



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

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CALIBRATION

Valid To: December 31, 2024

Certificate Number: 1527.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations^{1, 6}:

I. Dimensional

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
Optical Comparator ³ – Magnification	5×, 10×, 20× 31.25× 50× 100×	0.7× 0.13× 0.27× 0.54×	Glass master & ruler
X-Y Linearity	Up to 12 in	180 μin	Glass master
Rotation	360°	5'	
Squareness	6 in	160 μin	Precision square
Automatic Vision Systems ³ – X-Y-Z Coordinates	X, Y: Up to 12 in X, Y: Up to 40 in Z: Up to 6 in	(120 + 2.2L) μin (110 + 5L) μin 140 μin	Glass master Step gage Gage block
Squareness	6 in	150 μin	Precision square

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
Articulating Arm CMM ³ – Hemispherical Linearity Ball Bar	40 in Up to 24 in	0.0006 in 0.0011 in	Step gage 4 positional checks
Manual Vision System or Field of View Vision System ³ – X-Y-Z Coordinates Squareness	X, Y: Up to 12 in X, Y: (1 to 40) in Z: Up to 12 in 6 in	(150 + 1.5L) μin (130 + 4.7L) μin 140 μin 200 μin	Glass master Check master Gage block Precision square
CMM ³ – X-Y-Z Coordinates Repeatability Squareness (XY, XZ, YZ) Ball Bar	Up to 40 in Up to 40 in Up to 24 in Up to 24 in	(100 + 5L) μin 100 μin 120 μin 400 μin	Step gage Precision square 4 positional checks
Rotational CMM ³ – Rotational Axis Radial Axis Z-Axis Ball Bar Rotational Repeatability	Up to 24 in Up to 9 in Up to 9 in 8 in 360°	230 μin 150 μin 110 μin 270 μin 0.0017°	Step gage 4 positional checks 360° rotation
Universal Length Measuring Machine ³ – Linearity Parallelism	Up to 300 mm Up to 300 mm	(0.03 + 2.5L/1000) μm 1.4 μm	Gage blocks, force gage Sphere

Parameter/Equipment	Range	CMC ^{2, 4, 7} ($\pm$)	Comments
Laser Micrometer ³	Up to 1 in	16 μ in	Comparison to master pin gages
Height Gage ³	Up to 40 in	(130 + 3.7L) μ in	Step gage, gage blocks, indicator
Thread Wires	Up to 0.5 in	12 μ in	Universal length measuring machine
Surface Plate ³ – Flatness Repeat Reading	(8 $\times$ 12) in to (24 $\times$ 48) in (24 $\times$ 48) in to (6 $\times$ 12) ft (8 $\times$ 12) in to (6 $\times$ 12) ft	45 μ in 46 μ in 43 μ in	Planekator Autocollimator Repeat-o-meter
Threads ³ – Thread Rings (Functional Diameter) Thread Rings (Pitch Diameter) Thread Plugs, Set Plugs (Pitch Diameter)	Up to 12 in Up to 12 in Up to 13 in	300 μ in 150 μ in (60 + 5L) μ in	Truncated/HILO set plugs Universal length measuring machine, two-ball method Universal length measuring machine, thread wires
Cylindrical Measure ³ – OD Gages ID Gages Pin Gages Custom Designed Gages	Up to 20 in (0.039 to 0.3) in (> 0.3 to 15) in Up to 1 in Up to 20 in	(8.7 + 2.7L) μ in 29 μ in (13 + 3.8L) μ in 22 μ in (7 + 3.7L) μ in	Universal length measuring machine, gage blocks, cylindrical masters, laser gage, laser micrometer

Parameter/Equipment	Range	CMC ^{2, 4} ($\pm$)	Comments
Micrometer Length Standards ³	Up to 20 in (> 20 to 40) in	(36 + 2.6L) μ in (150 + 3.9L) μ in	Universal length machine Precision height gage
Micrometers ³ – Length Parallelism	Up to 24 in Up to 1 in	(64 + 1.5L) μ in 61 μ in	Gage blocks Gage balls
Gage Blocks	Up to 1 in (1 to 4) in (> 4 to 20) in	(3.3 + 0.8L) μ in (2.5 + 2.3L) μ in (5.9 + 2.3L) μ in	Electronic comparator, gage blocks
Calipers ³	Up to 12 in (18 to 40) in	800 μ in (800 + 1.2L) μ in	Gage blocks Check master
Indicators ³	Up to 12 in	(23 + 1.1L) μ in	Universal length measuring machine, gage block & stand, indicator calibrator
Step Gage	Up to 24 in	(95 + 4L) μ in	Electronic comparator, master step gage
Protractors ³ Bevel Digital	Up to 360° Up to 90°	(0.0036 - 0.000 14L) Ang° 0.037 + 0.58R Ang °	CMM/vision machine Sine plate, gage blocks, square
Glass Scales	Up to 12 in	(8 + 2.9L) μ in	Universal length measuring machine with microscope
Squares ³	Up to 12 in	70 μ in	Square master & master square
Bore Gages ³	Up to 6 in	200 μ in	Gage blocks, ring gage
CMM Spheres, Spheres-Balls ³	Up to 5 in	20 μ in	Universal length measuring machine

Parameter/Equipment	Range	CMC ^{2, 4} ($\pm$)	Comments
Surface Finish Masters ³ (Ra)	Up to 115 μ in	3.5 Ra- μ in	Surface finish tester
Surface Finish Testers ³ (Ra)	Up to 115 μ in	2.5 Ra- μ in	Master surface finish standard
Line Scales ³ – Steel Rulers Tape Measures ³	Up to 24 in (> 24 to 48) in Up to 48 in 6 in Up to 25 ft Up to 100 ft	(150 + 2.1L) μ in (300 + 2.1L) μ in 0.0018 in 0.0048 in 0.0068 in + 0.000 12 in/ft 0.016 in + 0.000 23 in/ft	Vision system Comparison to master ruler Lixer gage Comparison to master tape measure
Levels	Up to 36 in	31 μ in/in 5.5 arc sec + 0.58R	Gage blocks, sine plate, surface plate
Coating Thickness Gages Ultrasonic (Ferrous) Mechanical Feel	Up to 20 in (1 to 60) mil	(0.000 52 + 0.000 0066L) mm + 0.58R 0.024 mil + 0.58R	Gage blocks Coating thickness standards
Coating Thickness Standards	Up to 750 mil	0.012 mil	Universal length measuring machine
Feeler Gages	Up to 0.50 in	12 μ in	Universal length measuring machine

