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

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CALIBRATION

Valid To: January 31, 2023 Certificate Number: 1509.02

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, 4] (±)	Comments
Calipers[3]	Up to 24 in (24 to 48) in Up to 48 in (48 to 96) in	550 µin 1100 µin 99 µin 1500 µin	Gage blocks (field) Gage blocks (lab)
Dial and Test Indicators[3, 5]	Up to 3 in	99 µin	Gage blocks, ULM
Height Gages[3]	Up to 48 in	290 µin 100 µin	Gage blocks (field) Gage blocks (lab)
Length Standards	Up to 22 in	(43 + 1.5*L*) µin	ULM, gage blocks
Micrometers[3]	Up to 4 in (4 to 24) in Up to 4 in (4 to 24) in (24 to 48) in	93 µin 550 µin 19 µin 77 µin 99 µin	Gage blocks (field) Gage blocks (lab)

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Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Plain Ring Gages	(0.125 to 12) in	(22 + 1.5*L*) µin	ULM, gage blocks
Thread Plugs –			
Pitch Diameter	(0.040 to 4) in (4 to 12) in	(71 + 1.5*L*) µin (95 + 1.5*L*) µin	Three-wire method, direct measure
Major Diameter	(0.040 to 4) in (4 to 12) in	(19 + 1.5*L*) µin (35 + 1.5*L*) µin	Two-wire method, direct measure
Pitch Diameter (Taper)	(0.040 to 12) in	(77 + 1.5*L*) µin	
Surface Plates[3, 5]	Up to 107 in DL	(48 + 0.41*DL*) µin	Leveling system (*DL* is diagonal of the plate)
	(-0.002 to 0.002) in	31 µin	Repeat reading gage
Optical Comparators[3, 5]			
X-Axis	Up to 12 in	(250 + 91*L*) µin	Glass scale
Y-Axis	Up to 12 in	(250 + 91*L*) µin	
Angle	(0 to 90)°	0.029°	Angle blocks
Rulers[3, 5]	Up to 72 in	0.013 in	Standard ruler
Tape Measures[3, 5]	Up to 40 in Up to 100 ft	0.013 in 0.062 in	Standard ruler Standard tape
PI Tapes[3, 5]	Up to 72 in	910 µin	Gage blocks

II. Electrical/DC-Low Frequency

Parameter/Range	Frequency	CMC[2, 7, 8] (±)	Comments
AC Current – Measure[3, 5]			
Up to 1 A	60 Hz to 1 kHz	0.1 % + 0.4 mA	HP 34401
(1 to 3) A	60 Hz to 1 kHz	0.1 % + 1.8 mA	
AC Current – Generate[3, 5]			
(29 to 330) µA	45 Hz to 1 kHz	0.13 % + 0.1 µA	Fluke 5502A
330 µA to 3.3 mA		0.10 % + 0.15 µA	
(3.3 to 33) mA		0.07 % + 2 µA	
(33 to 330) mA		0.083 % + 20 µA	
(0.33 to 3) A		0.10 % + 100 µA	
(3 to 10) A		0.21 % + 2 mA	
(10 to 20) A		0.21 % + 5 mA	
(16 to 150) A	(45 to 440) Hz	1 % + 0.25 A	Using 50 turn coil
(150 to 1000) A		1 % + 0.9 A	
AC Voltage – Generate[3, 5]			
(32 to 320) mV	60 Hz to 3 kHz	0.041 % + 20 µV	Fluke 5502A
320 mV to 3.2 V		0.041 % + 200 µV	
(3.2 to 32) V		0.041 % + 2.0 mV	
(32 to 105) V		0.043 % + 6.3 mV	
(105 to 320) V	60 Hz to 1 kHz	0.066 % + 20 mV	
	(1 to 3) kHz	0.09 % + 20 mV	
(320 to 800) V	(60 to 100) Hz	0.079 % + 63 mV	
	(1 to 3) kHz	0.1 % + 63 mV	
AC Voltage – Measure[3, 5]			
Up to 100 mV	60 Hz to 3 kHz	0.069 % + 40 µV	HP 34401
(0.1 to 1) V		0.064 % + 300 µV	
(1 to 10) V		0.064 % + 3 mV	
(10 to 100) V		0.064 % + 30 mV	
(100 to 750) V		0.064 % + 230 mV	
Up to 10 kV		0.12 % + 100 mV	Vitrek 4700

