



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

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CALIBRATION

Valid To: August 31, 2019

Certificate Number: 1741.15

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations¹:

I. Chemical

Parameter/Equipment	Range	CMC ² (±)	Comments
pH Meters – Measure ³	4 7 10	0.046 pH 0.033 pH 0.043 pH	Standard pH solutions
Conductivity Meters ³ Fixed Points	10 µS/cm 100 µS/cm 1000 µS/cm	0.77 µS/cm 2.3 µS/cm 5.3 µS/cm	Standard conductivity solutions

II. Dimensional

Parameter/Equipment	Range	CMC ^{2, 4, 5} (±)	Comments
Pin Gage ³ – Class ZZ	Up to 1.0 in	130 µin	Micrometer
Calipers ³	Up to 40 in	(4.5 + 9.9L) µin + 0.6R	Gage blocks
Micrometers ³	Up to 40 in	(4.5 + 9.9L) µin + 0.6R	Gage blocks
Linear Indicators ³ – Dial and Test	Up to 4 in	(3 + 9.4L) µin + 0.6R	Gage blocks

Parameter/Equipment	Range	CMC ^{2, 4, 5} (±)	Comments
Height Gages ³	Up to 48 in	$(53 + 8.9L) \mu\text{in} + 0.6R$	Gage blocks w/surface plate
Steel Rules ³	Up to 72 in	$(1.5 + 10L) \mu\text{in} + 0.6R$	Gage blocks
Tape Measures ³	(Up to 25) ft	$(1.5 + 10L) \mu\text{in} + 0.6R$	Gage blocks
Angle Indicators and Protractors ³	30°, 45°, 60°, 75°, 90°	0.03°	Angle block set
Feeler/Thickness Gages ³	Up to 1 in	130 μin	Micrometer
Surface Plates ³ – Grades AA, A, and B			
Repeatability/Local Flatness	0.002 in	40 μin	Repeat-o-meter
Flatness	Up to 60 <i>DL</i> in (>60 to 120) <i>DL</i> in	$(31 + 0.2DL) \mu\text{in}$ $(30 + 0.3DL) \mu\text{in}$	Federal level systems
Coating Thickness Gages ³ (Film, Ultrasonic)	Up to 60 mils	100 μin	Coating thickness standards

III. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
DC Voltage – Generate ³	(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

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments	
DC Voltage – Measure ³	(0 to 100) mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 1000) V	0.011 % 0.0057 % 0.0049 % 0.0062 % 0.0067 %	Agilent 34401A	
	(1 to 6) kV	1.3 %	Fluke 80K-6 & DMM	
DC Current – Generate ³	(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	
DC Current – Measure ³	(1 to 10) mA (10 to 100) mA 100 mA to 1 A	0.039 % 0.043 % 0.1 %	Agilent 34401A	
	1A to 10 A	0.37 % + 2 mA	Fluke 287	
AC Voltage – Generate ³	(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	

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
AC Voltage – Generate ³ (cont.)			
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	Fluke 5500A
(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	
(330 to 1000) V	45 Hz to 1 kHz (1 to 5) kHz 5 kHz to 10 kHz	0.07 % + 80 mV 0.25 % + 100 mV 0.25 % + 500 mV	
AC Voltage – Measure ³			
Up to 750V	10 Hz to 20kHz (20 to 50) kHz (50 to 100) kHz	0.12 % 0.21 % 0.82 %	Agilent 34401A
(1 to 6) kV	60 Hz	1.6 %	Fluke 80K-6 & DMM

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
AC Current – Generate ³			
(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 mA 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 1) A	10 Hz to 5 kHz	0.18 %	Agilent 34401A
(1 to 3) A	10 Hz to 5 kHz	0.26 %	Fluke 287
(3 to 10) A	45 Hz to 1 kHz	0.97 % + 5 mA	

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments	
Resistance – Generate ³	(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 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	0.017 % 0.014 % 0.014 % 0.014 % 0.014 % 0.05 % 0.98 %	Agilent 34401A	
Capacitance – Generate ³	(0.33 to 11) nF (11 to 110) nF (110 to 330) nF (0.33 to 1.1) μF (1.1 to 3.3) μF (3.3 to 11) μF (11 to 33) μF (33 to 110) μF (110 to 330) μF 330 μF to 1.1 mF	(50 to 1000) Hz (50 to 1000) Hz (50 to 1000) Hz (50 to 1000) Hz (50 to 1000) Hz (50 to 400) Hz (50 to 400) Hz (50 to 200) Hz (50 to 100) Hz (50 to 100) Hz	1 % + 0.01 nF 0.32 % + 0.1 nF 0.32 % + 0.3 nF 0.32 % + 1 nF 0.43 % + 3 nF 0.44 % + 10 nF 0.5 % + 30 nF 0.63 % + 100 nF 0.86 % + 300 nF 1.3 % + 300 nF	Fluke 5500A

