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

TEKTRONIX, INC.
8020 Southpark Circle, Suite 300
Littleton, CO 80120
William Gottbreht Phone: 303 539 1400

CALIBRATION

Valid To: September 30, 2023 Certificate Number: 2357.14

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations and dimensional inspections[1, 7]:

I. Dimensional

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Angle Generation – Levels and Protractors	0° Up to 180° 90°	0.0051° 0.012° 0.0015°	10-inch sine bar, Grade 00 gage blocks, granite square, precision level & surface plate
Calipers[3]	(0.005 to 0.05) in (0.05 to 4) in (4 to 12) in (12 to 48) in	59 µin (58 + 0.25*L*) µin (59 + 4.0*L*) µin (91 + 5.3*L*) µin	Wafer gage block set, Grade 00 gage blocks, Grade AS1 gage blocks
Depth Gages[3]	(0.005 to 0.05) in (0.05 to 4) in (4 to 12) in (12 to 48) in	59 µin (58 + 0.25*L*) µin (43 + 4.0*L*) µin (55 + 3.0*L*) µin	Wafer gage block set, Grade 00 gage blocks, Grade AS1 gage blocks
Height Gages[3]	(0.005 to 0.05) in (0.05 to 4) in (4 to 48) in	59 µin (58 + 0.25*L*) µin (39 + 5.0*L*) µin	Wafer gage block set, Grade 00 gage blocks, Grade AS1 gage blocks

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Indicators[3]	Up to 0.2 in (0.005 to 0.05) in (0.05 to 4) in (4 to 10) in (10 to 48) in	51 µin 59 µin (58 + 0.25*L*) µin (43 + 4.0*L*) µin (31 + 5.2*L*) µin	Calibration tester, Wafer gage block set, Grade 00 gage blocks, Grade AS1 gage blocks
Feeler/Thickness Gage	(0.005 to 0.05) in (0.05 to 5) in	35 µin (48 + 14*L*) µin	Wafer gage block set, Pratt & Whitney PC w/grade 00 gage blocks
Micrometers[3] – Flatness	(0.05 to 12) in (12 to 48) in Up to 1 in	(9.0 + 5.2*L*) µin (30 + 5.0*L*) µin 8.0 µin	Grade 00 gage blocks, Grade AS1 gage blocks Optical flat
Plain Plugs and Pins	(0.05 to 1) in	28 µin	Pratt & Whitney PC w/grade 00 gage blocks

II. Dimensional Inspection/Testing[1]

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Length – 1D	Up to 10 in	(39 + 0.50*L*) µin	Pratt & Whitney PC w/grade 00 gage blocks

III. Electrical – DC/Low Frequency

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
AC Current – Generate[3] (9 to 220) µA	 (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	 0.41 mA/A + 16 nA 0.17 mA/A + 10 nA 0.13 mA/A + 8.0 nA 0.28 mA/A + 12 nA 1.0 mA/A + 65 nA	 Fluke 5720A

Parameter/Range	Frequency	CMC[2, 4, 5] (±)	Comments
AC Current – Generate[3] (cont)			
(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	0.42 mA/A + 40 nA 0.21 mA/A + 35 nA 0.16 mA/A + 35 nA 0.22 mA/A + 110 nA 1.0 mA/A + 650 nA	Fluke 5720A
(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	0.41 mA/A + 400 nA 0.17 mA/A + 350 nA 0.13 mA/A + 350 nA 0.20 mA/A + 550 nA 1.0 mA/A + 5.0 µA	
(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	0.42 mA/A + 4.0 µA 0.18 mA/A + 3.5 µA 0.13 mA/A + 2.5 µA 0.20 mA/A + 3.5 µA 1.0 mA/A + 10 µA	
(0.22 to 2.2) A	20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.26 mA/A + 35 µA 0.39 mA/A + 80 µA 6.2 mA/A + 160 µA	
(2.2 to 11) A	40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.36 mA/A + 170 µA 0.75 mA/A + 380 µA 2.8 mA/A + 750 µA	Fluke 5720A w/ 5725A
(11 to 20.5) A	(45 to 100) Hz (0.1 to 1) kHz (1 to 5) kHz	0.94 mA/A + 3.9 mA 1.2 mA/A + 3.9 mA 23 mA/A + 3.9 mA	Fluke 5520A
Clamp-On Only			
Torodial (16.5 to 150) A	(45 to 65) Hz (65 to 440) Hz	0.39 % 0.84 %	Fluke 5520A-SC1100 w/ Fluke 5500 coil
(150 to 1025) A	(45 to 65) Hz (65 to 440) Hz	0.38 % 0.84 %	
Non-Torodial (16.5 to 150) A	(45 to 65) Hz (65 to 440) Hz	0.77 % 1.2 %	
(150 to 1025) A	(45 to 65) Hz (65 to 440) Hz	1.2 % 1.6 %	

