

เอกสารแนบ 6

เอกสารสอบเทียบเครื่องมือที่ใช้ในการ
ตรวจวิเคราะห์

Calibration Results

Certificate No. : WK2402-300-865

Calibration Result of the Accuracy

Function : Dissolved Oxygen Measurement at 25 °C

Resolution : 0.01 mg/L

Page 2 of 2

STD Solution	UUC Reading		Error	Uncertainty (± mg/L)
	Before Adjustment	After Adjustment		
0.00	0.32	0.00	0.00	0.15
8.40	9.15	8.37	-0.03	0.33
8.70	9.01	8.65	-0.05	0.33
9.00	9.24	8.92	-0.08	0.33

() Without Adjustment (X) After Adjustment

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**** End of Certificate****

Certificate of Calibration

Certificate No. : WK2402-300-865

Customer : OKLA TESTING & CONSULTING SERVICE CO. LTD.
67/35-36, 3rd Floor, Petchkasem 7/1, Petchkasem Rd.,
Watthapra, Bangkok Yai, Bangkok 10600 Thailand.

Instrument : Dissolved Oxygen

Manufacturer : HANNA

Model : HI5421

Serial No. : 04240005101

Identity No. : KC1A1J78H

Range : See to data

Resolution : See to data

Calibration Method : CP-WK-C03

Ambient Temperature : (25.0 ± 2) °C

Humidity : (50.0 ± 15) %RH

Received Date : 27-Feb-24

Calibrated Date : 27-Feb-24

Issued Date : 27-Feb-24

Calibrated Location : In Lab

Page 1 of 2

Reference standard instruments :

Instrument	Serial No.	Certificate No.	Due Date	Traceability to
Zero Oxygen Solution	HI7040L	S0115/20	30-Aug-25	NIST
DO Meter	874477	WK2305-300-241	25-May-24	WK Electric Co.,Ltd.
Digital Thermometer	WK-CT-025	WK2402-300-25	25-Feb-25	WK Electric Co.,Ltd.

NIST : National Institute of Standard and Technology.

This result calibrate was found accurate as shown on date place of calibrate only

This certificate is traceability to th International System of Unit (SI)

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

Calibrated by : Mr. Usa Phuangphiphat

Approved by :

Authorized Signatory

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F5100

REV.00 27 Oct 16

Condition of this calibration result

1. Reference Standard Instruments : This certification is traceable to the international unit of unit maintained through:

Instruments	Model	Serial No.	Certificate No.	Traceable
Documenting Process Calibrator	Fluke 753	43160061	LF24-0014	Measuretronix Limited.
Thermometer with sensor	HI98509	39643D	23T1453	Technology Promotion Association (Thailand-Japan).
Digital Thermo-Hygrometer	HT-771SD	AL07155	24H41	

2. Reference Standard Materials : pH calibration standard traceable thru CPA chem Ltd.

Buffer Solution	Manufacture	Certified Value	Lot Number	Exp. date
pH 4.0	CPA chem	$4.008 \pm 0.006 @ 25^{\circ}\text{C}$	898494	3 June 2024
pH 7.0	CPA chem	$6.985 \pm 0.007 @ 25^{\circ}\text{C}$	898500	28 May 2024
pH 10.0	CPA chem	$10.011 \pm 0.012 @ 25^{\circ}\text{C}$	898502	24 May 2024

Calibration Result :

1. Performing standard curve by Simulator at: -177.5, 0.0, 177.5 mV

(Measurement Electrical Potential) After Adjust Result.

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement ($\pm$ mV)
			pH	mV	
pH Meter S/N 04160019101	4.01	177.5	4.01	177.5	0.097
	7.01	0.0	7.01	0.0	0.058
	10.01	-177.5	10.01	-177.5	0.097

2. Performing three buffer standard curve by using buffer nominal : pH 4,7,10 After Adjustment.

Unit Under Calibration	Standard pH Buffer Solution	Actual Reading (pH)	Actual Reading (mV)	Uncertainty of Measurement ($\pm$ pH)
pH Electrode S/N 094430BN	4.008	4.02	159.3	0.010
	6.985	6.99	-13.6	0.011
	10.011	10.04	-187.9	0.014

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

** End of certificate **

Certificate No. : HIT-2410-0320

Page : 1 of 2

CERTIFICATE OF CALIBRATION

Equipment :	pH/mV and EC/TDS/Salinity/Resistivity Meter				
Meter Model :	HI5521-02	Serial No. :	04160019101		
Probe Model :	HI1131B	Serial No. :	094430BN		
Resolution (pH) :	0.01	Resolution (mV) :	0.1		
Manufacturer :	Hanna Instruments				
Condition As-Received :	Used Product				
Ambient Temperature :	(25 ± 2) °C				
Relative Humidity :	(50 ± 15) % RH				
Customer name :	Okla Testing & Consulting Service Co., Ltd.				

67/35-36, 3RD Floor, Phetkasem 7/1 Road, Wat Tha Pra,
Bangkok Yai, Bangkok 10600 Thailand

Received date : 28 February 2024

Calibrate date : 4 March 2024

Issue date : 5 March 2024

Calibrated Location : Hanna Instruments (Thailand) Ltd.

