SCOPE OF ACCREDITATION TO ISO/IEC 17025: 2017

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CALIBRATION

Valid To: December 31, 2023 Certificate Number: 3884.01

In recognition of the successful completion of the A2LA evaluation process, 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	Piston Phone Tecpel 336 IEC60942

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	0.024 pH 0.017 pH 0.017 pH 0.017 pH 0.024 pH	Standard solution
Conductivity Meter[3]	84 µS/cm 1413 µS/cm 12 880 µS/cm	0.84 µS/cm 14 µS/cm 130 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	0.059 cmol/mol 0.12 cmol/mol 0.13 cmol/mol	Certified gas reference material (CRM)
Methane in Air; CH_4	2.5 cmol/mol 50 % LEL	0.086 cmol/mol 0.77 % 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 0.10 % 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 22 nD 0.000 22 nD 0.000 22 nD 0.000 22 nD 0.000 22 nD	Sucrose standard solution (CRM) OIML R142:2008(E)
UV/Vis Spectrophotometer[3] –			
Photometric Accuracy @ 235, 257, 313, 350, 440, 465, 546.1, 590 and 635 nm	(0.0 to 0.6) Abs >0.6 Abs	0.003 Abs 0.003 Abs	ASTM E 275-08 and 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	0.14 nm 0.14 nm 0.14 nm 0.14 nm 0.14 nm 0.14 nm 0.14 nm 0.14 nm 0.14 nm 0.14 nm 0.14 nm	ASTM E 275-08 and ASTM E 925-09

Parameter/Equipment	Range	CMC[2] (±)	Comments
UV/Vis Spectrophotometer[3] – (cont)			
Didymium Filter: Nominal	585 nm 684 nm 741 nm 748 nm 807 nm 880 nm	0.22 nm 0.22 nm 0.22 nm 0.22 nm 0.22 nm 0.22 nm	ASTM E 275-08 and ASTM E 925-09

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 and caliper checker
External Micrometer[3] (Digital, Analog)	Up to 25 mm (>25 to 125) mm	0.84 µm 1.2 µm	Gauge blocks and optical parallels
Dial Thickness Gage[3] (Digital, Analog)	Up to 10 mm	1.0 µm	Gauge blocks
Dial Gauge[3] (Digital, Analog)	Up to 50 mm	1.1 µm	Dial gauge tester and gauge blocks
Dial Gauge Tester	Up to 10 mm (>10 to 50) mm	0.31 µm 0.41 µm	Gauge blocks
Dial Test Indicator[3] (Digital, Analog)	Up to 1 mm	1.1 µm	Dial gauge tester and gauge blocks

Parameter/Equipment	Range	CMC[2] (±)	Comments
Bore Gauge[3] (Digital, Analog)	Up to 50 mm	1.1 µm	Dial gauge tester and gauge blocks
Glass Scales	Up to 300 mm	4.4 µm	Vision measuring machine
Height Gage[3] (Digital, Analog)	Up to 150 mm (>150 to 600) mm	6.5 µm 10 µm	Gauge blocks and 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
Measuring Microscope/Vision Measuring Machine/Profile Projector[3] – X-Axis Y-Axis Z-Axis	Up to 300 mm	3.1 µm	Glass scale and 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 and gauge blocks
Plain Ring Gauge	(0.5 to 100) mm (>100 to 250) mm	1.3 µm 2.1 µm	Universal length measuring machine and master ring gauges
Thread Measuring Wire	(0.1 to 50) mm	0.32 µm	Universal length measuring machine and gauge blocks
Thread Ring Gauge	M3 to M100 (3 to 100 mm)	1.8 µm	Universal length measuring machine and master ring gauges

Parameter/Equipment	Range	CMC[2] (±)	Comments
Thread Plug Gauge	M1 to M100 (1 mm to 100 mm)	1.6 µm	Universal length measuring machine, gauge blocks and 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 0.24 mm 0.33 mm 0.42 mm 0.51 mm	Steel tape calibrator
Optical Flat	Up to 60 mm	0.017 µm	Flatness calibrator
Optical Parallel – Parallel Thickness	 (0 to 10) µm (12.00 to 25.37) mm	 0.25 µm 0.42 µm	 Flatness calibrator ULM and gauge blocks
Gauge Blocks and 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 and long gauge blocks
Micrometer Head – Linear Measuring Face Flatness	 Up to 10 mm (>10 to 50) mm Up to 3 µm	 0.31 µm 0.41 µm 0.04 µm	 ULM and gauge blocks Optical flat

