



# PERRY JOHNSON LABORATORY ACCREDITATION, INC.

## Certificate of Accreditation

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

### **Laboratorios de Metrología FESO, S.A. de C.V.**

**Blvd. de la Nación #130 Int. 11, Col. Los Robles  
Querétaro, Querétaro, México. C.P. 76125**

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

***Dimensional, Mass, Force and Weighting Devices, Mechanical, Thermodynamic  
and Electrical 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/Operations Manager

*Initial Accreditation Date:*

August 13, 2014

*Issue Date:*

November 15, 2018

*Expiration Date:*

December 31, 2020

*Accreditation No.:*

78970

*Certificate No.:*

L18-527

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

## Laboratorio de Metrología FESO, S.A. de C.V.

Blvd. de la Nación #130 Inter. 11, Col. Los Robles

Querétaro, Querétaro, México C.P. 76125

Contact Name: Fernando Briseño Nabor Phone: 442-403-5892

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

### Dimensional

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
Calipers <sup>FO</sup>	0.05 in to 40 in	$(289.97 + 3.03L) \mu\text{in}$	Gage Blocks DI-008
	0.5 mm to 1 016 mm	$(7.37 + 3.02 \times 10^{-3}L) \mu\text{m}$	
Depth Calipers <sup>FO</sup>	1 mm to 600 mm	$(7.7 + 0.005L) \mu\text{m}$	Gage Blocks/ Depth Gage DI-008
Outside Micrometers <sup>FO</sup>	0.1 mm to 50 mm	$(7.33 \times 10^{-1} + 2.35 \times 10^{-3}L) \mu\text{m}$	Gage Blocks DI-005
Depth Micrometers <sup>FO</sup>	1 mm to 300 mm	$(1.2 + 0.016L) \mu\text{m}$	Gage Blocks/ Depth Gage CENAM Technical Guide for Dimensional Instruments
Inside Micrometers <sup>FO</sup>	0.02 in to 23,6 in (0.5 mm to 600 mm)	$(57.72 + 7.98 \times 10^{-1}L) \mu\text{in}$ $[(1.47 + 7.97 \times 10^{-4}L)] \mu\text{m}$	Universal Length Machine NMX-CH-092-IMNC-2005 CENAM Technical Guide for Dimensional Instruments
Micrometer Head <sup>FO</sup>	0.05 in to 1 in	58 $\mu\text{in}$	Universal Length Machine CENAM Technical Guide for Dimensional Instruments
Digital Indicators <sup>F</sup>	0.000 5 in to 1 in	63 $\mu\text{in}$	Dial Gage Tester Universal Length Machine DI-010
Bore Gage <sup>FO</sup>	0.7 in to 16 in	63 $\mu\text{m}$	
Dial Indicator <sup>F</sup>	0.001mm to 5 mm (Res.= 0.001 mm)	1.5 $\mu\text{m}$	
	0.01 mm to 100 mm (Res.= 0.01 mm)	6 $\mu\text{m}$	
Height Gages <sup>FO</sup>	0.05 in to 40 in	$(5.16 \times 10^{-1} + 3.09L) \mu\text{in}$	Gage Blocks/Check Master NMX-CH-141-IMNC-2005 DI-008 CENAM Technical Guide for Dimensional Instruments
	0.5 mm to 1 016 mm	$(4.01 \times 10^{-2} + 2.57 \times 10^{-3}L) \mu\text{m}$	
Rules <sup>FO</sup>	0.01 m to 2 m	0.29 mm	Master Rule, Optical Reticle DI-012
Plain Plug Gages <sup>F</sup>	0.2 mm to 200 mm	1 $\mu\text{m}$	Universal Length Machine CENAM Technical Guide for Dimensional Instruments ASME B89.1.5 ISO 286-2010 DIN 7164-1996 IS-3455-1971 & IS
Plain Plug Tapered <sup>F</sup>	0.2 mm to 200 mm	1 $\mu\text{m}$	Universal Length Machine CENAM Technical Guide for Dimensional Instruments IS: 9475-1986 IS: 2251-1986



