Laboratory	**Institute for Design of Electrical Measuring Instruments, Swatantryaveer Tatya Tope Marg, Chunabhatti, Sion, Mumbai, Maharashtra**
Accreditation Standard	**ISO/IEC 17025: 2017**
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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
	ELECTRO-TECHNICAL CALIBRATION			
I.	**SOURCE**			
	DC Voltage[$]	10 µV to 10 mV 10 mV to 10 V 10 V to 1050 V	500 ppm to 15 ppm 15 ppm to 0.1 ppm 0.1 ppm to 2.5 ppm	Using Binary Voltage Divider with Range Extender, Reference Voltage Divider, DC Voltage Standard, Reference Multimeter & Multifunction Calibrator Direct / Comparison Method
	DC Voltage[♣]	0.1mV to 1000 V	0.3% to 0.001 %	Using Multifunction Calibrator with 8½ Digital Multimeter by Direct / Comparison Method
	DC High Voltage [$]	1 kV to 100 kV	0.6 %	Using DC High Voltage Source with DC High Voltage Divider & 6½ Digit Multimeter by Comparison Method
	DC Current [$]	1 pA to 1mA 1 mA to 20 A 20 A to 1000 A 1000 A to 3000 A	500 ppm to 4 ppm 4 ppm to 20 ppm 20 ppm to 0.2 % 0.2 % to 0.5 %	Using High Precision Multi-Tap Shunt with Standard Multimeter by Comparison / V/R / Direct Method
		10 µA to 300 mA 300 mA to 20 A	0.25 % to 0.02 % 0.02 % to 0.15 %	Using Multifunction Calibrator with 8½ Digital Multimeter by

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
				Direct / Comparison Method
		20 A to 1000 A	0.6 %	Using Multifunction Calibrator with Current Coil by Direct Method
		10 µΩ (3000A/30 mV) 40 µΩ (1500A/60 mV) 60 µΩ (1000A/60 mV) 100 µΩ (300A/30 mV) 150 µΩ (400A/60 mV) 200 µΩ (500A/100 mV) 240 µΩ (250A/60 mV) 600 µΩ (100A/60 mV)	0.008 % 0.005 % 0.12 % 0.005 % 0.12 % 0.003 % 0.12 % 0.12 %	Using Standard Shunts by Direct Method
		1 mΩ 8 mΩ 10 mΩ 16 mΩ 100 mΩ	0.006 % 0.002 % 0.0008 % 0.002 % 0.0005 %	Using Precision Standard Shunts/ Standard Resistors by Direct Method
		1 Ω 10 Ω 100 Ω 1 kΩ 10 kΩ 100 kΩ 1 MΩ 10 MΩ 100 MΩ 1 GΩ 10 GΩ 1 TΩ 100 TΩ	2 ppm 10 ppm 10 ppm 2 ppm 2 ppm 15 ppm 15 ppm 16 ppm 30 ppm 0.03 % 1.2 % 2 % 3 %	Using Standard Resistors by Direct Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
		0.1 Ω to 190 kΩ 190 kΩ to 100 MΩ	60 ppm to 12 ppm 12 ppm to 100 ppm	Using Multifunction Calibrator & Decade Resistance Box with Reference Multimeter by Comparison Method
		100 MΩ to 1 TΩ	100 ppm to 1.2 %	Using High Value Decade Resistance Box with Dual Voltage Source High value Resistance Bridge by Comparison Method
		40 µΩ (1500A/60 mV) 60 µΩ (1000A/60 mV) 100 µΩ (600A/60 mV) 150 µΩ (400A/60 mV) 240 µΩ (250A/60 mV) 600 µΩ (100A/60 mV	0.15 % 0.15 % 0.15 % 0.15 % 0.15 % 0.15 %	
		1mΩ 10mΩ 100mΩ 1Ω 10Ω 100Ω 1kΩ 10kΩ 100kΩ 1MΩ 10 MΩ 100 MΩ 1 TΩ	0.01 % 0.005 % 0.005% 0.002 % 0.002 % 0.002 % 0.002 % 0.002 % 0.002% 0.002% 0.002% 0.005% 3%	
		0.1Ω to 100 kΩ 100 kΩ to 1 MΩ 1 MΩ to 100 MΩ	0.06% to 0.005% 0.005 % to 0.05% 0.05% to 0.1%	Using Multifunction Calibrator by Direct Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
		100 MΩ to 1 TΩ	0.1% to 2.5%	Using Multifunction Calibrator & Decade Meg Ohm Box by Direct Method
		100 TΩ	5%	Using Standard Resistor by Direct Method
		40 Hz to 70 Hz 1 V to 480 V	5 ppm to 20 ppm	Using Precision Power Calibration System by Direct Method
		10 Hz to 1 KHz 1 mV to 2 V 2 V to 200 V 200 V to 1000 V	0.64 % to 20 ppm 20 ppm to 200 ppm 200 ppm to 30 ppm	
		1 KHz to 1 MHz 1 mV to 20 V	0.62 % to 20 ppm	
		1 kHz to 300 kHz 20 V to 60 V	20 ppm to 50 ppm	
		1 kHz to 20 kHz 60 V to 1000 V	20 ppm to 200 ppm	
		500 kHz to 1.1 GHz 5 mV to 5.5 V (p-p)	4% to 10%	Using Multifunction Calibrator by Direct Method
	AC Voltage♣	**40 Hz to 1 kHz** 1m V to 1000 V	0.7 % to 0.008 %	Using Multifunction Calibrator with AC Measurement Standard by Comparison Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
	AC High Voltage[$]	**At 50 Hz to 60 Hz** 1 kV to 2.4 kV	0.35%	Using Precision AC Divider with 6½ DMM by Comparison Method
		At 50 Hz 2.4 kV to100 kV 100 kV to 200 kV	0.6 % 1.5 %	Using AC High Voltage Source with AC High Voltage Divider with 6½ Digit Multimeter and KV Meter by Comparison Method
		40 Hz to 70 Hz 1 mA to 10 mA 10 mA to 100 A 100 A to 160A	250 ppm to 10 ppm 10 ppm to 30 ppm 30 ppm to 80 ppm	Using Precision Power Calibration System, Power Comparator by Direct/Comparison Method
		10 Hz to 1 kHz 10 µA to 1 mA 1 mA to 120 A	0.08 % to 0.006 % 0.006 % to 0.25 %	
		1 kHz to 10 kHz 10 µA to 1 mA 1 mA to 100 A	0.05 % to 0.006 % 0.006 % to 5.5 %	
		50 Hz 120 A to 5000 A	0.03 % to 0.15 %	Using AC Current Source with Standard CT & Power Meter by Direct Method
		40 Hz to 1 kHz 30 µA to 1 A 1 A to 20 A	0.5 % to 0.07 % 0.07 % to 0.12 %	Using Multifunction Calibrator by Direct Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
		40 to 70 Hz 1 mA to 120 A	0.03 % to 0.01 %	Using Three Phase Power Calibrator with Power / Energy Comparator by Comparison Method
		50 Hz 120 A to 1000 A	0.6 %	Using Multifunction Calibrator with 50 Turn Current Coil by Direct Method
		40 Hz to 70 Hz 1 V to 480 V PF: 0.01 to 1 10 mA to 100 A	20 ppm to 40 ppm / PF	Using Precision Power Calibration System (PPCS) By Direct Method
		40 Hz to 70 Hz 25 V to 480 V PF: 0.01 to 1 1 mA to 10 mA 100 A to 160 A	0.04% to 0.01% /PF 0.01% / PF	Using Three Phase Power Calibrator /Tester with Power/Energy Comparator by Comparison Method
	Active / Reactive Apperent Power / Energy (Single Phase / Three Phase)♣	**40 Hz to 70 Hz** 25 V to 480 V PF: 0.01 to 1 1 mA to 10 mA 10 mA to 120 A	0.04% / PF to 0.013%/PF 0.013% /PF	Using Three Phase Power Calibrator with Power / Energy Comparator by Comparison Method
	Active / Reactive / Apparent Power /Energy (1 Phase) $	**50 Hz to 60 Hz** 480 V to 1050 V PF: 0.01 to 1 1 mA to 10 mA 10 mA to 120 A	0.04% to 0.011% /PF 0.011% / PF	Using Multifunction Calibrator, Trans Conductance Amplifier, Power Energy Comparator with Precision AC Voltage Divider by Comparison Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
7.	Power Factor / Phase Angle$	**40 Hz to 70 Hz** 0 to UPF (0º to 360º) 1 V to 480 V 10 mA to 100 A	0.0012º	Using Precision Power Calibration System (PPCS) by Comparison Method
		40 Hz to 70 Hz 25 V to 480 V 0 to UPF (0º to 360º) 1 mA to 10 mA 100 A to 160 A	0.008º	Using Three Phase Power Calibrator /Tester with Reference Meter by Comparison Method
		50 Hz to 60 Hz 480 V to 1050 V 0 to UPF (0º to 360º) 1 mA to 120 A	0.008º	Using Multifunction Calibrator, Trans Conductance Amplifier , Power Energy Comparator with Precision AC Voltage Divider by Comparison Method
	Power Factor/ Phase Angle♣	**40 Hz to 70 Hz** 0 to UPF 0 to 360° 25 V to 480 V 1 mA to 120 A	0.008º	Using Three Phase Power Calibrator with Power / Energy Comparator by Comparison Method
	Frequency / Time Period $	40 mHz to 4 GHz 250 ps to 25 s	1.5×10^{-11} to 1.3×10^{-12}	Using GPS Controlled Rubidium Standard with RF Reference Source by Direct Method
	Frequency / Time Period♣	1 Hz to 4 GHz 1s to 0.25 ns	6 ppm to 0.1 ppm	Using RF Reference by Source Direct Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
9.	Time Interval $	1 µs to 1000 s 1000 s to 24 Hrs & multiple of 24 hrs.	1.1×10^{-3} to 1.1×10^{-7} 1×10^{-7} to 0.023 %	Using Multifunction Calibrator and Frequency Counter/ Timer/Analyzer by Comparison Method
	Time Interval ♣	1µs to 1000 s 1000 s to 24 Hours & Above	1.1×10^{-3} to 1.1×10^{-7} 1×10^{-7} to 0.023 %	Using Frequency Counter/Timer/Analyzer & Time Interval Meter by Direct Method
		50 Hz 200 µΩ 1 mΩ 10 mΩ 100 mΩ 1Ω	 0.012 % 0.03 % 0.03 % 0.02 % 0.02 %	
		1 kHz 0.01 Ω 0.1 Ω 1 Ω 10 Ω 100 Ω	 0.07 % 0.04 % 0.005 % 0.005 % 0.005 %	
		50 Hz, 100 Hz & 1 kHz 1 kΩ 10 kΩ	 0.36 % 0.36 %	
	AC Resistance♣	**1 kHz** 0.01 Ω 0.1 Ω 1 Ω 10 Ω 100 Ω	 0.1% 0.05% 0.01% 0.01% 0.01%	Using Standard AC Resistors by Direct Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
11.	Inductance $	**1 kHz** 100 µH 1 mH 10 mH 100 mH 1 H 10 H	 0.3 % 0.15 % 0.06 % 0.05 % 0.05 % 0.06 %	Using Standard Inductors by Direct Method
	Inductance♣	**1kHz** 100 µH 1 mH 10 mH 100 mH 1 H 10 H	 0.3 % 0.2 % 0.1 % 0.05 % 0.05 % 0.06 %	Using Standard Inductors by Direct Method
		50 Hz 1 pF 10 pF 100 pF	 0.06% 0.06% 0.06%	
		100 Hz 1 pF 10 pF 100 pF 1 µF 10 µF 100 µF 1 mF 10 mF 100 mF 1 F	 6 ppm 3 ppm 2.5 ppm 0.015 % 0.03 % 0.03 % 0.05 % 0.05 % 0.05 % 0.2 %	

