



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

INNOCAL  
625 E. Bunker Court  
Vernon Hills, IL 60061  
Tony Szplit Phone: 847 327 5355

CALIBRATION

Valid To: October 31, 2025

Certificate Number: 1746.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations<sup>1, 11</sup>:

I. Acoustical

Parameter/Range	Frequency	CMC <sup>2,3</sup> (±)	Comments
Sound Level Meters – Measure			
94 dB	250 Hz 1000 Hz	0.39 dB 0.39 dB	Sound calibrator
114 dB	250 Hz 1000 Hz	0.4 dB 0.4 dB	

II. Chemical

Parameter/Equipment	Range	CMC <sup>2,3</sup> (±)	Comments
pH – Measuring Equipment	4 pH 7 pH 10 pH	0.014 pH 0.016 pH 0.016 pH	Standard reference buffer

Parameter/Equipment	Range	CMC <sup>2,3,4</sup> (±)	Comments
Conductivity – Measuring Equipment <sup>5</sup>	(5 to 30) μS (>30 to 84) μS (>84 to 300) μS (>300 to 1413) μS (>1413 to 3000) μS (>3000 to 13 000) μS	0.011 μS + 1 % 0.0025 μS + 1 % 0.33 μS + 0.64 % 1.4 μS + 0.3 % 15 μS 0.27 mS	Standard reference buffer  Electronic, decade substituter
pH Electrical Simulation	(0 to 14) pH	0.000 35 pH	Fluke 5520A

### III. Dimensional

Parameter/Equipment	Range	CMC <sup>2,4</sup> (±)	Comments
Calipers & Micrometers —	Up to 6 in (6 to 12) in (12 to 24) in (24 to 60) in	(16 + 22L) μin (3 + 14L) μin 20L μin (110 + 13L) μin	Gage blocks
Protractors/Angle Meters/Levels	(0 to 360)°	0.0079°	Sine plate, gage blocks
Rulers/Tape Measures	Up to 6 in (6 to 12) in (12 to 24) in (2 to 100) ft	(180 + 2.9L) μin (160 + 7.4L) μin (61 + 16L) μin 450 μin every 2 ft	Gage blocks
Radius Gages	Up to 12 in	0.001 in	Optical comparator
Thickness Gages	Up to 1 in	(0.0021 + 0.0003L) in	Step blocks
Surface Flatness – Optical Flat	Up to 4 in	3.7 μin	Optical flats & Van Keuren monochromatic light

Parameter/Equipment	Range	CMC <sup>2,4</sup> (±)	Comments
Sieves – Opening Size (X/Y) & Wire Diameter (X/Y)	Up to 5 in	(88 + 15L) μin	ASTM E11 Optical comparator with gage blocks
Durometers – Types A, B, C, D, O, DO & OO Indenter Extension & Shape – Diameter Radius Angle Extension Indenter Display Spring Calibration – Force	Up to 0.25 in Up to 0.5 in Up to 90° Up to 0.5 in Up to 0.1 in Up to 5 kg	0.001 in 0.001 in 0.097° 830 μin 330 μin 0.26 g	ASTM D2240  Optical comparator  Gage blocks Mass & balance
Angle Blocks	Up to 180°	0.097°	Optical comparator

#### IV. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC <sup>2,10</sup> (±)	Comments
Electrical Calibration of Thermocouple – Generate & Measure Type B	(250 to 350) °C (350 to 445) °C (445 to 580) °C (580 to 600) °C (600 to 800) °C	1.2 °C 0.87 °C 0.69 °C 0.53 °C 0.35 °C	Ectron 1140A or Fluke 5520A

