

ผลการติดตามตรวจสอบคุณภาพสิ่งแวดล้อม โครงการสุภาลัย ลอพ์ สำนัตลาดพลู ระยะดำเนินการ  
บริษัท สุภาลัย จำกัด (มหาชน)  
ระหว่างเดือนกรกฎาคม ถึง ธันวาคม พ.ศ. 2566

รายการใบรับรองสอบเทียบ / ทวนสอบ เครื่องมือหลักประจำห้องปฏิบัติการ สำหรับวิเคราะห์คุณภาพน้ำ									
No.	Instrument/ Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
Water									
1	pH Meter	pH Meter	Ecosense	pH100A JC04735	Technology Promotion Association (Thailand-Japan)	23CH531	28 Apr 23	26 Apr 24	-
2	pH Meter	pH Meter	Ecosense	pH100A JC03345	Technology Promotion Association (Thailand-Japan)	23CH806	27 Jun 23	25 Jun 24	-
Laboratory Instrument/Equipment.									
1	pH Meter	ค่าความเป็นกรด-ด่าง (pH)	Mettler-Toledo	Seven Easy pH 1230525212	National Food Institute, Ministry of Industry, Thailand	2302181-001-01	24 Mar 23	22 Mar 24	-
2	pH Meter		Mettler-Toledo	Seven Easy TMS20 pH 1231155210	National Food Institute, Ministry of Industry, Thailand	2301846-001-01	24 Feb 23	23 Feb 24	-
3	BOD Incubator	บีโอดี (Biochemical Oxygen Demand: BOD)	Arco	UC4-1320 / (UAE.WAO.015/2561)	Technology Promotion Association (Thailand-Japan)	23TM249	15 Feb 23	14 Feb 24	-
4	BOD Incubator		Arco	UC4-1320 / (UAEWAO002/2550)	Technology Promotion Association (Thailand-Japan)	23TM1176	21 Jul 23	19 Jul 24	-
5	COD Reactor (Heating Block)	ซีโอดี (Chemical Oxygen Demand: COD)	Hanna	HI839800-02 / H0185001	Hanna Instruments (Thailand) Ltd.	HIT-2312-0342	10 Mar 23	8 Mar 24	
6	Analytical Balance (Repeatability 0.01 mg)	ของแข็งที่ละลายได้ทั้งหมด (Total Dissolved Solids: TDS)	Mettler-Toledo	AB204-S/ 1129361010	National Food Institute, Ministry of Industry, Thailand	2303074-001-01	26 Apr 23	24 Apr 24	-
7	Hot Air Oven	ของแข็งแขวนลอย (Suspended Solids: SS)	Memmert	UF55 / B212.0411	Technology Promotion Association (Thailand-Japan)	23TM373	12 Apr 23	10 Apr 24	-

ผลการติดตามตรวจสอบคุณภาพสิ่งแวดล้อม โครงการศุภาลย์ ลอฟท์ สถานีตลาดพลู ระยะดำเนินการ  
บริษัท ศุภาลย์ จำกัด (มหาชน)  
ระหว่างเดือนกรกฎาคม ถึง ธันวาคม พ.ศ. 2566

รายการใบรับรองสอบเทียบ / ทวนสอบ เครื่องมือหลักประจำห้องปฏิบัติการ สำหรับวิเคราะห์คุณภาพน้ำ									
Laboratory Instrument/Equipment.									
8	Analytical Balance (Repeatability 0.1 mg)	น้ำมันและไขมัน (Fat, Oil and Grease)	Mettler-Toledo	XPE205 / B748058497	Mettler-Toledo (Thailand) Ltd.	TH3067-038- 092023-ACC-TH	20 Sep 23	18 Sep 24	-
9	Digestor Unit	ไนโตรเจนในรูปที่เคเอ็น (Total Kjeldahl Nitrogen: TKN)	FOSS TECATOR	2520auto / 91794469	National Food Institute, Ministry of Industry, Thailand	2302413-001-01	31 Mar 23	29 Mar 24	-
10	Distillation Unit (Kjeldahl Method)		FOSS TECATOR	KT200 / 91790524	FOSS South East Asia	Foss Customer Service Report	17 Jan 23	16 Jan 24	-
11	Incubator (Cooled Incubator)	โคลิฟอร์มแบคทีเรีย (Total Coliform Bacteria)	Memmert	IPP 260 / V615.0187	Technology Promotion Association (Thailand-Japan)	23TM378	12 Apr 23	10 Apr 24	-
12	Incubator (Cooled Incubator)	ฟิคอลโคลิฟอร์ม (Fecal coliform)	Memmert	IPP 260 / V616.0066	Technology Promotion Association (Thailand-Japan)	23TM728	28 Apr 23	26 Apr 24	-
13	Water Bath		Memmert	WNE 14 / L416.0606	Technology Promotion Association (Thailand-Japan)	23TM139	15 Feb 23	14 Feb 24	-
14	Water Bath		Memmert	WNE 14 / L416.0612	Technology Promotion Association (Thailand-Japan)	23TM194	15 Feb 23	14 Feb 24	-
15	Analytical Balance		Mettler-Toledo	XSR204 / C117635043	National Food Institute, Ministry of Industry, Thailand	2302827-001-01	10 May 23	8 May 24	-
16	Auto Clave		ALP	CL-40L / 808763	Technology Promotion Association (Thailand-Japan)	23TM763	27 Apr 23	25 Apr 24	-

