



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

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CALIBRATION

Valid To: July 31, 2019

Certificate Number: 1741.04

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory at the location listed above as well as the satellite laboratory location listed below to perform the following calibrations¹:

I. Chemical

Parameter/Equipment	Range	CMC ² (±)	Comments
pH Meters ³ , Fixed Points	4 pH 7 pH 10 pH	0.04 pH 0.04 pH 0.06 pH	Standard pH solutions
Conductivity Meters ³ , Fixed Points	10 µS/cm 100 µS/cm 1000 µS/cm	0.21 µS/cm 0.93 µS/cm 4.4 µS/cm	Standard conductivity solutions

II. Dimensional

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Thickness and Snap Gages ³	Up to 2 in	(1.7 + 9.3L) µin + 0.6R	Master gage blocks
Calipers ³	Up to 12 in (12 to 24) in (24 to 40) in	(1.7 + 9.3L) µin + 0.6R (53 + 8L) µin + 0.6R (220 + 6.8L) µin + 0.6R	Master gage blocks 24 in check master 40 in check master
Linear Indicators ³ (Dial and Test)	Up to 2 in	(1.7 + 9.3L) µin + 0.6R	Master gage blocks Indicator calibrators

Parameter/Equipment	Range	CMC ^{2,4} (\pm)	Comments
Micrometers ³ – Outside	Up to 12 in (12 to 24) in (24 to 40) in	(1.7 + 9.3L) μ in + 0.6R (53 + 8L) μ in + 0.6R (220 + 6.8L) μ in + 0.6R	Master gage blocks 24 in check master 40 in check master
Micrometers ³ – Inside	Up to 12 in (12 to 24) in (24 to 40) in	(1.7 + 9.3L) μ in + 0.6R (53 + 8L) μ in + 0.6R (220 + 6.8L) μ in + 0.6R	Master gage blocks 24 in check master 40 in check master
Height Gages ³	Up to 12 in (12 to 24) in (24 to 40) in	(1.7 + 9.3L) μ in + 0.6R (53 + 8L) μ in + 0.6R (220 + 6.8L) μ in + 0.6R	Master gage blocks 24 in check master 40 in check master
Pin Gages ³	Up to 1 in	80 μ in	Digimatic micrometer
Feeler Gages ³	Up to 1 in	80 μ in	Digimatic micrometer
Metal Tape Measures and Steel Rules	(0.1 to 25) ft	(5.2 + 69L) μ in + 0.6R	Gage blocks and calipers
Angle Indicators and Protractors ³	30°, 45°, 60°, 75°, 90°	0.05°	Angle block set
Optical Comparators ³ – X-Y Linearity Magnification Angle	Up to 12 in 10 \times to 250 \times 0° to 90°	150 μ in 0.014 in 0.1°	Glass master and scales Angle block set
Vision systems ³ – X-Y Linearity Z Axis	Up to 18 in Up to 4 in	(52 + 2.9L) μ in 60 μ in	Grid plate Gage blocks

Parameter/Equipment	Range ⁴	CMC ^{2,4} (\pm)	Comments
Surface Plates ³ – Grades AA, A, and B			
Repeatability Only	---	38 μ in	Repeat-o-meter
Flatness	Up to 60 <i>DL</i> in (>60 to 120) <i>DL</i> in	(31 + 0.2 <i>DL</i>) μ in (30 + 0.3 <i>DL</i>) μ in	Federal level systems
Surface Finish Specimens – (Waviness, Texture, Roughness)			
Ra	(2 to 500) μ in	4 μ in	Surface analyzer
Formtesters ³			
Gage Head Displacement	(0.05 to 2) mm	0.1 μ m	Gage blocks
Spindle Verification	0.15 μ m to 2mm	0.04 μ m	Roundness sphere
Axis to Spindle Alignment	(25 to 250) mm	3 μ m/m	Cylindrical square
Contour Systems ³ -			
Vertical Displacement	(2.5 to 60) mm	0.6 μ m	Gage blocks
Horizontal Displacement	(5 to 100) mm	1 μ m	Spheres
Radius Compensation	(2.56 to 10) mm	2.5 μ m	Pin gages

