



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

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CALIBRATION

Valid To: August 31, 2020

Certificate Number: 4692.01

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. Acoustic

| Parameter/Equipment | Range | CMC ² (±) | Comments |
|--------------------------------|------------------|----------------------|------------------|
| Sound Level Meters, @ 1 kHz | 94 dB, 114 dB | 0.52 dB | Sound calibrator |

II. Dimensional

| Parameter/Equipment | Range | CMC ^{2,4} (±) | Comments |
|----------------------------------|----------------|------------------------|--------------------------------------|
| Gage Blocks | Up to 20 in | (4.8 + 4.1L) µin | Master gage blocks & comparator |
| Length Standards – Step Gages | (0.5 to 22) in | (190 + 0.22L) µin | Gage blocks & height master |
| Micrometer Setting Standards | (1 to 39) in | (62 + 2.1L) µin | Step gage, height gage & gage blocks |

| Parameter/Equipment | Range | CMC ^{2,4} (±) | Comments |
|-------------------------------|--|-----------------------------|--|
| Length Standards – (cont) | | | |
| Endrods, Distance Indicators | (0.1 to 600) in (600 to 1200) in (1200 to 2000) in | 0.2 in 0.25 in 0.5 in | Laser distance meter |
| Plain Ring Gages | (0.1 to 8) in | (5.4 + 18L) μin | Length measuring machine & master ring gages |
| Pin Gages | (0.01 to 2) in | 91 μin | Laser micrometer |
| Thickness & Feeler Gages – | | | |
| Thickness | (0.0005 to 1) in | 580 μin | Gage blocks |
| Feeler Gages | (0.001 to 1) in | 80 μin | Digital micrometer |
| Ultrasonic Thickness | (0.01 to 100) mm | 0.01 mm | Steel gage blocks |
| Coating Thickness | (1 to 100) μm (100 to 250) μm (250 to 500) μm | 1.6 μm 6 μm 10 μm | Thickness standards |
| Radius Gages | (0.01 to 1) in | 690 μin | Optical projector |
| Stage Micrometers | (0.001 to 2) in | 220 μin | Vision system |
| Gaging Fixtures – | | | |
| Straight Edges, Parallel Bars | (1 to 72) in | (150 + 3L) μin | Height master |
| Squares | (1 to 20) in | 5L μin | Ceramic square, mu-checker & height gage |

| Parameter/Equipment | Range | CMC ^{2,4} (±) | Comments |
|---|--|--|--|
| Gaging Fixtures – (cont) V Blocks – Squareness of Sides Parallelism of Sides Angles Straightness | Up to 10 in | 58 µin 120 µin 0.07° 120 µin | Height master, square, video machine & gage blocks |
| Surface Plates ³ | (3 to 72) in x 144 in | 0.12 F^2 µin | Laser measuring system |
| Thread Plugs – Pitch Diameter | (0.05 to 2) in | 170 µin | Length measuring machine, thread wire set & optical projector |
| Calipers | (0.01 to 24) in (24 to 80) in | 0.0007 in 0.001 in | Length standards |
| Micrometers – Outside Inside Heads Depth | (0.01 to 40) in (1 to 60) in (0.01 to 2) in (0.05 to 12) in | (53 + 15L) µin (130 + 13L) µin 46 µin 0.000 86 in | Gage blocks & micmaster Check master Gage blocks Depth master & surface plate |
| Height Gages | (0.05 to 40) in | (84 + 7.9L) µin | Step gage & surface plate |
| Length Indicators – Dial & Test | Up to 1 in (1 to 4) in (4 to 6) in | 39 µin 86 µin 0.001 in | Gage blocks |

