

	ACCREDITATION DOCUMENT	F-06/02 Issue Date: 18/08/2020 Rev. No: 09 LAB 001
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Accreditation No: LAB 001

Awarded to

NATIONAL PHYSICAL & STANDARDS LABORATORY 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 17025:2005**.

The accreditation requires regular surveillance, and is valid until **11-02-2022**.

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

03-05-2021

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Director General

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Testing Laboratory.

Accreditation Scope of **NATIONAL PHYSICAL & STANDARDS LABORATORY**
PLOT NO. 16, SECTOR H-9/1, ISLAMABAD, PAKISTAN.

Permanent laboratory premises

Materials/ Products tested	Testing field (e.g. environmental testing or mechanical testing)	Types of test/ Properties measured	Reference to standardized method (e.g. ISO 14577-1:2003)/ Internal method reference
CHEMICAL METROLOGY			
Water/ Wastewater/ Industrial Effluents	Environmental testing	Measurement of Electrical Conductivity	2510-B, Standard Methods for the Examination of Water and Waste water, 23 rd edition, 2017, AWWA/APHA
		Total Dissolved Solids (TDS)	2540-C, Standard Methods for the Examination of Water and Waste water, 23 rd edition, 2017, AWWA/APHA
		Total Suspended Solids (TSS)	2540-B, Standard Methods for the Examination of Water and Waste water, 23 rd edition, 2017, AWWA/APHA
		Total Hardness	2340-B, Standard Methods for the Examination of Water and Waste water, 23 rd edition, 2017, AWWA/APHA
		Alkalinity	2320-B, Standard Methods for the Examination of Water and Waste water, 23 rd edition, 2017, AWWA/APHA
		Chloride	4500-C, Standard Methods for the Examination of Water and Waste water, 23 rd edition, 2017, AWWA/APHA
		Calcium	3500-Ca, Standard Methods for the Examination of Water and Waste water, 23 rd edition, 2017, AWWA/APHA
		Chemical Oxygen Demand (COD)	5220-B, Standard Methods for the Examination of Water and Waste water, 23 rd edition, 2017, AWWA/APHA
		Measurement of pH	4500-H ⁺ , Standard Methods for the Examination of Water and Waste water, 23 rd edition, 2017, AWWA/APHA

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Water/ Wastewater/ Industrial Effluents/ Solutions/ Liquids	Chemical and Environmental testing	Copper (Cu)	Standard Methods for the Examination of Water and Waste water, 23 rd edition, 2017, APHA, AWWA, WEF / Atomic Absorption Spectrometer, AAAnalyst -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)	
Liquids / Fluids	Petroleum	Kinematic Viscosity	ASTM D 445-09

Calibration Laboratory.

Accreditation Scope of **NATIONAL PHYSICAL & STANDARDS LABORATORY**
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Permanent laboratory premises

Field of measurement: MASS METROLOGY			
Measured quantity	Range	*Expanded Uncertainty (±)	Technique, Reference Standard, Equipment
Mass (Masses class E2 and below)	1 mg - 5 mg	0.0006 - 0.0008 mg	i) E ₂ , F ₁ and F ₂ class standard masses from 1 mg to 20 kg
	10 mg - 500 mg	0.0010 - 0.0028 mg	ii) Mass Comparator CCE6 having readability 0.1µg and capacity of 6.1 g
	1 g - 5 g	0.0031 - 0.0069 mg	iii) Mass Comparator CC111 having readability 1µg and capacity of 111 g
	10 g - 200 g	0.007 - 0.052 mg	iv) Mass Comparator AX1006 having readability 1 µg and capacity of 1000 g
	500 g - 1000 g	0.13 - 0.27 mg	v) Mass Comparator CC10000U-L having readability 10µg and capacity of 10 kg
	2000 g - 5000 g	0.37 - 0.98 mg	vi) Mass Comparator CC50001S-L having readability 1mg and capacity of 50 kg
	10000 g - 20000 g	1.8 - 5 mg	Method Used: MMD/TPP-21/01, 02, 03, 05, 06, 07, 08

