

ภาคผนวก ข.

เอกสารรับรองเครื่องมือการตรวจวัด

Certificate of Calibration

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

Submitted by : M Green Group Co.,Ltd.

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

Equipment : pH Meter with electrode

pH meter

Manufacturer : Eutech **Model :** pH 700

Range : N/A **pH Resolution :** 0.01

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 : Permpoon Chanpu

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-0030766 | 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 |

Approve

(Surachai Promthong)
Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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

Function : pH meter with electrode

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

| Adjustment Curve at nominal pH | Standard Buffer (pH) | UUC Reading (pH) | Correction (pH) | Uncertainty (± pH) |
|--------------------------------|------------------------|--------------------|-------------------|----------------------|
| 4, 7, 10 | 4.008 | 4.01 | 0.00 | 0.010 |
| | 6.985 | 7.00 | -0.01 | 0.011 |
| | 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 Wisetasukhakhon 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
Model : pH 700
Serial No. : 2884323
ID No. : N/A

Thermistor probe
Model : N/A
Diameter : 3.2 mm.
Serial No. : PHSTEMB01P
ID No. : N/A
Sheath Material : Stainless
Length : 100 mm.
On site calibration was carried out at the M Green Group Co.,Ltd.

Environment : 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 : Pempon Charpu

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

2. Standard Digital Thermometer
ID No. Cert.No. Due Date
400033 22E569 22 Feb 2024
Traceability
National Institute of Metrology Thailand (NIMT)

Approved
(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 (mm.) | Standard Reading (°C) | UUC Reading (°C) | Correction (°C) | Uncertainty (± °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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Approved
(Surachai Promthong)
Laboratory Manager



NSG-TIS-7025

Certificate of Calibration

Certificate No. : 66-200300-1 **Page : 1 of 2**

Submitted by : M Green Group Co., Ltd.
188/46 Wisutesuknakhon 25, Pracha-Utd 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-E2624 | 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 (g) | Correction (g) | Uncertainty ± (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 |

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Certificate of Calibration

Certificate No. : 66-400531-1 Page : 1 of 2

Submitted by : M Green Group Co., Ltd.
188/46 Wisatsuknakhon 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 : Chortip Samchusri

Calibration Method : This instrument was calibrated by In-house method comparison technique CAL-M4001 based on ASTM E77-07 by compared with PRT in the liquid bath at the constant controlled temperature.

The temperature scale used was based on ITS-90

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

| 1. Platinum Resistance Thermometer (PRT) | | | Traceability |
|--|------------|-------------|---|
| ID No. | Cert.No. | Due Date | National Institute of Metrology Thailand (NIMT) |
| 400001 | TY-0016-22 | 07 Feb 2024 | |
| 2. Standard Digital Thermometer | | | Traceability |
| ID No. | Cert.No. | Due Date | National Institute of Metrology Thailand (NIMT) |
| 400003 | 23E1866 | 01 Jun 2025 | |
| 400004 | 23E1866 | 01 Jun 2025 | National Institute of Metrology Thailand (NIMT) |

Approved by :
(Surachai Promthong)
Laboratory Manager

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

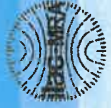
| Standard Reading (° C) | UUC Reading (° C) | Correction (° C) | Uncertainty (± ° C) |
|-----------------------------|------------------------|-----------------------|--------------------------|
| 39.7228 | 40 | -0.3 | 0.31 |

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 Page : 1 of 2

Submitted by : M Green Group Co., Ltd.
188/46 Wisatesukhakdon 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 : Permpoon 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. Due Date Traceability

400046 & 400042 66-400453-1 31 Jan 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

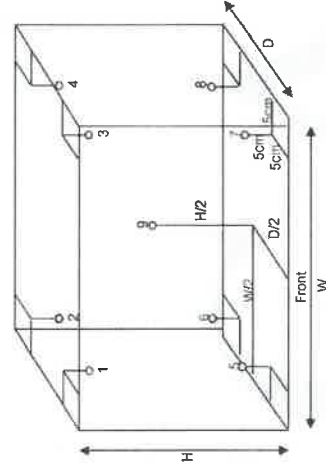
Certificate No. : 66-400520-1

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 m³

| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Temperature (°C) @ Sensor No. | | | | | | | | | Uncertainty (± °C) |
|--------------------|-----------------------------|--------------------------------|--|------|------|------|------|------|------|------|------|-----------------------|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
| 4.0 | 2.0 | 2.0 | 4.05 | 4.04 | 4.27 | 4.89 | 4.10 | 4.05 | 4.92 | 4.37 | 4.43 | 0.46 |

| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Uniformity (°C) | Measured Stability (°C) | Overall Variation (°C) |
|-----------------|--------------------------|-----------------------------|--------------------------|-------------------------|------------------------|
| 4.0 | 2.0 | 2.0 | 0.60 | 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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Certificate of Calibration

