

ภาคผนวก ฉ

สำเนาเอกสารรับรองเครื่องมือการตรวจวัด

## Certificate of Calibration

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

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

Equipment : Air Chamber (Refrigerator)  
Manufacturer : Biobase  
Range : N/A °C  
Serial No. : YC025025190108  
Model : BXC-V250M (II)  
Resolution : 0.1 °C  
ID No. : N/A

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

Ambient Temperature : (30.0 to 31.0) °C  
Relative Humidity : (45 to 50) %  
Line Voltage : (229.0 to 232.0) V

Date of Received : 21 September 2022

Date of Calibration : 21 September 2022

Date of Issue : 23 September 2022

Calibrated by : Pempon Chanpu

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

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

Standard Digital Thermometer with Thermocouple probe

ID No. Cert.No. Due Date Traceability

400029 & 400032 65-400274-1 25 Nov 2022 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

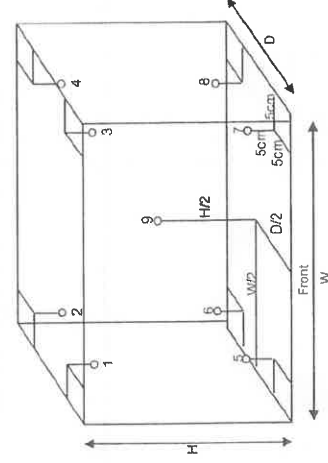
Certificate No. : 65-400499-1 Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

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



Inside of Chamber  
W = 0.50 m  
D = 0.40 m  
H = 1.20 m  
Capacity = 0.24 m<sup>3</sup>

| Test Point<br>(°C) | Setting Temperature<br>(°C) | Indicating Temperature<br>(°C) | Measured Temperature (°C) @ Sensor No. |     |     |     |     |     |     |     |     | Uncertainty<br>(± °C) |
|--------------------|-----------------------------|--------------------------------|----------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----------------------|
|                    |                             |                                | 1                                      | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   |                       |
| 4.0                | 2.0                         | 2.0                            | 3.9                                    | 4.8 | 5.2 | 5.0 | 5.2 | 4.7 | 5.2 | 4.1 | 5.1 | 0.75                  |

| Test Point<br>(°C) | Setting Temperature<br>(°C) | Indicating Temperature<br>(°C) | Measured Uniformity<br>(°C) | Measured Stability<br>(°C) | Overall Variation<br>(°C) |
|--------------------|-----------------------------|--------------------------------|-----------------------------|----------------------------|---------------------------|
| 4.0                | 2.0                         | 2.0                            | 1.6                         | 0.3                        | 1.9                       |

Remark The uncertainty is not combine uniformity of the air chamber

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

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

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Approved by :  
( [Redacted Signature] )  
Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

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

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

**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 :** (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 :** Pernon 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

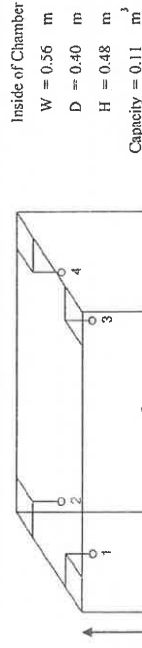
**Certificate No. :** 65-400499-2 **Page : 2 of 2**

**Result of Calibration :** Without Adjustment

**UUC Condition As-Received :** Good

**Function :** Temperature measurement

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



| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Temperature (°C) @ Sensor No. |       |       |       |       |       |       |       |       | Uncertainty (± °C) |
|-----------------|--------------------------|-----------------------------|----------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|--------------------|
|                 |                          |                             | 1                                      | 2     | 3     | 4     | 5     | 6     | 7     | 8     | 9     |                    |
| 104.0           | 104.0                    | 104.0                       | 103.8                                  | 103.4 | 104.6 | 104.0 | 104.1 | 103.8 | 104.2 | 103.4 | 104.1 | 0.71               |
| 180.0           | 180.0                    | 180.0                       | 179.5                                  | 179.1 | 181.4 | 179.9 | 180.3 | 179.5 | 181.0 | 179.0 | 180.3 | 0.96               |

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

**Remarks** The uncertainty is not combine uniformity of the air chamber

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

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

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## Certificate of Calibration

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

Submitted by :

M Green Group Co., Ltd.

188/46 Wisatesukhakdon 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 : Permpoon Chanpu

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

The temperature scale used was based on ITS-90

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

Standard Digital Thermometer with RTD probe

ID No. Cert. No. Due Date Traceability

400029 &amp; 400031 65-400273-1 23 Nov 2022 National Institute of Metrology Thailand (NIMT)

The Uncertainties are for a confidence probability of approximately 95%

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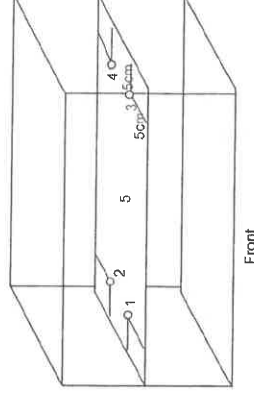
## Certificate of Calibration

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

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement



| 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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Approved by

( Bunjerd Mastr )

Supervisor



## Certificate of Calibration

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

**Submitted by :** M Green Group Co.,Ltd.  
188/46 Wisutesukhkhon 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<br>at nominal pH | Applied Voltage<br>( mV ) | Nominal Value<br>( pH ) | UUC Reading |        | Correction<br>( mV ) | Uncertainty<br>( ± 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<br>at nominal pH | Standard Buffer<br>( pH ) | UUC Reading<br>( pH ) | Correction<br>( pH ) | Uncertainty<br>( ± 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 Wisatesuknakhon 25, Pracha-Uttid 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 Sanchusri

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

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

Approved by :  
( Bunjerd Mastr )  
Supervisor

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

Certificate No. : 65-410112-1      Page : 2 of 2

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

| Standard Temperature<br>(°C) | UUC Reading<br>(°C) | Correction<br>(°C) | Uncertainty<br>(± °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 Callibration : Without Adjustment  
Function : Humidity measurement  
Reference Temperature @ 25 °C

| Standard Humidity<br>(%R.H.) | UUC Reading<br>(%R.H.) | Correction<br>(%R.H.) | Uncertainty<br>(± %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 Wisetuskunakhon 25, Pracha-Uttd Rd., Thungkru, Bangkok 10140 Thailand

**Equipment :** Electronic Balance  
**Manufacturer :** SHIMADZU **Model :** AP225WD  
**Serial No. :** D316300690  
**Capacity :** 220 g **Resolution :** 0.00001g/102g, 0.0001g/220g  
**Environment :** On site calibration was carried out at the Laboratory, M Green Group Co., Ltd.  
**Ambient Temperature :** (26.1 to 26.3) °C  
**Relative Humidity :** (62.1 to 64.5) %  
**Air Pressure :** 1007.0 mbar

**Date of Received :** 21 September 2022  
**Date of Calibration :** 21 September 2022  
**Date of Issue :** 24 September 2022  
**Calibrated by :** Akaradath Thippichai

**Calibration Method :** In-house method CAL-M2001 based on UKAS Publication ref : LAB 14  
Edition 5, July 2015

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

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

**Approved by**   
(Sirachai Promthong)  
Laboratory Manager

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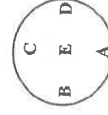
## Certificate of Calibration

**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<br>(g) | Correction<br>(g) | Uncertainty<br>± (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  
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Certificate of Calibration

Certificate No. : 65-210457-1

Page : 1 of 2

Submitted by : M Green Group Co., Ltd.  
188/4/6 Wisasuknkhon25, Pracha-Utd Rd., Thungkru, Bangkok 10140 Thailand

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

ID No. : 63-210391-1  
Assumed density of weight : 7950 kg / m<sup>3</sup>  
Assumed Air density : 1.2 kg / m<sup>3</sup>

Environment :  
Ambient Temperature : (20 ± 2) °C  
Relative Humidity : (50 ± 10) %  
Air Pressure : 1001.1 mbar

Date of Received : 21 September 2022  
Date of Calibration : 28 September 2022  
Date of Issue : 28 September 2022  
Calibrated by : Wuttichai Swatphong

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

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

Standard Weights

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

Approved by :  
( Surachai Promthong )  
Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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Certificate No. : 65-210457-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

| No. | Nominal Value | Id.Mark | Conventional mass Value | Measuring Uncertainty |
|-----|---------------|---------|-------------------------|-----------------------|
| 1   | 1 g           | none    | 1 g -0.016 mg           | ± 0.023 mg            |

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

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

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Certificate of Calibration

Certificate No. : 65-210457-2

Submitted by : M Green Group Co., Ltd.

