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

MSI-VIKING GAGE
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CALIBRATION

Valid To: July 31, 2025 Certificate Number: 3466.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations[1,9]:

I. Chemical

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
pH Measuring Equipment[3]	4 pH 7 pH 10 pH	0.04 pH 0.05 pH 0.06 pH	pH buffer solutions

II. Dimensional

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Thickness Feeler Gages[3]	Up to 2 in	$(24 + 1.1L)$ µin	Universal measuring machine
Thread Measuring Wires	(.001 to 1.00) in	$(12 + 14L)$ µin	Universal measuring machine

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Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Heigh Gages[3] 10 µin res[3] 50 µin res[3] 100 µin res[3] 500 µin res[3] 0.001 in res[3]	 Up to 12 in (12 to 24) in (24 to 40) in Up to 12 in (12 to 24) in (24 to 40) in Up to 12 in (12 to 24) in (24 to 40) in Up to 12 in (12 to 24) in (24 to 40) in Up to 12 in (12 to 24) in (24 to 40) in	 (3.7 + 5.5*L*) µin (19 + 3.2*L*) µin (9.7 + 3.4*L*) µin (27 + 3.0*L*) µin (22 + 3.4*L*) µin (14 + 3.3*L*) µin (56 + 2.0*L*) µin (53 + 2.3*L*) µin (35 + 3.0*L*) µin (290 + 0.47*L*) µin (280 + 1.2*L*) µin (270 + 1.3*L*) µin (580 + 0.24*L*) µin (560 + 1.6*L*) µin (570 + 0.68*L*) µin	Gage blocks, long gage blocks
Length Standards[3]	Up to 40 in	(110 + 3.5*L*) µin	Amplifier, surface plate
Steel Rulers	Up to 96 in	(270 + 0.63*L*) µin	Vision system
Disc, Pins, & Plug Gages[3]	Up to 13.5 in Up to 1 in	(9.4 + 1.8*L*) µin (51 + 11*L*) µin	ULM, gage blocks Laser micrometer
Cylindrical Ring Gages[3]	Up to 4.946 in Up to 13.5 in	(19 + 4.9*L*) µin (1.9 + 5.4*L*) µin	ULM, master rings ULM
Gage Blocks	 (0.05 to 4) in (4 to 20) in	 (5.1 to 1.5*L*) µin (1.8 + 2.1*L*) µin	Comparator, gage blocks

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Radius Gages	Up to 2 in	(260 + 1.2*L*) µin	Vision system
Thread/Set Plugs[3]– Major Diameter Pitch Diameter	 Up to 8 in Up to 64 TPI	 (18 + 4.2*L*) µin (31 + 3.1*L*) µin	ULM, thread wires, gage blocks
Spheres – Roundness Size	 Up to 2 in Up to 4 in	 7.3 µin (1.8 + 4.2*L*) µin	 Roundness machine ULM
Caliper Checkers	Up to 12 in	(12 + 3.1*L*) µin	Electronic indicator amplifier, gage blocks
Caliper Gage[3]– Internal External	 Up to 7.5 in Up to 7.5 in	 (17 + 1.8*L*) µin (17 + 1.8*L*) µin	Gage blocks
Dial Bore Gages – (Bore Gage w/ Indicator)[3] Resolution: 0.000 01 in 0.000 05 in 0.0001 in 0.0005 in 0.001 in	 Up to 4 in of travel	 (9.9 + 1.7*L*) µin (30 + 0.71*L*) µin (150 + 0.78*L*) µin (320 + 2.8*L*) µin (590 + 6.6*L*) µin	ULM, indicator calibrator, gage blocks
Calipers[3]– 	Up to 6 in (6 to 24) in (24 to 60) in	(290 + 0.54*L*) µin (510 + 4.0*L*) µin (270 + 11*L*) µin	Gage blocks, ring gage Long gage blocks

