



# CERTIFICATE OF ACCREDITATION

## The ANSI National Accreditation Board

Hereby attests that

**SP Metrology System (Thailand) Co., Ltd.**  
**69/29 Moo. 1 T. Klongsi A.Klongluang**  
**Pathumthani, Thailand 12120**

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](http://www.anab.org).

A handwritten signature in black ink, appearing to read 'R.D.L.', is positioned above a horizontal line.

R. Douglas Leonard Jr., VP, PILR SBU

Expiry Date: 16 May 2022

Certificate Number: ACT-2050



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

### SP Metrology System (Thailand) Co., Ltd.

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## CALIBRATION AND DIMENSIONAL MEASUREMENT

Valid to: **May 16, 2022**

Certificate Number: **ACT-2050**

### CALIBRATION

#### Acoustics and Vibration

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
<sup>1</sup> Sound Level Meter	94 dB 114 dB	0.15 dB 0.15 dB	Sound Level Calibrator

#### Chemical Quantities

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
<sup>1,2</sup> pH Meter	4.01 pH 7.01 pH 10.01 pH	0.012 pH 0.012 pH 0.012 pH	pH Solution Buffer
<sup>1,2</sup> Conductivity Meter	84 µS/cm 1 413 µS/cm 12 880 µS/cm	0.6 µS/cm 8.2 µS/cm 75 µS/cm	STD Conductivity Solution
<sup>1</sup> Refractometer	5 %Brix 10 %Brix 20 %Brix 30 %Brix 60 %Brix	0.075 %Brix 0.074 %Brix 0.074 %Brix 0.073 %Brix 0.072 %Brix	Sucrose Standard Solution
<sup>1</sup> Refractometer Refractive Index	1.340 27 nD 1.347 84 nD 1.363 85 nD 1.381 14 nD 1.441 89 nD	0.000 11 nD 0.000 11 nD 0.000 11 nD 0.000 11 nD 0.000 11 nD	Sucrose Standard Solution

### Chemical Quantities

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
<sup>1</sup> Turbidity meter	20 NTU 200 NTU 750 NTU	0.12 NTU 1.2 NTU 5.8 NTU	Turbidity Standard Solution
<sup>1</sup> Viscometer Rotational @25°C	101.1 cP 6 618 cP 15 608 cP	0.16 cP 15 cP 36 cP	STD Viscosity Solution
<sup>1</sup> Total Dissolved Solids (TDS) Meter	1 000 mg/l	32 mg/l	TDS Solution

### Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
<sup>1</sup> RTD Temperature Indicator (Simulator) Temperature Indicator	RTD (Pt100) (-200 to 800) °C 10 Ω, Cu 427 (-100 to 260) °C	0.25 °C 0.42 °C	Fluke 744 Process Calibrator
<sup>1</sup> Thermocouple Temperature Indicator (Simulator) Temperature Indicator	Type E (-250 to 1 000) °C Type J (-210 to 1 200) °C Type K (-200 to 1 372) °C Type R and S (0 to 1 768) °C Type T (-250 to 400) °C	0.42 °C 0.45 °C 0.38 °C 0.96 °C 0.64 °C	Fluke 744 Process Calibrator
DC Voltage <sup>1</sup> Source	Up to < 330 mV 330 mV to < 3.3 V (3.3 to < 33) V (33 to < 330) V (330 to 1 000) V	48 μV/V + 9 μV 40 μV/V + 60 μV 40 μV/V + 0.6 mV 45 μV/V + 6 mV 45 μV/V + 60 mV	Fluke 5502A Multiproduct Calibrator
DC Current <sup>1</sup> Source	Up to < 3.3 mA (3.3 to < 33) mA (33 to < 330) mA (0.33 to < 1.1) A (1.1 to < 3) A (3.0 to < 11) A (11 to 20) A	0.08 mA/A + 0.085 μA 0.08 mA/A + 0.65 μA 0.08 mA/A + 7.8 μA 0.3 mA/A + 0.08 mA 0.3 mA/A + 0.085 mA 0.47 mA/A + 0.8 mA 0.78 mA/A + 5.8 mA	Fluke 5502A Multiproduct Calibrator



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage <sup>1</sup> Source	(1 to < 33) mV		Fluke 5502A Multiproduct Calibrator
	(10 to 45) Hz	1.5 mV/V + 20 μV	
	> 45 Hz to 10 kHz	0.8 mV/V + 20 μV	
	1.5 mV/V + 20 μV		
	1.6 mV/V + 20 μV		
	3 mV/V + 30 μV		
	8 mV/V + 50 μV		
	(33 to < 330) mV		
	(10 to 45) Hz	0.5 mV/V + 20 μV	
	> 45 Hz to 10 kHz	0.25 mV/V + 20 μV	
	0.6 mV/V + 20 μV		
	0.8 mV/V + 35 μV		
	1.9 mV/V + 0.15 mV		
	4 mV/V + 0.3 mV		
	(0.33 to < 3.3) V		
	(10 to 45) Hz	0.4 mV/V + 0.08 mV	
	> 45 Hz to 10 kHz	0.25 mV/V + 0.1 mV	
	0.6 mV/V + 0.1 mV		
	0.8 mV/V + 0.1 mV		
	1.9 mV/V + 0.2 mV		
	4 mV/V + 0.8 mV		
	(3.3 to < 33) V		
	(10 Hz to 45) Hz	0.4 mV/V + 0.9 mV	
	> 45 Hz to 10 kHz	0.25 mV/V + 0.8 mV	
0.6 mV/V + 0.9 mV			
0.8 mV/V + 0.9 mV			
1.9 mV/V + 2 mV			
(33 to < 330) V			
45 Hz to 1 kHz	0.4 mV/V + 7 mV		
0.65 mV/V + 10 mV			
0.7 mV/V + 15 mV			
(330 to 1 000) V			
45 Hz to 1 kHz	0.4 mV/V + 0.06 V		
> 1 kHz to 5) kHz	0.65 mV/V + 0.078 V		
> 5 kHz to 10) kHz	0.7 mV/V + 0.078 V		

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current <sup>1</sup> Source	(0.029 to < 0.33) mA (20 Hz to 45) Hz > 45 Hz to 1 kHz (> 1 to 5) kHz (> 5 to 10) kHz	1.6 mA/A + 0.08 μA 1 mA/A + 0.08 μA 2.4 mA/A + 0.12 μA 6.3 mA/A + 0.16 μA	Fluke 5502A Multiproduct Calibrator
	(0.33 to < 3.3) mA (20 Hz to 45) Hz > 45 Hz to 1 kHz (> 1 to 5) kHz (> 5 to 10) kHz	1.6 mA/A + 0.15 μA 0.8 mA/A + 0.15 μA 1.6 mA/A + 0.2 μA 4 mA/A + 0.25 μA	
	(3.3 to < 33) mA (20 Hz to 45) Hz > 45 Hz to 1) kHz (> 1 to 5) kHz (> 5 to 10) kHz	1.4 mA/A + 2 μA 0.32 mA/A + 1.8 μA 0.65 mA/A + 1.8 μA 1.6 mA/A + 2.5 μA	
	(33 to < 330) mA (20 Hz to 45) Hz > 45 Hz to 1 kHz (> 1 to 5) kHz (> 5 to 10) kHz	1.5 mA/A + 18 μA 0.32 mA/A + 18 μA 0.8 mA/A + 40 μA 1.6 mA/A + 80 μA	
	(0.33 to < 1.1) A (20 to 45) Hz > 45 Hz to 1 kHz (> 1 to 5) kHz	1.4 mA/A + 0.15 mA 0.4 mA/A + 0.15 mA 5 mA/A + 0.8 mA	
	(1.1 to < 3) A (45 to 65) Hz (> 65 to 500) Hz > 500 Hz to 1 kHz (> 1 to 5) kHz	1.5 mA/A + 0.15 mA 0.5 mA/A + 0.15 mA 0.5 mA/A + 0.15 mA 4.8 mA/A + 6 mA	
	(3.0 to < 11) A (45 to 65) Hz > 65 Hz to 1 kHz	0.5 mA/A + 1.8 mA 0.8 mA/A + 2 mA	
	(11 to 20) A (45 to 65) Hz > 65 Hz to 1 kHz	0.95 mA/A + 7 mA 1.2 mA/A + 8.2 mA	



