



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

MICRO LABORATORIES INC.
7158 Industrial Park
Mentor, OH 44060
Keith Kokal Phone: 440 918 0001

CALIBRATION

Valid To: July 31, 2019

Certificate Number: 1312.01

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
Bore Micrometers ³	(0.5 to 12) in	100 µin	Ring gages
Calipers ³	(0.05 to 60) in	(620 + 3.5L) µin	Gage blocks/height gage
Chamfer Check Gages ³	Up to 4 in	82 µin	Chamfer check master
Chamfer Set Master	Up to 12 in	29 µin	Optical comparator and angle blocks, amp and indicator, splate
Concentricity Gage	Up to 2 in	27 µin	Mu checker/pin gage
Dial Bore Gages ³	(0.05 to 12) in	67 µin	Ring gages
Digital Bore Gages ³	(0.05 to 12) in	67 µin	Ring gages
Electronic Indicators and Amplifiers ³	Up to 2 in	8 µin	Optical height gage, surface plate, gage blocks

Parameter/Equipment	Range	CMC ^{2, 4} (\pm)	Comments
Feeler Gages	Up to 1 in	20 μ in	Supermicrometer TM ,
Gage Balls/CMM Sphere	(0.001 through 4) in	17 μ in	Supermicrometer TM
Gage Blocks	(0.01 to 4.0) in (5 to 20) in Up to 20 in	(3.5 + 2L) μ in (24 + 1.1L) μ in (14 + 4.5L) μ in	Mechanical comparison Mahr ULM
Gear Wires – Pitch	(1 to 200) pitch	22 μ in	Supermicrometer TM
Height Gages ³	(1 to 60) in	(70 + 4L) μ in	Height master
Indicator Calibrators	Up to 1 in	(21 + 2L) μ in	Gage blocks/ Mu checker
Indicators ³	(0.00002 to 2) in	(30 + 6.5L) μ in	Indicator calibrator
Indicators / LVDT's ³	Up to 2 in	8 μ in	Optical height gage, surface plate, gage blocks
Laser Micrometer Verification ³	Up to 6 in	23 μ in	Master pin standards
Levels	-45° through +45°	150 μ in	Surface plate, gage blocks
Luer Tapered Rings – Length/Step Small Diameter Large Diameter Taper	Up to 1500 mm Up to 100 mm Up to 100 mm	(14 + 4.5L) μ in (80 + 2L) μ in (80 + 2L) μ in 5 μ in	ISO 594/1 3a &3b Height gage IAC MasterScanner IAC MasterScanner IAC MasterScanner

Parameter/Equipment	Range	CMC ^{2,4} (\pm)	Comments
Luer Tapered Plugs – Length/Step Small Diameter Large Diameter Taper	Up to 1500 mm Up to 100 mm Up to 100 mm	$(14 + 4.5L) \mu\text{in}$ $(80 + 2L) \mu\text{in}$ $(80 + 2L) \mu\text{in}$ $5 \mu\text{in}$	ISO 594/1 3c Optical height gage IAC MasterScanner IAC MasterScanner IAC MasterScanner
Luer Ref Conical Fitting – Length/Step Diameter Flank Angle	Up to 1500 mm Up to 100 mm Up to 30°	$(14 + 4.5L) \mu\text{in}$ $(17 + 3.3L) \mu\text{in}$ $0^{\circ}6'0''$	ISO 594-2 Figures 5 & 6 Mahr ULM Mahr ULM IAC MasterScanner
Luer Ref Conical Fitting – Interior Diameter Interior Diameter Angles	Up to 100 mm Up to 100 mm Up to 30°	$(40 + 5L) \mu\text{in}$ $(40 + 5L) \mu\text{in}$ $0^{\circ}6'0''$	ISO 594-2 Figure 7 Mahr ULM Mahr ULM IAC MasterScanner
Luer Ref Conical Fitting – Interior Diameter Interior Diameter Angles	Up to 100 mm Up to 100 mm Up to 30°	$(40 + 5L) \mu\text{in}$ $(40 + 5L) \mu\text{in}$ $0^{\circ}6'0''$	ISO 594-2 Figure 8 Mahr ULM Mahr ULM IAC MasterScanner
Luer Ref Steel Male Conical Fitting – Diameter Length	Up to 100 mm Up to 1500 mm	$(80 + 2L) \mu\text{in}$ $(14 + 4.5L) \mu\text{in}$	ISO 594-2 Figure 5 IAC MasterScanner Optical height gage