Page : 1 of 2

Certificate No. : 66-400520-3

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

Equipment : Water Bath
Manufacturer : Memmert
Range : N/A °C
Serial No. : L619.0037
Model : WNB29
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 : (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 : 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 & 400024 66-400184-2 06 Oct 2023 National Institute of Metrology Thailand (NIMT)

Approved by :
(Surachai Promthong)
Laboratory Manager

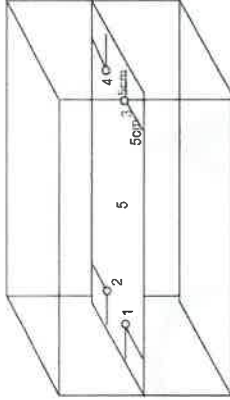
The Uncertainties are for a confidence probability of approximately 95%
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Certificate of Calibration

Certificate No. : 66-400520-3

Result of Calibration : Without Adjustment
UUC Condition As-Received : Good
Function : Temperature measurement



Front

| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Temperature (°C) @ | | | | | Uncertainty (± °C) | Measured Uniformity (°C) | Measured Stability (°C) |
|--------------------|-----------------------------|--------------------------------|-----------------------------|-------|-------|-------|-------|-----------------------|-----------------------------|----------------------------|
| | | | Sensor No. | | | | | | | |
| | | | 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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Approved by :
(Surachai Promthong)
Laboratory Manager





Certificate of Calibration

Page : 1 of 2

Certificate No. : 66-400520-4

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

Model : Biochemistry Incubator

Resolution : 0.1 °C

Serial No. : KYP1502202003

ID No. : N/A

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

Ambient Temperature : (25.0 to 25.5) °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. 400029 & 400043

Cert. No. 66-400226-1

Due Date 27 Oct 2023

Traceability

National Institute of Metrology Thailand (NIMT)

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Page : 2 of 2

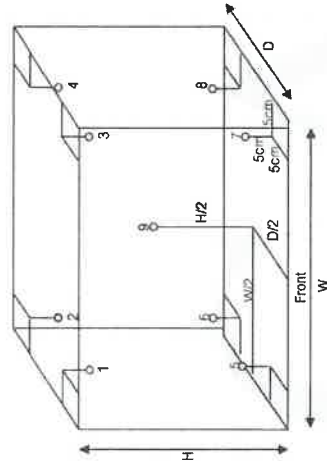
Certificate No. : 66-400520-4

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 m
D = 0.41 m
H = 0.85 m
Capacity = 0.16 m³

| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Temperature (°C) @ Sensor No. | | | | | | | | Uncertainty (± °C) | |
|--------------------|-----------------------------|--------------------------------|--|-------|-------|-------|-------|-------|-------|-------|-----------------------|------|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | 9 |
| 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 (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Uniformity (°C) | | Measured Stability (°C) | | Overall Variation (°C) |
|--------------------|-----------------------------|--------------------------------|-----------------------------|------|----------------------------|-----|---------------------------|
| | | | 0.28 | 0.37 | 0.37 | 0.8 | |
| 20.0 | 20.0 | 20.0 | 0.28 | 0.37 | 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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Approve

(Surachai Promthong)

Laboratory Manager



Certificate of Calibration

Certificate No. : 66-300589-8

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 ± 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. : 66-300589-8

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%

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Certificate of Calibration

Certificate No. : 66-300590-1

Page : 1 of 2

Submitted by : M Green Group Co., Ltd.

188/46 Wisatesuknakhon 25, Pracha-Ujtd 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 ± 3) °C

Relative Humidity : (50 ± 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 : Arcerat 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 |
|--------|-------------|-------------|---|
| 241002 | 66-200196-1 | 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. : 66-300590-1

Page : 2 of 2

Result of Callibration : 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 ± 0.17 ml

This result of callibration 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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การดูแลบำรุงรักษาเชิงป้องกัน Preventive Maintenance

เงื่อนไขการให้บริการ Preventive Maintenance

Type text here

บริษัทฯ จะส่งวิศวกรผู้ชำนาญ เพื่อให้ให้บริการตามขอบข่ายของการบริการ เฉพาะ ในวันและเวลา ราชการ หากมีความประสงค์ที่จะรับบริการนอกเหนือจากนี้ เวลา ราชการ (วันหยุดเสาร์ – อาทิตย์ หรือวันหยุด นักชัตดอร์) บริษัทฯ จะคิดค่าบริการเพิ่มเติมตามอัตราที่กฎหมายแรงงานกำหนดไว้

ขอบข่ายการบริการ

- ตรวจสอบสภาพการทำงานต่าง ๆ ของเครื่องมือ
- ทดสอบประสิทธิภาพการทำงานของเครื่องมือ
- รายการผลการตรวจสอบเครื่องมือ

