

ภาคผนวก จ
เอกสารสอบเทียบเครื่องมือที่ใช้ในการตรวจวิเคราะห์



List of Instruments Certification for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
Equipment for Water Quality Analysis									
1	pH Meter	pH	Mettler-Toledo	Seven Easy S20 / 1231155210	National Food Institute, Ministry of Industry, Thailand	2403718-001-01	11 Mar 24	10 Mar 25	-
2	Incubator	Standard Plate count Coliform Bacteria	Binder	K0400 / 2020000015535	Technology Promotion Association (Thailand-Japan)	24TM617	1 Apr 24	31 Mar 25	-
3	Incubator	E. Coli	Memmert	IPP 260 / W616.0066	Technology Promotion Association (Thailand-Japan)	24TM650	2 Apr 24	1 Apr 25	-
4	Water Bath	Legionella sp.	Memmert	WNE 14 / L416.0606	Technology Promotion Association (Thailand-Japan)	24TM29	10 Feb 24	8 Feb 25	-
5	Water Bath		Memmert	WNE 14 / L416.0612	Technology Promotion Association (Thailand-Japan)	24TM30	10 Feb 24	8 Feb 25	-
6	Auto Clave		ALP	CL-40L / 807298	National Food Institute, Ministry of Industry, Thailand	2403982-001-01	7 Aug 24	6 Aug 25	-
7	Auto Clave		ALP	CL-40L / 808763	National Food Institute, Ministry of Industry, Thailand	2402281-001-01	2 Apr 24	1 Apr 25	-
8	Analytical Balance		OHAUS	PX623 / C236754745	DKSH (Thailand) Ltd.	2402419-001-01	19 Apr 24	19 Apr 25	-

Due Date of Calibration* : Based on the annual calibration plan. At least 1 time per year.

Calibration Certificate

Certificate No.: 2401719-001-01
Client name: UNIT80 ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Set Udomsuk 41, Sukhumvit Road,
Bangnaeok, Prathanon, Bangkok 10260

Page 1 of 1

Equipment: pH Meter
Manufacturer: METTLER TOLEDO
Model: SevenEasy pH
Serial No.: 1231156210
ID No.: UAE.WAT.010Q2553
Order No.: 2401719
Operation No.: 2401719-001
Date of Receipt: 27 February 2024
Date of Calibration: 11 March 2024

Calibrated by: **Wanwan Somsak** Approved by: **[Signature]**

Date of Issue: 12 March 2024

The uncertainties are for a confidence probability of approximately 95%.

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

FC-012 Revision 01 Date: 20-04-05



Calibration Report

Certificate No.: 2401719-001-01
Equipment: pH Meter
Manufacturer: METTLER TOLEDO
Model: SevenEasy pH
Serial No.: 1231156210
ID No.: UAE.WAT.010Q2553

Page 2 of 5

Date of Calibration: 11 March 2024
Location: Chemical Calibration Laboratory, National Food Institute
Environment Condition: Ambient Temperature: (23.4 ± 1.5) °C Relative Humidity: (51 ± 0.5) %
Condition of Equipment: Good Condition
Condition of the Results of Calibration:

1. Calibration Method: V-CE-025: In-house method based on direct measurement by using standard voltage calibration and certified reference material (CRM).
2. Reference Standard Instrument / Certified Reference Material:

Instrument	Model / ID No.	Manufacturer	Certificate No.	Due Date
2.1 DC Voltage Calibrator	270007	Fluke	2301003	14 June 2024
2.2 Digital Thermometer	270007	Fluke	CC 00020-01	30 October 2024
2.3 Thermopile Meter	09187401023	Umet	OC 00024-01	3 April 2024
Certified Reference Material				
2.4 pH buffer 4.006 (Primary pH buffer Solution)	000042	CPAchem	PH00415	12 April 2025
2.5 pH buffer 6.86 (Primary pH buffer Solution)	000043	CPAchem	PH00416	12 April 2025
2.6 pH buffer 10.01 (Primary pH buffer Solution)	000044	CPAchem	PH00417	12 April 2025
2.7 pH buffer 7.00 (Universal pH buffer Solution)	000008	HACH-LANOE GmbH	2104004	30 October 2024

