



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005
& ANSI/NCSL Z540-1-1994

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CALIBRATION

Valid To: May 31, 2019

Certificate Number: 1332.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations and dimensional testing¹:

I. Dimensional

Parameter/Equipment	Range	CMC ^{2, 4} (\pm)	Comments
Gage Blocks	(0.1 to 1.0) in (>1.0 to 4.0) in (>4.0 to 12) in	(3.9 + 0.5L) μ in (4.4 + 0.5L) μ in (8.2 + 0.5L) μ in	Master gage block set
Micrometers ³	Up to 12 in	(51 + 1L) μ in	Gage blocks
Depth Micrometers ³	Up to 9 in	(31 + 1L) μ in	Gage blocks
Calipers ³	Up to 40 in	(300 + 1L) μ in	Gage blocks
Height Gages ³	Up to 40 in	(65 + 1L) μ in	Gage blocks
Thread Wires	Up to 80 TPI Up to 4 mm	13 μ in 0.41 μ m	Pratt & Whitney Labmaster TM

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Thread Plugs – Major Diameter Pitch Diameter	Up to 3 in (4 to 80) TPI	(14 + 0.9L) μin 72 μin	SIP 305M
Micrometer Heads	Up to 2 in	29 μin	Gage blocks/Indi-check
Thread Rings ¹⁰ – 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
Master Thread Rings	(0.12 to 8) in	(19 + 1.8L) μin	Pratt & Whitney Labmaster™
Indicators ³	Up to 1 in	54 μin	Micrometer head
Test Indicators ³	Up to 0.1 in	47 μin	Micrometer head
Gage Pins	(0.001 to 1) in (0.001 to 1) in	14 μin 35 μin	Pratt & Whitney Labmaster™ Laser micrometer
Plug Gages	(1.00 to 4) in	(14 + 0.9L) μin	Pratt & Whitney Labmaster™
Surface Plates ³ – Flatness	(18 × 36) in ² to (36 × 72) in ²	(29 + DL) μin	Electrical leveling system
Ring Gages – Classes XXX, XX, X, Y, Z, & ZZ	Up to 1 in (1 to 5) in (5 to 10) in	(12 + 1.8L) μin (18 + 1.8L) μin (27 + 1.8L) μin	Pratt & Whitney Labmaster™

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Optical Comparators ³	Up to 12 in (12 to 24) in (24 to 30) in 10x to 100x	(92 + 3L) μin (140 + 3L) μin (190 + 3L) μin 180 μin	Glass master scale, gage blocks, MU checker, magnification checker
Protractors	(0 to 180) °	78 μin	Sine plate gage blocks
Surface Finish – Profilometer & Surface Roughness	Up to 400 μin	2.2 μin	Master surface finish standard

II. Dimensional Testing/Calibration¹

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
1 Dimensional Length ⁸ –	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
3 Dimensional Length ⁸ – X Axis Y Axis Z Axis X Axis Y Axis Z Axis	Up to 35.4 in Up to 59 in Up to 25.6 in Up to 20 in Up to 18 in Up to 8 in	(66 + 3.6L) μin (66 + 3.6L) μin (66 + 3.6L) μin (60 + 5L) μin (60 + 5L) μin (60 + 5L) μin	CMM Video metrology system
Angle ⁸	(0 to 180) °	0°0'7"	Contour record

III. Electrical – DC / Low Frequency

Parameter/Equipment	Range	CMC ^{2, 5, 6, 9} (±)	Comments
DC Voltage – Measure ³	(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
DC Voltage – Generate ³	(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
DC Current – Measure ³	(10 to 100) μA 100 μA to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A	20 μA/A + 12 μA 20 μA/A + 9.5 μA 20 μA/A + 5.8 μA 35 μA/A + 5.8 μA 0.011 % + 12 μA	HP 3458A
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) A (3 to 11) A (11 to 20) A	0.015 % + 0.042 μA 0.01 % + 0.074 μA 0.01 % + 0.63 μA 0.01 % + 14 μA 0.02 % + 44 μA 0.038 % + 38 μA 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	0.26 % + 0.25 A 0.26 % + 0.31 A 0.27 % + 0.31 A	Fluke 5520A with 50 turn coil

