SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017,
ANSI/NCSL Z540-1-1994

ELEMENT MATERIALS TECHNOLOGY HUNTSVILLE
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CALIBRATION

Valid To: December 31, 2025 Certificate Number: 214.42

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations[1, 9]:

I. Dimensional

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Micrometers & Depth Gages[3]	Up to 24 in	(60 + 5*L* + 0.6*R*) µin	Gage blocks
Calipers[3]	Up to 24 in	(95 + 5*L* + 0.6*R*) µin	Gage blocks
Height Gages[3]	Up to 24 in	(90 + 0.6*R*) µin	Gage blocks with surface plate
Dial Indicators[3]	Up to 2 in	(60 + 0.6*R*) µin	Gage blocks

II. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC[2, 5, 7] (±)	Comments
DC Voltage – Generate[3]	Up to 220 mV > 220 mV to 2.2 V (> 2.2 to 11) V (> 11 to 22) V (> 22 to 220) V (> 220 to 1100) V	10 µV/V + 0.4 µV 6 µV/V + 0.7 µV 4 µV/V + 2.5 µV 7 µV/V + 4.0 µV 6 µV/V + 40 µV 8 µV/V + 400 µV	Fluke 5730A
DC Voltage – Measure[3]	Up to 100 mV (0.1 to 1) V (1 to 10) V (10 to 100) V (100 to 1000) V	13 µV/V + 0.3 µV 13 µV/V + 0.3 µV 14 µV/V + 0.5 µV 14 µV/V + 40 µV 14 µV/V + 100 µV	Agilent 3458A opt 002
DC Current – Generate[3]	< 220 µA 220 µA to 2.2 mA (> 2.2 to 22) mA (> 22 to 220) mA > 220 mA to 2.2 A (20 to 120) A (0 to 1000) A	0.005 % + 6 nA 43 µA/A + 7 nA 45 µA/A + 40 nA 52 µA/A + 0.7 nA 0.01 % + 12 nA 0.02 % + 10 mA 1.7 % + 900 mA	Fluke 5730A Fluke 52120A Fluke 5500 50-turn coil, Fluke 5730A with Fluke 52120A
Clamp Meters			
DC Current – Measure[3]	10 µA to 10 mA (10 to 100) mA (0.1 to 1) A	31 µA/A + 0.05 µA 37 µA/A + 0.5 µA 0.012 % + 10 µA	Agilent 3458A opt 002

Parameter/Equipment	Range	CMC[2, 4, 5, 7] (±)	Comments
Resistance – Generate[3]			
Fixed Points	1 Ω 1.9 Ω 10 Ω 19 Ω 100 Ω 190 Ω 1 kΩ 1.9 kΩ 10 kΩ 19 kΩ 100 kΩ 190 kΩ 1 MΩ 1.9 MΩ 10 MΩ 19 MΩ 100 MΩ	100 μΩ/Ω 98 μΩ/Ω 24 μΩ/Ω 25 μΩ/Ω 11 μΩ/Ω 11 μΩ/Ω 9 μΩ/Ω 8 μΩ/Ω 8 μΩ/Ω 8 μΩ/Ω 10 μΩ/Ω 11 μΩ/Ω 15 μΩ/Ω 21 μΩ/Ω 42 μΩ/Ω 54 μΩ/Ω 0.02 %	Fluke 5730A
Variable	Up to 11 Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω 330 Ω to 1.1 kΩ (1.1 to 3.3) kΩ (3.3 to 11) kΩ (11 to 33) kΩ (33 to 110) kΩ (110 to 330) kΩ 330 kΩ 1.1 MΩ (1.1 to 3.3) MΩ (3.3 to 11) MΩ (11 to 33) MΩ (33 to 110) MΩ (110 to 330) MΩ (330 to 1100) MΩ	43 μΩ/Ω + 0.01 Ω 33 μΩ/Ω + 0.02 Ω 30 μΩ/Ω + 0.02 Ω 30 μΩ/Ω + 0.02 Ω 30 μΩ/Ω + 0.02 Ω 31 μΩ/Ω + 0.2 Ω 30 μΩ/Ω + 0.1 Ω 31 μΩ/Ω + 1 Ω 30 μΩ/Ω + 1 Ω 34 μΩ/Ω + 10 Ω 38 μΩ/Ω + 10 Ω 62 μΩ/Ω + 150 Ω 130 μΩ/Ω + 250 Ω 260 μΩ/Ω + 2.5 kΩ 510 μΩ/Ω + 3 kΩ 3.0 kμΩ/Ω + 100 kΩ 15 kμΩ/Ω + 500 kΩ	Fluke 5522A
Resistance – Measure[3]	(0.1 to 10) Ω (10 to 100) Ω 100 Ω to 1 kΩ (0.1 to 10) kΩ (10 to 100) kΩ (0.1 to 1) MΩ (1 to 10) MΩ (10 to 100) MΩ	24 μΩ/Ω + 50 μΩ 20 μΩ/Ω + 0.5 mΩ 13 μΩ/Ω + 0.5 mΩ 13 μΩ/Ω + 5 mΩ 13 μΩ/Ω + 50 mΩ 19 μΩ/Ω + 5 Ω 64 μΩ/Ω + 200 Ω 0.060 % + 1 kΩ	Agilent 3458A opt 002

