



CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

Metrología y Pruebas, S. A. de C. V.
Privada Tecnológico 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, DIMENSIONAL MEASUREMENT, AND
TESTING**

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 2027
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

Metrología y Pruebas, S. A. de C. V.

Privada Tecnológico No.25

Nogales, Sonora, México

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CALIBRATION, DIMENSIONAL MEASUREMENT, AND TESTING

ISO/IEC 17025 Accreditation Granted: **30 October 2025**

Certificate Number: **ACT-1890**

Certificate Expiry Date: **11 November 2027**

CALIBRATION

Acoustics and Vibration

Nogales, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Sound Level Meter	1 kHz		Sound Level Meter (reference) and Source; PMP-C-036
	94 dB	0.5 dB	
	114 dB	0.5 dB	
	124 dB	0.5 dB	
Sound Level Source Devices	(70 to 124) dB 100 Hz to 10 kHz	0.93 dB	Sound Level Meter; PMP-C-036

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	17 % of reading	Master Particle Counter; PMP-C-050
	(10 to 50) particles/ft ³		
	(1.77 to 105 944) particles/L	13 % of reading	
pH Meters ⁵	(50 to 3 000 000) particles/ft ³		Accredited pH Buffer Solutions; PMP-C-040
	4 pH	0.013 pH	
	7 pH	0.013 pH	
	10 pH	0.013 pH	

Chemical Quantities

Nogales, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Conductivity Meters ⁵	10 μ S/cm 84 μ S/cm 100 μ S/cm 147 μ S/cm 1 000 μ S/cm 1 413 μ S/cm 10 000 μ S/cm 100 000 μ S/cm	0.11 μ S/cm 0.82 μ S/cm 2.2 μ S/cm 0.57 μ S/cm 5.1 μ S/cm 5.3 μ S/cm 44 μ S/cm 345 μ S/cm	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 (12 500 to 68 000) cP (68 000 to 100 000) cP	0.092 cP 0.66 cP 8.5 cP 97 cP 663 cP 988 cP	Accredited Viscosity Standards; PMP-C-037
Gas Measurement Equipment	CO (100 ppm) H ₂ S (25 ppm) CH ₄ (2.5 %vol, 50 %LEL) NO ₂ (10 ppm) SO ₂ (20 ppm) i-C ₄ H ₁₀ O ₂ CO ₂ C ₅ H 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	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	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 M Ω 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	Multifunction Calibrator; PMP-C-042
DC High Voltage – Source Equipment	(1 to 10) kV	13 mV/V	High Voltage Probe, Multimeter PMP-C-001
DC High Voltage – Measuring Equipment	(1 to 20) kV	13 mV/V	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 μ V/V 8.3 μ V/V 8.1 μ V/V 10 μ V/V 10 μ V/V	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 μ V/V 8.3 μ V/V 8.1 μ V/V 10 μ V/V 10 μ V/V	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 1 V 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	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	Agilent Multimeter, Multifunction Calibrator; PMP-C-003
AC High Voltage – Source Equipment	(1 to 10) kV 60 Hz	14 mV/V	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 1 V 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	Agilent Multimeter, Multifunction Calibrator; PMP-C-003
AC High Voltage – Measuring Equipment	(1 to 20) kV 60 Hz	14 mV/V	High Voltage Digital Meter; PMP-C-003
DC Current – Source Equipment	(10 to 100) nA 100 nA to 1 μ A (1 to 10) μ A (10 to 100) μ A 100 μ A to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A	0.11 mA/A 24 μ A/A 16 μ A/A 7 μ A/A 9 μ A/A 7 μ A/A 12 μ A/A 30 μ A/A	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	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 μ A (1 to 10) μ A (10 to 100) μ A 100 μ A to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A (1 to 11) A (11 to 100) A	90 μ A/A 24 μ A/A 16 μ A/A 7 μ A/A 9 μ A/A 7 μ A/A 12 μ A/A 21 μ A/A 71 μ A/A 0.32 mA/A	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	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 (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 0.14 mA/A 0.28 mA/A 0.21 mA/A 0.21 mA/A 0.21 mA/A 0.21 mA/A	Agilent Multimeter; PMP-C-004
AC Current – Source Equipment	(1 to 30) A 60 Hz	0.41 mA/A	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	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	Agilent Multimeter, Current Shunts; PMP-C-004
AC Current – Measuring Equipment Clamp-On Ammeters	(50 to 1 000) A 60 Hz	4.6 mA/A	Multifunction Calibrator with 50-Turn Coil; PMP-C-004

