

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

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CALIBRATION

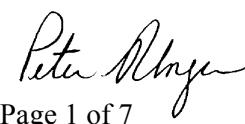
Valid To: June 30, 2012

Certificate Number: 2200.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations¹:

I. Dimensional

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Calipers	Up to 60 in	$(15 + 2L + 0.6R) \mu\text{in}$	Gage blocks and pins; IT/OIT 1002
Calipers ³	Up to 60 in	$(66 + 0.1L + 0.6R) \mu\text{in}$	Gage blocks and pins; IT/OIT 1002
Caliper and Depth Micrometer Masters	(0.001 to 6) in	$(84 + 6.4L) \mu\text{in}$	Gage blocks and comparator; IT1035
Gage Blocks	(0.005 to 4) in (> 4 to 13) in	$(3 + 1.5L) \mu\text{in}$ $(5 + 0.8L) \mu\text{in}$	P&W UMM with laser; IT 1060
Coordinate Measuring Machine ³ (CMM) – Linearity Squareness	(1 to 48) in	$(61 + 0.2L + 0.6R) \mu\text{in}$ $(69 + 0.6R) \mu\text{in}$	Verification of CMMs using gage blocks and granite squares; OIT 1049



Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Cylindrical Gages – Outside Diameter Inside Diameter – Up to XX XXX	(0.001 to 13) in (0.04 to 14) in (0.04 to 14) in	 (8 + 0.6D) μin (14 + 1.5D) μin (8.5 + 0.6D) μin	Up to class XXX using gage blocks and comparator; IT/OIT 1003 IT/OIT 1021 IT 1021
Cylindrical Gages ³ – Outside Diameter Inside Diameter – Up to XX	(0.001 to 9) in (0.04 to 9) in	 (62 + 0.3D) μin (63 + 10.3D) μin	Up to class XX using gage blocks and comparator; IT/OIT 1003 IT/OIT 1021
Glass Scales, Precision	(0.001 to 12) in	(72 + 0.02L) μin	Vision system; IT 1044
Height Gages	Up to 60 in	(54 + 6.7L + 0.6R) μin	Gage blocks, IT/OIT 1010
Height Gages ³	Up to 60 in	(180 + 0.2L + 0.6R) μin	Gage blocks, IT/OIT 1010
Indicators	(0.001 to 3) in	(62 + 1.2L + 0.6R) μin	Gage blocks with super micrometer IT/OIT 1007
Indicators ³	(0.001 to 3) in	(94 + 0.6R) μin	Gage blocks with super micrometer IT/OIT 1007
Length Standards	(0.001 to 6) in (> 6 to 34) in	(17 + 6L) μin (42 + 7.5L) μin	Gage blocks with amp and probe; IT 1012
Levels – Level Vial Setting	(2 to 24) in	66 μin	Surface plate and gage blocks; IT 1013

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Thread Micrometer Standards – Length Angle	Up to 5 in Up to 60°	62 μin 0.06° (3 minutes)	Vision System IT1039
Thread Micrometer Anvils – Cone & Vee Angles	29°, 60°	0.13°	Vision System IT1040
Microscopes/Reticles – Length	(0.001 to 4) in	(45 + 0.6R) μin	Glass standard; IT/OIT 1050
Microscopes/Reticles ³ – Length	(0.001 to 4) in	(120 + 0.6R) μin	Glass standard; IT/OIT 1050
Micrometers – Outside Depth Inside Bore/Holematic	Up to 24 in (0 to 12) in (0 to 12) in (0 to 9) in	(16 + 0.8L + 0.6R) μin (35 + 0.4L + 0.6R) μin (34 + 1.1L + 0.6R) μin (32 + 0.2D + 0.6R) μin	Gage blocks and spheres; IT/OIT 1017 IT/OIT 1006 IT/OIT 1011 IT/OIT 1011
Micrometers ³ – Outside Depth Inside Bore/Holematic	Up to 24 in (0 to 12) in (0 to 12) in (0 to 9) in	(63 + 0.3L + 0.6R) μin (67 + 2.7L + 0.6R) μin (69 + 0.6L + 0.6R) μin (66 + 2.1D + 0.6R) μin	Gage blocks and spheres; IT/OIT 1017 IT/OIT 1006 IT/OIT 1011 IT/OIT 1011
Optical Comparators & Vision Systems ³ – Linearity (X, Y)	(0.001 to 12) in	(56 + 0.6R) μin	Glass standard; OIT 1045
Pin Gages and Sets	(0.001 to 2) in	(20 + 0.5D) μin	Laser micrometer and master plugs or gage blocks and comparator; IT/OIT 1020

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Pin Gages and Sets ³	(0.001 to 2) in	(85 + 2.6D) μin	Laser micrometer and master plugs or gage blocks and comparator; IT/OIT 1020
Radius Gages	Up to 1 in	210 μin	Vision system IT1023
Plain Taper Gages – Outside Diameter Minimum Truncations B and BT Steps Inside Diameter	(0.05 to 6) in (0.2 to 3) in	(26 + 0.2D) μin (47 + 0.8D) μin 150 μin	Gage blocks, pins, master plugs and comparator IT 1031 IT 1032
Protractor – Bevel Digital	(0 to 90)° (0 to 90)°	0.05° + 0.6R 0.04° + 0.6R	Vision system or gage blocks and sine bar IT1022
Rules	Up to 24 in (> 24 to 72) in	(62 + 0.4L) μin (150 + 8.8L) μin	CMM or vision system IT 1024
Spheres	(0.04 to 2) in	(45 + 3.8D) μin	Gage blocks and super micrometer; IT 1036
Snap Gages – Plain Anvils Fixed or Adjustable Outside Diameter	(0.01 to 12) in	(12 + 0.7L) μin	Gage blocks and pins; IT/OIT 1057
Snap Gages ³ – Plain Anvils Fixed or Adjustable Outside Diameter	(0.01 to 12) in	(60 + 2.1L) μin	Gage blocks and pins; IT/OIT 1057

