

Laboratory **Excel Calibration Pvt. Ltd., Plot No.5-A/9,1<sup>st</sup> Floor, Road No. 1, IDA Nacharam, Hyderabad Urban, Telangana**

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

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Validity **01.01.2019 to 11.10.2019** Last Amended on **12.04.2019**

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
<b><u>ELECTRO-TECHNICAL CALIBRATION</u></b>				
<b>1.</b>	<b>SOURCE</b>			
1.	DC Voltage #	1 mV to 100 mV 100 mV to 10 V 10 V to 100 V 100 V to 1000V	0.24% to 0.0041% 0.0041% to 0.0018% 0.0018% to 0.0037% 0.0037 % to 0.0024%	Using Standard Calibrator Fluke 5522A By Direct Method
		<b>45 Hz to 10kHz</b> 30 mV to 100 mV 100 mV to 1V 1 V to 30V 30V to 300V	0.08%to 0.031% 0.031% to 0.035% 0.035% to 0.026% 0.026 % to 0.04%	
		<b>45 Hz to 1kHz</b> 300V to 1000V	0.04%	
3.	DC Current #	10µA to 100µA 100µA to 1 mA 1 mA to 1A 1A to 10A 10A to 20A 20A to 1000A	0.25% to 0.04% 0.04% to 0.017% 0.017% to 0.03% 0.03% to 0.062% 0.062% to 0.12% 1.45%% to 0.65%	Using Standard Calibrator Fluke 5522A By Direct Method  Using Fluke 5522A With Current Coil By Direct Method

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4.	AC Current #	<b>10Hz to 1kHz</b>		Using Standard Calibrator Fluke 5522A By Direct Method
		30 $\mu$ A to 300 $\mu$ A	0.65% to 0.2%	
		300 $\mu$ A to 300 mA	0.2% to 0.14%	
		300 mA to 3 A	0.14% to 0.21%	
		<b>45 Hz to 1 kHz</b>		
		3 A to 20A	0.21%	
		<b>50 Hz</b>		
		20 A to 900 A	2.23% to 1.41%	Using Fluke 5522A With Current Coil By Direct Method
		1 $\Omega$ to 100 $\Omega$	0.12% to 0.006%	
		100 $\Omega$ to 1 k $\Omega$	0.006 % to 0.004%	
		1 k $\Omega$ to 1 M $\Omega$	0.004%	
		1 M $\Omega$ to 10 M $\Omega$	0.004% to 0.017%	
		10 M $\Omega$ to 300 M $\Omega$	0.017% to 0.4%	
		300 M $\Omega$ to 1G $\Omega$	0.4% to 1.78%	
		0.001 $\Omega$	0.18%	
		0.01 $\Omega$	0.15%	
		0.1 $\Omega$	1.26%	
		0.5 $\Omega$	0.58%	
		0.9 $\Omega$	0.58%	
		1 G $\Omega$	5.80%	
		5 G $\Omega$	5.79%	
		9 G $\Omega$	5.78%	
		10 G $\Omega$	5.84%	
		50 G $\Omega$	5.83%	
		90 G $\Omega$	5.92%	
		100 G $\Omega$	5.86%	

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		500 G $\Omega$	6.07%	
		1000 G $\Omega$	7.64%	
		<b>1kHz</b>		
		1nF to 10nF	1.8% to 0.43%	
		10nF to 300nF	0.43% to 0.28%	
		<b>100Hz</b>		
		700nF to 3 $\mu$ F	0.45% to 0.41%	
		3 $\mu$ F to 100 $\mu$ F	0.41% to 0.64%	
		<b>1kHz</b>		
		100 $\mu$ H to 10H	1.25% to 1.65%	Using Decade Inductance Box
		<b>50Hz</b>		
		120V to 240V	1.29% to 1.05%	
		0.1A to 20A		
		0.2 (Lead)-UPF- 0.2 (Lag)		
		2.4W to 4.8kW		
<b>9.</b>	Power Factor #	0.2 Lead to UPF 0.2 Lag to UPF	0.003 PF	Using Standard Calibrator Fluke 5522A By Direct Method
		2.5mV to 130V	2.5% to 0.4%	
		2mV to 55V <sub>P-P</sub> <b>@1kHz</b>	2.35% to 0.55%	
		1nS to 5S	0.06% to 0.55%	
		50kHz to 1GHz	5.9%	

