



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017
& ANSI/NCSL Z540-1-1994 & ANSI/NCSL Z540.3

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CALIBRATION

Valid To: December 31, 2024

Certificate Number: 2357.24

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations^{1, 6}:

I. Dimensional

| Parameter/Equipment | Range | CMC ^{2, 4} (±) | Comments |
|--|---|--|------------------------------|
| Micrometers ³ – inside, outside & depth | Up to 4 in (4 to 12) in (12 to 48) in | (7.9 + 2.8L) µin (22 + 4.7L) µin (12 + 5.6L) µin | Gage blocks |
| Flatness | Up to 1 in | 6.1 µin | Optical flats/parallel |
| Parallelism | Up to 0.001 in | 6.6 µin | Optical flats/parallel |
| Calipers ³ | Up to 4 in (4 to 12) in (12 to 48) in | (30 + 1.3L) µin 290 µin (270 + 2.8L) µin | Gage blocks |
| Height Gage ³ | Up to 4 in (4 to 12) in (12 to 24) in | (58 + 0.76L) µin (48 + 3.4L) µin (36 + 4.3L) µin | Gage blocks w/ surface plate |

II. Electrical – DC/Low Frequency

| Parameter/Equipment | Range | CMC ^{2, 5} (\pm) | Comments |
|------------------------------------|--|--|---|
| DC Voltage – Generate ³ | Up to 220 mV 220 mV to 2.2 V (2.2 to 11) V (11 to 22) V (22 to 220) V (220 to 1100) V | 11 μ V/V + 0.39 μ V 4.9 μ V/V + 0.62 μ V 3.5 μ V/V + 2.3 μ V 3.6 μ V/V + 3.9 μ V 5.0 μ V/V + 39 μ V 6.4 μ V/V + 0.39 mV | Fluke 5730A |
| DC Voltage – Measure ³ | Up to 100 mV 100 mV to 1 V (1 to 10) V (10 to 100) V 100 V to 1 kV (1 to 75) kV | 8.9 μ V/V + 230 nV 4.8 μ V/V + 230 nV 4.7 μ V/V + 23 μ V 6.3 μ V/V + 0.23 mV 6.4 μ V/V + 2.3 mV 1.7 mV/V | HP 3458A opt 002 Ross VD90/HP 34401A |
| DC Current – Generate ³ | Up to 220 μ A 220 μ A to 2.2 mA (2.2 to 22) mA (22 to 220) mA 220 mA to 2.2 A (2.2 to 11) A (11 to 20.5) A (16.5 to 149.999) A (10 to 1025) A | 41 μ A/A + 5.4 nA 33 μ A/A + 6.2 nA 33 μ A/A + 39 nA 41 μ A/A + 0.62 μ A 71 μ A/A + 12 μ A 0.28 mA/A + 0.37 mA 0.78 mA/A + 0.58 mA 4.4 mA/A + 0.11 mA 5.1 mA/A + 0.39 mA | Fluke 5730A Fluke 5730A/5725A Fluke 5520A w/ 5500A 50 turn coil |
| DC Current – Measure ³ | Up to 100 nA (0.1 to 1) μ A (1 to 10) μ A (10 to 100) μ A 100 μ A to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A (1 to 20) A (20 to 100) A (100 to 300) A | 66 μ A/A + 31 pA 32 μ A/A + 31 pA 16 μ A/A + 78 pA 20 μ A/A + 0.62 nA 19 μ A/A + 3.9 nA 19 μ A/A + 39 nA 28 μ A/A + 0.39 μ A 89 μ A/A + 7.8 μ A 51 μ A/A 72 μ A/A 58 μ A/A | HP 3458A opt 002 Y5020 w/ HP 3458A 9211A w/ HP 3458A |

