



CERTIFICATE OF ACCREDITATION

ANSI-ASQ National Accreditation Board

500 Montgomery Street, Suite 625, Alexandria, VA 22314, 877-344-3044

This is to certify that

Techmaster de Mexico SA de CV

Calle Seminario No. 8610 Int. 11, Col. Niños Heroes, Deleg. La Presa. C.P. 22120

Tijuana, B.C., Mexico

(and satellite locations as listed on the scope)

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

ISO/IEC 17025:2005

and national standards

ANSI/NCSL Z540-1-1994 (R2002) AND

ANSI/NCSL Z540.3-2006 (R2013)

while demonstrating technical competence in the field of

CALIBRATION & DIMENSIONAL MEASUREMENT

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

AC-1342

Certificate Number


ANAB Approval

Certificate Valid: 08/13/2018-08/31/2020
Version No. 007 Issued: 08/13/2018



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).



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005,
ANSI/NCSL Z540-1-1994 (R2002), AND ANSI/NCSL Z540.3-2006 (R2013)

Techmaster de Mexico SA de CV

Calle Seminario #8610 Int. 11
Col. Niños Heroes, deleg. La Presa. C.P. 22120, Parque Industrial Arboledas
Tijuana, B.C., Mexico

J. Ernesto Matamoros Phone: (52) 664-624-4444
quality.mx@techmaster.us www.techmasterdemexico.com

Services performed at satellite locations as indicated
Calle Gales 1201 Fracc. Villa Fontana, Mexicali, B.C. C.P. 21180.
Contact: Mauricio Garayzar. Tels: 01(686) 555-1660, 557-6117 mxl_sales@techmaster.us
Blvd. Gomez Morin 9050-L8, Col. Partido Senecu, C.P. 32469,
Phone 01(656) 687-2471,648-1181 ventasjuarez@techmaster.us
Ave. Ignacio Morones Prieto No. 914 Ote. Int. 112 Col. La Huerta C.P. 67144 Guadalupe, N.L.
Phone: 01(81)1334-0701 monterrey@techmaster.us

CALIBRATION AND DIMENSIONAL MEASUREMENT

Valid to: **October 29, 2020**

Certificate Number: **AC-1342**

Calibration

Acoustics and Vibration

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Sound - Source	114 dB @ 1 kHz	1.3 dB	Sound Calibrator Tijuana Mexicali Juarez Monterrey
	(30 to 140) dB	0.43 dB	Sound Level Meter Tijuana Mexicali Juarez Monterrey



Acoustics and Vibration

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Vibration	(0.2 to 20) gpk (7 to 100) Hz 100 Hz to 5 kHz (5 to 10) kHz	3.5 % of reading + 0.03 g 3.1 % of reading + 0.03 g 3.6 % of reading + 0.03 g	Portable Vibration Calibrator Tijuana Mexicali Juarez Monterrey

Chemical Quantities

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
pH	4.011 pH 6.987 pH 10.03 pH	0.04 pH 0.04 pH 0.03 pH	pH Solutions Tijuana Mexicali Juarez Monterrey
Viscosity Kinematic @ 25 °C	33.76 mm ² /s 64.35 mm ² /s 117.5 mm ² /s 237.4 mm ² /s	0.49 mm ² /s 0.74 mm ² /s 1.2 mm ² /s 2.5 mm ² /s	Standard Solutions C20, C35, C60, C100 Tijuana Mexicali Juarez Monterrey
Viscosity Dynamic @ 25 °C	7.239 cP 100.9 cP 498.1 cP 717.7 cP 4 595 cP 7 686 cP 200 050 cP	0.26 cP 1.1 cP 5.1 cP 7.4 cP 48 cP 80 cp 210 cP	Standard Solutions: S6, S60, D500, N350, S2000, D7500, S8000 Tijuana Mexicali Juarez Monterrey
Density	0.8455 g/ml 0.8518 g/ml 0.8638 g/ml 0.9451 g/ml 0.9635 g/ml 0.9702 g/ml	0.008 g/ml 0.009 g/ml 0.009 g/ml 0.009 g/ml 0.01 g/ml 0.01 g/ml	Standard Solution Tijuana Mexicali Juarez Monterrey



Chemical Quantities

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Conductivity	2 µmhos/cm 10 µmhos/cm 100 µmhos/cm 1 000 µmhos/cm 1 400 µmhos/cm 10 000 µmhos/cm 100 000 µmhos/cm	0.25 µmhos/cm 1.2 µmhos/cm 15 µmhos/cm 120 µmhos/cm 180 µmhos/cm 2 200 µmhos/cm 8 000 µmhos/cm	Conductivity Solutions Tijuana Mexicali Juarez Monterrey

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage - Source	(2.2 to 220) mV 200 mV to 2.2 V (2.2 to 11) V (11 to 22) V (22 to 220) V 220 V to 1.1 kV	11 µV/V + 0.48 µV 6.2 µV/V + 0.87 µV 4.2 µV/V + 3 µV 4.2 µV/V + 5.2 µV 6.1 µV/V + 99 µV 8 µV/V + 0.53 mV	Multiproduct Calibrator Tijuana Mexicali Juarez Monterrey
DC Voltage - Measure	(2 to 200) mV 200 mV to 2 V (2 to 20) V (20 to 200) V 200 V to 1 kV	6.7 µV/V + 0.20 µV 4.3 µV/V + 0.50 µV 4.3 µV/V + 4.8 µV 6.7 µV/V + 98 µV 6.7 µV + 0.63 mV	Reference Multimeter Tijuana Mexicali Juarez Monterrey
DC Voltage - Measure	Up to 2 kV (1 to 20) kV (20 to 70) kV	0.5 mV/V + 11 V 0.5 mV/V + 6.9 V 0.56 mV/V + 51 V	High Voltage Meter Tijuana Mexicali Juarez Monterrey
Charge Analyzer	Up to 1 kV (1 to 5) kV	24 mV/V + 0.5 V 24 mV/V + 12 V	Charge Plate Analyzer Tijuana Mexicali Juarez Monterrey
DC Current - Source	(2 to 220) µA 220 µA to 2.2 mA (2.2 to 22) mA (22 to 220) mA 220 mA to 2.2 A	50 µA/A + 7.2 nA 43 µA/A + 8.4 nA 43 µA/A + 48 nA 55 µA/A + 0.84 µA 97 µA/A + 21 µA	Multiproduct Calibrator Tijuana Mexicali Juarez Monterrey