III. Dimensional Testing/Calibration¹

Parameter/Equipment	Range	CMC ² (\pm)	Comments
Surface Finish Measure ⁷	(2 to 500) μ in	4 μ in	Surface analyzer
Roundness	350 x 3000 mm	3.8 μ m	Formtester

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Length ⁷ – X Axis Y Axis Z Axis Volumetric	Up to 39 in (1000mm) Up to 59 in (1500mm) Up to 27 in (700mm) Up to 70 in (1700mm)	(160 + 8.3L) μin (160 + 8.7L) μin (160 + 7.9L) μin (160 + 8.9L) μin	Wenzel CMM
Length ⁷ X-Y Measurements Z Axis	18 x 18 in 6 in	(140 + 8.5L) μin (160 + 12L) μin	Vision machine

IV. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2,5,6} (±)	Comments
DC Input Devices ³ – Generate and Measure	(1 to 24) DCV output (1 to 60) DC mA output (1 to 150) DC mV output	0.07 % 0.1 % 0.05 %	Transmation 1080
DC Voltage ³ – Measure	(0 to 100) mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 1000) V (1 to 6) kV (6 to 20) kV (20 to 35) kV (35 to 40) kV	11 μV/V + 3 μV 10 μV/V + 0.3 μV 10 μV/V + 0.05 μV 12 μV/V + 0.3 μV 27 μV/V + 0.1 μV 1.2 % 2.4 % 1.2 % 2.4 %	Agilent/HP 3458A Fluke 80K-6 and DMM Fluke 80K-40 and DMM
DC Voltage – Generate	(0 to 330) mV (0 to 3.3) V (0 to 33) V (30 to 330) V (100 to 1020) V	25 μV/V + 1 μV 14 μV/V + 2 μV 15 μV/V + 15 μV 22 μV/V + 150 μV 22 μV/V + 1.5 mV	Fluke 5522A

Parameter/Equipment	Range	CMC ^{2,5,6} (±)	Comments
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 5522A
DC Current – Measure	(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 (1 to 300) 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 0.012 % + 10 µA 0.25 %	Agilent/HP 3458A Empro shunt /DMM
DC Current – Generate	(0 to 330) µA (0 to 3.3) mA (0 to 33) mA (0 to 330) mA (0 to 1.1) A (1.1 to 3) A (0 to 11) A (11 to 21) A 1 mA to 100 A	0.018 % + 0.02 µA 0.012 % + 0.05 µA 0.012 % + 0.25 µA 0.012 % + 2.5 µA 0.024 % + 40 µA 0.046 % + 40 µA 0.06 % + 500 µA 0.12 % + 750 µA 0.055 % of setting	Fluke 5522A Valhalla 2555A
DC Clamp-On Meters – (Toroidal) (Non-Toroidal)	 (Up to 1000) A (Up to 1000) A	 0.39 % + 0.5 A 0.65 % + 0.5 A	 Fluke 5522A w/5500 coil
Resistance – Measure	(0 to 10) Ω (10 to 100) Ω 100 Ω to 1kΩ (1 to 10) kΩ (10 to 100) kΩ 100 kΩ to 1 MΩ (1 to 10) MΩ (10 to 100) MΩ 100 MΩ to 1 GΩ	18 µΩ/Ω + 50 µΩ 15 µΩ/Ω + 0.5 mΩ 14 µΩ/Ω + 0.5 mΩ 14 µΩ/Ω + 5 mΩ 12 µΩ/Ω + 50 mΩ 17 µΩ/Ω + 2 Ω 52 µΩ/Ω + 100 Ω 0.05 % + 1 kΩ 0.5 % + 10 kΩ	Agilent/HP 3458A

