



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

MASTER GAGE & TOOL CO.  
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CALIBRATION

Valid To: June 30, 2024

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<sup>1, 6</sup>:

I. Dimensional

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

| Parameter/Equipment  | Range   | CMC <sup>2, 4</sup> ( $\pm$ )   | Comments  |
|--|---|---|---|
| Cylindrical Gages –<br>Plug: Outside Diameter –<br>Up to XXX<br>Ring: Inside Diameter –<br>Up to XX<br>XXX | (0.001 to 9) in<br>(> 9 to 13) in<br><br>(0.04 to 14) in<br>(0.04 to 14) in | (6.4 + 3.5D) $\mu$ in<br>(8.4 + 0.6D) $\mu$ in<br><br>(14 + 1.5D) $\mu$ in<br>(8.5 + 0.6D) $\mu$ in | Gage blocks &<br>P&W Universal<br>Labmaster™; IT 1003<br><br>Class XXX Master rings<br>or gage blocks & P&W<br>Universal Labmaster™;<br>IT 1021 |
| Cylindrical Gages <sup>3</sup> –<br>Plug: Outside Diameter –<br>Up to X                                    | (0.001 to 9) in   | (16 + 29D) $\mu$ in   | Gage blocks &<br>P&W used serviceable<br>material™; OIT 1003  |
| Glass Scales, Precision  | (0.001 to 12) in  | (63 + 4L) $\mu$ in  | Vision system; IT 1044  |
| Height Gages   | Up to 60 in   | (54 + 6.7L + 0.6R) $\mu$ in   | Gage blocks; IT 1010  |
| Height Gages <sup>3</sup>  | Up to 60 in   | (82 + 29L + 0.6R) $\mu$ in  | Gage blocks; OIT 1010   |
| Indicators   | Up to 4 in  | (4 + 17L + 0.6R) $\mu$ in   | Indicator stand & grade<br>2 gage blocks<br>IT 1007   |
| Indicators <sup>3</sup>  | Up to 4 in  | (4 + 31L + 0.6R) $\mu$ in   | Indicator stand & grade<br>2 gage blocks<br>OIT 1007  |
| Length Standards   | (0.001 to 6) in<br><br>(> 6 to 34) in                                       | (20 + 2.1L) $\mu$ in<br><br>(42 + 8L) $\mu$ in  | Gage blocks with<br>P&W Universal<br>Labmaster™; IT 1012<br><br>Gage blocks with amp &<br>probe; IT 1012  |

| Parameter/Equipment   | Range   | CMC <sup>2, 4</sup> ( $\pm$ )  | Comments  |
|---|---|--|---|
| Levels – Level Vial Setting   | (2 to 24) in  | 130 $\mu$ in   | Surface plate & gage blocks; IT 1013  |
| Micrometers –<br><br>Outside<br>Depth<br>Inside<br>Bore/Holematic                             | Up to 24 in<br>Up to 12 in<br>Up to 12 in<br>Up to 9 in | (20 + 7L + 0.6R) $\mu$ in<br>(31 + 5.8L + 0.6R) $\mu$ in<br>(33 + 6.4D + 0.6R) $\mu$ in<br>(48 + 4.2D + 0.6R) $\mu$ in | Gage blocks & spheres;<br><br>IT 1017<br>IT 1006<br>IT 1011<br>IT 1011      |
| Micrometers <sup>3</sup> –<br><br>Outside<br>Depth<br>Inside<br>Bore/Holematic                | Up to 24 in<br>Up to 12 in<br>Up to 12 in<br>Up to 9 in | (10 + 30L + 0.6R) $\mu$ in<br>(17 + 30L + 0.6R) $\mu$ in<br>(20 + 29L + 0.6R) $\mu$ in<br>(15 + 30D + 0.6R) $\mu$ in   | Gage blocks & spheres;<br><br>OIT 1017<br>OIT 1006<br>OIT 1011<br>OIT 1011  |
| Optical Comparators &<br>Vision Systems <sup>3</sup> –<br><br>X, Y, Z Axis Linear<br>Accuracy | (0.001 to 12) in  | (57 + 0.6R) $\mu$ in   | Glass standard; OIT 1045  |
| Microscopes/Reticles <sup>3</sup> –<br>Length   | (0.001 to 4) in   | (98 + 0.6R) $\mu$ in   | Glass standard; OIT 1050  |
| Pin Gages & Sets  | (0.001 to 2) in   | (26 + 2.4D) $\mu$ in   | Laser micrometer & master plugs or gage blocks & bench micrometer; IT 1020  |
| Pin Gages & Sets <sup>3</sup>   | (0.001 to 2) in   | (34 + 25D) $\mu$ in  | Laser micrometer & master plugs or gage blocks & bench micrometer; OIT 1020 |
| Radius Gages  | Up to 1 in  | 200 $\mu$ in   | Vision system; IT 1023  |

