



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



CERTIFICATE No : 20E2399
REFERENCE No : 56201-2

PAGE : 1 OF 3

Certificate of Calibration

EQUIPMENT : pH METER
MANUFACTURER : EUTECH
MODEL : PH700
SERIAL No : 2841305
ID No : LAB-PH-002
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : PACIFIC LABORATORY CO., LTD.
14/5358 MOO. 14 TAMBOL BANGBUA THONG
AMPHOE BANG NUA THONG, NONTABURI 11110

CALIBRATED BY : ATSAWIN Y.

CALIBRATION DATE : 04-Mar-20

APPROVED BY : 
PONGSAK J.

ISSUED DATE : 05-Mar-20

RECEIVED DATE : 04-Mar-20

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



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CERTIFICATE No : 20E2399

PAGE : 2 OF 3

Calibration Report

EQUIPMENT : pH METER
MANUFACTURER : EUTECH
ID No : LAB-PH-002
RECEIVED DATE : 04-Mar-20
AMBIENT TEMPERATURE : 26° C ± 1° C
MODEL : PH700
SERIAL NUMBER : 2841305
CALIBRATION DATE : 04-Mar-20
RELATIVE HUMIDITY : 50 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY DIRECT MEASUREMENT METHOD BASED ON WI-TQ-062 AND WI-TQ-063. THE DISPLAY UNIT WAS TESTED BY GENERATING STANDARD VOLTAGE TO THE UNIT AND READ THE VALUE COMPARED WITH CALCULATED VALUE. THE DISPLAY AND ELECTRODE WAS CALIBRATED BY USING STANDARD pH BUFFER
2. REFERENCE STANDARD INSTRUMENTS :-

| <u>INSTRUMENT</u> | <u>MODEL</u> | <u>SERIAL No</u> | <u>CERTIFICATE No</u> <u>/ LOT No</u> | <u>DUE DATE</u> |
|---------------------------|--------------|------------------|--|-----------------|
| 1) pH STANDARD SOLUTION | 00651-36 | CC616006 | 4956-10385667 | 11-Apr-21 |
| 2) pH STANDARD SOLUTION | 00651-38 | CC616007 | 4957-10385818 | 10-Apr-21 |
| 3) pH STANDARD SOLUTION | 00651-40 | CC616008 | 4958-10385819 | 10-Apr-21 |
| 4) PROCESS CALIBRATOR | 744 | 7514008 | 19E1365 | 06-Apr-20 |
| 5) BATH | 260014 | 1247 48074 | 19T9625 | 24-Sep-20 |
| 6) THERMOMETER WITH PROBE | 421504 | 55000379 | 19T9053 | 10-Sep-20 |

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO SI UNIT MAINTAINED AT :-
- NATIONAL INSTITUTE OF STANDARD AND TECHNOLOGY, USA.

RESULT OF CALIBRATION : ADJUSTMENT

1. DISPLAY UNIT ONLY

SLOPE FACTOR $k = 2.303 \text{ RT/F} = 59 \text{ mV/pH}$

| mV APPLIED | UUC READING (mV) | CORRECTION (mV) | UUC READING (pH) | UNCERTAINTY OF MEASUREMENT (± mV) | COVERAGE FACTOR k |
|---------------|---------------------|--------------------|---------------------|---|-------------------------|
| 414.11 | 414 | 0.11 | -0.14 | 0.14 | 2.0 |
| 354.95 | 355 | -0.05 | 0.85 | 0.14 | 2.0 |
| 295.80 | 296 | -0.20 | 1.86 | 0.14 | 2.0 |
| 236.64 | 237 | -0.36 | 2.87 | 0.14 | 2.0 |
| 177.48 | 177.5 | -0.02 | 3.87 | 0.14 | 2.0 |
| 118.32 | 118.4 | -0.08 | 4.88 | 0.14 | 2.0 |
| 59.16 | 59.2 | -0.04 | 5.88 | 0.14 | 2.0 |
| 0.00 | 0.1 | -0.10 | 6.89 | 0.14 | 2.0 |
| -59.16 | -59.1 | -0.06 | 7.97 | 0.14 | 2.0 |
| -118.32 | -118.3 | -0.02 | 9.05 | 0.14 | 2.0 |
| -177.48 | -177.5 | 0.02 | 10.14 | 0.14 | 2.0 |
| -236.64 | -237 | 0.36 | 11.22 | 0.14 | 2.0 |
| -295.80 | -296 | 0.20 | 12.31 | 0.14 | 2.0 |
| -354.95 | -355 | 0.05 | 13.39 | 0.14 | 2.0 |
| -414.11 | -414 | -0.11 | 14.48 | 0.14 | 2.0 |

END OF CALIBRATION REPORT PAGE 2 OF 3



Calibration Report

RESULT OF CALIBRATION (CONTINUE) :

2. DISPLAY UNIT WITH pH ELECTRODE S/N: 2925303

| STANDARD pH BUFFER SOLUTION (pH) | UUC READING (pH) | CORRECTION (pH) | VALUE BEFORE ADJUSTMENT | UNCERTAINTY OF MEASUREMENT (\pm pH) | COVERAGE FACTOR k |
|--|---------------------|--------------------|-------------------------------|--|-------------------------|
| 4.00 | 4.01 | -0.01 | 4.15 | 0.013 | 2.0 |
| 7.02 | 7.00 | 0.02 | 7.18 | 0.013 | 2.0 |
| 10.01 | 10.01 | 0.00 | 10.22 | 0.11 | 2.0 |

3. PERCENT SLOPE 92.1%

UUC : UNIT UNDER CALIBRATION

THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE.

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

END OF CALIBRATION REPORT



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CERTIFICATE No : 20E11877
REFERENCE No : 59417-2

PAGE : 1 OF 3

Certificate of Calibration

EQUIPMENT : pH METER
MANUFACTURER : EUTECH
MODEL : PH700
SERIAL No : 2841305
ID No : LAB-PH-002
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : PACIFIC LABORATORY CO., LTD.
14/5358 MOO. 14 TAMBOL BANGBUA THONG
AMPHOE BANG NUA THONG, NONTHABURI 11110

CALIBRATED BY : ATSAWIN Y.

CALIBRATION DATE : 30-Nov-20

APPROVED BY : 
PONGSAK J.

ISSUED DATE : 01-Dec-20

RECEIVED DATE : 30-Nov-20

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF
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CERTIFICATE No : 20E11877

PAGE : 2 OF 3

Calibration Report

EQUIPMENT : pH METER
MANUFACTURER : EUTECH
ID No : LAB-PH-002
RECEIVED DATE : 30-Nov-20
AMBIENT TEMPERATURE : 28° C ± 1° C
MODEL : PH700
SERIAL NUMBER : 2841305
CALIBRATION DATE : 30-Nov-20
RELATIVE HUMIDITY : 51 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY DIRECT MEASUREMENT METHOD BASED ON WI-TQ-062 AND WI-TQ-063. THE DISPLAY UNIT WAS TESTED BY GENERATING STANDARD VOLTAGE TO THE UNIT AND READ THE VALUE COMPARED WITH CALCULATED VALUE. THE DISPLAY AND ELECTROD WAS CALIBRATED BY USING STANDARD pH BUFFER
2. REFERENCE STANDARD INSTRUMENTS :-

| <u>INSTRUMENT</u> | <u>MODEL</u> | <u>SERIAL No</u> | <u>CERTIFICATE No</u> <u>/ LOT No</u> | <u>DUE DATE</u> |
|---------------------------|--------------|------------------|--|-----------------|
| 1) pH STANDARD SOLUTION | 00651-36 | CC616006 | 4956-10385667 | 11-Apr-21 |
| 2) pH STANDARD SOLUTION | 00651-38 | CC616007 | 4957-10385818 | 10-Apr-21 |
| 3) pH STANDARD SOLUTION | 00651-40 | CC616008 | 4958-10385819 | 10-Apr-21 |
| 4) PROCESS CALIBRATOR | 744 | 7514008 | 20E1318 | 10-Apr-21 |
| 5) BATH | 260014 | 1247 48074 | 20T9392 | 10-Sep-21 |
| 6) THERMOMETER WITH PROBE | 421504 | 55000379 | 20T9616 | 10-Sep-21 |

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO SI UNIT MAINTAINED AT :-
- NATIONAL INSTITUTE OF STANDARD AND TECHNOLOGY, USA.

