



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

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CALIBRATION

Valid To: November 30, 2024

Certificate Number: 4986.02

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations<sup>1, 8</sup>:

I. Dimensional

| Parameter/Equipment                                    | Range       | CMC <sup>2, 6</sup> (±)           | Comments                               |
|--|-------------|-----------------------------------|--|
| Calipers <sup>3</sup> –                                | Up to 60 in | $0.6R + (16L + 4.1) \mu\text{in}$ | CP-008, gage blocks                    |
| Micrometers –<br>External <sup>3</sup>                 | Up to 48 in | $0.6R + (3L + 10) \mu\text{in}$   | CP-010, gage blocks                    |
| Dial Indicator –<br>Mechanical/Electronic <sup>3</sup> | Up to 6 in  | $0.6R + (L + 33) \mu\text{in}$    | CP-009, gage blocks                    |
| Extensometer   | Up to 1 in  | 29 $\mu\text{in/inch}$            | CP-007, linear<br>calibrator           |
| Depth Gage <sup>3</sup>                                | Up to 8 in  | $0.6R + (16L + 4.1) \mu\text{in}$ | CP-115, gage blocks                    |
| Ring Gage  | Up to 6 in  | $(11L + 22) \mu\text{in}$         | CP-115, comparator<br>with gage blocks |

| Parameter/Equipment                 | Range  | CMC <sup>2, 6</sup> (±)          | Comments   |
|-------------------------------------|--|----------------------------------|--|
| Plug Gages                          | Up to 4 in   | $(13L + 46) \mu\text{in}$        | CP-115, gage blocks & comparator                                       |
| Pin Gages                           | Up to 4 in   | $(13L + 46) \mu\text{in}$        | CP-115, super mic, gage blocks   |
| Thread Plug Gages<br>Pitch Diameter | Up to 4 in   | 98 $\mu\text{in}$                | CP-115, super mic, gage blocks   |
| Micrometer Standards                | Up to 6 in<br>(> 6 to 12) in<br>(> 12 to 24) in<br>(> 24 to 36) in | $(15L + 18) \mu\text{in}$        | CP-115, height master, riser blocks, gage blocks, & electronic pick-up |
| Electronic Indicators               | 0.25 in  | $0.6R + 6 \mu\text{in}$          | CP-115, gage blocks  |
| Height Gages <sup>3</sup>           | Up to 40 in  | $0.6R + (8L + 220) \mu\text{in}$ | CP-115, end standards & electronic pick-up with $\mu$ -checker         |
| Rulers <sup>3</sup>                 | Up to 84 in  | $(62L + 56) \mu\text{in}$        | CP-115, gage blocks  |
| Tape Measures <sup>3</sup>          | Up to 100 ft   | $0.6R + (62L + 81) \mu\text{in}$ | CP-115, standard rule, gage blocks                                     |
| Riser Blocks                        | Up to 12 in  | $(8.4L + 150) \mu\text{in}$      | CP-115, gage blocks and $\mu$ -checker                                 |
| Microscope <sup>3</sup>             | X to Y Range:<br>(6 x 4) in<br>0.0001 in Resolution                | 1600 $\mu\text{in}$              | CP-115, gage blocks and image reticles                                 |

| Parameter/Equipment   | Range       | CMC <sup>2, 6, 9</sup> (±) | Comments                                     |
|---|-------------|----------------------------|--|
| Super Micrometer <sup>3</sup>   | Up to 1 in  | 7 μin                      | CP-115, gage blocks                          |
| Precision Levels  | Up to 12 in | 0.000 42 in/10 in          | CP-115, sine bar, surface plate, gage blocks |
| Protractor  | (0 to 340)° | 0.013°                     | CP-115, angle gage blocks                    |
| Displacement Measurement <sup>3</sup> –<br>(Feeler Gages, Film Thickness, Etc.) | Up to 24 in | (15L + 18) μin             | CP-115                                       |

## II. Dimensional Inspection

| Parameter/Equipment                        | Range       | CMC <sup>2</sup> (±) | Comments  |
|--|-------------|----------------------|---|
| 1 – Dimensional Inspection <sup>3, 4</sup> | Up to 12 in | 650 μin              | CP-115, ASTM & AASHTO procedures, calipers, rulers, straight edges, & gage blocks |

## III. Construction Material Laboratory Equipment

| Parameter/Equipment  | Range                                   | CMC <sup>2, 9</sup> (±)         | Comments   |
|--|---|---------------------------------|------------|
| CBR Mold & Spacer <sup>3</sup> –<br>Dimensions<br>Volume     | Up to 8 in<br>Up to 184 in <sup>3</sup> | 650 μin<br>0.13 in <sup>3</sup> | ASTM D1883 |
| Conical Mold & Tamper <sup>3</sup> –<br>Dimensions<br>Weight | Up to 3.5 in<br>Up to 340 g             | 650 μin<br>0.13 g               | ASTM C128  |

