



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005  
& ANSI/NCSL Z540-1-1994 & ANSI/NCSL Z540.3-2006

MITUTOYO AMERICA CORP. – CALIBRATION LABORATORY  
965 Corporate Blvd.  
Aurora, IL 60502  
Amosh Kumar Phone: 888 648 8869

CALIBRATION

Valid To: February 28, 2018

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<sup>1</sup>:

I. Dimensional

Parameter/Equipment	Range <sup>3</sup>	CMC <sup>2,4</sup> (±)	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	5° to 180°	2.2 arc min	Optical comparator
Angle Gage Blocks	Up to 90°	0.56 arc sec	CMM
Calipers <sup>7</sup>	Up to 12 in Up to 300 mm  (12 to 80) in (300 to 2000) mm	(100 + 2.0L) µin (2.5 + 0.002L) µm  (120 + 4.0L) µin (3.0 + 0.004L) 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 + 0.5L) µin (0.25 + 0.0005L) µm  (10 + 0.70L) µin (0.25 + 0.0007L) µm	CMM

Parameter/Equipment	Range <sup>3</sup>	CMC <sup>2,4</sup> (±)	Comments
Circular Flatness (Optical Flat) –  Normal Method	Up to 16 in diameter Up to 400 mm diameter	(0.90 + 0.30D) μin (0.023 + 0.0003D) μm	Roundness tester
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 + 1D) μin (0.17 + 0.001D) 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
Diameter of Sphere	Up to 6 in Up to 152 mm	(6 + 1D) μin (0.15 + 0.001D) 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 arc sec 160 μin or 4.0 μm 16 μin or 0.40 μm	ASTM E18-12, Vision CMM
Digimatic Indicators <sup>7</sup>	Up to 2.4 in Up to 60 mm	(6.0 + 4.0L) μin (0.15 + 0.004L) μm	Comparison to gage blocks

Parameter/Equipment	Range <sup>3</sup>	CMC <sup>2, 4</sup> ( $\pm$ )	Comments
Digital Protractor	0° to 90°	0.06°	Sine bar and gage blocks
Flatness	Up to 12 in diameter Up to 300 mm diameter	2.0 $\mu$ in 0.050 $\mu$ m	Comparison to master optical flat under monochromatic light source
Films (Plastic)	Up to 0.250 in Up to 6 mm	20 $\mu$ in 0.50 $\mu$ m	Linear measuring machine
Gage Blocks –  Length  Parallelism (Variation in Length)  Central Length Difference <sup>8</sup>	Up to 4 in Up to 100 mm (5 to 20) in (100 to 500) mm  Up to 4 in Up to 100 mm (4 to 20) in (100 to 500) mm  Up to 2 in Up to 50 mm  (2 to 4) in (50 to 100) mm	(1.3 + 0.80L) $\mu$ in (0.033 + 0.0008L) $\mu$ m (1.0 + 1.0L) $\mu$ in (0.025 + 0.001L) $\mu$ m  0.7 $\mu$ in 0.017 $\mu$ m 2.0 $\mu$ in 0.050 $\mu$ m  0.60 $\mu$ in 0.015 $\mu$ m  0.80 $\mu$ in 0.020 $\mu$ m	Comparison to master gage blocks  Comparison to master gage blocks  Comparison between gage block pairs
Height Gages <sup>7</sup>	Up to 40 in Up to 1000 mm	(4.0 + 6.0L) $\mu$ in (0.10 + 0.006L) $\mu$ m	Comparison to height master step gage
Height Masters	Up to 40 in Up to 1000 mm	(3.0 + 2.0L) $\mu$ in (0.076 + 0.002L) $\mu$ m	Comparison to master gage blocks
Heightmatic and Linear Height Gages	Up to 40 in Up to 1000 mm	(7.0 + 3.0L) $\mu$ in (0.18 + 0.003L) $\mu$ m	Comparison to gage blocks
I-Checker (Indicator Tester)	Up to 4 in Up to 100 mm	(4.0 + 3.0L) $\mu$ in (0.10 + 0.003L) $\mu$ m	Comparison to gage blocks

