CERTIFICATE OF ACCREDITATION

ANSI National Accreditation Board

11617 Coldwater Road, Fort Wayne, IN 46845 USA

This is to certify that

Metrología y Pruebas, S. A. de C. V.

Privada Tecnologico No. 25
Nogales, Sonora México

has been assessed by ANAB and meets the requirements of international standard

ISO/IEC 17025:2017

while demonstrating technical competence in the fields of

CALIBRATION, DIMENSIONAL MEASUREMENT & TESTING

Refer to the accompanying Scope of Accreditation for information regarding the types of activities to which this accreditation applies

ACT-1890
Certificate Number

ANAB Approval

Certificate Valid Through: 11/11/2021
Version No. 007 Issued: 08/06/2019

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).

ANSI National Accreditation Board

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

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CALIBRATION, DIMENSIONAL MEASUREMENT, AND TESTING

Valid to: **November 11, 2021** Certificate Number: **ACT-1890**

CALIBRATION

Acoustics and Vibration

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Sound	(20 to 140) dB 100 Hz to 10 kHz	0.86 dB	Sound Calibrator Sound Level Meter PMP-C-036
Acceleration[3]	(0.1 to 10) g @ (10 to 6 000) Hz	(0.000 7+0.013*a*) g	Accelerometer Brüel & Kjær PMP-C-051

Chemical Quantities

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Particle Counter	Size Particles 0.3 µm 0.5 µm 1.0 µm 5.0 µm 10.0 µm Concentration Limit (0 to 3 000 000) particles /ft^3	(1.3 + 0.000 83Δ) particles /ft^3 Δ en particles /ft^3	Particle counter PMP-C-050

Chemical Quantities

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
pH Meters	2.00 pH 4.00 pH 6.80 pH 7.00 pH 9.00 pH 10.00 pH 12.50 pH	0.01 pH 0.014 pH 0.012 pH 0.012 pH 0.018 pH 0.024 pH 0.031 pH	pH Buffer Solutions PMP-C-040
Conductivity Meters	100 µS/cm^2 1 000 µS/cm^2 5000 µS/cm^2 10 000 µS/cm^2 100 000 µS/cm^2	1 µS/cm^2 5.1 µS/cm^2 20 µScm^2 20 µS/cm^2 400 µS/cm^2	Traceable 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 100 000) cP	1.16 cP (1.1 + 0.004z) cP (0.42 + 0.01z) cP (0.68 + 0.01z) cP (14 + 0.01z) cP	Viscosity Standards PMP-C-37
Breathalyzer	0.020 g/210L @ 34 °C 0.030 g/210L @ 34 °C 0.1 g/210L @ 34 °C	0.000 8 g/210L 0.001 g/210L 0.003 g/210L	Alcohol Reference Solution PMP-C-049
Gas Measurement Equipment	CO (100 ppm) H2S (25 ppm) CH4 (2.5% vol, 50%LEL) NO2 (10ppm) SO2 (20ppm) i-C4H10	2% of reading	Gas Reference PMP-C-044

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscopes Leveled Sine Wave Square Wave Signal 10 Hz to 10 kHz Rise Time 5 mV to 2.5 V	5 mV to 5.5 V 50 kHz to 100 MHz (50 to 300) MHz (300 to 600) MHz (1 mV to 6.6 V) p-p (50 Ω load) (1 mV to 130 V) p-p (1 MΩ load) 1 kHz to 10 MHz	40 mV/V 45 mV/V 65 mV/V 1.2 mV/V 1.3 mV/V 1 ms/s	Fluke Multifunction Calibrator PMP-C-010
DC High Voltage - Source	(1 to 10) kV	0.021 V/V	High Voltage Probe Charged Plate Analyzer Monroe Electronics PMP-C-001
DC High Voltage - Measure	(1 to 10) kV	0.021 V/V	High Voltage Probe Charged Plate Analyzer Monroe Electronics Up to 10 000 V Multimeter DC Hy-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	HP Multimeter PMP-C-001
DC Voltage – Measure 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	HP Multimeter Fluke Multifunction Calibrator PMP-C-001

