Accreditation No: LAB 001

Awarded to

NATIONAL METRLOGY INSTITUTE OF PAKISTAN(NMIP) PLOT NO. 16, SECTOR H-9/1, ISLAMABAD, PAKISTAN.

The scope of accreditation is in accordance with the standard specifications outlined in the following page(s) of this document. The accredited scope shall be visible and legible in areas such as customer service, sample-receiving section etc and shall not mislead its users.

The accreditation was first time granted on **12-02-2004** by Pakistan National Accreditation Council.

The laboratory complies with the requirements of **ISO/IEC 17025:2017.**

The accreditation requires regular surveillance, and is valid until **11-08-2025.**

The decision of accreditation made by Pakistan National Accreditation Council implies that the organization has been found to fulfill the requirements for accreditation within the scope.

The organization however, itself is responsible for the results of performed measurements/tests.

PAKISTAN NATIONAL ACCREDITATION COUNCIL

19-05-2025
Date

SD
Director General

Testing Laboratory

Accreditation Scope of **NATIONAL METRLOGY INSTITUTE OF PAKISTAN**
Plot No. 16, Sector H-9/1, Islamabad, Pakistan

Permanent laboratory premises X

Materials/ Products tested	Testing field (e.g. environmental testing or mechanical testing)	Types of tests / Properties measured	Reference to standardized method (e.g. ISO 14577-1:2003)/ Internal method reference	
CHEMICAL METROLOGY				
Water/ Wastewater/ Industrial Effluents	Environmental testing	Electrical Conductivity	2510-B,	Standard Methods for the Examination of Water and Wastewater, 24th Edition, 2023. Lipps WC, Braun-Howland EB, and Baxter TE (Eds). American Public Health Association (APHA), American Water Works Association (AWWA), WEF, USA.
		Total Dissolved Solids (TDS)	2540-C	
		Total Suspended Solids (TSS)	2540-B	
		Total Hardness	2340-C	
		Alkalinity	2320-B	
		Chloride	4500-Cl^-	
		Calcium	3500-Ca	
		Magnesium	3500-Mg(B)	
		Chemical Oxygen Demand (COD)	5220-B,	
		pH	4500-H^+	
Water/ Wastewater/ Industrial Effluents/ Solutions/ Liquids	Chemical and Environmental testing	Copper (Cu)	Standard Methods for the Examination of Water and Wastewater, 24th Edition, 2023. Lipps WC, Braun-Howland EB, and Baxter TE (Eds). American Public Health Association (APHA), American Water Works Association (AWWA), WEF, USA. Atomic Absorption Spectrometer, AAnalyst -100, Perkin Elmer-USA Direct method (Flame - AAS)	
		Iron (Fe)		
		Lead (Pb)		
		Zinc (Zn)		
		Chromium (Cr)		
		Sodium (Na)		
		Potassium (K)		
		Calcium (Ca)		
		Magnesium (Mg)		
		Cadmium (Cd)		
		Nickel (Ni)		
		Manganese (Mn)		
		Cobalt (Co)		

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Calibration Laboratory

Accreditation Scope of **NATIONAL METROLOGY INSTITUTE OF PAKISTAN**
Plot No. 16, Sector H-9/1, Islamabad, Pakistan

Permanent laboratory premises X

Field of measurement: MASS METROLOGY

Measured quantity	Range	*Expanded Uncertainty (±)	Technique, Reference Standard, Equipment
Mass	1 mg - 10 mg	0.0011 - 0.0013 mg	**i)** E_2, F_1 and F_2 class standard masses from 1 mg to 10 kg **ii)** Mass Comparator CCE6 having readability 0.1 µg and capacity of 6.1 g **iii)** Mass Comparator CC111 having readability 1 µg and capacity of 111 g **iv)** Mass Comparator AX1006 having readability 1 µg and capacity of 1000 g **v)** Mass Comparator CC10000U-L having readability 10 µg and capacity of 10 kg **vi)** Top loading balance CC64K **vii**) Top loading Balance LP1200 **Unit Under Test:** Standard Masses class E2 and below **Method Used:** MMD/TPP-21/01, 02, 03, 05, 06, 07
	20 mg - 500 mg	0.0014 - 0.0044 mg	
	1 g - 5 g	0.0044 - 0.0082 mg	
	10 g - 200 g	0.0090 - 0.048 mg	
	500 g - 1000 g	0.16 - 0.29 mg	
	2000 g - 5000 g	0.52 -1.40 mg	
	10000 g	2.80 mg	