หมายเหตุ

- ราคาไม่รวมถึงค่าบริการซ่อม หรือ เปลี่ยนอะไหล่ที่ชำรุดเสียหาย หรือหมดสภาพการใช้งาน
- ในกรณีที่ผู้รับบริการอยู่นอกเขตพื้นที่ให้บริการ บริษัทฯ จำเป็นต้องคิดค่าใช้จ่ายเพิ่มเติม ได้แก่ ค่าเดินทาง เป็นต้น
- บริษัทฯ ขอสงวนสิทธิ์ในการเปลี่ยนแปลงราคา โดยไม่แจ้งให้ทราบล่วงหน้า



บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด

ฝ่ายบริการหลังการขาย

โทร 0 2 639 7000 E-mail: service.tec.th@dksh.com

ฝ่ายขายและการตลาด

โทร 0 2 639 7000 E-Mail : marketing.tec.th@dksh.com

Website : www.dksh.co.th/technology/scientific-thailand





ช่องทางการติดต่อ

DKSH Technology Limited (บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด)
เลขที่ 2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพฯ 10260
เลขประจำตัวผู้เสียภาษี 010-555-001-4547 (สำนักงานใหญ่)



Call center 0 2 639 7000



DKSH Scientific



www.dksh.com/scientific-thailand



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@dkshscientific

Preventive Maintenance Contract

จำนวนในการทำสัญญาบริการ ...ครั้ง ต่อปี
ครั้งที่ 1. วันที่ 19/04/2024.....

รายละเอียดผู้รับบริการ

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

ผู้ติดต่อ

| | | | |
|----------------|---------------------------|----------|---|
| ชื่อ - นามสกุล | คุณกรรณก จันทวิทย์ | | |
| ตำแหน่ง | หัวหน้าส่วน | | |
| โทรศัพท์ | 087 398 9274 | เบอร์โทร | - |
| E-mail | lab_center@testtech.co.th | | |

รายละเอียดผู้ให้บริการ

| | | | |
|--|-------------------------------|-------|---|
| บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด (ฝ่ายบริการหลังการขาย) (สำนักงานใหญ่) เลขที่ 2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพฯ 10260 โทรศัพท์ 0 2 693 7000 Email: marketing.tsc.th@dksh.com เจ้าหน้าที่ประสานงาน : คุณสุภารัตน์ ศรีรัตน์ โทรศัพท์ 090 678 6925 | | | |
| เจ้าหน้าที่ผู้ให้บริการ | นายจิรายุส ฤทธาภา | | |
| ตำแหน่ง | Specialist, Technical Service | | |
| โทรศัพท์ | 0938138736 | แฟกซ์ | - |
| E-mail | Jirayut.je@dksh.com | | |

| | |
|--------------------------|--------------------------|
| ลงนามผู้รับบริการ | ลงนามผู้ให้บริการ |
| ตัวจริง | ตัวจริง |
| ตำแหน่ง | ตำแหน่ง |
| วันที่ / ประทับตราบริษัท | วันที่ / ประทับตราบริษัท |

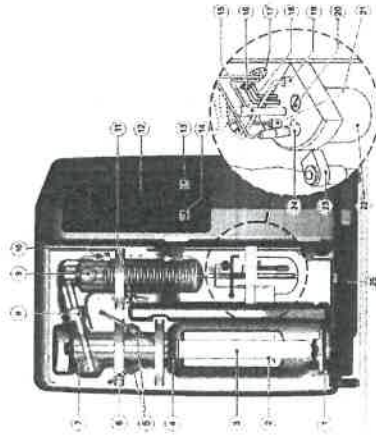
(นายจิรายุส ฤทธาภา)
Specialist, Technical Service
19/04/2024

JOB No: LSPR2402440.....MODEL: VAP300.....S/N: GER55300210095

Operational Qualification (OQ)