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Micrometer End Standard <sup>F</sup>	25 mm to 600 mm	$(0.3 + 0.01L) \mu\text{m}$	Universal Length Machine CENAM Technical Guide for Dimensional Instruments
Surface Plate Flatness <sup>F</sup>	0.25 m to 3.5 mm in diagonal	$(2.1 + 5.48D) \mu\text{m}$	Electronic Levels NMX-CH-8512-2:IMNC
Dial Thickness Gage <sup>F</sup>	1 mm to 25 mm (Res.= 0.001 mm)	0.7 $\mu\text{m}$	Blocks DI-010
	1 mm to 25 mm (Res.= 0.01)	7.6 $\mu\text{m}$	
Roughness Ra <sup>FO</sup>	0.41 $\mu\text{m}$ to 2.94 $\mu\text{m}$	0.04 $\mu\text{m}$	Roughness Master Specimen JIS B 0601
Roughness Ry <sup>FO</sup>	1.6 $\mu\text{m}$ to 11.3 $\mu\text{m}$	0.1 $\mu\text{m}$	
Roughness Meter <sup>FO</sup>	117 $\mu\text{in}$	1.6 $\mu\text{in}$	Roughness Master DI-02
	370 $\mu\text{in}$	4.2 $\mu\text{in}$	
Measuring Tape <sup>FO</sup>	0.1 m to 50 m	0.29 mm	Master Rule, Optical Reticle DI-011
Optical Comparators X Axis Linearity Y Axis Linearity <sup>O</sup>	0.5 mm to 300 mm	5 $\mu\text{m}$	Glass Master JIS B 7184
Optical Comparators Magnification <sup>O</sup>	5X	0.05 % of magnification	
	10X	0.05 % of magnification	
	20X	0.05 % of magnification	
	30X	0.05 % of magnification	
Optical Comparator Axial Squareness <sup>O</sup>	76.2 mm of Y axis Travel or maximum Y axis Travel if maximum is less than 76.2 mm (3 in of Y axis travel if maximum is less than 3 in).	4.4 $\mu\text{m}$ (170 $\mu\text{in}$ )	Master Square JIS B 7184
Optical Comparators Angularity <sup>F</sup>	360°	0.016°	Glass Scale, Angle Gage Blocks JIS-7184
Microscopes <sup>O</sup>	5X	0.35 % of reading	Glass Scale JIS B 7153
	10X	0.35 % of reading	
	20X	0.35 % of reading	



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Plain Ring Gage (Diameter) <sup>F</sup>	3 mm to 150 mm	1 $\mu$ m	Measurement Machine Ring Gage ANSI/ASME B89.1.6 CENAM Technical Guide for Dimensional Instruments ISO 286 part 1 and 2 –2010 & DIN 7164-1996 IS 3455-1971 & SIS 919-1993 Specific Gage
	150 mm to 250 mm	1.2 $\mu$ m	
Ring Gage Tapered (Diameter) <sup>F</sup>	3 mm to 250 mm	1.2 $\mu$ m	ANSI/ASME B89.1.6 CENAM Technical Guide for Dimensional Instruments. IS 9475-1986 IS 2251-1986 Specific gages
Thread Ring Gage (Pitch diameter) <sup>F</sup>	(M 1.6 x 0.35 to M 100 x 2)	3.2 $\mu$ m	Measurement Machine Ring Gage / Spherical Contacts ANSI/ASME B89.1.6 CENAM Technical Guide for Dimensional Instruments Metric Screw Thread M ISO 68-1, ISO-965, DIN 13 Unified inch screw thread, UN, UNR / ANSI/ASME B.1.1
Thread Ring Gage Tapered (Pitch Diameter) <sup>F</sup>	(M 1.6 x 0.35 to M 100 x 2)	3.2 $\mu$ m	Universal Length Machine Wires set ANSI/ASME B89.1.6 CENAM Technical Guide for Dimensional Instruments ANSI/ASME B120.1-1983 IS: 554-1999 & IS 8999-2003 (NPT) Specific Gages
Thread Plug Gage <sup>FO</sup>	(M 1.6 x 0.35 to M 100 x 2)	3.2 $\mu$ m	EA-10/10 Wires Mitutoyo, Model: 313-101 and Digital Micrometer ANSI/ASME B1.20.1-1983 CENAM Technical Guide for Dimensional Instruments
Thread Plug Gage Tapered (Pitch Diameter) <sup>F</sup>	(M 1.6 x 0.35 to M 100 x 2)	3.2 $\mu$ m	Universal Length Machine Wires Set ANSI/ASME B1.20.1-1983 IS 554-1999 & IS 8990-2003 CENAM Technical Guide for Dimensional Instruments



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Pin Gage <sup>F</sup>	0.01 in to 1 in	34 $\mu$ m	High Accuracy Micrometer Mitutoyo Model: 293-130 ASME B89.1.5 CENAM Technical Guide for Dimensional Instruments
Gage Block Steel <sup>F</sup>	0.5 mm to 10 mm	0.04 $\mu$ m	Gauge Block K Grade 0 Block Comparator Aditya JIS 7506
	10 mm to 25 mm	0.04 $\mu$ m	
	25 mm to 50 mm	0.05 $\mu$ m	
	50 mm to 75 mm	0.06 $\mu$ m	
	75 mm to 100 mm	0.08 $\mu$ m	
Gage Block Ceramic <sup>F</sup>	0.5 mm to 10 mm	0.04 $\mu$ m	
	10 mm to 25 mm	0.05 $\mu$ m	
	25 mm to 50 mm	0.08 $\mu$ m	
	50 mm to 75 mm	0.11 $\mu$ m	
	75 mm to 100 mm	0.15 $\mu$ m	

