

## ภาคผนวกที่ 4

---

ใบรับรองการสอบเทียบเครื่องมือ

## Certificate of Calibration

**Certificate No. :** 66-200067-1

**Page : 1 of 2**

**Submitted by :** M E T Company Limited

36/659 Moo 6, T. Bangrakpattana, A. Bangbuatong, Nonthaburi 11110

**Equipment :** Electronic Balance

**Manufacturer :** METTLER TOLEDO **Model :** AG285

**Serial No. :** 1122140126 **ID No. :** MET-EB01/46

**Capacity :** 210 g **Resolution :** 0.00001g/81g, 0.0001g/210g

**Environment :** On site calibration was carried out at the Laboratory, M E T Company Limited

**Ambient Temperature :** (26.4 to 26.8) °C

**Relative Humidity :** (54.9 to 58.8) %

**Air Pressure :** 1013.0 mbar

**Date of Received :** 02 March 2023

**Date of Calibration :** 02 March 2023

**Date of Issue :** 13 March 2023

**Calibrated by :** Akaradath Thippichai

**Calibration Method :** In-house method CAL-M2001 based on UKAS Publication ref : LAB 14

Edition 7 - November 2022

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

Standard Weights

ID No.	Cert. No.	Due Date	Traceability
E261-E2624	C02222345	10 Nov 2023	National Institute of Metrology (Thailand), (NIMT)

Approved by :

Laboratory Manager

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 Calibratech Co.,Ltd.



## Certificate of Calibration

**Certificate No. : 66-200067-1**

**Page : 2 of 2**

**Result of Calibration :** Without Adjustment

**UUC Condition As-Received :** Good

Departure of indication from nominal value

Nominal Value (g)	Correction (g)	Uncertainty $\pm$ (g)
0.01	0.00001	0.000020
0.1	0.00000	0.000019
1	-0.00002	0.000031
5	-0.00004	0.000043
10	-0.00008	0.000054
20	-0.00027	0.000071
50	-0.00059	0.00011
100	-0.0009	0.00023
150	-0.0012	0.00038
200	-0.0019	0.00040

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

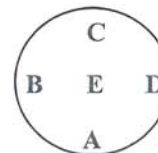
This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor  $k = 2.43$ , providing a level of confidence of approximately 95%

Eccentric error

Load test : 50 g

A B C D E

0.00055 0.00027 -0.00015 -0.00018 0.00000 g



Repeatability

Load test : 200 g

Stdev. : 0.000053 g

- o0o -



## Certificate of Calibration

**Certificate No. :** 64-400425-5

**Page : 1 of 2**

**Submitted by :** M E T Company Limited  
36/659 Moo 6, T.Bangrakpattana, A.Bangbuatong, Nonthaburi 11110

**Equipment :** Air Chamber (Incubator)  
Manufacturer : M-LAB Model : BIC-140  
Range : N/A °C Resolution : 0.1 °C  
Serial No. : 240412 ID No. : MET-BI01/55

**Environment :** On site calibration was carried out at the Laboratory, M E T Company Limited  
Ambient Temperature : (27.0 to 28.0) °C  
Relative Humidity : (50 to 55) %  
Line Voltage : (210.0 to 210.8) V

**Date of Received :** 10 August 2022

**Date of Calibration :** 10 August 2022

**Date of Issue :** 13 August 2022

**Calibrated by :** Permpoon Chanpu

**Calibration Method :** CAL-M4004, TLAS G-20  
The temperature scale used was based on ITS-90

**Reference Standard Instruments :** This certification is traceable to the International System of Units  
Standard Digital Thermometer with Thermocouple probe

ID No.	Cert. No.	Due Date	Traceability
400029 & 400032	65-400274-1	25 Nov 2022	National Institute of Metrology Thailand (NIMT)

Approved by :



Supervisor

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 Calibratech Co.,Ltd.





## Certificate of Calibration

Certificate No. :64-400425-5

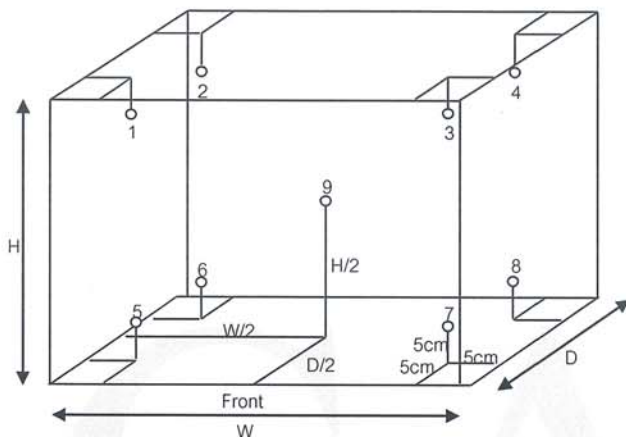
Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