Parameter/Equipment	Range	CMC[2, 6, 8] (±)	Comments
Capacitance – Generate[3, 5]			
Low	(0.5 to 4) nF (4 to 40) nF (40 to 400) nF 400 nF to 4 µF	0.61 % + 15 pF 0.6 % + 60 pF 0.61 % + 320 pF 0.8 % + 3.2 nF	Fluke 5502A
High	(4 to 40) µF (40 to 400) µF 400 µF to 4 mF (4 to 40) mF	1 % + 32 nF 1 % + 320 nF 1 % + 3.2 µF 2 % + 120 µF	
DC Current – Generate[3, 5]	(0 to 320) µA 320 µA to 3.2 mA (3.2 to 32) mA (32 to 320) mA 320 mA to 3.2 A (3.2 to 11) A (10 to 150) A (150 to 1000) A	0.014 % + 11 nA 0.014 % + 83 nA 0.014 % + 900 nA 0.016 % + 9.6 µA 0.06 % + 120 µA 0.057 % + 940 µA 0.5 % + 0.14 A 0.5 % + 0.5 A	Fluke 5502A Using 50 turn coil
DC Current – Measure[3, 5]	Up to 10 mA (10 to100) mA (0.1 to 1) A (1 to 3) A	0.076 % + 6 µA 0.05 % + 5 µA 0.1 % + 100 µA 0.14 % + 600 µA	HP 34401
DC Voltage – Generate[3, 5]	(0 to 320) mV 320 mV to 3.2 V (3.2 to 32) V (32 to 320) V (320 to 1050) V	0.0063 % + 4.2 µV 0.0062 % + 42 µV 0.0066 % + 420 µV 0.0069 % + 4.5 mV 0.0084 % + 20 mV	Fluke 5502A
DC Voltage – Measure[3, 5]	Up to 100 mV (0.1 to 1) V (1 to 10) V (10 to 100) V (100 to 1000) V Up to 10 kV	0.0054 % + 3.5 µV 0.0043 % + 7.0 µV 0.0036 % + 50 µV 0.0048 % + 600 µV 0.0047 % + 10 mV 0.041 % + 30 mV	HP 34401 Vitrek 4700

Parameter/Equipment	Range	CMC[2, 6, 7, 8] (±)	Comments
Electrical Calibration of Temperature Controllers[3, 5]	(-200 to 1371) °C	1.0 °C	Fluke 724 – J, K, T, E
Resistance – Generate[3, 5]	(0 to 40) Ω (40 to 400) Ω (0.4 to 4) kΩ (4 to 40) kΩ (40 to 400) kΩ (0.4 to 4) MΩ (4 to 40) MΩ (40 to 400) MΩ	0.11 % + 50 mΩ 0.051 % + 100 mΩ 0.037 % + 200 mΩ 0.052 % + 2 Ω 0.053 % + 20 Ω 0.049 % + 200 Ω 0.15 % + 2 kΩ 0.14 % + 40 kΩ	Fluke 5502A
Resistance – Measure[3, 5]	Up to 100 Ω (0.1 to 1) kΩ (1 to 10) kΩ (10 to 100) kΩ (0.1 to 1) MΩ (1 to 10) MΩ (10 to 100) MΩ	0.01 % + 4 mΩ 0.01 % + 10 mΩ 0.01 % + 100 mΩ 0.01 % + 1.0 Ω 0.01 % + 10 Ω 0.04 % + 100 Ω 0.8 % + 10 kΩ	HP 34401
RTD Simulation[3, 5] PT385, 100 Ω	(-200 to -100) °C (-100 to 100) °C (100 to 630) °C (630 to 850) °C	0.26 °C 0.17 °C 0.35 °C 0.53 °C	Fluke 5502A
Thermocouple Simulation[3, 5] Type E	(-250 to -200) °C (-200 to -100) °C (-100 to 100) °C (100 to 1000) °C	0.45 °C 0.23 °C 0.18 °C 0.22 °C	Fluke 5502A

