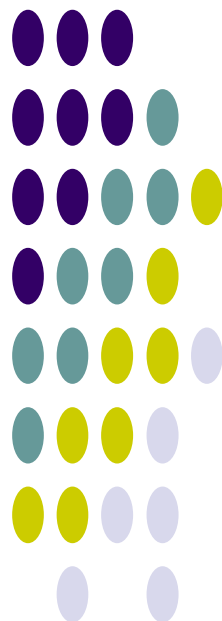


## ภาคผนวกที่ 4

เอกสารสอบเทียบความถูกต้องของเครื่องมือ



ใบรับรองการสอบเทียบ “เครื่องชั่ง”

(Calibration Certificate of Electronic Balance)

Mettler-Toledo (Thailand) Ltd.

846/4 - 846/5 Lasalle Rd., Bangna Tai Sub-District

Bangna District, Bangkok 10260

+66 2723 0382


MT-TH.ServiceSupport@mt.com



NSC-TISI-TIS 17025  
CALIBRATION 0062

## Accuracy Calibration Certificate

### Customer

**Company:** Emex Association Co., Ltd.  
**Address:** 27,29 Soi Rama 2, Soi 30, Rama 2 Road, Bang Mot  
**City:** Chom Thong **Contact:** Lamai Boonsri  
**Zip / Postal:** 10150  
**State / Province:** Bangkok  
**Order Number:**   
\* 0 3 3 2 3 4 0 3 8 2 \*

### Weighing Device

**Manufacturer:** Mettler Toledo **Instrument Type:** Weighing Instrument  
**Model:** XP105DR **Asset Number:** N/A  
**Serial No.:** B138280195 **Terminal Model:** PAT  
**Building:** Office **Terminal Serial No.:** B138280195  
**Floor:** 4 **Terminal Asset No.:** N/A  
**Room:** Laboratory

| Range | Max. Capacity | Readability (d) |
|-------|---------------|-----------------|
| 1     | 31 g          | 0.00001 g       |
| 2     | 120 g         | 0.0001 g        |

### Procedure

**Calibration Guideline:** EURAMET cg-18 v. 4.0 (11/2015)

**METTLER TOLEDO Work Instruction:** CP/W002/20

This calibration certificate contains measurements for As Found calibration. No As Left calibration was performed because the device was not modified after As Found calibration. Therefore, results for As Left correspond to As Found.

The sensitivity/span of the weighing instrument was adjusted before calibration with a built-in weight.

In accordance with EURAMET cg-18 (11/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

|          | Temperature                 | Humidity                  |
|----------|-----------------------------|---------------------------|
| As Found | Start: 24.8 °C End: 23.9 °C | Start: 47.6 % End: 47.3 % |

**As Found Calibration Date:** 04-Feb-2022  
**As Left Calibration Date:** N/A  
**Issue Date:** 07-Feb-2022

**Calibrator:**

Naruenat Paesri

**Approved Signatory:**

- ☒ Kassakorn Tassanachaisakul  
☐ Santi Jitniyom  
☐ Surachet Sukkate

## Measurement Results

### Repeatability

Test Load: 20 g

|    | As Found   | As Left |
|----|------------|---------|
| 1  | 20.00000 g | N/A     |
| 2  | 20.00001 g | N/A     |
| 3  | 20.00001 g | N/A     |
| 4  | 19.99999 g | N/A     |
| 5  | 20.00000 g | N/A     |
| 6  | 20.00000 g | N/A     |
| 7  | 19.99999 g | N/A     |
| 8  | 20.00000 g | N/A     |
| 9  | 19.99999 g | N/A     |
| 10 | 19.99999 g | N/A     |

|                    |            |     |
|--------------------|------------|-----|
| Standard Deviation | 0.000008 g | N/A |
|--------------------|------------|-----|

● As Found  
◆ As Left



The "d" in the graph represents the readability of the range/interval in which the test was performed.

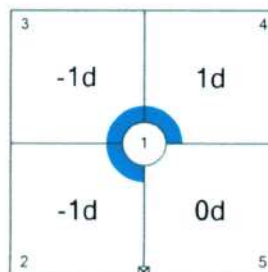
The results of this graph are based upon the absolute values of the differences from the mean value.

