

ภาคผนวก ช

เอกสารสอบเทียบเครื่องมือที่ใช้ในการวิเคราะห์


TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-29 FAX. 0-2719-9484

Certificate of Calibration

Cert. No.: 23CH951
Page: 1 of 2

Equipment: pH Meter
Manufacturer: Eutech
Model: pH 700
Serial No.: 2658459
ID No.: LB-Eq-027
Condition As-Received: Used Item
Received Date: 04 August 2023
Calibration Date: 07 August 2023
Reference: 2308-0115WN-1
Submitted by: Special Lab Envtl And Consultant Co., Ltd
47/91-93, 96 Moo 3 Thambon Tha-ti, Pakkret
Nonthaburi 11120

Ambient Temperature: (25 ± 2.5) °C
Relative Humidity: (50 ± 15) %
Calibration Procedure: In - house method :
- CP-CH5 by direct measurement with standard voltage calibrator and direct measurement with certified reference material (CRM)

Calibrated by: Warakorn Lerngagrakul
Approved by: 
Approved Signatory

Issue Date: 16 August 2023

The Uncertainties are for a confidence probability of approximately 95 %
This certificate may not be reproduced other than in full, except with the prior written Approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

A 0057105

Condition of this calibration result
1. Reference Standard Instrument : -
2. Document Process Calibrator 54030049 130RC116 22E2769 24 Aug 2023
This certification is traceable to the International System of Unit maintained through:-
- Technology Promotion Association (Thailand-Japan)
3. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	863832	28 Dec 2024
pH 6.986	CPA chem	863833	28 Dec 2023
pH 10.010	CPA chem	863835	28 Dec 2023

Calibration Results
Function : mV Measurement
Performing standard curve by Fluke at pH (4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input		Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor k
		mV	pH	mV	pH		
pH Meter S/N.: 2658459	4.00	177.48	4.01	177.5	4.01	0.058	2.00
	7.00	0.00	7.00	0.1	7.00	0.058	2.00
	10.00	-177.48	10.01	-177.4	10.01	0.058	2.00

Function : pH Measurement
Performing three buffers standard curve by using buffer nominal pH (4,7,10)

Unit Under Calibration	Standard Buffer Solution	Actual pH Reading		Uncertainty of pH measurement (±)	Coverage factor k
		Actual pH Reading (mV)	Actual pH Reading (pH)		
pH Electrode S/N.: 3101624	4.008	4.01	170.7	0.0085	2.05
	6.986	6.99	-2.0	0.011	2.00
	10.010	10.01	-178.2	0.0096	2.00

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95 %.

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a 1174396

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
53/44 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-29 FAX. 0-2719-9484

Cert. No.: 23LM132
Page.: 1 of 2

Certificate of Calibration

Equipment : pH Meter with Sensor
Manufacturer : Eutech
Model : pH 700
Serial No. : 2858459
ID No. : LB-Eq-027

Submitted by : Special Lab Envi And Consultant Co.,Ltd.
47/91-93 Moo 3 Tambon Tha-ti,
Pakket,
Nonthaburi 11120

Location : TPA On Site Calibration Laboratory

Received Order : 04 August 2023
Calibrated Date : 09 August 2023
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V

Calibrated by : Preecha Hahib

Approved by : [Signature]
() Ponthippa Tameyakul
() Ponpan Paipim
(✓) Suwit Imjai

Issue Date : 17 August 2023

The Uncertainties are for a confidence probability of approximately 95 %
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Approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

A 0057254

Cert. No.: 23LM132
Page.: 2 of 2

Equipment : pH Meter with Sensor
Condition As-Received : New Item
Reference : 2308-0115WN-2

Procedure Used :-
Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with
Industrial Platinum Resistance Thermometer (IPRT) into Temperature Bath.
The temperature scale used was based on ITS-90.

Condition of this result of calibration
1. Reference standard instrument:-
Instrument **Serial No.** **Cert. No.** **Traceable** **Due Date**
1) Digital Thermometer 2188080 2211285 TPA 21 Oct 2023
2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certification is traceable to the International System of Unit.

Remark : TPA : Technology Promotion Association (Thailand - Japan)
Result of Calibration :- (*) Without Adjustment

Function : Temperature measurement.
This instrument was connected with temperature sensor, S/N.: PH5TEMB01P

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty (± °C)	Coverage Factor k
25.0	100	25.002	25.0	-0.002	0.16	2.00

UUC* : Unit Under Calibration

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95 %.

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a 1175376

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES
5344 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-5000 FAX. 0-2719-9484


Certificate of Testing

Cert.No.: 23TW41
Page.: 1 of 2

Equipment : DO Meter
Manufacturer : Hanna
Model : HI98193
Serial No. : 03030056991
ID No. : LB-Eq-014
Received Date : 16 February 2023
Test Date : 17 February 2023
Reference : 2302-0616WN-1
Submitted by : Special Lab Envi And Consultant Co.,Ltd
47/91 Moo 3 Thambon The-It,
Pakkret, Nonthaburi 11120

Laboratory Condition : Temperature (25 ± 5) °C
Humidity (50 ± 20) %
Test Procedure : In - house method : CP-CH9
by Comparison Technique with Azide Modification Method

Tested by : Walalak Sirthean

Approved by : 
Approved Signatory

(/) Maisee Bulkruea
() Sathip Meangmal
() Warakorn Lernagitrakul

Issue Date : 20 February 2023

B 0307483

Cert.No.: 23TW41
Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :
This certification is traceable to the International System of Unit through the reference standards laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan).

Instruments	Serial No.	ID No.	Certificate No.	Due Date
1) Burette	-	130BU10	21CG1389	25 Mar 2023
2) Balance	1126143764	140RC004	22MM50	20 Sep 2023

2. Standard Material :-

Material	Manufacturer	Lot No.	Assay
Sodium Thiosulfate pentahydrate	Merck	AM1763316	100.2%

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: KC1N20CDU

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.12	8.13	0.0045

This report was certified only for the instrument we tested. It is allowable to use for study the system efficiency. The environmental impact control and present to organization it may concerned intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full without written approval of the laboratory

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a 1148751

SLECCO

บริษัท เอสแอลซีเค อีเอ็ม เอ็นวี คอนซัลแตนท์ จำกัด

วันที่: 1/1

วันที่พิมพ์: 01/04/2563

1. Block Digestion

ผู้ผลิต: HANNA รุ่น: 3420E Serial No.: 22251213 รหัสเครื่อง: 15-15-01

วันที่ตรวจสอบ: 3 ส.ค. 63 เวลา: 15.00 น. 1 ส.ค. 63 เวลา: 15.15 น.

