



# CERTIFICATE OF ACCREDITATION

## The ANSI National Accreditation Board

Hereby attests that

**ENV Services, Inc./Pro-Lab – Hatfield**  
2880 Bergey Road, Suite K  
Hatfield, PA 19440

Fulfills the requirements of

**ISO/IEC 17025:2017**

In the field(s) of

**CALIBRATION and TESTING**

This certificate is valid only when accompanied by a current scope of accreditation document.  
The current scope of accreditation can be verified at [www.anab.org](http://www.anab.org).

Jason Stine, Vice President

Expiry Date: 28 February 2027

Certificate Number: ACT-3365



This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017.  
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).

**SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017**

**ENV Services, Inc./Pro-Lab – Hatfield**

2880 Bergey Road, Suite K  
Hatfield, PA 19440  
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**CALIBRATION AND TESTING**

ISO/IEC 17025 Accreditation Granted: **28 February 2025**

Certificate Number: **ACT-3365** Certificate Expiry Date: **28 February 2027**

**CALIBRATION**

**Chemical Quantities**

| Parameter/Equipment  | Range  | Expanded Uncertainty of Measurement (+/-)                                      | Reference Standard, Method, and/or Equipment   |
|--|--|--|--|
| Conductivity Meters <sup>1,2</sup>                             | 10 µS/cm<br>100 µS/cm<br>1 000 µS/cm<br>10 mS/cm<br>100 mS/cm  | 0.81 µS/cm<br>2.2 µS/cm<br>5.2 µS/cm<br>40 mS/cm<br>370 mS/cm                  | Comparison to Accredited Reference Material  |
| Carbon Dioxide – Generate <sup>1,2</sup><br>(CO <sub>2</sub> ) | 3 % Concentration<br>5 % Concentration<br>10 % Concentration<br>15 % Concentration                                   | 1 % of reading<br>0.51 % of reading<br>0.71 % of reading<br>0.81 % of reading  | Comparison to Certified Reference Gases  |
| Oxygen – Generate <sup>1,2</sup><br>(O <sub>2</sub> )          | 10 % Concentration<br>20.8 % Concentration   | 0.42 % of reading<br>0.42 % of reading   | Comparison to Certified Reference Gases  |
| Carbon Dioxide – Measure <sup>1,2</sup><br>(CO <sub>2</sub> )  | Up to 3 % Concentration<br>(> 3 to 5) % Concentration<br>(> 5 to 10) % Concentration<br>(> 10 to 15) % Concentration | 0.76 % of reading<br>0.58 % of reading<br>1.3 % of reading<br>2.4 % of reading | Comparison to Bacharach CO <sub>2</sub> /O <sub>2</sub> Meter, Vaisala CO <sub>2</sub> Meter |
| Oxygen – Measure <sup>1</sup><br>(O <sub>2</sub> )             | Up to 100 % Concentration  | 0.67 % of reading  | Comparison to Bacharach CO <sub>2</sub> /O <sub>2</sub> Meter, Vaisala CO <sub>2</sub> Meter |
| pH Meters <sup>1,2</sup>                                       | 4 pH<br>7 pH<br>10 pH  | 0.027 pH<br>0.018 pH<br>0.017 pH   | Comparison to Accredited Buffers   |

**Electrical – DC/Low Frequency**

| Parameter/Equipment                | Range                            | Expanded Uncertainty of Measurement (+/-) | Reference Standard, Method, and/or Equipment            |
|------------------------------------|----------------------------------|---|---|
| AC Current – Generate <sup>1</sup> | Up to 120 $\mu$ A                |   | Comparison to<br>Fluke 5550A<br>Multiproduct Calibrator |
|                                    | (3 to 45) Hz                     | 0.06 % of reading + 15 nA                 |   |
|                                    | > 45 Hz to 1 kHz                 | 0.06 % of reading + 15 nA                 |   |
|                                    | (> 1 to 5) kHz                   | 0.06 % of reading + 15 nA                 |   |
|                                    | (> 5 to 10) kHz                  | 0.3 % of reading + 80 nA                  |   |
|                                    | (> 10 to 30) kHz                 | 0.3 % of reading + 1 $\mu$ A              |   |
|                                    | (> 0.12 to 1.2) mA               |   |   |
|                                    | (3 to 45) Hz                     | 0.06 % of reading + 0.15 $\mu$ A          |   |
|                                    | > 45 Hz to 1 kHz                 | 0.06 % of reading + 0.15 $\mu$ A          |   |
|                                    | (> 1 to 5) kHz                   | 0.06 % of reading + 0.15 $\mu$ A          |   |
|                                    | (> 5 to 10) kHz                  | 0.18 % of reading + 0.2 $\mu$ A           |   |
|                                    | (> 10 to 30) kHz                 | 0.3 % of reading + 5 $\mu$ A              |   |
|                                    | (> 1.2 to 12) mA                 |   |   |
|                                    | (3 to 45) Hz                     | 0.048 % of reading + 1.5 $\mu$ A          |   |
|                                    | > 45 Hz to 1 kHz                 | 0.048 % of reading + 1.5 $\mu$ A          |   |
|                                    | (> 1 to 5) kHz                   | 0.048 % of reading + 1.5 $\mu$ A          |   |
|                                    | (> 5 to 10) kHz                  | 0.11 % of reading + 2 $\mu$ A             |   |
|                                    | (> 10 to 30) kHz                 | 0.3 % of reading + 10 $\mu$ A             |   |
|                                    | (> 12 to 120) mA                 |   |   |
|                                    | (3 to 45) Hz                     | 0.048 % of reading + 12 $\mu$ A           |   |
|                                    | > 45 Hz to 1 kHz                 | 0.03 % of reading + 12 $\mu$ A            |   |
|                                    | (> 1 to 5) kHz                   | 0.048 % of reading + 12 $\mu$ A           |   |
|                                    | (> 5 to 10) kHz                  | 0.093 % of reading + 10 $\mu$ A           |   |
|                                    | (> 10 to 30) kHz                 | 0.3 % of reading + 0.1 mA                 |   |
| (> 0.12 to 1.2) A                  |                                  |   |   |
| (3 to 45) Hz                       | 0.048 % of reading + 0.1 $\mu$ A |   |   |
| > 45 Hz to 1 kHz                   | 0.036 % of reading + 50 $\mu$ A  |   |   |
| (> 1 to 5) kHz                     | 0.048 % of reading + 0.1 mA      |   |   |
| (> 5 to 10) kHz                    | 0.15 % of reading + 0.3 mA       |   |   |
| (> 10 to 30) kHz                   | 0.3 % of reading + 0.3 mA        |   |   |
| (> 1.2 to 3.1) A                   |                                  |   |   |
| (3 to 45) Hz                       | 0.072 % of reading + 0.5 mA      |   |   |
| > 45 Hz to 1 kHz                   | 0.054 % of reading + 0.45 mA     |   |   |
| (> 1 to 5) kHz                     | 0.072 % of reading + 0.45 mA     |   |   |
| (> 5 to 10) kHz                    | 0.36 % of reading + 1 mA         |   |   |