| Parameter/Equipment | Range | CMC ^{2,4} (±) | Comments |
|---|--|--|--|
| Rules & Tapes – Rulers Pi Tapes Tape Measures | (1 to 40) in (40 to 80) in (6.3 to 10.3) in (1 to 108) in, (9 to 100) ft | 0.0029 in 0.0036 in 900 μin (560 + 29L) μin | Length measuring machine Cylinder Length measuring machine |
| Length Measuring Systems ³ – (UMMs, ULMs, Length Setting Machine, Distance Indicators) | (0.1 to 4) in (100 to 500) mm (500 to 1300) mm (1300 to 2200) mm (2200 to 4000) mm | (5.7 + 3.8L) μin 2 μm 15 μm 23 μm 32 μm | Gage blocks, laser measuring system |
| Optical Comparators ³ – Linear Accuracy Angle Magnification | (1 to 250) mm 90° (10, 20, 31.25, 50) X | 6 μm 0.05° 290 μm | Glass scale master, precision square & gage blocks |
| Microscopes ³ – Linear Accuracy | (0.05 to 2) in | 110 μin | Glass scale master |
| Video Machines ³ – Linear Accuracy | (0.05 to 300) mm | (2.9 + 0.0043L) μm | Glass scale master |
| Angle Indicators – Inclinometer & Protractors Levels | 0.1° to 360° (4 to 12) in | 0.08 ° 330 μin | Angle blocks Master precision level, surface plate & gage blocks |
| Bore Gages | (0.2 to 3.5) in (3.5 to 7) in | 190 μin 210 μin | Ring gages |

| Parameter/Equipment | Range | CMC ^{2,4,7} (±) | Comments |
|---|---------------------|--------------------------|---|
| Roughness Testers | 16.1 Ra 119.5 Ra | 3.1 µin 4.2 µin | Roughness standard |
| Machine Tools Scale ³ (DRO) | 1 mm to 2.2 m | 26 µm | Laser measuring system; standard reference bar and step gages |

III. Electrical – DC/Low Frequency

| Parameter/Equipment | Range | CMC ^{2,7} (±) | Comments |
|------------------------|---|---|---|
| Capacitance – Generate | (0.1 to 10) nF (10 to 110) nF (0.1 to 1) µF (1 to 5) µF (5 to 11) µF (11 to 33) µF (33 to 110) µF | 18 pF 72 pF 0.7 nF 7.2 nF 44 nF 0.3 µF 0.9 µF | Multifunction calibrator |
| DC Current – Generate | (0 to 3) mA (3 to 30) mA (30 to 300) mA (0.3 to 3) A (3 to 10) A | 0.4 µA 3.8 µA 38 µA 1.3 mA 6.4 mA | Multifunction calibrator |
| Clamps | (0 to 50) A (50 to 500) A (500 to 1000) A | 0.14 A 0.9 A 2.5 A | Multifunction calibrator & 50 turn coil |
| DC Voltage – Generate | (0 to 300) mV (0.3 to 3) V (3 to 30) V (30 to 300) V (300 to 1000) V | 10 µV 71 µV 0.73 mV 8.7 mV 62 mV | Multifunction calibrator |

| Parameter/Equipment | Range | CMC ^{2,7} (±) | Comments |
|--|---|--|--------------------------|
| Resistance – Generate | (0 to 1) Ω (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 (100 to 110) MΩ | 0.06 mΩ 1.7 mΩ 7.5 mΩ 68 mΩ 680 mΩ 6.8 Ω 71 Ω 1.7 kΩ 85 kΩ 7.5 MΩ | Multifunction calibrator |
| Electrical Calibration of Temperature Sensors ³ | (32 to 1382) °C | 0.6 °C | Process calibrator |
| Electrical Calibration of Thermocouples – Measure | | | |
| Type K | (-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C | 0.59 °C 0.49 °C 0.48 °C 0.79 °C 0.86 °C | Multifunction calibrator |
| Type J | (-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C | 0.47 °C 0.39 °C 0.38 °C 0.4 °C 0.72 °C | |
| Type S | (0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1767) °C | 0.7 °C 0.83 °C 0.84 °C 0.9 °C | |