Electrical – DC/Low Frequency

Nogales, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Power – Measuring Equipment	10.89 mW to 11 220 W	0.82 mW/W	Multifunction Calibrator; PMP-C-004
DC Power – Source Equipment	10.89 mW to 11 220 W	0.41 mW/W	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	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	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 k Ω (1 to 10) k Ω (10 to 100) k Ω 100 k Ω to 1 M Ω (1 to 10) M Ω (10 to 100) M Ω 100 M Ω to 1 G Ω	0.23 m Ω / Ω 0.11 m Ω / Ω 20 $\mu\Omega$ / Ω 17 $\mu\Omega$ / Ω 11 $\mu\Omega$ / Ω 11 $\mu\Omega$ / Ω 11 $\mu\Omega$ / Ω 17 $\mu\Omega$ / Ω 60 $\mu\Omega$ / Ω 70 $\mu\Omega$ / Ω 5.8 m Ω / Ω	Agilent 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 k Ω (1 to 10) k Ω (10 to 100) k Ω 100 k Ω to 1 M Ω (1 to 10) M Ω (10 to 100) M Ω 100 M Ω to 1 G Ω	0.18 m Ω / Ω 0.11 m Ω / Ω 20 $\mu\Omega$ / Ω 17 $\mu\Omega$ / Ω 11 $\mu\Omega$ / Ω 11 $\mu\Omega$ / Ω 11 $\mu\Omega$ / Ω 17 $\mu\Omega$ / Ω 60 $\mu\Omega$ / Ω 70 $\mu\Omega$ / Ω 5.8 m Ω / Ω	Agilent Multimeter; PMP-C-006

Electrical – DC/Low Frequency

Nogales, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Resistance Generation Equipment (High Value Resistors and Decade Resistors)	1 M Ω to 1 T Ω (50 to 1 000) V	23 m Ω / Ω	Multifunction Calibrator, Agilent Multimeter, High Value Resistance Decade (1 M Ω to 1 T Ω); PMP-C-006
Resistance Measuring Equipment (Megohmmeters)	Up to 1 M Ω (50 to 1 000) V 1 M Ω to 1 T Ω Up to 1 000 V 1 M Ω to 1 T Ω (1 to 5) kV	81 m Ω / Ω 24 m Ω / Ω 24 m Ω / Ω	Direct Method with: High Value Resistance Decade (1 M Ω to 1 T Ω); PMP-C-006
Low Resistance, DC Shunt Resistance Equipment	0.5 m Ω to 1 Ω Up to 300 A	0.45 m Ω / Ω	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 m Ω to 1 Ω (1 to 60) A	2.5. m Ω / Ω	Multifunction Calibrator, Agilent Multimeter, DC Power Supply, Shunt Resistors; PMP-C-006
Capacitance – Source equipment	10 nF to 10 μ F 12 Hz to 100 kHz	0.42 mF/F	Capacitance Bridge, Precision LCR Meter; PMP-C-009
Capacitance – Measuring equipment	(1 to 10 000) pF 0.33 pF to 0.33 mF	4 mF/F 0.9 mF/F	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 μ H/H	LCR Bridge, Precision LCR Meter; PMP-C-029
Inductance – Measuring equipment	1 mH to 10 H	0.23 mH/H	Precision LCR Meter, Standard Inductors; PMP-C-029
Phase Angle Output	(0 to 180) $^{\circ}$	0.15 $^{\circ}$	Phase Meter; PMP-C-005
RTD Simulation – Measure/Source	Pt 385, 100 Ω (-196 to 800) $^{\circ}$ C	0.03 $^{\circ}$ C	Agilent Multimeter, Multifunction Calibrator; PMP-C-020

Electrical – DC/Low Frequency

Nogales, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Thermocouple Electrical Simulation			
Type B	(600 to 1 820) °C	0.07 °C	Multifunction Calibrator, Agilent Multimeter; PMP-C-020
Type C	(0 to 2 316) °C	0.11 °C	
Type E	(-200 to 1 000) °C	0.08 °C	
Type J	(-200 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	(-200 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 to 150) mT	0.36 % of reading + 4.3 µT 0.56 % of reading	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	Power Meter with Power Sensors; PMP-C-010
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	Spectrum Analyzer, Signal Generator (ref); PMP-C-010
Power – Measure 50 Ω load	(-60 to 10) dBm (10 MHz to 18 GHz) 10 dBm -60 dBm	0.18 dB 0.4 dB	Power Meter with Power Sensors, Signal Generator (ref); PMP-C-010
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	Spectrum Analyzer, Signal Generator (ref); PMP-C-010

Electrical – RF/Microwave

Nogales, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
RF/Microwave Phase Modulation – Measure/Source	Carrier Frequency: 100 kHz to 13.2 MHz (0.1 to 45) rad	0.84 % of reading	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	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	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	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	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	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	Gage Blocks Grade 2; PMP-C-014, NMX-CH-36-1994

Length – Dimensional Metrology

Nogales, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Optical Comparator ² X, Y Axis – Linear Error of Indication	Up to 508 mm Up to 20 in	6.1 µm 240 µin	Glass Scales, Gage Blocks Grade 2, Gage Block Grade 3; PMP-C-014
Optical Comparators ² Angular	(0 to 360)°	0.017°	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	Glass Ruler; PMP-C-014
Height Measuring Equipment ³	Up to 1 016 mm Up to 40 in	(0.97 + 0.008 6L) µm (38 + 8.6L) µin	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	Digital Indicator, Stainless Ruler, 5X Amplification Lens; PMP-C-014, NOM-040-SCFI-1994, NOM-046-SCFI-1999
Calipers ³	Up to 1 016 mm Up to 40 in	(11.43 + 0.002L) µm (450 + 2L) µin	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 3L) µm (4.4 + 2.24L) µin	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 7L) µm (28 + 1.7L) µin	Micrometer, 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	Mitutoyo Roughness Standard (Ra, Ry) Mitutoyo; PMP-C-038

