



CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

Micro Precision Calibration, Inc.

22835 Industrial Place

Grass Valley, CA 95949

(and satellite locations as shown on the scope)

Fulfills the requirements of

ISO/IEC 17025:2017

and national standards

ANSI/NCSL Z540-1-1994 (R2002) and

ANSI/NCSL Z540.3-2006 (R2013)

In the field of

CALIBRATION and DIMENSIONAL MEASUREMENT

This certificate is valid only when accompanied by a current scope of accreditation document.

The current scope of accreditation can be verified at www.anab.org.

Jason Stine, Vice President

Expiry Date: 31 October 2026

Certificate Number: AC-1969



This laboratory 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 (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

AND

ANSI/NCSL Z540-1-1994 (R2002)

ANSI/NCSL Z540.3-2006 (R2013)

Micro Precision Calibration, Inc.

22835 Industrial Place

Grass Valley, CA 95949

CALIBRATION AND DIMENSIONAL MEASUREMENT

ISO/IEC 17025 Accreditation Granted: **31 October 2024**

Certificate Number: **AC-1969** Certificate Expiry Date: **31 October 2026**

Services identified on tables as “Global Scope” are performed at all locations.

Services identified on tables with specified locations are performed at those locations using the methods and to the uncertainties as specified

Customers submitting items to Micro Precision for calibration will be directed to the appropriate delivery site based on capability, geography and capacity.

Calibrations are performed at the most appropriate center based on the customer's needs and location, and the resulting uncertainties may be higher depending on the equipment's performance.

The lowest uncertainties are achieved at the Grass Valley location.

Satellite locations in:

Micro Precision Calibration, Inc.
670 International Parkway
Richardson, TX 75081 USA

Micro Precision Calibration, Inc.
2165 N. Glassell
Orange (Los Angeles), CA 92865 USA

Micro Precision Calibration, Inc.
9831 S 51st Street, Suite C-108
Phoenix, AZ 85044 USA

Micro Precision Calibration, Inc.
3570 Commerce Drive
Columbus, IN 47201 USA

Micro Precision Calibration, Inc.
7877 SW Cirrus Drive, Building 25
Beaverton (Portland), OR 97008 USA

Micro Precision Calibration, Inc.
2590 Oakmont Dr., Unit 30
Round Rock, TX 78665 USA (Austin)

Micro Precision Calibration, Inc.
16 Columbia Drive
[Amherst, NH 03031 USA](#)

Micro Precision Calibration, Inc.
17072 Tye St. SE, Suite #170
[Monroe, WA 98272 USA \(Seattle\)](#)

Micro Precision Calibration de Mexico S. de R.L. de CV
Calle Paraíso #1596 Colonia Del Fresno
[Guadalajara, Jalisco 44900 Mexico](#)

Micro Precision Calibration de Mexico S. de R.L. de CV
Av. Nacional No. 3. Col Ejidos de San Cristobal
[Ecatepec de Morelos, Estado de Mexico C.P. 55024 Mexico \(Mexico City\)](#)

Micro Precision Instrument Calibration Sdn. Bhd.
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[Johor Bahru, Malaysia 81300](#)

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[Wuxi, Jiangsu PR China](#)

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[Nonthaburi 11120, Thailand](#)

Micro Precision Calibration Vietnam Ltd. Co.
No 201, 2nd Floor, Sacom Chipsang Building, Saigon High Tech Park
Thu Duc City, [Ho Chi Minh City, Vietnam](#)

Micro Precision Calibration Cebu, Inc.
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[Lapu-Lapu City, Philippines 6015](#)

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[Thonotosassa, FL 33592 USA](#)

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[Doha, Qatar](#)

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[Seoul, South Korea 150-772](#)

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TechPlace II [Singapore 569874](#)

Micro Precision Calibration Sdn. Bhd.
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Seberang Jaya 13600, [Penang, Malaysia](#)

Micro Precision Calibration Shezhen Inc.
3D-1505 Tian'an Cloud Park, 2018 Xuegang Road
Longgang District
[Shenzhen, Guanngdong 518129 PR China](#)

Micro Precision Calibration (India) Private Limited
No 57 Avadi Road, Sippoy Lane, Karayanchavadi
Poonamalle, [Chennai 600 056, India](#)

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Block 2 Lot 6 Calamba Premiere International Park
Brgy Batino, [Calamba City, Laguna Philippines 4027](#)

Micro Precision Calibration Taiwan Co. Ltd.
3F, No. 21, Shuili Road
[Hsinchu City 300053, Taiwan ROC](#)

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Micro Precision Calibration de Mexico S. de R.L. de CV
Carretera a San Luis Rio Colorado KM 10.5 Locales 13y 14
Parque Industrial las California
[Mexicali, BC C.P. 21394 Mexico](#)

Micro Precision Calibration, Inc.
12701 Tejon Street, Suite 100
[Westminster, CO USA \(Denver\)](#)

Micro Precision Brazil LTDA
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[Manaus, AM 69065-020 Brazil](#)

Micro Precision Calibration de Mexico S. de R.L. de C.V.
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[Silao](#), Guanajuato, Mexico, C.P.36100

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[Giroc](#) 307220, Timis County, Romania

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Micro Precision Calibration, Inc.
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[Lenexa](#), KS 66215

Miro Precision Calibration Pty Ltd
Unit 13/63 Ricky Way
[Epping](#), Victoria 3076 Australia

Services performed at Main Site laboratory and Satellite Locations

Acoustics and Vibration

Global Scope

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Sound Level Calibrator ¹	(74 to 114) dB 125 Hz to 1 kHz (1 to 4) kHz	0.2 dB 0.25 dB	Comparison to Standard Sound Level Calibrator and Sound Level Meter
Sound Level Meter ^{1,2}	(74 to 114) dB 125 Hz to 4 kHz	0.22 dB	Comparison to Standard Sound Level Calibrator

Chemical Quantities

Global Scope

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
pH Meters ^{1,4}	(4, 7, 10) pH units	0.012 pH	Comparison to Standard pH Solutions

Chemical Quantities

Global Scope

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Conductivity Meters ^{1,4}	1 μ S/cm 5 μ S/cm 10 μ S/cm 84 μ S/cm 100 μ S/cm 1 000 μ S/cm 1 413 μ S/cm 10 000 μ S/cm 12 880 μ S/cm 100 000 μ S/cm	0.62 μ S/cm 0.62 μ S/cm 0.62 μ S/cm 0.8 μ S/cm 2.1 μ S/cm 5.2 μ S/cm 5.6 μ S/cm 47 μ S/cm 81 μ S/cm 440 μ S/cm	Comparison to Standard Conductivity Solutions

Electrical – DC/Low Frequency

Global Scope

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage – Source ¹	(0 to 220) mV 220 mV to 2.2 V (2.2 to 11) V (11 to 22) V (22 to 220) V 220 V to 1.1 kV	5.1 μ V/V + 0.5 μ V 3.6 μ V/V + 0.8 μ V 2.5 μ V/V + 3.1 μ V 2.5 μ V/V + 4.7 μ V 3.6 μ V/V + 50 μ V 4.9 μ V/V + 0.46 mV	Comparison to Multifunction Calibrator
DC Voltage – Source ¹	(0 to 330) mV 330 mV to 3.3 V (3.3 to 33) V (33 to 330) V (330 to 1 020) V	17 μ V/V + 1.2 μ V 10 μ V/V + 2.4 μ V 12 μ V/V + 24 μ V 18 μ V/V + 0.17 mV 18 μ V/V + 1.7 mV	Comparison to Multiproduct Calibrator
pH Meters – Electrical Simulation ¹	(-414.12 to 414.12) mV (0 to 14) pH	6 μ V/V + 0.8 μ V 0.000 68 pH	Comparison to Multifunction Calibrator
DC Voltage – Measure ¹	(0 to 100) mV 100 mV to 1 V (1 to 10) V (10 to 100) V 100 V to 1 kV	2.8 μ V/V + 0.37 μ V 1.7 μ V/V + 0.37 μ V 0.6 μ V/V + 0.65 μ V 2.9 μ V/V + 37 μ V 5.2 μ V/V + 120 μ V	Comparison to Multimeter
DC High Voltage – Measure ¹	Up to 10 kV	0.37 mV/V + 0.01 V	Comparison to High Voltage Meter

Electrical – DC/Low Frequency

Global Scope

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Current – Source ¹	(0 to 220) μ A (0.22 to 2.2) mA (2.2 to 22) mA (22 to 220) mA 220 mA to 2.2 A (2.2 to 11) A	37 μ A/A + 6.9 nA 30 μ A/A + 8.6 nA 29 μ A/A + 63 nA 41 μ A/A + 0.91 μ A 60 μ A/A + 14 μ A 0.38 mA/A + 540 μ A	Comparison to Multifunction Calibrator, Amplifier
DC Current – Source ¹	(0 to 330) μ A (0.33 to 3.3) mA (3.3 to 33) mA (33 to 330) mA (330 to 1.1) A (1.1 to 3) A (3 to 11) A (11 to 20.5) A	0.14 mA/A + 24 nA 0.094 mA/A + 63 nA 0.095 mA/A + 0.46 μ A 0.1 mA/A + 3 μ A 0.17 mA/A + 64 μ A 0.32 mA/A + 0.13 mA 0.44 mA/A + 0.63 mA 0.92 mA/A + 0.87 mA	Comparison to Multiproduct Calibrator
DC Current – Source ¹	Up to 200 pA 200 pA to 20 nA 20 nA to 20 mA	96 μ A/A + 0.01 fA 34 μ A/A + 0.026 pA 32 μ A/A	Comparison to Stable Source, Standard Voltmeter and Standard Resistors
DC High Current – Source ¹	Up to 16.5 A (16.5 to 1 025) A	2.4 mA/A + 0.12 mA 2.4 mA/A	Comparison to Multiproduct Calibrator with w/50-turn Coil
DC Current – Measure ¹	Up to 100 nA (0.1 to 1) μ A (1 to 10) μ A (10 to 100) μ A (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A	10 μ A/A + 40 pA 10 μ A/A + 40 pA 10 μ A/A + 70 pA 10 μ A/A + 0.6 nA 10 μ A/A + 4 nA 10 μ A/A + 40 nA 25 μ A/A + 0.4 μ A 0.1 mA/A + 10 μ A	Comparison to 8.5 Digits Multimeter
DC Current – Measure ¹	Up to 1 μ A (1 to 10) μ A (10 to 100) μ A 100 μ A to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A (1 to 3) A (3 to 10) A	0.34 mA/A + 0.069 nA 0.35 mA/A + 0.24 nA 0.35 mA/A + 1.2 nA 0.36 mA/A + 0.034 μ A 0.35 mA/A + 2.3 μ A 0.35 mA/A + 4.7 μ A 0.81 mA/A + 0.07 mA 2.4 mA/A + 0.67 mA 1.4 mA/A + 1.1 mA	Comparison to 6.5 Digits Multimeter
DC Current – Measure ¹	Up to 200 pA 200 pA to 20 nA 20 nA to 20 mA	96 μ A/A + 0.01 fA 34 μ A/A + 0.026 pA 32 μ A/A	Comparison to Standard Voltmeter and Standard Resistors

Electrical – DC/Low Frequency

Global Scope

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Power – Source ^{1, 2} (0 to 330) μ A (0.33 to 330) mA (0.33 to 1.1) A (1.1 to 3) A (3 to 11) A (11 to 20.5) A	(0 to 330) mW (0.33 to 330) W (0.33 to 3.3) kW (3.3 to 33) kW (33 to 330) kW (330 to 3 366) kW	0.022 % of reading + 0.58R 0.013 % of reading 0.024 % of reading 0.037 % of reading 0.05 % of reading 0.1 % of reading	Comparison to Multiproduct Calibrator
Inductance – Source ^{1, 2} (Fixed Artifacts) 100 Hz to 10 kHz	100 μ H 1 mH 2 mH 10 mH 20 mH 50 mH 100 mH 200 mH 1 H 2 H 5 H 10 H	0.016 μ H 0.12 μ H 0.33 μ H 2.2 μ H 7 μ H 8.2 μ H 12 μ H 33 μ H 0.2 mH 0.33 mH 0.82 mH 1.2 mH	Comparison to Standard Inductors
Inductance – Source ^{1, 2} (Variable Artifacts) 100 Hz to 10 kHz	100 μ H to 10 H	0.41 mH/H + 0.58R	Comparison to Decade Inductor
Inductance – Measure ^{1, 2} 12 Hz to 100 kHz	0.01 μ H to 10 H	0.16 mH/H	Comparison to Precision LCR Meter w/Standard Inductors
	0.01 μ H to 10 H	0.27 mH/H + 0.58R	Comparison to RLC Digibridge
Resistance – Source ¹	(1 to 10) m Ω 10 m Ω to 100 Ω (0.1 to 1) k Ω (1 to 10) k Ω (10 to 100) k Ω (0.1 to 11) M Ω (10 to 110) M Ω (0.1 to 1) G Ω (1 to 10) G Ω (10 to 100) G Ω	1.6 $\mu\Omega/\Omega$ 1.3 $\mu\Omega/\Omega$ 1.6 $\mu\Omega/\Omega$ 1.4 $\mu\Omega/\Omega$ 1.6 $\mu\Omega/\Omega$ 3.8 $\mu\Omega/\Omega$ 7.3 $\mu\Omega/\Omega$ 18 $\mu\Omega/\Omega$ 61 $\mu\Omega/\Omega$ 200 $\mu\Omega/\Omega$	Comparison to Standard Resistors

