CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

Metrología y Pruebas, S. A. de C. V.
Privada Tecnologico No. 25
Nogales, Sonora México
(and satellite locations as listed on the scope)

Fulfills the requirements of

ISO/IEC 17025:2017

In the fields of

CALIBRATION, TESTING and
DIMENSIONAL MEASUREMENT

This certificate is valid only when accompanied by a current scope of accreditation document.
The current scope of accreditation can be verified at www.anab.org.

Jason Stine, Vice President

Expiry Date: 11 November 2025
Certificate Number: ACT-1890

This laboratory 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 (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

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CALIBRATION, TESTING AND DIMENSIONAL MEASUREMENT

Valid to: **November 11, 2025** Certificate Number: **ACT-1890**

CALIBRATION

Acoustics and Vibration Nogales, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Sound Level Meter	(70 to 130) dB 100 Hz to 10 kHz	0.93 dB	Comparison to Sound Level Meter (reference) and Source; PMP-C-036
Sound Level Source Devices	(70 to 109) dB 100 Hz to 10 kHz	0.93 dB	Comparison to Sound Level Meter; PMP-C-036
Acceleration	10 m/s^2 (80 to 5 000) Hz 50 m/s^2 (30 to 45) Hz	0.36 m/s^2 1.8 m/s^2	Comparison to Portable Vibration Calibrator; PMP-C-047 (g_n = 9.80665 m/s^2)

Chemical Quantities Nogales, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Particle Counter	(0.35 to 1.77) particles/L (10 to 50) particles/ft^3 (1.77 to 105 944) particles/L (50 to 3 000 000) particles/ft^3	17 % of reading 13 % of reading	Comparison to Master Particle Counter; PMP-C-050
pH Meters [5]	4 pH 7 pH 10 pH	0.013 pH 0.013 pH 0.013 pH	Comparison to Accredited pH Buffer Solutions; PMP-C-040

Chemical Quantities Nogales, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Conductivity Meters [5]	10 µS/cm 84 µS/cm 100 µS/cm 147 µS/cm 1 000 µs/cm 1 413 µS/cm 10 000 µS/cm 100 000 µS/cm	0.11 µS/cm 0.82 µS/cm 2.2 µS/cm 0.57 µS/cm 5.1 µS/cm 5.3 µS/cm 44 µS/cm 345 µS/cm	Comparison to Accredited Conductivity Solutions; PMP-C-043
Viscometers	Up to 10 cP (10 to 100) cP (100 to 1 000) cP (1 000 to 12 500) cP (1 250 to 6 800) cP (6 800 to 100 000) cP	0.092 cP 0.66 cP 8.5 cP 97 cP 663 cP 988 cP	Comparison to Accredited Viscosity Standards; PMP-C-037
Breathalyzer Ethanol weight per volume of vapor @ 34 °C	50 mg/210 L 0.1 g/210 L	1.4 mg/210 L 2.1 mg/210 L	Comparison to Accredited Alcohol Reference Solution; PMP-C-049
Gas Measurement Equipment	CO (100 ppm) H_2S (25 ppm) CH_4 (2.5 %vol, 50 %LEL) NO_2 (10 ppm) SO_2 (20 ppm) i-C_4H_{10} O_2 CO_2 C_5H_{12} HCN	2 % of reading 2 % of reading 2 % of reading 2 % of reading 2 % of reading 2 % of reading 2 % of reading 2 % of reading 5 % of reading 10 % of reading	Comparison to Accredited Gas Reference; PMP-C-044

Electrical – DC/Low Frequency Nogales, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscopes Leveled Sine Wave	5 mVp-p to 5.5 Vp-p 50 kHz to 100 MHz (50 to 300) MHz (300 to 600) MHz	 40 mV/V 45 mV/V 65 mV/V	Comparison to Multifunction Calibrator; PMP-C-042

Electrical – DC/Low Frequency Nogales, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscopes Square Wave Signal into 50 Ω load into 1 MΩ load Rise Time	 10 Hz to 10 kHz 1 mVp-p to 6.6 Vp-p 10 Hz to 10 kHz 1 mVp-p to 130 Vp-p 5 mVp-p to 2.5 Vp-p 1 kHz to 10 MHz	 1.2 mV/V 1.3 mV/V 1 ms/s	Comparison to Multifunction Calibrator; PMP-C-042
DC High Voltage – Source equipment	(1 to 20) kV	13 mV/V	Comparison to High Voltage Probe, Multimeter PMP-C-001
DC High Voltage – Measuring equipment	(1 to 20) kV	13 mV/V	Comparison to High Voltage Probe, Digital Multimeter, DC Hi-Pot; PMP-C-001
DC Voltage – Source equipment	(1 to 100) mV 100 mV to 1 V (1 to 10) V (10 to 100) V 100 V to 1.02 kV	12 µV/V 8.3 µV/V 8.1 µV/V 10 µV/V 10 µV/V	Comparison to Agilent Multimeter; PMP-C-001
DC Voltage – Measuring equipment	(1 to 100) mV 100 mV to 1 V (1 to 10) V (10 to 100) V 100 V to 1.02 kV	12 µV/V 8.3 µV/V 8.1 µV/V 10 µV/V 10 µV/V	Comparison to Agilent Multimeter, Multifunction Calibrator; PMP-C-001
AC Voltage – Source equipment	(1 to 100) mV 50 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz 100 mV to 1V 50 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (1 to 10) V 50 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	 0.1 mV/V 0.17 mV//V 0.4 mV/V 0.1 mV/V 0.16 mV//V 0.33 mV/V 0.82 mV/V 0.41 mV/V 0.16 mV/V 0.32 mV/V 0.82 mV/V	Comparison to Agilent Multimeter; PMP-C-003

Electrical – DC/Low Frequency Nogales, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Source equipment	(10 to 100) V 50 Hz to 1 kHz (1 to 20) kHz (100 to 1 000) V 50 Hz to 1 kHz	 0.22 mV/V 0.22 mV/V 0.43 mV/V	Comparison to Agilent Multimeter, Multifunction Calibrator; PMP-C-003
AC Voltage – Source equipment	(1 to 20) kV 60 Hz	 14 mV/V	Comparison to Tektronix High Voltage Probe; PMP-C-003
AC Voltage – Measuring equipment	(1 to 100) mV 50 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz 100 mV to 1V 50 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (1 to 10) V 50 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (10 to 100) V 50 Hz to 1 kHz (1 to 20) kHz (100 to 1 000) V 50 Hz to 1 kHz	 0.1 mV/V 0.17 mV/V 0.4 mV/V 0.1 mV/V 0.16 mV/V 0.33 mV/V 0.82 mV/V 0.41 mV/V 0.16 mV/V 0.32 mV/V 0.82 mV/V 0.22 mV/V 0.23 mV/V 0.43 mV/V	Comparison to Agilent Multimeter, Multifunction Calibrator; PMP-C-003
AC Voltage – Measuring equipment	(1 to 20) kV 60 Hz	 14 mV/V	Comparison to Hipotronics Transformer; PMP-C-003
DC Current – Source equipment	(10 to 100) nA 100 nA to 1 µA (1 to 10) µA (10 to 100) µA 100 µA to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A	0.11 mA/A 24 µA/A 16 µA/A 7 µA/A 9 µA/A 7 µA/A 12 µA/A 30 µA/A	Comparison to Agilent Multimeter; PMP-C-002
DC Current – Source equipment	(1 to 11) A (11 to 550) A	0.54 mA/A 2.6 mA/A	Comparison to Agilent Multimeter with Standard Shunts; PMP-C-002

Electrical – DC/Low Frequency Nogales, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Current – Measuring equipment	(10 to 100) nA 100 nA to 1 µA (1 to 10) µA (10 to 100) µA 100 µA to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A (1 to 11) A (11 to 100) A	90 µA/A 24 µA/A 16 µA/A 7 µA/A 9 µA/A 7 µA/A 12 µA/A 21 µA/A 71 µA/A 0.32 mA/A	Comparison to Agilent Digital Multimeter, Multifunction Calibrator, Shunt Resistor; PMP-C-002
DC Current – Measuring Equipment Clamp-On Ammeters	(50 to 500) A (500 to 1 000) A	9.1 mA/A 7 mA/A	Comparison to Multifunction Calibrator, 50-Turn Current Coil; PMP-C-002
AC Current – Source Equipment	(1 to 10) mA (50 to 100) Hz 100 Hz to 1 kHz (10 to 100) mA (50to 100) Hz 100 Hz to 1 kHz 100 mA to 1 A (50 to 100) Hz 100 Hz to 1 kHz	 0.2 mA/A 0.14 mA/A 0.28 mA/A 0.21 mA/A 0.21 mA/A 0.21 mA/A	Comparison to Agilent Multimeter; PMP-C-004
AC Current – Source Equipment	(1 to 30) A 60 Hz	 0.41 mA/A	Comparison to Agilent Multimeter. Current Shunts; PMP-C-004
AC Current – Measuring Equipment	(1 to 10) mA (50 to 100) Hz 100 Hz to 1 kHz (10 to 100) mA (50 to 100) Hz 100 Hz to 1 kHz 100 mA to 1 A (50 to 100) Hz 100 Hz to 1 kHz	 0.2 mA/A 0.8 mA/A 0.28 mA/A 0.2 mA/A 0.19 mA/A 0.17 mA/A	Comparison to Agilent Multimeter, Multifunction Calibrator; PMP-C-004
AC Current – Measuring Equipment	(1 to 30) A (50 to 100) Hz 100 Hz to 1 kHz	 1.2 mA/A 4 mA/A	Comparison to Agilent Multimeter, Current Shunts; PMP-C-004

Electrical – DC/Low Frequency Nogales, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Measuring Equipment Clamp-On Ammeters	(50 to 1 000) A 60 Hz	4.6 mA/A	Comparison to Multifunction Calibrator with 50-Turn Coil; PMP-C-004
DC Power – Measuring equipment	10.89 mW to 11 220 W	0.82 mW/W	Comparison to Multifunction Calibrator; PMP-C-004
DC Power – Source equipment	10.89 mW to 11 220 W	0.41 mW/W	Comparison to Agilent Multimeter, Shunt Resistors, DC Power Supply; PMP-C-005A
AC Power – Measuring equipment	0.89 mW to 11 220 W @ 60 Hz, P.F. = 1 0.89 mW to 11 220 W @ 60 Hz, P.F. = 0.9 10.89 mW to 11 220 W @ 60 Hz, P.F. = 0.8	2.2 mW/W 3.3 mW/W 3.9 mW/W	Comparison to Multifunction Calibrator; PMP-C-005
AC Power – Source equipment	0.89 mW to 11220 W @ 60 Hz, P.F. = 1 0.89 mW to 11220 W @ 60 Hz, P.F. = 0.9 0.89 mW to 11220 W @ 60 Hz, P.F. = 0.8	1.4 mW/W 3 mW/W 4.4 mW/W	Comparison to Agilent Multimeter, Shunt Resistors, DC Power Supply; PMP-C-005
Resistance – Measuring equipment	Up to 0.1 Ω (0.1 to 1) Ω (1 to 10) Ω (10 to 100) Ω 100 Ω to 1 kΩ (1 to 10) kΩ (10 to 100) kΩ 100 kΩ to 1 MΩ (1 to 10) MΩ (10 to 100) MΩ 100 MΩ to 1 GΩ	0.23 mΩ/Ω 0.11 mΩ/Ω 20 μΩ/Ω 17 μΩ/Ω 11 μΩ/Ω 11 μΩ/Ω 11 μΩ/Ω 17 μΩ/Ω 60 μΩ/Ω 70 μΩ/Ω 5.8 mΩ/Ω	Comparison to Agilent Multimeter, Multifunction Calibrator; PMP-C-006

