



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

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CALIBRATION

Valid To: September 30, 2021

Certificate Number: 1078.02

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations^{1,7}:

I. Dimensional

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Bore Gages	Up to 8 in	24 µin + 7.5 µin/in	ULM
Calipers ³	Up to 4 in (4 to 20) in (20 to 80) in	130 µin + 4.2 µin/in 170 µin + 4.2 µin/in 300 µin + 5.1 µin/in	Gage blocks
Cylindrical Rings	Up to 8 in	(15 + 10D) µin	UMM and gage blocks
Cylindrical Plugs	Up to 8 in (8 to 18) in	14 µin + 6.0 µin/in 8.7 µin + 4.2 µin/in	UMM and gage blocks
Gage Amp w/ Probe ³	Up to 0.025 in	13 µin	Gage blocks
Gage Blocks	Up to 1 in (1 to 4) in	5.8 µin + 1.8 µin/in 11 µin + 1.8 µin/in	Gage block and comparator
Height Gages ³	Up to 20 in (20 to 48) in	12 µin/in + 0.6R 14 µin + 12 µin/in + 0.6R	Standard reference bar

Parameter/Equipment	Range	CMC ^{2,4} (\pm)	Comments
Indicators ³	Up to 2 in	$(0.6R + 40L) \mu\text{in}$	Indicator calibrator
Indicator Calibrators ³	Up to 4 in	$0.6R + 19 \mu\text{in}$	Gage amp w/ probe
Length Standards	Up to 8 in (8 to 18) in	$14 \mu\text{in} + 6.0 \mu\text{in/in}$ $8.7 \mu\text{in} + 4.2 \mu\text{in/in}$	Universal measuring machine (UMM) and gage blocks
Micrometers –			
Depth ³	Up to 12 in	$40 \mu\text{in/in} + 0.6R$	Gage blocks
Inside	Up to 8 in (8 to 18) in	$14 \mu\text{in} + 6.0 \mu\text{in/in}$ $8.7 \mu\text{in} + 4.2 \mu\text{in/in}$	UMM and gage blocks
Outside ³	Up to 4 in (4 to 20) in	$58 \mu\text{in} + 4.7 \mu\text{in/in}$ $140 \mu\text{in} + 4.7 \mu\text{in/in}$	Gage blocks
Groove ³	Up to 4 in	$40 \mu\text{in/in} + 0.6R$	Gage blocks
Optical Comparators ³ –			
Squareness	$(0 \text{ to } 360)^\circ$	2'	Calibration sphere
Linear	Up to 12 in	0.0002 in	Glass scale
Magnification	10x, 20x, 50x, 62.5x, 100x	0.000 12 in	Calibration sphere w/ overlay
Protractors ³	$(0 \text{ to } 180)^\circ$	0.0076°	Sine bar and gage blocks
Rules/Linear Scales ³	Up to 24 in	$2200 \mu\text{in} + 11 \mu\text{in/in}$	Digiscope master rule

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Surface Plate ³ – Flatness	24 in × 24 in to 72 in × 144 in	$8\sqrt{D}$ μin	Level meters (<i>D</i> is the diagonal in inches)
Repeatability	6 in × 6 in to 72 in x 144 in	34 μin	Repeat-O-Meter
Tape Measures ³	Up to 50 ft	(0.08 + 0.003 <i>L</i>) in	Master rule
Threaded Plug Gages – Simple Pitch Diameter	Up to 14 in (5 to 80) TPI	(110 + 9 <i>D</i>) μin	UMM, thread wires
Major Diameter	Up to 8 in (8 to 14) in	14 μin + 6.0 μin/in 8.7 μin + 4.2 μin/in	UMM
Adjustable Thread Rings ⁴	Up to 14 in	X (Set Plug Tolerance)	Set using master plug gages

