



CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

Smart Tech Calibration & Services Co., Ltd.
14/506 Moo 3, Rangsit-Nakhon Nayok Road, Lam Phak Kut,
Thanyaburi, Pathum Thani 12110, Thailand

Fulfills the requirements of

ISO/IEC 17025:2017

In the field of

CALIBRATION

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.

A handwritten signature in black ink, appearing to be 'Jason Stine', is positioned above a horizontal line.

Jason Stine, Vice President

Expiry Date: 25 April 2026

Certificate Number: AC-3093



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

Smart Tech Calibration & Services Co., Ltd.

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CALIBRATION

Valid to: **April 25, 2026**

Certificate Number: **AC-3093**

Acoustics and Vibration

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ Sound Level Meter	1 kHz 94 dB 114 dB	0.4 dB 0.4 dB	Sound Calibrator

Chemical Quantities

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ pH Meter	2.00 pH 4.00 pH 7.00 pH 10.00 pH	0.017 pH 0.01 pH 0.01 pH 0.017 pH	Standard pH Solution
¹ Conductivity Meter	84 µS/cm 1 413 µS/cm 12.88 mS/cm	1.2 µS /cm 20 µS /cm 0.18 mS/cm	Standard Conductivity Solution
¹ Turbidity Meter	0.5 NTU 20 NTU 100 NTU 1 000 NTU	0.01 NTU 0.12 NTU 0.5 NTU 8.1 NTU	Standard Turbidity Solution
¹ Total Dissolved Solids (TDS) Meter	100 mg/L 1 000 mg/L	0.31 mg/L 2.4 mg/L	Standard TDS Solution
¹ Refractometer	10 % Brix 20 % Brix 30 % Brix 50 % Brix	0.19 % Brix 0.2 % Brix 0.21 % Brix 0.23 % Brix	Standard Sucrose Solution
¹ Refractometer - Refractive Index	1.347 83 nD 1.363 84 nD 1.381 13 nD 1.420 09 nD	0.000 29 nD 0.000 32 nD 0.000 34 nD 0.000 42 nD	Standard Sucrose Solution

Chemical Quantities

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ Oxidation Reduction Potential (ORP) Meter	-1 999 mV to 1 999 mV	0.9 mV	Document Process Calibrator

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ Electrical Simulation of RTD Indicating Devices – Source/Measure	RTD (Pt100) (-200 to 0) °C (0 to 400) °C (400 to 650) °C	0.15 °C 0.25 °C 0.48 °C	Fluke 744 Process Calibrator
¹ Electrical Simulation of RTD Indicating Devices – Measure	RTD (Pt100) (-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 600) °C	0.16 °C 0.18 °C 0.21 °C 0.24 °C 0.27 °C	Agilent 34410A 6.5 Digit Multimeter
¹ Electrical Simulation of Thermocouple Indicating Devices – Source/Measure	Type E (-200 to -100) °C (-100 to 0) °C (0 to 1 000) °C Type J (-200 to 0) °C (0 to 600) °C (600 to 900) °C (900 to 1 200) °C Type K (-200 to 0) °C (0 to 150) °C (150 to 1 100) °C (1 100 to 1 372) °C Type N (-200 to 0) °C (0 to 150) °C (150 to 900) °C (900 to 1 300) °C Type R (0 to 200) °C (200 to 400) °C (400 to 1 760) °C	0.47 °C 0.3 °C 0.29 °C 0.44 °C 0.3 °C 0.29 °C 0.3 °C 0.54 °C 0.4 °C 0.4 °C 0.4 °C 0.83 °C 0.62 °C 0.62 °C 0.4 °C 1.6 °C 1.2 °C 1.2 °C	Fluke 744 Process Calibrator