Parameter/Equipment	Range	CMC ^{2, 5, 6, 9} (±)	Comments
Resistance – Generate ³	(0 to 11) Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω 330 Ω to 1.1 kΩ (1.1 to 3.3) kΩ (3.3 to 11) kΩ (11 to 33) kΩ (33 to 110) kΩ (110 to 330) kΩ 330 kΩ to 1.1 MΩ (1.1 to 3.3) MΩ (3.3 to 11) MΩ (11 to 33) MΩ (33 to 110) MΩ (110 to 330) MΩ 330 MΩ to 1.1 GΩ	40 μΩ/Ω + 0.0012 Ω 30 μΩ/Ω + 0.0019 Ω 28 μΩ/Ω + 0.0025 Ω 28 μΩ/Ω + 0.0048 Ω 28 μΩ/Ω + 0.010 Ω 28 μΩ/Ω + 0.036 Ω 28 μΩ/Ω + 0.086 Ω 28 μΩ/Ω + 0.36 Ω 28 μΩ/Ω + 0.83 Ω 32 μΩ/Ω + 3.6 Ω 32 μΩ/Ω + 2.4 Ω 60 μΩ/Ω + 35 Ω 0.013 % + 59 Ω 0.025 % + 2.9 kΩ 0.05 % + 3.5 kΩ 0.3 % + 0.12 MΩ 1.5 % + 0.58 MΩ	Fluke 5520A
Resistance – Measure ³	Up to 10 Ω (10 to 100) Ω 100 Ω to 1 kΩ (1 to 10) kΩ (10 to 100) kΩ 100 kΩ to 1 MΩ (1 to 10) MΩ (10 to 100) MΩ 100 MΩ to 1 GΩ	15 μΩ/Ω + 6.4 μΩ 12 μΩ/Ω + 12 μΩ 10 μΩ/Ω + 100 μΩ 10 μΩ/Ω + 0.98 mΩ 10 μΩ/Ω + 1.1 mΩ 15 μΩ/Ω + 1.7 Ω 50 μΩ/Ω + 12 Ω 0.05 % + 11 kΩ 0.5 % + 12 kΩ	HP 3458A

Parameter/Range	Frequency	CMC ^{2, 6, 9} (±)	Comments
AC Voltage – Measure ³			
(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 ^{2,5,9} (±)	Comments
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	0.08 % + 14 µV 0.015 % + 14 µV 0.02 % + 14 µV 0.1 % + 17 µV 0.35 % + 27 µV 0.8 % + 82 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	0.05 % + 31 µV 0.015 % + 31 µV 0.016 % + 31 µV 0.035 % + 42 µV 0.08 % + 69 µV 0.2 % + 240 µV	
(0.33 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	0.03 % + 66 µV 0.015 % + 210 µV 0.019 % + 210 µV 0.03 % + 350 µV 0.07 % + 0.57 mV 0.24 % + 3 mV	
(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	0.03 % + 3.1 mV 0.015 % + 4 mV 0.024 % + 4 mV 0.035 % + 5 mV 0.09 % + 7.5 mV	
(33 to 330) V	45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.019 % + 4.7 mV 0.02 % + 8.1 mV 0.025 % + 32 mV 0.03 % + 93 mV 0.2 % + 71 mV	
(330 to 1020) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.03 % + 35 mV 0.025 % + 91 mV 0.03 % + 93 mV	

Parameter/Range	Frequency	CMC ^{2, 6, 9} (±)	Comments
AC Current – Measure ³			
(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	

Parameter/Range	Frequency	CMC ^{2, 5, 9} (±)	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	0.2 % + 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
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	
(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	
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	0.28 % + 140 mA	Fluke 5520 with 50 turn coil

