Laboratory	**Calitron Calibration Laboratory, Location-1: 207, Kohinoor Arcade, Tilak Chowk, Nigdi, Pune, Maharashtra Location-2: 238, Kohinoor Majestic, MIDC Chinchwad, Pune, Maharashtra**			
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Sl.	**Quantity Measured / Instrument**	**Range/Frequency**	***Calibration Measurement Capability (±)**	**Remarks**
	ELECTRO TECHNICAL CALIBRATION			
	Location – 2			
I.	**SOURCE**			
1.	DC Voltage #	100µV to 1 V 1V to 1000V	1.15 % to 0.12 % 0.12 % to 0.003 %	Using FLUKE 5522AMFC by direct method
2.	DC Current#	1 µA to 100 µA 100 µA to 10 mA 10mA to 1A 1A to 20A (>20 A to 1000 A)	2.3 % to 0.04 % 0.04 % to 0.015% 0.015% to 0.05% 0.05% to 0.12% 0.49% to 0.35%	Using FLUKE 5522AMFC by direct method
3.	DC Resistance# 4 wire	1Ω to 300Ω 300Ω to 3kΩ 3kΩ to 1.0MΩ 1MΩ to 1000MΩ	1.2% to 0.004 % 0.004% to 0.01% 0.01%to 0.005% 0.005%to 1.9%	Using FLUKE 5522AMFC by direct method
4.	DC Resistance# 2 wire	1 mΩ to 1 Ω	2.3% to 0.57%	Using Precision Decade box by direct method
5.	DC High Resistance# 2 wire	100 MΩ to 100GΩ	3.4% to 3.7%	Using High Decade box by direct method
6.	AC Current#	**50 Hz** 30 µA to 300 mA 300 mA to 20A >20A to 1000 A	 0.71% to 0.072% 0.072% to 0.2% 0.2% to 0.35%	Using FLUKE 5522AMFC by direct method

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Sl.	**Quantity Measured / Instrument**	**Range/Frequency**	***Calibration Measurement Capability (±)**	**Remarks**
7.	AC Voltage[#]	**50Hz to 10kHz** 1mV to 300V 300V to 1000V	 0.72% to 0.03% 0.03% to 0.04%	Using FLUKE5522AMFC by Direct Method
8.	Capacitance[#]	**1kHz** 40pF to 900pF	 5.96% to 2.5%	Using capacitance box by direct method
9.	Inductance[#]	**1kHz** 100µH to 10H	 2.6% to 2.4%	Using decade inductance box by direct method
10.	Temperature By Simulation Method Of Thermocouple[#] K & J Type R & S Type T Type RTD-PRT	 (-)200 to 1200) ºC 0 to 1750 ºC (-)250 to 400 ºC (-)250 to 800 ºC	 0.3°C 0.7°Cto 0.5°C 0.7°Cto 0.2°C 0.06°C to0.26°C	Using Fluke 5522AMFC by direct method
11.	Frequency And Period[#]	100 mHz to 10Hz 10Hz to 2MHz	12% to 0.11% 0.11% to 0.0032%	Using Fluke 5522AMFC by direct method
12.	DC Power[#]	10V to 600V 100mA to 20.5A	0.31% to 0.19%	Using Fluke 5522AMFC by direct method
13.	AC Power[#]	(30V to 300V 3.3mA to 20.5A) 1PF to 1PF	0.17% to 0.21% 0.003PF	Using Fluke 5522AMFC by direct method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
14.	Oscilloscope[#] Vertical deflection (DC function) Horizontal deflection (Timebase) Bandwidth	 10mV to 50V 2ns to 1s Upto 1GHz	 0.017% to 0.003% 0.06% 0.01%	Using Fluke 5522AMFC by Direct Method And RF Generator
15.	Power Factor[#]	(-)0.8PF to 0.8PF	0.003PF	Using Fluke 5522AMFC by Direct Method
II.	**MEASURE**			
1.	DC Voltage[$]	100 µV to 100 mV 100 mV o 1000 V	0.5% to 0.002% 0.002% to 0.001%	Using 8 ½ digit DMM (Transmille 8081) by direct measurement
2.	DC Current[$]	10 nA to 10µA >10 µA to 1 A 1 A to 20 A	1.5% to 0.009% 0.009% to 0.07% 0.07% to 0.1%	Using 8 ½ digit DMM(Transmille 8081) by direct measurement
3.	AC Voltage[$]	**50 Hz to 10 kHz** 10 mV to 100m V 100m V to 750 V	 0.45% to 0.2 % 0.2%	Using 6 ½ digit DMM (Agilent 34410A) by direct measurement
4.	AC Current[$]	**50 Hz to 1 kHz** 100 µA to 100 mA 100 mA to 2 A 2 A to 20 A **50Hz** >20A to 1000A	 0.4% to 0.28% 0.28% 0.28% to 1.64% 1.7% to 1.2%	Using 6 ½ digit DMM (Agilent 34410A) +shunt by direct measurement