เครื่องวัดค่าความเป็นกรด-เบส

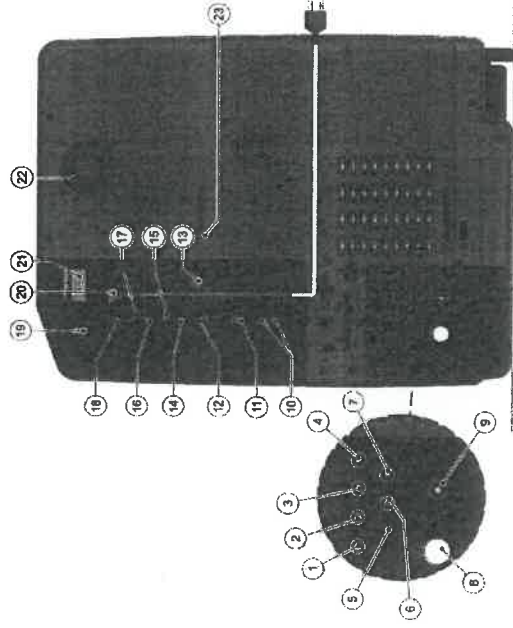
FRONT



| No | | PASS | FAIL | N/A |
|----|---|-------------------------------------|--------------------------|-------------------------------------|
| 1 | Quick clamping device with clamping block | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2 | Digestion tube 250/300 ml | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 3 | PTFE steam inlet tubing | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 4 | Connection stopper, Viton | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 5 | Screw cap GL18 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 6 | PTFE-inlet tubing NaOH | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 7 | Distribution head made of glass | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 8 | Screw cap GL32 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 9 | Distillation condenser made of glass | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 10 | Screw cap GL14 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 11 | Ventilation valve | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 12 | Control panel | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 13 | Operating Button | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 14 | USB interface (with protective cap) | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 15 | Silicone tubing 8/10 for distillate discharge ** | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 16 | Veriprene tubing 4/8, receiver suction ** | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 17 | Cable duct for electrode cable + titration tube** | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 18 | Silicone tubing 4/7, boric acid inlet** | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 19 | Sensor for level monitoring including connector** | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 20 | Agitator motor with propeller** | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 21 | Titration acid inlet tube ** | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 22 | Receiver glass** | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 23 | Holder for pH electrode, removable** | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 24 | pH electrode (combined electrode)** | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 25 | Drip tray PP | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

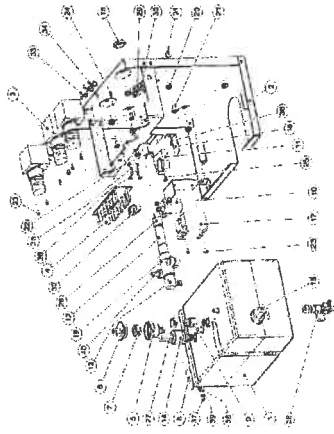
** only VAP 450

REAR



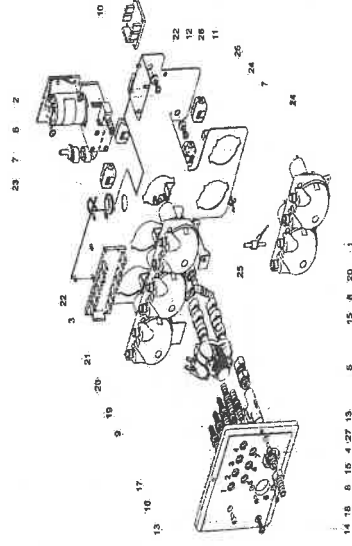
| No | | PASS | FAIL | N/A |
|----|---|-------------------------------------|--------------------------|-------------------------------------|
| 1 | Tube connection for sample H3BO3 supply | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 2 | Tube connection for sample H2O supply | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 3 | Tube connection for steam generator H2O supply | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 4 | Tube connection for NaOH supply | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 5 | Tube connection for receiver glass extraction | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 6 | Tube connection for sample waste extraction | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 7 | Tube connection, overpressure steam outlet | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 8 | Connection for cooling water supply (with cleaning sieve) | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 9 | Tube connection for cooling water outlet | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 10 | 4 X USB interface | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 11 | 1 X RS-232 interface | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 12 | LAN Interface | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 13 | Screw cap for Perspex cover | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 14 | Connection socket for sample waste tank level monitoring | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 15 | Connection (not used) | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 16 | Connection socket for H2O tank level monitoring | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 17 | Connection socket for H3BO3 tank level monitoring | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 18 | Connection socket for NaOH tank level monitoring | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 19 | Overcurrent circuit breaker | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 20 | Apparatus socket (mains cable connection) | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 21 | Rating plate with serial number | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 22 | Exhaust air fan | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 23 | Excess temperature switch | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Inside Steam generator



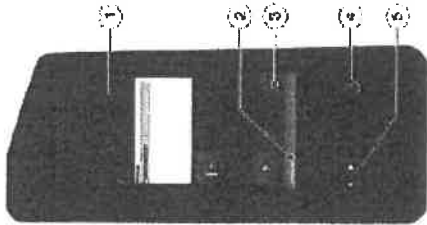
| No | | PASS | FAIL | N/A |
|----|--|-------------------------------------|--------------------------|--------------------------|
| 1 | Steam generator | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2 | Steam generator traverse | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 3 | Pinch valve | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 4 | Circuit board distributor | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 5 | Valve tubing connection | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 6 | Housing safety valve | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 7 | Safety valve SKT | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 8 | Excess temperature protection, steam generator | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 9 | Safety valve G 1/8 0.5 bar | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 10 | Ventilation glass pinch valve VAPODEST | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 11 | Hose clamp for ventilation clamp | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 12 | Distributor PP | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 13 | Angle connection PP | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 14 | Pressure transmitter | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 15 | Level switch | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 16 | Fixing bracket steam generator | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 17 | Relay HT+ | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 18 | VA Hexagon nut 1/2" | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 19 | Angle connection 1/8" | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 20 | Bushing nipple 6-10-14 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 21 | VA Lens head screw M5 X 10 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 22 | Grounding connection, 2-pole | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 23 | VA Lens head screw M4 X 6 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 24 | Spacer bolt 5 mm | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 25 | VA Lens head screw M4 X 10 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 26 | Tubing connection | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 27 | Hose clamp 14.5 mm | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 28 | Module ball valve with nozzles | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 29 | Cross manifold with spout | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 30 | Seal copter G 1/8 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 31 | Locking screw 1/8" | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 32 | Pin strip | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 33 | Bundle clamp 12 H 4500 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 34 | Bundle clamp 12 H 4502 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 35 | Temperature switch 80°C | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 36 | VA Lens head screw M3 X 6 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 37 | VA Hexagon nut M4 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 38 | Lins head screw M4 X 8 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 39 | VA Spring washer | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 40 | Angle connection, reduced, 1/8" PP | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Module Pump holder VAP200 - 450 V3