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
AC Current – Measure[3]			
(10 to 100) µA	(10 to 20) Hz (20 to 45) Hz (45 to 5) kHz	3.1 nA/µA + 23 nA 1.2 nA/µA + 23 nA 0.49 nA/µA + 23 nA	HP 3458A
(0.1 to 1) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz	3.1 µA/mA + 0.16 µA 1.2 µA/mA + 0.16 µA 0.52 µA/mA + 0.16 µA 0.28 µA/mA + 0.16 µA	
(1 to 10) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz	3.1 µA/mA + 1.6 µA 1.2 µA/mA + 1.6 µA 0.49 µA/mA + 1.6 µA 0.28 µA/mA + 1.6 µA	
(10 to 100) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz	3.1 µA/mA + 16 µA 1.2 µA/mA + 16 µA 0.49 µA/mA + 16 µA 0.28 µA/mA + 16 µA	
(0.1 to 1) A	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz	3.1 mA/A + 0.16 mA 1.3 mA/A + 0.16 mA 0.69 mA/A + 0.16 mA 0.83 mA/A + 0.16 mA	
(1 to 20) A	55 Hz to 1 kHz 1 to 5 kHz	0.42 mA/A 0.92 mA/A	Y5020 w/ 3458A
AC Voltage – Generate[3]			
(0.2 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 (0.5 to 1) MHz	1.2 mV/V + 5.0 µV 0.91 mV/V + 5.0 µV 0.90 mV/V + 5.0 µV 1.5 mV/V + 5.0 µV 2.1 mV/V + 6.0 µV 3.6 mV/V + 12 µV 5.2 mV/V + 25 µV 6.6 mV/V + 25 µV	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 (0.5 to 1) MHz	0.32 mV/V + 5.0 µV 0.18 mV/V + 5.0 µV 0.18 mV/V + 5.0 µV 0.33 mV/V + 5.0 µV 0.59 mV/V + 6.0 µV 1.3 mV/V + 12 µV 1.7 mV/V + 25 µV 3.2 mV/V + 25 µV	

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
AC Voltage – Generate[3] (cont)			
(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 (0.5 to 1) MHz	0.39 mV/V + 15 µV 99 µV/V + 8.0 µV 87 µV/V + 8.0 µV 0.21 mV/V + 8.0 µV 0.49 mV/V + 20 µV 0.89 mV/V + 25 µV 1.4 mV/V + 30 µV 2.7 mV/V + 60 µV	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 (0.5 to 1) MHz	0.54 mV/V + 50 µV 88 µV/V + 20 µV 46 µV/V + 10 µV 80 µV/V + 12 µV 0.14 mV/V + 40 µV 0.42 mV/V + 100 µV 0.96 mV/V + 250 µV 1.7 mV/V + 400 µV	
(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 (0.5 to 1) MHz	0.40 mV/V + 500 µV 95 µV/V + 200 µV 48 µV/V + 70 µV 82 µV/V + 120 µV 0.12 mV/V + 250 µV 0.30 mV/V + 800 µV 1.0 mV/V + 2.5 mV 1.7 mV/V + 4.0 mV	
(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 (0.5 to 1) MHz	0.46 mV/V + 5.0 mV 99 µV/V + 2.0 mV 71 µV/V + 0.70 mV 0.15 mV/V + 1.2 mV 0.23 mV/V + 3 mV 0.87 mV/V + 20 mV 4.2 mV/V + 50 mV 8.6 mV/V + 100 mV	
(220 to 250) V	(15 to 50) Hz 50 Hz to 1 kHz	0.28 mV/V + 20 mV 79 µV/V + 4.0 mV	
(220 to 1100) V	(1 to 20) kHz (20 to 30) kHz	0.13 mV/V + 6.0 mV 0.49 mV/V + 11 mV	Fluke 5720A w/5725A
(220 to 750) V	(30 to 50) kHz (50 to 100) kHz	0.47 mV/V + 11 mV 1.8 mV/V + 45 mV	