Calibration Procedure : This calibrator was conducted by using in-house: calibration procedure
CP-01, CP-02 by using certified reference material (CRM)

Calibrated by : ☒ Mr. Pichit Petthong
☐ Mr. Channarong Soimak

Approved by

Authorized Signatory


HANNA
Instruments
(Thailand) Limited

This certificate was certified only for the instrument we calibrated.

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

** This certificate may not be reproduced other than in full, except with the prior written **
approval of the head of Hanna Instrument (Thailand)



CALIBRATION LABORATORY CO., LTD.

2/10-11, 14, 55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax: 02-578-2672 www.call-laboratory.com Email: sale@call-laboratory.com



NSC-TIS-TIS 17025
CALIBRATION 0659
CLC



Accredited
ISO/IEC 17025

REPORT OF CALIBRATION

FOR

NOMENCLATURE : DIGITAL THERMOMETER
MANUFACTURER : HANNA INSTRUMENTS
MODEL / TYPE : HI5521/Hi7662-W
SERIAL NO. : 04160019101/0615024N
DATE OF CALIBRATION : 19 October 2023

ENVIRONMENT CONDITIONS :

Temperature : $(23 \pm 2) ^\circ\text{C}$ Relative Humidity : $(55 \pm 10) \% \text{ RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. WI-305-187 based on ASTM E 644-11:2019 as calibration guidelines.

The calibration was performed by using Calibration Bath, Precision Thermometer and IPT which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Calibration Bath, Kambie Model OB-22/2 ULT S/N. 17115653.
2. Precision Thermometer, ASL Model F200-A-8 S/N. 014433/03.
3. IPT, ASL Model T100-250-1D S/N. PO106346-1-13.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q22130792, Due Date 05 January 2024.
2. The measurements are traceable to International System of Units (SI), through Thailand Institute of Scientific and Technological Research (TISTR). Certificate No. PSL-T 0010/66, Due Date 06 November 2023.
3. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand). Certificate No. TT-0020-23, Due Date 22 February 2024.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %. It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q23115955

F3-011-04/01-12

page 2 of 3



@ckcalibration



Accredited
ISO/IEC 17025

CALIBRATION LABORATORY CO., LTD.

2/10-11, 14, 55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax: 02-578-2672 www.call-laboratory.com Email: sale@call-laboratory.com



NSC-TIS-TIS 17025
CALIBRATION 0659
CLC

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : DIGITAL THERMOMETER
MANUFACTURER : HANNA INSTRUMENTS
MODEL / TYPE : HI5521/Hi7662-W
SERIAL NO. : 04160019101/0615024N
CLID. NO. : 232202088
JOB CONTROL NO. : 231017115955

CUSTOMER : OKLA TESTING & CONSULTING SERVICE CO., LTD.
6735-36, 3RD FLOOR, PHETKASEM 7/1 RD., WATTAPRA,
BANGKOKYAI, BANGKOK 10600 THAILAND

DATE OF RECEIVED : 17 October 2023

DATE OF ISSUED : 20 October 2023

Report of calibration screening must not be taken in part. Except complete. Without the approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Pinsiri Hemtanon
Calibration Engineer

Approved By :
Authorized Signatory
20 October 2023

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q23115955

F3-011-04/01-12

page 1 of 3



@ckcalibration



Certificate of Calibration

Page : 1 of 2

Certificate No. : 67-200069-1

Submitted by :

Okla Testing&Consulting Service Co.,Ltd.

67/35-36, 3rd Floor, Petchkasem 7/1, Petchkasem Rd.,

Wattapra, Bangkok Yai, Bangkok 10600 Thailand

Equipment :

Electronic Balance

Manufacturer : Sartorius

Model : BSA224S-CW

Serial No. : 35790699

Capacity : 200 g Resolution : 0.0001 g

Environment :

On site calibration was carried out at ti Laboratory Environmental,Okla

Testing&Consulting Service Co.,Ltd.

Ambient Temperature : (28.4 to 28.5) °C

Relative Humidity : (49.4 to 51.1) %

Air Pressure : 1012.0 mbar

Date of Received :

26 February 2024

Date of Calibration :

26 February 2024

Date of Issue :

27 February 2024

Calibrated by :

Akaradath 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

ID No.

Cert. No.

Traceability

Due Date

E261-E2624

C02232088

08 Nov 2024

National Institute of Metrology (Thailand), (NIMT)

Approved by :

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The DUC Reading were recorded and the means value were reported of five times measurement in the table below.

CALIBRATION DATA

CORRECTION OF TEMPERATURE [THERMISTOR]

Immersion depth (mm)	Actual Temperature (°C)	DUC Reading (°C)	Correction (°C)	Uncertainty ± (°C)
105	19.99	20.0	-0.01	0.07
	24.98	25.0	-0.02	
	30.01	30.1	-0.09	

Note: Probe Ø 3.5 mm

Materials : Metal Sheath.

Note: The Scope of Accredited TISI Certificate No. 23-LB0092 Issue 02 Page 35 of 138

This report is valid for the above stated instrument/s only.

End of Certificate

Certificate No. Q23115955

F3-011-04/01-12

page 3 of 3





Certificate of Calibration

Certificate No. : 67-400117-2 Page : 1 of 2

Submitted by : Okla Testing & Consulting Service Co., Ltd.

