

**Laboratory** N.P.K. Founders (Test & Calibration Lab Division), Plot No. A-92 & 93, H-Block, MIDC, Pimpri, Pune, Maharashtra  
**Accreditation Standard** ISO/IEC 17025: 2005  
**Certificate Number** CC-2189 **Page** 1 of 10  
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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ( $\pm$ )	Remarks
<b><u>ELECTRO-TECHNICAL CALIBRATION</u></b>				
<b>I.</b>	<b>SOURCE</b>			
1.	DC Voltage <sup>#</sup>	1 mV to 100 mV 100 mV to 1 V 1 V to 100 V 100 V to 1000 V	0.482 % to 0.007 % 0.007 % to 0.012 % 0.012 % 0.012 %	Using Multifunction Calibrator By Direct Method
		10 $\mu$ A to 1 mA 1 mA to 10 mA 10 mA to 100 mA 100 mA to 1 A 1 A to 10 A 10 A to 20 A	0.14 % to 0.03 % 0.03 % 0.03 % 0.03 % to 0.09 % 0.09 % 0.1 %	Using Multifunction Calibrator By Direct Method
		20 A to 1000 A	0.45 % to 0.3 %	Using Multifunction Calibrator With 50 & 10 Turn Coils
3.	AC Voltage <sup>#</sup>	<b>50 Hz to 3 kHz</b> 10 mV to 100 mV 100 mV to 10 V 10 V to 1000 V	1.13 % to 0.071 % 0.071 % to 0.049 % 0.049 % to 0.08 %	Using Multifunction Calibrator By Direct Method
		<b>50 Hz</b> 100 $\mu$ A to 100 mA 100 mA to 1 A 1 A to 10 A 10 A to 20 A	0.5 % to 0.13 % 0.13 % to 0.17 % 0.17 % to 0.26 % 0.26 % to 0.28 %	Using Multifunction Calibrator By Direct Method
		<b>50 Hz</b> 20 A to 1000 A	0.6 % to 0.67 %	Using Multifunction Calibrator With 50 & 10 Turn Coils

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5.	Resistance <sup>#</sup>	1 $\Omega$ to 10 $\Omega$ 10 $\Omega$ to 1000 $\Omega$	0.53 % to 0.09 % 0.09 %	Using Low Resistance Decade Box by Direct Method
		1 $\Omega$ to 100 $\Omega$ 100 $\Omega$ to 10k $\Omega$ 10 k $\Omega$ to 1 M $\Omega$ 1 M $\Omega$ to 320 M $\Omega$	1.15 % to 0.045 % 0.045 % to 0.026 % 0.026 % to 0.067 % 0.067 % to 0.091 %	Using Multifunction Calibrator By Direct Method
		100 $\mu\Omega$ , 1 m $\Omega$ , 10 m $\Omega$ , 100 m $\Omega$ , 1000 m $\Omega$	0.86 % to 0.68 % 0.32 %	Using Standard Resistance Box By Direct Method
		10 m $\Omega$ to 100 m $\Omega$ 100 m $\Omega$ to 1000 $\Omega$	2.28 % to 0.58 % 0.58 % to 0.086 %	Using Low resistance Decade Box By Direct Method
7.	High Resistance <sup>#</sup>	100 k $\Omega$ to 1000 M $\Omega$	2.26 % to 2.3 %	Using High Resistance Decade Box Vaiseshika 8400 HV (Megger)
8.	Frequency <sup>#</sup>	1 Hz to 10 MHz	0.003 % to 0.006 %	Using Multifunction Calibrator By Direct Method
		1 kHz 3 nF to 100 $\mu$ F	0.42 % to 0.75 %	Using Multifunction Calibrator By Direct Method
		1 kHz 1nF to 100 $\mu$ F (in steps of 1, 2, 5, 10)	0.589 %	Using Time electronics Calibrator By Direct Method

