



Accredited Laboratory

A2LA has accredited

PRECISION METROLOGY, INC. - SOUTH

Dade City, FL

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/NCSLI 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 5th day of August 2015.

A handwritten signature in black ink, reading "Peter Abney".

President & CEO
For the Accreditation Council
Certificate Number 1078.02
Valid to September 30, 2017

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



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

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CALIBRATION

Valid until: September 30, 2017

Certificate Number: 1078.02

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations¹:

I. Dimensional

| Parameter/Equipment | Range | CMC ^{2,4} (±) | Comments |
|-----------------------|---|--|--------------|
| Bore Gages | Up to 8 in | 24 µin + 7.5 µin/in | ULM |
| Calipers ³ | Up to 4 in (4 to 20) in (20 to 80) in | 130 µin + 4.2 µin/in 170 µin + 4.2 µin/in 300 µin + 5.1 µin/in | Gage blocks |
| CMM ³ – | | | ASME B89.4.1 |
| Linear | Up to 52 in, in x, y Up to 20 in, in z | (38 + 5.2L) µin (58 + 8.1L) µin | |
| Probing Analysis | --- | 2 µm | |
| Volumetric | Up to 36 in for shortest axis | (82 + 13L) µin | |
| Bi-Directional | --- | (40 + 10L) µin | |

Peter M. Meyer

| Parameter/Equipment | Range | CMC ^{2,4} (±) | Comments |
|------------------------------------|----------------------------|--|---|
| Cylindrical Rings | Up to 8 in | (15 + 10D) μin | UMM and gage blocks |
| Cylindrical Plugs | Up to 8 in (8 to 18) in | 14 μin + 6.0 μin/in 8.7 μin + 4.2 μin/in | UMM and gage blocks |
| Gage Amp w/ Probe ³ | ---- | 13 μin | Gage blocks |
| Gage Blocks | Up to 4 in (4 to 20) in | 4.2 μin + 4.7 μin/in 4.6 μin + 4.7 μin/in | Gage block and comparator |
| Height Gages ³ | Up to 48 in | (0.6R + 30L) μin | Standard reference bar |
| Indicators ³ | Up to 4 in | (0.6R + 40L) μin | Gage blocks |
| Indicator Calibrators ³ | ---- | 0.6R + 19 μin | Gage amp w/probe |
| Length Standards | Up to 8 in (8 to 18) in | 14 μin + 6.0 μin/in 8.7 μin + 4.2 μin/in | Universal measuring machine (UMM) and gage blocks |
| Micrometers – | | | |
| Depth ³ | Up to 12 in | 40 μin/in + 0.6R | Gage blocks |
| Inside | Up to 8 in (8 to 18) in | 14 μin + 6.0 μin/in 8.7 μin + 4.2 μin/in | UMM and gage blocks |
| Outside ³ | Up to 4 in (4 to 20) in | 58 μin + 4.7 μin/in 140 μin + 4.7 μin/in | Gage blocks |
| Groove ³ | Up to 4 in | 40 μin/in + 0.6R | Gage blocks |
| NPT Plugs – | | | |
| Pitch Diameter Taper | Up to 2 in | (100 + 12D) μin (240 + 13D) μin/in | Thread wires, UMM |

| Parameter/Equipment | Range | CMC ^{2,4} (±) | Comments |
|---|--|--|--|
| Optical Comparators ³ – Squareness Linear Magnification | (0 to 360)° Up to 12 in 10x, 20x, 50x, 62.5x, 100x | 2’ 0.0002 in 0.00012 in | Calibration sphere Glass scale Calibration sphere w/overlay |
| Protractors ³ | (0 to 180)° | 0.0076° | Angle blocks |
| Rules/Linear Scales ³ | Up to 24 in | 2200 μin + 11 μin/in | Digiscope master rule |
| Surface Plate ³ – Flatness Repeatability | 24 in × 24 in to 72 in × 144 in 6 in × 6 in to 72 in x 144 in | 8√ <i>D</i> μin 34 μin | Level meters (<i>D</i> is the diagonal in inches) Repeat-O-Meter |
| Tape Measures ³ | Up to 50 ft | (0.08 + 0.003 <i>L</i>) in | Master rule |
| Threaded Plug Gages – Simple Pitch Diameter Major Diameter | Up to 14 in Up to 8 in (8 to 14) in | (110 + 9 <i>D</i>) μin 14 μin + 6.0 μin/in 8.7 μin + 4.2 μin/in | UMM, thread wires (Best thread wire size) |
| Threaded Rings – Simple Pitch Diameter Functional Diameter | Up to 14 in Up to 14 in | (140 + 9 <i>D</i>) μin (300 + 8 <i>D</i>) μin | UMM, set plug |

