



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

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

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 & pins; IT 1002
Calipers <sup>3</sup>	Up to 60 in	$(13 + 30L + 0.6R) \mu\text{in}$	Gage blocks, ring gages & pins; OIT 1002
Caliper & 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 <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> (±)	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 & P&W Universal Labmaster™; IT 1003  Class XXX Master rings or gage blocks & P&W Universal Labmaster™; IT 1021
Cylindrical Gages <sup>3</sup> – Plug: Outside Diameter – Up to X	(0.001 to 9) in	(16 + 29D) μin	Gage blocks & P&W used serviceable material™; OIT 1003
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 <sup>3</sup>	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 & grade 2 gage blocks IT 1007
Indicators <sup>3</sup>	Up to 4 in	(4 + 31L + 0.6R) μin	Indicator stand & grade 2 gage blocks OIT 1007
Length Standards	(0.001 to 6) in  (> 6 to 34) in	(20 + 2.1L) μin  (42 + 8L) μin	Gage blocks with P&W Universal Labmaster™; IT 1012  Gage blocks with amp & probe; IT 1012

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

Parameter/Equipment	Range	CMC <sup>2, 4</sup> ( $\pm$ )	Comments
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) $\mu$ in (50 + 1.3L) $\mu$ in  160 $\mu$ in (50 + 1.3L) $\mu$ in	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 & sine bar; IT 1022
Rules	Up to 24 in (> 24 to 72) in	(57 + 6L) $\mu$ in (150 + 9L) $\mu$ in	CMM or vision system IT 1024
Spheres –  Diameter & Sphericity	(0.04 to 2) in	(46 + 4D) $\mu$ in	Gage blocks & bench micrometer; IT 1036
Snap Gages – Plain Anvils Fixed or Adjustable Outside Diameter	(0.01 to 12) in	(40 + 5L) $\mu$ in	Gage blocks & pins; IT 1057
Snap Gages <sup>3</sup> – Plain Anvils Fixed or Adjustable Outside Diameter	(0.01 to 12) in	(32 + 28L) $\mu$ in	Gage blocks & pins; OIT 1057

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

Parameter/Equipment	Range	CMC <sup>2,4</sup> (±)	Comments
Taper Thread Gages –  Outside Diameter: Length of Step & Size at Gage Plane  Inside Diameter: Ring Thickness & Standoff to Master Plug	(0.05 to 3) in (3 to 10) in  (0.065 to 3) in	(46 + 9.5L) μin (56 + 6.1L) μin  (230 + 2D) μin (50 + 1.3L) μin	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) μin  0.2 % of reading	Gage blocks, force gage, IT 1005
Bench Micrometers <sup>3</sup> –  Linearity  Force	Up to 1 in  Up to 40 oz	(25 + 0.6R) μin  0.2 % of reading	Gage blocks, force gage; OIT 1005
Feeler Gages	Up to 0.2 in	48 μin	Bench micrometer; IT 1008
Feeler Gages <sup>3</sup>	Up to 0.2 in	51 μin	Bench micrometer; OIT 1008
Laser Bench Micrometer	Up to 2 in	(14 + 6.4D + 0.6R) μin	Gage pins; IT 1067
Laser Bench Micrometer <sup>3</sup>	Up to 2 in	(15 + 3.5D + 0.6R) μin	Gage pins; OIT 1067

