

ภาคผนวก จ

สำเนาเอกสารรับรองเครื่องมือการตรวจวัด

Certificate of Calibration

Certificate No. : 64-420107-1

Page : 1 of 2

Submitted by :

M Green Group Co.,Ltd.

81/109 Pinthong Group Building, Moo 1, Rama 2 Road,

Tha Kham, Bang Khun Thian, Bangkok 10150

Equipment :

pH Meter with electrode

pH meter

Manufacturer : Eutech

Model : pH 700

Range : N/A

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 : (25.0 to 25.8)°C

Relative Humidity : (55 to 58) %

Date of Received :

20 September 2021

Date of Calibration :

20 September 2021

Date of Issue :

21 September 2021

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
4.004	61218215	753167	02 Feb 2022	CPA chem
6.987	61211742	758970	02 Feb 2022	CPA chem
9.961	61223868	753169	02 Feb 2022	CPA chem

Approved by

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 64-420107-1

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	4.004	4.00	0.00	0.011
	6.987	7.00	-0.01	0.020
	9.961	10.00	-0.04	0.053

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. : 64-410100-1

Page : 1 of 2

Submitted by :

M Green Group Co., Ltd.

188/46 Wisatsukrakhoon 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 : 20 September 2021

Date of Calibration : 25 September to 27 September 2021

Date of Issue : 27 September 2021

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.	Due Date	Traceability
400034 & 400035	SG-H-00664/64	07 Jan 2022	Success Gateway Co., Ltd., Accredited by TISI Calibration No.0268
400034 & 400036	SG-H-00664/64	07 Jan 2022	Success Gateway Co., Ltd., Accredited by TISI Calibration No.0268

Appr

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 64-410100-1

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)
20.00	19.8	0.2	0.46
24.99	24.7	0.3	0.46
29.98	29.6	0.4	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.)
40.02	40	0	2.2
60.03	59	1	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. : 64-400489-1

Page : 1 of 2

Submitted by :

M Green Group Co.,Ltd.

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

Equipment :

Digital Thermometer with Thermistor probe

Temperature Indicator

Manufacturer : Eutech Model : p11 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. : PI15TEMB01P ID No. : N/A

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

Ambient Temperature : (25.0 to 25.8) °C

Relative Humidity : (55 to 58) %

Line Voltage : (229.0 to 230.0) VAC

Date of Received : 20 September 2021

Date of Calibration : 20 September 2021

Date of Issue : 21 September 2021

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-0050-20 18 Jun 2022 National Institute of Metrology Thailand (NIMT)

2. Standard Digital Thermometer

ID No. Cert.No. Due Date Traceability

400033 20E612 17 Feb 2022 National Institute of Metrology Thailand (NIMT)

Approved by

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 64-400489-1

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	25.002	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. : 64-200274-1 Page : 1 of 2

Submitted by : M Green Group Co., Ltd.

188/46 Wisatesuknakhon 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 : (64.0 to 64.4) %

Air Pressure : 1009.0 mbar

Date of Received : 20 September 2021

Date of Calibration : 20 September 2021

Date of Issue : 23 September 2021

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-E264	C02204101	17 Nov 2021	National Institute of Metrology (Thailand), (NIMT)

Approved by

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 64-200274-1 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	0.00000	0.000014
0.01	0.00000	0.000016
0.1	0.00001	0.000018
1	0.00000	0.000027
10	0.00000	0.000053
20	0.00002	0.000071
50	0.00009	0.00011
100	0.00013	0.00020
150	0.0002	0.00038
200	0.0001	0.00038

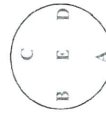
This result of calibration was found accurate as shown on date and place of calibration only.

