



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

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CALIBRATION

Valid To: December 31, 2020

Certificate Number: 4872.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations^{1, 8}:

I. Dimensional

| Parameter/Equipment | Range | CMC ^{2, 4} (±) | Comments |
|--|--------------------------------|------------------------------|--|
| Cylindrical Gages – Plain Rings Class X, Y, Z, ZZ, or Unmarked | (2 to 200) mm | (0.5 + 0.0017L) μm | Method: direct comparison Master reference(s): ULM, ring gages |
| Cylindrical Gages – Plain Plugs, Discs, Pins Class X, Y, Z, ZZ, or Unmarked | Up to 20 mm (>20 to 200) mm | 0.5 μm (0.5 + 0.0024L) μm | Method: direct comparison Master reference(s): ULM, gage blocks |

| Parameter/Equipment | Range | CMC ^{2,4} (±) | Comments |
|--|------------------------------|------------------------|---|
| Pitch Diameter (External) – Straight Thread, Taper Threads | (1 to 100) mm | 1.4 μm | Method: direct comparison Master reference(s): ULM, gage blocks, thread wires |
| Pitch Diameter (Internal) – Straight Thread, Taper Threads | (2.6 to 100) mm | 2.0 μm | Method: direct comparison Master reference(s): ULM, ring gages, spheres |
| Shims, Snap, Thickness Gages | Up to 10 mm (1 to 100) mm | 0.5 μm 0.9 μm | Method: direct comparison Master reference(s): ULM, gage blocks |
| End Rods/Standards, Micrometer Setting Standards | (25 to 600) mm | $(0.33 + 0.002L)$ μm | Method: direct comparison Master reference(s): ULM, gage blocks |
| Bore Gages ³ | (2 to 500) mm | $(2 + 0.01L)$ μm | Method: direct comparison Master reference(s): ULM, gauge blocks, ring gages |

| Parameter/Equipment | Range | CMC ^{2,4} (\pm) | Comments |
|---|--|-------------------------------|---|
| Micrometers ³ – Outside, Interior, Depth | Up to 600 mm | $(1.4 + 0.005L) \mu\text{m}$ | Method: direct comparison Master reference(s): gage blocks, step gage |
| Calipers ³ | Up to 1016 mm | $(8 + 0.008L) \mu\text{m}$ | Method: direct comparison Master reference(s): gage blocks, step gage, ring gage |
| Length Indicator (Dial, Test, LVDT, Transducer) | Up to 102 mm (Resolution of 0.001 mm) | $(1.0 + 0.03L) \mu\text{m}$ | Method: direct comparison Master reference(s): gage blocks, indicator calibrator |
| Height Gages ³ | Up to 600 mm | $(1.7 + 0.005L) \mu\text{m}$ | Method: direct comparison Master reference(s): step gage, gage blocks |
| Squares | Up to 500 mm | $(5.7 + 0.0059L) \mu\text{m}$ | Method: direct comparison Master reference(s): master square, LVDT |
| Splines – Internal | Up to 100 mm | 2.9 μm | Method: direct comparison Master reference(s): ULM, spheres, ring gages |
| External | Up to 100 mm | 2.3 μm | |

| Parameter/Equipment | Range | CMC ^{2, 4, 5, 6} (±) | Comments |
|-------------------------------------|---------------------------------------|-------------------------------|---|
| Surface Plate Flatness ³ | (160 x 100) mm to (3658 x 1828) mm | (2.0 + 0.003D) μm | Method: differential level |
| Optical Comparators ³ – | | | |
| Length | X = 250 mm Y = 250 mm | (2.3 + 0.01L) μm | Method: direct comparison |
| Amplification | 5X, 10X, 20X | 0.018 % of reading | Master reference(s): master glass scales |
| Angle | (0 to 360)° | 2.3" | |

