CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

Washington Calibration, LLC
1725 West 3rd Street
Tempe, AZ 85281

Fulfills the requirements of

ISO/IEC 17025:2017

In the field of

CALIBRATION

This certificate is valid only when accompanied by a current scope of accreditation document.
The current scope of accreditation can be verified at www.anab.org.

Jason Stine, Vice President

Expiry Date: 02 February 2027

Certificate Number: L2152-1

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017.
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).

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

Washington Calibration, LLC

1725 West 3rd Street
Tempe, AZ 85281
Rey Feliz
480-820-0506

CALIBRATION

Valid to: **February 2, 2027** Certificate Number: **L2152-1**

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage – Source/Measure	(0 to 100) mV	0.007 mV	Measurement/Comparison to Martel M2000A Calibrator with HP 3458A 8.5 Digit Multimeter
Thermocouple Temperature Simulation Source and Measure	Type J (-300 to 0) °F (0 to 2 100) °F Type K (-300 to 0) °F (0 to 2 400) °F Type N (-430 to 0) °F (0 to 2 370) °F Type R (32 to 2 400) °F Type S (32 to 2 400) °F Type T (-300 to 0) °F (0 to 750) °F	 0.51 °F 0.27 °F 0.73 °F 0.44 °F 0.57 °F 0.47 °F 2.4 °F 2.4 °F 0.79 °F 0.38 °F	Measurement/Comparison to Martel M2000A Calibrator with HP 3458A 8.5 Digit Multimeter

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Thermocouple Temperature Simulation Controllers & Recorders [1]	Type J (-300 to 0) °F (0 to 2 100) °F Type K (-300 to 0) °F (0 to 2 400) °F Type N (-430 to 0) °F (0 to 2 370) °F Type R (32 to 2 400) °F Type S (32 to 2 400) °F Type T (-300 to 0) °F (0 to 750) °F	 0.90 °F 0.79 °F 1.1 °F 0.93 °F 1.0 °F 0.94 °F 2.8 °F 2.8 °F 1.1 °F 0.83 °F	Measurement/Comparison to PIE Thermocouple Calibrator

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) [2]	Reference Standard, Method, and/or Equipment
Gage Blocks	(0.01 to 4) in	(4.3 + 1*L*) µin	Comparison to Gage Blocks, Edmunds Gage Block Comparator
	(5 to 20) in	(10 + 1.3*L*) µin	
	(0.5 to 100) mm	(0.11 + 0.001*L*) µmm	Comparison to Grade 1 Gage Blocks, Labmaster
	(0.01 to 4) in	(6.6 + 0.83*L*) µin	
Height Masters	Up to 40 in	(39 + 1.3*L*) µin	Comparison to Reference Bar Gage Blocks
Length Standards	(0.05 to 10) in	(25 + 1.7*L*) µin	Measurement using Supermicrometer
	(11 to 60) in	(38 + 1.3*L*) µin	Comparison to Gage Blocks, Height Transfer Standards

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) [2]	Reference Standard, Method, and/or Equipment
Feeler Gages (Leaf-Style)	(0.001 to 0.5) in	28 µin	Measurement using Supermicrometer
Ring Gages	(0.125 to 11) in	(7.2 + 3.4*L*) µin	Comparison to Grade 1 Gage Blocks, Labmaster
Plain Plug & Pin Gages	(0 to 10) in	(20 + 2.4*L*) µin	Measurement using Supermicrometer
Pin Gages Class Z & ZZ	0 to 0.9 in	54 µin	Measurement using Laser Micrometer
Thread Plugs	Major Diameter (0.06 to 6) in Pitch Diameter (0.06 to 6) in	(23 + 11*L*) µin (81 + 6.4*L*) µin	Measurement using Supermicrometer Gage Blocks
Thread Measuring Wires	Unified 60° (4 to 80) TPI Acme 29° (1 to 20) TPI	28 µin	Measurement using Supermicrometer Gage Blocks
Caliper Masters	Up to 48 in	(39 + 1.3*L*) µin	Measurement using Gage Blocks Reference Bar
Surface Plates [1] Flatness Repeatability	Up to 14 ft x 14 ft ± 0.001 in	(16 + 0.87*X*) µin 31 µin	Measurement using Autocollimator Repeat-Gage
Surface Roughness Standards	(15 to 130) µin	4.5 µin	Measurement using Profilometer
2 Pt. Bore Gages	Up to 5 in	63 µin	Comparison to Supermicrometer
3 Pt. Bore Gages (0.000 1 Resolution) (0.000 2 Resolution) (0.000 5 Resolution)	Up to 5.5 in	73 µin 190 µin 290 µin	Comparison to Ring Gages
Calipers [1] (0.001 Resolution) (0.0005 Resolution)	(0 to 120) in (0 to 60) in	(580 + 0.2*L*) µin (290 + 0.3*L*) µin	Comparison to Gage Blocks

