



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

ALDINGER COMPANY DBA PRECISION CALIBRATION SYSTEMS
1615 E Andrew Johnson Highway
Morristown, TN 37814
Matthew Shaw Phone: 423 617 9006

CALIBRATION

Valid To: March 31, 2027

Certificate Number: 1509.03

In recognition of the successful completion of the A2LA evaluation process (including an assessment of the organization's compliance with R205 – A2LA's Calibration Program Requirements), accreditation is granted to this laboratory to perform the following calibrations^{1,2,4, 5,6}:

I. Chemical

Parameter/Equipment	Range	CMC ² (±)	Comments
pH Meter ³	4 pH 7 pH 10 pH	0.022 pH 0.022 pH 0.027 pH	Std buffer solution
Conductivity Meter ³	1 µS/cm 10 µS/cm 100 µS/cm 1000 µS/cm 1413 µS/cm 10 000 µS/cm	0.56 µS/cm 0.63 µS/cm 2.1 µS/cm 5.8 µS/cm 7.5 µS/cm 55 µS/cm	Std conductivity solution

II. Dimensional

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
Micrometers ³	Up to 12 in >12 to 36 in >36 to 60 in	(70 + 22L) µin (90 + 24L) µin (190 + 27L) µin	Gage blocks, length standards
Caliper, Bore Gage, Snap Gage ³	Up to 60 in	(290 + 27L) µin	Gage blocks, length standards

Parameter/Equipment	Range	CMC ^{2, 4} ($\pm$)	Comments
Standard Length ³ (including Feeler Gages, Snap Gages, Taper Gages)	Up to 11 in	(12 + 2.9L) μ in	Universal measurement machine
Pin & Plug Gages ³	Up to 5 in	(19 + 18L) μ in	Universal measurement machine
External Threads Major Diameter ³	Up to 5 in	(17 + 22L) μ in	Universal measurement machine
External Threads Pitch Diameter ³	Up to 5 in	(51 + 17L) μ in	Universal measurement machine, thread wires
Ring Gages ³	Up to 6 in >6 to 11 in	(21 + 3.1L) μ in (7 + 6.6L) μ in	Universal measurement machine
Dimensional Measurement (including Radius Gages, Fillet Gages, Angle Blocks)	X/Y Axis: Up to 12 in X/Y Axis: Up to 8 in Z Axis: Up to 6 in Z Axis: Up to 2 in Angle Measurement: Up to 180° Angle Measurement: Up to 180° Z Axis: Up to 40 in Angle: Up to 180°	(180 + 11L) μ in (190 + 22L) μ in 470 μ in 380 μ in 0.007° 0.005° (49 + 21L) μ in 0.08°	Vision system 2D height gauge Digital protractor
Surface Finish – Measurement	(10 to 320) μ in Ra	2.2 μ in Ra	Profilometer
Surface Finish Equipment ³	(10 to 320) μ in Ra	2.2 μ in Ra	Master finish standards

Parameter/Equipment	Range	CMC ^{2, 4} ($\pm$)	Comments
Height Gauges ³	Up to 40 in	(15 + 22L) μ in	Length standard, gage blocks
Dial/Digital Indicators ³	Up to 4 in Up to 1 in	(220 + 3L) μ in (170 + 160L) μ in	Gage blocks Indicator calibrator
Vision Machine ³ X/Y Axis Z Axis Angle Measuring Microscope ³	Up to 12 in Up to 6 in (1 to 90) $^{\circ}$ (0.01 to 1) mm	140 μ in 150 μ in 0.026 $^{\circ}$ 9 μ m	Gage blocks / glass masters, angle blocks
Gage Block	Up to 6 in	(4.4 + 3.6L) μ in	Universal measurement machine, master gage blocks
Thread Ring – Pitch Diameter Minor Diameter	Up to 5 in (0.2 to 1.2 in	(51 + 17L) μ in 250 μ in	Universal measurement machine, inside micrometer
Tapered Thread Plug	Up to 4 in	(140 + 18L) μ in	Universal measurement machine, thread wires, height gauge

Parameter/Equipment	Range	CMC ^{2, 4} ($\pm$)	Comments
ULM ³ – Length Parallelism Flatness Tailstock Force	Up to 4 in (4 to 12) in (12 to 24) in Up to 4 in Up to 4 in Up to 40 ozf	$(10 + 2.8L) \mu\text{in}$ $(16 + 1.3L) \mu\text{in}$ $(7 + 2.3L) \mu\text{in}$ 3 μin 10 μin 2.9 %	Gage blocks/length standards Gage ball Optical flat Load cell
Steel Rules & Tape Measures ³	Up to 40 ft	$(0.011 + 0.000 25L)$ in	Length standard, reticle, push-pull block
Displacement ³ (Extensometers)	Up to 0.005 in (0.005 to 0.02) in (0.02 to 0.2) in (0.2 to 2) in	17 μin 41 μin 48 μin 240 μin	Linear displacement calibrator
Optical Comparators ³ – X & Y Linearity Magnification Angle	Up to 20 in Up to 6 in (1 to 90)°	0.0006 in 0.0025 in 0.047°	Glass master, gage blocks Glass master, caliper, pin gage Angle blocks
Protractors ³	(1 to 90)° (Up to 45)°	0.044° 0.024°	Angle blocks, surface plate Sine plate, gage blocks
Precision Levels	Up to 0.1 in per ft Deviation Level	0.0006 in 60 μin	Surface plate, sine plate, gage blocks Surface plate
Crimpers ³ – Crimp Height Crimp Die Diameter	Up to 1 in Up to 1 in	180 μin 240 μin	Crimp micrometer Pin/plug sets
Coating Thickness Testers ³	Up to 80 mils	0.7 % + 0.012 mils	Coating thickness standards

Parameter/Equipment	Range	CMC ^{2, 4} ($\pm$)	Comments
Coating Thickness Testers ³	Up to 80 mils	0.7 % + 0.012 mils	Thickness standards
Coating Thickness Standards	Up to 200 mils	(0.007 + 0.000 14L) mils	Universal measurement machine, gage blocks

III. Electrical – DC/Low Frequency

Parameter/Range	Frequency	CMC ^{2, 8} ($\pm$)	Comments
AC Current – Generate ³			
(29 to 330) μ A	(10 to 20) Hz (20 to 45) Hz (0.45 to 1) kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	1.8 mA/A + 0.1 μ A 1.4 mA/A + 0.1 μ A 1.2 mA/A + 0.1 μ A 2.7 mA/A + 0.15 μ A 6.7 mA/A + 0.2 μ A 13 mA/A + 0.4 μ A	Multi-function calibrator
330 μ A to 3.3 mA	(10 to 20) Hz (20 to 45) Hz (0.45 to 1) kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	1.6 mA/A + 0.15 μ A 1.0 mA/A + 0.15 μ A 0.82 mA/A + 0.15 μ A 1.6 mA/A + 0.2 μ A 4 mA/A + 0.3 μ A 7.9 mA/A + 0.6 μ A	
(3.3 to 33) mA	(10 to 20) Hz (20 to 45) Hz (0.45 to 1) kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	1.5 mA/A + 2 μ A 0.76 mA/A + 2 μ A 0.38 mA/A + 2 μ A 0.68 mA/A + 2 μ A 1.6 mA/A + 3 μ A 3.2 mA/A + 4 μ A	
(33 to 330) mA	(10 to 20) Hz (20 to 45) Hz (0.45 to 1) kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	1.5 mA/A + 20 μ A 0.76 mA/A + 20 μ A 0.38 mA/A + 20 μ A 0.9 mA/A + 50 μ A 1.8 mA/A + 100 μ A 3.6 mA/A + 200 μ A	
330 mA to 1.1 A	(10 to 45) Hz (0.45 to 1) kHz (1 to 5) kHz (5 to 10) kHz	1.5 mA/A + 100 μ A 0.53 mA/A + 100 μ A 5.4 mA/A + 1 mA 23 mA/A + 5 mA	