II. Electrical – DC/Low Frequency

Parameter/Range	Frequency	CMC ^{2,5} (±)	Comments
AC Current – Generate ³ (29 to 330) μA	(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	0.16 % + 0.1 μA 0.12 % + 0.1 μA 0.1 % + 0.1 μA 0.24 % + 0.15 μA 0.62 % + 0.2 μA 1.3 % + 0.4 μA	Fluke 5520A
330 μA 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	0.16 % + 0.15 μA 0.1 % + 0.15 μA 0.08 % + 0.15 μA 0.16 % + 0.2 μA 0.38 % + 0.3 μA 0.8 % + 0.6 μA	

Parameter/Range	Frequency	CMC ^{2, 4, 5} (±)	Comments
AC Current – Generate ³ (cont)			
(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	0.14 % + 2 µA 0.07 % + 2 µA 0.031 % + 2 µA 0.062 % + 2 µA 0.16 % + 3 µA 0.31 % + 4 µA	Fluke 5520A
(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	0.14 % + 20 µA 0.07 % + 20 µA 0.032 % + 20 µA 0.08 % + 50 µA 0.16 % + 0.12 mA 0.31 % + 0.2 mA	
330 mA to 1.1 A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.14 % + 0.1 mA 0.039 % + 0.1 mA 0.46 % + 1 mA 2.0 % + 5 mA	
(1.1 to 3) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.14 % + 0.1 mA 0.047 % + 0.1 mA 0.46 % + 1 mA 1.9 % + 5 mA	
(3 to 11) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.048 % + 5 mA 0.081 % + 2 mA 2.4 % + 2 mA	
(11 to 20.5) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.095 % + 5 mA 0.12 % + 5 mA 2.4 % + 5 mA	
20.5 A to 1 kA	(45 to 65) kHz (65 to 440) kHz	0.39 % 0.94 %	Fluke 5520A w/5500A coil

Parameter/Range	Frequency	CMC ^{2, 5} (±)	Comments
AC Current – Measure ³			
Up to 100 µA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz	0.46 % + 0.03 µ A 0.18 % + 0.03 µA 0.073 % + 0.03 µA 0.073 % + 0.03 µA	HP 3458A
1 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	0.46 % + 0.2 µA 0.18 % + 0.2 µA 0.072 % + 0.2 µA 0.043 % + 0.2 µA 0.072 % + 0.2 µA 0.46 % + 0.4 µA 0.64 % + 1.5 µA	
10 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	0.46 % + 2 µA 0.18 % + 2 µA 0.072 % + 2 µA 0.043 % + 2 µA 0.072 % + 2 µA 0.46 % + 4 µA 0.64 % + 15 µA	
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	0.46 % + 20 µA 0.18 % + 20 µA 0.072 % + 20 µA 0.043 % + 20 µA 0.072 % + 20 µA 0.46 % + 40 µA 0.64 % + 0.25 mA	
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	0.46 % + 0.2 mA 0.19 % + 0.2 mA 0.1 % + 0.2 mA 0.13 % + 0.2 mA 0.35 % + 0.2 mA 1.2 % + 0.4 mA	
(1 to 3) A	10 Hz to 5 kHz (5 to 10) kHz	0.18 % + 2 mA 0.41 % + 22 mA	
(3 to 10) A	10 Hz to 5 kHz (5 to 10) kHz	0.18 % + 6 mA 0.41 % + 70 mA	Fluke 8845A

