



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017
ANSI/NCSL Z540-1-1994 & ANSI/NCSL Z540.3-2006

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CALIBRATION

Valid To: February 28, 2026

Certificate Number: 1346.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations^{1, 9}:

I. Dimensional

Parameter/Equipment	Range	CMC ² (±)	Comments
Angle ³ – Measure & Measuring Equipment	Up to 90°	6.5 arc-sec	Sine bar/plate w/ gage blocks
Bore Gages – Bore Micrometer, Bore Indicators, Air Gage Systems	(0.4 to 6.0) in	40 µin + 11 µin/in	Plain cylindrical ring gages
Gage Blocks	Up to 0.05 in (0.05 to 20)	2.4 µin 2.4 µin + 1.5 µin/in	Gage blocks, gage block comparator
Height Master	Up to 24 in	18 µin + 1.2 µin/in	Gage blocks w/ electronic amplifier
Length Standards – Micrometer, Gaging Fixtures-Single Axis, Others	Up to 12 in (> 12 to 48) in	28 µin + 0.62 µin/in 38 µin + 1.2 µin/in	Gage blocks, UMM Surface plate w/ indicating gage

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
Optical Comparators ³ – Linear Travel Magnification Angle	Up to 12 in 10x, 20x, 31.25x, 50x Angle	15 µin + 5 µin/in 0.014 % 5.7 arc-sec	Glass scales, magnification scale, master balls
Hand Tools ^{3, 7} – Micrometers: Spindle Linearity Parallelism Anvil Flatness Indicators Depth Gages Height Gages Calipers: Outside Diameter Inside Diameter Step & Depth	Up to 72 in 50 µin Up to 1 in Up to 6 in Up to 72 in Up to 72 in Up to 120 in (1 to 6) in Up to 72 in	7.6 µin + 7.5 µin/in 8 µin 7.5 µin 9 µin + 6.3 µin/in 22 µin + 7.4 µin/in 25 µin + 7.3 µin/in 12 µin + 7.5 µin/in 42 µin + 13 µin/in 12 µin + 7.5 µin/in	Gage blocks, surface plate
Diameter – External – Plug, Pin Gages Internal – Cylindrical Rings, Ring Gages External – Plug, Pin Gages, Thread Wires Internal – Cylindrical Rings, Ring Gages	Up to 10 in Up to 12.1 in	35 µin + 1.5 µin 46 µin + 1.3 µin/in 4.6 µin + 3.9 µin/in 7.4 µin + 3.7 µin/in	P&W C-250 SuperMic, gage blocks P&W Labmaster, gage blocks
Thread Plugs – Simple Pitch Diameter Major Diameter	Up to 10 in, (2.5 to 80) TPI Up to 10 in	88 µin + 4.6 µin/in 35 µin + 2.8 µin/in	Supermic, thread wires, gage blocks Supermic, gage blocks

Parameter/Equipment	Range	CMC ^{2, 6} ($\pm$)	Comments
Thread Rings (Adjustable)	Up to 4 in	Class W (Master Set Plug Tolerance)	Class W thread setting plugs
NPT Plugs –			
Simple Pitch Diameter	Up to 10 in	92 μin + 1.8 $\mu\text{in/in}$	UMM, thread wires, sine block
Step	Up to 1 in	35 μin	Gage amplifier
NPT Rings –			
Pitch Diameter (Standoff)	Up to 3 in	250 μin	NPT master plugs
Thickness	Up to 10 in	33 μin + 2.4 $\mu\text{in/in}$	UMM, gage blocks
Length – Measure			
1D	Up to 7 in	360 μin	Optical comparator
2D	Up to 7 in x 4 in	460 μin	
Super Micrometer			
Linearity	Up to 20 in	10 μin + 1.6 $\mu\text{in/in}$	Master gage blocks
Anvil Flatness	50 μin	7.4 μin	Optical flat
Parallelism	50 μin	8 μin	Gage blocks
Force	Up to 50 oz	0.24 oz	Digital force gage

II. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2, 5} ($\pm$)	Comments
DC Voltage ^{3, 7} – Measure	Up to 100 mV (0.1 to 1) V (1 to 10) V (10 to 100) V (100 to 1000) V (1 to 10) kV	0.33 μV + 17 nV/mV 0.52 μV + 8 $\mu\text{V/V}$ 8.8 μV + 8.1 $\mu\text{V/V}$ 35 μV + 10 $\mu\text{V/V}$ 0.2 mV + 12 $\mu\text{V/V}$ 3.2 V + 0.16 V/kV	Agilent 3458A Voltage divider w/ multimeter

Parameter/Equipment	Range	CMC ^{2, 4, 5} ($\pm$)	Comments
DC Voltage ^{3, 7} – Generate	(0 to 220) mV (0.22 to 2.2) V (2.2 to 11) V (11 to 22) V (22 to 220) V (220 to 1100) V	0.49 μ V + 7.2 nV/mV 0.8 μ V + 5 μ V/V 2.9 μ V + 3.5 μ V/V 4.3 μ V + 3.5 μ V/V 43 μ V + 5 μ V/V 0.42 mV + 6.5 μ V/V	Fluke 5720A w/ 5725A
DC Current ^{3, 7} – Generate	Up to 220 μ A (0.22 to 2.2) mA (2.2 to 22) mA (22 to 220) mA (0.22 to 2.2) A (2.2 to 11) A	6 nA + 40 pA/ μ A 7.1 nA + 35 nA/mA 41 nA + 35 nA/mA 0.73 μ A + 50 nA/mA 12 μ A + 0.13 mA/A 0.49 mA + 0.36 mA/A	Fluke 5720A w/5725A
Clamp-On Only ³	(11 to 20.5) A (10 to 16.5) A (16.5 to 150) A (150 to 1025) A	9.4 mA + 0.8 mA/A 50 mA + 6.5 mA/A 0.18 A + 3.4 mA/A 0.83 A + 3.3 mA/A	Fluke 5522A Fluke 5522A w/ coil
DC Current ^{3, 7} – Measure	(0 to 100) nA (0.1 to 1) μ A (0.1 to 10) μ A (0.1 to 100) μ A (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A (1 to 10) A (10 to 100) A (100 to 300) A	41 pA + 89 fA/nA 41 pA + 28 pA/ μ A 0.4 nA + 24 pA/ μ A 0.82 nA + 22 pA/ μ A 5.8 nA + 24 nA/mA 53 nA + 21 nA/mA 0.53 μ A + 37 nA/mA 10 μ A + 0.11 mA/A 0.004 % 0.0065 % 0.0052 %	Agilent 3458A Guildline 9211A, Agilent 3458A
DC Resistance ^{3, 7} – Generate, Fixed Points	0 Ω 1 Ω 1.9 Ω 10 Ω 19 Ω 100 Ω 190 Ω 1 k Ω 1.9 k Ω 10 k Ω 19 k Ω 100 k Ω 190 k Ω 1 M Ω 1.9 M Ω 10 M Ω	50 $\mu\Omega$ 95 $\mu\Omega$ 0.18 m Ω 0.24 m Ω 0.44 m Ω 1 m Ω 1.9 m Ω 8.5 m Ω 16 m Ω 85 m Ω 0.16 Ω 1.1 Ω 2.1 Ω 20 Ω 40 Ω 0.4 k Ω	Fluke 5720A

