



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

TEST AND MEASUREMENT PARTS INC, DBA TOP DOG TEST
3848 Bay Center Place
Hayward, CA 94545
Jason Hardman Phone: 407 682 4228

CALIBRATION

Valid To: November 30, 2025

Certificate Number: 5546.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations^{1,4}:

I. Electrical DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2,3} (±)	Comments
DC Voltage – Source	(0 to 329.9999) mV (0 to 3.2999) V (0 to 32.9999) V (30 to 329.9999) V (100 to 1020) V	16 µV/V + 1 µV 9 µV/V + 2 µV 11 µV/V + 20 µV 15 µV/V + 150 µV 15 µV/V + 1.5 mV	Fluke 5522A
DC Current – Source	(0 to 329.9999) 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 2.999 999) A (0 to 10.9999) A (11 to 20.5) A	0.13 mA/A + 0.02 µA 94 µA/A + 0.05 µA 79 µA/A + 0.25 µA 0.11 mA/A + 2.5 µA 0.17 mA/A + 40 µA 0.42 mA/A + 40 µA 0.42 mA/A + 500 µA 0.8 mA/A + 750 µA	Fluke 5522A

Parameter/Equipment	Range	CMC ^{2,3} (±)	Comments
Electrical Calibration of Thermocouple Indicators			
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.21 °C 0.13 °C 0.12 °C 0.13 °C 0.18 °C	Fluke 5522A
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 T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.49 °C 0.19 °C 0.13 °C 0.11 °C	
Resistance – Source	0 to 10.9999 Ω 11 to 32.9999 Ω 33 to 109.9999 Ω 110 to 329.9999 Ω 330 Ω to 1.099 999 kΩ 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 329.999 99 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	35 μΩ/Ω + 1 mΩ 25 μΩ/Ω + 1.5 mΩ 23 μΩ/Ω + 1.4 mΩ 25 μΩ/Ω + 2 mΩ 23 μΩ/Ω + 2 mΩ 24 μΩ/Ω + 20 mΩ 23 μΩ/Ω + 20 mΩ 24 μΩ/Ω + 0.2 Ω 24 μΩ/Ω + 0.2 Ω 26 μΩ/Ω + 2 Ω 26 μΩ/Ω + 2 Ω 50 μΩ/Ω + 30 Ω 0.10 mΩ/Ω + 50 Ω 0.21 mΩ/Ω + 2.5 kΩ 0.39 mΩ/Ω + 3 kΩ 2.4 mΩ/Ω + 0.1 MΩ 12 mΩ/Ω + 0.5 MΩ	Fluke 5522A

Parameter/Range	Frequency	CMC ^{2,3} (±)	Comments
AC Voltage – Generate			
(1 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	0.61 mV/V + 6 μV 0.16 mV/V + 6 μV 0.18 mV/V + 6 μV 0.76 mV/V + 6 μV 2.6 mV/V + 12 μV 6.1 mV/V + 50 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	0.26 mV/V + 8 μV 0.11 mV/V + 8 μV 0.12 mV/V + 8 μV 0.26 mV/V + 8 μV 0.58 mV/V + 32 μV 1.5 mV/V + 70 μV	
(0.33 to 3.299 99) 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	0.25 mV/V + 50 μV 0.12 mV/V + 60 μV 0.15 mV/V + 60 μV 0.23 mV/V + 50 μV 0.52 mV/V + 130 μV 2.0 mV/V + 0.6 mV	
(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	0.12 mV/V + 650 μV 0.12 mV/V + 600 μV 0.18 mV/V + 600 μV 0.26 mV/V + 600 μV 0.64 mV/V + 1.6 μV	
(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	0.14 mV/V + 2 mV 0.14 mV/V + 6 mV 0.15 mV/V + 6 mV 0.19 mV/V + 6 mV 0.24 mV/V + 50 mV	
(330 to 1020) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.24 mV/V + 10 mV 0.20 mV/V + 10 mV 0.24 mV/V + 10 mV	