Electrical – DC/Low Frequency Nogales, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Resistance – Source equipment	Up to 0.1 Ω (0.1 to 1) Ω (1 to 10) Ω (10 to 100) Ω 100 Ω to 1 kΩ (1 to 10) kΩ (10 to 100) kΩ 100 kΩ to 1 MΩ (1 to 10) MΩ (10 to 100) MΩ 100 MΩ to 1 GΩ	0.18 mΩ/Ω 0.11 mΩ/Ω 20 μΩ/Ω 17 μΩ/Ω 11 μΩ/Ω 11 μΩ/Ω 11 μΩ/Ω 17 μΩ/Ω 60 μΩ/Ω 70 μΩ/Ω 5.8 mΩ/Ω	Comparison to Agilent Multimeter; PMP-C-006
Resistance Generation Equipment (High Value Resistors and Decade Resistors)	1 MΩ to 1 TΩ (50 to 1 000) V	23 mΩ/Ω	Comparison to Multifunction Calibrator, Agilent Multimeter, High Value Resistance Decade (1 MΩ to 1 TΩ); PMP-C-006
Resistance Measuring Equipment (Megohmmeters)	Up to 1 MΩ (50 to 1 000) V 1 MΩ to 1 TΩ Up to 1 000 V 1 MΩ to 1 TΩ (1 to 5) kV	81 mΩ/Ω 24 mΩ/Ω 24 mΩ/Ω	Direct method with: High Value Resistance Decade (1 MΩ to 1 TΩ); PMP-C-006
Low Resistance, DC Shunt Resistance Equipment	0.5 mΩ to 1 Ω (Up to 300) A	0.45 mΩ/Ω	Comparison to Agilent Multimeter, Shunt resistor 0.01 Ω, Shunt resistor 0.1 Ω; PMP-C-006
AC Electrical Resistance at 60 Hz Shunt Resistance	0.5 mΩ to 1 Ω (1 to 60) A	2.5. mΩ/Ω	Comparison to Multifunction Calibrator, Agilent Multimeter, DC Power Supply, Shunt Resistors; PMP-C-006
Capacitance – Source equipment	10 nF to 10 μF 12 Hz to 100 kHz	0.42 mF/F	Comparison to Capacitance Bridge, Precision LCR Meter; PMP-C-009

Electrical – DC/Low Frequency Nogales, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Capacitance – Measuring equipment	(1 to 10 000) pF 0.33 pF to 0.33 mF	4 mF/F 0.9 mF/F	Comparison to Capacitance Decade 1 pF Capacitor, 1 000 pF Capacitor, 10 000 pF Capacitor, Multifunction Calibrator; PMP-C-009
Inductance – Source equipment	Up to 10 H 12 Hz to 100 kHz	69 µH/H	Comparison to LCR Bridge, Precision LCR Meter; PMP-C-029
Inductance – Measuring equipment	1 mH to 10 H	0.23 mH/H	Comparison to Precision LCR Meter, Standard Inductors; PMP-C-029
Phase Angle Output	(0 to 180)°	0.15°	Comparison to Phase Meter; PMP-C-005
RTD Simulation – Measure/Source	Pt 385, 100 Ω (-196 to 1 000) °C	0.03 °C	Comparison to Agilent Multimeter, Multifunction Calibrator; PMP-C-020
Thermocouple Electrical Simulation			Comparison to Multifunction Calibrator, Agilent Multimeter; PMP-C-020
Type B	(600 to 1 820) °C	0.07 °C	
Type C	(0 to 2 316) °C	0.11 °C	
Type E	(-250 to 1 000) °C	0.08 °C	
Type J	(-250 to 1 200) °C	0.05 °C	
Type K	(-200 to 1 372) °C	0.07 °C	
Type L	(-200 to 900) °C	0.06 °C	
Type N	(-200 to 1 300) °C	0.07 °C	
Type R	(0 to 1 767) °C	0.08 °C	
Type T	(-250 to 400) °C	0.06 °C	
Type S	(0 to 1 767) °C	0.07 °C	
Type U	(-200 to 600) °C	0.08 °C	
Magnetic Field – Measure/Source	(0.3 to 3) mT 3 mT to 3 T	0.36 % of reading + 0.004 3 mT 0.56 % of reading	Comparison to Magnetic Field Meter; PMP-C-051

Electrical – RF/Microwave Nogales, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Power – Source 50 Ω load	(-60 to 10) dBm (10 MHz to 18 GHz) 10 dBm -60 dBm	 0.19 dB 0.4 dB	Comparison to Power Meter with Power Sensors; PMP-C-008
Power – Source 50 Ω load	(-80 to -10) dBm (10 MHz to 13.2 GHz) -10 dBm -80 dBm	 0.22 dB 0.21 dB	Comparison to Spectrum Analyzer, Signal Generator (ref); PMP-C-008
Power – Measure 50 Ω load	(-60 to 10) dBm (10 MHz to 18 GHz) 10 dBm -60 dBm	 0.18 dB 0.4 dB	Comparison to Power Meter with Power Sensors, Signal Generator (ref); PMP-C-008
Power – Measure 50 Ω load	(-80 to -10) dBm (10 MHz to 13.2 GHz) -10 dBm -80 dBm	 0.22 dB 0.22 dB	Comparison to Spectrum Analyzer, Signal Generator (ref); PMP-C-008
RF/Microwave Phase Modulation – Measure/Source	Carrier Frequency: 100 kHz to 13.2 MHz (0.1 to 45) rad	 0.84 % of reading	Comparison to Agilent PSA Spectrum Analyzer, Frequency Synthesizer, Frequency Generator; PMP-C-008
Amplitude Modulation – Measure/Source Rate: Depths: (5 to 99) %	20 Hz to 10 kHz 50 Hz to 100 kHz Flatness – Measure Rate: 90 Hz to 10 kHz 100 kHz to 10 MHz 10 MHz to 13.2 GHz	 0.7 % of reading 0.7 % of reading 1.2 % of reading	Comparison to Agilent PSA Spectrum Analyzer, Frequency Synthesizer, Frequency Generator; PMP-C-008
RF/Microwave Frequency Modulation – Measure/Source	20 Hz to 10 kHz 50 Hz to 200 kHz FM Dev 50 Hz to 50 kHz 250 kHz to 10 MHz 10 MHz to 13.2 GHz	 1 % of reading	Comparison to Agilent PSA Spectrum Analyzer, Frequency Synthesizer, Frequency Generator; PMP-C-008

Length – Dimensional Metrology Nogales, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Depth Micrometers	Up to 1 016 mm Up to 40 in	2.2 µm 87 µin	Comparison to Gage Blocks Grade 2, Gage Blocks Grade 3; PMP-C-014
Outside Micrometers	Up to 1 016 mm Up to 40 in	2.2 µin 87 µin	Comparison to Gage Blocks (Grade 2, Grade 3); PMP-C-014, Reference Standard NMX-CH-099-IMNC-2005
Inside Micrometers	(5.08 to 1 016) mm (0.2 to 40) in	2.2 µm 87 µin	Comparison to Gage Blocks Grade 2 Gage blocks Grade 3; PMP-C-014 NMX-CH-099-IMNC-2005
Dial and Digital Indicators	Up to 101.6 mm Up to 4 in	0.94 µm 37 µin	Comparison to Gage Blocks Grade 2; PMP-C-014, NMX-CH-36-1994
Optical Comparator [2] X, Y Axis – Linear Error of Indication	Up to 508 mm Up to 20 in	6.1 µm 240 µin	Comparison to Glass Scales, Gage Blocks Grade 2, Gage Block Grade 3; PMP-C-014
Optical Comparators [2] Angular	(0 to 360)°	0.017°	Comparison to Angle Blocks; PMP-C-014
Optical Comparators [2] Magnification	5X 10X 20X 50X 100X	0.14 % of reading 0.07 % of reading 0.11 % of reading 0.07 % of reading 0.07 % of reading	Comparison to Glass Ruler; PMP-C-014
Height Measuring Equipment [3]	Up to 1 016 mm Up to 40 in	(0.97 + 0.008 6*L*) µm (38 + 8.6*L*) µin	Comparison to Granite Surface Plate, Gage Blocks; PMP-C-014
Graduated Rules, Tape Measures	Up to 1 016 mm (1 016 to 10 160) mm Up to 40 in (40 to 400) in	0.16 mm 0.003 8 % of reading + 0.16 mm 0.006 2 in 0.003 8 % of reading + 0.005 8 in	Comparison to Digital Indicator, Stainless Ruler, 5X Amplification Lens; PMP-C-014, NOM-040-SCFI-1994, NOM-046-SCFI-1999

Length – Dimensional Metrology Nogales, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Calipers [3]	Up to 1 016 mm Up to 40 in	(11.43 + 0.002*L*) µm (450 + 2*L*) µin	Comparison to Gage Blocks Grade 2; PMP-C-014, NMX-CH-2:1993-SCFI
Coordinate Measuring Machines [2,3,6] X, Y, Z Axis (Linear Errors)	Up to 8 000 mm Up to 315 in	(0.1 + 0.002 3*L*) µm (4.4 + 2.24*L*) µin	Comparison to API Laser Interferometer; PMP-C-014 (Axis Linear Errors and Volumetric Performance)
Coating Thickness [3]	Up to 6.35 mm Up to 0.25 in	(0.72 + 0.001 7*L*) µm (28 + 1.7*L*) µin	Comparison to Digital Indicator, Gage Blocks Grade 2; PMP-C-014
Surface Roughness Measuring Devices	Ra = 3.024 µm (119 µin) Ry = 9.3 µm (366 µin) Ra = 0.401 µm (15.8µin) Ry = 1.58µm (62.2 µin)	66 nm 2.6 µin 0.21 µm 8.1 µin 66 nm 2.6 µin 0.21 µm 8.1 µin	Comparison to Mitutoyo Roughness Standard (Ra, Ry) Mitutoyo; PMP-C-038
Surface Roughness Standards	(0.4 to 3) µm	0.066 µm	Comparison to Roughness Tester; PMP-C-038
Levels	(0.000 19 to 3.814)°	0.005 8º	Comparison to Level Table; PMP-C-014
Surface Plates [1] Local Area Flatness (Repeat Reading)	Up to 3 600 x 2 032 mm Up to 144 x 80 in	1 µm 40 µin	Partial Verification using Datum Gauge; PMP-C-014
Gages Blocks [3] Grade 1, 2 and 3 (FS)	(0.1 to 25.4) mm (25.4 to 50.8) mm (50.8 to 76.2) mm (76.2 to 101.6) mm (101.6 to 152.4) mm (0.004 to 1) in (1 to 2) in (2 to 3) in (3 to 4) in (4 to 6) in	(0.078 + 0.000 8*L*) µm (0.052 + 0.001 8*L*) µm (0.089 + 0.001 1*L*) µm (0.095 + 0.001*L*) µm (0.002 5*L* - 0.059) µm (2.9 + 1*L*) µin (2.1 + 1.78*L*) µin (3.5 + 1.1*L*) µin (3.7 + 1*L*) µin (2.5*L* - 2.33) µin	Comparison to Gage Blocks Grade 1 (GGG-G-15C), Gage Block Comparator; PMP-C-014

Length – Dimensional Metrology Nogales, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Gages Blocks [3]	(152.4 to 1 016) mm (6 to 40) in	(0.015 + 0.001 3*L*) µm (0.6 + 1.3*L*) µin	Comparison to Laser Interferometer; PMP-C-014
Pin/Plug Gauges [3]	(0.254 to 101.6) mm (0.01 to 4) in	(1.04 + 0.005 5*L*) µm (41 + 5.5*L*) µin	Comparison to Gage Blocks Grade 2, Universal Length Measuring Machine; PMP-C-014
Ring Gages	(12.7 to 101.6) mm (0.5 to 4) in	1.2 µm 47 µin	Comparison to Universal Length Measuring Machine; PMP-C-014
Thickness Gauges & Measuring Equipment	(0.006 to 11.46) mm 236 µin to 0.45 in	2 µm 79 µin	ASTM E797 Thickness Gauge, Gage Blocks Grade 2; PMP-C-014
Angle Blocks	(0 to 90)°	0.02°	Comparison to Vision Microscope; PMP-C-014
Thread Plug Gage Pitch Diameter	M 1.6 x 0.35 to M 100 x 6 (0-80 to 4-12)	4.3 µm 170 µin	Comparison to P&W Supermicrometer®, Gage Blocks Grade 2 PMP-C-014
Thread Plug Gage Major Diameter	M 1.6 x 0.35 to M 100 x 6 (0-80 to 4-12)	2.1 µm 82 µin	Comparison to P&W Supermicrometer®, Gage Blocks Grade 2; PMP-C-014
Protractors	(0 to 360)°	0.019°	Comparison to Angle Block, Gage Blocks Grade 2, Sine Bar; PMP-C-014
Bore Gage	(0.762 to 304.8) mm (0.03 to 12) in	3.1 µm 120 µin	Comparison to Ring Gages, Vision Microscope; PMP-C-014
Radius Gage	(0.254 to 25.4) mm (0.01 to 1) in	1.3 µm 48 µin	Comparison to Microscope ”Vision Engineering Hawk”; PMP-C-014