II. Electrical – DC/Low Frequency

| Parameter/Range | Frequency | CMC ^{2,6} (±) | Comments |
|---------------------------------------|---|---|-------------|
| AC Current – Generate ³ | | | |
| (29 to 330) µA | (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz | 0.16 % + 0.1 µA 0.12 % + 0.1 µA 0.1 % + 0.1 µA 0.24 % + 0.15 µA 0.62 % + 0.2 µA 1.3 % + 0.4 µA | Fluke 5520A |
| 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 (10 to 30) kHz | 0.16 % + 0.15 µA 0.1 % + 0.15 µA 0.08 % + 0.15 µA 0.16 % + 0.2 µA 0.38 % + 0.3 µA 0.8 % + 0.6 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 (10 to 30) kHz | 0.14 % + 2 µA 0.07 % + 2 µA 0.031 % + 2 µA 0.062 % + 2 µA 0.16 % + 3 µA 0.31 % + 4 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 (10 to 30) kHz | 0.14 % + 20 µA 0.07 % + 20 µA 0.032 % + 20 µA 0.08 % + 50 µA 0.16 % + 0.12 mA 0.31 % + 0.2 mA | |
| 330 mA to 1.1 A | (10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz | 0.14 % + 0.1 mA 0.039 % + 0.1 mA 0.46 % + 1 mA 2.0 % + 5 mA | |
| (1.1 to 3) A | (10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz | 0.14 % + 0.1 mA 0.047 % + 0.1 mA 0.46 % + 1 mA 1.9 % + 5 mA | |
| (3 to 11) A | (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz | 0.048 % + 5 mA 0.081 % + 2 mA 2.4 % + 2 mA | |

| Parameter/Range | Frequency | CMC ^{2,5,6} (±) | Comments |
|--|---|--|----------------------------|
| AC Current – Generate ³ (cont) | | | |
| (11 to 20.5) A | (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz | 0.095 % + 5 mA 0.12 % + 5 mA 2.4 % + 5 mA | Fluke 5520A |
| (20 to 150) A 150 A to 1 kA | 50 Hz to 1 kHz 50 Hz to 1 kHz | 0.26 % 0.51 % | Fluke 5520 w/5500A coil |
| AC Current – Measure ³ | | | |
| Up to 100 µA | (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz | 0.46 % + 0.03 µA 0.18 % + 0.03 µA 0.073 % + 0.03 µA 0.073 % + 0.03 µA | HP 3458A |
| 1 mA | (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz | 0.46 % + 0.2 µA 0.18 % + 0.2 µA 0.072 % + 0.2 µA 0.043 % + 0.2 µA 0.072 % + 0.2 µA 0.46 % + 0.4 µA 0.64 % + 1.5 µA | |
| 10 mA | (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz | 0.46 % + 2 µA 0.18 % + 2 µA 0.072 % + 2 µA 0.043 % + 2 µA 0.072 % + 2 µA 0.46 % + 4 µA 0.64 % + 15 µA | |
| 100 mA | (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz | 0.46 % + 20 µA 0.18 % + 20 µA 0.072 % + 20 µA 0.043 % + 20 µA 0.072 % + 20 µA 0.46 % + 40 µA 0.64 % + 0.25 mA | |
| 100 mA to 1 A | (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz | 0.46 % + 0.2 mA 0.19 % + 0.2 mA 0.1 % + 0.2 mA 0.13 % + 0.2 mA 0.35 % + 0.2 mA 1.2 % + 0.4 mA | |