Field of measurement: VOLUME METROLOGY

Measured quantity	Range	*Expanded Uncertainty (±)	Technique, Reference Standard, Equipment	
Volume	200 µL - 5000 µL	0.60 µL – 2.90 µL	**Unit Under Test:** Micropipette	**Equipment Used:** M-39 ME414S, Sartorius, Germany M-58 CP8200, Sartorius, Germany M-28 CC64K, Sartorius, Germany M-27 LP1200S, Sartorius, Germany **Method Used:** ASTM E542-01 MMD/Vol-28/TPP-28
	1000 µL - 5000 µL	2.90 µL – 5.00 µL		
	1 mL – 1000m L	0.010 mL – 3.50 mL	**Unit Under Test:** Glassware	
	1 L - 5 L	0.0040 L – 0.030 L		
	20 mL - 2000 m L	0.12 mL - 5.78 mL	**Unit Under Test:** Metallic	
	2 L - 5 L	0.006 L - 0.017 L		
	5 L - 10 L	0.017 L - 0.029 L		
	10 L - 20 L	0.029 L - 0.050 L		

Field of measurement: DIMENSION METROLOGY

Measured quantity	Range	*Expanded Uncertainty (±)	Technique, Reference Standard, Equipment
Length	0-300 mm / 0-30 cm / 1 Foot	0.041 - 0.071 mm	**Unit Under Test:** Foot Scales using Length Comparator **Method Used:**

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			DMD/TP-1
	0-1000 mm (1 Meter)	0.041 - 0.062 mm	**Unit Under Test:** Meter Scales using Length Comparator **Method Used:** DMD/TP-1
	0.01 - 50 m	0.053 - 0.19 mm	**Unit Under Test:** Measuring Tapes using Length Comparator **Method Used:** DMD/TP-1
	1000 mm	0.0015 - 0.0050 mm	**Unit Under Test:** End Standard Meter Gauge Block using End to End Comparator **Method Used:** DMD/TP-2
	0.03 – 1 mm	0.20 - 3.00 µm	**Unit Under Test:** Feeler Gauge using UMM_2 **Method Used:** DMD/TP-3
Length	0.5 - 100 mm	0.11 – 15.00 µm	**Unit Under Test:** Gauge Blocks using UMM_2 **Method Used:** DMD/TP-3
	101 - 300 mm	0.13 - 4.8 µm	**Unit Under Test:** Gauge Blocks using UMM_2 **Method Used:** DMD/TP-3
	0 - 300 mm	0.10 - 25.00 µm	**Unit Under Test:** Precision Glass / Scale / Slide using UMM_1 **Technique Used:** Direct Measurements
	0 - 80 mm	0.72 – 14.00 µm	**Unit Under Test:** Dial Indicator / Gauge using UMM_1 **Method Used:** DMD/TP-7
	0 - 300 mm	0.0058 - 0.088 mm	**Unit Under Test:** Digital Vernier /Dial Caliper using Gauge Blocks **Method Used:** DMD/TP-4
	0 - 25.4 mm	0.00060 - 0.0090 mm	**Unit Under Test:** Micrometer using Gauge Blocks **Method Used:** DMD/TP-5
	0 - 25 mm	0.00060 - 0.0067 mm	**Unit Under Test:** Dial Gauge Calibrator/ Dial Testing Machine / Tesa Tronic Amplifier using Gauge Blocks **Method Used:** Direct Measurements
Diameter External	0.5 - 100 mm	0.18 - 10.00µm	**Unit Under Test:** Cylinders / Circular Steel Rods using UMM_2 **Method Used:** Direct Measurements
Diameter Internal	5 - 100 mm	0.74 - 16.00 µm	**Unit Under Test:**

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			Ring Gauges using UMM_1 **Method Used:** DMD/TP-8

Field of measurement: PRESSURE METROLOGY

Measured quantity	Range		*Expanded Uncertainty (±)	Technique, Reference Standard, Equipment
Hydraulic / Lubricant / Liquid / Electronic Simulated Pressure Source Mode	Active Lo Q-PRT (690 to 139.96) bar (1-2030) psi (0.009-14) MPa	1 – 200 psi	0.006 % of FS	**Reference Standards:** Electronic Dead Weight Tester (RPM4-EDWT, A140M), P-19 **Unit Under Test:** As mentioned below and electronic simulation-based pressure, transmitter / applications **Method Used:** PMD/TPP-38/ Fluke OEM DKD R-6-1 for CPB EURAMET PB/03 EAL-G26/EA-4/17
		201 – 500 psi		
		501 – 1000 psi		
		1001 – 1500 psi		
		1501 – 2000 psi		
	Active Hi Q-PRT (137 to 1378) bar (2001-20000) psi (14-140) MPa	2001 – 3000 psi	0.009 % of FS	
		30001 – 5000 psi		
		5001 – 7000 psi		
		7001 – 10000 psi		
		10001 – 15000 psi		
		15001 – 20000 psi		
Hydraulic / Lubricant/Liquid Pressure Source Mode	(1 to 690) bar or (10 to 10000) psi or (0.1 to 69) MPa	(10 – 500) psi	0.033 psi	**Reference Standards:** Hydraulic Dead Weight Tester / Pressure Balance P-01, P– 01/R and P-09 DPI / PG P-15 and SPG P-01/G **Unit Under Test:** Bourdon Tube / Diaphragm Pressure Gauge / Switch Digital (Medium/High multimode) Pressure Transducer / Gauges/ Indicator/ Switch/ Adaptor/ Sensor/ Valve/ Snubber/ Module/ Manifold/ Absolute/Differential Pressure Pneumatic/ vacuum gauges **Method Used:** PMD/TPP-23 & 29 / Druck OEM DKD R-6-1 for CPB EURAMET PB/03 EAL-G26/EA-4/17
		(501 – 1000) psi	0.034psi	
		(1001 – 5000) psi	0.052 psi	
		(5001 – 10000) psi	0.35 psi	
	(690 to 1240) bar or (10001 to 18000) psi or (69 to 124) MPa	(10001 – 11000) psi	0.15 % of FS	
		(11001 – 13000) psi		
		(13001 – 15000) psi		
		(15001 – 18000) psi		