| Parameter/Equipment   | Range  | CMC <sup>2,9</sup> (±)                              | Comments                                      |
|---|--|---|---|
| Compactor Marshall & Proctor <sup>3</sup> –<br>Height of Drop<br>Weight<br>Rammer Diameter  | Up to 18 in<br>Up to 10 lbs<br>Up to 4 in                                  | 0.002 in<br>0.016 lbs<br>650 μin                    | ASTM D6926, ASTM D698, ASTM D1557, ASTM D1883 |
| LA Abrasion Machine <sup>3</sup> –<br>Inside Diameter<br>Inside Length<br>Average Dia. of Charge<br>Average Mass of Charge<br>Rotation Per Minute | Up to 28 in<br>Up to 20 in<br>Up to 1.85 in<br>Up to 455 g<br>Up to 33 rpm | 800 μin<br>400 μin<br>650 μin<br>0.13 g<br>0.08 rpm | ASTM C131, ASTM C535                          |
| Liquid Limit Device & Groover <sup>3</sup> –<br>Dimensions<br>Weight of Cup & Hanger  | Up to 150 mm<br>Up to 215 g  | 0.02 mm<br>0.13 g                                   | ASTM D4318                                    |
| Molds Cylinder <sup>3</sup> –<br>Height<br>Diameter   | Up to 12 in<br>Up to 6 in  | 650 μin<br>650 μin                                  | ASTM C470                                     |
| Molds Marshall <sup>3</sup> –<br>Dimensions   | Up to 4 in   | 650 μin   | ASTM D6926                                    |
| Molds Mortar Cubes <sup>3</sup> –<br>Dimensions   | Up to 2 in   | 650 μin   | ASTM C109                                     |

| Parameter/Equipment   | Range  | CMC <sup>2, 5</sup> (±)                                 | Comments              |
|---|--|---|-----------------------|
| Molds Proctor <sup>3</sup> –<br>Volume<br>Dimensions  | Up to 3000 ml<br>Up to 5.9 in  | 0.01 %<br>650 μin                                       | ASTM D698, ASTM D1557 |
| Graduated Cylinder <sup>3</sup> –<br>Volume   | Up to 0.1 ft <sup>3</sup>  | 0.01 %  | ASTM E542             |
| Slump Cone & Tamping Rod <sup>3</sup> –<br>Cone Diameter<br>Cone Height<br>Cone Thickness<br>Rod Diameter<br>Rod Length | Up to 8 in<br>Up to 12 in<br>Up to 0.12 in<br>Up to 0.63 in<br>Up to 24 in | 650 μin<br>650 μin<br>650 μin<br>650 μin<br>Up to 24 in | ASTM C143             |
| Concrete Air Meter (Pressure Method) <sup>3</sup>   | Up to 10 of Air in Concrete  | 0.82 %  | ASTM C231             |

#### IV. Electrical DC/Low Frequency

| Parameter/Range  | Frequency   | CMC <sup>2, 5</sup> (±)   | Comments                         |
|--|---|---|----------------------------------|
| AC Current – Generate <sup>3</sup><br>(0.029 to 0.329 99) mA | (10 to 20) Hz<br>(20 to 45) Hz<br>45 Hz to 1 kHz<br>(1 to 5) kHz<br>(5 to 10) kHz | 0.28 % + 0.18 μA<br>0.15 % + 0.17 μA<br>0.15 % + 0.29 μA<br>0.46 % + 0.17 μA<br>1.5 % + 0.17 μA | CP-033, multifunction calibrator |

| Parameter/Range                              | Frequency   | CMC <sup>2,5</sup> (±)   | Comments                         |
|--|---|--|----------------------------------|
| AC Current – Generate <sup>3</sup><br>(cont) |   |  |                                  |
| (0.33 to 3.2999) mA                          | (10 to 20) Hz<br>(20 to 45) Hz<br>45 Hz to 1 kHz<br>(1 to 5) kHz<br>(5 to 10) kHz | 0.23 % + 0.47 μA<br>0.12 % + 0.4 μA<br>0.12 % + 0.4 μA<br>0.23 % + 0.4 μA<br>0.69 % + 0.3 μA | CP-033, multifunction calibrator |
| (3.3 to 32.999) mA                           | (10 to 20) Hz<br>(20 to 45) Hz<br>45 Hz to 1 kHz<br>(1 to 5) kHz<br>(5 to 10) kHz | 0.23 % + 4 μA<br>0.12 % + 3.5 μA<br>0.11 % + 3.4 μA<br>0.23 % + 3.5 μA<br>0.7 % + 3.4 μA     |                                  |
| (33 to 329.99) mA                            | (10 to 20) Hz<br>(20 to 45) Hz<br>45 Hz to 1 kHz<br>(1 to 5) kHz<br>(5 to 10) kHz | 0.23 % + 41 μA<br>0.12 % + 36 μA<br>0.11 % + 37 μA<br>0.23 % + 35 μA<br>0.7 % + 35 μA        |                                  |
| (0.33 to 2.199 99) A                         | (10 to 20) Hz<br>45 Hz to 1 kHz<br>(1 to 5) kHz                                   | 0.23 % + 350 μA<br>0.12 % + 350 μA<br>0.87 % + 350 μA  |                                  |
| (2.2 to 11) A                                | (45 to 65) Hz<br>(65 to 500) Hz<br>500 Hz to 1 kHz                                | 0.07 % + 2400 μA<br>0.12 % + 2400 μA<br>0.38 % + 2400 μA                                     |                                  |
| (11 to 550) A                                |   |  |                                  |
| Toroidal                                     | (40 to 400) Hz  | 1.3 % + 120 mA   |                                  |
| Other Clamps                                 | (40 to 400) Hz  | 1.5 % + 1 A  |                                  |

