



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, 2019

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 calibrations¹:

I. Chemical

| Parameter/Equipment | Range | CMC ² (±) | Comments |
|---------------------|---|---------------------------------------|------------------------|
| Conductivity | 9.62 µS/cm 101.1 µS/cm 1413 µS/cm 99 938 µS/cm | 0.76 µS 3.0 µS 9.3 µS 530 µS | Conductivity standards |

II. Dimensional

| Parameter/Equipment | Range | CMC ^{2,5} (±) | Comments |
|------------------------------------|---|--|-------------|
| Calipers ³ – Digital | Up to 4 in (4 to 12) in (12 to 36) in | 300 µin (280 + 4.5L) µin (230 + 8.9L) µin | Gage blocks |
| Vernier | Up to 4 in (4 to 12) in (12 to 36) in | 1200 µin (1100 + 6.1L) µin (1100 + 5.4L) µin | |

| Parameter/Equipment | Range | CMC ^{2,5} (\pm) | Comments |
|--|--|---|--|
| Micrometers ³ – Digital Vernier | Up to 1 in (1 to 4) in (4 to 12) in (12 to 36) in Up to 1 in (1 to 4) in (4 to 12) in (12 to 36) in | 80 μ in 99 μ in (70 + 9.0L) μ in (290 + 5.0L) μ in 130 μ in 140 μ in (60 + 12L) μ in (50 + 12L) μ in | Gage blocks |
| Height Gages | Up to 36 in | 1400 μ in | Gage blocks, surface plate |
| Depth Gages | Up to 4 in (4 to 12) in (12 to 36) in | 210 μ in 260 μ in 510 μ in | Gage blocks, surface plate |
| Dial Indicators | (0.05 to 6) in | 340 μ in | Gage blocks, surface plate, height gage |
| Thickness Gages ³ | (0.05 to 1) in | 40 μ in | Gage blocks |
| Pin Gauges | (0.011 to 1) in | 38 μ in | Supermicrometer TM , gage blocks |
| Plain Plugs | (0.011 to 1) in (1 to 6) in (6 to 14) in | 38 μ in (26 + 10D) μ in (22 + 12D) μ in | Supermicrometer TM , gage blocks |
| Protractors | 0° to 90° | 0.059° | Angle blocks, surface plate |

| Parameter/Equipment | Range | CMC ^{2,5} (±) | Comments |
|---|--|---|---|
| Optical Comparators ³ – Linearity | (0.05 to 12) in | (120 + 7.1L) μin | Gage blocks |
| Steel Rules ³ | (0.05 to 6) in (6 to 36) in | 0.010 in 0.036 in | Gage blocks |
| Precision Balls | Up to 1 in | 41 μin | Supermicrometer TM , gage blocks |
| Feeler/Thickness Gage | Up to 0.2 in | 25 μin | Supermicrometer TM , gage blocks |
| Length Standards | Up to 1 in (1 to 4) in (4 to 12) in (12 to 20) in | 28 μin (31 + 6.8L) μin (35 + 11L) μin (27 + 12L) μin | Supermicrometer TM , gage blocks |
| Thread Ring Gages | (0.12 to 7) in | (47 + 3.7D) μin | Labmaster Universal TM , gage blocks, master plain rings |
| Tapered Thread Ring Gages – Standoff | Up to 2 in | 480 μin | Gage blocks, test indicator, master set plug |
| Inner Diameter Gages | (0.12 to 4) in | 0.000 14 in | Ring gage set |
| Ring Gages | (0.04 to 14) in | (15 + 3.5D) μin | Labmaster TM , gage blocks |
| Radius Gages | Up to 4 in | 0.000 47 in | Optical comparator |
| Thread Plug Gages – Pitch Diameter | Up to 20 in | (87 + 4.0D) μin | Supermicrometer TM , gage blocks, thread measuring wires |
| Major Diameter | Up to 20 in | (37 + 12D) μin | Supermicrometer TM , gage blocks |

