



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

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CALIBRATION

Valid To: May 31, 2025

Certificate Number: 1332.01

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 to perform the following calibrations and dimensional testing<sup>1, 12</sup>:

I. Acoustical Qualities

Parameter/Equipment	Range	CMC ( $\pm$ )	Comments
Sound Level Meters	94 dB & 114 dB 1000 Hz	0.44 dB	Type 4231 sound level calibrator

II. Chemical

Parameter/Equipment	Range	CMC <sup>2, 11</sup> ( $\pm$ )	Comments
Conductivity Equipment	14 000 $\mu$ S 8400 $\mu$ S 3900 $\mu$ S	140 $\mu$ S 140 $\mu$ S 39 $\mu$ S	Conductivity solutions
pH – Measuring Equipment	(4, 7, 10) pH	0.02 pH	pH buffer solutions
Refractometers	Up to 30 % Brix (30 to 80) % Brix	0.04 % 0.06 %	Standard solutions

### III. Dimensional

Parameter/Equipment	Range	CMC <sup>2,4</sup> ( $\pm$ )	Comments
Bore Gages	Up to 8 in	$(39 + 2.5D) \mu\text{in}$	Comparison to ring Gages or gage blocks
Length Standard/Rod	(0.1 to 12) in (12.1 to 24) in (24.1 to 48) in	11 $\mu\text{in}$ 26 $\mu\text{in}$ 46 $\mu\text{in}$	Pratt & Whitney Labmaster™ comparison to gage blocks
Gage Blocks	(0.1 to 1.0) in (>1.0 to 4.0) in (>4.0 to 12) in	$(3.9 + 0.5L) \mu\text{in}$ $(4.4 + 0.5L) \mu\text{in}$ $(8.2 + 0.5L) \mu\text{in}$	Master gage block set
Calipers <sup>3</sup>	Up to 40 in	$(300 + 1L) \mu\text{in}$	Gage blocks
Micrometers <sup>3</sup>	Up to 12 in	$(51 + 1L) \mu\text{in}$	Gage blocks
Depth Micrometers <sup>3</sup>	Up to 9 in	$(31 + 1L) \mu\text{in}$	Gage blocks
Height Gages <sup>3</sup>	Up to 40 in	$(65 + 1L) \mu\text{in}$	Gage blocks
Thread Wires	Up to 80 TPI Up to 4 mm	13 $\mu\text{in}$ 0.41 $\mu\text{m}$	Pratt & Whitney Labmaster™
Thread Plugs – Major Diameter Pitch Diameter	Up to 3 in (4 to 80) TPI	$(14 + 0.9L) \mu\text{in}$ 72 $\mu\text{in}$	SIP 305M
Micrometer Heads	Up to 2 in	29 $\mu\text{in}$	Gage blocks/Indi-check
Thread Rings <sup>10</sup> – Adjustable	(0.12 to 4) in	(X) Set Plug Tolerance	Set using master plug gages. ASME/ANSI B1.2-1983 & ASME/ANSI B1.3-2007

Parameter/Equipment	Range	CMC <sup>2, 4</sup> ( $\pm$ )	Comments
Master Thread Rings	(0.12 to 8) in	(19 + 1.8L) $\mu$ in	Pratt & Whitney Labmaster <sup>TM</sup>
Indicators <sup>3</sup>	Up to 1 in	54 $\mu$ in	Micrometer head
Test Indicators <sup>3</sup>	Up to 0.1 in	47 $\mu$ in	Micrometer head
Gage Pins <sup>3</sup>	(0.001 to 1) in	14 $\mu$ in	Pratt & Whitney Labmaster <sup>TM</sup>
	(0.001 to 1) in	35 $\mu$ in	Laser micrometer
Plug Gages	(1.00 to 4) in	(14 + 0.9L) $\mu$ in	Pratt & Whitney Labmaster <sup>TM</sup>
Surface Plates <sup>3</sup> – Overall Flatness Only	(18 $\times$ 36) in <sup>2</sup> to (36 $\times$ 72) in <sup>2</sup>	(29 + DL) $\mu$ in	Electrical leveling system
Ring Gages – Classes X, Y, Z, & ZZ	Up to 1 in (1 to 5) in (5 to 10) in	(12 + 1.8L) $\mu$ in (18 + 1.8L) $\mu$ in (27 + 1.8L) $\mu$ in	Pratt & Whitney Labmaster <sup>TM</sup>
Optical Comparators <sup>3</sup>	Up to 12 in (12 to 24) in (24 to 30) in (10 to 100) x	(92 + 3L) $\mu$ in (140 + 3L) $\mu$ in (190 + 3L) $\mu$ in 180 $\mu$ in	Glass master scale, gage blocks, magnification checker
Precision Levels	Up to 18 in	40 $\mu$ in/10 in	Gage blocks, surface plate
Protractors	(0 to 180) <sup>o</sup>	0.2 <sup>o</sup>	Sine plate, gage blocks
Surface Finish – Profilometer, Ra	117 $\mu$ in	2.2 $\mu$ in	Master surface finish standard