Mass and Mass Related Nogales, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Weights (Class 2 and below)	10 mg 1 g 50 g 100 g 200 g 1000 g 10 kg 20 kg 50 kg	8.4 µg 8.8 µg 70 µg 0.16 mg 0.49 mg 8.3 mg 86 mg 92 mg 0.25 g	ASTM E617 Class 1 Weights, Digital Scale (comparator); PMP-C-021, NIST Handbook 44, OIML R111 (ABBA Method)
Scales and Balances [1,4]	(0.001 to 1) g (1 to 60) g (60 to 200) g (200 to 1 000) g (1 to 10) kg (10 to 60) kg (60 to 100) kg (100 to 1 000) kg (1 000 to 2 500) kg	0.000 2 % of reading + 11 µg 0.000 3 % of reading + 10 µg 0.000 15 % of reading + 0.11 mg 0.001 % of reading – 1.6 mg 0.000 31 % of reading + 5.3 mg 0.006 % of reading – 0.56 mg 0.023 % of reading – 11 g 0.015 % of reading 0.015 % of reading	ASTM E617 Class 1, OIML M2, NIST Class F weights and internal procedure PMP-C-012 utilized in the calibration of the weighing system.
Volumetric Recipients (Pipettes, Burettes) (Test Tubes, Syringes) (Flask, Beakers, Hasty Glasses) (Graduated volumetric containers) (Graduated volumetric containers)	(10 to 100) µL (100 to 500) µL (500 to 1 000) µL 1 mL to 5 L (5 to 30) L	0.04 % of reading + 0.11 µL 0.032 % of reading + 0.16 µL 0.38 µL - 0.018 % of reading 0.02 % of reading 0.012 % of reading + 0.35 nL	Comparison to Digital Balance; PMP-C-033
Water Flow [1]	Up to 1 500 lpm	1 % of reading + 0.6 lpm	Comparison to Digital Flow Meter; PMP-C-034
Torque Measuring Tools [1]	(0.9 to 20) N·m 8.0 lbf·in to 15 lbf·ft	0.056 N·m 0.5 lbf·in	Comparison to Torque Transducer; PMP-C-015 CNM-MMF-PT-002, EA-10/14
Torque Measuring Tools [1]	(7.4 to 500) N·m (5.5 to 369) lbf·ft	0.62 N·m 0.46 lbf·ft	Comparison to Torque Transducer; PMP-C-015, CNM-MMF-PT-002, EA-10/14

Mass and Mass Related Nogales, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Torque Measuring Tools [1]	(400 to 678) N·m (295 to 500) lbf·ft	1.6 N·m 1.2 lbf·ft	Comparison to Torque Transducer; PMP-C-015, CNM-MMF-PT-002, EA-10/14
Torque Measuring Devices [1]	(0.005 to 1) N·m (0.044 to 8.9) lbf·in	0.007 2 N·m 0.064 lbf·in	Comparison to Dead Weights. Torque Disk; PMP-C-015, CNM-MMF-PT-002, EA-10/14
Torque Measuring Devices	(20.34 to 135.58) N·m (15 to 100) lbf·ft	0.047 % of reading + 0.14 N·m 0.047 % of reading + 0.11 lbf·ft	Comparison to Dead Weighs, Torque Arm; PMP-C-015
Torque Measuring Devices	(135.58 to 1355.8) N·m (100 to 1 000) lbf·ft	0.083 % of reading + 0.092 N·m 0.083 % of reading + 0.068 lbf·ft	Comparison to Dead Weighs, Torque Arm; PMP-C-015
Air Flow [1]	Up to 1 slpm (1 to 20) slpm (20 to 300) slpm	1.1 % of reading + 0.000 39 slpm 0.35 % of reading + 0.000 8 slpm 0.82 % of reading + 0.45 slpm	Comparison to Master Flow Meter; PMP-C-030
Air Velocity [1]	(0.4 to 25) m/s	1 % of reading + 0.16 m/s	Comparison to Digital Anemometer PMP-C-030
Hydrometer [3]	(0.62 to 3) SG	0.023 SG – 0.4 % of reading	Comparison to Dead Weights, Digital Scale, Digital Thermometer; PMP-C-032, NBS Circular 555
Vacuum [1]	(-100 to 0) kPa (-14.5 to 0) psi	1.3 % of reading - 11 nPa 1.3 % of reading - 1.6 x 10^{-9} psi	Comparison to Pressure Sensor, High Vacuum Meter; PMP-C-013

Mass and Mass Related Nogales, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Rockwell and Rockwell Superficial Hardness Testers [1]	(20 to 40) HRA (41 to 75) HRA (76 to 88) HRA (40 to 59) HRBW (60 to 80) HRBW (81 to 100) HRBW (20 to 39) HRC (40 to 59) HRC (60 to 70) HRC (70 to 77) HR15N (78 to 88) HR15N (89 to 92) HR15N (42 to 54) HR30N (55 to 73) HR30N (74 to 80) HR30N (20 to 37) HR45N (38 to 62) HR45N (63 to 74) HR45N	0.33 HRA 0.39 HRA 0.19 HRA 1.41 HRBW 0.9 HRBW 0.44 HRBW 0.4 HRC 0.34 HRC 0.35 HRC 0.43 HR15N 0.43 HR15N 0.23 HR15N 0.43 HR30N 0.3 HR30N 0.35 HR30N 0.65 HR45N 0.65 HR45N 0.65 HR45N	Indirect Verification using Hardness Blocks; PMP-C-027
Rockwell and Rockwell Superficial Hardness Testers [1]	(73 to 80) HR15TW (81 to 87) HR15TW (88 to 93) HR15TW (43 to 56) HR30TW (57 to 69) HR30TW (70 to 82) HR30TW (12 to 32) HR45TW (33 to 52) HR45TW (53 to 73) HR45TW	0.41 HR15TW 0.34 HR15TW 0.34 HR15TW 0.51 HR30TW 0.35 HR30TW 0.35 HR30TW 0.65 HR45TW 0.65 HR45TW 0.65 HR45TW	Indirect Verification using Hardness Blocks; PMP-C-027
Durometers [7] Indenter Dimensions Length Tip Diameter Tip Radius Tip Angle Spring Force Types A, B, E, O Types C, D, OO	 (1 to 20) mm (1 to 20) mm (1 to 10) mm (5 to 90)° (0.55 to 8.05) N (4.445 to 44.45) N	 5 µm 5 µm 5 µm 0.02° 5 % of reading 0.5 % of reading	Direct Verification per ASTM D-2240 using Vision Microscope Balance; PMP-C-027

Mass and Mass Related Nogales, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Force [1] (Tension and Compression)	Up to 0.1 N 0.1 N to 1 N 1 N to 2500 N 2.5 kN to 44.5 kN	0.086 % of reading 0.015 % of reading + 0.000 071 N 0.026 % of reading 0.06 % of reading – 0.000 77 kN	Comparison to Dead weights; PMP-C-011, NMX-CH-27-1994-SCFI, NMX-CH-023-1994-SCFI
Force [1] (Tension and Compression)	(44.5 to 222.4) kN	0.06 % of reading	Comparison to Load Cells; PMP-C-011, NMX-CH-27-1994-SCFI, NMX-CH-023-1994-SCFI
Pressure Measuring Equipment (Gauge Pressure) [1]	Up to 500 Pa	1.8 Pa	Comparison to 2” water column; PMP-C-013, NMX-CH-058-1994, NMX-CH-060-2006-IMNC
Pressure Measuring Equipment (Gauge Pressure) [1]	Up to 206.8 kPa (0.207 to 21) MPa Up to 30 psi (30 to 3 000) psi	0.05 % of reading + 2.7 Pa 0.057 % of reading + 0.66 kPa 0.051 % of reading + 0.003 8 psi 0.057 % of reading + 0.093 PSI	Comparison to Pressure Calibrator (3000 psi); PMP-C-013, NMX-CH-058-1994, NMX-CH-060-2006-IMNC
Pressure Measuring Equipment (Gauge Pressure) [1]	(21 to 137) MPa (3 000 to 20 000) psi	37 kPa 5.4 psi	Comparison to Pressure Transducer; PMP-C-013, NMX-CH-058-1994, NMX-CH-060-2006-IMNC
Pressure Measuring Equipment (Absolute Pressure)	Up to 106 kPa	0.058 % of reading + 0.16 kPa	Comparison to Master Absolute Pressure Gage; PMP-C-013, NMX-CH-058-1994, NMX-CH-060-2006-IMNC

Photometry and Radiometry Nogales, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Light Intensity Meters	(100 to 7 000) lx	3 % of reading	Comparison to Master Illuminance Meter; PMP-C-035
UV Meters (Medidores de UV)	Up to 19 W/cm^2	0.17 % of reading + 3.4 x 10^{-6} W/cm^2	Comparison to Master UV Meter; PMP-C-035

Thermodynamic Nogales, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Relative Humidity	(10 to 75) %RH (75 to 97) %RH	2.2 %RH 2.5 %RH	Comparison to Digital Humidity Meter; PMP-C-028
Temperature [1] (Temperature Sources, Installations, Ovens, Chambers, Dry Wells)	(-80 to 0) ºC (0 to 232) ºC (232 to 660) ºC	0.0038 % of reading + 0.028 °C 0.0091 % of reading + 0.028 °C 0.0082 % of reading + 0.03 °C	Comparison to RTD with Digital Multimeter; PMP-C-007
	(660 to 1 000) ºC	0.088 % of reading + 1.3 °C	Comparison to Thermocouple with Temperature Indicator; PMP-C-007
Temperature – RTD with Multimeter	(-80 to 0) ºC (0 to 232) ºC (232 to 660) ºC	0.0038 % of reading + 0.034 °C 0.0065 % of reading + 0.034 °C 0.0063 % of reading + 0.035 °C	Comparison to RTD with Digital Multimeter, Dry Well, Bath Source; PMP-C-007
Temperature [1] (Digital/Analog Temperature Measuring Devices with Thermocouple, RTD, Thermistors, Mechanical/Analog Thermometers)	(-20 to 0) ºC (0 to 400) ºC (400 to 600) ºC	0.031 °C - 0.09 % of reading 0.009 % of reading + 0.031 °C 0.035 % of reading - 0.071 °C	RTD with Digital Multimeter, Comparison to Dry Well, Bath/Source; PMP-C-007
	(600 to 1 000) ºC	0.053 % of reading + 1.8 °C	Comparison to Thermocouple with Temperature Indicator; High Temperature Oven; PMP-C-007
Temperature [1] (Environmental Thermometers)	(-20 to 0) ºC (0 to 100) ºC	0.5 % of reading + 0.14 °C 0.27 % of reading + 0.14 °C	Comparison to RTD with Digital Multimeter; PMP-C-007

Time and Frequency Nogales, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Timers, Stopwatches	(1 to 36 000) s (36 000 to 172 800) s	0.001 4 % of reading + 6.5 ms 0.000 13 % of reading + 0.47 s	Comparison to Frequency Counter; PMP-C-008
Frequency – Measuring equipment	0.1 Hz to 18 GHz	1 nHz/Hz	Comparison to GPS Receiver, Spectrum Analyzer, Frequency Counter, Signal Generator, Frequency Synthesizer; PMP-C-008

Time and Frequency Nogales, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency – Source equipment	Up to 18 GHz	1 nHz/Hz	Comparison to GPS Receiver, Spectrum Analyzer, Frequency Counter, Power Meter with Power Sensors; PMP-C-008

DIMENSIONAL MEASUREMENT

3 Dimensional Nogales, Sonora

Specific Tests and / or Properties Measured	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
3D Dimensional Measurement [3]	Up to 1 in (1 to 2) in (2 to 6) in	95 µin (90 + 5*L*) µin (80 + 10*L*) µin	Comparison to Vision System utilized as Reference, Customer Drawings, Vision Software

TESTING

Mechanical Nogales, Sonora

Specific Tests and/or Properties Measured	Specification, Standard, Method, or Test Technique	Items, Materials or Product Tested	Key Equipment or Technology
Force Testing/ Tension and Compression Up to 445 kN	PMP-C-011	Cables and Materials	Comparison to Universal Testing Machine and Load Cell System utilized as Reference

