



CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

Ming Deng Metrology Services (Thailand) Co., Ltd.
46 Soi Serithai 81/2
Serithai Road, Kannayao
Bangkok 10230, Thailand
(and satellite locations as shown on the scope)

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.

R. Douglas Leonard Jr., VP, PILR SBU

Expiry Date: 27 October 2023
Certificate Number: ACT-2515



This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017.
This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory
quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).



**SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017 AND
ANSI/NCSL Z540-1-1994 (R2002)**

Ming Deng Metrology Services (Thailand) Co., Ltd.

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Serithai Road, Kannayao
Bangkok 10230, Thailand
John Peh

CALIBRATION & DIMENSIONAL MEASUREMENT

Valid to: **October 27, 2023**

Certificate Number: **ACT-2515**

Satellite locations in:

[Singapore](#)

[Malaysia](#)



ANSI National Accreditation Board

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CALIBRATION

Chemical Quantities

Singapore

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
pH Measuring Instruments ^{1,5}	4 pH 7 pH 10 pH	0.06 pH 0.06 pH 0.12 pH	Comparison to Certified Reference Material
Conductivity Measuring Instruments ^{1,5}	84 µS/cm 1 413 µS/cm 12.88 mS/cm	1 % of reading + 0.1 µS/cm 1.5 % of reading + 0.6 µS/cm 1.5 % of reading + 0.01 mS/cm	Comparison to Certified Reference Material
Refractometers ^{1,5}	(5, 10, 30, & 60) %Brix	0.07 %Brix	Comparison to Certified Reference Material

Electrical – DC/Low Frequency

Singapore

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Capacitance Source ¹			
10 Hz to 10 kHz	(0.22 to 0.4) nF	0.39 % of reading + 0.007 8 nF	Multiproduct Calibrator
10 Hz to 10 kHz	(0.4 to 1.1) nF	0.39 % of reading + 0.007 9 nF	
10 Hz to 3 kHz	(1.1 to 3.3) nF	0.39 % of reading + 0.007 8 nF	
10 Hz to 1 kHz	(3.3 to 11) nF	0.2 % of reading + 0.009 7 nF	
10 Hz to 1 kHz	(11 to 33) nF	0.2 % of reading + 0.097 nF	
10 Hz to 1 kHz	(33 to 110) nF	0.2 % of reading + 0.097 nF	
10 Hz to 1 kHz	(110 to 330) nF	0.2 % of reading + 0.63 nF	
10 Hz to 600 Hz	(0.33 to 1.1) µF	0.2 % of reading + 0.97 nF	

Electrical – DC/Low Frequency

Singapore

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Capacitance Source ¹ 10 Hz to 300 Hz 10 Hz to 150 Hz 0 Hz to 120 Hz 10 Hz to 80 Hz (0 to 50) Hz (0 to 20) Hz (0 to 6) Hz (0 to 2) Hz (0 to 0.6) Hz (0 to 0.2) Hz	(1.1 to 3.3) μ F (3.3 to 11) μ F (11 to 33) μ F (33 to 110) μ F (110 to 330) μ F (0.33 to 1.1) mF (1.1 to 3.3) mF (3.3 to 11) mF (11 to 33) mF (33 to 110) mF	0.2 % of reading + 6.3 nF 0.2 % of reading + 13 nF 0.32 % of reading + 24 nF 0.35 % of reading + 0.13 μ F 0.35 % of reading + 0.63 μ F 0.35 % of reading + 1.1 μ F 0.35 % of reading + 6.3 μ F 0.35 % of reading + 13 μ F 0.59 % of reading + 55 μ F 0.86 % of reading + 78 μ F	Multiproduct Calibrator
DC Current Source ¹	(0 to 330) μ A (0.33 to 3.3) mA (3.3 to 33) mA (33 to 330) mA (0.33 to 1.1) A (1.1 to 3) A (3 to 11) A (11 to 20.5) A	0.012 % of reading + 0.02 μ A 0.007 8 % of reading + 0.04 μ A 0.007 8 % of reading + 0.2 μ A 0.007 8 % of reading + 2.1 μ A 0.016 % of reading + 0.04 mA 0.03 % of reading + 0.05 mA 0.039 % of reading + 0.7 mA 0.078 % of reading + 0.59 mA	Multiproduct Calibrator
DC Current Clamp Meters ¹	(0 to 16.5) A (16.5 to 55) A (55 to 150) A (150 to 550) A (550 to 1 000) A	0.01 % of reading + 58 mA 0.29 % of reading + 0.2 A 0.29 % of reading + 0.2 A 0.04 % of reading + 0.2 A 0.08 % of reading + 0.2 A	Multiproduct Calibrator and Coil
AC Current Source ¹	(29 to 330) μ A (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz (0.33 to 3.3) mA (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.16 % of reading + 0.08 μ A 0.12 % of reading + 0.08 μ A 0.1 % of reading + 0.08 μ A 0.24 % of reading + 0.12 μ A 0.63 % of reading + 0.16 μ A 1.3 % of reading + 0.32 μ A 0.16 % of reading + 0.12 μ A 0.1 % of reading + 0.12 μ A 0.08 % of reading + 0.12 μ A 0.16 % of reading + 0.16 μ A 0.39 % of reading + 0.24 μ A 0.78 % of reading + 0.47 μ A	Multiproduct Calibrator