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
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	HP 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	 0.41 mV/V 0.16 mV/V 0.32 mV/V 0.82 mV/V	HP Multimeter PMP-C-003
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	HP Multimeter Fluke Multifunction Calibrator PMP-C-003
AC Voltage – Source equipment	(1 to 15) kV 60 Hz	 0.02 V/V	Tektronix High Voltage Probe PMP-C-003
AC Voltage – Source equipment	(15 to 60) kV 60 Hz	 0.032 mV/V	Hipotronix Transformer

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Measure 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 10V 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	 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	HP Multimeter Fluke Multifunction Calibrator PMP-C-003
	(100 to 1 000) V 50 Hz to 1 kHz	 0.43 mV/V	HP Multimeter PMP-C-003
AC Voltage – Measure equipment	(1 to 15) kV 60 Hz	 0.02 V/V	Hipotronics Transformer PMP-C-003
	(15 to 60) kV 60 Hz	 0.02 V/V	High Voltage Probe 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	432 µA/A 64 µA/A 32 µA/A 30 µA/A 26 µA/A 26 µA/A 40 µA/A 122 µA/A	HP Multimeter PMP-C-002
	(1 to 11) A (11 to 550) A	0.54 mA/A 2.6 mA/A	HP Multimeter with standard shunts PMP-C-002

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Current – Measure 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	720 µA/A 64 µA/A 32 µA/A 30 µA/A 26 µA/A 26 µA/A 41 µA/A 121 µA/A	HP Multimeter Fluke Multifunction Calibrator PMP-C-002
DC Current – Measure equipment Clamp-On Ammeters	(1 to 11) A (11 to 100) A (11 to 550) A	1.1 mA/A 0.92 mA/A 2.6 mA/A	Fluke Multifunction Calibrator Shunt Resistors 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 100mA to 1 A (50 to 100) Hz 100 Hz to 1 kHz	 0.8 mA/A 0.21 mA/A 0.21 mA/A 0.21 mA/A 0.21 mA/A 0.21 mA/A	HP Multimeter PMP-C-004
	(1 to 11) A 60 Hz	 1.4 mA/A	Fluke Multifunction Calibrator PMP-C-004 Current Shunts PMP-C-004
AC Current – Source equipment	(11 to 50) A 60 Hz (11 to 550) A 60 Hz	 6.8 mA/A 8 mA/A	with Shunt Resistor Leeds & Northrup 4361 PMP-C-004
AC Current – Measure 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	 0.8 mA/A 0.5 mA/A 0.8 mA/A 0.51 mA/A 1 mA/A 1.2 mA/A	HP Multimeter Fluke Multifunction Calibrator PMP-C-003

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
	(1 to 11) A 60 Hz (11 to 50) A 60 Hz	1.6 mA/A 6.8 mA/A	Current Shunts PMP-C-003
AC Current – Measure equipment Clamp-On Ammeters	(11 to 550) A 60 Hz	8 mA/A	Fluke Multifunction Calibrator with 50-Turn Coil PMP-C-003
DC Power Measure equipment	10.89 mW to 11 220 W	0.82 mW/W	Fluke Multifunction Calibrator PMP-C-005
DC Power Source equipment	10.89 mW to 11 220 W	0.41 mW/W	HP Multimeter Shunt resistors DC Power Supply PMP-C-005A
AC Power – Measure equipment	10.89 mW to 11 220 W @ 60 Hz, P.F. = 1 10.89 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	Fluke Multifunction Calibrator PMP-C-005
AC Power – Source equipment	10.89 mW to 11220 W @ 60 Hz, P.F. = 1 10.89 mW to 11220 W @ 60 Hz, P.F. = 0.9 10.89 mW to 11220 W @ 60 Hz, P.F. = 0.8	1.4 mW/W 3 mW/W 4.4 mW/W	HP Multimeter Shunt resistors DC Power Supply PMP-C-005
Resistance – Measure equipment	(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	20 μΩ/Ω 17 μΩ/Ω 11 μΩ/Ω 11 μΩ/Ω 11 μΩ/Ω 17 μΩ/Ω 60 μΩ/Ω 0.5 mΩ/Ω 5 mΩ/Ω	HP Multimeter Fluke Multifunction Calibrator PMP-C-006