Parameter/Equipment	Range <sup>3</sup>	CMC <sup>2,4</sup> ( $\pm$ )	Comments
Inside Diameter Measuring Instruments (Boremetrics, Holtest, and Bore Gages) <sup>7</sup>	Up to 12 in Up to 300 mm	$(20 + 6.0D) \mu\text{in}$ $(0.5 + 0.006D) \mu\text{m}$	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 $\mu\text{in}$ 0.42 $\mu\text{m}$  38 $\mu\text{in}$ 0.89 $\mu\text{m}$	Comparison to master pin gages
Specialty Gages	(900 x 1000 x 600) mm (36 x 40 x 24) in  (16 x 13.8) in (400 x 350) mm	$(15 + 1.5L) \mu\text{in}$ $(0.38 + 0.0015L) \mu\text{m}$  0.2 $\mu\text{in}$ 0.005 $\mu\text{m}$	CMM  Roundness tester
Length (of Dimensional Gages) –  1D  2D  3D	Up to 40 in Up to 1000 mm  (36 x 40) in (900 x 1000) mm  (36 x 40 x 24) in (900 x 1000 x 600) mm	$(10 + 0.50L) \mu\text{in}$ $(0.25 + 0.0005L) \mu\text{m}$  $(15 + 1.5L) \mu\text{in}$ $(0.38 + 0.0015L) \mu\text{m}$  $(15 + 1.5L) \mu\text{in}$ $(0.38 + 0.0015L) \mu\text{m}$	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	$(4.0 + 4.0L) \mu\text{in}$ $(0.1 + 0.004L) \mu\text{m}$  $(30 + 5.0L) \mu\text{in}$ $(0.76 + 0.005L) \mu\text{m}$	Comparison to gage blocks
Line Scales	Up to 16 in long  Up to 410 mm	$(10 + 0.6L) \mu\text{in}$  $(0.25 + 0.0006L) \mu\text{m}$	Vision CMM

Parameter/Equipment	Range <sup>3</sup>	CMC <sup>2, 4</sup> ( $\pm$ )	Comments
Linear Gage with Counter <sup>7</sup>	Up to 2.00 in Up to 50 mm	(6.0 + 4.0L) $\mu$ in (0.15 + 0.004L) $\mu$ m	Comparison to gage blocks
Litematic	Up to 2 in Up to 50 mm	(4.0 + 5.0L) $\mu$ in (0.10 to 0.005L) $\mu$ m	Comparison to gage blocks
Micrometer Heads	Up to 2 in Up to 51 mm	32L $\mu$ in 0.032L $\mu$ m	Linear measuring machine
Micrometers <sup>7</sup> –			
Outside	Up to 1 in Up to 25 mm (1 to 40) in (25 to 1000) mm	8.0 $\mu$ in 0.20 $\mu$ m (2.0 + 6.0L) $\mu$ in (0.050 + 0.006L) $\mu$ m	Comparison to gage blocks
Inside	Up to 40 in Up to 1000 mm	(12 + 6.0L) $\mu$ in (0.30 + 0.006L) $\mu$ m	
Depth	Up to 12 in Up to 300 mm	(10 + 6.0L) $\mu$ in (0.25 + 0.006L) $\mu$ m	
Indicating and Snap	Up to 1 in Up to 25 mm  (1 to 4) in (25 to 100) mm	8.0 $\mu$ in 0.20 $\mu$ m  (2.0 + 6.0L) $\mu$ in (0.050 + 0.006L) $\mu$ m	
Microscope –			
Linearity (X and Y)	Stage up to (16 x 8) in Stage up to (400 x 200) mm	80 $\mu$ in or 2.0 $\mu$ m	Comparison to stage micrometer scale and angle reticle
Magnification	Up to 100X	80 $\mu$ in or 2.0 $\mu$ m	
Angular	Up to 360°	2.0 arc min	
Mu-Checker/Amplifier	Up to 0.05 in Up to 1.5 mm	8.0 $\mu$ in 0.20 $\mu$ m	Comparison to gage blocks

Parameter/Equipment	Range <sup>3</sup>	CMC <sup>2, 4</sup> ( $\pm$ )	Comments
Overlay Charts – Radius/Diameter Angle Grid/Length	Up to 16 in diameter Up to 400 mm diameter  Up to 360°  Up to 16 in Up to 400 mm	(85 + 8.0D) $\mu$ in (2.2 + 0.008D) $\mu$ m  25 arc sec  (85 + 8.0L) $\mu$ in (2.2 + 0.008D) $\mu$ m	Vision CMM
Parallel Bars	Up to 6 in width & height  Up to 150 mm width & height	30 $\mu$ in  0.76 $\mu$ m	Comparison to Mu-checker
Parallelism (On Cylindrical Squares)	Up to 13.8 in height Up to 350 mm height	0.25 $\mu$ in/in 0.25 $\mu$ m/m	Roundness tester reversal method
Pin Gages	Up to 6 in diameter Up to 152 mm diameter	(6.5 + 1D) $\mu$ in (0.16 + 0.001D) $\mu$ m	Linear measuring machine
Pitch Micrometer Standard	(1 to 6) in (1 to 150) mm	(50 + 8.0L) $\mu$ in (1.3 + 0.008L) $\mu$ m	Linear measuring machine
Pixel Calibration Charts	Up to 0.16 in Up to 4 mm	(10 + 0.6L) $\mu$ in (0.25 + 0.0006L) $\mu$ m	Vision CMM
Precision Levels	Up to 12 in Up to 305 mm	100 $\mu$ in 2.5 $\mu$ m	Sine bar and gage blocks
Precision Sine Plates – Parallelism Squareness Angular	Up to 10 in (250 mm)	32 $\mu$ in or 0.80 $\mu$ m 40 $\mu$ in or 1.0 $\mu$ m 6.4 arc sec	Comparison to gage and angle blocks