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Current - Source	(2.2 to 10) A (10 to 10.9) A (10.9 to 20.5) A	0.6 mA/A + 0.77 mA 0.6 mA/A + 1 mA 1.2 mA/A + 1.4 mA	Multiproduct Calibrator Tijuana Mexicali Juarez Monterrey
DC Current - Source	(10 to 550) A (550 to 1 025) A	2.5 mA/A + 0.55 A 2.6 mA/A + 0.55 A	Multiproduct Calibrator with 50 Turn Coil Tijuana Mexicali Juarez Monterrey
DC Current - Measure	(2 to 200) μ A (200 μ A to 2) mA (2 to 20) mA (20 to 200) mA 200 mA to 2 A (2 to 20) A	15 μ A/A + 0.49 nA 15 μ A/A + 4.8 nA 17 μ A/A + 48 nA 59 μ A/A + 0.96 μ A 0.23 mA/A + 25 μ A 0.49 mA/A + 0.36 mA	Reference Multimeter Tijuana Mexicali Juarez Monterrey
DC Current – Measure	(20 to 100) A (100 to 300) A	0.5 mA/A + 0.004 A 1 mA/A + 0.004 A	Current Shunt Tijuana Mexicali Juarez Monterrey
DC Current - Measure	Up to 1 000 A	2.6 mA/A + 20 mA	Current Shunt Tijuana Mexicali Juarez Monterrey
Resistance - Source (Fixed Values)	0.001 Ω 0.01 Ω 0.1 Ω 0.333 Ω	0.23 m Ω 0.22 m Ω 0.2 m Ω 0.9 m Ω	Reference Resistor Tijuana Mexicali Juarez Monterrey
Resistance - Source (Fixed Values)	1 Ω 1.9 Ω 10 Ω 19 Ω 100 Ω 190 Ω	0.12 m Ω 0.22 m Ω 0.28 m Ω 0.53 m Ω 1.3 m Ω 2.3 m Ω	Multiproduct Calibrator Tijuana Mexicali Juarez Monterrey



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Resistance - Source (Fixed Values)	1 kΩ 1.9 kΩ 10 kΩ 19 kΩ 100 kΩ 190 kΩ 1 MΩ 1.9 MΩ 10 MΩ 19 MΩ 100 MΩ	11 mΩ 20 mΩ 0.11 Ω 0.2 Ω 1.4 Ω 2.6 Ω 25 Ω 51 Ω 0.50 kΩ 1.2 kΩ 14 kΩ	Multiproduct Calibrator Tijuana Mexicali Juarez Monterrey
Resistance - Source	100 MΩ to 1 GΩ (1 to 10) GΩ 10 GΩ to 1 TΩ	10 mV/V + 1 kΩ 11 mV/V + 0.19 MΩ 21 mV/V + 2.1 MΩ	Decade Resistor Tijuana Mexicali Juarez Monterrey
Resistance - Measure	Up to 2Ω (2 to 20) Ω (20 to 200) Ω 200 Ω to 2 kΩ (2 to 20) kΩ (20 to 200) kΩ 200 kΩ to 2 MΩ (2 to 20) MΩ (20 to 200) MΩ 200 MΩ to 2 GΩ	23 μΩ/Ω + 5.9 μΩ 12 μΩ/Ω + 18 μΩ 9.8 μΩ/Ω + 80 μΩ 12 μΩ/Ω + 0.94 mΩ 11 μΩ/Ω + 47 mΩ 11 μΩ/Ω + 60 mΩ 13 μΩ/Ω + 1.2 Ω 28 μΩ/Ω + 0.12 kΩ 0.15 mΩ/Ω + 1.2 kΩ 1.9 mΩ/Ω + 12 kΩ	Reference Multimeter Tijuana Mexicali Juarez Monterrey
Resistance – Measure at 500 V at 500 V at 1 kV at 1 kV at 2.5 kV at 5 kV at 5 kV at 10 kV at 10 kV	200 kΩ to 10 GΩ (10 to 100) GΩ 200 kΩ to 20 GΩ (20 to 200) GΩ 200 kΩ to 50 GΩ 200 kΩ to 100 GΩ 100 GΩ to 1 TΩ 200 kΩ to 200 GΩ 200 GΩ to 2 TΩ	61 mΩ/Ω + 0.6 MΩ 0.24 Ω/Ω + 0.6 MΩ 60 mΩ/Ω + 0.6 MΩ 0.24 Ω/Ω + 0.6 MΩ 60 mΩ/Ω + 0.6 MΩ 60 mΩ/Ω + 0.6 MΩ 0.24 Ω/Ω + 0.6 MΩ 62 mΩ/Ω + 0.6 MΩ 0.24 Ω/Ω + 0.6 MΩ	Insulation Resistance Tester Tijuana Mexicali Juarez Monterrey



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage - Source	Up to 2.2 mV		Multiproduct Calibrator Tijuana Mexicali Juarez Monterrey
	(10 to 20) Hz	0.29 mV/V + 4.8 μV	
	(20 to 40) Hz	0.11 mV/V + 4.8 μV	
	40 Hz to 20 kHz	96 μV/V + 9.6 μV	
	(20 to 50) kHz	0.24 mV/V + 4.8 μV	
	(50 to 100) kHz	0.6 mV/V + 6 μV	
	(100 to 300) kHz	1.3 mV/V + 12 μV	
	(300 to 500) kHz	1.7 mV/V + 24 μV	
	500 kHz to 1 MHz	3.3 mV/V + 24 μV	
	(2.2 to 22) mV		
	(10 to 20) Hz	0.3 mV/V + 4.8 μV	
	(20 to 40) Hz	0.13 mV/V + 4.8 μV	
	40 Hz to 20 kHz	0.12 mV/V + 4.8 μV	
	(20 to 50) kHz	0.24 mV/V + 4.8 μV	
	(50 to 100) kHz	0.62 mV/V + 6 μV	
	(100 to 300) kHz	1.3 mV/V + 12 μV	
	(300 to 500) kHz	1.7 mV/V + 24 μV	
	500 kHz to 1 MHz	3.3 mV/V + 24 μV	
	(22 to 220) mV		
	(10 to 20) Hz	0.29 mV/V + 20 μV	
	(20 to 40) Hz	0.11 mV/V + 8.9 μV	
	40 Hz to 20 kHz	98 μV/V + 8.5 μV	
	(20 to 50) kHz	0.24 mV/V + 8.5 μV	
	(50 to 100) kHz	0.55 mV/V + 21 μV	
(100 to 300) kHz	1.1 mV/V + 24 μV		
(300 to 500) kHz	1.7 mV/V + 32 μV		
500 kHz to 1 MHz	3.3 mV/V + 54 μV		
220 mV to 2.2 V			
(10 to 20) Hz	0.29 mV/V + 48 μV		
(20 to 40) Hz	0.11 mV/V + 18 μV		
40Hz to 20 kHz	57 μV/V + 9.6 μV		
(20 to 50) kHz	91 μV/V + 12 μV		
(50 to 100) kHz	0.13 mV/V + 36 μV		
(100 to 300) kHz	0.5 mV/V + 96 μV		
(300 to 500) kHz	1.2 mV/V + 0.24 mV		
500 kHz to 1 MHz	2.1 mV/V + 0.36 mV		