| Parameter/Range | Frequency | CMC ^{2,6,7} (±) | Comments |
|--|-----------------------------------|--|--------------|
| AC Current – Measure ³ (cont) | | | |
| (1 to 3) A | 10 Hz to 5 kHz (5 to 10) kHz | 0.18 % + 2 mA 0.41 % + 22 mA | Fluke 8845A |
| (3 to 10) A | 10 Hz to 5 kHz (5 to 10) kHz | 0.18 % + 6 mA 0.41 % + 70 mA | |
| AC High Voltage – Measure ³ | | | |
| (1 to 2) kV _{peak} | (20 to 100) Hz (100 to 400) Hz | 0.1 % + 0.12 % rng 0.46 % + 0.12 % rng | Vitrek 4620B |
| (2 to 20) kV _{peak} | (2 to 100) Hz | 0.23 % + 0.12 % rng | |
| AC Power ³ – PF = 1 | | | |
| (3.3 to 9) mA (9 to 33) mA (33 to 90) mA (90 to 330) mA 330 mA to 0.9 A (0.9 to 2.2) A (2.2 to 4.5) A (4.5 to 20.5) A | (10 to 65) Hz 33 mV to 1020 V | 0.15 % 0.13 % 0.15 % 0.13 % 0.19 % 0.18 % 0.29 % 0.18 % | Fluke 5520A |
| (3.3 to 9) mA (9 to 33) mA (33 to 90) mA (90 to 330) mA 330 mA to 0.9 A (0.9 to 2.2) A (2.2 to 4.5) A (4.5 to 20.5) A | (65 to 500) Hz 33 mV to 1020 V | 0.10 % 0.07 % 0.10 % 0.12 % 0.09 % 0.08 % 0.18 % 0.18 % | |

| Parameter/Range | Frequency | CMC ^{2,6} (±) | Comments |
|---------------------------------------|------------------|------------------------|-------------|
| AC Power ³ – (cont) | | | |
| PF = 1 | | | |
| (3.3 to 9) mA | 500 Hz to 1 kHz | 0.10 % | Fluke 5520A |
| (9 to 33) mA | 33 mV to 1020 V | 0.07 % | |
| (33 to 90) mA | | 0.10 % | |
| (90 to 330) mA | | 0.12 % | |
| 330 mA to 0.9 A | | 0.09 % | |
| (0.9 to 2.2) A | | 0.08 % | |
| (2.2 to 4.5) A | | 0.18 % | |
| (4.5 to 20.5) A | | 0.18 % | |
| (3.3 to 9) mA | (1 to 5) kHz | 0.14 % | |
| (9 to 33) mA | 33 mV to 1020 V | 0.12 % | |
| (33 to 90) mA | | 0.21 % | |
| (90 to 330) mA | | 0.15 % | |
| 330 mA to 0.9 A | | 0.69 % | |
| (0.9 to 2.2) A | | 0.56 % | |
| (2.2 to 4.5) A | | 2.5 % | |
| (4.5 to 20.5) A | | 2.5 % | |
| (3.3 to 9) mA | (5 to 10) kHz | 0.38 % | |
| (9 to 33) mA | 33 mV to 1020 V | 0.35 % | |
| (33 to 90) mA | | 0.52 % | |
| (90 to 330) mA | | 0.38 % | |
| 330 mA to 0.9 A | | 3.1 % | |
| (0.9 to 2.2) A | | 2.4 % | |
| (3.3 to 9) mA | (10 to 30) kHz | 1.3 % | |
| (9 to 33) mA | 33 mV to 1020 V | 1.2 % | |
| (33 to 90) mA | | 1.4 % | |
| (90 to 330) mA | | 1.3 % | |
| AC Voltage – Generate ³ | | | |
| (1 to 33) mV | (10 to 45) Hz | 0.063 % + 6 μV | Fluke 5520A |
| | 45 Hz to 10 kHz | 0.017 % + 6 μV | |
| | (10 to 20) kHz | 0.02 % + 6 μV | |
| | (20 to 50) kHz | 0.08 % + 6 μV | |
| | (50 to 100) kHz | 0.27 % + 12 μV | |
| | (100 to 500) kHz | 0.62 % + 50 μV | |

| Parameter/Range | Frequency | CMC ^{2,5,6} (±) | Comments |
|--|---|--|-------------|
| AC Voltage – Generate ³ (cont) | | | |
| (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 | 0.023 % + 8 μV 0.012 % + 8 μV 0.013 % + 8 μV 0.028 % + 8 μV 0.062 % + 32 μV 0.16 % + 70 μV | Fluke 5520A |
| 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 % + 50 μV 0.012 % + 60 μV 0.016 % + 60 μV 0.024 % + 50 μV 0.055 % + 0.13 mV 0.19 % + 0.6 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 % + 0.65 mV 0.012 % + 0.6 mV 0.019 % + 0.6 mV 0.028 % + 0.6 mV 0.072 % + 1.6 mV | |
| (33 to 330) V | (10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz | 0.015 % + 2 mV 0.016 % + 6 mV 0.02 % + 6 mV 0.026 % + 6 mV 0.16 % + 50 mV | |
| (330 to 1020) V | 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz | 0.024 % + 10 mV 0.02 % + 10 mV 0.024 % + 10 mV | |
| AC Voltage – Measure ³ | | | |
| 10 mV | (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz | 0.039 % + 3 μV 0.03 % + 1.1 μV 0.039 % + 1.1 μV 0.12 % + 1.1 μV 0.58 % + 1.1 μV 4.6 % + 2 μV | HP 3458A |