### Mass, Force and Weighting Devices

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
Balances <sup>O</sup>	1 mg to 100 g (Res.= 0.001 g)	$(1.2 \times 10^{-3} + 1.36 \times 10^{-6}Wt) \text{ g}$	Weight Set F1 EURAMET cg-18 SIM Guidelines
	0.1 g to 1 000 g (Res.= 0.01 g)	$(1.16 \times 10^{-2} + 1.36 \times 10^{-6}Wt) \text{ g}$	
	0.2 g to 5 000 g (Res.= 0.05 g)	$(5.78 \times 10^{-2} + 1.36 \times 10^{-2}Wt) \text{ g}$	
	1 mg to 220 g (Res.= 0.000 1 g)	$(3 \times 10^{-4} + 1.21 \times 10^{-7}Wt) \text{ g}$	
	1 mg to 1 000 g (Res.= 0.001 g)	$(1.2 \times 10^{-3} + 1.52 \times 10^{-7}Wt) \text{ g}$	
Scales <sup>O</sup>	0.01 kg to 10 kg (Res.= 0.001 kg)	$(1.154 7 + 1.44 \times 10^{-7}Wt) \text{ g}$	Weight set F1, Parallelepiped Weights Class M1. EURAMET cg-18 SIM Guidelines
	1 kg to 100 kg (Res.= 0.02 kg)	$(23.094 + 7.26 \times 10^{-8}Wt) \text{ g}$	
	100 kg to 2 000 kg (Res.= 0.2 kg)	$(2.31 \times 10^{-1} + 1.52 \times 10^{-7}Wt) \text{ kg}$	
	200 kg to 5 000 kg (Res.= 0.5 kg)	$(5.77 \times 10^{-1} + 1.50 \times 10^{-7}Wt) \text{ kg}$	
	500 kg to 10 000 kg (Res.= 5 kg)	$(5.773 5 + 1.94 \times 10^{-8}Wt) \text{ kg}$	





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Dynamometers <sup>FO</sup>	0.01 kgf to 100 kgf	0.012 kgf	Weight set F, Weights Parallelepipiped M1 PR-DIM-05 Internal Procedure
Force Measurement Instrument Tensile and Compression <sup>F</sup>	5 kgf to 5 000 kgf	0.23 % of reading	S Type Load Cells NMX-CH-7500-1-IMNC
	5 000 kgf to 30 000 kgf	0.23 % of reading	Cylindrical Load Cell NMX-CH-7500-1-IMNC
Load Cells <sup>F</sup>	5 kgf to 500 kgf	0.23 % of reading	S Type Load Cells ISO 373

### Mechanical

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Pressure Gage <sup>FO</sup>	3 psi to 300 psi	0.059 psi	Pressure Calibrator Druck; Digital Calibrator Heise; Transducer Ashcroft. EURAMET cg-17	
	301 psi to 10 000 psi	0.59 psi		
Pressure Transmitter <sup>FO</sup>	3 psi to 300 psi	0.059 psi		
	301 psi to 10 000 psi	0.59 psi		
Pressure Recorder <sup>FO</sup>	3 psi to 300 psi	0.059 psi		
	301 psi to 10 000 psi	0.59 psi		
Transducers <sup>FO</sup>	3 psi to 300 psi	0.059 psi		
	301 psi to 10 000 psi	0.59 psi		
Vacuum Meters <sup>FO</sup>	-10 psi to 3 psi	0.008 3 psi		Pressure Calibrator Druck EURAMET cg-17
Indirect Verification of Brinnell Hardness Tester HBW 10/3 000 <sup>FO</sup>	175 HBW to 463 HBW	2.1 HBW		Test Blocks ISO 6506-2 ASTM E10
Indirect Verification of Rockwell Hardness Testers HRC <sup>FO</sup>	20 HRC to 25 HRC	0.19 HRC	Test Blocks ISO 6508-2 ASTM E 18	
	25 HRC to 45 HRC	0.35 HRC		
	45 HRC to 70 HRC	0.32 HRC		
Indirect Verification of Rockwell Hardness Testers HRB <sup>FO</sup>	35 HRB to 40 HRB	0.45 HRB		
	40 HRB to 70 HRB	0.33 HRB		
	70 HRB to 100 HR	0.33 HRB		



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### Mechanical

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Dial Torque Wrench, Click Torque Wrench, Digital Torque Wrench and Torque Screwdriver <sup>FO</sup>	1.13 N•m to 670 N•m	0.44 % of reading	Torque Transducer and Torque Analyzer NMX-CH-6789
	670 N•m to 980 N•m	2 % of reading	Parallelepiped Weights ASME B 107.3