| Parameter/Equipment | Range | CMC ² (±) | Comments |
|---|--|---|-------------|
| Electrical Simulation of Thermocouples ³ – | | | |
| Type E | (-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C | 0.30 °C 0.099 °C 0.085 °C 0.099 °C 0.13 °C | Fluke 5520A |
| 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 0.11 °C 0.091 °C 0.11 °C 0.15 °C | |
| Type K | (-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C | 0.20 °C 0.12 °C 0.10 °C 0.15 °C 0.24 °C | |
| Type R | (0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C | 0.38 °C 0.22 °C 0.21 °C 0.24 °C | |
| Type T | (-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C | 0.38 °C 0.14 °C 0.099 °C 0.085 °C | |
| Electrical Simulation of RTDs ³ – | | | |
| Pt 385 / 100 | (-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C (630 to 800) °C | 0.082 °C 0.12 °C 0.12 °C 0.10 °C 0.091 °C 0.10 °C 0.18 °C | Fluke 5520A |
| Phase ³ | (0 to 360)° | 0.58° | Fluke 5520A |

| Parameter/Equipment | Range | CMC ^{2,5} (±) | Comments |
|---|--|---|-------------|
| DC Power Generate ³ | 0.01 mW to 337 W (0.01 to 3060) W (3.06 to 20.91) kW | 0.18 mW/W 0.18 mW/W 0.57 mW/W | Fluke 5520A |
| AC Power ³ – Generate PF = 1 (45 to 65) Hz | (0.1089 to 2.97) mW (0.297 to 10.89) mW (1.089 to 29.7) mW (2.97 to 108.9) mW (10.89 to 297) mW (29.7 to 726) mW 72.6 mW to 1.49 W 149 mW to 6.76 W 1.09 mW to 9.18 W 2.97 mW to 33.6 W 10.9 mW to 91.8 W 29.7 mW to 337 W 109 mW to 918 W 297 mW to 2244 W 72.6 mW to 4.59 kW 1.49 W to 20.91 kW | 2.3 mW/W 1.4 mW/W 1.1 mW/W 1.3 mW/W 1.0 mW/W 1.0 mW/W 1.1 mW/W 1.0 mW/W 3.4 mW/W 0.62 mW/W 0.94 mW/W 0.62 mW/W 0.86 mW/W 0.76 mW/W 0.96 mW/W 0.81 mW/W | Fluke 5520A |

| Parameter/Range | Frequency | CMC ^{2,5} (±) | Comments |
|---|--|--|-------------|
| AC Voltage – Generate ³ (0.2 to 2.2) mV | (10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz | 1.2 mV/V + 3.9 μV 0.86 mV/V + 3.9 μV 0.85 mV/V + 3.9 μV 1.4 mV/V + 3.9 μV 2.0 mV/V + 4.7 μV 3.5 mV/V + 9.3 μV 4.8 mV/V + 19 μV 6.5 mV/V + 19 μV | Fluke 5730A |

| Parameter/Range | Frequency | CMC ^{2, 5} (\pm) | Comments |
|--|--|---|-------------|
| AC Voltage – Generate ³ (cont) | | | |
| (2.2 to 22) mV | (10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz | 0.3 mV/V + 3.9 μ V 0.18 mV/V + 3.9 μ V 0.16 mV/V + 3.9 μ V 0.3 mV/V + 3.9 μ V 0.55 mV/V + 4.7 μ V 1.2 mV/V + 9.3 μ V 1.6 mV/V + 19 μ V 2.5 mV/V + 19 μ V | Fluke 5730A |
| (22 to 220) mV | (10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz | 0.36 mV/V + 12 μ V 91 μ V/V + 6.2 μ V 80 μ V/V + 6.2 μ V 0.19 mV/V + 6.2 μ V 0.44 mV/V + 16 μ V 0.73 mV/V + 19 μ V 1.2 mV/V + 23 μ V 2.4 mV/V + 47 μ V | |
| (0.22 to 2.2) V | (10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz | 0.49 mV/V + 39 μ V 81 μ V/V + 16 μ V 42 μ V/V + 7.8 μ V 75 μ V/V + 9.3 μ V 0.14 mV/V + 31 μ V 0.36 mV/V + 78 μ V 0.88 mV/V + 0.19 mV 1.6 mV/V + 0.47 mV | |
| (2.2 to 22) V | (10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz | 0.37 mV/V + 0.39 mV 0.09 mV/V + 0.16 mV 43 μ V/V + 54 μ V 78 μ V/V + 93 μ V 0.11 mV/V + 0.19 mV 0.28 mV/V + 0.62 mV 0.91 mV/V + 1.9 mV 1.6 mV/V + 3.1 mV | |