This instrument was setting air ventilation at position 0 (close)



Inside of Chamber

W = 0.37 m

D = 0.33 m

H = 1.14 m

Capacity = 0.14 m<sup>3</sup>

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Temperature (°C) @ Sensor No.									Uncertainty (± °C)
			1	2	3	4	5	6	7	8	9	
20.0	20.0	20.0	19.8	19.7	19.6	19.6	20.4	20.2	20.3	19.8	19.9	0.54

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)
20.0	20.0	20.0	0.6	0.1	1.0

**Remark** The uncertainty is not combine uniformity of the air chamber

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

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

- o0o -



## Certificate of Calibration

**Certificate No. :** 66-420002-1

**Page : 1 of 2**

**Submitted by :** M E T Company Limited

36/659 Moo 6, T.Bangrakpattana, A.Bangbuatong, Nonthaburi 11110

**Equipment :** pH Meter with electrode

pH meter

Manufacturer : Eutech

Model : pH 150

Range : -2.00 to 16.00 pH

Resolution : 0.01 pH

Serial No. : 2657036

ID No. : MET-PH04/60

Electrode

Model : N/A

Serial No. : 66365

**Environment :** Ambient Temperature :  $(25 \pm 2) ^\circ \text{C}$

Relative Humidity :  $(50 \pm 15) \%$

**Date of Received :** 05 January 2023

**Date of Calibration :** 11 January 2023

**Date of Issue :** 11 January 2023

**Calibrated by :** Bunjerd Masri

**Calibration Method :** In-house method CAL-M4201 direct measurement by using standard voltage calibrator and using certified reference material (CRM)

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

### 1. Multiproduct Calibrator

<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>	<u>Traceability</u>
440001	21E997	17 Mar 2023	National Institute of Metrology Thailand (NIMT)

### 2. Standard Buffer Solution

<u>pH</u>	<u>Cert. No.</u>	<u>Lot No.</u>	<u>Exp. Date</u>	<u>Traceability</u>
4.008	61235182	857394	11 Dec 2024	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
6.986	61267169	857395	11 Dec 2023	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
10.010	61260481	857396	11 Dec 2023	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025

Approved by :

Supervisor

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 Calibratech Co.,Ltd.



## Certificate of Calibration

**Certificate No. : 66-420002-1**

**Page : 2 of 2**

**Result of Calibration :**

**UUC Condition As-Received :** Good

**Function :** Electrical measurement

pH meter

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

Adjustment Curve at nominal pH	Applied Voltage ( mV )	Nominal Value ( pH )	UUC Reading		Correction ( mV )	Uncertainty ( ± mV )
			( pH )	( mV )		
4, 7, 10	177.4800	4	4.00	177.1	0.4	0.060
	0.0000	7	6.99	-0.1	0.1	0.060
	-177.4800	10	10.00	-177.3	-0.2	0.060

**Function :** pH meter with electrode

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

Adjustment Curve at nominal pH	Standard Buffer ( pH )	UUC Reading ( pH )	Correction ( pH )	Uncertainty ( ± pH )
4, 7, 10	4.008	4.01	0.00	0.0097
	6.986	7.00	-0.01	0.011
	10.010	10.01	0.00	0.014

Remark

UUC : Unit Under Calibration

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

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

- ๐0๐ -





## Certificate of Calibration

**Certificate No. :** 65-400424-2

**Page : 1 of 2**

**Submitted by :** M E T Company Limited  
36/659 Moo 6, T.Bangrakpattana, A.Bangbuatong, Nonthaburi 11110

**Equipment :** Air Chamber (Oven)  
Manufacturer : Binder Model : ED53  
Range : N/A °C Resolution : 1 °C  
Serial No. : 13-07419 ID No. : MET-OV02/57

**Environment :** On site calibration was carried out at the Laboratory, M E T Company Limited  
Ambient Temperature : (27.0 to 28.0) °C  
Relative Humidity : (50 to 55) %  
Line Voltage : (210.0 to 210.8) V

**Date of Received :** 10 August 2022

**Date of Calibration :** 10 August 2022

**Date of Issue :** 13 August 2022

**Calibrated by :** Permpon Chanpu

**Calibration Method :** CAL-M4004, TLAS G-20  
The temperature scale used was based on ITS-90

**Reference Standard Instruments :** This certification is traceable to the International System of Units  
Standard Digital Thermometer with Thermocouple probe

ID No.	Cert. No.	Due Date	Traceability
400029 & 400030	65-400272-1	24 Nov 2022	National Institute of Metrology Thailand (NIMT)

Approved by :

Supervisor

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 Calibratech Co.,Ltd.





