



CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

WK Electric Co., Ltd.

68/242 Moo 5 Sawaipracharaj Rd., T.Ladsawai A.Lamlukka
Pathumthani, Thailand 12150

Fulfills the requirements of

ISO/IEC 17025:2017

In the fields of

CALIBRATION, DIMENSIONAL MEASUREMENT, and TESTING

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: 28 July 2027

Certificate Number: AC-2487



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

WK Electric Co., Ltd.

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CALIBRATION, DIMENSIONAL MEASUREMENT, AND TESTING

ISO/IEC 17025 Accreditation Granted: **28 July 2025**

Certificate Number: **AC-2487**

Certificate Expiry Date: **28 July 2027**

CALIBRATION

Acoustics and Vibration

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
¹ Sound Level Meter	1 kHz 94 dB 114 dB	0.26 dB 0.29 dB	Comparison to CEM SC-05 Sound Level Calibrator
Sound Level Calibrator	1 kHz 94 dB 114 dB	0.23 dB 0.26 dB	Comparison to CEM SC-05 Sound Level Calibrator
¹ Vibration @ Test Frequency 10 Hz to 10 kHz	Acceleration (RMS) Up to 2 m/s ² (> 2 to 5) m/s ² (> 5 to 10) m/s ² (> 10 to 50) m/s ² (> 50 to 100) m/s ² (> 100 to 200) m/s ² (> 200 to 300) m/s ² Velocity (RMS) Up to 2 mm/s (> 2 to 5) mm/s (> 5 to 10) mm/s (> 10 to 50) mm/s (> 50 to 100) mm/s (> 100 to 200) mm/s (> 200 to 300) mm/s	0.012 % of reading 0.029 % of reading 0.058 % of reading 0.29 % of reading 0.58 % of reading 1.2 % of reading 1.9 % of reading 0.012 % of reading 0.029 % of reading 0.058 % of reading 0.29 % of reading 0.58 % of reading 1.2 % of reading 1.9 % of reading	Comparison to 3-AXIS G Force Data Logger

Acoustics and Vibration

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
¹ Vibration @ Test Frequency 10 Hz to 10 kHz	Displacement (RMS) Up to 2 μm (> 2 to 5) μm (> 5 to 10) μm (> 10 to 50) μm (> 50 to 100) μm	0.012 % of reading 0.029 % of reading 0.058 % of reading 0.29 % of reading 0.58 % of reading	Comparison to 3-AXIS G Force Data Logger

Chemical Quantities

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
¹ pH Meter	2 pH 4 pH 6.86 pH 7 pH 9.18 pH 10 pH	0.017 pH 0.008 pH 0.008 pH 0.01 pH 0.01 pH 0.01 pH	Comparison to pH Buffer Solution,
¹ Conductivity Meter	5 $\mu\text{S/cm}$ 10 $\mu\text{S/cm}$ 84 $\mu\text{S/cm}$ 1 413 $\mu\text{S/cm}$ 5 000 $\mu\text{S/cm}$ 12 880 $\mu\text{S/cm}$ 50 000 $\mu\text{S/cm}$	0.19 $\mu\text{S/cm}$ 0.18 $\mu\text{S/cm}$ 0.69 $\mu\text{S/cm}$ 11 $\mu\text{S/cm}$ 39 $\mu\text{S/cm}$ 98 $\mu\text{S/cm}$ 379 $\mu\text{S/cm}$	Comparison to Buffer Solution, Conductivity Meter Standard
¹ Oxidation Reduction Potential (ORP)	Up to 500 mV	4 mV	Comparison to Data Acquisition/Switch Unit with ORP Probe
¹ Total Dissolved Solids (TDS)	10 mg/l 100 mg/l 500 mg/l 1 000 mg/l 1 500 mg/l	0.19 mg/l 0.5 mg/l 2.5 mg/l 3.6 mg/l 6 mg/l	Comparison to TDS Buffer Solution
^{1,3} Turbidity Meter	10 NTU 20 NTU 100 NTU 500 NTU 800 NTU 1 000 NTU	0.051 NTU 0.1 NTU 0.8 NTU 3 NTU 4 NTU 7 NTU	Comparison to Turbidity Standard Solution

Chemical Quantities

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
^{1,3} Refractometer	10 %Brix 20 %Brix 30 %Brix 40 %Brix 50 %Brix 60 %Brix	0.021 %Brix 0.05 %Brix 0.06 %Brix 0.07 %Brix 0.09 %Brix 0.09 %Brix	Comparison to Source Standard Solution
Particle Counter Meter	Air Flow Rate 28.3 lpm Counting Efficiency 0.3 µm 0.5 µm 1 µm 3 µm 5 µm 10 µm	0.12 lpm 5.9 % of reading 6.1 % of reading 6.1 % of reading 6.1 % of reading 6.1 % of reading 6.1 % of reading	Comparison to Flow Meter/Particle Counter/Mono-sized Polymer Microspheres
^{1,3} Gas Detector / Analyzer	Oxygen in Nitrogen (O ₂) 18 % Concentration Methane in Air (CH ₄) 2.5 % Concentration Hydrogen Sulfide in Air (H ₂ S) 0.002 5 % Concentration Carbon Monoxide in Air (CO) 0.01 % Concentration	1.2 % Concentration 1.3 % Concentration 0.000 58 % Concentration 0.000 16 % Concentration	Comparison to Gas Standard
² Ozone Detector Ozone Chamber Tester	Concentration Up to 1 µmol/mol (> 1 to 5) µmol/mol	0.09 µmol/mol 0.45 µmol/mol	Calibration Method by Comparison with Standard Ozone Detector
Breath Alcohol Tester	45 mg% 55 mg%	1.2 mg% 1.4 mg%	Comparison to Standard Alcohol Solutions
³ Dissolved Oxygen Meter	0 mg/l 8.4 mg/l 8.7 mg/l 9 mg/l	0.15 mg/l 0.33 mg/l 0.33 mg/l 0.33 mg/l	Zero Oxygen Solution and Compare with DO Reference Value
³ Salinity Meter, Salinity Refractometer	0.3 g/l 3 g/l 58.4 g/l 125 g/l	1.2 mg/l 12 mg/l 0.16 g/l 0.38 g/l	Comparison to Salinity Standard Solutions
Chlorine Meters	Up to 2 ppm Cl	0.07 ppm Cl	Comparison to Agilent 34970A Datalogger, ORP Probe

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
¹ Source DC Voltage	Up to 330 mV 330 mV to 3.3 V (3.3 to 33) V (33 to 330) V (330 to 1 020) V	47 μ V/V + 2.8 μ V 39 μ V/V + 5.7 μ V 39 μ V/V + 55 μ V 43 μ V/V + 0.55 mV 43 μ V/V + 1.7 mV	Comparison to Fluke 5502A Multiproduct Calibrator
¹ Source DC High Voltage	(50 to 1 000) V (1 to 6) kV	0.35 mV/V + 71 mV 0.69 mV/V + 60 mV	Comparison to Chroma 19052 Hipot Tester characterized with Vitretek 4700 Precision HV Meter
¹ Source DC Current	Up to 330 μ A (0.33 to 3.3) mA (3.3 to 33) mA (33 to 330) mA (0.33 to 1.1) A (1.1 to 3.3) A (3.3 to 11) A (11 to 20) A	0.12 mA/A + 16 nA 78 μ A/A + 39 nA 78 μ A/A + 0.19 μ A 78 μ A/A + 1.9 μ A 0.29 mA/A + 34 μ A 0.29 mA/A + 67 μ A 0.47 mA/A + 0.7 mA 0.78 mA/A + 0.82 mA	Comparison to Fluke 5502A Multiproduct Calibrator
¹ DC Current Clamp-On Ammeters	(0.165 to 1.7) A (1.7 to 17) A (17 to 55) A (55 to 150) A (150 to 550) A (550 to 1 025) A	78 μ A/A + 58 mA 78 μ A/A + 58 mA 0.29 mA/A + 58 mA 0.29 mA/A + 58 mA 0.47 mA/A + 58 mA 0.78 mA/A + 58 mA	Comparison to Fluke 5502A Multiproduct Calibrator, 50-turn Coil
¹ Source AC Voltage	(1 to 33) mV (10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz (33 to 330) mV (10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	1.2 mV/V + 16 μ V 0.78 mV/V + 16 μ V 1.2 mV/V + 16 μ V 1.6 mV/V + 16 μ V 2.7 mV/V + 26 μ V 7.8 mV/V + 47 μ V 0.39 mV/V + 20 μ V 0.24 mV/V + 20 μ V 0.55 mV/V + 20 μ V 0.78 mV/V + 33 μ V 1.8 mV/V + 1.3 mV 3.9 mV/V + 0.26 mV	Comparison to Fluke 5502A Multiproduct Calibrator

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
¹ Source AC Voltage	330 mV to 3.3 V (10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz (3.3 to 33) V (10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (33 to 330) V 45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz (330 to 1 020) V 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	1.7 mV/V + 0.15 mV 0.35 mV/V + 36 µV 0.93 mV/V + 36 µV 1.6 mV/V + 0.17 mV 2.8 mV/V + 1 mV 5.8 mV/V + 1.9 mV 1.7 mV/V + 0.16 mV 0.47 mV/V + 0.38 mV 0.93 mV/V + 0.17 mV 2.2 mV/V + 0.31 mV 2.8 mV/V + 1.1 mV 0.58 mV/V + 3.9 mV 0.93 mV/V + 8.8 mV 1.1 mV/V + 19 mV 0.58 mV/V + 47 mV 2.3 mV/V + 58 mV 2.3 mV/V + 0.29 V	Comparison to Fluke 5502A Multiproduct Calibrator
¹ Source AC High Voltage 50 Hz, 60 Hz	(50 to 1 000) V (1 to 3) kV (3 to 5) kV	0.12 mV/V + 0.14 V 0.35 mV/V + 0.61 V 0.58 mV/V + 0.61 V	Comparison to Chroma 19052 Hipot Tester characterized with Vitretek 4700 Precision HV Meter
¹ Source AC Current	(29 to 330) µA (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 (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	1.2 mA/A + 78 nA 0.97 mA/A + 78 nA 2.3 mA/A + 0.12 µA 6.2 mA/A + 0.16 µA 13 mA/A + 0.31 µA 0.97 mA/A + 0.13 µA 0.78 mA/A + 0.13 µA 1.6 mA/A + 0.17 µA 3.9 mA/A + 0.24 µA 7.8 mA/A + 0.47 µA	Comparison to Fluke 5502A Multiproduct Calibrator