Parameter/Equipment	Range <sup>3</sup>	CMC <sup>2,4</sup> ( $\pm$ )	Comments
Precision Vise	Up to 6.00 in clamping Up to 150 mm clamping	72 $\mu$ in 1.8 $\mu$ m	Comparison to gage blocks, straightedge, and square master
Protractor	Up to 90°	1.5 arc min	Comparison the angle blocks and optical comparator
Radius Gages	(0.01 to 1) in (0.25 to 25.4) mm	0.0005 in 0.012 mm	Optical comparator
Reticles – Radius/Diameter Angle Grid/Length	Up to 1 in diameter Up to 25 mm diameter Up to 360° Up to 1 in Up to 25 mm	60 $\mu$ in 1.5 $\mu$ m 15 arc sec 60 $\mu$ in 1.5 $\mu$ m	Vision CMM
Ring Gages	(0.125 to 0.600) in (0.601 to 17.5) in  (3.0 to 15) mm (15 to 445) mm	8 $\mu$ in (6 + 1.0D) $\mu$ in  0.20 $\mu$ m (0.15 + 0.001D) $\mu$ m	Linear measuring machine
Roundness – Normal Method Reversal Method <sup>8</sup>	Up to 16 in diameter Up to 400 mm diameter Up to 2 in diameter Up to 50 mm diameter	(0.80 + 0.60H) $\mu$ in (0.02 + 0.0006H) $\mu$ m 0.20 $\mu$ in 0.0050 $\mu$ m	Roundness tester
Riser Blocks	Up to 24 in height Up to 600 mm height	(3.0 + 2.0H) $\mu$ in (0.076 + 0.002H) $\mu$ m	Comparison to gage blocks

Parameter/Equipment	Range <sup>3</sup>	CMC <sup>2,4</sup> ( $\pm$ )	Comments
Screw Pitch Gages (Leaf Type)	(4.0 to 84.0) TPI (0.25 to 7.0) mm	0.00040 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 $\mu$ in 48 $\mu$ in  0.76 $\mu$ m 1.2 $\mu$ m	Linear measuring machine
Squares	Up to 24 in Up to 610 mm  Up to 40 in Up to 1000 mm  Up to 13.8 in tall Up to 350 mm tall	6.0 $\mu$ in/in 0.0060 $\mu$ m/mm  (3.0 + 0.70L) $\mu$ in (0.076 + 0.0007L) $\mu$ m  8 $\mu$ in 0.20 $\mu$ m	Comparison to master square  CMM using reversal technique  Cylindrical squares on roundness tester
Step Height Specimen	Up to 0.120 in height Up to 3 mm height	3.0 $\mu$ in 0.076 $\mu$ m	Gage block comparator
Straightness	Normal Method:  Up to 13.8 in long Up to 350 mm long  Reversal Method:  Up to 13.8 in long Up to 350 mm long  Up to 40 in Up 1000 mm	8.0 $\mu$ in 0.20 $\mu$ m  1.0 $\mu$ in 0.025 $\mu$ m  2.0 $\mu$ in 0.050 $\mu$ m	Roundness tester     CMM
Surface Finish Measuring Instrument	Up to 400 $\mu$ in Up to 10 $\mu$ m	2.1 $\mu$ in 0.053 $\mu$ m	Surface finish machine



Parameter/Equipment	Range <sup>3</sup>	CMC <sup>2, 4</sup> ( $\pm$ )	Comments
Surface Finish Specimen	Ra Up to 200 $\mu$ in Ra Up to 5.1 $\mu$ m	2.0 $\mu$ in 0.051 $\mu$ m	Surface finish tester
	Ra (200 to 500) $\mu$ in Ra (5.1 to 12.7) $\mu$ m	3.0 $\mu$ in 0.076 $\mu$ m	
Surface Finish Spherical Surface	Ra Up to 400 $\mu$ in Ra Up to 10 $\mu$ m	3.0 $\mu$ in 0.076 $\mu$ m	Surface finish tester
Tap & Drill Gage	Up to 0.500 in Up to 12.70 mm	460 $\mu$ in 12 $\mu$ m	Optical comparator
Thickness and Parallelism (Optical Parallels) –			
Thickness	Up to 2 in diameter and 1 in thickness	5.0 $\mu$ in	Comparison to gage blocks
	Up to 50 mm diameter and 25 mm thickness	0.13 $\mu$ m	
Parallelism	Up to 2 in diameter and 1 in thickness	3.0 $\mu$ in	
	Up to 50 mm diameter and 25 mm thickness	0.075 $\mu$ m	
Thickness Gages (Feeler Type)	(0.001 to 0.050) in (0.025 to 1.27) mm	45 $\mu$ in 1.1 $\mu$ m	Linear measuring machine
Thickness Measuring Gages (Digital)	Up to 2 in Up to 51 mm	300 $\mu$ in 7.6 $\mu$ m	Comparison to gage blocks
Thickness Measuring Gages (Dial)	Up to 2 in Up to 51 mm	300 $\mu$ in 7.6 $\mu$ m	Comparison to gage blocks