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
		1 kHz 1 pF 10 pF 100 pF 1 nF 10 nF 100 nF 1 µF 10 µF 100 µF 1 mF 10 mF 100 mF 1 F	 4 ppm 2.5 ppm 2.3 ppm 0.015 % 0.015 % 0.015 % 0.015 % 0.03 % 0.03 % 0.03 % 0.04 % 0.05 % 0.07 %	
		1 nF to 110 mF	0.4 % to 1.5 %	Using Multifunction Calibrator by Direct Method
		1kHz 1pF 10 pF 100 pF 0.001 µF 0.01µF 0.1µF 1µF 10µF 100µF 1mF 10 mF 100 mF 1 F	 0.4 % 0.15 % 0.08 % 0.02 % 0.02 % 0.02 % 0.03 % 0.04 % 0.04 % 0.04 % 0.05 % 0.06 % 0.08 %	Using Standard Capacitors & Four Terminal Capacitance Standard by Direct Method
		1 nF to 110 mF	0.5 % to 2 %	Using Multifunction Calibrator by Direct Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
13.	Capacitance at High Voltage $	**Up to 2 kV, 50 Hz** 125 pF & 2000 pF	0.05 %	Using Standard Capacitor with High Precision Capacitance Bridge (Schering Bridge) by Comparison Method
		Up to 30 kV, 50 Hz 1000 pF **Up to 100 kV, 50 Hz** 100 pF	0.012 % 0.02 %	Using Standard Gas Filled Capacitor by Direct Method
		Up to 2 kV, 50 Hz 125 pF & 2000 pF	0.05 %	Using Standard Capacitor with High Precision Capacitance Bridge by Comparison Method
		Up to 30 kV, 50 Hz 1000 pF **Up to 100 kV, 50 Hz** 100 pF	0.012 % 0.02 %	Using Standard Gas Filled Capacitor by Direct Method
		5×10^{-5} to 5×10^{-2} **Up to 25 kV AC, 50 Hz**	2.5×10^{-5} to 4.2×10^{-4}	Using Standard Gas Filled Capacitor with Dissipation Boxes by Direct Method
		1×10^{-1} 1.5×10^{-1} 1.8×10^{-1} Up to 2 kV, 50 Hz	1.5%	Using Standard Tan Delta Calibrator with C & Tan Delta Measurement System by Comparison Method
		5×10^{-5} to 5×10^{-2} **Up to 25 kV AC, 50 Hz**	2.5×10^{-5} to 4.2×10^{-4}	Using Standard Gas Filled Capacitor with Dissipation Boxes by Direct Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
		1x 10^{-1} 1.5 x 10^{-1} 1.8 x 10^{-1} **Up to 2 kV, 50 Hz**	1.5%	Using Standard Tan Delta Calibrator with C & Tan Delta Measurement System by Comparison Method
	DC Power / Energy#	33 mV to 1000 V 3.3 mA to 20.5 A	0.015 % to 0.15 %	Using Multifunction Calibrator by Direct Method
	DC Power DC Clamp-on-Power Meter$	33 mV to 1000 V 3.3 mA to 1000 A	0.015 % to 0.8 %	Using Multifunction Calibrator & Current Coil by Direct Method
	DC Power DC Clamp-On-Power Meter♣	33 mV to 1000 V 3.3 mA to 1000 A	0.015 % to 0.8 %	Using Multifunction Calibrator & Current Coil by Direct Method
	Temperature Simulation$ (For Temperature Indicators, Recorders, Controllers)			
	RTD	(-) 200 °C to 850 °C	0.005 ºC to 0.02 ºC	
	T/C – K, J , N, E, T, R, S, B ,C, L & U	(-) 270 ºC to 2300 ºC	0.01 ºC to 0.26 ºC	
	Temperature Simulation♣ (For Temperature Indicators, Recorders, Controllers)			
	RTD	(-) 200 °C to 850 °C	0.005 ºC to 0.02 ºC	
	T/C – K, J, N, E, T, R, S, B ,C, L & U	(-) 270 ºC to 2300 ºC	0.01 ºC to 0.3 ºC	
	Oscilloscope $			
	Bandwidth	**50 kHz to 1.1 GHz** 5 mV to 5.5 V(p-p)	2.4 % to 5 %	
	Amplitude (Deflection Factor)	1 mV to 130 V (1MΩ) 1 mV to 6.6 V (50 Ω)	5 % to 0.15 % 5 % to 0.3 %	