67/35-36, 3rd Floor, Petchkasem 7/1, Petchkasem Rd.,

Wathapra, Bangkok Yai, Bangkok 10600 Thailand

Equipment : Temperature controlled enclosure (Oven)

Manufacturer : KWF

Model : SOV70B

Range : N/A °C

Resolution : 0.1 °C

Serial No. : KWF2021021902

ID No. : OKLA-LAB-013/170621

Environment : On site calibration was carried out at the Laboratory,

Okla Testing & Consulting Service Co., Ltd.

Ambient Temperature : (32.0 to 33.0) °C

Relative Humidity : (50 to 55) %

Line Voltage : (221.0 to 223.0) V

Date of Received : 26 February 2024

Date of Calibration : 26 February 2024

Date of Issue : 29 February 2024

Calibrated by : Pempon Chanpu

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

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

Standard Digital Thermometer with Thermocouple probe

ID No. Cert. No. Due Date Traceability

400029 & 400032 66-400594-1 27 Apr 2024

National Institute of Metrology Thailand (NIMT)

Approved by

Laboratory Manager



Certificate of Calibration

Certificate No. : 67-200069-1 Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Departure of indication from nominal value

Nominal Value (g)	Correction (g)	Uncertainty ± (g)
0.01	0.0000	0.00011
0.05	0.0000	0.00011
0.1	0.0000	0.00011
0.2	0.0000	0.00011
0.5	0.0000	0.00011
1	0.0000	0.00011
10	0.0000	0.00011
50	0.0000	0.00014
100	0.0000	0.00020
150	0.0001	0.00038
200	0.0002	0.00038

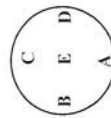
This result of calibration was found accurate as shown on date and place of calibration only.

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

Eccentric error

Load test : 50 g

A	B	C	D	E
-0.0001	0.0001	0.0001	0.0000	0.0000



Repeatability

Load test : 200 g

Sidev. : 0.00000 g

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Certificate of Calibration

Certificate No. : 67-400117-1 Page : 1 of 2

Submitted by :

Okla Testing & Consulting Service Co., Ltd.

67/35-36, 3rd Floor, Petchkasem 7/1, Petchkasem Rd.,

Wathapra, Bangkok Yai, Bangkok 10600 Thailand

Equipment :

Temperature controlled enclosure (Incubator)

Manufacturer : S-Cool

Model : SM 61 M

Range : N/A °C

Resolution : 0.1 °C

Serial No. : 18021147

ID No. : OKLA-LAB-011/190

Environment :

On site calibration was carried out at the Laboratory,

Okla Testing & Consulting Service Co., Ltd.

Ambient Temperature : (32.0 to 33.0) °C

Relative Humidity : (50 to 55) %

Line Voltage : (221.0 to 223.0) V

Date of Received : 26 February 2024

Date of Calibration : 26 February 2024

Date of Issue : 29 February 2024

Calibrated by :

Kittisak Kokaco

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

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

Standard Digital Thermometer with RTD Probe

ID No.

Cert. No.

Traceability

400046 & 400047

67-400047-2

Due Date

26 Jul 2024
National Institute of Metrology Thailand (NIMT)

Approved by

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

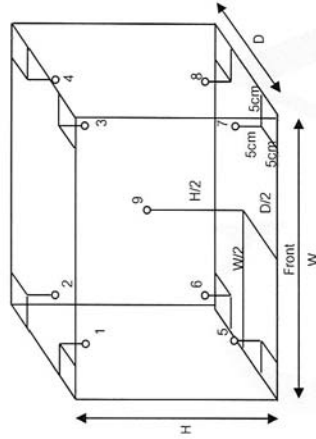
Certificate No. : 67-400117-2 Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

This instrument was setting air ventilation at position 0 (close)



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	
104.0	102.5	102.5	106.4	105.0	105.2	106.1	103.0	104.0	103.4	105.4	104.0	0.94
140.0	139.5	139.5	144.1	142.2	142.4	143.7	138.5	139.7	139.3	142.4	140.2	1.3
160.0	159.5	159.5	164.3	162.4	162.6	163.8	158.6	159.8	159.3	162.5	160.3	1.3
180.0	179.5	179.5	186.2	183.7	183.8	185.7	174.7	180.1	179.4	183.7	180.3	1.7

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured			Overall Variation (°C)
			Uniformity (°C)	Stability (°C)		
104.0	102.5	102.5	2.6	0.3		3.8
140.0	139.5	139.5	4.1	0.4		6.1
160.0	159.5	159.5	4.1	0.4		6.2
180.0	179.5	179.5	6.0	0.6		12.0

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%

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Certificate of Calibration

Customer : Okla Testing & Consulting Service Co., Ltd.

Address : 67/35-36, 3rd Floor, Phekasem 7/1 Rd.,
Wathapra, Bangkokyai, BKK. 10600

Equipment : Refrigerator

Manufacturer : SANDEN

Model : SPB-0500

Serial No. : SPB0500-231007454

ID No. : -

Resolution : 0.1 °C

Location of Calibration : Central Laboratory FL.3

Reference Job No. : JB24048

Received Request Date : 12 February 2024

Calibrated by : Pawut Wongnarakornkul

Date of Calibration : 12 February 2024

Approved by :

Date of Issue : 13 February 2024

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 the Megafil Co., Ltd.