| Parameter/Equipment | Range | CMC ^{2, 5, 6} (\pm) | Comments |
|---|----------------------------|--|---|
| Tapered Thread Plug Gages – | | | |
| Pitch Diameter | Up to 20 in | $(180 + 4.5D) \mu\text{in}$ | Supermicrometer TM , thread measuring wires, sine block, gage blocks |
| Major Diameter | Up to 20 in | $(150 + 7.5D) \mu\text{in}$ | Supermicrometer TM , sine block, gage blocks |
| Notch Height | Up to 2 in | 480 μin | Gage blocks, test indicator |
| Ultrasonic Thickness Gages ³ | Up to 4 in | 580 μin | Gage blocks |
| Coating Thickness Gages | Up to 60.25 mils | 0.55 % + 0.021 mils | Standard shims |
| Gage Blocks | Up to 4 in (4 to 13) in | $(4.8 + 0.88L) \mu\text{in}$ $(10 + 1.3L) \mu\text{in}$ | Master gage blocks |

III. Electrical – DC/Low Frequency

| Parameter/Equipment | Range | CMC ^{2,4} (±) | Comments |
|------------------------------------|--|---|---|
| DC Voltage ³ – Generate | (0 to 330) mV (0 to 3.3) V (0 to 33) V (30 to 330) V (100 to 1020) V | 13 $\mu\text{V}/\text{V}$ + 2.2 μV 7.6 $\mu\text{V}/\text{V}$ + 7.2 μV 10 $\mu\text{V}/\text{V}$ + 17 μV 12 $\mu\text{V}/\text{V}$ + 0.94 mV 13 $\mu\text{V}/\text{V}$ + 3.3 mV | Fluke 5520A-PQ/6 |
| DC Current ³ – Generate | (0 to 3.3) mA (0 to 33) mA (0 to 330) mA (0 to 1.1) A (0 to 3.0) A (0 to 11) A (0 to 20) A | 77 $\mu\text{A}/\text{A}$ + 0.052 μA 63 $\mu\text{A}/\text{A}$ + 0.94 μA 65 $\mu\text{A}/\text{A}$ + 9.0 μA 0.015 % + 51 μA 0.024 % + 0.2 mA 0.032 % + 1.4 mA 0.052 % + 7.0 mA | Fluke 5520A-PQ/6 |
| Clamp-On Only | (20 to 50) A (20 to 1000) A | 0.022 % + 3.6 mA 0.54 % + 1.1 A | Power supply, Fluke 8508A, Ohm Labs CS300 shunt Fluke 5520A-PQ/6, 50 turn coil |
| Resistance ³ – Generate | (0 to 11) Ω (11 to 33) Ω (33 to 110) Ω (33 to 330) Ω (0.33 to 1.1) k Ω 1.1 Ω to 3.3 k Ω (3.3 to 11) k Ω (11 to 33) k Ω (33 to 110) k Ω (110 to 330) k Ω (0.33 to 1.1) M Ω (1.1 to 3.3) M Ω (3.3 to 11) M Ω (11 to 33) M Ω (33 to 110) M Ω (110 to 330) M Ω (0.33 to 1.1) G Ω | 31 $\mu\Omega/\Omega$ + 0.8 m Ω 23 $\mu\Omega/\Omega$ + 1.2 m Ω 23 $\mu\Omega/\Omega$ + 1.1 m Ω 20 $\mu\Omega/\Omega$ + 2.4 m Ω 18 $\mu\Omega/\Omega$ + 8.0 m Ω 20 $\mu\Omega/\Omega$ + 25 m Ω 20 $\mu\Omega/\Omega$ + 57 m Ω 20 $\mu\Omega/\Omega$ + 0.25 Ω 20 $\mu\Omega/\Omega$ + 0.54 Ω 25 $\mu\Omega/\Omega$ + 2.2 Ω 24 $\mu\Omega/\Omega$ + 6.0 Ω 44 $\mu\Omega/\Omega$ + 46 Ω 0.01 % + 100 Ω 0.017 % + 3.4 k Ω 0.033 % + 12 k Ω 0.24 % + 78 k Ω 1.1 % + 1.4 M Ω | Fluke 5520A-PQ/6 |