**Electrical – DC/Low Frequency**

| Parameter/Equipment                | Range   | Expanded Uncertainty of Measurement (+/-)  | Reference Standard, Method, and/or Equipment                      |
|------------------------------------|---|--|---|
| AC Current – Generate <sup>1</sup> | (> 3.1 to 12) A<br>(3 to 45) Hz<br>> 45 Hz to 1 kHz<br>(> 1 to 5) kHz<br>(> 5 to 10) kHz<br>(> 12 to 30.2) A<br>(3 to 45) Hz<br>> 45 Hz to 1 kHz<br>(> 1 to 5) kHz  | 0.093 % of reading + 1.2 mA<br>0.072 % of reading + 0.6 mA<br>0.093 % of reading + 0.12 mA<br>0.36 % of reading + 1.2 mA<br>0.06 % of reading + 12 mA<br>0.042 % of reading + 10 mA<br>0.3 % of reading + 12 mA  | Comparison to<br>Fluke 5550A<br>Multiproduct Calibrator           |
| AC Current – Measure <sup>1</sup>  | (5 to 100) $\mu$ A<br>(10 to 20) Hz<br>(> 20 to 45) Hz<br>(> 45 to 100) Hz<br>> 100 Hz to 5 kHz<br>(> 0.1 to 1) mA<br>(10 to 20) Hz<br>(> 20 to 45) Hz<br>(> 45 to 100) Hz<br>> 100 Hz to 5 kHz<br>(> 5 to 20) kHz<br>(> 20 to 50) kHz<br>(> 50 to 100) kHz<br>(> 1 to 10) mA<br>(10 to 20) Hz<br>(> 20 to 45) Hz<br>(> 45 to 100) Hz<br>> 100 Hz to 5 kHz<br>(> 5 to 20) kHz<br>(> 20 to 50) kHz<br>(> 50 to 100) kHz<br>(> 10 to 100) mA<br>(10 to 20) Hz<br>(> 20 to 45) Hz<br>(> 45 to 100) Hz<br>> 100 Hz to 5 kHz<br>(> 5 to 20) kHz<br>(> 20 to 50) kHz<br>(> 50 to 100) kHz | 0.4 % of reading + 30 nA<br>0.15 % of reading + 30 nA<br>0.06 % of reading + 30 nA<br>0.06 % of reading + 30 nA<br>0.4 % of reading + 0.2 $\mu$ A<br>0.15 % of reading + 0.2 $\mu$ A<br>0.06 % of reading + 0.2 $\mu$ A<br>0.03 % of reading + 0.2 $\mu$ A<br>0.06 % of reading + 0.2 $\mu$ A<br>0.4 % of reading + 0.4 $\mu$ A<br>0.55 % of reading + 1.5 nA<br>0.4 % of reading + 2 $\mu$ A<br>0.15 % of reading + 2 $\mu$ A<br>0.06 % of reading + 2 $\mu$ A<br>0.03 % of reading + 2 $\mu$ A<br>0.06 % of reading + 2 $\mu$ A<br>0.4 % of reading + 4 $\mu$ A<br>0.55 % of reading + 15 $\mu$ A<br>0.4 % of reading + 20 $\mu$ A<br>0.15 % of reading + 20 $\mu$ A<br>0.06 % of reading + 20 $\mu$ A<br>0.03 % of reading + 20 $\mu$ A<br>0.06 % of reading + 20 $\mu$ A<br>0.4 % of reading + 40 $\mu$ A<br>0.55 % of reading + 0.15 mA | Comparison to<br>Keysight 3458A, Opt. 002<br>8.5 Digit Multimeter |



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Electrical – DC/Low Frequency