Parameter/Equipment	Range	CMC ^{2, 4, 5} ($\pm$)	Comments
DC Resistance ^{3, 7} – Generate, Fixed Points (cont)	19 M Ω 100 M Ω (1 to 10) M Ω (10 to 100) M Ω 100 M Ω to 1 G Ω (1 to 10) G Ω (10 to 100) G Ω	0.89 k Ω 10 k Ω 38 Ω + 48 $\mu\Omega/\Omega$ 0.75 k Ω + 0.1 m Ω/Ω 16 k Ω + 0.32 m Ω/Ω 0.84 M Ω + 2.8 m Ω/Ω 26 M Ω + 4 m Ω/Ω	Fluke 5720A IET HRRS-B-5-1M
Resistance ^{3, 7} – Generate	(0 to 10.9999) Ω (11 to 32.9999) Ω (33 to 109.9999) Ω (110 to 329.9999) Ω (0.33 to 1.099 999) k Ω (1.1 to 3.299 999) k Ω (3.3 to 10.999 99) k Ω (11 to 32.999 99) k Ω (33 to 109.999) k Ω (110 to 329.999) k Ω (0.33 to 1.099 99) M Ω (1.1 to 3.299 00) M Ω (3.3 to 10.9999) M Ω (11 to 32.9999) M Ω (33 to 109.9999) M Ω (110 to 329.9999) M Ω (330 to 1100) M Ω	1.2 m Ω + 24 $\mu\Omega/\Omega$ 1.5 m Ω + 24 $\mu\Omega/\Omega$ 1.9 m Ω + 22 $\mu\Omega/\Omega$ 4.1 m Ω + 22 $\mu\Omega/\Omega$ 9.1 m Ω + 22 $\mu\Omega/\Omega$ 41 m Ω + 22 $\mu\Omega/\Omega$ 92 m Ω + 22 $\mu\Omega/\Omega$ 0.41 Ω + 22 $\mu\Omega/\Omega$ 0.9 Ω + 22 $\mu\Omega/\Omega$ 8.4 Ω + 26 $\mu\Omega/\Omega$ 14 Ω + 26 $\mu\Omega/\Omega$ 93 Ω + 48 $\mu\Omega/\Omega$ 0.4 k Ω + 0.1 m Ω/Ω 4.4 k Ω + 0.2 m Ω/Ω 16 k Ω + 0.4 m Ω/Ω 0.35 M Ω + 2.4 m Ω/Ω 4.4 M Ω + 12 m Ω/Ω	Fluke 5522A
Resistance ^{3, 7} – Measure	(0 to 10) Ω (10 to 100) Ω (0.1 to 1) k Ω (1 to 10) k Ω (10 to 100) k Ω (0.1 to 1) M Ω (1 to 10) M Ω (10 to 100) M Ω (0.1 to 1) G Ω 10 k Ω 1 k Ω 100 Ω 10 Ω 1 Ω 100 m Ω 10 m Ω 1 m Ω 333 $\mu\Omega$	55 $\mu\Omega$ + 15 $\mu\Omega/\Omega$ 0.52 m Ω + 13 $\mu\Omega/\Omega$ 0.53 m Ω + 10 $\mu\Omega/\Omega$ 5.3 m Ω + 10 $\mu\Omega/\Omega$ 53 m Ω + 11 $\mu\Omega/\Omega$ 2.3 Ω + 17 $\mu\Omega/\Omega$ 0.1 k Ω + 55 $\mu\Omega/\Omega$ 1 k Ω + 0.52 m Ω/Ω 10 k Ω + 5.1 m Ω/Ω 0.0027 % 0.0027 % 0.0027 % 0.0027 % 0.0033 % 0.0052 % 0.0042 % 0.0049 % 0.0049 %	Agilent 3458A Current transfer method using 9211A standard shunt and 3458A

Parameter/Range	Frequency	CMC ^{2, 5} ($\pm$)	Comments
AC Voltage ³ – Generate			
Up to 2.2 mV	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	4 μ V + 0.24 μ V/mV 4 μ V + 90 nV/mV 4 μ V + 80 nV/mV 4 μ V + 0.2 μ V/mV 5 μ V + 0.5 μ V/mV 10 μ V + 1.1 μ V/mV 20 μ V + 1.4 μ V/mV 20 μ V + 2.7 μ V/mV	Fluke 5720A
(2.2 to 22) mV	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	4.6 μ V + 0.24 μ V/mV 4.2 μ V + 90 nV/mV 4.2 μ V + 80 nV/mV 4.5 μ V + 0.2 μ V/mV 6.2 μ V + 0.5 μ V/mV 12 μ V + 1.1 μ V/mV 23 μ V + 1.4 μ V/mV 26 μ V + 2.7 μ V/mV	
(22 to 220) mV	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	18 μ V + 0.24 μ V/mV 9.1 μ V + 90 nV/mV 8.9 μ V + 80 nV/mV 12 μ V + 0.2 μ V/mV 16 μ V + 0.46 μ V/mV 31 μ V + 0.9 μ V/mV 52 μ V + 1.4 μ V/mV 83 μ V + 2.7 μ V/mV	
220 mV to 2.2 V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	94 μ V + 0.24 mV/V 36 μ V + 89 μ V/V 19 μ V + 45 μ V/V 27 μ V + 75 μ V/V 55 μ V + 0.1 mV/V 0.17 mV + 0.42 mV/V 0.58 mV + 0.94 mV/V 0.68 mV + 1.7 mV/V	
(2.2 to 22) V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.94 mV + 0.24 mV/V 0.36 mV + 90 μ V/V 0.16 mV + 45 μ V/V 0.27 mV + 75 μ V/V 0.43 mV + 0.1 mV/V 1.2 mV + 0.28 mV/V 4.2 mV + 1 mV/V 6.6 mV + 1.5 mV/V	

Parameter/Range	Frequency	CMC ^{2, 5} ($\pm$)	Comments
AC Voltage ³ – Generate (cont)			
(22 to 220) V*	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	9.4 mV + 0.24 mV/V 3.6 mV + 90 μ V/V 1.8 mV + 52 μ V/V 3.6 mV + 77 μ V/V 6.3 mV + 0.15 mV/V 36 mV + 0.9 mV/V 0.14 V + 4.4 mV/V 0.26 V + 8 mV/V	Fluke 5720A * 220 V range subject to 2.2E7 V- Hz limitation
(220 to 1100) V	40 Hz to 1 kHz (1 to 20) kHz (20 to 30) kHz	24 mV + 90 μ V/V 43 mV + 0.17 mV/V 0.15 V + 0.6 mV/V	w/5725A
(220 to 750) V	(30 to 50) kHz (50 to 100) kHz	0.15 V + 0.6 mV/V 0.56 V + 2.3 mV/V	
AC Voltage ^{3, 7} – Measure			
(0.1 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	6.1 μ V + 0.3 μ V/mV 4.1 μ V + 0.2 μ V/mV 4.2 μ V + 0.3 μ V/mV 4.9 μ V + 1 μ V/mV 8.9 μ V + 5 μ V/mV 45 μ V + 40 μ V/mV	Agilent 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 (0.3 to 1) MHz (1 to 2) MHz	12 μ V + 70 nV/mV 2.7 μ V + 70 nV/mV 11 μ V + 0.14 μ V/mV 12 μ V + 0.3 μ V/mV 17 μ V + 0.8 μ V/mV 47 μ V + 3 μ V/mV 0.12 mV + 10 μ V/mV 3.8 mV + 15 μ V/mV	
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 (0.3 to 1) MHz (1 to 2) MHz	0.12 mV + 70 μ V/V 0.1 mV + 70 μ V/V 0.11 mV + 0.14 mV/V 0.12 mV + 0.3 mV/V 0.17mV + 0.8 mV/V 0.47 mV + 3 mV/V 1.2 mV + 10 mV/V 38 mV + 15 mV/V	
(1 to 10) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz	1.2 mV + 70 μ V/V 1 mV + 70 μ V/V 1.1 mV + 0.14 mV/V 1.2 mV + 0.3 mV/V	

Parameter/Range	Frequency	CMC ^{2, 5} ($\pm$)	Comments
AC Voltage ^{3, 7} – Measure (cont)			
(1 to 10) V	(50 to 100) kHz (100 to 300) kHz (0.3 to 1) MHz (1 to 2) MHz	1.7 mV + 0.8 mV/V 4.7 mV + 3 mV/V 12 mV + 10 mV/V 0.38 V + 15 mV/V	Agilent 3458A
(10 to 100) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (0.3 to 1) MHz	13 mV + 0.2 mV/V 11 mV + 0.2 mV/V 11 mV + 0.2 mV/V 13 mV + 0.35 mV/V 21 mV + 1.2 mV/V 57 mV + 4 mV/V 0.17 V + 15 mV/V	
(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	99 mV + 0.4 mV/V 85 mV + 0.4 mV/V 99 mV + 0.6 mV/V 0.14 V + 1.2 mV/V 0.26 V + 3 mV/V	
(1 to 10) kV	50, 60, & 400 Hz	9.6 V + 0.8 V/kV	Voltage divider w/ multimeter
AC Current ³ – Generate			
Up to 220 μ A	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz	63 nA + 0.14 nA/ μ A 12 nA + 0.14 nA/ μ A 9.3 nA + 0.14 nA/ μ A 15 nA + 0.14 nA/ μ A	Fluke 5720A w/5725A
(29 to 329.99) μ A	(5 to 10) kHz (10 to 30) kHz	77 nA + 0.14 nA/ μ A 0.69 μ A + 13 nA/ μ A	Fluke 5522A
(0.22 to 2.2) mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	97 nA + 0.25 μ A/mA 72 nA + 0.16 μ A/mA 62 nA + 0.12 μ A/mA 0.16 μ A + 0.2 μ A/mA 0.9 μ A + 1.1 μ A/mA	Fluke 5720A w/5725A
(0.33 to 3.2999) mA	(10 to 30) kHz	3.3 μ A + 8 μ A/mA	Fluke 5522A
(2.2 to 22) mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.96 μ A + 0.25 μ A/mA 0.73 μ A + 0.16 μ A/mA 0.62 μ A + 0.12 μ A/mA 1 μ A + 0.2 μ A/mA 7.4 μ A + 1.1 μ A/mA	Fluke 5720A w/5725A
(3.3 to 32.999) mA	(10 to 30) kHz	14 μ A + 3.2 μ A/mA	Fluke 5522A