| Parameter/Equipment | Range | CMC ^{2, 4} (±) | Comments |
|--|--------------|-------------------------|---|
| Fixtures and Functional Gages (X,Y) and Sieves | Up to 200 mm | (2.7 + 0.0011L) μm | Method: direct comparison Master reference(s): Vision System Tesa V-200gl |
| Fixtures and Functional Gages- Angle | 0 to 360° | 0.04° | Method: direct comparison Master reference(s): Vision System Tesa V-200gl |
| Fixtures and Functional Gages | Up to 600mm | (3.0 + 0.0052L) μm | Method: direct comparison Master reference(s): Llear Height Gauge |

| Parameter/Equipment | Range | CMC ² (±) | | Comments |
|---------------------------------|--|--|--|--|
| Gage Blocks – | | | | |
| Steel | (0.5 to 10.16) mm (10.16 to 25.4) mm (25.4 to 50.8) mm (50.8 to 76.2) mm (76.2 to 101.6) mm | <i>lc</i> 0.043 μm 0.050 μm 0.068 μm 0.091 μm 0.12 μm | <i>v</i> 0.017 μm 0.018 μm 0.023 μm 0.028 μm 0.034 μm | Master reference(s): Tesa gage block comparator, gage blocks |
| Ceramic | (0.5 to 10.16) mm (10.16 to 25.4) mm (25.4 to 50.8) mm (50.8 to 76.2) mm (76.2 to 101.6) mm | 0.045 μm 0.051 μm 0.069 μm 0.092 μm 0.12 μm | 0.021 μm 0.023 μm 0.027 μm 0.034 μm 0.042 μm | <i>lc</i> = uncertainty at the reference point <i>v</i> = uncertainty on parallelism (variation in length) |
| Carbide | (0.5 to 10.16) mm (10.16 to 25.4) mm (25.4 to 50.8) mm (50.8 to 76.2) mm (76.2 to 101.6) mm | 0.044 μm 0.051 μm 0.068 μm 0.10 μm 0.13 μm | 0.017 μm 0.018 μm 0.023 μm 0.028 μm 0.035 μm | |
| Long Gage Blocks – Materials | (102 to 150) mm (150 to 200) mm (200 to 250) mm (250 to 300) mm (300 to 400) mm (400 to 508) mm | 0.33 μm 0.40 μm 0.47 μm 0.51 μm 0.63 μm 0.75 μm | 0.11 μm 0.11 μm 0.13 μm 0.15 μm 0.20 μm 0.24 μm | Master reference(s): ULM. gage blocks |

II. Electrical – DC/Low Frequency

| Parameter/Equipment | Range | CMC ^{2,7} (±) | Comments |
|-----------------------|--|--|---------------|
| DC Voltage – Generate | 0 mV to <0.33 V (0.33 to <3.3) V (3.3 to <33) V (33 to <330) V (330 to 1000) V | 15 ppm + 1 μV 9.5 ppm + 2 μV 11 ppm + 20 μV 15 ppm + 150 μV 14 ppm + 1500 μV | Fluke 5520A |
| DC Voltage – Measure | (10 to <100) mV (0.1 to <1) V (1 to <10) V (10 to <100) V (100 to 1000) V | 9 ppm + 0.5 μV 8 ppm + 1.6 μV 8 ppm + 13 μV 10 ppm + 150 μV 10 ppm + 1.5 mV | Agilent 3458A |