Parameter/Equipment	Range	CMC[2] (±)	Comments
Electrical Simulation of Thermocouple Indicators[3] –			
Type J	(-210 to -140) °C (-140 to 760) °C	0.32 °C 0.32 °C	Xitron 2000
Type K	(-140 to 1372) °C	0.33 °C	
Type T	(-200 to 100) °C (100 to 400) °C	0.32 °C 0.32 °C	

Parameter/Range	Frequency	CMC[2, 7] (±)	Comments
AC Voltage – Generate[3]			
(0 to 2.2) mV	(10 to 40) Hz 20 Hz to 40 kHz (0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.03 % + 4 µV 0.03 % + 4 µV 0.02 % + 4 µV 0.03 % + 4 µV 0.06 % + 5 µV 0.11 % + 10 µV 0.15 % + 20 µV 0.28 % + 20 µV	Fluke 5730A
(2.2 to 22) mV	(10 to 20) Hz (20 to 40) Hz (0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.03 % + 4 µV 0.02 % + 4 µV 0.01 % + 4 µV 0.03 % + 4 µV 0.06 % + 5 µV 0.13 % + 10 µV 0.79 % + 20 µV 0.83 % + 20 µV	Fluke 5730A

Parameter/Range	Frequency	CMC[2, 7] (±)	Comments
AC Voltage – Generate[3] (cont)			
(22 to 220) mV	(10 to 20) Hz (20 to 40) Hz (0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.03 % + 12 µV 0.02 % + 7 µV 0.01 % + 7 µV 0.02 % + 7 µV 0.04 % + 17 µV 0.08 % + 20 µV 0.16 % + 25 µV 0.29 % + 45 µV	Fluke 5730A
(0.22 to 2.2) V	(10 to 20) Hz (20 to 40) Hz (0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.04 % + 40 µV 0.02 % + 15 µV 0.01 % + 8 µV 0.01 % + 10 µV 0.02 % + 30 µV 0.04 % + 80 µV 0.11 % + 200 µV 0.81 % + 300 µV	
(2.2 to 22) V	(10 to 20) Hz (20 to 40) Hz (0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.04 % + 400 µV 0.02 % + 150 µV 0.01 % + 50 µV 0.02 % + 100 µV 0.03 % + 200 µV 0.07 % + 600 µV 0.15 % + 2 mV 0.2 % + 3.2 mV	
(22 to 220) V	(10 to 20) Hz (20 to 40) Hz (0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.04 % + 4 mV 0.02 % + 1.5 mV 0.02 % + 0.6 mV 0.01 % + 1 mV 0.02 % + 2.5 mV 0.1 % + 16 mV 0.45 % + 40 mV 0.82 % + 80 mV	
(220 to 1100) V	(15 to 50) Hz (0.5 to 1) kHz	0.04 % + 16 mV 0.01 % + 3.5 mV	