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Field of measurement: VOLUME METROLOGY

Measured quantity	Range	*Expanded Uncertainty (\pm)	Technique, Reference Standard, Equipment
Micropipette	10 μ L - 5000 μ L	0.2 μ L - 5 μ L	Equipment Used: M-39 ME414S, Sartorius, Germany M-58 CP8200, Sartorius, Germany M-28 CC64K, Sartorius, Germany Method Used: ASTM E542-01 MMD/Vol-28/TPP-28
Glassware	1 mL - 1000 mL	0.1 mL - 3.5 mL	
Glassware	1 L - 5 L	0.004 L - 0.03 L	
Metallic	20 mL - 2000 mL	0.12 mL - 5.78 mL	
Metallic	2 L - 5 L	0.006 L - 0.017 L	
Metallic	5 L - 10 L	0.017 L - 0.029 L	
Metallic	10 L - 20 L	0.029 L - 0.050 L	

Field of measurement: DIMENSION METROLOGY

Measured quantity	Range	*Expanded Uncertainty (\pm)	Technique, Reference Standard, Equipment
Length	(0-300) mm /(0-30) cm	0.041 - 0.071 mm	Unit Under Test: Foot Scales using Length Comparator Method Used: DMD/TPP-16
	0-1000 mm (1Meter)	0.041 - 0.062 mm	Unit Under Test: Meter Scales using Length Comparator Method Used: DMD/TPP-16
	0.005 - 50 m	0.053 - 0.078 mm	Unit Under Test: Measuring Tapes using Length Comparator Method Used: DMD/TPP-16
	1000 mm	0.0015 - 0.0050 mm	Unit Under Test: End Standard Meter Gauge Block using End to End Comparator Method Used: DMD/TPP-17
	0.03 - 0.1 mm	0.20 - 3.00 μ m	Unit Under Test: Feeler Gauge using UMM ₂ Method Used: DMD/TPP-18
	0.5 - 100 mm	0.13 - 1.82 μ m	Unit Under Test: Gauge Blocks using UMM ₂ Method Used: DMD/TPP-18
	100 - 300 mm	0.18 - 0.30 μ m	Unit Under Test: Gauge Blocks using UMM ₂ Method Used:

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			DMD/TPP-18
	0 - 300 mm	0.10 - 24.52 μm	Unit Under Test: Precision Glass / Scale / Slide using UMM ₁ Technique Used: Direct Measurement
	0 - 80 mm	0.80 - 13.94 μm	Unit Under Test: Dial Indicator / Gauge using UMM ₁ Method Used: DMD/TPP-36
	0 - 300 mm	0.006 - 0.034 mm	Unit Under Test: Digital Vernier /Dial Caliper using Gauge Blocks Method Used: DMD/TPP-19
	0 - 25.4 mm	0.0006 - 0.009 mm	Unit Under Test: Micrometer using Gauge Blocks Method Used: DMD/TPP-20
	0 - 25 mm	0.0006 - 0.002 mm	Unit Under Test: Dial Gauge Calibrator/ Dial Testing Machine using Gauge Blocks Method Used: Direct Measurement
Diameter External	0.5 mm - 300 mm	0.18 μm - 10.00 μm	Unit Under Test: Cylinders using UMM ₂ Method Used: Direct Measurement
Diameter Internal	5.0 mm - 100 mm	0.74 μm - 15.5 μm	Unit Under Test: Ring Gauges using UMM ₁ Method Used: DMD/TPP-37

Field of measurement: PRESSURE METROLOGY

Measured quantity	Range	*Expanded Uncertainty (\pm)	Technique, Reference Standard, Equipment
Hydraulic Pressure	50 – 200 psi	0.007 psi	Reference Standards: Electronic Dead Weight Tester (P-19) Unit Under Test: Dead Weight Testers, Hydraulic Gauges and transducers Pressure Indicator Method Used: PMD/TPP-38
	201 – 500 psi	0.013 psi	
	501 – 1500 psi	0.040 psi	
	1501 – 2000 psi	0.050 psi	
	2001 – 5000 psi	0.170 psi	
	5001 – 10000 psi	0.4000 psi	
	10001 – 15000 psi	0.590 psi	
15001 – 20000 psi	0.790 psi		
Hydraulic Pressure	(10 – 1000) psi	0.09 psi	Reference Standards: Hydraulic Dead Weight Tester (P– 10/R)