Parameter/Range	Frequency	CMC ^{2, 8} ($\pm$)	Comments
AC Current – Generate ³ (con't)			
(1.1 to 3) A	(10 to 45) Hz (0.45 to 1) kHz (1 to 5) kHz (5 to 10) kHz	1.5 mA/A + 100 μ A 0.64 mA/A + 100 μ A 4.5 mA/A + 1 mA 21 mA/A + 5 mA	Multi-function calibrator
(3 to 11) A	(45 to 100) Hz (0.1 to 1) kHz (1 to 5) kHz	0.83 mA/A + 2 mA 1.9 mA/A + 2 mA 24 mA/A + 2 mA	
(11 to 20.5) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	16 mA/A + 5 mA 17 mA/A + 5 mA 24 mA/A + 5 mA	
Clamp-on Only (16.5 to 55) A (55 to 150) A (150 to 550) A (550 to 1020) A	(45 to 440) Hz (45 to 440) Hz (45 to 440) Hz (45 to 440) Hz	0.6 A 1.1 A 3.0 A 8.7 A	w/ 50-turn coil
AC Voltage – Generate ³			
(1 to 33) mV	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	1.7 mV/V + 6 μ V 1.3 mV/V + 6 μ V 1.7 mV/V + 6 μ V 2.1 mV/V + 6 μ V 3.6 mV/V + 12 μ V 9.3 mV/V + 50 μ V	Multi-function calibrator
(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	0.44 mV/V + 8 μ V 0.29 mV/V + 8 μ V 0.6 mV/V + 8 μ V 0.88 mV/V + 8 μ V 2.2 mV/V + 32 μ V 4.7 mV/V + 70 μ V	
(0.33 to 3.3) 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	0.44 mV/V + 50 μ V 0.39 mV/V + 60 μ V 0.59 mV/V + 60 μ V 0.83 mV/V + 50 μ V 1.5 mV/V + 125 μ V 4.1 mV/V + 600 μ V	
(3.3 to 33) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.41 mV/V + 650 μ V 0.26 mV/V + 600 μ V 0.56 mV/V + 600 μ V 0.8 mV/V + 600 μ V 1.8 mV/V + 1.6 mV	

Parameter/Range	Frequency	CMC ^{2, 8} ($\pm$)	Comments
AC Voltage – Generate ³ (con't)			
(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	0.4 mV/V + 2 mV 0.65 mV/V + 6 mV 0.73 mV/V + 6 mV 0.97 mV/V + 6 mV 2.1 mV/V + 50 mV	Multi-function calibrator
(330 to 1020) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.41 mV/V + 10 mV 0.64 mV/V + 10 mV 0.72 mV/V + 10 mV	
AC Current – Measure ³			
(5 to 100) μ A 100 μ A to 1 mA (1 to 10 mA) (10 to 100) mA (100 to 400) mA 400 mA to 1 A (1 to 3) A (3 to 10) A	10 Hz to 5 kHz	0.18 % + 0.07 μ A 0.12 % + 0.5 μ A 0.18 % + 7 μ A 0.12 % + 19 μ A 0.12 % + 0.47 mA 0.12 % + 0.57 mA 0.18 % + 7 mA 0.18 % + 9 mA	Precision multimeter
(10 to 1000) A	(50 to 400) Hz	6 %	Clamp meter
AC Voltage – Measure ³			
Up to 100 mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 1000) V	10 Hz to 20 kHz	0.07 % + 47 μ V 0.07 % + 0.46 mV 0.07 % + 4.6 mV 0.07 % + 36 mV 0.07 % + 0.32 V	Precision multimeter
Up to 100 mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 1000) V	(20 to 100) kHz	0.7 % + 94 μ V 0.7 % + 0.94 mV 0.7 % + 9.4 mV 0.7 % + 94 mV 0.7 % + 1.1 V	
(1 to 20) kV	50-60 Hz	5.9 %	Multimeter & high voltage probe
(1 to 10) kV	50-60 Hz	0.15 %	High voltage meter

Parameter/Equipment	Range	CMC ^{2, 8} (±)	Comments
DC Current – Generate ³	Up to 329.999 µA 329.999 µA to 3.299 99 mA (3.299 999 9 to 32.999 99) mA (32.999 99 to 329.9999) mA 329.999 mA to 1.099 99 A (1.1 to 2.999 99) A (2.999 99 to 10.9999) A (10.9999 to 20) A (20 to 1010) A	270 µA/A + 0.02 µA 140 µA/A + 0.05 µA 97 µA/A + 0.25 µA 98 µA/A + 2.5 µA 380 µA/A + 40 µA 310 µA/A + 40 µA 510 µA/A + 500 µA 810 µA/A + 750 µA 0.5 % + 0.5 A	Multi-function calibrator w/ 50 turn coil
DC Voltage – Generate ³	Up to 330 mV 330 mV to 3.299 999 V (3.299 999 to 32.999 99) V (32.999 99 to 329.9999) V (329.9999 to 1020) V	54 µV/V + 1 µV 40 µV/V + 2 µV 44 µV/V + 20 µV 44 µV/V + 150 µV 44 µV/V + 1.5 mV	Multi-function calibrator
Capacitance – Generate ³	(0.22 to 1.099) nF (1.1 to 3.299) nF (3.3 to 10.999) nF (11 to 32.999) nF (33 to 109.999) nF (110 to 329.999) nF (0.33 to 1.099) µF (1.1 to 3.299) µF (3.3 to 10.999) µF (11 to 32.999) µF (33 to 109.999) µF (110 to 329.999) µF (0.33 to 1.099) mF (1.1 to 3.299) mF (3.3 to 10.999) mF (11 to 32.999) mF (33 to 110) mF	0.013 nF 0.023 nF 0.031 nF 0.17 nF 0.53 nF 1.1 nF 3.3 nF 9.2 nF 35 nF 0.14 µF 0.49 µF 1.4 µF 4.7 µF 14 µF 47 µF 0.22 mF 1.0 mF	Multi-function calibrator