Parameter/Range	Frequency	CMC[2, 5, 7] (±)	Comments
AC Voltage – Measure[3]			
Up to 10 mV	(40 to 100) Hz	0.02 % of reading + 0.03 % of range	Agilent 3458A opt 002
	(0.1 to 1) kHz	0.02 % of reading + 0.011 % of range	
	(1 to 20) kHz	0.02 % of reading + 0.011 % of range	
	(20 to 50) kHz	0.1 % of reading + 0.011 % of range	
	(50 to 100) kHz	0.6 % of reading + 0.011 % of range	
(10 to 100) V	(40 to 100) Hz	0.004 % of reading + 0.04 % of range	
	(0.1 to 1) kHz	0.009 % of reading + 0.02 % of range	
	(1 to 20) kHz	0.015 % of reading + 0.02 % of range	
	(20 to 50) kHz	0.031 % of reading + 0.02 % of range	
	(50 to 100) kHz	0.08 % of reading + 0.02 % of range	
100 V	(1 to 40) Hz	0.022 % of reading + 0.04 % of range	
	(0.04 to 1) kHz	0.021 % of reading + 0.02 % of range	
	(1 to 20) kHz	0.021 % of reading + 0.02 % of range	
	(20 to 50) kHz	0.036 % of reading + 0.02 % of range	
	(50 to 100) kHz	0.12 % of reading + 0.02 % of range	
1000 V	(40 to 100) Hz	0.04 % of reading + 0.04 % of range	
	(0.1 to 1) kHz	0.04 % of reading + 0.02 % of range	
	(1 to 20) kHz	0.06 % of reading + 0.02 % of range	

Parameter/Range	Frequency	CMC[2, 5, 7] (±)	Comments
AC Current – Generate[3]			
(10 to 220) µA	(10 to 200) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.02 % + 10 nA 0.02 % + 10 nA 0.02 % + 8 nA 0.04 % + 14 nA 0.04 % + 14 nA	Fluke 5730A
220 µA to 2.2 mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.04 % + 40 nA 0.02 % + 35 nA 0.02 % + 35 nA 0.03 % + 110 nA 0.13 % + 650 nA	
(2.2 to 22) mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.04 % + 400 nA 0.02 % + 350 nA 0.02 % + 350 nA 0.03 % + 550 nA 0.13 % + 5 µA	
(22 to 220) mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.04 % + 4 µA 0.02 % + 3.5 µA 0.02 % + 2.5 µA 0.03 % + 3.5 µA 0.13 % + 10 µA	
220 mA to 2.2 A	20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.03 % + 35 µA 0.05 % + 80 µA 0.71 % + 160 µA	
(10.5 to 20) A	10 Hz to 3 kHz (3 to 10) kHz	0.5 % + 6.9 mA 1.1 % + 23 mA	Fluke 5522A
Clamp Meters: (0 to 1000) A	(45 to 440) Hz	1.5 % + 100 mA	Fluke 5500 50-turn coil, Fluke 5730A with Fluke 52120A
AC Current – Measure[3]			
Up to 100 µA	(20 to 45) Hz 45 Hz to 1 kHz	0.16 % + 30 nA 0.06 % + 30 nA	Agilent 3458A opt 002
(1 to 100) mA	(20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz	0.15 % + 20 µA 0.06 % + 20 µA 0.03 % + 20 µA	
100 mA to 1 A	(20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz	0.16 % + 0.2 mA 0.08 % + 0.2 mA 0.1 % + 0.2 mA	

