sup>§</sup>	0.17 mm to 6.3 mm	1.00 $\mu$ m	Using ULM
24.	Measuring Pin <sup>§</sup>	0.17 mm to 20 mm	1.22 $\mu$ m	Using ULM
25.	Measuring Tape/ Steel Tape <sup>§</sup> L.C.: 1 mm	0.5 mtr to 20 mtr	126 $\mu$ m $\sqrt{L}$ (L in Meter)	Using Tape & Scale Measuring Machine
26.	Depth Micrometer <sup>§</sup> L.C.: 0.01 mm	0 to 300 mm	12.2 $\mu$ m	Using Slip Gauge Set

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27.	Surface Plate <sup>#</sup>	Up to 2000 mm x 2000 mm	$1.02 \sqrt{\frac{L+W}{125}} \mu\text{m}$ (L in Meter)	Using Electronic Level
28.	Bench Center <sup>#</sup> -Parallelism of Centres w.r.f base -Co-Axiality	Up to 500 mm	15.6 $\mu\text{m}$ 12.0 $\mu\text{m}$	Using Test Mandrel, Dial Indicator (Plunger Dial)
29.	Pitch Gauge <sup>§</sup>	0.2 mm to 6 mm	43.2 $\mu\text{m}$	Using Profile Projector
30.	Std Foils <sup>§</sup>	10 $\mu\text{m}$ to 1200 $\mu\text{m}$	2.6 $\mu\text{m}$	Using ULM
31.	V Block <sup>§</sup>  Parallelism of V Axis Flatness Symmetry Squareness Matching Tolerance	Up to (200 x 150 x 125) mm	7.27 $\mu\text{m}$ 4.53 $\mu\text{m}$ 6.47 $\mu\text{m}$ 9.89 $\mu\text{m}$ 6.42 $\mu\text{m}$	Using Test Mandrel, Surface Plate, Lever Dial, Master Cylinder & Slip Block
32.	Try Square / Right Angle <sup>§</sup> Parallelism Squareness	Up to 230 mm	4.88 $\mu\text{m}$ 6.69 $\mu\text{m}$	Using Lever Dial, Surface Plate, Master Cylinder & Gauge Block Set
33.	Angle Plate / Box Angle Plate <sup>§</sup> Parallelism Squareness	Up to 200 mm	4.63 $\mu\text{m}$ 5.80 $\mu\text{m}$	Using Lever Dial, Surface Plate, Granite Cylinder & Gauge Block Set
34.	Inside Dial / Digital Caliper <sup>§</sup> L.C.: 0.01 mm	5 mm to 60 mm	12.2 $\mu\text{m}$	Using Gauge Block Set & Gauge Block Accessories

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35.	Test Mandrel <sup>§</sup> Straightness Size Variation Run Out	10 mm to 100 mm 10 mm to 100 mm 50 mm to 500 mm	3.87 $\mu$ m 1.81 $\mu$ m 3.17 $\mu$ m	Using ULM, Dial Indicator Plunger Type, Surface Plate & Bench Centre
36.	Comparator Stand <sup>#</sup> (Flatness of Surface)	Up to 230 mm	4.00 $\mu$ m	Using Lever Type Dial Gauge
37.	Microscope / Travelling Micro Scope <sup>#</sup> L.C.: 0.01 mm  Linear Scale Magnification	0 to 180 mm 10 X	7.64 $\mu$ m 0.1%	Using Gauge Block Set & Glass Scale
38.	Wire Gauge / Fillete Gauge <sup>§</sup>	0.19 mm to 7.62 mm	5.30 $\mu$ m	Using Profile Projector
39.	Taper Scale <sup>§</sup>	1 mm to 150 mm	12.70 $\mu$ m	Using Profile Projector
40.	Cylindrical Standard <sup>§</sup> Diameter Runout	5 mm to 100 mm 5 mm to 100 mm	2.21 $\mu$ m 3.15 $\mu$ m	Using ULM, Bench Centre, Plunger Type Dial Gauge
II.	<b>DIMENSION (PRECISION INSTRUMENTS)</b>			
1.	Profile Projector <sup>#</sup> L.C.: 0.001 mm / 1'  Linear Scale Angle Magnification	Up to 200 mm Up to 180 <sup>o</sup> 10 X, 20 X	2.7 $\mu$ m 171 sec. 0.1%	Using Glass Scale, Angle Gauge & Slip Block Set

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2.	Gauge Block Accessories <sup>§</sup>  Parallelism Flatness	Up to 300 mm Up to 300 mm	2.4 $\mu$ m 2.4 $\mu$ m	Using Surface Plate, Dial Gauge & Optical Flat
3.	Universal Length Measuring Machine <sup>#</sup> L.C: 0.0001 mm	Up to 100 mm	1.57 $\mu$ m	Using Slip Gauge Block
4.	Tape & Scale Measuring Machine <sup>#</sup> L.C.: 0.001 mm	0 to 1000 mm	21.1 $\mu$ m	Using Gauge Block Set & Long Gauge Block
5.	Sprit Level / Electronic Level <sup>§</sup> Sensitivity: 0.001mm/m	2mm/m	6 $\mu$ m/m	Using Electronic Level, Tilting Table & Dial Gauge
III.	<b>WEIGHING SCALE AND BALANCE</b>			
1.	Weighing Balance <sup>#</sup> Readability : 0.1 mg	Up to 210 gm	0.21 mg	Using Std Weights E2 Class and Weighing balance of class-1 or coarser as per OIML R-76-1
	Readability :0.1g	Up to 10 kg	1.26 g	Using Std Weights M1 Class Weighing balance of class-III or coarser as per OIML R-76-1
	Readability :10 g	Up to 100 kg	5 g	