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



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.: 23CH531  
Page.: 1 of 3

## Certificate of Calibration

Equipment : pH Meter  
Manufacturer : EcoSense  
Model : pH100A  
Serial No. : JC04735  
ID No. : UAE.EFM.064/2566(EFM.pH.07/66)  
Condition As-Received: Used Item  
Received Date : 26 April 2023  
Calibration Date : 27-28 April 2023  
Reference : 2304-0707WSC-9  
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udumsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong, Bangkok 10260  
Ambient Temperature : (25 ± 2.5) °C  
Relative Humidity : (50 ± 15) %  
Calibration Procedure : In - house method :  
- CP-CH5 by direct measurement with standard  
voltage calibrator and direct measurement with  
certified reference material (CRM)  
- CP-CH8 by comparison with standard thermometer

Calibrated by :

Approved by :

( / ) Malee Butkruea  
( ) Salthip Meangmai  
( ) Warakorn Lemgagtrakul

Issue Date : 9 May 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.

เอกสารไม่ควบคุม



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.: 23CH531  
Page.: 2 of 3

### Condition of this calibration result

1. Reference Standard Instrument : -  
Instrument Serial No. ID No. Cert. No. Due Date  
1) Document Process Calibrator 54030049 130RC116 22E2769 24 Aug 2023  
2) Ref. Standard Thermometer 4982054 110RC044 22I1306 27 Oct 2023  
This certification is traceable to the International System of Unit maintained at:-  
- Traceable to National Institute of Metrology (Thailand), NIMT

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	863832	28 Dec 2024
pH 6.987	CPA chem	826589	09 July 2023
pH 10.010	CPA chem	863835	28 Dec 2023

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 Fluke 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 S/N.: JC04735	4.00	177.48	177	4.01	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	10.00	-177.48	-177	10.01	0.58	2.00

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### 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 S/N.: 230308SIA605377	4.008	4.01	175	0.0079	2.00
	6.987	7.00	1	0.011	2.00
	6.987	7.00	1	0.011	2.00
	10.010	10.02	-173	0.0095	2.00

### Function : Temperature Measurement

(\*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : -  
- Serial No. : 230308SIA605377  
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	25.002	25.1	0.098	0.13	2.00
30.0	30.001	30.1	0.099	0.13	2.00
35.0	35.003	35.1	0.097	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 %.

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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.: 23CH806  
Page.: 1 of 3

## Certificate of Calibration

Equipment : pH Meter  
Manufacturer : EcoSense  
Model : pH100A  
Serial No. : JC03345  
ID No. : UAE.EFM.058/2562(ENV.pH.07/61)  
Condition As-Received: Used Item  
Received Date : 26 June 2023  
Calibration Date : 27 June 2023  
Reference : 2306-0831WSC-1  
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udumsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong, Bangkok 10260  
Ambient Temperature : (25 ± 2.5) °C  
Relative Humidity : (50 ± 15) %  
Calibration Procedure : In - house method :  
- CP-CH5 by direct measurement with standard  
voltage calibrator and direct measurement with  
certified reference material (CRM)  
- CP-CH8 by comparison with standard thermometer

Calibrated by :

Approved by :

( / ) Malee Butkruea  
( ) Salthip Meangmai  
( ) Warakorn Lemgagtrakul

Issue Date : 29 June 2023

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

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Cert.No.: 23CH806  
Page: 2 of 3

#### Condition of this calibration result

1. Reference Standard Instrument :-

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	22E2769	24 Aug 2023
2) Ref. Standard Thermometer	4982054	110RC044	2211306	27 Oct 2023