Parameter/Equipment	Range	CMC[2] (±)	Comments
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 0.43 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 and 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 0.64 µm 0.65 µm 0.69 µm 0.73 µm 0.90 µm 1.4 µm 2.1 µm	Gauge blocks and long gauge blocks
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 and long gauge blocks
CMM-Coordination Measuring Machine[3] – Linear Measurement Only: X (or Y or Z) Axis	Up to 10 mm (>10 to 20) mm (>20 to 50) mm (>50 to 100) mm (>100 to 200) mm (>200 to 400) mm (>400 to 600) mm (>600 to 1000) mm	0.15 µm 0.17 µm 0.25 µm 0.43 µm 0.92 µm 1.7 µm 2.5 µm 4.2 µm	Gauge blocks and long gauge blocks

Parameter/Equipment	Range	CMC[2] (±)	Comments
Thickness Plate/Standard Coating Thickness/ Standard Foil	Up to 5 mm	0.23 µm	ULM and 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 0.3 µm 0.6 µm 1 µm	Gauge blocks
Precision Level – Inclinometer-level Gauge[3]	Up to 1 mm/m	2.5 µm/m	Gauge blocks, sine bar and granite surface plate
Grind Gauge	Up to 100 µm	0.15 µm	ULM and gauge blocks
Bevel Protractor	Up to 360°	0° 0' 0.83"	Vision measuring machine
Feeler Gauge	Up to 5 mm	0.18 µm	ULM and gauge blocks
Radius Gauge (Convex and Concave)	Up to 1500 mm	3.5 µm	Vision measuring machine
Spheres and Precision Balls – Diameter	Up to 100 mm	0.42 µm	Universal length measuring machine and 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 2.0 mV 22 mV 67 mV	Fluke 5502A
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	1.9 µV 5.4 µV 47 µV 0.74 mV 7.3 mV	Keysight 3458A
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 (100 to 110) kV (110 to 120) kV (120 to 130) kV (130 to 140) kV	0.02 kV 0.03 kV 0.04 kV 0.05 kV 0.08 kV 0.11 kV 0.12 kV 0.13 kV 0.14 kV	HV Probe HVL-100 with precision HV meter Vitrek 4700 HV Probe HVL-150 with precision HV meter Vitrek 4700
DC Cutoff Current – Generate[3]	0.5 mA 1 mA 2 mA 5 mA 10 mA 20 mA 50 mA 100 mA	0.01 mA 0.02 mA 0.03 mA 0.06 mA 0.12 mA 0.24 mA 0.58 mA 1.2 mA	Kikusui current calibrator for Withstand Tester TOS 1200
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	95 nA 0.56 µA 4.1 µA 41 µA 0.53 mA 1.4 mA 8.2 mA 24 mA	Fluke 5502A

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
DC Current, Clamp – Generate[3]	Up to 60 A (60 to 300) A (300 to 1500) A	0.57 A 2.9 A 11 A	Fluke 5502A with turn coil EA 002
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 0.32 µA 4.8 µA 0.15 mA 4.5 mA	Keysight 3458A Keysight 34330A
DC Power – Generate[3]	Up to 330 W (At (0 to 330 V), < 1 A) (330 to 900) W (At (330 to 900) V, < 1 A) 900 W to 1.02 kW (At (900 to 1020) V, < 1 A) (1.02 to 2.7) kW (At (0 to 900) V, < 3 A) (2.7 to 3.06) kW (At (900 to 1020 V), < 3 A) (3.06 to 6.6) kW (At (0 to 330) V, < 20 A) (6.6 to 18) kW (At (330 to 900) V, < 20 A) (18 to 20.4) kW (At (900 to 1020) V, < 20 A)	0.02 W 0.04 W 0.08 W 0.17 W 0.19 W 0.45 W 1.2 W 1.3 W	Fluke 5502A
Resistance – Generate[3]	Up to 10.9 Ω (10.9 to 33) Ω (33 to 109) Ω (109 to 330) Ω	1.5 mΩ 4.7 mΩ 12 mΩ 35 mΩ	Fluke 5502A

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
Resistance – Generate[3] (cont)	330 Ω to 1.09 kΩ (1.09 to 3.30) kΩ (3.30 to 10.9) kΩ (10.9 to 33) kΩ (33 to 109) kΩ (109 to 330) kΩ 330 kΩ to 1.1 MΩ (1.1 to 3.3) MΩ (3.3 to 10.9) MΩ (10.9 to 33) MΩ (33 to 109) MΩ (109 to 290) MΩ 290 MΩ to 1.09 GΩ	0.11 Ω 1.1 Ω 1.2 Ω 3.5 Ω 14 Ω 46 Ω 0.19 kΩ 0.58 kΩ 7.6 kΩ 39 kΩ 0.63 MΩ 1.7 MΩ 19 MΩ	Fluke 5502A
	(1 to 90) mΩ (90 to 900) mΩ 900 mΩ to 9 Ω (9 to 90) Ω (90 to 999.99) Ω	11 mΩ 52 mΩ 0.11 Ω 3.1 Ω 16 Ω	Time Electronics 1041
	(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	0.12 kΩ 1.2 kΩ 12 kΩ 0.12 MΩ 1.2 MΩ 12 MΩ 0.12 GΩ 1.2 GΩ 24 GΩ	Cropico RH9A (1 kΩ to 1 TΩ)
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	0.24 mΩ 2.0 mΩ 13 mΩ 0.13 Ω 1.4 Ω 22 Ω 0.84 kΩ 61 kΩ	Keysight 3458A
Electrical Simulation of RTD[3] – Pt 385, 100 Ω	(-200 to 850) ºC	0.28 ºC	SIKA MC-50

