



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: July 31, 2017

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, 6} (±)	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 10 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 0.38 µV/V	Fluke 5720A 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 (1000 to 5000) V (1000 to 10 000) 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 0.2 % 0.2 %
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, 6} (\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	Up to 220 μ A 200 μ A to 2 mA (2 to 20) mA (20 to 200) mA 200 mA to 2 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	Fluke 8508A
DC to 60 Hz ³	0 μ A to 15 A 0 mA to 100 A	0.046 % 0.041 %	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 ^{2,6} (±)	Comments
Capacitance ³ – Generate @ 1 kHz	1 pF 10 pF 100 pF 1000 pF 10 000 pF 1 μF	0.041 pF 3.9 fF 39 fF 0.41 pF 4.0 pF 0.5 nF	HP 16380A (set) HP 16385A 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 (1 to 10) mH (10 to 100) mH 100 mH to 1 H (1 to 10) H	0.21 % 0.21 % 0.21 % 0.23 % 0.25 %	GenRad 1689 M
Inductance ³ – Generate, Fixed Points, 100 Hz to 1 kHz	100 μH 1 mH 10 mH 100 mH 1 H	0.26 μH 0.25 μH 3.1 μH 31 μH 310 μH	GenRad 1482 B GenRad 1482 E GenRad 1482 H GenRad 1482 L GenRad 1482 P

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

Parameter/Range	Frequency	CMC ^{2,5} (±)	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 ^{2,4,5} (±)	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 (20 to 100) A	DC to 1 kHz DC to 1 kHz	0.26 % + 4 mA 0.3 % + 20 mA	Ballantine 1620A Fluke 5720A w/ Fluke 5725A

Parameter/Range	Frequency	CMC ^{2,6} (±)	Comments
Oscilloscopes ³ –			
Square:			
50 Ω @ 1 kHz Source	1 mV to 130 V	0.25 % + 40 μV	Fluke 5820A
1 MΩ @ 1 kHz Source	1 mV to 130 V	0.09 % + 5 μV	
Leveled Sine Amplitude:			
50 kHz Reference	50 kHz to 100 MHz	3.5 % + 300 μV	
	(100 to 300) MHz	4.0 % + 300 μV	
	(300 to 500) MHz	5.5 % + 300 μV	
10 MHz Reference	(500 to 600) MHz	6.0 % + 300 μV	
	600 MHz to 1.1 GHz	7.0 % + 300 μV	
	(1.1 to 1.6) GHz	7.0 % + 300 μV	
	(1.6 to 2.1) GHz	8.0 % + 300 μV	
Leveled Sine Flatness:			
Relative to 50 kHz	50 kHz to 100 MHz	3.1 % + 100 μV	
	(100 to 300) MHz	3.7 % + 100 μV	
	(300 to 500) MHz	4.3 % + 100 μV	
Relative to 10 MHz	(500 to 600) MHz	7.4 % + 100 μV	
	600 MHz to 1.1 GHz	8.0 % + 100 μV	
	(1.1 to 1.6) GHz	7.9 % + 100 μV	
	(1.6 to 2.1) GHz	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	0.51 °C	Martel 3001M
	-100 °C to -25 °C	0.20 °C	
	-25 °C to 350 °C	0.20 °C	
	350 °C to 650 °C	0.20 °C	
	650 °C to 1000 °C	0.25 °C	

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 & Indicating Systems ³ –				
Pt 385, 100 Ω	-200 °C to -80 °C -80 °C to 0 °C 0 °C to 100 °C 100 °C to 300 °C 300 °C to 400 °C 400 °C to 630 °C 630 °C to 800 °C	0.05 °C 0.06 °C 0.06 °C 0.05 °C 0.05 °C 0.06 °C 0.06 °C		Martel 3001M

III. Mechanical

Parameter/Equipment	Range	CMC ^{2,6,7} (\pm)	Comments
Balances & 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) lbs	0.0022 oz + 0.6R 0.025 lbs + 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 250) in lbf (5 to 50) ft lbf	0.3 in ozf 1.6 in lbf 0.29 ft lbf	Torque tester
Torque- Measuring Equipment	0.11 in ozf to 16 in ozf 1.25 in lbf to 1000 in lbf	0.2 % 0.2 %	Reference wheel w/ weights

IV. Thermodynamics

Parameter/Equipment	Range	CMC ² (\pm)	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 series of instruments. This capability is 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 The measurands stated are generated Fluke 5700A series of instruments. This capability is suitable for the calibration of the devices intended to measure the measurand in the ranges indicated. CMC's are expressed as either a specific value that covers the full range or as a fraction of the reading plus a fixed floor specification.

⁶ In the statement of CMC, percentages are to be read as percent of reading unless otherwise noted.

⁷ 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/NCSLI Z540-1-1994 and the requirements of ANSI/NCSLI Z540.3-2006 and any additional program requirements in the field of calibration. 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 13th day of October 2015.

A handwritten signature in blue ink, appearing to read "J. C. Bunt".

Senior Director of Quality and Communications
For the Accreditation Council
Certificate Number 3471.01
Valid to July 31, 2017
Revised on May 31, 2016

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