



# PERRY JOHNSON LABORATORY ACCREDITATION, INC.

## Certificate of Accreditation

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

***Calmet Industrial, S.A. de C.V.***

***1<sup>era</sup> Privada 4831, Col. Niño Artillero  
Monterrey, Nuevo León, México. C.P. 64280***

*(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):

***Dimensional, Mechanical, Thermodynamic, Time & Frequency, Optical,  
Electrical, Chemical, Mass, Force and Weighing Devices and Acoustic  
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:*

February 11, 2011

*Issue Date:*

October 17, 2023

*Expiration Date:*

November 30, 2025

*Accreditation No.:*

45294

*Certificate No.:*

L23-760

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

### Calmet Industrial, S.A. de C.V.

1<sup>ra</sup> Privada No. 4831, Col. Niño Artillero  
 Monterrey, Nuevo León, México. C.P. 64280  
 Contact Name: Eliud Elizondo Phone: 818-351-0368

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
Outside Micrometers <sup>FO</sup>	1 mm to 1 000 mm	1.8 $\mu$ m	Gage Block Sets NMX-CH-099-IMNC
Laser Micrometer <sup>FO</sup>	0.1 mm to 50 mm	$(0.13 + 6 \times 10^{-3} L) \mu$ m	Pin Gage Set NMX-CH-099-IMNC
Caliper <sup>FO</sup>	1 mm to 1 000 mm	9.6 $\mu$ m	Gage Block Sets NMX-CH-002-IMNC
Indicator <sup>FO</sup>	0.01 mm to 50.8 mm	0.76 $\mu$ m	Dial Gauge Calibration Tester NMX-CH-36, JIS B-7503
Rules <sup>FO</sup>	1 mm to 2 000 mm	0.35 mm	Standard Steel Ruler, Microscope JIS B 7516
Surface Plates Repeat Measurement <sup>O</sup>	300 mm to 4 000 mm	1.9 $\mu$ m	Indicator Mitutoyo 543-554-1 JIS B 7513
Optical Comparator, Vision System and Microscope Length			Standard Glass Scale Gage Block Sets Angle Block JIS B 7184
X Axis Linearity	0.5 mm to 508 mm	3.3 $\mu$ m	
Y Axis Linearity	0.5 mm to 508 mm	3.3 $\mu$ m	
Z Axis Linearity	0.5 mm to 508 mm	5.8 $\mu$ m	
Error of Indication <sup>O</sup>			
Optical Comparator, Vision System and Microscope Angularity <sup>O</sup>	0° to 90°	0.38°	
Height Gage <sup>FO</sup>	1 mm to 1 000 mm	11 $\mu$ m	Gage Block Sets JIS B 7517
Pin Gages <sup>F</sup>	0.254 mm to 76.2 mm	1.4 $\mu$ m	Micrometer ASME B 89 1.5
Thread Plug Gage Major Diameter <sup>F</sup>	0-80 to 4-12	2.8 $\mu$ m	Conventional Micrometer ANSI/ASME B1.2
Ultrasonic Thickness <sup>FO</sup>	0.022 mm to 1.977 mm	2 $\mu$ m	Thickness Gages ASTM E 797
Thread Plug Gage Pitch Diameter <sup>F</sup>	0-80 to 4-12	2.8 $\mu$ m	Wires and Digital Micrometer ANSI/ASME B1.2
Measuring Tape <sup>F</sup>	0.001 m to 10 m	0.48 mm	Standard Steel Ruler JIS B 7512
Thickness Gages <sup>FO</sup>	0.022 mm to 1 mm	$(2.37 + 0.8L) \mu$ m	Micrometer JIS B 7524
Depth Micrometer <sup>FO</sup>	2.5 mm to 150 mm	$(2.23 + 6.78 \times 10^{-4}L) \mu$ m	Block Gages JIS B 7544



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Protector Angle Meter <sup>FO</sup>	0° to 90°	0.38°	Angle Blocks NMX-CH-151
Angle Gage Block <sup>FO</sup>	1° to 30°	0.02 °	Coordinate Measuring Machines (CMM) CEM Procedure DI-017
Inside Micrometers <sup>FO</sup>	25 mm to 600 mm	1.8 $\mu$ m	Caliper Checks NMX-CH-093-IMNC
Gages Blocks <sup>F</sup>	0.5 mm to 100 mm	( $2.6 \times 10^{-2} + 7.1 \times 10^{-5}L$ ) $\mu$ m	Set Master Block Grade K Edmunds Twin Head Comparator NMX-CH-3650
	0.05 in to 20 in	( $3.1 + 1.9L$ ) $\mu$ in	
Roughness Meter Ra <sup>F</sup>	0.21 $\mu$ m to 3 $\mu$ m	0.07 $\mu$ m	Ra Roughness Master ISO 4287 NMX-CH-4287
CMM Calibration and Volumetric Inspection <sup>O</sup>	10 mm to 10 000 mm	( $0.6 + 1.2L$ ) $\mu$ m	Gage Block, Laser Interferometer Sphere ISO 10360-2
Coordinate Measuring Machines (CMM) Linear Displacement	Up to 18 000 mm	( $0.3 + 1L$ ) $\mu$ m	B89.4.10360.2 Laser Interferometer Gage Blocks ISO 10360-2 ASME
Length Measuring Error	Up to 1 500 mm	( $0.41 + 1.3L$ ) $\mu$ m	Gage Blocks ISO 10360-2 ASME
Single Stylus and Multi- Stylus Probing error <sup>O</sup>	30 mm (diameter)	0.73 $\mu$ m	Test Sphere ISO 10360-5
Bore Gage <sup>F</sup>	6 mm to 100 mm	2.6 $\mu$ m	Ring Gage Sets, JIS B7515
Radius Gage <sup>FO</sup>	0.4 mm to 25.4 mm	5 $\mu$ m	Vision System Machine ISO-2769-2, ISO-22081
Ring Gages <sup>F</sup>	1 mm to 205 mm	6.3 $\mu$ m	Trimos Tels Coordinate Measuring Machines (CMM) ASME B89.1.6
Sieve <sup>F</sup>	0.01 mm to 16 mm	4.3 $\mu$ m	Vision System Machine ASTM E11
	18 mm to 100 mm	4.8 $\mu$ m	Coordinate Measuring Machines (CMM) ASTM E11
Numerically Controlled Machine Tool (CNC) – X, Y, Z Axial Positional Deviation (Linear Displacement Accuracy) <sup>O</sup>	Up to 18 000 mm	( $1.6 + 0.2L$ ) $\mu$ m	Laser Interferometer ISO 230-2