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments
Resistance– Generate	(0 to 11) Ω (11 to 33) Ω (33 to 110) Ω 110 Ω to 1.1 kΩ (1.1 to 11) kΩ (11 to 110) kΩ 110 kΩ to 1.1 MΩ (1.1 to 3.3) MΩ (3.3 to 11) MΩ (11 to 33) MΩ (33 to 110) MΩ (110 to 330) MΩ (330 to 1100) MΩ	49 μΩ/Ω + 0.001 Ω 37 μΩ/Ω + 0.0015 Ω 34 μΩ/Ω + 0.0014 Ω 34 μΩ/Ω + 0.002 Ω 34 μΩ/Ω + 0.02 Ω 34 μΩ/Ω + 0.2 Ω 39 μΩ/Ω + 2 Ω 73 μΩ/Ω + 30 Ω 0.016 % + 50 Ω 0.03 % + 2.5 kΩ 0.06 % + 3 kΩ 0.36 % + 100 kΩ 1.8 % + 500 kΩ	Fluke 5522A

Parameter/Range	Frequency	CMC ^{2,5} (±)	Comments
Capacitance – Generate ³ 40 pF to 1.2 μF	--	0.5 % + 3 pF	Agilent/HP 4440B
(220.0 to 399.9) pF	(10 to 10 000) Hz	0.6 % + 10 pF	Fluke 5522A
(0.4 to 1.0999) nF	(10 to 10 000) Hz	0.6 % + 0.01 nF	
(1.1 to 3.2999) nF	(10 to 3000) Hz	0.6 % + 0.01 nF	
(3.3 to 10.9999) nF	(10 to 1000) Hz	0.3 % + 0.1 nF	
(11 to 109.999) nF	(10 to 1000) Hz	0.3 % + 0.1 nF	
(110 to 329.999) nF	(10 to 1000) Hz	0.3 % + 0.3 nF	
(0.33 to 1.09999) μF	(10 to 600) Hz	0.3 % + 1 nF	
(1.1 to 3.29999) μF	(10 to 300) Hz	0.3 % + 3 nF	
(3.3 to 10.9999) μF	(10 to 150) Hz	0.3 % + 10 nF	
(11 to 32.9999) μF	(10 to 120) Hz	0.49 % + 30 nF	
(33 to 109.999) μF	(10 to 80) Hz	0.55 % + 100 nF	
(110 to 329.999) μF	(0 to 50) Hz	0.54 % + 300 nF	
(.33 to 1.09999) mF	(0 to 20) Hz	0.55 % + 1 μF	
(1.1 to 3.29999) mF	(0 to 6) Hz	0.55 % + 3 μF	
(3.3 to 10.9999) mF	(0 to 2) Hz	0.56 % + 10 μF	
(11 to 32.9999) mF	(0 to 0.6) Hz	0.91 % + 30 μF	
(33 to 110) mF	(0 to 0.2) Hz	1.4 % + 100 μF	

Parameter/Range	Frequency	CMC ^{2, 5} (±)	Comments
AC Voltage – Generate			
(1 to 33) mV	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.096 % + 6 μV 0.019 % + 6 μV 0.025 % + 6 μV 0.12 % + 6 μV 0.42 % + 12 μV 0.96 % + 50 μV	Fluke 5522A
(33 to 330) mV	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.036 % + 8 μV 0.018 % + 8 μV 0.02 % + 8 μV 0.042 % + 8 μV 0.096 % + 32 μV 0.24 % + 70 μV	
(0.33 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	0.036 % + 50 μV 0.019 % + 60 μV 0.023 % + 60 μV 0.036 % + 50 μV 0.084 % + 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	0.036 % + 650 μV 0.019 % + 600 μV 0.029 % + 600 μV 0.042 % + 600 μV 0.11 % + 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	0.023 % + 2 mV 0.025 % + 6 mV 0.03 % + 6 mV 0.036 % + 6 mV 0.24 % + 50 mV	
(330 to 1020) V	45 Hz to 10 kHz	0.036 % + 10 mV	
AC Voltage ³ – Measure			
Up to 10 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	0.03 % + 0.03 % of rng 0.02 % + 0.01 % of rng 0.03 % + 0.01 % of rng 0.1 % + 0.01 % of rng 0.5 % + 0.01 % of rng 4 % + 0.02 % of rng	HP 3458A