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	(1001 – 5000) psi	0.93 psi	Unit Under Test: Dead Weight Testers, Hydraulic Gauges and transducers Pressure Indicator Method Used: PMD/TPP-29
	(5001 – 10000) psi	1.07 psi	
Pneumatic Pressure	(-1 – 0) bar	0.0008 bar	Reference Standards: Digital Pneumatic Pressure Calibrator (P – 10) Unit Under Test: Pneumatic/ vacuum gauges, pressure calibrator, manometers and transducers Method Used: PMD/TPP-24
	(1– 20) bar	0.0012 bar	
Atmospheric Pressure	(0.70 – 1.10) bar	0.00016 bar	Reference Standards: Reference Barometer (P-12) Unit Under Test: Barometers and Manometers Method Used: PMD/TPP-30

Field of measurement: THERMAL METROLOGY

Measured quantity	Range	*Expanded Uncertainty (±)	Technique, Reference Standard, Equipment
Heat Sources Temperature (Sources)	-80.00 °C	0.20 °C	Reference Standards: (Black Stack Thermometer FLUKE), (Working Standard PRT FLUKE), (R-Type Thermocouple 5649 FLUKE) (Zero Point Dry Well FLUKE) (Temperature/ Pressure Calibrator 512B) Unit Under Test: All types of Heat Sources Method Used: TMD/TPP-33
	0.00 °C	0.20 °C	
	100 °C	1.18 °C	
	200 °C	1.14 °C	
	299.3 °C	1.13 °C	
	349.2 °C	1.14 °C	
	399.1 °C	1.14 °C	
	800.0 °C	2.00 °C	
	1100 °C	2.20 °C	
Liquid-in-glass Thermometer Temperature (Measure)	-40 °C	0.60 °C	Reference Standard:s: Ultra Low Temperature Bath (Heart Scientific 7380) Liquid In Glass Thermometer (ASTM) High Precision Thermostatic Bath (Model: PROLABO) Oil Bath (HO-21S) Working Standard PRT (5628) Black Stack Digital Readout (1560) Unit Under Test:-: Liquid –In- Glass Thermometers Method Used: TMD/TPP-25
	0 °C	0.12 °C	
	10 °C	0.12 °C	
	30 °C	0.12 °C	
	50 °C	0.12 °C	
	80 °C	0.20 °C	
	100 °C	1.20 °C	
	150 °C	1.20 °C	
	200 °C	1.20 °C	

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Thermo-Hygrometer Temperature / Humidity (Sources)	20 %RH	1.38 %RH	Reference Used: RH Generator (HumiLab) NESLAB RTE Bath/Circulator (USA) Humidity and Temperature Probe (HMP75)(Viasala) Unit Under Test:: All types of Thermo hygrometers Method Used: TMD/TPP-32
	30 %RH	1.38 %RH	
	40 %RH	1.38 %RH	
	50 %RH	1.74 %RH	
	60 %RH	1.74 %RH	
	70 %RH	1.86 %RH	
	80 %RH	1.86 %RH	
	18 °C	0.26 °C	
	20 °C	0.26 °C	
	22 °C	0.26 °C	
	24 °C	0.26 °C	
	26 °C	0.26 °C	
	28 °C	0.26 °C	
Platinum Resistance Thermometer (PRT) Temperature (Measure)	-80 °C	0.02 °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	0.06 °C	
	100 °C	0.20 °C	
	200 °C	0.22 °C	
	300 °C	0.26 °C	
	400 °C	0.31 °C	
	500 °C	0.40 °C	
	600 °C	0.50 °C	
Thermocouple Temperature (Sources)	-40 °C	0.2 °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) R-Type Thermocouple (Serial #: 2J13 ,Japan) Furnace (9112B,Fluke USA) Temperature/Pressure Calibrator (Model#: 525BFluke USA), Working Standard PRT (Model #: 5628) Digital Thermometer (YEW 2575) Digital Thermometer (YEW 2572), 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 Thermocouple R-Type Thermocouple K-Type Thermocouple Method Used: TMD/TPP-26
	0 °C	0.1 °C	
	200 °C	0.2 °C	
	400 °C	0.4 °C	
	600 °C	0.6 °C	
	800 °C	1.5 °C	
	1000 °C	1.8 °C	
	1100 °C	2.0 °C	
Field of measurement: TIME AND FREQUENCY METROLOGY			

