



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

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CALIBRATION

Valid To: September 30, 2019

Certificate Number: 3471.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations¹:

I. Dimensional

Parameter/Equipment	Range	CMC ² (±)	Comments
Calipers	Up to 12 in	130 µin + 2.3 µin/in	Gage blocks
Dial Indicators	Up to 2 in	140 µin + 1.2 µin/in	Gage blocks
Micrometers	Up to 24 in	140 µin + 1.5 µin/in	Gage blocks
Gage Blocks	Up to 1 in (1 to 2) in (2 to 3) in (3 to 4) in	5.5 µin 9.6 µin 14 µin 19 µin	Comparator w/ reference blocks
Height Gages	Up to 24 in	300 µin + 7.0 µin/in	Master gage blocks, surface plate (Grade AA), Federal 136B-5 W 432

Parameter/Equipment	Range	CMC ² (±)	Comments
Cylindricals – Outside Diameter	(0.011 to 2) in	41 µin	Starrett 673/715 super micrometer

II. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2,4,5} (±)	Comments
DC Voltage ³ – Generate	Up to 220 mV 220 mV to 2.2 V (2.2 to 22) V (22 to 220) V (220 to 1000) V	7.8 µV/V + 400 nV 5.6 µV/V + 700 nV 3.7 µV/V + 4 µV 5 µV/V + 40 µV 7.4 µV/V + 400 µV	Fluke 5720A
	10 V	0.38 µV/V	Fluke 732B
DC Voltage ³ – Measure	Up to 200 mV 200 mV to 2 V (2 to 20) V (20 to 200) V (200 to 1000) V	8 µV/V + 100 nV 5.5 µV/V + 400 nV 5.5 µV/V + 4 µV 8 µV/V + 40 µV 7.5 µV/V + 500 µV	Fluke 8508A
	(1000 to 5000) V	0.2 %	w/ Fluke 80B-5
	(1000 to 10 000) V	0.2 %	w /Fluke 80E
DC Current ³ – Generate	Up to 220 µA 220 µA to 2.2 mA (2.2 to 22) mA (22 to 220) mA 220 mA to 2 A	41 µA/A + 6 nA 36 µA/A + 7 nA 39 µA/A + 40 nA 45 µA/A + 700 nA 82 µA/A + 12 µA	Fluke 5720A
	(1 to 11) A	4 mA/A + 480 µA	w/ Fluke 5725A
	(2 to 20) A (20 to 100) A	2.6 mA/A + 4 mA 0.3 % + 20 mA	w/ Ballantine 1620

Parameter/Equipment	Range	CMC ^{2,4,5} (\pm)	Comments
DC/AC Current ³ – Generate, Clamp Meters DC to 440 Hz	(10 to 1025) A	1 % + 0.9 A	Fluke 5720A w/ coil
DC Current ³ – Measure DC to 60 Hz ³	Up to 220 μ A 200 μ A to 2 mA (2 to 20) mA (20 to 200) mA 200 mA to 2 A 0 μ A to 15 A 0 mA to 100 A	20 μ A/A + 400 nA 20 μ A/A + 4 nA 22 μ A/A + 40 nA 66 μ A/A + 800 nA 0.048 % + 16 μ A 0.046 % 0.041 %	Fluke 8508A Leeds and Northrup 4360 Leeds and Northrup 4361
Resistance ³ – Generate Fixed Points	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 , 19 M Ω 100 M Ω , 190 M Ω 1 Ω 10 k Ω	100 $\mu\Omega$ 96 $\mu\Omega$ 2.4 m Ω 9.2 m Ω 91 m Ω 1.2 Ω 21 Ω 420 Ω 11 k Ω 1.2 $\mu\Omega$ 10 m Ω	Fluke 5720A Fluke 742A-1 Fluke 742A-10K
Resistance ³ – Measure	(0 to 2) Ω (2 to 20) Ω (20 to 200) Ω 200 Ω to 2 k Ω (2 to 20) k Ω (20 to 200) k Ω 200 k Ω to 2 M Ω (2 to 20) M Ω (20 to 200) M Ω	26 $\mu\Omega/\Omega$ + 4 $\mu\Omega$ 15 $\mu\Omega/\Omega$ + 14 $\mu\Omega$ 15 $\mu\Omega/\Omega$ + 50 $\mu\Omega$ 15 $\mu\Omega/\Omega$ + 0.5 m Ω 15 $\mu\Omega/\Omega$ + 5 m Ω 15 $\mu\Omega/\Omega$ + 50 m Ω 15 $\mu\Omega/\Omega$ + 1 Ω 58 $\mu\Omega/\Omega$ + 100 Ω 0.046 % + 10 k Ω	Fluke 8508A