### 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
Bimetallic Thermometer <sup>FO</sup>	-15 °C to 500 °C	0.63 °C	Thermocouple Type S RTD Pt 100 and Multimeter Keithley; Temperature Baths, Drywell, Oven ASTM E220
Thermocouple Type J <sup>FO</sup>	0 °C to 850 °C	0.2 °C	
Thermocouple Type K <sup>FO</sup>	0 °C to 850 °C	0.2 °C	
RTD Resistance Temperature Detector <sup>FO</sup>	-15 °C to 500 °C	0.16 °C	Thermocouple type S, RTD Pt100 and Multimeter Keithley; Temperature baths, Drywell, Oven ASTM E644-11
Thermohygrometers- Temperature Only <sup>F</sup>	20 °C to 60 °C	0.19 °C	Thermohygrometer, Chamber Generator Termohygrometer Standard Rotronic: Hygroclip2 Pt100 Class: A Device Type: HC2-S TH-007
Hygrometers, Humidity Tester <sup>F</sup>	10 % RH to 80 % RH	1.6 % RH	Humidity chamber Method: Comparison vs Standard Rotronic: Hygroclip2 Pt100 Class: A Device Type: HC2-S HygroPalm Model: HP23-A Reference Set Fixed points: 10 %, 35 %, 80 % ASTM E104-02
Humidity Chamber <sup>F</sup>	10 % RH to 80 % RH	1.6 % RH	Rotronic: Hygroclip2 Pt100 Class: A Device Type: HC2-S HygroPalm Model: HP23-A Reference Set TH-007



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Liquid in Glass Thermometers <sup>FO</sup>	-15 °C to 200 °C	0.21 °C	RTD Pt 100 and Multimeter Keithley Keithley Temperature Baths, Drywell, CENAM Technical Guide to Calibrate Thermometer
Oven <sup>FO</sup>	20 °C to 1 000 °C	0.2 °C	Thermocouple Type S RTD Pt100 and Multimeter Keithley Uniformity Study SAE AMS 2750 E
Muffles and Furnace <sup>FO</sup>	20 °C to 1 000 °C	0.2 °C	
Controlled Temperature Rooms <sup>O</sup>	-20 °C to 100 °C	0.21 °C	RTD Pt 100 and Multimeter Keithley Uniformity study SAE AMS 2750 E

### Electrical

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Equipment to Measure AC Voltage At the listed frequencies <sup>FO</sup>			Fluke 5500A EL-001
10 Hz to 45 Hz	1 mV to 32.999 mV	200 $\mu$ V	
45 Hz to 10 kHz	1 mV to 32.999 mV	160 $\mu$ V	
10 kHz to 20 kHz	1 mV to 32.999 mV	170 $\mu$ V	
20 kHz to 50 kHz	1 mV to 32.999 mV	200 $\mu$ V	
50 kHz to 100 kHz	1 mV to 32.999 mV	230 $\mu$ V	
100 kHz to 500 kHz	1 mV to 32.999 mV	460 $\mu$ V	
Equipment to Measure AC Voltage At the listed frequencies <sup>FO</sup>			
10 Hz to 45 Hz	33 mV to 329.999 mV	960 $\mu$ V	
45 Hz to 10 kHz	33 mV to 329.999 mV	260 $\mu$ V	
10 kHz to 20 kHz	33 mV to 329.999 mV	350 $\mu$ V	





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Equipment to Measure AC Voltage At the listed frequencies <sup>FO</sup>			Fluke 5500A EL-001
20 kHz to 50 kHz	33 mV to 329.999 mV	680 $\mu$ V	
50 kHz to 100 kHz	33 mV to 329.999 mV	1 100 $\mu$ V	
100 kHz to 500 kHz	33 mV to 329.999 mV	2 700 $\mu$ V	
Equipment to Measure AC Voltage At the listed frequencies <sup>FO</sup>			
10 Hz to 45 Hz	0.33 V to 3.299 99 V	10 mV	
45 Hz to 10 kHz	0.33 V to 3.299 99 V	19 mV	
10 kHz to 20 kHz	0.33 V to 3.299 99 V	3 mV	
20 kHz to 50 kHz	0.33 V to 3.299 99 V	10 mV	
50 kHz to 100 kHz	0.33 V to 3.299 99 V	10 mV	
100 kHz to 500 kHz	0.33 V to 3.299 99 V	23 mV	
Equipment to Measure AC Voltage At the listed frequencies <sup>FO</sup>			
10 Hz to 45 Hz	3.3 V to 32.999 9 V	60 mV	
45 Hz to 10 kHz	3.3 V to 32.999 9 V	20 mV	
10 kHz to 20 kHz	3.3 V to 32.999 9 V	30 mV	
20 kHz to 50 kHz	3.3 V to 32.999 9 V	80 mV	
50 kHz to 100 kHz	3.3 V to 32.999 9 V	190 mV	
Equipment to Measure AC Voltage At the listed frequencies <sup>FO</sup>			
45 Hz to 1 kHz	33 V to 329.999 V	580 mV	
1 kHz to 10 kHz	33 V to 329.999 V	300 mV	
20 kHz to 20 kHz	33 V to 329.999 V	2 300 mV	
Equipment to Measure AC Voltage At the listed frequencies <sup>FO</sup>			
45 Hz to 1 kHz	330 V to 1 000 V	2 200 mV	
1 kHz to 10 kHz	330 V to 1 000 V	2 600 mV	



