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

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CALIBRATION

Valid To: June 30, 2020 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 calibrations[1]:

I. Dimensional

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Calipers	Up to 60 in	(14 + 7.3*L* + 0.6*R*) µin	Gage blocks, ring gages and pins; IT 1002
Calipers[3]	Up to 60 in	(13 + 30*L* + 0.6*R)* µin	Gage blocks, ring gages and pins; OIT 1002
Caliper and Depth Micrometer Masters	(0.001 to 6) in	(88 + 2.2*L*) µin	Gage blocks, amp & probe; IT 1035
Gage Blocks	Up to 4 in (> 4 to 13) in	(3 + 1.5*L*) µin (5 + 0.8*L*) µin	Master gage blocks & P&W Universal Labmaster™; IT 1060
Coordinate Measuring Machine[3] (CMM) –			
X, Y, Z Axis Linear Accuracy	(1 to 48) in	(7 + 30*L* + 0.6*R*) µin	Verification of CMMs using gage blocks and granite squares; OIT 1049
Squareness	(1 to 48) in	(66 + 0.6*R*) µin	

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Cylindrical Gages –			
Plug: Outside Diameter –			
Up to XXX	(0.001 to 9) in (> 9 to 13) in	(6.4 + 3.5*D*) µin (8.4 + 0.6*D*) µin	Gage blocks and P&W Universal Labmaster™; IT 1003
Ring: Inside Diameter –			
Up to XX XXX	(0.04 to 14) in (0.04 to 14) in	(14 + 1.5*D*) µin (8.5 + 0.6*D*) µin	Class XXX Master rings or gage blocks and P&W Universal Labmaster™; IT 1021
Cylindrical Gages[3] –			
Plug: Outside Diameter – Up to XX	(0.001 to 9) in	(16 + 29*D*) µin	Gage blocks and P&W Used Serviceable Material™; OIT 1003
Ring: Inside Diameter – Up to XX	(0.04 to 9) in	(7 + 30*D*) µin	Master rings and P&W Used Serviceable Material™; OIT 1021
Glass Scales, Precision	(0.001 to 12) in	(63 + 4*L*) µin	Vision system; IT 1044
Height Gages	Up to 60 in	(54 + 6.7*L* + 0.6*R*) µin	Gage blocks; IT 1010
Height Gages[3]	Up to 60 in	(82 + 29*L* + 0.6*R*) µin	Gage blocks; OIT 1010
Indicators	Up to 4 in	(4 + 17*L* + 0.6*R*) µin	Indicator stand and grade 2 gage blocks IT 1007
Indicators[3]	Up to 4 in	(4 + 31*L* + 0.6*R*) µin	Indicator stand and grade 2 gage blocks OIT 1007

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Length Standards	(0.001 to 6) in	(20 + 2.1*L*) µin	Gage blocks with P&W Universal Labmaster™; IT 1012
	(> 6 to 34) in	(42 + 8*L*) µin	Gage blocks with amp and probe; IT 1012
Levels – Level Vial Setting	(2 to 24) in	130 µin	Surface plate and gage blocks; IT 1013
Thread Micrometer Standards –			
Length	Up to 5 in	73 µin	Vision system; IT 1039
Angle	Up to 60°	0.07° (4')	
Thread Micrometer Anvils –			
Cone & Vee Angles	29°, 60°	0.13°	Vision system; IT 1040
Micrometers –			Gage blocks and spheres;
Outside	Up to 24 in	(20 + 7*L* + 0.6*R*) µin	IT 1017
Depth	Up to 12 in	(31 + 5.8*L* + 0.6*R*) µin	IT 1006
Inside	Up to 12 in	(33 + 6.4*D* + 0.6*R*) µin	IT 1011
Bore/Holematic	Up to 9 in	(48 + 4.2*D* + 0.6*R*) µin	IT 1011
Micrometers[3] –			Gage blocks and spheres;
Outside	Up to 24 in	(10 + 30*L* + 0.6*R*) µin	OIT 1017
Depth	Up to 12 in	(17 + 30*L* + 0.6*R*) µin	OIT 1006
Inside	Up to 12 in	(20 + 29*L* + 0.6*R*) µin	OIT 1011
Bore/Holematic	Up to 9 in	(15 + 30*D* + 0.6*R*) µin	OIT 1011
Optical Comparators & Vision Systems[3] –			
X, Y, Z Axis Linear Accuracy	(0.001 to 12) in	(57 + 0.6*R*) µin	Glass standard; OIT 1045