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
Electrical Simulation of Thermocouples[3]			
Type J	(-210 to 0) ºC (>0 to 1200) ºC	0.40 ºC 0.44 ºC	SIKA MC-50
Type K	(-200 to 0) ºC (>0 to 1372) ºC	0.74 ºC 0.39 ºC	
Type R	(0 to 120) ºC (>120 to 1768) ºC	0.99 ºC 1.0 ºC	
Type S	(0 to 120) ºC (>120 to 1768) ºC	1.2 ºC 1.0 ºC	
Type T	(-240 to 0) ºC >0 ºC to 400 ºC	0.69 ºC 0.53 ºC	

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	Fluke 5502A
(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	0.19 V 0.32 V	
(330 to 1020) V	(10 to 45) Hz 45 Hz to 10 kHz	0.61 V 0.97 V	
AC Voltage (3-Phase) Generate[3] –			
Up to 110 V (110 to 380) V	(45 to 65) Hz	0.03 V 0.04 V	Energy meter calibrator

Parameter/Range	Frequency	CMC[2, 7] (±)	Comments
AC Cutoff Current – Generate[3]			
0.5 mA 1 mA 2 mA 5 mA 10 mA 20 mA 50 mA 100 mA	(45 to 65) Hz	0.01 mA 0.02 mA 0.03 mA 0.06 mA 0.12 mA 0.24 mA 0.59 mA 1.2 mA	Kikusui current calibrator for Withstand tester TOS 1200
AC Voltage – Measure[3]			
Up to 10 mV	1 Hz to 1 kHz (1 to 20) kHz (20 to 100) kHz (100 to 300) kHz	3.8 µV 4.9 µV 60 µV 0.47 mV	Keysight 3458A
(10 to 100) mV	1 Hz to 1 kHz (1 to 20) kHz (20 to 100) kHz (100 to 300) kHz	11 µV 19 µV 0.10 mV 0.36 mV	
100 mV to 1 V	1 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz 300 kHz to 1 MHz	0.11 mV 0.2 mV 0.38 mV 0.95 mV 12 mV	
(1 to 10) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	1.3 mV 1.1 mV 1.9 mV 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 27 mV 43 mV 0.15 V	
(100 to 700) V	1 Hz to 1 kHz	0.49 V	
(700 to 1000) V	(50 to 400) Hz	6.3 V	Vitrek 4700

Parameter/Range	Frequency	CMC[2, 7] (±)	Comments
AC Voltage, High Voltage – Measure[3]			
(1 to 10) kV	(0 to 400) Hz	0.02 kV	HV probe HVL-100 with precision HV meter Vitrek 4700
(10 to 30) kV	(0 to 400) Hz	0.05 kV	
(30 to 50) kV	(0 to 400) Hz	0.1 kV	
(50 to 70) kV	(0 to 400) Hz	0.14 kV	
(70 to 80) kV	(0 to 400) Hz	0.49 kV	HV probe HVL-150 with precision HV meter Vitrek 4700
(80 to 90) kV	(0 to 400) Hz	0.55 kV	
(90 to 100) kV	(0 to 400) Hz	0.61 kV	
AC Current – Measure[3]			
(25 to 100) µA	10 Hz to 5 kHz	0.11 µA	Keysight 3458A
100 µA to 1 mA	10 Hz to 5 kHz	1.1 µA	
(1 to 10) mA	10 Hz to 5 kHz	5.9 µA	
(10 to 100) mA	10 Hz to 5 kHz	58 µA	
100 mA to 1 A	10 Hz to 5 kHz	1.4 mA	
AC Current – Generate[3]			
(29 to 330) µA	10 Hz to 1 kHz	0.6 µA	Fluke 5502A
	(1 to 5) kHz	1.4 µA	
	(5 to 30) kHz	6.6 µA	
330 µA to 3.3 mA	10 Hz to 1 kHz	4.0 µA	
	(1 to 5) kHz	7.9 µA	
	(5 to 30) kHz	39 µA	
(3.3 to 33) mA	10 Hz to 1 kHz	20 µA	
	(1 to 5) kHz	34 µA	
	(5 to 30) kHz	0.16 mA	
33 mA to 330 mA	10 Hz to 1 kHz	0.18 mA	
	(1 to 5) kHz	0.44 mA	
	(5 to 30) kHz	0.9 mA	
330 mA to 1.1 A	(10 to 45) Hz	2.2 mA	
	45 Hz to 1 kHz	0.7 mA	
	(1 to 5) kHz	8.1 mA	
	(5 to 10) kHz	35 mA	
(1.1 to 2.99) A	(10 to 45) Hz	6.4 mA	
	45 Hz to 1 kHz	2.2 mA	
	(1 to 5) kHz	22 mA	
	(5 to 10) kHz	93 mA	