Electrical – DC/Low Frequency

Singapore

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current Source ¹	(3.3 to 33) mA		Multiproduct Calibrator
	(10 to 20) Hz	0.14 % of reading + 1.6 μA	
	(20 to 45) Hz	0.07 % of reading + 1.6 μA	
	45 Hz to 1 kHz	0.04 % of reading + 1.6 μA	
	(1 to 5) kHz	0.07 % of reading + 1.6 μA	
	(5 to 10) kHz	0.16 % of reading + 2.4 μA	
	(10 to 30) kHz	0.32 % of reading + 3.2 μA	
	(33 to 330) mA		
	(10 to 20) Hz	0.14 % of reading + 0.02 mA	
	(20 to 45) Hz	0.07 % of reading + 0.02 mA	
	45 Hz to 1 kHz	0.04 % of reading + 0.02 mA	
	(1 to 5) kHz	0.08 % of reading + 0.04 mA	
	(5 to 10) kHz	0.16 % of reading + 0.08 mA	
	(10 to 30) kHz	0.32 % of reading + 0.16 mA	
	(0.33 to 3) A		
	(10 to 45) Hz	0.14 % of reading + 0.13 mA	
	45 Hz to 1 kHz	0.05 % of reading + 0.09 mA	
	(1 to 5) kHz	0.47 % of reading + 0.78 mA	
(5 to 10) kHz	2 % of reading + 3.9 mA		
(3 to 11) A			
(45 to 100) Hz	0.05 % of reading + 1.7 mA		
100 Hz to 1 kHz	0.08 % of reading + 1.7 mA		
(1 to 5) kHz	2.4 % of reading + 1.7 mA		
(11 to 20.5) A			
(45 to 100) Hz	0.1 % of reading + 3.9 mA		
(0.1 to 1) kHz	0.12 % of reading + 3.9 mA		
(1 to 5) kHz	2.4 % of reading + 3.9 mA		
AC Current Clamp Meters ¹	(10 to 16.5) A		Multiproduct Calibrator and Coil
	(45 to 65) Hz	0.33 % of reading + 58 mA	
	(65 to 100) Hz	0.92 % of reading + 58 mA	
	(100 to 440) Hz	0.93 % of reading + 58 mA	
	(16.5 to 150) A		
	(45 to 65) Hz	0.34 % of reading + 65 mA	
	(65 to 100) Hz	0.92 % of reading + 66 mA	
	(100 to 440) Hz	0.94 % of reading + 66 mA	
	(150 to 1 000) A		
	(45 to 65) Hz	0.34 % of reading + 0.12 A	
	(65 to 100) Hz	0.92 % of reading + 130 mA	
	(100 to 440) Hz	1.2 % of reading + 0.13 A	