| Parameter/Equipment                  | Range   | Expanded Uncertainty of Measurement (+/-)   | Reference Standard, Method, and/or Equipment   |
|--------------------------------------|---|---|--|
| AC Current – Measure <sup>1</sup>    | (> 0.1 to 1) A<br>(10 to 20) Hz<br>(> 20 to 45) Hz<br>(> 45 to 100) Hz<br>> 100 Hz to 5 kHz<br>(> 5 to 20) kHz<br>(> 20 to 50) kHz  | 0.4 % of reading + 0.2 mA<br>0.16 % of reading + 0.2 mA<br>0.08 % of reading + 0.2 mA<br>0.1 % of reading + 0.2 mA<br>0.3 % of reading + 0.2 mA<br>1 % of reading + 0.4 mA  | Comparison to<br>Keysight 3458A, Opt. 002<br>8.5 Digit Multimeter                            |
| AC Current Clamp Meters <sup>1</sup> | (45 to 65) Hz<br>(10 to 16.5) A<br>(> 16.5 to 150) A<br>(> 150 to 1 025) A<br>(> 65 to 440) Hz<br>(10 to 16.5) A<br>(> 16.5 to 150) A<br>(> 150 to 1 025) A   | 0.79 % of reading + 30 mA<br>0.79 % of reading + 0.29 A<br>0.79 % of reading + 1 A<br><br>1.2 % of reading + 30 mA<br>1.2 % of reading + 0.29 A<br>1.2 % of reading + 1 A   | Comparison to<br>Fluke 5550A<br>Multiproduct Calibrator,<br>Fluke 5500A/COIL<br>50-turn Coil |
| AC Voltage – Generate <sup>1</sup>   | (1 to 12) mV<br>(3 to 5) Hz<br>(> 5 to 10) Hz<br>> 10 Hz to 20 kHz<br>(> 20 to 50) kHz<br>(> 50 to 100) kHz<br>(> 100 to 300) kHz<br>(> 300 to 500) kHz<br>(> 12 to 120) mV<br>(3 to 5) Hz<br>(> 5 to 10) Hz<br>> 10 Hz to 20 kHz<br>(> 20 to 50) kHz<br>(> 50 to 100) kHz<br>(> 100 to 300) kHz<br>(> 300 to 500) kHz<br>(> 0.12 to 1.2) V<br>(3 to 5) Hz<br>(> 5 to 10) Hz<br>(10 to 40) Hz<br>> 40 Hz to 20 kHz<br>(> 20 to 50) kHz<br>(> 50 to 100) kHz<br>(> 100 to 300) kHz<br>(> 300 to 500) kHz | 0.27 % of reading + 8 μV<br>0.094 % of reading + 8 μV<br>0.012 % of reading + 7 μV<br>0.039 % of reading + 7 μV<br>0.16 % of reading + 18 μV<br>0.7 % of reading + 36 μV<br>0.7 % of reading + 36 μV<br><br>0.27 % of reading + 8 μV<br>0.093 % of reading + 8 μV<br>0.012 % of reading + 7 μV<br>0.029 % of reading + 9 μV<br>0.078 % of reading + 24 μV<br>0.19 % of reading + 36 μV<br>0.19 % of reading + 36 μV<br><br>0.27 % of reading + 90 μV<br>0.096 % of reading + 85 μV<br>0.021 % of reading + 85 μV<br>0.012 % of reading + 9 μV<br>0.026 % of reading + 16 μV<br>0.054 % of reading + 48 μV<br>0.16 % of reading + 96 μV<br>0.16 % of reading + 96 μV | Comparison to<br>Fluke 5550A<br>Multiproduct Calibrator                                      |

**Electrical – DC/Low Frequency**

| Parameter/Equipment                | Range                      | Expanded Uncertainty of Measurement (+/-) | Reference Standard, Method, and/or Equipment            |
|------------------------------------|----------------------------|---|---|
| AC Voltage – Generate <sup>1</sup> | (> 1.2 to 12) V            |   | Comparison to<br>Fluke 5550A<br>Multiproduct Calibrator |
|                                    | (3 to 5) Hz                | 0.27 % of reading + 0.9 mV                |   |
|                                    | (> 5 to 10) Hz             | 0.093 % of reading + 0.9 mV               |   |
|                                    | (10 to 40) Hz              | 0.012 % of reading + 0.35 mV              |   |
|                                    | > 40 Hz to 20 kHz          | 0.013 % of reading + 60 μV                |   |
|                                    | (> 20 to 50) kHz           | 0.025 % of reading + 60 μV                |   |
|                                    | (> 50 to 100) kHz          | 0.054 % of reading + 0.15 mV              |   |
|                                    | (> 100 to 300) kHz         | 0.19 % of reading + 0.72 mV               |   |
|                                    | (> 300 to 500) kHz         | 0.19 % of reading + 0.72 mV               |   |
|                                    | (> 12 to 120) V            |   |   |
|                                    | (3 to 5) Hz                | 0.27 % of reading + 9 mV                  |   |
|                                    | (> 5 to 10) Hz             | 0.093 % of reading + 9 mV                 |   |
|                                    | (10 to 40) Hz              | 0.012 % of reading + 3.5 mV               |   |
|                                    | > 40 Hz to 20 kHz          | 0.012 % of reading + 0.6 mV               |   |
|                                    | (> 20 to 50) kHz           | 0.027 % of reading + 0.6 mV               |   |
|                                    | (> 50 to 100) kHz          | 0.07 % of reading + 1.5 mV                |   |
|                                    | (> 120 to 330) V           |   |   |
|                                    | (3 to 5) Hz                | 0.27 % of reading + 90 mV                 |   |
|                                    | (> 5 to 10) Hz             | 0.093 % of reading + 90 mV                |   |
|                                    | > 10 Hz to 20 kHz          | 0.015 % of reading + 9 mV                 |   |
| (> 20 to 50) kHz                   | 0.023 % of reading + 9 mV  |   |   |
| (> 50 to 100) kHz                  | 0.16 % of reading + 15 mV  |   |   |
| (> 330 to 1 020) V                 |                            |   |   |
| (3 to 5) Hz                        | 0.27 % of reading + 90 mV  |   |   |
| (> 5 to 10) Hz                     | 0.093 % of reading + 90 mV |   |   |
| > 10 Hz to 10 kHz                  | 0.02 % of reading + 90 mV  |   |   |