Parameter/Equipment	Range	CMC <sup>2, 10</sup> (±)	Comments
Electrical Calibration of Thermocouple – Generate & Measure (cont.)			
Type B	(800 to 1000) °C (1000 to 1550) °C (1550 to 1820) °C	0.28 °C 0.24 °C 0.26 °C	Ectron 1140A or Fluke 5520A
Type E	(-270 to -250) °C (-250 to -245) °C (-245 to -195) °C (-195 to -155) °C (-155 to -90) °C (-90 to 15) °C (15 to 890) °C (890 to 1000) °C	1.4 °C 0.39 °C 0.21 °C 0.12 °C 0.1 °C 0.08 °C 0.07 °C 0.08 °C	
Type J	(-210 to -180) °C (-180 to -120) °C (-120 to -50) °C (-50 to 1200) °C	0.15 °C 0.12 °C 0.1 °C 0.09 °C	
Type K	(-270 to -255) °C (-255 to -200) °C (-200 to -195) °C (-195 to -115) °C (-115 to -55) °C (-55 to 1000) °C (1000 to 1372) °C	2.6 °C 0.81 °C 0.26 °C 0.14 °C 0.11 °C 0.09 °C 0.1 °C	
Type N	(-270 to -260) °C (-260 to -200) °C (-200 to -140) °C (-140 to -70) °C (-70 to 25) °C (25 to 160) °C (160 to 1300) °C	5.9 °C 1.2 °C 0.27 °C 0.18 °C 0.14 °C 0.12 °C 0.11 °C	
Type R	(-50 to -30) °C (-30 to 0) °C (0 to 250) °C (250 to 400) °C (400 to 1768) °C	0.77 °C 0.64 °C 0.26 °C 0.27 °C 0.26 °C	
Type S	(-50 to -30) °C (-30 to 0) °C (0 to 250) °C	0.73 °C 0.66 °C 0.37 °C	

Parameter/Equipment	Range	CMC <sup>2, 10</sup> (±)	Comments
Electrical Calibration of Thermocouple – Generate & Measure (cont.)			
Type S	(250 to 1000) °C (1000 to 1400) °C (1400 to 1768) °C	0.29 °C 0.3 °C 0.31 °C	Ectron 1140A or Fluke 5520A
Type T	(-270 to -255) °C (-255 to -250) °C (-250 to -240) °C (-240 to -210) °C (-210 to -150) °C (-150 to -40) °C (-40 to 100) °C (100 to 400) °C	2.1 °C 0.59 °C 0.5 °C 0.35 °C 0.21 °C 0.14 °C 0.1 °C 0.09 °C	
Type U	(-200 to 0) °C (0 to 600) °C	0.65 °C 0.31 °C	
Electrical Calibration of RTD's – Generate			
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	0.039 °C 0.054 °C 0.07 °C 0.078 °C 0.093 °C 0.18 °C	Fluke 5520A
Pt 385, 200 Ω	(-200 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.031 °C 0.039 °C 0.093 °C 0.1 °C 0.11 °C 0.12 °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	0.19 °C 0.031 °C 0.039 °C 0.047 °C 0.055 °C 0.062 °C 0.07 °C 0.078 °C 0.18 °C	

Parameter/Equipment	Range	CMC <sup>2,4,10</sup> (±)	Comments
Electrical Calibration of RTD's – Generate (cont)  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 0.054 °C 0.07 °C 0.078 °C 0.093 °C	Fluke 5520A
DC Voltage – Generate	(0 to 220) mV (0.22 to 2.2) V (2.2 to 11) V (11 to 22) V (22 to 220) V (220 to 1100) V	0.61 μV + 0.000 82 % 1 μV + 0.000 72 % 3.6 μV + 0.000 72 % 6.5 μV + 0.000 72 % 82 μV + 0.000 82 % 0.51 mV + 0.000 92 %	Fluke 5700A
DC Voltage – Measure	(0 to 199.999 999) mV (0.2 to 1.999 999 99) V (2 to 19.999 999 9) V (20 to 199.999 999) V (200 to 1000.000 00) V (1 to 2) kV (2 to 15) kV	0.11 μV + 0.0005 % 0.42 μV + 0.000 35 % 4.3 μV + 0.000 36 % 43 μV + 0.000 55 % 0.5 mV + 0.000 55 % 0.3 V + 0.066 % 7.6 V + 0.033 %	Fluke 8508A  High voltage divider Fluke 80F-15
DC Current – Generate	(0 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 (11 to 20.5) A (20 to 100) A  (100 to 1000) A	8.2 nA + 0.0051 % 8.2 nA + 0.0052 % 82 nA + 0.0051 % 820 nA + 0.0062 % 26 μA + 0.0082 % 490 μA + 0.037 % 57 μA + 0.078 % 18 mA + 0.035 %  0.093 A + 0.027 %	Fluke 5700A  Fluke 5520A, Valhalla 2555A with 5700A  Fluke 5520A with 5500 coil
DC Current – Measure	(0 to 200) μA (0.2 to 2) mA (2 to 20) mA (20 to 200) mA	0.52 nA + 0.0012 % 4.9 nA + 0.0012 % 48 nA + 0.0014 % 0.8 μA + 0.0048 %	Fluke 8508A