Parameter/Equipment	Range <sup>3</sup>	CMC <sup>2,4</sup> ( $\pm$ )	Comments
Thread Measuring Wires	(2 to 120) TPI (0.2 to 10.0 mm) Pitch  (1 to 20) TPI (ACME)	6.2 $\mu$ in 0.16 $\mu$ m  6.2 $\mu$ in	Linear measuring machine
Ultrasonic Thickness Gage (Mu Gage)	Up to 20 in Up to 600 mm	(480 + 25L) $\mu$ in (12 + 0.025L) $\mu$ m	Comparison to gage blocks
V-Anvil Micrometers	Up to 2 in Up to 50 mm	(28 + 18L) $\mu$ in (0.70 + 0.018L) $\mu$ m	Comparison to pin gages
V-Blocks	Up to 4 in Up to 102 mm	64 $\mu$ in 1.6 $\mu$ m	Mu checker with lever head probe & linear measuring machine
Wire Gages	Size: Up to 36 in	0.00050 in	Optical comparator
1-2-3 Blocks –  Parallelism Squareness	(1 x 2 x 3) in	32 $\mu$ in or 0.80 $\mu$ m 40 $\mu$ in or 1.0 $\mu$ m	Mu-checker with lever head probe

## II. Dimensional Testing<sup>1</sup>

Parameter/Equipment	Range	CMC <sup>2,4</sup> ( $\pm$ )	Comments
Geometric Measurements <sup>6</sup> –			
2D	(16 x 13.8) in (400 x 350) mm	0.20 $\mu$ in 0.005 $\mu$ m	Roundness tester
3D	(16 x 13.8) in (400 x 350) mm	0.25 $\mu$ in/in 0.25 $\mu$ m/m	Roundness tester
	(36 x 40 x 24) in (900 x 1000 x 600) mm	(15 + 1.5L) $\mu$ in (0.38 + 0.0015L) $\mu$ m	CMM

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Surface Finish <sup>6</sup>	Ra Up to 500 µin Ra Up to 12.5 µm	2.0 µin 0.05 µm	Surface roughness tester

### III. Mechanical

Parameter/Equipment	Range <sup>3</sup>	CMC <sup>2</sup> (±)	Comments
Hardness Tester (Leeb Scale)	(500 to 900) HLD	18 HLD	ASTM A956-06
Hardness Test Blocks (Leeb Scale)	(500 to 900) HLD	20 HLD	ASTM A956-06
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 D2240-05 (reapproved 2010)
Durometer Test Blocks Type A & D	Up to 100 Duro	0.80 Duro	ASTM D2240-05 (reapproved 2010)

### IV. Thermodynamic

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Temperature <sup>5</sup>	(0 to 21) °C	0.14 °C	By comparison

<sup>1</sup> This laboratory offers commercial calibration and dimensional testing services.

<sup>2</sup> 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.

<sup>3</sup> Metric equivalencies for these ranges and associated CMCs are also available.

<sup>4</sup> In the statement of CMC,  $L$  is the length in inches/millimeters;  $D$  is the diameter in inches/millimeters;  $H$  is the height in inches/millimeters and  $R$  is the resolution in  $\mu\text{in}/\mu\text{m}$ .

<sup>5</sup> For internal laboratory calibration only. Not available as a commercial calibration service.

<sup>6</sup> This test is not equivalent to that of a calibration.

<sup>7</sup> Repeatability of the Unit Under Test has not been utilized in the calculation of the CMC value for this measurement parameter.

<sup>8</sup> 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.



## Accredited Laboratory

A2LA has accredited

### MITUTOYO AMERICA CORP. – CALIBRATION LABORATORY

*Aurora, IL*

for technical competence in the field of

## Calibration

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets the requirements of ANSI/NCSLI Z540-1-1994 and the requirements of ANSI/NCSLI Z540.3-2006 and any additional program requirements in the field of calibration. 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 8 January 2009*).

Presented this 27<sup>th</sup> day of July 2016.

A handwritten signature in blue ink, appearing to read 'J. C. Bennett', is written over a horizontal line.

Senior Director of Quality & Communications  
For the Accreditation Council  
Certificate Number 750.01  
Valid to February 28, 2018



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