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
AC Voltage – Measure[3]			
Up 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 kHz to 1 MHz	0.43 µV/mV + 3.0 µV 0.22 µV/mV + 1.1 µV 0.32 µV/mV + 1.1 µV 1.0 µV/mV + 1.1 µV 5.0 µV/mV + 1.1 µV 40 µV/mV + 5.0 µV	HP 3458A, synchronous sub-sampled mode
(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	0.30 µV/mV + 4.0 µV 0.10 µV/mV + 2.0 µV 0.15 µV/mV + 2.0 µV 0.32 µV/mV + 2.0 µV 0.81 µV/mV + 2.0 µV 3.0 µV/mV + 10 µV 10 µV/mV + 10 µV	
(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	0.28 mV/V + 40 µV 87 µV/V + 20 µV 0.15 mV/V + 20 µV 0.32 mV/V + 20 µV 0.81 mV/V + 20 µV 3.0 mV/V + 0.10 mV 10 mV/V + 0.10 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 (0.3 to 1) MHz	0.28 mV/V + 0.40 mV 86 µV/V + 0.20 mV 0.15 mV/V + 0.20 mV 0.32 mV/V + 0.20 mV 0.81 mV/V + 0.20 mV 3.0 mV/V + 1.0 mV 10 mV/V + 1.0 mV	
(10 to 100) V	(1 to 40) Hz 40 Hz to 1 kHz (1to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (0.3 to 1) MHz	0.34 mV/V + 4.0 mV 0.21 mV/V + 2.0 mV 0.21 mV/V + 2.0 mV 0.37 mV/V + 2.0 mV 1.2 mV/V + 2.0 mV 4.0 mV/V + 10 mV 15 mV/V + 10 mV	
(100 to 700) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.49 mV/V + 40 mV 0.40 mV/V + 20 mV 0.60 mV/V + 20 mV 1.2 mV/V + 20 mV 3.0 mV/V + 20 mV	
(0.7 to 42) kV	60 Hz	6.2 mV/V	Ross VD60 w/ 34401A

Parameter/Range	Frequency	CMC[2, 4, 5] (±)	Comments
Oscilloscopes –			
Amplitude DC			
50 Ω	(0 to ±6.6) V_{pp}	1.9 mV/V + 31 µV	Fluke 5520A/SC1100
1 MΩ	(0 to ±130_ V_{pp}	0.39 mV/V + 31 µV	
Square Wave			
50 Ω	(0 to ±6.6) V_{pp}	1.6 mV/V + 31 µV	Fluke 5520A/SC1100
1 MΩ	(0 to ±130) V_{pp}	0.78 mV/V + 31 µV	
Leveled Sine Wave	50 kHz to 100 MHz	2.8 %	Fluke 5520A/SC1100
	(100 to 300) MHz	3.0 %	
	(300 to 600) MHz	4.0 %	
	(600 to 1100) MHz	4.7 %	
	(1100 to 3200) MHz	4.1 %	Fluke 9500B w/ 9530 active heads
Time Marker	5 s to 50 ms	(19 + 39*t*) µs/s	Fluke 5520A/SC1100; *t* = time
	1 ns to 20 ms (cardinal points)	2.1 µs/s	
	1 ns to 20 ms (noncardinal points)	39 µs/s	
Rise Time – Generate	1 kHz to 2 MHz (200 to 300) ps	19 ps	Fluke 5520A/SC1100
	(2 to 10) MHz (250 to 350) ps	19 ps	
Capacitance – Generate[3]			
(0.19 to 1.0999) nF	10 Hz to 10 kHz	4.1 pF/nF + 7.8 pF	Fluke 5520A
(1.1 to 3.2999) nF	10 Hz to 3 kHz	4.0 pF/nF + 7.8 pF	
(3.3 to 10.9999) nF	10 Hz to 1 kHz	2.3 pF/nF + 7.8 pF	
(11 to 109.999) nF	10 Hz to 1 kHz	2.3 pF/nF + 78 pF	
(110 to 329.999) nF	10 Hz to 1 kHz	2.3 pF/nF + 233 pF	
(0.33 to 1.09999) µF	(10 to 600) Hz	2.3 nF/µF + 0.78 nF	
(1.1 to 3.299 99) µF	(10 to 300) Hz	2.3 nF/µF + 2.3 nF	
(3.3 to 10.9999) µF	(10 to 150) Hz	2.3 nF/µF + 7.8 nF	
(11 to 32.9999) µF	(10 to 120) Hz	3.4 nF/µF + 23 nF	
(33 to 109.999) µF	(10 to 80) Hz	3.7 nF/µF + 78 nF	
(110 to 329.999) µF	(DC to 50) Hz	3.5 nF/µF + 233 nF	
(0.33 to 1.099 99) mF	(DC to 20) Hz	3.5 µF/mF + 0.78 µF	
(1.1 to 3.2999) mF	(DC to 6) Hz	3.5 µF/mF + 2.3 µF	
(3.3 to 10.9999) mF	(DC to 2) Hz	3.5 µF/mF + 7.8 µF	
(11 to 32.9999) mF	(DC to 0.6) Hz	5.8 µF/mF + 23 µF	
(33 to 110) mF	(DC to 0.2) Hz	8.5 µF/mF + 78 µF	

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
Distortion – Measure[3]			
(0 to 99.9) dB (0 to 99.9) dB	20 Hz to 20 kHz (20 to 100) kHz	1.2 dB 2.3 dB	HP 8903B
Inductance – Generate[3]			
100 mH	(0.1 to 1) kHz	2.9 mH/H	GenRad 1482L