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Standard and Measuring Rods to Micrometer zero Setting <sup>FO</sup>	25 mm to 1 000 mm (1 in to 40 in)	2.6 $\mu$ m	Coordinate Measuring Machines (CMM) JIS B 7420, BS 5317, NMX- CH-099-IMNC 6.10, ISO-3611
90° Steel Squares Perpendicularity <sup>FO</sup> 50.8 to 457.2 mm	Up to 800 mm	6.1 $\mu$ m	Coordinate Measuring Machines (CMM) C.E.M. DI-009 Procedure NMX-CH-062-IMNC JIS B 7526, DIN 875-1
	90°	0.000 3°	
Contour Measuring Machines <sup>FO</sup> X Axis Y Axis	Up to 200 mm	0.042 mm	Set Master Block JIS B 7450 CEM procedure DI-010
Contour Measuring Machines Angle <sup>FO</sup>	0° to 90°	0.003 6°	
Contour Measuring Machines Roughness Meter Ra <sup>FO</sup>	0.21 $\mu$ m to 3 $\mu$ m	0.07 $\mu$ m	Ra Roughness Master ISO 4287
Contour Measuring Machines Diameter <sup>FO</sup>	Up to to 30 mm	0.042 $\mu$ m	Standard Sphere ISO 10360-5
Roundness Measuring Machines Roundness Error	24.7 mm to 400 mm	0.029 $\mu$ m	Reference Hemisphere standard ring gages JIS B 7451 ISO 4291
Extensometer to Measuring Length Installed on Uniaxial Testing of Material Machine <sup>FO</sup>	0.001 mm to 25.4 mm	$(8.5 \times 10^{-1} + 1.2 \times 10^{-3}L) \mu$ m	Micrometric Head Standard INSTRON, ARIZONA TOOL & DIE CO. CEM ME-022
Length Measuring Wheel with Odometer and Measuring System with Odometer or Length Meter Counter <sup>FO</sup>	Up to 9 999.9 m	$(5.91 \times 10^{-3} + 1.9 \times 10^{-3}L) m$	Tachometer Exttech Measuring Tape Geometry NMX-CH-74
Optical Portable 3D Scanner -Probing Size Error <sup>FO</sup>	Up to 30 mm (Diameter)	4.9 $\mu$ m	Ball Bar Standards whit Reference Spheres VDI/VDE 2634 Part 3
Optical Portable 3D Scanner -Sphere Spacing Error <sup>FO</sup>	Up to 2 m	7.6 $\mu$ m	
Articulated Arm (ACMM) Verification <sup>FO</sup>	Up to 2 000 mm	$(1.88 \times 10^{-3} + 6 \times 10^{-6}L) mm$	Ball Bar Standards whit Reference Spheres, Set Master Block Gage Grade K ISO 10360-12



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Torque Meter Clockwise and Counterclockwise <sup>FO</sup>	0.23 N·m to 1.13 N·m	0.001 5 N·m	Torque Tester ISO 6789 NMX-CH-6789-IMNC
	0.5 N·m to 5.65 N·m	0.006 4 N·m	
	5.6 N·m to 56 N·m	0.066 N·m	
	81.3 N·m to 813 N·m	1.1 N·m	
	8.4 N·m to 84 N·m	0.58 N·m	
	203.33 N·m to 2 033.62 N·m	1.4 N·m	
Pressure Gauge and Pressure Transducer <sup>FO</sup>	20.68 kPa to 206.84 kPa	5.2 x 10 <sup>-2</sup> kPa	Fluke 717 30G NOM-013-SCFI
	206.8 kPa to 2 068 kPa	0.52 kPa	
Pressure Gauge and Transducer <sup>FO</sup>	689.47 kPa to 6 894.75 kPa	3.4 kPa	Fluke 700P27EX BETA BGPIR-PRO-01K NOM-013-SCFI
	6 894.75 kPa to 68 947.57 kPa	35 kPa	
	-85 kPa to -8.5 kPa	2 Pa	Fluke 700 P31 Fluke 718 1G, 717 30G NOM-013-SCFI
	Up to 6.8 kPa	0.8 Pa	
Pressure Drop Meter of QTM <sup>O</sup> 17.5 ml/s	0.490 33 kPa to 8.825 985 kPa	1.5 % of reading	Multi-Capillary Pressure Drop Standard QTM Manufacturer Guide ISO 6565
	50 mm/H <sub>2</sub> O to 900 mm/H <sub>2</sub> O	1.5 % of reading	
Indirect Verifications Hardness tester HRC <sup>FO</sup>	20 HRC to 30 HRC	0.43 HRC	Test Blocks ISO-6508-2 ASTME
	31 HRC to 59HRC	0.41 HRC	
	60 HRC to 70 HRC	0.41 HRC	
Indirect Verifications Hardness tester HRB <sup>FO</sup>	40 HRB to 59 HRB	0.84 HRB	
	60 HRB to 79 HRB	0.84 HRB	
	80 HRB to 100 HRB	0.66 HRB	
Indirect Verification of Brinell Hardness Testers HBW <sup>FO</sup>	95 HBW to 514 HBW	0.95 HBW	Brinell Hardness Blocks ISO 6506 -2
Micro-Indentation Hardness Testers HV <sup>FO</sup>	200 HV to 700 HV	7.7 HV	Vickers Hardness Blocks ISO 6507
Indirect Verification of Lebb Hardness Tester HLD <sup>FO</sup>	449 HLD to 800 HLD	5 HLD	Lebb Hardness Blocks ASTM A956, ISO 16859-2
Leak Test <sup>FO</sup>	0.015 L/min to 0.2 L/min	0.005 L/min	Furness Controls (Res.= 0.001 L/min) NIST-SP250-38



