SCOPE OF ACCREDITATION TO ISO/IEC 17025: 2017

INCTECH METROLOGICAL CENTER CO., LTD.
39/1 Soi 82 Sukhapiban 5 Rd.,
O Ngoen Saimai, Bangkok, THAILAND 10220
Pakorn Korathad Phone: +66 29098820-22

CALIBRATION

Valid To: December 31, 2027 Certificate Number: 3884.01

In recognition of the successful completion of the A2LA evaluation process, (including an assessment of the organization's compliance with R205 – A2LA's Calibration Program Requirements) accreditation is granted to this laboratory to perform the following calibrations[1, 6]:

I. Acoustical

Parameter/Equipment	Range	CMC[2] (±)	Comments
Sound Level Meter[3] –			
Sound Pressure Level @ 1000 Hz	94 dB 114 dB	0.6 dB 0.6 dB	Sound calibrator

II. Chemical

Parameter/Equipment	Range	CMC[2] (±)	Comments
pH Meter[3]	1.67 pH 4.01 pH 7.01 pH 10.01 pH 11.72 pH	0.02 pH 0.02 pH 0.02 pH 0.02 pH 0.02 pH	Standard solution
Conductivity Meter[3]	84 µS/cm 1413 µS/cm 12 880 µS/cm	1.0 µS/cm 8.0 µS/cm 75 µS/cm	Standard solution

Parameter/Equipment	Range	CMC[2] (±)	Comments
Gas Detector/Analyzer[3] –			
Oxygen in Nitrogen; O^2	2 cmol/mol 18 cmol/mol 21 cmol/mol	0.068 cmol/mol 0.15 cmol/mol 0.16 cmol/mol	Certified gas reference material (CRM)
Methane in Air; CH_4	2.5 cmol/mol 50 % LEL	0.11 cmol/mol 1.1 % LEL	In-house method
Refractometer[3]	10 % Brix 20 % Brix 30 % Brix 50 % Brix 60 % Brix	0.09 % Brix 0.09 % Brix 0.09 % Brix 0.10 % Brix 0.11 % Brix	Sucrose standard solution (CRM) OIML R142:2008(E)
Refractive Index[3]	1.347 82 nD 1.363 84 nD 1.381 15 nD 1.420 09 nD 1.441 93 nD	0.000 23 nD 0.000 23 nD 0.000 23 nD 0.000 23 nD 0.000 23 nD	Sucrose standard solution (CRM) OIML R142:2008(E)
UV/Vis Spectrophotometer[3] –			
Photometric Accuracy @ 235, 257, 313, 350, 440, 465, 546.1, 590 & 635 nm	(0.0 to 0.6) Abs >0.6 Abs	0.004 Abs 0.004 Abs	ASTM E 275-08 & ASTM E 925-09
Wavelength Accuracy Holmium Filter: Nominal	241 nm 279 nm 287 nm 334 nm 361 nm 418 nm 446 nm 453 nm 460 nm 536 nm 634 nm	0.16 nm 0.16 nm 0.16 nm 0.16 nm 0.16 nm 0.16 nm 0.16 nm 0.16 nm 0.16 nm 0.16 nm 0.16 nm	
Didymium Filter: Nominal	585 nm 684 nm 741 nm 748 nm 807 nm 880 nm	0.24 nm 0.24 nm 0.24 nm 0.24 nm 0.24 nm 0.24 nm	

III. Dimensional

Parameter/Equipment	Range	CMC[2] (±)	Comments
Calipers[3] (Analog, Digital) – External, Internal, Depth	Up to 300 mm (>300 to 600) mm	5.6 µm 6.7 µm	Gauge blocks & caliper checker
External Micrometer[3] (Digital, Analog)	Up to 25 mm (>25 to 125) mm	0.85 µm 1.2 µm	Gauge blocks & optical parallels
Dial Thickness Gauge[3] (Digital, Analog)	Up to 10 mm	0.81 µm	Gauge blocks
Dial Gauge[3] (Digital, Analog)	Up to 50 mm	1.2 µm	Dial gauge tester & gauge blocks
Dial Test Indicator[3] (Digital, Analog)	Up to 1 mm	1.1 µm	Dial gauge tester & gauge blocks
Bore Gauge[3] (Digital, Analog)	Up to 50 mm	1.2 µm	Dial gauge tester & gauge blocks
Glass Scales	Up to 300 mm	3.4 µm	Vision measuring machine
Height Gauge[3] (Digital, Analog)	Up to 150 mm (>150 to 600) mm	6.3 µm 7.5 µm	Gauge blocks & granite surface plate
Universal Length Measuring Machine[3]	Up to 10 mm (10 to 25) mm (25 to 50) mm (50 to 75) mm (75 to 100) mm (100 to 200) mm (200 to 300) mm (300 to 400) mm (400 to 500) mm (500 to 600) mm	0.08 µm 0.12 µm 0.20 µm 0.29 µm 0.38 µm 0.75 µm 1.1 µm 1.5 µm 1.9 µm 2.3 µm	Gauge blocks, forge gage, optical parallels

Parameter/Equipment	Range	CMC[2] (±)	Comments
Measuring Microscope/Vision Measuring Machine/Profile Projector[3] –			
X-Axis	Up to 300 mm	3.2 µm	Glass scale
Y-Axis Z-Axis	Up to 150 mm	5.2 µm	Gauge blocks & long gauge blocks
Plain Plug/Pin Gauge	(0.1 to 100) mm (>100 to 250) mm	0.53 µm 1.4 µm	Universal length measuring machine & gauge blocks
Plain Ring Gauge	(0.5 to 100) mm (>100 to 250) mm	1.1 µm 2.1 µm	Universal length measuring machine & master ring gauges
Thread Measuring Wire	(0.1 to 50) mm	0.32 µm	Universal length measuring machine & gauge blocks
Thread Ring Gauge	M3 to M100 (3 to 100 mm)	1.9 µm	Universal length measuring machine & master ring gauges
Thread Plug Gauge	M1 to M100 (1 mm to 100 mm)	1.6 µm	Universal length measuring machine, gauge blocks & 3-wire set
Steel Ruler	Up to 2000 mm	0.14 mm	Steel tape calibrator
Steel Tape/Textile Tape	Up to 10 m (>10 to 20) m (>20 to 30) m (>30 to 40) m (>40 to 50) m	0.17 mm 0.23 mm 0.31 mm 0.40 mm 0.49 mm	Steel tape calibrator
Optical Flat	Up to 60 mm	0.018 µm	Flatness calibrator