**Electrical – DC/Low Frequency**

| Parameter/Equipment               | Range                       | Expanded Uncertainty of Measurement (+/-) | Reference Standard, Method, and/or Equipment                      |
|-----------------------------------|-----------------------------|---|---|
| AC Voltage – Measure <sup>1</sup> | (1 to 10) mV                |   | Comparison to<br>Keysight 3458A, Opt. 002<br>8.5 Digit Multimeter |
|                                   | (1 to 40) Hz                | 0.03 % of reading + 3 μV                  |   |
|                                   | > 40 Hz to 1 kHz            | 0.02 % of reading + 1.1 μV                |   |
|                                   | > 1 to 20) kHz              | 0.03 % of reading + 1.1 μV                |   |
|                                   | > 20 to 50) kHz             | 0.1 % of reading + 1.1 μV                 |   |
|                                   | > 50 to 100) kHz            | 0.5 % of reading + 1.1 μV                 |   |
|                                   | > 100 to 300) kHz           | 4 % of reading + 2 μV                     |   |
|                                   | > 10 to 100) mV             |   |   |
|                                   | (1 to 40) Hz                | 0.01 % of reading + 4 μV                  |   |
|                                   | > 40 Hz to 1 kHz            | 0.007 % of reading + 2 μV                 |   |
|                                   | > 1 to 20) kHz              | 0.014 % of reading + 2 μV                 |   |
|                                   | > 20 to 50) kHz             | 0.03 % of reading + 2 μV                  |   |
|                                   | > 50 to 100) kHz            | 0.08 % of reading + 2 μV                  |   |
|                                   | > 100 to 300) kHz           | 0.3 % of reading + 10 μV                  |   |
|                                   | > 300 kHz to 1 MHz          | 1 % of reading + 10 μV                    |   |
|                                   | > 1 to 2) MHz               | 1.5 % of reading + 10 μV                  |   |
|                                   | > 0.1 to 1) V               |   |   |
|                                   | (1 to 40) Hz                | 0.007 % of reading + 40 μV                |   |
|                                   | > 40 Hz to 1 kHz            | 0.007 % of reading + 20 μV                |   |
|                                   | > 1 to 20) kHz              | 0.014 % of reading + 20 μV                |   |
|                                   | > 20 to 50) kHz             | 0.03 % of reading + 20 μV                 |   |
|                                   | > 50 to 100) kHz            | 0.08 % of reading + 20 μV                 |   |
|                                   | > 100 to 300) kHz           | 0.3 % of reading + 0.1 mV                 |   |
|                                   | > 300 kHz to 1 MHz          | 1 % of reading + 0.1 mV                   |   |
| > 1 to 2) MHz                     | 1.5 % of reading + 0.1 mV   |   |   |
| > 1 to 10) V                      |                             |   |   |
| (1 to 40) Hz                      | 0.007 % of reading + 0.4 mV |   |   |
| > 40 Hz to 1 kHz                  | 0.007 % of reading + 0.2 mV |   |   |
| > 1 to 20) kHz                    | 0.014 % of reading + 0.2 mV |   |   |
| > 20 to 50) kHz                   | 0.03 % of reading + 0.2 mV  |   |   |
| > 50 to 100) kHz                  | 0.08 % of reading + 0.2 mV  |   |   |
| > 10 to 100) V                    |                             |   |   |
| (1 to 40) Hz                      | 0.02 % of reading + 4 mV    |   |   |
| > 40 Hz to 1 kHz                  | 0.02 % of reading + 2 mV    |   |   |
| > 1 to 20) kHz                    | 0.02 % of reading + 2 mV    |   |   |
| > 20 to 50) kHz                   | 0.035 % of reading + 2 mV   |   |   |
| > 50 to 100) kHz                  | 0.12 % of reading + 10 mV   |   |   |

**Electrical – DC/Low Frequency**

| Parameter/Equipment                                     | Range   | Expanded Uncertainty of Measurement (+/-)   | Reference Standard, Method, and/or Equipment   |
|---|---|---|--|
| AC Voltage – Measure <sup>1</sup>                       | (> 100 to 1 000) V<br>(1 to 40) Hz<br>> 40 Hz to 1 kHz<br>(> 1 to 20) kHz<br>(> 20 to 50) kHz<br>(> 50 to 100) kHz  | 0.04 % of reading + 40 mV<br>0.04 % of reading + 20 mV<br>0.06 % of reading + 20 mV<br>0.12 % of reading + 20 mV<br>0.3 % of reading + 20 mV  | Comparison to<br>Keysight 3458A, Opt. 002<br>8.5 Digit Multimeter                            |
| Capacitance – Source <sup>1</sup><br>(Simulation-Fixed) | 1.2 nF<br>12 nF<br>0.12 μF<br>1.2 μF<br>12 μF<br>0.12 mF<br>1.2 mF<br>12 mF<br>0.12 F   | 0.15 % of reading + 4 pF<br>0.15 % of reading + 10 pF<br>0.12 % of reading + 50 pF<br>0.13 % of reading + 0.5 μF<br>0.12 % of reading + 5 nF<br>0.18 % of reading + 50 nF<br>0.28 % of reading + 0.5 μF<br>0.27 % of reading + 5 μF<br>0.6 % of reading + 50 μF | Comparison to<br>Fluke 5550A<br>Multiproduct Calibrator                                      |
| DC Current – Generate <sup>1</sup>                      | 1 nA<br>(> 1 to 10) nA<br>(> 10 to 100) nA<br>(> 0.1 to 1) μA   | 0.008 % of reading<br>0.055 % of reading<br>0.55 % of reading<br>0.003 % of reading   | Comparison to<br>Keithley Current Source   |
| DC Current – Generate <sup>1</sup>                      | (> 1 to 120) μA<br>(> 0.12 to 1.2) mA<br>(> 1.2 to 12) mA<br>(> 12 to 120) mA<br>(> 0.12 to 1.2) A<br>(> 1.2 to 3.1) A<br>(> 3.1 to 12) A<br>(> 12 to 30.2) A | 0.011 % of reading + 7.2 nA<br>0.008 5 % of reading + 18 nA<br>0.008 5 % of reading + 96 nA<br>0.008 5 % of reading + 0.96 μA<br>0.014 % of reading + 12 μA<br>0.029 % of reading + 0.18 mA<br>0.036 % of reading + 0.3 mA<br>0.085 % of reading + 0.6 mA       | Comparison to<br>Fluke 5550A<br>Multiproduct Calibrator                                      |
| DC Current – Measure <sup>1</sup>                       | Up to 100 nA<br>(> 0.1 to 1) μA<br>(> 1 to 10) μA<br>(> 10 to 100) μA<br>(> 0.1 to 1) mA<br>(> 1 to 10) mA<br>(> 10 to 100) mA<br>(> 0.1 to 1) A              | 0.003 4 % of reading + 40 aA<br>0.002 5 % of reading + 40 aA<br>0.002 5 % of reading + 0.1 fA<br>0.002 5 % of reading + 0.8 fA<br>0.002 5 % of reading + 5 fA<br>0.002 6 % of reading + 50 fA<br>0.004 1 % of reading + 0.5 μA<br>0.012 % of reading + 10 μA    | Comparison to<br>Keysight 3458A, Opt. 002<br>8.5 Digit Multimeter                            |
| DC Current Clamp Meters <sup>1</sup>                    | (> 20 to 150) A<br>(> 150 to 1 000) A   | 0.61 % of reading + 0.16 A<br>0.62 % of reading + 0.58 A  | Comparison to<br>Fluke 5550A<br>Multiproduct Calibrator,<br>Fluke 5500A/COIL<br>50-turn Coil |