### Eccentricity

Test Load: 50 g

| Position | As Found  | As Left |
|----------|-----------|---------|
| 1        | 50.0000 g | N/A     |
| 2        | 49.9999 g | N/A     |
| 3        | 49.9999 g | N/A     |
| 4        | 50.0001 g | N/A     |
| 5        | 50.0000 g | N/A     |

|                   |          |     |
|-------------------|----------|-----|
| Maximum Deviation | 0.0001 g | N/A |
|-------------------|----------|-----|



As Found

The "d" in the graph represents the readability of the range/interval in which the test was performed.

## Error of Indication

As Found

|      | Reference Value | Indication | Error of Indication | Expanded Uncertainty | k |
|------|-----------------|------------|---------------------|----------------------|---|
| 1    | 0.00000 g       | 0.00000 g  | 0.00000 g           | 0.017 mg             | 2 |
| 2    | 0.01000 g       | 0.01000 g  | 0.00000 g           | 0.019 mg             | 2 |
| 3    | 0.10000 g       | 0.10000 g  | 0.00000 g           | 0.023 mg             | 2 |
| 4    | 0.50000 g       | 0.50001 g  | 0.00001 g           | 0.028 mg             | 2 |
| 5    | 0.99999 g       | 0.99999 g  | 0.00000 g           | 0.032 mg             | 2 |
| 6    | 5.00001 g       | 5.00001 g  | 0.00000 g           | 0.048 mg             | 2 |
| 7    | 10.00002 g      | 10.00004 g | 0.00002 g           | 0.062 mg             | 2 |
| 8    | 30.00000 g      | 30.00004 g | 0.00004 g           | 0.14 mg              | 2 |
| 9 *  | 60.0000 g       | 60.0000 g  | 0.0000 g            | 0.20 mg              | 2 |
| 10   | 90.0000 g       | 90.0000 g  | 0.0000 g            | 0.30 mg              | 2 |
| 11 * | 120.0000 g      | 120.0001 g | 0.0001 g            | 0.31 mg              | 2 |

\*The calculated uncertainty was replaced by the CMC (Calibration and Measurement Capabilities) value because the calculated uncertainty was smaller than the CMC value.



The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor  $k$  – which can be larger than 2 according to EURAMET cg-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

## Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

### Weight Set 1: OIML E2

|                     |        |                       |             |
|---------------------|--------|-----------------------|-------------|
| Weight Set No.:     | WS01   | Date of Issue:        | 03-May-2021 |
| Certificate Number: | 172902 | Calibration Due Date: | 29-Oct-2022 |

### Thermo Hygrometer

|                     |         |                       |             |
|---------------------|---------|-----------------------|-------------|
| Equipment No.:      | IN254   | Date of Issue:        | 29-Jul-2021 |
| Certificate Number: | 21H1598 | Calibration Due Date: | 18-Jul-2022 |

## Remarks

FACT adjustment functionality activated

Equipment condition: Good

Next calibration according to customer's procedure

### End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.

EMEX ASSOCIATION CO., LTD.

  
D. N. B.

## Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with  $k=2$  in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value  $R$  represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use:  $1.0 \cdot 10^{-6} / K$

Temperature range on site for the evaluation of the measurement uncertainty in use: 3 K

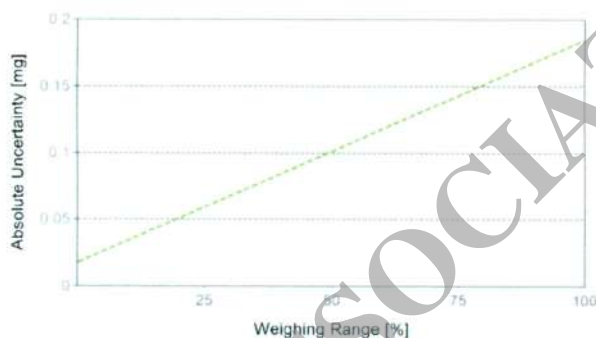
### Linearization of Uncertainty Equation

| Range |           |       | As Found  | As Left |
|-------|-----------|-------|---|---------|
|       | d         | Max   |   |         |
| 1     | 0.00001 g | 31 g  | $U_1 = 0.018 \text{ mg} + 0.00539 \text{ mg/g} \cdot R$                 | N/A     |
| 2     | 0.0001 g  | 120 g | $U_2 = 0.19 \text{ mg} + 0.00585 \text{ mg/g} \cdot (R - 31 \text{ g})$ | N/A     |

