

ภาคผนวกที่ 4

ใบรับรองการสอบเทียบเครื่องมือ

CAL

Calibratech Co.,Ltd.

7/106-7 Moo 2, Sukhprachasri 3 Rd., Bangpoo, Pakkred, Nonthaburi 11120

Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech_cal@yahoo.com, calibratech_cal@hotmail.com

NSC-TIS-TIS 17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 67-420025-1

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 : Thermo Scientific Model : pH 150

Range : N/A pH Resolution : 0.01 pH

Serial No. : 2943538 ID No. : MET-PH06/63

Electrode

Model : N/A Serial No. : 66365

Environment : Ambient Temperature : $(25 \pm 2) ^\circ \text{C}$ Relative Humidity : $(50 \pm 15) \%$

Date of Received : 22 February 2024

Date of Calibration : 29 February 2024

Date of Issue : 29 February 2024

Calibrated by : Permpon Chanpu

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

ID No.	Cert. No.	Due Date	Traceability
440001	23E1240	24 Mar 2025	National Institute of Metrology Thailand (NIMT)

2. Standard Buffer Solution

pH	Cert. No.	Lot No.	Exp. Date	Traceability
4.008	61293328	944535	27 Nov 2025	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
6.986	61281486	944537	17 Nov 2024	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
9.997	61281073	944536	17 Nov 2024	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025

Approved by

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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CAL-F0031-03

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Certificate of Calibration

Certificate No. : 67-420025-1

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 (\pm mV)
			(pH)	(mV)		
4, 7, 10	177.4800	4	4.00	177.4	0.1	0.060
	0.0000	7	7.00	0.0	0.0	0.060
	-177.4800	10	10.00	-177.5	0.0	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 (\pm pH)
4, 7, 10	4.008	4.01	0.00	0.0097
	6.986	7.00	-0.01	0.011
	9.997	10.01	-0.01	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%

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Certificate of Calibration

Certificate No. : 66-400618-3

Page : 1 of 2

Submitted by :

M E T Company Limited

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

Equipment :

Digital Thermometer with Thermistor probe

Temperature Indicator

Manufacturer : Eutech

Model : pH700

Range : N/A °C

Resolution : 0.1 °C

Serial No. : 678296

ID No. : MET-pH02/54

Thermistor probe

Model : N/A

Sheath Material : Stainless

Diameter : 3 mm.

Length : 120 mm.

Serial No. : 13-620-21

ID No. : MET-pH02/54

Environment :

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

Ambient Temperature : (24.8 to 25.7) °C

Relative Humidity : (55 to 60) %

Line Voltage : (224.5 to 225.0) VAC

Date of Received :

07 November 2023

Date of Calibration :

07 November 2023

Date of Issue :

11 November 2023

Calibrated by :

Permpon Chanpu

Calibration Method :

This instrument was calibrated by In-house method comparison technique CAL-M4003

by compared with PRT in the dry-well calibrator at the constant controlled temperature.

The temperature scale used was based on ITS-90

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

1. Platinum Resistance Thermometer (PRT)

ID No.

Cert. No.

Due Date

Traceability

400002

TT-0074-22

20 Jun 2024

National Institute of Metrology Thailand (NIMT)

2. Standard Digital Thermometer

ID No.

Cert. No.

Due Date

Traceability

400033

22E569

22 Feb 2024

National Institute of Metrology Thailand (NIMT)

Approved by

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 66-400618-3

Page : 2 of 2

Result of Calibration :

Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

Immersion Depth (mm.)	Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
120	10.003	9.8	0.2	0.19
120	30.004	30.0	0.0	0.19
120	50.002	50.2	-0.2	0.19

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%

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Certificate of Calibration

Certificate No. : 67-200064-2

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 : AND Model : FX-2000i
Serial No. : 15639789 ID No. : MET-EB03/61
Capacity : 2200 g Resolution : 0.01 g

Environment : On site calibration was carried out at the Laboratory, M E T Company Limited
Ambient Temperature : (25.8 to 26.0) °C
Relative Humidity : (60.8 to 61.2) %
Air Pressure : 1012.0 mbar

Date of Received : 22 February 2024

Date of Calibration : 22 February 2024

Date of Issue : 23 February 2024

Calibrated by : Satja Sangkhum

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
F161-F1821	67-210024-1	29 Jul 2024	National Institute of Metrology (Thailand), (NIMT)

Approved by :

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 67-200064-2

Page : 2 of 2

Result of Calibration : After Adjustment

UUC Condition As-Received : Good

Departure of indication from nominal value

Nominal Value (g)	Correction (g)	Uncertainty ± (g)	Error before Adjustment (g)
200	0.00	0.010	0.00
500	0.00	0.011	0.01
600	0.00	0.011	0.01
700	0.00	0.011	0.02
800	0.00	0.011	0.02
1000	0.00	0.011	0.03
1200	0.00	0.012	0.04
1500	0.00	0.012	0.05
2000	-0.01	0.014	0.08
2200	-0.01	0.023	0.09