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage - Source	(2.2 to 22) V (10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.29 mV/V + 0.14 mV 0.11 mV/V + 41 μV 57 μV/V + 23 μV 91 μV/V + 21 μV 0.13 mV/V + 43 μV 1.2 mV/V + 0.25 mV 2.1 mV/V + 0.4 mV	Multiproduct Calibrator Tijuana Mexicali Juarez Monterrey
	(22 to 220) V (10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (500 kHz to 1 MHz) 220 V to 1.1 kV (15 to 50) Hz 50 Hz to 1 kHz	0.29 mV/V + 0.12 V 0.12 mV/V + 1.9 mV 75 μV/V + 0.72 mV 0.10 mV/V + 1.2 mV 0.19 mV/V + 3 mV 1.1 mV/V + 19 mV 5.3 mV/V + 48 mV 9.7 mV/V + 96 mV 0.29 mV/V + 48 mV 0.11 mV/V + 18 mV	
AC Voltage - Measure	Up to 200 mV (1 to 10) Hz (10 to 40) Hz (40 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz 200 mV to 2 V (1 to 10) Hz (10 to 40) Hz (40 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz	0.2 mV/V + 29 μV 0.17 mV/V + 5 μV 0.14 mV/V + 5 μV 0.17 mV/V + 2 μV 0.17 mV/V + 5 μV 0.42 mV/V + 10 μV 0.93 mV/V + 24 μV 0.19 mV/V + 0.33 mV 0.15 mV/V + 3 μV 0.12 mV/V + 24 μV 0.17 mV/V + 24 μV 0.14 mV/V + 24 μV 0.27 mV/V + 48 μV 0.7 mV/V + 0.24 mV	Reference Multimeter Tijuana Mexicali Juarez Monterrey

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage - Measure	(2 to 20) V		Reference Multimeter Tijuana Mexicali Juarez Monterrey
	(1 to 10) Hz	0.18 mV/V + 3.3 mV	
	(10 to 40) Hz	0.14 mV/V + 0.3 mV	
	(40 to 100) Hz	0.11 mV/V + 0.24 mV	
	100 Hz to 2 kHz	0.15 mV/V + 0.24 mV	
	(2 to 10) kHz	0.14 mV/V + 0.24 mV	
	(10 to 30) kHz	0.27 mV/V + 0.48 mV	
	(30 to 100) kHz	0.69 mV/V + 2.4 mV	
	(100 to 300) kHz	3.6 mV/V + 24 mV	
	300 kHz to 1 MHz	12 mV/V + 0.24 mV	
	(20 to 200) V		
	1 to 10 Hz	0.19 mV/V + 58 mV	
	(10 to 40) Hz	0.15 mV/V + 2.7 mV	
	(40 to 100) Hz	0.12 mV/V + 2.4 mV	
	100 Hz to 2 kHz	0.15 mV/V + 2.4 mV	
(2 to 10) kHz	0.14 mV/V + 2.4 mV		
(10 to 30) kHz	0.27 mV/V + 4.8 mV		
(30 to 100) kHz	0.69 mV/V + 24 mV		
(100 to 300) kHz	3.6 mV/V + 0.24 mV		
300 kHz to 1 MHz	12 mV/V + 2.4 V		
200 V to 1 kV			
(1 to 10) Hz	0.19 mV/V + 84 mV		
(10 to 40) Hz	0.16 mV/V + 24 mV		
40 Hz to 10 kHz	0.29 mV/V + 24 mV		
(10 to 30) kHz	0.28 mV/V + 48 mV		
(30 to 100) kHz	0.72 mV/V + 0.24 V		
AC Voltage - Measure	(1 to 2) kV		High Voltage Meter Tijuana Mexicali Juarez Monterrey
	(20 to 400) Hz	0.86 mV/V + 11 V	
	(2 to 20) kV		
	(20 to 100) Hz	0.52 mV/V + 49 V	
AC Voltage - Measure	(20 to 70) kV		High Voltage Meter Tijuana Mexicali Juarez Monterrey
	(50 to 60) Hz	0.49 mV/V + 0.21 kV	
AC Current - Source	Up to 220 μ A		Multiproduct Calibrator Tijuana Mexicali Juarez Monterrey
	(10 to 20) Hz	0.38 mA/A + 21 nA	
	(20 to 40) Hz	0.3 mA/A + 12 nA	
	40 Hz to 1 kHz	0.27 mA/A + 9.9 nA	
	(1 to 5) kHz	0.41 mA/A + 15 nA	
	(5 to 10) kHz	1.4 mA/A + 78 nA	