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments
Capacitance ³ – Generate @ 1 kHz, Fixed Points	1 pF	0.041 pF	HP 16380A (set)
	10 pF	3.9 fF	
	100 pF	39 fF	
	1000 pF	0.41 pF	
	10 000 pF	4.0 pF	HP 16385A
	1 μF	0.5 nF	HP 16387A
Capacitance ³ – Measure @ 1 kHz	11 aF to 1.1 μF	0.017 % + 0.00003 pF	GenRad 1615-A
Inductance ³ – Measure, 12 Hz to 100 kHz	(0 to 1) mH	0.21 %	GenRad 1689 M
	(1 to 10) mH	0.21 %	
	(10 to 100) mH	0.21 %	
	100 mH to 1 H	0.23 %	
	(1 to 10) H	0.25 %	
Inductance ³ – Generate, Fixed Points, 100 Hz to 1 kHz	100 μH	0.26 μH	GenRad 1482 B GenRad 1482 E GenRad 1482 H GenRad 1482 L GenRad 1482 P
	1 mH	0.25 μH	
	10 mH	3.1 μH	
	100 mH	31 μH	
	1 H	310 μH	

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
AC Voltage ³ – Generate 220 μV to 2.2 mV	(10 to 20) Hz	0.029 % + 4 μV	Fluke 5720A
	(20 to 40) Hz	0.029 % + 4 μV	
	40 Hz to 20 kHz	0.04 % + 4 μV	
	(20 to 50) kHz	0.021 % + 4 μV	
	(50 to 100) kHz	0.28 % + 5 μV	
	(100 to 300) kHz	0.20 % + 10 μV	
	(300 to 500) kHz	0.18 % + 20 μV	
	500 kHz to 1 MHz	0.32 % + 20 μV	

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
AC Voltage ³ – Generate (cont)			
(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	0.034 % + 4 μV 0.021 % + 4 μV 0.019 % + 4 μV 0.028 % + 4 μV 0.068 % + 5 μV 0.13 % + 10 μV 0.18 % + 20 μV 0.34 % + 20 μV	Fluke 5720A
(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	0.029 % + 12 μV 0.011 % + 7 μV 0.01 % + 7 μV 0.025 % + 7 μV 0.06 % + 17 μV 0.12 % + 20 μV 0.16 % + 25 μV 0.32 % + 45 μV	
(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	0.14 % + 40 μV 0.011 % + 15 μV 0.01 % + 8 μV 0.024 % + 10 μV 0.057 % + 30 μV 0.12 % + 80 μV 0.16 % + 200 μV 0.045 % + 300 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 500 kHz to 1 MHz	0.028 % + 400 μV 0.011 % + 150 μV 0.01 % + 50 μV 0.023 % + 100 μV 0.057 % + 200 μV 0.12 % + 600 μV 0.16 % + 2 mV 0.33 % + 3.2 mV	



Parameter/Range	Frequency	CMC ^{2,4} (±)	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	0.029 % + 4 mV 0.011 % + 1.5 mV 0.011 % + 0.6 mV 0.024 % + 1 mV 0.058 % + 2.5 mV	Fluke 5720A
(220 to 700) V	(50 to 300) Hz 300 Hz to 1 kHz	0.034 % + 16 mV 0.12 % + 3.5 mV	
AC Voltage ³ – Measure			
(20 to 200) mV	(1 to 10) Hz (10 to 40) Hz (40 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz	0.016 % + 14 μV 0.013 % + 4 μV 0.011 % + 4 μV 0.011 % + 2 μV 0.011 % + 4 μV 0.031 % + 8 μV 0.071 % + 20 μV	Fluke 8508A
(0.2 to 2) V	(1 to 10) Hz (10 to 40) Hz (40 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz	0.014 % + 120 μV 0.011 % + 20 μV 85 μV/V + 20 μV 65 μV/V + 20 μV 85 μV/V + 20 μV 0.021 % + 40 μV 0.051 % + 200 μV	
(2 to 20) V	(1 to 10) Hz (10 to 40) Hz (40 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz	0.014 % + 1.2 mV 0.011 % + 200 μV 85 μV/V + 200 μV 65 μV/V + 200 μV 85 μV/V + 200 μV 0.021 % + 400 μV 0.051 % + 2 mV	