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
Orientation Characteristics- Measure ⁵			
Perpendicularity ⁵	Up to 18 in	78 µin	Height gage w/electronic indicator, Surface Plate, Vision System, CMM, Square, Column Probe
Parallelism ⁵	Up to 36 in	35 µin	
Angularity ⁵	Up to 360°	(0.0034 - 0.000 12L) Angular °	
Flatness ⁵	Up to 36 in	44 µin	

II. Dimensional Testing/Calibration

Parameter/Equipment	Range	CMC ^{2, 4, 7} (±)	Comments
Length, 1D – Measure ⁵	Up to 40 in Up to 50 mm Up to 300 mm Up to 12 in Up to 6 in Up to 1 in Up to 4 in	280 µin 0.59 µm 90 µm 950 µin 130 µin 110 µin 13 µin	Height gage Universal length measuring machine Calipers Micrometer Indicators Gage block comparator
Length, 2D – Measure ^{5, 11}	(12 × 6) in (10 × 6 × 6) in (25 × 25 × 10) in (6 × 6 × 6) in	260 µin 150 µin 150 µin 220 µin	Optical comparator Micro-Vu vertex Micro-Vu excel Micro-Vu sol
Length, 3D – Measure ^{5, 11}	(39 × 47 × 24) in (10 × 6 × 6) in (25 × 25 × 10) in (6 × 6 × 6) in	190 µin 150 µin 150 µin 220 µin	CMM Micro-Vu vertex Micro-Vu excel Micro-Vu sol
Angular Measurements – Measure ⁵	Up to 360°	(0.0034 - 0.000 12L) Angular°	CMM/vision or optical system

III. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2, 8} (±)	Comments
DC Voltage – Generate ³	(0 to 329.9999) mV (0.33 to 3.299 999) V (3.3 to 32.999 99) V (33 to 329.9999) V (330 to 1000) V	2.8 $\mu\text{V/V} + 1.0 \mu\text{V}$ 2.4 $\mu\text{V/V} + 1.5 \mu\text{V}$ 3.0 $\mu\text{V/V} + 15 \mu\text{V}$ 3.4 $\mu\text{V/V} + 100 \mu\text{V}$ 4.5 $\mu\text{V/V} + 0.30 \text{ mV}$	Meter calibrator
	(0 to 100) mV (0.1 to 1) V (1 to 15) V	59 $\mu\text{V/V} + 5.0 \mu\text{V}$ 58 $\mu\text{V/V} + 50 \mu\text{V}$ 40 $\mu\text{V/V} + 500 \mu\text{V}$	Process calibrator
DC Voltage – Measure ³	(0 to 200) mV 200 mV to 2 V (2 to 20) V (20 to 200) V (100 to 1000) V	5 $\mu\text{V/V} + 0.1 \mu\text{V}$ 3.5 $\mu\text{V/V} + 0.4 \mu\text{V}$ 3.5 $\mu\text{V/V} + 4 \mu\text{V}$ 5.5 $\mu\text{V/V} + 40 \mu\text{V}$ 5.5 $\mu\text{V/V} + 100 \mu\text{V}$	8.5 digit multimeter
	(1000 to 10 000) V (10 000 to 35 000) V (35 000 to 70 000) V	75 $\mu\text{V/V}$ 0.36 mV/V 1.5 mV/V	High voltage meter w/ probes
	(0 to 100) mV (0.1 to 1) V (1 to 10) V (10 to 100) V (100 to 1000) V	16 $\mu\text{V/V} + 0.5 \mu\text{V}$ 8.2 $\mu\text{V/V} + 1.0 \mu\text{V}$ 8.5 $\mu\text{V/V} + 10 \mu\text{V}$ 8.4 $\mu\text{V/V} + 100 \mu\text{V}$ 8.8 $\mu\text{V/V} + 1.0 \text{ mV}$	6.5 digit multimeter
	(0 to 100) mV (0.1 to 3) V (3 to 30) V (30 to 300) V	61 $\mu\text{V} + 5 \mu\text{V}$ 20 $\mu\text{V} + 50 \mu\text{V}$ 20 $\mu\text{V} + 0.5 \text{ mV}$ 0.20 mV + 50 mV	Process calibrator

Parameter/Equipment	Range	CMC ^{2, 4, 8} ($\pm$)	Comments
DC Current – Generate ³	(0 to 329.999) μ A (0.33 to 3.299 99) mA (3.3 to 32.9999) mA (33 to 329.999) mA (0.33 to 2.999 99) A (3.0 to 10) A (> 10 to 20.5) A	20 μ A/A + 0.023 μ A 14 μ A/A + 0.02 μ A 15 μ A/A + 0.3 μ A 29 μ A/A + 3 μ A 51 μ A/A + 58 μ A 80 μ A/A + 0.5 mA 0.15 mA/A + 0.2 mA	Meter calibrator
	(20 to 1000) A	0.26 %	Meter calibrator w/ X25/X50 current coil
	(0 to 22) mA	0.27 mA/A + 3 μ A	Process calibrator
DC Current – Measure ³	(1 to 100) nA (0.10 to 1) μ A (1 to 10) μ A (10 to 100) μ A (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A (1 to 2) A (2 to 20) A	8.2 μ A/A + 5 pA 11 μ A/A + 5 pA 12 μ A/A + 10 pA 8.4 μ A/A + 0.1 nA 6.0 μ A/A + 5 nA 5.9 μ A/A + 10 nA 14 μ A/A + 0.1 μ A 3.8 μ A/A + 2 μ A 0.2 mA/A + 0.16 mA 0.42 mA/A + 0.4 mA	8.5 digit multimeter
	(10 to 100) μ A (100 to 1) mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A (1 to 3) A (3 to 10) A	35 μ A/A + 3 nA 42 μ A/A + 5 nA 32 μ A/A + 200 nA 62 μ A/A + 0.5 μ A 0.61 mA/A + 2.0 μ A 0.33 mA/A + 10 μ A 0.15 mA/A + 60 μ A	6.5 digit multimeter
	(10 to 100) A (100 to 300) A (300 to 1000) A	0.069 % 0.063 % 0.058 %	Empro stunts w/ 6.5 digit multimeter
	(0 to 30 mA (30 to 100) mA	0.20 mA/A + 5 μ A 0.59 mA/A + 20 μ A	Process calibrator
AC Power – Generate ³ PF=1	(0.01 to 336) W (336 to 3060) W (3.06 to 20.9) kW	0.05 % 0.05 % 0.1 %	Meter calibrator