| Parameter/Range | Frequency | CMC ^{2,5} (\pm) | Comments |
|--|--|---|----------------------|
| AC Voltage – Generate ³ (cont) | | | |
| (22 to 220) V | (10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz | 0.59 mV/V + 7.8 mV 0.14 mV/V + 2.3 mV 74 μ V/V + 0.78 mV 0.20 mV/V + 3.1 mV 0.47 mV/V + 7.8 mV 1.3 mV/V + 85 mV 4.2 mV/V + 85 mV 11 mV/V + 0.17 V | Fluke 5730A w/ 5725A |
| (220 to 1100) V | 40 Hz to 1 kHz (1 to 20) kHz (20 to 30) kHz | 74 μ V/V + 3.1 mV 0.11 mV/V + 4.7 mV 0.31 mV/V + 8.5 mV | Fluke 5730A w/ 5725A |
| (220 to 750) V | (30 to 50) kHz (50 to 100) kHz | 0.29 mV/V + 8.5 mV 1.1 mV/V + 35 mV | |
| AC Voltage – Measure ³ | | | |
| Up to 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 | 0.27 μ V/V + 2.3 μ V 0.18 μ V/V + 0.85 μ V 0.25 μ V/V + 0.85 μ V 0.78 μ V/V + 0.85 μ V 3.9 μ V/V + 0.85 μ V 31 μ V/V + 3.9 μ V | HP 3458A opt 002 |
| (10 to 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 | 0.13 μ V/V + 3.1 μ V 71 nV/V + 1.6 μ V 0.11 μ V/V + 1.6 μ V 0.23 μ V/V + 1.6 μ V 0.62 μ V/V + 1.6 μ V 2.3 μ V/V + 7.8 μ V | |
| 100 mV to 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 | 61 μ V/V + 31 μ V 59 μ V/V + 16 μ V 0.11 mV/V + 16 μ V 0.24 mV/V + 16 μ V 0.63 mV/V + 16 μ V 2.3 mV/V + 78 μ V | |
| (1 to 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 | 59 μ V/V + 0.31 mV 59 μ V/V + 0.16 mV 0.11 mV/V + 0.16 mV 0.24 mV/V + 0.16 mV 0.63 mV/V + 0.16 mV 2.3 mV/V + 0.78 mV | |

| Parameter/Range | Frequency | CMC ^{2, 5} (\pm) | Comments |
|---|--|--|------------------------|
| AC Voltage – Measure ³ (cont) | | | |
| (10 to 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 | 0.16 mV/V + 3.1 mV 0.16 mV/V + 1.6 mV 0.16 mV/V + 1.6 mV 0.28 mV/V + 1.6 mV 0.94 mV/V + 1.6 mV 3.1 mV/V + 7.8 mV | HP 3458A opt 002 |
| (100 to 700) V | (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz | 0.32 mV/V + 31 mV 0.31 mV/V + 16 mV 0.47 mV/V + 16 mV | |
| (1 to 60) kV | 60 Hz | 7.0 mV/V | Ross VD90/HP 34401A |
| AC Current – Generate ³ | | | |
| Up to 220 μ A | (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz | 0.40 mA/A + 16 nA 0.16 mA/A + 9.3 nA 0.10 mA/A + 7.8 nA 0.28 mA/A + 12 nA 1.0 mA/A + 62 nA | Fluke 5730A |
| (0.22 to 2.2) mA | (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz | 0.35 mA/A + 39 nA 0.19 mA/A + 31 nA 0.15 mA/A + 31 nA 0.22 mA/A + 0.10 μ A 1.0 mA/A + 0.62 μ A | |
| (2.2 to 22) mA | (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz | 0.34 mA/A + 0.39 μ A 0.16 mA/A + 0.31 μ A 0.11 mA/A + 0.31 μ A 0.20 mA/A + 0.54 μ A 1.1 mA/A + 4.7 μ A | |
| (22 to 220) mA | (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz | 0.36 mA/A + 3.9 μ A 0.16 mA/A + 3.1 μ A 0.11 mA/A + 2.3 μ A 0.2 mA/A + 3.1 μ A 1.1 mA/A + 9.3 μ A | |