RESULT OF CALIBRATION : ADJUSTMENT**1. DISPLAY UNIT ONLY**SLOPE FACTOR $k = 2.303 RT/F = 59 \text{ mV/pH}$

| mV APPLIED | UUC READING (mV) | CORRECTION (mV) | UUC READING (pH) | UNCERTAINTY OF MEASUREMENT (± mV) | COVERAGE FACTOR k |
|---------------|---------------------|--------------------|---------------------|---|-------------------------|
| 414.11 | 414 | 0.11 | -0.06 | 0.59 | 2.0 |
| 354.95 | 355 | -0.05 | 0.92 | 0.59 | 2.0 |
| 295.80 | 296 | -0.20 | 1.92 | 0.59 | 2.0 |
| 236.64 | 237 | -0.36 | 2.92 | 0.59 | 2.0 |
| 177.48 | 177.5 | -0.02 | 3.92 | 0.14 | 2.0 |
| 118.32 | 118.4 | -0.08 | 4.91 | 0.14 | 2.0 |
| 59.16 | 59.2 | -0.04 | 5.91 | 0.14 | 2.0 |
| 0.00 | 0.0 | 0.00 | 6.91 | 0.14 | 2.0 |
| -59.16 | -59.1 | -0.06 | 7.93 | 0.14 | 2.0 |
| -118.32 | -118.2 | -0.12 | 8.95 | 0.14 | 2.0 |
| -177.48 | -177.4 | -0.08 | 9.98 | 0.14 | 2.0 |
| -236.64 | -237 | 0.36 | 11.00 | 0.59 | 2.0 |
| -295.80 | -296 | 0.20 | 12.03 | 0.59 | 2.0 |
| -354.95 | -355 | 0.05 | 13.05 | 0.59 | 2.0 |
| -414.11 | -414 | -0.11 | 14.08 | 0.59 | 2.0 |

END OF CALIBRATION REPORT PAGE 2 OF 3

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CERTIFICATE No : 20E11877

PAGE : 3 OF 3

Calibration Report**RESULT OF CALIBRATION (CONTINUE) :****2. DISPLAY UNIT WITH pH ELECTRODE S/N: ---**

| STANDARD pH BUFFER SOLUTION (pH) | UUC READING (pH) | CORRECTION (pH) | VALUE BEFORE ADJUSTMENT | UNCERTAINTY OF MEASUREMENT (\pm pH) | COVERAGE FACTOR k |
|--|---------------------|--------------------|-------------------------------|--|-------------------------|
| 4.01 | 4.01 | 0.00 | 4.10 | 0.013 | 2.0 |
| 7.00 | 7.00 | 0.00 | 7.07 | 0.013 | 2.0 |
| 10.01 | 10.01 | 0.00 | 9.97 | 0.014 | 2.0 |

3. TEMPERATURE

| STANDARD READING ($^{\circ}$ C) | UUC* READING ($^{\circ}$ C) | CORRECTION ($^{\circ}$ C) | UNCERTAINTY OF MEASUREMENT (\pm C) |
|--|------------------------------------|-------------------------------|---|
| 24.892 | 25.0 | -0.108 | 0.17 |

UUC : UNIT UNDER CALIBRATION

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, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



CRYSTAL CALIBRATION SALES AND SERVICE CO., LTD.

45/48 Soi Salathammassop31, Salathammassop Rd.,
Salathammassop, Thawewatthana, Bangkok 10170 Thailand
Tel : 0-2408-8474-5 Fax : 0-2408-8477 Email : info@crystalcal.com www.crystalcal.com



CERTIFICATE OF CALIBRATION

Issue Date : 14 August 2020
Certificate No. : 20-772-005
Work Order No. : 20/772

Customer Name : Pacific Laboratory Co., Ltd.
14/5358 Moo 14, T. Bangbuathong,
A. Bangbuathong, Nonthaburi 11110

Date of Received : 13 August 2020

Date of Calibration : 13 August 2020

Instrument Details : **Description** : Temperature Controlled Enclosures [Incubator]
Manufacturer : AQUALYTIC
Model : TC 135S
Serial No. : 0614/000033
ID No. : LAB-IB-001
Resolution : 0.1 °C
Location : Laboratory

Calibration Method : This instrument was calibrated by insert standard thermometer into the chamber according to calibration procedure no. CWI-T-10 follow up to TLAS G-20-1/02-08 (E) : Guidelines for Calibration and Checks of Temperature Controlled Enclosures.

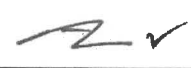
Environmental Conditions :

| | | | | |
|---------------------|-----------|-----------|----------------|-----------|
| Temperature | : Minimum | 23.8 °C | Maximum | 25.3 °C |
| Humidity | : Minimum | 44 % | Maximum | 47 % |
| Line Voltage | : Minimum | 219.3 VAC | Maximum | 222.2 VAC |

Traceability of Measurement :

This certificate of calibration documents the traceability to national standard, which realize the unit of measurement according to the International system of Units (SI) and The temperature scale in use at this laboratory is The International Temperature scale of 1990.

Calibrated by : Mr. Kritsada Kaewwangpa
Calibration Engineer

Approved by : 
(Mr. Anuwat Yaklermjit)
Laboratory Manager

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CERTIFICATE OF CALIBRATION

Issue Date : 14 August 2020

Certificate No. : 20-772-005

Work Order No. : 20/772

Details of Calibration

1. Reference Standards Instrument

| Instrument | Model | Serial No./Ins No. | Certificate No. | Due Date |
|-----------------------|--------|--------------------|-----------------|------------------|
| Data Acquisition unit | 34972A | MY49024826 | 19-799-001 | 23 November 2020 |
| Sensor type | RTD | RTD# 201-209 | 19-799-001 | 23 November 2020 |

2. Certificate traceable : This certificate traceable to The International System of Unit refer to
Crystal Calibration Sales and Service Co., Ltd. , NAC Calibration No. 0260

3. Condition of item : Used

4. Calibration site : On - Site

5. Result of Calibration : Without adjustment

6. Evaluate Condition : Time Constant : Hour 33 Minute At cal. point 20 °C
Air vent : Off
Fan speed status : Fixed Fan Speed

7. Calibration note : The results reported in this certificate refer to the condition of instrument on the process
into the steady state of chamber

8. Sensors Installation Diagram : When ; Sensor installation location in Chamber @ Working Space
A = Distance between sensor and wall of chamber is 5 cm

9. Dimensions of chamber : W = 0.60 m ; D = 0.50 m ; H = 0.60 m

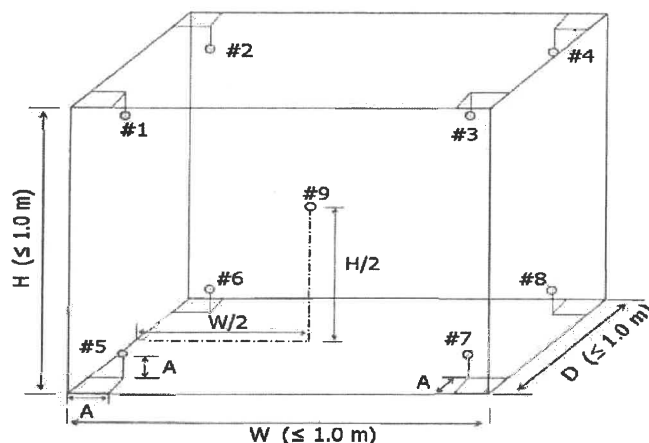


Diagram of Chamber

✓

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**CERTIFICATE OF CALIBRATION**

Issue Date : 14 August 2020

Certificate No. : 20-772-005

Work Order No. : 20/772

Result of Temperature Distribution and Performance Check

Table1 : Reporting of Temperature Distribution

| Calibration point (°C) | Average Measured Temperature (°C) @ Sensor No. (Sensor No.9 is REF) | | | | | | | | | Uncertainty ± (°C) |
|------------------------|--|-------|-------|-------|-------|-------|-------|-------|-------|-----------------------|
| | #1 | #2 | #3 | #4 | #5 | #6 | #7 | #8 | #9 | |
| 20.0 | 20.00 | 19.89 | 20.00 | 19.92 | 19.96 | 19.92 | 19.97 | 19.97 | 19.96 | 0.53 |

Table 2 : Reporting of Performance check

| Indicator Set Point (°C) | Indicator Reading (°C) | | | Stability ± (°C) | Uniformity (°C) | Overall variation (°C) |
|-----------------------------|------------------------|------|---------|---------------------|--------------------|---------------------------|
| | MAX | MIN | Average | | | |
| 20.0 | 20.7 | 20.4 | 20.6 | 0.40 | 0.26 | 0.83 |

Note

The reference sensor is preferably located of the geometric center of chamber

The measured temperature data readout by software "Benchlink Datalogger 3"

The quoted uncertainty include " Stability " and " Loading effect (20% of Temp Uniformity) "

Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.

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 time.

Indicating Temperature - the average reading of indicating device that forms the integral part of the enclosure.

