



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

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CALIBRATION

Valid To: May 31, 2020

Certificate Number: 1044.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations<sup>1, 6</sup>:

I. Dimensional

(Calibration of digital linear gages, calipers, dial indicators, extensometers, extensometer calibrators, rotary encoders, protractors, micrometers, length standards, and other general purpose dimensional M&TE.)

| Parameter/Equipment     | Range  | CMC <sup>2, 5</sup> ( $\pm$ )                                       | Comments   |
|-------------------------|--|---|--|
| Extensometer            | (0.0002 to 2) in   | 0.2 % + 0.000 013 in  | MTS extensometer calibration system              |
| Laser Extensometer      | Up to 5 in<br>Up to 15 in  | (400 + 2L) $\mu$ in<br>(1300 + 2L) $\mu$ in                         | Laser interferometer system per ASTM E83         |
| Extensometer Calibrator | (0.001 to 2) in  | (5 + 2L) $\mu$ in   | Laser interferometer system per ISO 9513 Annex B |
| Vee Length Standard     | 0.1 in<br>(0.5, 1, and 2) in<br>6 mm<br>12 mm<br>(15, 25, and 50) mm | 300 $\mu$ in<br>200 $\mu$ in<br>5 $\mu$ m<br>6 $\mu$ m<br>7 $\mu$ m | Gage blocks, optical comparator                  |

| Parameter/Equipment                        | Range                                     | CMC <sup>2,3</sup> (±)  | Comments                    |
|--|---|---|-----------------------------|
| Angle – Rotary Measuring Equipment         | 0° to 10°<br>11° to 30°<br>31° to 360°    | 0.0005°<br>0.001°<br>0.002°                                       | Rotary table system         |
| Digital Protractor                         | 0° to 360°                                | 0.035°  | Gage blocks, sine bar       |
| Digital Indicator                          | Up to 2.4 in<br>Up to 4 in<br>Up to 18 in | 12 μin<br>150 μin<br>200 μin or 0.003 %<br>(whichever is greater) | Gage blocks                 |
| Digital Caliper                            | Up to 6 in                                | 500 μin   | Gage blocks, ring gages     |
| MTS Temposonics for Linear Displacement    | Up to 48 in                               | 400 μin   | Laser interferometer system |
| Laser Based System for Linear Displacement | Up to 60 in                               | 25 μin  | Laser interferometer system |

## II. Electrical – DC/Low Frequency

(Calibration of multimeters, signal sources, generators, process calibrators, signal conditioners, strain gage instrumentation, recorders, bridge simulators, thermocouple and RTD instruments and other general purpose electrical M&TE.)

| Parameter/Equipment   | Range  | CMC <sup>2,4</sup> (±)  | Comments    |
|-----------------------|--|---|-------------|
| DC Voltage – Generate | (10 to 220) mV<br>220 mV to 2.2 V<br>(2.2 to 11) V<br>(11 to 22) V<br>(22 to 220) V<br>(220 to 1100) V | 6 μV/V + 0.4 μV<br>3.5 μV/V + 0.8 μV<br>2.5 μV/V + 3 μV<br>2.5 μV/V + 4 μV<br>3.5 μV/V + 41 μV<br>4.6 μV/V + 400 μV | Fluke 5720A |
| Fixed Points          | 10 V   | 5 μV  | Fluke 732B  |

