



CERTIFICATE OF ACCREDITATION

ANSI-ASQ National Accreditation Board

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

This is to certify that

Test Solutions de Mexico, S.A. de C.V.

Via Rápida Oriente #17228-3, Tercera Etapa Rio Tijuana

Tijuana B.C., C.P. 22226

Satellite Site:

Blvd. Lopez Mateos #2290-4, Centro Commercial Castellón, Mexicali Baja California

has been assessed by ANAB

and meets the requirements of international standard

ISO/IEC 17025:2005

and national standard

ANSI/NCSL Z540-1-1994 (R2002)

while demonstrating technical competence in the fields of

CALIBRATION AND TESTING

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

AC-1364

Certificate Number



ANAB Approval

Certificate Valid: 11/19/2018-01/05/2021
Version No. 009 Issued: 11/19/2018



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

Test Solutions de México, S.A. de C.V.
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CALIBRATION AND TESTING

Valid to: **January 5, 2021**

Certificate Number: **AC-1364**

Calibration

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage - Source	(1 to 100) μ V 100 μ V to 100 mV 100 mV to 1 V (1 to 10) V (10 to 100) V 100 V to 1.1 kV	13 μ V 37 μ V/V + 9 μ V 49 μ V/V + 5 μ V 64 μ V/V - 47 μ V 76 μ V/V + 0.45 mV 46 μ V/V + 9.7 mV	Fluke 5500A Multiproduct Calibrator
DC Current - Source	Up to 190 μ A 190 μ A to 3.3 mA (3.3 to 33) mA (33 to 330) mA 330 mA to 2.2 A (2.2 to 10) A	2.1 μ A 0.51 μ A/A + 2 μ A 1.1 μ A/A + 20 nA 2.7 mA/A - 52 μ A 1.4 mA/A + 0.38 mA 2.5 mA/A + 2 mA	Fluke 5500A Multiproduct Calibrator
AC Voltage - Source	(1 to 30) mV Up to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz	60 μ V 71 μ V 89 μ V 0.27 mV 1.7 mV	Fluke 5500A Multiproduct Calibrator



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage - Source	(30 to 330) mV Up to 45 Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz	1.4 mV/V + 17 μV 1.5 mV/V + 16 μV 1.5 mV/V + 26 μV 1.2 mV/V + 54 μV 7.8 mV/V + 28 μV 51 mV/V + 0.18 mV	Fluke 5500A Multiproduct Calibrator
AC Voltage - Source	330 mV to 3.3 V Up to 45 Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (3.3 to 33) V Up to 45 Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (33 to 330) V Up to 45 Hz 45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz (330 to 750) V Up to 45 Hz 45 Hz to 1 kHz (1 to 10) kHz	1.5 mV/V 1.5 mV/V + 16 μV 1.5 mV/V + 36 μV 2.7 mV/V 7.9 mV/V + 22 μV 51.5 mV/V 1.5 mV/V 1.5 mV/V 1.5 mV/V + 67 μV 2.7 mV/V + 89 μV 7.9 mV/V + 220 μV 1.2 mV/V + 7.8 mV 1.2 mV/V + 8 mV 1.3 mV/V + 6 mV 1.3 mV/V + 7.3 mV 0.65 mV/V + 0.2 V 0.65 mV/V + 0.2 V 0.68 mV/V + 0.2 V	Fluke 5500A Multiproduct Calibrator
AC Current - Source	(1 to 330) μA Up to 45 Hz 45 Hz to 1 kHz 330 μA to 3.3 mA Up to 45 Hz 45 Hz to 1 kHz (3.3 to 33) mA Up to 45 Hz 45 Hz to 1 kHz	17 μA 12 μA 20 μA/A + 10 μA 5.1 μA/A + 10 μA 20 μA/A + 10 μA 5.1 μA/A + 10 μA	Fluke 5500A Multiproduct Calibrator