Parameter/Range	Frequency	CMC ^{2, 5} (±)	Comments
AC Current ³ – Generate (cont)			
(22 to 220) mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	9.7 µA + 0.25 µA/mA 7.2 µA + 0.16 µA/mA 5.2 µA + 0.12 µA/mA 8 µA + 0.2 µA/mA 34 µA + 1.1 µA/mA	Fluke 5720A w/ 5725A
(33 to 329.99) mA	(10 to 30) kHz	0.27 mA + 3.2 µA/mA	Fluke 5522A
(0.22 to 2.2) A	20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	93 µA + 0.26 mA/A 0.18 mA + 0.45 mA/A 1.7 mA + 7 mA/A	Fluke 5720A
(2.2 to 11) A	40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	1.2 mA + 0.46 mA/A 2.5 mA + 0.95 mA/A 8.7 mA + 3.6 mA/A	Fluke 5720A w/ 5725A
(11 to 20.5) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	15 mA + 0.96 mA/A 17 mA + 1.2 mA/A 0.27 A + 24 mA/A	Fluke 5522A
Clamp-On Only ³			
Toroidal (10 to 16.5) A (16.5 to 150) A (150 to 1025) A	(45 to 65) Hz	26 mA + 2.1 mA/A 50 mA + 1.9 mA/A 0.34 A + 1.9 mA/A	Fluke 5522A w/ coil
(10 to 16.5) A (16.5 to 150) A (150 to 1025) A	(65 to 440) Hz	60 mA + 6 mA/A 0.11 A + 5.3 mA/A 0.86 A + 5.3 mA/A	
Non-Toroidal (10 to 16.5) A (16.5 to 150) A (150 to 1025) A	(45 to 65) Hz	60 mA + 3.8 mA/A 0.23 A + 3.7 mA/A 1.2 A + 3.7 mA/A	
(10 to 16.5) A (16.5 to 150) A (150 to 1025) A	(65 to 440) Hz	90 mA + 7.2 mA/A 0.28 A + 6.7 mA/A 1.6 A + 6.7 mA/A	

Parameter/Range	Frequency	CMC ^{2, 5} ($\pm$)	Comments
AC Current – Measure ^{3, 7}			
(5 to 100) μ A	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz	57 nA + 4 nA/ μ A 45 nA + 1.5 nA/ μ A 41 nA + 0.64 nA/ μ A	Agilent 3458A
(0.05 to 1) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.43 μ A + 4.1 μ A/mA 0.31 μ A + 1.6 μ A/mA 0.26 μ A + 0.67 μ A/mA 0.25 μ A + 0.37 μ A/mA 0.26 μ A + 0.67 μ A/mA 0.63 μ A + 4.1 μ A/mA 1.8 μ A + 5.6 μ A/mA	
(0.05 to 10) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz	2.4 μ A + 4.1 μ A/mA 2.3 μ A + 1.6 μ A/mA 2.3 μ A + 0.67 μ A/mA 2.3 μ A + 0.37 μ A/mA 2.3 μ A + 0.67 μ A/mA 4.5 μ A + 4.1 μ A/mA 16 μ A + 5.6 μ A/mA	
(5 to 100) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz	42 μ A + 4.1 μ A/mA 30 μ A + 1.6 μ A/mA 25 μ A + 0.6 μ A/mA 24 μ A + 0.37 μ A/mA 25 μ A + 0.6 μ A/mA 62 μ A + 4 μ A/mA 0.18 mA + 5.5 μ A/mA	
(0.05 to 1) A	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz (5 to 20) kHz (20 to 50) kHz	0.42 mA + 4.1 mA/A 0.3 mA + 1.7 mA/A 0.26 mA + 0.9 mA/A 0.27 mA + 1.1 mA/A 0.38 mA + 3.1 mA/A 0.92 mA + 10 mA/A	

Parameter/Range	Frequency	CMC ^{2, 5} (±)	Comments
Capacitance ³ – Generate			
(0.19 to 0.3999) nF	10 Hz to 10 kHz	8.8 pF + 4 pF/nF	Fluke 5522A
(0.4 to 1.0999) nF	10 Hz to 10 kHz	9.7 pF + 4 pF/nF	
(1.1 to 3.299) nF	10 Hz to 3 kHz	13 pF + 4 pF/nF	
(3.3 to 10.999) nF	(10 to 1000) Hz	15 pF + 2 pF/nF	
(11 to 32.9999) nF	(10 to 1000) Hz	0.1 nF + 2 pF/nF	
(33 to 109.999) nF	(10 to 1000) Hz	0.15 nF + 2 pF/nF	
(110 to 329.99) nF	(10 to 1000) Hz	0.46 nF + 2 pF/nF	
(0.33 to 1.0999) µF	(10 to 600) Hz	1.5 nF + 2 nF/µF	
(1.1 to 3.2999) µF	(10 to 300) Hz	4.6 nF + 2 nF/µF	
(3.3 to 10.999) µF	(10 to 150) Hz	15 nF + 2 nF/µF	
(11 to 32.999) µF	(10 to 120) Hz	59 nF + 3.2 nF/µF	
(33 to 109.99) µF	(10 to 80) Hz	0.2 µF + 3.6 nF/µF	
(110 to 329.99) µF	Up to 50 Hz	0.64 µF + 3.6 nF/µF	
(0.33 to 1.0999) mF	Up to 20 Hz	2 µF + 3.6 µF/mF	
(1.1 to 3.2999) mF	Up to 6 Hz	7 µF + 3.5 µF/mF	
(3.3 to 10.999) mF	Up to 2 Hz	38 µF + 2.6 µF/mF	
(11 to 32.999) mF	Up to 0.6 Hz	90 µF + 6 µF/mF	
(33 to 110) mF	Up to 0.2 Hz	0.37 mF + 8.8 µF/mF	

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Calibration of RTD Indicators ³ –			
Pt 385, 100 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C (630 to 800) °C	0.042 °C 0.041 °C 0.057 °C 0.073 °C 0.081 °C 0.097 °C 0.19 °C	Fluke 5522A
Pt 3926, 100 Ω	(-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C	0.041 °C 0.057 °C 0.073 °C 0.081 °C 0.097 °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 (600 to 630) °C	0.2 °C 0.033 °C 0.042 °C 0.049 °C 0.057 °C 0.065 °C 0.073 °C 0.09 °C 0.19 °C	
Pt 385, 200 Ω	(-200 to -80) °C (-80 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.034 °C 0.033 °C 0.042 °C 0.097 °C 0.11 °C 0.11 °C 0.13 °C	
Pt 385, 500 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 400) °C (400 to 600) °C (600 to 630) °C	0.034 °C 0.042 °C 0.041 °C 0.05 °C 0.065 °C 0.073 °C 0.089 °C	
Pt 385, 1000 Ω	(-200 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 600) °C (600 to 630) °C	0.026 °C 0.033 °C 0.042 °C 0.049 °C 0.057 °C 0.19 °C	

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Calibration of RTD Indicators ³ – (cont)			
PtNi 385, 120 Ω	(-80 to 0) °C (0 to 100) °C (100 to 260) °C	0.066 °C 0.066 °C 0.11 °C	Fluke 5522A
Cu 427, 10 Ω	(-100 to 260) °C	0.24 °C	
Electrical Calibration of Thermocouples & Indicators ³ –			
Type B	(600 to 800) °C (800 to 1000) °C (1000 to 1550) °C (1550 to 1820) °C	0.35 °C 0.27 °C 0.24 °C 0.26 °C	Fluke 5522A
Type C	(0 to 150) °C (150 to 650) °C (650 to 1000) °C (1000 to 1800) °C (1800 to 2316) °C	0.24 °C 0.21 °C 0.25 °C 0.4 °C 0.67 °C	
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.4 °C 0.13 °C 0.11 °C 0.13 °C 0.17 °C	
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.22 °C 0.13 °C 0.11 °C 0.14 °C 0.18 °C	
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.27 °C 0.14 °C 0.13 °C 0.21 °C 0.32 °C	
Type N	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 410) °C (410 to 1300) °C	0.32 °C 0.18 °C 0.15 °C 0.15 °C 0.22 °C	