| Parameter/Equipment                    | Range  | CMC <sup>2,4</sup> (±)   | Comments                       |
|--|--|--|--------------------------------|
| DC Voltage – Measure                   | (1 to 200) mV<br>(0.2 to 2) V<br>(2 to 20) V<br>(20 to 200) V<br>(200 to 1000) V   | 4.6 μV/V + 0.1 μV<br>3.1 μV/V + 0.4 μV<br>3 μV/V + 4 μV<br>4.5 μV/V + 40 μV<br>4.9 μV/V + 450 μV   | Fluke 8508A                    |
| Fixed Points                           | 10 V   | 5 μV   | 10 V (ratiometric)             |
| DC Current – Generate                  | (10 to 220) μA<br>220 μA to 2.2 mA<br>(2.2 to 22) mA<br>(22 to 220) mA<br>220 mA to 2.2 A<br><br>(3 to < 11) A<br>(11 to 20) A   | 35 μA/A + 6 nA<br>31 μA/A + 8 nA<br>31 μA/A + 41 nA<br>40 μA/A + 0.8 μA<br>61 μA/A + 12 μA<br><br>0.04 % + 600 μA<br>0.08 % + 1 mA   | Fluke 5720A<br><br>Fluke 5522A |
| DC Current – Measure                   | 120 nA to 1.2 μA<br>(1.2 to 12) μA<br>(12 to 120) μA<br>120 μA to 1.2 mA<br>(1.2 to 12) mA<br>(12 to 120) mA<br>120 mA to 1.0 A  | 20 μA/A + 0.05 nA<br>21 μA/A + 0.1 nA<br>20 μA/A + 0.8 nA<br>20 μA/A + 5 nA<br>20 μA/A + 51 nA<br>35 μA/A + 510 nA<br>0.011 % + 10 μA  | HP 3458A                       |
| Resistance – Generate,<br>Fixed Points | 1 Ω<br>10 kΩ<br><br>1 Ω<br>1.9 Ω<br>10 Ω<br>19 Ω<br>100 Ω<br>190 Ω<br>1 kΩ<br>1.9 kΩ<br>10 kΩ<br>19 kΩ<br>100 kΩ<br>190 kΩ<br>1 MΩ<br>1.9 MΩ<br>10 MΩ<br>19 MΩ<br>100 MΩ | 6 μΩ<br>0.03 Ω<br><br>84 μΩ<br>0.16 mΩ<br>0.21 mΩ<br>0.42 mΩ<br>1.0 mΩ<br>1.7 mΩ<br>8.0 mΩ<br>15 mΩ<br>80 mΩ<br>0.15 Ω<br>0.9 Ω<br>1.7 Ω<br>16 Ω<br>32 Ω<br>320 Ω<br>780 Ω<br>9.8 kΩ | Fluke 742A<br><br>Fluke 5720A  |

| Parameter/Equipment  | Range   | CMC <sup>2,4</sup> (±)   | Comments |
|----------------------|---|--|----------|
| Resistance – Measure | (1 to 12) Ω<br>(12 to 120) Ω<br>120 Ω to 1.2 kΩ<br>(1.2 to 12) kΩ<br>(12 to 120) kΩ<br>120 kΩ to 1.2 MΩ<br>(1.2 to 12) MΩ<br>(12 to 120) MΩ<br>120 MΩ to 1 GΩ | 15 μΩ/Ω + 0.06 mΩ<br>12 μΩ/Ω + 0.6 mΩ<br>10 μΩ/Ω + 0.6 mΩ<br>10 μΩ/Ω + 6.5 mΩ<br>10 μΩ/Ω + 63 mΩ<br>15 μΩ/Ω + 2 Ω<br>51 μΩ/Ω + 110 Ω<br>0.050 % + 1 kΩ<br>0.50 % + 12 kΩ | HP 3458A |

| Parameter/Range       | Frequency  | CMC <sup>2,4</sup> (±)  | Comments    |
|-----------------------|--|---|-------------|
| AC Voltage – Generate |  |   |             |
| (1 to 2.2) mV         | (10 to 20) Hz<br>(20 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<br>500 kHz to 1 MHz | 0.022 % + 4 μV<br>88 μV/V + 4 μV<br>79 μV/V + 4 μV<br>0.018 % + 4 μV<br>0.048 % + 5 μV<br>0.092 % + 10 μV<br>0.12 % + 20 μV<br>0.25 % + 20 μV   | Fluke 5720A |
| (2.2 to 22) mV        | (10 to 20) Hz<br>(20 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<br>500 kHz to 1 MHz | 0.022 % + 4 μV<br>88 μV/V + 4 μV<br>79 μV/V + 4 μV<br>0.018 % + 4 μV<br>0.048 % + 5 μV<br>0.092 % + 10 μV<br>0.12 % + 20 μV<br>0.25 % + 20 μV   |             |
| (22 to 220) mV        | (10 to 20) Hz<br>(20 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<br>500 kHz to 1 MHz | 0.022 % + 12 μV<br>88 μV/V + 7 μV<br>79 μV/V + 7 μV<br>0.018 % + 7 μV<br>0.044 % + 17 μV<br>0.076 % + 20 μV<br>0.12 % + 25 μV<br>0.25 % + 45 μV |             |