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) [2]	Reference Standard, Method, and/or Equipment
Indicators [1] (0.001 Resolution) (0.000 5 Resolution) (0.000 1 Resolution) (0.000 05 Resolution)	(0 to 4) in (0 to 2) in	580 µin 290 µin 63 µin 39 µin	Measurement using Supermicrometer
(0.000 02 Resolution)	(0 to 0.1) in	13 µin	Comparison to Gage Blocks
Supermicrometer [1] Linearity	(0 to 2) in	11 µin	Comparison to Gage Blocks
Micrometers, Outside [1] (0.001 Resolution) (0.000 1 Resolution)	(0 to 40) in	580 µin (58 + 1*L*) µin	Force Gage Optical Flats Gage Blocks Optical Flats
(0.000 05 Resolution)	(0.5 to 120) in	(29 + 1.9*L*) µin	Comparison to Gage Blocks
Micrometers, Inside [1] (0.001 Resolution)	(0.5 to 120) in	(580 + 0.6*L*) µin	Comparison to Gage Blocks
Micrometers, Depth [1] (0.001 Resolution) (0.000 1 Resolution) (0.000 05 Resolution)	(0 to 12) in	580 µin (71 + 0.6*L*) µin (46 + 1.1*L*) µin	Comparison to Gage Blocks Reference Bar Gage Blocks
Height Gages [1] (0.001 Resolution) (0.0005 Resolution)	(0 to 40) in	(580 + 0.2*L*) µin (290 + 0.3*L*) µin	
Profilometers	(0.1 µin Resolution) (1 µin Resolution)	3.1 µin 3.1 µin	Comparison to SRM Reference Patches
Steel Rules	(0 to 72) in	(280 + 3*L*) µin	Measurement using Optical Comparator
	(0 to 72) in	2 900 µin	Comparison to Standard Rule & Optical Loupe
Tape Measures	(0 to 40) ft	(2 900 + 0.28*L*) µin	Comparison to Standard Rule & Optical Loupe

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) [2]	Reference Standard, Method, and/or Equipment
Optical Comparators [1] Magnification	10X, 20X 31.25X, 50X, 62.5X, 100X	170 µin	Comparison to Precision Ball Standard Magnification Overlay
Linearity	(0 to 12) in	91 µin	Comparison to Stage Micrometer
Angularity and Squareness	0° to 360°	0.01°	Comparison to Steel Square

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Rockwell Hardness Testers [1]	HRA		Indirect Verification Method per ASTM E18
	< 70	0.33 HRA	
	≥ 70 and < 80	0.49 HRA	
	≥ 80	0.19 HRA	
	HRBW		
	< 60	0.40 HRBW	
	≥ 60 and < 88	0.51 HRBW	
	≥ 88	0.45 HRBW	
	HRC		
	< 35	0.41 HRC	
	≥ 35 and < 60	0.36 HRC	
	≥ 60	0.37 HRC	
	HREW		
	< 84	0.51 HREW	
	≥ 84 and < 93	0.26 HREW	
	≥ 93	0.53 HREW	
	HRFW		
	< 80	0.52 HRFW	
	≥ 80 and < 93	0.48 HRFW	
	≥ 93	0.50 HRFW	
	HRH		
	< 96	0.44 HRH	
	≥ 96	0.53 HRH	
	HR15N		
	< 78	0.52 HR15N	
	≥ 78 and < 90	0.46 HR15N	
	≥ 90	0.55 HR15N	

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Rockwell Hardness Testers [1]	HR30N < 55 ≥ 55 and < 77 ≥ 77 HR45N < 37 ≥ 37 and < 66 ≥ 66 HR15TW < 81 ≥ 81 and < 87 ≥ 87 HR30TW < 57 ≥ 57 and < 70 ≥ 70 HR15YW < 93 ≥ 93	 0.32 HR30N 0.31 HR30N 0.28 HR30N 0.71 HR45N 0.63 HR45N 0.26 HR45N 1.0 HR15TW 0.49 HR15TW 0.50 HR15TW 0.60 HR30TW 0.58 HR30TW 0.21 HR30TW 0.55 HR15YW 0.50 HR15YW	Indirect Verification Method per ASTM E18
Microhardness Testers Indirect Verification of Microhardness Testers [1] Knoop	 HK 300 grf HK 200 grf HK 100 grf	 24 HK 19 HK 19 HK	Indirect Verification Method per ASTM E384
Vickers	HV 500 grf HV 200 grf HV 100 grf	16 HV 19 HV 32 HV	

