

ภาคผนวก จ

สำเนาเอกสารรับรองเครื่องมือการตรวจวัด



## Certificate of Calibration

Certificate No. : 65-400499-1 Page : 1 of 2

Submitted by : M Green Group Co., Ltd.

188/46 Wisutesukhakhon 25, Pracha-Utd Rd., Thungkru Bangkok 10140 Thailand

Equipment : Air Chamber (Refrigerator)

Manufacturer : Biobase

Model : BXC-V250M (II)

Resolution : 0.1 °C

Range : N/A °C

Serial No. : YC025025190108

ID No. : N/A

Environment : On site calibration was carried out at the Laboratory, M Green Group Co., Ltd.

Ambient Temperature : (30.0 to 31.0) °C

Relative Humidity : (45 to 50) %

Line Voltage : (229.0 to 232.0) V

Date of Received : 21 September 2022

Date of Calibration : 21 September 2022

Date of Issue : 23 September 2022

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.

Traceability

400029 &amp; 400032

Due Date

National Institute of Metrology Thailand (NIMT)

25 Nov 2022

Approved

( Bunyerd Mastri )

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

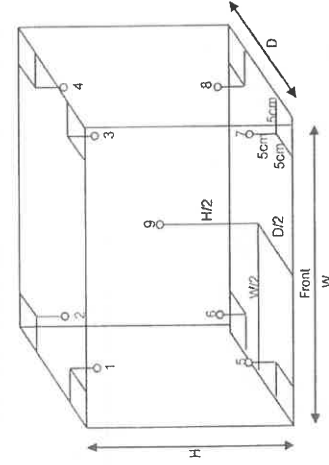
Certificate No. : 65-400499-1 Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

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



Inside of Chamber

W = 0.50 m

D = 0.40 m

H = 1.20 m

Capacity = 0.24 m<sup>3</sup>

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	
4.0	2.0	2.0	3.9	4.8	5.2	5.0	5.2	4.7	5.2	4.1	5.1	0.75

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured		Measured		Measured		Overall Variation (°C)
			Uniformity (°C)	Stability (°C)	Uniformity (°C)	Stability (°C)	Uniformity (°C)	Stability (°C)	
4.0	2.0	2.0	1.6	0.3	1.6	0.3	1.6	0.3	1.9

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

Certificate No. : 65-400499-2 Page : 1 of 2

Submitted by :

M Green Group Co., Ltd.

188/46 Wisutesukhakdon 25, Pracha-Utd Rd., Thungkru Bangkok 10140 Thailand

Equipment :

Air Chamber (Oven)

Manufacturer : Memmert

Model : UF110

Range : N/A °C

Resolution : 0.1 °C

Serial No. : B419.1092

ID No. : N/A

Environment :

On site calibration was carried out at the Laboratory, M Green Group Co., Ltd.

Ambient Temperature :

(30.0 to 31.0) °C

Relative Humidity :

(45 to 50) %

Line Voltage :

(229.0 to 232.0) V

Date of Received :

21 September 2022

Date of Calibration :

21 September 2022

Date of Issue :

23 September 2022

Calibrated by :

Pernpon 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.

Traceability

400029 &amp; 400030

65-400272-1

Due Date

24 Nov 2022

National Institute of Metrology Thailand (NIMT)

Approved

( Bunjerd Masri )

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

Certificate No. : 65-400499-2

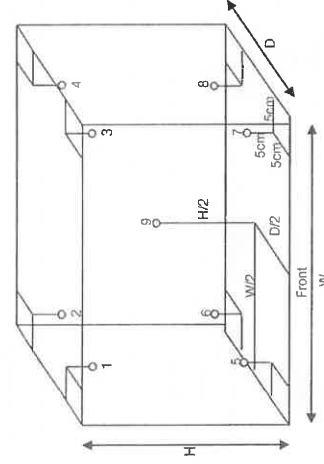
Page : 2 of 2

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 = 0.56 m  
 D = 0.40 m  
 H = 0.48 m  
 Capacity = 0.11 m<sup>3</sup>

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	104.0	104.0	103.8	103.4	104.6	104.0	104.1	103.8	104.2	103.4	104.1	0.71
180.0	180.0	180.0	179.5	179.1	181.4	179.9	180.3	179.5	181.0	179.0	180.3	0.96

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Uniformity (°C)		Measured Stability (°C)		Overall Variation (°C)
104.0	104.0	104.0	0.8		0.2		1.4
180.0	180.0	180.0	1.4		0.3		2.7

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

Certificate No. : 65-400499-3 Page : 1 of 2

Submitted by : M Green Group Co., Ltd.

188/46 Wisatsukthakhon 25, Pracha-Utd Rd., Thungkru Bangkok 10140 Thailand

Equipment : Water Bath

Manufacturer : Memmert

Model : WNB29

Range : N/A °C

Resolution : 0.1 °C

Serial No. : L619.0037

ID No. : N/A

Environment : On site calibration was carried out at the Laboratory, M Green Group Co., Ltd.

Ambient Temperature : (30.0 to 31.0) °C

Relative Humidity : (45 to 50) %

Line Voltage : (229.0 to 232.0) V

Date of Received : 21 September 2022

Date of Calibration : 21 September 2022

Date of Issue : 23 September 2022

Calibrated by : Permpon Chianpu

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 &amp; 400031 65-400273-1 23 Nov 2022 National Institute of Metrology Thailand (NIMT)

The Uncertainties are for a confidence probability of approximately 95%

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Approved

(Bunjerd Masri)

Supervisor

## Certificate of Calibration

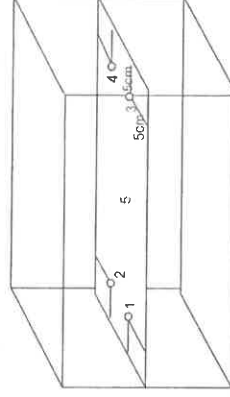
Certificate No. : 65-400499-3

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) @					Uncertainty (± °C)	Measured Uniformity (°C)	Measured Stability (°C)
			Sensor No.							
85.0	85.0	85.0	1	2	3	4	5	0.19	0.25	0.06
			84.65	84.57	84.77	84.70	84.74			

**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%

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## Certificate of Calibration

Certificate No. : 65-410112-1

Page : 1 of 2

Submitted by :

M Green Group Co., Ltd.

188/46 Wisetankhakhon 25, Pracha-Utd Rd.,

Thungkru, Bangkok 10140 Thailand

Equipment :

Digital Thermo-Hygrometer

Manufacturer : Digicon

Model : TH-02A

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

Range Humidity : 20 %R.H. to 99 %R.H. Resolution : 1 %R.H.

Serial No. : 1819A0771796 ID No. : N/A

Environment :

Ambient Temperature : (23 ± 2) °C

Relative Humidity : (50 ± 15) %

Date of Received : 21 September 2022

Date of Calibration : 22 September to 24 September 2022

Date of Issue : 24 September 2022

Calibrated by :

Chortip Samchusri

**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&amp;Hum

ID No. Cert.No. Due Date Traceability

400034 &amp; 400035 SG-H-00713/65 07 Jan 2023

Success Gateway Co., Ltd., Accredited by TISI Calibration No.0268

Approved by

(Bunjerd Mastr)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

Certificate No. : 65-410112-1

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)
20.04	19.8	0.2	0.46
24.99	24.7	0.3	0.46
30.03	29.7	0.3	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.)
40.00	39	1	2.2
60.01	58	2	2.3

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%

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## Certificate of Calibration

Certificate No. : 65-200300-1

Page : 1 of 2

Submitted by :

M Green Group Co., Ltd.

188/46 Wisetuknakhon 25, Pracha-Utd Rd., Thungkru, Bangkok 10140 Thailand

Equipment :

Electronic Balance

Manufacturer : SHIMADZU

Model : AP225WD

Serial No. : D316300690

Capacity : 220 g

Resolution : 0.00001g/102g, 0.0001g/220g

Environment :

On site calibration was carried out at the Laboratory, M Green Group Co., Ltd.

