

# ภาคผนวกที่ 4

---

เอกสารสอบเทียบ  
ความถูกต้องของเครื่องมือ

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 6 2 3 5 6 3 \*

### 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 7

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: 25.2 °C	End: 25.0 °C	Start: 51.6 %	End: 53.1 %

As Found Calibration Date: 04-Feb-2023  
As Left Calibration Date: N/A  
Issue Date: 06-Feb-2023

Calibrator:   
Suwicha Choykamchu

Approved Signatory:

  
Technical Manager / Head of Calibration Center

## Measurement Results

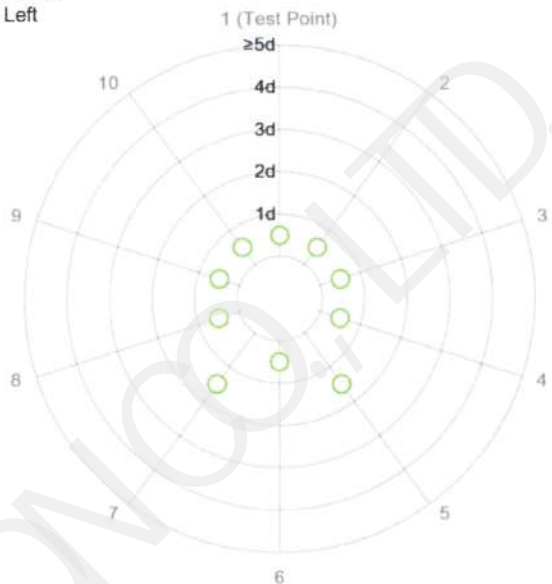
### Repeatability

Test Load: 30 g

	As Found	As Left
1	30.00006 g	N/A
2	30.00007 g	N/A
3	30.00006 g	N/A
4	30.00007 g	N/A
5	30.00008 g	N/A
6	30.00006 g	N/A
7	30.00005 g	N/A
8	30.00007 g	N/A
9	30.00006 g	N/A
10	30.00007 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.

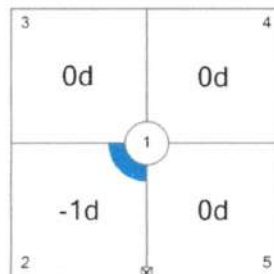
The results of this graph are based upon the absolute values of the differences from the mean value.

### Eccentricity

Test Load: 50 g

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

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



As Found

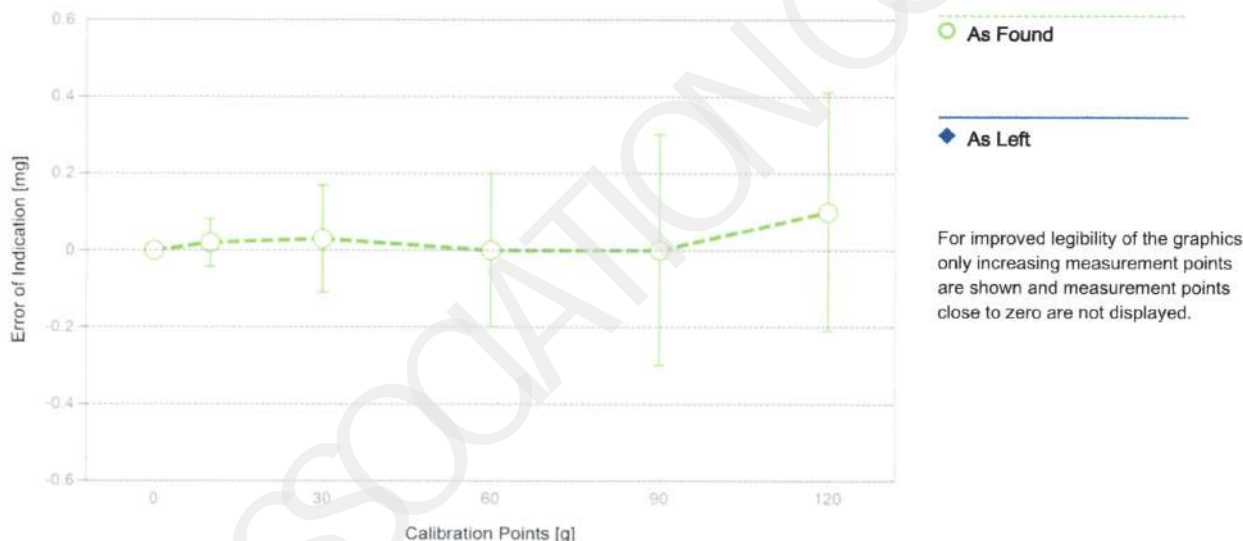
The "d" in the graph represents the readability of the range/interval in which the test was performed.

## Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.00000 g	0.00000 g	0.00000 g	0.018 mg	2
2	0.01000 g	0.01000 g	0.00000 g	0.020 mg	2
3	0.10001 g	0.10002 g	0.00001 g	0.024 mg	2
4	0.50000 g	0.50001 g	0.00001 g	0.029 mg	2
5	1.00000 g	1.00000 g	0.00000 g	0.033 mg	2
6	5.00000 g	5.00000 g	0.00000 g	0.049 mg	2
7	10.00002 g	10.00004 g	0.00002 g	0.062 mg	2
8	30.00003 g	30.00006 g	0.00003 g	0.14 mg	2
9 <sup>1</sup>	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 <sup>1</sup>	119.9999 g	120.0000 g	0.0001 g	0.31 mg	2

<sup>1</sup>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.:	WS54	Date of Issue:	15-Jun-2022
Certificate Number:	179958	Calibration Due Date:	14-Dec-2023

### Thermo Hygrometer

Equipment No.:	IN296	Date of Issue:	28-Oct-2022
Certificate Number:	22H2193	Calibration Due Date:	19-Oct-2023



## Remarks

FACT adjustment functionality activated

Equipment condition: Good

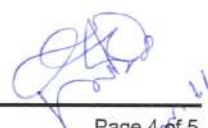
Next calibration according to customer's procedure

Calibration data not decide by calibration laboratory

## 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.

  
4.7.16

## 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:  $3 K$

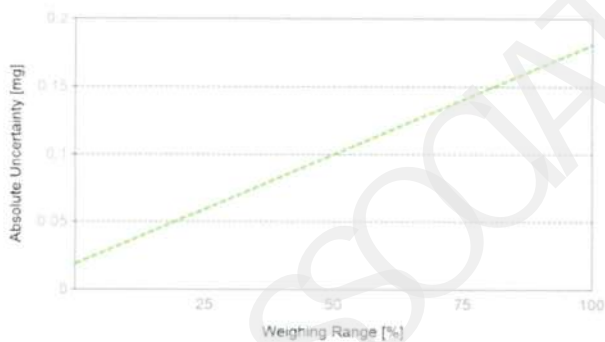
### Linearization of Uncertainty Equation

	Range		As Found	As Left
	d	Max		
1	0.00001 g	31 g	$U_1 = 0.019 \text{ mg} + 0.00523 \text{ mg/g} \cdot R$	N/A
2	0.0001 g	120 g	$U_2 = 0.19 \text{ mg} + 0.00572 \text{ mg/g} \cdot (R - 31 \text{ g})$	N/A

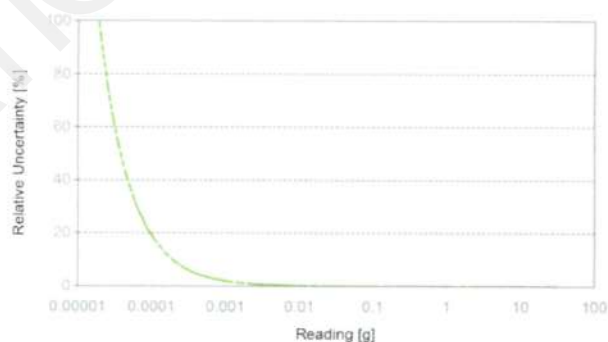
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

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

Net Indication	As Found		As Left	
0.00120 g	0.019 mg	1.6%	N/A	N/A
0.01200 g	0.019 mg	0.16%	N/A	N/A
0.12000 g	0.020 mg	0.016%	N/A	N/A
1.20000 g	0.025 mg	0.0021%	N/A	N/A
120.0000 g	0.70 mg	0.00058%	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.