ANSI National Accreditation Board

Electrical – DC/Low Frequency

Singapore

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Resistance Source ¹	(0 to 11) Ω	0.003 2 % of reading + 0.78 mΩ	Multiproduct Calibrator
	(11 to 33) Ω	0.002 4 % of reading + 12 mΩ	
	(33 to 110) Ω	0.002 2 % of reading + 12 mΩ	
	(110 to 330) Ω	0.002 2 % of reading + 16 mΩ	
	(0.33 to 1.1) kΩ	0.002 2 % of reading + 16 mΩ	
	(1.1 to 3.3) kΩ	0.002 2 % of reading + 16 mΩ	
	(3.3 to 11) kΩ	0.002 2 % of reading + 78 mΩ	
	(11 to 33) kΩ	0.002 2 % of reading + 0.78 Ω	
	(33 to 110) kΩ	0.002 2 % of reading + 0.78 Ω	
	(110 to 330) kΩ	0.002 5 % of reading + 7.8 Ω	
	(0.33 to 1.1) MΩ	0.002 5 % of reading + 7.8 Ω	
	(1.1 to 3.3) MΩ	0.004 7 % of reading + 0.12 kΩ	
	(3.3 to 11) MΩ	0.01 % of reading + 20 kΩ	
	(11 to 33) MΩ	0.02 % of reading + 3 kΩ	
	(33 to 110) MΩ	0.039 % of reading + 2.9 kΩ	
(110 to 330) MΩ	0.24 % of reading + 0.11 MΩ		
(330 to 1 100) MΩ	1.2 % of reading + 1.4 MΩ		
RTD Indicating Instruments ¹	PT385, 100 Ω		Multiproduct Calibrator
	(-200 to 0) °C	0.04 °C	
	(0 to 100) °C	0.05 °C	
	(100 to 300) °C	0.07 °C	
	(300 to 400) °C	0.08 °C	
	(400 to 630) °C	0.09 °C	
	(630 to 800) °C	0.18 °C	
	PT3926, 100 Ω		
	(-200 to 0) °C	0.04 °C	
	(0 to 100) °C	0.05 °C	
	(100 to 300) °C	0.07 °C	
	(300 to 400) °C	0.08 °C	
	(400 to 630) °C	0.09 °C	
	PT385, 200 Ω		
	(-200 to 0) °C	0.04 °C	
	(0 to 100) °C	0.05 °C	
	(100 to 260) °C	0.07 °C	
	(260 to 300) °C	0.08 °C	
(300 to 400) °C	0.09 °C		
(400 to 630) °C	0.18 °C		

Electrical – DC/Low Frequency

Singapore

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
RTD Indicating Instruments ¹	PT385, 1 000 Ω (-200 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 630) °C PT3916, 100 Ω (-200 to -190) °C (-190 to -80) °C (-80 to 0) °C (0 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C	0.04 °C 0.05 °C 0.07 °C 0.08 °C 0.09 °C 0.19 °C 0.03 °C 0.04 °C 0.05 °C 0.06 °C 0.07 °C 0.08 °C	Multiproduct Calibrator
DC Voltage Source ¹	(0 to 330) mV (0.33 to 3.3) V (3.3 to 33) V (33 to 330) V (330 to 1 000) V	0.001 6 % of reading + 2 μV 0.000 9 % of reading + 2 μV 0.001 % of reading + 17 μV 0.001 4 % of reading + 0.14 mV 0.001 4 % of reading + 1.4 mV	Multiproduct Calibrator
AC Voltage Source ¹	(1.0 to 33) mV (10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz (33 to 330) mV (10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz (0.33 to 3.3) V (10 to 45) Hz 45 Hz to 10 kHz (10 to 20) Hz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.063 % of reading + 5 μV 0.012 % of reading + 5 μV 0.016 % of reading + 5 μV 0.078 % of reading + 5 μV 0.28 % of reading + 10 μV 0.63 % of reading + 40 μV 0.024 % of reading + 7 μV 0.012 % of reading + 7 μV 0.013 % of reading + 7 μV 0.028 % of reading + 7 μV 0.063 % of reading + 25 μV 0.16 % of reading + 55 μV 0.024 % of reading + 0.05 mV 0.012 % of reading + 0.05 mV 0.015 % of reading + 0.05 mV 0.024 % of reading + 0.04 mV 0.055 % of reading + 0.1 mV 0.19 % of reading + 0.5 mV	Multiproduct Calibrator