Parameter/Equipment	Range	CMC ^{2, 6} (±)	Comments
Electrical Simulation of Temperature Displays and Readouts ³ –			
Type J	(-210 to -100) °C (-100 to 760) °C (760 to 1200) °C	0.4 °C 0.31 °C 0.36 °C	Fluke 5500A
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	
Electrical Calibration of RTD's ³			
Generate	(-200 to 0) °C (0 to 400) °C (400 to 800) °C	0.13 °C 0.25 °C 0.49 °C	Beamex MC2-MF
Measure	(-200 to 0) °C (0 to 400) °C (400 to 800) °C	0.37 °C 0.61 °C 0.97 °C	

IV. Mechanical

Parameter/Equipment	Range	CMC ^{2, 5, 6} (±)	Comments
Scales and Balances ³	(1 to 20 000) g (>20 to 5000) kg	0.017 % + 0.6R 0.017 % per 20 000 g + 0.6R	Class F weights (applied load)



Parameter/Equipment	Range	CMC ^{2, 5, 6} (±)	Comments
Scales and Balances ³ (cont)	Up to 1000 lbs (1000 to 120 000) lbs (1 to 5) g Up to 10 g Up to 30 g Up to 50 g Up to 100 g Up to 200 g Up to 300 g Up to 500 g Up to 1000 g Above 1000 g	0.017 % + 0.6R 0.017 % per 20 000 lb + 0.6R 0.043 mg + 0.6R 0.062 mg + 0.6R 0.092 mg + 0.6R 0.17 mg + 0.6R 0.31 mg + 0.6R 0.63 mg + 0.6R 0.93 mg + 0.6R 1.5 mg + 0.6R 3.1 mg + 0.6R 3.1 mg per 1000 g + 0.6R	ASTM class 1 weights
Force – Measure, Measuring Equipment ³	Up to 1000 lb	0.017 % + 0.6R	ASTM class F weights
Torque Wrenches ³	5 in·lbf to 250 ft·lbf	0.65 %	CDI Suretest 5000-ST
Pressure ³	(0.01 to 100) psig (0 to 1000) psig (0 to 2400) psig (0 to 10 000) psig	0.035 % FS 0.15 % FS 0.07 % FS 0.15 % FS	Fluke 2700G Fluke 2700G Beamex MC2 Fluke 2700G
Atmospheric Pressure (Vacuum) – Measure, Measuring Equipment ³	(0.01 to 24) in Hg	0.035 % FS	Fluke 2700G
Speed ³ – Optic/Non-contact: RPM Totalizer/Rate Meters	(6 to 100 000) rpm (2 to 3300) fpm	0.017 % 0.017 %	Monarch PLT200

V. Thermodynamics

Parameter/Equipment	Range	CMC ² (±)	Comments
Relative Humidity – Measure, Measuring Equipment ³	(10 to 90) % RH	1.2 % RH	Vaisala M170 w/ HMP- 76
Temperature – Measure ³	(-196 to 420) °C	0.34 °C	Beamex MC2 w/ PRT
Temperature – Direct ³	(-15 to 110) °C (50 to 350) °C	0.3 °C 0.75 °C	Fluke 9009

VI. Time and Frequency

Parameter/Equipment	Range	CMC ² (±)	Comments
Frequency – Measuring Equipment ³	0.01 Hz to 11.99 kHz 12kHz to 2 MHz	31 ppm + 1mHz 31 ppm + 15mHz	Fluke 5500A
Timers & Stopwatches ³	(1 to 3600) s	0.2 s	Stopwatch

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 and this laboratory meets A2LA R104 – *General Requirements: Accreditation of Field Testing and Field Calibration Laboratories* for these calibrations. 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 The measurands stated are generated with the Fluke 5500A series of instruments. This capability is

suitable for the calibration of the devices intended to measure the stated measurand in the ranges indicated. CMC is expressed as either a specific value that covers the full range or as a fraction or percentage of the reading plus a fixed floor specification.

- ⁵ The statement of Calibration and Measurement Capability, L is the numerical value of the nominal length of the device measured in inches, R is the numerical value of the resolution of the device in micro inches, D is the numerical value of the diagonal length of the device measured in inches and FS is the percentage of the Full Scale.
- ⁶ Unless otherwise noted, percentage refers to percent of reading.
- 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.



Accredited Laboratory

A2LA has accredited

J.A. KING & COMPANY, LLC

Olive Branch, MS

for technical competence in the field of

Calibration

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *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 8 January 2009).



Presented this 11th day of October 2017.

A handwritten signature in black ink, written over a horizontal line.

President and CEO
For the Accreditation Council
Certificate Number 1741.15
Valid to August 31, 2019
Revised October 18, 2018

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