This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k = 2.23$, providing a level of confidence of approximately 95%

Eccentric error

A	B	C	D	E
-0.00005	0.00001	0.00005	-0.00004	0.00000

Load test : 50 g



Repeatability

Load test	Sidev.
200 g	0.000052 g

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Certificate of Calibration

Certificate No. : 64-400494-1 Page : 1 of 2

Submitted by : M Green Group Co., Ltd.
188/46 Wisatsukhakhon 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 : 20 September 2021

Date of Calibration : 22 September to 24 September 2021

Date of Issue : 24 September 2021

Calibrated by : Chotrip 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-00116-20 04 Mar 2022 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

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 64-400494-1

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

Ice point check : UUC* reading 0 °C Standard reading 0.0520 °C

Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (±°C)
39.7937	40	-0.2	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

Page : 1 of 2

Certificate No. : 64-400488-2

Submitted by : M Green Group Co., Ltd.

Equipment : Air Chamber (Oven)

Manufacturer : Memmert

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 : (26.5 to 27.5) °C

Relative Humidity : (50 to 55) %

Line Voltage : (229.0 to 232.0) V

Date Received : 20 September 2021

Date of Calibration : 20 September 2021

Date of Issue : 24 September 2021

Calibrated by : Permpon Chanpu

Calibration Method : CAL-M4004, TLAS G-20

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. : 64-400207-1

Due Date : 19 Oct 2021

Traceability : National Institute of Metrology Thailand (NIMT)

The temperature scale used was based on ITS-90

Approve

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

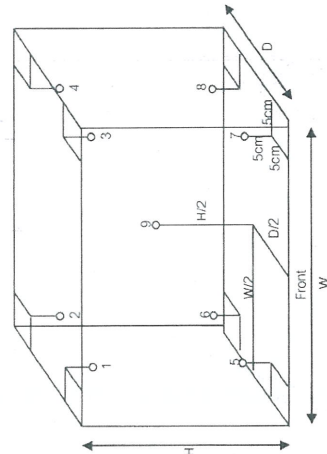
Certificate No. : 64-400488-2

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	104.5	104.8	104.9	104.5	104.5	104.2	104.8	103.5	104.4	0.73
180.0	180.0	180.0	180.5	179.5	181.9	180.6	180.5	179.9	180.1	179.0	180.6	0.97

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured		Overall Variation (°C)
			Uniformity (°C)	Stability (°C)	
104.0	104.0	104.0	1.1	0.2	1.8
180.0	180.0	180.0	1.7	0.3	3.3

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. : 64-400488-1

Page : 1 of 2

Submitted by :

M Green Group Co., Ltd.

Equipment :

Air Chamber (Refrigerator)

Manufacturer : Biobase

Model : BXC-V250M (II)

Range : N/A °C

Resolution : 0.1 °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 : (26.5 to 27.5) °C

Relative Humidity : (50 to 55) %

Line Voltage : (229.0 to 232.0) V

Date of Received :

20 September 2021

Date of Calibration :

20 September 2021

Date of Issue :

24 September 2021

Calibrated by :

Permpon 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 & 400032

Due Date

National Institute of Metrology Thailand (NIMT)

30 Sep 2021

Approved

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 64-400488-1

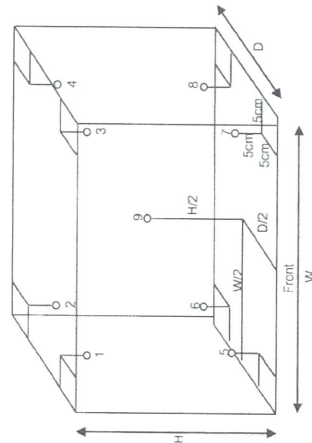
Page : 2 of 2

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 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	
4.0	2.0	2.0	5.2	4.2	5.2	4.5	5.2	4.9	4.6	4.4	4.0	0.67

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)
4.0	2.0	2.0	1.4	0.2	1.7

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. : 64-210435-1

Page : 1 of 2

Submitted by :

M Green Group Co.,Ltd.

188/46 Wisatsukhakhon 25, Pracha Utd Rd., Thungku 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 : 1006.7 mbar

Date of Received :

20 September 2021

Date of Calibration :

28 September 2021

Date of Issue :

28 September 2021

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.