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Resistance <sup>1</sup> Source	(0 to 11) Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω 330 Ω to 1.1 kΩ (1.1 to 3.3) kΩ (3.3 to 11) kΩ (11 to 33) kΩ (33 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	0.1 mΩ/Ω + 10 mΩ 0.1 mΩ/Ω + 15 mΩ 0.08 mΩ/Ω + 15 mΩ 0.08 mΩ/Ω + 20 mΩ 0.08 mΩ/Ω + 0.1 Ω 0.08 mΩ/Ω + 0.2 Ω 0.08 mΩ/Ω + 0.8 Ω 0.08 mΩ/Ω + 1.2 Ω 0.1 mΩ/Ω + 6 Ω 0.11 mΩ/Ω + 12 Ω 0.13 mΩ/Ω + 0.07 kΩ 0.13 mΩ/Ω + 0.15 kΩ 0.48 mΩ/Ω + 1 kΩ 0.8 mΩ/Ω + 3 kΩ	Fluke 5502A Multiproduct Calibrator
Capacitance <sup>1</sup> Source 10 Hz to 10 kHz 10 Hz to 10 kHz 10 Hz to 3 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz 10 Hz to 600 Hz 10 Hz to 300 Hz 10 Hz to 150 Hz 10 Hz to 120 Hz 10 Hz to 80 Hz 50 Hz 20 Hz 6 Hz 2 Hz 0.6 Hz 0.2 Hz	(0.1 to 0.5) nF (0.5 to 1.09) nF (1.1 to 3.29) nF (3.3 to 10.9) nF (11 to 32.9) nF (33 to 109.9) nF (110 to 329.9) nF (0.33 to 1.09) μF (1.1 to 3.29) μF (3.3 to 10.9) μF (11 to 32.9) μF (33 to 109.9) μF (110 to 329.9) μF (0.33 to 1.09) mF (1.1 to 3.29) mF (3.3 to 10.9) mF (11 to 32.9) mF (33 to 50) mF	0.4 % of reading + 8.0 pF 0.4 % of reading + 10 pF 0.4 % of reading + 10 pF 0.2 % of reading + 12 pF 0.2 % of reading + 0.1 nF 0.2 % of reading + 0.1 nF 0.2 % of reading + 0.7 nF 0.2 % of reading + 1.3 nF 0.2 % of reading + 7 nF 0.2 % of reading + 10 nF 0.32 % of reading + 0.08 μF 0.37 % of reading + 0.11 μF 0.37 % of reading + 0.7 μF 0.37 % of reading + 1 μF 0.37 % of reading + 6.5 μF 0.37 % of reading + 10 μF 0.6 % of reading + 63 μF 0.85 % of reading + 98 μF	Fluke 5502A Multiproduct Calibrator
DC Current Clamp <sup>1</sup> Source	Up to 200 A (> 200 to 550) A (> 550 to 1 000) A	3.8 mA/A + 0.06 A 3.3 mA/A + 0.08 A 3.2 mA/A + 0.07 A	Fluke 5502A Multiproduct Calibrator with Current Coil



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current Clamp <sup>1</sup> Source	Up to 20 A		Fluke 5502A Multiproduct Calibrator with Current Coil
	(45 to 100) Hz	5 mA/A + 0.08 A	
	(> 100 to 440) Hz	12 mA/A + 0.08 A	
	(> 20 to 200) A		
	(45 to 65) Hz	5 mA/A + 0.08 A	
	(> 65 to 100) Hz	9.5 mA/A + 0.08 A	
	(> 100 to 440) Hz	14 mA/A + 0.08 A	
	(> 200 to 550) A		
	(45 to 65) Hz	3.7 mA/A + 0.072 A	
(> 65 to 100) Hz	9 mA/A + 0.06 A		
Insulation Resistance <sup>1</sup> Source Test Voltage @ 50 V, 100 V, 250 V, 500 V, 1 000 V	(0.1 to 10) MΩ	0.005 8 MΩ	Resistance Decade Box
	(10 to 20) MΩ	0.032 MΩ	
	(20 to 30) MΩ	0.069 MΩ	
	(30 to 50) MΩ	0.075 MΩ	
	(50 to 100) MΩ	0.094 MΩ	
	(100 to 200) MΩ	2.8 MΩ	
	(200 to 500) MΩ	4.5 MΩ	
	(500 to 1 000) MΩ	7.1 MΩ	
	Temperature Indicator of Thermocouple (Electrical Simulation) Source	Type K	
(-200 to -100) °C		0.46 °C	
(-100 to -25) °C		0.26 °C	
(-25 to 120) °C		0.23 °C	
(120 to 1 000) °C		0.37 °C	
(1 000 to 1 372) °C		0.56 °C	
Type B			
(600 to 800) °C		0.61 °C	
(800 to 1 000) °C		0.48 °C	
(1 000 to 1 550) °C		0.42 °C	
(1 550 to 1 820) °C		0.46 °C	
Type E			
(-250 to -100) °C		0.7 °C	
(-100 to -25) °C		0.23 °C	
(-25 to 350) °C		0.2 °C	
(350 to 650) °C	0.23 °C		
(650 to 1 000) °C	0.3 °C		



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Temperature Indicator of Thermocouple (Electrical Simulation) Source	Type J		Fluke 5502A Multiproduct Calibrator
	(-210 to -100) °C	0.56 °C	
	(-100 to -25) °C	0.32 °C	
	(-25 to 150) °C	0.28 °C	
	(150 to 760) °C	0.24 °C	
	(760 to 1 200) °C	0.33 °C	
	Type N		
	(-250 to -100) °C	0.56 °C	
	(-100 to -25) °C	0.32 °C	
	(-25 to 120) °C	0.28 °C	
	(120 to 410) °C	0.26 °C	
	(410 to 1 300) °C	0.38 °C	
	Type R		
	(0 to 250) °C	0.8 °C	
	(250 to 400) °C	0.5 °C	
	(400 to 1 000) °C	0.47 °C	
	(1 000 to 1 767) °C	0.56 °C	
	Type S		
	(0 to 250) °C	0.66 °C	
	(250 to 400) °C	0.51 °C	
	(400 to 1 000) °C	0.52 °C	
(1 000 to 1 767) °C	0.65 °C		
Type U			
(-200 to 0) °C	0.79 °C		
(0 to 600) °C	0.38 °C		
Type T			
(-250 to -150) °C	0.88 °C		
(-150 to 0) °C	0.34 °C		
(0 to 120) °C	0.23 °C		
(120 to 400) °C	0.21 °C		





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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Temperature Indicator Simulation of Resistance Temperature Detector (RTD) Source	100 $\Omega$ , Pt385		Fluke 5502A Multiproduct Calibrator
	(-200 to -80) °C	0.09 °C	
	(-80 to 0) °C	0.09 °C	
	(0 to 100) °C	0.14 °C	
	(100 to 300) °C	0.14 °C	
	(300 to 400) °C	0.15 °C	
	(400 to 630) °C	0.18 °C	
	(630 to 800) °C	0.33 °C	
	200 $\Omega$ , Pt385		
	(-200 to -80) °C	0.08 °C	
	(-80 to 0) °C	0.08 °C	
	(0 to 100) °C	0.08 °C	
	(100 to 260) °C	0.09 °C	
	(260 to 300) °C	0.18 °C	
	(300 to 400) °C	0.19 °C	
	(400 to 600) °C	0.2 °C	
	(600 to 630) °C	0.23 °C	
	500 $\Omega$ , Pt385		
	(-200 to -80) °C	0.08 °C	
	(-80 to 0) °C	0.09 °C	
	(0 to 100) °C	0.09 °C	
	(100 to 260) °C	0.1 °C	
	(260 to 300) °C	0.13 °C	
	(300 to 400) °C	0.13 °C	
	(400 to 600) °C	0.14 °C	
	(600 to 630) °C	0.16 °C	
	1 000 $\Omega$ , Pt385		
	(-200 to -80) °C	0.08 °C	
(-80 to 0) °C	0.09 °C		
(0 to 100) °C	0.09 °C		
(100 to 260) °C	0.1 °C		
(260 to 300) °C	0.13 °C		
(300 to 400) °C	0.13 °C		
(400 to 600) °C	0.14 °C		
(600 to 630) °C	0.16 °C		



