



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

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CALIBRATION

Valid To: August 31, 2025

Certificate Number: 4286.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations^{1, 7}:

I. Acoustics

Parameter/Equipment	Frequency	CMC ^{2, 4} (±)	Comments
Sound Level Meters & Dosimeters –			
Acoustic Calibration (94, 104, 114) dB Re: 20 µPa	(31.5 to 125) Hz (250 to 500) Hz 1000 Hz (2000 to 4000) Hz 8000 Hz (12 500 to 16 000) Hz	0.20 dB 0.15 dB 0.13 dB 0.20 dB 0.28 dB 0.51 dB	Multifunction acoustic calibrator
Electric Calibration (30 to 150) dB	(20 to 20 000) Hz	0.078 dB	Multiproduct calibrator

II. Chemical

Parameter/Equipment	Range	CMC ^{2, 4, 9} ($\pm$)	Comments
Conductivity Meters ³	1 μ S/cm 5 μ S/cm 10 μ S/cm 100 μ S/cm 1000 μ S/cm 1413 μ S/cm 10 000 μ S/cm 100 000 μ S/cm	0.73 μ S/cm 0.62 μ S/cm 0.62 μ S/cm 2.1 μ S/cm 4.6 μ S/cm 4.6 μ S/cm 40 μ S/cm 360 μ S/cm	Conductivity standard solution
TDS Meters ³	0.66 mg/l 3.3 mg/l 6.6 mg/l 66 mg/l 660 mg/l 941 mg/l 6600 mg/l 66 000 mg/l	0.48 mg/l 0.41 mg/l 0.41 mg/l 1.4 mg/l 3.0 mg/l 3.0 mg/l 26 mg/l 240 mg/l	Conductivity standard solution
pH Meters ³	2 pH Unit 4 pH Unit 7 pH Unit 10 pH Unit 12 pH Unit	0.020 pH Unit 0.011 pH Unit 0.011 pH Unit 0.011 pH Unit 0.030 pH Unit	pH buffer solution
Viscometer ³ – Rotational Devices	(5.809 to 636.5) cP (636.5 to 6024) cP (6024 to 197 200) cP (197 200 to 843 100) cP	0.29 % 0.38 % 0.44 % 0.44 %	Viscosity standard solution

Parameter/Equipment	Range	CMC ^{2, 4, 9} (±)	Comments
Glass Capillary Kinematic Viscometers –			
Modified Ostwald for Transparent Liquids:			
Cannon-Fenske Routine	(0.5 to 20 000) mm ² /s	0.16 %	Viscosity standard solution
Zeitfuchs	(0.6 to 3000) mm ² /s	0.16 %	
SIL	(0.6 to 10 000) mm ² /s	0.16 %	
Cannon-Manning Semi-Micro	(0.4 to 20 000) mm ² /s	0.16 %	
BS/U-Tube	(0.9 to 10 000) mm ² /s	0.16 %	
BS/U/M Miniature	(0.2 to 100) mm ² /s	0.16 %	
Pinkevitch	(0.6 to 17 000) mm ² /s	0.16 %	
Suspended Level for Transparent Liquids			
Ubbelohde	(0.3 to 100 000) mm ² /s	0.16 %	
FitzSimons	(0.6 to 1200) mm ² /s	0.16 %	
Atlantic	(0.7 to 5000) mm ² /s	0.16 %	
Cannon-Ubbelohde (A) & Cannon-Ubbelohde Dilution (B)	(0.5 to 100 000) mm ² /s	0.16 %	
Cannon-Ubbelohde Semi-Micro	(0.4 to 20 000) mm ² /s	0.16 %	
BS/IP/SL(S)	(1.05 to 10 000) mm ² /s	0.16 %	
BS/IP/MSL	(0.6 to 3000) mm ² /s	0.16 %	

Parameter/Equipment	Range	CMC ^{2, 4, 9} (±)	Comments
Glass Capillary Kinematic Viscometers (cont)			
Reverse Flow for Transparent & Opaque Liquids:			
Zeitfuchs Cross-Arm	(0.6 to 100 000) mm ² /s	0.16 %	Viscosity standard solution
Cannon-Fenske Opaque	(0.4 to 20 000) mm ² /s	0.16 %	
Lantz-Zeitfuchs	(60 to 100 000) mm ² /s	0.29 %	
BS/IP/RF U-Tube Reverse Flow	(0.6 to 300 000) mm ² /s	0.16 %	
Viscosity Cups ³ –			
Ford Cup # 1	(10 to 35) mm ² /s	0.16 %	Viscosity standard solution
Ford Cup # 2	(20 to 120) mm ² /s	0.16 %	
Ford Cup # 3	(49 to 220) mm ² /s	0.16 %	
Ford Cup # 4	(70 to 370) mm ² /s	0.16 %	
Ford Cup # 5	(200 to 1200) mm ² /s	0.16 %	
Zahn Cup # 1	(5 to 78) mm ² /s	0.26 %	
Zahn Cup # 2	(20 to 250) mm ² /s	0.29 %	
Zahn Cup # 3	(100 to 800) mm ² /s	0.29 %	
Zahn Cup # 4	(200 to 1200) mm ² /s	0.32 %	
Zahn Cup # 5	(400 to 1800) mm ² /s	0.38 %	