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Leak Test <sup>FO</sup>	14 L/min to 113 L/min	1 L/min	F and J Specialty Products NIST-SP250-38
Accelerometer <sup>F</sup>	10.2 m/s <sup>2</sup> to 30 m/s <sup>2</sup>	0.34 m/s <sup>2</sup>	Agilent 34401, Fluke 289 Fluke 45, Accelerometer Endevco 2256A-100 + Endevco 4416B Data Acquisition, ISO 16063-21
Test Tube <sup>F</sup>	5 mL	6.4 % of reading	Analytical Balance ISO 8655, ASTM E 542- 01
	10 mL	3.2 % of reading	
	25 mL	1.3 % of reading	
	50 mL	0.64 % of reading	
	100 mL	0.32 % of reading	
	250 mL	0.13 % of reading	
	500 mL	0.064 % of reading	
	1 000 mL	0.032 % of reading	
	2 000 mL	0.017 % of reading	
Pipette <sup>F</sup>	0.01 mL to 0.1 mL	0.62 % of reading	
	0.02 mL to 0.2 mL	0.62 % of reading	
	0.1 mL to 0.2 mL	0.58 % of reading	
	0.1 mL to 1 mL	0.58 % of reading	
	0.5 mL to 5 mL	0.58 % of reading	
	1 mL to 5 mL	0.58 % of reading	
	1 mL to 10 mL	0.29 % of reading	
	10 mL to 50 mL	0.24 % of reading	
Volumetric Flask <sup>F</sup>	5 mL to 2 000 mL	0.33 mL	
Picnometer <sup>F</sup>	10 mL to 500 mL	0.33 mL	
Burette <sup>F</sup>	5 mL	0.33 mL	
	10 mL	0.33 mL	
	25 mL	0.33 mL	
	50 mL	0.33 mL	
	100 mL	0.33 mL	
	250 mL	0.33 mL	
	500 mL	0.33 mL	
	1 000 mL	0.33 mL	



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Densimeter <sup>F</sup>	0.6 kg/m <sup>3</sup> to 1.3 kg/m <sup>3</sup>	0.06 kg/m <sup>3</sup>	Analytical Balance CENAM Technical Guide
Liquid Flow Meter <sup>FO</sup>	0.1 L/min to 30 L/min	0.65 L/min	ZJ-LCD-M & YF-S201 Measuring Flow System CENAM Technical Guide
	0.1 L/min to 45 L/min	0.23 % of reading	Coriolis Type Flow Meter CENAM Technical Guide
	0.1 L/min to 200 L/min	0.29 % of reading	Stopwatch and Weighing Device, OIML R 117 ISO-4604-3 CENAM Technical Guide
	0.1 L/min to 37 854.12 L/min (0.026 GPM to 10 000 GPM) DN 6 to DN 700	0.38 % of reading	Ultrasonic Flow Meter CENAM Technical Guide
Air Velocity Measuring System and Anemometers <sup>F</sup>	1.3 m/s to 25 m/s	0.43 m/s	Fluke 925 Vane Anemometer IEC 61400-12-1 ASTM D5096, NIST Guide
Air Velocity of Sources and Fume Hood <sup>O</sup>	1.1 m/s to 25 m/s	0.79 m/s	Fluke 925 Vane Anemometer ANSI/ASHRAE 110
Vacuum Gauge and Transducer <sup>F</sup>	0.000 1 kPaA to 2.666 kPaA (1 micron to 20 000 micron)	5.8 PaA	TESTO 525 Vacuum Gauge, Fluke 71730G Fluke 7171G NOM-013-SCFI
Barometer <sup>F</sup>	0.001 kPa to 101.592 kPa (0.013 mBar to 1 015.92 mBar)	9.9 PaA	TESTO 525 Vacuum Gauge, Fluke 71730G, Fluke 7171G, Vacuum Chamber OIML R 97
Direct Verification of Durometer Hardness Tester Type A, C, D <sup>FO</sup>	2.46 mm to 2.54 mm	8 $\mu$ m	System Vision ASTMD-2240
Grometry of the Indentor <sup>FO</sup>		8 $\mu$ m	System Vision
Durometer Indentor Spring Type A <sup>FO</sup>	0.55 N to 8.05 N	0.32 N	Electronic Balance
Durometer Indentor Spring Type C and D <sup>FO</sup>	4.45 N to 44.45 N	0.32 N	



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Gas Flow Ventilation Meter of QTM 17.5 ml/s <sup>O</sup>	20 % to 100 % ventilation	1 % of reading	Gas Flow Ventilation Devices Standards QTM Manufacture Guide ISO 6565
Gas Flow Ventilation Device 17.5 ml/s <sup>O</sup>	100 % of ventilation	0.91 % of reading	Flow Meter, Digitron Pressure Gauge QTM Manufacturer Guide ISO 6565
Gas Flow Meter <sup>FO</sup>	0.02 L/min to 0.2 L/min (20 SCCM to 186 SCCM)	0.91 % of reading	Furness Controls FC0210-3 Flow Meter CENAM Technical Guide
	0.057 71 L/min to 2 L/min (56.26 SCCM to 1958.25 SCCM)	0.06 % of reading	Furness Controls FC0210 Flow Meter CENAM Technical Guide
	15 L/min to 116 L/min (14.432 SLPM to 111.352 9 SLPM)	1.7 % of reading	F&J Specialty Products D-812B, Flow Meter CENAM Technical Guide
	1.026 L/min to 204.26 L/min (20 SLPM to 200 SLPM)	0.58 % of reading	MF5712 Flow Meter CENAM Technical Guide

#### Thermodynamic

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Bimetallic Thermometers <sup>FO</sup>	-70 °C to 500 °C	0.75 °C	Indicator RTD pt 100 Standard,
Glass Thermometers <sup>F</sup>	-70 °C to 300 °C	0.76 °C	Dry Ice, Dry Block Calibrator NOM-CH-070
Thermal Chamber <sup>O</sup>	-70 °C to 300 °C	0.23 °C	Indicator RTD 100 TC Standards
Thermal Oven <sup>O</sup>	50 °C to 500 °C	0.23 °C	
Digital Thermometer <sup>F</sup>	-70 °C to 400 °C	0.48 °C	Dry Ice, Dry Block Calibrator Fluke, Hart Scientific NOM-CH-070
Digital Infrared Thermometer <sup>FO</sup>	50 °C to 500 °C	0.51 °C	Black Body Source CENAM Technical Guide





