



# PERRY JOHNSON LABORATORY ACCREDITATION, INC.

## Certificate of Accreditation

*Perry Johnson Laboratory Accreditation, Inc. has assessed the Laboratory of:*

### ***Metrología Aplicada y Servicios S. de R.L. de C.V.***

***Calle Amada Armendáriz # 233, Col. Revolución  
Chihuahua, Chihuahua, México. C.P. 31135***

*(Hereinafter called the Organization) and hereby declares that Organization 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  
(as outlined by the joint ISO-ILAC-IAF Communiqué dated April 2017):

### ***Electrical and Thermodynamic Calibration (As detailed in the supplement)***

Accreditation claims for such testing and/or calibration services shall only be made from addresses referenced within this certificate. This Accreditation is granted subject to the system rules governing the Accreditation referred to above, and the Organization hereby covenants with the Accreditation body's duty to observe and comply with the said rules.

For PJLA:

Tracy Szerszen  
President

*Initial Accreditation Date:*

April 12, 2023

*Issue Date:*

April 12, 2023

*Expiration Date:*

April 30, 2025

*Accreditation No.:*

22580

*Certificate No.:*

L23-290-2

Perry Johnson Laboratory  
Accreditation, Inc. (PJLA)  
755 W. Big Beaver, Suite 1325  
Troy, Michigan 48084

*The validity of this certificate is maintained through ongoing assessments based on a  
continuous accreditation cycle. The validity of this certificate should be  
confirmed through the PJLA website: [www.pjllabs.com](http://www.pjllabs.com)*



# Certificate of Accreditation: Supplement

## Metrología Aplicada y Servicios S. de R.L. de C.V.

Calle Amada Armendáriz # 233, Col. Revolución  
 Chihuahua, Chihuahua, México. C.P. 31135  
 Contact Name: Carlos Valenzuela Phone: 656-617-6617

Accreditation is granted to the facility to perform the following calibrations:

### Electrical

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY ( $\pm$ )	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Equipment to Simulate and Measure Thermocouple in Linear <sup>FO</sup> (10 $\mu$ V/ $^{\circ}$ C and 1 mV/ $^{\circ}$ C)	0.1 mV to 329.999 9 mV	50 $\mu$ V/V + 3 $\mu$ V	Fluke 5522A Euramet cg-11
Equipment to Measure DC Voltage <sup>FO</sup>	0.1 mV to 329.9999 mV	20 $\mu$ V/V + 1 $\mu$ V	Fluke 5522A EL-001 CEM-Procedure
	0.4 mV to 3.299 999 V	11 $\mu$ V/V + 2 $\mu$ V	
	4 V to 32.999 99 V	12 $\mu$ V/V + 20 $\mu$ V	
	30 V to 329.999 9 V	18 $\mu$ V/V + 150 $\mu$ V	
	100 V to 102 V	18 $\mu$ V/V + 1 500 $\mu$ V	
Equipment to Measure DC Current <sup>FO</sup>	0.1 $\mu$ A to 329.999 $\mu$ A	150 $\mu$ A/A + 0.02 $\mu$ A	
	0.4 $\mu$ A to 3.299 99 mA	100 $\mu$ A/A + 0.05 $\mu$ A	
	4 mA to 32.999 9 mA	100 $\mu$ A/A + 0.25 $\mu$ A	
	33 mA to 329.999 mA	100 $\mu$ A/A + 2.5 $\mu$ A	
	330 mA to 1.099 99 A	200 $\mu$ A/A + 40 $\mu$ A	
	1.1 A to 2.99 999 A	380 $\mu$ A/A + 40 $\mu$ A	
	3 A to 10.999 9 A	500 $\mu$ A/A + 500 $\mu$ A	
	11 A to 20.5 A	800 $\mu$ A/A + 750 $\mu$ A	
Equipment to Measure Resistance <sup>FO</sup>	0.1 $\Omega$ to 10.999 9 $\Omega$	47 $\mu\Omega/\Omega$ + 1.2 m $\Omega$	
	11 $\Omega$ to 32.999 9 $\Omega$	40 $\mu\Omega/\Omega$ + 1.7 m $\Omega$	
	33 $\Omega$ to 109.999 9 $\Omega$	34 $\mu\Omega/\Omega$ + 1.8 m $\Omega$	
	110 $\Omega$ to 329.999 9 $\Omega$	34 $\mu\Omega/\Omega$ + 2.4 m $\Omega$	
	330 $\Omega$ to 1.099 999 k $\Omega$	34 $\mu\Omega/\Omega$ + 2.4 m $\Omega$	
	1.1 k $\Omega$ to 3.299 999 k $\Omega$	34 $\mu\Omega/\Omega$ + 22 m $\Omega$	
	3.3 k $\Omega$ to 10.999 99 k $\Omega$	34 $\mu\Omega/\Omega$ + 23 m $\Omega$	
	11 k $\Omega$ to 32.999 99 k $\Omega$	34 $\mu\Omega/\Omega$ + 0.22 $\Omega$	
	33 k $\Omega$ to 109.999 9 k $\Omega$	34 $\mu\Omega/\Omega$ + 0.24 $\Omega$	
	110 k $\Omega$ to 329.999 99 k $\Omega$	44 $\mu\Omega/\Omega$ + 1.6 $\Omega$	
	330 k $\Omega$ to 1.099 999 M $\Omega$	40 $\mu\Omega/\Omega$ + 3 $\Omega$	
	1.1 M $\Omega$ to 3.299 999 M $\Omega$	0.12 m $\Omega/\Omega$	
	3.3 M $\Omega$ to 10.999 99 M $\Omega$	0.16 m $\Omega/\Omega$ + 86 $\Omega$	
	11 M $\Omega$ to 32.999 99 M $\Omega$	0.7 m $\Omega/\Omega$ + 2.5 k $\Omega$	
	33 M $\Omega$ to 109.999 9 M $\Omega$	0.76 m $\Omega/\Omega$ + 3.5 k $\Omega$	
	110 M $\Omega$ to 329.999 9 M $\Omega$	0.65 m $\Omega/\Omega$	
	330 M $\Omega$ to 1 100 M $\Omega$	15 m $\Omega/\Omega$ + 730 k $\Omega$	



