



The American Association for Laboratory Accreditation

World Class Accreditation

Accredited Laboratory

A2LA has accredited

SYPRIS TEST & MEASUREMENT CALIBRATION DIVISION

Lockport, 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 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 11th day of August 2009.

A handwritten signature in black ink, appearing to read "Peter Abney", written over a horizontal line.

President & CEO
For the Accreditation Council
Certificate Number 1623.02
Valid to March 31, 2011

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



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

SYPRIS TEST & MEASUREMENT – CALIBRATION DIVISION
 200 Upper Mountain Road, Bldg. 6, Plant 2
 Lockport, NY 14094
 Todd Savard Phone: 716 438 4584

CALIBRATION

Valid To: March 31, 2011

Certificate Number: 1623.02

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

I. Chemical

Parameter/Equipment	Range	Best Uncertainty ² (±)	Comments
Gas Flow ³	(0.1 to 10 cc/min)	0.97 % of reading	ATC IF2-010C-250P
Gas Concentration Alarms ³ – Carbon Monoxide (CO) Sulfur Dioxide (SO ₂)	25 parts in 10 ⁶ 50 parts in 10 ⁶ 10 parts in 10 ⁶	2.8 parts in 10 ⁶ 5.5 parts in 10 ⁶ 2 parts in 10 ⁶	Standard gases

II. Dimensional

Parameter/Equipment	Range	Best Uncertainty ^{2, 6} (±)	Comments
Micrometers ³	(0 to 36) in	(61 + 1.6L) μin	Grade 2 gage blocks
Calipers ³	(0 to 36) in	(610 + 1.6L) μin	Grade 2 gage blocks

Parameter/Equipment	Range	Best Uncertainty ^{2,6} (\pm)	Comments
Dial Indicators ³	(0 to 2) in	(61 + 1.6L) μ in	Grade 2 gage blocks
Height & Depth Gages ³	(0 to 36) in	(61 + 1.6L) μ in	Grade 2 gage blocks
Steel Rulers ³	Up to 48 in	0.009 in	Grade 2 gage blocks
Pin Gages ³	(0 to 10) in	(73 + 1.6L) μ in	P&W supermic with gage blocks

III. Electrical – DC/Low Frequency

Parameter/Equipment	Range	Best Uncertainty ^{2,4,5} (\pm)	Comments
DC Voltage ³ – Generate	(0 to 220) mV 220 mV to 2.2 V (2.2 to 11) V (11 to 22) V (22 to 220) V (220 to 1100) V	8.1 μ V/V + 0.6 μ V 7.1 μ V/V + 1 μ V 7.1 μ V/V + 3.5 μ V 7.1 μ V/V + 6.5 μ V 8.1 μ V/V + 80 μ V 9.1 μ V/V + 500 μ V	Fluke 5700A
DC Voltage ³ – Measure	Up to 0.1 V (0.1 to 1) V (1 to 10) V (10 to 100) V (100 to 1100) V	6.2 μ V/V + 0.3 μ V 5.2 μ V/V + 0.3 μ V 5.2 μ V/V + 5 μ V 7.3 μ V/V + 30 μ V 7.3 μ V/V + 110 μ V +12(V _{in} /1000) ² μ V/V	HP 3458A Opt. 002
DC Current ³ – Generate	0.1 nA to 2.2 mA (2.2 to 22) mA (22 to 220) mA 220 mA to 2.2 A (2.2 to 11) A	50 μ A/A + 8 nA 50 μ A/A + 80 nA 60 μ A/A + 0.8 μ A 80 μ A/A + 25 μ A 0.037 % + 480 μ A	Fluke 5700A Fluke 5700A Fluke 5725A

Parameter/Equipment	Range	Best Uncertainty ^{2,4,5} (\pm)	Comments
DC Current ³ – Generate (cont.)			
	(10 to 100) A	0.3 %	Power supply w/ shunt
Clamp-On Only	(0 to 550) A	0.3 % + 0.5 A	Fluke 5500A Fluke 50-turn coil
DC Power ³ – Generate	(0.01 to 330) watts (0.33 to 11) kwatts	0.20 % 0.21 %	Fluke 5500A
DC Current ³ – Measure	100 pA to 100 μ A (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A (1 to 100) A	24 μ A/A + 0.8 nA 24 μ A/A + 5 nA 24 μ A/A + 50 nA 41 μ A/A + 0.5 μ A 0.013 % + 10 μ A 0.29 %	HP 3458A Opt. 002 Empro shunts
DC Resistance ³ – Generate	(0 to 11) Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω (0.33 to 1.1) k Ω (1.1 to 3.3) k Ω (3.3 to 11) k Ω (11 to 33) k Ω (33 to 110) k Ω (110 to 330) k Ω (0.33 to 1.1) M Ω (1.1 to 3.3) M Ω (3.3 to 11) M Ω (11 to 33) M Ω (33 to 110) M Ω (110 to 330) M Ω	0.014 % + 8 m Ω 0.014 % + 15 m Ω 0.01 % + 15 m Ω 0.01 % + 15 m Ω 0.01 % + 15 m Ω 0.01 % + 60 m Ω 0.01 % + 60 m Ω 0.01 % + 0.6 Ω 0.011 % + 0.6 Ω 0.012 % + 6 Ω 0.02 % + 55 Ω 0.02 % + 55 Ω 0.06 % + 0.55 k Ω 0.1 % + 0.55 k Ω 0.51 % + 5.5 k Ω 0.58 % + 17 k Ω	Fluke 5500A