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Resistance – Source equipment	(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	20 µΩ/Ω 17 µΩ/Ω 11 µΩ/Ω 11 µΩ/Ω 11 µΩ/Ω 17 µΩ/Ω 60 µΩ/Ω 0.5 mΩ/Ω 5.1 mΩ/Ω	HP Multimeter PMP-C-006
Resistance Generation Equipment High value resistors and decade resistors	1 MΩ to 1 TΩ @ (50 to 1 000) V	0.023 Ω/Ω	Fluke Multifunction Calibrator HP Multimeter High Value R Decade (1 MΩ to 1 TΩ) PMP-C-006
Resistance Measuring Equipment Megaohmeters	100 kΩ to 1 GΩ @ (Up to 5 000) V 1 GΩ to 1 TΩ @ (1 to 10) kV	0.08 Ω/Ω 0.023 Ω/Ω	Direct method with: High Value R Decade (1 MΩ to 1 TΩ) PMP-C-006
DC Shunt Resistance Equipment	0.5 mΩ to 1 Ω @ (Up to 300) A	0.45 mΩ/Ω	HP Multimeter Shunt resistor 0.01Ω Shunt resistor 0.1Ω 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	Fluke Multifunction Calibrator HP Multimeter DC Power Supply Shunt resistors PMP-C-006
Capacitance Source equipment	0.01 pF to 10 µF 12 Hz to 100 kHz	0.42 mF/F	Capacitance Bridge Precision LCR Meter PMP-C-009
Capacitance – Measure 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 1000 pF Capacitor 10 000 pF Capacitor Fluke Multifunction Calibrator PMP-C-009

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Inductance – Source equipment	Up to10 H @ 12 Hz to 100 kHz	0.069 mH/H	LCR Bridge Precision LCR Meter PMP-C-029
Inductance – Measure equipment	1 mH to 10 H	0.23 mH/H	Precision LCR Meter Standard Inductors PMP-C-029
Phase Angle Output	(0 to 180) °	0.15 °	Krohn-Hite Phase Meter PMP-C-005
Electrical Simulation of Temperature – Measure/ Source	Pt 385, 100 Ω (-196 to 1 000) °C	0.03 °C	Electrical simulation of RTD HP Multimeter Fluke Multifunction Calibrator PMP-C-020
Electrical Simulation of Temperature Type B Type C Type E Type J Type K Type L Type N Type R Type T Type S Type U	 (600 to 1 820) °C (0 to 2 316) °C (-250 to 1 000) °C (-250 to 1 200) °C (-200 to 1 372) °C (-200 to 900) °C (-200 to 1 300) °C (0 to 1 767) °C (-250 to 400) °C (0 to 1 767) °C (-200 to 600) °C	 0.07 °C 0.11 °C 0.08 °C 0.05 °C 0.07 °C 0.06 °C 0.07 °C 0.08°C 0.06 °C 0.07°C 0.08 °C	Fluke Multifunction Calibrator HP Multimeter PMP-C-020
Magnetic Field[3]	3 mT to 3 T	(0.01+ 1*P*) mT	Magnetic Field Meter PMP-C-051

Electrical – RF/Microwave

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Power - Source 50 Ω load	(-30 to 20) dBm (10 MHz to 18 GHz) 20 dBm -30 dBm	 0.092 dB 1.1 dB	Power Sensor Power Meter PMP-C-008