MM-0060-19

Traceability

National Institute of Metrology (Thailand), (NIMT)

E2413-E2425

Due Date

27 Mar 2022

Approve

Wuttichai Swatphong /
Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 64-210435-1

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 +0.026 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. : 64-210435-2 Page : 1 of 2

Submitted by :

M Green Group Co.,Ltd.

188/46 Wisatsukhakhon 25, Pracha Utd Rd., Thungkru 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 : 1006.6 mbar

Date of Received : 20 September 2021

Date of Calibration : 28 September 2021

Date of Issue : 28 September 2021

Calibrated by : Wittichai 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. E2413-E2425

Cert.No. MM-0060-19

Due Date 27 Mar 2022

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

Approve

(Surachai Promthong)
Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 64-210435-2 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. : 64-210435-3

Page : 1 of 2

Submitted by : M Green Group Co.,Ltd.

188/46 Wisutesukhakhon 25, 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 : 1006.5 mbar

Date of Received :

20 September 2021

Date of Calibration :

28 September 2021

Date of Issue :

28 September 2021

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.

MM-0060-19

Traceability

E2413-E2425

Due Date

27 Mar 2022 National Institute of Metrology (Thailand), (NIMT)

Approve

(Surachai Promrithong)

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 64-210435-3

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

No.	Nominal Value	Id.Mark	Conventional mass Value	Measuring Uncertainty
1	200 g	none	200 g -0.16 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. : 64-300672-1

Page : 1 of 2

Submitted by :

M Green Group Co.,Ltd.

188/46 Wisatsukhakhon 25, Pracha-Uthit 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 : 1004.4 mbar.

Date of Received : 20 September 2021

Date of Calibration : 27 September 2021

Date of Issue : 27 September 2021

Calibrated by : Arcerat Sonbun

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

2411005

64-200165-4

02 Dec 2021

National Institute of Metrology (Thailand) (NIMT)

Approved by

(Wipaa Jovanee)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 64-300672-1

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	100.102

Uncertainty of measurement with in \pm 0.018 ml

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

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

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Certificate of Calibration

Certificate No. : 64-300672-2

Page : 1 of 2

Submitted by :

M Green Group Co.,Ltd.

188/46 Wisetsukhakhon 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 : 1004.4 mbar.

Date of Received : 20 September 2021

Date of Calibration : 27 September 2021

Date of Issue : 27 September 2021

Calibrated by : Arcarat 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

64-200165-1

02 Dec 2021

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. : 64-300672-2

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	250.08

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%

-o0o-



Certificate of Calibration

Certificate No. : 64-300672-3

Page : 1 of 2

Submitted by :

M Green Group Co.,Ltd.

188/46 Wisatesukhakhon 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 : 1004.4 mbar.

Date of Received : 20 September 2021

Date of Calibration : 27 September 2021

Date of Issue : 27 September 2021

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

64-200165-1

02 Dec 2021

National Institute of Metrology (Thailand) (NIMT)

Approved by :

(Wipa Tovadce)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 64-300672-3

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	1000.33

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. : 64-300672-4

Page : 1 of 2

Submitted by : M Green Group Co.,Ltd.

188/46 Wisetuesukhkhon 25, Prachar-Utd Rd., Thungkru, Bangkok 10140 Thailand

Equipment : Cylinder

Manufacturer : GLASSCO **Class :** A

Capacity : 100 ml **Graduation :** 1 ml

ID No. : CY100/01/19

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

Relative Humidity : (50 ± 15) %

Air Pressure : 1004.2 mbar.

Date of Received : 20 September 2021

Date of Calibration : 27 September 2021

Date of Issue : 27 September 2021

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 64-200165-1 02 Dec 2021 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. : 64-300672-4

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)
50	50.37
100	100.32

Uncertainty of measurement with in ± 0.063 ml

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

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

- oOo -





NSC-TISI-TIS17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-300672-5

Page : 1 of 2

Submitted by :

M Green Group Co.,Ltd.

188/46 Wisatesukhakhon 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 : 1004.2 mbar.