Parameter/Range	Frequency	CMC ^{2,3} (±)	Comments
AC Current – Source			
(29.00 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 mA/A + 0.1 µA 1.2 mA/A + 0.1 µA 1.0 mA/A + 0.1 µA 2.4 mA/A + 0.15 µA 6.1 mA/A + 0.2 µA 13 mA/A + 0.4 µA	Fluke 5522A
(0.33 to 3.299 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	1.6 mA/A + 0.15 µA 0.97 mA/A + 0.15 µA 0.79 mA/A + 0.15 µA 1.6 mA/A + 0.2 µA 4.0 mA/A + 0.3 µA 7.9 mA/A + 0.6 µA	
(3.3 to 32.9999) 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 mA/A + 2 µA 0.70 mA/A + 2 µA 0.34 mA/A + 2 µA 0.64 mA/A + 2 µA 1.6 mA/A + 3 µA 3.4 mA/A + 4 µA	
(33 to 329.999) 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 mA/A + 20 µA 0.70 mA/A + 20 µA 0.34 mA/A + 20 µA 0.82 mA/A + 50 µA 1.6 mA/A + 100 µA 3.4 mA/A + 200 µA	
(0.33 to 1.099 99) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	1.5 mA/A + 100 µA 0.40 mA/A + 100 µA 4.7 mA/A + 1.0 mA 19 mA/A + 5.0 mA	
(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 + 100 µA 0.53 mA/A + 100 µA 4.7 mA/A + 0.1 mA 19 mA/A + 0.5 mA	
(3 to 10.9999) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.52 mA/A + 0.2 mA 0.81 mA/A + 0.2 mA 23 mA/A + 0.2 mA	
(11 to 20.5) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.95 mA/A + 0.5 mA 1.2 mA/A + 0.5 mA 24 mA/A + 0.5 mA	

Parameter/Range	Frequency	CMC ^{2,3} (±)	Comments
AC Voltage – Measure (cont)			
(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	58 $\mu\text{V}/\text{V} + 400 \mu\text{V}$ 60 $\mu\text{V}/\text{V} + 200 \mu\text{V}$ 110 $\mu\text{V}/\text{V} + 200 \mu\text{V}$ 240 $\mu\text{V}/\text{V} + 200 \mu\text{V}$ 630 $\mu\text{V}/\text{V} + 200 \mu\text{V}$ 2.3 $\text{mV}/\text{V} + 1 \text{mV}$ 7.9 $\text{mV}/\text{V} + 1 \text{mV}$	HP 3458A OPT 002
(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	160 $\mu\text{V}/\text{V} + 4 \text{mV}$ 170 $\mu\text{V}/\text{V} + 2 \text{mV}$ 160 $\mu\text{V}/\text{V} + 2 \text{mV}$ 270 $\mu\text{V}/\text{V} + 2 \text{mV}$ 630 $\mu\text{V}/\text{V} + 2 \text{mV}$	
(100 to 700) V	(1 to 40) Hz 40 Hz to 1 kHz	0.32 $\text{mV}/\text{V} + 40 \text{mV}$ 0.32 $\text{mV}/\text{V} + 20 \text{mV}$	
AC Current – Measure			
(5 to 100) μA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 1 kHz	3.7 $\text{mA}/\text{A} + 30 \text{nA}$ 1.2 $\text{mA}/\text{A} + 30 \text{nA}$ 530 $\mu\text{A}/\text{A} + 30 \text{nA}$ 530 $\mu\text{A}/\text{A} + 30 \text{nA}$	HP 3458A OPT 002
100 μA to 1.0 mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 1 kHz	3.1 $\text{mA}/\text{A} + 200 \text{nA}$ 1.2 $\text{mA}/\text{A} + 200 \text{nA}$ 530 $\mu\text{A}/\text{A} + 200 \text{nA}$ 530 $\mu\text{A}/\text{A} + 200 \text{nA}$	
(1 to 10) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 1 kHz	3.1 $\text{mA}/\text{A} + 2 \mu\text{A}$ 1.2 $\text{mA}/\text{A} + 2 \mu\text{A}$ 500 $\mu\text{A}/\text{A} + 2 \mu\text{A}$ 290 $\mu\text{A}/\text{A} + 2 \mu\text{A}$	
(10 to 100) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 1 kHz	3.1 $\text{mA}/\text{A} + 20 \mu\text{A}$ 1.2 $\text{mA}/\text{A} + 20 \mu\text{A}$ 500 $\mu\text{A}/\text{A} + 20 \mu\text{A}$ 290 $\mu\text{A}/\text{A} + 20 \mu\text{A}$	
100 mA to 1.0 A	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 1 kHz	3.1 $\text{mA}/\text{A} + 200 \mu\text{A}$ 1.2 $\text{mA}/\text{A} + 200 \mu\text{A}$ 510 $\mu\text{A}/\text{A} + 200 \mu\text{A}$ 290 $\mu\text{A}/\text{A} + 200 \mu\text{A}$	
1 A	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 1 kHz	3.2 $\text{mA}/\text{A} + 200 \mu\text{A}$ 1.3 $\text{mA}/\text{A} + 200 \mu\text{A}$ 720 $\mu\text{A}/\text{A} + 200 \mu\text{A}$ 910 $\mu\text{A}/\text{A} + 200 \mu\text{A}$	