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2.	Spring Balance <sup>#</sup> L.C.: 5g	0 to 10 kg 0 to 20 kg	6 g 7.6 g	Using Std. Weights M1 Class by Direct Method
<b>IV.</b>	<b>DUROMETER</b>			
1.	Rubber Hardness Tester <sup>\$</sup> (Duro Meter) Shore A Shore D L.C.: 0.1/1 Shore A/D	0 to 100 Shore A 0 to 100 Shore D	0.78 Shore A 1.20 Shore D	Using Dig. Weighing Balance fixture set up based on ASTM D 2240
<b>V.</b>	<b>ACCELERATION AND SPEED</b>			
1.	Digital Tachometer/RPM/Stroboscope Meter <sup>\$</sup> L.C.: 0.1/1 RPM			
	Contact	125 RPM to 1000 RPM 1000 RPM to 9000 RPM	0.6 % 0.30 %	Using Digital Tachometer by Comparison Method
	Non- Contact	1000 RPM to 2000 RPM 2000 RPM to 60000 RPM	1.50 % 0.30 %	
<b>VI.</b>	<b>ACOUSTICS</b>			
1.	Sound Level Meter <sup>\$</sup> L.C.: 0.1 dB	<b>1 kHz</b> 94 dB & 114 dB	1.6 dB	Using Sound Level Calibrator

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<b>VII.</b>	<b>PRESSURE INDICATING DEVICES</b>			
<b>1.</b>	Hydraulic Pressure Gauge# (Digital/ Analog)	0 to 20 Bar 0 to 70 Bar 0 to 400 Bar 0 to 700 Bar	0.06 Bar 0.25 Bar 0.62 Bar 2.35 Bar	Using Digital Pressure Gauge & Hydraulic Pump based on DKD- R-6-1
<b>2.</b>	Digital/ Analog Vacuum Gauge#	0 to (-) 0.8 bar	0.029 bar	Using Vacuum Gauge & Vacuum Pump Comparator based on DKD- R-6-1

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<b><u>THERMAL CALIBRATION</u></b>				
<b>I.</b>	<b>TEMPERATURE</b>			
1.	RTD/Thermocouple with or without Indicator <sup>§</sup>	(-) 30 °C to 50°C 50 °C to 250 °C	0.43°C 0.84°C	Using 4 Wire RTD with Dig. Temp indicator and Liquid and Oil Bath
2.	Dig./Dial Gauge/ Liquid in Glass Thermometer <sup>§</sup>	(-) 30 °C to 250 °C	0.5°C	Using 4 Wire RTD with Dig. Temp indicator and Liquid & Oil Bath
3.	Thermocouple with or without Indicator <sup>§</sup>	250°C to 1200 °C	3.1°C	Using 'S' Type T/c with Dig. Temp Indicator and Dry Block Calibrator
4.	RTD/Thermocouple with or without Sensor <sup>*</sup>	(-) 30 °C to 50°C 50°C to 250°C	0.43°C 0.84°C	Using 4 Wire RTD with Dig. Temp Indicator and Liquid Bath
		250°C to 1200°C	3.1°C	Using 'S' Type Thermocouple with Dig. Temp Indicator and dry Block
5.	Indicator of Oven, Freezer, Dry & Muffle Furnace, Centrifuge Chamber, Liquid Bath & Water Bath Industrial Furnace, Muffle Furnace <sup>*</sup>	(-) 30°C to 50°C	0.5°C	Using 4 Wire RTD with Dig. Temp Indicator by Direct Method (Single Point Calibration)
		50°C to 250 °C 250°C to 1200°C	0.9°C 3.3°C	Using 'S' Type Thermocouple with Dig. Temp Indicator by Direct Method (Single Point Calibration)

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6.	Industrial Oven / Furnace / Spatial Thermal Mapping*	20°C to 250°C	2.8°C	Using Multi Point Data Logger with RTD Sensors (Multi position Calibration)
7.	Industrial Furnace/ Spatial Thermal Mapping*	250°C to 1200°C	7.4°C	Using Multi Point Data Logger with N Type Sensors (Multi position Calibration)
II.	<b>SPECIFIC HEAT &amp; HUMIDITY</b>			
1.	Digital /Analog Hygrometer, RH Sensor, RH Transmitter with or without indicator <sup>§</sup>	10°C to 50°C 30 % RH to 95 % RH	0.4°C 1.6 % RH	Using Dig. Temp and Humidity sensor with Indicator and Temp. Humidity Source

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

<sup>§</sup>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.

<sup>φ</sup> 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.

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