Parameter/Equipment	Range	CMC <sup>2,4</sup> (±)	Comments
Surface Finish – Measure Profilometer & Surface Roughness	Up to 400 µin	2.2 µin	Profilometer
Spheres & Precision Balls –  Diameter	Up to 3 in	(14 + 0.5L) µin	Pratt & Whitney Labmaster™
Roundness	Up to 3 in	2.9 µin	Roundness measuring machine

#### IV. Dimensional Testing/Calibration<sup>1</sup>

Parameter/Equipment	Range	CMC <sup>2,4,11</sup> (±)	Comments
1-Dimensional Length <sup>8</sup> – Measure	Up to 6 in Up to 8 in Up to 8 in	(51 + 1L) µin (180 + 6L) µin (310 + L) µin	Digital micrometer Optical comparator Digital caliper
Angle <sup>8</sup> – Measure	(0 to 180)°	7 arc secs	Contourecord
Thickness (Feeler) Gages	Up to 1 in	27 µin	Pratt & Whitney Labmaster™
Coating Thickness Shims/Precision Shims	(0 to 20) mil	0.05 mil	Pratt & Whitney Labmaster™
3-Dimensional Length <sup>8</sup> – Measure			
X-Axis Y-Axis Z-Axis	Up to 35.4 in Up to 59 in Up to 25.6 in	(66 + 3.6L) µin (66 + 3.6L) µin (66 + 3.6L) µin	CMM
X-Axis Y-Axis Z-Axis	Up to 20 in Up to 18 in Up to 8 in	86 µin 86 µin 150 µin	Vision system

Parameter/Equipment	Range	CMC <sup>2, 4, 11</sup> (±)	Comments
3-Dimensional Length <sup>8</sup> – Measure			
X-Axis Y-Axis Z-Axis	Up to 35.4 in Up to 59 in Up to 25.6 in	(66 + 3.6L) μin (66 + 3.6L) μin (66 + 3.6L) μin	CMM
X-Axis Y-Axis Z-Axis	Up to 20 in Up to 18 in Up to 8 in	86 μin 86 μin 150 μin	Vision System
Rulers	Up to 72 in	0.08 in	Gage blocks, master tape measure
PI Tape	Up to 72 in	0.08 in	Gage blocks, master tape measure
Tape Measures	Up to 300 in	0.08 in	Gage blocks, master tape measure

#### V. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC <sup>2, 5, 6, 9</sup> (±)	Comments
DC Voltage – Measure <sup>3</sup>	(0 to 100) mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 1000) V	7 μV/V + 9.6 μV 6 μV/V + 5.3 μV 6 μV/V + 5.9 μV 8 μV/V + 100 μV 8 μV/V + 0.27 mV	HP 3458A with opt 002
	(0.1 to 1.0) kV (1.0 to 4.0) kV (4.0 to 9.0) kV	0.79 V 1.5 V 5.6 V	Vitrek 4700A
DC Voltage – Generate <sup>3</sup>	(0 to 330) mV 330 mV to 3.3 V (3.3 to 33) V (33 to 330) V (330 to 1000) V	20 μV/V + 25 μV 11 μV/V + 24 μV 12 μV/V + 210 μV 18 μV/V + 2 mV 18 μV/V + 6.3 mV	Fluke 5520A