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ( $\pm$ )	Remarks
11.	Temperature Simulation # (Temperature indicators/ Controller/ Recorder/ Calibrator/ Transmitter) K-Type J-Type E-Type T-Type S-Type R-Type B-Type N-Type Thermocouples PT-100	(-)200°C to 1350°C (-)200°C to 1200°C (-)250°C to 1000°C (-)200°C to 400°C 250°C to 1700°C 250°C to 1700°C 600°C to 1800°C (-)200°C to 1300°C (-)200°C to 800°C	0.32°C to 0.6°C 0.32°C to 0.6°C 0.32°C to 0.6°C 0.32°C to 0.6°C 0.32°C to 0.6°C 0.32°C to 0.6°C 0.32°C to 0.6°C 0.32°C to 0.6°C 0.25°C	Using Standard Calibrator Fluke 5522A/ Signal Calibrator (Process Calibrator) By Direct Method
12.	Frequency #	10 Hz to 1 MHz	0.0065% to 0.029%	Using Standard Calibrator Fluke 5522A By Direct Method
II.	<b>MEASURE</b>			
		0.5mV to 100mV	0.13% to 0.06%	
		100 mV to 10V	0.06% to 0.005%	
		10 V to 100 V	0.005%	
		100 V to 1000V	0.005% to 0.001%	
		<b>40Hz to 10kHz</b>		
		10mV	0.081%	
		<b>45Hz to 20kHz</b>		
		100 mV to 1V	0.20% to 0.06%	

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		1V to 100V	0.06% to 0.03%	
		100V to 1000V	0.03% to 0.09%	
		10 $\mu$ A to 1mA	0.074% to 0.005%	
		1mA to 1A	0.005% to 0.026%	
		1A to 10A	0.026% to 0.060%	
		10A to 20A	0.060%	
		<b>50Hz to 5kHz</b>		
		100 $\mu$ A to 100mA	0.07% to 0.061%	
		100mA to 1A	0.061% to 0.05%	
		1A to 10A	0.05% to 0.12%	
		<b>50Hz</b>		
		10A to 20A	0.12%	
		10m $\Omega$ to 10 $\Omega$	0.5% to 0.06%	
		10 $\Omega$ to 100 $\Omega$	0.06% to 0.03%	
		100 $\Omega$ to 100k $\Omega$	0.03% to 0.045%	
		100k $\Omega$ to 10M $\Omega$	0.045% to 0.04%	
		10M $\Omega$ to 10G $\Omega$	0.04% to 0.3%	
		1mV to 100mV	0.41% to 0.060%	
		100 mV to 10V	0.060% to 0.0051%	
		10 V to 100 V	0.0051%	
		100 V to 1000V	0.0051% to 0.0059%	
		<b>45Hz to 1kHz</b>		
		100 mV to 1V	0.20% to 0.11%	
		1V to 100V	0.11%	
		100V to 1000V	0.11%	
		10 $\mu$ A to 1mA	0.035% to 0.064%	
		1mA to 1A	0.064% to 0.081%	
		1A to 10A	0.081% to 0.18%	