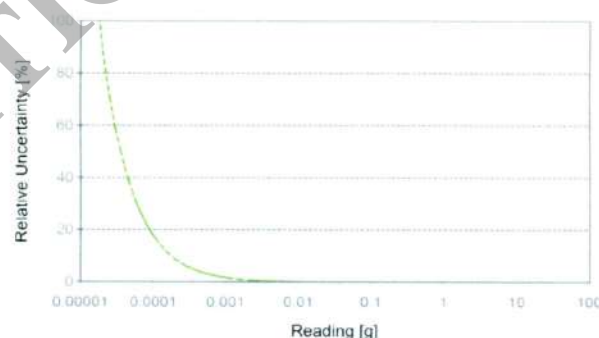
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

### Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Examples)

| Net Indication | As Found |          | As Left |     |
|----------------|----------|----------|---------|-----|
|                |          |          |         |     |
| 0.00120 g      | 0.018 mg | 1.5%     | N/A     | N/A |
| 0.01200 g      | 0.018 mg | 0.15%    | N/A     | N/A |
| 0.12000 g      | 0.019 mg | 0.016%   | N/A     | N/A |
| 1.20000 g      | 0.024 mg | 0.0020%  | N/A     | N/A |
| 120.0000 g     | 0.71 mg  | 0.00059% | N/A     | N/A |



As Found



As Left

The weighing range shown in the absolute uncertainty graph refers to the first interval/range of the device.

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ใบรับรองการสอบเทียบ “เครื่อง Hot Air Oven”

(Calibration Certificate of Hot Air Oven)



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.: 21MT1595

Page.: 1 of 3

**Equipment :** Hot Air Oven  
**Manufacturer :** Memmert  
**Model :** UFB 500  
**Serial No. :** G509.0594  
**ID No. :** 0407-0101-09  
**Submitted by :** Emex Association Co.,Ltd.  
27,29 Soirama II, Soi 30,  
Bangmod, Jomthong,  
Bangkok 10150  
**Location :** ห้องปฏิบัติการ 8  
**Received Order :** 7 September 2021  
**Calibration Date :** 7 September 2021  
**Ambient Temperature :** ( 26 ± 10 ) °C  
**Relative Humidity :** ( 50 ± 30 ) %  
**Calibrated by :** Suwit Imjai

**Approved by :**

*Malee*

Approved Signatory

- ( ☐ ) Pornthippa Tameyakul  
( ☒ ) Malee Butkruea

**Issue Date :** 17 September 2021  
**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.

*22.9.24*

A 0032315



**Equipment :** Hot Air Oven  
**Condition As-Received :** Used Item  
**Reference :** 2109-0106ON-3

**Cert. No.:** 21MT1595

**Page.:** 2 of 3

**Procedure Used :-**

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector ( RTD ) and 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>Model</u> | <u>Serial No.</u> | <u>Cert. No.</u> | <u>Due Date</u> |
|----------------------|--------------|-------------------|------------------|-----------------|
| 1 ) Data Acquisition | 34970A       | MY49023932        | 21LM8            | 06 Jul 2022     |

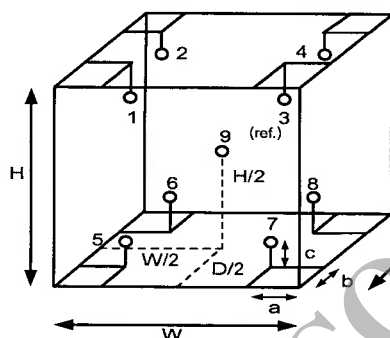
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

**Result of Calibration :-** ( \* ) Without Adjustment

**Function of UUC\* :** Temperature Source

**Fresh air setting :** Close



| Environment during calibration |           |          |
|--------------------------------|-----------|----------|
|                                | Beginning | Finished |
| Temp. ( °C )                   | 30        | 30       |
| REL.Humid. ( % )               | 55        | 57       |
| AC Supply ( Volt )             | 225       | 225      |

