CERTIFICATE OF ACCREDITATION

ANSI-ASQ National Accreditation Board
500 Montgomery Street, Suite 625, Alexandria, VA 22314, 877-344-3044

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 17025:2005

while demonstrating technical competence in the field of

CALIBRATION & TESTING

Refer to the accompanying Scope of Accreditation for information regarding the types of tests &/or calibrations to which this accreditation applies.

ACT-1890
Certificate Number

ANAB Approval

Certificate Valid: 06/12/2018-11/11/2019
Version No. 005 Issued: 06/12/2018

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. 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-ASQ National Accreditation Board

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

Metrología y Pruebas, S. A. de C. V.
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CALIBRATION

Valid to: **November 11, 2019** Certificate Number: **ACT-1890**

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+0.013a) g	Accelerometer Brüel & Kjær 4508B-002 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	Solair 3100 particle counter PMP-C-050
pH Meters	4.00 pH 6.86 pH 10.1 pH	0.012 pH 0.011 pH 0.012 pH	pH Buffer Solutions PMP-C-040

Chemical Quantities

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Conductivity Meters	100 µS 1 000 µS 5000 µS 10 000 µS 100 000 µS	1 µS/ cm^2 5.1 µS/ cm^2 20 µS cm^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	5 mV to 5.5 V 50 kHz to 100 MHz (50 to 300) MHz (300 to 600) MHz	40 mV/V 45 mV/V 65 mV/V	Fluke 5500A-SC600 PMP-C-010
Square Wave Signal 10 Hz to 10 kHz	(1 mV to 6.6 V) p-p (50 Ω load) (1 mV to 130 V) p-p (1 MΩ load)	1.2 mV/V 1.3 mV/V	
Rise Time 5 mV to 2.5 V	1 kHz to 10 MHz	1 ms/s	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC High Voltage - Source	(1 to 10) kV	0.021 V/V	High Voltage Probe Tektronix P6015A Charged Plate Analyzer Monroe Electronics 268A-1T PMP-C-001
DC High Voltage - Measure	(1 to 10) kV	0.021 V/V	High Voltage Probe Tektronix P6015A Charged Plate Analyzer Monroe Electronics 268A-1T Up to 10 000 V Multimeter Keithley 175A DC Hy-Pot Associated Research model 5220M4 Up to 15 kV 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	Multimeter HP 3458A 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	(standard) Multimeter HP 3458A (generator) Calibrator Fluke 5500A PMP-C-001
AC Voltage – Source equipment	(1 to 100) mV 50 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz 100 mV to 1V 50 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	 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	Multimeter HP 3458A PMP-C-003

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Source equipment	(1 to 10) V 50 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	 0.41 mV/V 0.16 mV/V 0.32 mV/V 0.82 mV/V	Multimeter HP 3458A PMP-C-003
	(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	Multimeter HP 3458A Calibrator Fluke 5500A PMP-C-003
	(1 to 15) kV 60 Hz	 0.02 V/V	Tektronix P6015A PMP-C-003
	(15 to 60) kV 60 Hz	.032 mV/V	Transformer Hipotronix OC60A PMP-C-003
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	Multimeter HP 3458A Calibrator Fluke 5500A PMP-C-003
	(100 to 1 000) V 50 Hz to 1 kHz	 0.43 mV/V	Multimeter HP 3458A PMP-C-003
AC Voltage – Measure equipment	(1 to 15) kV 60 Hz	 0.02 V/V	Transformer Hipotronics OC60A PMP-C-003
	(15 to 60) kV 60 Hz	 0.02 V/V	Tektronix P6015A PMP-C-003

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
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	Multimeter HP 3458A PMP-C-002
	(1 to 11) A (11 to 550) A	0.54 mA/A 2.6 mA/A	Multimeter HP 3458A with Shunt ResistorLeed, Northrup 4361 or 4360 & Shunt Resistor 1500 A PMP-C-002
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	(standard) Multimeter HP 3458A (generator) Calibrator Fluke 5500A 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	(generator) Calibrator Fluke 5500A with Shunt ResistorLeed & Northrup 4361 or 4360 with Fluke 5500A 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	Multimeter HP 3458A PMP-C-004
	(1 to 11) A 60 Hz	 1.4 mA/A	Calibrator Fluke 5500A PMP-C-004

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
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	Multimeter HP 3458A Calibrator Fluke 5500A PMP-C-003
	(1 to 11) A 60 Hz (11 to 50) A 60 Hz	 1.6 mA/A 6.8 mA/A	with Shunt Resistor Leeds & Northrup 4361 PMP-C-003
AC Current – Measure equipment Clamp-On Ammeters	(11 to 550) A 60 Hz	 8 mA/A	Calibrator Fluke 5500A with Fluke 5500A coil PMP-C-003
DC Power Measure equipment	10.89 mW to 11 220 W	0.82 mW/W	Calibrator Fluke 5500A PMP-C-005
DC Power Source equipment	10.89 mW to 11220 W	0.41 mW/W	Multimeter HP 3458 Shunt resistor Leeds & Northrup 4361 Shunt resistor Leeds & Northrup 4360 DC Power Supply HP 6032 PMP-C-005A
AC Power – Measure 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	2.2 mW/W 3.3 mW/W 3.9 mW/W	Calibrator Fluke 5500A PMP-C-005

