

Grande Centre Point

SURAWONG • BANGKOK

ภาคผนวก จ

เอกสารสอบเทียบเครื่องมือที่ใช้ในการตรวจวิเคราะห์



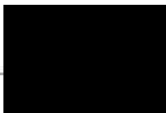
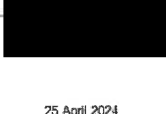
List of Instruments Certification for Water Quality Analysis

| No. | Instrument/Equipment | Parameter | Manufacturer | Model/Serial No. | Calibrator | Certification No. | Date of Calibration | Due date of Calibration | Remark |
|-------|----------------------|-----------|--------------|-------------------|--|-------------------|---------------------|-------------------------|--------|
| Water | | | | | | | | | |
| 1 | pH Meter | pH | Ecosence | pH100A JC04742 | Technology Promotion Association (Thailand-Japan) | 24CH454 | 24 Apr 24 | 23 Apr 25 | - |



Certificate of Calibration

Cert.No.: 24CH454
Page.: 1 of 3

Equipment : pH Meter
Manufacturer : EcoSense
Model : pH100A
Serial No. : JC04742
ID No. : UAE-EFM.061/2566 (EFM.pH 04/66)
Condition As-Received: Used Item
Received Date : 22 April 2024
Calibration Date : 24 April 2024
Reference : 2404-0487/WSC-3
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangkok,
Phrakhanong, Bangkok 10260
Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with DC voltage
standard and direct measurement with
certified reference material (CRM)
- CP-CH8 by comparison with temperature standard
Calibrated by : 
Approved by : 
() Unnopphol Harachai
() Ponpan Palpim
(✓) Salrip Meangmai
Issue Date : 25 April 2024

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม

Condition of this calibration result

1. Reference Standard Instrument

| Instrument | Serial No. | ID No. | Cert. No. | Due Date |
|--------------------------------|------------|----------|-----------|--------------|
| 1) Document Process Calibrator | 54030049 | 130RC116 | 23E2802 | 27 Aug 2024 |
| 2) Ref. Standard Thermometer | 4982054 | 110RC044 | 231908 | 26 July 2024 |

This certification is traceable to the International System of Unit maintained through:-
- Technology Promotion Association (Thailand-Japan)

2. Certified Reference Materials

The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1635

| Buffer Solution | Manufacturer | Lot No. | Exp. date |
|-----------------|--------------|---------|-------------|
| pH 4.008 | CPA chem | 970851 | 25 Apr 2026 |
| pH 6.986 | CPA chem | 970852 | 25 Apr 2025 |
| pH 9.997 | CPA chem | 970853 | 25 Apr 2025 |

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

Calibration Results

Function : mV Measurement

Performing standard curve by Document Process Calibrator at pH (4,7)(7,10)

| Unit Under Calibration | Nominal Value | Standard Voltage Input | Actual Reading | | Uncertainty of Measurement (± mV) | Coverage factor k |
|--------------------------|---------------|------------------------|----------------|-------|--|----------------------|
| | | | mV | pH | | |
| pH Meter S/N: JC04742 | 4.00 | 177.48 | 177 | 4.01 | 0.58 | 2.00 |
| | 7.00 | 0.00 | 0 | 7.00 | 0.58 | 2.00 |
| | 7.00 | 0.00 | 0 | 7.00 | 0.58 | 2.00 |
| | 10.00 | -177.48 | -177 | 10.01 | 0.58 | 2.00 |

เอกสารไม่ควบคุม



Cert.No.: 24CH454
Page.: 3 of 3

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7)(7,10)

| Unit Under Calibration | Standard pH Buffer Solution | Actual pH Reading | Actual mV Reading (mV) | Uncertainty of pH Measurement (±) | Coverage factor k |
|--------------------------------------|-----------------------------|-------------------|------------------------|-----------------------------------|-------------------|
| pH Electrode S/N: 230308SIA605377 | 4.008 | 4.01 | 154 | 0.0079 | 2.00 |
| | 6.986 | 7.00 | -20 | 0.0099 | 2.00 |
| | 6.986 | 7.00 | -20 | 0.0099 | 2.00 |
| | 9.997 | 10.00 | -193 | 0.0085 | 2.00 |

