



# 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.***

***Ramón Rayón # 1520, Int-9 Pino Seco/Lote Bravo  
Ciudad Juárez, Chihuahua, México. C.P. 32550***

*(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, Optical, Thermodynamic, Mechanical, , Mass, Force and Weighing Devices, Electrical, Chemical and Time and Frequency 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:*

August 28, 2002

*Issue Date:*

April 12, 2023

*Expiration Date:*

April 30, 2025

*Accreditation No.:*

22580

*Certificate No.:*

L23-290-1

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.pjlabs.com](http://www.pjlabs.com)*



## Certificate of Accreditation: Supplement

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

Ramón Rayón # 1520, Int-9 Pino Seco/Lote Bravo  
 Ciudad Juárez, Chihuahua, México. C.P. 32550  
 Contact Name: Carlos Valenzuela Phone: 656-617-6617

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
Optical Comparators <sup>O</sup> Magnification	Up to 100X	0.03 % of reading	Video and Comparator Reticle Kit/ Gage Blocks Set JIS B 7184
Optical Comparators <sup>O</sup> Axis Linearity X Axis Linearity Y	12 in maximum	(143 + 17.5L) $\mu$ m	
Optical Comparators <sup>O</sup> Axis Linearity X Axis Linearity Y	1 200 mm maximum	(1.21 + 0.03L) $\mu$ m	
Axis Squareness <sup>O</sup>	90°	0.1°	
Angularity <sup>O</sup>	30°, 45°, 60°, 90°	0.1°	981-103 Angle Plate JIS B 7184
Video Measurement System Magnification <sup>O</sup>	Up to 100X	0.03 % of reading	Video and Comparator Reticle Kit/ Gage Blocks Set JIS B 7184
Video Measurement System <sup>O</sup> Axis Linearity X Axis Linearity Y	12 in maximum (1 200 mm maximum)	30 $\mu$ m (1.21 + 0.03L) $\mu$ m	
Video Measurement System <sup>O</sup> Axis Squareness	90°	0.01°	
Video Measurement System <sup>O</sup> Angularity	30°, 45°, 60°, 90	0.01°	981-103 Angle Plate JIS B 7184
Block Gages <sup>F</sup>	0.01 in to 12 in (0.5 mm to 300 mm)	(2.5 + 0.959L) $\mu$ m [(0.04 + 0.005L) $\mu$ m]	Pratt & Whitney lab Master/Gage Blocks, Grade K ASME B89.1.9
Protractors <sup>F</sup>	1° to 180°	0.01°	Gage Blocks/Sine Bar
CMM Performance Verification (Coordinate Measuring Machines) Linear Displacement (X, Y, and Z axis) <sup>O</sup>	0.5 mm to 1 600 mm	(1.39 + 0.09L) $\mu$ m	Gage Blocks and Bar Ball Check ASME B89.4.10360.2
Volumetric Displacement <sup>O</sup>	0.025 4 m to 1.2 m	(2.9 + 0.09L) $\mu$ m	
Meter Counters Odometer <sup>O</sup>	0.025 4 m to 999 m	0.5 % of reading	Direct Measure - Totalizer Counter OIML R 55
Caliper <sup>FO</sup>	0.127 mm to 304.8 mm (0.005 in to 12 in)	9.5 $\mu$ m (374 $\mu$ m)	Comparison to Gage Blocks and Caliper ASME B89.1.14
	300.01 mm to 1 200 mm (12 5 in to 48 in)	(7.15 + 7.86 X 10 <sup>-3</sup> L) $\mu$ m [(281 + 7.86L) $\mu$ m]	
Micrometers <sup>FO</sup>	0.01 mm to 25 mm (0.000 5 in to 1 in)	0.63 $\mu$ m (25 $\mu$ m)	Comparison to Gage Blocks ASME B89.1.13



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### Dimensional

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Micrometers <sup>FO</sup>	25.01 mm to 508 mm (1.000 5 in to 20 in)	$(0.56 + 0.012L) \mu\text{m}$ [[22 + 120L] $\mu\text{in}$ ]	Comparison to Gage Blocks JIS B 7502
Metal Rules <sup>F</sup>	1 mm to 2 400 mm (0.05 in to 98.425 in)	$(58.85 + 1.58 \times 10^{-3}L) \mu\text{m}$ $(2\ 317 + 1.58L) \mu\text{in}$	ROI 30-4000-00 Vision System with Mitutoyo Digital Proscale JIS B 7516
Height Gages <sup>FO</sup>	10 mm to 900 mm (0.4 in to 36 in)	$(0.504 + 8.55 \times 10^{-3}L) \mu\text{m}$ [[19.8+ 8.55L] $\mu\text{in}$ ]	Comparison to Height Master Step Gage and Gage Blocks
Surface Plate Flatness <sup>FO</sup>	0.02 in to 157 in Diagonal	$(57.21 + 2.33 \times 10^{-2}L) \mu\text{in}$	Electronic Levels ASME B89.3.7
Surface Plate Repeat Reading <sup>FO</sup>	0.02 in to 0.002 in	20 $\mu\text{in}$	Repeat-o-Meter with 0.000 02 indicator ASME B89.3.7
Dial Indicators <sup>FO</sup>	0.02 in to 2 in	$(211 + 10.4L) \mu\text{in}$	Pratt & Whitney LabMaster Universal / Gage Blocks Grade 2 ASME B89.1.10M
Digital Indicators <sup>F</sup>	0.01 mm to 25 mm	$(2.95 \times 10^{-1} + 5.42 \times 10^{-3}L) \mu\text{m}$	Pratt & Whitney LabMaster Universal / Gage Blocks Grade 00 ASME B89.1.10M
Cylindrical Diameter Outside and Limit Gages <sup>F</sup>	0.1 mm to 300 mm $(3.94 \times 10^{-3}$ in to 11.81 in)	$(0.19 + 0.001\ 5L) \mu\text{m}$ [[7.4 + 1.5L] $\mu\text{in}$ ]	Pratt & Whitney labMaster Universal and Gage Blocks ASME B89.1.6
	0.1 mm to 25 mm	0.25 $\mu\text{m}$	Laser Scan Micrometer3 ASME B89.1.6
Thread Plugs Pitch Diameter <sup>F</sup>	4-40 to 4-14	$(109.44 + 5.21L) \mu\text{in}$	Pratt & Whitney LabMaster Universal & Three Wire System ASME B1.2 ASME B1.20.2M
Thread Plug Major Diameter <sup>F</sup>	4-40 to 4-14	$(29.78 + 12.58L) \mu\text{in}$	Pratt & Whitney LabMaster Universal and Gage Blocks ASME B1.2 ASME B1.20.2M
Thread Ring Pitch Diameter <sup>F</sup>	4-40 to 4-14	$(119.75 + 2.6L) \mu\text{in}$	Pratt & Whitney LabMaster Universal and Internal Thread Probe ASME B1.2, ASME 1.20.2M
Thread Ring Minor Diameter <sup>F</sup>	4-40 to 4-14	$(90.56 + 4.95L) \mu\text{in}$	



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Cylindrical Diameter Inside <sup>F</sup>	0.02 in to 10 in (0.5 mm to 254 mm)	$(7.7 + 6.82L) \mu\text{in}$ $[(0.196 + 6.82 \times 10^{-3}L) \mu\text{m}]$	Master Rings with Pratt & Whitney LabMaster ASME B89.1.6
Angle Gage Blocks <sup>F</sup>	1° to 90°	$7.8 \times 10^{-6}$ rad	CMM JIS B 7510
Angle Calibration of Precision Levels <sup>F</sup>	-400 rad to 400 rad	$5.8 \times 10^{-6}$ rad	Electronic Levels JIS B 7510
Digital Scale Ruler <sup>FO</sup>	1 mm to 2 000 mm	$(10.25 + 75 \times 10^{-3}L) \mu\text{m}$	Direct Comparison with Gage Blocks JIS B 7507
Graduate Ruler and Measurement Tape <sup>F</sup>	5 mm to 5 000 mm	0.11 mm	Digital Scale OIML R 35-1
Laser Scan Micrometer <sup>FO</sup>	0.1 mm to 50 mm	$(0.025 + 1.75 \times 10^{-3}L) \mu\text{m}$	Direct Comparison with Master Pin Gages ISO 14638
Diameter of Sphere <sup>F</sup>	0.1 mm to 100 mm	0.33 $\mu\text{m}$	Direct Method Measure Linear Measuring Machine ISO 14638
Roughness Measuring Instruments <sup>F</sup>	14 $\mu\text{in}$	3 $\mu\text{in}$	Surface Finish Specimen DI-025 JIS B 0601
	16 $\mu\text{in}$	3 $\mu\text{in}$	
	118 $\mu\text{in}$	3 $\mu\text{in}$	
	2.9 $\mu\text{m}$	0.03 $\mu\text{m}$	
	9.2 $\mu\text{m}$	0.05 $\mu\text{m}$	
Line Scales (Glass Scales) <sup>F</sup>	1 mm to 750 mm	$(0.3 + 1 \times 10^{-3}L) \mu\text{m}$	Vision System CENAM Technical Guide