Length – Dimensional Metrology

Nogales, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Surface Roughness Standards	(0.4 to 3) μm	0.066 μm	Roughness Tester; PMP-C-038
Levels	(0.000 19 to 3.814)°	0.005 8°	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 8L) μm (0.052 + 0.001 8L) μm (0.089 + 0.001 1L) μm (0.095 + 0.001L) μm (0.002 5L - 0.059) μm (2.9 + 1L) μin (2.1 + 1.78L) μin (3.5 + 1.1L) μin (3.7 + 1L) μin (2.5L - 2.33) μin	Gage Blocks Grade 1 (GGG-G-15C), Gage Block Comparator; PMP-C-014
Gages Blocks ³	(152.4 to 1 016) mm (6 to 40) in	(0.015 + 0.001 3L) μm (0.6 + 1.3L) μin	Laser Interferometer; PMP-C-014
Pin/Plug Gauges ³	(0.254 to 101.6) mm (0.01 to 4) in	(1 + 0.005 5L) μm (41 + 5.5L) μin	Laser Scan Diameter; PMP-C-014
Ring Gages	(12.7 to 101.6) mm (0.5 to 4) in	1.2 μm 47 μin	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	P&W Supermicrometer [®] , Gage Blocks Grade 2; PMP-C-014

Length – Dimensional Metrology

Nogales, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Thread Plug Gage Major Diameter	M 1.6 x 0.35 to M 100 x 6 (0-80 to 4-12)	2.1 μ m 82 μ in	P&W Supermicrometer [®] , Gage Blocks Grade 2; PMP-C-014
Protractors	(0 to 360)°	0.019°	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 μ m 120 μ in	Ring Gages, Vision Microscope; PMP-C-014
Radius Gage	(0.254 to 25.4) mm (0.01 to 1) in	1.3 μ m 48 μ in	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 μ g 8.8 μ g 70 μ g 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 μ g 0.000 3 % of reading + 10 μ g 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

Nogales, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
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	Digital Balance; PMP-C-033
Water Flow ¹	Up to 115 L/min	1 % of reading + 0.6 L/min	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	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	Torque Transducer; PMP-C-015, CNM-MMF-PT-002, EA-10/14
Torque Measuring Tools ¹	(400 to 678) N·m (295 to 500) lbf·ft	1.6 N·m 1.2 lbf·ft	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	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	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	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	Master Flow Meter; PMP-C-030
Air Velocity ¹	(0.4 to 25) m/s	1 % of reading + 0.16 m/s	Digital Anemometer; PMP-C-030

Mass and Mass Related

Nogales, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Hydrometer ³	(0.62 to 3) SG	0.023 SG – 0.4 % of reading	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	Pressure Sensor, High Vacuum Meter; PMP-C-013
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

Mass and Mass Related

Nogales, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
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
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	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	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	2 inch 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	Pressure Calibrator (3 000 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	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	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	1.4 % of reading	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	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	Digital Humidity Meter; PMP-C-028
Temperature ¹ (Temperature Sources, Installations, Ovens, Chambers, Dry Wells)	(-80 to 0) °C (0 to 232) °C (232 to 660) °C	0.0038 % of reading + 0.028 °C 0.0091 % of reading + 0.028 °C 0.0082 % of reading + 0.03 °C	RTD with Digital Multimeter; PMP-C-007
Temperature ¹ (Temperature Sources, Installations, Ovens, Chambers, Dry Wells)	(660 to 1 000) °C	0.088 % of reading + 1.3 °C	Thermocouple with Temperature Indicator; PMP-C-007
Temperature – RTD with Multimeter	(-80 to 0) °C (0 to 232) °C (232 to 660) °C	0.0038 % of reading + 0.034 °C 0.0065 % of reading + 0.034 °C 0.0063 % of reading + 0.035 °C	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) °C (0 to 400) °C (400 to 600) °C	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, Dry Well, Bath/Source; PMP-C-007
Temperature ¹ (Digital/Analog Temperature Measuring Devices with Thermocouple, RTD, Thermistors, Mechanical/Analog Thermometers)	(600 to 1 000) °C	0.053 % of reading + 1.8 °C	Thermocouple with Temperature Indicator; High Temperature Oven; PMP-C-007

Thermodynamic

Nogales, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Temperature ¹ (Environmental Thermometers)	(-20 to 0) °C (0 to 100) °C	0.5 % of reading + 0.14 °C 0.27 % of reading + 0.14 °C	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	Frequency Counter; PMP-C-008
Frequency – Measuring Equipment	0.1 Hz to 18 GHz	1 nHz/Hz	GPS Receiver, Spectrum Analyzer, Frequency Counter, Signal Generator, Frequency Synthesizer; PMP-C-008
Frequency – Source Equipment	Up to 18 GHz	1 nHz/Hz	GPS Receiver, Spectrum Analyzer, Frequency Counter, Power Meter with Power Sensors; PMP-C-008

DIMENSIONAL MEASUREMENT

3 Dimensional

Nogales, Sonora

Parameter/Equipment	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 + 5L) µin (80 + 10L) µin	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	Universal Testing Machine, Load Cell System