Parameter/Equipment	Range	Best Uncertainty ^{2,4,5} (\pm)	Comments
DC Resistance ³ –Generate (cont.) 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	95 parts in 10 ⁶ 95 parts in 10 ⁶ 28 parts in 10 ⁶ 27 parts in 10 ⁶ 17 parts in 10 ⁶ 17 parts in 10 ⁶ 13 parts in 10 ⁶ 13 parts in 10 ⁶ 12 parts in 10 ⁶ 12 parts in 10 ⁶ 14 parts in 10 ⁶ 14 parts in 10 ⁶ 20 parts in 10 ⁶ 21 parts in 10 ⁶ 40 parts in 10 ⁶ 47 parts in 10 ⁶ 0.011 %	Fluke 5700A
DC Resistance ³ – Measure	(0.1 to 10) Ω (10 to 100) Ω (0.1 to 1) k Ω (1 to 10) k Ω (10 to 100) k Ω (0.1 to 1) M Ω (1 to 10) M Ω (10 to 100) M Ω (0.1 to 1.2) G Ω	19 $\mu\Omega/\Omega$ + 0.05 m Ω 15 $\mu\Omega/\Omega$ + 0.5 m Ω 13 $\mu\Omega/\Omega$ + 0.5 m Ω 13 $\mu\Omega/\Omega$ + 5 m Ω 13 $\mu\Omega/\Omega$ + 0.05 Ω 24 $\mu\Omega/\Omega$ + 2 Ω 65 $\mu\Omega/\Omega$ + 100 Ω 0.058 % + 1 k Ω 0.58 % + 10 k Ω	HP 3458A Opt. 002
Electrical Calibration of Thermocouple Indicators ³ – Type B Type C	(600 to 800) $^{\circ}\text{C}$ (800 to 1000) $^{\circ}\text{C}$ (1000 to 1550) $^{\circ}\text{C}$ (1550 to 1820) $^{\circ}\text{C}$ (0 to 150) $^{\circ}\text{C}$ (150 to 650) $^{\circ}\text{C}$ (650 to 1000) $^{\circ}\text{C}$ (1000 to 1800) $^{\circ}\text{C}$ (1800 to 2316) $^{\circ}\text{C}$	0.44 $^{\circ}\text{C}$ 0.34 $^{\circ}\text{C}$ 0.3 $^{\circ}\text{C}$ 0.33 $^{\circ}\text{C}$ 0.3 $^{\circ}\text{C}$ 0.26 $^{\circ}\text{C}$ 0.31 $^{\circ}\text{C}$ 0.5 $^{\circ}\text{C}$ 0.84 $^{\circ}\text{C}$	Fluke 5500A Ectron 1140A

Parameter/Equipment	Range	Best Uncertainty ² (±)	Comments
Electrical Calibration of Thermocouple Indicators ³ – (cont.)			
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.5 °C 0.16 °C 0.14 °C 0.16 °C 0.21 °C	Fluke 5500A Ectron 1140A
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.27 °C 0.16 °C 0.14 °C 0.17 °C 0.23 °C	
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.33 °C 0.18 °C 0.16 °C 0.26 °C 0.4 °C	
Type N	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 410) °C (410 to 1300) °C	0.4 °C 0.22 °C 0.19 °C 0.18 °C 0.27 °C	
Type R	(0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C	0.57 °C 0.35 °C 0.33 °C 0.4 °C	
Type S	(0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1767) °C	0.47 °C 0.36 °C 0.37 °C 0.46 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.63 °C 0.24 °C 0.16 °C 0.14 °C	
Type U	(-200 to 0) °C (0 to 600) °C	0.56 °C 0.27 °C	

Parameter/Equipment	Range	Best Uncertainty ² (±)	Comments
Electrical Calibration of RTDs ³ –			
Pt 385, 100 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C (630 to 800) °C	0.05 °C 0.05 °C 0.07 °C 0.09 °C 0.1 °C 0.12 °C 0.23 °C	Fluke 5500A
Pt 3926, 100 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C	0.05 °C 0.05 °C 0.07 °C 0.09 °C 0.1 °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	0.25 °C 0.04 °C 0.05 °C 0.06 °C 0.07 °C 0.08 °C 0.09 °C 0.1 °C 0.23 °C	
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	0.04 °C 0.05 °C 0.12 °C 0.13 °C 0.14 °C 0.16 °C	
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	0.04 °C 0.05 °C 0.06 °C 0.08 °C 0.09 °C 0.11 °C	
Pt 385, 1000 Ω	(-200 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 600) °C (600 to 630) °C	0.03 °C 0.04 °C 0.05 °C 0.06 °C 0.07 °C 0.23 °C	

Parameter/Equipment	Range	Best Uncertainty ^{2, 4} (\pm)	Comments
Electrical Calibration of RTDs ³ – (cont.)			
Ni 120, 120 Ω	(-80 to 100) $^{\circ}\text{C}$ (100 to 260) $^{\circ}\text{C}$	0.08 $^{\circ}\text{C}$ 0.14 $^{\circ}\text{C}$	Fluke 5500A
Cu 427, 10 Ω	(-100 to 260) $^{\circ}\text{C}$	0.3 $^{\circ}\text{C}$	

Parameter/Range	Frequency	Best Uncertainty ^{2, 4} (\pm)	Comments
AC Voltage ³ – Generate			
(0.2 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	0.055 % + 4.5 μV 0.021 % + 4.5 μV 0.011 % + 4.5 μV 0.037 % + 4.5 μV 0.085 % + 7 μV 0.11 % + 13 μV 0.17 % + 25 μV 0.34 % + 25 μV	Fluke 5700A
(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	0.055 % + 5 μV 0.021 % + 5 μV 0.011 % + 5 μV 0.037 % + 5 μV 0.085 % + 7 μV 0.11 % + 12 μV 0.17 % + 25 μV 0.34 % + 25 μV	
(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	0.055 % + 13 μV 0.021 % + 8 μV 0.011 % + 8 μV 0.032 % + 8 μV 0.085 % + 25 μV 0.11 % + 25 μV 0.17 % + 35 μV 0.34 % + 80 μV	

Parameter/Range	Frequency	Best Uncertainty ^{2, 4} (\pm)	Comments
AC Voltage ³ – Generate (cont.)			
220 mV 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	0.05 % + 80 μ V 0.016 % + 25 μ V 75 μ V/V + 6 μ V 0.012 % + 16 μ V 0.025 % + 70 μ V 0.043 % + 130 μ V 0.11 % + 350 μ V 0.22 % + 850 μ V	Fluke 5700A
(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	0.05 % + 0.8 mV 0.016 % + 0.25 mV 75 μ V/V + 0.06 mV 0.012 % + 0.16 mV 0.025 % + 0.35 mV 0.05 % + 1.5 mV 0.13 % + 4.3 mV 0.27 % + 8.5 mV	
(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 (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.05 % + 8 mV 0.016 % + 2.5 mV 80 μ V/V + 0.8 mV 0.022 % + 3.5 mV 0.05 % + 8 mV 0.15 % + 90 mV 0.47 % + 90 mV 1.2 % + 190 mV	
(220 to 750) V	30 kHz to 50 kHz (50 to 100) kHz	0.06 % + 11 mV 0.23 % + 45 mV	
(220 to 1100) V	(15 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 30) kHz	0.04 % + 16 mV 90 μ V/V + 4 mV 0.017 % + 6 mV 0.06 % + 11 mV	Fluke 5700A Fluke 5725A
AC Power ³ – Generate			
(0.01 to 0.1) W (0.1 to 890) W (0.89 to 3) kW (3 to 11) kW	(45 to 65) Hz, PF = 1	0.23 % 0.14 % 0.13 % 0.15 %	Fluke 5500A

Parameter/Range	Frequency	Best Uncertainty ^{2,4} (\pm)	Comments
AC Current ³ – Generate			
(9 to 220) μ A	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.07 % + 25 nA 0.035 % + 20 nA 0.014 % + 16 nA 0.06 % + 40 nA 0.16 % + 80 nA	Fluke 5700A
220 μ A 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	0.07 % μ A/A + 40 nA 0.035 % μ A/A + 35 nA 0.014 % + 35 nA 0.06 % + 400 nA 0.16 % + 800 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	0.07 % + 0.4 μ A 0.035 % + 0.35 μ A 0.014 % + 0.35 μ A 0.060 % + 4 μ A 0.16 % + 8 μ A	
(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	0.07 % + 4 μ A 0.035 % + 3.5 μ A 0.014 % + 3.5 μ A 0.06 % + 40 μ A 0.16 % + 80 μ A	
220 mA to 2.2 A	20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.065 % + 35 μ A 0.075 % + 80 μ A 0.85 % + 160 μ A	
(2.2 to 11 A)	40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.046 % + 170 μ A 0.095 % + 380 μ A 0.36 % + 750 μ A	Fluke 5700A, Fluke 5725A
Clamp-On Only			
(0 to 550) A	(45 to 65) Hz	0.38 % + 0.5 A	Fluke 5500A, Fluke 50-turn coil
(0 to 110) A	(65 to 440) Hz	0.32 % + 0.5 A	Fluke 5500A, Fluke 50-turn coil

Parameter/Range	Frequency	Best Uncertainty ^{2,5} (±)	Comments
AC Voltage ³ – Measure			
3 μV to 10 mV	(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	0.03 % + 3 μV 0.02 % + 1.1 μV 0.03 % + 1.1 μV 0.12 % + 1.1 μV 0.58 % + 1.1 μV 4.6 % + 2 μV	HP 3458A Opt. 002
(10 to 100) mV	(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 (0.3 to 1) MHz (1 to 2) MHz	80 μV/V + 4 μV 80 μV/V + 2 μV 0.02 % + 2 μV 0.03 % + 2 μV 0.09 % + 2 μV 0.35 % + 10 μV 1.2 % + 10 μV 1.7 % + 10 μV	
(0.1 to 1) 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 (0.3 to 1) MHz (1 to 2) MHz	80 μV/V + 40 μV 80 μV/V + 20 μV 0.02 % + 20 μV 0.03 % + 20 μV 0.09 % + 20 μV 0.35 % + 100 μV 1.2 % + 100 μV 1.7 % + 100 μV	
(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 (0.3 to 1) MHz (1 to 2) MHz	80 μV/V + 0.4 mV 80 μV/V + 0.2 mV 0.02 % + 0.2 mV 0.03 % + 0.2 mV 0.09 % + 0.2 mV 0.35 % + 1 mV 1.2 % + 1 mV 1.7 % + 1 mV	
(10 to 100) V	(1 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (0.3 to 1) MHz	0.02 % + 4 mV 0.02 % + 2 mV 0.04 % + 2 mV 0.14 % + 2 mV 0.46 % + 10 mV 1.7 % + 10 mV	
(100 to 700) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.05 % + 40 mV 0.05 % + 20 mV 0.07 % + 20 mV 0.14 % + 20 mV 0.35 % + 20 mV	

Parameter/Range	Frequency	Best Uncertainty ^{2,5} (\pm)	Comments
AC Current ³ – Measure			
(5 to 100) μ A	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 1) kHz	0.46 % + 0.03 μ A 0.17 % + 0.03 μ A 0.07 % + 0.03 μ A 0.07 % + 0.03 μ A	HP 3458A Opt. 002
(0.1 to 1) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz	0.5 % + 0.2 μ A 0.17 % + 0.2 μ A 0.07 % + 0.2 μ A 0.04 % + 0.2 μ A	
(1 to 10) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz	0.46 % + 2 μ A 0.17 % + 2 μ A 0.07 % + 2 μ A 0.04 % + 2 μ A	
(10 to 100) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz	0.46 % + 20 μ A 0.17 % + 20 μ A 0.07 % + 20 μ A 0.04 % + 20 μ A	
(0.1 to 1) A	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz	0.46 % + 200 μ A 0.18 % + 200 μ A 0.09 % + 200 μ A 0.12 % + 200 μ A	
Capacitance ³ – Generate			
(0.33 to 11) nF (11 to 110) nF (110 to 330) nF (0.33 to 1.1) μ F (1.1 to 3.3) μ F (3.3 to 11) μ F (11 to 33) μ F (33 to 110) μ F (110 to 330) μ F (0.33 to 1.1) mF	(0.05 to 1) kHz (0.05 to 1) kHz (0.05 to 1) kHz (0.05 to 1) kHz (0.05 to 1) kHz (50 to 400) Hz (50 to 400) Hz (50 to 200) Hz (50 to 100) Hz (50 to 100) Hz	0.54 % + 0.01 μ F 0.27 % + 0.1 μ F 0.27 % + 0.3 μ F 0.27 % + 1 μ F 0.38 % + 3 μ F 0.38 % + 10 μ F 0.44 % + 30 μ F 0.53 % + 100 μ F 0.75 % + 300 μ F 1.1 % + 300 μ F	Fluke 5500A

IV. Electrical – RF / Microwave

Parameter/Range	Frequency	Best Uncertainty ² (±)	Comments
RF Power ³ – Generate DC to 20 MHz	(-56 to +24) dBm	0.5 dB	HP 3325B

V. Mechanical

Parameter/Equipment	Range	Best Uncertainty ² (±)	Comments
Vibration ³ – Measuring Equipment (10 to 99) Hz (0.10 to 1.999) kHz (2 to 7) kHz (7 to 10) kHz	(0 to 490) pC/m/s ² (0 to 50) g	6.1 % of reading 6.0 % of reading 6.7 % of reading 13 % of reading	MB Dynamics WIN475
Pressure Gauges & Transducers ³	(0 to 20) psia (0 to 30) psig (30 to 1000) psig (1000 to 10 000) psig (0 to 24) in H ₂ O (24 to 40) in H ₂ O	0.03 psia 0.03 psig 0.065 % of reading 0.12 % of reading 0.0027 in H ₂ O 0.005 in H ₂ O	Setra 370 Eaton UPC 5000 Deadweight tester Hook Gauge Micro-manometer
Vacuum Gauges ³	< 0.25 psia	0.013 psia	Setra 370
Torque Wrenches – Measure	(5 to 50) in·lb (50 to 250) in·lb (250 to 1000) in·lb (25 to 250) ft·lb	0.3 % of reading	CDI 5000-ST

Parameter/Equipment	Range	Best Uncertainty ² (±)	Comments
Scales & Balances ³	(1 to 10) mg	0.026 mg	Class S 1 weights
	(10 to 500) mg	0.043 mg	
	(1 to 50) g	0.15 mg	
	(50 to 300) g	0.90 mg	
	(300 to 500) g	1.7 mg	
	(0.5 to 1) kg	3.7 mg	
	(1 to 3) kg	8 mg	
	(3 to 5) kg	12 mg	
	(5 to 10) kg	34 mg	
	(10 to 20) kg	55 mg	
	(1 to 5) lb	0.0006 lb	Class F weights
	(3 to 10) lb	0.001 lb	
	(10 to 25) lb	0.004 lb	
	(25 to 50) lb	0.006 lb	
(50 to 100) lb	0.02 lb		

VI. Thermodynamics

Parameter/Equipment	Range	Best Uncertainty ² (±)	Comments
Relative Humidity ³ – Measure	(5 to 95) % RH	1.2 % RH	Vaisala HMI-41 and HMP-46
Temperature ³ – Measuring Equipment Thermocouples, RTDs and Thermometers	-40 °C to 150 °C	0.015 °C	Fluke 7340 bath Azonix A1011 thermometer Rosemont 162CE SPRT

VII. Time & Frequency

Parameter/Equipment	Range	Best Uncertainty ² (±)	Comments
Frequency ³ – Measure	10 Hz to 100 MHz	6 parts in 10 ¹¹	HP 5335A
Time Interval ³	1 s to 8 hr	0.5 s	HP 5335A

Satellite Laboratory
 SYPRIS TEST & MEASUREMENT – CALIBRATION DIVISION
 4236 Ridge Lea Road
 Amherst, NY 14226

I. Electrical – DC/Low Frequency

Parameter/Equipment	Frequency	Best Uncertainty ^{2,4,5} (±)	Comments
DC Voltage ³ – Measure	Up to 0.1 V (0.1 to 1) V (1 to 10) V (10 to 100) V (100 to 1100) V	6.2 μV/V + 0.3 μV 5.2 μV/V + 0.3 μV 5.2 μV/V + 5 μV 7.3 μV/V + 30 μV 7.3 μV/V + 110 μV +12(V _{in} /1000) ² μV/V	HP 3458A Opt. 002
DC Current ³ – Measure	100 pA to 100 μA (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A (1 to 100) A	24 μA/A + 0.8 nA 24 μA/A + 5 nA 24 μA/A + 50 nA 41 μA/A + 0.5 μA 0.013 % + 10 μA 0.29 %	HP 3458A Opt. 002 Empro shunts
DC Current ³ – Generate	0.1 nA to 2.2 mA (2.2 to 22) mA (22 to 220) mA 220 mA to 2.2 A	50 μA/A + 8 nA 50 μA/A + 80 nA 60 μA/A + 0.8 μA 80 μA/A + 25 μA	Fluke 5700A
Electrical Calibration of Thermocouple Indicators ³			
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.27 °C 0.16 °C 0.14 °C 0.17 °C 0.23 °C	Ectron 1140A
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.33 °C 0.18 °C 0.16 °C 0.26 °C 0.4 °C	
Type T	(-200 to 0) °C (0 to 600) °C	0.56 °C 0.27 °C	

II. Mechanical

Parameter/Equipment	Range	Best Uncertainty ² (±)	Comments
Pressure Gauges & Transducers ³	(0 to 20) psia	0.03 psia	Setra 370
	(0 to 30) psig	0.03 psig	
	(30 to 1000) psig	0.065 % of reading	Eaton UPC 5000

III. Time & Frequency

Parameter/Equipment	Range	Best Uncertainty ² (±)	Comments
Frequency ³ – Measuring Equipment	DC to 20 MHz	5 parts in 10 ¹²	HP 3325B

Satellite Laboratory
 SYPRIS TEST & MEASUREMENT – CALIBRATION DIVISION
 135 Calkin Road
 Rochester, NY 14623

I. Chemical

Parameter/Equipment	Range	Best Uncertainty ² (±)	Comments
Gas Flow ³	(10 to 100) sccm	2.1 % of Full Scale	DHI MoBlocs
	(100 to 500) sccm	2.1 % of Full Scale	
	(500 to 5000) sccm	2.1 % of Full Scale	
	(5000 to 10 000) sccm	2.1 % of Full Scale	
	(10 000 to 100 000) sccm	2.1 % of Full Scale	
	(100 000 to 3000 000) sccm	2.1 % of Full Scale	

II. Dimensional

Parameter/Equipment	Range	Best Uncertainty ^{2, 6} (\pm)	Comments
Gage Blocks ³	(0 to 24) in	$(4.2 + 1.9L) \mu\text{in}$	Mechanical comparison with Grade 2 gage blocks
Length ³	(40 to 48) in (24 to 39) in	$(57 + 1.9L) \mu\text{in}$ $(16 + 1.9L) \mu\text{in}$	Laser measuring machine
Surface Plate Flatness ³	0 to <500 μin >500 μin	7.8 μin 0.63 % of reading	Electronic levels
Thread Gages ³ – (4 to 96) TPI	(0 to 10) in	73 μin	P&W supermic with gage blocks

III. Electrical – DC & Low Frequency

Parameter/Equipment	Range	Best Uncertainty ² (\pm)	Comments
AC Level Flatness ³ – Measure (1, 3) V	10 Hz (0.1, 10, 30) kHz 100 kHz (0.3, 1) MHz (3,8,10) MHz (20, 30) MHz 50 MHz 70 MHz 80 MHz 100 MHz	0.011 % of reading 0.006 % of reading 0.007 % of reading 0.01 % of reading 0.08 % of reading 0.2 % of reading 0.5 % of reading 1 % of reading 1 % of reading 1 % of reading	(1 and 3) V thermal converters, Ballentine 1395A, Precision Measurements 1160 with HP 3458A and Fluke 5700A
Inductance ³ – Generate 100 μH 1, 10 mH 1 H	100 Hz to 1 kHz 100 Hz to 1 kHz 100 Hz to 1 kHz	0.1 % of reading 0.03 % of reading 0.05 % of reading	Western Electric D-17990X series Inductors

Parameter/Equipment	Range	Best Uncertainty ² (±)	Comments
Bandwidth ³	50 kHz to 100 MHz (100 to 300) MHz (300 to 500) MHz (500 to 600) MHz 600 MHz to 1.5 GHz (1.6 to 2.1) GHz	2.8 % of reading (+/- 300µV) 3.4 % of reading (+/- 300µV) 5.1 % of reading (+/- 300µV) 5.7 % of reading (+/- 300µV) 6.8 % of reading (+/- 300µV) 8 % of reading (+/- 300µV)	Fluke 5820A
Rise Time ³ – Generate Fast Edge Rise Time	<300 ps <150 ps	0/-100 ps 0/-25 ps	Fluke 5820A
AC Resistance ³ – Generate			
10 Ω	DC to 1 MHz (1 to 2) MHz (2 to 3) MHz (3 to 4) MHz (4 to 5) MHz (5 to 10) MHz (10 to 13) MHz	0.13 % of reading 0.14 % of reading 0.17 % of reading 0.19 % of reading 0.26 % of reading 0.66 % of reading 1 % of reading	HP 42030A resistance set
100 Ω	DC to 1 MHz (1 to 2) MHz (2 to 3) MHz (3 to 4) MHz (4 to 5) MHz (5 to 10) MHz (10 to 13) MHz	0.13 % of reading 0.14 % of reading 0.17 % of reading 0.14 % of reading 0.17 % of reading 0.34 % of reading 0.46 % of reading	
1 kΩ	DC to 3 MHz (3 to 5) MHz (5 to 10) MHz (10 to 13) MHz	0.09 % of reading 0.11 % of reading 0.28 % of reading 0.41 % of reading	
(10, 100) kΩ	DC to 1 MHz	0.09 % of reading	
Phase ³ – Generate			
0° to 180°	(10 to 65) Hz (65 to 500) Hz (0.5 to 1) kHz (1 to 5) kHz (5 to 10) kHz	0.15° 0.3° 0.6° 3° 10°	Fluke 5500A

Parameter/Range	Frequency	Best Uncertainty ² (±)	Comments
Capacitance ³ – Generate (cont)			
Fixed Values			HP 1638XX standard capacitor
1 pF	100 Hz to 1 kHz 1 kHz to 1 MHz (1 to 2) MHz (2 to 3) MHz (3 to 4) MHz (4 to 5) MHz (5 to 10) MHz (10 to 13) MHz	0.062 % of reading 0.072 % of reading 0.083 % of reading 0.099 % of reading 0.16 % of reading 0.22 % of reading 0.68 % of reading 1 % of reading	
10 pF	100 Hz to 1 kHz 1 kHz to 1 MHz (1 to 2) MHz (2 to 3) MHz (3 to 4) MHz (4 to 5) MHz (5 to 10) MHz (10 to 13) MHz	0.062 % of reading 0.066 % of reading 0.075 % of reading 0.076 % of reading 0.083 % of reading 0.095 % of reading 0.15 % of reading 0.18 % of reading	
100 pF	100 Hz to 1 kHz 1 kHz to 1 MHz (1 to 2) MHz (2 to 3) MHz (3 to 4) MHz (4 to 5) MHz (5 to 10) MHz (10 to 13) MHz	0.073 % of reading 0.066 % of reading 0.075 % of reading 0.076 % of reading 0.083 % of reading 0.095 % of reading 0.15 % of reading 0.18 % of reading	
1000 pF	100 Hz to 1 kHz 1 kHz to 1 MHz (1 to 2) MHz (2 to 3) MHz (3 to 4) MHz (4 to 5) MHz (5 to 10) MHz (10 to 13) MHz	0.062 % of reading 0.072 % of reading 0.083 % of reading 0.099 % of reading 0.13 % of reading 0.16 % of reading 0.35 % of reading 0.48 % of reading	
(10, 100) nF	(100 to 120) Hz 120 Hz to 1 kHz (1 to 10) kHz (10 to 100) kHz	0.063 % of reading 0.062 % of reading 0.064 % of reading 0.071 % of reading	
1 μF	(100 to 120) Hz 120 Hz to 1 kHz (1 to 10) kHz (10 to 100) kHz	0.067 % of reading 0.062 % of reading 0.067 % of reading 0.091 % of reading	

Parameter/Equipment	Frequency	Best Uncertainty ² (±)	Comments
Distortion ³ – Measure (5 Hz to 600 kHz Fundamental Frequency)			HP 334A
(100 to 0.3) % < 30 V	10 Hz to 1 MHz (1 to 3) MHz	3.5 % of reading 6.9 % of reading	
(30 to 300) V	10 Hz to 300 kHz (300 to 500) kHz (0.5 to 3) MHz	3.5 % of reading 6.9 % of reading 14 % of reading	
0.1 % < 300 V	(10 to 20) Hz (20 to 30) Hz 30 Hz to 300 kHz (300 to 500) kHz (0.5 to 1.2) MHz	13 % of reading 6.9 % of reading 3.5 % of reading 6.9 % of reading 14 % of reading	
(0 to 99.9) dB dist., 50 Hz to 500 kHz	20 Hz to 20 kHz (20 to 100) kHz	1.2 dB 2.3 dB	

IV. Electrical – RF / Microwave

Parameter/Range	Frequency	Best Uncertainty ² (±)	Comments
RF Power ³ – Measure (-20 to +30) dBm	100 kHz to 1.3 GHz	2.9 % of reading	HP 8902A with 11722A

Parameter/Range	Frequency	Best Uncertainty ² (±)	Comments
Tuned RF Power ³ – Measure (0 to -1) dB (-1.0 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	100 kHz to 1.3 GHz	0.008 dB 0.03 dB 0.06 dB 0.08 dB 0.11 dB 0.14 dB 0.16 dB 0.20 dB 0.22 dB 0.24 dB 0.26 dB 0.32 dB 0.37 dB	HP 8902A HP 11722A
Amplitude Modulation ³ – Measure Rate: 50 Hz to 10 kHz Depths: 5 % to 99 % Rate: 20 Hz to 10 kHz Depths: to 99 % Rate: 50 Hz to 50 kHz Depths: 5 % to 99 % Rate: 20 Hz to 10 kHz Depths: to 99 %	150 kHz to 10 MHz 150 kHz to 10 MHz 10 MHz to 1.3 GHz 10 MHz to 1.3 GHz	2 % of reading + 1 digit 3 % of reading + 1 digit 1 % of reading + 1 digit 3 % of reading + 1 digit	HP 8902A with 11722A
Frequency Modulation ³ – Measure Rate: 20 Hz to 10 kHz Dev.: ≤ 40 kHz peak Rate: 50 Hz to 100 kHz Dev.: ≤ 400 kHz peak Rate: 20 Hz to 10 kHz Dev.: ≤ 40 kHz peak	250 kHz to 10 MHz 10 MHz to 1.3 GHz 10 MHz to 1.3 GHz	2 % of reading + 1 digit 1 % of reading + 1 digit 5 % of reading + 1 digit	HP 8902A with 11722A
Phase Modulation ³ – Measure Rate: 200 Hz to 10 kHz Rate: 200 Hz to 20 kHz	150 kHz ≤ f _c < MHz 10 MHz ≤ f _c < 1.3 GHz	4 % of reading + 1 digit 3 % of reading + 1 digit	HP 8902A

V. Fluid Quantities

Parameter/Equipment	Range	Best Uncertainty ² (±)	Comments
Volumetric Flow, Liquids ³	(0.04 to 400) gpm	0.06 % of reading	Flow calibrator

VI. Mechanical

Parameter/Equipment	Range	Best Uncertainty ² (±)	Comments	
Mass	1 mg	1 µg	Mass comparator w/class 1 weights	
	2 mg	1 µg		
	3 mg	1 µg		
	5 mg	1.1 µg		
	10 mg	1.4 µg		
	20 mg	1.5 µg		
	30 mg	1.6 µg		
	50 mg	1.7 µg		
	100 mg	1.9 µg		
	200 mg	1.7 µg		
	300 mg	2.0 µg		
	500 mg	2.3 µg		
	1 g	2.8 µg		
	2 g	3 µg		
	3 g	3.9 µg		
	5 g	4.5 µg		
	10 g	11 µg		
	20 g	14 µg		
	30 g	17 µg		
	50 g	22 µg		
	100 g	42 µg		
	200 g	82.5 µg		
	0.3 kg	0.2 mg		
	0.5 kg	0.17 mg		
	1 kg	0.2 mg		
	3 kg	2.7 mg		PR5003 w/class 1 weights
	5 kg	3.5 mg		
10 kg	6.2 mg	Mass comparator w/class 1 weights		
20 kg	11 mg			

VI. Thermodynamics

Parameter/Equipment	Range	Best Uncertainty ² (±)	Comments
Temperature ³ – Measure Thermocouples, RTDs and Thermometers	-45 °C to 400 °C	0.012 °C	Azonix A1011 Rosemont 162CE SPRT

VII. Time & Frequency

Parameter/Equipment	Range	Best Uncertainty ² (±)	Comments
Frequency ³ – Measuring Equipment	DC to 20 MHz	5 parts in 10 ¹²	HP 3325B
	20 MHz to 1 GHz	5 parts in 10 ¹²	HP 8647A
	10 MHz	5 parts in 10 ¹²	HP 58503B GPS

¹ This laboratory offers commercial and field calibration service. This accreditation covers calibrations performed at the main laboratory and the satellite laboratories listed.

² “Best Uncertainty” 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 of nearly ideal measuring equipment. Best uncertainties represent expanded uncertainties expressed at approximately the 95 % level of confidence, usually using a coverage factor of $k = 2$. The best uncertainty of a specific calibration performed by the laboratory may be greater than the best uncertainty 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 uncertainties achievable on a customer's site can normally be expected to be larger than the Best Measurement Capabilities (BMC) that the accredited laboratory has been assigned as Best Uncertainty 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 uncertainty introduced by the item being calibrated, (e.g. resolution) must also be considered and this, on its own, could result in the calibration uncertainty being larger than the BMC.

⁴ The measurands stated are generated with the Fluke 5700A. This capability is suitable for the calibration of the devices intended to measure the stated measurand in the ranges indicated. Best measurement uncertainty is read as output plus one-year floor specifications where defined.

⁵ The measurands stated are measured with the HP 3458A. This capability is suitable for the calibration of the devices intended to generate the measurand in the ranges indicated. Best measurement uncertainty is based upon one-year floor specifications plus one-year floor specifications where defined.

⁶ In the statement of best uncertainty, L is the numerical value of the nominal length of the device measured in inches.