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment				
AC Current – Source	220 μ A to 2.2 mA (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.3 mA/A + 68 nA 0.19 mA/A + 48 nA 0.15 mA/A + 48 nA 0.27 mA/A + 0.13 μ A 1.3 mA/A + 0.78 μ A	Multiproduct Calibrator Tijuana Mexicali Juarez Monterrey				
	(2.2 to 22) mA (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.3 mA/A + 0.49 μ A 0.2 mA/A + 0.43 μ A 0.15 mA/A + 0.43 μ A 0.39 mA/A + 0.66 μ A 1.4 mA/A + 6 μ A					
	(22 to 220) mA (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.43 mA/A + 7.9 μ A 0.37 mA/A + 4.7 μ A 0.36 mA/A + 3.9 μ A 0.41 mA/A + 4.3 μ A 3.3 mA/A + 12 μ A					
	220 mA to 2.2 A 20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.5 mA/A + 55 μ A 4 μ A/A + 96 μ A 9.3 mA/A + 0.19 mA					
	AC Current – Source	(3 to 20) A (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz		0.5 mA/A + 1.4 mA 0.7 mA/A + 1.4 mA 20 mA/A + 1.4 mA	Multiproduct Calibrator Tijuana Mexicali Juarez Monterrey		
		(11 to 20.5) A (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz		0.8 mA/A + 3.4 mA 1 mA/A + 3.4 mA 20 mA/A + 3.4 mA			
		AC Current – Source		(16.5 to 55) A 65 Hz 440 Hz		2.8 mA/A + 0.17 A 7.9 mA/A + 0.19 A	Multiproduct Calibrator with 50 Turn Coil Tijuana Mexicali Juarez Monterrey
				(55 to 150) A 65 Hz 440 Hz		2.8 mA/A + 0.31 A 7.9 mA/A + 0.16 A	
				(150 to 550) A 65 Hz 440 Hz		2.8 mA/A + 1.3 A 7.9 mA/A + 0.41 A	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Source	(550 to 1 025) A 65 Hz 440 Hz	2.9 mA/A + 0.71A 8 mA/A + 1.2 A	Multiproduct Calibrator with 50 Turn Coil Tijuana Mexicali Juarez Monterrey
AC Current - Measure	Up to 200 μ A 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz 200 μ A to 2 mA 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz 2 to 20 mA 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz 20 to 200 mA 10 Hz to 10 kHz (10 to 30) kHz 200 mA to 2 A 10 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz 2 to 20 A 10 Hz to 2 kHz (2 to 10) kHz	0.42 mA/A + 24 nA 0.88 mA/A + 24 nA 4.8 mA/A + 24 nA 0.36 mA/A + 0.24 μ A 0.86 mA/A + 0.24 μ A 4.8 mA/A + 0.24 μ A 0.37 mA/A + 2.4 μ A 0.86 mA/A + 2.4 μ A 4.8 mA/A + 2.4 μ A 0.35 mA/A + 24 μ A 0.75 mA/A + 24 μ A 0.75 mA/A + 0.25 mA 0.87 mA/A + 0.27 mA 3.6 mA/A + 0.26 mA 0.99 mA/A + 2.4 mA 3.1 mA/A + 2.4 mA	Reference Multimeter Tijuana Mexicali Juarez Monterrey
AC Current - Measure	(20 to 1 000) A (60 to 100) Hz	2.6 mA/A + 0.28 A	Current Shunt Tijuana Mexicali Juarez Monterrey



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of Thermocouple Indicators	Type B		Multiproduct Calibrator Tijuana Mexicali Juarez Monterrey
	(600 to 800) °C	0.53 °C	
	(800 to 1 000) °C	0.43 °C	
	(1 000 to 1 550) °C	0.37 °C	
	(1 550 to 1 820) °C	0.41 °C	
	Type C		
	(0 to 150) °C	0.36 °C	
	(150 to 650) °C	0.30 °C	
	(650 to 1 000) °C	0.37 °C	
	(1 000 to 1 800) °C	0.61 °C	
	(1 800 to 2 316) °C	1 °C	
	Type E		
	(-250 to -100) °C	0.6 °C	
	(-100 to -25) °C	0.19 °C	
	(-25 to 350) °C	0.17 °C	
	(350 to 650) °C	0.19 °C	
	(650 to 1 000) °C	0.26 °C	
	Type J		
	(-200 to -100) °C	0.19 °C	
	(-100 to -30) °C	0.32 °C	
	(-30 to 150) °C	0.17 °C	
	(150 to 760) °C	0.21 °C	
	(760 to 1 200) °C	0.28 °C	
	Type K		
	(-200 to -100) °C	0.57 °C	
	(-100 to -25) °C	0.22 °C	
	(-25 to 120) °C	0.19 °C	
	(120 to 1 000) °C	0.31 °C	
(1 000 to 1 372) °C	0.48 °C		
Type L			
(-200 to -100) °C	0.45 °C		
(-100 to 800) °C	0.32 °C		
(800 to 900) °C	0.21 °C		
Type N			
(-200 to -100) °C	0.48 °C		
(-100 to -25) °C	0.26 °C		
(-25 to 120) °C	0.23 °C		
(120 to 410) °C	0.22 °C		
(410 to 1 300) °C	0.33 °C		

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of Thermocouple Indicators	Type R (0 to 250) °C (250 to 400) °C Type S (400 to 1 000) °C (1 000 to 1 767) °C Type T (0 to 250) °C (250 to 1 000) °C (1 000 to 1 400) °C (1 400 to 1 767) °C Type U (-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.69 °C 0.42 °C 0.48 °C 0.6 °C 0.57 °C 0.43 °C 0.44 °C 0.57 °C 0.76 °C 0.29 °C 0.19 °C 0.48 °C	Multiproduct Calibrator Tijuana Mexicali Juarez Monterrey
Electrical Simulation of RTD Indicators	Pt 385, 100 Ω (-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C (630 to 800) °C Pt 385, 200 Ω (-200 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C Pt 385, 500 Ω (-200 to -80) °C (-80 to 100) °C (100 to 260) °C (260 to 400) °C (400 to 600) °C (600 to 630) °C	0.06 °C 0.08 °C 0.11 °C 0.12 °C 0.14 °C 0.28 °C 0.05 °C 0.06 °C 0.14 °C 0.16 °C 0.17 °C 0.19 °C 0.07 °C 0.07 °C 0.08 °C 0.11 °C 0.12 °C 0.14 °C	Multiproduct Calibrator Tijuana Mexicali Juarez Monterrey

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of RTD Indicators	Pt 385, 1 000Ω (-200 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 600) °C (600 to 630) °C Pt 3926, 100 Ω (-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C	0.06 °C 0.07 °C 0.07 °C 0.08 °C 0.1 °C 0.28 °C 0.06 °C 0.08 °C 0.11 °C 0.12 °C 0.14 °C	Multiproduct Calibrator Tijuana Mexicali Juarez Monterrey
Capacitance - Source 10 Hz to 10 kHz 10 Hz to 10 kHz 10 Hz to 3 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz (10 to 600) Hz (10 to 300) Hz (10 to 150) Hz (10 to 120) Hz (10 to 80) Hz	(200 to 400) pF 400 pF to 1.1 nF (1.1 to 3.3) nF (3.3 to 11) nF (11 to 33) nF (33 to 110) nF (110 to 330) nF 330 nF to 1.1 μF (1.1 to 3.3) μF (3.3 to 11) μF (11 to 33) μF (33 to 110) μF	6 mF/F + 12 pF 6 mF/F + 12 pF 6 mF/F + 12 pF 3 mF/F + 13 pF 3 mF/F + 0.12 nF 3 mF/F + 0.14 nF 3 mF/F + 0.43 nF 3 mF/F + 1.5 nF 3 mF/F + 4.1 nF 3 mF/F + 14 nF 4.8 mF/F + 41 nF 5.4 mF/F + 0.16 μF	Multiproduct Calibrator Tijuana Mexicali Juarez Monterrey
Capacitance - Measure (1 to 100) kHz 300 Hz to 100 kHz (50 to 100) kHz (50 to 200) kHz 50 Hz to 10 kHz 50 Hz to 1 kHz	100 pF to 1 nF (1 to 10) nF (10 to 100) nF (0.1 to 1) μF (1 to 10) μF (10 to 100) μF	1.3 mF/F + 0.013 pF 1.3 mF/F + 0.17 pF 1.2 mF/F + 2.7 pF 1.2 mF/F + 0.14 nF 1.2 mF/F + 1.1 nF 1.2 mF/F + 1.7 nF	Impedance Meter Tijuana Mexicali Juarez Monterrey
Capacitance - Source (Fixed Values @ 1 kHz)	1 nF 10 nF 100 nF 1 μF	0.8 pF 14 pF 0.14 nF 0.65 nF	Reference Capacitors Tijuana Mexicali Juarez Monterrey