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Direct Reading Thermometer used Termistor, RTD, Thermocouple <sup>FO</sup>	-20 °C to 600 °C	0.25 °C	Reference Temperature Calibrator RTD 100 $\Omega$ Dry Block Calibrator NOM-011-SCFI
Temperature Measurement Thermocouple Type J <sup>FO</sup>	0 °C to 300 °C	0.53 °C	Fluke 743 with Sensor K Dry Well, Fluke 9141 CENAM Technical Guide
	300 °C to 500 °C	0.91 °C	
Temperature Measurement Thermocouple Type K <sup>FO</sup>	0 °C to 300 °C	0.53 °C	Fluke 743 with Sensor RTD Dry Well, Fluke 9141 CENAM Technical Guide
	300 °C to 500 °C	0.91 °C	
Temperature Measurement Thermocouple Type T <sup>FO</sup>	0 °C to 300 °C	0.53 °C	Fluke 743 with Sensor RTD Dry Well Fluke 9141 CENAM Technical Guide
	300 °C to 500 °C	0.91 °C	
Temperature Measurement RTD Pt 100 $\Omega$ <sup>FO</sup>	0 °C to 300 °C	0.53 °C	Fluke 743 with sensor RTD Dry Well Fluke 9141 CENAM Technical Guide
	300 °C to 500 °C	0.91 °C	
Hygro-thermometer Humidity Sensors <sup>F</sup>	20 % RH to 95 % RH	1.3 % RH	Hygrometer Vaisala, Humidity Chamber CENAM Technical Guide
Humidity Generators, Humidity Chamber, Climatic Chamber <sup>F</sup>	20 % RH to 95 % RH	1.4 % RH	Hygrometer Vaisala with Humidity Sensor Dataloggers EURATHERM CENAM Technical Guide SAE/AMS 2750
Equipment to Output Generators, Chambers, Enclosure Sources <sup>F</sup>	11 % RH to 95 % RH	0.8 % RH	Hygrometer Vaisala EURATHERM Technical Guide CENAM Technical Guide
Temperature System Accuracy Test (SAT) Furnace, Autoclave, Freezer, and Isothermal Sources with Thermocouple Types K <sup>F</sup>	100 °C to 30°C	0.78 °C	Beta PTC-8001, Fluke 702 Fluke 51 series TC Temperature Indicators with Reference Thermocouple wire SAE/AMS 2750
	30 °C to 1 000 °C	0.75 °C	



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Temperature System Accuracy Test (SAT) Furnace, Autoclave, Freezer, and Isothermal Sources with Thermocouple Types J <sup>F</sup>	100 °C to 30 °C	0.66 °C	Beta PTC-8001, Fluke 702, Fluke 51 series TC Temperature Indicators with Reference Thermocouple wire SAE/AMS 2750
Temperature System Accuracy Test (SAT) Furnace, Autoclave, Freezer, and Isothermal Sources with Thermocouple Types N <sup>F</sup>	30 °C to 1 000 °C	0.63 °C	
Temperature System Accuracy Test (SAT) Furnace, Autoclave, Freezer, and Isothermal Sources with Thermocouple Types T <sup>F</sup>	-100 °C to 30 °C	0.75 °C	
	30 °C to 400 °C	0.44 °C	
Temperature Uniformity Surveys (TUS) Furnace, Autoclave, Freezer, and Isothermal Sources with Thermocouple Types T <sup>F</sup>	-100 °C to 30 °C	0.82 °C	HP 34970A Data Acquisition, Datapaq TC Temperature Indicator with Reference Thermocouples wire set SAE/AMS 2750E NT-04 ENAC Guide
	30 °C to 400 °C	0.64 °C	
Temperature Uniformity Surveys (TUS) Furnace, Autoclave, Freezer, and Isothermal Sources with Thermocouple Types K <sup>F</sup>	30 °C to 1 000 °C	0.77 °C	
Temperature Uniformity Surveys (TUS) Furnace, Autoclave, Freezer, and Isothermal Sources with Thermocouple Types J <sup>F</sup>	-100 °C to 30 °C	0.71 °C	
	30 °C to 1 000 °C	0.68 °C	
Temperature Uniformity Surveys (TUS) Furnace, Autoclave, Freezer, and Isothermal Sources with Thermocouple Types N <sup>F</sup>	30 °C to 1 000 °C	1.3 °C	

#### Time and Frequency

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
Stopwatch Timer <sup>FO</sup>	Up to 86 400 s	1.3 s/day	Stop Watch CENAM Technical Guide



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#### Time and Frequency

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Equipment to Output Electrical Welding Equipment Power Sources or Generators wire Feed Speed 1.3 m/min to 36.6 m/min (50 rpm to 1 440 rpm) <sup>O</sup>	1.06 rad/s to 29.76 rad/s (10 rpm to 285 rpm)	0.085 rad/s (0.82 rpm)	Photo-Tachometer Ono Sokki Welding Equipment Manufacturer 275053 Guide ANSI/IEC 60974-1 ISO 17662
Equipment to Output Angular Velocity Sources, Stroboscope, Vortex Mixers, Centrifuges, Rotarex <sup>FO</sup>	10.471 98 rad/s to 5 235.987 76 rad/s (100 rpm to 50 000 rpm)	0.061 rad/s (0.58 rpm)	Photo- tachometer Ono sokki CENAM Technical Guide
Equipment to Output Frequency 100 mV to 750 V <sup>FO</sup>	3 Hz to 9.999 999 Hz	0.008 2 Hz	Agilent 34401A Multimeter CENAM Technical Guide ANSI C39.6
	10 Hz to 99.999 99 Hz	0.012 Hz	
	100 Hz to 999.999 9 Hz	0.59 Hz	
	1 kHz to 9.999 999 kHz	0.005 9 kHz	
	10 kHz to 99.999 99 kHz	0.058 kHz	
Equipment to Output Frequency 0.005 V to 30 V <sup>FO</sup>	10 Hz to 60 MHz	0.014 Hz	Oscilloscope Tektronix TDS 1002B CENAM Technical Guide
Equipment to Measure Frequency 1 mV to 3.3 V <sup>FO</sup>	0.002 Hz to 11.999 kHz	0.002 Hz	Fluke 5500A CENAM Technical Guide
	12 kHz to 2 MHz	50 Hz	
Equipment to Measure Angular Velocity Systems, Photo and Contact Tachometer <sup>FO</sup>	0.125 7 rad/s to 10 471.98 rad/s (1.2 rpm to 100 000 rpm)	0.000 048 rad/s (0.000 46 rpm)	Fluke 5500A with Infrared Led CENAM Technical Guide
Equipment to Measure Frequency 0.1 V to 10 V p-p <sup>FO</sup>	2 Hz to 109.9 Hz	0.059 Hz	Fluke 702 Process Calibrator CENAM Technical Guide
	110 Hz to 1 000 Hz	0.59 Hz	
	1.01 kHz to 11 kHz	0.014 Hz	
	11.1 kHz to 50 kHz	0.059 kHz	