Parameter/Range	Frequency	CMC ^{2, 4, 5} (±)	Comments
AC High Voltage – Measure ³			
(1 to 2) kV _{peak}	(20 to 100) Hz (100 to 400) Hz	0.1 % + 0.12 % rng 0.46 % + 0.12 % rng	Vitrek 4620B
(2 to 20) kV _{peak}	(2 to 100) Hz	0.23 % + 0.12 % rng	
AC Power ³ – PF = 1			
(3.3 to 9) mA (9 to 33) mA (33 to 90) mA (90 to 330) mA 330 mA to 0.9 A (0.9 to 2.2) A (2.2 to 4.5) A (4.5 to 20.5) A	(10 to 65) Hz 33 mV to 1020 V	0.15 % 0.13 % 0.15 % 0.13 % 0.19 % 0.18 % 0.29 % 0.18 %	Fluke 5520A
(3.3 to 9) mA (9 to 33) mA (33 to 90) mA (90 to 330) mA 330 mA to 0.9 A (0.9 to 2.2) A (2.2 to 4.5) A (4.5 to 20.5) A	(65 to 500) Hz 33 mV to 1020 V	0.10 % 0.07 % 0.10 % 0.12 % 0.09 % 0.08 % 0.18 % 0.18 %	
(3.3 to 9) mA (9 to 33) mA (33 to 90) mA (90 to 330) mA 330 mA to 0.9 A (0.9 to 2.2) A (2.2 to 4.5) A (4.5 to 20.5) A	500 Hz to 1 kHz 33 mV to 1020 V	0.10 % 0.07 % 0.10 % 0.12 % 0.09 % 0.08 % 0.18 % 0.18 %	

Parameter/Range	Frequency	CMC ^{2, 4, 5} (±)	Comments	
AC Power ³ – (cont) PF = 1				
(3.3 to 9) mA (9 to 33) mA (33 to 90) mA (90 to 330) mA 330 mA to 0.9 A (0.9 to 2.2) A (2.2 to 4.5) A (4.5 to 20.5) A	(1 to 5) kHz 33 mV to 1020 V	0.14 % 0.12 % 0.21 % 0.15 % 0.69 % 0.56 % 2.5 % 2.5 %	Fluke 5520A	
(3.3 to 9) mA (9 to 33) mA (33 to 90) mA (90 to 330) mA 330 mA to 0.9 A (0.9 to 2.2) A	(5 to 10) kHz 33 mV to 1020 V	0.38 % 0.35 % 0.52 % 0.38 % 3.1 % 2.4 %		
(3.3 to 9) mA (9 to 33) mA (33 to 90) mA (90 to 330) mA	(10 to 30) kHz 33 mV to 1020 V	1.3 % 1.2 % 1.4 % 1.3 %		
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	0.063 % + 6 μV 0.017 % + 6 μV 0.02 % + 6 μV 0.08 % + 6 μV 0.27 % + 12 μV 0.62 % + 50 μV		Fluke 5520A
(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	0.023 % + 8 μV 0.012 % + 8 μV 0.013 % + 8 μV 0.028 % + 8 μV 0.062 % + 32 μV 0.16 % + 70 μV		
330 mV 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	0.023 % + 50 μV 0.012 % + 60 μV 0.016 % + 60 μV 0.024 % + 50 μV 0.055 % + 0.13 mV 0.19 % + 0.6 mV		

Parameter/Range	Frequency	CMC ^{2,5} (±)	Comments
AC Voltage – Generate ³ (cont)			
(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	0.023 % + 0.65 mV 0.012 % + 0.6 mV 0.019 % + 0.6 mV 0.028 % + 0.6 mV 0.072 % + 1.6 mV	Fluke 5520A
(33 to 330) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.015 % + 2 mV 0.016 % + 6 mV 0.02 % + 6 mV 0.026 % + 6 mV 0.16 % + 50 mV	
(330 to 1020) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.024 % + 10 mV 0.02 % + 10 mV 0.024 % + 10 mV	
AC Voltage – Measure ³			
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	0.039 % + 3 μV 0.03 % + 1.1 μV 0.039 % + 1.1 μV 0.12 % + 1.1 μV 0.58 % + 1.1 μV 4.6 % + 2 μV	HP 3458A
100 mV	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz	0.014 % + 4 μV 0.012 % + 2 μV 0.018 % + 2 μV 0.031 % + 2 μV 0.092 % + 2 μV 0.34 % + 10 μV 1.2 % + 10 μV 1.8 % + 10 μV	