3. This certificate is traceable to the International System of Units (SI Units).

- 3.1 Indirectly to NIST 7.1 Through: NIST-1161-176 11622 Laboratory Accreditation of Calibration No. 0008
- 3.2 Indirectly to NIST 2.3 and 2.5 Through: NIST-1161-176 11622 Laboratory Accreditation of Calibration No. 0001
- 3.3 Certified Reference Material NIST 2.4 to 2.6 Indirectly to Primary measurement method (NIST) Method 201 using calibrated commercial thermometer and measurement. The Standard Solution preparation and certified by CPAchem is also accredited to ISO 17024 and ISO/IEC 17025
- 3.4 Certified Reference Material NIST 2.7 Indirectly to: NIST Certificate No. 01201014-00020002000 and Certificate No. 01201014-00020002000 (PTB) Physikalisch-Technische Bundesanstalt (Braunschweig, Germany)

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

5. The result of calibration was found accurate as shown in this and place of calibration only.

FC-012 Revision 01 Date: 20-04-05



Calibration Report

Certificate No.: 2401719-001-01
Equipment: pH Meter
Manufacturer: METTLER TOLEDO
Model: SevenEasy pH
Serial No.: 1231156210
ID No.: UAE.WAT.010Q2553

Date of Calibration: 11 March 2024 Page 2 of 5

Calibration Results: 1. Calibration of pH Meter (Ambient Temperature Compensation of 25 °C)
(Before value before 0.000: -0.4 mV)

Measured pH	DC Voltage Standard (mV)	Average Indicator Reading (mV)	Uncertainty (mV)	Coverage Factor (k)
0	414.124	494	0.50	2.00
3	286.814	208	0.50	2.00
4	172.484	170	0.50	2.00
6	59.100	58	0.50	2.00
7	0.294	0	0.50	2.00
8	-46.150	-50	0.50	2.00
10	-172.461	-177	0.50	2.00
12	-240.011	-236	0.50	2.00
14	-416.136	-414	0.50	2.00

2. Calibration of pH Meter with Electrode (Ambient Temperature Compensation of 25 °C)

Equipment: pH Electrode Type: Combined Electrode
Manufacturer: METTLER TOLEDO Model: InLab Style
Serial No.: 3045791 ID No.: 214

Performance of Electrode system (Thermo-Potential Calibration at pH 4, 7 and 10)

Calibrator Value (25 °C (pH))	Average Indicator Reading		Relative Error (%)	Repeatability (± mV)	Coverage Factor (k)
	pH	mV			
4.006	4.01	108	0.0271	2.00	
7.004	7.00	13	0.0096	2.00	
10.019	10.01	-108	0.0085	2.00	
8.005	8.02	21	0.0079	2.00	

FC-012 Revision 01 Date: 20-04-05



Calibration Report

Certificate No.: 2401719-001-01
Equipment: Digital Thermometer with RTD (pH Meter)
Resolution: 0.1 °C Model: SevenEasy pH
Serial No.: 1231156210 ID No.: UAE.WAT.010Q2553
Manufacturer: METTLER TOLEDO

Date of Calibration: 11 March 2024 Page 4 of 1

Location: Chemical Calibration Laboratory, National Food Institute
Environment Condition: Ambient Temperature: 21 °C ± 1 °C
Relative Humidity: 51 % ± 2 %

Condition of the Results of Calibration:

- 1. Calibration Method: - In-house method, V-TE-025 by comparison with standard thermometer
- The Calibration is determined by comparing with a known temperature from a standard reference thermometer.
- The temperature scale in use at the laboratory is the International Temperature scale of 1990 (ITS-90).

2. Reference Standard Instrument:

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
HANNA HD 11000000000000000000	1175	2118154	POL-T 000200	05-Jun-24	10/10
Platinum Resistance Thermometer (PRT)	5672A	07332			

Support Equipment: - Low Temperature Bath (BIOCAL-8), Model: Europa-8 Plus Series, Ser: 3410020

3. This certificate is traceable to International System of Units (SI Units).

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

5. The result of calibration was found accurate as shown in this and place of calibration only.

6. Condition of Calibration Item: Good

7. Status of Calibration: ☒ Without adjustment ☐ After adjustment

FC-012 Revision 01 Date: 20-04-05





มูลนิธิพัฒนาชุมชนและสังคม
Foundation for Industrial Development
Food Industrial Laboratory Service Center



Calibration Report

Certificate No.:

2481713-001-01

Equipment:

Digital Thermometer with RTD (pH Meter)

Resolution: 0.1 °C Model: SevenEasy pH

Serial No.: 1231182248 ID No.: UAE/RCT/6102553

Manufacturer: BRUNNER-LOREO

Date of Calibration:

11 March 2024

Page 9 of 8

Calibration point:

15.0, 21.0 and 35.0 °C

Calibration result:

- The probe was immersed in liquid bath or dry bath to a minimum depth of 100 mm.
- Description of probe: model: HSA SN: 364
- Dimension of probe: Diameter: 4 mm, Length: 120 mm.
- Sheath material: Stainless Steel

UUC Reading (°C)	Standard Temperature (°C)	Correction Value (°C)	Uncertainty ± (°C)
15.1	15.000	0.1	0.000
25.1	25.000	0.1	0.000
35.1	35.000	0.1	0.000

Notes:

- UUC: Unit Under Calibration

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

----- End -----

F-CB-012 Revision: 01 Date: 2024-05





Certificate of Calibration

Cert. No.: 24TH647
Page : 1 of 3

Equipment : Incubator
Manufacturer : Binder
Model : KB 400 E8
Serial No. : 2020000015535
ID No. : UAE.MIC.0182564
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
3 Sai Udonnak 41, Sukhumvit Road,
Bangkok, Phrakhanong,
Bangkok 10260
Location : Microbiology Laboratory (302)
Received Order : 01 April 2024
Calibration Date : 01 April 2024
Ambient Temperature : $(26 \pm 10) ^\circ\text{C}$
Relative Humidity : $(50 \pm 30) \%$

Calibrated by : Min Paitanontapoboon

Approved by :

() Ponpan Palpin
(✓) Suwit Injai
() Kanchit Promprut

Issue Date : 7 April 2024

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 & Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2404-0003DC-6
Procedure Used :-

Cert. No.: 24TH647
Page : 2 of 3

Calibration were conducted using calibration procedure CP-0702 based on TLAS G-20 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	MY49023932	23LM122	TPA	26 Jul 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.

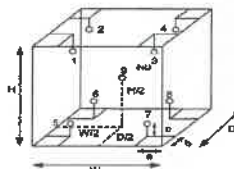
Remark : TPA : Technology Promotion Association (Thailand - Japan.)

Result of Calibration :- (✓) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. (°C)	24	24
REL Humid. (%)	56	67
AC Supply (Volt)	221	223



Probe Installation Details :

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

Dimension of Chamber :

D = 0.48 m
W = 0.65 m
H = 1.2 m
Capacity = 0.37 m³

Position :	Ref. Std. ID No.:
1	20-16RTD-01
2	20-16RTD-02
3	20-16RTD-03
4	20-16RTD-04
5	22-16RTD-05
6	20-16RTD-06
7	20-16RTD-07
8	22-16RTD-08
9 (ref.)	22-16RTD-09

เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2404-0003DC-6
Result of Calibration :- (✓) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 24TH647
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
35.0	35.0	35.0	0.035	0.19	0.22	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (±°C)
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
35.0	35.000	35.022	34.841	34.851	35.027	35.011	35.023	35.028	35.007	0.30

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 %.

-00-

เอกสารไม่ควบคุม



Certificate of Calibration

Cert. No.: 24TM650
Page: 1 of 3

Equipment : Incubator
Manufacturer : Memmert
Model : IFF 260
Serial No. : V018.0063
ID No. : UAE.MC.032/2599
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsak 41, Sukhumvit Road,
Bangkok, Phraekhenong,
Bangkok 10260
Location : Microbiology Laboratory (302)
Received Order : 01 April 2024
Calibration Date : 02 - 03 April 2024
Ambient Temperature : $(26 \pm 10) ^\circ\text{C}$
Relative Humidity : $(50 \pm 30) \%$
Calibrated by :
Approved by :
() Ronpan Paiphan
(✓) Sumi Injai
() Kunchit Phonprai

Issue Date : 7 April 2024

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2404-0003OC-2
Procedure Used :>

Cert. No.: 24TM650
Page: 2 of 3

Calibration was conducted using calibration procedure CP-QT02 based on TLAS G-20 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 the result of calibration

1. Reference standard (Instrument)

Instrument Serial No. Cert. No. Traceable Due Date
1) Data Acquisition MY48023632 23LM122 TPA 28 Jul 2024

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

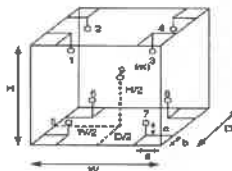
3. This certificate is traceable to the International System of Unit.