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Equipment to Measure AC Current At the listed frequencies <sup>FO</sup>			Fluke 5500A EL-001
10 Hz to 20 Hz	0.029 mA to 0.329 99 mA	1.5 $\mu$ A	
20 Hz to 45 Hz	0.029 mA to 0.329 99 mA	1.3 $\mu$ A	
45 Hz to 1 kHz	0.029 mA to 0.329 99 mA	1.3 $\mu$ A	
1 kHz to 5 kHz	0.029 mA to 0.329 99 mA	1.9 $\mu$ A	
5 kHz to 10 kHz	0.029 mA to 0.329 99 mA	4.4 $\mu$ A	
Equipment to Measure AC Current At the listed frequencies <sup>FO</sup>			
10 Hz to 20 Hz	3.3 mA to 32.999 mA	87 $\mu$ A	
20 Hz to 45 Hz	3.3 mA to 32.999 mA	37 $\mu$ A	
45 Hz to 1 kHz	3.3 mA to 32.999 mA	35 $\mu$ A	
1 kHz to 5 kHz	3.3 mA to 32.999 mA	71 $\mu$ A	
5 kHz to 10 kHz	3.3 mA to 32.999 mA	210 $\mu$ A	
Equipment to Measure AC Current At the listed frequencies <sup>FO</sup>			
10 Hz to 20 Hz	33 mA to 329.99 mA	700 $\mu$ A	
20 Hz to 45 Hz	33 mA to 329.99 mA	380 $\mu$ A	
45 Hz to 1 kHz	33 mA to 329.99 mA	350 $\mu$ A	
1 kHz to 5 kHz	33 mA to 329.99 mA	700 $\mu$ A	
5 kHz to 10 kHz	33 mA to 329.99 mA	2 100 $\mu$ A	
Equipment to Measure AC Current At the listed frequencies <sup>FO</sup>			
10 Hz to 45 Hz	0.33 A to 2.199 99 A	4.8 mA	
45 Hz to 1 kHz	0.33 A to 2.199 99 A	2.6 mA	
Equipment to Measure AC Current At the listed frequencies <sup>FO</sup>			
45 Hz to 65 Hz	2.2 A to 11 A	14 mA	
65 Hz to 500 Hz	2.2 A to 11 A	17 mA	
500 Hz to 1 kHz	2.2 A to 11 A	40 mA	
60 Hz	10 A to 550 A	0.25 % of reading	5500A/COIL SIT/Tec_014/06



# Certificate of Accreditation: Supplement

## Laboratorio de Metrología FESO, S.A. de C.V.

Blvd. de la Nación #130 Inter. 11, Col. Los Robles

Querétaro, Querétaro, México C.P. 76125

Contact Name: Fernando Briseño Nabor Phone: 442-403-5892

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 Measure DC Voltage <sup>FO</sup>	33 mV to 330 mV	0.006 % of reading + 3 $\mu$ V	Fluke 5500A EL-001
	0.33 V to 3.3 V	0.005 % of reading + 5 $\mu$ V	
	3.3 V to 33 V	0.005 % of reading + 50 mV	
	33 V to 330 V	0.005 5 % of reading + 500 mV	
	330 V to 1 020 V	0.005 5 % of reading + 1 500 mV	
Equipment to Measure DC Current <sup>FO</sup>	0.33 mA to 3.3 mA	0.47 $\mu$ A	Fluke 5500A/Coil SIT/Tec_014/06
	3.3 mA to 33 mA	4.1 $\mu$ A	
	33 mA to 330 mA	43 $\mu$ A	
	330 mA to 2.2 A	820 $\mu$ A	
	2.2 A to 11 A	8 100 $\mu$ A	
	1 A to 550 A	0.25 % of reading	
Equipment to Measure Resistance <sup>FO</sup>	1 m $\Omega$ to 10.999 $\Omega$	9.3 m $\Omega$	Fluke 5500A EL-001
	11 $\Omega$ to 32.9990 0 $\Omega$	19 m $\Omega$	
	33 $\Omega$ to 109.999 $\Omega$	25 m $\Omega$	
	110 $\Omega$ to 329.999 $\Omega$	46 m $\Omega$	
	330 $\Omega$ to 1 099.99 $\Omega$	0.15 $\Omega$	
	1.1 k $\Omega$ to 3.299 99 k $\Omega$	0.36 $\Omega$	
	3.3 k $\Omega$ to 10.999 9 k $\Omega$	1.5 $\Omega$	
	11 k $\Omega$ to 32.999 99 k $\Omega$	3.6 $\Omega$	
	33 k $\Omega$ to 109.999 k $\Omega$	18 $\Omega$	
	110 k $\Omega$ to 329.999 k $\Omega$	46 $\Omega$	
	330 k $\Omega$ to 1 099.99 k $\Omega$	0.24 k $\Omega$	
	330 k $\Omega$ to 1 099.99 k $\Omega$	0.56 k $\Omega$	
	1.1 M $\Omega$ to 10.999 9 M $\Omega$	7.1 k $\Omega$	
	11 M $\Omega$ to 32.999 M $\Omega$	36 k $\Omega$	
	33 M $\Omega$ to 109.99 M $\Omega$	0.56 M $\Omega$	
110 M $\Omega$ to 330 M $\Omega$	1.7 M $\Omega$		
Equipment to Measure Capacitance <sup>FO</sup>	0.33 nF to 0.499 9 nF	0.019 nF	Fluke 5500A CENAM Guide for Capacitance Measure Direct Method
	0.5 nF to 1.099 9 nF	0.022 nF	
	1.1 nF to 3.299 9 nF	0.032 nF	
	3.3 nF to 10.999 nF	0.075 nF	
	11 nF to 32.999 nF	0.22 nF	