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current - Source	(33 to 330) mA Up to 45 Hz 45 Hz to 1 kHz (1 to 5) kHz	1.2 μ A/A + 0.4 mA 1.1 μ A/A + 0.4 mA 1.1 μ A/A + 0.4 mA	Fluke 5500A Multiproduct Calibrator
	330 mA to 2.2 A Up to 45 Hz 45 Hz to 1 kHz (1 to 5) kHz	3.3 mA/A + 0.3 mA 2.6 mA/A + 78 μ A 4 mA/A + 555 μ A	
Resistance	(2.2 to 10) A Up to 45 Hz 45 Hz to 1 kHz	14 mA/A + 25 mA 16 mA/A + 29 mA	Fluke 5500A Multiproduct Calibrator
	(0 to 11) Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω 330 Ω to 1.1 k Ω (1.1 to 3.3) k Ω (3.3 to 11) k Ω (11 to 33) k Ω (33 to 110) k Ω (110 to 330) k Ω 330 k Ω to 1.1 M Ω (1.1 to 3.3) M Ω (3.3 to 11) M Ω (11 to 33) M Ω	0.5 m Ω / Ω + 3.4 m Ω 0.13 m Ω / Ω + 3.9 m Ω 0.17 m Ω / Ω + 2.6 m Ω 99 $\mu\Omega$ / Ω + 10 m Ω 0.22 m Ω / Ω - 29 m Ω 0.1 m Ω / Ω + 0.1 Ω 0.2 m Ω / Ω - 0.29 Ω 0.1 m Ω / Ω + 0.98 Ω 0.2 m Ω / Ω - 2.8 Ω 0.1 m Ω / Ω + 9.9 Ω 0.65 m Ω / Ω - 0.17 k Ω 0.41 m Ω / Ω + 95 Ω 13 m Ω / Ω - 40 k Ω 8.4 m Ω / Ω + 6 k Ω	
Electrical Simulation of Thermocouple indicating devices	Type B (600 to 800) $^{\circ}$ C (800 to 1 000) $^{\circ}$ C (1 000 to 1 820) $^{\circ}$ C	1.5 $^{\circ}$ C 1.2 $^{\circ}$ C 1.1 $^{\circ}$ C	Fluke 5500A Multiproduct Calibrator
	Type C (0 to 150) $^{\circ}$ C (150 to 650) $^{\circ}$ C (650 to 1 000) $^{\circ}$ C (1 000 to 1 800) $^{\circ}$ C (1 800 to 2 316) $^{\circ}$ C	0.79 $^{\circ}$ C 0.78 $^{\circ}$ C 0.95 $^{\circ}$ C 1.3 $^{\circ}$ C 2.3 $^{\circ}$ C	
Electrical Simulation of Thermocouple indicating devices	Type E (-250 to -100) $^{\circ}$ C (-100 to -25) $^{\circ}$ C (-25 to 650) $^{\circ}$ C (650 to 1 000) $^{\circ}$ C	0.83 $^{\circ}$ C 0.69 $^{\circ}$ C 0.68 $^{\circ}$ C 0.62 $^{\circ}$ C	Fluke 5500A Multiproduct Calibrator



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of Thermocouple indicating devices	Type J		Fluke 5500A Multiproduct Calibrator
	(-210 to -100) °C	0.79 °C	
	(-100 to 760) °C	0.54 °C	
	(760 to 1 200) °C	0.7 °C	
	Type K		
	(-200 to -100) °C	0.89 °C	
	(-100 to -25) °C	0.55 °C	
	(-25 to 120) °C	0.54 °C	
	(120 to 1 000) °C	0.7 °C	
	(1 000 to 1 372) °C	0.92 °C	
Type L			
(-200 to -100) °C	0.83 °C		
(-100 to 800) °C	0.58 °C		
(800 to 900) °C	0.68 °C		

Length – Dimensional metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Calipers			Gage Blocks Ring Gages
Outside	(1 to 6) in	(410 + 7L) μin	
Inside	1 and 2 in	580 μin	
Micrometers			Gage Blocks
Inside	Up to 1 in	40 μin	
Outside	(1 to 6) in	74 μin	

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Scales and Balances	Up to 16 oz	0.004 oz	Class F & Cast Iron Weights
	(1 to 5) lb	0.000 4 lb	
	(5 to 10) lb	0.000 8 lb	
	(10 to 100) lb	0.02 lb	



Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Scales and Balances	Up to 500 g 500 g to 2.2 kg (2.2 to 4.4) kg (4.4 to 45) kg	0.12 g 0.16 g 0.37 g 6.4 g	Class F & Cast Iron Weights
Torque	Up to 500 lbf-in (500 to 5000) lbf-in	2.6 lbf-in 23 lbf-in	Torque Transducers Transducer Techniques TRT-500 Transducer Techniques TRS-5K
Mass Flow Meters	Up to 2 ml/min (2 to 20) ml/min (20 to 200) ml/min (200 to 2 000) ml/min (2 000 to 20 000) ml/min	110 µl/min (0.007F + 0.092) ml/min (0.011F + 0.011) ml/min (0.015F - 0.82) ml/min (0.015F + 0.890) ml/min	Ateq CDF Flowmeter
Pressure	(-12 to 300) psi	0.07 psi	Fluke 725 Process Calibrator with Fluke 700P27 Pressure Module
	(100 to 5 000) psi	0.83 psi	Ametek PPC 350 BAR Pressure Calibrator
Pipettes and Other Volumetric Devices ¹	100 µL 1 mL 5 mL 25 mL 100 mL 250 mL 500 mL 1 000 mL 4 000 mL 6 000 mL	1.4 µl 1.4 µl 4.2 µl 12 µl 54 µl 67 µl 0.16 ml 0.46 ml 1.1 ml 1.6 ml	Balances Ohaus EX-225D A&D GX-1000 Ohaus EX-10202