| Parameter/Equipment | Range | CMC ^{2,4} (\pm) | Comments |
|------------------------------------|---|---|------------------|
| AC Voltage ³ – Generate | | | |
| (1 to 33) mV | (10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz | 0.059 % + 6.5 μ V 0.01 % + 6.1 μ V 0.015 % + 6.0 μ V 0.071 % + 7.7 μ V 0.26 % + 15 μ V 0.60 % + 50 μ V | Fluke 5520A-PQ/6 |
| (33 to 330) mV | (10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz | 0.021 % + 16 μ V 0.01 % + 16 μ V 0.011 % + 13 μ V 0.024 % + 20 μ V 0.06 % + 35 μ V 0.13 % + 0.17 mV | |
| 330 mV to 3.3 V | (10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz | 0.023 % + 74 μ V 0.011 % + 97 μ V 0.015 % + 77 μ V 0.021 % + 0.15 mV 0.051 % + 0.24 mV 0.17 % + 1.1 mV | |
| (3.3 to 33) V | (10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz | 0.023 % + 0.92 mV 0.011 % + 0.9 mV 0.018 % + 0.89 mV 0.025 % + 1.5 mV 0.066 % + 2.7 mV | |
| (33 to 330) V | 45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz | 0.013 % + 9.8 mV 0.014 % + 13 mV 0.019 % + 11 mV | |
| (330 to 1020) V | 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz | 0.021 % + 33 mV 0.018 % + 33 mV 0.021 % + 33 mV | |

| Parameter/Range | Frequency | CMC ^{2,4} (±) | Comments | |
|------------------------------------|---|--|------------------|-----------------------------------|
| AC Current ³ – Generate | | | | |
| (30 to 330) μA | (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz | 0.15 % + 0.11 μA 0.11 % + 0.11 μA 0.097 % + 0.1 μA 0.22 % + 0.17 μA 0.62 % + 0.18 μA | Fluke 5520A-PQ/6 | |
| 330 μA to 3.3 mA | (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz | 0.15 % + 0.56 μA 0.09 % + 0.4 μA 0.071 % + 0.43 μA 0.14 % + 0.76 μA 0.34 % + 2.4 μA | | |
| (3.3 to 33) mA | (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz | 0.14 % + 4.8 μA 0.065 % + 3.8 μA 0.024 % + 5.6 μA 0.054 % + 5.1 μA 0.15 % + 7.7 μA | | |
| (33 to 330) mA | (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz | 0.14 % + 43 μA 0.065 % + 38 μA 0.025 % + 47 μA 0.061 % + 0.12 mA 0.11 % + 0.35 mA | | |
| (0.33 to 1.1) A | (10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz | 0.14 % + 0.25 mA 0.04 % + 0.12 mA 0.47 % + 0.89 mA | | |
| (1.1 to 3) A | (10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz | 0.14 % + 0.25 mA 0.038 % + 0.61 mA 0.47 % + 0.89 mA | | |
| (3 to 11) A | (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz | 0.04 % + 2.8 mA 0.072 % + 2.6 mA 2.4 % + 1.9 mA | | |
| (11 to 20.5) A | (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz | 0.092 % + 4.8 mA 0.12 % + 4.2 mA 2.4 % + 4.1 mA | | |
| Clamp-On Only | | | | |
| (20 to 1000) A | (45 to 65) Hz | 0.69 % + 1.1 A | | Fluke 5520A-PQ/6, 50 turn coil |
| (20 to 150) A | (65 to 440) Hz | 1.3 % + 0.30 A | | |