### Optical

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Luxmeters <sup>F</sup>	10 Lux to 30 000 Lux	2.9 % of reading	Konica Minolta T-10 CNM-MFO-PT-004
Power and Energy Meter <sup>F</sup>	10 mW to 10 W	3 % of reading	Comparison Method with PD100 reader and S310C - Thermal Power Sensor Head
Irradiance Ultraviolet <sup>F</sup> Light 320 nm to 400 nm	0 mW/cm <sup>2</sup> to 20 W/cm <sup>2</sup>	1.2 % of reading	Comparison Method with Radiometer Photometer OMNICURE S2000 System, Model XR-3000
Illuminance -Visible Light <sup>F</sup> 460 nm to 675 nm	0 Lux to 5 300 Lux (0 FC to 500 FC)	1.2 % of reading	



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### Thermodynamic

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Infrared Temperature Measuring Devices <sup>FO</sup>	10 °C to 50 °C	0.2 °C	Venus Isotech Blackbody Source ASTM E-1256
	50 °C to 500 °C	0.54 °C	Blackbody Source Hart 9132 JSA JIS C 1612
Infrared Temperature Measuring Devices <sup>FO</sup>	500 °C to 1 000 °C	0.7 °C	IR Cavity 461 IR Industries JSA JIS C 1612
Equipment to Measure Temperature <sup>FO</sup>	-50 °C to 130 °C	0.05 °C	Venus ISO TECH Bath Euramet-cg-13
	50 °C to 250 °C	0.01 °C	6331 Fluke Calibration Bath Euramet-cg-13
	50 °C to 660 °C	0.07 °C	9144 Fluke Metrology Well Euramet-cg-13
Temperature Measurement Metrology Wells and Baths <sup>F</sup>	-50 °C to 155 °C	0.02 °C	Fluke 8508A and PRT Euramet-cg-13
	155 °C to 250 °C	0.03 °C	
	250 °C to 425 °C	0.04 °C	
	425 °C to 500 °C	0.05 °C	
	500 °C to 660 °C	0.06 °C	
Hygrometers <sup>F</sup>	5 % to 95 %	1 % of reading	Vaisala MI70/HMP75 Humidity Chamber Euramet-cg-20
	10 %	0.4 % of reading	Optronic Humidity Standards Feutchenormal Humidity Standards Euramet-cg-20
	35 %	0.5 % of reading	
	50 %	0.7 % of reading	
	75 %	0.8 % of reading	
	95 %	0.9 % of reading	

### Mechanical

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Indirect Verification of Rockwell Hardness Testers HRB <sup>FO</sup>	20 HRB to 59 HRB	1.1 HRB	Standardized Test Blocks ASTM E 18
	60 HRB to 84 HRB	0.66 HRB	
	85 HRB to 100 HRB	0.49 HRB	





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Indirect Verification of Rockwell Hardness Testers HRC <sup>FO</sup>	20 HRC to 34 HRC	0.42 HRC	Standardized Test Blocks ASTM E 18
	35 HRC to 59 HRC	0.35 HRC	
	60 HRC to 70 HRC	0.33 HRC	
Indirect Verification of Rockwell Hardness Testers HR30N <sup>FO</sup>	42 HR30N to 54 HR30N	0.44 HR30N	Standardized Test Blocks ASTM E 18
	55 HR30N to 76 HR30N	0.34 HR30N	
	77 HR30N to 82 HR30N	0.31 HR30N	
Magnetic Source– Verification of Gauss Meter <sup>FO</sup>	100 G	0.41 G	Magnetic Instrumentation References Fixed Points A312-100/A312-1K
	1 000 G	5.3 G	
Gas Flowmeter <sup>FO</sup>	10 sccm to 1 000 sccm	0.36 % of reading	Alicat Flow Portable Calibration Unit CEM/ME-009
	0.1 slpm to 50 slpm	0.52 % of reading	
	50 slpm to 500 slpm	0.33 % of reading	
	0.2 sccm to 2 sccm	1 % of reading	ATEQ CDF CEM/ME-009
	1 sccm to 40 sccm	0.77 % of reading	
Direct Verification of Durometer Hardness Tester Types A, B, C, D, O & DO <sup>F</sup> Extension at Zero Reading  Indenter Shape (Not all parameters apply to all Durometer Types) Indenter Tip Diameter A, C Indenter Tip Radius B, D Indenter Tip Radius O, DO Indenter Tip Angle A, C Indenter Tip Angle B, D  Durometer Indenter Spring Types A, B, E & O Types C, D & DO	2.46 mm to 2.54 mm	6.1 $\mu$ m	ASTM D2240  Video Comparator 20x
	0.76 mm to 0.82 mm	6.1 $\mu$ m	Video Comparator 20x Video Comparator 20x Video Comparator 20x Video Comparator 20x Video Comparator 20x
	0.88 mm to 0.112 mm	6.1 $\mu$ m	
	1.14 mm to 1.24 mm	6.1 $\mu$ m	
	34.75° to 35.25°	0.1°	
	29.5° to 30.5°	0.1°	
	0.55 N to 8.05 N	0.01 N	Load Cell Load Cell
4.445 N to 44.45 N	0.1 N		
Flow Devices – Water Flow <sup>F</sup>	1 L/min to 1 000 L/min	0.12 % of reading	Gravimetric Method CEM- ME- 008



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### Mechanical

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Liquid Volume – Pipettes/Burettes <sup>F</sup>	10 $\mu$ L to 1 000 $\mu$ L	0.3 % of reading	Gravimetric Method ASTM E1154
	1 mL to 100 mL	0.2 % of reading	
Micropipettes <sup>F</sup>	1 $\mu$ L to 10 $\mu$ L	1.2 % of reading	
Differential Pressure Devices <sup>F</sup>	-2 in H <sub>2</sub> O to 2 in H <sub>2</sub> O	0.002 in H <sub>2</sub> O	Dwyer 1430 Microtector CEM-ME- 020
Calibration of Pressure Devices (w/Oil) <sup>F</sup>	200 psi to 20 000 psi	0.01 % of reading	P3116-3 Fluke Dead Weight Tester opt 0.008 %
Pressure Device <sup>F</sup>	-103.5 kPa to 34.5 kPa (-15 psi to 5 psi)	0.07 % of reading	Type 6-201 CEC Deadweight Tester Euramet-cg-3
Calibration of Pressure Devices (w/Air) <sup>FO</sup>	-82.7 kPa to 3 500 kPa (-12 psi to 500 psi)	0.01 % of reading	PPC4 Pressure Calibrator & Q-RPT Gauge, Negative Gauge and Absolute CEM ME-010 Euramet-g-17
Pressure Device <sup>F</sup>	-103.5 kPa to 34.5 kPa (-15 psi to 5 psi)	0.07 % of reading	Type 6-201 CEC Deadweight Tester Euramet-cg-3
	34.5 kPa to 344.8 kPa (5 psi to 50 psi)	0.03 % of reading	
	275.8 kPa to 3.45 MPa (40 psi to 500 psi)	0.02 % of reading	
Torque Hand Tools and Torque Power Tools <sup>FO</sup>	0.113 N·m to 11.3 N·m (1 in·lb to 100 in·lb)	0.08 % of reading	System & Digital Torque Tester with QC Transducers ISO 6789 Euramet-cg-14
	1.13 N·m to 338.9 N·m (10 in·lb to 3 000 in·lb)	0.12 % of reading	
	81.3 N·m to 813.5 N·m (60 ft·lb to 600 ft·lb)	0.15 % of reading	
Torque Transducers Clockwise & Counter-Clockwise <sup>F</sup>	1.3 N·m to 813.5 N·m (1 lbf·ft to 600 lbf·ft)	0.026 % of reading	Torque –Dead Weight Primary Standard ASTM E2428 Euramet-cg-14
Air Velocity Measuring Equipment <sup>F</sup>	0.25 m/s to to 30 m/s	0.38 % of reading + 0.02 m/s	Wind Tunnel and Rotating Vane Anemometer/ ASTMD5096
	100 ft/min to 6 013 ft/min	0.38 % of reading + 3.9 ft./min	