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
DC Current – Generate[3]	Up to 220 µA (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	41 µA/A + 5.4 nA 33 µA/A + 6.2 nA 33 µA/A + 39 nA 41 µA/A + 0.62 µA 71 µA/A + 12 µA 0.28 mA/A + 0.37 mA	Fluke 5720A opt 3 w/ 5725A
	(11 to 20.5) A	0.78 mA/A + 0.58 mA	Fluke 5520A
Clamp-On Only	(16.5 to 149.999) A (150 to 1025) A	3.9 mA/A + 0.11 mA 4.0 mA/A + 0.39 mA	Fluke 5520A w/ 5500A coil
DC Current – Measure[3]	(0 to 100) nA (0.1 to 1 µA (1 to 10) µA (10 to 100 µA (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A	67 µA/A + 40 pA 34 µA/A + 40 pA 20 µA/A + 0.10 nA 22 µA/A + 0.80 nA 23 µA/A + 5.0 nA 22 µA/A + 50 nA 42 µA/A + 500 nA 110 µA/A + 10 µA	HP 3458A
	(1 to 20) A	56 µA/A	Y5020 w/ 3458A
	(20 to 100) A	0.46 mA/A	L&N Shunt w/ 3458A

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
DC Resistance – Measure[3]	Up to 10 Ω (10 to 100) Ω (0.1 to 1) kΩ (1 to 10) kΩ (10 to 100) kΩ (0.1 to 1) MΩ (1 to 10) MΩ (10 to 100) MΩ (0.1 to 1) GΩ	15 μΩ/Ω + 50 μΩ 12 μΩ/Ω + 0.50 mΩ 10 μΩ/Ω + 0.50 mΩ 10 μΩ/Ω + 5.0 mΩ 11 μΩ/Ω + 50 mΩ 16 μΩ/Ω + 2.0 Ω 51 μΩ/Ω + 100 Ω 0.51 mΩ/Ω + 1.0 kΩ 5.6 mΩ/Ω + 10 kΩ	HP 3458A
DC Resistance – Generate[3]	(0 to 10.9999) Ω (11 to 32.9999) Ω (33 to 109.9999) Ω (110 to 329.9999) Ω (330 to 1099.999) Ω (1.1 to 3.299 999) kΩ (3.3 to 10.999 99) kΩ (11 to 32.999 99) kΩ (33 to 109.9999) kΩ (110 to 329.9999) kΩ (330 to 1099.999) kΩ (1.1 to 3.299 999) MΩ (3.3 to 10.999 99) MΩ (11 to 32.999 99) MΩ (33 to 109.9999) MΩ (110 to 329.9999) MΩ (330 to 1099.999) MΩ	33 μΩ/Ω + 0.78 mΩ 24 μΩ/Ω + 1.2 mΩ 22 μΩ/Ω + 1.1 mΩ 23 μΩ/Ω + 1.6 mΩ 22 μΩ/Ω + 1.6 mΩ 23 μΩ/Ω + 16 mΩ 23 μΩ/Ω + 16 mΩ 23 μΩ/Ω + 0.16 Ω 23 μΩ/Ω + 0.16 Ω 26 μΩ/Ω + 1.6 Ω 26 μΩ/Ω + 1.6 Ω 48 μΩ/Ω + 23 Ω 0.10 mΩ/Ω + 39 Ω 0.21 mΩ/Ω + 1.9 kΩ 0.40 mΩ/Ω + 2.3 kΩ 2.3 mΩ/Ω + 78 kΩ 12 mΩ/Ω + 390 kΩ	Fluke 5520A
DC Resistance – Generate[3], Fixed Points	1 Ω 1.9 Ω 10 Ω 19 Ω 100 Ω 190 Ω 1 kΩ 1.9 kΩ 10 kΩ 19 kΩ 100 kΩ 190 kΩ 1 MΩ 1.9 MΩ 10 MΩ 19 MΩ 100 MΩ	0.11 mΩ 0.16 mΩ 0.21 mΩ 0.41 mΩ 0.96 mΩ 1.8 mΩ 8.6 mΩ 16 mΩ 80 mΩ 0.15 Ω 1.2 Ω 2.2 Ω 20 Ω 38 Ω 0.37 kΩ 0.84 kΩ 12 kΩ	Fluke 5720A