Parameter/Equipment	Range	CMC[2] (±)	Comments
Optical Parallel –			
Parallel	(0 to 10) µm	0.02 µm	Flatness calibrator
Thickness	(12.00 to 25.37) mm	0.25 µm	ULM & gauge blocks
Gauge Blocks & Long Gauge Blocks	Up to 10 mm (>10 to 20) mm (>20 to 50) mm (>50 to 70) mm (>70 to 100) mm (>100 to 200) mm (>200 to 300) mm (>300 to 400) mm (>400 to 500) mm (>500 to 600) mm	0.18 µm 0.20 µm 0.28 µm 0.32 µm 0.43 µm 0.93 µm 1.3 µm 1.7 µm 2.1 µm 2.6 µm	ULM, gauge blocks & long gauge blocks
Micrometer Head –			
Linear	Up to 10 mm (>10 to 50) mm	0.19 µm 0.30 µm	ULM & gauge blocks
Measuring Face Flatness	Up to 3 µm	0.04 µm	Optical flat
Inside Micrometer	Up to 50 mm (>50 to 100) mm (>100 to 125) mm (>125 to 175) mm (>175 to 200) mm (>200 to 225) mm (>225 to 250) mm (>250 to 300) mm (>300 to 400) mm (>400 to 500) mm (>500 to 600) mm	0.33 µm 0.55 µm 0.92 µm 1.0 µm 1.2 µm 1.4 µm 1.5 µm 1.6 µm 2.1 µm 2.3 µm 3.1 µm	Universal length measuring machine, gauge blocks & long gauge blocks
Depth Micrometer[3]	Up to 50 mm (>50 to 75) mm (>75 to 100) mm (>100 to 125) mm (>125 to 150) mm (>150 to 200) mm (>200 to 400) mm (>400 to 600) mm	0.60 µm 0.62 µm 0.65 µm 0.69 µm 0.73 µm 0.90 µm 1.4 µm 2.1 µm	Gauge blocks & long gauge blocks

Parameter/Equipment	Range	CMC[2] (±)	Comments
Micrometer Setting Rod	Up to 25 mm (>25 to 50) mm (>50 to 100) mm (>100 to 125) mm (>125 to 150) mm (>150 to 175) mm (>175 to 200) mm (>200 to 225) mm (>225 to 250) mm (>250 to 300) mm (>300 to 500) mm (>500 to 600) mm	0.20 µm 0.27 µm 0.42 µm 0.47 µm 0.64 µm 0.85 µm 0.92 µm 1.0 µm 1.1 µm 1.3 µm 2.1 µm 2.6 µm	Universal length measuring machine, gauge blocks & long gauge blocks
Thickness Plate/Standard Coating Thickness/ Standard Foil	Up to 5 mm	0.23 µm	ULM & gauge blocks
Coating Thickness Gauge[3]	Up to 263 µm (>263 to 500) µm (>500 to 988) µm (>988 to 1523) µm	1.3 µm 1.6 µm 2.5 µm 3.6 µm	Standard thickness plate/standard foil clothing
Ultrasonic Thickness Gauge[3]	Up to 50 mm (>50 to 100) mm (>100 to 200) mm (>200 to 400) mm	0.2 µm 0.2 µm 0.4 µm 0.98 µm	Gauge blocks
Precision Level – Inclinometer-level Gauge[3]	Up to 1 mm/m	2.3 µm/m	Gauge blocks, sine bar & granite surface plate
Caliper Checker – Depth Micro Checker	Up to 300 mm (>300 to 600) mm	3.9 µm 7.6 µm	Height measuring instruments & granite surface
Grind Gauge	Up to 100 µm	0.16 µm	ULM & gauge blocks
Bevel Protractor	Up to 360°	0° 0' 0.83"	Vision measuring machine

Parameter/Equipment	Range	CMC[2] (±)	Comments
Feeler Gauge	Up to 5 mm	0.19 µm	ULM & gauge blocks
Radius Gauge (Convex & Concave)	Up to 1500 mm	3.3 µm	Vision measuring machine
Spheres & Precision Balls – Diameter	Up to 100 mm	0.42 µm	Universal length measuring machine & gauge blocks
Test Sieve	Up to 300 mm	4 µm	Vision measuring machine
Jig Fixture	Up to 300 mm	4.4 µm	Vision measuring machine

IV. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
DC Voltage – Generate[3]	Up to 329 mV 329 mV to 3.3 V (3.3 to 33) V (33 to 330) V (330 to 1020) V	27 µV 0.2 mV 0.19 V 0.35 V 1.1 V	Multi-product calibrator
DC Voltage – Measure[3]	Up to 100 mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 1000) V	1.1 µV 6.9 µV 67 µV 0.87 mV 8.7 mV	Digital multimeter
DC Voltage, High Voltage – Measure[3]	(1 to 10) kV (10 to 30) kV (30 to 50) kV (50 to 70) kV (70 to 100) kV	0.02 kV 0.04 kV 0.06 kV 0.08 kV 0.11 kV	High voltage meter with high voltage probe

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
DC Voltage, High Voltage – Measure[3] (cont)	(100 to 110) kV (110 to 120) kV (120 to 130) kV (130 to 140) kV	0.12 kV 0.13 kV 0.14 kV 0.15 kV	High voltage meter with high voltage probe
DC Cutoff Current – Generate[3]	0.5 mA 1 mA 2 mA 5 mA 10 mA 20 mA 50 mA 100 mA	0.06 mA 0.06 mA 0.07 mA 0.09 mA 0.14 mA 0.24 mA 0.59 mA 1.2 mA	Current calibrator for withstanding tester
DC Current – Generate[3]	Up to 329 µA 329 µA to 3.29 mA (3.29 to 32.9) mA (32.9 to 329) mA 329 mA to 1.09 A (1.09 to 2.99) A (2.99 to 11) A (11 to 20) A	81 nA 0.44 µA 4.2 µA 42 µA 0.54 mA 1.4 mA 8.3 mA 24 mA	Multi-product calibrator
DC Current, Clamp – Generate[3]	Up to 60 A (60 to 300) A (300 to 1000) A	0.6 A 3 A 15 A	Multi-product calibrator with turn coil
DC Current – Measure[3]	Up to 100 µA 100 µA to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A (1 to 30) A	3.4 nA 31 nA 0.31 µA 4.8 µA 0.14 mA 0.11 A	Digital multimeter Digital multimeter with current shunt
DC Power – Generate[3]	Up to 330 W (@ (0 to 330 V), <1 A) (330 to 900) W (@ (330 to 900) V, <1 A)	0.4 W 1.1 W	Multi-product calibrator