| Parameter/Equipment | Range | CMC ^{2, 4, 6} (\pm) | Comments |
|--|---|--|---|
| Capacitance ³ – Generate | (0.33 to 0.3999) nF (0.4 to 1.0999) nF (1.1 to 3.2999) nF (3.3 to 10.999) nF (11 to 32.999) nF (33 to 109.99) nF (110 to 329.99) nF (0.33 to 1.0999) μ F (1.1 to 3.2999) μ F (3.3 to 10.999) μ F (11 to 32.999) μ F (33 to 109.99) μ F (110 to 329.99) μ F (330 to 1.1) mF | 0.4 % + 0.009 nF 0.35 % + 0.01 nF 0.36 % + 0.01 nF 0.19 % + 0.01 nF 0.18 % + 0.1 nF 0.19 % + 0.1 nF 0.19 % + 0.3 nF 0.19 % + 1.1 nF 0.19 % + 3.0 nF 0.19 % + 12 nF 0.28 % + 56 nF 0.3 % + 0.16 μ F 0.31 % + 0.58 μ F 0.33 % + 1.2 μ F | Fluke 5520A-PQ/6 |
| DC Voltage ³ – Measure | Up to 200 mV 200 mV to 2 V (2 to 20) V (20 to 200) V (200 to 1000) V (1 to 30) kV | 6.0 μ V/V + 0.6 μ V 3.8 μ V/V + 0.25 μ V 3.8 μ V/V + 0.25 μ V 6.0 μ V/V + 0.25 μ V 6.1 μ V/V + 0.6 μ V 0.21 % + 7.3 V | Fluke 8508A Fluke 187, Ross Engineering VMP30E |
| Electrical Simulation of Thermocouples – Generate ³ | | | |
| Type C | (0 to 150) $^{\circ}$ C (150 to 650) $^{\circ}$ C (650 to 1000) $^{\circ}$ C (1000 to 1800) $^{\circ}$ C (1800 to 2316) $^{\circ}$ C | 0.24 $^{\circ}$ C 0.22 $^{\circ}$ C 0.26 $^{\circ}$ C 0.40 $^{\circ}$ C 0.66 $^{\circ}$ C | Fluke 5520A-PQ/6 |
| Type J | (-210 to -100) $^{\circ}$ C (-100 to -30) $^{\circ}$ C (-30 to 150) $^{\circ}$ C (150 to 760) $^{\circ}$ C (760 to 1200) $^{\circ}$ C | 0.22 $^{\circ}$ C 0.14 $^{\circ}$ C 0.13 $^{\circ}$ C 0.15 $^{\circ}$ C 0.18 $^{\circ}$ C | |
| Type K | (-200 to -100) $^{\circ}$ C (-100 to -25) $^{\circ}$ C (-25 to 120) $^{\circ}$ C (120 to 1000) $^{\circ}$ C (1000 to 1372) $^{\circ}$ C | 0.27 $^{\circ}$ C 0.15 $^{\circ}$ C 0.14 $^{\circ}$ C 0.21 $^{\circ}$ C 0.32 $^{\circ}$ C | |

| Parameter/Equipment | Range | CMC ^{2, 4, 6} (±) | |
|--|---|---|---|
| Electrical Simulation of Thermocouples ³ – Generate (cont) | | | |
| Type T | (-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C | 0.5 °C 0.2 °C 0.14 °C 0.13 °C | Fluke 5520A-PQ/6 |
| Electrical Calibration of Thermocouple Simulators ³ – Measure | | | |
| Type C | (0 to 150) °C (150 to 650) °C (650 to 1000) °C (1000 to 1800) °C (1800 to 2316) °C | 0.24 °C 0.22 °C 0.26 °C 0.40 °C 0.66 °C | Fluke 5520A-PQ/6 “Measure” refers to measurement of thermocouple simulators/source |
| Type J | (-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C | 0.21 °C 0.13 °C 0.11 °C 0.13 °C 0.18 °C | |
| Type K | (-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C | 0.26 °C 0.14 °C 0.13 °C 0.2 °C 0.31 °C | |
| Type T | (-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C | 0.49 °C 0.19 °C 0.13 °C 0.12 °C | |