Parameter/Equipment	Range	CMC ^{2, 4, 9} (±)	Comments
Viscosity Cups ³ – (cont)			
Shell Cup # 1	(2 to 20) mm ² /s	0.26 %	Viscosity standard solution
Shell Cup # 2	(10 to 50) mm ² /s	0.26 %	
Shell Cup # 2 ½	(20 to 80) mm ² /s	0.26 %	
Shell Cup # 3	(30 to 120) mm ² /s	0.29 %	
Shell Cup # 3 ½	(40 to 170) mm ² /s	0.32 %	
Shell Cup # 4	(70 to 270) mm ² /s	0.29 %	
Shell Cup # 5	(125 to 520) mm ² /s	0.32 %	
Shell Cup # 6	(320 to 1300) mm ² /s	0.38 %	
Stein Hall Cup	15 s	0.040 %	
Turbidity Meters ³	0.50 NTU 10 NTU 20 NTU 100 NTU 500 NTU 1000 NTU 4000 NTU	1.0 % 1.0 % 1.0 % 2.0 % 0.40 % 1.5 % 0.80 %	Stabilized formazin turbidity standard
Breath Analyzer	0.2420 g/l 0.6050 g/l 1.2100 g/l	0.0030 g/l 0.0073 g/l 0.015 g/l	Standard reference solutions

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
Refractometers ³ –			
Brix	(2.50 to 40.00) °Brix 70.00 °Brix 97.00 °Brix	0.019 °Brix 0.031 °Brix 0.027 °Brix	Standard solutions
Refractive Index	(1.336 59 to 1.399 86) RI (1.466 66 to 1.557 68) RI	0.000 027 RI 0.000 074 RI	RI = Refractive Index
Gas Detection Equipment –			
H ₂ S	25 parts in 10 ⁶ H ₂ S	0.78 parts in 10 ⁶ H ₂ S	Standard gas
O ₂	18 % O ₂	0.36 % O ₂	
CO	3 parts in 10 ⁶ CO 40 parts in 10 ⁶ CO 100 parts in 10 ⁶ CO 500 parts in 10 ⁶ CO 1000 parts in 10 ⁶ CO	0.58 parts in 10 ⁶ CO 0.70 parts in 10 ⁶ CO 2.1 parts in 10 ⁶ CO 2.1 parts in 10 ⁶ CO 9.8 parts in 10 ⁶ CO	
Methane (% LEL)	50 % LEL	1.2 % LEL	LEL = lower explosive limit
SO ₂	3 parts in 10 ⁶ SO ₂ 40 parts in 10 ⁶ SO ₂ 500 parts in 10 ⁶ SO ₂ 1000 parts in 10 ⁶ SO ₂	0.58 parts in 10 ⁶ SO ₂ 0.70 parts in 10 ⁶ SO ₂ 4.0 parts in 10 ⁶ SO ₂ 8.0 parts in 10 ⁶ SO ₂	
NO	3 parts in 10 ⁶ NO 40 parts in 10 ⁶ NO 500 parts in 10 ⁶ NO 1000 parts in 10 ⁶ NO	0.58 parts in 10 ⁶ NO 0.73 parts in 10 ⁶ NO 4.1 parts in 10 ⁶ NO 7.1 parts in 10 ⁶ NO	
NH ₃	25 parts in 10 ⁶ NH ₃ 50 parts in 10 ⁶ NH ₃ 100 parts in 10 ⁶ NH ₃	1.4 parts in 10 ⁶ NH ₃ 2.5 parts in 10 ⁶ NH ₃ 2.0 parts in 10 ⁶ NH ₃	

III. Dimensional

Parameter/Equipment	Range	CMC ^{2, 4} ($\pm$)	Comments
Calipers ³ –			
Digital	Up to 450 mm	8.2 μ m	Gauge blocks
Analog (Vernier)	Up to 450 mm	16 μ m	
Analog (Dial)	Up to 200 mm (200 to 300) mm	8.2 μ m 16 μ m	
Outside, Inside & Depth Micrometers, Indicators, Thickness Gauges ³ –			
Digital	Up to 25 mm (25 to 50) mm (50 to 75) mm (75 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 275) mm (275 to 300) mm (300 to 325) mm (325 to 350) mm (350 to 375) mm (375 to 400) mm (400 to 425) mm (425 to 450) mm	0.58 μ m 0.60 μ m 0.60 μ m 0.61 μ m 0.61 μ m 0.62 μ m 0.67 μ m 0.70 μ m 0.70 μ m 0.70 μ m 0.72 μ m 0.76 μ m 0.76 μ m 0.80 μ m 0.83 μ m 0.83 μ m 0.87 μ m 0.87 μ m	Gauge blocks

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Outside, Inside & Depth Micrometers, Indicators, Thickness Gauges ³ – (cont)			
Analog	Up to 25 mm (25 to 50) mm (50 to 75) mm (75 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 275) mm (275 to 300) mm (300 to 325) mm (325 to 350) mm (350 to 375) mm (375 to 400) mm (400 to 425) mm (425 to 450) mm	1.2 µm 1.2 µm 1.2 µm 1.2 µm 1.7 µm 1.7 µm 1.7 µm 1.7 µm 1.7 µm 1.7 µm 1.7 µm 1.7 µm 1.7 µm 1.7 µm 1.8 µm 1.8 µm 1.8 µm 1.8 µm	Gauge blocks
Depth Gages ³ –			
Digital	Up to 450 mm	5.8 µm	Gauge blocks
Analog (Vernier)	Up to 450 mm	12 µm	
Analog (Dial)	Up to 450 mm	5.8 µm	
Height Gauges ³ –			
Digital	Up to 450 mm	5.8 µm	Gauge blocks
Analog (Vernier)	Up to 450 mm	12 µm	
Analog (Dial)	Up to 450 mm	5.8 µm	