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ Electrical Simulation of Thermocouple Indicating Devices – Source/Measure	Type S (0 to 200) °C (200 to 1 760) °C Type T (-200 to -100) °C (-100 to 0) °C (0 to 400) °C	1.6 °C 1.3 °C 0.56 °C 0.52 °C 0.4 °C	Fluke 744 Process Calibrator
¹ High Resistance, Insulation Testers, Resistivity Meters @ (10 to 1 000) V	(0.01 to 1) MΩ (1 to 2) MΩ (2 to 5) MΩ (5 to 10) MΩ (10 to 20) MΩ (20 to 30) MΩ (30 to 50) MΩ (50 to 100) MΩ 200 MΩ 500 MΩ 1 GΩ 10 GΩ 100 GΩ	5.8 kΩ 6 kΩ 6.9 kΩ 9.3 kΩ 30 kΩ 72 kΩ 93 kΩ 0.16 MΩ 1.4 MΩ 3 MΩ 5.4 MΩ 0.062 GΩ 0.46 GΩ	Resistance Decade Box
¹ High Resistance, Insulation Testers, Resistivity Meters @ (1 to 10) kV	200 MΩ 500 MΩ 1 GΩ 10 GΩ 100 GΩ	1.4 MΩ 3 MΩ 5.4 MΩ 0.062 GΩ 0.46 GΩ	Resistance Decade Box
¹ DC Voltage – Source	Up to 50 mV (> 50 to 200) mV (> 200 to 500) mV (> 0.5 to 2) V (> 2 to 5) V (>5 to 20) V (>20 to 50) V (>50 to 100) V (>100 to 200) V (>200 to 500) V (>500 to 1 000) V	0.35 mV/V + 47 μV 0.35 mV/V + 47 μV 0.35 mV/V + 0.24 mV 0.35 mV/V + 0.47 mV 0.35 mV/V + 1.2 mV 0.35 mV/V + 4.7 mV 0.35 mV/V + 12 mV 0.35 mV/V + 24 mV 0.35 mV/V + 47 mV 0.35 mV/V + 120 mV 0.35 mV/V + 240 mV	Multiproduct Calibrator
¹ DC Voltage – Measure	Up to 10 mV (> 10 to 100) mV (> 0.1 to 1) V (> 1 to 10) V (> 10 to 100) V (>100 to 1 000) V	0.06 mV/V + 2.5 μV 0.06 mV/V + 4.7 μV 0.041 mV/V + 12 μV 0.035 mV/V + 71 μV 0.047 mV/V + 0.8 mV 0.047 mV/V + 9.2 mV	Agilent 34410A 6.5 Digit Multimeter

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ AC Voltage – Source	50 Hz, 60 Hz, 400 Hz Up to 50 mV (> 50 to 200) mV (> 20 to 500) mV (> 0.5 to 2) V (> 2 to 5) V (> 5 to 20) V (> 20 to 50) V (> 50 to 100) V (> 100 to 200) V (> 200 to 500) V (> 500 to 1 000) V	0.58 mV/V + 47 μV 0.58 mV/V + 48 μV 0.58 mV/V + 0.24 mV 0.58 mV/V + 0.47 mV 0.58 mV/V + 1.2 mV 0.58 mV/V + 4.7 mV 0.58 mV/V + 10 mV 0.58 mV/V + 25 mV 0.58 mV/V + 48 mV 0.58 mV/V + 119 mV 0.58 mV/V + 244 mV	Multiproduct Calibrator
¹ AC Voltage – Measure	10 Hz to 20 kHz Up to 10 mV (> 10 to 100) mV (> 0.1 to 1) V (> 1 to 10) V (> 10 to 100) V (> 100 to 750) V (20 to 50) kHz Up to 100 mV (> 0.1 to 1) V (> 1 to 10) V (> 10 to 100) V (> 100 to 750) V	1.5 mV/V + 60 μV 1.2 mV/V + 0.04 mV 1.2 mV/V + 0.4 mV 1.2 mV/V + 3.6 mV 1.2 mV/V + 36 mV 1.2 mV/V + 0.3 V 1.5 mV/V + 0.06 mV 1.2 mV/V + 0.5 mV 1.2 mV/V + 6 mV 1.2 mV/V + 60 mV 1.2 mV/V + 0.45 V	Agilent 34410A 6.5 Digit Multimeter
Magnetic Field – Permanent Magnets	(300 to 1 500) G (>1 500 to 3 000) G (>3 000 to 5 000) G (>5 000 to 10 000) G	1.2 % reading 1.2 % reading 1.2 % reading 1.2 % reading	In-house method CPE-04-13, Direct Measurement with Gauss Meter
¹ DC Current – Source	Up to 100 μA (> 100 to 500) μA (> 0.5 to 2) mA (> 2 to 5) mA (> 5 to 20) mA (> 20 to 50) mA (> 50 to 200) mA (> 200 to 500) mA (> 0.5 to 1) A (> 1 to 5) A (> 5 to 10) A (> 10 to 20) A	0.58 mA/A + 0.12 μA 0.58 mA/A + 0.13 μA 0.58 mA/A + 0.9 μA 0.58 mA/A + 1.4 μA 0.58 mA/A + 5 μA 0.58 mA/A + 12 μA 0.58 mA/A + 0.07 mA 0.58 mA/A + 0.18 mA 0.58 mA/A + 0.31 mA 0.58 mA/A + 4.8 mA 0.58 mA/A + 5.1 mA 0.58 mA/A + 6 mA	Multiproduct Calibrator