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model :
- Serial No. : 230308SIA605377
Dimension of probe
- Length : 110 mm.
- Diameter : 12 mm.
- Immersion Depth : 100 mm.

| Calibration Point (°C) | Standard Temperature (°C) | UUC* Reading (°C) | Error (°C) | Uncertainty of measurement (± °C) | Coverage factor k |
|------------------------|---------------------------|-------------------|------------|-----------------------------------|-------------------|
| 25.0 | 24.999 | 25.0 | 0.001 | 0.13 | 2.00 |
| 30.0 | 30.000 | 30.0 | 0.000 | 0.13 | 2.00 |
| 35.0 | 35.000 | 35.0 | 0.000 | 0.13 | 2.00 |

Remark - UUC* = Unit Under Calibration

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

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เอกสารไม่ควบคุม

List of Instruments Certification for Environmental Quality Analysis

| No. | Instrument/Equipment | Parameter | Manufacturer | Model/Serial No. | Calibrator | Certification No. | Date of Calibration | Due date of Calibration* | Remark |
|--------------------------------------|----------------------|--|--------------|-------------------------------|---|-------------------|---------------------|--------------------------|--------|
| Equipment for Water Quality Analysis | | | | | | | | | |
| 1 | pH Meter | pH | Horiba | LAQUA-PH210 / HA0D0082 | Technology Promotion Association (Thailand-Japan) | 24CH727 | 19 Jun 24 | 17 Jun 25 | - |
| 2 | Cooled Incubator | ESCHERICHIA COLI TOTAL COLIFORM BACTERIA | Binder | KB400 / WTB202000000015535 | Technology Promotion Association (Thailand-Japan) | 24TM647 | 1 Apr 24 | 31 Mar 25 | - |
| 3 | Incubator | ESCHERICHIA COLI TOTAL COLIFORM | Binder | KB400 / 202200000022479 | DKSH Technology | C31231678 | 7 Aug 24 | 6 Aug 25 | - |
| 4 | Incubator | BACTERIA | Memmert | KB400 / 20200000015535 | Technology Promotion Association (Thailand-Japan) | 24TM650 | 2 Apr 24 | 2 Apr 25 | - |
| 5 | Incubator | LEGIONELLA SPP. PSEUDOMONAS AERUGINOSA | Binder | KB400 / 202200000000391 | Technology Promotion Association (Thailand-Japan) | 24TM884 | 7 Jun 24 | 6 Jun 25 | - |

Due Date of Calibration* : Based on the annual calibration plan. At least 1 time per year.



Certificate of Calibration

Cert.No.: 24CH727
Page.: 1 of 3

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH210
Serial No. : HA000082
ID No. : UAE.EFM.072/2564(EFM.pH C5/G4)
Condition As-Received: Used Item
Received Date : 18 June 2024
Calibration Date : 19 June 2024
Reference : 2406-057CWSC-5
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phraekhanong, Bangkok 10260

Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In-house method :
- CP-CH5 by direct measurement with DC voltage
standard and direct measurement with
certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by :

Approved by :

() Unnopphol Harachai
() Ponpan Palpin
(✓) Saitthip Meangmai

Issue Date : 20 June 2024

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

Condition of this calibration result

1. Reference Standard Instrument

| Instrument | Serial No. | ID No. | Cert. No. | Due Date |
|--------------------------------|------------|----------|-----------|--------------|
| 1) Document Process Calibrator | 54030049 | 130RC116 | 23E2802 | 27 Aug 2024 |
| 2) Ref. Standard Thermometer | 4982054 | 110RC044 | 23I908 | 26 July 2024 |

- This Certification is traceable to SI Through Technology Promotion Association (Thailand - Japan)