2. Digital Thermometer with TC Probe

ผู้ผลิต: Omega Series: 5C รุ่น: 5C20 Serial No.: 3000000 รหัสเครื่อง: 15-15-01

ความละเอียด: 0.1 °C ที่อุณหภูมิ: 8 และ 35 °C ส่วนที่อื่นที่ต่ำกว่า 7 องศาเซลเซียส

3. ผลการตรวจสอบ (รวมเวลา 00.00 น. - 00.30 น.)

อุณหภูมิห้อง: 35.0 °C ความชื้นสัมพัทธ์: 55.0 %

No.	Position	Set point (°C)	อุณหภูมิที่อ่านได้จากเครื่อง (°C)	อุณหภูมิที่อ่านได้ต่อไมโคร (°C)		Error	สรุปผลการตรวจสอบ	
				ครั้งที่ 1 (A)	ครั้งที่ 2 (B)		การยอมรับ	ไม่ผ่าน
1	1	35.0	35.2	35.1	35.2	+0.2	✓	
2	2			35.3	35.0	+0.4	✓	
3	3			35.4	35.0	+0.4	✓	
4	4			35.7	35.1	+0.6	✓	
5	5			35.6	35.0	+0.6	✓	
6	6			35.3	35.0	+0.3	✓	
7	7			35.0	35.0	+0.0	✓	
8	8			35.1	35.1	+0.0	✓	
9	9			35.1	35.0	+0.1	✓	
10	10			35.0	35.1	+0.1	✓	
11	11			35.0	35.0	+0.0	✓	
12	12			35.0	35.0	+0.0	✓	
13	13			35.0	35.0	+0.0	✓	
14	14			35.0	35.0	+0.0	✓	
15	15			35.0	35.0	+0.0	✓	
16	16			35.1	35.1	+0.0	✓	
17	17			35.0	35.0	+0.0	✓	
18	18			35.0	35.0	+0.0	✓	
19	19			35.0	35.0	+0.0	✓	
20	20			35.0	35.0	+0.0	✓	

FM-LB-8S:Re00

CAL

Calibratech Co., Ltd.

7/106-7 Moo 2, Sakdaphrachan 3 Rd., Banggood, Pakkret, Nonthaburi 11120

Tel: (02) 964-6211 Fax: (02) 964-5155, email: calibratech.cal@calibratech.com, calibratech.cal@gmail.com

Certificate of Calibration

Page: 1 of 2

Certificate No.: 66-400192-1

Submitted by: Special Lab Envi and Consultant Co., Ltd.

47/91 Moo 3, Tambol Tho-it, Pakkret, Nonthaburi 11120

Equipment: Digital Thermometer with Thermocouple probe Type K

Environment: Temperature Indicator

Manufacturer: Thermo Scientific Model: TEMP 10K

Range: -250 °C to 1372 °C Resolution: 0.1 °C

Serial No.: 4008958 ID No.: LB-Eq-013

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

Line Voltage: (220 ± 22) VAC

Date of Received: 06 April 2023

Date of Calibration: 08 April to 10 April 2023

Date of Issue: 10 April 2023

Calibrated by: Chortip Samchusri

Calibration Method: This instrument was calibrated by in-house method comparison technique CAL-M4003 by compared with PRT in the liquid bath at the constant controlled temperature.

The temperature scale used was based on ITS-90

Reference Standard Instruments: This certification is traceable to the International System of Units

1. Platinum Resistance Thermometer (PRT)

ID No. Cert. No. Due Date

400001 TT-0016-22 07 Feb 2024

400016 TT-0059-21 02 Jun 2023

2. Standard Digital Thermometer

ID No. Cert. No. Due Date

400003 21E1850 14 Jun 2023

400004 21E1850 14 Jun 2023

Traceability

National Institute of Metrology Thailand (NIMT)

National Institute of Metrology Thailand (NIMT)

National Institute of Metrology Thailand (NIMT)

Approved by: (Signature)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%.

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CAL-F003-03

CAL
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Tel: (02) 964-6211 Fax: (02) 964-5155, e-mail: calibratech.co@yahoo.com, calibratech.co@gmail.com

Certificate of Calibration

Page : 2 of 2

Certificate No. : 66-400192-1

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement with Thermocouple probe Type K

Model : Type K Sheath Material : Teflon
Diameter : 2 mm. Length : 1500 mm.
Serial No. : N/A ID No. : SL-39

Immersion Depth (mm.)	Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
130	3.0036	3.5	-0.5	0.18
130	20.0024	20.4	-0.4	0.18
130	104.0011	104.3	-0.3	0.45
130	150.0027	150.2	-0.2	0.58
130	180.0040	180.0	0.0	0.65

Model : AD-1218-230 Sheath Material : Stainless
Diameter : 3.5 mm. Length : 230 mm.
Serial No. : N/A ID No. : SL-40

Immersion Depth (mm.)	Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
124	379.9914	379.3	0.7	1.5
124	400.0011	399.2	0.8	1.6

Remark
UUC : Unit Under Calibration

This result of calibration was found accurate as shown on date and place of calibration only.
This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor providing a level of confidence of approximately 95%.

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CAL-P0031-03

Thermology Co., Ltd.
96/177-96/178 Moo 6, T. La-harn, A. Bangbua Thong, Nonthaburi 11110
Tel : 0 2191 6479 Fax : 0 2191 6480 website : www.thermology.co

**NSC-TISI-TIS7025
CALIBRATION 0109**

CALIBRATION CERTIFICATE

Date of Issue Jun 23, 2023 **Cert No.** 2322342
Site Calibration **Order No.** 23060302

Customer SPECIAL LAB ENVI AND CONSULTANT CO., LTD.
47/81 Moo 3 Thae-t, Pak Kret, Nonthaburi, 11120.

Place of Calibration 1350, 1352 Suthisarnwinitchai Rd, Dindaeng, Bangkok 10400. (Calibration Room)

Description Oven
Model UJF30
Serial No. B123.0544
ID No.