*[Handwritten signature]*  
0.2.66

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. 0-2717-3000-29 FAX. 0-2719-9484



Cert. No.: 23TM1281

Page : 1 of 3

## Certificate of Calibration

**Equipment :** Hot Air Oven

**Manufacturer :** Memmert

**Model :** UF 55

**Serial No. :** B220.0396

**ID No. :** -

**Submitted by :** Emex Association Co.,Ltd.  
27,29 Soi Rama II, Soi 30,  
Bangmod, Jomthong,  
Bangkok 10150

**Location :** ห้องปฏิบัติการ 8

**Received Order :** 04 September 2023

**Calibration Date :** 04 September 2023

**Ambient Temperature :** ( 26 ± 10 ) °C

**Relative Humidity :** ( 50 ± 30 ) %

**Calibrated by :** Preecha Hlahib

**Approved by :**

Approved Signatory

- ( ) Pornthippa Tameyakul  
( ) Ponpan Paipim  
(✓) Suwit Imjai

**Issue Date :** 15 September 2023

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.

A 0053637



Equipment : Hot Air Oven  
Condition As-Received : Used Item  
Reference : 2309-0046ON-4

Cert. No.: 23TM1281

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 Thermocouple Type T.

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	MY59003411	22LM165	TPA	26 Nov 2023

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

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

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

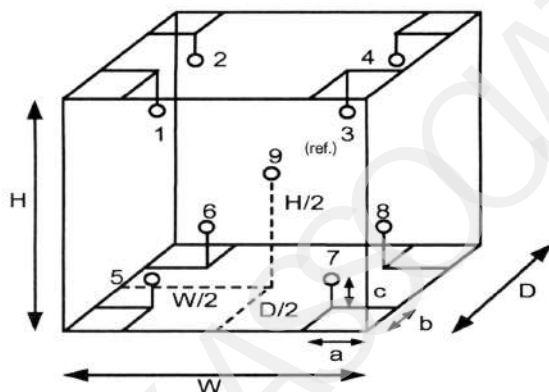
**Result of Calibration :-** ( \* ) Without Adjustment

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

**Fresh air setting :** Close

**Environment during calibration**

	Beginning	Finished
Temp. ( °C )	27	28
REL.Humid. ( % )	33	35
AC Supply ( Volt )	220	221



Position :	Ref. Std. ID No.:
1	18-20TC-01
2	18-20TC-02
3	18-20TC-03
4	18-20TC-04
5	18-20TC-05
6	18-20TC-06
7	18-20TC-07
8	18-20TC-08
9 (ref.)	18-20TC-09

**Probe Installation Details :**

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

**Dimension of Chamber :**

D = 0.33 m  
W = 0.40 m  
H = 0.40 m  
Capacity = 0.053 m<sup>3</sup>

*Handwritten signature and date: 21 Nov 2023*



Equipment : Hot Air Oven  
Condition As-Received : Used Item  
Reference : 2309-0046ON-4  
**Result of Calibration :-** ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source  
Fresh air setting : Close

Cert. No.: 23TM1281

Page : 3 of 3

Calibration Point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Temperature stability ( ± °C )	Temperature uniformity ( °C )	Overall Variation ( °C )	Coverage Factor <i>k</i>
180.0	180.0	180.0	0.20	1.1	1.3	2

Calibration Point ( °C )	Measured Temperature ( °C )									Uncertainty  ( ± °C )
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
180.0	179.898	179.804	180.204	180.201	180.382	180.332	179.654	180.272	180.552	1.1

**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-

  
21.08.16  


a 1179953

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. 0-2717-3000-29 FAX. 0-2719-9484