Parameter/Equipment	Range	CMC ^{2,4} ($\pm$)	Comments
Welding Gauges	Up to 60 mm	0.58 mm	Gauge blocks
Oil Gauging Tapes	Up to 30 m	580 μ m	Master tape
Tapes & Rulers	Up to 30 m	580 μ m	Master tape
Gauge Blocks (Grade 1 & 2)	(0.5 to 5) mm (5 to 15) mm (15 to 20) mm (20 to 25) mm (25 to 50) mm (50 to 75) mm (75 to 100) mm (100 to 125) mm (125 to 150) mm	0.082 μ m 0.083 μ m 0.084 μ m 0.085 μ m 0.12 μ m 0.16 μ m 0.19 μ m 0.24 μ m 0.27 μ m	Gauge block comparator & gauge blocks
Sieves ³	Up to 850 μ m (0.85 to 125) mm	10 μ m 12 μ m	Magnifying glass (loupe)
Ultrasonic Thickness Gauges ³	Up to 100 mm	0.58 μ m	Gauge blocks
Optical & Stereo Microscopes, with Reticle ³	Up to 400X Magnification	4.7 μ m	Stage micrometer
Goniometer ³	Up to 30°	0°00'21"	Angle block set

IV. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2, 4, 8} ($\pm$)	Comments
DC Voltage – Generate	(0 to 200) mV (0.2 to 2) V (2 to 20) V (20 to 200) V (200 to 1000) V	4.2 μ V + 34 μ V/V 9.3 μ V + 34 μ V/V 4.1 μ V + 31 μ V/V 0.83 mV + 35 μ V/V 9.0 mV + 32 μ V/V	Multiproduct calibrator
DC Current – Generate	(0 to 200) μ A (0.2 to 2) mA (2 to 20) mA (20 to 200) mA (0.2 to 2) A (2 to 20) A	35 nA + 0.12 nA/ μ A 45 nA + 97 nA/mA 0.19 μ A + 92 nA/mA -5.2 μ A + 0.28 μ A/mA 39 μ A + 0.24 mA/A 0.23 mA + 0.53 mA/A	Multiproduct calibrator
Resistance (2 Wire) – Generate	0 Ω 0.1 Ω 1 Ω 10 Ω 100 Ω 1 k Ω 10 k Ω 100 k Ω 1 M Ω 10 M Ω 100 M Ω 1000 M Ω	5.8 m Ω 5.9 m Ω 6.0 m Ω 7.0 m Ω 12 m Ω 0.094 Ω 0.94 Ω 9.4 Ω 0.16 k Ω 4.5 k Ω 0.58 M Ω 12 M Ω	Multiproduct calibrator

Parameter/Range	Frequency	CMC ^{2, 4, 8} ($\pm$)	Comments
AC Voltage – Generate			
(0 to 200) mV	56 Hz 1 kHz	25 μ V + 0.47 mV/V 43 μ V + 1.0 mV/V	Multiproduct calibrator
(0.2 to 2) V	56 Hz 1 kHz	0.12 mV + 0.44 mV/V 0.16 mV + 1.0 mV/V	
(2 to 20) V	56 Hz 1 kHz	1.1 mV + 0.41 mV/V 1.5 μ V + 0.82 mV/V	
(20 to 200) V	56 Hz 1 kHz	9.5 mV + 0.45 mV/V 47 mV + 1.0 mV/V	
(200 to 1000) V	56 Hz 1 kHz	82 mV + 0.48 mV/V 0.46 V + 1.8 mV/V	

Parameter/Range	Frequency	CMC ^{2, 4, 8} ($\pm$)	Comments
AC Current – Generate			
(0.2 to 2) mA	40 Hz 56 Hz	0.64 μ A + 2.3 μ A/mA 0.46 μ A + 0.72 μ A/mA	Multiproduct calibrator
(2 to 20) mA	40 Hz 56 Hz	5.3 μ A + 2.3 μ A/mA 47 μ A + 0.67 μ A/mA	
(20 to 200) mA	40 Hz 56 Hz	53 μ A + 2.3 μ A/mA 46 μ A + 0.72 μ A/mA	
(0.2 to 2) A	40 Hz 56 Hz	0.52 mA + 2.4 mA/A 0.44 mA + 1.1 mA/A	
(2 to 20) A	40 Hz 56 Hz	5.1 mA + 2.4 mA/A 0.78 mA + 1.9 mA/A	

Parameter/Equipment	Range	CMC ^{2, 4, 8} ($\pm$)	Comments
DC Voltage – Measure	(0 to 100) mV (0.1 to 1) V (1 to 10) V (10 to 100) V (100 to 1000) V	1.4 μ V + 15 μ V/V 1.9 μ V + 8.9 μ V/V 8.2 μ V + 9.2 μ V/V 78 μ V + 14 μ V/V 1.1 mV + 0.015 mV/V	Precision multimeter
DC Current – Measure	(0 to 100) μ A (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A (1 to 10) A (10 to 30) A	0.55 nA + 0.017 nA/ μ A 4.5 nA + 0.017 μ A/mA 45 nA + 0.021 μ A/mA 0.63 μ A + 0.059 μ A/mA 15 μ A + 0.29 mA/A 0.39 mA + 0.69 mA/A 4.9 mA + 0.94 mA/A	Precision multimeter
Resistance (2 Wire) – Measure	100 k Ω 1 M Ω 10 M Ω	2.7 Ω 23 Ω 390 Ω	Precision multimeter
Resistance (4 Wire) – Measure	1 Ω 10 Ω 100 Ω 1 k Ω 10 k Ω 100 k Ω	35 $\mu\Omega$ 0.22 m Ω 1.7 m Ω 16 m Ω 0.18 Ω 2.7 Ω	Precision multimeter