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Vacuum /Air / Gas / Low Pressure Source Mode	(-1 to 20) bar or (-14 to 290) psi or (-100 to 2000) kPa	(-1 – 0.1) bar	0.001 bar	**Reference Standards:** Pneumatic Pressure Calibrator with DPI/RPG P-10 &P-13 (Pneumatic Pressure Indicator), P-16, P-20 and P-21 **Unit Under Test:** Bourdon Tube / Diaphragm Pressure Gauge / Switch Digital Vacuum / Low Pressure Transducer / Gauges / Indicator / Switch / Adapter / Sensor / Valve / Snubber / Module Barometer / Manometer **Method Used:** PMD/TPP-24 / Druck OEM DKD R-6-1 for CPB EURAMET PB/03 EAL-G26/EA-4/17
		(0– 20) bar	0.041 bar	
Barometric/ Atmospheric Pressure (Measure Mode)	(0.70 – 1.10) bar		0.005 % of FS	**Reference Standards:** Barometer Fluke RPM4, BA100ks, P-12 and Druck DPI 142 P-11 **Unit Under Test:** Aneroid / Altimeter / Atmospheric meter Barometers and Manometers **Method Used:** PMD/TPP-30 / Druck OEM /DPI K0343
Hydraulic / Lubricant/Liquid Gauge Pressure (Measure Mode)	(1 to 690) bar or (10 to 10000) psi or (0.1 to 69) MPa	(0-500) psi	0.56 psi	**Reference Standards:** Hydraulic Dead Weight Tester / Pressure Balance P-01, P– 01/R and P-09 DPI / PG P-15 and SPG P-01/G **Unit Under Test:** Hydraulic / Lubricant DWT / PB, Pressure Balance / Pump / Source **Method Used:** PMD/TPP-23 & 29 / Druck OEM DKD R-6-1 for CPB
		(501-1000) psi	0.56 psi	
		(1001-3000) psi	0.60 psi	
		(3001-5000) psi	0.90 psi	
		(5001-7000) psi	1.43 psi	
		(7001-10000) psi	1.98 psi	
Pneumatic / Air / Gauge Pressure (Measure Mode)	(-1 to 20) bar or (-14 to 290) psi or (-100 to 2000) kPa	-1 to 0 bar	0.001 bar	**Reference Standards:** Pneumatic Pressure Calibrator with DPI/RPG P-10 & P-13, P-16, P-20 and P-21 **Unit Under Test:** Pneumatic / Air data calibrator / Vacuum / Low Pressure Pump **Method Used:** PMD/TPP-24 / Druck OEM DKD R-6-1 for CPB
		0 to 2 bar	0.002 bar	
		0 to 20 bar	0.041 bar	

Field of measurement: THERMAL METROLOGY

Measured quantity	Range	*Expanded Uncertainty (±)	Technique, Reference Standard, Equipment
Temperature (Sources)	-80.00 °C	0.05 °C	**Reference Standards:** Black Stack Thermometer FLUKE, Working Standard PRT FLUKE,
	0.00 °C	0.02 °C	
	100 °C	0.12 °C	

