



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

usCALIBRATION  
 17922 Sky Park Circle, Suite P  
 Irvine, CA 92614  
 Jim Simmons Phone: 949 724 9474

CALIBRATION

Valid To: August 31, 2013

Certificate Number: 2092.01

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

I. Dimensional

| Parameter/Equipment        | Range  | CMC <sup>2</sup> (±)                         | Comments    |
|----------------------------|--|--|-------------|
| Calipers <sup>3</sup> –    |  |  |             |
| Digital                    | Up to 4 in<br>Up to 6 in<br>Up to 12 in<br>Up to 36 in | 0.29 min<br>0.30 min<br>0.36 min<br>0.75 min | Gage blocks |
| Vernier                    | Up to 4 in<br>Up to 6 in<br>Up to 12 in<br>Up to 36 in | 0.58 min<br>0.58 min<br>0.62 min<br>0.90 min |             |
| Micrometers <sup>3</sup> – |  |  |             |
| Digital                    | Up to 4 in<br>Up to 6 in<br>Up to 12 in<br>Up to 36 in | 73 μin<br>88 μin<br>0.17 min<br>0.46 min     | Gage blocks |
| Vernier                    | Up to 1 in<br>Up to 6 in<br>Up to 12 in<br>Up to 36 in | 62 μin<br>80 μin<br>0.17 min<br>0.49 min     |             |

| Parameter/Equipment                             | Range  | CMC <sup>2</sup> (±)             | Comments                                      |
|---|--|----------------------------------|---|
| Height Gages                                    | Up to 36 in                                    | 3.3 min                          | Gage blocks,<br>surface plate                 |
| Depth Gages                                     | Up to 4 in<br>(4 to 12) in<br>(12 to 36) in    | 0.27 min<br>0.34 min<br>0.70 min | Gage blocks,<br>surface plate                 |
| Dial Indicators                                 | (0.05 to 6) in                                 | 0.59 min                         | Gage blocks,<br>surface plate,<br>height gage |
| Thickness Gages <sup>3</sup>                    | (0.05 to 1) in                                 | 75 μin                           | Gage blocks                                   |
| Pin Gauges                                      | (0.011 to 1) in                                | 40 μin                           | Super micrometer,<br>gage blocks              |
| Plain Plugs                                     | (0.011 to 1) in<br>(1 to 6) in<br>(6 to 14) in | 40 μin<br>85 μin<br>0.18 min     | Super micrometer,<br>gage blocks              |
| Protractors                                     | 0° to 90°                                      | 0.058°                           | Angle blocks,<br>surface plate                |
| Optical Comparators <sup>3</sup> –<br>Linearity | (0.05 to 12) in                                | 0.20 min                         | Gage blocks                                   |
| Steel Rules <sup>3</sup>                        | (0.05 to 36) in                                | 12 min                           | Gage blocks                                   |

II. Electrical – DC/Low Frequency

| Parameter/Equipment                | Range  | CMC <sup>2,4,5,7</sup> (±)   | Comments  |
|------------------------------------|--|--|---|
| DC Voltage <sup>3</sup> – Generate | (0 to 330) mV<br>(0 to 3.3) V<br>(0 to 33) V<br>(30 to 330) V<br>(100 to 1020) V   | 54 μV/V + 3.0 μV<br>43 μV/V + 5.0 μV<br>43 μV/V + 50 μV<br>47 μV/V + 0.50 mV<br>47 μV/V + 1.5 mV   | Fluke 5500A/6   |
| DC Current <sup>3</sup> – Generate | (0 to 3.3) mA<br>(0 to 33) mA<br>(0 to 330) mA<br>(0 to 2.2) A<br>(0 to 11) A  | 0.010 % + 0.05 μA<br>81 μA/A + 0.25 μA<br>84 μA/A + 3.3 μA<br>0.025 % + 44 μA<br>0.048 % + 0.33 mA   | Fluke 5500A/6   |
| Clamp-On Only                      | (11 to 50) A<br><br>(0 to 20) A<br>(20 to 550) A   | 0.26 % + 1.0 mA<br><br>1.4 % + 0.15 A<br>0.73 % + 0.50 A   | Power Supply, Agilent 34401A DMM, Deltec MKA C shunt<br><br>Fluke 5500A/6, 50 turn coil |
| Resistance <sup>3</sup> – Generate | (0 to 11) Ω<br>(11 to 33) Ω<br>(33 to 330) Ω<br>330 Ω to 3.3 kΩ<br>(3.3 to 33) kΩ<br>(33 to 110) kΩ<br>(110 to 330) kΩ<br>330 kΩ to 3.3 MΩ<br>(3.3 to 11) MΩ<br>(11 to 33) MΩ<br>(33 to 110) MΩ<br>(110 to 330) MΩ | 94 μΩ/Ω + 8.0 mΩ<br>94 μΩ/Ω + 15 mΩ<br>70 μΩ/Ω + 15 mΩ<br>71 μΩ/Ω + 60 mΩ<br>71 μΩ/Ω + 0.60 Ω<br>86 μΩ/Ω + 6.0 Ω<br>94 μΩ/Ω + 6.0 Ω<br>0.013 % + 55 Ω<br>0.054 % + 0.55 kΩ<br>0.093 % + 0.55 kΩ<br>0.39 % + 5.5 kΩ<br>0.39 % + 17 kΩ | Fluke 5500A/6   |