Parameter/Equipment	Range	CMC ^{2,4} (\pm)	Comments
Luer Ref Steel Female Conical Fitting –			ISO 594-1 Figure 4
Diameter	Up to 100 mm	$(80 + 2L) \mu\text{in}$	IAC MasterScanner
Length	Up to 1500 mm	$(14 + 4.5L) \mu\text{in}$	Optical height gage
MasterScanner Master Gage (Gauge)	DIN Ring, ID Wires	13 μin 9.4 μin	Mahr ULM
MasterScanner Reference Plane gage (gauge)	(0.0250 to 0.2500) in Wires Height	9.4 μin 7.5 μin	Mahr ULM, Mu checker, surface plate
Micrometers ³	(0.05 to 48) in	$(94 + 3.5L) \mu\text{in}$	Gage blocks/optical flats
Micrometer Setting Masters and Caliper Setting Masters	(1 to 60) in	$(40 + 4L) \mu\text{in}$	Height gage, Mu checker, and surface plate
Micrometer Setting Standards, Length Standards	(1 to 60) in	$(15 + 4L) \mu\text{in}$	Optical height gage and Mu checker
Optical Comparators and Optical Measuring Machines ³			Magnification standards optical linear standards angle blocks
Magnification- Up to 8 in (>8 to 16) in (>16 to 36) in	5x, 10x, 20x, 30x, 31.25x, 50x, 62.5x	0.011 % of magnification	Glass scale, magnification checker
Linear Axis	X & Y Axis	1000 μin	Glass scale
Angularity	0° to 360°	1' 12"	Angle blocks
Optical Flats	Up to 6 in	1.2 μin	Optical interferometer
Parallels	Up to 36 in	$(66 + 32L) \mu\text{in}$	Surface plate and indicator

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Pin Gages (OD)	(0.01 to 4) in Up to 20 in	22 μin (15 + 3.2L) μin	Supermicrometer™ Mahr ULM
Plug Gages (OD) – Taper Diameter	(0.001 to 4) in (0.001 to 20) in (0.039 to 3.7) in (0.039 to 3.7) in	22 μin (15 + 3.2L) μin 5 μin (80 + 2L) μin	Supermicrometer™ Mahr ULM IAC Masterscanner IAC Masterscanner
Protractors /Digital	0° through 360°	0° 6' 29"	Sine bar / surface plate /gage blocks
Radius Gages	Up to 6 in	2000 μin	Optical comparator
Railroad Track Gage/ Geismar Bar – Linearity Elevation	Up to 62 in Up to 62 in	0.030 in 0.037 in	Rail Gage
Ring Gages (ID) – Taper Diameter	(0.06 to 12) in (0.118 to 4) in (0.118 to 4) in	(17 + 3.3L) μin 5 μin (40 + 5L) μin	Mahr ULM IAC Masterscanner IAC Masterscanner
Screw Thread Micrometers ³	Up to 6 in	150 μin	Master screw thread standards
Screw Thread Micrometer Standards	Up to 6 in	200 μin	Nikon optical comparator and Supermicrometer

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
Sine Bars/Sine Plates Angle Parallelism	Up to 10" Up to 10 in	0° 5" 40 µin	Surface plate electronic indicator/amp, optical height gage
Snap Gages ³	(0.125 to 20) in	(120 + 4.8L) µin	Gage blocks
Square Masters	Up to 0.008 in	50 µin	Granite square, surface plate, indicator
Squareness	Up to 0.008 in	45 µin	Square master
Spline Gages	Up to 12 in	40 µin	ULM with wires or balls
Stage Micrometer	Up to 4 in Up to 48 in	80 µin 600 µin	Mahr ULM with scope. custom optical vision linear system
Steel Rules/Tapes	Up to 100 ft	600 µin	Optical vision measuring system
Supermicrometer TM	Up to 48 in	16 µin	Gage blocks and force gage
Supermicrometers ^{TM, 3}	Up to 48 in	16 µin	Gage blocks and force gage
Surface Finish Testers ³	2 to 500 µin	4 µin	Roughness standards
Surface Roughness Standards	(2 to 500) µin	3.5 µin	Roughness analyzer