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	200 °C	0.13 °C	R-Type Thermocouple 5649 FLUKE Zero Point Dry Well FLUKE Dry Block Calibrator (Model: Gemini700LRI) **Unit Under Test:** All types of Heat Sources **Method Used:** TMD/TPP-33
	300 °C	0.02 °C	
	400.0 °C	0.03 °C	
	500.0 °C	0.02 °C	
	600.0 °C	0.60 °C	
	700.0 °C	0.60 °C	
	800 °C	0.60 °C	
	1150 °C	2.20 °C	
Temperature (Measure)	-40 °C	0.26 °C	**Reference Standards:** Ultra Low Temperature Bath (Heart Scientific 7380) Liquid In Glass Thermometer (ASTM) Dry Block Calibrator ISOTECH GIMNI 700LRI Working Standard PRT (5628) Black Stack Digital Readout (1560) **Unit Under Test:** Liquid –In- Glass Thermometers **Method Used:** TMD/TPP-25
	0 °C	0.24 °C	
	10 °C	0.24 °C	
	30 °C	0.24 °C	
	50 °C	0.24 °C	
	80 °C	0.24 °C	
	100 °C	0.24 °C	
	150 °C	0.30 °C	
	200 °C	0.32 °C	
Temperature / Humidity (Sources)	20 %RH	0.6 %RH	**Reference Used:** RH Generator (Humi-Lab) NESLAB RTE Bath/Circulator (USA) Humidity and Temperature Probe OMEGAETTE (USA) Model: HH311 Fluke 971 **Unit Under Test:** All types of Thermo hygrometers **Method Used:** TMD/TPP-32
	30 %RH	0.6 %RH	
	40 %RH	0.6 %RH	
	50 %RH	0.6 %RH	
	60 %RH	0.6 %RH	
	70 %RH	0.7 %RH	
	80 %RH	0.8 %RH	
	18 °C	0.2 °C	
	20 °C	0.2 °C	
	22 °C	0.2 °C	
	24 °C	0.2 °C	
	26 °C	0.2 °C	
	28 °C	0.2 °C	
Temperature (Measure)	-80 °C	0.0025 °C	**Reference Used:** Working Standard PRT (5628) Black Stack Digital Readout (1560) Dry Block Calibrator ISOTECH GIMNI 700LRI Ultra-Low Temperature Bath (7380) **Unit Under Test:** All types of PRT/RTD **Method Used:** TMD/TPP-31
	0 °C	0.0010 °C	
	100 °C	0.0015 °C	
	200 °C	0.0015 °C	
	300 °C	0.0015 °C	
	400 °C	0.002 °C	
	500 °C	0.002 °C	
	600 °C	0.0035 °C	
Temperature (Sources)	0 °C	0.60 °C	**Reference Used:** Dry Block Calibrator (Model: Gemini700LRI) Ultra-Low Temperature Bath (Model:7380 USA), E-Type Thermocouple (Serial#:2H19 Japan) Black Stack Digital Readout (Serial#: A8B906, Fluke USA)
	200 °C	0.60 °C	
	400 °C	0.60 °C	

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	600 °C	0.60 °C	Furnace (9112B, Fluke USA) Temperature/Pressure Calibrator (Model#: 525BFluke USA), Working Standard PRT (Model #: 5628) R-Type Thermocouple Serial#:4996), Muffle Furnace (Model#:KE-6HK1200-3) Zero Point Dry Well (Model#:9101) S-Type Thermocouple (Model#:5650) **Unit Under Test:** S-Type, R-Type and K-Type Thermocouple **Method Used:** TMD/TPP-26
	800 °C	0.60 °C	
	1000 °C	0.60 °C	
	1100 °C	2.00 °C	

Field of measurement: TIME AND FREQUENCY METROLOGY

Measured quantity	Range	*Expanded Uncertainty (±)	Technique, Reference Standard, Equipment
Frequency (Source)	10 Hz to 500 Hz @0dBm	7.80 E-03	**Reference Standards:** a) Cesium Frequency Standard 5071A b) Precision Test Systems RFS10, Rb Frequency Standard c) Marconi Instrument, AM/FM signal Generator 2024 (Source) d) SMF100 Signal Generator **Unit Under Test:** Agilent Universal Frequency Counter/Timer 53230A (Measure) Microwave Frequency Counter 53152A **Method Used:** Direct Frequency Comparison (T&FMD/TPP-04)
	501 Hz to 10 kHz @0dBm	7.80 E-03 to 2.30 E-05	
	11 Hz to 500 kHz @0dBm	2.30 E-05	
	501 kHz to 1 MHz @0dBm	2.30 E-05 to 3.20 E-08	
	2 MHz to 100 MHz @0dBm	3.20 E-08 to 4.10 E-07	
	101 MHz to 500 MHz @0dBm	4.10 E-07 to 5.00 E-07	
	501 MHz to 1 GHz @0dBm	5.00 E-07 to 5.00 E-09	
	2 GHz to 10 GHz @0dBm	5.00 E-09 to 6.20 E-09	
	11 GHz to 20 GHz @0dBm	6.20 E-09 to 6.90 E-09	
	21 GHz to 30 GHz @0dBm	6.90 E-09 to 1.00 E-08	
	31 MHz to 40 GHz @0dBm	1.00 E-08 to 1.40 E-08	
	Time base 10 MHz	**3.4 E-08**	
Frequency (Measure)	10 Hz - 500 Hz @ 0 dBm	7.80 E-03	**Reference Standards:** Cesium Frequency Standard 5071A Agilent Universal Frequency Counter/Timer 53230A Microwave Frequency Counter 53152A **Unit Under Test:** Marconi Instrument, AM/FM signal Generator 2024 SMF100 Signal Generator Power Meter E4416A Agilent
	501 Hz - 10 kHz @ 0 dBm	7.80 E-03 to 2.40 E-05	
	11 KHz - 500 kHz @ 0 dBm	2.40 E-05	
	501 kHz - 1 MHz @ 0 dBm	2.40 E-05 to 3.20 E-08	
	2 MHz - 100 MHz @ 0dBm	3.20 E-08	
	101 MHz - 500 MHz @ 0 dBm	3.20 E-08 to 3.50 E-08	

