# PERRY JOHNSON LABORATORY ACCREDITATION, INC.

# *Certificate of Accreditation*

*Perry Johnson Laboratory Accreditation, Inc. has assessed the Laboratory of:*

## *LABCAT, S. de R.L. M.I.*

***Galeana No. 619, Col. Moderna***
***Matamoros, Tamaulipas, México. C.P. 87300***

*(Hereinafter called the Organization) and hereby declares that Organization is accredited in accordance with the recognized International Standard:*

## ISO/IEC 17025:2017

This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system
(as outlined by the joint ISO-ILAC-IAF Communiqué dated April 2017):

## *Dimensional, Thermodynamic, Chemical, Mass, Force and Weighing Devices, Time and Frequency, Mechanical and Electrical Calibration*

***(As detailed in the supplement)***

Accreditation claims for such testing and/or calibration services shall only be made from addresses referenced within this certificate. This Accreditation is granted subject to the system rules governing the Accreditation referred to above, and the Organization hereby covenants with the Accreditation body's duty to observe and comply with the said rules.

For PJLA:

Tracy Szerszen
President

Perry Johnson Laboratory Accreditation, Inc. (PJLA)
755 W. Big Beaver, Suite 1325
Troy, Michigan 48084

| *Initial Accreditation Date:* | *Issue Date:* | *Expiration Date:* |
|---|---|---|
| May 12, 2011 | November 30, 2023 | December 31, 2025 |

| *Accreditation No.:* | *Certificate No.:* |
|---|---|
| 70451 | L23-921 |

*The validity of this certificate is maintained through ongoing assessments based on a continuous accreditation cycle. The validity of this certificate should be confirmed through the PJLA website: www.pjlabs.com*

# *Certificate of Accreditation: Supplement*

**LABCAT, S. de R.L. M.I.**
Galeana, No. 619, Col. Moderna
Matamoros, Tamaulipas, México. C.P. 87300
Contact Name: J. Alexandro Santos Vargas  Phone: (868) 149-0812

*Accreditation is granted to the facility to perform the following calibrations:*

Dimensional

| MEASURED INSTRUMENT, QUANTITY OR GAUGE | RANGE (AND SPECIFICATION WHERE APPROPRIATE) | CALIBRATION OR MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±) | CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED | CALIBRATION MEASUREMENT METHOD OR PROCEDURES USED |
|---|---|---|---|---|
| Calipers[F] | 0.05 in to 4 in | (350.86 + 6.94L) µin | Block Gauge Mod: 516-421-12 | NMX-CH-002-IMNC |
| | 5 in to 20 in | (360.17 + 3.99L) µin | Bar Set Mod: 167-145 al 160 | |
| Micrometer Outside[F] | 0.05 in to 1 in | (38.05 + 2.95L) µin | Block Gauge Mod:516-421-12 | NMX-CH-99-SCFI |
| | 5 in to 20 in | (29.74 + 3.86L) µin | Bar Set Mod:167-145 to 160 | |
| Depth Micrometer[F] | 1 in to 8 in | (220 + 35L) µin | Comparison Block Gauge Mitutoyo Mod: 516-421-12 | NMX-CH-149-SCFI |
| Indicators[F] | 0.5 in to 2 in | (90 + 6L) µin | | |
| | 0.000 1 in to 1 in | (80 + 6L) µin | Head Micrometer Mitutoyo Mod: 0-1" | |
| Set Pin Gage[FO] | 0.011 to 0.06 | (52.92 + 73.47L) µin | Micrometer "1'' | Euramet cg-6 |
| | 0.061 to 0.25 | (54.21 + 51.06L) µin | | |
| | 0.501 to 0.625 | (32.23 + 42.91L) µin | | |
| Height Gauge[F] | 0.6 in to 24 in | (635.72 + 5.31L) µin | Block Gauge, Bar Set Mitutoyo Mod: 516-421-12 Mod: 167-145 al 160 | JIS B 7517 |
| Rules[F] | 2.54 mm to 1 016 mm | 0.8 mm | Graduate Rule Mitutoyo Mod: 182-309 | JID B 7516 |
| Glass Scale[F] | 2.54 mm to 300 mm | 0.8 mm | | |
| Optical Comparator[F] X Axis Linearity | 12 in maximum | 520 µin | Glass Rule Mod: 172-162 Comparison Block Gauge Mitutoyo Mod: 516-421-12 | JIS B 7184 |
| Y Axis Linearity | 12 in maximum | 520 µin | | |
| Optical Comparator[F] Squareness of Y axis to X axis | 8 in of Y travel or Maximum Y axis travel if Maximum is less than 8 in | 0.005 7° | Master Square Comparison Block Gauge Mitutoyo Mod: 516-421-12 | |
| Optical Comparator Angularity[F] | Up to 180° | 0.15° | Angular Reticle Mitutoyo Comparison Block Gauge Mitutoyo Mod: 516-421-12 | |