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Microscopes/Reticles – Length	(0.001 to 4) in	(49 + 0.6*R*) µin	Glass standard; IT 1050
Microscopes/Reticles[3] – Length	(0.001 to 4) in	(98 + 0.6*R*) µin	Glass standard; OIT 1050
Pin Gages and Sets	(0.001 to 2) in	(26 + 2.4*D*) µin	Laser micrometer and master plugs or gage blocks and bench micrometer; IT 1020
Pin Gages and Sets[3]	(0.001 to 2) in	(34 + 25*D*) µin	Laser micrometer and master plugs or gage blocks and bench micrometer; OIT 1020
Radius Gages	Up to 1 in	200 µin	Vision system; IT 1023
Plain Taper Gages –			Gage blocks, pins, master plugs, bench micrometer & comparator;
Outside Diameter – Minimum Truncations: Length Steps	(0.05 to 6) in (0.2 to 3) in	(30 + 4.1*D*) µin (50 + 1.3*L*) µin	IT 1031
Inside Diameter – Minimum Truncations: Length Steps	(0.2 to 3) in	160 µin (50 + 1.3*L*) µin	IT 1032
Protractor –			
Bevel Digital	(0 to 90)° (0 to 90)°	0.06° + 0.6*R* 0.05° + 0.6*R*	Vision system or gage blocks and sine bar; IT 1022
Rules	Up to 24 in (> 24 to 72) in	(57 + 6*L*) µin (150 + 9*L*) µin	CMM or vision system IT 1024

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Spheres –			
Diameter and Sphericity	(0.04 to 2) in	(46 + 4*D*) µin	Gage blocks and bench micrometer; IT 1036
Snap Gages – Plain Anvils Fixed or Adjustable Outside Diameter	(0.01 to 12) in	(40 + 5*L*) µin	Gage blocks and pins; IT 1057
Snap Gages[3] – Plain Anvils Fixed or Adjustable Outside Diameter	(0.01 to 12) in	(32 + 28*L*) µin	Gage blocks and pins; OIT 1057
Straight Thread Gages –			Thread wires, optical comparator, gage blocks & Supermicrometer™;
Outside Diameter	(0.04 to 3) in	(42 + 8.8*D*) µin	IT 1033
Pitch Diameter	(> 3 to 9) in	(38 + 11*D*) µin	
Major Diameter	(0.04 to 9) in	(56 + 4.5*D*) µin	
Pitch, Lead, and Flank Angles		0.09° (6″)	
Inside Diameter: Minor Diameter	(0.04 to 3) in	(210 + 27*D*) µin	IT 1034
Straight Thread Gages[3] –			
Outside Diameter: Pitch Diameter	(0.04 to 3) in	(39 + 13*D*) µin	Thread wires, optical comparator, and Supermicrometer™; OIT 1033
	(> 3 to 9) in	(38 + 14*D*) µin	
Major Diameter	(0.04 to 9) in	(57 + 11*D*) µin	
Surface Finish –			Master pad and comparator;
Gages	Ra/Ry	(3.8 + 0.6*R*) µin	IT 1028
Specimens	Ra/Ry	3.4 µin	IT 1059

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Contour Measuring Instruments[3] –			
Surface finish	Ra/Ry	(3.8 + 0.6*R*) µin	Master surface finish pad per OIT 1028
Detector Displacement –			
Z Axis	(-30 to +30) mm	(0.22 + 0.01*L* + 0.6*R*) µm	Straight edge, gage blocks and pitch gage per OIT 1069
Straightness	Up to 200 mm	0.46 µm + 0.6*R*	
Length – X Axis	Up to 200 mm	(0.36 + 0.012*L* + 0.6*R*) µm	
Granite Surface Plates[3] –			
Total Flatness	Up to 26 ft	(60 + 0.2*D*) µin	Electronic levels OIT 1048
Local Flatness	Up to 0.002 in	28 µin	
Taper Thread Gages –			
Outside Diameter:			Micrometer Supermicrometer™; IT 1037
Length of Step and Size of Gage Plane	(0.05 to 3) in (3 to 10) in	(46 + 9.5*L*) µin (56 + 6.1*L*) µin	
Inside Diameter:			
Ring Thickness and Standoff to Master Plug	(0.065 to 3) in	(230 + 2*D*) µin (50 + 1.3*L*) µin	Master plugs, IT 1038
Thread Wires	All pitches, 60°	10 µin	P&W Universal Labmaster™, IT 1064
Bench Micrometers –			
Linearity	Up to 1 in	(25 + 0.6*R*) µin	Gage blocks, force gage, IT 1005
Force	Up to 40 oz	0.2 % of reading	