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	501 MHz - 1 GHz @ 0 dBm	3.50 E-08 to 4.80 E-09	**Method Used:** Direct Frequency Comparison with Frequency Counter (T&FMD/TPP-01)
	2 GHz - 10 GHz @ 0 dBm	4.80 E-09 to 6.20 E-09	
	11 GHz - 20 GHz @ 0 dBm	6.20 E-09 to 6.90 E-09	
	21 GHz - 30 GHz @ 0 dBm	6.90 E-09 to 1.00 E-08	
	31 GHz - 40 GHz @ 0 dBm	1.00 E-08 to 1.40 E-08	
	Time base 10 MHz	**3.20 E-08**	
Power Level (Measure)	-5 dBm to +20 dBm @ 50 MHz	3.40 E-08	**Method Used:** Direct Frequency Comparison with Power Meter (T&FMD/TPP-08)
Time Interval Measure	1s to 60s (1min)	4.80E-01	**Reference Standards:** Precision Test Systems GPS10RBN **Unit Under Test:** Casio, HS-60W-IDF, Q&Q Digital Stopwatch **Method Used:** Direct Frequency Comparison (T&FMD/TPP-02)
	1s to 1800s (1/2 hr)		
	1s to 3600s (1hrs)		
	1s to 7200s (2 hrs)		

Field of measurement: ELECTRICAL METROLOGY

A. (Measure Mode Scope)

Measured quantity	Range	*Expanded Uncertainty (±)	Technique, Reference Standard, Equipment
DC Voltage	0 - 100 mV	0.000059 mV	**Reference Standards:** 3458-Agilent, 34401 – Agilent, Reference Multimeter 8508 - A, Fluke, Digital multi-meters High voltage divider DVR 150 **Unit Under Test:** Fluke-5720-A, 9100-Wavetek, Multifunction Calibrator, High voltage source etc. **Method Used:** EMD/TPP-09
	100.00001 mV - 1 V	0.000070 V	
	1.000001 - 10 V	0.0000021 V	
	10.00001 - 100 V	0.0000072 V	
	100.0001 - 1000 V	0.000075 V	
	1000.001 V - 150 kV	0.00055 kV	
DC Current	0 - 100 µA	0.00022 µA	**Reference Standard:** 3458-Agilent, 34401 – Agilent, Reference Multimeter 8508 - A, Fluke, Digital Multi-meters, Clamp meter Radian TX-21 **Unit Under Test:** Fluke-5720-A, 9100-Wavetek Multifunction Calibrator (Source) **Method Used:** EMD/TPP-09
	100.0001 µA - 1 mA	0.00064 mA	
	1.000001 - 10 mA	0.000021 mA	
	10.00001 - 100 mA	0.000040 mA	
	100.01 mA - 3 A	0.000026 A	
	3.00001 - 20 A	0.00050 A	
	20.00001 - 2000 A	1.5 %	
AC Voltage	0 - 10 mV, at 50Hz to 300 Hz	0.00046 mV	**Reference Standard:** 3458-Agilent, 34401 – Agilent, Reference Multimeter 8508 - A, Fluke,
	10.0001 - 100 mV, at	0.00046 mV	