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CALIBRATION

Acoustics and Vibration Hermosillo, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Sound Level Meters [1]	(60 to 129) dB 100 Hz to 10 kHz	0.93 dB	Comparison to Sound Level Meter (reference) and Source; PMP-C-036
Sound Level Source Devices	(60 to 129) dB 100 Hz to 10 kHz	0.93 dB	Comparison to Sound Level Meter; PMP-C-036

Chemical Quantities Hermosillo, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Conductivity Meters [5]	1.9 µS/cm 10.1 µS/cm 84.6 µS/cm 501 µS/cm 1 001 µS/cm 1 416 µS/cm 10 070 µS/cm 99 800 µS/cm	0.14 µS/cm 0.1 µS/cm 0.82 µS/cm 2.3 µS/cm 3.4 µS/cm 5.4 µS/cm 32 µS/cm 321 µS/cm	Comparison to Conductivity Solutions; PMP-C-043
pH Meters [5]	4 pH 6.86 pH 10.1 pH	0.019 pH 0.013 pH 0.025 pH	Comparison to pH Solutions; PMP-C-040

Electrical – DC/Low Frequency Hermosillo, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscopes [1,3]			Comparison to Multifunction Calibrator; PMP-C-042
Leveled Sine Wave (Relative to 50 kHz)	5 mVp-p to 5.5 Vp-p		
	50 kHz to 100 MHz	1.5 mV	
	(100 to 300) MHz	2.7 mV	
	(300 to 600) MHz	3.9 mV	
Square Wave Signal			
into 50 Ω load	10 Hz to 10 kHz		
	1 mVp-p to 6.6 Vp-p	0.05 % of reading + 0.2 µV	
into 1 MΩ load	10 Hz to 10 kHz		
	1 mVp-p to 130 Vp-p	0.12 % of reading + 80 nV	
Rise Time	5 mVp-p to 2.5 Vp-p		
	1 kHz to 10 MHz	0.1 ns	
DC High Voltage – Source/Measure [1]	(1 to 5) kV	2.8 % of reading - 5.6 V	Comparison to Keysight Multimeter, High Voltage Probe; PMP-C-001
AC High Voltage – Source/Measure [1]	(0.7 to 1.02) kV 60 Hz	8.2 % of reading - 56 V	Comparison to Keysight Multimeter, High Voltage Probe; PMP-C-003
	(1.02 to 35) kV 60 Hz	3.2 % of reading - 5.5 V	
DC Voltage – Source equipment	(1 to 100) mV	12 µV/V	Comparison to Agilent Multimeter; PMP-C-001
	100 mV to 1 V	8 µV/V	
	(1 to 10) V	8 µV/V	
	(10 to 100) V	10 µV/V	
	100 V to 1.02 kV	10 µV/V	
DC Voltage – Measuring equipment [1]	(1 to 100) mV	12 µV/V	Comparison to Agilent Multimeter, Multifunction Calibrator; PMP-C-001
	100 mV to 1 V	8 µV/V	
	(1 to 10) V	8 µV/V	
	(10 to 100) V	10 µV/V	
	100 V to 1.02 kV	10 µV/V	
AC Voltage – Source equipment	(1 to 100) mV		Comparison to Agilent Multimeter; PMP-C-003
	50 Hz to 1 kHz	0.1 mV/V	
	(1 to 20) kHz	0.17 mV/V	
	(20 to 50) kHz	0.4 mV/V	
	100 mV to 1V		
	50 Hz to 1 kHz	0.1 mV/V	
	(1 to 20) kHz	0.16 mV/V	
	(20 to 50) kHz	0.33 mV/V	
	(50 to 100) kHz	0.82 mV/V	

Electrical – DC/Low Frequency Hermosillo, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Source equipment	(1 to 10) V 50 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (10 to 100) V 50 Hz to 1 kHz (1 to 20) kHz (100 to 1 020) V 50 Hz to 1 kHz	 0.41 mV/V 0.16 mV/V 0.32 mV/V 0.82 mV/V 0.22 mV/V 0.22 mV/V 0.43 mV/V	Comparison to Agilent Multimeter; PMP-C-003
AC Voltage – Measuring equipment [1]	(1 to 100) mV 50 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz 100 mV to 1V 50 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (1 to 10) V 50 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (10 to 100) V 50 Hz to 1 kHz (1 to 20) kHz (100 to 1 020) V 50 Hz to 1 kHz	 0.1 mV/V 0.17 mV/V 0.4 mV/V 0.1 mV/V 0.16 mV/V 0.33 mV/V 0.82 mV/V 0.41 mV/V 0.16 mV/V 0.32 mV/V 0.82 mV/V 0.22 mV/V 0.22 mV/V 0.43 mV/V	Comparison to Agilent Multimeter, Multifunction Calibrator; PMP-C-003
DC Current – Source equipment	(10 to 100) nA 100 nA to 1 µA (1 to 10) µA (10 to 100) µA 100 µA to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A	0.11 mA/A 24 µA/A 16 µA/A 7 µA/A 9 µA/A 7 µA/A 12 µA/A 30 µA/A	Comparison to Agilent Multimeter; PMP-C-002
DC Current – Source equipment [1]	(1 to 11) A (11 to 100) A	0.54 mA/A 2.6 mA/A	Comparison to Agilent Multimeter with Leeds & Northrup Shunt Resistor; PMP-C-002

Electrical – DC/Low Frequency Hermosillo, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Current – Measuring equipment [1]	(10 to 100) nA 100 nA to 1 µA (1 to 10) µA (10 to 100) µA 100 µA to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A (1 to 11) A (11 to 100) A	90 µA/A 24 µA/A 16 µA/A 7 µA/A 9 µA/A 7 µA/A 12 µA/A 21 µA/A 1.1 mA/A 0.92 mA/A	Comparison to Agilent Multimeter, Multifunction Calibrator; PMP-C-002
DC Current – Measuring equipment Clamp-On Ammeters [1]	(50 to 500) A (500 to 1 000) A	9.1 mA 7 mA	Comparison to Multifunction Calibrator, 50-turn Coil; PMP-C-002
AC Current – Source equipment	(1 to 10) mA (50 to 100) Hz 100 Hz to 1 kHz (10 to 100) mA (50 to 100) Hz 100 Hz to 1 kHz 100mA to 1 A (50 to 100) Hz 100 Hz to 1 kHz	 0.2 mA/A 0.14 mA/A 0.28 mA/A 0.21 mA/A 0.21 mA/A 0.21 mA/A	Comparison to Agilent Multimeter; PMP-C-004
AC Current – Source equipment	(1 to 50) A 60 Hz	 0.7 mA	Comparison to Agilent Multimeter with Shunt Resistor; PMP-C-004
AC Current – Measuring equipment [1]	(1 to 10) mA (50 to 100) Hz 100 Hz to 1 kHz (10 to 100) mA (50 to 100) Hz 100 Hz to 1 kHz 100 mA to 1 A (50 to 100) Hz 100 Hz to 1 kHz	 0.2 mA/A 0.8 mA/A 0.28 mA/A 0.2 mA/A 0.19 mA/A 0.17 mA/A	Comparison to Agilent Multimeter, Multifunction Calibrator; PMP-C-004
AC Current – Measuring equipment [1]	(1 to 30) A (50 to 100) Hz 100 Hz to 1 kHz	 1.2 mA/A 4 mA/A	Comparison to Multifunction Calibrator with Shunt Resistor; PMP-C-004

Electrical – DC/Low Frequency Hermosillo, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Measuring equipment Clamp-On Ammeters [1]	(50 to 1 000) A 60 Hz	4.6 mA/A	Comparison to Multifunction Calibrator, 50-turn Coil; PMP-C-004
DC Power Source equipment	10.89 mW to 11 220 W	0.04 % of reading - 2 µW	Comparison to Agilent Multimeter with Shunt Resistor; PMP-C-005
AC Power – Source equipment	0.89 mW to 11 220 W @ 60 Hz, P.F. = 1	0.12 % of reading + 10 µW	Comparison to Agilent Multimeter with Shunt Resistor; PMP-C-005
AC Power – Source equipment	0.89 mW to 11 220 W @ 60 Hz, P.F. = 0.9	0.21 % of reading + 12 µW	Comparison to Agilent Multimeter with Shunt Resistor; PMP-C-005
AC Power - Source equipment	0.89 mW to 11 220 W @ 60 Hz, P.F. = 0.8	0.3 % of reading + 9.2 µW	Comparison to Agilent Multimeter with Shunt Resistor; PMP-C-005
DC Power Measuring equipment [1]	10.89 mW to 11 220 W	0.2 % of reading - 2 µW	Comparison to Multifunction Calibrator; PMP-C-005
AC Power – Measuring equipment [1]	0.89 mW to 11 220 W @ 60 Hz, P.F. = 1	0.12 % of reading + 10 µW	Comparison to Multifunction Calibrator; PMP-C-005
AC Power – Measuring equipment [1]	0.89 mW to 11 220 W @ 60 Hz, P.F. = 0.9	0.12 % of reading + 12 µW	Comparison to Multifunction Calibrator; PMP-C-005
AC Power – Measuring equipment [1]	0.89 mW to 11 220 W @ 60 Hz, P.F. = 0.8	0.3 % of reading + 9.2 µW	Comparison to Multifunction Calibrator; PMP-C-005

Electrical – DC/Low Frequency Hermosillo, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Resistance – Measuring equipment [1]	Up to 1 Ω (1 to 10) Ω (10 to 100) Ω 100 Ω to 1 kΩ (1 to 10) kΩ (10 to 100) kΩ 100 kΩ to 1 MΩ (1 to 10) MΩ (10 to 100) MΩ 100 MΩ to 1 GΩ	0.11 mΩ/Ω 20 µΩ/Ω 19 µΩ/Ω 11 µΩ/Ω 11 µΩ/Ω 11 µΩ/Ω 18 µΩ/Ω 61 µΩ/Ω 70 µΩ/Ω 5.8 mΩ/Ω	Comparison to Agilent Multimeter, Multifunction Calibrator; PMP-C-006
Resistance – Source equipment	Up to 1 Ω (1 to 10) Ω (10 to 100) Ω 100 Ω to 1 kΩ (1 to 10) kΩ (10 to 100) kΩ 100 kΩ to 1 MΩ (1 to 10) MΩ (10 to 100) MΩ 100 MΩ to 1 GΩ	0.11 mΩ/Ω 20 µΩ/Ω 19 µΩ/Ω 11 µΩ/Ω 11 µΩ/Ω 11 µΩ/Ω 18 µΩ/Ω 61 µΩ/Ω 70 µΩ/Ω 5.8 mΩ/Ω	Comparison to Agilent Multimeter; PMP-C-006
Resistance – Source/Measuring Equipment (High Value Resistors and Decade Resistors)	100 kΩ to 1 TΩ up to 5 000 V Max	23 mΩ/Ω	Comparison to Multifunction Calibrator, Agilent Multimeter, High Voltage Probe; PMP-C-006
DC Shunt Resistance Equipment [1]	0.5 mΩ to 1 Ω @ (1 to 50) A	0.005 % of reading + 11 µΩ	Comparison to Agilent Multimeter with Shunt Resistor; PMP-C-006
AC electrical Resistance at 60 Hz Shunt Resistance [1]	1 mΩ to 1 Ω (1 to 50) A	0.005 % of reading + 11 µΩ	Comparison to Agilent Multimeter with Shunt Resistor; PMP-C-006
Capacitance – Measuring equipment [1]	100 pF to 1 µF 50 Hz to 1 kHz	(0.07 + 0.000 001C) pF	Comparison to Capacitance Decade; PMP-C-009
Inductance [1,3] – Measuring equipment	100 mH to 2 H	0.23 mH/H	Comparison to Inductance Decade; PMP-C-029

