

ภาคผนวก ฉ.

เอกสารรับรองเครื่องมือการตรวจวัด

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## Certificate of Calibration

Certificate No. : 66-420087-1 Page : 1 of 2

Submitted by :

M Green Group Co.,Ltd.

188/46 Wisatesukhakhon 25, Pracha-Uitd 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. : 01X099320

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

Ambient Temperature : (25.0 to 25.5)°C

Relative Humidity : (45 to 50) %

Date of Received : 20 September 2023

Date of Calibration : 20 September 2023

Date of Issue : 25 September 2023

Calibrated by : Permpon Chauu

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-00307/66 | 23 Aug 2025 | National Institute of Metrology Thailand (NIMT) |

2. Standard Buffer Solution

| pH    | Cert. No. | Lot No. | Exp. Date   | Traceability                                            |
|-------|-----------|---------|-------------|---------------------------------------------------------|
| 4.008 | 61270213  | 915161  | 19 Jul 2025 | CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025 |
| 6.985 | 61275614  | 898428  | 28 May 2024 | CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025 |
| 9.997 | 61281073  | 915163  | 19 Jul 2024 | CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025 |

Approved by :

( Surachan Prommong )

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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



## Certificate of Calibration

Certificate No. : 66-420087-1 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                   |
|                                   | 9.997                     | 10.01                 | -0.01                | 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. : 66-400519-1

Page : 1 of 2

Submitted by :

M Green Group Co.,Ltd.

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

Equipment :

Digital Thermometer with Thermistor probe

Temperature Indicator

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

Model : N/A Sheath Material : Stainless  
Diameter : 3.2 mm. Length : 100 mm.  
Serial No. : PH5TEMB01P ID No. : N/A

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

Ambient Temperature : (25.0 to 26.0) °C  
Relative Humidity : (56 to 60) %  
Line Voltage : (224.0 to 225.2) VAC

Date of Received : 20 September 2023

Date of Calibration : 20 September 2023

Date of Issue : 25 September 2023

Calibrated by : Penupon Chanpu

Calibration Method : This instrument was calibrated by In-house method comparison technique CAL-M4003  
by compared with PRT in the liquid bath at the constant controlled temperature.

The temperature scale used was based on ITS-90

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

1. Platinum Resistance Thermometer (PRT)

ID No. Cert.No. Due Date Traceability

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 :

( Surachai Promthong )

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

Certificate No. : 66-400519

Page : 2 of 2

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                        | 25.006                     | 24.9                  | 0.1                  | 0.19                    |

Remark

UUC : Unit Under Calibration

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

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

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## Certificate of Calibration

Certificate No. : 66-200300-1

Page : 1 of 2

Submitted by :

M Green Group Co., Ltd.

188/46 Wisatsuknaklion 25, Prachia-Uit Rd., Thungkru, Bangkok 10140 Thailand

Equipment :

Electronic Balance

Manufacturer : SHIMADZU

Model : AP225WD

Serial No. : D316300690

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

Environment :

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

Ambient Temperature : (25.6 to 26.7) °C

Relative Humidity : (54.4 to 56.6) %

Air Pressure : 1010.0 mbar

Date of Received :

20 September 2023

Date of Calibration :

20 September 2023

Date of Issue :

22 September 2023

Calibrated by :

Akaradath Thippichai

Calibration Method :

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

Edition 7 - November 2022

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

Standard Weights

| ID No.    | Cert. No. | Due Date    | Traceability                                       |
|-----------|-----------|-------------|----------------------------------------------------|
| E261-E264 | C02222345 | 10 Nov 2023 | National Institute of Metrology (Thailand), (NIMT) |

Approved by :

( Surachai Promthong )  
Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

Certificate No. : 66-200300-1

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                | 0.00000           | 0.000012             |
| 0.01                 | 0.00000           | 0.000013             |
| 0.1                  | 0.00000           | 0.000015             |
| 1                    | 0.00000           | 0.000026             |
| 10                   | 0.00000           | 0.000053             |
| 20                   | -0.00003          | 0.000071             |
| 50                   | 0.00004           | 0.00011              |
| 100                  | -0.00009          | 0.00020              |
| 150                  | 0.0000            | 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

-0.00003 0.00000 0.00000 -0.00005 0.00000 g



Repeatability

Load test : 200 g

Sidev. : 0.000048 g

-0.000 -





## Certificate of Calibration

Certificate No. : 66-400531-1

Page : 1 of 2

Submitted by :

M Green Group Co., Ltd.

