CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

Isocal Technology Co., Ltd.
170/405 Moo 3 Serithai Rd., Kannayao, Kannayao
Bangkok 10230, Thailand

Fulfills the requirements of

ISO/IEC 17025:2017

In the fields 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: 09 December 2027

Certificate Number: AC-3045

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

ISOCAL Technology Co., Ltd.

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CALIBRATION AND DIMENSIONAL MEASUREMENT

ISO/IEC 17025 Accreditation Granted: **08 December 2025**

Certificate Number: **AC-3045** Certificate Expiry Date: **09 December 2027**

CALIBRATION

Acoustics and Vibration

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
[1] Sound level meter	94 dB, 1 kHz 114 dB, 1 kHz	0.6 dB 0.68 dB	Comparison to Sound Calibrator
Vibraton Meter (160 Hz) [1] Acceleration (RMS)	Up to 1 m/s^2 (>1 to 5) m/s^2 (>5 to 10) m/s^2 (>10 to 20) m/s^2 (>20 to 30) m/s^2 (>30 to 40) m/s^2 (>40 to 50) m/s^2	0.07 m/s^2 0.34 m/s^2 0.67 m/s^2 1.3 m/s^2 2 m/s^2 2.7 m/s^2 3.3 m/s^2	Comparison to Vibration Calibrator (YMC , VC-02)
[1] Velocity (RMS)	Up to 1 mm/s (>1 to 5) mm/s (>5 to 10) mm/s (>10 to 20) mm/s (>20 to 30) mm/s (>30 to 40) mm/s (>40 to 50) mm/s	0.07 mm/s 0.33 mm/s 0.67 mm/s 1.3 mm/s 2 mm/s 2.7 mm/s 3.3 mm/s	
Vibraton Meter (160 Hz) [1] Displacement (RMS)	Up to 10 µm (>10 to 20) µm (>20 to 30) µm (>30 to 40) µm (>40 to 50) µm	1 µm 1.7 µm 2.4 µm 3.1 µm 3.8 µm	Comparison to Vibration Calibrator (YMC , VC-02)

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Chemical Quantities

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
[1,2] pH Meter	4 pH 7 pH 10 pH	0.021 pH 0.026 pH 0.038 pH	Comparison to pH Buffer CRMs
[1,2] Conductivity Meter	84 µS/cm 1 413 µS/cm 12.88 mS/cm	0.66 µS/cm 10 µS/cm 0.27 mS/cm	Comparison to Conductivity Solution CRMs
[1] Refractometer	5 %Brix 30 %Brix 60 %Brix	0.06 %Brix 0.08 %Brix 0.09 %Brix	Comparison to Sucrose Standard Solution
[1] Refractometer (Refractive Index)	1.340 26 nD 1.381 15 nD 1.441 93 nD	0.001 1 nD 0.001 1 nD 0.001 1 nD	Comparison to Sucrose Standard Solution

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
[1] DC Voltage - Source	0 mV (> 0 to < 330) mV 330 mV to < 3.3 V (3.3 to < 33) V (33 to < 330) V (330 to 1 020) V	0.7 µV 70 µV/V + 7 µV 58 µV/V + 71 µV 59 µV/V + 0.7 mV 64 µV/V + 5.8 mV 64 µV/V + 6 mV	Comparison to Multifunction Calibrator (Fluke 5500A)
[1] DC Voltage - Measure	(0 to 100) mV (> 0.1 to 1) V (> 1 to 10) V (> 10 to 100) V (>100 to 1 000) V	14 µV/V + 0.36 µV 14 µV/V + 0.93 µV 13 µV/V + 7.6 µV 16 µV/V + 0.84 µV 27 µV/V + 0.72 mV	Comparison to Digital Multimeter (Agilent 3458A)
[1] DC High Voltage - Measure	(1 to 10) kV (>10 to 20) kV (>20 to 30) kV (>30 to 40) kV	0.33 mV/V + 5.8 V 0.33 mV/V + 6.1 V 0.42 mV/V + 6.3 V 0.42 mV/V + 6.4 V	Measurement with HV Probe (80k-40), Digital Multimeter (34401A)
[1] DC Current - Source	(> 0 to < 3.3) mA (3.3 to < 33) mA (33 to < 330) mA (0.33 to 2.2) A (2.2 to < 11) A (11 to 20) A	0.15 mA/A + 91 nA 0.12 mA/A + 0.65 µA 0.12 mA/A + 6.9 µA 0.35 mA/A + 87 µA 0.69 mA/A + 0.8 mA 0.58 mA/A + 7 mA	Comparison to Multifunction Calibrator (Fluke 5500A) (Meatest M130)

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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
[1] DC Clamp-On Ammeters	(0 to 200) A (> 200 to 400) A (> 400 to 1 000) A	3.5 mA/A + 71 mA 3.5 mA/A + 76 mA 3.5 mA/A + 76 mA	Comparison to Multifunction Calibrator with Turns coil (M-130), (Fluke 5500A)
[1] DC Current - Measure	(> 10 to 100) µA (0.1 to 1) mA (>1.0 to 10) mA (> 10 to 100) mA (> 0.10 to 1.0) A (> 1 to 3) A	29 µA/A + 7.1 nA 31 µA/A + 12 nA 30 µA/A + 0.11 µA 43 µA/A + 1.1 µA 0.16 mA/A + 15 µA 1.4 mA/A + 0.7 mA	Comparison to Digital Multimeter (Agilent 3458A) (Agilent 34401A)
[1] DC Cutoff Current - Measure	DC: (0.1 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	17 mA/A + 0.6 µA 17 mA/A + 6 µA 17 mA/A + 6 µA 17 mA/A + 6 µA 17 mA/A + 6 µA 17 mA/A + 58 µA	Comparison to Current Calibrator for W. Tester (Kikusui TOS1200)
[1] AC Cutoff Current - Measure	AC @ 50, 60 Hz (0.1 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	 17 mA/A + 0.6 µA 17 mA/A + 6 µA 17 mA/A + 6 µA 17 mA/A + 6 µA 17 mA/A + 6 µA 17 mA/A + 58 µA	Comparison to Current Calibrator for W. Tester (Kikusui TOS1200)
[1] AC Voltage - Source	(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 450) kHz (30 to < 300) mV (10 to 45) Hz > 45 Hz to 10 kHz (> 10 to 20) kHz (> 20 to 50) kHz (> 50 to 100) kHz (> 100 to 450) kHz	 0.25 mV/V + 0.94 µV 0.25 mV/V + 0.99 µV 0.25 mV/V + 0.99 µV 0.25 mV/V + 0.94 µV 0.41 mV/V + 1.2 µV 1.1 mV/V + 0.99 µV 56 µV/V + 9.9 µV 56 µV/V + 8.6 µV 56 µV/V + 9.9 µV 77 µV/V + 12 µV 0.12 mV/V + 12 µV 0.47 mV/V + 12 µV	Comparison to Multifunction Calibrator (Fluke 5500A)

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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
[1] AC Voltage - Source	(0.3 to < 3) V		Comparison to Multifunction Calibrator (Fluke 5500A)
	(10 to 45) Hz	51 µV/V + 76 µV	
	> 45 Hz to 10 kHz	51 µV/V + 94 µV	
	(> 10 to 20) kHz	51 µV/V + 86 µV	
	(> 20 to 50) kHz	71 µV/V + 94 µV	
	(> 50 to 100) kHz	0.12 mV/V + 99 µV	
	(> 100 to 450) kHz	0.59 mV/V + 99 µV	
	(3 to < 30) V		
	(10 to 45) Hz	51 µV/V + 0.76 mV	
	> 45 Hz to 10 kHz	51 µV/V + 0.76 mV	
	(> 10 to 20) kHz	51 µV/V + 0.76 mV	
	(> 20 to 50) kHz	76 µV/V + 0.99 mV	
	(> 50 to 90) kHz	0.13 mV/V + 0.99 mV	
	(30 to < 300) V		
	45 Hz to 1 kHz	61 µV/V + 0.58 mV	
	(> 1 to 10) kHz	61 µV/V + 0.58 mV	
	(> 10 to 18) kHz	61 µV/V + 0.58 mV	
	(300 to < 1 000) V		
	45 Hz to 1 kHz	61 µV/V + 5.8 mV	
	(> 1 to 5) kHz	61 µV/V + 5.8 mV	
	(> 5 to 10) kHz	61 µV/V + 5.8 mV	
[1] AC Current - Source	(0.029 to < 0.33) mA		Comparison to Multifunction Calibrator (Fluke 5500A) (Meatest M-130)
	(20 to 45) Hz	0.46 mA/A + 7.6 nA	
	> 45 Hz to 1 kHz	0.6 mA/A + 8.6 nA	
	(> 1 to 5) kHz	0.6 mA/A + 12 nA	
	(> 5 to 10) kHz	0.6 mA/A + 12 nA	
	(0.33 to < 3.3) mA		
	(20 to 45) Hz	0.23 mA/A + 86 nA	
	> 45 Hz to 1 kHz	0.23 mA/A + 86 nA	
	(> 1 to 5) kHz	0.23 mA/A + 76 nA	
	(> 5 to 10) kHz	0.23 mA/A + 86 nA	
	(3.3 to < 33) mA		
	(20 to 45) Hz	0.3 mA/A + 0.76 µA	
	> 45 Hz to 1 kHz	0.3 mA/A + 0.58 µA	
	(> 1 to 5) kHz	0.3 mA/A + 0.58 µA	
	(> 5 to 10) kHz	0.3 mA/A + 0.76 µA	

