



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

CROSS TECHNOLOGIES, INC. DBA CROSS (FORMERLY J.A. KING)
6541 Franz Warner Parkway
Whitsett, NC 27377
Connie Foster Phone: 800 327 7727

CALIBRATION

Valid To: May 31, 2025

Certificate Number: 1741.02

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory at the location listed above to perform the following calibrations^{1, 10}:

I. Acoustical Quantities

Parameter/Range	Frequency	CMC ^{2, 9} (±)	Comments
Sound Measuring Equipment			
114 dB	(125 to 2000) Hz 4000 Hz	0.35 dB 0.63 dB	Genrad 1986 Omni Cal sound level calibrator
104 dB	(125 to 4000) Hz	0.74 dB	
94 dB	(125 to 4000) Hz	0.74 dB	
84 dB	(125 to 4000) Hz	0.74 dB	
74 dB	(125 to 4000) Hz	0.74 dB	

II. Chemical

Parameter/Equipment	Range	CMC ² (±)	Comments
pH Meters ³	4 pH 7 pH 10 pH	0.027 pH 0.027 pH 0.027 pH	Standard pH solutions

III. Dimensional

Parameter/Equipment	Range	CMC ^{2, 6} (\pm)	Comments
Angle Plates, Parallels & Squares	Up to 18 in	$(43 + 5L) \mu\text{in}$	Tri square & Mahr Supramess
Bore Gages	Up to 7 in	$(15 + 31L) \mu\text{in} + 0.6R$	Ring gages
Calipers ³	Up to 12 in (12 to 40) in (40 to 60) in	$(4.6 + 2.8L) \mu\text{in} + 0.6R$ $(13 + 2.1L) \mu\text{in} + 0.6R$ $(290 + 6.3L) \mu\text{in} + 0.6R$	Gage blocks Micrometer standards
Caliper Master	Up to 12 in	$(6.9 + 1.5L) \mu\text{in}$	P&W Labmaster™
Feeler Gages ³	Up to 1 in	75 μin	Fowler mini-horizontal
Cylindrical Measure – Plain Rings Pins, Plain Plugs, Discs, Spheres – External Diameter	Up to 14 in Up to 13 in	$(6.9 + 1.8L) \mu\text{in}$ $(6.9 + 1.8L) \mu\text{in}$	P&W Labmaster™
Combination Squares/Protractors/Angle Gages	Up to 180°	0.16°	Optical comparator
Gage Blocks	Up to 4 in (4 to 20) in	$(3.5 + 1.2L) \mu\text{in}$ $(3.2 + 1.6L) \mu\text{in}$	Federal gage block comparator Federal 130B-16 long block comparator
Hand Tools ³ – Depth Gages, Snap Gages, Fixture Gages, Thickness Gages	Up to 12 in (12 to 40) in	$(4.6 + 2.8L) \mu\text{in} + 0.6R$ $(13 + 2.1L) \mu\text{in} + 0.6R$	Gage blocks
Height Gages ³	Up to 48 in	$(56 + 1.3L) \mu\text{in} + 0.6R$	Gage blocks, surface plate

Parameter/Equipment	Range	CMC ^{2,6} (±)	Comments
Linear Indicators ³ , Dial & Test	Up to 0.1 in (0.1 to 0.5) in	13 μin + 0.6R 61 μin + 0.6R	Federal indicator calibrator
	Up to 4 in	(4.3 + 3.3L) μin + 0.6R	Gage blocks
	Up to 12 in	(6.9 + 1.5L) μin + 0.6R	P&W Labmaster™
Micrometer Head	Up to 2 in	(4.3 + 3.3L) μin + 0.6R	Gage blocks
Micrometer Master	Up to 12 in	(6.9 + 1.5L) μin	P&W Labmaster™
Pin Gages ³	Up to 1 in	75 μin	Bench micrometer
Protractor & Angle Indicators ³	1°, 2°, 3°, 4°, 5°, 10°, 15°, 20°, 25°, 30°	0.03°	Sine bar & gage blocks
	45°, 60°, 75°, 90°	0.03°	Angle block set
Optical Comparator ³ –	X-Y Linearity	Up to 12 in	150 μin
	Magnification	10x to 250x	0.014 in
	Angle	0° to 90°	0.1°
Radius Gages	Up to 2 in	480 μin	Optical comparator
Roughness Specimens – Ra	(15 to 120) μin	3.6 μin	Mitutoyo CV-500 surface analyzer
Steel Rules ³	Up to 72 in	480 μin	Optical comparator
	Up to 72 in	(66 + 8.8L) μin + 0.6R	Gage blocks
Micrometers ³ –	Outside	Up to 12 in (12 to 40) in (40 to 60) in	(4.6 + 2.8L) μin + 0.6R (13 + 2.1L) μin + 0.6R (290 + 6.3L) μin + 0.6R
	Inside	Up to 60 in	(63 + 8.4L) μin + 0.6R
			B&S 6' UltraMic