This certification is traceable to the International System of Unit maintained at:-  
- Traceable to National Institute of Metrology (Thailand), NIMT

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	863832	28 Dec 2024
pH 6.986	CPA chem	863833	28 Dec 2023
pH 10.010	CPA chem	863835	28 Dec 2023

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 Fluke at pH (4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement	Coverage factor
	pH	mV	mV	pH	( ±mV )	k
pH Meter S/N.: JC03345	4.00	177.48	177	4.01	0.58	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	-177.48	-177	10.01	0.58	2.00



Cert.No.: 23CH806  
Page: 3 of 3

#### Calibration Results

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement ( ± )	Coverage factor k
pH Electrode S/N.:220323SIA605377	4.008	4.01	173	0.0071	2.00
	6.986	6.99	0	0.0099	2.00
	6.986	7.00	1	0.0099	2.00
	10.010	10.01	-176	0.0085	2.00

#### Function : Temperature Measurement

( ° ) Without adjustment

This equipment was connected with Temperature Probe;

- Model : YSI Environmental

- Serial No. : 220323SIA605377

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	25.002	25.1	0.098	0.13	2.00
30.0	30.003	30.1	0.097	0.13	2.00
35.0	35.003	35.0	-0.003	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 %.

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มูลนิธิศูนย์พัฒนาอาหาร  
ศูนย์บริการห้องปฏิบัติการอาหาร  
Foundation for Industrial Development National Food Institute  
Food Industrial Laboratory Service Center



## Calibration Certificate

Certificate No.: 2302181-001-01  
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.  
Address: 3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchack, Prakhonong, Bangkok 10260

Page 1 of 5

Equipment: pH Meter  
Manufacturer: METTLER TOLEDO  
Model: SevenEasy pH  
Serial No.: 1230525212  
ID No.: UAE.WAS.003/2553  
Order No.: 2302181  
Operation No.: 2302181-001  
Date of Receipt: 14 March 2023  
Date of Calibration: 24 March 2023

Calibrated by [Signature] Approved by [Signature]  
Scientist Specialist, Division of Calibration Laboratory  
Responsible for the Technical Management Team  
Date of Issue: 24 March 2023

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-009 Revision: 01 Date: 20-04-65



มูลนิธิศูนย์พัฒนาอาหาร  
ศูนย์บริการห้องปฏิบัติการอาหาร  
Foundation for Industrial Development National Food Institute  
Food Industrial Laboratory Service Center



## Calibration Report

Certificate No.: 2302181-001-01  
Equipment: pH Meter  
Resolution: 0.01 pH ; 1 mV  
Manufacturer: METTLER TOLEDO  
Model: SevenEasy pH  
Serial No.: 1230525212  
Type: Bench top  
ID No.: UAE.WAS.003/2553

Date of Calibration: 24 March 2023 Page 2 of 5

Location: Chemical Calibration Laboratory, National Food Institute  
Environment Condition: Ambient Temperature: ( 23.4 ± 1.5 ) °C Relative Humidity: ( 52 ± 3 ) %  
Condition of Equipment: Good Condition

#### Condition of this Results of Calibration

1. Calibration Method In house method : W-CO-002 based on direct measurement by using standard voltage calibrator and certified reference material (CRM)

2. Reference Standards / Certified Reference Material					
Instruments	Serial / ID No.	Manufacturer	Certificate No.	Due Date	
2.1 DC Voltage Calibrator	2709007	Fluke	22E1959	17 June 2023	
2.2 Digital Thermometer	2709007	Fluke	CC-650557-01	30 October 2023	
2.3 Thermo-Hygro Meter	NFLBTH003/17	PONPE	TE 650555-01	21 September 2023	
Certified Reference Material	Lot No.	Manufacturer	Ref N	Expire Date	
2.4 pH buffer 4.008 (Primary pH buffer Solution)	873608	CPAchem	PH216.L5	16 February 2025	
2.5 pH buffer 6.865 (Primary pH buffer Solution)	873609	CPAchem	PH217.L5	16 February 2025	
2.6 pH buffer 10.01 (Primary pH buffer Solution)	873611	CPAchem	PH220.L5	16 February 2024	
2.7 pH buffer 7.00 (Standard pH buffer Solution)	873612	CPAchem	PH107.L5	16 February 2024	