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#### 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
Analytical Balances <sup>O</sup>	1 mg to 20 g (Res.= 0.01 mg)	$(1.35 \times 10^{-2} + 3.98 \times 10^{-6}Wt)$ mg	Class E2 Weights OIML R 76-1
	20 g to 500 g (Res.= 0.1 mg)	$(1.15 \times 10^{-1} + 1.63 \times 10^{-6}Wt)$ mg	
	500 g to 2 kg (Res.= 0.5 mg)	$(2.82 \times 10^{-1} + 1.62 \times 10^{-6}Wt)$ mg	
	2 kg to 30 kg (Res.= 1 mg)	$(1.17 \times 10^{-1} + 1.77 \times 10^{-6}Wt)$ mg	
Scales and Balances Class III <sup>O</sup>	454 g to 4.54 kg (Res.= 0.2 g)	$(2.09 \times 10^{-1} + 7.93 \times 10^{-5}Wt)$ g	Verification using Handbook 44 with: Class F Weights OIML R 76-1
	4.54 kg to 9.08 kg (Res.= 1 g)	$(9.71 \times 10^{-1} + 6.50 \times 10^{-5}Wt)$ g	
	9.08 kg to 22.7 kg (Res.= 2 g)	$(1.88 + 7.21 \times 10^{-5}Wt)$ g	
	22.7 kg to 45.4 kg (Res.= 5 g)	$(4.94 + 6.22 \times 10^{-5}Wt)$ g	
	45.4 kg to 227 kg (Res.= 10 g)	$(8.58 + 8.97 \times 10^{-5}Wt)$ g	
	227 kg to 2 270 kg (Res.= 0.2 kg)	$(219 + 5.85 \times 10^{-5}Wt)$ g	
	2 270 kg to 4 540 kg (Res.= 0.5 kg)	$(0.494 + 6.22 \times 10^{-5}Wt)$ kg	
Mass, Weight and Weight Sets F1, F2 M1, M2, M3 <sup>F</sup>	1 g	22 $\mu$ g	Double Substitution with Class E2 Weights, Balances & Mass Comparators OIML R111
	2 g	25 $\mu$ g	
	5 g	40 $\mu$ g	
	10 g	43 $\mu$ g	
	20 g	68 $\mu$ g	
	50 g	80 $\mu$ g	
	100 g	100 $\mu$ g	
	200 g	200 $\mu$ g	
	500 g	0.5 mg	
	1 kg	1.1 mg	
	2 kg	1.9 mg	
	5 kg	5 mg	
	10 kg	10 mg	
20 kg	21 mg		





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Mass – Weight and Weight Sets F1, F2, M1, M2, M3 <sup>F</sup>	1 mg	5 $\mu$ g	Double Substitution with Class E2 Weights, Balances & Mass Comparators OIML R111
	2 mg	5 $\mu$ g	
	5 mg	5 $\mu$ g	
	10 mg	5 $\mu$ g	
	20 mg	6 $\mu$ g	
	50 mg	10 $\mu$ g	
	100 mg	10 $\mu$ g	
	200 mg	12 $\mu$ g	
	500 mg	15 $\mu$ g	
Mass–Weight and Weight Sets NIST 105-1 Class F Weights <sup>F</sup>	1 oz	2.3 $\mu$ lb	
	2 oz	4.3 $\mu$ lb	
	4 oz	8.3 $\mu$ lb	
	8 oz	20 $\mu$ lb	
	1 lb	37 $\mu$ lb	
	2 lb	42 $\mu$ lb	
	3 lb	49 $\mu$ lb	
	5 lb	65 $\mu$ lb	
	10 lb	150 $\mu$ lb	
	20 lb	290 $\mu$ lb	
Verification of Testing Machines in Tension and Compression <sup>F0</sup>	1 N to 889 N (1 lb·f to 200 lb·f)	0.07 % of reading	Class F Weights ASTM E4 ISO 376
	88.9 N to 4.41 kN (20 lb·f to 1 000 lb·f)	0.35 N (0.08 lb·f)	Morehouse- Calibration Load Cell with Hadi (High Accuracy Digital Indicator) ASTM E4 ISO 376
	889.6 N to 44.13 kN (200 lb·f to 10 000 lb·f)	3.5 N (0.8 lb·f)	



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### Electrical

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Equipment to Measure Power Reference 50 MHz <sup>FO</sup>	240 $\mu$ W to 16 $\mu$ W	81.5 $\mu$ W	Fluke 9640A/LPN Agilent E4418B HP 8482A, HP 8481D Agilent U2004A T.O. kkK1-4-60-1 Power Meter
Equipment to Measure Power Reference At the listed frequencies			
100 kHz to 600 kHz (75 $\Omega$ ) <sup>FO</sup>	20 dB to -30 dB	0.057 dB	
600 kHz to 2 GHz (75 $\Omega$ ) <sup>FO</sup>	20 dB to -30 dB	0.059 dB	
300 kHz to 1 MHz (50 $\Omega$ ) <sup>FO</sup>	20 dB to -20 dB	0.049 dB	
1 MHz to 2 GHz (50 $\Omega$ )	20 dB to -20 dB	0.051 dB	
2 GHz to 4.2 GHz (50 $\Omega$ ) <sup>FO</sup>	20 dB to -20 dB	0.05 dB	
Equipment to Measure Power Reference At the listed frequencies			
300 kHz to 1 MHz (50 $\Omega$ ) <sup>FO</sup>	-20 dB to -20 dB	0.049 dB	
10 MHz to 30 MHz (50 $\Omega$ ) <sup>FO</sup>	-20 dB to -70 dB	0.074 dB	
30 MHz to 4 GHz (50 $\Omega$ ) <sup>FO</sup>	-20 dB to -70 dB	0.074 dB	
4 GHz to 10 GHz (50 $\Omega$ ) <sup>FO</sup>	-20 dB to -70 dB	0.074 dB	
10 GHz to 15 GHz (50 $\Omega$ ) <sup>FO</sup>	-20 dB to -70 dB	0.1 dB	
15 GHz to 18 GHz (50 $\Omega$ ) <sup>FO</sup>	-20 dB to -70 dB	0.11 dB	
Equipment to Measure Power Reference At the listed frequencies			
50 MHz to 100 MHz (50 $\Omega$ ) <sup>FO</sup>	20 dB to -30 dB	0.06 dB	
0.1 GHz to 2 GHz (50 $\Omega$ ) <sup>FO</sup>	20 dB to -30 dB	0.075 dB	
2 GHz to 12.4 GHz (50 $\Omega$ ) <sup>FO</sup>	20 dB to -30 dB	0.062 dB	
12.4 GHz to 18 GHz (50 $\Omega$ ) <sup>FO</sup>	20 dB to -30 dB	0.065 dB	
18 GHz to 26.5 GHz (50 $\Omega$ ) <sup>FO</sup>	20 dB to -30 dB	0.099 dB	
26.5 GHz to 40 GHz (50 $\Omega$ ) <sup>FO</sup>	20 dB to -30 dB	0.097 dB	
40 GHz to 50 GHz (50 $\Omega$ ) <sup>FO</sup>	20 dB to -30 dB	0.13 dB	



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

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Equipment to Measure Power Reference At the listed frequencies			Fluke 9640A/LPN Agilent E4418B, HP 8482A, HP 8481D Agilent U2004A T.O. kkK1-4-60-1 Power Meter
50 MHz to 100 MHz (50 $\Omega$ ) <sup>FO</sup>	-20 dB to -70 dB	0.054 dB	
0.1 GHz to 2 GHz (50 $\Omega$ ) <sup>FO</sup>	-20 dB to -70 dB	0.054 dB	
2 GHz to 12.4 GHz (50 $\Omega$ ) <sup>FO</sup>	-20 dB to -70 dB	0.058 dB	
12.4 GHz to 18 GHz (50 $\Omega$ ) <sup>FO</sup>	-20 dB to -70 dB	0.068 dB	
18 GHz to 26.5 GHz (50 $\Omega$ ) <sup>FO</sup>	-20 dB to -70 dB	0.095 dB	
26.5 GHz to 40 GHz (50 $\Omega$ ) <sup>FO</sup>	-20 dB to -70 dB	0.11 dB	
40 GHz to 50 GHz (50 $\Omega$ ) <sup>FO</sup>	-20 dB to -70 dB	0.19 dB	
Equipment to Measure Power Reference At the listed frequencies			
100 kHz to 2.6 GHz (50 $\Omega$ ) <sup>FO</sup>	30 dB to -20 dB	0.071 dB	
50 MHz to 1 300 MHz (50 $\Omega$ ) <sup>FO</sup>	30 dB to -20 dB	0.071 dB	
1.3 GHz to 18 GHz (50 $\Omega$ ) <sup>FO</sup>	30 dB to -20 dB	0.081 dB	
18 GHz to 26.5 GHz (50 $\Omega$ ) <sup>FO</sup>	30 dB to -20 dB	0.092 dB	
Power Meter Output Power Accuracy Band 0 0.01 GHz to 2.3 GHz <sup>FO</sup>	20 dB to 10 dB	0.9 dB	
	10 dB to -9.95 dB	0.9 dB	
	-10 dB to 19.95 dB	1.2 dB	
	-20 dB to 49.95 dB	1.5 dB	
	-50 dB to -79.95 dB	1.8 dB	
	-80 dB to -99.95 dB	2.1 dB	
	-100 dB to -110 dB	2.1 dB	
Output Power Accuracy Band 1-3 (2.3 GHz to 20 GHz) <sup>FO</sup>	18 dB to 10 dB	1.8 dB	
	10 dB to -9.95 dB	1.5 dB	
	-10 dB to 19.95 dB	2 dB	
	-20 dB to 49.95 dB	2.3 dB	
	-50 dB to -79.95 dB	2.6 dB	
	-80 dB to -100 dB	2.9 dB	
	20 dB to -110 dB	2.9 dB	