| Parameter/Equipment | Range | CMC ² (±) | Comments |
|--|-------------------|----------------------|------------------|
| Electrical Calibration of RTD Indicating Systems ³ – Generate | | | |
| Pt 385, 100 Ω | (-200 to -80) °C | 0.04 °C | Fluke 5520A-PQ/6 |
| | (-80 to 0) °C | 0.04 °C | |
| | (0 to 100) °C | 0.055 °C | |
| | (100 to 300) °C | 0.071 °C | |
| | (300 to 400) °C | 0.08 °C | |
| | (400 to 630) °C | 0.094 °C | |
| | (630 to 800) °C | 0.18 °C | |
| Pt 385, 200 Ω | (-200 to 100) °C | 0.032 °C | |
| | (100 to 260) °C | 0.04 °C | |
| | (260 to 300) °C | 0.094 °C | |
| | (300 to 400) °C | 0.11 °C | |
| | (400 to 600) °C | 0.12 °C | |
| | (600 to 630) °C | 0.13 °C | |
| Pt 385, 500 Ω | (-200 to -80) °C | 0.035 °C | |
| | (-80 to 100) °C | 0.042 °C | |
| | (100 to 260) °C | 0.049 °C | |
| | (260 to 400) °C | 0.064 °C | |
| | (400 to 600) °C | 0.072 °C | |
| | (600 to 630) °C | 0.087 °C | |
| Pt 385, 1000 Ω | (-200 to 0) °C | 0.028 °C | |
| | (0 to 100) °C | 0.035 °C | |
| | (100 to 260) °C | 0.042 °C | |
| | (260 to 300) °C | 0.054 °C | |
| | (300 to 600) °C | 0.067 °C | |
| | (600 to 630) °C | 0.18 °C | |
| Pt 3916, 100 Ω | (-200 to -190) °C | 0.2 °C | |
| | (-190 to -80) °C | 0.032 °C | |
| | (-80 to 0) °C | 0.04 °C | |
| | (0 to 100) °C | 0.048 °C | |
| | (100 to 260) °C | 0.055 °C | |
| | (260 to 300) °C | 0.063 °C | |
| | (300 to 400) °C | 0.07 °C | |
| | (400 to 600) °C | 0.079 °C | |
| | (600 to 630) °C | 0.18 °C | |

| Parameter/Equipment | Range | CMC ^{2,4,6} (±) | Comments |
|--|---|--|--|
| Electrical Calibration of RTD Indicating Systems ³ – Generate (cont) | | | |
| Pt 3926, 100 Ω | (-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C | 0.04 °C 0.055 °C 0.071 °C 0.079 °C 0.095 °C | Fluke 5520A-PQ/6 |
| PtNi 385, 120 Ω (Ni 120) | (-80 to 100) °C (100 to 260) °C | 0.063 °C 0.11 °C | |
| Cu 427, 10 Ω | (-100 to 260) °C | 0.24 °C | |
| Oscilloscope Calibration ³ – Generate | | | |
| Amplitude DC Signal 50 Ω Load 1 M Ω Load | (-6.6 to 6.6) V (-130 to 130) V | 0.25 % + 40 μV 0.05 % + 40 μV | Fluke 5520A-PQ/6 |
| Amplitude Square Wave Signal 50 Ω Load 1 M Ω Load | ±1 mV to ± 6.6 V _{p-p} ±1 mV to ± 130 V _{p-p} | 0.25 % + 40 μV 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 5 mV _{pp} to 5.5 V _{pp} | 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz | 1.5 % + 0.1 mV 2.0 % + 0.1 mV 4.0 % + 0.1 mV | |
| (+14 to +20) dBm (-17 to +14) dBm (-48 to -17) dBm (-17 to +14) dBm (-48 to -17) dBm | (300 to 1400) MHz (300 to 1400) MHz (300 to 1400) MHz (1400 to 3000) MHz (1400 to 3000) MHz | 0.32 dBm 0.31 dBm 0.47 dBm 0.48 dBm 0.67 dBm | Fluke 9640A-LPN |
| Time Marker into 50 Ω | 5 s to 50 ms 20 ms to 2 ns | (25 + 1000t) μs/s 65 μs/s | Fluke 5520A-PQ/6 t = time in seconds |
| Rise Time into 50 Ω Load | ≤600 ps | (+0 ps / -100 ps) | |