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ DC Current - Source Clamp-On Ammeters	Up to 50 A (> 50 to 100) A (> 100 to 250) A (> 200 to 500) A (> 500 to 1 000) A	0.58 mA/A + 0.2 A 0.58 mA/A + 0.33 A 0.58 mA/A + 0.84 A 0.58 mA/A + 1.7 A 0.58 mA/A + 2.9 A	Multiproduct Calibrator, Current Coil
¹ DC Current – Measure	Up to 1 mA (> 1 to 10) mA (> 10 to 100) mA (> 0.1 to 1) A (> 1 to 3) A	0.6 mA/A + 0.1 µA 0.6 mA/A + 2.5 µA 0.6 mA/A + 6.5 µA 1.2 mA/A + 0.12 mA 1.8 mA/A + 0.75 mA	Agilent 34410A 6.5 Digit Multimeter
¹ AC Current – Source	50 Hz, 60 Hz, 400 Hz (Up to 2) mA (>2 to 5) mA (> 5 to 20) mA (> 20 to 50) mA (> 50 to 200) mA (> 200 to 500) mA (> 0.5 to 1) A (> 1 to 5) A (> 5 to 10) A	1.2 mA/A + 1.6 µA 1.2 mA/A + 2.8 µA 1.2 mA/A + 0.009 mA 1.2 mA/A + 0.021 mA 1.2 mA/A + 0.08 mA 1.2 mA/A + 0.21 mA 1.2 mA/A + 0.4 mA 1.2 mA/A + 4.9 mA 1.2 mA/A + 5.6 mA	Multiproduct Calibrator
	50 Hz, 60 Hz (> 10 to 12) A	1.2 mA/A + 6.8 mA	
	400 Hz (> 10 to 12) A	1.2 mA/A + 13 mA	
¹ AC Current - Source Clamp-On Ammeters	50 Hz, 60 Hz Up to 50 A (> 50 to 100) A (> 100 to 250) A (> 200 to 500) A (> 500 to 600) A	1.2 mA/A + 0.22 A 1.2 mA/A + 0.38 A 1.2 mA/A + 1.1 A 1.2 mA/A + 2.0 A 1.2 mA/A + 2.3 A	Multiproduct Calibrator, Current Coil
¹ AC Current – Measure	10 Hz to 1 kHz Up to 0.1 mA (> 0.1 to 1) mA (> 1.0 to 10) mA (> 10 to 100) mA (> 0.1 to 1) A (> 1 to 3) A	1.2 mA/A + 0.5 µA 1.2 mA/A + 0.5 µA 1.2 mA/A + 5 µA 1.2 mA/A + 50 µA 1.2 mA/A + 0.5 mA 1.2 mA/A + 2.0 mA	Agilent 34410A 6.5 Digit Multimeter
¹ DC/AC Cutoff Current – Measure	DC Up to 50 mA (> 50 to 100) mA AC @ (50, 60) Hz Up to 50 mA (> 50 to 100) mA	0.02 mA 0.3 mA 0.09 mA 0.81 mA	Fluke 289 Digital Multimeter