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
Electrical Calibration of Thermocouples & Indicators ³ – (cont)			
Type R	(0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C	0.46 °C 0.28 °C 0.27 °C 0.33 °C	Fluke 5522A
Type S	(0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1767) °C	0.38 °C 0.29 °C 0.3 °C 0.37 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.51 °C 0.21 °C 0.15 °C 0.13 °C	
Type U	(-200 to 0) °C (0 to 600) °C	0.45 °C 0.22 °C	
Oscilloscopes ³ –			
DC Signal 50 Ω 1 MΩ	(0 to ± 6.6) V (0 to ± 130) V	33 μV + 2 mV/V 33 μV + 0.39 mV/V	Fluke 5522A/SC1100
Squarewave Signal 50 Ω	1 mV _{p-p} to 6.6 V _{p-p} 10 Hz to 10 kHz	91 μV + 4.4 mV/V	
1 MΩ	1 mV _{p-p} to 130 V _{p-p} 10 Hz to 1 kHz (1 to 10) kHz	0.2 mV + 0.8 mV/V 0.24 mV + 2 mV/V	
Leveled Sine Wave Amplitude –	50 kHz reference	0.33 mV + 17 mV/V	
Range: 5 mV to 5.5 V _{p-p}	50 kHz to 100 MHz (100 to 300) MHz	0.4 mV + 31 mV/V 0.43 mV + 36 mV/V	<i>t</i> = seconds
Range: 4 mV to 3.5 V _{p-p}	(300 to 600) MHz (600 to 1100) MHz	0.53 mV + 57 mV/V 0.58 mV + 67 mV/V	
Time Marker, 50 Ω	5 s to 50 ms 20 ms to 1 ns	0.0021 % + <i>t</i> /1000) % 0.000 36 %	
Edge Into 50 Ω	≤ 300 ps (Up to 2 MHz) ≤ 350 ps (Above 2 MHz)	82 ps 82 ps	

Parameter/Equipment		Range		CMC ^{2, 4, 5} (±)		Comments
Duty Cycle ³ – Generate		(1 to 9.99) % (10 to 49.99) % 50 % (50.01 to 90) % (90.01 to 99) %		0.33 % 0.021 % 0.013 % 0.021 % 0.32 %		Fluke 5522A
DC Power ³ – Generate Up to 330 µA Up to 3.3 mA Up to 33 mA Up to 330 mA Up to 1.1 A Up to 3 A Up to 11 A Up to 20.5 A		Up to 337 mW (0.337 to 3.366) W (3.366 to 33.66) W (33.66 to 336.6) W (0.3366 to 1.122) kW (1.122 to 3.06) kW (3.06 to 11.22) kW (11.22 to 20.91) kW		0.017 % 0.021 % 0.0093 % 0.0093 % 0.019 % 0.043 % 0.044 % 0.13 %		Fluke 5522A
AC Power ³ – Generate		See Table below		See Table below		Fluke 5522A
(45 to 65) Hz	(3.366 to 33.66) W	(33.66 to 336.6) W	(0.3366 to 1.122) kW	(1.122 to 3.06) kW	(3.06 to 11.22) kW	(11.22 to 20.9) kW
Ø 0 ° PF=1.000	0.052 %		0.068 %	0.076 %	0.083 %	0.17 %
Ø 10 ° PF=0.985	0.06 %		0.075 %	0.082 %	0.088 %	0.18 %
Ø 20 ° PF=0.940	0.082 %		0.093 %	0.099 %	0.1 %	0.18 %
Ø 30 ° PF=0.866	0.11 %		0.12 %	0.13 %		0.2 %
Ø 40 ° PF=0.766	0.16 %			0.17 %		0.23 %
Ø 50 ° PF=0.643	0.21 %		0.22 %			0.27 %
Ø 60 ° PF=0.500	0.31 %					0.35 %
Ø 70 ° PF=0.342	0.48 %			0.49 %		0.51 %
Ø 80 ° PF=0.174	0.99 %					1 %
(65 to 500) Hz	(33.66 to 336.6) W	(0.3366 to 1.122) kW	(1.122 to 3.06) kW	(3.06 to 11.22) kW		(11.22 to 20.9) kW
Ø 0 ° PF=1.000	0.052 %	0.068 %	0.076 %	0.12 %		0.21 %
(65 to 500) Hz	(33.66 to 336.6) W	(0.3366 to 1.122) kW	(1.122 to 3.06) kW	(3.06 to 11.22) kW		(11.22 to 20.9) kW

Parameter/Equipment		Range		CMC ^{2, 4, 6} (±)		Comments
AC Power ³ – Generate		See Table below		See Table below		Fluke 5522A
(65 to 500) Hz	(33.66 to 336.6) W	(0.3366 to 1.122) kW	(1.122 to 3.06) kW	(3.06 to 11.22) kW	(11.22 to 20.9) kW	(65 to 500) Hz
Ø 10 ° PF=0.985	0.094 %	0.1 %	0.11 %	0.14 %		0.22 %
Ø 20 ° PF=0.940	0.17 %		0.18 %	0.2 %		0.26 %
Ø 30 ° PF=0.866	0.26 %			0.28 %		0.33 %
Ø 40 ° PF=0.766	0.37 %			0.39 %		0.42 %
Ø 50 ° PF=0.643	0.53 %					0.56 %
Ø 60 ° PF=0.500	0.76 %			0.77 %		0.78 %
Ø 70 ° PF=0.342	1.2 %					
Ø 80 ° PF=0.174	2.5 %					
500 Hz to 1 kHz	(33.66 to 336.6) W	(0.3366 to 1.122) kW	(1.122 to 3.06) kW	(3.06 to 11.22) kW		(11.22 to 20.9) kW
Ø 0 ° PF=1.000	0.052 %	0.068 %	0.076 %	0.12 %		0.21 %
Phase ³ (PF=1) – Generate		(10 to 65) Hz (65 to 500) Hz 500 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz		Ø 0.1 ° Ø 0.26 ° Ø 0.51 ° Ø 2.6 ° Ø 5.1 ° Ø 10 °		Fluke 5522A

III. Mechanical

Parameter/Equipment	Range		CMC ^{2, 4, 6} (±)		Comments	
Balances ³	Up to 10 kg		Matrix value x <i>R</i>		Class 1 weights <i>R = Unit under test resolution</i>	
	Unit Under Test Resolution					
	0.0001 g	0.001 g	0.01 g	0.1 g	1 g	10 g
10 mg						
20 mg						
50 mg						
100 mg						
200 mg						
500 mg						
1 g						
2 g	0.92			0.82		
5 g						
10 g	1.0					
20 g	1.2					
50 g	1.7					
100 g	3.0	0.87				
200 g	6.0	1.0				
300 g		1.2				
500 g		1.6				
1 kg		3.0	0.87			
2 kg		5.8	1.0			
5 kg			1.6	0.84		
10 kg			3.0	0.89		
Scales ³	Up to 500 lbs		0.82 x <i>R</i>		Class F, Class 6 weights <i>R = Unit under test resolution</i>	
Force Gages	Up to 500 lbf		0.0023 %		Class 6/F weights	
Force – Measure						
Compression	(1000 to 17 000) lbf (1000 to 60 000) lbf		4.6 lb + 0.45 % 2 lb + 0.0088 %		Load cells	
Compression & Tension	(10 000 to 120 000) lbf		25 lb + 0.24 %			