Parameter/Range	Frequency	CMC ^{2, 4, 8} ($\pm$)	Comments
AC Voltage – Measure (0 to 100) mV (0.1 to 1) V (1 to 10) V (10 to 100) V (100 to 1000) V	40 Hz to 20 kHz	15 μ V + 0.36 mV/V 71 μ V + 0.31 mV/V 720 μ V + 0.29 mV/V 9.5 mV + 0.40 mV/V 83 mV + 0.39 mV/V	Precision multimeter
AC Current – Measure (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A (1 to 10) A (10 to 30) A	40 Hz to 1 kHz	0.17 μ A + 0.73 μ A/mA 1.3 μ A + 0.74 μ A/mA 13 μ A + 0.74 μ A/mA 0.18 mA + 0.81 mA/A 4.6 mA + 1.4 mA/A 14 mA + 1.4 mA/A	Precision multimeter
AC Current – Clamp On Meters Up to 100 A (>100 to 300) A (>300 to 500) A (>500 to 700) A (>700 to 1000) A	56 Hz	0.25 A 1.1 A 1.2 A 1.2 A 1.3 A	Multiproduct calibrator & multifunction workstation

Parameter/Equipment	Range	CMC ^{2, 4, 8} ($\pm$)	Comments
Insulation Resistance – Fixed Points	Up to 1 M Ω 5 M Ω 10 M Ω 50 M Ω 100 M Ω 500 M Ω 1 G Ω 5 G Ω 10 G Ω 15 G Ω 20 G Ω	0.0024 M Ω 0.013 M Ω 0.12 M Ω 0.58 M Ω 1.2 M Ω 5.8 M Ω 0.012 G Ω 0.061 G Ω 0.11 G Ω 0.18 G Ω 0.24 G Ω	Multiproduct calibrator & standard resistance box
Electrical Simulation of Thermocouples ³ – Type B Type J Type K Type R Type S Type T	(600 to 1820) °C (-180 to 750) °C (-140 to 1340) °C 1700 °C 1700 °C (-250 to 400) °C	0.89 °C 0.76 °C 1.0 °C 0.41 °C 0.37 °C 0.82 °C	Multiproduct calibrator & multifunction workstation

V. Fluid Quantities

Parameter/Equipment	Range	CMC ^{2, 4} ($\pm$)	Comments
Volume – Laboratory Glassware ³			
Single Volume Pipettes	0.5 ml 1 ml 2 ml 5 ml 10 ml 20 ml 25 ml 50 ml 100 ml	0.000 29 ml 0.000 56 ml 0.000 92 ml 0.000 93 ml 0.0012 ml 0.0014 ml 0.0015 ml 0.0020 ml 0.0034 ml	Gravimetric method
One-mark Volumetric Flasks	1 ml 2 ml 5 ml 10 ml 20 ml 25 ml 50 ml 100 ml 200 ml 250 ml 500 ml 1000 ml 2000 ml 5000 ml	0.0022 ml 0.0022 ml 0.0022 ml 0.0022 ml 0.0037 ml 0.0037 ml 0.0055 ml 0.0077 ml 0.012 ml 0.012 ml 0.017 ml 0.033 ml 0.056 ml 0.13 ml	
Graduated Pipettes	Up to 25 ml	4.6 nl + 0.022 μ l/ml	
Graduated Measuring Cylinders	Up to 5 ml (> 5 to 10) ml (> 10 to 25) ml (> 25 to 50) ml (> 50 to 100) ml (> 100 to 250) ml (> 250 to 500) ml (> 500 to 1000) ml (> 1000 to 2000) ml	0.029 μ l + 0.018 μ l/ml 0.065 μ l + 0.017 μ l/ml 0.13 μ l + 0.018 μ l/ml 0.091 μ l + 0.020 μ l/ml 0.40 μ l + 0.019 μ l/ml 1.2 μ l + 0.017 μ l/ml 1.3 μ l + 0.019 μ l/ml 4.2 μ l + 0.019 μ l/ml 2.3 μ l + 0.098 μ l/ml	
Burettes	Up to 100 ml	1.1 nl + 0.022 μ l/ml	

Parameter/Equipment	Range	CMC ^{2, 4, 9} (±)	Comments
Volume – Laboratory Glassware ³ (cont)			
Pyknometers: Type 3 (Gay-Lussac), Type 5 (Hubbard), Type 6 (With Thermometer Coupled)	Up to 10 ml (> 10 to 25) ml (> 25 to 50) ml (> 50 to 100) ml	0.000 22 ml 0.000 37 ml 0.000 55 ml 0.000 77 ml	Gravimetric method
Pyknometer Type 4 (Reischauer)	Up to 25 ml (> 25 to 50) ml (> 50 to 100) ml	0.000 45 ml 0.0055 ml 0.0077 ml	
Centrifuge Tube (6 in, 8 in)	Up to 25 ml (> 25 to 50) ml (> 50 to 100) ml	35 µl + 0.026 µl/ml -0.94 µl + 0.065 µl/ml -5.4 µl + 0.15 µl/ml	
Imhoff Cone	Up to 100 ml (> 100 to 500) ml (> 500 to 1000) ml	0.044 µl + 0.14 µl/ml -4.8 µl + 0.19 µl/ml 8.0 µl + 0.16 µl/ml	
Beaker	Up to 10 ml (> 10 to 50) ml (> 50 to 100) ml (> 100 to 150) ml (> 150 to 200) ml (> 200 to 250) ml (> 250 to 500) ml (> 500 to 1000) ml	0.000 45 ml 0.0021 ml 0.0041 ml 0.0096 ml 0.012 ml 0.013 ml 0.042 ml 0.10 ml	
Water Trap	Up to 10 ml Up to 2 ml	24 nl + 0.019 µl/ml 53 nl + 0.0074 µl/ml	
Standard Test Measures (Seraphin Test Measures)	Up to 5 gal (> 5 to 10) gal (> 10 to 20) gal	0.05 %	