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

Result of Calibration : () Without Adjustment

Function of UUC : Temperature Source

Fresh air setting : Close



Probe Installation Details :

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

Dimension of Chamber :

D = 0.50 m
W = 0.54 m
H = 0.50 m
Capacity = 0.25 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	25	25
REL Humid. (%)	67	54
AC Supply (Volt)	221	222

Position :	Ref. Std. ID No.:
1	19-16RTD-01
2	19-16RTD-02
3	19-16RTD-03
4	19-16RTD-04
5	19-16RTD-05
6	19-16RTD-06
7	21-16RTD-07
8	19-16RTD-08
9 (ref.)	19-16RTD-09

เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2404-0003OC-2
Result of Calibration : () Without Adjustment
Function of UUC : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM650
Page: 3 of 3

Calibration Point (°C)	UUC* Reading (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor K
20.0	25.0	25.0	0.063	0.78	1.3	2
30.0	30.0	30.0	0.14	0.57	0.93	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
20.0	25.585	25.310	25.439	25.412	24.347	24.332	24.319	24.414	24.875	0.50
30.0	35.543	35.665	35.618	35.701	35.239	35.290	35.343	35.397	35.083	0.51

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 at the measured temperature of 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 %.

<0>

เอกสารไม่ควบคุม



Cert. No.: 24TM29
Page: 1 of 3

Certificate of Calibration

Equipment : Water Bath
Manufacturer : Memmert
Model : WNE 14
Serial No. : L416.0605
ID No. : UAE.MC.002/2560
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangkok, Phrakhanong,
Bangkok 10260
Location : Microbiology Laboratory
Received Order : 10 February 2024
Calibration Date : 10 February 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by :
Approved by :
() Pornthippa Tamayakul
(✓) Umpophol Harschal
() Savitri Injai

Issue Date : 19 February 2024

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 & Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2402-0232OC-2
Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT04 Based on ASTM E715 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer (IPT).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cal. No.	Traceable	Due Date
1) Data Acquisition	MY48001451	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.

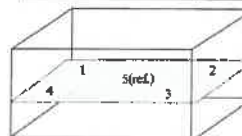
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration : (*) Without Adjustment

Function of UUC* : Temperature Source

Heat transfer medium used : Water

	Environmental		AC Voltage Supply
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	26	51	220
Finished of Calibration	26	50	221



Front

Position :	Ref. Std. ID No.:
1	N37P301416
2	N37P300732
3	N37P301420
4	N37P301421
5 (ref.)	N37P301425

187



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2402-0232OC-2
Result of Calibration : (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 24TM29
Page: 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)					Uncertainty (± °C)
			1	2	3	4	5 (ref.)	
44.5	44.4	44.4	44.508	44.489	44.502	44.521	44.527	0.15

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Coverage Factor k
44.5	0.15	0.024	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 %.

-00-

เอกสารไม่ควบคุม





TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
2344 PATTANAKARN ROAD SOI 18, SUKJULUANG, SUKJULUANG BANGKOK 10250
TEL. 0-2717-3062-7 FAX 0-2710-9453



Cert. No.: 24TM30
Page : 1 of 3

Certificate of Calibration

Equipment : Water Bath
Manufacturer : Memmert
Model : WNE 14
Serial No. : L418.0612
ID No. : UAE.MIC.003/2550
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Sol Udomsuk 41, Sukhumvit Road,
Bangchak, Phraethanong,
Bangkok 10260
Location : Microbiology Laboratory
Received Order : 10 February 2024
Calibration Date : 10 February 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (00 ± 30) %
Calibrated by : 
Approved by : 
() Ponnipope Taneyakul
(✓) Uonnophol Hareedial
() Suddit Injai

Issue Date : 19 February 2024

The Uncertainties are for a confidence probability of approximately 95 %

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

เอกสารไม่ควบคุม



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2402-02320C-3
Procedure Used :-

Cert. No.: 24TM30
Page : 2 of 3

Calibration were conducted using in-house calibration procedure CP-0704 Based on ASTM E715 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-

Instrument	Serial No.	Cert. No.	Traceable	Buy Date
1) Data Acquisition	MY49001451	23LA27	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.

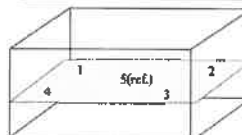
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :-

Function of UUC* : Temperature Source

Heat transfer medium used : Water

	Environmental		AC Voltage Supply (Volt)
	(°C)	(%RH)	
Beginning of Calibration	24	64	221
Finished of Calibration	26	65	220



Front

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



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2402-02320C-3
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 24TM30
Page : 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)					Uncertainty (± °C)
			1	2	3	4	5 (ref.)	
44.5	44.5	44.5	44.491	44.463	44.495	44.518	44.528	0.15

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Coverage Factor
44.5	0.12	0.058	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 %.