188/46 Wisasuknakhon25, Pracha-Utd Rd., Thungkru, Bangkok 10140 Thailand

Equipment : Weight  
Manufacturer : N/A  
Weight size : 100 g  
Material : Stainless Steel  
ID No. : 63-210391-2  
Assumed density of weight : 7950 kg / m<sup>3</sup>  
Assumed Air density : 1.2 kg / m<sup>3</sup>  
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

Certificate No. : 65-210457-2

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

Submitted by : M Green Group Co., Ltd.  
188/46 Wisassuknakhon25, Pracha-Uttd Rd., Thungkru, Bangkok 10140 Thailand

**Equipment :**  
**Weight**  
**Manufacturer :** N/A  
**Weight size :** 200 g  
**ID No. :** 63-210391-3  
**Assumed density of weight :** 7950 kg / m<sup>3</sup>  
**Assumed Air density :** 1.2 kg / m<sup>3</sup>  
**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 Swapthong  
**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

# Certificate of Calibration

Certificate No. : 65-210457-3

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

| No. | Nominal Value | Idt.Mark | Conventional mass Value | Measuring Uncertainty |
|-----|---------------|----------|-------------------------|-----------------------|
| 1   | 200 g         | none     | 200 g +0.09 mg          | ± 0.17 mg             |

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

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Certificate of Calibration

Certificate No. : 65-400500-1

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

Equipment : Digital Thermometer with Thermistor probe

Temperature Indicator

Manufacturer : Eutech  
Range : N/A °C  
Resolution : 0.1 °C  
Serial No. : 2384323  
ID No. : N/A

Thermistor probe

Model : N/A  
Diameter : 3.2 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%

This certificate may not be reproduced other than in full except with the prior written approval of the Calibratech Co.,Ltd.



Certificate of Calibration

Certificate No. : 65-400500-1

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

| Immersion Depth<br>( mm. ) | Standard Reading<br>( °C ) | UUC Reading<br>( °C ) | Correction<br>( °C ) | Uncertainty<br>( ± °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%

- o0o -



Certificate of Calibration

Certificate No. : 65-400503-1

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

Equipment : Liquid in Glass Thermometer  
Manufacturer : N/A  
Range : 0 °C to 100 °C  
Resolution : 1 °C  
Model : N/A  
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 : Chorip 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) |            | Traceability                                    |
|------------------------------------------|------------|-------------------------------------------------|
| ID No.                                   | Cert. No.  | Due Date                                        |
| 400001                                   | TT-0016-22 | 07 Feb 2024                                     |
| 2. Standard Digital Thermometer          |            | National Institute of Metrology Thailand (NIMT) |
| ID No.                                   | Cert. No.  | Due Date                                        |
| 400003                                   | 21E1850    | 14 Jun 2023                                     |
| 400004                                   | 21E1850    | 14 Jun 2023                                     |
|                                          |            | National Institute of Metrology Thailand (NIMT) |

Approved by :   
( Bunjerd Masri )  
Supervisor

Certificate No. : 65-400503-1

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<br>( °C ) | UUC Reading<br>( °C ) | Correction<br>( °C ) | Uncertainty<br>( ± °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%

-o0o-



CAL

Calibratech Co.,Ltd.

7/106-7 Moo 2, Sukkapraditsan 3 Rd., Bangpood, Pakkret, Nonthaburi 11120

Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech\_cal@yahoo.com, calibratech\_cal@hotmail.com



NSC-TS1-1817025  
CALIBRATION 0030

## Certificate of Calibration

Certificate No. : 65-300541-1

Page : 1 of 2

Submitted by : M Green Group Co.,Ltd.

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

Equipment : Volumetric Flask

Manufacturer : GLASSCO Class : A

Capacity : 100 ml

ID No. : VF100/01/19

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

Relative Humidity : ( 50 ± 15 ) %

Air Pressure : 1007.5 mbar.

Date of Received : 21 September 2022

Date of Calibration : 26 September 2022

Date of Issue : 26 September 2022

Calibrated by : Areerat Sombun

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

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

Electronic Balance

ID No. Cert.No. Due Date Traceability

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

Approved by :

( W/ipa Toivadee )

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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CAL-F0031-03

CAL

Calibratech Co.,Ltd.

7/106-7 Moo 2, Sukkapraditsan 3 Rd., Bangpood, Pakkret, Nonthaburi 11120

Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech\_cal@yahoo.com, calibratech\_cal@hotmail.com

## Certificate of Calibration

Certificate No. : 65-300541-1

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%

-o0o-



CAL-F0031-03

Certificate of Calibration

Certificate No. : 65-300541-2

Page : 1 of 2

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

Equipment : Volumetric Flask  
Manufacturer : GLASSCO  
Capacity : 250 ml  
ID No. : VF250/01/19  
Class : A

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 Towadee )  
Supervisor

Certificate No. : 65-300541-2

Page : 2 of 2

Result of Calibration : This result of true Volume is referred to standard temperature at 20 °C  
UUC Condition As-Received : Good

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

Uncertainty of measurement with in ± 0.049 ml  
This result of calibration was found accurate as shown on date and place of calibration only  
This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k = 2.00 ,  
providing a level of confidence of approximately 95%

-o0o-



CAL

Calibratech Co.,Ltd.

7/106-7 Moo 2, Sukhprachasan 3 Rd., Bangpood, Paktred, Nonthaburi 11120

Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech.co@yaho.com, calibratech.co@hotmail.com



NSC-TISI-TIS 7025  
CALIBRATION 0030

## Certificate of Calibration

Certificate No. : 65-300541-3

Submitted by : M Green Group Co.,Ltd.

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

Page : 1 of 2

Equipment : Volumetric Flask

Manufacturer : GLASSCO

Class : A

Capacity : 1000 ml

ID No. : VF1000/01/19

Environment : Ambient Temperature :  $(23 \pm 2)$  °C

Relative Humidity :  $(50 \pm 15)$  %

Air Pressure : 1007.4 mbar.

Date of Received : 21 September 2022

Date of Calibration : 26 September 2022

Date of Issue : 26 September 2022

Calibrated by : Areerat Sombun

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

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

Electronic Balance

ID No. Cert. No. Due Date Traceability

241002 65-200172-1 02 Dec 2022 National Institute of Metrology (Thailand) (NIMT)

Approved by :

( Wipa Toivadee )

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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CAL-F0031-03



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Calibratech Co.,Ltd.

7/106-7 Moo 2, Sukhprachasan 3 Rd., Bangpood, Paktred, Nonthaburi 11120

Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech.co@yaho.com, calibratech.co@hotmail.com

## Certificate of Calibration

Certificate No. : 65-300541-3

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-



CAL-F0031-03

Certificate of Calibration

Certificate No. : 65-300541-4  
Submitted by : M Green Group Co.,Ltd.  
188/46 Wisatesuknakhon 25, Pracha-Utd Rd., Thungkru, Bangkok 10140 Thailand

Page : 1 of 2

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. | 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. : 65-300541-4  
Result of Callibration : This result of true Volume is referred to standard temperature at 20 °C  
UUC Condition As-Received : Good

Page : 2 of 2

| 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 Wisutesuknakhon 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 :  $(23 \pm 2)$  °CRelative Humidity :  $(50 \pm 15)$  %

Air Pressure : 1002.7 mbar.

Date of Received : 21 September 2022

Date of Calibration : 26 September 2022

Date of Issue : 26 September 2022

Calibrated by : Areearat 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.

Due Date

Traceability

65-200172-4

02 Dec 2022

National Institute of Metrology (Thailand) (NIMT)

Approved by :

( Wipa Tovadee )

Supervisor

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## Certificate of Calibration

Certificate No. : 65-300541-5

Page : 2 of 2

Result of Calibration :

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

UUC Condition As-Received : Good

Delivery Time : 12.14 sec.

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

Uncertainty of measurement with in  $\pm$  0.0039 ml

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

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

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## Certificate of Calibration

**Certificate No. :** 65-300541-6 **Page : 1 of 2**

**Submitted by :** M Green Group Co.,Ltd.  
188/46 Wisatusuknakhon 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 :** 1002.7 mbar.

**Date of Received :** 21 September 2022  
**Date of Calibration :** 26 September 2022  
**Date of Issue :** 26 September 2022  
**Calibrated by :** Areerat Sornbun

**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 Meirology (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** ± 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-



**SX**

**S K SALES AND SERVICE CO.,LTD.**  
194/56, 194/57 Thokhom Rd. Somdej Dom  
Bang Khun Thian Bangkok 10150  
Tel : 02-417-2144 Fax : 02-417-2155



ISO 9001:2015  
CALIBRATION 1281

## Certificate of Calibration

**Reference No.** : 3484/2209-049  
**Customer** : M GREEN GROUP CO.,LTD  
: 188/48 Pracha-Uthit Rd., Thungkru,  
: Bangkok 10140 Thailand  
: Incubator  
: BIOBASE  
: Biochemistry Incubator  
: KYP1502202003  
: -  
: 14 September 2022  
: 14 September 2022  
: 16 September 2022  
**Environment**

|                          | Minimum Value | Maximum Value |
|--------------------------|---------------|---------------|
| Ambient Temperature (°C) | 25.1          | 25.8          |
| Relative Humidity (% RH) | 54            | 55            |
| AC Line Voltage (VAC)    | 223           | 225           |

**Place Of Calibration** : Temperature Caalibration Room  
**Calibrated by** : Mr. Teerasak Chaiyaporn

### Calibration Method

In-house method : SK-WI-23 base on Thai Laboratory Accreditation Scheme Publication Reference G-20

### Condition of this result of calibration

- Reference standard instrument
 

| Instrument                      | Model  | Serial No. | Certificate No. | Due Date  |
|---------------------------------|--------|------------|-----------------|-----------|
| 1) Data acquisition/Switch unit | 34972A | MY44021731 | L2205-1241      | 27 Nov 22 |
| 2) Multiplexer Module           | 34901A | MY41085938 | L2205-1241      | 27 Nov 22 |
- This result of calibration was found accurate as shown on date and place of calibration only
- This certificate can be traceable to International System of Unit :  
- Through Thailand Institute of Scientific And Technological Research (TISTR)