Parameter/Equipment	Range	CMC <sup>2, 5, 6, 9</sup> (±)	Comments
DC Current – Generate <sup>3</sup>	(0 to 330) $\mu$ A 330 $\mu$ A to 3.3 mA (3.3 to 33) mA (33 to 330) mA 330 mA to 1.1 A (1.1 to 3) A (3 to 11) A (11 to 20) A	0.015 % + 0.042 $\mu$ A 0.01 % + 0.074 $\mu$ A 0.01 % + 0.63 $\mu$ A 0.01 % + 14 $\mu$ A 0.02 % + 44 $\mu$ A 0.038 % + 38 $\mu$ A 0.05 % + 1.3 mA 0.1 % + 3.8 mA	Fluke 5520A
Clamp-On	(20 to 150) A (150 to 550) A (550 to 1000) A	0.3 % + .25A 0.3 % + .31A 0.3 % + .31A	Fluke 5520A with 50 turn coil
DC Current – Measure <sup>3</sup>	(10 to 100) $\mu$ A 100 $\mu$ A to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A	20 $\mu$ A/A + 12 $\mu$ A 20 $\mu$ A/A + 9.5 $\mu$ A 20 $\mu$ A/A + 5.8 $\mu$ A 35 $\mu$ A/A + 5.8 $\mu$ A 0.011 % + 12 $\mu$ A	HP 3458A
Resistance – Measure <sup>3</sup>	Up to 10 $\Omega$ (10 to 100) $\Omega$ 100 $\Omega$ to 1 k $\Omega$ (1 to 10) k $\Omega$ (10 to 100) k $\Omega$ 100 k $\Omega$ to 1 M $\Omega$ (1 to 10) M $\Omega$ (10 to 100) M $\Omega$ 100 M $\Omega$ to 1 G $\Omega$	15 $\mu\Omega/\Omega$ + 6.4 $\mu\Omega$ 12 $\mu\Omega/\Omega$ + 12 $\mu\Omega$ 10 $\mu\Omega/\Omega$ + 100 $\mu\Omega$ 10 $\mu\Omega/\Omega$ + 0.98 m $\Omega$ 10 $\mu\Omega/\Omega$ + 1.1 m $\Omega$ 15 $\mu\Omega/\Omega$ + 1.7 $\Omega$ 50 $\mu\Omega/\Omega$ + 12 $\Omega$ 0.05 % + 11 k $\Omega$ 0.5 % + 12 k $\Omega$	HP 3458A
Resistance – Generate <sup>3</sup>	(0 to 11) $\Omega$ (11 to 33) $\Omega$ (33 to 110) $\Omega$ (110 to 330) $\Omega$ 330 $\Omega$ to 1.1 k $\Omega$ (1.1 to 3.3) k $\Omega$ (3.3 to 11) k $\Omega$ (11 to 33) k $\Omega$ (33 to 110) k $\Omega$ (110 to 330) k $\Omega$ 330 k $\Omega$ to 1.1 M $\Omega$ (1.1 to 3.3) M $\Omega$ (3.3 to 11) M $\Omega$ (11 to 33) M $\Omega$ (33 to 110) M $\Omega$ (110 to 330) M $\Omega$ 330 M $\Omega$ to 1.1 G $\Omega$	40 $\mu\Omega/\Omega$ + 0.0012 $\Omega$ 30 $\mu\Omega/\Omega$ + 0.0019 $\Omega$ 28 $\mu\Omega/\Omega$ + 0.0025 $\Omega$ 28 $\mu\Omega/\Omega$ + 0.0048 $\Omega$ 28 $\mu\Omega/\Omega$ + 0.010 $\Omega$ 28 $\mu\Omega/\Omega$ + 0.036 $\Omega$ 28 $\mu\Omega/\Omega$ + 0.086 $\Omega$ 28 $\mu\Omega/\Omega$ + 0.36 $\Omega$ 28 $\mu\Omega/\Omega$ + 0.83 $\Omega$ 32 $\mu\Omega/\Omega$ + 3.6 $\Omega$ 32 $\mu\Omega/\Omega$ + 2.4 $\Omega$ 60 $\mu\Omega/\Omega$ + 35 $\Omega$ 0.013 % + 59 $\Omega$ 0.025 % + 2.9 k $\Omega$ 0.05 % + 3.5 k $\Omega$ 0.3 % + 0.12 M $\Omega$ 1.5 % + 0.58 M $\Omega$	Fluke 5520A