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Output Power Accuracy Band 4 (20 GHz to 26.5 GHz) <sup>FO</sup>	18 dB to 10 dB	2.3 dB	HP 8340B E4420B T.O. kkK1-4-60-1 Power Meter
	10 dB to -9.95 dB	2 dB	
	-10 dB to 19.95 dB	2.5 dB	
	-20 dB to 49.95 dB	2.8 dB	
	-50 dB to -79.95 dB	3.1 dB	
	-80 dB to -110 dB	3.4 dB	
Frequency Modulation 20 Hz to 10 kHz 40 kHz Peak <sup>FO</sup>	0.25 MHz to 10 MHz	2 % of reading + 1 digit	HP 8902A T.O. kkK1-4-60-1 Power Meter
Frequency Modulation 50 Hz to 100 kHz 400 kHz Peak <sup>FO</sup>	10 MHz to 1 300 MHz	1 % of reading + 1 digit	HP 8902A w/ HP 11722A T.O. kkK1-4-60-1 Power Meter
Single – Sideband Phase Noise Standard Band 0-1 0.05 GHz to 7 GHz) <sup>FO</sup>	30 Hz Offset from Carrier	64 dB	HP 8593A T.O. kkK1-4-60-1 Power Meter  HP 8340B T.O. kkK1-4-60-1 Power Meter
	100 Hz Offset from Carrier	70 dB	
	1 kHz Offset from Carrier	78 dB	
	10 kHz Offset from Carrier	86 dB	
	100 kHz Offset from Carrier	110 dB	
Single – Sideband Phase Noise Standard Band 2 (7 GHz to 13.5 GHz) <sup>FO</sup>	30 Hz Offset from Carrier	58 dB	
	100 Hz Offset from Carrier	64 dB	
	1 kHz Offset from Carrier	72 dB	
	10 kHz Offset from Carrier	80 dB	
	100 kHz Offset from Carrier	110 dB	
Single – Sideband Phase Noise Standard Band 3 (13.5 GHz to 20 GHz) <sup>FO</sup>	30 Hz Offset from Carrier	54 dB	
	100 Hz Offset from Carrier	60 dB	
	1 kHz Offset from Carrier	68 dB	
	10 kHz Offset from Carrier	76 dB	
	100 kHz Offset from Carrier	97 dB	



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Single –Sideband Phase Noise Standard Band 4 (20 GHz to 26.5 GHz) <sup>FO</sup>	30 Hz Offset from Carrier	55 dB	HP 8340B T.O. kkk1-4-60-1 Power Meter
	100 Hz Offset from Carrier	58 dB	
	1 kHz Offset from Carrier	66 dB	
	10 kHz Offset from Carrier	74 dB	
	100 kHz Offset from Carrier	95 dB	
Equipment to Measure DC Voltage <sup>FO</sup>	5 $\mu$ V to 30 mV	20 $\mu$ V/V + 1 $\mu$ V	Fluke 5520A/SC600 Euramet-cg-15
	115 $\mu$ V to 3.3 V	11 $\mu$ V/V + 2 $\mu$ V	
	3.3 V to 33 V	12 $\mu$ V/V + 20 $\mu$ V	
	33 V to 330 V	18 $\mu$ V/V + 150 $\mu$ V	
	330 V to 1 000 V	18 $\mu$ V/V + 1 500 $\mu$ V	
Equipment to Output DC Voltage <sup>FO</sup>	3 $\mu$ V to 200 mV	4.5 $\mu$ V/V + 0.1 $\mu$ V	Fluke 8508A Euramet-cg-15
	200 mV to 2 V	3 $\mu$ V/V + 0.4 $\mu$ V	
	2 V to 20 V	3 $\mu$ V/V + 4 $\mu$ V	
	20 V to 200 V	4.5 $\mu$ V/V + 40 $\mu$ V	
	200 V to 1 000 V	4.5 $\mu$ V/V + 0.5 mV	
Equipment to Output DC Current <sup>FO</sup>	1.3 $\mu$ A to 200 $\mu$ A	12 $\mu$ A/A + 0.000 4 $\mu$ A	Fluke 5520A/SC600 Euramet-cg-15
	12 $\mu$ A to 2 mA	12 $\mu$ A/A + 0.004 $\mu$ A	
	2 mA to 20 mA	13 $\mu$ A/A + 0.04 $\mu$ A	
	20 mA to 200 mA	36 $\mu$ A/A + 0.8 $\mu$ A	
	200 A to 2 A	170 $\mu$ A/A + 16 $\mu$ A	
	2 A to 20 A	380 A/A + 0.4 mA	
Equipment to Measure DC Current <sup>FO</sup>	0.2 $\mu$ A to 330 $\mu$ A	150 $\mu$ A/A + 0.02 $\mu$ A	Fluke 5520A/SC600 Euramet-cg-15
	0.33 mA to 3.3 mA	100 $\mu$ A/A + 0.05 $\mu$ A	
	3.3 mA to 33 mA	100 $\mu$ A/A + 0.25 $\mu$ A	
	33 mA to 330 mA	100 $\mu$ A/A + 2.5 $\mu$ A	
	0.33 A to 1.1 A	200 $\mu$ A/A + 40 $\mu$ A	
	1.1 A to 3 A	380 $\mu$ A/A + 40 $\mu$ A	
	3 A to 11 A	500 $\mu$ A/A + 500 $\mu$ A	
	11 A to 20.5 A	1 000 $\mu$ A/A + 750 $\mu$ A	
	11 A to 1 000 A	1.2 mA/A	Fluke 5520A/SC600 Fluke 5500A/Coil Euramet-cg-15