Date of Received : 20 September 2021

Date of Calibration : 27 September 2021

Date of Issue : 27 September 2021

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

64-200165-1

02 Dec 2021

National Institute of Metrology (Thailand) (NIMT)

Approved by :

(Wipa Tovaldee)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 64-300672-5

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

Nominal Volume (ml)	Measuring Volume (ml)
150	151.11
250	251.41

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-





Certificate of Calibration

Certificate No. : 64-300672-6

Page : 1 of 2

Submitted by :

M Green Group Co.,Ltd.

188/46 Wisutesukhakdon 25, Pracha-Utd 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) °CRelative Humidity : (50 ± 15) %

Air Pressure : 1004.5 mbar.

Date of Received : 20 September 2021

Date of Calibration : 27 September 2021

Date of Issue : 27 September 2021

Calibrated by : Arcerat 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 64-200765-4 02 Dec 2021

National Institute of Metrology (Thailand) (NIMT)

Approved by :

(Wipa Tovadee)

Supervisor

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Certificate of Calibration

Certificate No. : 64-300672-6

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 : 12.23 sec.

Nominal Volume (ml)	Measuring Volume (ml)
2	1.9981
5	4.9793
10	9.9897

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%

-o0o-



Certificate of Calibration

Certificate No. : 64-300672-7

Page : 1 of 2

Submitted by :

M Green Group Co.,Ltd.

188/46 Wisatesukhukhon 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) °C

Relative Humidity : (50 ± 15) %

Air Pressure : 1004.5 mbar.

Date of Received : 20 September 2021

Date of Calibration : 27 September 2021

Date of Issue : 27 September 2021

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

64-200165-4

02 Dec 2021

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. : 64-300672-7

Page : 2 of 2

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

UUC Condition As-Received : Good

Delivery Time : 15.63 sec.

Nominal Volume (ml)	Measuring Volume (ml)
5	5.0299
15	15.0742
25	25.0262

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%

-o0o-





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235 Petchkasem 63/2 Road, Laksong, Bangkok 10160
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www.qcalibration.com



CERTIFICATE No : 21T8205
REFERENCE No : 62206-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : INCUBATOR
MANUFACTURER :
MODEL :
SERIAL No :
ID No : EQL-166
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : TEST TECH CO., LTD.
3032 RAMA II SOI 63, RAMA II RD., SAMAEADAM,
BANGKHUNTHIAN, BANGKOK 10150
CALIBRATED BY : TETNITHI W.
CALIBRATION DATE : 24-Aug-21
APPROVED BY :
ISSUED DATE : 24-Aug-21
RECEIVED DATE : 24-Aug-21

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



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235 Petchkasem 63/2 Road, Laksong, Bangkok 10160
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

CERTIFICATE No : 21T8205

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : INCUBATOR
MANUFACTURER :
ID No : EQL-166
RECEIVED DATE : 24-Aug-21
AMBIENT TEMPERATURE : 24°C ± 1°C
MODEL :
SERIAL NUMBER :
CALIBRATION DATE : 24-Aug-21
RELATIVE HUMIDITY : 53 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO TLAS G-20 BY COMPARISON WITH CALIBRATED THERMOCOUPLE TYPE K UNDER NO LOAD CONDITION. THE THERMOCOUPLES WERE PLACED ON 13 POINTS AND LOCATED AS THE PICTURE BELOW AND WAS AWAY FROM THE EACH WALL OF 5 cm TO 10 cm. AND PLACED THE SEVENTH THERMOCOUPLE 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 :-

INSTRUMENT : DATA LOGGER WITH TC TYPE K
MODEL : HYDRA 2635A
SERIAL No : 7903007
CERTIFICATE No : 21T6763
DUE DATE : 05-Jul-22
1. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.
2. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
3. 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

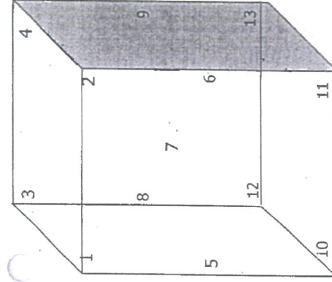
Overall Ambient Temperature around the Chamber (°C) variation : 0
Overall Line Voltage (V) variation : 3
Instrument Condition : Normal
Chamber Size (W*L*H): 190*70*170 cm