Date of Receipt Jun 20, 2023
Date of Calibration Jun 20, 2023


Environment
Temperature (Min) 23.1 °C (Max) 25.3 °C
Relative Humidity (Min) 46.3 %RH (Max) 78.9 %RH

Calibration Method
WI-17 : The reference thermometer was placed into the chamber and measurement was performed based on AS-2853.
The temperature scale in use at this laboratory is the International Temperature Scale of 1990.

Standard
1) Data Acquisition with Sensor Model 34972A SIN. MY49007789, Certificate No. QR23-0024. Calibrated by Quality Reborn Co., Ltd., ONAC Calibration No. 0292. Due Date Jan 10, 2024.
This certificate is traceable to SI unit.

Page 1 of 4

This certificate is issued in accordance with the conditions of Thermology Laboratory. The traceability to recognised national standard and the unit of measurement realised at corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of laboratory.



Thermology Co., Ltd.
96/177-96/178 Moo 6, T. Le-harn, A. Bangbuastrong, Nonthaburi 11110
Tel : 0 2191 6479 Fax : 0 2191 6480 website : www.thermology.co

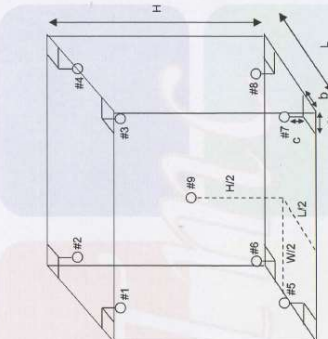
CALIBRATION CERTIFICATE

Cert No. 23/2342
Order No. 23060302

Date of Issue Jun 23, 2023
Site Calibration

Results (without adjustment)


Position of reference thermometers were placed



Note.

- 1). Dimension (W x L x H) is 40 x 25 x 32 cm.
- 2). Stability - greatest one half of difference between max peak and min peak of each reference probe measured temperature obtained during the calibration interval.
- 3). Uniformity - the maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady state conditions. The reference sensor should preferably be located at the geometric center of the chamber.

Page 2 of 4



Thermology Co., Ltd.
96/177-96/178 Moo 6, T. Le-harn, A. Bangbuastrong, Nonthaburi 11110
Tel : 0 2191 6479 Fax : 0 2191 6480 website : www.thermology.co

CALIBRATION CERTIFICATE

Cert No. 23/2342
Order No. 23060302

Date of Issue Jun 23, 2023
Site Calibration


Results (without adjustment)

Position of reference thermometers were placed

UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)	Stability ± (°C)	Uniformity (°C)	Uncertainty ± (°C)	
104.0	104.0	Position 1	104.544	0.058	0.704	0.30
		Position 2	103.789			
		Position 3	103.396			
		Position 4	103.886			
		Position 5	104.031			
		Position 6	103.886			
		Position 7	103.342			
		Position 8	103.939			
		Position 9	103.867			

UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)	Stability ± (°C)	Uniformity (°C)	Uncertainty ± (°C)	
150.0	150.0	Position 1	151.388	0.052	1.248	0.41
		Position 2	150.037			
		Position 3	149.313			
		Position 4	149.649			
		Position 5	150.519			
		Position 6	150.188			
		Position 7	149.370			
		Position 8	150.383			
		Position 9	150.201			

Page 3 of 4



Thermology Co., Ltd.
96/177-96/178 Moo 6, T. La-harn, A. Bangbuahtong, Nonthaburi 11110
Tel : 0 2191 6479 Fax : 0 2191 6480 website : www.thermology.co

CALIBRATION CERTIFICATE

Date of Issue Jun 23, 2023

Site Calibration

Cert No. 232342

Order No. 23060302

Results (without adjustment)

UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)	Stability ± (°C)	Uniformity (°C)	Uncertainty ± (°C)
180.0	180.0	Position 1	181.507	0.059	1.693
		Position 2	179.668		
		Position 3	178.772		
		Position 4	179.371		
		Position 5	180.334		
		Position 6	179.830		
		Position 7	178.855		
		Position 8	180.323		
		Position 9	179.876		

The stability and uniformity was taken into account in the measurement uncertainty stated.

The above results are valid exclusively for calibration samples as mentioned in the report.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with ONAC requirements.

APPROVED SIGNATORY :


☐ MR. PRAJUCKPETCH THONGSOOKCHOTE

☒ MR. DAMRONG MULSING

☐ MR. JATURAPAT THONGSOOKCHOTE

Supervisor

Page 4 of 4



Calibratech Co., Ltd.
7/106-7 Moo 2, Sukhaphrasang 3 Rd., Banggood, Pakkret, Nonthaburi 11120
Tel: (02) 964-6211 Fax: (02) 964-5155, e-mail : calibratech-cal@yahoo.com, calibratech-cal@hotmail.com

Certificate of Calibration

Certificate No. : 66-400220-2

Submitted by : Special Lab Envi and Consultant Co., Ltd.
47/91 Moo 3 Thambol Thit-it, Pakkret, Nonthaburi 11120

Equipment : Air Chamber (Incubator)
Manufacturer : Lovibond
Model : FKU 1800
Range : N/A °C
Resolution : 0.1 °C
Serial No. : 0914643-01
ID No. : LB-Eq-004

Environment : On site calibration was carried out at the Laboratory, Special Lab Envi and Consultant Co., Ltd.
Ambient Temperature : (29.0 to 29.6) °C
Relative Humidity : (40 to 45) %
Line Voltage : (226.0 to 226.5) V

Date of Received : 24 April 2023

Date of Calibration : 24 April 2023

Date of Issue : 26 April 2023

Calibrated by : Penpon Chaiyap

Calibration Method : CAL-M4004, TLAS G-20

Reference Standard Instruments : This certification is traceable to the International System of Units
Standard Digital Thermometer with RTD Probe

ID No. 400046 & 400042 Cert. No. 66-400066-1 Due Date 02 Aug 2023 Traceability National Institute of Metrology Thailand (NIMT)

Approved by :

Supervisor

Supervisor

Page 1 of 2

CAL
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Tel: (02) 964-4211 Fax: (02) 964-5155, e-mail: calibratech.cal@yahoo.com, calibratech.cal@hotmail.com