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Taper Pipe Thread Plugs –	(0.062 to 3.0) in	130 μin	Supermicrometer™ and thread wires
	(2 to 120) TPI Up to 20 in	52 μin	Mahr ULM
Effective Pitch Diameter	(0.039 to 3.7) in	(80 + 5L) μin	IAC Masterscanner
Simple Pitch Diameter	(0.039 to 3.7) in	(80 + 5L) μin	IAC Masterscanner
Major Diameter	(0.039 to 3.7) in	(80 + 5L) μin	IAC Masterscanner
Minor Diameter	(0.039 to 3.7) in	(100 + 5L) μin	IAC Masterscanner
Thread Pitch	(0.039 to 3.7) in	(40 + 5L) μin	IAC Masterscanner
Accumulated Pitch Deviation	Pitch ≤ 0.0394 in (1 mm)	(40 + 5L) μin	IAC Masterscanner
Flank Angles	Pitch > 0.0394 in (1 mm)	(0°6'0'')/p	IAC Masterscanner p=Pitch
		0°6'0'	IAC Masterscanner
Taper	(0.039 to 3.7) in	22 μin	IAC Masterscanner

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Taper Pipe Thread Rings –	(0.062 to 3.0) in	170 µin	Master plugs
	(2 to 120) TPI Up to 12 in	52 µin	Mahr ULM
Effective Pitch Diameter	(0.118 to 4) in	(80 + 5L) µin	IAC Masterscanner
Simple Pitch Diameter	(0.118 to 4) in	(80 + 5L) µin	IAC Masterscanner
Major Diameter	(0.118 to 4) in	(80 + 5L) µin	IAC Masterscanner
Minor Diameter	(0.118 to 4) in	(100 + 5L) µin	IAC Masterscanner
Thread Pitch	(0.118 to 4) in	(40 + 5L) µin	IAC Masterscanner
Accumulated Pitch Deviation	(0.118 to 4) in	(40 + 5L) µin	IAC Masterscanner
Flank Angles	Pitch ≤ 0.0394 in (1 mm)	(0°6'0'')/p	IAC Masterscanner p=Pitch
	Pitch > 0.0394 in (1 mm)	0°6'0'	IAC Masterscanner
Taper	(0.118 to 4) in	22 µin	IAC Masterscanner
Thickness Gages	Up to 1 in	20 µin	Supermicrometer™
Thread Plug Gages –	(2 to 120) TPI Up to 36 in	85 µin	Supermicrometer™ and thread wires
	(2 to 120) TPI Up to 20 in	74 µin	Mahr ULM
Effective Pitch Diameter	(0.039 to 3.7) in	(80 + 5L) µin	IAC Masterscanner
Simple Pitch Diameter	(0.039 to 3.7) in	(80 + 5L) µin	IAC Masterscanner
Major Diameter	(0.039 to 3.7) in	(80 + 5L) µin	IAC Masterscanner
Minor Diameter	(0.039 to 3.7) in	(100 + 5L) µin	IAC Masterscanner
Thread Pitch	(0.039 to 3.7) in	(40 + 5L) µin	IAC Masterscanner
Accumulated Pitch Deviation	(0.039 to 3.7) in	(40 + 5L) µin	IAC Masterscanner

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Thread Plug Gages – (cont)			
Flank Angles	Pitch ≤ 0.039 4in (1 mm)	(0°6'0'')/p	IAC Masterscanner p=Pitch
	Pitch > 0.0394 in (1 mm)	0°6'0'	IAC Masterscanner
Taper	(0.039 to 3.7) in	22 μin	IAC Masterscanner
Thread Rings –	(2 to 120) TPI Up to 36 in	140 μin	Set plugs
Effective Pitch Diameter	(2 to 120) TPI Up to 12 in	52 μin	Mahr ULM
Simple Pitch Diameter	(0.118 to 4) in	(80 + 5L) μin	IAC Masterscanner
Major Diameter	(0.118 to 4) in	(80 + 5L) μin	IAC Masterscanner
Minor Diameter	(0.118 to 4) in	(100 + 5L) μin	IAC Masterscanner
Thread Pitch	(0.118 to 4) in	(40 + 5L) μin	IAC Masterscanner
Accumulated Pitch Deviation	(0.118 to 4) in	(40 + 5L) μin	IAC Masterscanner
Flank Angles	Pitch ≤ 0.0394 in (1 mm)	(0°6'0'')/p	IAC Masterscanner p=Pitch
	Pitch > 0.0394 in (1 mm)	0°6'0'	IAC Masterscanner
Taper	(0.118 to 4) in	22 μin	IAC Masterscanner
Thread Set Plug Gages –	(2 to 120) TPI Up to 12 in	85 μin	Supermicrometer™ and thread wires
	(2 to 120) TPI Up to 12 in	52 μin	Mahr ULM
Effective Pitch Diameter	(0.118 to 4) in	(80 + 5L) μin	IAC Masterscanner
Simple Pitch Diameter	(0.118 to 4) in	(80 + 5L) μin	IAC Masterscanner
Major Diameter	(0.118 to 4) in	(80 + 5L) μin	IAC Masterscanner
Minor Diameter	(0.118 to 4) in	(100 + 5L) μin	IAC Masterscanner