Electrical – DC/Low Frequency

Global Scope

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Resistance – Source ¹ Fixed Points	0 Ω	40 $\mu\Omega$	Comparison to Multifunction Calibrator
	1.0 Ω	80 $\mu\Omega/\Omega$	
	1.9 Ω	80 $\mu\Omega/\Omega$	
	10 Ω	21 $\mu\Omega/\Omega$	
	19 Ω	21 $\mu\Omega/\Omega$	
	100 Ω	9.1 $\mu\Omega/\Omega$	
	190 Ω	9.1 $\mu\Omega/\Omega$	
	1 k Ω	7.7 $\mu\Omega/\Omega$	
	1.9 k Ω	7.7 $\mu\Omega/\Omega$	
	10 k Ω	7.6 $\mu\Omega/\Omega$	
	19 k Ω	7.7 $\mu\Omega/\Omega$	
	100 k Ω	9.1 $\mu\Omega/\Omega$	
	190 k Ω	9.1 $\mu\Omega/\Omega$	
	1 M Ω	15 $\mu\Omega/\Omega$	
	1.9 M Ω	16 $\mu\Omega/\Omega$	
	10 M Ω	31 $\mu\Omega/\Omega$	
	19 M Ω	40 $\mu\Omega/\Omega$	
	100 M Ω	95 $\mu\Omega/\Omega$	
Resistance – Source ¹	(0 to 11) Ω	43 $\mu\Omega/\Omega + 1.2$ m Ω	Comparison to Multiproduct Calibrator
	(11 to 33) Ω	31 $\mu\Omega/\Omega + 1.7$ m Ω	
	(33 to 110) Ω	28 $\mu\Omega/\Omega + 1.6$ m Ω	
	(110 to 330) Ω	28 $\mu\Omega/\Omega + 2.3$ m Ω	
	(0.33 to 1.1) k Ω	32 $\mu\Omega/\Omega + 1.9$ m Ω	
	(1.1 to 3.3) k Ω	32 $\mu\Omega/\Omega + 19$ m Ω	
	(3.3 to 11) k Ω	29 $\mu\Omega/\Omega + 34$ m Ω	
	(11 to 33) k Ω	35 $\mu\Omega/\Omega + 0.16$ Ω	
	(33 to 110) k Ω	31 $\mu\Omega/\Omega + 0.14$ Ω	
	(110 to 330) k Ω	33 $\mu\Omega/\Omega + 2.5$ Ω	
	(0.33 to 1.1) M Ω	34 $\mu\Omega/\Omega + 2.6$ Ω	
	(1.1 to 3.3) M Ω	49 $\mu\Omega/\Omega + 35$ Ω	
	(3.3 to 11) M Ω	0.13 m $\Omega/\Omega + 58$ Ω	
	(11 to 33) M Ω	0.24 m $\Omega/\Omega + 2.8$ k Ω	
	(33 to 110) M Ω	0.50 m $\Omega/\Omega + 3.2$ k Ω	
	(110 to 330) M Ω	2.9 m $\Omega/\Omega + 0.11$ M Ω	
	(330 to 1 100) M Ω	15 m $\Omega/\Omega + 0.54$ M Ω	

Electrical – DC/Low Frequency

Global Scope

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Resistance – Measure ¹	(0 to 10) Ω (10 to 100) Ω 100 Ω to 1 k Ω (1 to 10) k Ω (10 to 100) k Ω 100 k Ω to 1 M Ω (1 to 10) M Ω (10 to 100) M Ω 100 M Ω to 1 G Ω	5 $\mu\Omega/\Omega$ + 31 $\mu\Omega$ 3 $\mu\Omega/\Omega$ + 0.3 m Ω 2 $\mu\Omega/\Omega$ + 0.21 m Ω 2 $\mu\Omega/\Omega$ + 2.1 m Ω 2 $\mu\Omega/\Omega$ + 21 m Ω 10 $\mu\Omega/\Omega$ + 1 Ω 50 $\mu\Omega/\Omega$ + 50 Ω 0.5 m Ω/Ω + 1 k Ω 5 m Ω/Ω + 10 k Ω	Comparison to Multimeter
Resistance – Measure ¹	(0.22 to 2.2) V 50 Ω to 1 k Ω (1 to 100) k Ω 100 k Ω to 1 M Ω (2.2 to 22) V 500 Ω to 10 k Ω 10 k Ω to 1 M Ω (1 to 10) M Ω (10 to 100) M Ω (22 to 220) V (5 to 100) k Ω 100 k Ω to 10 M Ω (10 to 100) M Ω 100 M Ω to 1 G Ω (1 to 10) G Ω (220 to 1000) V 100 k Ω to 100 M Ω 100 M Ω to 1 G Ω (1 to 10) G Ω (10 to 100) G Ω	89 $\mu\Omega/\Omega$ 42 $\mu\Omega/\Omega$ 96 $\mu\Omega/\Omega$ 92 $\mu\Omega/\Omega$ 43 $\mu\Omega/\Omega$ 91 $\mu\Omega/\Omega$ 0.74 m Ω/Ω 90 $\mu\Omega/\Omega$ 42 $\mu\Omega/\Omega$ 94 $\mu\Omega/\Omega$ 0.75 m Ω/Ω 6.6 m Ω/Ω 44 $\mu\Omega/\Omega$ 0.1 m Ω/Ω 0.75 m Ω/Ω 6.5 m Ω/Ω	Comparison to Multifunction Calibrator and Multimeter
AC Resistance – Source ¹ 100 Hz to 100 kHz	1 m Ω to 100 k Ω	0.34 m Ω	Comparison to Calibration RL Standard
AC Resistance – Measure ¹ 100 Hz to 100 kHz	1 m Ω to 10 Ω 10 Ω to 100 k Ω 100 k Ω to 10 M Ω	0.44 m Ω/Ω 0.28 m Ω/Ω 0.4 m Ω/Ω	Comparison to RLC Digibridge

Electrical – DC/Low Frequency

Global Scope

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Capacitance – Source ¹ 50 Hz to 1 kHz	(0.19 to 0.4) nF (0.4 to 1.1) nF (1.1 nF to 3.3) nF (3.3 to 11) nF (11 to 33) nF (33 to 110) nF (110 to 330) nF 330 nF to 1.1 µF (1.1 to 3.3) µF (3.3 to 11) µF	3.9 mF/F + 7.8 pF 3.9 mF/F + 7.8 pF 3.9 mF/F + 7.8 pF 1.9 mF/F + 7.8 pF 1.9 mF/F + 78 pF 1.9 mF/F + 78 pF 1.9 mF/F + 0.23 nF 1.9 mF/F + 0.78 nF 1.9 mF/F + 2.3 nF 1.9 mF/F + 7.8 nF	Comparison to Multiproduct Calibrator
Capacitance – Source ¹ 50 Hz to 1 kHz	(11 to 33) µF (33 to 110) µF (110 to 330) µF 330 µF to 1.1 mF (1.1 to 3.3) mF (3.3 to 11) mF (11 to 33) mF (33 to 110) mF	3.1 mF/F + 23 nF 3.5 mF/F + 78 nF 3.5 mF/F + 0.23 µF 3.5 mF/F + 0.78 µF 3.5 mF/F + 2.3 µF 3.5 mF/F + 7.8 µF 5.8 mF/F + 23 µF 8.5 mF/F + 78 µF	Comparison to Multi-Product Calibrator
Capacitance – Source ^{1,2} Fixed Values	(1, 10, 100, 1 000) pF 1 kHz 1 kHz to 13 MHz	2 µF/F + 0.58R 67 µF/F + 0.58R	Comparison to Standard Capacitors
	(10, 100, 1 000) nF 120 Hz to 100 kHz	62 µF/F + 0.58R	
Dissipation Factor ¹ Terminal Capacitors and LCR Meters	0 < DF < 1 1 pF 1 kHz 1 MHz 2 MHz 3 MHz 4 MHz 5 MHz 10 MHz 13 MHz	0.000 02 0.000 03 0.000 06 0.000 09 0.000 14 0.000 20 0.000 57 0.000 83	Comparison to Standard Capacitors

Electrical – DC/Low Frequency

Global Scope

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Dissipation Factor ¹ Terminal Capacitors and LCR Meters	0 < DF <1		Comparison to Standard Capacitors
	10 pF		
	1 kHz	0.000 02	
	1 MHz	0.000 02	
	2 MHz	0.000 02	
	3 MHz	0.000 03	
	4 MHz	0.000 03	
	5 MHz	0.000 03	
	10 MHz	0.000 07	
	13 MHz	0.000 09	
	100 pF		
	1 kHz	0.000 02	
	1 MHz	0.000 02	
	2 MHz	0.000 02	
	3 MHz	0.000 03	
	4 MHz	0.000 05	
	5 MHz	0.000 06	
	10 MHz	0.000 16	
	13 MHz	0.000 24	
	1 000 pF		
	1 kHz	0.000 02	
	1 MHz	0.000 03	
	2 MHz	0.000 07	
	3 MHz	0.000 12	
	4 MHz	0.000 18	
	5 MHz	0.000 26	
	10 MHz	0.000 71	
	13 MHz	0.001 1	
	10 nF		
	120 Hz	0.000 04	
	1 kHz	0.000 04	
	10 kHz	0.000 04	
	100 kHz	0.000 04	
	100 nF		
	120 Hz	0.000 05	
	1 kHz	0.000 04	
	10 kHz	0.000 04	
	100 kHz	0.000 05	

Electrical – DC/Low Frequency

Global Scope

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Dissipation Factor ¹ Terminal Capacitors and LCR Meters	0 < DF <1 1 000 nF 120 Hz 1 kHz 10 kHz 100 kHz	0.000 06 0.000 04 0.000 05 0.000 66	Comparison to Standard Capacitors
Capacitance – Measure ^{1,2} 12 Hz to 13 MHz	(0 to 10) pF 10 pF to 10 nF 10 nF to 100 µF (100 to 1 000) µF	0.45 mF/F + 0.58R 0.26 mF/F 0.27 mF/F 0.37 mF/F	Direct measurement using RLC Digibridge
Electrical Calibration of Thermocouple Indicators and Calibrators ¹	Type B (600 to 800) °C (800 to 1 000) °C (1 000 to 1 550) °C (1 550 to 1 820) °C Type C (0 to 150) °C (150 to 650) °C (650 to 1 000) °C (1 000 to 1 800) °C (1 800 to 2 316) °C Type E (-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1 000) °C Type J (-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1 200) °C Type K (-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1 000) °C (1 000 to 1 372) °C	0.36 °C 0.29 °C 0.27 °C 0.28 °C 0.27 °C 0.24 °C 0.27 °C 0.41 °C 0.66 °C 0.41 °C 0.18 °C 0.17 °C 0.18 °C 0.21 °C 0.25 °C 0.18 °C 0.17 °C 0.18 °C 0.22 °C 0.29 °C 0.19 °C 0.18 °C 0.24 °C 0.34 °C	Comparison to Multiproduct Calibrator

Electrical – DC/Low Frequency

Global Scope

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Calibration of Thermocouple Indicators and Calibrators ¹	Type L (-200 to -100) °C	0.31 °C	Comparison to Multiproduct Calibrator
	(-100 to 800) °C	0.24 °C	
	(800 to 900) °C	0.18 °C	
	Type N (-200 to -100) °C	0.34 °C	
	(-100 to -25) °C	0.21 °C	
	(-25 to 120) °C	0.2 °C	
	(120 to 410) °C	0.19 °C	
	(410 to 1 300) °C	0.25 °C	
	Type R (0 to 250) °C	0.46 °C	
	(250 to 400) °C	0.3 °C	
	(400 to 1 000) °C	0.29 °C	
	(1 000 to 1 767) °C	0.34 °C	
	Type S (0 to 250) °C	0.39 °C	
	(250 to 1 000) °C	0.31 °C	
	(1 000 to 1 400) °C	0.31 °C	
	(1 400 to 1 767) °C	0.38 °C	
	Type T (-250 to -150) °C	0.51 °C	
	(-150 to 0) °C	0.23 °C	
	(0 to 120) °C	0.18 °C	
	(120 to 400) °C	0.17 °C	
Electrical Calibration of Thermocouple Indicators and Calibrators ¹	Type U (-200 to 0) °C	0.45 °C	Comparison to Multifunction Calibrator, Multimeter and SPRT
	(0 to 600) °C	0.25 °C	
	Type B (600 to 1 820) °C	0.098 °C	
	Type C (0 to 2 316) °C	0.091 °C	
	Type E (-250 to 1 000) °C	0.078 °C	
	Type J (-210 to 1 200) °C	0.078 °C	
	Type K (-200 to 1 372) °C	0.08 °C	

Electrical – DC/Low Frequency

Global Scope

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Calibration of Thermocouple Indicators and Calibrators ¹	Type L (-200 to 900) °C	0.079 °C	Comparison to Multifunction Calibrator, Multimeter and SPRT
	Type N (-200 to 1 300) °C	0.081 °C	
	Type R (0 to 1 767) °C	0.096 °C	
	Type S (0 to 1 767) °C	0.097 °C	
	Type T (-250 to 400) °C	0.081 °C	
	Type U (-200 to 600) °C	0.078 °C	
Electrical Calibration of RTD Indicators and Calibrators ¹	Pt 385, 100 Ω (-200 to -80) °C	0.04 °C	Comparison to Multiproduct Calibrator
	(-80 to 0) °C	0.04 °C	
	(0 to 100) °C	0.055 °C	
	(100 to 300) °C	0.07 °C	
	(300 to 400) °C	0.078 °C	
	(400 to 630) °C	0.093 °C	
	(630 to 800) °C	0.18 °C	
	Pt 3926, 100 Ω (-200 to -80) °C	0.04 °C	
	(-80 to 0) °C	0.04 °C	
	(0 to 100) °C	0.055 °C	
	(100 to 300) °C	0.07 °C	
	(300 to 400) °C	0.078 °C	
	(400 to 630) °C	0.093 °C	
	Pt 3916, 100 Ω (-200 to -190) °C	0.19 °C	
	(-190 to -80) °C	0.032 °C	
	(-80 to 0) °C	0.04 °C	
	(0 to 100) °C	0.047 °C	
	(100 to 260) °C	0.055 °C	
	(260 to 300) °C	0.062 °C	
	(300 to 400) °C	0.07 °C	
	(400 to 600) °C	0.078 °C	
	(600 to 630) °C	0.18 °C	

Electrical – DC/Low Frequency

Global Scope

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Calibration of RTD Indicators and Calibrators ¹	Pt 385, 200 Ω		Comparison to Multiproduct Calibrator
	(-200 to -80) °C	0.032 °C	
	(-80 to 0) °C	0.032 °C	
	(0 to 100) °C	0.032 °C	
	(100 to 260) °C	0.04 °C	
	(260 to 300) °C	0.093 °C	
	(300 to 400) °C	0.1 °C	
	(400 to 600) °C	0.11 °C	
	(600 to 630) °C	0.12 °C	
	Pt 385, 500 Ω		
	(-200 to -80) °C	0.032 °C	
	(-80 to 0) °C	0.04 °C	
	(0 to 100) °C	0.04 °C	
	(100 to 260) °C	0.047 °C	
	(260 to 300) °C	0.063 °C	
	(300 to 400) °C	0.063 °C	
	(400 to 600) °C	0.07 °C	
	(600 to 630) °C	0.086 °C	
	Pt 385, 1 k Ω		
	(-200 to -80) °C	0.025 °C	
	(-80 to 0) °C	0.025 °C	
	(0 to 100) °C	0.032 °C	
	(100 to 260) °C	0.04 °C	
	(260 to 300) °C	0.047 °C	
	(300 to 400) °C	0.055 °C	
	(400 to 600) °C	0.055 °C	
	(600 to 630) °C	0.18 °C	
	PtNi 385, 100 Ω		
	(-80 to 0) °C	0.063 °C	
	(0 to 100) °C	0.063 °C	
	(100 to 260) °C	0.11 °C	
	Cu 427, 10 Ω		
	(-100 to 260) °C	0.23 °C	