Parameter/Equipment	Range	CMC ^{2, 8} ($\pm$)	Comments
Resistance – Generate ³	Up to 10.999 Ω (11 to 32.999) Ω (32.999 to 109.999) Ω (109.999 to 329.999) Ω 330 Ω to 1.099 99 k Ω (1.1 to 3.299 99) k Ω (3.3 to 10.999) k Ω (11 to 32.999) k Ω (33 to 109.999) k Ω (110 to 329.999) k Ω 330 k Ω to 1.0999 M Ω (1.1 to 3.2999) M Ω (3.3 to 10.9999) M Ω (11 to 32.999) M Ω (33 to 109.999) M Ω (110 to 329.999) M Ω (330 to 1100) M Ω	170 $\mu\Omega/\Omega$ + 1 m Ω 130 $\mu\Omega/\Omega$ + 1.5 m Ω 82 $\mu\Omega/\Omega$ + 1.4 m Ω 76 $\mu\Omega/\Omega$ + 2 m Ω 73 $\mu\Omega/\Omega$ + 2 m Ω 76 $\mu\Omega/\Omega$ + 20 m Ω 73 $\mu\Omega/\Omega$ + 20 m Ω 76 $\mu\Omega/\Omega$ + 0.2 Ω 88 $\mu\Omega/\Omega$ + 0.2 Ω 98 $\mu\Omega/\Omega$ + 2 Ω 0.12 m Ω/Ω + 2 Ω 0.13 m Ω/Ω + 30 Ω 0.47 m Ω/Ω + 50 Ω 0.84 m Ω/Ω + 2.5 k Ω 3.9 m Ω/Ω + 3 k Ω 4.2 m Ω/Ω + 0.1 M Ω 12 m Ω/Ω + 0.5 M Ω	Multi-function calibrator
Temperature Calibration, Indication, & Control Equipment Used With RTD – (Electrical Simulation) ³			
Cu 42 710 Ω	(-100 to 260) $^{\circ}\text{C}$	0.31 $^{\circ}\text{C}$	Multi-function calibrator
PT 385 100 Ω	(-200 to 630) $^{\circ}\text{C}$ (630 to 800) $^{\circ}\text{C}$	0.15 $^{\circ}\text{C}$ 0.25 $^{\circ}\text{C}$	
PT 385 200 Ω	(-200 to 260) $^{\circ}\text{C}$ (260 to 630) $^{\circ}\text{C}$	0.07 $^{\circ}\text{C}$ 0.17 $^{\circ}\text{C}$	
PT 385 500 Ω	(-200 to 260) $^{\circ}\text{C}$ (260 to 630) $^{\circ}\text{C}$	0.07 $^{\circ}\text{C}$ 0.12 $^{\circ}\text{C}$	
PT 3 851 000 Ω	(-200 to 600) $^{\circ}\text{C}$ (600 to 630) $^{\circ}\text{C}$	0.07 $^{\circ}\text{C}$ 0.24 $^{\circ}\text{C}$	
PT 3 916 100 Ω	(-200 to -190) $^{\circ}\text{C}$ (-190 to 600) $^{\circ}\text{C}$ (600 to 630) $^{\circ}\text{C}$	0.26 $^{\circ}\text{C}$ 0.11 $^{\circ}\text{C}$ 0.24 $^{\circ}\text{C}$	
PT 3 926 100 Ω	(-200 to 100) $^{\circ}\text{C}$ (100 to 630) $^{\circ}\text{C}$	0.08 $^{\circ}\text{C}$ 0.13 $^{\circ}\text{C}$	
PtNi 385 120 Ω	(-80 to 100) $^{\circ}\text{C}$ (100 to 260) $^{\circ}\text{C}$	0.09 $^{\circ}\text{C}$ 0.15 $^{\circ}\text{C}$	

Parameter/Equipment	Range	CMC ^{2,8} (±)	Comments
Temperature – Instruments (Electrical Simulation) – Thermocouple Devices ³			
Type B	(600 to 800) °C (800 to 1800) °C	0.41 °C 0.33 °C	Multi-function calibrator
Type C	(0 to 1000) °C (1000 to 1800) °C (1800 to 2316) °C	0.25 °C 0.41 °C 0.66 °C	
Type E	(-250 to -100) °C (-100 to 650) °C (650 to 1000) °C	0.39 °C 0.13 °C 0.17 °C	
Type J	(-210 to -100) °C (-100 to 760) °C (760 to 1200) °C	0.21 °C 0.15 °C 0.19 °C	
Type K	(-200 to -100) °C (-100 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.26 °C 0.15 °C 0.21 °C 0.32 °C	
Type N	(-200 to -100) °C (-100 to 120) °C (120 to 410) °C (410 to 1300) °C	0.32 °C 0.18 °C 0.21 °C 0.30 °C	
Type R	(0 to 250) °C (250 to 1000) °C (1000 to 1767) °C	0.45 °C 0.29 °C 0.37 °C	
Type S	(0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1767) °C	0.49 °C 0.38 °C 0.32 °C 0.39 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.49 °C 0.38 °C 0.31 °C 0.39 °C	
Type U	(-200 to 0) °C (0 to 600) °C	0.44 °C 0.22 °C	

Parameter/Equipment	Range	CMC ^{2, 8} ($\pm$)	Comments
DC Current – Measure ³	(1 to 100) μ A 100 μ A to 1 mA (1 to 100) mA (100 to 400) mA 400 mA to 1 A (1 to 3) A (3 to 10) A	0.06 % + 0.06 μ A 0.06 % + 0.6 μ A 0.06 % + 6 μ A 0.06 % + 24 μ A 0.06 % + 28 μ A 0.12 % + 2.4 mA 0.18 % + 4.4 mA	Precision multimeter
	(10 to 1000) A	2.6 %	Clamp meter
DC Voltage – Measure ³	(0.01 to 100) mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 1000) V	0.004 % + 5 μ V 0.003 % + 13 μ V 0.003 % + 86 μ V 0.004 % + 0.94 mV 0.005 % + 14 mV	Precision multimeter
	(1 to 20) kV	2.4 %	Multimeter & high voltage probe
	(1 to 10) kV	0.05 %	High voltage meter
Capacitance – Measure ³	Up to 1 nF (1 to 10) nF (10 to 100) nF 100 nF to 1 μ F (1 to 10) μ F (10 to 100) μ F 100 μ F to 1 mF (1 to 10) mF (10 to 100) mF	2.4 % + 0.034 nF 1.2 % + 0.09 nF 1.2 % + 0.65 nF 1.2 % + 7.4 nF 1.2 % + 73 nF 1.2 % + 0.77 μ F 1.2 % + 7.8 μ F 1.2 % + 78 μ F 4.7 % + 1.30 mF	Precision multimeter
Resistance – Measure ³ Equipment to Source	Up to 10 Ω (10 to 100) Ω 100 Ω to 1 k Ω (1 to 10) k Ω (10 to 100) k Ω 100 k Ω to 1 M Ω (1 to 10) M Ω (10 to 100) M Ω (100 to 1000) M Ω	0.012 % + 3.5 m Ω 0.012 % + 5.7 m Ω 0.012 % + 15 m Ω 0.012 % + 0.34 Ω 0.012 % + 0.36 Ω 0.012 % + 0.58 Ω 0.046 % + 0.79 k Ω 0.93 % + 0.14 M Ω 2.30 % + 0.14 M Ω	Precision multimeter
	10 M Ω 100 M Ω 1 G Ω 10 G Ω (8 to 1200) Ω	0.04 M Ω 0.26 M Ω 2 M Ω 0.19 G Ω 3.6 m Ω	Insulation resistance standard Transfer standard

IV. Fluid Quantities

Parameter/Equipment	Range	CMC ^{2, 6} ($\pm$)	Comments
Liquid Flow Meter ³	Up to 500 GPM	2 %	Ultrasonic flow meter
Liquid Flow Meter ³			
Rate	Up to 30 GPM (31 to 200) GPM	0.16 % 0.13 %	Coriolis flow meter
Totalization	Up to 6 kg	0.11 %	Balance
POVA (Piston/Plunger Operated Volumetric Apparatus) ³ – Including But Not Limited To: Pipettes, Syringes, Dispensers, & Burettes	(0.1 to 20) μ L (20 to 200) μ L (200 to 1000) μ L (1000 to 10 000) μ L (10 000 to 20 000) μ L (10 to 100) mL	0.16 μ L 0.22 μ L 0.53 μ L 5 μ L 11 μ L (0.58 % + 0.3) mL	Micro balance Balance
Graduated Cylinder/Flask/Beaker ³	(50 to 6000) mL	(0.98 % + 0.16) mL	Balance
Viscometers ³	Up to 10 000 cP	1.7 %	Viscosity reference standards
Anemometers	(400 to 3000) fpm	2.30 %	Differential pressure transducer, wind tunnel, pitot tube

V. Mechanical

Parameter/Equipment	Range	CMC ^{2, 6} ($\pm$)	Comments
Force Gages ³	Up to 500 lbf	0.11 %	Calibrated weights
Load Cells, Load Stands & Tension/Compression Testers ³	Up to 500 lbf (20 to 1000) lbf	0.11 % 0.21 %	Calibrated weights Load cells w/indicator