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| Optical Comparator Magnification[O] | 10X | 0.03 % | Comparison Block Gauge Mitutoyo Mod: 516-421-12 | NMX-CH-3650 |
| | 20X | 0.03 % | | |
| | 31.5X | 0.03 % | | |
| | 62.5X | 0.03 % | | |
| | 50X | 0.04 % | | |
| Angle Block and Protactor[F] | Up to 90° | 0.2° | Westward D Mini Mag Protactor Electronic | CEM DI-003 |
| Thickness Gauge[F] | 23 µm to 1 457 µm | 2 µm | Plastic Shims Defelsko Mod: Set | ASTM D7091 |
| Granite Surface Plate Repeat Only[F] | 0.002 µm | 80 µm | Repeat Reading Gauge Starrett with Electronic Indicator | GGG-P-463c |
| Thread Plug Gage (Pitch Diameter) [F] | 3-48 to 1-14 | (53.96 + 3.21L) µin | Micrometer 1'' Three Wires Gages | ASME B1.1 ASME B1.13M |
| Plug Gage Go, No Go[F] | 0.085 5 in to 0.960 9 in | (53.96 + 3.21L) µin | | |
| Thread Ring Gages (Pitch Diameter) [F] | 10-24 to 4-4 (Pitch Diameter 0.161 9 in to 3.834 2 in) | (2.4 + 6.26 x $10^{-1}$L) µin | MAHR 828 Universal Length Machine MAHR Internal Thread Probes (Accessories) | ASME B1.1, ASME B1.13M |
| Gages Block, Steel Grade 0,1,2[F] | 0.05 in to 4 in | (2.35 + 1.09L) µin | Gauge Block Set Grade 00 MAHR 828 Universal Length Machine | ASME B89.1.9 |
| Cylindrical Ring Gages[F] | 0.2 in to 20 in | (2.17 + 1.68L) µin | MAHR 828 Universal Length Machine, Internal Probe | ASME B89.1.5 |
| Standard and Measuring Rods to Micrometer Setting[FO] | 1 in to 17 in | (64.49 + 4.13x $10^{-1}$L) µin | Gauge Block Set Grade 00 Gauge Block Set Grade 0 Digital Indicator | MAHR MILLITAST 1085 BS 5317 |

## Thermodynamic

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|---|---|---|---|---|
| Hygrometers[F] | 10 % RH to 90 % RH | 2 % of reading | Temperature and Humidity Recorder and Humidity Chamber Generator | CEM TH-007 |
| Humidity Tester[F] | 10 % RH to 90 % RH | 2 % of reading | | |
| Humidity Chamber[F] | 10 % RH to 90 % RH | 2 % of reading | | |

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Thermodynamic

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|---|---|---|---|---|
| Oven[FO] | 30 °C to 150 °C | 0.089 % of reading | Omega CL3515R Temperature Simulator and Reader, Type K Thermal Probe Specification and Temperature-Electromotive Force | CENAM Technical Guide |
| | 151 °C to 530 °C | 0.026 % of reading | | |
| | 531 °C to 810°C | 0.026 % of reading | | |
| | 811 °C to 1 345 °C | 0.026 % of reading | | |
| Infrared Pyrometers[FO] | 50 °C to 500 °C | 0.17 °C | Black Body Reed BX-500 | |

Mass, Force and Weighing Devices

| MEASURED INSTRUMENT, QUANTITY OR GAUGE | RANGE (AND SPECIFICATION WHERE APPROPRIATE) | CALIBRATION OR MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±) | CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED | CALIBRATION MEASUREMENT METHOD OR PROCEDURES USED |
|---|---|---|---|---|
| Force -Tension[O] | 0.001 N to 49 N | 0.2 % of reading | Dead Weight F Rice Lake Mod: 1 MG-5KG | ISO 7500-1 |
| | 2 kN to 22 kN | 0.5 % of reading | Force Gauge Dillon Mod: EDxtreme | |
| | 4 kN to 44 kN | 0.3 % of reading | Load Cell Transducer Techniques Mod: SW0-20K | |
| Force - Compression[O] | 0.001 N to 49 N | 0.2 % of reading | Dead Weight F Rice Lake Mod: 1MG-5KG | |
| | 2 kN to 22 kN | 0.5 % of reading | Force Gauge Dillon Mod: EDxtreme | |
| | 4 kN to 44 kN | 0.3 % of reading | Load Cell Transducer Techniques Mod: SW0-20K | |
| Scales and Balances[O] | 1 mg to 500 mg (Res.= 0.1 mg) | $(2.57 \times 10^{-1} + 1.35 \times 10^{-3}Wt)$ mg | Class M1 Weighs Rice Like Mod: | Euramet_cg-18 |
| | 500 mg to 500 g (Res.= 1 mg) | $(1.5 \times 10^{-3} + 5.49 \times 10^{-5}Wt)$ g | | |
| | 500 g to 5 kg (Res.= 10 g) | 12 g | | |
| | 5 kg to 450 kg (Res.= 0.5 kg) | 580 g | Class M1 Weights Esher | |

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Time and Frequency

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|---|---|---|---|---|
| Clock[FO] | 9 h: 59 min: 599 s | 0.6 s | Digital Stopwatch | NIST 960-12 |
| Chronometer[FO] | 23 h: 59 min: 599 s | 5.3 s | | |
| Timers[FO] | 23 h: 59 min: 599 s | 5.3 s | | |
| Tachometers[FO] | 10 rpm to 14 000 rpm | 0.05 % of reading | Speed Meters and rpm Laser Photo/Contact | ASTM 432-B |
| Equipment to Output Frequency[FO] | 0.1 Hz to 1 kHz | 0.009 % of reading | Frequency Counter BK Precision 1856D | Euramet cg-07 Euramet cg-15 |
| | 1.1 kHz to 10 kHz | 0.001 5 % of reading | | |
| | 10.1 kHz to 100 kHz | 0.000 15 % of reading | | |
| | 100.1 kHz to 1 MHz | 0.015 % of reading | | |
| | 1.1 MHz to 10 MHz | 0.001 5 % of reading | | |
| | 10.1 MHz to 100 MHz | 0.001 5 % of reading | | |
| | 100.1 MHz to 3.5 GHz | 0.004 % of reading | | |

Mechanical

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|---|---|---|---|---|
| Indirect Verification of Rockwell Hardness Tester HRC[O] | 20 HRC to 39 HRC | 0.28 HRC | Rockwell Standardized Hardness Test Block | ASTM E18 |
| | 40 HRC to 59 HRC | 0.52 HRC | | |
| | 60 HRC to 68 HRC | 0.21 HRC | | |
| Indirect Verification of Rockwell Hardness Tester HRBW[O] | 10 HRBW to 50 HRBW | 0.38 HRBW | | |
| | 51 HRBW to 79 HRBW | 0.49 HRBW | | |
| | 80 HRBW to 100 HRBW | 0.42 HRBW | | |
| Pressure Gauge[F] | 100 psi to 1 000 psi | 0.25 % of reading | Omega, Pressure Gauge Mod: DPG8001-1K | ASME B40.100 |
| | 1 000 psi to 10 000 psi | 0.4 % of reading | Cristal, Pressure Gauge Mod: M1-10KPSI | |
| Vacuum Gage[FO] | 1 inHg to 25 inHg | 0.25 % of reading | Cristal, Pressure Gauge Mod: M1-10KPSI | |
| Torque Wrench[F] | 60 lbf·ft to 600 lbf·ft | 1.2 % of reading | Torque Tester Sturtevant Richmond Mod: 600 | ISO 6789-2 |