| Parameter/Equipment | Range | CMC ^{2,4} (\pm) | Comments |
|-----------------------------------|--|---|------------------------------|
| DC Current ³ – Measure | Up to 200 μ A 200 μ A to 2 mA (2 to 20) mA (20 to 200) mA 200 mA to 2 A (2 to 20) A | 14 μ A /A + 0.31 nA 14 μ A/A + 3.1 nA 15 μ A/A + 31 nA 48 μ A/A + 0.62 μ A 0.018 % + 13 μ A 0.042 % + 20 μ A | Fluke 8508A |
| | (20 to 50) A (50 to 100) A | 0.051 % + 8.0 mA 0.056 % + 6.0 mA | Fluke 8508A, Ohm Labs CS-300 |
| Resistance ³ – Measure | Up to 2 Ω (2 to 20) Ω (20 to 200) Ω 200 Ω to 2 k Ω (2 to 20) k Ω (20 to 200) k Ω 200 k Ω to 2 M Ω (2 to 20) M Ω (20 to 200) M Ω 200 M Ω to 2 G Ω | 20 $\mu\Omega/\Omega$ + 4.0 $\mu\Omega$ 11 $\mu\Omega/\Omega$ + 62 $\mu\Omega$ 10 $\mu\Omega/\Omega$ + 10 $\mu\Omega$ 8.7 $\mu\Omega/\Omega$ + 0.5 m Ω 8.4 $\mu\Omega/\Omega$ + 5.0 m Ω 8.0 $\mu\Omega/\Omega$ + 0.15 Ω 8.0 $\mu\Omega/\Omega$ + 12 Ω 22 $\mu\Omega/\Omega$ + 120 Ω 0.013 % + 11 k Ω 0.14 % + 1.0 M Ω | Fluke 8508A |
| AC Voltage ³ – Measure | | | |
| Up to 200 mV | (10 to 40) Hz (40 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz | 0.014 % + 3.9 μ V 0.011 % + 3.9 μ V 0.011 % + 3.1 μ V 0.014 % + 3.9 μ V 0.032 % + 7.8 μ V 0.068 % + 19 μ V | Fluke 8508A |
| 200 mV to 2 V | (10 to 40) Hz (40 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz (300 to 1000) kHz | 0.012 % + 19 μ V 96 μ V/V + 20 μ V 73 μ V/V + 19 μ V 0.011 % + 19 μ V 0.021 % + 39 μ V 0.052 % + 0.19 mV 0.24 % + 1.9 mV 0.78 % + 19 mV | |
| (2 to 20) V | (10 to 40) Hz (40 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz | 0.011 % + 0.19 mV 89 μ V/V + 0.19 mV 74 μ V/V + 0.19 mV 0.011 % + 0.19 mV 0.021 % + 0.39 mV 0.051 % + 1.9 mV | Fluke 8508A |
| (20 to 200) V | (40 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz | 92 μ V/V + 2.3 mV 77 μ V/V + 2.0 mV 0.011 % + 1.9 mV 0.021 % + 3.9 mV 0.051 % + 19 mV | |