-090-

เอกสารไม่ควบคุม

Calibration Certificate

Certificate No.: 2403982-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udomsak 41, Sukhumvit Road,
Bangkok, Prakanong, Bangkok 10260

Page 1 of 3

Equipment: Autoclave
Manufacturer: ALP
Model: CL-40L
Serial No.: 807288
ID No.: UAE.MIC.019/2360
Order No.: 2403982
Operation No.: 2403982-001
Date of Receipt: 7 August 2024
Date of Calibration: 7 August 2024

Calibrated by: Mr. Arunas Somsak Specialist
Approved by: [Signature]
Vice President, Department of Laboratory Services
Responsible for the Technical Management Team

Date of Issue: 14 August 2024

The uncertainties are for a confidence probability of approximately 95 %.
This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

F-C5-009 Revision: 01 Date: 19-04-25

Calibration Report

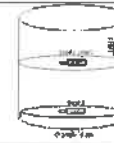
Certificate No.: 2403982-001-01
Equipment: Autoclave
Model: CL-40L **Serial No.:** 807288
Resolution: 1 °C **ID No.:** UAE.MIC.019/2360
Manufacturer: ALP

Date of Calibration: 7 August 2024

Page 3 of 3

Calibration point: 121 °C

Calibration Condition	Temperature (°C)	Relative Humidity (%)	Line Voltage (VAr)
Min	25.0	33	224
Max	30.0	66	225



Method of Calibration
The sensor is located in the top right corner of the autoclave.
The sensor is located in the top right corner of the autoclave.
The sensor is located in the top right corner of the autoclave.

Table 1: Reporting of Temperature

Calibration Point (°C)	Measured Temperature (°C) @ Sensor No. (Sensor No. 2 in RSW)			Uncertainty ± (°C)
	Std.# 1	Std.# 2 (Ref)	Std.# 3	
121	122.43	122.44	122.44	0.65

Table 2: Reporting of Characterization Result

UUC* Setting (°C)	UUC* Reading				Stability ± (°C)	Uniformity ± (°C)	Oversight Variation ± (°C)
	Min (°C)	Max (°C)	Average (°C)	MPa			
122	122	122	122	0.11	0.065	0.031	0.19

Note

The quoted uncertainty includes "Stability" and "Loading effect" (20% of Uniformity).

UUC* = Unit Under Calibration

Stability = One-half of the greatest maximum difference of measured temperatures at any one sensor, for at least half an hour after reaching steady state.

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.

Oversight Variation = The difference of the maximum and minimum measured temperatures throughout the entire item.

The report uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor of 2, which provides a level of confidence of approximately 95 %.

Foundation for Industrial Development National Food Institute

F-C5-012 Revision: 01 Date: 19-04-25

Calibration Report

Certificate No.: 2403982-001-01
Equipment: Autoclave
Model: CL-40L **Serial No.:** 807288
Resolution: 1 °C **ID No.:** UAE.MIC.019/2360
Manufacturer: ALP
Date of Calibration: 7 August 2024

Page 2 of 3

Location: MICROBIOLOGY LABORATORY (301), UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.

Environment Conditions: Ambient Temperature (28 ± 1) °C
Relative Humidity (68 ± 5) %
Line Voltage (225 ± 1) VAr

Condition of this results of Calibration:

- This instrument was calibrated by insert 3 standard Data loggers with RTD into its autoclave and calibration according to W-TE-018 based on BS 2646-1:2021, Autoclaves for sterilization in laboratories.
- Part 1: Design, construction, safety and performance - Specification.
- The temperature scale used was based on ITS - 90.
- All data show below were final values and the initial data may be obtained upon request.

2. Reference Standard Instrument:

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
Digital Thermometer with RTD (Data Logger)	DM-CH-UTEM-140	088593	TE 670230-01	25-Feb-26	NATIONAL FOOD INSTITUTE
	DM-CH-UTEM-140	055951	TE 670231-01	25-Feb-25	NATIONAL FOOD INSTITUTE
	DM-CH-UTEM-140	056916	TE 670232-01	25-Feb-25	NATIONAL FOOD INSTITUTE

3. This certificate is traceable to International System of Units (SI Units).

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

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

6. This standard does not apply to sterilizers or disinfectors used for medical, dental, pharmaceutical.

7. Condition of Calibrated Item: Good

UUC Description: Setting program function sterilization: STERILIZE/NOVAUL
Time of sterilization: 35 Minute At 121 °C

8. Result of Calibration: [X] Without adjustment
[] After adjustment

F-C5-012 Revision: 01 Date: 19-04-25

Calibration Certificate

Certificate No.: 2402281-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Prakhong, Bangkok 10280