| Parameter/Equipment | Range | CMC ^{2,7} (\pm) | Comments |
|-----------------------|--|---|----------------------------------|
| DC Current – Generate | (33 to <330) μ A (0.33 to <3.3) mA (3.3 to <33) mA (33 to <330) mA (0.33 to <1.1) A (1.1 to <3) A (3 to <11) A (11 to 20) A | 110 ppm + 0.02 μ A 85 ppm + 0.05 μ A 90 ppm + 0.25 μ A 90 ppm + 2.5 μ A 160 ppm + 40 μ A 290 ppm + 40 μ A 380 ppm + 0.50 mA 740 ppm + 0.75 mA | Fluke 5520A |
| Clamp | (20 to <55) A (55 to <150) A (150 to <550) A (550 to <1000) A | 0.20 % + 2 mA 0.20 % + 15 mA 0.20 % + 50 mA 0.20 % + 50 mA | Fluke 5520A with 50 turn coil |
| DC Current – Measure | (10 to <100) nA (0.1 to <1) μ A (1 to <10) μ A (10 to <100) μ A (0.1 to <1) mA (1 to <10) mA (10 to <100) mA 0.1 mA to 1 A | 30 ppm + 47 pA 20 ppm + 50 pA 20 ppm + 150 pA 20 ppm + 1.2 nA 20 ppm + 9 nA 20 ppm + 90 nA 35 ppm + 1.1 μ A 110 ppm + 25 μ A | Agilent 3458A |
| DC Power – Generate | 0.010 89 mW to <336.6 W 336.6 W to <3.06 kW (3.06 to 20.4) kW | 0.018 % 0.017 % 0.055 % | Fluke 5520A |
| Resistance – Generate | (1.1 to <11) Ω (11 to <33) Ω (33 to <110) Ω (110 to <330) Ω (0.33 to <1.1) k 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 (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 | 5 ppm + 0.001 Ω 15 ppm + 0.0015 Ω 21 ppm + 0.0014 Ω 22 ppm + 0.002 Ω 22 ppm + 0.002 Ω 22 ppm + 0.02 Ω 22 ppm + 0.02 Ω 22 ppm + 0.2 Ω 22 ppm + 0.2 Ω 26 ppm + 2 Ω 21 ppm + 2 Ω 44 ppm + 30 Ω 95 ppm + 50 Ω 180 ppm + 2.5 k Ω 380 ppm + 3 k Ω 0.23 % + 0.1 M Ω 1.1 % + 0.5 M Ω | Fluke 5520A |

| Parameter/Equipment | Range | CMC ^{2,7} (±) | Comments |
|----------------------|--|--|---------------|
| Resistance – Measure | (1 to <10) Ω (10 to <100) Ω (0.1 to <1) kΩ (1 to <10) kΩ (10 to <100) kΩ (0.1 to <1) MΩ (1 to <10) MΩ (10 to <100) MΩ (0.1 to <1) GΩ | 15 ppm + 90 μΩ 12 ppm + 0.80 mΩ 10 ppm + 1.5 mΩ 10 ppm + 15 mΩ 10 ppm + 0.70 Ω 15 ppm + 5 Ω 50 ppm + 0.2 kΩ 0.05 % + 9 kΩ 0.6 % + 1 kΩ | Agilent 3458A |

| Parameter/Range | Frequency | CMC ^{2,7} (±) | Comments |
|-----------------------|--|---|-------------|
| AC Voltage – Generate | | | |
| (3.3 to <33) mV | 45 Hz to 10 kHz | 100 ppm + 6 μV | Fluke 5520A |
| (33 to <330) mV | 45 Hz to <10 kHz (10 to <20) kHz (20 to <50) kHz | 110 ppm + 8 μV 120 ppm + 8 μV 270 ppm + 8 μV | |
| (0.33 to <3.3) V | 45 Hz to <10 kHz (10 to <20) kHz (20 to <50) kHz (50 to <100) kHz | 120 ppm + 60 μV 150 ppm + 60 μV 230 ppm + 50 μV 550 ppm + 130 μV | |
| (3.3 to < 33) V | 45 Hz to <10 kHz (10 to <20) kHz (20 to <50) kHz (50 to 100) kHz | 120 ppm + 0.60 mV 190 ppm + 0.60 mV 280 ppm + 0.60 mV 680 ppm + 1.6 mV | |
| (33 to <330) V | 45 Hz to <1 kHz (1 to <10) kHz (10 to <20) kHz | 150 ppm + 2 mV 160 ppm + 6 mV 200 ppm + 6 mV | |
| (330 to <1000) V | 45 Hz to <1 kHz (1 to <5) kHz (5 to 10) kHz | 240 ppm + 10 mV 200 ppm + 10 mV 240 ppm + 10 mV | |