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Equipment to Measure AC Current At the listed frequencies 65 Hz to 440 Hz <sup>F0</sup>	11 A to 1 000 A (W/Coil)	0.25 % of reading	Fluke 5520A/SC600 Fluke 5500A/Coil Euramet-cg-15
Equipment to Measure Resistance <sup>F0</sup>	1 $\Omega$ to 11 $\Omega$	40 $\mu\Omega/\Omega$ + 6 m $\Omega$	Fluke 5520A/SC600 Euramet-cg-15
	11 $\Omega$ to 33 $\Omega$	30 $\mu\Omega/\Omega$ + 6.5 m $\Omega$	
	33 $\Omega$ to 110 $\Omega$	28 $\mu\Omega/\Omega$ + 6.4 m $\Omega$	
	110 $\Omega$ to 330 $\Omega$	28 $\mu\Omega/\Omega$ + 7 m $\Omega$	
	330 $\Omega$ to 1.1 k $\Omega$	28 $\mu\Omega/\Omega$ + 7 m $\Omega$	
	1.1 k $\Omega$ to 3.3 k $\Omega$	28 $\mu\Omega/\Omega$ + 25 m $\Omega$	
	3.3 k $\Omega$ to 11 k $\Omega$	28 $\mu\Omega/\Omega$ 25 m $\Omega$	
	11 k $\Omega$ to 33 k $\Omega$	28 $\mu\Omega/\Omega$ + 205 m $\Omega$	
	33 k $\Omega$ to 110 k $\Omega$	28 $\mu\Omega/\Omega$ + 205 m $\Omega$	
	110 k $\Omega$ to 330 k $\Omega$	32 $\mu\Omega/\Omega$ + 2 $\Omega$	
	0.33 M $\Omega$ to 1.1 M $\Omega$	32 $\mu\Omega/\Omega$ + 2 $\Omega$	
	1.1 M $\Omega$ to 3.3 M $\Omega$	60 $\mu\Omega/\Omega$ + 30 $\Omega$	
	3.3 M $\Omega$ to 11 M $\Omega$	130 $\mu\Omega/\Omega$ + 50 $\Omega$	
	11 M $\Omega$ to 33 M $\Omega$	250 $\mu\Omega/\Omega$ + 2.5 k $\Omega$	
	33 M $\Omega$ to 110 M $\Omega$	500 $\mu\Omega/\Omega$ + 3 k $\Omega$	
	0.11 G $\Omega$ o 1.1 G $\Omega$	15 000 $\mu\Omega/\Omega$ + 500 k $\Omega$	
	1 $\Omega$ to 11 $\Omega$	40 $\mu\Omega/\Omega$ + 6 m $\Omega$	
	11 $\Omega$ to 33 $\Omega$	30 $\mu\Omega/\Omega$ + 6.5 m $\Omega$	
	33 $\Omega$ to 110 $\Omega$	28 $\mu\Omega/\Omega$ + 6.4 m $\Omega$	
	110 $\Omega$ to 330 $\Omega$	28 $\mu\Omega/\Omega$ + 7 m $\Omega$	
330 $\Omega$ to 1.1 k $\Omega$	28 $\mu\Omega/\Omega$ + 7 m $\Omega$		
1.1 k $\Omega$ to 3.3 k $\Omega$	28 $\mu\Omega/\Omega$ + 25 m $\Omega$		
3.3 k $\Omega$ to 11 k $\Omega$	28 $\mu\Omega/\Omega$ 25 m $\Omega$		
Equipment to Output Resistance <sup>F0</sup>	110 $\mu\Omega$ to 2 $\Omega$	15 $\mu\Omega/\Omega$ + 4 $\mu\Omega$	Fluke 8508A Euramet-cg-15
	2 $\Omega$ to 20 $\Omega$	9 $\mu\Omega/\Omega$ + 14 $\mu\Omega$	
	20 $\Omega$ to 200 $\Omega$	7.5 $\mu\Omega/\Omega$ + 500 $\mu\Omega$	
	200 $\Omega$ to 2 k $\Omega$	7.5 $\mu\Omega/\Omega$ + 5 000 $\mu\Omega$	
	2 k $\Omega$ to 20 k $\Omega$	7.5 $\mu\Omega/\Omega$ + 50 000 $\mu\Omega$	





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Equipment to Output Resistance <sup>FO</sup>	20 k $\Omega$ to 200 k $\Omega$	7.5 $\mu\Omega/\Omega$ + 500 000 $\mu\Omega$	Fluke 8508A Euramet-cg-15	
	200 k $\Omega$ to 2 M $\Omega$	8.5 $\mu\Omega/\Omega$ + 1 $\Omega$		
	2 M $\Omega$ to 20 M $\Omega$	15 $\mu\Omega/\Omega$ + 100 $\Omega$		
	20 M $\Omega$ to 200 M $\Omega$	60 $\mu\Omega/\Omega$ + 10 k $\Omega$		
	200 M $\Omega$ to 2 G $\Omega$	525 $\mu\Omega/\Omega$ + 1 M $\Omega$		
	110 $\mu\Omega$ to 2 $\Omega$	15 $\mu\Omega/\Omega$ + 4 $\mu\Omega$		
Equipment to Measure Capacitance (Calibration of Capacitance Meter) <sup>FO</sup>	0.19 nF to 1.099 9 nF (10 Hz to 10 KHz)	5 000 $\mu\text{f}/\text{f}$ + 0.01 nF	Fluke 5520A/SC600 Euramet-cg-15	
	1.1 nF to 3.299 9 nF (10 Hz to 3 KHz)	5 000 $\mu\text{f}/\text{f}$ + 0.01 nF		
	3.3 nF to 109.999 nF (10 Hz to 1 KHz)	2 500 $\mu\text{f}/\text{f}$ + 0.1 nF		
	110 nF to 329.999 nF (10 Hz to 1 KHz)	2 500 $\mu\text{f}/\text{f}$ + 0.3 nF		
Equipment to Measure AC Current At the listed Frequency 45 Hz to 1 kHz <sup>FO</sup>	0.3 $\mu\text{A}$ to 0.33 mA	1 250 $\mu\text{A}/\text{A}$ + 0.1 $\mu\text{A}$		
	0.33 mA to 3.3 mA	1 000 $\mu\text{A}/\text{A}$ + 0.15 $\mu\text{A}$		
	3.3 mA to 33 mA	400 $\mu\text{A}/\text{A}$ + 2 $\mu\text{A}$		
	33 mA to 330 mA	400 $\mu\text{A}/\text{A}$ + 20 $\mu\text{A}$		
	330 mA to 1.1 A	500 $\mu\text{A}/\text{A}$ + 100 $\mu\text{A}$		
	1.1 A to 3 A	600 $\mu\text{A}/\text{A}$ + 100 $\mu\text{A}$		
	3 A to 11 A	1 000 $\mu\text{A}/\text{A}$ + 2 000 $\mu\text{A}$		
	11 A to 20.5 A	1 500 $\mu\text{A}/\text{A}$ + 5 000 $\mu\text{A}$		
Verification of Capacitance – Fixed Values <sup>FO</sup>	1 pF	3.6 pF	HP16380A Standard Air Capacitor Set to Measure Capacitance through Direct Method CENAM Technical Guide	
	10 pF	10 pF		
	100 pF	100 pF		
	1 000 pF	2.9 pF		
Equipment Output AC Current At the listed frequencies <sup>FO</sup>			Fluke 8508A Euramet-cg-15	
	1 Hz to 10 Hz	0.35 $\mu\text{A}$ to 200 $\mu\text{A}$		475 $\mu\text{A}/\text{A}$ + 0.02 $\mu\text{A}$
	10 Hz to 10 kHz	0.35 $\mu\text{A}$ to 200 $\mu\text{A}$		475 $\mu\text{A}/\text{A}$ + 0.02 $\mu\text{A}$
	10 kHz to 30 kHz	0.45 $\mu\text{A}$ to 200 $\mu\text{A}$		650 $\mu\text{A}/\text{A}$ + 0.02 $\mu\text{A}$
	30 kHz to 100 kHz	2.5 $\mu\text{A}$ to 200 $\mu\text{A}$		4 000 $\mu\text{A}/\text{A}$ + 0.02 $\mu\text{A}$



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Equipment to Output AC Current At the listed frequencies <sup>FO</sup>			Fluke 8508A Euramet-cg-15
1 Hz to 10 Hz	200 µA to 2 mA	290 µA/A + 0.2 µA	
10 Hz to 10 kHz	200 µA to 2 mA	280 µA/A + 0.2 µA	
10 kHz to 30 kHz	200 µA to 2 mA	650 µA/A + 0.2 µA	
30 kHz to 100 kHz	200 µA to 2 mA	4 000 µA/A + 0.2 µA	
Equipment to Output AC Current At the Listed frequencies <sup>FO</sup>			
1 Hz to 10 Hz	2 mA to 20 mA	290 µA/A + 2 µA	
10 Hz to 10 kHz	2 mA to 20 mA	280 µA/A + 2 µA	
10 kHz to 30 kHz	2 mA to 20 mA	650 µA/A + 2 µA	
30 kHz to 100 kHz	2 mA to 20 mA	4 000 µA/A + 2 µA	
Equipment to Output AC Current At the listed frequencies <sup>FO</sup>			
1 Hz 10 Hz	20 mA to 200 mA	290 µA/A + 20 µA	
10 Hz to 10 kHz	20 mA to 200 mA	250 µA/A + 20 µA	
10 kHz to 30 kHz	20 mA to 200 mA	600 µA/A + 20 µA	
Equipment to Output AC Current At the listed frequencies <sup>FO</sup>			
10 Hz to 2 kHz	200 mA to 2 A	600 µA/A + 0.2 mA	
2kHz to 10 kHz	200 mA to 2 A	710 µA/A + 0.2 mA	
10 kHz to 30 kHz	200 mA to 2 A	3 000 µA/A + 0.2 mA	
Equipment to Output AC Current At the listed frequencies <sup>FO</sup>			
10 Hz to 2 kHz	2 A to 20 A	800 µA/A + 2 mA	
2 kHz to 10 kHz	2 A to 20 A	2 500 µA/A + 2 mA	
Equipment to Measure High Voltage <sup>FO</sup>			Fluke 80 K-06 Euramet-cg-15
	1 kV to 10 kV DC	3 mV/V + 5 V DC	Fluke 5320A
	1 kV to 15 kV DC (50 Hz to 60 Hz)	5 mV/V + 5 V DC	Euramet-cg-15