Parameter/Range	Frequency	CMC[2, 7] (±)	Comments
AC Current – Generate[3] (cont)			
(2.99 to 11) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	10 mA 16 mA 0.39 A	Fluke 5502A
(11 to 20) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	34 mA 41 mA 0.7 A	
AC Power – Generate[3] –			
Up to 330 W	45 Hz to 1 kHz (@ (0 to 330) V, < 1 A)	0.02 W	Fluke 5502A
330 W to 1.02 kW	45 Hz to 1 kHz (@ (330 to 1020) V, < 1 A)	0.03 W	
(1.02 to 3.06) kW	45 Hz to 1 kHz (@ (0 to 1020) V, < 3 A)	0.11 W	
(3.06 to 6.6) kW	45 Hz to 1 kHz (@ (0 to 330) V, < 20 A)	2.7 W	
(6.6 to 20.4) kW	45 Hz to 1 kHz (@ (330 to 1020) V, < 20 A	7.7 W	
AC Current, Clamp – Generate[3]			
Up to 60 A (60 to 300) A (300 to 1500) A	(30 to 60) Hz	0.57 A 2.9 A 11 A	Fluke 5502A with turn coil EA 002

Parameter/Range	Frequency	CMC[2, 7] (±)	Comments
AC Power (3-Phase) @ -60º Phase Angle and, 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	3 mW 60 mW 0.11 W 0.40 W 1.0 W 2.0 W 3.9 W 10 W 20 W	Energy meter calibrator
AC Power (3-Phase) @ 0º 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	12 mW 83 mW 0.2 W 0. W 2.0 W 3.9 W 7.8 W 20 W 39 W	Energy meter calibrator
Watt-Hour (3-Phase) @ PF 0.5 (Inductive) Pulse – Measure[3] Up to 3.3 Wh (3.3 to 66) Wh (66 to 165) Wh (165 to 660) Wh 660 Wh to 1.65 kWh (1.65 to 3.3) kWh (3.3 to 6.6) kWh (6.6 to 16.5) kW (16.5 to 33) kW	(45 to 65) Hz	4.4 mWh 88 mWh 0.22 Wh 0.88 Wh 2.2 Wh 4.4 Wh 8.8 Wh 22 Wh 44 Wh	Energy meter calibrator

Parameter/Range	Frequency	CMC[2, 7] (±)	Comments
Watt-Hour (3-Phase) @ PF 1 (pulse) – Measure[3]			
Up to 6.6 Wh (6.6 to 132) Wh (132 to 330) Wh 330 Wh to 1.32 kWh (1.32 to 3.3) kWh (3.3 to 6.6) kWh (6.6 to 13.2) kWh (13.2 to 33) kW (33 to 66) kW	(45 to 65) Hz	5.5 mWh 0.11 Wh 0.28 Wh 1.1 Wh 2.8 Wh 5.5 Wh 11 Wh 28 Wh 55 Wh	Energy meter calibrator
AC Power (3-Phase 4-Wire) @ PF 1 – Generate[3]			
Up to 660 W	50 Hz (@ (0 to 220) V, < 1 A)	0.39 W	Energy generator calibrator GF302D1
(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)	3.9 W	
(6600 to 9900) W	50 Hz (@ (220 to 220) V, < 15 A)	5.9 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 V to 220 V, < 0.2 A)	0.03 W	Energy generator calibrator GF302D1
(44 to 220) W	50 Hz (@ 220 V to 220 V, < 1 A)	0.13 W	
(220 to 1100) W	50 Hz (@ 220 V to 220 V, < 5 A)	0.65 W	
(1100 to 2200) W	50 Hz (@ 220 V to 220 V, < 10 A)	1.3 W	
(2200 to 3300) W	50 Hz (@ 220 V to 220 V, < 15 A)	2.0 W	
Channel 2 –			
Up to 44 W	50 Hz (@ 0 V to 220 V, < 0.2 A)	0.03 W	
(44 to 220) W	50 Hz (@ 220 V to 220 V, < 1 A)	0.13 W	
(220 to 1100) W	50 Hz (@ 220 V to 220 V, < 5 A)	0.65 W	
(1100 to 2200) W	50 Hz (@ 220 V to 220 V, < 10 A)	1.3 W	
(2200 to 3300) W	50 Hz (@ 220 V to 220 V, < 15 A)	2.0 W	
Channel 3 –			
Up to 44 W	50 Hz (@ 0 V to 220 V, < 0.2 A)	0.03 W	
(44 to 220) W	50 Hz (@ 220 V to 220 V, < 1 A)	0.13 W	