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ Resistance – Source	Up to 10 Ω (> 10 to 50) Ω (> 50 to 100) Ω (> 100 to 500) Ω (> 500 to 1 000) Ω (> 1 to 2) kΩ (> 2 to 5) kΩ (> 5 to 10) kΩ (> 10 to 20) kΩ (> 20 to 50) kΩ (> 50 to 100) kΩ (> 100 to 200) kΩ (> 200 to 500) kΩ (> 0.5 to 1) MΩ (> 1 to 2) MΩ (> 2 to 5) MΩ (> 5 to 10) MΩ (> 10 to 20) MΩ	5.8 mΩ/Ω + 0.024 Ω 5.8 mΩ/Ω + 0.024 Ω 1.2 mΩ/Ω + 0.025 Ω 1.2 mΩ/Ω + 0.026 Ω 1.2 mΩ/Ω + 0.065 Ω 1.2 mΩ/Ω + 0.074 Ω 1.2 mΩ/Ω + 0.11 Ω 1.2 mΩ/Ω + 0.61 Ω 1.2 mΩ/Ω + 0.71 Ω 1.2 mΩ/Ω + 1.1 Ω 1.2 mΩ/Ω + 6.1 Ω 1.2 mΩ/Ω + 8.4 Ω 1.2 mΩ/Ω + 0.017 kΩ 1.2 mΩ/Ω + 0.07 kΩ 1.2 mΩ/Ω + 0.32 kΩ 1.2 mΩ/Ω + 0.56 kΩ 1.2 mΩ/Ω + 5.9 kΩ 1.2 mΩ/Ω + 6.1 kΩ	Multiproduct Calibrator
¹ Resistance – Source	(1 to 10) Ω (> 10 to 100) Ω (> 100 to 500) Ω (> 0.5 to 1) kΩ (> 1 to 5) kΩ (> 5 to 10) kΩ (> 10 to 50) kΩ (> 50 to 100) kΩ (> 100 to 500) kΩ (> 0.5 to 1) MΩ (> 1 to 5) MΩ (> 5 to 10) MΩ (> 10 to 50) MΩ (> 50 to 100) MΩ	0.01 Ω 0.027 Ω 0.14 Ω 0.23 Ω 0.002 kΩ 0.01 kΩ 0.02 kΩ 0.03 kΩ 0.16 kΩ 0.58 kΩ 0.003 7 MΩ 0.007 3 MΩ 0.007 3 MΩ 0.15 MΩ	Resistance Decade Box
¹ Resistance – Measure	Up to 100 Ω (> 100 to 1 000) Ω (> 1.0 to 10) kΩ (> 10 to 100) kΩ (> 0.1 to 1) MΩ (> 1 to 10) MΩ (> 10 to 100) MΩ (> 100 to 1 000) MΩ	0.12 mΩ/Ω + 5 mΩ 0.12 mΩ/Ω + 15 mΩ 0.12 mΩ/Ω + 0.15 Ω 0.12 mΩ/Ω + 1.6 Ω 0.15 mΩ/Ω + 25 Ω 0.47 mΩ/Ω + 0.28 kΩ 0.93 mΩ /Ω + 8.3 kΩ 0.93 mΩ /Ω + 15 kΩ	Agilent 34410A 6.5 Digit Multimeter
¹ DC High Voltage – Measure	Up to 1 kV (> 1 to 2) kV (> 2 to 2.5) kV (> 2.5 to 5) kV (> 5 to 10) kV	0.024 kV 0.047 kV 0.058 kV 0.12 kV 0.24 kV	Digital Multimeter Fluke 289, Fluke 80K-40 High Voltage Probe

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ AC High Voltage – Measure	50 Hz Up to 1 kV (> 1 to 2) kV (> 2 to 2.5) kV (> 2.5 to 5) kV (> 5 to 10) kV	0.058 kV 0.12 kV 0.15 kV 0.29 kV 0.58 kV	Digital Multimeter Fluke 289, Fluke 80K-40 High Voltage Probe

