



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

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CALIBRATION

Valid To: June 30, 2026

Certificate Number: 1509.01

In recognition of the successful completion of the A2LA evaluation process (including an assessment of the organization's compliance with A2LA's Calibration Program Requirements) accreditation is granted to this laboratory at the location listed above as well as the satellite laboratory location listed below to perform the following calibrations^{1,10}:

I. Chemical

Parameter/Equipment	Range	CMC ² (±)	Comments
Conductivity Meters ³	1 µS/cm 10 µS/cm 100 µS/cm 1000 µS/cm 10 000 µS/cm 100 000 µS/cm	0.55 µS/cm 0.41 µS/cm 2.8 µS/cm 20 µS/cm 190 µS/cm 1900 µS/cm	Reference conductivity standards
pH Meters ³			
Electrical Calibration	(0 to 14) pH	0.015 pH	mV/pH calibrator
Probe/Meter Standardization	4 pH 7 pH 10 pH	0.030 pH 0.030 pH 0.030 pH	Reference buffer standards

II. Dimensional

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Calipers ³	Up to 24 in (24 to 48) in	550 μin 1100 μin	Gage blocks (field)
	Up to 48 in (48 to 96) in	77 μin 1500 μin	Gage blocks (lab)
Dial & Test Indicators ³	Up to 1 in Up to 3 in	20 μin 59 μin	Gage blocks (lab) Gage blocks, ULM, SuperMicrometer ¹⁰ (lab)
	Up to 3 in	90 μin	Gage blocks (field)
Gage Blocks	Up to 1 in (2 to 4) in	(3.3 + 1.5L) μin (7.7 + 1.5L) μin	Master gage block set, Federal 130B-24 comparator
	(4 to 20) in	(7 + 2L) μin	Maser gage block set, ULM
Angle Blocks	Up to 90°	0.005°	Sine bar & gage blocks
Squares	Up to 18 in	99 μin	Master square, amplified gage head
Height Gages ³	Up to 48 in	280 μin	Gage blocks (field)
		89 μin	Gage blocks (lab)
Length Standards	Up to 18 in Up to 48 in	(37 + 1.5L) μin (65 + 1.5L) μin	ULM/SuperMicrometer ⁹ , gage blocks
Levels ³	Up to 12 in	(40 + 14L) μin	Surface plate, granite square
Micrometers ³	Up to 4 in (4 to 24) in (24 to 48) in	92 μin 550 μin 1100 μin	Gage blocks (field)
	Up to 4 in (4 to 24) in (24 to 96) in	15 μin 60 μin 1500 μin	Gage blocks (lab)

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Plain Ring Gages	(0.060 to 12) in	(22 + 1.5L) μin	ULM, gage blocks
Protractors ³	Up to 90°	0.049°	Surface plate, angle blocks, sine bar w/ gage blocks
Thread Plugs – Pitch Diameter Major Diameter	(0.040 to 4) in (4 to 12) in (0.040 to 4) in (4 to 12) in	(71 + 1.5L) μin (94 + 1.5L) μin (19 + 1.5L) μin (35 + 1.5L) μin	Three-wire method, direct measure
Tapered Thread Plugs – Pitch Diameter	(0.040 to 12) in	(77 + 1.5L) μin	Two-wire method, direct measure
Adjustable Thread Rings ⁵	Up to 3.125 in	(W) Master Plug Tolerance	Set using master plug gages. ASME/ANSI B1.2-1983 & ASME/ANSI B1.3- 2007
Taper Thread Rings – Pitch Diameter	Up to 3 in	120 μin	Setting plug, standoff to master
Thread Wires	(4 to 80) TPI	(11 + 1.5L) μin	Master thread wire set

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Surface Plates – Flatness & Repeatability ³	Up to 107 in <i>DL</i>	(48 + 0.41 <i>DL</i>) μin	Leveling system (<i>DL</i> is diagonal of the plate)
Indicator Stands	(-0.002 to 0.002) in	31 μin	Repeat reading gage
	(-0.002 to 0.002) in	45 μin	Repeat reading gage, triangular gage block base
	(-0.01 to 0.01) in	580 μin	Indicator, triangular gage block base
Optical Comparators ³			
X-Axis	Up to 12 in	(250 + 91 <i>L</i>) μin	Glass scale
Y-Axis	Up to 12 in	(250 + 91 <i>L</i>) μin	
Angle	Up to 90°	0.029°	Angle blocks
Rulers ³	Up to 72 in	0.013 in	Standard ruler
Radius Gages ³	Up to 0.75 in	1300 μin	Optical comparator & overlay
Angle Gages ³	Up to 180°	0.044°	Optical comparator & vernier
Torque Arms	Up to 24 in	0.0047 in	Height gage, test indicator
	Up to 48 in	0.003 in	Gage blocks
Coating/Electromagnetic Thickness ³	Up to 120 mils	0.25 mils	Shims
Tape Measures ³	Up to 40 in Up to 100 ft	0.013 in 0.062 in	Standard ruler Standard tape
PI Tapes	Up to 72 in	910 μin	Gage blocks

III. Electrical – DC/Low Frequency

Parameter/Range	Frequency	CMC ^{2, 6, 12} (\pm)	Comments
AC Current – Measure ³ Up to 1 A (1 to 3) A	60 Hz to 1 kHz	0.16 % + 0.4 mA 0.14 % + 1.8 mA	HP 34401A
AC Current – Generate ³ (29 to 330) μ A 330 μ A to 3.3 mA (3.3 to 33) mA (33 to 330) mA (0.33 to 3) A (3 to 10) A (10 to 20) A (16 to 150) A (150 to 1000) A	45 Hz to 1 kHz (45 to 440) Hz	0.13 % + 0.1 μ A 0.10 % + 0.15 μ A 0.07 % + 2 μ A 0.083 % + 20 μ A 0.10 % + 100 μ A 0.21 % + 2 mA 0.21 % + 5 mA 1 % + 0.25 A 1 % + 0.9 A	Fluke 5522A Using 50 turn coil
AC Voltage – Generate ³ (1 to 330) mV (0.330 to 3.3) V (3.3 to 33) V (33 to 330) V (330 to 1020) V	45 Hz to 10 kHz 45 Hz to 10 kHz 45 Hz to 10 kHz 45 Hz to 1 kHz (1 to 10) kHz 45 Hz to 1 kHz (1 to 5) kHz	0.018 % + 8 μ V 0.018 % + 60 μ V 0.017 % + 0.6 mV 0.023 % + 2 mV 0.023 % + 6 mV 0.046 % + 10 mV 0.040 % + 10 mV	Fluke 5522A
AC Voltage – Measure ³ Up to 100 mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 750) V Up to 10 kV Up to 50 kV	60 Hz to 3 kHz	0.063 % + 40 μ V 0.063 % + 300 μ V 0.062 % + 3 mV 0.064 % + 30 mV 0.075 % + 230 mV 0.12 % + 100 mV 0.1 % + 400 mV	HP 34401A Vitretek 4700 w/ HVL-70