| Parameter/Range | Frequency | CMC ^{2,4} (±) | Comments |
|---|-----------------------------------|--|--|
| AC Voltage ³ – Measure (cont) | | | |
| (200 to 1000) V | 40 Hz to 10 kHz | 0.012 % + 20 mV | Fluke 8508A |
| Up to 1 kV (1 to 21) kV | 60 Hz 60 Hz | 0.011 kV 1.2 % + 0.017 kV | Fluke 187 plus Ross Engineering VMP30E Probe |
| AC Current ³ – Measure | | | |
| (0 to 200) µA | 10 Hz to 10 kHz (10 to 30) kHz | 0.034 % + 0.019 µA 0.065 % + 0.019 µA | Fluke 8508A |
| 200 µA to 2 mA | 10 Hz to 10 kHz (10 to 30) kHz | 0.03 % + 0.19 µA 0.063 % + 0.19 µA | |
| (2 to 20) mA | 10 Hz to 10 kHz (10 to 30) kHz | 0.031 % + 1.9 µA 0.063 % + 1.9 µA | |
| (20 to 200) mA | 10 Hz to 10 kHz (10 to 30) kHz | 0.030 % + 19 µA 0.058 % + 19 µA | |
| 200 mA to 2 A | 10 Hz to 2 kHz (2 to 10) kHz | 0.074 % + 0.19 mA 0.083 % + 0.19 mA | |
| (2 to 20) A | 10 Hz to 2 kHz | 0.072 % + 1.9 mA | |

IV. Electrical – RF/Microwave

| Parameter/Equipment | Range | CMC ^{2,4} (±) | Comments |
|---|----------------|------------------------|---------------------------------|
| RF Voltage Low Frequency – Generate and Measure | 10 Hz to 1 MHz | 0.09 Vrms | Fluke 9640A-LPN, Fluke 8508A |
| RF Power ³ – Generate | | | |
| (+14 to +20) dBm | Up to 1.4 GHz | 0.32 dBm | Fluke 9640A-LPN |
| (-17 to +14) dBm | Up to 1.4 GHz | 0.31 dBm | |
| (-48 to -17) dBm | Up to 1.4 GHz | 0.48 dBm | |
| (-17 to +14) dBm | (1.4 to 3) GHz | 0.40 dBm | |
| (-48 to -17) dBm | (1.4 to 3) GHz | 0.52 dBm | |
| (-48 to +14) dBm | (3 to 4) GHz | 0.52 dBm | |

V. Mechanical

| Parameter/Equipment | Range | CMC ^{2, 5, 6} (±) | Comments |
|---|--|--|--|
| Pressure Gages ³ | (0.2 to 1) inH ₂ O (0 to 5) psi | 0.043 inH ₂ O 0.0036 psi @ FS | Fluke pressure module |
| | (0 to 100) psi (5 to 500) psi (500 to 2000) psi (1500 to 10 000) psi | 0.036 psi 0.15 psi 0.63 psi 3.8 psi | Additel pressure modules |
| | Up to 100 psia | 0.13 psia | Fluke pressure module |
| Vacuum ³ | Up to -30 inHg | 0.027 inHg | Additel ADT681-CP30 |
| Torque ³ – Wrenches, Screwdrivers | (15 to 200) in.oz (4 to 50) in·lbf (50 to 400) in·lbf (400 to 1000) in·lbf (1000 to 3000) in·lbf | 2.9 in·oz 0.30 in·lbf (0.0013Q + 2.7) in·lbf (0.0016Q + 3.6) in·lbf (0.0015Q + 9.1) in·lbf | Torque transducers |
| | | | |
| Weights ³ | (0.001 to 2) g (2 to 20) g (20 to 210) g (210 to 500) g | 0.22 mg 0.30 mg 0.93 mg 1.9 mg | Sartorius MSE524S with Class 1 weights |
| | (500 to 3000) g (3000 to 7000) g | 28 mg 58 mg | Scale and Class 4 weights |
| Scales ³ | (1 to 500) mg | 0.58R + 0.000 35 % | Class 1 weights |
| | (0.5 to 5) g | 0.58R + 0.026 mg | |
| | (5 to 1000) g | 0.58R + 0.000 43 % | Class 4 weights |
| | (1000 to 10 000) g | 0.58R + 0.000 73 % | |
| | (20 to 500) lbs | 0.58R + 0.008 lbs | Class F weights |
| | Up to 1150 lb | 2.1 lb | Class F weights, bulk substitution weights |