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
AC Voltage ³ – Measure (cont)			
(20 to 200) V	(1 to 10) Hz (10 to 40) Hz (40 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz	0.014 % + 12 mV 0.011 % + 2 mV 85 µV/V + 2 mV 65 µV/V + 2 mV 85 µV/V + 2 mV 0.021 % + 4 mV 0.051 % + 20 mV	Fluke 8508A
(200 to 1000) V	(1 to 10) Hz (10 to 40) Hz 40 Hz to 1 kHz	0.014 % + 70 mV 0.011 % + 20 mV 0.011 % + 20 mV	
AC Current ³ – Measure			
(20 to 200) µA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.065 % + 20 nA 0.065 % + 20 nA 0.065 % + 20 nA 0.4 % + 20 nA	Fluke 8508A
(0.2 to 2) mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.065 % + 200 nA 0.065 % + 200 nA 0.065 % + 200 nA 0.4 % + 200 nA	
(2 to 20) mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.07 % + 2 µA 0.07 % + 2 µA 0.065 % + 2 µA 0.4 % + 2 µA	
(20 to 200) mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz	0.06 % + 20 µA 0.06 % + 20 µA 0.06 % + 20 µA	
(0.2 to 2) A	(1 to 2) Hz 2 Hz to 10 kHz (10 to 30) kHz	0.13 % + 200 µA 0.15 % + 200 µA 0.31 % + 200 µA	

Parameter/Range	Frequency	CMC ^{2, 5} (±)	Comments
AC Current ³ – Generate			
(20 to 220) µA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.026 % + 16 nA 0.017 % + 10 nA 0.013 % + 8 nA 0.032 % + 12 nA 0.11 % + 65 nA	Fluke 5720A
(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	0.026 % + 40 nA 0.017 % + 35 nA 0.013 % + 35 nA 0.021 % + 110 nA 0.11 % + 650 nA	
(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	0.026 % + 400 nA 0.017 % + 350 nA 0.013 % + 350 nA 0.026 % + 550 nA 0.11 % + 5 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	0.028 % + 4 µA 0.017 % + 3.5 µA 0.013 % + 2.5 µA 0.021 % + 3.5 µA 0.11 % + 10 µA	
(0.22 to 2.2) A	20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.027 % + 35 µA 0.05 % + 80 µA 0.7 % + 160 µA	
(2.2 to 11) A	40 Hz to 1 kHz 1 kHz to 10 kHz	1.3 % + 380 µA 3.7 % + 750 µA	Fluke 5720A w/ Fluke 5725A
(2 to 20) A	DC to 1 kHz	0.26 % + 4 mA	Ballantine 1620A
(20 to 100) A	DC to 1 kHz	0.3 % + 20 mA	Fluke 5720A w/ Fluke 5725A

Parameter/Range	Frequency	CMC ^{2, 5} (±)	Comments
Oscilloscopes ³ –			
Square: 50 Ω @ 1 kHz Source 1 MΩ @ 1 kHz Source	1 mV to 130 V 1 mV to 130 V	0.25 % + 40 μV 0.09 % + 5 μV	Fluke 5820A
Leveled Sine Amplitude: 50 kHz Reference	50 kHz to 100 MHz (100 to 300) MHz (300 to 500) MHz	3.5 % + 300 μV 4.0 % + 300 μV 5.5 % + 300 μV	
10 MHz Reference	(500 to 600) MHz 600 MHz to 1.1 GHz (1.1 to 1.6) GHz (1.6 to 2.1) GHz	6.0 % + 300 μV 7.0 % + 300 μV 7.0 % + 300 μV 8.0 % + 300 μV	
Leveled Sine Flatness: Relative to 50 kHz	50 kHz to 100 MHz (100 to 300) MHz (300 to 500) MHz	3.1 % + 100 μV 3.7 % + 100 μV 4.3 % + 100 μV	
Relative to 10 MHz	(500 to 600) MHz 600 MHz to 1.1 GHz (1.1 to 1.6) GHz (1.6 to 2.1) GHz	7.4 % + 100 μV 8.0 % + 100 μV 7.9 % + 100 μV 9.3 % + 100 μV	