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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
[1] AC Current - Source	(33 to < 330) mA (20 to 45) Hz > 45 Hz to 1 kHz (> 1 to 5) kHz (> 5 to 10) kHz (0.33 to < 2.2) A (20 to 45) Hz > 45 Hz to 1 kHz (> 1 to 5) kHz (2.2 to < 11) A (45 to 500) Hz > 500 Hz to 1 kHz	 0.44 mA/A + 7.6 nA 0.44 mA/A + 7.6 nA 0.44 mA/A + 7.6 nA 0.44 mA/A + 7.6 nA 0.91 mA/A + 76 µA 0.91 mA/A + 86 µA 0.94 mA/A + 86 µA 0.75 mA/A + 7.6 mA 0.75 mA/A + 7.6 mA	Comparison to Multifunction Calibrator (Fluke 5500A) (Meatest M-130)
[1] AC Voltage - Measure	(10 to 100) mV 40 Hz to 1 kHz >100 mV to 1 V 40 Hz to 1 kHz (>1 to 10) V >20 Hz to 1 kHz (>1 to 20) kHz (> 20 to 100) kHz > 100 kHz to 1 MHz (> 10 to 100) V 40 Hz to 1 kHz (> 100 to 700) V 40 Hz to 1 kHz	 0.21 mV/V + 2.5 µV 0.13 mV/V + 25 µV 0.13 mV/V + 0.55 mV 0.19 mV/V + 0.25 mV 0.97 mV/V + 0.25 mV 13 mV/V + 1.2 mV 0.26 mV/V + 2.5 mV 0.48 mV/V +18 mV	Comparison to Digital Multimeter 3458A
[1] AC High Voltage - Measure @ 50 Hz, 60 Hz	500 V to 1 kV (>1 to 10) kV (>10 to 28) kV	8.6 mV/V + 5.8 V 4.7 mV/V + 5.8 V 4.7 mV/V + 5.8 V	Comparison to HV Probe (80k-40) Digital Multimeter (34401A)
[1] AC Clamp-On Ammeters	(> 20 to 200) A (40 to 500) Hz (> 200 to 500) A (40 to 500) Hz	 4.2 mA/A + 70 mA 4.2 mA/A + 70 mA	Comparison to Multifunction Calibrator (Fluke 5500A) (Meatest M-130) With 50 Turn Coil
[1] AC/DC Current - Measure	>100 mA to 1 A 10 Hz to 1 kHz DC to 1 kHz (> 1 to 30) A (>1 to 5) kHz (> 1 to 30) A	 1.4 mA/A + 0.47 mA 6.9 mA/A + 7 mA 65 mA/A + 7.6 mA	Comparison to Current Shunt (Agilent 34330A) Digital Multimeter (Agilent 34401A)

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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
[1] Resistance - Source	0 Ω (>0 to <11) Ω (11 to <30) Ω (30 to <110) Ω (110 to <300) Ω 300 Ω to <1.1 kΩ (1.1 to <3.3) kΩ (3.3 to <11) kΩ (11 to <30) kΩ (30 to <110) kΩ (110 to <330) kΩ 330 kΩ to <1.1 MΩ (1.1 to <3.3) MΩ (3.3 to <11) MΩ (11 to <33) MΩ (33 to <110) MΩ (110 to <330) MΩ	1.8 mΩ 0.14 mΩ/Ω + 0.76 mΩ 51 μΩ/Ω + 0.76 mΩ 14 μΩ/Ω + 7.8 mΩ 51 μΩ/Ω + 7.6 mΩ 14 μΩ/Ω + 78 mΩ 41 μΩ/Ω + 58 mΩ 28 μΩ/Ω + 0.71 Ω 41 μΩ/Ω + 0.7 Ω 28 μΩ/Ω + 5.8 Ω 20 μΩ/Ω + 7 Ω 29 μΩ/Ω + 0.1 kΩ 92 μΩ/Ω + 76 Ω 43 μΩ/Ω + 0.96 kΩ 36 μΩ/Ω + 1.2 kΩ 0.17 mΩ/Ω + 7 kΩ 0.17 mΩ/Ω + 7 kΩ	Comparison to Multifunction Calibrator (Fluke 5500A)
[1] Resistance - Source	(0.1 to 1) Ω (1 to 10) Ω (10 to 100) Ω (100 to 1000) Ω (1 to 10) kΩ (10 to 100) kΩ (0.1 to 1) MΩ (1 to 10) MΩ	0.22 mΩ/Ω + 3.8 mΩ 77 μΩ/Ω + 4.6 mΩ 38 μΩ/Ω + 4.8 mΩ 15 μΩ/Ω + 60 mΩ 13 μΩ/Ω + 0.35 Ω 43 μΩ/Ω + 3.5 Ω 0.19 mΩ/Ω + 0.15 kΩ 1.3 mΩ/Ω + 0.65 kΩ	Comparison to Decade Resistance R802 JJ Instrument
[1] Resistance - Source	(10 to 100) MΩ (100 to 1 000) MΩ	1.8 mΩ/Ω + 0.7 kΩ 18 mΩ/Ω + 5.8 kΩ	Comparison to Decade Resistance (Cropico RBB4G)

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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
[1] Resistance - Source, High Resistance, Insulation Resistance, Surface Resistivity, Electrostatic Resistance	± (10 to 500) V		Comparison to Decade Resistance Box
	1 MΩ	6 kΩ	
	2 MΩ	6.3 kΩ	
	3 MΩ	6.7 kΩ	
	4 MΩ	7.4 kΩ	
	5 MΩ	8.5 kΩ	
	6 MΩ	11 kΩ	
	7 MΩ	13 kΩ	
	8 MΩ	15 kΩ	
	9 MΩ	18 kΩ	
	10 MΩ	22 kΩ	
	100 MΩ	0.22 MΩ	
	200 MΩ	1 MΩ	
	300 MΩ	1.8 MΩ	
	400 MΩ	3 MΩ	
	500 MΩ	4.6 MΩ	
	600 MΩ	6.6 MΩ	
	700 MΩ	8.9 MΩ	
	800 MΩ	12 MΩ	
	900 MΩ	15 MΩ	
	1 GΩ	19 MΩ	
	± (>500 to 1 000) V		
	10 MΩ	8.8 kΩ	
	50 MΩ	72 kΩ	
	100 MΩ	89 kΩ	
	500 MΩ	0.74 MΩ	
	1 GΩ	6.1 MΩ	
[1] Resistance - Measure	Up to 10 Ω	27 µΩ/Ω + 0.78 mΩ	Comparison to Digital Multimeter (Agilent 3458A)
	(> 10 to 100) Ω	21 µΩ/Ω + 0.91 mΩ	
	> 100 Ω to 1 kΩ	19 µΩ/Ω + 7.6 mΩ	
	(> 1 to 10) kΩ	14 µΩ/Ω + 76 mΩ	
	(> 10 to 100) kΩ	19 µΩ/Ω + 0.76 Ω	
	(> 0.1 to 1) MΩ	30 µΩ/Ω + 8 Ω	
	(> 1 to 10) MΩ	68 µΩ/Ω + 0.14 kΩ	

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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
[1] DC Power - Source	(1 to < 296.1) W 33 mV to 900 V (3.3 to <330) mA	0.35 mW/W + 70 mW	Comparison to Multifunction Calibrator (Fluke 5500A)
	296.1 W to <1.971 kW 33 mV to 900 V (0.33 to <2.2) A	0.69 mW/W + 0.7 W	
	(1.971 to <9.9) kW 33 mV to 900 V (3 to 11) A	1 mW/W + 0.7 W	
[1] AC Power - Source, Single Phase, PF = (0.5 to 1) @ 45 Hz to 65 Hz	(1 to < 9) W 330 mV to 1 000 V (3.3 to <9) mA	2.9 mW/W + 0.7 mW	Comparison to Multifunction Calibrator (Fluke 5500A)
	(9 to < 32.9) W 330 mV to 1 000 V (9 to <33) mA	1.7 mW/W + 7 mW	
	(32.9 to < 89.99) W 330 mV to 1 000 V (33 to < 90) mA	2.9 mW/W + 7 mW	
	(89.99 to < 329) W 330 mV to 1000 V (90 to < 330) mA	1.7 mW/W + 58 mW	
	(329 to < 899.9) W 330 mV to 1 000 V (0.33 to < 0.90) A	2.9 mW/W + 70 mW	
	(0.899 to < 2.19) kW 330 mV to 1 000 V (0.9 to < 2.2) A	1.7 mW/W + 0.7 W	
	(2.19 to < 4.49) kW 330 mV to 1 000 V (2.2 to < 4.5) A	2.3 mW/W + 0.7 W	
	(4.49 to < 11) kW 330 mV to 1 000 V (4.5 to 11) A	1.7 mW/W + 0.7 W	