Parameter/Equipment	Range	CMC ^{2, 6, 7} (\pm)	Comments
Micrometer Standards	Up to 60 in	(63 + 8.4L) μ in	B&S 6' UltraMic
Tape Measures ³	Up to 25 ft	(66 + 8.8L) μ in + 0.6R	Gage blocks
Thread Plugs – Major Diameter Pitch Diameter	Up to 7 in Up to 7 in	(6.9 + 1.8L) μ in (98 + 0.2L) μ in	P&W Labmaster™ universal w/ thread wires
Gage Block Comparators ³ – Amplifier Gain Contact Force	0.002 in (0 to 150) g	2.9 μ in 5.2 g	Master gage block Force gage
Interim Verification of Coordinate Measuring Machines ³ – X, Y, Z Linearity Volumetric Performance	Up to 36 in Up to 10 in	(55 + 3L) μ in 140 μ in	Gage blocks Ball bar
Surface Plates ³ – Grades AA, A, & B Repeatability/Local Flatness Flatness	0.002 in Up to 60 DL in (> 60 to 120) DL in	26 μ in (31 + 0.2DL) μ in (30 + 0.3DL) μ in	Repeat-o-meter Federal level systems
Crimpers ³ – Functional Diameter Crimp Pull Force Crimp Handle Force Crimp Height	(0.011 to 0.060) in (0.061 to 0.250) in Up to 50 lb Up to 100 lb Up 1 in	260 μ in 260 μ in 0.05 % 0.32 lb 0.0003 in	Pin gages Test weights Force gauge Micrometer

Parameter/Equipment	Range	CMC ^{2, 6, 7} (±)	Comments
Bench Micrometers, Universal Length Measuring Machines ³ –			
Linearity	Up to 20 in	$(5.4 + 1.6L) \mu\text{in} + 0.6R$	Gage blocks
Parallelism	Up to 50 μin	5 μin	Reference sphere
Force	Up to 80 oz	0.32 oz	Futek load cell
Linear Encoders ³ – (Displacement Transducers, LVDT's)	Up to 48 in Up to 24 in	$(160 + 0.7L) \mu\text{in} + 0.6R$ 0.005 % + 0.6R	Gage blocks Gage blocks w/ multimeter
Vision Systems ³			
X-Y Linearity	Up to 18 in	$(52 + 2.9L) \mu\text{in}$	Grid plates
Z Axis	Up to 4 in	60 μin	Gage blocks

IV. Dimensional Testing/Calibration¹

Parameter/Equipment	Range	CMC ^{2, 6} (±)	Comments
Length ⁸ –			
X-Axis	Up to 29 in (750 mm)	$(230 + 8.4L) \mu\text{in}$	CMM
Y-Axis	Up to 39 in (1000 mm)	$(230 + 8.4L) \mu\text{in}$	
Z-Axis	Up to 25 in (500 mm)	$(230 + 8.4L) \mu\text{in}$	
Volumetric ³	39 in (1000 mm)	$(510 + 3.2L) \mu\text{in}$	Sprint 300
X-Y Measurements	(12 x 12) in	$(200 + 6L) \mu\text{in}$	
Z-Axis	Up to 4 in	400 μin	
1-D	Up to 43 in	$(150 + 4.2L) \mu\text{in}$	Trimos height gauge
Surface Finish Measure –			
Ra	(15 to 120) μin	3.6 μin	Mitutoyo CV-500 surface analyzer

V. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2, 4, 7} (±)	Comments
DC Voltage – Measure ³	(0 to 200) mV 200 mV to 2 V (2 to 20) V (20 to 200) V (200 to 1000) V (1 to 10) kV (10 to 100) kV	5.8 μV/V + 0.1 μV 4.7 μV/V + 0.4 μV 4.5 μV/V + 4.0 μV 6.2 μV/V + 40 μV 6.2 μV/V + 500 μV 0.03 % + 0.03 V 0.05 % + 0.3 V	Fluke 8508A Vitrek 4700 w/ HVL-100
DC Voltage – Generate ³	(0 to 220) mV 220 mV to 2.2 V (2.2 to 11) V (11 to 22) V (22 to 220) V (220 to 1100) V	11 μV/V + 0.4 μV 6.7 μV/V + 0.7 μV 5 μV/V + 2.5 μV 5.1 μV/V + 4 μV 6.7 μV/V + 40 μV 8.5 μV/V + 400 μV	Fluke 5730A
DC Power – Generate ³ 33 mV to 1020 V (0.33 to 329.99) mA (0.33 to 2.9999) A (3 to 20.5) A	(0.01 to 330) W (0.33 to 3.3) kW (3.3 to 20.5) kW	0.03 % 0.03 % 0.09 %	Fluke 5520A
DC Current – Measure ³	(0 to 200) μA 200 μA to 2 mA (2 to 20) mA (20 to 200) mA 200 mA to 2 A (2 to 20) A (1 to 100) A	13 μA/A + 0.4 nA 13 μA/A + 4.0 nA 15 μA/A + 40 nA 49 μA/A + 0.8 nA 0.019 % + 16 μA 0.041 % + 0.4 mA 0.07 %	Fluke 8508A GL 9230A/100 shunt w/ HP 3458A