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Temperature Indicator Simulation of Resistance Temperature Detector (RTD) Source	100 Ω, Pt3916 (-200 to -190) °C (-190 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C 100 Ω, Pt3926 (-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C	0.36 °C 0.08 °C 0.09 °C 0.11 °C 0.11 °C 0.13 °C 0.14 °C 0.15 °C 0.33 °C 0.08 °C 0.09 °C 0.12 °C 0.14 °C 0.16 °C 0.18 °C	Fluke 5502A Multiproduct Calibrator
DC Power <sup>1</sup> Source	(0.33 to 1 000) V, < 0.33 A (0.108 9 to < 330) W (0.33 to 1 000) V, (0.33 to < 3) A (330 to < 3.0) kW (0.33 to 1 000) V, (3 to < 10.9) A (3.0 to < 10.9) kW (0.33 to 1 000) V, (10.99 to 20) A (10.9 to 20) kW	0.10 mW/W + 6 mW 0.31 mW/W + 60 mW 0.5 mW/W + 0.6 W 0.81 mW/W + 0.6 W	Fluke 5502A Multiproduct Calibrator
AC Power <sup>1</sup> Source	(45 to 65) Hz, PF=1 (0.33 to 1 000) V up to 0.329 A (0.109 to < 10.9) W (10.9 to < 330) W	0.55 mW/W + 1.5 mW 0.8 mW/W + 6 mW	Fluke 5502A Multiproduct Calibrator



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Power <sup>1</sup> Source	(0.33 to 1 000) V, (0.33 to < 3) A 330 W to < 3 kW (0.33 to 1 000) V, (3 to < 10.9) A (3 to < 3.5) kW (3.5 to < 10.9) kW (0.33 to 1 000) V, (10.9 to 20) A (10.9 to 20) kW	1.2 mW/W + 0.06 W  1.4 mW/W + 0.06 W 1.4 mW/W + 0.6 W  1.2 mW/W + 0.6 W	Fluke 5502A Multiproduct Calibrator
DC Voltage <sup>1</sup> Measure	Up to 100 mV (> 0.1 to 1) V (> 1 to 10) V (> 10 to 100) V (>100 to 1 000) V	14 μV/V + 0.35 μV 4.9 μV/V + 0.35 μV 4.7 μV/V + 0.58 μV 7 μV/V + 0.035 mV 21 μV/V + 0.12 mV	Digital Multimeter HP 3458A
AC Voltage <sup>1</sup> Measure	100 mV to 10 V (10 to 50) Hz > 50 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	85 μV/V + 0.46 mV 85 μV/V+0.23 mV 0.16 mV/V+0.23 mV 0.35 mV/V +0.23 mV 0.93 mV/V+0.23 mV 3.5 mV/V+1.2 mV 12 mV/V+1.2 mV	Digital Multimeter HP 3458A
AC Voltage <sup>1</sup> Measure	(> 10 to 100) V (10 to 50) Hz > 50 Hz to 1kHz (> 1 to 20) kHz (> 20 to 50) kHz (> 50 to 100) kHz (> 100 to 1 000) V (10 to 50) Hz > 50 Hz to 1 kHz (> 1 to 20) kHz (> 20 to 50) kHz (> 50 to 100) kHz	0.23 mV/V+4.6 mV 0.23 mV/V+2.3 mV 0.23 mV/V+2.3 mV 0.41 mV/V+2.3 mV 1.4 mV/V+2.3 mV  0.46 mV/V+ 0.046 V 0.46 mV/V + 0.023 V 0.69 mV/V+ 0.023 V 1.4 mV/V+ 0.023 V 3.5 mV/V+ 0.023 V	Digital Multimeter HP 3458A
DC Current <sup>1</sup> 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	24 μA/A + 0.92 nA 24 μA/A + 5.8 nA 24 μA/A + 58 nA 41 μA/A + 0.58 μA 0.13 mA/A + 0.012 mA	Digital Multimeter HP 3458A

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Current <sup>1</sup> Measure	(>1 to 3) A	2.4 mA/A + 1.1 mA	Digital Multimeter 34460A
AC Current <sup>1</sup> Measure	(0.1 to 1) mA (10 to 20) Hz	4.6 mA/A + 0.35 $\mu$ A	Digital Multimeter HP 3458A
	(>20 to 45) Hz	1.7 mA/A + 0.35 $\mu$ A	
	(>45 to 100) Hz	0.7 mA/A + 0.35 $\mu$ A	
	>100 Hz to 1 kHz	0.7 mA/A + 0.35 $\mu$ A	
	(1 to 100) mA (10 to 20) Hz	4.6 mA/A + 0.23 mA	
	(>20 to 45) Hz	1.7 mA/A + 0.023 mA	
(0.1 to 1) A (10 to 20) Hz	4.6 mA/A + 0.23 mA	Digital Multimeter HP 3458A	
(>20 to 45) Hz	1.8 mA/A + 0.23 mA		
(>45 to 100) Hz	0.93 mA/A + 0.23 mA		
>100 Hz to 1 kHz	1.2 mA/A + 0.23 mA		
AC Current <sup>1</sup> Measure	(>1 to 3) A 50 Hz to 5 kHz	2.7 mA/A + 2mA	Digital Multimeter 34460A
Resistance Measure <sup>1</sup>	Up to 10 $\Omega$	18 $\mu\Omega/\Omega$ + 0.058 m $\Omega$	Digital Multimeter HP 3458A
	(> 10 to 100) $\Omega$	14 $\mu\Omega/\Omega$ + 0.58 m $\Omega$	
	> 100 $\Omega$ to 1 k $\Omega$	12 $\mu\Omega/\Omega$ + 0.58 m $\Omega$	
	(> 1 to 10) k $\Omega$	1 $\mu\Omega/\Omega$ + 5.8 m $\Omega$	
	(> 10 to 100) k $\Omega$	12 $\mu\Omega/\Omega$ + 58 m $\Omega$	
	(> 0.1 to 1) M $\Omega$	19 $\mu\Omega/\Omega$ + 2.3 $\Omega$	
	(> 1 to 10) M $\Omega$	59 $\mu\Omega/\Omega$ + 0.12 k $\Omega$	
	(> 10 to 100) M $\Omega$	0.58 m $\Omega/\Omega$ + 1.2 k $\Omega$	
DC High Voltage <sup>1</sup> Measure	Up to 1 kV	24 mV/V + 0.06 mV	Digital Multimeter 34460A with Fluke 80K-40 High voltage probe
	(> 1 to 3) kV	24 mV/V + 0.07 mV	
	(> 3 to 5) kV	24 mV/V + 0.09 mV	
	(> 5 to 10) kV	24 mV/V + 0.18 mV	
AC High Voltage <sup>1</sup> Measure	(1 to 6) kV (50 to 60) Hz	58 mV/V + 4 mV	Digital Multimeter 34460A with Fluke 80K-40 High voltage probe
LCR Meter Inductance (L)	1 $\mu$ H to 10 H @ 100 mV, 1 V, 1 kHz	1.2 % of reading + 0.9 $\mu$ H	Decade Inductance iET1492
LCR Meter Capacitance (C)	1 pF to 1 $\mu$ F @ 1 V, 1 kHz	0.06 % of reading + 0.6 pF	Precision Decade Capacitor, GR1413

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
LCR Meter Resistance (R)	1 $\Omega$ to 100 k $\Omega$ @ 1 V, 1 kHz	0.2 % of reading +2.4 m $\Omega$	Decade Resistance Box
Inductance Source	1 $\mu$ H to 10 H @ 1 V, 1 kHz	0.06 % of reading	LCR Meter Agilent E4980A
Capacitance Source	1pF to 1 $\mu$ F @ 1 V, 0.1 kHz to 1 MHz	0.06 % of reading	LCR Meter, Agilent E4980A
Oscilloscope <sup>1</sup> Vertical deflection DC 50 $\Omega$ and 1 M $\Omega$	2 mV 5 mV 10 mV 20 mV 50 mV 100 mV 200 mV 500 mV 1 V 2 V 5 V 10 V 20 V	0.84 % of reading 0.49 % of reading 0.34 % of reading 0.26 % of reading 0.29 % of reading 0.23 % of reading 0.21 % of reading 0.28 % of reading 0.27 % of reading 0.22 % of reading 0.28 % of reading 0.2 % of reading 0.2 % of reading	Multi Product Calibrator Model: 5502A, Universal frequency Counter Calibrator model: PM6685R, Digital Multimeter model: 3458A
Oscilloscope Vertical Bandwidth <sup>1</sup> 3 dB down from reference amplitude	50 kHz to 100 MHz (>100 to 300) MHz	1.4 % of reading 1.8 % of reading	Multi Product Calibrator Model: 5502A, Universal frequency Counter Calibrator model: PM6685R, Digital Multimeter model: 3458A
Oscilloscope Horizontal deflection: Time Mark <sup>1</sup>	1 ns 2 ns 5 ns 10 ns 20 ns 50 ns 100 ns 200 ns 500 ns 1 $\mu$ s 2 $\mu$ s 5 $\mu$ s	0.01 % of reading 0.04 % of reading 0.01 % of reading 0.01 % of reading 0.04 % of reading 0.01 % of reading 0.01 % of reading 0.04 % of reading 0.01 % of reading 0.01 % of reading 0.04 % of reading 0.01 % of reading	Multi Product Calibrator Model: 5502A