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
DC Power – Generate[3] (cont)	900 W to 1.02 kW (@ (900 to 1020) V, <1 A)	1.3 W	Multi-product calibrator
	(1.02 to 2.7) kW (@ (0 to 900) V, <3 A)	3.3 W	
	(2.7 to 3.06) kW (@ (900 to 1020 V), <3 A)	3.7 W	
	(3.06 to 6.6) kW (@ (0 to 330) V, <20 A)	8 W	
	(6.6 to 18) kW (@ (330 to 900) V, <20 A)	22 W	
	(18 to 20.4) kW (@ (900 to 1020) V, <20 A)	25 W	
Resistance – Generate[3]	Up to 10.9 Ω	1.6 mΩ	Multi-product calibrator
	(10.9 to 33) Ω	4.6 mΩ	
	(33 to 109) Ω	12 mΩ	
	(109 to 330) Ω	35 mΩ	
	330 Ω to 1.09 kΩ	0.12 Ω	
	(1.09 to 3.30) kΩ	0.35 Ω	
	(3.30 to 10.9) kΩ	1.2 Ω	
	(10.9 to 33) kΩ	3.5 Ω	
	(33 to 109) kΩ	14 Ω	
	(109 to 330) kΩ	46 Ω	
	330 kΩ to 1.1 MΩ	0.2 kΩ	
	(1.1 to 3.3) MΩ	0.58 kΩ	
	(3.3 to 10.9) MΩ	7.6 kΩ	
	(10.9 to 33) MΩ	39 kΩ	
	(33 to 109) MΩ	0.63 MΩ	Multi-product Calibrator
	(109 to 290) MΩ	1.7 MΩ	
	290 MΩ to 1.09 GΩ	6.3 MΩ	
	(0.101 to 1.1) Ω	2.5 mΩ	Decade resistance box
	(1.1 to 10.1) Ω	3.5 mΩ	
	(10.1 to 100.1) Ω	15 mΩ	
	(100.1 to 1000.1) Ω	0.12 Ω	
	(1 to 90) mΩ	16 mΩ	
	(90 to 900) mΩ	0.13 Ω	
	900 mΩ to 9 Ω	0.16 Ω	
	(9 to 90) Ω	1.3 Ω	
	(90 to 999.99) Ω	1.6 Ω	

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
Resistance – Generate[3] (cont)	(1 to 10) kΩ (10 to 100) kΩ 100 kΩ to 1 MΩ (1 to 10) MΩ (10 to 100) MΩ 100 MΩ to 1 GΩ (1 to 10) GΩ (10 to 100) GΩ 100 GΩ to 1 TΩ	12 Ω 0.17 Ω 1.8 kΩ 17 kΩ 1.7 MΩ 17 MΩ 0.17 GΩ 1.7 GΩ 51 GΩ	Decade resistance box
Resistance – Measure[3]	Up to 10 Ω (10 to 100) Ω 100 Ω to 1 kΩ (1 to 10) kΩ (10 to 100) kΩ 100 kΩ to 1 MΩ (1 to 10) MΩ (10 to 100) MΩ	0.25 mΩ 2.1 mΩ 15 mΩ 0.14 Ω 1.4 Ω 22 Ω 0.71 kΩ 60 kΩ	Digital multimeter
Electrical Simulation of RTD[3] –			
Pt 385, 100 Ω	(-200 to 850) °C	0.28 °C	Documenting process calibrator
Electrical Simulation of Thermocouples[3]			
Type J	(-210 to 0) °C (>0 to 1200) °C	0.40 °C 0.44 °C	Documenting process calibrator
Type K	(-200 to 0) °C (>0 to 1372) °C	0.74 °C 0.39 °C	
Type R	(0 to 120) °C (>120 to 1768) °C	0.99 °C 1.1 °C	
Type S	(0 to 120) °C (>120 to 1768) °C	1.2 °C 1.1 °C	
Type T	(-240 to 0) °C (>0 to 400) °C	0.69 °C 0.53 °C	

Parameter/Range	Frequency	CMC[2, 7] (±)	Comments
AC Voltage – Generate[3]			
Up to 33 mV	(10 to 45) Hz 45 Hz to 10 kHz	81 µV 62 µV	Multi-product calibrator
(33 to 330) mV	(10 to 45) Hz 45 Hz to 10 kHz	0.22 mV 0.14 mV	
330 mV to 3.3 V	(10 to 45) Hz 45 Hz to 10 kHz	2.0 mV 1.3 mV	
(3.3 to 33) V	(10 to 45) Hz 45 Hz to 10 kHz	21 mV 13 mV	
(33 to 330) V	(10 to 45) Hz 45 Hz to 10 kHz	0.2 V 0.32 V	
(330 to 1020) V	(10 to 45) Hz 45 Hz to 10 kHz	0.62 V 0.97 V	
AC Voltage (3-Phase) Generate[3] –			
Up to 110 V (110 to 380) V	(45 to 65) Hz	0.07 V 0.23 V	Energy meter calibrator
AC Current (3-Phase) Generate[3] –			
Channel 1:			Energy meter calibrator
Up to 0.2 A (0.2 to 0.5) A (0.5 to 2) A (2 to 5) A (5 to 10) A (10 to 20) A	(45 to 65) Hz	0.15 mA 0.52 mA 1.3 mA 3 mA 9.1 mA 16 mA	
Channel 2:			
Up to 0.2 A (0.2 to 0.5) A (0.5 to 2) A (2 to 5) A (5 to 10) A (10 to 20) A	(45 to 65) Hz	0.21 mA 0.38 mA 1.6 mA 3.2 mA 7 mA 19 mA	

Parameter/Range	Frequency	CMC[2, 7] (±)	Comments
AC Current (3-Phase) Generate[3] – (cont)			
Channel 3:			Energy meter calibrator
Up to 0.2 A	(45 to 65) Hz	0.14 mA	
(0.2 to 0.5) A		0.36 mA	
(0.5 to 2) A		1.3 mA	
(2 to 5) A		3.7 mA	
(5 to 10) A		6.4 mA	
(10 to 20) A		16 mA	
AC Cutoff Current – Generate[3]			
0.5 mA	(45 to 65) Hz	0.02 mA	Current calibrator for withstand tester
1 mA		0.03 mA	
2 mA		0.03 mA	
5 mA		0.18 mA	
10 mA		0.21 mA	
20 mA		0.3 mA	
50 mA		1.8 mA	
100 mA		2.1 mA	
AC Voltage – Measure[3]			
Up to 10 mV	1 Hz to 1 kHz	4.6 µV	Digital multimeter
	(1 to 20) kHz	5.6 µV	
	(20 to 100) kHz	60 µV	
	(100 to 300) kHz	0.47 mV	
(10 to 100) mV	1 Hz to 1 kHz	12 µV	
	(1 to 20) kHz	46 µV	
	(20 to 100) kHz	0.10 mV	
	(100 to 300) kHz	0.36 mV	
100 mV to 1 V	1 Hz to 1 kHz	0.11 mV	
	(1 to 20) kHz	0.2 mV	
	(20 to 50) kHz	0.38 mV	
	(50 to 100) kHz	0.95 mV	
	300 kHz to 1 MHz	12 mV	
(1 to 10) V	(1 to 40) Hz	1.4 mV	
	40 Hz to 1 kHz	1.1 mV	
	(1 to 20) kHz	1.9 mV	