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## Mechanical

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|---|---|---|---|---|
| Kinematic Viscosity Zahn Cups No. 2[F] | 19 cSt a 156 cSt | 0.15 % of reading | Canon Certified Viscosity Standard C60 and C200 Chronometer Casio Thermohygrometer Fluke 971 | ASTM D4212 |
| Kinematic Viscosity Zahn Cups No. 3[F] | 64 cSt a 596 cSt | 0.47 % of reading | | |
| Kinematic Viscosity Zahn Cups No. 4[F] | 79 cSt a 784 cSt | 0.47 % of reading | | |
| Kinematic Viscosity Zahn Cups No. 5[F] | 161 cSt a 1 401 cSt | 0.47 % of reading | | |

## Chemical

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|---|---|---|---|---|
| pH Meter[F] | 4 pH to 10 pH | 0.035 pH | pH Calibrations Buffers | NMX-CH-068 |
| Conductivity Fixed Points[F] | 84 mS/cm | 0.5 mS/cm | Buffer, Analytic Solution | |
| | 1 413 mS/cm | 0.5 mS/cm | | |

## Electrical

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|---|---|---|---|---|
| Electrical Simulation of Temperature Calibration, Indication, and Control Equipment used with RTD Pt 385, 100 Ω[FO] | -200 °C to -80 °C | 0.026 % of reading | Fluke 5522A Electrical Simulation of RTD Output | ASTM E220 |
| | -80 °C to 0 °C | 0.079 % of reading | | |
| | 0 °C to 100 °C | 0.11 % of reading | | |
| | 100 °C to 300 °C | 0.03 % of reading | | |
| | 300 °C to 400 °C | 0.022 % of reading | | |
| | 400 °C to 630 °C | 0.019 % of reading | | |
| | 630 °C to 800 °C | 0.026 % of reading | | |
| Electrical Simulation of Temperature Calibration, Indication, and Control Equipment used with RTD Pt 3926, 100 Ω[FO] | 200 °C to -80 °C | 0.05 °C | | |
| | -80 °C to 0 °C | 0.06 °C | | |
| | 0 °C to 100 °C | 0.08 °C | | |
| | 100 °C to 300 °C | 0.09 °C | | |
| | 300 °C to 400°C | 0.1 °C | | |
| | 400 °C to 630 °C | 0.12 °C | | |

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|---|---|---|---|---|
| Electrical Simulation of Temperature Calibration, Indication, and Control Equipment used with RTD Pt 3916, 100 $\Omega^{FO}$ | -200 °C to -190 °C | 0.29 °C | Fluke 5522A Electrical Simulation of RTD Output | ASTM E220 |
| | -190 °C to -80 °C | 0.05 °C | | |
| | -80 °C to 0 °C | 0.06 °C | | |
| | 0 °C to 100 °C | 0.07 °C | | |
| | 100 °C to 260 °C | 0.07 °C | | |
| | 260 °C to 300 °C | 0.08 °C | | |
| | 300 °C to 400 °C | 0.09 °C | | |
| | 400 °C to 600 °C | 0.09 °C | | |
| | 600 °C to 630 °C | 0.24 °C | | |
| | -80 °C to 0 °C | 0.03 °C | | |
| | 0 °C to 100 °C | 0.05 °C | | |
| | 100 °C to 260 °C | 0.05 °C | | |
| | 260 °C to 300 °C | 0.13 °C | | |
| | 300 °C to 400 °C | 0.14 °C | | |
| | 400 °C to 600 °C | 0.14 °C | | |
| | 600 °C to 630 °C | 0.16 °C | | |
| Electrical Simulation of Temperature Calibration, Indication, and Control Equipment used with RTD Pt 385, 500 $\Omega^{FO}$ | 0 °C to 100 °C | 0.06 °C | | |
| | 100 °C to 260 °C | 0.07 °C | | |
| | 260 °C to 300 °C | 0.08 °C | | |
| | 300 °C to 400 °C | 0.08 °C | | |
| | 400 °C to 600 °C | 0.09 °C | | |
| | 600 °C to 630 °C | 0.1 °C | | |
| Electrical Simulation of Temperature Calibration, Indication, and Control Equipment used with RTD Pt 385, 1 000 $\Omega^{FO}$ | -200 °C to -80 °C | 0.016 % of reading | | |
| | -80 °C to 0 °C | 0.049 % of reading | | |
| | 0 °C to 100 °C | 0.064 % of reading | | |
| | 100 °C to 260 °C | 0.014 % of reading | | |
| | 260 °C to 300 °C | 0.017 % of reading | | |
| | 300 °C to 400 °C | 0.016 % of reading | | |
| | 400 °C to 600 °C | 0.011 % of reading | | |
| | 600 °C to 630 °C | 0.05 % of reading | | |