Electrical – DC/Low Frequency

Singapore

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage Source ¹	(3.3 to 33) V (10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (33 to 330) V 45 Hz to 1 kHz 1 kHz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (330 to 1 000) V 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.024 % of reading + 0.6 mV 0.012 % of reading + 0.5 mV 0.019 % of reading + 0.5 mV 0.028 % of reading + 0.5 mV 0.07 % of reading + 1.5 mV 0.015 % of reading + 1.6 mV 0.016 % of reading + 4.7 mV 0.020 % of reading + 4.7 mV 0.024 % of reading + 4.7 mV 0.16 % of reading + 39 mV 0.024 % of reading + 7.9 mV 0.02 % of reading + 7.9 mV 0.024 % of reading + 8 mV	Multiproduct Calibrator
Thermocouple Indicating Instruments ¹	Type E (-250 to -100) °C (-100 to 1 000) °C Type J (-210 to 1 200) °C Type K (-200 to 1 372) °C Type N (-200 to 1 300) °C Type R (0 to 1 767) °C Type S (0 to 1 767) °C Type T (-250 to -150) °C (-150 to 400) °C	0.5 °C 0.2 °C 0.3 °C 0.4 °C 0.4 °C 0.9 °C 0.7 °C 0.5 °C 0.3 °C	Multiproduct Calibrator

Length – Dimensional Metrology

Singapore

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
External Micrometer ¹ Linearity	(0 to 200) mm (200 to 500) mm (500 to 1 000) mm	0.4 µm 2 µm 4 µm	Gauge Blocks

Length – Dimensional Metrology

Singapore

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
External Micrometers ¹ Flatness Up to 25 mm diameter	(0 to 0.5) μm	0.1 μm	Optical Parallel or Optical Flat Dial Test Indicator
External Micrometers ¹ Parallelism Up to 50 mm diameter	(0 to 1) μm	0.1 μm	Optical Parallel Dial Test Indicator
Depth Micrometer	(0 to 300) mm	1 μm	Gauge Blocks
Internal & Stick Micrometer ¹	(0 to 200) mm (200 to 500) mm (500 to 1 000) mm	2 μm 3 μm 4 μm	Gauge Blocks
Internal Micrometer ¹ (2-leg type)	(0 to 300) mm	2 μm	Ring Gauges
Micrometer Head	(0 to 50) mm	0.9 μm	Universal Length Measuring Machine or Gauge Blocks
Screw Thread Micrometer ¹	(0 to 300) mm	1 μm	Gauge Block or Pin Gauge
Caliper ¹	(0 to 1 000) mm (1 000 to 1 500) mm	3 μm 20 μm	Caliper Checker or Gauge Block
Caliper Gauge ¹	(0 to 500) mm	1 μm	Gauge Blocks
Caliper Checker ¹ (Step Gauges) Depth Micrometer Checker	(0 to 630) mm	0.9 μm	Gauge Blocks, Mu Checker
Optical Flats/Parallels Flatness Thickness	Up to 10 μm	0.1 μm 0.4 μm	Optical Flat
Optical Flats/ Parallels Parallelism	Up to 1 mm	0.1 μm	Gauge Block Comparator
Gauge Block Comparator ^{1,4}	(0.5 to 10) mm (10 to 25) mm (25 to 50) mm (50 to 75) mm (75 to 100) mm	0.04 + (1 \times 10 ⁻⁶ L) μm	Gauge Blocks
Gauge Blocks Length (Dissimilar & Similar Material)	(0.5 to 10) mm (10 to 25) mm (25 to 50) mm (50 to 75) mm (75 to 100) mm	0.05 μm 0.06 μm 0.08 μm 0.1 μm 0.12 μm	Gauge Block Comparator with 1 mm Probe Radius