Megafil Co., Ltd.

MG-FM-7.8-001, R00 (01/07/19)

Certificate of Calibration

Certificate No. : 67-400117-1

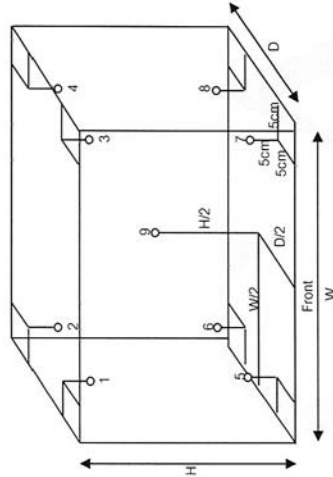
Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

This instrument was setting air ventilation at position 0 (close)



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	20.0	20.0	20.46	20.25	19.60	19.58	19.84	19.64	19.45	19.59	20.01	0.34

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured			Overall Variation (°C)
			Uniformity (°C)	Stability (°C)	Variation (°C)	
20.0	20.0	20.0	0.589	0.073	1.129	

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.

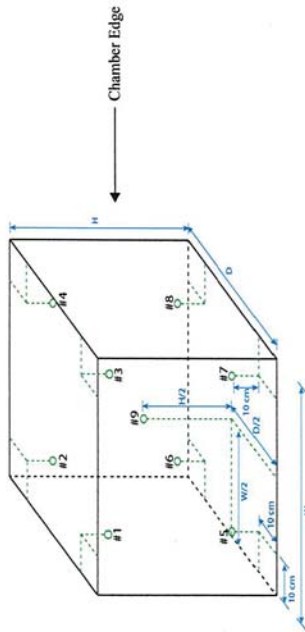
This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%

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Result of Calibration

Sensor installation at nine locations as show in figure.

Chamber capacity (W x H x D) : (0.55 x1.61 x 0.42) m : 0.37 m³

Position	1	2	3	4	5	6	7	8	9
Ref. Std/ID No.:	RTD50501	RTD50502	RTD50503	RTD50504	RTD50505	RTD50506	RTD50507	RTD50508	RTD50509

Temperature distribution

Cal. Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Temperature (°C) @ Sensor No. (Sensor No.9 is REF)									Uncertainty (± °C)
			1	2	3	4	5	6	7	8	9	
2.0	2.0	2.0	2.03	1.26	1.94	1.31	3.06	2.95	2.21	2.15	2.17	0.44
4.0	4.0	4.0	3.96	3.22	3.84	3.31	5.05	4.91	4.19	4.18	4.14	0.44
6.0	6.0	6.0	5.85	5.16	5.88	5.32	7.07	6.91	6.18	6.24	6.10	0.44

Chamber performance

Cal. Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)			Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
		Min	Max	Average			
2.0	2.0	2.0	2.0	2.0	1.07	0.19	2.06
4.0	4.0	4.0	4.0	4.0	1.09	0.22	2.04
6.0	6.0	6.0	6.0	6.0	0.98	0.24	2.18

Note: The quoted uncertainty include Stability and 20% of Uniformity.

Stability = One-half of the greatest maximum difference of measured temperatures at any one sensor.

Uniformity = The maximum difference of measured temperatures at any sensors and measured temperature at the reference location which are observed at the same time.

Overall Variation = The Difference of the maximum and minimum measured temperatures throughout observation.

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%.

Calibration Report

Equipment	: Refrigerator	Manufacturer	: SANDEN
Model	: SPB-0500	Serial No	: SPB0500-231007454
Environment	Ambient Temperature	(24.3 to 24.9)	°C
	Relative Humidity	(45.3 to 51.9)	%
	Line Voltage	(226 to 228)	V _{ac}

Detail of this calibration result.:

1. This instrument was calibrated by insert 9 standards Resistance Thermometer Detector, in to the chamber, under no load condition in according to TLAS G-20-1/02-08 (E).

2. The temperature scale used was based on ITS-90.

3. Reference standards instrument :

Instrument	Model	Serial No./ID No.	Certificate No.	Due Date
Data Acquisition Switch unit	34972A	MY49010832	QR23-2679	15 November 2024
Resistance Thermometer Detector	100 ohm	RTD505(01 to 10)	QR23-2679	15 November 2024

4. This certificate was certified only for the instrument we calibrated.

5. The measured values in this report refer to the time of examination.

6. This certificate is traceable to SI Unit through Quality Reborn Co.,Ltd.

NSC - ONSC accredited no. Calibration 0292

7. Condition of calibrated item : Good

UUC Description :

Operation time 5 Hour 00 Minute Calibration point 2.0, 4.0, 6.0 °C

The air ventilation of the instrument was set at position.