| Parameter/Range | Frequency | CMC ^{2,5} (±) | Comments |
|---|--|--|---------------------------|
| AC Current – Generate ³ (cont) | | | |
| (0.22 to 2.2) A | 20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz | 0.26 mA/A + 31 µA 0.41 mA/A + 78 µA 6.2 mA/A + 0.16 mA | Fluke 5730A/5725A |
| (2.2 to 11) A | 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz | 0.41 mA/A + 0.13 mA 0.76 mA/A + 0.29 mA 2.9 mA/A + 0.58 mA | Fluke 5520A |
| (11 to 20.5) A | (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz | 0.96 mA/A + 3.9 mA 1.2 mA/A + 3.9 mA 23 mA/A + 3.9 mA | |
| (29 to 329.99) µA (0.33 to 3.2999) mA (3.3 to 32.999) mA (33 to 329.99) mA | (10 to 30) kHz (10 to 30) kHz (10 to 30) kHz (10 to 30) kHz | 12 mA/A + 0.31 µA 7.8 mA/A + 0.47 µA 3.5 mA/A + 3.1 µA 3.2 mA/A + 0.16 mA | |
| (16.5 to 149.999) A | (45 to 65) Hz (65 to 440) Hz | 0.47 % 0.88 % | Fluke 5520A w/ 5500A coil |
| (150 to 1025) A | (45 to 65) Hz (65 to 440) Hz | 0.47 % 0.88 % | |
| AC Current – Measure ³ | | | |
| (0 to 100) µA | (10 to 20) Hz (20 to 45) Hz 45 Hz to 5 kHz | 3.3 mA/A + 23 nA 1.2 mA/A + 23 nA 0.50 mA/A + 23 nA | HP 3458A opt 002 |
| 100 µA to 1 mA | (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz | 3.4 mA/A + 0.16 µA 1.3 mA/A + 0.16 µA 0.53 mA/A + 0.16 µA 0.25 mA/A + 0.16 µA | |
| (1 to 10) mA | (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz | 3.4 mA/A + 1.6 µA 1.3 mA/A + 1.6 µA 0.51 mA/A + 1.6 µA 0.25 mA/A + 1.6 µA | |

| Parameter/Range | Frequency | CMC ^{2, 5} (±) | Comments |
|---|---|---|----------------------|
| AC Current – Measure ³ (cont) | | | |
| (10 to 100) mA | (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz | 3.4 mA/A + 16 µA 1.3 mA/A + 16 µA 0.50 mA/A + 16 µA 0.25 mA/A + 16 µA | HP 3458A opt 002 |
| 100 mA to 1 A | (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz | 3.4 mA/A + 0.16 mA 1.4 mA/A + 0.16 mA 0.69 mA/A + 0.16 mA 0.85 mA/A + 0.16 mA | |
| (1 to 20) A | 55 Hz to 1 kHz (1 to 5) kHz | 0.15 mA/A 0.21 mA/A | HP 3458A w/ Y5020A |
| AC Level Flatness – Measure ³ | | | |
| 3 V | (10 to < 100) Hz (100 to < 1000) Hz (1 to < 10) kHz (10 to < 30) kHz (30 to < 100) kHz (100 to < 300) kHz (0.3 to < 1) MHz (1 to < 3) MHz (3 to < 8) MHz (8 to < 10) MHz (10 to < 20) MHz (20 to < 30) MHz (30 to < 50) MHz (50 to < 70) MHz (70 to < 80) MHz (80 to < 100) MHz 100 MHz | 0.12 % 0.12 % 0.12 % 0.12 % 0.23 % 0.29 % 0.29 % 0.58 % 0.70 % 0.71 % 0.71 % 0.76 % 1.8 % 2.8 % 3.6 % 3.9 % 4.8 % | 3V thermal convertor |