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Depth Micrometers/Depth Gages[3]	Up to 12 in	(370 + 21*L*) µin	Gage blocks, surface plate
Indicators/LVDT's–			
Resolution:	Up to 4 in of travel		ULM
0.000 01 in		(14 + 9.7*L*) µin	
0.000 05 in		(50 + 9.3*L*) µin	
0.0001 in		(71 + 6.9*L*) µin	Indicator calibrator
0.0005 in		(290 + 1.8*L*) µin	
0.001 in		(580 + 0.9*L*) µin	
	Up to 4 in	(1 + 18*L*) µin	I-checker
Electronic Indicator Analog Amplifier[3]	Up to 0.01 in	(5.4 + 360*L*) µin	Gage blocks
Micrometers[3]			
Resolution: 50 µin	Up to 1 in	(51 + 12*L*) µin	Gage blocks
	(1 to 2) in	(50 + 0.9*L*) µin	
	(2 to 3) in	(50 + 1.1*L*) µin	
	(3 to 4) in	(53 + 2.4*L*) µin	
Resolution: 100 µin	Up to 1 in	(52 + 27*L*) µin	Gage blocks
	(1 to 2) in	(58 + 0.66*L*) µin	
	(2 to 3) in	(62 + 12*L*) µin	
	(3 to 4) in	(67 + 6.7*L*) µin	
	(4 to 5) in	(92 + 1.5*L*) µin	
	(5 to 6) in	(100 + 1.9*L*) µin	
	(6 to 7) in	(110 + 2.3*L*) µin	
	(7 to 8) in	(110 + 6.1*L*) µin	
	(8 to 12) in	(110 + 2.5*L*) µin	
	(12 to 24) in	(160 + 1.7*L*) µin	
	(24 to 48) in	(29 + 3.1*L*) µin	

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Micrometers[3] (cont)			
Resolution: 500 µin	Up to 1 in (1 to 2) in (2 to 3) in (3 to 4) in (4 to 5) in (5 to 6) in (6 to 7) in (7 to 8) in (8 to 12) in (12 to 24) in (24 to 48) in	(290 + 6.4*L*) µin (290 + 0.13*L*) µin (290 + 3.7*L*) µin (290 + 2.0*L*) µin (300 + 0.49*L*) µin (300 + 0.72*L*) µin (300 + 0.92*L*) µin (300 + 2.9*L*) µin (300 + 1.1*L*) µin (320 + 0.97*L*) µin (270 + 1.4*L*) µin	Gage blocks
Resolution: 0.01 in	Up to 1 in (1 to 2) in (2 to 3) in (3 to 4) in (4 to 5) in (5 to 6) in (6 to 7) in (7 to 8) in (8 to 12) in (12 to 24) in (24 to 48) in	(580 + 0.13*L*) µin (580 + 0.09*L*) µin (580 + 0.11*L*) µin (580 + 0.13*L*) µin (580 + 0.17*L*) µin (580 + 0.43*L*) µin (580 + 0.44*L*) µin (580 + 0.059*L*) µin (580 + 0.53*L*) µin (570 + 0.33*L*) µin (570 + 0.73*L*) µin	Gage blocks
Groove	Up to 4 in (4 to 24) in (24 to 28) in	(110 + 0.5*L*) µin (120 + 5.1*L*) µin (650 + 3.6*L*) µin	Gage blocks
Inside	Up to 13 in	(230 + 61*L*) µin	Gage blocks
Specialty Micrometers	Up to 2 in	(110 + 6.2*L*) µin	Gage blocks, master pins
ULM/Bench Mircometer[3]	Up to 12 in	(4.0 + 2.6*L)* µin	Gage blocks
Laser Micrometer[3]	Up to 2.0 in	(27 + 1.9*L)* µin	Master plug gages

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Bore Gages[3] – 3 pt.	(0.350 to 4.00) in	(70 + 1.9*L*) µin	Master rings
Levels –			
Bubble	+/- 0.002 in/ft	100 µin/ft	Digal indicator, surface plate, gage block
Digital	Up to 90°	0.002 in/in	
Levels – Differential	Angular ± 990 arc sec	3.6 arc sec	Sine plate, gage blocks, surface plates
Protractor[3]–			
Bevel	Up to 180°	2.4°	Sine plate, gage blocks
Digital	Up to 60°	(0.049 + 0.000 24 °/°)	Sine plate, gage blocks, amplifier
	90°	0.12°	Granite angle
Optical Comparators[3]–			
Linearity, X, Y	Up to 6 in	(370 + 1.3*L*) µin	Glass master
Vertical Linearity	Up to 6 in	(400 + 3.0*L*) µin	Glass master
Magnification	10x to 100x	5.6 %	Glass mater
Vision System[3] – Linear	Up to 30 in	(420 + 4.6*L*) µin	High precision, glass scale
Surface Plates[3] –			
Flatness	Up to 144 in	(22 + 0.7*L*) µin	Electronic levels
Repeatability	Up to 0.002 in	(32 + 41*L*) µin	Repeat reading indicator

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Parallels[3]	Up to 12 in	22 µin	Surface plate, amplifier, gage blocks
Squares	Up to 4 in (4 to 6) in (6 to 12) in	20 µin 23 µin 25 µin	Surface plate, amplifier, master square, granite angle
Depth Step Gages	(0.5 to 12.0) in	(10 + 3.7*L*) µin	Electronic indicator amplifier, gage blocks
Optical Flat – Flatness	Up to 6 in	5.5 µin	Using roundness tester RT800