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ Caliper (External/Internal/Depth)	Up to 300 mm (> 300 to 500) mm (> 500 to 600) mm (> 600 to 1 000) mm	18 µm 25 µm 36 µm 42 µm	Gauge Block Set (Steel) per JIS B 7507
¹ Height Gauge Dial and Digital	Up to 200 mm (> 200 to 300) mm (> 300 to 600) mm (> 600 to 1 000) mm	16 µm 18 µm 36 µm 42 µm	Gauge Block Set (Steel) per JIS B 7517
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 1.6 µm 2.3 µm 3 µm 6.8 µm 7.2 µm 7.6 µm 8 µm 8.5 µm 9 µm 9.6 µm 11 µm 11 µm 12 µm 12 µm 13 µm 13 µm 14 µm 15 µm 16 µm	Gauge Block Set (Steel) per JIS B 7502
¹ Dial and Digital Thickness Gauge	Up to 25 mm (> 25 to 50) mm (> 50 to 75) mm (> 75 to 100) mm	1.5 µm 1.9 µm 2.5 µm 3 µm	Gauge Block Set

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ Dial and Digital Depth Gauge	Up to 300 mm (> 300 to 450) mm (> 450 to 600) mm	16 µm 18 µm 21 µm	Gauge Block Set per JIS B 7518
¹ Coating Thickness Gauge	50 µm 100 µm 250 µm 500 µm 1 000 µm 1 793 µm 2 726 µm 3 893 µm 4 694 µm	0.5 µm 0.5 µm 0.8 µm 0.8 µm 0.8 µm 2.9 µm 3.5 µm 5.6 µm 5.2 µm	Master Calibration Foil
¹ Caliper Gauge (External/Internal)	Up to 10 mm (> 10 to 20) mm (> 20 to 50) mm (> 50 to 100) mm	3 µm 3.2 µm 6.1 µm 12 µm	Gauge Block Set
¹ Ultrasonic Thickness Gauge	Up to 50 mm (50 to 100) mm (100 to 200) mm (200 to 300) mm	0.006 mm 0.007 mm 0.008 mm 0.01 mm	Gauge Block Set
¹ Cylinder Gauge/ Bore Gauge	Up to 1.5 mm	3.5 µm	Calibration Tester per JIS-B 7515
¹ Dial Test Indicator	Up to 1.5 mm	3.5 µm	Calibration Tester per JIS-B 7533
¹ Dial Gauge & Digital Indicator	Up to 25 mm	4 µm	Calibration Tester per JIS-B 7503
Metallic Measuring Tapes	(0 to 1 000) mm (> 1 000 to 2 000) mm (> 2 000 to 3 000) mm (> 3 000 to 5 000) mm (> 5 000 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	0.014 mm + 0.016 mm/m 0.055 mm 0.081 mm 0.14 mm 0.27 mm 0.54 mm 0.8 mm 1.1 mm 1.4 mm	Comparison with tape and scale measuring machine

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Rulers	(0 to 100) mm	0.003 mm	Comparison with tape and scale measuring machine
	(> 100 to 200) mm	0.007 mm	
	(> 200 to 300) mm	0.01 mm	
	(> 300 to 400) mm	0.013 mm	
	(> 400 to 500) mm	0.016 mm	
	(> 500 to 600) mm	0.019 mm	
	(> 600 to 700) mm	0.022 mm	
	(> 700 to 800) mm	0.024 mm	
	(> 800 to 900) mm	0.028 mm	
	(> 900 to 1 000) mm	0.03 mm	
	(> 1 000 to 1 500) mm	0.043 mm	
(> 1 500 to 2 000) mm	0.055 mm		

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ Scales, Balances (0.000 1 g Resolution)	(10 to 20) mg	0.13 mg	OIML Class F1, M1 weights and internal calibration procedure utilized in the calibration of the weighing system.
	(> 20 to 50) mg	0.16 mg	
	(> 0.05 to 5) g	0.17 mg	
	50 mg to 5 g	0.2 mg	
	(> 5 to 20) g	0.27 mg	
	(> 20 to 100) g	0.37 mg	
¹ Scales, Balances (0.000 1 g Resolution)	(> 100 to 200) g	0.64 mg	
	(> 200 to 300) g	1.2 mg	
¹ Scales, Balances (0.001 g Resolution)	(> 300 to 500) g	1.8 mg	
	(> 500 g to 1000) g	3.3 mg	
	(> 1000 to 2000) g	12 mg	
¹ Scales, Balances (0.01 g Resolution)	(> 2000 to 5000) g	23 mg	
¹ Scales, Balances (0.001 kg Resolution)	(> 5 to 10) kg	88 mg	
	(> 10 to 20) kg	0.14 g	
¹ Scales, Balances (0.01 kg Resolution)	(> 20 to 30) kg	8.2 g	
	(> 30 to 60) kg	8.2 g	
	(> 60 to 100) kg	8.3 g	
	(> 100 to 150) kg	8.3 g	
	(> 150 to 200) kg	17 g	
¹ Scales, Balances (0.02 kg Resolution)	(> 200 to 300) kg	20 g	
¹ Scales, Balances (0.05 kg Resolution)	(> 300 to 400) kg	41 g	
	(> 400 to 600) kg	42 g	