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### Electrical

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY ( $\pm$ )	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Equipment to Measure AC Voltage At the listed frequency <sup>FO</sup>			Fluke 5522A EL-001 CEM-Procedure
10 Hz to 45 Hz	1 mV to 32.999 mV	800 $\mu$ V/V + 6 $\mu$ V	
45 Hz to 10 kHz	1 mV to 32.999 mV	150 $\mu$ V/V + 6 $\mu$ V	
10 kHz to 20 kHz	1 mV to 32.999 mV	200 $\mu$ V/V + 6 $\mu$ V	
20 kHz to 50 kHz	1 mV to 32.999 mV	1 000 $\mu$ V/V + 6 $\mu$ V	
50 kHz to 100 kHz	1 mV to 32.999 mV	3 500 $\mu$ V/V + 12 $\mu$ V	
100 kHz to 500 kHz	1 mV to 32.999 mV	8 000 $\mu$ V/V + 50 $\mu$ V	
Equipment to Measure AC Voltage At the listed frequency <sup>FO</sup>			
10 Hz to 45 Hz	33 mV to 329.999 mV	300 $\mu$ V/V + 8 $\mu$ V	
45 Hz to 10 kHz	33 mV to 329.999 mV	145 $\mu$ V/V + 8 $\mu$ V	
10 kHz to 20 kHz	33 mV to 329.999 mV	160 $\mu$ V/V + 8 $\mu$ V	
20 kHz to 50 kHz	33 mV to 329.999 mV	350 $\mu$ V/V + 8 $\mu$ V	
50 kHz to 100 kHz	33 mV to 329.999 mV	800 $\mu$ V/V + 32 $\mu$ V	
100 kHz to 500 kHz	33 mV to 329.999 mV	2 000 $\mu$ V/V + 70 $\mu$ V	
Equipment to Measure AC Voltage At the listed frequency <sup>FO</sup>			
10 Hz to 45 Hz	0.33 V to 3.299 99 V	300 $\mu$ V/V + 50 $\mu$ V	
45 Hz to 10 kHz	0.33 V to 3.299 99 V	150 $\mu$ V/V + 60 $\mu$ V	
10 kHz to 20 kHz	0.33 V to 3.299 99 V	190 $\mu$ V/V + 60 $\mu$ V	
20 kHz to 50 kHz	0.33 V to 3.299 99 V	300 $\mu$ V/V + 50 $\mu$ V	
50 kHz to 100 kHz	0.33 V to 3.299 99 V	700 $\mu$ V/V + 130 $\mu$ V	
100 kHz to 500 kHz	0.33 V to 3.299 99 V	2 400 $\mu$ V/V + 600 $\mu$ V	
Equipment to Measure AC Voltage At the listed frequency <sup>FO</sup>			
10 Hz to 45 Hz	3.3 V to 32.999 9 V	300 $\mu$ V/V + 600 $\mu$ V	
45 Hz to 10 kHz	3.3 V to 32.999 9 V	150 $\mu$ V/V + 600 $\mu$ V	
10 kHz to 20 kHz	3.3 V to 32.999 9 V	240 $\mu$ V/V + 600 $\mu$ V	
20 kHz to 50 kHz	3.3 V to 32.999 9 V	350 $\mu$ V/V + 600 $\mu$ V	
50 kHz to 100 kHz	3.3 V to 32.999 9 V	900 $\mu$ V/V + 1 600 $\mu$ V	