Page 1 of 3

Equipment: Autoclave
Manufacturer: ALP
Model: CL-40L
Serial No.: 808763
ID No.: UAE.MTC.026/2563
Order No.: 2402281
Operation No.: 2402281-001
Date of Receipt: 2 April 2024
Date of Calibration: 2 April 2024

Calibrated by: Mr. Jaranvit Prapavutpong
Approved by: [Signature]

Date of Issue: 9 April 2024

Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team

The uncertainties are for a confidence probability of approximately 95 %.
This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to designated national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute

F-C5-009 Revision 01 Date: 20-04-45

Calibration Report

Certificate No.: 2402281-001-01
Equipment: Autoclave
Model: CL-40L Serial No.: 808763
Resolution: 0.1 °C ID No.: UAE.MTC.026/2563
Manufacturer: ALP
Date of Calibration: 2 April 2024

Page 1 of 3

Location: LABORATORY, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Environment Condition: Ambient Temperature (25 ± 1) °C
Relative Humidity (55 ± 7) %
Line Voltage (225 ± 5) Volt

Condition of this results of Calibration:

- 1. This instrument was calibrated by means of standard temperature recorder with RTD with an autoclave and calibration according to W-TE-018 based on BS 2646-1(2021) : Autoclaves for sterilization in laboratories Design, construction, safety and performance Specification.
- The temperature scale equal was based on ITS - 90 .
- All data show below were field values and the initial data may be obtained upon request.
2. Reference Standard Instrument :

Table with 6 columns: Instrument, Model, Serial No., Certificate No., Date, Through. It lists digital thermometers with RTD (Data Logger) and their calibration details.

- 3. This certificate is traceable to International System of Units (SI Units).
4. This certificate was certified only for the instrument we calibrated.
5. This result of calibration was found accurate as shown on date and place of calibration only.
6. This standard does not apply to sterilizers or disinfectors used for medical, dental, pharmaceutical.
7. Condition of Calibrated item : Good
UNC Description : Setting program function sterilization : STERILIZE/NORMAL
Time of sterilization 15 Minute At 115.0 and 121.0 °C
8. Result of Calibration : [X] Without adjustment
[] After adjustment

F-C5-012 Revision 01 Date: 20-04-45

Calibration Report

Certificate No.: 2402281-001-01
Equipment: Autoclave
Model: CL-40L Serial No.: 808763
Resolution: 0.1 °C ID No.: UAE.MTC.026/2563
Manufacturer: ALP
Date of Calibration: 2 April 2024

Page 3 of 3

Calibration points: 115.0 and 121.0 °C

Table with 4 columns: Calibration Condition, Temperature (°C), Relative Humidity (%), Line Voltage (Volt). It shows calibration conditions for Air and Water.



Standard method:
D191 : Adjusted to 100 °C for temperature of the water bath.
D192 : To the upper half of the chamber
D193 : To the bottom part, water 100 mm

Table 1 : Reporting of Temperature

Table with 5 columns: Calibration Point (°C), Std. # 1, Std. # 2 (Ref), Std. # 3, Uncertainty (°C). It shows temperature readings at 115.0 and 121.0 °C.

Table 2 : Reporting of Characterization Result

Table with 7 columns: UUC* Setting (°C), UUC* reading (Min, Max, Average, MP), Stability (°C), Uniformity (°C), Overall Variation (°C). It shows characterization results for 115.0 and 121.0 °C.

Note

The quoted uncertainty include "Stability" and "Loading effect (20% of Uniformity)"
UUC* = Unit under Calibration
Stability = One-half of the greatest maximum difference of measured temperatures at any one sensors, for at least half an hour after reaching steady state.
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.
Overall Variation = The difference of the maximum and minimum measured temperatures throughout observation time.
The report uncertainty of measurement was based on standard uncertainty multiplied by coverage factor k= 2, providing a level of confidence of approximately 95 %.

F-C5-012 Revision 01 Date: 20-04-45

Calibration Certificate

Certificate No.: 2402419-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsak 41, Sukhumvit Road,
Bangchak, Prathumwan, Bangkok 10280

Page 1 of 3

Equipment: Electronic Balance

Manufacturer: OHAUS

Model: P3623

Serial No.: C236754745

ID No.: UAE.NIC.895/2565

Order No.: 2402419

Operation No.: 2402419-001

Date of Receipt: 19 April 2024

Date of Calibration: 19 April 2024

Calibrated by: Mr. Phoraphet Tongsit
Sachit

Approved: (Mr. Phoraphet Tongsit)
Vice President, Department of Laboratory Services
Responsible for the Technical Management Team

Date of Issue: 23 April 2024

The uncertainties are for a confidence probability of approximately 95%.