| Parameter/Range                    | Frequency   | CMC <sup>2, 5</sup> ( $\pm$ )  | Comments                         |
|------------------------------------|---|--|----------------------------------|
| AC Current – Measure <sup>3</sup>  |   |  |                                  |
| (0 to 200) $\mu$ A                 | (1 to 10) Hz<br>10 Hz to 10 kHz<br>(10 to 30) kHz<br>(30 to 100) kHz  | 0.017 % + 46 nA<br>0.029 % + 26 nA<br>0.065 % + 25 nA<br>0.44 % + 24 nA  | CP-033, Fluke 8508A              |
| (0.200 to 200) mA                  | (1 to 10) Hz<br>10 Hz to 10 kHz<br>(10 to 30) kHz<br>(30 to 100) kHz  | 0.015 % + 47 nA<br>0.029 % + 26 nA<br>0.065 % + 25 nA<br>0.44 % + 25 nA  |                                  |
| > 200 mA to 2 A                    | 10 Hz to 2 kHz<br>(2 to 10) kHz<br>(10 to 30) kHz   | 0.029 % + 230 $\mu$ A<br>0.029 % + 230 $\mu$ A<br>0.07 % + 230 $\mu$ A   |                                  |
| (> 2 to 20) A                      | 10 Hz to 2 kHz<br>(2 to 10) kHz   | 0.09 % + 2.3 $\mu$ A<br>0.29 % + 2.3 mA  |                                  |
| (0 to 2500) A                      | 60 Hz   | 0.33 % + 110 mA  |                                  |
| AC Voltage – Generate <sup>3</sup> |   |  |                                  |
| (1.0 to 32.99) mV                  | (10 to 45) Hz<br>45 Hz to 10 kHz<br>(10 to 20) kHz<br>(20 to 50) kHz<br>(50 to 100) kHz<br>(100 to 500) kHz | 0.4 % + 23 $\mu$ V<br>0.17 % + 23 $\mu$ V<br>0.23 % + 23 $\mu$ V<br>0.29 % + 23 $\mu$ V<br>0.4 % + 38 $\mu$ V<br>1.1 % + 95 $\mu$ V      | CP-033, multifunction calibrator |
| (33 to 329.999) mV                 | (10 to 45) Hz<br>45 Hz to 10 kHz<br>(10 to 20) kHz<br>(20 to 50) kHz<br>(50 to 100) kHz<br>(100 to 500) kHz | 0.29 % + 58 $\mu$ V<br>0.057 % + 25 $\mu$ V<br>0.12 % + 24 $\mu$ V<br>0.18 % + 47 $\mu$ V<br>0.28 % + 200 $\mu$ V<br>0.8 % + 380 $\mu$ V |                                  |
| (0.33 to 3.299 99) V               | (10 to 45) Hz<br>45 Hz to 10 kHz<br>(10 to 20) kHz<br>(20 to 50) kHz<br>(50 to 100) kHz<br>(100 to 500) kHz | 0.17 % + 360 $\mu$ V<br>0.034 % + 67 $\mu$ V<br>0.09 % + 100 $\mu$ V<br>0.16 % + 360 $\mu$ V<br>0.28 % + 1.9 mV<br>0.58 % + 3.8 mV       |                                  |