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| Electrical Simulation of Temperature Calibration, Indication, and Control Equipment used with RTD Pt Ni 385, 120 $\Omega^{FO}$ | -80 °C to 0 °C | 0.07 °C | Fluke 5522A Electrical Simulation of RTD Output | ASTM E220 |
| | 0 °C to 100 °C | 0.08 °C | | |
| | 100 °C to 260 | 0.15 °C | | |
| Electrical Simulation of Temperature Calibration, Indication, and Control Equipment used with RTD Cu 427, 10 $\Omega^{FO}$ | -100 °C to 260 °C | 0.35 °C | | |
| Electrical Simulation of Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type $B^{FO}$ | 600 °C to 800 °C | 0.49 °C | Fluke 5522A Electrical Simulation of Thermocouple Output | |
| | 800 °C to 1 000 °C | 0.39 °C | | |
| | 1 000 °C to 1 550 °C | 0.36 °C | | |
| | 1 550 °C to 1 820 °C | 0.31 °C | | |
| Electrical Simulation of Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type $C^{FO}$ | 0 °C to 150 °C | 0.27 °C | | |
| | 150 °C to 650 °C | 0.23 °C | | |
| Electrical Simulation of Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type $C^{FO}$ | 650 °C to 1 000 °C | 0.27 °C | | |
| | 1 000 °C to 1 800 °C | 0.44 °C | | |
| | 1 800 °C to 2 316 °C | 0.73 °C | | |
| Electrical Simulation of Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type $E^{FO}$ | -250 °C to -100 °C | 0.26 % of reading | | |
| | -100 °C to -25 °C | 0.27 % of reading | | |
| | -25 °C to 350 °C | 0.061 % of reading | | |
| | 350 °C to 650 °C | 0.03 % of reading | | |
| | 650 °C to 1 000 °C | 0.017 % of reading | | |
| Electrical Simulation of Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type $J^{FO}$ | -250 °C to -100 °C | 0.14 °C | | |
| | -100 °C to -30 °C | 0.27 °C | | |
| | -30 °C to 150 °C | 0.24 °C | | |
| | 150 °C to 760 °C | 0.48 °C | | |
| | 760 °C to 1 200 °C | 0.19 °C | | |

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| Electrical Simulation of Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type K[FO] | -200 °C to -100 °C | 0.17 % of reading | Fluke 5522A Electrical Simulation of Thermocouple Output | ASTM E220 |
| | -100 °C to -25 °C | 0.3 % of reading | | |
| | -25 °C to 120 °C | 0.14 % of reading | | |
| | 120 °C to 1 000 °C | 0.07 % of reading | | |
| | 1 000 °C to 1 372 °C | 0.032 % of reading | | |
| Electrical Simulation of Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type L[FO] | -200 °C to -100 °C | 0.43 °C | | |
| | 100 °C to 800 °C | 0.3 °C | | |
| | 800 °C to 900 °C | 0.21 °C | | |
| Electrical Simulation of Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type N[FO] | -200 °C to -100 °C | 0.21 % of reading | | |
| | -100 °C to -25 °C | 0.36 % of reading | | |
| | -25 °C to 120 °C | 0.16 % of reading | | |
| | 120 °C to 410 °C | 0.05 % of reading | | |
| | 410 °C to 1 300 °C | 0.022 % of reading | | |
| Electrical Simulation of Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type R[FO] | 0 °C to 250 °C | 0.45 % of reading | | |
| | 250 °C to 400 °C | 0.11 % of reading | | |
| | 400 °C to 1 000 °C | 0.52 % of reading | | |
| | 1 000 °C to 1 767 °C | 0.021 % of reading | | |
| Electrical Simulation of Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type S[FO] | 0 °C to 250 °C | 0.54 °C | | |
| | 250 °C to 1 000 °C | 0.35 °C | | |
| | 1 000 °C to 1 400 °C | 0.33 °C | | |
| | 1 400 °C to 1 767 °C | 0.4 °C | | |
| Electrical Simulation of Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type T[FO] | -250 °C to -150 °C | 0.33 % of reading | | |
| | -150 °C to 0 °C | 0.39 % of reading | | |
| | 0 °C to 120 °C | 0.14 % of reading | | |
| | 120 °C to 400 °C | 0.04 % of reading | | |
| Electrical Simulation of Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type U[FO] | -200 °C to 0 °C | 0.29 °C | | |
| | 0 °C to 600 °C | 0.54 °C | | |

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Contact Name: J. Alexandro Santos Vargas  Phone: (868) 149-0812

*Accreditation is granted to the facility to perform the following calibrations:*

Electrical

| MEASURED INSTRUMENT, QUANTITY OR GAUGE | RANGE (AND SPECIFICATION WHERE APPROPRIATE) | CALIBRATION OR MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±) | CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED | CALIBRATION MEASUREMENT METHOD OR PROCEDURES USED |
|---|---|---|---|---|
| Equipment to Measure DC Voltage [FO] | Up to 329.999 9 mV | 0.002 2 % of reading | Fluke 5522A | Euramet-cg-15 |
| | 329.999 9 mV to 3.299 999 V | 0.000 92 % of reading | | |
| | 3.299 999 V to 32.999 99 V | 0.001 % of reading | | |
| | 32.999 99 V to 329.999 9 V | 0.001 4 % of reading | | |
| | 329.999 9 V to 1 020 V | 0.001 6 % of reading | | |
| Equipment to Measure DC Current [FO] | Up to 329.999 µA | 0.016 % of reading | Fluke 5522A/ Coil 50 Turns | |
| | 329.999 µA to 3.299 99 mA | 0.55 % of reading | | |
| | 3.299 99 µA to 32.999 9 mA | 0.097 % of reading | | |
| | 32.999 9 mA to 329.999 mA | 0.011 % of reading | | |
| | 329.999 mA to 1.099 99 A | 0.02 % of reading | | |
| | 1.099 99 A to 2.999 99 A | 0.031 % of reading | | |
| | 2.999 99 A to 10.999 9 A | 0.042 % of reading | | |
| | 10.999 9 A to 20.5 A | 0.08 % of reading | | |
| | 20.5 A to 1 000 A | 0.064 % of reading | | |
| Equipment to Measure Resistance[FO] | Up to 10.999 9 Ω | 0.011 % of reading | Fluke 5522A | |
| | 11 Ω to 32.999 9 Ω | 0.038 % of reading | | |
| | 33 Ω to109.999 9 Ω | 0.013 % of reading | | |
| | 110 Ω to 329.999 9 Ω | 0.006 9 % of reading | | |
| | 330 kΩ to 1.099 999 kΩ | 0.003 6 % of reading | | |
| | 1.1 kΩ to 3.299 999 kΩ | 0.006 9 % of reading | | |
| | 3.3 kΩ to 10.999 99 kΩ | 0.002 9 % of reading | | |
| | 11 k Ω to 32.999 99 kΩ | 0.004 5 % of reading | | |
| | 33 kΩ to 109.999 9 kΩ | 0.002 9 % of reading | | |
| | 110 kΩ to 329.999 99 kΩ | 0.004 8 % of reading | | |
| | 330 kΩ to 1.099 999 MΩ | 0.003 2 % of reading | | |
| | 1.1 MΩ to 3.299 999 MΩ | 0.008 2 % of reading | | |
| | 3.3 MΩ to 10.999 99 MΩ | 0.012 % of reading | | |
| | 11 MΩ to 32.999 99 MΩ | 0.025 % of reading | | |