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ Scales, Balances (0.1 kg Resolution)	(> 600 to 1 000) kg	83 g	
¹ Mass Determination	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 1 kg 2 kg 5 kg 10 kg 20 kg	84 µg 86 µg 88 µg 91 µg 96 µg 0.11 mg 0.12 mg 0.13 mg 0.16 mg 0.21 mg 0.35 mg 0.66 mg 2.2 mg 3.7 mg 11 mg 19 mg 89 mg 0.11 g	OIML Class F1, and M1 weights, Electronic Balance, internal procedure based on OIML R111-1
¹ Moisture Analyzer/Balance Mass	Up to 20 g (20 to 70) g (70 to 110) g	0.6 mg 0.65 mg 0.72 mg	OIML Class F1 weights and internal calibration procedure utilized in the calibration of the weighing system.
¹ Force - Push-Pull Gauge, Force Gauge, Tension Gauge, Tensile Gauge	Up to 29.4) N (> 29.4 to 98) N (> 98 to 196) N (> 196 to 294) N (> 294 to 392) N (> 392 to 490) N	0.058 N 0.3 N 0.6 N 0.6 N 0.6 N 0.6 N	OIML Class F1, and M1 weights
¹ Pressure Gauge (Pneumatic & Hydraulic) – Gauge Pressure Digital Pressure Gauge, Vacuum Gauge, Pressure Transducer, Manometer, Pressure Switch	(-90 to 0) kPa (> 0 to 200) kPa (> 0.2 to 3.4) MPa (> 3.4 to 20) MPa (> 20 to 68) MPa	0.12 kPa 0.24 kPa 2 kPa 13 kPa 50 kPa	Pressure Calibrator
¹ Pressure Transmitter	(-90 to 0) kPa (> 0 to 200) kPa (> 0.2 to 3.4) MPa (> 3.4 to 20) MPa (> 20 to 68) MPa	0.14 kPa 0.23 kPa 3.3 kPa 18 kPa 65 kPa	Pressure Calibrator and Electrical Process Calibrator



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Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ Volume Flow Meter (Water flow)	(8.33 to 16.67) l/s (> 16.67 to 30.56) l/s	0.4 % of reading 0.41 % of reading	Ultrasonic flow meter Water flow in ambient conditions.
Air Velocity - Anemometer	(2.5 to 5) m/s (> 5 to 7.5) m/s (> 7.5 to 10) m/s (> 10 to 15) m/s (> 15 to 20) m/s	0.15 m/s 0.2 m/s 0.26 m/s 0.38 m/s 0.5 m/s	Standard Anemometer
¹ Glass Volumetric Apparatus – Glass Volumetric flask, Cylinder, Beaker	5 ml 10 ml 25 ml 50 ml 100 ml 200 ml 250 ml 500 ml 1 000 ml 2 000 ml	0.003 ml 0.005 ml 0.015 ml 0.03 ml 0.058 ml 0.07 ml 0.088 ml 0.1 ml 0.19 ml 0.37 ml	Internal procedure CPM-04-14 based on ASTM E542-01:2012 using Electronic Balance, OIML Class F1 weights
¹ Glass Volumetric Apparatus – Glass Measuring Pipettes, Graduated Pipette, Volumetric Pipette	(0.5 to 5) ml 10 ml 25 ml 50 ml 100 ml	0.003 ml 0.006 ml 0.015 ml 0.03 ml 0.06 ml	Internal procedure CPM-04-12 based on ASTM E542-01:2012 using Electronic Balance, OIML Class F1 weights
¹ Piston Operated Pipette, Micro Pipette, Auto Pipette	(100 to 200) µl (> 200 to 500) µl (> 500 to 1 000) µl (> 1 to 2) ml (> 2 to 5) ml (> 5 to 10) ml	0.25 µl 0.27 µl 0.31 µl 0.42 µl 1.1 µl 1.8 µl	Internal Procedure CPM-04-19 based on ISO 8655-6:2022 using Analytical Balance
¹ Burettes	5 ml 10 ml 25 ml 50 ml 100 ml	0.003 ml 0.006 ml 0.015 ml 0.029 ml 0.058 ml	Internal Procedure CPM-04-12 based on ASTM E542-01 using Electronic Balance, OIML Class F1 weights
¹ Viscosity Meter (20 to 60) °C	Dynamic Viscosity (Nominal): 390 mPa·s (cP) 640 mPa·s (cP) 1 100 mPa·s (cP) 2 100 mPa·s (cP) 4 000 mPa·s (cP) 16 000 mPa·s (cP) 25 000 mPa·s (cP)	3.4 mPa·s 7 mPa·s 13 mPa·s 29 mPa·s 64 mPa·s 220 mPa·s 520 mPa·s	Viscosity Certified Reference Standard