IV. Thermodynamic

Parameter/Equipment	Range	CMC ^{2, 6} ($\pm$)	Comments
Temperature – Measuring Equipment ^{3, 7}	(-45 to 140) °C	0.028 °C + 0.000 009 x $T_{\text{Change from -45}}$	Fluke 1524, PRT, calibration bath
Temperature ^{3, 7} – Measure	(-200 to 660) °C	0.011 °C + 0.000 021 x $T_{\text{Change from -200}}$	Fluke 1524, PRT
	(0 to 955) °C	1.7 °C + 0.0029 °C/°C	Fluke 725, Type K thermocouple
Infrared Thermometers – Measuring Equipment ³	(-15 to < -12) °C (-12 to < -8) °C (-8 to < -4) °C (-4 to < 0) °C (0 to 120) °C	0.51 °C 0.5 °C 0.49 °C 0.48 °C 0.6 °C + 0.0017 x ΔT_{change} from 0 °C	Fluke 4180 $\epsilon = 0.95$ $\lambda = (8 \text{ to } 14) \mu\text{m}$
	(35 to 500) °C	0.54 °C + 0.0042 x $\Delta T_{\text{change from 35 °C}}$	Fluke 4181 $\epsilon = 0.95$ $\lambda = (8 \text{ to } 14) \mu\text{m}$
Relative Humidity – Measuring Equipment	(20 to 80) % RH	1.2 % RH	Geo Instrument 2000SP Vaisala HMP233
	(20 to 80) % RH	1.4 % RH	

V. Time & Frequency

Parameter/Equipment	Range	CMC ^{2, 6} ($\pm$)	Comments
Frequency ^{3, 7} – Measuring Equipment	1 μHz to 21 MHz	0.58 μHz + 4 nHz/Hz	HP 3325B
Frequency ^{3, 7} – Measure	1 mHz to 225 MHz	5.8 μHz + 4 nHz/Hz	Agilent 53132A
Stopwatches & Timers	$\pm$ (0 to 19.99) sec/day	0.037 sec/day	Time base method using timometer

SATELLITE LOCATION

TRESCAL, INC.
11090 Industrial Rd
Manassas, VA 20109
Ben Slaughter Phone: 252 337 9975

CALIBRATION

I. Dimensional

Parameter/Equipment	Range	CMC ² (±)	Comments
Hand Tools ³ –			
Calipers	Up to 72 in	11 µin + 4.6 µin/in	Gage blocks
Micrometers (Linearity)	Up to 72 in	9.7 µin + 4.6 µin/in	
Height Gages	Up to 48 in	11 µin + 5 µin/in	
Indicators	Up to 2 in	7 µin + 3.3 µin/in	
Depth Micrometers (Linearity)	Up to 12 in	9.7 µin + 4.1 µin/in	

II. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2, 5} (±)	Comments
DC Voltage ³ – Generate	(0 to 220) mV (0.22 to 2.2) V (2.2 to 11) V (11 to 22) V (22 to 220) V (220 to 1100) V	0.49 µV + 5.7 nV/mV 0.8 µV + 3.5 µV/V 2.9 µV + 2.5 µV/V 4.3 µV + 2.5 µV/V 43 µV + 3.5 µV/V 0.42 mV + 4.5 µV/V	Fluke 5720A

Parameter/Equipment	Range	CMC ^{2, 4, 5} ($\pm$)	Comments
DC Voltage ³ – Measure	(0 to 100) mV (0.1 to 1) V (1 to 10) V (10 to 100) V (100 to 1000) V (1 to 10) kV	0.33 μ V + 17 μ V/V 0.52 μ V + 8 μ V/V 8.8 μ V + 8.1 μ V/V 35 μ V + 10 μ V/V 0.2 mV + 12 μ V/V 3.2 V + 0.16 V/kV	3458A Voltage divider w/ multimeter
DC Current ³ – Generate	(0 to 220) μ A (0.22 to 2.2) mA (2.2 to 22) mA (22 to 220) mA (0.22 to 2.2) A (2.2 to 11) A (11 to 20.5) A (1 to 20) A (1 to 100) A	6 nA + 35 pA/ μ A 7.1 nA + 30 nA/mA 41 nA + 30 nA/mA 0.73 μ A + 1 μ A/mA 12 μ A + 0.11 mA/A 0.49 mA + 0.34 mA/A 9.4 mA + 0.8 mA/A 0.0045 % 0.0051 %	Fluke 5720A Fluke 5522A Power supply, L&N shunt & 3458A
Clamp-On Only	(10 to 16.5) A (16.5 to 150) A (150 to 1025) A	50 mA + 6.5 mA/A 0.18 A + 3.4 mA/A 0.83 A + 3.3 mA/A	Fluke 5522A w/ 5500A/coil
DC Current ³ – Measure	(0 to 100) nA 100 nA to 1 μ A (1 to 10) μ A (10 to 100) μ A 100 μ A to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A (1 to 20) A (1 to 100) A	41 pA + 89 μ A/A 41 pA + 28 pA/ μ A 0.4 nA + 24 pA/ μ A 0.82 nA + 22 pA/ μ A 5.8 nA + 24 nA/mA 53 nA + 21 nA/mA 0.53 μ A + 37 nA/mA 10 μ A + 0.11 mA/A 0.0045 % 0.0051 %	Agilent 3458A Agilent 3458A w/ shunts

Parameter/Equipment	Range	CMC ^{2, 4, 5} ($\pm$)	Comments
DC Resistance ³ – Generate	0 Ω	50 $\mu\Omega$	Fluke 5720A
	1 Ω	95 $\mu\Omega$	
	1.9 Ω	0.18 m Ω	
	10 Ω	0.26 m Ω	
	19 Ω	0.48 m Ω	
	100 Ω	1.1 m Ω	
	190 Ω	2 m Ω	
	1 k Ω	9 m Ω	
	1.9 k Ω	17 m Ω	
	10 k Ω	90 m Ω	
	19 k Ω	0.17 Ω	
	100 k Ω	1.1 Ω	
	190 k Ω	2.1 Ω	
	1 M Ω	18 Ω	
	1.9 M Ω	36 Ω	
	10 M Ω	0.37 k Ω	
	19 M Ω	0.89 k Ω	
	100 M Ω	50 k Ω	
	(0 to 10.9999) Ω	1.2 m Ω + 24 $\mu\Omega/\Omega$	Fluke 5522A
	(11 to 32.9999) Ω	1.5 m Ω + 24 $\mu\Omega/\Omega$	
	(33 to 109.9999) Ω	1.9 m Ω + 22 $\mu\Omega/\Omega$	
	(110 to 329.9999) Ω	4.1 m Ω + 22 $\mu\Omega/\Omega$	
	(330 to 1099.999) Ω	9.1 m Ω + 22 $\mu\Omega/\Omega$	
	(1.1 to 3.299 999) k Ω	41 m Ω + 22 $\mu\Omega/\Omega$	
	(3.3 to 10.999 99) k Ω	92 m Ω + 22 $\mu\Omega/\Omega$	
	(11 to 32.999 99) k Ω	0.41 Ω + 22 $\mu\Omega/\Omega$	
	(33 to 109.9999) k Ω	0.9 Ω + 22 $\mu\Omega/\Omega$	
	(110 to 329.9999) k Ω	8.4 Ω + 26 $\mu\Omega/\Omega$	
	(330 to 1099.999) k Ω	14 Ω + 26 $\mu\Omega/\Omega$	
	(1.1 to 3.299 999) M Ω	93 Ω + 48 $\mu\Omega/\Omega$	
	(3.3 to 10.999 99) M Ω	0.4 k Ω + 0.1 m Ω/Ω	
	(11 to 32.999 99) M Ω	4.4 k Ω + 0.2 m Ω/Ω	
	(33 to 109.9999) M Ω	16 k Ω + 0.4 m Ω/Ω	
	(110 to 329.9999) M Ω	0.35 M Ω + 2.4 m Ω/Ω	
	(330 to 1100) M Ω	4.4 M Ω + 12 m Ω/Ω	
DC Resistance ³ – Measure	(0 to 10) Ω	55 $\mu\Omega$ + 15 $\mu\Omega/\Omega$	Agilent 3458A
	(10 to 100) Ω	0.52 m Ω + 13 $\mu\Omega/\Omega$	
	(0.1 to 1) k Ω	0.53 m Ω + 10 $\mu\Omega/\Omega$	
	(1 to 10) k Ω	5.3 m Ω + 10 $\mu\Omega/\Omega$	
	(10 to 100) k Ω	53 m Ω + 11 $\mu\Omega/\Omega$	
	(0.1 to 1) M Ω	2.3 Ω + 17 $\mu\Omega/\Omega$	
	(1 to 10) M Ω	0.1 k Ω + 55 $\mu\Omega/\Omega$	
	(10 to 100) M Ω	1 k Ω + 0.52 m Ω/Ω	
	(0.1 to 1) G Ω	10 k Ω + 5.1 m Ω/Ω	