Ambient Temperature : (26.1 to 26.3) °C

Relative Humidity : (62.1 to 64.5) %

Air Pressure : 1007.0 mbar

Date of Received :

21 September 2022

Date of Calibration :

21 September 2022

Date of Issue :

24 September 2022

Calibrated by :

Akaradath Thippichai

Calibration Method :

In-house method CAL-M2001 based on UKAS Publication ref : LAB 14

Edition 5, July 2015

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

Standard Weights

ID No.	Cert. No.	Due Date	Traceability
E261-E2624	C02213103	18 Nov 2022	National Institute of Metrology (Thailand), (NIMT)

Approved by :

( Surachai Promthong )  
Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

Certificate No. : 65-200300-1

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)
0.001	0.00001	0.000012
0.01	0.00000	0.000014
0.1	0.00001	0.000018
1	0.00000	0.000026
10	0.00000	0.000053
20	-0.00001	0.000071
50	0.00001	0.00011
100	-0.00008	0.00020
150	-0.0001	0.00038
200	-0.0001	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  $k = 2.15$ , providing a level of confidence of approximately 95%

Eccentric error

Load test : 50 g

A	B	C	D	E
0.00001	0.00006	0.00004	-0.00006	0.00000



Repeatability

Load test : 200 g

Sidev. : 0.000053 g

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## Certificate of Calibration

**Certificate No. :** 65-400503-1 **Page : 1 of 2**

**Submitted by :** M Green Group Co., Ltd.  
188/46 Wisatuknaknon 25, Prachin-Utd Rd.,  
Thungkru, Bangkok 10140 Thailand

**Equipment :** Liquid in Glass Thermometer  
**Manufacturer :** N/A **Model :** N/A  
**Range :** 0 °C to 100 °C **Resolution :** 1 °C  
**Serial No. :** N/A **Immersion :** Total  
**ID No. :** 94-49747

**Environment :**  
**Ambient Temperature :** (23 ± 2) °C  
**Relative Humidity :** (50 ± 15) %  
**Line Voltage :** (220 ± 22) VAC

**Date of Received :** 21 September 2022  
**Date of Calibration :** 23 September to 26 September 2022  
**Date of Issue :** 26 September 2022  
**Calibrated by :** Chortip Samchusri

**Calibration Method :** This instrument was calibrated by In-house method comparison technique CAL-M4001 based on ASTM E77-07 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	Traceability
400001	TT-0016-22	07 Feb 2024	National Institute of Metrology Thailand (NIMT)

2. Standard Digital Thermometer

ID No.	Cert. No.	Due Date	Traceability
400003	21E1850	14 Jun 2023	National Institute of Metrology Thailand (NIMT)
400004	21E1850	14 Jun 2023	National Institute of Metrology Thailand (NIMT)

Approved by  
( Bunjerd Masri )  
Supervisor

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

**Certificate No. :** 65-400503-1 **Page : 2 of 2**

**Result of Calibration :** Without Adjustment

**UUC Condition As-Received :** Good

**Function :** Temperature measurement

Ice point check : UUC\* reading 0 °C Standard reading 0.0327 °C

Standard Reading ( °C )	UUC Reading ( °C )	Correction ( °C )	Uncertainty ( ± °C )
39.7131	40	-0.3	0.31

### 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%

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## Certificate of Calibration

Certificate No. : 65-420076-1 Page : 1 of 2

Submitted by : M Green Group Co.,Ltd.

188/46 Wisatsukhakhon 25, Pracha-Ud Rd., Thungkru Bangkok 10140 Thailand

Equipment : pH Meter with electrode  
pH meterManufacturer : Eutech Model : pH 700  
Range : N/A pH Resolution : 0.01 pH  
Serial No. : 2884323 ID No. : N/AElectrode  
Model : N/A Serial No. : 40417

Environment : On site calibration was carried out at the Laboratory, M Green Group Co.,Ltd.

Ambient Temperature : (25.4 to 26.0)°C  
Relative Humidity : (56 to 60) %Date of Received : 21 September 2022  
Date of Calibration : 21 September 2022  
Date of Issue : 24 September 2022  
Calibrated by : Bunjerd Masri

Calibration Method : In-house method CAL-M4201 direct measurement by using standard voltage calibration and using certified reference material (CRM)


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

## 1. Multiproduct Calibrator

ID No.	Cert. No.	Due Date	Traceability
400005	SG-E-00473/64	27 Aug 2023	National Institute of Metrology Thailand (NIMT)

## 2. Standard Buffer Solution

pH	Cert. No.	Lot No.	Exp. Date	Traceability
4.008	61235182	795894	14 Feb 2024	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
6.985	61243095	809356	21 Apr 2023	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
10.008	61244986	795895	25 Feb 2023	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025

Approved by :   
( Bunjerd Masri )  
Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

Certificate No. : 65-420076-1 Page : 2 of 2

Result of Calibration :

UUC Condition As-Received : Good

Function : Electrical measurement  
pH meter

Performing standard curve by Multiproduct Calibrator at pH (4,7,10)

Adjustment Curve at nominal pH	Applied Voltage ( mV )	Nominal Value ( pH )	UUC Reading		Correction ( mV )	Uncertainty ( ± mV )
			( pH )	( mV )		
4, 7, 10	177.4800	4	4.00	177.5	0.0	0.12
	0.0000	7	7.00	0.1	-0.1	0.086
	-177.4800	10	10.00	-177.4	-0.1	0.12

Function : pH meter with electrode

Performing a three - buffer standard curve using buffer nominal pH (4,7,10)

Adjustment Curve at nominal pH	Standard Buffer ( pH )	UUC Reading		Correction ( pH )	Uncertainty ( ± pH )
		( pH )	( mV )		
4, 7, 10	4.008	4.01	0.00	0.00	0.010
	6.985	7.00	-0.01	0.011	0.011
	10.008	10.01	0.00	0.014	0.014

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%

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## Certificate of Calibration

Certificate No. : 65-400500-1

Page : 1 of 2

Submitted by :

M Green Group Co.,Ltd.

188/46 Wisatusukhakhon 25, Pracha-Uttid Rd., Thungkru Bangkok 10140 Thailand

Equipment :

Digital Thermometer with Thermistor probe

Temperature Indicator

Manufacturer : Eutech  
Range : N/A °C  
Serial No. : 2884323  
Model : pH 700  
Resolution : 0.1 °C  
ID No. : N/A

Thermistor probe

Model : N/A  
Diameter : 3.2 mm.  
Serial No. : PHSTEMB01P  
Sheath Material : Stainless  
Length : 100 mm.  
ID No. : N/A

Environment :

On site calibration was carried out at the Laboratory, M Green Group Co.,Ltd.

Ambient Temperature : (25.4 to 26.0) °C  
Relative Humidity : (56 to 60) %  
Line Voltage : (224.0 to 225.2) VAC

Date of Received : 21 September 2022

Date of Calibration : 21 September 2022

Date of Issue : 24 September 2022

Calibrated by : Bunjerd Masri

**Calibration Method :** This instrument was calibrated by In-house method comparison technique CAL-M4003 by compared with PRT in the dry-well calibrator 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 Traceability

400002 TT-0074-22 20 Jun 2024 National Institute of Metrology Thailand (NIMT)

2. Standard Digital Thermometer

ID No. Cert. No. Due Date Traceability

400033 22E569 22 Feb 2024 National Institute of Metrology Thailand (NIMT)

Approved by

( Bunjerd Masri )

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

Certificate No. : 65-400500-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

Immersion Depth ( mm. )	Standard Reading ( °C )	UUC Reading ( °C )	Correction ( °C )	Uncertainty ( ± °C )
100	25.004	24.9	0.1	0.19

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%

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## Certificate of Calibration

Certificate No. : 65-300541-1

Submitted by : M Green Group Co.,Ltd.

188/46 Wisatesuknakhon 25, Pracha-Utd Rd., Thungkru, Bangkok 10140 Thailand

Equipment : Volumetric Flask

Manufacturer : GLASSCO

Class : A

Capacity : 100 ml

ID No. : VF100/01/19

Environment : Ambient Temperature : (23 ± 2) °C

Relative Humidity : (50 ± 15) %

Air Pressure : 1007.5 mbar.

Date of Received : 21 September 2022

Date of Calibration : 26 September 2022

Date of Issue : 26 September 2022

Calibrated by : Areerat 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.	Cert. No.	Due Date	Traceability
241005	65-200172-4	02 Dec 2022	National Institute of Metrology (Thailand) (NIMT)

Approved by:

( Wipa Tovadee )  
Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

Certificate No. : 65-300541-1

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	100.081

Uncertainty of measurement with in ± 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%

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## Certificate of Calibration

Certificate No. : 65-300541-2

Page : 1 of 2

Submitted by :

M Green Group Co.,Ltd.

188/46 Wisetuknakhon 25, Pracha-Utd Rd., Thungkru, Bangkok 10140 Thailand

Equipment :

Volumetric Flask

Manufacturer : GLASSCO

Class : A

Capacity : 250 ml

ID No. : VF250/01/19

Environment :

Ambient Temperature : (23 ± 2) °C

Relative Humidity : (50 ± 15) %

Air Pressure : 1007.4 mbar.

Date of Received : 21 September 2022

Date of Calibration : 26 September 2022

Date of Issue : 26 September 2022

Calibrated by : Areerat 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.	Cert. No.	Due Date	Traceability
241002	65-200172-1	02 Dec 2022	National Institute of Metrology (Thailand) (NIMT)

Approved by :

( Wipa Tovadee )

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

Certificate No. : 65-300541-2

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

Nominal Volume ( ml )	Measuring Volume ( ml )
250	250.11

Uncertainty of measurement with in ± 0.049 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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## Certificate of Calibration

**Certificate No. :** 65-300541-3 **Page : 1 of 2**

**Submitted by :** M Green Group Co.,Ltd.  
188/46 Wisutesulakchon 25, Pracha-Uitd Rd., Thungkru, Bangkok 10140 Thailand

**Equipment :** Volumetric Flask  
**Manufacturer :** GLASSCO **Class :** A  
**Capacity :** 1000 ml  
**ID No. :** VF1000/01/19

**Environment :** **Ambient Temperature :**  $(23 \pm 2)$  °C  
**Relative Humidity :**  $(50 \pm 15)$  %  
**Air Pressure :** 1007.4 mbar.