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Equipment to Measure Capacitance <sup>FO</sup>	33 nF to 109.99 nF	0.44 nF	Fluke 5500A CENAM Guide for Capacitance Measure Direct Method
	110 nF to 329.99 nF	1.5 nF	
	0.33 $\mu$ F to 1.099 9 $\mu$ F	4.4 nF	
	1.1 $\mu$ F to 3.299 9 $\mu$ F	17 nF	
	3.3 $\mu$ F to 10.999 $\mu$ F	56 nF	
	11 $\mu$ F to 32.999 $\mu$ F	190 nF	
	33 $\mu$ F to 109.99 $\mu$ F	760 nF	
	110 $\mu$ F to 329.99 $\mu$ F	3.1 $\mu$ F	
	0.33 mF to 1.1 mF	14 $\mu$ F	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type B <sup>FO</sup>	600 °C to 800 °C	0.44 °C	Fluke 5500A Electrical Simulation of Thermocouple Output EURAMET CG 11
	800 °C to 1 000 °C	0.34 °C	
	1 000 °C to 1 550 °C	0.3 °C	
	1 550 °C to 1 820 °C	0.33 °C	
Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type C <sup>FO</sup>	0 °C to 150 °C	0.3 °C	
	150 °C to 650 °C	0.26 °C	
	650 °C to 1 000 °C	0.31 °C	
	1 000 °C to 1 800 °C	0.5 °C	
	1 800 °C to 2 316 °C	0.84 °C	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type E <sup>FO</sup>	-250 °C to -100 °C	0.5 °C	
	-100 °C to -25 °C	0.16 °C	
	-25 °C to 350 °C	0.14 °C	
	350 °C to 650 °C	0.16 °C	
	650 °C to 1 000 °C	0.21 °C	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type J <sup>FO</sup>	-210 °C to -100 °C	0.27 °C	
	-100 °C to -30 °C	0.16 °C	
	-30 °C to 150 °C	0.14 °C	
	150 °C to 760 °C	0.17 °C	
	760 °C to 1 200 °C	0.23 °C	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type K <sup>FO</sup>	-200 °C to -100°C	0.33 °C	
	-100 °C to -25°C	0.18 °C	
	-25 °C to 120°C	0.16 °C	
	120 °C to 1 000 °C	0.26 °C	
	1 000 °C to 1 372 °C	0.4 °C	



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Temperature Calibration, Indication and Control Equipment used with Thermocouple Type L <sup>FO</sup>	-200 °C to -100 °C	0.37 °C	Fluke 5500A Electrical Simulation of Thermocouple Output EURAMET CG 11
	-100 °C to 800 °C	0.26 °C	
	800 °C to 900 °C	0.17 °C	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type N <sup>FO</sup>	-200 °C to -100 °C	0.4 °C	
	-100 °C to -25 °C	0.22 °C	
	-25 °C to 120 °C	0.19 °C	
	120 °C to 410 °C	0.18 °C	
	410 °C to 1 300 °C	0.27 °C	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type R <sup>FO</sup>	0 °C to 250 °C	0.57 °C	
	250 °C to 400 °C	0.35 °C	
	400 °C to 1 000 °C	0.33 °C	
	1 000 °C to 1 767 °C	0.4 °C	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type S <sup>FO</sup>	0 °C to 250 °C	0.47 °C	
	250 °C to 1 000 °C	0.36 °C	
	1 000 °C to 1 400 °C	0.37 °C	
	1 400 °C to 1 767 °C	0.46 °C	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type T <sup>FO</sup>	-250 °C to -150 °C	0.63 °C	
	-150 °C to 0 °C	0.24 °C	
	0 °C to 120 °C	0.16 °C	
	120 °C to 400 °C	0.14 °C	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type U <sup>FO</sup>	-200 °C to 0 °C	0.56 °C	
	0 °C to 600 °C	0.57 °C	
Temperature Calibration, Indication and Control Equipment used with RTD Pt 385, 100 $\Omega$ <sup>FO</sup>	-200 °C to -80 °C	0.05 °C	Fluke 5500A Electrical Simulation of RTD Output EURAMET CG 11
	-80 °C to 0 °C	0.05 °C	
	0 °C to 100 °C	0.07 °C	
	100 °C to 300 °C	0.09 °C	
	300 °C to 400 °C	0.1 °C	
	400 °C to 630 °C	0.12 °C	
	630 °C to 800 °C	0.23 °C	