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10.	Temperature Simulation# RTD J Type T/C K Type T/C R Type T/C S Type T/C	(-) 100°C to 850 °C 0 °C to 700 °C 0 °C to 1200°C 0°C to 1600°C 0°C to 1600°C	0.3°C 0.35°C 0.35°C 1.0°C 1.2°C	Using Multifunction Calibrator By simulation
11.	Inductance#	<b>1 kHz</b> 1 mH to 10 H (in steps of 1,2,5,10)	0.2 %	Using Multifunction Calibrator By Direct Method
12.	Oscilloscope# Amplitude Bandwidth Time	15 mV/div to 5V/div Upto 100 MHz 200ns/div to 2ms/div	0.54 % to 0.3 % 2.21 % 1.7 %	Using Multifunction Calibrator By Direct Method
13.	AC Power#	50 Hz 50V to 300 V 0.2 to 20 A 0.2 to 1 PF 2 W to 20 W 20 W to 6000 W	2.87 % to 0.44 % 0.44 % to 0.25 %	Using Multifunction Calibrator Time By Direct Method
14.	AC Power#	<b>50 Hz</b> 50 to 300 VAC Upto 1000 A 0.2 to 1 PF 6 kW to 300 kW	0.5 %	Using Multifunction Calibrator By Direct Method
15.	Power Factor#	50 to 300 V 0.2 to 20 A 0.2 to 1 PF	0.009 PF	Using Multifunction Calibrator Time Electronics 5025 C By Direct Method

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II.	<b>MEASURE</b>			
	DC Voltage <sup>#</sup>	1 mV to 100 mV 100 mV to 10V 10V to 1000 V	0.10 % to 0.003 % 0.003 % to 0.002 % 0.002 %	Using 8.5 Digit Multimeter By Direct / Comparison Method
	DC High Voltage <sup>#</sup>	1 kV to 10 kV 10 kV to 100 kV	2.04 % to 2.02 % 2.02 % to 1.96 %	Using 100kV HV divider By Direct/Comparison Method
		100 $\mu$ A to 100mA 100 mA to 1A	0.014 % to 0.009 % 0.009 % to 0.03 %	Using 8.5 Digit Multimeter By Direct / Comparison Method
		1 A to 10 A	0.03 % to 0.02 %	Using 6.5 Digit Multimeter By Direct / Comparison Method
		10 A to 20 A	0.02 % to 0.38 %	Using Shunt with 6.5 Multimeter By Direct/ Comparison Method
		30 A to 500 A	1.45 % to 0.73%	Using High Current Shunt & DMM
		<b>50 Hz to 1 kHz</b> 10 mV to 100 mV 100 mV to 1V 1 V to 100 V 100 V to 700V	0.169 % to 0.019 % 0.019 % to 0.033 % 0.033 % to 0.019 % 0.019 % to 0.05 %	Using 8.5 Digit Multimeter By Direct / Comparison Method
		700 V to 1000 V	0.05 % to 0.112 %	Using 6.5 Digit Multimeter By Direct / Comparison Method
4.	AC High Voltage <sup>#</sup>	1 kV to 100 kV	2.04 %	Using 100kV HV divider By Direct/Comparison Method