| Parameter/Range | Frequency | CMC ^{2,5} (±) | Comments |
|---|--|--|----------|
| AC Voltage – Measure ³ (cont) | | | |
| 100 mV | (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz | 0.014 % + 4 μV 0.012 % + 2 μV 0.018 % + 2 μV 0.031 % + 2 μV 0.092 % + 2 μV 0.34 % + 10 μV 1.2 % + 10 μV 1.8 % + 10 μV | HP 3458A |
| 1 V | (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz | 0.014 % + 40 μV 0.012 % + 20 μV 0.018 % + 20 μV 0.031 % + 20 μV 0.092 % + 20 μV 0.34 % + 0.1 mV 1.2 % + 0.1 mV 1.8 % + 0.1 mV | |
| 10 V | (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz | 0.014 % + 0.4 mV 0.012 % + 0.2 mV 0.018 % + 0.2 mV 0.031 % + 0.2 mV 0.092 % + 0.2 mV 0.34 % + 1 mV 1.2 % + 1 mV 1.8 % + 1 mV | |
| 100 V | (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz | 0.025 % + 4 mV 0.025 % + 2 mV 0.025 % + 2 mV 0.04 % + 2 mV 0.14 % + 2 mV 0.46 % + 10 mV 1.7 % + 10 mV | |
| 1000 V | (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz | 0.047 % + 40 mV 0.047 % + 20 mV 0.07 % + 20 mV 0.14 % + 20 mV 0.34 % + 20 mV | |

| Parameter/Equipment | Range | CMC ^{2, 5, 6, 7} (±) | Comments |
|---|--|--|---|
| Capacitance – Generate ³ | (0.19 to 3.3) nF (3.3 to 11) nF (11 to 110) nF (110 to 330) nF 330 nF to 1.1 μF (1.1 to 3.3) μF (3.3 to 11) μF (11 to 33) μF (33 to 110) μF (110 to 330) μF 330 μF to 1.1 mF (1.1 to 3.3) mF (3.3 to 11) mF (11 to 33) mF | 0.5 % + 0.01 nF 0.25 % + 0.01 nF 0.25 % + 0.1 nF 0.25 % + 0.3 nF 0.25 % + 1 nF 0.25 % + 3 nF 0.25 % + 10 nF 0.4 % + 30 nF 0.45 % + 100 nF 0.45 % + 300 nF 0.45 % + 1 μF 0.45 % + 3 μF 0.45 % + 10 μF 0.75 % + 30 μF | Fluke 5520A |
| DC Current – Generate ³ | (0 to 330) μA 330 μA to 3.3 mA (3.3 to 33) mA (33 to 330) mA 330 mA to 1.1 A (1.1 to 3.0) A (3 to 11) A (11 to 20.5) A | 0.012 % + 0.02 μA 79 μA/A + 0.05 μA 79 μA/A + 0.25 μA 79 μA/A + 2.5 μA 0.016 % + 40 μA 0.03 % + 40 μA 0.04 % + 500 μA 0.078 % + 750 μA | Fluke 5520A |
| DC Current – Measure ³ | 100 nA 100 nA to 1 μA (1 to 10) μA (10 to 100) μA 100 μA to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A (1 to 2) A (2 to 10) A | 52 mA/A + 0.04 nA 25 mA/A + 0.04 nA 25 mA/A + 0.1 nA 26 mA/A + 0.8 nA 27 mA/A + 5 nA 26 mA/A + 50 nA 42 mA/A + 0.5 mA 0.013 % + 10 mA 0.15 % 0.19 % | HP 3458A Fluke 8845A |
| DC High Voltage – Measure ³ | (1 to 2) kV (2 to 20) kV | 0.05 % + 0.023 % rng 0.46 % + 0.12 % rng | Vitrek 4620B |