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Thermocouple Simulation[3, 5] (cont)			
Type J	(-210 to -100) °C (-100 to 800) °C (800 to 1000) °C (1000 to 1200) °C	0.26 °C 0.20 °C 0.22 °C 0.24 °C	Fluke 5502A
Type K	(-250 to -200) °C (-200 to -100) °C (-100 to 100) °C (100 to 600) °C (600 to 1372) °C	0.57 °C 0.28 °C 0.20 °C 0.24 °C 0.28 °C	
Type T	(-250 to -200) °C (-200 to -100) °C (-100 to 0) °C (0 to 400) °C	0.59 °C 0.28 °C 0.23 °C 0.18 °C	
Welding Devices[3, 5]	(0 to 350) ADC (0 to 100) VDC (100 to 700) Feed Rate IPM	0.87 ADC 0.012 VDC 3.6 IPM	Load bank, current shunt, DMM

III. Mechanical

Parameter/Equipment	Range	CMC[2] (±)	Comments
Balances[3, 5]			
	(0 to 20) g (0 to 200) g	0.11 mg 0.69 mg	Class 1 weights
	(0 to 200) g (0 to 1000) g (0 to 5000) g	1.3 mg 6.6 mg 34 mg	Class 2 weights

Parameter/Equipment	Range	CMC[2, 10] (±)	Comments
Balances[3, 5] (cont)	(0 to 20) g (0 to 200) g (0 to 1000) g (0 to 5000) g (0 to 10 000) g (0 to 20 000) g	0.81 mg 4.8 mg 24 mg 130 mg 370 mg 460 mg	Class 4 weights
Force – Measuring Equipment[3, 5]			
Tension / Compression	(0 to 300) lbf	0.019 lbf	Class F weights
Compression	(100 to 1000) lbf (1000 to 10 000) lbf (10 000 to 50 000) lbf (10 000 to 100 000) lbf (50 000 to 500 000) lbf	0.26 % Indication 0.24 % Indication 0.33 % Indication 1.6 % Indication 0.4 % Indication	Load cells
Tension	(100 to 1000) lbf (1000 to 10 000) lbf (10 000 to 50 000) lbf	0.23 % Indication 0.23 % Indication 0.29 % Indication	
Optical Tachometer[3, 5]	200 FPM 3000 FPM 29 999 FPM	1.3 FPM 1.7 FPM 3.9 FPM	Calibrated strobe
Pressure Measuring Equipment – Gages, Transducers and Transmitters[3, 5]	(0 to 10 000) psig (0 to 300) psig (0 to 1000) psig (0 to 300) psig (0 to 50) psig (0 to 5) psig (0 to 10) inH_20	6.6 psig 0.25 psig 2.5 psig 0.090 psig 0.019 psig 0.012 psig 0.034 inH_20	Druck DPI 104 gages Druck DPI 620