**Electrical – DC/Low Frequency**

| Parameter/Equipment   | Range  | Expanded Uncertainty of Measurement (+/-)  | Reference Standard, Method, and/or Equipment                      |
|---|--|--|---|
| DC Resistance – Measure <sup>1</sup>                              | Up to 10 Ω<br>(> 10 to 100) Ω<br>(> 0.1 to 1) kΩ<br>(> 1 to 10) kΩ<br>(> 10 to 100) kΩ<br>(> 0.1 to 1) MΩ<br>(> 1 to 10) MΩ<br>(> 10 to 100) MΩ<br>(> 0.1 to 1) GΩ   | 20 μΩ/Ω + 50 pΩ<br>15 μΩ/Ω + 0.5 nΩ<br>13 μΩ/Ω + 0.5 nΩ<br>13 μΩ/Ω + 5 μΩ<br>13 μΩ/Ω + 50 μΩ<br>18 μΩ/Ω + 2 Ω<br>53 μΩ/Ω + 0.1 kΩ<br>0.15 mΩ/Ω + 1 kΩ<br>5.1 mΩ/Ω + 10 kΩ  | Comparison to<br>Keysight 3458A, Opt. 002<br>8.5 Digit Multimeter |
| Electrical Simulation of PRT/RTD Indicators – Source <sup>1</sup> | Pt 385, 100 Ω<br>(-200 to 0) °C<br>(> 0 to 100) °C<br>(> 100 to 300) °C<br>(> 300 to 400) °C<br>(> 400 to 630) °C<br>(> 630 to 800) °C<br>Pt 3916, 100 Ω<br>(-200 to -190) °C<br>(> -190 to -80) °C<br>(> -80 to 0) °C<br>(> 0 to 260) °C<br>(> 260 to 400) °C<br>(> 400 to 600) °C<br>(> 600 to 630) °C<br>Pt 3926, 100 Ω<br>(-200 to 0) °C<br>(> 0 to 100) °C<br>(> 100 to 300) °C<br>(> 300 to 400) °C<br>(> 400 to 630) °C | 0.03 °C<br>0.04 °C<br>0.05 °C<br>0.06 °C<br>0.07 °C<br>0.14 °C<br>0.15 °C<br>0.02 °C<br>0.03 °C<br>0.04 °C<br>0.05 °C<br>0.06 °C<br>0.14 °C<br>0.03 °C<br>0.04 °C<br>0.05 °C<br>0.06 °C<br>0.07 °C   | Comparison to<br>Fluke 5550A<br>Multiproduct Calibrator           |
| DC Resistance – Generate <sup>1</sup><br>(Simulation)             | Up to 12 Ω<br>(> 12 to 120) Ω<br>(> 0.12 to 1.2) kΩ<br>(> 1.2 to 12) kΩ<br>(> 12 to 120) kΩ<br>(> 0.12 to 1.2) MΩ<br>(> 1.2 to 12) MΩ<br>(> 12 to 120) MΩ<br>(> 0.12 to 1.2) GΩ  | 0.013 % of reading + 10 mΩ<br>0.002 2 % of reading + 15 mΩ<br>0.001 8 % of reading + 20 mΩ<br>0.001 7 % of reading + 0.2 Ω<br>0.001 7 % of reading + 1 Ω<br>0.001 9 % of reading + 10 Ω<br>0.011 % of reading + 0.15 kΩ<br>0.032 % of reading + 3 kΩ<br>0.39 % of reading + 0.1 MΩ | Comparison to<br>Fluke 5550A<br>Multiproduct Calibrator           |



ANSI National Accreditation Board

Electrical – DC/Low Frequency

| Parameter/Equipment  | Range  | Expanded Uncertainty of Measurement (+/-)   | Reference Standard, Method, and/or Equipment                      |
|--|--|---|---|
| DC Voltage – Measure <sup>1</sup>  | (10 to 100) mV<br>(> 0.1 to 1) V<br>(> 1 to 10) V<br>(> 10 to 100) V<br>(> 100 to 1 000) V   | 0.000 7 % of reading + 0.3 μV<br>0.000 8 % of reading + 0.3 μV<br>0.000 8 % of reading + 0.5 μV<br>0.000 9 % of reading + 30 μV<br>0.000 9 % of reading + 0.1 mV  | Comparison to<br>Keysight 3458A, Opt. 002<br>8.5 Digit Multimeter |
| DC Voltage – Generate <sup>1</sup>   | Up to 120 mV<br>(> 0.12 to 1.2) V<br>(> 1.2 to 12) V<br>(> 12 to 120) V<br>(> 120 to 1 020) V  | 0.001 % of reading + 1 μV<br>0.001 2 % of reading + 1.2 μV<br>0.002 3 % of reading + 10 μV<br>0.000 9 % of reading + 0.1 mV<br>0.000 9 % of reading + 1.2 mV  | Comparison to<br>Fluke 5550A<br>Multiproduct Calibrator           |
| Electrical Simulation of Thermocouple Indicating Devices – Source/Measure <sup>1</sup> | Type B<br>(600 to 800) °C<br>(800 to 1 000) °C<br>(1 000 to 1 550) °C<br>(1 550 to 1 820) °C<br>Type C<br>(0 to 150) °C<br>(150 to 650) °C<br>(650 to 1000) °C<br>(1 000 to 1 800) °C<br>(1 800 to 2 316) °C<br>Type E<br>(-250 to -100) °C<br>(-100 to -25) °C<br>(-25 to 350) °C<br>(350 to 650) °C<br>(650 to 1 000) °C<br>Type J<br>(-210 to -100) °C<br>(-100 to -30) °C<br>(-30 to 150) °C<br>(150 to 760) °C<br>(760 to 1 200) °C | 0.26 °C<br>0.2 °C<br>0.18 °C<br>0.2 °C<br>0.15 °C<br>0.12 °C<br>0.16 °C<br>0.27 °C<br>0.47 °C<br>0.24 °C<br>0.09 °C<br>0.07 °C<br>0.09 °C<br>0.12 °C<br>0.15 °C<br>0.08 °C<br>0.07 °C<br>0.09 °C<br>0.12 °C | Comparison to<br>Fluke 5550A<br>Multiproduct Calibrator           |