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ Temperature Controlled Chambers - Hot Air Oven, Incubator, Refrigerator, Freezer	(-40 to 0) °C (> 0 to 10) °C (> 10 to 70) °C (> 70 to 200) °C (> 200 to 400) °C	0.25 °C 0.3 °C 0.36 °C 0.7 °C 0.94 °C	Agilent 34970A Data Logger with RTD Sensors
¹ Temperature Controlled Enclosures - Hot Air Oven and Furnaces	(> 200 to 400) °C (> 400 to 550) °C (> 550 to 700) °C (> 700 to 1 000) °C	0.94 °C 0.8 °C 2.9 °C 2.9 °C	Agilent 34970A Data Logger with Thermocouple sensors
¹ Temperature Controlled Chambers - Autoclave	(105 to 135) °C	0.4 °C	Agilent 34970A Data Logger with RTD Sensors
¹ Liquid Baths, Micro Baths	(-40 to 0) °C (> 0 to 100) °C (> 100 to 200) °C	0.25 °C 0.3 °C 0.3 °C	Agilent 34970A Data Logger with RTD Sensors
¹ Analog & Dial Thermometers	(-30 to 0) °C (> 0 to 200) °C (> 200 to 400) °C	0.14 °C 0.14 °C 0.21 °C	PRT Standard with Digital Readout
¹ Thermocouple Sensors Types K, J, E, T, N, R, S	(-30 to 200) °C (> 200 to 400) °C (> 400 to 650) °C	0.41 °C 0.52 °C 0.8 °C	PRT Standard with Digital Readout
¹ Temperature Indicator with Thermocouple Types K, J, E, T, N, R, S	(-30 to 0) °C (> 0 to 200) °C (> 200 to 400) °C	0.22 °C 0.22 °C 0.27 °C	PRT Standard with Digital Readout
¹ Temperature Indicator with Thermocouple Types K, J, E, T, N, R, S	(> 400 to 550) °C (> 550 to 650) °C	0.3 °C 0.3 °C	PRT Standard with Digital Readout
¹ Temperature Indicator with Thermocouple Types R, S	(0 to 200) °C (> 200 to 400) °C	0.27 °C 0.13 °C	PRT Standard with Digital Readout
¹ Temperature Indicator with Thermocouple Types R, S	(> 400 to 550) °C (> 400 to 650) °C	0.33 °C 0.33 °C	PRT Standard with Digital Readout
¹ Temperature Indicators with RTD or Thermistor Sensor	(-30 to 0) °C (> 0 to 100) °C (> 100 to 200) °C (> 200 to 400) °C (> 400 to 650) °C	0.12 °C 0.12 °C 0.24 °C 0.28 °C 0.7 °C	PRT Standard with Digital Readout
¹ RTD Sensors	(-30 to 0) °C (> 0 to 200) °C (> 200 to 400) °C (> 400 to 600) °C	0.2 °C 0.24 °C 0.34 °C 0.8 °C	PRT Standard with Digital Readout, Agilent 34410A 6.5 Digit Multimeter