Parameter/Range	Frequency	CMC[2, 7] (±)	Comments
AC Power (3-Phase 4-Wire) @ PF 1 – Generate[3] (cont)			
Channel 3 – (220 to 1100) W	50 Hz (at 220 V to 220 V, < 5 A)	0.65 W	Energy generator calibrator GF302D1
(1100 to 2200) W	50 Hz (@ 220 V to 220 V, < 10 A)	1.3 W	
(2200 to 3300) W	50 Hz (@ 220 V to 220 V, < 15 A)	2.1 W	

Parameter/Equipment	Range	CMC[2, 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 GF302D1
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	5.8 mA 8.2 mA 13 mA	Energy generator calibrator GF302D1
Channel 2	1 A 10 A 20 A	5.8 mA 8.2 mA 13 mA	
Channel 3	1 A 10 A 20 A	5.8 mA 8.2 mA 13 mA	

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
Harmonic Voltage – Harmonic Number 2nd to 51st (5 to 1000) Hz	100 % of range 1 % of range	0.36 % of reading 0.009 % of reading	Energy generator calibrator GF302D1
Harmonic Current – Harmonic Number 2nd to 51st (5 to 1000) Hz	100 % of range 1 % of range	0.22 % of reading 0.009 % of reading	Energy generator calibrator GF302D1
Capacitance – Generate LCR Meter and 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	14 pF 18 pF 20 pF 33 pF 0.22 nF 0.44 nF 1.5 nF 4.4 nF 14 nF 44 nF 0.19 µF 0.71 µF 2.1 µF 5.8 µF 21 µF 69 µF 0.21 mF 0.69 mF	Fluke 5502A
Inductance – Generate LCR Meter and Multimeter	(1 to 10) mH (10 to 100) mH (0.1 to 1) H (1 to 10) H	0.37 mH 3.7 mH 37 mH 0.37 H	Time electronics 1053 (1mH to 10 mH)

Parameter/Equipment	Range	CMC[2] (±)	Comments
Oscilloscope[3] –			
DC Vertical Deflection Accuracy 50 Ω Load	10 mV to 10 V	6 mV	HP 3325B and HP 8665B
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	0.13 mV 0.25 mV 0.50 mV 1.3 mV 2.5 mV 4.9 mV 13 mV 25 mV 49 mV 0.14 V 0.25 V	
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	0.13 mV 0.25 mV 0.50 mV 1.2 mV 2.5 mV 4.9 mV 13 mV 25 mV 49 mV 0.14 V 0.25 V	
Horizontal Cursor Accuracy (Time Base)	5 s to 2 ns	5.8 ms/s	

V. Electrical/RF Microwave

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
RF Tuned Power[3] – Generate (+13 to -139.9) dB	(1.1to 1 MHz) 1 MHz to 1 GHz (1 to 3 GHz) (3 to 6 GHz)	3.5 dBm 1.2 dBm 1.8 dBm 2.4 dBm	Agilent 8665B
Amplitude Modulation[3] – Generate Carrier: (0.01 to 100) MHz Rate: 50 Hz to 1 kHz,	(5 to 90) % of range	7.4 % of reading	Agilent 8665B
Frequency Modulation[3] – Generate Rate: 400 Hz Rate Max. Dev. (1 to 300) kHz	100 MHz to 1 GHz	7 % of reading	Agilent 8665B

VI. Fluid Quantities

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Air Velocity – Measure	Up to 10 m/s (>10 to 25) m/s	0.52 m/s 1.2 m/s	Wind tunnel with anemometer
Burettes	5 ml 10 ml 25 ml 50 ml 100 ml	0.0042 ml 0.0043 ml 0.0068 ml 0.011 ml 0.019 ml	Analytical balance and standard weight ASTM E542-01,
Pipettes	(1 to 5) ml 10 ml 15 ml 25 ml 50 ml 100 ml	0.0033 ml 0.0043 ml 0.0064 ml 0.0068 ml 0.010 ml 0.017 ml	Analytical balance and standard weight ASTM E542-01,