2. Certified Reference Materials

: The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1635

| Buffer Solution | Manufacturer | Lot No. | Exp. date |
|-----------------|--------------|---------|-------------|
| pH 4.008 | CPA chem | 970851 | 25 Apr 2026 |
| pH 6.986 | CPA chem | 970852 | 25 Apr 2025 |
| pH 9.997 | CPA chem | 970853 | 25 Apr 2025 |

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

Calibration Results

Function : mV Measurement

Performing standard curve by Document Process Calibrator at pH (4,7)(7,10)

| Unit Under Calibration | Nominal Value | Standard Voltage Input | Actual Reading | | Uncertainty of Measurement | Coverage factor |
|----------------------------|---------------|------------------------|----------------|-------|----------------------------|-----------------|
| | pH | mV | mV | pH | (±mV) | k |
| pH Meter S/N.: HA000082 | 4.00 | 177.48 | 177.5 | 4.01 | 0.058 | 2.00 |
| | 7.00 | 0.00 | 0.2 | 7.00 | 0.058 | 2.00 |
| | 7.00 | 0.00 | 0.2 | 7.00 | 0.058 | 2.00 |
| | 10.00 | -177.48 | -177.0 | 10.01 | 0.058 | 2.00 |



Cert.No.: 24CH727
Page.: 3 of 3

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7)(7,10)

| Unit Under Calibration | Standard pH Buffer Solution | Actual pH Reading | Actual mV Reading (mV) | Uncertainty of pH Measurement (±) | Coverage factor k |
|--------------------------------|-----------------------------|-------------------|------------------------|-----------------------------------|-------------------|
| pH Electrode S/N.: Q9AA0036 | 4.008 | 4.01 | 179.9 | 0.0079 | 2.00 |
| | 6.986 | 7.00 | 4.6 | 0.0099 | 2.00 |
| | 6.986 | 7.00 | 3.2 | 0.0093 | 2.00 |
| | 9.997 | 10.01 | -171.2 | 0.0092 | 2.00 |

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe:

- Model : 9652-10D

- Serial No. : Q9AA0036

Dimension of probe

- Length : 103 mm.

- Diameter : 16 mm.

- Immersion Depth : 80 mm.

| Calibration Point (°C) | Standard Temperature (°C) | UUC* Reading (°C) | Error (°C) | Uncertainty of measurement (± °C) | Coverage factor k |
|------------------------|---------------------------|-------------------|------------|-----------------------------------|-------------------|
| 25.0 | 25.001 | 25.0 | -0.001 | 0.13 | 2.00 |
| 30.0 | 30.004 | 30.0 | -0.004 | 0.13 | 2.00 |
| 35.0 | 35.002 | 35.0 | -0.002 | 0.13 | 2.00 |

Remark : - UUC* = Unit Under Calibration

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



Certificate of Calibration

Cert. No.: 24TM547
Page : 1 of 3

Equipment : Incubator
Manufacturer : Binder
Model : KB 400 ES
Serial No. : 2620000015505
ID No. : UAE.MIC.018/2564
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10250
Location : Microbiology Laboratory (302)
Received Order : 01 April 2024
Calibration Date : 01 April 2024
Ambient Temperature : $(26 \pm 10) ^\circ\text{C}$
Relative Humidity : $(50 \pm 30) \%$
Calibrated by :
Approved by :
() Ponpan Palpim
(✓) Suwit Imjai
() Kunchit Promprat

Issue Date : 7 April 2024

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

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Equipment : Incubator
Condition As-Received : Used Item
Reference : 2404-0003OC-6
Procedure Used :-

Cert. No.: 24TM647
Page : 2 of 3

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

| Instrument | Serial No. | Cert. No. | Traceable | Due Date |
|----------------------|------------|-----------|-----------|-------------|
| 1) Data Acquisition | MY49023932 | 23LM122 | TPA | 26 Jul 2024 |

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

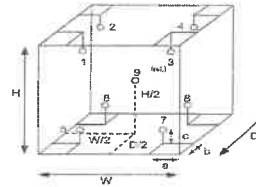
3. This certification is traceable to the International System of Unit.

Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



| Environment during calibration | | |
|--------------------------------|-----------|----------|
| | Beginning | Finished |
| Temp. (°C) | 24 | 24 |
| REL.Humid. (%) | 54 | 57 |
| AC Supply (Volt) | 221 | 223 |

| Position : | Ref. Std. ID No.: |
|------------|----------------------|
| 1 | 20-16RTD-01 |
| 2 | 20-16RTD-02 |
| 3 | 20-16RTD-03 |
| 4 | 23-16RTD-04 |
| 5 | 22-16RTD-05 |
| 6 | 20-16RTD-06 |
| 7 | 20-16RTD-07 |
| 8 | 22-16RTD-08 |
| 9 (ref.) | 22-16RTD-09 |

Probe Installation Details :

a = 10 cm
b = 10 cm
c = 10 cm

Dimension of Chamber :

D = 0.48 m
W = 0.65 m
H = 1.2 m
Capacity = 0.37 m³

เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2404-0003OC-6
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM647
Page : 3 of 3

| Calibration Point (°C) | UUC* Setting (°C) | UUC* Reading (°C) | Temperature stability (± °C) | Temperature uniformity (°C) | Overall Variation (°C) | Coverage Factor k |
|--------------------------|---------------------|---------------------|--------------------------------|-------------------------------|--------------------------|-------------------|
| 35.0 | 35.0 | 35.0 | 0.035 | 0.19 | 0.22 | 2 |

| Calibration Point (°C) | Measured Temperature (°C) | | | | | | | | | Uncertainty (± °C) |
|--------------------------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|----------|----------------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 (ref.) | |
| 35.0 | 35.000 | 35.022 | 34.841 | 34.851 | 35.027 | 35.011 | 35.023 | 35.028 | 35.007 | 0.30 |

Average* : The average of 30 values in each position.

Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.

Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.

UUC* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity .

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

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เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2404-0003OC-2
Procedure Used :-

Cert. No.: 24TM650
Page : 2 of 3

Certificate of Calibration

Cert. No.: 24TM650
Page : 1 of 3

Equipment : incubator
Manufacturer : Memmert
Model : IPP 250
Serial No. : V616.0066
ID No. : UAE.MIC.032/2559
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Sni Udomsuk 41, Sukhumvit Road,
Bangkok, Phrakhanong,
Bangkok 10260
Location : Microbiology Laboratory (302)
Received Order : 01 April 2024
Calibration Date : 02 - 03 April 2024
Ambient Temperature : $(26 \pm 10) ^\circ\text{C}$
Relative Humidity : $(50 \pm 30) \%$

Calibrated by :

Approved by :

() Ponpan Palpin
(✓) Suwit Injai
() Kunchit Promprat

Issue Date : 7 April 2024

The Uncertainties are for a confidence probability of approximately 95%

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Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument-

| Instrument | Serial No. | Cert. No. | Traceable | Due Date |
|---------------------|------------|-----------|-----------|-------------|
| 1) Data Acquisition | MY45023932 | 23LA1122 | TPA | 26 Jul 2024 |

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

3. This certification is traceable to the International System of Unit.

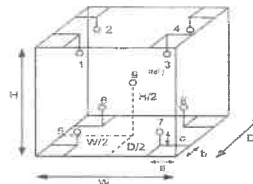
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

| Environment during calibration | | |
|--------------------------------|-----------|----------|
| | Beginning | Finished |
| Temp. (°C) | 25 | 25 |
| REL.Humid. (%) | 57 | 54 |
| AC Supply (Volt) | 221 | 222 |



Probe Installation Details :

a = 5.0 cm
b = 5.0 cm
c = 5.0 cm

Dimension of Chamber :

D = 0.50 m
W = 0.64 m
H = 0.80 m
Capacity = 0.26 m³

| Position : | Ref. Std. ID No.: |
|------------|-------------------|
| 1 | 19-16RTD-01 |
| 2 | 19-16RTD-02 |
| 3 | 19-16RTD-03 |
| 4 | 19-16RTD-04 |
| 5 | 19-16RTD-05 |
| 6 | 19-16RTD-06 |
| 7 | 21-16RTD-07 |
| 8 | 19-16RTD-08 |
| 9 (ref.) | 19-16RTD-09 |