| Parameter/Equipment | Range | CMC ^{2,7} (±) | Comments |
|--|---|--|--------------------------|
| Electrical Calibration of Thermocouples – Measure (cont) | | | |
| Type C | (0 to 150) °C (150 to 650) °C (650 to 1000) °C (1000 to 1800) °C (1800 to 2316) °C | 0.56 °C 0.53 °C 0.8 °C 0.92 °C 1.2 °C | Multifunction calibrator |
| Type E | (-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C | 0.66 °C 0.36 °C 0.35 °C 0.36 °C 0.7 °C | |
| Type U | (-200 to 0) °C (0 to 600) °C | 0.76 °C 0.5 °C | |
| Type N | (-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 410) °C (410 to 1300) °C | 0.63 °C 0.5 °C 0.48 °C 0.48 °C 0.78 °C | |
| Electrical Calibration of pH Meters & Calibrators – | | | |
| pH Meters | (0 to 14) pH units | 0.017 pH units | pH meter calibrator |
| Calibrators | (-400 to 400) mV (0 to 14) pH | 0.01 mV 0.01 pH | Multifunction calibrator |

| Parameter/Range | Frequency | CMC ^{2,7} (±) | Comments |
|-----------------------|---|--|---|
| AC Current – Generate | | | |
| (0 to 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 | 7.4 μA 6.9 μA 6.9 μA 9.2 μA 8.4 μA 36 μA | Multifunction calibrator |
| (3 to 30) 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 | 34 μA 17 μA 17 μA 31 μA 73 μA 0.14 mA | |
| (30 to 300) 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 | 0.3 mA 0.1 mA 0.1 mA 0.4 mA 0.8 mA 1.6 mA | |
| (0.3 to 3) A | 45 Hz to 1 kHz (1 to 5) kHz | 21 mA 21 mA | |
| (3 to 10) A | 60 Hz to 1 kHz (1 to 5) kHz | 14 mA 0.35 A | |
| Clamp | | | |
| (0 to 50) A | (45 to 60) Hz (60 to 400) Hz | 0.17 A 0.26 A | Multifunction calibrator & 50 turn coil |
| (50 to 500) A | (45 to 60) Hz (60 to 400) Hz | 0.91 A 1.8 A | |
| (500 to 1000) A | (45 to 60) Hz (60 to 400) Hz | 2.6 A 4.8 A | |

| Parameter/Range | Frequency | CMC ^{2,7} (±) | Comments |
|-----------------------|---|--|-----------------------------|
| AC Voltage – Generate | | | |
| (0 to 30) mV | (10 to 45) Hz 45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz | 12 µV 12 µV 12 µV 14 µV 42 µV 0.14 mV 0.34 mV | Multifunction calibrator |
| (30 to 300) mV | (10 to 45) Hz 45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz | 61 µV 61 µV 61 µV 66 µV 0.13 mV 0.32 mV 0.78 mV | |
| (0.3 to 3) V | (10 to 45) Hz 45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz | 0.59 mV 0.59 mV 0.59 mV 0.73 mV 1.1 mV 2.6 mV 9.1 mV | |
| (3 to 30) V | (10 to 45) Hz 45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz | 6 mV 6 mV 6 mV 9 mV 13 mV 33 mV | |
| (30 to 300) V | 45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz | 69 mV 77 mV 94 mV 0.12 V 0.76 V | |
| (300 to 750) V | 45 Hz to 1 kHz (1 to 10) kHz | 0.3 V 0.36 V | |
| (750 to 1000) V | 45 Hz to 1 kHz (1 to 10) kHz | 0.31 V 0.36 V | |