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

Equipment :

Liquid in Glass Thermometer

Manufacturer : N/A

Model : N/A

Range : 0 °C to 100 °C

Resolution : 1 °C

Serial No. : N/A

Immersion : Total

ID No. : 94-49747

Environment :

Ambient Temperature : (23 ± 2) °C

Relative Humidity : (50 ± 15) %

Line Voltage : (220 ± 22) VAC

Date of Received : 21 September 2023

Date of Calibration : 23 September to 26 September 2023

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)

ID No. Cert. No. Due Date Traceability

400001 TT-0016-22 07 Feb 2024

National Institute of Metrology Thailand (NIMT)

2. Standard Digital Thermometer

ID No. Cert. No. Due Date Traceability

400003 23E1866 01 Jun 2025

National Institute of Metrology Thailand (NIMT)

400004 23E1866 01 Jun 2025

National Institute of Metrology Thailand (NIMT)

Approved by :

( Surachai Promthong )  
Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

Certificate No. : 66-400531-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

Ice point check : UUC\* reading 0 °C Standard reading 0.0352 °C

| Standard Reading<br>( °C ) | UUC Reading<br>( °C ) | Correction<br>( °C ) | Uncertainty<br>( ± °C ) |
|----------------------------|-----------------------|----------------------|-------------------------|
| 39.7228                    | 40                    | -0.3                 | 0.31                    |

Remark

UUC : Unit Under Calibration

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

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

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## Certificate of Calibration

Certificate No. : 66-400520-1

Submitted by : M Green Group Co., Ltd.

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

Equipment : Air Chamber (Refrigerator)

Manufacturer : Biobase

Model : BXC-V250M (II)

Range : N/A °C

Resolution : 0.1 °C

Serial No. : YC025025190108

ID No. : N/A

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

Ambient Temperature : (25.0 to 26.0) °C

Relative Humidity : (40 to 50) %

Line Voltage : (226.0 to 230.0) V

Date of Received : 20 September 2023

Date of Calibration : 20 September 2023

Date of Issue : 25 September 2023

Calibrated by : Pempon Chamru

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

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

Standard Digital Thermometer with RTD Probe

ID No. Cert. No.

Traceability

400046 &amp; 400042 66-400453-1

Due Date

31 Jan 2024 National Institute of Metrology Thailand (NIMT)

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

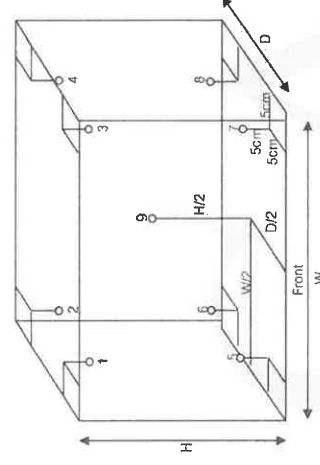
Certificate No. : 66-400520-1

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                            | 4.05                                   | 4.04 | 4.27 | 4.89 | 4.10 | 4.05 | 4.92 | 4.37 | 4.43 | 0.46                  |

| Test Point<br>(°C) | Setting Temperature<br>(°C) | Indicating Temperature<br>(°C) | Measured Uniformity<br>(°C) |            | Measured Stability<br>(°C) |           | Overall Variation<br>(°C) |
|--------------------|-----------------------------|--------------------------------|-----------------------------|------------|----------------------------|-----------|---------------------------|
|                    |                             |                                | Measured                    | Uniformity | Measured                   | Stability |                           |
| 4.0                | 2.0                         | 2.0                            | 0.60                        | 0.60       | 0.21                       | 0.21      | 1.2                       |

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 :

( Surachai Promthong )

Laboratory Manager





## Certificate of Calibration

Certificate No. : 66-400520-2

Page : 1 of 2

Submitted by :

M Green Group Co., Ltd.