Certificate of Calibration

Certificate No. : 66-400220-2 **Page : 2 of 2**

Result of Calibration : Without Adjustment
UUC Condition As-Received : Good
Function : Temperature measurement
This instrument was setting air ventilation at position 0 (close)

Inside of Chamber
W = 0.55 m
D = 0.73 m
H = 0.50 m³
Capacity = 0.20 m³

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Temperature (°C) @ Sensor No.									Uncertainty (± °C)
			1	2	3	4	5	6	7	8	9	
20.0	19.9	19.9	20.35	20.35	20.23	20.25	20.12	20.12	20.14	20.28	20.08	0.42

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)

Remark: The uncertainty is not combine uniformity of the air chamber
This result of calibration was found accurate as shown on date and place of calibration only.
This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%
- 0/0 -

CAL-F0031-03

CAL
Calibratech Co., Ltd.
7/106-7 Moo 2, Sukhprachasan 3 Rd., Banggood, Pakkret, Nonthaburi 11120
Tel: (02) 964-4211 Fax: (02) 964-5155, e-mail: calibratech.cal@yahoo.com, calibratech.cal@hotmail.com

Certificate of Calibration

Certificate No. : 66-200145-1 **Page : 1 of 2**

Submitted by : Special Lab Envi and Consultant Co., Ltd.
47/91 Moo 3, Tambol Tha-It, Pakkret, Nonthaburi 11120

Equipment : Electronic Balance
Manufacturer : AND
Model : GR-200
Serial No. : 14245322
ID No. : LB-Fg-016
Capacity : 210 g
Resolution : 0.0001 g

Environment : On site calibration was carried out at the Laboratory, Special Lab Envi and Consultant Co., Ltd.
Ambient Temperature : (29.4 to 29.7) °C
Relative Humidity : (50.9 to 51.5) %
Air Pressure : 1011.0 mbar

Date of Received : 24 April 2023
Date of Calibration : 24 April 2023
Date of Issue : 26 April 2023
Calibrated by : Akaraduth Thippichai

Calibration Method : In-house method CAL-M2001 based on UKAS Publication ref : LAB 14
Edition 7 - November 2022

Reference Standard Instruments : This certification is traceable to the International System of Units

Standard Weights	Cert. No.	Due Date	Traceability
ID No. E-20-E2024	C02222345	10 Nov 2023	National Institute of Metrology (Thailand) (NIMT)

Approved by : [Signature]
Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%
This certificate may not be reproduced other than in full except with the prior written approval of the Calibratech Co., Ltd.
CAL-F0031-03

CAL
Calibratech Co., Ltd.
7/106-7 Moo 2, Sullayachuan 3 Rd., Banggood, Pakred, Nonthaburi 11120
Tel: (02) 964-6211 Fax: (02) 964-5155, e-mail: cal@caltech.co.th, cal@caltech.co.th

Certificate of Calibration

Certificate No. : 66-200145-1

Result of Calibration : Without Adjustment

UUC Condition As Received : Good

Departure of indication from nominal value

Nominal Value (g)	Correction (g)	Uncertainty \pm (g)
0.001	0.0000	0.00010
0.01	0.0000	0.00011
0.1	0.0000	0.00011
0.5	0.0000	0.00010
2	0.0000	0.00011
5	-0.0001	0.00011
10	0.0000	0.00012
50	-0.0001	0.00014
100	-0.0001	0.00020
200	0.0000	0.00038

This result of calibration was found accurate as shown on date and place of calibration only.
This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k=2.06$, providing a level of confidence of approximately 95%.

Eccentric error

Load test	50 g
A	-0.0003
B	0.0001
C	0.0004
D	0.0000
E	0.0000

Repeatability

Load test	200 g
Sidev	0.00005 g

-0.000 -

CAL-P003-1-03

BECTHAI BANGKOK EQUIPMENT & CHEMICAL CO., LTD.
CALIBRATION LABORATORY
300 Phadonphet Road Phayathai Bangkok 10400, Thailand Tel: +66 2615-2929 Fax: +66 2615-2350-1
E-mail: bkk@becthai.com Website: www.becthai.com

CERTIFICATE OF CALIBRATION

Certificate No. : CAL-23-297

Equipment : Spectrophotometer

Manufacturer : Thermo Scientific

Model : Genesis 20

Serial No. : 3SGT041007

ID No. : LB-Eq-029

Customer : Special Lab Envi And Consultant Co., Ltd.

Location : 47/91-93 Moo 3, Tambol Tail, Amphur Pakrad, Nonthaburi, 11120.

Date of Receipt : 3 May 2023

Date of Calibration : 3 May 2023

Date of Issue : 3 May 2023

Ambient Temperature : (25±10) °C

Relative Humidity : (60±20) %

Condition As-Received : Used Item

Calibrated by : [Redacted]

Calibration Engineer : [Redacted]

Calibration Manager : [Redacted]

The reported expanded uncertainty of measurement was based on a combined standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%.


This certificate may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

Indicated values are valid for the state of the Spectrophotometer at the time of calibration only.

ISSUE: 5 REV:4

FM-CAL-33/2

15/05/61



BECTHAI BANGKOK EQUIPMENT & CHEMICAL CO., LTD.
CALIBRATION LABORATORY
300 Phaholyothin Road, Phayathai, Bangkok 10400, Thailand Tel: +66 2615-2329 Fax: +66 2615-2350-1
E-mail: bkk@becthai.com Website: www.becthai.com

Page : 2 of 3

CALIBRATION REPORT

Certificate No. : CAL-23-297

Conditions of this result of calibration

1. Reference Standard Material :

Material	Model	Serial No.	Cert. No.	Due date
Holmium Glass Filter	RM-HG	12705	98236	12 Feb 24
Didymium Glass Filter	RM-DG	13498	98233	12 Feb 24
Neutral Density Filter	RM-1N2K3N	8323	98259	13 Feb 24

2. Traceability : This certification is traceable to the International System of Unit maintained at:
The Sarna Scientific Ltd. Accredited Calibration Laboratory No. 0659.

3. Method of calibration :
The calibration procedure was carried out according to ASTM E275-08 (2022) and ASTM E925-09 (2014).