Parameter/Range	Frequency	CMC ^{2, 5, 6} (±)	Comments
AC Voltage ³ – Measure (cont)			
10 mV 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	0.008 % + 0.004 % of rng 0.008 % + 0.002 % of rng 0.014 % + 0.002 % of rng 0.03 % + 0.002 % of rng 0.08 % + 0.002 % of rng 0.3 % + 0.01 % of rng	HP 3458A
(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	0.02 % + 0.004 % of rng 0.02 % + 0.002 % of rng 0.02 % + 0.002 % of rng 0.035 % + 0.002 % of rng 0.12 % + 0.002 % of rng 0.4 % + 0.01 % of rng	
(100 to 700) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.041 % + 0.004 % of rng 0.041 % + 0.002 % of rng 0.061 % + 0.002 % of rng 0.013 % + 0.002 % of rng 0.31 % + 0.002 % of rng	
700 V to 6 kV	(1 to 500) Hz	1.2 %	Fluke 80K-6 and DMM
(6 to 40) kV	(1 to 500) Hz	6 %	Fluke 80K-40 and DMM
AC Current ³ – Generate			
(0 to 0.33) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.24 % + 0.1 µA 0.18 % + 0.1 µA 0.15 % + 0.1 µA 0.36 % + 0.15 µA 0.96 % + 0.2 µA 2 % + 0.4 µA	Fluke 5522A
(0.33 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	0.25 % + 0.15 µA 0.16 % + 0.15 µA 0.13 % + 0.15 µA 0.25 % + 0.2 µA 0.6 % + 0.3 µA 1.2 % + 0.6 µA	
(3.3 to 33) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.22 % + 2 µA 0.11 % + 2 µA 0.05 % + 2 µA 0.096 % + 2 µA 0.24 % + 3 µA 0.48 % + 4 µA	

Parameter/Range	Frequency	CMC ^{2,5} (±)	Comments
AC Current ³ – Generate (cont)			
(33 to 330) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.22 % + 20 µA 0.11 % + 20 µA 0.05 % + 20 µA 0.12% + 50 µA 0.24 % + 100 µA 0.48 % + 200 µA	Fluke 5522A
(0.33 to 1.1) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.22 % + 100 µA 0.06 % + 100 µA 0.72 % + 1 mA 3 % + 5 mA	
(1.1 to 3) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.22 % + 100 µA 0.072 % + 100 µA 0.72 % + 1 mA 3 % + 5 mA	
(3 to 11) A	45 Hz to 1 kHz (1 to 5) kHz	0.12 % + 2 mA 3.6 % + 2 mA	
(11 to 20.5) A	45 Hz to 1 kHz (1 to 5) kHz	0.18 % + 5 mA 3.6 % + 5 mA	
1 mA to 100 A	100 Hz 400 Hz 1 kHz	0.23 % of setting 0.35 % of setting 0.52 % of setting	
AC Clamp-On Meters – Up to 1000 A			
(Toroidal)	(50 to 400) Hz	0.43 % + 0.5 A	Fluke 5522A w/5500 Coil
(Non Toriodal)	(50 to 400) Hz	0.68 % + 0.5 A	
AC Current – Measure			
(0 to 100) µA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz 100 Hz to 5 kHz	0.4 % + 0.03 % of rng 0.15 % + 0.03 % of rng 0.06 % + 0.03 % of rng 0.06 % + 0.03 % of rng	Agilent/HP 3458A

