



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

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CALIBRATION

Valid To: June 30, 2020

Certificate Number: 1509.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations^{1,11}:

I. Dimensional

Parameter/Equipment	Range	CMC ^{2, 4, 12} (\pm)	Comments
Calipers ^{3,5}	Up to 24 in (24 to 48) in	0.6R 1100 μ in	Gage blocks (field)
	Up to 48 in (48 to 96) in	0.6R 1500 μ in	Gage blocks (lab)
Dial and Test Indicators ^{3,5}	Up to 3 in	99 μ in	Gage blocks, ULM, SuperMic ¹⁰
Gage Blocks	Up to 1 in (2 to 4) in	(2.6 + 1.5L) μ in (4.1 + 1.5L) μ in	Master gage block set, Federal 130B-24 comparator
	(4 to 20) in	(6.7 + 1.9L) μ in	Maser gage block set, ULM
Height Gages ^{3,5}	Up to 36 in	0.6R	Gage blocks
Length Standards	Up to 18 in Up to 48 in	(37 + 1.5L) μ in (65 + 1.5L) μ in	ULM/SuperMic ¹⁰ , gage blocks

Parameter/Equipment	Range	CMC ^{2,4} (\pm)	Comments
Levels	Up to 0.0001 in	0.67 DIV	Surface plate, granite square
Micrometers ^{3,5}	Up to 4 in (4 to 24) in (24 to 48) in	33 μ in 0.6R 1100 μ in	Gage blocks (field)
	Up to 48 in (48 to 96) in	0.6R 1500 μ in	Gage blocks (lab)
Plain Ring Gages	(0.125 to 12) in	(22 + 1.5L) μ in	ULM, gage blocks
Protractors	(0 to 90) $^{\circ}$	0.049 $^{\circ}$	Surface plate, angle blocks
Thread Plugs – Pitch Diameter Major Diameter	(0.040 to 12) in (0.040 to 12) in	(69 + 1.5L) μ in (18 + 1.5L) μ in	Three-wire method, direct measure
Pitch Diameter (Taper)	(0.040 to 12) in	(75 + 1.5L) μ in	Two-wire method, direct measure
Thread Rings Pitch Diameter	Up to 3.125 in	250 μ in	Setting plug
Taper Thread Rings Pitch Diameter	Up to 3 in	120 μ in	Setting plug, standoff to master
Thread Wires	(4 to 80) TPI	(11 + 1.5L) μ in	Master thread wire set
Surface Plates ^{3,5}	(1.5 X 1.5) to (4 X 8) ft	31 μ in	Repeat reading gage
Indicator Stands	(Up to 12 X 12) in	45 μ in	Repeat reading gage, triangular gage block base
	(Up to 12 X 12) in	580 μ in	Indicator, triangular gage block base

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Optical Comparators ^{3,5} X-Axis Y-Axis Angle	Up to 12 in Up to 12 in (0 to 90)°	(250 + 91L) μin (250 + 91L) μin 0.029°	Glass scale Angle blocks
Rulers ^{3,5} Tape Measures ^{3,5} PI Tapes ^{3,5}	Up to 40 in Up to 40 in Up to 100 ft Up to 72 in	0.013 in 0.013 in 0.062 in 910 μin	Standard ruler Standard ruler Standard tape Gage blocks
Radius Gages	Up to 0.75 in	1300 μin	Optical comparator and overlay
Angle Gages	Up to 180°	0.044°	Optical comparator and vernier
Torque Arms	Up to 24 in Up to 48 in	0.0047 in 0.003 in	Height gage, test indicator Gage blocks

II. Electrical – DC/Low Frequency

Parameter/Range	Frequency	CMC ^{2,7,9,12} (±)	Comments
AC Current – Measure 1 A 3 A	60 Hz to 1 kHz	0.1 % + 0.4 mA 0.1 % + 1.8 mA	HP 34401