Parameter/Equipment	Range	CMC ^{2, 6} (±)	Comments
Load Cells, Load Stands & Tension/Compression Testers ³ (con't)	(500 to 5000) lbf	0.24 %	Load cells w/indicator
	(2000 to 20 000) lbf	0.24 %	
	(500 to 25 000) lbf	0.20 %	
	(5000 to 50 000) lbf	0.24 %	
Compression Only	(28 200 to 500 000) lbf	0.20 %	
Weighing Instruments/Scales ^{3,9}	Up to 10 000 lb	0.013 %	ASTM Class 6 weights, Class F weights
Analytical Balance ^{3,9}	Up to 500 mg 500mg to 5 g 10 g 20 g 50 g 100 g 200 g 500 g 1 kg 2 kg 5 kg 10 kg 20 kg 30 kg 50 lb	13 µg 41 µg 61 µg 90 µg 0.15 mg 0.31 mg 0.61 mg 1.5 mg 3.1 mg 6.2 mg 15 mg 31 mg 62 mg 92 mg 73 mg	ASTM Class 6 weights, Class F weights

Parameter/Equipment	Range	CMC ^{2, 6} (±)	Comments
Vacuum Gauge ³	(-14 to -1) psi (-1 to 0) psi (-10 to -1) in H ₂ O (-1 to 0) in H ₂ O	0.009 psi 0.0024 psi 0.012 H ₂ O 0.0017 in H ₂ O	Reference pressure gauges
Indirect Verification of Rockwell Hardness Testers ³	HRC (20 to 35) HRC (35 to 59) HRC (60 to 70) HRC HRBW (40 to 59) HRB (60 to 87) HRB (88 to 99) HRB HRA (20 to 69) HRA (70 to 79) HRA (80 to 99) HRA HR15N (70 to 77) HR15N (78 to 89) HR15N (90 to 99) HR15N HR30N (40 to 54) HR30N (55 to 76) HR30N (77 to 90) HR30N HR15TW (65 to 80) HR15TW (81 to 86) HR15TW (87 to 99) HR15TW HR30TW (43 to 56) HR30TW (57 to 69) HR30TW (70 to 90) HR30TW	0.45 HRC 0.41 HRC 0.33 HRC 0.37 HRB 0.37 HRB 0.34 HRB 0.34 HRA 0.34 HRA 0.33 HRA 0.37 HR15N 0.34 HR15N 0.35 HR15N 0.37 HR30N 0.38 HR30N 0.35 HR30N 0.35 HR15TW 0.33 HR15TW 0.40 HR15TW 0.44 HR30TW 0.37 HR30TW 0.35 HR30TW	Hardness test block masters
Knoop Hardness Testers HK, (Indirect verification) ³	(250 to 650) HK (651 to 750) HK	10 HK 16 HK	Hardness test block masters

Parameter/Equipment	Range	CMC ^{2, 6} (±)	Comments
Vickers Hardness Testers HV, (Indirect Verification) ³	(240 to 600) HV (601 to 750) HV	10 HV 16 HV	Hardness test block masters
Brinell Hardness Testers HBW, (Indirect Verification) ³	(125 to 225) HBW >225 HBW	4.1 HBW 10 HBW	Hardness test block masters, Brinell scope
Durometers ¹⁰ – Force Displacement Length Indenter Geometry	Up to 90 Duros Type A, B, E, O Type C, D, DO Type M, OO, OOO, OOO-S Up to 0.2 in Length, Diameter, Radius Angle	(1 % + 0.3) Duros (0.25 % + 0.38) Duros (0.4 % + 1.3) Duros 0.0007 in 200 µin 0.01°	Balance Gage blocks Vision system
Torque Wrenches ³	(4 to 40) ozf·in (1 to 10) lbf·in (2 to 20) lbf·in (2.5 to 25) lbf·in (1.5 to 29.5) lbf·ft (5 to 50) lbf·ft (25 to 250) lbf·ft (22 to 1100) lbf·ft (200 to 1000) lbf·ft	0.7 % + 0.051 ozf·in 0.7 % + 0.014 lbf·in 0.7 % + 0.024 lbf·in 0.7 % + 0.032 lbf·in 0.7 % + 0.04 lbf·ft 0.7 % + 0.07 lbf·ft 0.7 % + 0.034 lbf·ft 0.81 % + 0.4 lbf·ft 0.82 %	Torque transducers
Torque Testers ³	Up to 150 lbf·in Up to 750 lbf·ft	0.18 % 0.14 %	Torque arm, weights

Parameter/Equipment	Range	CMC ^{2, 6, 7} (±)	Comments
Rate of Rotation – Measurement Equipment ³			
Contact	(10 to 3800) RPM	0.05 % + 0.015 RPM	Reference tachometer
Non-Contact	(5 to 999) RPM	0.013 % + 0.0014 RPM	Reference strobe
	(1000 to 9999) RPM	0.006 % + 0.008 RPM	
	(10 000 to 99 999) RPM	0.003 % + 0.4 RPM	
Rate of Rotation – Measure ³			
Length	Up to 1000 FPM	0.21 % + 0.9 FPM	Reference tachometer w/wheel
Non-Contact	(6 to 8299) RPM	1.70 RPM	Reference tachometer
	(8300 to 24 999) RPM	2.7 RPM	
	(25 000 to 99 999) RPM	0.007 % + 1.5 RPM	

VI. Optical

Parameter/Equipment	Range	CMC ^{2, 6} (±)	Comments
Spectrophotometer ³ –			
Photometric Accuracy	(250 to 635) nm	0.0044 AU	Neutral density filter, holmium oxide filter
Wavelength Accuracy	(240 to 640) nm	0.28 nm	
Light Meters			
Visible Light	(400 to 700) nm/ (0.01 to 50 000) Lux	6.1 %	Light meter, broadband sensor
UVA Light	(315 to 390) nm/ (2.0 E-2 to 2.0 E-8) W/cm ²	6.9 %	

Parameter/Equipment	Range	CMC ^{2, 6} ($\pm$)	Comments
Light Booth ³			
Visible Light	(400 to 700) nm/ (0.01 to 50 000) Lux	6.1 %	Light meter, broadband sensor
UVA Light	(315 to 390) nm/ (2.0 E-2 to 2.0 E-8) W/cm ²	6.6 %	

VII. Thermodynamics

Parameter/Equipment	Range	CMC ^{2, 6, 7} ($\pm$)	Comments
Temperature Measuring Equipment – Infrared Thermometers ³	(50 to 500) °C Fixed Points 50 °C 150 °C 250 °C 350 °C 500 °C	1.5 % + 0.9 °C 1.70 °C 3 °C 4.5 °C 5.6 °C 8.6 °C	Black body calibrator
Thermohygrometers – Humidity (% RH) ³	(20 to 90) % RH	2 % RH	Reference thermohygrometer
Thermohygrometers – Temperature ³	(5 to 55) °C	0.15 °C	Reference thermohygrometer
Temperature – Measurement ³	(-200 to 0) °C (0 to 200) °C (200 to 420) °C (420 to 660) °C	0.020 °C 0.033 °C 0.048 °C 0.065 °C	PRT w/readout

Parameter/Equipment	Range	CMC ^{2, 6, 7} ($\pm$)	Comments
Temperature – Measurement ³ (con't)	(-100 to 300) °C	1.70 °C	Portable calibrator, K thermocouple
	(300 to 1372) °C	3.20 °C	
	(-250 to 0) °C	1.10 °C	Portable calibrator, T thermocouple
	(0 to 400) °C	0.76 °C	
	(200 to 700) °C	2.50 °C	Portable calibrator, S thermocouple
	(700 to 1767) °C	3.90 °C	
	(50 to 500) °C	5.6 % + 0.3 °C	IR thermometer
Temperature – Measuring Equipment ³	(-90 to 40) °C	0.025 °C	PRT w/readout
	(40 to 300) °C	0.04 °C	
	(300 to 660) °C	0.065 °C	
	(660 to 1200) °C	3.9 °C	Portable calibrator, S thermocouple