**Date of Received :** 21 September 2022  
**Date of Calibration :** 26 September 2022  
**Date of Issue :** 26 September 2022  
**Calibrated by :** Areerat 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.	Cert.No.	Due Date	Traceability
241002	65-200172-1	02 Dec 2022	National Institute of Metrology (Thailand) (NIMT)

**Approved by :** [Redacted]  
( Wipa Tovadee )  
Supervisor

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

**Certificate No. :** 65-300541-3 **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

Nominal Volume ( ml )	Measuring Volume ( ml )
1000	1000.47

Uncertainty of measurement with in  $\pm$  0.14 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. : 65-300541-4

Page : 1 of 2

Submitted by : M Green Group Co.,Ltd.

188/46 Wisutesuknakhon 25, Pracha-Utd Rd., Thungkru, Bangkok 10140 Thailand

Equipment :

Cylinder

Manufacturer : GLASSCO

Class : A

Capacity : 250 ml

Graduation : 2 ml

ID No. : CY250/01/19

Environment :

Ambient Temperature :  $(23 \pm 2)$  °CRelative Humidity :  $(50 \pm 15)$  %

Air Pressure : 1007.4 mbar.

Date of Received : 21 September 2022

Date of Calibration : 26 September 2022

Date of Issue : 26 September 2022

Calibrated by : Areerat 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. Cert. No. Due Date

241002 65-200172-1 02 Dec 2022

Traceability

National Institute of Metrology (Thailand) (NIMT)

Approved by:

( Wipa Towadee )

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.



## Certificate of Calibration

Certificate No. : 65-300541-4

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 )
150	151.08
250	251.34

Uncertainty of measurement with in  $\pm$  0.087 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-



NSC-TSI-TIS17025  
CALIBRATION 0030

## Certificate of Calibration

Certificate No. : 65-300541-5 Page : 1 of 2

Submitted by : M Green Group Co.,Ltd.

188/46 Wisatesuknakhon 25, Pracha-Utd Rd., Thungkru, Bangkok 10140 Thailand

Equipment : Measuring Pipette

Manufacturer : GLASSCO Class : A

Capacity : 10 ml Graduation : 0.1 ml

ID No. : MP10001/19

Environment : Ambient Temperature :  $(23 \pm 2)$  °CRelative Humidity :  $(50 \pm 15)$  %

Air Pressure : 1002.7 mbar.

Date of Received : 21 September 2022

Date of Calibration : 26 September 2022

Date of Issue : 26 September 2022

Calibrated by : Areerat 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. Cert. No. Due Date Traceability

241005 65-200172-4 02 Dec 2022 National Institute of Metrology (Thailand) (NIMT)

Approved by :

( Wipa Tovadee )  
Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

Certificate No. : 65-300541-5 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 : 12.14 sec.

Nominal Volume ( ml )	Measuring Volume ( ml )
2	1.9942
5	4.9827
10	9.9888

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%

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## Certificate of Calibration

Certificate No. : 65-300541-6

Submitted by : M Green Group Co.,Ltd.

188/46 Wisatsuknakhon 25, Pracha-Utd Rd., Thungkru, Bangkok 10140 Thailand

Page : 1 of 2

Equipment : Measuring Pipette

Manufacturer : GLASSCO Class : A

Capacity : 25 ml Graduation : 0.1 ml

ID No. : MP25/01/19

Environment : Ambient Temperature : (23 ± 2) °C

Relative Humidity : (50 ± 15) %

Air Pressure : 1002.7 mbar.

Date of Received : 21 September 2022

Date of Calibration : 26 September 2022

Date of Issue : 26 September 2022

Calibrated by : Areerat 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.	Cert.No.	Due Date	Traceability
241005	65-200172-4	02 Dec 2022	National Institute of Metrology (Thailand) (NIMT)

Approved by :

( Wipa Tovadee )

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

Certificate No. : 65-300541-6

Result of Calibration :

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

UUC Condition As-Received : Good

Delivery Time : 12.14 sec.

Nominal Volume ( ml )	Measuring Volume ( ml )
5	5.0254
15	15.0847
25	25.0413

Uncertainty of measurement with in ± 0.0067 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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## Certificate of Calibration

Certificate No. : 65-210457-1 Page : 1 of 2

Submitted by : M Green Group Co., Ltd.

188/46 Wisakunakhon25, Pracha-Utd Rd., Thungkru, Bangkok 10140 Thailand

Equipment : Weight  
 Manufacturer : N/A Material : Stainless Steel  
 Weight size : 1 g

ID No. : 63-210391-1

Assumed density of weight : 7950 kg / m<sup>3</sup>Assumed Air density : 1.2 kg / m<sup>3</sup>

Environment : Ambient Temperature : (20 ± 2) °C

Relative Humidity : (50 ± 10) %

Air Pressure : 1001.1 mbar

Date of Received : 21 September 2022

Date of Calibration : 28 September 2022

Date of Issue : 28 September 2022

Calibrated by : Wuttichai Swatphong

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)

The Uncertainties are for a confidence probability of approximately 95%

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Approved by : ( Surachai Promthong )  
 Laboratory Manager



## Certificate of Calibration

Certificate No. : 65-210457-1 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	1 g	none	1 g -0.016 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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## Certificate of Calibration

Certificate No. : 65-210457-2 Page : 1 of 2

Submitted by : M Green Group Co., Ltd.  
188/46 Wiassuknakon25, Pracha-Utd Rd., Thungkru, Bangkok 10140 Thailand

Equipment : Weight  
Material : Stainless Steel

Manufacturer : N/A  
Weight size : 100 g  
ID No. : 63-210391-2  
Assumed density of weight : 7950 kg / m<sup>3</sup>  
Assumed Air density : 1.2 kg / m<sup>3</sup>  
Ambient Temperature : (20 ± 2) °C  
Relative Humidity : (50 ± 10) %  
Air Pressure : 1001.8 mbar

Date of Received : 21 September 2022  
Date of Calibration : 28 September 2022  
Date of Issue : 28 September 2022  
Calibrated by : Wuttichai Swatphong  
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 : ( Surachai Promthong )  
Laboratory Manager

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

Certificate No. : 65-210457-2

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

No.	Nominal Value	Idt. Mark	Conventional mass Value	Measuring Uncertainty
1	100 g	none	100 g -0.17 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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## Certificate of Calibration

Certificate No. : 65-210457-3 Page : 1 of 2

Submitted by : M Green Group Co., Ltd.  
188/46 Wisasuknakhon25, Pracha-Utd Rd., Thungkru, Bangkok 10140 Thailand

Equipment : Weight  
Material : Stainless Steel

Manufacturer : N/A

Weight size : 200 g

ID No. : 63-210391-3

Assumed density of weight : 7950 kg / m<sup>3</sup>

Assumed Air density : 1.2 kg / m<sup>3</sup>

Ambient Temperature : ( 20 ± 2 ) °C

Relative Humidity : ( 50 ± 10 ) %

Air Pressure : 1001.8 mbar

Date of Received : 21 September 2022

Date of Calibration : 28 September 2022

Date of Issue : 28 September 2022

Calibrated by : Wuttichai Swatphong

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

ID.No.  
E221-E2210

Cert.No.  
MM-0042-22

Due Date  
21 Mar 2025

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

Approved by :  
( Surachai Promthong )  
Laboratory Manager



The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

Certificate No. : 65-210457-3 Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

No.	Nominal Value	Idt.Mark	Conventional mass Value	Measuring Uncertainty
1	200 g	none	200 g +0.09 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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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
53/44 PATTANAKARN ROAD SOI 18, SUANLIANG, SUANLIANG BANGKOK 10250  
TEL. 0-2717-3000-27 FAX. 0-2719-9484



MSC-78817657025  
CALIBRATION 0406

Cert.No.: 22CH120  
Page.: 1 of 3

## Certificate of Calibration

Equipment : Conductivity Meter

Manufacturer : TOA DKK

Model : CM-41X

Serial No. : 842572

ID No. : EQL-211

Condition As-Received: Used Item

Received Date : 24 January 2022

Calibration Date : 26 January 2022

Reference : 2201-0646DN-1

Submitted by :  
TEST TECH CO.,LTD (HEAD Office)  
30,32 Rama II Soi 63, Rama II Rd.,  
Samaedam, Bangkhunthian, Bangkok 10150

Ambient Temperature : (25 ± 2.5) °C

Relative Humidity : (50 ± 15) %

Calibration Procedure: In-house method:

- CP-CH6 by direct measurement with certified reference material (CRM)
- CP-CH8 by comparison with standard thermometer

Calibrated by : Warakorn Lemgagtrakul

Approved by :

( ) Malee Bulkruea  
( ) Sathip Meangmai  
( ) Warakorn Lemgagtrakul

Issue Date :

3 February 2022

The Uncertainties are for a confidence probability of approximately 95 %

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Cert.No.: 22CH120  
Page.: 2 of 3

### Condition of this result of calibration

#### 1. Reference Standard Instrument :

Instrument	Serial No.	ID No.	Certificate No.	Due date
1) Thermometer	1963878	130RC095	211977	17 Sep 2022
2) Ref. Std. Thermometer	4982054	110RC044	2111201	26 Oct 2022

This certification is traceable to the International System of Unit maintained at:-

- Traceable to National Institute of Metrology (Thailand), NIMT

#### 2. Certified Reference Materials :-

- Conductivity calibration solution, CPA chem Ltd., The measurement results are traceable to SI through CPA chem Ltd., ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Conductivity Solution	Manufacturer	Lot No.	Exp. date
147.0 µS/cm	CPA Chem	761020	02 Aug 2022
1.413 mS/cm	CPA Chem	761021	02 Aug 2022
12.8806 mS/cm	CPA Chem	754037	28 June 2022