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2404-0003OC-2
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM650
Page : 3 of 3

| Calibration Point (°C) | UUC* Setting (°C) | UUC* Reading (°C) | Temperature stability (± °C) | Temperature uniformity (°C) | Overall Variation (°C) | Coverage Factor k |
|--------------------------|---------------------|---------------------|--------------------------------|-------------------------------|--------------------------|-------------------|
| 25.0 | 25.0 | 25.0 | 0.053 | 0.76 | 1.3 | 2 |
| 36.0 | 36.0 | 36.0 | 0.14 | 0.57 | 0.93 | 2 |

| Calibration Point (°C) | Measured Temperature (°C) | | | | | | | | | Uncertainty (± °C) |
|-----------------------------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|----------|-------------------------|
| | Position | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 (ref.) | |
| 25.0 | 25.698 | 25.310 | 25.439 | 25.412 | 24.347 | 24.332 | 24.313 | 24.414 | 24.875 | 0.30 |
| 36.0 | 35.843 | 35.865 | 35.618 | 35.701 | 36.239 | 36.260 | 36.343 | 36.357 | 36.093 | 0.31 |

Average* : The average of 30 values in each position.

Temperature stability : One-half of the greatest maximum difference of measured temperatures at any one sensor.

Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.

UUC* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity .

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

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เอกสารไม่ควบคุม



Certificate of Calibration

Cert. No.: 24TM884
Page : 1 of 3

Equipment : Incubator
Manufacturer : Binder
Model : KB 400
Serial No. : 20220000000391
ID No. : UAE.MIC.029/2565
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Microbiology Laboratory
Received Order : 07 June 2024
Calibration Date : 07 June 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by :
Approved by :
() Ponpan Palpin
() Suwit Imjai
(✓) Kunchit Promprat
Issue Date : 11 June 2024

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the Head of Corporate Services 3: Equipment Calibration and Testing Services

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Equipment : Incubator
Condition As-Received : Used Item
Reference : 2406-01900C-2
Procedure Used :-

Cert. No.: 24TM884
Page : 2 of 3

Calibration were conducted using calibration procedure CP-OT02 based on TLA5 G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

| Instrument | Serial No. | Cert. No. | Traceable | Due Date |
|----------------------|------------|-----------|-----------|-------------|
| 1) Data Acquisition | MY49001451 | 24LM44 | TPA | 17 Mar 2025 |

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

3. This certification is traceable to the International System of Unit.

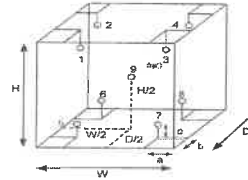
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

| Environment during calibration | | |
|--------------------------------|-----------|----------|
| | Beginning | Finished |
| Temp. (°C) | 21 | 19 |
| REL.Humid. (%) | 77 | 75 |
| AC Supply (Volt) | 228 | 229 |



Probe Installation Details :

| | | |
|-----|----|----|
| a = | 10 | cm |
| b = | 10 | cm |
| c = | 10 | cm |

Dimension of Chamber :

| | | |
|------------|------|----------------|
| D = | 0.50 | m |
| W = | 0.65 | m |
| H = | 1.2 | m |
| Capacity = | 0.39 | m ³ |

| Position : | Ref. Std. ID No.: |
|------------|-------------------|
| 1 | 19RTD-2/1 |
| 2 | 19RTD-2/2 |
| 3 | 19RTD-2/3 |
| 4 | 19RTD-2/4 |
| 5 | 19RTD-2/5 |
| 6 | 24-19RTD-2/6 |
| 7 | 19RTD-2/7 |
| 8 | 19RTD-2/8 |
| 9 (ref.) | 19RTD-2/9 |