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|---|---|---|---|---|
| Equipment to Measure Resistance[FO] | 33 MΩ to 109.999 9 MΩ | 0.041 % of reading | Fluke 5522A | Euramet-cg-15 |
| | 110 MΩ to 329.999 9 MΩ | 0.26 % of reading | | |
| | 330 MΩ to 1 100 MΩ | 1.2 % of reading | | |
| Equipment to Measure AC Voltage at listed frequencies[FO] | | | | |
| 10 Hz to 45 Hz | 1 mV to 32.999 mV | 0.18 % of reading | | |
| 45 Hz to 10 kHz | 1 mV to 32.999 mV | 0.17 % of reading | | |
| 10 kHz to 20 kHz | 1 mV to 32.999 mV | 0.038 % of reading | | |
| 20 kHz to 50 kHz | 1 mV to 32.999 mV | 0.094 % of reading | | |
| 50 kHz to 100 kHz | 1 mV to 32.999 mV | 0.3 % of reading | | |
| 100 kHz to 500 kHz | 1 mV to 32.999 mV | 0.75 % of reading | | |
| Equipment to Measure AC Voltage at listed frequencies[FO] | | | | |
| 10 Hz to 45 Hz | 33 mV to 329.999 mV | 0.028 % of reading | | |
| 45 Hz to 10 kHz | 33 mV to 329.999 mV | 0.018 % of reading | | |
| 10 kHz to 20 kHz | 33 mV to 329.999 mV | 0.019 % of reading | | |
| 20 kHz to 50 kHz | 33 mV to 329.999 mV | 0.03 % of reading | | |
| 50 kHz to 100 kHz | 33 mV to 329.999 mV | 0.071 % of reading | | |
| 100 kHz to 500 kHz | 33 mV to 329.999 mV | 0.18 % of reading | | |
| Equipment to Measure AC Voltage at listed frequencies[FO] | | | | |
| 10 Hz to 45 Hz | 330 mV to 3.299 99 V | 0.025 % of reading | | |
| 45 Hz to 10 kHz | 330 mV to 3.299 99 V | 0.013 % of reading | | |
| 10 kHz to 20 kHz | 330 mV to 3.299 99 V | 0.016 % of reading | | |
| 20 kHz to 50 kHz | 330 mV to 3.299 99 V | 0.025 % of reading | | |
| 50 kHz to 100 kHz | 330 mV to 3.299 99 V | 0.059 % of reading | | |
| 100 kHz to 500 kHz | 330 mV to 3.299 99 V | 0.21 % of reading | | |
| Equipment to Measure AC Voltage at listed frequencies[FO] | | | | |
| 10 Hz to 45 Hz[F] | 3.3 V to 32.9 999 V | 0.025 % of reading | | |
| 45 Hz to 10 kHz | 3.3 V to 32.9 999 V | 0.013 % of reading | | |

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|---|---|---|---|---|
| Equipment to Measure AC Voltage at listed frequencies[FO] | | | Fluke 5522A | Euramet-cg-15 |
| 10 kHz to 20 kHz | 3.3 V to 32.9 999 V | 0.02 % of reading | | |
| 20 kHz to 50 kHz | 3.3 V to 32.9 999 V | 0.03 % of reading | | |
| 50 kHz to 100 kHz | 3.3 V to 32.9 999 V | 0.075 % of reading | | |
| Equipment to measure AC Voltage at listed frequencies[FO] | | | | |
| 45 Hz to 1 kHz | 33 V to 329.999 V | 0.015 % of reading | | |
| 1 kHz to 10 kHz | 33 V to 329.999 V | 0.017 % of reading | | |
| 10 kHz to 20 kHz | 33 V to 329.999 V | 0.021 % of reading | | |
| 20 kHz to 50 kHz | 33 V to 329.999 V | 0.025 % of reading | | |
| 50 kHz to 100 kHz | 33 V to 329.999 V | 0.17 % of reading | | |
| Equipment to measure AC Voltage at listed frequencies[FO] | | | | |
| 45 Hz to 1 kHz | 330 V to 1 020 V | 0.025 % of reading | | |
| 1 kHz to 5 kHz | 330 V to 1 020 V | 0.021 % of reading | | |
| 5 kHz to 10 kHz | 330 V to 1 020 V | 0.025 % of reading | | |
| Equipment to Measure AC Current At listed frequencies[FO] | | | | |
| 10 Hz to 20 Hz | 29 µA to 329.99 µA | 0.18 % of reading | | |
| 20 Hz to 45 Hz | 29 µA to 329.99 µA | 0.14 % of reading | | |
| 45 Hz to 1 kHz | 29 µA to 329.99 µA | 0.12 % of reading | | |
| 1 to 5 kHz | 29 µA to 329.99 µA | 0.27 % of reading | | |
| 5 kHz to 10 kHz | 29 µA to 329.99 µA | 0.67 % of reading | | |
| 10 kHz to 30 kHz | 29 µA to 329.99 µA | 1.4 % of reading | | |
| Equipment to Measure AC Current At listed frequencies[FO] | | | | |
| 10 Hz to 20 Hz | 330 µA to 3.299 99 mA | 0.16 % of reading | | |
| 20 Hz to 45 Hz | 330 µA to 3.299 99 mA | 0.1 % of reading | | |
| 45 Hz to 1 kHz | 330 µA to 3.299 99 mA | 0.084 % of reading | | |
| 1 kHz to 5 kHz | 330 µA to 3.299 99 mA | 0.16 % of reading | | |