Fresh Air Damper

☒	Open	Position	☐ Min	☐ Medium	☐ Max
☐	Close				
☒	Not Available				

8 Result of calibration :

(X) Without adjustment () After adjustment

Certificate of Calibration

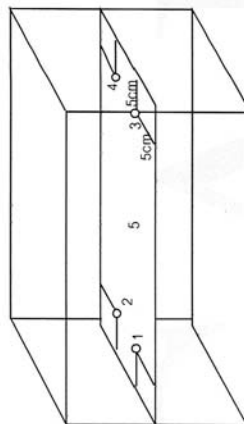
Certificate No. : 67-400117-4

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement



Front

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Temperature (°C) @ Sensor					Uncertainty (± °C)	Measured Uniformity (°C)	Measured Stability (°C)
			No.							
60	As Mark 60	-	1	2	3	4	5	0.53	0.69	0.40
			60.02	59.97	60.02	59.95	60.05			

Remark: The uncertainty is not combine uniformity of the water bath

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%

-o0o-



Certificate of Calibration

Certificate No. : 67-400117-4

Page : 1 of 2

Submitted by :

Okla Testing & Consulting Service Co., Ltd.
67/35-36, 3rd Floor, Petchkasem 7/1, Petchkasem Rd.,
Wathapra, Bangkok Yai, Bangkok 10600 Thailand

Equipment :

Water Bath

Manufacturer : LabTech

Model : LWB-222A

Range : N/A °C

Resolution : 0.01 °C

Serial No. : BCCLJ23001C

ID No. : OKLA-LAB-008/122011

Environment :

On site calibration was carried out at the Laboratory,

Okla Testing & Consulting Service Co., Ltd.

Ambient Temperature : (32.0 to 33.0) °C

Relative Humidity : (50 to 55) %

Line Voltage : (221.0 to 223.0) V

Date of Received : 26 February 2024

Date of Calibration : 26 February 2024

Date of Issue : 29 February 2024

Calibrated by : Pernpon Chumpu

Calibration Method :

This instrument was calibrated by In-house method CAL-M4006 based on ASTM E715-80

The temperature scale used was based on ITS-90

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

Standard Digital Thermometer with RTD probe

ID No.

Cert. No.

Due Date

Traceability

400029 & 400043 66-400593-1

25 Apr 2024

National Institute of Metrology Thailand (NIMT)

Approv

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.



Measurement Results:

This equipment was connected with Air Temperature Sensor on display. Model: -, Serial number: -.

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 °C to 30 °C

The results of calibration of air temperature are reported in table below.

Determined (°C)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
20.0	20.00	20.1	0.1	0.30
25.0	25.00	25.3	0.3	0.30
30.0	30.00	30.3	0.3	0.30

UUC: Unit Under Calibration

End of Certificate of Calibration



CERTIFICATE OF CALIBRATION

Certificate No. : CAT-006-66

Page 1 of 2 Pages

MEASUREMENT ITEM
MANUFACTURER
MODEL/TYPE
SERIAL NUMBER
ID NUMBER
CONDITION AS-RECEIVED
CUSTOMER

: Digital Thermo Hygrometer
: KEPLER
: KTH-02
: 234011890
: -
: Used item
: Okla Testing and consulting services Co., Ltd.
: 67/35-36, 3rd Fl, Petchkasem soi 7/1, Wat Thapra,
Bangkokkai, Bangkok, Thailand 10600.

RECEIVED DATE
MEASUREMENT DATE
ISSUE DATE

: 18 Oct 2023
: 19 Oct 2023
: 19 Oct 2023

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:
Temperature
Relative Humidity

: 23.0 ± 3.0 °C
: 55.0 ± 15.0 %RH

NOTED: The certificate is valid only to the item calibrated on date and place of calibration.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

- ☐ Mr. Sorawit Thachalad
☐ Miss Jitraporn Ler somphol
☒ Miss Ruangrumpai Phoommit

Approved signatory:

Calibration Department Manager



JIRANATEE ASSOCIATES CO.,LTD.

Continuation of Certificate of Calibration Number: CRH-008-66

Measurement Results:

This equipment was connected with Relative Humidity Sensor on display. Model: -, Serial number: -.

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 40%RH to 80%RH

The results of calibration of relative humidity are reported in table below.

Determined (%RH)	Standard Reading (%RH)	UUC Reading (%RH)	Error (%RH)	Uncertainty (%RH)
40.0	40.12	40.0	-0.1	1.16
60.0	60.22	60.0	-0.2	1.17
80.0	80.39	79.0	-1.4	1.15

UUC*: Unit Under Calibration

End of Certificate of Calibration



Page 2 of 2 Pages



JIRANATEE ASSOCIATES CO.,LTD.

Jiranatee Associates Co.,Ltd
63/14-15, 67/35-36
Perthkasem 7/1, Rd. Wattapara, Bangkokkylai,
Bangkok 10600 (Thailand)
Tel: +6688650812
Mobile: +66883999453
E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

Accredited calibration laboratory
ISO/IEC 17025:2017
NSC-TSI-TS 17025
CALIBRATION 0367

Relative humidity measurement laboratory
Calibration services department.

CERTIFICATE OF CALIBRATION

Certificate No. : CRH-008-66

Page 1 of 2 Pages

MEASUREMENT ITEM
MANUFACTURER
MODEL/TYPE
SERIAL NUMBER
ID NUMBER
CONDITION AS-RECEIVED
CUSTOMER

: Digital Thermo Hygrometer
: KEPLER
: KTH-02
: 234011890
: -
: Used item
: Okla Testing and consulting services Co., Ltd.
67/35-36, 3rd Fl, Phetkasem soi 7/1, Wat Thapra,
Bangkokkylai, Bangkok, Thailand 10600.