| Parameter/Range                    | Frequency   | CMC <sup>2,4,7</sup> (±)   | Comments      |
|------------------------------------|---|--|---------------|
| AC Voltage <sup>3</sup> – Generate |   |  |               |
| (1 to 33) 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 | 0.28 % + 20 µV<br>0.12 % + 20 µV<br>0.16 % + 20 µV<br>0.20 % + 20 µV<br>0.28 % + 33 µV<br>0.80 % + 60 µV         | Fluke 5500A/6 |
| (33 to 330) 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 | 0.20 % + 50 µV<br>0.044 % + 20 µV<br>0.080 % + 20 µV<br>0.13 % + 40 µV<br>0.19 % + 0.17 mV<br>0.55% + 0.33 mV    |               |
| 330 mV to 3.3 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 | 0.12 % + 0.25 mV<br>0.024 % + 60 µV<br>0.063 % + 60 µV<br>0.11 % + 0.30 mV<br>0.19 % + 1.7 mV<br>0.39 % + 3.3 mV |               |
| (3.3 to 33) 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                     | 0.12 % + 2.5 mV<br>0.032 % + 0.60 mV<br>0.063 % + 2.6 mV<br>0.15 % + 5.0 mV<br>0.19 % + 17 mV                    |               |
| (33 to 330) V                      | 45 Hz to 1 kHz<br>(1 to 10) kHz<br>(10 to 20) kHz   | 0.039 % + 6.6 mV<br>0.063 % + 15 µV<br>0.070 % + 33 µV   |               |
| (330 to 1020) V                    | 45 Hz to 1 kHz<br>(1 to 5) kHz<br>(5 to 10) kHz   | 0.040 % + 80 mV<br>0.16 % + 0.10 mV<br>0.16 % + 0.50 mV  |               |

| Parameter/Range                    | Frequency   | CMC <sup>2,4,7</sup> (±)   | Comments                       |
|------------------------------------|---|--|--------------------------------|
| AC Current <sup>3</sup> – Generate |   |  |                                |
| (30 to 330) µA                     | (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 | 0.20 % + 0.15 µA<br>0.098 % + 0.15 µA<br>0.098 % + 0.25 µA<br>0.31 % + 0.15 µA<br>0.97 % + 0.15 µA | Fluke 5500A/6                  |
| 330 µA to 3.3 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 | 0.16 % + 0.30 µA<br>0.078 % + 0.30 µA<br>0.081 % + 0.30 µA<br>0.17 % + 0.30 µA<br>0.47 % + 0.30 µA |                                |
| (3.3 to 33) 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 | 0.16 % + 3.0 µA<br>0.079 % + 3.0 µA<br>0.071 % + 3.0 µA<br>0.16 % + 3.0 µA<br>0.47 % + 3.0 µA      |                                |
| (33 to 330) 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 | 0.16 % + 30 µA<br>0.078 % + 30 µA<br>0.071 % + 30 µA<br>0.16 % + 30 µA<br>0.47 % + 30 µA           |                                |
| 330 mA to 2.2 A                    | (10 to 45) Hz<br>45 Hz to 1 kHz<br>(1 to 5) kHz                                   | 0.16 % + 0.30 mA<br>0.078 % + 0.30 mA<br>0.59 % + 0.30 mA  |                                |
| (2.2 to 11) A                      | (45 to 65) Hz<br>(65 to 500) Hz<br>500 Hz to 1 kHz                                | 0.049 % + 2.0 mA<br>0.079 % + 2.0 mA<br>0.26 % + 2.0 mA  |                                |
| Clamp-On Only                      |   |  |                                |
| (Up to 20) A                       | (45 to 65) Hz<br>(65 to 440) Hz   | 2.0 % + 0.26 A<br>2.7 % + 0.90 A   | Fluke 5500A/6,<br>50 turn coil |
| (20 to 550) A                      | (45 to 65) Hz   | 0.81 % + 0.91 A  |                                |
| (20 to 150) A                      | (65 to 440) Hz  | 1.9 % + 0.91 A   |                                |

