SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017
& ANSI/NCSL Z540-1-1994 & ANSI/NCSL Z540.3-2006

MITUTOYO AMERICA CORPORATION
965 Corporate Blvd
Aurora, IL 60502
Aysegul Konu Phone: 888 648 8869

CALIBRATION

Valid To: May 31, 2022 Certificate Number: 0750.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations[1, 12]:

I. Dimensional

Parameter/Equipment	Range[4]	CMC[2, 5] (±)	Comments
Adjustable Parallels	Up to 3.00 in height Up to 75 mm height	40 µin 1.0 µm	Comparison to Mu-checker
Angle Gages	5º to 180º	2.2 arc min	Optical comparator
Angle Gage Blocks	Up to 90°	0.56 arc sec	CMM
Calipers[7]	Up to 12 in Up to 300 mm (12 to 80) in (300 to 2000) mm	(100 + 2.0*L*) µin (2.5 + 2.0*L*) µm (120 + 4.0*L*) µin (3.0 + 4.0*L*) µm	Comparison to gage blocks and a caliper checker
Check Masters/ Step Gages –	Up to 40 in Up to 1000 mm Up to 60 in Up to 1500 mm	(10 + 0.5*L*) µin (0.25 + 0.50*L*) µm (10 + 0.70*L*) µin (0.25 + 0.70*L*) µm	CMM
Circle Chart (Chart 009)	Up to 26 mm diameter	0.050 µm	Vision CMM

Parameter/Equipment	Range[4]	CMC[2, 5] (±)	Comments
Coordinate Measuring Machines (CMM) and Vision Instruments[3] –			
Length Accuracy	Up to 1000 mm	(0.11 + 0.13*L*) µm	Gage blocks[9]
	Up to 1000 mm	(0.25 + 0.50*L*) µm	Step gage[9]
	Up to 5 m	(0.71*L*) µm	He-Ne laser[9]
	Up to 300 mm (>300 to 1000) mm	(0.10 + 0.12*L*) µm (0.06 + 0.25*L*) µm	Linescale[10]
	Up to 150 mm	(0.060 + 0.67*L*) µm	Gage blocks[10]
Probe Performance	(10 to 51) mm	0.025 µm	Sphere[11]
	(2 to 4) mm	0.20 µm	Circle chart[10]
Squareness	Up to 600 mm	(0.076 + 0.70*L*) µm	Square[10]
Video Probe	(0.02 to 4) mm	0.50 µm	Pixel chart
Magnification Offset	0.5x to 30x	1.2 µm	Pixel chart
Coating Thickness Gage (Digi-Derm and Lamina Checker)	Up to 0.060 in thick Up to 1.5 mm thick	48 µin 1.2 µm	Comparison to master films
Cylindrical Plug Gage	Up to 6 in diameter Up to 152 mm diameter	(7.0 + 1.0*D*) µin (0.17 + 1.0*D*) µm	Linear measuring machine
Dial and Test Indicators	Up to 0.2 in Up to 5 mm Up to 4 in Up to 100 mm	25 µin 0.60 µm 210 µin 5.3 µm	Dial calibration tester
Dial Indicator Tester	Up to 0.2 in Up to 5 mm Up to 2 in Up to 50 mm	10 µin 0.25 µm 21 µin 0.53 µm	Comparison to gage blocks

Parameter/Equipment	Range[4]	CMC[2, 5] (±)	Comments
Diameter of Sphere	Up to 6 in Up to 152 mm	(6 + 1.0*D*) µin (0.15 + 1.0*D*) µm	Linear measuring machine
Diamond Hardness Indenters – Mean Cone Angle Mean Tip Radius Straightness of Diamond Cone	 120° 0.008 in or 0.2 mm	 15 arcsec 160 µin or 4.0 µm 16 µin or 0.40 µm	 ASTM E18, vision CMM
Digimatic Indicators[7]	Up to 2.4 in Up to 60 mm	(6.0 + 4.0*L*) µin (0.15 + 4.0*L*) µm	Comparison to gage blocks
Digital Protractor	0º to 90º	0.060º	Sine bar and gage blocks
Flatness	Up to 12 in diameter Up to 300 mm diameter Up to 16 in diameter Up to 400 mm diameter	2.0 µin 0.050 µm (0.90 + 0.30*D*) µin (0.023 + 0.30*D*) µm	Comparison to master optical flat under monochromatic light source Roundness tester
Films (Plastic)	Up to 0.250 in Up to 6 mm	20 µin 0.50 µm	Linear measuring machine