Parameter/Range	Frequency	CMC ^{2,5} (±)	Comments
AC Voltage – Measure ³ (cont)			
1 V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz	0.014 % + 40 μV 0.012 % + 20 μV 0.018 % + 20 μV 0.031 % + 20 μV 0.092 % + 20 μV 0.34 % + 0.1 mV 1.2 % + 0.1 mV 1.8 % + 0.1 mV	HP 3458A
10 V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz	0.014 % + 0.4 mV 0.012 % + 0.2 mV 0.018 % + 0.2 mV 0.031 % + 0.2 mV 0.092 % + 0.2 mV 0.34 % + 1 mV 1.2 % + 1 mV 1.8 % + 1 mV	
100 V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	0.025 % + 4 mV 0.025 % + 2 mV 0.025 % + 2 mV 0.04 % + 2 mV 0.14 % + 2 mV 0.46 % + 10 mV 1.7 % + 10 mV	
1000 V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.047 % + 40 mV 0.047 % + 20 mV 0.07 % + 20 mV 0.14 % + 20 mV 0.34 % + 20 mV	

Parameter/Equipment	Range	CMC ^{2, 4, 5} (±)	Comments
Capacitance – Generate ³	(0.19 to 3.3) nF (3.3 to 11) nF (11 to 110) nF (110 to 330) nF 330 nF to 1.1 µF (1.1 to 3.3) µF (3.3 to 11) µF (11 to 33) µF (33 to 110) µF (110 to 330) µF 330 µF to 1.1 mF (1.1 to 3.3) mF (3.3 to 11) mF (11 to 33) mF	0.5 % + 0.01 nF 0.25 % + 0.01 nF 0.25 % + 0.1 nF 0.25 % + 0.3 nF 0.25 % + 1 nF 0.25 % + 3 nF 0.25 % + 10 nF 0.4 % + 30 nF 0.45 % + 100 nF 0.45 % + 300 nF 0.45 % + 1 µF 0.45 % + 3 µF 0.45 % + 10 µF 0.75 % + 30 µF	Fluke 5520A
DC Current – Generate ³	(0 to 330) µA 330 µA to 3.3 mA (3.3 to 33) mA (33 to 330) mA 330 mA to 1.1 A (1.1 to 3.0) A (3 to 11) A (11 to 20.5) A	0.012 % + 0.02 µA 79 µA/A + 0.05 µA 79 µA/A + 0.25 µA 79 µA/A + 2.5 µA 0.016 % + 40 µA 0.03 % + 40 µA 0.04 % + 500 µA 0.078 % + 750 µA	Fluke 5520A
DC Clamp Meters	Up to 1 kA	0.34 %	Fluke 5520A w/5500 Coil
DC Current – Measure ³	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 2) A (2 to 10) A	52 mA/A + 0.04 nA 25 mA/A + 0.04 nA 25 mA/A + 0.1 nA 26 mA/A + 0.8 nA 27 mA/A + 5 nA 26 mA/A + 50 nA 42 mA/A + 0.5 mA 0.013 % + 10 mA 0.15 % 0.19 %	HP 3458A Fluke 8845A
DC High Voltage – Measure ³	(1 to 2) kV (2 to 20) kV	0.05 % + 0.023 % rng 0.46 % + 0.12 % rng	Vitretek 4620B

Parameter/Equipment	Range	CMC ^{2, 4, 5} (±)	Comments
DC Power – Generate ³ 33 mV to 1020 V	330 µA to 1.1 A (1.1 to 3) A (3 to 11) A (11 to 20.5) A	0.068 % 0.070 % 0.095 % 0.12 %	Fluke 5520A
DC Voltage – Generate ³	(0 to 330) µV 330 µV to 3.3 V (3.3 to 33) V (33 to 330) V (330 to 1000) V	16 µV + 1 µV 9.1 µV/V + 2 µV 11 µV/V + 20 µV 15 µV/V + 150 µV 15 µV/V + 1500 µV	Fluke 5520A
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	9.6 µV/V + 0.23 µV 6.1 µV/V + 0.25 µV 5.6 µV/V + 1 µV 7.4 µV/V + 25 µV 7.6 µV/V + 100 µV	HP 3458A
Electrical Simulation of RTDs ³ – Pt 385, 100 Ω Pt 3926, 100 Ω PtNi 385, 120 Ω	 (-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C (630 to 800) °C (-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C (-80 to 100) °C (100 to 260) °C	 0.05 °C 0.07 °C 0.09 °C 0.1 °C 0.12 °C 0.23 °C 0.05 °C 0.07 °C 0.09 °C 0.1 °C 0.12 °C 0.08 °C 0.14 °C	Fluke 5520A