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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Power Quality, Single and Three Phase			Comparison to Power & Quality Analyzer (CHAUVIN ARNOUX C.A 8331)
[1] DC Voltage	Up to 600 V (>600 to 1 000) V	12 m/V/V + 0.58 V 12 mV/V + 1 V	
[1] AC Voltage @ 50/60 Hz	Up to 900 V	5.8 m/V/V + 0.24 V	
[1] AC Current @ 50/60 Hz	Up to 4.5 A (>4.5 to 90) A (>90 to 500) A (>500 to 1 000) A	5.9 mA/A + 2.6 mA 11 mA/A + 26 mA 11 mA/A + 0.26 A 9.9 mA/A + 1.1 A	
[1] Active Power (W), 50/60 Hz	Up to 4 kW (>4 to 81) kW (>81 to 900) kW	12 mW/W + 1.2 W 12 mW/W + 12 W 12 mW/W + 0.12 kW	
Reactive Power (var) 50/60 Hz	Up to 4 kvar (>1 to 81) kvar (>81 to 900) kvar	12 mvar/var + 1.2 var 12 mvar/var + 12 var 12 mvar/var + 0.12 kvar	
[1] Apparent Power (VA), 50/60 Hz	Up to 4 kVA (>4 to 81) kVA (>81 to 900) kVA	12 mVA/VA + 1.2 VA 12 mVA/VA + 12 VA 12 mVA/VA + 0.12 kVA	
[1] Energy (kWh)	50/60 Hz	1.2 x 10^{-2} + 0.12 kWh	
[1] Energy (kVAh)	50/60 Hz	1.2 x 10^{-2} + 0.12 kVAh	
[1] Frequency	(40 to 70) Hz	0.02 Hz	
[1] Phase Angel	Up to 360º	1.8º	
[1] Power Factor	Up to 1 PF	2.1 % of reading + 0.000 82 PF	
[1] Oscilloscope Vertical Deflection DC	0 mV (> 0 to < 330) mV 330 mV to < 3.3 V (3.3 to 33) V (33 to < 330) V (330 to 1 020) V	0.85 µV 70 µV/V + 7.8 µV 61 µV/V + 0.71mV 58 µV/V + 0.7 mV 64 µV/V + 7 mV 64 µV/V + 7.2 mV	Comparison to Multifunction Calibrator (Fluke 5500A)

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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
[1] Oscilloscope Square Wave Signal, @ 10 Hz to 20 kHz	(10 to 30) mV p-p (>30 to 300) mV p-p >300 mV p-p to 3 V p-p (>3 to 30) V p-p	2.1 mV/V + 0.36 mV 2 mV/V + 3.6 mV 2.2 mV/V + 36 mV 2.2 mV/V + 0.36 V	Comparison to Synthesizer/function generator (3325A) +Fluke 5500A Multifunction Calibrator
[1] Oscilloscope Horizontal Deflection: Time Mark	1 s 0.5 s 0.2 s 0.1 s 50 ms 20 ms 10 ms 5 ms 2 ms 1 ms 0.5 ms 0.2 ms 0.1 ms 50 µs 20 µs 10 µs 5 µs 2 µs 1 µs 0.5 µs 0.2 µs 0.1 µs	6.2 µs/s + 0.8 ms 6.1 µs/s + 0.8 ms 6.1 µs/s + 0.8 ms 6.1 µs/s + 0.8 ms 5.9 µs/s + 7.2 µs 6 µs/s + 7.3 µs 6.1 µs/s + 0.8 µs 6.1 µs/s + 0.8 µs 6.1 µs/s + 0.8 µs 6.1 µs/s + 0.8 µs 6.1 µs/s + 0.8 µs 6.1 µs/s + 0.8 µs 6.1 µs/s + 0.8 ns 6.1 µs/s + 0.8 ns 6.1 µs/s + 0.8 ns 6.1 µs/s + 0.8 ns 6 µs/s + 0.72 ns 5.8 µs/s + 0.58 ns 6 µs/s + 0.73 ns 6 µs/s + 0.73 ns 6 µs/s + 0.73 ns 6 µs/s + 0.73 ns	Comparison to Synthesizer/function generator (3325A)
[1] Temperature Simulation Resistance Temperature Detectors	Pt100 (385) 2 Wire (-200 to 800) °C Pt100 (385) 3 Wire (-200 to 800) °C Pt100 (385) 4 Wire (-200 to 800) °C	 0.2 °C 0.2 °C 0.2 °C	Comparison to Multifunction Calibrator (MCX)
[1] Temperature Simulation - Measure Thermocouple	Type K (-190 to 0) °C (>0 to 800) °C (>800 to 1 300) °C Type T (-50 to 0) °C (>0 to 390) °C	 0.55 °C 0.53 °C 0.59 °C 0.51 °C 0.49 °C	Comparison to Multifunction Calibrator (MCX)

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Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
[1] Temperature Simulation - Measure Thermocouple	Type E (-140 to 0) °C (>0 to 600) °C (>600 to 990) °C Type J (-200 to 0) °C (>0 to 400) °C (>400 to 1 190) °C Type R (0 to 400) °C (>400 to 1 760) °C Type S (0 to 400) °C (>400 to 1 760) °C Type N (-200 to 0) °C (>0 to 800) °C (>800 to 1 290) °C	 0.62 °C 0.5 °C 0.52 °C 0.52 °C 0.50 °C 0.53 °C 1.1 °C 1 °C 1.1 °C 1.1 °C 0.57 °C 0.53 °C 0.54 °C	Comparison to Multifunction Calibrator (MCX)
[1] Temperature Simulation - Measure Resistance Temperature Detector	Pt100 (385) 2 Wire (-190 to 0) °C (>0 to 800) °C Pt100 (385) 3 Wire (-190 to 0) °C (>0 to 800) °C Pt100 (385) 4 Wire (-190 to 0) °C (>0 to 800) °C	 0.2 °C 0.27 °C 0.2 °C 0.27 °C 0.2 °C 0.27 °C	Comparison to Multifunction Calibrator (MCX)
[1] Temperature-Simulation Thermocouple	Type K (-190 to 0) °C (>0 to 800) °C (>800 to 1 370) °C Type T (-50 to 0) °C (>0 to 400) °C Type E (-140 to 0) °C (>0 to 600) °C (>600 to 1 000) °C	 0.5 °C 0.38 °C 0.46 °C 0.62 °C 0.36 °C 0.52 °C 0.37 °C 0.39 °C	Comparison to Multifunction Calibrator (MCX)

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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
[1] Temperature-Simulation Thermocouple	Type J (-200 to 0) °C (>0 to 400) °C (>400 to 1 200) °C Type R (0 to 400) °C (>400 to 1 760) °C Type S (0 to 400) °C (>400 to 1 760) °C Type N (-200 to 0) °C (>0 to 800) °C (>800 to 1 300) °C	 0.42 °C 0.34 °C 0.37 °C 1.33 °C 0.83 °C 1.33 °C 0.84 °C 0.7 °C 0.41 °C 0.42 °C	Comparison to Multifunction Calibrator (MCX)
[1] Temperature-Simulation Resistance Temperature Detector	Pt100 (385) 2 Wire (-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 Pt100 (385) 3 Wire (-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 Pt100 (385) 4 Wire (-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	 0.08 °C 0.09 °C 0.11 °C 0.12 °C 0.13 °C 0.16 °C 0.31 °C 0.08 °C 0.09 °C 0.11 °C 0.12 °C 0.13 °C 0.16 °C 0.31 °C 0.08 °C 0.09 °C 0.11 °C 0.12 °C 0.13 °C 0.16 °C 0.31 °C	Comparison to Multi-Product Calibrator (5500A)