Cert. No.: 23TM1283

Page : 1 of 3

## Certificate of Calibration

**Equipment :** Incubator  
**Manufacturer :** Accuplus  
**Model :** i250-S  
**Serial No. :** 0408-0113-0001  
**ID No. :** -  
**Submitted by :** Emex Association Co.,Ltd.  
27,29 Soi Rama II, Soi 30,  
Bangmod, Jomthong,  
Bangkok 10150  
**Location :** ห้องปฏิบัติการ 9  
**Received Order :** 04 September 2023  
**Calibration Date :** 04 September 2023  
**Ambient Temperature :** ( 26 ± 10 ) °C  
**Relative Humidity :** ( 50 ± 30 ) %

**Calibrated by :** Preecha Hlahib

**Approved by :**

Approved Signatory

- ( ) Pornthippa Tameyakul  
( ) Ponpan Paipim  
(✓) Suwit Imjai

**Issue Date :** 15 September 2023

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.

A 0053635



Equipment : Incubator  
Condition As-Received : Used Item  
Reference : 2309-0046ON-6

Cert. No.: 23TM1283

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	Serial No.	Cert. No.	Traceable	Due Date
1 ) Data Acquisition	MY59003411	22LM165	TPA	26 Nov 2023

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

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

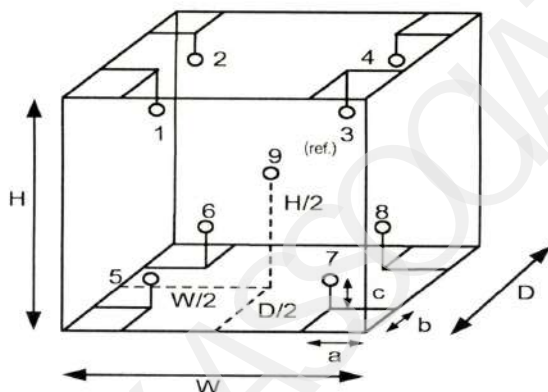
**Remark :** TPA : Technology Promotion Association ( Thailand - Japan )

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

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

**Fresh air setting :** Not Available

Environment during calibration		
	Beginning	Finished
Temp. ( °C )	26	25
REL.Humid. ( % )	44	46
AC Supply ( Volt )	221	221



Position :	Ref. Std. ID No.:
1	20RTD-2/1
2	20RTD-2/2
3	20RTD-2/3
4	20RTD-2/4
5	20RTD-2/5
6	20RTD-2/6
7	20RTD-2/7
8	20RTD-2/8
9 (ref.)	20RTD-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 = 0.50 m  
H = 1.0 m  
Capacity = 0.25 m<sup>3</sup>

*Handwritten signature and date: 21 Nov 11*





Equipment : Incubator  
Condition As-Received : Used Item  
Reference : 2309-0046ON-6  
Result of Calibration :- ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source  
Fresh air setting : Not Available

Cert. No.: 23TM1283

Page : 3 of 3

Calibration Point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Temperature stability ( ± °C )	Temperature uniformity ( °C )	Overall Variation ( °C )	Coverage Factor <i>k</i>
20.0	19.5	19.5	0.14	0.22	0.50	2

Calibration Point ( °C )	Measured Temperature ( °C )									Uncertainty  ( ±°C )
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
20.0	20.017	20.170	20.090	20.168	20.155	20.084	19.939	19.940	20.021	0.35

**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-

  
21.04.16  
Lem!

a 1179947

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. 0-2717-3000-29 FAX. 0-2719-9484



Cert.No.: 23CHO531

Page.: 1 of 2

## Certificate of Calibration

**Equipment :** pH Meter  
**Manufacturer :** Waterproof  
**Model :** AD 12  
**Serial No. :** 11002070410  
**ID No. :** pH No. 04  
**Condition As-Received:** Used Item  
**Received Date :** 04 September 2023  
**Calibration Date :** 06 September 2023  
**Reference :** 2309-0046ON-12  
**Submitted by :** Emex Association Co.,Ltd.  
27,29 Soi Rama II, Soi 30, Bangmod  
Jomthong, Bangkok 10150  
**Calibration Place :** Laboratory 7  
**Ambient Temperature :** (25.6 - 25.3) °C  
**Relative Humidity :** (51 - 53) %  
**Calibration Procedure :** In - house method :  
- CP-OCH2 by direct measurement with standard  
voltage calibrator and direct measurement  
with certified reference material (CRM)