4. Result of calibration :
(✓) without adjustment () after adjustment


5. Equipment Specifications:

Spectral Bandwidth :	5 nm
Data Interval :	1 nm
Scan Speed :	N/A nm/min

ISSUE-5 REV/4

FM-CAL-33/2

15/05/61



BECTHAI BANGKOK EQUIPMENT & CHEMICAL CO., LTD.
CALIBRATION LABORATORY
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E-mail: bkk@becthai.com Website: www.becthai.com

Page : 3 of 3

CALIBRATION REPORT

Certificate No. : CAL-23-297

Wavelength Calibration

Certified Values of Reference Material (nm)	Nominal Value (nm)	UUC* Reading (nm)	Error (nm)	Uncertainty of Measurement (± nm)
418.40	418	418	-0.40	0.59
537.00	537	537	0.00	0.59
638.00	638	638	0.00	0.59

Photometric Calibration for Visible

Wavelength (nm)	Certified Values of Reference Material (A)	UUC* Reading (A)	Error (A)	Uncertainty of Measurement (± A)
420.0	Zero	0.000	0.000	0.0028
	0.5716	0.572	0.0004	0.0044
	0.7358	0.733	-0.0028	0.0040
	1.0713	1.073	0.0017	0.0039
	Zero	0.000	0.000	0.0028
440.0	0.561	0.560	-0.0010	0.0042
	0.718	0.714	-0.0040	0.0037
	1.0459	1.044	-0.0019	0.0037
	Zero	0.000	0.000	0.0028
	0.5111	0.513	0.0019	0.0044
465.0	0.6618	0.661	-0.0008	0.0035
	0.9635	0.966	0.0025	0.0034
	Zero	0.000	0.000	0.0028
	0.5222	0.523	0.0008	0.0036
	0.6687	0.668	-0.0007	0.0031
546.1 (546.0)	0.9768	0.978	0.0012	0.0043
	Zero	0.000	0.000	0.0028
	0.5541	0.554	-0.0001	0.0035
	0.6975	0.696	-0.0015	0.0031
	1.0206	1.021	0.0004	0.0045
590.0	Zero	0.000	0.000	0.0028
	0.5398	0.543	0.0032	0.0035
	0.6658	0.667	0.0012	0.0033
	0.9741	0.977	0.0029	0.0045
	635.0			

Remark : Each individual filter is measured against the empty filter holder (blank) used to zero the Spectrophotometer.

Note:
UUC* : Unit Under Calibration

- End of Report -

ISSUE-5 REV/4

FM-CAL-33/2

15/05/61

CAL
Calibratech Co., Ltd.
7/06-7 Moo 2, Sukprachasri 3 Rd., Bangpoo, Pakkret, Nonthaburi 11120
Tel: (02) 964-6211 Fax: (02) 964-5155, e-mail: calibratech.co@yahoo.com, calibratech.co@hotmail.com

Certificate of Calibration

Page : 1 of 2

Certificate No. : 66-400240-1

Submitted by : Special Lab Envi and Consultant Co., Ltd.
47/91-93 Moo 3, Tambol Tha-It, Pakkret, Nonthaburi 11120

Equipment : Air Chamber (Refrigerator)

Manufacturer : Frozen
Model : CC-2288F
Resolution : 1 °C
Range : N/A °C
Serial No. : CC-2288F-1163-003
ID No. : LB-Eq-046

Environment : On site calibration was carried out at the Laboratory, Special Lab Envi and Consultant Co., Ltd.

Ambient Temperature : (31.0 to 32.0) °C
Relative Humidity : (40 to 45) %
Line Voltage : (226.0 to 226.5) V

Date of Received : 02 May 2023
Date of Calibration : 02 May 2023
Date of Issue : 02 May 2023
Calibrated by : Pempon Chianpu
Calibration Method : CAL-M4004, ILAS G-20

Reference Standard Instruments : This certification is traceable to the International System of Units
Standard Digital Thermometer with RTD Probe
ID No. : 400046 & 400047
Cert. No. : 66-400066-2
Due Date : 03 Aug 2023
Traceability : National Institute of Metrology Thailand (NIMT)

Approved by [Signature]
Supervisor

The Uncertainties are for a confidence probability of approximately 95%
This certificate may not be reproduced other than in full except with the prior written approval of the Calibratech Co., Ltd.
CAL-F0001-03

CAL
Calibratech Co., Ltd.
7/06-7 Moo 2, Sukprachasri 3 Rd., Bangpoo, Pakkret, Nonthaburi 11120
Tel: (02) 964-6211 Fax: (02) 964-5155, e-mail: calibratech.co@yahoo.com, calibratech.co@hotmail.com

Certificate of Calibration

Page : 2 of 2

Certificate No. : 66-400240-1

Result of Calibration : Without Adjustment
UUC Condition As-Received : Good
Function : Temperature measurement
This instrument was setting air ventilation at position D (close)

Inside of Chamber
W = 1.02 m
D = 0.47 m
H = 1.48 m
Capacity = 0.71 m³

Diagram: A 3D perspective view of a rectangular calibration chamber. The front face is labeled 'Front' and 'W' (width). The top edge is labeled 'D' (depth). The side edge is labeled 'H' (height). The chamber is divided into sections by vertical lines. A small diagram shows the internal layout with points 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000.