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
DC Current – Generate ³	(0 to 220) μ A	50 μ A/A + 6 nA	Fluke 5730A $\pm (200 I^2)$ μ A/A for $I > 100$ mA
	220 μ A to 2.2 mA	44 μ A/A + 7 nA	
	(2.2 to 22) mA	44 μ A/A + 40 nA	$\pm (10 I^2)$ μ A/A for $I > 1$ A
	(22 to 220) mA	55 μ A/A + 0.7 μ A	
Clamp-On Meters	220 mA to 2.2 A	0.011 % + 12 μ A	Fluke 5730A w/ Fluke 5725A
	(2.2 to 11) A	0.044 % + 480 μ A	
	(11 to 20.5) A	0.12 % + 750 μ A	Fluke 5520A
	(Up to 1000) A	0.65 % + 0.5 A	Fluke 5520A w/5500 coil
Resistance – Measure ³	(0 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 (2 to 20) G Ω	18 $\mu\Omega/\Omega$ + 4.0 $\mu\Omega$ 12 $\mu\Omega/\Omega$ + 14 $\mu\Omega$ 10 $\mu\Omega/\Omega$ + 50 $\mu\Omega$ 10 $\mu\Omega/\Omega$ + 0.5 m Ω 10 $\mu\Omega/\Omega$ + 5.0 m Ω 10 $\mu\Omega/\Omega$ + 50 m Ω 11 $\mu\Omega/\Omega$ + 1.0 Ω 21 $\mu\Omega/\Omega$ + 100 Ω 0.013 % + 10 k Ω 0.016 % + 1 M Ω 0.016 % + 10 M Ω	Fluke 8508A
Resistance – Generate ³	(0 to 11) Ω (11 to 33) Ω (33 to 110) Ω 110 Ω to 1.1 k Ω (1.1 to 11) k Ω (11 to 110) k Ω 110 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 to 1100) M Ω	49 $\mu\Omega/\Omega$ + 0.001 Ω 37 $\mu\Omega/\Omega$ + 0.0015 Ω 34 $\mu\Omega/\Omega$ + 0.0014 Ω 34 $\mu\Omega/\Omega$ + 0.002 Ω 34 $\mu\Omega/\Omega$ + 0.02 Ω 34 $\mu\Omega/\Omega$ + 0.2 Ω 39 $\mu\Omega/\Omega$ + 2 Ω 73 $\mu\Omega/\Omega$ + 30 Ω 0.016 % + 50 Ω 0.03 % + 2.5 k Ω 0.06 % + 3 k Ω 0.36 % + 100 k Ω 1.8 % + 500 k Ω	Fluke 5520A

Parameter/Equipment	Range	CMC ^{2, 4, 7} (±)	Comments
Resistance – Generate ³ (cont)			
Fixed Points	0 Ω (1, 1.9) Ω (10, 19) Ω (100, 190) Ω (1, 1.9, 10, 19) kΩ (100, 190) kΩ 1 MΩ 1.9 MΩ 10 MΩ 19 MΩ 100 MΩ	50 μΩ 0.012 % 31 μΩ/Ω 13 μΩ/Ω 8.2 μΩ/Ω 11 μΩ/Ω 16 μΩ/Ω 22 μΩ/Ω 50 μΩ/Ω 59 μΩ/Ω 0.013 %	Fluke 5730A
	0.001 Ω 0.01 Ω	0.012 % 0.01 %	Yokogawa 2792
	0.1 Ω 1 Ω 10 Ω 100 Ω 1k Ω 10 kΩ 100 kΩ 1 MΩ 10 MΩ	14 x 10 ⁻⁶ Ω 13 x 10 ⁻⁶ Ω 13 x 10 ⁻⁶ Ω 13 x 10 ⁻⁶ Ω 13 x 10 ⁻⁶ Ω 13 x 10 ⁻⁶ Ω 16 x 10 ⁻⁶ Ω 22 x 10 ⁻⁶ Ω 28 x 10 ⁻⁶ Ω	Guildline 9330 series standard resistors
Insulation Resistance ³ – Generate			
Fixed Points	10 Ω 100 Ω 1 kΩ 10 kΩ 100 kΩ 1 MΩ 10 MΩ 100 MΩ 1 GΩ	1.2 % 1.2 % 1.2 % 1.2 % 1.2 % 1.2 % 1.2 % 1.2 % 1.2 %	Standard resistor set
Decade Steps	10 Ω to 10 MΩ (10 to 100) MΩ 100 MΩ to 1 GΩ	0.026 % 0.044 % 0.13 %	IET decade resistors 1433- 22-K & HRRS-5Q