Parameter/Equipment	Range	CMC ^{2, 6, 7, 9, 12} (\pm)	Comments
Capacitance – Generate			
Low	(0.5 to 4) nF (4 to 40) nF (40 to 400) nF 400 nF to 4 μ F	0.61 % + 15 pF 0.6 % + 60 pF 0.61 % + 320 pF 0.8 % + 3.2 nF	Wavetek 9100
High	(4 to 40) μ F (40 to 400) μ F 400 μ F to 4 mF (4 to 40) mF	1 % + 32 nF 1 % + 320 nF 1 % + 3.2 μ F 2 % + 120 μ F	
DC Current – Generate	(0 to 320) μ A 320 μ A to 3.2 mA (3.2 to 32) mA (32 to 320) mA 320 mA to 3.2 A (3.2 to 11) A (3.2 to 32) A (32 to 100) A (100 to 160) A (160 to 520) A (520 to 1000) A	0.014 % + 11 nA 0.014 % + 83 nA 0.014 % + 900 nA 0.016 % + 9.6 μ A 0.06 % + 120 μ A 0.057 % + 940 μ A 0.19 % + 1.2 mA 0.072 % + 9.4 mA 0.068 % + 45 mA 0.056 % + 47 mA 0.055 % + 230 mA	Wavetek 9100 10 turn coil 50 turn coil
DC Current – Measure, Fixed Points	10 mA 100 mA 1 A 3 A	0.076 % + 6 μ A 0.05 % + 5 μ A 0.1 % + 100 μ A 0.14 % + 600 μ A	HP 34401
DC Voltage – Generate	(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 μ V 0.0062 % + 42 μ V 0.0066 % + 420 μ V 0.0069 % + 4.5 mV 0.0084 % + 20 mV	Wavetek 9100
DC Voltage – Measure, Fixed Points	100 mV 1 V 10 V 100 V 1000 V Up to 10 kV	0.0055 % + 3.5 μ V 0.0042 % + 7 μ V 0.0036 % + 50 μ V 0.0047 % + 600 μ V 0.0047 % + 10 mV 0.071 % + 30 mV	HP 34401 Vitretek 4700

Parameter/Equipment	Range	CMC ^{2, 6, 7, 9, 12} (\pm)	Comments
Electrical Calibration of Temperature Controllers ^{3, 5}	(-200 to 1371) °C	0.56 °C	Omega CL27
Resistance – Generate	(0 to 40) Ω (40 to 400) Ω (0.4 to 4) k Ω (4 to 40) k Ω (40 to 400) k Ω (0.4 to 4) M Ω (4 to 40) M Ω (40 to 400) M Ω	0.11 % + 50 m Ω 0.051 % + 100 m Ω 0.037 % + 200 m Ω 0.052 % + 2 Ω 0.053 % + 20 Ω 0.049 % + 200 Ω 0.15 % + 2 k Ω 0.14 % + 40 k Ω	Wavetek 9100
Resistance – Measure, Fixed Points	100 Ω 1 k Ω 10 k Ω 100 k Ω 1 M Ω 10 M Ω 100 M Ω	0.01 % + 4 m Ω 0.01 % + 10 m Ω 0.01 % + 100 m Ω 0.01 % + 1 Ω 0.01 % + 10 Ω 0.04 % + 100 Ω 0.8 % + 10 k Ω	HP 34401
RTD Simulation – 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	Wavetek 9100
Thermocouple Simulation – Type E Type J	(-250 to -200) °C (-200 to -100) °C (-100 to 100) °C (100 to 1000) °C (-210 to -100) °C (-100 to 800) °C (800 to 1000) °C (1000 to 1200) °C	0.45 °C 0.23 °C 0.18 °C 0.22 °C 0.26 °C 0.20 °C 0.22 °C 0.24 °C	Wavetek 9100