Test Point	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Temperature (°C) @ Sensor No.	Uncertainty (± °C)
3	3	3	3.21	0.83
1	2.53	2.23	2.38	2.05
2	2.53	2.38	3.74	4.12
3	2.53	2.38	4.12	2.20
4	2.53	2.38	4.12	2.05
5	2.53	2.38	4.12	2.05
6	2.53	2.38	4.12	2.05
7	2.53	2.38	4.12	2.05
8	2.53	2.38	4.12	2.05
9	2.53	2.38	4.12	2.05
10	2.53	2.38	4.12	2.05
11	2.53	2.38	4.12	2.05
12	2.53	2.38	4.12	2.05
13	2.53	2.38	4.12	2.05
14	2.53	2.38	4.12	2.05
15	2.53	2.38	4.12	2.05
16	2.53	2.38	4.12	2.05
17	2.53	2.38	4.12	2.05
18	2.53	2.38	4.12	2.05
19	2.53	2.38	4.12	2.05
20	2.53	2.38	4.12	2.05
21	2.53	2.38	4.12	2.05
22	2.53	2.38	4.12	2.05
23	2.53	2.38	4.12	2.05
24	2.53	2.38	4.12	2.05
25	2.53	2.38	4.12	2.05
26	2.53	2.38	4.12	2.05
27	2.53	2.38	4.12	2.05
28	2.53	2.38	4.12	2.05
29	2.53	2.38	4.12	2.05
30	2.53	2.38	4.12	2.05
31	2.53	2.38	4.12	2.05
32	2.53	2.38	4.12	2.05
33	2.53	2.38	4.12	2.05
34	2.53	2.38	4.12	2.05
35	2.53	2.38	4.12	2.05
36	2.53	2.38	4.12	2.05
37	2.53	2.38	4.12	2.05
38	2.53	2.38	4.12	2.05
39	2.53	2.38	4.12	2.05
40	2.53	2.38	4.12	2.05
41	2.53	2.38	4.12	2.05
42	2.53	2.38	4.12	2.05
43	2.53	2.38	4.12	2.05
44	2.53	2.38	4.12	2.05
45	2.53	2.38	4.12	2.05
46	2.53	2.38	4.12	2.05
47	2.53	2.38	4.12	2.05
48	2.53	2.38	4.12	2.05
49	2.53	2.38	4.12	2.05
50	2.53	2.38	4.12	2.05
51	2.53	2.38	4.12	2.05
52	2.53	2.38	4.12	2.05
53	2.53	2.38	4.12	2.05
54	2.53	2.38	4.12	2.05
55	2.53	2.38	4.12	2.05
56	2.53	2.38	4.12	2.05
57	2.53	2.38	4.12	2.05
58	2.53	2.38	4.12	2.05
59	2.53	2.38	4.12	2.05
60	2.53	2.38	4.12	2.05
61	2.53	2.38	4.12	2.05
62	2.53	2.38	4.12	2.05
63	2.53	2.38	4.12	2.05
64	2.53	2.38	4.12	2.05
65	2.53	2.38	4.12	2.05
66	2.53	2.38	4.12	2.05
67	2.53	2.38	4.12	2.05
68	2.53	2.38	4.12	2.05
69	2.53	2.38	4.12	2.05
70	2.53	2.38	4.12	2.05
71	2.53	2.38	4.12	2.05
72	2.53	2.38	4.12	2.05
73	2.53	2.38	4.12	2.05
74	2.53	2.38	4.12	2.05
75	2.53	2.38	4.12	2.05
76	2.53	2.38	4.12	2.05
77	2.53	2.38	4.12	2.05
78	2.53	2.38	4.12	2.05
79	2.53	2.38	4.12	2.05
80	2.53	2.38	4.12	2.05
81	2.53	2.38	4.12	2.05
82	2.53	2.38	4.12	2.05
83	2.53	2.38	4.12	2.05
84	2.53	2.38	4.12	2.05
85	2.53	2.38	4.12	2.05
86	2.53	2.38	4.12	2.05
87	2.53	2.38	4.12	2.05
88	2.53	2.38	4.12	2.05
89	2.53	2.38	4.12	2.05
90	2.53	2.38	4.12	2.05
91	2.53	2.38	4.12	2.05
92	2.53	2.38	4.12	2.05
93	2.53	2.38	4.12	2.05
94	2.53	2.38	4.12	2.05
95	2.53	2.38	4.12	2.05
96	2.53	2.38	4.12	2.05
97	2.53	2.38	4.12	2.05
98	2.53	2.38	4.12	2.05
99	2.53	2.38	4.12	2.05
100	2.53	2.38	4.12	2.05
101	2.53	2.38	4.12	2.05
102	2.53	2.38	4.12	2.05
103	2.53	2.38	4.12	2.05
104	2.53	2.38	4.12	2.05
105	2.53	2.38	4.12	2.05
106	2.53	2.38	4.12	2.05
107	2.53	2.38	4.12	2.05
108	2.53	2.38	4.12	2.05
109	2.53	2.38	4.12	2.05
110	2.53	2.38	4.12	2.05
111	2.53	2.38		

CAL
Calibratech Co.,Ltd.
7/106-7 Moo 2, Subhaphrasam 3 Rd., Bangpoo, Pakkret, Nonthaburi 11120
Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech.cal@yahoo.com, calibratech.cal@hotmail.com

Certificate of Calibration

Certificate No. : 65-410141-1 **Page : 1 of 2**

Submitted by : Special Lab Envi and Consultant Co., Ltd.
47/91 Moo 3, Tambol Tha-Ha, Pakkret, Nonthaburi 11120

Equipment : Digital Thermo-Hygrometer
Model : 608-HI
Manufacturer : Testo
Range Temperature : 0 °C to 50 °C Resolution : 0.1 °C
Range Humidity : 10 %R.H. to 95 %R.H. Resolution : 0.1 %R.H.
Serial No. : 2083256817 ID No. : LB-Eq-042

Environment : Ambient Temperature : (23 ± 2) °C
Relative Humidity : (50 ± 15) %

Date of Received : 07 December 2022
Date of Calibration : 09 December 2022
Date of Issue : 09 December 2022
Calibrated by : Chonrip Sanchusri

Calibration Method : This instrument was calibrated by In-house method comparison technique CAL-M4013 by compared with standard probe sensor humidity/temperature into humidity/temperature chamber.

Reference Standard Instruments : This certification is traceable to the International System of Units
Digital Indicator with Standard Probe Temp&Hum
ID No. Cert. No. Due Date Traceability
400034 & 400035 SG-H-00713/65 07 Jun 2023 Success Gateway Co., Ltd., Accredited by TISI Calibration No.0268

Approved by : [Redacted]
Supervisor

The Uncertainties are for a confidence probability of approximately 95%
This certificate may not be reproduced other than in full except with the prior written approval of the Calibratech Co., Ltd.
CAL-F0001-03

CAL
Calibratech Co.,Ltd.
7/106-7 Moo 2, Subhaphrasam 3 Rd., Bangpoo, Pakkret, Nonthaburi 11120
Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech.cal@yahoo.com, calibratech.cal@hotmail.com

Certificate of Calibration

Certificate No. : 65-410141-1 **Page : 2 of 2**

UUC Condition As-Received : Good
Result of Calibration : Without Adjustment
Function : Temperature measurement
Reference Humidity @ 50 %R.H.

Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
24.99	25.0	0.0	0.46

Result of Calibration : Without Adjustment
Function : Humidity measurement
Reference Temperature @ 25 °C

Standard Humidity (%R.H.)	UUC Reading (%R.H.)	Correction (%R.H.)	Uncertainty (± %R.H.)
49.98	56.0	-6.0	2.2

Remark
UUC : Unit Under Calibration

This result of calibration was found accurate as shown on date and place of calibration only.
This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%

Approved by : [Redacted]
Supervisor

The Uncertainties are for a confidence probability of approximately 95%
This certificate may not be reproduced other than in full except with the prior written approval of the Calibratech Co., Ltd.
CAL-F0001-03

CAL
Calibratech Co., Ltd.
7/06-7 Moo 2, Sukhaphachan 3 Rd., Banggood, Pakkret, Nonthaburi 11120
Tel: (02) 964-6211 Fax: (02) 964-5155 e-mail: calibratech.co@yahoo.com, calibratech.co@hotmail.com

Certificate of Calibration

Certificate No. : 66-410081-1 **Page : 1 of 2**

Submitted by : Special Lab Envi and Consultant Co., Ltd.
47/91-93/95 Moo 3, Tambol Tha-H, Pakkret, Nonthaburi 11120

Equipment : Digital Thermo-Hygrometer

Manufacturer : Testo **Model :** 608-H1

Range Temperature : 0 °C to 50 °C **Resolution :** 0.1 °C

Range Humidity : 10 %R.H. to 95 %R.H. **Resolution :** 0.1 %R.H.

Serial No. : 2083236817 **ID No. :** LB-Eg-042

Environment : Ambient Temperature : (23 ± 2) °C
Relative Humidity : (50 ± 15) %

Date of Received : 03 August 2023

Date of Calibration : 09 August 2023

Date of Issue : 09 August 2023

Calibrated by : Chotrip Saenchuri

Calibration Method : This instrument was calibrated by In-house method comparison technique CAL-M4013 by compared with standard probe sensor humidity/temperature into humidity/temperature chamber.

Reference Standard Instruments : This certification is traceable to the International System of Units

Digital Indicator with Standard Probe Temp&Hum

ID No. : 400034 & 400035 **Cert. No. :** SG-H-00502/66 **Due Date :** 06 Jan 2024 **Traceability :** Success Gateway Co., Ltd. Accredited by TISI Calibration No.0268

Approved by: [Signature] Supervisor

The Uncertainties are for a confidence probability of approximately 95%
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CAL-F0031-03

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7/06-7 Moo 2, Sukhaphachan 3 Rd., Banggood, Pakkret, Nonthaburi 11120
Tel: (02) 964-6211 Fax: (02) 964-5155 e-mail: calibratech.co@yahoo.com, calibratech.co@hotmail.com

Certificate of Calibration

Certificate No. : 66-410081-1 **Page : 2 of 2**

UUC Condition As-Received : Good

Result of Calibration : Without Adjustment

Function : Temperature measurement

Reference Humidity @ 50 %R.H.

Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
25.01	25.0	0.0	0.46

Result of Calibration : Without Adjustment

Function : Humidity measurement

Reference Temperature @ 25 °C

Standard Humidity (%R.H.)	UUC Reading (%R.H.)	Correction (%R.H.)	Uncertainty (± %R.H.)
49.97	57.0	-7.0	2.2

Remark : UUC : Unit Under Calibration

This result of calibration was found accurate as shown on date and place of calibration only.
This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k = 2,
providing a level of confidence of approximately 95%

Approved by: [Signature] Supervisor

The Uncertainties are for a confidence probability of approximately 95%
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Certificate of Calibration

Page : 1 of 2

Certificate No. : 66-300220-6

Submitted by : Special Lab Envi and Consultant Co.,Ltd.
47/91 Moo 3, Jumbol Tha-It, Pakkret, Nonthaburi 11120

Equipment : Buret

Manufacturer : Witeg

Capacity : 25 ml

Class : A

Graduation : 0.1 ml

ID No. : LB-Gw-001

Environment : Ambient Temperature : $(20 \pm 3) ^\circ\text{C}$
Relative Humidity : $(60 \pm 15) \%$
Air Pressure : 1009.7 mbar.

Date of Received : 06 April 2023

Date of Calibration : 18 April 2023

Date of Issue : 18 April 2023

Calibrated by : Aroent Sombun

Calibration Method : In-house method CAL-M3001 based on ASTM E 542-01

Reference Standard Instruments : This certification is traceable to the International System of Units

Electronic Balance

ID No. 241005

Cert. No. 65-200370-4

Due Date 02 Jun 2023

Traceability National Institute of Metrology (Thailand) (NIMT)

Approved by: [Redacted]

Supervisor

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Certificate of Calibration

Page : 2 of 2

Certificate No. : 66-300220-6

Result of Calibration : This result of true Volume is referred to standard temperature at $20 ^\circ\text{C}$

UUC Condition As-Received : Good

Delivery Time : 40.55 sec.

Nominal Volume (ml)	Measuring Volume (ml)
10	10.0121
20	20.0086
25	25.0116

Uncertainty of measurement with in $\pm 0.0066 \text{ ml}$

This result of calibration was found accurate as shown on date and place of calibration only.

This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k = 2.00$ providing a level of confidence of approximately 95%.

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[Redacted]

CAL-F0031-03

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Certificate of Calibration

Page : 1 of 2

Certificate No. : 66-210415-1

Submitted by : Special Lab Envi And Consultant Co., Ltd.
47/91-93,96 Moo 3, Tambol Tha - It, Pakkret, Nonthaburi 11120

Equipment : Weight
Manufacturer : LS
Weight size : 1 g
ID No. : LB-Eq-034
Assumed density of weight : 7950 kg / m³
Assumed Air density : 1.2 kg / m³

Material : Stainless Steel

Environment : Ambient Temperature : (20 ± 2) °C
Relative Humidity : (50 ± 10) %
Air Pressure : 1005.9 mbar

Date of Received : 03 August 2023
Date of Calibration : 16 August 2023
Date of Issue : 16 August 2023

Calibrated by : Wuttichai Swaphong

Calibration Method : In-house method CAL-M2101 based on OIML R 111-1 : 2004(E)

Reference Standard Instruments : This certification is traceable to the International System of Units

Standard Weights

ID No.	Cert. No.	Due Date	Traceability
E221-E2210	MM-0042-22	21 Mar 2025	National Institute of Metrology (Thailand), (NIMT)

Approved by [Redacted]
Laboratory Manager

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Certificate of Calibration

Page : 2 of 2

Certificate No. : 66-210415-1

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

No.	Nominal Value	Id.Mark	Conventional mass Value	Measuring Uncertainty
1	1 g	none	-0.017 mg	± 0.023 mg

This result of calibration was found accurate as shown on date and place of calibration only.