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

Equipment :

Air Chamber (Oven)

Manufacturer : Mornnert

Model : UF110

Range : N/A °C

Resolution : 0.1 °C

Serial No. : B419.1092

ID No. : N/A

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

Ambient Temperature : (25.0 to 26.0) °C

Relative Humidity : (40 to 50) %

Line Voltage : (226.0 to 230.0) V

Date of Received :

20 September 2023

Date of Calibration :

20 September 2023

Date of Issue :

25 September 2023

Calibrated by :

Permpon Chanpu

Calibration Method :

CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

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

Standard Digital Thermometer with Thermocouple probe

ID No. Cert.No.

Traceability

400046 &amp; 400028

66-400184-3 National Institute of Metrology Thailand (NIMT)

Due Date

04 Oct 2023

Approved by :

( Surachai Promthong )

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

Certificate No. : 66-400520-2

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

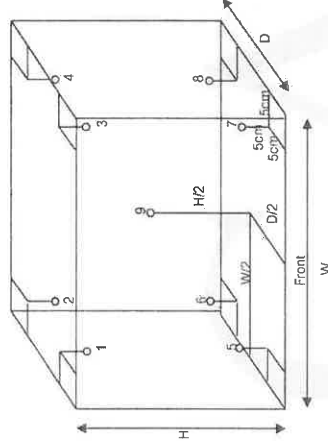
This instrument was setting air ventilation at position 0 (close)

Inside of Chamber

W = 0.56 m

D = 0.40 m

H = 0.48 m

Capacity = 0.11 m<sup>3</sup>

| Test Point<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     |                       |
| 103.0              | 103.0                       | 103.0                          | 103.3                                  | 103.0 | 103.7 | 103.3 | 103.1 | 103.0 | 103.8 | 102.7 | 103.3 | 0.69                  |
| 105.0              | 105.0                       | 105.0                          | 105.3                                  | 105.0 | 105.7 | 105.3 | 105.2 | 105.0 | 105.8 | 104.6 | 105.3 | 0.71                  |
| 180.0              | 180.0                       | 180.0                          | 180.4                                  | 180.1 | 181.2 | 180.4 | 180.3 | 180.0 | 181.4 | 179.0 | 180.5 | 0.95                  |

| Test Point<br>(°C) | Setting Temperature<br>(°C) | Indicating Temperature<br>(°C) | Measured Uniformity<br>(°C) | Measured Stability<br>(°C) | Overall Variation<br>(°C) |
|--------------------|-----------------------------|--------------------------------|-----------------------------|----------------------------|---------------------------|
| 103.0              | 103.0                       | 103.0                          | 0.8                         | 0.1                        | 1.3                       |
| 105.0              | 105.0                       | 105.0                          | 0.9                         | 0.1                        | 1.4                       |
| 180.0              | 180.0                       | 180.0                          | 1.7                         | 0.2                        | 2.7                       |

Remark: The uncertainty is not combine uniformity of the air chamber

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

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

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## Certificate of Calibration

Certificate No. : 66-400520-3 Page : 1 of 2

Submitted by : M Green Group Co., Ltd.  
188/46 Wisutesukhachon 25, Pracha-Uttd Rd., Thungkru Bangkok 10140 ThailandEquipment : 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 : (25.0 to 26.0) °C

Relative Humidity : (40 to 50) %

Line Voltage : (226.0 to 230.0)V

Date of Received : 20 September 2023

Date of Calibration : 20 September 2023

Date of Issue : 25 September 2023

Calibrated by : Permpon Chianpu

Calibration Method : This instrument was calibrated by In-house method CAL-M4006 based on ASTM E715-80  
The temperature scale used was based on ITS-90

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

Standard Digital Thermometer with RTD probe

ID No. Cert. No. Due Date Traceability

400046 &amp; 400024 66-400184-2 06 Oct 2023 National Institute of Metrology Thailand (NIMT)