**Calibrated by :** Uthen Kankawi

**Approved by :**

*Saithip*

Approved Signatory

- (☒) Saithip Meangmai  
( ) Warakorn Lerngagtrakul  
( ) Ponpan Paipim

**Issue Date :** 15 September 2023

**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.

*21.9.23*

A 0058290





Cert.No.: 23CHO531

Page.: 2 of 2

**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) Digital Thermometer	307901	70RC137	23I928	11 Aug 2024

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

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd.,  
ANSI-ASQ National Accreditation Board, Accredited No. AR-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	913598	14 July 2025
pH 6.986	CPA chem	863833	28 Dec 2023
pH 9.997	CPA chem	913600	14 July 2024

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

**Calibration Results**

**Function : pH Measurement**


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

<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 (<math>\pm</math>)</u>	<u>Coverage factor <math>k</math></u>
pH Electrode S/N.: 11002070410	*2.01	1.95	N/A	0.022	2.00
	4.008	4.00	N/A	0.0086	2.05
	6.986	6.98	N/A	0.011	2.00
	9.997	10.00	N/A	0.014	2.05

**Remark** - pH meter does not have voltage mode.  
- Can not connect the BNC because the plug does not match with the socket.  
- N/A = Not Available  
- \* = Not NSC-ONSC Accredited

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-

  
21.11.23  
Santhya

a 1179936

ใบรับรองการสอบเทียบ “ตู้เย็น”

(Calibration Certificate of Refrigerator)



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert. No.: 23TM1284

Page : 1 of 3

## Certificate of Calibration

**Equipment :** Refrigerator

**Manufacturer :** Accuplus

**Model :** P700

**Serial No. :** 0315-0004

**ID No. :** -

**Submitted by :** Emex Association Co.,Ltd.  
27,29 Soi Rama II, Soi 30,  
Bangmod, Jomthong,  
Bangkok 10150

**Location :** ห้องปฏิบัติการ 1

**Received Order :** 04 September 2023

**Calibration Date :** 05 September 2023

**Ambient Temperature :** ( 26 ± 10 ) °C

**Relative Humidity :** ( 50 ± 30 ) %

**Calibrated by :** Preecha Hlahib

**Approved by :**

Approved Signatory

- ( ) Pornthippa Tameyakul  
( ) Ponpan Paipim  
(✓) Suwit Imjai

**Issue Date :** 15 September 2023

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.

A 0053634





**Equipment :** Refrigerator  
**Condition As-Received :** Used Item  
**Reference :** 2309-0046ON-7

**Cert. No.:** 23TM1284

**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 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	MY59003411	22LM165	TPA	26 Nov 2023

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

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

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

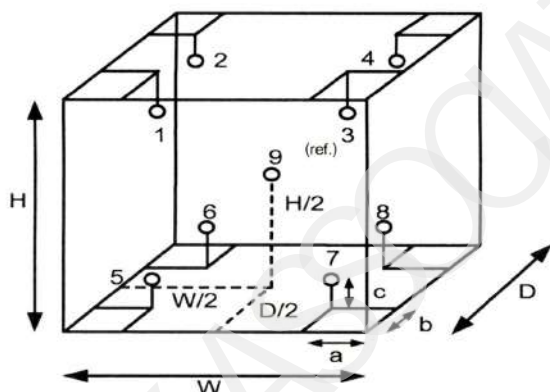
**Result of Calibration :-** ( \* ) Without Adjustment

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

**Fresh air setting :** Not Available

**Environment during calibration**

	Beginning	Finished
Temp. ( °C )	24	25
REL.Humid. ( % )	38	41
AC Supply ( Volt )	220	221