#### Optical

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Light Meters <sup>F</sup>	120 lux to 6 000 lux	1 % of reading	Light Meter Master CENAM Technical Guide



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Refractometers <sup>F</sup>	0.1 °Brix to 20 °Brix	0.13 °Brix	R °Bx Standards Traceable NIST and PTB, Merck Millipore OIML R108
Refractometers <sup>FO</sup>	20 °Brix to 90 °Brix	0.15 °Brix	Standard Solutions OIML R-108
Spectral Reflectance 400nm to 700nm Geometry d/8° Specular Component Included SCI (CEI) <sup>FO</sup>  CIE L*: CIE a* CIE b*	0 to 100 CIE L*	0.2 CIE L*	White Standard Tile CENAM Technical Guide ASTM D2244, ASTM E-1164 ASTM E-1331, ASTM E-1347
	-100 to 100 CIE a*	0.2 CIE a*	
	-100 to 100 CIE b*	0.15 CIE b*	
Spectral Reflectance 400nm to 700nm Geometry d/8° Specular Component Excluded SCE (CEE) <sup>FO</sup>  CIE L: CIE a* CIE b*	0 to 100 CIE L*	0.2 CIE L*	White Standard Tile CENAM Technical Guide ASTM D2244, ASTM E-1164, ASTM E-1331 ASTM E-1347
	-100 to 100 CIE a*	0.2 CIE a*	
	-100 to 100 CIE b*	0.15 CIE b*	
Gloss/Specular Reflectance Meter <sup>FO</sup>  Angle of Incline: 20° Angle of Incline: 60° Angle of Incline: 85°	92.6 Gloss Units	0.23 Gloss Units	BS in ISO 2813 ASTM D-523-14
	92.6 Gloss Units	0.19 Gloss Units	
	92.6 Gloss Units	0.25 Gloss Units	

### Electrical

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Equipment to Output DC Voltage <sup>FO</sup>	1 mV to 99.99 mV	0.005 % of reading + 0.003 5 mV	Agilent 34401A Multimeter CENAM Technical Guide
	100 mV to 0.99 V	0.004 % of reading + 7 $\mu$ V	
	1 V to 9.99 V	0.003 5 % of reading + 50 $\mu$ V	
	10 V to 99.99 V	0.004 5 % of reading + 0.6 mV	
	100 V to 1 000 V	0.004 5 % of reading + 10 mV	
Equipment to Output AC Voltage At the listed frequencies <sup>FO</sup>			
3 Hz to 5 Hz	10 mV to 100 mV	1.1 mV	



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Equipment to Output AC Voltage At the listed frequencies <sup>FO</sup>			Agilent 34401A Multimeter CENAM Technical Guide
5 Hz to 10 Hz	10 mV to 100 mV	0.39 mV	
10 Hz to 20 kHz	10 mV to 100 mV	0.1 mV	
20 kHz to 50 kHz	10 mV to 100 mV	0.16 mV	
50 kHz to 100 kHz	10 mV to 100 mV	0.68 mV	
100 kHz to 300 kHz	10 mV to 100 mV	4.5 mV	
Equipment to Output AC Voltage At the listed frequencies <sup>FO</sup>			
3 Hz to 5 Hz	100 mV to 1 V	0.011 V	
5 Hz to 10 Hz	100 mV to 1 V	0.003 8 V	
10 Hz to 20 kHz	100 mV to 1 V	0.000 9 V	
20 kHz to 50 kHz	100 mV to 1 V	0.001 6 V	
50 kHz to 100 kHz	100 mV to 1 V	0.006 8 V	
100 kHz to 300 kHz	100 mV to 1 V	0.045 V	
Equipment to Output AC Voltage At the listed frequencies <sup>FO</sup>			
3 Hz to 5 Hz	1 V to 750 V	7.8 V	
5 Hz to 10 Hz	1 V to 750 V	2.9 V	
10 Hz to 20 kHz	1 V to 750 V	0.68 V	
20 kHz to 50 kHz	1 V to 750 V	1.2 V	
50 kHz to 100 kHz	1 V to 750 V	5.1 V	
100 kHz to 300 kHz	1 V to 750 V	34 V	
Equipment to Output AC Current At the listed frequencies <sup>FO</sup>			
3 Hz to 5 Hz	1 mA to 0.999 99 A	0.011 A	
5 Hz to 10 Hz	1 m A to 0.999 99 A	0.003 4 A	
10 Hz to 5 kHz	1 m A to 0.999 99 A	0.001 4 A	
Equipment to Output AC Current At the listed frequencies <sup>FO</sup>			
3 Hz to 5 Hz	1 A to 3 A	0.035 A	
5 Hz to 10 Hz	1 A to 3 A	0.013 A	