Length – Dimensional Metrology

Singapore

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Long Gauge Blocks (Dissimilar & Similar Material)	125 mm 150 mm 175 mm	0.37 μ m 0.4 μ m 0.46 μ m	Gauge Block Comparator
Long Gage Blocks (Dissimilar & Similar Material)	125 mm 150 mm 175 mm 200 mm 250 mm 300 mm 400 mm 500 mm	0.46 μ m 0.48 μ m 0.5 μ m 0.52 μ m 0.57 μ m 0.62 μ m 0.73 μ m 0.84 μ m	Universal Length Measuring Machine (ULM)
Height Gauge ¹	(0 to 600) mm (600 to 1 000) mm	10 μ m 20 μ m	Gauge Block or Caliper Checker
Linear Height Gauge ¹ Length Setting Master Height Setting Master Parallelism	(0 to 1 000) mm (0 to 30) mm (0 to 10) μ m	2 μ m 2 μ m 0.4 μ m	Gauge Blocks, Mu Checker
Height Master ¹ Micrometer Head Length Parallelism Riser Block	(0 to 25) mm (0 to 600) mm (0 to 10) μ m (0 to 300) mm	0.7 μ m	Gauge Blocks, Mu Checker
Vernier Depth Gauge ¹	(0 to 600) mm (600 to 1 000) mm	10 μ m 20 μ m	Gauge Blocks
Dial Depth Gauge ¹	(0 to 100) mm	3 μ m	Gauge Blocks
Mu Checker	(0 to 5) mm	0.2 μ m	Gauge Blocks or Calibration Tester
Dial Indicator ¹	Up to 100 mm	0.5 μ m	Dial Gauge Calibrator
Dial Test Indicator ¹	(0 to 3) mm	0.5 μ m	Dial Gauge Calibrator
Digimatic Indicator ¹ Linear Gauge	Up to 100 mm	0.5 μ m	Dial Gauge Calibrator
Digimatic Indicator ¹ Linear Gauge	Up to 100 mm	0.2 μ m	Gauge Blocks
Dial Thickness Gauge ¹	(0 to 200) mm	1 μ m	Gauge Blocks
Dial Gauge Stand ¹	(0 to 1) mm	0.9 μ m	Gauge Blocks

Length – Dimensional Metrology

Singapore

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Dial Gauge Calibrator ¹	(0 to 100) mm	0.2 µm	Gauge Blocks
Calibration Tester ¹	(0 to 100) mm	0.3 µm	Gauge Blocks
Bore Gauge	(0 to 600) mm	2 µm	Height Setting Micrometer
Holtest/ Borematic	(0 to 200) mm	0.9 µm	Setting Ring Gauge or Universal Length Measuring Machine
Steel Rule	(0 to 1 500) mm (1 500 to 2 000) mm	0.07 mm 0.12 mm	Profile Projector
Steel Rule	(0 to 1 500) mm (1 500 to 2 000) mm	0.13 mm 0.16 mm	Comparison with Reference Ruler
Straight Edge ¹	Up to 1 000 mm	2 µm	Mu-Checker or Dial Test Indicator
Surface Plate ^{1,2} Overall Flatness	Up to 2 500 mm×2 000 mm	1 µm	Planekator (Straight Edge)
Local Area Flatness (Repeat Readings)	Up to 0.1 µm		
Profile Projector ¹ Optical Comparators	Up to 300 mm	2 µm	Glass Scale
Universal Length Measuring Machine ¹ Length	(0 to 600) mm	0.3 µm	Gauge Blocks
Setting Rod	Up to 1 000 mm	0.8 µm	Gauge Blocks and Mu-Checker
Bevel Protractor	Up to 300 mm (0 to 360) °	1.5 µm 5 ‘	Dial Test Indicator Angle Blocks or
Bevel Protractor	Up to 300 mm (0 to 360) °	33 ‘	Profile Projector
Precision Levels Spirit Level Inclinometer Level Gauge	0.01 mm/m to 1 cm/m (0 to 35) °	0.1 Division 0.1 °	Sine Plate, Gauge Blocks
Measuring Microscope ¹	(0 to 300) mm	2 µm	Glass Scale
Sine Bar	(0 to 300) mm	1.5 µm	Universal Length Measuring Machine, Millitron

Length – Dimensional Metrology

Singapore

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Vee Block Flatness Squareness Parallelism of Vee	(0 to 1.2) mm	4 µm	Levelling Plate, Square, Indicator
Precision Square	(0 to 450) mm	3 µm	Granite Square
Parallel Bars	(0 to 1.2) mm	2 µm	Dial Indicator, Mu Checker, Micrometer
Centre Bench ¹	(0 to 1.2) mm	3 µm	Height Master, Gauge Blocks, Mu Checker
Coating Thickness Gauge	Up to 1 000 µm	0.5 µm	Thickness Standards
Roughness Machine ¹	(0.3 to 3) µm	0.021 µm	Roughness Specimen
Roughness Specimen ¹	(0.3 to 3) mm	0.021 µm	Roughness Machine
Feeler Gauge Shim Shock Calibration Foil	Up to 5 mm	0.4 µm	Universal Length Measuring Machine
Plain Plug Gauge / Pin Gauge	Up to 10 mm (10 to 100) mm (100 to 200) mm	0.5 µm 0.8 µm 1 µm	Universal Length Measuring Machine
Thread Wires Diameter	Up to 10 mm	0.4 µm	Universal Length Measuring Machine
Plain Ring Gauge	(1 to 100) mm (100 to 200) mm	0.7 µm 1.4 µm	Universal Length Measuring Machine
Thread Plug Gauge (> M1 to M50) Pitch Diameter Major Diameter Pitch	(1 to 200) mm	0.9 µm 0.5 µm 6 µm	Universal Length Measuring Machine, Thread Wires
Adjustable Thread Rings Pitch Diameter (tactile fit) Minor Diameter	(0 to 100) mm	2 µm	ULM, Internal Micrometer
Solid Thread Ring Gauge Pitch Diameter (tactile fit) Minor Diameter	Up to 2.5 mm (1.2 to 2.5) mm	N/A 2 µm	Thread Setting Plug, Internal Micrometer

Length – Dimensional Metrology

Singapore

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Solid Thread Ring Gauge (> M2.5 to M100) Pitch Diameter (measured) Minor Diameter	(2.5 to 100) mm	1 μ m 0.8 μ m	Universal Length Measuring Machine
Coordinate Measuring Machine ¹	Up to 1 500 mm	0.82 μ m	Gauge Block, Step Gauge
Glass Scale	(0 to 150) mm	3.1 μ m	Profile Projector
Tapered Ring Gauge Diameter	Up to 100 mm	1.3 μ m	Universal Length Measuring Machine (ULM)
Tapered Ring Gauge Step Height	Up to 75 mm	2 μ m	Micrometer
Tapered Plug Gauge Diameter	Up to 75 mm	1.2 μ m	Universal Length Measuring Machine (ULM)
Tapered Plug Gauge Step Height	Up to 75 mm	2 μ m	Micrometer
Tapered Thread Plug Gauges Pitch Diameter	Up to 150 mm	3.1 μ m	Universal Length Measuring Machine (ULM)
Tapered Thread Plug Gauges Taper	(0 to 10) °	4 ‘	Profile Projector
Tapered Thread Plug Gauges Step Height	Up to 75 mm	2.2 μ m	Micrometer
Tapered Thread Ring Gauges Step Height	Up to 75 mm	2.2 μ m	Micrometer
Tapered Thread Ring Gauges Pitch Diameter	Up to 100 mm	1.6 μ m	Universal length Measuring Machine (ULM), Probing System

Mass and Mass Related

Singapore

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Force Gauge ¹	(0 to 5) kgf (5 to 200) kgf	0.000 6 kgf 0.06 kgf	Masses
Force Gauge ¹	(0 to 5 000) N	1.5 N	Load Cells