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|---|---|---|---|---|
| Equipment to Measure AC Current At listed frequencies[FO] | | | Fluke 5522A | Euramet-cg-15 |
| 5 kHz to 10 kHz | 330 µA to 3.299 99 mA | 0.4 % of reading | | |
| 10 kHz to 30 kHz | 330 µA to 3.299 99 mA | 0.79 % of reading | | |
| Equipment to Measure AC Current At listed frequencies[FO] | | | | |
| 10 Hz to 20 Hz | 3.3 mA to 32.9 999 mA | 0.19 % of reading | | |
| 20 Hz to 45 Hz | 3.3 mA to 32.9 999 mA | 0.14 % of reading | | |
| 45 Hz to 1 kHz | 3.3 mA to 32.9 999 mA | 0.13 % of reading | | |
| 1 kHz to 5 kHz | 3.3 mA to 32.9 999 mA | 0.14 % of reading | | |
| 5 kHz to 10 kHz | 3.3 mA to 32.9 999 mA | 0.2 % of reading | | |
| 10 kHz to 30 kHz | 3.3 mA to 32.9 999 mA | 0.34 % of reading | | |
| Equipment to Measure AC Current At listed frequencies[FO] | | | | |
| 10 Hz to 20 Hz | 33 mA to 329.999 mA | 0.073 % of reading | | |
| 20 Hz to 45 Hz | 33 mA to 329.999 mA | 0.076 % of reading | | |
| 45 Hz to 1 kHz | 33 mA to 329.999 mA | 0.039 % of reading | | |
| 1 kHz to 5 kHz | 33 mA to 329.999 mA | 0.091 % of reading | | |
| 5 kHz to 10 kHz | 33 mA to 329.999 mA | 0.18 % of reading | | |
| 10 kHz to 30 kHz | 33 mA to 329.999 mA | 0.36 % of reading | | |
| Equipment to Measure AC Current At listed frequencies[FO] | | | | |
| 10 kHz to 45 Hz | 330 mA to 1.099 99 A | 0.15 % of reading | | |
| 45 Hz to 1 kHz | 330 mA to 1.099 99 A | 0.047 % of reading | | |
| 1 kHz to 5 kHz | 330 mA to 1.099 99 A | 0.54 % of reading | | |
| 5 kHz to 10 kHz | 330 mA to 1.099 99 A | 2.3 % of reading | | |
| Equipment to Measure AC Current At listed frequencies[FO] | | | | |
| 45 Hz to 100 Hz | 3 A to 10.999 9 A | 0.062 % of reading | | |
| 100 Hz to 1 kHz | 3 A to 10.999 9 A | 0.093 % of reading | | |
| 1 kHz to 5 kHz | 3 A to 10.999 9 A | 2.4 % of reading | | |

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|---|---|---|---|---|
| Equipment to Measure AC Current At listed frequencies[FO] | | | Fluke 5522A | Euramet-cg-15 |
| 45 Hz to 100 Hz | 11 A to 20.5 A | 0.11 % of reading | | |
| 100 Hz to 1 kHz | 11 A to 20.5 A | 0.14 % of reading | | |
| 1 kHz to 5 kHz | 11 A to 20.5 A | 2.4 % of reading | | |
| Equipment to Measure AC Current At listed frequencies[FO] | | | Fluke 5522A Coil 50 Turns | |
| 45 Hz to 65 Hz | 20.5 A to 1 000 A | 0.064 % of reading | | |
| Equipment to Measure Capacitance At listed frequencies[FO] | | | Fluke 5522A | |
| 10 Hz to 10 kHz | 220 pF to 399.9 pF | 2.3 % of reading | | |
| 10 Hz to 10 kHz | 400 nF to 1.099 9 nF | 1.1 % of reading | | |
| 10 Hz to 3 kHz | 1.1 nF to 3.299 9 nF | 0.61 % of reading | | |
| 10 Hz to 1 kHz | 3.3 nF to 10.999 9 nF | 0.26 % of reading | | |
| 10 Hz to 1 kHz | 11 nF to 32.999 9 nF | 0.22 % of reading | | |
| 10 Hz to 1 kHz | 33 nF to 109.999 nF | 0.2 % of reading | | |
| 10 Hz to 1 kHz | 110 nF to 329.999 nF | 0.21 ‰o f reading | | |
| 10 Hz to 600 Hz | 330 µF to 1.099 99 µF | 0.2 % of reading | | |
| 10 Hz to 300 Hz | 1.1 µF to 3.299 99 µF | 0.26 % of reading | | |
| 10 Hz to 150 Hz | 3.3 µF to 10.999 9 µF | 0.28 % of reading | | |
| 10 Hz to 120 Hz | 11 µF to 32.999 9 µF | 0.4 % of reading | | |
| 10 Hz to 80 Hz | 33 µF to 109.999 µF | 0.43 % of reading | | |
| Equipment to Measure Capacitance At listed frequencies[FO] | | | | |
| 0 Hz to 50 Hz | 110 µF to 329.999 µF | 0.44 % of reading | | |
| 0 Hz to 20 Hz | 330 µF to 1.099 99 mF | 0.42 % of reading | | |
| 0 Hz to 6 Hz | 1.1 mF to 3.299 99 mF | 0.42 % of reading | | |
| 0 Hz to 2 Hz | 3.3 mF to 10.999 9 mF | 0.42 % of reading | | |
| 0 Hz to 0.6 Hz | 11 mF to 32.999 9 mF | 0.65 % of reading | | |
| 0 Hz to 0.2 Hz | 33 mF to 110 mF | 0.92 % of reading | | |