Parameter/Equipment	Range	CMC[2, 4, 5] (±)	Comments
Coordinate Measuring Machine (CMM)[3]–			ASME B89.4.1 – 2001
X, Y, Z Linear Accuracy	Up to 240 in	(36 + 17*L*) µin	Renishaw laser system
			ASME B89.4.1 – 2001
Single Axis Length Gage[3]	Up to 360 in	(36 + 17*L*) µin	Reinshaw laser system, ball bar, sphere
Linear Accuracy	Up to 5 in	(120 + 1.2*L*) µin	Gage blocks
Machine Tool[3]–			
X, Y, Z Linearity	(0.1 to 120) in	(36 + 17*L*) µin	Reinshaw laser system
Surface Finish Testers[3]– Ra	(1.0 to 120) µin Ra	5.3 µin Ra	Master surface finish standards

Parameter/Equipment	Range	CMC[2, 4, 5] (±)	Comments
Surface Finish Standards[3] – Ra	(1.0 to 120) µin Ra	5.3 µin Ra	Direct comparison to master finish standards
Microscopes[3] –			
Reticule	Up to 250 mm	0.25 µm/mm + 6.2 µm	Stage micrometer
Magnification	Up to 1000x	5.6 %	Glass master
Sine Plate/Bars –			
Length	Up to 5 in	37 µin	Amplifier, height master
Flatness	Up to 5 in	24 µin	Electronic indicator amplifier
Parallelism	Up to 5 in	22 µin	
Cylindrical Square –			
Straightness	Up to 12 in	$(4.2 + 1.8L)$ µin	Roundness machine
Roundness	Up to 10 in	$(4.2 + 1.8L)$ µin	
Squareness	Up to 12 in	$(4.2 + 1.8L)$ µin	
Indicator Calibrators[3] (Mic Head Type)	Up to 1 in	78 µin	LVDT
Snap Gage[3] –			
Flatness- Anvils	Up to 1 in	3.3 µin	Optical flat
Size	Up to 4 in	$(58 + 0.45L)$ µin	Gage blocks

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Angle/Angle Blocks	Up to 360° Up to 360°	0.0026°/ 9.5 arc sec 1.8 arc sec	Vision system CMM
Screw Thread Micrometer	Up to 4 in	(79 + 1.1*L*) µin	Gage blocks, thread wire set
Screw Thread Micrometer Standards	Up to 4 in	(260 + 0.44*L*) µin	Vision System

III. Dimensional Testing/Calibration[1]

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Roundness Measurement[6]	Up to 12 in	5.6 µin	Roundness machine
Surface Finish[6]	Up to 125 µin Ra	5.2 µin	Profilometer
Length 1D[6]	Up to 12 in	(21 + 3.1*L*) µin	Heigh master, surface plate, gage amplifier
Length 2D[6]	Up to 48 in	(370 + 3.2*L*) µin	Vision system
Length 3D[6]–			CMM
Steel	Up to (80 x 48 x 40) in	(160 + 4.0*L*) µin	
Aluminum	Up to (80 x 48 x 40) in	(55 + 17*L*) µin	
Plastic	Up to (80 x 48 x 40) in	(14 + 78*L*) µin	

IV. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC[2,4,8] (±)	Comments
DC Current – Generate[3]	(0 to 330) µA 330 µA to 3.3 mA (3.3 to 33) mA (33 to 329.999) mA 300 mA to 1.099 99 A (1.1 to 2.999 99) A (3 to 10.9999) A (11 to 20.5) A (20.5 to 1000) A	0.018 % + 0.02 µA 0.012 % + 0.05 µA 0.012 % + 0.25 µA 0.015 % + 2.5 µA 0.025 % + 40 µA 0.046 % + 40 µA 0.06 % + 500 µA 0.12 % + 750 µA 0.13 % + 1.8 A	Fluke 5520A Fluke 5520A w/50 turn coil
DC Current – Measure[3]	(0 to 100) nA 100 nA to 1 µA (1 to 10) µA (10 to 100) µA 100 µA to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A	32 µA/A + 0.04 nA 23 µA/A + 0.04 nA 23 µA/A + 0.1 nA 23 µA/A + 0.8 nA 23 µA/A + 5 nA 23 µA/A + 50 nA 37 µA/A + 0.5 µA 0.011 % + 10 µA	HP 3458A, option 002
DC Voltage – Generate[3]	(0 to 330) mV (0 to 3.299 999) V (3.3 to 32.999 99) V (33 to 329.9999) V (330 to 1000) V	24 µV + 1.0 µV/V 14 µV + 2.0 µV/V 15 µV + 20 µV/V 22 µV + 150 µV/V 22 µV + 1500 µV/V	Fluke 5520A
DC Voltage – Measure[3]	(0 to 100) mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 1000) V	11 µV + 0.3 µV/V 10 µV + 0.3 µV/V 10 µV + 0.5 µV/V 11 µV + 30 µV/V 27 µV + 100 µV/V	HP 3458A, option 002
DC High Voltage– Measure[3]	(1 to 100) kV	35 vdc	Vitrek 4700 w/ HL100 probe