RECEIVED DATE
MEASUREMENT DATE
ISSUE DATE

: 18 Oct 2023
: 19 Oct 2023
: 19 Oct 2023

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature : 23.0 ± 3.0 °C
Relative Humidity : 55.0 ± 15.0 %RH

NOTED: The certificate is valid only to the item calibrated on date and place of calibration.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibration procedure:
The Relative humidity calibration was done by In-
House calibration method as WI-CL-010 according to
comparison method with Standard Chilled Mirror
hygrometer and standard Humidity generator
chamber.

Traceability:
This instrument was calibrated using standard
equipment whose accuracy is traceability through
National Institute of Standards and Technology to
the international system of units (SI) via Process
Sensing Technologies, Corp. Certificate number:
57483-A.

Uncertainty of Measurement:
The reported uncertainty of measurement is based
on the standard uncertainty multiplied by a
coverage factor k=2, Which for a normal distribution
corresponds to a coverage probability of
approximately 95%. The standard uncertainty has
been determined in accordance with the GUM
'Evaluation of measurement data - Guide to the
expression of uncertainty in measurement'

Calibrated by:

- ☐ Mr. Sravit Thachalad
☐ Miss Jitraporn Lertsomphol
☒ Miss Ruangrumpai Phoommit

Approved signator



Calibration department manager

Certificate of Calibration

Certificate No. : 67-300115-14

Page : 2 of 2

Result of Calibration : This result of true Volume is referred to standard temperature at 20 °C

UUC Condition As-Received : Good

Delivery Time : 38.85 sec.

Nominal Volume (ml)	Measuring Volume (ml)
5	5.0020
15	14.9767
25	24.9836

Uncertainty of measurement with in $\pm$ 0.0066 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%

- o o -

Certificate of Calibration

Certificate No. : 67-300115-14

Page : 1 of 2

Submitted by : Okla Testing & Consulting Service Co.,Ltd.

67/35-36, 3rd Floor, Petchkasem 7/1, Petchkasem Rd.,
Watthapra, Bangkok Yai, Bangkok 10600 Thailand

Equipment : Burette

Manufacturer : ISOLAB

Class : A

Capacity : 25 ml

Graduation : 0.05 ml

ID No. : BU25/01

Environment

Ambient Temperature : (20 $\pm$ 3) °CRelative Humidity : (50 $\pm$ 10) %

Air Pressure : 1011.8 mbar.

Date of Received : 26 February 2024

Date of Calibration : 02 March 2024

Date of Issue : 02 March 2024

Calibrated by : Wipa Tovadee

Calibration Method : In-house method CAL-M3001 based on ASTM E 542-22

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

Electronic Balance

ID No. : 241003

Cert. No. : 66-200388-2

Due Date : 02 Jun 2024

Traceability : National Institute of Metrology (Thailand) (NIMT)

Approved by

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 67-300115-12

Page : 2 of 2

Result of Calibration : This result of true Volume is referred to standard temperature at 20 °C

UUC Condition As-Received : Good

Nominal Volume (ml)	Measuring Volume (ml)
50	50.07
100	100.13

Uncertainty of measurement with in $\pm$ 0.063 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%

-o0o-

Certificate of Calibration

Certificate No. : 67-300115-12

Page : 1 of 2

Submitted by : Okla Testing & Consulting Service Co.,Ltd.

67/35-36, 3rd Floor, Petchkasem 7/1, Petchkasem Rd.,

Watthapra, Bangkok Yai, Bangkok 10600 Thailand

Equipment : Cylinder

Manufacturer : DURAN

Class : A

Capacity : 100 ml

Graduation : 1 ml

ID No. : CY100/01

Environment : Ambient Temperature : (20 $\pm$ 3) °C

Relative Humidity : (50 $\pm$ 10) %

Air Pressure : 1011.1 mbar.

Date of Received : 26 February 2024

Date of Calibration : 02 March 2024

Date of Issue : 02 March 2024

Calibrated by : Areerat Sombun

Calibration Method : In-house method CAL-M3001 based on ASTM E 542-22

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

Electronic Balance

ID No. Cert. No. Due Date Traceability

241002 66-200388-1 02 Jun 2024

National Institute of Metrology (Thailand) (NIMT)

Approved by :

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 67-300115-11

Page : 2 of 2

Result of Calibration : This result of true Volume is referred to standard temperature at 20 °C

UUC Condition As-Received : Good

Nominal Volume (ml)	Measuring Volume (ml)
30	30.24
50	50.27

Uncertainty of measurement with in $\pm$ 0.054 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%

-o0o-



Certificate of Calibration

Certificate No. : 67-300115-11

Page : 1 of 2

Submitted by : Okla Testing & Consulting Service Co.,Ltd.

67/35-36, 3rd Floor, Petchkasem 7/1, Petchkasem Rd.,
Wathapra, Bangkok Yai, Bangkok 10600 Thailand

Equipment : Cylinder

Manufacturer : FAVORIT

Class : A

Capacity : 50 ml

Graduation : 1 ml

ID No. : CY50/01

Environment : Ambient Temperature : (20 $\pm$ 3) °C

Relative Humidity : (50 $\pm$ 10) %

Air Pressure : 1005.8 mbar.