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Equipment to Measure AC Voltage At the listed frequency <sup>FO</sup>			Fluke 5522A EL-001 CEM-Procedure
10 Hz to 45 Hz	33 V to 329.999 V	190 $\mu$ V/V + 2 000 $\mu$ V	
45 Hz to 10 kHz	33 V to 329.999 V	200 $\mu$ V/V + 6 000 $\mu$ V	
10 kHz to 20 kHz	33 V to 329.999 V	250 $\mu$ V/V + 6 000 $\mu$ V	
20 kHz to 50 kHz	33 V to 329.999 V	300 $\mu$ V/V + 6 000 $\mu$ V	
50 kHz to 100 kHz	33 V to 329.999 V	2 000 $\mu$ V/V + 50 000 $\mu$ V	
Equipment to Measure AC Voltage At the listed frequency <sup>FO</sup>			
10 Hz to 1 kHz	330 V to 1 020 V	300 $\mu$ V/V + 10 000 $\mu$ V	
1 kHz to 5 kHz	330 V to 1 020 V	250 $\mu$ V/V + 10 000 $\mu$ V	
5 kHz to 10 kHz	330 V to 1 020 V	300 $\mu$ V/V + 10 000 $\mu$ V	
Equipment to Measure AC Current At the listed frequency <sup>FO</sup>			
10 Hz to 20 Hz	29 $\mu$ A to 329.99 $\mu$ A	0.2 $\mu$ A /A + 0.1 $\mu$ A	
20 Hz to 45 Hz	29 $\mu$ A to 329.99 $\mu$ A	0.15 $\mu$ A /A + 0.1 $\mu$ A	
45 Hz to 1 kHz	29 $\mu$ A to 329.99 $\mu$ A	0.125 $\mu$ A /A + 0.1 $\mu$ A	
1 kHz to 5 kHz	29 $\mu$ A to 329.99 $\mu$ A	0.3 $\mu$ A /A + 0.15 $\mu$ A	
5 kHz to 10 kHz	29 $\mu$ A to 329.99 $\mu$ A	0.8 $\mu$ A /A + 0.2 $\mu$ A	
10 kHz to 30 kHz	29 $\mu$ A to 329.99 $\mu$ A	1.6 $\mu$ A /A + 0.4 $\mu$ A	
Equipment to Measure AC Current At the listed frequency <sup>FO</sup>			
10 Hz to 20 Hz	0.33 mA to 3.299 99 mA	0.2 $\mu$ A /A + 0.15 $\mu$ A	
20 Hz to 45 Hz	0.33 mA to 3.299 99 mA	0.125 $\mu$ A /A + 0.15 $\mu$ A	
45 Hz to 1 kHz	0.33 mA to 3.299 99 mA	0.1 $\mu$ A /A + 0.15 $\mu$ A	
1kHz to 5 kHz	0.33 mA to 3.299 99 mA	0.2 $\mu$ A /A + 0.2 $\mu$ A	
5 kHz to 10 kHz	0.33 mA to 3.299 99 mA	0.5 $\mu$ A /A + 0.3 $\mu$ A	
10 kHz to 30 kHz	0.33 mA to 3.299 99 mA	1 $\mu$ A /A + 0.6 $\mu$ A	