Parameter/Range	Frequency	CMC ^{2, 8} ($\pm$)	Comments
AC Voltage – Generate ³			
(1 to 32.999) 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	0.019 % + 6.0 μ V 0.018 % + 6.0 μ V 0.011 % + 6.0 μ V 0.020 % + 6.0 μ V 0.017 % + 12 μ V 0.017 % + 50 μ V	Meter calibrator
(33 to 329.999) 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	0.0067 % + 8.0 μ V 0.0025 % + 8.0 μ V 0.0028 % + 8.0 μ V 0.0036 % + 8.0 μ V 0.0056 % + 32 μ V 0.0022 % + 70 μ V	
(0.33 to 3.299 99) 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	0.0058 % + 50 μ V 0.0021 % + 60 μ V 0.0022 % + 60 μ V 0.0032 % + 50 μ V 0.0040 % + 130 μ V 0.028 % + 600 μ V	
(3.3 to 32.9999) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.0065 % + 650 μ V 0.0024 % + 600 μ V 0.0030 % + 600 μ V 0.0036 % + 600 μ V 0.0052 % + 1.6 mV	
(33 to 329.999) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.0045 % + 2.0 mV 0.0053 % + 6.0 mV 0.0037 % + 6.0 mV 0.0082 % + 6.0 mV 0.0049 % + 50 mV	
(330 to 1000) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.0053 % + 10 mV 0.0046 % + 10 mV 0.0049 % + 10 mV	

Parameter/Range	Frequency	CMC ^{2, 8} ($\pm$)	Comments
AC Voltage – Measure ³			
(1 to 100) mV	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz	75 μ V/V + 4.3 μ V 71 μ V/V + 2.2 μ V 0.014 % + 2.2 μ V 0.03 % + 2.1 μ V 0.08 % + 2.1 μ V 0.3 % + 11 μ V 1 % + 11 μ V 1.5 % + 10 μ V	8.5 digit multimeter
100 mV to 1 V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz	75 μ V/V + 43 μ V 71 μ V/V + 22 μ V 0.014 % + 22 μ V 0.03 % + 21 μ V 0.08 % + 21 μ V 0.3 % + 110 μ V 1 % + 110 μ V 1.5 % + 100 μ V	
(1 to 10) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz	75 μ V/V + 0.43 mV 71 μ V/V + 0.22 mV 0.014 % + 0.22 mV 0.03 % + 0.21 mV 0.08 % + 0.21 mV 0.3 % + 1 mV 1 % + 1 mV 1.5 % + 1 mV	
(10 to 100) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 40) Hz	0.021 % + 4 mV 0.02 % + 22 mV 0.02 % + 22 mV 0.035 % + 21 mV 0.12 % + 21 mV 0.4 % + 110 mV 1.5 % + 110 mV 0.04 % + 43 mV	
(100 to 1050) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.16 mV/V + 74 mV 0.04 % + 21 mV 0.06 % + 22 mV 0.12 % + 21 mV 0.3 % + 21 mV	
(0 to 3) V	(40 to 500) Hz	0.2 % + 2 mV	Process calibrator
(3 to 30) V	(40 to 500) Hz	0.2 % + 20 mV	
(30 to 300) V	(40 to 500) Hz	0.2 % + 200 mV	

Parameter/Range	Frequency	CMC ^{2, 8} ($\pm$)	Comments
AC Voltage – Measure High Frequency			
(1 to 10) mV	100 kHz to 4 MHz (4 to 8) MHz	54 mV/V + 11 μ V 160 mV/V + 8.2 μ V	8.5 digit multimeter
(10 to 100) mV	100 kHz to 4 MHz (4 to 8) MHz (8 to 10) MHz	30 mV/V + 130 μ V 30 mV/V + 220 μ V 120 mV/V + 160 μ V	
(0.1 to 1) V	(1 to 4) MHz (4 to 8) MHz (8 to 10) MHz	30 mV/V + 1.3 mV 30 mV/V + 2.2 mV 120 mV/V + 1.6 mV	
(1 to 10) V	(1 to 4) MHz (4 to 8) MHz (8 to 10) MHz	31 mV/V + 6.2 mV 31 mV/V + 7.9 mV 120 mV/V + 8.5 mV	
AC High Voltage – Measure ³			
(0.7 to 10) kV (10 to 30) kV (30 to 50) kV	(0.01 to 600) Hz	0.29 mV/V 0.48 mV/V 0.48 mV/V	High voltage meter w/probes
AC Current – Generate ³			
(29 to 329.99) μ A	(10 to 20) Hz (20 to 45) Hz (0.045 to 1) kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.017 % + 0.10 μ A 0.011 % + 0.10 μ A 0.011 % + 0.10 μ A 0.011 % + 0.20 μ A 0.017 % + 0.20 μ A 0.011 % + 0.40 μ A	Meter calibrator