Parameter/Equipment	Range	CMC ^{2, 6, 12} (\pm)	Comments
Capacitance – Generate ³			
Low	(0.22 to 3.3) nF (3.3 to 33) nF (33 to 330) nF (330 to 3300) nF	0.5 % + 10 pF 0.26 % + 100 pF 0.26 % + 300 pF 0.26 % + 3 nF	Fluke 5522A
High	(3.3 to 33) μ F (33 to 330) μ F (330 to 3300) μ F (3.3 to 110) mF	0.4 % + 30 nF 0.45 % + 300 nF 0.45 % + 3 μ F 1.1 % + 10 μ F	
DC Current – Generate ³	(0 to 330) μ A Up to 3.3 mA Up to 33 mA Up to 330 mA Up to 3 A (1.1 to 11) A (11 to 20.5) A (10 to 150) A (150 to 1000) A	0.015 % + 20 nA 0.010 % + 50 nA 0.014 % + 250 nA 0.010 % + 2.5 μ A 0.038 % + 40 μ A 0.050 % + 500 μ A 0.1 % + 750 μ A 0.5 % + 0.14 A 0.5 % + 0.5 A	Fluke 5522A Using 50 turn coil
DC Current – Measure ³	Up to 10 mA (10 to 100) mA 100 mA to 1 A (1 to 3) A	0.075 % + 6 μ A 0.051 % + 5 μ A 0.11 % + 100 μ A 0.13 % + 600 μ A	HP 34401A
DC Voltage – Generate ³	(0 to 330) mV Up to 3.3 V Up to 33 V (30 to 330) V (100 to 1000) V	0.002 % + 1 μ V 0.0012 % + 2 μ V 0.0013 % + 20 μ V 0.0018 % + 0.15 mV 0.0019 % + 1.5 mV	Fluke 5522A
DC Voltage – Measure ³	Up to 100 mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 1000) V Up to 10 kV Up to 70 kV	0.0054 % + 3.5 μ V 0.0042 % + 7 μ V 0.0037 % + 50 μ V 0.0048 % + 600 μ V 0.0049 % + 10 mV 0.041 % + 30 mV 0.049 % + 200 mV	HP 34401A Vitretek 4700 w/ HVL-70

Parameter/Equipment	Range	CMC ^{2, 12} (\pm)	Comments
Oscilloscopes ³			
Square Wave Amplitude:			
50 Ω at 1 kHz	1 mV to 6.6 V pk-pk	0.34 % + 40 μ V	Fluke 5522A/ SC1100
1 M Ω at 1 kHz	1 mv to 130 V pk-pk	0.25 % + 40 μ V	
DC Voltage Amplitude:			
50 Ω Load	Up to \pm 6.6 V	0.25 % + 40 μ V	
1 M Ω Load	Up to \pm 130 V	0.05 % + 40 μ V	
Level Sine Wave:			
Frequency	Up to 1100 MHz	2.5 parts \times 10 ⁶	
Amplitude	50 kHz Reference	2.8 % + 300 μ V	
	50 kHz to 100 MHz	4.2 % + 300 μ V	
	(100 to 300) MHz	4.6 % + 300 μ V	
	(300 to 600) MHz	6.4 % + 300 μ V	
	(600 to 1100) MHz	7.4 % + 300 μ V	
Flatness	50 kHz to 100 MHz	2.7 % + 100 μ V	
	(100 to 300) MHz	3.0 % + 100 μ V	
	(300 to 600) MHz	4.6 % + 100 μ V	
	(600 to 1100) MHz	5.5 % + 100 μ V	
Time Markers:			
50 Ω Load	5 s to 50 ms	28 + 1000t μ s/s	<i>t</i> = time in seconds
	20 ms to 1 ns	3.2 μ s/s	
Rise Time – Generate	1 kHz to 2 MHz	120 ps	
	(200 to 300) ps		
	(2 to 10) MHz	120 ps	
	(200 to 300) ps		
Electrical Calibration of Temperature Controllers ³			
Thermocouple Types J, K, T & E	(-200 to < 0) $^{\circ}$ C	1.2 $^{\circ}$ C	Fluke 725
	(0 to 1370) $^{\circ}$ C	0.85 $^{\circ}$ C	
PT385, 100 Ω	(-200 to 800) $^{\circ}$ C	0.66 $^{\circ}$ C	

Parameter/Equipment	Range	CMC ^{2, 6, 12} (±)	Comments
Resistance – Generate ³	Up to 330 Ω (330 to 3300) Ω (3300 to 33 000) Ω (33 to 330) kΩ (330 to 3300) kΩ (3.3 to 33) MΩ (33 to 110) MΩ (110 to 330) MΩ (330 to 1100) MΩ	0.065 % + 20 mΩ 0.029 % + 100 mΩ 0.029 % + 1.0 Ω 0.0037 % + 10 Ω 0.0063 % + 150 Ω 0.026 % + 2500 Ω 0.063 % + 3.0 kΩ 0.14 % + 100 kΩ 0.14 % + 500 kΩ	Fluke 5522A
Resistance – Measure ³	Up to 100 Ω 100 Ω to 1 kΩ (1 to 10) kΩ (10 to 100) kΩ 100 kΩ to 1 MΩ (1 to 10) MΩ (10 to 100) MΩ	0.066 % + 4 mΩ 0.031 % + 10 mΩ 0.031 % + 100 mΩ 0.011 % + 1 Ω 0.012 % + 10 Ω 0.048 % + 100 Ω 0.8 % + 10 kΩ	HP 34401A
Electrical Simulation of RTD ³ PT385, 100 Ω	(-200 to 0) °C (0 to 100) °C (100 to 400) °C (400 to 630) °C (630 to 800) °C	0.058 °C 0.17 °C 0.12 °C 0.14 °C 0.28 °C	Fluke 5522A

Parameter/Equipment	Range	CMC ² (±)	Comments	
Electrical Simulation of Thermocouples & Indicators ³				
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 0.16 °C 0.19 °C 0.20 °C 0.24 °C	Fluke 5522A	
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.28 °C 0.16 °C 0.14 °C 0.17 °C 0.23 °C		
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.33 °C 0.18 °C 0.20 °C 0.24 °C 0.40 °C		
Type T	(-250 to -150) °C (-150 to 0.0) °C (0.0 to 120) °C (120 to 400) °C	0.63 °C 0.24 °C 0.16 °C 0.14 °C		
Welding Devices ³	(0 to 350) Amps DC (0 to 100) Volts DC (100 to 700) Feed Rate IPM	0.87 ADC 0.012 VDC 3.6 IPM		Load bank, current shunt, DMM

IV. Fluid Quantities

Parameter/Equipment	Range	CMC ² (±)	Comments
POVA (Piston/Plunger Operated Volumetric Apparatus) ³ – Including But Not Limited To: Pipettes, Syringes, Dispensers, & Burettes	(0.1 to 50) µL (50 to 100) µL (100 to 500) µL (500 to 1000) µL (1000 to 5000) µL (5000 to 10 000) µL (10 000 to 20 000) µL (20 000 to 50 000) µL	0.31 µL 0.31 µL 0.56 µL 0.72 µL 5.4 µL 18 µL 30 µL 72 µL	Gravimetric method