| Parameter/Range                 | Frequency  | CMC <sup>2,4</sup> ( $\pm$ )  | Comments    |
|---------------------------------|--|---|-------------|
| AC Voltage – Generate<br>(cont) |  |   |             |
| 220 mV to 2.2 V                 | (10 to 20) Hz<br>(20 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<br>500 kHz to 1 MHz | 0.022 % + 44 $\mu$ V<br>83 $\mu$ V/V + 16 $\mu$ V<br>43 $\mu$ V/V + 9 $\mu$ V<br>72 $\mu$ V/V + 12 $\mu$ V<br>0.011 % + 31 $\mu$ V<br>0.034 % + 81 $\mu$ V<br>0.090 % + 210 $\mu$ V<br>0.15 % + 310 $\mu$ V | Fluke 5720A |
| (2.2 to 22) V                   | (10 to 20) Hz<br>(20 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<br>500 kHz to 1 MHz | 0.022 % + 0.44 mV<br>83 $\mu$ V/V + 0.16 mV<br>43 $\mu$ V/V + 0.06 mV<br>72 $\mu$ V/V + 0.12 mV<br>96 $\mu$ V/V + 0.20 mV<br>0.026 % + 0.61 mV<br>0.090 % + 2.0 mV<br>0.13 % + 3.3 mV                       |             |
| (22 to 220) V                   | (10 to 20) Hz<br>(20 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<br>500 kHz to 1 MHz | 0.022 % + 4.0 mV<br>86 $\mu$ V/V + 1.5 mV<br>49 $\mu$ V/V + 0.60 mV<br>76 $\mu$ V/V + 1.0 mV<br>0.013 % + 3.0 mV<br>0.080 % + 17 mV<br>0.42 % + 40 mV<br>0.70 % + 80 mV                                     |             |
| (220 to 1100) V                 | 50 Hz to 1 kHz   | 60 $\mu$ V/V + 4 mV   |             |
| AC Voltage – Measure            |  |   |             |
| (1 to 10) mV                    | (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<br>(100 to 300) kHz   | 0.03 % + 3.2 $\mu$ V<br>0.02 % + 1.1 $\mu$ V<br>0.03 % + 1.1 $\mu$ V<br>0.10 % + 1.1 $\mu$ V<br>0.5 % + 1.1 $\mu$ V<br>4 % + 2.1 $\mu$ V  | HP 3458A    |

| Parameter/Range                | Frequency  | CMC <sup>2,4</sup> (±)  | Comments |
|--------------------------------|--|---|----------|
| AC Voltage – Measure<br>(cont) |  |   |          |
| (10 to 100) mV                 | (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<br>(100 to 300) kHz<br>300 kHz to 1 MHz<br>(1 to 2) MHz | 75 µV/V + 4.3 µV<br>71 µV/V + 2.2 µV<br>0.014 % + 2.2 µV<br>0.03 % + 2.1 µV<br>0.08 % + 2.1 µV<br>0.3 % + 11 µV<br>1 % + 11 µV<br>1.5 % + 10 µV   | HP 3458A |
| 100 mV to 1 V                  | (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<br>(100 to 300) kHz<br>300 kHz to 1 MHz<br>(1 to 2) MHz | 75 µV/V + 43 µV<br>71 µV/V + 22 µV<br>0.014 % + 22 µV<br>0.03 % + 21 µV<br>0.08 % + 21 µV<br>0.3 % + 110 µV<br>1 % + 110 µV<br>1.5 % + 100 µV     |          |
| (1 to 10) V                    | (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<br>(100 to 300) kHz<br>300 kHz to 1 MHz<br>(1 to 2) MHz | 75 µV/V + 0.43 mV<br>71 µV/V + 0.22 mV<br>0.014 % + 0.22 mV<br>0.03 % + 0.21 mV<br>0.08 % + 0.21 mV<br>0.3 % + 1 mV<br>1 % + 1 mV<br>1.5 % + 1 mV |          |
| (10 to 100) V                  | (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<br>(100 to 300) kHz<br>300 kHz to 1 MHz                 | 0.021 % + 4 mV<br>0.02 % + 22 mV<br>0.02 % + 22 mV<br>0.035 % + 21 mV<br>0.12 % + 21 mV<br>0.4 % + 110 mV<br>1.5 % + 110 mV                       |          |
| (100 to 1000) V                | (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 % + 43 mV<br>0.04 % + 21 mV<br>0.06 % + 22 mV<br>0.12 % + 21 mV<br>0.3 % + 21 mV   |          |