| No | | PASS | FAIL | N/A |
|----|--|-------------------------------------|--------------------------|--------------------------|
| 1 | Peristaltic pump | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2 | Diaphragm pump NaOH, with non return valve | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 3 | Circuit board | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 4 | Tubing connection module | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 5 | Flow controller | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 6 | Lens head screw M5 x 10 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 7 | Bushing nozzle | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 8 | Screw in socket | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 9 | Magnetic valve 2/2 way | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 10 | Circuit board distributor | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 11 | Bushing nozzle | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 12 | Screw 5 x 25 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 13 | Cylinder screw | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 14 | Screw 5 x 20 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 15 | Seal EPDM 1.5 x 4 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 16 | Tubing connection piece 51x10x6.5 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 17 | Tubing connection piece 51x10x10 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 18 | Screw M4x10 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 19 | Clamp | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 20 | Clamp | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 21 | Y-tube connector | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 22 | Spacer bolt 5 mm | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 23 | Bundle clamp | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 24 | Bundle clamp | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 25 | Retrofit earthing pump/v | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 26 | Snap ferrite | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 27 | Nut G 3/8" | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 28 | Pump holder plate | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Control panel



| No | | PASS | FAIL |
|----|--------------------------------------|-------------------------------------|--------------------------|
| 1 | Title bar | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 2 | Status bar | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 3 | Navigation button | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 4 | Smart switch with multiple functions | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 5 | USB interface | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

- รายละเอียดการตรวจสอบ
- ขั้นตอนการบริการ
- ตรวจสอบระบบไฟฟ้า (Electrical Test)
- ความต้านทานทางไฟฟ้าของเครื่องกับกราวด์
 - กระแสไฟฟ้าที่ใช้ทำงาน
- ตรวจสอบสภาพเครื่อง (Optical Test)
- Main cable
 - Electric wiring
 - Pumps
 - Distribution Head
 - Condensor
 - Steam generator
 - Tubing
 - Viton cone
- ตรวจสอบ Function การทำงาน (The Function Test)
- ระบบสร้างและควบคุมความดันคั่นของ Steam
 - ระบบการเติมน้ำเข้า Sample Tube
 - ระบบการเติม Na OH
 - ระบบการเติม H3BO3

รายงานผลการปฏิบัติงาน

1. TECHNICAL DATA

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

Pass ☒ Fail ☐ N/A ☐
Remark
.....
.....8a.....

1.1 COOLING WATER BATH
Temperature 15-20 °C
Cooling Water Outlet
Control Temperature

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

1.2 OPTICAL TEST/AP300

Screw cap GL14
Screw cap GL18
Screw cap GL32
Distillation Head
Condensor
Viton Cone
Ventilation Valve BV
Micro Switch Sample
Agitator motor for propeller

Pass ☒ Fail ☐ N/A ☐
Remark
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2. SYSTEM COOLING WATER INLET

Cooling Water Inlet
Cooling Water Outlet
Flow control valve

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

3. SYSTEM CONTROL

Display
Program
Adding NaOH
Adding H2O
Adding H3BO3
Suction Sample
Suction Receiver

Pass ☒ Fail ☐ N/A ☐
Remark
.....
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4. SYSTEM DISTILLATION

Boiler
Level Sensor
Novopren
Solenoid Valve Shut-Off
Solenoid Valve Steam
Solenoid Valve soft steam
Ventilation Valve Premount
Excess Pressure Detector
Heating Element

Pass ☒ Fail ☐ N/A ☐
Remark
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5. PUMP

Pump H₂O Steam
- Non-Return Valve
Pump H₂O Sample
- Non-Return Valve
Pump NaOH
- Non-Return Valve
Pump H3BO3
- Non-Return Valve
Pump suction
Pump suction receiver

Pass ☒ Fail ☐ N/A ☐
Remark
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6. The Following Program Run :

Addition H2O 0-999 ml
Addition NaOH 0-999 ml
Addition H3BO3 0-999 ml
Reaction Time 0-108 min
Distillation Time 0-108 min
Steam Capacity 10%-100%
Suction Sample
Suction Receiver

Pass ☒ Fail ☐ N/A ☐
Remark
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7. Measured pumps

Pump NaOH
Pump H2O
Pump H3BO3

Volume :20.40.....ml
Volume :16.00.....ml
Volume :ml
Remark
.....
.....
.....