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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
[1] Temperature-Simulation Thermocouple	Type E		Comparison to Multi-Product Calibrator (5500A)
	(-250 to -100) °C	0.46 °C	
	(>-100 to -25) °C	0.09 °C	
	(>-25 to 350) °C	0.07 °C	
	(>350 to 650) °C	0.1 °C	
	(>650 to 1 000) °C	0.13 °C	
	Type J		
	(-210 to -100) °C	0.23 °C	
	(>-100 to -30) °C	0.1 °C	
	(>-30 to 150) °C	0.08 °C	
	(>150 to 760) °C	0.11 °C	
	(>760 to 1 200) °C	0.16 °C	
	Type K		
	(-200 to -100) °C	0.27 °C	
	(>-100 to -25) °C	0.13 °C	
	(>-25 to 120) °C	0.1 °C	
	(>120 to 1 000) °C	0.18 °C	
	(>1 000 to 1 370) °C	0.23 °C	
	Type N		
	(-200 to -100) °C	0.4 °C	
	(>-100 to -25) °C	0.19 °C	
	(>-25 to 120) °C	0.13 °C	
	(>120 to 410) °C	0.13 °C	
	(>410 to 1 300) °C	0.2 °C	
	Type R		
	(0 to 250) °C	0.41 °C	
	(>250 to 400) °C	0.38 °C	
	(>400 to 1 000) °C	0.34 °C	
	(>1 000 to 1 767) °C	0.4 °C	
	Type S		
	(0 to 250) °C	0.42 °C	
	(>250 to 1 000) °C	0.38 °C	
	(>1 000 to 1 400) °C	0.39 °C	
	(>1 400 to 1 767) °C	0.39 °C	
	Type T		
	(-250 to -150) °C	0.65 °C	
	(>-150 to 0) °C	0.18 °C	
	(>0 to 120) °C	0.09 °C	
	(>120 to 400) °C	0.09 °C	

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Electrical – DC/Low Frequency

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[1] High Voltage -Measure (HV Probe)	DC (0.1 to 6) kV AC @ 50, 60 Hz (0.1 to 5) kV	0.022 % of reading 0.48 % of reading	Comparison to High Voltage Probe, Voltage Divider with Digital Multimeter (Fluke, 80K-40), (Fluke, 80E-10/AN), (Agilent, 34401A)
[1] Resistance - Measure Insulation Resistance	Test Voltages Up to 500 V (1 to 5) MΩ (>5 to 9) MΩ 10 MΩ (100 to 500) MΩ (>500 to 900) MΩ 1 GΩ	 24 mΩ/Ω + 5.8 kΩ 25 mΩ/Ω + 5.8 kΩ 25 mΩ/Ω + 58 kΩ 58 mΩ/Ω + 0.58 MΩ 61 mΩ/Ω + 0.58 MΩ 61 mΩ/Ω + 5.8 MΩ	Comparison to Hipot Tester TOS9201
[1] Current - Measure (Test Voltage)	Test Voltage DC @ (Up to 4) kV Up to 1 mA (>1 to 5) mA (>5 to 10) mA Test Voltage AC, 50 Hz @ (Up to 4) kV Up to 1 mA (>1 to 5) mA (>5 to 10) mA	 42 mA/A + 24 µA 39 mA/A + 24 µA 39 mA/A + 24 µA 42 mA/A + 24 µA 39 mA/A + 24 µA 42 mA/A + 62 µA	Comparison to Hipot Tester TOS9201
[1] Pulse - Source	(1 to 100 000) Counts (>100 000 to 500 000)Counts	0.9 Count 1 Count	Comparison to Mulifunction Calibrator
[1] Weld Machine, Weld Tester	DC Up to 100 A (>100 to 500) A (>500 to 1000) A (>1 to 9.99) kA (>9.99 to 40) kA AC @ 50/60 Hz Up to 100 A (>100 to 500) A (>500 to 1000) A (>1 to 9.99) kA (>9.99 to 40) kA	 1.7 % of Reading +0.73 A 1.7 % of Reading +2 A 1.7 % of Reading +6.9 A 2.3 % of Reading +0.3 kA 1.7 % of Reading +1.1 kA 1.7 % of Reading +0.77 A 1.7 % of Reading +2.3 A 1.7 % of Reading +7.3 A 2.3 % of Reading +0.3 kA 2.3 % of Reading +1.1 kA	Comparison to Weld Checker, Digital Clamp Meter

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Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Gauge Block	(0.5 to 10) mm (>10 to 25) mm (>25 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	0.15 µm 0.29 µm 0.55 µm 1.1 µm 1.3 µm 1.4 µm 1.6 µm 2.2 µm 2.7 µm	Comparison to ULM, Gauge Block set Grade 0, 1
[1] Vernier Caliper, Dial and Digital (Outside, Inside, Depth)	Up to 100 mm (>100 to 150) mm (>150 to 200) mm (>200 to 300) mm (>300 to 450) mm (>450 to 600) mm (>600 to 1 000) mm (>1 000 to 1 500) mm	0.014 mm 0.014 mm 0.014 mm 0.016 mm 0.018 mm 0.021 mm 0.03 mm 0.042 mm	Comparison to Gauge Block set
[1] Dial Gauge & Digital Indicator (Linear)	(0 to 1) mm (>1 to 12.7) mm (>12.7 to 25) mm	0.000 82 mm 0.003 6 mm 0.003 6 mm	Comparison to Calibration Tester
[1] Dial Test Indicator (Linear)	Up to 1 mm >1 to 1.6 mm	0.82 µm 3.5 µm	Comparison to Calibration Tester
[1] Gap Sensor	(-10 to 10) mm	0.013 mm	Comparison to Calibration tester
[1] Dial Gauge & Digital Indicator (Thickness)	Up to 12.7 mm (>12.7 to 25) mm (>25 to 50) mm (>50 to 75) mm (>75 to 100) mm	0.8 µm 1 µm 1.5 µm 2.1 µm 2.8 µm	Comparison to Gauge Block Set
[1] Linear Length Gauge /Electrical Comparator /Mu Checker	Up to 5 µm (>5 to 10) µm (>10 to 20) µm (>20 to 25) µm (>25 to 50) µm	0.3 µm 0.4 µm 0.6 µm 0.8 µm 1.4 µm	Comparison to Gauge Blocks
[1] Cylinder Gauge /Bore Gauge	(0 to 18) mm (>18 to 35) mm (>35 to 60) mm (>60 to 100) mm (>100 to 160) mm (>160 to 250) mm	2.7 µm 2.8 µm 3.1 µm 3.8 µm 5 µm 7.2 µm	Comparison to Calibration Tester

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Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
[1] Outside/Inside Micrometer	(0 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 (>200 to 225) mm (>225 to 250) mm (>250 to 275) mm (>275 to 300) mm (>300 to 325) mm (>325 to 350) mm (>350 to 375) mm (>375 to 400) mm (>400 to 425) mm (>425 to 450) mm (>450 to 475) mm (>475 to 500) mm	1 µm 1.5 µm 2.1 µm 2.8 µm 3.4 µm 4.1 µm 4.7 µm 5.4 µm 6.1 µm 6.7 µm 7.4 µm 8.1 µm 8.7 µm 9.4 µm 10 µm 11 µm 11 µm 12 µm 13 µm 13 µm	Comparison to Gauge Block set
[1] Depth Micrometer	(0 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 (>200 to 225) mm (>225 to 250) mm (>250 to 275) mm (>275 to 300) mm	1 µm 1.5 µm 2.1 µm 2.8 µm 3.4 µm 4.1 µm 4.7 µm 5.4 µm 6.1 µm 6.7 µm 7.4 µm 8.1 µm	Comparison to Gauge Block Set
[1] Gear Tooth Vernier Caliper	Up to 60 mm	0.014 mm	Comparison to Gauge Block Set
[1] Height Gauge	Up to 150 mm (>150 to 300) mm (>300 to 450) mm (>450 to 600) mm (>600 to 1 000) mm	0.016 mm 0.017 mm 0.019 mm 0.022 mm 0.031 mm	Comparison to Gauge Block Set and Surface Plate

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Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Feeler Gauge	(0.01 to 3) mm (>3 to 20) mm	0.3 µm 0.61 µm	Comparison to Universal Length Measuring Machine
Thickness Plate (Calibration Foil)	Up to 50 µm (>50 to 200) µm (>200 to 500) µm (>0.5 to 1) mm (>1 to 6) mm (>6 to 20) mm	0.23 µm 0.23 µm 0.23 µm 0.23 µm 0.25 µm 0.44 µm	Comparison to Universal Length Measuring Machine
Holtest/Three-points Internal Micrometer	(6 to 14) mm (>14 to 20) mm (>20 to 40) mm (>40 to 50) mm (>50 to 75) mm (>75 to 100) mm	1 µm 1.4 µm 1.4 µm 2.3 µm 2.3 µm 3 µm	Comparison to Master Ring Gauge
[1] Coating Thickness Gauge	(12.5 to 50) µm (>50 to 100) µm (>100 to 200) µm (>200 to 500) µm (>500 to 1 500) µm	0.52 µm 0.52 µm 0.9 µm 0.9 µm 0.9 µm	Comparison to Calibration Foil
Setting Rod for micrometer	(0 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 400) mm (400 to 500) mm	0.29 µm 0.27 µm 0.34 µm 1.1 µm 1.4 µm 1.5 µm 2.3 µm 2.7 µm	Comparison to Gauge Block Set & Universal Length Measuring Machine
[1] Can Seam Micrometer	(0 to 13) mm	2.4 µm	Comparison to Gauge Block Set
[1] Point Micrometer	(0 to 25) mm	1 µm	Comparison to Gauge Block Set
[1] Gear Micrometer	0 to 25 mm (>25 to 50) mm (>50 to 75) mm (>75 to 100) mm	1 µm 1.5 µm 2.1 µm 2.8 µm	Comparison to Gauge Block Set
[1] Dial Gauge and Micrometer Head	(0 to 5) mm (>5 to 25) mm (>25 to 50) mm	0.7 µm 1 µm 1.5 µm	Comparison to Gauge Block Set