| Parameter/Range       | Frequency   | CMC <sup>2,4</sup> (±)   | Comments    |
|-----------------------|---|--|-------------|
| AC Current – Generate |   |  |             |
| (22 to 220) µA        | (10 to 20) Hz<br>(20 to 40) Hz<br>40 Hz to 1 kHz<br>(1 to 5) kHz<br>(5 to 10) kHz | 0.024 % + 17 nA<br>0.015 % + 10 nA<br>0.011 % + 9 nA<br>0.026 % + 12 nA<br>0.091 % + 65 nA         | Fluke 5720A |
| 220 µA to 2.2 mA      | (10 to 20) Hz<br>(20 to 40) Hz<br>40 Hz to 1 kHz<br>(1 to 5) kHz<br>(5 to 10) kHz | 0.024 % + 41 nA<br>0.015 % + 36 nA<br>0.011 % + 38 nA<br>0.019 % + 120 nA<br>0.091 % + 650 nA      |             |
| (2.2 to 22) mA        | (10 to 20) Hz<br>(20 to 40) Hz<br>40 Hz to 1 kHz<br>(1 to 5) kHz<br>(5 to 10) kHz | 0.024 % + 0.42 µA<br>0.014 % + 0.36 µA<br>0.011 % + 0.36 µA<br>0.019 % + 0.55 µA<br>0.094 % + 5 µA |             |
| (22 to 220) mA        | (10 to 20) Hz<br>(20 to 40) Hz<br>40 Hz to 1 kHz<br>(1 to 5) kHz<br>(5 to 10) kHz | 0.024 % + 4.2 µA<br>0.014 % + 3.6 µA<br>0.011 % + 2.5 µA<br>0.019 % + 3.5 µA<br>0.094 % + 10 µA    |             |
| (3 to < 11) A         | (45 to 100) Hz<br>100 Hz to 1 kHz   | 0.05 % + 2 mA<br>0.08 % + 2 mA   |             |
| (11 to 20) A          | (45 to 100) Hz<br>100 Hz to 1 kHz   | 0.09 % + 5 mA<br>0.12 % + 5 mA   | Fluke 5522A |
| AC Current – Measure  |   |  |             |
| (12 to 120) µA        | (10 to 20) Hz<br>(20 to 45) Hz<br>(45 to 100) Hz<br>100 Hz to 1 kHz               | 0.41 % + 21 nA<br>0.16 % + 21 nA<br>0.06 % + 21 nA<br>0.06 % + 21 nA                               | HP 3458A    |

| Parameter/Range                | Frequency   | CMC <sup>2,4</sup> (±)  | Comments |
|--------------------------------|---|---|----------|
| AC Current – Measure<br>(cont) |   |   |          |
| 120 µA to 1.2 mA               | (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 | 0.41 % + 0.21 µA<br>0.16 % + 0.21 µA<br>0.06 % + 0.21 µA<br>0.03 % + 0.21 µA<br>0.06 % + 0.21 µA<br>0.41 % + 0.41 µA<br>0.57 % + 1.6 µA | HP 3458A |
| (1.2 to 12) mA                 | (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 | 0.41 % + 2.1 µA<br>0.16 % + 2.1 µA<br>0.06 % + 2.1 µA<br>0.03 % + 2.1 µA<br>0.06 % + 2.1 µA<br>0.41 % + 4.1 µA<br>0.57 % + 16 µA        |          |
| (12 to 120) mA                 | (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 | 0.41 % + 21 µA<br>0.16 % + 21 µA<br>0.06 % + 21 µA<br>0.03 % + 21 µA<br>0.06 % + 21 µA<br>0.41 % + 41 µA<br>0.57 % + 160 µA             |          |
| 120 mA to 1 A                  | (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                    | 0.41 % + 0.21 mA<br>0.16 % + 0.21 mA<br>0.08 % + 0.21 mA<br>0.10 % + 0.21 mA<br>0.31 % + 0.21 mA<br>1 % + 0.41 mA                       |          |

| Parameter/Equipment                  | Range   | CMC <sup>2</sup> (±)                                | Comments    |
|--------------------------------------|---|---|-------------|
| Thermocouple<br>Simulation – Measure |   |   |             |
| Type E                               | (-250 to -100) °C<br>(-100 to -25) °C<br>(-25 to 350) °C<br>(350 to 650) °C<br>(650 to 1000) °C | 0.38 °C<br>0.12 °C<br>0.11 °C<br>0.12 °C<br>0.16 °C | Fluke 5522A |