Parameter/Equipment	Range[4]	CMC[2, 5] (±)	Comments
Gage Blocks –			
Length	Up to 4 in Up to 100 mm (4 to 20) in (100 to 500) mm (20 to 40) in (500 to 1000) mm	(1.3 + 0.80*L*) µin (0.033 + 0.80*L*) µm (1.0 + 0.70*L*) µin (0.025 + 0.70*L*) µm (10 + 0.50*L*) µin (0.25 + 0.50*L*) µm	Comparison to master gage blocks CMM
Parallelism (Variation in Length)	Up to 4 in Up to 100 mm (4 to 20) in (100 to 500) mm (20 to 40) in (500 to 1000) mm	0.70 µin 0.017 µm 2.0 µin 0.050 µm 3.0 µin 0.080 µm	Comparison to master gage blocks
Central Length Difference[8]	Up to 2 in Up to 50 mm (2 to 4) in (50 to 100) mm	0.60 µin 0.015 µm 0.80 µin 0.020 µm	Comparison between gage block pairs
Height Gages[3, 7] (Including Heightmatic, QM-Height and Linear Height) –			
Length	Up to 24 in Up to 610 mm Up to 40 in Up to 1000 mm	(20 + 0.90*L*) µin (0.5 + 0.90*L*) µm (20 + 1.1*L*) µin (0.5 + 1.1*L*) µm	Step gage Comparison to height master step gage
Straightness	Up to 24 in Up to 610 mm	55 µin 1.4 µm	Comparison to master square
Perpendicularity	Up to 24 in Up to 610 mm	(30 + 1.5*L*) µin (0.77 + 1.5*L*) µm	Comparison to master square
Height Masters	Up to 40 in Up to 1000 mm	(3.0 + 2.0*L*) µin (0.076 + 2.0*L*) µm	Comparison to master gage blocks
I-Checker (Indicator Tester)	Up to 4 in Up to 100 mm	(4.0 + 3.0*L*) µin (0.10 + 3.0*L*) µm	Comparison to gage block

Parameter/Equipment	Range[4]	CMC[2, 5] (±)	Comments
Inside Diameter Measuring Instruments (Borematics, Holtest, and Bore Gages)[7]	Up to 12 in Up to 300 mm	(20 + 6.0*D*) µin (0.5 + 6.0*D*) µm	Comparison to ring gages
Laser Scan Micrometer	Up to 1 in Up to 25 mm Up to 2.5 in diameter Up to 63.5 mm diameter	17 µin 0.42 µm 38 µin 0.89 µm	Comparison to master pin gages
Length (of Dimensional Gages) –			
1D	Up to 40 in Up to 1000 mm Up to 16 in long Up to 410 mm	(10 + 0.50*L*) µin (0.25 + 0.50*L*) µm (10 + 0.60*L*) µin (0.25 + 0.60*L*) µm	CMM Vision CMM
2D	(36 x 40) in (900 x 1000) mm (16 x 16) in (400 x 400) mm	(15 + 1.5*L*) µin (0.38 + 1.5*L*) µm (20 + 2.2*L*) µin (0.5 + 2.2*L*) µm	CMM Vision CMM
3D	(36 x 40 x 24) in (900 x 1000 x 600) mm	(15 + 1.5*L*) µin (0.38 + 1.5*L*) µm	CMM
Length Standards/ Micrometer Standards – Flat End Spherical End	Up to 60 in Up to 1500 mm Up to 60 in Up to 1500 mm	(4.0 + 4.0*L*) µin (0.1 + 4.0*L*) µm (30 + 5.0*L*) µin (0.76 + 5.0*L*) µm	Comparison to gage blocks
Line Scales	Up to 16 in long Up to 410 mm	(10 + 0.60*L*) µin (0.25 + 0.60*L*) µm	Vision CMM
Linear Gage with Counter[7]	Up to 2.00 in Up to 50 mm	(6.0 + 4.0*L*) µin (0.15 + 4.0*L*) µm	Comparison to gage blocks