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Oscilloscopes 50 kHz Reference <sup>FO</sup>	5 mVpp to 5.5 Vpp	20 000 $\mu$ V/V + 300 $\mu$ V	Fluke 5520A/SC600 Euramet-cg-7
Equipment to Measure AC Current for Oscilloscopes (5 mV to 5 V) Relative to 50 kHz Reference <sup>FO</sup>	50 kHz to 100 MHz	35 000 $\mu$ V/V + 100 $\mu$ V	
	100 MHz to 300 MHz	40 000 $\mu$ V/V + 100 $\mu$ V	
	300 MHz to 600 MHz	60 000 $\mu$ V/V + 100 $\mu$ V	
Square Wave DC Signal for Oscilloscopes 1 MF to 100 Hz 50 $\Omega$ to 1 kHz <sup>FO</sup>	50 kHz to 100 MHz	35 000 $\mu$ V/V + 100 $\mu$ V	
	100 MHz to 300 MHz	40 000 $\mu$ V/V + 100 $\mu$ V	
Square Wave Signal <sup>FO</sup> 1 M $\Omega$ to 100 Hz 50 $\Omega$ to 1 kHz	50 mVpp to 6.6 Vpp	2 500 $\mu$ V/V + 40 $\mu$ V	
	130 mVpp to 130 Vpp	1 000 $\mu$ V/V + 40 $\mu$ V	
Time Marker Measure Into 50 $\Omega$ <sup>FO</sup>	5 s to 50 ms	5 ms/s	
	20 ms to 100 ns	2.5 $\mu$ s/s	
	50 ns to 20 ns	2.5 $\mu$ s/s	
	10 ns	25 ps	
	5 ns to 2 ns	2.5 $\mu$ s/s	
Equipment to Measure AC Voltage At the listed frequencies <sup>FO</sup>			
10 Hz to 45 Hz	1 mV to 33 mV	800 $\mu$ V/V + 6 $\mu$ V	
45 Hz to 10 kHz	1 mV to 33 mV	150 $\mu$ V/V + 6 $\mu$ V	
10 kHz to 20 kHz	1 mV to 33 mV	200 $\mu$ V/V + 6 $\mu$ V	
20 kHz to 50 kHz	1 mV to 33 mV	1 000 $\mu$ V/V + 6 $\mu$ V	
50 kHz to 100 kHz	1 mV to 33 mV	3 500 $\mu$ V/V + 12 $\mu$ V	
100 kHz to 500 kHz	1 mV to 33 mV	8 000 $\mu$ V/V + 50 $\mu$ V	
Equipment to Measure AC Voltage at the listed frequencies <sup>FO</sup>			
10 Hz to 45 Hz	33 mV to 330 mV	300 $\mu$ V/V + 8 $\mu$ V	
45 Hz to 10 kHz	33 mV to 330 mV	145 $\mu$ V/V + 8 $\mu$ V	
10 kHz to 20 kHz	33 mV to 330 mV	160 $\mu$ V/V + 8 $\mu$ V	
20 kHz to 50 kHz	33 mV to 330 mV	350 $\mu$ V/V + 8 $\mu$ V	
50 kHz to 100 kHz	33 mV to 330 mV	800 $\mu$ V/V + 32 $\mu$ V	
100 kHz to 500 kHz	33 mV to 330 mV	2 000 $\mu$ V/V + 70 $\mu$ V	



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Equipment to Measure AC Voltage At the listed frequencies <sup>FO</sup>			Fluke 5520A/SC600 Euramet-cg-15
10 Hz to 45 Hz	0.33 V to 3.3 V	300 $\mu$ V/V + 50 $\mu$ V	
45 Hz to 10 kHz	0.33 V to 3.3 V	150 $\mu$ V/V + 60 $\mu$ V	
10 kHz to 20 kHz	0.33 V to 3.3 V	190 $\mu$ V/V + 60 $\mu$ V	
Equipment to Measure AC Voltage At the listed frequencies <sup>FO</sup>			
20 kHz to 50 kHz	0.33 V to 3.3 V	300 $\mu$ V/V + 50 $\mu$ V	
50 kHz to 100 kHz	0.33 V to 3.3 V	700 $\mu$ V/V + 125 $\mu$ V	
100 kHz to 500 kHz	0.33 V to 3.3 V	2 400 $\mu$ V/V + 600 $\mu$ V	
Equipment to Measure AC Voltage At the listed frequencies <sup>FO</sup>			
10 Hz to 45 Hz	3.3 V to 33 V	300 $\mu$ V/V + 650 $\mu$ V	
45 Hz to 10 kHz	3.3 V to 33 V	150 $\mu$ V/V + 600 $\mu$ V	
10 kHz to 20 kHz	3.3 V to 33 V	240 $\mu$ V/V + 600 $\mu$ V	
20 kHz to 50 kHz	3.3 V to 33 V	350 $\mu$ V/V + 600 $\mu$ V	
50 kHz to 100 kHz	3.3 V to 33 V	900 $\mu$ V/V + 1 600 $\mu$ V	
Equipment to Measure AC Voltage At the listed frequencies <sup>FO</sup>			
45 Hz to 1 kHz	33 V to 330 V	190 $\mu$ V/V + 2 000 $\mu$ V	
1 kHz to 10 kHz	33 V to 330 V	200 $\mu$ V/V + 6 000 $\mu$ V	
10 kHz to 20 kHz	33 V to 330 V	250 $\mu$ V/V + 6 000 $\mu$ V	
20 kHz to 50 kHz	33 V to 330 V	300 $\mu$ V/V + 6 000 $\mu$ V	
50 kHz to 100 kHz	33 V to 330 V	2 000 $\mu$ V/V + 50 000 $\mu$ V	
Equipment to Measure AC Voltage At the listed frequencies <sup>FO</sup>			
45 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	



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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 (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Equipment to Output AC Voltage At the listed frequencies <sup>FO</sup>			Fluke 8508A Euramet-cg-15
1 Hz to 10 Hz	140 µV to 200 mV	160 µV/V + 14 µV	
10 Hz to 40 Hz	120 µV to 200 mV	130 µV/V + 4 µV	
40 Hz to 100 Hz	80 µV to 200 mV	110 µV/V + 4 µV	
100 Hz to 2 kHz	70 µV to 200 mV	105 µV/V + 2 µV	
2 kHz to 10 kHz	75 µV to 200 mV	105 µV/V + 4 µV	
10 kHz to 30 kHz	210 µV to 200 mV	305 µV/V + 8 µV	
30 kHz to 100 kHz	500 µV to 200 mV	705 µV/V + 20 µV	
Equipment to Output AC Voltage At the listed frequencies <sup>FO</sup>			
1 Hz to 10 Hz	200 mV to 2 V	140 µV/V + 1 200 µV	
10 Hz to 40 Hz	200 mV to 2 V	105 µV/V + 20 µV	
40 Hz to 100 Hz	200 mV to 2 V	85 µV/V + 20 µV	
100 Hz to 2 kHz	200 mV to 2 V	65 µV/V + 20 µV	
2 kHz to 10 kHz	200 mV to 2 V	85 µV/V + 20 µV	
10 kHz to 30 kHz	200 mV to 2 V	205 µV/V + 40 µV	
30 kHz to 100 kHz	200 mV to 2 V	505 µV/V + 200 µV	
100 kHz to 300 kHz	200 mV to 2 V	3 000 µV/V + 2 mV	
300 kHz to 1 MHz	200 mV to 2 V	1 000 µV/V + 20 mV	
Equipment to Output AC Voltage At the listed frequencies <sup>FO</sup>			
1 Hz to 10 Hz	2 V to 20 V	140 µV/V + 1 200 µV	
10 Hz to 40 Hz	2 V to 20 V	105 µV/V + 200 µV	
40 Hz to 100 Hz	2 V to 20 V	85 µV/V + 200 µV	
100 Hz to 2 kHz	2 V to 20 V	65 µV/V + 200 µV	
2 kHz to 10 kHz	2 V to 20 V	85 µV/V + 200 µV	
10 kHz to 30 kHz	2 V to 20 V	205 µV/V + 400 µV	
30 kHz to 100 kHz	2 V to 20 V	505 µV/V + 2 000 µV	
100 kHz to 300 kHz	2 V to 20 V	3 000 µV/V + 20 mV	
300 kHz to 1MHz	2 V to 20 V	1 000 µV/V + 200 mV	