Electrical – DC/Low Frequency

Global Scope

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Source ¹	Up to 2.2 mV		Comparison to Multifunction Calibrator
	(10 to 20) Hz	0.37 mV/V + 4 μ V	
	(20 to 40) Hz	0.31 mV/V + 4 μ V	
	40 Hz to 20 kHz	0.31 mV/V + 4 μ V	
	(20 to 50) kHz	0.35 mV/V + 4 μ V	
	(50 to 100) kHz	0.61 mV/V + 5 μ V	
	(100 to 300) kHz	1 mV/V + 10 μ V	
	(300 to 500) kHz	1.3 mV/V + 20 μ V	
	500 kHz to 1 MHz	2.6 mV/V + 20 μ V	
	(2.2 to 22) mV		
	(10 to 20) Hz	0.24 mV/V + 4 μ V	
	(20 to 40) Hz	0.11 mV/V + 4 μ V	
	40 Hz to 20 kHz	96 μ V/V + 4 μ V	
	(20 to 50) kHz	0.2 mV/V + 4 μ V	
	(50 to 100) kHz	0.46 mV/V + 5 μ V	
	(100 to 300) kHz	0.9 mV/V + 10 μ V	
	(300 to 500) kHz	1.2 mV/V + 20 μ V	
	500 kHz to 1 MHz	2.5 mV/V + 20 μ V	
	(22 to 220) mV		
	(10 to 20) Hz	0.22 mV/V + 12 μ V	
	(20 to 40) Hz	86 μ V/V + 7 μ V	
	40 Hz to 20 kHz	76 μ V/V + 7 μ V	
	(20 to 50) kHz	0.18 mV/V + 7 μ V	
	(50 to 100) kHz	0.42 mV/V + 17 μ V	
	(100 to 300) kHz	0.75 mV/V + 20 μ V	
	(300 to 500) kHz	1.2 mV/V + 25 μ V	
	500 kHz to 1 MHz	2.5 mV/V + 45 μ V	
	220 mV to 2.2 V		
	(10 to 20) Hz	0.22 mV/V + 40 μ V	
	(20 to 40) Hz	80 μ V/V + 15 μ V	
	40 Hz to 20 kHz	40 μ V/V + 8 μ V	
	(20 to 50) kHz	70 μ V/V + 10 μ V	
	(50 to 100) kHz	0.11 mV/V + 30 μ V	
	(100 to 300) kHz	0.34 mV/V + 8 μ V	
	(300 to 500) kHz	0.9 mV/V + 0.2 mV	
	500 kHz to 1 MHz	1.5 mV/V + 0.3 mV	

Electrical – DC/Low Frequency

Global Scope

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Source ¹	(2.2 to 22) V		Comparison to Multifunction Calibrator
	(10 to 20) Hz	0.22 mV/V + 0.4 mV	
	(20 to 40) Hz	80 μ V/V + 0.15 mV	
	40 Hz to 20 kHz	40 μ V/V + 50 μ V	
	(20 to 50) kHz	70 μ V/V + 0.1 mV	
	(50 to 100) kHz	96 μ V/V + 0.2 mV	
	(100 to 300) kHz	0.26 mV/V + 0.6 mV	
	(300 to 500) kHz	0.9 mV/V + 2 mV	
	500 kHz to 1 MHz	1.3 mV/V + 3.2 mV	
	(22 to 220) V		
	(10 to 20) Hz	0.22 mV/V + 4 mV	
	(20 to 40) Hz	80 μ V/V + 1.5 mV	
	40 Hz to 20 kHz	48 μ V/V + 0.6 mV	
	(20 to 50) kHz	76 μ V/V + 1 mV	
	(50 to 100) kHz	0.13 mV/V + 2.5 mV	
AC Voltage – Source ¹	(100 to 300) kHz	0.8 mV/V + 16 mV	Comparison to Multifunction Calibrator with Amplifier
	(300 to 500) kHz	4.2 mV/V + 40 mV	
	500 kHz to 1 MHz	7 mV/V + 80 mV	
	(220 to 1 100) V		
	(15 to 50) Hz	0.26 mV/V + 16 mV	
	50 Hz to 1 kHz	61 μ V/V + 3.5 mV	
	(220 to 750) V		
AC Voltage – Source ¹	(30 to 50) kHz	0.36 mV/V + 11 mV	Comparison to Multifunction Calibrator with Amplifier
	(50 to 100) kHz	1.3 mV/V + 45 mV	
	(750 to 1 100) V		
	40 Hz to 1 kHz	0.08 mV/V + 4 mV	
	(1 to 20) kHz	0.13 mV/V + 6 mV	
	(20 to 30) kHz	0.36 mV/V + 11 mV	

Electrical – DC/Low Frequency

Global Scope

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage Flatness – Source ¹ Referenced to 1 kHz	(0.3 to 1.1) mV		Comparison to Multifunction Calibrator with Wideband Option
	(10 to 30) Hz	3.7 mV/V	
	30 Hz to 120 kHz	1.7 mV/V	
	120 kHz to 1.2 MHz	2.6 mV/V + 3.6 μV	
	(1.2 to 2) MHz	2.5 mV/V + 3.6 μV	
	(2 to 10) MHz	4.9 mV/V + 3.6 μV	
	(10 to 20) MHz	7.3 mV/V + 3.6 μV	
	(20 to 30) MHz	18 mV/V + 18 μV	
	(1.1 to 3) mV		
	(10 to 30) Hz	3.6 mV/V + 0.1 μV	
	30 Hz to 120 kHz	1 mV/V + 0.8 μV	
	120 kHz to 2 MHz	1.2 mV/V + 3.8 μV	
	(2 to 10) MHz	3.6 mV/V + 3.8 μV	
	(10 to 20) MHz	6 mV/V + 3.6 μV	
	(20 to 30) MHz	18 mV/V + 3.6 μV	
	3 mV to 3.5 V		
AC Voltage – Measure ¹	(10 to 30) Hz	3.6 mV/V	Comparison to Multimeter
	30 Hz to 120 kHz	1.3 mV/V	
	120 kHz to 2 MHz	1.3 mV/V + 3.3 μV	
	(2 to 10) MHz	2.5 mV/V + 3.4 μV	
	(10 to 20) MHz	4.8 mV/V + 3.5 μV	
	(20 to 30) MHz	12 mV/V + 3.6 μV	
	Up to 10 mV		
	(1 to 40) Hz	0.36 mV/V + 3.6 μV	
	40 Hz to 1 kHz	0.24 mV/V + 1.3 μV	
	(1 to 20) kHz	0.35 mV/V + 1.3 μV	
	(20 to 50) kHz	1.2 mV/V + 1.3 μV	
	(50 to 100) kHz	5.9 mV/V + 1.3 μV	
	(100 to 300) kHz	47 mV/V + 2.4 μV	
	300 kHz to 1 MHz	14 mV/V + 5.9 μV	
	(1 to 4) MHz	83 mV/V + 8.2 μV	
	(4 to 8) MHz	240 mV/V + 9.1 μV	

Electrical – DC/Low Frequency

Global Scope

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Measure ¹	(10 to 100) mV		Comparison to Multimeter
	(1 to 40) Hz	0.083 mV/V + 4.8 μ V	
	40 Hz to 1 kHz	0.083 mV/V + 2.4 μ V	
	(1 to 20) kHz	0.17 mV/V + 2.4 μ V	
	(20 to 50) kHz	0.36 mV/V + 2.4 μ V	
	(50 to 100) kHz	0.95 mV/V + 2.4 μ V	
	(100 to 300) kHz	3.6 mV/V + 12 μ V	
	300 kHz to 1 MHz	12 mV/V + 12 μ V	
	(1 to 2) MHz	18 mV/V + 12 μ V	
	(2 to 4) MHz	48 mV/V + 82 μ V	
	(4 to 8) MHz	47 mV/V + 94 μ V	
	(8 to 10) MHz	180 mV/V + 110 μ V	
	100 mV to 1 V		
	(1 to 40) Hz	0.083 mV/V + 0.047 mV	
	40 Hz to 1 kHz	0.083 mV/V + 0.024 mV	
	(1 to 20) kHz	0.17 mV/V + 0.024 mV	
	(20 to 50) kHz	0.36 mV/V + 0.024 mV	
	(50 to 100) kHz	0.95 mV/V + 0.024 mV	
	(100 to 300) kHz	3.6 mV/V + 0.12 mV	
	300 kHz to 1 MHz	12 mV/V + 0.12 mV	
	(1 to 2) MHz	18 mV/V + 0.12 mV	
	(2 to 4) MHz	48 mV/V + 0.83 mV	
	(4 to 8) MHz	47 mV/V + 1 mV	
	(8 to 10) MHz	180 mV/V + 1.1 mV	
	(1 to 10) V		
	(1 to 40) Hz	0.083 mV/V + 0.48 mV	
	40 Hz to 1 kHz	0.083 mV/V + 0.24 mV	
	(1 to 20) kHz	0.17 mV/V + 0.24 mV	
	(20 to 50) kHz	0.36 mV/V + 0.24 mV	
	(50 to 100) kHz	0.95 mV/V + 0.23 mV	
	(100 to 300) kHz	3.6 mV/V + 1.2 mV	
	300 kHz to 1 MHz	12 mV/V + 1.2 mV	
	(1 to 2) MHz	18 mV/V + 1.1 mV	
	(2 to 4) MHz	47 mV/V + 8.4 mV	
	(4 to 8) MHz	48 mV/V + 9.3 mV	
	(8 to 10) MHz	180 mV/V + 12 mV	

Electrical – DC/Low Frequency

Global Scope

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Measure ¹	(10 to 100) V (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (100 to 1 000) V (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.24 mV/V + 4.7 mV 0.24 mV/V + 2.4 mV 0.24 mV/V + 2.4 mV 0.42 mV/V + 2.4 mV 1.4 mV/V + 2.4 mV 4.7 mV/V + 12 mV 18 mV/V + 13 mV 0.48 mV/V + 47 mV 0.47 mV/V + 24 mV 0.71 mV/V + 24 mV 1.4 mV/V + 24 mV 3.6 mV/V + 120 mV	Comparison to Multimeter
AC High Voltage – Measure ¹	(0 to 10) kV (45 to 65) Hz	0.87 mV/V + 0.87 V	Comparison to High Voltage Meter and High Voltage Probe
AC Current – Source ¹	Up to 220 μ A (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz 220 μ A to 2.2 mA (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (2.2 to 22) mA (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.23 mA/A + 16 nA 0.14 mA/A + 10 nA 0.11 mA/A + 8 nA 0.25 mA/A + 12 nA 0.9 mA/A + 65 nA 0.23 mA/A + 40 nA 0.14 mA/A + 35 nA 0.11 mA/A + 35 nA 0.18 mA/A + 0.11 μ A 0.9 mA/A + 0.65 μ A 0.23 mA/A + 0.4 μ A 0.14 mA/A + 0.35 μ A 0.11 mA/A + 0.35 μ A 0.18 mA/A + 0.5 μ A 0.9 mA/A + 5 μ A	Comparison to Multifunction Calibrator and Amplifier

Electrical – DC/Low Frequency

Global Scope

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Source ¹	(22 to 220) mA (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz 220 mA to 2.2 A 20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (2.2 to 11) A 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.23 mA/A + 4 μ A 0.14 mA/A + 3.5 μ A 0.11 mA/A + 2.6 μ A 0.18 mA/A + 3.5 μ A 0.9 mA/A + 10 μ A 0.25 mA/A + 35 μ A 0.39 mA/A + 80 μ A 6 mA/A + 0.16 mA 0.42 mA/A + 0.17 mA 0.85 mA/A + 0.38 mA 3.3 mA/A + 0.75 mA	Comparison to Multifunction Calibrator and Amplifier
AC Current – Source ¹	Up to 330 μ A (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz (0.33 to 3.3) mA (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz (3.3 to 33) mA (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	1.9 mA/A + 0.12 μ A 1.4 mA/A + 0.12 μ A 1.2 mA/A + 0.12 μ A 2.9 mA/A + 0.17 μ A 6.9 mA/A + 0.23 μ A 14 mA/A + 0.46 μ A 1.9 mA/A + 0.17 μ A 1.2 mA/A + 0.17 μ A 0.93 mA/A + 0.17 μ A 1.8 mA/A + 0.23 μ A 4.6 mA/A + 0.35 μ A 9.2 mA/A + 0.69 μ A 1.7 mA/A + 2.3 μ A 0.88 mA/A + 2.3 μ A 0.42 mA/A + 2.3 μ A 0.76 mA/A + 2.3 μ A 1.9 mA/A + 3.5 μ A 3.7 mA/A + 4.6 μ A	Comparison to Multiproduct Calibrator

Electrical – DC/Low Frequency

Global Scope

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Source ¹	(33 to 330) mA (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz (0.33 to 1.1) A (10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (1.1 to 3) A (10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (3 to 11) A (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz (11 to 20.5) A (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	1.7 mA/A + 23 μ A 0.87 mA/A + 23 μ A 0.42 mA/A + 23 μ A 0.93 mA/A + 58 μ A 1.9 mA/A + 0.12 mA 3.7 mA/A + 0.23 mA 1.7 mA/A + 0.12 mA 0.44 mA/A + 0.11 mA 5.8 mA/A + 1.2 mA 23 mA/A + 5.8 mA 1.7 mA/A + 0.12 mA 0.59 mA/A + 0.11 mA 5.8 mA/A + 1.2 mA 23 mA/A + 5.8 mA 0.59 mA/A + 2.3 mA 0.93 mA/A + 2.3 mA 29 mA/A + 2.3 mA 1.2 mA/A + 5.8 mA 1.5 mA/A + 5.8 mA 29 mA/A + 5.8 mA	Comparison to Multiproduct Calibrator
	(10 to 16.5) A (45 to 65) Hz (65 to 1 000) Hz (16.5 to 150) A (45 to 65) Hz (65 to 440) Hz (150 to 1 025) A (45 to 65) Hz (65 to 440) Hz	2.5 mA/A + 1.4 mA 3.1 mA/A + 5 mA 2.7 mA/A + 1.4 mA 3.8 mA/A + 47 mA 2.7 mA/A + 57 mA 8 mA/A + 0.1 A	

Electrical – DC/Low Frequency

Global Scope

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Measure ¹	Up to 100 μ A (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz	4 mA/A + 0.03 μ A 1.5 mA/A + 0.03 μ A 0.6 mA/A + 0.03 μ A 0.6 mA/A + 0.03 μ A	Comparison to 8.5 Digits Multimeter
	100 μ A to 1 mA (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz (1 to 10) mA (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz (10 to 100) mA (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz 100 mA to 1 A (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz	4 mA/A + 0.2 μ A 1.5 mA/A + 0.2 μ A 0.6 mA/A + 0.2 μ A 0.3 mA/A + 0.2 μ A 0.6 mA/A + 0.2 μ A 4 mA/A + 0.4 μ A 5.5 mA/A + 1.5 μ A 4 mA/A + 2 μ A 1.5 mA/A + 2 μ A 0.6 mA/A + 2 μ A 0.3 mA/A + 2 μ A 0.6 mA/A + 2 μ A 4 mA/A + 4 μ A 5.5 mA/A + 15 μ A 4 mA/A + 20 μ A 1.5 mA/A + 20 μ A 0.6 mA/A + 20 μ A 0.3 mA/A + 20 μ A 0.6 mA/A + 20 μ A 4 mA/A + 40 μ A 5.5 mA/A + 0.15 mA 4 mA/A + 0.2 mA 1.6 mA/A + 0.2 mA 0.8 mA/A + 0.2 mA 1 mA/A + 0.2 mA 3 mA/A + 0.2 mA 10 mA/A + 0.4 mA	
AC Current – Measure ¹	(1 to 3) A 3 Hz to 10 kHz (3 to 10) A 3 Hz to 10 kHz	2.7 mA/A + 1.4 mA 1.8 mA/A + 4.7 mA	Comparison to 6.5 Digits Multimeter