Parameter/Equipment	Range[4]	CMC[2, 5] (±)	Comments
Litematic	Up to 2 in Up to 50 mm	(4.0 + 5.0*L*) µin (0.10 to 5.0*L*) µm	Comparison to gage blocks
Micrometer Heads	Up to 2 in Up to 51 mm	32*L* µin 0.032*L* µm	Linear measuring machine
Micrometers[7] –			
Outside	Up to 1 in Up to 25 mm (1 to 40) in (25 to 1000) mm	4.0 µin 0.10 µm (6.0 + 2.0*L*) µin (0.15 + 2.0*L*) µm	Comparison to gage blocks
Inside	Up to 40 in Up to 1000 mm	(12 + 2.0*L*) µin (0.30 + 2.0*L*) µm	
Depth	Up to 12 in Up to 300 mm	(10 + 2.0*L*) µin (0.25 + 2.0*L*) µm	
Indicating and Snap	Up to 1 in Up to 25 mm (1 to 4) in (25 to 100) mm	4.0 µin 0.10 µm (6.0 + 2.0*L*) µin (0.15 + 2.0*L*) µm	
Microscope –			
Linearity (X and Y)	Stage up to (16 x 8) in Stage up to (400 x 200) mm	80 µin or 2.0 µm	Comparison to stage micrometer scale and angle reticle
Magnification	Up to 100x	80 µin or 2.0 µm	
Angular	Up to 360°	2.0 arc min	
Mu-Checker/Amplifier	Up to 0.05 in Up to 1.5 mm	8.0 µin 0.20 µm	Comparison to gage blocks

Parameter/Equipment	Range[4]	CMC[2, 5] (±)	Comments
Overlay Charts –			
Radius/Diameter	Up to 16 in diameter Up to 400 mm diameter	(85 + 8.0*D*) µin (2.2 + 8.0*D*) µm	Vision CMM
Angle	Up to 360°	25 arcsec	
Grid/Length	Up to 16 in Up to 400 mm	(85 + 8.0*L*) µin (2.2 + 8.0*L*) µm	
Parallel Bars	Up to 6 in width and height Up to 150 mm width and height	30 µin 0.76 µm	Comparison to Mu-checker
Parallelism (On Cylindrical Squares)	Up to 20.7 in height Up to 550 mm height	0.25 µin/in 0.25 µm/m	Roundness tester reversal method
Pin Gages	Up to 6 in diameter Up to 152 mm diameter	(6.5 + 1.0*D*) µin (0.16 + 1.0*D*) µm	Linear measuring machine
Pitch Micrometer Standard	(1 to 6) in (1 to 150) mm	(50 + 8.0*L*) µin (1.3 + 8.0*L*) µm	Linear measuring machine
Pixel Calibration Charts	Up to 0.16 in Up to 4 mm	(10 + 0.60*L*) µin (0.25 + 0.60*L*) µm	Vision CMM
Precision Levels	Up to 12 in Up to 305 mm	100 µin 2.5 µm	Sine bar and gage blocks
Precision Sine Plates –			
Parallelism Squareness Angular	Up to 10 in (250 mm)	32 µin or 0.80 µm 40 µin or 1.0 µm 6.4 arc sec	Comparison to gage and angle blocks
Precision Vise	Up to 6.00 in clamping Up to 150 mm clamping	72 µin 1.8 µm	Comparison to gage blocks, straightedge, and square master

Parameter/Equipment	Range[4]	CMC[2, 5] (±)	Comments
Protractor	Up to 360°	1.5 arc min	Optical comparator
Projectors[3, 7] –			
Squareness	Up to 150 mm	(0.5 + 2.3*L*) µm	Steel square
Length Accuracy	Up to 300 mm	(1.3 + 6.1*L*) µm	Glass scale
Magnification	0x to 50x	0.013 %	Glass scales
Stage Parallelism	Up to 300 mm	10 µm	
Screen Eccentricity	Up to 600 mm	10 µm	
Radius Gages	(0.01 to 1) in (0.25 to 25.4) mm	0.000 50 in 0.012 mm	Optical comparator
Reticles –			
Radius/Diameter	Up to 1 in diameter Up to 25 mm diameter	60 µin 1.5 µm	Vision CMM
Angle	Up to 360°	15 arcsec	
Grid/Length	Up to 1 in Up to 25 mm	60 µin 1.5 µm	
Ring Gages	(0.125 to 0.600) in (0.601 to 17.5) in (3.0 to 15) mm (15 to 445) mm	8.0 µin (6.0 + 1.0*D*) µin 0.20 µm (0.15 + 1.0*D*) µm	Linear measuring machine
Roundness –			
Normal Method	Up to 16 in diameter Up to 400 mm diameter	(0.80 + 0.60*H*) µin (0.02 + 0.60*H*) µm	Roundness tester
Reversal Method[8]	Up to 2 in diameter Up to 50 mm diameter	0.20 µin 0.0050 µm	
Riser Blocks	Up to 24 in height Up to 600 mm height	(3.0 + 2.0*H*) µin (0.076 + 2.0*H*) µm	Comparison to gage blocks