IV. Mechanical

| Parameter/Equipment | Range | CMC ^{2,7} (±) | Comments |
|--|--|---|--|
| Force Gages ³ – Compression & Tension | (1 to 8) ozf (0.5 to 2) lbf (2 to 10) lbf (10 to 25) lbf (25 to 500) lbf | 0.002 ozf 0.001 lbf 0.008 lbf 0.009 lbf 0.06 lbf | NIST handbook 105-1 Class F weights |
| Load Cells ³ | (30 to 300) lbf (200 to 2000) lbf (2500 to 25 000) lbf (5000 to 50 000) lbf (50 000 to 320 000) lbf | 0.07 % of rdg 0.07 % of rdg 0.07 % of rdg 0.07 % of rdg 0.25 % of rdg | Load cell system High capacity load cell system |
| Mass Flow ³ | (0.1 to 30) l/s | 1 % of rdg | Ultrasonic flowmeter |
| Durometers – A, B, E, O, C, D, & DO Test Blocks Indenter Shape: Length Angle Diameter Radius Calibrators | (0 to 90) Duro (20 to 90) Duro (2 to 3) mm (2 to 40) ° (0.7 to 12) mm (0.09 to 11) mm (0 to 4.54) kg·f | 0.9 Duro 1.9 Duro 0.01 mm 0.066 ° 0.01 mm 0.01 mm 9 g·f | ASTM D2240 with: Durometer calibrator/force gauge Durometers Vision system Force gage |
| Rockwell Hardness Testers ³ – (Indirect Verification) | HRBW: High Middle Low HRC: High Middle Low | 0.72 HRBW 0.52 HRBW 0.65 HRBW 0.52 HRC 0.45 HRC 0.41 HRC | ASTM E18 with test blocks |

| Parameter/Equipment | Range | CMC ² (±) | Comments |
|---|--|--|---|
| Rockwell Hardness Testers ³ – (Indirect Verification) (cont) | HRFW: High Middle Low | 0.55 HRFW 0.58 HRFW 0.57 HRFW | ASTM E-18 with test blocks |
| Leeb Hardness Testers – (Indirect Verification) | (500 to 800) HLD | 17 HLD | ASTM A956 |
| Mass | 1 mg 2 mg 5 mg 10 mg 20 mg 50 mg 100 mg 20 mg 500 mg 1 g 2 g 5 g 10 g 20 g 50 g 100 g 200 g 500 g 1 kg 2 kg 5 kg 10 kg 20 kg 2 oz 4 oz 8 oz 1 lb 2 lb 5 lb 10 lb 20 lb 25 lb 50 lb | 0.04 mg 0.04 mg 0.04 mg 0.04 mg 0.05 mg 0.05 mg 0.04 mg 0.05 mg 0.04 mg 0.05 mg 0.04 mg 0.03 mg 0.02 mg 0.04 mg 0.03 mg 0.08 mg 0.27 mg 0.32 mg 0.87 mg 3.2 mg 5.7 mg 0.14 g 0.2 g 0.22 g 0.26 g 0.000 01 oz 0.000 02 oz 0.000 05 oz 0.000 12 oz 0.000 16 oz 0.000 37 lb 0.000 37 lb 0.000 43 lb 0.000 46 lb 0.000 48 lb | ASTM E617 Class I weights and precision balance |

| Parameter/Equipment | Range | CMC ^{2,7} (±) | Comments |
|---|--|---|---|
| Pressure ³ – Generate & Measure | (0.1 to 100) psi (100 to 500) psi (500 to 5000) psi (5000 to 10 000) psi | 0.02 psi 0.1 psi 1 psi 2.2 psi | Dead weight tester, Pressure meter |
| Negative Pressure (Barometric) | (-14 to -1) psi | 0.07 psi | Dead weight tester |
| Scales & Balances ³ – | | | ASTM E898 with: |
| 0.01 mg Resolution | (0 to 1) g (0 to 10) g (0 to 20) g | 35 µg 2.3 mg 3.8 mg | Class 0 and 1 weights |
| 0.10 mg Resolution | (0 to 50) g (0 to 100) g (0 to 200) g | 0.18 mg 0.24 mg 0.6 mg | |
| 1 mg Resolution | (0 to 500) g (0 to 1200) g | 2.3 mg 3.8 mg | Class 1 weights |
| 0.0002 lb Resolution | (0 to 5) lb (0 to 10) lb (0 to 20) lb (0 to 50) lb (0 to 60) lb | 0.0003 lb 0.0003 lb 0.0004 lb 0.0004 lb 0.0026 lb | Class F weights in accordance with NIST Handbook 105-1 |
| 0.1 lb Resolution | (0 to 1000) lb | 0.3 lb | |
| Torque – Wrenches, Indicators, Transducers | (1.25 to 250) lbf·in (20 to 260) lbf·ft (4 to 36) ozf·in (4 to 1000) lbf·in (20 to 250) lbf·ft (250 to 1000) lbf·ft | 0.1 % of rdg 0.23 % of rdg 2 % of rdg 0.4 % of rdg 0.7 % of rdg 0.9 % of rdg | NIST Handbook 105- 1 with Class F weights, torque arm Torque calibration system |