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|---|---|---|---|---|
| Equipment to Output DC Voltage[FO] | 100 mV | 0.003 7 % of reading + 0.003 5 % range | 6 ½ Multimeter Fluke 8846A | Euramet cg-15 |
| | 1 V | 0.002 5 % of reading + 0.000 7 % range | | |
| | 10 V | 0.002 4 % of reading + 0.000 5 % range | | |
| | 100 V | 0.003 8 % of reading + 0.000 6 % range | | |
| | 1 000 V | 0.004 1 % of reading + 0.001 % range | | |
| Equipment to Output AC Voltage At the listed frequencies[FO] | | | | |
| 3 Hz to 5 Hz | 100 mV | 1 % of reading + 0.04% range | | |
| 5 Hz to 10 Hz | 100 mV | 0.35 % of reading + 0.04% range | | |
| 10 Hz to 20 kHz | 100 mV | 0.06 % of reading + 0.04 % range | | |
| 20 kHz to 50 kHz | 100 mV | 0.12 % of reading + 0.05 % range | | |
| 50 kHz to 100 kHz | 100 mV | 0.6 % of reading g + 0.08 % range | | |
| 100 kHz to 300 kHz | 100 mV | 4 % of reading + 0.5 % range | | |
| Equipment to Output AC Voltage At the listed frequencies[FO] | | | | |
| 3 Hz to 5 Hz | 1 V | 1 % of reading + 0.03 % range | | |
| 5 Hz to 10 Hz | 1 V | 0.35 % of reading + 0.03 % range | | |
| 10 Hz to 20 kHz | 1 V | 0.06 % of reading + 0.03 % range | | |
| 20 kHz to 50 kHz | 1 V | 0.12 % of reading + 0.05 % range | | |
| 50 kHz to 100 kHz | 1 V | 0.6 % of reading + 0.08 % range | | |
| 100 kHz to 300 kHz | 1 V | 4 % of reading + 0.5 % range | | |
| Equipment to Output AC Voltage At the listed frequencies[FO] | | | | |
| 3 Hz to 5 Hz | 10 V | 1 % of reading + 0.03 % range | | |
| 5 Hz to 10 Hz | 10 V | 0.35 % of reading + 0.03 % range | | |
| 10 Hz to 20 kHz | 10 V | 0.06 % of reading dg + 0.03 % range | | |
| 20 kHz to 50 kHz | 10 V | 0.12 % of reading + 0.05 % range | | |
| 50 kHz to 100 kHz | 10 V | 0.6 % of reading + 0.08 % range | | |
| 100 kHz to 300 kHz | 10 V | 4 % of reading + 0.5 % range | | |

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|---|---|---|---|---|
| Equipment to Output AC Voltage At the listed frequencies[FO] | | | 6 ½ Multimeter Fluke 8846A | Euramet cg-15 |
| 3 Hz to 5 Hz | 100 V | 1 % of reading dg + 0.03 % range | | |
| 5 Hz to 10 Hz | 100 V | 0.35 % of reading + 0.03 % range | | |
| 10 Hz to 20 kHz | 100 V | 0.06 % of reading + 0.03 % range | | |
| 20 kHz to 50 kHz | 100 V | 0.12 % of reading + 0.05 % range | | |
| 50 kHz to 100 kHz | 100 V | 0.6 % of reading + 0.08 % range | | |
| Equipment to Output AC Voltage At the listed frequencies[FO] | | | | |
| 3 Hz to 5 Hz | 1 000 V | 1 % of reading + 0.023 % range | | |
| 5 Hz to 10 Hz | 1 000 V | 0.35 % of reading + 0.023 % range | | |
| 10 Hz to 10 kHz | 1 000 V | 0.06 % of reading + 0.023 % range | | |
| Equipment to Output DC Current[FO] | 100 µA | 0.05 % of reading + 0.025 % range | | |
| | 1 mA | 0.05 % of reading g + 0.005 % range | | |
| | 10 mA | 0.05 % of reading + 0.02 % range | | |
| | 100 mA | 0.05 % of reading + 0.005 % range | | |
| | 400 mA | 0.05 % of reading + 0.005 % range | | |
| | 1 A | 0.05 % of reading + 0.02 % range | | |
| | 3 A | 1 % of reading + 0.02 % range | | |
| | 10 A | 0.15 % of reading + 0.008 % range | | |
| Equipment to Output DC Current (Indirect Method) | 100 A | 0.004 9 % of reading | 6 ½ Multimeter Fluke 8846A Current Shunt | Euramet cg-15 |
| Equipment to Output AC Current At the listed frequencies[FO] | | | 6 ½ Multimeter Fluke 8846A | |
| 5 Hz to 10 Hz | 100 µA | 1.1 % of reading + 0.06 % range | | |
| 10 Hz to 5 kHz | 100 µA | 0.35 % of reading + 0.06 % range | | |
| 5 kHz to 10 kHz | 100 µA | 0.15 % of reading + 0.06 % range | | |
| Equipment to Output AC Current At the listed frequencies[FO] | | | | |
| 5 Hz to 10 Hz | 1 mA | 0.3 % of reading + 0.04 % range | | |
| 10 Hz to 5 kHz | 1 mA | 0.1 % of reading + 0.04 % range | | |