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
DC Voltage – Measure[3]	(0 to 100) mV (0.1 to 1) V (1 to 10) V (10 to 100) V (100 to 1100) V (1 to 60) kV	5.9 µV/V + 0.23 µV 3.5 µV/V + 0.23 µV 3.4 µV/V + 0.39 µV 4.9 µV/V + 23 µV 5.0 µV/V + 78 µV 1.7 mV/V	HP 3458A opt 002 VD60 Ross divider w/ HP 34401A
DC Voltage – Generate[3]	(0 to 220) mV 220 mV to 2.2 V (2.2 to 11) V (11 to 22) V (22 to 220) V 220 V to 1.1 kV	9.0 µV/V + 0.62 µV 7.3 µV/V + 0.93 µV 7.3 µV/V + 3.1 µV 7.3 µV/V + 6.2 µV 7.9 µV/V + 78 µV 9.3 µV/V + 470 µV	Fluke 5720A
Electrical Calibration of Thermocouple Indicators –			
Type B	(600 to 800) °C (800 to 1000) °C (1000 to 1550) °C (1550 to 1820) °C	0.34 °C 0.27 °C 0.24 °C 0.26 °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	0.24 °C 0.21 °C 0.25 °C 0.39 °C 0.65 °C	
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.39 °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	0.25 °C 0.13 °C 0.12 °C 0.14 °C 0.18 °C	

Parameter/Equipment	Range	CMC[2] (±)	Comments
Electrical Calibration of Thermocouple Indicators (cont)			
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1 000) °C (1000 to 1372) °C	0.26 °C 0.14 °C 0.13 °C 0.20 °C 0.31 °C	Fluke 5520A
Type N	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 410) °C (410 to 1300) °C	0.31 °C 0.17 °C 0.15 °C 0.14 °C 0.21 °C	
Type R	(0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C	0.45 °C 0.28 °C 0.26 °C 0.32 °C	
Type S	(0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1767) °C	0.38 °C 0.28 °C 0.29 °C 0.36 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.50 °C 0.19 °C 0.13 °C 0.11 °C	
Type U	(-200 to 0) °C (0 to 600) °C	0.44 °C 0.21 °C	

Parameter/Equipment	Range	CMC[2] (±)	Comments
Electrical Calibration of RTDs[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	0.085 °C 0.12 °C 0.12 °C 0.11 °C 0.097 °C 0.11 °C 0.20 °C	Fluke 5520A
Pt 3926, 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	0.064 °C 0.076 °C 0.075 °C 0.089 °C 0.095 °C 0.17 °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	0.21 °C 0.060 °C 0.068 °C 0.070 °C 0.077 °C 0.084 °C 0.090 °C 0.13 °C 0.19 °C	
Pt 385, 200 Ω	(-200 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	0.041 °C 0.043 °C 0.044 °C 0.051 °C 0.098 °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 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.036 °C 0.043 °C 0.044 °C 0.051 °C 0.066 °C 0.066 °C 0.073 °C 0.088 °C	

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Electrical Calibration of RTDs[3] – (cont)			
Pt 385, 1000 Ω	(-200 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	0.029 °C 0.029 °C 0.036 °C 0.042 °C 0.050 °C 0.18 °C 0.057 °C 0.18 °C	Fluke 5520A
PtNi 385, 120 Ω	(-80 to 0) °C (0 to 100) °C (100 to 260) °C	0.081 °C 0.11 °C 0.11 °C	
Cu 427, 10 Ω	(-100 to 260) °C	0.69 °C	
Rise/Fall Time – Measure	> 400 ps	79 ps	Tektronix TDS784D

IV. Electrical – RF/Microwave

Parameter/Equipment	Frequency	CMC[2, 4, 5] (±)	Comments
RF Power – Measure			
(-30 to + 20) dBm	(100 to 500) kHz 500 kHz to 1 MHz (1 to 100) MHz (0.1 to 2) GHz (2 to 4.2) GHz	2.1 % 1.6 % 1.5 % 1.6 % 1.8 %	HP N1914A w/ HP 8482A-H84
RF Power @ 50 MHz	1.00 mW	0.30 %	HP 432C w/ HP 478A-H76 and HP 3458A

V. Mechanical

Parameter/Equipment	Range	CMC[2, 5, 8] (±)	Comments
Force – Measure, Compression/Tension[3]	(0 to 1) lbf (1 to 10) lbf (10 to 50) lbf (50 to 100) lbf (100 to 500) lbf	0.066 % 0.030 % 0.038 % 0.055 % 0.022 %	NIST Class F weights
Pressure Gages[3] –			
Pneumatic:			
Absolute	Up to 100 psia Up to 1000 psia	0.02 % span + 0.0073 psi 0.02 % span + 0.0073 psi	Fluke PPC4EX 7M
Gauge	(-11.8 to 100) psig (-11.8 to 1000) psig	0.02 % span + 0.0073 psi 0.02 % span + 0.0073 psi	
Hydraulic	Up to 3000 psi Up to 10 000 psi	0.093 % 0.10 %	Fluke 700P29 Fluke 700P31
Scales & Balances[3]	(1 to 500) mg (0.5 to 2) g (2 to 3) g (3 to 5) g (5 to 10) g (10 to 50) g (50 to 100) g (100 to 200) g (200 to 300) g (300 to 500) g (0.5 to 1) kg (1 to 2) kg	12 µg 44 µg 47 µg 54 µg 61 µg 0.15 mg 0.30 mg 0.61 mg 0.63 mg 1.4 mg 2.9 mg 5.9 mg	Class 1 weights
	Up to 0.2 lb (0.2 to 0.5) lb (0.5 to 1) lb (1 to 2) lb (2 to 5) lb (5 to 10) lb (10 to 20) lb (20 to 50) lb (50 to 100) lb (100 to 250) lb (250 to 500) lb	21 mg 53 mg 82 mg 0.16 g 0.27 g 0.53 g 1.1 g 2.7 g 5.3 g 13 g 27 g	NIST Class F weights