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	50Hz to 300 Hz		Digital Multi-meters (Measure) High Voltage Divider **Unit Under Test:** Multifunction Calibrator Fluke-5720-A, High Voltage Source etc. **Method Used:** EMD/TPP-09
	100.00001 mV - 1 V, at 50 to 500 Hz	0.00016 V	
	1.00001 - 10 V, at 50 Hz to 10 kHz	0.00007 V	
	10.00001 - 100 V, at 50 Hz to 10 kHz	0.00040 V	
	100.0001 - 1000 V, at 50 Hz to 10 kHz	0.0030 V	
	1kV to 150kV, at 50Hz to 1kHz	0.016 kV	
AC Current	0 - 200 µA, at 10 Hz to 1 kHz	0.0020 µA	**Reference Standard:** 3458-Agilent, 34401 – Agilent, Reference Multimeter 8508 - A, Fluke, Digital Multi-meters (Measure), Clamp meter **Unit Under Test:** Fluke-5720-A, Multifunction Calibrator (Source), High Voltage Source etc. **Method Used:** EMD/TPP-09
	200.001 µA - 10 mA, at 10 Hz to 1 kHz	0.0013 mA	
	10.0001 - 100 mA, at 10 Hz to 1 kHz	0.00017 mA	
	100.001 mA - 3 A, at 10 Hz to 1 kHz	0.00014 A	
	3.00001 - 20 A, at 10 Hz to 1 kHz	0.0019 A	
	20.00001 - 2000 A, at 50 Hz to 1 kHz	0.82 A	
Resistance	0 - 10 Ω	0.000012 Ω	**Reference Standard:** 3458-Agilent, 34401 – Agilent, Reference Multimeter 8508 - A, Fluke, Digital Multi-meters (Measure) **Unit Under Test:** Multifunction Calibrator Fluke-5720-A, 9100-Wavetek Multifunction Calibrator, Fixed Standard Resistors. AC/DC Shunts etc. (Source) **Method Used:** EMD/TPP-09, EMD/TPP-10, EMD/TPP-11, EMD/TPP-12
	10.00001 - 100 Ω	0.000016 Ω	
	100.0001 Ω - 1 kΩ	0.0000065 kΩ	
	1.0000001 - 100 kΩ	0.0000065 kΩ	
	100.00001 KΩ - 1 MΩ	0.0000077 MΩ	
	1.00001 - 100 MΩ	0.0000087 MΩ	
	100.001 MΩ - 2 GΩ	0.000031 GΩ	
	2.00001 - 20 GΩ	0.000034GΩ	
Capacitance	0.00 - 10 pF	0.058 pF	**Reference Standard:** PM-6306 Fluke, Reference Digital Capacitance Meter (Measure) **Unit Under Test:** Universal Calibration System (Sources), Discrete Standard Capacitors **Method Used:** EMD/TPP-13
	10.001 - 1000 pF	0.041 pF	
	1.000 – 1000 nF	0.67 nF	
	1.000 - 1000 µF	0.00067 µF	
Inductance	100 – 1000 µH	0.067 µH	**Reference Standard:** PM 6306 Fluke, Reference Digital Capacitance Meter (Measure) Digital Inductance / LCR Meter PM-6304 Fluke, (Measure) **Unit Under Test:** Universal Calibration System (Sources), Discrete Standard Inductors **Method Used:** EMD/TPP-14
	1 - 10 mH	0.00010 mH	
	10.001 - 90 mH	0.0076 mH	
	90.01 - 1000 mH	0.0095 mH	
	1 – 10 H	0.00030 H	

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AC/DC Power	50 mW – 87 kW (Direct) Up to 96 MW (with Sensors)	0.13 mW to 0.0067 kW 9.0 mW (with Sensors)	**Reference Standard:** Three Phase Power Network Tester/ Analyzer (TE30) Three Phase 4 Channel Power Analyzer (PA2203A) Comparator COM5003, Zeera, Germany **Unit Under Test:** Electrical Power Standard (6105A), Three Phase Current & Voltage Source (MT551) Reference Standard Universal Calibration System **(Source)** **Method Used:** EMD/TPP-16
Field of measurement: ELECTRICAL METROLOGY **B. (Source Generation Scope)**			
Measured quantity	**Range**	***Expanded Uncertainty (±)**	**Technique, Reference Standard, Equipment**
DC Voltage	1.018 V	0.20 µV	**Reference Standard:** Fluke – 732-B, DC Voltage Standard (Source) **Unit Under Test:** 3458-Agilent, Reference Multimeter 8508 - A, Fluke, Digital Multi-meter MFC 5720 A, 5700 A (Measure) **Method Used:** EMD/TPP-10
	10 V	0.40 µV	
	220 mV	0.00020 mV	**Reference Standard:** Fluke – 5720-A Multifunction Calibrator (Source) **Unit Under Test:** All Types of Digital / Analog Multi-meter 3458-AGILENT, 8508-A, Fluke, 45-Fluke, etc. **Method Used:** EMD/TPP-10
	2.2 V	0.000001 V	
	11 V	0.000011 V	
	22 V	0.000020 V	
	220 V	0.00020 V	
	1100 V	0.0020 V	
DC Current	220 µA	0.15 µA	**Reference Standard:** Fluke – 5720-A Multifunction Calibrator (Source) **Unit Under Test:** All Types of Digital / Analog Multi-meters 3458-Agilent, 8508- A, Fluke, 45-Fluke, Clamp meter, etc. (Measure) **Method Used:** EMD/TPP-10
	1.2 mA	0.0000060 mA	
	22 mA	0.000060 mA	
	220 mA	0.00060 mA	
	2.2 A	0.000013 A	
AC Voltage	20 A, 1000 A (via current coil)	0.0041 A 0.0044 A	**Reference Standard:** Fluke – 5720- A Multifunction Calibrator etc. (Source) **Unit Under Test:**
	2.2 mV, at 10 Hz to 100 kHz	0.000042 mV	
	22 mV, at 10 Hz to 100 kHz	0.00040 mV	