CHAMBER PERFORMANCE

Calibration Point (°C)	Controller Temperature (°C)	Indicating Temperature (°C)	Average All Locations (°C)	Temperature Stability (± °C)	Temperature Uniformity (°C)	Overall Variation (°C)
20.0	20.0	20.0	19.8	0.0	0.4	0.5

TEMPERATURE MEASUREMENT ACCURACY TEST

Controller temperature (°C)		Indicating Temperature	
1		20.0	
2		19.7	
3		20.0	
4		19.8	
5		19.9	
6		19.6	
7 Ref.		19.6	
8		19.6	
9		19.6	
10		19.6	
11		19.9	
12		19.9	
13		19.9	
Uncertainty of Measurement(± °C)		0.48	



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

NOTE 2 : LOCATION 7 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

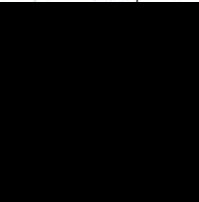


CERTIFICATE No : 21T2164
REFERENCE No : 60338-4

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : INCUBATOR
MANUFACTURER : MEMMERT
MODEL : IF 110
SERIAL No : D415.0802
ID No : EQL-190
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 : 02-Mar-21
APPROVED BY : 
ISSUED DATE : 08-Mar-21
RECEIVED DATE : 02-Mar-21

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 : 21T2164

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : INCUBATOR
MANUFACTURER : MEMMERT
MODEL : IF 110
ID No : EQL-190
RECEIVED DATE : 02-Mar-21
AMBIENT TEMPERATURE : 25 °C ± 1 °C
S/N : D415.0802
CALIBRATION DATE : 02-Mar-21
RELATIVE HUMIDITY : 49 %RH ± 10 %RH

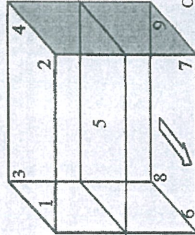
CONDITION OF THIS RESULTS OF CALIBRATION

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 : DATA LOGGER WITH RTD
MODEL : HYDRA 2633A
SERIAL No : 7301307
CERTIFICATE No : 20T7220
DUE DATE : 11-Jul-21
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 : 0
Instrument Condition : Normal
Chamber Size (W*L*H): 56*40*48 cm

CHAMBER PERFORMANCE

Controller Temperature (°C)	Indicating Temperature (°C)	Average All Locations (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
37.0	37.0	36.98	0.10	0.28	0.31
44.0	44.0	44.10	0.14	0.45	0.66

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	
37.0	37.0	36.91	36.98	37.00	36.91	37.10	37.02	36.97	37.00	36.87	0.25
44.0	44.0	43.91	44.06	44.13	43.96	44.27	44.15	44.34	44.15	43.93	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 MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%
END OF CALIBRATION REPORT



CERTIFICATE No : 21T2165
REFERENCE No : 60338-5

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., SAMAEDAM,
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY : CHAICHARN CH.
CALIBRATION DATE : 02-Mar-21

APPROVED BY :
ISSUED DATE : 08-Mar-21
RECEIVED DATE : 02-Mar-21



CERTIFICATE No : 21T2165

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : INCUBATOR
MANUFACTURER : MEMMERT
MODEL : IF 160
ID No : EQL-205
RECEIVED DATE : 02-Mar-21
AMBIENT TEMPERATURE : 25 °C ± 1 °C
S/N : D518.0082
CALIBRATION DATE : 02-Mar-21
RELATIVE HUMIDITY : 49 %RH ± 10 %RH

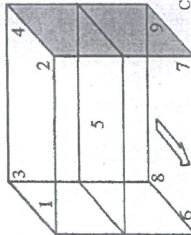
CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO TLAS 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 7301307 2017720 11-Jul-21
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 : 0
Overall Line Voltage (V) variation : 0
Instrument Condition : Normal
Chamber Size (W*L*H): 56*40*72 cm