Parameter/Range	Frequency	CMC ^{2, 5, 9} (±)	Comments
Capacitance – Generate ³			
(0.19 to 0.4) nF	10 Hz to 10 kHz	0.5 % + 0.03 nF	Fluke 5520A
(0.4 to 1.1) nF	10 Hz to 10 kHz	0.5 % + 0.03 nF	
(1.1 to 3.3) nF	10 Hz to 3 kHz	0.5 % + 0.03 nF	
(3.3 to 11) nF	10 Hz to 1 kHz	0.25 % + 0.03 nF	
(11 to 33) nF	10 Hz to 1 kHz	0.25 % + 0.13 nF	
(33 to 110) nF	10 Hz to 1 kHz	0.25 % + 0.19 nF	
(110 to 330) nF	10 Hz to 1 kHz	0.25 % + 0.56 nF	
(0.33 to 1.1) µF	(10 to 600) Hz	0.25 % + 1.8 nF	
(1.1 to 3.3) µF	(10 to 300) Hz	0.25 % + 3.8 nF	
(3.3 to 11) µF	(10 to 150) Hz	0.25 % + 21 nF	
(11 to 33) µF	(10 to 120) Hz	0.4 % + 60 nF	
(33 to 110) µF	Up to 80 Hz	0.45 % + 0.79 µF	
(110 to 330) µF	Up to 50 Hz	0.45 % + 0.78 µF	
330 µF to 1.1 mF	Up to 20 Hz	0.45 % + 1.9 µF	
(1.1 to 3.3) mF	Up to 6 Hz	0.45 % + 4 µF	
(3.3 to 11) mF	Up to 2 Hz	0.45 % + 16 µF	
(11 to 33) mF	Up to 0.6 Hz	0.75 % + 37 µF	
(33 to 110) mF	Up to 0.2 Hz	1.1 % + 130 µF	
Leveled Sine Wave –			
5 mV to 5.5 V	50 kHz Reference	2 % + 0.57 mV	Fluke 5520A with 1.1 GHz option
Absolute	50 kHz to 100 MHz	3.5 % + 0.57 mV	
	(100 to 300) MHz	4 % + 0.57 mV	
	(300 to 600) MHz	6 % + 0.57 mV	
Flatness	50 kHz to 100 MHz	1.5 % + 0.47 mV	
	(100 to 300) MHz	2 % + 0.47 mV	
	(300 to 600) MHz	4 % + 0.47 mV	

Parameter/Equipment	Range	CMC ^{2, 5} (±)	Comments
Time Marker in Oscilloscope Uncertainty –	(2, 5) ns (1, 2, 5, 10, 20, 50) µs (100, 200, 500) µs	3.2 µs/s 3.2 µs/s 3.2 µs/s	Fluke 5520A with 1.1 GHz option

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments
Edge Rise Time Uncertainty – Into 50 Ω	≤ 300 ps	0 ps -100 ps	Fluke 5520A with 1.1 GHz option
Electrical Calibration of RTD Indicators & Indicating Systems ³ –			
Pt 385, 100 Ω	(-200 to 0) °C (0 to 100) °C (100 to 400) °C (400 to 630) °C (630 to 800) °C	0.065 °C 0.086 °C 0.11 °C 0.15 °C 0.27 °C	Fluke 5520A
Pt 3926, 100 Ω	(-200 to 0) °C (0 to 100) °C (100 to 400) °C (400 to 630) °C	0.065 °C 0.086 °C 0.12 °C 0.15 °C	
Pt 3916, 100 Ω	(-200 to -190) °C (-190 to 100) °C (100 to 400) °C (400 to 600) °C (600 to 630) °C	0.29 °C 0.08 °C 0.11 °C 0.12 °C 0.27 °C	
Pt 385, 200 Ω	(-200 to 260) °C (260 to 600) °C (600 to 630) °C	0.065 °C 0.17 °C 0.19 °C	
Pt 385, 500 Ω	(-200 to 260) °C (260 to 600) °C (600 to 630) °C	0.075 °C 0.11 °C 0.12 °C	
Pt 385, 1000 Ω	(-200 to 0) °C (0 to 300) °C (300 to 600) °C (600 to 630) °C	0.045 °C 0.075 °C 0.086 °C 0.27 °C	
Ni 120, 120 Ω	(-80 to 100) °C (100 to 260) °C	0.097 °C 0.17 °C	
Cu 427, 10 Ω	(-100 to 260) °C	0.35 °C	