Parameter/Equipment	Range	CMC[2] (±)	Comments
Micro Pipette	(10 to 100) µl (>100 to 200) µl (>200 to 1000) µl (>1 to 2) ml (>2 to 5) ml (>5 to 10) ml	0.12 µl 0.12 µl 0.17 µl 0.26 µl 1.2 µl 1.2 µl	Analytical balance and standard weight ISO 8655-6:2003(E)
Volumetric Flask	5 ml 10 ml 25 ml 50 ml 100 ml 200 ml 250 ml 500 ml 1000 ml 2000 ml	0.0062 ml 0.0063 ml 0.0089 ml 0.014 ml 0.020 ml 0.030 ml 0.037 ml 0.065 ml 0.14 ml 0.26 ml	Analytical balance and standard weight ASTM E542-01
Cylinder and Beaker	5 ml 10 ml 25 ml 50 ml 100 ml 250 ml 500 ml 1000 ml 2000 ml	0.021 ml 0.027 ml 0.049 ml 0.056 ml 0.063 ml 0.073 ml 0.085 ml 0.14 ml 0.23 ml	Analytical balance and standard weight ASTM E542-01
Viscometer[3]	100 mPa.s 500 mPa.s 5000 mPa.s 10 000 mPa.s	0.43 mPa.s 2.3 mPa.s 22 mPa.s 46 mPa.s	Viscosity certified standard (CRM) ASTM E2975-15

VII. Mechanical

Parameter/Equipment	Range	CMC[2] (±)	Comments
Centrifuge[3]	Up to 999 rpm (1000 to 9999) rpm (10 000 to 15 000) rpm	0.14 rpm 1.4 rpm 5.9 rpm	Digital tachometer

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Digital Tachometer[3] –			
Photo Type	(1 to 999.9) rpm (1000 to 9999) rpm (10 000 to 99 999) rpm	0.1 rpm 0.84 rpm 1.0 rpm	Sika MC50 with lamp HP 3325B with lamp
Mechanical Tachometers, (Contact)	(1 to 999.9) rpm (1000 to 9999) rpm (10 000 to 99 999) rpm	0.1 rpm 0.84 rpm 1.0 rpm	Sika MC50 HP 3325B
Balances and Scales[3]	Up 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 500) kg (500 to 1000) kg (1000 to 2000) kg	0.22 mg 0.27 mg 0.59 mg 1.7 mg 2.2 mg 4.5 mg 0.03 g 0.04 g 8.7 g 14 g 31 g 61 g 120 g	Standard weight Class E2, F1 and M1
Mass – Measure (Standard Weight)	50 mg 100 mg 200 mg 500 mg 1 g 2 g 5 g 10 g 20 g 50 g 100 g 200 g 500 g 1000 g 2000 g 5 kg 10 kg 20 kg	0.017 mg 0.020 mg 0.027 mg 0.053 mg 0.039 mg 0.062 mg 0.055 mg 0.084 mg 0.14 mg 0.15 mg 0.20 mg 0.40 mg 1.6 mg 2.2 mg 4.5 mg 13 mg 25 mg 43 mg	Standard weight Class E1, F1 and electronic balance

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Force Gauge/Tension Gauge[3] (Digital, Analog)	Up 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	0.22 mg 0.27 mg 0.40 mg 1.4 mg 2.2 mg 4.5 mg 0.03 g 0.04 g 8.7 g 14 g 19 g	Standard weight Class F1, M1 and standard load cell
Torque, Hand Tools[3]	(0.5 to 1500) N·m	1.4 % of reading	Torque tester calibrator
Torque Tester[3]	(0.5 to 500) N·m	0.26 % of reading	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	 0.4 HRA 0.4 HRA 0.4 HRA 0.42 HRB 0.4 HRB 0.4 HRB 0.45 HRC 0.4 HRC 0.4 HRC	Indirect verification per ASTM E18
Indirect Verification of Microindentation Hardness Testing Machine[3] – HV 1 (1 kgf): Knoop/Vickers	 (100 to 240) HV (>240 to 600) HV >600 HV	 2.3 HV1 16 HV1 34 HV1	 Indirect verification per ASTM E384

Parameter/Equipment	Range	CMC[2] (±)	Comments
Indirect Verification of Microindentation Hardness Testing Machine[3] – (cont)			
HV 5 (5 kgf): Vickers	(100 to 240) HV (>240 to 600) HV >600 HV	2.2 HV5 11 HV5 29 HV5	Indirect verification per ASTM E384
HV 10 (10 kgf): Vickers	(100 to 240) HV (>240 to 600) HV >600 HV	2.1 HV10 11 HV10 19 HV10	
Indirect Verification of Brinell Hardness Testers[3] at Test Condition(s) –			
HBW 10/3000/15	(200 to 399) HBW (400 to 600) HBW	2.6 HBW 3.9 HBW	Indirect verification per ASTM E10 and E110
Durometers[3] – Types A, B, C, D, O, DO, OO and M			ASTM D2240
Indentor Extension Length	Up to 5 mm	5.2 µm	Vision measuring machine
Indentor Display	(0 to 90) durometer unit	0.7 durometer units	Gauge blocks
Spring Calibration – Force	Up to 5 kg	0.26 g	Electronic balance and load cell
Universal Testing Machine[3]/Load Cell and Force Sensor			
Compression and Tension	Up 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	0.77 N 1.5 N 2.1 N 2.7 N 3.3 N 4.0 N 4.6 N	Standard load cell ASTM E4, ISO 7500-1, ISO 5893