| Parameter/Equipment  | Range   | CMC <sup>2,4,5,7</sup> (±)   | Comments   |
|--|---|--|--|
| Capacitance <sup>3</sup> – Generate                            | (0.33 to 0.4999) nF<br>(0.5 to 1.0999) nF<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 | 0.70 % + 0.010 nF<br>1.9 % + 0.010 nF<br>0.72 % + 0.010 nF<br>0.43 % + 0.010 nF<br>0.43 % + 0.10 nF<br>0.63 % + 0.10 nF<br>0.21 % + 0.30 nF<br>0.22 % + 1.0 nF<br>0.34 % + 3.0 nF<br>0.31 % + 10 nF<br>0.38 % + 30 nF<br>0.41 % + 0.10 μF<br>0.59 % + 0.30 μF<br>1.0 % + 0.30 μF | Fluke 5500A/6  |
| DC Voltage <sup>3</sup> – Measure                              | 100 mV<br>1 V<br>10 V<br>100 V<br>1000 V<br><br>(1 to 20) kV  | 46 μV/V + 3.5 μV<br>25 μV/V + 7.0 μV<br>18 μV/V + 50 μV<br>27 μV/V + 0.60 mV<br>24 μV/V + 10 mV<br><br>2.3 %   | Agilent 34401A<br><br><br><br><br>Fluke 187,<br>Fluke 80K-40 |
| Electrical Simulation of Thermocouples – Generate <sup>3</sup> |   |  |  |
| Type J   | -210 °C to -100 °C<br>-100 °C to -30 °C<br>-30 °C to 150 °C<br>150 °C to 760 °C<br>760 °C to 1200 °C  | 0.22 °C<br>0.14 °C<br>0.13 °C<br>0.15 °C<br>0.61 °C  | Fluke 5500A/6  |
| Type K   | -200 °C to -100 °C<br>-100 °C to -25 °C<br>-25 °C to 120 °C<br>120 °C to 1000 °C<br>1000 °C to 1372 °C  | 0.27 °C<br>0.15 °C<br>0.14 °C<br>0.21 °C<br>0.66 °C  |  |
| Type T   | -250 °C to -150 °C<br>-150 °C to 0 °C<br>0 °C to 120 °C<br>120 °C to 400 °C   | 0.50 °C<br>0.20 °C<br>0.14 °C<br>0.13 °C   |  |

| Parameter/Equipment  | Range   | CMC <sup>2</sup> (±)  | Comments   |
|--|---|---|--|
| Electrical Calibration of Thermocouple Simulators <sup>3</sup> – Measure |   |   |  |
| Type J   | -210 °C to -100 °C<br>-100 °C to -30 °C<br>-30 °C to 150 °C<br>150 °C to 760 °C<br>760 °C to 1200 °C                  | 0.22 °C<br>0.14 °C<br>0.13 °C<br>0.15 °C<br>0.61 °C                 | Fluke 5500A/6<br><br>“Measure” refers to measurement of thermocouple simulators/source |
| Type K   | -200 °C to -100 °C<br>-100 °C to -25 °C<br>-25 °C to 120 °C<br>120 °C to 1000 °C<br>1000 °C to 1372 °C                | 0.27 °C<br>0.15 °C<br>0.14 °C<br>0.21 °C<br>0.66 °C                 |  |
| Type T   | -250 °C to -150 °C<br>-150 °C to 0 °C<br>0 °C to 120 °C<br>120 °C to 400 °C   | 0.50 °C<br>0.20 °C<br>0.14 °C<br>0.13 °C                            |  |
| Electrical Calibration of RTD Indicating Systems – Generate <sup>3</sup> |   |   |  |
| Pt 385, 100 Ω  | -200 °C to -0 °C<br>0 °C to 100 °C<br>100 °C to 400 °C<br>400 °C to 630 °C<br>630 °C to 800 °C                        | 0.070 °C<br>0.080 °C<br>0.097 °C<br>0.11 °C<br>0.19 °C              | Fluke 5500A/6  |
| Pt 385, 200 Ω  | -200 °C to 100 °C<br>100 °C to 260 °C<br>260 °C to 300 °C<br>300 °C to 400 °C<br>400 °C to 600 °C<br>600 °C to 630 °C | 0.066 °C<br>0.070 °C<br>0.11 °C<br>0.12 °C<br>0.13 °C<br>0.14 °C    |  |
| Pt 385, 500 Ω  | -200 °C to -80 °C<br>-80 °C to 100 °C<br>100 °C to 260 °C<br>260 °C to 400 °C<br>400 °C to 600 °C<br>600 °C to 630 °C | 0.068 °C<br>0.072 °C<br>0.076 °C<br>0.086 °C<br>0.092 °C<br>0.11 °C |  |
| Pt 385, 1000 Ω   | -200 °C to 0 °C<br>0 °C to 100 °C<br>100 °C to 260 °C<br>260 °C to 300 °C<br>300 °C to 600 °C<br>600 °C to 630 °C     | 0.064 °C<br>0.071 °C<br>0.075 °C<br>0.079 °C<br>0.090 °C<br>0.20 °C |  |