Parameter/Equipment	Range	CMC <sup>2, 4, 10</sup> (±)	Comments
DC Current – Measure (cont)	(0.2 to 2) A (2 to 20) A (20 to 100) A	16 µA + 0.019 % 0.4 mA + 0.04 % 0.0084 %	Fluke 8508A Leeds & Northrop resistors with 8508A

Parameter/Range	Frequency	CMC <sup>2, 10</sup> (±)	Comments
AC Voltage – Generate			
(0.22 to 2.2) mV	(10 to 20) Hz (20 to 40) Hz (40 to 20 000) Hz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (500 to 1000) kHz	4.6 µV + 0.057 % 4.6 µV + 0.022 % 4.6 µV + 0.011 % 4.6 µV + 0.038 % 7.2 µV + 0.086 % 13 µV + 0.12 % 26 µV + 0.18 % 26 µV + 0.35 %	Fluke 5700A
(2.2 to 22) mV	(10 to 20) Hz (20 to 40) Hz (40 to 20 000) Hz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (500 to 1000) kHz	5.1 µV + 0.057 % 5.1 µV + 0.022 % 5.1 µV + 0.011 % 5.1 µV + 0.038 % 5.1 µV + 0.087 % 12 µV + 0.12 % 26 µV + 0.18 % 26 µV + 0.35 %	
(22 to 220) mV	(10 to 20) Hz (20 to 40) Hz (40 to 20 000) Hz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (500 to 1000) kHz	1.3 µV + 0.057 % 8.2 µV + 0.022 % 8.2 µV + 0.011 % 8.2 µV + 0.033 % 26 µV + 0.087 % 26 µV + 0.12 % 36 µV + 0.18 % 82 µV + 0.35 %	
(0.22 to 2.2) V	(10 to 20) Hz (20 to 40) Hz (40 to 20 000) Hz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (500 to 1000) kHz	0.31 mV + 0.041 % 0.026 mV + 0.017 % 6.1 µV + 0.0077 % 16 µV + 0.013 % 71 µV + 0.026 % 0.13 mV + 0.044 % 0.36 mV + 0.11 % 0.87 mV + 0.23 %	

Parameter/Range	Frequency	CMC <sup>2,10</sup> (±)	Comments
AC Voltage – Generate (cont)			
(2.2 to 22) V	(10 to 20) Hz (20 to 40) Hz (40 to 20 000) Hz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (500 to 1000) kHz	0.82 mV + 0.051 % 0.26 mV + 0.017 % 62 µV + 0.0077 % 0.16 mV + 0.013 % 0.36 mV + 0.026 % 1.5 mV + 0.051 % 4.4 mV + 0.13 % 8.7 mV + 0.28 %	Fluke 5700 with amplifier
(22 to 220) V	(10 to 20) Hz (20 to 40) Hz (40 to 20 000) Hz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (500 to 1000) kHz	8.2 mV + 0.051 % 2.6 mV + 0.017 % 0.82 mV + 0.0082 % 3.6 mV + 0.023 % 8.2 mV + 0.051 % 92 mV + 0.16 % 92 mV + 0.48 % 0.19 V + 1.2 %	Fluke 5700
(220 to 250) V	(15 to 40) Hz	16 mV + 0.041 %	
(220 to 1100) V	(40 to 50) Hz (50 to 1000) Hz (1 to 20) kHz (20 to 30) kHz	4.1 mV + 0.01 % 3.6 mV + 0.009 % 6.2 mV + 0.017 % 11 mV + 0.062 %	
(220 to 750) V	(30 to 50) kHz (50 to 100) kHz	11 mV + 0.062 % 46 mV + 0.24 %	
AC Voltage – Measure			
(0 to 200) mV	(1 to 10) Hz (10 to 40) Hz (40 to 100) Hz (100 to 2000) Hz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz	14 µV + 0.017 % 4 µV + 0.014 % 4 µV + 0.012 % 2 µV + 0.011 % 0.004 mV + 0.012 % 0.008 mV + 0.034 % 20 µV + 0.077 %	Fluke 8508A
(0.2 to 2.0) V	(1 to 10) Hz (10 to 40) Hz (40 to 100) Hz (100 to 2000) Hz (2 to 10) kHz (10 to 30) kHz	0.12 mV + 0.015 % 20 µV + 0.012 % 20 µV + 0.009 % 20 µV + 0.0075 % 20 µV + 0.011 % 40 µV + 0.022 %	



Parameter/Range	Frequency	CMC <sup>2, 10</sup> (±)	Comments
AC Voltage – Measure (cont)			
(0.2 to 2.0) V	(30 to 100) kHz (100 to 300) kHz (300 to 1000) kHz	0.2 mV + 0.057 % 2 mV + 0.3 % 20 mV + 1 %	Fluke 8508A
(2.0 to 20) V	(1 to 10) Hz (10 to 40) Hz (40 to 100) Hz (100 to 2000) Hz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz (300 to 1000) kHz	1.2 mV + 0.015 % 0.2 mV + 0.012 % 0.2 mV + 0.009 % 0.2 mV + 0.0075 % 0.2 mV + 0.011 % 0.4 mV + 0.022 % 2 mV + 0.057 % 20 mV + 0.3 % 200 mV + 1 %	
(20 to 200) V	(1 to 10) Hz (10 to 40) Hz (40 to 100) Hz (100 to 2000) Hz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz (300 to 1000) kHz	12 mV + 0.015 % 2 mV + 0.012 % 2 mV + 0.009 % 2 mV + 0.0075 % 2 mV + 0.011 % 4 mV + 0.022 % 20 mV + 0.057 % 200 mV + 0.3 % 2 V + 1 %	
(200 to 1000) V	(1 to 10) Hz (10 to 40) Hz (40 to 10 000) Hz (10 to 30) kHz (30 to 100) kHz	70 mV + 0.015 % 21 mV + 0.012 % 20 mV + 0.012 % 40 mV + 0.023 % 0.2 V + 0.058 %	
AC Current – Generate			
(0 to 220) µA	(10 to 20) Hz (20 to 40) Hz (40 to 1000) Hz (1 to 5) kHz (5 to 10) kHz	26 nA + 0.072 % 20 nA + 0.036 % 16 nA + 0.015 % 41 nA + 0.062 % 82 nA + 0.17 %	Fluke 5700A
(0.22 to 2.2) mA	(10 to 20) Hz (20 to 40) Hz (40 to 1000) Hz (1 to 5) kHz (5 to 10) kHz	41 nA + 0.072 % 36 nA + 0.036 % 36 nA + 0.015 % 0.41 µA + 0.062 % 0.82 µA + 0.17 %	

Parameter/Range	Frequency	CMC <sup>2, 10</sup> (±)	Comments
AC Current – Generate (cont)			
(2.2 to 22) mA	(10 to 20) Hz (20 to 40) Hz (40 to 1000) Hz (1 to 5) kHz (5 to 10) kHz	0.41 µA + 0.072 % 0.36 µA + 0.036 % 0.36 µA + 0.015 % 4.1 µA + 0.062 % 8.2 µA + 0.16 %	Fluke 5700A
(22 to 220) mA	(10 to 20) Hz (20 to 40) Hz (40 to 1000) Hz (1 to 5) kHz (5 to 10) kHz	4.1 µA + 0.072 % 3.6 µA + 0.036 % 3.6 µA + 0.015 % 41 µA + 0.062 % 82 µA + 0.17 %	
(0.22 to 2.2) A	(20 to 1000) Hz (1 to 5) kHz (5 to 10) kHz	36 µA + 0.067 % 82 µA + 0.077 % 0.16 mA + 0.87 %	
(2.2 to 11) A	(40 to 1000) Hz (1 to 5) kHz (5 to 10) kHz	0.18 mA + 0.047 % 0.39 mA + 0.097 % 0.77 mA + 0.37 %	
(29 to 329.99) µA	(10 to 30) kHz	0.31 µA + 1.3 %	Fluke 5520A
(0.33 to 3.2999) mA	(1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.16 µA + 0.16 % 0.23 µA + 0.39 % 0.47 µA + 0.78 %	
(3.3 to 32.999) mA	(1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	1.6 µA + 0.062 % 2.3 µA + 0.16 % 3.1 µA + 0.32 %	
(33 to 329.99) mA	(1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	39 µA + 0.078 % 78 µA + 0.16 % 160 µA + 0.32 %	
(11 to 20.5) A	(45 to 100) Hz (100 to 1000) Hz (1 to 5) kHz	3.9 mA + 0.093 % 3.8 mA + 0.12 % 3.9 mA + 2.4 %	
(20.5 to 1000) A	(45 to 65) Hz (65 to 440) Hz	0.1 A + 0.33 % 0.12 A + 0.92 %	Fluke 5520A & 5500 coil

Parameter/Range	Frequency	CMC <sup>2, 10</sup> (±)	Comments
AC Current – Measure			
(0 to 200) μA	(1 to 10 000) Hz (10 to 30) kHz (30 to 100) kHz	0.02 μA + 0.031 % 0.02 μA + 0.071 % 0.02 μA + 0.4 %	Fluke 8508A
(0.2 to 2) mA	(1 to 10) Hz (10 to 10 000) Hz (10 to 30) kHz (30 to 100) kHz	0.2 μA + 0.031 % 0.2 μA + 0.03 % 0.2 μA + 0.071 % 0.2 μA + 0.4 %	
(2 to 20) mA	(1 to 10) Hz (10 to 10 000) Hz (10 to 30) kHz (30 to 100) kHz	2 μA + 0.031 % 2 μA + 0.03 % 2 μA + 0.071 % 2 μA + 0.4 %	
(20 to 200) mA	(1 to 10) Hz (10 to 10 000) Hz (10 to 30) kHz	20 μA + 0.031 % 20 μA + 0.029 % 20 μA + 0.063 %	
(0.2 to 2) A	(10 to 2000) Hz (2 to 10) kHz (10 to 30) kHz	0.2 mA + 0.062 % 0.2 mA + 0.073 % 0.2 mA + 0.3 %	
(2 to 20) A	(10 to 2000) Hz (2 to 10) kHz	2 mA + 0.082 % 2 mA + 0.25 %	
(20 to 30) A	20 to 400 Hz	0.56 A + 5 %	Fluke 5320A

Parameter/Equipment	Range	CMC <sup>2, 4, 5, 10</sup> (±)	Comments
Resistance – Generate	(0 to 10.9999) Ω (11 to 32.9999) Ω (33 to 109.9999) Ω (0.11 to 1.099 999) kΩ (1.1 to 10.999 99) kΩ (11 to 109.999 99) kΩ (0.11 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	0.78 mΩ + 0.003 % 1.2 mΩ + 0.002 % 1.1 mΩ + 0.0022 % 1.6 mΩ + 0.0022 % 1.6 mΩ + 0.0022 % 0.16 Ω + 0.0022 % 1.6 Ω + 0.0025 % 23 Ω + 0.0047 % 40 Ω + 0.01 % 2 kΩ + 0.019 % 2.3 kΩ + 0.039 % 75 kΩ + 0.24 % 390 kΩ + 1.2 %	Fluke 5520A

Parameter/Equipment	Range	CMC <sup>2, 4, 5, 10</sup> (±)	Comments
Resistance – Generate (cont)	(1.1 to 10) GΩ (10 to 20) GΩ (20 to 100) GΩ. (100 to 1000) GΩ  (1 to 10) TΩ	0.96 MΩ + 0.59 % 0.79 MΩ + 1.2 % 6.2 MΩ + 1.2 % 2.1 %  9 MΩ + 3.2 %	Resistance decade box  Fluke 5320A
Resistance – Measure	(0 to 2) Ω (2 to 20) Ω (20 to 200) Ω (200 to 2000) Ω (2 to 20) kΩ (20 to 200) kΩ (200 to 2000) kΩ (2 to 20) MΩ (20 to 200) MΩ (200 to 2000) MΩ (2 to 20) GΩ	5.3 μΩ + 0.0016 % 1.4 μΩ + 0.000 97 % 50 μΩ + 0.000 82 % 0.56 mΩ + 0.0008 % 5 mΩ + 0.000 82 % 50 mΩ + 0.0008 % 1Ω + 0.000 93 % 100 Ω + 0.0021 % 10 kΩ + 0.012 % 1 MΩ + 0.15 % 15 MΩ + 0.14 %	Fluke 8508A
Capacitance – Generate	(0.19 to 3.2999) nF (3.3 to 10.9999) nF (11 to 109.999) nF (110 to 329.999) nF (0.33 to 1.099 99) μF (1.1 to 3.299 99) μF (3.3 to 10.9999) μF (11 to 32.9999) μF (33 to 109.999) μF (110 to 329.999) μF (0.33 to 1.099 99) mF (1.1 to 3.2999) mF (3.3 to 10.9999) mF (11 to 32.9999) mF (33 to 110) mF	8 pF + 0.39 % 7.9 pF + 0.2 % 78 pF + 0.2 % 0.23 nF + 0.2 % 0.81 nF + 0.2 % 2.3 nF + 0.2 % 1.8 nF + 0.38 % 23 nF + 0.31 % 76 nF + 0.36 % 0.24 μF + 0.35 % 0.76 μF + 0.36 % 2.4 μF + 0.35 % 7.2 μF + 0.37 % 24 μF + 0.58 % 78 μF + 0.85 %	Fluke 5520A

Parameter/Equipment	Frequency	CMC <sup>2, 10</sup> (±)	Comments
Distortion – Measure  (0 to 99.99) dB	20 Hz to 20 kHz (20 to 100) kHz	1.2 dB 2.4 dB	HP 8903B

V. Electrical/RF Microwave

Parameter/Range	Frequency	CMC <sup>2, 10</sup> (±)	Comments
RF Power – Measure			
(+13 to -67) dB	0.1 MHz to 3.2 GHz	1 dB	Rohde & Schwarz NRV
(-67 to -57) dB	0.1 MHz to 3.2 GHz	0.19 dB	
(-57 to -47) dB	0.1 MHz to 2 GHz	0.075 dB	
(-47 to -37) dB	(2 to 3.2) GHz	0.093 dB	
(-37 to -27) dB	0.1 MHz to 2 GHz (2 to 3.2) GHz	0.076 dB 0.092 dB	
(-27 to -17) dB	0.1 MHz to 2 GHz (2 to 3.2) GHz	0.078 dB 0.093 dB	
(-17 to -7) dB	0.1 MHz to 2 GHz (2 to 3.2) GHz	0.078 dB 0.093 dB	
(-7 to 3) dB	(0.1 to 30) MHz (0.03 to 2) GHz (2 to 3.2) GHz	0.077 dB 0.092 dB 0.19 dB	
(3 to 13) dB	(0.1 to 30) MHz (0.03 to 2) GHz (2 to 3.2) GHz	0.08 dB 0.11 dB 0.31 dB	

Parameter/Equipment	Range	CMC <sup>2, 4</sup> (±)	Comments
Oscilloscopes –			
Square Wave Signal - Generate (1 kHz Input)			Fluke 5520A/SC1100
50 Ω	(1 to 109.99) mV (0.11 to 6.599) V	32 μV + 0.21 % 32 μV + 0.19 %	
1 MΩ	(1 to 109.99) mV (0.110 to 10.999) V (11 to 130) V	32 μV + 0.1 % 32 μV + 0.11 % 960 μV + 0.1 %	
Leveled Sine Wave Amplitude			
5 mV to 5.5 V	50 kHz Reference (0.050 to 100) MHz	0.24 mV + 1.6 % 0.23 mV + 2.8 %	

Parameter/Equipment	Range	CMC <sup>2,4</sup> (±)	Comments
Oscilloscopes – (cont)			
Leveled Sine Wave Amplitude			
5 mV to 3.5 V	(100 to 300) MHz (300 to 600) MHz (600 to 1100) MHz	0.23 mV + 3.1 % 0.23 mV + 4.7 % 0.23 mV + 5.4 %	Fluke 5520A/SC1100
Leveled Sine Wave Flatness			
5 mV to 5.5 V	(0.050 to 100) MHz (100 to 300) MHz (300 to 600) MHz	7.7 μV + 1.2 % 7.8 μV + 1.6 % 7.8 μV + 3.1 %	
5 mV to 3.5 V	(600 to 1100) MHz	0.23 mV + 5.4 %	
Time Marker			
50 Ω Load	(1 to 5) ns 10 ns (20 to 50) ns 100 ns to 20 ms 50 ms to 5 s	0.0002 % 0.0002 % 0.0002 % 0.0002 % 0.51 %	
Edge – Rise Time			
1 kHz to 2 MHz (> 2 to 10) MHz	≤ 300 ps ≤ 350 ps	79 ps 79 ps	
Edge – Amplitude	5 mV to 2.5 V	0.16 mV + 1.6 %	

#### VI. Fluid Quantities

Parameter/Equipment	Range	CMC <sup>2,3,4</sup> (±)	Comments
Airflow – Mass Flow & Correlated, Direct Read	(0.002 to 20) LPM (20 to 80) LPM  (80 to 500) LPM	0.23 % 0.22 %  0.34 %	Laminar flow elements  Volumetric comparison