Services performed at satellite location

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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 Meter	(60 to 129) dB 100 Hz to 10 kHz	0.93 dB	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	Sound Level Meter; PMP-C-036

Chemical Quantities

Hermosillo, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
pH Meters ⁵	4 pH 6.86 pH 10.1 pH	0.019 pH 0.013 pH 0.025 pH	Accredited pH Buffer Solutions; PMP-C-040

Chemical Quantities

Hermosillo, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Conductivity Meters ⁵	1.9 $\mu\text{S/cm}$ 10.1 $\mu\text{S/cm}$ 84.6 $\mu\text{S/cm}$ 501 $\mu\text{S/cm}$ 1 001 $\mu\text{S/cm}$ 1 416 $\mu\text{S/cm}$ 10 070 $\mu\text{S/cm}$ 99 800 $\mu\text{S/cm}$	0.14 $\mu\text{S/cm}$ 0.1 $\mu\text{S/cm}$ 0.82 $\mu\text{S/cm}$ 2.3 $\mu\text{S/cm}$ 3.4 $\mu\text{S/cm}$ 5.4 $\mu\text{S/cm}$ 32 $\mu\text{S/cm}$ 321 $\mu\text{S/cm}$	Accredited Conductivity Solutions; PMP-C-043

Electrical – DC/Low Frequency

Hermosillo, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscopes ^{1,3} Leveled Sine Wave (Relative to 50 kHz)	5 mVp-p to 5.5 Vp-p 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz	1.5 mV 2.7 mV 3.9 mV	Multifunction Calibrator; PMP-C-042
Square Wave Signal into 50 Ω load into 1 M Ω load	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	0.05 % of reading + 0.2 μV 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	Keysight Multimeter, High Voltage Probe; 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 $\mu\text{V/V}$ 8 $\mu\text{V/V}$ 8 $\mu\text{V/V}$ 10 $\mu\text{V/V}$ 10 $\mu\text{V/V}$	Agilent Multimeter; PMP-C-001

Electrical – DC/Low Frequency

Hermosillo, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage – Measuring Equipment ¹	(1 to 100) mV 100 mV to 1 V (1 to 10) V (10 to 100) V 100 V to 1.02 kV	12 μ V/V 8 μ V/V 8 μ V/V 10 μ V/V 10 μ V/V	Agilent Multimeter, Multifunction Calibrator; PMP-C-001
AC High Voltage – Source/Measure ¹	(0.7 to 1.02) kV 60 Hz (1.02 to 35) kV 60 Hz	8.2 % of reading – 56 V 3.2 % of reading – 5.5 V	Keysight Multimeter, High Voltage Probe; PMP-C-003
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	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	Agilent Multimeter; PMP-C-003
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	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	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	Agilent Multimeter, Multifunction Calibrator; PMP-C-003

Electrical – DC/Low Frequency

Hermosillo, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Measuring Equipment ¹	(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	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	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	Agilent Multimeter with Leeds & Northrup Shunt Resistor; PMP-C-002
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	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	Multifunction Calibrator, 50-turn Coil; PMP-C-002

Electrical – DC/Low Frequency

Hermosillo, 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 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	Agilent Multimeter; PMP-C-004
AC Current – Source Equipment	(1 to 50) A 60 Hz	0.7 mA	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	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 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	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	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	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	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	Agilent Multimeter with Shunt Resistor; PMP-C-005

Electrical – DC/Low Frequency

Hermosillo, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Power Measuring Equipment ¹	10.89 mW to 11 220 W	0.2 % of reading – 2 μ W	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 μ W	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 μ W	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 μ W	Multifunction Calibrator; PMP-C-005
Resistance – Measuring Equipment ¹	Up to 1 Ω (1 to 10) Ω (10 to 100) Ω 100 Ω to 1 k Ω (1 to 10) k Ω (10 to 100) k Ω 100 k Ω to 1 M Ω (1 to 10) M Ω (10 to 100) M Ω 100 M Ω to 1 G Ω	0.11 m Ω / Ω 20 $\mu\Omega$ / Ω 19 $\mu\Omega$ / Ω 11 $\mu\Omega$ / Ω 11 $\mu\Omega$ / Ω 11 $\mu\Omega$ / Ω 18 $\mu\Omega$ / Ω 61 $\mu\Omega$ / Ω 70 $\mu\Omega$ / Ω 5.8 m Ω / Ω	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 k Ω (1 to 10) k Ω (10 to 100) k Ω 100 k Ω to 1 M Ω (1 to 10) M Ω (10 to 100) M Ω 100 M Ω to 1 G Ω	0.11 m Ω / Ω 20 $\mu\Omega$ / Ω 19 $\mu\Omega$ / Ω 11 $\mu\Omega$ / Ω 11 $\mu\Omega$ / Ω 11 $\mu\Omega$ / Ω 18 $\mu\Omega$ / Ω 61 $\mu\Omega$ / Ω 70 $\mu\Omega$ / Ω 5.8 m Ω / Ω	Agilent Multimeter; PMP-C-006
Resistance – Source/Measuring Equipment (High Value Resistors and Decade Resistors)	100 k Ω to 1 T Ω Up to 5 000 V Max	23 m Ω / Ω	Multifunction Calibrator, Agilent Multimeter, High Voltage Probe; PMP-C-006
DC Shunt Resistance Equipment ¹	0.5 m Ω to 1 Ω @ (1 to 50) A	0.005 % of reading + 11 $\mu\Omega$	Agilent Multimeter with Shunt Resistor; PMP-C-006
AC electrical Resistance at 60 Hz Shunt Resistance ¹	1 m Ω to 1 Ω (1 to 50) A	0.005 % of reading + 11 $\mu\Omega$	Agilent Multimeter with Shunt Resistor; PMP-C-006