| Parameter/Equipment                            | Range   | CMC <sup>2</sup> (±)                                | Comments    |
|--|---|---|-------------|
| Thermocouple<br>Simulation – Measure<br>(cont) |   |   |             |
| Type J   | (-210 to -100) °C<br>(-100 to -30) °C<br>(-30 to 150) °C<br>(150 to 760) °C<br>(760 to 1200) °C   | 0.21 °C<br>0.12 °C<br>0.11 °C<br>0.13 °C<br>0.18 °C | Fluke 5522A |
| Type K   | (-200 to -100) °C<br>(-100 to -25) °C<br>(-25 to 120) °C<br>(120 to 1000) °C<br>(1000 to 1372) °C | 0.25 °C<br>0.14 °C<br>0.12 °C<br>0.20 °C<br>0.31 °C |             |
| Type R   | (0 to 250) °C<br>(250 to 400) °C<br>(400 to 1000) °C<br>(1000 to 1767) °C                         | 0.44 °C<br>0.27 °C<br>0.25 °C<br>0.31 °C            |             |
| Type S   | (0 to 250) °C<br>(250 to 1400) °C<br>(1400 to 1760) °C  | 0.36 °C<br>0.28 °C<br>0.35 °C                       |             |
| Type T   | (-250 to -150) °C<br>(-150 to 0) °C<br>(0 to 120) °C<br>(120 to 400) °C                           | 0.48 °C<br>0.19 °C<br>0.12 °C<br>0.11 °C            |             |
| RTD Simulation –                               |   |   |             |
| Pt 385, 100 Ω                                  | (-200 to 0) °C<br>(0 to 100) °C<br>(100 to 400) °C<br>(400 to 630) °C<br>(630 to 800) °C          | 0.04 °C<br>0.06 °C<br>0.08 °C<br>0.09 °C<br>0.18 °C | Fluke 5522A |
| Pt 3926, 100 Ω                                 | (-200 to 0) °C<br>(0 to 100) °C<br>(100 to 400) °C<br>(400 to 630) °C                             | 0.04 °C<br>0.06 °C<br>0.08 °C<br>0.09 °C            |             |

| Parameter/Equipment        | Range   | CMC <sup>2</sup> (±)   | Comments    |
|----------------------------|---|--|-------------|
| RTD Simulation –<br>(cont) |   |  |             |
| Pt 3916, 100 Ω             | (-200 to -190) °C<br>(-190 to 0) °C<br>(0 to 100) °C<br>(100 to 300) °C<br>(300 to 600) °C<br>(600 to 630) °C | 0.19 °C<br>0.04 °C<br>0.05 °C<br>0.06 °C<br>0.08 °C<br>0.18 °C | Fluke 5522A |

### III. Mechanical

(Calibration of force transducers, force gages, torque transducers, pressure transducers, pressure gages, vacuum transducers, vacuum gages, weight sets, and other general purpose mechanical M&TE.)

| Parameter/Equipment                     | Range                   | CMC <sup>2, 3, 7</sup> (±) | Comments   |
|---|-------------------------|----------------------------|--|
| Force –<br>(Tension and<br>Compression) | (1 to 25 000) lbf       | 0.01 %                     | Calibration per ISO<br>376, ASTM E74 and<br>EN10002-3<br><br>Primary deadweight<br>systems |
|   | (1000 to 240 000) lbf   | 0.05 %                     | Secondary force<br>systems   |
| Torque                                  | (5 to 2000) in·lbf      | 0.06 %                     | Calibration per<br>ASTM E2428<br><br>Deadweight and<br>torque arm system                   |
|   | (200 to 12 000) in·lbf  | 0.06 %                     | Deadweight and<br>torque arm system  |
|   | (400 to 100 000) in·lbf | 0.05 %                     | Torque transducer<br>system  |

| Parameter/Equipment            | Range  | CMC <sup>2, 3, 7</sup> (±)  | Comments                                |
|--------------------------------|--|---|---|
| Pressure – Measuring Equipment |  |   |   |
| Pneumatic                      | (4 to 400) psi   | 0.015 %   | Dead weight pressure calibrator         |
| Hydraulic                      | (10 to 10 000) psi   | 0.02 %  | Dead weight pressure calibrator         |
| Vacuum – Measuring Equipment   |  |   |   |
| Pneumatic                      | (3 to 29) inHg   | 0.02 %  | Dead weight vacuum calibrator           |
| Mass – Fixed Points            | (1, 2, 5, 10, 20) g<br>(50, 100) g<br>(200, 500, 1000) g<br>(2, 5) kg<br>(10, 20) kg<br><br>(0.1, 0.2) lb<br>(0.25, 0.5, 1, 2) lb<br>(5, 10) lb<br>(20, 50) lb | 0.3 mg<br>0.3 mg<br>3 mg<br>0.02 g<br>0.2 g<br><br>0.000 000 6 lb<br>0.000 01 lb<br>0.0001 lb<br>0.001 lb | Comparison to ASTM E617 Class 1 weights |