Parameter/Equipment	Range	CMC ^{2, 4, 7} (±)	Comments
Capacitance – Generate ³	50 pF to 1.2 μF	0.61 % + 5 pF	GenRad 1412-BC
	(3.3 to 11) nF (11 to 110) nF (110 to 330) nF (0.33 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	0.34 % + 0.01 nF 0.32 % + 0.1 nF 0.32 % + 0.3 nF 0.32 % + 1 nF 0.32 % + 3 nF 0.32 % + 10 nF 0.5 % + 30 nF 0.57 % + 100 nF 0.57 % + 300 nF 0.58 % + 300 nF 0.56 % + 3 μF 0.56 % + 10 μF 0.9 % + 30 μF 2.2 % + 100 μF	Fluke 5520A
Fixed Values	1 nF 10 nF 100 nF 1 μF	0.036 % 0.032 % 0.033 % 0.034 %	GenRad 1409 series capacitors
Inductance – Generate	100 mH	0.14 %	GenRad 1482-L
	100 μH steps 1 mH steps 10 mH steps 100 mH steps 1 H steps	2.4 % per step 2.4 % per step 1.9 % per step 0.97 % per step 0.97 % per step	GenRad 1491-G decade inductor

Parameter/Range	Frequency	CMC ^{2, 4} (±)	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	0.017 % + 14 μV 0.014 % + 4 μV 0.012 % + 4 μV 0.011 % + 2 μV 0.014 % + 4 μV 0.034 % + 8 μV 0.077 % + 20 μV	Fluke 8508A

Parameter/Range	Frequency	CMC ^{2, 4} (±)	Comments
AC Voltage – Measure ³ (cont)			
200 mV to 2 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	0.015 % + 0.12 mV 0.012 % + 0.02 mV 0.01 % + 0.02 mV 0.008 % + 0.02 mV 0.012 % + 0.02 mV 0.023 % + 0.04 mV 0.058 % + 0.2 mV 0.31 % + 2 mV 1 % + 20 mV	Fluke 8508A
(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	0.015 % + 1.2 mV 0.012 % + 0.2 mV 0.01 % + 0.2 mV 0.008 % + 0.2 mV 0.012 % + 0.2 mV 0.023 % + 0.4 mV 0.058 % + 2 mV 0.31 % + 20 mV 1 % + 0.2 V	
(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	0.015 % + 12 mV 0.012 % + 2 mV 0.01 % + 2 mV 0.008 % + 2 mV 0.012 % + 2 mV 0.023 % + 4 mV 0.058 % + 20 mV 0.31 % + 0.2 V 1 % + 2 V	
(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	0.015 % + 70 mV 0.013 % + 20 mV 0.012 % + 20 mV 0.023 % + 40 mV 0.058 % + 0.2 V	
(1 to 10) kV (10 to 70) kV	(50 to 60) Hz (50 to 60) Hz	0.15% + 0.1 V 0.15% + 0.6 V	Vitrek 4700 w/transfer probe
AC Voltage – Generate ³			
(0.22 to 2.2) mV	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz	0.19 % + 4 μV 0.12 % + 4 μV 0.086 % + 4 μV 0.15 % + 4 μV	Fluke 5730A

Parameter/Range	Frequency	CMC ^{2, 4} (±)	Comments
AC Voltage – Generate ³ (cont)			
(0.22 to 2.2) mV	(50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.21 % + 5 μV 0.37 % + 10 μV 0.53 % + 20 μV 0.69 % + 20 μV	Fluke 5730A
(2.2 to 22) mV	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.031 % + 4 μV 0.014 % + 4 μV 0.013 % + 4 μV 0.03 % + 4 μV 0.066 % + 5 μV 0.14 % + 10 μV 0.18 % + 20 μV 0.35 % + 20 μV	
(22 to 220) mV	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.03 % + 12 μV 0.011 % + 7 μV 0.0073 % + 7 μV 0.015 % + 7 μV 0.038 % + 17 μV 0.08 % + 20 μV 0.17 % + 25 μV 0.34 % + 45 μV	
220 mV to 2.2 V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.062 % + 40 μV 0.024 % + 15 μV 53 μV/V + 8 μV 83 μV/V + 10 μV 0.011 % + 30 μV 0.041 % + 80 μV 0.12 % + 200 μV 0.21 % + 300 μV	
(2.2 to 22) V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.029 % + 400 μV 0.012 % + 150 μV 55 μV/V + 50 μV 86 μV/V + 100 μV 0.011 % + 200 μV 0.032 % + 600 μV 0.12 % + 2 mV 0.19 % + 3.2 mV	
(22 to 220) V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz	0.029 % + 4 mV 0.012 % + 1.5 mV 66 μV/V + 0.6 mV 0.011 % + 1 mV 0.019 % + 2.5 mV	