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Thread Set Plug Gages – (cont)			
Thread Pitch	(0.118 to 4) in	(40 + 5L) μin	IAC Masterscanner
Accumulated Pitch Deviation	(0.118 to 4) in	(40 + 5L) μin	IAC Masterscanner
Flank Angles	Pitch ≤ 0.0394 in (1 mm)	(0°6'0'')/p	IAC Masterscanner p=Pitch
	Pitch > 0.0394 in (1 mm)	0°6'0'	IAC Masterscanner
Taper	(0.118 to 4) in	22 μin	IAC Masterscanner
Thread Wires	(2 to 120) TPI	22 μin	Supermicrometer™
Tool Makers Microscope ³	Up to 12 in	700 μin	Magnification standards optical linear standards
Torque Arms	Up to 60 in	370 μin	Height master, surface plate, Mu checker
Universal Measuring Machines, ULM's	Up to 60"	0.0000078"	Gage blocks, force gage

II. Dimensional Testing/Calibration¹

Parameter/Equipment	Range	CMC ² (±)	Comments
2-D Optical Inspection ⁵ – Linearity	Up to 12 in × 12 in	700 μin	Optical comparator
Angle ⁵	(0 to 360) °	60 μin	Optical comparator master optical grid overlay

Parameter/Equipment	Range	CMC ^{2, 4} (\pm)	Comments
Height/Diameter ⁵	Up to 60 in	(70 + 4L) μ in	Height gage, indicator and gage blocks
	Up to 20 in	(14 + 4.5L) μ in	
ID Diameter ⁵	(0.06 to 12) in	(21 + 8.3L) μ in	Comparator
OD Diameter/Length ⁵	Up to 36 in	22 μ in	Supermicrometer TM
	Up to 20 in	(40 + 5L) μ in	Mahr ULM
Parallelism ⁵	Up to 36 in	(66 + 32L) μ in	Surface plate and height gage
Radii ⁵	(0 to 360) °	2000 μ in	Optical comparator master optical grid overlay
Squareness ⁵	Up to 0.008 in	60 μ in	Surface plate and squaremaster

III. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2, 6} (\pm)	Comments
DC Current – Measure ³	Up to 200 μ A 200 μ A to 2 mA (2 to 20) mA (20 to 200) mA 200 mA to 2 A (2 to 20) A	0.0015 % + 40 nA 0.0015 % + 400 nA 0.0018 % + 4 μ A 0.006 % + 80 μ A 0.023 % + 1.6 mA 0.048 % + 40 mA	Fluke 8508A
DC Current – Generate ³	(0 to 330) μ A 330 μ A to 3.3 mA (3.3 to 33) mA (33 to 330) mA 330 mA to 1.1 A (1.1 to 2.3) A (2.3 to 11) A (11 to 20.5) A	0.015 % + 20 nA 0.01 % + 50 nA 0.01 % + 250 nA 0.01 % + 2.5 μ A 0.02 % + 40 μ A 0.038 % + 40 μ A 0.05 % + 500 μ A 0.1 % + 750 μ A	Fluke 5522A