#### IV. Thermodynamic

(Calibration of temperature probes, thermometers, temperature meters, humidity meters, thermocouple and RTD instruments, recorders, and other general purpose temperature M&TE.)

| Parameter/Equipment            | Range  | CMC <sup>2,7</sup> (±)                           | Comments   |
|--------------------------------|--|--|--|
| Relative Humidity –<br>Measure | (10 to 75) % RH                                      | 2 % RH   | Humidity meter   |
| Measuring Equipment            | (10 to 90) % RH<br><br>11 % RH<br>33 % RH<br>75 % RH | 0.6 % RH<br><br>1.4 % RH<br>1.3 % RH<br>1.6 % RH | Humidity generator<br>(two-pressure)<br><br>Humidity calibrator<br>(saturated salts) |
| Temperature –<br>Measure       | (-100 to 400) °C                                     | 0.04 °C  | Thermometer w/ PRT   |
| Measuring Equipment            | 0 °C<br>(-5 to 200) °C<br>(50 to 400) °C             | 0.01 °C<br>0.1 °C<br>0.25 °C                     | Ice bath reference<br>Oil bath w/PRT<br>Dry well w/PRT                               |

#### V. Time & Frequency

(Calibration of counters, generators, oscillators, process calibrators, optical tachometers, and general purpose time and frequency M&TE.)

| Parameter/Equipment                | Range                         | CMC <sup>2,7</sup> (±)                              | Comments                        |
|------------------------------------|-------------------------------|---|---------------------------------|
| Frequency –<br>Measuring Equipment | (5, 10) MHz<br>1 Hz to 20 MHz | 1 x 10 <sup>-11</sup> Hz<br>1 x 10 <sup>-8</sup> Hz | Fluke 910 GPS<br>Agilent 33220A |
| Frequency – Measure                | 1 Hz to 225 MHz               | 1 x 10 <sup>-10</sup> Hz                            | Agilent 53131A                  |

## VI. Vibration

(Calibration of accelerometers, vibration transducers, velocity transducers, vibration instrumentation, portable shakers, vibration tables, vibration controllers and related systems, and other general purpose vibration M&TE.)

| Parameter/Equipment   | Range             | CMC <sup>2,3,7</sup> (±) | Comments                              |
|---|-------------------|--------------------------|---------------------------------------|
| Vibration – Measuring Equipment and Measure (Sensitivity or acceleration) | (3 to < 100) Hz   | 1.3 %                    | Accelerometer (LF) calibration system |
|   | ≥ 100 Hz to 1 kHz | 1.2 %                    |                                       |
|   | (5 to < 100) Hz   | 1.3 %                    | Accelerometer (HF) calibration system |
|   | ≥ 100 Hz to 1 kHz | 1.2 %                    |                                       |
| (> 1 to 5) kHz  | 1.4 %             |                          |                                       |
|   | (> 5 to 10) kHz   | 1.9 %                    |                                       |

<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> In the statement of CMC, the value is defined as the percentage of reading unless otherwise noted.

<sup>4</sup> The measurands stated are generated using the indicated instrument (see Comments). This capability is suitable for the calibration of the devices intended to measure the measurand in the ranges indicated. CMC's are expressed as either a specific value that covers the full range or as a fraction of the reading plus a fixed floor specification.

<sup>5</sup>  $L$  is the numerical value of the nominal length of the device measured in inches.

<sup>6</sup> This scope meets A2LA's *P112 Flexible Scope Policy*.

<sup>7</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.



## Accredited Laboratory

A2LA has accredited

# MTS METROLOGY AND CALIBRATION LABORATORY

*Eden Prairie, MN*

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/NCSLI 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 3<sup>rd</sup> day of May 2018.

A handwritten signature in black ink, written over a horizontal line.

President and CEO  
For the Accreditation Council  
Certificate Number 1044.01  
Valid to May 31, 2020

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