Approved by : \_\_\_\_\_

☒ Mr. Suphachai Saksri ☐ Mr. Phayak Tootit ☐ Miss Tantaraporn Peitong

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

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**Certificate No. : S2209-3148**

Page 2 of 2

Table1 General Information

|                      |               |
|----------------------|---------------|
| Working Area (W*L*H) | 45 *42 *84 cm |
| Fresh Air            | OFF           |

Table2 Chamber Performance

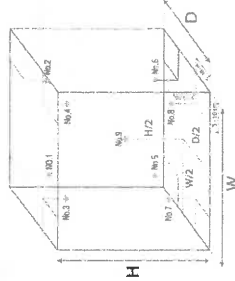
| Setting Temperature (°C) | Average Indicating Temperature (°C) | Measured Stability (± °C) | Measured Uniformity (°C) | Overall Variation (°C) |
|--------------------------|-------------------------------------|---------------------------|--------------------------|------------------------|
| 20.0                     | 20.0                                | 0.96                      | 0.55                     | 1.92                   |

Table3 Temperature Distribution

| Setting Temperature (°C) | Average Standard Reading (°C) |       |       |       |       |       |       |       |       | Uncertainty (± °C) |
|--------------------------|-------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|--------------------|
|                          | No. 1                         | No. 2 | No. 3 | No. 4 | No. 5 | No. 6 | No. 7 | No. 8 | No. 9 |                    |
| 20.0                     | 19.78                         | 19.72 | 19.94 | 19.70 | 19.80 | 19.63 | 19.79 | 19.66 | 19.82 | 1.3                |

Resolution : 0.1 (°C)

\* Probe No. 9 is Reference Probe



- Notes :
- The temperature stability is the one-half of greatest maximum difference of measured temperatures at any one probe.
  - The temperature uniformity is the maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time
  - Overall variation is the difference of maximum and minimum measured temperatures throughout observation time.
  - The reported uncertainty of measurement were excluded Uniformity and Stability

\*\* End of Calibration Report \*\*



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0-2717-3000-27 FAX. 0-2719-9484



NSC-TIB-TIS717025  
CALIBRATION 0008

Cert.No.: 22CG4889  
Page.: 1 of 2

## Certificate of Calibration

Equipment : Burette

Capacity : 25 mL

Serial No. :

ID. No. : 2212-0344-2

Manufacturer : Glassco

Made in :

Submitted by :

M GREEN GROUP CO., LTD.  
188/46 Precha-Ulud Rd., Thungkru  
Bangkok 10140 Thailand

Ambient Temperature :

Relative Humidity : (20 ± 2.5) °C

Barometric Pressure : (50 ± 10) %

Calibration Procedure : 759 mmHg

Calibrated by : ASTM E 542 - 01

Panward Pranklam

Approved by :

Approved Signatory

( ) Ponthippa Tamayakul

( ) Malee Bulkruea

( ) Ponpan Peipim

( ) Srisuda Khamtha

Issue Date :

16 December 2022

The Uncertainties are for a confidence probability of approximately 95 %

This certificate may not be reproduced other than in full, except with the prior written  
Approval of the Head of Corporate Services 3 : Equipment Calibration and Testing Services.



Equipment : Burette

Received Date : 13 December 2022

Condition As-Received : New Item

Calibration Date : 15 December 2022

Reference : 2212-0344WN-2

### Condition of this result of calibration

1. Reference Standard Instruments :

| Instruments          | Model   | Serial No. | ID. No.  | Certificate No. | Traceability | Due date     |
|----------------------|---------|------------|----------|-----------------|--------------|--------------|
| 1) Balance           | MS204TS | C226356983 | 140RC010 | TH2068-012      | METTLER      | 29 Sep 2023  |
| 2) Thermo-Hygrograph | THDX-CE | 00016540   | 140EC001 | 22H1243         | NIST, NIMT   | 09 June 2023 |
| 3) Thermometer       | -       | 1594592    | 140EC010 | 221181          | NIMT         | 10 Feb 2023  |

This certification is traceable to SI Unit

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

3. True value is converted to true volume at the standard temperature of 20 °C

### Calibration result :

| Nominal capacity<br>( mL ) | Reading<br>( mL ) | Uncertainty<br>( ± mL ) | k<br>Factor |
|----------------------------|-------------------|-------------------------|-------------|
| 25                         | 24.9569           | 0.0065                  | 2.00        |

Remark mL = cm<sup>3</sup>

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

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A 0048587

a 1140299



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUKUM VIANG, SUKUMVIANG BANGKOK 10250  
TEL: 0-2717-3830-27 FAX: 0-2719-9484



NSC-TS-TIS7925  
CALIBRATION 0006

Cert.No.: 22CG4888  
Page.: 1 of 2

## Certificate of Calibration

**Equipment :** Burette  
**Capacity :** 10 mL  
**Serial No. :** -  
**ID. No. :** 2212-0344-1  
**Manufacturer :** Glassco  
**Made in :** -  
**Submitted by :** M GREEN GROUP CO., LTD.  
188/46 Precha-Ulud Rd., Thungkru  
Bangkok 10140 Thailand  
**Ambient Temperature :** (20 ± 2.5) °C  
**Relative Humidity :** (50 ± 10) %  
**Barometric Pressure :** 759 mmHg  
**Calibration Procedure :** ASTM E 542 - 01  
**Calibrated by :** Panward Pranklam

**Approved by :**   
Approved Signatory

( ) Ponthippa Tameyakul  
( ) Malee Butkruea  
( ) Ponpan Paipim  
( ) Srisuda Khamtha

**Issue Date :** 16 December 2022

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written  
Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.



**Equipment :** Burette  
**Received Date :** 13 December 2022  
**Condition As-Received :** New Item  
**Calibration Date :** 15 December 2022  
**Reference :** 2212-0344WN-1

Cert.No.: 22CG4888  
Page.: 2 of 2

### Condition of this result of calibration

#### 1. Reference Standard Instruments :

| Instruments         | Model   | Serial No. | ID. No.  | Certificate No. | Traceability | Due date     |
|---------------------|---------|------------|----------|-----------------|--------------|--------------|
| 1) Balance          | MS204TS | C226356983 | 140RC010 | TH2068-012      | METTLER      | 29 Sep 2023  |
| 2) Thermo-Hygograph | THDX-CE | 00016540   | 140EC001 | 22H1243         | NIST, NIMT   | 09 June 2023 |
| 3) Thermometer      | -       | 1594592    | 140EC010 | 221H81          | NIMT         | 10 Feb 2023  |

This certification is traceable to SI Unit

2. The certificate is valid only to the item calibrated on date and place of calibration.  
3. True value is converted to true volume at the standard temperature of 20 °C

#### Calibration result :

| Nominal capacity<br>( mL ) | Reading<br>( mL ) | Uncertainty<br>( ± mL ) | k<br>Factor |
|----------------------------|-------------------|-------------------------|-------------|
| 10                         | 9.9867            | 0.0038                  | 2.00        |

**Remark** mL = cm<sup>3</sup>

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

-o0o-



A 0048588

a 1140298



# QUALITY CALIBRATION CO.,LTD.

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



CERTIFICATE No : 23T1387  
REFERENCE No : 68174-5

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,  
BANGKOHUNTHIAN, BANGKOK 10150

CALIBRATED BY : PRASERT P.  
CALIBRATION DATE : 13-Feb-23

APPROVED BY :   
ISSUED DATE : 14-Feb-23  
RECEIVED DATE : 13-Feb-23

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

F-G010 REV : 02



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

CERTIFICATE No : 23T1387

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : INCUBATOR  
MANUFACTURER : MEMMERT  
MODEL : IF 110  
ID No : EQL-190  
RECEIVED DATE : 13-Feb-23  
AMBIENT TEMPERATURE : 24 °C ± 1 °C  
S/N : D415.0802  
CALIBRATION DATE : 13-Feb-23  
RELATIVE HUMIDITY : 50 %RH ± 10 %RH

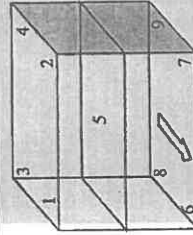
### CONDITION OF THIS RESULTS OF CALIBRATION

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

### 2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT : MODEL : SERIAL No : CERTIFICATE No : DUE DATE :  
1) DATA LOGGER WITH RTD : HYDRA 2635A : 6635300 : 22T7509 : 10-Jul-23  
3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION.  
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



FRONT

### GENERAL INFORMATION

Overall Ambient Temperature around the Chamber (°C) variation : 5  
Overall Line Voltage (V) variation : 8  
Instrument Condition : Normal  
Chamber Size (W\*L\*H): 56\*40\*48 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) |
|------------------------|-----------------------------|-----------------------------|----------------------------|-----------------------------|-----------------------------|------------------------|
| 37.0                   | 37.0                        | 37.0                        | 36.93                      | 0.07                        | 0.16                        | 0.26                   |
| 44.0                   | 44.0                        | 44.0                        | 44.17                      | 0.07                        | 0.22                        | 0.27                   |