Electrical – DC/Low Frequency Hermosillo, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Thermocouple Electrical Simulation [1]	Type B		Comparison to Multifunction Calibrator; PMP-C-020
	(600 to 800) °C	0.44 °C	
	(800 to 1 000) °C	0.34 °C	
	(1 000 to 1 550) °C	0.3 °C	
	(1 550 to 1 820) °C	0.33 °C	
	Type C		
	(0 to 150) °C	0.3 °C	
	(150 to 650) °C	0.26 °C	
	(650 to 1 000) °C	0.31 °C	
	(1 000 to 1 800) °C	0.5 °C	
	(1 800 to 2 316) °C	0.84 °C	
	Type E		
	(-250 to -100) °C	0.5 °C	
	(-100 to -25) °C	0.16 °C	
	(-25 to 350) °C	0.14 °C	
	(350 to 650) °C	0.16 °C	
	(650 to 1 000) °C	0.21 °C	
	Type J		
	(-250 to -100) °C	0.27 °C	
	(-100 to -30) °C	0.16 °C	
	(-30 to 150) °C	0.14 °C	
	(150 to 760) °C	0.17 °C	
	(760 to 1 200) °C	0.23 °C	

Electrical – DC/Low Frequency Hermosillo, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Thermocouple Electrical Simulation [1]	Type K		Comparison to Multifunction Calibrator; PMP-C-020
	(-200 to -100) °C	0.33 °C	
	(-100 to -25) °C	0.18 °C	
	(-25 to 120) °C	0.16 °C	
	(120 to 1 000) °C	0.26 °C	
	(1 000 to 1 372) °C	0.4 °C	
	Type L		
	(-200 to -100) °C	0.37 °C	
	(-100 to 800) °C	0.26 °C	
	(800 to 900) °C	0.17 °C	
	Type N		
	(-200 to -100) °C	0.4 °C	
	(-100 to -25) °C	0.22 °C	
	(-25 to 120) °C	0.19 °C	
	(120 to 410) °C	0.18 °C	
	(410 to 1 300) °C	0.27 °C	
	Type R		
	(0 to 250) °C	0.57 °C	
	(250 to 400) °C	0.35 °C	
	(400 to 1000) °C	0.33 °C	
	(1000 to 1767) °C	0.4 °C	
	Type S		
	(0 to 250) °C	0.47 °C	
	(250 to 1 000) °C	0.36 °C	
	(1 000 to 1 400) °C	0.37 °C	
	(1 400 to 1 767) °C	0.46 °C	
	Type T		
	(-250 to -150) °C	0.63 °C	
	(-150 to 0) °C	0.24 °C	
	(0 to 120) °C	0.16 °C	
	(120 to 400) °C	0.14 °C	
	Type U		
	(-200 to 0) °C	0.56 °C	
	(0 to 600) °C	0.27 °C	

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
RTD Electrical Simulation [1]	Cu 427 10 Ω		Comparison to Multifunction Calibrator; PMP-C-020
	(-100 to 260) °C	0.3 °C	
	Pt 385, 100 Ω		
	(-200 to -80) ºC	0.05 ºC	
	(-80 to 0) ºC	0.05 ºC	
	(0 to 100) ºC	0.07 ºC	
	(100 to 300) ºC	0.09 ºC	
	(300 to 400) ºC	0.1 ºC	
	(400 to 630) ºC	0.12 ºC	
	(630 to 800) ºC	0.23 ºC	
	Pt 3916, 100 Ω		
	(-200 to -190) °C	0.25 °C	
	(-190 to -80) °C	0.04 °C	
	(-80 to 0) °C	0.05 °C	
	(0 to 100) °C	0.06 °C	
	(100 to 260) °C	0.07 °C	
	(260 to 300) °C	0.08 °C	
	(300 to 400) °C	0.09 °C	
	(400 to 600) °C	0.1 °C	
	(600 to 630) °C	0.23 °C	
	Pt 3926, 100 Ω		
	(-200 to -80) °C	0.05 °C	
	(-80 to 0) °C	0.05 °C	
	(0 to 100) °C	0.07 °C	
	(100 to 300) °C	0.09 °C	
	(300 to 400) °C	0.1 °C	
	(400 to 630) °C	0.12 °C	
	Pt 385, 200 Ω		
	(-200 to -80) °C	0.04 °C	
	(-80 to 0) °C	0.04 °C	
	(0 to 100) °C	0.04 °C	
	(100 to 260) °C	0.05 °C	
	(260 to 300) °C	0.12 °C	
	(300 to 400) °C	0.13 °C	
	(400 to 600) °C	0.14 °C	
	(600 to 630) °C	0.16 °C	

Electrical – DC/Low Frequency Hermosillo, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
RTD Electrical Simulation [1]	Pt 385, 500 Ω (-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C Pt 385, 1000 Ω (-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C PtNi 385, 120 Ω (Ni120) (-80 to 0) °C (0 to 100) °C (100 to 260) °C	 0.04 °C 0.05 °C 0.05 °C 0.06 °C 0.08 °C 0.08 °C 0.09 °C 0.11 °C 0.03 °C 0.03 °C 0.04 °C 0.05 °C 0.06 °C 0.07 °C 0.07 °C 0.23 °C 0.08 °C 0.08 °C 0.14 °C	Comparison to Multifunction Calibrator; PMP-C-020

Length – Dimensional Metrology Hermosillo, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Outside Micrometers [1]	Up to 1 016 mm Up to 40 in	2.2 µm 87 µin	Comparison to Gage Blocks Grade 2, Gage blocks Grade 3; PMP-C-014 Reference Standard NMX-CH-099-IMNC-2005
Depth Micrometers [1]	Up to 1 016 mm Up to 40 in	2.2 µm 87 µin	Comparison to Gage Blocks Grade 2, Gage Blocks Grade 3; PMP-C-014

Length – Dimensional Metrology Hermosillo, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Dial and Digital Indicators [1]	Up to 101.6 mm Up to 4 in	0.94 µm 37 µin	Comparison to Gage Blocks Grade 2, Gage Blocks Grade 3; PMP-C-014, NMX-CH-36-1994
Calipers [1,3]	Up to 1 016 mm Up to 40 in	$(11.4 + 0.002L)$ *µm* $(450 + 2L)$ µin	Comparison to Gage Blocks Grade 2, Gage Blocks Grade 3; PMP-C-014, NMX-CH-2:1993-SCFI
Height Measuring Equipment [3]	Up to 1 016 mm Up to 40 in	$(0.97 + 0.008\ 6L)$ µm $(38 + 8.6L)$ µin	Comparison to Gage Blocks Grade 2, Gage Blocks Grade 3; PMP-C-014
Optical Comparator [2,3] X, Y Axis – Linear Error of Indication	Up to 508 mm Up to 20 in	$(0.33 + 0.014L)$ µm $(13 + 14L)$ µin	Comparison to Glass Scales, Gage Blocks Grade 2, Gage Block Grade 3; PMP-C-014
Optical Comparators [2] Angle Measurement	(0 to 360)°	0.019°	Comparison to Angle Blocks; PMP-C-014
Optical Comparators [2] Magnification	5x 10x 20x 50x 100x	0.1 % of reading 0.051 % of reading 0.076 % of reading 0.051 % of reading 0.051 % of reading	Comparison to Glass Ruler; PMP-C-014
Graduated Rules, Tape Measures	Up to 25 m Up to 985 in	0.41 mm 16.2 µin	Comparison to Digital Indicator, Stainless Ruler, 5X Amplification Lens; PMP-C-014, NOM-040-SCFI-1994, NOM-046-SCFI-1999
Coating Thickness [1,3]	Up to 6.35 mm Up to 0.25 in	$(0.72 + 0.001\ 7L)$ µm $(28 + 1.7L)$ µin	Comparison to Digital Indicator, Gage Blocks Grade 2; PMP-C-014

Length – Dimensional Metrology Hermosillo, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Roughness Measuring Devices [1]	Ra 2.94 µm 116 µin Ry 9.3 µm 366 µin	61 nm 2 µin 0.2 µm 8 µin	Comparison to Roughness Standard (Ra, Ry); PMP-C-038
Levels [1,3]	(-4 125 to +4 125)″	0.42″	Comparison to Sine Bar; PMP-C-014
Digital Levels [1]	(15, 30, 45, 90)°	0.42″	Comparison to Angle Blocks; PMP-C-014
Surface Plates [1] Local Area Flatness (Repeat Reading)	Up to (192 x 192) in	21 µin	Partial Verification using Datum Gauge; PMP-C-014
Gages Blocks [3] Grade 1, 2 and 3 (FS)	(0.254 to 152.9) mm (0.01 to 6) in	(0.1+ 0.047*L*) µm (3.9 + 1.9*L*) µin	Comparison to Gage Blocks Grade 1 FS, Gage Blocks Comparator; PMP-C-014

Mass and Mass Related Hermosillo, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Weights (Class 2 and below)	10 mg 1 g 50 g 100 g 200 g 1000 g 10 kg 20 kg 50 kg	8.4 µg 8.8 µg 70 µg 0.16 mg 0.49 mg 8.3 mg 86 mg 92 mg 0.25 g	ASTM E617 Class 1 Weights, Digital Scale (comparator); PMP-C-021, NIST Handbook 44, OIML R111 (ABBA Method)
Scales and Balances [1,4]	(0.001 to 1) g (1 to 60) g (60 to 200) g (200 to 1 000) g (1 to 10) kg (10 to 60) kg (60 to 100) kg (100 to 1 000) kg (1 000 to 2 500) kg	0.000 2 % of reading + 11 µg 0.000 3 % of reading + 10 µg 0.000 15 % of reading + 0.11 mg 0.001 % of reading – 1.6 mg 0.000 31 % of reading + 5.3 mg 0.006 % of reading – 0.56 mg 0.023 % of reading – 11 g 0.015 % of reading 0.015 % of reading	ASTM E617 Class 1, OIML M2, NIST Class F weights and internal procedure PMP-C-012 utilized in the calibration of the weighing system.

Mass and Mass Related Hermosillo, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Volumetric Recipients [3] (measuring cylinder, flask, beaker precipitate, special containers, containers volumetric of graduates collar, plastic, glass and metallic)	(10 to 100) µL (100 to 500) µL (500 to 1 000) µL 1 mL to 5 L (5 to 30) L	0.04 % of reading + 0.11 µL 0.032 % of reading + 0.16 µL 0.38 µL – 0.018 % of reading 0.02 % of reading 0.012 % of reading + 0.35 nL	Comparison to Digital Balance; PMP-C-033
Water Flow [2]	(2 965 to 8 952) l/min	3.3 % of reading – 52 l/min	Comparison to Master Water Flow Meter; PMP-C-034
Torque Measuring Tools [1]	(0.005 to 1) N·m (1 to 20) N·m (20 to 500) N·m	0.4 % of reading + 1 µN·m 0.7 % of reading - 4 mN·m 0.8 % of reading - 20 mN·m	Comparison to Dead Weights, Torque Arm; PMP-C-015, CNM-MMF-PT-002, EA-10/14
Torque Measuring Tools [1]	(67.8 to 678) N·m	0.48 % of reading – 0.11 N·m	Comparison to Torque Transducer, Torque Meter; PMP-C-015, CNM-MMF-PT-002, EA-10/14
Torque Measuring Tools [1]	(678 to 1 355) N·m	(2.9 + 0.000 7*T*) N·m	Comparison to Torque Transducer, Torque Meter; PMP-C-015, CNM-MMF-PT-002, EA-10/14
Torque Measuring Devices	(20.34 to 135.58) N·m (15 to 100) lbf·ft	0.036 % of reading + 0.17 N·m 0.036 % of reading + 0.13 lbf·ft	Comparison to Dead Weights, Torque Arm; PMP-C-015
Torque Measuring Devices	(135.58 to 1355.8) N·m (100 to 1 000) lbf·ft	0.08 % of reading + 0.11 N·m 0.08 % of reading + 0.08 lbf·ft	Comparison to Dead Weights, Torque Arm; PMP-C-015
Air Flow [1]	Up to 20 slpm Up to 300 slpm	0.25 % of reading + 0.000 4 slpm 0.33 % of reading + 0.24 slpm	Comparison to Air Flow Meters; PMP-C-030
Air Velocity (Air Speed)	Up to 25 m/s	0.87 % of reading + 0.18 m/s	Comparison to Wind Tunnel with Master Anemometer; PMP-C-046