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Universal Testing Machine[3]/Load Cell and Force Sensor (cont)			
Compression and Tension	(>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	5.1 N 5.8 N 6.4 N 50 N 88 N 0.18 kN 0.25 kN 0.31 kN 0.38 kN	Standard load cell ASTM E4, ISO 7500-1, ISO 5893
Pressure – Measuring Instruments[3] (Analog, Digital)			
Pneumatic	Up to 2500 Pa Up to 70 kPa Up to 2 bar Up to 20 bar Up to 1 bar (1 to 20) bar	0.97 Pa 0.025 kPa 2.7 mbar 12 mbar 0.22 mbar 2.5 mbar	GE Druck DPI 800 GE Druck DPI 104 GE Druck PACE 1000
Water	Up to 200 bar (200 to 700) bar Up to 700 bar	0.14 bar 0.42 bar 0.09 bar	GE Druck DPI 104 GE Druck PACE 1000
Hydraulic	Up to 1500 bar	4.3 bar	SIKA D.2
Transmitter	(4 to 20) mA (1 to 5) V (0 to 10) V	0.009 mA 0.003 V 0.004 V	SIKA MC-50
Vacuum Measuring Instruments[3] (Analog, Digital)			
Pneumatic	Up to -0.95 bar Up to -0.95 bar	1.3 mbar 0.22 mbar	GE Druck DPI 104 GE Druck PACE 1000

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Vacuum Measuring Instruments[3] (Analog, Digital) (cont)			
Transmitter	(4 to 20) mA	0.009 mA	SIKA MC-50
Non-Invasive Sphygmomanometer –			
Static Pressure Indicator – Air Medium	(0 to 525) mmHg	0.32 mmHg	Pressure indicator (DPI800)
Systolic and Diastolic Blood Pressure, Gauge Pressure – Air Medium	(20 to 250) mmHg	7.6 mmHg	NIBP simulator (MS200)
Diastolic Blood Pressure, Gauge Pressure – Air Medium	(10 to 200) mmHg	7.5 mmHg	NIBP simulator (MS200)
Pulse Rate	(30 to 250) BPM	2.5 BPM	

VIII. Optical Quantities

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Light (Light Meters) – Measure			
Illuminance	Up to 4000 Lux	2.0 % of reading	Standard light meter

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Light (Light Meters) – Measure (cont)			
Irradiance ($\mu W/cm^2 * nm$)	(300 to 400) nm (400 to 930) nm (930 to 1100) nm	2.9 % of reading 2.2 % of reading 1.6 % of reading	Gamma Scientific RS-10 with RS 70-1
Radiance ($\mu W/cm^2 * nm$)	(300 to 400) nm (400 to 930) nm (930 to 1100) nm	2.9 % of reading 2.2 % of reading 1.6 % of reading	
Illuminance	677.1 lm/m^2	1.0 % of reading	
Luminance	850 cd/m^2	1.2 % of reading	
Color Temperature	2855 K	8.7 K	
CIE Color 1931 (x)	0.4483	0.0016 % of reading	
CIE Color 1931 (y)	0.4089	0.0008 % of reading	
Spectral Irradiance – Measure			
UV Ultraviolet Radiometers	Up to 200 mW/cm^2	2.2 % of reading	Gamma Scientific S470 with optimized sensor head
Solar Radiometers	(250 to 400) nm (400 to 930) nm (930 to 1200) nm	3.2 % of reading 2.3 % of reading 2.2 % of reading	
Optical Power Meter	Up to 20 mW	2.2 % of reading	Gamma Scientific S470 with optimized sensor head
Laser Power Meter	Up to 100 W	2.8 % of reading	Gamma Scientific S470 with optimized sensor head