Parameter/Equipment	Range	CMC ^{2,3} (±)	Comments
Resistance – Measure	(0 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	13 μΩ/Ω + 50 μΩ 12 μΩ/Ω + 500 μΩ 11 μΩ/Ω + 500 μΩ 10 μΩ/Ω + 5 mΩ 11 μΩ/Ω + 50 mΩ 17 μΩ/Ω + 2 Ω 54 μΩ/Ω + 100 Ω 460 μΩ/Ω + 1 kΩ 3.9 mΩ/Ω + 10 kΩ	HP 3458A OPT 002

II. Electrical – RF/Microwave

Parameter/Range	Frequency	CMC ^{2,3,6} (±)	Comments
RF Power – Generate			
> 10 dBm (10 to -10) dBm (-10 to -60) dBm -60 to -110 dBm	< 2 GHz	1.6 dB 0.5 dB 0.7 dB 1.1 dB	HP 83650B
> 10 dBm (10 to -10) dBm (-10 to -60) dBm -60 to -110 dBm	(2 to 20) GHz	1.7 dB 0.6 dB 0.8 dB 1.4 dB	
(10 to -10) dBm (-10 to -60) dBm -60 to -110 dBm	(> 20 to 40) GHz	0.8 dB 1.0 dB 1.4 dB	
(10 to -10) dBm (-10 to -60) dBm (-60 to -110) dBm	(40 to 50) GHz	1.4 dB 1.6 dB 2.0 dB	
Power Flatness	10 MHz to < 2 GHz (2.0 to 20) GHz (20.0 to 40) GHz (40.0 to 50) GHz	0.4 dB 0.5 dB 0.7 dB 1.3 dB	
AM Source Rate: 10 MHz to 50 GHz (0 to 100) %	DC to 100 kHz	5.0 %	

Parameter/Range	Frequency	CMC ^{2,3} (±)	Comments
RF Power – Measure (cont.)			
(- 60 to -30) dBm	(14 to 18) GHz	2.1 dB	N1914B & E9304-H18
(-30 to -20) dBm		0.14 dB	
(-20 to -10) dBm		0.14 dB	
(-10 to 0) dBm		0.13 dB	
(0 to 10) dBm		0.13 dB	
(10 to 20) dBm		0.13 dB	
(-20 to -10) dBm	< 2 GHz	0.29 dB	N1914B & 8487A
(-10 to 0) dBm		0.08 dB	
(0 to 10) dBm		0.16 dB	
(10 to 20) dBm		0.13 dB	
(-20 to -10) dBm	(2 to 18) GHz	0.16 dB	
(-10 to 0) dBm		0.1 dB	
(0 to 10) dBm		0.11 dB	
(10 to 20) dBm		0.18 dB	
(-20 to -10) dBm	(26.5 to 33) GHz	0.14 dB	
(-10 to 0) dBm		0.13 dB	
(0 to 10) dBm		0.19 dB	
(10 to 20) dBm		0.19 dB	
(-20 to -10) dBm	(33 to 40) GHz	0.18 dB	
(-10 to 0) dBm		0.18 dB	
(0 to 10) dBm		0.22 dB	
(10 to 20) dBm		0.22 dB	
(-20 to -10) dBm	(40 to 45) GHz	0.21 dB	
(-10 to 0) dBm		0.21 dB	
(0 to 10) dBm		0.25 dB	
(10 to 20) dBm		0.25 dB	
(-20 to -10) dBm	(45 to 50) GHz	0.21 dB	
(-10 to 0) dBm		0.21 dB	
(0 to 10) dBm		0.25 dB	
(10 to 20) dBm		0.25 dB	