**Ref. Std. ID No.: @  
Calibration Point**

| Position : | ( 150, 180 ) °C | ( 104 ) °C  |
|------------|-----------------|-------------|
| 1          | 21-16TC-01      | 20-16RTD-01 |
| 2          | 21-16TC-02      | 20-16RTD-02 |
| 3          | 21-16TC-03      | 20-16RTD-03 |
| 4          | 21-16TC-04      | 20-16RTD-04 |
| 5          | 21-16TC-05      | 20-16RTD-05 |
| 6          | 21-16TC-06      | 20-16RTD-06 |
| 7          | 21-16TC-07      | 20-16RTD-07 |
| 8          | 21-16TC-08      | 20-16RTD-08 |
| 9 (ref.)   | 21-16TC-09      | 20-16RTD-09 |

**Probe Installation Details :**

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

**Dimension of Chamber :**

D = 0.40 m  
W = 0.56 m  
H = 0.48 m  
Capacity = 0.11 m<sup>3</sup>

*Handwritten signature and date: 22 Nov 2022*



Equipment : Hot Air Oven  
Condition As-Received : Used Item  
Reference : 2109-0106ON-3  
Result of Calibration :- ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source  
Fresh air setting : Close

Cert. No.: 21MT1595

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> |
|--------------------------|---------------------|---------------------|--------------------------------|-------------------------------|--------------------------|----------------------|--------------------------|
| 104.0                    | 104.5               | 104.5               | 0.039                          | 0.32                          | 0.49                     | 0.42                 | 2                        |
| 150.0                    | 150.0               | 150.0               | 0.10                           | 0.54                          | 0.91                     | 1.1                  | 2                        |
| 180.0                    | 180.0               | 180.0               | 0.098                          | 0.94                          | 1.4                      | 1.1                  | 2                        |

| Calibration Point ( °C ) | Measured Temperature ( °C ) |         |         |         |         |         |         |         |          |
|--------------------------|-----------------------------|---------|---------|---------|---------|---------|---------|---------|----------|
|                          | Position                    |         |         |         |         |         |         |         |          |
|                          | 1                           | 2       | 3       | 4       | 5       | 6       | 7       | 8       | 9 (ref.) |
| 104.0                    | 104.211                     | 104.128 | 104.021 | 103.972 | 104.268 | 104.013 | 104.418 | 104.118 | 104.269  |
| 150.0                    | 149.676                     | 149.544 | 149.367 | 149.386 | 150.104 | 149.547 | 150.041 | 149.760 | 149.811  |
| 180.0                    | 179.704                     | 179.581 | 179.232 | 179.272 | 180.431 | 179.792 | 180.224 | 179.873 | 179.558  |

**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-

22.11.2024  
Maku

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ใบรับรองการสอบเทียบ “เครื่อง Water Bath”

(Calibration Certificate of Water Bath)



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.: 21TM1597

Page.: 1 of 3

## Certificate of Calibration

**Equipment :** Water Bath  
**Manufacturer :** M-LAB  
**Model :** WBN 30  
**Serial No. :** 0138  
**ID No. :** 0408-0101-09  
**Submitted by :** Emex Association Co.,Ltd.  
27,29 Soi Rama II, Soi 30,  
Bangmod, Jomthong,  
Bangkok 10150  
**Location :** ห้องปฏิบัติการ 8  
**Received Order :** 7 September 2021  
**Calibration Date :** 7 September 2021  
**Ambient Temperature :** ( 26 ± 10 ) °C  
**Relative Humidity :** ( 50 ± 30 ) %  
**Calibrated by :** Suwit Imjai


**Approved by :**

  
Approved Signatory

( ) Pornthippa Tameyakul  
(✓) Malee Butkruea

**Issue Date :** 17 September 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.

  
22.9.21

A 0032313



Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2109-0106ON-1

Cert. No.: 21TM1597

Page.: 2 of 3

**Procedure Used :-**

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>Model</u> | <u>Serial No.</u> | <u>Cert. No.</u> | <u>Due Date</u> |
|----------------------|--------------|-------------------|------------------|-----------------|
| 1 ) Data Acquisition | 34970A       | MY44067817        | 21LM10           | 20 Jul 2022     |