| Parameter/Range | Frequency | CMC ^{2,6} (±) | Comments |
|--|--|--|-------------|
| DC Power ³ – 33 mV to 1020 V | 330 µA to 1.1 A (1.1 to 3) A (3 to 11) A (11 to 20.5) A | 0.068 % 0.070 % 0.095 % 0.12% | Fluke 5520A |

| Parameter/Equipment | Range | CMC ^{2,5,6} (±) | Comments |
|---|---|--|-------------|
| DC Voltage – Generate ³ | (0 to 330) µV 330 µV to 3.3 V (3.3 to 33) V (33 to 330) V (330 to 1000) V | 16 µV + 1 µV 9.1 µV/V + 2 µV 11 µV/V + 20 µV 15 µV/V + 150 µV 15 µV/V + 1500 µV | Fluke 5520A |
| DC Voltage – Measure ³ | Up to 100 mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 1000) V | 9.6 µV/V + 0.23 µV 6.1 µV/V + 0.25 µV 5.6 µV/V + 1 µV 7.4 µV/V + 25 µV 7.6 µV/V + 100 µV | HP 3458A |
| Electrical Simulation of RTDs ³ – | | | Fluke 5520A |
| Pt 385, 100 Ω | -200 °C to 0 °C 0 °C to 100 °C 100 °C to 300 °C 300 °C to 400 °C 400 °C to 630 °C 630 °C to 800 °C | 0.05 °C 0.07 °C 0.09 °C 0.1 °C 0.12 °C 0.23 °C | |
| Pt 3926, 100 Ω | -200 °C to 0 °C 0 °C to 100 °C 100 °C to 300 °C 300 °C to 400 °C 400 °C to 630 °C | 0.05 °C 0.07 °C 0.09 °C 0.1 °C 0.12 °C | |
| PtNi 385, 120 Ω | -80 °C to 100 °C 100 °C to 260 °C | 0.08 °C 0.14 °C | |

| Parameter/Equipment | Range | CMC ² (±) | Comments |
|--|---|---|-------------|
| Electrical Simulation of RTDs ³ – (cont) | | | |
| Pt 385, 200 Ω | -200 °C to 100 °C 100 °C to 260 °C 260 °C to 300 °C 300 °C to 400 °C 400 °C to 600 °C 600 °C to 630 °C | 0.04 °C 0.05 °C 0.12 °C 0.13 °C 0.14 °C 0.16 °C | Fluke 5520A |
| Pt 385, 500 Ω | -200 °C to -80 °C -80 °C to 100 °C 100 °C to 260 °C 260 °C to 400 °C 400 °C to 600 °C 600 °C to 630 °C | 0.04 °C 0.05 °C 0.06 °C 0.08 °C 0.09 °C 0.11 °C | |
| Pt 385, 1000 Ω | -200 °C to 0 °C 0 °C to 100 °C 100 °C to 260 °C 260 °C to 300 °C 300 °C to 600 °C 600 °C to 630 °C | 0.03 °C 0.04 °C 0.05 °C 0.06 °C 0.07 °C 0.23 °C | |
| Pt 3916, 100 Ω | -200 °C to -190 °C -190 °C to -80 °C -80 °C to 0 °C 0 °C to 100 °C 100 °C to 260 °C 260 °C to 300 °C 300 °C to 400 °C 400 °C to 600 °C | 0.25 °C 0.04 °C 0.05 °C 0.06 °C 0.07 °C 0.08 °C 0.09 °C 0.1 °C | |
| Electrical Simulation of Thermocouple ³ – | | | |
| Type E | -250 °C to -100 °C -100 °C to 650 °C 650 °C to 1000 °C | 0.5 °C 0.16 °C 0.21 °C | Fluke 5520A |
| Type J | -210 °C to -100 °C -100 °C to 760 °C 760 °C to 1200 °C | 0.28 °C 0.17 °C 0.23 °C | |