Parameter/Range	Frequency	CMC <sup>2, 6, 9</sup> (±)	Comments
AC Voltage – Measure <sup>3</sup>			
(5 to 10) mV	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz	0.03 % + 4.1 μV 0.02 % + 4.1 μV 0.03 % + 4.2 μV 0.1 % + 4.5 μV 0.5 % + 5.2 μV 4 % + 7.5 μV	HP 3458A
(10 to 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	72 μV/V + 7.1 μV 72 μV/V + 7.1 μV 15 μV/V + 7.4 μV 0.03 % + 17 μV 0.08 % + 17 μV 0.3 % + 110 μV 1 % + 110 μV 1.5 % + 110 μV	
100 mV to 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	72 μV/V + 31 μV 72 μV/V + 31 μV 15 μV/V + 35 μV 0.03 % + 41 μV 0.08 % + 43 μV 0.3 % + 0.077 mV 1 % + 0.51 mV 1.5 % + 0.51 mV	
(1 to 10) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz	72 μV/V + 0.65 mV 72 μV/V + 0.54 mV 15 μV/V + 0.54 mV 0.03 % + 0.65 mV 0.08 % + 0.65 mV 0.3 % + 1.1 mV 1 % + 6 mV 1.5 % + 6 mV	
(10 to 100) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	0.02 % + 3.7 mV 0.02 % + 3.7 mV 0.02 % + 3.9 mV 0.036 % + 4.9 mV 0.12 % + 6.7 mV 0.4 % + 11 mV 1.5 % + 11 mV	
(100 to 1000) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.04 % + 120 mV 0.04 % + 120 mV 0.06 % + 120 mV 0.12 % + 120 mV 0.3 % + 120 mV	

Parameter/Range	Frequency	CMC <sup>2, 5, 6, 9</sup> (±)	Comments
AC Voltage – Measure <sup>3</sup> (cont)  (0.1 to 1.0) kV (1.0 to 4.0) kV (4.0 to 9.0) kV	(50 to 60) Hz	2.8 V 9.9 V 13 V	HP 3458A
AC Voltage – Generate <sup>3</sup>  (1 to 33) mV  (33 to 330) mV  (0.33 to 3.3) V  (3.3 to 33) V  (33 to 330) V  (330 to 1020) 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  (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  (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  (10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz  45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz  45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.08 % + 14 μV 0.015 % + 14 μV 0.02 % + 14 μV 0.1 % + 17 μV 0.35 % + 27 μV 0.8 % + 82 μV  0.05 % + 31 μV 0.015 % + 31 μV 0.016 % + 31 μV 0.035 % + 42 μV 0.08 % + 69 μV 0.2 % + 240 μV  0.03 % + 66 μV 0.015 % + 210 μV 0.019 % + 210 μV 0.03 % + 350 μV 0.07 % + 0.57 mV 0.24 % + 3 mV  0.03 % + 3.1 mV 0.015 % + 4 mV 0.024 % + 4 mV 0.035 % + 5 mV 0.09 % + 7.5 mV  0.019 % + 4.7 mV 0.02 % + 8.1 mV 0.025 % + 32 mV 0.03 % + 93 mV 0.2 % + 71 mV  0.03 % + 35 mV 0.025 % + 91 mV 0.03 % + 93 mV	Fluke 5520A



Parameter/Range	Frequency	CMC <sup>2, 5, 6, 9</sup> (±)	Comments
AC Current – Measure <sup>3</sup>			
(5 to 100) µA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 1 kHz	0.4 % + 40 nA 0.15 % + 40 nA 0.06 % + 40 nA 0.06 % + 40 nA	HP 3458A
100 µA to 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	0.4 % + 0.3 µA 0.15 % + 0.3 µA 0.06 % + 0.3 µA 0.03 % + 0.3 µA 0.06 % + 0.3 µA 0.4 % + 0.5 µA 0.55 % + 1.8 µA	
(1 to 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	0.4 % + 2.9 µA 0.15 % + 2.9 µA 0.06 % + 2.9 µA 0.03 % + 2.9 µA 0.06 % + 2.9 µA 0.4 % + 5.4 µA 0.55 % + 18 µA	
(10 to 100) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.4 % + 30 µA 0.15 % + 30 µA 0.06 % + 30 µA 0.03 % + 30 µA 0.06 % + 30 µA 0.4 % + 50 µA 0.55 % + 180 µA	
Fixed Point, 1 A	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz	0.4 % + 0.31 mA 0.16 % + 0.31 mA 0.08 % + 0.31 mA 0.1 % + 0.31 mA 0.3 % + 0.31 mA 1 % + 0.51 mA	
AC Current – Generate <sup>3</sup>			
(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	0.2 % + 0.28 µA 0.15 % + 0.28 µA 0.13 % + 0.28 µA 0.3 % + 0.32 µA 0.8 % + 0.37 µA 1.6 % + 0.54 µA	Fluke 5520A