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
		>20A to 1000A	2.5%	Using 6 ½ digit DMM (Agilent 34410A) +CT by direct measurement
5.	DC Resistance[$]	1 mΩ to 1 Ω 1 Ω to 100 kΩ 100 kΩ to 100 MΩ 100 MΩ to 100 GΩ	0.80% to 0.007% 0.007% to 0.003% 0.004% 0.004% to 1.0%	Using 8 ½ digit DMM (Transmille 8081) by direct measurement
6.	Frequency & Period[$]	1 Hz to 1 GHz 1ns to 1s	0.06% to 0.001%	Using High Resolution Counter (HTC - FC3165)`By Direct Measurement
7.	DC High Voltage[$]	2 kV to 40 kV	2.6%	Using HV Probe And 5 4/5 Digit DMM By Direct And Comparison Measurement
8.	AC High Voltage[$]	**50 Hz** 2 kV to 10 kV	1.6%	Using HV Probe And 5 4/5 Digit DMM By Direct And Comparison Measurement
9.	Time[$]	6s to 9999s	0.07s to 6.3s	Using Time Interval Meter By Using Direct And Comparison Method
10.	AC Power/Energy [$] @UPF Power Factor	0.1 W to 6 kW (30 V-300 V 3.3mA-20 A), 50 Hz -1 to +1	0.6% to 3.4% 0.007PF	Using Power Analyzer By Direct And Comparison Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
11.	DC Power[$]	10 W to12 kW (10 Vto 600 V 1A-20 A)	0.75%	By Using 8 ½ Digit DMM (Transmille 8081) By Direct And Comparison Method
12.	Capacitance[$]	**1 kHz** 20 pF to 1 mF	1.4%	By Using Agilent LCR Meter (U1732C) By Direct And Comparison Method
13.	Inductance[$]	**1 kHz** 100 µH to 10 H	1.3% to 0.6%	Using Agilent LCR Meter (U1732C) By Direct & Comparison Method
14.	Temperature Measurement[$] K Type Thermocouple J Type Thermocouple R Type Thermocouple S Type Thermocouple T Type Thermocouple RTD-PRT	 (-)140°C to 1340 °C (-)180°C to750 °C 50°C to 1700 °C 50°C to 1700 °C 0°C to 400 °C (-)100°C to 400 °C	 0.6 °C 0.5 °C 1.2 °C 1.2 °C 0.5 °C 0.09 °C to 0.04°C	 Using 8 ½ digit DMM (Transmille 8081) by direct measurement
15.	Electrical Fast Transient Test Systems[$]	±250 V to ±4.0 kV 5 ± 1.5 ns 50 ± 15 ns	8.67 % 6.45 % 4.2%	Using Oscilloscope By Direct Measurement
16.	CT Ratio[$]	>20A to 1000A	0.35%	Using Standard CT & 6&1/2 Digit DMM(Agilent 34410A) By Direct Measurement