| Parameter/Equipment | Range | CMC ^{2,6} (±) | Comments | |
|---|---|--|--|-----------------------|
| Electrical Simulation of Thermocouple ³ – (cont) | | | | |
| Type K | -200 °C to -100 °C -100 °C to 120 °C 120 °C to 1000 C 1000 °C to 1372 °C | 0.34 °C 0.18 °C 0.26 °C 0.4 °C | Fluke 5520A | |
| Type S | 0 °C to 250 °C 250 °C to 1400 °C 1400 °C to 1767 °C | 0.47 °C 0.37 °C 0.46 °C | | |
| Type T | -250 °C to -150 °C -150 °C to 0 °C 0 °C to 400 °C | 0.63 °C 0.24 °C 0.15 °C | | |
| Oscilloscope Calibration ³ – | | | | |
| Squarewave Signal 50 Ω at 1 kHz Source | ± 1 mV to 6.6 V _{p-p} | 0.28 % + 40 μV | | Fluke 5520A/SC1100 |
| Squarewave Signal 1 MΩ at 1 kHz Source | ± 1 mV to 130 V _{p-p} | 0.12 % + 40 μV | | |
| Leveled Sine Wave Amplitude – Range: 5 mV to 5.5 V _{p-p} | 50 kHz reference 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz | 2 % + 300 μV 3.5 % + 300 μV 4 % + 300 μV 6 % + 300 μV | Fluke 5520A/SC1100, <i>t</i> is in seconds | |
| Range: 4 mV to 3.5 V _{p-p} | (600 to 1100) MHz | 7 % + 300 μV | | |
| Leveled Sine Wave Flatness (Relative to 50 kHz) | 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1100) MHz | 1.5 % + 100 μV 2 % + 100 μV 4 % + 100 μV 5 % + 100 μV | | |
| Time Marker into 50 Ω Generate and Measure | 5 s to 50 ms 20 ms to 1 ns | (26 + <i>t</i> *1000) parts in 10 ⁶ 2.6 parts in 10 ⁶ | | |
| Rise Time | ≤ 300 ps | +0 /-100 ps | | |

| Parameter/Equipment | Range | CMC ^{2,5,6} (\pm) | Comments |
|------------------------------------|--|---|------------------|
| Resistance – Generate ³ | (0 to 11) Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω (330 to 1100) Ω (1.1 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 (330 to 1100) k 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 (330 to 1100) M Ω | 34 $\mu\Omega/\Omega + 0.001 \Omega$ 30 $\mu\Omega/\Omega + 0.015 \Omega$ 25 $\mu\Omega/\Omega + 0.015 \Omega$ 27 $\mu\Omega/\Omega + 0.02 \Omega$ 24 $\mu\Omega/\Omega + 0.02 \Omega$ 25 $\mu\Omega/\Omega + 0.2 \Omega$ 24 $\mu\Omega/\Omega + 0.1 \Omega$ 24 $\mu\Omega/\Omega + 1 \Omega$ 24 $\mu\Omega/\Omega + 1 \Omega$ 31 $\mu\Omega/\Omega + 10 \Omega$ 28 $\mu\Omega/\Omega + 10 \Omega$ 47 $\mu\Omega/\Omega + 0.15 \text{ k}\Omega$ 0.011 % + 0.25 k Ω 0.02 % + 2.5 k Ω 0.039 % + 3 k Ω 0.24 % + 0.1 M Ω 1.2 % + 0.5 M Ω | Fluke 5520A |
| Resistance – Generate, | (1 to 999) M Ω (1 to 9.9) G Ω (10 to 100) G Ω | 0.13 % + 550 k Ω 0.50 % + 130 k Ω 1.0 % + 7.5 M Ω | Decade resistors |
| Resistance – Measure ³ | (0 to 10) Ω (10 to 100) Ω 100 Ω to 1 k Ω (1 to 10) k Ω (10 to 100) k Ω 100 k Ω to 1 M Ω (1 to 10) M Ω (10 to 100) M Ω 100 M Ω to 1 G Ω | 19 $\mu\Omega/\Omega + 50 \mu\Omega$ 14 $\mu\Omega/\Omega + 0.05 \text{ m}\Omega$ 12 $\mu\Omega/\Omega + 0.5 \text{ m}\Omega$ 12 $\mu\Omega/\Omega + 5 \text{ m}\Omega$ 12 $\mu\Omega/\Omega + 50 \text{ m}\Omega$ 17 $\mu\Omega/\Omega + 2 \Omega$ 59 $\mu\Omega/\Omega + 100 \Omega$ 0.058 % + 1 k Ω 0.58 % + 10 k Ω | HP 3458A |