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Equipment to Output AC Current At the listed frequencies <sup>FO</sup>			Agilent 34401A Multimeter CENAM Technical Guide
10 Hz to 5 kHz	1 A to 3 A	0.006 3 A	
Equipment to Output Resistance <sup>FO</sup>	Up to 100 Ω	16 mΩ	
	100 Ω to 1 000 Ω	130 mΩ	
	1 kΩ to 10 kΩ	1.3 Ω	
	10 kΩ to 100 kΩ	13 Ω	
	100 kΩ to 1 MΩ	130 Ω	
	1 MΩ to 10 MΩ	4.8 Ω/kΩ	
	10 MΩ to 100 MΩ	0.93 kΩ/MΩ	
Electrical Current Derivator (Shunt) <sup>F</sup>	20 A to 600 A	1 % of reading	Agilent 34401A, Fluke 289, Current Clamp Amp Meter CEM Guide, NIST Guide
Equipment to Measure Low Resistance At the listed frequencies 0.01 A to 10 A <sup>FO</sup>	1 mΩ to 5 mΩ	58 μΩ/Ω + 5.8 μΩ	Fluke 5500A, Multimeter Agilent 34401A, Fluke 289, Fluke 87 V, CENAM Technical Guide
	5.001 mΩ to 50mΩ	580 μΩ/Ω + 58 μΩ	
	50.01 mΩ to 500 mΩ	580 μΩ /Ω + 577 μΩ	
	0.500 1 Ω to 9.999 9 Ω	15 mΩ/Ω + 14.9 mΩ	
Equipment to Measure High resistance At the listed frequencies 20 V to 100 V <sup>FO</sup>	0.6 MΩ to 1 MΩ	0.96 % of reading	GenRad 1433-F High Resistance Standard Decade Box CENAM Technical Guide
Equipment to Output Resistance At the listed frequenciess 100 mV to 750 V <sup>FO</sup>	3 Hz to 5 Hz	0.56 % of reading	Agilent 34401A Multimeter CENAM Technical Guide
	5 Hz to 10 Hz	0.67 % of reading	
	10 Hz to 40 Hz	0.9 % of reading	
	40 Hz to 300 kHz	0.9 % of reading	
Equipment to Measure DC Voltage <sup>FO</sup>	33 mV to 330 mV	0.002 % of reading + 57 μV	Fluke 5500A CENAM Technical Guide
	0.33 V to 3.3 V	0.001 % of reading + 600 μV	
	3.3 V to 33 V	0.001 % of reading + 5.7 mV	
	33 V to 330 V	0.001 % of reading + 56 mV	
	330 V to 1 000 V	0.003 % of reading + 608 mV	
Equipment to Measure DC Current <sup>FO</sup>	0.33 mA to 3.3 mA	0.47 μA	
	3.3 mA to 33 mA	4.1 μA	
	33 mA to 330 mA	42 μA	



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Equipment to Measure DC Current <sup>FO</sup>	330 mA to 2.2 A	820 $\mu$ A	Fluke 5500A CENAM Technical Guide	
	2.2 A to 11 A	8 100 $\mu$ A		
Equipment to Measure AC Voltage At the listed frequencies <sup>FO</sup>				
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		Fluke 5500A CENAM Technical Guide
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		
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		



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Equipment to Measure AC Voltage At the listed frequencies <sup>FO</sup>			Fluke 5500A CENAM Technical Guide
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	
10 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	
Equipment to Measure AC Current At the listed frequencies <sup>FO</sup>			
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	0.33 mA to 3.299 9 mA	14 $\mu$ A	
20 Hz to 45 Hz	0.33 mA to 3.299 9 mA	12 $\mu$ A	
45 Hz to 1 kHz	0.33 mA to 3.299 9 mA	12 $\mu$ A	
1kHz to 5 kHz	0.33 mA to 3.299 9 mA	14 $\mu$ A	
5 kHz to 10 kHz	0.33 mA to 3.299 9 mA	23 $\mu$ 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	





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Equipment to Measure AC Current At the listed frequencies <sup>FO</sup>			Fluke 5500A CENAM Technical Guide
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	
Equipment to Measure Resistance <sup>FO</sup>	1.1 $\Omega$ to 11 $\Omega$	0.011 $\Omega$	
	11 $\Omega$ to 33 $\Omega$	0.025 $\Omega$	
	33 $\Omega$ to 110 $\Omega$	0.031 $\Omega$	
	110 $\Omega$ to 330 $\Omega$	0.13 $\Omega$	
	0.33 k $\Omega$ to 1.1 k $\Omega$	0.18 $\Omega$	
	1.1 k $\Omega$ to 3.3 k $\Omega$	0.42 $\Omega$	
	3.3 k $\Omega$ to 11 k $\Omega$	1.9 $\Omega$	
	11 k $\Omega$ to 33 k $\Omega$	4.2 $\Omega$	
	33 k $\Omega$ to 110 k $\Omega$	21 $\Omega$	
	110 k $\Omega$ to 330 k $\Omega$	53 $\Omega$	
	330 k $\Omega$ to 1.1 M $\Omega$	260 $\Omega$	



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Equipment to Measure Resistance <sup>FO</sup>	1.1 M $\Omega$ to 3.3 M $\Omega$	640 $\Omega$	Fluke 5500A CENAM Technical Guide
	3.3 M $\Omega$ to 11M $\Omega$	8.3 k $\Omega$	
	11 M $\Omega$ to 33 M $\Omega$	39 k $\Omega$	
	33 k $\Omega$ to 110 k $\Omega$	21 $\Omega$	
	110 k $\Omega$ to 330 k $\Omega$	53 $\Omega$	
Equipment to Measure Capacitance <sup>FO</sup>	0.33 nF to 0.499 9 nF	0.019 nF	
	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	
	33 nF to 109.99 nF	0.44 nF	
	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	
	330 $\mu$ F to 1.1 mF	14 $\mu$ F	
Equipment to Output AC Voltage (Hipot) <sup>FO</sup>	1 kV to 6 Kv	0.6 kV	Multimeter High Voltage Probe CENAM Technical Guide
	6 kV to 10 Kv	1 kV	
	10 kV to 25 kV	2.5 kV	
Equipment to Output DC Voltage (Hipot) <sup>FO</sup>	1 kV to 6 kV	0.24 kV	
	6 kV to 10 kV	0.4 kV	
	10 kV to 35 kV	1.4 kV	
Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type B <sup>FO</sup>	600 °C to 800 °C	0.46 °C	Fluke 5500A Electrical Simulation of Thermocouple Output CENAM Technical Guide
	800 °C to 1 000 °C	0.46 °C	
	1 000 °C to 1 550 °C	0.33 °C	
	1 550 °C to 1 820 °C	0.35 °C	
Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type C <sup>FO</sup>	0 °C to 150 °C	0.33 °C	
	150 °C to 650 °C	0.29 °C	
	650 °C to 1 000 °C	0.33 °C	
	1 000 °C to 1 800 °C	0.52 °C	
	1 800 °C to 2 316 °C	0.85 °C	



