SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005
& ANSI/NCSL Z540-1-1994 & ANSI/NCSL Z540.3-2006

TRESCAL, INC.
600 S 56th St, Ste. 2
Chandler, AZ 85226
Dainna Lowrance Phone: 480 753 7000

CALIBRATION

Valid To: March 31, 2021 Certificate Number: 2737.03

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations[1, 6]:

I. Dimensional

Parameter/Equipment	Range	CMC[2] (±)	Comments
Hand Tools[3] –			
Calipers	Up to 72 in	2.2 µin/in + 12 µin	Gage blocks
Micrometers	Up to 48 in		
Height Gages	Up to 48 in		
Drop Micrometers	Up to 2 in		
Depth Micrometers	Up to 12 in		
Diameter, External – Cylindrical Plug Gages, Thread Wires	Up to 3.0 in	9.5 µin/in + 11 µin	Laser micrometer
Precision Levels	Up to 90°	8.7”	Surface plate, sine bar, gage blocks

5202 Presidents Court, Suite 220 | Frederick, MD 21703-8515 | Phone: 301 644 3248 | Fax: 240 454 9449 | www.A2LA.org

II. Dimensional Testing/Calibration[1]

Parameter/Equipment	Range	CMC[2, 7, 8] (±)	Comments
1D Length – Measure	Up to 1 in Up to 6 in	58 µin 0.0012 in	Micrometer Caliper
Diameter – Measure	Up to 1 in Up to 6 in	58 µin 0.0012 in	Micrometer Caliper

III. Electrical – DC/ Low Frequency

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
DC Voltage[3] – Generate	(0 to 330) mV (0.33 to 3.3) V (3.3 to 33) V (33 to 330) V (330 to 1000) V	23 µV/V + 1 µV 14 µV/V + 2 µV 14 µV/V + 20 µV 22 µV/V + 0.15 mV 22 µV/V + 1.5 mV	Fluke 5520A
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 (1000 to 6000) V	12 µV/V + 0.3 µV 11 µV/V + 3 µV 11 µV/V + 0.5 µV 13 µV/V + 30 µV 13 µV/V + 100 µV 1.2 %	3458A 34401A w/ 80K6
DC Current[3] – Generate	(0 to 3.3) mA (3.3 to 330) mA (0.33 to 3.3) A (3.3 to 20.5) A (20.5 to 150) A (150 to 1000) A (20.5 to 100) A	0.17 mA/A + 50 nA 0.12 mA/A + 2.5 µA 4.6 mA/A + 40 µA 9.3 mA/A + 1.5 mA 0.30 % + 0.018 A 0.33 % + 0.082 A 33 µA/A	Fluke 5520A w/ 5500A/coil Power supply, L&N shunt & 3458A

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
DC Current[3] – Measure	(0 to 100) ŋA (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 (1.0 to 100) A	0.21 mA/A + 0.04 nA 59 µA/A + 0.04 nA 27 µA/A + 0.1 nA 26 µA/A + 0.8 nA 26 µA/A + 5 pA 26 µA/A + 50 pA 46 µA/A + 0.5 µA 0.18 µA/A + 10 µA 33 µA/A	3458A 3458A w/ L&N shunts
DC Resistance[3] – Generate	(0 to 10.999) Ω (11 to 32.999) Ω (33 to 109.999) Ω (110 to 329.999) Ω (0.33 to 1.0999) kΩ (1.1 to 3.2999) kΩ (3.3 to 109.999) kΩ (110 to 329.999) kΩ (0.33 to 1.0999) MΩ (1.1 to 3.2999) MΩ (3.3 to 10.999) MΩ (11 to 32.999) MΩ (33 to 109.999) MΩ (110 to 329.999) MΩ (330 to 1100) MΩ	55 µΩ/Ω + 1 mΩ 42 µΩ/Ω + 1.5 mΩ 94 µΩ/Ω + 1.4 mΩ 34 µΩ/Ω + 2 mΩ 34 µΩ/Ω + 2 mΩ 37 µΩ/Ω + 20 mΩ 19 µΩ/Ω + 20 mΩ 37 µΩ/Ω + 200 mΩ 37 µΩ/Ω + 200 mΩ 40 µΩ/Ω + 2 Ω 39 µΩ/Ω + 2 Ω 73 µΩ/Ω + 30 Ω 51 µΩ/Ω + 50 Ω 0.32 mΩ/Ω + 2.5 kΩ 0.57 mΩ/Ω + 3 kΩ	Fluke 5520A
DC Resistance[3] – Measure	(0 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	49 µΩ/Ω + 50 µΩ 17 µΩ/Ω + 500 µΩ 15 µΩ/Ω + 500 µΩ 14 µΩ/Ω + 500 µΩ 14 µΩ/Ω + 5.0 µΩ 20 µΩ/Ω + 50 µΩ 66 µΩ/Ω + 1.0 Ω 3.4 mΩ/Ω + 100 Ω 6.5 mΩ/Ω + 10 kΩ	HP 3458A