V. Mechanical

Parameter/Equipment	Range	CMC ^{2, 8, 9, 11} (±)	Comments
Accelerometers (Amplitude Response)	(5 to 9) Hz (10 to 99) Hz (100 to 1999) Hz (2000 to 10 000) Hz (10 001 to 15 000) Hz	2.1 % 1.3 % 1.5 % 2.0 % 2.5 %	Back-to-back comparison
Balances ³	Up to 20 g Up to 200 g	0.11 mg 0.69 mg	Class 1 weights
	Up to 200 g Up to 1000 g Up to 5000 g	1.3 mg 6.6 mg 34 mg	Class 2 weights
	Up to 20 g Up to 200 g Up to 1000 g Up to 5000 g Up to 10 000 g Up to 20 000 g	0.81 mg 4.8 mg 24 mg 130 mg 370 mg 460 mg	Class 4 weights
Force – Measuring Equipment ³			
Tension/Compression	Up to 100 lbf	0.0064 lbf	Class F weights w/ load cells
Compression	(100 to 1000) lbf	0.26 % Indication	
	(1000 to 10 000) lbf	0.24 % Indication	
	(10 000 to 50 000) lbf	0.33 % Indication	
	(10 000 to 100 000) lbf	0.20 % Indication	
	(50 000 to 500 000) lbf	0.4 % Indication	
Tension	(100 to 1000) lbf	0.23 % Indication	
	(1000 to 10 000) lbf	0.23 % Indication	
	(10 000 to 50 000) lbf	0.29 % Indication	
	(10 000 to 100 000) lbf	0.20 % Indication	

Parameter/Equipment	Range ⁷	CMC ² (±)	Comments
Mass, Fixed Points	1 mg	2.2 µg	Modified double substitution
	2 mg	2.1 µg	
	5 mg	2.9 µg	
	10 mg	1.4 µg	
	20 mg	1.5 µg	
	30 mg	2.2 µg	
	50 mg	1.6 µg	
	100 mg	1.7 µg	
	200 mg	1.6 µg	
	300 mg	1.6 µg	
	500 mg	2.1 µg	
	1 g	11 µg	
	2 g	3.3 µg	
	5 g	5.7 µg	
	10 g	7.2 µg	
	20 g	13 µg	
	50 g	11 µg	
	100 g	39 µg	
	200 g	140 µg	
	500 g	320 µg	
	1 kg	390 µg	
	2 kg	1.7 mg	
	5 kg	2.6 mg	
	10 kg	93 mg	
	20 kg	94 mg	
	25 kg	140 mg	
	0.8859 g (1/32 oz)	12 µg	
	1.772 g (1/16 oz)	94 µg	
	3.544 g (1/8 oz)	240 µg	
	7.087 g (1/4 oz)	170 µg	
	14.17 g (1/2 oz)	170 µg	
	28.35 g (1 oz)	370 µg	
	56.7 g (2 oz)	150 µg	
	113.4 g (4 oz)	740 µg	
	226.8 g (8 oz)	5.1 mg	
0.4536 g (0.001 lb)	130 µg		
0.9072 g (0.002 lb)	56 µg		
2.27 g (0.005 lb)	26 µg		
4.54 g (0.01 lb)	16 µg		
9.07 g (0.02 lb)	56 µg		
22.68 g (0.05 lb)	79 µg		
45.36 g (0.1 lb)	37 µg		
90.72 g (0.2 lb)	87 µg		

Parameter/Equipment	Range	CMC ^{2, 11} (±)	Comments
Mass, Fixed Points (cont)	453.6 g (1 lb) 907.2 g (2 lb) 2267.96 g (5 lb) 4535.9 g (10 lb) 9071.8 g (20 lb) 11 339.8 g (25lb) 22 679.62 g (50 lb) 45 359.237 g (100 lb) 90 718.475 g (200 lb) 226 796.185 g (500 lb) 453 592.37 g (1000 lb)	3.8 mg 7.9 mg 8.3 mg 7.4 mg 94 mg 94 mg 95 mg 0.43 g 0.43 g 0.45 g 0.47 g	Direct comparison
Optical Tachometer ³	Up to 200 FPM Up to 3000 FPM Up to 29 999 FPM	0.12 FPM 0.39 FPM 3.9 FPM	Calibrated strobe (FPM = flashes per minute)
Pressure Measuring Equipment – Gages, Transducers & Transmitters ³	Up to 300 psig Up to 3000 psig Up to 5000 psig Up to 10 000 psig Up to 30 000 psig Up to 2 in H ₂ O Up to 300 psig Up to 3000 psig Up to 10 000 psig (10 to 17) psia	0.18 psig 3.8 psig 3.9 psig 12 psig 43 psig 0.0026 in H ₂ O 0.051 psig 0.4 psig 1.3 psig 0.000 78 psia	Digital pressure gage Dwyer hook gage GE/Pace 1003 Barometric reference
Scales ³	Up to 10 lb Up to 20 lb Up to 50 lb Up to 100 lb Up to 200 lb Up to 500 lb Up to 1000 lb Up to 5000 lb Up to 20 000 lb	0.000 25 lb 0.000 25 lb 0.0063 lb 0.0063 lb 0.0064 lb 0.0064 lb 0.18 lb 0.19 lb 0.21 lb	Class 4 weights Class F weights

Parameter/Equipment	Range	CMC ^{2, 8, 11} (±)	Comments
Torque Wrenches – Measure ³	(1 to 10) lbf·in (10 to 50) lbf·in (30 to 400) lbf·in (80 to 1000) lbf·in (240 to 3000) lbf·in (1200 to 6000) lbf·in (2400 to 12 000) lbf·in	0.33 lbf·in 0.17 lbf·in 1.8 lbf·in 5.1 lbf·in 21 lbf·in 23 lbf·in 58 lbf·in	CDI/Norbar torque calibrator Norbar torque calibrator
Torque Measuring Equipment – Transducers	Up to 200 lbf·in Up to 1200 lbf·in Up to 12 000 lbf·in	0.10 % 0.091 % 0.10 %	Torque arm & weights
Vacuum Measuring Equipment – Gauges ³	Up to 13 psig	0.033 psig	Druck DPI 610
Rotations Speed – Measurement ³	Contact: Up to 200 RPM (200 to 3000) RPM (3000 to 20 000) RPM Optical: Up to 3000 RPM (3000 to 30 000) RPM	0.67 RPM 13 RPM 16 RPM 0.5 RPM 5.0 RPM	Monarch PLT200
Indirect Verification of Rockwell Hardness Testers ³	HRB: Low Medium High HRC: Low Medium High	1.0 HRB 0.65 HRB 0.49 HRB 0.45 HRC 0.36 HRC 0.37 HRC	Indirect verification
Indirect Verification of Brinell Hardness Testers ³	HBW 10/500: Low HBW 10/3000: High	4.0 HBW 4.8 HBW	Indirect verification

VI. Thermodynamics

Parameter/Equipment	Range	CMC ^{2,11} (\pm)	Comments
Temperature – Measuring Equipment ³	(-100 to 300) °C (-148 to 572) °F	0.09 °C 0.16 °F	Hart 1502A/5614 PRT or Fluke 1523
Temperature – Measuring Equipment	(-40 to 200) °C (-40 to 392) °F	0.061 °C 0.11 °F	Hart 1502A/5614 PRT in wet bath
Temperature – Measure ³	(-100 to 600) °C (-148 to 1112) °F (> 600 to 1200) °C (> 1112 to 2192) °F	1.5 °C 2.7 °F 10 °C 18 °F	Fluke 51 or 725 with thermocouple
IR Thermometer ³	(-20 to 150) °C (Amb + 10 to 400) °C	1.1 °C 2.1 °C	Mikron M340 (lab only) Omega BB703 Emissivity \approx 0.95 Wavelength (8 to 14) μ m
Humidity – Measure & Measuring Equipment ³	(20 to 90) % RH	3.4 % RH	SensoScientific B13-200