Parameter/Equipment	Range	CMC[2,4,8] (±)	Comments
DC Power– Generate[3]	(0.09 to 330) W (0.33 to 3) kW (3 to 20) kW	390 µW/W -2.9 µW 390 µW/W - 1100 µW 840 µW/W + 7500 µW	Fluke 5520A
AC Power– Generate[3] PF=1 @ 60Hz	(0.11 to 3.0) mW (3.0 to 11) mW (11 to 30) mW (30 to 110) mW (110 to 300) mW (300 to 730) mW (0.73 to 1.5) W (1.5 to 6.8) W (6.8 to 9.2) W (9.2 to 34) W (34 to 92) W (92 to 337) W (337 to 918) W (918 to 2244) W (2244 to 4590) W (4590 to 20 910) W	0.44 % 0.16 % 0.17 % 0.13 % 0.16 % 0.17 % 0.20 % 0.15 % 0.14 % 0.11 % 0.14 % 0.10 % 0.13 % 0.11 % 0.15 % 0.11 %	Fluke 5520A
Resistance– Generate[3]	Up to 10.999 Ω (11 to 32.9999) Ω (33 to 109.9999) Ω (110 to 329.9999) Ω 330 Ω to 1.099 999 kΩ (1.1 to 10.999 99) kΩ (11 to 109.9999) kΩ 110 kΩ to 1.099 999MΩ (1.1 to 3.299 999) MΩ (3.3 to 10.999 99) MΩ (11 to 32.999 99) MΩ (33 to 109.9999) MΩ (110 to 329.9999) MΩ 330 MΩ to 1.1 GΩ	53 µΩ/ Ω + 0.001 Ω 52 µΩ / Ω + 0.0015 Ω 34 µΩ/ Ω + 0.0014 Ω 34 µΩ/ Ω + 0.002 Ω 35 µΩ/ Ω + 0.002 Ω 35 µΩ/ Ω + 0.02 Ω 36 µΩ/ Ω + 0.2 Ω 39 µΩ/ Ω + 2 Ω 73 µΩ/ Ω + 30 Ω 0.016 % + 50 Ω 0.030 % + 2.5 kΩ 0.060 % + 3.0 kΩ 0.37 % + 100 kΩ 1.8 % + 500 kΩ	Fluke 5520A

Parameter/Equipment	Range	CMC[2, 4, 8] (±)	Comments
Resistance– Measure[3]	Up to 10 Ω (10 to 100) Ω 100 Ω to 1.0 kΩ (1 to 10) kΩ (10 to 100) kΩ 100 kΩ to 1.0 MΩ (1 to 10) MΩ (10 to 100) MΩ 100 MΩ to 1.0 GΩ	18 µΩ/ Ω + 50 µΩ 15 µΩ / Ω + 0.5 mΩ 14 µΩ/ Ω + 0.5 mΩ 12 µΩ/ Ω + 5 mΩ 12 µΩ/ Ω + 50 mΩ 17 µΩ/ Ω + 2 Ω 51 µΩ/ Ω + 100 Ω 0.051 % + 1 kΩ 11 % + 10 kΩ	HP 3458A, option 002
Capacitance– Generate[3]	(0.19 to 3.3) nF (3.3 to 11) nF (11 to 33) nF (33 to 110) nF (110 to 330) nF 330 nF to 1.1 µF (1.1 to 3.3) µF (3.3 to 11) µF (11 to 33) µF (33 to 110) µF (110 to 330) µF 330 µF to 1.1 mF (1.1 to 3.3) mF (3.3 to 11) mF (11 to 33) mF (33 to 110) mF	0.62 % + 10 pF 0.35 % + 10 pf 0.31 % + 100 pF 0.32 % + 100 pF 0.32 % + 300 pF 0.32 % + 1 nF 0.31 % + 3 nF 0.32 % + 10 nF 0.49 % + 30 nF 0.56 % + 100 nF 0.56 % + 300 nF 0.57 % + 1 µF 0.56 % + 3 µF 0.56 % + 10 µF 0.91 % + 30 µF 1.3 % + 100 µF	Fluke 5520A