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
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	Multimeter HP 3458 Shunt resistor Leeds & Northrup 4361 Shunt resistor Leeds & Northrup 4360 DC Power Supply HP 6032A 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	(standard) Multimeter HP 3458A (generator) Calibrator Fluke 5500A PMP-C-006
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 3458A 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	Calibrator Fluke 5500A Multimeter HP 3458A High Value R Decade (1 MΩ to 1 TΩ) Make: MYPSA model: AVTR-001 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) Make: MYPSA model: AVTR-001 PMP-C-006

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Shunt Resistance Equipment	0.5 mΩ to 1 Ω @ (Up to 300) A	0.45 mΩ/Ω	Multimeter HP 3458A 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	Calibrator Fluke 5500A Multimeter HP 3458A DC Power Supply HP 6032A Shunt resistor Leeds & Northrup 4361 Shunt resistor Leeds & Northrup 4360 PMP-C-006
Capacitance Source equipment	0.01 pF to 10 µF 12 Hz to 100 kHz	0.42 mF/F	Capacitance Bridge GenRad 1689-9750 Precision LCR Meter HP 4285A 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 GenRad 1423A 1 pF Capacitor GenRad 1403K 1000 pF Capacitor GenRad 1404A 10 000 pF Capacitor GenRad1615-P1 Calibrator Fluke 5500A PMP-C-009
Inductance – Source equipment	Up to10 H @ 12 Hz to 100 kHz	0.069 mH/H	LCR Bridge GenRad 1689M LCR HP 4285A PMP-C-029
Inductance – Measure equipment	1 mH to 10 H	0.23 mH/H	LCR HP 4285A GenRad 1482-L GenRad 1482-Q Bundy Electronics 6625-714-4046 PMP-C-029

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Phase Angle Output	(0 to 180) °	0.15 °	Krohn-Hite 6400 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 Multimeter HP 3458A Calibrator Fluke 5500A 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	Calibrator Fluke 5500A Multimeter HP 3458A PMP-C-020
Magnetic Field[3]	3 mT to 3 T	(0.01+ 1W) mT	Magnetic Field FH 54 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 dBm 1.1 dBm	Power Sensor Power Meter PMP-C-008
	(-90 to 20) dBm (10 MHz to 13.2 GHz) 20 dBm -90 dBm	 0.26 dBm 0.4 dBm	Spectrum Analizer PMP-C-008

Electrical – RF/Microwave

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Power - Measure 50 Ω load	(-90 to 20) dBm (10 MHz to 4 GHz) 20 dBm -90 dBm	 0.41 dBm 0.49 dBm	Signal Generator Spectrum Analizer PMP-C-008
	(-90 to 8) dBm (2 GHz to 13.2 GHz) 8 dBm -30 dBm	 0.23 dBm 1.1 dBm	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 dBm 0.45 dBm	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 E4445A HP 8673E HP E4433B 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 E4445A HP 8673E HP E4433B 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 E4445A HP 8673E HP E4433B 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 + 0.008L) µm (61 + 8L) µin	Gage Blocks Grade 2 Gage Blocks Grade 3 PMP-C-014

Length – Dimensional metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Outside Micrometers[3]	Up to 1016 mm Up to 40 in	(0.78 + 0.008 7L) µm L=mm (31 + 8.7L) µin L=in	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 8L) µm (27 + 8.8L) 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 3L) µm (36 + 4.3L) 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 9L) µm (9.2 + 1.9L) 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 + 0.0032L) µm (289 + 3.2L) 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 (0.51L+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+0.041L)µm L=mm (791+41L) µin L=in	Digital Indicator Stainless Ruler 5X Amplification Lens PMP-C-014 NOM-040-SCFI-1994 & NOM-046-SCFI-1999
Calipers[3]	Up to1016 mm	(20 + 0.002 2L) µm	Gage Blocks Grade 2 PMP-C-014 NMX-CH-2:1993-SCFI
	(Up to 40 in)	(780 + 2.2L) 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 13L) µm (3.4 + 1.4L) 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 5L) µm L=mm (4.1+ 0.5L) µin L=in	API Laser Interferometer XD5LS 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+16L) µm L=mm (77+ 0.016) µin L=in	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

Length – Dimensional metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Surface Plates[1] Local Area Flatness (Repeat Reading)	0.050 8 mm (0.002 in)	0.99 µm 39 µin	Repetibility Gauge PMP-C-014
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 to152.9) mm (0.01 to 6) in	(0.1 + 0.000 8L) µm L=mm (4 + 0.75L) µin L=in	Gage Blocks Grade 1 FS Gage Blocks Comparator PMP-C-014
Gages Blocks[3]	(152.4 to 1016) mm (6 to 40) in	(-0.033 + 0.000 8L) µm L=mm (-1.3 + 0.8L) µin L=in	Laser Interferometer API XD5LS 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 Mahr 828 M PMP-C-014
Ring Gages	(12.7 to 101.6) mm (0.5 to 4) in	0.36 µm 14 µin	Universal measuring machine Mahr 828 M PMP-C-014
Thickness gauges & Measuring Equipment	(0.006 to 11.46) mm 236 □n 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