| Parameter/Equipment   | Range   | CMC <sup>2,4,7</sup> (±)   | Comments   |
|---|---|--|--|
| Electrical Calibration of RTD Indicating Systems – Generate <sup>3</sup> (cont) |   |  |  |
| Pt 3916, 100 Ω  | -200 °C to -190 °C<br>-190 °C to -80 °C<br>-80 °C to 0 °C<br>0 °C to 100 °C<br>100 °C to 260 °C<br>260 °C to 300 °C<br>300 °C to 400 °C<br>400 °C to 600 °C<br>600 °C to 630 °C | 0.21 °C<br>0.066 °C<br>0.070 °C<br>0.075 °C<br>0.080 °C<br>0.085 °C<br>0.091 °C<br>0.097 °C<br>0.19 °C | Fluke 5500A/6  |
| Pt 3926, 100 Ω  | -200 °C to -0 °C<br>0 °C to 100 °C<br>100 °C to 300 °C<br>300 °C to 400 °C<br>400 °C to 630 °C  | 0.070 °C<br>0.080 °C<br>0.091 °C<br>0.097 °C<br>0.11 °C  |  |
| PtNi 385, 120 Ω (Ni 120)  | -80 °C to 100 °C<br>100 °C to 260 °C  | 0.085 °C<br>0.13 °C  |  |
| Cu 427, 10 Ω  | -100 °C to 260 °C   | 0.24 °C  |  |
| Oscilloscope Calibration <sup>3</sup> – Generate                                |   |  |  |
| Amplitude DC Signal<br>50 Ω Load<br>1 M Ω Load                                  | (-6.6 to 6.6) V<br>(-130 to 130) V  | 0.25 % + 40 μV<br>0.050 % + 40 μV  | Fluke 5500A/6  |
| Amplitude Square Wave Signal<br>50 Ω Load<br>1 M Ω Load                         | ±1 mV to ±6.6 Vp-p<br>±1 mV to ±130 Vp-p  | 0.25 % + 40 μV<br>0.10 % + 40 μV*  | * For square wave frequencies above 1 kHz, ± (0.25% of output + 40 μV) |
| Leveled Sine Wave Flatness Into 50 Ω, Relative to 50 kHz<br>5 mVpp to 5.5 Vpp   | 50 kHz to 100 MHz<br>(100 to 300) MHz<br>(300 to 600) MHz   | 1.5 % + 0.10 mV<br>2.0 % + 0.10 mV<br>4.0 % + 0.10 mV  |  |
| Time Marker Into 50 Ω, Generate Fixed Markers in 5-2-1 Sequence                 | 5 s to 50 ms<br>20 ms to 2 ns   | (25 + 1000 <i>t</i> ) μs/s<br>0.10 ms/s  | <i>t</i> = time in seconds   |
| Rise Time Into 50 Ω Load  | ≤600 ps   | (+0 ps / -100 ps)  |  |

