

ภาคผนวก จ

สำเนาเอกสารรับรองเครื่องมือการตรวจวัด



Certificate of Calibration

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

Submitted by : M Green Group Co., Ltd.
188/46 Wisatuesakhakhon 25, Pracha-Utd Rd., Thungkru Bangkok 10140 ThailandEquipment : Air Chamber (Oven)
Manufacturer : Memmert
Range : N/A °C
Model : UF110
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) VDate of Received : 21 September 2022
Date of Calibration : 21 September 2022
Date of Issue : 23 September 2022
Calibrated by : Permon 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. 400029 & 400030
Cert. No. 65-400272-1
Due Date 24 Nov 2022
Traceability 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

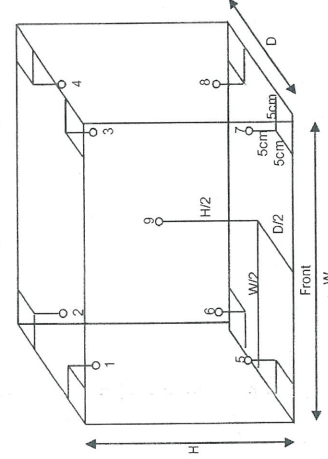
Certificate No. : 65-400499-2 Page : 2 of 2

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 m³

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Temperature (°C) @ Sensor No.									Uncertainty (± °C)
			1	2	3	4	5	6	7	8	9	
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			Overall Variation (°C)
			Uniformity (°C)	Stability (°C)	Measured	
104.0	104.0	104.0	0.8	0.2	1.4	1.4
180.0	180.0	180.0	1.4	0.3	2.7	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%

- oOo -



Certificate of Calibration

Page : 1 of 2

Certificate No. : 65-400499-3

Submitted by :

M Green Group Co., Ltd.

188/46 Wisutesukhakhon 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 : Pornpon Chamru

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 & 400031 65-400273-1 23 Nov 2022

National Institute of Metrology Thailand (NIMT)

Approved by :

(Bunjerd Masi)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

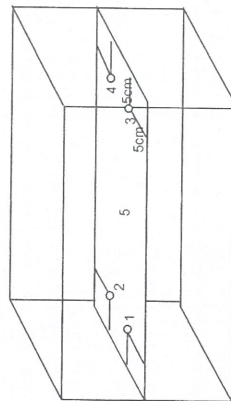
Page : 2 of 2

Certificate No. : 65-400499-3

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

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. : 65-420076-1 Page : 1 of 2

Submitted by : M Green Group Co.,Ltd.

138/46 Wisetuekukhkhon 25, Pracha-Utd Rd., Thungkru Bangkok 10140 Thailand

Equipment : pH Meter with electrode

pH meter

Manufacturer : Eutech Model : pH 700

Range : N/A pH Resolution : 0.01 pH

Serial No. : 2884323 ID No. : N/A

Electrode

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 calibrator 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 (pH)	Correction (pH)	Uncertainty (± pH)
4, 7, 10	4.008	4.01	0.00	0.010
	6.985	7.00	-0.01	0.011
	10.008	10.01	0.00	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. : 65-410112-1

Page : 1 of 2

Submitted by :

M Green Group Co., Ltd.

188/46 Wisutesuknakhon 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&Hum

ID No. Cert. No.

Traceability

Due Date

400034 & 400035

SG-H-00713/65

07 Jan 2023

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

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 65-410112-1

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 Wisatesuknakhon 25, Pracha-Uttd Rd., Thungkru, Bangkok 10140 ThailandEquipment : Electronic Balance
Manufacturer : SHIMADZU Model : AP225WD
Serial No. : D316300690
Capacity : 220 g Resolution : 0.00001g/102g, 0.0001g/220gEnvironment : 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 mbarDate of Received : 21 September 2022
Date of Calibration : 21 September 2022
Date of Issue : 24 September 2022
Calibrated by : Akaradath ThippichaiCalibration 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

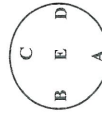
Nominal Value (g)	Correction (g)	Uncertainty ± (g)
0.001	0.00001	0.000012
0.01	0.00000	0.000014
0.1	0.00001	0.000018
1	0.00000	0.000026
10	0.00000	0.000053
20	-0.00001	0.000071
50	0.00001	0.00011
100	-0.00008	0.00020
150	-0.0001	0.00038
200	-0.0001	0.00038

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 g

Repeatability

Load test : 200 g

Sidev. : 0.000053 g

-o0o-



Certificate of Calibration

Certificate No. : 65-210457-1

Page : 1 of 2

Submitted by :

M Green Group Co., Ltd.