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Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type E <sup>FO</sup>	-250 °C to -100 °C	0.52 °C	Electrical Simulation of Thermocouple Output Fluke 5500A CENAM Technical Guide
	-100 °C to -25 °C	0.19 °C	
	-25 °C to 350 °C	0.19 °C	
	350 °C to 650 °C	0.2 °C	
	650 °C to 1000 °C	0.25 °C	
Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type J <sup>FO</sup>	-210 °C to -100 °C	0.3 °C	
	-100 °C to -30 °C	0.3 °C	
	-30 °C to 150 °C	0.19 °C	
	150 °C to 760 °C	0.21 °C	
	760 °C to 1 200 °C	0.26 °C	
Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type K <sup>FO</sup>	-200 °C to -100 °C	0.36 °C	
	-100 °C to -25 °C	0.22 °C	
	-25 °C to 120 °C	0.23 °C	
	120 °C to 1 000 °C	0.29 °C	
	1 000 °C to 1 372 °C	0.42 °C	
Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type L <sup>FO</sup>	-200 °C to -100 °C	0.39 °C	
	-100 °C to 800 °C	0.29 °C	
	800 °C to 900 °C	0.21 °C	
Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type N <sup>FO</sup>	-200 °C to -100 °C	0.42 °C	
	-100 °C to -25 °C	0.24 °C	
	-25 °C to 120 °C	0.22 °C	
	120 °C to 410 °C	0.22 °C	
Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type R <sup>FO</sup>	410 °C to 1 300 °C	0.3 °C	
	0 °C to 250 °C	0.58 °C	
	250 °C to 400 °C	0.58 °C	
	400 °C to 1 000 °C	0.35 °C	
Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type S <sup>FO</sup>	1 000 °C to 1 767 °C	0.42 °C	
	0 °C to 250 °C	0.49 °C	
	250 °C to 1 000 °C	0.38 °C	
	1 000 °C to 1 400 °C	0.39 °C	
	1 400 °C to 1 767 °C	0.48 °C	



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1<sup>era</sup> Privada No. 4831, Col. Niño Artillero  
 Monterrey, Nuevo León, México. C.P. 64280  
 Contact Name: Eliud Elizondo Phone: 818-351-0368

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
Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type T <sup>FO</sup>	-250 °C to -150 °C	0.64 °C	Fluke 5500A Electrical Simulation of Thermocouple Output CENAM Technical Guide
	-150 °C to 0 °C	0.27 °C	
	0 °C to 120 °C	0.19 °C	
	120 °C to 400 °C	0.19 °C	
Temperature Calibration, Indication, and Control Equipment used with Thermocouple Type U <sup>FO</sup>	-200 °C to 0 °C	0.57 °C	
	0 °C to 600 °C	0.3 °C	
Temperature Calibration, Indication, and Control Equipment used with RTD Pt 385, 100 $\Omega$	-200 °C to -80 °C	0.05 °C	Fluke 5500A Electrical Simulation of RTD Output CENAM Technical Guide
	-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	
	-200 °C to -80 °C	0.05 °C	
Temperature Calibration, Indication, and Control Equipment used with RTD Pt 3 926, 100 $\Omega$	-200 °C to -80 °C	0.05 °C	
	-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 $\Omega$	-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	
	600 °C to 630 °C	0.23 °C	



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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
Temperature Calibration, Indication, and Control Equipment used with RTD Pt 385, 100 $\Omega^{FO}$	-200 °C to -80 °C	0.25 °C	Fluke 5500A Electrical Simulation of RTD Output CENAM Technical Guide
	-80 °C to 0 °C	0.04 °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 3 926, 100 $\Omega^{FO}$	-200 °C to -80 °C	0.23 °C	
Temperature Calibration, Indication, and Control Equipment used with RTD Pt 385, 500 $\Omega^{FO}$	-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	
Temperature Calibration, Indication, and Control Equipment used with RTD Pt 385, 1 000 $\Omega^{FO}$	-200 °C to -80 °C	0.03 °C	
	-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	
Temperature Calibration, Indication, and Control Equipment used with RTD Pt 385, Ni 120, 120 $\Omega^{FO}$	-80 °C to 0 °C	0.08 °C	
	0 °C to 100 °C	0.08 °C	
	100 °C to 260 °C	0.14 °C	
Temperature Calibration, Indication, and Control Equipment used with RTD CU 427, 10 $\Omega^{FO}$	-100 °C to 260 °C	0.3 °C	



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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 High Resistance Fixed Point @ 50 V to 10 kV <sup>FO</sup>	38 M $\Omega$	0.4 % of reading	High Resistance CENAM Technical Guide
	42 M $\Omega$	0.44 % of reading	
	100 M $\Omega$	1.1 % of reading	
	1 G $\Omega$	0.019 % of reading	
	10 G $\Omega$	0.26 % of reading	
	100 G $\Omega$	2.1 % of reading	
Porosity Detector <sup>F</sup>	1 kV to 28 kV	0.24 kV	Multimeter High Voltage Probe CENAM Technical Guide
Equipment to Measure Capacitance <sup>FO</sup>	10 nF to 1 000 nF	0.088 % of reading	General Radio 1412-BC Decade Box CENAM Technical Guide
Equipment to Measure Inductance At the listed frequencies 100 Hz to 1 kHz <sup>FO</sup>	1 mH to 10 H	0.15 % of reading	CENAM Technical Guide
Equipment to Measure High Resistance Tester of ESD (Wristrap & Foot Strap) <sup>FO</sup>	600 k $\Omega$ to 1 M $\Omega$ 38 M $\Omega$ fixed point	1.5 k $\Omega$	GenRad 1433-F Decade Box, High Resistance Standard Set CENAM Technical Guide ESD Equipment Manufacturing Guide
Equipment to Output Air Ionizer Charger ESD <sup>F</sup>	0.5 kV to 28 kV	0.33 % of output	Multimeter High Voltage Probe CENAM Technical Guide
Equipment to Measure ESD Air Ionizer Meters and Sensors <sup>F</sup>	0.5 kV to 28 kV	0.33 % of output	ESD manufacturer Equipment's Guide
Equipment to Output DC Voltage and DC Current of Electrical Welding Equipment Power Sources or Generators <sup>F</sup>	1 V to 100 V	0.058 V	Multimeter, Current Clamp Amp Meter, Load Bank Welding Equipment Manufacturer 275053 Guide ANSI/IEC 60974-1 ISO 17662
	1 A to 750 A	0.064 A	

#### Chemical

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
pH Meter Fixed point <sup>FO</sup>	4 pH	0.012 pH	pH Buffer Solutions CENAM Technical Guide