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
¹ Source AC Current	(3.3 to 33) mA (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz (33 to 330) mA (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	0.7 mA/A + 1.7 μ A 0.31 mA/A + 1.7 μ A 0.62 mA/A + 1.7 μ A 1.6 mA/A + 2.4 μ A 3.1 mA/A + 3.2 μ A 0.7 mA/A + 17 μ A 0.31 mA/A + 17 μ A 0.78 mA/A + 39 μ A 1.6 mA/A + 78 μ A 3.1 mA/A + 0.16 mA 1.4 mA/A + 97 μ A 0.39 mA/A + 97 μ A 4.7 mA/A + 0.78 mA 20 mA/A + 3.9 mA 1.4 mA/A + 97 μ A 0.47 mA/A + 97 μ A 4.7 mA/A + 0.78 mA 20 mA/A + 3.9 mA 0.47 mA/A + 1.7 mA 0.78 mA/A + 1.7 mA 24 mA/A + 1.7 mA	Comparison to Fluke 5502A Multiproduct Calibrator
	(11 to 20.5) A (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.39 mA/A + 3.9 mA 1.2 mA/A + 3.9 mA 24 mA/A + 3.9 mA	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
¹ Source AC Current Clamp-On Ammeters	(0.165 to 1.7) A		Comparison to Fluke 5502A Multiproduct Calibrator, 50-turn Coil
	45 Hz to 65 Hz	2.2 mA/A + 58 mA	
	> 65 Hz to 400 Hz	6.1 mA/A + 58 mA	
	(1.7 to 17) A		
	45 Hz to 65 Hz	2.2 mA/A + 58 mA	
	> 65 Hz to 400 Hz	6.1 mA/A + 58 mA	
	(17 to 55) A		
	45 Hz to 65 Hz	2.2 mA/A + 61 mA	
	> 65 Hz to 400 Hz	6.1 mA/A + 61 mA	
	(55 to 150) A		
¹ Source Resistance (Simulation)	45 Hz to 65 Hz	2.2 mA/A + 61 mA	Comparison to Fluke 5502A Multiproduct Calibrator (4-wire Mode)
	> 65 Hz to 400 Hz	6.1 mA/A + 61 mA	
	(150 to 550) A		
	45 Hz to 65 Hz	2.2 mA/A + 91 mA	
	> 65 Hz to 400 Hz	6.2 mA/A + 97 mA	
	(550 to 1025) A		
	45 Hz to 65 Hz	2.4 mA/A + 91 mA	
	> 65 Hz to 400 Hz	6.2 mA/A + 97 mA	
¹ Source Resistance (Simulation)	Up to 11 Ω	0.19 m Ω / Ω + 1.9 m Ω	Comparison to Fluke 5502A Multiproduct Calibrator (4-wire Mode)
	(11 to 33) Ω	0.19 m Ω / Ω + 2.8 m Ω	
	(33 to 110) Ω	0.14 m Ω / Ω + 6.8 m Ω	
	(110 to 330) Ω	0.14 m Ω / Ω + 21 m Ω	
	(0.33 to 1.1) k Ω	0.14 m Ω / Ω + 65 m Ω	
	(1.1 to 3.3) k Ω	0.14 m Ω / Ω + 0.21 Ω	
	(3.3 to 11) k Ω	0.14 m Ω / Ω + 0.65 Ω	
	(11 to 33) k Ω	0.14 m Ω / Ω + 2.1 Ω	
¹ Source Resistance (Simulation)	(33 to 110) k Ω	0.17 m Ω / Ω + 6.5 Ω	Comparison to Fluke 5502A Multiproduct Calibrator (Comp. Off, 2-wire Mode)
	(110 to 330) k Ω	0.19 m Ω / Ω + 6.6 Ω	
	(0.33 to 1.1) M Ω	0.23 m Ω / Ω + 65 Ω	
	(1.1 to 3.3) M Ω	0.23 m Ω / Ω + 0.12 k Ω	
	(3.3 to 11) M Ω	0.93 m Ω / Ω + 0.66 k Ω	
	(11 to 33) M Ω	1.6 m Ω / Ω + 5.6 k Ω	
	(33 to 110) M Ω	7.8 m Ω / Ω + 59 k Ω	
	(110 to 330) M Ω	7.8 m Ω / Ω + 0.17 M Ω	
	(330 to 1 100) M Ω	23 m Ω / Ω + 0.79 M Ω	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
¹ Source Resistance (Variable Artifacts)	(1 to 9) Ω (10 to 99) Ω (100 to 999) Ω (1 to 9.999) k Ω (10 to 99.999) k Ω (100 k Ω to 999.999) k Ω (1 to 9.999) M Ω (10 to 99.999) M Ω	12 m Ω/Ω + 5.8 $\mu\Omega$ 5.8 m Ω/Ω + 5.8 $\mu\Omega$ 1.2 m Ω/Ω + 58 $\mu\Omega$ 1.2 m Ω/Ω + 0.58 m Ω 1.2 m Ω/Ω + 5.8 m Ω 1.2 m Ω/Ω + 58 m Ω 1.2 m Ω/Ω + 0.58 Ω 12 m Ω/Ω + 5.8 Ω	Comparison to Yokogawa 2793-01 Decade Resistance Box, Time Electronics 1040 Decade Resistance Box
¹ Source DC Power 33 mV to 1 020 V, 330 mA to 20 A	(0.108 9 to 1.088 7) W (1.089 to 10.89) W (10.9 to 32.9) W (33 to 329) W (0.33 to 1.09) kW (1.1 to 2.9) kW (3.0 to 10.9) kW (11 to 20) kW	87 μ W/W + 0.58 μ W 88 μ W/W + 0.7 μ W 88 μ W/W + 1.3 μ W 88 μ W/W + 5.9 μ W 0.3 μ W/W + 58 mW 0.3 μ W/W + 58 mW 0.47 μ W/W + 58 mW 0.78 μ W/W + 58 mW	Comparison to Fluke 5502A Multiproduct Calibrator
¹ Source DC Power 33 mV to 1 020 V, 330 mA to 20 A	(16.5 to 54.9) kW (55 to 149.9) kW (150 to 549.9) kW (0.55 to 1) MW	0.3 μ W/W + 5.8 W 0.3 μ W + 5.8 W 0.47 μ W + 5.8 W 0.47 mW/W + 58 W	Comparison to Fluke 5502A Multiproduct Calibrator, 50-turn Coil
¹ Source AC Power (45 to 65) Hz, 330 mV to 1 020 V, PF = 1	(0.018 9 to 1.089) W (> 0.089 to 10.9) W (> 10.9 to 33) W (> 33 to 330) W (> 0.33 to 1.1) kW (> 1.1 to 3) kW (> 3 to 11) kW (> 11 to 20) kW	0.39 mW/W + 74 μ W 0.39 mW/W + 0.58 mW 0.5 mW/W + 16 mW 0.5 mW/W + 17 mW 0.55 μ W/W + 60 mW 0.61 μ W/W + 60 mW 0.61 μ W/W + 74 mW 1 μ W/W + 0.5 W	Comparison to Fluke 5502A Multiproduct Calibrator
¹ Source AC Power (45 to 65) Hz, 330 mV to 1 020 V, PF = 1	(0.545 to 1.65) kW (> 1.65 to 16.5) kW (> 16.5 to 55) kW (> 55 to 150) kW (150 to 550) kW (0.55 to 1) MW	3.2 mW/W + 60 mW 3.2 mW/W + 0.58 W 3.2 mW/W + 5.8 W 3.2 mW/W + 5.8 W 3.2 mW/W + 5.8 W 3.2 mW/W + 58 W	Comparison to Fluke 5502A Multiproduct Calibrator, 50-turn Coil

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
¹ Source Capacitance (Simulation)			Comparison to Fluke 5502A Multiproduct Calibrator
10 Hz to 10 kHz	(0.22 to 1.099) nF	3.9 mF/F + 7.8 pF	
10 Hz to 3 kHz	(1.1 to 3.299 9) nF	3.9 mF/F + 9.7 pF	
10 Hz to 1 kHz	(3.3 to 10.999) nF	1.9 mF/F + 9.7 pF	
10 Hz to 1 kHz	(11 to 32.999) nF	1.9 mF/F + 59 pF	
10 Hz to 1 kHz	(33 to 109.99) nF	1.9 mF/F + 59 pF	
10 Hz to 1 kHz	(110 to 329.99) nF	1.9 mF/F + 0.24 nF	
10 Hz to 600 Hz	(0.33 to 1.099 9) μ F	1.9 mF/F + 0.97 nF	
10 Hz to 300 Hz	(1.1 to 3.299 9) μ F	1.9 mF/F + 6.2 nF	
10 Hz to 150 Hz	(3.3 to 10.999) μ F	1.9 mF/F + 9.7 nF	
(10 to 120) Hz	(11 to 32.999) μ F	3.1 mF/F + 63 nF	
(10 to 80) Hz	(33 to 109.99) μ F	3.5 mF/F + 97 nF	
DC to 50 Hz	(110 to 329.99) μ F	3.5 mF/F + 0.24 μ F	
DC to 20 Hz	(0.33 to 1.099 9) mF	3.5 mF/F + 0.97 μ F	
DC to 6 Hz	(1.1 to 3.2999) mF	3.5 mF/F + 6.2 μ F	
DC to 2 Hz	(3.3 to 10.999) mF	3.5 mF/F + 9.7 μ F	
DC to 0.6 Hz	(11 to 32.999) mF	5.8 mF/F + 63 μ F	
DC to 0.2 Hz	(33 to 110) mF	8.5 mF/F + 97 μ F	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
¹ Source Electrical Simulation of Thermocouple Indicating Devices	Type K		Comparison to Fluke 5502A Multiproduct Calibrator
	(-200 to -100) °C	0.26 °C	
	(-100 to -25) °C	0.15 °C	
	(-25 to 120) °C	0.14 °C	
	(120 to 1 000) °C	0.21 °C	
	(1 000 to 1 372) °C	0.32 °C	
	Type T		
	(-250 to -150) °C	0.49 °C	
	(-150 to 0) °C	0.2 °C	
	(0 to 120) °C	0.14 °C	
	(120 to 400) °C	0.12 °C	
	Type J		
	(-210 to -100) °C	0.21 °C	
	(-100 to -30) °C	0.13 °C	
	(-30 to 150) °C	0.12 °C	
¹ Source Electrical Simulation of Thermocouple Indicating Devices	(150 to 760) °C	0.14 °C	
	(760 to 1 200) °C	0.18 °C	
	Type E		
	(-250 to -100) °C	0.39 °C	
	(-100 to -25) °C	0.13 °C	
	(-25 to 350) °C	0.12 °C	
	(350 to 650) °C	0.13 °C	
	(650 to 1 000) °C	0.17 °C	
	Type R, S		
	(0 to 250) °C	0.44 °C	
	(250 to 400) °C	0.28 °C	
	(400 to 1 000) °C	0.26 °C	
	(1 000 to 1 767) °C	0.31 °C	
	Type N		
	(-200 to -100) °C	0.32 °C	
	(-100 to -25) °C	0.19 °C	
	(-25 to 120) °C	0.17 °C	
	(120 to 410) °C	0.17 °C	
	(410 to 1 300) °C	0.23 °C	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
¹ Source Electrical Simulation of RTD Indicating Devices	Pt385 (100 Ω) (-200 to -80) $^{\circ}\text{C}$ (-80 to 0) $^{\circ}\text{C}$ (0 to 100) $^{\circ}\text{C}$ (100 to 300) $^{\circ}\text{C}$ (300 to 400) $^{\circ}\text{C}$ (400 to 630) $^{\circ}\text{C}$ (630 to 800) $^{\circ}\text{C}$	0.078 $^{\circ}\text{C}$ 0.078 $^{\circ}\text{C}$ 0.11 $^{\circ}\text{C}$ 0.14 $^{\circ}\text{C}$ 0.16 $^{\circ}\text{C}$ 0.19 $^{\circ}\text{C}$ 0.36 $^{\circ}\text{C}$	Comparison to Fluke 5502A Multiproduct Calibrator (4-wire Mode)
¹ Measure Electrical Simulation of Thermocouple Indicating Devices (Without Cold Junction Compensation)	Type K (-200 to -100) $^{\circ}\text{C}$ (-100 to -25) $^{\circ}\text{C}$ (-25 to 120) $^{\circ}\text{C}$ (120 to 1 000) $^{\circ}\text{C}$ (1 000 to 1 372) $^{\circ}\text{C}$ Type T (-250 to -150) $^{\circ}\text{C}$ (-150 to 0) $^{\circ}\text{C}$ (0 to 120) $^{\circ}\text{C}$ (120 to 400) $^{\circ}\text{C}$ Type J (-210 to -100) $^{\circ}\text{C}$ (-100 to -30) $^{\circ}\text{C}$ (-30 to 150) $^{\circ}\text{C}$ (150 to 760) $^{\circ}\text{C}$ (760 to 1 200) $^{\circ}\text{C}$ Type E (-250 to -100) $^{\circ}\text{C}$ (-100 to -25) $^{\circ}\text{C}$ (-25 to 350) $^{\circ}\text{C}$ (350 to 650) $^{\circ}\text{C}$ (650 to 1 000) $^{\circ}\text{C}$	0.44 $^{\circ}\text{C}$ 0.37 $^{\circ}\text{C}$ 0.37 $^{\circ}\text{C}$ 0.35 $^{\circ}\text{C}$ 0.35 $^{\circ}\text{C}$ 0.44 $^{\circ}\text{C}$ 0.35 $^{\circ}\text{C}$ 0.35 $^{\circ}\text{C}$ 0.35 $^{\circ}\text{C}$ 0.35 $^{\circ}\text{C}$ 0.34 $^{\circ}\text{C}$ 0.34 $^{\circ}\text{C}$ 0.34 $^{\circ}\text{C}$ 0.34 $^{\circ}\text{C}$ 0.56 $^{\circ}\text{C}$ 0.51 $^{\circ}\text{C}$ 0.5 $^{\circ}\text{C}$ 0.5 $^{\circ}\text{C}$ 0.5 $^{\circ}\text{C}$	Comparison to Agilent 3458A Opt 002 8.5 Digit Multimeter
¹ Measure Electrical Simulation of Thermocouple Indicating Devices (Without Cold Junction Compensation)	Type R, S (0 to 250) $^{\circ}\text{C}$ (250 to 400) $^{\circ}\text{C}$ (400 to 1 000) $^{\circ}\text{C}$ (1 000 to 1 767) $^{\circ}\text{C}$	0.5 $^{\circ}\text{C}$ 0.5 $^{\circ}\text{C}$ 0.49 $^{\circ}\text{C}$ 0.5 $^{\circ}\text{C}$	Comparison to Agilent 3458A Opt 002 8.5 Digit Multimeter