Electrical – DC/Low Frequency

Hermosillo, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Capacitance – Measuring Equipment ¹	100 pF to 1 μ F 50 Hz to 1 kHz	(0.07 + 0.000 001C) pF	Capacitance Decade; PMP-C-009
Inductance ^{1,3} – Measuring Equipment	100 mH to 2 H	0.23 mH/H	Inductance Decade; PMP-C-029
Thermocouple Electrical Simulation ¹	Type B (600 to 800) °C	0.44 °C	Multifunction Calibrator; PMP-C-020
	(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	
	Type K (-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	

Electrical – DC/Low Frequency

Hermosillo, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Thermocouple Electrical Simulation ¹	Type N (-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 410) °C (410 to 1 300) °C Type R (0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C Type S (0 to 250) °C (250 to 1 000) °C (1 000 to 1 400) °C (1 400 to 1 767) °C Type T (-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C Type U (-200 to 0) °C (0 to 600) °C	0.4 °C 0.22 °C 0.19 °C 0.18 °C 0.27 °C 0.57 °C 0.35 °C 0.33 °C 0.4 °C 0.47 °C 0.36 °C 0.37 °C 0.46 °C 0.63 °C 0.24 °C 0.16 °C 0.14 °C 0.56 °C 0.27 °C	Multifunction Calibrator; PMP-C-020
RTD Electrical Simulation ¹	Cu 427 10 Ω (-100 to 260) °C Pt 385, 100 Ω (-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C (630 to 800) °C	0.3 °C 0.05 °C 0.05 °C 0.07 °C 0.09 °C 0.1 °C 0.12 °C 0.23 °C	Multifunction Calibrator; PMP-C-020

Electrical – DC/Low Frequency

Hermosillo, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
RTD Electrical Simulation ¹	Pt 3916, 100 Ω		Multifunction Calibrator; PMP-C-020
	(-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	
	Pt 385, 500 Ω		
	(-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	

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, 1000 Ω		Multifunction Calibrator; PMP-C-020
	(-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

Hermosillo, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Outside Micrometers	Up to 1 016 mm	2.2 μin	Gage Blocks (Grade 2, Grade 3); PMP-C-014, Reference Standard NMX-CH-099-IMNC-2005
	Up to 40 in	87 μin	
Depth Micrometers	Up to 1 016 mm	2.2 μm	Gage Blocks Grade 2, Gage Blocks Grade 3; PMP-C-014
	Up to 40 in	87 μin	
Dial and Digital Indicators	Up to 101.6 mm	0.94 μm	Gage Blocks Grade 2; PMP-C-014, NMX-CH-36-1994
	Up to 4 in	37 μin	
Calipers ³	Up to 1 016 mm	(11.4 + 0.002L) μm	Comparison to Gage Blocks Grade 2; PMP-C-014, NMX-CH-2:1993-SCFI
	Up to 40 in	(450 + 2L) μin	
Height Measuring Equipment ³	Up to 1 016 mm	(0.97 + 0.008 6L) μm	Granite Surface Plate, Gage Blocks; PMP-C-014
	Up to 40 in	(38 + 8.6L) μin	

Length – Dimensional Metrology

Hermosillo, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Optical Comparator ^{2,3} X, Y Axis – Linear Error of Indication	Up to 508 mm Up to 20 in	$(0.33 + 0.014L) \mu\text{m}$ $(13 + 14L) \mu\text{in}$	Glass Scales, Gage Blocks Grade 2, Gage Block Grade 3; PMP-C-014
Optical Comparators ² Angular	(0 to 360)°	0.019°	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	Glass Ruler; PMP-C-014
Graduated Rules, Tape Measures	Up to 25 m Up to 985 in	0.41 mm 16.2 μin	Digital Indicator, Stainless Ruler, 5X Amplification Lens; PMP-C-014, NOM-040-SCFI-1994, NOM-046-SCFI-1999
Coating Thickness ³	Up to 6.35 mm Up to 0.25 in	$(0.72 + 0.0017L) \mu\text{m}$ $(28 + 1.7L) \mu\text{in}$	Digital Indicator, Gage Blocks Grade 2; PMP-C-014
Surface Roughness Measuring Devices	Ra 2.94 μm 116 μin Ry 9.3 μm 366 μin	61 nm 2 μin 0.2 μm 8 μin	Roughness Standard (Ra, Ry); PMP-C-038
Levels	(-4 125 to +4 125)"	0.42"	Sine Bar; 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	$(0.1 + 0.047L) \mu\text{m}$ $(3.9 + 1.9L) \mu\text{in}$	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 μ g 8.8 μ g 70 μ g 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 μ g 0.000 3 % of reading + 10 μ g 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 Class 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) μ L (100 to 500) μ L (500 to 1 000) μ L 1 mL to 5 L (5 to 30) L	0.04 % of reading + 0.11 μ L 0.032 % of reading + 0.16 μ L 0.38 μ L – 0.018 % of reading 0.02 % of reading 0.012 % of reading + 0.35 nL	Digital Balance; PMP-C-033
Water Flow ¹	Up to 1 500 lpm	1 % of reading + 0.6 lpm	Digital 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 μ N·m 0.7 % of reading – 4 mN·m 0.8 % of reading – 20 mN·m	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	Torque Transducer, Torque Meter; PMP-C-015, CNM-MMF-PT-002, EA-10/14

