



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

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CALIBRATION

Valid To: September 30, 2023

Certificate Number: 1741.09

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. Chemical

Parameter/Equipment	Range	CMC ² (±)	Comments
pH Meters ³ – Fixed Points	4 pH 7 pH 10 pH	0.027 pH 0.024 pH 0.024 pH	Standard pH solutions

II. Dimensional

Parameter/Equipment	Range	CMC ^{2, 4, 5} (±)	Comments
Pin Gage ³ – Class Z & Class ZZ	Up to 1.0 in	79 µin	Micrometer
Calipers ³	Up to 40 in	(4.1 + 9.5L) µin + 0.6R	Gage blocks
Micrometers ³	Up to 40 in	(4.1 + 9.5L) µin + 0.6R	Gage blocks
Linear Indicators ³ – Dial & Test	Up to 4 in	(4.3 + 9.1L) µin + 0.6R	Gage blocks

Parameter/Equipment	Range	CMC ^{2, 4, 5} (\pm)	Comments
Height Gages ³	Up to 48 in	$(53 + 8.5L) \mu\text{in} + 0.6R$	Gage blocks w/surface plate
Steel Rules ³	Up to 72 in	$(2.6 + 9.6L) \mu\text{in} + 0.6R$	Gage blocks
Tape Measures ³	Up to 25 ft	$(2.6 + 9.6L) \mu\text{in} + 0.6R$	Gage blocks
Feeler/Thickness Gages ³	Up to 1 in	79 μin	Micrometer

III. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2, 8} (\pm)	Comments
DC Voltage ³ – Generate	(0 to 330) mV 330 mV to 3.3 V (3.3 to 33) V (33 to 330) V (100 to 1020) V	73 $\mu\text{V/V} + 3 \mu\text{V}$ 61 $\mu\text{V/V} + 5 \mu\text{V}$ 61 $\mu\text{V/V} + 50 \mu\text{V}$ 67 $\mu\text{V/V} + 500 \mu\text{V}$ 69 $\mu\text{V/V} + 1.5 \text{ mV}$	Fluke 5500A
DC Voltage – Measure ³ (Power Sources, Supplies, Hipot Testers)	(0 to 50) mV (50 to 500) mV 500 mV to 5 V (5 to 50) V (50 to 500) V (500 to 1000) V (1 to 6) kV	0.058 % + 20 μV 0.029 % + 20 μV 0.029 % + 0.2 mV 0.029 % + 2 mV 0.035 % + 20 mV 0.036 % + 0.2 V 1.2 %	Fluke 287 Fluke 80K-6 & DMM
DC Current ³ – Generate	(0 to 3.3) mA (3.3 to 33) mA (33 to 330) mA 330 mA to 2.2 A (2.2 to 11) A	0.016 % + 0.05 μA 0.013 % + 0.25 μA 0.013 % + 3.3 μA 0.037 % + 44 μA 0.08 % + 330 μA	Fluke 5500A

Parameter/Equipment	Range	CMC ^{2, 8} (±)	Comments
DC Current – Measure ³ (Process Devices, Loop Calibrators)	(0 to 500) µA (500 to 5000) µA (5 to 50) mA (50 to 400) mA (0.4 to 5) A (5 to 10) A	0.088 % + 0.2 µA 0.39 % + 0.2 µA 0.059 % + 0.01 mA 0.18 % + 0.02 mA 0.35 % + 1 mA 0.35 % + 2 mA	Fluke 287

Parameter/Range	Frequency	CMC ^{2, 8} (±)	Comments
AC Voltage ³ – Generate			
(1 to 33) mV	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.43 % + 20 µV 0.19 % + 20 µV 0.25 % + 20 µV 0.31 % + 20 µV 0.43 % + 33 µV 1.2 % + 60 µV	Fluke 5500A
(33 to 330) mV	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.3 % + 50 µV 0.06 % + 20 µV 0.12 % + 20 µV 0.2 % + 40 µV 0.29 % + 170 µV 0.84 % + 330 µV	
330 mV to 3.3 V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.18 % + 250 µV 0.037 % + 60 µV 0.097 % + 60 µV 0.17 % + 300 µV 0.29 % + 1.7 mV 0.6 % + 3.3 mV	
(3.3 to 33) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.19 % + 2.5 mV 0.05 % + 600 µV 0.1 % + 2.6 mV 0.23 % + 5 mV 0.29 % + 17 mV	
(33 to 330) V	45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz	0.06 % + 6.6 mV 0.1 % + 15 mV 0.11 % + 33 mV	