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Piston Operated Volumetric Apparatus ³ –			
Piston Pipettes	Up to 3 µl (> 3 to 7) µl (> 7 to 10) µl (> 10 to 100) µl (> 100 to 1000) µl (> 1000 to 10 000) µl	1.1 nl 1.3 nl 0.70 µl + 0.10 nl/ml 0.59 µl + 0.13 nl/ml 1.6 µl + 0.14 nl/ml 4.0 µl + 0.14 nl/ml	Gravimetric method
Piston Burettes	Up to 2 ml (> 2 to 5) ml (> 5 to 10) ml (> 10 to 25) ml (> 25 to 50) ml	0.000 19 ml 0.000 20 ml 0.000 23 ml 0.000 38 ml 0.000 68 ml	
Dispensers	Up to 0.5 ml (> 0.5 to 2) ml (> 2 to 5) ml (> 5 to 10) ml (> 10 to 25) ml (> 25 to 50) ml (> 50 to 100) ml	0.000 19 ml 0.000 19 ml 0.000 20 ml 0.000 23 ml 0.000 38 ml 0.000 68 ml 0.0013 ml	
Hydrometry: Specific Gravity (Relative Density) Hydrometers & Equivalent Values in Other Hydrometer Scales: Density (g/ml, g/cm ³ , kg/m ³)	(0.500 to 0.650) SG (0.650 to 0.950) SG (0.950 to 1.150) SG (1.150 to 1.300) SG (1.300 to 1.450) SG (1.450 to 1.500) SG (1.500 to 1.650) SG (1.650 to 1.750) SG (1.750 to 1.800) SG (1.800 to 1.900) SG (1.900 to 1.950) SG (1.950 to 2.000) SG	0.000 12 SG 0.000 059 SG 0.000 060 SG 0.000 061 SG 0.000 062 SG 0.000 063 SG 0.000 064 SG 0.000 065 SG 0.000 066 SG 0.000 067 SG 0.000 068 SG 0.000 069 SG	Cuckow method
Baumé Light Hydrometers	(10.0 to 70.0) °Bé Lt	0.012 °Bé Lt	

Parameter/Equipment	Range	CMC ^{2, 4, 6, 8, 9} (±)	Comments
Hydrometry: Specific Gravity (Relative Density) Hydrometers & Equivalent Values in Other Hydrometer Scales: Density (g/ml, g/cm ³ , kg/m ³) (cont)			
Baumé Heavy Hydrometers	(0.0 to 70.0) °Bé Hy	0.012 °Bé Hy	Cuckow method
API Hydrometers & Thermo-hydrometers (API Scale for Petroleum Products)	(-1.0 to 101.0) °API	0.012 °API	
Lactometers (Quevenne Scale)	(15 to 40) °Q	0.060 °Q	
Flow Rate – Liquids ³			
Mass Volumetric	Up to 500 kg/min Up to 500 l/min	0.026 % 0.031 %	Gravimetric flow rig
Mass Volumetric	Up to 500 kg/min Up to 500 l/min	0.58 % 0.58 %	Direct comparison with Coriolis reference standard
Mass Volumetric	Up to 490 kg/min Up to 490 l/min	0.82 % 0.82 %	Direct comparison with standard flow rig or standard ultrasonic flow meter
Flow Rate – Gases ^{3, 6}			
Volumetric	(0.005 to 0.5) l/min (>0.5 to 50) l/min	(0.48R + 0.0070) % (0.033R + 0.0015) %	Gas flow primary standards

VI. Mechanical

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
Mass – OIML Classes E2, F1, F2, M1, M2 & M3	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 500 g 1 kg 2 kg 5 kg 10 kg 20 kg 50 kg 100 kg 200 kg 500 kg 1000 kg	0.0020 mg 0.0020 mg 0.0020 mg 0.0025 mg 0.0030 mg 0.0040 mg 0.0050 mg 0.0060 mg 0.0080 mg 0.010 mg 0.012 mg 0.016 mg 0.020 mg 0.025 mg 0.03 mg 0.05 mg 0.10 mg 0.25 mg 0.50 mg 1.0 mg ⁵ 2.5 mg 5.0 mg 10 mg 800 mg 1600 mg 10 000 mg 8000 mg 16 000 mg	Mass comparator, weight set Class E1, E2, F1
Scales, Comparators & Balances ³	Up to 200 mg (>0.2 to 6) g (>6 to 30) g (>30 to 110) g (>110 to 220) g (>220 to 350) g (>350 to 700) g (>700 to 1200) g (>1200 to 2500) g (>2500 to 4300) g (>4300 to 6200) g	1.6 µg 1.1 µg + 0.71 µg/g 0.74 µg + 0.34 µg/g 0.62 µg + 0.14 µg/g 75 µg + 0.088 µg/g 0.82 mg 0.83 mg 0.77 mg + 0.080 µg/g 0.069 mg + 0.20 µg/g 8.2 mg 8.3 mg	Standard weights