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Electrical – DC/Low Frequency

| Parameter/Equipment  | Range               | Expanded Uncertainty of Measurement (+/-) | Reference Standard, Method, and/or Equipment      |
|--|---------------------|---|---|
| Electrical Simulation of Thermocouple Indicating Devices – Source/Measure <sup>1</sup> | Type K              |   | Comparison to Fluke 5550A Multiproduct Calibrator |
|  | (-200 to -100) °C   | 0.17 °C                                   |   |
|  | (-100 to -25) °C    | 0.08 °C                                   |   |
|  | (-25 to 120) °C     | 0.07 °C                                   |   |
|  | (120 to 1 000) °C   | 0.12 °C                                   |   |
|  | (1 000 to 1 372) °C | 0.21 °C                                   |   |
|  | Type L              |   |   |
|  | (-200 to -100) °C   | 0.19 °C                                   |   |
|  | (-100 to 800) °C    | 0.12 °C                                   |   |
|  | (800 to 900) °C     | 0.07 °C                                   |   |
|  | Type N              |   |   |
|  | (-200 to -100) °C   | 0.2 °C                                    |   |
|  | (-100 to -25) °C    | 0.09 °C                                   |   |
|  | (-25 to 120) °C     | 0.07 °C                                   |   |
|  | (120 to 410) °C     | 0.07 °C                                   |   |
|  | (410 to 1 300) °C   | 0.12 °C                                   |   |
|  | Type R              |   |   |
|  | (0 to 250) °C       | 0.31 °C                                   |   |
|  | (250 to 400) °C     | 0.18 °C                                   |   |
|  | (400 to 1 000) °C   | 0.16 °C                                   |   |
|  | (1 000 to 1 767) °C | 0.2 °C                                    |   |
| Type S   |                     |   |   |
| (0 to 250) °C  | 0.26 °C             |   |   |
| (250 to 1 000) °C  | 0.19 °C             |   |   |
| (1 000 to 1 400) °C  | 0.19 °C             |   |   |
| (1 400 to 1 767) °C  | 0.25 °C             |   |   |
| Type T   |                     |   |   |
| (-250 to -150) °C  | 0.36 °C             |   |   |
| (-150 to 0) °C   | 0.12 °C             |   |   |
| (0 to 120) °C  | 0.08 °C             |   |   |
| (120 to 400) °C  | 0.07 °C             |   |   |
| Type U   |                     |   |   |
| (-200 to 0) °C   | 0.24 °C             |   |   |
| (0 to 600) °C  | 0.07 °C             |   |   |

**Electrical – DC/Low Frequency**

| Parameter/Equipment  | Range   | Expanded Uncertainty of Measurement (+/-)              | Reference Standard, Method, and/or Equipment  |
|--|---|--|---|
| Oscilloscopes <sup>1,2</sup><br>Amplitude DC<br>into 50 Ω load<br>into 1 MΩ load | (-6.6 to 6.6) V<br>(-120 to 120) V  | 0.19 % of reading + 40 μV<br>0.04 % of reading + 40 μV | Comparison to<br>Fluke 5550A/600<br>Multiproduct Calibrator<br>with 600 MHz Scope<br>Option |
| Amplitude Square Wave<br>into 50 Ω load<br>into 1 MΩ load                        | 10 Hz to 10 kHz<br>1 mVp-p to 6.6 Vp-p<br>10 Hz to 1 kHz<br>1 mVp-p to 120 Vp-p | 0.19 % of reading + 40 μV<br>0.08 % of reading + 40 μV |   |
| Leveled Sine Wave<br>(50 kHz Reference)<br>into 50 Ω load                        | 50 kHz<br>5 mVp-p to 5.5 Vp-p   | 1.6 % of reading + 0.3 mV                              |   |
| Leveled Sine Wave Flatness<br>(50 kHz Reference)                                 | 5 mVp-p to 5.5 Vp-p<br>50 kHz to 10 MHz<br>(> 10 to 600) MHz                    | 1.2 % of reading + 0.1 mV<br>2.3 % of reading + 0.1 mV |   |
| Time Marker<br>into 50 Ω load  | 2 ns to 5 s   | 2.6 μs/s   |   |

**Length – Dimensional Metrology**

| Parameter/Equipment        | Range           | Expanded Uncertainty of Measurement (+/-) | Reference Standard, Method, and/or Equipment  |
|----------------------------|-----------------|---|---|
| Calipers <sup>1,3</sup>    | Up to 12 in     | (290 + 1L) μin                            | Comparison to<br>Gage Blocks;<br>ENV WI 4372  |
| Micrometers <sup>1,3</sup> | (0.01 to 20) in | (81 + 5L) μin                             | Comparison to<br>Gage Blocks;<br>ENV WI 36585 |

