SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

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CALIBRATION

Valid To: January 31, 2023 Certificate Number: 1165.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations[1, 4, 7]:

I. Dimensional

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Gage Blocks –			Gage block comparison
Steel, Ceramic, Carbide, Chrome Carbide			
Length	(0.010 to 4) in	(2.3 + 1*L*) µin	
Parallelism		3 µin	
Steel Only:			
Length	(5 to 8) in	(3 + 1*L*) µin	
Parallelism		3 µin	
Length	(10 to 20) in	(10 + 2.7*L*) µin	
Parallelism		3 µin	
Angle Blocks	Up to 90°	3 in	Sine bar and gage blocks

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Plug Gages – Parallel			
Plain	(0.007 to 4) in	(11 + 7*L*) µin	ANSI B89.1.5, ULM with gage block
Plug Gages – Taper			
Diameter	Up to 6 in	60 µin	Taper measuring machine
Taper	Up to 6 in	90 µin	
Length / Step	Up to 6 in	150 µin	Gage block/MuCheck
Pin Gages/Set	Up to 1 in	20 µin	SuperMIC™, setting disc
Thread Measure Wire	Up to 80 TPI	4 µin	ANSI B891.17
Plain Ring Gages – Parallel	(0.04 to 6) in	(7 + 1.5*L*) µin	ANSI B89.1.6M
	(6 to 12) in	(15 + 1.5*L*) µin	ULM/master ring
Plain Ring Gages – Taper			
Inside Diameter	(0.125 to 4) in	65 µin	ULM – gage block
Inside Diameter	Up to 6 in	110 µin	By maser plug
Taper	(0.125 to 6) in	90 µin	By calculation
Length / Step	Up to 4 in	150 µin	Gage block/MuCheck
Micrometers –			
Outside[3]	Up to 36 in	(0.6*R* + 15*L*) µin	By comparison
ID Rod Type	Up to 24 in	(0.6*R* + 30 + 15*L*) µin	
High Resolution	Up to 4 in	10 µin	

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Depth Gages[3] – Dial, Digital, Micrometer Types	(1 to 24) in	(0.6*R* + 15 + 15*L*) µin	By comparison
Squares – Squareness	Length: Up to 18 in	25 µin/in	Square checker
Thread Plug Gages – Parallel			
Major Diameter	Up to 16 in	25 µin/in	ULM/gage blocks
Simple Pitch Diameter	Up to 4 in (>4 to 12) in	65 µin (85 + 7*L*) µin	3-wire method
Linear Pitch Variation	Up to 16 in	25 µin per 4 in	ULM
Flank Angle	Up to 180°	20 arcmin	Optical comparator
Thread Plug Gauge – Taper			
Major Diameter	Up to 6 in	65 µin	Taper measuring instrument
Simple Pitch Diameter	Up to 6 in	170 µin	2 wire/PD measuring
Standoff	Up to 6 in	170 µin	
Taper	Up to 6 in	130 µin	By calculation
Lead	Up to 6 in	25 µin per 4 in	
Flank Angle	Up to 180°	20 arcmin	
Step	Up to 4 in	150 µin	Gage block/MuCheck
Thread Ring Gages – Parallel Adjustable Type			
Functional Pitch Diameter	(0.06 to 12) in	(320 + 15*L*) µin	By comparison, fit to master plug
Flank Angle	(5 to 80)°	20 arcmin	By cast method
Minor Diameter	Up to12 in	70 µin	Bore micrometer/gage block & pins

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Thread Ring Gages – Parallel Non-Adjustable Type			
Simple Pitch Diameter	(0.5 to 6) in	120 µin	By comparison
Lead Variation	(0.5 to 2) in	25 µin per 4 in	
Flank Angle	(5 to 80)°	20 arcmin	By cast method
Minor Diameter	Up to 12 in	70 µin	Bore micrometer /gage block & pins
Thread Ring Gauge – Taper Non-Adjustable			
Simple Pitch Diameter	Up to 4 in	150 µin	ULM/plain ring
Standoff	Up to 6 in	250 µin	Master plug
Taper	Up to 4 in	150 µin	PD measurements
Step/Length	Up to 6 in	150 µin	Gage blocks/MuCheck
Thread Caliper Gauges – Adjustable			
Knife Edge	Up to 12 in	(420 + 5*L*) µin	Fit to master
Roller Type	Up to 12 in	(250 + 10*L*) µin	
Vernier, Dial, and Digital Calipers[3]	Up to 60 in	(0.6*R* + 15*L*) µin	By comparison
Flush Pins – Gages	Up to 6 in	200 µin	Electronic amp, probe, gage blocks
Step Masters	Up to 1 in (>1 to 24) in	20 µin (20 + 6.5*L*) µin	Electronic amp, probe, gage blocks