Parameter/Range	Frequency	CMC ^{2, 4, 8} (±)	Comments
AC Current – Generate ³ cont.			
(0.33 to 3.2999) mA	(10 to 20) Hz (20 to 45) Hz (0.045 to 1) kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.011 % + 0.20 µA 0.010 % + 0.20 µA 0.010 % + 0.20 µA 0.010 % + 0.20 µA 0.012 % + 0.30 µA 0.027 % + 0.60 µA	Meter calibrator
(3.3 to 32.9999) mA	(10 to 20) Hz (20 to 45) Hz (0.045 to 1) kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.016 % + 2.0 µA 0.012 % + 2.0 µA 0.012 % + 2.0 µA 0.012 % + 2.0 µA 0.013 % + 3.0 µA 0.020 % + 4.0 µA	
(33 to 329.99) mA	(10 to 20) Hz (20 to 45) Hz (0.045 to 1) kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.016 % + 20 µA 0.011 % + 20 µA 0.012 % + 20 µA 0.011 % + 50 µA 0.013 % + 100 µA 0.022 % + 200 µA	
(0.33 to 1.099 99) A	(10 to 45) Hz (0.045 to 1) kHz (1 to 5) kHz (5 to 10) kHz	0.030 % + 100 µA 0.028 % + 100 µA 0.038 % + 1.0 mA 0.079 % + 5.0 mA	
(1.1 A to 2.999 99) A	(10 to 45) Hz (0.045 to 1) kHz (1 to 5) kHz (5 to 10) kHz	0.017 % + 100 µA 0.014 % + 100 µA 0.030 % + 1.0 mA 0.065 % + 5.0 mA	
(3 to 10.9999) A	(45 to 100) Hz (0.1 to 1) kHz (1 to 5) kHz	0.013 % + 2.0 mA 0.013 % + 2.0 mA 0.056 % + 2.0 mA	
(11 to 20.5) A	(45 to 100) Hz (0.1 to 1) kHz (1 to 5) kHz	0.0084 % + 5.0 mA 0.018 % + 5.0 mA 0.054 % + 5.0 mA	
(20 to 1000) A	(45 to 65) Hz (66 to 440) Hz	0.29 % 0.80 %	Meter calibrator w/ X25/X50 current coil
(>1000 to 2000) A	(45 to 65) Hz (66 to 440) Hz	0.58 % 1.6 %	Meter calibrator w/X50 current coil & iFlex Current Probe
(>2000 to 3000) A	(45 to 65) Hz (66 to 440) Hz	0.87 % 2.4 %	

Parameter/Range	Frequency	CMC ^{2, 4, 8} ($\pm$)	Comments
AC Current – Measure ³			
(0 to 100) μ A	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz	0.4 % + 0.03 μ A 0.15 % + 0.03 μ A 0.06 % + 0.03 μ A 0.06 % + 0.03 μ A	8.5 digit multimeter
(0.1 to 100) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz (5 to 20) kHz (20 to 100) kHz	0.4 % + 0.02 μ A 0.15 % + 0.02 μ A 0.06 % + 0.02 μ A 0.03 % + 0.02 μ A 0.06 % + 0.02 μ A 0.55 % + 0.15 μ A	
(0.1 to 1) A	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz (5 to 20) kHz (20 to 100) kHz	0.4 % + 0.2 mA 0.16 % + 0.2 mA 0.08 % + 0.2 mA 0.1 % + 0.2 mA 0.3 % + 0.2 mA 1 % + 0.4 mA	
(1 to 2) A	10 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz	0.32 μ A /A + 0.2 mA 0.75 μ A /A + 0.2 mA 0.3 % + 0.2 mA	
(2 to 20) A	10 Hz to 2 kHz (2 to 10) kHz	0.84 μ A /A + 2 mA 0.25 % + 2 mA	
(1 to 600) A	(45 to 440) Hz	0.28 % + 0.58R	Current clamp/probe with 6.5 digital multimeter

Parameter/Equipment	Range	CMC ^{2, 8} ($\pm$)	Comments
Resistance – Generate ³ (Variable)	(0 to 11) Ω	84 $\mu\Omega/\Omega$ + 1 m Ω	Meter calibrator
	(11 to 33) Ω	40 $\mu\Omega/\Omega$ + 1.5 m Ω	
	(33 to 110) Ω	14 $\mu\Omega/\Omega$ + 1.4 m Ω	
	(110 to 1.1) k Ω	6.4 $\mu\Omega/\Omega$ + 2 m Ω	
	(1.1 to 11) k Ω	5.8 $\mu\Omega/\Omega$ + 20 m Ω	
	(11 to 110) k Ω	6.0 $\mu\Omega/\Omega$ + 0.2 Ω	
	(0.11 to 1.1) M Ω	5.6 $\mu\Omega/\Omega$ + 2 Ω	
	(1.1 to 3.3) M Ω	18 $\mu\Omega/\Omega$ + 30 Ω	
	(3.3 to 11) M Ω	18 $\mu\Omega/\Omega$ + 50 Ω	
	(11 to 33) M Ω	0.17 m Ω/Ω + 2.5 k Ω	
	(33 to 110) M Ω	0.18 m Ω/Ω + 3 k Ω	
	(110 to 330) M Ω	0.58 m Ω/Ω + 100 k Ω	
	(330 to 1100) M Ω	1.1 m Ω/Ω + 500 k Ω	
	(0.1 to 1.9999) Ω	21 $\mu\Omega/\Omega$ + 8 $\mu\Omega$	Programable resistance substituter w/ 8.5 digit multimeter
	(2 to 19.9999) Ω	11 $\mu\Omega/\Omega$ + 28 $\mu\Omega$	
	(20 to 199.999) Ω	8.7 $\mu\Omega/\Omega$ + 80 $\mu\Omega$	
	(0.2 to 1.999 99) k Ω	8.7 $\mu\Omega/\Omega$ + 0.8 m Ω	
	(2 to 19.9999) k Ω	8.7 $\mu\Omega/\Omega$ + 8 m Ω	
	(20 to 199.999) k Ω	8.7 $\mu\Omega/\Omega$ + 80 m Ω	
	(0.2 to 1.999 99) M Ω	9.6 $\mu\Omega/\Omega$ + 1 Ω	
	(2 to 19.9999) M Ω	25 $\mu\Omega/\Omega$ + 100 Ω	Process calibrator
	(0 to 10) Ω	0.59 m Ω/Ω + 10 m Ω	
	(10 to 100) Ω	0.58 m Ω/Ω + 20 m Ω	
	(100 to 1000) Ω	0.58 m Ω/Ω + 200 m Ω	
	(1 to 10) k Ω	6.2 m Ω/Ω + 3 Ω	