Parameter/Range	Frequency	CMC ^{2, 5, 6} (±)	Comments
AC Current – Measure (cont)			
(0.1 to 100) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.4 % + 0.02 % of rng 0.15 % + 0.02 % of rng 0.06 % + 0.02 % of rng 0.03 % + 0.02 % of rng 0.06 % + 0.02 % of rng 0.4 % + 0.04 % of rng 0.55 % + 0.15 % of rng	Agilent/HP 3458A
100 mA to 1 A	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz	0.4 % + 0.02 % of rng 0.16 % + 0.02 % of rng 0.08 % + 0.02 % of rng 0.1 % + 0.02 % of rng 0.3 % + 0.02 % of rng 1 % + 0.04 % of rng	
AC Power ³ – Generate			
(45 to 65) Hz; PF=1			Fluke 5522A
(33 to 330) mV 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	110 μW to 3 mW (3 to 11) mW (1.1 to 30) mW (3 to 110) mW (11 to 300) mW (30 to 730) mW 73 mW to 1.5W 150 mW to 6.8 W	0.17 % 0.12 % 0.17 % 0.12 % 0.16 % 0.14 % 0.16 % 0.14 %	
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 %	

Parameter/Range	Frequency	CMC ^{2,5} (±)	Comments	
Oscilloscopes ³ –				
Square Wave Signal:				
50 Ω Load @ 1 kHz	1 mV to 6.6 V _{pk - pk}	0.31 % + 40 μV	Fluke 5522A w/ SC1100	
1 MΩ Load @ 1 kHz	1 mV to 130 V _{pk - pk}	0.14 % + 40 μV		
DC Volt Amplitude:				
50 Ω Load	(0 to 6.6) V	0.3 % + 40 μV		
1 MΩ Load	(0 to 130) V	0.06 % + 40 μV		
Level Sine Wave:				
Frequency	(0 to 1100) MHz	3.3 μHz/Hz		
	50 kHz Reference	2.4 % + 300 μV		
	50 kHz to 100 MHz	4.2 % + 300 μV		
Amplitude	(100 to 300) MHz	4.8 % + 300 μV		
	(300 to 600) MHz	7.2 % + 300 μV		
	(600 to 1100) MHz	8.4 % + 300 μV		
Flatness (Bandwidth)	0 kHz to 100 MHz	1.8 % + 100 μV		
	(100 to 300) MHz	2.4 % + 100 μV		
	(300 to 600) MHz	4.8 % + 100 μV		
	(600 to 1100) MHz	6 % + 100 μV		
Time Markers:				
Into a 50 Ω Load	5 s to 50 ms	(30 + 1000 <i>t</i>) μs/s	<i>t</i> = time in seconds	
	20 ms to 1 ns	3.5 μs/s		
Rise Time:				
1 kHz to 2 MHz	≤300 ps	130 ps		
(2 to 10) MHz	≤350 ps	130 ps		

Parameter/Equipment	Range	CMC ² (±)	Comments
Thermocouple Simulation –			
Type B	(600 to 800) °C	0.54 °C	Fluke 5522A
	(800 to 1820) °C	0.42 °C	
Type E	(-250 to -100) °C	0.61 °C	
	(-100 to 650) °C	0.22 °C	
Type J	(650 to 1000) °C	0.28 °C	
	(-210 to -100) °C	0.34 °C	
	(-100 to 760) °C	0.23 °C	
	(760 to 1200) °C	0.30 °C	
Type K	(-200 to -100) °C	0.41 °C	
	(-100 to 1000) °C	0.33 °C	
	(1000 to 1372) °C	0.49 °C	
Type N	(-200 to -100) °C	0.49 °C	
	(-100 to 410) °C	0.29 °C	
	(410 to 1300) °C	0.34 °C	
Type R	(0 to 250) °C	0.70 °C	
	(250 to 1000) °C	0.41 °C	
	(1000 to 1767) °C	0.49 °C	
Type S	(0 to 250) °C	0.58 °C	
	(250 to 1400) °C	0.46 °C	
	(1400 to 1767) °C	0.57 °C	
Type T	(-250 to -150) °C	0.76 °C	
	(-150 to 0) °C	0.31 °C	
	(0 to 400) °C	0.22 °C	