Mass and Mass Related Hermosillo, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Hydrometers [3]	(0.62 to 3) SG	0.42 % of reading + 0.023 SG	Comparison to Digital Scale, Digital Thermometer; PMP-C-032, NBS Circular 555
Vacuum Meters [1] (Source/Measure)	(0.000 001 to 0.001) mbar 0.004 mbar to 1 bar	1.6 % of reading 1.3 % of reading + 0.000 05 mbar	Comparison to High Vacuum Pressure Sensor; PMP-C-013
Rockwell and Rockwell Superficial Hardness Testers [1]	(20 to 30) HRC (35 to 55) HRC (60 to 65) HRC (40 to 59) HRBW (60 to 79) HRBW (80 to 100) HRBW	0.4 HRC 0.29 HRC 0.24 HRC 0.32 HRBW 0.41 HRBW 0.41 HRBW	Indirect Verification using Hardness Test Blocks; PMP-C-027
Durometers (Types A, B, C, D) Spring Force Only	(0 to 100) Duro	0.58 Duro	Partial Verification per ASTM D2240 using Digital Scale; PMP-C-027
Force [1] (Tension and Compression)	Up to 0.1 N (0.1 to 1) N (1 to 2 500) N (2.5 to 44.5) kN	0.086 % of reading 0.015 % of reading + 71 µN 0.026 % of reading 0.06 % of reading – 0.77 N	Comparison to Dead Weights; PMP-C-011, NMX-CH-27-1994-SCFI, NMX-CH-023-1994-SCFI
Force Transducers, Force Tools, Force Measuring Equipment [1]	5.6 N to 6.67 kN (6.67 to 66.7) kN (45 to 222) kN	0.2 % of reading + 8 mN 0.2 % of reading - 5 N 0.1 % of reading + 80 µN	Comparison to Multifunction Calibrator, Digital Multimeter, Deadweights; PMP-C-011, NMX-CH-27-1994-SCFI, NMX-CH-023-1994-SCFI

Mass and Mass Related Hermosillo, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Force Transducers, Force Tools, Force Measuring Equipment [1] (compression)	(222 to 1 760) kN	1 % of reading - 3.7 N	Comparison to Load Cell; PMP-C-011 NMX-CH-27-1994-SCFI, NMX-CH-023-1994-SCFI
Pressure Measuring Equipment (Gauge Pressure)	Up to 4 733 Pa Up to 19 inH2O	0.37 % of reading – 8.5 mPa 0.37 % of reading - 0.000 034 inH_2O	Comparison to Digital Manometer; PMP-C-013; NMX-CH-058-1994, NMX-CH-060-2006-IMNC
Pressure Measuring Equipment (Gauge Pressure)	Up to 30 psig Up to 0.2 MPa Up to 3 000 psig Up to 20.7 MPa	0.1 % of reading - 0.000 004 psi 0.1 % of reading - 28 mPa 0.07 % of reading - 0.000 001 psi 0.07 % of reading - 6.9 mPa	Comparison to Pressure Calibrator; PMP-C-013, NMX-CH-058-1994, NMX-CH-060-2006-IMNC
Pressure Measuring Equipment (Gauge Pressure)	(3 000 to 20 000) psig (20.7 to 138) MPa	5.3 psi 36.5 kPa	Pressure Sensor; PMP-C-013, NMX-CH-058-1994, NMX-CH-060-2006-IMNC

Photometry and Radiometry Hermosillo, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Optical Power – Wavelength (nm)	(-38 to 20) dB (850 to 1 550) nm	1 dB 4 % of reading	Comparison to Master Power Meter; PMP-C-039
Light Intensity Meters	(0.1 to 10 000) lux (10 k to 100 k) lux	0.4 % of reading + 0.006 lux 4.3 % of reading	Comparison to Master Illuminance Meter; PMP-C-035
UV Meters	Up to 19.99 mW/cm^2 20 mW/cm^2 to 19 W/cm^2	0.82 % of reading 0.2 % if reading - 0.000 003 W/cm^2	Comparison to Master UV Meter; PMP-C-035

Thermodynamic Hermosillo, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Relative Humidity – Source/Measure [1]	(10 to 75) %RH (75 to 97) %RH	2.2 %RH 2.5 %RH	Comparison to Humidity Meter and Thermometer using Certified Salts; PMP-C-028
Liquid-in-Glass Thermometers (Partial and Full Immersion)	(-30 to 300) °C	0.000 33 % of reading + 0.045 °C	Comparison to RTD with Digital Multimeter; PMP-C-007
Temperature [1] (Temperature Sources, Installations, Ovens, Chambers, Dry Wells)	(-80 to 0) ºC (0 to 232) ºC (232 to 660) ºC	0.003 8 % of reading + 0.028 °C 0.009 1 % of reading + 0.028 °C 0.008 2 % of reading + 0.030 °C	Comparison to RTD with Digital Multimeter; PMP-C-007
Temperature [1] (Temperature Sources and Temperature Chambers)	(660 to 1 000) ºC	0.088 % of reading + 1.3 °C	Comparison to Thermocouple Probe and Temperature Indicator; PMP-C-007
Temperature – RTD with Multimeter	(-80 to 0) ºC (0 to 232) ºC (232 to 660) ºC	0.003 8 % of reading + 0.034 °C 0.006 5 % of reading + 0.034 °C 0.006 3 % of reading + 0.035 °C	Comparison to RTD with Digital Multimeter, Dry Well, Temperature Bath; PMP-C-007
Temperature [1] (Digital/Analog Temperature Measuring Devices with Thermocouple, RTD, Thermistors; Mechanical/ Analog Thermometers)	(-20 to 0) ºC (0 to 400) ºC (400 to 600) ºC	0.031 °C - 0.09 % of reading 0.009 % of reading + 0.031 °C 0.035 % of reading - 0.071 °C	Comparison to RTD with Digital Multimeter, Dry Well, Temperature Bath; PMP-C-007
Temperature [1] Temperature Measuring Devices (Digital, Mechanical)	(600 to 1 000) ºC	0.053 % of reading + 1.8 °C	Comparison to Thermocouple Probe with Temperature Indicator, High Temperature Oven; PMP-C-007
Temperature [1] Environmental Thermometers	(-20 to 0) ºC (0 to 100) ºC	0.5 % of reading + 0.14 °C 0.27 % of reading + 0.14 °C	Comparison to RTD with Digital Multimeter; PMP-C-007
Temperature [1] (Temperature Sources, Installations, Ovens, Chambers, Dry Wells)	(-80 to 0) ºC (0 to 232) ºC (232 to 660) ºC	0.003 8 % of reading + 0.028 °C 0.009 1 % of reading + 0.028 °C 0.008 2 % of reading + 0.030 °C	Comparison to RTD with Digital Multimeter; PMP-C-007

Time and Frequency Hermosillo, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency – Measure	Up to 1 MHz (1 to 225) MHz	0.3 µHz/Hz 15 nHz/Hz	Comparison to Universal Counter, GPS Receiver; PMP-C-008
Frequency – Source	Up to 1 MHz (1 to 225) MHz (225 to 600) MHz	0.3 µHz/Hz 15 nHz/Hz 14 nHz/Hz	Comparison to Multifunction Calibrator, Universal Counter, GPS Frequency Counter; PMP-C-008
Timers, Stopwatches	(1 to 36 000) s (36 000 to 172 800) s	0.001 4 % of reading + 6.5 ms 0.000 13 % of reading + 0.47 s	Comparison to Frequency Counter; PMP-C-008

DIMENSIONAL MEASUREMENT

2 Dimensional Hermosillo, Sonora

Specific Tests and / or Properties Measured	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
2D Dimensional Measurement [3]	Up to 1 in (1 to 2) in (2 to 6) in	95 µin (90 + 5*L*) µin (80 + 11*L*) µin	Comparison to Vision System utilized as Reference, Customer Drawings, Vision Software

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CALIBRATION

Acoustics and Vibration — Guaymas, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Sound Level Meters [1]	(70 to 130) dB 100 Hz to 10 kHz	0.93 dB	Comparison to Sound Level Meter (reference) and Source; PMP-C-036
Sound Level Source Devices	(70 to 130) dB 100 Hz to 10 kHz	0.93 dB	Comparison to Sound Level Meter; PMP-C-036

Chemical Quantities — Guaymas, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Conductivity Meters [5]	1.77 µS/cm 9.8 µS/cm 84.6 µS/cm 501 µS/cm 1002 µS/cm 1413 µS/cm 10 070 µS/cm 99 880 µS/cm	0.13 µS/cm 0.1 µS/cm 0.82 µS/cm 2.4 µS/cm 3.3 µS/cm 5.2 µS/cm 31.2 µS/cm 310 µS/cm	Comparison to Accredited Conductivity Solutions; PMP-C-043
pH Meters [5]	4 pH 7.01 pH 10 pH	0.017 pH 0.013 pH 0.025 pH	Comparison to Accredited pH Buffer Solutions; PMP-C-040

Electrical – DC/Low Frequency Guaymas, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscopes Leveled Sine Wave	5 mVp-p to 5.5 Vp-p 50 kHz to 100 MHz (50 to 300) MHz (300 to 600) MHz	 40 mV/V 45 mV/V 65 mV/V	Comparison to Multifunction Calibrator; PMP-C-042
Oscilloscopes Square Wave Signal into 50 Ω load into 1 MΩ load Rise Time	 10 Hz to 10 kHz 1 mVp-p to 6.6 Vp-p 10 Hz to 10 kHz 1 mVp-p to 130 Vp-p 5 mVp-p to 2.5 Vp-p 1 kHz to 10 MHz	 1.2 mV/V 1.3 mV/V 1 ms/s	Comparison to Multifunction Calibrator; PMP-C-042
DC High Voltage – Source/Measure [1]	(1 to 10) kV	1.4 % of reading	Comparison to High Voltage Probe with Digital Multimeter; PMP-C-001
AC High Voltage – Source/Measure [1]	(1 to 10) kV 60 Hz	 1.6 % of reading	Comparison to High Voltage Probe with Digital Multimeter; PMP-C-003
DC Voltage – Source equipment	(1 to 100) mV (0.1 to 1) V (1 to 10) V (10 to 100) V 100 V to 1000 V	12 µV/V 8.3 µV/V 8.1 µV/V 10 µV/V 10 µV/V	Comparison to Agilent Multimeter, Multifunction Calibrator; PMP-C-001
DC Voltage – Measuring equipment [1]	(1 to 100) mV (0.1 to 1) V (1 to 10) V (10 to 100) V 100 V to 1000 V	12 µV/V 8.3 µV/V 8.1 µV/V 10 µV/V 10 µV/V	Comparison to Agilent Multimeter, Multifunction Calibrator; PMP-C-001
AC Voltage – Source and Measure	(1 to 100) mV 50 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz 100 mV to 1 V 50 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	 0.1 mV/V 0.17 mV/V 0.4 mV/V 0.1 mV/V 0.16 mV/V 0.33 mV/V 0.82 mV/V	Comparison to Agilent Multimeter, Multifunction Calibrator; PMP-C-003

Electrical – DC/Low Frequency Guaymas, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Source and Measure	(1 to 10) V 50 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (10 to 100) V 50 Hz to 1 kHz (1 to 20) kHz (100 to 700) V 50 Hz to 1 kHz	 0.41 mV/V 0.16 mV/V 0.32 mV/V 0.82 mV/V 0.22 mV/V 0.22 mV/V 0.43 mV/V	Comparison to Agilent Multimeter, Multifunction Calibrator; PMP-C-003
DC Current – Source equipment	(10 to 100) nA (0.1 to 1) µA (1 to 10) µA (10 to 100) µA (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A	0.11 mA/A 24 µA/A 16 µA/A 7 µA/A 9 µA/A 7 µA/A 12 µA/A 30 µA/A	Comparison to Agilent Multimeter; PMP-C-002
DC Current – Source equipment [1]	(1 to 11) A (11 to 50) A	0.54 mA/A 0.21 mA/A	Comparison to Multifunction Calibrator with Shunt Resistor; PMP-C-002
DC Current – Measuring Equipment [1]	(10 to 100) nA (0.1 to 1) µA (1 to 10) µA (10 to 100) µA (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A (1 to 11) A (11 to 50) A	90 µA/A 24 µA/A 16 µA/A 7 µA/A 9 µA/A 7 µA/A 12 µA/A 21 µA/A 71 µA/A 0.32 mA/A	Comparison to Multifunction Calibrator with Shunt Resistor PMP-C-002
DC Current – Measuring equipment Clamp-On Ammeters [1]	(50 to 550) A (500 to 1 000) A	9.1 mA/A 7 mA/A	Comparison to Multifunction Calibrator, 50-turn Coil; PMP-C-002