VII. Time & Frequency

Parameter/Equipment	Range	CMC ^{2,6,11} (\pm)	Comments
Frequency – Measuring Equipment ³	Up to 1100 MHz	2.5 parts \times 10 ⁶	Fluke 5522A/SC1100
Frequency – Measure ³	40 Hz to 300 kHz	0.014 % Indication	HP 34401
Timers & Stopwatches ³	Up to 1 hr (> 1 to 24) hr	0.14 s 0.59 s	Reference stopwatch
Stroboscopes ³	Up to 3600 FPM Up to 30 000 FPM	0.11 FPM 0.72 FPM	Universal counter

SATELLITE

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CALIBRATION

I. Chemical

Parameter/Equipment	Range	CMC ² (±)	Comments
Conductivity Meters ³	1 µS/cm 10 µS/cm 100 µS/cm 1000 µS/cm 10 000 µS/cm 100 000 µS/cm	0.55 µS/cm 0.41 µS/cm 2.8 µS/cm 20 µS/cm 190 µS/cm 1900 µS/cm	Reference conductivity standards
pH Meters ³			
Electrical Calibration	(0 to 14) pH	0.015 pH	mV/pH calibrator
Probe/Meter Standardization	4 pH 7 pH 10 pH	0.030 pH 0.030 pH 0.030 pH	Reference buffer standards

II. Dimensional

Parameter/Equipment	Range	CMC ² (±)	Comments
Calipers ³	Up to 24 in (24 to 48) in	550 µin 1100 µin	Gage blocks (field)
	Up to 48 in (48 to 96) in	77 µin 1500 µin	Gage blocks (lab)

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments	
Dial & Test Indicators ³	Up to 1 in Up to 3 in	20 μin 59 μin	Gage blocks (lab) Gage blocks, ULM, SuperMicrometer ¹⁰ (lab)	
	Up to 3 in	90 μin	Gage blocks (field)	
Height Gages ³	Up to 48 in	280 μin	Gage blocks (field)	
		89 μin	Gage blocks (lab)	
Levels ³	Up to 12 in	(40 + 14L) μin	Surface plate, granite square	
Micrometers ³	Up to 4 in (4 to 24) in (24 to 48) in	92 μin 550 μin 1100 μin	Gage blocks (field)	
	Up to 4 in (4 to 24) in (24 to 96) in	15 μin 60 μin 1500 μin	Gage blocks (lab)	
Protractors ³	Up to 90°	0.049°	Surface plate, angle blocks, sine bar w/ gage blocks	
Surface Plates – Flatness & Repeatability ³ Indicator Stands	Up to 107 in <i>DL</i>	(48 + 0.41 <i>DL</i>) μin	Leveling system (<i>DL</i> is diagonal of the plate)	
	(-0.002 to 0.002) in	31 μin	Repeat reading gage	
	(-0.002 to 0.002) in	45 μin	Repeat reading gage, triangular gage block base	
	(-0.01 to 0.01) in	580 μin	Indicator, triangular gage block base	
Optical Comparators ³				
	X-Axis Y-Axis	Up to 12 in Up to 12 in	(250 + 91L) μin (250 + 91L) μin	Glass scale
	Angle	Up to 90°	0.029°	Angle blocks
Rulers ³	Up to 72 in	0.013 in	Standard ruler	

Parameter/Equipment	Range	CMC ² (±)	Comments
Radius Gages ³	Up to 0.75 in	1300 μin	Optical comparator & overlay
Angle Gages ³	Up to 180°	0.044°	Optical comparator & vernier
Coating/Electromagnetic Thickness ³	Up to 120 mils	0.25 mils	Shims
Tape Measures ³	Up to 40 in Up to 100 ft	0.013 in 0.062 in	Standard ruler Standard tape

III. Electrical – DC/Low Frequency

Parameter/Range	Frequency	CMC ^{2, 6, 12} (±)	Comments
AC Current – Measure ³ Up to 1 A (1 to 3) A	60 Hz to 1 kHz	0.16 % + 0.4 mA 0.14 % + 1.8 mA	HP 34401A
AC Current – Generate ³ (29 to 330) μA 330 μA to 3.3 mA (3.3 to 33) mA (33 to 330) mA (0.33 to 3) A (3 to 10) A (10 to 20) A (16 to 150) A (150 to 1000) A	45 Hz to 1 kHz (45 to 440) Hz	0.13 % + 0.1 μA 0.10 % + 0.15 μA 0.07 % + 2 μA 0.083 % + 20 μA 0.10 % + 100 μA 0.21 % + 2 mA 0.21 % + 5 mA 1 % + 0.25 A 1 % + 0.9 A	Fluke 5522A Using 50 turn coil
AC Voltage – Generate ³ (1 to 330) mV (0.330 to 3.3) V (3.3 to 33) V (33 to 330) V (330 to 1020) V	45 Hz to 10 kHz 45 Hz to 10 kHz 45 Hz to 10 kHz 45 Hz to 1 kHz (1 to 10) kHz 45 Hz to 1 kHz (1 to 5) kHz	0.018 % + 8 μV 0.018 % + 60 μV 0.017 % + 0.6 mV 0.023 % + 2 mV 0.023 % + 6 mV 0.046 % + 10 mV 0.040 % + 10 mV	Fluke 5522A

Parameter/Range	Frequency	CMC ^{2, 6, 12} (±)	Comments
AC Voltage – Measure ³ Up to 100 mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 750) V Up to 10 kV Up to 50 kV	60 Hz to 3 kHz	0.063 % + 40 μV 0.063 % + 300 μV 0.062 % + 3 mV 0.064 % + 30 mV 0.075 % + 230 mV 0.12 % + 100 mV 0.1 % + 400 mV	HP 34401A Vitretek 4700 w/ HVL-70

Parameter/Equipment	Range	CMC ^{2, 6, 12} (±)	Comments
Capacitance – Generate ³ Low High	(0.22 to 3.3) nF (3.3 to 33) nF (33 to 330) nF (330 to 3300) nF (3.3 to 33) μF (33 to 330) μF (330 to 3300) μF (3.3 to 110) mF	0.5 % + 10 pF 0.26 % + 100 pF 0.26 % + 300 pF 0.26 % + 3 nF 0.4 % + 30 nF 0.45 % + 300 nF 0.45 % + 3 μF 1.1 % + 10 μF	Fluke 5522A
DC Current – Generate ³	(0 to 330) μA Up to 3.3 mA Up to 33 mA Up to 330 mA Up to 3 A (1.1 to 11) A (11 to 20.5) A (10 to 150) A (150 to 1000) A	0.015 % + 20 nA 0.010 % + 50 nA 0.014 % + 250 nA 0.010 % + 2.5 μA 0.038 % + 40 μA 0.050 % + 500 μA 0.1 % + 750 μA 0.5 % + 0.14 A 0.5 % + 0.5 A	Fluke 5522A Using 50 turn coil
DC Current – Measure ³	Up to 10 mA (10 to 100) mA 100 mA to 1 A (1 to 3) A	0.075 % + 6 μA 0.051 % + 5 μA 0.11 % + 100 μA 0.13 % + 600 μA	HP 34401A
DC Voltage – Generate ³	(0 to 330) mV Up to 3.3 V Up to 33 V (30 to 330) V (100 to 1000) V	0.002 % + 1 μV 0.0012 % + 2 μV 0.0013 % + 20 μV 0.0018 % + 0.15 mV 0.0019 % + 1.5 mV	Fluke 5522A