IX. Thermodynamic

Parameter/Equipment	Range	CMC[2] (±)	Comments
Dial Thermometer[3]	(-30 to 200) ºC (200 to 600) ºC	0.3 ºC 1.4 ºC	Fluke 1586A with standard PRT
Liquid in Glass Thermometer[3]	(-30 to 250) ºC	0.06 ºC	Fluke 1586A with standard PRT
Liquid Bath[3] – Oil/Water COD Reactor	 (-40 to 250) ºC (25 to 250) ºC	 0.13 ºC 0.12 ºC	Agilent 34972A with RTD sensor
Temperature Mapping of Storage Areas	(-30 to 60) ºC	0.44 ºC	Data loggers
Temperature Sensor[3] – Thermocouples Type J Type K Type R Type S Type T	 (-80 to 300) ºC (>300 to 600) ºC (>600 to 1200) ºC (-80 to 100) ºC (>100 to 300) ºC (>300 to 600) ºC (>600 to 1200) ºC (0 to 600) ºC (>600 to 1200) ºC (0 to 600) ºC (>600 to 1200) ºC (-80 to 100) ºC (>100 to 300) ºC (>300 to 400 ºC	 0.43 ºC 0.44 ºC 2.9 ºC 0.74 ºC 0.39 ºC 0.41 ºC 2.9 ºC 1.1 ºC 3.1 ºC 1.1 ºC 3.1 ºC 0.70 ºC 0.53 ºC 0.54 ºC	Fluke 1586A with standard PRT (NOTE: type S thermocouple is used above 600 °C)

Parameter/Equipment	Range	CMC[2] (±)	Comments
Temperature Sensor[3] –			
RTDs	(-80 to 600) ºC	0.29 ºC	Fluke 1586A with standard PRT (NOTE: type S thermocouple is used above 600 °C)
PRTs	(-80 to 600) ºC	0.29 ºC	
Temperature Indicator with Sensor[3] –			
Thermocouple	(-80 to -30) ºC (>-30 to 100) ºC (>100 to 200) ºC (>200 to 300) ºC (>300 to 400) ºC (>400 to 500) ºC (>500 to 600) ºC (>600 to 700) ºC (>700 to 900) ºC (>900 to 1200) ºC	0.19 ºC 0.24 ºC 0.47 ºC 0.70 ºC 0.93 ºC 1.2 ºC 1.4 ºC 2.7 ºC 2.8 ºC 3.0 ºC	Fluke 1586A with standard PRT (NOTE: type S thermocouple is used above 600 ºC)
Temperature Indicator Sensor[3] –			
RTDs	(-80 to -30) ºC (>-30 to 200) ºC (>200 to 600) ºC	0.04 ºC 0.06 ºC 0.08 ºC	Fluke 1586A with standard PRT
PRTs	(-80 to -30) ºC (>-30 to 200) ºC (>200 to 600) ºC	0.04 ºC 0.06 ºC 0.08 ºC	Fluke 1586A with standard PRT
Transmitter	(4 to 20) mA	0.007 mA	SIKA MC-50
Autoclave[3]	(110 to 135) ºC	0.53 ºC	Agilent 34972A with RTD sensor
Temperature Chamber Systems[3], Calibration and Profiling	(-80 to -40) °C (>-40 to 50) °C (>50 to 250) °C	0.41 °C 0.31 °C 0.44 °C	Agilent 34972A with RTD sensor

Parameter/Equipment	Range	CMC[2] (±)	Comments
Humidity Chamber Systems[3], Calibration and Profiling	(20 to 95) % RH	3.4 % RH	Data logger with humidity sensor
Furnace[3]	(200 to 1200) °C	3.5 °C	Agilent 34972A with TC sensor
Infrared Temperature[3]	(-30 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 650) °C (>650 to 1200) °C	0.85 °C 1.2 °C 1.3 °C 1.5 °C 1.8 °C 2.0 °C 3.1 °C 4.1 °C	Dual Black body calibrator with standard digital thermometer with probe
Temperature Block and Liquid Bath Calibrator[3]	(-80 to 600) °C (>600 to 1200) °C	0.08 °C 2.9 °C	Fluke 1586A with standard PRT and standard type S
Thermo-Hygrometer[3] – Temperature Relative Humidity	 (-30 to 60) °C (20 to 95) % RH	 0.36 °C 2.3 % RH	Standard thermometer and standard humidity with temperature and humidity chamber

X. 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	0.58 mHz 5.8 mHz 0.06 Hz 0.58 Hz 5.8 Hz	HP 3325B

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Frequency – Measuring Equipment[3] (cont)	(1 to 10) MHz (10 to 20) MHz (20 to 100) MHz 100 MHz to 1 GHz (1 to 6) GHz	4.4 Hz 8.7 Hz 0.04 kHz 0.43 kHz 2.6 kHz	Agilent 8665B
Frequency – Measure[3]	Up to 1 MHz (1 to 100) MHz (100 to 225) MHz	5.9 mHz 0.6 Hz 0.64 Hz	HP 53131A
Totalizing Counter[3]	(5 to 99 999) count	1.4 count	SIKA MC50
Stopwatch Quartz Crystal[3]	32 768 Hz (nominal)	0.76 ms/s	HP 53131A

[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] Adjustable thread rings are set to applicable specifications using calibrated master set plug gages.

[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

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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 16th day of December 2021.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3884.01
Valid to December 31, 2023

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