VIII. Time & Frequency

Parameter/Equipment	Range	CMC ^{2,6} ($\pm$)	Comments
Timers & Stopwatches ³	(0.01 to 3600) s	0.13 s	Calibrated stopwatch
	(3600 to 86 400) s	3.10 s	
Frequency – Source ³	(0.1 to 119.99) Hz	0.004 Hz	Multi-function calibrator
	(120 to 1199.99) Hz	0.025 Hz	
	(1.2 to 11.999) kHz	0.24 Hz	
	(1.2 to 119.99) kHz	2.4 Hz	
	(120 to 1199.9) kHz	24 Hz	
	(1.2 to 2.000) MHz	40 Hz	
Frequency – Measure ³	(3 to 5) Hz	0.13 %	Precision multimeter
	(5 to 10) Hz	0.07 %	
	(10 to 40) Hz	0.04 %	
	40 Hz to 300 kHz	0.02 %	
	300 kHz to 1 MHz	0.04 %	

SATELLITE

ALDINGER COMPANY DBA PRECISION CALIBRATION SYSTEMS
107 N. Porter St, Suite 5
Winchester, TN 37398
Matthew Shaw Phone: 423 617 9006

CALIBRATION

I. Chemical

Parameter/Equipment	Range	CMC ² ($\pm$)	Comments
pH Meter ³	4 pH 7 pH 10 pH	0.022 pH 0.022 pH 0.027 pH	Std buffer solution
Conductivity Meter ³	1 μ S/cm 10 μ S/cm 100 μ S/cm 1000 μ S/cm 1413 μ S/cm 10 000 μ S/cm	0.56 μ S/cm 0.63 μ S/cm 2.10 μ S/cm 5.8 μ S/cm 7.5 μ S/cm 55 μ S/cm	Std conductivity solution

II. Dimensional

Parameter/Equipment	Range	CMC ^{2, 4} ($\pm$)	Comments
Micrometers ³	Up to 12 in (>12 to 36) in (>36 to 60) in	(70 + 22L) μ in (90 + 24L) μ in (190 + 27L) μ in	Gage blocks, length standards
Caliper, Bore Gage, Snap Gage ³	Up to 60 in	(290 + 27L) μ in	Gage blocks, length standards
Standard Length ³ (including Feeler Gages, Snap Gages, Taper Gages)	Up to 11 in	(12 + 2.9L) μ in	Universal measurement machine

Parameter/Equipment	Range	CMC ^{2, 4, 7} (±)	Comments
Pin & Plug Gages ³	Up to 5 in	(19 + 18L) μin	Universal measurement machine
External Threads Major Diameter ³	Up to 5 in	(17 + 22L) μin	Universal measurement machine
External Threads Pitch Diameter ³	Up to 5 in	(51 + 17L) μin	Universal measurement machine, thread wires
Ring Gages ³	Up to 6 in >6 to 11 in	(21 + 3.1L) μin (7 + 6.6L) μin	Universal measurement machine
Dimensional Measurement ³	Z Axis: Up to 24 in Angle: Up to 180°	(360 + 3L) μin 0.08°	2D height gauge Digital protractor
Surface Finish Equipment ³	(10 to 320) μin Ra	2.20 μin Ra	Master finish standards
Height Gages ³	Up to 40 in	(15 + 22L) μin	Length standard, gage blocks
Dial/Digital Indicators ³	Up to 4 in Up to 1 in	(220 + 3L) μin (170 + 160L) μin	Gage blocks Indicator calibrator
Vision Machine ³ X/Y Axis Z Axis Angle Measuring Microscope ³	Up to 12 in Up to 6 in (1 to 90)° (0.01 to 1) mm	140 μin 150 μin 0.029° 9 μm	Gage blocks / glass masters, angle blocks

Parameter/Equipment	Range	CMC ^{2, 4} ($\pm$)	Comments
ULM ³ – Length Parallelism Flatness Tailstock Force	Up to 4 in (4 to 12) in (12 to 24) in Up to 4 in Up to 4 in Up to 40 ozf	$(10 + 2.8L) \mu\text{in}$ $(16 + 1.3L) \mu\text{in}$ $(7 + 2.3L) \mu\text{in}$ 3 μin 10 μin 2.9 %	Gage blocks/length standards Gage ball Optical flat Load cell
Steel Rules & Tape Measures ³	Up to 40 ft	$(0.011 + 0.000 25L)$ in	Length standard, reticle, push-pull block
Displacement ³ (Extensometers)	Up to 0.005 in (0.005 to 0.02) in (0.02 to 0.2) in (0.2 to 2) in	17 μin 41 μin 48 μin 240 μin	Linear displacement calibrator
Optical Comparators ³ – X & Y Linearity Magnification Angle	Up to 20 in Up to 6 in (1 to 90)°	0.0006 in 0.0025 in 0.047°	Glass master, gage blocks Glass master, caliper, pin gage Angle blocks
Protractors ³	(1 to 90)° (Up to 45)°	0.044° 0.024°	Angle blocks, surface plate Sine plate, gage blocks
Precision Levels	Up to 0.1 in per ft Deviation Level	0.0006 in 60 μin	Surface plate, sine plate, gage blocks Surface plate
Crimpers ³ – Crimp Height Crimp Die Diameter	Up to 1 in Up to 1 in	180 μin 240 μin	Crimp micrometer Pin/plug sets
Coating Thickness Testers ³	Up to 80 mils	0.7 % + 0.012 mils	Coating thickness standards

III. Electrical – DC/Low Frequency

Parameter/Range	Frequency	CMC ^{2,8} ($\pm$)	Comments
AC Current – Generate ³			
(29 to 330) μ A	(10 to 20) Hz (20 to 45) Hz (0.45 to 1) kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	1.8 mA/A + 0.1 μ A 1.40 mA/A + 0.1 μ A 1.20 mA/A + 0.1 μ A 2.70 mA/A + 0.15 μ A 6.70 mA/A + 0.2 μ A 13 mA/A + 0.4 μ A	Multi-function calibrator
330 μ A to 3.3 mA	(10 to 20) Hz (20 to 45) Hz (0.45 to 1) kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	1.6 mA/A + 0.15 μ A 1 mA/A + 0.15 μ A 0.82 mA/A + 0.15 μ A 1.60 mA/A + 0.2 μ A 4 mA/A + 0.3 μ A 7.9 mA/A + 0.6 μ A	
(3.3 to 33) mA	(10 to 20) Hz (20 to 45) Hz (0.45 to 1) kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	1.5 mA/A + 2 μ A 0.76 mA/A + 2 μ A 0.38 mA/A + 2 μ A 0.68 mA/A + 2 μ A 1.60 mA/A + 3 μ A 3.2 mA/A + 4 μ A	
(33 to 330) mA	(10 to 20) Hz (20 to 45) Hz (0.45 to 1) kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	1.5 mA/A + 20 μ A 0.76 mA/A + 20 μ A 0.38 mA/A + 20 μ A 0.9 mA/A + 50 μ A 1.80 mA/A + 100 μ A 3.60 mA/A + 200 μ A	
330 mA to 1.1 A	(10 to 45) Hz (0.45 to 1) kHz (1 to 5) kHz (5 to 10) kHz	1.5 mA/A + 100 μ A 0.53 mA/A + 100 μ A 5.40 mA/A + 1 mA 23 mA/A + 5 mA	
(1.1 to 3) A	(10 to 45) Hz (0.45 to 1) kHz (1 to 5) kHz (5 to 10) kHz	1.5 mA/A + 100 μ A 0.64 mA/A + 100 μ A 4.90 mA/A + 1 mA 21 mA/A + 5 mA	
(3 to 11) A	(45 to 100) Hz (0.1 to 1) kHz (1 to 5) kHz	0.83 mA/A + 2 mA 1.1 mA/A + 2 mA 24 mA/A + 2 mA	
(11 to 20.5) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	16 mA/A + 5 mA 17 mA/A + 5 mA 24 mA/A + 5 mA	