AV

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

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

--END--

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CERTIFICATE OF CALIBRATION

Certificate No. : 20-772-004

Work Order No. : 20/772

Issue Date : 14 August 2020

Customer Name : Pacific Laboratory Co., Ltd.
14/5358 Moo 14, T. Bangbuathong,
A. Bangbuathong, Nonthaburi 11110

Date of Received : 13 August 2020

Date of Calibration : 13 August 2020

Instrument Details : Description : Water Bath
Manufacturer : memmert
Model : WNB 22
Serial No. : L514.0184
ID No. : LAB-WB-001
Resolution : 0.1 °C
Location : Laboratory

Calibration Method : This instrument was calibrated by insert standard thermometer into the liquid bath according to calibration procedure CWI-T-11 in-house methods based on ASTM E715-80 (Reapproved 2006) : Gravity-Convection And Forced-Circulation Water Bath.


Environmental Conditions :

| | | | | |
|--------------|-----------|-----------|---------|-----------|
| Temperature | : Minimum | 31.8 °C | Maximum | 32.1 °C |
| Humidity | : Minimum | 52 % | Maximum | 55 % |
| Line Voltage | : Minimum | 219.5 VAC | Maximum | 222.2 VAC |

Traceability of Measurement :

This certificate of calibration documents the traceability to national standard, which realize the unit of measurement according to the International system of Units (SI) and The temperature scale in use at this laboratory is The International Temperature scale of 1990.

Calibrated by : Mr. Kritsada Kaewwangpa
Calibration Engineer

Approved by : 
(Mr. Anuwat Yaklermjit)
Laboratory Manager

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CERTIFICATE OF CALIBRATION

Issue Date : 14 August 2020

Certificate No. : 20-772-004

Work Order No. : 20/772

Details of calibration

1. Reference Standards Instrument

| Instrument | Model | Serial No. / ID No. | Certificate No. | Due Date |
|-----------------------|--------|---------------------|-----------------|------------------|
| Data Acquisition unit | 34972A | MY49024826 | 19-799-001 | 23 November 2020 |
| Sensor type | RTD | Channel 301 to 305 | 19-799-001 | 23 November 2020 |

2. Certificate traceable : This certificate traceable to The International System of Unit refer to
Crystal Calibration Sales and Service Co., Ltd. , NAC Calibration No. 0260

3. Condition of Item : Used

4. Calibration site : On-site

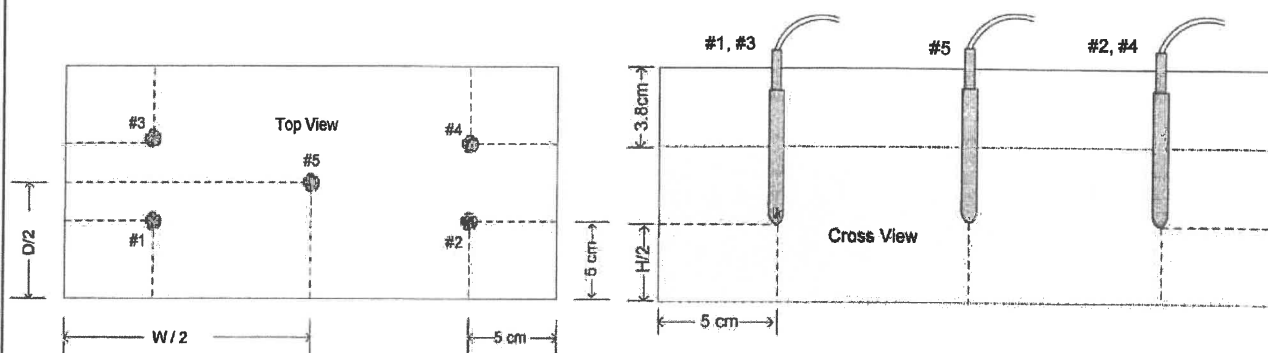
5. Result of Calibration : Without Adjustment

6. Evaluate Condition : Time Constant : - Hour 33 Minute At Cal. point 65 °C
Type of Control : PID Control

Testing liquid bath use media is water

7. Calibration note : The results reported in this certificate refer to the condition of instrument on the process into
the standby state of Liquid Bath

8. Sensors Installation Diagram :



Position Diagrams

AV



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CERTIFICATE OF CALIBRATION

Issue Date : 14 August 2020

Certificate No. : 20-772-004

Work Order No. : 20/772

Result of Temperature Distribution and Performance Check

Table 1 : Reporting of Temperature

| Calibration point (°C) | Average Measured Temperature (°C) @ Sensor No. (Sensor No.5 is REF) | | | | | Uncertainty ± (°C) |
|------------------------|--|-------|-------|-------|-------|-----------------------|
| | #1 | #2 | #3 | #4 | #5 | |
| 65.0 | 64.48 | 64.47 | 64.46 | 64.44 | 64.42 | 0.18 |
| 95.0 | 94.39 | 94.31 | 94.33 | 94.27 | 94.32 | 0.19 |

Table 2 : Reporting of Characterization Result

| Indicator Set point (°C) | Indicator Reading (°C) | | | Stability ± (°C) | Uniformity (°C) | Overall variation (°C) |
|-----------------------------|------------------------|------|---------|---------------------|--------------------|---------------------------|
| | MAX | MIN | Average | | | |
| 65.0 | 65.0 | 64.9 | 65.0 | 0.04 | 0.09 | 0.10 |
| 95.0 | 95.0 | 94.9 | 95.0 | 0.06 | 0.12 | 0.22 |

Note :

The reference sensor is preferably located of the center of bath

The measured temperature data readout by software "Benchlink Datalogger 3"

The quoted uncertainty include " Stability " and exclude " Loading effect (20% of Temp Uniformity) "

Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.

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 bath under steady state conditions.

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

Indicating Temperature - the average reading of indicating device that forms the integral part of the enclosure.

AV

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

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

--END--

PAGE 3/3



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Tel : 0-2408-8474-5 Fax : 0-2408-8477 Email : info@crystalcal.com www.crystalcal.com



CERTIFICATE OF CALIBRATION

Issue Date : 14 August 2020 **Certificate No. :** 20-772-002
Work Order No. : 20/772

Customer Name : Pacific Laboratory Co., Ltd.
14/5358 Moo 14, T. Bangbuathong,
A. Bangbuathong, Nonthaburi 11110

Date of Received : 13 August 2020

Date of Calibration : 13 August 2020

Instrument Details : **Description** : Temperature Controlled Enclosures [Hot Air Oven]
Manufacturer : memmert
Model : UN 55
Serial No. : B214.1879
ID No. : LAB-OV-001
Resolution : 0.1 °C
Location : Laboratory


Calibration Method : This instrument was calibrated by insert standard thermometer into the chamber according to calibration procedure no. CWI-T-10 follow up to TLAS G-20-1/02-08 (E) : Guidelines for Calibration and Checks of Temperature Controlled Enclosures.

Environmental Conditions :

| | | | | |
|---------------------|-----------|-----------|----------------|-----------|
| Temperature | : Minimum | 33.4 °C | Maximum | 34.5 °C |
| Humidity | : Minimum | 52 % | Maximum | 55 % |
| Line Voltage | : Minimum | 219.3 VAC | Maximum | 222.2 VAC |

Traceability of Measurement :

This certificate of calibration documents the traceability to national standard, which realize the unit of measurement according to the International system of Units (SI) and The temperature scale in use at this laboratory is The International Temperature scale of 1990.

Calibrated by : Mr. Kritsada Kaewwangpa **Approved by** : 
Calibration Engineer (Mr. Anuwat Yaklermjit)
Laboratory Manager

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Salathammassop, Thawewatthana, Bangkok 10170 Thailand

Tel : 0-2408-8474-5 Fax : 0-2408-8477 Email : info@crystalcal.com www.crystalcal.com



CERTIFICATE OF CALIBRATION

Issue Date : 14 August 2020

Certificate No. : 20-772-002

Work Order No. : 20/772

Details of Calibration

1. Reference Standards Instrument

| Instrument | Model | Serial No./Ins No. | Certificate No. | Due Date |
|-----------------------|--------|-----------------------|-----------------|------------------|
| Data Acquisition unit | 34972A | MY49018270 | 19-888-009 | 20 December 2020 |
| Sensor type | RTD | RTD# 101-106, 108-110 | 19-888-009 | 20 December 2020 |

2. Certificate traceable : This certificate traceable to The International System of Unit refer to
Crystal Calibration Sales and Service Co., Ltd. , NAC Calibration No. 0260

3. Condition of item : Used

4. Calibration site : On - Site

5. Result of Calibration : Without adjustment

6. Evaluate Condition : Time Constant : Hour 33 Minute At cal. point 104 °C
Air vent : Off
Fan speed status : None Fan Speed

7. Calibration note : The results reported in this certificate refer to the condition of instrument on the process
into the steady state of chamber

8. Sensors Installation Diagram : When ; Sensor installation location in Chamber @ Working Space
A = Distance between sensor and wall of chamber is 5 cm

9. Dimensions of chamber : W = 0.40 m ; D = 0.34 m ; H = 0.40 m

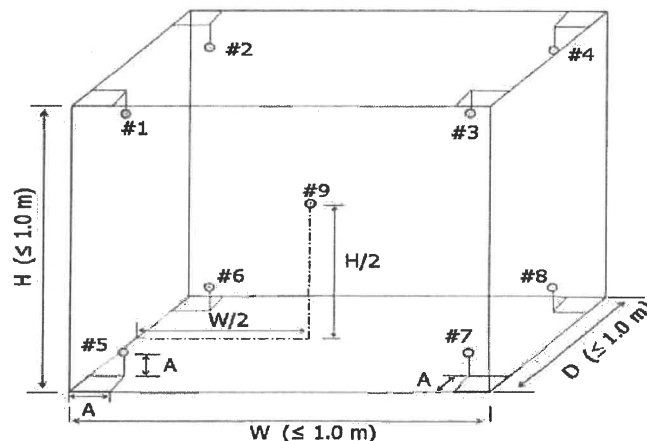


Diagram of Chamber

AV



CRYSTAL CALIBRATION SALES AND SERVICE CO., LTD.