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

F-CS-001 Revision: 01 Date: 20-04-65

Calibration Report

Certificate No.: 2402419-001-01
Equipment: Electronic Balance
Manufacturer: OHAUS
Model: P3623
Serial No.: C236754745
Capacity: 620 g

Manufacturer: OHAUS
Resolution: 0.001 g
ID No.: UAE.NIC.895/2565

Page 1 of 3

Environment Condition: Ambient Temperature: 26.5 ± 0.3 °C Relative Humidity: 57 ± 0.4 %

Place of Calibration: Room 201, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method NFI-01-001 In-House Method based on NIS LAB 14 : 2019

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Exp. Date
Standard Weight Class 12	1-600g	13881	TCS	NF2118025	28 November 2023
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Exp. Date
Thermo-Hygro Meter	688-H	NFI-01-015/23	Quality Room	0624-0492	4 March 2023

2. The calibration is conducted in 17 UNIT

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

5. The result of calibration was found accurate as shown on data and place of calibration only.

Calibration Results:

1. Repeatability of Readings:

Nominal Value (g)	Standard Deviation of Reading (g)
300	0.0007
600	0.0012

2. Off-Center Error:

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

The balance reading obtained is given in the table.

1	2	3
4	5	6
7	8	9
10	11	12
13	14	15
16	17	18
19	20	21
22	23	24
25	26	27
28	29	30
31	32	33
34	35	36
37	38	39
40	41	42
43	44	45
46	47	48
49	50	51
52	53	54
55	56	57
58	59	60
61	62	63
64	65	66
67	68	69
70	71	72
73	74	75
76	77	78
79	80	81
82	83	84
85	86	87
88	89	90
91	92	93
94	95	96
97	98	99
100	101	102
103	104	105
106	107	108
109	110	111
112	113	114
115	116	117
118	119	120
121	122	123
124	125	126
127	128	129
130	131	132
133	134	135
136	137	138
139	140	141
142	143	144
145	146	147
148	149	150
151	152	153
154	155	156
157	158	159
160	161	162
163	164	165
166	167	168
169	170	171
172	173	174
175	176	177
178	179	180
181	182	183
184	185	186
187	188	189
190	191	192
193	194	195
196	197	198
199	200	201
202	203	204
205	206	207
208	209	210
211	212	213
214	215	216
217	218	219
220	221	222
223	224	225
226	227	228
229	230	231
232	233	234
235	236	237
238	239	240
241	242	243
244	245	246
247	248	249
250	251	252
253	254	255
256	257	258
259	260	261
262	263	264
265	266	267
268	269	270
271	272	273
274	275	276
277	278	279
280	281	282
283	284	285
286	287	288
289	290	291
292	293	294
295	296	297
298	299	300
301	302	303
304	305	306
307	308	309
310	311	312
313	314	315
316	317	318
319	320	321
322	323	324
325	326	327
328	329	330
331	332	333
334	335	336
337	338	339
340	341	342
343	344	345
346	347	348
349	350	351
352	353	354
355	356	357
358	359	360
361	362	363
364	365	366
367	368	369
370	371	372
373	374	375
376	377	378
379	380	381
382	383	384
385	386	387
388	389	390
391	392	393
394	395	396
397	398	399
400	401	402
403	404	405
406	407	408
409	410	411
412	413	414
415	416	417
418	419	420
421	422	423
424	425	426
427	428	429
430	431	432
433	434	435
436	437	438
439	440	441
442	443	444
445	446	447
448	449	450
451	452	453
454	455	456
457	458	459
460	461	462
463	464	465
466	467	468
469	470	471
472	473	474
475	476	477
478	479	480
481	482	483
484	485	486
487	488	489
490	491	492
493	494	495
496	497	498
499	500	501
502	503	504
505	506	507
508	509	510
511	512	513
514	515	516
517	518	519
520	521	522
523	524	525
526	527	528
529	530	531
532	533	534
535	536	537
538	539	540
541	542	543
544	545	546
547	548	549
550	551	552
553	554	555
556	557	558
559	560	561
562	563	564
565	566	567
568	569	570
571	572	573
574	575	576
577	578	579
580	581	582
583	584	585
586	587	588
589	590	591
592	593	594
595	596	597
598	599	600
601	602	603
604	605	606
607	608	609
610	611	612
613	614	615
616	617	618
619	620	621
622	623	624
625	626	627
628	629	630
631	632	633
634	635	636
637	638	639
640	641	642
643	644	645
646	647	648
649	650	651
652	653	654
655	656	657
658	659	660
661	662	663
664	665	666
667	668	669
670	671	672
673	674	675
676	677	678
679	680	681
682	683	684
685	686	687
688	689	690
691	692	693
694	695	696
697	698	699
700	701	702
703	704	705
706	707	708
709	710	711
712	713	714
715	716	717
718	719	720
721	722	723
724	725	726
727	728	729
730	731	732
733	734	735
736	737	738
739	740	741
742	743	744
745	746	747
748	749	750
751	752	753
754	755	756
757	758	759
760	761	762
763	764	765
766	767	768
769	770	771
772	773	774
775	776	777
778	779	780
781	782	783
784	785	786
787	788	789
790	791	792
793	794	795
796	797	798
799	800	801
802	803	804
805	806	807
808	809	810
811	812	813
814	815	816
817	818	819
820	821	822
823	824	825
826	827	828
829	830	831
832	833	834
835	836	837
838	839	840
841	842	843
844	845	846
847	848	849
850	851	852
853	854	855
856	857	858
859	860	861
862	863	864
865	866	867
868	869	870
871	872	873
874	875	876
877	878	879
880	881	882
883	884	885
886	887	888
889	890	891
892	893	894
895	896	897
898	899	900
901	902	903
904	905	906
907	908	909
910	911	912
913	914	915
916	917	918
919	920	921
922	923	924
925	926	927
928	929	930
931	932	933
934	935	936
937	938	939
940	941	942
943	944	945
946	947	948
949	950	951
952	953	954
955	956	957
958	959	960
961	962	963</

List of Instruments Certification for Water Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Water									
1	pH Meter	pH	Ecosence	pH100A JC04742	Technology Promotion Association (Thailand-Japan)	24CH454	24 Apr 24	23 Apr 25	-



Certificate of Calibration

Cert.No.: 24CH454
Page: 1 of 3

Equipment : pH Meter
Manufacturer : EcoSense
Model : pH300A
Serial No. : J004742
ID No. : UAE.EFM.061/2588 (EPM.pH.04/68)
Condition As-Received: Used Item
Received Date : 22 April 2024
Calibration Date : 24 April 2024
Reference : 2404-0487WSC-3
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Sak Uthrasuk 41, Sukhumvit Road, Bangkok,
Phrakhanong, Bangkok 10200
Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In-house method :
- CP-CH5 by direct measurement with DC voltage
standard and direct measurement with
certified reference material (CRM)
- CP-CH9 by comparison with temperature standard

Calibrated by :

Approved by :

() Unnophol Harnchal
() Porpan Palpin
(✓) Sathip Moongmal
Issue Date : 25 April 2024

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 & Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม



Cert.No.: 24CH454
Page: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Exp. Date
1) Document Process Calibrator	54030049	130RC116	23E2002	27 Aug 2024
2) Ref. Standard Thermometer	4582254	110RC044	23808	26 July 2024

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

2. Certified Reference Materials : The reference material results are traceable to SI through CPA chem Ltd., ANSA-ASQ Material Accreditation Board, Accredited No. AR-1635

Buffer Solution	Manufacturer	Lot No.	Exp. Date
pH 4.008	CPA chem	870851	25 Apr 2026
pH 6.968	CPA chem	870852	25 Apr 2026
pH 8.997	CPA chem	870853	25 Apr 2026

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

Calibration Results

Function : mV Measurement

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

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (mV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter SN: J004742	4.00	177.48	177	4.01	0.56	2.00
	7.00	0.00	0	7.00	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	10.00	-177.45	-177	10.01	0.58	2.00

เอกสารไม่ควบคุม



Cert.No.: 24CH454
Page: 3 of 3

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7,7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (±)	Coverage factor k
pH Electrode SN: 2303065A05377	4.008	4.01	164	0.0079	2.00
	6.968	7.00	-20	0.0089	2.00
	6.968	7.00	-20	0.0089	2.00
	8.997	10.00	-198	0.0085	2.00

Function : Temperature Measurement

(°) Without adjustment

This equipment was connected with Temperature Probe:

- Model : -
- Serial No. : 2303065A05377
- Dimension of probe : -
- Length : 110 mm.
- Diameter : 12 mm.
- Immersion Depth : 100 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC° Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
25.0	24.999	25.0	0.001	0.13	2.00
30.0	30.000	30.0	0.000	0.13	2.00
35.0	35.000	35.0	0.000	0.13	2.00

Remark : - UUC° = Unit Under Calibration

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 %.

-00-

เอกสารไม่ควบคุม