Parameter/Range	Frequency	CMC <sup>2, 5, 9</sup> (±)	Comments
AC Current – Generate <sup>3</sup> (cont)			
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	0.2 % + 0.33 µA 0.13 % + 0.33 µA 0.1 % + 0.33 µA 0.2 % + 0.37 µA 0.5 % + 0.65 µA 1 % + 1.1 µA	Fluke 5520A
(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	0.18 % + 2.5 µA 0.09 % + 2.5 µA 0.04 % + 2.5 µA 0.08 % + 3.9 µA 0.2 % + 5.7 µA 0.4 % + 7.2 µA	
(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	0.18 % + 25 µA 0.09 % + 25 µA 0.04 % + 25 µA 0.1 % + 59 µA 0.2 % + 0.12 mA 0.4 % + 0.24 mA	Fluke 5520A with 50 turn coil
33 mA to 3 A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.18 % + 0.25 mA 0.06 % + 0.25 mA 0.6 % + 1.2 mA 2.5 % + 5.8 mA	
(3 to 11) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.06 % + 3.4 mA 0.1 % + 3.4 mA 3 % + 3.4 mA	
(11 to 21) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.12 % + 14 mA 0.15 % + 14 mA 3 % + 14 mA	
(20 to 1000) A	(45 to 440) Hz	0.3 % + 140 mA	
Capacitance – Generate <sup>3</sup>			
(0.19 to 0.4) nF (0.4 to 1.1) nF (1.1 to 3.3) nF (3.3 to 11) nF (11 to 33) nF (33 to 110) nF (110 to 330) nF	10 Hz to 10 kHz 10 Hz to 10 kHz 10 Hz to 3 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz	0.5 % + 0.03 nF 0.5 % + 0.03 nF 0.5 % + 0.03 nF 0.25 % + 0.03 nF 0.25 % + 0.13 nF 0.25 % + 0.19 nF 0.25 % + 0.56 nF	Fluke 5520A

Parameter/Range	Frequency	CMC <sup>2, 5, 7, 9</sup> (±)	Comments
Capacitance – Generate <sup>3</sup> (cont)  (0.33 to 1.1) μF (1.1 to 3.3) μF (3.3 to 11) μF (11 to 33) μF (33 to 110) μF (110 to 330) μF  330 μF to 1.1 mF (1.1 to 3.3) mF (3.3 to 11) mF (11 to 33) mF (33 to 110) mF	(10 to 600) Hz (10 to 300) Hz (10 to 150) Hz (10 to 120) Hz Up to 80 Hz Up to 50 Hz  Up to 20 Hz Up to 6 Hz Up to 2 Hz Up to 0.6 Hz Up to 0.2 Hz	0.25 % + 1.8 nF 0.25 % + 3.8 nF 0.25 % + 21 nF 0.4 % + 60 nF 0.45 % + 0.79 μF 0.45 % + 0.78 μF  0.45 % + 1.9 μF 0.45 % + 4 μF 0.45 % + 16 μF 0.75 % + 37 μF 1.1 % + 130 μF	Fluke 5520A
Inductance – Generate  Fixed Point	1 mH 50 mH 5 H	0.15 % 0.16 % 0.16 %	GR 1482-E GR 1482-K GR 1482-R
Hypot Testers  DC  AC (50 to 60 Hz)	(0.1 to 1.0) kV (1.0 to 4.0) kV (4.0 to 9.0) kV  (0.1 to 1.0) kV (1.0 to 4.0) kV (4.0 to 9.0) kV	0.79 V 1.5 V 5.6 V  2.8 V 9.9 V 13 V	Vitretek 4700A
Oscilloscopes <sup>3</sup> –  Amplitude, DC Signal: 50 Ω Load 1 MΩ Load  Amplitude, Square Wave: 50 Ω Load  1 MΩ Load	Up to 6.6 V Up to 130 V  1 mVp-p to 6.6 Vp-p 10 Hz to 10 kHz  1 mVp-p to 130 Vp-p 10 Hz to 1 kHz	0.29 % IV + 40 μV 0.058 % IV + 40 μV  0.29 % IV + 40 μV  0.12 % IV + 40 μV	Fluke 5520A