	220 mV, at 10 Hz to 100 kHz	0.00034 mV	All Types of Digital / Analog Multi- meters i.e. 3458 -Agilent, 8508 - A, Fluke, 45-Fluke etc. (Measure) **Method Used:** EMD/TPP-10 EMD/TPP-08
	2.2 V, at 10 Hz to 100 kHz	0.0000020 V	
	22 V, at 10 Hz to 100 kHz	0.000025 V	
	220 V, at 10 Hz to 100 kHz	0.00022 V	
	750 V, at 40 Hz to 10 kHz	0.00022 V	
	1100 V, at 40 Hz to 10 kHz	0.0025 V	
AC Current	220 µA, at 10 Hz to 10 kHz	0.00033 µA	**Reference Standard:** Fluke – 5720-A Multifunction Calibrator - 9100 (Source) **Unit Under Test:** All Types of Digital / Analog Multi-meter i.e. 3458-Agilent, 8508-A, Fluke, 45-Fluke, clamp meters etc. (Measure) **Method Used:** EMD/TPP-10
	2.2 mA, at 10 Hz to 10 kHz	0.0000022 mA	
	22 mA, at 10 Hz to 10 kHz	0.000025 mA	
	220 mA, at 10 Hz to 10 kHz	0.00024 mA	
	2.2 A, at 20 Hz to 10 kHz	0.0000037 A	
	20 A, at 40 Hz to 10 kHz 1000 A, at 40 Hz to 1 kHz (via current coil)	0.000015 A	
Resistance	1 Ω	0.00000073 Ω	**Reference Standard:** Fluke – 5720-A Multifunction Calibrator, High Resistance Decade Box RH9A-5 **Unit Under Test:** All Types of Digital / Analog Multi-meter i.e. 3458-Agilent, 8508-A, Fluke, 45-Fluke, etc. (Measure) **Method Used:** EMD/TPP-10, EMD/TPP-11, EMD/TPP-12
	10 Ω	0.000267 Ω	
	100 Ω	0.000089 Ω	
	1 kΩ	0.0000018 kΩ	
	10 kΩ	0.0000050 kΩ	
	100 kΩ	0.0010 kΩ	
	1 MΩ	0.000010 MΩ	
	10 MΩ	0.00020 MΩ	
	100 MΩ	0.028 MΩ	
	1 GΩ	0.000022 GΩ	
Resistance	0.0001 Ω	60.00 µΩ	**Reference Standard:** Hi-Accuracy Working Standard, 4-Terminal Standard Resistors 20-E/D to 28 E/D, H&B Germany (Source) **Unit Under Test:** 34420-Agilent Digital µΩ Meter (Measure) **Method Used:** EMD/TPP-11, EMD/TPP-12
	10 kΩ	0.008 Ω	
Capacitance	0.1 µF	0.000080 µF	**Reference Standard:** Fixed Value Working Standard Capacitors (Source) **Unit Under Test:** Digital Capacitance/ LCR Meter PM-6304 Fluke, (Measure) **Method Used:** EMD/TPP-13
	1 µF	0.00010 µF	
AC Power	0.02 W – 72 kW (Direct), Up to 1MW (with coil)	0.01 W to 0.16 kW	**Reference Standard:** 6105A Electrical Power Standard., MT551 Three Phase Voltage and Current Source

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			Unit Under Test: Power Meters / Analyzers etc. **Method Used:** EMD/TPP-17
Inductance	100 µH	0.020 µH	**Reference Standard:** Fixed Value Working Standard Inductors (Source) **Unit Under Test:** Digital Inductance/ LCR Meter PM-6304 Fluke (Measure) **Method Used:** EMD/TPP-14
	1 mH	0.060 mH	
	10 mH	0.050 mH	
	100 mH	0.010 mH	
	1 H	0.00040 H	

Field of measurement: CHEMICAL METROLOGY

Measured quantity	Range	*Expanded Uncertainty (±)	Technique, Reference Standard, Equipment
Electrical Conductivity (EC)	1413 µmhos / cm	5.2 µmhos /cm	**Calibration of Conductivity meter** **Reference Standard:** NIST Traceable Conductivity standard solution **Unit Under Test:** Conductivity Meter **Method Used:** APHA, AWWA, WEF, USA, 2510B
	12.9 mmhos / cm	0.10 mmhos /cm	
pH	0 -14	0.02	**Reference Standard:** NIST Traceable pH buffers **Unit Under Test:** pH Meter **Method Used:** APHA, AWWA, WEF, USA, 2510B Standard Buffer solutions / Two - point calibration method

Calibration Laboratory.