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### Electrical

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Equipment to Measure AC Current At the listed frequency <sup>FO</sup>			Fluke 5522A EL-001 CEM-Procedure
10 Hz to 20 Hz	3.3 mA to 32.999 9 mA	0.18 $\mu$ A /A + 2 $\mu$ A	
20 Hz to 45 Hz	3.3 mA to 32.999 9 mA	0.09 $\mu$ A /A + 2 $\mu$ A	
45 Hz to 1 kHz	3.3 mA to 32.999 9 mA	0.04 $\mu$ A /A + 2 $\mu$ A	
1 kHz to 5 kHz	3.3 mA to 32.999 9 mA	0.08 $\mu$ A /A + 2 $\mu$ A	
5 kHz to 10 kHz	3.3 mA to 32.999 9 mA	0.2 $\mu$ A /A + 3 $\mu$ A	
10 kHz to 30 kHz	3.3 mA to 32.999 9 mA	0.04 $\mu$ A /A + 4 $\mu$ A	
Equipment to Measure AC Current At the listed frequency <sup>FO</sup>			
10 Hz to 20 Hz	33 mA to 329.999 mA	0.18 $\mu$ A /A + 20 $\mu$ A	
20 Hz to 45 Hz	33 mA to 329.999 mA	0.09 $\mu$ A /A + 20 $\mu$ A	
45 Hz to 1 kHz	33 mA to 329.999 mA	0.04 $\mu$ A /A + 20 $\mu$ A	
1kHz to 5 kHz	33 mA to 329.999 mA	0.1 $\mu$ A /A + 50 $\mu$ A	
5 kHz to 10 kHz	33 mA to 329.999 mA	0.2 $\mu$ A /A + 100 $\mu$ A	
10 kHz to 30 kHz	33 mA to 329.999 mA	0.4 $\mu$ A /A + 200 $\mu$ A	
Equipment to Measure AC Current At the listed frequency <sup>FO</sup>			
10 to 45 Hz	0.33 A to 1.099 99 A	0.18 $\mu$ A /A + 100 $\mu$ A	
45 Hz to 1 kHz	0.33 A to 1.099 99 A	0.05 $\mu$ A /A + 100 $\mu$ A	
1 kHz to 5 kHz	0.33 A to 1.099 99 A	0.6 $\mu$ A /A + 1000 $\mu$ A	
5 kHz to 10 kHz	0.33 A to 1.099 99 A	2.5 $\mu$ A /A + 5 000 $\mu$ A	
Equipment to Measure AC Current At the listed frequency <sup>FO</sup>			
10 to 45 Hz	1.1 A to 2.999 99 A	0.18 $\mu$ A /A + 100 $\mu$ A	
45 Hz to 1 kHz	1.1 A to 2.999 99 A	0.06 $\mu$ A /A + 100 $\mu$ A	
1 to 5 kHz	1.1 A to 2.999 99 A	0.6 $\mu$ A /A + 1 000 $\mu$ A	
5 to 10 kHz	1.1 A to 2.999 99 A	2.5 $\mu$ A /A + 5 000 $\mu$ A	