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments
Electrical Simulation of RTDs ³ – (cont)			
Pt 385, 200 Ω	(-200 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.04 °C 0.05 °C 0.12 °C 0.13 °C 0.14 °C 0.16 °C	Fluke 5520A
Pt 385, 500 Ω	(-200 to -80) °C (-80 to 100) °C (100 to 260) °C (260 to 400) °C (400 to 600) °C (600 to 630) °C	0.04 °C 0.05 °C 0.06 °C 0.08 °C 0.09 °C 0.11 °C	
Pt 385, 1000 Ω	(-200 to 0) °C (100 to 260) °C (260 to 300) °C (300 to 600) °C (600 to 630) °C	0.03 °C 0.04 °C 0.05 °C 0.06 °C 0.07 °C	
Pt 3916, 100 Ω	(-200 to -190) °C (-190 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C	0.23 °C 0.25 °C 0.04 °C 0.05 °C 0.06 °C 0.07 °C 0.08 °C 0.09 °C	
Electrical Simulation of Thermocouple ³ –			
Type E	(-250 to -100) °C (-100 to 650) °C (650 to 1000) °C	0.5 °C 0.16 °C 0.21 °C	Fluke 5520A
Type J	(-210 to -100) °C (-100 to 760) °C (760 to 1200) °C	0.28 °C 0.17 °C 0.23 °C	

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments
Electrical Simulation of Thermocouple ³ – (cont)			
Type K	(-200 to -100) °C (-100 to 120) °C (120 to 1000) C (1000 to 1372) °C	0.34 °C 0.18 °C 0.26 °C 0.4 °C	Fluke 5520A
Type S	(0 to 250) °C (250 to 1400) °C (1400 to 1767) °C	0.47 °C 0.37 °C 0.46 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 400) °C	0.63 °C 0.24 °C 0.15 °C	
Oscilloscope Calibration ³ –			
Squarewave Signal 50 Ω at 1 kHz Source	± 1 mV to 6.6 V _{p-p}	0.28 % + 40 μV	Fluke 5520A/SC1100
Squarewave Signal 1 MΩ at 1 kHz Source	± 1 mV to 130 V _{p-p}	0.12 % + 40 μV	
Leveled Sine Wave Amplitude – Range: 5 mV to 5.5 V _{p-p}	50 kHz reference 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz	2 % + 300 μV 3.5 % + 300 μV 4 % + 300 μV 6 % + 300 μV	Fluke 5520A/SC1100
Range: 4 mV to 3.5 V _{p-p}	(600 to 1100) MHz	7 % + 300 μV	
Leveled Sine Wave Flatness (Relative to 50 kHz)	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1100) MHz	1.5 % + 100 μV 2 % + 100 μV 4 % + 100 μV 5 % + 100 μV	
Time Marker into 50 Ω Generate and Measure	5 s to 50 ms 20 ms to 1 ns	(26 + <i>t</i> · 1000) parts in 10 ⁶ 2.6 parts in 10 ⁶	<i>t</i> = seconds Fluke 5520A/ SC1100
Rise Time	≤ 300 ps	+0 /-100 ps	