Parameter/Equipment	Range	CMC[2, 10] (±)	Comments
Vacuum – Measuring Equipment[3, 5]	(0 to 15) psig	0.19 psig	Druck DPI 610
Scales[3, 5]	 (0 to 10) lb (0 to 20) lb (0 to 50) lb (0 to 100) lb (0 to 200) lb (0 to 500) lb (0 to 1000) lb (0 to 5000) lb (0 to 20 000) lb	 0.000 25 lb 0.000 25 lb 0.0063 lb 0.0063 lb 0.0064 lb 0.0064 lb 0.18 lb 0.19 lb 0.21 lb	Handbook 44 w/: Class 4 weights Class F weights
Torque Wrenches – Measure[3, 5]	(10 to 50) in·lbf (30 to 400) in·lbf (80 to 1000) in·lbf (240 to 3000) in·lbf	0.41 in·lbf 2.4 in·lbf 6.0 in·lbf 21 in·lbf	CDI
Rotational Speed – Measure[3, 5]	Contact: 200 RPM 3000 RPM 20 000 RPM Optical: 3000 RPM 30 000 RPM	 1.5 RPM 2.4 RPM 11 RPM 1.3 RPM 3.3 RPM	Shimpo DT-207LR
Indirect Verification of Rockwell Hardness Testers[3, 5]	HRB: Low Medium High HRC: Low Medium High	 1.0 HRB 0.65 HRB 0.49 HRB 0.45 HRC 0.36 HRC 0.37 HRC	Indirect verification
Indirect Verification of Brinell Hardness Testers[3, 5]	HBW 10/500: Low	 4.0 HBW	Indirect verification

Parameter/Equipment	Range	CMC[2] (±)	Comments
Indirect Verification of Brinell Hardness Testers (cont)[3, 5]	HBW 10/3000: High	4.8 HBW	Indirect verification

IV. Fluid Quantities

Parameter/Equipment	Range	CMC[2] (±)	Comments
Pipettes[3, 5]	(1 to 50) µL (50 to 100) µL (100 to 500) µL (500 to 1000) µL (1000 to 5000) µL (5000 to 10 000) µL	0.31 µL 0.6 µL 1.3 µL 2.2 µL 12 µL 18 µL	Gravimetric method

V. Thermodynamics

Parameter/Equipment	Range	CMC[2, 10] (±)	Comments
Temperature – Measuring Equipment[3, 5]	(50 to 400) °C	0.35 °C	Fluke 9144 in dry block
Temperature – Measuring Equipment	(-15 to 90) °C	0.35 °C	Fluke 9144 probe in wet bath (lab only)
Temperature – Measure[3, 5]	(-100 to 1370) °C (-148 to 2498) °F (-25 to 400) °C	1.2 °C 2.2 °F 0.098 °C	Fluke 724 w/ thermocouple 5609 PRT w/Fluke 9144
Infrared Measuring Equipment[3, 5]	(Amb + 10 to 400) °C	1.8 °C	Ametek ETC-400R $\varepsilon = 0.95, \lambda = (8 \text{ to } 14)$ µm
Humidity – Measure and Measuring Equipment[3, 5]	(10 to 90) % RH	3.4 % RH	Sensor Scientific B13-200

VI. Time & Frequency

Parameter/Equipment	Range	CMC[2, 10] (±)	Comments
Frequency – Measure	40 Hz to 300 kHz	0.014 % Indication	HP 34401
Timers and Stopwatches[3, 5]	Up to 24 hr	0.84 sec/24 hr	Reference timer

[1] This laboratory offers commercial calibration service 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 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, repeatability) 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, L is the numerical value of the nominal length of the device measured in inches.

[5] The CMC stated for calibrations performed in the laboratory is applicable for calibrations performed in the field.

[6] CMC for the Fluke 5502A is based on 1-year specifications within a temperature range of 23 °C ± 5 °C. Field calibrations will be performed within 23 °C ± 5 °C.

[7] CMC for the HP 34401 is based on 1-year specifications within a temperature range of 18 °C to 28 °C. Field calibrations will be performed within 18 °C to 28 °C, 30 % to 55 % humidity.

[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. CMC's 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.

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

[10] 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

ALDINGER COMPANY

Little Rock, AR

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/NCSL Z540-1-1994 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 17th day of November 2020.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1509.02
Valid to January 31, 2023
Revised December 22, 2022

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