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
	Time Base (Marker)	1 ns to 20 ms 50 ms to 5 s	3 ppm 80 ppm to 0.6 %	
	Oscilloscope Calibration ♣			
	Bandwidth	**50 kHz to 1.1 GHz** 5 mV to 5.5 V p-p	3 % to 5 %	
	Amplitude (Deflection Factor)	1 mV to 130V (1MΩ) 1 mV to 6.6 V (50 Ω)	5 % to 0.2% 5 % to 0.3 %	
	Time Base (Marker)	1 ns to 20 ms 50 ms to 5 s	3 ppm 80 ppm to 0.6 %	
	Power Quality $			
	Harmonics	1 to 40th	0.2%	Using Multifunction Calibrator with PQ Option by Direct Method
	Power Quality♣			
	Harmonics	1 to 40th Order	0.2 %	
	Transformer Turns Ratio Meter $	**At 50 Hz** 0.8 to 10,000	0.05 %	Using TTR Calibrator with Digital Multimeter by Comparison Method
	Transformer Turns Ratio Meter♣	**At 50 Hz** 0.8 to 10,000	0.05 %	Using TTR Calibrator with Digital Multimeters by Comparison Method
	RF Power $ (With 50 Ω Level Head)	**10 Hz to 128 MHz** +20 dBm to +24 dBm 100 mW to 251 mW **10 Hz to 1.4 GHz** (-) 48 dBm to +20 dBm 15.85 nW to 100 mW	2.2 % 6 %	

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
		1.4 GHz to 4GHz (-) 48 dBm to +14 dBm 15.85 nW to 25.12mW **100 KHz to 4 GHz** (-) 94 dBm to (-) 48dBm 0.398 pW to 15.85 nW	15 % 30 %	
	RF Power $ (With 75 Ω Level Head)	**10 Hz to 125 MHz** +18dBm to (-) 54 dBm 63.10 mW to 3.98 mW **125 MHz to 4 GHz** +14 dBm to (-) 54 dBm 25.12 mW to 3.98 mW **100 KHz to 4GHz** -90 dBm to (-) 54 dBm 1 pW to 3.98 mW **100 KHz to 3 GHz** (-) 100 dBm to (-)90dBm 100 fW to 1 pW	5 % 16 % 20 % 30 %	
	RF Power♣ (With 50 Ω Level head)	**10 Hz to 128 MHz** +20 dBm to +24 dBm 100 mW to 251 mW **10 Hz to 1.4 GHz** (-) 48 dBm to 20 dBm 15.85 nW to 100 mW **1.4 GHz to 4GHz** (-) 48 dBm to +14 dBm 15.85 nW to 25.12mW **100 KHz to 4 GHz** (-) 94 dBm to (-) 48dBm 0.398 pW to 15.85 nW	2.2 % 6 % 15 % 30 %	Using RF Reference Source by Direct Method
	RF Power♣ (With 75 Ω Level head)	**10 Hz to 125MHz** +18 dBm to (-) 54 dBm 63.10 mW to 3.98 mW **125 MHz to 4 GHz**	5 %	Using RF Reference Source by Direct Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
		+14 dBm to (-) 54 dBm 25.12 mW to 3.98 mW **100 KHz to 4GHz** (-) 90 dBm to (-) 54 dBm 1 pW to 3.98mW **100 KHz to 3 GHz** (-) 100 dBm to (-)90dBm 100 fW to 1 pW	16 % 20 % 30 %	
	RF Attenuation $	**200 Hz to 4 GHz** 1 dB to 110 dB	0.03 dB to 0.2 dB	Using RF Calibrator by Direct Method
	RF Attenuation♣	**At 200 Hz to 4 GHz** 1 dB to 110 dB	0.03 dB to 0.2 dB	Using RF Reference Source by Direct Method
	Amplitude Modulation$	**Carrier Frequency** 125 MHz to 1 GHz **Modulation Depth** 10 % to 99 % **Modulation Rate** 1 Hz to 100 kHz at 125 MHz 1 Hz to 20 kHz at 1GHz	5 %	Using RF Calibrator by Direct Method
	Amplitude Modulation♣	**Carrier Frequency** 125 MHz to 1 GHz **Modulation Depth** 10 % to 99 % **Modulation Rate** 1 Hz to 100 kHz at 125 MHz 1 Hz to 20 kHz at 1GHz	5 %	Using RF Reference Source by Direct Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
23.	Frequency Modulation $	**Carrier Frequency** 125MHz to 1GHz **Modulation Rate** 400Hz to 200 kHz **Deviation** 1 Hz to 300 kHz at 125MHz 300kHz to 1 MHz at 1GHz	4 %	Using RF Calibrator by Direct Method
	Frequency Modulation♣	**Carrier Frequency** 125MHz to 1GHz **Modulation Rate** 400Hz to 200 kHz **Deviation** 1 Hz to 300 kHz at 125 MHz 300 kHz to 1 MHz at 1 GHz	4 %	Using RF Reference Source by Direct Method
	Impulse Calibration$ Load: >250 kΩ 100 pF to 300 pF			
	Lightning Impulse Voltage (LI)	80 V to 1600 V (± Polarity)	0.6 %	
	Time Parameters T1 (Front Time) T2 (Time to Half Value)	 0.84 µs 60 µs	 2.5 % 2.5 %	
	Lightning Impulse Chopped Voltage (LIC)	400 V to 1250 V (± Polarity)	1.3 %	
	Time Parameters Tc (Time to Chop)	0.50 µs	2.5 %	

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
	Switching Impulse Voltage (Sl)	80 V to 1600 V (± Polarity)	0.6 %	
	Time parameters Tp (Time to Peak) T2 (Time to Half Value)	20 µs 4000 µs	2.5 % 2.5 %	
	Impulse Calibration♣ Load:>250 kΩ, 100 pF to 300 pF			
	Lightning Impulse voltage (LI)	80 V to 1600 V (± Polarity)	0.6 %	
	Time parameters T1(Front Time) T2(Time to Half Value)	0.84 µs 60 µs	2.5 % 2.5 %	
	Lightning Impulse Chopped Voltage (LIC)	400 V to 1250 V (± Polarity)	1.3 %	
	Time parameters Tc (Time to Chop)	0.50 µs	2.5 %	
	Switching Impulse Voltage (Sl)	80 V to 1600 V (± Polarity)	0.6%	
	Time parameters Tp(Time to Peak) T2(Time to Half Value)	20 µs 4000 µs	2.5 % 2.5 %	
	Partial Discharge Calibration $			
	Apparent Charge q_0	1 pC to 50 nC	6 %	