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Calibration of Thermocouples & Indicators ³ –			
Type B	(600 to 800) °C (800 to 1000) °C (1000 to 1550) °C (1550 to 1820) °C	0.35 °C 0.27 °C 0.24 °C 0.26 °C	Fluke 5522A
Type C	(0 to 150) °C (150 to 650) °C (650 to 1000) °C (1000 to 1800) °C (1800 to 2316) °C	0.24 °C 0.21 °C 0.25 °C 0.4 °C 0.67 °C	
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.4 °C 0.13 °C 0.11 °C 0.13 °C 0.17 °C	
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.22 °C 0.13 °C 0.11 °C 0.14 °C 0.18 °C	
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.27 °C 0.14 °C 0.13 °C 0.21 °C 0.32 °C	
Type N	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 410) °C (410 to 1300) °C	0.32 °C 0.18 °C 0.15 °C 0.15 °C 0.22 °C	
Type R	(0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C	0.46 °C 0.28 °C 0.27 °C 0.33 °C	
Type S	(0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1767) °C	0.38 °C 0.29 °C 0.3 °C 0.37 °C	

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Calibration of Thermocouples & Indicators ³ – (cont)			
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.51 °C 0.21 °C 0.15 °C 0.13 °C	Fluke 5522A
Type U	(-200 to 0) °C (0 to 600) °C	0.45 °C 0.22 °C	
Electrical Calibration of RTD Indicators ³ –			
Pt 385, 100 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C (630 to 800) °C	0.042 °C 0.041 °C 0.057 °C 0.073 °C 0.081 °C 0.097 °C 0.19 °C	Fluke 5522A
Pt 3926, 100 Ω	(-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C	0.041 °C 0.057 °C 0.073 °C 0.081 °C 0.097 °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 (600 to 630) °C	0.2 °C 0.033 °C 0.042 °C 0.049 °C 0.057 °C 0.065 °C 0.073 °C 0.09 °C 0.19 °C	
Pt 385, 200 Ω	(-200 to -80) °C (-80 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.034 °C 0.033 °C 0.042 °C 0.097 °C 0.11 °C 0.11 °C 0.13 °C	

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Calibration of RTD Indicators ³ – (cont)			
Pt 385, 500 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 400) °C (400 to 600) °C (600 to 630) °C	0.034 °C 0.042 °C 0.041 °C 0.05 °C 0.065 °C 0.073 °C 0.089 °C	Fluke 5522A
Pt 385, 1000 Ω	(-200 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 600) °C (600 to 630) °C	0.026 °C 0.033 °C 0.042 °C 0.049 °C 0.057 °C 0.19 °C	
PtNi 385, 120 Ω	(-80 to 0) °C (0 to 100) °C (100 to 260) °C	0.066 °C 0.066 °C 0.11 °C	
Cu 427, 10 Ω	(-100 to 260) °C	0.24 °C	
Oscilloscopes ³ –			
DC Signal 50 Ω 1 MΩ	0 to ± 6.6 V 0 to ± 130 V	33 μV + 2 mV/V 33 μV + 0.39 mV/V	Fluke 5522A/SC1100
Squarewave Signal 50 Ω	1 mV _{p-p} to 6.6 V _{p-p} 10 Hz to 10 kHz	91 μV + 4.4 mV/V	
1 MΩ	1 mV _{p-p} to 130 V _{p-p} 10 Hz to 1 kHz (1 to 10) kHz	0.2 mV + 0.8 mV/V 0.24 mV + 2 mV/V	
Leveled Sine Wave Amplitude –	50 kHz Reference	0.33 mV + 17 mV/V	
Range: 5 mV to 5.5 V _{p-p}	50 kHz to 100 MHz (100 to 300) MHz	0.4 mV + 31 mV/V 0.43 mV + 36 mV/V	
Range: 4 mV to 3.5 V _{p-p}	(300 to 600) MHz (600 to 1100) MHz	0.53 mV + 57 mV/V 0.58 mV + 67 mV/V	

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Oscilloscopes ³ – (cont)			
Time Marker, 50 Ω	5 s to 50 ms 20 ms to 1 ns	0.0021 % + $t/1000$ % 0.000 36 %	Fluke 5522A/SC1100 t = seconds
Edge Into 50 Ω	≤ 300 ps (up to 2 MHz) ≤ 350 ps (above 2 MHz)	82 ps 82 ps	
Duty Cycle ³ – Generate	(1 to 9.99) % (10 to 49.99) % 50 % (50.01 to 90) % (90.01 to 99) %	0.33 % 0.021 % 0.013 % 0.021 % 0.32 %	Fluke 5522A

Parameter/Range	Frequency	CMC ^{2,5} (±)	Comments
AC Voltage ³ – Generate			
Up to 2.2 mV	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	4 μV + 0.33 μV/mV 4 μV + 85 nV/mV 4 μV + 75 nV/mV 4 μV + 0.18 μV/mV 5 μV + 0.46 μV/mV 10 μV + 0.9 μV/mV 20 μV + 1.2 μV/mV 20 μV + 2.5 μV/mV	Fluke 5720A
(2.2 to 22) mV	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	4.5 μV + 0.22 μV/mV 4.2 μV + 85 nV/mV 4.2 μV + 75 nV/mV 4.4 μV + 0.18 μV/mV 6.1 μV + 0.46 μV/mV 12 μV + 0.9 μV/mV 23 μV + 1.2 μV/mV 26 μV + 2.5 μV/mV	
(22 to 220) mV	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	17 μV + 0.22 μV/mV 9 μV + 85 nV/mV 8.7 μV + 75 nV/mV 11 μV + 0.18 μV/mV 16 μV + 0.46 μV/mV 31 μV + 0.9 μV/mV 48 μV + 1.2 μV/mV 78 μV + 2.5 μV/mV	

Parameter/Range	Frequency	CMC ^{2, 5} (±)	Comments
AC Voltage ³ – Generate (cont)			Fluke 5720A
(0.22 to 2.2) V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	90 µV + 0.22 mV/V 34 µV + 79 µV/V 18 µV + 39 µV/V 26 µV + 70 µV/V 54 µV + 0.11 mV/V 0.16 mV + 0.34 mV/V 0.56 mV + 0.83 mV/V 0.64 mV + 1.5 mV/V	
(2.2 to 22) V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.89 mV + 0.22 mV/V 0.34 mV + 80 µV/V 0.15 mV + 40 µV/V 0.26 mV + 70 µV/V 0.41 mV + 0.1 mV/V 1.2 mV + 0.26 mV/V 4 mV + 0.9 mV/V 6.1 mV + 1.3 mV/V	
(22 to 220) V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	8.9 mV + 0.22 mV/V 3.4 mV + 80 µV/V 1.7 mV + 47 µV/V 3.5 mV + 72 µV/V 5.9 mV + 0.13 mV/V 34 mV + 0.8 mV/V 0.13 V + 4.2 mV/V 0.24 V + 7 mV/V	
(220 to 1100) V	40 Hz to 1 kHz (1 to 20) kHz (20 to 30) kHz	22 mV + 80 µV/V 34 mV + 0.13 mV/V 93 mV + 0.36 mV/V	
(220 to 750) V	(30 to 50) kHz (50 to 100) kHz	93 mV + 0.36 mV/V 0.34 V + 1.3 mV/V	
AC Voltage – Measure			Agilent 3458A
(0 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	6.1 µV + 0.0003 mV/mV 4.1 µV + 0.0002 mV/mV 4.2 µV + 0.0003 mV/mV 4.9 µV + 0.001 mV/mV 9 µV + 0.005 mV/mV 45 µV + 0.04 mV/mV	

Parameter/Range	Frequency	CMC ^{2, 5} (±)	Comments
AC Voltage – Measure (cont)			
(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 (0.3 to 1) MHz (1 to 2) MHz	12 µV + 0.000 07 mV/mV 2.7 µV + 0.000 07 mV/mV 11 µV + 0.000 14 mV/mV 12 µV + 0.0003 mV/mV 17 µV + 0.0008 mV/mV 47 µV mV + 0.003 mV/mV 0.12 mV + 0.01 mV/mV 3.8 mV + 0.01 mV/mV	Agilent 3458A
(0.1 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 (0.3 to 1) MHz (1 to 2) MHz	0.12 mV + 0.000 07 V/V 0.1 mV + 0.000 07 V/V 0.11 mV + 0.000 14 V/V 0.12 mV + 0.0003 V/V 0.17 mV + 0.0008 V/V 0.47 mV + 0.003 V/V 1.2 mV + 0.010 V/V 38 mV + 0.015 V/V	
(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 (0.3 to 1) MHz (1 to 2) MHz	1.2 mV + 0.000 07 V/V 1 mV + 0.000 07 V/V 1 mV + 0.000 14 V/V 1.2 mV + 0.0003 V/V 1.7 mV + 0.0008 V/V 4.7 mV + 0.003 V/V 12 mV + 0.01 V/V 0.38 V + 0.015 V/V	
(10 to 100) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (0.3 to 1) MHz	13 mV + 0.0002 V/V 11 mV + 0.0002 V/V 11 mV + 0.0002 V/V 13 mV + 0.000 35 V/V 21 mV + 0.0012 V/V 57 mV + 0.004 V/V 0.17 V + 0.015 V/V	
(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	98 mV + 0.0004 V/V 84 mV + 0.0004 V/V 98 mV V + 0.0006 V/V 0.14 V + 0.0012 V/V 0.27 V + 0.003 V/V	Voltage divider w/ multimeter
(1 to 10) kV	50, 60 and 400 Hz	9.6 V + 0.8 V/kV	