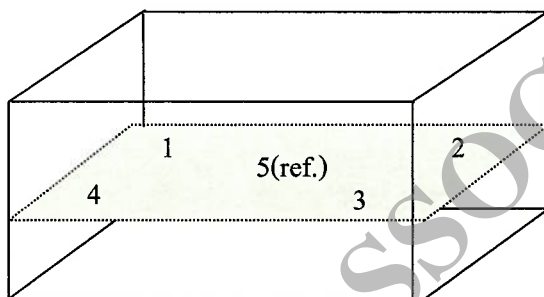
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

**Result of Calibration :-** ( \* ) Without Adjustment

**Function of UUC\* :** Temperature Source

|                          | Environmental |           | AC Voltage Supply |
|--------------------------|---------------|-----------|-------------------|
|                          | ( °C )        | ( %R.H. ) | ( Volt )          |
| Beginning of Calibration | 30            | 56        | 226               |
| Finished of Calibration  | 30            | 58        | 225               |



Front

| Position : | Ref. Std. ID No.: |
|------------|-------------------|
| 1          | 70RC143           |
| 2          | 70RC144           |
| 3          | 70RC145           |
| 4          | 70RC146           |
| 5(ref.)    | 70RC147           |

22.7.2022  
Mahu

|  |                          |
|--|--------------------------|
| <b>Equipment :</b>                     | Water Bath               |
| <b>Condition As-Received :</b>         | Used Item                |
| <b>Reference :</b>                     | 2109-0106ON-1            |
| <b><u>Result of Calibration :-</u></b> | ( * ) Without Adjustment |
| <b>Function of UUC* :</b>              | Temperature Source       |

**Cert. No.:** 21TM1597

Page.: 3 of 3

| Calibration<br>point<br>( °C ) | UUC*<br>Setting<br>( °C ) | UUC*<br>Reading<br>( °C ) | Average* Standard Reading ( °C ) |        |        |        |          |
|--------------------------------|---------------------------|---------------------------|----------------------------------|--------|--------|--------|----------|
|                                |                           |                           | Position                         |        |        |        |          |
|                                |                           |                           | 1                                | 2      | 3      | 4      | 5 (ref.) |
| 85.0                           | 85.0                      | 85.0                      | 84.887                           | 84.876 | 84.897 | 84.953 | 84.890   |

| Calibration point<br>( °C ) | Uniformity<br>( °C ) | Stability<br>( ± °C ) | Uncertainty<br>( ± °C ) | Coverage Factor<br><i>k</i> |
|-----------------------------|----------------------|-----------------------|-------------------------|-----------------------------|
| 85.0                        | 0.19                 | 0.074                 | 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-

28 n.s. 64  
Male.

---

ใบรับรองการสอบเทียบ “เครื่อง pH Meter”

(Calibration Certificate of pH Meter)



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.: 21CHO463

Page.: 1 of 3

## Certificate of Calibration

**Equipment :** pH Meter  
**Manufacturer :** Mettler Toledo  
**Model :** SevenCompact  
**Serial No. :** B535358167  
**ID No. :** -  
**Condition As-Received:** Used Item  
**Received Date :** 7 September 2021  
**Calibration Date :** 7 September 2021  
**Reference :** 2109-0106ON-9  
**Submitted by :** Emex Association Co.,Ltd.  
27,29 Soirama II, Soi 30, Bangmod,  
Jomthong, Bangkok 10150  
**Calibration Place :** ห้องปฏิบัติการ 7  
**Ambient Temperature :** (24.3 - 24.1) °C  
**Relative Humidity :** (50 - 46) %  
**Calibration Procedure :** In - house method :  
- CP-OCH2 by direct measurement with standard  
voltage calibrator and direct measurement with  
certified reference material (CRM)

**Calibrated by :** Saithip Meangmai

**Approved by :**

*Malee*

Approved Signatory

- (☒) Malee Butkruea  
(☐) Saithip Meangmai  
(☐) Warakorn Lernagtrakul

**Issue Date :** 17 September 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.

*22 Nov 21*

A 0032321



Cert. No.: 21CHO463

Page.: 2 of 3

**Condition of this calibration result**

1. Reference Standard Instrument : -

| <u>Instrument</u>              | <u>Serial No.</u> | <u>ID No.</u> | <u>Cert. No.</u> | <u>Due Date</u> |
|--------------------------------|-------------------|---------------|------------------|-----------------|
| 1) Document Process Calibrator | 54030049          | 130RC116      | 21E2682          | 25 Aug 2022     |
| 2) Digital Thermometer         | -                 | 130RC018      | 21T687           | 8 Apr 2022      |