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Inductance - Source 100 Hz to 10 kHz	100 μ H 1 mH 20 mH 100 mH @ (0.1 to 1) kHz 101.88 mH @ 10 kHz	0.85 μ H 18 μ H 27 μ H 0.13 mH 0.15 mH	Reference Inductor Tijuana Mexicali Juarez Monterrey
Inductance - Measure (2 to 100) kHz 300 Hz to 100k Hz 100 Hz to 100 kHz (50 to 100) kHz 50 Hz to 10 kHz 50 Hz to 2 kHz	100 μ H to 1 mH (1 to 10) mH (10 to 100) mH 100 mH to 1 H (1 to 10) H (10 to 100) H	1.2 mH/H + 23 nH 1.2 mH/H + 0.27 μ H 1.2 mH/H + 3.3 μ H 1.3 mH/H + 27 μ H 1.3 mH/H + 1.1 μ H 1.3 mH/H + 3.5 mH	Impedance Meter Tijuana Mexicali Juarez Monterrey
Oscilloscopes Amplitude Square Wave 50 Ω Load 1 M Ω Load Leveled Sine Wave Time Marker into 50 Ω	1 mV to 6.6 V p-p 10 Hz to 10 kHz 1 mV to 130 V p-p 10 Hz to 10 kHz 5 mV to 5.5 V 50 kHz to 100 MHz (100 to 300) MHz (300 to 500) MHz (500 to 600) MHz 1 ns to 50 ms 20 ms to 5 s	3 mV/V + 0.96 mV 3 mV/V + 1.8 mV 42 mV/V + 1.4 mV 48 mV/V + 1.4 mV 66 mV/V + 1.4 mV 72 mV/V + 1.4 mV 1 μ s/s + 60 ns 3 μ s/s + 9 μ s	Oscilloscope Calibrator Tijuana Mexicali Juarez Monterrey
DC Power - Source	Up to 3.06 kW (3.06 to 20.91) kW	20 μ W/W + 0.39 W 50 μ W/W + 3.1W	Multiproduct Calibrator Tijuana Mexicali Juarez Monterrey
AC Power - Source (45 to 65 Hz)	Up to 336.6 W 336.6 W to 2.244 kW (2.244 to 4.59) kW (4.59 to 20.91) kW	50 μ W/W + 0.39 W 60 μ W/W + 2.8 W 90 μ W/W + 2.8 W 50 μ W/W + 2.8 W	Multiproduct Calibrator Tijuana Mexicali Juarez Monterrey



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Phase	Up to 90 ° (10 to 500) Hz 500 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	1.4 ° 1.5 ° 2.2 ° 3.7 ° 6.9 °	Multiproduct Calibrator Tijuana Mexicali Juarez Monterrey

Electrical – RF/Microwave

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
RF Power/Gain – Measure ¹	(-30 to 20) dB (10 to 20) MHz (20 to 50) MHz (50 to 100) MHz 100 MHz to 1 GHz (1 to 4) GHz (4 to 8) GHz (8 to 18) GHz	2.1 % of reading + 0.09 dB 1.8 % of reading + 0.09 dB 1.4 % of reading + 0.09 dB 1.2 % of reading + 0.09 dB 1.2 % of reading + 0.09 dB 1.4 % of reading + 0.09 dB 2.5 % of reading + 0.09 dB	Feed thru Power Standard, Control Unit Tijuana Mexicali Juarez Monterrey
Frequency Modulation - Measure	Rate: 20 Hz to 10 kHz Deviation: ≤ 40 kHz peak 250 kHz to 10 MHz Rate: 20 Hz to 10 kHz Deviation: ≤ 400 kHz peak 10 MHz to 1.3 GHz	2.4 % of reading + 210 Hz 1.2 % of reading + 210 Hz	Measuring Receiver w/ Power Sensor Tijuana Mexicali Juarez Monterrey
Amplitude Modulation - Measure	Rate: 50 Hz to 10 kHz Depths;(5 to 99) % 150 kHz to 10 MHz Rate 10 MHz to 1.3 GHz Depths (5 to 99) % 50 Hz to 50 kHz	2.4 % of reading + 0.19 % depth 1.2 % of reading + 0.19 % depth	Measuring Receiver w/ Power Sensor Tijuana Mexicali Juarez Monterrey
Phase Modulation - Measure	Rate: 200 Hz to 10 kHz 150 kHz to 10 MHz Rate: 200 Hz to 20 kHz 10 MHz to 1.3 GHz	4.8 % of reading + 0.32 rad 3.6 % of reading + 0.32 rad	Measuring Receiver w/ Power Sensor Tijuana Mexicali Juarez Monterrey



Electrical – RF/Microwave

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
RF Power - Measure	(-20 to 30) dBm 100 kHz to 2.6 GHz	0.1 dB	Measuring Receiver w/ Power Sensor Tijuana Mexicali Juarez Monterrey
RF Power - Measure	(-30 to 20) dBm 100 kHz to 4.2 GHz 50 MHz to 26.5 GHz	4.9 % of reading + 0.21 dB 3.1 % of reading + 0.13 dB	Power Sensors w/Power Meter Tijuana Mexicali Juarez Monterrey
Tuned RF Power Relative - Measure	2.5 MHz to 1.3 GHz (0 to -10) dB (-10 to -40) dB (-40 to -50) dB (-50 to -80) dB (-80 to -90) dB (-90 to -110) dB (-110 to -127) dB	0.03 dB 0.06 dB 0.13 dB 0.18 dB 0.16 dB 0.43 dB 0.44 dB	Measuring Receiver w/ Power Sensor Tijuana Mexicali Juarez Monterrey
RF Power - Source	10 MHz to 2 GHz (13 to 10) dBm (10 to -10) dBm (-10 to -60) dBm (-60 to -110) dBm 2 to 20 GHz (13 to 10) dBm (10 to -10) dBm (-10 to -60) dBm (-60 to -110) dBm 20 GHz to 26.5 GHz (13 to -10) dBm (-10 to -60) dBm (-60 to -1) dBm	1.5 dB 0.73 dB 1.1 dB 1.7 dB 1.6 dB 0.84 dB 1.2 dB 1.8 dB 1.1 dB 1.5 dB 1.8 dB	Signal Generator Tijuana Mexicali Juarez Monterrey