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9.	AC Current <sup>#</sup>	<b>50Hz to 1kHz</b>		
		100µA to 100mA	0.17%	
		100mA to 1A	0.17%	
		1A to 10A	0.17% to 0.24%	
		1Ω to 10Ω	0.36% to 0.060%	
		10Ω to 100Ω	0.060% to 0.03%	
		100Ω to 100kΩ	0.03% to 0.045%	
		100kΩ to 10MΩ	0.045% to 0.047%	
		10MΩ to 100MΩ	0.047% to 0.93%	
		100MΩ to 1GΩ	0.93% to 2.29%	
11.	Frequency <sup>#</sup>	10Hz to 1MHz	0.035%	Using 6½ DMM Fluke 8846A By Direct Method
12.	Temperature Measurement <sup>#</sup> K-Type J-Type E-Type T-Type S-Type R-Type N-Type Thermocouples RTD (PT-100)	(-)200°C to 1350°C	0.24°C to 0.43°C	Using MFC 5522A & 6½ DMM Fluke 8846A (for PT100)
		(-)200°C to 1200°C	0.24°C to 0.43°C	
		(-)250°C to 1000°C	0.24°C to 0.43°C	
		(-)250°C to 400°C	0.24°C to 0.43°C	
		300°C to 1700°C	0.24°C to 0.43°C	
		250°C to 1700°C	0.24°C to 0.43°C	
		(-)200°C to 1300°C	0.24°C to 0.43°C	
		(-) 200°C to 800°C	0.16°C	
13.	Time Interval <sup>#</sup>	10 sec to 9000 sec	0.23 sec	Using Time Totalizer By Comparison Method
14.	DC Current <sup>#</sup>	10A to 100A	1.47%	Using 6½ DMM Fluke 8846A With Current Shunt By Direct method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ( $\pm$ )	Remarks
15.	AC High Voltage <sup>#</sup>	50Hz 1 kV to 25 kV	8.8%	Using HV Probe & DMM By Direct Method

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Convenor

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<b><u>MECHANICAL CALIBRATION</u></b>				
<b>1.</b>	<b>DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)</b>			
1.	External Micrometer \$ L.C.0.001 mm L.C.0.01 mm	Upto 25 mm Above 25 mm to 500 mm Above 500 mm to 1000 mm	1.2 $\mu$ m 4.2 $\mu$ m 12.6 $\mu$ m	Using Gauge Blocks & Long gauge blocks By Comparison Method Base on IS:2967
2.	Vernier Calipers\$ (dial and digital) L.C.0.01mm L.C.0.02mm	Upto 300 mm Above 300 mm to 1000 mm	8.4 $\mu$ m 15.9 $\mu$ m	Using Caliper Checker / Long gauges Blocks By Comparison Method Base on IS:3651(part 1&2)
3.	Vernier Depth Gauge\$ L.C.0.01mm	Upto 600 mm	11.0 $\mu$ m	Using Gauge Blocks / Long gauge blocks By Comparison Method Base on IS:4213
4.	Depth micrometer \$ L.C.:0.01mm	Upto 150 mm	8.3 $\mu$ m	Using Gauge Blocks & Long gauge blocks By Comparison Method Base on BS:6468
5.	Height Gauge\$ (digital and dial) L.C.0.001mm	Upto 300mm Above 300 mm to 600 mm Above 600 mm to 1000 mm	6.6 $\mu$ m 9.3 $\mu$ m 13.0 $\mu$ m	Using Gauge Blocks / Long gauge blocks By Comparison Method Base on IS:2921