Parameter/Equipment	Range	CMC ^{2, 6, 12} (±)	Comments
DC Voltage – Measure ³	Up to 100 mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 1000) V	0.0054 % + 3.5 μV 0.0042 % + 7 μV 0.0037 % + 50 μV 0.0048 % + 600 μV 0.0049 % + 10 mV	HP 34401A
	Up to 10 kV Up to 70 kV	0.041 % + 30 mV 0.049 % + 200 mV	Vitrek 4700 w/ HVL-70
Oscilloscopes ³			
Square Wave Amplitude:			
50 Ω at 1 kHz 1 MΩ at 1 kHz	1 mV to 6.6 V pk-pk 1 mv to 130 V pk-pk	0.34 % + 40 μV 0.25 % + 40 μV	Fluke 5522A/ SC1100
DC Voltage Amplitude:			
50 Ω Load 1 MΩ Load	Up to ± 6.6 V Up to ± 130 V	0.25 % + 40 μV 0.05 % + 40 μV	
Level Sine Wave:			
Frequency	Up to 1100 MHz	2.5 parts × 10 ⁶	
Amplitude	50 kHz Reference 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1100) MHz	2.8 % + 300 μV 4.2 % + 300 μV 4.6 % + 300 μV 6.4 % + 300 μV 7.4 % + 300 μV	
Flatness	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1100) MHz	2.7 % + 100 μV 3.0 % + 100 μV 4.6 % + 100 μV 5.5 % + 100 μV	
Time Markers:			
50 Ω Load	5 s to 50 ms 20 ms to 1 ns	28 + 1000 <i>t</i> μs/s 3.2 μs/s	<i>t</i> = time in seconds
Rise Time – Generate	1 kHz to 2 MHz (200 to 300) ps (2 to 10) MHz (200 to 300) ps	120 ps 120 ps	

Parameter/Equipment	Range	CMC ^{2, 6, 12} (±)	Comments
Electrical Calibration of Temperature Controllers ³ Thermocouple types J, K, T & E PT385, 100 Ω	(-200 to < 0) °C (0 to 1370) °C (-200 to 800) °C	1.2 °C 0.85 °C 0.66 °C	Fluke 725
Resistance – Generate ³	Up to 330 Ω (330 to 3300) Ω (3300 to 33 000) Ω (33 to 330) kΩ (330 to 3300) kΩ (3.3 to 33) MΩ (33 to 110) MΩ (110 to 330) MΩ (330 to 1100) MΩ	0.065 % + 20 mΩ 0.029 % + 100 mΩ 0.029 % + 1.0 Ω 0.0037 % + 10 Ω 0.0063 % + 150 Ω 0.026 % + 2500 Ω 0.063 % + 3.0 kΩ 0.14 % + 100 kΩ 0.14 % + 500 kΩ	Fluke 5522A
Resistance – Measure ³	Up to 100 Ω 100 Ω to 1 kΩ (1 to 10) kΩ (10 to 100) kΩ 100 kΩ to 1 MΩ (1 to 10) MΩ (10 to 100) MΩ	0.066 % + 4 mΩ 0.031 % + 10 mΩ 0.031 % + 100 mΩ 0.011 % + 1 Ω 0.012 % + 10 Ω 0.048 % + 100 Ω 0.8 % + 10 kΩ	HP 34401A
Electrical Simulation of RTD ³ PT385, 100 Ω	(-200 to 0) °C (0 to 100) °C (100 to 400) °C (400 to 630) °C (630 to 800) °C	0.058 °C 0.17 °C 0.12 °C 0.14 °C 0.28 °C	Fluke 5522A

Parameter/Equipment	Range	CMC ² (±)	Comments	
Electrical Simulation of Thermocouples & Indicators ³				
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 0.16 °C 0.19 °C 0.20 °C 0.24 °C	Fluke 5522A	
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.28 °C 0.16 °C 0.14 °C 0.17 °C 0.23 °C		
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.33 °C 0.18 °C 0.20 °C 0.24 °C 0.40 °C		
Type T	(-250 to -150) °C (-150 to 0.0) °C (0.0 to 120) °C (120 to 400) °C	0.63 °C 0.24 °C 0.16 °C 0.14 °C		
Welding Devices ³	(0 to 350) Amps DC (0 to 100) Volts DC (100 to 700) Feed Rate IPM	0.87 ADC 0.012 VDC 3.6 IPM		Load bank, current shunt, DMM

IV. Fluid Quantities

Parameter/Equipment	Range	CMC ² (±)	Comments
POVA (Piston/Plunger Operated Volumetric Apparatus) ³ – Including But Not Limited To: Pipettes, Syringes, Dispensers, & Burettes	(.1 to 50) µL (50 to 100) µL (100 to 500) µL (500 to 1000) µL (1000 to 5000) µL (5000 to 10 000) µL (10 000 to 20 000) µL (20 000 to 50 000) µL	0.31 µL 0.31 µL 0.56 µL 0.72 µL 5.4 µL 18 µL 30 µL 72 µL	Gravimetric method

V. Mechanical

Parameter/Equipment	Range	CMC ^{2, 7, 11} (±)	Comments
Balances ³	Up to 20 g Up to 200 g	0.11 mg 0.69 mg	Class 1 weights
	Up to 200 g Up to 1000 g Up to 5000 g	1.3 mg 6.6 mg 34 mg	Class 2 weights
	Up to 20 g Up to 200 g Up to 1000 g Up to 5000 g Up to 10 000 g Up to 20 000 g	0.81 mg 4.8 mg 24 mg 130 mg 370 mg 460 mg	Class 4 weights
Force – Measuring Equipment ³			
Tension/Compression	Up to 100 lbf	0.0064 lbf	Class F weights w/ load cells
Compression	(100 to 1000) lbf	0.26 % Indication	
	(1000 to 10 000) lbf	0.24 % Indication	
	(10 000 to 50 000) lbf	0.33 % Indication	
	(10 000 to 100 000) lbf	0.20 % Indication	
	(50 000 to 500 000) lbf	0.4 % Indication	
Tension	(100 to 1000) lbf	0.23 % Indication	
	(1000 to 10 000) lbf	0.23 % Indication	
	(10 000 to 50 000) lbf	0.29 % Indication	
	(10 000 to 100 000) lbf	0.20 % Indication	

Parameter/Equipment	Range	CMC ^{2, 11} (±)	Comments
Optical Tachometer ³	Up to 200 FPM Up to 3000 FPM Up to 29 999 FPM	0.12 FPM 0.39 FPM 3.9 FPM	Calibrated strobe (FPM = Flashes per minute)
Pressure Measuring Equipment – Gages, Transducers & Transmitters ³	Up to 300 psig Up to 3000 psig Up to 5000 psig Up to 10 000 psig Up to 30 000 psig Up to 2 in H ₂ O Up to 300 psig Up to 3000 psig Up to 10 000 psig (10 to 17) psia	0.18 psig 3.8 psig 3.9 psig 12 psig 43 psig 0.0026 in H ₂ O 0.051 psig 0.4 psig 1.3 psig 0.000 78 psia	Digital pressure gage Dwyer hook gage GE/Pace 1003 Barometric reference
Scales ³	Up to 10 lb Up to 20 lb Up to 50 lb Up to 100 lb Up to 200 lb Up to 500 lb Up to 1000 lb Up to 5000 lb Up to 20 000 lb	0.000 25 lb 0.000 25 lb 0.0063 lb 0.0063 lb 0.0064 lb 0.0064 lb 0.18 lb 0.19 lb 0.21 lb	Class 4 weights Class F weights