Electrical – DC/Low Frequency

Global Scope

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Power – Source ¹ 45 Hz to 1 kHz Power Factor = 1	(0.33 to 19) mA		Comparison to Multiproduct Calibrator
	(0.11 to 5.7) mW	1.4 mW/W + 0.015 μ W	
	5.7 mW to 19 W	0.53 mW/W + 1.1 μ W	
	(19 to 33) mA		
	(0.6 to 10) mW	1.8 mW/W	
	6 mW to 33 W	1.1 mW/W + 3.3 μ W	
	(33 to 190) mA		
	(1 to 57) mW	1.4 mW/W + 0.14 μ W	
	11 mW to 190 W	0.53 mW/W + 11 μ W	
	(190 to 330) mA		
	(6 to 100) mW	1.5 mW/W	
	100 mW to 330 W	0.77 mW/W	
	(0.33 to 1.09) A		
	(11 to 330) mW	1.4 mW/W	
	330 mW to 1.1 kW	0.53 mW/W + 0.066 mW	
	(1.09 to 2.9) A		
	36 mW to 0.9 W	1.4 mW/W	
	363 mW to 2.9 kW	0.62 mW/W	
AC Power – Source ¹ 45 Hz to 1 kHz Power Factor = (0.985 to 0.999)	(2.9 to 10.9) A		Comparison to Multiproduct Calibrator
	100 mW to 3.3 W	1.8 mW/W	
	1 W to 10.9 kW	1.1 mW/W	
	(10.9 to 20.5) A		
	(0.36 to 6) W	2.3 mW/W	
	3.6 W to 20 kW	1.8 mW/W	
	(0.33 to 19) mA		
	(0.11 to 5.7) mW	2.3 mW/W + 0.012 μ W	
	5.7 mW to 19 W	1.9 mW/W + 0.54 μ W	
	(19 to 33) mA		
	(0.6 to 10) mW	2.5 mW/W	
	6 mW to 33 W	2.2 mW/W + 2 μ W	
	(33 to 190) mA		
	(1 to 57) mW	2.3 mW/W + 0.087 μ W	
	11 mW to 190 W	1.9 mW/W + 5.1 μ W	
	(190 to 330) mA		
	(6 to 100) mW	2.4 mW/W	
	100 mW to 330 W	2 mW/W	
	(0.33 to 1.09) A		
	(11 to 330) mW	2.3 mW/W	
	330 mW to 1.1 kW	1.9 mW/W + 0.022 mW	

Electrical – DC/Low Frequency

Global Scope

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Power – Source ¹ 45 Hz to 1 kHz Power Factor = (0.985 to 0.999)	(1.09 to 2.9) A 36 mW to 0.9 W 363 mW to 2.9 kW (2.9 to 10.9) A 100 mW to 3.3 W 1 W to 10.9 kW (10.9 to 20.5) A (0.36 to 6) W 3.6 W to 20 kW	2.3 mW/W 1.9 mW/W 2.6 mW/W 2.2 mW/W 2.9 mW/W 2.6 mW/W	Comparison to Multiproduct Calibrator
Oscilloscopes ¹ Bandwidth	0.1 Hz to 3.2 GHz (3.2 to 6) GHz (6 to 14) GHz (14 to 18) GHz (18 to 20) GHz	2.7 % of reading 2.7 % of reading 2.8 % of reading 2.9 % of reading 3.3 % of reading	Comparison to Oscilloscope Calibrator, Signal Generator and RF Power Sensor
Oscilloscopes ¹ Amplitude Square Wave Signal 50 Ω , 10 Hz to 10 kHz 1 M Ω , 10 Hz to 10 kHz Amplitude Sine Wave Signal Into 50 Ω 50 kHz 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz Flatness Into 50 Ω , Relative to 50 kHz Rise Time Source 1 kHz to 10 MHz Pulse Width Pulse Period Time Marker Output Into 50 ohms	 1 mV to 6.6 V 1 mV to 130 V 5 mV to 5.5 V 5 mV to 5.5 V 5 mV to 5.5 V 5 mV to 5.5 V 5 mV to 5.5 V 5 mV to 5.5 V 5 mV to 5.5 V Up to 300 ps (4 to 500) ns 200 ns to 20 ms 2 ns to 20 ms 20 ms to 5 s	 0.25 % of reading + 40 μ V 0.1 % of reading + 40 μ V 2 % of reading + 0.3 mV 3.5 % of reading + 0.3 mV 4 % of reading + 0.3 mV 6 % of reading + 0.3 mV 1.5 % of reading + 0.1 mV 2 % of reading + 0.1 mV 4 % of reading + 0.1 mV 37 ps 5.8 % + 2.3 ns 2.9 μ s/s 2.5 μ s/s 5.1 ms/s	 Comparison to Multiproduct Calibrator w/Scope Option

Electrical – RF/Microwave

Global Scope

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
RF Power Meter ¹ Reference Output Indication	1 mW, 50 MHz 3 μ W to 100 mW	3.3 mW/W 0.37 mW/W + 0.4 nW	Comparison to Power Meter and Sensor Range Calibrator
RF Power Sensors Calibration Factors ^{1,5}	Referenced to 1 mW (9 to 300) kHz 300 kHz to 50 MHz (50 to 100) MHz (100 to 600) MHz 600 MHz to 1 GHz (1 to 4) GHz (4 to 8) GHz (8 to 12) GHz (12 to 16) GHz (16 to 18) GHz (18 to 20) GHz	1 % 0.85 % 0.78 % 0.78 % 0.78 % 0.8 % 0.87 % 0.96 % 1 % 1.1 % 2 %	Comparison to Power Meter, Coaxial Thermistor and Thermocouple Power Sensors
Tuned RF Power, Relative – Measure ¹ 100 kHz to 26.5 GHz	(-130 to -120) dB (-120 to -100) dB (-100 to -80) dB (-80 to -60) dB (-60 to -50) dB (-50 to -30) dB (-30 to -20) dB (-20 to -10) dB (-10 to 10) dB (10 to 20) dB (20 to 30) dB	0.1 dB 0.098 dB 0.091 dB 0.084 dB 0.082 dB 0.079 dB 0.074 dB 0.072 dB 0.071 dB 0.072 dB 0.074 dB	Comparison to Power Sensors with Measuring Receiver, Power Meter and Spectrum Analyzers
Tuned RF Power, Absolute – Measure ¹ 100 kHz to 26.5 GHz	(-130 to -100) dBm (-100 to -80) dBm (-80 to -60) dBm (-60 to -50) dBm (-50 to -30) dBm (-30 to -20) dBm (-20 to 10) dBm (10 to 20) dBm (20 to 30) dBm	0.12 dB 0.11 dB 0.1 dB 0.095 dB 0.093 dB 0.084 dB 0.081 dB 0.082 dB 0.084 dB	Comparison to Power Sensors with Measuring Receiver, Power Meter and Spectrum Analyzers

Electrical – RF/Microwave

Global Scope

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
RF Absolute Power – Measure ¹	(-70 to -35) dBm 9 kHz to 14 GHz (14 to 26.5) GHz (-35 to 20) dBm 9 kHz to 14 GHz (14 to 18) GHz (18 to 26.5) GHz (26.5 to 33) GHz (33 to 50) GHz (50 to 67) GHz (67 to 70) GHz	0.063 dB 0.071 dB 0.063 dB 0.071 dB 0.083 dB 0.092 dB 0.13 dB 0.15 dB 0.2 dB	Comparison to Power Sensors with Measuring Receiver, Power Meter and Spectrum Analyzers
Frequency Modulation – Measure ¹ FM Deviation Accuracy Rate: 20 Hz to 10 kHz Rate: 50 Hz to 200 kHz AM Rejection 50 Hz to 3 kHz BW Depth ≤ 50 % Residual FM 50 Hz to 3 kHz BW Distortion 100 kHz to 26.5 GHz	Dev: ≤ 40 kHz 100 kHz to 10 MHz Dev: ≤ 400 kHz 10 MHz to 6.6 GHz (6.6 to 13.2) GHz (13.2 to 26.5) GHz Rate: 400 Hz to 1 kHz 150 kHz to 6.6 GHz (6.6 to 26.5) GHz 100 kHz to 6.6 GHz (6.6 to 13.2) GHz (13.2 to 26.5) GHz Rate: 20 Hz to 250 kHz	0.3 % of reading 0.4 % of reading 0.5 % of reading 0.6 % of reading 12 Hz 28 Hz 1.8 Hz 2.1 Hz 3 Hz 0.13 % of reading	Comparison to Signal Analyzer, Measuring Receiver

Electrical – RF/Microwave

Global Scope

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Amplitude Modulation – Measure ¹			
AM Depth Accuracy Rate: 50 Hz to 10 kHz	Depth: (5 to 99) % 100 kHz to 10 MHz	0.32 % of reading	Comparison to Signal Analyzer, Measuring Receiver
Rate: 50 Hz to 100 kHz	Depth: (5 to 20) % 10 MHz to 3 GHz (3 to 26.5) GHz	0.6 % of reading 0.83 % of reading	
	Depth: (20 to 99) % 10 MHz to 3 GHz (3 to 26.5) GHz	0.33 % of reading 0.43 % of reading	
Flatness Rate: 90 Hz to 10 kHz	Depth: (5 to 99) % 10 MHz to 26.5 GHz	0.19 % of reading	
Distortion	Depth. (5 to 99) % 100 kHz to 1 300 MHz 1 300 MHz to 26.6 GHz	0.25 % THD 0.36 % THD	
FM Rejection 50 Hz to 3 kHz BW Rate: 400 Hz to 1 kHz	250 kHz to 10 MHz Dev: < 5 kHz 10 MHz to 26.5 GHz Dev: < 50 kHz	0.17 % AM 0.43 % AM	
Residual AM 50 Hz to 3 kHz BW	100 kHz to 26.5 GHz	0.012 % of reading	

Electrical – RF/Microwave

Global Scope

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Phase Modulation – Measure ¹ PM Accuracy Rate: 200 Hz to 20 kHz	100 kHz to 6.6 GHz Dev: (0.3 to 0.7) rad Dev: > 0.7 rad (6.6 to 13.2) GHz Dev: (0.6 to 2) rad Dev: > 2 rad (13.2 to 26.5) GHz Dev: (1.2 to 4) rad Dev: > 4 rad	0.4 % of reading 0.3 % of reading 0.4 % of reading 0.3 % of reading 0.4 % of reading 0.3 % of reading	Comparison to Signal Analyzer, Measuring Receiver
AM Rejection (Peak) 50 Hz to 3 kHz BW	100 kHz to 26.5 GHz	0.035 rad	
Residual PM (rms) 50 Hz to 3 kHz BW	100 kHz to 6.6 GHz (6.6 to 13.2) GHz (13.2 to 26.5) GHz	0.0023 rad 0.0041 rad 0.0079 rad	
Distortion 50 Hz to 3 kHz BW	100 kHz to 26.5 GHz	0.12 % THD	
Harmonic Measurements ¹ 3 Hz to 26.5 GHz	(-90 to 0.01) dB	0.8 dB	Comparison to Spectrum Analyzer
Distortion – Measure ¹ 20 Hz to 20 kHz (20 to 100) kHz	(0 to 99.9) dB (50 to 500) kHz (50 to 500) kHz	1.2 dB 2.4 dB	Comparison to Audio Analyzer

Length – Dimensional Metrology

Global Scope

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Calipers ^{1,2}	Up to 48 in Up to 1 500 mm	$(6.4 + 6.8 \cdot L) \mu\text{in} + 0.58R$ $(0.16 + 0.006 8 \cdot l) \mu\text{m} + 0.58R$	Comparison to Gage Blocks
Height Gages ^{1,2}	Up to 48 in Up to 1 500 mm	$(27 + 6.2 \cdot L) \mu\text{in} + 0.58R$ $(0.69 + 0.006 2 \cdot l) \mu\text{m} + 0.58R$	Comparison to Gage Blocks

Length – Dimensional Metrology

Global Scope

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Micrometers ^{1,2} External, Internal, Depth, Bore and Micrometer Head	Length Up to 48 in Up to 1 500 mm Flatness Up to 40 µin Up to 1.1 µm Parallelism Up to 50 µin Up to 1.3 µm	$(5 + 6.7 \cdot L) \mu\text{in} + 0.58R$ $(0.1 + 0.006 \cdot l) \mu\text{m} + 0.58R$ 4.5 µin 0.11 µm 5.6 µin 0.14 µm	Comparison to Gage Blocks, Optical Parallels or Optical Flats
Indicators ¹ Dial Gauge, Dial Test Indicator, LVDTs	Up to 4 in Up to 100 mm	$(3.1 + 2.3L) \mu\text{in}$ $(0.08 + 0.002 \cdot l) \mu\text{m} + 0.58R$	Comparison to Gage Block, Comparator Stand
Rigid Rules & Tape Measures ²	Up to 40 in (40 to 2 000) in Up to 1 000 mm (1 000 to 50 000) mm	0.000 43 in (11L) µin 11 µm (0.011 · l) µm	Comparison to Gage Blocks, Standard Scale
Optical Comparators and Vision Systems/Measuring Microscope ^{1,2} X, Y Axis	Up to 24 in Up to 610 mm	$(38 + 1.8L) \mu\text{in}$ $(1 + 0.001 \cdot l) \mu\text{m}$	Comparison to Glass Scale
Optical Comparators and Vision Systems/Measuring Microscope ^{1,2} X, Y, Z Axis	Up to 24 in Up to 610 mm	$(9 + 2.5L) \mu\text{in}$ $(0.23 + 0.002 \cdot l) \mu\text{m}$	Comparison to Gage Blocks
Optical Comparators and Vision Systems/Measuring Microscope ^{1,2} Angle – 4 Quadrants	Up to 90°	0.001 1°	Comparison to Standard Angle Blocks
Length Measuring Machine, Linear Measurement ^{1,2}	Up to 4 in 4 to 24 in Up to 100 mm (100 to 610) mm	$(1.8 + 1.3L) \mu\text{in}$ $(4.9 + 1.3L) \mu\text{in}$ $(0.046 + 0.001 \cdot l) \mu\text{m}$ $(0.12 + 0.001 \cdot l) \mu\text{m}$	Comparison to Gage Blocks