CHAMBER PERFORMANCE

Controller Temperature (°C)	Indicating Temperature (°C)	Average All Locations (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation
35.0	35.0	35.04	0.03	0.30	0.31
36.0	36.0	36.03	0.05	0.29	0.34
41.5	41.5	41.49	0.03	0.35	0.39

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	
35.0	35.0	34.90	34.99	34.91	34.98	35.16	35.17	34.99	35.14	35.14	0.25
36.0	36.0	35.90	35.98	35.91	35.97	36.15	36.15	35.97	36.12	36.13	0.25
41.5	41.5	41.36	41.43	41.29	41.38	41.62	41.63	41.45	41.61	41.63	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 MULTIPLIED BY A COVERAGE FACTOR k =2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.
END OF CALIBRATION REPORT



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CERTIFICATE No : 2117075
REFERENCE No : 61873-3

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : INCUBATOR
MANUFACTURER : MEMMERT
MODEL : INB 400
SERIAL No : E405.0946
ID No : EQL-087
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 : 20-Jul-21
APPROVED BY :
ISSUED DATE : 21-Jul-21
RECEIVED DATE : 20-Jul-21

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

F-G010 REV. 07



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

CERTIFICATE No : 2117075

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : INCUBATOR
MANUFACTURER : MEMMERT
MODEL : INB 400
ID No : EQL-087
RECEIVED DATE : 20-Jul-21
AMBIENT TEMPERATURE : 24 °C ± 1 °C
S/N : E405.0946
CALIBRATION DATE : 20-Jul-21
RELATIVE HUMIDITY : 50 %RH ± 10 %RH

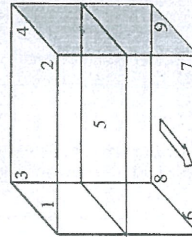
CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO TLAS 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 :-

- 1) DATA LOGGER WITH RTD HYDRA 2635A 7301307
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 : 9
Instrument Condition : Normal
Chamber Size (W*L*H): 40*33*40 cm

CHAMBER PERFORMANCE

Calibration Point (°C)	Controller Temperature (°C)	Indicating Temperature (°C)	Average All Locations	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
44.0	43.5	43.5	44.15	0.17	1.25	1.27
55.0	54.5	54.5	55.06	0.27	1.47	1.50

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	
43.5	43.5	43.75	43.82	43.87	43.82	44.62	44.52	44.61	44.68	44.68	0.36
54.5	54.5	54.63	54.67	54.77	54.68	55.47	55.64	55.52	55.67	55.67	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 MULTIPLIED BY A COVERAGE FACTOR k =2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



CERTIFICATE No : 21T8207
REFERENCE No : 62206-3

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : WATER BATH
MANUFACTURER : MEMMERT
MODEL : WNE45
SERIAL No : L720.0266
ID No : EQL-241

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 : TETNITHI W.
CALIBRATION DATE : 24-Aug-21

APPROVED BY : 
ISSUED DATE : 24-Aug-21
RECEIVED DATE : 24-Aug-21

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



CERTIFICATE No : 21T8207

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : WATER BATH
MANUFACTURER : MEMMERT
ID NUMBER : EQL-241
RECEIVED DATE : 24-Aug-21
AMBIENT TEMPERATURE : 29 °C ± 1 °C
MODEL : WNE45
SERIAL NUMBER : L720.0266
CALIBRATION DATE : 24-Aug-21
RELATIVE HUMIDITY : 56 %RH ± 10 % RH

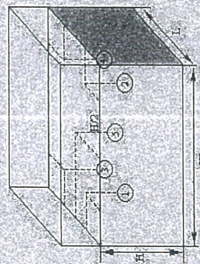
CONDITION OF THIS RESULTS OF CALIBRATION

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 : 1) DATA LOGGER WITH RTD
MODEL : 2625A
SERIAL No : 6603614
CERTIFICATE No : 21T6761
DUE DATE : 05-Jul-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 THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO.,LTD.