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### Electrical

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Equipment to Measure AC Current At the listed frequency <sup>F0</sup>			Fluke 5522A EL-001 CEM-Procedure
45 Hz to 100 Hz	3 A to 10.999 9 A	0.06 $\mu$ A /A + 2 000 $\mu$ A	
100 Hz to 1 kHz	3 A to 10.999 9 A	0.1 $\mu$ A /A + 2 000 $\mu$ A	
1 kHz to 5 kHz	3 A to 10.999 9 A	3 $\mu$ A /A + 2 000 $\mu$ A	
Equipment to Measure AC Current At the listed frequency <sup>F0</sup>			
45 Hz to 100 Hz	11 A to 20.5 A	0.12 $\mu$ A /A + 5 000 $\mu$ A	
100 Hz to 1 kHz	11 A to 20.5 A	0.15 $\mu$ A /A + 5 000 $\mu$ A	Fluke 5522A Electrical Simulation of Thermocouple Output Euramet cg-11
1 kHz to 5 kHz	11 A to 20.5 A	3 $\mu$ A /A + 5 000 $\mu$ A	
Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type J <sup>F0</sup>	210 °C to -100 °C	0.21 °C	
	-100 °C to -30 °C	0.13 °C	
	-30 °C to 150 °C	0.11 °C	
	150 °C to 760 °C	0.13 °C	
Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type K <sup>F0</sup>	760 °C to 1 200 °C	0.18 °C	
	-210 °C to -100 °C	0.26 °C	
	-100 °C to -25 °C	0.14 °C	
	-25 °C to 120 °C	0.13 °C	
Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type R <sup>F0</sup>	120 °C to 1 000 °C	0.2 °C	
	1 000 °C to 1 372 °C	0.31 °C	
	0 °C to 250 °C	0.44 °C	
	250 °C to 400 °C	0.27 °C	
Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type S <sup>F0</sup>	400 °C to 1 000 °C	0.26 °C	
	1 000 °C to 1 767 °C	0.31 °C	
	0 °C to 250 °C	0.37 °C	
	250 °C to 1 000 °C	0.28 °C	
Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type T <sup>F0</sup>	1 000 °C to 1 400 °C	0.29 °C	
	1 400 °C to 1 767 °C	0.36 °C	
	-250 °C to -150 °C	0.49 °C	
	-150 °C to 0 °C	0.19 °C	
Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type T <sup>F0</sup>	0 °C to 120 °C	0.13 °C	
	120 °C to 400 °C	0.11 °C	



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### Electrical

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Equipment to Output DC Voltage <sup>FO</sup>	Up to 330 mV	16 $\mu$ V/V + 780 $\mu$ V	Agilent 3458A / EL-001 CEM-Procedure
	330 mV to 3.3 V	8.5 $\mu$ V/V + 1.6 $\mu$ V	
	3.3 V to 33 V	9.3 $\mu$ V/V + 16 $\mu$ V	
	33 V to 330 V	14 $\mu$ V/V + 120 $\mu$ V 14	
	100 V to 1.02 kV	14 $\mu$ V/V + 1.2 mV	
Equipment to Output DC Current <sup>FO</sup>	Up to 320 $\mu$ A	0.038 $\mu$ A/A + 16 $\mu$ A	
	320 $\mu$ A to 3.2 mA	78 $\mu$ A/A + 39 $\mu$ A	
	3.2 mA to 32 mA	78 $\mu$ A/A + 190 $\mu$ A	
	32 mA to 320 mA	78 $\mu$ A/A + 1.9 $\mu$ A	
	320 mA to 1.1 A	150 $\mu$ A/A + 31 $\mu$ A	
	1.1 A to 2.9 A	290 $\mu$ A/A + 31 $\mu$ A	
	2.9 A to 11A	390 $\mu$ A/A + 390 $\mu$ A	
	11 A to 20.5 A	780 $\mu$ A/A + 580 $\mu$ A	
Equipment to Output Resistance <sup>FO</sup>	0 $\Omega$ to 11 $\Omega$	31 $\mu\Omega/\Omega$ + 78 $\mu\Omega$	
	11 $\Omega$ to 33 $\Omega$	23 $\mu\Omega/\Omega$ + 1.2 m $\Omega$	
	33 $\Omega$ to 110 $\Omega$	22 $\mu\Omega/\Omega$ + 1.1 m $\Omega$	
	110 $\Omega$ to 330 $\Omega$	22 $\mu\Omega/\Omega$ + 1.6 m $\Omega$	
	330 $\Omega$ to 1.1 k $\Omega$	22 $\mu\Omega/\Omega$ + 1.6 m $\Omega$	
	1.1 k $\Omega$ to 3.3 k $\Omega$	22 $\mu\Omega/\Omega$ + 16 m $\Omega$	
	3.3 k $\Omega$ to 11 k $\Omega$	22 $\mu\Omega/\Omega$ + 16 m $\Omega$	
	11 k $\Omega$ to 33 k $\Omega$	22 $\mu\Omega/\Omega$ + 160 m $\Omega$	
	33 k $\Omega$ to 110 k $\Omega$	22 $\mu\Omega/\Omega$ + 160 m $\Omega$	
	110 k $\Omega$ to 330 k $\Omega$	25 $\mu\Omega/\Omega$ + 1.6 $\Omega$	
	330 k $\Omega$ to 1.1 M $\Omega$	25 $\mu\Omega/\Omega$ + 1.6 $\Omega$	
	1.1 M $\Omega$ to 3.3 M $\Omega$	47 $\mu\Omega/\Omega$ + 23 $\Omega$	
	3.3 M $\Omega$ to 11 M $\Omega$	100 $\mu\Omega/\Omega$ + 39 $\Omega$	
	11 k $\Omega$ to 33 k $\Omega$	190 $\mu\Omega/\Omega$ + 1.9 k $\Omega$	
	33 k $\Omega$ to 110 k $\Omega$	390 $\mu\Omega/\Omega$ + 2.3 k $\Omega$	
	110 k $\Omega$ to 330 k $\Omega$	230 $\mu\Omega/\Omega$ + 78 k $\Omega$	
	330 k $\Omega$ to 1 100 M $\Omega$	1.2 m $\Omega/\Omega$ + 390 k $\Omega$	