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Temperature Calibration, Indication and Control Equipment used with RTD Pt 3926, 100 $\Omega^{\text{FO}}$	-200 °C to -80 °C	0.05 °C	Fluke 5500A Electrical Simulation of RTD Output EURAMET CG 11
	-80 °C to 0 °C	0.05 °C	
	0 °C to 100 °C	0.07 °C	
	100 °C to 300 °C	0.09 °C	
	300 °C to 400 °C	0.1 °C	
	400 °C to 630 °C	0.12 °C	
Temperature Calibration, Indication and Control Equipment used with RTD Pt 3916, 100 $\Omega^{\text{FO}}$	-200 °C to -190 °C	0.25 °C	
	-190 °C to -80 °C	0.04 °C	
	-80 °C to 0 °C	0.05 °C	
	0 °C to 100 °C	0.06 °C	
	100 °C to 260 °C	0.07 °C	
	260 °C to 300 °C	0.08 °C	
	300 °C to 400 °C	0.09 °C	
	400 °C to 600 °C	0.1 °C	
Temperature Calibration, Indication and Control Equipment used with RTD Pt 385, 200 $\Omega^{\text{FO}}$	-200 °C to -80 °C	0.04 °C	
	-80 °C to 0 °C	0.04 °C	
	0 °C to 100 °C	0.04 °C	
	100 °C to 260 °C	0.05 °C	
	260 °C to 300 °C	0.12 °C	
	300 °C to 400 °C	0.13 °C	
	400 °C to 600 °C	0.14 °C	
	600 °C to 630 °C	0.16 °C	
Temperature Calibration, Indication and Control Equipment used with RTD Pt 385, 500 $\Omega^{\text{FO}}$	-200 °C to -80 °C	0.04 °C	
	-80 °C to 0 °C	0.05 °C	
	0 °C to 100 °C	0.05 °C	
	100 °C to 260 °C	0.06 °C	
	260 °C to 300 °C	0.08 °C	
	300 °C to 400 °C	0.08 °C	
	400 °C to 600 °C	0.09 °C	
	600 °C to 630 °C	0.11 °C	





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Temperature Calibration, Indication and Control Equipment used with RTD Pt 385, 1 000 $\Omega$ <sup>FO</sup>	-200 °C to -80 °C	0.03 °C	Fluke 5500A Electrical Simulation of RTD Output EURAMET CG 11
	-80 °C to 0 °C	0.03 °C	
	0 °C to 100 °C	0.04 °C	
	100 °C to 260 °C	0.05 °C	
	260 °C to 300 °C	0.06 °C	
	300 °C to 400 °C	0.07 °C	
	400 °C to 600 °C	0.07 °C	
	600 °C to 630 °C	0.23 °C	
Equipment to Output AC Voltage At the listed frequencies <sup>FO</sup>			Fluke 8808A PR-EL-01 Internal Procedure
20 Hz to 45 Hz	200 mV to 750 V	0.9 % of reading	
45 Hz to 20 kHz	200 mV to 750 V	0.9 % of reading	
20 kHz to 50 kHz	200 mV to 750 V	0.9 % of reading	
50 kHz to 100 kHz	200 mV to 750 V	0.9 % of reading	
Equipment to Output AC Voltage At the listed frequencies <sup>FO</sup>			Fluke 8808A PR-EL-01 Internal Procedure
20 Hz to 45 Hz	750 V to 40 kV	5 % of reading	
45 Hz to 20 kHz	750 V to 40 kV	5 % of reading	
20 kHz to 50 kHz	750 V to 40 kV	5 % of reading	
Equipment to Output DC Voltage <sup>FO</sup>	200 mV to 1 000 V	0.015 % of reading + 10 mV	Fluke 80K40 PR-EL-01
	10 V to 40 kV	5 % of reading	
Equipment to Output AC Current <sup>FO</sup>	20 mA to 10 A	1.3 % of reading	Fluke 8808A PR-EL-01
	1 $\mu$ A to 10 A	0.08 % of reading	
	1 A to 50 A	2 % of reading	Shunt 50A Fluke 8808A PR-EL-01
Equipment to Output Frequency <sup>FO</sup>	20 Hz to 1 MHz	0.01 % of reading	Fluke 8808A PR-EL-01
Equipment to Output Resistance <sup>FO</sup>	1 $\mu\Omega$ to 199.999 k $\Omega$	0.03 % of reading	Resistance Decade: Burster, Model 1443 Burster, Model 1448 Burster, Model 1441 PR-EL-01
	199.999 K $\Omega$ to 19.999 9 M $\Omega$	0.25 % of reading	
	19.999 9 M $\Omega$ to 100 M $\Omega$	1.8 % of reading	