| Parameter/Equipment  | Range  | CMC <sup>2, 4</sup> ( $\pm$ )  | Comments  |
|--|--|--|---|
| Plain Taper Gages –<br><br>Outside Diameter –<br>Minimum Truncations:<br>Length Steps<br><br>Inside Diameter –<br>Minimum Truncations:<br>Length Steps | <br><br>(0.05 to 6) in<br>(0.2 to 3) in<br><br>(0.2 to 3) in | <br><br>(30 + 4.1D) $\mu$ in<br>(50 + 1.3L) $\mu$ in<br><br>160 $\mu$ in<br>(50 + 1.3L) $\mu$ in | <br><br>Gage blocks, pins, master<br>plugs, bench micrometer<br>& comparator;<br><br>IT 1031<br><br><br>IT 1032 |
| Protractor –<br><br>Bevel<br>Digital   | <br><br>(0 to 90)°<br>(0 to 90)°                             | <br><br>0.06° + 0.6R<br>0.05° + 0.6R   | <br><br>Vision system or gage<br>blocks & sine bar; IT<br>1022  |
| Rules  | Up to 24 in<br>(> 24 to 72) in                               | (57 + 6L) $\mu$ in<br>(150 + 9L) $\mu$ in  | CMM or vision system<br>IT 1024   |
| Spheres –<br><br>Diameter & Sphericity   | <br><br>(0.04 to 2) in                                       | <br><br>(46 + 4D) $\mu$ in   | <br><br>Gage blocks & bench<br>micrometer; IT 1036  |
| Snap Gages – Plain Anvils<br>Fixed or Adjustable<br>Outside Diameter   | (0.01 to 12) in  | (40 + 5L) $\mu$ in   | Gage blocks & pins; IT<br>1057  |
| Snap Gages <sup>3</sup> – Plain<br>Anvils Fixed or<br>Adjustable Outside<br>Diameter   | (0.01 to 12) in  | (32 + 28L) $\mu$ in  | Gage blocks & pins; OIT<br>1057   |

| Parameter/Equipment  | Range   | CMC <sup>2, 4</sup> ( $\pm$ )  | Comments   |
|--|---|--|--|
| Straight Thread Gages –<br><br>Outside Diameter:<br>Simple Pitch Diameter<br><br>Major Diameter:<br>Pitch, Lead, & Flank<br>Angles<br><br>Inside Diameter:<br>Minor Diameter | <br><br>(0.04 to 3) in<br>(> 3 to 9) in<br><br>(0.04 to 9) in<br><br>(0.04 to 3) in | <br><br>$(64 + 6.7D) \mu\text{in}$<br>$(57 + 9D) \mu\text{in}$<br><br>$(56 + 4.5D) \mu\text{in}$<br>$0.09^\circ (6'')$<br><br>$(210 + 27D) \mu\text{in}$ | Thread wires, optical<br>comparator, gage<br>blocks &<br>Supermicrometer <sup>TM</sup> ;<br><br>IT 1033<br><br><br><br><br><br><br><br><br>IT 1034 |
| Straight Thread Gages <sup>3</sup> –<br><br>Outside Diameter:<br>Simple Pitch Diameter<br><br>Major Diameter   | <br><br>(0.04 to 3) in<br>(> 3 to 9) in<br><br>(0.04 to 9) in                       | <br><br>$(62 + 10D) \mu\text{in}$<br>$(55 + 12D) \mu\text{in}$<br><br>$(57 + 11D) \mu\text{in}$  | Thread wires, optical<br>comparator, &<br>Supermicrometer <sup>TM</sup> ;<br>OIT 1033  |
| Surface Finish –<br><br>Gages<br><br>Specimens   | <br><br>Ra/Ry<br><br>Ra/Ry  | <br><br>$(3.8 + 0.6R) \mu\text{in}$<br><br>3.4 $\mu\text{in}$  | Master pad &<br>comparator;<br><br>IT 1028<br><br>IT 1059  |
| Contour Measuring<br>Instruments <sup>3</sup> –<br><br>Surface finish<br><br>Detector Displacement –<br>Z Axis<br>Straightness<br>Length – X Axis                            | <br><br>Ra/Ry<br><br>(-30 to +30) mm<br>Up to 200 mm<br>Up to 200 mm                | <br><br>$(3.8 + 0.6R) \mu\text{in}$<br><br>$(0.22 + 0.01L + 0.6R) \mu\text{m}$<br>$0.46 \mu\text{m} + 0.6R$<br>$(0.36 + 0.012L + 0.6R) \mu\text{m}$      | Master surface finish<br>pad per OIT 1028<br><br>Straight edge, gage<br>blocks & pitch gage<br>per OIT 1069  |