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



PROBE INSTALLATION
POSITION IN THE BATH

GENERAL INFORMATION

Overall Variation of Ambient Temperature around the Bath (°C) : 0.6
Overall Variation of Line Voltage (V) : 5
Instrument Condition : Normal
Bath Inner Size (W*L*H) : 59*35*22 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)
83.0	83.0	83.0	83.32	0.19	0.06	0.39
92.0	92.0	92.0	92.34	0.22	0.26	0.57

TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations				Uncertainty (± °C)
		#1	#2	#3	#4	
83.0	83.31	83.32	83.35	83.32	83.29	0.26
92.0	92.0	92.30	92.51	92.25	92.37	0.29

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 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 10160
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584
www.qcalibration.com



CERTIFICATE No. : 21T7073
REFERENCE No. : 61873-1

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.
3032 RAMA II SOI 63, RAMA II RD., SAMAEDAM,
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY : CHAICHARN CH.
CALIBRATION DATE : 20-Jul-21

APPROVED BY : 
ISSUED DATE : 21-Jul-21
RECEIVED DATE : 20-Jul-21

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



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235 Petchkasem 63/2 Road, Laksoeng, Bangkok 10160
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www.qcalibration.com

CERTIFICATE No. : 21T7073

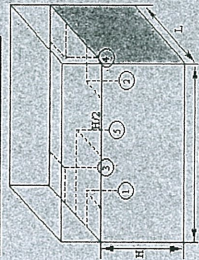
PAGE : 2 OF 2

Calibration Report

EQUIPMENT : WATER BATH
MANUFACTURER : MEMMERT
ID NUMBER : EQL-147
RECEIVED DATE : 20-Jul-21
AMBIENT TEMPERATURE : 24 °C ± 1 °C
RELATIVE HUMIDITY : 50 %RH ± 10 %RH
MODEL : WPE 45
SERIAL NUMBER : L711.0024
CALIBRATION DATE : 20-Jul-21

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 :
 - 1) DATA LOGGER WITH RTD 2625A
 - 2) REFERENCE TEMPERATURE UNIFORMITY
 3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.
 4. THIS RESULT EXCLUDES 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) : 1.8
Overall Variation of Line Voltage (V) : 2
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	41.52	0.05	0.03	0.12
44.5	44.5	44.5	44.51	0.05	0.03	0.13

TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations				Uncertainty (± °C)
		#1	#2	#3	#4	
41.5	41.5	41.53	41.52	41.51	41.52	0.14
44.5	44.5	44.51	44.50	44.50	44.51	0.14

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

NSC-TISI-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., Samaedam,

Bangkhunthian Bangkok 10150

Customer Location : LABORATORY FLOOR 3

Date of Receipt : 12 January 2022

Calibrated By : Watcharapon Sangtong (Technician)

Approved By : Sujjar Naknakred (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-L1.4 11701-02-64

NSC-TISI-TIS 17025
CALIBRATION 0244

Certificate No. T220021

Page 2 of 4

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 WT-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-TNI70	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-TISI-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					

☒ Not Available

5. Adjustment :

() without adjustment

(X) after adjustment

Approved By : 

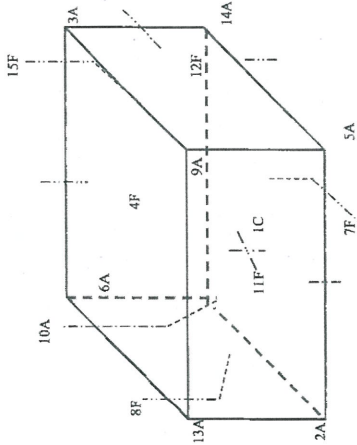
FM-L1.5 11715-05-63



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 _____

FM-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				
Setting (°C)	Reading (°C)		Average (°C)	Stability (±°C)	Uniformity (±°C)	Coverage Factor k
	Min	Max				
3.0	2.9	3.1	3.0	0.47	1.02	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 _____