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#### Chemical

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
pH Meter Fixed point <sup>FO</sup>	7 pH	0.012 pH	pH Buffer Solutions CENAM Technical Guide
	10 pH	0.012 pH	
Conductivity Meter <sup>FO</sup>	84 $\mu$ S	0.94 $\mu$ S	Conductivity Buffer Solutions CENAM Technical Guide
	1 413 $\mu$ S	6.5 $\mu$ S	
	12 880 $\mu$ S	6 $\mu$ S	
Viscometers - Kinematic Viscosity (Zhan) 2/3/4, Ford 3, 4 <sup>FO</sup>	120 mm <sup>2</sup> /s (cSt)	0.34 mm <sup>2</sup> /s (cSt)	Cannon Certified Viscosity Reference Standard (C60, C100) 25 °C CENAM Technical Guide
	230 mm <sup>2</sup> /s (cSt)		
Viscometers - Dynamic Viscosity <sup>FO</sup>	335.3 mPa.s	0.66 mPa.s	Cannon Certified Viscosity Reference Standard (S200, RT500) 25 °C CENAM Technical Guide
	484.7 mPa.s	0.89 mPa.s	
	100 mPa.s	0.95 mPa.s	Cannon, Brookfield STD CENAM Technical Guide
	500 mPa.s	1.8 mPa.s	
	1 000 mPa.s	3 mPa.s	
	5 000 mPa.s	19 mPa.s	
12 500 mPa.s	55 mPa.s		
Alcohol Meter <sup>F</sup>	Up to 0.4 BAC	0.012 % BAC	Alcohol Meter Master OIMLR-126
Combustion Analyzer <sup>F</sup>	51 $\mu$ mol/mol (CO)	1.1 $\mu$ mol/mol (CO)	PRAXAIR Certified Standard NOM-034-ECOL
Explosimeter <sup>F</sup> Methane	100 $\mu$ mol/mol	0.05 $\mu$ mol/mol	
Explosimeter <sup>F</sup> Hydrogen Sulfide	26 $\mu$ mol/mol	0.05 $\mu$ mol/mol	
Explosimeter <sup>F</sup> Butane	109 $\mu$ mol/mol	0.05 $\mu$ mol/mol	

#### Mass, Force, and Weighing 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
Analytical Balance <sup>FO</sup>	1 mg to 210 g (Res.= 0.01 mg)	$(8 \times 10^{-5} + 6 \times 10^{-7}Wt)$ g	Weight Class E2 CENAM Technical Guide
Scales <sup>O</sup>	5 g to 2 000 g (Res.= 0.01 g)	$(7.8 \times 10^{-3} + 1 \times 10^{-6}Wt)$ g	Weight Class E2, F1 CENAM Technical Guide
	200 g to 50 000 g (Res.= 0.1 g)	$(7.73 \times 10^{-2} + 3 \times 10^{-6}Wt)$ g	Weight Class E2, F1, F2 CENAM Technical Guide



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#### Mass, Force, and Weighing 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
Scales <sup>O</sup>	4 kg to 200 kg (Res.= 0.02 kg)	$(3.3 \times 10^{-3} + 2 \times 10^{-5}Wt)$ kg	Weight Class M1, F1, F2 CENAM Technical Guide
Weighing Scales, Crane Scale, Dynamic Checkweighing Systems <sup>O</sup>	20 kg to 2 000 kg (Res.= 0.2 kg)	$(0.16 + 3 \times 10^{-5}Wt)$ kg	Weight Class M1, M2 CENAM Technical Guide
Weights Class M1, M2, M3 <sup>F</sup>	1 g	0.33 mg	NOM-EM-020-SE Mass Set Class E2
	2 g	0.4 mg	
	5 g	0.53 mg	
	10 g	0.66 mg	
	20 g	0.83 mg	
	50 g	1 mg	
	100 g	1.7 mg	
	200 g	3.4 mg	
Weights Class M1, M2, M3 <sup>F</sup>	1 000 g	17 mg	Mass Set Class F2 NOM-EM-020-SE
	20 000 g	340 mg	
	2 000 g	10 mg	
Weights Class M2, M3 <sup>F</sup>	5 000 g	270 mg	Mass Set Class M1 NOM-EM-020-SE
	10 000 g	540 mg	
Weights Class F1 <sup>F</sup>	5 mg	0.006 1 mg	Mass Set Class E2 NOM-EM-020-SE
	10 mg	0.006 4 mg	
	20 mg	0.008 mg	
	50 mg	0.019 mg	
	100 mg	0.01 mg	
	200 mg	0.018 mg	
	500 mg	0.024 mg	
	1 g	0.024 mg	
	2 g	0.022 mg	
	5 g	0.022 mg	
	10 g	0.021 mg	
	20 g	0.05 mg	
	50 g	0.074 mg	
	100 g	0.29 mg	
	200 g	0.28 mg	





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### Mass, Force, and Weighing 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
Force Machines Compression and Tension <sup>FO</sup>	44 N to 444 N	0.21 % of reading	Load Cells Strainsense SST104ULP, BLH Electronics 82060, 59676 Laumas CLS- 5t, CLS-1t NMX-CH-7500-1 IMNC
	44 N to 4.44 kN	0.5 % of reading	
	4.44 kN to 44.48 kN	0.6 % of reading	
	44.48 kN to 444.82 kN	0.3 % of reading	
Force Machines Tension <sup>FO</sup>	0.009 8 N to 1.96 N	0.001 N	Class F1, F2 y M1 Weight ISO-7500-1, ASTM E4 NMX-CH-7500-1-IMNC
	1.97 N to 9.8 N	0.007 N	
	9.81 N to 588 N	0.012 N	
Force Measuring Systems, Gauges and Devices Compression and Tension <sup>FO</sup>	0.8 895 N to 980.665 N	0.006 3 % of reading	F1, F2, M1 Weight Set ISO 376, ISO-7500-1 ASTM E4 NMX-CH-7500-1-IMNC
Force Load Cells Tension <sup>FO</sup>	22.24 N to 490.33 kN	0.17 % of reading	Standard Load Cells ISO 376
Force Load Cells Compression <sup>FO</sup>	22.24 N to 98.0665 kN	0.17 % of reading	

### Acoustic

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
Acoustical Meter <sup>FO</sup>	94 dB	0.27 dB	Acoustical Calibrator UNE-EN 61672-2014
	114 dB	0.27 dB	

- 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.
- 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.
- 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.



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

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.