45/48 Soi Salathammassop31, Salathammassop Rd.,
Salathammassop, Thawewatthana, Bangkok 10170 Thailand
Tel : 0-2408-8474-5 Fax : 0-2408-8477 Email : info@crystalcal.com www.crystalcal.com



CERTIFICATE OF CALIBRATION

Issue Date : 14 August 2020

Certificate No. : 20-772-002

Work Order No. : 20/772

Result of Temperature Distribution and Performance Check

Table1 : Reporting of Temperature Distribution

| Calibration point (°C) | Average Measured Temperature (°C) @ Sensor No. (Sensor No.9 is REF) | | | | | | | | | Uncertainty ± (°C) |
|------------------------|--|--------|--------|--------|--------|--------|--------|--------|--------|-----------------------|
| | #1 | #2 | #3 | #4 | #5 | #6 | #7 | #8 | #9 | |
| 104.0 | 104.71 | 104.53 | 104.88 | 104.94 | 104.51 | 104.62 | 104.44 | 104.57 | 105.06 | 0.83 |
| 180.0 | 178.45 | 178.19 | 179.21 | 179.02 | 178.45 | 178.68 | 178.84 | 178.87 | 179.68 | 1.3 |

Table 2 : Reporting of Performance check

| Indicator Set Point (°C) | Indicator Reading (°C) | | | Stability ± (°C) | Uniformity (°C) | Overall variation (°C) |
|-----------------------------|------------------------|-------|---------|---------------------|--------------------|---------------------------|
| | MAX | MIN | Average | | | |
| 105.0 | 105.6 | 104.3 | 105.0 | 0.38 | 0.85 | 1.23 |
| 182.0 | 182.5 | 181.3 | 181.9 | 0.92 | 1.98 | 3.21 |

Note

The reference sensor is preferably located of the geometric center of chamber

The measured temperature data readout by software "Benchlink Datalogger 3"

The quoted uncertainty include " Stability " and " Loading effect (20% of Temp Uniformity) "

Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.

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 time.

Indicating Temperature - the average reading of indicating device that forms the integral part of the enclosure.

RV

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

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

—END—

PAGE 3/3



CERTIFICATE No : 20M2398
REFERENCE No : 56201-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : AND
MODEL : HR-202I
SERIAL No : 15201125
ID No : LAB-BL-001
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : PACIFIC LABORATORY CO., LTD.
14/5358 MOO. 14 TAMBOL BANGBUA THONG AMPHOE
BANG NUA THONG, NONTHABURI 11110

CALIBRATED BY : ATSAWIN Y.

CALIBRATION DATE : 04-Mar-20

APPROVED BY : 
PONGSAK J.

ISSUED DATE : 05-Mar-20

RECEIVED DATE : 04-Mar-20



CERTIFICATE No : 20M2398

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : HR-2021
MANUFACTURER : AND S/N : 15201125
ID No : LAB-BL-001 RECEIVED DATE : 04-Mar-20
AIR PRESSURE : 1012mbar \pm 2mbar CALIBRATION DATE : 04-Mar-20
AMBIENT TEMPERATURE : 28°C \pm 1°C RELATIVE HUMIDITY : 52 %RH \pm 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

- THIS INSTRUMENT WAS CALIBRATED BY ACCORDING TO UKAS LAB 14 EDITION 4:2006 BY USING KNOWN WEIGHT STANDARD WEIGHT. THE BALANCE WAS ADJUSTED USING CUSTOMER'S WEIGHT TO ADJUST. THE BALANCE HAS NO ZERO TRACKING FUNCTION. REPEATABILITY WAS MEASURED BY USING 10 REPEATED MEASUREMENTS. LINEARITY WAS MEASURED COVERING 10 POINTS, EVENLY SPREAD OVER THE RANGE. THE INSTRUMENT WAS SET ZERO BEFORE PERFORMING THE LINEARITY TEST. OFF-CENTER LOADING WAS MEASURED BY USING STANDARD WEIGHTS PLACED ON THE PAN AND MOVED TO VARIOUS POSITIONS ON THE PAN.
- REFERENCE STANDARD INSTRUMENTS :-

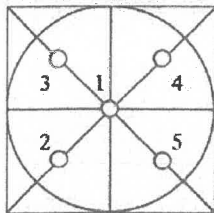
| INSTRUMENT | MODEL | SERIAL No | CERTIFICATE No | DUE DATE |
|------------------------|-------|-----------|----------------|-----------|
| 1) STANDARD WEIGHT SET | E2 | QK-I-151 | SM9/2562 | 23-Jan-21 |
| 2) STANDARD WEIGHT | E2 | 15843 | SM9/2562 | 23-Jan-21 |
- THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.
- THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
- THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH CENTRAL BUREAU OF WEIGHTS&MEASURES

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

- ZERO SETTING FUNCTION : NORMAL
- TARE FUNCTION : NORMAL
- REPEATABILITY OF READING AT 200 g WAS 0.000082 g
- DEPARTURE FROM NOMINAL VALUE/ LINEARITY

| NOMINAL VALUE (g) | BALANCE READING (g) | CORRECTION (g) | UNCERTAINTY (\pm g) |
|-------------------|---------------------|----------------|------------------------|
| 0.0 | 0.0000 | 0.0000 | 0.00011 |
| 0.1 | 0.1000 | 0.0000 | 0.00011 |
| 0.2 | 0.2001 | -0.0001 | 0.00011 |
| 0.5 | 0.5000 | 0.0000 | 0.00011 |
| 1.0 | 0.9999 | 0.0001 | 0.00011 |
| 2.0 | 2.0000 | 0.0000 | 0.00011 |
| 5.0 | 5.0000 | 0.0000 | 0.00012 |
| 10.0 | 10.0000 | 0.0000 | 0.00012 |
| 20.0 | 19.9999 | 0.0001 | 0.00012 |
| 50.0 | 49.9999 | 0.0001 | 0.00013 |
| 100.0 | 99.9997 | 0.0003 | 0.00019 |
| 200.0 | 199.9999 | 0.0001 | 0.00032 |

5. OFF CENTER LOADING ERROR



| POINT | READING (g) |
|--------------------|-------------|
| 1 | 50.0000 |
| 2 | 49.9999 |
| 3 | 49.9999 |
| 4 | 49.9998 |
| 5 | 49.9999 |
| OFF-CENTER LOADING | 0.0001 |

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

END OF CALIBRATION REPORT



CERTIFICATE No : 20M11876
REFERENCE No : 59417-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : AND
MODEL : HR-202I
SERIAL No : 150201125
ID No : LAB-BL-001
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : PACIFIC LABORATORY CO., LTD.
14/5358 MOO. 14 TAMBOL BANGBUA THONG AMPHOE
BANG NUA THONG, NONTHABURI 11110

CALIBRATED BY : ATSAWIN Y.

CALIBRATION DATE : 30-Nov-20

APPROVED BY : 
PONGSAK J.

ISSUED DATE : 01-Dec-20

RECEIVED DATE : 30-Nov-20



QUALITY CALIBRATION CO.,LTD.