| Parameter/Equipment               | Range         | CMC <sup>2,5,7</sup> (±) | Comments                                 |
|-----------------------------------|---------------|--------------------------|--|
| DC Current <sup>3</sup> – Measure | 10 mA         | 0.026 % + 2.0 μA         | Agilent 34401A                           |
|                                   | 100 mA        | 0.026 % + 5.0 μA         |  |
|                                   | 1 A           | 0.052 % + 0.10 mA        |  |
|                                   | 3 A           | 0.071 % + 0.60 mA        |  |
|                                   | (3 to 10) A   | 0.30 % + 0.70 mA         | Agilent 34401A,<br>Deltac MKA C<br>shunt |
|                                   | (10 to 50) A  | 0.30 % + 2.0 mA          |  |
|                                   | (50 to 100) A | 0.30 % + 2.0 mA          |  |
| Resistance <sup>3</sup> – Measure | 100 Ω         | 51 μΩ/Ω + 4.0 mΩ         | Agilent 34401A                           |
|                                   | 1 kΩ          | 50 μΩ/Ω + 10 mΩ          |  |
|                                   | 10 kΩ         | 50 μΩ/Ω + 0.10 Ω         |  |
|                                   | 100 kΩ        | 50 μΩ/Ω + 1.0 Ω          |  |
|                                   | 1 MΩ          | 50 μΩ/Ω + 10 Ω           |  |
|                                   | 10 MΩ         | 0.020 % + 0.10 kΩ        |  |
|                                   | 100 MΩ        | 0.40 % + 10 kΩ           |  |

| Parameter/Range                     | Frequency    | CMC <sup>2,5,7</sup> (±) | Comments                  |                   |
|-------------------------------------|--------------|--------------------------|---------------------------|-------------------|
| AC Voltage <sup>3</sup> – Measure   | 100 mV       | (3 to 5) Hz              | Agilent 34401A            |                   |
|                                     |              | (5 to 10) Hz             |                           | 0.55 % + 40 μV    |
|                                     |              | 10 Hz to 20 kHz          |                           | 0.27 % + 40 μV    |
|                                     |              | (20 to 50) kHz           |                           | 0.047 % + 40 μV   |
|                                     |              | (50 to 100) kHz          |                           | 0.090 % + 40 μV   |
|                                     |              | (100 to 300) kHz         |                           | 0.34 % + 80 μV    |
|                                     | (1 to 750) V | (3 to 5) Hz              | 2.0 % + 0.50 mV           |                   |
|                                     |              | (5 to 10) Hz             | 0.51 % + 0.23 V           |                   |
|                                     |              | 10 Hz to 20 kHz          | 0.18 % + 0.23 V           |                   |
|                                     |              | (20 to 50) kHz           | 0.040 % + 0.23 V          |                   |
|                                     |              | (50 to 100) kHz          | 0.066 % + 0.38 V          |                   |
|                                     |              | (100 to 300) kHz         | 0.31 % + 0.60 V           |                   |
| (0.75 to 1) kV                      | 60 Hz        | 2.0 % + 3.8 V            | Fluke 187<br>Fluke 80K-40 |                   |
|                                     | (1 to 10) kV | 6.1 % + 0.020 kV         |                           |                   |
|                                     | 60 Hz        | 4.6 % + 0.0060 kV        |                           |                   |
| AC Current <sup>3,5</sup> – Measure | 1 A          | (3 to 5) Hz              | Agilent 34401A            |                   |
|                                     |              | (5 to 10) Hz             |                           | 0.51 % + 0.40 mA  |
|                                     |              | 10 Hz to 5 kHz           |                           | 0.16 % + 0.40 mA  |
|                                     | 3 A          | (3 to 5) Hz              |                           | 0.085 % + 0.40 mA |
|                                     |              | (5 to 10) Hz             |                           | 0.56 % + 1.8 mA   |
|                                     |              | 10 Hz to 5 kHz           |                           | 0.20 % + 1.8 mA   |
|                                     |              | 0.17 % + 1.8 mA          |                           |                   |

### III. Mechanical

| Parameter/Equipment                          | Range  | CMC <sup>2, 6, 7</sup> (±)  | Comments   |
|--|--|---|--|
| Pressure Gages <sup>3</sup>                  | (0.2 to 1) in H <sub>2</sub> O<br>(1 to 5) psi<br>(5 to 500) psi<br>(500 to 1500) psi<br>(1500 to 10000) psi<br><br>Up to 100 psia | 0.043 in H <sub>2</sub> O<br>0.12 psi @ FS<br>0.80 psi<br>0.91 psi<br>16 psi<br><br>0.69 psia | Fluke pressure modules   |
| Vacuum <sup>3</sup>                          | Up to -30 inHg   | 1.2 inHg  | Fluke 700PV4   |
| Torque <sup>3</sup> – Wrenches, Screwdrivers | (5 to 40) in·lb<br>(40 to 3000) in·lb  | 1.1 %<br>0.74 %   | Torque transducers   |
| Weights <sup>3</sup>                         | (0.001 to 2) g<br>(2 to 20) g<br>(20 to 210) g   | 0.29 mg<br>0.34 mg<br>0.72 mg   | Acculab ALC-210.4 with Class 1 weights   |
| Scales <sup>3</sup>                          | (0.001 to 1000) g<br><br>(5 to 200) lb<br><br>Up to 1150 lb  | 0.58R + 0.00035 %<br><br>0.58R + 0.00062 %<br><br>1.0 lb                                      | Class 1 weights<br><br>Class F weights<br><br>Class F weights<br>bulk substitution weights |