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5.	AC Current <sup>#</sup>	50 Hz to 1 kHz 100 $\mu$ A to 100 mA 100 mA to 1A	0.13 % to 0.12 % 0.12 % to 0.3 %	Using 6.5 Digit Multimeter By Direct / Comparison Method
		50 Hz 1 A to 10 A	0.3 % to 0.34 %	Using 6.5 Digit Multimeter By Direct / Comparison Method
		10 A to 20 A	0.34 % to 1 %	Using Shunt with 6.5 Multimeter By Direct/ Comparison Method
		30 A to 500 A	2.12 % to 1.41 %	Using AC High Current Shunt & DMM
6.	Frequency <sup>#</sup>	3 Hz to 300 kHz 300 kHz to 10 MHz	0.12 % to 0.016 % 0.016 % to 0.043 %	Using 6.5 & 5.5 Digit Multimeter By Direct / Comparison Method
		1 $\Omega$ to 1M $\Omega$ 1M $\Omega$ to 100 M $\Omega$	0.12 % to 0.004 % 0.004 % to 0.116 %	Using 8.5 Digit Multimeter By Direct / Comparison Method
		100 M $\Omega$ to 1G $\Omega$	0.116 % to 1.347 %	Using 8.5 Digit Multimeter
8.	Low Resistance <sup>#</sup>	10 m $\Omega$ to 1000 m $\Omega$	0.07 % to 0.012 %	By Direct / Comparison Method
9.	Time <sup>#</sup>	1 s to 3600s 3600s to 24 hrs	0.15s to 2.18s 2.18s to 21.26s	Using Digital Timer By Direct / Comparison Method

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<b><u>MECHANICAL CALIBRATION</u></b>				
<b>I.</b>	<b>DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)</b>			
1.	Caliper <sup>s</sup> (Vernier/Dial/Digital) Error of External, Internal Jaws L.C.: 10 $\mu$ m	0 to 300 mm	11.0 $\mu$ m	Using Caliper Checker By Comparison Method As per IS 3651
2.	Height Gauge <sup>s</sup> (Vernier/Dial/Digital) Error Along Working Length L.C.: 10 $\mu$ m	Up to 300 mm	12.0 $\mu$ m	Using Caliper Checker By Comparison Method As per IS 2921
3.	Thickness Foils <sup>s</sup>	0.01 mm to 1.25 mm	2.6 $\mu$ m	Using Electronic probe with DRO By Comparison Method
4.	Coating Thickness Gauge <sup>s</sup> L.C.: 0.001 mm	0.01 mm to 2 mm	2.7 $\mu$ m	Using Standard Thickness Foils By Comparison Method
5.	Digital/Analog Ultrasonic Thickness Gauge <sup>s</sup> L.C.: 0.1 mm	5 mm to 200 mm	60 $\mu$ m	Using Height Masters By Comparison Method
<b>II.</b>	<b>ACOUSTICS</b>			
1.	Sound Level Meters <sup>s</sup>	94 dB & 114 dB	1.1 dB	Using Sound Level Calibrator By Comparison Method

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<b>III.</b>	<b>ACCELERATION AND SPEED</b>			
1.	Speed (RPM) <sup>§</sup> (Contact Type) Resolution: 0.1 & 1 RPM	10 RPM to 3,000 RPM	1.2 %	Using Digital Tachometer & VFD Equipment as per Sanas TR 45-1
2.	Speed (RPM) <sup>§</sup> (Non Contact Type) Resolution: 0.1 & 1 RPM	10 RPM to 99,000 RPM	1.2 %	Using Digital Tachometer & VFD Equipment as per Sanas TR 45-1
3.	Centrifuge & RPM Indicators*	100 RPM to 10,000 RPM	1.2 %	Using Digital Tachometer Sanas TR 45-2
<b>IV.</b>	<b>WEIGHING SCALE AND BALANCE</b>			
1.	Mass/Weighing Balance# Readability: d=0.1mg (Class II & Coarser) Readability: d=0.01g (Class II & Coarser)	Up to 220 g > 220 g to 1000 g 1 kg to 5 kg	1.25 mg 13.5 mg 18mg	Using Standard Weights (E2 Class-upto 500g And F1 Class-5kg) as per OIML R-76-1
<b>V.</b>	<b>DENSITY AND VISCOSITY</b>			
1.	Density <sup>§</sup>	0.7 g/cc to 2 g/cc	0.0006 g/cc	Using Analytical Balance And Suspension By Cuckows Method and HPLC Grade Water And Methanol
2.	Viscosity <sup>§</sup> Flow Cups (Determination of Flow Time)	30 cSt to 150 cSt	0.5 s	Using Viscosity Reference Standard Liquids & IS 3944