Mass and Mass Related

Hermosillo, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Torque Measuring Tools ¹	(678 to 1 355) N·m	(2.9 + 0.000 77) N·m	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	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	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	Master Flow Meter; PMP-C-030
Air Velocity ¹	Up to 25 m/s	0.87 % of reading + 0.18 m/s	Digital Anemometer; PMP-C-030
Hydrometer ³	(0.62 to 3) SG	0.42 % of reading + 0.023 SG	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	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 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 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	Dead weights; 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	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 μ N	Multifunction Calibrator, Digital Multimeter, Deadweights; PMP-C-011, NMX-CH-27-1994-SCFI, NMX-CH-023-1994-SCFI
Force Transducers, Force Tools, Force Measuring Equipment ¹ (compression)	(222 to 1 760) kN	1 % of reading – 3.7 N	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 inH ₂ O	0.37 % of reading – 8.5 mPa 0.37 % of reading – 0.000 034 inH ₂ O	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	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	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	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	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	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	RTD with Digital Multimeter; PMP-C-007
Temperature ¹ (Temperature Sources, Installations, Ovens, Chambers, Dry Wells)	(-80 to 0) °C (0 to 232) °C (232 to 660) °C	0.003 8 % of reading + 0.028 °C 0.009 1 % of reading + 0.028 °C 0.008 2 % of reading + 0.030 °C	RTD with Digital Multimeter; PMP-C-007
Temperature ¹ (Temperature Sources and Temperature Chambers)	(660 to 1 000) °C	0.088 % of reading + 1.3 °C	Thermocouple Probe and Temperature Indicator; PMP-C-007
Temperature – RTD with Multimeter	(-80 to 0) °C (0 to 232) °C (232 to 660) °C	0.003 8 % of reading + 0.034 °C 0.006 5 % of reading + 0.034 °C 0.006 3 % of reading + 0.035 °C	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) °C (0 to 400) °C (400 to 600) °C	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, Dry Well, Temperature Bath; PMP-C-007
Temperature ¹ Temperature Measuring Devices (Digital, Mechanical)	(600 to 1 000) °C	0.053 % of reading + 1.8 °C	Thermocouple Probe with Temperature Indicator, High Temperature Oven; PMP-C-007
Temperature ¹ Environmental Thermometers	(-20 to 0) °C (0 to 100) °C	0.5 % of reading + 0.14 °C 0.27 % of reading + 0.14 °C	RTD with Digital Multimeter; PMP-C-007
Temperature ¹ (Temperature Sources, Installations, Ovens, Chambers, Dry Wells)	(-80 to 0) °C (0 to 232) °C (232 to 660) °C	0.003 8 % of reading + 0.028 °C 0.009 1 % of reading + 0.028 °C 0.008 2 % of reading + 0.030 °C	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
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	Frequency Counter; PMP-C-008
Frequency – Measuring Equipment	0.1 Hz to 18 GHz	1 nHz/Hz	GPS Receiver, Universal Counter, PMP-C-008
Frequency – Source Equipment	Up to 1 MHz (1 to 225) MHz (225 to 600) MHz	0.3 μ Hz/Hz 15 nHz/Hz 14 nHz/Hz	Multifunction Calibrator, Universal Counter, GPS Frequency Counter; PMP-C-008

DIMENSIONAL MEASUREMENT

2 Dimensional

Hermosillo, Sonora

Parameter/Equipment	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 μ m (90 + 5L) μ m (80 + 11L) μ m	Vision System utilized as Reference; Customer Drawings, Vision Software

Services performed at satellite location

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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	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	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	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	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	Multifunction Calibrator; PMP-C-042
Oscilloscopes Square Wave Signal into 50 Ω load into 1 M Ω 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	Multifunction Calibrator; PMP-C-042
DC High Voltage – Source/Measure ¹	(1 to 10) kV	1.4 % of reading	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	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 μ V/V 8.3 μ V/V 8.1 μ V/V 10 μ V/V 10 μ V/V	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 μ V/V 8.3 μ V/V 8.1 μ V/V 10 μ V/V 10 μ V/V	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	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	Agilent Multimeter, Multifunction Calibrator; PMP-C-003
DC Current – Source Equipment	(10 to 100) nA (0.1 to 1) μ A (1 to 10) μ A (10 to 100) μ A (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A	0.11 mA/A 24 μ A/A 16 μ A/A 7 μ A/A 9 μ A/A 7 μ A/A 12 μ A/A 30 μ A/A	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	Multifunction Calibrator with Shunt Resistor; PMP-C-002
DC Current – Measuring Equipment ¹	(10 to 100) nA (0.1 to 1) μ A (1 to 10) μ A (10 to 100) μ A (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A (1 to 11) A (11 to 50) A	90 μ A/A 24 μ A/A 16 μ A/A 7 μ A/A 9 μ A/A 7 μ A/A 12 μ A/A 21 μ A/A 71 μ A/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	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	0.2 mA/A 0.14 mA/A 0.28 mA/A 0.21 mA/A	Agilent Multimeter, Multifunction Calibrator; PMP-C-004