Parameter/Range	Frequency	CMC ^{2, 6, 8} ($\pm$)	Comments
AC Current – Generate ³ (cont.)			
Clamp-on Only			
(16.5 to 55) A	(45 to 440) Hz	0.6 A	w/ 50-turn coil
(55 to 150) A	(45 to 440) Hz	1.1 A	
(150 to 550) A	(45 to 440) Hz	3 A	
(550 to 1020) A	(45 to 440) Hz	8.7 A	
AC Voltage – Generate ³			
(1 to 33) mV	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	1.7 mV/V + 6 μ V 1.3 mV/V + 6 μ V 1.7 mV/V + 6 μ V 2.1 mV/V + 6 μ V 3.6 mV/V + 12 μ V 9.3 mV/V + 50 μ V	Multi-function calibrator
(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	0.44 mV/V + 8 μ V 0.29 mV/V + 8 μ V 0.6 mV/V + 8 μ V 0.88 mV/V + 8 μ V 2.2 mV/V + 32 μ V 4.7 mV/V + 70 μ V	
(0.33 to 3.3) 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	0.44 mV/V + 50 μ V 0.39 mV/V + 60 μ V 0.59 mV/V + 60 μ V 0.83 mV/V + 50 μ V 1.9 mV/V + 125 μ V 4.1 mV/V + 600 μ V	
(3.3 to 33) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.41 mV/V + 650 μ V 0.26 mV/V + 600 μ V 0.56 mV/V + 600 μ V 0.8 mV/V + 600 μ V 1.8 mV/V + 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	0.4 mV/V + 2 mV 0.65 mV/V + 6 mV 0.73 mV/V + 6 mV 0.97 mV/V + 6 mV 2.1 mV/V + 50 mV	
(330 to 1020) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.41 mV/V + 10 mV 0.64 mV/V + 10 mV 0.72 mV/V + 10 mV	

Parameter/Range	Frequency	CMC ^{2, 6, 8} ($\pm$)	Comments
AC Current – Measure ³ (5 to 100) μ A 100 μ A to 1 mA (1 to 10 mA) (10 to 100) mA (100 to 400) mA 400 mA to 1 A (1 to 3) A (3 to 10) A (10 to 1000) A	10 Hz to 5 kHz (50 to 400) Hz	0.18 % + 0.07 μ A 0.12 % + 0.5 μ A 0.18 % + 7 μ A 0.12 % + 19 μ A 0.12 % + 0.47 mA 0.12 % + 0.57 mA 0.18 % + 7 mA 0.18 % + 9 mA 6 %	Precision multimeter Clamp meter
AC 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 100 mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 1000) V (1 to 20) kV (1 to 10) kV	10 Hz to 20 kHz (20 to 100) kHz (50 to 60) Hz (50 to 60) Hz	0.07 % + 47 μ V 0.07 % + 0.46 mV 0.07 % + 4.6 mV 0.07 % + 36 mV 0.07 % + 0.32 V 0.7 % + 94 μ V 0.7 % + 0.94 mV 0.7 % + 9.4 mV 0.7 % + 94 mV 0.7 % + 1.1 V 5.9 % 0.15 %	Precision multimeter Multimeter & high voltage probe High voltage meter

Parameter/Equipment	Range	CMC ^{2, 8} ($\pm$)	Comments
DC Current – Generate ³	Up to 329.999 μ A 329.999 μ A to 3.299 99 mA (3.299 999 9 to 32.999 99) mA (32.999 99 to 329.9999) mA 329.999 mA to 1.099 99 A (1.1 to 2.999 99) A (2.999 99 to 10.9999) A (10.9999 to 20) A (20 to 1010) A	270 μ A/A + 0.02 μ A 140 μ A/A + 0.05 μ A 97 μ A/A + 0.25 μ A 98 μ A/A + 2.5 μ A 38 μ A/A + 40 μ A 310 μ A/A + 40 μ A 510 μ A/A + 500 μ A 81 μ A/A + 750 μ A 0.5 % + 0.5 A	Multi-function calibrator w/ 50 turn coil
DC Voltage – Generate ³	Up to 330 mV 330 mV to 3.299 999 V (3.299 999 to 32.999 99) V (32.999 99 to 329.9999) V (329.9999 to 1020) V	54 μ V/V + 1 μ V 40 μ V/V + 2 μ V 44 μ V/V + 20 μ V 44 μ V/V + 150 μ V 44 μ V/V + 1.5 mV	Multi-function calibrator
Capacitance – Generate ³	(0.22 to 1.099) nF (1.1 to 3.299) nF (3.3 to 10.999) nF (11 to 32.999) nF (33 to 109.999) nF (110 to 329.999) nF (0.33 to 1.099) μ F (1.1 to 3.299) μ F (3.3 to 10.999) μ F (11 to 32.999) μ F (33 to 109.999) μ F (110 to 329.999) μ F (0.33 to 1.099) mF (1.1 to 3.299) mF (3.3 to 10.999) mF (11 to 32.999) mF (33 to 110) mF	0.013 nF 0.023 nF 0.031 nF 0.17 nF 0.53 nF 1.1 nF 3.3 nF 9.2 nF 35 nF 0.14 μ F 0.49 μ F 1.4 μ F 4.7 μ F 14 μ F 47 μ F 0.22 mF 1.1 mF	Multi-function calibrator

Parameter/Equipment	Range	CMC ^{2, 8} ($\pm$)	Comments
Resistance – Generate ³	Up to 10.999 Ω (11 to 32.999) Ω (32.999 to 109.999) Ω (109.999 to 329.999) Ω 330 Ω to 1.099 99 k Ω (1.1 to 3.299 99) k Ω (3.3 to 10.999) k Ω (11 to 32.999) k Ω (33 to 109.999) k Ω (110 to 329.999) k Ω 330 k Ω to 1.0999 M Ω (1.1 to 3.2999) M Ω (3.3 to 10.9999) M Ω (11 to 32.999) M Ω (33 to 109.999) M Ω (110 to 329.999) M Ω (330 to 1100) M Ω	170 $\mu\Omega/\Omega$ + 1 m Ω 130 $\mu\Omega/\Omega$ + 1.5 m Ω 82 $\mu\Omega/\Omega$ + 1.4 m Ω 76 $\mu\Omega/\Omega$ + 2 m Ω 73 $\mu\Omega/\Omega$ + 2 m Ω 76 $\mu\Omega/\Omega$ + 20 m Ω 73 $\mu\Omega/\Omega$ + 20 m Ω 76 $\mu\Omega/\Omega$ + 0.2 Ω 88 $\mu\Omega/\Omega$ + 0.2 Ω 98 $\mu\Omega/\Omega$ + 2 Ω 0.12 m Ω/Ω + 2 Ω 0.13 m Ω/Ω + 30 Ω 0.47 m Ω/Ω + 50 Ω 0.84 m Ω/Ω + 2.5 k Ω 3.9 m Ω/Ω + 3 k Ω 4.2 m Ω/Ω + 0.1 M Ω 12 m Ω/Ω + 0.5 M Ω	Multi-function calibrator
Temperature Calibration, Indication, & Control Equipment Used With RTD – (Electrical Simulation) ³			
Cu 42 710 Ω	(-100 to 260) $^{\circ}\text{C}$	0.31 $^{\circ}\text{C}$	Multi-function calibrator
PT 385 100 Ω	(-200 to 630) $^{\circ}\text{C}$ (630 to 800) $^{\circ}\text{C}$	0.15 $^{\circ}\text{C}$ 0.25 $^{\circ}\text{C}$	
PT 385 200 Ω	(-200 to 260) $^{\circ}\text{C}$ (260 to 630) $^{\circ}\text{C}$	0.07 $^{\circ}\text{C}$ 0.17 $^{\circ}\text{C}$	
PT 385 500 Ω	(-200 to 260) $^{\circ}\text{C}$ (260 to 630) $^{\circ}\text{C}$	0.07 $^{\circ}\text{C}$ 0.12 $^{\circ}\text{C}$	
PT 3 851 000 Ω	(-200 to 600) $^{\circ}\text{C}$ (600 to 630) $^{\circ}\text{C}$	0.07 $^{\circ}\text{C}$ 0.24 $^{\circ}\text{C}$	
PT 3 916 100 Ω	(-200 to -190) $^{\circ}\text{C}$ (-190 to 600) $^{\circ}\text{C}$ (600 to 630) $^{\circ}\text{C}$	0.26 $^{\circ}\text{C}$ 0.11 $^{\circ}\text{C}$ 0.24 $^{\circ}\text{C}$	
PT 3 926 100 Ω	(-200 to 100) $^{\circ}\text{C}$ (100 to 630) $^{\circ}\text{C}$	0.08 $^{\circ}\text{C}$ 0.13 $^{\circ}\text{C}$	
PtNi 385 120 Ω	(-80 to 100) $^{\circ}\text{C}$ (100 to 260) $^{\circ}\text{C}$	0.09 $^{\circ}\text{C}$ 0.15 $^{\circ}\text{C}$	