Parameter/Range	Frequency	CMC ^{2, 8} (±)	Comments
AC Voltage ³ – Generate (cont) (330 to 1000) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.07 % + 80 mV 0.25 % + 100 mV 0.25 % + 500 mV	Fluke 5500A
AC Voltage – Measure ³ (Power Sources, Supplies, Hipot Testers)			
(0 to 50) mV	(20 to 45) Hz (45 to 65) Hz 65 Hz to 10 kHz (10 to 20) kHz (20 to 100) kHz	1.8 % + 60 µV 0.37 % + 25 µV 0.48 % + 25 µV 0.82 % + 40 µV 4.1 % + 40 µV	Fluke 287
(50 to 500) mV	(20 to 45) Hz (45 to 65) Hz 65 Hz to 10 kHz (10 to 20) kHz (20 to 100) kHz	1.8 % + 0.6 mV 0.35 % + 0.25 mV 0.47 % + 0.25 mV 0.82 % + 0.4 mV 4.1 % + 0.4 mV	
(0.5 to 5) V	(20 to 45) Hz (45 to 65) Hz 65 Hz to 10 kHz (10 to 20) kHz (20 to 100) kHz	1.8 % + 6 mV 0.36 % + 2.5 mV 0.7 % + 2.5 mV 1.8 % + 4 mV 4.1 % + 4 mV	
(5 to 50) V	(20 to 45) Hz (45 to 65) Hz 65 Hz to 10 kHz (10 to 20) kHz (20 to 100) kHz	1.8 % + 0.06 V 0.37 % + 25 mV 0.47 % + 25 mV 0.81 % + 0.04 V 4.1 % + 0.04 V	
(50 to 500) V	(20 to 45) Hz (45 to 65) Hz 65 Hz to 10 kHz	1.8 % + 0.6 V 0.35 % + 0.25 V 0.47 % + 0.25 V	
(500 to 1000) V	(20 to 45) Hz (45 to 65) Hz 65 Hz to 10 kHz	1.8 % + 6.0 V 0.35 % + 2.5 V 0.47 % + 2.5 V	
(1 to 6) kV	(45 to 65) Hz	1.4 %	Fluke 80K-6 & DMM

Parameter/Range	Frequency	CMC ^{2, 8} (±)	Comments
AC Current ³ – Generate			
(29 to 330) µA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.3 % + 0.15 µA 0.15 % + 0.15 µA 0.15 % + 0.25 µA 0.48 % + 0.15 µA 1.5 % + 0.15 µA	Fluke 5500A
(0.33 to 3.3) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.24 % + 0.3 µA 0.12 % + 0.3 µA 0.12 % + 0.3 µA 0.24 % + 0.3 µA 0.72 % + 0.3 µA	
(3.3 to 33) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.24 % + 3 µA 0.12 % + 3 µA 0.11 % + 3 µA 0.24 % + 3 µA 0.72 % + 3 µA	
(33 to 330) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.24 % + 30 µA 0.12 % + 30 µA 0.11 % + 30 µA 0.24 % + 30 µA 0.72 % + 30 µA	
330 mA to 2.2 A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz	0.24 % + 300 µA 0.12 % + 300 µA 0.9 % + 300 µA	
(2.2 to 11) A	(45 to 65) Hz (65 to 500) Hz 500 Hz to 1 kHz	0.08 % + 2 mA 0.12 % + 2 mA 0.4 % + 2 mA	
AC Current – Measure ³			
(0 to 500) µA	45 Hz to 1 kHz	0.7 % + 0.2 µA	Fluke 287
(0.5 to 5) mA	45 Hz to 1 kHz	0.79 % + 0.5 µA	
(5 to 50) mA	45 Hz to 1 kHz	0.77 % + 0.02 mA	
(50 to 400) mA	45 Hz to 1 kHz	0.7 % + 0.05 mA	
(0.4 to 5) A	45 Hz to 1 kHz	0.93 % + 2 mA	
(5 to 10) A	45 Hz to 1 kHz	0.93 % + 5 mA	