ANSI National Accreditation Board

Mass and Mass Related

Singapore

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Force Testing Machines ¹ and Load Cells Compression and Tension ¹	(0 to 10) N (10 to 100) N (100 to 1 000) N (1 to 5) kN (5 to 10) kN (10 to 50) kN (50 to 100) kN (100 to 250) kN	0.006 N 0.06 N 2.3 N 0.005 kN 0.001 kN 0.048 kN 0.11 kN 0.05 kN	Direct measurement to reference load cell or Standard Weight
Masses	1 mg to 10 g 20 g (50 to 200) g 500 g 1 000 g (2 000 to 5 000) g 10 kg 20 kg	0.08 mg 0.09 mg 0.2 mg 0.001 g 0.002 g 0.2 g 10 mg 61 mg	Analytical Balance, Mass
Scales and Balances ^{1,4}	(0 to 400) kg	0.002 g	Masses
Torque Tools ¹	(0 to 1 000) N·m	0.001 N·m	Torque Transducers
Torque Meter/Gauge	(0 to 15) N·m	0.006 N·m	Torque Arm, Masses
Durometers ¹ (Force only) Types A, B, E & O Types C, D, & DO	(0 to 100) °	0.2 °	Standard Weight
Rockwell Hardness Testers ¹	(10 to 100) HRBW (20 to 95) HRA (10 to 70) HRC	0.5 HRBW 0.5 HRA 0.5 HRC	Hardness Test Blocks
Vickers Hardness Testers ¹	(100 to 1000) HV	0.5 % of reading	Hardness Test Blocks
Brinell Hardness Testers ¹	(100 to 600) HBW	1 % of readings	Hardness Test Blocks
Pressure Gauges ¹	(-1 to 140) bar (0 to 2 700) bar	0.013 % of reading 0.018 % of reading	Pressure Calibrator Dead Weight Tester
Flow Meters ¹	(0 to 5) LPM (5 to 10) LPM (50 to 500) LPM	0.042 LPM 0.29 LPM 2.2 LPM	Comparison to Flowmeters



ANSI National Accreditation Board

Thermodynamic

Singapore

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Enclosures ¹ Chamber / Oven / Freezers System Accuracy Test	(-20 to 200) °C	2.1 °C	Datalogger, Thermocouples
Furnace ¹ System Accuracy Test	(200 to 800) °C	3.1 °C	Datalogger, Thermocouples
Thermometers ¹ (except liquid in glass)	(-20 to 150) °C (150 to 500) °C (500 to 650) °C	1.1 °C 1.3 °C 2.7 °C	PRT Sensor, Dry Block Calibrator
Surface Style Thermometer	(30 to 300) °C	2 °C	Flat Plate Calibrator
Dry Block Calibrators	(-20 to 150) °C (150 to 500) °C	0.4 °C 0.9 °C	PRT sensor
Thermohygrometer Instruments	(18 to 70) °C (40 to 95) %RH	1 °C 4.8 %RH	Reference Thermohygrometer

Time and Frequency

Singapore

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Stopwatches and Timers ¹	1 s to 1 hr	0.22 s	Reference Stopwatch
Tachometers ¹ Non-Contact	(0 to 99 999) rpm	1.7 rpm	Multiproduct Calibrator with LED
Frequency Source ¹	(0.01 to 99.99) Hz (100 to 119.99) Hz (120 to 1199.9) Hz (1.2 to 11.99) kHz (12 to 119.99) kHz (120 to 1 199.99) kHz (1.2 to 2.0) MHz	0.000 2 % of reading + 8.6 μHz 0.000 2 % of reading + 71 μHz 0.000 2 % of reading + 0.49 mHz 0.000 2 % of reading + 7.6 mHz 0.000 2 % of reading + 71 mHz 0.000 2 % of reading + 0.76 Hz 0.000 2 % of reading + 0.99 Hz	Multiproduct Calibrator

DIMENSIONAL MEASUREMENT

1 Dimensional

Singapore

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Layout Measurement Length	X Axis (0 to 300) mm Y Axis (0 to 100) mm	0.5 μ m	Optical Comparator or Universal Length Measuring Machine

2 Dimensional

Singapore

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Layout Measurement Angle	(0 to 360) °	10 ‘	Optical Comparator

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