Mass and Mass Related

Global Scope

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Piston/Plunger Operated ¹ Volumetric Apparatus (POVA) Pipettes, Syringes, Dilutors, Titrators, Piston/Displacement Burettes (Burets), Dispensers, Liquid Handlers	Up to 50 μ l 50 μ l to 2 000 ml	0.02 μ l 0.007 % of reading + 0.016 μ l	Gravimetric Method referenced to OIML Class E1 Mass Standard and Balances
Volumetric Glassware ¹ Volumetric Apparatus, Flasks, Burettes, Volumetric Dispensers, Cylinders, Graduated Cylinders, Beakers, Vials, & Containers	Up to 10 ml (10 to 2 000) ml	0.001 5 ml 0.014 % of reading	Gravimetric Method referenced to OIML Class E1 Mass Standard and Balances
Scales and Balances ^{1,3}	Up to 20 mg (20 to 50) mg (50 to 100) mg (100 to 200) mg (200 to 500) mg 500 mg to 1 g (1 to 2) g (2 to 5) g (5 to 10) g (10 to 20) g (20 to 50) g (50 to 100) g (100 to 200) g (200 to 500) g 500 g to 1 kg (1 to 2) kg (2 to 5) kg (5 to 10) kg (10 to 20) kg	0.0015 mg 0.0020 mg 0.0025 mg 0.0031 mg 0.0041 mg 0.0051 mg 0.0061 mg 0.0081 mg 0.01 mg 0.013 mg 0.018 mg 0.033 mg 0.065 mg 0.32 mg 0.63 mg 1.3 mg 3.2 mg 6.3 mg 0.64 μ g/g	Comparison to E1 Standard Weights
Torque Testers ^{1,2}	Up to 200 ozf-in (4 to 150) lbf-in (2.5 to 250) lbf-ft	0.1 % of reading + 0.58R 0.082 % of reading 0.075 % of reading	Comparison to Torque Wheel, Torque Standard, Calibration Arms, Weights

Photometry and Radiometry

Global Scope

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Optical Wavelength – Measure and Source ¹	(400 to 1 800) nm	0.19 μ m/m + 0.13 pm	Comparison to Wavelength Meter
Optical Power – Measure and Source ¹ Absolute	(700 to 1 800) (-80 to 20) dBm	0.1 dB	Comparison to Optical Test System
Relative	(700 to 1800) nm (-60 to -30) dB (-30 to 20) dB	0.005 dB/dB 0.03 dB	

Thermodynamic

Global Scope

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Temperature – Measure ¹	(-200 to 660) °C	0.009 °C	Comparison to Platinum Resistance Thermometers
Temperature – Measuring Equipment ¹	(-200 to 660) °C	0.009 °C	Comparison to Platinum Resistance Thermometers
Relative Humidity – Measuring Equipment ¹	(10 to 95) %RH	0.65 %RH	Comparison to Humidity Generator, Standard Humidity Meter
Relative Humidity – Measure ¹	(10 to 95) %RH	0.83 %RH	Comparison to Standard Humidity Meter

Time and Frequency

Global Scope

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency – Measure ¹	0.1 Hz to 26.5 GHz	2.2 pHz/Hz	Comparison to Frequency Reference Standard and Counter
Frequency Measuring Equipment ¹	1 mHz to 50 GHz (1, 5, 10) MHz	3.4 pHz/Hz 2.2 pHz/Hz	Comparison to Frequency Reference Standard and Signal Generator

Time and Frequency

Global Scope

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Photo Tachometer ¹	Up to 100 000 rpm	0.000 25 % of reading + 0.58R	Comparison to Multi-Product Calibrator, Signal Generator with LED
Angular Speed – Measure ^{1,2}	Up to 100 000 rpm	0.083 % of reading + 0.58R	Comparison to Standard Tachometer
Timers, Stopwatches, Chronometers ¹	Up to 24 hr	31 ms	Comparison to Frequency Counter
	Up to 24 hr	10 μ s/s + 39 ms	Comparison to Stopwatch

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Services performed at satellite laboratory

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CALIBRATION AND DIMENSIONAL MEASUREMENT

Acoustics and Vibration

Ho Chi Minh City, Vietnam

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Sound Level Meter ¹	(74 to 114) dB 125 Hz to 4 kHz	0.14 dB	Comparison to Sound Calibrator, Sound Level Meter
Sound Calibrator ¹	(74 to 124) dB 10 Hz to 20 kHz	0.095 dB	Comparison to Sound Calibrator, Sound Level Meter / Reference Microphone with Sound Calibration System
Microphones ¹ Sensitivity	(-80 to -10) dB re. 1V/Pa 10 Hz to 20 kHz	0.093 dB	Comparison to Reference Microphone with Sound Calibration System
Microphones ¹ Frequency Response	(-80 to -10) dB re. 1V/Pa (10 to 80) Hz (80 to 100) Hz 100 Hz to 4 kHz (4 to 8) kHz (8 to 12.6) kHz (12.6 to 16) kHz (16 to 20) kHz	0.13 dB 0.12 dB 0.093 dB 0.12 dB 0.16 dB 0.18 dB 0.26 dB	Comparison to Reference Microphone with Sound Calibration System

Acoustics and Vibration

Ho Chi Minh City, Vietnam

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Vibration ¹ 0.2 Hz to 10 kHz Acceleration Velocity Displacement 0.2 Hz to 10 kHz (0.2 to 100) Hz Accelerometers / Velocity Sensors / Displacement Sensors	(0 to 200) m/s ² (0 to 200) mm/s (0 to 200) µm (0.2 to 20) mm Sensitivity: (0.04 to 1 000) pC/units (0.04 to 1 000) mV/units	1.1 % of reading + 0.012 m/s ² 1.1 % of reading + 0.012 mm/s 1.1 % of reading + 0.012 µm 0.73 % of reading + 1.6 µm 1 % of sensitivity	Comparison to Reference Accelerometer with Vibration System

Chemical Quantities

Ho Chi Minh City, Vietnam

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
pH – Meter ¹	(4, 7, 10) pH	0.009 1 pH	Comparison to Standard Solutions
Gas Detector, Gas Analyzer	Iso-Butylene 10 parts in 10 ⁶ Iso-Butylene 100 parts in 10 ⁶ CO ₂ 1.5% CO 50 parts in 10 ⁶ H ₂ S 10 parts in 10 ⁶ CH ₄ 50% LEL O ₂ 18% O ₂ 10 parts in 10 ⁶ O ₂ 100 parts in 10 ⁶ O ₂ 1 000 parts in 10 ⁶	1.6 parts in 10 ⁶ Concentration 3.4 parts in 10 ⁶ Concentration 0.05 % Concentration 8.2 parts in 10 ⁶ Concentration 1.6 parts in 10 ⁶ Concentration 0.41 % Concentration 2.9 % Concentration 0.61 parts in 10 ⁶ Concentration 8.7 parts in 10 ⁶ Concentration 72 parts in 10 ⁶ Concentration	Comparison to Standard Gas
Optical System Aerosol Particle Counter	(0 to 100) % Counting Efficiency Particle sizes (0.1, 0.2, 0.3, 0.5, 1, 2, 5, 10) µm	6 % Counting efficiency	Comparison to Master Particle Counter
Refractometer	Up to 25 % Salinity Up to 50 % Brix	0.15 % Salinity 0.16 % Brix	Comparison to Standard Refractometer
Turbidity Meter ¹	1.01 NTU 15 NTU 100 NTU 750 NTU	0.022 NTU 0.15 NTU 0.77 NTU 6.7 NTU	Comparison to Standard Solutions

Chemical Quantities

Ho Chi Minh City, Vietnam

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Viscometer ¹	1 000 cP 200 000 cP 87 KU	12 cP 2 400 cP 1 KU	Comparison to Standard Solutions

Electrical – DC/Low Frequency

Ho Chi Minh City, Vietnam

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage – Source Fixed Points	1 V 1.018 V 10 V	2 μ V 2 μ V 6.6 μ V	Comparison to DC Voltage Reference Standard
DC High Voltage – Source ¹ Electrostatic Field Meter	(0 to 10) kV (10 to 20) kV	0.35 mV/V + 0.035 V 0.47 mV/V + 4.7 V	Comparison with High Voltage Meter and High Voltage Probe
DC High Voltage – Measure ¹	(10 to 20) kV	0.47 mV/V + 4.7 V	Comparison with High Voltage Meter and High Voltage Probe
ESD Simulators Contact Voltage Rise Time Peak Current 30 ns Current 60 ns Current Air Discharge Voltage	(-8 to 8) kV (0.6 to 1) ns (3.75 to 33) A (2 to 20.8) A (1 to 10.4) A (-30 to 30) kV	1.2 mV/V + 0.6 V 74 ps 2 % of reading 2 % of reading 2 % of reading 1.2 mV/V + 5.8 V	Comparison to High Voltage meter, ESD Target, Attenuator and Oscilloscope
DC Current – Source ¹	Up to 20 pA (20 to 200) pA (0.2 to 2) nA (2 to 20) nA (20 to 200) nA (0.2 to 20 μ A (20 to 200) μ A (0.2 to 2 mA	4.3 mA/A + 12 fA 2.9 mA/A + 39 fA 0.73 mA/A + 0.23 pA 0.72 mA/A + 2.2 pA 0.41 mA/A + 13 pA 0.32 mA/A + 0.12 nA 0.33 mA/A + 11 nA 0.31 mA/A + 0.12 μ A	Comparison to Calibrator/Source
DC Current – Measure ¹	(1 to 20) A (20 to 150) A (150 to 1 500) A	0.12 mA/A + 0.25 mA 2.9 mA/A + 2.7 mA 2.9 mA/A + 27 mA	Comparison to Shunt monitored with Multimeter
Resistance – Source ¹ (Fixed Points)	0.1 m Ω 1 m Ω 10 m Ω 100 m Ω	0.25 $\mu\Omega$ 3.5 $\mu\Omega$ 4 $\mu\Omega$ 10 $\mu\Omega$	Comparison to Resistance Shunts

Electrical – DC/Low Frequency

Ho Chi Minh City, Vietnam

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Resistance – Source ¹ (Fixed Artifacts)	1 Ω 10 k Ω	16 $\mu\Omega$ 85 m Ω	Comparison to Standard Resistors
AC Resistance – Measure ¹ 12 Hz to 100 kHz	Up to 10 k Ω	0.23 m Ω/Ω + 6 $\mu\Omega$	Comparison to RLC Digibridge
Transformer Ratio – Source ⁵	(0.001 to 1.110) Ratio 50 Hz to 1 kHz (1 to 10) kHz (10 to 100) kHz	0.24 parts in 10 ⁶ + 0.000 000 6 5.3 parts in 10 ⁶ + 0.000 000 6 57 parts in 10 ⁶ + 0.000 000 6	Decade Transformer
AC High Voltage – Source ¹	Up to 10 kV (50 to 60) Hz	1.4 mV/V + 0.13 V	Comparison with High Voltage Meter and High Voltage Probe
AC Voltage – Measure ¹	Up to 2.2 mV (10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz (2.2 to 7) mV (10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz (7 to 22) mV (10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	1.2 mV/V + 0.87 μ V 0.52 mV/V + 0.87 μ V 0.32 mV/V + 0.87 μ V 0.58 mV/V + 1.3 μ V 0.85 μ V/V + 1.7 μ V 1.6 mV/V + 2.7 μ V 1.7 mV/V + 5.3 μ V 2.4 mV/V + 5.3 μ V 0.57 mV/V + 0.87 μ V 0.26 mV/V + 0.87 μ V 0.16 mV/V + 0.87 μ V 0.28 mV/V + 1.3 μ V 0.4 mV/V + 1.7 μ V 0.8 mV/V + 2.7 μ V 0.87 mV/V + 5.3 μ V 1.5 mV/V + 5.3 μ V 0.2 μ V/V + 0.87 μ V 0.13 mV/V + 0.87 μ V 80 μ V/V + 0.87 μ V 0.14 mV/V + 1.3 μ V 0.22 mV/V + 1.7 μ V 0.54 mV/V + 2.7 μ V 0.59 mV/V + 5.3 μ V 1.1 mV/V + 5.3 μ V	Comparison to AC Measurement Standard

Electrical – DC/Low Frequency

Ho Chi Minh City, Vietnam

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Measure ¹	(22 to 70) mV		Comparison to AC Measurement Standard
	(10 to 20) Hz	0.16 mV/V + 1 μ V	
	(20 to 40) Hz	81 μ V/V + 1 μ V	
	40 Hz to 20 kHz	45 μ V/V + 1 μ V	
	(20 to 50) kHz	90 μ V/V + 1.3 μ V	
	(50 to 100) kHz	0.18 mV/V + 1.7 μ V	
	(100 to 300) kHz	0.35 mV/V + 2.7 μ V	
	(300 to 500) kHz	0.45 mV/V + 5.3 μ V	
	500 kHz to 1 MHz	0.73 mV/V + 5.3 μ V	
	(70 to 220) mV		
	(10 to 20) Hz	0.14 mV/V + 1 μ V	
	(20 to 40) Hz	57 μ V/V + 1 μ V	
	40 Hz to 20 kHz	26 μ V/V + 1 μ V	
	(20 to 50) kHz	47 μ V/V + 1.3 μ V	
	(50 to 100) kHz	0.11 mV/V + 1.7 μ V	
	(100 to 300) kHz	0.17 mV/V + 2.7 μ V	
	(300 to 500) kHz	0.26 mV/V + 5.3 μ V	
	500 kHz to 1 MHz	0.67 mV/V + 5.3 μ V	
	(220 to 700) mV		
	(10 to 20) Hz	0.14 mV/V + 1 μ V	
	(20 to 40) Hz	51 μ V/V + 1 μ V	
	40 Hz to 20 kHz	23 μ V/V + 1 μ V	
	(20 to 50) kHz	35 μ V/V + 1.3 μ V	
	(50 to 100) kHz	54 μ V/V + 1.7 μ V	
	(100 to 300) kHz	0.12 mV/V + 2.7 μ V	
	(300 to 500) kHz	0.2 mV/V + 5.3 μ V	
	500 kHz to 1 MHz	0.64 mV/V + 5.3 μ V	
	700 mV to 2.2 V		
	(10 to 20) Hz	0.13 mV/V + 0.58 μ V	
	(20 to 40) Hz	44 μ V/V + 0.58 μ V	
	40 Hz to 20 kHz	17 μ V/V + 0.58 μ V	
	(20 to 50) kHz	31 μ V/V + 0.58 μ V	
	(50 to 100) kHz	48 μ V/V + 0.58 μ V	
	(100 to 300) kHz	0.11 mV/V + 0.58 μ V	
	(300 to 500) kHz	0.18 mV/V + 0.58 μ V	
	500 kHz to 1 MHz	0.6 mV/V + 0.58 μ V	