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



CERTIFICATE No : 21M9564
REFERENCE No : 62575-2

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 : 23-Sep-21
APPROVED BY :
ISSUED DATE :
RECEIVED DATE : 23-Sep-21

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



CERTIFICATE No : 21M9564

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : SARTORIUS
MODEL : BP210S
ID No : EQL-008
AIR PRESSURE : 1010mbar \pm 1mbar
AMBIENT TEMPERATURE : 25°C \pm 1°C
RECEIVED DATE : 23-Sep-21
RELATIVE HUMIDITY : 51 %RH \pm 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

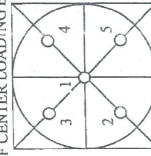
1. THIS INSTRUMENT WAS CALIBRATED BY ACCORDING TO UKAS LAB 14 EDITION 6:2019 BY USING KNOWN WEIGHT STANDARD WEIGHT. THE BALANCE WAS ADJUSTED USING INTERNAL WEIGHT TO ADJUST. THE BALANCE HAS NO ZERO TRACKING FUNCTION. REPEATABILITY WAS MEASURED BY USING 10 REPEATED MEASUREMENTS. LINEARITY WAS MEASURED 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 :-
 - 1) STANDARD WEIGHT SET E2
 - 2) STANDARD WEIGHT E2
 - 3) STANDARD WEIGHT E2
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

1. ZERO SETTING FUNCTION : NORMAL
2. TARE FUNCTION : NORMAL
3. REPEATABILITY OF READING AT 200 g WAS 0.000048 g
4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (\pm g)
0.000	0.0000	0.0000	0.000078
0.100	0.1000	0.0000	0.000078
0.20	0.2000	0.0000	0.000078
1.0	1.0000	0.0000	0.000079
2.0	2.0000	0.0000	0.000080
20.0	19.9999	0.0001	0.000089
45.0	44.9999	0.0001	0.00014
65.0	64.9999	0.0001	0.00016
80.0	79.9999	0.0001	0.00019
100.0	99.9998	0.0002	0.00022
120.0	119.9998	0.0002	0.00025
140.0	139.9998	0.0002	0.00027
160.0	159.9998	0.0001	0.00030
180.0	179.9999	0.0001	0.00032
200.0	199.9995	0.0005	0.00032

5. OFF CENTER LOADING ERROR



POINT	READING (g)
1	99.9997
2	99.9996
3	99.9994
4	99.9998
5	99.9997
OFF-CENTER LOADING	0.0003

6. INTERNAL WEIGHT ERROR : 0.00040000000000013279 g

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

END OF CALIBRATION REPORT



CERTIFICATE No : 22TI730
REFERENCE No : 64109-6

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : AUTOCLAVE
MANUFACTURER : HIRAYAMA
MODEL : HVE-50
SERIAL No : 30612085166
ID No : EQL-155
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : TEST TECH CO., LTD.
30,32 RAMA II SOI 65, RAMA II RD.,
SAMAEDAM, BANGKHUNTHIAN, BANGKOK
10150

CALIBRATED BY : CHAICHARN CHL
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.

F-G010 REV : 02



CERTIFICATE No : 22TI730

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

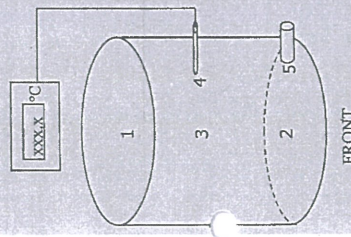
CONDITION OF THIS RESULTS OF CALIBRATION

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.

REFERENCE STANDARD INSTRUMENTS :-

- 1) DATA LOGGER VALPROBE S350, DV35, DN04 22T0541 31-Jan-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 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)

Measured Temperature (°C) at Spread Locations					Uncertainty (± °C)	
Cont. Temp	Ind Temp	#1	#2	#3	#4	#5
116	116	116.45	116.50	116.53	116.45	0.59
122	122	122.40	122.46	122.50	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 MULTI FACTOR k =2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT