



THE AMERICAN ASSOCIATION FOR  
LABORATORY ACCREDITATION

## ACCREDITED LABORATORY

A2LA has accredited

**ENV SERVICES, INC.**  
**Hatfield, PA**

for technical competence in the field of

### **Mechanical Testing**

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 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 31<sup>st</sup> day of March 2009.

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

President  
For the Accreditation Council  
Certificate Number 1591.02  
Valid to May 31, 2010



For the tests or types of tests to which this accreditation applies,  
please refer to the laboratory's Mechanical Scope of Accreditation.



THE AMERICAN ASSOCIATION FOR  
LABORATORY ACCREDITATION

## ACCREDITED LABORATORY

A2LA has accredited

**ENV SERVICES, INC./PRO-LAB**  
**Hatfield, PA**

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 18 June 2005*).

Presented this 29<sup>th</sup> day of September 2008.

A handwritten signature in cursive script, reading "Peter Abney", positioned above a horizontal line.

President  
For the Accreditation Council  
Certificate Number 1591.01  
Valid to May 31, 2010



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

ENV SERVICES, INC.  
2880 Bergey Road, Suite K  
Hatfield, PA 19440  
Joseph Wickward      Phone: 215 997 5080

MECHANICAL

Valid To: May 31, 2010

Certificate Number: 1591.02

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform field testing of laboratory fume hoods, bio-safety cabinets, glove boxes, clean rooms, etc. to the following test methods: <sup>1</sup>

<u>Test</u>	<u>Referenced Published Procedures</u>	<u>ENV Test Methods</u>
Chemical Fume Hood	ASHRAE 110, SEFA 1, ANSI/AIHA Z9.5	WI-CON-0040, WI-CON-0045
Ductless Fume Hood	SETA 1, IEST-RP-CC034.2	
Class I BioSafety Cabinet		WI-CON-0039
Class II, Type A1 BioSafety Cabinet	NSF/ANSI 49	WI-CON-0039
Class II, Type A2 BioSafety Cabinet	NSF/ANSI 49	
Class II, Type B1 BioSafety Cabinet	NSF/ANSI 49	WI-CON-0039
Class II, Type B2 BioSafety Cabinet	NSF/ANSI 49	WI-CON-0039
Class III BioSafety Cabinet	IEST-RP-CC028.1, ISO 14644-7	WI-CON-0448
Glove Box	IEST-RP-CC028.1, ISO 14644-7, AGS-G001	
Laminar Flow Glove Box	IEST-RP-CC028.1, ISO 14644-7, AGS-G001	

<u>Test</u>	<u>Referenced Published Procedures</u>	<u>ENV Test Methods</u>
Barrier Isolator	IEST-RP-CC028.1, ISO 14644-7, AGS-G001	
Laminar Flow Hood	IEST-RP-CC002.2	WI-CON-0265
Laminar Flow Module	IEST-RP-CC002.2	WI-CON-0265
Terminal HEPA Filter	IEST-RP-CC002.2, IEST-RP- CC034.2	WI-CON-0265
Clean Room	ISO 14644, Part 1 & 2, IEST-RP- CC006.3, FDA Guidance for Industry 2004	WI-CON-0047

<sup>1</sup> This laboratory meets A2LA R104 – *General Requirements: Accreditation of Field Testing and Field Calibration Laboratories* for all tests listed. Accreditation is granted for field testing activities at this location only, and only applies to field technicians that are based out of this location.

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

PRO-LAB A DIVISION OF ENV SERVICES, INC.<sup>7</sup>  
 2880 Bergey Road, Suite K  
 Hatfield, PA 19440  
 Michael I. Parente Phone: 215 822 0135

CALIBRATION

Valid To: May 31, 2010

Certificate Number: 1591.01

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

I. Electrical – DC & Low Frequency

Parameter/Equipment	Range	Best Uncertainty <sup>2</sup> (±)	Comments
DC Voltage – Measure <sup>5,6</sup>	Up to 100 mV (0.1 to 1) V (1 to 10) V (10 to 100) V (100 to 1000) V	7 μV/V + 1 μV 8 μV/V + 2 μV 8 μV/V + 20 μV 9 μV/V + 150 μV 9 μV/V + 1.2 mV + 12(V <sub>IN</sub> /1000) <sup>2</sup>	Agilent 3458A w/Opt 002
DC Voltage – Generate <sup>4,6</sup>	(0 to 330) mV 330 mV to 3.3 V (3.3 to 33) V (33 to 330) V (330 to 1000) V	20 μV/V + 1 μV 11 μV/V + 2 μV 12 μV/V + 20 μV 18 μV/V + 150 μV 18 μV/V + 1.2 mV	Fluke 5520A
DC Current – Measure <sup>5,6</sup>	(0 to 100) nA 100 nA to 1 μA (1 to 10) μA (10 to 100) μA 100 μA to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1A	37 μA/A + 40 pA 28 μA/A + 40 pA 28 μA/A + 100 pA 28 μA/A + 0.8 nA 30 μA/A + 5 nA 29 μA/A + 50 nA 40 μA/A + 0.5 μA 0.014 % + 10 μA	Agilent 3458A w/Opt 002

Parameter/Equipment	Range	Best Uncertainty <sup>2</sup> (±)	Comments
DC Current – Generate <sup>4,6</sup>	(0 to 330) $\mu$ A 330 $\mu$ A to 3.9 mA (3.3 to 33) mA (33 to 330) mA 330 mA to 1.1 A (1.1 to 3.0) A (3 to 11) A (11 to 20) A	0.015 % + 0.02 $\mu$ A 0.010 % + 0.05 $\mu$ A 0.010 % + 0.25 $\mu$ A 0.010 % + 2.5 $\mu$ A 0.020 % + 40 $\mu$ A 0.038 % + 40 $\mu$ A 0.050 % + 500 $\mu$ A 0.10 % + 750 $\mu$ A	Fluke 5520A
DC Resistance – Measure <sup>5,6</sup>	(0 to 10) $\Omega$ (10 to 100) $\Omega$ 100 $\Omega$ to 1 k $\Omega$ (1 to 10) k $\Omega$ (10 to 100) k $\Omega$ 100 k $\Omega$ to 1 M $\Omega$ (1 to 10) M $\Omega$ (10 to 100) M $\Omega$ 100 M $\Omega$ to 1G $\Omega$	19 $\mu\Omega/\Omega$ + 50 $\mu\Omega$ 17 $\mu\Omega/\Omega$ + 500 $\mu\Omega$ 16 $\mu\Omega/\Omega$ + 500 $\mu\Omega$ 14 $\mu\Omega/\Omega$ + 5 m $\Omega$ 17 $\mu\Omega/\Omega$ + 50 m $\Omega$ 18 $\mu\Omega/\Omega$ + 2 $\Omega$ 57 $\mu\Omega/\Omega$ + 100 $\Omega$ 0.050 % + 1 k $\Omega$ 0.50 % + 10 k $\Omega$	Agilent 3458A w/Opt 002
DC Resistance – Generate <sup>4,6</sup>	(0 to 11) $\Omega$ (11 to 33) $\Omega$ (33 to 110) $\Omega$ (110 to 330) $\Omega$ 330 $\Omega$ to 1.1 k $\Omega$ (1.1 to 3.3) k $\Omega$ (3.3 to 11) k $\Omega$ (11 to 33) k $\Omega$ (33 to 110) k $\Omega$ (110 to 330) k $\Omega$ 330 k $\Omega$ to 1.1 M $\Omega$ (1.1 to 3.3) M $\Omega$ (3.3 to 11) M $\Omega$ (11 to 33) M $\Omega$ (33 to 110) M $\Omega$ (110 to 330) M $\Omega$ 330 M $\Omega$ to 1.1 G $\Omega$	40 $\mu\Omega/\Omega$ + 10 m $\Omega$ 36 $\mu\Omega/\Omega$ + 15 m $\Omega$ 28 $\mu\Omega/\Omega$ + 15 m $\Omega$ 28 $\mu\Omega/\Omega$ + 20 m $\Omega$ 28 $\mu\Omega/\Omega$ + 20 m $\Omega$ 28 $\mu\Omega/\Omega$ + 0.2 $\Omega$ 28 $\mu\Omega/\Omega$ + 0.1 $\Omega$ 28 $\mu\Omega/\Omega$ + 1 $\Omega$ 28 $\mu\Omega/\Omega$ + 1 $\Omega$ 33 $\mu\Omega/\Omega$ + 10 $\Omega$ 32 $\mu\Omega/\Omega$ + 10 $\Omega$ 93 $\mu\Omega/\Omega$ + 150 $\Omega$ 0.013 % + 250 $\Omega$ 0.056 % + 2.5 k $\Omega$ 0.064 % + 3 k $\Omega$ 0.50 % + 100 k $\Omega$ 1.5 % + 500 k $\Omega$	Fluke 5520A

Parameter/Equipment	Range	Best Uncertainty <sup>2</sup> (±)	Comments	
Electrical Simulation of RTDs <sup>6</sup> –				
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	0.10 °C 0.11 °C 0.11 °C 0.12 °C 0.13 °C 0.20 °C	Process calibration using Fluke 5520A	
Pt 3926, 100 Ω	(-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C	0.10 °C 0.11 °C 0.11 °C 0.12 °C 0.13 °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 0.10 °C 0.10 °C 0.10 °C 0.11 °C 0.11 °C 0.11 °C 0.12 °C 0.23 °C		
Electrical Simulation of Thermocouples <sup>6</sup> –				
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.50 °C 0.31 °C 0.30 °C 0.31 °C 0.32 °C		Process calibration using Fluke 5520A
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.35 °C 0.31 °C 0.30 °C 0.31 °C 0.33 °C		
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.38 °C 0.31 °C 0.31 °C 0.35 °C 0.42 °C		

Parameter/Equipment	Range	Best Uncertainty <sup>2</sup> (±)	Comments
Electrical Simulation of Thermocouples <sup>6</sup> (cont.) –			
Type R	(0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C	0.57 °C 0.39 °C 0.38 °C 0.42 °C	Process calibration using Fluke 5520A
Type S	(0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1767) °C	0.47 °C 0.40 °C 0.40 °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 0.34 °C 0.31 °C 0.30 °C	

Parameter/Range	Frequency	Best Uncertainty <sup>2</sup> (±)	Comments
AC Voltage – Measure <sup>5,6</sup>			
(1 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	0.050 % + 3 μV 0.030 % + 1.1 μV 0.040 % + 1.1 μV 0.11 % + 1.1 μV 0.50 % + 1.1 μV 4.0 % + 2 μV	Agilent 3458A w/opt 002
(10 to 100) mV	(1 to 40) Hz 40Hz 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	0.013 % + 4 μV 0.0090 % + 2 μV 0.015 % + 2 μV 0.030 % + 2 μV 0.080 % + 2 μV 0.30 % + 10 μV 1.0 % + 10 μV 1.5 % + 10 μV	
100 mV to 1 V	(1 to 40) Hz 40Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (0.3 to 1) MHz	0.010 % + 40 μV 0.0080 % + 20 μV 0.014 % + 20 μV 0.030 % + 20 μV 0.080 % + 20 μV 0.30 % + 100 μV 1.0 % + 100 μV	

Parameter/Range	Frequency	Best Uncertainty <sup>2</sup> (±)	Comments
AC Voltage – Measure <sup>5,6</sup>			
100 mV to 1 V	(1 to 2) MHz	1.5 % + 100 µV	Agilent 3458A w/opt 002
(1 to 10) V	(1 to 40) Hz 40Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.011 % + 400 µV 0.0080 % + 200 µV 0.015 % + 200 µV 0.030 % + 200 µV 0.080 % + 200 µV	
(10 to 100) V	(1 to 40) Hz 40Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.020 % + 4 mV 0.020 % + 2 mV 0.020 % + 2 mV 0.036 % + 2 mV 0.12 % + 2 mV	
AC Voltage – Generate <sup>4,6</sup>			
(1 to 33) 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	0.080 % + 6 µV 0.015 % + 6 µV 0.020 % + 6 µV 0.10 % + 6 µV 0.35 % + 12 µV 0.80 % + 50 µV	Fluke 5520A
(33 to 330) 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	0.030 % + 8 µV 0.015 % + 8 µV 0.016 % + 8 µV 0.035 % + 8 µV 0.080 % + 33 µV 0.20 % + 70 µV	
330 mV to 3.3 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	0.030 % + 50 µV 0.015 % + 60 µV 0.019 % + 60 µV 0.030 % + 50 µV 0.070 % + 130 µV 0.24 % + 600 µV	
(3.3 to 33) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.030 % + 0.65 mV 0.015 % + 0.6 mV 0.024 % + 0.6 mV 0.035 % + 0.6 mV 0.090 % + 1.6 mV	
(33 to 330) V	45 Hz to 1 kHz (1 to 10) kHz	0.019 % + 2 mV 0.020 % + 6 mV	

Parameter/Range	Frequency	Best Uncertainty <sup>2</sup> (±)	Comments
AC Voltage (cont.) – Generate <sup>4,6</sup>  (33 to 330) V  (330 to 1020) V	 (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz  45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	 0.025 % + 6 mV 0.030 % + 6 mV 0.20 % + 50 mV  0.030 % + 10 mV 0.025 % + 10 mV 0.030 % + 10 mV	 Fluke 5520A
AC Current – Measure <sup>5,6</sup>  (5 to 100) µA  100 µA to 1 mA  (1 to 10) mA  (10 to 100) mA  100 mA to 1 A	 (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz  (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz  (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz  (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz	 0.46 % + 30 nA 0.17 % + 30 nA 0.070 % + 30 nA 0.070 % + 30 nA  0.46 % + 200 nA 0.17 % + 200 nA 0.070 % + 200 nA 0.030 % + 200 nA 0.070 % + 200 nA 0.46 % + 400 nA 0.64 % + 1.5 µA  0.46 % + 2 µA 0.17 % + 2 µA 0.070 % + 2 µA 0.030 % + 2 µA 0.070 % + 2 µA 0.46 % + 4 µA 0.64 % + 15 µA  0.46 % + 20 µA 0.17 % + 20 µA 0.070 % + 20 µA 0.030 % + 20 µA 0.070 % + 20 µA 0.46 % + 40 µA 0.64 % + 150 µA  0.47 % + 200 µA 0.19 % + 200 µA 0.10 % + 200 µA 0.12 % + 200 µA 0.35 % + 200 µA 1.2 % + 400 µA	 Agilent 3458A w/opt 002

Parameter/Range	Frequency	Best Uncertainty <sup>2</sup> (±)	Comments
AC Current – Generate <sup>4, 6</sup>			
(29 to 330) 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	0.20 % + 0.1 μA 0.15 % + 0.1 μA 0.13 % + 0.1 μA 0.30 % + 0.15 μA 0.80 % + 0.2 μA 1.6 % + 0.4 μA	Fluke 5520A
330 μA to 3.3 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	0.20 % + 0.15 μA 0.13 % + 0.15 μA 0.10 % + 0.15 μA 0.20 % + 0.2 μA 0.50 % + 0.3 μA 1.0 % + 0.6 μA	
(3.3 to 33) 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	0.18 % + 2 μA 0.090 % + 2 μA 0.040 % + 2 μA 0.080 % + 2 μA 0.20 % + 3 μA 0.40 % + 4 μA	
(33 to 330) 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	0.18 % + 20 μA 0.090 % + 20 μA 0.040 % + 20 μA 0.10 % + 50 μA 0.20 % + 100 μA 0.40 % + 200 μA	
330 mA to 1.1 A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.18 % + 100 μA 0.050 % + 100 μA 0.60 % + 1 mA 2.5 % + 5 mA	
(1.1 to 3) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.18 % + 100 μA 0.060 % + 100 μA 0.60 % + 1 mA 2.5 % + 5 mA	
(3 to 11) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.060 % + 2 mA 0.10 % + 2 mA 3.0 % + 2 mA	
(11 to 20.5) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.12 % + 5 mA 0.15 % + 5 mA 3.0 % + 5 mA	

Parameter/Equipment	Range	Best Uncertainty <sup>2</sup> (±)	Comments
Leveled Sine Wave – Generate <sup>4,6</sup>  50 kHz Reference  (5 mV to 5.5 V) <sub>pk-pk</sub> Relative to 50 kHz Reference	5 mV to 5.5 V <sub>pk-pk</sub>  50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1100) MHz	2.0 % + 300 μV  1.5 % + 100 μV 2.0 %+ 100 μV 4.0 %+ 100 μV 5.0 %+ 100 μV	Fluke 5520A/SC1100
Vertical Gain <sup>4,6</sup>  DC Into 50 Ω  Into 1 M Ω  AC Into 50 Ω  Into 1 M Ω	(0 to 6.6) V  (0 to 130) V  (1 mV to 6.6 V) <sub>pk-pk</sub>  (1 mV to 130 V) <sub>pk-pk</sub>	0.25 % + 40 μV  0.050 % + 40 μV  0.25 % + 40 μV  0.10 % + 40 μV	Fluke 5520A/SC1100
Time Markers into 50 Ω <sup>6</sup>	1 ns to 20 ms 50 ms to 5 s	2.5 μs/s (25 + 1000*t) μs/s	Fluke 5520A/SC1100 t = time in seconds
Rise Time <sup>6</sup> – Generate  (5 mV to 2.5 V) <sub>pk-pk</sub>  Up to 2 MHz  (2 to 10) MHz	≤ 300 ps  ≤ 350 ps	+0 / -100 ps  +0 / -100 ps	Fluke 5520A/SC1100

## II. Fluid Quantities

Parameter/Equipment	Range	Best Uncertainty <sup>2</sup> (±)	Comments
Balometer <sup>6</sup>	(0 to 15) inH <sub>2</sub> O	2.3 % of reading	Dead weight testers

Parameter/Equipment	Range	Best Uncertainty <sup>2</sup> (±)	Comments
Air Velocity Meters <sup>6</sup>	(30 to 250) SFM (250 to 1500) SFM (1500 to 9000) SFM	2.3 % of reading + 2.5 SFM 2.3 % of reading + 2.9 SFM 1.2 % of reading + 5.9 SFM	TSI Wind Tunnel Model 8390

### III. Mechanical

Parameter/Equipment	Range	Best Uncertainty <sup>2,3</sup> (±)	Comments
Pressure <sup>6</sup> – Measuring Equipment	(0.025 to 2) inH <sub>2</sub> O (2 to 10) inH <sub>2</sub> O (10 to 850) inH <sub>2</sub> O (5 to 60) psi (60 to 15 000) psi	0.6R + 0.001 inH <sub>2</sub> O 0.6R + 0.020 % of reading 0.6R + 0.017 % of reading 0.6R + 0.010 % of full scale 0.6R + 0.010 % of reading	Dead weight testers
Scales and Balances <sup>6</sup>	1 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 100 g 200 g 500 g 1 kg 3 kg 5 kg	0.002 mg +0.6R 0.002 mg +0.6R 0.002 mg +0.6R 0.002 mg +0.6R 0.003 mg +0.6R 0.003 mg +0.6R 0.005 mg +0.6R 0.005 mg +0.6R 0.005 mg +0.6R 0.007 mg +0.6R 0.009 mg +0.6R 0.010 mg +0.6R 0.019 mg +0.6R 0.026 mg +0.6R 0.050 mg +0.6R 0.09 mg +0.6R 0.14 mg +0.6R 0.07 mg +0.6R 1.2 mg +0.6R	Class 1 weights

Parameter/Equipment	Range	Best Uncertainty <sup>2</sup> (±)	Comments
Pipettes <sup>6</sup>	(0 to 2) µL (2 to 20) µL (10 to 100) µL (100 to 200) µL (200 to 1000) µL (1000 to 5000) µL	0.12 mg/µL 0.13 mg/µL 0.18 mg/µL 0.30 mg/µL 1.2 mg/µL 6.3 mg/µL	Gravimetric method
Optical Tachometers <sup>6</sup>	(10 to 90,000) RPM	0.1 RPM	Fluke 5520A

#### IV. Optical Quantities

Parameter/Equipment	Range	Best Uncertainty <sup>2</sup> (±)	Comments
Optical System – Aerosol Particle Counter	(0.3, 0.5, 5.0) µm particle size	24 % reading	Comparison method master particle counter
Photometric Quantities – Photometer	(0 to 100) % leakage	1.3 % full scale	Picoamp source, flow meter, DMM

#### V. Thermodynamics

Parameter/Equipment	Range	Best Uncertainty <sup>2</sup> (±)	Comments
Relative Humidity <sup>6</sup>	(10 to 98) % RH	0.59 % RH	Thunder Scientific 2500
Temperature <sup>6</sup> – Measuring Equipment	-196 °C (-80 to ambient) °C (ambient to 200) °C (200 to 300) °C (300 to 500) °C	0.006 °C 0.017 °C 0.013 °C 0.014 °C 0.021 °C	SPRT and baths
Temperature <sup>6</sup> – Measure	(-189.3 to 660) °C	0.005 °C	SPRT

## VI. Time & Frequency

Parameter/Equipment	Range	Best Uncertainty <sup>2</sup> (±)	Comments
Frequency <sup>6</sup> – Generate	10 MHz	1 nHz/Hz	GPS, Fluke 5520
Frequency <sup>6</sup> – Measure	10 MHz	90 nHz/Hz	EIP 578
Stopwatches <sup>6</sup>	15 s to 24 hrs	0.48 s	NIST 960-12, land line

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

<sup>2</sup> “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, to the environment and to influences from the circumstances of the specific calibration.

<sup>3</sup> In the statement of best uncertainty,  $R$  is the numerical value of the resolution of the device.

<sup>4</sup> The measurands stated are generated with the Fluke 5520A. This capability is suitable for the calibration of the devices intended to measure the stated measurand in the ranges indicated. Best measurement uncertainties are expressed as either a specific value that covers the full range or as a combination of the fraction or percentage of the output plus a fixed floor specification.

<sup>5</sup> The measurands stated are measured with the Agilent 3458A. This capability is suitable for the calibration of the devices intended to generate the measurand in the ranges indicated. Best measurement uncertainties are expressed as either a specific value that covers the full range or as a combination of the fraction of the reading plus a fraction of the range specification.

<sup>6</sup> 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.

<sup>7</sup> Pro-Lab, a subsidiary of ENV Services, Inc., provides accredited calibrations performed in their internal calibration facility. ENV Services, Inc. provides accredited field calibrations.