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6.	Plain Plug Gauges <sup>s</sup>	Upto 300 mm	2.2 $\mu$ m	Using ULM By Comparison Method Base on IS:3455
7.	Thread Plug Gauge <sup>s</sup> (Effective dia.)	Upto 100 mm Above 100 to 300 mm	3.8 $\mu$ m 5 $\mu$ m	Using ULM By Comparison Method Base on IS:6311
8.	Plain Ring Gauge <sup>s</sup>	1.8 to 100mm Above 100 to 300 mm	3.4 $\mu$ m 3.8 $\mu$ m	Using ULM By Comparison Method Base on IS:3544
9.	Thread Ring Gauge <sup>s</sup> (Effective dia.)	1.8 to 100 mm Above 100 to 300 mm	3.8 $\mu$ m 3.8 $\mu$ m	Using ULM By Comparison Method Base on IS:2334
10.	Taper Plain Plug Gauge <sup>s</sup>	Upto 100 mm	3.9 $\mu$ m	Using ULM By Comparison Method
11.	Taper Plain Ring Gauge <sup>s</sup>	Upto 100 mm	3.1 $\mu$ m	Using ULM By Comparison Method
12.	Taper Thread Plug Gauge <sup>s</sup> (Effective dia.)	Upto 100 mm	4.0 $\mu$ m	Using ULM By Comparison Method
13.	Taper Thread Ring Gauge <sup>s</sup> (Effective dia.)	Upto 100 mm	4.3 $\mu$ m	Using ULM By Comparison Method
14.	Feeler Gauges <sup>s</sup>	Upto 2 mm	1.7 $\mu$ m	Using Micrometer/ULM By Comparison Method Base on IS:3179
15.	Plunger Dial Gauges <sup>s</sup> L.C.0.001mm	Upto 100 mm	1.7 $\mu$ m	Using ULM and Dial Calibration Tester By Comparison Method Base on IS:2092

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ( $\pm$ )	Remarks
16.	Lever Dial Gauge <sup>§</sup> L.C. 0.001 mm	Upto 2 mm	1.72 $\mu$ m	Using ULM and Dial Calibration Tester By Comparison Method Base on IS:11498
17.	Bore Gauges <sup>§</sup> (Transmission Only)	Upto 2 mm	2.5 $\mu$ m	Using ULM and Dial Calibration Tester By Comparison Method
18.	Internal/Inside Micrometer <sup>§</sup> (Travel Only) L.C.0.01mm	Upto 50 mm	7.2 $\mu$ m	Using ULM By Comparison Method
19.	Internal/External Groove Dial Gauge <sup>§</sup> (Travel Only) L.C.0.01mm	Upto 100 mm	6 $\mu$ m	Using Gauge Blocks, ULM By Comparison Method
20.	Dial Thickness Gauge <sup>§</sup> L.C.0.001mm	Upto 100 mm	8 $\mu$ m	Using Gauge Blocks By Comparison Method Base On IS:2092
21.	Ultrasonic Thickness Gauge <sup>§</sup>	Upto 300mm	5 $\mu$ m	Using Gauge Blocks & Long gauge blocks By Comparison Method
22.	Coating Thickness Gauge <sup>§</sup>	Upto 2mm	2 $\mu$ m	Using Coating Thickness Foil By Comparison Method
23.	Snap Gauge <sup>§</sup>	Upto 300mm	4.6 $\mu$ m	Using Gauge blocks / ULM By Comparison Method Base on IS:3477
24.	Groove Micrometer <sup>§</sup>	Upto 100mm	2 $\mu$ m	Using Gauge blocks By Comparison Method

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25.	Three Pin Micrometer <sup>§</sup>	Upto 100 mm	8.2 $\mu$ m	Using plain ring gauges By Comparison Method
26.	Pistol Caliper <sup>§</sup>	Upto 100 mm	28.9 $\mu$ m	Using Gauge blocks By Comparison Method
27.	Millimess <sup>§</sup>	Upto 1 mm	1.7 $\mu$ m	Using ULM By Comparison Method
28.	Sine Bar <sup>§</sup>	Upto 500 mm	0.4 arc of min	Using Angle gauges, dial indicators, Slip Gauge Set By Comparison Method Base On IS:4239
29.	Bevel Protractor , Combination Set, Inclinometer <sup>§</sup>	Upto 360 deg	3.3 arc of min	Using Angle gauge blocks By Comparison Method Base On IS:4239
30.	V-Blocks <sup>§</sup> (Parallelism) (Squareness) (Symmetrically)	Upto 250 mm	10 $\mu$ m	Using Test mandrel and Dial indicators By Comparison Method Base On IS:2949
31.	Angle Plates <sup>§</sup> (Parallelism) (Squareness)	300 x 300 mm	7.1 $\mu$ m	Using Height Gauge Surface table and dial indicators By Comparison Method Base On IS:2554, IS:6973 & IS:6232
32.	Thickness Foils <sup>§</sup>	Upto 2 mm	1.7 $\mu$ m	Using ULM/Micrometer By Comparison Method
33.	Engineer Square <sup>§</sup> (Squareness)	Upto 300mm	7.2 $\mu$ m	Height Gauge Surface table and dial indicators By Comparison Method Base On IS:2103
34.	Test Sieve <sup>§</sup>	0.003mm to 25mm 25mm to 300mm	8.2 $\mu$ m 8.1 $\mu$ m	Using Profile Projector / Digital Vernier By Comparison Method Base On IS:460(part I,II,III)