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 $k = 2.06$,
providing a level of confidence of approximately 95%

Eccentric error Load test : 500 g
A B C D E
0.00 -0.01 -0.02 -0.01 0.00 g



Repeatability Load test : 2000 g
Stdev. : 0.004 g

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NSC-TISI-TIS 17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 66-400619-1

Page : 1 of 2

Submitted by :

MET Company Limited

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

Equipment :

Air Chamber (Refrigerator)

Manufacturer : Sanden Interecool

Model : SRC-680SRTM

Range : N/A °C

Resolution : 1 °C

Serial No. : SRC680201-1107-00165

ID No. : MET-RE 01/54

Environment :

On site calibration was carried out at the Laboratory, MET Company Limited

Ambient Temperature : (29.0 to 30.0) °C

Relative Humidity : (55 to 60) %

Line Voltage : (226.5 to 228.2) V

Date of Received :

07 November 2023

Date of Calibration :

07 November 2023

Date of Issue :

11 November 2023

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 RTD Probe

ID No.

Cert. No.

Due Date

Traceability

400046 & 400042 66-400453-1

31 Jan 2024

National Institute of Metrology Thailand (NIMT)

Approved by :

Laboratory Manager

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Certificate of Calibration

Certificate No. : 66-400619-1

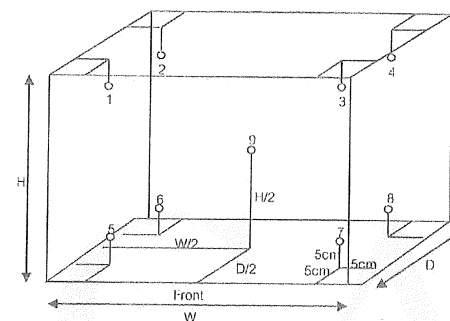
Page : 2 of 2

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 = 1.35 m

Capacity = 0.47 m³

Test Point	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	3.84	3.95	3.07	3.10	3.47	3.74	3.67	3.90	2.93	0.75

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)
3	2	2	1.09	0.17	1.31

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%

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Certificate of Calibration

Certificate No. : 66-400476-1

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 : Memmert

Model : UM 100

Range : N/A °C

Resolution : 0.1 °C

Serial No. : b197.0985

ID No. : MET-OV01/46

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

Ambient Temperature : (31.0 to 32.0) °C

Relative Humidity : (55 to 60) %

Line Voltage : (210.0 to 210.8) V

Date of Received : 23 August 2023

Date of Calibration : 23 August 2023

Date of Issue : 23 August 2023

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 & 400032 66-400228-1 25 Oct 2023 National Institute of Metrology Thailand (NIMT)

Approved by :

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 66-400476-1

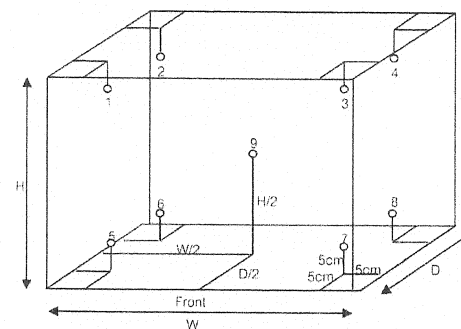
Page : 2 of 2

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 = 0.32 m
D = 0.18 m
H = 0.24 m
Capacity = 0.01 m³

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	
180.0	180.0	180.0	181.7	180.1	180.5	180.7	181.5	181.7	181.3	181.4	180.1	0.95

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)
180.0	180.0	180.0	1.7	0.2	2.0

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%

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CAL-F0031-03

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NSC-TISI-TIS17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 66-400476-2

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 : (31.0 to 32.0) °C

Relative Humidity : (55 to 60) %

Line Voltage : (210.0 to 210.8) V

Date of Received : 23 August 2023

Date of Calibration : 23 August 2023

Date of Issue : 23 August 2023

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 66-400227-1 24 Oct 2023

National Institute of Metrology Thailand (NIMT)

Approved by

Supervisor

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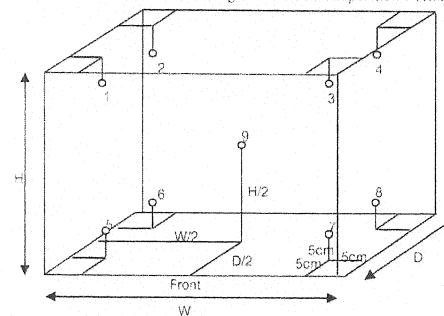
Page : 2 of 2

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 m³

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	105.0	104.9	103.9	103.9	104.2	104.2	104.2	0.94
180	184	184	180.1	181.9	180.8	179.7	180.2	180.8	180.7	180.8	180.2	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	1.3
180	184	184	1.9	0.3	2.7

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%

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