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
AC Voltage – Generate ³ (cont)			
(22 to 220) V	(100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.11 % + 16 mV 0.53 % + 40 mV 0.97 % + 80 mV	Fluke 5730A
(220 to 1100) V	(15 to 50) Hz 50 Hz to 1 kHz	0.037 % + 16 mV 90 μV/V + 3.5 mV	
(220 to 1100) V	40 Hz to 1 kHz (1 to 20) kHz (20 to 30) kHz	0.012 % + 4 mV 0.02 % + 6 mV 0.073 % + 11 mV	
(220 to 750) V	(30 to 50) kHz (50 to 100) kHz	0.073 % + 11 mV 0.28 % + 45 mV	Fluke 5730A w/ 5725A
AC Current – Measure ³			
(0 to 200) μA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.051 % + 0.02 μA 0.051 % + 0.02 μA 0.072 % + 0.02 μA 0.41 % + 0.02 μA	Fluke 8508A
(0.2 to 2) mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.032 % + 0.2 μA 0.031 % + 0.2 μA 0.072 % + 0.2 μA 0.41 % + 0.2 μA	
(2 to 20) mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.032 % + 2 μA 0.031 % + 2 μA 0.072 % + 2 μA 0.41 % + 2 μA	
(20 to 200) mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz	0.032 % + 0.02 mA 0.031 % + 0.02 mA 0.063 % + 0.02 mA	
(0.2 to 2) A	10 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz	0.063 % + 0.2 mA 0.074 % + 0.2 mA 0.31 % + 0.2 mA	
(2 to 20) A	10 Hz to 2 kHz (2 to 10) kHz	0.083 % + 2 mA 0.26 % + 2 mA	

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
AC Current – Generate			
(0 to 220) µA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.031 % + 16 nA 0.02 % + 10 nA 0.014 % + 8 nA 0.029 % + 12 nA 0.14 % + 65 nA	Fluke 5730A
220 µA to 2.2 mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.031 % + 40 nA 0.02 % + 35 nA 0.013 % + 35 nA 0.025 % + 110 nA 0.14 % + 650 nA	
(2.2 to 22) mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.033 % + 400 nA 0.02 % + 350 nA 0.013 % + 350 nA 0.025 % + 550 nA 0.14 % + 5 µA	
(22 to 220) mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.033 % + 4 µA 0.02 % + 3.5 µA 0.013 % + 2.5 µA 0.025 % + 3.5 µA 0.14 % + 10 µA	
220 mA to 2.2 A	20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.03 % + 35 µA 0.055 % + 80 µA 0.85 % + 160 µA	
(2.2 to 11) A	40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.056 % + 170 µA 0.12 % + 380 µA 0.44 % + 750 µA	
(11 to 20.5) A	45 Hz to 1 kHz	0.19 % + 5 mA	
AC Clamp-On Meters ³ –			
Up to 150 A			
Toroidal	(45 to 65) Hz (65 to 440) Hz	0.49 % + 0.025 A 1 % + 0.027 A	Fluke 5520A w/ 5500 coil
Non-Toroidal	(45 to 65) Hz (65 to 440) Hz	0.76 % + 0.25 A 1.3 % + 0.25 A	

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
AC Clamp-On Meters ³ – (cont)			
(150 to 1025) A			
Toroidal	(45 to 65) Hz (65 to 440) Hz	0.49 % + 0.09 A 1 % + 0.1 A	Fluke 5520A w/ 5500 coil
Non-Toroidal	(45 to 65) Hz (65 to 440) Hz	0.76 % + 0.9 A 1.3 % + 0.9 A	

Parameter/Equipment	Range	CMC ^{2,4,7} (±)	Comments
AC Power – Generate ³			
(45 to 65) Hz; PF=1			
(33 to 330) mV			
Range:			
(3.3 to 8.99) mA	110 µW to 3 mW	0.17 %	Fluke 5520A
(9 to 32.99) mA	(3 to 11) mW	0.12 %	
(33 to 89.99) mA	(1.1 to 30) mW	0.17 %	
(90 to 329.99) mA	(3 to 110) mW	0.12 %	
(0.33 to 0.8999) A	(11 to 300) mW	0.16 %	
(0.9 to 2.1999) A	(30 to 730) mW	0.14 %	
(2.2 to 4.4999) A	73 mW to 1.5 W	0.16 %	
(4.5 to 20.5) A	150 mW to 6.8 W	0.14 %	