Parameter/Range	Frequency	CMC[2, 7] (±)	Comments
AC Voltage – Measure[3] (cont)			Digital multimeter
(1 to 10) V	(20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	3.8 mV 9.5 mV 36 mV 0.12 V	
(10 to 100) V	1 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	26 mV 26 mV 43 mV 0.15 V	
(100 to 700) V	1 Hz to 1 kHz	0.35 V	
(700 to 1000) V	(50 to 400) Hz	7.2 V	High voltage meter
AC Voltage, High Voltage – Measure[3]			
(1 to 10) kV (10 to 30) kV (30 to 50) kV (50 to 70) kV	(0 to 400) Hz (0 to 400) Hz (0 to 400) Hz (0 to 400) Hz	0.062 kV 0.19 kV 0.31 kV 0.43 kV	High voltage meter with high voltage probe
(70 to 80) kV (80 to 90) kV (90 to 100) kV	(0 to 400) Hz (0 to 400) Hz (0 to 400) Hz	0.49 kV 0.55 kV 0.61 kV	
AC Current – Measure[3]			
(25 to 100) µA 100 µA to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A	10 Hz to 5 kHz 10 Hz to 5 kHz 10 Hz to 5 kHz 10 Hz to 5 kHz 10 Hz to 5 kHz	0.11 µA 0.59 µA 5.8 µA 58 µA 1.4 mA	Digital multimeter
AC Current – Generate[3]			
(29 to 330) µA	10 Hz to 1 kHz (1 to 5) kHz (5 to 30) kHz	0.61 µA 1.4 µA 6.6 µA	Multi-product calibrator

Parameter/Range	Frequency	CMC[2, 7] (±)	Comments
AC Current – Generate[3] (cont)			
330 µA to 3.3 mA	10 Hz to 1 kHz (1 to 5) kHz (5 to 30) kHz	4.1 µA 7.9 µA 39 µA	Multi-product calibrator
(3.3 to 33) mA	10 Hz to 1 kHz (1 to 5) kHz (5 to 30) kHz	19 µA 34 µA 0.17 mA	
(33 to 330) mA	10 Hz to 1 kHz (1 to 5) kHz (5 to 30) kHz	0.21 mA 0.46 mA 0.9 mA	
330 mA to 1.1 A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	2.5 mA 0.85 mA 8.8 mA 38 mA	
(1.1 to 2.99) A	(10 to 45) Hz 45 Hz to 1 kHz	6.6 mA 2.8 mA	
(1.1 to 2.99) A	(1 to 5) kHz (5 to 10) kHz	22 mA 93 mA	
(2.99 to 11) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	12 mA 16 mA 0.39 A	
(11 to 20) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	38 mA 44 mA 0.71 A	
AC Power – Generate[3] –			
Up to 330 W	45 Hz to 1 kHz (@ (0 to 330) V, <1 A)	0.6 W	Multi-product calibrator
330 W to 1.02 kW	45 Hz to 1 kHz (@ (330 to 1020) V, <1 A)	1.9 W	
(1.02 to 3.06) kW	45 Hz to 1 kHz (@ (0 to 1020) V, <3 A)	5.8 W	

Parameter/Range	Frequency	CMC[2, 7] (±)	Comments
AC Power – Generate[3] – (cont)			
(3.06 to 6.6) kW	45 Hz to 1 kHz (@ (0 to 330) V, <20 A)	14 W	Multi-product calibrator
(6.6 to 20.4) kW	45 Hz to 1 kHz (@ (330 to 1020) V, <20 A	41 W	
AC Current, Clamp – Generate[3]			
Up to 60 A (60 to 300) A (300 to 1000) A	(30 to 60) Hz	0.6 A 3 A 15 A	Multi product calibrator with turn coil
AC Power (3-Phase) @ -60° Phase Angle, PF 0.5 (Inductive) – Measure[3]			
Up to 3.3 W (3.3 to 66) W (66 to 165) W (165 to 660) W 660 W to 1.65 kW (1.65 to 3.3) kW (3.3 to 6.6) kW (6.6 to 16.5) kW (16.5 to 33) kW	(45 to 65) Hz	15 mW 83 mW 0.11 W 0.41 W 1.0 W 2.0 W 30 W 74 W 0.15 kW	Energy meter calibrator
AC Power (3-Phase) @ 0° Phase Angle, PF 1 – Measure[3]			
Up to 6.6 W (6.6 to 132) W (132 to 330) W 330 W to 1.32 kW (1.32 to 3.3) kW (3.3 to 6.6) kW (6.6 to 13.2) kW (13.2 to 33) kW (33 to 66) kW	(45 to 65) Hz	7.2 mW 84 mW 0.21 W 0.81 W 2.0 W 4 W 15 W 36 W 71 W	Energy meter calibrator

Parameter/Range	Frequency	CMC[2, 7] (±)	Comments
Watt-Hour (3-Phase) @ PF 0.5 (Inductive) Pulse – Measure[3]			
Up to 3.3 Wh	(45 to 65) Hz	2.3 mWh	Energy meter calibrator
(3.3 to 66) Wh		41 Wh	
(66 to 165) Wh		0.16 Wh	
(165 to 660) Wh		0.41 Wh	
660 Wh to 1.65 kWh		1 Wh	
(1.65 to 3.3) kWh		2 Wh	
(3.3 to 6.6) kWh		4 Wh	
(6.6 to 16.5) kW		10 Wh	
(16.5 to 33) kW		20 Wh	
Watt-Hour (3-Phase) @ PF 1 (pulse) – Measure[3]			
Up to 6.6 Wh	(45 to 65) Hz	4.1 mWh	Energy meter calibrator
(6.6 to 132) Wh		0.14 Wh	
(132 to 330) Wh		0.23 Wh	
330 Wh to 1.32 kWh		0.81 Wh	
(1.32 to 3.3) kWh		2 Wh	
(3.3 to 6.6) kWh		4 Wh	
(6.6 to 13.2) kWh		8 Wh	
(13.2 to 33) kWh		20 Wh	
(33 to 66) kWh		40 Wh	
AC Power (3-Phase 4-Wire) @ PF 1 – Generate[3]			
Up to 660 W	50 Hz (@ (0 to 220) V, <1 A)	0.4 W	Energy generator calibrator
(660 to 3300) W	50 Hz (@ (220 to 220) V, <5 A)	2.0 W	
(3300 to 6600) W	50 Hz (@ (220 to 220) V, <10 A)	4 W	
(6600 to 9900) W	50 Hz (@ (220 to 220) V, <15 A)	6 W	

Parameter/Range	Frequency	CMC[2, 7] (±)	Comments
AC Power (3-Phase 4-Wire) @ PF 1 – Generate[3]			
Channel 1:			
Up to 44 W	50 Hz (@ (0 to 220 V), <0.2 A)	0.03 W	Energy generator calibrator
(44 to 220) W	50 Hz (@ (220 to 220 V), <1 A)	0.14 W	
(220 to 1100) W	50 Hz (@ (220 to 220 V), <5 A)	0.66 W	
(1100 to 2200) W	50 Hz (@ (220 to 220) V, <10 A)	1.4 W	
(2200 to 3300) W	50 Hz (@ (220 to 220) V, <15 A)	2.0 W	
Channel 2:			
Up to 44 W	50 Hz (@ (0 to 220) V, <0.2 A)	0.03 W	
(44 to 220) W	50 Hz (@ (220 to 220) V, <1 A)	0.14 W	
(220 to 1100) W	50 Hz (@ (220 to 220) V, <5 A)	0.66 W	
(1100 to 2200) W	50 Hz (@ (220 to 220) V, <10 A)	1.4 W	
(2200 to 3300) W	50 Hz (@ (220 to 220) V, <15 A)	2.0 W	
Channel 3:			
Up to 44 W	50 Hz (@ (0 to 220) V, <0.2 A)	0.03 W	
(44 to 220) W	50 Hz (@ (220 to 220) V, <1 A)	0.14 W	