### TEMPERATURE MEASUREMENT ACCURACY TEST

| Controller Temp (°C) | Measured Temperature (°C) at Spread Locations |       |       |       |       |       |       |       |       | Uncertainty (± °C) |
|----------------------|-----------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|--------------------|
|                      | #1                                            | #2    | #3    | #4    | #5    | #6    | #7    | #8    | #9    |                    |
| 37.0                 | 37.0                                          | 36.97 | 36.95 | 36.94 | 36.96 | 36.92 | 36.91 | 36.90 | 36.84 | 0.25               |
| 44.0                 | 44.0                                          | 44.21 | 44.23 | 44.09 | 44.23 | 44.13 | 44.21 | 44.15 | 44.07 | 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

F-G010 REV : 02



CERTIFICATE No : 23T1386  
REFERENCE No : 68174-4

PAGE : 1 OF 2

## Certificate of Calibration

EQUIPMENT : INCUBATOR  
MANUFACTURER : MEMMERT  
MODEL : IF 160  
SERIAL No : D518.0082  
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 : PRASERT P.  
CALIBRATION DATE : 13-Feb-23

APPROVED BY :   
PONGSAK J.  
ISSUED DATE : 14-Feb-23  
RECEIVED DATE : 13-Feb-23

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 : 23T1386

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : INCUBATOR  
MANUFACTURER : MEMMERT  
MODEL : IF 160  
ID No : EQL-205  
RECEIVED DATE : 13-Feb-23  
AMBIENT TEMPERATURE : 24 °C ± 1 °C  
S/N : D518.0082  
CALIBRATION DATE : 13-Feb-23  
RELATIVE HUMIDITY : 50 %RH ± 10 %RH

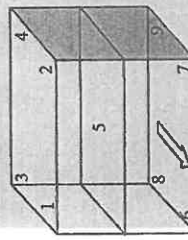
### CONDITION OF THIS RESULTS OF CALIBRATION

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

### 2-REFERENCE STANDARD INSTRUMENTS :-

- 1) DATA LOGGER WITH RTD HYDRA 2655A
3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-  
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO.,LTD.

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



### GENERAL INFORMATION

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

### CHAMBER PERFORMANCE

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

### TEMPERATURE MEASUREMENT ACCURACY TEST

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

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

NOTE 2 : LOCATION 5 WAS REFERENCE LOCATION.

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

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

F-G010 REV : 02



CERTIFICATE No : 23T1391  
REFERENCE No : 68175-1

PAGE : 1 OF 2

## Certificate of Calibration

EQUIPMENT : AUTOCLAVE  
MANUFACTURER : HIRAYAMA  
MODEL : HVE-50  
SERIAL No : 30612085166  
No : EQ-155  
CONDITION AS RECEIVED : USED ITEM  
SUBMITTED BY : TEST TECH CO., LTD.  
30,32 RAMA II SOI 63, RAMA II RD.,  
SAMAEDAM, BANGKHUNTHIAN, BANGKOK  
10150

CALIBRATED BY : PRASERT P.  
CALIBRATION DATE : 13-Feb-23

APPROVED BY :   
ISSUED DATE : 14-Feb-23  
RECEIVED DATE : 13-Feb-23

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



CERTIFICATE No : 23T1391

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : AUTOCLAVE  
MANUFACTURER : HIRAYAMA  
ID NUMBER : EQ-155  
RECEIVED DATE : 13-Feb-23  
AMBIENT TEMPERATURE : 30° C ± 1° C  
MODEL : HVE-50  
SERIAL NUMBER : 30612085166  
CALIBRATION DATE : 13-Feb-23  
RELATIVE HUMIDITY : 50 %RH ± 10 % RH

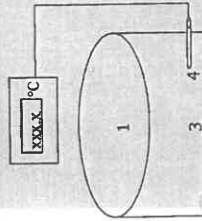
### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BASED ON BS 2646 : Part 5 : 1993 BY COMPARISON WITH CALIBRATED THERMOCOUPLE TYPE K UNDER NO LOAD CONDITION. THE THERMOCOUPLES WERE PLACED ON FIVE LOCATIONS AS SHOWN IN THE PICTURE. TWO PROBES WERE PLACES NEAR TOP AND BOTTOM WALL AND EACH PROBE WAS AWAY FROM THE EACH WALL OF 5 cm TO 10 cm. AND PLACED THE THIRD PROBE WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE INSTRUMENT CHAMBER. PROBE NUMBER 4 WAS ATTACHED TO THE LOAD TEMPERATURE PROBE, IF FITTED, WITHIN 20 mm OF ITS TIP. PROBE NUMBER 5 WAS PLACED IN THE CHAMBER DRAIN OR VENT WITHIN 100 mm OF ITS CONNECTION TO THE CHAMBER.

### 2. N. . . REFERENCE STANDARD INSTRUMENTS . . .

- 1) DATA LOGGER  
VAL PROBE S350, DV35, DN94 23T0885 27-Jan-24  
2) THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.  
3. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.  
4. 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 Temperature (°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                         |

FRONT

### TEMPERATURE MEASUREMENT ACCURACY TEST(° C)

| Cont Temp | Ind Temp | Measured Temperature (°C) at Spread Locations |        |        |        | Uncertainty (± °C) |
|-----------|----------|-----------------------------------------------|--------|--------|--------|--------------------|
|           |          | #1                                            | #2     | #3     | #4     |                    |
| 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 MULTIPLIED BY A COVERAGE FACTOR k = 2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

ใบรับรองการทวนสอบ "เครื่องกลั่นไนโตรเจน"  
(Calibration Certificate of Distillation Unit VAPODEST  
VAP20, VAP30s)

## การดูแลบำรุงรักษาเชิงป้องกัน

### Preventive Maintenance



บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด  
ฝ่ายบริการหลังการขาย  
โทร 0 2 639 7000 E-mail: service.thailand@dksh.com  
ฝ่ายขายและการตลาด  
โทร 0 2 639 7000 E-Mail : marketing.thailand@dksh.com  
Website : [www.dksh.co.th/technology/scientific-thailand](http://www.dksh.co.th/technology/scientific-thailand)



### เงื่อนไขการให้บริการ Preventive Maintenance

บริษัทฯ จะส่งวิศวกรผู้ชำนาญ เพื่อให้บริการตามขอบข่ายของบริการ เฉพาะ ในวันและเวลา ราชการ หากมีความประสงค์ที่จะรับบริการนอกเหนือจากวัน เวลา ราชการ (วันหยุดเสาร์ – อาทิตย์ หรือวันหยุด นักชดถุกณ์) บริษัทฯ จะคิดค่าบริการเพิ่มเติมตามอัตราที่กฎหมายแรงงานกำหนดไว้

#### ขอบข่ายการบริการ

- ตรวจสอบสภาพการทำงานต่าง ๆ ของเครื่องมือ
- ทดสอบประสิทธิภาพการทำงานของเครื่องมือ
- รายการผลการตรวจสอบเครื่องมือ

#### หมายเหตุ

- ราคาไม่รวมถึงค่าบริการซ่อม หรือ เปลี่ยนอะไหล่ที่ชำรุดเสียหาย หรือหมดสภาพการใช้งาน
- ในกรณีที่ผู้ใช้บริการอยู่นอกเขตพื้นที่ให้บริการ บริษัทฯ จำเป็นต้องคิดค่าใช้จ่ายเพิ่มเติม ได้แก่ ค่าเดินทาง เป็นต้น
- บริษัท ฯ ขอสงวนสิทธิ์ในการเปลี่ยนแปลงราคา โดย ไม่แจ้งให้ทราบล่วงหน้า



DKSH Technology Limited (บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด)

เลขที่ 2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพฯ 10260

เลขประจำตัวผู้เสียภาษี 010-555-001-4547 (สำนักงานใหญ่)

### ช่องทางการติดต่อ



Call center 0 2 639 7000



DKSH Scientific



www.dksh.com/scientific-thailand



mailto:info.th@dksh.com



@dkshscientific



### Preventive Maintenance Contract

จำนวนในการที่สัญญาบริการ ..... 1 ..... ครั้ง ต่อ ปี  
ครั้งที่/วันที่ ..... 28 Mar. 2023 .....

#### รายละเอียดผู้รับบริการ

|          |                                                                                         |       |             |
|----------|-----------------------------------------------------------------------------------------|-------|-------------|
| หน่วยงาน | บริษัท เทสท์ เทคโนโลยี จำกัด                                                            |       |             |
| ที่อยู่  | 30,32 ซอยพระรามที่ 2 ซอย 63 ถนนพระรามที่ 2 แขวงแสนคำ เขตบางขุนเทียน กรุงเทพมหานคร 10150 |       |             |
| โทรศัพท์ | 0-2893-4211-7                                                                           | แฟกซ์ | 0-2893-4218 |

#### ผู้ติดต่อ

|                |                           |             |                   |
|----------------|---------------------------|-------------|-------------------|
| ชื่อ - นามสกุล | คุณปริศนา วิเศษสังข์      |             |                   |
| ตำแหน่ง        | หัวหน้าส่วน               |             |                   |
| โทรศัพท์       | 0-2893-4211-7             | เบอร์ติดต่อ | แฟกซ์ 0-2893-4218 |
| E-mail         | Lab_center@testtech.co.th |             |                   |