Parameter/Equipment	Range	CMC ^{2,6} (\pm)	Comments
DC Voltage – Measure ³	Up to 200 mV 200 mV to 2 V (2 to 20) V (20 to 200) V (200 to 1000) V	0.00063 % + 10 nV 0.00044 % + 40 nV 0.00044 % + 400 nV 0.00069 % + 4 mV 0.00069 % + 50 mV	Fluke 8508A
DC Voltage – Generate ³	(0 to 330) mV 330 mV to 3.3 V (3.3 to 33) V (33 to 330) V (330 to 1020) V	20 μ V/V + 1 μ V 11 μ V/V + 2 μ V 12 μ V/V + 20 μ V 18 μ V/V + 150 μ V 18 μ V/V + 1.5 mV	Fluke 5522A
Resistance – Measure ³	Up to 2 Ω (2 to 20) Ω (20 to 200) Ω 200 Ω to 2 k Ω (2 to 20) k Ω (20 to 200) k Ω 200 k Ω to 2 M Ω (2 to 20) M Ω (20 to 200) M Ω 200 M Ω to 2 G Ω	0.0022 % + 4 $\mu\Omega$ 0.0012 % + 14 $\mu\Omega$ 0.0010 % + 50 $\mu\Omega$ 0.0010 % + 500 $\mu\Omega$ 0.0010 % + 5 m Ω 0.0010 % + 50 m Ω 0.0012 % + 1 Ω 0.0025 % + 100 Ω 0.015 % + 10 k Ω 0.19 % + 1 M Ω	Fluke 8508A
Resistance – Generate ³	(0 to 11) Ω (11 to 33) Ω 33 Ω to 110 Ω (110 to 330) Ω 330 Ω to 1.1 k Ω (1.1 to 3.3) k Ω (3.3 to 11) k Ω (11 to 33) k Ω (33 to 110) k Ω (110 to 330) k Ω 330 k Ω to 1.1 M Ω (1.1 to 3.3) M Ω (3.3 to 11) M Ω (11 to 33) M Ω (33 to 110) M Ω (110 to 330) M Ω 330 M Ω to 1.1 G Ω	40 $\mu\Omega/\Omega$ + 0.01 Ω 30 $\mu\Omega/\Omega$ + 0.015 Ω 28 $\mu\Omega/\Omega$ + 0.015 Ω 28 $\mu\Omega/\Omega$ + 0.02 Ω 28 $\mu\Omega/\Omega$ + 0.2 Ω 28 $\mu\Omega/\Omega$ + 0.1 Ω 28 $\mu\Omega/\Omega$ + 1 Ω 28 $\mu\Omega/\Omega$ + 1 Ω 28 $\mu\Omega/\Omega$ + 1 Ω 32 $\mu\Omega/\Omega$ + 10 Ω 32 $\mu\Omega/\Omega$ + 10 Ω 60 $\mu\Omega/\Omega$ + 150 Ω 0.013 % + 250 Ω 0.025 % + 2.5 k Ω 0.05 % + 3 k Ω 0.3 % + 100 k Ω 1.5 % + 500 k Ω	Fluke 5522A

Parameter/Equipment	Range	CMC ^{2,6} (±)	Comments
AC Voltage – Measure ³			
Up to 200 mV	(1 to 10) Hz (10 to 40) Hz (40 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz	0.021 % + 14 μV 0.018 % + 4 μV 0.015 % + 4 μV 0.014 % + 2 μV 0.017 % + 4 μV 0.043 % + 8 μV 0.096 % + 20 μV	Fluke 8508A
200 mV to 2V	(1 to 10) Hz (10 to 40) Hz (40 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	0.019 % + 120 μV 0.015 % + 20 μV 0.012 % + 20 μV 0.010 % + 20 μV 0.014 % + 20 μV 0.028 % + 40 μV 0.072 % + 200 μV 0.38 % + 200 μV 1.3 % + 2 mV	
(2 to 20) V	(1 to 10) Hz (10 to 40) Hz (40 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	0.019 % + 1.2 mV 0.015 % + 200 μV 0.012 % + 200 μV 0.010 % + 200 μV 0.014 % + 200 μV 0.028 % + 400 μV 0.072 % + 2 mV 0.38 % + 2 mV 1.3 % + 20 mV	
(20 to 200) V	(1 to 10) Hz (10 to 40) Hz (40 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	0.019 % + 12 mV 0.015 % + 2 mV 0.012 % + 2 mV 0.010 % + 2 mV 0.014 % + 2 mV 0.028 % + 4 mV 0.072 % + 20 mV 0.38 % + 20 mV 1.3 % + 200 mV	
(200 to 1000) V	(1 to 10) Hz (10 to 40) Hz 40 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.019 % + 73.5 mV 0.015 % + 21 mV 0.014 % + 21 mV 0.028 % + 42 mV 0.073 % + 210 mV	

Parameter/Equipment	Range	CMC ^{2, 6} (\pm)	Comments
AC Voltage – Generate ³			
(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	0.16 % + 6 μ V 0.03 % + 6 μ V 0.04 % + 6 μ V 0.2 % + 6 μ V 0.7 % + 12 μ V 1.6 % + 50 μ V	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	0.06 % + 8 μ V 0.029 % + 8 μ V 0.032 % + 8 μ V 0.07 % + 8 μ V 0.016 % + 32 μ V 0.4 % + 70 μ V	
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	0.06 % + 50 μ V 0.03 % + 60 μ V 0.038 % + 60 μ V 0.06 % + 50 μ V 0.14 % + 125 μ V 0.48 % + 600 μ V	
(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	0.06 % + 650 μ V 0.03 % + 600 μ V 0.048 % + 600 μ V 0.07 % + 600 μ V 0.18 % + 1.6 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	0.038 % + 2 mV 0.04 % + 6 mV 0.05 % + 6 mV 0.06 % + 6 mV 0.4 % + 50 mV	
(330 to 1020) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.06 % + 10 mV 0.05 % + 10 mV 0.06 % + 10 mV	
AC Current – Measure ³			
Up to 200 μ A	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.063 % + 20 nA 0.063 % + 20 nA 0.089 % + 20 nA 0.5 % + 20 nA	Fluke 8508A
200 μ A to 2 mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.039 % + 200 nA 0.038 % + 200 nA 0.089 % + 200 nA 0.5 % + 200 nA	

Parameter/Equipment	Range	CMC ^{2, 6} (\pm)	Comments
AC Current – Measure (cont) ³			
(2 to 20) mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.039 % + 2 μ A 0.038 % + 2 μ A 0.089 % + 2 μ A 0.5 % + 2 μ A	Fluke 8508A
(20 to 200) mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz	0.039 % + 20 μ A 0.036 % + 20 μ A 0.078 % + 20 μ A	
200 mA to 2 A	10 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz	0.078 % + 200 μ A 0.092 % + 200 μ A 0.38 % + 200 μ A	
(2 to 20) A	10 Hz to 2 kHz (2 to 10) kHz	0.10 % + 2 mA 0.31 % + 2 mA	
AC Current – Generate ³			
(29 to 330) μ A	(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	0.4 % + 0.1 μ A 0.3 % + 0.1 μ A 0.25 % + 0.1 μ A 0.6 % + 0.15 μ A 1.6 % + 0.2 μ A 3.2 % + 40 μ A	Fluke 5522A
300 μ A 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	0.4 % + 0.15 μ A 0.25 % + 0.15 μ A 0.2 % + 0.15 μ A 0.4 % + 0.2 μ A 1.0 % + 0.3 μ A 2.0 % + 0.6 μ A	
(3.3 to 33.3) 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	0.36 % + 2 μ A 0.18 % + 2 μ A 0.08 % + 2 μ A 0.16 % + 2 μ A 0.4 % + 3 μ A 0.8 % + 4 μ A	
(33.3 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	0.36 % + 20 μ A 0.18 % + 20 μ A 0.08 % + 20 μ A 0.2 % + 50 μ A 0.4 % + 100 μ A 0.8 % + 200 μ A	

Parameter/Equipment	Range	CMC ^{2,6} (\pm)	Comments
AC Current – Generate ³ (cont)			
330 mA to 1.1 A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.36 % + 100 μ A 0.1 % + 100 μ A 1.2 % + 1 mA 5.0 % + 5 mA	Fluke 5522A
(1.1 to 3.0) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.36 % + 100 μ A 0.12 % + 100 μ A 1.2 % + 1 mA 5.0 % + 5 mA	
(3.0 to 11) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.12 % + 2 mA 0.2 % + 2 mA 6.0 % + 2 mA	
(11 to 20.5) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.24 % + 5 mA 0.30 % + 5 mA 6.0 % + 5 mA	
Capacitance – Generate			
	(200 to 400) pF 400 pF to 1.1 nF (1.1 to 3.3) nF (3.3 to 11) nF	1.0 % + 10 pF 1.0 % + 10 pF 1.0 % + 10 pF 0.5 % + 10 pF	Fluke 5522A
	(11 to 33) nF (33 to 110) nF (110 to 330) nF 330 nF to 1.1 μ F	0.5 % + 10 pF 0.5 % + 10 pF 0.5 % + 30 pF 0.5 % + 100 pF	
	(1.1 to 3.3) μ F (3.3 to 11) μ F (11 to 33) μ F (33 to 110) μ F	0.5 % + 300 pF 0.5 % + 10 nF 0.8 % + 30 nF 0.9 % + 100 nF	
	(110 to 330) μ F 330 μ F to 1.1 mF (1.1 to 3.3) mF (3.3 to 11) mF	0.9 % + 300 nF 0.9 % + 1 μ F 0.9 % + 3 μ F 0.9 % + 10 μ F	
	(11 to 33) mF (33 to 110) mF	1.5 % + 30 μ F 2.2 % + 100 μ F	