Electrical – RF/Microwave

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
	(-90 to 20) dBm (10 MHz to 13.2 GHz) 20 dBm -90 dBm	 0.26 dB 0.4 dB	Spectrum Analizer PMP-C-008
Power - Measure 50 Ω load	(-90 to 20) dBm (10 MHz to 4 GHz) 20 dBm -90 dBm	 0.41 dB 0.49 dB	Signal Generator Spectrum Analizer PMP-C-008
Power - Measure 50 Ω load	(-90 to 8) dBm (2 GHz to 13.2 GHz) 8 dBm -30 dBm	 0.23 dB 1.1 dB	Signal Generator Power Sensor Power Meter PMP-C-008
Power - Measure 50 Ω load	(-30 to 8) dBm (2 to 18) GHz 8 dBm -90 dBm	 0.33 dB 0.45 dB	Signal Generator Spectrum Analizer PMP-C-008
RF/Microwave Phase Modulation – Measure / Generate	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 - Source and Measure 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- Source and Measure	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

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Depth Micrometers[3]	Up to 1016 mm Up to 40 in	(1.5 + 0.008*L*) µm (61 + 8*L*) µin	Gage Blocks Grade 2 Gage Blocks Grade 3 PMP-C-014
Outside Micrometers[3]	Up to 1 016 mm Up to 40 in	(0.78 + 0.008 7*L*) µm (31 + 8.7*L*) µin	Gage Blocks Grade 2 Gage blocks Grade 3 PMP-C-014 Reference Standard NMX-CH-099-IMNC-2005
Inside Micrometers[3]	5.08 to 1016 mm 0.2 to 40 in	(0.7+ 0.008 8*L*) µm (27 + 8.8*L*) µin	Gage Blocks Grade 2 Gage blocks Grade 3 PMP-C-014 NMX-CH-099-IMNC-2005
Dial and Digital Indicators[3]	Up to 101.6 mm Up to 4 in	(0.91+ 0.004 3*L*) µm (36 + 4.3*L*) µin	Gage Blocks Grade 2 PMP-C-014 NMX-CH-36-1994
Optical Comparator[2,3] Linear	Up to 508 mm Up to 20 in	(0.23 + 0.001 9*L*) µm (9.2 + 1.9*L*) µin	Glass Scales Gage Blocks Grade 2 Gage Block Grade 3 PMP-C-014
Optical Comparators[2] Angular	(0 to 360) º	0.015 º	Angle block PMP-C-014
Optical Comparators[2] Squareness	4 in of Y axis travel or maximum, Y axis travel if maximum is less than 4 in. 276.5µin at 4 in	1 °	Master Square PMP-C-014
Optical Comparators[2] Magnification	5x 10x 20x 50x 100x	0.07x 0.13x 0.24x 0.45x 0.7 x	Glass Ruler PMP-C-014
Height Measuring Equipment[3]	Up to 609.6 mm (Up to 24 in)	(7.33 + 0.0032*L*) µm (289 + 3.2*L*) µin	Granite Surfase Gage Blocks PMP-C-014
Graduated Rules and Flexometers[3]	Up to 25 m (Up to 984 in)	(0.000 5*L*+0.000 84) µm (0.51*L*+0.033) µin,	MPC490 API Laser Interferometer PMP-C-014 NOM-040-SCFI-1994 & NOM-046-SCFI-1999