Electrical – DC/Low Frequency

Ho Chi Minh City, Vietnam

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Measure ¹	(2.2 to 7) V		Comparison to AC Measurement Standard
	(10 to 20) Hz	0.13 mV/V + 0.58 μ V	
	(20 to 40) Hz	45 μ V/V + 0.58 μ V	
	40 Hz to 20 kHz	17 μ V/V + 0.58 μ V	
	(20 to 50) kHz	33 μ V/V + 0.58 μ V	
	(50 to 100) kHz	55 μ V/V + 0.58 μ V	
	(100 to 300) kHz	0.13 mV/V + 0.58 μ V	
	(300 to 500) kHz	0.27 mV/V + 0.58 μ V	
	500 kHz to 1 MHz	0.8 mV/V + 0.58 μ V	
	(7 to 22) V		
	(10 to 20) Hz	0.13 mV/V + 5.8 μ V	
	(20 to 40) Hz	45 μ V/V + 5.8 μ V	
	40 Hz to 20 kHz	19 μ V/V + 5.8 μ V	
	(20 to 50) kHz	33 μ V/V + 5.8 μ V	
	(50 to 100) kHz	55 μ V/V + 5.8 μ V	
	(100 to 300) kHz	0.13 mV/V + 5.8 μ V	
	(300 to 500) kHz	0.27 mV/V + 5.8 μ V	
	500 kHz to 1 MHz	0.8 mV/V + 5.8 μ V	
	(22 to 70) V		
	(10 to 20) Hz	0.13 mV/V + 5.8 μ V	
	(20 to 40) Hz	46 μ V/V + 5.8 μ V	
	40 Hz to 20 kHz	22 μ V/V + 5.8 μ V	
	(20 to 50) kHz	39 μ V/V + 5.8 μ V	
	(50 to 100) kHz	64 μ V/V + 5.8 μ V	
	(100 to 300) kHz	0.14 mV/V + 5.8 μ V	
	(300 to 500) kHz	0.27 mV/V + 5.8 μ V	
	500 kHz to 1 MHz	0.8 mV/V + 5.8 μ V	
	(70 to 220) V		
	(10 to 20) Hz	0.13 mV/V + 58 μ V	
	(20 to 40) Hz	46 μ V/V + 58 μ V	
	40 Hz to 20 kHz	22 μ V/V + 58 μ V	
	(20 to 50) kHz	47 μ V/V + 58 μ V	
	(50 to 100) kHz	67 μ V/V + 58 μ V	
	(100 to 300) kHz	0.14 mV/V + 58 μ V	
	(300 to 500) kHz	0.33 mV/V + 58 μ V	

Electrical – DC/Low Frequency

Ho Chi Minh City, Vietnam

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Measure ¹	(220 to 700) V (10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (700 to 1 000) V (10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz	0.13 mV/V + 58 μ V 67 μ V/V + 58 μ V 29 μ V/V + 58 μ V 87 μ V/V + 58 μ V 0.34 mV/V + 58 μ V 0.13 mV/V + 58 μ V 67 μ V/V + 58 μ V 28 μ V/V + 58 μ V 87 μ V/V + 58 μ V 0.33 mV/V + 58 μ V	Comparison to AC Measurement Standard
AC Voltage Flatness – Measure ¹ (Relative to 1 kHz)	Up to 2.2 mV (10 to 30) Hz (30 to 120) Hz 120 Hz to 1.2 kHz (1.2 to 120) kHz (120 to 500) kHz 500 kHz to 1.2 MHz (1.2 to 2) MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz (2.2 to 7) mV (10 to 30) Hz (30 to 120) Hz 120 Hz to 1.2 kHz (1.2 to 120) kHz (120 to 500) kHz 500 kHz to 1.2 MHz (1.2 to 2) MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz	0.94 mV/V + 0.08 μ V 0.47 mV/V + 0.08 μ V 0.47 mV/V + 0.08 μ V 0.47 mV/V + 0.08 μ V 0.66 mV/V + 0.95 μ V 0.66 mV/V + 0.95 μ V 0.66 mV/V + 0.95 μ V 1.6 mV/V + 0.95 μ V 2.8 mV/V + 0.95 μ V 6.6 mV/V + 1.9 μ V 0.94 mV/V + 0.082 μ V 0.47 mV/V + 0.082 μ V 0.47 mV/V + 0.082 μ V 0.47 mV/V + 0.082 μ V 0.66 mV/V + 0.95 μ V 0.66 mV/V + 0.95 μ V 0.66 mV/V + 0.95 μ V 0.94 mV/V + 0.95 μ V 1.6 mV/V + 0.95 μ V 3.5 mV/V + 0.95 μ V	Comparison to AC Measurement Standard

Electrical – DC/Low Frequency

Ho Chi Minh City, Vietnam

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage Flatness – Measure ¹ (Relative to 1 kHz)	(7 to 22) mV		Comparison to AC Measurement Standard
	(10 to 30) Hz	0.94 mV/V + 0.082 μ V	
	(30 to 120) Hz	0.47 mV/V + 0.082 μ V	
	120 Hz to 1.2 kHz	0.47 mV/V + 0.082 μ V	
	(1.2 to 120) kHz	0.47 mV/V + 0.082 μ V	
	(120 to 500) kHz	0.66 mV/V + 0.082 μ V	
	500 kHz to 1.2 MHz	0.66 mV/V + 0.082 μ V	
	(1.2 to 2) MHz	0.66 mV/V + 0.082 μ V	
	(2 to 10) MHz	0.94 mV/V + 0.082 μ V	
	(10 to 20) MHz	1.6 mV/V + 0.082 μ V	
	(20 to 30) MHz	3.5 mV/V + 0.082 μ V	
	(22 to 70) mV		
	(10 to 30) Hz	0.94 mV/V + 0.82 μ V	
	(30 to 120) Hz	0.47 mV/V + 0.82 μ V	
	120 Hz to 1.2 kHz	0.47 mV/V + 0.82 μ V	
	(1.2 to 120) kHz	0.47 mV/V + 0.82 μ V	
	(120 to 500) kHz	0.47 mV/V + 0.82 μ V	
	500 kHz to 1.2 MHz	0.47 mV/V + 0.82 μ V	
	(1.2 to 2) MHz	0.47 mV/V + 0.82 μ V	
	(2 to 10) MHz	0.94 mV/V + 0.82 μ V	
	(10 to 20) MHz	1.4 mV/V + 0.82 μ V	
	(20 to 30) MHz	3.3 mV/V + 0.82 μ V	
	(70 to 220) mV		
	(10 to 30) Hz	0.94 mV/V + 0.82 μ V	
	(30 to 120) Hz	0.38 mV/V + 0.82 μ V	
	120 Hz to 1.2 kHz	0.38 mV/V + 0.82 μ V	
	(1.2 to 120) kHz	0.38 mV/V + 0.82 μ V	
	(120 to 500) kHz	0.38 mV/V + 0.82 μ V	
	500 kHz to 1.2 MHz	0.47 mV/V + 0.82 μ V	
	(1.2 to 2) MHz	0.47 mV/V + 0.82 μ V	
	(2 to 10) MHz	0.94 mV/V + 0.82 μ V	
	(10 to 20) MHz	1.4 mV/V + 0.82 μ V	
	(20 to 30) MHz	3.3 mV/V + 0.82 μ V	

Electrical – DC/Low Frequency

Ho Chi Minh City, Vietnam

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage Flatness – Measure ¹ (Relative to 1 kHz)	(220 to 700) mV (10 to 30) Hz (30 to 120) Hz 120 Hz to 1.2 kHz (1.2 to 120) kHz (120 to 500) kHz 500 kHz to 1.2 MHz (1.2 to 2) MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz	0.94 mV/V + 8.2 μ V 0.28 mV/V + 8.2 μ V 0.28 mV/V + 8.2 μ V 0.28 mV/V + 8.2 μ V 0.28 mV/V + 8.2 μ V 0.47 mV/V + 8.2 μ V 0.47 mV/V + 8.2 μ V 0.94 mV/V + 8.2 μ V 1.4 mV/V + 8.2 μ V 3.3 mV/V + 8.2 μ V	Comparison to AC Measurement Standard
	700 mV to 2.2 V (10 to 30) Hz (30 to 120) Hz 120 Hz to 1.2 kHz (1.2 to 120) kHz (120 to 500) kHz 500 kHz to 1.2 MHz (1.2 to 2) MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz	0.94 mV/V + 8.2 μ V 0.28 mV/V + 8.2 μ V 0.28 mV/V + 8.2 μ V 0.28 mV/V + 8.2 μ V 0.28 mV/V + 8.2 μ V 0.47 mV/V + 8.2 μ V 0.47 mV/V + 8.2 μ V 0.94 mV/V + 8.2 μ V 1.4 mV/V + 8.2 μ V 3.3 mV/V + 8.2 μ V	
	(2.2 to 7) V (10 to 30) Hz (30 to 120) Hz 120 Hz to 1.2 kHz (1.2 to 120) kHz (120 to 500) kHz 500 kHz to 1.2 MHz (1.2 to 2) MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz	0.94 mV/V + 8.2 μ V 0.28 mV/V + 8.2 μ V 0.28 mV/V + 8.2 μ V 0.28 mV/V + 8.2 μ V 0.28 mV/V + 8.2 μ V 0.47 mV/V + 8.2 μ V 0.47 mV/V + 8.2 μ V 0.94 mV/V + 8.2 μ V 1.4 mV/V + 8.2 μ V 3.3 mV/V + 8.2 μ V	
AC High Voltage – Measure ¹	(10 to 20) kV (45 to 65) Hz	2.3 mV/V + 23 V	Comparison with High Voltage Meter and High Voltage Probe

Electrical – DC/Low Frequency

Ho Chi Minh City, Vietnam

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current Measure ¹	(0.001 to 20) A 45 Hz to 1 kHz (1 to 5) kHz (20 to 30) A 45 Hz to 1 kHz (1 to 5) kHz (30 to 1 000) A (45 to 400) Hz	0.29 mA/A + 2.1 mA 0.41 mA/A + 2.1 mA 2.1 mA/A + 3.2 mA 2.5 mA/A + 3.2 mA 2.9 mA/A + 100 mA	Comparison to Shunt with Multimeter
Inductance – Source ¹ (Fixed Artifacts)	100 Hz to 10 kHz 10 μ H 50 μ H 500 mH	2.2 nH 11 nH 0.11 mH	Comparison to Standard Inductors
Capacitance – Source ¹ (Fixed Artifacts)	100 Hz to 13 MHz 1 pF 10 pF 100 pF 1 000 pF 10 Hz to 200 kHz 1 nF 10 nF 100 nF 1 μ F 100 Hz to 1 kHz (10, 100, 1 000) μ F	0.58 mF/F + 0.000 058 pF 0.58 mF/F + 0.000 58 pF 0.58 mF/F + 0.005 8 pF 0.58 mF/F + 0.058 pF 0.23 mF/F + 0.058 pF 0.23 mF/F + 0.58 pF 0.23 mF/F + 5.8 pF 0.23 mF/F + 58 pF 3.6 mF/F	Comparison to Standard Capacitors
Capacitance Dissipation Factor – Source ⁵	(10, 100, 1 000) μ F 100 Hz to 1 kHz	0.000 67	Comparison to Standard Capacitors
Capacitance – Measure ^{1,2}	Up to 1 000 nF 100 kHz to 1 MHz (1 to 30) MHz	0.52 mF/F + 0.58R 0.96 mF/F + 0.58R	Comparison to Impedance Analyzer
Oscilloscope ¹ Square Wave Amplitude, < 10 kHz into 50 Ω or 1 M Ω Load Impedance	Up to 1 mVp-p (1 to 21) mVp-p (21 to 556) mVp-p 556 mVp-p to 210 Vp-p	10 mV/V + 10 μ V 1.5 mV/V + 20 μ V 1.5 mV/V + 1.2 μ V 1.3 mV/V + 1.2 μ V	Comparison to Oscilloscope Calibrator and Active Head
Oscilloscopes ¹ Horizontal Deflection (Time)	150 ps to 50 s	0.39 μ s/s	Comparison to Oscilloscope Calibrator and Active Head
Oscilloscopes ¹ Vertical Deflection (Amplitude)	Up to 50 Vp-p (50 to 100) Vp-p (100 to 200) Vp-p	250 μ V/V + 25 μ V 250 μ V/V + 26 μ V 250 μ V/V + 63 μ V	Comparison to Oscilloscope Calibrator and Active Head

Electrical – DC/Low Frequency

Ho Chi Minh City, Vietnam

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscopes – Bandwidth ¹	100 mHz to 50 GHz	2.1 % of reading	Comparison to Oscilloscope Calibrator w/Active Head, Power Sensor
Oscilloscopes ¹ Rise / Fall Time, (10 to 90) %	(0 to 1.25) s	1.3 ps	Comparison to Oscilloscope Calibrator with Calibration Head
Tesla Meter / Gauss Meter	500 G 5 000 G	1.2 % of reading 0.58 % of reading	Comparison to Reference Magnets
Moisture Meters	(7 to 25) % Moisture Content	0.26 % Moisture Content	Comparison to Resistance Standard
Phase – Measure ¹ (10 to 32) mV (10 to 100) mV 32 mV to 100 V 100 mV to 100 V (100 to 320) V	(0 to 360)° 1 Hz to 10 kHz (10 to 50) kHz 50 kHz to 100 MHz (1 to 10) Hz 10 Hz to 10 kHz (10 to 50) kHz (50 to 100) kHz 100 kHz to 10 MHz (1 to 10) Hz 10 Hz to 5 kHz	0.25° 0.43° 0.86° 0.13° 0.071° 0.071° 0.43° 0.43° 0.25° 0.13°	Comparison to Precision Phasemeter
Magnetic Flux Meter	10 mV Test Voltage (0.1 to 100) mWb 1 V Test Voltage (0.01 to 10) Wb	0.31 % of reading + 0.1 μWb 0.068 % of reading + 7μWb	Comparison to Standard Volt-Second Generator

Electrical – RF/Microwave

Ho Chi Minh City, Vietnam

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
RF Power Meter ¹ (Reference)	1 mW 50 MHz	0.78 % of reading	Comparison to Power Meter and Thermistor Mount