Parameter/Equipment	Range	CMC ^{2,4,7} (±)	Comments
AC Power – Generate ³ (cont) (45 to 65) Hz; PF=1 330 mV to 1020 V Range: (3.3 to 8.99) mA (9 to 32.99) mA (33 to 89.99) mA (90 to 329.99) mA (0.33 to 0.8999) A (0.9 to 2.1999) A (2.2 to 4.4999) A (4.5 to 20.5) A	 1.1 mW to 9 W 3 mW to 33 W 11 mW to 90 W 30 mW to 330 W 110 mW to 900 W 300 mW to 2200 W 730 mW to 4500 W (1.5 to 20.9) kW	 0.15 % 0.1 % 0.15 % 0.1 % 0.14 % 0.11 % 0.15 % 0.12 %	 Fluke 5520A
Oscilloscopes ³ – Square Wave Amplitude: 50 Ω @ 1 kHz 1 MΩ @ 1 kHz DC Voltage Amplitude: 50 Ω Load 1 MΩ Load Level Sine Wave: Frequency Amplitude Flatness (Bandwidth)	 1.0 mV to 6.6 V _{pk - pk} 1.0 mV to 130 V _{pk - pk} (0 to ± 6.6) V (0 to ± 130) V Up to 600 MHz 50 kHz Reference 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz	 0.32 % + 40 μV 0.16 % + 40 μV 0.3 % + 40 μV 0.07 % + 40 μV 3.3 μHz/Hz 2.4 % + 300 μV 4.4 % + 300 μV 4.9 % + 300 μV 7.3 % + 300 μV 2.1 % + 100 μV 2.6 % + 100 μV 4.9 % + 100 μV	 Fluke 5520A SC600

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Oscilloscopes ³ – (cont)			
Time Markers: Into a 50 Ω Load	5 s to 50 ms 20 ms to 2 ns	(30 + 1000t) μs/s 3.5 μs/s	t = time in seconds
Rise Time	1 kHz to 10 MHz (200 to 300) ps	120 ps 120 ps	
Electrical Simulation of RTD's ³ , Pt 385, 100 Ω	(-200 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C (630 to 800) °C	0.1 °C 0.11 °C 0.13 °C 0.15 °C 0.28 °C	Fluke 5520A
Electrical Simulation of Thermocouples ³			
Type B	(600 to 800) °C (800 to 1820) °C	0.18 °C 0.15 °C	Fluke 5730A w/ice point reference
Type E	(-270 to 1000) °C	0.13 °C	
Type J	(-210 to 1200) °C	0.13 °C	
Type K	(-270 to 1372) °C	0.13 °C	
Type N	(-270 to 1300) °C	0.13 °C	
Type R	(-50 to 0) °C (0 to 1767) °C	0.17 °C 0.14 °C	
Type S	(-50 to 0) °C (0 to 1767) °C	0.17 °C 0.15 °C	
Type T	(-270 to 400) °C	0.13 °C	

Parameter/Frequency	Range	CMC ² (±)	Comments
Electrical Calibration of Process Meters – Thermocouple Output ³			
Type B	(600 to 800) °C (800 to 1820) °C	0.13 °C 0.13 °C	HP 3458A w/ice point reference
Type E	(-270 to 1000) °C	0.13 °C	
Type J	(-210 to 1200) °C	0.13 °C	
Type K	(-270 to 1372) °C	0.13 °C	
Type N	(-270 to 1300) °C	0.13 °C	
Type R	(-50 to 0) °C (0 to 1767) °C	0.13 °C 0.13 °C	
Type S	(-50 to 0) °C (0 to 1767) °C	0.13 °C 0.13 °C	
Type T	(-270 to 400) °C	0.13 °C	

Parameter/Range	Frequency	CMC ^{2, 4, 7} (±)	Comments
Distortion – Measure 20 Hz to 100 kHz Fundamental Frequency Input: 50 mV to 300 V (0 to 99.9) dB Dist. (0 to 99.9) dB Dist.	20 Hz to 20 kHz (20 to 100) kHz	2.5 % 2.5 %	HP 8903B

VI. Electrical – RF/Microwave

Parameter/Frequency	Frequency	CMC ^{2, 4, 7} (±)	Comments
RF Power – Measure			
(-70 to -20) dBm 100 pW to 10 μW	10 MHz to 18 GHz	1.2 %	HP437B/8484A/ 11708A
(-20 to 30) dBm 1 μW to 100 mW	100 kHz to 4.2 GHz	1.1 %	HP437B/8482A
(-20 to 30) dBm 1 μW to 100 mW	10 MHz to 18 GHz	1.1 %	HP437B/8481A

VII. Mechanical

Parameter/Equipment	Range	CMC ^{2, 6, 7} (±)	Comments
Scales & Balances ³	(1 to 500) mg	0.013 mg + 0.6R	ASTM Class 1 weights (applied load)
	Up to 5 g	0.043 mg + 0.6R	
	Up to 10 g	0.062 mg + 0.6R	
	Up to 30 g	0.096 mg + 0.6R	
	Up to 50 g	0.17 mg + 0.6R	
	Up to 100 g	0.31 mg + 0.6R	
	Up to 200 g	0.63 mg + 0.6R	
	Up to 300 g	0.92 mg + 0.6R	
	Up to 500 g	1.5 mg + 0.6R	
	Up to 1000 g	3.1 mg + 0.6R	
	(> 1 to 35) kg	3.1 mg per 1000 g + 0.6R	
	(5 to 10) g	0.04 % + 0.6R	
(10 to 500) g	0.025 % + 0.6R		
501 g to 20 kg	0.017 % + 0.6R		
(> 20 to 5000) kg	0.017 % per 20 kg + 0.6R		
Up to 1000 lb	0.017 % + 0.6R	Class F weights (applied load)	
(1000 to 120 000) lb	0.017 % per 1000 lb + 0.6R		

Parameter/Equipment	Range	CMC ² (±)	Comments
Mass – Fixed Points	1 mg	0.0038 mg	By comparison w/ ultra-class weights
	2 mg	0.005 mg	
	3 mg	0.004 mg	
	5 mg	0.0034 mg	
	10 mg	0.0033 mg	
	20 mg	0.0033 mg	
	30 mg	0.0035 mg	
	50 mg	0.0042 mg	
	100 mg	0.0039 mg	
	200 mg	0.0037 mg	
	300 mg	0.0068 mg	
	500 mg	0.0039 mg	
	1 g	0.010 mg	
	2 g	0.011 mg	
	3 g	0.010 mg	
	5 g	0.015 mg	
	10 g	0.016 mg	
	20 g	0.019 mg	
	25 g	0.020 mg	
	30 g	0.017 mg	
	40 g	0.026 mg	
	50 g	0.079 mg	
	100 g	0.047 mg	
	200 g	0.23 mg	
	300 g	0.12 mg	
	500 g	0.22 mg	
	1 kg	0.43 mg	
	2 kg	2.6 mg	
	3 kg	2.5 mg	
	4 kg	3.6 mg	
	5 kg	4.7 mg	
	10 kg	4.7 mg	
	20 kg	17 mg	By comparison w/ ASTM class 1 weights
25 kg	20 mg		
1/32 oz	6.1 μoz (180 μg)		
1/16 oz	6.1 μoz (180 μg)		
1/8 oz	6.1 μoz (180 μg)		
1/4 oz	6.1 μoz (180 μg)		
1/2 oz	6.1 μoz (180 μg)		
1 oz	6.1 μoz (180 μg)		
2 oz	6.1 μoz (180 μg)		
4 oz	6.1 μoz (180 μg)		

Parameter/Equipment	Range	CMC ^{2, 7, 9} (±)	Comments
Mass – Fixed Points (cont)	0.001 lb 0.002 lb 0.005 lb 0.01 lb 0.02 lb 0.05 lb 0.1 lb 0.2 lb 0.5 lb 1 lb 2 lb 3 lb 4 lb 5 lb 10 lb 20 lb 25 lb 50 lb	2.4 μlb (1.1 mg) 2.4 μlb (1.1 mg) 2.4 μlb (1.1 mg) 2.4 μlb (1.1 mg) 2.4 μlb (1.1 mg) 2.4 μlb (1.1 mg) 2.4 μlb (1.1 mg) 2.4 μlb (1.1 mg) 2.7 μlb (1.2 mg) 2.4 μlb (1.1 mg) 2.8 μlb (1.3 mg) 3.1 μlb (1.4 mg) 4.2 μlb (1.9 mg) 2.8 μlb (1.3 mg) 600 μlb (270 mg) 600 μlb (270 mg) 670 μlb (310 mg) 610 μlb (280 mg)	By comparison w/ ASTM class 1 weights
Mass – Field Check Weight Comparison ³ – Load Fixtures, Hangers, Package & Check Weights	Up to 1000 g Up to 70 lb	5.4 mg 0.022 %	Balance w/ Class 1 mass standards Scale w/ Class F weights
Torque – Measure (Wrenches) ³	5 lbf·in to 600 lbf·ft (600 to 1000) lbf·ft	0.65 % 0.93 %	CDI Suretest 5000-ST Sturtevant TT-1000
Torque – Measuring Equipment ³	Up to 2000 lbf·ft	0.13 %	Class F weights & torque arms
Rotary Torque Measure ³ – Pneumatic, DC, Pulse	(0.2 to 250) N·m	0.8 %	Mountz w/ rotary transducers