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ Liquid in Glass Thermometers	(-30 to 0) °C (> 0 to 200) °C	0.1 °C 0.15 °C	PRT Standard, Digital Readout
¹ Dry Blocks, Dry Wells	(-40 to 0) °C (> 0 to 400) °C (> 400 to 550) °C (> 550 to 650) °C	0.35 °C 0.36 °C 0.4 °C 0.4 °C	PRT Standard with digital Readout
¹ Temperature - Thermo Hygrometer	(-20 to 0) °C (> 0 to 50) °C (> 50 to 100) °C	0.15 °C 0.15 °C 0.15 °C	PRT Standard with Digital Readout / Data Logger
¹ Humidity - Thermo Hygrometers	(20 to 40) %RH (> 40 to 60) %RH (> 60 to 90) %RH	1.6 %RH 1.7 %RH 1.8 %RH	Humidity Data Logger with sensor
Humidity Controlled Chambers	(20 to 40) %RH (> 40 to 60) %RH (> 60 to 90) %RH	1.6 %RH 1.7 %RH 1.8 %RH	Humidity Meter, (Relative humidity in an empty working-volume at a single spot)
¹ Infrared Thermometers	(25 to 50) °C (>50 to 100) °C (>100 to 200) °C (>200 to 300) °C (>300 to 400) °C (>400 to 500) °C	0.97 °C 1.5 °C 2.7 °C 4 °C 5.1 °C 6.8 °C	Blackbody Source, Digital Thermometer $\epsilon = 0.95, \lambda = (8 \text{ to } 14) \mu\text{m}$
¹ Moisture Analyzer Temperature	(100 to 200) °C	0.34 °C	Digital Thermometer

Photometry and Radiometry

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Illuminance / Lux Meter	(25 to 5 000) lux	4.4 % of reading	Standard Lux Meter

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ Frequency – Source	50 Hz 60 Hz 400 Hz	0.058 Hz 0.07 Hz 0.47 Hz	Multiproduct Calibrator

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ Frequency – Source	Up to 5 Hz (5 to 50) Hz (> 50 to 500) Hz (> 0.5 to 10) kHz (> 10 to 50) kHz	0.014 Hz 0.026 Hz 0.12 Hz 0.003 1 kHz 0.005 9 kHz	Fluke 744 Process Calibrator
¹ Frequency – Measure	Up to 10 Hz (> 10 to 500) Hz (> 0.5 to 10) kHz (> 10 to 50) kHz	0.061 Hz 0.61 Hz 0.006 1 kHz 0.061 kHz	Fluke 744 Process Calibrator
¹ Digital Tachometer (Photo-type)	(60 to 600) rpm (> 600 to 1 200) rpm (> 1 200 to 3 000) rpm (> 3 000 to 9 000) rpm (> 9 000 to 30 000) rpm (> 30 000 to 60 000) rpm (> 60 000 to 75 000) rpm (> 75 000 to 99 000) rpm	0.01 rpm 0.023 rpm 0.04 rpm 0.2 rpm 0.7 rpm 0.9 rpm 2.3 rpm 3.2 rpm	Process Calibrator and LED
¹ Centrifuge Rotational Speed	(60 to 100) rpm (>100 to 500) rpm (>500 to 900) rpm (>900 to 1000) rpm (>1 000 to 2 000) rpm (>2 000 to 3 000) rpm (>3 000 to 5 000) rpm (>5 000 to 9 000) rpm (>9 000 to 10 000) rpm (>10 000 to 12 000) rpm (>12 000 to 15 000) rpm (>15 000 to 20 000) rpm	0.2 rpm 0.42 rpm 0.65 rpm 0.72 rpm 1.3 rpm 1.9 rpm 3.1 rpm 5.4 rpm 7.1 rpm 8.2 rpm 10 rpm 13 rpm	Digital Tachometer
¹ Centrifuge Time Interval	Up to 30 min	0.28 s	Digital Stopwatch

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. This scope is formatted as part of a single document including Certificate of Accreditation No. AC-3093.



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