Electrical – DC/Low Frequency

Guaymas, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
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	Agilent Multimeter, Multifunction Calibrator; PMP-C-004
AC Current – Source Equipment	(1 to 30) A 60 Hz	0.41 mA/A	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	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	Multifunction Calibrator, 50-turn Coil; PMP-C-004
DC Power – Source Equipment	10.89 mW to 11 220 W	0.04 % of reading - 2 μ W	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 μ W	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 μ W	Digital Multimeter, 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 μ W	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 μ W	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 μ W	Multifunction Calibrator; PMP-C-005

Electrical – DC/Low Frequency

Guaymas, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Power – Measuring Equipment ¹	0.89 mW to 11 220 W @ 60 Hz, P.F. = 0.9	0.21 % of reading + 12 μ W	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 μ W	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 k Ω (1 to 10) k Ω (10 to 100) k Ω 100 k Ω to 1 M Ω (1 to 10) M Ω (10 to 100) M Ω 100 M Ω to 1 G Ω	0.23 m Ω / Ω 0.11 m Ω / Ω 20 $\mu\Omega$ / Ω 17 $\mu\Omega$ / Ω 11 $\mu\Omega$ / Ω 11 $\mu\Omega$ / Ω 11 $\mu\Omega$ / Ω 18 $\mu\Omega$ / Ω 61 $\mu\Omega$ / Ω 70 $\mu\Omega$ / Ω 5.8 m Ω / Ω	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 k Ω (1 to 10) k Ω (10 to 100) k Ω 100 k Ω to 1 M Ω (1 to 10) M Ω (10 to 100) M Ω 100 M Ω to 1 G Ω	0.18 m Ω / Ω 0.11 m Ω / Ω 20 $\mu\Omega$ / Ω 19 $\mu\Omega$ / Ω 11 $\mu\Omega$ / Ω 11 $\mu\Omega$ / Ω 11 $\mu\Omega$ / Ω 18 $\mu\Omega$ / Ω 61 $\mu\Omega$ / Ω 70 $\mu\Omega$ / Ω 5.8 m Ω / Ω	Digital Multimeter; PMP-C-006
Generation/Measuring Resistance Equipment ¹ (High value resistors, Decades)	100 k Ω to 10 G Ω Up to 5 kV	2.6 % of reading - 12 M Ω	Multifunction Calibrator, Agilent Digital Multimeter, High Voltage Probe; PMP-C-006
DC Shunt Resistance Equipment ¹	0.5 m Ω to 1 Ω @ (1 to 50) A	0.059 % of reading - 17 $\mu\Omega$	Agilent Digital Multimeter, Shunt Resistor; PMP-C-006
AC Resistance – Shunt Resistance ¹	0.5 m Ω to 1 Ω (1 to 50) A	0.059 % of reading - 17 $\mu\Omega$	Agilent Digital Multimeter, Shunt Resistor; PMP-C-006
Capacitance ^{1,3} Source Equipment	100 pF to 10 μ F 50 Hz to 1 kHz	0.42 mF/F	LCR Meter; PMP-C-009
Capacitance ^{1,3} – Measuring Equipment	100 pF to 1 μ F 50 Hz to 1 kHz	4 mF/F	Capacitance Decade; PMP-C-009

Electrical – DC/Low Frequency

Guaymas, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
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	Multifunction Calibrator, Agilent Multimeter; PMP-C-020
RTD Electrical Simulation ¹	Cu 427 10 Ω (-100 to 260) °C Pt 385, 100 Ω (-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C (630 to 800) °C	0.3 °C 0.05 °C 0.05 °C 0.07 °C 0.09 °C 0.1 °C 0.12 °C 0.23 °C	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 3926, 100 Ω		Multifunction Calibrator; PMP-C-020
	(-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 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 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	
	Pt 385, 500 Ω		
	(-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	

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, 1000 Ω		Multifunction Calibrator; PMP-C-020
	(-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	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	Gage Blocks Grade 2, Gage Blocks Grade 3; PMP-C-014
	Up to 40 in	87 μin	
Dial and Digital Indicators ¹	Up to 101.6 mm	0.94 μm	Calibration Tester, Dial Gage Tester; PMP-C-014, NMX-CH-36-1994
	Up to 4 in	37 μin	
Calipers ^{1,3}	Up to 1 016 mm	(11.4 + 0.003L) μm	Gage Blocks Grade 2, Gage Blocks Grade 3; PMP-C-014, NMX-CH-2:1993-SCFI
	Up to 40 in	(450 + 2L) μin	
Height Measuring Equipment	Up to 1 016 mm	11.2 μm	Gage Blocks Grade 2, Gage Blocks Grade 3, Surface Plate; PMP-C-014
	Up to 40 in	440 μin	