This certification is traceable to the International System of Unit maintained at:-

- Traceable to National Institute of Metrology (Thailand), NIMT

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd.,  
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

| <u>Buffer Solution</u> | <u>Manufacturer</u> | <u>Lot No.</u> | <u>Exp. date</u> |
|------------------------|---------------------|----------------|------------------|
| *pH 2.01               | Merck               | HC03981033     | 30 Sep 2023      |
| pH 4.008               | CPA chem            | 761016         | 02 Aug 2023      |
| pH 6.982               | CPA chem            | 754030         | 28 June 2022     |
| pH 10.015              | CPA chem            | 761018         | 02 Aug 2022      |

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

**Calibration Results**

**Function : pH Measurement**

**Performing four buffers standard curve by using buffer nominal pH (2,4,7,10)**

| <u>Unit Under Calibration</u> | <u>Standard pH Buffer Solution</u> | <u>Actual pH Reading</u> | <u>Actual mV Reading ( mV )</u> | <u>Uncertainty of pH measurement (±)</u> | <u>Coverage factor k</u> |
|-------------------------------|------------------------------------|--------------------------|---------------------------------|--|--------------------------|
| pH Electrode<br>S/N.: 7183509 | *2.01                              | 2.017                    | 293.6                           | 0.021                                    | 2.00                     |
|                               | 4.008                              | 4.002                    | 177.6                           | 0.0084                                   | 2.18                     |
|                               | 6.982                              | 6.970                    | 3.0                             | 0.017                                    | 2.00                     |
|                               | 10.015                             | 10.010                   | -174.0                          | 0.056                                    | 2.00                     |

**Remark :** \* : Not NSC-ONSC Accredited

*Handwritten signature and date:*  
22 Aug 2022  
Malu



Cert.No.: 21CHO463

Page.: 3 of 3

**Calibration Results****Function : mV Measurement****Performing standard curve by Fluke at pH (2,4,7,10)**

| Unit Under Calibration       | Nominal Value | Standard Voltage Input | Actual Reading |        | Uncertainty of Measurement | Coverage factor |
|------------------------------|---------------|------------------------|----------------|--------|----------------------------|-----------------|
|                              | pH            | mV                     | mV             | pH     | ( $\pm$ mV)                | k               |
| pH Meter<br>S/N.: B535358167 | 0.000         | 414.12                 | 413.9          | 0.000  | 0.058                      | 2.00            |
|                              | 1.000         | 354.96                 | 354.7          | 1.000  | 0.058                      | 2.00            |
|                              | 2.000         | 295.80                 | 295.6          | 2.000  | 0.058                      | 2.00            |
|                              | 3.000         | 236.64                 | 236.5          | 3.000  | 0.058                      | 2.00            |
|                              | 4.000         | 177.48                 | 177.3          | 4.000  | 0.058                      | 2.00            |
|                              | 5.000         | 118.32                 | 118.2          | 5.000  | 0.058                      | 2.00            |
|                              | 6.000         | 59.16                  | 59.0           | 6.000  | 0.058                      | 2.00            |
|                              | 7.000         | 0.00                   | -0.1           | 7.000  | 0.058                      | 2.00            |
|                              | 8.000         | -59.16                 | -59.2          | 8.000  | 0.058                      | 2.00            |
|                              | 9.000         | -118.32                | -118.4         | 9.000  | 0.058                      | 2.00            |
|                              | 10.000        | -177.48                | -177.5         | 10.000 | 0.058                      | 2.00            |
|                              | 11.000        | -236.64                | -236.7         | 11.001 | 0.058                      | 2.00            |
|                              | 12.000        | -295.80                | -295.8         | 12.001 | 0.058                      | 2.00            |
|                              | 13.000        | -354.96                | -354.9         | 13.001 | 0.058                      | 2.00            |
|                              | 14.000        | -414.12                | -414.1         | 14.001 | 0.058                      | 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 %.