Approved by :  
( Surachai Promthong )  
Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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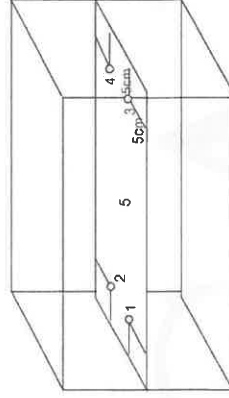
## Certificate of Calibration

Certificate No. : 66-400520-3 Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement



| Test Point<br>(°C) | Setting Temperature<br>(°C) | Indicating Temperature<br>(°C) | Measured Temperature (°C) @ |       |       |       |       | Uncertainty<br>(± °C) | Measured Uniformity<br>(°C) | Measured Stability<br>(°C) |
|--------------------|-----------------------------|--------------------------------|-----------------------------|-------|-------|-------|-------|-----------------------|-----------------------------|----------------------------|
|                    |                             |                                | 1                           | 2     | 3     | 4     | 5     |                       |                             |                            |
| 85.0               | 85.0                        | 85.0                           | 85.08                       | 85.04 | 84.98 | 85.17 | 85.02 | 0.18                  | 0.2                         | 0.05                       |

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

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

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

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## Certificate of Calibration

Certificate No. : 66-400520-4

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 (Incubator)

Manufacturer : Biobase

Range : 0 °C to 65 °C

Serial No. : KYP1502202003

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

Ambient Temperature : (25.0 to 25.5) °C

Relative Humidity : (45 to 50) %

Line Voltage : (226.0 to 230.0) V

Date of Received : 20 September 2023

Date of Calibration : 20 September 2023

Date of Issue : 25 September 2023

Calibrated by : Permpon Chanpu

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

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

Standard Digital Thermometer with RTD Probe

ID No. Cert.No.

400029 &amp; 400043 66-400226-1

Traceability

National Institute of Metrology Thailand (NIMT)

Due Date

27 Oct 2023

Approved by :

( Surachai Promthong )

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

Certificate No. : 66-400520-4

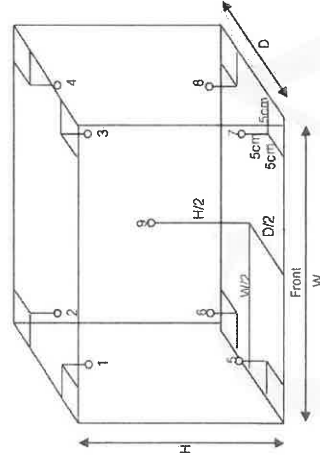
Page : 2 of 2

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  
 $W = 0.45 \text{ m}$   
 $D = 0.41 \text{ m}$   
 $H = 0.85 \text{ m}$   
 $\text{Capacity} = 0.16 \text{ m}^3$

| 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     |                       |
| 20.0               | 20.0                        | 20.0                           | 20.14                                  | 20.04 | 19.91 | 19.97 | 20.03 | 19.96 | 19.91 | 19.96 | 19.92 | 0.70                  |

| Test Point<br>(°C) | Setting Temperature<br>(°C) | Indicating Temperature<br>(°C) | Measured Uniformity<br>(°C) |  |  | Measured Stability<br>(°C) |  |  | Overall Variation<br>(°C) |
|--------------------|-----------------------------|--------------------------------|-----------------------------|--|--|----------------------------|--|--|---------------------------|
|                    |                             |                                | 20.0                        |  |  | 0.37                       |  |  |                           |
| 20.0               | 20.0                        | 20.0                           | 0.28                        |  |  | 0.37                       |  |  | 0.8                       |

Remark: The uncertainty is not combine uniformity of the air chamber

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

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

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## Certificate of Calibration

Certificate No. : 66-300589-7

Page : 1 of 2

Submitted by : M Green Group Co., Ltd.

188/46 Wisetsukrakkhon 25, Pracha-Uthit Rd., Thungkru, Bangkok 10140 Thailand

Equipment : Burette

Manufacturer : GLASSCO

Class : A

Capacity : 10 ml Graduation : 0.05 ml

ID No. : 2212-0344-1

Environment : Ambient Temperature : ( 20 ± 3 ) °C

Relative Humidity : ( 50 ± 10 ) %

Air Pressure : 1006.7 mbar.