| Parameter/Range | Frequency | CMC ^{2,7} (\pm) | Comments |
|----------------------|---|--|---------------|
| AC Voltage – Measure | | | |
| (1 to <10) mV | (1 to 40) Hz 40 Hz to <1 kHz (1 to <20) kHz (20 to <100) kHz | 0.035 % + 4 μ V 0.030 % + 1.6 μ V 0.040 % + 1.7 μ V 0.12 % + 8 μ V | Agilent 3458A |
| (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 300 kHz to 1 MHz | 75 ppm + 6 μ V 75 ppm + 3 μ V 0.020 % + 4 μ V 0.035 % + 7 μ V 0.082% + 15 μ V 0.3 % + 60 μ V 1.0 % + 170 μ V | |
| (0.1 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 300 kHz to 1 MHz | 70 ppm + 60 μ V 70 ppm + 30 μ V 0.014 % + 40 μ V 0.030 % + 70 μ V 0.081 % + 150 μ V 0.3 % + 0.6 mV 1.0 % + 2 mV | |
| (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 300 kHz to 1 MHz | 70 ppm + 0.60 mV 70 ppm + 0.30 mV 0.016 % + 0.40 mV 0.030 % + 0.70 mV 0.081 % + 1.5 mV 0.3 % + 6 mV 1.0 % + 20 mV | |
| (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 300 kHz to 1 MHz | 0.020 % + 8 mV 0.021 % + 5 mV 0.021 % + 5 mV 0.035 % + 8 mV 0.12 % + 20 mV 0.40 % + 70 mV 1.5 % + 150 mV | |
| (100 to 700) V | (1 to 40) Hz 40 Hz to <1 kHz (1 to <20) kHz (20 to <50) kHz (50 to <100) kHz | 0.040 % + 0.12 V 0.040 % + 0.08 V 0.060 % + 0.11 V 0.12 % + 0.21 V 0.30 % + 0.40 V | |

| Parameter/Range | Frequency | CMC ^{2,7} (\pm) | Comments |
|--|---|--|----------------------------------|
| AC Current – Generate | | | |
| (33 to <330) μ A | (20 to <45) Hz 45 Hz to <1 kHz (1 to <5) kHz (5 to 10) kHz | 0.11% + 0.1 μ A 0.090 % + 0.1 μ A 0.22 % + 0.15 μ A 0.62 % + 0.2 μ A | Fluke 5520A |
| (0.33 to <3.3) mA | (20 to <45) Hz 45 Hz to <1 kHz (1 to <5) kHz (5 to 10) kHz | 0.094 % + 0.15 μ A 0.076 % + 0.15 μ A 0.16 % + 0.20 μ A 0.37 % + 0.30 μ A | |
| (3.3 to <33) mA | (20 to <45) Hz 45 Hz to <1 kHz (1 to <5) kHz (5 to 10) kHz | 0.069 % + 2 μ A 0.030 % + 2 μ A 0.060 % + 2 μ A 0.15 % + 3 μ A | |
| (33 to <330) mA | (20 to <45) Hz 45 Hz to <1 kHz (1 to <5) kHz (5 to 10) kHz | 0.070 % + 20 μ A 0.030 % + 20 μ A 0.072 % + 50 μ A 0.15 % + 0.1 mA | |
| (0.33 to <1.1) A | (10 to <45) Hz 45 Hz to <1 kHz (1 to <5) kHz | 0.14 % + 0.1 mA 0.037 % + 0.1 mA 0.45 % + 1 mA | |
| (1.1 to <3) A | (10 to <45) Hz 45 Hz to <1 kHz (1 to <5) kHz | 0.14 % + 0.1 mA 0.045 % + 0.1 mA 0.45 % + 1 mA | |
| (3 to <11) A | (45 to < 100) Hz 100 Hz to < 1 kHz (1 to 5) kHz | 0.043 % + 2 mA 0.074 % + 2 mA 2.3 % + 2 mA | |
| (11 to 20) A | (45 to < 100) Hz 100 Hz to < 1 kHz (1 to 5) kHz | 0.085 % + 5 mA 0.11 % + 5 mA 2.3 % + 5 mA | |
| Clamp | | | |
| (20 to <55) A (55 to <150) A (150 to <550) A (550 to <1000) A | (45 to 65) Hz | 0.24 % + 3 mA 0.24 % + 25 mA 0.25 % + 90 mA 0.25 % + 90 mA | Fluke 5520A with 50 turn coil |