Parameter/Equipment	Range	CMC[2] (±)	Comments
Electrical Calibration of Thermocouples and 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 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	0.53 °C 0.14 °C 0.12 °C 0.14 °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 0.14 °C 0.12 °C 0.14 °C 0.19 °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 0.15 °C 0.13 °C 0.21 °C 0.33 °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 0.18 °C 0.16 °C 0.15 °C 0.22 °C	

Parameter/Equipment	Range	CMC[2] (±)	Comments
Electrical Calibration of Thermocouples and Indicators[3] – (cont)			
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 0.31 °C	Fluke 5520A
Type S	(0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1767) °C	0.37 °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	0.49 °C 0.19 °C 0.14 °C 0.15 °C	
Type U	(-200 to 0) °C (0 to 600) °C	0.44 °C 0.22 °C	
Electrical Calibration of RTD Indicators[3] –			
Pt 385, 100 Ω	(-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C (630 to 800) °C	0.068 °C 0.055 °C 0.07 °C 0.098 °C 0.11 °C 0.18 °C	Fluke 5520A
Pt 3926, 100 Ω	(-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C	0.039 °C 0.055 °C 0.07 °C 0.078 °C 0.093 °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 0.032 °C 0.039 °C 0.076 °C 0.073 °C 0.084 °C 0.09 °C 0.096 °C 0.18 °C	

Parameter/Equipment	Range	CMC[2] (±)	Comments
Electrical Calibration of RTD Indicators[3] – (cont)			
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	0.032 °C 0.032 °C 0.039 °C 0.093 °C 0.11 °C 0.11 °C 0.12 °C	Fluke 5520A
Pt 385, 500 Ω	(-200 to -80) °C (-80 to 100) °C (100 to 260) °C (260 to 400) °C (400 to 600) °C (600 to 630) °C	0.032 °C 0.039 °C 0.047 °C 0.062 °C 0.07 °C 0.086 °C	
Pt 385, 1000 Ω	(-200 to 0) °C (0 to 100) °C (100 to 260) °C	0.024 °C 0.032 °C 0.039 °C	
PtNi 385, 120 Ω	(-80 to 0) °C (0 to 100) °C (100 to 260) °C	0.062 °C 0.062 °C 0.11 °C	
Cu 427, 10 Ω	(-100 to 260) °C	0.23 °C	
Oscilloscope[3]–			
50 Ω Load	(1 to 24.999) mV (0.025 to 2.1999) V (2.2 to 130) V	0.25 % of output + 40 µV 0.24 % of output + 40 µV 0.27 % of output + 40 µV	Fluke 5520A-SC1100
1 MΩ Load	(1 to 24.999) mV (25 to 109.999) mV (0.11 to 2.1999) V (2.2 to 10.999) V (11 to 130) V	0.12 % of output + 40 µV 0.09 % of output + 40 µV 0.31 % of output + 40 µV 0.21 % of output + 40 µV 0.14 % of output + 40 µV	