Parameter	Range	CMC[2, 8] (±)	Comments
Oscilloscopes[3]–			
Square Wave Signal: 50Ω @ 1kHz	Up to ± 6.6 V	100 µV + 2900 µV/V	Fluke 5520A/SC600
1 MΩ	Up to ± 130 V	46 µV + 630 µV/V	
Leveled Sine Wave Characteristics in 50Ω	50 kHz (reference)	0.029 V + 0.018 V/V	
Sine Wave Signal	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz	0.029 V + 0.035 V/V 0.029 V + 0.041 V/V 0.029 V + 0.064 V/V	
Time Mark (50Ω)	(1 to 5) ns 10 ns (20 to 50) ns 100 ns to 20 ms 50 ms 5 s	0.0083 nS 0.000 029 nS 0.0001 nS 0.000 058 mS 0.0043 mS 0.029 S	
Rise Time	≤300 ps	120 pS	
Electrical Simulation of RTD[3]–			
PT 385 (100Ω)	(-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C (630 to 800) °C	0.073 °C (0.14 °F) 0.092 °C (0.17 °F) 0.11 °C (0.20 °F) 0.12 °C (0.22 °F) 0.15 °C (0.27 °F) 0.27 °C (0.49 °F)	Fluke 5520A
PT 3926 (100Ω)	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C	0.073 °C (0.14 °F) 0.073 °C (0.14 °F) 0.092 °C (0.17 °F) 0.11 °C (0.20 °F) 0.12 °C (0.22 °F) 0.15 °C (0.27 °F)	
PT 3916 (100Ω)	(-200 to -190) °C (-190 to -80) °C (-80 to 0) °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	0.29 °C (0.53 °F) 0.064 °C (0.12 °F) 0.073 °C (0.14 °F) 0.082 °C (0.15 °F) 0.092 °C (0.17 °F) 0.10 °C (0.18 °F) 0.11 °C (0.20 °F) 0.12 °C (0.22 °F) 0.27 °C (0.49 °F)	

Parameter/Equipment	Range	CMC[2] (±)	Comments
Electrical Simulation of Thermocouples[3]–			
Type B	(600 to 800) °C (800 to 1820) °C	0.53 °C 0.43 °C	Fluke 5520A
Type E	(-250 to -100) °C (-100 to 650) °C (650 to 1000) °C	0.60 °C 0.21 °C 0.27 °C	
Type J	(-210 to -100) °C (-100 to 760) °C (760 to 1200) °C	0.34 °C 0.22 °C 0.29 °C	
Type K	(-200 to -100) °C (-100 to 1000) °C (1000 to 1372) °C	0.40 °C 0.33 °C 0.49 °C	
Type L	(-200 to -100) °C (-100 to 900) °C	0.46 °C 0.34 °C	
Type N	(-200 to -100) °C (-100 to 410) °C (410 to 1300) °C	0.50 °C 0.30 °C 0.36 °C	
Type R	(0 to 250) °C (250 to 1000) °C (1000 to 1767) °C	0.70 °C 0.45 °C 0.50 °C	
Type S	(0 to 250) °C (250 to 1400) °C (1400 to 1767) °C	0.58 °C 0.47 °C 0.57 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 400) °C	0.77 °C 0.31 °C 0.22 °C	
Type U	(-200 to 0) °C (0 to 600) °C	0.70 °C 0.36 °C	

Parameter/Range	Frequency	CMC[2,4,8] (±)	Comments
AC Current– Generate[3]			
(29 to 330) µA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1.0 kHz (1.0 to 5.0) kHz (5.0 to 10) kHz (10 to 30) kHz	0.25 % + 0.1 µA 0.18 % + 0.1 µA 0.16 % + 0.1 µA 0.37 % + 0.15 µA 0.97 % + 0.2 µA 1.9 % + 0.4 µA	Fluke 5520A
330 µA to 3.3 mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1.0 kHz (1.0 to 5.0) kHz (5.0 to 10) kHz (10 to 30) kHz	0.24 % + 0.15 µA 0.15 % + 0.15 µA 0.13 % + 0.15 µA 0.25 % + 0.20 µA 0.60 % + 0.30 µA 1.2 % + 0.6 µA	
(3.3 to 33) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1.0 kHz (1.0 to 5.0) kHz (5.0 to 10) kHz (10 to 30) kHz	0.22 % + 2 µA 0.11 % + 2 µA 0.05 % + 2 µA 0.1 % + 2 µA 0.25 % + 3 µA 0.49 % + 4 µA	
(33 to 330) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1.0 kHz (1.0 to 5.0) kHz (5.0 to 10) kHz (10 to 30) kHz	0.22 % + 20 µA 0.11 % + 20 µA 0.05 % + 20 µA 0.13 % + 50 µA 0.25 % + 100 µA 0.49 % + 200 µA	
330 mA to 1.1 A	(10 to 45) Hz 45 Hz to 1.0 kHz (1.0 to 5.0) kHz (5.0 to 10) kHz	0.22 % + 100 µA 0.063 % + 100 µA 0.73 % + 1 mA 3 % + 5 mA	
(0.35 to 3) A	(10 to 45) Hz 45 Hz to 1 kHz (1.0 to 5.0) kHz (5.0 to 10) kHz	0.22 % + 100 µA 0.08 % + 100 µA 0.73 % + 1 mA 3 % + 5 mA	
(3 to 11) A	45Hz to 1 kHz (1 to 5.0) kHz	0.13 % + 2 mA 3.6 % + 2 mA	
(11 to 20.5) A	45Hz to 1 kHz (1 to 5.0) kHz	0.19 % + 5 mA 3.6 % + 5 mA	