Position :	Ref. Std. ID No.:
1	18-20TC-01
2	18-20TC-02
3	18-20TC-03
4	18-20TC-04
5	18-20TC-05
6	18-20TC-06
7	18-20TC-07
8	18-20TC-08
9 (ref.)	18-20TC-09

**Probe Installation Details :**

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

**Dimension of Chamber :**

D = 0.52 m  
W = 1.0 m  
H = 1.2 m  
Capacity = 0.62 m<sup>3</sup>

*Handwritten signature and date: 21 Nov. 23*

a 0970370



Equipment : Refrigerator  
Condition As-Received : Used Item  
Reference : 2309-0046ON-7  
Result of Calibration :- ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source  
Fresh air setting : Not Available

Cert. No.: 23TM1284

Page : 3 of 3

Calibration Point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Temperature stability ( ± °C )	Temperature uniformity ( °C )	Overall Variation ( °C )	Coverage Factor <i>k</i>
3.0	3.0	5.3	1.3	1.7	2.9	2.05

Calibration Point ( °C )	Measured Temperature ( °C )									Uncertainty  ( ± °C )
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
3.0	1.921	2.049	1.428	1.813	1.889	2.438	1.897	2.239	1.575	3.3

**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-

  
21.8.2023  
Gaut

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. 0-2717-3000-29 FAX. 0-2719-9484



Cert. No.: 23TM718

Page : 1 of 3

## Certificate of Calibration

**Equipment :** Water Bath  
**Manufacturer :** M-LAB  
**Model :** WBN 30 SC  
**Serial No. :** 0336  
**ID No. :** 0408-0102-09  
**Submitted by :** Emex Association Co.,Ltd.  
27,29 Soi Rama II, Soi 30,  
Bangmod, Jomthong,  
Bangkok 10150  
**Location :** LABORATORY 8  
**Received Order :** 04 September 2023  
**Calibration Date :** 04 September 2023  
**Ambient Temperature :** ( 26 ± 10 ) °C  
**Relative Humidity :** ( 50 ± 30 ) %  
**Calibrated by :** Khit Ruttanaprapachai

**Approved by :**

Approved Signatory

- ( ) Pornthippa Tameyakul  
( ) Ponpan Paipim  
(✓) Suwit Imjai

**Issue Date :**

15 September 2023

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.

A 0053639



Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2309-00460N-2

Cert. No.: 23TM718

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>Serial No.</u>	<u>Cert. No.</u>	<u>Traceable</u>	<u>Due Date</u>
1 ) Data Acquisition	MY49001451	23LM27	TPA	25 Feb 2024

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

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

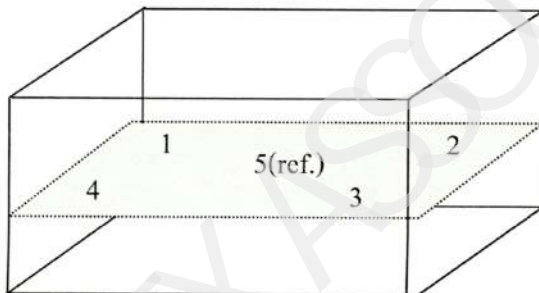
**Remark :** TPA : Technology Promotion Association ( Thailand - Japan )

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

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

**Heat transfer medium used :** Water

	<u>Environmental</u>		<u>AC Voltage Supply</u>
	( °C )	( %R.H. )	( Volt )
Beginning of Calibration	26	49	221
Finished of Calibration	27	52	221



Front

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

21 Nov. 66  
Lant



Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2309-0046ON-2  
Result of Calibration :- ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source

Cert. No.: 23TM718

Page : 3 of 3

Calibration point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Average* Standard Reading ( °C )					Uncertainty  ( ± °C )
			Position					
			1	2	3	4	5 (ref.)	
85.0	85.0	85.0	84.970	84.997	85.009	84.995	85.012	0.18

Calibration point ( °C )	Uniformity ( °C )	Stability ( ± °C )	Coverage Factor <i>k</i>
85.0	0.15	0.11	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-

  
at 11.4.16  
Sevent

a 1179958