Testing

Mechanical

Specific Tests and/or Properties Measured	Specification, Standard, Method, or Test Technique	Items, Materials or Product Tested	Key Equipment or Technology
Fume Hoods, Bio-Safety Cabinets, Clean Room	ISO 14644, Part 1 & 3, IEST-RP-CC002.4, IEST-RPCC006.3	Clean Room	-
Fume Hoods, Bio-Safety Cabinets, Clean Room	ISO 14644, Part 3, IEST-RP-CC002.4, IEST-RP-CC034.4	Terminal HEPA Filter	-

Services performed at satellite location

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 Mexicali, Baja California
 Fernando Garcia 686 561 9322, 9326 and 9327
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Calibration

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage - Source	(1 to 100) μ V 100 μ V to 100 mV 100 mV to 1 V (1 to 10) V (10 to 100) V 100 V to 1.1 kV	13 μ V 37 μ V/V + 9 μ V 49 μ V/V + 5 μ V 64 μ V/V - 47 μ V 76 μ V/V + 0.45 mV 46 μ V/V + 9.7 mV	Fluke 5500A Multiproduct Calibrator
DC Current - Source	Up to 190 μ A 190 μ A to 3.3 mA (3.3 to 33) mA (33 to 330) mA 330 mA to 2.2 A (2.2 to 10) A	2.1 μ A 0.51 μ A/A + 2 μ A 1.1 μ A/A + 20 nA 2.7 mA/A - 52 μ A 1.4 mA/A + 0.38 mA 2.5 mA/A + 2 mA	Fluke 5500A Multiproduct Calibrator



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage - Source	(1 to 30) mV Up to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz	60 μ V 71 μ V 89 μ V 0.27 mV 1.7 mV	Fluke 5500A Multiproduct Calibrator
AC Voltage - Source	(30 to 330) mV Up to 45 Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 330 mV to 3.3 V Up to 45 Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (3.3 to 33) V Up to 45 Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (33 to 330) V Up to 45 Hz 45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz (330 to 750) V Up to 45 Hz 45 Hz to 1 kHz (1 to 10) kHz	1.4 mV/V + 17 μ V 1.5 mV/V + 16 μ V 1.5 mV/V + 26 μ V 1.2 mV/V + 54 μ V 7.8 mV/V + 28 μ V 51 mV/V + 0.18 mV 1.5 mV/V 1.5 mV/V + 16 μ V 1.5 mV/V + 36 μ V 2.7 mV/V 7.9 mV/V + 22 μ V 51.5 mV/V 1.5 mV/V 1.5 mV/V 1.5 mV/V + 67 μ V 2.7 mV/V + 89 μ V 7.9 mV/V + 220 μ V 1.2 mV/V + 7.8 mV 1.2 mV/V + 8 mV 1.3 mV/V + 6 mV 1.3 mV/V + 7.3 mV 6.5 0.65 mV/V + 0.2 V 6.5 0.65 mV/V + 0.2 V 6.8 0.68 mV/V + 0.2 V	Fluke 5500A Multiproduct Calibrator



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current - Source	(1 to 330) μ A Up to 45 Hz 45 Hz to 1 kHz	17 μ A 12 μ A	Fluke 5500A Multiproduct Calibrator
	330 μ A to 3.3 mA Up to 45 Hz 45 Hz to 1 kHz	20 μ A/A + 10 μ A 5.1 μ A/A + 10 μ A	
	(3.3 to 33) mA Up to 45 Hz 45 Hz to 1 kHz	20 μ A/A + 10 μ A 5.1 μ A/A + 10 μ A	
AC Current - Source	(33 to 330) mA Up to 45 Hz 45 Hz to 1 kHz (1 to 5) kHz	1.2 μ A/A + 0.4 mA 1.1 μ A/A + 0.4 mA 1.1 μ A/A + 0.4 mA	Fluke 5500A Multiproduct Calibrator
	330 mA to 2.2 A Up to 45 Hz 45 Hz to 1 kHz (1 to 5) kHz	3.3 mA/A + 0.3 mA 2.6 mA/A + 78 μ A 4 mA/A + 555 μ A	
	(2.2 to 10) A Up to 45 Hz 45 Hz to 1 kHz	14 mA/A + 25 mA 16 mA/A + 29 mA	
Resistance	(0 to 11) Ω	0.5 m Ω / Ω + 3.4 m Ω	Fluke 5500A Multiproduct Calibrator
	(11 to 33) Ω	0.13 m Ω / Ω + 3.9 m Ω	
	(33 to 110) Ω	0.17 m Ω / Ω + 2.6 m Ω	
	(110 to 330) Ω	99 μ Ω / Ω + 10 m Ω	
	330 Ω to 1.1 k Ω	0.22 m Ω / Ω - 29 m Ω	
	(1.1 to 3.3) k Ω	0.1 m Ω / Ω + 0.1 Ω	
	(3.3 to 11) k Ω	0.2 m Ω / Ω - 0.29 Ω	
	(11 to 33) k Ω	0.1 m Ω / Ω + 0.98 Ω	
	(33 to 110) k Ω	0.2 m Ω / Ω - 2.8 Ω	
	(110 to 330) k Ω	0.1 m Ω / Ω + 9.9 Ω	
	330 k Ω to 1.1 M Ω	0.65 m Ω / Ω - 0.17 k Ω	
	(1.1 to 3.3) M Ω	0.41 m Ω / Ω + 95 Ω	
(3.3 to 11) M Ω	13 m Ω / Ω - 40 k Ω		
(11 to 33) M Ω	8.4 m Ω / Ω + 6 k Ω		