| Parameter/Equipment | Range | CMC ^{2,6} (±) | Comments |
|--------------------------------------|-----------------------------------|---|----------------------|
| Force ³ – Tension Only | (0 to 50 lbf) (50 to 150) lbf | 0.0083 lbf 0.060 lbf | Class F weights |
| Tension and Compression | (0 to 500) lbf (0 to 5000) lbf | 0.011 % + 0.18 lbf 0.025 % + 2.0 lbf | Interface load cells |

VI. Thermodynamic

| Parameter/Equipment | Range | CMC ² (±) | Comments |
|---|---|--|---|
| Temperature ³ – Measure | (-200 to 0) °C (0 to 200) °C (200 to 420) °C (32 to 1000) °F (1000 to 1999) °F (1999 to 2150) °F | 0.065 °C 0.088 °C 0.081 °C 3.0 °F 2.8 °F 6.0 °F | Hart scientific 1523, 5627A PRT Fluke 5520A w thermocouple |
| Temperature ³ – Measuring Equipment | (-25 to 0) °C (0 to 150) °C | 0.083 °C 0.086 °C | Hart Scientific 1523 readout + 5627 PRT + 9142 bath |
| Relative Humidity ³ | (10 to 75) % RH | 1.8 % RH | Kaymont M2000SPA- X |

VII. Time & Frequency

| Parameter/Equipment | Range | CMC ^{2,4,6} (±) | Comments |
|---|---------------------|--------------------------|--------------------------|
| Timers and Stop Watches ³ | (0 to 10 000) s | 1 µs/s + 0.014 s | Fluke 5520A HP 53131A |
| Tachometers – Non- Contact | (30 to 100 000) RPM | 0.000 20 % + 0.04 RPM | Fluke 5520A-PQ/6 |

| Parameter/Equipment | Range | CMC ^{2, 4, 6} (\pm) | Comments |
|--|---|--|------------------|
| Frequency ³ – Measuring Equipment | | | |
| AC Voltage | (0.01 to 119.99) Hz (120.0 to 1199.9) Hz (1.200 to 9.999) kHz (10.000 to 11.999) kHz (12.00 to 119.99) kHz (120.0 to 1199.9) kHz (1.200 to 2.000) MHz | 20 μ Hz/Hz + 1.0 mHz 20 μ Hz/Hz + 1.0 mHz 20 μ Hz/Hz + 1.5 mHz 22 μ Hz/Hz + 15 mHz 20 μ Hz/Hz + 15 mHz 20 μ Hz/Hz + 15 mHz 20 μ Hz/Hz + 15 mHz | Fluke 5520A-PQ/6 |
| Leveled Sine Wave | 50 kHz to 600 MHz (10 kHz Resolution) | 2.0 μ Hz/Hz + 30 Hz | Fluke 5520A-PQ/6 |
| Frequency ³ – Measure | 10 Hz to 3 GHz | 2.0 μ Hz/Hz | Agilent 53131A |

¹ This laboratory offers commercial and field calibration service.

² 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.

³ 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.

⁴ 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. CMCs 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.

⁵ In the statement of CMC, R is the resolution of the unit under test, L is the numerical value of the nominal length measured in inches, D is the numerical value of the nominal length of the diameter measured in inches, and Q is the numerical value of the nominal torque measured in in·lbf.

⁶ In the statement of CMC, percentages are percentage of reading, unless otherwise indicated.



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 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 2nd day of August 2017.

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

President and CEO
For the Accreditation Council
Certificate Number 2092.01
Valid to August 31, 2019
Revised on August 10, 2018

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