Parameter/Range	Frequency	CMC <sup>2, 5, 7</sup> (±)	Comments
Oscilloscopes <sup>3</sup> (cont) –			
Time Marker into 50 Ω Load-Source	5 s to 50 ms	29 parts in 10 <sup>6</sup> + 1000 parts in 10 <sup>6</sup> /s	Fluke 5520A
	20 ms to 2 ns	2.9 parts in 10 <sup>6</sup>	
Leveled Sine Wave Relative to 50 kHz [5 mV to 5.5 V] p-p	50 kHz to 100 MHz	2.0 %	
	(100 to 300) MHz	2.5 %	
	(300 to 600) MHz	4.7 %	
	(550 to 1100) MHz	4.3 %	
Rise Time	(1.1 to 3.2) GHz	5.3 %	
	(3.2 to 6.0) GHz	5.3 %	
	10 Hz to 2 MHz	20 ps	
	(125 to 175) ps		
	10 Hz to 1 MHz	14 ps	
	(59 to 81) ps		

Parameter/Equipment	Range	CMC <sup>2, 5</sup> (±)	Comments
Electrical Calibration of RTD Indicators & Indicating Systems <sup>3</sup> –			
Pt 385, 100 Ω	(-200 to 0) °C	0.07 °C	Fluke 5520A
	(0 to 100) °C	0.09 °C	
	(100 to 400) °C	0.12 °C	
	(400 to 630) °C	0.16 °C	
	(630 to 800) °C	0.28 °C	
Pt 3926, 100 Ω	(-200 to 0) °C	0.07 °C	
	(0 to 100) °C	0.09 °C	
	(100 to 400) °C	0.13 °C	
	(400 to 630) °C	0.16 °C	
Pt 3916, 100 Ω	(-200 to -190) °C	0.30 °C	
	(-190 to 100) °C	0.10 °C	
	(100 to 400) °C	0.12 °C	
	(400 to 600) °C	0.13 °C	
	(600 to 630) °C	0.28 °C	
Pt 385, 200 Ω	(-200 to 260) °C	0.07 °C	
	(260 to 600) °C	0.18 °C	
	(600 to 630) °C	0.20 °C	

Parameter/Equipment	Range	CMC <sup>2, 5</sup> (±)	Comments
Electrical Calibration of RTD Indicators & Indicating Systems <sup>3</sup> – (cont)			
Pt 385, 500 Ω	(-200 to 260) °C (260 to 600) °C (600 to 630) °C	0.08 °C 0.12 °C 0.13 °C	Fluke 5520A
Pt 385, 1000 Ω	(-200 to 0) °C (0 to 300) °C (300 to 600) °C (600 to 630) °C	0.05 °C 0.08 °C 0.09 °C 0.28 °C	
Ni 120, 120 Ω	(-80 to 100) °C (100 to 260) °C	0.10 °C 0.20 °C	
Cu 427, 10 Ω	(-100 to 260) °C	0.35 °C	
Electrical Calibration of Thermocouple Indicators & Indicating Systems <sup>3</sup> –			
Type B	(600 to 800) °C (800 to 1000) °C (1000 to 1550) °C (1550 to 1820) °C	0.52 °C 0.41 °C 0.36 °C 0.40 °C	Fluke 5520A
Type E	(-250 to -100) °C (-100 to 650) °C (650 to 1000) °C	0.59 °C 0.20 °C 0.26 °C	
Type J	(-210 to -100) °C (-100 to 760) °C (760 to 1200) °C	0.33 °C 0.21 °C 0.28 °C	
Type K	(-200 to -100) °C (-100 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.40 °C 0.22 °C 0.32 °C 0.48 °C	
Type N	(-200 to -100) °C (-100 to -25) °C (-25 to 410) °C (410 to 1300) °C	0.48 °C 0.27 °C 0.24 °C 0.33 °C	

Parameter/Equipment	Range	CMC <sup>2, 5</sup> (±)	Comments
Electrical Calibration of Thermocouple Indicators & Indicating Systems <sup>3</sup> – (cont)			
Type R	(0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C	0.67 °C 0.42 °C 0.40 °C 0.48 °C	Fluke 5520A
Type S	(0 to 250) °C (250 to 1400) °C (1400 to 1767) °C	0.56 °C 0.45 °C 0.48 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.74 °C 0.28 °C 0.20 °C 0.18 °C	