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscope Horizontal deflection: Time Mark <sup>1</sup>	10 μs	0.01 % of reading	Multi Product Calibrator Model: 5502A
	20 μs	0.04 % of reading	
	50 μs	0.01 % of reading	
	100 μs	0.01 % of reading	
	200 μs	0.04 % of reading	
	500 μs	0.01 % of reading	
	1 ms	0.01 % of reading	
	2 ms	0.04 % of reading	
	5 ms	0.01 % of reading	
	10 ms	0.01 % of reading	
	20 ms	0.04 % of reading	
	50 ms	0.01 % of reading	
	100 ms	0.01 % of reading	
	200 ms	0.04 % of reading	
	500 ms	0.01 % of reading	
	1 s	0.62 % of reading	
2 s	1.2 % of reading		
5 s	3.1 % of reading		
10 s	6.2 % of reading		
Oscilloscope DC accuracy <sup>1</sup> 50 Ω and 1 MΩ (Digital)	2 mV	0.11 % of reading	Multi Product Calibrator Model: 5502A, Universal frequency Counter Calibrator Model: PM6685R, Digital Multimeter Model: 3458A
	5 mV	0.39 % of reading	
	10 mV	0.19 % of reading	
	20 mV	0.1 % of reading	
	50 mV	0.38 % of reading	
	100 mV	0.19 % of reading	
	200 mV	0.1 % of reading	
	500 mV	0.38 % of reading	
	1 V	0.19 % of reading	
	2 V	0.1 % of reading	
	5 V	0.04 % of reading	
	10 V	0.02 % of reading	
20 V	0.01 % of reading		
Oscilloscope Time base <sup>1,3</sup>	10 MHz	$2.4 \times 10^{-10} f$	Multi Product Calibrator Model: 5502A, Universal frequency Counter Calibrator Model: PM6685R, Digital Multimeter Model: 3458A



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**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscope Calibrator calibration <sup>1</sup>	≤10 V <sub>p-p</sub> @ ≤10 kHz	0.02 % of reading	Multi Product Calibrator Model: 5502A, Universal frequency Counter Calibrator Model: PM6685R, Digital Multimeter Model: 3458A
Rise Time, Fall Time, Phase Source	Rise/Fall Time 10 ns to 10 ms Phase 0 ° to 360 °	2 ns 1.2 °	Universal Counter Agilent 53131A, Universal Frequency Counter Calibrator Fluke PM6685R
Single and Three Phase Power Meter	AC Voltage @50/60 Hz (0 to 600) V AC Current @50/60 Hz (0 to 1 000) A AC Power @50/60 Hz (0 to 60) kW Power Factor (0.5 to 1)	0.58 % of reading 1.3 % of reading 1.3 % of reading 1.2 % of reading	Power Meter, Hioki 3197 And Clamp Sensor, Hioki 9669.  (Compare With Power Meter Standard)

**Electrical – RF/Microwave**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
<sup>4</sup> Tuned RF Level Measure 10 dB/step	(-40 to 0) dB 10 MHz 50 MHz 100 MHz 400 MHz 1 000 MHz 2 000 MHz 3 000 MHz 4 000 MHz 5 000 MHz 6 000 MHz 7 000 MHz 8 000 MHz 9 000 MHz	0.11 dB 0.10 dB 0.10 dB 0.10 dB 0.10 dB 0.11 dB 0.11 dB 0.13 dB 0.11 dB 0.13 dB 0.17 dB 0.15 dB 0.12 dB	HP 8902A Measuring Receiver and HP 11722A/11792A Power Sensor

**Electrical – RF/Microwave**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
<sup>4</sup> Tuned RF Level Measure 10 dB/step	(-40 to 0) dB		HP 8902A Measuring Receiver and HP 11722A/11792A Power Sensor
	1 000 MHz	0.12 dB	
	11 000 MHz	0.11 dB	
	12 000 MHz	0.16 dB	
	13 000 MHz	0.15 dB	
	14 000 MHz	0.14 dB	
	15 000 MHz	0.23 dB	
	16 000 MHz	0.26 dB	
Distortion Source	@ 20 Hz to 20 kHz (-80 to -40) dB	1.2 dB	Audio Analyzer, HP 8903B
	@ (>20 to 100) kHz (-80 to -40) dB	2.3 dB	

**Length – Dimensional Metrology**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
<sup>1</sup> External Micrometer V-Anvil, Screw Thread, Indicating	Up to 100 mm	1.5 µm	Gauge Block Set
	(100 to 125) mm	1.8 µm	
	(125 to 150) mm	2.1 µm	
	(150 to 175) mm	2.4 µm	
	(175 to 200) mm	2.8 µm	
	(200 to 250) mm	3.4 µm	
	(250 to 300) mm	4.1 µm	
	(300 to 400) mm	5.4 µm	
	(400 to 500) mm	6.8 µm	
	(500 to 600) mm	8.1 µm	
<sup>1</sup> Vernier Caliper Dial and Digital	Up to 200 mm	0.006 mm	Gauge Block Set
	(200 to 300) mm	0.007 mm	
	(300 to 400) mm	0.008 mm	
	(400 to 500) mm	0.009 mm	
	(500 to 600) mm	0.010 mm	
	(600 to 700) mm	0.011 mm	
	(700 to 800) mm	0.012 mm	
	(800 to 900) mm	0.013 mm	
	(900 to 1 000) mm	0.015 mm	
	(1 000 to 1 500) mm	0.021 mm	



### Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
<sup>1</sup> Can Seam Micrometer	Up to 13 mm	2.3 μm	Gauge Block Set
<sup>1</sup> Internal Micrometer All type Snap Micrometer (Up to 100 mm)	Up to 30 mm (30 to 45) mm (45 to 50) mm (50 to 60) mm (60 to 70) mm (70 to 80) mm (80 to 87) mm (87 to 97) mm (97 to 100) mm (100 to 125) mm (125 to 150) mm (150 to 175) mm	0.7 μm 0.8 μm 0.9 μm 1 μm 1.1 μm 1.2 μm 1.3 μm 1.4 μm 1.5 μm 1.8 μm 2.1 μm 2.4 μm	Gauge Block Set
<sup>1</sup> Internal Micrometer All type Snap Micrometer (Up to 100 mm)	(175 to 200) mm (200 to 250) mm (250 to 300) mm (300 to 400) mm (400 to 500) mm (500 to 600) mm	2.8 μm 3.4 μm 4.1 μm 5.4 μm 6.8 μm 8.1 μm	Gauge Block Set
<sup>1</sup> Caliper Gauge External	Up to 25 mm (25 to 50) mm	1.2 μm 1.3 μm	Gauge Block
<sup>1</sup> Caliper Gauge Internal (0.005mm) Internal (0.01mm)	2.5 to 15 mm (10 to 180) mm	3 μm 6 μm	Gauge Block
<sup>1</sup> Thickness Gauge	Up to 20 mm (20 to 25) mm	0.6 μm 0.7 μm	Gauge Block
<sup>1</sup> Height Gauge Dial and Digital	Up to 20 mm (20 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 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	0.6 μm 0.9 μm 1.5 μm 2.1 μm 2.8 μm 3.4 μm 4.1 μm 5.4 μm 6.8 μm 8.1 μm 9.5 μm 11 μm 12 μm 14 μm	Gauge Block Set

### Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Feeler Gauge / Thickness Plate	Up to 1 mm (1 to 5) mm	0.21 $\mu$ m 0.22 $\mu$ m	ULM
Measuring Foil Standard Foil	Up to 1 mm (1 to 5) mm	0.21 $\mu$ m 0.22 $\mu$ m	ULM
<sup>1</sup> Indicator	Up 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	0.6 $\mu$ m 0.7 $\mu$ m 0.8 $\mu$ m 0.9 $\mu$ m 1 $\mu$ m 1.1 $\mu$ m 1.2 $\mu$ m 1.3 $\mu$ m 1.5 $\mu$ m	Gauge Block
<sup>1</sup> Linear Length Gauge / Electrical Comparators / Mu Checker	Up to 5 mm (5 to 12) mm (12 to 20) mm (20 to 25) mm (25 to 50) mm	0.1 $\mu$ m 0.2 $\mu$ m 0.3 $\mu$ m 0.4 $\mu$ m 0.7 $\mu$ m	Gauge Block
Steel Ruler	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 1 200) mm (1 200 to 1 500) mm (1 500 to 1 800) mm (1 800 to 2 000) mm	3 $\mu$ m 4 $\mu$ m 5 $\mu$ m 6 $\mu$ m 7 $\mu$ m 9 $\mu$ m 10 $\mu$ m 11 $\mu$ m 12 $\mu$ m 16 $\mu$ m 20 $\mu$ m 24 $\mu$ m 27 $\mu$ m	3D Vision Measuring Machine
Steel Tape & Textile Tape	Up to 200 mm (200 to 400) mm (400 to 600) mm (600 to 800) mm (800 to 1 000) mm (1 000 to 1 200) mm (1 200 to 1 400) mm	0.004 mm 0.012 mm 0.017 mm 0.03 mm 0.05 mm 0.06 mm 0.09 mm	3D Vision Measuring Machine

**Length – Dimensional Metrology**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Steel Tape & Textile Tape	(1 400 to 1 600) mm (1 600 to 1 800) mm (1 800 to 2 000) mm (2 000 to 3 000) mm (3 000 to 4 000) mm (4 000 to 5 000) mm (5 000 to 6 000) mm (6 000 to 7 000) mm (7 000 to 8 000) mm (8 000 to 9 000) mm (9 000 to 10 000) mm (10 000 to 20 000) mm (20 000 to 30 000) mm (30 000 to 40 000) mm (40 000 to 50 000) mm	0.13 mm 0.14 mm 0.19 mm 0.4 mm 0.74 mm 1.1 mm 1.6 mm 2.2 mm 2.9 mm 3.6 mm 4.5 mm 18 mm 40 mm 71 mm 0.11 m	3D Vision Measuring Machine
<sup>1</sup> Depth Micro Checker, Step Gauge, Inside Checker,  Anvil Block	Up to 100 mm (100 to 200) mm (200 to 250) mm (250 to 300) mm  Up to 25 mm	2 μm 3 μm 4 μm 5 μm  2 μm	Gauge Block/ Linear Height Master
<sup>1</sup> Depth Gauge, Depth Micrometer	Up to 25 mm (25 to 50) mm (50 to 100) mm (100 to 150) mm (150 to 250) mm (250 to 300) mm (300 to 400) mm (400 to 450) mm	0.7 μm 0.9 μm 1 μm 2 μm 3 μm 4 μm 5 μm 6 μm	Gauge Block Set
<sup>1</sup> Surface Plate Overall Flatness  Local Area Flatness (Repeat Reading)	Up to 4 m Diagonal (>4 to 10) m  Up to 0.1 μm	1.5 μm 6.5 μm  1 μm	Planekator (Straight Edge) and Dial Indicator

**Length – Dimensional Metrology**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Plain Plug Gauge, Pin Gauge, Three Wires, T-probe	Up to 15 mm	0.3 µm	ULM / Gauge Block
	(15 to 22) mm	0.4 µm	
	(22 to 30) mm	0.5 µm	
	(30 to 40) mm	0.6 µm	
	(40 to 50) mm	0.7 µm	
	(50 to 60) mm	0.9 µm	
	(60 to 70) mm	1 µm	
	(70 to 80) mm	1.2 µm	
	(80 to 90) mm	1.3 µm	
	(90 to 100) mm	1.4 µm	
	(100 to 150) mm	2 µm	
	(150 to 200) mm	2.7 µm	
	(200 to 250) mm	3.4 µm	
Plain Ring Gauge	Up to 3 mm	0.44 µm	ULM / Plain Ring Gauge
	(3 to 6) mm	0.45 µm	
	(6 to 10) mm	0.46 µm	
	(10 to 12) mm	0.48 µm	
	(12 to 16) mm	0.5 µm	
	(16 to 18) mm	0.51 µm	
	(18 to 20) mm	0.53 µm	
	(20 to 22) mm	0.57 µm	
	(22 to 25) mm	0.59 µm	
	(25 to 28) mm	0.61 µm	
	(28 to 30) mm	0.63 µm	
	(30 to 75) mm	2.3 µm	
	(75 to 100) mm	3.1 µm	
(100 to 300) mm	4.9 µm		
<sup>1</sup> Check Master /Caliper Checker	Up to 100 mm	2.7 µm	Linear Height Master / Gauge Block
	(100 to 125) mm	2.9 µm	
	(125 to 150) mm	3.1 µm	
	(150 to 175) mm	3.3 µm	
	(175 to 200) mm	3.6 µm	
	(200 to 250) mm	4.1 µm	
	(250 to 300) mm	4.7 µm	
	(300 to 400) mm	5.9 µm	
	(400 to 500) mm	7.1 µm	
	(500 to 600) mm	8.4 µm	
(600 to 700) mm	9.7 µm		

**Length – Dimensional Metrology**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment	
Thread Plug Gauge	(M2 to M10) mm	0.47 $\mu\text{m}$	ULM / 3 Wire / Gauge Block	
	(M10 to M20) mm	0.49 $\mu\text{m}$		
Pitch Diameter	(M20 to M50) mm	0.51 $\mu\text{m}$		
	(M50 to M70) mm	0.55 $\mu\text{m}$		
	(M70 to M100) mm	0.61 $\mu\text{m}$		
	(M100 to M150) mm	0.63 $\mu\text{m}$		
	Major Diameter	(M2 to M10) mm		0.3 $\mu\text{m}$
		(M10 to M20) mm		0.4 $\mu\text{m}$
(M20 to M30) mm		0.5 $\mu\text{m}$		
(M30 to M40) mm		0.6 $\mu\text{m}$		
(M40 to M50) mm		0.7 $\mu\text{m}$		
(M50 to M60) mm		0.9 $\mu\text{m}$		
(M60 to M70) mm		1 $\mu\text{m}$		
(M70 to M80) mm		1.2 $\mu\text{m}$		
Thread Ring Gauge	(M2 to M5) mm	0.57 $\mu\text{m}$	ULM / Plain Ring Gauge	
	(M5 to M8) mm	0.58 $\mu\text{m}$		
	(M8 to M10) mm	0.59 $\mu\text{m}$		
	(M10 to M12) mm	0.6 $\mu\text{m}$		
	(M12 to M18) mm	0.63 $\mu\text{m}$		
	(M18 to M20) mm	0.64 $\mu\text{m}$		
	Pitch Diameter	(M20 to M25) mm		0.68 $\mu\text{m}$
		(M25 to M30) mm		0.72 $\mu\text{m}$
		(M30 to M75) mm		2.3 $\mu\text{m}$
		(M75 to M90) mm		2.4 $\mu\text{m}$
(M90 to M100) mm		2.5 $\mu\text{m}$		
(M100 to M125) mm		2.7 $\mu\text{m}$		
Minor Diameter	(M125 to M150) mm	2.9 $\mu\text{m}$		
	(M2 to M8) mm	0.4 $\mu\text{m}$		
	(M8 to M20) mm	0.5 $\mu\text{m}$		
	(M20 to M30) mm	0.6 $\mu\text{m}$		
	(M30 to M75) mm	1.1 $\mu\text{m}$		
	(M75 to M90) mm	1.3 $\mu\text{m}$		
	(M90 to M100) mm	1.4 $\mu\text{m}$		
	(M100 to M125) mm	1.8 $\mu\text{m}$		
(M125 to M150) mm	2.1 $\mu\text{m}$			