Parameter/Range	Frequency	CMC[2,4,8] (±)	Comments
AC Current– Generate[3] (cont)			
(20.5 to 1000) A	(45 to 65) Hz (65 to 440) Hz	1.1 mA/A + 290 mA 3.4 mA/A + 430 mA	Fluke 5520A w/50-turn coil
AC Current– Measure[3]			
100 µA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5.0 kHz	0.41 % + 0.03 % Rng 0.16 % + 0.03 % Rng 0.07 % + 0.03 % Rng 0.07 % + 0.03 % Rng	HP 3458A, option 002
1 mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5.0 kHz (5.0 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.07 % + 0.03 % Rng 0.16 % + 0.02 % Rng 0.07 % + 0.02 % Rng 0.04 % + 0.02 % Rng 0.07 % + 0.02 % Rng 0.41 % + 0.04 % Rng 0.56 % + 0.15 % Rng	
(1 to 10) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5.0 kHz (5.0 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.41 % + 0.02 % Rng 0.16 % + 0.02 % Rng 0.07 % + 0.02 % Rng 0.04 % + 0.02 % Rng 0.07 % + 0.02 % Rng 0.41 % + 0.04 % Rng 0.56 % + 0.15 % Rng	
(10 to 100) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5.0 kHz (5.0 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.41 % + 0.02 % Rng 0.16 % + 0.02 % Rng 0.07 % + 0.02 % Rng 0.04 % + 0.02 % Rng 0.07 % + 0.02 % Rng 0.41 % + 0.02 % Rng 0.56 % + 0.15 % Rng	
100 mA to 1 A	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5.0 kHz (5.0 to 20) kHz (20 to 50) kHz	0.56 % + 0.15 % Rng 0.56 % + 0.15 % Rng 0.56 % + 0.15 % Rng 0.56 % + 0.15 % Rng 0.56 % + 0.15 % Rng 0.56 % + 0.15 % Rng	
(1 to 10) A	(20 to 50) Hz (0.05 to 2.0) kHz	0.56 % + 0.15 % Rng 0.56 % + 0.15 % Rng	Fluke 45

Parameter/Range	Frequency	CMC[2,4,8] (±)	Comments
AC Voltage– Generate[3]			
Up 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	0.11 % + 6 µV 0.021 % + 6 µV 0.026 % + 6 µV 0.13 % + 6 µV 0.43 % + 12 µV 0.97 % + 50 µV	Fluke 5520A
(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	0.04 % + 8 µV 0.018 % + 8 µV 0.02 % + 8 µV 0.043 % + 8 µV 0.097 % + 32 µV 0.25 % + 70 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	0.04 % + 50 µV 0.019 % + 60 µV 0.023 % + 60 µV 0.036 % + 50 µV 0.085 % + 130 µV 0.29 % + 600 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	0.04 % + 650 µV 0.019 % + 600 µV 0.029 % + 600 µV 0.043 % + 600 µV 0.11 % + 1.6 mV	
(33 to 330) V	45 Hz to 1 kHz (0.35 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.024 % + 2 mV 0.025 % + 6 mV 0.03 % + 6 mV 0.038 % + 6 mV 0.25 % + 50 mV	
220 V to 1.0 kV	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.037 % + 10 mV 0.03 % + 10 mV 0.037 % + 10 mV	