- Control Conductivity calibration solution temperature by Water bath (25±0.1) °C

3. This certificate is valid only to the item calibrated on date and place of calibration.

### Calibration results

#### Function : Conductivity Measurement

(\*) After Adjustment at 147.0, 1413.0, 12880.6 µS/cm  
Conductivity Electrode Serial No.: 806F0005

Standard Conductivity Solution	Before Adjustment UUC* Reading	After Adjustment UUC* Reading	Uncertainty of Measurement (±)	Coverage factor k
147.0 µS/cm	149.1 µS/cm	146.9 µS/cm	0.99 µS/cm	2.00
1.413 mS/cm	1.424 mS/cm	1.413 mS/cm	0.0092 mS/cm	2.00
12.8806 mS/cm	12.81 mS/cm	12.88 mS/cm	0.086 mS/cm	2.00

#### Remark

- UUC\* = Unit Under Calibration
- 147.0 µS/cm Adjustment Cell constant = 98.4m<sup>-1</sup>
- 1.413 mS/cm Adjustment Cell constant = 99.2m<sup>-1</sup>
- 12.8806 mS/cm Adjustment Cell constant = 100.7m<sup>-1</sup>

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Cert.No.: 22CH120  
Page.: 3 of 3

**Calibration Results**

**Function : Temperature Measurement**

**(\*) Without adjustment**

This equipment was connected with Temperature Probe;

- Model : CT-58101B  
- Serial No. 806F0005

Dimension of probe;

- Length : 114 mm.  
- Diameter : 12 mm.  
- Immersion Depth : 100 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement ( $\pm$ °C)	Coverage factor $k$
25.0	25.003	25.1	0.097	0.13	2.00

**Remark : - 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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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
53/44 PATTANAKARN ROAD SOI 18, SUANLUANG, BANGKOK 10250  
TEL. 0-2717-3000-24 FAX. 0-2719-9484



## Certificate of Calibration

Certificate No. : 22H2197  
Page : 1 of 2

Equipment : Dial Thermo-Hygrometer  
Manufacturer: Barigo  
Model :  
Serial No.:  
ID No.: EQL-084  
Condition As-Received: Used Item  
Received Date: 17 October 2022  
Calibration Date: 25 October 2022  
Reference: 2210-0461DN  
Ambient Temperature: ( 25 ± 3 ) °C  
Relative Humidity: ( 50 ± 20 ) %

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.

Submitted by: TEST TECH CO.,LTD. (HEAD Office)  
30, 32 Rama II Sol 63, Rama II Rd.,  
Samaedam, Bangkhuntian, Bangkok 10150

Procedure used: Calibration were conducted using in-house calibration procedure CP-H02 according to comparison  
with standard chilled mirror sensor for humidity measurement function and comparison with standard  
temperature probe for temperature measurement function into humidity / temperature chamber.

### Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Chilled-Mirror Hygrometer	Dew Master	41282	19848	03 Nov 2022
2) Handheld Thermometer With Sensor	1523	3240076	221248	02 Mar 2023

2.The 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 maintained at:-  
-National Institute of Standards and Technology (NIST) , The United States of America  
-National Institute of Metrology Thailand (NIMT)

Calibrated by : Surasil Phansudnoi  
Issue Date : 01 November 2022

Approved Signatory :

[✓] Chakrit Waewanjua  
[ ] Pornthippa Tameyakul  
[ ] Viporn Tantiyawutti



Cert. No.: 22H2197  
Page.: 2 of 2

Result of Calibration:-			
Function:			
Humidity measurement:			
Without Adjustment			
Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)
25.0	30.1	29.0	-1.1
25.0	40.1	39.0	-1.1
25.0	50.1	50.0	-0.1
25.0	60.0	61.0	1.0
25.0	75.2	76.5	1.3
UUC* of Measurement (±%R.H.)			Uncertainty (±%R.H.)
			1.5
			1.5
			1.7
			1.7

Result of Calibration:-			
Function:			
Temperature measurement:			
Without Adjustment			
Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
15.013	15.0	-0.013	0.72
20.023	20.0	-0.023	0.72
25.019	25.0	-0.019	0.72
30.009	30.0	-0.009	0.72

UUC\* : Unit Under Calibration

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

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QUALITY CALIBRATION CO., LTD.  
235 Petchkasem 63/2 Road, Laksong, Bangkok 10160  
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4384  
www.qcalibration.com




CERTIFICATE No : 22M9915  
REFERENCE No : 66549-2

PAGE : 1 OF 2

## Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE  
MANUFACTURER : SARTORIUS  
MODEL : BP210S  
SERIAL No : S0736477  
ID No : EQL-008  
CONDITION AS RECEIVED : USED ITEM  
SUBMITTED BY : TEST TECH CO., LTD.  
30,32 RAMA II SOI 63, RAMA II RD.,  
SAMAEDAM, BANGKHUNTHIAN, BANGKOK  
10150

CALIBRATED BY : PRASERT P.  
CALIBRATION DATE : 15-Sep-22  
APPROVED BY :   
ISSUED DATE : 21-Sep-22  
RECEIVED DATE : 15-Sep-22

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF  
QUALITY CALIBRATION CO., LTD.



QUALITY CALIBRATION CO., LTD.  
235 Petchkasem 63/2 Road, Laksong, Bangkok 10160  
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4384  
www.qcalibration.com

CERTIFICATE No : 22M9915

PAGE : 2 OF 2

## Calibration Report

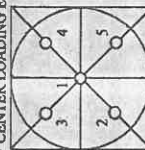
EQUIPMENT : DIGITAL BALANCE  
MANUFACTURER : SARTORIUS  
ID No : EQL-008  
MODEL : BP210S  
SN : S0736477  
RECEIVED DATE : 15-Sep-22  
CALIBRATION DATE : 15-Sep-22  
RELATIVE HUMIDITY : 51 %RH ± 10 % RH  
CONDITION OF THIS RESULTS OF CALIBRATION  
1. THIS INSTRUMENT WAS CALIBRATED BY ACCORDING TO UKAS LAB 14 EDITION 62019 BY USING KNOWN WEIGHT  
STANDARD WEIGHT. THE BALANCE WAS ADJUSTED USING INTERNAL WEIGHT TO ADJUST. THE BALANCE HAS NO  
ZERO TRACKING FUNCTION. REPEATABILITY WAS MEASURED BY USING 10 REPEATED MEASUREMENTS. LINEARITY  
WAS MEASURED COVERING 10 POINTS, EVENLY SPREAD OVER THE RANGE. THE INSTRUMENT WAS SET ZERO BEFORE  
PERFORMING THE LINEARITY TEST. OFF-CENTER LOADING WAS MEASURED BY USING STANDARD WEIGHTS PLACED  
ON THE PAN AND MOVED TO VARIOUS POSITIONS ON THE PAN. THE INTERNAL WEIGHT WAS CHECKED BY USING  
2. REFERENCE STANDARD INSTRUMENTS :-  
INSTRUMENT MODEL SERIAL No CERTIFICATE No DUE DATE  
1) STANDARD WEIGHT SET E2 QK-1-151 C02210415 09-Feb-23  
2) STANDARD WEIGHT E2 15843 C02210419 10-Feb-23  
3) STANDARD WEIGHT E2 QK-1-349 M21032358 26-Mar-23  
3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.  
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.  
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-  
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH CENTRAL BUREAU OF WEIGHTS&MEASURES

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

- ZERO SETTING FUNCTION : NORMAL
- TARE FUNCTION : NORMAL
- REPEATABILITY OF READING AT 200 g WAS 0.000063 g
- DEPARTURE FROM NOMINAL VALUE/LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (±g)
0.00	0.0000	0.0000	0.000090
0.10	0.1000	0.0000	0.000090
0.20	0.2000	0.0000	0.000090
0.50	0.5000	0.0000	0.000091
1.00	1.0000	0.0000	0.000091
2.00	2.0000	0.0000	0.000092
5.00	5.0000	0.0000	0.000093
10.00	10.0000	0.0000	0.000095
20.00	19.9999	0.0001	0.00010
50.00	49.9998	0.0002	0.00012
100.00	99.9998	0.0002	0.00019
200.00	199.9993	0.0007	0.00032

### 5. OFF CENTER LOADING ERROR



POINT	READING (g)
1	99.9997
2	99.9996
3	99.9995
4	99.9997
5	99.9998
OFF-CENTER LOADING	0.0002

INTERNAL WEIGHT ERROR: 0.00066666666660376 g

NOTE: THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT PRODUCTION AREA  
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%.

END OF CALIBRATION REPORT





CERTIFICATE No : 22T9917  
REFERENCE No : 66549-4

PAGE : 1 OF 2

## Certificate of Calibration

EQUIPMENT : HOT AIR OVEN,  
MANUFACTURER : MEMMERT  
MODEL : UFE 500  
SERIAL No : G508.0791  
ID No : EQL-128  
CONDITION AS RECEIVED : USED ITEM  
SUBMITTED BY : TEST TECH CO.,LTD.  
30,32 RAMA II SOI 63, RAMA II RD., SAMAEADAM,  
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY : CHAICHARN CH.  
CALIBRATION DATE : 15-Sep-22

APPROVED BY :   
ISSUED DATE : 21-Sep-22  
RECEIVED DATE : 15-Sep-22

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF  
QUALITY CALIBRATION CO., LTD.