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Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
[1] Caliper Gauge (External/Internal)	Up to 30 mm (>30 to 150) mm	1.1 µm 4.1 µm	Comparison to Gauge Block Set
[1] Measuring microscope/tool maker's microscope, measuring accuracy of respective axis, X-axis direction and Y-axis direction	(0 to 10) mm (>10 to 50) mm (>50 to 100) mm (>100 to 150) mm (>100 to 200) mm	0.001 4 mm 0.001 7 mm 0.002 4 mm 0.003 3 mm 0.004 1 mm	Internal Procedure based on JIS B 7153:1995 using Comparison to Glass Scale
Taper Gauge	Up to 50 mm	0.004 6 mm	Measurement using Comparison to Vision Measuring System
[1] Profile Projector, measuring accuracies of respective axis, X-axis direction and y-axis direction	(0 to 50) mm (>50 to 100) mm (>100 to 150) mm (>150 to 200) mm (>200 to 300) mm	0.002 4 mm 0.002 9 mm 0.003 7 mm 0.004 5 mm 0.006 5 mm	Internal Procedure based on JIS B 7184:1972 using Glass Scale
Scale Lupe	Up to 100 mm	0.004 4 mm	Comparison to Vision Measuring System
Thread Plug Gauge - Pitch Diameter	Major Diameter (>1 to 10) mm (>10 to 50) mm (>50 to 75) mm (>75 to 100) mm (>100 to 125) mm (>125 to 150) mm	 1.6 µm 1.8 µm 2 µm 2.2 µm 2.6 µm 3.1 µm	Comparison to Universal Length Measuring Machine, 3 Thread Wires
Thread Plug Gauge - Major Diameter	(>1 to 10) mm (>10 to 50) mm (>50 to 75) mm (>75 to 100) mm (>100 to 125) mm (>125 to 150) mm	0.3 µm 0.37 µm 0.38 µm 0.44 µm 0.54 µm 0.75 µm	Comparison to Universal Length Measuring Machine
Thread Ring Gauge - Pitch Diameter	(2 to 10) mm (>10 to 50) mm (>50 to 75) mm (>75 to 100) mm	1.4 µm 1.8 µm 2.2 µm 2.4 µm	Comparison to Universal Length Measuring Machine and T probe
Thread Ring Gauge – Minor Diameters	(2 to 10) mm (>10 to 50) mm (>50 to 75) mm (>75 to 100) mm	0.5 µm 1.3 µm 1.5 µm 1.3 µm	Comparison to Master Ring Gauge, Universal Length Measuring Machine

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Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Plain Ring Gauge	(3 to 20) mm (>20 to 50) mm (>50 to 70) mm (>70 to 80) mm (>80 to 100) mm (>100 to 150) mm (>150 to 200) mm (>200 to 300) mm	0.34 µm 0.46 µm 0.59 µm 0.64 µm 0.75 µm 1.1 µm 1.5 µm 2.1 µm	Comparison to Master Ring Gauge, Universal Length Measuring Machine
Plain Plug Gauge /Pin Gauge/ 3-wires (Diameter measurement)	(0 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	0.29 µm 0.31 µm 0.34 µm 0.37 µm 0.42 µm 0.46 µm 0.52 µm 0.57 µm 0.62 µm 0.68 µm 0.86 µm 1.2 µm 1.2 µm 1.3 µm 1.6 µm 1.9 µm	Comparison to Universal Length Measuring Machine Gauge Block Set
[1] Laser Scan Micrometer	Length measurement Up to 100 mm Diameter measurement Up to 20 mm	 2.7 µm 0.9 µm	Comparison to Master Pin Gauge, Gauge Block Set
[1] Surface Roughness Testers	Ra: 0.44 µm Rz: 1.6 µm Ra: 3.0 µm Rz: 11.6 µm	0.02 µm 0.08 µm 0.06 µm 0.3 µm	Comparison to Roughness Standards
[1] Snap Indicating Micrometer	(0 to 25) mm (25 to 50) mm (50 to 75) mm (75 to 100) mm	1 µm 1.5 µm 2.1 µm 2.8 µm	Comparison to Gauge Block Set
Snap Gauge (Length, Diameter, Inside, Outside)	Up to 50 mm (50 to 100) mm (100 to 200) mm (200 to 300) mm	5.5 µm 5.8 µm 8.1 µm 10 µm	Comparison to Universal Length Measuring Machine, 3D Coordinate Measuring Machine

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Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Steel Ruler	Up to 150 mm (>150 to 300) mm (>300 to 600) mm (>600 to 750) mm (>750 to 1 000) mm (>1 000 to 1 500) mm (>1 500 to 2 000) mm	0.007 mm 0.01 mm 0.017 mm 0.021 mm 0.027 mm 0.04 mm 0.053 mm	Comparison to Linear Scale
Steel Tape & Textile Tape	Up to 1 000 mm (>1 000 to 2 000) mm (>2 000 to 5 000) mm (>5 000 to 7 500) mm (>7.5 to 10) m (>10 to 50) m (>50 to 100) m	0.027 mm 0.053 mm 0.14 mm 0.2 mm 0.27 mm 1.4 mm 2.7 mm	Comparison to Linear Scale
[1] Internal Micrometer All Types	Up to 30 mm (>30 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	0.75 µm 1.5 µm 2.8 µm 4.1 µm 5.5 µm 6.8 µm 8.1 µm 9.5 µm 11 µm 13 µm 14 µm	Comparison to Gauge Block Set
Surface Plate Overall Flatness	Up to (250 x 250) mm	4.7 µm	Partial Calibration per JIS B 7513, ISO 8512 using CMM
[1] Granite Surface Plate Overall Flatness	(250 X 250) mm (≤250 X 400) mm (≤300 X 300) mm (≤300 X 450) mm (≤400 X 400) mm (≤450 X 450) mm (≤450 X 600) mm (≤750 X 1000) mm	3.2 µm 3.4 µm 3.2 µm 3.5 µm 3.4 µm 3.5 µm 4.2 µm 7.8 µm	Partial calibration per JIS B 7513, ISO 8512 Using Granite Straight Edge and Dial Comparator

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Length – Dimensional Metrology

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[1] Linear Scale	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	0.014 µm 0.014 µm 0.016 µm 0.017 µm 0.019 µm 0.021 µm 0.023 µm	Comparison to Gauge Block Set
Test Sieve Opening Dimension	Up to 50 mm	3.4 µm	Comparison to Vision Measuring System
Angle Block	(0 to 30)° (30 to 45)° (45 to 60)° (60 to 90)°	6.3” 8.5” 11” 12”	Comparison to 3D Coordinate Measuring Machine
Angle Tester	Up to 90° >90° to 180° >180° to 270° >270° to 360°	12” 17” 21” 24”	Direct measurement using Vision Measuring Machine
[1] Rotational Angle – Torque Testing Machines	(0 to 360)°	0.026°	Direct measurement using Speed and Angle Tester
Steel Step Gauge	Up to 5 mm (5 to 25) mm (25 to 100) mm (100 to 200) mm	0.22 µm 0.33 µm 1.1 µm 2.2 µm	Comparison to Universal Length Measuring Machine
[1] Air Micrometer	Up to 400 µm	0.46 µm	Comparison to Magnification Tester
[1] Ultrasonic Thickness Gauge	Up to 10 mm (>10 to 25) mm (>50 to 100) mm	11 µm 12 µm 9.5 µm	Comparison to Standard Step Gauge
[1] Wheel Counter / Wheel Encoder	(Up to 10) m (>10 to 100) m (>100 to 500) m (>500 to 1 000) m (>1 000 to 5 000) m	0.016 m 0.017 m 0.034 m 0.061 m 0.3 m	Comparison to Length Meter
Radius gauge	Up to 5 mm	0.003 8 mm	Comparison to Vision Measuring System
Radius gauge	(5 to 10) mm (10 to 50) mm (50 to 100) mm	0.005 6 mm 0.006 1 mm 0.006 5 mm	Comparison to 3D Coordinate Measuring Machine