Parameter/Equipment	Range	CMC ^{2, 4, 9} (±)	Comments
Scales, Comparators & Balances ³ (cont)	(>6.2 to 30) kg (>30 to 100) kg (>100 to 300) kg (>300 to 600) kg (>600 to 1500) kg (>1500 to 3000) kg (>3000 to 4000) kg (>4000 to 10 000) kg (>10 000 to 14 000) kg (>14 000 to 18 000) kg (>18 000 to 20 000) kg (>20 000 to 50 000) kg (>50 000 to 70 000) kg	0.082 g 0.84 g 4.1 g 4.2 g 3.8 g + 0.66 mg/kg 0.44 kg 1.6 kg 1.7 kg 1.8 kg 1.9 kg 2.0 kg 3.6 kg + 0.026 g/kg 5.0 kg	Standard weights
Pressure – Pneumatic Pressure Devices (Including Pressure Modules & Pressure Switch) ^{3, 6} Barometric	(-15 to 0) psi Up to 300 psi (>300 to 1000) psi (>1000 to 10 000) psi (600 to 650) mbar (>650 to 770) mbar (>770 to 950) mbar (>950 to 1030) mbar	0.0058 psi 0.0056 psi + 0.000 012 R 0.14 psi 1.2 psi 0.12 mbar 0.13 mbar 0.14 mbar 0.15 mbar	Digital pressure calibrator Vacuum chamber & standard barometer
Torque Tools	Up to 813 N·m	0.27 %	Torque transducer
Air Velocity – Anemometers & Air Velocity Meters Balometers – Air Velocity Balometers – Flow Rate	(0.15 to 5) m/s (5.01 to 10) m/s (10.01 to 20) m/s (20.01 to 30) m/s (0.50 to 5) m/s (5.01 to 12) m/s (25 to 100) ft ³ /min (100 to 500) ft ³ /min (500 to 1580) ft ³ /min	0.016 m/s 0.012 m/s 0.029 m/s 0.030 m/s 0.016 m/s 0.011 m/s 0.94 ft ³ /min 1.1 ft ³ /min 1.6 ft ³ /min	Wind tunnel & standard anemometer

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
Centrifuges ³ – Rotational Speed	(60 to 900) rpm (> 900 to 3000) rpm (> 3000 to 12 000) rpm (> 12 000 to 18 000) rpm (> 18 000 to 20 000) rpm (> 20 000 to 30 000) rpm (> 30 000 to 40 000) rpm (> 40 000 to 50 000) rpm (> 50 000 to 60 000) rpm	1.2 rpm 1.3 rpm 1.7 rpm 2.1 rpm 2.2 rpm 3.0 rpm 3.7 rpm 4.5 rpm 5.3 rpm	Digital tachometer

VII. Optical Quantities

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
Spectrophotometers ³ – Absorbance			
λ: (235 to 350) nm	(0.1 to 1.5) A	0.0010 A	Potassium dichromate quartz cells
λ: (440 to 750) nm	(0.3 to 0.6) A (0.6 to 1.5) A	0.000 91 A 0.0010 A	Neutral density glass filters
Transmittance			
λ: (235 to 350) nm	(5.5 to 80.5) %	0.012 % of Transmittance	Potassium dichromate quartz cells
λ: (440 to 750) nm	(2.5 to 26.0) % (26.0 to 50.5) %	0.022 % of Transmittance 0.041 % of Transmittance	Neutral density glass filters

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Spectrophotometers ³ – (cont)			
Wavelength			
SBW: (0.5, 1.0) nm	(240 to 638) nm	0.070 nm	Holmium glass filter
SBW: (1.5, 2.0) nm	(240 to 638) nm	0.080 nm	
SBW: (3.0, 4.0) nm	(240 to 638) nm	0.12 nm	
SBW: (0.5, 1.0, 1.5, 2.0, 3.0, 4.0) nm	(430 to 880) nm	0.11 nm	Didymium glass filter
Spectrophotometers Filters –			
Absorbance			
λ: (235 to 350) nm	(0.09 to 0.28) A (0.19 to 0.57) A (0.29 to 0.87) A (0.39 to 1.15) A (0.48 to 1.45) A	0.000 92 A 0.0010 A 0.0012 A 0.0010 A 0.0010 A	Standard spectrophotometer
λ: (440 to 750) nm	(0.83 to 1.08) A (0.58 to 0.75) A (0.52 to 0.61) A	0.0010 A 0.0010 A 0.000 92 A	
Transmittance			
λ: (235 to 350) nm	(52.5 to 80.5) % (26.9 to 64.3) % (13.5 to 51.0) % (7.0 to 40.9) % (5.7 to 32.8) %	0.11 % of Transmittance 0.072 % of Transmittance 0.062 % of Transmittance 0.020 % of Transmittance 0.012 % of Transmittance	
λ: (440 to 750) nm	(8.3 to 14.8) % (17.6 to 26.1) % (24.6 to 30.0) %	0.022 % of Transmittance 0.041 % of Transmittance 0.057 % of Transmittance	
Wavelength			
SBW: (0.5, 1.0, 1.5, 2.0, 3.0, 4.0) nm	(240 to 638) nm	0.070 nm	
SBW: (0.5, 1.0, 1.5, 2.0, 3.0, 4.0) nm	(430 to 880) nm	0.11 nm	