Length – Dimensional metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Graduated Rules and Flexometers[3]	Up to 508 mm (Up to 20 in)	(20+0.041*L*) µm (791+41*L*) µin	Digital Indicator Stainless Ruler 5X Amplification Lens PMP-C-014 NOM-040-SCFI-1994 & NOM-046-SCFI-1999
Calipers[3]	Up to1 016 mm	(20 + 0.002 2*L*) µm	Gage Blocks Grade 2 PMP-C-014 NMX-CH-2:1993-SCFI
Calipers[3]	(Up to 40 in)	(780 + 2.2*L*) µin	Gage Blocks Grade 3 PMP-C-014 NMX-CH-2:1993-SCFI
Coordinate Measuring Machines[2,3] Linear Error	Up to 609.6 mm (Up to 24 in)	(0.087 + 0.00 13*L*) µm (3.4 + 1.4*L*) µin	Gage Blocks Grade 2 Gage Blocks Grade 3 PMP-C-014
	(100 to 25 000) mm (4 in to 984 in)	(0.11 + 0.000 5*L*) µm (4.1+ 0.5*L*) µin	API Laser Interferometer PMP-C-014
Coordinate Measuring Machines[2] Volumetric error	(200 to 800) mm (8 to 32 in)	4.34 µm 171 µin	Ball Bars PMP-C-014
Coating Thickness[3]	Up to 1.52 mm Up to 60 000 µin	(2+16*L*) µm (77+ 0.016*L*) µin	Digital Indicator Gage Blocks Grade 2 PMP-C-014
Rugosity	Ra = 2.94 µm (116 µin) Ry = 9.3 µm (366 µin) Ra = 0.41 µm (15.8µin) Ry = 1.58µm (62.2 µin)	0.061 µm 2.4 µin 0.21 µm 8.1 µin 0.061 µm 2.4 µin 0.21 µm 8.1 µin	Rugosity Standard (Ra, Ry) Mitutoyo PMP-C-038
Surface Roughness Standards	(0.13 to 3.8) µm (5 to 150) µin	0.021 µm/µm 0.007 µin/µin	Roughness Tester PMP-C-038
Levels	(0 to 1.15) º	0.000 12 º	MPC286 Level Table Traceable to NIST PMP-C-014
Surface Plates[1] Local Area Flatness only (Repeat Reading)	Up to 1 727 mm (0 to 0.000 2) in	0.99 µm 39 µin	Repetibility Gauge PMP-C-014

Length – Dimensional metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Surface Plates[1] Overall Flatness	Up to (609.6 x 914.4) mm Diagonal (24 x 36) in	0.43 µm 17 µin	API Laser Interferometer 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 + 0.000 8*L*) µm (4 + 0.75*L*) µin	Gage Blocks Grade 1 FS Gage Blocks Comparator PMP-C-014
Gages Blocks[3]	(152.4 to 1 016) mm (6 to 40) in	(-0.033 + 0.000 8*L*) µm (-1.3 + 0.8*L*) µin	Laser Interferometer PMP-C-014
Pin/Plug Gauges	(0.254 to 101.6) mm (0.01 to 4) in	0.36 µm 14µin	Gage Blocks Grade 2 Universal measuring machine PMP-C-014
Ring Gages	(12.7 to 101.6) mm (0.5 to 4) in	0.36 µm 14 µin	Universal 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 PMP-C-014
Angle Blocks	(0 to 90) °	0.014 °	Microscope ”Vision Engineering Hawk” PMP-C-014
Thread Plug Gage Pitch Diameter	M 1.6 x 0.35 to M 100 x 6 (0-80 to 4-12)	5.1 µm 200 µn	Supermicrometer Brown & Sharpe Gage block set 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)	1.8 µm 71 µin	Supermicrometer Brown & Sharpe Gage block set grade 2 PMP-C-014
Protractors	(0 to 360) º	0.059 º	Angle Block PMP-C-014
Bore Gage	(0.762 to 304.8) mm (0.03 to 12) in	3.1 µm 120 µin	Ring gages (anillos) -Microscope ”Vision Engineering Hawk” PMP-C-014
Radius Gage	(0.254 to 25.4) mm (0.01 to 1) in	4.1 µm 160 µin	Microscope ”Vision Engineering Hawk” PMP-C-014