Date of Received : 20 September 2023

Date of Calibration : 27 September 2023

Date of Issue : 27 September 2023

Calibrated by : Wipa Tovadee

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

241003

66-200196-2

02 Dec 2023

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. : 66-300589-7

Page : 2 of 2

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

UUC Condition As-Received : Good

Delivery Time : 21.33 sec.

| Nominal Volume ( ml ) | Measuring Volume ( ml ) |
|-----------------------|-------------------------|
| 10                    | 9.9913                  |

Uncertainty of measurement with in ± 0.0039 ml

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

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

-o0o-





## Certificate of Calibration

Certificate No. : 66-300589-8

Page : 1 of 2

Submitted by : M Green Group Co., Ltd.

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

## Equipment

: Burette

Manufacturer : GLASSCO

Class : A

Capacity : 25 ml

Graduation : 0.1 ml

ID No. : 2212-0344-2

## Environment

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

: Air Pressure : 1006.7 mbar.

Date of Received : 20 September 2023

Date of Calibration : 27 September 2023

Date of Issue : 27 September 2023

Calibrated by : Wipa Tovadee

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

241003 66-200196-2

02 Dec 2023

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. : 66-300589-8

Page : 2 of 2

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

UUC Condition As-Received : Good

Delivery Time : 46.01 sec.

| Nominal Volume ( ml ) | Measuring Volume ( ml ) |
|-----------------------|-------------------------|
| 25                    | 24.9741                 |

Uncertainty of measurement with in  $\pm$  0.0066 ml

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

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

-o0o-



## Certificate of Calibration

Certificate No. : 66-300590-1

Page : 1 of 2

Submitted by

: M Green Group Co., Ltd.

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

Equipment

: Imhoff Cone

Manufacturer : VITLAB

Capacity : 1000 ml Graduation : 50 ml

ID No. : CY1000/01/22

Environment

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

Air Pressure : 1005.4 mbar.

Date of Received : 20 September 2023

Date of Calibration : 26 September 2023

Date of Issue : 26 September 2023

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

66-200196-1

02 Dec 2023

National Institute of Metrology (Thailand) (NIMT)

Approved by :

( Wipa Tovadec )

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

Certificate No. : 66-300590-1

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 ) |
|-----------------------|-------------------------|
| 500                   | 501.19                  |
| 1000                  | 1010.67                 |

Uncertainty of measurement with in  $\pm$  0.17 ml

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

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

- o0o -





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www.qcalibration.com



CERTIFICATE No : 24T1185  
REFERENCE No : 72116-3

PAGE : 1 OF 2

## Certificate of Calibration

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

CALIBRATED BY : CHAICHARN CH.  
CALIBRATION DATE : 09-Feb-24

APPROVED BY :   
PONGSAK J.  
ISSUED DATE : 12-Feb-24  
RECEIVED DATE : 09-Feb-24

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

F-G010 REV : 03



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Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

CERTIFICATE No : 24T1185

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : INCUBATOR  
MANUFACTURER : MEMMERT  
MODEL : IF 160  
ID No : EQL-205  
RECEIVED DATE : 09-Feb-24  
AMBIENT TEMPERATURE : 25 °C ± 1 °C  
S/N : D518.0082  
CALIBRATION DATE : 09-Feb-24  
RELATIVE HUMIDITY : 53 %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 : DATA LOGGER WITH RTD  
MODEL : HYDRA 2635A  
SERIAL No : 7301307  
CERTIFICATE No : 23T6636  
DUE DATE : 10-Jul-24

3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.

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

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO., LTD.

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

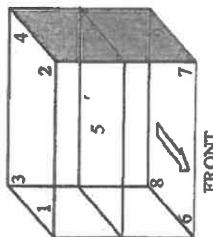
### GENERAL INFORMATION

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

Overall Line Voltage (V) variation : 3

Instrument Condition : Normal

Chamber Size (W\*L\*H): 36\*40\*72 cm



### CHAMBER PERFORMANCE

| Calibrate Point (°C) | Average All Position Temp. (°C) | Temperature Stability (±°C) | Temperature Uniformity (°C) | Overall Variation (°C) |
|----------------------|---------------------------------|-----------------------------|-----------------------------|------------------------|
| 35.0                 | 35.03                           | 0.05                        | 0.09                        | 0.16                   |
| 36.0                 | 36.05                           | 0.07                        | 0.08                        | 0.19                   |
| 41.5                 | 41.45                           | 0.08                        | 0.13                        | 0.20                   |

### 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    |                    |
| 35.0                 | 35.0                 | 34.98                                         | 35.01 | 35.00 | 35.00 | 35.02  | 35.08 | 35.07 | 35.04 | 35.10 | 0.25               |
| 36.0                 | 36.0                 | 36.00                                         | 36.03 | 36.03 | 36.03 | 36.02  | 36.04 | 36.09 | 36.10 | 36.12 | 0.25               |
| 41.5                 | 41.5                 | 41.45                                         | 41.45 | 41.39 | 41.46 | 41.46  | 41.47 | 41.43 | 41.44 | 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 : 03



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CERTIFICATE No : 23T8796  
REFERENCE No : 70515-4

PAGE : 1 OF 2

## Certificate of Calibration

EQUIPMENT : WATER BATH  
MANUFACTURER : MEMMERT  
MODEL : WNE 45  
SERIAL No : L720.0266  
ID No : EQL-241  
CONDITION AS RECEIVED : USED ITEM  
SUBMITTED BY : TEST TECH CO., LTD.  
30,32 RAMA II SOI 63, RAMA II RD., SAMAEADAM,  
BANGKIUHNTIAN, BANGKOK 10150

CALIBRATED BY : CHAICHARN CH.  
CALIBRATION DATE : 16-Aug-23

APPROVED BY :   
ISSUED DATE : 16-Aug-23  
RECEIVED DATE : 16-Aug-23

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

F-C010 REV : 03



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

CERTIFICATE No : 23T8796

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : WATER BATH  
MANUFACTURER : MEMMERT  
ID NUMBER : EQL-241  
RECEIVED DATE : 16-Aug-23  
AMBIENT TEMPERATURE : 25 °C ± 1 °C  
MODEL : WNE 45  
SERIAL NUMBER : L720.0266  
CALIBRATION DATE : 16-Aug-23  
RELATIVE HUMIDITY : 50 %RH ± 10 % RH

### CONDITION OF THIS RESULTS OF CALIBRATION

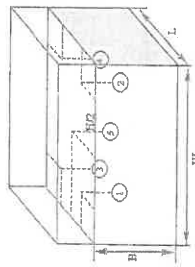
1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO ASTM E715-80 (REAPPROVED 2001) BY COMPARISON WITH CALIBRATED RTD. THE PROBES WERE PLACED ON FIVE POINTS AND LOCATED ONE PROBE IN EACH OF THE FOUR CORNERS OF THE BATH AND PLACED THE FIFTH RTD WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE WATER VOLUME (REFERENCE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

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT : MODEL : 2625A  
SERIAL No : 603614  
CERTIFICATE No : 23T6642  
DUE DATE : 19-Jul-24

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

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



PROBE INSTALLATION  
POSITION IN THE BATH

### GENERAL INFORMATION

Overall Variation of Ambient Temperature around the Bath (°C) : 0.6  
Overall Variation of Line Voltage (V) : 3  
Instrument Condition : Normal  
Bath Inner Size (W\*L\*H) : 59\*35\*20 cm

### BATH PERFORMANCE

| Calibrate Point (°C) | Average All Position Temp. (±°C) | Temperature Stability (±°C) | Radius Uniformity (°C) | Axial Uniformity (°C) | Overall Variation (°C) |
|----------------------|----------------------------------|-----------------------------|------------------------|-----------------------|------------------------|
| 83.0                 | 83.09                            | 0.05                        | 0.07                   | 0.05                  | 0.16                   |
| 92.0                 | 92.13                            | 0.11                        | 0.06                   | 0.06                  | 0.28                   |

### TEMPERATURE MEASUREMENT ACCURACY TEST

| Controller Temp (°C) | Measured Temperature (°C) at Spread Locations |       |       |       | Uncertainty (± °C) |
|----------------------|-----------------------------------------------|-------|-------|-------|--------------------|
|                      | #1                                            | #2    | #3    | #4    |                    |
| 83.0                 | 83.08                                         | 83.09 | 83.06 | 83.11 | 0.15               |
| 92.0                 | 92.11                                         | 92.13 | 92.10 | 92.16 | 0.19               |

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

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

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

END OF CALIBRATION REPORT

F-G010 REV : 03



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www.qcalibration.com

CERTIFICATE No : 24T1189  
REFERENCE No : 72116-7

PAGE : 1 OF 2

## Certificate of Calibration

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

CALIBRATED BY : CHAICHARN CH.  
CALIBRATION DATE : 09-Feb-24

APPROVED BY :  
ISSUED DATE : 12-Feb-24  
RECEIVED DATE : 09-Feb-24

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF  
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CERTIFICATE No : 24T1189

PAGE : 2 OF 2

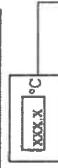
## Calibration Report

EQUIPMENT : AUTOCLAVE  
MANUFACTURER : HIRAYAMA  
MODEL : HVE-50  
ID NUMBER : EQL-155  
RECEIVED DATE : 09-Feb-24  
AMBIENT TEMPERATURE : 30° C ± 1° C  
RELATIVE HUMIDITY : 53 %RH ± 10 % RH

### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BASED ON BS 2646-1:2021 BY COMPARISON WITH CALIBRATED RTD DATA LOGGERS UNDER NO LOAD CONDITION. THE SENSORS WERE PLACED ON FIVE LOCATIONS AS SHOWN IN THE PICTURE. THE SENSOR ON LOCATION 1 AND 2 WERE PLACED IN THE UPPER HALF AND LOWER HALF OF CHAMBER FREE SPACE RESPECTIVELY. THE THIRD SENSOR WAS PLACED WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE INSTRUMENT CHAMBER. SENSOR NUMBER 4 WAS ATTACHED TO THE LOAD TEMPERATURE PROBE, IF FITTED, WITHIN 15 mm OF ITS TIP. SENSOR NUMBER 5 WAS PLACED IN THE CHAMBER DRAIN OR VENT WITHIN 100 mm OF ITS CONNECTION TO THE CHAMBER.
2. REFERENCE STANDARD INSTRUMENTS :-
  - 1) DATA LOGGER : MODEL VALPROBE S350,S367,DV35,DN94  
SERIAL No 24T0890  
CERTIFICATE No 26-Jan-25
  3. THIS CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.
  4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
  5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-  
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO.,LTD.

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



#### GENERAL INFORMATION

Overall Ambient Temperature around the Chamber variation : 0.5 °C  
Autoclave Condition : Normal  
Chamber Size (Diameter\*H): 30 \* 71 cm

#### CHAMBER PERFORMANCE

| Calibrate Point (°C) | Average all Position (°C) | Temperature Stability (±°C) | Temperature Uniformity (°C) | Overall Variation (°C) | Pressure (MPa) | Holding time (min) | Operating Cycle time (min) |
|----------------------|---------------------------|-----------------------------|-----------------------------|------------------------|----------------|--------------------|----------------------------|
| 115                  | 115.74                    | 0.09                        | 0.11                        | 0.25                   | 0.090          | 20                 | 60                         |
| 121                  | 121.59                    | 0.06                        | 0.21                        | 0.28                   | 0.125          | 20                 | 60                         |

#### FRONT

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

| Cont. Temp | Ind Temp | #1     | #2     | #3     | #4     | #5     | Uncertainty (± °C) |
|------------|----------|--------|--------|--------|--------|--------|--------------------|
| 115        | 115.     | 115.72 | 115.74 | 115.79 | 115.71 | 115.71 | 0.59               |
| 121        | 121.     | 121.59 | 121.62 | 121.56 | 121.58 | 121.59 | 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