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
Colorimeters ³	0.10 mg/L Cl ₂ 0.50 mg/L Cl ₂ 1.0 mg/L Cl ₂ 1.5 mg/L Cl ₂ 2.0 mg/L Cl ₂	0.0058 mg/L Cl ₂ 0.0061 mg/L Cl ₂ 0.0065 mg/L Cl ₂ 0.0091 mg/L Cl ₂ 0.020 mg/L Cl ₂	Total residual chlorine standards
Polarimeters ³ – Optical Rotation			
Sugar Degrees (°Z)	24.98 °Z 25.03 °Z	0.017 °Z 0.017 °Z	Quartz control plate
λ: (546, 589, 632, 850 to 880) nm	25.06 °Z	0.017 °Z	
	25.08 °Z	0.017 °Z	
	25.07 °Z	0.017 °Z	
	49.59 °Z	0.017 °Z	
	49.69 °Z	0.017 °Z	
	49.75 °Z	0.017 °Z	
	49.79 °Z	0.017 °Z	
	49.77 °Z	0.017 °Z	
	99.44 °Z	0.017 °Z	
	99.63 °Z	0.017 °Z	
	99.75 °Z	0.017 °Z	
	99.84 °Z	0.017 °Z	
	99.80 °Z	0.017 °Z	
Angle Degrees	10.185°	0.006°	
λ: (546, 589, 632, 850 to 880) nm	8.665°	0.006°	
	7.455°	0.005°	
	4.023°	0.003°	
	3.742°	0.003°	
	20.222°	0.006°	
	17.204°	0.006°	
	14.801°	0.005°	
	7.987°	0.003°	
	7.4330°	0.003°	
	40.547°	0.006°	
	34.496°	0.006°	
	29.678°	0.005°	
	16.015°	0.003°	
	14.897°	0.003°	

Parameter/Equipment	Range	CMC ^{2,4,9} (±)	Comments
Light Meters	(30 to 10 000) lux (>10 000 to 20 000) lux	1.0 % 1.1 %	Reference standard lamp
Aerosol Particle Counter ³ –			
Particle Size	(0.3 to 10) µm	3.2 %	Direct comparison
Flow	(2.83 to 100) l/min	1.0 %	
Sample Time	(10 to 1800) s	0.19 %	

VIII. Thermodynamics

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Liquid & Dry Baths (Dry Wells) ³	(-80 to -40) °C (>-40 to -25) °C (>-25 to -10) °C (>-10 to 0) °C (>0 to 150) °C (>150 to 200) °C (>200 to 400) °C (>400 to 800) °C (>800 to 1000) °C (>1000 to 1100) °C	0.030 °C 0.028 °C 0.026 °C 0.027 °C 0.032 °C 0.073 °C 0.079 °C 0.66 °C 1.3 °C 1.3 °C	Reference RTD thermometers, thermistors, thermocouples

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
Climatic Chambers (Including Ovens, Incubators, Stoves, Refrigerators, Freezers, Muffles, Thermo-reactors, Weather Cameras, Centrifuges) ³			
Humidity (% RH)	(10 to 30) % RH (>30 to 50) % RH (>50 to 70) % RH (>70 to 90) % RH	0.73 % RH 0.86 % RH 0.81 % RH 0.98 % RH	Reference standard thermometers, thermistors, thermocouples, thermo-hygrometers
Temperature	(-80 to -50) °C (-50 to -25) °C (-25 to 0) °C (0 to 50) °C (50 to 100) °C (100 to 150) °C (150 to 200) °C (200 to 400) °C (400 to 600) °C (600 to 1100) °C	0.064 °C 0.063 °C 0.063 °C 0.066 °C 0.066 °C 0.066 °C 0.067 °C 0.077 °C 0.29 °C 1.3 °C	
Autoclaves ³ –			
Temperature	(100 to 180) °C	0.094 °C	
Temperature Deviation in Time & Space	(100 to 180) °C	0.082 °C	
Stability	(100 to 180) °C	0.041 °C	
Uniformity	(100 to 180) °C	0.084 °C	

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Bi-metal Thermometers ³	(-50 to -25) °C (-25 to 0) °C (0 to 50) °C (50 to 100) °C (100 to 150) °C (150 to 200) °C (200 to 300) °C (300 to 400) °C	0.21 °C 0.18 °C 0.089 °C 0.15 °C 0.16 °C 0.28 °C 0.32 °C 0.65 °C	Reference standard thermometers & temperature blocks
Digital Thermometers ³	(-80 to -40) °C (-40 to -25) °C (-25 to 0) °C (0 to 50) °C (50 to 100) °C (100 to 150) °C (150 to 200) °C (200 to 400) °C (400 to 600) °C (600 to 1100) °C	0.072 °C 0.070 °C 0.051 °C 0.051 °C 0.058 °C 0.072 °C 0.081 °C 0.15 °C 0.59 °C 1.4 °C	Reference standard thermometers & temperature blocks
Partial Immersion Liquid-In-Glass Thermometers	(-80 to -50) °C (-50 to -38) °C (-38 to -20) °C (-20 to 0) °C (0 to 25) °C (25 to 50) °C (50 to 70) °C (70 to 90) °C (90 to 110) °C (110 to 130) °C (130 to 150) °C (150 to 200) °C (200 to 250) °C (250 to 300) °C	0.58 °C 0.093 °C 0.091 °C 0.077 °C 0.077 °C 0.081 °C 0.081 °C 0.092 °C 0.092 °C 0.10 °C 0.10 °C 0.14 °C 0.18 °C 0.19 °C	Reference standard thermometers & temperature blocks