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Torque Wrenches[3]	(5 to 50) lbf·in (25 to 250) lbf·in (100 to 1000) lbf·in (20 to 250) lbf·ft (60 to 600) lbf·ft	0.30 % 0.31 % 0.46 % 0.34 % 0.44 %	CDI 2000-400-02 CDI 2000-12-02

VI. Thermodynamics

Parameter/Equipment	Range	CMC[2, 5, 8] (±)	Comments
Relative Humidity – Measure[3]	(20 to 90) % RH	1.3 %	Vaisala HMI-41 RH meter w/ HMP 46 probe
Temperature – Measure[3]	(-197 to -35) °C (-35 to -80) °C (-80 to -38) °C (-38 to 0) °C (0 to 100) °C (100 to 400) °C (400 to 420) °C	0.033 °C 0.035 °C 0.029 °C 0.029 °C 0.030 °C 0.033 °C 0.044 °C	PRT w/ digital thermometer
Temperature – Measuring Equipment	(-38 to 0.0) °C (0.0 to 100) °C (100 to 400) °C	0.29 °C 0.060 °C 0.061 °C	PRT w/ digital thermometer, bath

VII. Time & Frequency

Parameter/Equipment	Range	CMC[2, 8] (±)	Comments
Frequency – Generate[3]	 (0.001 to 1000) Hz 1000 Hz to 80 MHz 80 MHz to 26.5 GHz	 0.66 µHz/Hz 1.2 nHz/Hz 1.2 nHz/Hz	Symmetricom ET 6000-RB1 w/: HP 33250A HP 8340B

Parameter/Equipment	Range	CMC[2, 5, 8] (±)	Comments
Frequency – Measure[3]	0.001 Hz to 1 kHz 1 kHz to 255 MHz 50 MHz to 26.5 GHz	0.12 mHz/Hz 1.2 nHz/Hz 1.2 nHz/Hz	Symmetricom ET 6000-RB1 w/: HP 53132A HP 53152A
Stop Watches[3]	(1 to 86 400) sec	39 msec	Symmetricom ET 6000-RB1 w/HP53132A
Non-Contact Tachometers[3]	(1 to 100 000) RPM (100 000 to 200 000) RPM	0.0023 RPM + 0.6*R* 0.21 RPM + 0.6*R*	Symmetricom ET 6000-RB1 w HP 33250A

Satellite Facility

TEKTRONIX, INC.
10811 West Collins Ave
Lakewood, CO 80215
William Gottbreht Phone: 303 231 4553

CALIBRATION

I. Fluid Quantities

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Gas Flow	(1 to 10) sccm (10 to 1000) sccm (1 000 to 30 000) sccm	0.44 % 0.29 % 0.30 %	DHI Molbox

II. Mechanical

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Pressure Gages[3] –			
Pneumatic:			
Absolute	Up to 100 psia Up to 1000 psia	0.02 % span + 0.0073 psi 0.02 % span + 0.0073 psi	Fluke 700P00, Fluke PPC4EX 7M
Gauge	(-11.8 to 100) psig (-11.8 to 1000) psig	0.02 % span + 0.0073 psi 0.02 % span + 0.0073 psi	

III. Thermodynamics

Parameter/Equipment	Range	CMC[2, 5, 8] (±)	Comments
Relative Humidity – Measuring Equipment	(14.7 to 49.9) % RH (50 to 95) % RH	0.55 % 0.62 %	Thunder Scientific 2500
Temperature – Measure	(-38 to 0) °C (0 to 130) °C	0.020 °C 0.045 °C	PRT w/ digital thermometer
Temperature – Measuring Equipment	(-38 to 0) °C (0 to 130) °C	0.049 °C 0.064 °C	PRT w/ digital thermometer, bath

Satellite Facility

TEKTRONIX, INC.
799 E. Utah Valley Drive
American Fork, UT 84003
William Gottbreht Phone: 801-847-9297