| Parameter/Equipment  | Range   | CMC <sup>2, 4</sup> ( $\pm$ )   | Comments  |
|--|---|---|---|
| Taper Thread Gages –<br><br>Outside Diameter:<br>Length of Step & Size<br>at Gage Plane<br><br>Inside Diameter:<br>Ring Thickness &<br>Standoff to Master Plug | <br><br>(0.05 to 3) in<br>(3 to 10) in<br><br>(0.065 to 3) in | <br><br>(46 + 9.5L) $\mu$ in<br>(56 + 6.1L) $\mu$ in<br><br>(230 + 2D) $\mu$ in<br>(50 + 1.3L) $\mu$ in | <br><br>Micrometer<br>Supermicrometer™;<br>IT 1037<br><br>Master plugs, IT 1038 |
| Thread Wires   | All pitches, 60°  | 10 $\mu$ in   | P&W Universal<br>Labmaster™, IT 1064  |
| Bench Micrometers –<br><br>Linearity<br><br>Force  | <br><br>Up to 1 in<br><br>Up to 40 oz                         | <br><br>(25 + 0.6R) $\mu$ in<br><br>0.2 % of reading  | <br><br>Gage blocks, force<br>gage, IT 1005                                     |
| Bench Micrometers <sup>3</sup> –<br><br>Linearity<br><br>Force   | <br><br>Up to 1 in<br><br>Up to 40 oz                         | <br><br>(25 + 0.6R) $\mu$ in<br><br>0.2 % of reading  | <br><br>Gage blocks, force<br>gage;<br>OIT 1005                                 |
| Feeler Gages   | Up to 0.2 in  | 48 $\mu$ in   | Bench micrometer;<br>IT 1008  |
| Feeler Gages <sup>3</sup>  | Up to 0.2 in  | 51 $\mu$ in   | Bench micrometer;<br>OIT 1008   |
| Laser Bench Micrometer   | Up to 2 in  | (14 + 6.4D + 0.6R) $\mu$ in   | Gage pins;<br>IT 1067   |
| Laser Bench Micrometer <sup>3</sup>  | Up to 2 in  | (15 + 3.5D + 0.6R) $\mu$ in   | Gage pins;<br>OIT 1067  |

## II. Dimensional Testing/Calibration<sup>1</sup> – Fixtures & Gauging

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

## III. Mechanical

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

| Parameter/Equipment   | Range  | CMC <sup>2</sup> (±) | Comments   |
|---|--------|----------------------|--|
| Indirect Verification of Rockwell & Rockwell Superficial Testers <sup>3</sup> | 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 <sup>2</sup> (±) | Comments   |
|--|---------|----------------------|--|
| Indirect Verification of Rockwell & Rockwell Superficial Testers <sup>3</sup> – (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:   |                      |  |
|  | Low     | 1.2 HRRW             |  |
|  | High    | 1.2 HRRW             |  |

<sup>1</sup> This laboratory offers commercial calibration service, field calibration service and dimensional/calibration 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 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.

<sup>3</sup> Field calibration service is available for this calibration. 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.

<sup>4</sup> 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.

<sup>5</sup> 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.

<sup>6</sup> This scope meets A2LA's *P112 Flexible Scope Policy*.



# 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 17025:2017 *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 14th of April 2022.

A blue ink signature of a person, likely the Vice President of Accreditation Services, written over a horizontal line.

Vice President, Accreditation Services  
For the Accreditation Council  
Certificate Number 2200.01  
Valid to June 30, 2024

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