Parameter/Equipment	Range	CMC ^{2, 11} (±)	Comments
Torque Wrenches – Measure ³	(1 to 10) lbf·in (10 to 50) lbf·in (30 to 400) lbf·in (80 to 1000) lbf·in (240 to 3000) lbf·in (1200 to 6000) lbf·in (2400 to 12 000) lbf·in	0.33 lbf·in 0.17 lbf·in 1.8 lbf·in 5.1 lbf·in 21 lbf·in 23 lbf·in 58 lbf·in	CDI/Norbar torque calibrator Norbar torque calibrator
Vacuum Measuring Equipment – Gauges ³	Up to 13 psig	0.033 psig	Druck DPI 610
Rotations Speed – Measurement ³	Contact: Up to 200 RPM (200 to 3000) RPM (3000 to 20 000) RPM Optical: Up to 3000 RPM (3000 to 30 000) RPM	0.67 RPM 13 RPM 16 RPM 0.5 RPM 5.0 RPM	Monarch PLT200
Indirect Verification of Rockwell Hardness Testers ³	HRB: Low Medium High HRC: Low Medium High	1.0 HRB 0.65 HRB 0.49 HRB 0.45 HRC 0.36 HRC 0.37 HRC	Indirect verification
Indirect Verification of Brinell Hardness Testers ³	HBW 10/500: Low HBW 10/3000: High	4.0 HBW 4.8 HBW	Indirect verification

VI. Thermodynamic

Parameter/Equipment	Range	CMC ^{2,11} (\pm)	Comments
Temperature – Measuring Equipment ³	(-100 to 300) °C (-148 to 572) °F	0.09 °C 0.16 °F	Hart 1502A/5614 PRT or Fluke 1523
Temperature – Measure ³	(-100 to 600) °C (-148 to 1112) °F (> 600 to 1200) °C (> 1112 to 2192) °F	1.5 °C 2.7 °F 10 °C 18 °F	Fluke 51 or 725 with thermocouple
IR Thermometer ³	(-20 to 150) °C (Amb + 10 to 400) °C	1.1 °C 2.1 °C	Mikron M340 (lab only) Omega BB703 Emissivity \approx 0.95 Wavelength (8 to 14) μ m
Humidity – Measure & Measuring Equipment ³	(20 to 90) % RH	3.4 % RH	SensoScientific B13-200

VII. Time & Frequency

Parameter/Equipment	Range	CMC ^{2,6,11} (\pm)	Comments
Frequency – Measuring Equipment ³	Up to 1100 MHz	2.5 parts \times 10 ⁶	Fluke 5522A/SC1100
Frequency – Measure ³	40 Hz to 300 kHz	0.014 % Indication	HP 34401
Timers & Stopwatches ³	Up to 1 hr (> 1 to 24) hr	0.14 s 0.59 s	Reference stopwatch
Stroboscopes ³	Up to 3600 FPM Up to 30 000 FPM	0.11 FPM 0.72 FPM	Universal counter

SATELLITE

ALDINGER COMPANY
 8023 Interstate 30
 Little Rock, AR 72209
 Dustin Detten Phone: 214 638 1808

CALIBRATION

I. Chemical

Parameter/Equipment	Range	CMC ² (±)	Comments
Conductivity Meters ³	1 µS/cm 10 µS/cm 100 µS/cm 1000 µS/cm 10 000 µS/cm 100 000 µS/cm	0.55 µS/cm 0.41 µS/cm 2.8 µS/cm 20 µS/cm 190 µS/cm 1900 µS/cm	Reference conductivity standards
pH Meters ³			
Electrical Calibration	(0 to 14) pH	0.015 pH	mV/pH calibrator
Probe/Meter Standardization	4 pH 7 pH 10 pH	0.030 pH 0.030 pH 0.030 pH	Reference buffer standards

II. Dimensional

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
Calipers ³	Up to 24 in (24 to 48) in	550 µin 1100 µin	Gage blocks (field)
	Up to 48 in (48 to 96) in	77 µin 1500 µin	Gage blocks (lab)

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments	
Dial & Test Indicators ³	Up to 1 in Up to 3 in	20 μin 59 μin	Gage blocks (lab) Gage blocks, ULM, SuperMicrometer ¹⁰ (lab)	
	Up to 3 in	90 μin	Gage blocks (field)	
Height Gages ³	Up to 48 in	280 μin	Gage blocks (field)	
	Up to 48 in	89 μin	Gage blocks (lab)	
Levels ³	Up to 12 in	(40 + 14L) μin	Surface plate, granite square	
Micrometers ³	Up to 4 in (4 to 24) in (24 to 48) in	92 μin 550 μin 1100 μin	Gage blocks (field)	
	Up to 4 in (4 to 24) in (24 to 96) in	15 μin 60 μin 1500 μin	Gage blocks (lab)	
Protractors ³	Up to 90°	0.049°	Surface plate, angle blocks, sine bar w/ gage blocks	
Surface Plates – Flatness & Repeatability ³ Indicator Stands	Up to 107 in <i>DL</i>	(48 + 0.41 <i>DL</i>) μin	Leveling system (<i>DL</i> is diagonal of the plate)	
	(-0.002 to 0.002) in	31 μin	Repeat reading gage	
	(-0.002 to 0.002) in	45 μin	Repeat reading gage, triangular gage block base	
	(-0.01 to 0.01) in	580 μin	Indicator, triangular gage block base	
Optical Comparators ³				
	X-Axis Y-Axis	Up to 12 in Up to 12 in	(250 + 91L) μin (250 + 91L) μin	Glass scale
	Angle	Up to 90°	0.029°	Angle blocks
Rulers ³	Up to 72 in	0.013 in	Standard ruler	

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Radius Gages ³	Up to 0.75 in	1300 μin	Optical comparator & overlay
Angle Gages ³	Up to 180°	0.044°	Optical comparator & vernier
Coating/Electromagnetic Thickness ³	Up to 120 mils	0.25 mils	Shims
Tape Measures ³	Up to 40 in Up to 100 ft	0.013 in 0.062 in	Standard ruler Standard tape

III. Electrical – DC/Low Frequency

Parameter/Range	Frequency	CMC ^{2,6,12} (±)	Comments
AC Current – Measure ³ Up to 1 A (1 to 3) A	60 Hz to 1 kHz	0.16 % + 0.4 mA 0.14 % + 1.8 mA	HP 34401A
AC Current – Generate ³ (29 to 330) μA 330 μA to 3.3 mA (3.3 to 33) mA (33 to 330) mA (0.33 to 3) A (3 to 10) A (10 to 20) A (16 to 150) A (150 to 1000) A	45 Hz to 1 kHz (45 to 440) Hz	0.13 % + 0.1 μA 0.10 % + 0.15 μA 0.07 % + 2 μA 0.083 % + 20 μA 0.10 % + 100 μA 0.21 % + 2 mA 0.21 % + 5 mA 1 % + 0.25 A 1 % + 0.9 A	Fluke 5522A Using 50 turn coil
AC Voltage – Generate ³ (1 to 330) mV (0.330 to 3.3) V (3.3 to 33) V (33 to 330) V (330 to 1020) V	45 Hz to 10 kHz 45 Hz to 10 kHz 45 Hz to 10 kHz 45 Hz to 1 kHz (1 to 10) kHz 45 Hz to 1 kHz (1 to 5) kHz	0.018 % + 8 μV 0.018 % + 60 μV 0.017 % + 0.6 mV 0.023 % + 2 mV 0.023 % + 6 mV 0.046 % + 10 mV 0.040 % + 10 mV	Fluke 5522A