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### Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
<sup>1</sup> Dial Gauge Tester, Calibration Tester	Up to 5 mm (5 to 12) mm (12 to 20) mm (20 to 25) mm (25 to 50) mm	0.65 μm 0.66 μm 0.68 μm 0.7 μm 0.73 μm	Liner Gauge with Display
Plain Snap Gauge/Gap Gauge (External)	(2 to 4) mm (4 to 16) mm (16 to 22) mm (22 to 30) mm (30 to 75) mm (75 to 100) mm (100 to 200) mm (200 to 300) mm (300 to 400) mm (400 to 500) mm	0.2 μm 0.3 μm 0.4 μm 0.5 μm 1.1 μm 1.4 μm 2.7 μm 4 μm 5.4 μm 6.7 μm	ULM / Gauge Block
Plain Snap Gauge / Gap Gauge (Internal)	(2 to 6) mm (6 to 20) mm (20 to 30) mm (30 to 75) mm (75 to 100) mm (100 to 300) mm	0.4 μm 0.5 μm 0.6 μm 2.3 μm 2.4 μm 4.5 μm	ULM / Plain Ring Gauge
<sup>1</sup> Hole test, Three-Point Micrometer	(2 to 3) mm (3 to 8) mm (8 to 18) mm (18 to 20) mm (20 to 25) mm (25 to 28) mm (28 to 30) mm 75 mm	0.8 μm 0.9 μm 1.2 μm 1.3 μm 1.4 μm 1.5 μm 1.7 μm 3 μm	Master Ring Gauge
Dial Test Indicator	Up to 1.6 mm	0.3 μm	ULM
<sup>1</sup> Universal Length Measuring Machine	Up to 1 mm (1 to 3) mm (3 to 5) mm (5 to 10) mm (10 to 25) mm (25 to 50) mm (50 to 75) mm (75 to 100) mm (100 to 125) mm	0.06 μm 0.07 μm 0.09 μm 0.15 μm 0.34 μm 0.67 μm 1 μm 1.3 μm 1.7 μm	Gauge Block

### Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
<sup>1</sup> Universal Length Measuring Machine	(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	2.1 μm 2.4 μm 2.7 μm 3.4 μm 4.1 μm 5.4 μm 6.7 μm	Gauge Block
<sup>1</sup> Vernier Depth Gauge	Up 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	6 μm 7 μm 8 μm 9 μm 10 μm 11 μm 12 μm 13 μm 15 μm	Gauge Block Set
Bore Gauge / Cylinder Gauge	(0.5 to 10) mm (10 to 30) mm (30 to 50) mm (50 to 70) mm (70 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 (300 to 400) mm	0.6 μm 0.8 μm 0.9 μm 1.1 μm 1.5 μm 1.8 μm 2.1 μm 2.5 μm 2.8 μm 3.5 μm 4.1 μm 5.4 μm	ULM / Gauge Block
Bore Gauge / Cylinder Gauge	(400 to 500) mm (500 to 600) mm (600 to 700) mm (700 to 800) mm	6.8 μm 8.1 μm 9.5 μm 11 μm	ULM / Gauge Block
<sup>1</sup> Profile Projector			
Linearity	Up to 50 mm (50 to 200) mm (200 to 410) mm	2 μm 3 μm 7 μm	Glass Scale
Angle	(0.25 to 30) °	12 second	Angle Block Set
<sup>1</sup> Measuring Microscope, Optical Comparator, 3D Vision Measuring System	Up to 50 mm (50 to 200) mm (200 to 410) mm	2 μm 3 μm 7 μm	Glass Scale

### Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
<sup>1</sup> Height Master	Up to 175 mm (175 to 250) mm (250 to 300) mm (300 to 400) mm (400 to 500) mm (500 to 600) mm (600 to 700) mm	3 μm 4 μm 5 μm 6 μm 7 μm 8 μm 10 μm	Gauge Block / Linear Height Master
Bevel Protractor	Up to 30 ° (30 to 45) ° (45 to 90) °	12 second 24 second 48 second	Angle Block
	Up to 100 mm (100 to 200) mm (200 to 300) mm	3 μm 4 μm 5 μm	3D Vision Measuring Machine
Chamfer Gauge	Up to 10 mm	3 μm	3D Vision Measuring Machine
Pitch Gauge	Up to 7 mm	3 μm	3D Vision Measuring Machine
Radius Gauge	Up to 100 mm	3 μm	3D Vision Measuring Machine
Taper Gauge (Scale Type)	Up to 100 mm	3 μm	3D Vision Measuring Machine
Taper Thread Ring	M2 to M5 M5 to M11 M11 to M22 M22 to M45 M45 to M180	0.9 μm 0.91 μm 1.8 μm 5.1 μm 11 μm	ULM / Ring Gauge
<sup>1</sup> Riser Block	150 mm 300 mm 600 mm	9 μm 10 μm 12 μm	Linear Height Master / Gauge Block
Long Gauge Block (Grade 1, 2)	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 (300 to 400) mm (400 to 500) mm	1.3 μm 1.7 μm 2.1 μm 2.4 μm 2.7 μm 3.4 μm 4.1 μm 5.4 μm 6.7 μm	ULM / Gauge Block





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**Length – Dimensional Metrology**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Standard Micrometer, Setting Rod, Length Bar	Up to 25 mm	0.4 $\mu\text{m}$	ULM / Gauge Block
	(25 to 50) mm	0.7 $\mu\text{m}$	
	(50 to 75) mm	1.1 $\mu\text{m}$	
	(75 to 100) mm	1.4 $\mu\text{m}$	
	(100 to 125) mm	1.7 $\mu\text{m}$	
	(125 to 150) mm	2 $\mu\text{m}$	
	(150 to 175) mm	2.4 $\mu\text{m}$	
	(175 to 200) mm	2.7 $\mu\text{m}$	
	(200 to 300) mm	4 $\mu\text{m}$	
Angle Block / Angular	(0.25 to 30) °	12 second	Angle Block / 3D Vision
	(30 to 45) °	24 second	
	(45 to 60) °	36 second	
	(60 to 90) °	48 second	
Gauge Block	1 mm	0.22 $\mu\text{m}$	ULM / Gauge Block
	(1 to 5) mm	0.23 $\mu\text{m}$	
	(5 to 10) mm	0.26 $\mu\text{m}$	
	(10 to 25) mm	0.43 $\mu\text{m}$	
	(25 to 50) mm	0.72 $\mu\text{m}$	
	(50 to 75) mm	1.1 $\mu\text{m}$	
Test Sieve	Up to 50 mm	3 $\mu\text{m}$	3D Vision Measuring Machine
Taper Plug Gauge	Up to M7	0.2 $\mu\text{m}$	ULM / Gauge Block
	M7 to M15	0.3 $\mu\text{m}$	
	M15 to M25	0.4 $\mu\text{m}$	
	M25 to M30	0.5 $\mu\text{m}$	
	M30 to M40	0.6 $\mu\text{m}$	
	M40 to M50	0.7 $\mu\text{m}$	
	M50 to M60	0.9 $\mu\text{m}$	
	M60 to M70	1 $\mu\text{m}$	
	M70 to M80	1.1 $\mu\text{m}$	
	M80 to M90	1.3 $\mu\text{m}$	
	M90 to M100	1.4 $\mu\text{m}$	
	M100 to M200	2.7 $\mu\text{m}$	
	M200 to M300	4 $\mu\text{m}$	

**Length – Dimensional Metrology**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Taper Ring Gauge	M2 to M6 M6 to M20 M20 to M30 M30 to M75 M75 to M100 M100 to M150	0.4 µm 0.5 µm 0.6 µm 2.3 µm 2.4 µm 2.9 µm	ULM / Ring Gauge
Taper Thread Plug	M2 to M5 M5 to M11 M11 to M22 M22 to M45 M45 to M180	0.92 µm 1.8 µm 1.1 µm 4.7 µm 7.6 µm	ULM / 3 Wire
<sup>1</sup> Coordinate Measuring Machine X, Y, Z Axis	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 (200 to 250) mm (250 to 300) mm (300 to 400) mm (400 to 500) mm (500 to 800) mm (800 to 1 000) mm (1 000 to 1 200) mm (1 200 to 1 500) mm	0.16 µm 0.34 µm 0.67 µm 1 µm 1.3 µm 1.7 µm 2.1 µm 2.4 µm 2.7 µm 3.4 µm 4.1 µm 5.4 µm 6.7 µm 11 µm 13 µm 16 µm 20 µm	Gauge Block
Ultrasonic Thickness Gauge	Up to 100 mm	0.006 µm	Gauge Blocks
Standard Scale	Up to 50 mm. (>50 to 200) mm. (>200 to 410) mm	1.3 µm 2.4 µm 3.4 µm	3D Vision Measuring Machine, Standard Glass Scale
Coating Thickness Gauge	(30 to 1 470) µm	0.92 µm	Calibration Foils
Square	Up to 100 mm (> 100 to 200) mm (> 200 to 300) mm (> 300 to 400) mm (> 400 to 500) mm (>500 to 700) mm	3.1 µm 3.8 µm 4.5 µm 6.0 µm 7.2 µm 9.8 µm	Coordinate Measuring Machine