Date of Received : 26 February 2024

Date of Calibration : 02 March 2024

Date of Issue : 02 March 2024

Calibrated by : Areerat Sombun

Calibration Method : In-house method CAL-M3001 based on ASTM E 542-22

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

Electronic Balance

ID No.	Cert. No.	Due Date	Traceability
241002	66-200388-1	02 Jun 2024	National Institute of Metrology (Thailand) (NIMT)

Approved by :

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 67-300115-13

Page : 2 of 2

Result of Calibration : This result of true Volume is referred to standard temperature at 20 °C

UUC Condition As-Received : Good

Nominal Volume (ml)	Measuring Volume (ml)
250	248.94
500	499.25

Uncertainty of measurement with in $\pm$ 0.12 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%

-o0o-

Certificate of Calibration

Certificate No. : 67-300115-13

Page : 1 of 2

Submitted by : Okla Testing & Consulting Service Co.,Ltd.

67/35-36, 3rd Floor, Petchkasem 7/1, Petchkasem Rd.,

Wathapra, Bangkok Yai, Bangkok 10600 Thailand

Equipment : Cylinder

Manufacturer : BOROSIL Class : A

Capacity : 500 ml Graduation : 5 ml

ID No. : CY500/01

Environment : Ambient Temperature : (20 ± 3) °CRelative Humidity : (50 ± 10) %

Air Pressure : 1005.7 mbar.

Date of Received : 26 February 2024

Date of Calibration : 02 March 2024

Date of Issue : 02 March 2024

Calibrated by : Areerat Sombun

Calibration Method : In-house method CAL-M3001 based on ASTM E 542-22

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

Electronic Balance

ID No. Cert. No. Due Date Traceability

241002 66-200388-1 02 Jun 2024 National Institute of Metrology (Thailand) (NIMT)

Approved by :

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 67-300115-1

Page : 2 of 2

Result of Calibration : This result of true Volume is referred to standard temperature at 20 °C

UUC Condition As-Received : Good

Delivery Time : 5.89 sec.

Nominal Volume (ml)	Measuring Volume (ml)
0.1	0.1010
0.5	0.4988
1	1.0004

Uncertainty of measurement with in $\pm$ 0.0026 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%

-oOo-



Certificate of Calibration

Certificate No. : 67-300115-1

Page : 1 of 2

Submitted by : Okla Testing & Consulting Service Co.,Ltd.

67/35-36, 3rd Floor, Petchkasem 7/1, Petchkasem Rd.,

Wathapra, Bangkok Yai, Bangkok 10600 Thailand

Equipment : Measuring Pipette

Manufacturer : GLASSCO

Class : A

Capacity : 1 ml

Graduation : 0.01 ml

ID No. : MP1/01

Environment : Ambient Temperature : (20 $\pm$ 3) °CRelative Humidity : (50 $\pm$ 10) %

Air Pressure : 1007.4 mbar.

Date of Received : 26 February 2024

Date of Calibration : 02 March 2024

Date of Issue : 02 March 2024

Calibrated by : Areerat Sombun

Calibration Method : In-house method CAL-M3001 based on ASTM E 542-22

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

Electronic Balance

ID No.

Cert. No.

Due Date

Traceability

241005

66-200388-4

02 Jun 2024

National Institute of Metrology (Thailand) (NIMT)

Approved by :

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 67-300115-2

Page : 2 of 2

Result of Calibration : This result of true Volume is referred to standard temperature at 20 °C

UUC Condition As-Received : Good

Delivery Time : 9.75 sec.

Nominal Volume (ml)	Measuring Volume (ml)
0.5	0.5023
2.5	2.4847
5	4.9835

Uncertainty of measurement with $\pm$ 0.0027 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%

-oOo-

Certificate of Calibration

Certificate No. : 67-300115-2

Page : 1 of 2

Submitted by : Okla Testing & Consulting Service Co.,Ltd.

67/35-36, 3rd Floor, Petchkasem 7/1, Petchkasem Rd.,

Wathapra, Bangkok Yai, Bangkok 10600 Thailand

Equipment : Measuring Pipette

Manufacturer : GLASSCO

Class : A

Capacity : 5 ml

Graduation : 0.05 ml

ID No. : MP5/01

Environment : Ambient Temperature : (20 $\pm$ 3) °CRelative Humidity : (50 $\pm$ 10) %

Air Pressure : 1007.4 mbar.

Date of Received : 26 February 2024

Date of Calibration : 02 March 2024

Date of Issue : 02 March 2024

Calibrated by : Areerat Sombun

Calibration Method : In-house method CAL-M3001 based on ASTM E 542-22

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

Electronic Balance

ID No. : 241005

Cert. No. : 66-200388-4

Due Date : 02 Jun 2024

Traceability

National Institute of Metrology (Thailand) (NIMT)

Approved by :

Supervisor



Certificate of Calibration

Certificate No. : 67-300115-3

Page : 2 of 2

Result of Calibration : This result of true Volume is referred to standard temperature at 20 °C

UUC Condition As-Received : Good

Delivery Time : 11.11 sec.

Nominal Volume (ml)	Measuring Volume (ml)
1	1.0010
5	4.9790
10	9.9759

Uncertainty of measurement with in $\pm$ 0.0039 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%

- o O o -

Certificate of Calibration

Certificate No. : 67-300115-3

Page : 1 of 2

Submitted by : Okla Testing & Consulting Service Co.,Ltd.