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
¹ Measure Electrical Simulation of RTD Indicating Devices	PT385 (100Ω) (-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C (630 to 800) °C	0.082 °C 0.082 °C 0.1 °C 0.11 °C 0.12 °C 0.13 °C 0.25 °C	Comparison to Agilent 3458A Opt 002 8.5 Digit Multimeter (4-wire Mode)
¹ Source AC Voltage Wide Band	35 mV to 5 V < 100 kHz to 1 MHz (1 to 15) MHz	1.5 % of reading + 2 mV 2 % of reading + 2 mV	Comparison to HP 33120A Function Generator
¹ Source Inductance ≤ 1 kHz (Variable Artifact)	(1 to 10) μH (10 to 100) μH 100μH to 1 mH (1 to 10) mH (10 to 100) mH 100 mH to 1H (1 to 10) H	0.29 μH 2.9 μH 29 μH 0.29 mH 2.9 mH 29 mH 0.29 H	Comparison to MCP BXL-70 Decade Inductor
¹ Measure Inductance	(45 to 100) Hz (> 100 to 1 000) μH (> 1 to 10) mH (> 10 to 100) mH (> 0.1 to 1) H (> 1 to 10) H (>0.1 to 1) kHz Up to 100 μH (> 100 to 1 000) μH (> 1 to 10) mH (> 10 to 100) mH (> 0.1 to 1) H (> 1 to 10) H (>1 to 10) kHz Up to 100 μH (> 100 to 1 000) μH (> 1 to 10) mH (> 10 to 100) mH	0.58 mH/H + 5.7 μH 0.58 mH/H + 17 μH 0.58 mH/H + 0.13 mH 0.58 mH/H + 1.3 mH 0.58 mH/H + 12 mH 0.58 mH/H + 0.11 μH 0.58 mH/H + 0.27 μH 0.58 mH/H + 2.3 μH 0.58 mH/H + 25 μH 0.58 mH/H + 0.25 mH 0.58 mH/H + 3.1 mH 0.58 mH/H + 0.15 μH 0.58 mH/H + 1.6 μH 0.58 mH/H + 6.4 μH 0.58 mH/H + 73 μH	Comparison to Hioki IM3533 LCR Meter

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
¹ Measure DC Voltage	Up to 100 mV 100 mV to 1 V (1 to 10) V (10 to 100) V 100 V to 1 kV	11 μ V/V + 0.78 μ V 9.4 μ V/V + 3.6 μ V 9.4 μ V/V + 8.2 μ V 12 μ V/V + 58 μ V 12 μ V/V + 0.59 mV	Comparison to Agilent 3458A Opt 002 8.5 Digit Multimeter
¹ Measure DC High Voltage	Up to 1 kV (1 to 2) kV (2 to 3) kV (3 to 4) kV (4 to 5) kV (5 to 6) kV (6 to 7) kV (7 to 8) kV (8 to 9) kV (9 to 10) kV	1.2 V 1.3 V 1.4 V 1.5 V 1.6 V 1.6 V 1.7 V 1.8 V 1.9 V 2 V	Comparison to Vitretek 4700 Precision High Voltage Meter
¹ Measure DC High Voltage	(1 to 5) kV (> 5 to 10) kV (> 10 to 20) kV (> 20 to 30) kV (> 30 to 40) kV (> 40 to 50) kV (> 50 to 60) kV (> 60 to 70) kV	1.7 V 2.2 V 14 V 15 V 17 V 18 V 22 V 24 V	Comparison to Vitretek 4700 Precision High Voltage Meter, Vitretek HVL-70 High Voltage Benchtop Probe
¹ Measure DC Current	Up to 100 nA 100 nA 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	40 nA/A + 6 pA 30 nA/A + 6 pA 30 nA/A + 6 pA 20 μ A/A + 0.6 nA 30 μ A/A + 5.8 nA 30 μ A/A + 58 nA 50 μ A/A + 0.6 μ A 0.13 mA/A + 13 μ A	Comparison to Agilent 3458A Opt 002 8.5 Digit Multimeter
¹ Measure DC Current	Up to 75 A (75 to 1 000) A	40 μ A/A + 13 mA 40 μ A/A + 13 mA	Comparison to Agilent 3458A Opt 002 8.5 Digit Multimeter, Yokogawa 2215-10 Shunt

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
¹ Measure AC Voltage	(1 to 10) mV (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	90 μ V/V + 3.6 μ V 80 μ V/V + 1.4 μ V 90 μ V/V + 1.4 μ V 0.14 mV/V + 1.4 μ V 0.59 mV/V + 1.4 μ V 4.6 mV/V + 2.4 μ V	Comparison to HP 3458A Opt 002 8.5 Digit Multimeter
¹ Measure AC Voltage	100 mV to 10 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 (1 to 2) MHz (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 V to 1 kV (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	80 μ V/V + 23.2 μ V 80 μ V/V + 23.2 μ V 80 μ V/V + 23.2 μ V 90 μ V/V + 23.2 μ V 0.12 mV/V + 23.2 μ V 0.36 mV/V + 28.9 μ V 1.2 mV/V + 28.9 μ V 1.7 mV/V + 28.9 μ V 30 μ V/V + 4.7 μ V 30 μ V/V + 2.4 μ V 30 μ V/V + 2.4 μ V 50 μ V/V + 2.4 μ V 0.14 mV/V + 2.4 μ V 0.47 mV/V + 12 μ V 1.7 mV/V + 12 μ V 50 μ V/V + 24 mV 50 μ V/V + 13 mV 70 μ V/V + 13 mV 0.14 mV/V + 13 mV 0.35 mV/V + 13 mV	Comparison to Agilent 3458A Opt 002 8.5 Digit Multimeter
¹ Measure AC High Voltage	Up to 1 kV (1 to 2) kV (2 to 3) kV (3 to 4) kV (4 to 5) kV (5 to 6) kV (6 to 7) kV (7 to 8) kV (8 to 9) kV (9 to 10) kV	1.2 V 1.9 V 2 V 2.3 V 2.6 V 2.9 V 3.3 V 3.6 V 4 V 4.3 V	Comparison to Vitretek 4700 Precision High Voltage Meter

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
¹ Measure AC High Voltage (50 to 60) Hz	(1 to 5) kV (> 5 to 10) kV (> 10 to 20) kV (> 20 to 30) kV (> 30 to 40) kV (> 40 to 50) kV	4.5 V 5.3 V 11 V 22 V 35 V 53 V	Comparison to Vitrek 4700 Precision High Voltage Meter, Vitrek HVL-70 High Voltage Benchtop Probe
¹ Measure AC Current	Up to 100 μ A (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 1 kHz 100 μ A 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	0.47 mA/A + 36 nA 0.18 mA/A + 36 nA 70 μ A/A + 36 nA 70 μ A/A + 36 nA 0.47 mA/A + 36 μ A 0.18 mA/A + 24 μ A 70 μ A/A + 24 μ A 40 μ A/A + 24 μ A 70 μ A/A + 24 μ A 0.47 mA/A + 47 μ A 0.64 mA/A + 0.17 mA 0.47 mA/A + 0.24 mA 0.19 mA/A + 0.24 mA 0.1 mA/A + 0.24 mA 0.2 mA/A + 0.24 mA 0.35 mA/A + 0.24 mA 1.2 mA/A + 0.47 mA	Comparison to Agilent 3458A Opt 002 8.5 Digit Multimeter
¹ Measure AC Current	(1 to 30) A (50 to 60) Hz (1 to 5) kHz	10 μ A/A + 10 μ A 0.1 mA/A + 0.24 mA	Comparison to Agilent 3458A Opt 002 8.5 Digit Multimeter, Agilent 34330A Current Shunt
¹ Measure AC Cutoff Current (50 to 60) Hz	Up to 0.5 mA (> 0.5 to 1) mA (> 1 to 2) mA (> 2 to 5) mA (> 5 to 10) mA (> 10 to 20) mA (> 20 to 50) mA (> 50 to 100) mA (> 100 to 400) mA	6.9 mA/A + 0.62 μ A 6.9 mA/A + 0.82 μ A 6.9 mA/A + 0.82 μ A 6.9 mA/A + 5.8 μ A 6.9 mA/A + 24 μ A 6.9 mA/A + 24 μ A 6.9 mA/A + 24 μ A 6.9 mA/A + 82 μ A 6.9 mA/A + 82 μ A	Comparison to Agilent 3458A Opt 002 8.5 Digit Multimeter, Fluke 289 Digital Multimeter, Resistance Box 83903

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
¹ Measure DC Cutoff Current	Up to 0.5 mA > 0.5 to 1) mA > 1 to 2) mA > 2 to 5) mA > 5 to 10) mA > 10 to 20) mA > 20 to 50) mA > 50 to 100) mA > 100 to 400) mA	0.87 mA/A + 0.62 μ A 0.87 mA/A + 0.63 μ A 0.87 mA/A + 0.63 μ A 0.87 mA/A + 5.8 μ A 0.58 mA/A + 13 μ A 0.58 mA/A + 13 μ A 0.58 mA/A + 13 μ A 1.7 mA/A + 63 μ A 1.7 mA/A + 63 μ A	Comparison to Agilent 3458A Opt 002 8.5 Digit Multimeter, Fluke 289 Digital Multimeter, Resistance Box 83903
Watt Hour Meter – AC Power (Single-Phase)	Up to 0.22 kw-h > 0.22 to 1.32 kw-h > 1.32 to 2.2 kw-h > 2.2 to 2.64 kw-h > 2.64 to 4.4 kw-h > 4.4 to 6.6 kw-h > 6.6 to 8.8 kw-h > 8.8 to 13.3 kw-h > 13.2 to 22 kw-h > 22 to 26.4 kw-h > 26.4 to 35.2 kw-h > 35.2 to 44 kw-h > 44 to 52.8 kw-h > 52.8 to 66 kw-h > 66 to 70.4 kw-h > 70.4 to 110 kw-h > 110 to 132 kw-h > 132 to 176 kw-h	0.008 kw-h 0.01 kw-h 0.018 kw-h 0.024 kw-h 0.034 kw-h 0.05 kw-h 0.067 kw-h 0.26 kw-h 0.27 kw-h 0.28 kw-h 0.30 kw-h 0.32 kw-h 0.42 kw-h 0.50 kw-h 0.55 kw-h 1.3 kw-h 1.4 kw-h 1.4 kw-h	Comparison to Kyoritsu KEW 6315 Power Quality Analyzer

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Watt Hour Meter – AC Power (Three-Phase)	Up to 0.38 kw-h > 0.38 to 2.28 kw-h > 2.28 to 3.8 kw-h > 3.8 to 4.56 kw-h > 4.56 to 7.6 kw-h > 7.6 to 15.2 kw-h > 15.2 to 22.8 kw-h > 22.8 to 30.4 kw-h > 30.4 to 38 kw-h > 38 to 45.6 kw-h > 45.6 to 60.8 kw-h > 60.8 to 76 kw-h > 76 to 91.2 kw-h > 91.2 to 121.6 kw-h > 121.6 to 152 kw-h > 152 to 190 kw-h > 190 to 228 kw-h > 228 to 304 kw-h	0.011 kw-h 0.019 kw-h 0.028 kw-h 0.035 kw-h 0.054 kw-h 0.26 kw-h 0.27 kw-h 0.29 kw-h 0.31 kw-h 0.33 kw-h 0.44 kw-h 0.53 kw-h 0.61 kw-h 1.3 kw-h 1.4 kw-h 1.5 kw-h 1.6 kw-h 2.1 kw-h	Comparison to Kyoritsu KEW 6315 Power Quality Analyzer
¹ Measure Resistance	Up 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	18 $\mu\Omega/\Omega$ + 13 $\mu\Omega$ 14 $\mu\Omega/\Omega$ + 0.7 m Ω 12 $\mu\Omega/\Omega$ + 1.2 m Ω 12 $\mu\Omega/\Omega$ + 12 m Ω 12 $\mu\Omega/\Omega$ + 0.13 Ω 18 $\mu\Omega/\Omega$ + 2.6 Ω 58 $\mu\Omega/\Omega$ + 0.12 k Ω 0.58 m Ω/Ω + 12 k Ω 5.8 m Ω/Ω + 1.2 M Ω	Comparison to Agilent 3458A Opt 002 8.5 Digit Multimeter
¹ Source Capacitance @ 1 kHz (Fixed Artifacts)	1 pF 10 pF 100 pF 1 000 pF 10 nF 100 nF	1.2 fF 12 fF 0.12 pF 1.2 pF 5.8 pF 58 pF	Comparison to Hewlett Packard 16380A Air Capacitor Set consisting of 16381A, 16382A, 16383A, and 16384A
¹ Source Capacitance Algorithmic Deviation (Fixed Artifacts) (1 to 3) MHz (1 to 13) MHz (1 to 13) MHz (1 to 13) MHz	1 pF 10 pF 100 pF 1 000 pF	1.2 fF 12 fF 0.12 pF 1.2 pF	Comparison to Hewlett Packard 16380A Air Capacitor Set consisting of 16381A, 16382A, 16383A, and 16384A