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Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
[1] Balance/Scale			
Resolution: 0.000 01 g	Up to 100 g	0.22 mg	Comparison to OIML Class M1 and E2 Mass Pieces UKAS LAB 14
0.000 1 g	(>100 to 220) g	0.31 mg	
0.000 1 g	(>220 to 320) g	0.45 mg	
0.001 g	(>320 to 500) g	1.3 mg	
0.001 g	(>500 to 1 000) g	1.6 mg	
0.001 g	(>1 000 to 2 000) g	2.8 mg	
0.001 g	(>2 000 to 3 000) g	4 mg	
0.001 g	(>3 000 to 5 000) g	6.4 mg	
0.001 g	(>5 000 to 6 000) g	7.6 mg	
0.01 g	(>6 to 10) kg	16 mg	
0.01 g	(>10 to 20) kg	27 mg	
0.01 g	(>20 to 30) kg	39 mg	
0.01 kg	(>30 to 50) kg	8.2 g	
0.01 kg	(>50 to 100) kg	8.2 g	
0.1 kg	(>100 to 1 000) kg	82 g	
0.5 kg	(>1 000 to 3 000) kg	0.41 kg	
Mass	100 mg	0.0098 mg	Comparison to OIML Class M1, F1 and E2 Mass Pieces OML R-111-1
	1 g	0.014 mg	
	2 g	0.08 mg	
	5 g	0.07 mg	
	10 g	0.10 mg	
	20 g	0.13 mg	
	50 g	0.16 mg	
	100 g	0.24 mg	
	200 g	0.37 mg	
	500 g	1.44 mg	
	1 kg	2.1 mg	
	2 kg	3.8mg	
	5 kg	8.5 mg	
	10 kg	17 mg	
	20 kg	0.11 g	

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Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
[1] Force - Universal Testing Machine	Tension Up to 10 N (>10 to 100) N (>100 to 1 000) N (>1 to 2.5) kN (>2.5 to 5) kN (>5 to 10) kN (>10 to 50) kN (>50 to 100) kN Compression Up to 10 N (>10 to 100) N (>100 to 1 000) N (>1 to 2.5) kN (>2.5 to 5) kN (>5 to 10) kN (>10 to 50) kN (>50 to 100) kN	 0.003 N 1.2 N 12 N 0.029 kN 0.058 kN 0.12 kN 0.6 kN 1.2 kN 0.003 N 1.2 N 12 N 0.029 kN 0.058 kN 0.12 kN 0.6 kN 1.2 kN	ISO 7500-1 using Standard Load Cell and DMM, and Standard Weight Set (Up to 100 N)
[1] Rockwell/Vickers/Brinell Hardness Testing Machine (Force)	200 gf 1000 gf 3 kgf 10 kgf 100 kgf 150 kgf 500 kgf 3 000 kgf	1.7 gf 7.7 gf 23 gf 0.04 kgf 0.7 kgf 1 kgf 3.1 kgf 19 kgf	Direct Calibration (partial) using Standard Load Cell
[1] Rockwell Hardness Testing Machine	30 HRC 45 HRC 60 HRC 71 HRB 93 HRB	0.53 HRC 0.54 HRC 0.5 HRC 0.62 HRB 0.71 HRB	Indirect Verification using Rockwell Hardness Test Block
[1] Micro Vickers Hardness Testing Machine (Indirect Measurement)	711 HV	37 HV	Indirect Calibration using Vickers Hardness Test Block
[1] Vickers Hardness Testing Machine	200 HV 500 HV 800 HV	4.9 HV 12 HV 18 HV	Indirect Calibration using Vickers Hardness Test Block
[1] Brinell Hardness Testing Machine	750 kgf 210 HB 490 HB	 3.2 HB 3.6 HB	Indirect Calibration using Brinell Hardness Test Block

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Mass and Mass Related

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[1] Brinell Hardness Testing Machine	3 000 kgf 210 HB 490 HB	 4.1 HB 6.2 HB	Indirect Calibration using Brinell Hardness Test Block
Shore Hardness Tester/ Durometer (Rubber) Spring Force (Shore A, B, C, D, E, OO)	(0 to 100) Duro Up to 79 gf (>79 to 114) gf (>114 to 198) gf (>198 to 821) gf (>821 to 4533) gf	 1.6 gf 1.6 gf 1.7 gf 3.1 gf 11 gf	Partial Calibration for Spring Force using Standard Load Cell with Indicator
[1] Hand Torque Tools, Torque Wrenches, Torque Drivers	Clockwise (0.01 to 1) N·m (>1 to 10) N·m (>10 to 20) N·m (>20 to 100) N·m (>100 to 180) N·m (>180 to 500) N·m (>500 to 1 000) N·m Counterclockwise (0.01 to 1) N·m (>1 to 10) N·m (>10 to 20) N·m (>20 to 100) N·m (>100 to 180) N·m	 1.2 % of reading 1.4 % of reading 1.2 % of reading 1.2 % of reading 1.2 % of reading 2.3 % of reading 2.3 % of reading 1.2 % of reading 1.4 % of reading 1.2 % of reading 1.2 % of reading 1.2 % of reading	ISO 6789:2003 by Comparison to Torque Tester
[1] Torque Meter/Torque Tester/Torque Cell Clockwise and Counterclockwise	(0 to 0.5) N·m (>0.5 to 1) N·m (>1 to 2) N·m (>2 to 6) N·m (>6 to 10) N·m (>10 to 20) N·m (>20 to 50) N·m (>50 to 100) N·m (>100 to 200) N·m (>200 to 250) N·m	0.000 6 N·m 0.001 6 N·m 0.003 1 N·m 0.009 N·m 0.016 N·m 0.031 N·m 0.077 N·m 0.15 N·m 0.31 N·m 0.38 N·m	Comparison to Torque Arm & Standard Weight Set
[1] Torque Gauge	Up to 1.5 cN·m (1.5 to 3) cN·m (3 to 12) cN·m (12 to 30) cN·m (30 to 150) cN·m	0.007 2 cN·m 0.031 cN·m 0.067 cN·m 0.30 cN·m 0.74 cN·m	Comparison to Torque Arm & Standard Weight Set

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Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
[1] Gauge Pressure (Pneumatic): Digital Pressure Gauge, Pressure Transducer, Pressure Transmitter, Manometer, Pressure Switch Vacuum Gauge Absolute pressure	(-90 to 0) kPa (>0 to 100) kPa (>100 to 700) kPa (>700 to 2 000) kPa	0.09 kPa 0.09 kPa 0.15 kPa 0.84 kPa	DKD R6-1, DKD R6-2 by Comparison to Pressure Calibrator, Pressure Transducer, Digital Test Gauge
[1] Gauge Pressure (Hydraulic): Digital Pressure Gauge, Pressure Transducer, Pressure Transmitter, Manometer, Pressure Switch Vacuum Gauge	(>2 000 to 7 000) kPa (>7 to 34) MPa (>34 to 70) MPa (>70 to 100) MPa	7.1 kPa 0.02 MPa 0.04 MPa 0.058 MPa	DKD R6-1, DKD R6-2 by Comparison to Pressure Calibrator, Pressure Transducer, Digital Test Gauge
Absolute pressure gauges	(10 to 200) kPa Abs (200 to 2 000) kPa Abs	0.09 kPa 0.84 kPa	DKD R6-1, DKD R6-2 by Comparison to Pressure Calibrator, Pressure Transducer, Digital Test Gauge
[1] Pirani Vacuum Gauge	(0.135 to 0.4) Pa (>0.4 to 0.8) Pa (>0.8 to 8.0) Pa (>8.0 to 80) Pa (>80 to 800) Pa (>800 to 10 000) Pa (>10 000 to 100 000) Pa	8.2 % of reading 6.4 % of reading 6.4 % of reading 5.7 % of reading 5.3 % of reading 5.2 % of reading 5.2 % of reading	Comparison to Pirani Vacuum Gauge (Tamagawa PG800)
[1] Force - Push –Pull Gauge & Digital Force Gauge, Tension, Tensile Gauge (Analog/Digital)	(0 to 10) N (>10 to 50) N (>50 to 250) N (>250 to 1 000) N (>1 000 to 3 000) N (>3 000 to 5 000) N (>5 000 to 10 000) N	0.001 N 0.004 N 0.017 N 0.10 N 0.26 N 0.41 N 0.82 N	Comparison to Standard Weight Set
[1] Force - Push –Pull Gauge & Digital Force Gauge, Tension, Tensile Gauge (Analog/Digital)	(>1 000 to 3 000) N (>3 000 to 5 000) N (>5 000 to 10 000) N	1.5 N 2.4 N 6.4 N	Comparison to Standard Loadcell