Length – Dimensional metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
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 31Wt) mg (0.049+0.000 1Wt) mg (-0.058+0.000 31Wt) mg (0.37+0.000 1Wt) mg (0.18+0.000 14Wt) mg (-0.055+0.0038Wt) g (-2.6+0.055Wt) g (-0.68+0.036Wt) g (1.7+0.024Wt) g (-33 + 0.094 Wt) g (-39 + 0.1Wt) 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

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
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 Sartorius LC62019 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 Sartorius LC16000S PMP-C-033
Volumetric Recipients[3] (Pipettes, Burettes) (Test Tubes, Syringes) (Flask, Beakers, Hasty Glasses) (Graduated volumetric containers) (Graduated volumetric containers)	(200 to 3 000) ml (200 to 3 000) c m^3	(-0.016 + 0.000 21V)) ml (-0.016 + 0.000 21V) cm^3	Digital Scale Sartorius 380MP PMP-C-033
	(3 000 to 30 000) ml (3 000 to 30 000) c m^3	(0.000 13 + 0.03V) ml (0.000 13 + 0.03V) cm^3	Digital Scale Sartorius BP3100S 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 (0.00057 to .11) lbf·in	0.0072 Nm 0.000 81 lbf·in	Dead Weights Rice Lake PMP-C-015 CNM-MMF-PT-002 & EA-10/14
	(0.9 to 20) Nm (0.10 to 2.3) lbf·in	0.056 Nm 0.006 4 lbf·in	Torque Transducer Mountz BTSX10i PMP-C-015 CNM-MMF-PT-002 & EA-10/14
	(7.4 to 500) Nm (0.84 to 56) lbf·in	0.62 Nm 0.07 lbf·in	Torque Transducer Mountz BTSX100F PMP-C-015 CNM-MMF-PT-002 & EA-10/14
	(400 to 678) Nm (45 to 77) lbf·in	1.6 Nm 0.18 lbf·in	Torque Transducer Mountz BTSX500F PMP-C-015 CNM-MMF-PT-002 & EA-10/14

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Air Flow[1,3]	Up to 300 l/min	(0.01 + 0.042f) l/min	Flow Transducer TSI 41221 Flow Transducer TSI 40211 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 Instrutech CVG101GA Edwards high Vacum AIM-S-MW25 PMP-C-013
Indirect Verification of Rockwell Hardness[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 (70 to 77) HR15N (78 to 88) HR15N (89 to 92) HR15N (42 to 54) HR30N (55 to 73) HR30N (74 to 80) HR30N	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	Hardness Blocks

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Indirect Verification of Rockwell Hardness[2]	(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	0.65 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	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
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	0.17 HRA 0.15 HRA 0.14 HRA 0.28 HRBW 0.21 HRBW 0.17 HRBW	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	≥ 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 ≥ 70 HR30TW (50 to 70) HR30TW ≤ 55 HR30TW ≥ 50 HR45TW (25 to 50) HR45TW ≤ 25 HR45TW	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 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

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
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 7υ) W/cm^2	Meter UV Dymax RCH-108-4 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

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
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 Hart Scientific 5614-B MPC002 Multimeter HP 3458A 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
Time	0.01 ms to 604 800 s	$(2.5 \times 10^{-8} + 2.5 \times 10^{-9}\ t)$	Counter HP 53131A PMP-C-008
Frequency Counting Equipment	0.1 Hz to 18 GHz	1×10^{-9} Hz/Hz	GPS Receiver HP Z3801A Spectrum Analizer HP E4445A Counter HP 53131A Counter HP 5340A Signal Generator HP8656B Synthesized Signal Generator HP8673E Signal Generator HP E4433B PMP-C-008

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency Generating Equipment	Up to 18 GHz	1×10^{-9} Hz/Hz	GPS Receiver HP Z3801A Spectrum Analizer HP E4445A Counter HP 53131A Counter HP 5340A Power Meter Agilent E4418B Power Sensor Agilent E9301A Power Sensor HP 8481A Power Sensor HP 8484A PMP-C-008

TESTING

Dimensional Measurement

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

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) is applied to acceleration in g-force; (f) is applied flow in liters/minute; (G) is applied in terms of specific gravity; (L) is length in either mm or inches (ρ) is applied pressure in Pascal or psi; (t) is applied time in seconds; (υ) is applied ultra-violet light in Watts/$cm^{2;}$ (V) is applied volume in milli-liters or cm^3; (W) is applied weight in games or milli-grams; (χ) is applied light intensity in lux; (y) is applied Air Velocity in m/s; (z) is 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