#### รายละเอียดผู้ให้บริการ

|                                                                                                                                                                                                                                                                                                       |                                |       |   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-------|---|
| บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด (ฝ่ายบริการหลังการขาย) (สำนักงานใหญ่)<br>เลขที่ 2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพฯ 10260<br>โทรศัพท์ 0 2 693 7000 Email: siriporn.s@dksh.com Line ID : siriporn3007<br>เจ้าหน้าที่ประสานงาน : คุณศิริพร อู่ทองจุ้ย โทรศัพท์ 090 678 6924 , 02 301 7467 |                                |       |   |
| เจ้าหน้าที่ผู้ให้บริการ                                                                                                                                                                                                                                                                               | นายอิทธิพล สมอาด               |       |   |
| ตำแหน่ง                                                                                                                                                                                                                                                                                               | Specialist, Technical Service. |       |   |
| โทรศัพท์                                                                                                                                                                                                                                                                                              | 0938138736                     | แฟกซ์ | - |
| E-mail                                                                                                                                                                                                                                                                                                | Iritayut.j@dksh.com            |       |   |

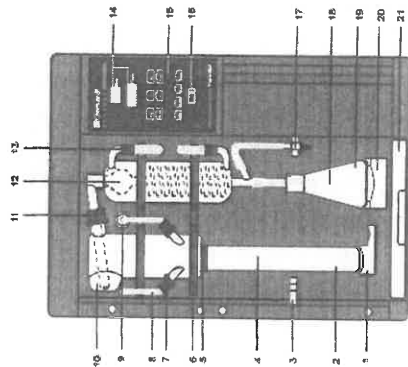
|                          |                                       |
|--------------------------|---------------------------------------|
| ลงนามผู้รับบริการ        | ลงนามผู้ให้บริการ                     |
| ตัวจริง (.....)          | ตัวจริง (...นายอิทธิพล สมอาด...)      |
| ตำแหน่ง                  | ตำแหน่ง Specialist, Technical Service |
| วันที่ / ประทับตราบริษัท | วันที่ / ประทับตราบริษัท 28/3/2023    |

JOB No: Lsp2302591..... MODEL: Vap30..... S/N: 003718.....

Part : Operational Qualification (OQ)

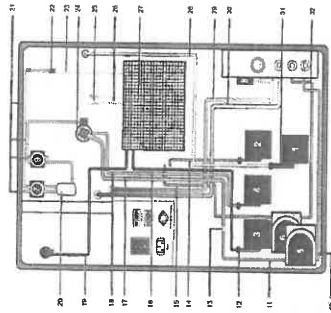
ตรวจสอบสภาพเครื่อง

FRONT



- |                                                  |                                     |                          |                          |        |
|--------------------------------------------------|-------------------------------------|--------------------------|--------------------------|--------|
| 1.Quick clamping device with wedge               | Pass                                | Fail                     | N/A                      | Remark |
| 2. Kjeldatherm digestion tube                    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | .....  |
| 3. Holder for steam inlet tubing                 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | .....  |
| 4. PTFP-Inlet tubing, steam                      | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | .....  |
| 5. Viton-cone                                    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | .....  |
| 6. Clamping for glassware                        | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | .....  |
| 7. Screw cap GL18 with silicone seal             | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | .....  |
| 8. PTFP-Inlet tubing, NaOH                       | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | .....  |
| 9. PP-Distributor with PP-threaded joint         | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | .....  |
| 10. Distribution head, glass                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | .....  |
| 11. Screw cap GL32 with silicone seal            | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | .....  |
| 12. Distillation condenser                       | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | .....  |
| 13. Screw cap GL14 with plastic screw connection | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | .....  |
| 14. Display                                      | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | .....  |
| 15. Keyboard, chemical-resistant                 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | .....  |
| 16. Main switch, green                           | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | .....  |
| 17. Ventilation valve                            | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | .....  |
| 18. Distillate outlet tubing                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | .....  |
| 19. Erlenmeyer flask                             | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | .....  |
| 20. Platform                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | .....  |
| 21. Drip tray                                    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | .....  |

REAR



- |                                                        |                                     |                          |                                     |                |
|--------------------------------------------------------|-------------------------------------|--------------------------|-------------------------------------|----------------|
| 1. Diaphragm pump NaOH                                 | Pass                                | Fail                     | N/A                                 | Remark         |
| 2. Diaphragm pump H <sub>2</sub> BO <sub>3</sub>       | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | .....          |
| 3. Diaphragm pump H <sub>2</sub> O for steam generator | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | vap 40 only    |
| 4. Diaphragm pump H <sub>2</sub> O for sample          | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | .....          |
| 5. Peristaltic pump for suction sample                 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | vap 30,40 only |
| 6. Peristaltic pump for suction receiver               | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | vap 30,40 only |
| 7. Pinch-solenoid valve, steam                         | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | option         |
| 8. Magnetic valve with pressure control                | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | .....          |
| 9. Pinch-solenoid valve, shut-off                      | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | .....          |
| 10. Verprene-tubing 4x8 mm.                            | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | .....          |
| 11. Verprene-tubing 4x8 mm.                            | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | vap 30,40 only |
| 12. Non-return valve for diaphragm pumps               | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | .....          |
| 13. Tubing reduction PP 51x10x5 mm.                    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | vap 30,40 only |
| 14. Silicone tubing 4x7 mm.                            | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | vap 40 only    |
| 15. Silicone tubing 4x7 mm.                            | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | option         |
| 16. Silicone -tubing 4x7 mm.                           | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | .....          |
| 17. Verprene-tubing 8x12 mm.                           | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | vap 30,40 only |
| 18. Verprene tubing 4x7 mm.                            | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | vap 30,40 only |
| 19. Silicone tubing 4x7 mm.                            | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | .....          |
| 20. Ventilation glass                                  | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | .....          |
| 21. Novoprene-tubing 4.8x8 mm.                         | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | .....          |
| 22. Tubing reduction                                   | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | .....          |
| 23. Silicone tubing 6x10 mm.                           | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | .....          |
| 24. PP-distributor with PP-thread                      | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | .....          |
| 25. SKT-valve (built in with brass fitting)            | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | .....          |
| 26. Silicone tubing 8x16x80 mm.                        | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | .....          |
| 27. Steam generator                                    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | .....          |
| 28. PTFE-inlet tubing NaOH                             | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | .....          |
| 29. Silicone tubing 8x16 for cooling water inlet       | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | .....          |
| 30. Silicone tubing 8x16 for cooling water outlet      | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | .....          |
| 31. Viton-tubing 6x12*50 mm.                           | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | .....          |
| 32. Silicone tubing 4x7 mm.                            | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | option         |

รายละเอียดการตรวจสอบ

ขั้นตอนการบริการ

- ตรวจสอบระบบไฟฟ้า (Electrical Test)
- ความดันหม้อต้มไฟฟ้าของเครื่องกับทาวด์
  - กระแสไฟฟ้าที่ใช้งาน

ตรวจสอบสภาพเครื่อง (Optical Test)

- Main cable
- Electric wiring
- Pumps
- Distribution Head
- Condensor
- Steam generator
- Tubing
- Viton cone

ตรวจสอบ Function การทำงาน (The Function Test)

- ระบบสร้างและควบคุมความดันของ Steam
- ระบบการเติมน้ำ Sample Tube
- ระบบการเติม Na OH
- ระบบการ Suction ทั้ง Sample Tube และ Receiver

รายงานผลการให้บริการ

1. TECHNICAL DATA

Main Supply 220 volt + 10% 50 Hz with ground  
Nominal current

Pass ☒ ☒  
Fail ☐ ☐  
N/A ☐ ☐  
Remark .....  
6 a.....

1.1 COOLING WATER BATH

Temperature 15-20 °C  
Cooling Water Outlet  
Control Temperature

Pass ☒ ☒ ☒  
Fail ☐ ☐ ☐  
N/A ☐ ☐ ☐  
Remark .....  
.....  
.....

1.2 OPTICAL TEST VAP..30..

Screw cap GL14  
Screw cap GL18  
Screw cap GL32  
Distillation Head  
Condensor  
Viton Cone  
Ventilation Valve  
Micro Switch Sample

Pass ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒  
Fail ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐  
N/A ☐ ☐ ☐ ☐ ☐ ☐ ☐  
Remark .....  
.....  
.....  
.....  
.....  
.....  
.....  
.....

2. SYSTEM COOLING WATER INLET

Cooling Water Inlet  
Cooling Water Outlet  
Magnetic valve

Pass ☒ ☒ ☒  
Fail ☐ ☐ ☐  
N/A ☐ ☐ ☐  
Remark .....  
.....  
.....

3.SYSTEM CONTROL

Key Board  
Display  
Program  
Adding H<sub>2</sub>O  
Adding NaOH  
Adding H<sub>3</sub>BO<sub>3</sub>  
Suction Sample

Pass ☒ ☒ ☒ ☒ ☒ ☒ ☒  
Fail ☐ ☐ ☐ ☐ ☐ ☐ ☐  
N/A ☐ ☐ ☐ ☐ ☐ ☐ ☐  
Remark .....  
.....  
.....  
vap 30,40 only  
vap 40 only  
vap 30,40 only

4.SYSTEM DISTILLATION

Boiler  
Level Sensor  
Novoprene-Tubing  
Solenoid Valve Shut-Off  
Solenoid Valve Steam  
Excess Pressure Detector  
Ventilation Valve  
Heater

Pass ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒  
Fail ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐  
N/A ☐ ☐ ☐ ☐ ☐ ☐ ☐  
Remark .....  
.....  
.....  
.....  
.....  
.....  
.....  
.....

Part : ข้อมูลสนับสนุนด้านเทคนิค (General Technical Support)  
การบำรุงรักษาทั่วไป (Basic maintenance)

|                                                   |                                     |                                     |        |
|---------------------------------------------------|-------------------------------------|-------------------------------------|--------|
| 5. PUMP                                           |                                     |                                     |        |
| Pump H <sub>2</sub> O Steam                       | Pass                                | Fail                                | Remark |
| - Non-Return Valve                                | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | .....  |
| Pump H <sub>2</sub> O Sample                      | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | .....  |
| - Non-Return Valve                                | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | .....  |
| Pump NaOH                                         | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | .....  |
| - Non-Return Valve                                | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | .....  |
| Pump H <sub>3</sub> BO <sub>3</sub>               | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | .....  |
| - Non-Return Valve                                | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | .....  |
| Pump Suction                                      | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | .....  |
| 6. The Following Program Run :                    |                                     |                                     |        |
| Addition H <sub>2</sub> O 0-99 sec.               | Pass                                | Fail                                | Remark |
| Addition NaOH 0-99 sec.                           | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | .....  |
| Addition H <sub>3</sub> BO <sub>3</sub> 0-99 sec. | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | .....  |
| Reaction Time 0-99 min.                           | <input type="checkbox"/>            | <input type="checkbox"/>            | .....  |
| Distillation Time 0-99 min                        | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | .....  |
| Steam Capacity 30%-100%                           | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | .....  |
| Suction Time 0-99 sec.                            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | .....  |
| The Instrument is in perfect technical shape      | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | .....  |

Remark : .....

.....

Cleaning

Glass parts and suction pump should be cleaned before long periods of non-usage (i.e. holidays). This way blockages caused by crystalline deposits are avoided.

The following program should be run:

|                                         |     |      |
|-----------------------------------------|-----|------|
| Addition H <sub>3</sub> BO <sub>3</sub> | 0   | s    |
| Addition H <sub>2</sub> O:              | 13  | s    |
| Addition NaOH:                          | 0   | s    |
| Reaction time:                          | 0   | s    |
| Distillation time:                      | 7   | min. |
| Steam capacity:                         | 100 | %    |
| Suction time:                           | 20  | s    |

Place an empty digestion tube and an Erlenmeyer flask into position, and start the program.  
In case of extreme deposits in the glassware you can clean the system by putting about 10 ml of sulphuric acid into the digestion tube.

## Error Code

The micro-processor continuously surveys all the functions of the distillation system. As soon as an error arises it is shown on the display and accompanied by an acoustic signal.

| Error message                                                                       | Measures                                                                         |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| No tap water                                                                        | Check cooling water inlet for blockages.<br>Ensure the tap is turned on →        |
| No sample tube                                                                      | Insert tube →                                                                    |
| Check chemicals                                                                     | Check set of tanks →                                                             |
| Low water<br>Press Enter                                                            | Check the water inlet distilled H <sub>2</sub> O →                               |
| Filling<br>Steam generator<br>↓                                                     | This message disappears as soon as steam generator is filled                     |
| After the above mentioned errors are corrected, the following message is displayed. |                                                                                  |
| Error message                                                                       | Measures                                                                         |
| Stop Prog. No. x<br>Continue=Enter                                                  | Enter=continue of interrupted program<br>Reset=Standby-mode                      |
| Other error messages                                                                |                                                                                  |
| Error message                                                                       | Measures                                                                         |
| Wait for steam                                                                      | Message disappears as soon as stand-by is reached                                |
| Add sol. > 1 min<br>Continue=Enter                                                  | Check programming<br>Enter=continue of interrupted program<br>Reset=Standby-mode |
| Program undefined                                                                   | Check programming →                                                              |
| Excess steam pressure                                                               | Switch the system off and call service                                           |
| Sensor error                                                                        | Switch the system off and call service                                           |



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, BANGKOK 10250  
TEL. 0-2717-3000-24 FAX. 0-2715-9484



## Certificate of Calibration

Certificate No.: 23M259  
Page: 1 of 2

**Equipment:** Standard Weight  
**Manufacturer:** LS  
**Model:**  
**Serial No.:**  
**ID No.:** EQL-121  
**Condition As-Received:** Used Item  
**Received Date:** 02 February 2023  
**Calibration Date:** 07 February 2023  
**Reference:** 2302-0080DN  
**Ambient Temperature:** ( 23 ± 2 ) °C  
**Relative Humidity:** ( 50 ± 15 ) %  
**Atmospheric Pressure:** 1008.9 mbar

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

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

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

**Procedure used:** Calibration were conducted using in-house calibration procedure CP-M01 according to comparison method against standard weights on the basis of weightings at an average air density of 1.2 kg/m<sup>3</sup> and a temperature of 23.4 °C material density of weight is 8000 kg/m<sup>3</sup>.

### Condition of this result of calibration

1. Reference standards instruments :

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

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

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

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

-National Institute of Metrology Thailand (NIMT)

Calibrated by: Chaowalit Ritirak  
Issue Date: 08 February 2023

Approved Signatory:

[ ] Phalinee Prabpaipal  
[x] Sura Suwanmasri  
[ ] Chaowalit Ritirak



Result of calibration Without adjustment

| Nominal Value | Conventional mass | Uncertainty of Measurement ( ± ) | Maximum Permissible error ( ± ) |
|---------------|-------------------|----------------------------------|---------------------------------|
| 50 g          | 50.00015 g        | 0.10 mg                          | 0.30 mg                         |

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

-o0o-



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
53/4 PATTANAKARN ROAD SOI 18, SUANLUANG, BANGKOK 10250  
TEL. 0-2717-3000-24 FAX. 0-2719-2484



## Certificate of Calibration

Certificate No. : 23M260  
Page : 1 of 2

Equipment : Standard Weight  
Manufacturer :  
Model :  
Serial No. :  
ID No. : EOL-258  
Condition As-Received: Used Item  
Received Date: 02 February 2023  
Calibration Date: 07 February 2023  
Reference: 2302-0080DN  
Ambient Temperature: ( 23 ± 2 ) °C  
Relative Humidity: ( 50 ± 15 ) %  
Atmospheric Pressure: 1012 mbar

This certificate may not be reproduced other than in full,  
except with the prior written approval of the head of  
Corporate Services 3: Equipment Calibration and Testing Services.

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

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

Procedure used: Calibration were conducted using in-house calibration procedure CP-M01 according to comparison method against standard weights on the basis of weighings at an average air density of 1.2 kg/m<sup>3</sup> and a temperature of 23.6 °C material density of weight is 8000 kg/m<sup>3</sup>.

### Condition of this result of calibration

1.Reference standards instruments :

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

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

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

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

-National Institute of Metrology Thailand (NIMT)

Calibrated by : Chaowalit Rittrak  
Issue Date : 09 February 2023

Approved Signatory :

[ ] Pholinee Prabpalai  
[x] Sura Suwannasri  
[ ] Chaowalit Rittrak



Cert No.: 23M260  
Page: 2 of 2

Result of calibration Without adjustment

| Nominal Value | Conventional mass | Uncertainty of Measurement ( ± ) | Maximum Permissible error ( ± ) |
|---------------|-------------------|----------------------------------|---------------------------------|
| 2 kg          | 2.0000034 kg      | 3.0 mg                           | 10 mg                           |

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

-000-

B 0307756

B 1146232



## Metrological Center

SCI ECO Services Company Limited

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

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

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

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



NSC-TISI-TIS 17025  
CALIBRATION 0244

Certificate No. T230022

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 : 13 January 2023  
Calibrated By : Sujjar Naknakred ( Site Calibration Manager )  
Approved By : *[Signature]* / Boonchai Suriyawong (Site Calibration Manager)  
Date of Issue : 24 JAN 2023

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-L14118/31-08-64



## Metrological Center

SCI ECO Services Company Limited

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NSC-TISI-TIS 17025  
CALIBRATION 0244

Certificate No. T230022

Page 2 of 4

### Calibration Report

Equipment : Chamber ( Cooling Room )  
Date of Calibration : 18 January 2023  
Environment : Temperature : 25.0-27.2 °C  
Line Voltage : 221.9-227.3 V  
Relative Humidity : 55 - 65 %RH

#### Condition of this results of calibration :

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

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

#### 2. Reference Standard Instrument :

| Instrument  | Model  | Instrument No. | Certificate No. | Due Date       |
|-------------|--------|----------------|-----------------|----------------|
| TC          | TYPE T | TN141-TN150    | T222123         | 5 October 2023 |
| TC          | TYPE T | TN151-TN160    | T222123         | 5 October 2023 |
| DATA LOGGER | 34970A | TI50           | T222123         | 5 October 2023 |

#### 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 : 2 Hour 8 Minute At 3 °C  
Fresh Air Damper : ☐ Open ☐ Min ☐ Medium ☐ Max  
Close

☒ Not Available

#### 5. Adjustment :

( ) without adjustment

( X ) after adjustment

Approved By



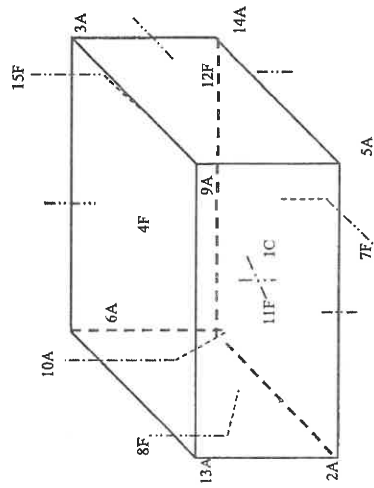
FM-L15117/15-05-63



Certificate No. T230022

Page 3 of 4

## Calibration Report



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

|     |   |       |
|-----|---|-------|
| 1C  | = | TN141 |
| 2A  | = | TN142 |
| 3A  | = | TN143 |
| 4F  | = | TN144 |
| 5A  | = | TN145 |
| 6A  | = | TN146 |
| 7F  | = | TN147 |
| 8F  | = | TN148 |
| 9A  | = | TN149 |
| 10A | = | TN150 |

|     |   |       |
|-----|---|-------|
| 11F | = | TN151 |
| 12F | = | TN152 |
| 13A | = | TN153 |
| 14A | = | TN154 |
| 15F | = | TN155 |

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



Certificate No. T230022

Page 4 of 4

## Calibration Report

Measurement Results:

| Average Standard Reading at each position (°C) |       |       |       |       |       |       |       |       |       |       |
|------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Calibration Point                              | TN141 | TN142 | TN143 | TN144 | TN145 | TN146 | TN147 | TN148 | TN149 | TN150 |
| 3                                              | 2.93  | 2.77  | 2.79  | 2.26  | 3.04  | 3.39  | 2.91  | 3.05  | 3.54  | 2.95  |
|                                                | TN151 | TN152 | TN153 | TN154 | TN155 |       |       |       |       |       |
|                                                | 3.32  | 3.28  | 3.00  | 2.96  | 2.90  |       |       |       |       |       |

| Chamber (Cooling Room) |              |     | Temperature Distribution |                  |                 |                    |                   |
|------------------------|--------------|-----|--------------------------|------------------|-----------------|--------------------|-------------------|
| Setting (°C)           | Reading (°C) |     | Average (°C)             | Stability (± °C) | Uniformity (°C) | Uncertainty (± °C) | Coverage Factor k |
|                        | Min          | Max |                          |                  |                 |                    |                   |
| 3.0                    | 2.9          | 3.1 | 3.0                      | 3.01             | 1.04            | 0.98               | 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. \_\_\_\_\_



## Metrological Center

SCI ECO Services Company Limited

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

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



NSC-TISI-TIS 17025  
CALIBRATION 0244

Certificate No. T230121

Page 1 of 4

### Certificate of Calibration

Equipment : Chamber ( Cooling Room )

Manufacturer : -

Model : -

Serial No. : -

Customer Code : EQL-181

ID No. : T0399A5

Customer : Test Tech Co.,Ltd

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

Bangkhunthian Bangkok 10150

Customer Location : LABORATORY FLOOR 4

Date of Receipt : 26 January 2023

Calibrated By : Sujjar Naknakred ( Site Calibration Manager )

Approved By : [Redacted] / Boonchai Suriyawong (Site Calibration Manager)

01 FEB 2023

Date of Issue :

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.

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SCI ECO Services Company Limited

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NSC-TISI-TIS 17025  
CALIBRATION 0244

Certificate No. T230121

Page 2 of 4

### Calibration Report

Equipment : Chamber ( Cooling Room )

Date of Calibration : 30 January 2023

Environment : Temperature : 25.0-27.2 °C

Line Voltage : 221.9-227.3 V

Relative Humidity : 55 - 65 %RH

#### Condition of this results of calibration :

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

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

#### 2. Reference Standard Instrument :

| Instrument  | Model  | Instrument No. | Certificate No. | Due Date       |
|-------------|--------|----------------|-----------------|----------------|
| TC          | TYPE T | TN141-TN150    | T222123         | 5 October 2023 |
| TC          | TYPE T | TN151-TN160    | T222123         | 5 October 2023 |
| DATA LOGGER | 34970A | T150           | T222123         | 5 October 2023 |

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

5. Adjustment :

( ) without adjustment

( X ) after adjustment

Approved By [Redacted]

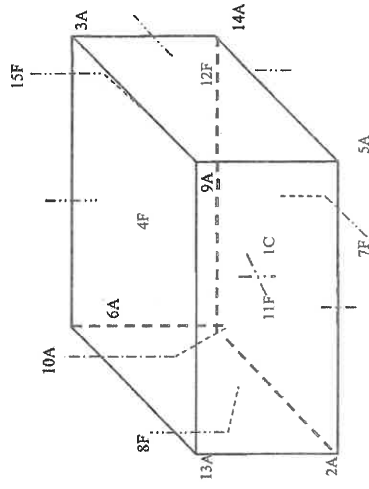
FM-L15 117/15-05-63



Certificate No. T230121

Page 3 of 4

## Calibration Report



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

|     |   |       |
|-----|---|-------|
| 1C  | = | TN141 |
| 2A  | = | TN142 |
| 3A  | = | TN143 |
| 4F  | = | TN144 |
| 5A  | = | TN145 |
| 6A  | = | TN146 |
| 7F  | = | TN147 |
| 8F  | = | TN148 |
| 9A  | = | TN149 |
| 10A | = | TN150 |

|     |   |       |
|-----|---|-------|
| 11F | = | TN151 |
| 12F | = | TN152 |
| 13A | = | TN153 |
| 14A | = | TN154 |
| 15F | = | TN155 |

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

FM-L15 11/15-05-63



Certificate No. T230121

Page 4 of 4

## Calibration Report

Measurement Results:

| Calibration Point | Average Standard Reading at each position (°C) |       |       |       |       |       |       |       |       |       |
|-------------------|------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                   | TN141                                          | TN142 | TN143 | TN144 | TN145 | TN146 | TN147 | TN148 | TN149 | TN150 |
|                   | 2.84                                           | 2.89  | 3.01  | 3.07  | 3.13  | 3.19  | 3.04  | 2.99  | 3.15  | 2.94  |
| 3                 | TN151                                          | TN152 | TN153 | TN154 | TN155 |       |       |       |       |       |
|                   | 2.99                                           | 2.99  | 3.14  | 2.85  | 2.88  |       |       |       |       |       |

| Chamber (Cooling Room) |              |         | Temperature Distribution |                 |                 |                   |                   |
|------------------------|--------------|---------|--------------------------|-----------------|-----------------|-------------------|-------------------|
| S (°C)                 | Reading (°C) |         | Average (°C)             | Stability (±°C) | Uniformity (°C) | Uncertainty (±°C) | Coverage Factor k |
|                        | Min, Max     | Average |                          |                 |                 |                   |                   |
| 3.0                    | 2.8, 3.1     | 3.0     | 3.01                     | 0.48            | 0.93            | 0.99              | 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 11/15-05-63



CERTIFICATE No : 2217648  
REFERENCE No : 63843-2

PAGE : 1 OF 2

## Certificate of Calibration

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

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

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



CERTIFICATE No : 2217648

PAGE : 2 OF 2

## Calibration Report

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

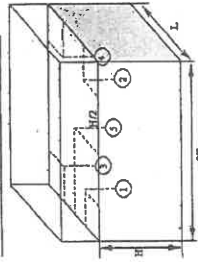
### CONDITION OF THIS RESULTS OF CALIBRATION

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

### 2. REFERENCE STANDARD INSTRUMENTS :-

- 1) DATA LOGGER WITH RTD
- 2) INSTRUMENT MODEL 2625A
3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-  
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO., LTD.

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



### GENERAL INFORMATION

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

### BATH PERFORMANCE

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

### TEMPERATURE MEASUREMENT ACCURACY TEST

| Controller Temp (°C) | Indicating Temp (°C) | Measured Temperature (°C) at Spread Locations |       |       |       | Uncertainty (± °C) |
|----------------------|----------------------|-----------------------------------------------|-------|-------|-------|--------------------|
|                      |                      | #1                                            | #2    | #3    | #4    |                    |
| 41.5                 | 41.5                 | 41.54                                         | 41.55 | 41.52 | 41.55 | 0.14               |
| 44.5                 | 44.5                 | 44.48                                         | 44.51 | 44.50 | 44.51 | 0.15               |

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE BATH.  
NOTE 2 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT QC LABORATORY AREA.  
THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLIANG, SUANLIANG, BANGKOK 10250  
TEL. 0-2717-3000-24 FAX. 0-2719-9484



NIST-781-781-7825  
CALIBRATION 0098

## Certificate of Calibration

Certificate No. : 22H2197  
Page : 1 of 2

Equipment : Dial Thermo-Hygrometer  
Manufacturer : Barigo  
Model :  
Serial No. :  
ID No. : EOL-064  
Condition As-Received: Used Item  
Received Date: 17 October 2022  
Calibration Date: 25 October 2022  
Reference: 2210-0461DN  
Ambient Temperature: ( 25 ± 3 ) °C  
Relative Humidity: ( 50 ± 20 ) %

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

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

### Condition of this result of calibration

1.Reference standards instruments :

| Model      | Serial No. | Certificate No. | Due Date    |
|------------|------------|-----------------|-------------|
| Dew Master | 41292      | 19848           | 03 Nov 2022 |
| 1523       | 3240076    | 221249          | 02 Mar 2023 |

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

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

-National Institute of Standards and Technology (NIST) , The United States of America  
-National Institute of Metrology Thailand (NIMT)

Calibrated by : Surasit Phansudnoi  
Issue Date : 01 November 2022

Approved Signatory :  
[ ] Chakrit Waevarjua  
[ ] Pornhippa Tameyakul  
[ ] Viporn Tantayawuti



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

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

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

UUC\* : Unit Under Calibration  
The reported uncertainty of measurement was base on standard uncertainty multiplied by coverage factor k = 2.00, providing confidence level approximately 95%.

-o0o-

Signature

a 1133179



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



CERTIFICATE No : 22M9915  
REFERENCE No : 66549-2

PAGE : 1 OF 2

## Certificate of Calibration

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

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

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF  
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F-G010 REV 02



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

CERTIFICATE No : 22M9915

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : DIGITAL BALANCE  
MANUFACTURER : SARTORIUS  
ID No : EQL-008  
AIR PRESSURE : 1011mbar  $\pm$  1mbar  
AMBIENT TEMPERATURE : 21°C  $\pm$  1°C  
RECEIVED DATE : 15-Sep-22  
CALIBRATION DATE : 15-Sep-22  
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 62019 BY USING KNOWN WEIGHT STANDARD WEIGHT. THE BALANCE WAS ADJUSTED USING INTERNAL WEIGHT TO ADJUST. THE BALANCE HAS NO ZERO TRACKING FUNCTION. REPEATABILITY WAS MEASURED BY USING 10 REPEATED MEASUREMENTS. LINEARITY WAS MEASURED COVERING 10 POINTS. EVENLY SPREAD OVER THE RANGE. THE INSTRUMENT WAS SET ZERO BEFORE PERFORMING THE LINEARITY TEST. OFF-CENTER LOADING WAS MEASURED BY USING STANDARD WEIGHTS PLACED ON THE PAN AND MOVED TO VARIOUS POSITIONS ON THE PAN. THE INTERNAL WEIGHT WAS CHECKED BY USING 2. REFERENCE STANDARD INSTRUMENTS :-

| INSTRUMENT             | MODEL | SERIAL No | CERTIFICATE No | DATE      |
|------------------------|-------|-----------|----------------|-----------|
| 1) STANDARD WEIGHT SET | E2    | QK-151    | C02210415      | 09-Feb-23 |
| 2) STANDARD WEIGHT     | E2    | 13843     | C02210419      | 10-Feb-23 |
| 3) STANDARD WEIGHT     | E2    | QK-1549   | M21032358      | 26-Mar-23 |

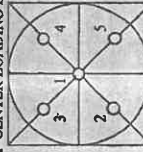
3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.  
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.  
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-  
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH CENTRAL BUREAU OF WEIGHTS&MEASURES

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL  
2. TARE FUNCTION : NORMAL  
3. REPEATABILITY OF READING AT 200 g WAS 0.000063 g  
4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

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

### 5. OFF CENTER LOADING ERROR



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

6. INTERNAL WEIGHT ERROR -0.00066666666666660376 g  
NOTE: THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT PRODUCTION AREA  
THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

F-G010 REV 02



CERTIFICATE No : 22T9917  
REFERENCE No : 66549-4

PAGE : 1 OF 2

## Certificate of Calibration

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

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

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

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

F-G010 REV : 02



CERTIFICATE No : 22T9917

PAGE : 2 OF 2

## Calibration Report

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

### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO 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.

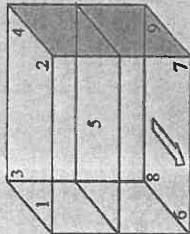
### 2. REFERENCE STANDARD INSTRUMENTS :-

- INSTRUMENT : HYDRA 2635A  
MODEL : 6655500  
SERIAL No : 22T7509  
DUE DATE : 10-Jul-23
- 1) DATA LOGGER WITH RTD  
2) THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.  
3) THIS RESULT EXCLUDES LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.  
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 Ambient Temperature around the Chamber (°C) variation : 1  
Overall Line Voltage (V) variation : 3  
Instrument Condition : Normal  
Chamber Size (W\*H\*H): 56\*40\*48 cm



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

### TEMPERATURE MEASUREMENT ACCURACY TEST

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

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

NOTE 2 : LOCATION 5 WAS REFERENCE LOCATION.

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

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

F-G010 REV : 02



QUALITY CALIBRATION CO., LTD.

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

www.qcalibration.com



REGISTERED  
CALIBRATION

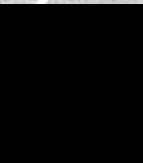
CERTIFICATE No : 22T9918  
REFERENCE No : 66549-5

PAGE : 1 OF 2

## Certificate of Calibration

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

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

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

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF  
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F-G010 REV : 02



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 : 22T9918

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : HOT AIR OVEN  
MANUFACTURER : MEMMERT  
MODEL : UFE 500  
ID No : BQL-161  
RECEIVED DATE : 15-Sep-22  
AMBIENT TEMPERATURE : 25 °C ± 1 °C  
S/N : G512.2005  
CALIBRATION DATE : 15-Sep-22  
RELATIVE HUMIDITY : 51 %RH ± 10 %RH

### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO 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  
2) REFERENCE TEMPERATURE POINTS  
3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.  
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-  
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO., LTD.  
RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

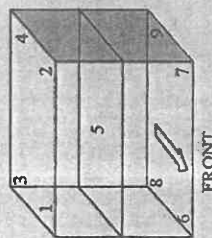
### GENERAL INFORMATION

Overall Ambient Temperature around the Chamber (°C) variation : 1

Overall Line Voltage (V) variation : 8

Instrument Condition : Normal

Chamber Size (W\*L\*H): 56\*40\*48 cm



### CHAMBER PERFORMANCE

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

### TEMPERATURE MEASUREMENT ACCURACY TEST

| Controller Temp (°C) | Indicating Temp (°C) | Measured Temperature (°C) at Spread Locations |        |        |        |        |        |        |        |        | Uncertainty (± °C) |
|----------------------|----------------------|-----------------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------------------|
|                      |                      | #1                                            | #2     | #3     | #4     | Ref. 5 | #6     | #7     | #8     | #9     |                    |
| 104.0                | 104.0                | 104.07                                        | 104.09 | 104.21 | 103.93 | 103.38 | 103.79 | 103.99 | 103.78 | 104.36 | 0.38               |
| 120.0                | 120.0                | 120.03                                        | 120.13 | 120.34 | 119.94 | 119.53 | 119.69 | 119.94 | 119.71 | 120.48 | 0.38               |
| 140.5                | 140.5                | 140.15                                        | 140.30 | 140.44 | 140.10 | 139.56 | 139.74 | 140.03 | 139.80 | 140.72 | 0.46               |
| 150.5                | 150.5                | 150.04                                        | 150.25 | 150.54 | 150.35 | 149.46 | 149.55 | 149.83 | 149.60 | 150.67 | 0.46               |

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

NOTE 2 : LOCATION 5 WAS REFERENCE LOCATION.

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

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

F-G010 REV : 02



## Certificate of Calibration

Equipment: TURBIDIMETER  
Model: 2100N  
Serial No. (or ID.): 97040000415 (EQL-024)  
Manufacturer: HACH  
Condition: In Condition

Certificate No.: C08220157  
Issued Date: 21 September 2022  
Job No.: KSPR2211615  
Page: 1 of 2

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

Environment Condition: Temperature 23 °C ± 2 °C  
Humidity 50 %RH ± 15 %RH

Calibration Place: Environment Laboratory, DKSH Technology Limited,  
1194 Soi Wachirathamsathit 57, Sukhumvit 101/1 Rd.,  
Bangchak, Prakhong, Bangkok 10260 Thailand

Calibration By: Mr. Wasan Nuchabee  
Calibration Date: 21 September 2022  
In house method, CAL-WI-23, base on Hach Manufacturer Method 8195  
This certificate is traceable to Primary standard Fromazin and StabCal accepted by  
United States Environmental Protection Agency (EPA) through Hach Company  
Certificate No. A1075, A1074, A1091, A1074, A1074

(Mr. Wasan Nuchabee)

Person in charge

(Mr. Thalemgkret Pongnangam)

Authorized signatory

This certificate is issued based on the results of measurement according to the International System of Units (SI). It provides traceability of measurement to International or national standard or other recognized national standard laboratory.  
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).  
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

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CAL-FIN-C08-08: 20 Jul 2022



Certificate No.: C08220157

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### Calibration Results:

#### Before Adjustment

| Std Turbidity (NTU) | UUC Reading | Correction | Deviation | Uncertainty |
|---------------------|-------------|------------|-----------|-------------|
| 0.080               | 0.048       | 0.012      | 0.0004    | 0.070       |
| 20.40               | 20.1        | 0.30       | 0.05      | 1.0         |
| 208.0               | 204         | 2.0        | 0.5       | 10          |
| 1020.0              | 1013        | 7.0        | 1.2       | 50          |
| 4085.0              | 3875        | 180.0      | 1.8       | 200         |

#### After Adjustment

| Std Turbidity (NTU) | UUC Reading | Correction | Deviation | Uncertainty |
|---------------------|-------------|------------|-----------|-------------|
| 0.080               | 0.057       | 0.003      | 0.0015    | 0.070       |
| 20.40               | 20.5        | -0.10      | 0.04      | 1.0         |
| 208.0               | 206         | 0.0        | 0.5       | 10          |
| 1020.0              | 1018        | 2.0        | 0.5       | 50          |
| 4085.0              | 4084        | 1.0        | 0.5       | 200         |

The End of Certificate

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