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Equipment to Output AC Voltage At the listed frequencies <sup>FO</sup>			Fluke 8508A Euramet-cg-15
1 Hz to 10 Hz	20 V to 200 V	140 $\mu$ V/V + 12 mV	
10 Hz to 40 Hz	20 V to 200 V	105 $\mu$ V/V + 2 mV	
40 Hz to 100 Hz	20 V to 200 V	85 $\mu$ V/V + 2 mV	
100 Hz to 2 kHz	20 V to 200 V	65 $\mu$ V/V + 2 mV	
2 kHz to 10 kHz	20 V to 200 V	85 $\mu$ V/V + 2 mV	
10 kHz to 30 kHz	20 V to 200 V	205 $\mu$ V/V + 4 mV	
30 kHz to 100 kHz	20 V to 200 V	505 $\mu$ V/V + 20 mV	
100 kHz to 300 kHz	20 V to 200 V	3 000 $\mu$ V/V + 200 mV	
300 kHz to 1MHz	20 V to 200 V	1 000 $\mu$ V/V + 2 V	
Equipment to Output AC Voltage At the listed frequencies <sup>FO</sup>			
1 Hz to 10 Hz	200 V to 1 000 V	140 $\mu$ V/V + 70 mV	
10 Hz to 40 Hz	200 V to 1 000 V	110 $\mu$ V/V + 20 mV	
40 Hz to 10 kHz	200 V to 1 000 V	95 $\mu$ V/V + 20 mV	
10 kHz to 30 kHz	200 V to 1 000 V	205 $\mu$ V/V + 40 mV	
30 kHz to 100 kHz	200 V to 1 000 V	510 $\mu$ V/V + 200 mV	
Equipment to Measure Low Resistance <sup>FO</sup>			Fluke 5320A Euramet-cg-15
100 m $\Omega$ to 4.99 $\Omega$		3 000 $\mu\Omega/\Omega$ + 25 m $\Omega$	
5 $\Omega$ to 29.9 $\Omega$		2 000 $\mu\Omega/\Omega$ + 25 m $\Omega$	
30 $\Omega$ to 199.9 $\Omega$		2 000 $\mu\Omega/\Omega$ + 25 m $\Omega$	
200 $\Omega$ to 499 $\Omega$		2 000 $\mu\Omega/\Omega$	
500 $\Omega$ to 1.999 k $\Omega$		2 000 $\mu\Omega/\Omega$	
2 k $\Omega$ to 4.99 k $\Omega$		2 000 $\mu\Omega/\Omega$	
5 k $\Omega$ to 10 k $\Omega$		2 000 $\mu\Omega/\Omega$	
100 k $\Omega$ to 199.99 k $\Omega$		2 000 $\mu\Omega/\Omega$	
200 k $\Omega$ to 999.9 M $\Omega$		2 000 $\mu\Omega/\Omega$	
1 M $\Omega$ to 9.999 M $\Omega$		3 000 $\mu\Omega/\Omega$	
10 M $\Omega$ to 99.99 M $\Omega$		5 000 $\mu\Omega/\Omega$	
100 M $\Omega$ to 999.9 M $\Omega$		10 000 $\mu\Omega/\Omega$	
1 G $\Omega$ to 10 G $\Omega$		30 000 $\mu\Omega/\Omega$	





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Equipment to Measure AC Voltage 40 Hz to 400 Hz Calibrator <sup>FO</sup>	3 V to 29.99 V	1 000 $\mu$ V/V + 9 mV	Fluke 5320A Euramet-cg-15
	30 V to 99.99 V	1 000 $\mu$ V/V + 30 mV	
	100 V to 299.9 V	1 000 $\mu$ V/V + 90 mV	
	300 V to 600 V	1 000 $\mu$ V/V + 180 mV	
Equipment to Measure DC Voltage Calibrator <sup>FO</sup>	3 V to 29.99 V	1 000 $\mu$ V/V + 9 mV	
	30 V to 149.9 V	1 000 $\mu$ V/V + 45 mV	
	150 V to 600 V	1 000 $\mu$ V/V + 180 mV	
Equipment to Measure AC/DC Voltage 40 Hz to 400 Hz Multimeter <sup>FO</sup>	0.1 V to 10 V	1 500 $\mu$ V/V + 5 mV	
	10 V to 100 V	2 000 $\mu$ V/V + 50 mV	
	100 V to 1 100 V	2 000 $\mu$ V/V + 550 mV	
Equipment to Measure AC/DC Current 20 Hz to 400 Hz Multimeter <sup>FO</sup>	5 mA to 300 mA	1 500 $\mu$ A/A + 0.15 mA	
	300 mA to 3A	1 500 $\mu$ A/A + 1.5 mA	
	3A to 30 A	1 500 $\mu$ A/A + 15 mA	
Temperature Calibration, Indication and Control Equipment Used with Thermocouple Type B <sup>FO</sup>	600 °C to 800 °C	0.44 °C	Electrical Simulation of Thermocouple Output Fluke 5520A/SC600 Euramet-cg-11
	800 °C to 1 000 °C	0.34 °C	
	1 000 °C to 1 050 °C	0.3 °C	
	1 050 °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	0.23 °C	
	150 °C to 650 °C	0.19 °C	
	650 °C to 1 000 °C	0.23 °C	
	1 000 °C to 1 800 °C	0.38 °C	
	1 800 °C to 2 316 °C	0.63 °C	
Temperature Calibration, Indication and Control Equipment Used with Thermocouple Type E <sup>FO</sup>	-196 °C to 100 °C	0.38 °C	
	-100 °C to -25 °C	0.12 °C	
	-25 °C to 350 °C	0.1 °C	
	350 °C to 650 °C	0.12 °C	
	650 °C to 1 000 °C	0.16 °C	
	-100 °C to -30 °C	0.12 °C	
	-30 °C to 150 °C	0.1 °C	
	150 °C to 760 °C	0.13 °C	
	760 °C to 1 200 °C	0.18 °C	
	-100 °C to -25 °C	0.14 °C	
-25 °C to 120 °C	0.12 °C		



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Temperature Calibration, Indication and Control Equipment Used with Thermocouple Type E <sup>FO</sup>	120 °C to 1 000 °C	0.19 °C	Electrical Simulation of Thermocouple Output Fluke 5520A/SC600 Euramet-cg-11
	1 000 °C to 1 372 °C	0.3 °C	
Temperature Calibration, Indication and Control Equipment Used with Thermocouple Type L <sup>FO</sup>	-196 °C to -100 °C	0.37 °C	
	-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>	-196 °C to -100 °C	0.3 °C	
	-100 °C to -25 °C	0.17 °C	
	-25 °C to 120 °C	0.15 °C	
	120 °C to 410 °C	0.14 °C	
Temperature Calibration, Indication and Control Equipment Used with Thermocouple Type R <sup>FO</sup>	410 °C to 1 300 °C	0.21 °C	
	0 °C to 250 °C	0.48 °C	
	250 °C to 400 °C	0.28 °C	
	400 °C to 1 000 °C	0.26 °C	
Temperature Calibration, Indication and Control Equipment Used with Thermocouple Type S <sup>FO</sup>	1 000 °C to 1 767 °C	0.3 °C	
	0 °C to 250 °C	0.47 °C	
	250 °C to 1 000 °C	0.3 °C	
	1 000 °C to 1 400 °C	0.28 °C	
Temperature Calibration, Indication and Control Equipment Used with Thermocouple Type T <sup>FO</sup>	1 400 °C to 1 767 °C	0.34 °C	
	-196 °C to -150 °C	0.63 °C	
	-150 °C to 0 °C	0.24 °C	
	0 °C to 120 °C	0.16 °C	
Temperature Calibration, Indication and Control Equipment Used with Thermocouple Type U <sup>FO</sup>	120 °C to 400 °C	0.14 °C	
	-196 °C to 0 °C	0.56 °C	
	0 °C to 600 °C	0.27 °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 Type Pt 3926, 100 $\Omega^{FO}$	-196 °C to -80 °C	0.05 °C	Electrical Simulation of Thermocouple Output Fluke 5520A/SC600 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 Type Pt 3916, 100 $\Omega^{FO}$	-196 °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	0.12 °C	
	300 °C to 400 °C	0.13 °C	
	400 °C to 600 °C	0.14 °C	
Temperature Calibration, Indication and Control Equipment Used with RTD Type Pt 385, 500 $\Omega^{FO}$	-196 °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	
Temperature Calibration, Indication and Control Equipment Used with RTD Type Pt 385, 1 000 $\Omega^{FO}$	-196 °C to -80 °C	0.03 °C	Electrical Simulation of RTD Output Fluke 5520A/SC600 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	
Temperature Calibration, Indication and Control Equipment Used With RTD Pt Ni 385, 120 $\Omega$ (Ni 120) <sup>FO</sup>	-80 °C to 0 °C	0.08 °C	
	0 °C to 100 °C	0.08 °C	
	100 °C to 260 °C	0.14 °C	



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Temperature Calibration, Indication and Control Equipment Used with RTD Cu 427, 10 $\Omega$ <sup>FO</sup>	-100 °C to 260 °C	0.1 °C	Electrical Simulation of RTD Output Fluke 5520A/SC600 Euramet-cg-11
Equipment to Output DC Voltage <sup>FO</sup>	Up to 330 mV	16 $\mu$ V/V + 780 $\mu$ V	Fluke 5522A Multiproduct Calibrator Euramet-cg-15
	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 $\mu\Omega/\Omega$ + 390 k $\Omega$		



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Equipment to Output AC Voltage At the listed frequencies <sup>FO</sup>			Fluke 5522A Multiproduct Calibrator Euramet-cg-15
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	2.7 % of reading + 9.3 $\mu$ V	
100 kHz to 500 kHz	1 mV to 33 mV	0.62 % of 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>			Fluke 5522A Multiproduct Calibrator Euramet-cg-15
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 kHz	330 V to 1 020 V	0.019 % of reading + 7.8 mV	
5 kHz to kHz	330 V to 1 020 V	0.023 % of reading + 7.8 mV	
Equipment to Output AC Voltage 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 Voltage 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	





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Ramón Rayón # 1520, Int-9 Pino Seco/Lote Bravo  
 Ciudad Juárez, Chihuahua, México. C.P. 32550  
 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 Voltage At the listed frequencies <sup>FO</sup>			Fluke 5522A Multiproduct Calibrator Euramet-cg-15
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 Voltage 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 Voltage 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 Voltage 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

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Equipment to Output AC Voltage At the listed frequencies <sup>F0</sup>			Fluke 5522A Multiproduct Calibrator Euramet-cg-15
45 Hz to 100 Hz	3 A to 11 A	0.047 % of reading + 1.5 mA	
100 Hz to 1 kHz	3 A to 11 A	0.078 % of reading + 1.5 mA	
1 kHz to 5 kHz	3 A to 11 A	2.3 % of reading + 1.5 mA	
Equipment to Output AC Voltage At the listed frequencies <sup>F0</sup>			
45 Hz to 100 Hz	11 A to 20.5 A	0.09 % of reading + 3.9 mA	
100 Hz to 1 kHz	11 A to 20.5 A	0.12 % of reading + 3.9 mA	
1 kHz to 5 kHz	11 A to 20.5 A	2.3 % of reading + 3.9 mA	
Equipment to Output Capacitance <sup>F0</sup>	220 pF to 399.9 pF	0.39 % of reading + 7.8 pF	
	0.4 nF to 1.1 nF	0.39 % of reading + 7.8 pF	
	1.1 nF to 3.3 nF	0.39 % of reading + 7.8 pF	
	3.3 nF to 11 nF	0.19 % of reading + 7.8 pF	
	11 nF to 33nF	0.19 % of reading + 78 pF	
	33 nF to 110 nF	0.19 % of reading + 78 pF	
	110 nF to 330 nF	0.19 % of reading + 0.23 nF	
	0.33 $\mu$ F to 1.1 $\mu$ F	0.19 % of reading + 0.78 nF	
	1.1 $\mu$ F to 3.3 $\mu$ F	0.19 % of reading + 2.3 nF	
	3.3 $\mu$ F to 11 $\mu$ F	0.19 % of reading + 7.8 nF	
	11 $\mu$ F to 33 $\mu$ F	0.31 % of reading + 23 nF	
	33 $\mu$ F to 110 $\mu$ F	0.35 % of reading + 78 nF	
	110 $\mu$ F to 330 $\mu$ F	0.35 % of reading + 230 nF	
	0.33 mF to 1.1 mF	0.35 % of reading + 0.78 $\mu$ F	
	1.1 mF to 3.3 mF	0.35 % of reading + 2.3 $\mu$ F	
	3.3 mF to 11 mF	0.35 % of reading + 7.8 $\mu$ F	
	11 mF to 33mF	0.35 % of reading + 23 $\mu$ F	
	33 mF to 110 mF	0.85 % of reading + 78 $\mu$ F	
Temperature Calibration Indication, and Control Equipment used with Thermocouple Type J <sup>F0</sup>	-210 °C to -100 °C	0.27 °C	Electrical Simulation of Thermocouple Output Fluke 5522A Multiproduct Calibrator Euramet-cg-15
	-100 °C to -30 °C	0.16 °C	
	-30 °C to 150 °C	0.14 °C	



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### Electrical

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Temperature Calibration Indication, and Control Equipment used with Thermocouple Type J <sup>FO</sup>	150 °C to 760 °C	0.17 °C	Electrical Simulation of Thermocouple Output Fluke 5522A Multiproduct Calibrator Euramet-cg-15
	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	
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	
Electrical Simulation Frequency <sup>FO</sup>	0.01 Hz to 2 MHz	1.9 $\mu$ Hz/Hz + 3.9 $\mu$ Hz	Fluke 5522A Euramet-cg-11

### Chemical

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pH Meter Fixed Point <sup>F</sup>	4 pH	0.009 pH	CRMs-pH Buffer Solution CEM QU-003
	7 pH	0.009 pH	
	10 pH	0.009 pH	
Conductivity Meters Fixed Point <sup>FO</sup>	10 $\mu$ S	0.5 $\mu$ S	CRMs- Conductivity Standard Solutions to Measure Electrolytic Conductivity CENAM- Technical Guide
	100 $\mu$ S	2.2 $\mu$ S	
	1000 $\mu$ S	3.7 $\mu$ S	
	10 000 $\mu$ S	36 $\mu$ S	
	100 000 $\mu$ S	430 $\mu$ S	
Dynamic Viscometers Rotational <sup>F</sup>	9 cP	0.027 cP	Reference Standard Silicone Oils ASTM D445
	96 cP	0.35 cP	
	969 cP	3.5 cP	
	11 860 cP	61 cP	
	59 940 cP	290 cP	



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### Chemical

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Kinematic Viscosity Zahn, Ford, Dip and ISO Cups <sup>F</sup>	17 mm <sup>2</sup> /sec	0.49 mm <sup>2</sup> /sec	Viscosity Standards ASTM D4212, ASTM 1200, ASTM D4212 and ISO 2431
	34 mm <sup>2</sup> /sec	0.51 mm <sup>2</sup> /sec	
	120 mm <sup>2</sup> /sec	0.55 mm <sup>2</sup> /sec	
	230 mm <sup>2</sup> /sec	0.59 mm <sup>2</sup> /sec	
	710 mm <sup>2</sup> /sec	0.6 mm <sup>2</sup> /sec	

### 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
Frequency – Measuring Equipment <sup>FO</sup>	1 rpm to 999.9 rpm	0.06 rpm	Agilent 53132A CENAM Technical Guide
	1 000 rpm to 100 000 rpm	0.006 % of reading	
	0.1 Hz to 225 MHz	6.8 MHz	Agilent 53132A OPC 030, 012 CENAM Technical Guide
	100 MHz to 3 GHz	110 MHz	
Digital Stopwatch Timer and Time Base Error <sup>O</sup>	Up to 24 s/day	0.95 s/day	Agilent 53132A (Option 12) and Fluke 199C, Scope Meter NIST Recommended Practice Guide Special Publication 960-12
Time Measurement – Time Counters <sup>FO</sup>	5 ms to 3 600 s	1.2 ms	
Microwave Frequency Counter <sup>FO</sup>	10 Hz to 500 MHz	1 Hz	HP5343A T.O. 33K1-4-60-1 General Microwave
	500 MHz to 26.5 GHz	1 Hz	
CW Model Frequency <sup>FO</sup>	0.01 GHz to 26.5 GHz	10 kHz	HP8340B HP8902A W/11722 T.O. 33K1-4-60-1 General Microwave
Spectrum Analyzer Sweep Time <sup>FO</sup>	10 ms to 50 s	0.39 % of reading	HP 8593A T.O. 33K1-4-60-1 General Microwave
Spectrum Analyzer Frequency Modulation 20 Hz to 100 kHz 400 kHz Peak <sup>FO</sup>	10 MHz to 1 300 MHz	2.1 % of reading	HP8340B HP8902A W/11722 T.O. 33K1-4-60-1 General Microwave
Spectrum Analyzer Pulse Modulation <sup>FO</sup>	0.01 MHz to 400 MHz	25 ns	Rise/Fall Time
	Band 0		HP 8340B
	0.01 MHz to 26.5 MHz	1.4 MHz	T.O. 33K1-4-60-1
	Band 1 to 4		General Microwave
	0.01 MHz to 26.5 MHz	0.053 MHz	



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

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 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 D represents diameter 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.
9. The term L represents length in inches or millimeters as appropriate to the uncertainty statement.
10. This is the primary site for all quality management system activities.