| Parameter/Equipment | Range | CMC ^{2,5} (±) | Comments |
|------------------------------------|---|---|-------------|
| Resistance – Generate ³ | (0 to 11) Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω 330 Ω to 1.1 kΩ (1.1 to 3.3) kΩ (3.3 to 11) kΩ (11 to 33) kΩ (33 to 110) kΩ (110 to 330) kΩ 330 kΩ to 1.1 MΩ (1.1 to 3.3) MΩ (3.3 to 11) MΩ (11 to 33) MΩ (33 to 110) MΩ (110 to 330) MΩ 330 MΩ to 1.1 GΩ | 33 μΩ/Ω + 0.78 mΩ 24 μΩ/Ω + 1.2 mΩ 22 μΩ/Ω + 1.1 mΩ 23 μΩ/Ω + 1.6 mΩ 22 μΩ/Ω + 1.6 mΩ 23 μΩ/Ω + 16 mΩ 23 μΩ/Ω + 16 mΩ 23 μΩ/Ω + 160 mΩ 23 μΩ/Ω + 160 mΩ 26 μΩ/Ω + 1.6 Ω 26 μΩ/Ω + 1.6 Ω 48 μΩ/Ω + 23 Ω 0.10 mΩ/Ω + 39 Ω 0.21 mΩ/Ω + 1.9 kΩ 0.40 mΩ/Ω + 2.3 kΩ 2.3 mΩ/Ω + 78 kΩ 12 mΩ/Ω + 390 kΩ | Fluke 5520A |
| | 1 Ω 1.9 Ω 10 Ω 19 Ω 100 Ω 190 Ω 1.0 kΩ 1.9 kΩ 10 kΩ 19 kΩ 100 kΩ 190 kΩ 1.0 MΩ 1.9 MΩ 10 MΩ 19 MΩ 100 MΩ | 0.13 mΩ 0.18 mΩ 0.23 mΩ 0.42 mΩ 1.1 mΩ 2.0 mΩ 6.7 mΩ 13 mΩ 67 mΩ 0.12 Ω 0.81 Ω 2.6 Ω 49 Ω 58 Ω 4.0 kΩ 8.5 kΩ 26 kΩ | Fluke 5730A |