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

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

## III. Electrical – DC/Low Frequency

Parameter/Equipment	Frequency	CMC <sup>2,7</sup> ( $\pm$ )	Comments
DC Voltage <sup>3</sup> – Measure	Up to 202 mV 202 mV to 2.02 V (2.02 to 20.2) V (20.2 to 202) V (202 to 1050) V	8.3 $\mu\text{V/V} + 400 \text{ nV}$ 2.9 $\mu\text{V/V} + 600 \text{ nV}$ 2.9 $\mu\text{V/V} + 1.0 \mu\text{V}$ 4.3 $\mu\text{V/V} + 61 \mu\text{V}$ 4.4 $\mu\text{V/V} + 530 \mu\text{V}$	Fluke 8588A
DC Voltage <sup>3</sup> – Generate	(0 to 330) mV 330 mV to 3.3 V (3.3 to 33) V (33 to 330) V (330 to 1000) V	16 $\mu\text{V/V} + 0.8 \mu\text{V}$ 9 $\mu\text{V/V} + 2.0 \mu\text{V}$ 9 $\mu\text{V/V} + 16 \mu\text{V}$ 14 $\mu\text{V/V} + 120 \mu\text{V}$ 14 $\mu\text{V/V} + 1.2 \text{ mV}$	Fluke 5522A
DC Current <sup>3</sup> – Measure	Up to 20.2 $\mu\text{A}$ (10 to 202) $\mu\text{A}$ 202 $\mu\text{A}$ to 2.02 mA (2.02 to 20.2) mA (20.2 to 202) mA 202 mA to 2.02 A (2.02 to 20.2) A (20.2 to 30.2) A	27 $\mu\text{A/A} + 0.40 \text{ nA}$ 10 $\mu\text{A/A} + 0.40 \text{ nA}$ 9 $\mu\text{A/A} + 4.0 \text{ nA}$ 15 $\mu\text{A/A} + 40 \text{ nA}$ 57 $\mu\text{A/A} + 1.0 \mu\text{A}$ 140 $\mu\text{A/A} + 100 \mu\text{A}$ 240 $\mu\text{A/A} + 400 \mu\text{A}$ 550 $\mu\text{A/A} + 4.4 \text{ mA}$	Fluke 8588A

Parameter/Equipment	Frequency	CMC <sup>2,7</sup> (±)	Comments
DC Current <sup>3</sup> – Generate	(0 to 330) $\mu$ A 330 $\mu$ A to 3.3 mA (3.3 to 33) mA (33 to 330) mA 330 mA to 1.1 A (1.1 to 3.0) A (3 to 11) A (11 to 20.5) A	120 $\mu$ A/A + 0.020 $\mu$ A 78 $\mu$ A/A + 0.040 $\mu$ A 78 $\mu$ A/A + 0.20 $\mu$ A 78 $\mu$ A/A + 1.9 $\mu$ A 160 $\mu$ A/A + 31 $\mu$ A 300 $\mu$ A/A + 31 $\mu$ A 390 $\mu$ A/A + 390 $\mu$ A 780 $\mu$ A/A + 580 $\mu$ A	Fluke 5522A
Clamp-On Only	(20.5 to 32) A (>32 to 105) A (>105 to 200) A (>200 to 525) A (>525 to 1000) A	0.16 % output + 1.2 mA 0.16 % output + 9.4 mA 0.17 % output + 45 mA 0.16 % output + 47 mA 0.18 % output + 230 mA	Fluke 9100 coil & Fluke 5522A
DC Resistance <sup>3</sup> – Measure	Up to 2.02 $\Omega$ (2.02 to 20.2) $\Omega$ (20.2 to 202) $\Omega$ 202 $\Omega$ to 2.02 k $\Omega$ (2.02 to 20.2) k $\Omega$ (20.2 to 202) k $\Omega$ 202 k $\Omega$ to 2.02 M $\Omega$ (2.02 to 20.2) M $\Omega$ (20.2 to 202) M $\Omega$ 202 M $\Omega$ to 2.02 G $\Omega$	21 $\mu\Omega/\Omega$ + 8.1 $\mu\Omega$ 15 $\mu\Omega/\Omega$ + 28 $\mu\Omega$ 9.0 $\mu\Omega/\Omega$ + 100 $\mu\Omega$ 9.0 $\mu\Omega/\Omega$ + 1.0 m $\Omega$ 9.0 $\mu\Omega/\Omega$ + 10 m $\Omega$ 9.0 $\mu\Omega/\Omega$ + 100 m $\Omega$ 11 $\mu\Omega/\Omega$ + 20 $\Omega$ 39 $\mu\Omega/\Omega$ + 200 $\Omega$ 130 $\mu\Omega/\Omega$ + 20 k $\Omega$ 0.32 % + 2.0 M $\Omega$	Fluke 8588A