III. Mechanical

Parameter/Equipment	Range	CMC[2, 4, 8] (±)	Comments
Torque Wrenches[3] – Measure	(10 to 100) lbf·in (30 to 300) lbf·in (25 to 500) lbf·ft (500 to 2000) lbf·ft	1 % 2 % 1 % 2 %	Sturtevant Richmont system 5AC AKO TSD6000-3
Scales & Balances[3]	(100 to 200) g 200 g to 2 kg (2 to 10) kg (25 to 50) lb (50 to 100) lb (100 to 300) lb	2.2 mg 200 mg 1 g 0.014 lb 0.031 lb 0.071 lb	Verification with NIST S & ASTM Class 1 weights Verification with NIST Class F weights
Pressure Gauges & Transducers – Hydraulic Pneumatic	 (5 to 15 000) psig (-14.5 to 15) psig (-14.5 to 300) psig	 0.04 % 0.02 % of F.S. 0.016 % of F.S.	 Mansfield Green TQ150 GE Druck PACE6000
Acceleration – Measuring Equipment	(0.5 to 1) Hz (> 1 to 5) Hz (5 to 9) Hz (10 to 99) Hz 100 Hz (> 100 to 920) Hz 920 Hz to 5 kHz (> 5 to 10) kHz	1.2 % 1.1 % 2.3 % 1.6 % 1.2 % 1.4 % 1.8 % 2.3 %	Standard low frequency accelerometer. Data acquisition card w/ low frequency long stroke shaker Standard accelerometer Data acquisition card w/ air bearing shaker TMS9155C
Acceleration (Shock) – Measuring Equipment	(20 to 10 000) g	2.0 %	TMS9155C

IV. Thermodynamic

Parameter/Equipment	Range	CMC[2, 4, 5, 8] (±)	Comments
Relative Humidity – Measuring Equipment	(10 to 20) % RH (20 to 80) % RH (80 to 95) % RH	0.62 % RH 0.66 % RH 0.62 % RH	Thunder Scientific 2500
Temperature – Measuring Equipment			
Fixed Point	0 °C	0.02 °C	Hart Scientific 5699-S PRT & ice bath
Thermocouples –			
Type J Type K Type T	(0 to 400) °C (0 to 400) °C (0 to 400) °C	0.8 °C 0.8 °C 0.5 °C	Hart Scientific 5699-S PRT in dry block calibrator &/or Rosemount 910C oil bath & Agilent 3458A opt 002
RTDs			
Pt 385, 100 Ω	(0 to 400) °C	0.14 °C	Scientific 2560 black stack
Temperature – Measure[3]	(-200 to 600) °C	0.021 °C	Fluke 5699 SPRT

V. Time & Frequency

Parameter/Equipment	Frequency	CMC[2] (±)	Comments
Stopwatches	12 Hrs to 24 Hrs	0.34 sec/day	3325A generator & 5335A universal counter

[1] This laboratory offers commercial calibration services.

[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, percentages are percent of reading, unless otherwise indicated.

[5] Based on using the standard at the temperature the Agilent 3458A was calibrated (tcal ± 5°C) and an auto calibration (ACAL) was performed within the previous 24 hours (±1°C of ambient temperature). The CMC is expressed as either a specific value that covers the full range, a combination of the fraction of the reading/output plus a range specification, or as a combination of the fraction of the reading/output plus a fraction of the range specification. For factory traceability to NIST, add 5 µA/A additional error to AC/DC Current and 2 µV/V additional error for AC Voltage.

[6] In the statement of CMC, *L* represents the nominal length of the device in inches; *R* represents the resolution of the device in microinches.

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

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

Accredited Laboratory

A2LA has accredited

ELEMENT MATERIALS TECHNOLOGY HUNTSVILLE

Huntsville, AL

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 ANSI/NCSLZ540-1-1994 and 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 11th day of March 2024.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 214.42
Valid to December 31, ~~2024~~2025

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