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Measured quantity	Range	*Expanded Uncertainty (±)	Technique, Reference Standard, Equipment
Frequency (Source)	10 MHz	2.56E-09 MHZ	Reference Standards: Cesium Frequency Standard 5071A Agilent Universal Frequency Counter/Timer 53230A(Measure) Unit Under Test:: Precision Test Systems RfFS10,Rb.Frequency Standard (Source) Method Used: Direct Frequency Comparison with Frequency counter (T&FMD/TPP-03)
Frequency (Measure)	10 Hz - 500 Hz @ 0 dBm	2.91E-03	Reference Standards: Cesium Frequency Standard 571A Marconi Instrument, AM/FM signal Generator 2024 (Source) 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-01)
	501 Hz - 10 kHz @ 0 dBm	2.91E-03 to 1.15E-05	
	11 KHz - 500 kHz @ 0 dBm	1.15E-05	
	501 kHz - 1 MHz @ 0 dBm	1.15 -05 to 1.33E-08	
	2 MHz - 100 MHz @ 0dBm	1.33E-08 to 1.02E-07	
	101 MHz - 500 MHz @ 0 dBm	1.02E-07 to 4.28E-07	
	501 MHz - 1 GHz @ 0 dBm	4.28E-07 to 1.73E-10	
	1.1 GHz - 10 GHz @ 0 dBm	1.73E-10 to 1.42E-09	
	11 GHz - 20 GHz @ 0 dBm	1.42E-09 to 1.98E-09	
	21 GHz - 30 GHz @ 0 dBm	1.98E-09 to 3.04E-09	
	31 GHz - 40 GHz @ 0 dBm	3.04E-09 to 1.38E-07	
	Time base 10 MHz	4.90E-07	
Frequency (Measure)	10 Hz to 500 Hz @ 0 dBm	1.15E-02	Reference Standards: Cesium Frequency Standard 5071A Agilent Universal Frequency Counter/Timer 53230A(Measure) Microwave Frequency Counter 53152A Unit Under Test:: Marconi Instrument, AM/FM signal Generator 2024 (Source) SMF100 Signal Generator Method Used: Direct Frequency Comparison with Frequency
	501 Hz to 10kHz @ 0 dBm	1.15E-02 to 1.15E-05	
	11 KHz to 500 kHz @ 0 dBm	1.15E-05 to 8.00E-05	
	501 kHz to 1 MHz @ 0 dBm	8.00E-05 to 1.16E-08	
	2 MHz to 100 MHz @ 0 dBm	1.16E-08 to 4.13E-07	
	101 MHz to 500 MHz @	4.13E-07 to 1.73E-08	

