



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

MASTER GAGE & TOOL CO.
 112 Maplewood Street
 Danville, VA 24540
 Sean Cobb Phone: 434 836 4243

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 calibrations¹:

I. Dimensional

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

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



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

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



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



Parameter/Equipment	Range	CMC ^{2,4} (\pm)	Comments
Contour Measuring Instruments ³ – Surface finish	Ra/Ry	$(3.8 + 0.6R) \mu\text{in}$	Master surface finish pad per OIT 1028
Detector Displacement – Z Axis Straightness Length – X Axis	(-30 to +30) mm Up to 200 mm Up to 200 mm	$(0.22 + 0.01L + 0.6R) \mu\text{m}$ $0.46 \mu\text{m} + 0.6R$ $(0.36 + 0.012L + 0.6R) \mu\text{m}$	Straight edge, gage blocks and pitch gage per OIT 1069
Granite Surface Plates ³ – Total Flatness Local Flatness	Up to 26 ft Up to 0.002 in	$(60 + 0.2D) \mu\text{in}$ 28 μin	Electronic levels 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	$(46 + 9.5L) \mu\text{in}$ $(56 + 6.1L) \mu\text{in}$ $(230 + 2D) \mu\text{in}$ $(50 + 1.3L) \mu\text{in}$	Micrometer Supermicrometer™; IT 1037 Master plugs, IT 1038
Thread Wires	All pitches, 60°	10 μin	P&W Universal Labmaster™, IT 1064
Bench Micrometers – Linearity Force	Up to 1 in Up to 40 oz	$(25 + 0.6R) \mu\text{in}$ 0.2 % of reading	Gage blocks, force gage, IT 1005



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

II. Dimensional Testing/Calibration¹ – Fixtures and Gauging

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

III. Mechanical

Parameter/Equipment	Range	CMC ² (±)	Comments
Torque ³ – Wrenches Handles/Screwdriver	Up to 600 ft·lbf Up to 3000 in·lbf Up to 120 in·lbf	0.36 % of reading 0.30 % of reading 0.58 % of reading	Torque calibrator; IT/OIT 1063
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:		Indirect verification per method ASTM E18 with test blocks; OIT 1047
	Low	1.2 HRA	
	Medium	1.2 HRA	
	High	1.2 HRA	
	HRBW:		
	Low	1.7 HRBW	
	Medium	1.7 HRBW	
	High	1.4 HRBW	
	HRC:		
	Low	0.98 HRC	
	Medium	0.8 HRC	
	High	0.6 HRC	
	HRD:		
	Low	1.2 HRD	
	Medium	1.2 HRD	
	High	0.64 HRD	
	HREW:		
	Low	1.3 HREW	
	Medium	1.3 HREW	
	High	1.3 HREW	
	HRFW:		
	Low	1.3 HRFW	
	Medium	1.3 HRFW	
	High	1.3 HRFW	
	HRGW:		
	Low	1.4 HRGW	
	Medium	1.6 HRGW	
	High	1.3 HRGW	
HRHW:			
Low	1.3 HRHW		
High	1.2 HRHW		
HRKW:			
Low	1.5 HRKW		
Medium	1.5 HRKW		
High	1.4 HRKW		



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

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.

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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/NCCL 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.

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President and CEO
For the Accreditation Council
Certificate Number 2200.01
Valid to June 30, 2020

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