Parameter/Equipment	Range	CMC ^{2, 5} (\pm)	Comments
Resistance – Generate ³	(0 to 11) Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω (330 to 1100) Ω (1.1 to 3.3) k Ω (3.3 to 11) k Ω (11 to 33) k Ω (33 to 110) k Ω (110 to 330) k Ω (330 to 1100) k Ω (1.1 to 3.3) M Ω (3.3 to 11) M Ω (11 to 33) M Ω (33 to 110) M Ω (110 to 330) M Ω (330 to 1100) M Ω	34 $\mu\Omega/\Omega$ + 0.001 Ω 30 $\mu\Omega/\Omega$ + 0.015 Ω 25 $\mu\Omega/\Omega$ + 0.015 Ω 27 $\mu\Omega/\Omega$ + 0.02 Ω 24 $\mu\Omega/\Omega$ + 0.02 Ω 25 $\mu\Omega/\Omega$ + 0.2 Ω 24 $\mu\Omega/\Omega$ + 0.1 Ω 24 $\mu\Omega/\Omega$ + 1 Ω 24 $\mu\Omega/\Omega$ + 1 Ω 31 $\mu\Omega/\Omega$ + 10 Ω 28 $\mu\Omega/\Omega$ + 10 Ω 47 $\mu\Omega/\Omega$ + 0.15 k Ω 0.011 % + 0.25 k Ω 0.02 % + 2.5 k Ω 0.039 % + 3 k Ω 0.24 % + 0.1 M Ω 1.2 % + 0.5 M Ω	Fluke 5520A
Resistance – Generate	(1 to 999) M Ω (1 to 9.9) G Ω (10 to 100) G Ω	0.13 % + 550 k Ω 0.50 % + 130 k Ω 1.0 % + 7.5 M Ω	Decade resistors
Resistance – Measure ³	(0 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 M Ω to 1 G Ω	19 $\mu\Omega/\Omega$ + 50 $\mu\Omega$ 14 $\mu\Omega/\Omega$ + 0.05 m Ω 12 $\mu\Omega/\Omega$ + 0.5 m Ω 12 $\mu\Omega/\Omega$ + 5 m Ω 12 $\mu\Omega/\Omega$ + 50 m Ω 17 $\mu\Omega/\Omega$ + 2 Ω 59 $\mu\Omega/\Omega$ + 100 Ω 0.058 % + 1 k Ω 0.58 % + 10 k Ω	HP 3458A

III. Mechanical

Parameter/Equipment	Range	CMC ^{2, 4, 6} (±)	Comments
Force ³ – Measuring Equipment	(0 to 250) lbf	0.12 % + 0.6R	Deadweights
Indirect Verification of Rockwell Hardness and Rockwell Superficial Hardness Testers ³	<p>HRA: Low Mid High</p> <p>HRBW: Low Mid High</p> <p>HRC: Low Mid High</p> <p>HREW: Low Mid High</p> <p>HR15N: Low Mid High</p> <p>HR30N: Low Mid High</p>	<p>0.29 HRA 0.56 HRA 0.24 HRA</p> <p>0.94 HRBW 0.69 HRBW 0.62 HRBW</p> <p>0.78 HRC 0.92 HRC 0.39 HRC</p> <p>0.92 HREW 1.1 HREW 0.89 HREW</p> <p>0.76 HR15N 0.75 HR15N 1.0 HR15N</p> <p>0.55 HR30N 0.48 HR30N 0.46 HR30N</p>	ASTM E18