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Oscilloscope[3]– (cont)			
Level Sine Wave:			
Amplitude (50kHz Reference)	50 kHz 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1100) MHz	1.6 % + 0.3 mV 2.8 % + 0.3 mV 3.2 % + 0.3 mV 4.7 % + 0.3 mV 5.7 % + 0.3 mV	Fluke 5520A-SC1100
Flatness (50kHz Reference)	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1100) MHz	1.4 % + 0.1 mV 1.6 % + 0.1 mV 3.2 % + 0.1 mV 3.9 % + 0.1 mV	
Time Markers:			
Source and Period into a 50 Ω load	5 s to 50 ms 20 ms to 2 ns	160 µs + *t* parts in 10^6 s 64 µs + *t* parts in 10^6 s	*t* = time in seconds
Amplitude			
1 MΩ 50 Ω	1.8 mV to 55 $V_{(pk-pk)}$ 1.8 mV to 2.5 $V_{(pk-pk)}$	2.4 % + 0.1 mV 2.4 % + 0.1 mV	
Frequency	10 Hz to 100 kHz	34 parts in 10^6 Hz +15 mHz	
Phase[3] – Measure, Fixed Points	101 Hz 1 kHz 101 kHz 1 MHz 13 MHz	0.01° 0.0061° 0.068° + 4.9 µ°/° 0.65° + 60 µ°/° 8.4° + 0.67 m°/°	Agilent 53131A

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
AC Power[3] – @ (45 to 65) Hz – (PF =1)			
(3.3 to 9) mA	(33 to 330) mV (0.33 to 1020) V	0.11 % 0.1 %	Fluke 5520A
(9 to 33) mA	(33 to 330) mV (0.33 to 1020) V	0.08 % 0.06 %	
(33 to 90) mA	(33 to 330) mV (0.33 to 1020) V	0.11 % 0.09 %	
(90 to 330) mA	(33 to 330) mV (0.33 to 1020) V	0.08 % 0.06 %	
(0.33 to 0.9) A	(33 to 330) mV (0.33 to 1020) V	0.1 % 0.1 %	
(0.9 to 2.2) A	(33 to 330) mV (0.33 to 1020) V	0.09 % 0.07 %	
(2.2 to 4.5) A	(33 to 330) mV (0.33 to 1020) V	0.1 % 0.1 %	
(4.5 to 20.5) A	(33 to 330) mV (0.33 to 1020) V	0.09 % 0.31 %	

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
AC Voltage[3] – Generate			
(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	0.064 % + 6 µV 0.012 % + 6 µV 0.016 % + 6 µV 0.078 % + 6 µV 0.27 % + 6 µV 0.62 % + 6 µV	Fluke 5520A
(33 to 330) mV	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.023 % + 8 µV 0.011 % + 8 µV 0.012 % + 8 µV 0.027 % + 8 µV 0.062 % + 32 µV 0.16 % + 70 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	0.023 % + 50 µV 0.012 % + 60 µV 0.018 % + 60 µV 0.027 % + 50 µV 0.059 % + 130 µV 0.22 % + 600 µV	
(3.3 to 33) V	45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.54 % + 0.65mV 0.026 % + 0.6 mV 0.11 % + 0.6 mV 0.15 % + 0.6 mV 0.17 % + 1.6 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	0.23 % + 2 mV 0.23 % + 6 mV 0.24 % + 6 mV 0.40 % + 6 mV 0.43 % + 6 mV	
(330 to 1020) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.41 % + 10 mV 0.41 % + 10 mV 0.40 % + 10 mV	