Parameter/Equipment	Range	CMC <sup>2,7</sup> (±)	Comments
Electrical Simulation of RTDs <sup>3</sup> –			
Pt 385, 100 Ω	(-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C (630 to 800) °C	0.040 °C 0.050 °C 0.070 °C 0.080 °C 0.090 °C 0.18 °C	Fluke 5522A
Pt 3926, 100 Ω	(-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C	0.040 °C 0.050 °C 0.070 °C 0.080 °C 0.090 °C	Fluke 5522A
Pt 3916, 100 Ω	(-200 to -190) °C (-190 to -80) °C (-190 to -80) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.19 °C 0.030 °C 0.040 °C 0.050 °C 0.050 °C 0.060 °C 0.070 °C 0.080 °C 0.18 °C	
DC Resistance <sup>3</sup> – Generate	(0 to 11) Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω 330 Ω to 1.1 kΩ (1.1 to 3.3) kΩ (3.3 to 11) kΩ (11 to 33) kΩ (33 to 110) kΩ (110 to 330) kΩ 330 kΩ to 1.1 MΩ (1.1 to 3.3) MΩ (3.3 to 11) MΩ (11 to 33) MΩ (33 to 110) MΩ (110 to 330) MΩ 330 MΩ to 1.1 GΩ	33 μΩ/Ω + 0.010 Ω 24 μΩ/Ω + 0.012 Ω 22 μΩ/Ω + 0.012 Ω 22 μΩ/Ω + 0.016 Ω 22 μΩ/Ω + 0.016 Ω 22 μΩ/Ω + 0.16 Ω 22 μΩ/Ω + 0.08 Ω 22 μΩ/Ω + 0.78 Ω 22 μΩ/Ω + 0.78 Ω 25 μΩ/Ω + 7.8 Ω 25 μΩ/Ω + 7.8 Ω 58 μΩ/Ω + 120 Ω 110 μΩ/Ω + 200 Ω 200 μΩ/Ω + 1.9 kΩ 390 μΩ/Ω + 2.3 kΩ 0.37 % + 77 kΩ 1.2 % + 390 kΩ	Fluke 5522A

Parameter/Equipment	Range	CMC <sup>2,7</sup> (±)	Comments
Electrical Simulation of Thermocouples <sup>3</sup> –			
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.39 °C 0.12 °C 0.11 °C 0.12 °C 0.16 °C	Fluke 5522A
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.21 °C 0.12 °C 0.11 °C 0.13 °C 0.18 °C	
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.26 °C 0.14 °C 0.12 °C 0.20 °C 0.31 °C	
Type N	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 410) °C (1000 to 1372) °C	0.31 °C 0.17 °C 0.15 °C 0.14 °C 0.21 °C	
Type R	(0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C	0.44 °C 0.27 °C 0.26 °C 0.31 °C	
Type S	(0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1767) °C	0.36 °C 0.28 °C 0.29 °C 0.36 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.49 °C 0.19 °C 0.12 °C 0.11 °C	

Parameter/Range	Frequency	CMC <sup>2,7</sup> (±)	Comments
AC Voltage <sup>3</sup> – Measure			
Up to 10 mV	(1 to 2) kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	290 μV/V + 1.3 μV 370 μV/V + 1.3 μV 380 μV/V + 1.3 μV 0.3% + 1.3 μV 1.0 % + 5.0 μV 2.0 % + 5.0 μV	Fluke 8588A
(10 to 100) mV	(1 to 2) kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz	88 μV/V + 1.0 μV 130 μV/V + 1.0 μV 230 μV/V + 1.2 μV 530 μV/V + 6.1 μV 0.21 % + 36 μV 0.11 % + 120 μV 0.15 % + 610 μV	
100 mV to 10 V	(1 to 2) kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz	76 μV/V + 6.0 μV 130 μV/V + 61 μV 230 μV/V + 130 μV 530 μV/V + 610 μV 0.21 % + 3.6 mV 0.10 % + 12 mV 0.15 % + 61 mV	
(10 to 100) V	(1 to 2) kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	90 μV/V + 0.5 mV 110 μV/V + 0.5 mV 230 μV/V + 1.0 mV 590 μV/V + 5.0 mV 0.37 % + 50 mV 1.1 % + 500 mV	
(100 to 1000) V	(1 to 2) kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz	110 μV/V + 25 mV 110 μV/V + 25 mV 230 μV/V + 25 mV 590 μV/V + 100 mV	