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of Thermocouple indicating devices	Type B (600 to 800) °C	1.5 °C	Fluke 5500A Multiproduct Calibrator
	(800 to 1 000) °C	1.2 °C	
	(1 000 to 1 820) °C	1.1 °C	
	Type C (0 to 150) °C	0.79 °C	
	(150 to 650) °C	0.78 °C	
	(650 to 1 000) °C	0.95 °C	
	(1 000 to 1 800) °C	1.3 °C	
	(1 800 to 2 316) °C	2.3 °C	
	Type E (-250 to -100) °C	0.83 °C	
	(-100 to -25) °C	0.69 °C	
	(-25 to 650) °C	0.68 °C	
	(650 to 1 000) °C	0.62 °C	
	Electrical Simulation of Thermocouple indicating devices	Type J (-210 to -100) °C	
(-100 to 760) °C		0.54 °C	
(760 to 1 200) °C		0.7 °C	
Type K (-200 to -100) °C		0.89 °C	
(-100 to -25) °C		0.55 °C	
(-25 to 120) °C		0.54 °C	
(120 to 1 000) °C		0.7 °C	
(1 000 to 1 372) °C		0.92 °C	
Type L (-200 to -100) °C		0.83 °C	
(-100 to 800) °C		0.58 °C	
(800 to 900) °C		0.68 °C	

Length – Dimensional metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Calipers Outside Inside	(1 to 6) in 1 and 2 in	(410 + 7L) μin 580 μin	Gage Blocks Ring Gages



Length – Dimensional metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Micrometers Inside Outside	Up to 1 in (1 to 6) in	40 μ in 74 μ in	Gage Blocks

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Scales and Balances	Up to 16 oz (1 to 5) lb (5 to 10) lb (10 to 100) lb	0.004 oz 0.000 4 lb 0.000 8 lb 0.02 lb	Class F & Cast Iron Weights
Scales and Balances	Up to 500 g 500 g to 2.2 kg (2.2 to 4.4) kg (4.4 to 45) kg	0.12 g 0.16 g 0.37 g 6.4 g	Class F & Cast Iron Weights
Torque	Up to 500 lbf·in (500 to 5000) lbf·in	2.6 lbf·in 23 lbf·in	Torque Transducers Transducer Techniques TRT-500 Transducer Techniques TRS-5K
Mass Flow Meters	Up to 2 ml/min (2 to 20) ml/min (20 to 200) ml/min (200 to 2 000) ml/min (2 000 to 20 000) ml/min	110 μ l/min (0.007F + 0.092) ml/min (0.011F + 0.011) ml/min (0.015F – 0.82) ml/min (0.015F + 0.890) ml/min	Ateq CDF Flowmeter
Pressure	(-12 to 300) psi	0.07 psi	Fluke 725 Process Calibrator with Fluke 700P27 Pressure Module
	(100 to 5 000) psi	0.83 psi	Ametek PPC 350 BAR Pressure Calibrator

Testing

Mechanical

Specific Tests and/or Properties Measured	Specification, Standard, Method, or Test Technique	Items, Materials or Product Tested	Key Equipment or Technology
Fume Hoods, Bio-Safety Cabinets, Clean Room	ISO 14644, Part 1 & 3, IEST-RP-CC002.4, IEST-RPCC006.3	Clean Room	-
Fume Hoods, Bio-Safety Cabinets, Clean Room	ISO 14644, Part 3, IEST-RP-CC002.4, IEST-RP-CC034.4	Terminal HEPA Filter	-

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. F = flow in ml/min, L = length in.
3. This scope is formatted as part of a single document including Certificate of Accreditation No. AC-1364.



Vice President