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	0 dBm		Counter (T&FMD/TPP-04)
	501 MHz to 1 GHz @ 0 dBm	0.73E-08 to 2.91E-10	
	1.1 GHz to 10 GHz @ 0 dBm	2.91E-10 to 1.42E-09	
	11 GHz to 20 GHz @ 0 dBm	1.42E-09 to 2.61E-09	
	21 GHz to 30 GHz @ 0 dBm	2.61E-09 to 2.42E-09	
	31 GHz to 40 GHz @ 0 dBm	2.42E-09 to 2.39E-07	
	Time base 10 MHz	1.65E-08	
Time (Measure)	01 s to 2 hrs.	2.60E-01s	Reference Standards: Cesium Frequency Standard 5071A Precision Test Systems GPS10RBN Unit Under Test:: Casio, HS-60W-IDF ,Q&Q Digital Stopwatch Method Used: Direct Frequency Comparison Method (T&FMD/TPP-02)
Field of measurement: ELECTRICAL METROLOGY			
A. (Measure Mode Scope)			
Measured quantity	Range	*Expanded Uncertainty (±)	Technique, Reference Standard, Equipment
DC Voltage	0 - 100 mV	0.00085 mV	Reference Standard: 3458-Agilent, 34401 – Agilent, 8508- A, Fluke, Digital multi-meters High voltage divider DVR 150 Unit Under Test: Fluke-5720-a, 9100-Wavetek, Multifunction Calibrator, High voltage source) Method Used: EMD/TPP-08 EMD/TPP-10
	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	
	1000.001 V - 150 kV	0.5%	
DC Current	0 - 100 μA	0.0019 μA	Reference Standard: 3458-Agilent, 34401 – Agilent, 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 EMD/TPP-10
	100.0001 μA - 1 mA	0.000015 mA	
	1.000001 - 10 mA	0.00015 mA	
	10.00001 - 100 mA	0.0019 mA	
	100.01 mA - 3 A	0.00002 A	
	3.00001 - 20 A	0.00024 A	
	20.00001 - 2000 A	1.5%	
AC Voltage	0 - 10 mV, at 50Hz to 300 Hz	0.0039 mV	Reference Standard:

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	10.0001 - 100 mV, at 50Hz to 300 Hz	0.00039 mV	3458-Agilent, 34401 – Agilent, 8508- A, Fluke, Digital Multi-meters (Measure) High Voltage Divider Unit Under Test: Fluke-5720-A, 9100-Wavetek Multifunction Calibrator (Source), High Voltage Source Method Used: EMD/TPP-08 EMD/TPP-10
	100.00001 mV - 1 V, at 50 to 500 Hz	0.00021 V	
	1.00001 - 10 V, at 50 Hz to 10 kHz	0.0038 V	
	10.00001 - 100 V, at 50 Hz to 10 kHz	0.018 V	
	100.0001 - 1000 V, at 50 Hz to 10 kHz	0.028 V	
	1kV to 150kV, at 50Hz to 1kHz	0.5%	
AC Current	0 - 100 μ A, at 10 Hz to 1 kHz	0.012 μ A	Reference Standard: 3458-Agilent, 34401 – Agilent, 8508- A, Fluke, Digital Multi-meters (Measure), Clamp meter Unit Under Test: Fluke-5720-a, 9100-Wavetwk Multifunction Calibrator (Source) Method Used: EMD/TPP-09 EMD/TPP-10
	100.001 μ A - 10 mA, at 10 Hz to 1 kHz	0.0013 mA	
	10.0001 - 100 mA, at 10 Hz to 1 kHz	0.013 mA	
	100.001 mA - 3 A, at 10 Hz to 1 kHz	0.00013 A	
	3.00001 - 20 A, at 10 Hz to 1 kHz	0.0063 A	
	20.00001 - 2000 A, at 50 Hz to 1 kHz	1.5%	
Resistance	0 - 10 Ω	0.00017 Ω	Reference Standard: 3458-Agilent, 34401 – Agilent, 8508- A, Fluke, Digital Multi-meters (Measure) Unit Under Test: Fluke-5720-A, 9100-Wavetek Multifunction Calibrator (Source) Method Used: EMD/TPP-10 EMD/TPP-11 EMD/TPP-12
	10.00001 - 100 Ω	0.0014 Ω	
	100.0001 Ω - 1 k Ω	0.0000077 k Ω	
	1.0000001 - 100 k Ω	0.00069 k Ω	
	100.00001 K Ω - 1 M Ω	0.00001 M Ω	
	1.00001 - 100 M Ω	0.014 M Ω	
	100.001 M Ω - 2 G Ω	0.00026 G Ω	
	2.00001 - 20 G Ω	0.0024 G Ω	
Capacitance	0.00 - 10 pF	0.003 pF	Reference Standard: PM-6306 Fluke, Reference Digital Capacitance Meter (Measure) Unit Under Test: 9100-Wavetek, Universal Calibration System (Sources) Method Used: EMD/TPP-14
	10.001 - 1000 pF	3.16 pF	
	1 nF	0.001 nF	
	1.001 nF - 1000 nF	2.89 nF	
	1 μ F	0.0001 μ F	
	1.0001 - 1000 μ F	0.058 μ F	
Inductance	100 μ H	0.05 μ H	Reference Standard: Fixed value working standard Inductors (source) Unit Under Test:
	1 mH	0.0058 mH	
	10 mH	0.0058 mH	