Remark :



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



Certificate of Calibration

Certificate No. BSCC-UV-166/24

Number of Page(s) 1 of 3

Equipment

UV/Vis Spectrophotometer

Model

UV-1900i

Manufacturer

Shimadzu

Serial No.

A12535780311 ML

ID No.

EOL-233

Date of receipt

26 April 2024

Date of calibration

30 April 2024

Date of issue

30 April 2024

Customer name

Test Tech Co., Ltd.

Address

30/32 Rama II Soi 63, Rama II Road, Samae Dam, Bang Khun Thian, Bangkok 10150

Temperature

(24.9 - 25.4) °C (On site)

Humidity

(49.4 - 51.1) %RH (On site)

Equipment condition

Good Operation

Calibration Location

Water Room

Calibration Procedure

In-house method WJUV-702-01 based on ASTM E275-01

Traceability

Wavelength Accuracy is traceable to certificate No. 106372 and 106371

Photometric Accuracy is traceable to certificate No. 106364 and 111398

Spectral Light is traceable to certificate No. 106377

The above certificate are traceable to SI unit through Stama Scientific Ltd.

(UKAS accredited calibration laboratory NO. 0659)

Calibrated by

Mr. Wanchana Janboey

Approved by

Service Manager

Signature

Signature

Signature

Signature

Signature

Signature

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.
Advertising the report / Certificate and publicity of the results are prohibited and also shall not be reproduced
except in full, without written approval of the Bara Scientific Co., Ltd.



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



Certificate of Calibration

Certificate No. BSCC-UV-166/24

Number of Page(s) 2 of 3

Calibration Results:

1. Wavelength Accuracy

| Certified Wavelength (nm) | UUC (nm) | Error (nm) | Uncertainty (±nm) |
|---------------------------|----------|------------|-------------------|
| 279.44 | 279.18 | -0.26 | 0.18 |
| 418.53 | 418.46 | -0.07 | 0.18 |
| 536.52 | 536.54 | 0.02 | 0.18 |
| 684.50 | 684.63 | 0.13 | 0.18 |
| 879.41 | 879.43 | 0.02 | 0.18 |

2. Photometric Accuracy (UV)

| Wavelength (nm) | Certified Absorbance (A) | UUC (A) | Error (A) | Uncertainty (±A) |
|-----------------|--------------------------|---------|-----------|------------------|
| 235 | CNR | CNR | CNR | CNR |
| 257 | CNR | CNR | CNR | CNR |
| 257 | 0.0000 | 0.0000 | 0.0000 | 0.0075 |
| 257 | 0.8354 | 0.8333 | -0.0021 | 0.0075 |
| 313 | CNR | CNR | CNR | CNR |
| 350 | CNR | CNR | CNR | CNR |
| 350 | 0.0000 | -0.0001 | -0.0001 | 0.0075 |
| 350 | 0.6199 | 0.6190 | -0.0009 | 0.0075 |

*CNR = Customer not request

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.
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Bara Scientific Co., Ltd.
988 U Chu Liang Building Floor7 Rama4 Road
Siam, Bangkok Bangkok Thailand 10500
Tel : 02-6324300 Fax : 02-6375496-7
www.barascientific.com



Certificate of Calibration

Certificate No. BSCC-UV-166/24 Number of Page(s) 3 of 3

Calibration Results:

3. Photometric Accuracy (Visible)

| Wavelength (nm) | Certified Absorbance (A) | UUC (A) | Error (A) | Uncertainty (±A) |
|-----------------------------|--------------------------|---------|-----------|------------------|
| 420.0 | 0.0000 | 0.0000 | 0.0000 | 0.0042 |
| | 0.5761 | 0.5791 | 0.0030 | 0.0042 |
| | 0.7119 | 0.7132 | 0.0013 | 0.0042 |
| 440.0 | 1.0189 | 1.0221 | 0.0032 | 0.0042 |
| | 0.0000 | 0.0000 | 0.0000 | 0.0042 |
| | 0.5610 | 0.5636 | 0.0026 | 0.0042 |
| 465.0 | 0.7001 | 0.7012 | 0.0011 | 0.0042 |
| | 1.0026 | 1.0052 | 0.0026 | 0.0042 |
| | CNR | CNR | CNR | CNR |
| 546.1 | CNR | CNR | CNR | CNR |
| | 0.0000 | 0.0000 | 0.0000 | 0.0042 |
| | 0.5249 | 0.5260 | 0.0011 | 0.0042 |
| 590.0 | 0.6975 | 0.6971 | -0.0004 | 0.0042 |
| | 1.0009 | 1.0012 | 0.0003 | 0.0042 |
| | CNR | CNR | CNR | CNR |
| 635.0 | CNR | CNR | CNR | CNR |
| | 0.0000 | 0.0000 | 0.0000 | 0.0042 |
| | 0.5666 | 0.5673 | 0.0007 | 0.0042 |
| *CNR = Customer not request | | 0.7620 | -0.0009 | 0.0042 |
| | | 1.0982 | -0.0006 | 0.0042 |