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Equipment to Output AC Voltage At the listed frequencies <sup>FO</sup>			Agilent 3458A / EL-001 CEM-Procedure
10 Hz to 45 Hz	1 mV to 33 mV	0.062 % of reading + 4.7 $\mu$ V	
45 kHz to 10 kHz	1 mV to 33 mV	0.012 % of reading + 4.7 $\mu$ V	
10 kHz to 20 kHz	1 mV to 33 mV	0.016 % of reading + 4.7 $\mu$ V	
20 kHz to 50 kHz	1 mV to 33 mV	0.078 % of reading + 4.7 $\mu$ V	
50 kHz to 100 kHz	1 mV to 33 mV	0.27 % reading + 9.3 $\mu$ V	
100 kHz to 500 kHz	1 mV to 33 mV	0.62 % reading + 39 $\mu$ V	
Equipment to Output AC Voltage At the listed frequencies <sup>FO</sup>			
10 Hz to 45 Hz	33 mV to 330 mV	0.023 % of reading + 6.2 $\mu$ V	
45 kHz to 10 kHz	33 mV to 330 mV	0.011 % of reading + 6.2 $\mu$ V	
10 kHz to 20 kHz	33 mV to 330 mV	0.012 % of reading + 6.2 $\mu$ V	
20 kHz to 50 kHz	33 mV to 330 mV	0.027 % of reading + 6.2 $\mu$ V	
50 kHz to 100 kHz	33 mV to 330 mV	0.062 % of reading + 25 $\mu$ V	
100 kHz to 500 kHz	33 mV to 330 mV	0.15 % of reading + 54 $\mu$ V	
Equipment to Output AC Voltage At the listed frequencies <sup>FO</sup>			
10 Hz to 45 Hz	0.33 V to 3.3 V	0.023 % of reading + 39 $\mu$ V	
45 kHz to 10 kHz	0.33 V to 3.3 V	0.011 % of reading + 47 $\mu$ V	
10 kHz to 20 kHz	0.33 V to 3.3 V	0.015 % of reading + 47 $\mu$ V	
20 kHz to 50 kHz	0.33 V to 3.3 V	0.023 % of reading + 39 $\mu$ V	
50 kHz to 100 kHz	0.33 V to 3.3 V	0.054 % of reading + 97 $\mu$ V	
100 kHz to 500 kHz	0.33 V to 3.3 V	0.18 % of reading + 470 $\mu$ V	
Equipment to Output AC Voltage At the listed frequencies <sup>FO</sup>			
10 Hz to 45 Hz	3.3 V to 33 V	0.023 % of reading + 500 $\mu$ V	
45 kHz to 10 kHz	3.3 V to 33 V	0.012 % of reading + 470 $\mu$ V	
10 kHz to 20 kHz	3.3 V to 33 V	0.019 % of reading + 470 $\mu$ V	
20 kHz to 50 kHz	3.3 V to 33 V	0.027 % of reading + 470 $\mu$ V	
50 kHz to 100 kHz	3.3 V to 33 V	0.07 % of reading + 1.2 mV	