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<b>VI.</b>	<b>PRESSURE INDICATING DEVICES</b>			
1.	Pneumatic Pressure Analogue/Digital Pressure Gauges, Transmitters, Transducer With Indicator <sup>#</sup>	0.25 bar to 1.5 bar >1.5 bar to 15 bar	0.0015 bar 0.014 bar	Using Digital Pressure Gauge & Pneumatic Pump Comparator By Comparison Method as per DKD-R6-1
2.	Hydraulic Pressure Analogue/Digital Pressure Gauges, Transmitters, Transducer With Indicator <sup>#</sup>	>15 bar to 100 bar >100 bar to 700 bar > 700 bar to 1000 bar	0.017 bar 0.59 bar 0.93 bar	Using Digital Pressure Gauge/Pressure Transmitter with Indicator & Hydraulic Pump Comparator By Comparison Method as per DKD-R6-1
3.	Vacuum Analogue/Digital Pressure Gauges, Transmitters, Transducer With Indicator <sup>#</sup>	0 to (-) 0.9 bar	0.0018 bar	Using Digital Vacuum Gauge & Pneumatic Pump Comparator By Comparison Method as per DKD-R6-2
<b>VII.</b>	<b>TORQUE GENERATING DEVICES</b>			
1.	Torque Wrench <sup>§</sup> (Type I,II) All Class	0.5 Nm to 5 Nm 2 Nm to 20 Nm 10 Nm to 100 Nm 50 Nm to 500 Nm	2 % 1.4 % 1.4 % 1.4 %	Using Torque Wrench Calibration System & Torque Sensors

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<b><u>THERMAL CALIBRATION</u></b>				
<b>I.</b>	<b>TEMPERATURE</b>			
1.	Liquid in Glass Thermometer, Dial/ Temperature Gauge RTD/Thermocouple with or without Indicator <sup>§</sup>	(-) 80 °C to 25 °C 25 °C to 250 °C	0.18 °C 0.27 °C	Using SPRT & 6.5 DMM With Liquid Bath & Oil Bath By Comparison Method
2.	RTD/Thermocouples Sensors with or Without Temperature Indicator/ Data Logger/ Recorder/Dial Temp Gauge <sup>#</sup>	(-) 40 °C to 50 °C 50 °C to 400 °C	0.18 °C 0.3 °C	Using SPRT & 6½ DMM & Low Temperature Dry Block, High Temperature Dry Block Calibrator By Comparison Method
3.	Thermocouple/Sensor With or Without Temperature Indicator/Data Logger/ Recorder <sup>#</sup>	400 °C to 900 °C	2.1 °C	Using S-Type Thermocouple & 6½ DMM & Dry Block Furnace By Comparison Method
4.	Non Contact Thermometers IR Thermometers Pyrometers <sup>#</sup>	40 °C to 500 °C	2.5 °C	Using Black Body Source & Ref. IR Thermometer By Comparison Method
5.	Oven, Muffle Furnace Chamber <sup>*</sup>	0 °C to 250 °C	2.2 °C	Using RTD Sensors (Minimum Nine) with Multi Channel Data Logger By Comparison Method (Multi Position Calibration)

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II.	<b>SPECIFIC HEAT &amp; HUMIDITY</b>			
1.	Temperature/Humidity Data Loggers, Thermo-Hygrometers within Built or External Sensor <sup>§</sup>	5 °C to 45 °C @ $\approx$ 50 % RH 20 to 95 % RH @ $\approx$ 25 °C	0.38 °C 1.6 % RH	Using Temperature Humidity Meter with Sensor & Temperature/ Humidity Chamber By Comparison Method

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

<sup>§</sup>Only in Permanent Laboratory

<sup>^</sup>Only for Site Calibration

<sup>#</sup> The laboratory is also capable for site calibration however, the uncertainty at site depends on the prevailing actual environmental conditions and master equipment used.