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35.	Radius Gauge/ Form Gauge <sup>§</sup>	0.5mm to 100mm	7.3 $\mu$ m	Using Profile Projector By Comparison Method
36.	Thread Pitch Gauge <sup>§</sup>	0.1mm to 25mm	7.3 $\mu$ m	Using Profile Projector By Comparison Method
<b>II. DIMENSION (PRECISION INSTRUMENTS)</b>				
1.	Slip Gauge <sup>§</sup> Grade 0,I,II	0.5 mm to 25 mm >25 mm to 50 mm >50 mm to 100 mm	$\pm$ 0.18 $\mu$ m $\pm$ 0.21 $\mu$ m $\pm$ 0.30 $\mu$ m	Using Gauge blocks Comparator & "K" Grade Slip Gauges By Comparison Method Base on IS:3650
2.	Extension Rods <sup>§</sup> Of internal Mic./Length Bars/ Width gauge/Setting Rod of Ext. Mic.	Upto 300 mm >300 mm to 1000 mm	3.0 $\mu$ m 14.0 $\mu$ m	Using Electronic height gauge & Surface Plate as Reference By Comparison Method Base on IS:2966
3.	Thread Measuring Wire/ Cylindrical Measuring pins <sup>§</sup>	0.17mm to 6.35 mm Upto 20 mm	0.7 $\mu$ m 1.0 $\mu$ m	Using ULM By Comparison Method Base on IS:11103
4.	2D Height Measuring Instrument <sup>§</sup> L.C.0.0001 mm	Upto 1000 mm	7.3 $\mu$ m	Using Long gauge blocks By Comparison Method Base On IS:2921
5.	Angle Gauge, <sup>§</sup> Angular Scale, Angle Graticule	0° to 360°	0.4 arc of min.	Using Profile Project By Comparison Method
6.	ULM * L.C.0.00001mm	0 to 1000 mm	(0.12+0.93 L) $\mu$ m L in meter	Using Laser Interferometer / K grade slip gauge blocks By Comparison Method

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7.	Profile Projector / Measuring Microscope/Video Measuring System* L.C.0.001mm	Upto 1000 mm 0 to 360 deg 5X to 100X	(0.6+0.5 L) $\mu$ m L in meter 5 min 0.9%	Using Laser Interferometer Using Angle Gauge, Slip Gauge & Linear Glass Scale By Comparison Method
8.	CMM * L.C.0.001mm	Upto 700 mm	7.2 $\mu$ m	Using Long gauge blocks By Comparison Method ISO:15635, ISO:10360
9.	Surface Plates*	Up to 4000 mm X4000mm	4 $\mu$ m/m	Using Spirit Level By Comparison Method ISO:7327:2003,ISO:8512-2
10.	Electronic Height Gauge*	Up to 700mm	8.5 $\mu$ m	Using long gauge blocks By Comparison Method
11.	CNC Machine, CNC Machine Tools/ Machining Center * L.C. 0.001 mm & Coarser	Up to 15000 mm	(0.8+0.93L) $\mu$ m L in meter	Using Laser Interferometer By Comparison Method VDI 344
12.	Tape & Scale Measuring Machine* L.C. 0.001 mm & Coarser	Up to 1000 mm	(0.8+0.93L) $\mu$ m L in meter	Using Laser Interferometer By Comparison Method