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Calibration of Thermocouple Indicators and Indicating Systems ³ –			
Type E	-250 °C to -100 °C -100 °C to -25 °C -25 °C to 350 °C 350 °C to 650 °C 650 °C to 1000 °C	0.51 °C 0.20 °C 0.20 °C 0.20 °C 0.25 °C	Martel 3001M

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Calibration of Thermocouple Indicators and Indicating Systems ³ – (cont)			
Type J	-210 °C to -100 °C -100 °C to -30 °C -30 °C to 150 °C 150 °C to 760 °C 760 °C to 1200 °C	0.29 °C 0.20 °C 0.20 °C 0.18 °C 0.25 °C	Martel 3001M
Type K	-200 °C to -100 °C -100 °C to -25 °C -25 °C to 120 °C 120 °C to 1 000 °C 1000 °C to 1372 °C	0.36 °C 0.23 °C 0.17 °C 0.27 °C 0.41 °C	
Type R	0 °C to 250 °C 250 °C to 400 °C 400 °C to 1000 °C 1000 °C to 1750 °C	0.59 °C 0.36 °C 0.34 °C 0.41 °C	
Type S	0 °C to 250 °C 250 °C to 1000 °C 1000 °C to 1400 °C 1400 °C to 1750 °C	0.57 °C 0.40 °C 0.40 °C 0.50 °C	
Type T	-250 °C to -150 °C -150 °C to 0 °C 0 °C to 120 °C 120 °C to 400 °C	0.64 °C 0.25 °C 0.17 °C 0.15 °C	
Electrical Calibration of RTD Indicators and Indicating Systems ³ –			
Pt 385, 100 Ω	-200 °C to 800 °C	0.06 °C	Martel 3001M

III. Mechanical

Parameter/Equipment	Range	CMC ^{2, 5, 6} (±)	Comments
Balances and Scales	(1 to 1000) g	0.012 g + 0.6R	Class M3 weights
	200 mg to 200 g	0.00058 g + 0.6R	Class 1 weights
	(0.5 to 8) oz (1 to 218) lb	0.0022 oz + 0.6R 0.025 lb + 0.6R	Class F weights
	(2. 2) kg	46 g	Class 4 weights
Pressure – Measure			
Gage Pressure	(-12 to 150) psi (0 to 500) psi (0 to 3000) psi	0.09 psi 0.15 psi 1.8 psi	Martel - Betaports
Absolute Pressure	(0 to 15) psi	0.009 psi	
Torque – Measure	(0.8 to 80) in·ozf (0.5 to 50) in·lbf (50 to 250) in·lbf (5 to 50) ft·lbf	0.3 in·ozf 0.288 in·lbf 1.6 in·lbf 0.29 ft·lbf	Torque tester
Torque – Measuring Equipment	(0.11 to 16) in·ozf (1.25 to 1000) in·lbf	0.2 % 0.2 %	Reference wheel w/ weights

IV. Thermodynamics

Parameter/Equipment	Range	CMC ² (±)	Comments
Relative Humidity Measuring Equipment – Nominal Fixed Points	(11, 33, 75, 90) % RH	3.2 % RH	Saturated salts/ Vaisala HMC20

V. Time & Frequency

Parameter/Equipment	Range	CMC ² (±)	Comments
Frequency – Measuring Equipment	10 MHz	1.2 x 10 ⁻¹² Hz	HP 58503A GPS
Counters, Timers and Clocks	(1 to 3600) s	0.2 s	Computer and NIST website

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 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 measurands stated are measured with the Fluke 8508A and Fluke 5700 A series of instruments. These capabilities are suitable for the calibration of the devices intended to generate the measurand in the ranges indicated. CMC's are expressed as either a specific value that covers the full range or as a combination of the fraction of the reading/output plus a range specification.

⁵ In the statement of CMC, percentages are to be read as percent of reading unless otherwise noted.

⁶ In the statement of CMC, R represents the resolution of the unit under test.



Accredited Laboratory

A2LA has accredited

EXPHIL CALIBRATION LABS, INC

Bohemia, NY

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/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 8 January 2009*).



Presented this 15th day of August 2017.

A blue ink signature of the Vice President of Accreditation Services.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3471.01
Valid to September 30, 2019
Revised September 1, 2019

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