III. Mechanical

| Parameter/Equipment | Range | CMC ^{2,4,7} (±) | Comments |
|---|--|--|-------------|
| Force Gages ³ | (0 to 250) lbf | 0.12 % + 0.6R | Deadweights |
| Indirect Verification of Rockwell Hardness and Rockwell Superficial Hardness Testers ³ | HRA: Low Mid High HRBW: Low Mid High HRC: Low Mid High HREW: Low Mid High HR15N: Low Mid High HR30N: Low Mid High | 0.29 HRA 0.56 HRA 0.24 HRA 0.94 HRBW 0.69 HRBW 0.62 HRBW 0.78 HRC 0.92 HRC 0.39 HRC 0.92 HREW 1.1 HREW 0.89 HREW 0.76 HR15N 0.75 HR15N 1.0 HR15N 0.55 HR30N 0.48 HR30N 0.46 HR30N | ASTM E18 |

| Parameter/Equipment | Range | CMC ^{2,7} (±) | Comments |
|--|---|---|---|
| Indirect Verification of Rockwell Hardness and Rockwell Superficial Hardness Testers ³ (cont) | HR45N: Low Mid High HR15TW: Low Mid High HR30TW: Low Mid High HR45TW: Low Mid High | 0.68 HR45N 0.72 HR45N 0.66 HR45N 0.79 HR15TW 0.52 HR15TW 0.61 HR15TW 0.70 HR30TW 0.61 HR30TW 0.42 HR30TW 0.98 HR45TW 0.78 HR45TW 0.81 HR45TW | ASTM E18 |
| Pressure Gages/Transducers ³ | (0 to 2000) psig (2000 to 30 000) psig | (0.24 + 0.025 % full scale) psi (13 + 0.07 % full scale) psi | Heise HQS pressure calibrator Heise 901A pressure calibrator |

| Parameter/Equipment | Range | CMC ^{2,4} (±) | Comments |
|--|---|--|--------------------|
| Scales ³ | (50 to 100) lb (100 to 750) lb | 0.04 lb + 0.6R 0.09 lb + 0.6R | Class F weights |
| Scales/Balances ³ | (1 to 162) mg 162 mg to 400 g (1 to 50) lb | 0.26 mg 2.6 mg 0.0028 lb | Class S1 weights |
| Scales ³ – Proportional Testing | (750 to 1500) lb (1500 to 3000) lb (3000 to 4500) lb (4500 to 6000) lb | 0.41 lb + 0.6R 0.81 lb + 0.6R 1.3 lb + 0.6R 1.7 lb + 0.6R | Class F weights |
| Tachometers ³ – Photo | Up to 100 000 rpm | 0.8R | Function generator |
| Torque Testers | (0.1 to 1000) ft·lbf | 0.1 % + 0.6R | Class F weights |
| Torque Wrenches ³ | (0 to 1000) ft·lbf (0 to 1200) in·lbf | 0.62 % + 0.12 ft·lbf 0.7 % + 1.1 in·lbf | Torque calibrator |

IV. Thermodynamics

| Parameter/Equipment | Range | CMC ^{2,4} (±) | Comments |
|---|---|---------------------------------|------------------|
| Temperature – Temperature Measuring Devices | @ 100 °C -30 °C to 139 °C 140 to 660 °C | 0.076 °C 0.081 °C 0.25 °C | Drywell and SPRT |

V. Time & Frequency

| Parameter/Range | Frequency | CMC ² (±) | Comments |
|-------------------------|-----------------|---------------------------------|--|
| Frequency | 10 MHz | 1 part in 10 ⁹ Hz/Hz | Agilent Z3801A GPS receiver |
| Frequency ³ | 0.1 Hz to 3 GHz | 2.5 μHz/Hz | Agilent 53131 counter |
| Stop Watches and Timers | ≥ 10 ms | 28 ms + 0.18 ms/s | Functional generator and frequency counter |

¹ This laboratory offers commercial calibration service and field calibration service (where noted).

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 In the statement of CMC, L is the linear displacement in inches; R is the resolution of the unit under test; D is the linear displacement in inches.

⁵ CMCs for calibrations performed in the laboratory with the HP 3458A is based upon 90-day specifications and is read as a portion or percent of reading plus a portion or percent of range. CMC for calibrations performed field with the HP 3458A is based upon 1-year specifications and is also read as a portion or percent of reading plus a portion or percent of range.

⁶ CMCs for calibrations performed with the Fluke 5520A is based upon 1-year specifications and is read as a portion or percent of reading plus a portion or percent of range or as a portion or percent of reading plus floor specification.

⁷ In the statement of CMC, percentages are to be read as percent of reading, unless noted otherwise.