Electrical – DC/Low Frequency Guaymas, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Source equipment	(1 to 10) mA (50 to 100) Hz 100 Hz to 1 kHz (10 to 100) mA (50 to 100) Hz 100 Hz to 1 kHz	 0.2 mA/A 0.14 mA/A 0.28 mA/A 0.21 mA/A	Comparison to Agilent Multimeter, Multifunction Calibrator; PMP-C-004
AC Current – Source equipment	100 mA to 1 A (50 to 100) Hz 100 Hz to 1 kHz	 0.21 mA/A 0.21 mA/A	Comparison to Agilent Multimeter, Multifunction Calibrator; PMP-C-004
AC Current – Source equipment	(1 to 30) A 60 Hz	 0.41 mA/A	Comparison to Digital Multimeter with Shunt Resistor PMP-C-004
AC Current – Measuring equipment	(1 to 10) mA (50 to 100) Hz 100 Hz to 1 kHz (10 to 100) mA (50 to 100) Hz 100 Hz to 1 kHz 100 mA to 1 A (50 to 100) Hz 100 Hz to 1 kHz	 0.2 mA/A 0.8 mA/A 0.28 mA/A 0.2 mA/A 0.19 mA/A 0.17 mA/A	Comparison to Agilent Multimeter, Multifunction Calibrator PMP-C-004
AC Current – Measuring equipment [1]	(1 to 30) A (50 to 100) Hz 100 Hz to 1 kHz	 1.2 mA/A 4 mA/A	Multifunction Calibrator Comparison to with Shunt Resistor; PMP-C-004
AC Current – Measuring equipment Clamp-On Ammeters [1]	(50 to 1 000) A 60 Hz	 4.6 mA/A	Comparison to Multifunction Calibrator, 50-turn Coil; PMP-C-004
DC Power – Source equipment	10.89 mW to 11 220 W	0.04 % of reading - 2 µW	Comparison to Digital Multimeter, Shunt Resistor; PMP-C-005
AC Power – Source equipment	0.89 mW to 11 220 W @ 60 Hz, P.F. = 1	0.12 % of reading + 10 µW	Comparison to Digital Multimeter, Shunt Resistor; PMP-C-005
AC Power – Source equipment	0.89 mW to 11 220 W @ 60 Hz, P.F. = 0.9	0.21 % of reading + 12 µW	Comparison to Digital Multimeter with Shunt Resistor; PMP-C-005

Electrical – DC/Low Frequency Guaymas, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Power – Source equipment	0.89 mW to 11 220 W @ 60 Hz, P.F. = 0.8	0.3 % of reading + 9.2 µW	Comparison to Digital Multimeter with Shunt Resistor; PMP-C-005
DC Power – Measuring equipment [1]	10.89 mW to 11 220 W	0.04 % of reading - 2 µW	Comparison to Multifunction Calibrator; PMP-C-005
AC Power – Measuring equipment [1]	0.89 mW to 11 220 W @ 60 Hz, P.F. = 1	0.12 % of reading + 10 µW	Comparison to Multifunction Calibrator; PMP-C-005
AC Power – Measuring equipment [1]	0.89 mW to 11 220 W @ 60 Hz, P.F. = 0.9	0.21 % of reading + 12 µW	Comparison to Multifunction Calibrator; PMP-C-005
AC Power – Measuring equipment [1]	0.89 mW to 11 220 W @ 60 Hz, P.F. = 0.8	0.3 % of reading + 9.2 µW	Comparison to Multifunction Calibrator; PMP-C-005
Resistance – Measuring equipment [1]	Up to 0.1 Ω (0.1 to 1) Ω (1 to 10) Ω (10 to 100) Ω 100 Ω to 1 kΩ (1 to 10) kΩ (10 to 100) kΩ 100 kΩ to 1 MΩ (1 to 10) MΩ (10 to 100) MΩ 100 MΩ to 1 GΩ	0.23 mΩ/Ω 0.11 mΩ/Ω 20 µΩ/Ω 17 µΩ/Ω 11 µΩ/Ω 11 µΩ/Ω 11 µΩ/Ω 18 µΩ/Ω 61 µΩ/Ω 70 µΩ/Ω 5.8 mΩ/Ω	Comparison to Digital Multimeter, Multifunction Calibrator; PMP-C-006
Resistance – Source equipment	Up to 0.1 Ω (0.1 to 1) Ω (1 to 10) Ω (10 to 100) Ω 100 Ω to 1 kΩ (1 to 10) kΩ (10 to 100) kΩ 100 kΩ to 1 MΩ (1 to 10) MΩ (10 to 100) MΩ 100 MΩ to 1 GΩ	0.18 mΩ/Ω 0.11 mΩ/Ω 20 µΩ/Ω 19 µΩ/Ω 11 µΩ/Ω 11 µΩ/Ω 11 µΩ/Ω 18 µΩ/Ω 61 µΩ/Ω 70 µΩ/Ω 5.8 mΩ/Ω	Comparison to Digital Multimeter; PMP-C-006

Electrical – DC/Low Frequency Guaymas, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Generation/Measuring Resistance Equipment [1] (High value resistors, Decades)	100 kΩ to 10 GΩ Up to 5 kV	2.6 % of reading - 12 MΩ	Comparison to Multifunction Calibrator, Agilent Digital Multimeter, High Voltage Probe; PMP-C-006
DC Shunt Resistance Equipment [1]	0.5 mΩ to 1 Ω @ (1 to 50) A	0.059 % of reading - 17 µΩ	Comparison to Agilent Digital Multimeter, Shunt Resistor; PMP-C-006
AC Resistance – Shunt Resistance [1]	0.5 mΩ to 1 Ω (1 to 50) A	0.059 % of reading - 17µΩ	Comparison to Agilent Digital Multimeter, Shunt Resistor; PMP-C-006
Capacitance [1,3] Source equipment	100 pF to 10 µF 50 Hz to 1 kHz	0.42 mF/F	Comparison to LCR Meter; PMP-C-009
Capacitance [1,3] – Measuring equipment	100 pF to 1 µF 50 Hz to 1 kHz	4 mF/F	Comparison to Capacitance Decade; PMP-C-009
Thermocouple Electrical Simulation [1]	Type B (600 to 1 820) °C Type C (0 to 2 316) °C Type E (-250 to 1 000) °C Type J (-250 to 1 200) °C Type K (-200 to 1 372) °C Type L (-200 to 900) °C Type N (-200 to 1 300) °C Type R (0 to 1 767) °C Type S (0 to 1 767) °C Type T (-250 to 400) °C Type U (-200 to 600) °C	0.07 °C 0.07 °C 0.08 °C 0.07 °C 0.07 °C 0.06 °C 0.07 °C 0.08 °C 0.07 °C 0.06 °C 0.08 °C	Comparison to Multifunction Calibrator, Agilent Multimeter; PMP-C-020

Electrical – DC/Low Frequency Guaymas, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
RTD Electrical Simulation [1]	Cu 427 10 Ω (-100 to 260) °C Pt 385, 100 Ω (-200 to -80) ºC (-80 to 0) ºC (0 to 100) ºC (100 to 300) ºC (300 to 400) ºC (400 to 630) ºC (630 to 800) ºC	 0.3 °C 0.05 ºC 0.05 ºC 0.07 ºC 0.09 ºC 0.1 ºC 0.12 ºC 0.23 ºC	Comparison to Multifunction Calibrator; PMP-C-020
RTD Electrical Simulation [1]	Pt 3926, 100 Ω (-200 to -80) ºC (-80 to 0) ºC (0 to 100) ºC (100 to 300) ºC (300 to 400) ºC (400 to 630) ºC Pt 3916, 100 Ω (-200 to -190) °C (-190 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C Pt 385, 200 Ω (-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	 0.05 ºC 0.05 ºC 0.07 ºC 0.09 ºC 0.1 ºC 0.12 ºC 0.25 °C 0.04 °C 0.05 °C 0.06 °C 0.07 °C 0.08 °C 0.09 °C 0.1 °C 0.23 °C 0.04 °C 0.04 °C 0.04 °C 0.05 °C 0.12 °C 0.13 °C 0.14 °C 0.16 °C	Comparison to Multifunction Calibrator; PMP-C-020

Electrical – DC/Low Frequency Guaymas, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
RTD Electrical Simulation [1]	Pt 385, 500 Ω		Comparison to Multifunction Calibrator; PMP-C-020
	(-200 to -80) °C	0.04 °C	
	(-80 to 0) °C	0.05 °C	
	(0 to 100) °C	0.05 °C	
	(100 to 260) °C	0.06 °C	
	(260 to 300) °C	0.08 °C	
	(300 to 400) °C	0.08 °C	
	(400 to 600) °C	0.09 °C	
	(600 to 630) °C	0.11 °C	
	Pt 385, 1000 Ω		
	(-200 to -80) °C	0.03 °C	
	(-80 to 0) °C	0.03 °C	
	(0 to 100) °C	0.04 °C	
	(100 to 260) °C	0.05 °C	
	(260 to 300) °C	0.06 °C	
	(300 to 400) °C	0.07 °C	
	(400 to 600) °C	0.07 °C	
	(600 to 630) °C	0.23 °C	
	PtNi 385, 120 Ω (Ni120)		
	(-80 to 0) °C	0.08 °C	
	(0 to 100) °C	0.08 °C	
	(100 to 260) °C	0.14 °C	

Length – Dimensional Metrology Guaymas, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Outside Micrometers [1]	Up to 1 016 mm	2.2 µm	Comparison to Gage Blocks Grade 2, Gage blocks Grade 3, PMP-C-014; Reference Standard NMX-CH-099-IMNC-2005
	Up to 40 in	87 µin	
Depth Micrometers [1]	Up to 1 016 mm	2.2 µm	Comparison to Gage Blocks Grade 2, Gage Blocks Grade 3; PMP-C-014
	Up to 40 in	87 µin	

Length – Dimensional Metrology Guaymas, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Dial and Digital Indicators [1]	Up to 101.6 mm Up to 4 in	0.94 µm 37 µin	Comparison to Calibration Tester, Dial Gage Tester; PMP-C-014, NMX-CH-36-1994
Calipers [1,3]	Up to 1 016 mm Up to 40 in	$(11.4 + 0.003L)$ µm $(450 + 2L)$ µin	Comparison to Gage Blocks Grade 2, Gage Blocks Grade 3; PMP-C-014, NMX-CH-2:1993-SCFI
Height Measuring Equipment	Up to 1 016 mm Up to 40 in	11.2 µm 440 µin	Comparison to Gage Blocks Grade 2, Gage Blocks Grade 3, Surface Plate; PMP-C-014
Optical Comparator [2] X, Y Axis – Linear Error of Indication	Up to 508 mm Up to 20 in	6.1 µm 240 µin	Comparison to Glass Scales, Gage Blocks Grade 2 Gage Block Grade 3; PMP-C-014
Optical Comparators [2] Angular	(0 to 360)°	0.019°	Comparison to Angle Block; PMP-C-014
Optical Comparators [2] Magnification	5x 10x 20x 50x 100x	0.1 % of reading 0.051 % of reading 0.076 % of reading 0.051 % of reading 0.051 % of reading	Comparison to Glass Ruler; PMP-C-014
Graduated Rules, Tape Measures	Up to 1 016 mm (1 016 to 10 160) mm Up to 40 in (40 to 400) in	0.16 mm 0.003 8 % of reading + 0.16 mm 0.006 2 in 0.003 8 % of reading + 0.005 8 in	Comparison to Digital Indicator, Stainless Ruler, 5X Amplification Lens; PMP-C-014; NOM-040-SCFI-1994, NOM-046-SCFI-1999
Coating Thickness [1]	Up to 508 µm Up to 0.06 in	1.2 % of reading + 4.9 µm 1.2 % of reading + 190 µin	Comparison to Digital Indicator, Gage Blocks Grade 2 (GGG-G-15C); PMP-C-014