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
AC Voltage – Measure			
(0 to 10) mV	(1 to 40) Hz (40 to 1000) Hz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz	0.039 % + 3 µV 0.023 % + 1.1 µV 0.034 % + 1.1 µV 0.11 % + 1.1 µV 0.57 % + 1.1 µV 4.5 % + 2 µV	Agilent 3458A-002
(10 to 100) mV	(10 to 40) Hz (40 to 1000) Hz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz	0.049 % + 4 µV 0.12 % + 2 µV 0.045 % + 2 µV 0.091% + 2 µV 0.12 % + 2 µV 0.35 % + 10 µV	
(0.1 to 1) V	(1 to 40) Hz (40 to 1000) Hz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz	0.008 % + 40 µV 0.008 % + 20 µV 0.016 % + 20 µV 0.034 % + 20 µV 0.091 % + 20 µV 0.34 % + 100 µV	
(1 to 10) V	(1 to 40) Hz (40 to 1000) Hz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz	0.043 % + 400 µV 0.027 % + 200 µV 0.023 % + 200 µV 0.041 % + 200 µV 0.094 % + 200 µV 0.34 % + 1 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	0.21 % + 4 mV 0.21 % + 2 mV 0.21 % + 2 mV 0.28 % + 2 mV 0.31 % + 2 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	1.6 % + 40 mV 1.7 % + 20 mV 2.3 % + 20 mV 2.3 % + 20 mV 0.36 % + 20 mV	
(1000 to 5000) V	DC to 500 Hz	1.2 %	34401A w/ 80K

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
Capacitance[3] – Generate			
(0.19 to 0.3999) nF	10 Hz to 10 kHz	0.55 % + 0.01 nF	Fluke 5520A
(0.4 to 1.0999) nF	10 Hz to 10 kHz	0.42 % + 0.01 nF	
(1.1 to 3.2999) nF	10 Hz to 3 kHz	0.43 % + 0.01 nF	
(3.3 to 10.9999) nF	10 Hz to 1 kHz	0.19 % + 0.01 nF	
(11 to 32.9999) nF	10 Hz to 1 kHz	0.19 % + 0.1 nF	
(33 to 109.999) nF	10 Hz to 1 kHz	0.19 % + 0.1 nF	
(110 to 329.999) nF	10 Hz to 1 kHz	0.19 % + 0.3 nF	
(0.33 to 1.0999) µF	(10 to 600) Hz	0.19 % + 1 nF	
(1.1 to 3.29999) µF	(10 to 300) Hz	0.19 % + 3 nF	
(3.3 to 10.9999) µF	(10 to 150) Hz	0.19 % + 10 nF	
(11 to 32.9999) µF	(10 to 120) Hz	0.31 % + 30 nF	
(33 to 109.999) µF	(10 to 80) Hz	0.36 % + 100 nF	
(110 to 329.999) µF	(10 to 50) Hz	0.35 % + 300 nF	
(0.33 to 1.09999) mF	(10 to 20) Hz	0.35 % + 1 µF	
(1.1 to 3.2999) mF	(0 to 6) Hz	0.35 % + 3 µF	
(3.3 to 10.9999) mF	(0 to 2) Hz	0.35 % + 10 µF	
(11 to 32.9999) mF	(0 to 0.6) Hz	0.58 % + 30 µF	
(33 to 110) mF	(0 to 0.2) Hz	0.85 % + 100 µF	
AC Current[3] – Generate			
(29 to 329.99) µA	(10 to 45) Hz	0.16 % + 100 nA	Fluke 5520A
	45 Hz to 1 kHz	0.097 % + 100 nA	
	(1 to 5) kHz	0.23 % + 150 nA	
	(5 to 10) kHz	0.62 % + 200 nA	
	(10 to 30) kHz	1.2 % + 400 nA	
(0.33 to 3.2999) mA	(10 to 45) Hz	0.16 % + 150 nA	
	45 Hz to 1 kHz	0.078 % + 150 nA	
	(1 to 5) kHz	0.16 % + 200 nA	
	(5 to 10) kHz	0.39 % + 300 nA	
	(10 to 30) kHz	0.78 % + 600 nA	