Parameter/Range	Frequency	CMC ^{2, 6, 12} (±)	Comments
AC Voltage – Measure ³ Up to 100 mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 750) V Up to 10 kV Up to 50 kV	60 Hz to 3 kHz	0.063 % + 40 μV 0.063 % + 300 μV 0.062 % + 3 mV 0.064 % + 30 mV 0.075 % + 230 mV 0.12 % + 100 mV 0.1 % + 400 mV	HP 34401A Vitretek 4700 w/ HVL-70

Parameter/Equipment	Range	CMC ^{2, 6, 12} (±)	Comments
Capacitance – Generate ³ Low High	(0.22 to 3.3) nF (3.3 to 33) nF (33 to 330) nF (330 to 3300) nF (3.3 to 33) μF (33 to 330) μF (330 to 3300) μF (3.3 to 110) mF	0.5 % + 10 pF 0.26 % + 100 pF 0.26 % + 300 pF 0.26 % + 3 nF 0.4 % + 30 nF 0.45 % + 300 nF 0.45 % + 3 μF 1.1 % + 10 μF	Fluke 5522A
DC Current – Generate ³	(0 to 330) μA Up to 3.3 mA Up to 33 mA Up to 330 mA Up to 3 A (1.1 to 11) A (11 to 20.5) A (10 to 150) A (150 to 1000) A	0.015 % + 20 nA 0.010 % + 50 nA 0.014 % + 250 nA 0.010 % + 2.5 μA 0.038 % + 40 μA 0.050 % + 500 μA 0.1 % + 750 μA 0.5 % + 0.14 A 0.5 % + 0.5 A	Fluke 5522A Using 50 turn coil
DC Current – Measure ³	Up to 10 mA (10 to 100) mA 100 mA to 1 A (1 to 3) A	0.075 % + 6 μA 0.051 % + 5 μA 0.11 % + 100 μA 0.13 % + 600 μA	HP 34401A
DC Voltage – Generate ³	(0 to 330) mV Up to 3.3 V Up to 33 V (30 to 330) V (100 to 1000) V	0.002 % + 1 μV 0.0012 % + 2 μV 0.0013 % + 20 μV 0.0018 % + 0.15 mV 0.0019 % + 1.5 mV	Fluke 5522A

Parameter/Equipment	Range	CMC ^{2, 6, 12} (±)	Comments
DC Voltage – Measure ³	Up to 100 mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 1000) V	0.0054 % + 3.5 μV 0.0042 % + 7 μV 0.0037 % + 50 μV 0.0048 % + 600 μV 0.0049 % + 10 mV	HP 34401A
	Up to 10 kV Up to 70 kV	0.041 % + 30 mV 0.049 % + 200 mV	Vitretek 4700 w/ HVL-70
Oscilloscopes ³			
Square Wave Amplitude:			Fluke 5522A/ SC1100
50 Ω at 1 kHz 1 MΩ at 1 kHz	1 mV to 6.6 V pk-pk 1 mv to 130 V pk-pk	0.34 % + 40 μV 0.25 % + 40 μV	
DC Voltage Amplitude:			
50 Ω Load 1 MΩ Load	Up to ± 6.6 V Up to ± 130 V	0.25 % + 40 μV 0.05 % + 40 μV	
Level Sine Wave:			
Frequency	Up to 1100 MHz	2.5 parts × 10 ⁶	
Amplitude	50 kHz Reference 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1100) MHz	2.8 % + 300 μV 4.2 % + 300 μV 4.6 % + 300 μV 6.4 % + 300 μV 7.4 % + 300 μV	
Flatness	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1100) MHz	2.7 % + 100 μV 3.0 % + 100 μV 4.6 % + 100 μV 5.5 % + 100 μV	
Time Markers:			
50 Ω Load	5 s to 50 ms 20 ms to 1 ns	28 + 1000 <i>t</i> μs/s 3.2 μs/s	<i>t</i> = time in seconds
Rise Time – Generate	1 kHz to 2 MHz (200 to 300) ps (2 to 10) MHz (200 to 300) ps	120 ps 120 ps	

Parameter/Equipment	Range	CMC ^{2, 6, 12} (±)	Comments
Electrical Calibration of Temperature Controllers ³			
Thermocouple types J, K, T & E	(-200 to < 0) °C (0 to 1370) °C	1.2 °C 0.85 °C	Fluke 725
PT385, 100 Ω	(-200 to 800) °C	0.66 °C	
Resistance – Generate ³	Up to 330 Ω (330 to 3300) Ω (3300 to 33 000) Ω (33 to 330) kΩ (330 to 3300) kΩ (3.3 to 33) MΩ (33 to 110) MΩ (110 to 330) MΩ (330 to 1100) MΩ	0.065 % + 20 mΩ 0.029 % + 100 mΩ 0.029 % + 1.0 Ω 0.0037 % + 10 Ω 0.0063 % + 150 Ω 0.026 % + 2500 Ω 0.063 % + 3.0 kΩ 0.14 % + 100 kΩ 0.14 % + 500 kΩ	Fluke 5522A
Resistance – Measure ³	Up to 100 Ω 100 Ω to 1 kΩ (1 to 10) kΩ (10 to 100) kΩ 100 kΩ to 1 MΩ (1 to 10) MΩ (10 to 100) MΩ	0.066 % + 4 mΩ 0.031 % + 10 mΩ 0.031 % + 100 mΩ 0.011 % + 1 Ω 0.012 % + 10 Ω 0.048 % + 100 Ω 0.8 % + 10 kΩ	HP 34401A
Electrical Simulation of RTD ³			
PT385, 100 Ω	(-200 to 0) °C (0 to 100) °C (100 to 400) °C (400 to 630) °C (630 to 800) °C	0.058 °C 0.17 °C 0.12 °C 0.14 °C 0.28 °C	Fluke 5522A

Parameter/Equipment	Range	CMC ² (±)	Comments	
Electrical Simulation of Thermocouples & Indicators ³				
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 0.16 °C 0.19 °C 0.20 °C 0.24 °C	Fluke 5522A	
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.28 °C 0.16 °C 0.14 °C 0.17 °C 0.23 °C		
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.33 °C 0.18 °C 0.20 °C 0.24 °C 0.40 °C		
Type T	(-250 to -150) °C (-150 to 0.0) °C (0.0 to 120) °C (120 to 400) °C	0.63 °C 0.24 °C 0.16 °C 0.14 °C		
Welding Devices ³	(0 to 350) Amps DC (0 to 100) Volts DC (100 to 700) Feed Rate IPM	0.87 ADC 0.012 VDC 3.6 IPM		Load bank, current shunt, DMM

IV. Fluid Quantities

Parameter/Equipment	Range	CMC ² (±)	Comments
POVA (Piston/Plunger Operated Volumetric Apparatus) ³ – Including But Not Limited To: Pipettes, Syringes, Dispensers, & Burettes	(0.1 to 50) µL (50 to 100) µL (100 to 500) µL (500 to 1000) µL (1000 to 5000) µL (5000 to 10 000) µL (10 000 to 20 000) µL (20 000 to 50 000) µL	0.31 µL 0.31 µL 0.56 µL 0.72 µL 5.4 µL 18 µL 30 µL 72 µL	Gravimetric method