Parameter/Range	Frequency	CMC[2, 4, 7] (±)	Comments
AC Power (3-Phase 4-Wire) @ PF 1 – Generate[3] (cont)			
Channel 3:			
(220 to 1100) W	50 Hz (@ (220 to 220) V, <5 A)	0.66 W	Energy generator calibrator
(1100 to 2200) W	50 Hz (@ (220 to 220) V, <10 A)	1.4 W	
(2200 to 3300) W	50 Hz (@ (220 to 220) V, <15 A)	4.8 W	

Parameter/Equipment	Range	CMC[2, 4, 7] (±)	Comments
AC Voltage – Measure[3] @ 50 Hz –			
Channel 1	110 V 220 V 456 V	0.07 V 0.13 V 0.27 V	Energy generator calibrator
Channel 2	110 V 220 V 456 V	0.07 V 0.13 V 0.27 V	
Channel 3	110 V 220 V 456 V	0.07 V 0.13 V 0.27 V	
AC Current – Measure[3] @ 50 Hz –			
Channel 1	1 A 10 A 20 A	0.6 mA 6.1 mA 12 mA	Energy generator calibrator
Channel 2	1 A 10 A 20 A	0.9 mA 6 mA 12 mA	

Parameter/Equipment	Range	CMC[2, 4, 7] (±)	Comments
AC Current – Measure[3] @ 50 Hz – (cont) Channel 3	 1 A 10 A 20 A	 0.6 mA 6 mA 12 mA	 Energy generator calibrator
Harmonic Voltage – Harmonic Number 2nd to 51st (5 to 1000) Hz	100 % of range 1 % of range	0.37 % 0.25 %	Energy generator calibrator
Harmonic Current – Harmonic Number 2nd to 51st (5 to 1000) Hz	100 % of range 1 % of range	0.22 % 0.22 %	Energy generator calibrator
Capacitance – Generate LCR Meter & Multimeter	(220 to 399.9) pF (0.4 to 1.09) nF (1.1 to 3.29) nF (3.3 to 10.9) nF (11 to 32.9) nF (33 to 109.9) nF (110 to 329.9) nF (0.33 to 1.09) µF (1.1 to 3.29) µF (3.3 to 10.9) µF (11 to 32.9) µF (33 to 109.9) µF (110 to 329.9) µF (0.33 to 1.09) mF (1.1 to 3.29) mF (3.3 to 10.9) mF (11 to 32.9) mF (33 to 110) mF (10 to 90) pF (90 to 900) pF (0.9 to 9) nF (9 to 90) nF (90 to 900) nF (0.9 to 9) µF (9 to 90) µF	14 pF 19 pF 32 pF 53 pF 0.23 nF 0.52 nF 1.8 nF 5.7 nF 18 nF 59 nF 0.23 µF 0.7 µF 2.1 µF 7 µF 21 µF 70 µF 0.21 mF 0.69 mF 6.9 pF 17 pF 0.12 nF 1.1 nF 11 nF 0.11 µF 5.3 µF	Multi-product calibrator Capacitance decade box

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
Inductance – Generate LCR Meter & Multimeter	(1 to 10) mH (10 to 100) mH (0.1 to 1) H (1 to 10) H	0.5 mH 5 mH 49 mH 0.5 H	Inductance decade box
Oscilloscope[3] –			
DC Vertical Deflection Accuracy 50 Ω Load	10 mV to 10 V	6 mV	Function/arbitrary waveform generator & synthesized signal generator
DC Vertical Deflection Accuracy 1 MΩ Load	10 mV to 10 V	6 mV	
Vertical Deflection Accuracy 50 Ω Load Square Wave Signal <10 kHz	5 mV 10 mV 20 mV 50 mV 100 mV 200 mV 500 mV 1 V 2 V 5 V 10 V	0.16 mV 0.19 mV 0.29 mV 0.84 mV 1.4 mV 2.4 mV 5.9 mV 1.8 mV 1.8 mV 1.8 mV 15 mV	
Vertical Deflection Accuracy 1 MΩ Load Square Wave Signal <10 kHz	5 mV 10 mV 20 mV 50 mV 100 mV 200 mV 500 mV 1 V 2 V 5 V 10 V	0.16 mV 0.19 mV 0.29 mV 0.84 mV 1.4 mV 2.4 mV 5.9 mV 1.8 mV 1.8 mV 1.8 mV 15 mV	
Horizontal Cursor Accuracy (Time Base)	5 s to 2 ns	8.2 ms/s	

V. Fluid Quantities

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Air Velocity – Measure	Up to 10 m/s (>10 to 25) m/s	0.53 m/s 1.3 m/s	Wind tunnel with anemometer
Burettes	(0.1 to 5) mL 10 mL 25 mL 50 mL 100 mL	0.0038 mL 0.0040 mL 0.0069 mL 0.011 mL 0.019 mL	Analytical balance & standard weight ASTM E542-22
Pipettes	(0.5 to 5) mL (>5 to 10) mL 15 mL 20 mL 25 mL 50 mL 100 mL	0.0026 mL 0.0039 mL 0.0064 mL 0.0066 mL 0.0069 mL 0.012 mL 0.018 mL	Analytical balance & standard weight ASTM E542-22
Micro Pipette	(0.1 to 1) µL (>1 to 10) µL (>10 to 20) µL (>20 to 50) µL (>50 to 100) µL (>100 to 200) µL (>200 to 500) µL (>500 to 1000) µL (>1000 to 2000) µL (>2000 to 5000) µL (>5000 to 10 000) µL	0.007 µL 0.018 µL 0.031 µL 0.070 µL 0.14 µL 0.27 µL 0.66 µL 1.3 µL 2.5 µL 6.6 µL 13 µL	Analytical balance & standard weight ISO 8655-6:2022
Volumetric Flask	1 mL 5 mL 10 mL 20 mL 25 mL 50 mL 100 mL 150 mL 200 mL 250 mL 500 mL 1000 mL 2000 mL	0.0041 mL 0.0062 mL 0.0064 mL 0.0068 mL 0.0071 mL 0.011 mL 0.018 mL 0.025 mL 0.031 mL 0.037 mL 0.068 mL 0.14 mL 0.27 mL	Analytical balance & standard weight ASTM E542-22