Parameter/Equipment	Range[4]	CMC[2, 5] (±)	Comments
Screw Pitch Gages (Leaf Type)	(4.0 to 84.0) TPI (0.25 to 7.0) mm	0.000 40 in 0.010 mm	Optical comparator
Screw Thread Anvils	60° and 55°	2.2 arc min	Optical comparator
Sine Bars	5 in 10 in 127 mm 254 mm	30 µin 48 µin 0.76 µm 1.2 µm	Linear measuring machine and gage blocks
Squares	Up to 24 in Up to 610 mm Up to 40 in Up to 1000 mm Up to 20.7 in tall Up to 550 mm tall	6.0 µin/in 0.0060 µm/mm (3.0 + 0.70*L*) µin (0.076 + 0.70*L*) µm 8 µin 0.20 µm	Comparison to master square CMM using reversal technique Cylindrical squares on roundness tester
Specialty Gages	(36 x 40 x 24) in (900 x 1000 x 600) mm (16 x 16) in (400 x 400) mm (16 x 20.7) in (400 x 550) mm	(15 + 1.5*L*) µin (0.38 + 1.5*L*) µm (20 + 2.2*L*) µin (0.5 + 2.2*L*) µm (0.8 + 0.60*H*) µin (0.02 + 0.60*H*) µm	CMM Vision CMM Roundness tester
Step Height Specimen	Up to 0.120 in height Up to 3 mm height	3.0 µin 0.076 µm	Gage block comparator

Parameter/Equipment	Range[4]	CMC[2, 5] (±)	Comments
Straightness	Normal Method:		
	Up to 21.7 in long Up to 550 mm long	8.0 µin 0.20 µm	Roundness tester
	Reversal Method:		
	Up to 21.7 in long Up to 550 mm long	1.0 µin 0.025 µm	
	Up to 40 in Up 1000 mm	2.0 µin 0.050 µm	CMM
Surface Finish and Form Measuring Instruments[3, 7] –			
Detector Accuracy	(-30 to 30) mm	(0.033 + 0.80*L*) µm	Gage blocks
Straightness	Up to 550 mm	0.025 µm	Straight edge
Radial Motion	(0 to 360)°	0.0050 µm	Precision sphere
Axial Motion	(0 to 360)°	0.0010 µm	Precision sphere
Parallelism	Up to 200 mm	0.13 µm/m	Cylindrical square
Squareness	Up to 100 mm	0.28 µm/m	Square reversal
Length	Up to 200 mm	(0.25 +1.2*L*) µm	Pitch gage
	Up to 200 mm	(0.71*L*) µm	He-Ne laser
Surface Finish	Up to 10 µm Up to 400 µin	0.035 µm 1.4 µin	Surface finish specimen
Surface Finish Specimen	Ra Up to 40 µin Ra Up to 1.0 µm	0.50 µin 0.013 µm	Surface finish tester
	Ra (40 to 500) µin Ra (1.0 to 12.7) µm	1.2 % of nominal value	
Surface Finish Spherical Surface	Ra Up to 400 µin Ra Up to 10 µm	3.0 µin 0.076 µm	Surface finish tester

Parameter/Equipment	Range[4]	CMC[2, 5] (±)	Comments
Tap and Drill Gage	Up to 0.500 in Up to 12.70 mm	360 µin 9.0 µm	Optical comparator
Thickness and Parallelism (Optical Parallels) –			
Thickness	Up to 2 in diameter and 1 in thickness	5.0 µin	Comparison to gage blocks
	Up to 50 mm diameter and 25 mm thickness	0.13 µm	
Parallelism	Up to 2 in diameter and 1 in thickness	3.0 µin	
	Up to 50 mm diameter and 25 mm thickness	0.075 µm	
Thickness Gages (Feeler Type)	(0.001 to 0.050) in (0.025 to 1.27) mm	45 µin 1.1 µm	Linear measuring machine
Thickness Measuring Gages (Digital)	Up to 2 in Up to 51 mm	300 µin 7.6 µm	Comparison to gage blocks
Thickness Measuring Gages (Dial)	Up to 2 in Up to 51 mm	300 µin 7.6 µm	Comparison to gage blocks
Thread Measuring Wires	(2 to 120) TPI (0.2 to 10.0 mm) Pitch	6.2 µin 0.16 µm	Linear measuring machine
	(1 to 20) TPI (ACME)	6.2 µin	
Ultrasonic Thickness Gage (Mu Gage)	Up to 20 in Up to 600 mm	(480 + 25L) µin (12 + 25L) µm	Comparison to gage blocks
V-Anvil Micrometers	Up to 2 in Up to 50 mm	(28 + 18L) µin (0.70 + 18L) µm	Comparison to pin gages
V-Blocks	Up to 4 in Up to 102 mm	64 µin 1.6 µm	Mu checker with lever head probe