Parameter/Range	Frequency	CMC <sup>2,7</sup> (±)	Comments
AC Voltage <sup>3</sup> – Generate			
(1 to 33) mV	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.062 % + 5.0 μV 0.012 % + 5.0 μV 0.016 % + 5.0 μV 0.078 % + 5.0 μV 0.27 % + 9.0 μV 0.62 % + 39 μV	Fluke 5522A
(33 to 330) mV	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.023 % + 6.0 μV 0.011 % + 6.0 μV 0.012 % + 6.0 μV 0.027 % + 6.0 μV 0.062 % + 25 μV 0.16 % + 54 μV	
330 mV to 3.3 V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.023 % + 39 μV 0.012 % + 47 μV 0.015 % + 47 μV 0.023 % + 39 μV 0.054 % + 97 μV 0.19 % + 470 μV	
(3.3 to 33) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.023 % + 510 μV 0.012 % + 470 μV 0.019 % + 470 μV 0.027 % + 470 μV 0.070 % + 1.2 mV	
(33 to 330) V	45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.015 % + 1.6 mV 0.016 % + 4.7 mV 0.019 % + 4.7 mV 0.023 % + 4.7 mV 0.16 % + 39 mV	
(330 to 1020) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.023 % + 7.8 mV 0.019 % + 7.8 mV 0.023 % + 7.8 mV	

Parameter/Range	Frequency	CMC <sup>2,7</sup> (±)	Comments
AC Current <sup>3</sup> – Measure			
Up to 20.2 μA	(1 to 2) kHz (2 to 10) kHz (10 to 30) kHz	0.20 % + 5.0 nA 0.20 % + 5.0 nA 0.21 % + 5.0 nA	Fluke 8588A
(20.2 to 202) μA	(1 to 2) kHz	280 μV/V + 10 nA	
202 μA to 2.02 mA	(2 to 10) kHz	530 μV/V + 0.1 μA	
(2.02 to 20.2) mA	(10 to 30) kHz (30 to 100) kHz	740 μV/V + 1.0 μA 0.41 % + 2.0 μA	
(20.2 to 202) mA	(1 to 2) kHz (2 to 10) kHz (10 to 30) kHz	290 μV/V + 10 μA 530 μV/V + 10 μA 750 μV/V + 10 μA	
202 mA to 2.02 A	10 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz	310 μV/V + 202 μA 550 μV/V + 202 μA 790 μV/V + 202 μA	
(2.02 to 20.2) A	10 Hz to 2 kHz (2 to 10) kHz	840 μV/V + 1 mA 840 μV/V + 1 mA	
(20.2 to 30.2) A	10 Hz to 2 kHz (2 to 10) kHz	840 μV/V + 120 mA 0.12 % output + 120 mA	

Parameter/Range	Frequency	CMC <sup>2, 7</sup> (±)	Comments
AC Current <sup>3</sup> – Generate			
(29 to 330) μA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.16 % output + 0.10 μA 0.12 % output + 0.10 μA 0.10 % output + 0.10 μA 0.23 % output + 0.10 μA 0.62 % output + 0.20 μA 1.2 % output + 0.30 μA	Fluke 5522A
330 μA to 3.3 mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.16 % output + 0.12 μA 0.10 % output + 0.10 μA 0.08 % output + 0.10 μA 0.16 % output + 0.20 μA 0.39 % output + 0.20 μA 0.78 % output + 0.50 μA	
(3.3 to 33) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.14 % output + 2.0 μA 0.070 % output + 1.6 μA 0.030 % output + 1.6 μA 0.060 % output + 1.6 μA 0.16 % output + 2.3 μA 0.31 % output + 3.0 μA	
(33 to 330) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.14 % output + 16 μA 0.070 % output + 16 μA 0.030 % output + 16 μA 0.080 % output + 39 μA 0.16 % output + 78 μA 0.31 % output + 160 μA	
330 mA to 1.1 A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.14 % output + 78 μA 0.050 % output + 78 μA 0.47 % output + 780 μA 1.9 % output + 3.9 mA	
(1.1 to 3) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.14 % output + 78 μA 0.05 % output + 78 μA 0.47 % output + 0.8 mA 1.9 % output + 3.8 mA	
(3 to 11) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.050 % output + 1.6 mA 0.08 % output + 1.6 mA 2.3 % output + 1.6 mA	
(11 to 20.5) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.09 % output + 3.8 mA 0.12 % output + 3.8 mA 2.3 % output + 5.0 mA	