#### VI. Fluid Quantities

Parameter/Equipment	Range	CMC <sup>2, 7, 11</sup> (±)	Comments
Flow – Air – Measure & Measuring Equipment	0.025 SCCM to 250 SLPM	1.8 %	Standard flow meters
Air Velocity – Anemometers	Up to 16 m/s	1.9 %	Velocity comparison

#### VII. Magnetic Quantities

Parameter/Equipment	Range	CMC <sup>2, 7, 11</sup> (±)	Comments
DC – Gauss <sup>3</sup> – Measuring Equipment	5 G 10 G 20 G	5.6 %	Direct comparison to Gauss standards

VIII. Mechanical

Parameter/Equipment	Range	CMC <sup>2,7</sup> (±)	Comments
Accelerometer	(10 to 99) Hz 100 Hz (101 to 920) Hz (921 to 5000) Hz (5001 to 10 000) Hz	3 % 3 % 3 % 3 % 3 %	Dual-mode amplifier
Indirect Verification of Rockwell Hardness Testers <sup>3</sup>	HRBW: Low Medium High  HRC: Low Medium High  HR15N: Low Medium High  HR30N: Low Medium High  HR15TW: Low Medium High  HR30TW: Low Medium High  HREW: Low Medium High	1 HRBW 0.7 HRBW 0.6 HRBW  0.4 HRC 0.3 HRC 0.4 HRC  0.6 HR15N 0.6 HR15N 0.3 HR15N  0.5 HR30N 0.6 HR30N 0.4 HR30N  0.5 HR15TW 0.5 HR15TW 0.4 HR15TW  0.5 HR30TW 0.6 HR30TW 0.5 HR30TW  1.0 HREW 1.0 HREW 1.0 HREW	ASTM E18
Indirect Verification of Brinell Hardness Testers at Test Conditions  10/3000/15	(100 to 199) HBW	6.6 HBW	Indirect comparison with test blocks to ASTM E92

Parameter/Equipment	Range	CMC <sup>2,7,11</sup> (±)	Comments
Indirect Verification of Micro Indentation Hardness Testers <sup>3</sup> –  Knoop  Vickers	(250 to 600) HK (600 to 800) HK  (250 to 600) HV (600 to 800) HV	12 HK 27 HK  8.4 HV 26 HV	Indirect comparison with test blocks to ASTM E92
Torque Wrenches <sup>3</sup>	(4 to 1000) lbf·in (20 to 600) lbf·ft	0.5 % 0.5 %	CDI Suretest 5000-ST
Torque Wrenches	(100 to 2000) lbf·ft	0.59 %	CDI Computest
Torque Transducer	0.5 ozf·in to 2000 lbf·ft	0.092 %	Arm & weights
Force – Compression <sup>3</sup> – Measure & Measuring Equipment	Up to 50 000 lbf (50 to 200) klf	0.48 % 0.52 %	Load cells
Pneumatic Gage Pressure <sup>3</sup> – Measuring Equipment	(10 to 1000) psi  (-12 to 300) psig (300 to 3000) psig (3000 to 10 000) psig	0.05 %  0.075 % 0.24 % 0.35 %	Deadweight pneumatic  Fluke pressure calibrator
Scales <sup>3</sup>	(1 to 500) mg 500 mg to 100 g (100 to 500) g (1 to 70) lb 453.592 g to 71.752 kg  (70 to 600) lb (71.752 to 272.155) kg	0.022 mg 0.32 mg 8.6 mg 0.24 lb 110 mg  0.97 lb 440 mg	Weights
Mass – Measuring Equipment	500 mg to 100 g (100 to 210) g	0.68 mg 0.97 mg	Electronic balance / ASTM Class 1 mass pieces



## IX. Optical Quantities

Parameter/Equipment	Range	CMC <sup>7,11</sup> (±)	Comments
Luminance – Measuring Equipment	5.00 FL 20.0 FL 200.0 FL 2000.0 FL	5.0 % 4.3 % 3.9 % 4.3 %	Luminance/radiance standard