Parameter/Equipment	Range	CMC[2, 4, 5] (±)	Comments
Cylinder & Beaker	1 mL 5 mL 10 mL 25 mL 50 mL 100 mL 250 mL 500 mL 1000 mL 2000 mL	0.0081 mL 0.020 mL 0.024 mL 0.049 mL 0.053 mL 0.062 mL 0.081 mL 0.12 mL 0.19 mL 0.31 mL	Analytical balance & standard weight ASTM E542-22
Viscometer[3]	100 mPa·s 500 mPa·s 5000 mPa·s 10 000 mPa·s	0.51 mPa·s 2.6 mPa·s 25 mPa·s 53 mPa·s	Viscosity certified standard (CRM) ASTM E2975-15
Viscometer	60 000 mPa·s	320 mPa·s	Viscosity reference Standard
Viscosity Cup – DIN Cup No. 4 Ford Cup No. 2 Ford Cup No. 3 Ford Cup No. 4 Ford Cup No. 5 ISO Flow Cup No. 4 ISO Flow Cup No. 5 ISO Flow Cup No. 6 Zahn Cup No. 2 Zahn Cup No. 3 Zahn Cup No. 4 Zahn Cup No. 5 Shell Cup No. 3 Shell Cup No. 4 Shell Cup No. 6	 100 cSt 100 cSt 100 cSt 100 cSt 500 cSt 100 cSt 100 cSt 500 cSt 100 cSt 500 cSt 500 cSt 500 cSt 100 cSt 100 cSt 500 cSt	 0.68 % 0.69 % 0.68 % 0.70 % 0.68 % 0.68 % 0.68 % 0.68 % 0.68 % 0.68 % 0.69 % 0.70 % 0.68 % 0.70 % 0.69 %	Viscosity reference standard & stopwatch

VI. Mechanical

Parameter/Equipment	Range	CMC[2] (±)	Comments
Centrifuge[3]	Up to 999 rpm (1000 to 9999) rpm (10 000 to 15 000) rpm	0.38 rpm 2.7 rpm 3.8 rpm	Digital tachometer
Digital Tachometer[3] –			
Photo Type	(1 to 999.9) rpm (1000 to 9999) rpm (10 000 to 99 999) rpm	0.36 rpm 3 rpm 21 rpm	Multifunction calibrator or function generator
Mechanical Tachometers, (Contact)	(1 to 999.9) rpm (1000 to 9999) rpm (10 000 to 99 999) rpm	0.36 rpm 2.1 rpm 21 rpm	Multifunction calibrator or function generator
Balances & Scales[3]	(1 to 20) mg (20 to 50) mg (50 to 100) mg (100 to 200) mg (200 to 500) mg 500 mg to 1 g (1 to 2) g (2 to 5) g (5 to 10) g (10 to 20) g (20 to 50) g (50 to 100) g (100 to 200) g	0.0090 mg 0.0096 mg 0.010 mg 0.011 mg 0.013 mg 0.015 mg 0.017 mg 0.022 mg 0.029 mg 0.04 mg 0.07 mg 0.13 mg 0.26 mg	Standard weight Class E1
	(200 to 500) g 500 g to 1 kg (1 to 2) kg (2 to 10) kg (10 to 20) kg	1.0 mg 2.8 mg 5.4 mg 0.03 g 0.05 g	Standard weight Class F1
	(20 to 100) kg (100 to 200) kg (200 to 500) kg (500 to 1000) kg (1000 to 2000) kg	10 g 15 g 32 g 63 g 130 g	Standard weight Class M

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Mass – Measure (Standard Weight)	(1 to 20) mg (>20 to 50) mg (>50 to 100) mg (>100 to 200) mg (>200 to 500) mg >500 mg to 1 g (>1 to 2) g (>2 to 5) g (>5 to 10) g (>10 to 20) g (>20 to 50) g (>50 to 100) g (>100 to 200) g (>200 to 500) g >500 g to 1 kg (>1 to 2) kg (>2 to 5) kg (>5 to 10) kg (>10 to 20) kg	0.0083 mg 0.0089 mg 0.0096 mg 0.010 mg 0.012 mg 0.014 mg 0.016 mg 0.021 mg 0.025 mg 0.031 mg 0.037 mg 0.060 mg 0.12 mg 0.88 mg 2.5 mg 5.3 mg 12 mg 22 mg 40 mg	Standard weight Class E1, F1 & electronic balance
Force Gauge/Tension Gauge[3] (Digital, Analog)	(1 to 20) mg (>20 to 50) mg (>50 to 100) mg (>100 to 200) mg (>200 to 500) mg (>500 to 1) g (>1 to 2) g (>2 to 5) g (>5 to 10) g (>10 to 20) g (>20 to 50) g (>50 to 100) g (>100 to 200) g (>200 to 500) g >500 g to 1 kg (>1 to 2) kg (>2 to 10) kg (>10 to 20) kg (>20 to 100) kg (>100 to 200) kg (>200 to 300) kg	0.0093 mg 0.0097 mg 0.010 mg 0.011 mg 0.013 mg 0.015 mg 0.017 mg 0.022 mg 0.028 mg 0.039 mg 0.069 mg 0.13 mg 0.26 mg 0.87 mg 2.1 mg 5.6 mg 0.02 g 0.04 g 9.5 g 15 g 20 g	Standard weight Class E1, F1, M1 & standard load cell

Parameter/Equipment	Range	CMC[2, 4, 5] (±)	Comments
Torque, Hand Tools	(0.5 to 1000) N·m	1.4 %	Torque tester calibrator
Torque Tester[3]	(0.5 to 500) N·m	0.27 %	Torque transfer wrench/static torque measuring device
Indirect Verification of Rockwell Hardness Testers[3]	HRA: Low Medium High HRB: Low Medium High HRC: Low Medium High	 0.62 HRA 0.62 HRA 0.62 HRA 0.65 HRB 0.74 HRB 0.62 HRB 0.69 HRC 0.62 HRC 0.62 HRC	Indirect verification per ASTM E18
Indirect Verification of Microindentation Hardness Testing Machine[3] –			
HV1 (1 kgf): Knoop/Vickers	(100 to 240) HV1 (>240 to 600) HV1 >600 HV1	3.5 HV1 24 HV1 52 HV1	Indirect verification per ASTM E384
HV5 (5 kgf): Vickers	(100 to 240) HV5 (>240 to 600) HV5 >600 HV5	3.4 HV5 17 HV5 44 HV5	
HV10 (10 kgf): Vickers	(100 to 240) HV10 (>240 to 600) HV10 >600 HV10	3.2 HV10 16 HV10 30 HV10	

Parameter/Equipment	Range	CMC[2, 4, 5] (±)	Comments
Durometers – Types A, B, C, D, O, DO, OO & M			ASTM D2240
Indentor Extension Length	Up to 50 mm	2.3 µm	Vision measuring machine
Angle	Up to 90°	0.05°	Vision measuring machine
Indentor Display	(0 to 90) durometer unit	0.32 durometer units	Gauge blocks
Spring Calibration – Force	Up to 5 kg	0.24 g	Electronic balance & load cell
Universal Testing Machine[3]/Load Cell & Force Sensor			
Compression & Tension	Up to 0.05 kN (>0.05 to 0.5) kN (>0.5 to 1) kN (>1 to 2) kN (>2 to 3) kN (>3 to 4) kN (>4 to 5) kN (>5 to 6) kN (>6 to 7) kN (>7 to 8) kN (>8 to 9) kN (>9 to 10) kN (>10 to 50) kN (>50 to 100) kN (>100 to 200) kN (>200 to 300) kN (>300 to 400) kN (>400 to 500) kN	0.059 N 0.39 N 0.77 N 1.5 N 2.1 N 2.7 N 3.4 N 4.0 N 4.6 N 5.1 N 5.8 N 6.4 N 50 N 89 N 0.18 kN 0.25 kN 0.31 kN 0.38 kN	Standard load cell ISO 7500-1, ISO 376
Pressure – Measuring Instruments[3] (Analog, Digital)			
Pneumatic	Up to 2500 Pa Up to 70 kPa	1.2 Pa 0.035 kPa	Pressure indicator