Parameter/Equipment	Range	CMC ^{2, 7, 9} (±)	Comments
Force – Measuring Equipment ³	(0.002 to 3000) lbf (200 to 50 000) lbf (50 001 to 100 000) lbf	0.05 % 0.04 % 0.06 %	Class F weights Morehouse universal 100K
Durometer Calibration – (Type A, B, C, D, DO, O, OO) Indenter Extension & Shape – Diameter Radius Angle Extension Indenter Display Spring Calibration – Force	 Up to 0.105 in Up to 0.125 in 25° to 40° Up to 0.105 in (0 to 100) durometer units Up to 45 N	 120 μin 120 μin 0.16° 70 μin 0.7 durometer units 0.032 N	ASTM D2240 Vision system Gage blocks Gage blocks Precision bench scale
Pressure ³ – Measuring Equipment Absolute Differential Pneumatic Hydraulic	 (0 to 100) psia (0 to 28) in·H ₂ O (Up to 300) psig (5 to 7500) psig (100 to 1000) psig (1000 to 10 000) psig	 0.08 psi 0.03 % of full scale 0.07 % 0.2 % 0.03 % of full scale 0.03 % of full scale	Fluke 754 w/ 750PA6 Merriam M200-LS Beamex MC5 Ametek Type 10/ Ametek HL-36 Additel ADT681-1K Additel ADT681-10K
Vacuum ³ – Measuring Equipment	(0.01 to 28) in-Hg	0.09 %	Beamex MC5

Parameter/Equipment	Range	CMC ^{2, 6, 7, 9} (±)	Comments
Speed ³ – Measure Optic/Non-Contact: RPM Totalizer/Rate Meters Contact: RPM Totalizer/Rate Meters	(5 to 200 000) rpm (2 to 3300) fpm (0.5 to 12 000) rpm (2 to 3300) fpm	0.017 % 0.017 % 0.22 % 0.22 %	Monarch PLT200
Totalize Meters ³ – (Length Counters & Totalizers) Distance Measure	Up to 2000 yards	0.7 %	Monarch PLT200 w/ encoder wheel
Speed/RPM/Rate ³ – Simulation	(2.5 to 100 000) rpm	0.00025 % + 0.6R	Keysight 33250A
Tensile Tester ³ – Speed/Rate Displacement	Up 50 in/min Up to 20 inches	0.025 % 0.00025 in	Timer & caliper Gage blocks w/ indicator
Indirect Verification of Rockwell Hardness Testers ³	HRC: Low Medium High HRBW: Low Medium High HR30T: Low Medium High	0.84 HRC 0.84 HRC 0.81 HRC 0.83 HRBW 0.82 HRBW 0.81 HRBW 0.81 HRT 0.82 HRT 0.81 HRT	Indirect verification per ASTM E18

VIII. Optical Quantities

Parameter/Equipment	Range	CMC ^{2, 7} (±)	Comments
Illuminance – Light Meters (360 to 780) nm	(0.1 to 10 000) Lux	2.7 %	Comparison by standard light meter

IX. Thermodynamics

Parameter/Equipment	Range	CMC ^{2, 9} (±)	Comments
Temperature – Measuring Equipment ³	(-15 to 100) °C	0.3 °C	Fluke 9009
	(101 to 420) °C	0.65 °C	Fluke 9144
	(421 to 650) °C	0.9 °C	
Temperature – Measure ³	(-196 to 300) °C (300 to 670) °C	0.05 °C 0.1 °C	Fluke 1524 w/PRT
Plate Temperature – Infrared Measuring Devices ³	35 °C	0.84 °C	Fluke 4181
	(35 to 100) °C	0.95 °C	
	(100 to 200) °C	1.2 °C	
	(200 to 350) °C	1.7 °C	
	(350 to 500) °C	2.3 °C	
Relative Humidity – Measure ³	(10 to 90) % RH	1.0 % RH	Rotronic HC2-SH
Relative Humidity – Measuring Equipment ³	(20 to 90) % RH	1 % RH	Rotronic HC2-SH & Humidity Generator

X. Time & Frequency

Parameter/Equipment	Range	CMC ^{2, 9} (\pm)	Comments
Frequency – Measuring Equipment	Up to 80 MHz	0.06 μ Hz/Hz	Keysight 33250A w/ external timebase
	100 kHz to 6 GHz	0.06 μ Hz/Hz	N5181A w/ external timebase
Frequency – Measure	Up to 15 GHz	0.06 μ Hz/Hz	Keysight 53230A
Timers & Stopwatches ³	(1 to 3600) s	0.026 s	Keysight 53230A

¹ This laboratory offers commercial calibration and field calibration services and is performed at the main laboratory.

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 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.

⁵ The standards used don't include the individual load cells calibrated using ASTM standards & methods.

⁶ In the statement of CMC, L is the numerical value of the nominal length of the device; R is the numerical value of the resolution of the device. DL is the diagonal length of the device.

⁷ In the statement of CMC a percentage refers to percent of reading unless otherwise noted.

⁸ 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.

⁹ 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.

¹⁰ This scope meets A2LA's P112 Flexible Scope Policy.



Accredited Laboratory

A2LA has accredited

CROSS TECHNOLOGIES, INC DBA CROSS (FORMERLY J.A. KING)

Whitsett, 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 the requirements of 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 18th day of January 2023.

A blue ink signature of Trace McInturff, written in a cursive style.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1741.02
Valid to May 31, 2025

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