เอกสารไม่ควบคุม

UAE.FM.6.4.016-10/09-SEP-2020

กำหนดจุดห้ามใช้งาน

References Certificate Number. : 24TM884

Equipment : Incubator

Model : KB 400

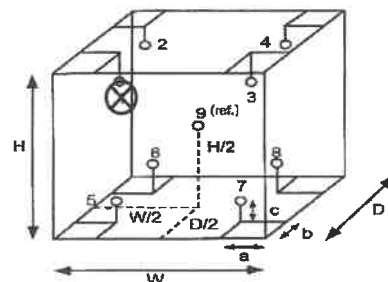
Serial No. : 20220000000391

ID No. : UAE.MIC.029/2565

Manufacturer : Binder

Calibration Point : 35.0 °C

Unit Under Calibration Setting : 35.0 °C



รูปภาพเครื่องมือ แสดงจุดที่ได้รับการสอบเทียบ และสัญลักษณ์ ⊗ แสดงจุดห้ามใช้งาน

กำหนดจุดห้ามใช้งานตำแหน่งที่....1.....



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2406-01900C-2
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM884
Page : 3 of 3

| Calibration Point (°C) | UUC* Setting (°C) | UUC* Reading (°C) | Temperature stability (± °C) | Temperature uniformity (°C) | Overall Variation (°C) | Coverage Factor k |
|--------------------------|---------------------|---------------------|--------------------------------|-------------------------------|--------------------------|-------------------|
| 35.0 | 35.0 | 35.0 | 0.028 | 0.28 | 0.53 | 2 |

| Calibration Point (°C) | Measured Temperature (°C) | | | | | | | | | Uncertainty (± °C) |
|--------------------------------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|----------|-------------------------|
| | Position | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 (ref.) | |
| 35.0 | 35.317 | 35.184 | 35.142 | 35.064 | 35.088 | 35.093 | 34.894 | 34.826 | 35.056 | 0.30 |

Average* : The average of 30 values in each position.

Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.

Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.

UUC* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity .

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

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เอกสารไม่ควบคุม

หมายเลข เก็บใบพิมพ์.....


\\uae.net\app\lapp_LAB\Lab-8\INSTRUMENT\01-7\6.4\Certificate\ใบยืนยันการสอบเทียบเครื่องมือ 2567\กำหนดจุดห้ามใช้งาน

เอกสารไม่ควบคุม



Certificate of Calibration

Cert. No.: 24TM938
Page : 1 of 3

Equipment : Incubator
Manufacturer : Binder
Model : KB 400 E6
Serial No. : 20220005022479
ID No. : UAE.MIC.025/2566
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Microbiology Laboratory
Received Order : 09 July 2024
Calibration Date : 09 July 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : 
Approved by : 
() Ponpan Palpim
(✓) Suwit Imjai
() Kunchit Promprat

Issue Date : 19 July 2024

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2407-0153OC-4
Procedure Used :-

Cert. No.: 24TM938
Page : 2 of 3

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

| Instrument | Serial No. | Cert. No. | Traceable | Due Date |
|----------------------|------------|-----------|-----------|-------------|
| 1) Data Acquisition | MT49001451 | 24LM44 | TPA | 17 Mar 2025 |

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

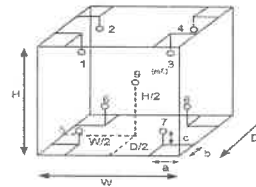
3. This certification is traceable to the International System of Unit.

Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available



| Environment during calibration | | |
|--------------------------------|-----------|----------|
| | Beginning | Finished |
| Temp. (°C) | 23 | 24 |
| REL.Humid. (%) | 52 | 54 |
| AC Supply (Volt) | 221 | 222 |

| Position : | Ref. Std. ID No.: |
|------------|-------------------|
| 1 | 19RTD-2/1 |
| 2 | 19RTD-2/2 |
| 3 | 19RTD-2/3 |
| 4 | 19RTD-2/4 |
| 5 | 19RTD-2/5 |
| 6 | 24-19RTD-2/6 |
| 7 | 19RTD-2/7 |
| 8 | 19RTD-2/8 |
| 9 (ref.) | 19RTD-2/9 |