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Pressure – Measuring Instruments[3] (Analog, Digital) (cont)			
Pneumatic	Up to 2 bar Up to 20 bar	2.8 mbar 13 mbar	Digital test gauge
	Up to 1 bar (1 to 20) bar	0.53 mbar 3.4 mbar	Pressure calibrator
Water	Up to 200 bar (200 to 700) bar	0.15 bar 0.82 bar	Digital test gauge
	Up to 700 bar	0.12 bar	Pressure calibrator
Hydraulic	Up to 1500 bar	4.4 bar	Digital test gauge
Transmitter	(4 to 20) mA (1 to 5) V (0 to 10) V	0.008 mA 0.003 V 0.003 V	Multifunction calibrator
Vacuum Measuring Instruments[3] (Analog, Digital)			
Pneumatic	Up to -0.95 bar	1.4 mbar	Digital test gauge
	Up to -0.95 bar	0.26 mbar	Pressure calibrator
Transmitter	(4 to 20) mA	0.008 mA	Multifunction calibrator
Non-Invasive Sphygmomanometer –			
Static Pressure Indicator – Air Medium	(0 to 525) mmHg	0.24 mmHg	Pressure indicator
Systolic Blood Pressure, Gauge Pressure – Air Medium	(20 to 250) mmHg	2.5 mmHg	NIBP simulator

Parameter/Equipment	Range	CMC[2, 4, 5] (±)	Comments
Diastolic Blood Pressure, Gauge Pressure – Air Medium	(10 to 200) mmHg	2.3 mmHg	NIBP simulator
Pulse Rate	(30 to 250) BPM	2.3 BPM	
NIBP Simulator / NIBP Analyzer			
Pressure – Air Medium	(0 to 525) mmHg	0.2 mmHg	Pressure indicator
Infusion Pump –			
Flow Rate	Up to 10 mL/hr (>10 to 200) mL/hr	3.1 % 2.4 %	Infusion device analyzer
Occlusion Pressure	Up to 1500 mmHg	27 mmHg	
Infusion Device Analyzer –			
Flow Rate	Up to 10 mL/hr (>10 to 200) mL/hr	1.1 % 0.58 %	Electrical balance & pressure indicator
Occlusion Pressure	Up to 1500 mmHg	4.3 mmHg	

VII. Optical Quantities

Parameter/Equipment	Range	CMC[2, 4, 5] (±)	Comments
Light (Light Meters) – Measure			
Illuminance	Up to 4000 Lux	1.6 %	Standard light meter
Irradiance ($\mu W/cm^2 * nm$)	(300 to 400) nm (400 to 930) nm (930 to 1100) nm	2.9 % 2.1 % 1.7 %	Standard light source

Parameter/Equipment	Range	CMC[2, 4, 5] (±)	Comments
Light (Light Meters) – Measure (cont)			
Radiance ($\mu W/cm^2$ * nm)	(300 to 400) nm (400 to 930) nm (930 to 1100) nm	2.9 % 2.1 % 1.7 %	Standard light source
Illuminance	605.2 lm/m^2	1.3 %	
Luminance	541.5 cd/m^2	1.4 %	
Color Temperature	2855 K	25 K	
CIE Color 1931 (x)	0.4483	0.001 %	
CIE Color 1931 (y)	0.4089	0.0013 %	
Spectral Irradiance – Measure			
UV Ultraviolet Radiometers	Up to 200 mW/cm^2	1.1 %	Optometer with optimized sensor head
Laser Power Meter	Up to 100 W	4.3 %	Optometer with optimized sensor head

VIII. Thermodynamics

Parameter/Equipment	Range	CMC[2] (±)	Comments
Dial Thermometer[3]	(-30 to 200) °C (200 to 600) °C	0.3 °C 1.5 °C	Standard thermometer with standard PRT

Parameter/Equipment	Range	CMC[2] (±)	Comments
Liquid in Glass Thermometer[3]	(-30 to 250) °C	0.06 °C	Standard thermometer with standard PRT
Liquid Bath[3] –			Data acquisition system with sensor
Oil/Water	(-40 to 250) °C	0.17 °C	
COD Reactor	(25 to 250) °C	0.16 °C	
PCR / RT-PCR / Thermal Cycler	(0 to 100) °C	0.17 °C	Multi-channel temperature verification system
Temperature Sensor[3] – Thermocouples			
Type J	(-80 to 100) °C (>100 to 300) °C (>300 to 600) °C (>600 to 700) °C (>700 to 1200) °C	0.45 °C 0.44 °C 0.45 °C 2.4 °C 2.6 °C	Standard thermometer with standard PRT (NOTE: type S thermocouple is used above 600 °C)
Type K	(-80 to 100) °C (>100 to 600) °C (>600 to 700) °C (>700 to 1200) °C	0.74 °C 0.40 °C 2.5 °C 2.6 °C	
Type R	(0 to 600) °C (>600 to 700) °C (>700 to 900) °C (>900 to 1200) °C	1.1 °C 2.6 °C 2.7 °C 2.8 °C	
Type S	(0 to 600) °C (>600 to 700) °C (>700 to 900) °C (>900 to 1200) °C	1.2 °C 2.6 °C 2.7 °C 2.8 °C	Thermometer with standard PRT (NOTE: type S thermocouple is used above 600 °C)
Type T	(-80 to 100) °C (>100 to 200) °C (>200 to 400 °C	0.69 °C 0.53 °C 0.54 °C	

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Temperature Sensor[3] –			
RTDs	(-80 to 600) °C	0.29 °C	Standard thermometer with standard PRT
PRTs	(-80 to 600) °C	0.29 °C	(NOTE: type S thermocouple is used above 600 °C)
Temperature Indicator with Sensor[3] –			
Thermocouple	(-80 to -30) °C (>-30 to 100) °C (>100 to 200) °C (>200 to 300) °C (>300 to 400) °C (>400 to 500) °C (>500 to 600) °C (>600 to 700) °C (>700 to 900) °C (>900 to 1200) °C	0.19 °C 0.24 °C 0.47 °C 0.70 °C 0.93 °C 1.2 °C 1.4 °C 2.4 °C 2.6 °C 2.7 °C	Standard thermometer with standard PRT (NOTE: type S thermocouple is used above 600 °C)
Temperature Indicator Sensor[3] –			
RTDs	(-80 to 200) °C (>200 to 600) °C	0.06 °C 0.09 °C	Standard thermometer with standard PRT
PRTs	(-80 to 200) °C (>200 to 600) °C	0.06 °C 0.09 °C	Standard thermometer with standard PRT
Transmitter	(4 to 20) mA	0.008 mA	Documenting process calibrator
Autoclave[3]	(110 to 135) °C	0.53 °C	High temperature data logger or data acquisition system with sensor