Parameter/Equipment	Range	CMC ^{2, 6} (±)	Comments
Indirect Verification of Rockwell Hardness and Rockwell Superficial Hardness Testers ³ (cont)	HR45N: Low Mid High HR15TW: Low Mid High HR30TW: Low Mid High HR45TW: Low Mid High	0.68 HR45N 0.72 HR45N 0.66 HR45N 0.79 HR15TW 0.52 HR15TW 0.61 HR15TW 0.70 HR30TW 0.61 HR30TW 0.42 HR30TW 0.98 HR45TW 0.78 HR45TW 0.81 HR45TW	ASTM E18
Mass	1 mg to 300 g (>300 to 500) g (>500 to 1000) g (>1000 to 4989) g (>4989 to 9177) g (>9177 to 11 191) g	0.0058 g 0.0071 g 0.0082 g 0.012 g 0.015 g 0.021 g	By comparison
Pressure – Measuring Equipment ³ Pneumatic	Up to 10 inH ₂ O (>10 to 200) inH ₂ O (0.5 to 30) psia (30 to 60) psia (60 to 100) psia (100 to 300) psia (300 to 600) psia (600 to 1000) psia (0.5 to 30) psig (30 to 60) psig (60 to 100) psig (100 to 300) psia (300 to 600) psig (600 to 1000) psig	0.0078 inH ₂ O 0.14 inH ₂ O 0.0042 psia 0.084 psia 0.014 psia 0.042 psia 0.083 psia 0.14 psia 0.0059 psig 0.012 psig 0.02 psig 0.059 psig 0.12 psig 0.2 psig	Ashcroft ASQ-1 DHI PPC 2

Parameter/Equipment	Range	CMC ^{2, 4, 6} (\pm)	Comments
Pressure – Measuring Equipment ³ (cont)			
Hydraulic	Up to 5000 psig (5000 to 10 000) psig	5.8 psig 12 psig	Druck DPI610
	Up to 30 000 psig	35 psig	Additel 681
Scales ³	(50 to 100) lb (100 to 750) lb	0.04 lb + 0.6R 0.09 lb + 0.6R	Class F weights
Scales/Balances ³	(1 to 162) mg 162 mg to 400 g (1 to 50) lb	0.26 mg 2.6 mg 0.0028 lb	Class S1 weights
Scales ³ – Proportional Testing	(750 to 1500) lb (1500 to 3000) lb (3000 to 4500) lb (4500 to 6000) lb	0.41 lb + 0.6R 0.81 lb + 0.6R 1.3 lb + 0.6R 1.7 lb + 0.6R	Class F weights
Tachometers ³ – Photo	Up to 100 000 rpm	0.8R	Function generator
Torque – Measuring Equipment	(0.1 to 1000) ft·lbf	0.1 % + 0.6R	Class F weights
Torque – Measure Wrenches ³	(0 to 1000) ft·lbf (0 to 1200) in·lbf	0.62 % + 0.12 ft·lbf 0.7 % + 1.1 in·lbf	Torque calibrator

IV. Thermodynamics

Parameter/Equipment	Range	CMC ^{2, 6} (\pm)	Comments
Temperature – Measuring Devices	(-30 to 139) °C (140 to 660) °C	0.081 °C 0.25 °C	Drywell and SPRT

Parameter/Equipment	Range	CMC ^{2, 6} (\pm)	Comments
Relative Humidity – Measure ³	(0 to 90) %RH	1.2 %RH	Vaisala hygrometer/probe

V. Time & Frequency

Parameter/Equipment	Range	CMC ^{2, 6} (\pm)	Comments
Frequency – Measuring Equipment	0.1 Hz to 3 GHz 10 MHz	180 pHz/Hz + 12 pHz 1 part in 10 ⁹ Hz/Hz	GPS, frequency counter Agilent Z3801A GPS receiver
Frequency – Measure ³	0.1 Hz to 3 GHz	0.22 μ Hz/Hz + 1.4 μ Hz	Frequency counter
Stop Watches and Timers	Up to 24 hr	28 ms + 0.18 ms/s	Functional generator and frequency 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 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 linear displacement in inches; R is the resolution of the unit under test; D is the linear displacement in inches; percentages are to be read as percent of reading, unless noted otherwise.

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. 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.

⁶ 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.

⁷ This scope meets A2LA's P112 *Flexible Scope Policy*.



Accredited Laboratory

A2LA has accredited

TRESCAL, INC.

Dade City, FL

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 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 7th day of February 2020.

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

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1078.02
Valid to September 30, 2021

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