V. Thermodynamics

| Parameter/Equipment | Range | CMC ^{2,7} (±) | Comments |
|---|---|--------------------------------|--|
| Relative Humidity – Measure & Generate | (30 to 55) % RH | 1.6 % RH | Humidity standard at ambient RH |
| Infrared Thermometers (ε = 0.95) | (50 to 100) °C (101 to 249) °C (250 to 500) °C | 0.7 °C 1.9 °C 3.5 °C | Infrared calibrator |
| Temperature – Measuring Equipment & Measure | (-45 to 150) °C (150 to 200) °C (150 to 650) °C | 0.024 °C 0.04 °C 0.06 °C | Temperature calibrator, liquid temperature calibrator, PRT probe |

VI. Time & Frequency

| Parameter/Equipment | Range | CMC ^{2,7} (±) | Comments |
|---------------------------------|--|---|--------------------------------|
| Frequency – Measuring Equipment | (0.1 to 120) Hz (0.12 to 1) kHz (1 to 100) kHz (100 to 500) kHz | 360 μHz 3 mHz 320 mHz 1.5 Hz | Multifunction calibrator |
| Tachometers & Stroboscopes – | | | |
| Contact | (1 to 500) rpm (500 to 2000) rpm (2000 to 4000) rpm | 0.2 rpm 0.5 rpm 1 rpm | Tachometer, calibrator |
| Non-Contact | (1 to 1000) rpm (1000 to 10 000) rpm (10 000 to 100 000) rpm | 0.022 rpm 0.062 rpm 0.61 rpm | Multifunction calibrator & LED |
| | (1 to 12 500) fpm (20 000 to 100 000) fpm | 0.019 % rdg + 0.64 fpm 0.058 % rdg + 0.5 fpm | Digital tachometer |
| Speed | (0.1 to 12) in/min | 0.6 % of rdg | Ruler & stopwatch |

| Parameter/Equipment | Range | CMC ² (±) | Comments |
|---------------------|------------|----------------------|---------------------------|
| Stopwatch | 1 s to 8 h | 0.55 s | Master stopwatch & camera |

VII. Dimensional Testing⁵

| Parameter/Equipment | Range | CMC ^{2,7} (±) | Comments |
|---------------------|---|---|--|
| Length – 1D | Up to 2 in Up to 6 in Up to 12 in Up to 24 in Up to 40 in | 150 µin 370 µin 300 µin 0.0025 in 300 µin | Digital micrometer Optical comparator Video machine Digital caliper Check master |
| Length – 2D | Up to 60 in Up to 90 ° | 370 µin 0.015 ° | Optical comparator or video machine Video machine |
| Length – 3D | Up to 18 in | 266 µin | Coordinate measuring machine |

MECHANICAL TESTING

Test

Compression Test

Tensile Test

Test Method

Internal Procedure TP02

Internal Procedure TP03

¹ This laboratory offers commercial calibration, dimensional testing and mechanical testing 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 In the statement of CMC L is the numerical value of the nominal length of the device measured in inches and F is the diagonal length of the surface plate in inches.

⁵ This test is not equivalent to that of a calibration.

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

⁷ 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

DIGITAL MEASUREMENT METROLOGY INC

Brampton ON, CANADA

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 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 22nd day of October 2018.

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

Senior Director, Accreditation Services
For the Accreditation Council
Certificate Number 4692.01
Valid to August 31, 2020
Revised January 15, 2019

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