Parameter/Range	Frequency	CMC ^{2, 5} ($\pm$)	Comments
Capacitance ³ – Generate			
(0.19 to 0.3999) nF	10 Hz to 10 kHz	8.8 pF + 4 pF/nF	Fluke 5522A
(0.4 to 1.0999) nF	10 Hz to 10 kHz	9.7 pF + 4 pF/nF	
(1.1 to 3.2999) nF	10 Hz to 3 kHz	13 pF + 4 pF/nF	
(3.3 to 10.9999) nF	10 Hz to 1 kHz	15 pF + 2 pF/nF	
(11 to 32.9999) nF	10 Hz to 1 kHz	0.1 nF + 2 pF/nF	
(33 to 109.999) nF	10 Hz to 1 kHz	0.15 nF + 2 pF/nF	
(110 to 329.999) nF	10 Hz to 1 kHz	0.46 nF + 2 pF/nF	
(0.33 to 1.0999) μ F	(10 to 600) Hz	1.5 nF + 2 nF/ μ F	
(1.1 to 3.299 99) μ F	(10 to 300) Hz	4.6 nF + 2 nF/ μ F	
(3.3 to 10.9999) μ F	(10 to 150) Hz	15 nF + 2 nF/ μ F	
(11 to 32.9999) μ F	(10 to 120) Hz	59 nF + 3.2 nF/ μ F	
(33 to 109.999) μ F	(10 to 80) Hz	0.2 μ F + 3.6 nF/ μ F	
(110 to 329.999) μ F	(10 to 50) Hz	0.64 μ F + 3.6 nF/ μ F	
(0.33 to 1.099 99) mF	(10 to 20) Hz	2 μ F + 3.6 μ F/mF	
(1.1 to 3.2999) mF	(0 to 6) Hz	7 μ F + 3.5 μ F/mF	
(3.3 to 10.9999) mF	(0 to 2) Hz	38 μ F + 2.6 μ F/mF	
(11 to 32.9999) mF	(0 to 0.6) Hz	90 μ F + 6 μ F/mF	
(33 to 110) mF	(0 to 0.2) Hz	0.37 mF + 8.8 μ F/mF	
AC Current ³ – Generate			
Up to 220 μ A	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz	63 nA + 0.13 nA/ μ A 12 nA + 0.14 nA/ μ A 9 nA + 0.11 nA/ μ A 15 nA + 0.25 nA/ μ A	Fluke 5720A
(29 to 329.99) μ A	(5 to 10) kHz (10 to 30) kHz	75 nA + 0.9 nA/ μ A 0.69 μ A + 13 nA/ μ A	Fluke 5522A
(0.22 to 2.2) mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz	93 nA + 0.23 μ A/mA 67 nA + 0.14 μ A/mA 60 nA + 0.11 μ A/mA 0.15 μ A + 0.18 μ A/mA	Fluke 5522A
(0.33 to 3.2999) mA	(5 to 10) kHz (10 to 30) kHz	0.85 μ A + 0.9 μ A/mA 3.4 μ A + 8 μ A/mA	
(2.2 to 22) mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz	0.92 μ A + 0.23 μ A/mA 0.69 μ A + 0.14 μ A/mA 0.6 μ A + 0.11 μ A/mA 0.95 μ A + 0.18 μ A/mA	Fluke 5522A
(3.3 to 32.999) mA	(5 to 10) kHz (10 to 30) kHz	7 μ A + 0.9 μ A/mA 14 μ A + 3.2 μ A/mA	

Parameter/Range	Frequency	CMC ^{2, 5} ($\pm$)	Comments
AC Current ³ – Generate (cont)			
(22 to 220) mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	9.3 μ A + 0.23 μ A/mA 6.8 μ A + 0.14 μ A/mA 5 μ A + 0.11 μ A/mA 7.5 μ A + 0.18 μ A/mA 30 μ A + 0.9 μ A/mA	Fluke 5720A
(33 to 329.99) mA	(10 to 30) kHz	0.27 mA + 3.2 μ A/mA	Fluke 5522A
(0.22 to 2.2) A	20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	89 μ A + 0.24 mA/A 0.17 mA + 0.39 mA/A 1.5 mA + 6 mA/A	
(2.2 to 11) A	40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	1.1 mA + 0.4 mA/A 2.3 mA + 0.85 mA/A 8 mA + 3.3 mA/A	
(11 to 20.5) A	(45 to 100) Hz (0.100 to 1) kHz (1 to 5) kHz	15 mA + 0.96 mA/A 17 mA + 1.2 mA/A 0.27 A + 24 mA/A	Fluke 5522A
Toroidal: (10 to 16.5) A (16.5 to 150) A (150 to 1025) A	(45 to 65) Hz	26 mA + 2.1 mA/A 50 mA + 1.9 mA/A 0.34 A + 1.9 mA/A	Fluke 5522A w/5500A/coil
(10 to 16.5) A (16.5 to 150) A (150 to 1025) A	(65 to 440) Hz	60 mA + 6 mA/A 0.11 A + 5.3 mA/A 0.86 A + 5.3 mA/A	
Non-Toroidal: (10 to 16.5) A (16.5 to 150) A (150 to 1025) A	(45 to 65) Hz	60 mA + 3.8 mA/A 0.23 A + 3.7 mA/A 1.2 A + 3.7 mA/A	
(10 to 16.5) A (16.5 to 150) A (150 to 1025) A	(65 to 440) Hz	90 mA + 7.2 mA/A 0.28 A + 6.7 mA/A 1.6 A + 6.7 mA/A	

Parameter/Range	Frequency	CMC ^{2, 5} (±)	Comments
AC Current ³ – Measure			Agilent 3458A
(5 to 100) µA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 5 kHz	57 nA + 4 nA/µA 45 nA + 1.5 nA/µA 41 nA + 0.64 nA/µA	
(0.1 to 1) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.43 µA + 4.1 µA/mA 0.31 µA + 1.6 µA/mA 0.26 µA + 0.67 µA/mA 0.25 µA + 0.37 µA/mA 0.26 µA + 0.67 µA/mA 0.63 µA + 4.1 µA/mA 1.8 µA + 5.6 µA/mA	
(1 to 10) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz	2.4 µA + 4.1 µA/mA 2.3 µA + 1.6 µA/mA 2.3 µA + 0.67 µA/mA 2.3 µA + 0.37 µA/mA 2.3 µA + 0.67 µA/mA 4.5 µA + 4.1 µA/mA 16 µA + 5.6 µA/mA	
(10 to 100) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz	42 µA + 4.1 µA/mA 30 µA + 1.6 µA/mA 25 µA + 0.6 µA/mA 24 µA + 0.37 µA/mA 25 µA + 0.6 µA/mA 62 µA + 4 µA/mA 0.18 mA + 5.5 µA/mA	
(0.1 to 1) A	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz (5 to 20) kHz (20 to 50) kHz	0.42 mA + 4.1 mA/A 0.3 mA + 1.7 mA/A 0.26 mA + 0.9 mA/A 0.27 mA + 1.1 mA/A 0.378 mA + 3.1 mA/A 0.92 mA + 10 mA/A	