| Parameter/Equipment | Range | CMC ^{2, 5} (\pm) | Comments |
|--|---|--|------------------------------|
| Resistance – Generate ³ (cont) | 0.33333 m Ω 1 m Ω 10 m Ω 100 m Ω | 12 $\mu\Omega$ 12 $\mu\Omega$ 12 $\mu\Omega$ 22 $\mu\Omega$ | Guildline 9211A |
| High Resistance – Generate ³ | (1 to 10) M Ω (10 to 100) M Ω 100 M Ω to 1 G Ω (1 to 10) G Ω (10 to 100) G Ω | 1.2 m Ω/Ω 1.3 m Ω/Ω 2.4 m Ω/Ω 5.8 m Ω/Ω 18 m Ω/Ω | Biddle mega decade box |
| 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 (0.1 to 1) M Ω (1 to 10) M Ω (10 to 100) M Ω (100 to 1200) M Ω | 17 $\mu\Omega/\Omega$ + 39 $\mu\Omega$ 13 $\mu\Omega/\Omega$ + 0.39 m Ω 11 $\mu\Omega/\Omega$ + 0.39 m Ω 11 $\mu\Omega/\Omega$ + 3.9 m Ω 11 $\mu\Omega/\Omega$ + 39 m Ω 16 $\mu\Omega/\Omega$ + 1.6 Ω 43 $\mu\Omega/\Omega$ + 78 Ω 0.40 m Ω/Ω + 0.78 Ω 4.8 m Ω/Ω + 7.8 k Ω | HP 3458A opt 002 |
| Oscilloscopes ³ – Amplitude – DC 50 Ω 1 M Ω Amplitude – Square Wave 50 Ω 1 M Ω Leveled Sine Wave (ref 50 kHz) 5 mV to 5.5 V _(p-p) | 0 to \pm 5.0 V 0 to \pm 200 V 0 mV to 5.0 V 10 Hz to 10 kHz 1 mV to \pm 200 V 10 Hz to 1 kHz 0.1 Hz to 300 MHz (300 to 550) MHz 550 MHz to 1.1 GHz (3.0 to 3.2) GHz | 0.20 mV/V + 19 μ V 0.20 mV/V + 19 μ V 0.85 mV/V + 7.8 μ V 0.80 mV/V + 7.8 μ V 2.1 % 2.4 % 4.1 % 5.4 % | Wavetek 9500 w/ 9530 |

| Parameter/Equipment | Range | CMC ² (±) | Comments |
|---|---------------------------------|------------------------|----------------------|
| Oscilloscopes ³ – (cont) | | | |
| Resistance – Measure | (40 to 90) Ω (0.8 to 1.2) MΩ | 0.80 mΩ/Ω 0.81 mΩ/Ω | Wavetek 9500 w/ 9530 |
| Time Marker | 450.5 ps to 55 s | 0.29 μs/s | |
| Pulse Characterization Transition time (Rise Time) – Generate | (125 to 175) ps | 18 ps | |

| Parameter/Range | Frequency | CMC ^{2,5} (±) | Comments |
|-------------------------------------|-----------------|------------------------|--------------------|
| Capacitance – Generate ³ | | | |
| (220 to 399.9) pF | 10 Hz to 10 kHz | 6.0 mF/F + 7.8 pF | Fluke 5520A/SC1100 |
| (0.4 to 1.0999) nF | 10 Hz to 10 kHz | 4.3 mF/F + 7.8 pF | |
| (1.1 to 3.3) nF | 10 Hz to 3 kHz | 4.1 mF/F + 7.8 pF | |
| (3.3 to 11) nF | 10 Hz to 1 kHz | 2.1 mF/F + 7.8 pF | |
| (11 to 32.9999) nF | 10 Hz to 1 kHz | 2.1 mF/F + 78 pF | |
| (33 to 109.999) nF | 10 Hz to 1 kHz | 2.1 mF/F + 78 pF | |
| (110 to 330) nF | 10 Hz to 1 kHz | 2.1 mF/F + 0.23 nF | |
| 330 nF to 1.1 μF | (10 to 600) Hz | 2.1 mF/F + 0.78 nF | |
| (1.1 to 3.3) μF | (10 to 300) Hz | 2.0 mF/F + 2.3 nF | |
| (3.3 to 11) μF | (10 to 150) Hz | 2.2 mF/F + 7.8 nF | |
| (11 to 33) μF | (10 to 120) Hz | 3.2 mF/F + 23 nF | |
| (33 to 110) μF | (10 to 80) Hz | 3.7 mF/F + 78 nF | |
| (110 to 330) μF | (0 to 50) Hz | 3.7 mF/F + 0.23 μF | |
| 330 μF to 1.1 mF | (0 to 20) Hz | 3.7 mF/F + 0.78 μF | |
| (1.1 to 3.3) mF | (0 to 6) Hz | 3.5 mF/F + 2.3 μF | |
| (3.3 to 11) mF | (0 to 2) Hz | 3.5 mF/F + 7.8 μF | |
| (11 to 33) mF | (0 to 0.6) Hz | 5.8 mF/F + 23 μF | |
| (33 to 110) mF | (0 to 0.2) Hz | 8.5 mF/F + 78 μF | |