Parameter/Range	Frequency	CMC[2,8] (±)	Comments
AC Voltage–Measure[3]			
(1 to 10) mV	(1 to 40) Hz 40 Hz to 1.0 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz	0.031 % rdg + 0.03 % rng 0.021 % rdg + 0.011 % rng 0.031 % rdg + 0.011 % rng 0.011 % rdg + 0.01 % rng 0.51 % rdg + 0.011 % rng 0.31 % rdg + 0.02 % rng	HP 3458A, option 002
(10 to 100) mV	(1 to 40) Hz 40 Hz to 1.0 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1.0 MHz (1.0 to 2.0) MHz	0.008 % rdg + 0.004 % rng 0.008 % rdg + 0.002 % rng 0.021 % rdg + 0.002 % rng 0.031 % rdg + 0.002 % rng 0.081 % rdg + 0.002 % rng 0.31 % rdg + 0.01 % rng 1.1 % rdg + 0.01 % rng 1.6 % rdg + 0.01 % rng	
100 mV to 1 V	(1 to 40) Hz 40 Hz to 1.0 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1.0 MHz (1.0 to 2.0) MHz	0.008 % rdg + 0.004 % rng 0.008 % rdg + 0.002 % rng 0.015 % rdg + 0.002 % rng 0.031 % rdg + 0.002 % rng 0.081 % rdg + 0.002 % rng 0.31 % rdg + 0.01 % rng 1.1 % rdg + 0.01 % rng 1.6 % rdg + 0.01 % rng	
(1 to 10) V	(1 to 40) Hz 40 Hz to 1.0 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1.0 MHz (1.0 to 4.0) MHz	0.008 % rdg + 0.004 % rng 0.008 % rdg + 0.002 % rng 0.015 % rdg + 0.002 % rng 0.031 % rdg + 0.002 % rng 0.081 % rdg + 0.002 % rng 0.31 % rdg + 0.01 % rng 1.1 % rdg + 0.01 % rng 1.6 % rdg + 0.01 % rng	

Parameter/Range	Frequency	CMC[2,8] (±)	Comments
AC Voltage–Measure[3] (cont)			HP 3458A, option 002
(10 to 100) V	(1 to 40) Hz 40 Hz to 1.0 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1.0 MHz	0.021 % rdg + 0.004 % rng 0.021 % rdg + 0.002 % rng 0.021 % rdg + 0.002 % rng 0.036 % rdg + 0.002 % rng 0.13 % rdg + 0.002 % rng 0.41 % rdg + 0.01 % rng 1.6 % rdg + 0.01 % rng	
100 V to 1 kV	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.008 % rdg + 0.004 % rng 0.041 % rdg + 0.002 % rng 0.061 % rdg + 0.002 % rng 0.13 % rdg + 0.002 % rng 0.31 % rdg + 0.002 % rng	
AC High Voltage[3]–Measure			
60 Hz	(1 to 70) kV	97 VAC	Vitrek 4700 w/ HL100 probe

V. Mechanical

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Force/Load Cell	(1 to 10 000) gf (1 to 220) lbf	0.0085 mg/g + 0.011 mg 0.012 % + 0.0047 lbf	Class 1 weights Class 6 weight
Durometers –			
Scale Accuracy			ASTM D2240:
ASTM Type A, B, C, D, DO, E, M, O, OOO, OOO-S, R	(0 to 100) duros	0.06 duros	Standards weights & balance
Type OO	(0 to 100) duros	0.3 duros	
Indentor Geometry			
Durometer Extension	Up to 2 in	58 µin	Gage block
Angle Radius Diameter Length	Up to 35° Up to 0.5 in Up to 1 in Up to 0.5 in	0.0026°/ 9.5 arc sec (260 + 1.2*L*) µin (260 + 1.2*L*) µin 250 µin	Vision system

Parameter/Equipment	Range	CMC[2] (±)	Comments
Indirect Verification of Rockwell Hardness Testers[3]	HRA: Low Medium High HRB: Low Medium High HRC: Low Medium High HR15N: Low Medium High HR30N: Low Medium High HR45N: Low Medium High HR15TW: Low Medium High HR30TW: Low Medium High HR45TW: Low Medium High	 0.64 HRA 0.66 HRA 0.82 HRA 0.75 HRB 1.2 HRB 0.86 HRB 0.67 HRC 0.68 HRC 0.63 HRC 0.65 HR15N 0.74 HR15N 0.70 HR15N 0.68 HR30N 0.86 HR30N 1.1 HR30N 0.68 HR45N 0.87 HR45N 0.69 HR45N 0.66 HR15TW 0.64 HR15TW 0.70 HR15TW 0.67 HR30TW 0.67 HR30TW 0.70 HR30TW 0.68 HR45TW 0.73 HR45TW 0.68 HR45TW	Indirect comparison with test blocks ASTM E-18