Parameter/Range	Frequency	CMC ^{2,3,6} (±)	Comments
Phase Modulation – Measure Rate: 200 Hz to 10 kHz (w/11722A) Rate: 200 Hz to 20 kHz (w/11722A) Rate: 200 Hz to 20 kHz (w/11792A)	150 kHz to 10 MHz 10 MHz to 1.3 GHz (1.3 to 26.5) GHz	5.0 % 3.8 % 3.8 %	8902A w/ 11722A & 11792A
RF Power – Measure (30 to -20) dBm w/11722A w/11792A	100 kHz to 2.6 GHz (2 to 26.5) GHz	0.072 dBm 0.077 dBm	8902A w/ 11722A & 11792A
RF Attenuation/ Insertion Loss – (0 to -10) dBm w/11722A w/11792A (-10 to -40) dBm w/11722A w/11792A (-40 to -50) dBm w/11722A w/11792A (-50 to -80) dBm w/11722A w/11792A (-80 to -90) dBm w/11722A w/11792A (-90 to -110) dBm w/11722A w/11792A (-110 to -127) dBm w/11722A w/11792A	2.5 MHz to 1.3 GHz (1.3 to 26.5) GHz 2.5 MHz to 1.3 GHz (1.3 to 26.5) GHz 2.5 MHz to 1.3 GHz (1.3 to 26.5) GHz 2.5 MHz to 1.3 GHz (1.3 to 26.5) GHz 2.5 MHz to 1.3 GHz (1.3 to 26.5) GHz 2.5 MHz to 1.3 GHz (1.3 to 26.5) GHz	0.0027 dB 0.0027 dB 0.088 dB 0.088 dB 0.18 dB 0.18 dB 0.18 dB 0.18 dB 0.29 dB 0.29 dB 0.32 dB 0.32 dB 0.49 dB 0.49 dB	8902A w/ 11722A & 11792A

Parameter/Range	Frequency	CMC ^{2,3,6} (±)	Comments
Amplitude Modulation – Measure			
Depths (5 to 99) %			8902A w/ 11722A & 11792A
Rate: 50 Hz to 10 kHz (w/11722A)	150 kHz to 10 MHz	2.5 %	
Rate: 20 Hz to 10 kHz (w/11722A)	150 kHz to 10 MHz	3.7 %	
Rate: 50 Hz to 50 kHz (w/11722A)	10 MHz to 1.3 GHz	1.3 %	
Rate: 20 Hz to 100 kHz (w/11722A)	10 MHz to 1.3 GHz	3.7 %	
Rate: 50 Hz to 50 kHz (w/11792A)	(1.3 to 26.5) GHz	1.3 %	
Rate: 20 Hz to 100 kHz (w/11792A)	(1.3 to 26.5) GHz	3.7 %	
Frequency Modulation – Measure			
Deviation: ≤ 40 kHz Peak			8902A w/ 11722A & 11792A
Rate: 20 Hz to 10 kHz (w/11722A)	150 kHz to 10 MHz	2.5 %	
Deviation: ≤ 400 kHz Peak			
Rate: 50 Hz to 100 kHz (w/11722A)	10 MHz to 1.3 GHz	1.3 %	
Rate: 20 Hz to 200 kHz (w/11722A)	10 MHz to 1.3 GHz	6.2 %	
Rate: 50 Hz to 100 kHz (w/11792A)	(1.3 to 26.5) GHz	1.3 %	
Rate: 20 Hz to 200 kHz (w/11792A)	(1.3 to 26.5) GHz	6.2 %	

III. Time & Frequency

Parameter/Equipment	Range	CMC ^{2, 5} (±)	Comments
Frequency – Generate	100 µHz to 10 MHz 10 MHz to 50 GHz	1.6 µHz/Hz 2.8 x 1 ^{e-7} Hz/Hz	33120A 83650B
Frequency – Measure	1 Hz to 10 MHz 10 Hz to 46 GHz	78 µHz/Hz 1 x 1 ^{e-7} Hz/Hz	3458A 53152A

¹ This laboratory offers commercial 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 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

⁴ This scope meets A2LA's *P112 Flexible Scope Policy*.

⁵ 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.

⁶ In the statement of CMC, percentages are percentages of reading, unless otherwise indicated.