Parameter/Equipment	Range	CMC ^{2, 6, 8} (±)	Comments
Temperature – Instruments (Electrical Simulation) – Thermocouple Devices ³			
Type B	(600 to 800) °C (800 to 1800) °C	0.41 °C 0.33 °C	Multi-function calibrator
Type C	(0 to 1000) °C (1000 to 1800) °C (1800 to 2316) °C	0.25 °C 0.41 °C 0.66 °C	
Type E	(-250 to -100) °C (-100 to 650) °C (650 to 1000) °C	0.39 °C 0.13 °C 0.17 °C	
Type J	(-210 to -100) °C (-100 to 760) °C (760 to 1200) °C	0.21 °C 0.15 °C 0.19 °C	
Type K	(-200 to -100) °C (-100 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.26 °C 0.15 °C 0.21 °C 0.32 °C	
Type N	(-200 to -100) °C (-100 to 120) °C (120 to 410) °C (410 to 1300) °C	0.32 °C 0.18 °C 0.21 °C 0.30 °C	
Type R	(0 to 250) °C (250 to 1000) °C (1000 to 1767) °C	0.45 °C 0.29 °C 0.37 °C	
Type S	(0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1767) °C	0.49 °C 0.38 °C 0.32 °C 0.39 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.49 °C 0.38 °C 0.31 °C 0.39 °C	
Type U	(-200 to 0) °C (0 to 600) °C	0.44 °C 0.22 °C	

Parameter/Equipment	Range	CMC ^{2, 6, 8} ($\pm$)	Comments
DC Current – Measure ³	(1 to 100) μ A 100 μ A to 1 mA (1 to 100) mA (100 to 400) mA 400 mA to 1 A (1 to 3) A (3 to 10) A	0.06 % + 0.06 μ A 0.06 % + 0.6 μ A 0.06 % + 6 μ A 0.06 % + 24 μ A 0.06 % + 28 μ A 0.12 % + 2.4 mA 0.18 % + 4.4 mA	Precision multimeter
	(10 to 1000) A	2.6 %	Clamp meter
DC Voltage – Measure ³	(0.01 to 100) mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 1000) V	0.004 % + 5 μ V 0.003 % + 13 μ V 0.003 % + 86 μ V 0.004 % + 0.94 mV 0.005 % + 14 mV	Precision multimeter
	(1 to 20) kV	2.4 %	Multimeter & high voltage probe
	(1 to 10) kV	0.05 %	High voltage meter
Capacitance – Measure ³	Up to 1 nF (1 to 10) nF (10 to 100) nF 100 nF to 1 μ F (1 to 10) μ F (10 to 100) μ F 100 μ F to 1 mF (1 to 10) mF (10 to 100) mF	2.4 % + 0.034 nF 1.2 % + 0.09 nF 1.2 % + 0.65 nF 1.2 % + 7.4 nF 1.2 % + 73 nF 1.2 % + 0.77 μ F 1.2 % + 7.8 μ F 1.2 % + 78 μ F 4.7 % + 1.30 mF	Precision multimeter
Resistance – Measure ³ Equipment to Source	Up to 10 Ω (10 to 100) Ω 100 Ω to 1 k Ω (1 to 10) k Ω (10 to 100) k Ω 100 k Ω to 1 M Ω (1 to 10) M Ω (10 to 100) M Ω (100 to 1000) M Ω	0.012 % + 3.5 m Ω 0.012 % + 5.7 m Ω 0.012 % + 15 m Ω 0.012 % + 0.34 Ω 0.012 % + 0.36 Ω 0.012 % + 0.58 Ω 0.046 % + 0.79 k Ω 0.93 % + 0.14 M Ω 2.30 % + 0.14 M Ω	Precision multimeter
	10 M Ω 100 M Ω 1 G Ω 10 G Ω (8 to 1200) Ω	0.04 M Ω 0.26 M Ω 2 M Ω 0.19 G Ω 3.6 m Ω	Insulation resistance standard Transfer standard

IV. Fluid Quantities

Parameter/Equipment	Range	CMC ^{2, 6} ($\pm$)	Comments
Liquid Flow Meter ³	Up to 500 GPM	2 %	Ultrasonic flow meter
Liquid Flow Meter ³			
Rate	Up to 30 GPM (31 to 200) GPM	0.16 % 0.13 %	Coriolis flow meter
Totalization	Up to 6 kg	0.11 %	Balance
POVA (Piston/Plunger Operated Volumetric Apparatus) ³ – Including But Not Limited To: Pipettes, Syringes, Dispensers, & Burettes	(0.1 to 20) μ L (20 to 200) μ L (200 to 1000) μ L (1000 to 10 000) μ L (10 000 to 20 000) μ L (10 to 100) mL	0.16 μ L 0.22 μ L 0.53 μ L 5 μ L 11 μ L (0.58 % + 0.3) mL	Micro balance Balance
Graduated Cylinder/Flask/Beaker ³	(50 to 6000) mL	(0.98 % + 0.16) mL	Balance
Viscometers ³	Up to 10 000 cP	1.7 %	Viscosity reference standards

V. Mechanical

Parameter/Equipment	Range	CMC ^{2, 6} (±)	Comments
Force Gauges ³	Up to 500 lbf	0.11 %	Calibrated weights
Load Cells, Load Stands & Tension/Compression Testers ³	Up to 500 lbf	0.11 %	Calibrated weights
	(20 to 1000) lbf	0.21 %	Load cells w/indicator
	(500 to 5000) lbf	0.24 %	
	(2000 to 20 000) lbf	0.24 %	
	(500 to 25 000) lbf	0.20 %	
	(5000 to 50 000) lbf	0.24 %	
	Compression Only (28 200 to 500 000) lbf	0.20 %	
Weighing Instruments/Scales ^{3,9}	Up to 10 000 lb	0.013 %	ASTM Class 6 weights, Class F weights

Parameter/Equipment	Range	CMC ^{2, 6} (±)	Comments
Analytical Balance ^{3,9}	Up to 500 mg 500 mg to 5 g 10 g 20 g 50 g 100 g 200 g 500 g 1 kg 2 kg 5 kg 10 kg 20 kg 30 kg 50 lb	13 µg 41 µg 61 µg 90 µg 0.15 mg 0.31 mg 0.61 mg 1.5 mg 3.1 mg 6.2 mg 15 mg 31 mg 62 mg 92 mg 73 mg	ASTM Class 1 mass
Crimpers ³ – Pull Force Jaw Force	 Up to 500 lbf Up to 15 Tons	 6.4 % 2.8 %	 Force gauge Load cell
Pressure Gauge ³ Absolute	Up to 1 in H2O (1 to 10) in H2O Up to 1 psi (1 to 15) psi (15 to 300) psi (300 to 1000) psi (1000 to 10 000) psi Up to 30 psia	0.0017 in H2O 0.012 in H2O 0.0024 psi 0.0045 psi 0.092 psi 0.28 psi 2.8 psi 0.02 psia	Reference pressure gauges