| Parameter/Range                              | Frequency  | CMC <sup>2,5</sup> (±)  | Comments                               |
|--|--|---|--|
| AC Voltage – Generate <sup>3</sup><br>(cont) |  |   |  |
| (3.3 to 32.9999) V                           | (10 to 45) Hz<br>45 Hz to 10 kHz<br>(10 to 20) kHz<br>(20 to 50) kHz<br>(50 to 100) kHz  | 0.17 % + 650 μV<br>0.046 % + 0.8 mV<br>0.09 % + 3.1 mV<br>0.22 % + 5.9 mV<br>0.28 % + 20 mV   | CP-033,<br>multifunction<br>calibrator |
| (33 to 329.999) V                            | 45 Hz to 1 kHz<br>(1 to 10) kHz<br>(10 to 20) kHz  | 0.06 % + 1.4 mV<br>0.09 % + 1.4 mV<br>0.1 % + 1.1 mV  |  |
| (330 to 1020) V                              | 45 Hz to 1 kHz<br>(1 to 5) kHz<br>(5 to 10) kHz  | 0.06 % + 180 μV<br>0.23 % + 130 μV<br>0.23 % + 640 μV   |  |
| AC Voltage – Measure <sup>3</sup>            |  |   |  |
| (0 to 200) mV                                | (1 to 10) Hz<br>(10 to 40) Hz<br>(40 to 100) Hz<br>100 Hz to 2 kHz<br>(2 to 10) kHz<br>(10 to 30) kHz<br>(30 to 100) kHz   | 0.014 % + 17 μV<br>0.014 % + 5 μV<br>0.012 % + 4.6 μV<br>0.012 % + 2.3 μV<br>0.012 % + 5 μV<br>0.04 % + 9.3 μV<br>0.08 % + 23 μV  | CP-033, Fluke<br>8508A                 |
| > 200 mV to 200 V                            | (1 to 10) Hz<br>(10 to 40) Hz<br>(40 to 100) Hz<br>100 Hz to 2 kHz<br>(2 to 10) kHz<br>(10 to 30) kHz<br>(30 to 100) kHz<br>(100 to 300) kHz<br>300 kHz to 1 MHz | 0.012 % + 14 μV<br>0.012 % + 2.3 μV<br>0.01 % + 2.3 μV<br>0.007 % + 2.3 μV<br>0.009 % + 2.3 μV<br>0.023 % + 4.6 μV<br>0.06 % + 23 μV<br>0.35 % + 230 μV<br>1.2 % + 2.3 mV |  |
| (> 200 to 1050) V                            | (1 to 10) Hz<br>(10 to 40) Hz<br>40 Hz to 10 kHz<br>(10 to 30) kHz<br>(30 to 100) kHz  | 0.012 % + 60 mV<br>0.012 % + 17 mV<br>0.009 % + 17 mV<br>0.023 % + 35 mV<br>0.058 % + 170 mV  |  |
| (> 1 to 20) kV                               | (20 to 100) Hz   | 0.05 % + 5 V  | Precision HV meter                     |



| Parameter/Equipment                 | Range   | CMC <sup>2, 5</sup> (±)   | Comments   |
|-------------------------------------|---|---|--|
| Capacitance – Generate <sup>3</sup> | (0.33 to 0.4999) nF<br>(0.5 to 1.0999) nF<br><br>(1.1 to 3.2999) nF<br>(3.3 to 10.999) nF<br>(11 to 32.999) nF<br>(33 to 109.99) nF<br>(110 to 329.99) nF<br>(0.33 to 1.0999) μF<br>(1.1 to 3.2999) μF<br>(3.3 to 10.999) μF<br>(11 to 32.999) μF<br>(33 to 109.99) μF<br>(110 to 329.99) μF<br>(330 to 1.1) mF | 0.56 % + 12 pF<br>0.57 % + 12 pF<br><br>0.58 % + 12 pF<br>0.56 % + 15 pF<br>0.29 % + 120 pF<br>0.29 % + 120 pF<br>0.29 % + 350 pF<br>0.29 % + 1.2 nF<br>0.4 % + 3.5 nF<br>0.4 % + 12 nF<br>0.46 % + 35 nF<br>0.58 % + 120 nF<br>0.81 % + 350 nF<br>1.2 % + 350 nF | CP-033, standard capacitor, decade capacitor<br><br>Multifunction calibrator |
| DC Current – Generate <sup>3</sup>  | 0 to 3.299 99) mA<br>(3.3 to 32.9999) mA<br>(33 to 329.999) mA<br>330 mA to 2.199 99 A<br>(2.2 to 11) A<br><br>(11 to 16.5) A<br>(16.5 to 150) A<br>(150 to 500) A  | 0.013 % + 0.5 μA<br>0.01 % + 0.2 μA<br>0.01 % + 3.4 μA<br>0.03 % + 60 μA<br>0.05 % + 0.5 mA<br><br>0.29 % + 2.3 mA<br>0.29 % + 17 mA<br>0.29 % + 58 mA  | CP-033, multifunction calibrator<br><br>Fluke 5500A/coil 50 turns            |
| DC Current – Measure <sup>3</sup>   | (0 to 2) mA<br>(> 2 to 20) mA<br>(> 20 to 200) mA<br>> 200 mA to 2 A<br>(> 2 to 20) A<br><br>(0 to 2500) A  | 6.5 μA/A + 0.4nA<br>6.5 μA/A + 4 nA<br>8 μA/A + 40 nA<br>170 μA/A + 16 μA<br>370 μA/A + 600 μA<br><br>430 μA/A + 680 μA   | CP-033, Fluke 8508A<br><br>Current shunt & DMM                               |
| DC Voltage – Generate <sup>3</sup>  | (0 to 329.9999) mV<br>330 mV to 3.299 999 V<br>(3.3 to 32.999 99) V<br>(33 to 329.9999) V<br>(100 to 1020) V  | 60 μV/V + 3 μV<br>50 μV/V + 5 μV<br>50 μV/V + 50 μV<br>55 μV/V + 500 μV<br>55 μV/V + 1.5 mV   | CP-033, multifunction calibrator   |

| Parameter/Equipment                | Range  | CMC <sup>2,5</sup> (±)  | Comments  |
|------------------------------------|--|---|---|
| DC Voltage – Measure <sup>3</sup>  | (0 to 200) mV<br>> 200 mV to 2 V<br>(> 2 to 20) V<br>(> 20 to 200) V<br>(> 200 to 1000) V<br><br>(20 to 20 000) V  | 2.7 μV/V + 100 nV<br>2.7 μV + 0.4 μV<br>2.7 μV + 4 μV<br>4 μV + 40 μV<br>4 μV + 0.5 mV<br><br>0.024 % + 39 mV   | CP-033, Fluke 8508A<br><br><br><br><br><br>Precision HV meter |
| Resistance – Generate <sup>3</sup> | (0 to 10.99) Ω<br>(11 to 32.999) Ω<br>(33 to 109.999) Ω<br>(110 to 329.999) Ω<br>330 Ω to 1.099 99 kΩ<br>(1.1 to 3.299 99) kΩ<br>(3.3 to 10.9999) kΩ<br>(11 to 32.9999) kΩ<br>(33 to 109.999) kΩ<br>(110 to 329.999) kΩ<br>330 kΩ to 1.099 99 MΩ<br>(1.1 to 3.299 99) MΩ<br>(3.3 to 10.9999) MΩ<br>(11 to 32.9999) MΩ<br>(33 to 109.999) MΩ<br>(110 to 330) MΩ | 0.014 % + 0.009 Ω<br>0.14 % + 0.017 Ω<br>0.01 % + 0.017 Ω<br>0.01 % + 0.017 Ω<br>0.01 % + 0.07 Ω<br>0.004 % + 0.6 Ω<br>0.009 % + 0.9 Ω<br>0.01 % + 0.8 Ω<br>0.013 % + 7 Ω<br>0.014 % + 7 Ω<br>0.017 % + 64 Ω<br>0.009 % + 610 Ω<br>0.069 % + 730 Ω<br>0.12 % + 660 Ω<br>0.58 % + 6.4 kΩ<br>0.58 % + 20 kΩ | CP-033, multifunction calibrator                              |
| Resistance – Measure <sup>3</sup>  | (0 to 2) Ω<br>(> 2 to 20) Ω<br>(> 20 to 200) Ω<br>> 200 Ω to 2 kΩ<br>(> 2 to 20) kΩ<br>(> 20 to 200) kΩ<br>> 200 kΩ to 2 MΩ<br>(> 2 to 20) MΩ<br>(> 20 to 200) MΩ<br>> 200 MΩ to 2 GΩ<br>(> 2 to 20) GΩ  | 2 μΩ/Ω + 96 μΩ<br>5 μΩ/Ω + 120 μΩ<br>6.7 μΩ/Ω + 390 μΩ<br>6 μΩ/Ω + 790 μΩ<br>8 μΩ/Ω + 5.8 mΩ<br>8.1 μΩ/Ω + 58 mΩ<br>8 μΩ/Ω + 580 mΩ<br>8.1 μΩ/Ω + 1.2 kΩ<br>10 μΩ/Ω + 120 Ω<br>35 μΩ/Ω + 120 kΩ<br>35 μΩ/Ω + 1.2 MΩ   | CP-033, Fluke 8508A   |

| Parameter/Equipment                                   | Range             | CMC <sup>2</sup> (±) | Comments                                  |
|---|-------------------|----------------------|---|
| Electrical Simulation of Thermocouples <sup>3</sup> – |                   |                      |   |
| Type B  | (600 to 800) °C   | 0.77 °C              | CP-013, 5500A<br>multifunction calibrator |
|   | (800 to 1000) °C  | 0.72 °C              |   |
|   | (1000 to 1550) °C | 0.70 °C              |   |
|   | (1550 to 1800) °C | 0.71 °C              |   |
| Type C  | (0 to 150) °C     | 0.32 °C              |   |
|   | (150 to 650) °C   | 0.27 °C              |   |
|   | (650 to 1000) °C  | 0.32 °C              |   |
|   | (1000 to 1800) °C | 0.50 °C              |   |
|   | (1800 to 2316) °C | 0.84 °C              |   |
| Type E  | (-250 to -100) °C | 0.50 °C              |   |
|   | (-100 to -25) °C  | 0.18 °C              |   |
|   | (-25 to 350) °C   | 0.15 °C              |   |
|   | (350 to 650) °C   | 0.17 °C              |   |
|   | (650 to 1000) °C  | 0.23 °C              |   |
| Type J  | (-210 to -100) °C | 0.28 °C              |   |
|   | (-100 to -30) °C  | 0.21 °C              |   |
|   | (-30 to 150) °C   | 0.15 °C              |   |
|   | (150 to 760) °C   | 0.19 °C              |   |
|   | (760 to 1200) °C  | 0.24 °C              |   |
| Type K  | (-200 to -100) °C | 0.34 °C              |   |
|   | (-100 to -25) °C  | 0.19 °C              |   |
|   | (-25 to 120) °C   | 0.17 °C              |   |
|   | (120 to 1000) °C  | 0.27 °C              |   |
|   | (1000 to 1372) °C | 0.41 °C              |   |
| Type L  | (-200 to -100) °C | 0.43 °C              |   |
|   | (-100 to 800) °C  | 0.31 °C              |   |
|   | (800 to 900) °C   | 0.20 °C              |   |
| Type N  | (-200 to -100) °C | 0.40 °C              |   |
|   | (-100 to -25) °C  | 0.21 °C              |   |
|   | (-25 to 120) °C   | 0.20 °C              |   |
|   | (120 to 410) °C   | 0.20 °C              |   |
|   | (410 to 1300) °C  | 0.28 °C              |   |

| Parameter/Equipment   | Range  | CMC <sup>2</sup> (±)                                | Comments                                  |   |
|---|--|---|---|---|
| Electrical Simulation of Thermocouples <sup>3</sup> (cont)– |  |   |   |   |
| Type R  | (0 to 250) °C<br>(250 to 400) °C<br>(400 to 1000) °C<br>(1000 to 1767) °C                  | 0.85 °C<br>0.72 °C<br>0.71 °C<br>0.75 °C            | CP-013, 5500A<br>multifunction calibrator |   |
| Type S  | (0 to 250) °C<br>(250 to 1000) °C<br>(1000 to 1400) °C<br>(1400 to 1767) °C                | 0.55 °C<br>0.35 °C<br>0.33 °C<br>0.40 °C            |   |   |
| Type T  | (-250 to -150) °C<br>(-150 to 0) °C<br>(0 to 120) °C<br>(120 to 400) °C                    | 0.64 °C<br>0.25 °C<br>0.17 °C<br>0.15 °C            |   |   |
| Electrical Simulation of RTDs <sup>3</sup> –                |  |   |   |   |
| Pt 385, 100 Ω   | (-200 to 0) °C<br>(0 to 100) °C<br>(100 to 300) °C<br>(300 to 630) °C<br>(630 to 800) °C   | 0.07 °C<br>0.09 °C<br>0.10 °C<br>0.12 °C<br>0.25 °C |   | CP-013, 5500A<br>multifunction calibrator |
| Pt 3926, 100 Ω  | (-200 to 0) °C<br>(0 to 300) °C<br>(300 to 630) °C   | 0.11 °C<br>0.14 °C<br>0.16 °C                       |   |   |
| Pt 3916, 100 Ω  | (-200 to -190) °C<br>(-190 to 0) °C<br>(0 to 260) °C<br>(260 to 600) °C<br>(600 to 630) °C | 0.25 °C<br>0.05 °C<br>0.07 °C<br>0.10 °C<br>0.23 °C |   |   |
| Pt 385, 200 Ω   | (-200 to 260) °C<br>(260 to 600) °C<br>(600 to 630) °C                                     | 0.12 °C<br>0.13 °C<br>0.15 °C                       |   |   |

| Parameter/Equipment                               | Range  | CMC <sup>2</sup> (±)          | Comments                                  |
|---|--|-------------------------------|---|
| Electrical Simulation of RTDs <sup>3</sup> (cont) |  |                               |   |
| Pt 385, 500 Ω                                     | (-200 to 260) °C<br>(260 to 400) °C<br>(400 to 630) °C | 0.12 °C<br>0.13 °C<br>0.15 °C | CP-013, 5500A<br>multifunction calibrator |
| Pt 385, 1000 Ω                                    | (-200 to 260) °C<br>(260 to 600) °C<br>(600 to 630) °C | 0.14 °C<br>0.15 °C<br>0.27 °C |   |
| Pt Ni 385, 120 Ω                                  | (-80 to 100) °C<br>(100 to 260) °C                     | 0.13 °C<br>0.17 °C            |   |

#### V. Fluid Quantities

| Parameter/Equipment                         | Range            | CMC <sup>2,7</sup> (±) | Comments   |
|---|------------------|------------------------|--|
| Rotational/Cups<br>Viscometers <sup>3</sup> | Up to 150 000 cp | 0.6 % cp               | CP-100, certified viscosity<br>reference standards |

#### VI. Mechanical

| Parameter/Equipment                    | Range                          | CMC <sup>2,7</sup> (±) | Comments   |
|--|--------------------------------|------------------------|--|
| Test Machine<br>Alignment <sup>3</sup> | Up to 30 000 lbf Axial<br>Load | 1.1 % Bending          | CP-096, ASTM E1012<br>strain recorder & strain<br>gauge bars |

| Parameter/Equipment  | Range  | CMC <sup>2, 7, 9</sup> (±)  | Comments   |
|--|--|---|--|
| Mass   | 5 kg<br>2 kg<br>1 kg<br>100 g<br>50 g<br>30 g<br>20 g<br>10 g<br>5 g<br>3 g<br>2 g<br>1 g<br>500 mg<br>300 mg<br>200 mg<br>100 mg<br>50 mg<br>30 mg<br>20 mg<br>10 mg<br>50 lb | 58 mg<br>58 mg<br>1.6 mg<br>0.15 mg<br>0.07 mg<br>0.04 mg<br>0.03 mg<br>0.031 mg<br>0.023 mg<br>0.022 mg<br>0.02 mg<br>0.021 mg<br>0.013 mg<br>0.008 mg<br>0.008 mg<br>0.01 mg<br>0.021 mg<br>0.013 mg<br>0.01 mg<br>0.015 mg<br>140 mg | CP-019, analytical balance   |
| Mass – Direct Measure <sup>3</sup>                                     | Up to 34 kg  | 2 g   | CP-019, precision balance  |
| Force – Compression <sup>3</sup><br>Measure and Measuring<br>Equipment | Up to 2000) lbf<br>(2000 to 10 000) lbf<br>(10 000 to 50 000) lbf<br>(50 000 to 100 000) lbf<br><br>(100 000 to 600 000) lbf<br>(600 000 to 1 000 000) lbf                     | 0.19 %<br>0.19 %<br>0.19 %<br>0.19 %<br><br>0.2 %<br>0.45 %   | CP-001, gram force gages, dead weights<br><br>ASTM E4 method using load cells & dead weights |
| Force – Tension <sup>3</sup><br>Measure and Measuring<br>Equipment     | Up to 200 000 lbf  | 0.2 %   | CP-001, ASTM E4 method using load cells & dead weights                                       |

| Parameter/Equipment   | Range      | CMC <sup>2</sup> (±) | Comments   |
|---|------------|----------------------|--|
| Indirect Validation of Rockwell Hardness Testers <sup>3</sup> | HRC:       |                      | CP-004, indirect method (ASTM E18) standard hardness test blocks |
|   | Low        | 0.54 HRC             |  |
|   | Medium     | 0.48 HRC             |  |
|   | High       | 0.48 HRC             |  |
|   | HRA:       |                      |  |
|   | Low        | 0.26 HRA             |  |
|   | Medium     | 0.24 HRA             |  |
|   | High       | 0.20 HRA             |  |
|   | HRBW:      |                      |  |
|   | Low        | 0.36 HRB             |  |
|   | Medium     | 0.37 HRB             |  |
|   | High       | 0.44 HRB             |  |
|   | HR15N:     |                      |  |
|   | Low        | 0.47 HR15N           |  |
|   | Medium     | 0.29 HR15N           |  |
|   | High       | 0.30 HR15N           |  |
|   | HR30N:     |                      |  |
|   | Low        | 0.46 HR30N           |  |
|   | Medium     | 0.44 HR30N           |  |
|   | High       | 0.32 HR30N           |  |
|   | HR45N:     |                      |  |
|   | Low        | 0.50 HR45N           |  |
|   | Medium     | 0.23 HR45N           |  |
|   | High       | 0.24 HR45N           |  |
| HR15T:  |            |                      |  |
| Low   | 0.46 HR15T |                      |  |
| Medium  | 0.40 HR15T |                      |  |
| High  | 0.38 HR15T |                      |  |
| HR30T:  |            |                      |  |
| Low   | 0.58 HR30T |                      |  |
| Medium  | 0.39 HR30T |                      |  |
| High  | 0.40 HR30T |                      |  |
| HR45T:  |            |                      |  |
| Low   | 0.64 HR45T |                      |  |
| Medium  | 0.64 HR45T |                      |  |
| High  | 0.46 HR45T |                      |  |

| Parameter/Equipment  | Range   | CMC <sup>2, 6, 7, 9</sup> (±)        | Comments  |
|--|---|--------------------------------------|---|
| Durometer –<br>Type A, B, O <sup>3</sup><br><br>Type C, D, DO <sup>3</sup> | Up to 100 Points<br>(56.08 to 820.87) g<br><br>Up to 100 Points<br>Up to 4.53 kg              | 4.7 grams<br><br>26 grams            | CP-017, electronic<br>balance   |
| Durometer –<br>Indenter Calibration <sup>3</sup>                           | (0.096 to 0.100) in   | 0.000 32 in                          | CP-017, gage blocks   |
| Precision Balances <sup>3</sup>  | Up to 500 g<br>501 g to 35 kg   | 0.6R + 0.000 14 %<br>0.6R + 0.01 %   | CP-002, ultra class<br>weights  |
| Platform Scales <sup>3</sup>   | Up to 50 lb<br>(51 to 500) lb<br>(501 to 5000) lb   | 0.6R + 0.01 %                        | CP-002, Class F weights   |
| Pressure <sup>3</sup> –<br><br>Hydraulic<br><br>Pneumatic                  | (0.59 to 10 000) psi<br>Up to 200 in·H <sub>2</sub> O<br><br>Up to 2000 in·H <sub>2</sub> O   | 0.016 %<br>0.037 %<br><br>0.013 %    | CP-003, hydraulic dead<br>weight tester<br><br>Pneumatic digital<br>pressure indicator<br>using digital pressure<br>gauge |
| Volume – Volume<br>Measurement <sup>3</sup>                                | Up to 0.01 ft <sup>3</sup><br>(0.01 to 0.05) ft <sup>3</sup><br>(0.05 to 1.2) ft <sup>3</sup> | 0.09 %<br>0.027 %<br>0.014 %         | CP-038 thermometer,<br>balance  |
| Vacuum – Measure <sup>3</sup>  | Up to 30 in·Hg  | 0.03 %                               | CP-003, vacuum gage,<br>digital gage  |
| Torque – Measure <sup>3</sup>  | (0 to 50) lbf·in<br>(> 50 to 750) lbf·in<br>(25 to 250) lbf·ft<br>(> 250 to 1000) lbf·ft      | 0.55 %<br>0.55 %<br>0.56 %<br>0.59 % | CP-006, torque<br>transducer  |



## VII. Thermodynamics

| Parameter/Equipment  | Range  | CMC <sup>2,7,9</sup> (±)                                 | Comments                                     |
|--|--|--|--|
| Humidity – Measure <sup>3</sup>  | (20 to 75) % RH<br>(75 to 95) %  | 1.5 %<br>1.9 %   | CP-012, digital hygrometer thermometer       |
| Thermal Ovens, Freezers, Environmental Chambers, Autoclaves, Water Baths, & Sealers <sup>3</sup> | (-100 to 0) °C<br>(0 to 100) °C<br>(100 to 200) °C<br>(200 to 400) °C<br>(400 to 600) °C | 0.3 °C<br>0.11 °C<br>0.14 °C<br>0.16 °C<br>0.17 °C       | CP-011, thermocouple/RTD meters              |
| Thermometers <sup>3</sup>  | (-40 to 0) °C<br>(0 to 100) °C<br>(100 to 200) °C<br>(200 to 400) °C<br>(400 to 600) °C  | 0.062 °C<br>0.028 °C<br>0.043 °C<br>0.050 °C<br>0.066 °C | CP-012, thermocouple/RTD meters              |
| IR Thermometers/Pyrometers <sup>3</sup>  | (50 to 500) °C   | 5.3 °C   | CP-012, black body, PRT, reference pyrometer |
| Conductivity – Generate <sup>3</sup>   | 98.80 μS/cm<br>9.21 μS/cm  | 2.3 μS/cm<br>0.57 μS/cm                                  | CP-024 conductivity standards                |

## VIII. Time & Frequency

| Parameter/Equipment              | Range              | CMC <sup>2,9</sup> (±) | Comments                                     |
|----------------------------------|--------------------|------------------------|--|
| Frequency – Measure <sup>3</sup> | 0.33 ns to 10 s    | 520 ns                 | Universal counter                            |
| Frequency – Source <sup>3</sup>  | 0.01 Hz to 600 MHz | 29 μHz/Hz + 17 mHz     | Multifunction calibrator<br>Scope calibrator |
| Time Verification <sup>3</sup>   | (Up to 10) Hr      | 0.06 s/d               | Stopwatch                                    |
| Stopwatches, Timers <sup>3</sup> | 24 Hr              | 34 ms                  | Vibrograf TM-4500                            |

| Parameter/Equipment | Range  | CMC <sup>2,7,9</sup> ( $\pm$ )                                | Comments                  |
|---------------------|--|---|---------------------------|
| RPM <sup>3</sup>    | (Up to 7200) RPM<br>(7200 to 72 000) RPM<br>(72 000 to 99 999) RPM | 0.0028 % + 0.07 RPM<br>0.001 % + 0.2 RPM<br>0.0003 % to 1 RPM | Fluke 5500A, HP<br>53132A |

<sup>1</sup> This laboratory offers commercial calibration service and field 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> Field calibration service is available for this calibration. Please note the actual measurement uncertainties achievable on a customer's site can normally be expected to be larger than the CMC found 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 actual uncertainty introduced by the item being calibrated, (e.g. resolution) must also be considered and this, on its own, could result in the actual measurement uncertainty achievable on a customer's site being larger than the CMC.

<sup>4</sup> Dimensional Inspection covers sieves, liquid limit device, grooving tool, followers, plunger, metal specimens, Kelly ball, LA abrasion, Marshall and proctor hammers, platens, expansion racks, slump cones, tampers, 123 blocks, and sample splitters.

<sup>5</sup> The stated measured values are determined using the indicated instrument (see Comments). This capability is suitable for the calibration of the devices intended to measure or generate the measured value in the ranges indicated. CMC's are expressed as either a specific value that covers the full range or as a percent or fraction of the reading plus a fixed floor specification.

<sup>6</sup> In the statement of CMC,  $SG$  is the numerical value of the specific gravity,  $R$  is the resolution of the unit under test, and  $L$  is the numerical value of the nominal length of the device measured in inches.

<sup>7</sup> In the statement of CMC, percentages are percentages of reading unless otherwise noted.

<sup>8</sup> This scope meets A2LA's *P112 Flexible Scope Policy*.

<sup>9</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

## CAL-CERT COMPANY

Anaheim Hills, CA

for technical competence in the field of

## Calibration

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets the requirements of ANSI/NCSL Z540-1-1994 and R205 – Specific Requirements: Calibration Laboratory Accreditation Program. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).



Presented this 22<sup>nd</sup> day of November 2022.

A blue ink signature of the Vice President of Accreditation Services.

Vice President, Accreditation Services  
For the Accreditation Council  
Certificate Number 4986.02  
Valid to November 30, 2024

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