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**Mass and Mass Related**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment		
<sup>1</sup> Electronic Balance, Spring Balance, Load Cell Resolution: 0.000 01 g 0.000 01 g 0.000 01 g 0.000 01 g 0.000 01 g 0.000 01 g 0.000 1 g 0.000 1 g 0.000 1 g 0.001 g 0.001 g 0.001 g 0.001 g 0.001 g 0.01 g 0.01 g 0.01 g 0.01 kg 0.1 kg 0.5 kg 1 kg 5 kg 10 kg	Up to 10 g (10 to 20) g (20 to 50) g (50 to 60) g (60 to 70) g (70 to 100) g (100 to 150) g (150 to 220) g (220 to 300) g (300 to 1 000) g (1 000 to 2 000) g (2 to 3) kg (3 to 5) kg (5 to 6) kg (6 to 8) kg (8 to 10) kg (10 to 12) kg (12 to 20) kg (20 to 100) kg (100 to 1 000) kg (1 000 to 5 000) kg (5 000 to 10 000) kg (10 000 to 40 000) kg (40 000 to 80 000) kg	0.04 mg 0.05 mg 0.08 mg 0.11 mg 0.12 mg 0.16 mg 0.2 mg 0.3 mg 0.4 mg 1 mg 2 mg 3 mg 5 mg 10 mg 12 mg 17 mg 20 mg 26 mg 5.8 g 58 g 0.33 kg 0.66 kg 3.2 kg 6.3 kg	Weight Sets (E2, F1, M1)		
	<sup>1</sup> Push-Pull Gauge, Force Gauge, Tension, Tensile	Up to 1 000 N (1 000 to 3 000) N (3 000 to 5 000) N (5 000 to 10 000) N		0.006 N 0.01 N 0.02 N 0.03 N	Weight Sets
	<sup>1</sup> Hand Torque Tool, Torque Wrench, Torque Driver, Electronic Torque	(0.2 to 20) N·m (20 to 40) N·m (40 to 60) N·m (60 to 80) N·m (80 to 100) N·m (100 to 200) N·m (200 to 400) N·m (400 to 600) N·m (600 to 800) N·m (800 to 1 000) N·m		0.06 N·m 0.07 N·m 0.08 N·m 0.09 N·m 0.1 N·m 3.1 N·m 3.5 N·m 3.9 N·m 4.4 N·m 5 N·m	

### Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
<sup>1</sup> Hardness Tester, Duro Tester Type (A, B, O) Spring Force Only	(Up to 30) Duro (30 to 40) Duro (40 to 100) Duro	0.6 Duro 0.7 Duro 0.9 Duro	Weight Sets
<sup>1</sup> Hardness Tester, Duro Tester Type (C, D, DO) Spring Force Only	Up to 20) Duro (20 to 30) Duro (30 to 40) Duro (40 to 50) Duro (50 to 60) Duro (60 to 70) Duro (70 to 80) Duro (80 to 90) Duro (90 to 100) Duro	1.2 Duro 2.1 Duro 2.4 Duro 2.3 Duro 2.7 Duro 3.9 Duro 4.3 Duro 6.1 Duro 6.5 Duro	Weight Sets
Manometer	(0 to 1) psi	0.007 3 psi	Pressure Module Fluke model 700PD2
<sup>1</sup> Pressure Gauge (Pneumatic &Hydraulic), Digital Pressure Gauge, Pressure Transducer, Differential Pressure Gauge, Pressure Transmitter, Manometer, Pressure Switch	Pneumatic gauge pressure (0 kPa to 200) kPa (> 200 to 2 000) kPa  Hydraulic gauge pressure (0 to 7) MPa (> 7 to 70) MPa	0.15 kPa 1.2 kPa  23 kPa 31 kPa	Pressure Calibrator
<sup>1</sup> Vacuum Gauge	(-90 to 0) kPa	55 Pa	Pressure Calibrator
Mass (Standard Weights)	10 mg 20 mg 50 mg 100 mg 200 mg 500 mg 1 g 2 g 5 g 10 g 20 g 50 g 100 g 200 g 500 g	0.013 mg 0.014 mg 0.024 mg 0.026 mg 0.027 mg 0.03 mg 0.012 mg 0.014 mg 0.018 mg 0.024 mg 0.035 mg 0.087 mg 0.14 mg 0.26 mg 0.85 mg	Electronic Balance and Weight Sets (E2, F1, M1)



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**Mass and Mass Related**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Mass (Standard Weights)	1 kg 2 kg 5 kg 10 kg 20 kg 500 kg	2.1 mg 6.9 mg 11 mg 61 mg 69 mg 8.7 g	Electronic Balance and Weight Sets (E2, F1, M1)
Torque Calibrator	(0.1 to 2) N.m (2 to 4) N.m (4 to 6) N.m (6 to 8) N.m (8 to 10) N.m (10 to 20) N.m (20 to 40) N.m (40 to 200) N.m (200 to 400) N.m (400 to 1 000) N.m (1 000 to 1 500) N.m	0.92 % of reading 0.46 % of reading 0.31 % of reading 0.23 % of reading 0.18 % of reading 0.1 % of reading 0.05 % of reading 0.03 % of reading 0.02 % of reading 0.01 % of reading 0.006 % of reading	Weight and Calibration arm
Universal Testing Machine <sup>1</sup> Crane Scales <sup>1</sup> Compression / Tensile Testing Machine	Compression Testing Machine (0.10 to 200) kN Tensile Testing Machine 100 N to 30 kN	0.32 % of reading 0.16 % of reading	Standard Load cell
Volumetric Glassware Burette	5 ml 10 ml 25 ml 50 ml 100 ml	0.003 5 ml 0.003 7 ml 0.006 5 ml 0.01 ml 0.018 ml	Electronic Balance
Volumetric Glassware Volumetric Flask	2 ml 5 ml 10 ml 20 ml 25 ml 50 ml 100 ml 200 ml 250 ml 500 ml 1 000 ml	0.005 8 ml 0.005 8 ml 0.005 9 ml 0.006 2 ml 0.006 5 ml 0.01 ml 0.017 ml 0.028 ml 0.035 ml 0.063 ml 0.13 ml	Electronic Balance

### Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Volumetric Glassware Measuring Cylinder	5 ml	0.005 8 ml	Electronic Balance
	10 ml	0.005 9 ml	
	25 ml	0.006 5 ml	
	50 ml	0.01 ml	
	100 ml	0.017 ml	
	250 ml	0.035 ml	
	500 ml	0.063 ml	
	1 000 ml	0.13 ml	
Volumetric Glassware Measuring Pipette	0.5 ml	0.002 3 ml	Electronic Balance
	1 ml	0.002 3 ml	
	2 ml	0.002 3 ml	
	5 ml	0.002 4 ml	
	10 ml	0.003 7 ml	
	15 ml	0.006 ml	
	25 ml	0.006 5 ml	
	50 ml	0.01 ml	
Volumetric Glassware Volumetric Pipette	0.5 ml	0.002 3 ml	Electronic Balance
	1 ml	0.002 3 ml	
	2 ml	0.00 23 ml	
	5 ml	0.002 4 ml	
	10 ml	0.003 7 ml	
	15 ml	0.006 ml	
	25 ml	0.006 5 ml	
	50 ml	0.01 ml	
100 ml	0.016 ml		

### Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
<sup>1</sup> Temperature Controlled Chamber, Hot Air Oven, Incubator, Refrigerator, Low Temperature Incubator, Autoclave	(-40.0 to 0) °C	0.27 °C	Agilent 34970A Data logger and Thermocouple with RTD sensor
	(0 to 100) °C	0.19 °C	
	(100 to 200) °C	0.26 °C	
	(200 to 250) °C	0.31 °C	
<sup>1</sup> Temperature Gauge & Dial Thermometer	(-80 to 250) °C	0.07 °C	PRT Standard Hart Scientific 1575
	(250 to 500) °C	0.7 °C	Thermocouple Standard Fluke 1524
	(500 to 650) °C	2.6 °C	

### Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
<sup>1</sup> Thermocouple Sensor TC	(-80 to 250) °C	0.07 °C	PRT Standard Hart Scientific 1575
	(250 to 500) °C (500 to 1 200) °C	0.7 °C 2.6 °C	Thermocouple Standard Fluke 1524
<sup>1</sup> Liquid Bath	(-40.0 to 0) °C	0.27 °C	Agilent 34970A Data logger and Thermocouple with RTD sensor
	(0 to 100) °C	0.19 °C	
	(100 to 200) °C	0.26 °C	
	(200 to 250) °C	0.31 °C	
<sup>1</sup> Digital Thermometer with Thermocouple Sensors Types K, J, E, T, N, R, S	(-80 to 250) °C	0.07 °C	PRT Standard Hart Scientific 1575
	(250 to 500) °C (500 to 1 200) °C	0.7 °C 2.6 °C	Thermocouple Standard Fluke 1524
<sup>1</sup> Digital Thermometer with RTD or Thermistor Sensor	(-80 to 250) °C	0.07 °C	PRT Standard Hart Scientific 1575
	(250 to 500) °C (500 to 850) °C	0.7 °C 2.6 °C	Thermocouple Standard Fluke 1524
<sup>1</sup> RTD Sensor	(-80 to 250) °C	0.07 °C	PRT Standard Hart Scientific 1575
	(250 to 500) °C (500 to 850) °C	0.7 °C 2.6 °C	Thermocouple Standard Fluke 1524
Liquid in Glass Thermometers	(-80 to 250) °C	0.29 °C	PRT Standard Hart Scientific 1575
Dry Block, Dry Well	Up to 250 °C	0.07 °C	PRT Standard Fluke 1524
	(250 to 450) °C (450 to 1 200) °C	0.7 °C 2.6 °C	Thermocouple Standard
Digital Thermometer with Surface Probe	(40 to 350) °C	2.4 °C	Digital Thermometer Fluke 714 with Surface Probe
Infrared Thermometer	(-40 to 50) °C	0.91 °C	Comparison to Radiation Thermometer $\epsilon = (0.9 \text{ to } 1.0)$ , $\lambda = (8 \text{ to } 14)\mu\text{m}$
	(>50 to 100) °C	0.92 °C	
	(>100 to 200) °C	1.5 °C	
	(>200 to 400) °C	2 °C	
Thermo Hygrometer Temperature	(15 to 40) °C	0.5 °C	Thermo-Hygrometer model: Fluke 5020A Temp/Humidity Chamber

### Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Thermo Hygrometer Humidity	(30 to 50) %RH (50 to 70) %RH (70 to 90) %RH	1.6 %RH 2 %RH 2.3 %RH	Thermo-Hygrometer model: Fluke 5020A Temp/Humidity Chamber
Thermo Hygrometer Temperature Chamber	(20 to 40) °C	0.11 °C	Agilent 34901A Datalogger with RTD sensor
Thermo Hygrometer Humidity Chamber	(30 to 70) %RH	3.3 %RH	Data Logger CEM DT-172 Comparison

### Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Digital Tachometer	Photo Type (2.5 to 999.9) rpm (> 999.9 to 9 999.9) rpm (> 9 999.9 to 99 999) rpm	0.01 rpm 0.06 rpm 0.58 rpm	Fluke 5502A Multiproduct Calibrator with LED
	Contact Type (0.5 to 999.9) rpm (> 999.9 to 9 999.9) rpm (> 9 999.9 to 19 999) rpm	0.01 rpm 0.06 rpm 0.58 rpm	Fluke 5502A Multiproduct Calibrator
Stop watch <sup>1</sup>	10 s to 1 h	27 ms	Universal Counter, Agilent 53132A, Universal Frequency Counter Fluke PM6685R and Multifunction synthesizer, HP 8904A
Frequency <sup>1</sup> Source	(0.01 to 500) Hz 500 Hz to 5 kHz (5 to 50) kHz	20 μHz/Hz + 5.9 mHz 20 μHz/Hz + 58 mHz 20 μHz/Hz + 0.58 Hz	Fluke 5502A Multiproduct Calibrator
<sup>3</sup> General Frequency Source	(1 to 1 000) Hz >1Hz to 10 kHz (>0.01 to 225) MHz (>225 to 300) MHz >300 MHz to 1 GHz (>1 to 1.8) GHz (>1.8 to 18) GHz	4.4 x 10 <sup>-10</sup> f 2.4 x 10 <sup>-10</sup> f 2.4 x 10 <sup>-10</sup> f 2.4 x 10 <sup>-9</sup> f 7 x 10 <sup>-10</sup> f 4.2 x 10 <sup>-10</sup> f 2.7 x 10 <sup>-10</sup> f	Universal Counter Agilent 53132A, Standard Universal Frequency Counter Fluke PM 6685R and Measuring receiver HP 8902A



### Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Radar Gun Speed	24.150 GHz 40.25 km/h 56.35 km/h 104.65 km/h	1 km/h	Using Tuning Forks
	34.7 GHz 40.64 km/h 64.75 km/h	1 km/h	
<sup>1</sup> Radar Speed All Frequency band	60 km/h 90 km/h 120 km/h	0.4 km/h 0.6 km/h 0.9 km/h	Rasmi Racing Drag and Timer, Measuring Tape, Calculate speed (S) by known distance (D) and known elapse time (T) $S = \frac{D}{T}$
<sup>1</sup> Centrifuge	(50.00 to 999.99) rpm (1 000.0 to 3 000.0) rpm (3 000.1 to 9 999.9) rpm (10 000 to 20 000) rpm	0.53 rpm 1.9 rpm 5.3 rpm 13 rpm	Digital Tachometer
Universal Frequency Counter	Time Base 1 MHz to 10 MHz Frequency DC to 18 GHz Time Interval 1 μs to 1 ms Trigger Level (0 to ±5.25) V	2.4x10 <sup>-10</sup> 2.9x10 <sup>-10</sup> 0.6 ps 0.001 9 mV	Universal Counter Agilent 53131A, Universal Frequency Counter Calibrator Fluke PM6685R, RF Signal Generator Agilent N9310A, Function Generator/Arbitrary Waveform Generator Hewlett-Packard 33120A, Synthesizer Signal Generator Hewlett Packard 83731A, Multifunction Synthesizer Hewlett Packard 8904A
Time Interval Source	10 ns to 1 s (>1 to 10) s (>10 to 50) s (>50 to 100) s	2 ns 4 ns 14 ns 26 ns	Universal Counter Agilent 53131A, Universal Frequency Counter Calibrator Fluke PM6685R.

## DIMENSIONAL MEASUREMENT

### 1 Dimensional

Specific Tests and / or Properties Measured	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Jig, Fixture and Mold, Die  X Axis	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 (200 to 250) mm (250 to 300) mm (300 to 400) mm (400 to 500) mm (500 to 600) mm	0.002 7 mm 0.002 8 mm 0.002 9 mm 0.003 mm 0.003 2 mm 0.003 4 mm 0.003 6 mm 0.003 8 mm 0.004 3 mm 0.004 9 mm 0.006 mm 0.007 2 mm 0.008 5 mm	Coordinate Measuring Machine
Jig, Fixture and Mold, Die  Y Axis	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 (200 to 250) mm (250 to 300) mm (300 to 400) mm (400 to 500) mm (500 to 700) mm	0.002 7 mm 0.002 8 mm 0.002 9 mm 0.003 mm 0.003 2 mm 0.003 4 mm 0.003 6 mm 0.003 8 mm 0.004 3 mm 0.004 9 mm 0.006 mm 0.007 2 mm 0.009 8 mm	Coordinate Measuring Machine
Jig, Fixture and Mold, Die  Z Axis	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 (200 to 250) mm (250 to 300) mm (300 to 400) mm (400 to 500) mm	0.002 7 mm 0.002 8 mm 0.002 9 mm 0.003 mm 0.003 2 mm 0.003 4 mm 0.003 6 mm 0.003 8 mm 0.004 3 mm 0.004 9 mm 0.006 mm 0.007 2 mm	Coordinate Measuring Machine

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

Notes:

1. On-site calibration service is available for this parameter, since on-site conditions are typically more variable than those in the laboratory, larger measurement uncertainties are expected on-site than what is reported on the accredited scope.
2. Nominal values listed are approximate.
3.  $f$  = frequency in Hz.
4. Mismatch Uncertainty is based on DUT SWR: 1.4 for <2 GHz; 1.6 for <18 GHz
5. This scope is formatted as part of a single document including Certificate of Accreditation No. ACT-2050.



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