Parameter/Equipment	Range	CMC ^{2, 6} (±)	Comments
Vacuum Gauge ³	(-14 to -1) psi (-1 to 0) psi (-10 to -1) in H ₂ O (-1 to 0) in H ₂ O	0.009 psi 0.0024 psi 0.012 in H ₂ O 0.0017 in H ₂ O	Reference pressure gauges
Indirect Verification of Rockwell Hardness Testers ³	HRC (20 to 35) HRC (35 to 59) HRC (60 to 70) HRC HRBW (40 to 59) HRB (60 to 87) HRB (88 to 99) HRB HRA (20 to 69) HRA (70 to 79) HRA (80 to 99) HRA HR15N (70 to 77) HR15N (78 to 89) HR15N (90 to 99) HR15N HR30N (40 to 54) HR30N (55 to 76) HR30N (77 to 90) HR30N HR15TW (65 to 80) HR15TW (81 to 86) HR15TW (87 to 99) HR15TW HR30TW (43 to 56) HR30TW (57 to 69) HR30TW (70 to 90) HR30TW	0.45 HRC 0.41 HRC 0.33 HRC 0.37 HRB 0.37 HRB 0.34 HRB 0.34 HRA 0.34 HRA 0.33 HRA 0.37 HR15N 0.34 HR15N 0.35 HR15N 0.37 HR30N 0.38 HR30N 0.35 HR30N 0.35 HR15TW 0.33 HR15TW 0.40 HR15TW 0.44 HR30TW 0.37 HR30TW 0.35 HR30TW	Hardness test block masters

Parameter/Equipment	Range	CMC ^{2, 6} (±)	Comments
Knoop Hardness Testers HK (Indirect Verification) ³	(250 to 650) HK (651 to 750) HK	10 HK 16 HK	Hardness test block masters
Vickers Hardness Testers HV (Indirect Verification) ³	(240 to 600) HV (601 to 750) HV	10 HV 16 HV	Hardness test block masters
Brinell Hardness Testers HBW (Indirect Verification) ³	(125 to 225) HBW >225 HBW	4.1 HBW 10 HBW	Hardness test block masters, Brinell scope
Torque Wrenches ³	(4 to 40) ozf·in (1 to 10) lbf·in (2 to 20) lbf·in (2.5 to 25) lbf·in (1.5 to 29.5) lbf·ft (5 to 50) lbf·ft (25 to 250) lbf·ft (22 to 1100) lbf·ft (200 to 1000) lbf·ft	0.7 % + 0.051 ozf·in 0.7 % + 0.014 lbf·in 0.7 % + 0.024 lbf·in 0.7 % + 0.032 lbf·in 0.7 % + 0.04 lbf·ft 0.7 % + 0.07 lbf·ft 0.7 % + 0.034 lbf·ft 0.81 % + 0.4 lbf·ft 0.82 %	Torque transducers
Rate of Rotation – Measurement Equipment ³			
Contact	(10 to 3800) RPM	0.05 % + 0.015 RPM	Reference tachometer
Non-Contact	(5 to 999) RPM (1000 to 9999) RPM (10 000 to 99 999) RPM	0.013 % + 0.0014 RPM 0.006 % + 0.008 RPM 0.003 % + 0.4 RPM	Reference strobe

Parameter/Equipment	Range	CMC ^{2, 6} (±)	Comments
Rate of Rotation – Measure ³			
Length	Up to 1000 FPM	0.21 % + 0.9 FPM	Reference tachometer w/wheel
Non-Contact	(6 to 8299) RPM	1.70 RPM	Reference tachometer
	(8300 to 24 999) RPM	2.7 RPM	
	(25 000 to 90 000) RPM	0.007 % + 1.5 RPM	

VI. Optical

Parameter/Equipment	Range	CMC ^{2, 6} (±)	Comments
Spectrophotometer ³ –			
Photometric Accuracy	(250 to 635) nm	0.0044 AU	Neutral density filter holmium oxide filter
Wavelength Accuracy	(240 to 640) nm	0.28 nm	

VII. Thermodynamics

Parameter/Equipment	Range	CMC ^{2, 6, 7} (±)	Comments
Temperature Measuring Equipment – Infrared Thermometers ³	(50 to 500) °C Fixed Points 50 °C 150 °C 250 °C 350 °C 500 °C	1.5 % + 0.9 °C 1.70 °C 3 °C 4.5 °C 5.6 °C 8.6 °C	Black body calibrator
Thermohygrometers – Humidity (%RH) ³	(20 to 90) % RH	2 % RH	Reference thermohygrometer
Thermohygrometers – Temperature ³	(5 to 55) °C	0.15 °C	Reference thermohygrometer
Temperature – Measurement ³	(-200 to 0) °C (0 to 200) °C (200 to 420) °C (420 to 660) °C (-100 to 300) °C (300 to 1372) °C (-250 to 0) °C (0 to 400) °C (200 to 700) °C (700 to 1767) °C (50 to 500) °C	0.020 °C 0.033 °C 0.048 °C 0.065 °C 1.70 °C 3.20 °C 1.10 °C 0.76 °C 2.50 °C 3.80 °C 5.6 % + 0.3 °C	PRT w/readout Portable calibrator, K thermocouple Portable calibrator, T thermocouple Portable calibrator, S thermocouple IR thermometer

Parameter/Equipment	Range	CMC ^{2, 6, 7} ($\pm$)	Comments
Temperature – Measuring Equipment ³	(-90 to 40) °C	0.025 °C	PRT w/readout
	(40 to 300) °C	0.04 °C	
	(300 to 660) °C	0.065 °C	
	(660 to 1200) °C	3.9 °C	Portable calibrator, S thermocouple

VIII. Time & Frequency

Parameter/Equipment	Range	CMC ^{2, 6, 7} ($\pm$)	Comments
Timers & Stopwatches ³	(0.01 to 3600) s (3600 to 86 400) s	0.13 s 3.10 s	Calibrated stopwatch
Frequency – Source ³	(0.1 to 119.99) Hz (120 to 1199.99) Hz (1.2 to 11.999) kHz (1.2 to 119.99) kHz (120 to 1199.9) kHz (1.2 to 2.000) MHz	0.004 Hz 0.025 Hz 0.24 Hz 2.4 Hz 24 Hz 40 Hz	Multi-function calibrator
Frequency – Measure ³	(3 to 5) Hz (5 to 10) Hz (10 to 40) Hz 40 Hz to 300 kHz 300 kHz to 1 MHz	0.13 % 0.07 % 0.04 % 0.02 % 0.04 %	Precision multimeter

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 of 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 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 length measured in inches.
- ⁵ This scope meets A2LA's *P112 Flexible Scope Policy*.
- ⁶ In the statement of CMC, percentages are percentage of reading, unless otherwise indicated.
- ⁷ The type of instrument or material being calibrated is defined by the parameter. This indicates the laboratory is capable of calibrating instruments that measure or generate the values in the ranges indicated for the listed measurement parameter
- ⁸ The stated measured values are determined using the indicated instrument (see Comments). This capability is suitable for the calibration of the devices intended to measure or generate the measured value in the ranges indicated. CMC's are expressed as either a specific value that covers the full range or as a percent or fraction of the reading plus a fixed floor specification.
- ⁹ The uncertainties for scales and balances are highly dependent upon the resolution of the unit under test. The uncertainties presented here do not include the resolution of the unit under test. The resolution will be included in the reported measurement uncertainty at the time of calibration.
- ¹⁰ In the statement of CMC, H is the hardness value displayed in Durometer units.



Accredited Laboratory

A2LA has accredited

ALDINGER COMPANY DBA PRECISION CALIBRATION SYSTEMS

Morristown, TN

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/NCSL 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 20th day of May 2025.

A blue ink signature of Mr. Trace McInturff.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1509.03
Valid to March 31, 2027

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