Parameter/Equipment	Range	CMC ^{2, 4, 8} ($\pm$)	Comments
Resistance – Generate ³ (Fixed Points)	0.0001 Ω 0.0005 Ω 0.01 Ω /Step 0.1 Ω /Step 1 Ω /Step 10 Ω /Step 100 Ω /Step 1 k Ω /Step 10 k Ω /Step 100 k Ω /Step 1 M Ω /Step 10 M Ω /Step 100 M Ω /Step 1 G Ω /Step	11 $\mu\Omega$ 11 $\mu\Omega$ 0.61 m Ω / Ω + 0.58R 69 $\mu\Omega$ / Ω + 0.58R 11 $\mu\Omega$ / Ω + 0.58R 20 $\mu\Omega$ / Ω + 0.58R 4.1 $\mu\Omega$ / Ω + 0.58R 3.9 $\mu\Omega$ / Ω + 0.58R 2.9 $\mu\Omega$ / Ω + 0.58R 6.5 $\mu\Omega$ / Ω + 0.58R 25 $\mu\Omega$ / Ω + 0.58R 0.34 m Ω / Ω + 0.58R 9.9 m Ω / Ω + 0.58R 11 m Ω / Ω + 0.58R	Current shunt Decade resistance boxes
Low Resistance – Measure ³	(0 to 1) m Ω (1 to 100) m Ω (0.1 to 1) Ω (1 to 10) Ω (10 to 100) Ω (0.1 to 1) k Ω (1 to 10) k Ω (10 to 100) k Ω (0.1 to 1) M Ω	46 $\mu\Omega$ / Ω + 0.2 $\mu\Omega$ 62 $\mu\Omega$ / Ω + 0.2 $\mu\Omega$ 83 $\mu\Omega$ / Ω + 0.2 $\mu\Omega$ 66 $\mu\Omega$ / Ω + 1.0 $\mu\Omega$ 7.1 $\mu\Omega$ / Ω + 10 $\mu\Omega$ 13 $\mu\Omega$ / Ω + 0.1 m Ω 12 $\mu\Omega$ / Ω + 1.0 m Ω 12 $\mu\Omega$ / Ω + 20 m Ω 12 $\mu\Omega$ / Ω + 20 m Ω	7.5 digit micro-ohm meter
Resistance – Measure ³	(0 to 0.9999) Ω (1 to 10.9999) Ω (11 to 109.9999) Ω (0.11 to 1.099 999) k Ω (1.1 to 10.999 99) k Ω (11 to 109.9999) k Ω (0.11 to 1.099 999) M Ω (1.1 to 10.999 99) M Ω (11 to 109.9999) M Ω (0.11 to 1.1) G Ω (1.1 to 1.999 99) G Ω (2.0 to 20.0) G Ω	21 $\mu\Omega$ / Ω + 8 $\mu\Omega$ 5.4 $\mu\Omega$ / Ω + 10 $\mu\Omega$ 3.9 $\mu\Omega$ / Ω + 100 $\mu\Omega$ 3.8 $\mu\Omega$ / Ω + 100 $\mu\Omega$ 3.6 $\mu\Omega$ / Ω + 1.0 m Ω 2.6 $\mu\Omega$ / Ω + 10 m Ω 3.1 $\mu\Omega$ / Ω + 1.0 Ω 15 $\mu\Omega$ / Ω + 20 Ω 22 $\mu\Omega$ / Ω + 200 Ω 0.86 m Ω / Ω + 2 k Ω 2 m Ω / Ω + 1 M Ω 16 m Ω / Ω + 10 M Ω	8.5 digit multimeter

Parameter/Equipment	Range	CMC ^{2, 4, 8} ($\pm$)	Comments
Resistance – Measure ³	(0 to 10) Ω (10 to 100) Ω (0.10 to 1) k Ω (1 to 10) k Ω (10 to 100) k Ω (0.1 to 1) M Ω (1 to 10) M Ω (10 to 100) M Ω	0.20 m Ω/Ω + 50 $\mu\Omega$ 30 $\mu\Omega/\Omega$ + 100 $\mu\Omega$ 12 $\mu\Omega/\Omega$ + 1.0 m Ω 12 $\mu\Omega/\Omega$ + 10 m Ω 12 $\mu\Omega/\Omega$ + 100 m Ω 17 $\mu\Omega/\Omega$ + 2.0 Ω 53 $\mu\Omega/\Omega$ + 40 Ω 1.3 m Ω/Ω + 200 k Ω	6.5 digit multimeter
Resistance – Measure ³	(0 to 10) Ω (10 to 100) Ω (0.100 to 1) k Ω (1 to 10) k Ω	0.63 m Ω/Ω + 50 m Ω 0.59 m Ω/Ω + 50 m Ω 0.58 m Ω/Ω + 500 m Ω 0.58 m Ω/Ω + 10 Ω	Process calibrator
Capacitance – Generate ³	(0.30 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) μ F (1.1 to 3.299 99) μ F (3.3 to 10.9999) μ F (11 to 32.9999) μ F (33 to 109.9999) μ F (110 to 329.999) μ F (0.33 to 1.099 99) mF (1.1 to 3.299 99) mF (3.3 to 10.9999) mF (11 to 32.9999) mF (33 to 110) mF	0.62 % + 10 pF 0.21 % + 10 pF 0.19 % + 10 pF 0.084 % + 10 pF 0.017 % + 10 pF 0.076 % + 10 pF 0.17 % + 10 pF 0.077 % + 1.0 nF 0.092 % + 3.0 nF 0.077 % + 10 nF 0.075 % + 30 nF 0.16 % + 100 nF 0.034 % + 300 nF 0.034 % + 1.0 μ F 0.034 % + 3.0 μ F 0.034 % + 10 μ F 0.034 % + 30 μ F 0.044 % + 100 μ F	Meter calibrator
Oscilloscopes ³ – DC: 50 Ω 1 M Ω	 (0 to +/- 6.6) V (0 to +/- 130) V	 0.25 % + 40 μ V 0.10 % + 40 μ V	 Meter calibrator w/ 1.1 GHz oscilloscope calibration option