**Mass and Mass Related**

| Parameter/Equipment   | Range  | Expanded Uncertainty of Measurement (+/-)  | Reference Standard, Method, and/or Equipment  |
|---|--|--|---|
| Balometer <sup>1</sup>  | Up to 15 inH <sub>2</sub> O  | 2.4 % of reading   | Comparison to Deadweight Tester   |
| Pneumatic Differential Pressure Gages/Transducers <sup>1</sup> (Absolute)                               | Up to 10 Torr<br>(> 10 to 100) Torr  | 0.073 % of reading<br>0.064 % of reading   | Comparison to MKS Baratron System; ASME B40.100   |
| Pneumatic Pressure Gages/Transducers <sup>1,5</sup> (Absolute)  | Up to 10 Torr<br>(> 10 to 100) Torr<br>(> 100 to 1 000) Torr   | 0.21 % of reading<br>0.14 % of reading<br>0.093 % of reading                           | Comparison to MKS System; ASME B40.100  |
| Pneumatic Pressure Gages/Transducers <sup>1</sup> (Absolute)  | (10 to 550) inH <sub>2</sub> O<br><br>Up to 31.25 psia   | 0.018 % of reading<br><br>0.004 5 psia   | Comparison to Ametek Deadweight Tester; ASME B40.100  |
| Pneumatic Pressure Gages/Transducers <sup>1</sup> (Absolute)  | (> 31.25 to 500) psia  | 0.012 % of reading   | Comparison to Mensor System; ASME B40.100   |
| Hydraulic Pressure Gages/Transducers <sup>1</sup> (Gauge)   | (50 to 10 000) psig  | 0.12 % of reading  | Ametek Deadweight Tester; ASME B40.100  |
| Scales and Balances <sup>1,4</sup>  | 24 µg to 500 mg<br>500 mg to 2 g<br>(> 2 to 20) g<br>(> 20 to 30) g<br>(> 30 to 150) g<br>(> 150 to 600) g<br>(> 600 to 800) g<br>> 800 g to 2 kg<br>(> 2 to 25) kg<br>(> 25 to 60) kg | 8 µg<br>24 µg<br>53 µg<br>94 µg<br>0.28 mg<br>1 mg<br>1 mg<br>3 mg<br>0.12 g<br>0.23 g | ASTM E617 Class 1 weights and ASTM E898 utilized for the calibration of the electronic weighing system. |
| Torque Wrenches/Sensors <sup>1</sup>  | (1 to 10) lbf·in<br>(> 1 to 100) lbf·in<br>(> 100 to 250) lbf·in<br>(> 20.8 to 250) lbf·ft   | 0.12 lbf·in<br>1.2 lbf·in<br>2.9 lbf·in<br>2.9 lbf·ft                                  | Comparison to Torque Transducers  |
| Digital Aerosol Photometer <sup>1</sup>   | Up to 20 % leakage<br>(> 20 to 100) % leakage  | 0.16 % leakage<br>0.1 % leakage  | Comparison to Keithley Current Source   |
| Piston Operated Volumetric Apparatus <sup>1</sup> (Pipettes, Burettes, Titrators, Dispensers, Diluters) | (0.2 to 1) µL<br>(> 1 to 2) µL<br>(> 2 to 20) µL<br>(> 20 to 100) µL<br>(> 100 to 200) µL  | 13 nL<br>14 nL<br>15 nL<br>0.16 nL<br>0.16 nL  | Precision Balances, ASTM E617 Ultra-Class weights; Gravimetric Method                                   |



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**Mass and Mass Related**

| Parameter/Equipment  | Range  | Expanded Uncertainty of Measurement (+/-) | Reference Standard, Method, and/or Equipment                                |
|--|--|---|---|
| Piston Operated Volumetric Apparatus <sup>1</sup><br>(Pipettes, Burettes, Titrators, Dispensers, Diluters) | > 200 µL to 1 mL<br>(> 1 to 5) mL<br>(> 5 to 10) mL<br>(> 10 to 50) mL | 0.23 µL<br>0.23 µL<br>5.7 µL<br>17 µL     | Precision Balances,<br>ASTM E617 Ultra-Class weights;<br>Gravimetric Method |

**Thermodynamic**

| Parameter/Equipment  | Range   | Expanded Uncertainty of Measurement (+/-)   | Reference Standard, Method, and/or Equipment  |
|--|---|---|---|
| Humidity – Generate<br>(Meters, Sensors, etc.)                             | Up to 30 %RH<br>(> 30 to 80) %RH  | 0.14 %RH<br>0.79 %RH  | Comparison to<br>General Eastern<br>Chilled Mirror  |
| Temperature – Generate <sup>1</sup><br>(Temperature Probes, Sensors, etc.) | -196 °C<br>(-90 to 38) °C<br>(> -38 to -10) °C<br>(> -10 to 35) °C<br>(> 35 to 100) °C<br>(> 100 to 120) °C<br>(> 120 to 200) °C<br>(> 200 to 420) °C<br>(> 420 to 480) °C<br>(> 480 to 590) °C | 0.017 °C<br>0.018 °C<br>0.02 °C<br>0.017 °C<br>0.014 °C<br>0.018 °C<br>0.016 °C<br>0.021 °C<br>0.52 °C<br>0.86 °C | Comparison to<br>PRT,<br>Super-thermometer<br>Readout,<br>Baths,<br>Dry Wells                                   |
| Temperature – Measure <sup>1</sup><br>(Room, Chambers, Dry Wells, etc.)    | (-196 to -38.8) °C<br>(> -38.8 to 0) °C<br>(> 0 to 156) °C<br>(> 156 to 231) °C<br>(> 231 to 419) °C<br>(> 419 to 660) °C   | 0.017 °C<br>0.016 °C<br>0.014 °C<br>0.015 °C<br>0.02 °C<br>0.14 °C  | Comparison to<br>Burns Engineering PRT,<br>Super-thermometer<br>Readout   |
| Infrared Thermometers,<br>Thermal Video Devices <sup>1</sup>               | Up to 100 °C<br>(> 100 to 300) °C<br>(> 300 to 500) °C  | 0.61 °C<br>0.78 °C<br>0.96 °C   | Comparison to<br>Blackbody Source<br>(flat body)<br>$\epsilon = 0.95, \lambda = (8 \text{ to } 14) \mu\text{m}$ |



**Thermodynamic**

| Parameter/Equipment  | Range  | Expanded Uncertainty of Measurement (+/-)                         | Reference Standard, Method, and/or Equipment  |
|--|--|---|---|
| Temperature Uniformity Survey (TUS) <sup>1</sup><br>(Ovens, Furnaces, Freezers, Environmental Chambers)<br>Temperature | (-196 to -80) °C<br>(> -80 to 140) °C<br>(> 140 to 220) °C<br>(> 220 to 537) °C<br>(> 537 to 760) °C<br>(> 760 to 982) °C<br>(> 982 to 1 204) °C | 0.93 °C<br>0.15 °C<br>0.93 °C<br>3.4 °C<br>4.1 °C<br>5 °C<br>6 °C | Per AMS-2750 using<br>Fluke 1586A<br>Precision Temperature Scanner,<br>Type T Thermocouple<br><br>Type K Thermocouple |
| Humidity   | (20 to 90) %RH   | 2.5 %RH   | Temp/Humidity Dataloggers   |