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
AC Current[3] – Generate (cont)			
(3.3 to 32.999) mA	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.14 % + 2 µA 0.10 % + 2 µA 0.062 % + 2 µA 0.16 % + 3 µA 1.1 % + 4 µA	Fluke 5520A
(33 to 329.99) mA	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.14 % + 20 µA 0.032 % + 20 µA 0.078 % + 50 µA 0.16 % + 100 µA 0.31 % + 200 µA	
(0.33 to 1.09999) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.14 % + 100 µA 0.04 % + 100 µA 0.47 % + 1 mA 1.9 % + 5 mA	
(1.1 to 2.99999) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.21 % + 100 µA 0.13 % + 100 µA 0.14 % + 1 mA 2 % + 5 mA	
(3 to 10.9999) A	(45 to 100) Hz (0.100 to 1) kHz (1 to 5) kHz	0.31 % + 2 mA 0.31 % + 2 mA 2.4 % + 2 mA	
(11 to 20.5) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.12 % + 5 mA 0.15 % + 5 mA 3 % + 5 mA	
(16.5 to 150) A (16.5 to 150) A (150 to 1025) A (150 to 1025) A	(45 to 65) Hz (65 to 440) Hz (45 to 65) Hz (65 to 440) Hz	0.38 % + 0.029 A 1.0 % + 0.031 A 0.54 % + 0.10 A 1.0 % + 0.12 A	5520A w/ 5500A/Coil
AC Current[3] – Measure			
Up to 100 µA (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A	40 Hz to 5 kHz	0.071 % + 31 nA 0.036 % + 0.21 µA 0.036 % + 2.1 µA 0.036 % + 21 µA 0.12 % + 0.21 mA	3458A-002

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
Distortion – Measure[3] (0 to -80) dB (0 to -65) dB	 20 Hz to 20 kHz (20 to 100) kHz	 1.2 dB 2.3 dB	 8903B

IV. Electrical – RF/Microwave

Parameter/Range	Frequency	CMC[2, 5, 7] (±)	Comments
RF Microwave – Power[3] Power Reference at 1 mW Calibration Factor	 50 MHz 10 MHz to 18 GHz	 0.62 % 1.1 %	 Weinschel 1805/1807
RF Microwave – Absolute Power, Measure[3] (-70 to 20) dBm (-30 to 20) dBm	 9 kHz to 6 GHz 100 kHz to 4.2 GHz (4.2 to 18) GHz (18 to 30) GHz (30 to 40) GHz (40 to 50) GHz	 0.18 dBm 0.21 dBm 0.26 dBm 0.23 dBm 0.29 dBm 0.31 dBm	 Power meter w/ power sensors

Parameter/Equipment	Range	CMC[2, 4, 7] (±)	Comments
Attenuation[3] – Measure and Generate			
(0 to -10) dB (-10 to -20) dB (-20 to -30) dB (-30 to -40) dB (-40 to -50) dB (-50 to -60) dB (-60 to -70) dB (-70 to -80) dB (-80 to -90) dB (-90 to -100) dB (-100 to -110) dB (-110 to -120) dB	10 MHz to 26.5 GHz	0.046 dB 0.053 dB 0.080 dB 0.098 dB 0.11 dB 0.11 dB 0.12 dB 0.17 dB 0.17 dB 0.18 dB 0.19 dB 0.20 db	8902A
Amplitude Modulation – Measure			
Rate: 50 Hz to 10 kHz Depths: 5 % to 99 %	150 kHz to 10 MHz	0.14% rdg + 0.023 % rng	8902A w/ 11793A
Rate: 20 Hz to 10 kHz Depths: to 99 %	150 kHz to 10 MHz	0.13 % rdg + 0.034% rng	
Rate: 50 Hz to 50 kHz Depths: 5 % to 99 %	(0.01 to 26.5) GHz	0.18 % rdg + 0.012% rng	
Rate: 20 Hz to 100 kHz Depths: to 99 %	(0.01 to 26.5) GHz	0.15 % rdg + 0.035 % rng	
Frequency Modulation – Measure			
Rate: 20 Hz to 10 kHz Dev.: ≤ 40 kHz Peak	250 kHz to 10 MHz	0.018 kHz + 0.023 kHz/kHz	8902A w 11793A
Rate: 50 Hz to 100 kHz Dev.: ≤ 400 kHz Peak	(0.01 to 26.5) GHz	0.37 kHz + 0.011 kHz/kHz	
Rate: 20 Hz to 200 kHz Dev.: ≤ 400 kHz Peak	(0.01 to 26.5) GHz	0.33 kHz + 0.057 kHz/kHz	