Parameter/Equipment	Range	CMC ^{2, 4, 8} ($\pm$)	Comments
Oscilloscopes ³ – cont.			
Square Wave: 50 Ω	(0 to +/- 6.6) V 10 Hz to 10 kHz	0.25 % + 40 μ V	Meter calibrator w/ 1.1 GHz oscilloscope calibration option
1 M Ω	(0 to +/- 130) V 10 Hz to 10 kHz	0.10 % + 40 μ V	
Level Sine Wave Amplitude (50 kHz Reference)	50 kHz 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1100) MHz	2.0 % + 300 μ V 3.5 % + 300 μ V 4.0 % + 300 μ V 6.0 % + 300 μ V 7.0 % + 300 μ V	
Flatness (50 kHz Reference)	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1100) MHz	1.5 % + 100 μ V 2.0 % + 100 μ V 4.0 % + 100 μ V 5.0 % + 100 μ V	
Time Marker	1 ns to 20 ms 50 ms to 5 s	2.5 μ s/s (25 + 1000t) μ s/s	
Frequency	Up to 1.1 GHz	2.5 μ Hz/Hz	
Electrical Calibration of Thermocouples and Thermocouple Indicating Systems ³ –			
Type B	(600 to 800) °C (800 to 1000) °C (1000 to 1820) °C	0.45 °C 0.35 °C 0.31 °C	Meter calibrator
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.51 °C 0.18 °C 0.16 °C 0.18 °C 0.22 °C	
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.30 °C 0.18 °C 0.16 °C 0.19 °C 0.25 °C	

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Calibration of Thermocouples and Thermocouple Indicating Systems ³ – cont.			
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.34 °C 0.20 °C 0.18 °C 0.27 °C 0.41 °C	Meter calibrator
Type L	(-200 to -100) °C (-100 to 800) °C (800 to 900) °C	0.38 °C 0.27 °C 0.19 °C	
Type N	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 410) °C (410 to 1300) °C	0.41 °C 0.24 °C 0.21 °C 0.20 °C 0.28 °C	
Type R	(0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C	0.58 °C 0.36 °C 0.34 °C 0.40 °C	
Type S	(0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1767) °C	0.48 °C 0.37 °C 0.38 °C 0.47 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.64 °C 0.26 °C 0.18 °C 0.16 °C	
Electrical Calibration of Thermocouples and Thermocouple Indicating Systems ³ –			
Type B	(250 to <350) °C (350 to <445) °C (445 to <580) °C (580 to <750) °C (750 to <1000) °C (1000 to 1820) °C	0.19 °C + 0.58R 0.14 °C + 0.58R 0.12 °C + 0.58R 0.090 °C + 0.58R 0.075 °C + 0.58R 0.051 °C + 0.58R	Thermocouple Simulator/Calibrator

Parameter/Equipment	Range	CMC ² ($\pm$)	Comments
Electrical Calibration of Thermocouples and Thermocouple Indicating Systems ³ – cont.			
Type E	(-270 to <-245) °C (-245 to <-195) °C (-195 to <-155) °C (-155 to <-90) °C (-90 to 890) °C (890 to 1000) °C	0.34 °C + 0.58R 0.047 °C + 0.58R 0.043 °C + 0.58R 0.029 °C + 0.58R 0.011 °C + 0.58R 0.031 °C + 0.58R	Thermocouple Simulator/Calibrator
Type J	(-210 to <-180) °C (-180 to <-120) °C (-120 to <-50) °C (-50 to <990) °C (990 to 1200) °C	0.028 °C + 0.58R 0.033 °C + 0.58R 0.025 °C + 0.58R 0.021 °C + 0.58R 0.012 °C + 0.58R	
Type K	(-270 to <-255) °C (-255 to <-195) °C (-195 to <-115) °C (-115 to <1000) °C (1000 to 1372) °C	0.28 °C + 0.58R 0.30 °C + 0.58R 0.053 °C + 0.58R 0.029 °C + 0.58R 0.033 °C + 0.58R	
Type N	(-270 to <-260) °C (-260 to <-200) °C (-200 to <-140) °C (-140 to <25) °C (25 to <160) °C (160 to 1300) °C	6.0 °C + 0.58R 3.2 °C + 0.58R 0.53 °C + 0.58R 0.032 °C + 0.58R 0.028 °C + 0.58R 0.022 °C + 0.58R	
Type R	(-50 to <-30) °C (-30 to <45) °C (45 to <160) °C (160 to <380) °C (380 to <775) °C (775 to 1768) °C	0.39 °C + 0.58R 0.10 °C + 0.58R 0.043 °C + 0.58R 0.036 °C + 0.58R 0.031 °C + 0.58R 0.027 °C + 0.58R	
Type S	(-50 to <-30) °C (-30 to <45) °C (45 to <160) °C (160 to <380) °C (380 to 1768) °C	0.13 °C + 0.58R 0.096 °C + 0.58R 0.047 °C + 0.58R 0.037 °C + 0.58R 0.033 °C + 0.58R	
Type T	(-270 to <-255) °C (-255 to <-240) °C (-240 to <-210) °C (-210 to <-150) °C (-150 to <-40) °C (-40 to 400) °C	0.27 °C + 0.58R 0.10 °C + 0.58R 0.035 °C + 0.58R 0.022 °C + 0.58R 0.014 °C + 0.58R 0.0086 °C + 0.58R	

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Calibration of RTDs ³ –			
Pt 385, 100 Ω	(-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 630) °C (630 to 800) °C	0.065 °C 0.081 °C 0.10 °C 0.13 °C 0.23 °C	Meter calibrator
Pt 3926, 100 Ω	(-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 630) °C	0.065 °C 0.081 °C 0.10 °C 0.13 °C	
Pt 3916, 100 Ω	(-200 to -190) °C (-190 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 600) °C (600 to 630) °C	0.25 °C 0.058 °C 0.073 °C 0.081 °C 0.11 °C 0.24 °C	
Pt 385, 200 Ω	(-200 to 100) °C (100 to 260) °C (260 to 600) °C (600 to 630) °C	0.058 °C 0.065 °C 0.15 °C 0.17 °C	
Pt 385, 500 Ω	(-200 to -80) °C (-80 to 100) °C (100 to 260) °C (260 to 600) °C (600 to 630) °C	0.058 °C 0.065 °C 0.073 °C 0.10 °C 0.12 °C	
Pt 385, 1000 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 600) °C (600 to 630) °C	0.052 °C 0.031 °C 0.058 °C 0.071 °C 0.081 °C 0.24 °C	
PtNi 385, 120 Ω	(-80 to 100) °C (100 to 260) °C	0.090 °C 0.15 °C	
Cu 427 10 Ω	(-100 to 260) °C	0.31 °C	