Parameter/Equipment	Range	CMC[2,4] (±)	Comments
Indirect Verification of Brinell Hardness Testers at Test Condition(s)[3,7]–			
HBW 10/3000/15	(67 to 300) HBW (300 to 650) HBW	3.6 HBw 2.8 HBw	Indirect comparison with test blocks to ASTM E10
Indirect Verification of Micro Indentation Hardness Testers[3]–			
Knoop	(100 to 250) HK (250 to 650) HK (>650 HK)	3.3 HK 10 HK 15 HK	Indirect comparison with test blocks to ASTM E384
Vickers	(<250) HV (250 to 650) HV (>650) HV	3.3 HV 8.4 HV 11 HV	
Scales & Balances[3]	Up to 10 000 g	0.0085 mg/g + 0.011 mg	ASTM Class 1 weights
	Up to 220 lb	0.024 % + 0.0039 lb	Class 6 weights
Torque Wrenches[3]	(5 to 50) ozf·in	0.27 % + 0.08 ozf·in	Torque transducer
	(15 to 200) ozf·in	0.27 % + 0.14 ozf·in	Torque transducer
	(4 to 50) lbf·in	0.1 % + 0.29 lbf·in	Torque transducer
	(30 to 400) lbf·in	0.39 % + 0.32 lbf·in	Torque transducer
	(80 to 1000) lbf·in	0.46 % + 0.73 lbf·in	Torque transducer
	(20 to 250) lbf·ft	0.42 % + 0.27 lbf·ft	Torque transducer
	(60 to 600) lbf·ft	0.28 % + 0.76 lbf·ft	Torque transducer
	(100 to 1000) lbf·ft	0.48 % + 1.6 lbf·ft	Torque transducer

Parameter/Equipment	Range	CMC[2,4] (±)	Comments
Torque – Testers/Transducers	(5 to 2200) lbf·in (10 to 730) lbf·ft	0.043 % 0.05 %	Torque arms/weights
Pressure[3]	(-13 to 300) psig (300 to 3000) psig (0 to 10 000) psia	0.099 psig 0.99 psig 3.2 psia	Druck PV621 Pressure calibrator

VI. Thermodynamics

Parameter/Equipment	Range	CMC[2] (±)	Comments
Thermometers[3]	(-25 to 150) °C (50 to 420) °C (420 to 550) °C (550 to 600) °C	0.23 °C 0.42 °C 0.49 °C 0.60 °C	Hart Scientific 9142 Hart Scientific 9144
Thermocouples/RTDs[3]	(-25 to 150) °C (50 to 420) °C (420 to 500) °C (550 to 600) °C	0.40 °C 0.57 °C 0.62 °C 0.71 °C	Hart Scientific 9142, Fluke 5520A Hart Scientific 9144, Fluke 5520A

VII. Time & Frequency

Parameter/Equipment	Range	CMC[2,4] (±)	Comments
Stopwatches & Timers[3]	Up to 24 hr Up to 24 hr	0.0058 % 0.03 sec	Stopwatch calibrator Frequency counter

Parameter/Equipment	Range	CMC[2] (±)	Comments
Tachometers – Contact & Non-contact	Up to 199 999 RPM	0.006 %	HP 3325A, function generator
Frequency– Measure	Up to 350 MHz	0.058 Hz	Keysight 53220A Spectracom 8194B
Frequency– Generate Measuring Equipment	Up to 20 MHz	0.29 + 0.013 µHz/Hz	HP 3325A w/ Spectracom 8194B

Mechanical Testing

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

Test	Test Method
Hardness	
Rockwell HRC	ASTM E18

[1]This laboratory offers commercial dimensional testing/calibration service and field calibration service.

[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 or 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 Uncertainty 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. Please note the actual measurement uncertainties achievable on a customer's site can normally be expected to be larger than the CMC Uncertainty 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 Uncertainty.

[4]In the statement of CMC, the value is defined as the percentage of reading.

[5]In the statement of CMC, L represents the numerical value of the nominal length of the device measured in inches, $L2$ represents the numerical value of the nominal length of the device measured in meters, D represents the numerical value of diagonal length of device measured in inches, and $D2$ represents the numerical value of diagonal length of device measured in meters.

[6]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.

[7]The notation HBW 10/3000/15 gives the conditions of the verification: the 10 is the indenter diameter in millimeters, the 3000 is the test force in kilogram-force, and the 15 is the force application duration in seconds.

[8]The stated measured values are determined using the indicated instrument (see Comments). This capability is suitable for the calibration of the devices intended to measure or generate the measured value in the ranges indicated. CMCs are expressed as either a specific value that covers the full range or as a fraction/percentage of the reading plus a fixed floor specific.

[9]This scope meets A2LA's *P112 Flexible Scope Policy*.

Accredited Laboratory

A2LA has accredited

MSI-VIKING GAGE

Canton, MI

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 1st day of February 2024.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3466.01
Valid to July 31, 2025

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