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|---|---|---|---|---|
| Equipment to Output<br>AC Current<br>At the listed frequencies[FO] | | | 6 ½ Multimeter<br>Fluke 8846A | Euramet cg-15 |
| 5 kHz to 10 kHz | 1 mA | 0.2 % of reading + 0.25 % range | | |
| Equipment to Output<br>AC Current<br>At the listed frequencies[FO] | | | | |
| 5 Hz to 10 Hz | 10 mA | 0.35 % of reading + 0.06 % range | | |
| 10 Hz to 5 kHz | 10 mA | 0.15 % of reading + 0.06 % range | | |
| 5 kHz to 10 kHz | 10 mA | 0.35 % of reading + 0.7 % range | | |
| Equipment to Output<br>AC Current<br>At the listed frequencies[FO] | | | | |
| 5 Hz to 10 Hz | 100 mA | 0.3 % of reading dg + 0.04 % range | | |
| 10 Hz to 5 kHz | 100 mA | 0.1 % of reading + 0.04 % range | | |
| 5 kHz to 10 kHz | 100 mA | 0.2 % of reading + 0.25 % range | | |
| Equipment to Output<br>AC Current<br>At the listed frequencies[FO] | | | | |
| 5 Hz to 10 Hz | 400 mA | 0.3 % of reading + 0.1 % range | | |
| 10 Hz to 5 kHz | 400 mA | 0.1 % of reading + 0.1 % range | | |
| 5 kHz to 10 kHz | 400 mA | 0.2 % of reading + 0.7 % range | | |
| Equipment to Output<br>AC Current<br>At the listed frequencies[FO] | | | | |
| 10 Hz to 45 Hz | 1 A | 0.1 % of reading + 0.04 % range | | |
| 45 Hz to 5 kHz | 1 A | 0.1 % of reading + 0.04 % range | | |
| 5 kHz to 10 kHz | 1 A | 0.35 % of reading + 0.7 % range | | |
| Equipment to Output<br>AC Current<br>At the listed frequencies[FO] | | | | |
| 45 Hz to 100 Hz | 3 A | 0.15 % of reading + 0.06 % range | | |
| 100 Hz to 1 kHz | 3 A | 0.15 % of reading + 0.06 % range | | |
| 1 kHz to 10 kHz | 3 A | 0.35 % of reading + 0.7 % range | | |

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|---|---|---|---|---|
| Equipment to Output AC Current At the listed frequencies[FO] | | | 6 ½ Multimeter Fluke 8846A | Euramet cg-15 |
| 45 Hz to 100 Hz | 10 A | 0.15 % of reading + 0.06 % range | | |
| 100 Hz to 1 kHz | 10 A | 0.15 % of reading + 0.06 % range | | |
| 1 kHz to 10 kHz | 10 A | 0.35 % of reading + 0.7 % range | | |
| Equipment to Output AC Current At the listed frequencies (Indirect Method) [FO] | | | 6 ½ Multimeter Fluke 8846A Current Shunt | Euramet cg-15 |
| 45 Hz to 100 Hz | 100 A | 0.13 % of reading | | |
| 100 Hz to 1 kHz | 100 A | 0.16 % of reading | | |
| Equipment to Output Electrical Resistance[FO] | 10 Ω | 0.01 % of reading + 0.03 % range | 6 ½ Multimeter Fluke 8846A | |
| | 100 Ω | 0.01 % of reading + 0.004 % range | | |
| | 1 kΩ | 0.01 % of reading + 0.001 % range | | |
| | 10 kΩ | 0.01 % of reading + 0.001 % range | | |
| | 100 kΩ | 0.01 % of reading + 0.001 % range | | |
| | 1 MΩ | 0.01 % of reading + 0.001 % range | | |
| | 10 MΩ | 0.04 % of reading + 0.001 % range | | |
| | 100 MΩ | 0.01 % of reading + 0.01 % range | | |
| | 1 000 MΩ | 2 % of reading + 0.01v% range | | |
| Equipment to Output Capacitance[FO] | 10 nF | 2 % of reading + 2.5 % range | | |
| | 100 nF | 1 % of reading + 0.5 % range | | |
| | 1 µF | 1 % of reading + 0.5 % range | | |
| | 10 µF | 1 % of reading + 0.5 % range | | |
| | 100 µF | 1 % of reading + 0.5 % range | | |
| | 1 mF | 1 % of reading + 0.5 % range | | |
| | 10 mF | 1 % of reading + 0.5 % range | | |
| | 100 mF | 4 % of reading + 0.2 % range | | |

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*Accreditation is granted to the facility to perform the following calibrations:*

1. The CMC (Calibration and Measurement Capability) stated for calibrations included on this scope of accreditation represents the smallest measurement uncertainty attainable by the laboratory when performing a more or less routine calibration of a nearly ideal device under nearly ideal conditions. It is typically expressed at a confidence level of 95 % using a coverage factor *k* (usually equal to 2). The actual measurement uncertainty associated with a specific calibration performed by the laboratory will typically be larger than the CMC for the same calibration since capability and performance of the device being calibrated and the conditions related to the calibration may reasonably be expected to deviate from ideal to some degree.

2. The laboratories range of calibration capability for all disciplines for which they are accredited is the interval from the smallest calibrated standard to the largest calibrated standard used in performing the calibration. The low end of this range must be an attainable value for which the laboratory has or has access to the standard referenced. Verification of an indicated value of zero in the absence of a standard is common practice in the procedure for many calibrations but by its definition it does not constitute calibration of zero capacity.

3. The presence of a superscript F means that the laboratory performs calibration of the indicated parameter at its fixed location. Example: Outside Micrometer$^{F}$ would mean that the laboratory performs this calibration at its fixed location.

4. The presence of a superscript O means that the laboratory performs calibration of the indicated parameter onsite at customer locations. Example: Outside Micrometer$^{O}$ would mean that the laboratory performs this calibration onsite at the customer's location.

5. The presence of a superscript FO means that the laboratory performs calibration of the indicated parameter both at its fixed location and onsite at customer locations. Example: Outside Micrometer$^{FO}$ would mean that the laboratory performs this calibration at its fixed location and onsite at customer locations.

6. Measurement uncertainties obtained for calibrations performed at customer sites can be expected to be larger than the measurement uncertainties obtained at the laboratories fixed location for similar calibrations. This is due to the effects of transportation of the standards and equipment and upon environmental conditions at the customer site which are typically not controlled as closely as at the laboratories fixed location.

7. The term L represents length in inches or millimeters as appropriate to the uncertainty statement.

8. The term T represents temperature in ºC or ºF as appropriate to the uncertainty statement.

9. The term Wt represents weight in pounds or grams (including SI multiple and submultiple units) appropriate to the uncertainty statement.