Parameter/Equipment	Range	CMC ^{2, 4} ($\pm$)	Comments
Current Coils			
DC	Up to 25 Turns (> 25 to 50) Turns	0.079 % of Turns 0.099 % of Turns	Meter calibrator w/ current clamp probe & 8.5 digit multimeter
AC, Torroidal			
Up to 500 Amps Up to 1000 Amps	(45 to 65) Hz (45 to 65) Hz	0.040 % 0.077 %	
AC/DC Insulation Tester – High Pot Tester & Meggers			
AC Voltage – 10 kV	(0.01 to 600) Hz	0.17 mV/V	High voltage voltmeter & 8.5 digit multimeter
DC Voltage	Up to 10 000 V	60 μ V/V	8.5 digit multimeter
AC Current	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz	0.4 % + 0.02 μ A 0.15 % + 0.02 μ A 0.06 % + 0.02 μ A	
DC Current	(10 to 100) mA	7.8 μ A/A + 0.1 μ A	
Resistance	10 M Ω /Step 100 M Ω /Step 1 G Ω /Step	0.33 m Ω / Ω + 0.58R 9.8 m Ω / Ω + 0.58R 9.9 m Ω / Ω + 0.58R	High power resistance decade box

IV. Mechanical

Parameter/Equipment	Range	CMC ^{2, 4, 7} ($\pm$)	Comments
Torque – Measure ³	(10 to 100) ozf·in (5 to 1000) lbf·in (25 to 250) lbf·ft (251 to 600) lbf·ft	0.65 % 0.30 % 0.29 % 0.29 %	Torque calibrator

Parameter/Equipment	Range	CMC ^{2, 4, 7} ($\pm$)	Comments
Vacuum – Measuring Equipment ³	(-30 to 0) in·Hg (-25 to 0) in·Hg (-15 to 0) psi	0.11 in·Hg + 0.58R 0.11 in·Hg + 0.58R 0.000 62 psi + 0.58R	Master vacuum gage Process calibrator w/ reference pressure module High precision pressure controller
Pressure – Measuring Equipment ³	(0 to 15) psia (0 to 30) psia (0 to 50) psia (0 to 300) psia/psig (0 to 600) psia/psig (0 to 1000) psia/psig Up to 1000 psig (1000 to 10 000) psig (0 to 10) inH ₂ O (0 to 1) psig (0 to 15) psia (0 to 30) psig (0 to 100) psig (0 to 300) psig	0.000 62 psia + 0.58R 0.0013 psia + 0.58R 0.0021 psia + 0.58R 0.013 psi + 0.58R 0.026 psi + 0.58R 0.043 psi + 0.58R 0.077 psig + 0.58R 0.38 psig + 0.58R 0.022 inH ₂ O + 0.58R 0.000 42 psig + 0.58R 0.0037 psia + 0.58R 0.0025 psig + 0.58R 0.023 psig + 0.58R 0.036 psig + 0.58R	High precision pressure controller Master pressure gage Process calibrator w/ reference pressure module
High Pressure – Measuring Equipment ³	Up to 30 000 psig Up to 60 000 psig	6.5 psig + 0.58R 12 psig + 0.58R	Process calibrator w/ reference pressure module
Barometers	(0 to 30.5) InHg (30.5 to 60) InHg	0.0013 InHg + 0.58R 0.0027 InHg + 0.58R	High precision pressure controller

Parameter/Equipment	Range	CMC ^{2, 4, 7} ($\pm$)	Comments
Weighing Scales & Balances ³	Up to 5 mg (5 to 50) mg (50 to 200) mg (200 to 500) mg (0.5 to 2) g (2 to 5) g (5 to 10) g (10 to 20) g (20 to 50) g (50 to 100) g (100 to 1000) g (1 to 2) kg (2 to 5) kg (5 to 10) kg (10 to 68) kg	0.56 μ g + 0.58R 0.81 μ g + 0.58R 0.96 μ g + 0.58R 1.1 μ g + 0.58R 1.6 μ g + 0.58R 3.1 μ g + 0.58R 5.7 μ g + 0.58R 7.9 μ g + 0.58R 16 μ g + 0.58R 29 μ g + 0.58R 0.13 mg + 0.58R 0.24 mg + 0.58R 0.62 mg + 0.58R 1.3 mg + 0.58R 65 mg + 0.58R	Standard weights
Mass ³	(1 to 1000) mg (1 to 2) g 5 g 10 g 20 g 50 g 100 g 200 g 500 g 1 kg 2 kg 5 kg 10 kg 20 kg	41 μ g 41 μ g 42 μ g 46 μ g 58 μ g 0.23 mg 0.29 mg 0.46 mg 2.9 mg 3.7 mg 8.0 mg 15 mg 83 mg 0.13 g	Mechanical comparison to standard weights
Speed – Measure ³	(6 to 200 000) RPM	(0.034 + 0.000 045R) RPM	Optical tachometer R = RPM
Speed – Measuring Instruments ³			
Optical Tachometer ³	Up to 200 000 RPM	0.000 044 RPM/RPM	Function generator w/ LED
Indirect Verification of Brinell Hardness Testers ³	HBW 10/3000: Low Medium High	7 HBW 10/3000 7 HBW 10/3000 7 HBW 10/3000	Indirect verification method per ASTM E10 with test blocks

Parameter/Equipment	Range	CMC ² (±)	Comments
Indirect Verification of Microindentation Hardness Testers (Knoop & Vickers) ³	< 250 HV (250 to 650) HV > 650 HV < 240 HV (240 to 600) HV > 600 HV	5 HK 5 HK 5 HK 5 HV 5 HV 5 HV	Indirect verification method per ASTM E92 with test blocks
Indirect Verification of Rockwell Hardness Testers ³	HRC: Low Medium High HRBW: Low Medium High	1 HRC 1 HRC 1 HRC 1 HRBW 1 HRBW 1 HRBW	Indirect verification method per ASTM E18 with test blocks
Indirect Verification of Superficial Hardness Testers ³	HR15TW: Low Medium High HR15N: Low Medium High HR30TW: Low Medium High HR30N: Low Medium High HR45TW: Low Medium High HR45N: Low Medium High	1 HR15TW 1 HR15TW 1 HR15TW 1 HR15N 1 HR15N 1 HR15N 1 HR30TW 1 HR30TW 1 HR30TW 1 HR30N 1 HR30N 1 HR30N 1 HR45TW 1 HR45TW 1 HR45TW 1 HR45N 1 HR45N 1 HR45N	Indirect verification method per ASTM E18 with test blocks