4. Stray Light*

| Standard cut-off wavelength (nm) | Unit Under Calibration(UUC) | |
|----------------------------------|-----------------------------|----------------|
| | Wavelength (nm) | Absorbance (A) |
| 200.85±0.11nm | 200.76 | 2.0091 |

The Stray light transmission reference is less than 1.0%* and Stray light absorbance reference is greater than 2.00A
*Stray Light not NSC-ONSC Accredited.

The measurement uncertainty is base on a standard uncertainty multiplied by a coverage factor (k=2) providing a level of confidence of approximately 95%.
End of Certificate

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.
Advertising the report / Certificate and publicity of the results are prohibited and also shall not be reproduced except in full, without written approval of the Bara Scientific Co., Ltd.



Certificate of Calibration

Equipment: SPECTROPHOTOMETER
Model: DR6000
Serial No. (or ID.): 1693421 (EGL-197)
Manufacturer: HACH
Condition: In Condition
Certificate No.: C06240153
Issued Date: 18 April 2024
Job No.: WO-00024683
Page: 1 of 3

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

Environment Condition: Temperature 29.8 °C ± 0.1 °C
Humidity 45.7 %RH ± 6.9 %RH

Calibration Place: TEST TECH CO., LTD. (แทนทีช)
30,32 Rama II Soi 63, Rama II Rd.,
Samaedam, Bangkhuntien Bangkok 10150 Thailand

Calibration By: Miss.Kaewkan Suradech
Calibration Date: 18 April 2024

The Method used: In house method, CAL-WI-24, base on ASTM E 275-08 and ASTM E 387-04
Traceability: This certificate is traceable to the CRM maintained by National Institute of Standards and Technology (NIST) through Starna Scientific Limited.

The standard for Wavelength Certificate No. 118106 and 118118
The standard for Photometric Certificate No. 118123 and 118113
The standard for Stray light Certificate No. 118110 and 118112
The standard for Spectral resolution Certificate No. 118104

(Miss Kaewkan Suradech)
(Mr. Nitinun Sihawan)
Authorized signatory

Person in charge

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

DKSH Technology Limited
2533 Sukhumvit Road, Bangkok, Phrakasong, Bangkok 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth - In Asia and Beyond.

CAL-FM-C06-16: 11 Mar 2024



Calibration Results:
Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of Std at 2 nm and UUC at 2 nm

| Standard Wavelength | Unit Under Calibration | Correction | Uncertainty |
|---------------------|------------------------|------------|-------------|
| 418.61 | 418.5 | 0.11 | 0.13 |
| 536.66 | 536.7 | -0.04 | 0.13 |
| 637.98 | 637.9 | 0.08 | 0.13 |
| 748.48 | 748.6 | -0.12 | 0.13 |
| 807.03 | 807.4 | -0.37 | 0.13 |

Photometric Accuracy (Absorbance)

| Wavelength | Standard absorbance | Unit Under Calibration | Correction | Uncertainty |
|------------|---------------------|------------------------|------------|-------------|
| 420 nm | 0.0000 | 0.000 | 0.0000 | 0.0045 |
| | 0.5772 | 0.576 | 0.0012 | 0.0045 |
| | 0.7198 | 0.719 | 0.0008 | 0.0045 |
| | 1.0394 | 1.039 | 0.0004 | 0.0045 |
| 440 nm | 0.0000 | 0.000 | 0.0000 | 0.0045 |
| | 0.5608 | 0.560 | 0.0008 | 0.0045 |
| | 0.7062 | 0.705 | 0.0012 | 0.0045 |
| | 1.0189 | 1.018 | 0.0009 | 0.0045 |
| 465 nm | 0.0000 | 0.000 | 0.0000 | 0.0045 |
| | 0.5214 | 0.521 | 0.0004 | 0.0045 |
| | 0.6652 | 0.664 | 0.0012 | 0.0045 |
| | 0.9577 | 0.957 | 0.0007 | 0.0045 |
| 546.1 nm | 0.0000 | 0.000 | 0.0000 | 0.0045 |
| | 0.5192 | 0.518 | 0.0012 | 0.0045 |
| | 0.6907 | 0.689 | 0.0017 | 0.0045 |
| | 0.9949 | 0.993 | 0.0019 | 0.0045 |
| 590 nm | 0.0000 | 0.000 | 0.0000 | 0.0045 |
| | 0.5530 | 0.551 | 0.0020 | 0.0045 |
| | 0.7555 | 0.753 | 0.0025 | 0.0045 |
| | 1.0761 | 1.073 | 0.0031 | 0.0045 |
| 635 nm | 0.0000 | 0.000 | 0.0000 | 0.0045 |
| | 0.5604 | 0.559 | 0.0014 | 0.0045 |
| | 0.7418 | 0.739 | 0.0028 | 0.0045 |
| | 1.0467 | 1.044 | 0.0027 | 0.0045 |