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Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
[1] Force - Digital/Dial Tension Gauge	Up to 10 cN (>10 to 20) cN (>20 to 500) cN >500 cN to 10 N (10 to 50) N (50 to 500) N	0.12 cN 0.12 cN 0.41 cN 0.06 N 0.12 N 0.3 N	Comparison to Standard Weight Set
[1] Volume Flow Meter (Air Flow)	(>50 to 100) L/min (>100 to 200) L/min	0.6 % of reading 2 % of reading	Comparison to Standard Flow Meter Temp & Humidity Barometer Flow reference conditions at 101 325 Pa (abs) and 0 °C.
[1] Volume Flow Meter (Liquid Flow)	(0.1 to 100) L/min (>100 to 300) L/min (>300 to 500) L/min (>500 to 1 000) L/min	0.65 % of reading 0.61 % of reading 0.60 % of reading 0.59 % of reading	Comparison to Ultrasonic Flow Meter (water at ambient temperature)
Viscosity Meter	(9 to 11.04) cP (110 to 150) cP (100 to 650) cP (1 000 to 1 500) cP (6 000 to 9 000) cP (9 000 to 90 000) cP	0.8 % of reading 0.9 % of reading 0.9 % of reading 1 % of reading 1.2 % of reading 1.5 % of reading	Comparison to Standard viscosity Solutions
Volumetric Glassware Burette	(1 to 10) ml (>10 to 25) ml (>25 to 50) ml (>50 to 100) ml	0.001 7 ml 0.003 5 ml 0.006 4 ml 0.012 ml	Comparison to Electronic Balance
Volumetric Glassware Graduated Cylinder, Measuring Tube	(1 to 10) ml (>10 to 25) ml (>25 to 50) ml (>50 to 100) ml (>100 to 250) ml (>250 to 500) ml (>500 to 1 000) ml (>1 000 to 2 000) ml	0.001 7 ml 0.003 5 ml 0.006 4 ml 0.049 ml 0.066 ml 0.096 ml 0.15 ml 0.27 ml	Comparison to Electronic Balance
Volumetric Glassware Measuring Pipette	(1 to 10) ml (>10 to 25) ml (>25 to 50) ml (>50 to 100) ml (>100 to 250) ml	0.001 7 ml 0.003 5 ml 0.006 4 ml 0.049 ml 0.067 ml	Comparison to Electronic Balance

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Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Volumetric Glassware Volumetric Flask	(1 to 10) ml (>10 to 25) ml (>25 to 50) ml (>50 to 100) ml (>100 to 250) ml (>250 to 500) ml (>500 to 1 000) ml (>1 000 to 2 000) ml	0.001 8 ml 0.003 5 ml 0.006 4 ml 0.049 ml 0.066 ml 0.096 ml 0.15 ml 0.27 ml	Comparison to Electronic Balance
Volumetric Glassware Volumetric Pipette	(0.1 to 5) ml (>5 to 10) ml (>10 to 25) ml (>25 to 50) ml (>50 to 100) ml	0.001 2 ml 0.001 8 ml 0.003 5 ml 0.006 4 ml 0.013 ml	Comparison to Electronic Balance

Photometry and Radiometry

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
[1] Total Solar Irradiance / Pyranometer	(1 to 4 000) W/m^{-2}	2.5 % of reading	Comparison to Kipp & Zonen CM21 Pyranometer Agilent 34401A Digital Multimeter
[1] Total Solar Irradiance / Pyranometer (Sensitivity)	(1 to 200) $\mu V/W/m^{-2}$	2.5 % of reading	Comparison to Kipp & Zonen CM21 Pyranometer Agilent 34401A Digital Multimeter

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
[1] Temperature Gauge & Dial Thermometer	(-50 to -40) °C (-40 to -20) °C (-20 to 0) °C (0 to 50) °C (50 to 100) °C (100 to 200) °C (200 to 300) °C (300 to 400) °C (400 to 600) °C	0.1 °C 0.11 °C 0.11 °C 0.08 °C 0.1 °C 0.1 °C 0.28 °C 0.28 °C 2.7 °C	Comparison to Digital Thermometer (Hart Scientific, 1502A, ITS-90) Thermocouple Type R
[1] Temperature Source Liquid bath	(-20 to 0) °C (>0 to 50) °C (>50 to 100) °C (>100 to 200) °C	0.088 °C 0.088 °C 0.088 °C 0.088 °C	Comparison to Digital Thermometer With PRT Sensor (Hart Scientific,1502A, ITS-90) Thermocouple Type R
[1] Temperature Source Dry well, Dry block	(-20 to 0) °C (0 to 50) °C (>50 to 200) °C (>200 to 400) °C	0.15 °C 0.15 °C 0.28 °C 0.54 °C	
[1] Temperature Controlled Chamber Hot Air Oven, Refrigerator	(-20 to 0) °C (0 to 50) °C (50 to 100) °C (100 to 200) °C (200 to 250) °C	0.52 °C 0.6 °C 0.84 °C 1 °C 1.3 °C	Comparison to Agilent, 34970A
[1] Autoclave	Up to 100 °C (>100 to 115) °C (>115 to 125) °C	0.87 °C 0.92 °C 1 °C	Comparison to Agilent 34970A
Temperature Thermo-Hygrometer Measurement Data Logger	(-20 to 0) °C (>0 to 50) °C (>50 to 100) °C	0.21 °C 0.2 °C 0.28 °C	Comparison to Digital Thermometer With Probe
Humidity, Thermo-Hygrometer Measurement Data Logger	(30 to 50) %RH (50 to 75) %RH (70 to 90) %RH	1.8 %RH 1.9 %RH 2 %RH	Comparison to Temperature & Humidity Meter Fourier-SYS,529-USB
[1] Infrared Thermometer	(-20 to 50) °C (>50 to 100) °C (>100 to 200) °C (>200 to 300) °C (>300 to 400) °C	1 °C 1.6 °C 3 °C 5.7 °C 6.6 °C	Comparison to Portable IR Calibrator, Liquid bath $\varepsilon = 0.95$, $\lambda = (8 \text{ to } 14)$ µm

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Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
[1] Liquid in Glass Thermometers	(-20 to 0) °C (>0 to 50) °C (>50 to 100) °C (>100 to 200) °C	0.125 °C 0.089 °C 0.32 °C 0.43 °C	Comparison to PRT Sensor, Hart Scientific 1502A, Liquid Baths
Thermo-Hygrograph	Temperature (0 to 40) °C Humidity (20 to 50) %RH (50 to 85) %RH	 0.61 °C 2.1 %RH 2.3 %RH	Comparison to Temp & Humidity Meter
[1] Temperature Indicator with RTD, Thermistor Sensor	(-50 to -40) °C (-40 to -20) °C (-20 to 0) °C (>0 to 50) °C (>50 to 100) °C (>100 to 200) °C (>200 to 300) °C (>300 to 400) °C	0.1 °C 0.09 °C 0.08 °C 0.05 °C 0.05 °C 0.07 °C 0.19 °C 0.19 °C	Comparison to Digital Thermometer With PRT Sensor (Hart Scientific 1502A, ITS-90)
[1] Temperature Indicator with RTD, Thermistor Sensor	(>400 to 800) °C	2.8 °C	Comparison to Digital Thermometer With Thermocouple Type R
[1] Temperature Indicator with Thermocouple Sensor	Type E, K, J, N, T (-50 to -40) °C (-40 to -20) °C (-20 to 0) °C (>0 to 50) °C (>50 to 100) °C (>100 to 200 °C (>200 to 300) °C (>300 to 400) °C (>400 to 500) °C (>500 to 650) °C (>650 to 800) °C (>800 to 1 000) °C (>1 000 to 1 200) °C	 0.30 °C 0.20 °C 0.14 °C 0.2 °C 0.36 °C 0.71 °C 1.1 °C 1.5 °C 3.2 °C 3.6 °C 4 °C 4.5 °C 5 °C	Comparison to Digital Thermometer With PRT Sensor (Hart Scientific 1502A, ITS-90)