V. Mechanical

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Scales and Balances ³	(1 to 5) g	0.041 mg + 0.6R	ASTM Class 1 weights (applied load)
	Up to 10 g	0.06 mg + 0.6R	
	Up to 30 g	0.09 mg + 0.6R	
	Up to 50 g	0.14 mg + 0.6R	
	Up to 100 g	0.3 mg + 0.6R	
	Up to 200 g	0.6 mg + 0.6R	
	Up to 300 g	0.9 mg + 0.6R	
	Up to 500 g	1.5 mg + 0.6R	
	Up to 1000 g	3 mg + 0.6R	



Parameter/Equipment	Range	CMC ^{2, 4, 6} (\pm)	Comments
Scales and Balances ³ (cont)	1 g to 20 kg (20 to 900) kg	0.017 % + 0.6R 0.017 % per 20 kg + 0.6R	Class F weights (applied load)
	Up to 1000 lb (1000 to 16 000) lb	0.017 % + 0.6R 0.017 % per 1000 lb + 0.6R	
Force Gages	1 g to 20 kgf (20 to 900) kgf Up to 500 lbf	0.017 % + 0.6R 0.017 % per 20 kgf + 0.6R 0.017 % + 0.6R	Class F weights (applied load)
Torque Wrenches	4 in·lbf to 600 ft·lbf	0.65 %	CDI suretest 5000-ST
Torque Testers	4 in·lbf to 600 ft·lbf	0.065 %	Class F weights and torque arms
Speed/RPM/Rate ³ – Simulation	(2.5 to 100 000) RPM	0.004 %	Agilent 33250A
Speed/RPM/Rate ³ – Non-Contact	(6 to 60 000) RPM	0.02 %	Monarch tachometer
Totalizer/Rate Meters ³ –	Contact	0.25 %	Shimpo tachometer
	Simulation	0.004 %	Agilent 33250A
Pressure ³	(0.2 to 1000) psi	0.0084 %	Ruska 2465-753
	(1 to 100) psi	0.05 %	Ametek RK-100
	(5 to 10 000) psi	0.073 %	Ametek DMTQ-100
	Up to 4 inH ₂ O	0.63 % Full Scale	Dwyer 475 Mark III
	Up to 20 inH ₂ O	0.63 % Full Scale	Dwyer 477-1-FM



Parameter/Equipment	Range	CMC ^{2,6} (±)	Comments
Barometric Pressure ³	(17 to 34) in Hg	0.02 %	Mensor CPG2300
Vacuum ³	(0 to 30) in Hg	0.04 % Full Scale	Mensor DPG 210

VI. Thermodynamics

Parameter/Equipment	Range	CMC ² (±)	Comments
Humidity ³	(10 to 90) % RH	1.6 % RH	Vaisala HMP-233
Thermocouple ³ – Simulation and Measure			
Type B	(600 to 1800) °C	0.77 °C	Applied resources, AK-20
Type E	(-100 to 800) °C	0.37 °C	
Type J	(0 to 1000) °C	0.37 °C	
Type K	(0 to 1315) °C	0.37 °C	
Type N	(-100 to 1000) °C	0.37 °C	
Type R	(0 to 1700) °C	0.77 °C	
Type S	(0 to 1700) °C	0.77 °C	
Type T	(-50 to 350) °C	0.37 °C	
Temperature ³ – Direct Method	(-15 to 110) °C (50 to 350) °C	0.3 °C 0.75 °C	Fluke 9009
Temperature – Measure	(0 to 100) °C	0.04 °C	Fluke 1524 w/ thermistor probe
	(-200 to 300) °C	0.06 °C	Fluke 1524 w/ PRT Probe
	(300 to 450) °C	0.37 °C	ASL F250 with matching RTD system