Onsite Accreditation Scope of **NATIONAL METROLOGY INSTITUTE OF PAKISTAN**
Plot No. 16, Sector H-9/1, Islamabad, Pakistan

Mobile laboratory (Onsite Calibration) X

Field of measurement: MASS METROLOGY

Measured quantity	Range	*Expanded Uncertainty (±)	Technique, Reference Standard, Equipment
Mass	1mg to 500 g	0.010 to 0.10 mg (depends upon readability/resolution of unit under-test)	**Calibration of Balance / Weighing machine** **Reference Standards:** E2 class standard masses (1 mg to 5000 g) **Method Used:** MMD/TPP-21/04
	500 g to 5000 g	0.10 to 1.0 mg (depends upon readability/resolution of unit under-test)	

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Field of measurement: THERMAL METROLOGY			
Measured quantity	**Range**	***Expanded Uncertainty (±)**	**Technique, Reference Standard, Equipment**
Temperature	Ambient to 1100 °C	0.6 °C to 2.0 °C	**Calibration of Thermocouples** Dry block Temperature Calibrator, Digital Readout, Reference Thermometers, Zero-point Dry Well **Method Used:** TMD/TPP-26
	Ambient to 650 °C	0.0025 °C to 0.0035 °C	**Calibration of PRT/SPRT** Reference Thermometers, Digital Readout, Zero-point Dry Well, Dry block Temperature Calibrator **Method Used:** TMD/TPP-31
	-80 °C to1400 °C	0.01 °C to 2.20 °C	**Calibration of Low Temperature Bath/ Heat Sources (Oven, Incubator, Dry Block, Furnace)** PRT, S & R Type Thermometer **Method Used:** TMD/TPP-34
Temperature and Humidity	20 %RH to 80 %RH 18 °C to 30 °C	0.6 % RH to 0.8 %RH 0.2 °C	**Calibration of Thermo-hygrometers** RH Generator Humi-Lab. Humidity and Temperature Probe (OMEGAETTE, USA; Model: HH311) **Method Used:** TMD/TPP-32

Field of measurement: ELECTRICAL METROLOGY			
Measured quantity	**Range**	***Expanded Uncertainty (±)**	**Technique, Reference Standard, Equipment**
DC Voltage	100 mV	0.00085 mV	**Reference Standard:** Digital multi-meters High voltage divider DVR 150 **Unit under test:** Multifunction Calibrator, High voltage source
	100.00001 mV - 1 V	0.0000042 V	
	1.000001 - 10 V	0.000037 V	
	10.00001 - 100 V	0.00056 V	
	100.0001 - 1000 V	0.0056 V	
	1 kV – 150 kV	0.5%	
AC Voltage	100 mV – 1000 V at 50 Hz to 10 kHz	0.0039 mV - 0.028 V	
	1kV - 150kV at 50Hz to 1kHz	0.5%	
DC Current	1 mA – 20 A	0.00015 mA – 0.00025A	**Reference Standard**: 3458-Agilent, 34401- Agilent, 8508- A, Fluke, Digital Multi-meters, Clamp meter Radian TX-21 **Unit under test:** Multifunction Calibrator High Current Source
	20 A – 2000 A	1.5%	
AC Current	1 mA to 20 A, at 10 Hz to 1 kHz	0.0013 mA	
	20 A – 2000 A, at 50 Hz to 10 kHz	1.5%	

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Resistance	1 Ω - 2 GΩ	0.00017 Ω - 0.00026 GΩ	**Reference Standard**: Digital multi-meters **Unit Under Test:** Resistance Calibrator Fixed / Decade Resistance Box
	2 GΩ - 20 GΩ	0.0026 GΩ	
Capacitance	1 nF – 1000 µF	0.001 nF – 0.058 µF	**Reference Standard:** PM-6306 Fluke **Unit Under Test:** Decade / Fixed Capacitance Standards
Inductance	100 µH – 1 H	0.05 µH – 0.0061 H	**Reference Standard:** PM-6306 Fluke, **Unit under test:** Digital / Fixed / Decade Inductance

* **Expanded Uncertainty:**

- Expanded Uncertainty is the measurement uncertainty at a coverage probability of 95 %, which usually requires the use of a coverage factor of k = 2. This measurement uncertainty is a value for which the laboratory has been accredited using the procedure that was the subject of assessment. In certificates issued under its accreditation scope an accredited laboratory is not permitted to quote an uncertainty that is smaller than the published uncertainty for respective ranges as given above.

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