Parameter/Equipment	Range	CMC ^{2, 6, 9, 12} (±)	Comments
Thermocouple Simulation – (cont)			
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	Wavetek 9100
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	
Thermocouple – Measure			
Type E	(-270 to -100) °C (-100 to -25) °C (-25 to 650) °C (650 to 1000) °C	0.51 °C 0.21 °C 0.19 °C 0.23 °C	Martel 3001
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 760) °C (760 to 1200) °C	0.29 °C 0.23 °C 0.20 °C 0.25 °C	
Type K	(-270 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.34 °C 0.24 °C 0.29 °C 0.28 °C 0.41 °C	
Type T	(-270 to -150) °C (-150 to 0) °C (0 to 400) °C	0.64 °C 0.26 °C 0.19 °C	
Welding Devices	(0 to 350) Amps DC (0 to 100) Volts DC (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 ⁸	CMC ^{2, 12} (±)	Comments
Balances ^{3, 5}	(0 to 20) g (0 to 200) g (0 to 200) g (0 to 1000) g (0 to 5000) g (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	0.11 mg 0.69 mg 1.3 mg 6.6 mg 34 mg 0.81 mg 4.8 mg 24 mg 130 mg 370 mg 460 mg	Handbook 44: Class 1 weights Class 2 weights Class 4 weights
Force – Universal Testing Machines ^{3, 5} Tension/Compression Compression Tension	(0 to 100) lbf (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 (100 to 1000) lbf (1000 to 10 000) lbf (10 000 to 50 000) lbf	0.0064 lbf 0.26 % Indication 0.24 % Indication 0.33 % Indication 1.6 % Indication 0.4 % Indication 0.23 % Indication 0.23 % Indication 0.29 % Indication	Class F weights w/ load cells
Mass, Fixed Points	1 mg 2 mg 5 mg 10 mg 20 mg 30 mg 50 mg 100 mg 200 mg 300 mg 500 mg 1 g 2 g 5 g 10 g	2.2 µg 2.1 µg 2.9 µg 1.4 µg 1.5 µg 2.2 µg 1.6 µg 1.7 µg 1.6 µg 1.6 µg 2.1 µg 11 µg 3.3 µg 5.7 µg 7.2 µg	Modified double substitution



Parameter/Equipment	Range ⁸	CMC ^{2, 12} (±)	Comments
Mass, Fixed Points (cont)	20 g 50 g 100 g 200 g 500 g 1 kg 2 kg 5 kg	13 µg 11 µg 39 µg 140 µg 320 µg 390 µg 1.7 mg 2.6 mg	Modified double substitution
	10 kg 20 kg 0.8859 g (1/32 oz) 1.772 g (1/16 oz) 3.544 g (1/8 oz) 7.087 g (1/4 oz) 14.17 g (1/2 oz) 28.35 g (1 oz) 56.7 g (2 oz) 113.4 g (4 oz) 226.8 g (8 oz) 0.4536 g (0.001 lb) 0.9072 g (0.002 lb) 2.27 g (0.005 lb) 4.54 g (0.01 lb) 9.07 g (0.02 lb) 22.68 g (0.05 lb) 45.36 g (0.1 lb) 90.72 g (0.2 lb) 453.6 g (1 lb) 907.2 g (2 lb) 2267.96 g (5 lb) 4535.9 g (10 lb) 9071.8 g (20 lb) 22 679.62 g (50 lb) 45 359.237 g (100 lb) 90 718.475 g (200 lb) 226 796.185 g (500 lb) 453 592.37 g (1000 lb)	93 mg 94 mg 12 µg 94 µg 240 µg 170 µg 170 µg 370 µg 150 µg 740 µg 5.1 mg 130 µg 56 µg 26 µg 16 µg 56 µg 79 µg 37 µg 87 µg 3.8 mg 7.9 mg 8.3 mg 7.4 mg 94 mg 95 mg 0.43 g 0.43 g 0.45 g 0.47 g	Direct comparison
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