## X. Thermodynamics

Parameter/Equipment	Range	CMC <sup>2,7,11</sup> (±)	Comments
Humidity <sup>3</sup> – Measure & Measuring Equipment	(10 to 90) % RH (90 to 95) % RH	1.4 % 2.0 %	Temperature/ humidity standard
Temperature – Measure <sup>3</sup> (Freezers, Refrigerators, Incubators, Ovens, Environmental Chambers, & Furnaces)	(0 to 1200) °C (-200 to 0) °C	1.4 °C 1.5 °C	Fluke 725/ thermocouples
Infrared Thermometer <sup>3</sup>	(122 to 289) °F (290 to 591) °F (592 to 932) °F	1.1 °F 5.1 °F 9.9 °F	Fluke 9132
Temperature <sup>3</sup> – Measure Drywell	(0 to 300) °C (300 to 660) °C	0.067 °C 0.31 °C	Fluke 5627A PRT Fluke 5609 PRT
Temperature <sup>3</sup> – Measuring Equipment (Thermometers, Thermocouples, Temperature Probes)	(-45 to 140) °C (50 to 425) °C (425 to 660) °C (0 to 660) °C	0.17 °C 0.26 °C 0.77 °C 0.37 °C	Fluke 9170 drywell Fluke 9173 drywell Fluke 9173 drywell Fluke 5609 PRT, thermal bath

## XI. Time & Frequency

Parameter/Equipment	Range	CMC <sup>2, 7, 11</sup> ( $\pm$ )	Comments
Frequency – Measuring Equipment <sup>3</sup> (Time Base)	10 Hz to 3 GHz	2.3 $\mu$ Hz/Hz	Fluke PM6690
Non-Contact (Photo) Tachometers	(0.01 to 100 000) RPM	0.02 %	Fluke 5520A, LED
Stopwatches/Timers <sup>3</sup>	Up to 24 hrs	0.6 sec	Certified stopwatch

<sup>1</sup> This laboratory offers commercial dimensional testing/calibration service and field calibration service.

<sup>2</sup> 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.

<sup>3</sup> Field calibration service is available for this calibration. Please note the actual measurement uncertainties achievable on a customer's site can normally be expected to be larger than the CMC found on the A2LA Scope. Allowance must be made for aspects such as the environment at the place of calibration and for other possible adverse effects such as those caused by transportation of the calibration equipment. The usual allowance for the actual uncertainty introduced by the item being calibrated, (e.g. resolution) must also be considered and this, on its own, could result in the actual measurement uncertainty achievable on a customer's site being larger than the CMC.

<sup>4</sup> In the statement of CMC,  $L$  is the numerical value of the nominal length of the device measured in inches;  $R$  is the numerical value of the resolution of the device in microinches or micrograms, FS is full scale, and  $DL$  is the Diagonal Length of the plate in inches.

<sup>5</sup> Based on using the standard at the temperature the Fluke 5520A was calibrated (tcal) within  $\pm 5$  °C and assuming the instrument is zeroed at least every seven days or when ambient temperature changes more than 5 °C. For resistance, a zero calibration is performed at least every 12 hours within  $\pm 1$  °C of use. For AC Current, best uncertainties are determined with LCOMP Off. The CMC is based upon 1-year specifications and using the standard at ambient temperature that is within  $\pm 5$  °C of tcal.

<sup>6</sup> Based on using the standard at the temperature the HP 3458A was calibrated (tcal) within  $\pm 5$  °C and an auto-calibration (ACAL) was performed within the previous 24 hours ( $\pm 1$  °C of ambient temperature). The CMC is based upon 1-year specification and using the standard at ambient temperature that is within  $\pm 5$  °C of tcal.

<sup>7</sup> In the statement of CMC, percentage (%) refers to percent of reading, unless otherwise noted.

<sup>8</sup> This laboratory meets R205 – *Specific Requirements: Calibration Laboratory Accreditation Program* for the types of dimensional tests listed above and is considered equivalent to that of a calibration.

- <sup>9</sup> 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 are expressed as either a specific value that covers the full range or as a fraction/percent of the reading plus a fixed floor specification.
- <sup>10</sup> Adjustable thread rings are set to applicable specifications using calibrated master set plug gages.
- <sup>11</sup> 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.
- <sup>12</sup> This scope meets A2LA's *P112 Flexible Scope Policy*.



## Accredited Laboratory

A2LA has accredited

### INCAL TECHNOLOGIES, INC.

Saginaw, MI

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 18<sup>th</sup> day of July 2023.

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

Mr. Trace McInturff Vice President, Accreditation Services  
For the Accreditation Council  
Certificate Number 1332.01  
Valid to May 31, 2025  
Revised August 29, 2024

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