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Total Immersion Liquid-In-Glass Thermometers	(-80 to -50) °C (-50 to -38) °C (-38 to -10) °C (-10 to 0) °C (0 to 50) °C (50 to 100) °C (100 to 140) °C (140 to 150) °C (150 to 200) °C (200 to 250) °C (250 to 300) °C (300 to 350) °C (350 to 400) °C	0.30 °C 0.092 °C 0.091 °C 0.077 °C 0.081 °C 0.092 °C 0.10 °C 0.10 °C 0.24 °C 0.43 °C 0.43 °C 0.43 °C 0.50 °C	Reference standard thermometers & temperature blocks
Thermocouples –			
Type B	600 °C (>600 to 800) °C (>800 to 1100) °C	1.1 °C 1.2 °C 2.3 °C	Temperature sources monitored with standard thermometer. Thermocouple output is read using process calibrator.
Type E	(-80 to 100) °C (>100 to 300) °C (>300 to 800) °C (>800 to 1000) °C	0.11 °C 0.22 °C 1.1 °C 2.3 °C	
Type J	(-80 to 100) °C (>100 to 300) °C (>300 to 800) °C (>800 to 1100) °C	0.14 °C 0.23 °C 1.1 °C 2.3 °C	
Type K	(-80 to 100) °C (>100 to 300) °C (>300 to 800) °C (>800 to 1100) °C	0.15 °C 0.24 °C 1.1 °C 2.3 °C	
Type R	(-20 to 100) °C (>100 to 300) °C (>300 to 600) °C (>600 to 800) °C (>800 to 1000) °C	0.81 °C 0.83 °C 1.3 °C 1.4 °C 2.4 °C	

Parameter/Equipment	Range	CMC ^{2,4,8} (±)	Comments
Thermocouples – (cont)			
Type S	(-20 to 100) °C (>100 to 300) °C (>300 to 600) °C (>600 to 800) °C (>800 to 1000) °C	0.81 °C 0.83 °C 1.3 °C 1.4 °C 2.4 °C	Temperature sources monitored with standard thermometer; thermocouple output is read using process calibrator
Type T	(-80 to 100) °C (>100 to 300) °C (>300 to 400) °C	0.15 °C 0.24 °C 1.0 °C	
Infrared Temperature – Measuring Equipment λ: (8 to 14) μm ε: (0.1 to 1.0)	(≥ -10 to 1) °C (> 1 to 30) °C (> 30 to 100) °C (> 100 to 200) °C (> 200 to 300) °C (> 300 to 420) °C (> 420 to 660) °C (> 660 to 810) °C (> 810 to 960) °C (> 800 to 960) °C	0.69 °C 0.73 °C 0.77 °C 1.2 °C 2.1 °C 3.1 °C 4.0 °C 6.3 °C 7.7 °C 8.5 °C	Transfer radiation thermometer IR calibrator (black body), dry well
Thermo-Hygrometers, Dataloggers & Heat Stress WBGT Meters*–			
Humidity (% RH)	(10 to 30) % RH (30 to 50) % RH (50 to 70) % RH (70 to 90) % RH	0.86 % RH 0.86 % RH 0.81 % RH 0.98 % RH	Reference thermo-hygrometer & climatic chamber *Including wet bulb, dry bulb, globe temperature, & dew point
Temperature	0 °C (0 to 10) °C (10 to 20) °C (20 to 30) °C (30 to 40) °C (40 to 50) °C	0.26 °C 0.15 °C 0.15 °C 0.18 °C 0.22 °C 0.27 °C	

Parameter/Equipment	Range	CMC ^{2, 4} ($\pm$)	Comments
Moisture Analyzers ³	(0 to 100) % h	0.058 % h	Convection oven & balance % h = percent humidity of the sample

IX. Time & Frequency

Parameter/Equipment	Range	CMC ^{2, 4} ($\pm$)	Comments
Stopwatches & Timers ³	Up to 1024 s (> 1024 to 32 768) s	0.82 ms 0.56 ms + 0.084 ms/s	Reference stopwatch
Non-Contact Tachometers ⁶	(60 to 300) rpm (> 300 to 900) rpm (> 900 to 3000) rpm (> 3000 to 12 000) rpm (> 12 000 to 18 000) rpm (> 18 000 to 20 000) rpm (> 20 000 to 30 000) rpm (> 30 000 to 40 000) rpm (> 40 000 to 50 000) rpm (> 50 000 to 60 000) rpm	0.12 rpm 0.13 rpm 0.59 rpm 0.72 rpm 0.86 rpm 0.90 rpm 1.2 rpm 1.5 rpm 1.8 rpm 2.2 rpm	Multiproduct calibrator & multifunction workstation

¹ This laboratory offers commercial calibration 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. CMCs 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 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 The contributions from the "best existing device" are not included in the CMC claim.
- ⁵ The CMC claim is smaller than that of the expanded uncertainty claim for INEN as listed in the BIPM Key Comparison Database. A2LA has evaluated the laboratory's CMC claim and has verified this information to be correct and appropriate.
- ⁶ In the statement of CMC, R is the reading of the unit under test.
- ⁷ This scope meets A2LA's *P112 Flexible Scope Policy*.
- ⁸ 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.
- ⁹ In statement of CMC, percentages are percentage of reading, unless otherwise indicated.



Accredited Laboratory

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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 10th day of October 2023.

A blue ink signature of Mr. Trace McInturff.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 4286.01
Valid to August 31, 2025

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