Probe Installation Details :

a = 10 cm
b = 10 cm
c = 10 cm

Dimension of Chamber :

D = 0.47 m
W = 0.65 m
H = 1.2 m
Capacity = 0.37 m³

เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2407-0153OC-4
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Cert. No.: 24TM938
Page : 3 of 3

| Calibration Point (°C) | UUC* Setting (°C) | UUC* Reading (°C) | Temperature stability (± °C) | Temperature uniformity (°C) | Overall Variation (°C) | Coverage Factor k |
|--------------------------|---------------------|---------------------|--------------------------------|-------------------------------|--------------------------|-------------------|
| 35.0 | 35.0 | 35.0 | 0.030 | 0.31 | 0.33 | 2 |

| Calibration Point (°C) | Measured Temperature (°C) | | | | | | | | | Uncertainty (± °C) |
|--------------------------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|----------|----------------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 (ref.) | |
| 35.0 | 35.093 | 35.011 | 35.081 | 35.118 | 34.840 | 35.054 | 34.924 | 34.976 | 34.824 | 0.30 |

Average* : The average of 30 values in each position.

Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.

Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation

UUC* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity .

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

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เอกสารไม่ควบคุม



Certificate of Calibration

Certificate No.: C31231678

Page: 2 of 3

Equipment: Cooled incubator
Model: KB 400
Serial No.(or ID): 20220000022479
Manufacturer: Binder
Condition: New
Shelves(pc.): 5

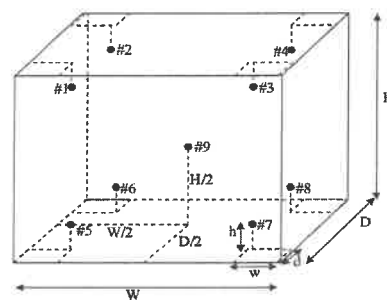
Certificate No.: C31231678
Issued Date: 10 August 2023
Job No.: WO-00002652
Page: 1 of 3
Ventilation Valve: None

Customer: United Analyst and Engineering Consultant Company Limited.
3 Soi Udomsuk 41 Sukhumvit Road,
Bangkok, Prakanong, Bangkok 10260 Thailand.

Environment Condition: Temperature: 25 °C ± 1.9 °C
Humidity: 49 %RH ± 5.3 %RH
Voltage: 232 VAC ± 1.2 VAC

Calibration Place: United Analyst and Engineering Consultant Company Limited. (Control Area)
3 Soi Udumsuk 41 Sukhumvit Road,
Bangkok, Prakanong, Bangkok 10260 Thailand.

Calibration By: Mr. Thanekrit Raksapol
Calibration Date: 07 August 2023
The Method used: In house method, CAL-WI-16, base on TLAS-G20
Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited.
Certificate No. C10230019



Standard Installation Locations

Volume (Calibration Zone)= 193 (Liters)

Inside chamber: W = 65 (cm) D = 49 (cm) H = 127 (cm)
Standard Locations (#1, #2, #3, #4): w = 7 (cm) d = 5 (cm) h = 15 (cm)
Standard Locations (#5, #6, #7, #8): w = 7 (cm) d = 5 (cm) h = 15 (cm)

#9: Geometric center of the chamber

| Position of Std | #1 | #2 | #3 | #4 | #5 | #6 | #7 | #8 | #9 |
|-------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Channel of Logger | 301 | 302 | 303 | 304 | 305 | 306 | 307 | 308 | 309 |

Definitions

Indicating Temperature: The average reading of indicating device which forms the integral part of the enclosure.

Measured Temperature: The average reading of standards at any positions or location.

Measured Uniformity: The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference probe is preferably located in the geometric center of the chamber.

Measured Stability: The one-half of greatest maximum difference of measured temperatures at any one probe.

Overall Variation: The difference of maximum and minimum measured temperatures throughout observation time.



Person in charge



Authorized signatory

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.