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
	Partial Discharge Calibration♣			
	Apparent Charge q_0	1 pC to 50 nC	6 %	Using Partial Discharge Calibrator by Comparison Method.
II.	**MEASURE**			
		10 µV to 10 mV	500 ppm to 15 ppm	
		10 mV to 10 V 10 V to 1050 V	0.6 ppm to 0.1 ppm 0.1 ppm to 2.5 ppm	
	DC Voltage ♣	0.1 mV to 1050 V	0.3% to 0.001%	Using Reference Multimeter by Direct Method
	DC High Voltage$	1 kV to 100 kV	0.03%	Using DC High Voltage Divider & 6½ Digit Multimeter by Direct Method
	DC High Voltage ♣	1 kV to 150 kV	1.4 %	Using DC High Voltage Divider with kV Meter by Direct Method
	DC Current$	1 pA to 1mA 1 mA to 20 A 20 A to 1000 A 1000 A to 3000 A	1.5 % to 40 ppm 40 ppm to 10 ppm 10 ppm to 20 ppm 20 ppm to 0.2 %	Using Electrometer Standard Resistor / Standard Shunts with Reference Multimeter by Direct/ V/R Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
	DC Current ♣	10 µA to 1 A 1 A to 100 A 100 A to 3000 A	0.015% to 0.002% 0.002% to 0.005% 0.005% to 0.15%	Using Standard DC Resistor / DC Shunt with Digital Multimeter by V / R Method
	DC Resistance$	1 µΩ to 10 Ω 10 Ω to 100 MΩ 100 MΩ to 100 GΩ 100 GΩ to 1 TΩ 1 TΩ to 100 TΩ	500 ppm to 1 ppm 1 ppm to 15 ppm 15 ppm to 200 ppm 200 ppm to 0.1 % 0.1 % to 1.5 %	Using DCC Bridge and Automated Dual Source & High Resistance Ratio Bridge by Comparison Method
		0.1 Ω to 200 kΩ	0.02 % to 0.001 %	
		200 kΩ to 100 TΩ	0.001 % to 3 %	
		10 Hz to 20 kHz 1 mV	0.3 % to 0.06 %	
		10 Hz to 1 kHz 2 mV to 2 V 2 V to 1000 V	400 ppm to 10 ppm 10 ppm to 36 ppm	
		1 kHz to 1 MHz 2 mV to 20 V	800 ppm to 10 ppm	
		1 kHz to 300 kHz 20 V to 60 V	30 ppm to 10 ppm	
		1 kHz to 100 kHz 60 V to 600 V	400 ppm to 10 ppm	
		1 kHz to 20 kHz 600 V to 1000 V	12 ppm	
		1 MHz to 1100 MHz 5 mV to 5.5 V (p-p)	4 % to 10%	Using Multifunction Calibrator & Digital Storage Oscilloscope by Comparison Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
	AC Voltage♣	**10 Hz to 100 kHz** 1 mV to 1000 V **100 kHz to 300 kHz** 2mV to 60 V **300 kHz to 1 MHz** 2 mV to 20 V	0.15 % to 0.005% 0.03% to 0.5% 0.03% to 1%	Using AC Measurement Standard by Direct Method
		1 MHz to 1100 MHz 5 mV to 5.5 V (p-p)	4% to 10%	Using Multifunction Calibrator & Digital Storage Oscilloscope by Comparison Method
		At 50 Hz to 60 Hz 1 kV to 2.4 kV	0.01%	Using Precision AC Divider with 6½ DMM by Direct Method
		At 50 Hz 2.4 kV to 100 kV 100 kV to 200 kV	0.22 % 1.4 %	Using AC High Voltage Divider & 6½ Digit Multimeter by Direct Method
	AC High Voltage♣	**50 Hz** 1 kV to 200 kV	1.4%	Using AC High Voltage Divider with kV Meter by Direct Method
		10 Hz to 1 kHz 10 µA to 1 mA 1 mA to 100 A	0.025 % to 0.006 % 0.006 % to 0.01 %	
		1 kHz to 10 kHz 10 uA to 100 A	0.015 %	
		40 Hz to 70 Hz 100 A to 160 A	90 ppm	Using Power / Energy Comparator by Direct Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
		50 Hz 100 A to 10,000 A	0.25%	Using Standard CT with Power / Energy Reference Meter by Direct Method
		40 Hz to 70 Hz 1mA to 50 mA 50 mA to 160 A	300 ppm to 70 ppm 70 ppm to 90 ppm	Using Power / Energy Comparator by Direct Method
		10 Hz to 1 kHz 10 µA to 200 µA 200 µA to 20 A	0.3 % to 0.05 % 0.05% to 0.3 %	
		1 kHz to 10 kHz 10 uA to 20 A	0.1 % to 0.3%	
		50 Hz 100 A to 3500 A	0.1%	Using Standard CT with Power / Energy Reference Meter by Direct Method
	Frequency / Period $	40 mHz to 20 GHz 50 ps to 25 s	4×10^{-8} to 1.5×10^{-11}	Using GPS Controlled Frequency Standard & Counter by Direct Method
	Frequency /Time Period ♣	40 mHz to 20 GHz 25 s to 50 ps	4×10^{-7} to 1.5×10^{-8}	Using Frequency Counter by Direct Method
	Time Interval $	1 µs to 1000 s 1000 s to 24 Hrs & multiple of 24 hours	1.1×10^{-3} to 1.1×10^{-7} 1×10^{-7} to 0.023 %	Using GPS Controlled Frequency Standard & Counter by Comparison Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
	Time Interval ♣	1 µs to 1000 s 1000 s to 24 Hrs. & Multiple of 24 Hrs.	1.1 x 10^{-3} to 1.1 x 10^{-7} 1 x 10^{-7} to 0.023 %	Using Frequency Counter & Time Interval Meter by Direct Method
		40 Hz to 70 Hz 25 V to 480 V PF: 0.01 to 1 1 mA to 120 A	0.04 % to 0.01 % / PF	Using Power/ Energy Comparator by Direct Method
		40 Hz to 70 Hz 25 V to 480 V PF: 0.01 to 1 120 A to 300 A	0.01 % to 0.25 % / PF	Using Power/ Energy Meter Test System by Direct Method
		40 Hz to 70 Hz 25 V to 480 V PF: 0.01 to 1 1 mA to 120 A	0.04% to 0.01% / PF	Using Power/ Energy Comparator by Direct Method
		40 Hz to 70 Hz 25 V to 480 V PF: 0.01 to 1 120 A to 300 A	0.01 % to 0.25 % / PF	Using Power/ Energy Meter Test System by Direct Method
	Active / Reactive / Apparent Power /Energy (1 Phase) $	**50 Hz & 60 Hz** 480 V to 1050V PF: 0.01 to 1 1 mA to 10 mA 10 mA to 120A	0.04 % to 0.011 % /PF 0.011 % / PF	Using Power Energy Comparator with Precision AC Voltage Divider by Direct Method
	Active / Reactive / Apparent Power / Energy (1 Phase) ♣	**50 Hz & 60 Hz** 480 V to 1000V 1 mA to 10 mA 10 mA to 120A PF: 0.01 to 1	110 ppm /PF	Using Power Energy Comparator with Precision AC Voltage Divider by Direct Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
9.	Power Factor[$] (Phase Angle)	**40 to 70 Hz** 0 to UPF (0 to 360°) 25 V to 1050 V, 1 mA to 160 A	0.008°	Using Power/ Energy Comparator & Precision AC Voltage Divider by Direct Method
	Power Factor / Phase Angle ♣	**40Hz to 70 Hz** 0 to UPF (0 to 360°) 25 V to 1050 V 1 mA to 160 A	0.008°	Using Power/ Energy Comparator & Precision AC Voltage Divider by Direct Method
		1 kHz 1 pF to 100 pF 100 pF to 1 µF 1 µF to 1 F	5 ppm 5 ppm to 150 ppm 150 ppm to 800 ppm	
		100 Hz 1 pF to 100 pF 1 µF to 1 F	7 ppm to 3 ppm 200 ppm to 800 ppm	
		50 Hz 1 pF 10 pF 100 pF	60 ppm 7 ppm 4 ppm	Using Fused Silica Capacitance Standard , with Precision Component Analyzer by Comparison Method
	Capacitance ♣	**1 kHz** 1 pF to 100 nF 100 nF to 1 F	0.5% to 0.03% 0.03% to 0.1 %	Using Standard Capacitor & Four Terminal Capacitance Standard with RLC Dig bridge by Comparison Method
	Inductance [$]	**1 kHz** 100 µH to 100 mH 100 mH to 10 H	0.07 % to 0.02 % 0.02 % to 0.04 %	Using Precision Component Analyzer by Direct Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
	Inductance ♣	**1 kHz** 100 µH to 100 mH 100 mH to 10 H	 0.07 % to 0.02 % 0.02 % to 0.04 %	Using Precision Component Analyzer by Direct Method
	AC Resistance $	**1 kHz** 0.001 Ω to 10 kΩ	0.02 % to 0.0025 %	Using Precision Component Analyzer by Direct Method
	AC Resistance ♣	**1 kHz** 0.001 Ω to 10 kΩ	0.02 % to 0.0025 %	Using Precision Component Analyzer by Direct Method
	DC Power / Energy $	10 V to 1000 V 1 A to 30 A	0.006 % to 0.05 %	Using Digital Multimeters by Direct Method
	DC Power/ Energy♣	10 V to 1000 V 1 A to 30 A	0.15 %	Using Digital Power Meter by Direct Method
	Temperature By Simulation Method : For Temperature Indicators, Recorders, Controllers $			
	RTD	(-) 200 °C to 850 °C	0.001 ºC to 0.02 ºC	
	T/C – K, J, N, E, T, R, S, B, C, L & U	(-) 270 ºC to 2300 ºC	0.01 ºC to 0.26 ºC	
	Temperature Simulation By Simulation Method For Temperature Indicators, Recorders, Controllers ♣			
	RTD$	(-) 200 °C to 850 °C	0.005 ºC to 0.02 ºC	
	T/C – K, J, N, E, T, R, S, B, C, L & U$	(-) 270 ºC to 2300 ºC	0.01 ºC to 0.3 ºC	
	Tan Delta$ (Absolute Value) & Capacitance at High Voltage	**At 50 Hz** 200 V to 100kV 10 pF to 1.5 µF 1×10^{-5} to 5×10^{-2}	 0.14 % to 0.025% 1.6×10^{-5} to 5.7×10^{-3}	Using C &Tan Delta Measurement System & Standard Capacitor by Comparison Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
	Tan Delta ♣ (Absolute Value) & Capacitance at High Voltage	**At 50 Hz** 200 V to 100kV 10 pF to 1.5 µF 1 x 10^{-5} to 1	0.14 % to 0.025% 1.6 x 10^{-5} to 5.7 x 10^{-3}	Using C &Tan Delta Measurement System & Standard Capacitor by Direct Method
	Harmonics $ Fundamental Frequency 50 Hz	1 to 40th Order with Fundamental Frequency	0.5 %	Using Power / Energy Comparator by Direct Method
	Harmonics Order ♣ Fundamental Frequency 50 Hz	1 to 40th Order with Fundamental Frequency	0.5 %	Using Power / Energy Test System by Direct Method
	CT / PT Burden $	**At 50 Hz** 1 VA to 100 VA	0.05 %	Using Power / Energy Meter by Direct Method
	CT / PT Burden ♣	**At 50 Hz** 1 VA to 100 VA	0.05 %	Using Power / Energy Test System by Direct Method
18.	Transformer Turns Ratio Meter Calibrator $	**At 50 Hz** 0.8 to 2100	0.03 %	Using Multifunction Calibrator with Digital Multimeter by Comparison Method
	Ratio Error and Phase Displacement Error of CT/ PT Comparator $ (AITTS)	**50 Hz** 0.05 A to 6A **50 Hz** 25 V to 150 V	**For CT** Ratio Error: 0.003% to 0.02% Phase Displacement Error: 0.1 min to 0.6 min **For PT** Ratio Error: 0.008% to 0.013% Phase Displacement	Using Power / Energy Test System with AITTS by Comparison Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
			Error: 0.25 min	
	Ratio Error and Phase Displacement Error of CT/ PT Comparator ♣ (AITTS)	**50 Hz** 0.05 A to 6A **50 Hz** 25 V to 150 V	**CT** Ratio Error= 0.003% to 0.02% Phase Displacement Error=0.1 min to 0.6 min **PT** Ratio Error =0.008% to 0.013% Phase Displacement Error =0.25 min	Using Power / Energy Test System with AITTS by Comparison Method
	CT/PT Calibration$			
	Current Transformer Ratio Error & Phase Displacement Error	**At 50 Hz** 1-5,000A / 1-5A (Direct) 5000-10,000A / 1-5A (By Turns)	Ratio Error: 0.004% to 0.025% Phase Displacement Error: 0.15 min to 0.65 min	Using Standard CT , Instrument Transformer Measuring Bridge by Comparison Method
	Voltage Transformer Ratio Error & Phase Displacement Error (Inductive)	**At 50 Hz** 1.1 kV - 100 kV / 110 V 1.1 kV - 132 kV/√3 / 110 V/√3	Ratio Error: 0.01% Phase Displacement Error: 0.32 min	Using Standard Capacitor, EPD, Instrument Transformer Measuring Bridge by Comparison Method
	CT / PT Calibration♣			
	Current Transformer Ratio Error & Phase Displacement Error	**At 50 Hz** 1-10,000A / 1-5A	Ratio Error = 0.02% to 0.06% Phase Displacement Error =0.5 min to 2.5 min	Using Standard CT , Instrument Transformer Measuring Bridge by Comparison Method
	Voltage Transformer Ratio Error & Phase Displacement Error (Inductive)	**At 50 Hz** 1.1 kV to 66 kV / 110 V 1.1 kV to 66 kV/√3 /	Ratio Error = 0.06% Phase Displacement	Using Standard Capacitor, EPD , Instrument Transformer Measuring Bridge by

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
		110 V/√3	Error = 2 min	Comparison Method
		At 50 Hz & 60 Hz 1 mA to 100 A	Ratio Error 0.0076% Phase Displacement Error: 0.30 min to 0.25 min	Using ICT Calibration System by Direct Method
		At 50 Hz & 60 Hz 100A to 120 A	0.01% 0.25 min	Using Power/ Energy Comparator by Comparison Method
	Isolation Current Transformer ♣	**At 40 Hz to 70 Hz** 1 mA to 120 A	Ratio Error =0.008% Phase Displacement Error =0.30 min	Using Power/ Energy Comparator by Comparison Method
	Electrical Fast Transient (50Ω & 1kΩ) $ As per IEC 61000-4-4:2012 Ed.3.0			
	a. Amplitude	± 0.25 kV to 4.0kV	6.7%	
	b. Rise Time	5ns	6.5%	
	c. Pulse Width	50 ns ±30% at 50 Ω 50 ns, -15ns to +100ns at 1kΩ	6.5%	
	d. Repetition Rate	200µs (5kHz) 10 µs (100kHz)	6.5%	
	e. Burst Period	300 ms	6.5%	
	f. Burst Duration	15ms (5 kHz) 0.75ms (100kHz)	6.5%	
	Surge In Open Circuit Voltage $ As per IEC 61000-4-5:2017 Ed.3.1			
	a. Amplitude	± 0.5kV to ± 7.0 kV	6.6%	

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
	b. Front Time	1.2 µs	7.9%	Differential probe model 4241 & Current Monitor Model 411 by Direct Method
	c. Pulse Width	50 µs	6.5%	
	In short Circuit Current			
	a. Current Amplitude	± 0.25kA to ± 4 kA (±0.5kV to ± 7.0 kV)	6.3%	
	b. Front Time	8 µs	6.1%	
	c. Pulse Width	20 µs	6.0%	
	Telecom Surge In Open Circuit Voltage[$] As per IEC 61000-4-5:2017 Ed.3.1			
	a. Amplitude	± 0.5kV to ± 10.0 kV	6.6%	
	b. Front Time	10 µs	7.9%	
	c. Pulse Width	700 µs	6.5%	
	In short Circuit Current			
	a. Current Amplitude	± 12.5 A to ± 250 A (±0.5kV to ± 10.0 kV)	6.3%	
	b. Front Time	5 µs	6.1%	
	c. Pulse Width	320 µs	6.0%	
	Electrostatic Discharge [$] (± 2kV to ± 15 kV) As per IEC 61000-4-2:2008 Ed.2.0			
	a. Peak current	± 7.5 to ± 60 A	7.2%	
	b. Rise Time	0.8ns	7.0%	
	c. Current at 30ns	4 A to 30 A	7.2%	
	d. Current at 60ns	2A to 15 A	7.2%	
		a.0 % to 80% of Voltage	5 %	
		b.10ms – 5 sec	6 %	

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
	As per IEC 61000-4-11 : 2017 IEC 61000-4-29 : 2000[$]			model 4241 by Direct Method
	Power frequency Magnetic Field[$] As per IEC 61000-4-8:2009 Ed.2.0)			
	Current	1 A to 100A	1%	
	Pulse Magnetic Field[$] As per IEC 61000-4-9 :2016 Ed.2.0			
	a. Pulse Level	100 A to 1000 A	6.3%	
	b. Rise Time	8 µs	6.1%	
	c. Pulse Duration	20 µs	6.1%	
	Damped Oscillatory Generator[$] As per IEC 61000-4-18:2011 Ed.1.1 I. Slow Damped Oscillatory (In open Circuit)			
	a. Amplitude	± 0.25kV to ± 2.5 kV	6.6%	
	b. Rise Time	75ns	6.5%	
	c. Repetition Rate	40/s for 100kHz & 400/s for 1 MHz	6.0%	
	d. Voltage Decay	Pk 5 must be > 50% of the Pk1 Pk10 must be < 50% of thePk1	6.7%	
	(Short circuit)			
	a. Current Amplitude	1.25 to 12.5A	6.3%	
	II. Fast Damped Oscillatory (Open Circuit)			
	a. Amplitude	± 0.25kV to ± 4 kV	6.5%	
	b. Rise Time	5ns	6.1%	
	c. Voltage oscillation Frequency	3MHz, 10MHz, 30MHz	6.0 %	
	d. Decaying	Pk 5 must be > 50% of	6.7 %	

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
		the Pk1 Pk10 must be < 50% of thePk1		
	e. Bust Duration	3 MHz to 50ms 10 MHz to 15ms 30 MHz to 5 ms	6.0 %	
	f. Burst Period	300ms	6.0 %	
	(Short Circuit)			
	a. Current Amplitude	5 A to 80A	6.2 %	
	b. Current Rise Time	3 MHz to < 330 ns 10 MHz to < 100 ns 30 MHz to < 33 ns	6.0 %	
	c. Current Oscillation Frequency	3, 10, 30MHz	6.1 %	
	d. Decaying	Pk 5 must be > 25% of the Pk1 Pk10 must be < 25% of the Pk1	6.2 %	
	Ring Wave Generator Open Circuit[$] As per IEC 61000-4-12:2017 Ed.3.0			
	a. Amplitude	± 0.25kV to ± 4 kV	6.6%	
	b. Rise Time	0.5 µs	12.1%	
	c. Oscillation Frequency	100kHz	6.5%	
	d. Decaying	Pk2 40% to 110% of Pk1 Pk3 40% to 80% of Pk2 Pk4 40% to 80% of Pk3	6.7%	
	Short Circuit			
	a. Current Amplitude	20.8 to 333.3 A at 12 Ω 8.3 to 133.3 A at 30 Ω	6.2%	

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
	b. Rise Time	≤ 1 µs	11.8%	
	Damped Oscillatory Magnetic Field [$] As per IEC 61000-4-10:2016 Ed.2.0			
	a. Peak current	11.1 A to 111 A ± 20%	6.3%	
	b. Oscillation Period	10 µs ± 1 µs at 100kHz 1 µs ± 0.1 µs at 1MHz	6.0%	
	c. Repetition Time	25ms ± 2.5 ms at 100kHz 2.5ms ± 0.25 ms at 1MHz	6.0%	
	d. Decay Rate	Pk5 shall be >50% of the Pk1 Value Pk10 shall be < 50% of the Pk1 Value	6.3%	
	Impulse Voltage[$]	1 kV to 15 kV 10 ns to 100 µs	6.3% 0.1%	By Using Impulse Probe with DSO by Direct Method
	Impulse Voltage [♠]	1 kV to 15 kV 10 ns to 100 µs	6.3% 0.1%	Using Impulse Probe with DSO by Direct Method

FLUID FLOW CALIBRATION

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
1.	Volumetric Flow Rate[$]	1.5 m^3/h to 240 m^3/h	0.20 %	By Comparison Method as per ISO-4185
2.	Mass Flow Rate [$]	1500 kg/h to 240000 kg/ h	0.20 %	By Comparison Method as per ISO-4185
3.	Volumetric Flow Rate[♣]	5 m^3/h to 240 m^3/h	1.5 %	Using Ultrasonic Flow Meter By Comparison Method

MECHANICAL CALIBRATION

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
I.	**DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)**			
1.	Calipers (Analog, Dial, Digital)[$] L.C.: 10 µm	Up to 600 mm Up to 1000 mm	10.1 µm 13.2 µm	Using Caliper Checker & By Comparison IS 3651 Using Check Master By Comparison IS 3651
2.	Height Gauges[$] (Analog, Dial, Digital) L.C.: 10 µm	Up to 600mm	12.8 µm	Using Caliper Checker, & Surface plate By Comparison IS 2921
3.	External Micrometer[$] L.C.: 1 µm	Up to 25mm Up to 300mm	1.2 µm 3.1 µm	Using Tungsten Carbide Slip Gauges Grade '0' & 'I', Long Slip Gauge Grade 'K' & Optical Flat By Comparison IS 2967
4.	Inside Micrometer [$] L.C.: 10 µm	25 to 200mm	11 µm	Using Universal Measuring System Microrep By Comparison IS 2961
5.	Bevel Protractor[$] L.C.: 1 min.	0° to 180 °	0.71 min.	Using Steel Angle Gauge Set By Comparison IS 4239
6.	Dial Gauge (Plunger / Lever Type) [$] L.C.: 1 µm L.C.: 10 µm	Up to 25 mm Up to 50 mm	3.9 µm 5.1 µm	Using Electronic Dial Calibrator Tester & Universal Measuring System Microrep By Comparison IS 2092 & IS11498
7.	Bore Dial Gauge (Transmission Movement) [$]	Up to 2 mm	3.9 µm	Using Electronic Dial Calibrator Tester

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
8.	Feeler Gauges Set/ Step Wedge[$]	Up to 2 mm Up to 40 mm	1.9 µm 5.7 µm	Using Ext. Micrometer L.C. 1 µm By Comparison IS 3179
9.	Measuring Scale[$] L.C.: 0.5 mm	Up to 1000mm Up to 2000mm	75 µm 100√L µm (L in m)	Using Tape & Scale Calibrator
10.	Measuring Tape (Oven Metallic Steel, Glass Fiber, Cloth) [$]	Up to 50000 mm	108√L µm (L in m)	Using Tape & Scale Calibrator
11.	Depth Gauge[$] (Analog, Dial, Digital) L.C. 10 µm	Up to 300 mm	7.8 µm	Using Tungsten Carbide Slip Gauges Grade '0' & Long Slip Gauge Grade 'K' & Surface Plate
12.	Depth Micrometer[$] (Analog, Dial, Digital) L.C.: 1µm	Up to 300 mm	5.0 µm	Using Tungsten Carbide Slip Gauges Grade '0' & 'I', Long Slip Gauge Grade 'K' & surface plate By Comparison IS 2967
13.	Micrometer Head[$] L.C.: 1 µm	Up to 50 mm	2.69 µm	Using Tungsten Carbide Slip Gauges Grade '0' & 'I', & Optical Flat By Comparison IS 9483
14.	Length Gauge / Setting Rod / Length Bar / Height Block[$]	25 mm to 500 mm	4.4 µm	Using Electronic Probe with DRO & Comparator stand, Tungsten Carbide Slip Gauges Grade '0' & Long Slip Gauge Grade 'K' By Comparison IS

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
				7014
15.	Dial Thickness Gauge[$] L.C.: 1 µm	Up to 10mm	7.1 µm	Using Tungsten Carbide Slip Gauge Grade '0' & Lever dial gauge By Comparison IS 2092
16.	Cylindrical Measuring Pins[$]	0.1 to 20 mm	1.3 µm	Using Electronic Probe with DRO & Comparator stand, Tungsten Carbide Slip Gauges Grade '0' By Comparison IS 11103
17.	Plain Plug Gauge / Cylindrical Setting Master / Plain Mandrill[$]	Up to 100mm	3.3 µm	Using Electronic Probe with DRO & Comparator stand, Tungsten Carbide Slip Gauges Grade '0' By Comparison IS 3455, IS 2220, IS 4349
18.	Snap Gauge / Dial Snap Gauge (Parameter - Flatness, Parallelism) [$]	Up to 300mm	2.6 µm	Using Tungsten Carbide Slip Gauge Grade '0' , Long Slip Gauge Grade 'K' & Lever dial gauge By Comparison IS 8023 & IS 7606
19.	Test Sieve Aperture Size / Pitch[$]	30 µm to 4mm	6.1 µm	Using Universal Measuring System Microrep By Comparison IS 460 (Part I, II & III)
20.	Ultrasonic Thickness Gauge[$] L.C. 0.1 mm	Up to 300 mm	71 µm	Using Tungsten Carbide Slip Gauge Grade '0' , Long Slip Gauge Grade

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
				'K'
21.	Wire Gauge (Parameter - Diameter) $	Up to 10 mm	5.1 µm	Using Universal Measuring System
22.	Ring Gauge$	Up to 100 mm	6.5 µm	Using CMM
23.	Industrial Gauge Test Probe (Electrical) (Parameter - Length, Diameter, Angle) $	Up to 450 mm Up to 90°	5 µm 1.2 min.	Using Universal Measuring System Microrep By comparison IEC 61032
24.	Industrial Gauge Go - Nogo Gauge (Electrical Verification) (Parameter - Length, Diameter, Width, Thickness, Angle) $	Up to 100mm Up to 90°	5.7 µm 1.2 min.	Using CMM By comparison IS 15518:2004 (Part I)
25.	Electronic Height$ L.C.: 0.1 µm	Up to 600mm Up to 1000mm	4.4 µm 5.2 µm	Using Check Master
26.	Universal Measuring System / Length Measuring Machine$ L.C.: 1 µm	X Axis 300mm Y Axis 200mm	1.8 µm	Using Tungsten Carbide Slip Gauges Grade '0' & Long Slip Gauge Grade 'K'
II.	**DIMENSION (PRECISION INSTRUMENTS)**			
1.	CMM $			Using Check Master

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
	L.C.: 0.01 µm	Up to 1500mm	6 µm	By Comparison Method ISO10360/IS15635
2.	Caliper Checker[$]	Up to 1000mm	4.6 µm	Using Check Master & Lever Dial Gauge
3.	Profile Projector Linear/Magnification / Angle[$] L.C.: 1 µm	 300 mm x 300 mm 10X to 100X 0° to 360°	 1.8 µm 0.16 % 2.7 min.	Using Glass Scale, Steel Angle Gauge Set & Digital Caliper
4.	Tape & Scale Calibrator[$] L.C.: 1 µm	 Up to 1000 mm	 16 µm	Using Tungsten Carbide Slip Gauges Grade '0' & Long Slip Gauge Grade 'K'
5.	Angle Gauge Error in Angle[$]	Up to 90°	1 min.	Using CMM
6.	CNC Machine Positioning Accuracy Rotary / Indexing Table[$]	Up to 15000 mm 0° to 360°	5.7 µm 2.3 min.	Using Laser Measuring System Using Laser Measuring System with Rotary Indexer
7.	Electronic Height[♣] L.C.: 0.1 µm	 Up to 600 mm Up to 1000 mm	 4.4 µm 5.2 µm	Using Check Master
8.	Universal Measuring System / Length Measuring Machine[♣]	X Axis 300 mm	1.8 µm	Using Tungsten Carbide Slip Gauges Grade '0' & Long Slip Gauge

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
	L.C.: 1 µm	Y Axis 200 mm		Grade 'K'
9.	CMM♣ L.C.: 0.01 µm	Up to 1500 mm	6 µm	Using Check Master By comparison ISO10360/IS15635
10.	Profile Projector Linear/Magnification / Angle♣ L.C. 1 µm	300 mm X 300 mm 10X - 100X 0° - 360°	1.8 µm 0.16% 2.7 min.	Using Glass Scale, Steel Angle Gauge Set & Digital Caliper
11.	Tape & Scale Calibrator♣ L.C. 1 µm	Up to 1000mm	16 µm	Using Tungsten Carbide Slip Gauges Grade '0' & Long Slip Gauge Grade 'K'
12.	CNC Machine Positioning Accuracy Rotary / Indexing Table♣	Up to 15000mm 0° to 360°	5.7 µm 2.3 min.	Using Laser Measuring System Using Laser Measuring System with Rotary Indexer
III.	**TORQUE GENERATING DEVICES**			
1.	Torque Screw Driver$ Torque Wrench Driver$	0 to 10 Nm 0 to 20 Nm 20 Nm to 1000 Nm 1000 Nm to 2000 Nm	2.98 % 2.98 % 2.36 % 2.0 %	Using Torque Calibration Systems ISO 6789
IV.	**ACCELERATION AND SPEED**			
1.	Speed Calibration of	10 RPM to1,000 RPM	0.83 RPM	Using Tachometer

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
	Tachometer / RPM Measurement / Stroboscope / Tachometer (Contact Mode) #	≥ 1,000 RPM to 12,000 RPM	3 RPM	By Comparison Method
2.	Non Contact Mode RPM Measurement / Stroboscope#	10 RPM to 30 RPM ≥ 30 RPM to 12,000 RPM ≥ 12,000 RPM to 1,00,000 RPM ≥ 1,00,000 RPM to 1,20,000 RPM	0.83 RPM 3 RPM 6 RPM 24 RPM	Using Tachometer By Comparison Method
V.	**ACCOUSTICS**			
1.	Sound – Source (Sound Measuring Instruments) #	74 dB, 84 dB, 94 dB, 104 dB, 114 dB (at 125 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz & 4 kHz)	0.39 dB	Using Sound Level Meter with Anechoic Chamber By Direct Method
2.	Sound-Measure (Sound Level Calibrator / Sound Generator) #	74 dB to 114 dB (at 125 Hz to 4 kHz)	0.39 dB	Using Sound Level Calibrator By Comparison Method
VI.	**WEIGHTS**			

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
1.	Weights[$]	1 mg 2 mg 5 mg 10 mg 50 mg 100 mg 200 mg 500 mg 1 g 2 g	0.003 mg 0.003 mg 0.003 mg 0.003 mg 0.003 mg 0.003 mg 0.004 mg 0.005 mg 0.006 mg 0.008 mg	Using E1 class standard Weights 1mg-20kg and Balance of d:0.001mg & 0.01mg Calibration of weights as Per OIML R111-1 of Accuracy class E2
		5 g 10 g 20 g 50 g 100 g 200 g	0.009 mg 0.02 mg 0.03 mg 0.03 mg 0.04 mg 0.07 mg	
		500 g 1 kg 2 kg 5 kg	0.2 mg 0.5 mg 1 mg 1.5 mg	Using Mass Comparator of d:0.1mg
		10 kg 20 kg	4 mg 9 mg	Using Mass Comparator of d:1mg

VII.	**WEIGHING SCALE & BALANCE**		

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
1.	Mass / Electronic♣			Using E1 & E2 class Standard weights 1mg to 20kg & Electronics Weighing Balances of accuracy Class I & Coarser as per OIML R76-1
	Weighing Balance d : 0.001mg d : 0.1mg d : 0.01mg d : 1mg d : 10mg d : 100mg	 0 to 5g 0 to 5g 0 to 220g 0 to 5kg 0 to 10kg 0 to 34kg	 0.005mg 0.2mg 0.06mg 3mg 3mg 220mg	
	d : 1g d : 10g d : 10g d : 20g d : 0.1kg	0 to 100kg 0 to 100kg 0 to 200kg 0 to 200kg 500g to 5000kg	2g 15g 15g 30g 0.35kg	Using F1 class weights 20kg & Electronics Weighing Balances of accuracy Class III & Coarser as per OIML R76-1 & OIML R 47 & ISO 4185:1990
VIII.	**VOLUME**			
1.	Micropipettes / Piston Operated Pipettes$	5µl to 100 µl >100 µl to 1000 µl	0.4 µl 0.4 µl	Using weighing balance with d:0.001mg and distilled water & Calibration of Micro Pipettes based on Gravimetric method as per ISO 8655 Part 6
2.	Glassware Pipette/ Burette Measuring Cylinder / Volumetric Flask/Graduated Jar/ Can etc. $	1ml to 10ml >10ml to 100ml >100ml to 2000ml >2000ml to 20000ml	12 µl 0.07ml 0.62ml 4ml	Using weighing balance with d:0.1mg &1mg distilled water & Calibration of glassware Based on Gravimetric method as per ISO 4787
IX.	**PRESSURE INDICATING DEVICES**			

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
1.	Pressure Indicator/ Calibrator/ Controller, Manometer, Magnehelic Gauge, Low Pressure Gauge Low Pressure Instruments (Pneumatic) $	0 to 75 mbar g	0.02% of Rdg.	By Comparison method UUC to Standard as per DKD-R-6-1
2.	Pressure Indicator/ Calibrator/ Controller, Manometer, Magnehelic Gauge, Low Pressure Gauge. Low pressure instruments (Pneumatic) $	0 to (-) 75 mbar g	0.02% of Rdg.	By Comparison method UUC to Standard as per DKD-R-6-1
3.	Pressure Indicator/ Calibrator/ Controller, Manometer, Magnehelic Gauge, Low Pressure Gauge Low Pressure Instruments (Pneumatic) $	75 mbar g to 350 mbar g	0.02% of Rdg.	By Comparison method UUC to Standard as per DKD-R-6-1
4.	Pressure Indicator/ Calibrator/ Controller, Manometer, Magnehelic Gauge, Low Pressure Gauge. Low Pressure Instruments (Pneumatic) $	(-) 75 mbar g to (-)350 mbar g	0.02% of Rdg.	By Comparison method UUC to Standard as per DKD-R-6-1
5.	Pneumatic Dead Weight Tester	0.1 bar g to 35 bar g	0.005% of Rdg	By Cross Float Comparison method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
	(Pneumatic) $			UUC to Standard as per Euramet-cg-3
6.	Pneumatic Pressure Indicator/Calibrator/ Controller, Digital Pressure Gauge & Pressure Instruments (Pneumatic) $	0.1 bar g to 35 bar g	0.005% of Rdg	By Comparison method UUC to Standard as per DKD-R-6-1
7.	Calibration of Pneumatic Pressure Indicator/Calibrator/ Controller, Digital Pressure Gauge & Pressure Instruments (Pneumatic) $	2 bar g to 200 bar g	0.005% of Rdg	By Comparison method UUC to Standard as per DKD-R-6-1
8.	Hydraulic Dead Weight Tester (Hydraulic) $	2 bar g to 2500 bar g	0.007% of Rdg	By Cross Float Comparison method UUC to Standard as per Euramet-cg-3
9.	Pressure Indicator/ Calibrator/ Controller, Pressure Chart Recorder, Pressure Instruments & Analog Gauge (Hydraulic) $	2 bar g to 2800 bar g	0.007% of Rdg	By Direct method UUC to Standard as per DKD-R-6-1
10.	Calibration of Digital Pressure Indicator, Calibrator/Controller Instruments and Gauges (Pneumatic) $	(-) 0.9750 bar g to (-)0.1 bar g	0.005 % of Rdg	By Comparison method UUC to Standard as per DKD-R-6-1
11.	Calibration Of Absolute Pressure	0 to 1 bar a	0.02 % Rdg	By Comparison method UUC to Standard as per

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
	Manometer/Indicator, Analog/Digital Barometers (Pneumatic) $			DKD-R-6-1
12.	Pressure(Pneumatic) Analog/Digital Pressure Gauge, Pressure Indicator, Transmitter, Pressure Chart Recorder♣	0 to 20 bar	0.05 % Rdg	By Comparison method UUC to Standard as per DKD-R-6-1
13.	Pressure(Hydraulic) Analog/Digital Pressure Gauge, Pressure Indicator, Transmitter, Pressure Chart Recorder♣	0 to 100 bar	0.05 % Rdg	By Comparison method UUC to Standard as per DKD-R-6-1
14.	Pressure(Hydraulic) Analog/Digital Pressure Gauge, Pressure Indicator, Transmitter, Pressure Chart Recorder♣	0 to 1000 bar	0.05 % Rdg	By Comparison method UUC to Standard as per DKD-R-6-1
15.	Negative Pressure Analog/Digital Pressure Gauge, Pressure Indicator, Transmitter, Pressure Chart Recorder♣	1 bar to 0.1 bar vacuum	0.1 % Rdg	By Comparison method UUC to Standard as per DKD-R-6-1

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
	THERMAL CALIBRATION			
I.	**TEMPERATURE**			
	Fixed Point Method			
1.	Liquid Nitrogen Comparator[$]	(-) 195.795 °C	4.4 mK	Using SPRT, Liquid Nitrogen Comparator & Precision Thermometry Bridge by Comparison Method
2.	Triple Point of Mercury[$]	(-) 38.8344 °C	2.9 mK	Using SPRT, Mercury T.P. Cell & Precision Thermometry Bridge & Stirred Liquid Bath by Fixed Point Method
3.	Triple Point of Water[$]	0.01°C	1.5 mK	Using SPRT, Water Triple Point Cell & Precision Thermometry Bridge & Stirred Liquid Bath by Fixed Point Method
4.	Gallium Melting Point[$]	29.7646 °C	3.2 mK	Using SPRT, Optimal Gallium Melting Point Cell & Precision Thermometry Bridge & Stirred Liquid Bath by Fixed Point Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
5.	Tin Freezing Point[$]	231.928 °C	4.4 mK	Using SPRT, Tin Freezing Point Cell & Precision Thermometry Bridge & Dry Block Calibrator by Fixed Point Method
6.	Zinc Freezing Point[$]	419.527 °C	5.4 mK	Using SPRT, Zinc Freezing Point Cell & Precision Thermometry Bridge & Dry Block Calibrator by Fixed Point Method
7.	Aluminium Freezing Point[$]	660.323°C	6.9 mK	Using SPRT, Aluminum Freezing Point Cell & Precision Thermometry Bridge & Dry Block Calibrator by Fixed Point Method
8.	RTD, Thermocouple (with or without Indicator), Temperature Indicator, Data Loggers etc. with Sensors[$]	(-) 80 °C to 140 °C 140 °C to 660 °C	0.12 °C 0.23 °C	Using SPRT and Read Unit & Fluke Dry Block Calibrators by Comparison method
9.	Liquid-In-Glass Thermometer[$]	(-) 50°C to 250°C	0.17 °C	Using SPRT and Read Unit & Using Julabo / Isotech Liquid Bath Based on Facility Available by Comparison method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
10.	Thermocouple (with & without Indicator), Temperature Indicators/ Data Logger etc with Sensor[$]	>660 °C to 1000 °C	1.52 °C	Using S-Type Thermocouple Read Unit & Using High Temperature Furnace by Comparison method
11.	IR/Non-Contact Thermometer/ Pyrometer[$]	50 °C to 500 °C	5.7 °C	Using Standard Infra-Red Thermometer, Using Black Body Source Emissivity 0.95 By Comparison Method
12.	Humidity Indicator with Sensor of Humidity Chamber/ Environmental Chamber[♣]	10 % to 95 %RH @25°C 95 %RH @25°C to 70°C	1.3 % RH 1.3 % RH	Using Reference Temp./Humidity Sensor with Indicator by Single Position Calibration at Different Temperature by Comparison Method
13.	Temperature Chambers/ Deep Freezers/Oven[♣]	(-) 80 °C to 0 °C 0 °C to 250 °C	1.2 °C 2.5 °C	Using RTD Sensors With Data Logger by Multi Position Calibration By Comparison Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
14.	Temperature Indicator of Cold Chambers, Ovens, Incubators (for Non-Medical Applications), Furnaces, Baths etc At Single Position♣	(-) 80°C to 660 °C 660 °C to 1000 °C	0.23 °C 1.52 °C	Using RTD/SPRT and Read Out Unit By Comparison method

*** Measurement Capability is expressed as an uncertainty (±) 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.