235 Petchkasem 63/2 Road, Laksong, Bangkae, Bangkok 10160

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

www.qcalibration.com

CERTIFICATE No : 20M11876

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : AND
ID No : LAB-BL-001
AIR PRESSURE : 1013mbar \pm 1mbar
AMBIENT TEMPERATURE : 24° C \pm 1° C
MODEL : HR-202I
S/N : 150201125
RECEIVED DATE : 30-Nov-20
CALIBRATION DATE : 30-Nov-20
RELATIVE HUMIDITY : 64 %RH \pm 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY ACCORDING TO UKAS LAB 14 EDITION 6:2019 BY USING KNOWN WEIGHT STANDARD WEIGHT. THE BALANCE WAS ADJUSTED USING WEIGHT OF QUALITY CALIBRATION TO ADJUST. THE BALANCE HAS NO ZERO TRACKING FUNCTION. REPEATABILITY WAS MEASURED BY USING 10 REPEATED MEASUREMENTS. LINEARITY WAS MEASURED COVERING 10 POINTS, EVENLY SPREAD OVER THE RANGE. THE INSTRUMENT WAS SET ZERO BEFORE PERFORMING THE LINEARITY TEST. OFF-CENTER LOADING WAS MEASURED BY USING STANDARD WEIGHTS PLACED ON THE PAN AND MOVED TO VARIOUS POSITIONS ON THE PAN.

2. REFERENCE STANDARD INSTRUMENTS :-

| INSTRUMENT | MODEL | SERIAL No | CERTIFICATE No | DUE DATE |
|------------------------|-------|-----------|----------------|-----------|
| 1) STANDARD WEIGHT SET | E2 | QK-I-151 | SM9/2562 | 23-Jan-21 |
| 2) STANDARD WEIGHT | E2 | 15843 | SM9/2562 | 23-Jan-21 |

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.

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

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

- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH CENTRAL BUREAU OF WEIGHTS&MEASURES

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

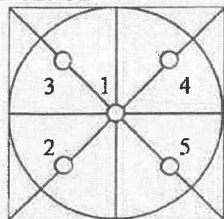
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0.000074 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

| NOMINAL VALUE (g) | BALANCE READING (g) | CORRECTION (g) | UNCERTAINTY (\pm g) |
|-------------------|---------------------|----------------|------------------------|
| 0.0 | 0.0000 | 0.0000 | 0.00010 |
| 0.1 | 0.1000 | 0.0000 | 0.00010 |
| 0.2 | 0.2000 | 0.0000 | 0.00010 |
| 0.5 | 0.5000 | 0.0000 | 0.00010 |
| 1.0 | 1.0000 | 0.0000 | 0.00010 |
| 2.0 | 2.0000 | 0.0000 | 0.00010 |
| 5.0 | 5.0000 | 0.0000 | 0.00010 |
| 10.0 | 10.0000 | 0.0000 | 0.00011 |
| 20.0 | 20.0000 | 0.0000 | 0.00011 |
| 50.0 | 50.0000 | 0.0000 | 0.00013 |
| 100.0 | 100.0000 | 0.0000 | 0.00019 |
| 200.0 | 200.0000 | 0.0000 | 0.00032 |

5. OFF CENTER LOADING ERROR



| POINT | READING (g) |
|--------------------|-------------|
| 1 | 50.0000 |
| 2 | 50.0000 |
| 3 | 50.0000 |
| 4 | 50.0000 |
| 5 | 50.0000 |
| OFF-CENTER LOADING | 0.0000 |

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

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

END OF CALIBRATION REPORT



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



Certificate of Calibration

Cert. No.: 20TM842

Page.: 1 of 3

Equipment : Incubator

Manufacturer : Memmert

Model : IPP 260

Serial No. : V615.0187

ID No. : UAE.LAB.003/2559

Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260

Location : Microbiology Laboratory

Received Order : 27 April 2020
Calibration Date : 27 April 2020
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %

Calibrated by : Preecha Hlahib

Approved by :

Malee

Approved Signatory

- () Pornthippa Tameyakul
(/) Malee Butkruea
() Suwit Imjai

Issue Date : 7 May 2020

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม
A 0019784



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2004-0379OC-4
Procedure Used :-

Cert. No.: 20TM842
Page.: 2 of 3

Calibration were conducted using calibration procedure CP-OT02 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:-

| <u>Instrument</u> | <u>Serial No.</u> | <u>Cert. No.</u> | <u>Traceable</u> | <u>Due Date</u> |
|----------------------|-------------------|------------------|------------------|-----------------|
| 1) Data Acquisition | MY44031769 | 19LM5 | NIST | 02 Aug 2020 |

2. This certification is traceable to the SI unit.

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

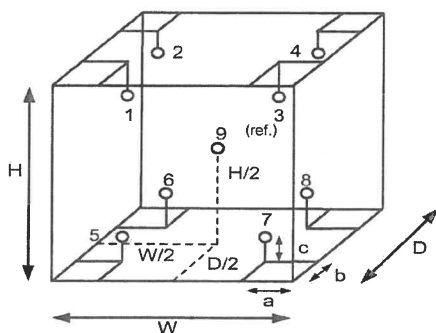
Remark : NIST : National Institute of Standards and Technology, The United State of America.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available

| Environment during calibration | | |
|---------------------------------------|------------------|-----------------|
| | Beginning | Finished |
| Temp. (°C) | 21 | 20 |
| REL.Humid. (%) | 60 | 62 |
| AC Supply (Volt) | 220 | 222 |



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

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



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2004-0379OC-4
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 20TM842

Page.: 3 of 3

| Calibration Point (°C) | UUC* Setting (°C) | UUC* Reading (°C) | Temperature stability (± °C) | Temperature uniformity (°C) | Overall Variation (°C) | Uncertainty (± °C) | Coverage Factor <i>k</i> |
|-----------------------------|------------------------|------------------------|-----------------------------------|----------------------------------|-----------------------------|-------------------------|-----------------------------|
| 35.0 | 35.0 | 35.0 | 0.032 | 0.45 | 0.68 | 0.30 | 2 |

| Calibration Point (°C) | Measured Temperature (°C) | | | | | | | | |
|-----------------------------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|----------|
| | Position | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 (ref.) |
| 35.0 | 35.280 | 35.323 | 35.257 | 35.237 | 34.914 | 35.194 | 34.702 | 35.260 | 35.107 |

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 %.

-o0o-



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



Certificate of Calibration

Cert. No.: 20TM843

Page.: 1 of 3

Equipment : Water Bath

Manufacturer : Memmert

Model : WNE 14

Serial No. : L414.1407

ID No. : UAE.LAB.006/2558

Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260

Location : Microbiology Laboratory

Received Order : 27 April 2020
Calibration Date : 27 April 2020
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %

Calibrated by : Preecha Hlahib

Approved by :

Approved Signatory

- () Pornthippa Tameyakul
(✓) Malee Butkruea
() Suwit Imjai

Issue Date :

7 May 2020

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2004-0379OC-6
Procedure Used :-

Cert. No.: 20TM843
Page.: 2 of 3

Calibration were conducted using in-house calibration procedure CP-OT04 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer (IPRT).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

| <u>Instrument</u> | <u>Serial No.</u> | <u>Cert. No.</u> | <u>Traceable</u> | <u>Due Date</u> |
|----------------------|-------------------|------------------|------------------|-----------------|
| 1) Data Acquisition | MY44031769 | 19LM5 | NIST | 02 Aug 2020 |

2. This certification is traceable to the SI unit.

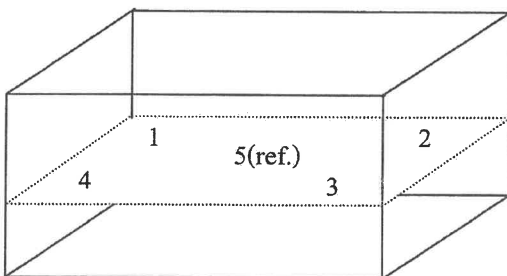
3. This result of calibration was found accurate as shown on date and place of calibration only.

Remark : NIST : National Institute of Standards and Technology, The United State of America.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

| | <u>Environmental</u> | | <u>AC Voltage Supply</u> |
|---------------------------------|----------------------|-----------|--------------------------|
| | (°C) | (%R.H.) | (Volt) |
| Beginning of Calibration | 20 | 62 | 222 |
| Finished of Calibration | 20 | 63 | 222 |



Front

| <u>Position :</u> | <u>Ref. Std. ID No.</u> |
|-------------------|-------------------------|
| 1 | N37P301419 |
| 2 | N37P300732 |
| 3 | N37P301420 |
| 4 | N37P301421 |
| 5(ref.) | N37P301425 |


 เอกสารไม่ควบคุม



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2004-0379OC-6
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 20TM843

Page.: 3 of 3

| Calibration point (°C) | UUC* Setting (°C) | UUC* Reading (°C) | Average* Standard Reading (°C) | | | | |
|--------------------------------|---------------------------|---------------------------|----------------------------------|--------|--------|--------|----------|
| | | | Position | | | | |
| | | | 1 | 2 | 3 | 4 | 5 (ref.) |
| 44.5 | 44.4 | 44.4 | 44.519 | 44.519 | 44.513 | 44.479 | 44.484 |

| Calibration point (°C) | Uniformity (°C) | Stability (± °C) | Uncertainty (± °C) | Coverage Factor <i>k</i> |
|--------------------------------|----------------------|-----------------------|-------------------------|--------------------------------|
| 44.5 | 0.094 | 0.074 | 0.15 | 2 |

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

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.