Parameter/Range	Frequency	CMC ^{2, 8} (±)	Comments
Capacitance ³ – Generate			Fluke 5500A
(0.33 to 11) nF	(50 to 1000) Hz	1 % + 0.01 nF	
(11 to 110) nF	(50 to 1000) Hz	0.32 % + 0.1 nF	
(110 to 330) nF	(50 to 1000) Hz	0.32 % + 0.3 nF	
(0.33 to 1.1) μF	(50 to 1000) Hz	0.32 % + 1 nF	
(1.1 to 3.3) μF	(50 to 1000) Hz	0.43 % + 3 nF	
(3.3 to 11) μF	(50 to 400) Hz	0.44 % + 10 nF	
(11 to 33) μF	(50 to 400) Hz	0.5 % + 30 nF	
(33 to 110) μF	(50 to 200) Hz	0.63 % + 100 nF	
(110 to 330) μF	(50 to 100) Hz	0.86 % + 300 nF	
330 μF to 1.1 mF	(50 to 100) Hz	1.3 % + 300 nF	

Parameter/Equipment	Range	CMC ^{2, 8} (±)	Comments
Resistance ³ – Generate	(0 to 11) Ω (11 to 33) Ω (33 to 330) Ω 330 Ω to 3.3 kΩ (3.3 to 33) kΩ (33 to 110) kΩ (110 to 330) kΩ 330 kΩ to 3.3 MΩ (3.3 to 11) MΩ (11 to 33) MΩ (33 to 110) MΩ (110 to 330) MΩ	0.015 % + 0.008 Ω 0.015 % + 0.015 Ω 0.011 % + 0.015 Ω 0.011 % + 0.06 Ω 0.011 % + 0.6 Ω 0.014 % + 6 Ω 0.015 % + 6 Ω 0.019 % + 55 Ω 0.073 % + 550 Ω 0.12 % + 550 Ω 0.61 % + 5.5 kΩ 0.61 % + 17 kΩ	Fluke 5500A
Resistance – Measure ³	(0 to 50) Ω (50 to 500) Ω (500 to 5000) Ω (5 to 50) kΩ (50 to 500) kΩ 500 kΩ to 5 MΩ (5 to 30) MΩ (30 to 50) MΩ (50 to 100) MΩ	0.18 % + 0.02 Ω 0.058 % + 0.1 Ω 0.058 % + 0.2 Ω 0.058 % + 2 Ω 0.058 % + 20 Ω 0.18 % + 0.4 kΩ 1.8 % + 4 kΩ 1.8 % + 40 kΩ 3.5 % + 0.2 MΩ	Fluke 287

Parameter/Equipment	Range	CMC ^{2, 8} (±)	Comments
Electrical Calibration of RTDs ³⁻			
Generate	(-200 to 0) °C (0 to 400) °C (400 to 800) °C	0.2 °C 0.38 °C 0.52 °C	Beamex MC2-MF
Measure	(-200 to 0) °C (0 to 400) °C (400 to 800) °C	0.13 °C 0.26 °C 0.39 °C	
Electrical Simulation of Temperature Displays & Readouts ³ –			
Type E	(-250 to -100) °C (-100 to 650) °C (650 to 1000) °C	0.64 °C 0.38 °C 0.34 °C	Fluke 5500A
Type J	(-210 to -100) °C (-100 to 760) °C (760 to 1200) °C	0.4 °C 0.31 °C 0.36 °C	
Type K	(-200 to -100) °C (-100 to 1000) °C (1000 to 1372) °C	0.46 °C 0.39 °C 0.53 °C	
Type R	(0 to 250) °C (250 to 1000) °C (1000 to 1767) °C	0.72 °C 0.48 °C 0.53 °C	
Type S	(0 to 250) °C (250 to 1400) °C (1400 to 1767) °C	0.61 °C 0.5 °C 0.6 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 400) °C	0.79 °C 0.37 °C 0.3 °C	