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
¹ Capacitance Measure	(50 to 100) Hz		Comparison to Hioki IM3533 LCR Meter
	100 pF	0.58 mF/F + 19 fF	
	1 nF	0.58 mF/F + 0.19 pF	
	10 μF	0.58 mF/F + 18 nF	
	100 μF	0.58 mF/F + 0.24 μF	
	1 mF	0.58 mF/F + 4.2 μF	
	10 mF	0.58 mF/F + 0.2 mF	
	(> 100 to 120) Hz		
	10 pF	0.58 mF/F + 2.4 fF	
	100 pF	0.58 mF/F + 19 fF	
	1 nF	0.58 mF/F + 0.19 pF	
	10 nF	0.58 mF/F + 2.2 pF	
	100 nF	0.58 mF/F + 21 pF	
	1 μF	0.58 mF/F + 0.21 nF	
	10 μF	0.58 mF/F + 18 nF	
	100 μF	0.58 mF/F + 0.24 μF	
	1 mF	0.58 mF/F + 5.2 μF	
	10 mF	0.58 mF/F + 0.2 mF	
	120 Hz to 1 kHz		
	1 pF	0.58 mF/F + 0.84 fF	
	10 pF	0.58 mF/F + 2.4 fF	
	100 pF	0.58 mF/F + 19 fF	
	1 nF	0.58 mF/F + 0.19 pF	
	10 nF	0.58 mF/F + 2.1 pF	
	100 nF	0.58 mF/F + 21 pF	
	1 μF	0.58 mF/F + 0.21 nF	
	10 μF	0.58 mF/F + 24 nF	
	100 μF	0.58 mF/F + 0.32 μF	
	1 mF	0.58 mF/F + 10 μF	
	10 mF	0.58 mF/F + 0.8 μF	
	(> 1 to 10) kHz		
	1 pF	0.58 mF/F + 0.77 fF	
	10 pF	0.58 mF/F + 2.3 fF	
	100 pF	0.58 mF/F + 19 fF	
	1 nF	0.58 mF/F + 0.2 pF	
	10 nF	0.58 mF/F + 2.1 pF	
	100 nF	0.58 mF/F + 21 pF	
	1 μF	0.58 mF/F + 0.21 nF	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
¹ Capacitance Measure	(> 10 to 100) kHz 1 pF 10 pF 100 pF 1 nF 10 nF 100 nF 1 μ F	0.58 mF/F + 0.77 fF 0.58 mF/F + 2.3 fF 0.58 mF/F + 19 fF 0.58 mF/F + 0.2 pF 0.58 mF/F + 2.1 pF 0.58 mF/F + 21 pF 0.58 mF/F + 0.31 nF	Comparison to Hioki IM3533 LCR Meter
¹ Source Insulation Resistance (DC Voltage) 15 V to 5 kV	1 k Ω 10 k Ω 100 k Ω 1 M Ω 10 M Ω 100 M Ω 1 G Ω 10 G Ω	2.9 Ω 29 Ω 0.29 k Ω 2.9 k Ω 29 k Ω 0.29 M Ω 5.8 M Ω 58 M Ω	Comparison to High Voltage Resistors 3 RLAB HTE39 3 RLAB HTE39 3 RLAB HTE52 3 RLAB HTE39 3 RLAB HTE39 3 RLAB HTE52 3 RLAB HTE72 3 RLAB HTE76
¹ Source Surface resistivity / Resistance Meter / Electrostatic Resistance (DC Voltage) Up to 100 V	1 M Ω 5 M Ω 10 M Ω 20 M Ω 50 M Ω 1 G Ω 10 G Ω	6 m Ω / Ω + 59 k Ω 6 m Ω / Ω + 90 k Ω 6 m Ω / Ω + 0.82 M Ω 6 m Ω / Ω + 0.82 M Ω 6 m Ω / Ω + 0.82 M Ω 6 m Ω / Ω + 8.2 M Ω 6 m Ω / Ω + 82 M Ω	Comparison to 3 RLAB High Voltage Resistors, Time Electronics 1040 Resistance Box
¹ Source Earth Ground Continuity / Ground Bond (Test Current max 30 A)	0.1 Ω 0.2 Ω 0.5 Ω	0.002 9 Ω 0.002 9 Ω 0.002 9 Ω	Comparison to Standard Resistors

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
¹ Measure Resistance Meter / Electrostatic Resistance (DC Voltage)	Up to 500V		Comparison to Professional Insulation Tester
	1 MΩ	0.12 MΩ	
	10 MΩ	0.12 MΩ	
	100 MΩ	1 MΩ	
	210 MΩ	2 MΩ	
	470 MΩ	2 MΩ	
	1 GΩ	20 MΩ	
	1.3 GΩ	31 MΩ	
	4.3 GΩ	50 MΩ	
	10 GΩ	0.2 GΩ	
	20 GΩ	0.4 GΩ	
	(> 0.5 to 1) kV		
	1 MΩ	0.12 MΩ	
	10 MΩ	0.12 MΩ	
	100 MΩ	1 MΩ	
	210 MΩ	2 MΩ	
	470 MΩ	2 MΩ	
	1 GΩ	20 MΩ	
	1.3 GΩ	31 MΩ	
	4.3 GΩ	50 MΩ	
	10 GΩ	0.2 GΩ	
	20 GΩ	0.4 GΩ	
	40 GΩ	0.4 GΩ	
	(> 1 to 2.5) kV		
	10 MΩ	0.12 MΩ	
	100 MΩ	1 MΩ	
	210 MΩ	2 MΩ	
	470 MΩ	2 MΩ	
	1 GΩ	20 MΩ	
	1.3 GΩ	31 MΩ	
	4.3 GΩ	50 MΩ	
	10 GΩ	0.2 GΩ	
	20 GΩ	0.4 GΩ	
	100 GΩ	0.4 GΩ	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
¹ Measure Resistance Meter / Electrostatic Resistance (DC Voltage)	(> 2.5 to 5) kV 10 MΩ 100 MΩ 210 MΩ 470 MΩ 1 GΩ 1.3 GΩ 4.3 GΩ 10 GΩ 20 GΩ 100 GΩ 0.5 TΩ 1 TΩ	0.12 MΩ 1 MΩ 2 MΩ 2 MΩ 20 MΩ 31 MΩ 50 MΩ 0.2 GΩ 0.4 GΩ 0.4 GΩ 0.7 GΩ 0.7 GΩ	Comparison to Professional Insulation Tester
¹ Magnetic North and South (Magnetic Flux Density)	Up to 300 G (> 300 to 3 000) G (> 3 000 to 30 000) G Up to 30 mT (> 30 to 300 mT) (> 300 to 3 000 mT)	0.18 G 0.6 G 5.8 G 18 μT 60 μT 0.58 mT	Comparison to Standard Magnet
¹ Measure Winding and Impulse-Surge Tester (DC High Voltage)	Up to 20 kV DC to 1 MHz	0.69 kV	Comparison to Tektronix P6015A High Voltage Probe, Picoscope
Moisture Meter Instrumentation Simulation	(9 to 30) %	0.12 %	Comparison to Decade Resistance Standard, Insulation Resistance Box

Electrical - RF/Microwave

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
¹ Measure Amplitude Modulation Rate: 50 Hz to 10 kHz, (5 to 99) % Depth 50 Hz to 100 kHz, (20 to 99) %	150 kHz to 10 MHz 10 MHz to 1.3 GHz	2 % Depth + 1 Digit 1 % Depth + 1 Digit	Comparison to HP 8902A Measuring Receiver
¹ Measure RF Tuned Power (0 to 139) dB	150 kHz to 1.3 GHz (1.3 to 2.6) GHz	0.023 % of reading + 0.38 dB 0.23 % of reading + 0.38 dB	Comparison to HP 8902A Measuring Receiver, HP 11722A Power Sensor, HP E4407B Spectrum Analyzer
¹ Measure Frequency Modulation 250 kHz to 10 MHz 10 MHz to 1.3 GHz	Rate: 20 Hz to 10 kHz Dev:20 Hz to 40 kHz peak Rate: 50 Hz to 200 kHz Dev:250 Hz to 400 kHz peak	0.23 kHz + 1 Digit 1.2 kHz + 1 Digit	Comparison to HP 8902A Measuring Receiver
¹ Measure Phase Modulation 150 kHz to 10 MHz 10 MHz to 1.3 GHz 150 kHz to 10 MHz 10 MHz to 1.3 GHz	> 0.7 rad Deviation > 0.6 rad Deviation Rate: 200 Hz to 10 kHz Rate :200 Hz to 20 kHz	0.1 % of reading + 0.03 rad 0.1 % of reading + 0.03 rad 4 % of reading + 1 Digit 3 % of reading + 1 Digit	Comparison to HP 8902A Measuring Receiver
¹ Measure Distortion Rate: 20 Hz to 100 kHz (0.001 to 100) %	(-80 to 0) dB 20 Hz to 20 kHz (20 to 100) kHz	1.2 dB 2.3 dB	Comparison to HP 8903B Audio Analyzer
¹ Measure Flatness Rate: 90 Hz to 10 kHz (20 to 80) %	10 MHz to 1.3 GHz	70 Hz + 1 Digit	Comparison to HP 8902A Measuring Receiver, HP 11722A Power Sensor
¹ Source Frequency Level Units	9 kHz to 2.05 GHz Level: (-140 to 13) dBm	0.06 dB	Comparison to IFR 2023B Signal Generator

Electrical - RF/Microwave

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
^{1,2} Source Power 1 mW Reference	0 dBm	1.2 % of reading	Comparison to HP 8902A Measuring Receiver, HP 11722A Power Sensor
¹ Source Frequency Modulation 9 kHz to 2.05 GHz	Rate: DC to 30 kHz Rate: 1 kHz to 120 kHz	2.8 kHz 2.8 kHz	Comparison to IFR 2023B Signal Generator
¹ Source Amplitude Modulation DC to 30 kHz	Rate: 9 MHz to 2.05 GHz, Up to 99.9 % Depth	1.5 % Depth	Comparison to IFR 2023B Signal Generator
¹ Source Phase Modulation 9 kHz to 2.05 GHz	Rate: 100 Hz to 10 kHz Rate: Up to 90 rad	0.23 rad	Comparison to IFR 2023B Signal Generator

Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Gauge Blocks	(0.1 to 0.4) mm (0.5 to 25) mm (> 25 to 50) mm (> 50 to 75) mm (> 75 to 100) mm	89 nm 75 nm 77 nm 79 nm 0.11 µm	Calibration Method by Comparison with Standard Gauge Block based on ISO 3650: 1998 and JIS B 7506: 1997.
Long Length Gauge Blocks	Up to 125 mm (> 125 to 150) mm (> 150 to 175) mm (> 175 to 200) mm (> 200 to 250) mm (> 250 to 300) mm (> 300 to 400) mm (> 400 to 500) mm	94 nm 0.1 µm 0.11 µm 0.12 µm 0.14 µm 0.16 µm 0.2 µm 0.25 µm	Calibration Method by Comparison with Standard Gauge Block, based on ISO 3650: 1998 and JIS B 7506: 1997.
Gauge Block Comparators	Up to 100 mm	0.11 µm	Calibration Method by Comparison with Standard Gauge Block and according to EURAMET cg-02 v0.2.

Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
² Optical Flats	$D \leq 60$ mm Flatness Up to 10 μm $D (> 60 \text{ to } 200)$ mm Flatness Up to 10 μm	0.12 μm 84 nm	Calibration Method by Comparison with Master Flat with a Monochromatic Light Source according to JIS B 7430: 1977.
Optical Parallels Diameter ≥ 60 mm, Up to 200 mm Flatness Parallelism Thickness	Up to 10 μm Up to 10 μm (12 to 12.37) mm	0.11 μm 0.2 μm 2.4 μm	Calibration Method by Comparison with Master Flat with a Monochromatic Light Source, Gauge Block Comparator and Micrometer Caliper according to JIS B 7431:1977.
Glass Hemispheres (Roundness)	Up to 50 μm	0.1 μm	Calibration Method by Direct measurement with Roundness Tester.
Surface Roughness Specimens	Up to 15 μm	63 nm	Calibration Method by Direct measurement with Roughness Tester.
Thickness Foils	Up to 0.5 mm (> 0.5 to 1) mm (> 1 to 5) mm (> 5 to 10) mm (> 10 to 20) mm	0.46 μm 0.48 μm 0.83 μm 1.5 μm 2.8 μm	Calibration Method by Direct measurement with Universal Length Measuring Machine.
¹ Caliper (Outside, Inside, Depth)	Up to 150 mm (> 150 to 200) mm (> 200 to 300) mm (> 300 to 400) mm (> 400 to 500) mm (> 500 to 600) mm (> 600 to 1 000) mm	6.1 μm 6.4 μm 7 μm 7.9 μm 8.8 μm 9.9 μm 19 μm	Comparison to Gauge Block Set
¹ Depth Gauges	Up to 150 mm (> 150 to 200) mm (> 200 to 300) mm (> 300 to 400) mm (> 400 to 500) mm (> 500 to 600) mm	6.1 μm 6.4 μm 7 μm 7.9 μm 8.8 μm 9.9 μm	Comparison to Gauge Block Set

Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
¹ Outside Micrometers	Up to 25 mm (25 to 50) mm (> 50 to 75) mm (> 75 to 100) mm (> 100 to 125) mm (> 125 to 150) mm (> 150 to 175) mm (> 175 to 225) mm (> 225 to 250) mm (> 250 to 325) mm (> 325 to 350) mm (> 350 to 400) mm (> 400 to 425) mm (> 425 to 475) mm (> 475 to 500) mm	0.73 µm 0.76 µm 0.78 µm 0.8 µm 0.83 µm 0.88 µm 0.93 µm 1 µm 1.1 µm 1.2 µm 1.3 µm 1.4 µm 1.5 µm 1.6 µm 1.7 µm	Comparison to Gauge Block Set
¹ High Accuracy Outside Micrometer	Up to 7.5 mm (> 7.5 to 17.5) mm (> 17.5 to 22.5) mm (> 22.5 to 25) mm	0.15 µm 0.26 µm 0.32 µm 0.35 µm	Comparison to Gauge Block Set, Optical Parallel Set
¹ Depth Micrometers	Up to 25 mm (> 25 to 50) mm (> 50 to 75) mm (> 75 to 100) mm	0.74 µm 0.76 µm 0.83 µm 0.89 µm	Comparison to Gauge Block Set
¹ Disk Micrometers	Up to 25 mm (> 25 to 50) mm (> 50 to 75) mm (> 75 to 100) mm	0.74 µm 0.78 µm 0.83 µm 0.8 µm	Comparison to Gauge Block Set
¹ Inside Micrometers	Up to 25 mm (> 25 to 50) mm (> 50 to 75) mm (> 75 to 100) mm	0.73 µm 0.76 µm 0.78 µm 0.8 µm	Comparison to Gauge Block Set
¹ Laser Micrometer, Laser Scan Diameter	Up to 13.5 mm (> 13.5 to 25) mm (> 25 to 30) mm (> 30 to 60) mm	0.24 µm 0.36 µm 0.41 µm 0.81 µm	Comparison to Pin Gauge Set, Gauge Block Set
¹ Dial Gauge Thickness Gauge	Up to 25 mm (> 25 to 50) mm (> 50 to 75) mm (> 75 to 100) mm	0.65 µm 0.89 µm 1.2 µm 1.5 µm	Comparison to Gauge Block Set

Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
¹ Digital Linear Gauges	Up to 25 mm (> 25 to 50) mm (> 50 to 75) mm (> 75 to 100) mm	0.5 µm 0.55 µm 0.63 µm 0.72 µm	Comparison to Gauge Block Set
¹ Caliper Gauges (Internal and External)	Up to 25 mm (> 25 to 50) mm (> 50 to 75) mm (> 75 to 100) mm	0.67 µm 0.89 µm 1.2 µm 1.5 µm	Comparison to Gauge Block Set
¹ Height Gauges	Up to 150 mm (> 150 to 200) mm (> 200 to 300) mm (> 300 to 600) mm (> 600 to 700) mm (> 700 to 800) mm (> 800 to 900) mm (> 900 to 1 000) mm	1.1 µm 1.3 µm 1.8 µm 3.4 µm 4 µm 4.5 µm 5.1 µm 5.6 µm	Comparison to Gauge Block Set
¹ Precision Height Gauges	Up to 150 mm (> 150 to 200) mm (> 200 to 300) mm (> 300 to 600) mm (> 600 to 700) mm (> 700 to 800) mm (> 800 to 900) mm (> 900 to 1 000) mm	0.97 µm 1.2 µm 1.7 µm 3.3 µm 4 µm 4.5 µm 5.1 µm 5.6 µm	Comparison to Gauge Block Set
¹ Surface Plates Overall Flatness Only	≤ 1 600 mm x 1 600 mm ≤ 1 800 mm x 1 800 mm ≤ 2 000 mm x 2 000 mm ≤ 2 600 mm x 2 600 mm ≤ 2 800 mm x 2 800 mm ≤ 3 000 mm x 3 000 mm ≤ 4 000 mm x 4 000 mm ≤ 5 000 mm x 5 000 mm	1 µm 1 µm 1.1 µm 1.1 µm 1.1 µm 1.1 µm 1.3 µm 1.6 µm	In accordance with Internal Procedure CP-WK-D15 (based on JIS B 7513:1992, Method 3) using Straightedge and Dial Comparator.
Rulers	Up to 2 000 mm	27 µm	Direct Measure using Visual Measuring Machine
Radius Gauges	(> 0.5 to 100) mm	1.5 µm	Direct Measure using Visual Measuring Machine
Square Gauges	Up to 300 mm	3.5 µm	Comparison to CMM, Master Square, Dial Indicator

This Scope of Accreditation, version 016, was last updated on: 23 July 2025 and is valid only when accompanied by the Certificate.

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Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Pitch Gauges	(> 0.1 to 10) mm	0.6 μ m	Direct Measure using Visual Measuring Machine
^{1,2} Working Standard Scales, Glass Scales	Up to 100 mm (> 100 to 300) mm (> 300 to 400) mm (> 400 to 500) mm (> 500 to 600) mm	(0.6 + 0.001 8L) μ m (0.7 + 0.001 8L) μ m (0.8 + 0.001 8L) μ m (0.9 + 0.001 8L) μ m (1 + 0.001 8L) μ m	Comparison to Laser Interferometer
¹ Caliper Checker	Up to 10) mm (> 10 to 50) mm (> 50 to 75) mm (> 75 to 100) mm (> 100 to 150) mm (> 150 to 200) mm (> 200 to 300) mm (> 300 to 400) mm (> 400 to 500) mm (> 500 to 600) mm (> 600 to 700) mm (> 700 to 800) mm (> 800 to 900) mm (> 900 to 1 000) mm	0.46 μ m 0.49 μ m 0.53 μ m 0.57 μ m 0.73 μ m 0.87 μ m 1.2 μ m 1.5 μ m 1.8 μ m 2.2 μ m 2.4 μ m 2.7 μ m 2.9 μ m 3.2 μ m	Comparison to Gauge Block Set
¹ Ultrasonic Thickness Gages	Up to 20 mm (> 20 to 25) mm (> 25 to 50) mm (> 50 to 75) mm (> 75 to 100) mm (> 100 to 150) mm (> 150 to 200) mm (> 200 to 300) mm	0.64 μ m 0.67 μ m 0.89 μ m 1.2 μ m 1.5 μ m 2.1 μ m 3 μ m 4.2 μ m	Comparison to Gauge Block Set
¹ Coating Thickness Gauge	24 μ m 52 μ m 129 μ m 256 μ m 517 μ m	0.7 μ m 0.7 μ m 0.7 μ m 0.7 μ m 0.7 μ m	Comparison to Thickness Standards
Stage Micrometers, Scale Lupe	Up to 30 mm (> 30 to 100) mm	0.6 μ m 0.71 μ m	Direct Measure using Visual Measuring Machine
¹ Shims/Feeler Gages	Up to 25 mm	0.7 μ m	Direct Measure using Digital Micrometer (High Accuracy)

Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
¹ Micrometer Standards, Length Gauges	(> 25 to 125) mm (> 125 to 200) mm (> 200 to 400) mm (> 400 to 500) mm	0.65 μ m 0.87 μ m 1.5 μ m 1.8 μ m	Comparison to Gauge Block Set Gauge Block Set, Dial Comparator
¹ Length Measuring Machine	Up to 25 mm (> 25 to 50) mm (> 50 to 75) mm (> 75 to 100) mm (> 100 to 200) mm (> 200 to 300) mm	0.45 μ m 0.47 μ m 0.49 μ m 0.53 μ m 0.76 μ m 1.8 μ m	Comparison to Master Gauge Block Set
¹ Industrial Length Measurement Standards (Length Bars, Wires, Cables)	(> 25 to 125) mm (> 125 to 200) mm (> 200 to 400) mm (> 400 to 500) mm (> 500 to 600) mm	0.65 μ m 0.87 μ m 1.5 μ m 1.8 μ m 2.2 μ m	Comparison to Master Gauge Block Set
Test Sieves	Up to 10 mm (> 10 to 25) mm (> 25 to 50) mm	0.6 μ m 0.7 μ m 1 μ m	Direct Measure using Visual Measuring Machine
¹ Measuring Microscopes X-axis, Y-axis	Up to 50 mm (> 50 to 100) mm (> 100 to 150) mm (> 150 to 200) mm (> 200 to 250) mm (> 250 to 300) mm (> 300 to 350) mm (> 350 to 400) mm (> 400 to 450) mm (> 450 to 500) mm	0.69 μ m 0.78 μ m 0.88 μ m 0.97 μ m 1.1 μ m 1.2 μ m 1.3 μ m 1.4 μ m 1.4 μ m 1.5 μ m	Comparisons to Standard Scale Gauge Block Set
Z-axis	Up to 50 mm (> 50 to 100) mm (> 100 to 150) mm (> 150 to 200) mm (> 200 to 300) mm (> 300 to 400) mm (> 400 to 500) mm	0.67 μ m 1.3 μ m 2.1 μ m 2.7 μ m 4 μ m 5.4 μ m 6.7 μ m	

Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
¹ Profile Projector	X Axis, Y Axis Up to 50 mm (> 50 to 100) mm (> 100 to 150) mm (> 150 to 200) mm (> 200 to 300) mm (> 300 to 350) mm (> 350 to 400) mm (> 400 to 500) mm	0.6 µm 0.61 µm 0.71 µm 0.72 µm 0.73 µm 0.84 µm 0.85 µm 0.96 µm	Comparison to Standard Scale
¹ Can Seam Micrometer	Up to 13 mm	0.73 µm	Comparison to Gauge Blocks
² Protractors	Up to 360°	18"	Direct Measure using Visual Measuring Machine
Inclinometer Length	Up to 100 mm (> 100 to 200) mm (> 200 to 300) mm	1.5 µm 2.8 µm 4.1 µm	Direct Measure using Visual Measuring Machine
² Inclinometer Angle	Up to 1°	23"	Comparison to Laser Interferometer, Small Angle Generator
² Inclinometer Angle	Up to 360°	18"	Comparison to Digital Angle Protractors
¹ Roughness Testers	2.95 µm Ra 3.05 µm Ra 9.5 µm Rz 9.7 µm Rz	53 nm 53 nm 0.45 µm 0.47 µm	Comparison to Roughness Standards
¹ Roundness Testers	Up to 1 000 µm	90 nm	Comparison to Glass Hemisphere Standard
¹ Dial Gauge	Up to 25 mm	1 µm	Comparison to Calibration Tester
¹ Dial Test Indicator	Up to 1 mm	1 µm	Comparison to Calibration Tester
¹ Air Micrometer	Up to 10 µm (> 10 to 100) µm (> 100 to 1 000) µm (> 1 000 to 10 000) µm	59 nm 59 nm 0.059 µm 0.14 µm	Comparison to Calibration Tester

Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
¹ Plain Plug Gauge, Pin Gauges, Three Wires, T-probe	Up to 3 mm (3 to 5) mm (5 to 10) mm (10 to 15) mm	0.5 µm 0.51 µm 0.52 µm 0.54 µm	Comparison to Laser Scan (Diameter)
¹ Universal Length Machine	Up to 10 mm (> 10 to 25) mm (> 25 to 50) mm (> 50 to 75) mm (> 75 to 100) mm (>100 to 200) mm (>200 to 300) mm (>300 to 600) mm	90 nm 0.13 µm 0.22 µm 0.3 µm 0.41 µm 0.76 µm 1 µm 1.8 µm	Comparison to Master Gauge Block Set
¹ Universal Length Machine	Up to 25 mm (> 25 to 50) mm (> 50 to 75) mm (> 75 to 100) mm (> 100 to 200) mm (> 200 to 300) mm (> 300 to 600) mm (> 600 to 800) mm (> 800 to 1 000) mm	33 nm 66 nm 0.1 µm 0.13 µm 0.27 µm 0.4 µm 0.8 µm 1.1 µm 1.3 µm	Comparison to Laser Interferometer
¹ Height Master	Up to 15 mm (> 15 to 25) mm (> 25 to 50) mm (> 50 to 75) mm (> 75 to 100) mm (> 100 to 150) mm (> 150 to 200) mm (> 200 to 300) mm (> 300 to 600) mm	0.48 µm 0.5 µm 0.55 µm 0.63 µm 0.72 µm 0.97 µm 1.2 µm 1.7 µm 3.3 µm	Comparison to Gauge Blocks

Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
¹ Linear Measurement Axis (X, Y, Z)	Up to 50 mm (> 50 to 100) mm (> 100 to 200) mm (> 200 to 300) mm (> 300 to 400) mm (> 400 to 500) mm (> 500 to 600) mm (> 600 to 700) mm (> 700 to 800) mm (> 800 to 900) mm (> 900 to 1 000) mm	66 nm 85 nm 0.14 µm 0.2 µm 0.26 µm 0.32 µm 0.38 µm 0.44 µm 0.5 µm 0.57 µm 0.63 µm	Comparison to Laser Interferometer
¹ Linear Measurement Axis (X, Y, Z)	(> 1 000 to 1 500) mm (> 1 500 to 2 000) mm (> 2 000 to 2 500) mm (> 2 500 to 3 000) mm (> 3 000 to 3 500) mm (> 3 500 to 4 000) mm (> 4 000 to 4 500) mm (> 4 500 to 5 000) mm	0.94 µm 1.3 µm 1.6 µm 1.9 µm 2.2 µm 2.5 µm 2.8 µm 3.1 µm	Comparison to Laser Interferometer
Steel Tape, Textile Tape	Up to 100 mm (> 100 to 200) mm (> 200 to 300) mm (> 300 to 400) mm (> 400 to 500) mm (> 500 to 600) mm (> 600 to 700) mm (> 700 to 800) mm (> 800 to 900) mm (> 900 to 1 000) mm	1 µm 3 µm 4 µm 5 µm 7 µm 8 µm 9 µm 11 µm 12 µm 13 µm	Direct Measure using Visual Measuring Machine
Steel Tape, Textile Tape	(> 1 000 to 1 500) mm (> 1 500 to 2 000) mm (> 2 000 to 3 000) mm (> 3 000 to 6 000) mm (> 6 000 to 8 000) mm (> 8 000 to 30 000) mm (> 30 000 to 40 000) mm (> 40 000 to 50 000) mm	20 µm 27 µm 40 µm 80 µm 0.11 mm 0.4 mm 0.53 mm 0.66 mm	Direct Measure using Visual Measuring Machine
Precision Level	Slope/Length Up to 0.24 mm/m	3.4 µm/m	Comparison to Digital Dial Indicator, Small Angle Generator

Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
¹ Contour Measurement Machine	X Axis, Z Axis Up to 2 mm (> 2 to 5) mm (> 5 to 10) mm (> 10 to 20) mm (> 20 to 50) mm (> 50 to 100) mm	0.58 µm 0.59 µm 0.6 µm 0.64 µm 0.89 µm 1.5 µm	Comparison to Gauge Blocks, Pin Gauges
	Radius Up to 5 mm	0.79 µm	
¹ Calibration Tester	Up to 1 mm Up to 25 mm Up to 100 mm	58 nm 58 nm 59 nm	Comparison to Laser Interferometer, Optical Flats
	(3 to 20) mm (> 20 to 50) mm (> 50 to 70) mm (> 70 to 80) mm (> 80 to 125) mm	0.9 µm 1 µm 1 µm 1 µm 2 µm	
¹ Holtest	(1 to 25) mm (> 25 to 50) mm (> 50 to 75) mm (> 75 to 100) mm	1.5 µm 1.6 µm 1.7 µm 1.8 µm	Comparison to Standard Micrometer, Three Wire Set
Thread Plug Gauges	(1 to 25) mm (> 25 to 50) mm (> 50 to 75) mm (> 75 to 100) mm	1.5 µm 1.6 µm 1.7 µm 1.8 µm	Comparison to Standard Micrometer, Three Wire Set
Cylindrical Plug Gauge, Pin Gauge	Up to 10 mm (> 10 to 20) mm (> 20 to 30) mm (> 30 to 40) mm (> 40 to 50) mm (> 50 to 60) mm (> 60 to 70) mm (> 70 to 80) mm (> 80 to 90) mm (> 90 to 100) mm (> 100 to 125) mm (> 125 to 150) mm (> 150 to 175) mm (> 175 to 200) mm (> 200 to 250) mm (> 250 to 300) mm	0.11 µm 0.13 µm 0.14 µm 0.16 µm 0.18 µm 0.2 µm 0.22 µm 0.24 µm 0.26 µm 0.28 µm 0.34 µm 0.4 µm 0.45 µm 0.51 µm 0.63 µm 0.75 µm	Comparison to Universal Length Measuring Machine
Taper Plug Gauge	Up to 25 mm (> 25 to 50) mm (> 50 to 75) mm	0.13 µm 0.18 µm 0.23 µm	Comparison to Universal Length Measuring Machine

Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Taper Plug Gauge	(> 75 to 100) mm (> 100 to 125) mm (> 125 to 150) mm (> 150 to 175) mm (> 175 to 200) mm	0.28 µm 0.34 µm 0.4 µm 0.45 µm 0.51 µm	Comparison to Universal Length Measuring Machine
Taper Thread Plug Gauge	Up to 25 mm (> 25 to 50) mm (> 50 to 75) mm (> 75 to 100) mm (> 100 to 125) mm (> 125 to 150) mm (> 150 to 200) mm	0.13 µm 0.18 µm 0.23 µm 0.28 µm 0.34 µm 0.4 µm 0.51 µm	Comparison to Universal Length Measuring Machine
Thread Plug Gauge	Up to 20 mm (> 20 to 40) mm (> 40 to 60) mm (> 60 to 80) mm (> 80 to 100) mm (> 100 to 125) mm (> 125 to 150) mm (> 150 to 175) mm (> 175 to 200) mm	0.47 µm 0.48 µm 0.49 µm 0.51 µm 0.53 µm 0.56 µm 0.6 µm 0.64 µm 0.68 µm	Comparison to Universal Length Measuring Machine
Spline Plug Gauge	Up to 25 mm (> 25 to 50) mm (> 50 to 75) mm (> 75 to 100) mm (> 100 to 125) mm (> 125 to 150) mm (> 150 to 175) mm (> 175 to 200) mm	0.13 µm 0.18 µm 0.23 µm 0.28 µm 0.34 µm 0.4 µm 0.45 µm 0.51 µm	Comparison to Universal Length Measuring Machine
Cylindrical Ring Gauge	Up to 20 mm (> 20 to 40) mm (> 40 to 60) mm (> 60 to 80) mm (> 80 to 100) mm (> 100 to 125) mm (> 125 to 150) mm (> 150 to 175) mm (> 175 to 200) mm (> 200 to 250) mm (> 250 to 300) mm	0.13 µm 0.16 µm 0.20 µm 0.24 µm 0.28 µm 0.34 µm 0.4 µm 0.45 µm 0.51 µm 0.63 µm 0.75 µm	Comparison to Universal Length Measuring Machine

Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Taper Ring Gauge	Up to 25 mm (> 25 to 50) mm (> 50 to 75) mm (> 75 to 100) mm (> 100 to 125) mm (> 125 to 150) mm (> 150 to 175) mm (> 175 to 200) mm	0.13 μm 0.18 μm 0.23 μm 0.28 μm 0.34 μm 0.4 μm 0.45 μm 0.51 μm	Comparison to Universal Length Measuring Machine
Taper Thread Ring Gauge	5 to 25 mm (> 25 to 50) mm (> 50 to 75) mm (> 75 to 100) mm (> 100 to 125) mm (> 125 to 150) mm (> 150 to 200) mm	0.13 μm 0.18 μm 0.23 μm 0.28 μm 0.34 μm 0.4 μm 0.51 μm	Comparison to Universal Length Measuring Machine
Thread Ring Gauge	Up to 20 mm (> 20 to 40) mm (> 40 to 60) mm (> 60 to 80) mm (> 80 to 100) mm (> 100 to 125) mm (> 125 to 150) mm (> 150 to 175) mm (> 175 to 200) mm	0.13 μm 0.16 μm 0.2 μm 0.24 μm 0.28 μm 0.34 μm 0.4 μm 0.45 μm 0.51 μm	Comparison to Universal Length Measuring Machine
Spline Ring Gauge	Up to 25 mm (> 25 to 50) mm (> 50 to 75) mm (> 75 to 100) mm (> 100 to 125) mm (> 125 to 150) mm (> 150 to 175) mm (> 175 to 200) mm	0.13 μm 0.18 μm 0.23 μm 0.28 μm 0.34 μm 0.4 μm 0.45 μm 0.51 μm	Comparison to Universal Length Measuring Machine
Snap Gauge, Gap Gauge	Up to 10 mm (> 10 to 20) mm (> 20 to 30) mm (> 30 to 40) mm (> 40 to 50) mm	0.11 μm 0.13 μm 0.14 μm 0.16 μm 0.18 μm	Comparison to Universal Length Measuring Machine

Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Snap Gauge, Gap Gauge	(> 50 to 60) mm (> 60 to 70) mm (> 70 to 80) mm (> 80 to 90) mm (> 90 to 100) mm	0.2 μ m 0.22 μ m 0.24 μ m 0.26 μ m 0.28 μ m	Comparison to Universal Length Measuring Machine
Feeler Gauge, Thickness Shims	Up to 10 mm (> 10 to 25) mm (> 25 to 50) mm (> 50 to 100) mm	0.11 μ m 0.13 μ m 0.18 μ m 0.28 μ m	Comparison to Universal Length Measuring Machine
Standard Foil, Thickness Plate	Up to 10 mm (> 10 to 25) mm	0.11 μ m 0.13 μ m	Comparison to Universal Length Measuring Machine
Go/No-Go Gauges, Jig Fixtures	Up to 10 mm (> 10 to 25) mm (> 25 to 50) mm (> 50 to 75) mm (> 75 to 100) mm (> 100 to 125) mm (> 125 to 150) mm (> 150 to 175) mm (> 175 to 200) mm	0.11 μ m 0.13 μ m 0.18 μ m 0.23 μ m 0.28 μ m 0.34 μ m 0.4 μ m 0.45 μ m 0.51 μ m	Comparison to Universal Length Measuring Machine
Test Bar (Diameter)	2 to 25 mm (> 25 to 50) mm (> 50 to 75) mm (> 75 to 100) mm (> 100 to 125) mm (> 125 to 150) mm (> 150 to 200) mm (> 200 to 250) mm (> 250 to 300) mm	0.13 μ m 0.18 μ m 0.23 μ m 0.28 μ m 0.34 μ m 0.4 μ m 0.51 μ m 0.63 μ m 0.75 μ m	Comparison to Universal Length Measuring Machine

Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Mass Determination	1 mg 2 mg 5 mg 10 mg 20 mg 50 mg 100 mg	11 µg 11 µg 11 µg 11 µg 11 µg 12 µg 13 µg	Comparison to Electronic Balances, Master Weights
Mass Determination	200 mg 500 mg 1 g 2 g 5 g 10 g 20 g 50 g 100 g 200 g 500 g 1 kg 2 kg 5 kg 10 kg 20 kg	14 µg 16 µg 30 µg 40 µg 40 µg 40 µg 50 µg 70 µg 0.11 mg 0.2 mg 0.3 mg 0.71 mg 3 mg 5 mg 29 mg 29 mg	Comparison to Electronic Balances, Master Weights
^{1,4} Scales and Balances, Load Cells	Up to 100 g (> 100 to 200) g (> 200 g to 300) g (> 300 g to 400) g (> 400 to 500) g (> 0.5 to 1.2) kg (> 1.2 to 2) kg (> 2 to 12) kg (> 12 to 20) kg (> 20 to 300) kg (> 300 to 500) kg (> 500 to 1 000) kg	0.14 mg 0.28 mg 0.43 mg 0.56 mg 0.7 mg 2.4 mg 3.1 mg 20 mg 29 mg 5.8 g 5.9 g 66 g	Master Weights and internal calibration procedure utilized in the calibration of the weighing device.
¹ Universal Testing Machine (Tension and Compression)	(0.1 to 100) N 100 N to 1 kN (1 to 10) kN (10 to 100) kN	0.11 % of reading 0.11 % of reading 0.07 % of reading 0.14 % of reading	Comparison to Force Transducers

Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
¹ Force Gauge, Push-Pull	(0.1 to 100) N	0.11 % of reading	Comparison to Weight Set
Force Gauge, Push-Pull	100 N to 1 kN (1 to 10) kN (10 to 100) kN	0.11 % of reading 0.07 % of reading 0.14 % of reading	Comparison to Force Transducers
¹ Rockwell Hardness Testing Machine (Force Measurement)	(10 to 150) kgf	0.15 % of reading	Comparison to Force Transducer
¹ Rockwell Hardness Testers	24.54 HRC 44.45 HRC 59.67 HRC 81.13 HRA 33.96 HRBW 54.41 HRBW 88.31 HRBW 90.69 HRBW	0.48 HRC 0.46 HRC 0.45 HRC 0.43 HRA 0.46 HRBW 0.45 HRBW 0.44 HRBW 0.51 HRBW	Indirect Verification using Test Blocks
¹ Vickers Hardness Testers	(10 to 150) kgf	0.12 % of reading	Direct Verification using Force Transducer
¹ Vickers Hardness Testers	408 HV 710.6 HV	12.1 HV 3.8 HV	Indirect Verification using Test Blocks
¹ Durometer Spring Force Only (Types A, B, E, O, C, D, DO, M and FO)	Up to 90 Duro	0.16 Duro	Partial Verification using Force Transducer
Rockwell Hardness Test Blocks	(20 to 40) HRC (> 40 to 70) HRC (20 to 95) HRA Up to 50 HRBW (> 50 to 100) HRBW	0.65 HRC 0.64 HRC 0.63 HRA 0.44 HRBW 0.47 HRBW	Direct verification using Rockwell Hardness Tester per internal procedure CP-WK-M20.
Brinell Hardness Test Blocks	Up to 38 HBW (> 38 to 226) HBW (> 226 to 524) HBW (> 524 to 734) HBW	0.73 HBW 2.7 HBW 6.1 HBW 8.5 HBW	Brinell Hardness Tester characterized by Brinell Hardness Blocks. Indention Diameter is measured with Brinell Scope per internal procedure CP-WK-M20.

Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Brinell Hardness Test Blocks Force Indication Error	Up to 250 kgf	0.15 kgf	Direct Measure with Brinell Hardness Tester per internal procedure CP-WK-M20.
Vickers Hardness Test Blocks	Up to 402 HV (> 402 to 695) HV	5 HV 7.2 HV	Vickers Hardness Tester characterized by Brinell Hardness Blocks per internal procedure CP-WK-M20.
¹ Hand Torque Tool, Torque Wrench, Torque Driver, Electronic Torque	Up to 0.2 N·m (0.2 to 1) N·m (1 to 5) N·m (5 to 10) N·m (10 to 150) N·m (150 to 250) N·m (250 to 350) N·m (350 to 500) N·m (500 to 1 000) N·m	0.006 N·m 0.006 N·m 0.1 N·m 0.12 N·m 0.46 N·m 1 N·m 1.4 N·m 5 N·m 10 N·m	Comparison to Torque Transducer
¹ Torque Transducer	Up to 10 N·m (10 to 350) N·m (350 to 1 500) N·m	0.06 % of reading 0.005 % of reading 0.004 % of reading	Comparison to Standard Weights, Torque Calibration Arm
¹ Pressure Gauge, Digital Pressure Gauge, Pressure Transducer, Differential Pressure Gauge, Pressure Transmitter, Manometer, Pressure Switch (Pneumatic-Air)	Up to 2 068 kPa Up to 70 MPa	0.3 kPa 10 kPa	Comparison to Pneumatic Pressure Calibrator
¹ Pressure Gauge, Digital Pressure Gauge, Pressure Transducer, Differential Pressure Gauge, Pressure Transmitter, Manometer, Pressure Switch (Hydraulic)	Up to 2 068 kPa Up to 70 MPa	0.98 kPa 10 kPa	Comparison to Hydraulic Pressure Calibrator
¹ Vacuum Gauge	(-15 to 0) psi	0.022 psi	Comparison to Pressure Calibrator

Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Barometers	(90 to 105) kPa	0.11 kPa	Comparison to Rion Barometer Standard
¹ Flow Meter (Air Flow)	Up to 20 lpm (> 20 to 30) lpm (> 30 to 50) lpm (> 50 to 250) lpm	0.002 6 lpm 0.002 6 lpm 2.7 lpm 4.3 lpm	Comparison to Flow Meter Standard
Liquid Flow Meter	Up to 10 m ³ /hr (> 10 to 20) m ³ /hr (> 20 to 30) m ³ /hr (> 30 to 40) m ³ /hr (> 40 to 60) m ³ /hr	0.12 m ³ /hr 0.19 m ³ /hr 0.27 m ³ /hr 0.36 m ³ /hr 0.53 m ³ /hr	Comparison to Ultrasonic Flow Meter, Thermocouples
¹ Air Velocity (Hot Wire)	Up to 3 m/s (> 3 to 6) m/s (> 6 to 9) m/s (> 9 to 12) m/s (> 12 to 15) m/s (> 15 to 20) m/s (> 20 to 25) m/s (> 25 to 30) m/s (> 30 to 45) m/s	0.05 m/s 0.06 m/s 0.07 m/s 0.09 m/s 0.11 m/s 0.14 m/s 0.18 m/s 0.21 m/s 0.31 m/s	Comparison to Master Hot Wire Anemometer
¹ Air Velocity (Vane)	Up to 3 m/s (> 3 to 6) m/s (> 6 to 9) m/s (> 9 to 12) m/s (> 12 to 15) m/s (> 15 to 20) m/s (> 20 to 25) m/s (> 25 to 30) m/s (> 30 to 45) m/s	0.29 m/s 0.33 m/s 0.43 m/s 0.15 m/s 0.34 m/s 0.25 m/s 0.26 m/s 0.53 m/s 0.68 m/s	Comparison to Master Vane Anemometer
Hydrometer	(0.6 to 2) g/cm ³	0.000 4 g/cm ³	Electronic Balance per Cuckow Method.
Volumetric Flask, Graduated Cylinder, Beaker, Erlenmeyer Flask	Up to 1 ml (> 1 to 5) ml (> 5 to 10) ml (> 10 to 20) ml (> 20 to 50) ml (> 50 to 100) ml	0.74 µl 3.4 µl 6.7 µl 14 µl 34 µl 67 µl	Electronic Balance per ASTM E542-01
Micropipette	Up to 100 µl (> 100 to 500) µl (> 500 to 1 000) µl	67 nl 0.34 µl 0.67 µl	Electronic Balance per ASTM E542-01

Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Screen Tension Meters	Up to 10 N/cm (> 10 to 15) N/cm (> 15 to 20) N/cm (> 20 to 30) N/cm (> 30 to 50) N/cm	0.17 N/cm 0.21 N/cm 0.26 N/cm 0.38 N/cm 0.6 N/cm	Comparison to Digital Force Tester
^{1,3} Rotational Viscometer	Kinematic Viscosity 23.36 mm ² /s (cSt) 67.27 mm ² /s (cSt) 115.7 mm ² /s (cSt) 560.2 mm ² /s (cSt) 1 249 mm ² /s (cSt) 6 972 mm ² /s (cSt) 18490 mm ² /s (cSt) 76430 mm ² /s (cSt)	0.32 % of reading 0.38 % of reading 0.47 % of reading 0.47 % of reading 0.66 % of reading 0.66 % of reading 0.54 % of reading 0.54 % of reading	Comparison to Viscosity Reference Standard
^{1,3} Rotational Viscometer	Dynamic Viscosity 20 mPa·s (cP) 56 mPa·s (cP) 104 mPa·s (cP) 480 mPa·s (cP) 1 100 mPa·s (cP) 6 000 mPa·s (cP) 16 000 mPa·s (cP) 71 000 mPa·s (cP)	0.32 % of reading 0.39 % of reading 0.47 % of reading 0.47 % of reading 0.66 % of reading 0.66 % of reading 0.54 % of reading 0.54 % of reading	Comparison to Viscosity Reference Standard

Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
^{1,3} Ford and Zahn Viscosity Cups	Dynamic Viscosity		Comparison to Viscosity Reference Standard, Stopwatch
	20 mPa·s (cP)	0.32 % of reading	
	56 mPa·s (cP)	0.38 % of reading	
	104 mPa·s (cP)	0.48 % of reading	
	480 mPa·s (cP)	0.48 % of reading	
	1 100 mPa·s (cP)	0.67 % of reading	
	6 000 mPa·s (cP)	0.67 % of reading	
	16 000 mPa·s (cP)	0.54 % of reading	
	71 000 mPa·s (cP)	0.54 % of reading	
	Kinematic Viscosity		
	23.36 mm ² /s (cSt)	0.32 % of reading	
	67.27 mm ² /s (cSt)	0.38 % of reading	
	115.7 mm ² /s (cSt)	0.48 % of reading	
	560.2 mm ² /s (cSt)	0.48 % of reading	
	1 249 mm ² /s (cSt)	0.67 % of reading	
	6 972 mm ² /s (cSt)	0.67 % of reading	
	18 490 mm ² /s (cSt)	0.54 % of reading	
	76 430 mm ² /s (cSt)	0.54 % of reading	

Photometry and Radiometry

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
¹ Source, Measure Laser Power Meter	10 mW to 2.5 W (> 2.5 to 10) W (> 10 to 100) W (> 100 to 300) W (> 300 to 1 000) W	4 % of reading 4 % of reading 4 % of reading 5.2 % of reading 9.1 % of reading	Comparison to Laser Power Meter
¹ UV Meter (UVA) (UVC)	Up to 10 000 mJ/cm ² Up to 500 mW/cm ²	2.3 % of reading 2.4 % of reading	Comparison to UV Meter STD
^{1,2,3} Gloss Meter 20° 60° 85°	89.8 GU 94.5 GU 99.5 GU	0.7 GU 0.7 GU 0.9 GU	Comparison to Gloss Tile AMECaL/GT-HG3 Gloss Meter JEDTO/GM-268
¹ Lux Meter	0 lx (> 0 to 5 000) lx (5 000 to 30 000) lx	0.058 lx 1.6 % of reading 0.27 % of reading	Comparison to Digital Light Meter, Chroma Meter

Photometry and Radiometry

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
¹ Color Meter Color Reader	White		Comparison to Glossy Tile
	L*	0.63 % of reading	
	a*	0.29 % of reading	
	b*	0.1 % of reading	
	Y	0.04 % of reading	
	x	0.2 % of reading	
	y	0.25 % of reading	
	Black		
	L*	0.62 % of reading	
	a*	0.37 % of reading	
	b*	0.42 % of reading	
	Y	0.04 % of reading	
	x	0.37 % of reading	
	y	0.42 % of reading	
	White		
	L*	0.24	
	a*	0.26	
	b*	0.2	
	Y	0.26	
	x	0.009 3	
	y	0.009 3	
⁵ Color Plate	Black		Comparison to Color Meter, Standard Color Glossy Tile
	L*	0.01	
	a*	0.01	
	b*	0.01	
	Y	0.01	
	x	0.009 3	
	y	0.009 3	
Color Temperature	(1 000 to 10 000) K	0.82 K	Comparison to Chroma Meter Standard
⁵ Color Coffee Meter	Black		Direct Measurement with Glossy Tile and Color Meter.
	L*	0.14	
	a*	0.048	
	b*	0.048	
	X	0.31	
	Y	0.31	
	Z	0.31	

Photometry and Radiometry

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
⁵ Color Coffee Meter	Black L* a* b* X Y Z	0.31 0.23 0.23 0.31 0.31 0.31	Direct Measurement with Color Meter.
Color Box			
Color Temperature	(1 000 to 10 000) K	0.58 K	Direct Measurement with Chroma Meter
Illuminance	(1 000 to 5 000) lux	1.6 % of reading	
Ultraviolet Irradiance	365 nm Up to 500 mW/cm ²	2.4 % of reading	
Pyranometer	Total solar irradiance Indoor calibration Pyrheliometer Reference Pyranometer Reference Pyranometer Pyranometer Sensitivity (9.51 $\mu\text{V}/\text{Wm}^{-2}$) Outdoor calibration Pyranometer	2.5 % of reading	Comparison to Pyranometer Standard
Solar Power Meter (Input Voltage)	Up to 140 mV Up to 3 200 W/m ²	0.25 W/m ²	Comparison to Solar Power Meter Standard