Length – Dimensional metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Plug Gages ^{1,2}	Up to 0.5 in (0.5 to 1) in (1 to 2.5) in (2.5 to 4) in (4 to 12) in	(6.5 + 2.6L) μin (7.8 + 2.3L) μin (11 + 4.6L) μin (18 + 3L) μin (13 + 7.7L) μin	LabMaster System Tijuana Juarez Monterrey
Ring Gages ^{1,2}	Up to 1 in (1 to 4) in (4 to 10) in (10 to 40) in	(9 + 20L) μin (8.1 + 8.4L) μin (11 + 11L) μin [26 + 13 (L-10)] μin	LabMaster System Tijuana Juarez Monterrey
Gage Blocks ^{1,2}	Up to 1 in (1 to 4) in 6 in 10 in (10 to 40) in	(4 + 0.8L) μin (3.1 + 1.7L) μin 14 μin 23 μin [9.7 + 13 (L-10)] μin	LabMaster System Tijuana Juarez Monterrey
Thread Plug Gages ^{1,2}	(0.05 to 1) in (1 to 2) in (2 to 12) in (10 to 40) in	100 μin 100 μin 130 μin [68 + 13 (L-10)] μin	LabMaster System Tijuana Juarez Monterrey
Thread Ring Gages ^{1,2}	(0.19 to 1) in (1 to 2) in (2 to 10) in (10 to 40) in	38 μin 40 μin 77 μin [60 + 13 (L-10)] μin	LabMaster System Tijuana Juarez Monterrey
OD Micrometers ²	Up to 12 in	(66 + 9.6L) μin	Gage Blocks Tijuana Mexicali Juarez Monterrey
ID Micrometers ²	Up to 12 in (12 to 40) in	(66 + 9.5L) μin (150 + 10L) μin	Gage Blocks Tijuana Mexicali Juarez Monterrey
Calipers ²	Up to 12 in (12 to 40) in (40 to 80) in (80 to 120) in	(610 + 1.1L) μin (630 + 4.3L) μin (940 + 0.25L) μin (1 000 + 7.5L) μin	Gage Blocks Tijuana Mexicali Juarez Monterrey

Length – Dimensional metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Dial Indicators ²	Up to 4 in	$(62 + 5.6L) \mu\text{in}$	Gage Blocks Tijuana Mexicali Juarez Monterrey
Test Indicators ²	Up to 0.06 in	$(6.2 + 4.4L) \mu\text{in}$	Gage Blocks Tijuana Mexicali Juarez Monterrey
Pin Gages	Up to 60 mm	3 μm	Laser Micrometer Tijuana Mexicali Juarez Monterrey
Laser Micrometer	Up to 60 mm	0.64 μm	Master Plug Gages Tijuana Mexicali Juarez Monterrey
Height Gages ²	Up to 12 in (12 to 40) in	$(130 + 7L) \mu\text{in}$ $(130 + 13L) \mu\text{in}$	Gage Blocks Tijuana Mexicali Juarez Monterrey
Optical Length ²	(0 to 50) mm (50 to 100) mm	$(2.1 + 0.005L) \mu\text{m}$ $(2.6 + 0.005L) \mu\text{m}$	Reference Glass Scale Tijuana Mexicali Juarez Monterrey
Optical Flat - Flatness	Up to 4 in	9.6 μin	Optical Parallels Tijuana Mexicali Juarez Monterrey



Length – Dimensional metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Distance Measurement ²	Up to 972 mm Up to 1 200 in	$(2.4+0.7L/600) \mu\text{m}$ 0.06 in	Height Gage, Distance Meter Tijuana Mexicali Juarez Monterrey
Protractor/Angle	(Up to 90) °	2 arc min	Angle Block Set Tijuana Mexicali Juarez Monterrey
Square/Block Parallelism	(-0.1 to 0.10) in	21 μin	Federal Head/Amplifier Tijuana Mexicali Juarez Monterrey
Surface Plates Local Area Flatness (Repeat Reading) Overall Flatness	Up to 1 in Up to 1 000 arc sec	34 μin /step 12 arc sec	Repeat-o-Meter Federal Level System Tijuana Mexicali Juarez Monterrey
Surface Finish - Source	118 μin	2.6 μin	Roughness Standard Tijuana Mexicali Juarez Monterrey
Surface Finish - Measure	(0 to 300) μin	5.6 μin	Surface Roughness Meter Tijuana Mexicali Juarez Monterrey



Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Force - Tension/Compression	Up to 500 lbf Up to 1 000 lbf (1 000 to 5 000) lbf (5 000 to 10 000) lbf (10 000 to 50 000) lbf	0.26 lbf 0.68 lbf 6.3 lbf 24 lbf 60 lbf	Reference Load Cells Tijuana Mexicali Juarez Monterrey
Scales/Balances ²	Up to 5 g	0.021 mg +0.6R	Class 0 Weights Tijuana Mexicali Juarez Monterrey
	Up to 50 g (50 to 200) g 200 g to 10 kg (10 to 500) kg (500 to 1 000) kg	0.046 mg + 0.6R 0.1 mg + 0.6R 88 mg + 0.6R 4.5 g + 0.6R 110 g + 0.6R	Class F Weights Tijuana Mexicali Juarez Monterrey
Torque - Measure	Up to 20 ozf·in 50 lbf·in 250 lbf·in 1 000 lbf·in 250 lbf·ft	0.5 % of reading + 0.38 ozf·in 0.33 % of reading + 0.006 lbf·in 0.31 % of reading + 0.04 lbf·in 0.31 % of reading + 0.12 lbf·in 0.31 % of reading + 1.9 lbf·ft	Torque Cell/ Torque Tester Tijuana Mexicali Juarez Monterrey
Torque - Measure	1 000 lbf·ft	0.31 % of reading + 0.88 lbf·ft	Torque Tester Tijuana Mexicali Juarez Monterrey
Torque - Source	(0.07 to 0.28) Nm (0.28 to 8.47) Nm (8.47 to 16.93) Nm (16.93 to 56.44) Nm (56.44 to 67.71) Nm (67.71 to 225.7) Nm (225.7 to 1 221.05) Nm	0.054 % of reading + 0.00018 Nm 0.053 % of reading + 0.0015 Nm 0.015 % of reading + 0.0021 Nm 0.007 5 % of reading + 0.022 Nm 0.002 9 % of reading + 0.021 Nm 0.007 4 % of reading +0.025 Nm 0.002 5 % of reading +0.02 Nm	Calibration Arms and Weights Tijuana Mexicali Juarez Monterrey
Pressure - Measure	(-14.7 to 300) psig (15 to 1 000) psig (1 000 to 10 000) psig (0.25 to 2.5) psig	0.09 psi 0.32 psi 3.8 psi 0.000 8 psi	Pressure Calibrator, Tijuana Mexicali Juarez Monterrey



Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Pressure Source	(-14 to -0.43) psig (0 to 1 000) psig	0.016 % of reading + 0.0005 psi 0.016 % of reading + 0.0012 psi	Pneumatic Deadweight Tester Tijuana
Pressure Source	(90 to 10 000) psig	0.006 % of reading + 0.008 psi	Hydraulic Deadweight Tester Tijuana
Volumetric Calibration	Up to 5 ml (5 to 100) ml (100 ml to 250) ml 250 ml to 1.2 l (1.2 to 25) l	0.018 ml 0.071 ml 0.355 ml 0.63 ml 0.81 ml	Analytical Balance and DI Water Tijuana Mexicali Juarez Monterrey
Air Flow	(0 to 30) sccm (30 to 300) sccm (1 to 10) slm (10 to 100) slm (100 to 1 000) slm	1.4 % of reading + 0.01 sccm 1.4 % of reading + 0.1 sccm 1.4 % of reading + 0.001 slm 1.4 % of reading + 0.01 slm 1.4 % of reading + 0.91 slm	Flowmeter Tijuana Mexicali Juarez Monterrey
	(0 to 200) sccm	1% of reading + 2 sccm	Leak Tester Tijuana Mexicali Juarez Monterrey
Air Velocity	(100 to 6 800) fpm	1.3 % of reading + 41 fpm	Anemometer Tijuana Mexicali Juarez Monterrey
Mass DOD Midas, OEM and GIDEP Sourced Procedures NIST 105-1 Handbook Up to Class F only	1 mg 2 mg 5 mg 10 mg 20 mg 50 mg 100 mg 200 mg 500 mg 1 g 2 g 5 g 10 g	0.13 mg 0.15 mg 0.17 mg 0.21 mg 0.24 mg 0.42 mg 0.52 mg 0.65 mg 0.74 mg 1.1 mg 1.3 mg 1.8 mg 2.4 mg	Class F Weights and Balances Tijuana Mexicali Juarez Monterrey



Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Mass DOD Midas, OEM and GIDEP Sourced Procedures NIST 105-1 Handbook Up to Class F only	20 g 50 g 100 g 200 g 500 g 1 kg 2 kg 5 kg 25 kg	4.8 mg 12 mg 24 mg 48 mg 84 mg 0.14 g 0.25 g 0.61 g 0.6 g	Class F Weights and Balances Tijuana Mexicali Juarez Monterrey
Leak Standards	0.3175 sccm @ 6.22 psi 0.3921 sccm @ 8.68 psi 0.5545 sccm @ 11.12psi 0.6608 sccm @ 13.08 psi 0.7616 sccm @14.56 psi 0.4350 sccm @ 5.38 psi 0.6411 sccm @ 7.49 psi 0.9769 sccm @ 10.54psi 1.3161 sccm @ 13.30psi 1.6584 sccm @ 15.79psi 1.6813 sccm @ 4.30psi 3.0969 sccm @ 7.27psi 4.8716 sccm @ 10.51psi 6.2687 sccm @ 12.80psi 8.2315 sccm @ 15.76psi 3.4512 sccm @ 4.39psi 5.9868 sccm @ 48.81psi 9.4685 sccm @ 10.35psi 12.7553 sccm @ 13.15psi 15.6443 sccm @ 15.46psi (0.803 to 1.017) sccm (-6.5 to -10.35) psi (31.25 to 102.06) sccm (5.62 to 15.84) psi (35.33 to 113.43) sccm (5.73 to 16.15) psi	0.008 sccm 0.008 sccm 0.009 sccm 0.009 sccm 0.01 sccm 0.007 sccm 0.009 sccm 0.012 sccm 0.015 sccm 0.019 sccm 0.018 sccm 0.032 sccm 0.05 sccm 0.063 sccm 0.083 sccm 0.036 sccm 0.061 sccm 0.096 sccm 0.13 sccm 0.16 sccm 1.2 % of reading + 0.17 sccm 1.2 % of reading + 0.16 sccm 1.2 % of reading + 0.16 sccm	American Specialty Gold Restrictor Tijuana Mexicali Juarez Monterrey



Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Leak Tester	Up to 10 sccm	0.17 sccm	Optima VT Leak Tester Tijuana Mexicali Juarez Monterrey
	(10 to 200) sccm	1 % of reading. + 2 sccm	Leak Tester Tijuana Mexicali Juarez Monterrey
Rockwell Hardness Testers	82.57 HRBW 62.56 HRBW 45.28 HRBW	1.3 HRBW 1.5 HRBW 2.1 HRBW	Indirect Verification per ASTM E18 using Hardness Test Blocks Tijuana Mexicali Juarez Monterrey
	49.20 HRC 62.42 HRC 27.11 HRC	1.2 HRC 0.68 HRC 1.2 HRC	
Rockwell Hardness Testers	76.15 HREW 89.62 HREW 97.23 HREW	1.3 HREW 1.4 HREW 1.3 HREW	Tijuana Mexicali Juarez Monterrey
	56.88 HRKW 72.56 HRKW 91.62 HRKW	1.1 HRKW 1.1 HRKW 1 HRKW	
Rockwell Superficial Hardness Testers	29.51 HR45N 47.37 HR45N 70.07 HR45N	1.3 HR45N 1.3 HR45N 0.75 HR45N	Indirect Verification per ASTM E18 using Hardness Test Blocks Tijuana Mexicali Juarez Monterrey
	82.41 HR30TW 59.90 HR30TW 54.51 HR30TW	1.2 HR30TW 1.2 HR30TW 1.4 HR30TW	
Rockwell Superficial Hardness Testers	91.10 HR15N 81.10 HR15N 74.04 HR15N	0.77 HR15N 1.1 HR15N 1.2 HR15N	Tijuana Mexicali Juarez Monterrey