CALIBRATION

I. Electrical – DC/Low Frequency

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
AC Current – Generate[3]			
(29 to 329.99) 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	1.6 nA/µA + 78 nA 1.2 nA/µA + 78 nA 0.98 nA/µA + 78 nA 2.3 nA/µA + 0.12 µA 6.2 nA/µA + 0.16 µA 12 nA/µA + 0.31 µA	Fluke 5522A
(0.33 to 3.2999) 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	1.6 µA/mA + 0.12 µA 1.0 µA/mA + 0.12 µA 0.79 µA/mA + 0.12 µA 1.6 µA/mA + 0.16 µA 4.0 µA/mA + 0.23 µA 7.8 µA/mA + 0.47 µA	
(3.3 to 32.999) 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	1.4 µA/mA + 1.6 µA 0.71 µA/mA + 1.6 µA 0.35 µA/mA + 1.6 µA 0.64 µA/mA + 1.6 µA 1.6 µA/mA + 2.3 µA 3.5 µA/mA + 3.1 µA	
(33 to 329.99) 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	1.5 µA/mA + 16 µA 0.71 µA/mA + 16 µA 0.34 µA/mA + 16 µA 0.79 µA/mA + 39 µA 1.6 µA/mA + 78 µA 3.2 µA/mA + 0.16 mA	

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
AC Current – Generate[3] (cont)			
(0.33 to 1.099 99) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	1.4 mA/A + 0.078 mA 0.41 mA/A + 0.078 mA 4.7 mA/A + 0.78 mA 19 mA/A + 3.9 mA	Fluke 5522A
(1.1 to 2.999 99) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	1.4 mA/A + 78 µA 0.56 mA/A + 78 µA 4.7 mA/A + 0.78 mA 19 mA/A + 3.9 mA	
(3 to 10.9999) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.52 mA/A + 1.6 mA 0.81 mA/A + 1.6 mA 23 mA/A + 1.6 mA	
(11 to 20.5) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.96 mA/A + 3.9 mA 1.2 mA/A + 3.9 mA 23 mA/A + 3.9 mA	
AC Voltage – Generate[3]			
(1.0 to 32.999) 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	0.63 mV/V + 4.7 µV 0.15 mV/V + 4.7 µV 0.19 mV/V + 4.7 µV 0.80 mV/V + 4.7 µV 2.7 mV/V + 9.3 µV 6.2 mV/V + 39 µV	Fluke 5522A
(33 to 329.999) 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	0.23 mV/V + 6.2 µV 0.12 mV/V + 6.2 µV 0.13 mV/V + 6.2 µV 0.28 mV/V + 6.2 µV 0.63 mV/V + 25 µV 1.6 mV/V + 54 µV	
(0.33 to 3.29999) 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	0.23 mV/V + 39 µV 0.12 mV/V + 47 µV 0.15 mV/V + 47 µV 0.24 mV/V + 39 µV 0.55 mV/V + 97 µV 1.9 mV/V + 0.47 mV	

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
AC Voltage – Generate[3] (cont)			
(3.3 to 32.9999) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.23 mV/V + 0.50 mV 0.12 mV/V + 0.47 mV 0.19 mV/V + 0.47 mV 0.27 mV/V + 0.47 mV 0.7 mV/V + 1.2 mV	Fluke 5522A
(33 to 329.999) V	45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.15 mV/V + 1.6 mV 0.16 mV/V + 4.7 mV 0.44 mV/V + 4.7 mV 0.25 mV/V + 4.7 mV 1.6 mV/V + 39 mV	
(330 to 1020) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.23 mV/V + 7.8 mV 0.20 mV/V + 7.8 mV 0.23 mV/V + 7.8 mV	
Capacitance – Generate[3]			
(220 to 399.9) pF	10 Hz to 10 kHz	5.6 fF/pF + 7.8 pF	Fluke 5522A
(0.4 to 1.0999) nF	10 Hz to 10 kHz	4.3 pF/nF + 7.8 pF	
(1.1 to 3.2999) nF	10 Hz to 3 kHz	4.1 pF/nF + 7.8 pF	
(3.3 to 10.9999) nF	10 Hz to 1 kHz	2.0 pF/nF + 7.8 pF	
(11 to 32.9999) nF	10 Hz to 1 kHz	2.0 pF/nF + 78 pF	
(33 to 109.999) nF	10 Hz to 1 kHz	2.0 pF/nF + 78 pF	
(110 to 329.999) nF	10 Hz to 1 kHz	2.1 pF/nF + 0.23 nF	
(0.33 to 1.099 99) µF	(10 to 600) Hz	2.0 nF/µF + 0.78 nF	
(1.1 to 3.299 99) µF	(10 to 300) Hz	2.0 nF/µF + 2.3 nF	
(3.3 to 10.9999) µF	(10 to 150) Hz	2.1 nF/µF + 7.8 nF	
(11 to 32.9999) µF	(10 to 120) Hz	3.2 nF/µF + 23 nF	
(33 to 109.999) µF	(10 to 80) Hz	3.7 nF/µF + 78 nF	
(110 to 329.999) µF	(DC to 50) Hz	3.7 nF/µF + 0.23 µF	
(0.33 to 1.099 99) mF	(DC to 20) Hz	3.7 µF/mF + 0.78 µF	
(1.1 to 3.299 99) mF	(DC to 6) Hz	3.5 µF/mF + 2.3 µF	
(3.3 to 10.9999) mF	(DC to 2) Hz	3.5 µF/mF + 7.8 µF	
(11 to 32.9999) mF	(DC to 0.6) Hz	5.8 µF/mF + 23 µF	
(33 to 110) mF	(DC to 0.2) Hz	8.5 µF/mF + 78 µF	