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Equipment to Output AC Voltage At the listed frequencies <sup>FO</sup>			Agilent 3458A / EL-001 CEM-Procedure
10 Hz to 45 Hz	33 V to 330 V	0.015 % of reading + 1.6 mV	
45 kHz to 10 kHz	33 V to 330 V	0.016 % of reading + 4.7 mV	
10 kHz to 20 kHz	33 V to 330 V	0.019 % of reading + 4.7 mV	
20 kHz to 50 kHz	33 V to 330 V	0.023 % of reading + 4.7 mV	
50 kHz to 100 kHz	33 V to 330 V	0.16 % of reading + 39 mV	
Equipment to Output AC Voltage At the listed frequencies <sup>FO</sup>			
45 Hz to 1 kHz	330 V to 1 020 V	0.023 % of reading + 7.8 mV	
1 kHz to 5 kHz	330 V to 1 020 V	0.019 % of reading + 7.8 mV	
5 kHz to 10 kHz	330 V to 1 020 V	0.023 % of reading + 7.8 mV	
Equipment to Output AC Current At the listed frequencies <sup>FO</sup>			
10 Hz to 20 Hz	29 $\mu$ A to 330 $\mu$ A	0.16 % of reading + 78 nA	
20 Hz to 45 Hz	29 $\mu$ A to 330 $\mu$ A	0.12 % of reading + 78 nA	
45 Hz to 1 kHz	29 $\mu$ A to 330 $\mu$ A	0.1 % of reading + 78 nA	
1 kHz to 5 kHz	29 $\mu$ A to 330 $\mu$ A	0.23 % of reading + 0.12 $\mu$ A	
5 kHz to 10 kHz	29 $\mu$ A to 330 $\mu$ A	0.62 % of reading + 0.16 $\mu$ A	
10 kHz to 30 kHz	29 $\mu$ A to 330 $\mu$ A	1.3 % of reading + 0.31 $\mu$ A	
Equipment to Output AC Current At the listed frequencies <sup>FO</sup>			
10 Hz to 20 Hz	0.33 mA to 3.3 mA	0.16 % of reading + 0.12 $\mu$ A	
20 Hz to 45 Hz	0.33 mA to 3.3 mA	0.1 % of reading + 0.12 $\mu$ A	
45 Hz to 1 kHz	0.33 mA to 3.3 mA	0.075 % of reading + 0.12 $\mu$ A	
1 kHz to 5 kHz	0.33 mA to 3.3 mA	0.16 % of reading + 0.16 $\mu$ A	
5 kHz to 10 kHz	0.33 mA to 3.3 mA	0.39 % of reading + 0.23 $\mu$ A	
10 kHz to 30 kHz	0.33 mA to 3.3 mA	0.77 % of reading + 0.47 $\mu$ A	