| Parameter/Range | Frequency | CMC ^{2,7} (\pm) | Comments |
|-----------------------|--|---|---------------|
| AC Current – Measure | | | |
| (10 to <100) μ A | (20 to <45) Hz (45 to <100) Hz 100 Hz to 1 kHz | 0.15 % + 60 nA 0.07 % + 40 nA 0.07 % + 40 nA | Agilent 3458A |
| (0.1 to <1) mA | (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 | 0.15 % + 0.50 μ A 0.061 % + 0.32 μ A 0.031 % + 0.28 μ A 0.061 % + 0.32 μ A 0.40 % + 1.1 μ A 0.55 % + 2.6 μ A | |
| (1 to <10) mA | (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 | 0.15 % + 4.5 μ A 0.061 % + 3.2 μ A 0.031 % + 2.8 μ A 0.061 % + 3.2 μ A 0.40 % + 11 μ A 0.55 % + 26 μ A | |
| (10 to <100) mA | (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 | 0.15 % + 45 μ A 0.061 % + 32 μ A 0.031 % + 28 μ A 0.061 % + 32 μ A 0.40 % + 0.11 mA 0.55 % + 0.26 mA | |
| (0.1 to <1) A | (20 to <45) Hz (45 to <100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz | 0.16 % + 0.45 mA 0.080 % + 0.35 mA 0.10 % + 0.35 mA 0.30 % + 0.65 mA 1.0 % + 1.5 mA | |
| AC Power – Generate | | | |
| (PF = 1) | | | Fluke 5520A |
| (0.108 9 to <2.97) mW | (45 to 65) Hz | 0.13 % | |
| (2.97 to <10.89) mW | | 0.080 % | |
| (10.89 to <29.7) mW | | 0.11 % | |
| (29.7 to <108.9) mW | | 0.077 % | |
| 108.9 mW to <0.297 W | | 8.2 mW | |
| (0.297 to <0.726) W | | 8.2 mW | |
| (0.726 to <1.485) W | | 8.2 mW | |

| Parameter/Range | Frequency | CMC ^{2,7} (±) | Comments |
|----------------------------|---------------|------------------------|-------------|
| AC Power – Generate (cont) | | | Fluke 5520A |
| (PF = 1) | | | |
| (1.485 to <6.6) W | (45 to 65) Hz | 8.2 mW | |
| (6.6 to <9.18) W | | 0.093 % | |
| (9.18 to <33.66) W | | 0.062 % | |
| (33.66 to <91.18) W | | 0.093 % | |
| (91.18 to <336.6) W | | 0.062 % | |
| (336.6 to <918) W | | 0.085 % | |
| 9.18 W to <2.244 kW | | 0.070 % | |
| (2.244 to <4.59) kW | | 0.093 % | |
| (4.59 to 20.4) kW | | 0.078 % | |
| (PF = 0.5) | | | |
| (0.108 9 to <2.97) mW | (45 to 65) Hz | 0.26 % | |
| (2.97 to < 10.89) mW | | 0.25 % | |
| (10.89 to <29.7) mW | | 0.26 % | |
| (29.7 to <108.9) mW | | 0.25 % | |
| 108.9 mW to <0.297 W | | 8.2 mW | |
| (0.297 to <0.726) W | | 8.2 mW | |
| (0.726 to <1.485) W | | 8.2 mW | |
| (1.485 to <6.6) W | | 8.2 mW | |
| (6.6 to <9.18) W | | 0.25 % | |
| (9.18 to <33.66) W | | 0.24 % | |
| (33.66 to <91.18) W | | 0.25 % | |
| (91.18 to <336.6) W | | 0.24 % | |
| (336.6 to <918) W | | 0.25 % | |
| (9.18 to <2.244) kW | | 0.24 % | |
| (2.244 to <4.59) kW | | 0.25 % | |
| (4.59 to 20.4) kW | | 0.25 % | |