Parameter/Range	Frequency	CMC <sup>2,7</sup> (±)	Comments
AC Current <sup>3</sup> – Generate (Cont)			
(20.5 to 32) A	(10 to 100) Hz (100 to 440) Hz	0.56 % output + 5.5 mA 0.94 % output + 27 mA	Fluke 9100 coil & Fluke 5522A
(> 32 to 160) A (> 32 to 200) A	(10 to 100) Hz (100 to 440) Hz	0.32 % output + 28 mA 0.72% output + 250 mA	
(> 160 to 1000) A	(10 to 100) Hz	0.27 % output + 450 mA	
Capacitance <sup>3</sup> – Generate	(0.19 to 0.3999) nF (0.4 to 1.0999) nF (1.1 to 3.2999) nF (3.3 to 10.9999) nF (11 to 32.9999) nF (33 to 109.999) nF (110 to 329.999) nF (0.33 to 1.099 99) μF (1.1 to 3.299 99) μF (3.3 to 10.9999) μF (11 to 32.9999) μF (33 to 109.999) μF (110 to 329.999) μF (0.33μF to 1.099 99) mF (1.1 to 3.2999) mF (3.3 to 10.9999) mF (11 to 32.9999) mF (33 to 110) mF	0.4 % + 0.01 nF 0.4 % + 0.01 nF 0.39 % + 0.01 nF 0.19 % + 0.01 nF 0.19 % + 0.1 nF 0.19 % + 0.1 nF 0.19 % + 0.02 nF 0.19 % + 0.78 nF 0.19 % + 2.3 nF 0.19 % + 7.8 nF 0.31 % + 23 nF 0.35 % + 78 nF 0.35 % + 240 nF 0.35 % + 0.8 μF 0.35 % + 2.3 μF 0.35 % + 7.8 μF 0.58 % + 23 μF 0.85 % + 78 μF	Fluke 5522A

IV. Mechanical

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Torque <sup>3</sup> – Wrenches Handles/Screwdriver	Up to 600 lbf.ft Up to 3000 lbf.in Up to 120 lbf.in	0.36 % of reading 0.30 % of reading 0.58 % of reading	Torque calibrator; IT/OIT 1063
Indirect Verification of Vickers Hardness Testers <sup>3</sup> – 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 <sup>3</sup> – 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 <sup>3</sup> – 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 <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: Low Medium High	1.6 HR15N 1.3 HR15N 0.98 HR15N	Indirect verification per method ASTM E18 with test blocks; OIT 1047
	HR30N: Low Medium High	1.3 HR30N 1.3 HR30N 0.96 HR30N	
	HR45N: Low Medium High	1.3 HR45N 1.2 HR45N 0.8 HR45N	
	HR15TW: Low Medium High	2 HR15TW 1.4 HR15TW 1.4 HR15TW	
	HR30TW: Low Medium High	2 HR30TW 1.4 HR30TW 1.4 HR30TW	
	HR45TW: Low Medium High	2.0 HR45TW 1.4 HR45TW 1.3 HR45TW	
	HRRW: Low High	1.2 HRRW 1.2 HRRW	
Pressure – Precision Measuring Equipment <sup>3</sup>			
Pneumatic	Up to 30 psig >30 to 300 psig)	0.0061 psi+ 0.6R 0.060 psi + 0.6R	Fluke 6270A w/PM200-BG200K w/PM200-G2M w/PM200-G2M
Hydraulic	Up to 100 psig >100 to 1000 psig	0.04 psig 0.023 % Rdg	Fluke E-DWT w/QRPT A7M1
	Up to 2000 psig >2000 to 5000 psig >5000 to 20000 psig	0.4 psig 0.031% Rdg 0.023 %Rdg	w/QRPT A140M1

## V. Time & Frequency

Parameter/Equipment	Range	CMC <sup>2, 8</sup> ( $\pm$ )	Comments
Frequency <sup>3</sup> – Measuring Equipment	0.01 Hz to 2 MHz	2.1 $\mu$ Hz/Hz + 3.9 $\mu$ Hz	Fluke 5522A

<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/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 14th of April 2022.

A blue ink signature of the Vice President of Accreditation Services.

Vice President, Accreditation Services  
For the Accreditation Council  
Certificate Number 2200.01  
Valid to June 30, 2024  
Revised January 23, 2023

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