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Class F Weights	25 kg 10 kg 5 kg 3 kg 2 kg 1 kg 500 g 300 g 200 g 100 g 50 g 30 g 20 g 10 g 5 g 3 g 2 g 1 g 500 mg 300 mg 200 mg 100 mg 50 mg 30 mg 20 mg 10 mg 5 mg 3 mg 2 mg 1 mg	290 mg 130 mg 58 mg 35 mg 24 mg 13 mg 8.2 mg 6.7 mg 2.3 mg 1.2 mg 0.69 mg 0.52 mg 0.4 mg 0.29 mg 0.21 mg 0.17 mg 0.15 mg 0.12 mg 0.093 mg 0.081 mg 0.07 mg 0.058 mg 0.049 mg 0.044 mg 0.041 mg 0.035 mg 0.033 mg 0.029 mg 0.029 mg 0.029 mg	Double Substitution Method – Tolerances per NIST Handbook 105-1

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Class F Weights	50 lb	570 µlb	Double Substitution Method – Tolerances per NIST Handbook 105-1
	30 lb	330 µlb	
	25 lb	310 µlb	
	20 lb	330 µlb	
	10 lb	140 µlb	
	5 lb	62 µlb	
	3 lb	35 µlb	
	2 lb	31 µlb	
	1 lb	19 µlb	
	0.5 lb / 8 oz	6.6 µlb	
	0.3 lb	4.8 µlb	
	0.2 lb	3.5 µlb	
	0.1 lb	2.2 µlb	
	0.05 lb	1.4 µlb	
	0.03 lb	1.3 µlb	
	0.02 lb	0.99 µlb	
	0.01 lb	0.77 µlb	
	0.005 lb	0.072 µlb	
	0.003 lb	0.053 µlb	
	0.002 lb	0.037 µlb	
	0.001 lb	0.021 µlb	
	4 oz	44 µoz	
	2 oz	29 µoz	
	1 oz	28 µoz	
	0.5 oz	22 µoz	
	0.3 oz	19 µoz	
	0.25 oz	18 µoz	
	0.2 oz	16 µoz	
	0.125 oz	13 µoz	
	0.1 oz	9.5 µoz	
	0.062 5 oz	11 µoz	
	0.05 oz	9.2 µoz	
	0.031 25 oz	6 µoz	
	0.03 oz	8.1 µoz	
	0.015 oz	4.9 µoz	
	0.02 oz	3 µoz	
	0.01 oz	3 µoz	

Mass & Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) [2]	Reference Standard, Method, and/or Equipment
Torque Wrenches	(4 to 50) ozf·in (25 to 1 000) lbf·in (25 to 1 000) lbf·ft	0.2 ozf·in 0.007 6 + 0.003 3 lbf·in/lbf·in 0.36 + 0.002 9 lbf·ft/lbf·ft	Comparison to Torque Calibration System
Pneumatic Vacuum – Measuring Equipment	(-26 to 100) inHg	0.005 + 0.037 % of reading	Comparison to Mensor 2101Digital Pressure Gauge
Pneumatic Pressure – Measuring Equipment	(0 to 500) psig	0.059 psig	Comparison to Mensor Corp CPC6050 Modular Pressure Controller
Hydraulic Pressure – Measuring Equipment	(0 to 1500) psig	0.007 3 + 0.026 % of reading	Comparison to Fluke RPM4-E-DWT A100Me-L Electronic Deadweight Tester

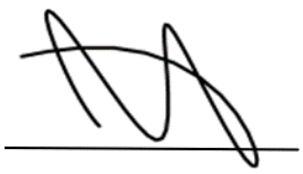
Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) [2]	Reference Standard, Method, and/or Equipment
Temperature Uniformity Survey [1]	(32 to 2 400) °F (0 to 1 316) °C	(2.5 + 0.004 5*F*) °F (1.4 + 0.004 5*C*) °C	Measurement using Multi-Channel Datalogger with Type K Thermocouple as Per AMS 2750G

Calibration and Measurement Capability (CMC) is expressed in terms of the measurement parameter, measurement range, expanded uncertainty of measurement and reference standard, method, and/or equipment. The expanded uncertainty of measurement is expressed as the standard uncertainty of the measurement multiplied by a coverage factor of 2 (k=2), corresponding to a confidence level of approximately 95%.

Notes:

1. On-site calibration service is available for this parameter, since on-site conditions are typically more variable than those in the laboratory, larger measurement uncertainties are expected on-site than what is reported on the accredited scope.
2. L = length in inches or mm where applicable, X = diagonal length in inches, F = temperature reading in Fahrenheit, C = temperature reading in Celsius.
3. This scope is formatted as part of a single document including Certificate of Accreditation No. L2152-1.



Jason Stine, Vice President