# Certificate of Accreditation: Supplement

## Metrología Aplicada y Servicios, S. de R.L. de C.V.

Calle Amada Armendáriz # 233, Col. Revolución

Chihuahua, Chihuahua, México. C.P. 31135

Contact Name: Carlos Valenzuela Phone: 656-617-6617

Accreditation is granted to the facility to perform the following calibrations

### Electrical

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY ( $\pm$ )	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Equipment to Output AC Current At the listed frequencies <sup>FO</sup>			Agilent 3458A / EL-001 CEM-Procedure
10 Hz to 20 Hz	3.3 mA to 33 mA	0.14 % of reading + 1.6 $\mu$ A	
20 Hz to 45 Hz	3.3 mA to 33 mA	0.07 % of reading + 1.6 $\mu$ A	
45 Hz to 1 kHz	3.3 mA to 33 mA	0.03 % of reading + 1.6 $\mu$ A	
1 kHz to 5 kHz	3.3 mA to 33 mA	0.06 % of reading + 1.6 $\mu$ A	
5 kHz to 10 kHz	3.3 mA to 33 mA	0.16 % of reading + 2.3 $\mu$ A	
10 kHz to 30 kHz	3.3 mA to 33 mA	0.31 % of reading + 3.1 $\mu$ A	
Equipment to Output AC Current At the listed frequencies <sup>FO</sup>			
10 Hz to 20 Hz	33 mA to 330 mA	0.14 % of reading + 16 $\mu$ A	
20 Hz to 45 Hz	33 mA to 330 mA	0.07 % of reading + 16 $\mu$ A	
45 Hz to 1 kHz	33 mA to 330 mA	0.03 % of reading + 16 $\mu$ A	
1 kHz to 5 kHz	33 mA to 330 mA	0.08 % of reading + 39 $\mu$ A	
5 kHz to 10 kHz	33 mA to 330 mA	0.16 % of reading + 78 $\mu$ A	
10 kHz to 30 kHz	33 mA to 330 mA	0.31 % of reading + 160 $\mu$ A	
Equipment to Output AC Current At the listed frequencies <sup>FO</sup>			
10 Hz to 20 Hz	0.33 A to 1.1 A	0.14 % of reading + 78 $\mu$ A	
45 Hz to 1 kHz	0.33 A to 1.1 A	0.039 % of reading + 78 $\mu$ A	
1 kHz to 5 kHz	0.33 A to 1.1 A	0.47 % of reading + 780 $\mu$ A	
5 kHz to 10 kHz	0.33 A to 1.1 A	1.9 % of reading + 3.9 mA	
Equipment to Output AC Current At the listed frequencies <sup>FO</sup>			
10 Hz to 20 Hz	1.1 A to 3 A	0.14 % of reading + 78 $\mu$ A	
45 Hz to 1 kHz	1.1 A to 3 A	0.05 % of reading + 78 $\mu$ A	
1 kHz to 5 kHz	1.1 A to 3 A	0.47 % of reading + 780 $\mu$ A	
5 kHz to 10 kHz	1.1 A to 3 A	1.9 % of reading + 3.9 mA	



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### Electrical

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY ( $\pm$ )	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Oscilloscopes Voltage p-p (50 $\Omega$ ) (50 kHz to 600 MHz) <sup>FO</sup>	5 mV to 5.5 V	6 % of output + 300 $\mu$ V	Fluke 5522A/SC600 Euramet-cg-7
Oscilloscope (Timing Accuracy) <sup>FO</sup>	2 ns to 20 ms	0.000 25 % of reading	

### Thermodynamic

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY ( $\pm$ )	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Thermohygrometer Humidity Only <sup>F</sup>	10 % RH to 90 % RH	1 % RH	Vaisala MI70/HMP75 Humidity Chamber Euramet-cg-20
Thermohygrometer Temperature Only <sup>F</sup>	10 °C to 50 °C	0.1 °C	

1. The CMC (Calibration and Measurement Capability) stated for calibrations included on this scope of accreditation represents the smallest measurement uncertainty attainable by the laboratory when performing a more or less routine calibration of a nearly ideal device under nearly ideal conditions. It is typically expressed at a confidence level of 95 % using a coverage factor  $k$  (usually equal to 2). The actual measurement uncertainty associated with a specific calibration performed by the laboratory will typically be larger than the CMC for the same calibration since capability and performance of the device being calibrated and the conditions related to the calibration may reasonably be expected to deviate from ideal to some degree.
2. The laboratories range of calibration capability for all disciplines for which they are accredited is the interval from the smallest calibrated standard to the largest calibrated standard used in performing the calibration. The low end of this range must be an attainable value for which the laboratory has or has access to the standard referenced. Verification of an indicated value of zero in the absence of a standard is common practice in the procedure for many calibrations but by its definition it does not constitute calibration of zero capacity.
3. The presence of a superscript F means that the laboratory performs calibration of the indicated parameter at its fixed location. Example: Outside Micrometer<sup>F</sup> would mean that the laboratory performs this calibration at its fixed location.
4. The presence of a superscript FO means that the laboratory performs calibration of the indicated parameter both at its fixed location and onsite at customer locations. Example: Outside Micrometer<sup>FO</sup> would mean that the laboratory performs this calibration at its fixed location and onsite at customer locations.



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5. Measurement uncertainties obtained for calibrations performed at customer sites can be expected to be larger than the measurement uncertainties obtained at the laboratories fixed location for similar calibrations. This is due to the effects of transportation of the standards and equipment and upon environmental conditions at the customer site which are typically not controlled as closely as at the laboratories fixed location.
6. This location is linked to Ramón Rayón #1520, Int-9, Pino Seco/Lote Bravo Ciudad Juárez, Chihuahua, México. C.P. 32550 due to a share quality management system.