| Parameter/Equipment | Range | CMC ^{2,7} (±) | Comments |
|------------------------|--------------------|------------------------|-------------|
| Capacitance – Generate | (0.19 to <0.40) nF | 0.69 % + 6.5 pF | Fluke 5520A |
| | (0.40 to <1.1) nF | 0.70 % + 6 pF | |
| | (1.1 to <3.3) nF | 0.70 % + 4 pF | |
| | (3.3 to <11) nF | 0.30 % + 4 pF | |
| | (11 to <33) nF | 0.35 % + 60 pF | |
| | (33 to <110) nF | 0.31 % + 40 pF | |
| | (110 to <330) nF | 0.31 % + 0.10 nF | |
| | (0.33 to <1.1) μF | 0.25 % + 0.40 nF | |

| Parameter/Equipment | Range | CMC ^{2,7} (±) | Comments |
|--|--|---|-------------|
| Capacitance – Generate (cont) | (1.1 to <3.3) μF (3.3 to <11) μF (11 to <33) μF (33 to <110) μF (110 to <330) μF (0.33 to <1.1) mF (1.1 to <3.3) mF (3.3 to <11) mF (11 to <33) mF (33 to 110) mF | 0.25 % + 1 nF 0.25 % + 4 nF 0.40 % + 5 nF 0.45 % + 20 nF 0.45 % + 30 nF 0.45 % + 0.20 μF 0.45 % + 0.30 μF 0.45 % + 2 μF 0.48 % + 30 μF 0.84 % + 0.1 mF | Fluke 5520A |
| Electrical Calibration of Thermocouple Indicators – | | | |
| Type B | (600 to 1820) °C | 0.21 °C | Fluke 5520A |
| Type C | (0 to 2316) °C | 0.18 °C | |
| Type E | (-250 to 1000) °C | 0.11 °C | |
| Type J | (-210 to 1200) °C | 0.11 °C | |
| Type K | (-200 to 1372) °C | 0.12 °C | |
| Type L | (-200 to 900) °C | 0.13 °C | |
| Type N | (-200 to 1300) °C | 0.13 °C | |
| Type R | (0 to 1767) °C | 0.23 °C | |
| Type S | (0 to 1767) °C | 0.25 °C | |
| Type T | (-250 to 400) °C | 0.11 °C | |
| Type U | (-200 to 600) °C | 0.19 °C | |
| Electrical Calibration of RTDs – | | | |
| Pt 385, 100 Ω | (-200 to 800) °C | 0.034 °C | Fluke 5520A |
| Pt 3926, 100 Ω | (-200 to 630) °C | 0.034 °C | |
| Pt 3916, 100 Ω | (-200 to 630) °C | 0.027 °C | |
| Pt 385, 200 Ω | (-200 to 630) °C | 0.027 °C | |

| Parameter/Equipment | Range | CMC ^{2,7} (±) | Comments |
|---|------------------|------------------------|-------------|
| Electrical Calibration of RTDs – (cont) | | | |
| Pt 385, 500 Ω | (-200 to 630) °C | 0.027 °C | Fluke 5520A |
| Pt 385, 1 000 Ω | (-200 to 630) °C | 0.021 °C | |
| PtNi 385, 120 Ω | (-80 to 260) °C | 0.054 °C | |
| Cu 427, 10 Ω | (-100 to 260) °C | 0.20 °C | |