Length – Dimensional Metrology

Guaymas, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Optical Comparator ² X, Y Axis – Linear Error of Indication	Up to 508 mm Up to 20 in	6.1 µm 240 µin	Glass Scales, Gage Blocks Grade 2, Gage Block Grade 3; PMP-C-014
Optical Comparators ² Angular	(0 to 360)°	0.019°	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	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	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	Digital Indicator, Gage Blocks Grade 2 (GGG-G-15C); PMP-C-014
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	Mitutoyo Roughness Standards; PMP-C-038
Levels ¹	(0 to 60)°	0.000 7°	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 + 0.02L) 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	Gage Blocks Grade 2, Universal Length Measuring Machine; PMP-C-014

Length – Dimensional Metrology

Guaymas, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Thread Plug Gauge Pitch Diameter	M 1.6 x 0.35 to M 100 x 6 (0-80 to 4-12)	5.1 μ m 200 μ in	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 μ m 71 μ in	P&W Supermicrometer [®] , Gage block set grade 2; PMP-C-014
Protractors	(0 to 360)°	0.059°	Angle Block; PMP-C-014
Bore Gauges	(0.762 to 304.8) mm (0.03 to 12) in	3.1 μ m 120 μ in	Ring Gages, Vision Microscope; PMP-C-014
Ring Gauges	(12.7 to 101.6) mm (0.5 to 4) in	0.36 μ m 14 μ in	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 μ g 0.000 3 % reading + 10 μ g 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	Digital Balance; PMP-C-033

Mass and Mass Related

Guaymas, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
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	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	Dead Weights, 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	Dead Weights, 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	Dead Weights, Torque Arm; PMP-C-015
Hydrometers ³	(0.62 to 3) SG	0.02 % of reading + 0.005 6 SG	Digital Scale, Digital Thermometer; PMP-C-032, NBS Circular 555
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

Mass and Mass Related

Guaymas, 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 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	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	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	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	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	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	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	Humidity Meter and Thermometer using Certified Salts; PMP-C-028

Thermodynamic

Guaymas, Sonora

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Temperature ¹ Furnace System Accuracy Test (SAT), Furnace Temperature Uniformity Test (TUS)	(50 to 150) °C	0.15 % of reading + 0.16 °C	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	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)	(300 to 400) °C	1.6 % of reading - 3.8 °C	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) °C (0 to 232) °C (232 to 660) °C	0.003 8 % of reading + 0.028 °C 0.009 1 % of reading + 0.028 °C 0.008 2 % of reading + 0.03 °C	RTD with Digital Multimeter; PMP-C-007
Temperature ¹ (Temperature Sources, Installations, Ovens, Chambers, Dry Wells Temperature Sources, Temperature Chambers)	(660 to 1 000) °C	0.088 % of reading + 1.3 °C	Thermocouple Probe with Temperature Indicator; PMP-C-007
Temperature ¹ (Digital/Analog Temperature Measuring Devices with Thermocouple, RTD, Thermistors; Mechanical/ Analog Thermometers)	(-20 to 0) °C (0 to 400) °C (400 to 600) °C	-0.09 % of reading + 0.031 °C 0.009 % of reading + 0.031 °C 0.035 % of reading - 0.071 °C	RTD with Digital Multimeter, Dry Well, Temperature Bath; PMP-C-007
Temperature ¹ (Temperature Measuring Devices; Digital, Mechanical)	(600 to 1 000) °C	0.053 % of reading + 1.8 °C	Thermocouple Probe with Temperature Indicator, High Temperature Oven; PMP-C-007
Temperature ¹ (Environmental Thermometers)	(-20 to 0) °C (0 to 100) °C	0.5 % of reading + 0.14 °C 0.27 % of reading + 0.14 °C	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 μ Hz/Hz 15 nHz/Hz	GPS Frequency Standard; PMP-C-008
Frequency – Measure	Up to 1 MHz (1 to 225) MHz (225 to 600) MHz	0.3 μ Hz/Hz 15 nHz/Hz 14 nHz/Hz	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	Frequency Counter; PMP-C-008

DIMENSIONAL MEASUREMENT

3 Dimensional

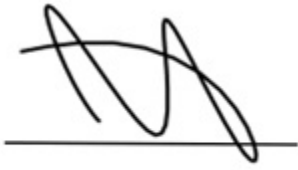
Guaymas, Sonora

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 μ in (44 + 5.5L) μ in (26 + 7.3L) μ in (10 + 8L) μ in	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:

- 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.
- This parameter is only available on-site and not in the laboratory's facilities.
- L = length in inches or mm; SG = specific gravity; DF = dissipation factor; " = arc-second.
- 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.
- Nominal values are approximate. The actual values will be used at the time of calibration, along with the appropriate measurement uncertainty.
- Volumetric performance test (reproducibility) is done using a non-calibrated ball length bar per ASME B89.4.1-1997.
- Not all parameters apply to all Durometer Types.
- This parameter is a dimensionless parameter (no unit of measure).



Jason Stine, Vice President