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments
Electrical Calibration of Thermocouple Indicators & Indicating Systems ³ –			
Type B	(600 to 800) °C (800 to 1000) °C (1000 to 1550) °C (1550 to 1820) °C	0.51 °C 0.4 °C 0.35 °C 0.39 °C	Fluke 5520A
Type C	(0 to 150) °C (150 to 650) °C (650 to 1000) °C (1000 to 1800) °C (1800 to 2316) °C	0.35 °C 0.31 °C 0.36 °C 0.58 °C 0.97 °C	
Type E	(-250 to -100) °C (-100 to 650) °C (650 to 1000) °C	0.58 °C 0.19 °C 0.25 °C	
Type J	(-210 to -100) °C (-100 to 760) °C (760 to 1200) °C	0.32 °C 0.2 °C 0.27 °C	
Type K	(-200 to -100) °C (-100 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.39 °C 0.21 °C 0.31 °C 0.48 °C	
Type L	(-200 to -100) °C (-100 to 800) °C (800 to 900) °C	0.43 °C 0.31 °C 0.2 °C	
Type N	(-200 to -100) °C (-100 to -25) °C (-25 to 410) °C (410 to 1300) °C	0.47 °C 0.26 °C 0.23 °C 0.32 °C	
Type R	(0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C	0.66 °C 0.41 °C 0.39 °C 0.47 °C	
Type S	(0 to 250) °C (250 to 1400) °C (1400 to 1767) °C	0.55 °C 0.44 °C 0.47 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.73 °C 0.28 °C 0.19 °C 0.17 °C	
Type U	(-200 to 0) °C (0 to 600) °C	0.65 °C 0.32 °C	

IV. Fluid Quantities

Parameter/Equipment	Range	CMC ^{2,7} (±)	Comments
Flow	0.025 SCCM to 250 SLPM	1.8 %	Standard flow meters

V. Magnetic Quantities

Parameter/Equipment	Range	CMC ^{2,7} (±)	Comments
DC – Gauss	10 G 20 G	5.5 %	Direct comparison

VI. Mechanical

Parameter/Equipment	Range	CMC ^{2,7} (±)	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

Parameter/Equipment	Range	CMC ^{2, 4, 7} (±)	Comments
Indirect Verification of Rockwell Hardness Testers ³ –	HRBW: Low Medium High HRC: Low Medium High HR15N: Low Medium High HR30N: Low Medium High HR15TW: Low Medium High HR30TW: 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	ASTM E18
Indirect Verification of Micro Indentation Hardness Testers –			
Knoop	(250 to 600) HK (600 to 800) KH	12 HK 27 HK	Indirect comparison with test blocks to ASTM E92
Vickers	(250 to 600) HV (600 to 800) HV	8.4 HV 26 HV	
Torque Wrenches ³	(4 to 1000) in·lbf (20 to 600) ft·lbf	0.4 % 0.4 %	CDI suretest 5000-ST
Torque Wrenches	(100 to 2000) ft·lbf	0.59 %	Computest
Torque Transducer	0.5 in·ozf to 2000 ft·lbf	0.092 %	Arm & weights
Force – Compression ³	Up to 50 000 lbf	0.48 %	Load cells
Force – Tension ³	Up to 50 000 lbf	0.47 %	Load cells

Parameter/Equipment	Range	CMC ^{2, 4, 7} (±)	Comments
Pressure	(0 to 10 000) psig	0.078 % of FS	Fluke pressure calibrator
	(0 to 1000) psi	0.025 %	Deadweight Pneumatic
Scales	1 mg to 100 g (100 to 500) g	0.069 mg (62 + 0.6R) mg	Weights
	(11 to 600) lb	440 mg	

VII. Thermodynamics

Parameter/Equipment	Range	CMC ^{2, 7} (±)	Comments
Humidity	(10 to 80) % RH	2.9 %	Temperature/humidity standard

VIII. Time & Frequency

Parameter/Equipment	Range	CMC ² (±)	Comments
Frequency – Measuring Equipment ³	10 Hz to 600 MHz	2.3 x 10 ⁻⁸ Hz	Fluke PM6690

¹ This laboratory offers commercial dimensional testing/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 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.

⁵ Based on using the standard at the temperature the Fluke 5520A was calibrated (tcal) within ± 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 ± 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 ± 5 °C of tcal.

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

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

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 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.

¹⁰ Adjustable thread rings are set to applicable specifications using calibrated master set plug gages.



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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 17025:2005 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets the requirements of ANSI/NCSLI 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 8 January 2009).



Presented this 28th day of July 2017.

A handwritten signature in black ink, written over a horizontal line.

President and CEO
For the Accreditation Council
Certificate Number 1332.01
Valid to May 31, 2019
Revised July 5, 2018

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