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<b>III.</b>	<b>SPEED AND ACCELERATION</b>			
1.	Tachometer, Rotation Meters, Tacho-Generator # (Contact Type) L.C. 0.1/1 rpm	10 mm to 100 rpm 100 mm to 1000 rpm 100 mm 0 to 10000 rpm	1.0 rpm 2.0 rpm 3.5 rpm	Using Digital Tachometer and RPM Source by Comparison Method By Using SANAS TR45-02
2.	Tachometer, RPM Indicators # (Non Contact Type) L.C. 0.1/1 rpm	10 mm to 1000 rpm 1000 mm to 10000 rpm 10000 mm to 90000 rpm	1.0 rpm 2.0 rpm 4.4 rpm	Using Digital Tachometer and RPM Source by Comparison Method By Using SANAS TR45-02
3.	Centrifuge, RPM Source/ RPM Meter / Rotating Machineries L.C. 1 rpm	10 mm to 1000 rpm 1000 mm to 10000 rpm	1.0 rpm 3.0 rpm	Using Tachometer by Source by Comparison Method SANAS TR45-02
<b>IV.</b>	<b>ACOUSTIC</b>			
1.	Sound Level Meter #	94 dB and 114 dB (at 1kHz)	0.5 dB	Using Sound Level Calibrator By Comparison Method as per IS: 15575-1
<b>V.</b>	<b>PRESSURE INDICATING AND GENERATING DEVICES</b>			
1.	Pressure Pneumatic <sup>§</sup>  Dead Weight Tester	2 bar to 50 bar	0.06 % rdg	Using Dead Weight Tester and Cross Float Method (Generated Pressure Method)

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2.	Pressure Pneumatic <sup>§</sup>  Pressure Calibrators, Pressure Gauges and Transducers	2 bar to 50 bar	0.069 % rdg	Using Dead Weight Tester (Pneumatic) by comparison method as per DKD-R6-1
3.	Pressure Hydraulic <sup>§</sup>  Dead Weight Tester	6 bar to 60 bar  60 bar to 1200 bar	0.015 % rdg  0.015 % rdg	Using Dead Weight Tester and Cross Float Method (Generated Pressure Method)
4.	Pressure Hydraulic <sup>§</sup>  Pressure Calibrators, Pressure Gauges and Transducers	6 bar to 60 bar  60 bar to 1200 bar	0.02 % rdg  0.02 % rdg	Using Dead Weight Tester (Hydraulic) by comparison method as per DKD-R6-1
5.	Pressure Pneumatic <sup>§</sup>  Pressure Calibrators, Pressure Gauges and Transducers	(-) 950 mbar to (-) 15 mbar  15 mbar to 1000 mbar	0.08 % rdg  0.08 % rdg	Using Dead Weight Tester (Pneumatic and Vacuum) by comparison method as per DKD-R6-1
6.	Hydraulic Pressure <sup>#</sup>  Pressure Gauge, Digital Pressure Gauge, Transmitter/ Transducer, Pressure Switch	0 to 200 bar 0 to 700 bar 0 to 1000 bar	0.078 bar 0.15 bar 2 bar	Using Digital Pressure Gauge / Pressure Calibrator By Comparison Method as per DKD R6-1

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7.	Pneumatic Pressure <sup>#</sup>  Pressure Gauge Digital Pressure Gauge, Transmitter/ Transducer, Pressure Switch	0 to 40 bar 0 to 2bar	0.0081 bar 0.001 bar	Using Digital Pressure Gauge / Hand Pump By Comparison Method as per DKD R6-1
8.	Pressure Negative <sup>#</sup>  Vacuum Gauge Digital Vacuum Gauge, Vacuum Transmitter/ Transducer Vacuum switch <sup>#</sup>	(-)0.95 to 0 bar	0.0005 bar	Using Digital Pressure Gauge / Vacuum Pump By Comparison Method as per DKD R6-2
9.	Low Pressure <sup>#</sup>  Magnehelic Gauge Manometer Differential Pressure Transmitter	0 to 2000 mmWc	1.0 mmWc	Using Low Pressure Calibrator By Comparison Method as per DKD R6-1
10.	Absolute Pressure Pneumatic <sup>#</sup>  Pressure Gauges, Pressure Indicator, Pressure Transmitter / Transducers and Barometer	25 mbar to 1050 mbar	2.84 mbar	Using Absolute Pressure Calibrator By Comparison Method as per DKD-R6-1