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Rockwell Superficial Hardness Testers	92.21 HR15TW 81.07 HR15TW 75.69 HR15TW	1.1 HR15TW 1.1 HR15TW 1.2 HR15TW	Indirect Verification per ASTM E18 using Hardness Test Blocks Tijuana Mexicali Juarez Monterrey
Brinell Hardness Testers	100HBW 10/500 142HBW 10/3000 163HBW 10/500 197 HBW 3000 239 HBW 10/500 248 HBW 10/3000	4.3 HBW 5.7 HBW 7.9 HBW 8.7 HBW 9 HBW 14 HBW	Indirect Verification per ASTM E10 using Hardness Test Blocks Tijuana Mexicali Juarez Monterrey
Micro-Indentation Hardness Testers	712 HK 714 HV 117 HV 393 HV	36 HK 35 HV 24 HV 28 HV	Indirect Verification per ASTM E92 using Hardness Test Blocks Tijuana Mexicali Juarez Monterrey
Durometers Force Types A, B, O Types C, D, DO Types M, OO Indenter Length	 (20 to 90) Duro (0.096 to 0.104) in	 0.8 grf 4.9 grf 0.31 grf 0.001 in	Partial Direct Verification to T.O 33K6-4-1362-1 Tijuana Mexicali Juarez Monterrey

Photometry and Radiometry

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Optical Power Source 850,1300,1310 and 1550 nm	(-7 to 0) dBm	0.35 dB	Laser Source Tijuana Mexicali Juarez Monterrey



Photometry and Radiometry

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Optical Power Measure-Linearity Measure –Accuracy 800 nm to 1650 nm	(-80 to 10) dBm Up to 10 mW	0.035 dB 3.5% of reading + 0.073 uW	Optical Power Sensor Tijuana Mexicali Juarez Monterrey
Optical Attenuation Source 1310 nm – 1550 nm	(-60 to 0) dB	0.13 dB	Optical Attenuator Tijuana Mexicali Juarez Monterrey
Optical Power Source 850,1300,1310 and 1550 nm	(-7 to 0) dBm	0.35 dB	Laser Power Source Tijuana Mexicali Juarez Monterrey

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Humidity	(0 to 90) %RH	1.2 %RH	Indicator/Hygrometer Tijuana Mexicali Juarez Monterrey
Temperature - Source (Black Body)	(50 to 100) °C (100 to 500) °C	0.63 °C 1 °C	Infrared Calibrator $\epsilon = 0.95, \lambda = (8 \text{ to } 14) \mu\text{m}$ Tijuana Mexicali Juarez Monterrey
Temperature - Source (Black Body)	(100 to 1 200) °C	2.5 °C	High Temperature Blackbody Source $\epsilon = 0.995, \lambda = (8 \text{ to } 14) \mu\text{m}$ Tijuana Mexicali Juarez Monterrey



Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Temperature Measurement	(-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 420) °C (420 to 650) °C	0.03 °C 0.05 °C 0.07 °C 0.11 °C 0.14 °C	Reference Thermometer w/ PRT Tijuana Mexicali Juarez Monterrey
Temperature Measurement	0 to 1 200 °C	0.6 °C	Type S Reference Thermocouple Tijuana Mexicali Juarez Monterrey
Temperature Measurement	(650 to 1 200) °C	0.1 % of reading + 1.4 °C	Type R Reference Thermocouple Tijuana Mexicali Juarez Monterrey
Dew Point	(-40 to 60) °C	2.5 °C	Reference Dew Point Indicator Tijuana Mexicali Juarez Monterrey

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Chronometers, Stopwatches, Timers	1 ms to 100 000 s	0.12 ms	Frequency Counter Tijuana Mexicali Juarez Monterrey
Time - Source	1 ms to 100 000 s	(4.8 x 10 ⁻³) μs	Frequency Counter Tijuana Mexicali Juarez Monterrey



Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency – Measure ²	150 kHz to 1.3 GHz	$(2.4 \times 10^{-8}) \text{ Hz} + 2R$	Measuring Receiver Tijuana Mexicali Juarez Monterrey
	DC to 3.2 GHz	$(9.4 \times 10^{-6}) \text{ Hz} + 2R$	Frequency Counter Tijuana Mexicali Juarez Monterrey
Frequency - Source	(0.01 to 120) Hz 120 Hz to 1.2 kHz (1.2 to 120) kHz 120 kHz to 1.2 MHz (1.2 to 2) MHz	3 $\mu\text{Hz}/\text{Hz} + 61 \mu\text{Hz}$ 3 $\mu\text{Hz}/\text{Hz} + 61 \mu\text{Hz}$ 3 $\mu\text{Hz}/\text{Hz} + 120 \mu\text{Hz}$ 3 $\mu\text{Hz}/\text{Hz} + 10 \text{ mHz}$ 3 $\mu\text{Hz}/\text{Hz} + 12 \text{ mHz}$	Multiproduct Calibrator Tijuana Mexicali Juarez Monterrey
Frequency – Source ²	2 MHz to 6 GHz	1.3 $\mu\text{Hz}/\text{Hz} + 0.02 \text{ Hz}$	Signal Generator Tijuana Mexicali Juarez Monterrey
	10 MHz to 26.5 GHz	$(1.2 \times 10^{-7}) \text{ Hz} + R$	Signal Generator Frequency Counter Tijuana Mexicali Juarez Monterrey
Tachometer (Stroboscope)	Up to 100 rpm (100 to 1 000) rpm	0.03 % of reading + 0.014 rpm 0.03 % of reading + 0.14 rpm	Tachometer/Stroboscope Tijuana Mexicali Juarez Monterrey
Tachometer (Stroboscope)	(1 000 to 99 999) rpm	0.0 3% of reading + 1.4 rpm	Tachometer/Stroboscope Tijuana Mexicali Juarez Monterrey

Dimensional Measurement

3 Dimensional Measurement

Specific Tests and / or Properties Measured	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Dimensional ^{1,2} (CMM)	X axis to 705 mm Y axis to 1 005 mm Z axis to 605 mm	(7.6 + 4.6L/1 000) um	Mitutoyo CRTAS7106 with TP20 Probe per Customer Print or Report Tijuana
Dimensional ^{1,2} (Non-Contact)	X axis to 250 mm Y axis to 200 mm Z axis to 200 mm	(2.5+3.5L/1 000) um (2.5+3.5L/1 000) um (3.9+4.6L/1 000) um	Quick Vision QV-E202 per Customer Print or Report Tijuana Mexicali Juarez

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. This parameter is available at the laboratory facilities only, all other parameters are available for on-site calibration service, 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. L = length in inches, N = the diagonal length of the surface plate divided by four, R = resolution of the unit under test.
3. This scope is formatted as part of a single document including Certificate of Accreditation No. AC-1342.



Vice President