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
Straight Thread Gages – Outside Diameter – Pitch Diameter Major Diameter Pitch, Lead and Flank Angles Inside Diameter – Minor Diameter	(0.04 to 3) in (> 3 to 9) in (0.04 to 9) in (0.04 to 3) in	(46 + 8.4D) μin (41 + 9.7D) μin (44 + 0.3D) μin 220 μin (240 + 1D) μin	Thread wires, comparator & Supermic; IT/OIT 1033 IT 1034
Straight Thread Gages ³ – Outside Diameter Pitch Diameter Major Diameter	(0.04 to 3) in (> 3 to 9) in (0.04 to 9) in	(73 + 4.6D) μin (83 + 1.2D) μin (71 + 2.5D) μin	Thread wires, comparator & Supermic; IT/OIT 1033
Surface Finish – Gages Specimens	Ra/Ry Ra/Ry	(3.1 + 0.6R) μin 2.2 μin	Master pad and comparator; IT 1028 IT 1059
Granite Surface Plates ³ – Flatness	Up to 26 ft	(66 + 0.2DL) μin	Repeat-o-meter and autocollimator OIT 1048
Taper Thread Gages – Outside Diameter Length of Step and Size of Gage Plane Inside Diameter Ring Thickness and Standoff to Master Plug	(0.05 to 3) in (3 to 10) in (0.065 to 3) in	(64 + 5L) μin (72 + 2.4L) μin (230 + 1.6D) μin	Super micrometer; IT 1037 Master plugs; IT 1038

II. Dimensional Testing/Calibration⁵ – Fixtures and Gauging

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Length –			Vision systems
Single X Axis	Up to 12 in	(60 + 6.8L) μin	IT 1042
Single Y Axis	Up to 8 in	(63 + 3.7L) μin	
Single Z Axis	Up to 6 in	(60 + 8.4L) μin	
Dual Axis (X and Y)	Up to 12 in	(98 + 6.2L) μin	
X Axis Dimension	Up to 24 in	(130 + 6.6L) μin	CMM
Y Axis Dimension	Up to 36 in	(130 + 7.7L) μin	
Z Axis Dimension	Up to 24 in	(130 + 6.6L) μin	

III. Mechanical

Parameter/Equipment	Range	CMC ² (±)	Comments
Torque ³ –			
Wrenches	Up to 600 ft·lb Up to 3000 in·lb	0.35 % of reading 0.29 % of reading	Torque calibrator IT/OIT 1063
Handles/Screwdriver	Up to 120 in·lb	0.58 % of reading	
Indirect Verification of Rockwell and Rockwell Superficial Testers ³	HRB: Low Middle High HRC: Low Middle High HR15N: Low Middle High HR30N: Low Middle High	1.3 HRB 1.2 HRB 1.2 HRB 0.95 HRC 0.7 HRC 0.5 HRC 1.6 HR15N 1.3 HR15N 0.98 HR15N 1.3 HR30N 1.3 HR30N 0.96 HR30N	Indirect verification per ASTM E180; OIT 1047

Parameter/Equipment	Range	CMC ² (±)	Comments
Indirect Verification of Rockwell and Rockwell Superficial Testers ³ (cont)	HR15T: Low Middle High HR30T: Low Middle High	2 HR15T 1.4 HR15T 1.4 HR15T 2 HR30T 1.4 HR30T 1.4 HR30T	Indirect verification per ASTM E180; OIT 1047
Indirect Verification of Vickers Hardness Testers ³ – @ 500 gf	Up to 700 HV	24 HV	ASTM E-384-07; OIT 1066
Indirect Verification of Knoop Hardness Testers ³ – @ 500 gf	Up to 700 HK	23 HK	ASTM E-384-07; OIT 1066

¹ This laboratory offers commercial calibration service and field calibration service.

² Calibration and Measurement Capability (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. Calibration and Measurement Capabilities 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 In the statement of CMC, L is the numerical value of the nominal length of the device measured in inches; R is the resolution of the device under test; D is the numerical value of the nominal diameter of the device measured in inches; DL is the diagonal length of the unit under test in inches.

⁵ This laboratory meets R205 – *Specific Requirements: Calibration Laboratory Accreditation Program* for the types of dimensional calibrations listed above. Accredited test reports issued containing appropriate statements of measurement results, measurement uncertainty, and traceability are considered equivalent to a “calibration” certificate.



World Class Accreditation

The American Association for Laboratory Accreditation

Accredited Laboratory

A2LA has accredited

MASTER GAGE & TOOL CO.

Danville, VA

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/NCSL Z540-1-1994 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 22nd day of June 2010.



A handwritten signature in black ink, appearing to read "Peter Meyer", written over a horizontal line.

President & CEO
For the Accreditation Council
Certificate Number 2200.01
Valid to June 30, 2012

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