Parameter/Equipment	Range	CMC ^{2, 8} (±)	Comments
Electrical Simulation of Thermocouples ³ –			
Type J	(-200 to 1200) °C	0.38 °C	Beamex MC2-MF
Type K	(-270 to 1372) °C	0.49 °C	
Type T	(-270 to 400) °C	0.38 °C	

IV. Fluid Quantities

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
Fume Hoods – Air Velocity Only ³	(20 to 200) ft/min	4.2 %	Anemometer

V. Mechanical

Parameter/Equipment	Range	CMC ^{2, 4, 7} (±)	Comments
Scales & Balances ³	(Up to 500) g	0.024 % + 0.6R	Class F weights (applied load)
	(500 to 20 000) g	0.017 % + 0.6R	
	(> 20 to 5000) kg	0.017 % per 20 000 g + 0.6R	
	Up to 1000 lb	0.017 % + 0.6R	Class E2 weights (applied load)
	(1000 to 120 000) lb	0.017 % per 20 000 lb + 0.6R	
	(Up to 5) mg	0.008 mg + 0.6R	
	(Up to 50) mg	0.015 mg + 0.6R	
	(Up to 500) mg	0.03 mg + 0.6R	
	(1 to 5) g	0.06 mg + 0.6R	
	(Up to 10) g	0.073 mg + 0.6R	
	(Up to 30) g	0.099 mg + 0.6R	
	(Up to 50) g	0.12 mg + 0.6R	
	(Up to 100) g	0.2 mg + 0.6R	
	(Up to 200) g	0.36 mg + 0.6R	
	(Up to 300) g	0.56 mg + 0.6R	

Parameter/Equipment	Range	CMC ^{2, 4, 7} (±)	Comments
Scales & Balances ³ (cont)	(Up to 500) g (Up to 1000) g (> 1000) g	0.97 mg + 0.6R 2 mg + 0.6R 2 mg per 1000 g + 0.6R	Class E2 weights (applied load)
Force – Measuring Equipment ³	Up to 100 lb	0.017 % + 0.6R	Class F weights
Torque – Measuring Equipment (Wrenches) ³	5 lbf-in to 600 lbf-ft	0.63 %	CDI Suretest 5000-ST
Pressure – Measuring Equipment ³	(0.01 to 300) psig (0 to 3000) psig (5 to 10 000) psig	0.063 % FS 0.065 % FS 0.065 % FS	Beamex MC2- IPM20C Druck DPI-3000 Druck DPI-10K
Atmospheric Pressure (Vacuum) – Measuring Equipment ³	(0.01 to 30) in-Hg	0.025 in-Hg	Beamex MC2-IPM2C

VI. Thermodynamics

Parameter/Equipment	Range	CMC ^{2, 7} (±)	Comments
Relative Humidity – Measure ³	(10 to 90) % RH	1.4 % RH	Vaisala M170 w/ HMP- 76
Temperature – Measure ³	(-196 to 420) °C	0.33 °C	Beamex w/ PRT

VII. Time & Frequency

Parameter/Equipment	Range	CMC ² (±)	Comments
Timers & Stopwatches ³	(1 to 3600) s	0.16 s	Stopwatch
Frequency – Measuring Equipment	0.01 Hz to 2 MHz	31 μHz/Hz + 15 mHz	Fluke 5500A

¹ This laboratory offers commercial calibration and field calibration services, where noted.

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 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, FS represents "Full Scale," and the value is defined as the percentage of reading, unless otherwise noted and R is the resolution of the unit under test.

⁵ In the statement of CMC, L is the numerical value of the nominal length of the device measured in inches.

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

⁷ 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.

⁸ 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

CROSS TECHNOLOGIES, INC. dba CROSS (FORMERLY J.A.KING)

La Vista, NE

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 the requirements of 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 7th day of September 2021.

A blue ink signature of a person, likely the Vice President of Accreditation Services, written over a horizontal line.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1741.09
Valid to September 30, 2023

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