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Calibration of Thermocouples – Generate ³			
Type B	600 °C to 800 °C 800 °C to 1000 °C 1000 °C to 1550 °C 1550 °C to 1820 °C	0.55 °C 0.43 °C 0.38 °C 0.42 °C	Fluke 5522A
Type C	0° to 150 °C 150 °C to 650 °C 650 °C to 1000 °C 1000 °C to 1800 °C 1800 °C to 2316 °C	0.38 °C 0.33 °C 0.39 °C 0.63 °C 1.1 °C	
Type E	-250 °C to -100 °C -100 °C to -25 °C -25 °C to 350 °C 350 °C to 650 °C 650 °C to 1000 °C	0.63 °C 0.20 °C 0.18 °C 0.20 °C 0.27 °C	
Type J	-210 °C to -100 °C -100 °C to -30 °C -30 °C to 150 °C 150 °C to 760 °C 760 °C to 1200 °C	0.34 °C 0.20 °C 0.18 °C 0.22 °C 0.29 °C	
Type K	-200 °C to -100 °C -100 °C to -25 °C -25 °C to 120 °C 120 °C to 1000 °C 1000 °C to 1372 °C	0.42 °C 0.23 °C 0.20 °C 0.33 °C 0.50 °C	
Type L	-200 °C to -100 °C -100 °C to 800 °C 800 °C to 900 °C	0.47 °C 0.33 °C 0.22 °C	
Type N	-200 °C to -100 °C -100 °C to -25 °C -25 °C to 120 °C 120 °C to 410 °C 410 °C to 1300 °C	0.50 °C 0.28 °C 0.24 °C 0.23 °C 0.34 °C	
Type R	0 °C to 250 °C 250 °C to 400 °C 400 °C to 1000 °C 1000 °C to 1767 °C	0.72 °C 0.44 °C 0.42 °C 0.50 °C	
Type S	0 °C to 250 °C 250 °C to 1000 °C 1000 °C to 1400 °C 1400 °C to 1767 °C	0.59 °C 0.45 °C 0.47 °C 0.58 °C	

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Calibration of Thermocouples - Generate ³ (cont)			
Type T	-250 °C to -150 °C -150 °C to 0 °C 0 °C to 120 °C 120 °C to 400 °C	0.79 °C 0.30 °C 0.20 °C 0.13 °C	Fluke 5522A
Type U	-200 °C to 0 °C 0 °C to 600 °C	0.70 °C 0.34 °C	
Electrical Calibration of RTDs – Generate ³			
Pt 385 (100 Ω)	-200 °C to -80 °C -80 °C to 0 °C 0 °C to 100 °C 100 °C to 300 °C 300 °C to 400 °C 400 °C to 630 °C 630 °C to 800 °C	0.063 °C 0.063 °C 0.088 °C 0.11 °C 0.13 °C 0.15 °C 0.29 °C	Fluke 5522A
Pt 3926 (100 Ω)	-200 °C to -80 °C -80 °C to 0 °C 0 °C to 100 °C 100 °C to 300 °C 300 °C to 400 °C 400 °C to 630 °C	0.063 °C 0.063 °C 0.088 °C 0.11 °C 0.13 °C 0.15 °C	
Pt 3916 (100 Ω)	-200 °C to -190 °C -190 °C to -80 °C -80 °C to 0 °C 0 °C to 100 °C 100 °C to 260 °C 260 °C to 300 °C 300 °C to 400 °C 400 °C to 600 °C 600 °C to 630 °C	0.31 °C 0.05 °C 0.063 °C 0.075 °C 0.088 °C 0.10 °C 0.11 °C 0.13 °C 0.29 °C	
Pt 385 (200 Ω)	-200 °C to -80 °C -80 °C to 0 °C 0 °C to 100 °C 100 °C to 260 °C 260 °C to 300 °C 300 °C to 400 °C 400 °C to 600 °C 600 °C to 630 °C	0.05 °C 0.05 °C 0.05 °C 0.063 °C 0.15 °C 0.16 °C 0.18 °C 0.20 °C	