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Dead Weights[3]	(0.01 to 200) g (0.2 to 3) kg (3 to 34) kg (34 to 50) kg	(0.005 8 + 0.000 31W) mg (2.1W - 0.34) mg (9.1W - 22) mg (18W – 320) mg	Class 1 Stainless Weights Digital Scale as Comparison Element Class M2 Weights and Scales PMP-C-021 NIST Handbook 44 OIML R111 ABBA Method
Scales and Balances[1,3]	(1 to 200) g (Res. = 0.01 mg) (200 to 500) g (Res. = 0.1 mg) (500 to 2 000) g (Res. = 0.5 mg) (2 000 to 5 000) g (Res. = 0.5 mg) (5 000 to 15 000) g (Res. = 0.5 mg) (15 to 50) kg (Res.= 0.01 g) (50 to 100) kg (Res.= 0.1 g) (100 to 200) kg (Res.= 0.1 g) (200 to 500) kg (Res.= 5 g) (500 to 1 000) kg (Res.= 5 g) (1 000 to 2 500) kg (Res.= 100 g)	(0.005 7+0.000 31W) mg (0.049+0.000 1W) mg (-0.058+0.000 31W) mg (0.37+0.000 1W) mg (0.18+0.000 14W) mg (-0.055+0.0038W) g (-2.6+0.055W) g (-0.68+0.036W) g (1.7+0.024W) g (-33 + 0.094W) g (-39 + 0.1W) g	ASTM class 1 Weight set MPC088 Weight set MPC458 Weight MPC091 Weight MPC092 Weight MPC093 Weight MPC094 Weight MPC095 Weight MPC096 Weight MPC097 PMP-C-012
Volumetric Recipients[3] (Pipettes, Burettes) (Test Tubes, Syringes) (Flask, Beakers, Hasty Glasses) (Graduated volumetric containers) (Graduated volumetric containers)	(0.1 to 200) ml (0.1 to 200) c m^3	(0.000 0013+ 0.000 13V) ml (0.001 3 + 0.13V) mm^3	Dead Weights Rice Lake PMP-C-033
	(0.1 to 200) ml (0.1 to 200) c m^3	(0.000 0013+ 0.000 13V) ml (0.00 13 + 0.13V) mm^3	Digital Scale PMP-C-033
	(1 to 2000) ml (1 to 2000) c m^3	(0.000 014+ 0.000 14V) ml (-0.014 + 0.14V) mm^3	Digital Scale PMP-C-033
Volumetric Recipients[3] (Pipettes, Burettes)	(200 to 3 000) ml (200 to 3 000) cm^3	(-0.016 + 0.000 21V) ml (-0.016 + 0.000 21V) cm^3	Digital Scale PMP-C-033

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
(Test Tubes, Syringes) (Flask, Beakers, Hasty Glasses) (Graduated volumetric containers) (Graduated volumetric containers)	(3 000 to 30 000) ml (3 000 to 30 000) cm^3	(0.000 13 + 0.03V) ml (0.000 13 + 0.03V) cm^3	Digital Scale PMP-C-033
Water Flow[1,3]	Up to 1 500 l/min	(0.6 + 0.01f) l/min	Digital Flow Meter Badger meter Magneto Flow Primo PMP-C-034
Torque [1]	(0.005 to 1) Nm (0.044 to 8.9) lbf·in	0.007 2 Nm 0.064 lbf·in	Dead Weights Rice Lake PMP-C-015 CNM-MMF-PT-002 & EA-10/14
Torque [1]	(0.9 to 20) Nm 8.0 lbf·in to 15 lbf·ft	0.056 Nm 0.5 lbf·in	Torque Transducer PMP-C-015 CNM-MMF-PT-002 & EA-10/14
Torque [1]	(7.4 to 500) Nm (5.5 to 369) lbf·ft	0.62 Nm 0.46 lbf·ft	Torque Transducer PMP-C-015 CNM-MMF-PT-002 & EA-10/14
Torque [1]	(400 to 678) Nm (295 to 500) lbf·ft	1.6 Nm 1.2 lbf·ft	Torque Transducer PMP-C-015 CNM-MMF-PT-002 & EA-10/14
Air Flow[1,3]	Up to 1 L/min (1 to 20) L/min (20 to 300) L/min	(0.00039 + 0.011f) l/min (0.00076 + 0.0035f) l/min (0.45 + 0.0082f) l/min	Flow Transducers PMP-C-030
Air Velocity[1,3]	(0.4 to 25) m/s	(0.16 + 0.01y) m/s	TPI 575 Digital Anemometer PMP-C-030
Hydrometer[3]	(0.62 to 3) SG	(0.023 – 0.004G) SG	Dead Weights Digital Scale Digital Thermometer PMP-C-032 NBS Circular 555
Vacuum[1,3]	(-100 to 0) kPa (-14.5 to 0) psi	(-1.1 x 10^{-8} + 0.013ρ) kPa (-1.6 x 10^{-9} + 0.013ρ) psi	Pressure Sensor Edwards high Vacuum PMP-C-013