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Temperature Chamber Systems[3], Calibration & Profiling	(-80 to -40) °C (>-40 to 50) °C (>50 to 250) °C	0.42 °C 0.32 °C 0.45 °C	Data acquisition system with sensor
Humidity Chamber Systems[3], Calibration & Profiling	(20 to 30) % RH (>30 to 60) % RH (>60 to 90) % RH (>90 to 95) % RH	2.8 % RH 2.9 % RH 3.1 % RH 3.3 % RH	Data logger with humidity sensor
Furnace[3]	(200 to 600) °C (>600 to 1200) °C	2.4 °C 3.5 °C	Data acquisition system with TC sensor
Infrared Temperature[3]	(-30 to 50) °C (>50 to 110) °C (>110 to 200) °C (>200 to 300) °C (>300 to 400) °C (>400 to 500) °C (>500 to 600) °C (>600 to 1200) °C	2.0 °C 1.8 °C 3.1 °C 4.6 °C 6.2 °C 7.9 °C 9.7 °C 11 °C	Dual black body calibrator with standard digital thermometer with probe
Temperature Block & Liquid Bath Calibrator[3]	(-80 to 600) °C (>600 to 700) °C (>700 to 900) °C (>900 to 1200) °C	0.10 °C 2.3 °C 2.4 °C 2.5 °C	Standard thermometer with standard PRT (NOTE: type S thermocouple is used above 600 °C)
Thermo-Hygrometer Temperature Humidity	 (-30 to 60) °C (20 to 30) % RH (30 to 60 % RH (60 to 90) % RH (90 to 95) % RH	 0.36 °C 1.4 % RH 1.6 % RH 1.9 % RH 2.0 % RH	Chilled mirror hygrometer

IX. Time & Frequency

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Frequency – Measuring Equipment[3]	Up to 100 Hz 100 Hz to 1 kHz (1 to 10) kHz (10 to 100) kHz 100 kHz to 1 MHz (1 to 10) MHz (10 to 20) MHz (20 to 100) MHz 100 MHz to 1 GHz (1 to 6) GHz	1.3 mHz 3.5 mHz 33 mHz 0.33 Hz 3.3 Hz 4.4 Hz 8.8 Hz 0.75 kHz 0.47 kHz 2.7 kHz	Function generator
Frequency – Measure[3]	Up to 1 MHz (1 to 100) MHz (100 to 225) MHz	14 mHz 0.81 Hz 0.95 Hz	Universal counter
Totalizing Counter[3]	(1 to 1000) count (1001 to 99 999) count	1.5 count 6 count	Multifunction calibrator
Stopwatch Quartz Crystal[3]	32 768 Hz (nominal) 30.517 57 µs	0.59 mHz/Hz 0.97 ms/s	Universal counter
NIBP Analyzer – Heart Rate Measure	(30 to 200) BPM	1.3 BPM	Pulse rate measurement for NIBP monitor
Ventilator – Inspiratory Pressure, PINSP Positive End-Expiratory Pressure Inspiratory tidal volume, VTI Expiratory tidal volume VTE Oxygen, O_2	 (0.49 to 3.92) kPa (0.49 to 3.92) kPa (300 to 600) mL (300 to 600) mL (21 to 100) % O_2	 4.5 % 4.5 % 4.0 % 4.0 % 2.5 %	Ventilator analyzer

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Gas Flow Analyzer / Ventilator Analyzer			
Flow Continuous	Up to 30 Ln (>30 to 300) Ln	60 mL/min 1.5 L/n	Mass flow meter /controller
Airway Pressure Low Pressure (±) High Pressure	Up to 250 mmHg Up to 160 mbar Up to 10 bar	0.26 mmHg 0.35 mbar 3.4 mbar	Indicator
Volume Vti Vte	Up to 2000 mL Up to 2000 mL	4.2 mL 4.2 mL	Mass flow meter /controller
Oxygen, O_2	30 % O_2 60 % O_2 100 % O_2	1.2 % vol 1.2 % vol 1.2 % vol	
Flow Meter Mass Flow Rate	Up to 30 Ln (>30 to 300) Ln	60 mL/min 1.5 L/n	Mass flow meter / controller
Safety Test Analyzer			
Earth Bond	(0.101 to 1.1) Ω (1.1 to 10.1) Ω (10.1 to 100.1) Ω	2.5 m Ω 3.5 mΩ 15 mΩ	Resistance decade
Insulation Resistance	(1 to 10) kΩ (10 to 100) kΩ 100 kΩ to 1 MΩ (1 to 10) MΩ (10 to 100) MΩ	12 Ω 0.17 kΩ 1.8 kΩ 17 kΩ 1.7 MΩ	Resistance decade
Leakage Current	Up to 329 µA 329 µA to 3.29 mA (3.29 to 32.9) mA	81 nA 0.44 µA 4.2 µA	Multi-product calibrator

[1] This laboratory offers commercial and field calibration service.

[2] Calibration and Measurement Capability Uncertainty (CMC) is the smallest uncertainty of measurement that a laboratory can achieve within its scope of accreditation when performing more or less routine calibrations of nearly ideal measurement standards or nearly ideal measuring equipment. Calibration and Measurement Capabilities represent expanded uncertainties expressed at approximately the 95 % level of confidence, usually using a coverage factor of k = 2. The actual measurement uncertainty of a specific calibration performed by the laboratory may be greater than the CMC due to the behavior of the customer's device and to influences from the circumstances of the specific calibration.

[3] Field calibration service is available for this calibration. Please note the actual measurement uncertainties achievable on a customer's site can normally be expected to be larger than the CMC found on the A2LA Scope. Allowance must be made for aspects such as the environment at the place of calibration and for other possible adverse effects such as those caused by transportation of the calibration equipment. The usual allowance for the actual uncertainty introduced by the item being calibrated, (e.g., resolution) must also be considered and this, on its own, could result in the actual measurement uncertainty achievable on a customer's site being larger than the CMC.

[4] In the statement of CMC, percentages are percentages of reading, unless otherwise indicated.

[5] The type of instrument or material being calibrated is defined by the parameter. This indicates the laboratory is capable of calibrating instruments that measure or generate the values in the ranges indicated for the listed measurement parameter.

[6] This scope meets A2LA's *P112 Flexible Scope Policy.*

[7] The stated measured values are determined using the indicated instrument (see Comments). This capability is suitable for the calibration of the devices intended to measure or generate the measured value in the ranges indicated. CMCs are expressed as either a specific value that covers the full range or as a percent or fraction of the reading plus a fixed floor specification.

Accredited Laboratory

A2LA has accredited

INCTECH METROLOGICAL CENTER CO.,LTD.

Bangkok, THAILAND

for technical competence in the field of

Calibration

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. This laboratory also meets R205 – Specific Requirements: Calibration Laboratory Accreditation Program. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system
(refer to joint ISO-ILAC-IAF Communiqué dated April 2017).

Presented this 26th day of March 2026.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3884.01
Valid to December 31, 2027

For the calibrations to which this accreditation applies, please refer to the laboratory's Calibration Scope of Accreditation.