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Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
[1] Temperature Indicator with Thermocouple Sensor	Type B, R, S (0 to 400) °C (>400 to 500) °C (>500 to 650) °C (>650 to 800) °C (>800 to 1 000) °C (>1 000 to 1 200) °C	 0.55 °C 2.8 °C 2.8 °C 2.8 °C 2.9 °C 3 °C	Comparison to Digital Thermometer With PRT Sensor (Hart Scientific 1502A, ITS-90)
[1] Temperature Indicator with Thermocouple Sensor	Type E, K, J, N, T (>650 to 800) °C (>800 to 1 000) °C (>1 000 to 1 200) °C Type B, R, S (>650 to 800) °C (>800 to 1 000) °C (>1 000 to 1 200) °C	 4 °C 4.5 °C 5 °C 2.8 °C 2.9 °C 3 °C	Comparison to Digital Thermometer with Thermocouple Type R
[1] Temperature Sensor/Probe (RTD, Thermistor)	RTD, Thermistors (-50 to -40) °C (-40 to -20) °C (-20 to 0) °C (>0 to 50) °C (>50 to 100) °C (>100 to 200) °C (>200 to 300) °C (>300 to 400) °C	 0.11°C 0.1°C 0.09°C 0.06 °C 0.06 °C 0.1 °C 0.2 °C 0.2 °C	Comparison to Digital Thermometer with PRT Sensor (Hart Scientific 1502A, ITS-90) MCX
[1] Temperature Sensor/Probe (RTD, Thermistor)	RTD, Thermistors (>400 to 800) °C	 2.8 °C	Comparison to Digital Thermometer with Thermocouple Type R MCX

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Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
[1] Temperature Sensor/Probe (Thermocouple)	Type E, K, J, N, T (-50 to -40) °C (-40 to -20) °C (-20 to 0) °C (>0 to 50) °C (>50 to 100) °C (>100 to 200 °C (>200 to 300) °C (>300 to 400) °C (>400 to 500) °C (>500 to 650) °C (>650 to 800) °C (>800 to 1 000) °C (>1 000 to 1 200) °C Type B, R, S (0 to 400) °C (>400 to 650) °C (>650 to 800) °C (>800 to 1 000) °C (>1 000 to 1 200) °C	 0.23 °C 0.2 °C 0.15 °C 0.21 °C 0.37 °C 0.71 °C 1.1 °C 1.4 °C 3.2 °C 3.6 °C 4 °C 4.5 °C 5 °C 0.52 °C 2.8 °C 2.8 °C 2.9 °C 3.9 °C	Comparison to Digital Thermometer with PRT Sensor (Hart Scientific 1502A, ITS-90) MCX
[1] Temperature Sensor/Probe (Thermocouple)	Type E, K, J, N, T (>650 to 800) °C (>800 to 1 000) °C (>1 000 to 1 200) °C Type B, R, S (>650 to 800) °C (>800 to 1 000) °C (>1 000 to 1 200) °C	 4 °C 4.5 °C 5 °C 3 °C 3 °C 3.1 °C	Comparison to Digital Thermometer with Thermocouple Type MCX Thermocouple Type R
[1] Temperature Transmitters (RTD, Thermistor)	(-50 to -40) °C (-40 to -20) °C (-20 to 0) °C (>0 to 50) °C (>50 to 100) °C (>100 to 180) °C (>180 to 400) °C	0.2 °C 0.19 °C 0.18 °C 0.11 °C 0.11 °C 0.12 °C 0.22 °C	Comparison to Digital Thermometer with PRT Sensor, DMM, MCX
[1] Temperature Transmitters (RTD, Thermistor)	(>400 to 800) °C	2.8 °C	Comparison to Digital Thermometer with Thermocouple Type R, DMM, MCX

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Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
[1] Temperature Transmitters (Thermocouple)	Type E, K, J, N, T (-20 to 0) °C (>0 to 50) °C (>50 to 100) °C (>100 to 200 °C (>200 to 300) °C (>300 to 400) °C (>400 to 500) °C (>500 to 650) °C (>650 to 800) °C (>800 to 1 000) °C (>1 000 to 1 200) °C Type B, R, S (0 to 400) °C (>400 to 650) °C (>650 to 800) °C (>800 to 1 200) °C	 0.16 °C 0.22 °C 0.37 °C 0.71 °C 1.1 °C 1.4 °C 3.2 °C 3.6 °C 4 °C 4.5 °C 5 °C 0.54 °C 2.8 °C 2.8 °C 3 °C	Comparison to Digital Thermometer with PRT Sensor, DMM, MCX
[1] Temperature Transmitters (Thermocouple)	Type E, K, J, N, T (>650 to 800) °C (>800 to 1 000) °C (>1 000 to 1 200) °C Type B, R, S (>650 to 800) °C (>800 to 1 200) °C	 3.9 °C 4.5 °C 5 °C 2.9 °C 3.1 °C	Comparison to Digital Thermometer with Thermocouple Type R, DMM, MCX

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
[1] Speed Measurement Material Testing Machines	Up to 100 mm/min (>100 to 300) mm/min (>300 to 500) mm/min	0.032 mm/min 0.037 mm/min 0.043 mm/min	Comparison to Stopwatch, Length Measuring Device
[1] Tachometer Non-Contact	(0 to 100) rpm (> 100 to 999.99) rpm (> 999.99 to 100 000) rpm	0.059 rpm 0.064 rpm 1.2 rpm	Comparison to LED + synthesizer/function Generator (HP 3325A)

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Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
[1] Frequency Measurement	(0.1 to 10) Hz (>10 to 100) Hz >100 Hz to 1 kHz (>1 to 10) kHz (>10 to 100) kHz >100 kHz to 1 MHz (>1 to 10) MHz (>10 to 100) MHz >100 MHz to 1 GHz (>1 to 3) GHz	3.9 µHz/Hz 3.6 µHz/Hz 3.2 µHz/Hz 3.2 µHz/Hz 3.2 µHz/Hz 3.2 µHz/Hz 3.2 µHz/Hz 3.2 µHz/Hz 3.2 µHz/Hz 3.2 µHz/Hz	Comparison to Universal Counter (Agilent 53131A)
[1] Frequency - Source	(1 to 100) Hz > 100 Hz to 1 kHz (> 1 to 10) kHz (> 10 to 100) kHz > 100 kHz to 1 MHz (> 1 to 10) MHz (> 10 to 20) MHz	5.8 µHz/Hz + 76 µHz 5.8 µHz/Hz + 76 µHz 5.8 µHz/Hz + 0.7 mHz 5.8 µHz/Hz + 0.76 mHz 5.8 µHz/Hz + 0.76 Hz 5.8 µHz/Hz + 0.7 Hz 5.8 µHz/Hz + 7.6 Hz	Comparison to Synthesizer/Function Generator (HP 3325A)
[1] Timer/Stopwatches	(0.5 to 60) s (> 1 to 2) min (> 2 to 3) min (> 3 to 4) min (> 4 to 5) min (> 5 to 10) min (> 10 to 30) min (> 30 to 60) min (> 60 to 90) min (> 90 to 120) min	87 ms 87 ms 87 ms 88 ms 88 ms 91 ms 85 ms 89 ms 95 ms 0.1 s	Comparison to Universal Counter (Agilent 53131A)
[1] Centrifuge	(10 to 900) rpm (>900 to 5 000) rpm (>5 000 to 10 000) rpm (>10 000 to 30 000) rpm	5.8×10^{-4} + 0.16 rpm 5.8×10^{-4} + 0.85 rpm 5.8×10^{-4} + 1 rpm 5.8×10^{-4} + 1 rpm	Comparison to Tachometer
[1] Rotational Speed – Testing Machine	(0.01 to 5) rpm (>5 to 10) rpm (>10 to 20) rpm	0.38 % of reading 0.19 % of reading 0.097 % of reading	Direct measurement using Speed and Angle Tester
[1] Movement Speed	Up to 120 km/h	0.83% of reading + 1.2 km/h	Comparison to Laser Speed Gun

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Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Radar Speed Measuring Devices			
[1] X Band	56.24 km/h (35 mph) 128.81 km/h (80 mph)	0.94 km/h 0.94 km/h	Comparison to Tuning Forks
[1] K Band	56.84 km/h (35 mph) 105.29 km/h (65 mph)	0.94 km/h 0.94 km/h	
[1] KA Band	39.56 km/h (25 mph) 48.77 km/h (30 mph) 63.33 km/h (40 mph) 89.54 km/h (55 mph)	0.93 km/h 0.93 km/h 0.94 km/h 0.94 km/h	

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DIMENSIONAL MEASUREMENT

1 Dimensional

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Length - Measurement	(0 to 50) mm (>50 to 100) mm (>100 to 200) mm	3.6 µm 3.8 µm 11 µm	Direct measurement using Vision Measuring Machine

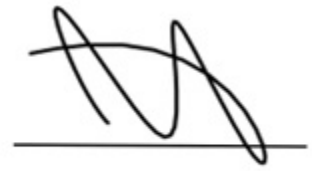
2 Dimensional

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Radius- Measurement	Up to 20 mm	0.003 6 mm	Direct measurement using Vision Measuring Machine
Angle Tester	Up to 90° (>90 to 180)° (>180 to 270)° (>270 to 360)°	12” 17” 21” 24”	Direct measurement using Vision Measuring Machine
[1] Rotational Angle – Torque Testing Machines	(0 to 360)°	0.026°	Direct measurement using Speed and Angle Tester

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.



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