V. Mechanical

Parameter/Equipment	Range	CMC ^{2, 11} (±)	Comments
Balances ³	Up to 20 g Up to 200 g	0.11 mg 0.69 mg	Class 1 weights
	Up to 200 g Up to 1000 g Up to 5000 g	1.3 mg 6.6 mg 34 mg	Class 2 weights
	Up to 20 g Up to 200 g Up to 1000 g Up to 5000 g Up to 10 000 g Up to 20 000 g	0.81 mg 4.8 mg 24 mg 130 mg 370 mg 460 mg	Class 4 weights
Force – Measuring Equipment ³			
Tension/Compression	Up to 100 lbf	0.0064 lbf	Class F weights w/ load cells
Compression	(100 to 1000) lbf	0.26 % Indication	
	(1000 to 10 000) lbf	0.24 % Indication	
	(10 000 to 50 000) lbf	0.33 % Indication	
	(10 000 to 100 000) lbf	0.20 % Indication	
	(50 000 to 500 000) lbf	0.4 % Indication	
Tension	(100 to 1000) lbf	0.23 % Indication	
	(1000 to 10 000) lbf	0.23 % Indication	
	(10 000 to 50 000) lbf	0.29 % Indication	
	(10 000 to 100 000) lbf	0.20 % Indication	

Parameter/Equipment	Range	CMC ^{2, 11} (±)	Comments
Optical Tachometer ³	Up to 200 FPM Up to 3000 FPM Up to 29 999 FPM	0.12 FPM 0.39 FPM 3.9 FPM	Calibrated strobe (FPM = Flashes per minute)
Pressure Measuring Equipment – Gages, Transducers & Transmitters ³	Up to 300 psig Up to 3000 psig Up to 5000 psig Up to 10 000 psig Up to 30 000 psig Up to 2 in H ₂ O Up to 300 psig Up to 3000 psig Up to 10 000 psig (10 to 17) psia	0.18 psig 3.8 psig 3.9 psig 12 psig 43 psig 0.0026 in H ₂ O 0.051 psig 0.4 psig 1.3 psig 0.000 78 psia	Digital pressure gage Dwyer hook gage GE/Pace 1003 Barometric reference
Scales ³	Up to 10 lb Up to 20 lb Up to 50 lb Up to 100 lb Up to 200 lb Up to 500 lb Up to 1000 lb Up to 5000 lb Up to 20 000 lb	0.000 25 lb 0.000 25 lb 0.0063 lb 0.0063 lb 0.0064 lb 0.0064 lb 0.18 lb 0.19 lb 0.21 lb	Class 4 weights Class F weights

Parameter/Equipment	Range	CMC ^{2, 11} (\pm)	Comments
Torque Wrenches – Measure ³	(1 to 10) lbf·in (10 to 50) lbf·in (30 to 400) lbf·in (80 to 1000) lbf·in (240 to 3000) lbf·in (1200 to 6000) lbf·in (2400 to 12 000) lbf·in	0.33 lbf·in 0.17 lbf·in 1.8 lbf·in 5.1 lbf·in 21 lbf·in 23 lbf·in 58 lbf·in	CDI/Norbar torque calibrator Norbar torque calibrator
Vacuum Measuring Equipment – Gauges ³	Up to 13 psig	0.033 psig	Druck DPI 610
Rotations Speed – Measurement ³	Contact: Up to 200 RPM (200 to 3000) RPM (3000 to 20 000) RPM Optical: Up to 3000 RPM (3000 to 30 000) RPM	0.67 RPM 13 RPM 16 RPM 0.5 RPM 5.0 RPM	Monarch PLT200
Indirect Verification of Rockwell Hardness Testers ³	HRB: Low Medium High HRC: Low Medium High	1.0 HRB 0.65 HRB 0.49 HRB 0.45 HRC 0.36 HRC 0.37 HRC	Indirect verification
Indirect Verification of Brinell Hardness Testers ³	HBW 10/500: Low HBW 10/3000: High	4.0 HBW 4.8 HBW	Indirect verification

VI. Thermodynamic

Parameter/Equipment	Range	CMC ^{2,11} (\pm)	Comments
Temperature – Measuring Equipment ³	(-100 to 300) °C (-148 to 572) °F	0.09 °C 0.16 °F	Hart 1502A/5614 PRT or Fluke 1523
Temperature – Measure ³	(-100 to 600) °C (-148 to 1112) °F (> 600 to 1200) °C (> 1112 to 2192) °F	1.5 °C 2.7 °F 10 °C 18 °F	Fluke 51 or 725 with thermocouple
IR Thermometer ³	(-20 to 150) °C (Amb + 10 to 400) °C	1.1 °C 2.1 °C	Mikron M340 (lab only) Omega BB703 Emissivity \approx 0.95 Wavelength (8 to 14) μ m
Humidity – Measure & Measuring Equipment ³	(20 to 90) % RH	3.4 % RH	SensoScientific B13-200

VII. Time & Frequency

Parameter/Equipment	Range	CMC ^{2,6,11} (\pm)	Comments
Frequency – Measuring Equipment ³	Up to 1100 MHz	2.5 parts \times 10 ⁶	Fluke 5522A/SC1100
Frequency – Measure ³	40 Hz to 300 kHz	0.014 % Indication	HP 34401
Timers & Stopwatches ³	Up to 1 hr (> 1 to 24) hr	0.14 s 0.59 s	Reference stopwatch
Stroboscopes ³	Up to 3600 FPM Up to 30 000 FPM	0.11 FPM 0.72 FPM	Universal counter

- ¹ This laboratory offers commercial calibration service and field calibration service.
- ² Calibration and Measurement Capability Uncertainty (CMC) is the smallest uncertainty of measurement that a laboratory can achieve within its scope of accreditation when performing more or less routine calibrations of nearly ideal measurement standards or nearly ideal measuring equipment. CMCs represent expanded uncertainties expressed at approximately the 95 % level of confidence, usually using a coverage factor of $k = 2$. The actual measurement uncertainty of a specific calibration performed by the laboratory may be greater than the CMC 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, repeatability) 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 microinches unless otherwise noted.
- ⁵ Adjustable thread rings are set to applicable specification using calibrated master set plug gages.
- ⁶ CMC for the HP 34401 is based on 1-year specifications within a temperature range of 18 °C to 28 °C. Field calibrations will be performed within 18 °C to 28 °C, 30 % to 55 % humidity.
- ⁷ Where ranges are not specified, the CMC stated is for the cardinal points only.
- ⁸ In the statement of CMC, percentage (%) refers to percent of reading, unless otherwise noted.
- ⁹ "Supermicrometer" is a registered trademark with a last listed owner of Pratt & Whitney Measurement Systems, Inc., Connecticut U.S.A.
- ¹⁰ This scope meets A2LA's *P112 Flexible Scope Policy*.
- ¹¹ 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.
- ¹² 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.



Accredited Laboratory

A2LA has accredited

ALDINGER COMPANY

Dallas, TX

for technical competence in the field of

Calibration

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets the requirements of ANSI/NCCL Z540-1-1994 and R205 – Specific Requirements: Calibration Laboratory Accreditation Program. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).



Presented this 30th day of July 2024.

A blue ink signature of Mr. Trace McInturff, written over a horizontal line.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1509.01
Valid to June 30, 2026

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