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<b>VI.</b>	<b>TORQUE GENERATING DEVICE</b>			
1.	Torque Wrench <sup>\$</sup> Type I Class B,C,D,E Type II Class A,B,D,E	1Nm to 100 Nm 100Nm to 1000 Nm 1000Nm to 2000 Nm	1.2 % 1.5 % 1.6 %	Using Digital Torque Wrench Tester By Comparison Method as per IS:6789:2003
<b>VII.</b>	<b>TORQUE MEASURING DEVICE</b>			
1.	Torque Calibrator, Torque Transducers with and without indicator, Torque Meter and Torque Tester <sup>\$</sup> Class 0.2 and Coarser	0.5 Nm to 5 Nm 2 Nm to 20 Nm 20 Nm to 200 Nm 200 Nm to 2000 Nm	0.04 % 0.04 % 0.04 % 0.04 %	Using Dead Weight Torque Calibration System Consisting of Lever Arm and Dead Weights As per BS 7882-2008
<b>VIII.</b>	<b>FORCE PROVING INSTRUMENTS</b>			
1.	Load cells <sup>\$</sup> (With/Without Indicator), Proving Rings, Dynamometer (Compression and Tension Mode) (Class 00 and Coarser)	0.5 N to 10 N 10 N to 5000 N	0.04 % 0.05 %	Using Dead Weight Force Calibration Machine with Stainless Steel/ Dead Weight and Loading Hangers as per IS 4169-2014 and ISO 376-2011

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2.	Load cells, Proving Rings, Dynamometers <sup>§</sup> (Compression and Tension Mode) (Class 1 and Coarser)	5 kN to 50 kN	0.06 %	Using Force Comparator Machine and Calibrated Load Cells as per IS 4169-2014 and ISO 376-2011
<b>IX.</b>	<b>MOBILE FORCE MEASURING MACHINE</b>			
1.	Push Pull Gauge, Force Gauges <sup>§</sup> (Push and Pull Mode)	10 N to 500N	0.47%	Using Dead Weight Force Calibration Machine with Stainless Steel/ Dead Weight and Loading Hangers and as per VDI/VDE-2624
<b>X.</b>	<b>WEIGHTS</b>			
1.	Accuracy Class F2 and Coarser <sup>§</sup>	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	0.015 mg 0.015 mg 0.015 mg 0.015 mg 0.015 mg 0.015 mg 0.015 mg 0.015 mg 0.015 mg 0.015 mg 0.015 mg 0.015 mg 0.015 mg 0.015 mg 0.015 mg 0.10 mg 0.15 mg	Using E2 Class Standard Weights and Electronic Balance upto 80 g of $d=0.01$ mg and upto 200 g of $d=0.1$ mg Using ABBA method as per OIML R111:2004

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2.	Accuracy Class F2 and Coarser <sup>s</sup>	500 g 1 kg 2 kg 5 kg 10 kg 20 kg	0.00114 g 0.0018 g 0.0018 g 0.0114 g 0.1 g 0.15 g	Using F1 Class Standard Weights and Electronic Balance upto 1 kg of d=1mg, upto 6 kg of d=10 mg and upto 30 kg of d=100 mg Using ABBA method as per OIML R111:2004
<b>XI.</b>	<b>WEIGHING SCALES AND BALANCE</b>			
1.	Weighing Balances <sup>#</sup>	1 mg to 80 g d $\geq$ 0.01 mg	0.08 mg	Using E2 class Weights as per OIML R-76
		>80 g to 200 g d $\geq$ 1 mg	1.1 mg	
		>200 g to 1 kg d $\geq$ 1 mg	1.7 mg	Using F1 class Weights as per OIML R-76
		>1 kg to 6 kg d $\geq$ 10 mg	11.43 mg	
		>6 kg to 30 kg d $\geq$ 1 g	2.1 g	
		>30 kg to 100 kg d $\geq$ 10 g	8.3 g	Using M1 class Weights as per OIML R-76
		>100 kg to 500 kg d $\geq$ 50 g	50 g	Using M1 Class Weights as per OIML R-76
		>500 kg to 1000 kg d $\geq$ 200 g	200 g	
<b>XII.</b>	<b>VOLUME</b>			
1.	Piston Pipettes and Micropipettes <sup>s</sup>	>10 $\mu$ l to 100 $\mu$ l >100 $\mu$ l to 1000 $\mu$ l >1000 $\mu$ l to 5000 $\mu$ l	0.034 $\mu$ l 0.13 $\mu$ l 1.17 $\mu$ l	Using weighing Balance of Range 82 g / 220 g and Readability 0.01mg / 0.1mg as per ISO 8655-6 ISO/TR 20461

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2.	Glass Pipettes (Graduated / non graduated) and Glass Burette, Measuring Cylinder, Volumetric Flask, Conical Flask Beaker and Jar <sup>s</sup>	>1 ml to 100 ml >100 ml to 500 ml >500 ml to 1000 ml >1000 ml to 2500 ml >2500 ml to 5000 ml >5000 ml to 10000 ml	0.7 ml 0.31 ml 4.6 ml 8.0 ml 14.0 ml 20.14 ml	Using weighing Balance of Range 1kg / 1mg, 6 kg / 10 mg and 30 kg /100 mg as per ISO 4787 and ISO/TR 20461

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ( $\pm$ )	Remarks
<b><u>THERMAL CALIBRATION</u></b>				
<b>I.</b>	<b>TEMPERATURE</b>			
		(-)80 °C to 50 °C	0.32 °C	
		50 °C to 250 °C	0.35 °C	
		(-)30 °C to 50 °C	0.2 °C	
		50 °C to 250 °C	0.25°C	
		250 °C to 600 °C	1.82°C	
		600 °C to1200 °C	2.5°C	
<b>3.</b>	RTDs, Thermocouples (With and Without Indicators), Data Loggers, Recorders, Transmitters, Digital Thermometers, Temperature Gauges, Temperature Switches \$	(-)80 °C to 50 °C	0.2 °C	Using 4-Wire RTD with Digital Temp. Indicator and Liquid Bath By Comparison method

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4.	Infra Red Thermometers, Pyrometers \$	50 °C to 500 °C	3.0 °C	Using Infrared Thermometer & Black Body Source by Comparison Method
		(-) 80 °C to 250 °C	0.2 °C	Using 4-Wire RTD with Digital Temp. Indicator, By Comparison method (Single Position)
		250 °C to 600 °C	1.81 °C	
		600 °C to 1200 °C	2.5 °C	
		(-) 80 °C to 250 °C	1.0 °C	Using Multi channel Data Logger with RTD sensors (Multi Position Calibration) By Mapping
		250 °C to 1200 °C	4.16 °C	Multi Channel Data Loggers With Thermocouples and Portable Data Loggers (Multi Position Calibration ) By Mapping

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ( $\pm$ )	Remarks
II.	SPECIFIC HEAT & HUMIDITY			
		20% to 95%RH @ 25 °C	2.3 % RH	
		5 to 50 °C @ 50%RH	0.81 °C	
2.	Environmental Chambers, Humidity Chambers*	20% RH to 95 % RH @ 10 °C to 60 °C	2.0 % RH	Using Digital Humidity Meter / Data Loggers (Single Position) By Comparison Method
3.	Humidity Chambers, Environmental Chambers*	20% RH to 95 % RH @ 20 °C to 50 °C	3.0 % RH	Using Temperature and humidity data loggers (Minimum nine) Multi Position Calibration By Mapping

\* 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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