Parameter/Equipment	Range[4]	CMC[2, 5] (±)	Comments
Wire Gages	Up to 36 in	0.000 50 in	Optical comparator
1-2-3 Blocks – Parallelism Squareness	(1 x 2 x 3) in	32 µin or 0.80 µm 40 µin or 1.0 µm	Mu-checker with lever head probe

II. Dimensional Testing[1]

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Geometric Measurements[6] –			
2D	(16 x 20.7) in (400 x 550) mm	0.20 µin 0.0050 µm	Roundness tester
	(16 x 16) in (400 x 400) mm	(20 +2.2*L*) µin (0.5 + 2.2*L*) µm	Vision CMM
3D	(16 x 20.7) in (400 x 550) mm	0.25 µin/in 0.25 µm/m	Roundness tester
	(36 x 40 x 24) in (900 x 1000 x 600) mm	(15 + 1.5*L*) µin (0.38 + 1.5*L*) µm	CMM
Surface Finish[6]	Ra Up to 40 µin Ra Up to 1.0 µm	0.50 µin 0.013 µm	Surface roughness tester
	Ra (40 to 500) µin Ra (1.0 to 12.7) µm	1.2 % of nominal value	

III. Mechanical

Parameter/Equipment	Range	CMC[2] (±)	Comments
Hardness Tester (Leeb Scale)	(500 to 900) HLD	18 HLD	ASTM A956
Hardness Test Blocks (Leeb Scale)	(500 to 900) HLD	20 HLD	ASTM A956
Durometer Tester Type A & D – Indenter Length Indenter Angle Indenter Radius Indenter Tip Diameter	Up to 100 Duro	0.40 Duro 240 µin or 6.0 µm 4.0 arc min 180 µin or 4.4 µm 400 µin or 10 µm	ASTM D2240 with Vision CMM
Durometer Test Blocks Type A & D	Up to 100 Duro	0.80 Duro	ASTM D2240
Indirect Verification of Rockwell and Rockwell Superficial Hardness Testers[3]	HRA: High Medium Low HRBW: High Medium Low HRC: High Medium Low HRD: High Medium Low	 0.20 HRA 0.22 HRA 0.24 HRA 0.43 HRBW 0.54 HRBW 0.66 HRBW 0.32 HRC 0.34 HRC 0.35 HRC 0.40 HRD 0.42 HRD 0.51 HRD	ASTM E18

Parameter/Equipment	Range	CMC[2] (±)	Comments
Indirect Verification of Rockwell and Rockwell Superficial Hardness Testers[3] (cont)	HR30N: High Medium Low HR30TW: High Medium High	 0.32 HR30N 0.36 HR30N 0.41 HR30N 0.34 HR30TW 0.42 HR30TW 0.50 HR30TW	ASTM E18
Indirect Verification of Vickers and Knoop Hardness Testers[3] – > 1 kgf ≤ 1 kgf	 Low Medium High Low Medium High Low Medium High	 0.12 HV 1.2 HV 2.4 HV 0.21 HV 1.8 HV 4.6 HV 0.5 HK 3.7 HK 7.5 HK	ASTM E92

[1] This laboratory offers commercial and field calibration and dimensional testing 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 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] Metric equivalencies for these ranges and associated CMCs are also available.

[5] In the statement of CMC, *L* is the length in inches/meters; *D* is the diameter in inches/meters; *H* is the

height in inches/meters and *R* is the resolution in µin/µm.

[6] This test is not equivalent to that of a calibration.

[7] Repeatability of the Unit Under Test has not been utilized in the calculation of the CMC value for this measurement parameter.

[8] The CMC claim is smaller than that of the expanded uncertainty claim for NIST as listed in the BIPM Key Comparison Database. A2LA has evaluated the laboratory's CMC claim and has verified this information to be correct and appropriate.

[9] Calibration method in accordance to ISO 10360-2:2001 or ISO 10360-2:2009.

[10] Calibration method in accordance to ISO 10360-7.

[11] Calibration method in accordance to ISO 10360-5.

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

Accredited Laboratory

A2LA has accredited

MITUTOYO AMERICA CORPORATION

Aurora, IL

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, ANSI/NCSL Z540.3-2006 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 20th day of February 2020.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 750.01
Valid to May 31, 2022
Revised August 30, 2021

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