## Certificate of Calibration

**Certificate No. : 65-400424-2**

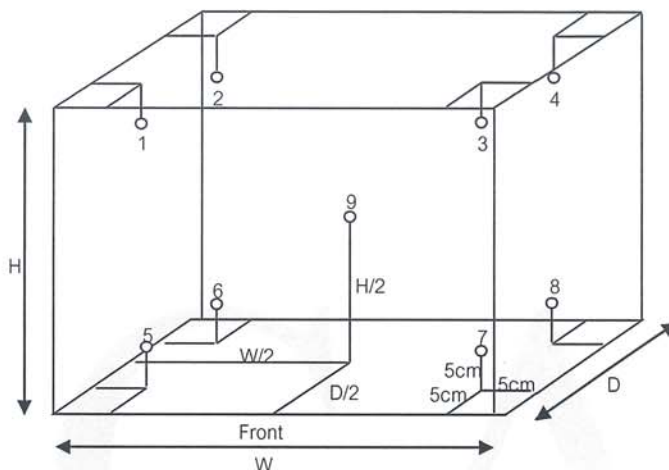
**Page : 2 of 2**

**Result of Calibration :** Without Adjustment

**UUC Condition As-Received :** Good

**Function :** Temperature measurement

This instrument was setting air ventilation at position 0 (close)



Inside of Chamber

W = 0.40 m

D = 0.33 m

H = 0.40 m

Capacity = 0.05 m<sup>3</sup>

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Temperature (°C) @ Sensor No.									Uncertainty (± °C)
			1	2	3	4	5	6	7	8	9	
104	110	110	105.0	105.0	104.7	105.0	104.4	104.5	104.0	103.7	104.2	0.95
180	184	184	180.8	182.0	179.4	180.8	180.8	180.8	180.3	180.0	180.0	1.2

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)
104	110	110	1.0	0.2	1.7
180	184	184	2.3	0.3	3.0

**Remark** The uncertainty is not combine uniformity of the air chamber

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

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

- o0o -



## Certificate of Calibration

**Certificate No. :** 65-400424-3

**Page : 1 of 2**

**Submitted by :** M E T Company Limited

36/659 Moo 6, T.Bangrakpattana, A.Bangbuatong, Nonthaburi 11110

**Equipment :** Air Chamber (Refrigerator)

Manufacturer : Sanden Intercool

Model : YPR-068S

Range : N/A °C

Resolution : 1 °C

Serial No. : YPR0659S-141200060R

ID No. : MET-RE03/59

**Environment :** On site calibration was carried out at the Laboratory, M E T Company Limited

Ambient Temperature : (29.8 to 31.5) °C

Relative Humidity : (55 to 58) %

Line Voltage : (220.8 to 222.8) V

**Date of Received :** 10 August 2022

**Date of Calibration :** 10 August 2022

**Date of Issue :** 13 August 2022

**Calibrated by :** Bunjerd Masri

**Calibration Method :** CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

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

Standard Digital Thermometer with Thermocouple probe

ID No.

Cert. No.

Due Date

Traceability

400046 & 400023

65-400157-1

02 Oct 2022

National Institute of Metrology Thailand (NIMT)

Approved by :

Supervisor

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 Calibratech Co.,Ltd.



## Certificate of Calibration

**Certificate No. : 65-400424-3**

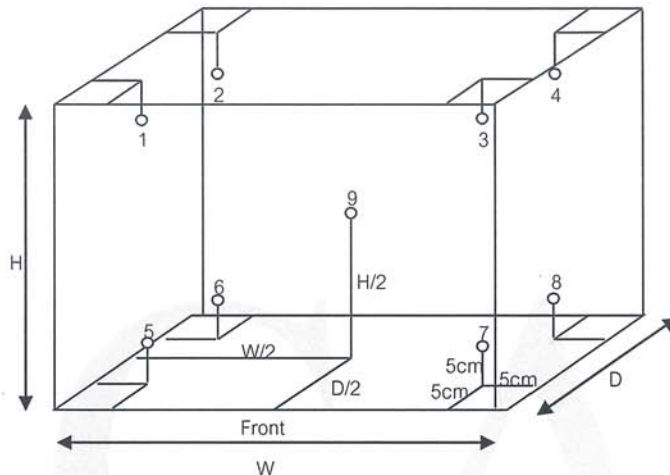
**Page : 2 of 2**

**Result of Calibration :** Without Adjustment

**UUC Condition As-Received :** Good

**Function :** Temperature measurement

This instrument was setting air ventilation at position 0 (close)



Inside of Chamber

W = 0.58 m

D = 0.60 m

H = 1.45 m

Capacity = 0.50 m<sup>3</sup>

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Temperature (°C) @ Sensor No.									Uncertainty (± °C)
			1	2	3	4	5	6	7	8	9	
3	2	2	3.7	3.7	4.0	3.7	3.0	3.5	2.8	3.4	2.9	0.84

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)
3	2	2	1.2	0.2	1.5

**Remark** The uncertainty is not combine uniformity of the air chamber

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

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

- o0o -