Electrical – RF/Microwave

Ho Chi Minh City, Vietnam

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
RF Power Meter ^{1,2} (Fixed Points)	(3, 10, 30, 100, 300) μ W (1, 3, 10, 30, 100) mW	0.37 % of Watts output + 0.58R	Comparison to Range Calibrator
RF Absolute Power – Measure ¹	(-70 to 44) dBm 9 kHz to 2 GHz (2 to 14) GHz (14 to 18) GHz (18 to 26.5) GHz (26.5 to 40) GHz (40 to 50) GHz	0.083 dB 0.097 dB 0.12 dB 0.2 dB 0.26 dB 0.36 dB	Comparison to Power Meter, Measuring Receiver and Power Sensors
RF Power – Source ¹	(-120 to 10) dBm Up to 250 kHz 250 kHz to 4 GHz (4 to 20) GHz (20 to 26.4) GHz	0.14 dB 0.11 dB 0.13 dB 0.16 dB	Comparison to Signal Generator / Synthesized Sweep Generator
Distortion – Measure ¹ 20 Hz to 22 kHz 20 Hz to 80 kHz 20 Hz to 250 kHz	40 kHz BW: -95 dB 80 kHz BW: -90 dB 250 kHz BW: -84 dB	0.016 dB 0.082 dB 0.24 dB	Comparison to Audio Analyzer
Digital Modulation – Measure ¹ For 2/3/4/5G Composite Rho ⁵	450 MHz to 26.5 GHz $\rho = (0.9 \text{ to } 1.0)$	0.001	Comparison to PSA Series Spectrum Analyzer, Signal Generator
Error Vector Magnitude (rms)	450 MHz to 26.5 GHz EVM = (0 to 25) %	0.3 % of reading	
Peak Code Domain Error	(-80 to 0) dB 450 MHz to 26.5 GHz	1.2 dB	
Phase error	450 MHz to 26.5 GHz (1 to 15)°	0.71°	

Electrical – RF/Microwave

Ho Chi Minh City, Vietnam

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Digital Modulation – Measure ¹ For 2/3/4/5G	3 Hz to 26.5GHz	0.21 μ Hz/Hz	Comparison to PSA Series Spectrum Analyzer, Signal Generator
Frequency Error	(-80 to 0) dB	1.2 dB	
I/Q Origin Offset	450 MHz to 26.5 GHz		
Channel Power	450 MHz to 26.5 GHz Power > -70 dBm	0.62 dB	
Amplitude Modulation – Source ¹	(11 to 13.5) MHz Rate: 20 Hz to 100 kHz Depth: 0% to 95%	0.13 % Depth	Comparison to AM/FM Test Source
	Depth: 95% to 99%	0.24 % Depth	
Frequency Modulation – Source ¹	(11 to 432) MHz Rate: 20 Hz to 100 kHz Deviations: $\leq$ 400 kHz	0.29 % Modulation	Comparison to AM/FM Test Source
Reflection S11 / S22 – Measure ¹	Magnitude (0 to 110) dB 45 MHz to 2 GHz (2 to 26.5) GHz Phase (-180 to 180) $^{\circ}$ 45 MHz to 2 GHz (2 to 20) GHz (20 to 26.5) GHz	0.55 dB 0.74 dB 0.33 $^{\circ}$ 0.74 $^{\circ}$ 2.3 $^{\circ}$	Comparison to Network Analyzer and Calibration Kits
Transmission S12 / S21 – Measure ¹	Magnitude (0 to 110) dB 45 MHz to 2 GHz (2 to 8) GHz (8 to 26.5) GHz Phase (-180 to 180) $^{\circ}$ 45 MHz to 2 GHz (2 to 20) GHz (20 to 26.5) GHz	0.074 dB 0.084 dB 0.093 dB 0.33 $^{\circ}$ 0.74 $^{\circ}$ 2.3 $^{\circ}$	Comparison to Network Analyzer and Calibration Kits
Coupling Decoupling Networks – CDNs ¹ Impedance Phase Angle Voltage Division Factor Isolation (Decoupling Factor)	15 kHz to 230 MHz (0.1 to 210) Ω (-360 to 360) $^{\circ}$ (-20 to 0) dB (-80 to 0) dB	1.8 % of reding 1.2 $^{\circ}$ 0.3 dB 2.5 dB	CISPR 16-1-2 IEC 6100-4-6 Comparison to Network Analyzer, Calibration Kit

Electrical – RF/Microwave

Ho Chi Minh City, Vietnam

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Line Impedance Stabilization Networks – LISNs ¹	9 kHz to 400 MHz		CISPR 16-1-2 ANSI C63.4
Impedance	(0.1 to 210) Ω	1.8 % of reading	
Phase Angle	(-360 to 360) $^{\circ}$	1.2 $^{\circ}$	
Voltage Division Factor	(-10 to 0) dB	0.34 dB	Comparison to Network Analyzer, Calibration Kit
Isolation (Decoupling Factor)	(-80 to 0) dB	2.5 dB	
Impedance Stabilization Networks – ISNs ¹	150 kHz to 230 MHz		CISPR 16-1-2
Impedance	(0.1 to 210) Ω	1.8 % of reading	
Phase Angle	(-360 to 360) $^{\circ}$	1.2 $^{\circ}$	
Voltage Division Factor	(-10 to 0) dB	0.3 dB	Comparison to Network Analyzer, Calibration Kit
Longitudinal Conversion Loss	(-85 to -20) dB	0.7 dB	
Isolation (Decoupling Factor)	(-80 to 0) dB	2.5 dB	

Length – Dimensional Metrology

Ho Chi Minh City, Vietnam

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Indicators Dial Gauge, Dial Test Indicator, LVDTs ^{1,2}	Up to 1 mm (1 to 100) mm	0.17 μ m (0.32 + 0.004 6 <i>l</i>) μ m + 0.58 <i>R</i>	Comparison to Universal Length Measuring Machine, Indicator Tester
Plain Plug Gages / Pin Gages / Thread Wires ^{1,2} (Cylindrical and Taper)	(0.001 to 300) mm	(0.19 + 0.002 <i>l</i>) μ m	Comparison to Universal Length Measuring Machine, High-Accuracy Micrometer, Gage Blocks
Plain Ring Gages ² (Cylindrical and Taper)	(1 to 300) mm	(0.22 + 0.001 7 <i>l</i>) μ m	Comparison to Universal Length Measuring Machine, Master Ring, Gage Block
Thread Plug Gages ² (Cylindrical and Taper) Simple Pitch Diameter	(0.001 to 150) mm	(1.4 + 0.007 <i>l</i>) μ m	Comparison to Universal Length Measuring Machine, High-Accuracy Micrometer, Gage Block, Thread Measuring Wires
Major Diameter	(0.001 to 150) mm	(0.22 + 0.001 9 <i>l</i>) μ m	
Thread Ring Gages ² (Cylindrical and Taper) Simple Pitch Diameter	(1 to 150) mm	(1.3 + 0.005 <i>l</i>) μ m	Comparison to Universal Length Measuring Machine, Gage Block, Master Ring Gage, Thread Calibration Standards
Minor Diameter	(1 to 150) mm	(0.33 + 0.002 7 <i>l</i>) μ m	

This Scope of Accreditation, version 064, was last updated on: 17 July 2026 and is valid only when accompanied by the Certificate.

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Length – Dimensional Metrology

Ho Chi Minh City, Vietnam

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Gage Block – Length ²	(0.1 to 100) mm	$(0.068 + 0.001\ 1l)\ \mu\text{m}$	Comparison to Gage block, Gage Block Comparator
Gage Block – Length ²	(0.1 to 100) mm (100 to 500) mm	$(0.08 + 0.001l)\ \mu\text{m}$ $(0.041 + 0.001\ 3l)\ \mu\text{m}$	Comparison to Gage block, Universal Length Measuring Machine
Surface Plates ^{1,2} Overall Flatness	(150 to 3 600) mmD	$(0.5 + 0.001\ 3D)\ \mu\text{m}$	Comparison to Differential Level Comparison to Repeat-o-meter
Local Area Flatness (Variation)	(0 to 0.13) mm	0.6 μm	
Setting Rod, Micrometer Standard, Length Standards ²	(0.1 to 500) mm	$(0.37 + 0.002\ 7l)\ \mu\text{m}$	Comparison to Gage block, Universal Length Measuring Machine
Ruler & Tape Measures ^{1,2}	Up to 1 000 mm (1 000 to 50 000) mm	$(15 + 0.007l)\ \mu\text{m}$ 0.022l μm	Comparison to Gage block, Standard Scale, Scale Loupe, Ruler Calibrator
Precision Level	Up to 1 mm/m (1 to 2) mm/m	0.85 % of reading + 3.5 $\mu\text{m}/\text{m}$ 1.8 % of reading	Comparison to Differential Level
Master Level / Electronic Inclinometer / Angle Meter	Up to 5 mm/m Up to 90° (4 Quadrant)	1.1 $\mu\text{m}/\text{m}$ 0.000 82°	Comparison to Sine Bar, Gage Block, Surface Plate
Bevel Protractor / Universal Bevel Protractor ¹	Up to 90° (4 Quadrant)	2'	Comparison to Standard Angle Block
Roughness Tester ¹	Up to 5 μm Ra Up to 15 μm Rz	0.056 μm Ra 0.4 μm Rz	Comparison to Roughness Standard
Sine Bar & Sine Plate ²	Up to 300 mm	$(0.15 + 0.002\ 1l)\ \mu\text{m}$	Comparison to Universal Length Measuring Machine, LVDT w/Amplifier, Granite Surface Plate, Granite, Square, Angle Block, Gage Block, Optical Flat, Precision Height Gauge
Optical Comparators and Vision Systems /Measuring Microscope ^{1,2} X, Y, Z Axis	Up to 50 mm (50 to 300) mm (300 to 1 000) mm	$(0.85 + 0.002\ 5l)\ \mu\text{m}$ $(0.7 + 0.007\ 3l)\ \mu\text{m}$ $(2 + 0.011l)\ \mu\text{m}$	Comparison to Standard Scales and Gage Blocks

Length – Dimensional Metrology

Ho Chi Minh City, Vietnam

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Check Master / Caliper Checker / Height Master / Riser Block ²			Comparison to Gage Blocks, Surface Plate
Block Pitch Accuracy	Up to 1 000 mm	$(0.54 + 0.001\ 1l)\ \mu\text{m}$	
Parallelism of Block	Up to 1 000 mm	0.55 μm	Electric Comparator, Linear Gage,
Micrometer Head Accuracy	Up to 25 mm	$(0.14 + 0.01l)\ \mu\text{m}$	Precision Height Gage
Calibration Tester / Dial Gauge Tester / Indicator Calibrator ²	Up to 25 mm	$(0.14 + 0.01l)\ \mu\text{m}$	Comparison to Linear Gage and Optical Flat
Coating Thickness Gauge ¹	Up to 5 000 μm	0.55 μm	Comparison to Calibration Foil
Thickness Gauge / Feeler Gauge ²	(0.001 to 25) mm	$(0.2 + 0.002\ 1l)\ \mu\text{m}$	Comparison to Universal Measuring Machine, High- Accuracy Micrometer, Gage Blocks
Standard Scale / Glass Scale ²	Up to 300 mm	$(0.7 + 0.002\ 4l)\ \mu\text{m}$	Comparison to Reference Standard Scale, Smart Scope
Coordinate Measuring Machine (CMM) ^{1,2}	X, Y, Z Axis Up to 1 000 mm	$(0.16 + 0.002\ 1l)\ \mu\text{m} + 0.58R$	Comparison to Gage Block, Step Gage, Master Ball

Mass and Mass Related

Ho Chi Minh City, Vietnam

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Rockwell Hardness Testers ¹	HRC (Low, Middle, High) HRBW (Low, Middle, High)	0.53 HRC 0.78 HRBW	Indirect Verification ISO 6508-2
Brinell Hardness Testers ¹	5 mm / 750 kgf 172 HBW 10 mm / 1 000 kgf 132 HBW 10 mm / 3 000 kgf 107 HBW 598 HBW	2.3 HBW 1.4 HBW 1.2 HBW 7.3 HBW	Indirect Verification per ASTM E10

Mass and Mass Related

Ho Chi Minh City, Vietnam

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Brinell Hardness Testers ^{1,2} Force Indentation	Up to 3 333 kgf (0.1 to 10) mm	0.21 % of reading + 0.031 kgf (2.6 + 0.094l) μ m	Direct Verification per ASTM E10
Vickers Hardness Tester ¹	232 HV1 550 HV10 712 HV30	3 HV 5.6 HV 4.6 HV	Indirect Verification ISO 6507-2
Hydrometer	(0.7 to 1.5) g/cm ³	0.000 17 g/cm ³	Comparison to Analytical Balance Standard Thermometer
Pressure Gage / Absolute & Differential & Vacuum Gauges, Transmitters ¹	(-14.5 to 5) psi (5 to 30) psi (30 to 300) psi (300 to 10 000) psi	0.034 % of reading + 0.58R 0.034 % of reading 0.035 % of reading 0.057 % of reading	Comparison to Pressure Calibrator & Pressure Module
Absolute Pressure Gages and Transmitters	Up to 10 Torr (10 to 100) Torr	0.058 Torr 0.04 % of reading + 0.052 Torr	Comparison to Standard Calibration System
Scales & Balances ^{1,3} (Platform & Spring)	(20 to 500) kg	0.000 5 % of reading	Comparison to Standard Weight
Mass (Weights)	(1 to 5) mg (5 to 10) mg (10 to 20) mg (20 to 50) mg (50 to 100) mg (100 to 200) mg (200 to 500) mg 500 mg to 1 g (1 to 2) g (2 to 5) g (5 to 10) g (10 to 20) g (20 to 50) g (50 to 100) g 100 g to 20 kg	0.003 2 mg 0.004 2 mg 0.005 2 mg 0.006 2 mg 0.008 2 mg 0.011 mg 0.013 mg 0.016 mg 0.021 mg 0.027 mg 0.034 mg 0.048 mg 0.078 mg 0.17 mg 3 μ g/g	Comparison to Standard Weight and Electronic Balance
Torque Tools ¹	Up to 50 cN·m 50 cN·m to 1 N·m (1 to 60) N·m (60 to 200) N·m (200 to 1 500) N·m	0.6 % of reading + 0.005 8 cN·m 0.3 % of reading + 0.000 58 N·m 0.3 % of reading + 0.000 58 N·m 0.4 % of reading + 0.005 8 N·m 0.68 % of reading + 0.058 N·m	Comparison to Torque Testers

Mass and Mass Related

Ho Chi Minh City, Vietnam

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Torque Testers ¹	Up to 10 N·m (10 to 50) N·m (50 to 200) N·m (200 to 500) N·m (500 to 1 500) N·m	0.16 % of reading + 0.005 8 N·m 0.048 % of reading 0.028 % of reading 0.031 % of reading 0.014 % of reading	Comparison to Torque Calibration Wheel with Standard Weight
Force and Load Cell ^{1,2} (Compression and Tension)	Up to 10 N (10 to 20) N (20 to 50) N (50 to 1 000) N	0.01 % of reading + 0.58R 0.007 4 % of reading 0.006 4 % of reading 0.006 2 % of reading	Comparison to Standard weights
	Up to 220 kN (220 to 440) kN	0.046 % of reading + 0.58 N 0.044 % of reading	Comparison to Load cell
Durometers ² Indenter Dimensions Length Angle Radius	Up to 12.7 mm Up to 35° Up to 12.7 mm	0.015 mm 0.039° (6.8 + 0.6 l) µm	Direct Verification per ASTM D2240-02b using Digital Microscope
Spring Force	Up to 5 000 gf	0.036 % of reading + 0.1 gf	Electronic Balance
Flow – Air ¹	(5 to 500) ml/min (0.5 to 100) L/min	0.82 % of reading 0.81 % of reading + 4 mL/min	Comparison to Flow Calibrators
Air Velocity	2.5 m/s 5 m/s 10 m/s 15 m/s	0.13 m/s 0.17 m/s 0.42 m/s 1 m/s	Comparison to Wind Tunnel