Parameter/Equipment	Range	CMC ^{2,9} (\pm)	Comments
Optical Tachometer ^{3,5}	200 FPM 3000 FPM 29 999 FPM	1.3 FPM 1.7 FPM 3.9 FPM	Calibrated strobe
Pressure Gages, Transducers and Transmitters ^{3,5}	(0 to 30 000) psig (0 to 10 000) psig (0 to 3000) psig (0 to 5000) psig (0 to 300) psig (0 to 2) in H ₂ O	43 psig 12 psig 3.8 psig 3.9 psig 0.18 psig 0.0026 in H ₂ O	Additel digital test gauge Crystal XP2 digital test gauge Druck/Martel transducer Dwyer hook gage
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: Class 4 weights Class F weights
Torque Wrenches ^{3,5}	(1 to 50) in·lbf (30 to 400) in·lbf (80 to 1000) in·lbf (240 to 3000) in·lbf (1200 to 6000) in·lbf (2400 to 12 000) in·lbf	0.17 in·lbf 1.8 in·lbf 5.1 in·lbf 21 in·lbf 23 in·lbf 58 in·lbf	CDI/Norbar torque calibrator Norbar torque calibrator
Torque Transducers	Up to 200 in·lbf Up to 1200 in·lbf Up to 12 000 in·lbf	0.10 % 0.091 % 0.10 %	Torque arm and weights

Parameter/Equipment	Range	CMC ² (±)	Comments
Vacuum Gauges ^{3,5}	(0 to 15) psig	0.03 psig	Druck DPI 610
Rotations Speed Measurement	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	Monarch PLT200

IV. Thermodynamic

Parameter/Equipment	Range	CMC ^{2, 12} (±)	Comments
Temperature – Measuring Equipment ^{3,5}	(30 to 300) °C (86 to 572) °F	0.09 °C 0.16 °F	Hart 1502A/5628 PRT in dry block
Temperature – Measuring Equipment	(-40 to 200) °C (-40 to 392) °F	0.061 °C 0.11 °F	Hart 1502A/5628 PRT in wet bath, in lab only
Temperature – Measure ^{3,5}	(-100 to 600) °C (-148 to 1112) °F (600 to 1200) °C (1112 to 2192) °F	0.64 °C 1.2 °F 1.1 °C 2.0 °F	Fluke 51 with thermocouple
IR Thermometer ^{3,5}	(-20 to 150) °C (Amb + 10 to 400) °C	0.33 °C 1.8 °C	Mikron M340 (lab only) Omega BB703
Humidity – Measure ^{3,5}	(10 to 90) % RH	3.0 % RH	Sensor Scientific B13-200

V. Time & Frequency

Parameter/Equipment	Range	CMC ^{2, 7, 12} (\pm)	Comments
Frequency – Measure	40 Hz to 300 kHz	0.014 % Indication	HP 34401
Timers and Stopwatches ^{3, 5}	< 1 hr ≥ 1 hr	0.14 s/24 hr 0.59 s/24 hr	Reference stopwatch

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 and R is the numerical value of the resolution of the device in microinches unless otherwise noted.

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

⁶ CMC for the Wavetek 9100A is based on 1-year specifications within a temperature range of $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$. Field calibrations will be performed within $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$.

⁷ CMC for the HP 34401 is based on 1-year specifications within a temperature range of $18\text{ }^{\circ}\text{C}$ to $28\text{ }^{\circ}\text{C}$. Field calibrations will be performed within $18\text{ }^{\circ}\text{C}$ to $28\text{ }^{\circ}\text{C}$, 30 % to 55 % humidity.

⁸ Where ranges are not specified, the CMC stated is for the cardinal points only.

⁹ In the statement of CMC, percentage (%) refers to percent of reading, unless otherwise noted.

¹⁰ "SuperMic" is a registered trade mark with a last listed owner of Pratt & Whitney Measurement Systems, Inc., Connecticut U.S.A.

¹¹ This scope meets A2LA's P112 Flexible Scope Policy.

¹² 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.

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Accredited Laboratory

A2LA has accredited

ALDINGER COMPANY

Dallas, TX

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 24th day of July 2018.

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President and CEO
For the Accreditation Council
Certificate Number 1509.01
Valid to June 30, 2020

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