This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%

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Approved by [Redacted]
Laboratory Manager

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Certificate of Calibration

Certificate No. : 66-210415-2 **Page : 1 of 2**

Submitted by : Special Lab Envi And Consultant Co. Ltd.
47/91-93/96 Moo 3, Tumbol Tha - It, Pakkret, Nonthaburi 11120

Equipment : Weight
Manufacturer : LS
Weight size : 100 g
ID No. : LB-Eq-035
Assumed density of weight : 7950 kg/m³
Assumed Air density : 1.2 kg/m³

Material : Stainless Steel

Environment : Ambient Temperature : (20 ± 2) °C
Relative Humidity : (50 ± 10) %
Air Pressure : 1005.9 mbar

Date of Received : 03 August 2023
Date of Calibration : 16 August 2023
Date of Issue : 16 August 2023
Calibrated by : Wutichai Swaphong

Calibration Method : In-house method CAL-M2101 based on OIML R 111-1 : 2004(E)
Reference Standard Instruments : This certification is traceable to the International System of Units

Standard Weights

ID No.	Cert. No.	Due Date	Traceability
E221-E2210	MM-0042-22	21 Mar 2025	National Institute of Metrology (Thailand), (NIMT)

Approved by: [Signature]
Laboratory Manager

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CAL-P001-03

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Certificate of Calibration

Certificate No. : 66-210415-2 **Page : 2 of 2**

Result of Calibration : Without Adjustment
UUC Condition As-Received : Good

No.	Nominal Value	Id. Mark	Conventional mass Value	Measuring Uncertainty
1	100 g	none	100 g -0.20 mg	± 0.11 mg

This result of calibration was found accurate as shown on date and place of calibration only.
This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k = 2,
providing a level of confidence of approximately 95%.

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Approved by: [Signature]
Laboratory Manager

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CAL-P001-03

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Certificate of Calibration

Certificate No. : 66-210415-3 **Page :** 1 of 2

Submitted by : Special Lab Envi And Consultant Co. Ltd.
47/91-93/96 Moo 3, Tambol Tha - It, Pakkret, Nonthaburi 11120

Equipment : Weight
Manufacturer : LS
Material : Stainless Steel
Weight size : 200 g
ID No. : LB-Eq-036
Assumed density of weight : 7950 kg / m³
Assumed Air density : 1.2 kg / m³

Environment : Ambient Temperature : (20 ± 2) °C
Relative Humidity : (50 ± 10) %
Air Pressure : 1005.9 mbar

Date of Received : 03 August 2023
Date of Calibration : 16 August 2023
Date of Issue : 16 August 2023
Calibrated by : Wuttichai Swaiphong

Calibration Method : In-house method CAL-M2/01 based on OIML R 111-1 : 2004(E)
Reference Standard Instruments : This certification is traceable to the International System of Units

Standard Weights
ID.No. : E221-E2210
Cert. No. : MM-0042-22
Due Date : 21 Mar 2025
Traceability : National Institute of Metrology (Thailand), (NIMT)

Approved by [Redacted] Laboratory Manager

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Certificate of Calibration

Certificate No. : 66-210415-3 **Page :** 2 of 2

Result of Calibration : Without Adjustment
UUC Condition As-Received : Good

No.	Nominal Value	Id.Mark	Conventional mass Value	Measuring Uncertainty
1	200 g	none	+0.11 mg	± 0.17 mg

This result of calibration was found accurate as shown on date and place of calibration only.
This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%
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Approved by [Redacted] Laboratory Manager

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CAL-MRA
NSC-TISI-TIS17025
CALIBRATION 0359

Certificate of Calibration

Certificate No. : 66-300471-1 **Page : 1 of 2**

Submitted by : Special Lab Ewri and Consultant Co., Ltd.
47/91-93,96 Moo 3, Tambol Tha-I, Pakret, Nonthaburi 11120

Equipment : Piston Pipette
Manufacturer : sartorius
Serial No. : 4541601431
Capacity : 100 µl to 1000 µl
Resolution : 5 µl

Model : N/A
ID No. : LB-Eg-045

Environment : Ambient Temperature : (20 ± 3) °C
Relative Humidity : (55 ± 10) %
Air Pressure : (1007.6 to 1007.7) mbar

Date of Received : 03 August 2023
Date of Calibration : 07 August 2023
Date of Issue : 07 August 2023
Calibrated by : Areeart Sombun

Calibration Method : In-house method CAL-M3002 base on ISO 8655-6 : 2002-09

Reference Standard Instruments : This certification is traceable to the International System of Units

Electronic Balance

ID No. : 241005
Cert. No. : 66-200196-4
Due Date : 02 Dec 2023
Traceability : National Institute of Metrology (Thailand) (NIMT)

Approved by :

Supervisor

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CAL-F0031-03

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CAL-MRA
NSC-TISI-TIS17025
CALIBRATION 0359

Certificate of Calibration

Certificate No. : 66-300471-1 **Page : 2 of 2**

Result of Calibration : Without Adjustment
UUC Condition As-Received : Good

Test Volume (µl)	Measuring Volume at 20 °C (µl)	Systematic error (e _s %)	Coeff. of Variation (CV%)	Uncertainty (± µl)
100	97.92	0.21	0.15	0.69
500	496.58	0.34	0.04	0.69
1000	997.55	0.24	0.01	0.69

e_s : Systematic error (%)
CV : Coefficient of variation (%)

UUC Calibrated by : Blue Tip

This result of calibration was found accurate as shown on date and place of calibration only.

This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k = 2.00, providing a level of confidence of approximately 95%.

Approved by :

Supervisor

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