Parameter/Equipment	Range	CMC <sup>2,3,4</sup> (±)	Comments
Air Velocity – Measuring Equipment	(4 to 13) m/s (13 to 40) m/s	0.038 m/s + 0.056 % 0.61 %	Wind tunnel & pressure transducers
Refractive Index – Refractometers	(5 to 91.75) <sup>o</sup> Brix	0.02 <sup>o</sup> Brix + 0.012 %	Standard reference materials
Liquid Volume – Pipettes/Burettes <sup>9</sup>	(0.1 to 1) µL (1 to 10) µL (10 to 100) µL (100 to 1000) µL (1 to 10) mL (10 to 500) mL (500 to 2000) mL (2000 to 4000) mL	2.4 nL + 1 % 1 nL + 1.2 % 130 nL + 1.1 nL/µL 100 nL + 1.4 nL/µL 1.6 µL/mL 2.1 µL + 1.3 µL/mL 1.4 µL/mL 4.2 µL/mL	Photometric calibrator  Gravimetric method & class 1 mass
Specific Gravity – Hydrometers	(0.65 to 0.95) sg (0.95 to 1.05) sg (1.05 to 1.55) sg (1.55 to 2.00) sg	0.000 38 sg 0.000 11 sg 0.000 23 sg 0.000 48 sg	Hydrostatic weighing
Viscosity – Measuring Equipment	4.5 cP 9 cP 48 cP 96 cP 480 cP 969 cP 4859 cP 11 860 cP 30 160 cP 59 940 cP	0.012 cP 0.027 cP 0.15 cP 0.35 cP 1.8 cP 3.5 cP 22 cP 61 cP 150 cP 290 cP	Reference standard silicone oils

VII. Mechanical

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Barometers	(700 to 1100) mBar	0.11 mBar	RPM4/BA100Ks & chamber

Parameter/Equipment	Range	CMC <sup>2,3,4</sup> (±)	Comments
Vacuum	(0 to 24) inHg (24 to 29.2) inHg	0.0071 inHg + 0.0021 % 0.0098 inHg	Quartz reference transducer
	(24 to 100) mTorr (0.1 to 1) Torr (1 to 10) Torr	0.17 mTorr + 0.44 % 0.033 Torr + 0.0092 % 0.033 Torr + 0.082 %	Capacitance manometers
Pressure	(0 to 2) inH <sub>2</sub> O	0.000 34 inH <sub>2</sub> O	MicroTector deadweight tester
	(2 to 30) inH <sub>2</sub> O	0.0011 inH <sub>2</sub> O + 0.05 %	
	(30 to 100) inH <sub>2</sub> O	0.000 12 inH <sub>2</sub> O + 0.021 %	Quartz reference transducers
	(0 to 5) psi	0.000 09 psi + 0.012 %	
	(5 to 15) psi	0.000 011 psi + 0.013 %	
	(15 to 30) psi	0.027 %	
	(30 to 100) psi	0.0029 psi + 0.01 %	
	(100 to 300) psi	0.013 %	
	(300 to 1000) psi	0.000 21 psi + 0.013 %	
	(1000 to 3000) psi	0.29 psi + 0.0009 %	
(3000 to 10 000) psi	0.012 %		
(10 000 to 20 000) psi	0.43 psi + 0.02 %		
Torque – Measuring Equipment	(0.5 to 160) ozf·in (10 to 20) lbf·in (20 to 600) lbf·in (50 to 1000) lbf·ft	0.0016 ozf·in + 0.027 % 0.0034 lbf·in + 0.15 % 0.12 % 0.07 %	Dead weights & torque arm or wheels
Mass <sup>6</sup>	1 mg 2 mg 5 mg 10 mg 20 mg 50 mg 100 mg 200 mg 500 mg 1 g 2 g 5 g 10 g 20 g 50 g	6.2 µg 6.1 µg 6.1 µg 6 µg 6 µg 6 µg 6 µg 6 µg 6 µg 6 µg 20 µg 20 µg 21 µg 32 µg 50 µg 92 µg	OIML ultra class