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Bench Micrometers[3] –			
Linearity	Up to 1 in	(25 + 0.6*R*) µin	Gage blocks, force gage;
Force	Up to 40 oz	0.2 % of reading	OIT 1005
Feeler Gages	Up to 0.2 in	48 µin	Bench micrometer; IT 1008
Feeler Gages[3]	Up to 0.2 in	51 µin	Bench micrometer; OIT 1008
Laser Bench Micrometer	Up to 2 in	(14 + 6.4*D* + 0.6*R*) µin	Gage pins; IT 1067
Laser Bench Micrometer[3]	Up to 2 in	(15 + 3.5*D* + 0.6*R*) µin	Gage pins; OIT 1067

II. Dimensional Testing/Calibration[1] – Fixtures and Gauging

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Length[5] – Workpieces and Gage Fixtures			IT 1042
1D (X Axis)	Up to 12 in	(60 + 6.8*L*) µin	Vision systems
1D (Y Axis)	Up to 8 in	(63 + 3.7*L*) µin	
1D (Z Axis)	Up to 6 in	(60 + 8.4*L*) µin	
2D (Axis X and Y)	Up to 12 in	(98 + 6.2*L*) µin	
3D	Up to (24 in x 36 in x 24 in)	(54 + 7.6*L*) µin	CMM

III. Mechanical

Parameter/Equipment	Range	CMC[2] (±)	Comments
Torque[3] –			
Wrenches	Up to 600 ft·lbf Up to 3000 in·lbf	0.36 % of reading 0.30 % of reading	Torque calibrator; IT/OIT 1063
Handles/Screwdriver	Up to 120 in·lbf	0.58 % of reading	
Indirect Verification of Vickers Hardness Testers[3]– Up to 1000 gf	50 gf 100 gf 300 gf 500 gf 1000 gf	38 HV 26 HV 14 HV 12 HV 9.8 HV	ASTM E-384; OIT 1066
Indirect Verification of Knoop Hardness Testers[3] – Up to 1000 gf	50 gf 100 gf 300 gf 500 gf 1000 gf	24 HK 17 HK 27 HK 14 HK 16 HK	ASTM E-384; OIT 1066
Indirect Verification of Brinell Hardness Testers[3] –			
HBW 10/500/(10 to 15) HBW 10/3000/(10 to 15) HBW 10/3000/(10 to 15)	(100 to 200) HBW (300 to 400) HBW (500 to 600) HBW	4.7 HBW 5.6 HBW 8.1 HBW	ASTM E10, E110; OIT 1047

Parameter/Equipment	Range	CMC[2] (±)	Comments
Indirect Verification of Rockwell and Rockwell Superficial Testers[3]	HRA: Low Medium High HRBW: Low Medium High HRC: Low Medium High HRD: Low Medium High HREW: Low Medium High HRFW: Low Medium High HRGW: Low Medium High HRHW: Low High HRKW: Low Medium High	 1.2 HRA 1.2 HRA 1.2 HRA 1.7 HRBW 1.7 HRBW 1.4 HRBW 0.98 HRC 0.8 HRC 0.6 HRC 1.2 HRD 1.2 HRD 0.64 HRD 1.3 HREW 1.3 HREW 1.3 HREW 1.3 HRFW 1.3 HRFW 1.3 HRFW 1.4 HRGW 1.6 HRGW 1.3 HRGW 1.3 HRHW 1.2 HRHW 1.5 HRKW 1.5 HRKW 1.4 HRKW	Indirect verification per method ASTM E18 with test blocks; OIT 1047

Parameter/Equipment	Range	CMC[2] (±)	Comments
Indirect Verification of Rockwell and Rockwell Superficial Testers[3] – (cont)	HR15N: Low Medium High HR30N: Low Medium High HR45N: Low Medium High HR15TW: Low Medium High HR30TW: Low Medium High HR45TW: Low Medium High HRRW	 1.6 HR15N 1.3 HR15N 0.98 HR15N 1.3 HR30N 1.3 HR30N 0.96 HR30N 1.3 HR45N 1.2 HR45N 0.8 HR45N 2 HR15TW 1.4 HR15TW 1.4 HR15TW 2 HR30TW 1.4 HR30TW 1.4 HR30TW 2.0 HR45TW 1.4 HR45TW 1.3 HR45TW 1.2 HRRW	Indirect verification per method ASTM E18 with test blocks; OIT 1047

[1] This laboratory offers commercial calibration service, field calibration service and dimensional/calibration 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 of 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 CMCs 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 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, or in mm for metric units; *R* is the resolution of the device under test in micro inches, or in micro meter for metric units; *D* is the numerical value of the nominal diameter of the device measured in inches.

[5] 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.

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 *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 24th day of April 2018.

President and CEO
For the Accreditation Council
Certificate Number 2200.01
Valid to June 30, 2020
Revised on July 12, 2018

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