Length – Dimensional Metrology Guaymas, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Surface Roughness Measuring Devices [1]	2.99 µm Ra 118 µin Ra 0.4 µm Ry 16 µin Ry	61 nm 2.4 µin 61 nm 2.4 µm	Comparison to Mitutoyo Roughness Standards; PMP-C-038
Levels [1]	(0 to 60)°	0.000 7°	Comparison to Surface Plate, Sine Bar, Gage Blocks PMP-C-014
Surface Plates [1,3] Local Area Flatness (Only) (Repeat Reading)	Up to (192 x 192) in	(37 + 0.02*L*) µin	Partial Verification using Datum Gauge; PMP-C-014
Pin/Plug Gauges	(0.254 to 101.6) mm (0.01 to 4) in	0.36 µm 14 µin	Comparison to Gage Blocks Grade 2, Universal Length Measuring Machine; PMP-C-014
Thread Plug Gauge Pitch Diameter	M 1.6 x 0.35 to M 100 x 6 (0-80 to 4-12)	5.1 µm 200 µin	Comparison to P&W Supermicrometer®, Gage block set grade 2; PMP-C-014
Thread Plug Gauges Major Diameter	M 1.6 x 0.35 to M 100 x 6 (0-80 to 4-12)	1.8 µm 71 µin	Comparison to P&W Supermicrometer®, Gage block set grade 2; PMP-C-014
Protractors	(0 to 360)°	0.059°	Comparison to Angle Block; PMP-C-014
Bore Gauges	(0.762 to 304.8) mm (0.03 to 12) in	3.1 µm 120 µin	Comparison to Ring Gages, Vision Microscope; PMP-C-014
Ring Gauges	(12.7 to 101.6) mm (0.5 to 4) in	0.36 µm 14 µin	Comparison to Universal Length Measuring Machine; PMP-C-014

Mass and Mass Related Guaymas, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Scales and Balances [4]	(0.001 to 1) g (1 to 60) g (60 to 200) g (200 to 1 000) g (1 to 10) kg (10 to 60) kg (60 to 100) kg (100 to 1 000) kg (1 000 to 2 500) kg	0.000 2 % reading + 11 µg 0.000 3 % reading + 10 µg 0.000 15 % reading + 0.11 mg 0.001 % reading - 1.6 mg 0.000 31 % reading + 5.3 mg 0.006 % reading - 0.56 mg 0.023 % reading - 11 g 0.015 % reading 0.015 % reading	ASTM E617 Class 1, OIML M2, NIST Class F weights and internal procedure PMP-C-012 utilized in the calibration of the weighing system.
Volumetric Recipients [3] (measuring cylinder, flask, beaker precipitate, special containers, containers volumetric of graduates collar, plastic, glass and metallic)	1 mL to 5 L (5 to 30) L	0.02 % of reading 0.012 % of reading + 0.35 nL	Comparison to Digital Balance; PMP-C-033
Torque Transducers, Torque Measuring Equipment [1]	(0.005 to 1) N·m (1 to 20) N·m (20 to 500) N·m (500 to 1 000) N·m	0.37 % of reading + 0.000 84 N·m 0.76 % of reading + 0.003 1 N·m 0.84 % of reading - 0.13 N·m 0.19 % of reading + 3.3 N·m	Comparison to Dead Weights, Torque Arm, Torque Transducer; PMP-C-015, CNM-MMF-PT-002, EA-10/14
Torque Measuring Devices	(20.34 to 135.58) N·m 15 lbf·ft to 100 lbf·ft	0.036 % of reading + 0.17 N·m 0.036 % of reading + 0.13 lbf·ft	Comparison to Dead Weighs, Torque Arm; PMP-C-015
Torque Measuring Devices	(135.58 to 677.9) N·m 100 lbf·ft to 500 lbf·ft	(0.011 % of reading + 0.075 N·m 0.11 % of reading + 0.055 lbf·ft	Comparison to Dead Weighs, Torque Arm; PMP-C-015
Torque Measuring Devices	(677.9 to 1 355.8) N·m 500 lbf·ft to 500 lbf·ft	(0.06 % of reading + 0.38 N·m (0.06 % of reading + 0.28 lbf·ft	Comparison to Dead Weighs, Torque Arm; PMP-C-015
Hydrometers [3]	(0.62 to 3) SG	0.02 % of reading + 0.005 6 SG	Comparison to Digital Scale, Digital Thermometer; PMP-C-032, NBS Circular 555

Mass and Mass Related Guaymas, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Rockwell Hardness Testers [1]	21.31 HRC 25.29 HRC 28.33 HRC 46.12 HRC 52.97 HRC 64.06 HRC 64.20 HRC	0.64 HRC 0.64 HRC 0.62 HRC 0.55 HRC 0.54 HRC 0.53 HRC 0.53 HRC	Indirect Verification using Hardness Test Blocks; PMP-C-027
Rockwell Hardness Testers [1]	42.13 HRBW 42.66 HRBW 48.59 HRBW 71.42 HRBW 73.27 HRBW 73.43 HRBW 90.73 HRBW 91.51 HRBW 98.22 HRBW 98.40 HRBW	0.46 HRBW 0.37 HRBW 0.4 HRBW 0.29 HRBW 0.27 HRBW 0.31 HRBW 0.48 HRBW 0.41 HRBW 0.42 HRBW 0.42 HRBW	Indirect Verification using Hardness Test Blocks; PMP-C-027
Durometers (Types A, B, C, D) Spring Force Only	(0 to 100) Duro	0.58 Duro	Partial Verification per ASTM D2240 using Digital Scale; PMP-C-027
Force [1] (Tension and Compression)	Up to 0.1 N (0.1 to 1) N (1 to 2 500) N (2.5 to 44.5) kN	0.086 % of reading 0.015 % of reading + 0.000 071 N 0.026 % of reading 0.06 % of reading – 0.000 77 kN	Comparison to Dead Weights; PMP-C-011, NMX-CH-27-1994-SCFI, NMX-CH-023-1994-SCFI
Force Transducers, Force Tools, Force Measuring Equipment [1]	5.5 N to 6.67 kN (6.67 to 66.7) kN (45 to 222) kN	0.22 % of reading + 0.66 N 0.25 % of reading - 1.7 N 0.23 % of reading + 120 N	Comparison to Master Load Cell, Multiproduct Calibrator, Digital Multimeter; PMP-C-011, NMX-CH-27-1994-SCFI, NMX-CH-023-1994-SCFI
Pressure Measuring Equipment (Gauge Pressure)	Up to 30 psig Up to 0.2 MPa Up to 3 000 psig Up to 20.7 MPa	0.1 % of reading - 0.000 004 psi 0.1 % of reading - 28 mPa 0.07 % of reading - 0.000 001 psi 0.07 % of reading - 6.9 mPa	Comparison to Pressure Calibrator; PMP-C-013 NMX-CH-058-1994, NMX-CH-060-2006-IMNC
Pressure Measuring Equipment (Gauge Pressure)	(20.7 to 138) MPa (3 000 to 20 000) psi	9.1 psi	Comparison to Pressure Sensor; PMP-C-013 NMX-CH-058-1994, NMX-CH-060-2006-IMNC

Photometry and Radiometry Guaymas, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Light Intensity Meters [3]	(0.1 to 10 000) lux (10 000 to 100 000) lux	7 % of reading - 75 lux 11 % of reading - 890 lux	Comparison to Master Illuminance Meter; PMP-C-035
UV Meters [3]	Up to 19.99 mW/cm^2 19.99 mW to 30 W/cm^2	5 % of reading + 0.000 2 mW/cm^2 4 % of reading + 2.5 mW/cm^2	Comparison to Master UV Meter; PMP-C-035

Thermodynamic Guaymas, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Relative Humidity – Source/Measure [1]	(10 to 75) %RH (75 to 97) %RH	2.2 %RH 2.5 %RH	Comparison to Humidity Meter and Thermometer using Certified Salts; PMP-C-028
Temperature [1] Furnace System Accuracy Test (SAT), Furnace Temperature Uniformity Test (TUS)	(50 to 150) °C	0.15 % of reading + 0.16 °C	Comparison to Temperature Measurement System; PMP-C-053 per the current version of AMS 2750
Temperature [1] Furnace System Accuracy Test (SAT), Furnace Temperature Uniformity Test (TUS)	(150 to 300) °C	0.25 % of reading + 0.052 °C	Comparison to Temperature Measurement System; PMP-C-053 per the current version of AMS 2750
	(300 to 400) °C	1.6 % of reading - 3.8 °C	Comparison to Temperature Measurement System; PMP-C-053 per the current version of AMS 2750
Temperature [1] (Temperature Sources, Installations, Ovens, Chambers, Dry Wells Temperature Sources, Temperature Chambers	(-80 to 0) ºC (0 to 232) ºC (232 to 660) ºC	0.003 8 % of reading + 0.028 °C 0.009 1 % of reading + 0.028 °C 0.008 2 % of reading + 0.03 °C	Comparison to RTD with Digital Multimeter; PMP-C-007
	(660 to 1 000) ºC	0.088 % of reading + 1.3 °C	Comparison to Thermocouple Probe with Temperature Indicator; PMP-C-007

Thermodynamic Guaymas, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Temperature [1] (Digital/Analog Temperature Measuring Devices with Thermocouple, RTD, Thermistors; Mechanical/ Analog Thermometers)	(-20 to 0) ºC (0 to 400) ºC (400 to 600) ºC	-0.09 % of reading + 0.031 °C 0.009 % of reading + 0.031 °C 0.035 % of reading - 0.071 °C	Comparison to RTD with Digital Multimeter, Dry Well, Temperature Bath; PMP-C-007
Temperature [1] Temperature Measuring Devices (Digital, Mechanical)	(600 to 1 000) ºC	0.053 % of reading + 1.8 °C	Comparison to Thermocouple Probe with Temperature Indicator, High Temperature Oven; PMP-C-007
Temperature [1] Environmental Thermometers	(-20 to 0) ºC (0 to 100) ºC	0.5 % of reading + 0.14 °C 0.27 % of reading + 0.14 °C	Comparison to RTD with Digital Multimeter; PMP-C-007

Time and Frequency Guaymas, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency – Source	Up to 1 MHz (1 to 225) MHz	0.3 µHz/Hz 15 nHz/Hz	Comparison to GPS Frequency Standard; PMP-C-008
Frequency – Measure	Up to 1 MHz (1 to 225) MHz (225 to 600) MHz	0.3 µHz/Hz 15 nHz/Hz 14 nHz/Hz	Comparison to Multifunction Calibrator, Universal Counter, GPD Frequency Standard; PMP-C-008
Timers, Stopwatches	(1 to 36 000) s (36 000 to 172 800) s	0.001 4 % of reading + 6.5 ms 0.000 13 % of reading + 0.47 s	Comparison to Frequency Counter; PMP-C-008

DIMENSIONAL MEASUREMENT

3 Dimensional Guaymas, Sonora

Specific Tests and / or Properties Measured	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
3D Dimensional Measurement [3]	Up to 1 in (1 to 10) in (10 to 20) in (20 to 25) in	49 µin (44 + 5.5*L*) µin (26 + 7.3*L*) µin (10 + 8*L*) µin	Comparison to Coordinate Measuring Machine utilized as Reference, Customer Drawings, CMM Software

Calibration and Measurement Capability (CMC) is expressed in terms of the measurement parameter, measurement range, expanded uncertainty of measurement and reference standard, method, and/or equipment. The expanded uncertainty of measurement is expressed as the standard uncertainty of the measurement multiplied by a coverage factor of 2 (k=2), corresponding to a confidence level of approximately 95%.

Notes:

1. On-site calibration service is available for this parameter, since on-site conditions are typically more variable than those in the laboratory, larger measurement uncertainties are expected on-site than what is reported on the accredited scope.
2. This parameter is only available on-site and not in the laboratory's facilities.
3. L = length in inches or mm; SG = specific gravity; DF = dissipation factor; ″ = arc-second.
4. The CMC for scales and balances is highly dependent upon the resolution of the unit under test. The uncertainties presented here do not include the resolution of the unit under test. The resolution will be included in the reported measurement uncertainty at the time of calibration.
5. Nominal values are approximate. The actual values will be used at the time of calibration, along with the appropriate measurement uncertainty.
6. Volumetric performance test (reproducibility) is done using a non-calibrated ball length bar per ASME B89.4.1-1997.
7. Not all parameters apply to all Durometer Types.
8. This parameter is a dimensionless parameter (no unit of measure).
9. This scope is formatted as part of a single document including Certificate of Accreditation No. ACT-1890.

Jason Stine, Vice President