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Equipment to Measure DC Voltage <sup>FO</sup>	25 mV to 90 mV	0.009 7 mV	Electrical Simulation Output Fluke 753 PR-EL-01
	1 V to 2.5 V	0.000 15 V	
	10 V to 25 V	0.001 5 V	
	100 V to 250 V	0.02 V	
Equipment to Measure AC Current At the listed frequencies 60Hz <sup>FO</sup>	1 V to 2.5 V	0.001 6 V	
	10 V to 25 V	0.018 V	
	100 V to 250 V	0.19 V	
Equipment to Measure DC Current <sup>FO</sup>	10 mA to 25 mA	0.003 3 mA	
	35 mA to 90 mA	0.018 mA	
Equipment to Measure Resistance <sup>FO</sup>	2 $\Omega$ to 9 $\Omega$	0.01 $\Omega$	
	20 $\Omega$ to 90 $\Omega$	0.029 $\Omega$	
	200 $\Omega$ to 900 $\Omega$	0.19 $\Omega$	
	2 k $\Omega$ to 9 k $\Omega$	0.002 1 k $\Omega$	
Equipment to Measure Frequency <sup>FO</sup>	25 Hz to 100 Hz	0.012 Hz	
	250 Hz to 1000 Hz	0.11 Hz	
	2.5 kHz to 10 kHz	0.001 1 kHz	
	20 kHz to 45 kHz	0.011 kHz	
Equipment to Output DC Voltage <sup>FO</sup>	20 mV to 90 mV	0.008 9 mV	
	0.2 V to 0.9 V	0.000 05 V	
	2.5 V to 13 V	0.000 78 V	
Equipment to Output DC Current <sup>FO</sup>	1 mA to 20 mA	0.003 2 mA	
Equipment to Output Resistance <sup>FO</sup>	1 $\Omega$ to 9 $\Omega$	0.001 8 $\Omega$	
	20 $\Omega$ to 90 $\Omega$	0.018 $\Omega$	
	0.2 k $\Omega$ to 0.9 k $\Omega$	0.000 16 $\Omega$	
Equipment to Output Frequency <sup>FO</sup>	3 Hz to 10 Hz	0.011 Hz	
	20 Hz to 100 Hz	0.012 Hz	
	200 Hz to 1000 Hz	0.11 Hz	
	2 kHz to 20 kHz	0.002 3 kHz	
	25 kHz to 45 kHz	0.005 9 kHz	
Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type B <sup>FO</sup>	650 °C to 1 750 °C	0.52 °C	Fluke 753 Electrical Simulation of Thermocouple Output PR-EL-01



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Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type C <sup>FO</sup>	400 °C to 2 200 °C	0.97 °C	Fluke 753 Electrical Simulation of Thermocouple Output PR-EL-01
Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type E <sup>FO</sup>	100 °C to 900 °C	0.26 °C	
Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type J <sup>FO</sup>	100 °C to 900 °C	0.28 °C	
Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type K <sup>FO</sup>	100 °C to 1 200 °C	0.33 °C	
Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type L <sup>FO</sup>	150 °C to 850 °C	0.32 °C	
Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type N <sup>FO</sup>	100 °C to 1 200 °C	0.33 °C	
Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type R <sup>FO</sup>	200 °C to 1 600 °C	0.66 °C	
Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type S <sup>FO</sup>	100 °C to 1 650 °C	0.57 °C	
Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type T <sup>FO</sup>	100 °C to 350 °C	0.21 °C	
Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type U <sup>FO</sup>	100 °C to 550 °C	0.33 °C	



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Temperature Calibration, Indication, and Control Equipment used with RTD Pt 385, 100 $\Omega^{FO}$	100 °C to 700 °C	0.28 °C	Fluke 753 Electrical Simulation of RTD Output PR-EL-01
Temperature Calibration, Indication, and Control Equipment used with RTD Pt 385, 200 $\Omega^{FO}$	100 °C to 550 °C	0.19 °C	
Temperature Calibration, Indication, and Control Equipment used with RTD Pt 385, 500 $\Omega^{FO}$	100 °C to 550 °C	0.15 °C	
Temperature Calibration, Indication, and Control Equipment used with RTD Pt 385, 1 000 $\Omega^{FO}$	100 °C to 550 °C	0.14 °C	
Temperature Calibration, Indication, and Control Equipment used with RTD Pt 3916, 100 $\Omega^{FO}$	100 °C to 550 °C	0.16 °C	
Temperature Calibration, Indication, and Control Equipment used with RTD Pt 3926, 100 $\Omega^{FO}$	100 °C to 550 °C	0.18 °C	
Temperature Calibration, Indication, and Control Equipment used with RTD Cu 427, 10 $\Omega^{FO}$	0.0 °C to 200 °C	0.36 °C	
Temperature Calibration, Indication, and Control Equipment used with RTD Ni 672, 120 $\Omega^{FO}$	0.0 °C to 200 °C	0.16 °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.



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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 O means that the laboratory performs calibration of the indicated parameter onsite at customer locations. Example: Outside Micrometer<sup>O</sup> would mean that the laboratory performs this calibration onsite at the customer's location.
5. 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.
6. 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.
7. The term L represents length in inches or millimeters as appropriate to the uncertainty statement.
8. The term Wt represents weight in pounds or grams (including SI multiple and submultiple units) appropriate to the uncertainty statement.