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Rockwell Hardness Testers[2]	(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	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	Indirect Verification using Hardness Blocks
Rockwell Superficial Hardness Testers[2]	(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 (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	0.43 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 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
Direct verification of Hardness Tester A, B, C, D, E, O & DO Extension at zero Reading	(2.46 to 2.54) mm	5 µm	ASTM D-2240 Load Cell, Force Gauge, Balance & Gage Block Optical Projection

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Durometer Indentor Spring Types A, B, E & O Types C, D & DO	 (0.55 to 8.05) N (4.445 to 44.45) N	 0.05 N/N 0.005 N/N	The Durometer Spring is verified with Dead Weights PMP-C-027
Indentor Shape (Not all parameters apply to all of Durometer Types) Indentor Diameter Indentor Tip Diameter Indentor Tip Radius Indentor Tip Angle	 (1 to 20) mm (5 to 90) °	 5 µm 5 µm 5 µm 0.02 °	Microscope "Vision Engineering Hawk"
Standardized Rockwell Hardness Test Blocks	≥ 80 HRA (60 to 80) HRA ≤ 60 HRA ≥ 80 HRBW (60 to 80) HRBW ≤ 60 HRBW ≥ 60 HRC (40 to 60) HRC ≤ 40 HRC ≥ 90 HR15N (80 to 90) HR15N < 80 HR15N ≥ 79 HR30N (60 to 79) HR30N ≤ 60 HR30N ≥ 65 HR45N (50 to 65) HR45N ≤ 50 HR45N ≥ 100 HR15TW (80 to 100) HR15TW ≤ 80 HR15TW	0.17 HRA 0.15 HRA 0.14 HRA 0.28 HRBW 0.21 HRBW 0.17 HRBW 0.2 HRC 0.16 HRC 0.14 HRC 0.21 HR15N 0.2 HR15N 0.2 HR15N 0.22 HR30N 0.2 HR30N 0.19 HR30N 0.2 HR45N 0.25 HR45N 0.23 HR45N 0.22 HR15TW 0.22 HR15TW 0.22 HR15TW	MPC159 Hardness Tester PMP-C-027