III. Electrical – RF/Microwave

| Parameter/Range | Frequency | CMC ² (±) | Comments |
|--|--|--|---|
| RF Power – Generate ³ (23 to -55) dBm (+13 to -136) dBm (+10 to -136) dBm (+7 to -136) dBm | DC to 10 MHz (10 to 50) MHz (50 to 80) MHz 250 kHz to 2 GHz (>2 to 3) GHz (>3 to 4) GHz | 0.12 dB 0.28 dB 0.49 dB 0.65 dB 1.1 dB 1.2 dB | Agilent 33250A Agilent E4437B |
| RF Power – Generate & Measure ³ (-30 to +30) dBm (-70 to -30) dBm (+10 to +20) dBm (-10 to +10) dBm (-20 to -10) dBm (-20 to -60) dBm RF Display Average Noise (DANL) ³ Residual Response ³ | 3 Hz to 100 kHz 100 kHz to 4.2 GHz 9 kHz to 18 GHz (9 to 50) kHz 50 kHz to 5 MHz (5 to 400) MHz (0.4 to 3) GHz (3 to 4) GHz 9 kHz to 4 GHz | 0.060 dB 0.091 dB 0.079 dB 0.080 dB 0.079 dB 0.076 dB 1.4 dBm/Hz 2.2 dBm/Hz 0.33 dBm/Hz 0.48 dBm/Hz 0.54 dBm/Hz 0.69 dB | HP 33250A/ 3458A E441X, 8482A w/ generator E441X, E9304A w/ generator 50 Ohm load 50 Ohm load |

IV. Mechanical

| Parameter/Equipment | Range | CMC ^{2, 4, 5} (±) | Comments |
|--|---|---|------------------------------|
| Pressure ³ – Pneumatic | (-2.16 to 2.16) psig (-13.2 to 35) psig (35 to 300) psig (300 to 1000) psig (1000 to 3000) psig | 0.06 % of Full Scale 0.03 % of Full Scale 0.014 % 0.014 % 0.014 % | Fluke PM600-series module |

| Parameter/Equipment | Range | CMC ^{2, 4, 5} (±) | Comments |
|--|---|---|---|
| Pressure ³ – Pressure Absolute | (0.9 to 15.0) psia (1.5 to 50) psia (10 to 300) psia (ATM to 1000) psia (ATM to 2000) psia | 0.022 % + 0.000 17 psi 0.011 % + 0.000 60 psi 0.011 % + 0.0034 psi 0.01 % + 0.012 psi 0.013 % + 0.034 psi | Fluke PM 600-A100K Fluke PM 600-A350K Fluke PM600-A2M Fluke PM600-A7M Fluke PM600-A20M |
| Scales & Balances ³ | Up to 500 mg 500 mg to 2 g (2 to 3) g (3 to 5) g (5 to 10) g (10 to 50) g (50 to 100) g (100 to 200) g (200 to 300) g (300 to 500) g (0.5 to 1) kg (1 to 2) kg (2 to 3) kg (3 to 5) kg (5 to 10) kg (10 to 20) kg (20 to 50) kg (50 to 100) kg | 12 µg 44 µg 48 µg 56 µg 60 µg 0.15 mg 0.30 mg 0.61 mg 0.91 mg 1.9 mg 3.6 mg 7.0 mg 9.8 mg 15 mg 0.12 g 60 mg 0.25 g 0.39 g | Master weights |
| Torque – Measure ³ | (5 to 50) ozf·in (15 to 200) ozf·in (5 to 50) lbf·in (40 to 400) lbf·in (100 to 1000) lbf·in (25 to 250) lbf·ft (60 to 600) lbf·ft (200 to 2000) lbf·ft | 0.60 % 0.32 % 0.30 % 0.31 % 0.46 % 0.43 % 0.65 % 0.45 % | CDI 2000-04-02/Snap-On TTC4 CDI 2000-05-02/Snap-On TTC5 CDI 4 in 1 2000-400-02/Snap-on TTC400 CDI 2000-12-02/Snap-On TTC12 CDI 2000-14-02/Snap-On TTC14 |