188/46 Wisuakrakhon25, 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 / m³Assumed Air density : 1.2 kg / m³

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 Svaiphong

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
National Institute of Metrology (Thailand), (NIMT)

E221-E2210

MM-0042-22

21 Mar 2025

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. : 65-210457-1

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	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%

-oOo-





Certificate of Calibration

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

Submitted by :

M Green Group Co., Ltd.

188/46 Wissuwanakorn25, Pracha-Utd Rd., Thungku, Bangkok 10140 Thailand

Equipment :

Weight

Manufacturer : N/A

Material : Stainless Steel

Weight size : 100 g

ID No. : 63-210391-2

Assumed density of weight : 7950 kg / m³Assumed Air density : 1.2 kg / m³

Environment :

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 :

Wutichai Swaphong

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

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

Standard Weights

ID No.

Cert. No.

Due Date

Traceability

E221-E2210

MM-0042-22

21 Mar 2025

National Institute of Metrology (Thailand), (NIMT)

Approved by :

(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	Id.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 Wisasukraknakhon25, Pracha-Utd Rd., Thungkru, Bangkok 10140 Thailand

Equipment :

Weight

Manufacturer : N/A

Material : Stainless Steel

Weight size : 200 g

ID No. : 63-210391-3

Assumed density of weight : 7950 kg / m³Assumed Air density : 1.2 kg / m³

Environment :

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 Swaiphong

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. : 65-210457-3

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

No.	Nominal Value	Id.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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Certificate of Calibration

Certificate No. : 65-400500-1

Page : 1 of 2

Submitted by :

M Green Group Co.,Ltd.

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

Equipment :

Digital Thermometer with Thermistor probe

Temperature Indicator

Manufacturer : Eutech Model : pH 700

Range : N/A °C Resolution : 0.1 °C

Serial No. : 2884323 ID No. : N/A

Thermistor probe

Model : N/A Sheath Material : Stainless

Diameter : 3.2 mm. Length : 100 mm.

Serial No. : PH5TEMB01P 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 Masi

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 Masi)

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. : 65-400503-1

Page : 1 of 2

Submitted by :

M Green Group Co., Ltd.

188/46 Wisatesuknakhon 25, Pracha-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. : 65-300541-1

Page : 1 of 2

Submitted by :

M Green Group Co.,Ltd.

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

Equipment :

Volumetric Flask

Manufacturer : GLASSCO

Class : A

Capacity : 100 ml

ID No. : VF100/01/19

Environment :

°C

Ambient Temperature : (23 ± 2)

Relative Humidity : (50 ± 15)

%

Air Pressure :

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

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	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

Submitted by : M Green Group Co.,Ltd.

188/46 Wisatsuknakhon 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

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 \pm 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%

-o0o-





Certificate of Calibration

Certificate No. : 65-300541-3

Page : 1 of 2

Submitted by :

M Green Group Co.,Ltd.

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

Equipment :

Volumetric Flask

Manufacturer : GLASSCO

Class : A

Capacity : 1000 ml

ID No. : VF1000/01/19

Environment :

Ambient Temperature : (23 ± 2) °CRelative 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. : 65-300541-3

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 Wisatsuknakhon 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 ± 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. 241002

Cert.No. 65-200172-1

Due Date 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%

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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 ± 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 -





Certificate of Calibration

Certificate No. : 65-300541-5

Page : 1 of 2

Submitted by :

M Green Group Co.,Ltd.

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

Equipment :

Measuring Pipette

Manufacturer : GLASSCO

Class : A

Capacity : 10 ml **Graduation :** 0.1 ml

ID No. : MP10/01/19

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. : 65-300541-5

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 ± 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%

-o0o-



Certificate of Calibration

Certificate No. : 65-300541-6

Page : 1 of 2

Submitted by :

M Green Group Co.,Ltd.

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

Equipment :

Measuring Pipette

Manufacturer : GLASSCO

Class : A

Capacity : 25 ml Graduation : 0.1 ml

ID No. : MP25/01/19

Environment :

Ambient Temperature : (23 ± 2) °CRelative 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. 241005

Cert.No.

Traceability

Due Date

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

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)
5	5.0254
15	15.0847
25	25.0413

Uncertainty of measurement with in \pm 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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MAINTENANCE REPORT

ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

AAAnalyst 100&FIAS

Customer : บริษัท เพล็กซ์ เทคโนโลยี	Date Tested: 18-ส.ค.-21
Address : 30,32 ซอยพระรามที่ 2 ซอย 63 ถนนพระราม2, เขตบางขุนเทียน, กรุงเทพฯ 10150	Recommendation Recertification Period 12 Months 17-ส.ค.-22 26-ส.ค.-20 1 OF 1
User Name: คุณ ลลิตา สระจันทร์	Visit Number: 081-7316733
Phone: 02-8934211-7	Mobile Phone
E-mail: Aoyiny_999@hotmail.com	E-Mail thonesource@gmail.com

CONFIGURATION TESTED		SOFTWARE	
MODEL	SERIAL NUMBER	AA WinLab Version 3.2	
AAAnalyst 100	040S0020203		
FIAS 200 (EQL-052)	2671		
TEST STANDARD USED		EXPIRATION DATE	
MERCURY	LOT NUMBER	14-ก.ย.-21	
ARSENIC	S191106032	16-ก.ย.-21	
SELENIUM	S190916002	14-ก.ย.-21	
FILTER 0.2 %	S200302006		
	MGO-057		

Page 1 of 4



MAINTENANCE REPORT

ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

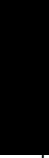
AAAnalyst 100&FIAS

SERIAL NUMBER 040S0020203	DATE TESTED 18-ส.ค.-21
1. OPTIC CHECKS	
A. Optical alignment condition (if necessary)	
B. Condition of Mirrors, Lenses etc.	
ELECTRONICS CHECKS	
A. Power Supplies	
+ 5.00 Vdc ± 0.2 Vdc	+ 5.01 Vdc
+ 12.00 Vdc ± 1.0 Vdc	+ 11.3 Vdc
+ 15.00 Vdc ± 1.0 Vdc	+ 15.0 Vdc
- 15.00 Vdc ± 1.0 Vdc	- 15.0 Vdc
+ 35.00 Vdc ± 3.5 Vdc	+ 32.2 Vdc
B. High Voltage	
1000 VAC ± 75 VAC	1003 VAC
3. FIAS CHECKS	
A. Output power supplies	
+5 VDC ± 0.5 VDC	+4.9 Vdc
+15 VDC ± 1.0 VDC	+14.80 Vdc
-15.00 Vdc ± 1.0 Vdc	-14.90 Vdc
B. 5 Port Valve & Pump	
C. Check Flow Meter	
4. WAVELENGTH ACCURACY TEST	
A. Ni Lamp wavelength 303.8 nm ± 0.3 nm.	
B. Cu Lamp wavelength 324.8 nm ± 0.3 nm.	
C. As Lamp wavelength 193.7 nm ± 0.3 nm.	
D. K Lamp wavelength 766.5 nm ± 0.3 nm.	
E. Zn Lamp wavelength 213.9 nm ± 0.3 nm.	
303.86 nm.	
324.85 nm.	
193.58 nm.	
766.38 nm.	
213.80 nm.	

Page 2 of 4



MAINTENANCE REPORT
ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL
Analyst 100&FIAS

SERIAL NUMBER	040S0020203	DATE TESTED	18-๘.๙.-21
Remarks :			
<div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div>			
<p>This is to certify that the above tests have been performed and the configuration tested</p> <p><input checked="" type="checkbox"/> meets <input type="checkbox"/> does not meet</p> <p>the PerkinElmer Specifications listed on this certificate.</p> <p>This certificate does not modify PerkinElmer's standard terms and condition of sale, including warranty terms.</p> <p>Service Department TH One Source Co., Ltd.</p> <p>() Krungchal Treevichien Customer Support Engineer</p>			



MAINTENANCE REPORT
ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL
Analyst 100&FIAS

SERIAL NUMBER	040S0020203	DATE TESTED	18-๘.๙.-21
PARAMETER	SPECIFICATION	ACTUAL VALUE	
5. PERFORMANCE TESTS			
A. Neutral density filter checks with Copper (324.8 nm)		0.1713 ± 10%	0.182 Abs.
Neutral Density Filter 0.2			
B. AA Baseline noise test with Copper (324.8 nm)		SD ≤ 0.005	Results 0.000
Integration time = 0.5 seconds		ACTUAL VALUE	
Replicates = 99 times		0.068 Abs.	
		349.2 pg/0.0044 Abs.	
		3.90 %	
C. PERFORMANCE TEST FOR FIAS			
1. Characteristic mass for Mercury (500 ul of 10 ug/l for Hg and 3 replicates)		0.161 Abs.	
Characteristic Mass		136.6 pg/0.0044 Abs.	
% RSD		2.22 %	
2. Characteristic mass for Arsenic (500 ul of 10 ug/l for As and 3 replicates)		0.317 Abs.	
Characteristic Mass		71.0 pg/0.0044 Abs.	
% RSD		0.32 %	
3. Characteristic mass for Selenium (500 ul of 10 ug/l for Se and 3 replicates)			
Characteristic Mass			
% RSD			



บริษัท ไทยยูนิค จำกัด THAI UNIQUE CO., LTD.

80-82 ถนนประชาภิไทย แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200
80-82 Prachathipatai Rd., Bangkokphrom, Pranakorn, Bangkok 10200
Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thauw@thaiunique.com, Website : www.thaiunique.com

ATOMIC ABSORPTION SPECTROMETER TEST CERTIFICATE

Certificate No : SV2101/19153
Instrument Type : Atomic Absorption Spectrophotometers
Model : AA240FS
Serial Number : EL08043418
Organization : Test Tech Co., Ltd.
Address : 30.32 Rama II Soi 63 Rd. Samedam Bangkokhuentien, Bangkok 10150
Date : 06 Jan 2021

Hollow cathode lamps used

Element	Lamp number	Comments
Arsenic	56-101003-00	
Copper	56-101014-00	
Potassium	56-101042-00	
Iron	56-101027-00	
Manganese	56-101337-00	

Test description	Specification	Result	Comments
Light throughput (%Gain) or (EHT)			
Cu at 324.8 nm	≤ 64 % or 380 V	32 %	Pass
As at 193.7 nm	≤ 80 % or 540 V	56 %	Pass
K at 766.5 nm*	≤ 84 % or 540 V	63 %	Pass
Fe at 248.3 nm	≤ 80 % or 540 V	65 %	Pass
Mn at 279.5 nm	≤ 64 % or 380 V	48 %	Pass
Photometric noise Cu BGC off			
STDV @ 0 Abs	≤ 0.0005	0.0000	Pass



บริษัท ไทยยูนิค จำกัด THAI UNIQUE CO., LTD.

80-82 ถนนประชาภิไทย แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200
80-82 Prachathipatai Rd., Bangkokphrom, Pranakorn, Bangkok 10200
Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thauw@thaiunique.com, Website : www.thaiunique.com

Wavelength accuracy

Cu at 324.8 nm	323.0 nm – 326.0 nm	324.7 nm	Pass
As 193.7 nm	192.0 nm – 195.0 nm	193.7 nm	Pass
K at 766.5 nm*	765.0 nm – 768.0 nm	766.5 nm	Pass
Fe at 248.3 nm	246.8 nm – 249.8 nm	248.2 nm	Pass
Mn at 279.5 nm	278.0 nm – 281.0 nm	279.5 nm	Pass

High solids nebulizer setting**

Uptake rate	7.2 – 10.6 ml / min	7.5 ml/min	Pass
Max Abs	≥ 0.75 Abs	0.83 Abs	Pass
Precision(%RSD)	≤ 0.5 %	0.5 %	Pass

Zeeman Background Correction Accuracy (%)***

BCA @ Au 242.8 nm	< 3.7 %	***	***
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Zeeman Magnetic Sensitivity Ratio (%)***

MSR @ Cu 324.7 nm	> 70 %	***	***
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Characteristic mass and sensitivity ****

Sensitivity	≥ 0.21 Abs	****	****
Precision (%RSD)	≤ 4.0 %	****	****

* for Wideband PMT (Wavelength 190nm – 900nm)

** for Flame system

*** for Zeeman system

**** for Graphite furnace system

CALIBRATION BY



APPROVE

Signature:

Engineer

Date : 6 / Jan / 2021

Signature:

Service Manager

Date : 06 / Jan / 2021