VIII. Thermodynamics

Parameter/Equipment	Range	CMC <sup>2,3,4</sup> (±)	Comments
Temperature – IR Systems	(-15 to 0) °C (0 to 100) °C (100 to 200) °C (200 to 500) °C	0.55 °C + 0.19 % 0.54 °C + 0.15 % 0.38 °C + 0.31 % 0.13 °C + 0.44 %	Blackbody IR calibrator
Temperature – Measuring Equipment & Measure <sup>8</sup>	-196.0 °C  (-95 to -80) °C  (-80 to 0) °C  0 °C  (0 to 90) °C (90 to 235) °C  (235 to 550) °C (550 to 660) °C (660 to 700) °C (700 to 800) °C (800 to 900) °C (900 to 1000) °C (1000 to 1100) °C (1100 to 1200) °C	0.0046 °C  0.061 °C  0.0098 °C  0.0045 °C  0.006 °C + 0.000 77 % 0.007 °C + 0.0034 %  0.0042 % 0.022 °C + 0.000 66 % 0.12 °C 0.27 °C 0.48 °C 0.75 °C 1.1 °C 1.5 °C	Liquid nitrogen BP apparatus, SPRT  Metrology well & SPRT  Liquid bath & SPRT  Ice bath & SPRT  Liquid bath & SPRT  Salt bath, SPRT  Sand bath, SPRT  Dry well, SPRT, T/C  Dry well, T/C
Dewpoint	(-70 to -60) °C (-60 to -40) °C (-40 to -20) °C (-20 to 10) °C (10 to 20) °C	0.47 °C 0.29 °C 0.27 °C 0.26 °C 0.16 °C	Chilled mirror & moisture generator  Two-pressure humidity generator
Relative Humidity <sup>8</sup>	(10 to 60) % RH (60 to 95) % RH	0.51 % RH 0.52 % RH	Two-pressure humidity generator

IX. Time & Frequency

Parameter/Equipment	Range	CMC <sup>2,3,4,6</sup> ( $\pm$ )	Comments
Stopwatches – Mechanical Electronic	60 s to 720 hr 60 s to 720 hr	0.58 s/day 0.054 s/day	Vibrograf
Stroboscopes	(0 to 20 000) fpm (20 000 to 120 000) fpm	0.0031 fpm + 0.000 82 % 0.24 fpm + 0.000 67 %	Comparison to counter & detector
Optical Tachometers	(0 to 100 000) rpm (100 000 to 125 000) rpm (125 000 to 150 000) rpm (150 000 to 175 000) rpm (175 000 to 200 000) rpm	0.000 51 rpm + 0.000 17 % 0.96 rpm 1.8 rpm 2.6 rpm 3.4 rpm	Comparison to function generator & lamp
Contact Tachometers	(60 to 12 000) rpm (12 000 to 24 000) rpm	0.016 rpm + 0.003 % 0.31 rpm + 0.0003 %	Comparison to counter & tachometer tester
Frequency – Measure	0.1 Hz to 3.1 GHz	2.1 $\mu$ Hz + 0.000 021 %	Universal counter
Frequency – Measuring Equipment	0.1 Hz to 20 MHz  (20 to 3200) MHz  10 MHz	12 nHz/Hz + 80 $\mu$ Hz  (0.12 Hz + 0.000 24 %)  7.7 parts in $10^{-11}$ Hz/Hz	3325A Function generator with $5 \times 10^{-11}$ oscillator  8648C generator  10 MHz reference using rubidium oscillator

<sup>1</sup> This laboratory offers commercial calibration service.

<sup>2</sup> 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.

- <sup>3</sup> 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.
- <sup>4</sup> In the statement of CMC, % is to be read as % of the absolute value of reading unless otherwise noted. *R* indicates unit under test resolution. *L* is the numerical value of the nominal length of the device measured in inches.
- <sup>5</sup> Resistance functions can be used to simulate conductivity, dissolved oxygen, RTD, and thermistor functions. Uncertainties are translated into simulated measurement units through known conversion factors.
- <sup>6</sup> CMC values listed are for cardinal points. Other values within the range can be obtained using substitution method with uncertainty increased for each value added.
- <sup>7</sup> Typical temperature measuring devices are liquid-in-glass (LIG) thermometers, thermocouples, RTDs, thermistors, bimetal thermometers, dry-well baths, liquid baths, ovens, PRTs, temperature transmitters, temperature controllers, temperature dataloggers, temperature recorders, and digital thermometers.
- <sup>8</sup> Typical relative humidity devices are thermohygrometers, hygrometers, psychrometers, hygrothermographs, humidity dataloggers, transmitters and recorders.
- <sup>9</sup> Typical liquid volume devices are pipettes, burettes, dispensers and rain gauges.
- <sup>10</sup> 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.
- <sup>11</sup> This scope meets A2LA's *P112 Flexible Scope Policy*.



# Accredited Laboratory

A2LA has accredited

**INNOCAL**

*Vernon Hills, IL*

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 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 12<sup>th</sup> day of January 2024.

A blue ink signature of Trace McInturff.

Mr. Trace McInturff, Vice President, Accreditation Services  
For the Accreditation Council  
Certificate Number 1746.01  
Valid to October 31, 2025

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