**Time and Frequency**

| Parameter/Equipment                | Range                                     | Expanded Uncertainty of Measurement (+/-)                        | Reference Standard, Method, and/or Equipment                |
|------------------------------------|---|--|---|
| Frequency – Generate (Reference)   | 10 MHz                                    | (3.7 x 10 <sup>-8</sup> ) Hz                                     | Comparison to GPS,<br>Fluke PM6681 Counter                  |
| Frequency – Generate <sup>1</sup>  | 10 mHz to 1.2 kHz<br>> 1.2 kHz to 2 MHz   | 0.000 3 % of reading + 3.9 μHz<br>0.000 2 % of reading + 3.9 μHz | Comparison to Fluke 5500A Multiproduct Calibrator           |
| Frequency – Measure (Reference)    | 10 MHz                                    | (6.8 x 10 <sup>-8</sup> ) Hz                                     | Comparison to GPS,<br>Fluke PM6681 Counter                  |
| Frequency – Measure <sup>1</sup>   | (1 to 40) Hz<br>> 40 Hz to 100 MHz        | 0.05 % of reading<br>0.01 % of reading                           | Comparison to Keysight 3458A, Opt. 002 8.5 Digit Multimeter |
| Optical Tachometers <sup>1,3</sup> | (10 to 300) rpm<br>(> 300 to 200 000) rpm | 0.001 rpm<br>0.000 3 % of reading                                | Comparison to Fluke 5550A Multiproduct Calibrator, LED      |
| Stopwatches <sup>1</sup>           | 15 s to 24 hr                             | 50 ms  | Timometer;<br>NIST 960-2                                    |



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**TESTING**

**Mechanical**

| Specific Tests and/or Properties Measured                | Specification, Standard, Method, or Test Technique                            | Items, Materials or Product Tested                             | Key Equipment or Technology   |
|--|---|--|---|
| Chemical Fume Hood, Ductless Fume Hood                   | ASHRAE 110, SEFA 1, ANSI/AIHA Z95, ENV Method WI-4380 & WI-4381               | Fume Hoods, Bio-Safety Cabinets, Glove Boxes, Clean Room, etc. | Thermo Anemometer, Visual Aerosol Generator   |
| Class 1 Bio-Safety Cabinet                               | WI-4389   | Fume Hoods, Bio-Safety Cabinets, Glove Boxes, Clean Room, etc. | Thermo Anemometer, Visual Aerosol Generator, Particle Aerosol Generator, Photometer   |
| Class II, Type A2 Bio-Safety Cabinet                     | NSF/ANSI 49 (except vibration)  | Fume Hoods, Bio-Safety Cabinets, Glove Boxes, Clean Room, etc. | Thermo Anemometer, Direct Inflow Measurement (DIM), Visual Aerosol Generator, Particle Aerosol Generator, Photometer        |
| Class II, Type B2 Bio-Safety Cabinet                     | NSF/ANSI 49 (except vibration), WI-4374                                       | Fume Hoods, Bio-Safety Cabinets, Glove Boxes, Clean Room, etc. | Thermo Anemometer, Direct Inflow Measurement (DIM), Visual Aerosol Generator, Particle Aerosol Generator, Photometer        |
| Class III Bio-Safety Cabinet/Glove Box, Barrier Isolator | IEST-RP-CC028/.1, ISO 14644-7, WI-4382  | Fume Hoods, Bio-Safety Cabinets, Glove Boxes, Clean Room, etc. | Thermo Anemometer, Visual Aerosol Generator, Particle Aerosol Generator, Photometer, Particle Counter                       |
| Laminar Flow Hood  | IEST-RP-CC002.3, WI-4387  | Fume Hoods, Bio-Safety Cabinets, Glove Boxes, Clean Room, etc. | Thermo Anemometer, Visual Aerosol Generator, Particle Aerosol Generator, Photometer   |
| Terminal HEPA Filter                                     | IEST-RP-CC002.3, IEST-RP-C034.2, WI-4387                                      | Fume Hoods, Bio-Safety Cabinets, Glove Boxes, Clean Room, etc. | Particle Aerosol Generator, Photometer  |
| Clean Room   | ISO 14644 Part 1 & 2, IEST-RP-C006.3, FDA Guidance for Industry 2004, WI-1146 | Fume Hoods, Bio-Safety Cabinets, Glove Boxes, Clean Room, etc. | Thermo Anemometer, Visual Aerosol Generator, Particle Aerosol Generator, Photometer, Balometer, Manometer, Particle Counter |



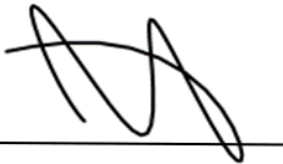
**Mechanical**

| Specific Tests and/or Properties Measured                           | Specification, Standard, Method, or Test Technique | Items, Materials or Product Tested                             | Key Equipment or Technology   |
|---|--|--|---|
| Certificate of Sterile Compounding Facilities and Aseptic Isolators | USP797, CETA CAG-001, CETA CAG-002, CETA CAG-003   | Fume Hoods, Bio-Safety Cabinets, Glove Boxes, Clean Room, etc. | Thermo Anemometer, Visual Aerosol Generator, Particle Aerosol Generator, Photometer, Balometer, Manometer, Particle Counter, Viable Air Sampler |

Calibration and Measurement Capability (CMC) is expressed in terms of the measurement parameter, measurement range, expanded uncertainty of measurement and reference standard, method, and/or equipment. The expanded uncertainty of measurement is expressed as the standard uncertainty of the measurement multiplied by a coverage factor of 2 ( $k=2$ ), corresponding to a confidence level of approximately 95%.

Notes:

1. On-site calibration service is available for this parameter, since on-site conditions are typically more variable than those in the laboratory, larger measurement uncertainties are expected on-site than what is reported on the accredited scope.
2. The values shown in the Range column are "Nominal" values. The actual values will be reported on the calibration certificate at the time of calibration, along with the associated Measurement Uncertainty.
3.  $L$  = length in inches; SFM = standard feet per minute; SCFM = standard cubic feet per minute; rpm = revolutions per minute.
4. The CMC for scales and balances is highly dependent upon the resolution of the unit under test. The CMC presented here does not include the resolution of the unit under test. The resolution will be included in the reported measurement uncertainty at the time of calibration.
5.  $0.6R$  will be added to Measurement Uncertainty at the time of calibration.  $R$  = resolution in the unit of measure of the measurand.
6. Unless otherwise specified in the far-right column, the calibration procedure utilized was developed internally.
7. The legal entity for this site is ENV Services, Inc./Pro-Lab.



Jason Stine, Vice President