Stability : One-half of the greatest maximum difference of measured temperature at any one probe.

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 %.

-o0o-

เอกสารไม่ควบคุม

Calibration Certificate

Certificate No.: 2000970-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260

Page 1 of 3

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: MS603S/01

Serial No.: B007010311

ID No.: UAE.LAB.008/2553

Order No.: 2000970

Operation No.: 2000970-001

Date of Receipt: 25 December 2019

Date of Calibration: 25 December 2019

Calibrated by Mr.Manas Somsak
Senior Analyst

Approved by 
(Mr.Pheraphat Tuanjit)
Manager, Division of Calibration Laboratory

Date of Issue: 27 December 2019

Responsible for the Technical Management Team

The uncertainties are for a confidence probability of approximately 95%

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

Calibration Report

Certificate No.: 2000970-001-01

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: MS603S/01

Resolution: 0.001 g

Serial No.: B007010311

ID No.: UAE.LAB.008/2553

Capacity: 620 g

Date of Calibration: 25 December 2019

Page 2 of 3

Environment Condition: Ambient Temperature 23.6 ± 0.2 °C Relative Humidity: 50 ± 2.5 %

Place of Calibration: 306 Balance Room, UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001 In-House Method Based on UKAS LAB 14 Calibration of Weighing Machines : 2006

2. Reference Standards:

| Reference Standard | Model | Serial No. | Calibrated By | Certificate No. | Due Date |
|--------------------------|-------------|------------|---------------|-----------------|--------------|
| Standard Weight Class E2 | 1mg to 200g | B505567572 | TCS | M1904059S | 6 April 2020 |

| Instrument | Model | Serial No. | Calibrated By | Certificate No. | Due Date |
|--------------------|-------|--------------------|----------------|-----------------|----------------|
| Thermo-Hygro Meter | 11A1 | สอ.น.ป. BTH 003/55 | Quality Reborn | QR19-1416 | 19 August 2020 |

3. This certification is traceable to SI UNIT

4. This certificate was certified only for the instrument we calibrated.

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

Calibration Results:

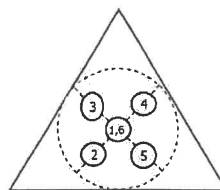
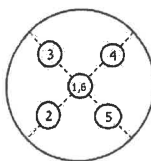
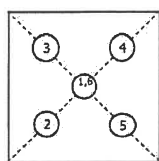
1. Repeatability of Reading:

| Nominal Value (g) | Standard Deviation of Reading (g) |
|---------------------|-------------------------------------|
| 300 | 0.00032 |
| 600 | 0.00032 |

2. Off-Center Error:

A mass of 200 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



| 1 (g) | 2 (g) | 3 (g) | 4 (g) | 5 (g) | 6 (g) | (Maximum Difference) (g) |
|------------|------------|------------|------------|------------|------------|-------------------------------|
| 200.000 | 199.999 | 200.000 | 200.001 | 200.001 | 200.000 | 0.001 |

Calibration Report

Certificate No.: 2000970-001-01

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: MS603S/01

Resolution: 0.001 g

Serial No.: B007010311

ID No.: UAE.LAB.008/2553

Capacity: 620 g

Date of Calibration: 25 December 2019

Page 3 of 3

Calibration Results: (Continued)

Calibration Range: 0 - 600 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value:

| Nominal Value (g) | Standard Value (g) | Average Reading (g) | Correction (g) | Uncertainty (± g) | Coverage Factor <i>k</i> |
|------------------------|-------------------------|--------------------------|---------------------|------------------------|-----------------------------|
| Unload | 0.0000 | 0.000 | 0.000 | 0.00085 | 2.00 |
| 0.1 | 0.1000 | 0.100 | 0.000 | 0.00085 | 2.00 |
| 0.5 | 0.5000 | 0.500 | 0.000 | 0.00085 | 2.00 |
| 1 | 1.0000 | 1.000 | 0.000 | 0.00085 | 2.00 |
| 5 | 5.0000 | 5.000 | 0.000 | 0.00085 | 2.00 |
| 10 | 10.0000 | 10.000 | 0.000 | 0.00085 | 2.00 |
| 20 | 20.0000 | 20.000 | 0.000 | 0.00085 | 2.00 |
| 50 | 50.0000 | 50.000 | 0.000 | 0.00085 | 2.00 |
| 70 | 70.0001 | 70.000 | 0.000 | 0.00085 | 2.00 |
| 100 | 100.0001 | 100.000 | 0.000 | 0.00086 | 2.00 |
| 150 | 150.0001 | 150.000 | 0.000 | 0.00087 | 2.00 |
| 200 | 200.0002 | 200.000 | 0.000 | 0.00088 | 2.00 |
| 300 | 300.0003 | 300.000 | 0.000 | 0.00092 | 2.00 |
| 400 | 400.0004 | 400.000 | 0.000 | 0.00098 | 2.00 |
| 500 | 500.0004 | 500.000 | 0.000 | 0.0011 | 2.00 |
| 600 | 600.0005 | 600.000 | 0.000 | 0.0012 | 2.00 |

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 %.

----- End -----



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



Certificate of Calibration

Cert. No.: 20TM405

Page.: 1 of 3

Equipment : Autoclave

Model : CL-40L

Serial No. : 802664

ID No. : UAE.LAB.014/2550

Manufacturer : ALP

Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260

Location : Air Analysis Unit

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Tawatchai Pama

Approved by :

Approved Signatory

() Pornthippa Tameyakul
() Malee Butkruea
(✓) Suwit Imjai

Issue Date :

4 March 2020

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
A 0011864



Equipment : Autoclave
Model : CL-40L
Serial No. : 802664
ID No. : UAE.LAB.014/2550
Manufacturer : ALP
Received Order : 26 February 2020
Condition As-Received : Used Item
Calibration Date : 27 February 2020
Reference : 2002-0784OC-5

Cert. No.: 20TM405

Page.: 2 of 3

Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT03 according to direct measurement method with Data Acquisition which connected with Thermocouple Type T

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

| <u>Instrument</u> | <u>Serial No.</u> | <u>Cert. No.</u> | <u>Traceable</u> | <u>Due Date</u> |
|----------------------|-------------------|------------------|------------------|-----------------|
| 1) Data Acquisition | MY44060450 | 19I276 | NIMT | 05 Mar 2020 |

2. This certification is traceable to the SI unit.

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

4. This result of calibration covers laboratory autoclaves for the sterilization of goods and material which could be infected with organisms categorized as Hazard Group 1, 2 and 3**

(** = Categorization of pathogens according to hazard and categories of containment, second edition, 1990)

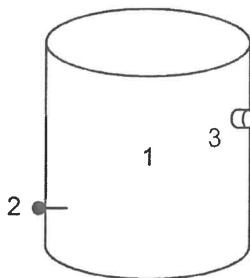
It does not cover autoclaves for use with material infect with organisms in Hazard Group 4, for which complete containment and sterilization of infected condensate is considered to be essential.

This result of calibration does not apply to sterilizers or disinfectors used for medical, dental, pharmaceutical or veterinary purposes which are directly concerned with patient care, or those used for fabrics subjected to sterilization which are required to be dry at the end of cycle.

Remark : NIMT : National Institute of Metrology Thailand.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source



| | <u>Environmental</u> | | |
|---------------------------------|----------------------|-----------|----------|
| | (°C) | (%R.H.) | (Volt) |
| Beginning of Calibration | 24 | 87 | 240 |
| Finished of Calibration | 23 | 85 | 240 |

| <u>Position</u> | <u>Description</u> | <u>Ref. Std. Thermocouple</u> |
|-----------------|--------------------|-------------------------------|
| 1 = | Center of chamber | 19-14TC-04 |
| 2 = | Temperature sensor | 19-14TC-05 |
| 3 = | Exhaust port | 19-14TC-06 |

[Signature]

เอกสารไม่ควบคุม
20988427



Equipment : Autoclave
Model : CL-40L
Serial No. : 802664
ID No. : UAE.LAB.014/2550
Manufacturer : ALP
Received Order : 26 February 2020
Condition As-Received : Used Item
Calibration Date : 27 February 2020
Reference : 2002-0784OC-5
Result of Calibration :- (*) Without Adjustment

Cert. No.: 20TM405

Page.: 3 of 3

Operating parameter Set : Temperature = 116 °C
Sterilization period = 15 minute

| UUC* Setting (°C) | UUC* Reading (°C) | Position | Average* Standard Reading (°C) | Stability (± °C) | Pressure Reading (MPa) | Uncertainty (± °C) | Coverage Factor <i>k</i> |
|---------------------------|---------------------------|----------|--|-----------------------|--------------------------------|-------------------------|--------------------------------|
| 116 | 116 | 1 | 116.594 | 0.18 | 0.08 | 0.90 | 2 |
| | | 2 | 116.430 | | | | |
| | | 3 | 116.361 | | | | |

Operating parameter Set : Temperature = 122 °C
Sterilization period = 15 minute

| UUC* Setting (°C) | UUC* Reading (°C) | Position | Average* Standard Reading (°C) | Stability (± °C) | Pressure Reading (MPa) | Uncertainty (± °C) | Coverage Factor <i>k</i> |
|---------------------------|---------------------------|----------|--|-----------------------|--------------------------------|-------------------------|--------------------------------|
| 122 | 122 | 1 | 122.474 | 0.17 | 0.12 | 1.1 | 2 |
| | | 2 | 122.301 | | | | |
| | | 3 | 122.285 | | | | |

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

Stability : One-half of the greatest maximum difference of measured temperature at any one probe.