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
DC Current – Generate[3]	(0 to 329.999) µA (0 to 3.299 99) mA (0 to 32.9999) mA (0 to 329.999) mA (0 to 1.099 99) A (1.1 to 2.999 99) A (0 to 10.9999) A (11 to 20.5) A	120 µA/A + 16 nA 78 µA/A + 39 nA 78 µA/A + 0.19 µA 80 µA/A + 1.9 µA 0.16 mA/A + 31 µA 0.3 mA/A + 31 µA 0.39 mA/A + 0.39 mA 0.78 mA/A + 0.58 mA	Fluke 5522A
DC Voltage – Generate[3]	(0 to 329.9999) mV (0 to 3.299 999) V (0 to 32.999 99) V (30 to 329.9999) V (100 to 1000.000) V	16 µV/V + 0.78 µV 9.0 µV/V + 1.6 µV 9.8 µV/V + 16 µV 14 µV/V + 0.12 mV 14 µV/V + 1.2 mV	Fluke 5522A
DC Resistance – Generate[3]	(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) kΩ (1.1 to 3.299 999) kΩ (3.3 to 10.999 99) kΩ (11 to 32.999 99) kΩ (33 to 109.9999) kΩ (110 to 329.9999) kΩ (0.33 to 1.099 999) MΩ (1.1 to 3.299 999) MΩ (3.3 to 10.999 99) MΩ (11 to 32.999 99) MΩ (33 to 109.9999) MΩ (110 to 329.9999) MΩ (330 to 1100) MΩ	33 µΩ/Ω + 0.78 mΩ 24 µΩ/Ω + 1.2 mΩ 22 µΩ/Ω + 1.1 mΩ 23 µΩ/Ω + 1.6 mΩ 22 µΩ/Ω + 1.6 mΩ 23 µΩ/Ω + 16 mΩ 23 µΩ/Ω + 16 mΩ 23 µΩ/Ω + 0.16 Ω 23 µΩ/Ω + 0.16 Ω 26 µΩ/Ω + 1.6 Ω 26 µΩ/Ω + 1.6 Ω 48 µΩ/Ω + 23 Ω 0.10 mΩ/Ω + 39 Ω 0.21 mΩ/Ω + 1.9 kΩ 0.40 mΩ/Ω + 2.3 kΩ 2.4 mΩ/Ω + 78 kΩ 12 mΩ/Ω + 0.39 MΩ	Fluke 5522A

Parameter/Equipment	Range	CMC[2] (±)	Comments
Electrical Calibration of Thermocouple Indicators[3] –			
Type B	(600 to 800) °C (800 to 1000) °C (1000 to 1550) °C (1550 to 1820) °C	0.34 °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 0.39 °C 0.65 °C	
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.39 °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	0.25 °C 0.13 °C 0.12 °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	0.26 °C 0.14 °C 0.13 °C 0.20 °C 0.31 °C	
Type N	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 410) °C (410 to 1300) °C	0.31 °C 0.17 °C 0.15 °C 0.14 °C 0.21 °C	
Type R	(0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C	0.45 °C 0.28 °C 0.26 °C 0.32 °C	

Parameter/Equipment	Range	CMC[2] (±)	Comments
Electrical Calibration of Thermocouple Indicators[3] (cont)			
Type S	(0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1767) °C	0.38 °C 0.28 °C 0.29 °C 0.36 °C	Fluke 5522A
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.50 °C 0.19 °C 0.13 °C 0.11 °C	
Type U	(-200 to 0) °C (0 to 600) °C	0.44 °C 0.21 °C	

[1] This laboratory offers commercial and field calibration and inspection 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] 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. CMCs 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.

[5] In the statement of CMC, L is the numerical value of the nominal length of the device measured in inches; R is the resolution of the unit under test; % is defined as the percentage of reading, unless otherwise noted.

[6] 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.

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

[8] 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.

Accredited Laboratory

A2LA has accredited

TEKTRONIX, INC

Littleton, CO

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 11th day of November 2021.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 2357.14
Valid to September 30, 2023

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