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Standardized Rockwell Hardness Test Blocks	≥ 70 HR30TW (50 to 70) HR30TW ≤ 55 HR30TW ≥ 50 HR45TW (25 to 50) HR45TW ≤ 25 HR45TW	0.2 HR30TW 0.21 HR30TW 0.23 HR30TW 0.24 HR45TW 0.23 HR45TW 0.2 HR45TW	MPC159 Hardness Tester PMP-C-027
Force[1] (Tension and Compression)	(0.1 to 5.5) N 5.6 N to 2.5 kN	5.5 mN/N 2.7 mN/N	Dead weights PMP-C-011 NMX-CH-27-1994-SCFI & NMX-CH-023-1994-SCFI
Force[1] (Tension and Compression)	(2.5 to 45) kN (45 to 450) kN	0.7 mN/N	Load Cell PMP-C-011 NMX-CH-27-1994-SCFI & NMX-CH-023-1994-SCFI
Equipment to measure Relative Pressure[1]	Up to 500 Pa	1.8 Pa	2” column Dwyer PMP-C-013 NMX-CH-058-1994 & NMX-CH-060-2006-IMNC
Equipment to measure Relative Pressure[1,3]	Up to 21 MPa	(0.027 + 0.73ρ) kPa	Calibrador de Presion 3000 psi PMP-C-013 NMX-CH-058-1994 & NMX-CH-060-2006-IMNC
Equipment to measure Relative Pressure[1]	21 MPa to 137 MPa	37 kPa	Bascula de pesos muertos PMP-C-013 NMX-CH-058-1994 & NMX-CH-060-2006-IMNC
Equipment to measure Absolute Pressure [3]	UP to 106 kPa	(0.16 + 0.000 58ρ) kPa	Absolute Pressure 0 to 31.5 Hg-in PMP-C-013 NMX-CH-058-1994 & NMX-CH-060-2006-IMNC

Photometry and Radiometry

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Light Intensity Meters[3]	(0.1 to 10 000) lux	(0.043+0.011χ) lux	Minolta T-1 PMP-C-035
UV Meters[3] Medidores de UV	Up to 19W/cm^2	(3.4 x 10^{-6}+0.001 7v) W/cm^2	Meter UV PMP-C-035

Thermodynamic

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	MPP132 Digital Meter Omega iTXH-SD PMP-C-028
Temperature[1]	(-80 to 0) ºC (0 to 150) ºC (150 to 230) ºC (230 to 400) ºC (400 to 950) ºC	0.027 ºC 0.034 ºC 0.043 ºC 0.052 ºC 1.4 ºC	MPC036 PRT Thermometer HP Multimeter Temperature Calibration Bath type JH01, 117PT000, 106F0H920 (-30 ºC to 0 ºC) HETOFRIG Temperature Calibration Bath type KB 03, CB 217 (300 ºC to 400 ºC) ASSOCIATED Enviromental System Oven PMP-C-007

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Timers and Stopwatches	0.01 ms to 604 800 s	(2.5 x 10^{-8} +2.5 x 10^{-9} t)	Frequency Counter PMP-C-008
Frequency Counting Equipment	0.1 Hz to 18 GHz	1 x 10^{-9} Hz/Hz	GPS Receiver, Spectrum Analyzer, Frequency Counter, Signal Generator, Frequency Synthesizer, PMP-C-008
Frequency Generating Equipment	Up to 18 GHz	1 x 10^{-9} Hz/Hz	GPS Receiver, Spectrum Analyzer, Frequency Counter, Power Meter, Power Sensors PMP-C-008

DIMENSIONAL MEASUREMENT

3 Dimensional

Specific Tests and / or Properties Measured	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Dimensional Inspection CMM 3D / Inspection Dimensional	X = Up to 700 mm Y = Up to 650 mm Z = Up to 550 mm	0.005 1 mm	Coordinate Measuring Machine and Vision System used as Reference Customer Drawings CMM and Vision Software

TESTING

Mechanical

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	Universal Testing Equipment	Cables and Materials	Universal Testing Machine and Load Cell System used as Reference

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. Symbols of applied units in the above scope of capabilities: a = applied to acceleration in g-force; f = applied flow in liters/minute; G = applied in terms of specific gravity; L = length in either mm or inches P = magnetic flux density in teslas, ρ = applied pressure in Pascal or psi; t = applied time in seconds; υ = applied ultra-violet light in Watts/cm^2; V = applied volume in milli-liters or cm^3; W = applied weight in games or milli-grams; χ = applied light intensity in lux; y = applied Air Velocity in m/s; z = applied viscosity in centi-poise-cP and (Δ) is applied particle counters in particle size/ft^3
4. This scope is formatted as part of a single document including Certificate of Accreditation No. ACT-1890.

Vice President