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 %.

-o0o-

I. Yarnit

เอกสารไม่ควบคุม

0988426



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



Cert. No.: 21TM706

Page.: 1 of 3

Certificate of Calibration

Equipment : Incubator

Manufacturer : Memmert

Model : IPP260

Serial No. : V615.0187

ID No. : UAE.MIC.003/2559

Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260

Location : Microbiology Laboratory

Received Order : 21 April 2021

Calibration Date : 21 April 2021

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Kritsada Chaitrong

Approved by :

Malee

Approved Signatory

- () Pornthippa Tameyakul
(✓) Malee Butkruea
() Suwit Imjai

Issue Date :

5 May 2021

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

A 0027609



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2104-0019OC-1
Procedure Used :-

Cert. No.: 21TM706
Page.: 2 of 3

Calibration were conducted using calibration procedure CP-OT02 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 | MY44060450 | 21LM4 | NIMT | 06 Mar 2022 |

2. This certification is traceable to the SI unit.

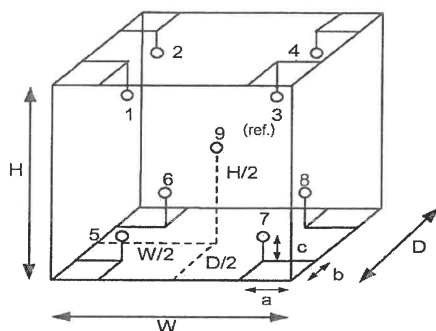
3. This certificate is valid only to the item calibrated on date and place of calibration.

Remark : NIMT : National Institute of Metrology Thailand.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



| Environment during calibration | | |
|--------------------------------|-----------|----------|
| | Beginning | Finished |
| Temp. (°C) | 24 | 23 |
| REL.Humid. (%) | 60 | 63 |
| AC Supply (Volt) | 223 | 224 |

| Position : | Ref. Std. ID No.: |
|------------|-------------------|
| 1 | 19-14RTD-01 |
| 2 | 19-14RTD-02 |
| 3 | 19-14RTD-03 |
| 4 | 19-14RTD-04 |
| 5 | 19-14RTD-05 |
| 6 | 19-14RTD-06 |
| 7 | 21-14RTD-07 |
| 8 | 19-14RTD-08 |
| 9 (ref.) | 19-14RTD-09 |

Probe Installation Details :

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

Dimension of Chamber :

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

เอกสารไม่ควบคุม

a 1052708



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2104-0019OC-1
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 21TM706
Page.: 3 of 3

| Calibration Point (°C) | UUC* Setting (°C) | UUC* Reading (°C) | Temperature stability (± °C) | Temperature uniformity (°C) | Overall Variation (°C) | Uncertainty (± °C) | Coverage Factor <i>k</i> |
|-----------------------------|------------------------|------------------------|-----------------------------------|----------------------------------|-----------------------------|-------------------------|-----------------------------|
| 35.0 | 35.0 | 35.0 | 0.11 | 0.36 | 0.55 | 0.30 | 2 |

| Calibration Point (°C) | Measured Temperature (°C) | | | | | | | | |
|-----------------------------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|----------|
| | Position | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 (ref.) |
| 35.0 | 34.946 | 35.035 | 35.120 | 35.087 | 34.989 | 35.121 | 34.745 | 35.004 | 34.994 |

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 %.

-o0o-

Male-
เอกสารไม่ควบคุม

a 1052707



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



Cert. No.: 21TM708

Page.: 1 of 3

Certificate of Calibration

Equipment : Water Bath

Manufacturer : Memmert

Model : WNE 14

Serial No. : L414.1407

ID No. : UAE.MIC.006/2558

Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260

Location : Microbiology Laboratory

Received Order : 21 April 2021

Calibration Date : 21 April 2021

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Kritsada Chaitrong

Approved by :


Approved Signatory

() Pornthippa Tameyakul
(✓) Malee Butkruea
() Suwit Imjai

Issue Date : 5 May 2021

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
A 0027612



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2104-0019OC-4
Procedure Used :-

Cert. No.: 21TM708

Page.: 2 of 3

Calibration were conducted using in-house calibration procedure CP-OT04 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer (IPRT).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

| <u>Instrument</u> | <u>Serial No.</u> | <u>Cert. No.</u> | <u>Traceable</u> | <u>Due Date</u> |
|----------------------|-------------------|------------------|------------------|-----------------|
| 1) Data Acquisition | MY44060450 | 21LM4 | NIMT | 06 Mar 2022 |

2. This certification is traceable to the SI unit.

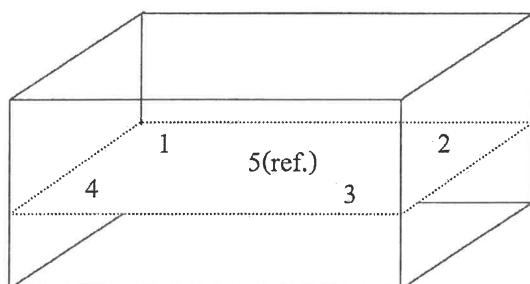
3. This certificate is valid only to the item calibrated on date and place of calibration.

Remark : NIMT : National Institute of Metrology Thailand.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

| | Environmental | | AC Voltage Supply |
|---------------------------------|----------------------|-----------|--------------------------|
| | (°C) | (%R.H.) | (Volt) |
| Beginning of Calibration | 24 | 60 | 223 |
| Finished of Calibration | 23 | 65 | 224 |



Front

| Position : | Ref. Std. S/N.: |
|-------------------|------------------------|
| 1 | 4803988-001 |
| 2 | 4803988-002 |
| 3 | 4803988-003 |
| 4 | 4803988-004 |
| 5(ref.) | 4803988-005 |

Malu.

เอกสารไม่ควบคุม
a 1052702



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2104-0019OC-4
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 21TM708

Page.: 3 of 3

| Calibration point (°C) | UUC* Setting (°C) | UUC* Reading (°C) | Average* Standard Reading (°C) | | | | |
|--------------------------------|---------------------------|---------------------------|----------------------------------|--------|--------|--------|----------|
| | | | Position | | | | |
| | | | 1 | 2 | 3 | 4 | 5 (ref.) |
| 44.5 | 44.5 | 44.5 | 44.524 | 44.507 | 44.501 | 44.518 | 44.518 |

| Calibration point (°C) | Uniformity (°C) | Stability (± °C) | Uncertainty (± °C) | Coverage Factor <i>k</i> |
|--------------------------------|----------------------|-----------------------|-------------------------|--------------------------------|
| 44.5 | 0.052 | 0.035 | 0.16 | 2 |

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

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.

Stability : One-half of the greatest maximum difference of measured temperature at any one probe.

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 %.

-o0o-

Malu.