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22.04.14  
malu

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ใบรับรองการสอบเทียบ “เครื่อง Incubator”  
(Calibration Certificate of Incubator)



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.: 21TM1600

Page.: 1 of 3

## Certificate of Calibration

**Equipment :** Incubator  
**Manufacturer :** Accuplus  
**Model :** i250  
**Serial No. :** i250402-0609-0265  
**ID No. :** 0410-0101-09  
**Submitted by :** Emex Association Co.,Ltd.  
27,29 Soirama II, Soi 30,  
Bangmod, Jomthong,  
Bangkok 10150  
**Location :** ห้องปฏิบัติการ 9  
**Received Order :** 7 September 2021  
**Calibration Date :** 7 September 2021  
**Ambient Temperature :** ( 26 ± 10 ) °C  
**Relative Humidity :** ( 50 ± 30 ) %  
**Calibrated by :** Suwit Imjai

**Approved by :**

Approved Signatory

( ) Pornthippa Tameyakul  
( ✓ ) Malee Butkruea

**Issue Date :** 17 September 2021  
**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.

  
22 N.S. 64

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Equipment : Incubator  
Condition As-Received : Used Item  
Reference : 2109-0106ON-5

Cert. No.: 21TM1600

Page.: 2 of 3

**Procedure Used :-**

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           | Model  | Serial No. | Cert. No. | Due Date    |
|----------------------|--------|------------|-----------|-------------|
| 1 ) Data Acquisition | 34970A | MY44067817 | 21LM10    | 20 Jul 2022 |

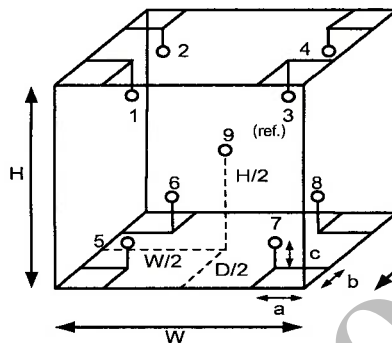
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

**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. ( % )               | 54        | 58       |
| AC Supply ( Volt )             | 225       | 225      |

**Probe Installation Details :**

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

**Dimension of Chamber :**

D = 0.49 m  
W = 0.48 m  
H = 1.2 m  
Capacity = 0.28 m<sup>3</sup>

| Position : | Ref. Std. ID No.: |
|------------|-------------------|
| 1          | 15RTD2/11         |
| 2          | 15RTD2/12         |
| 3          | 15RTD2/13         |
| 4          | 15RTD2/14         |
| 5          | 15RTD2/15         |
| 6          | 15RTD2/16         |
| 7          | 15RTD2/17         |
| 8          | 15RTD2/18         |
| 9 (ref.)   | 15RTD2/19         |

29 A.S. 64  
Maha



Equipment : Incubator  
Condition As-Received : Used Item  
Reference : 2109-0106ON-5  
Result of Calibration :- ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source  
Fresh air setting : Not Available

Cert. No.: 21TM1600

Page.: 3 of 3

| Calibration Point<br>( °C ) | UUC* Setting<br>( °C ) | UUC* Reading<br>( °C ) | Temperature stability<br>( ± °C ) | Temperature uniformity<br>( °C ) | Overall Variation<br>( °C ) | Uncertainty<br>( ± °C ) | Coverage Factor<br><i>k</i> |
|-----------------------------|------------------------|------------------------|-----------------------------------|----------------------------------|-----------------------------|-------------------------|-----------------------------|
| 20.0                        | 19.5                   | 19.4                   | 0.37                              | 0.46                             | 0.88                        | 0.57                    | 2                           |

| Calibration Point<br>( °C ) | Measured Temperature ( °C ) |        |        |        |        |        |        |        |          |
|-----------------------------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|----------|
|                             | Position                    |        |        |        |        |        |        |        |          |
|                             | 1                           | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9 (ref.) |
| 20.0                        | 20.123                      | 20.040 | 20.199 | 20.100 | 20.226 | 20.394 | 20.054 | 20.029 | 20.028   |

**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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22.8.2021  
Malu.