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CAL-FM-C31-10: 12 Sep 2022

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Calibration Results:
Without adjustment

Certificate No.: C31231678

Page: 3 of 3

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 35.0 °C

| Locations | Measured Temperature (°C) | Correction of UUC. (°C) | Uncertainty (± °C) |
|-----------|------------------------------|----------------------------|-----------------------|
| #1 | 35.11 | 0.11 | 0.23 |
| #2 | 35.04 | 0.04 | 0.23 |
| #3 | 35.03 | 0.03 | 0.23 |
| #4 | 35.13 | 0.13 | 0.23 |
| #5 | 35.02 | 0.02 | 0.23 |
| #6 | 35.07 | 0.07 | 0.23 |
| #7 | 34.97 | -0.03 | 0.23 |
| #8 | 34.97 | -0.03 | 0.23 |
| #9 | 35.10 | 0.10 | 0.23 |

Temperature Distribution

| Desired (°C) | Setting (°C) | Indicating (°C) | Measured Temperature at Spread Locations (°C) | | | | | | | | | Uncertainty (± °C)* |
|-----------------|-----------------|--------------------|---|-------|-------|-------|-------|-------|-------|-------|-------|------------------------|
| 35.0 | 35.0 | 35.0 | #1 | #2 | #3 | #4 | #5 | #6 | #7 | #8 | #9 | 0.23 |
| | | | 35.11 | 35.04 | 35.03 | 35.13 | 35.02 | 35.07 | 34.97 | 34.97 | 35.10 | |

Chamber Characterization

| Indicating (°C) | Measured Uniformity (°C) | Measured Stability (± °C) | Overall Variation (°C) |
|--------------------|-----------------------------|------------------------------|---------------------------|
| 35.0 | 0.16 | 0.04 | 0.22 |

Note: * Maximum uncertainty of the each position

The End of Certificate

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CAL-FM-C31-10: 12 Sep 2022

Refer to Certificate No.: C31231678

Page: 1 of 1

Statements of conformity:

This conformity certificate documents the validity of the following statements of conformity based on the measurement results of corresponding calibration certificate:

The connection of indication determined during calibration are under given measurement and environmental conditions and considering the expanded measurement uncertainty (coverage probability 95%) within the specification. The given measurement uncertainty already includes other all effects by according to the standard method, TLAS-G20. Therefore, those parameters have not been assessed separately.

Tolerance and Decision rules:

Assessment of the conformity of the measurement device are done based on direct comparison of the relevant measurement results with the tolerances and decision rule are prescribed by the customer.

Decision rule: ☐ Choice A Binary Statement for Simple Acceptance Rule ($w = 0$), Specific Risk < 50% PFA.

☒ Choice B Non-binary statement with guard band ($w = 1 U$), Pass or Fail Specific Risk < 2.5% PFA and Condition Pass or Condition Fail Specific Risk < 50% PFA.

☐ Choice C Customer defined, Customers may define arbitrary multiple of r to have applied as guard band ($w = r U$).
; PFA – Probability of False Accept

Without adjustment

Desired Temperature : 35.0°C Tolerances : 0.5 °C

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 35.0 °C

| Locations | Measured (°C) | Correction* (°C) | Guard band (W) (± °C) | Tolerance (± °C) | Conformity |
|-----------|------------------|---------------------|-----------------------------|---------------------|------------|
| #1 | 35.11 | 0.11 | 0.23 | 0.5 | Pass |
| #2 | 35.04 | 0.04 | 0.23 | 0.5 | Pass |
| #3 | 35.03 | 0.03 | 0.23 | 0.5 | Pass |
| #4 | 35.13 | 0.13 | 0.23 | 0.5 | Pass |
| #5 | 35.02 | 0.02 | 0.23 | 0.5 | Pass |
| #6 | 35.07 | 0.07 | 0.23 | 0.5 | Pass |
| #7 | 34.97 | -0.03 | 0.23 | 0.5 | Pass |
| #8 | 34.97 | -0.03 | 0.23 | 0.5 | Pass |
| #9 | 35.10 | 0.10 | 0.23 | 0.5 | Pass |

Correction* = Measured Temperature - Desired Temperature

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

The End of Statements of Conformity

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