เอกสารไม่ควบคุม
a 1052701



National Food Institute, Ministry of Industry, Thailand

2008 Soi 36, Arun Amarin Road, Bang Yi Khan Subdistrict, Bang Phlat District, Bangkok 10700, Thailand.

Tel : +66 (0) 2422 8688 Fax : +66 (0) 2422 8545 Website : www.nfi.or.th E-mail : cal@nfi.or.th



Calibration Certificate

Certificate No.: 2100858-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakanong, Bangkok 10260

Page 1 of 3

Equipment: Electronic Balance

Manufacturer: Mettler Toledo

Model: MS603S/01

Serial No.: B007010311

ID No.: UAE.MIC.008/2553


Order No.: 2100858

Operation No.: 2100858-001

Date of Receipt: 8 December 2020

Date of Calibration: 8 December 2020

Calibrated by Mr.Worapob Sooktong
Scientist

Approved by 
(Mr.Pheraphat Tuanjit)

Manager, Division of Calibration Laboratory

Date of Issue: 14 December 2020

Responsible for the Technical Management Team

The uncertainties are for a confidence probability of approximately 95%

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2100858-001-01

Equipment:

Electronic Balance

Manufacturer: Mettler Toledo

Model: MS603S/01

Resolution: 0.001 g

Serial No.: B007010311

ID No.: UAE.MIC.008/2553

Capacity: 620 g

Date of Calibration: 8 December 2020

Page 2 of 3

Environment Condition: Ambient Temperature: 21.1 ± 0.5 °C Relative Humidity: 49 ± 3.5 %

Place of Calibration: Balance Room, UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001 In-House Method Based on UKAS LAB 14 Calibration of Weighing Machines : 2006

2. Reference Standards:

| Reference Standard | Model | Serial No. | Calibrated By | Certificate No. | Due Date |
|--------------------------|---------|------------|---------------|-----------------|-----------------|
| Standard Weight Class E2 | 1-500mg | B308068554 | TCS | M2001161S | 24 January 2021 |
| Standard Weight Class E2 | 1-500g | B308068128 | TCS | M2001161S | 23 January 2021 |

| Instrument | Model | Serial No. | Calibrated By | Certificate No. | Due Date |
|--------------------|-----------|----------------|----------------|-----------------|-----------------|
| Thermo-Hygro Meter | PONPE 490 | NFI.BTH 004/58 | Quality Reborn | QR20-0194 | 7 February 2021 |

3. This certification is traceable to SI UNIT

4. This certificate was certified only for the instrument we calibrated.

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

Calibration Results:

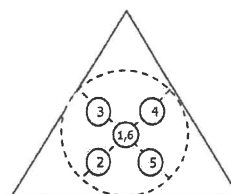
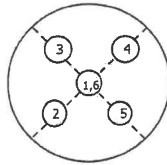
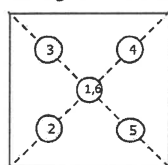
1. Repeatability of Reading:

| Nominal Value (g) | Standard Deviation of Reading (g) |
|---------------------|-------------------------------------|
| 300 | 0.00042 |
| 600 | 0.00042 |

2. Off-Center Error:

A mass of 200 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



| 1 | 2 | 3 | 4 | 5 | 6 | (Maximum Difference) |
|---------|---------|---------|---------|---------|---------|----------------------|
| (g) | (g) | (g) | (g) | (g) | (g) | (g) |
| 200.000 | 199.999 | 199.998 | 199.999 | 200.001 | 200.000 | 0.002 |

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2100858-001-01

Equipment: Electronic Balance

Manufacturer: Mettler Toledo

Model: MS603S/01

Resolution: 0.001 g

Serial No.: B007010311

ID No.: UAE.MIC.008/2553

Capacity: 620 g

Date of Calibration: 8 December 2020

Page 3 of 3

Calibration Results: (Continued)

Calibration Range: 0-600 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value:

| Nominal Value (g) | Standard Value (g) | Average Reading (g) | Correction (g) | Uncertainty (± g) | Coverage Factor <i>k</i> |
|------------------------|-------------------------|--------------------------|---------------------|------------------------|-----------------------------|
| Unload | 0.0000 | 0.000 | 0.000 | 0.00086 | 2.00 |
| 0.1 | 0.1000 | 0.100 | 0.000 | 0.00086 | 2.00 |
| 0.5 | 0.5000 | 0.500 | 0.000 | 0.00086 | 2.00 |
| 1 | 1.0000 | 1.000 | 0.000 | 0.00086 | 2.00 |
| 5 | 5.0000 | 5.000 | 0.000 | 0.00086 | 2.00 |
| 10 | 10.0000 | 10.001 | -0.001 | 0.00086 | 2.00 |
| 20 | 20.0000 | 20.000 | 0.000 | 0.00086 | 2.00 |
| 50 | 50.0000 | 50.000 | 0.000 | 0.00086 | 2.00 |
| 70 | 70.0000 | 70.000 | 0.000 | 0.00086 | 2.00 |
| 100 | 100.0000 | 100.001 | -0.001 | 0.00087 | 2.00 |
| 150 | 150.0000 | 150.000 | 0.000 | 0.00088 | 2.00 |
| 200 | 200.0000 | 200.000 | 0.000 | 0.00091 | 2.00 |
| 300 | 300.0000 | 300.000 | 0.000 | 0.00095 | 2.00 |
| 400 | 400.0000 | 400.000 | 0.000 | 0.00100 | 2.00 |
| 500 | 500.0000 | 500.000 | 0.000 | 0.0011 | 2.00 |
| 600 | 600.0000 | 600.000 | 0.000 | 0.0012 | 2.00 |

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 %.

----- End -----

เอกสารไม่ควบคุม



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



Cert. No.: 21TM425

Page.: 1 of 3

Certificate of Calibration

Equipment : Autoclave

Manufacturer : ALP

Model : CL-40L

Serial No. : 802664

ID No. : UAE.MIC.014/2550

Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260

Location : Air Analysis Unit

Received Order : 22 February 2021

Calibration Date : 23 February 2021

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Man Pattanapongpaiboon

Approved by :

Approved Signatory

- () Pornthippa Tameyakul
(✓) Malee Butkruea
() Suwit Imjai

Issue Date :

3 March 2021

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

A 0025135



Equipment : Autoclave
Condition As-Received : Used Item
Reference : 2102-0751OC-1
Procedure Used :-

Cert. No.: 21TM425

Page.: 2 of 3

Calibration were conducted using in-house calibration procedure CP-OT03 according to direct measurement method with Data Acquisition which connected with Thermocouple Type T

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

| <u>Instrument</u> | <u>Serial No.</u> | <u>Cert. No.</u> | <u>Traceable</u> | <u>Due Date</u> |
|----------------------|-------------------|------------------|------------------|-----------------|
| 1) Data Acquisition | MY49023932 | 20LM6 | NIST, NIMT | 20 Apr 2021 |

2. This certification is traceable to the SI unit.

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

4. This result of calibration covers laboratory autoclaves for the sterilization of goods and material which could be infected with organisms categorized as Hazard Group 1, 2 and 3**

(** = Categorization of pathogens according to hazard and categories of containment, second edition, 1990)

It does not cover autoclaves for use with material infect with organisms in Hazard Group 4, for which complete containment and sterilization of infected condensate is considered to be essential.

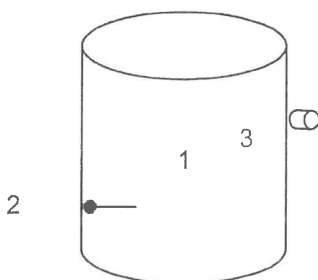
This result of calibration does not apply to sterilizers or disinfectors used for medical, dental, pharmaceutical or veterinary purposes which are directly concerned with patient care, or those used for fabrics subjected to sterilization which are required to be dry at the end of cycle.

Remark : NIST : National Institute of Standards and Technology, The United State of America.

NIMT : National Institute of Metrology Thailand.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source



| | Environmental | | |
|---------------------------------|----------------------|-----------|----------|
| | (°C) | (%R.H.) | (Volt) |
| Beginning of Calibration | 26 | 61 | 222 |
| Finished of Calibration | 26 | 63 | 223 |

| <u>Position</u> | <u>Description</u> | <u>Ref. Std. Thermocouple</u> |
|-----------------|--------------------|-------------------------------|
| 1 = | Center of chamber | 19-16TC-08 |
| 2 = | Temperature sensor | 19-16TC-09 |
| 3 = | Exhaust port | 19-16TC-10 |

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Equipment : Autoclave
Condition As-Received : Used Item
Reference : 2102-0751OC-1

Cert. No.: 21TM425

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Result of Calibration :- (*) Without Adjustment

Operating parameter Set : Temperature = 116 °C
Sterilization period = 15 minute

| UUC* Setting (°C) | UUC* Reading (°C) | Position | Average* Standard Reading (°C) | Stability (± °C) | Pressure Reading (MPa) | Uncertainty (± °C) | Coverage Factor <i>k</i> |
|---------------------------|---------------------------|----------|--|-----------------------|--------------------------------|-------------------------|--------------------------------|
| 116 | 116 | 1 | 117.021 | 0.23 | 0.08 | 0.92 | 2 |
| | | 2 | 117.111 | | | | |
| | | 3 | 117.212 | | | | |

Operating parameter Set : Temperature = 122 °C
Sterilization period = 15 minute

| UUC* Setting (°C) | UUC* Reading (°C) | Position | Average* Standard Reading (°C) | Stability (± °C) | Pressure Reading (MPa) | Uncertainty (± °C) | Coverage Factor <i>k</i> |
|---------------------------|---------------------------|----------|--|-----------------------|--------------------------------|-------------------------|--------------------------------|
| 122 | 122 | 1 | 122.817 | 0.15 | 0.12 | 1.10 | 2 |
| | | 2 | 122.914 | | | | |
| | | 3 | 122.978 | | | | |

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

Stability : One-half of the greatest maximum difference of measured temperature at any one probe.

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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