| Parameter/Equipment | Range | CMC ^{2, 4, 5} (±) | Comments |
|--|--|---|----------|
| Force Measuring Equipment – Compression & Tension ³ | (0.1 to 1) lbf (1 to 10) lbf (10 to 50) lbf (50 to 100) lbf (100 to 200) lbf | 0.061 % 0.031 % 0.038 % 0.056 % 0.056 % | Weights |

V. Thermodynamics

| Parameter/Equipment | Range | CMC ^{2, 5} (±) | Comments |
|--|--|--|---|
| Temperature – Measuring Equipment | (0 to 70) °C | 0.08 °C | Thunder Scientific 2500ST |
| | (-95 to 35) °C | 0.12 °C | PRT w/ dry blocks |
| | (35 to 350) °C | 0.39 °C | |
| Temperature – Measure ³ | (-200 to 100) °C (100 to 660) °C | 0.012 °C 0.019 °C | 5626 PRT w/ 3458A |
| Relative Humidity – Measure ³ | (10 to 40) % RH (41 to 60) % RH (61 to 95) % RH | 1.1 % RH 1.3 % RH 1.4 % RH | Rotronic HC2-S/ HP22-A, humidity meter |
| Relative Humidity – Measuring Equipment | (10 to 14.7) % RH (14.7 to 49) % RH (49 to 73.5) % RH (73.5 to 95) % RH | 0.51 % RH 0.54 % RH 0.56 % RH 0.63 % RH | Thunder Scientific 2500ST |

VI. Time & Frequency

| Parameter/Equipment | Range | CMC ^{2, 5} (±) | Comments |
|----------------------------------|--|---|-------------------------------------|
| Frequency – Measure ³ | 0.001 Hz to 1 kHz (1 to 1000) kHz (1 to 225) MHz (0.225 to 3.0) GHz | 0.12 mHz/Hz 2.3 nHz/Hz 2.3 nHz/Hz 2.3 nHz/Hz | 5680A rubidium w/ Agilent 53132A |

| Parameter/Equipment | Range | CMC ^{2, 5} (\pm) | Comments |
|--|--------------------------------------|---------------------------------|---------------------------------|
| Frequency – Measuring Equipment ³ | 0.001 Hz to 1 kHz 1 kHz to 50 MHz | 0.66 μ Hz/Hz 0.16 nHz/Hz | FEI 5680A rubidium w/ 33250A |
| | 10 MHz to 4.0 GHz | 2.3 nHz/Hz | FEI 5680A rubidium w/ E4437B |
| Tachometers – Non-Contact | (10 to 100 000) RPM | 0.0023 RPM | FEI 5680A rubidium w/ 33250A |
| Stopwatches & Timing Devices ³ | Up to 24 hrs | 0.039 s/day | Agilent 53132A |

¹ This laboratory offers commercial calibration service 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. CMC's 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. 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 numerical value of the nominal length of the device measured in inches. R is the numerical value of the resolution of the device measured in inches. Percentages are percentage of reading, unless otherwise indicated

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

⁶ This scope meets A2LA's *P112 Flexible Scope Policy*.



Accredited Laboratory

A2LA has accredited

TEKTRONIX, INC.

Mississauga, CANADA

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 the requirements of ANSI/NCSLI Z540.3-2006 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 8th day of August 2022.

A blue ink signature of the Vice President of Accreditation Services, written over a horizontal line.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 2357.24
Valid to December 31, 2024

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