Calibration Results:
Without Adjustment

Photometric Accuracy (Absorbance)

| Wavelength | Standard absorbance | Unit Under Calibration | Correction | Uncertainty |
|------------|---------------------|------------------------|------------|-------------|
| 235 nm | 0.0000 | 0.000 | 0.0000 | 0.0080 |
| | 0.7533 | 0.748 | 0.0053 | 0.0080 |
| 257 nm | 0.0000 | 0.000 | 0.0000 | 0.0080 |
| | 0.8745 | 0.869 | 0.0055 | 0.0080 |
| 313 nm | 0.0000 | 0.000 | 0.0000 | 0.0080 |
| | 0.2926 | 0.293 | -0.0004 | 0.0080 |
| 350 nm | 0.0000 | 0.000 | 0.0000 | 0.0080 |
| | 0.6486 | 0.644 | 0.0046 | 0.0080 |

Stay light *

| Standard: cut-off | UUC: Wavelength (nm) | UUC: Transmission (%T) | Absorbance (A) |
|--------------------|----------------------|------------------------|----------------|
| 260.95 +/- 0.11 nm | 261.0 | 0.9 | 2.046 |
| 392.04 +/- 0.11 nm | 392.0 | 1.3 | 1.886 |

Spectral Resolution *

| Nominal Concentration 0.02 % v/v | Peak | Trough | Ratio | SBW |
|----------------------------------|--------|--------|-------|------|
| Standard Wavelength (nm) | 268.74 | 266.81 | 1.29 | 2.00 |
| UUC: Wavelength (nm) | 268.6 | 266.6 | | |
| Std Absorbance (A) | 0.5137 | 0.3473 | | |
| UUC: Absorbance (A) | 0.463 | 0.359 | | |

* Calibration Marked " Not TISI Accredited " in this Certificate have been included for completeness.

The End of Certificate



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



QUALITY CALIBRATION CO., LTD.
235 Petchkasem 63/2 Road, Laksong, Bangkok, Bangkok 10160
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 : EOL-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 P100 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.

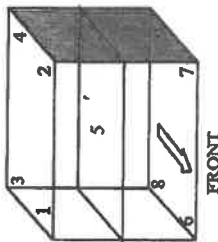
2. REFERENCE STANDARD INSTRUMENTS :-

- 1) DATA LOGGER WITH RTD : MODEL : HYDRA 2635A : SERIAL No : 7301307 : CERTIFICATE No : 2376636 : 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): 56*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 | 36.02 | 36.09 | 36.10 | 36.10 | 36.04 | 36.12 | 0.25 |
| 41.5 | 41.5 | 41.45 | 41.45 | 41.45 | 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



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
QUALITY CALIBRATION CO., LTD.



CERTIFICATE No : 24T1189

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : AUTOCLAVE
MANUFACTURER : HIRAYAMA
MODEL : HVE-50
ID NUMBER : EQL-155
SERIAL NUMBER : 30612085166
RECEIVED DATE : 09-Feb-24
CALIBRATION DATE : 09-Feb-24
AMBIENT TEMPERATURE : 30° C ± 1° C
RELATIVE HUMIDITY : 53 %RH ± 10 % RH

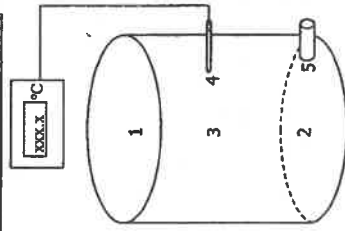
CONDITION OF THIS RESULTS OF CALIBRATION

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 S350,3567,DV35,DN94 : SERIAL No : 24T0890 : CERTIFICATE No : 26-Jan-23
2) TEMPERATURE STABILITY : 0.5 °C
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 | 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 | | Measured Temperature (°C) at Spread Locations | | | | | Uncertainty (± °C) |
|-----------|-----|---|--------|--------|--------|--------|--------------------|
| | | #1 | #2 | #3 | #4 | #5 | |
| 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 BUDGET WAS REPLACED BY THE STANDARD REPEATABILITY. 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