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
17.	Shunt[$]	>20A to 1000A	1.2%	Using Standard Shunt & 6&1/2 Digit DMM(Agilent 34410A)By Direct Measurement
18.	DC Voltage[♣]	100 µV to 100 mV 100 mV to 1000 V	0.42 % to 0.12% 0.12% to 0.01 %	Using 6&1/2 digit DMM(Agilent 34410A) by Direct Measurement
19.	AC Voltage[♣]	**50Hz to 2kHz** 10 mVto100mV 100mV to 750V	 0.45% to 0.2% 0.2 %	Using 6&1/2 digit DMM(Agilent 34410A) by Direct Measurement
20.	AC Voltage[♣]	**10kHz** 100mV to 100V	 0.2% to 0.56%	Using 6&1/2 digit DMM(Agilent 34410A) by Direct Measurement
21.	Resistance[♣]	1 Ω to 1 kΩ >1 kΩ to 1000MΩ	1.4% to 0.014 % 0.014% to 9.3%	Using 6&1/2 digit DMM(Agilent 34410A) by Direct Measurement
22.	DC Current[♣]	100µA to 100mA 100mA to 2A >2A to 20A	0.2 % to 0.12 % 0.12 % to 0.21 % 1.37% to 1.5%	Using 6 ½ digit DMM (Agilent DMM34410A+Shunt) by Direct Measurement
23.	AC Current[♣]	**50Hz to 1kHz** 100µA to 100mA 100mA to 2A 2A to 20A >20 A to 1000 A	 0.4% to 0.28% 0.28% 0.28% to 1.54% 2.3%	Using 6 ½ digit DMM (Agilent DMM34410A+Shunt) by Direct Measurement

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
24.	DC Power♣	10 W to 12 kW (10 V to 600 V 1A to 20 A)	0.75%	Using 6 ½ digit DMM (Agilent DMM34410A+Shunt) by Direct Measurement
25.	PRT Measurement♣	(-)200°C to 0 °C >0°C to 600 °C	0.13 °C to 0.17 °C 0.17 °C to 0.37 °C	Using 6& 1/2 digit DMM by Direct Measurement

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
	MECHANICAL CALIBRATION			
Location: 2				
I.	**DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)**			
1.	Calipers[$] All Type L.C. 0.01mm	0 to 600mm	13 µm	Using Caliper Checker by Comparison Method
2.	Depth Vernier Caliper [$] L.C.0.01 mm	0 to 300 mm	15 µm	Using Depth Checker and Slip gauge set by Comparison Method
3.	Height Gauge[$] All Type L.C 0.01 mm	0 to 600mm	16.5 µm	Using Caliper Checker by Comparison Method
4.	External Micrometer [$] L.C. 0.001 mm.	0 to 100 mm	2.2 µm	Using Mic Check set and Slip gauge set by Comparison Method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
5.	Depth Micrometer Gauges[$] L.C.0.001 mm	0 to 300 mm	9.5 µm	Using Depth Checker and Slip gauge set by Comparison Method
6.	Dial Gauge-Plunger Dial[$] LC 0.001mm LC 0.01 mm	 0 to 25mm 0 to 25mm	 3.8 µm 4.8 µm	 Using dial calibration tester by Comparison Method
7.	Lever Dial Gauge[$] LC 0.001 mm LC 0.01 mm	 0 to 0.14mm 0 to 1 mm	 3.9 µm 6.9 µm	 Using dial calibration tester by Comparison Method
8.	Bore Gauge[$] [For Transmission Mechanism Up to 1 mm.) LC 0.2 / 1 µm	 Up to 1mm	 5.6 µm	 Using dial calibration tester by Comparison Method
9.	Snap Gauge[$]	3mm to 100mm	4 µm	Using slip gauge set by Comparison Method
10.	Feeler gauge / Foils[$]	Up to 1mm	4.2 µm	Using Dial gauge with Comparator by Comparison Method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
11.	Bevel Protractor[$] L.C. 5' arc	0 to 360°	5' arc	Using angle gauge set by Comparison Method
12.	Combination Square[$]	0 to 360°	34' arc	Using angle gauge set by Comparison Method
13.	Measuring Scale/Tape[$]	Up to 1000 mm	205 µm	Using tape and scale calibrator by Comparison Method
14.	Measuring Tape[$]	Up to 15m	$205\sqrt{\frac{l}{1000}}$ L in mm	Using tape and scale calibrator by Comparison Method
15.	Pi Tape[$]	Up to 300mm OD	565 µm	Using Tape And Scale Calibrator By Comparison Method
16.	Tape and Scale Machine[$] L.C: 0.001mm	Up to 1000mm	62 µm	Using Long Slip Gauge Set By Comparison Method
17.	Pistol Caliper[$]	Up to 100mm	82 µm	Using Slip Gauge Set
18.	Plain Plug Gauge[$]	1mm to 200mm	4.2 µm	Using Dial Gauge With Comparator By Comparison Method
19.	Measuring Pins[$]	1mm to 20mm	4.2 µm	Using Dial Gauge With Comparator By Comparison Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
20.	Micrometer Setting Rods[$]	25mm to 275 mm	8.2 µm	Using Dial Gauge With Comparator By Comparison Method
II.	**ACCELERATION AND SPEED**			
1.	Tachometer- Contract [$]	100 rpm to 10000 rpm	7.4 rpm to 68.1 rpm	Using Tachometer And Tachometer Speed Rig
2.	Tachometer- Non Contract[$]	1000rpm to 99,999rpm	58 rpm to 3412 rpm	Using Tachometer And Tachometer Speed Rig
3.	Speed measurement in RPM - Contact type[$]	100 rpm to 10,000rpm	7.4 rpm to 68.1 rpm	Using Tachometer-Contact
4.	Speed measurement in RPM - - Non Contact type[$]	100rpm to 99,000rpm	58 rpm to 3412 rpm	Using Tachometer- Non Contact
III.	**ACOUSTICS**			
1.	Sound Level Meter[$]	94 dB and 114dB	0.9 dB	Using Sound Calibrator

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
IV.	**PRESSURE INDICATING DEVICES**			
1.	Pressure Pneumatic Calibration Of Pressure Indicator , Instrument & Gauges #	(-)0.9 bar to 0 bar	1 mbar	Using Digital Pressure Indicator with uncertainty of 0.3mbar
		(-)200 mbar to 200 mbar	0.2 mbar	Using Digital Pressure Indicator with uncertainty of 0.06 mbar
		0 bar to 2 bar	2.4 mbar	Using Digital Pressure Indicator with uncertainty of 0.5 mbar
		0 bar to 20 bar	5.5 mbar	Using Digital Pressure Indicator with uncertainty of 5 mbar
2.	Pressure Hydraulic Calibration Of Pressure Indicator , Instrument & Gauges #	0 bar to 400 bar	0.1 bar	Using Digital Pressure Indicator with uncertainty of 0.05 bar
		0 bar to 700 bar	0.2 bar	Using Digital Pressure Indicator with uncertainty of 0.07 bar

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
V.	**WEIGHTS**			
1.	Weights[$]	1 mg 2 mg 5 mg 10 mg 20 mg 50 mg 100 mg 200 mg 500 mg 1 g 2 g 5 g 10 g 20 g 50 g 100 g 200 g	0.02 mg 0.02 mg 0.02 mg 0.02 mg 0.02 mg 0.02 mg 0.02 mg 0.02 mg 0.03 mg 0.03 mg 0.03 mg 0.05 mg 0.05 mg 0.1 mg 0.1 mg 0.1 mg 0.2 mg	Using E2 class standard weights ABBA method with Digital weighing Balance up to 80 g of d = 0.01 mg and up to 200g of d=0.1 mg.
		500 g 1 kg	1.7 mg 2.2 mg	Using F1 Class weights and Digital Weighing Balance up to 1 kg with d = 1 mg
		2 kg 5 kg 10 kg	2.2 mg 9.2 mg 18.0 mg	Using F1 Class weights and Digital Weighing Balance up to 10kg with d=10mg
		20 kg	0.4 g	Using F1 Class weights and Digital Weighing Balance up to 25 kg with d =0.5g

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
		50 kg	1.1 g	Using M1 Class weights and Digital Weighing Balance up to 50kg with d= 1 g
VI.	**WEIGHING SCALE AND BALANCES**			
1.	Electronic Weighing Balances♣			
	d=0.01 mg	1 mg to 100 g	0.06 mg	Using E2 class standard weights 1 mg to 200 g
	d=0.1 mg	>100g to 200 g	0.13 mg	Using E2 class standard weights 1 mg to 200 g
	d=1 mg	>200 g to 1 kg	2.0 mg	Using E2 and F1 class standard weights
	d=10 mg	>1kg to 10 kg	20.0 mg	Using E2 and F1 class standard weights
	d=0.1 g	>10 kg to 20 kg	0.2 g	Using E2 and F1 class standard weights
	d=0.5 g	20 kg to 50 kg	1.26 g	Using F1 and M1 class standard weights
	d=1 g	>50 kg to 100 kg	2.0 g	Using F1 and M1 class standard weights

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
VII.	**VOLUME**			
1.	Micropipettes / Piston Pipettes[$]	>10 µl to 100 µl >100 µl to 1000 µl	0.2 µl	Using Digital Balance up to 100 g /200g readability 0.01/0.1 mg and distilled water of known density
2.	Glassware Volumetric Flask , Burettes, Pipetets, Measuring Cylinders[$]			
3.	Glassware Glass Pipettes[$] (Graduated / non graduated)	1 ml to 50 ml	0.01 ml to 0.06 ml	Using Digital Precision Balance and distilled water of known density as per ISO 4787
4.	Glass Burette	1 ml to 50 ml	0.01 ml to 0.06 ml	
5.	Measuring Cylinder/ Volumetric Flask/Conical Flask/Beaker/ Measuring can[$]	1 ml to 100 ml >100 ml to 1000 ml >1000 ml to 5000 ml	0.1 ml 0.4 ml 0.8 ml	

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
VIII.	**MOBILE FORCE MEASURING SYSTEM**			
1.	Force Push Pull Gauge[$]	0 to 500 N Push and Pull mode	0.08%	Using Dead weights push pull calibration system (0 to 500) N with different denomination Newtonian weights and loading frames
IX.	**TORQUE GENERATING DEVICES**			
1.	Torque Generating Devices[$] (Torque Wrenches) Class I and II	0.2 to 20 Nm 20Nm to 100Nm 100Nm to 500Nm	0.29% % of reading 0.15% % of reading 0.35% % of reading	Using Torque transducers with display unit and gradual loading set up
X.	**UTM TENSION CREEP & TORSION TESTING MACHINE**			
1.	Force Measuring system of UTM – Compression[♣] UTM- Tension	 25 N to 45 kN 50kN to 500 kN 25 N to 45 kN	 0.50% 0.50% 0.51%	 Using Class 1 Load Cells as per IS 1828 (part 1)

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Sl.	**Quantity Measured / Instrument**	**Range/Frequency**	***Calibration Measurement Capability (±)**	**Remarks**
		THERMAL CALIBRATION		
Location: 1				
I.	**TEMPERATURE**			
1.	Liquid in Glass thermometer[$]	(-)75ºC to 50 ºC >50ºC to 200 ºC	0.31 ºC 0.43 ºC	Using PRT & RTD (4W)with 6&1/2 digit DMM in refrigerated bath and oil bath by Comparison Method
2.	RTD/Thermocouple with or without indicator Temperature Gauges[$]	(-) 75ºC to 0 ºC	0.23 ºC	Using PRT & RTD(4W)with 6&1/2 digit DMM in refrigerated liquid bath by Comparison Method
		0ºC to 50 ºC >50 ºC to 200 ºC >200ºC to 600ºC	0.08 ºC 0.1 ºC 0.2ºC	Using PRT with 6&1/2 digit DMM in dry block bath by Comparison Method
		>600 ºC to 1000 ºC >1000 ºC to 1200 ºC	1.63 ºC 2.1 ºC	Using S type thermocouple with 6&1/2 digit DMM in dry block bath by Comparison Method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
3.	Temperature Indicator with sensor of liquid baths, Dry block bath[$]	(-) 75ºC to 0 ºC 0ºC to 50 ºC >50 ºC to 200 ºC >200ºC to 600ºC	0.23 ºC 0.08 ºC 0.1 ºC 0.2ºC	Using PRT & RTD(4W)with 6&1/2 digit DMM by single position calibration at measuring location in DUC
		>600 ºC to 1000 ºC >1000 ºC to 1200 ºC	1.63 ºC 2.1 ºC	Using S type thermocouple with 6&1/2 digit DMM by single position calibration at measuring location in DUC
4.	Non contact type Infrared Pyrometers, IR Thermometer[$]	50 ºC to 400 ºC	2.6 ºC	Using Infrared pyrometers by Comparison method using black body furnace
5.	Temperature Humidity meters[$]	(-5 ºC to 50 ºC)approx 50%RH RH(20% to 95%)approx25 ºC	0.5 ºC 1%RH	Using temperature humidity meter Comparison method
6.	RTD/Thermocouple with and without indicator Temperature Gauges[♣]	-30ºC to 50 ºC >50 ºC to 200 ºC >200ºC to 600ºC	0.15 ºC 0.1 ºC 0.2 ºC	Using PRT & RTD(4W)with 6&1/2 digit DMM, in dry block by Comparison method

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
		>600 ºC to 1000 ºC	1.63 ºC	Using S Type Thermocouple With 6&1/2 Digit DMM In Dry Block By Comparison Method
		>1000 ºC to 1200 ºC	2.1 ºC	Using S Type Thermocouple With 6&1/2 Digit DMM In Dry Block Comparison Method
7.	Indicator With Sensor Of Chamber, Oven Or Furnace♣	-30ºC to 50 ºC >50 ºC to 200 ºC >200ºC to 600ºC	0.23 ºC 0.1 ºC 0.2 ºC	Using PRT & RTD(4W)With 6&1/2 Digit DMM By Single Position Calibration At Measuring Location In DUC
		>600 ºC to 1000 ºC >1000 ºC to 1200 ºC	1.63 ºC 2.1 ºC	Using S Type Thermocouple With 6&1/2 Digit DMM By Single Position Calibration At Measuring Location In DUC
8.	Temperature/ Humidity Indicator With Sensor Of Climatic Chambers♣	-75 ºC to 50 ºC RH(25% to 90%)@25 ºC	0.5 ºC 1.3%	Using Temperature humidity meter . with single position calibration at measuring location in DUC

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (±)	Remarks
9.	Calibration Of Chambers, Oven And Furnaces♣	-40 ºC to 200 ºC >200 ºC to 1000 ºC	1.5 ºC 4.5 ºC	Using RTD's /Thermocouples minimum 9 with multichannel datalogger at multiposition calibration
10.	Calibration Of Chambers, Oven And Furnaces♣	RH(20% to 95%)@ Approx 25°C	2.6%	Using Multiposition calibration using minimum 9 humidity data loggers

*** 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.

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