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	100 mH	0.008 mH	Digital inductance/ LCR meter pm-6304 fluke, (measure) Method Used: EMD/TPP-15
	1 H	0.0001 H	
Field of measurement: ELECTRICAL METROLOGY B. (Source Generation Scope)			
Measured quantity	Range	*Expanded Uncertainty (±)	Technique, Reference Standard, Equipment
DC Voltage	1.018 V	0.2 μV	Reference Standard: Fluke – 732-B, Reference DC Voltage Standard (Source) Unit Under Test: 3458-Agilent Reference, 8508- A, Fluke, Digital Multi-meter (Measure) Method Used: EMD/TPP-10
	10 V	0.4 μV	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 (Measure) Method Used: EMD/TPP-10 EMD/TPP-08
	220 mV	0.0021 mV	
	2.2 V	0.000012 V	
	11 V	0.000041 V	
	22 V	0.000081 V	
	220 V	0.0011 V	
1100 V	0.0076 V		
DC Current	220 μA	0.15 μA	Reference Standard: Fluke – 5720-A Multifunction Calibrator-9100 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 EMD/TPP-09
	1.2 mA	0.000084 mA	
	22 mA	0.00081 mA	
	220 mA	0.011 mA	
	2.2 A	0.00019 A	
AC Voltage	20 A, 1000 A (via current coil)	0.0041 A 0.0044 A	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, etc. (Measure)
	2.2 mV, at 10 Hz to 100 kHz	0.026 mV	
	22 mV, at 10 Hz to 100 kHz	0.079 mV	
	220 mV, at 10 Hz to 100 kHz	0.64 mV	
	2.2 V, at 10 Hz to 100 kHz	0.0040 V	

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	22 V, at 10 Hz to 100 kHz	0.036 V	Method Used: EMD/TPP-10 EMD/TPP-08
	220 V, at 10 Hz to 100 kHz	0.057 V	
	750 V, at 40 Hz to 10 kHz	0.46 V	
	1100 V, at 40 Hz to 10 kHz	0.67 V	
AC Current	220 μ A, at 10 Hz to 10 kHz	0.31 μ A	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 EMD/TPP-09
	2.2 mA, at 10 Hz to 10 kHz	0.0031 mA	
	22 mA, at 10 Hz to 10 kHz	0.029 mA	
	220 mA, at 10 Hz to 10 kHz	0.25 mA	
	2.2 A, at 20 Hz to 10 kHz	0.016 A	
	20 A, at 40 Hz to 10 kHz 1000 A, at 40 Hz to 1 kHz (via current coil)	0.040 A	
Resistance	1 Ω	0.000095 Ω	Reference Standard: Fluke – 5720-A Multifunction Calibrator (Source) 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
	10 Ω	0.000023 Ω	
	100 Ω	0.00001 Ω	
	1 k Ω	0.000009 k Ω	
	10 k Ω	0.000009 k Ω	
	100 k Ω	0.00001 Ω	
	1 M Ω	0.00002 M Ω	
	10 M Ω	0.00005 M Ω	
Resistance	0.0001 Ω	60 $\mu\Omega$	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 $\mu\Omega$ Meter (Measure) Method Used: EMD/TPP-12
	10 k Ω	0.008 Ω	
Capacitance	0.1 μ F	0.0005 μ F	Reference Standard: Fixed Value Working Standard Capacitors (Source) Unit Under Test: Digital Capacitance/ LCR Meter PM-6304 Fluke, (Measure) Method Used: EMD/TPP-13 Reference Standard: 9100-Wavetek, Universal Calibration system (Source) Unit Under Test:
	1 μ F	0.0005 μ F	
	4 μ F	0.05 % + 3 pF	
	40 μ F	0.05 %	
	400 μ F	0.05 %	

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	4 mF	0.05 %	Digital Capacitance Meter LCR Meter, (Measure)
	40 mF	0.1 %	Method Used: EMD/TPP-13
DC Power	1 W – 500 kW	0.1 W to 0.16 kW	Reference Standard: 9100-Wavetek, Universal Calibration system (Source) Unit Under Test: Power Analyzer / Wattmeter (Measure) Method Used: EMD/TPP-14
AC Power	1 W – 500 kW, at 50 Hz – 1 kHz	0.1 W to 0.16 kW	Reference Standard: Universal Calibration System 9100-Wavetek (Source) Unit Under Test: Power Analyzer (Measure) Method Used: EMD/TPP-14
Inductance	100 μ H	0.008 μ H	Reference Standard: Fixed Value Working standard Inductors (Source) Unit Under Test: Digital Inductance/ LCR Meter PM-6304 Fluke, (Measure) Method Used: EMD/TPP-15
	1 mH	0.006 mH	
	10 mH	0.006 mH	
	100 mH	0.006 mH	
	1 H	0.006 H	
Field of measurement: CHEMICAL METROLOGY			
Measured quantity	Range	*Expanded Uncertainty (\pm)	Technique, Reference Standard, Equipment
Calibration of Conductivity meter	1413 μ mhos /cm	5.2 μ mhos /cm	Reference Standard: NIST Traceable Conductivity standard solution Method Used: APHA, AWWA, WEF, USA, 2510B
Calibration of pH meter	0 -14	0.02	Reference Standard: NIST Traceable pH buffers Method Used: APHA, AWWA, WEF, USA, 2510B Standard Buffer solutions / Two point calibration method
Calibration of Ubbelohde Viscometer	0.003 – 500 mm ² /s ²	1,05 %	Reference Standard: NIST Traceable Viscosity Standard oils Method Used: ASTM D 2162-06

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Calibration Laboratory.

Onsite Accreditation Scope of
NATIONAL PHYSICAL & STANDARDS LABORATORY
PLOT NO.16, SECTOR H-9/1, ISLAMABAD, PAKISTAN.

Mobile laboratory (Onsite Calibration)

Field of measurement: MASS METROLOGY			
Measured quantity	Range	*Expanded Uncertainty (±)	Technique, Reference Standard, Equipment
Balance/ Weighing machine	Up to 500 g	0.01 to 1 mg	F class standard masses (500 g to 5000 g) Method Used: MMD/TPP-21/04
	500 g to 5000 g		
Field of measurement: THERMAL METROLOGY			
Measured quantity	Range	*Expanded Uncertainty (±)	Technique, Reference Standard, Equipment
Calibration of Thermocouples	Ambient to 650 °C	1 °C to 1.5 °C	Dry block Temperature Calibrator, Digital Readout, Reference Thermometers, Zero point Dry Well Method Used: TMD/TPP-26
Calibration of PRT/SPRT	Ambient to 650 °C	0.15 °C to 0.5 °C	Reference Thermometers, Digital Readout, Zero point Dry Well, Dry block Temperature Calibrator Method Used: TMD/TPP-31
Calibration of Low Temperature Bath/ Heat Sources (Oven, Incubator, Dry Block, Furnace)	-80 °C to 1400 °C	0.1 °C to 0.5 °C	PRT, S & R Type Thermometer Method Used: TMD/TPP-34
Calibration of Thermo Hygrometers	20 %RH to 80 %RH	1.4 % RH to 1.9 %RH	RH Generator Humi-Lab. Humidity and Temperature Probe (VAISALA) Method Used: TMD/TPP-32

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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	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
	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	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, at 50 Hz to 10 kHz	1.5%	
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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