Parameter/Equipment	Range	CMC ² (±)	Comments
Plate Temperature – Infrared Devices ³	Ambient to 100 °C (100 to 250) °C (250 to 400) °C	0.65 °C 0.81 °C 1.1 °C	Hart Scientific 9132
RTD – Simulation and Measure ³	(-195.5 to 815.6) °C	0.43 °C	Fluke 712

VII. Time and Frequency

Parameter/Equipment	Range	CMC ² (±)	Comments
Frequency – Measuring Equipment	(0 to 1100) MHz	3.3 µHz/Hz	Fluke 5522A /1 GHz
Frequency – Measure	Up to 225 MHz	0.23 µHz/Hz	HP 53131A
Timers and Stop Watches ³	(2 to 3600) s	0.1 s	HP 53131A with Agilent 33250A



CALIBRATION

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
Cylindrical Measure – Plain Rings Pins, Plain Plugs, Discs, Spheres – External Diameter	Up to 14 in Up to 13 in	(6.9 + 1.8L) μin (6.9 + 1.8L) μin	P and W Labmaster™
Gage Blocks, Jo Blocks, Length Gages, Fixture Gages	Up to 12 in	(6.9 + 1.5L) μin	P and W Labmaster™
Hand Tools – Depth Gages, Snap Gages, Fixture Gages, Thickness Gages	Up to 12 in (12 to 40) in	(4.6 + 2.8L) μin + 0.6R (13 + 2.1L) μin + 0.6R	Gage blocks
Height Gages	Up to 48 in	(56 + 1.3L) μin	Gage blocks
Calipers	Up to 12 in (12 to 24) in (24 to 40) in	(1.7 + 9.3L) μin + 0.6R (53 + 8L) μin + 0.6R (220 + 6.8L) μin + 0.6R	Master gage blocks 24 in check master 40 in check master
Linear Indicators, Dial and Test	(0.5 to 4) in Up to 12 in	(4.3 + 3.3L) μin + 0.6R (6.9 + 1.5L) μin + 0.6R	Gage blocks PandW Labmaster™



Parameter/Equipment	Range	CMC ^{2,4} (\pm)	Comments
Micrometers – Outside Inside	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
Thread Plugs – Major Diameter Pitch Diameter	Up to 7 in Up to 7 in	$(6.9 + 1.8L) \mu\text{in}$ $(98 + 0.2L) \mu\text{in}$	P and W Labmaster™ w/ thread wires
NPT Plugs – Simple Pitch Diameter	Up to 7 in	$(100 + 0.2L) \mu\text{in}$	P and W Labmaster™ w/ thread wires and taper master
Spline Gages – Plugs Diameter (Over Pins) Rings Diameter (Over Pins)	Up to 7 in Up to 7 in	$(46 + 0.2L) \mu\text{in}$ $(46 + 0.2L) \mu\text{in}$	P and W Labmaster™ w/ gear wires

¹ This laboratory offers commercial and field calibration/dimensional testing services and is performed at the main laboratory and satellite laboratory listed.

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 CMC, L is the numerical value of the nominal length of the device measured in inches, and R is the numerical value of the resolution of the device in micrometers and in the statement of the Range, DL is the diagonal length of the device in inches.

⁵ 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 specification.

⁶ In the statement of CMC a percentage refers to percent of reading unless otherwise noted.

⁷ 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.





Accredited Laboratory

A2LA has accredited

J.A. KING & COMPANY, LLC

Greenville, SC

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 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 8th day of May 2017.

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

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1741.04
Valid to July 31, 2019
Revised on May 16, 2019

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