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Dial, Digital, and Test Indicators –	Up to 2 in	32 µin	ULM
High-Resolution/Digital High-Resolution/Analog	(0.001 to 0.05) in Up to 0.1 in	1.2 µin 5 µin	Gage blocks
Bore Gages			
2-Point	(0.5 to 24) in	(0.6*R* + 50) µin	By comparison
3-Point	Up to 6 in	(0.6*R* + 82 + 10*L*) µin	Plain setting ring
Length Standards – Setting Rods	(1 to 48) in	(13 + 7*L*) µin	By comparison
Surface Plates[3] –			
Local Area Flatness	Diagonal: Plates up to 20 ft	9 µin	Fed GGG-P-463c, local flatness variation up to 0.020 in
Overall Flatness	Up to 20 ft	(50 + 4*D*) µin	*D* is the length of the diagonal in feet
Optical Comparators[3] –			
Magnification	Up to 100x	800 µin	Opti-master, mag rule, angle blocks, balls
Linearity	Up to 18 in	200 µin	
Angle	Up to 360°	Angle: 2.7 arcmin	
High Resolution Comparators	Up to 2 in	1.5 µin	Master blocks
Height Masters[3]	Up to 24 in	(0.6*R* + 10*L*) µin	Gage blocks/MuCheck
Digital, Dial, and Vernier Height Gages[3]	Up to 48 in	(0.6*R* + 10*L*) µin	By comparison
Sine Bars and Plates	Up to 10 in	30 µin/5 in	By comparison

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Precision Levels	Up to 20 in	(0.6*R* + 5.5) µin	Level test rig
Autocollimator	5 in	0.31 arcsec	Gage blocks and sine equipment
Plain Snap Gages[3]	Up to 12 in	70 µin	By comparison
Steel Rules	Up to 24 in	0.003 in	Optical comparator
Protractors	Up to 180°	0° 5’	Angle Blocks

II. Dimensional Testing/Calibration[1]

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
One Dimensional Measurement[6] –			
Diameter	Up to 10 in	70 µin	Bench micrometer
Length	Up to 10 in	70 µin	Bench micrometer
Angle	Up to 180°	0° 3 arcmin	Optical comparator

III. Mechanical

Parameter/Equipment	Range	CMC[2] (±)	Comments
Indirect Verification of Rockwell Hardness Testers[3]	HRA: Low Medium High HRBW: Low Medium High HRC: Low Medium High HREW: Low Medium High HR15N: Low Medium High HR15TW: Low Medium High HR30N: Low Medium High HR30TW: Low Medium High	 0.67 HRA 0.63 HRA 0.63 HRA 0.60 HRBW 0.76 HRBW 0.49 HRBW 0.65 HRC 0.96 HRC 0.43 HRC 0.67 HREW 0.75 HREW 0.56 HREW 0.48 HR15N 0.94 HR15N 0.95 HR15N 0.61 HR15TW 0.47 HR15TW 0.57 HR15TW 0.49 HR30N 0.86 HR30N 0.40 HR30N 0.74 HR30TW 0.69 HR30TW 0.50 HR30TW	Indirect verification method per ASTM E18

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Indirect Verification of Rockwell Hardness Testers[3] – (cont)	HR45N: Low Medium High HR45TW: Low Medium High	 0.66 HR45N 0.81 HR45N 0.90 HR45N 1.1 HR45TW 0.73 HR45TW 0.59 HR45TW	Indirect verification method per ASTM E18
Torque Tools[3]	450 ft·lbf	1.6 % IV	Torque tester
Torque Testers	5500 in·lbf	0.33 % IV	Standard weights and arms
Force Gauges	Up to 250 lbf	0.1 % IV	By comparison with standard weights
Direct Verification of Durometers (Shore Types A, B, C, D, DO, M, O, and OO) –			ASTM D2240
Indenter Shape and Extension:			
Diameter	Up to 1 in	200 µin	Optical comparator
Radius	Up to 0.5 in	200 µin	
Angle	Up to 45°	0.8 arcmin	
Extension	Up to 0.1 in	200 µin	
Indenter Display	Up to 100 Duro	200 µin	Gage blocks
Spring Calibration – Force	Up to 100 Duro	1.8 % IV	Durocalibrator

[1] This laboratory offers commercial dimensional testing/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) 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] This laboratory offers metric equivalent capability for all items listed.

[5] In the statement of CMC, *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 microinches; *D* is the numerical value of the nominal diameter of the device measured in inches except where noted; IV is the indicated value.

[6] This laboratory meets *R205 – Specific Requirements: Calibration Laboratory Accreditation Program* for the types of dimensional tests listed above and is considered equivalent to that of a calibration.

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

Accredited Laboratory

A2LA has accredited

FRANK COX METROLOGY

Brampton, ON, CANADA

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 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 1st day of December 2020.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1165.01
Valid to January 31, 2023

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