F-G010 REV : 02



CERTIFICATE No : 22T9917

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : HOT AIR OVEN  
MANUFACTURER : MEMMERT  
MODEL : UFE 500  
ID No : EQL-128  
RECEIVED DATE : 15-Sep-22  
AMBIENT TEMPERATURE : 25 °C ± 1 °C  
S/N : G508.0791  
CALIBRATION DATE : 15-Sep-22  
RELATIVE HUMIDITY : 51 %RH ± 10 %RH

### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO TLAS G-20 BY COMPARISON WITH CALIBRATED RTD PH100 UNDER NO LOAD CONDITION. THE TEMPERATURE PROBES WERE PLACED ON NINE POINTS AND LOCATED ONE THERMOMETER PROBE IN EACH OF THE EIGHT CORNERS OF THE CHAMBER AND WAS AWAY FROM THE EACH WALL OF 5 cm TO 10 cm. AND PLACED THE NINTH THERMOMETER PROBE WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE CHAMBER. THE UNIFORMITY WAS MEASURED BETWEEN REFERENCE PROBE AND OTHER PROBES AT THE SAME TIME.

### 2. REFERENCE STANDARD INSTRUMENTS :-

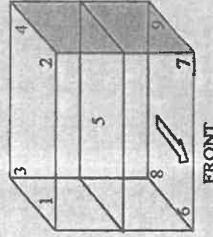
- 1) DATA LOGGER WITH RTD  
HYDRA 2633A  
SERIAL No 6653300  
MODEL 2217509  
DUE DATE 10-Jul-23
3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-  
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO.,LTD.

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

#### GENERAL INFORMATION

Overall Ambient Temperature around the Chamber (°C) variation : 1  
Overall Line Voltage (V) variation : 3  
Instrument Condition : Normal  
Chamber Size (W\*L\*H): 36\*40\*48 cm



CHAMBER PERFORMANCE			
Calibrate Point (°C)	Average All Position Temp. (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)
104.0	104.32	0.15	0.62
180.0	180.09	0.29	1.23
			Overall Variation (± °C)
			1.02
			1.86

#### TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (± °C)
		#1	#2	#3	#4	#5	#6	#7	#8	#9	
104.0	104.0	104.23	103.89	104.54	104.02	104.33	104.63	104.42	104.48	104.39	0.38
180.0	180.0	180.16	179.13	180.46	179.35	179.79	180.66	180.36	180.29	180.61	1.1

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER.  
NOTE 2 : LOCATION 5 WAS REFERENCE LOCATION.

NOTE 3 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.  
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%  
END OF CALIBRATION REPORT





QUALITY CALIBRATION CO.,LTD.  
235 Petchkasem 63/2 Road, Laksoeng, Bangkok, Bangkok 10160  
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584  
www.qcalibration.com



CERTIFICATE No : 22T9918  
REFERENCE No : 66549-5

PAGE : 1 OF 2

## Certificate of Calibration

EQUIPMENT : HOT AIR OVEN  
MANUFACTURER : MEMMERT  
MODEL : UFE 500  
SERIAL No : G512.2005  
ID No : EQL-161  
CONDITION AS RECEIVED : USED ITEM  
SUBMITTED BY : TEST TECH CO., LTD.  
30,32 RAMA II SOI 63, RAMA II RD., SAMAEDAM,  
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY : CHAICHARN CH.  
CALIBRATION DATE : 15-Sep-22

APPROVED BY :   
ISSUED DATE : 21-Sep-22  
RECEIVED DATE : 15-Sep-22

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF  
QUALITY CALIBRATION CO., LTD.

F-G010 REV : 02



QUALITY CALIBRATION CO.,LTD.  
235 Petchkasem 63/2 Road, Laksoeng, Bangkok, Bangkok 10160  
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

CERTIFICATE No : 22T9918

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : HOT AIR OVEN  
MANUFACTURER : MEMMERT  
MODEL : UFE 500  
ID No : EQL-161  
RECEIVED DATE : 15-Sep-22  
AMBIENT TEMPERATURE : 22 °C ± 1 °C  
SN : G512.2005  
CALIBRATION DATE : 15-Sep-22  
RELATIVE HUMIDITY : 51 %RH ± 10 %RH

### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO TIAS G-20 BY COMPARISON WITH CALIBRATED RTD PH00 UNDER NO LOAD CONDITION. THE TEMPERATURE PROBES WERE PLACED ON NINE POINTS AND LOCATED ONE THERMOMETER PROBE IN EACH OF THE EIGHT CORNERS OF THE CHAMBER AND WAS AWAY FROM THE EACH WALL OF 5 cm TO 10 cm. AND PLACED THE NINTH THERMOMETER PROBE WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE CHAMBER. THE UNIFORMITY WAS MEASURED BETWEEN REFERENCE PROBE AND OTHER PROBES AT THE SAME TIME.

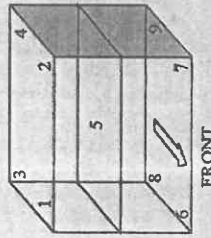
### REFERENCE STANDARD INSTRUMENTS :

- 1) DATA LOGGER WITH RTD HYDRA 2635A 2217508
3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-  
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO.,LTD.

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

#### GENERAL INFORMATION

Overall Ambient Temperature around the Chamber (°C) variation : 1  
Overall Line Voltage (V) variation : 8  
Instrument Condition : Normal  
Chamber Size (W\*H\*HT) : 56\*40\*48 cm



CHAMBER PERFORMANCE		Temperature Stability (±°C)		Temperature Uniformity (°C)		Overall Variation (°C)	
Calibrate Point (°C)	Average All Position Temp. (°C)	#4	#7	#8	#9		
104.0	103.98	0.12	0.91	1.06	1.13	1.00	
120.0	119.98	0.13	1.06	1.35	1.39	1.13	
140.0	140.09	0.13	1.35	1.38	1.49	1.39	
150.0	150.03	0.14	1.38	1.49	1.49	1.49	

### TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (± °C)
		#1	#2	#3	#4	Ref. 5	#6	#7	#8	#9	
104.0	104.0	104.07	104.09	104.21	103.93	103.58	103.79	103.99	103.78	104.36	0.38
120.0	120.0	120.03	120.13	120.34	119.94	119.69	119.94	119.71	120.48	120.48	0.38
140.5	140.5	140.15	140.30	140.44	140.10	139.56	139.74	140.03	139.80	140.72	0.46
150.5	150.5	150.04	150.25	150.54	150.35	149.46	149.55	149.83	149.60	150.67	0.46

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER.

NOTE 2 : LOCATION 5 WAS REFERENCE LOCATION.

NOTE 3 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

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%.

END OF CALIBRATION REPORT

F-G010 REV : 02






CERTIFICATE No : 22T1726  
REFERENCE No : 64109-2

PAGE : 1 OF 2

## Certificate of Calibration

EQUIPMENT : INCUBATOR  
MANUFACTURER : MEMMERT  
MODEL : IF 160  
SERIAL No : D518.0082  
ID No : EQL-205  
CONDITION AS RECEIVED : USED ITEM  
SUBMITTED BY : TEST TECH CO., LTD.  
30,32 RAMA II SOI 63, RAMA II RD., SAMAEADAM,  
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY : CHAICHARN CH.  
CALIBRATION DATE : 21-Feb-22

APPROVED BY :  PONGKAJ J.  
ISSUED DATE : 22-Feb-22  
RECEIVED DATE : 21-Feb-22

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF  
QUALITY CALIBRATION CO., LTD.

F-G010 REV : 02



CERTIFICATE No : 22T1726

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : INCUBATOR  
MANUFACTURER : MEMMERT  
MODEL : IF 160  
ID No : EQL-205  
RECEIVED DATE : 21-Feb-22  
AMBIENT TEMPERATURE : 24°C ± 1 °C  
S/N : D518.0082  
CALIBRATION DATE : 21-Feb-22  
RELATIVE HUMIDITY : 50 %RH ± 10 %RH

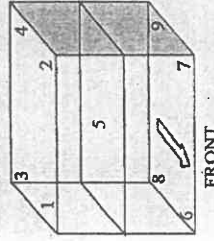
### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO TIAS G-20 BY COMPARISON WITH CALIBRATED RTD Pt100 UNDER NO LOAD CONDITION. THE TEMPERATURE PROBES WERE PLACED ON NINE POINTS AND LOCATED ONE THERMOMETER PROBE IN EACH OF THE EIGHT CORNERS OF THE CHAMBER AND WAS AWAY FROM THE EACH WALL OF 5 cm TO 10 cm. AND PLACED THE NINTH THERMOMETER PROBE WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE CHAMBER. THE UNIFORMITY WAS MEASURED BETWEEN REFERENCE PROBE AND OTHER PROBES AT THE SAME TIME.

### REFERENCE STANDARD INSTRUMENTS :-

- INSTRUMENT MODEL SERIAL No CERTIFICATE No DUE DATE  
1) DATA LOGGER WITH RTD HYDRA 2635A 6635300 21T6765 10-Jul-22  
2) REFERENCE TEMPERATURE PROBE PT100 21T6765  
3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.  
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.  
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-  
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO., LTD.

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



### GENERAL INFORMATION

Overall Ambient Temperature around the Chamber (°C) variation : 2  
Overall Line Voltage (V) variation : 9  
Instrument Condition : Normal  
Chamber Size (W\*L\*H): 56\*40\*72 cm

### CHAMBER PERFORMANCE

Calibration Point (°C)	Controller Temperature (°C)	Indicating Temperature (°C)	Average All Locations (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
35.0	35.0	35.0	34.99	0.02	0.14	0.20
36.0	36.0	36.0	36.00	0.03	0.14	0.22
41.5	41.5	41.5	41.46	0.05	0.10	0.19

### TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (± °C)
	#1	#2	#3	#4	#5	#6	#7	#8	#9	
35.0	35.0	34.91	34.94	34.93	34.98	35.03	35.08	35.01	35.08	0.25
36.0	36.0	35.93	35.95	35.94	36.00	36.05	36.10	36.01	36.10	0.25
41.5	41.5	41.46	41.47	41.41	41.47	41.50	41.45	41.43	41.49	0.36

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER.

NOTE 2 : LOCATION 5 WAS REFERENCE LOCATION.

NOTE 3 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA. THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.  
END OF CALIBRATION REPORT

F-G010 REV : 02



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235 Petchkasem 63/2 Road, Laksong, Bangkok, Bangkok 10160  
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4384



CERTIFICATE No : 22E0980  
REFERENCE No : 63904-1

PAGE : 1 OF 2

## Certificate of Calibration

EQUIPMENT : pH METER  
MANUFACTURER : DKK-TOA  
MODEL : HM-25R  
SERIAL No : 760205

ID No : EQL-183  
CONDITION AS RECEIVED : USED ITEM

SUBMITTED BY : TEST TECH CO., LTD.  
30,32 RAMA II SOI 63, RAMA II RD., SAMAEADAM,  
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY : PRASERT P.  
CALIBRATION DATE : 02-Feb-22

APPROVED BY :   
ISSUED DATE : 02-Feb-22  
RECEIVED DATE : 02-Feb-22

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF  
QUALITY CALIBRATION CO., LTD.

F-G010 REV 02



QUALITY CALIBRATION CO.,LTD.  
235 Petchkasem 63/2 Road, Laksong, Bangkok, Bangkok 10160  
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4384

CERTIFICATE No : 22E0980

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : pH METER  
MANUFACTURER : DKK-TOA  
ID No : EQL-183  
RECEIVED DATE : 02-Feb-22  
AMBIENT TEMPERATURE : 25°C ± 1°C  
RELATIVE HUMIDITY : 57%RH ± 10% RH

### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY DIRECT MEASUREMENT METHOD BASED ON WL-TQ-062. THE DISPLAY UNIT WAS TESTED BY GENERATING STANDARD VOLTAGE TO THE UNIT AND READ THE VALUE COMPARED WITH CALCULATED VALUE. THE DISPLAY AND ELECTROD WAS CALIBRATED BY USING STANDARD pH BUFFER SOLUTION.

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No/	CERTIFICATE No	DUE DATE
1) pH STANDARD SOLUTION	00651-06	CC719181	4880-12119147	05-Apr-23
2) pH STANDARD SOLUTION	00651-08	CC718727	4881-12110709	31-Mar-23
3) pH STANDARD SOLUTION	00651-10	CC717045	4882-12065386	17-Mar-23
4) PROCESS CALIBRATOR	744	7514008	21E1392	29-Apr-22
5) BATH	260014	1247 48074	21T9121	10-Sep-22
6) THERMOMETER WITH PROBE	421504	55000379	21T9129	14-Sep-22
7) STANDARD THERMOMETER	2560	A14546	PSL-T0049/64	23-Nov-22

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.

4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

5. THIS CERTIFICATE IS TRACEABLE TO SI UNIT MAINTAINED AT :-

- NATIONAL INSTITUTE OF STANDARD AND TECHNOLOGY, USA.

- NATIONAL INSTITUTE OF METROLOGY (THAILAND)

RESULT OF CALIBRATION : WITHOUT ADJUSTMENT

1. DISPLAY UNIT WITH pH ELECTRODE S/N: 002F0035MK

STANDARD pH BUFFER SOLUTION (pH)	UUC READING (pH)	CORRECTION (pH)	ACTUAL READING (mV)	UNCERTAINTY OF MEASUREMENT (± pH)	COVERAGE FACTOR k
4.007	4.01	-0.003	174	0.013	2.0
7.003	7.00	0.003	0.0	0.013	2.0
10.014	10.01	0.004	-172	0.014	2.0

2. DISPLAY UNIT MEASUREMENT TEMPERATURE WITH PROBE

STANDARD READING (°C)	UUC* READING (°C)	IMMERSION DEPTH (mm)	CORRECTION (°C)	UNCERTAINTY OF MEASUREMENT (± °C)
25.003	25.1	80	-0.097	0.21

UUC : UNIT UNDER CALIBRATION

THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMERS PLACE AT LABORATORY AREA.

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

F-G010 REV 02



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
3344 PATANAKARN ROAD SOI 18, SUANLUANG, BANGKOK 10250  
TEL. 0-2717-3000-24 FAX. 0-2719-9484



## Certificate of Calibration

Certificate No.: 22M196  
Page: 1 of 2

Equipment: Standard Weight  
Manufacturer: LS  
Model: -  
Serial No.: -  
ID No.: EQL-121  
Condition As-Received: Used Item  
Received Date: 03 February 2022  
Calibration Date: 08 February 2022  
Reference: 2202-0110DN  
Ambient Temperature: ( 23 ± 2 ) °C  
Relative Humidity: ( 50 ± 15 ) %  
Atmospheric Pressure: 1011 mbar

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except with the prior written approval of the head of  
Corporate Services 3: Equipment Calibration and Testing Services.

Submitted by: TEST TECH CO.,LTD (HEAD Office)

30,32 Rama II Soi 63, Rama II Rd., Samaedam,  
Bangkhunhian, Bangkok 10150

Procedure used: Calibration were conducted using in-house calibration procedure CP-M01 according to comparison method  
against standard weights on the basis of weighings at an average air density of 1.2 kg/m<sup>3</sup> and a temperature  
of 23 °C material density of weight is 8000 kg/m<sup>3</sup>.

### Condition of this result of calibration

#### 1. Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard weight Set (E2)	YCS31-712-00	50202965	MM-0102-20	13 Jul 2022

2. This certificate is not certified for any commercial transaction.

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

4. This Certification is traceable to the International System of Unit maintained at:-

-National Institute of Metrology Thailand (NIMT)

Calibrated by : Suwat Wuthicharnmongkol  
Issue Date : 08 February 2022

Approved Signatory :  
[ ] Phalinee Prabpaijal  
[x] Sura Suwanasri  
[ ] Chaowalit Ritthrak

B 0280632



Cert No.: 22M196  
Page: 2 of 2

### Result of calibration Without adjustment

Nominal Value	Conventional mass	Uncertainty of Measurement ( ± )	Maximum Permissible error ( ± )
50 g	50.00008 g	0.10 mg	0.30 mg

The 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-

a 1092727



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
53/4/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250  
TEL. 0-2717-3000-24 FAX. 0-2715-9484



## Certificate of Calibration

Certificate No. : 22M1563  
Page : 1 of 2

**Equipment :** Standard Weight  
**Manufacturer :**  
**Model :**  
**Serial No. :** M 0030/11  
**ID No. :** EQL-139  
**Condition As-Received:** Used Item  
**Received Date:** 11 August 2022  
**Calibration Date:** 24 August 2022

**Reference:** 2208-0438DN  
**Ambient Temperature:** ( 23 ± 2 ) °C  
**Relative Humidity:** ( 50 ± 15 ) %  
**Atmospheric Pressure:** -1008 mbar

**Procedure used:** Calibration were conducted using in-house calibration procedure CP-M01 according to comparison method against standard weights on the basis of weightings at an average air density of 1.2 kg/m<sup>3</sup> and a temperature of 23.0 °C material density of weight is 8000 kg/m<sup>3</sup>.

### Condition of this result of calibration

1. Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard weight Set (E2)	YCS31-712-00	50202965	MM-0109-22	11 Jul 2024

2. This certificate is not certified for any commercial transaction.  
3. The certificate is valid only to the item calibrated on date and place of calibration.  
4. This Certification is traceable to the International System of Unit maintained at:-

-National Institute of Metrology Thailand (NIMT)

**Calibrated by :** Chaowalit Ritirak  
**Issue Date :** 25 August 2022

**Approved Signatory :**

[ ] Phalinee Prabpalpal  
[x] Sura Suwanmaest  
[ ] Chaowalit Ritirak



Cert No.: 22M1563  
Page: 2 of 2

### Result of calibration

Without adjustment

Nominal Value	Conventional mass	Uncertainty of Measurement ( ± )	Maximum Permissible error ( ± )
2 g	2.000020 g	0.040 mg	0.12 mg

The 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-

B 0295804

B 1122491



## Certificate of Calibration

Equipment: TURBIDIMETER  
Model: 2100N  
Serial No. (or ID.): 970400003415 (EOL-024)  
Manufacturer: HACH  
Condition: In Condition  
Certificate No.: C08220157  
Issued Date: 21 September 2022  
Job No.: KSPR2211615  
Page: 1 of 2

Customer: TEST TECH CO., LTD.  
30,32 Rama II Sol 63, Rama II Rd.,  
Samaedam, Bangkokhantien Bangkok 10150 Thailand

Environment Condition: Temperature 23 °C  $\pm$  2 °C  
Humidity 50 %RH  $\pm$  15 %RH

Calibration Place: Environment Laboratory, DKSH Technology Limited.  
1194 Sol Wachirathamsathil 57, Sukhumvit 10/1 Rd.,  
Bangchak, Prakhnanong, Bangkok 10260 Thailand

Calibration By: Mr.Wasan Nuchnaabee  
Calibration Date: 21 September 2022  
The Method used: In house method, CAL-WI-23, base on Hach Manufacturer Method 8195  
Traceability: This certificate is traceable to Primary standard Fromachn and StabCal accepted by United States Environmental Protection Agency (EPA) through Hach Company  
Certificate No. A1075 , A1074 , A1081 , A1074 , A1074



(Mr. Wasan Nuchnaabee)

Person in charge

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).

These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

Uthairi Kongsakulchai  
DKSH Technology Limited  
2533 Rungtunjit Road, Rungtunjit Industrial Estate, Rungtunjit, Bangkok 10260  
Phone: +66 2038 7000 Email: info.calibration@dksh.com Website: www.dksh.com/en/thailand

Delivering Growth - In Asia and Beyond.

CAL-FM-C08-08: 20 Jul 2022



Certificate No.: C08220157

Page 2 of 2

### Calibration Results:

#### Before Adjustment

Std Turbidity (NTU)	UUC Reading	Correction	Deviation	Uncertainty
0.060	0.048	0.012	0.0004	0.070
20.40	20.1	0.30	0.05	1.0
206.0	204	2.0	0.5	10
1020.0	1013	7.0	1.2	50
4065.0	3875	190.0	1.8	200

#### After Adjustment

Std Turbidity (NTU)	UUC Reading	Correction	Deviation	Uncertainty
0.060	0.057	0.003	0.0015	0.070
20.40	20.5	-0.10	0.04	1.0
206.0	206	0.0	0.5	10
1020.0	1018	2.0	0.5	50
4065.0	4064	1.0	0.5	200

The End of Certificate

Uthairi Kongsakulchai  
DKSH Technology Limited  
2533 Rungtunjit Road, Rungtunjit Industrial Estate, Rungtunjit, Bangkok 10260  
Phone: +66 2038 7000 Email: info.calibration@dksh.com Website: www.dksh.com/en/thailand

Delivering Growth - In Asia and Beyond.

CAL-FM-C08-08: 20 Jul 2022



CERTIFICATE No : 22T7648  
REFERENCE No : 65843-2

PAGE : 1 OF 2

## Certificate of Calibration

EQUIPMENT : WATER BATH  
MANUFACTURER : MEMMERT  
MODEL : WPE 45  
SERIAL No : L711.0024  
ID No : EQL-147  
CONDITION AS RECEIVED : USED ITEM  
SUBMITTED BY : TEST TECH CO., LTD.  
30,32 RAMA II SOI 63, RAMA II RD., SAMAEDAM,  
BANGKHUNTHIAN, BANGKOK 10150  
CALIBRATED BY : PRASERT P.  
CALIBRATION DATE : 14-Jul-22

APPROVED BY :   
ISSUED DATE : 15-Jul-22  
RECEIVED DATE : 14-Jul-22

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF  
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CERTIFICATE No : 22T7648

PAGE : 2 OF 2

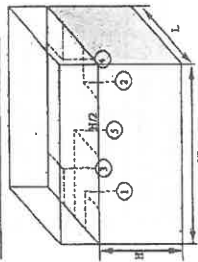
## Calibration Report

EQUIPMENT : WATER BATH  
MANUFACTURER : MEMMERT  
ID NUMBER : EQL-147  
RECEIVED DATE : 14-Jul-22  
AMBIENT TEMPERATURE : 24 °C ± 1 °C  
MODEL : WPE 45  
SERIAL NUMBER : L711.0024  
CALIBRATION DATE : 14-Jul-22  
RELATIVE HUMIDITY : 50 %RH ± 10 % RH

### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO ASTM E715-80 (REAPPROVED 2001) BY COMPARISON WITH CALIBRATED RTD. THE PROBES WERE PLACED ON FIVE POINTS AND LOCATED ONE PROBE IN EACH OF THE FOUR CORNERS OF THE BATH AND PLACED THE FIFTH RTD WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE WATER VOLUME (REFERENCE LOCATION) UNDER NO LOAD CONDITION.  
2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT : MODEL : 2625A  
SERIAL No : 6603614  
CERTIFICATE No : 22T7514  
DUE DATE : 05-Jul-23  
1) DATA LOGGER WITH RTD  
3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.  
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.  
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-  
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO.,LTD.  
RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



### GENERAL INFORMATION

Overall Variation of Ambient Temperature around the Bath (°C) : 0.9  
Overall Variation of Line Voltage (V) : 3  
Instrument Condition : Normal  
Bath Inner Size (W/L/H) : 60\*42\*24 cm

### BATH PERFORMANCE

Calibration Point (°C)	Controller Temperature (°C)	Indicating Temperature (°C)	Average All Locations (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
41.5	41.5	41.5	41.54	0.05	0.03	0.12
44.5	44.5	44.5	44.50	0.07	0.02	0.15

### TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Measured Temperature (°C) at Spread Locations					Uncertainty (± °C)
	#1	#2	#3	#4	Ref. 5	
41.5	41.5	41.54	41.55	41.55	41.55	0.14
~ 44.5	44.5	44.48	44.51	44.50	44.51	0.15

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE BATH.

NOTE 2 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT QC LABORATORY AREA.

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%.

END OF CALIBRATION REPORT



## Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110, Thailand.

Saraburi Tel : +66 3627 3096 Fax : +66 3627 3100

Bangkok Tel : +668 9205 6851 , +669 8247 2360

Website : www.scieco.co.th E-Mail : calibrate@scg.co.th



NSC-TIS-TIS 17025  
CALIBRATION 0244

Certificate No. T220021

Page 1 of 4

### Certificate of Calibration

Equipment : Chamber ( Cooling Room )

Manufacturer : -

Model : -

Serial No. : -

Customer Code : EQL-167

ID No. : T1447A1

Customer : Test Tech Co.,Ltd

30, 32 Rama II Soi 63, Rama II Rd., Samadom,

Bangkhunthian Bangkok 10150

Customer Location : LABORATORY FLOOR 3

Date of Receipt : 12 January 2022

Calibrated By : Watcharapon Sangtong (Technician)

Approved By : [Redacted] / Sujjar Nakkred ( Site Calibration Manager )

Date of Issue : 19 JAN 2022

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

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center.

FM-L14 11701-02-64



## Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110, Thailand.



NSC-TIS-TIS 17025  
CALIBRATION 0244

Certificate No. T220021

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### Calibration Report

Equipment : Chamber ( Cooling Room )

Date of Calibration : 19 January 2022

Environment : Temperature : 24.2-26.8 °C

Line Voltage : 221.6-225.5 V

Relative Humidity : 55 - 65 %RH

#### Condition of this results of calibration :

1. This equipment was calibrated by insert nine standard thermocouples type T into its chamber , the other one standard thermocouples type T use for ambient temperature measurement . The calibration was done in according to WI-T20 ( based on ASTM E145-94 ( Reapproved 2001) and AS2853-1986 ) .

All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .

#### 2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN161-TN170	T210009	31 January 2022
DATA LOGGER	34970A	T149	T210009	31 January 2022

3. This certificate is traceable to :

National Institute of Metrology ( Thailand ) through Metrological Center ( NSC-TIS-TIS 17025 CALIBRATION 0244 )

4. Condition of calibrated item : good

#### Equipment Description :

Time Constant	1	Hour	30	Minute	At	3	°C
Fresh Air Damper	<input type="checkbox"/>	Open	<input type="checkbox"/>	Min	<input type="checkbox"/>	Medium	<input type="checkbox"/>
	<input type="checkbox"/>	Close					Max
	<input checked="" type="checkbox"/>	Not Available					

5. Adjustment :

( ) without adjustment

( X ) after adjustment

Approved By : [Redacted]

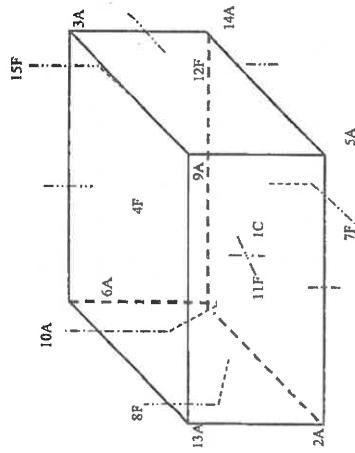
FM-L15 11717/15-05-63



Certificate No. T220021

Page 3 of 4

## Calibration Report



C = Centre, F = Centre of Face, A = Corner, E = Centre of Edge

1C	=	TN161
2A	=	TN162
3A	=	TN163
4F	=	TN164
5A	=	TN165
6A	=	TN166
7F	=	TN167
8F	=	TN168
9A	=	TN169
10A	=	TN170

11F	=	TN171
12F	=	TN172
13A	=	TN173
14A	=	TN174
15F	=	TN175

Approved By \_\_\_\_\_

PM-L15 11/7/15-05-63



Certificate No. T220021

Page 4 of 4

## Calibration Report

Measurement Results:

Calibration Point	Average Standard Reading at each position (°C)										
	TN161	TN162	TN163	TN164	TN165	TN166	TN167	TN168	TN169	TN170	
	3	3.15	3.01	3.03	3.25	3.15	3.32	3.15	2.50	3.02	2.93
	TN171	TN172	TN173	TN174	TN175						
	2.99	2.47	2.60	2.95	2.60						

Chamber (Cooling Room)			Temperature Distribution				Coverage Factor k
Setting (°C)	Reading (°C)		Average (°C)	Stability (±°C)	Uniformity (°C)	Uncertainty (±°C)	
3.0	Min, Max	Average					
	2.9, 3.1	3.0	2.94	0.47	1.02	0.93	2.00

\* The quoted uncertainty exclude " uniformity "

The calibration result apply only the above calibrated item.

The result of test was found accurate as shown on date and place of test only.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k which for a t-distribution, providing a level of confidence of approximately 95 % .

Approved By \_\_\_\_\_

PM-L15 11/7/15-05-63





QUALITY CALIBRATION CO.,LTD.  
235 Petchkasem 63/2 Road, Laksong, Bangkok 10160  
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584  
www.qcalibration.com



CERTIFICATE No : 22T1730  
REFERENCE No : 64109-6

### Certificate of Calibration

EQUIPMENT : AUTOCLAVE  
MANUFACTURER : HIRAYAMA  
MODEL : HVE-50  
SERIAL No : 30612085166  
D No : EQL-155

CONDITION AS RECEIVED : USED ITEM  
SUBMITTED BY : TEST TECH CO., LTD.  
30,32 RAMA II SOI 63, RAMA II RD.,  
SAMAEDAM, BANGKHUNTHIAN, BANGKOK  
10150

CALIBRATED BY : CHAICHARN CH.  
CALIBRATION DATE : 21-Feb-22

APPROVED BY :  
ISSUED DATE : 22-Feb-22  
RECEIVED DATE : 21-Feb-22

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF  
QUALITY CALIBRATION CO., LTD.

CERTIFICATE No : 22T1730

PAGE : 2 OF 2

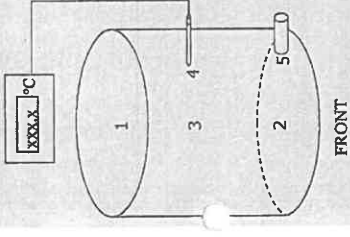
### Calibration Report

EQUIPMENT : AUTOCLAVE  
MANUFACTURER : HIRAYAMA  
ID NUMBER : EQL-155  
RECEIVED DATE : 21-Feb-22  
AMBIENT TEMPERATURE : 30° C ± 1° C  
MODEL : HVE-50  
SERIAL NUMBER : 30612085166  
CALIBRATION DATE : 21-Feb-22  
RELATIVE HUMIDITY : 50 %RH ± 10 % RH

#### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BASED ON BS 2646 : Part 5 : 1993 BY COMPARISON WITH CALIBRATED THERMOCOUPLE TYPE K UNDER NO LOAD CONDITION. THE THERMOCOUPLES WERE PLACED ON FIVE LOCATIONS AS SHOWN IN THE PICTURE. TWO PROBES WERE PLACES NEAR TOP AND BOTTOM WALL AND EACH PROBE WAS AWAY FROM THE EACH WALL OF 5 cm TO 10 cm. AND PLACED THE THIRD PROBE WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE INSTRUMENT CHAMBER. PROBE NUMBER 4 WAS ATTACHED TO THE LOAD TEMPERATURE PROBE, IF FITTED, WITHIN 20 mm OF ITS TIP. PROBE NUMBER 5 WAS PLACED IN THE CHAMBER DRAIN OR VENT WITHIN 100 mm OF ITS CONNECTION TO THE CHAMBER.  
2. REFERENCE STANDARD INSTRUMENTS :-  
3. 1) DATA LOGGER VAL PROBE S350, DV35, DN94 22T0541 31-Jan-23  
4. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.  
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-  
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO.,LTD.

#### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



#### GENERAL INFORMATION

Overall Ambient Temperature around the Chamber variation : 1.2 °C  
Autoclave Condition : Normal  
Chamber Size (Diameter\*H): 30 \* 71 cm

#### CHAMBER PERFORMANCE

Controller Temperature (°C)	Average All Locations (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)	Pressure (MPa)	Holding time (min)	Operating Cycle time (min)
116	116.48	0.09	0.10	0.27	0.090	15	60
122	122.43	0.09	0.13	0.27	0.130	15	60

#### TEMPERATURE MEASUREMENT ACCURACY TEST(° C)

Cont Temp		Measured Temperature (°C) at Spread Locations					Uncertainty (± °C)
		#1	#2	#3	#4	#5	
116	116	116.45	116.50	116.53	116.45	116.45	0.59
122	122	122.40	122.46	122.50	122.39	122.39	0.59

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT OF TEMPERATURE MEASUREMENT ACCURACY TEST EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER.  
NOTE 2 : THE STABILITY TERM IN THE UNCERTAINTY BUDGET WAS REPLACED BY THE STANDARD REPEATABILITY.  
NOTE 3 : LOCATION 3 WAS REFERENCE LOCATION.  
NOTE 4 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLY FACTOR k = 2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.  
END OF CALIBRATION REPORT



Bara Scientific Co., Ltd.  
968 U Chu Liang Building Floor7 Rama4 Road  
Siam Bangkok Bangkok Thailand 10500  
Tel : 02-6324300 Fax : 02-6375496-7  
www.barascientific.com



## Certificate of Calibration

Number of Page(s) 1 of 3

Certificate No. BSCC-UV-173/22  
Equipment UV/Vis Spectrophotometer  
Model UV-1900i  
Manufacturer Shimadzu  
Serial No. A12535780311 ML  
ID No. EQL-233  
Date of receipt 19 May 2022  
Date of calibration 19 May 2022  
Date of issue 26 May 2022  
Customer name Test Tech Co., Ltd.  
Address 30, 32 Rama II Soi 63, Rama II RD., Samaedam, Bangkokthian, Bangkok 10150.

Temperature (23.7-24.3) °C (On site)  
Humidity (47.5-48.3) %RH (On site)  
Equipment condition Good Operation  
Calibration Location Water Room  
Calibration Procedure In-house method WI-UV-702-01 based on ASTM E275-01  
Traceability Wavelength Accuracy is traceable to certificate No. 96367 and 96366  
Photometric Accuracy is traceable to certificate No. 99925 and 100147  
Sray Light is traceable to certificate No. 99385  
The above certificate are traceable to SI unit through Sarna Scientific Ltd.  
(UKAS accredited calibration laboratory NO. 0659)

Calibrated by Mr.Kandhit Choothep

Approved by



Technical Manager

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968 U Chu Liang Building Floor7 Rama4 Road  
Siam Bangkok Bangkok Thailand 10500  
Tel : 02-6324300 Fax : 02-6375496-7  
www.barascientific.com



## Certificate of Calibration

Number of Page(s) 2 of 3

Certificate No. BSCC-UV-173/22

Calibration Results:

1.Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty (±nm)
279.44	279.06	-0.38	0.18
418.53	418.35	-0.18	0.18
536.52	536.47	-0.06	0.18
684.50	684.50	0.00	0.18
879.41	879.24	-0.17	0.18

2.Photometric Accuracy (UV)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
235	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
257	0.0000	0.0000	0.0000	0.0075
	0.8499	0.8490	-0.0010	0.0075
313	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
350	0.0000	0.0000	0.0000	0.0075
	0.6306	0.6308	0.0002	0.0075

\*CNR = Customer not request

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www.barascientific.com



# Certificate of Calibration

Certificate No. BSCC-UV-173/22 Number of Page(s) 3 of 3

## Calibration Results:

### 3. Photometric Accuracy (Visible)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
420.0	0.0000	0.0000	0.0000	0.0042
	0.5472	0.5481	0.0009	0.0042
	0.7637	0.7626	-0.0011	0.0042
440.0	1.0480	1.0484	0.0004	0.0042
	0.0000	0.0000	0.0000	0.0042
	0.5371	0.5381	0.0010	0.0042
465.0	0.7457	0.7450	-0.0008	0.0042
	1.0233	1.0243	0.0010	0.0042
	CNR	CNR	CNR	CNR
546.1	CNR	CNR	CNR	CNR
	0.0000	0.0000	0.0000	0.0042
	0.5006	0.5012	0.0006	0.0042
590.0	0.6961	0.6946	-0.0015	0.0042
	0.9563	0.9558	-0.0005	0.0042
	CNR	CNR	CNR	CNR
635.0	CNR	CNR	CNR	CNR
	0.0000	0.0000	0.0000	0.0042
	0.5137	0.5143	0.0006	0.0042
	0.6907	0.6892	-0.0015	0.0042
	0.9533	0.9527	-0.0006	0.0042

\*CNR = Customer not request

### 4. Stray Light\*

Standard cut-off wavelength (nm)	Unit Under Calibration(UUC)	
	Wavelength (nm)	Absorbance (A)
200.98±0.11nm	200.95	2.0401

The Stray light transmission reference is less than 1.0%T and Stray light absorbance reference is greater than 2.00A

\*Stray Light not NSC-ONSC Accredited.

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

\*\*\*End of Certificate\*\*\*

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