67/35-36, 3rd Floor, Petekkasem 7/1, Petekkasem Rd.,

Wattapra, Bangkok Yai, Bangkok 10600 Thailand

Equipment : Measuring Pipette

Manufacturer : GLASSCO Class : A

Capacity : 10 ml Graduation : 0.1 ml

ID No. : MP10/01

Environment : Ambient Temperature : (20 $\pm$ 3) °CRelative Humidity : (50 $\pm$ 10) %

Air Pressure : 1007.2 mbar.

Date of Received : 26 February 2024

Date of Calibration : 02 March 2024

Date of Issue : 02 March 2024

Calibrated by : Arcerat Sombun

Calibration Method : In-house method CAL-M3001 based on ASTM E 542-22

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

Electronic Balance

Traceability

ID No. Cert.No. Due Date

241005 66-200388-4 02 Jun 2024 National Institute of Metrology (Thailand) (NIMT)

Approved by :

Supervisor

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Certificate of Calibration

Certificate No. : 67-300115-6 Page : 2 of 2

Result of Calibration : This result of true Volume is referred to standard temperature at 20 °C

UUC Condition As-Received : Good

Delivery Time : 15.28 sec.

Nominal Volume (ml)	Measuring Volume (ml)
20	20.0063

Uncertainty of measurement with in $\pm$ 0.0064 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%

- oDo -



Certificate of Calibration

Certificate No. : 67-300115-6 Page : 1 of 2

Submitted by : Okla Testing & Consulting Service Co.,Ltd.

67/35-36, 3rd Floor, Petchkasem 7/1, Petchkasem Rd.,
Wathapra, Bangkok Yai, Bangkok 10600 Thailand

Equipment : Volumetric Pipette
Manufacturer : GLASSCO
Capacity : 20 ml
ID No. : VP20/01
Class : A

Environment : Ambient Temperature : (20 ± 3) °C
Relative Humidity : (50 ± 10) %
Air Pressure : 1007.6 mbar.

Date of Received : 26 February 2024

Date of Calibration : 02 March 2024

Date of Issue : 02 March 2024

Calibrated by : Arcerat Sombun

Calibration Method : In-house method CAL-M3001 based on ASTM E 542-22

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

Electronic Balance

ID No.	Cert. No.	Due Date	Traceability
241005	66-200388-4	02 Jun 2024	National Institute of Metrology (Thailand) (NIMT)



Approved by

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 67-300115-8

Page : 2 of 2

Result of Calibration : This result of true Volume is referred to standard temperature at 20 °C

UUC Condition As-Received : Good

Nominal Volume (ml)	Measuring Volume (ml)
100	99.983

Uncertainty of measurement with in $\pm$ 0.018 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%

-o0o-



Certificate of Calibration

Certificate No. : 67-300115-8

Page : 1 of 2

Submitted by : Okla Testing & Consulting Service Co.,Ltd.

67/35-36, 3rd Floor, Petchkasem 7/1, Petchkasem Rd.,
Wathapra, Bangkok Yai, Bangkok 10600 Thailand

Equipment : Volumetric Flask
Manufacturer : SCI
Capacity : 100 ml
ID No. : VF100/01
Class : A

Environment :
Ambient Temperature : (20 ± 3) °C
Relative Humidity : (50 ± 10) %
Air Pressure : 1005.8 mbar.

Date of Received : 26 February 2024

Date of Calibration : 02 March 2024

Date of Issue : 02 March 2024

Calibrated by : Areearat Sonbun

Calibration Method : In-house method CAL-M3001 based on ASTM E 542-22

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

Electronic Balance

ID No.	Cert. No.	Due Date	Traceability
241005	66-200388-4	02 Jun 2024	National Institute of Metrology (Thailand) (NIMT)

Approved by

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 67-300115-9

Page : 2 of 2

Result of Calibration : This result of true Volume is referred to standard temperature at 20 °C

UUC Condition As-Received : Good

Nominal Volume (ml)	Measuring Volume (ml)
500	499.92

Uncertainty of measurement with in $\pm$ 0.075 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%

- o0o -

Certificate of Calibration

Certificate No. : 67-300115-9

Page : 1 of 2

Submitted by : Okla Testing & Consulting Service Co.,Ltd.

67/35-36, 3rd Floor, Petchkasem 7/1, Petchkasem Rd.,

Wathapra, Bangkok Yai, Bangkok 10600 Thailand

Equipment : Volumetric Flask

Manufacturer : BOROSIL

Class : A

Capacity : 500 ml

ID No. : VF500/01

Environment : Ambient Temperature : (20 $\pm$ 3) °C

Relative Humidity : (50 $\pm$ 10) %

Air Pressure : 1006.0 mbar.

Date of Received : 26 February 2024

Date of Calibration : 02 March 2024

Date of Issue : 02 March 2024

Calibrated by : Areerat Sombun

Calibration Method : In-house method CAL-M3001 based on ASTM E 542-22

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

Electronic Balance

ID No. : 241002

Cert. No. : 66-200388-1

Due Date : 02 Jun 2024

Traceability

National Institute of Metrology (Thailand) (NIMT)

Approved by :

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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