Parameter/Equipment	Range	CMC ² (±)	Comments
Durometer Calibration – (Types: A, B, C, D, E, DO, M, O, OO, OOO, and OOO-S)			ASTM D2240
Indenter Extension & Shape –			Optical inspection under magnification
Diameter	Up to 0.5 in	0.15 min	
Radius (Tip)	Up to 0.25 in	0.15 min	
Angle (Cone)	Up to 35°	0.0076°	
Extension	Up to 0.2 in	0.15 min	
Indenter Display	Indenter Thickness	0.15 min	
	Indenter Radius	0.15 min	
Spring Calibration – Force ³			Durometer calibrator
Types: A, B, E, O	(0 to 100) duro units (0 to 822) gf	0.064 duro 0.26 gf	
Types: C, D, DO	(0 to 100) duro units (0 to 10) lbf	0.27 duro 0.12 lbf	

V. Thermodynamics

Parameter/Equipment	Range	CMC ^{2, 4, 7} (±)	Comments
Temperature – Generate/Measure ³			
Dial & Liquid in Glass Thermometers, RTDs, Thermocouples	(-196 to 0.0) °C (0 to 232) °C (232 to 660) °C (200 to 1200) °C	0.0082 °C + 0.58R 0.0091 °C + 0.58R 0.012 °C + 0.58R (0.65 + 0.00063t) °C + 0.58R	PRT probe w/display & reference dry well/LN2 comparator Type S thermocouple probe w/dry well

Parameter/Equipment	Range	CMC ^{2, 4, 7} ($\pm$)	Comments
Temperature – Generate/Measure ³ Dial & Liquid in Glass Thermometers, RTDs, Thermocouples	(-196 to 0.0) °C (0 to 232) °C (232 to 660) °C (-195 to 370) °C (200 to 1200) °C	0.0082 °C + 0.58R 0.0091 °C + 0.58R 0.012 °C + 0.58R 0.40 °C + 0.58R (0.65 + 0.000 63 <i>t</i>) °C + 0.58R	PRT probe w/display & reference dry well/LN2 comparator Type T thermocouple probe w/ display Type S thermocouple probe w/display
Temperature/Humidity Recorders ³ Temperature Humidity – Variable Values	(-20 to 0.0) °C (0 to 100) °C (10 to 90) % RH @ 23 °C	0.0082 °C + 0.58R 0.0091 °C + 0.58R (0.15 + 0.0055 <i>H</i>) % RH	PRT probe w/display Master hygrometer w/ humidity chamber
Relative Humidity – Generate/Measure ³	(10 to 90) % RH @ 23 °C	(0.15 + 0.0055 <i>H</i>) % RH	Master hygrometer w/ humidity chamber
Relative Humidity – Measuring Equipment, Fixed Points ³	11 % RH 35 % RH 76 % RH 95 % RH	(0.15 + 0.0055 <i>H</i>) % RH	Master hygrometer w/saturated salts
Temperature – IR Measuring Equipment ^{3,9}	(-15 to 120) °C (50 to 200) °C (200 to 950) °C (950 to 1200) °C	(0.43 + 0.0019 <i>t</i>) + 0.58R (0.62 + 0.0020 <i>t</i>) + 0.58R (0.55 + 0.0010 <i>t</i>) + 0.58R (-0.78 + 0.0024 <i>t</i>) + 0.58R	Infrared calibrator
Ovens, Chambers, Freezers, Furnaces ^{3,10}	(-195 to 0) °C (> 0 to 660) °C (-50 to 700) °C (700 to 1200) °C	0.13 + 0.58R (0.13 + 0.00026 <i>t</i>) + 0.58R (1.1 + 0.0015 <i>t</i>) + 0.58R (0.65 + 0.00063 <i>t</i>) °C + 0.58R	Process calibrator w/ RTD & TC probes

VI. Time & Frequency

Parameter/Equipment	Range	CMC ^{2, 4, 7} ($\pm$)	Comments
Frequency – Measuring Equipment ³	0.1 Hz to 15 MHz	1.1 nHz/Hz	Function generator w/ 10-digit counter
Frequency – Measure ³	0.1 Hz to 5 GHz	1.1 nHz/Hz	10-digit counter
Stop Watches/Time Measurement ³	Up to 24 hrs	0.52 s/day	Direct comparison
	(0.1 to 86 400) s	35 ms/day + 0.58R	Totalize method
	(2.0 to 120) s	0.051 s/day	Time base method

¹ This laboratory offers commercial calibration service, dimensional testing service, and field calibration and testing services.

² Calibration and Measurement Capability Uncertainty (CMC) is the smallest uncertainty of measurement that a laboratory can achieve within its scope of accreditation when performing more or less routine calibrations of nearly ideal measurement standards 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. 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 CMC, L is the length of the unit under test in either inches or millimeters (where appropriate), H is percent relative humidity, R is the resolution of the unit under test, t is the temperature in degrees Celsius, and percentages are percentage of reading, unless otherwise indicated.

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 This scope meets A2LA's *PI12 Flexible Scope Policy*.

⁷ The type of instrument or material being calibrated is defined by the parameter. This indicates the laboratory is capable of calibrating instruments that measure or generate the values in the ranges indicated for the listed measurement parameter.

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 percent or fraction of the reading plus a fixed floor specification.

⁹ Emissivity “ $\lambda = 0.95$, where $\varepsilon = (8 \text{ to } 14) \mu\text{m}$ ”

¹⁰ The contributions from the “best existing device” are not included in the CMC claim.

¹¹ Parameter includes: Straightness, Flatness, Circularity, Cylindricity, Parallelism, Perpendicularity, Angularity, Profile of a Line, Profile of a Surface, Circular Runout, Total Runout, Position, and Concentricity.



Accredited Laboratory

A2LA has accredited

F.D. HURKA METROLOGY

Charlotte, NC

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 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 7th day of December 2022.

A blue ink signature of Mr. Trace McInturff.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1527.01
Valid to December 31, 2024
Revised October 23, 2023

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