### IV. Thermodynamic

| Parameter/Equipment                            | Range  | CMC <sup>2</sup> (±)        | Comments  |
|--|--|-----------------------------|---|
| Temperature – Measure <sup>3</sup>             | (-197 to 0) °C<br>(0 to 200) °C<br>(200 to 500) °C | 48 m°C<br>76 m°C<br>0.16 °C | Hart scientific 1523, 5608                          |
| Temperature – Measuring Equipment <sup>3</sup> | (-25 to 0) °C<br>(0 to 150) °C                     | 0.064 °C<br>0.071 °C        | Hart scientific 1523 Readout + 5608 PRT + 9142 Bath |
| Relative Humidity – Fixed Points               | 33 % RH<br>75 % RH                                 | 2.5 % RH<br>3.5 % RH        | Dickson FH325 salt solutions                        |

#### IV. Time and Frequency

| Parameter/Equipment                | Range           | CMC <sup>2</sup> (±) | Comments                 |
|------------------------------------|-----------------|----------------------|--------------------------|
| Timers & Stop Watches <sup>3</sup> | (0 to 10 000) s | 0.026 s              | Fluke 5500A<br>HP 53131A |

| Parameter/Range                   | Frequency   | CMC <sup>2,4,7</sup> (±)   | Comments       |
|-----------------------------------|---|--|----------------|
| Frequency <sup>3</sup> – Generate |   |  |                |
| AC Voltage                        | (0.01 to 119.99) Hz<br>(120.0 to 1199.9) Hz<br>(1.200 to 9.999) kHz<br>(10.000 to 11.999) kHz<br>(12.00 to 119.99) kHz<br>(120.0 to 1199.9) kHz<br>(1.200 to 2.000) MHz | 20 µHz/Hz +1.0 mHz<br>20 µHz/Hz +1.0 mHz<br>18 µHz/Hz +1.0 mHz<br>22 µHz/Hz +15 mHz<br>20 µHz/Hz +15 mHz<br>20 µHz/Hz +15 mHz<br>20 µHz/Hz +15 mHz | Fluke 5500A/6  |
| Leveled Sine Wave                 | 50 kHz to 600 MHz<br>(10 kHz Resolution)  | 2.5 µHz/Hz   | Fluke 5500A/6  |
| Frequency <sup>3</sup> – Measure  |   |  |                |
| 100 mV to 750 V                   | (3 to 5) Hz<br>(5 to 10) Hz<br>(10 to 40) Hz<br>40 Hz to 300 kHz  | 0.050 %<br>0.025 %<br>0.015 %<br>0.0050 %  | Agilent 34401A |

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

<sup>2</sup> Calibration and Measurement Capability (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. Calibration and Measurement Capabilities 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 and this laboratory meets A2LA R104 – *General Requirements: Accreditation of Field Testing and Field Calibration Laboratories* for these calibrations. 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> The measurands stated are generated with the Fluke 5500A. This capability is suitable for the calibration of the devices intended to measure the stated measurand in the ranges indicated. CMC is 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> The measurands stated are measured with the Agilent 34401A. This capability is suitable for the calibration of the devices intended to generate the stated measurand in the ranges indicated. CMC is expressed as either a specific value that covers the full range or as a fraction of the reading plus a fixed floor specification.

<sup>6</sup>  $R$  is the resolution of the unit under test.

<sup>7</sup> Unless otherwise stated, all CMCs stated in % are for % of the reading.



World Class Accreditation

The American Association for Laboratory Accreditation

# Accredited Laboratory

A2LA has accredited

**usCALIBRATION INC.**

*Irvine, CA*

for technical competence in the field of

**Calibration**

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*. This laboratory also meets the requirements of ANSI/NCSL Z540-1-1994 and any additional program requirements in the field of calibration. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009*).

Presented this 21<sup>st</sup> day of September 2011.



  
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Peter Abney

President & CEO  
For the Accreditation Council  
Certificate Number 2092.01  
Valid to August 31, 2013

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