Photometry and Radiometry

Ho Chi Minh City, Vietnam

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Optical Power ¹ (Source & Measure) (800 to 1 000) nm (1 000 to 1 310) nm (1 310 to 1 700) nm	(-90 to 10) dB (-110 to 10) dB (-110 to 10) dB	2.9 % of reading 2.9 % of reading 2.9 % of reading	Comparison to Agilent optical test System
Laser Power – Measure (250 to 10 600) nm	100 mW to 20 W	2.4 % of reading	Comparison to Thermopile Sensor, Silicon Detector
Illuminance	(0.01 to 19 000) lux	1.2 % of reading	Comparison to Standard Light Meter

Photometry and Radiometry

Ho Chi Minh City, Vietnam

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
UV Meter/ Radiometer	(5 to 100) mW/cm ²	2.5 % of reading	Comparison to Standard UV/Radiometer
Color Meter Spectral Diffuse Reflectance			Comparison to Standard Color Plates
	White		
(380 to 425) nm	(80 to 90) %R	1.2 %R	
(425 to 500) nm	(90 to 95) %R	0.94 %R	
(500 to 780) nm	(95 to 98) %R	0.8 %R	
	Green		
(380 to 490) nm	(17 to 35) %R	0.47%R	
(490 to 525) nm	(35 to 48) %R	0.51%R	
(525 to 570) nm	(48 to 27) %R	0.51%R	
(570 to 670) nm	(27 to 18) %R	0.44%R	
(670 to 690) nm	(18 to 30) %R	0.49%R	
(690 to 700) nm	(30 to 46) %R	0.6%R	
(700 to 725) nm	(46 to 80) %R	1.1%R	
(725 to 780) nm	(80 to 87) %R	0.74%R	
	Deep Pink		
(380 to 425) nm	(33 to 30) %R	0.57%R	
(425 to 455) nm	(30 to 26) %R	0.51 %R	
(455 to 540) nm	(26 to 19) %R	0.45 %R	
(540 to 650) nm	(19 to 44) %R	0.48 %R	
(650 to 695) nm	(44 to 55) %R	0.51 %R	
(695 to 780) nm	(55 to 72) %R	0.64 %R	
	Yellow		
(380 to 450) nm	(11 to 19) %R	0.39 %R	
(450 to 495) nm	(19 to 35) %R	0.47 %R	
(495 to 540) nm	(35 to 68) %R	0.63 %R	
(540 to 780) nm	(68 to 90) %R	0.71 %R	

Photometry and Radiometry

Ho Chi Minh City, Vietnam

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Color Meter Spectral Diffuse Reflectance			Comparison to Standard Color Plates
	Cyan		
(380 to 415) nm	(47 to 57) %R	0.8 %R	
(415 to 525) nm	(57 to 70) %R	0.73 %R	
(525 to 565) nm	(70 to 40) %R	0.61 %R	
(565 to 675) nm	(40 to 30) %R	0.46 %R	
(675 to 700) nm	(30 to 69) %R	0.65 %R	
(700 to 710) nm	(69 to 80) %R	0.92 %R	
(710 to 780) nm	(80 to 90) %R	0.79 %R	
	Brown		
(380 to 580) nm	(11 to 29) %R	0.43 %R	
(580 to 660) nm	(29 to 44) %R	0.47 %R	
(660 to 780) nm	(44 to 65) %R	0.58 %R	
	Yellow - Green		
(380 to 480) nm	(13 to 28) %R	0.44 %R	
(480 to 535) nm	(28 to 57) %R	0.56 %R	
(535 to 565) nm	(57 to 41) %R	0.54 %R	
(565 to 610) nm	(41 to 32) %R	0.48 %R	
(610 to 690) nm	(32 to 52) %R	0.53 %R	
(690 to 780) nm	(52 to 86) %R	0.69 %R	
	Red		
(380 to 590) nm	(12 to 18) %R	0.4 %R	
(590 to 605) nm	(18 to 34) %R	0.57 %R	
(605 to 780) nm	(34 to 89) %R	0.71 %R	
	Purple		
(380 to 430) nm	(45 to 50) %R	0.7 %R	
(430 to 465) nm	(50 to 46) %R	0.58 %R	
(465 to 505) nm	(46 to 33) %R	0.56 %R	
(505 to 535) nm	(33 to 21) %R	0.47 %R	
(535 to 645) nm	(21 to 24) %R	0.42 %R	
(645 to 665) nm	(24 to 39) %R	0.48 %R	
(665 to 780) nm	(39 to 88) %R	0.69 %R	
	Orange		
(380 to 530) nm	(17 to 30) %R	0.45 %R	
(530 to 580) nm	(30 to 48) %R	0.5 %R	
(580 to 780) nm	(48 to 74) %R	0.63 %R	

Photometry and Radiometry

Ho Chi Minh City, Vietnam

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Color Meter 8° Colorimetric Data 2° and 10° Observers	White		Comparison to Standard Color Plates
	x: (0.31 to 0.46)	0.000 63	
	y: (0.32 to 0.41)	0.000 71	
	Y%: (95 to 97)	0.86	
	u': (0.20 to 0.27)	0.000 5	
	v': (0.46 to 0.53)	0.000 64	
	L*: (98.0 to 98.6)	0.34	
	a*: (-0.50 to 0.60)	0.13	
	b*: (2.82 to 2.93)	0.22	
	Green		
	x: (0.27 to 0.40)	0.000 57	
	y: (0.36 to 0.46)	0.000 82	
	Y%: (29 to 33)	0.3	
	u': (0.15 to 0.21)	0.000 52	
	v': (0.48 to 0.54)	0.000 69	
	L*: (61 to 64)	0.26	
	a*: (-32 to -25)	0.15	
	b*: (2.3 to 9.9)	0.21	
	Deep Pink		
	x: (0.35 to 0.50)	0.000 73	
	y: (0.31 to 0.40)	0.000 9	
	Y%: (29 to 33)	0.3	
	u': (0.23 to 0.30)	0.000 38	
	v': (0.46 to 0.53)	0.000 63	
	L*: (61 to 64)	0.24	
	a*: (16 to 18)	0.13	
	b*: (4 to 12)	0.21	
	Yellow		
	x: (0.41 to 0.52)	0.000 59	
	y: (0.42 to 0.45)	0.000 55	
	Y%: (65 to 74)	0.65	
	u': (0.22 to 0.30)	0.000 5	
	v': (0.52 to 0.55)	0.000 28	
	L*: (84 to 89)	0.31	
	a*: (-1.3 to 11.4)	0.15	
	b*: (56 to 59)	0.18	

Photometry and Radiometry

Ho Chi Minh City, Vietnam

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Color Meter 8° Colorimetric Data 2° and 10° Observers	Cyan		Comparison to Standard Color Plates
	x: (0.25 to 0.39)	0.000 62	
	y: (0.29 to 0.42)	0.000 87	
	Y%: (43 to 50)	0.46	
	u': (0.16 to 0.22)	0.000 45	
	v': (0.44 to 0.52)	0.000 57	
	L*: (72 to 76)	0.28	
	a*: (-24 to -19)	0.18	
	b*: (-19 to -11)	0.25	
	Brown		
	x: (0.36 to 0.51)	0.000 65	
	y: (0.33 to 0.40)	0.000 6	
	Y%: (26 to 29)	0.25	
	u': (0.22 to 0.30)	0.000 56	
	v': (0.48 to 0.53)	0.000 54	
	L*: (58 to 61)	0.24	
	a*: (9.6 to 15)	0.1	
	b*: (12 to 15)	0.14	
	Yellow - Green		
	x: (0.32 to 0.45)	0.000 59	
	y: (0.40 to 0.46)	0.000 72	
	Y%: (40 to 43)	0.39	
	u': (0.17 to 0.24)	0.000 54	
	v': (0.50 to 0.55)	0.000 48	
	L*: (69 to 72)	0.27	
	a*: (-24 to -13)	0.13	
	b*: (22 to 27)	0.18	
	Red		
	x: (0.43 to 0.59)	0.000 98	
	y: (0.31 to 0.36)	0.000 6	
	Y%: (19 to 25)	0.24	
	u': (0.29 to 0.39)	0.000 73	
	v': (0.48 to 0.53)	0.000 6	
	L*: (51 to 57)	0.24	
	a*: (35 to 46)	0.22	
	b*: (15 to 26)	0.23	

Photometry and Radiometry

Ho Chi Minh City, Vietnam

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Color Meter 8° Colorimetric Data 2° and 10° Observers	Purple		Comparison to Standard Color Plates
	x: (0.24 to 0.40)	0.000 76	
	y: (0.22 to 0.36)	0.000 7	
	Y%: (22 to 26)	0.24	
	u': (0.18 to 0.25)	0.000 62	
	v': (0.39 to 0.50)	0.000 66	
	L*: (54 to 58)	0.24	
	a*: (0.44 to 13)	0.22	
	b*: (-32 to -29)	0.26	
	Orange		
	x: (0.42 to 0.54)	0.000 55	
	y: (0.36 to 0.41)	0.000 63	
	Y%: (39 to 47)	0.42	
	u': (0.25 to 0.32)	0.000 42	
	v': (0.50 to 0.54)	0.000 49	
	L*: (68 to 74)	0.27	
	a*: (19 to 26)	0.12	
	b*: (30 to 39)	0.18	

Thermodynamic

Ho Chi Minh City, Vietnam

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Humidity Measuring Equipment, Transmitters ¹	(5 to 40) %RH (40 to 95) %RH	0.83 %RH 1.3 %RH	Compare with Temp. & Humidity Meter
Temperature Measure & Measuring Equipment / Transmitters ¹	(660 to 1 100) °C	0.88 °C	Comparison to SPRT, Thermocouple, Micro Bath, Dry-Well, Temperature Calibrator
Radiation (Infrared) Thermometers ¹	-18 °C (-18 to -10) °C (-10 to 0) °C (0 to 32) °C (32 to 50) °C (50 to 100) °C (100 to 150) °C (150 to 200) °C (200 to 300) °C (300 to 400) °C	1.1 °C 0.51 °C 0.45 °C 0.34 °C 0.4 °C 0.62 °C 1.1 °C 1.2 °C 1.7 °C 2.2 °C	Comparison to Blackbody Calibrator (cavity) $\epsilon = 0.95$, $\lambda = (8 \text{ to } 14) \mu\text{m}$

Thermodynamic

Ho Chi Minh City, Vietnam

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Chambers, System Calibration & Profiling ¹			
Temperature	(-80 to 400) °C	0.63 °C	Comparison to Datalogger with Thermocouple sensors
Humidity	(5 to 40) %RH (40 to 95) %RH	0.83 %RH 1.3 %RH	Relative humidity sensor

DIMENSIONAL MEASUREMENT

1 Dimensional

Ho Chi Minh City, Vietnam

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Linear Measurements ^{1,2}	Up to 100 mm	(0.056 + 0.002 8/) µm	Comparison to Gage block
	Up to 1 000 mm	(1.5 + 0.008/) µm	Comparison to Precision Rule, Standard Scale
Inspection Fixtures /Gages ² Straight Edges Thickness Pads	(0 to 500) mm	(0.12 + 0.003 8/) µm	Comparison to Universal Length Measuring Machine, Precision Height Gage, Electric Comparator, Linear Length Gage, Gage Block, Surface Plate, Smart Scope, Sine Bar, Differential Level, Granite Square
Inspection Fixtures Angle Blocks, V-Blocks, Riser Blocks, Straight Edges, Parallel Bars, Machine Squares, Precision Squares, Radius Gages, Chamfer Gages, Taper Gauges, Attribute Gages go/NoGo, Dedicated Fixture Gages	Up to 600 mm	(2.2 + 0.006/) µm	Comparison to Electronic Height Gage, Hand Tools, Electronic Comparator

1 Dimensional

Ho Chi Minh City, Vietnam

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Inspection Fixtures Angle Blocks, V-Blocks, Riser Blocks, Straight Edges, Parallel Bars, Machine Squares, Precision Squares, Radius Gages, Chamfer Gages, Taper Gauges, Attribute Gages go/NoGo, Dedicated Fixture Gages	Up to 600 mm	$(2.2 + 0.006l) \mu\text{m}$	Comparison to Universal Length Measuring Machine, Gage Blocks

2 Dimensional

Ho Chi Minh City, Vietnam

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Inspection Fixtures /Gages ² Angle Block Parallel Bars Machine Squares Precision Squares Radius Gauge Chamfer Gauge Taper Gauge Attribute Gages – GO / NOGO Dedicated Fixture Gages	Up to 500 mm	$(0.12 + 0.0038l) \mu\text{m}$	Comparison to Universal Length Measuring Machine, Precision Height Gage, Electric Comparator, Linear Length Gage, Gage Block, Surface Plate, Smart Scope, Sine Bar, Differential Level, Granite Square
Angle Block, V-Blocks, Riser Blocks, Straight Edges Parallel Bars, Machine Squares, Precision Squares Radius Gauge, Chamfer Gauge, Taper Gauge Attribute Gauges – Go/No-Go Dedicated Fixture Gauges	Length Up to 300 mm Angle Up to 360°	$(3.7 + 0.011l) \mu\text{m}$ 0.23 arc min	Comparison to Video Measuring Machine

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Calibration and Measurement Capability (CMC) is expressed in terms of the measurement parameter, measurement range, expanded uncertainty of measurement and reference standard, method, and/or equipment. The expanded uncertainty of measurement is expressed as the standard uncertainty of the measurement multiplied by a coverage factor of 2 ($k=2$), corresponding to a confidence level of approximately 95%.

Notes:

1. On-site calibration service is available for this parameter, since on-site conditions are typically more variable than those in the laboratory, larger measurement uncertainties are expected on-site than what is reported on the accredited scope.
2. D = diagonal length, f = frequency, L = length or diameter in inches, l = length or diameter in millimeters, P = power, R = resolution (or readability) of the unit under test, t = time in seconds, V = variation, W = applied weight; rpm = revolutions per minute.
3. The CMC for scales and balances is highly dependent upon the resolution of the unit under test. The uncertainties presented here do not include the resolution of the unit under test. The resolution will be included in the reported measurement uncertainty at the time of calibration.
4. The values of the solutions reflected in this scope of accreditation are the approximate reference value at a reference temperature of 25 °C as taken from the certificate of accreditation and will vary with change in temperature.
5. Unitless linear measure.
6. 1 mil = 0.001 inch., SpGr refers to specific gravity or relative density.
7. Adjustable threaded rings are adjusted for a tactile fit using threaded setting plug verified using a Universal Length Measuring Machine followed by a measurement of the minor diameter.
8. Nominal values are approximate. The actual values will be utilized at the time of calibration.



Jason Stine, Vice President