III. Mechanical

| Parameter/Equipment | Range | CMC ^{2,9} (±) | Comments |
|-------------------------------------|--|---|---|
| Pressure – Measuring Equipment | (>6.90 to 103.43) kPa (>103.43 to 2068.43) kPa (>2060.07 to 20 684.09) kPa (>20 623.24 to 68 947.76) kPa | 0.073 kPa 0.10 kPa 4.8 kPa 8.0 kPa | Method: direct comparison Crystal nVision indicator and pressure modules |
| Negative Pressure (Relative Vacuum) | (-68.949 to -6.897) kPa | 0.051 kPa | |
| Differential Pressure ³ | (-249.089 to 249.089) Pa | 0.62 Pa | Additel ADT681-05-DP1-INH2O |
| Torque ³ Wrenches | (0.6 to 3) N·m (>3 to 6) N·m (>6 to 10) N·m (>10 to 30) N·m (>30 to 100) N·m (>100 to 300) N·m (>300 to 700) N·m | 0.014 N·m 0.039 N·m 0.035 N·m 0.18 N·m 0.95 N·m 0.75 N·m 0.71 N·m | Method: direct comparison Torque calibrator with transducers |

IV. Thermodynamics

| Parameter/Equipment | Range | CMC ^{2,9} (±) | Comments |
|--|---|--|---|
| Temperature – Measuring Equipment ³ | (25 to 300) °C (>300 to 630) °C | 0.092 °C 0.17 °C | PT 100 RTD and indicator |
| Liquid-in-Glass | (25 to 300) °C (>300 to 500) °C | 0.43 °C 0.83 °C | PT 100 RTD and indicator, dry well |
| IR Thermometers ³ – (Infrared) | (50 to 300) °C (>300 to 500) °C | 2.1 °C 3.2 °C | Black Body radiator, PT 100 RTD and indicator |
| Environmental Chambers ³ – System Accuracy Test (SAT) | (-100 to 0) °C (>0 to 300) °C (>300 to 600) °C (>600 to 800) °C (>800 to 1200) °C | 1.1 °C 1.0 °C 1.0 °C 1.0 °C 1.5 °C | AMS2750, CQI-9, requirements of the customer. Process calibrator and standard thermocouples |
| Environmental Chambers ³ – Uniformity Surveys (TUS) | (-100 to 0) °C (>0 to 500) °C (>500 to 1200) °C | 1.1 °C 1.0 °C 1.5 °C | AMS2750, CQI-9, requirements of the customer. Data logger calibrator and standard thermocouples |

V. Time & Frequency

| Parameter/Range | Frequency | CMC ² (±) | Comments |
|---|--|--|-------------------------|
| Frequency – Generate | | | |
| (1 to 5) V _{p-p} | (0.01 to 119.99) Hz (120.0 to 1199.9) Hz (1.200 to 11.999) kHz (12.00 to 49.99) kHz | 5.8 mHz 58 mHz 0.58 Hz 5.8 Hz | Fluke 5520A / SC1100 |
| 5 mV _{p-p} to 5.5 V _{p-p} | 50 kHz to <100 MHz (100 to <300) MHz (300 to 500) MHz | 5.8 kHz 5.8 kHz 5.8 kHz | |

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- ¹ This laboratory offers commercial calibration and field calibration services, where noted.
- ² Calibration and Measurement 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 95.45 % level of confidence, with 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 numerical value of the nominal length of the device measured in millimeters.
- ⁵ In the statement of CMC, D is the numerical value of the diagonal length of the device measured in millimeters.
- ⁶ In the statement of CMC, percentages are percentage of reading, unless otherwise indicated.
- ⁷ The stated measured values are determined using the indicated instrument (see Comments). This capability is suitable for the calibration of the devices intended to measure or generate the measured value in the ranges indicated. CMC's are expressed as either a specific value that covers the full range or as a percent or fraction of the reading plus a fixed floor specification.
- ⁸ This scope meets A2LA's *P112 Flexible Scope Policy*.
- ⁹ The type of instrument or material being calibrated is defined by the parameter. This indicates the laboratory is capable of calibrating instruments that measure or generate the values in the ranges indicated for the listed measurement parameter.



Accredited Laboratory

A2LA has accredited

KALIBRIXCAL S.A. DE C.V. A TRESICAL COMPANY

Santiago de Querétaro, MEXICO

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 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 14th day of December 2018.

A blue ink signature of the Senior Director of Accreditation Services.

Senior Director, Accreditation Services
For the Accreditation Council
Certificate Number 4872.01
Valid to December 31, 2020

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