Parameter/Equipment	Range	CMC[2, 4, 5, 7] (±)	Comments
Phase Modulation – Measure			
Rate: 200 Hz to 10 kHz (0 to 100) rad	Carrier: 150 kHz ≤ fc < 10MHz	0.12R + 0.047R/R	8902A w/ 11793A
Rate: 200 Hz to 20 kHz (0 to 100) rad	10 MHz ≤ fc <26.5GHz	0.12R + 0.035R/R	
Reflection S_{11}/S_{22} – Measure			
(0.0001 to 1.0) lin	45 MHz 45 MHz to 2 GHz (2 to 8) GHz (8 to 20) GHz (20 to 26.5) GHz	0.0076 lin 0.007 lin 0.013 lin 0.013 lin 0.014 lin	8510C and cal kits
Transmission S_{12}/S_{21} – Measure			
(0 to 20) dB (20 to 40) dB (40 to 60) dB	45 MHz	0.038 dB 0.16 dB 0.10 dB	8510C and cal kits
(0 to 20) dB (20 to 40) dB (40 to 60) dB	45 MHz to 2 GHz	0.056 dB 0.15 dB 0.23 dB	
(0 to 20) dB (20 to 40) dB (40 to 60) dB	(2 to 8) GHz	0.051 dB 0.19 dB 0.11 dB	
(0 to 20) dB (20 to 40) dB (40 to 60) dB	(8 to 20) GHz	0.074 dB 0.21 dB 0.38 dB	
(0 to 20) dB (20 to 40) dB (40 to 60) dB	(20 to 26.5) GHz	0.091 dB 0.25 dB 0.71 dB	

V. Mechanical

Parameter/Equipment	Range	CMC[2, 5, 7] (±)	Comments
Acceleration –			
Sensitivity (mV/g, pC/g)	100 Hz	3.4 %	Dytran 3120B reference accelerometer
Frequency Response	(10 to 99) Hz (100 to 2500) Hz (2.5 to 10) kHz	4.3 % 3.4 % 3.8 %	
Torque Tools	(4 to 50) in·lbf (40 to 400) in·lbf (100 to 1000) in·lbf (25 to 250) ft·lbf (60 to 600) ft·lbf	0.29 % 0.29 % 0.29 % 0.29 % 0.29 %	CDI 4-in-1 Suretest system
Scales and Balances[3]	Up to 20 g (20 to 100) g 2 oz to 1 lb (1 to 50) lb (50 to 300) lb	320 µg/g + 0.6*R* 67 µg/g + 0.6*R* 180 µg/g + 0.6*R* 120 µg/g + 0.6*R* 48 µg/g + 0.6*R*	Class 2 weights Class F weights
Pressure Gages, Transducers and Calibrators – Measure and Measuring Equipment[3]	(0 to 100) psig (0 to 500) psig (0 to 1000) psig (0 to 10 000) psig (1 to 15) psia	0.08 psi 0.06 psi 0.83 psi 9.3 psi 0.06 psia	Fluke 700P06 Fluke 700P07 Fluke 700P Fluke 700P31 Fluke 700PA4

VI. Time & Frequency

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
Time Interval	Up to 86 400 s	30 ms	Counter phase locked to GPS
Frequency – Measure	1 mHz to 40 GHz	$1.2 \times 10^{-9} \times f + 5$ µHz	Counter phase locked to GPS (f is the frequency)

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
Frequency – Measuring Equipment	10 MHz 1 mHz to 50 GHz	$1.2 \times 10^{-9} \times f$ $1.2 \times 10^{-9} \times f$ + 5 µHz	Datum GPS receiver Signal generators Phase locked to GPS (f is the frequency)

[1] This laboratory offers commercial dimensional testing, calibration 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] 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.

[5] In the statement of CMC uncertainty, the value is defined as the percentage of reading unless otherwise indicated; L represents the length of displacement in inches; R represents the resolution of the unit under test.

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

[7] 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.

[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.

Accredited Laboratory

A2LA has accredited

TRESCAL, INC.

Chandler, AZ

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 the requirements of ANSI/NCSLI 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 12th day of March 2019.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 2737.03
Valid to March 31, 2021
Revised October 15, 2019

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