Thermodynamic

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
¹ Thermo-Hygrometer			
Temperature	(5 to 60) °C	0.41 °C	Comparison to Master Temp/Humidity Standard
Humidity	(2 to 9) %RH (> 9 to 50) %RH (> 50 to 95) %RH	1.5 %RH 0.77 %RH 0.82 %RH	

Thermodynamic

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Dew Point Meter	(-5 to 40) °C	0.27 °C	Comparison to Master Dew Point Meter
¹ Air Temperature Controlled Chamber	50 °C	0.17 °C	Comparison to Agilent 34970A Datalogger, RTD Sensor
Hot Air Oven	(50 to 100) °C	0.17 °C	
	(100 to 200) °C	0.17 °C	
	(200 to 300) °C	0.48 °C	
Incubator	(10 to 50) °C	0.17 °C	
Refrigerator	(0 to 10) °C	0.17 °C	
¹ Air Temperature Controlled Chamber			Comparison to Agilent 34970A Datalogger, Type T Thermocouple Sensor
Freezer	(-80 to 0) °C	0.3 °C	
¹ Dial Thermometer	(-30 to -10) °C	0.23 °C	Comparison to Temperature Indicator, SPRT
	(> -10 to 20) °C	0.22 °C	
	(> -20 to 600) °C	0.095 °C	Type S Thermocouple Probe
	(> 600 to 1 200) °C	3.7 °C	
¹ Thermocouple Sensor Types K, J, E, T, N, R, S	(-30 to -10) °C	0.23 °C	Comparison to Temperature Indicator, SPRT
	(> -10 to 20) °C	0.22 °C	
	(> -20 to 600) °C	0.095 °C	Type S Thermocouple Probe
	(> 600 to 1 200) °C	3.7 °C	
¹ Sensor Type RTD	(-30 to -10) °C	0.23 °C	Comparison to Temperature Indicator, SPRT
	(> -10 to 20) °C	0.22 °C	
	(> -20 to 600) °C	0.095 °C	Type S Thermocouple Probe
	(> 600 to 1 200) °C	3.7 °C	
¹ Digital Thermometer with Thermocouple Sensor Types K, J, E, T, N, R, S	(-80 to 200) °C	0.032 °C	Comparison to Temperature Indicator, SPRT
	(200 to 300) °C	0.061 °C	
	(300 to 400) °C	0.071 °C	
	(400 to 600) °C	0.081 °C	
	(> 600 to 1 200) °C	3.7 °C	Type S Thermocouple Probe

Thermodynamic

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
¹ Digital Thermometer with Sensor Type RTD	(-30 to -10) °C (> -10 to 20) °C (> -20 to 600) °C (> 600 to 1 200) °C	0.23 °C 0.22 °C 0.095 °C 3.7 °C	Comparison to Temperature Indicator, SPRT Type S Thermocouple Probe
¹ Digital Thermometer with Thermocouple Sensor Type S	(> 600 to 800) °C (> 800 to 1 000) °C (> 1 000 to 1 200) °C	2.5 °C 2.6 °C 2.8 °C	Comparison to Temperature Indicator, Type S Reference Thermocouple Probe,
¹ Dry Block, Temperature Bath	(-80 to 400) °C (400 to 600) °C	0.31 °C 0.32 °C	Comparison to Temperature Indicator, PRT Standard
¹ Dry Block, Temperature Bath	(> 600 to 800) °C (> 800 to 1 000) °C (> 1 000 to 1 200) °C	2.5 °C 2.6 °C 2.8 °C	Comparison to Temperature Indicator, Type S Thermocouple Probe
¹ Autoclave	(110 to 135) °C	0.17 °C	Comparison to Agilent 34970A Datalogger, RTD Sensor
¹ Liquid-in-Glass (Partial Immersion)	(-10 to 0) °C (> 0 to 20) °C (> 20 to 50) °C (> 50 to 100) °C (> 100 to 150) °C	0.24 °C 0.26 °C 0.27 °C 0.31 °C 0.28 °C	Comparison to Temp Indicator, SPRT
¹ Liquid Bath	(5 to 100) °C	0.081 °C	Agilent 34970A Datalogger
¹ Temperature/Humidity Chamber			
Temperature	(10 to 40) °C	0.65 °C	Comparison to Master Temp/Humidity Standard
Humidity	(20 to 85) %RH	1.8 %RH	

Thermodynamic

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
¹ Infrared Thermometer	(-30 to 50) °C (> 50 to 100) °C (> 100 to 300) °C (> 300 to 500) °C (> 500 to 600) °C (> 600 to 800) °C (> 800 to 980) °C (> 980 to 1 200) °C	0.47 °C 0.76 °C 1.4 °C 1.9 °C 1.4 °C 3.1 °C 3.5 °C 3.9 °C	Comparison to Black Body (flat plate) $\lambda = (8 \text{ to } 14) \mu\text{m}$, $\varepsilon = 0.95$, Temperature Indicator with PRT Probe, Temperature Indicator with Thermocouple Type S Probe, Master Infrared Thermometer
³ Rice Moisture Meter	12 % Moisture Content 14 % Moisture Content 16 % Moisture Content	0.35 % Moisture Content 0.35 % Moisture Content 0.35 % Moisture Content	Comparison to CRM Moisture Content in Rice
³ Paddy Moisture Meter	12 % Moisture Content 14 % Moisture Content 16 % Moisture Content	0.53 % Moisture Content 0.44 % Moisture Content 0.44 % Moisture Content	Comparison to CRM Moisture Content in Paddy
¹ Heat Treat Furnaces	Type R / S Up to 300 °C (> 300 to 600) °C (> 600 to 1 200) °C	1.6 °C 1.9 °C 2.8 °C	Comparison to Agilent 34970A Datalogger, Thermocouple Probe

Time and Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
¹ Measure Frequency	30 Hz to 225 MHz > 225 MHz to 6 GHz	4.8 nHz/Hz + 23 mHz 19 mHz/GHz	Comparison to HP 53131A opt 050 Universal Counter
¹ Stopwatch, Timers	Up to 9 h	38 ms	Comparison to HP 53131A opt 050 Universal Counter
¹ Stroboscopes	Up to 10 rpm (> 10 to 100) rpm (> 100 to 1 000) rpm (> 1 000 to 10 000) rpm (> 10 000 to 100 000) rpm	0.005 9 rpm 0.058 rpm 0.063 rpm 0.62 rpm 2.6 rpm	Comparison to HP 34401A 6.5 Digit Multimeter

Time and Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
^{1,2} Non-Contact Tachometers	Up to 10 rpm (> 10 to 100) rpm (> 100 to 1 000) rpm (> 1 000 to 10 000) rpm (> 10 000 to 100 000) rpm	0.006 1 rpm 0.058 rpm 0.058 rpm 0.58 rpm 5.8 rpm	Comparison to HP 33120A Function Generator
² Contact Tachometers	(0.1 to 999.9) rpm (> 999.9 to 9 999.9) rpm (> 9 999.9 to 20 000) rpm	0.11 rpm 0.89 rpm 1.2 rpm	Comparison to Master Tachometer
Velocity Chronograph	Up to 10 m/s (> 10 to 50) m/s (> 50 to 100) m/s (> 100 to 500) m/s (> 500 to 1 000) m/s	0.06 m/s 0.1 m/s 0.17 m/s 0.82 m/s 1.6 m/s	Comparison to Picoscope
Velocity Speed Gun	Up to 120 km/h	0.82 km/h	Comparison to Master Tachometer
Sonic Tension Meter Simulation by Signal Injection	Up to 1 kHz (> 1 to 10) kHz (> 10 to 100) kHz > 100 kHz to 1 MHz (> 1 to 15) MHz	0.67 Hz 0.58 Hz 0.6 Hz 1.6 Hz 15 Hz	Comparisons to HP 33120A Function Generator
Microphone Functional Check	1 kHz 94 dB 114 dB	0.26 dB 0.29 dB	CEM SC-05 Sound Level Calibrator

DIMENSIONAL MEASUREMENT

1 Dimensional

Specific Tests and / or Properties Measured	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
1D Measurement – Length X-axis, Y-axis	Up to 5 mm (5 to 10) mm (10 to 20) mm (20 to 30) mm (30 to 40) mm (40 to 50) mm (50 to 100) mm	0.63 μ m 0.64 μ m 0.67 μ m 0.73 μ m 0.81 μ m 1 μ m 1.6 μ m	Vision Measuring Machine utilized as the Reference Standard for 1D Dimensional Measurement.
X-axis Only	(100 to 200) mm (200 to 250) mm	2.8 μ m 3.5 μ m	
1D Measurement – Length	Up to 200 mm	12 μ m	Digital Vernier Caliper utilized as the Reference Standard for 1D Dimensional Measurement.
1D Measurement – Length	Up to 25 mm	1.3 μ m	Digital Outside Micrometer utilized as the Reference Standard for 1D Dimensional Measurement.
1D Measurement – Length	Up to 100 mm (> 100 to 1 000) mm	0.93 mm 1.9 mm	Steel Rule utilized as the Reference Standard for 1D Dimensional Measurement.
1D Measurement – Length	Up to 5 000 mm	0.93 mm	Steel Tape utilized as the Reference Standard for 1D Dimensional Measurement.
1D Measurement – Length	Up to 5 000 mm	1.1 mm	Laser Distance Meter utilized as the Reference Standard for 1D Dimensional Measurement.

2 Dimensional

Specific Tests and / or Properties Measured	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
² Angle	Up to 360°	18"	Vision Measuring Machine utilized as the Reference Standard for 2D Dimensional Measurement.

3 Dimensional

Specific Tests and / or Properties Measured	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Dimensional Measurements – 3D	X-axis: Up to 400 mm Y-axis: Up to 300 mm Z-axis: Up to 300 mm	4.7 µm 4.7 µm 4.7 µm	Coordinate Measuring Machine utilized in Direct Measurements for Length, Diameter, Flatness, Parallelism and Straightness
Dimensional Measurements – 3D	Up to 360°	0.000 9°	Coordinate Measuring Machine utilized in Direct Measurements for Angle.
Dimensional Measurements – 3D	Up to 90°	3.6"	Coordinate Measuring Machine utilized in Direct Measurements for Squareness.

TESTING

Mechanical

Specific Tests and/or Properties Measured	Specification, Standard, Method, or Test Technique	Items, Materials or Product Tested	Key Equipment or Technology
Weight	CP-WK-TM01	Workpieces, Objects	Electronic Balance; Up to 20 kg
Acceleration (RMS)	CP-WK-TM02	Electronic Parts, Industrial Parts	3-AXIS G Force Data Logger, Vibration Shaker; Up to 68 m/s ²
¹ Detection Performance of Magnetic and/or Non-magnetic Objects	NIJ Standard 0602.02	¹ Handheld Metal Detector Metal Object Detection	Test Objects: Length – Up to 500 mm Width – Up to 100 mm Thickness – Up to 60 mm Weight – 1 kg
¹ Detection Performance of Magnetic and/or Non-magnetic Objects	NIJ Standard 0601.02	¹ Walk-Through Metal Detectors Metal Object Detection	Test Objects: Height – Up to 200 cm Width – Up to 100 cm Depth – Up to 70 cm Distance – 0.178 mm
¹ Detection Performance of Magnetic and/or Non-magnetic Objects	CP-WK-DM01	Industrial Metal Detector	Standard Balls (0.8 to 20) mm

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:

- 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
- D = diameter in mm, L = length of scale; " = arc-second; GU = gloss unit; rpm = revolutions per minute,
- Reference standard values are approximate values. The certified values will be utilized at the time of calibration along with the inherent uncertainty.
- The CMC for scales and balances is highly dependent upon the resolution of the unit under test. The CMC presented here does not include the resolution of the unit under test. The resolution will be included in the reported measurement uncertainty at the time of calibration.
- Unitless measurement.
- The unit of measure for Magnetic Flux Density G = gauss is reference to the three-dimensional CGS system and cannot be compared to the corresponding SI unit (T = Tesla), which has four dimensions when considering electric and mechanical quantities. It is strictly used here for customers who request measurements in G .
- Unless otherwise specified in the far-right column under the field of Calibration, the calibration procedure utilized by the laboratory was developed internally.



Jason Stine, Vice President

This Scope of Accreditation, version 016, was last updated on: 23 July 2025 and is valid only when accompanied by the Certificate.

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