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Calibration of RTDs – Generate ³ (cont)			
Pt 385 (500 Ω)	-200 °C to -80 °C -80 °C to 0 °C 0 °C to 100 °C 100 °C to 260 °C 260 °C to 300 °C 300 °C to 400 °C 400 °C to 600 °C 600 °C to 630 °C	0.05 °C 0.063 °C 0.063 °C 0.075 °C 0.10 °C 0.10 °C 0.11 °C 0.14 °C	Fluke 5522A
Pt 385 (1000 Ω)	-200 °C to -80 °C -80 °C to 0 °C 0 °C to 100 °C 100 °C to 260 °C 260 °C to 300 °C 300 °C to 400 °C 400 °C to 600 °C 600 °C to 630 °C	0.038 °C 0.038 °C 0.05 °C 0.063 °C 0.075 °C 0.088 °C 0.088 °C 0.29 °C	
PtNi 385 (120 Ω) Ni120	-80 °C to 0 °C 0 °C to 100 °C 100 °C to 260 °C	0.10 °C 0.10 °C 0.18 °C	
Cu 427 (10 Ω)	-100 °C to 260 °C	0.22 °C	

IV. Mechanical

Parameter/Equipment	Range	CMC ² (±)	Comments
Force Gages ³ – Tension	Up to 300 lbf	0.08 % of range	Weights

Parameter/Equipment	Range	CMC ² (±)	Comments
Rockwell Hardness Testers ³ , Indirect Verification	HRB:		Hardness blocks, Indirect verification per ASTM E18
	Low	0.67 HRB	
	Middle	0.64 HRB	
	High	0.64 HRB	
	HRBW:		
	Low	0.67 HRB	
	Middle	0.64 HRB	
	High	0.64 HRB	
	HRC:		
	Low	0.65 HRC	
	Middle	0.65 HRC	
	High	0.63 HRC	
	HREW:		
	Low	0.83 HREW	
	Middle	0.82 HREW	
	High	0.82 HREW	
	HRHW:		
	Low	0.68 HRHW	
	Middle	0.67 HRHW	
	High	0.67 HRHW	
	HR15N:		
	Low	0.69 HR15N	
	Middle	0.78 HR15N	
	High	0.65 HR15N	
HR30N:			
Low	0.65 HR30N		
Middle	0.61 HR30N		
High	0.63 HR30N		
HR45N:			
Low	0.63 HR45N		
Middle	0.61 HR45N		
High	0.64 HR45N		
HR15TW:			
Low	0.81 HR15TW		
Middle	0.81 HR15TW		
High	0.73 HR15TW		



Parameter/Equipment	Range	CMC ² (±)	Comments
Rockwell Hardness Testers ³ , Indirect Verification (cont)	HR30TW: Low Middle High	0.81 HR30TW 0.76 HR30TW 0.70 HR30TW	Hardness blocks, Indirect verification per ASTM E18
Torque – Measure Testers and Transducers	Up to 1000 ft·lbf	0.1 % of range 0.1 % of range	Torque arms and weights
Torque Measuring Equipment ³ – Wrenches and Watches	(4 to 12 000) in·lbf, Up to 1000 ft·lbf	2.6 % of range	Digital torque tester with loader

V. Time and Frequency

Parameter/Equipment	Range	CMC ² (±)	Comments
Frequency – Measuring Equipment	(0.01 to 120) Hz 120 Hz to 1.2 kHz (1.2 to 12) kHz (12 to 120) kHz 120 kHz to 1.2 MHz (1.2 to 2) MHz	0.0003% + 5 μHz 0.0003% + 5 μHz 0.0003% + 5 μHz 0.0003% + 5 μHz 0.0003% + 5 μHz 0.0003% + 5 μHz	Fluke 5522A
Frequency – Measure	0.1 Hz to 2.7 GHz	1 part in 10 ⁻⁸ Hz/Hz	Fluke PM6681

¹ This laboratory offers commercial dimensional testing, calibration 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 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 CMC 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.
- ⁴ In the statement of Calibration and Measurement Capabilities, L is the numerical value of the nominal length 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.
- ⁶ The measurands stated are generated with the Fluke 5522 or 8500 series of instruments. This capability is suitable for the calibration of the devices intended to measure the stated measurand in the ranges indicated. CMCs are expressed as either a specific value that covers the full range or as a percentage of the reading plus a fixed floor specification.



Accredited Laboratory

A2LA has accredited

MICRO LABORATORIES, INC.

Mentor, OH

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/NCSLI 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 8 January 2009).



Presented this 12th day of June 2017.

A handwritten signature in black ink, written over a horizontal line.

President and CEO
For the Accreditation Council
Certificate Number 1312.01
Valid to July 31, 2019

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