III. Electrical – RF/Microwave

Parameter/Range	Frequency	CMC ^{2, 4, 5} ($\pm$)	Comments
Amplitude Modulation – Measure			
Rate: 50 Hz to 10 kHz Depths: (5 to 99) %	150 kHz to 10 MHz	0.14 % depth + 0.024 % depth/% depth	8902A
Rate: 20 Hz to 10 kHz Depths: To 99 %	150 kHz to 10 MHz	0.11 % depth + 0.023 % depth/% depth	
Rate: 50 Hz to 50 kHz Depths: (5 to 99) %	(0.01 to 1.3) GHz	0.15 % depth + 0.01 % depth/% depth	
Rate: 20 Hz to 100 kHz Depths: To 99 %	(0.01 to 1.3) GHz	0.11 % depth + 0.023 % depth/% depth	
Rate: 50 Hz to 50 kHz Depths: (5 to 99) %	(1.3 to 26.5) GHz	1.2 % depth + 0.004 % depth/% depth	
Rate: 20 Hz to 100 kHz Depths: To 99 %	(1.3 to 26.5) GHz	1.2 % depth + 0.015 % depth/% depth	
Phase Modulation – Measure			
Rate: 200 Hz to 10 kHz (0 to 100) rad	150 kHz to 10MHz	36 mrad + 37 mrad/rad	8902A
Rate: 200 Hz to 20 kHz (0 to 100) rad	(0.01 to 1.3) GHz	36 mrad + 37 mrad/rad	
Rate: 200 Hz to 20 kHz (0 to 100) rad	(1.3 to 26.5) GHz	36 mrad + 37 mrad/rad	
Frequency Modulation – Measure			
Rate: 20 Hz to 10 kHz Dev.: $\leq$ 40 kHz Peak	250 kHz to 10 MHz	3.5 Hz + 16 Hz/kHz	8902A
Rate: 50 Hz to 100 kHz Dev.: $\leq$ 400 kHz Peak	(0.01 to 1.3) GHz	3.5 Hz + 7.8 Hz/kHz	
Rate: 20 Hz to 200 kHz Dev.: $\leq$ 400 kHz Peak	(0.01 to 1.3) GHz	6.8 Hz + 39 Hz/kHz	

Parameter/Range	Frequency	CMC ^{2, 4, 5} (±)	Comments
Frequency Modulation – Measure (cont)			
Rate: 50 Hz to 100 kHz Dev.: ≤ 400 kHz Peak	(1.3 to 26.5) GHz	6.8 Hz + 7.8 Hz/kHz	8902A
Rate: 20 Hz to 200 kHz Dev.: ≤ 400 kHz Peak	(1.3 to 26.5) GHz	6.8 Hz + 39 Hz/kHz	
RF Microwave – Power Meter ³			
Power Reference at 1 mW	50 MHz	0.42 %	432A power meter, 478A-H75 thermistor mount, 3458A
Power Accuracy (3 μW to 100 mW)		0.29 %	Range calibrator
RF Microwave – Absolute Power, Measure ³			
(-70 to +20) dBm	10 MHz to 18 GHz	3.7 %	E4418B power meter w/: E4412A
(+10 to +20) dBm	50 MHz to 3 GHz (3 to 13) GHz (13 to 18) GHz (18 to 26.5) GHz (26.5 to 33) GHz (33 to 38) GHz (38 to 50) GHz	1.5 % 1.8 % 1.9 % 2.2 % 2.4 % 2.9 % 3.6 %	N8487A
(-30 to +10) dBm	50 MHz to 3 GHz (3 to 13) GHz (13 to 15) GHz (15 to 18) GHz (18 to 26.5) GHz (26.5 to 33) GHz (33 to 38) GHz (38 to 50) GHz	1.4 % 1.6 % 1.7 % 1.8 % 2.1 % 2.3 % 2.8 % 3.6 %	

Parameter/Range	Frequency	CMC ^{2, 5} (±)	Comments
RF Absolute Power – Generate ³ (cont)			
Amplitude Into 75 Ω: (-46.75 to +11.25) dBm (-88.74 to -46.75) dBm	200 Hz to 25 MHz	0.22 dB 0.3 dB	Agilent 3335A
(-26.75 to 11.25) dBm (-46.75 to -26.75) dBm (88.74 to -46.75) dBm	(25 to 80) MHz	0.26 dB 0.35 dB 0.61 dB	
(-70 to +20) dBm	80 MHz to 18 GHz (18 to 33) GHz (33 to 38) GHz (38 to 50) GHz	0.35 dB 0.36 dB 0.51 dB 0.52 dB	83650B, 8902A, E4412A & power splitter
(-110 to -70) dBm	80 MHz to 2 GHz (2 to 20) GHz (20 to 40) GHz (40 to 50) GHz	2.1 dB 2.2 dB 2.6 dB 3.8 dB	
Distortion ³ – Measure			
(0 to 60) dBc	20 Hz to 20 kHz (20 to 100) kHz	1.2 dB 2.3 dB	Audio analyzer
(0 to 100) dBc	100 MHz to 2.9 GHz (2.9 to 6.5) GHz (6.5 to 13.2) GHz (13.2 to 50) GHz	2.4 dB 3.1 dB 3.6 dB 4.8 dB	Spectrum analyzer

IV. Mechanical

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
Torque Equipment	(15 to 200) ozf·in 4 lbf·in to 2000 lbf·ft	0.58 % 0.31 %	CDI Suretest system
Scales ³	Up to 400 lbs	0.82 x <i>R</i>	Class F weights <i>R</i> = Unit under test resolution

Parameter/Equipment	Range	CMC ^{2, 4, 6} (±)	Comments			
Force – Measuring Equipment, Compression & Tension	Up to 100 lbf	0.0023 %	Class 4 & Class F weights & hangers			
Pressure ³ – Measure & Measuring Equipment						
Pneumatic	± 10 inH ₂ O (0.3 to 15) psia (-15 to 30) psig (30 to 100) psig (100 to 500) psig (500 to 1500) psig (1500 to 3000) psig (0 to 10) inH ₂ O (-15 to 0) psig (0 to 30) psig (30 to 100) psig (100 to 300) psig (300 to 500) psig	0.0058 inH ₂ O 0.0032 psia 0.0032 psi 0.01 psi 0.05s psi 0.15 psi 0.3 psi 0.035 inH ₂ O 0.012 psi 0.017 psi 0.059 psi 0.19 psi 0.29 psi	Fluke 6270A w/ PM200 modules Fluke 750P01 Fluke 700PV4 Fluke 700P05 Fluke 700P06 Fluke 717 300G Fluke 700P07			
Balances ³	Up to 10 kg	Matrix value x <i>R</i>	Class 1 weights <i>R = Unit under test resolution</i>			
	Unit Under Test Resolution					
	0.0001 g	0.001 g	0.01 g	0.1 g	1 g	10 g
10 mg						
20 mg						
50 mg						
100 mg						
200 mg						
500 mg						
1 g						
2 g	0.92			0.82		
5 g						
10 g	1.0					
20 g	1.2					
50 g	1.7					
100 g	3.1	0.87				
200 g	6.1	1.0				
500 g		1.7				
1 kg		3.1	0.87			

V. Thermodynamics

Parameter/Equipment	Range	CMC ^{2, 4, 6} ($\pm$)	Comments
Humidity/Temperature – Measuring Equipment ³			
Humidity	(10 to 90) % RH (90 to 95) % RH	1.3 % RH 2.1 % RH	Vaisala humidity meter/probe
Temperature	(0 to 60) °C	0.77 °C	
Temperature – Measure ³	(0 to 955) °C	1.7 °C + 0.0029 x T _{Change} from 0	Fluke 725 with type K probe

VII. Time & Frequency

Parameter/Equipment	Range	CMC ^{2, 6} ($\pm$)	Comments
Frequency – Measure	Up to 3 GHz	5.8 μ Hz + 59 pHz/Hz	Counter phase locked to GPS
Frequency – Measuring Equipment	10 MHz 1 μ Hz to 20 MHz 20 MHz to 50 GHz	6.9 μ Hz 0.58 μ Hz + 29 pHz/Hz 0.58 Hz	Spectracom rubidium Signal generators phase locked to GPS

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) 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; D is the length of the diagonal in inches; R is the resolution of the unit under test; percentages are percentage of reading unless otherwise indicated.

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 Uncertainty components that can be reasonably attributed to the Unit Under Test have not been utilized in the calculation of the CMC value for this measurement parameter.

⁸ 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.

⁹ This scope meets A2LA's P112 *Flexible Scope Policy*.



Accredited Laboratory

A2LA has accredited

TRESCAL, INC.

Sparks, MD

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 the requirements of ANSI/NCSL Z540.3-2006 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 19th day of March 2024.

A blue ink signature of Mr. Trace McInturff.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1346.01
Valid to February 28, 2026

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