3. This certification is traceable to The International System of Unit (SI Unit)  
3.1 Instruments No.2.1 through NSC-TISI-TIS 17025 Laboratory Accreditation of Calibration No.008  
3.2 Instruments No.2.2 through NSC-TISI-TIS 17025 Laboratory Accreditation of Calibration No.0061  
3.3 Instruments No.2.3 through NSC-TISI-TIS 17025 Laboratory Accreditation of Calibration No.0061  
3.4 Certified Reference Material No. 2.4 to 2.6 traceable to Primary measurement method- Hamed cell using calibrated thermometer, barometer, and nanovoltmeter. The Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17034 and ISO/IEC 17025  
3.5 Certified Reference Material No.2.7 traceable to BIM ReN Hi-13 LotN 25.05.2022; BIM ReN Hi-16 LotN 02.06.2022; BIM ReN Hi-13 LotN 25.05.2022; BIM ReN Hi-16 LotN 02.06.2022, the Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17034 and ISO/IEC 17025

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.

F-CS-012 Revision: 01 Date: 20-04-65





## Calibration Report

Certificate No.: 2302181-001-01  
Equipment: pH Meter  
Resolution: 0.01 pH ; 1 mV  
Manufacturer: METTLER TOLEDO  
Model: SevenEasy pH  
Serial No.: 1230525212  
Type: Bench top  
ID No.: UAE.WAS.003/2553  
Date of Calibration: 24 March 2023

Calibration Results:  
1. Calibration of pH Meter (Manual Temperature Compensation at 25 °C)

Nominal pH	DC Voltage Standard (mV)	Average Indicator Reading		Uncertainty (±mV)	Coverage Factor (k)
		mV	pH		
0	414.120	414	0.00	0.58	2.00
2	295.814	296	2.00	0.58	2.00
4	177.464	178	4.00	0.58	2.00
6	59.160	59	6.00	0.58	2.00
7	0.000	0	7.00	0.58	2.00
8	-59.158	-59	8.00	0.58	2.00
10	-177.460	-177	10.00	0.58	2.00
12	-295.811	-296	12.00	0.58	2.00
14	-414.117	-414	14.00	0.58	2.00

2. Calibration of pH Meter with Electrode (Manual Temperature Compensation at 25 °C)  
Equipment: pH Electrode Type: Combined Electrode  
Manufacturer: METTLER TOLEDO Model: InLab Solids  
Serial No.: 1156883 ID.No. N/A  
Performance of Electrode system (Three-Point Calibration at pH 4, pH 7 and pH 10)

Certified Value (25 °C (pH))	Average Indicator Reading		Relative Slope (%)	Uncertainty (± pH)	Coverage Factor (k)
	pH	mV			
4.008	4.01	187	-	0.0071	2.00
6.885	6.86	22	97.86	0.0075	2.00
10.010	10.01	-160	97.86	0.0086	2.00
6.985	6.99	14	-	0.0093	2.00

F-CS-012 Revision: 01 Date: 20-04-65

## Calibration Report

Certificate No.: 2302181-001-01  
Equipment: Digital Thermometer with RTD (pH Meter)  
Resolution: 0.1 °C Model: SevenEasy pH  
Serial No.: 1230525212 ID No.: UAE.WAS.003/2553  
Manufacturer: METTLER TOLEDO  
Date of Calibration: 24 March 2023

Calibration point: 15.0, 25.0 and 30.0 °C  
Calibration result:  
- The probe was immersed in liquid bath or dry bath to a minimum depth of 120 mm.  
- Description of probe, model : N/A S/N : N/A  
Dimension of probe : Diameter 3 mm., Length 120 mm.,  
Sheath material : N/A

UUC* Reading (°C)	Standard Temperature (°C)	Correction Value (°C)	Uncertainty ± (°C)
15.2	14.999	- 0.2	0.12
25.2	24.999	- 0.2	0.12
30.2	29.999	- 0.2	0.12

Note  
- UUC\* : Unit Under Calibration

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-CS-012 Revision: 01 Date: 20-04-65

## Calibration Report

Certificate No.: 2302181-001-01  
Equipment: Digital Thermometer with RTD (pH Meter)  
Resolution: 0.1 °C Model: SevenEasy pH  
Serial No.: 1230525212 ID No.: UAE.WAS.003/2553  
Manufacturer: METTLER TOLEDO  
Date of Calibration: 24 March 2023

Location: Chemical Calibration Laboratory, National Food Institute  
Environment Condition: Ambient Temperature 25 °C ± 1 °C  
Relative Humidity 55 % ± 5 %

Condition of this results of Calibration:  
1. Calibration Method : - In house method: W-TE-025 by comparison with standard thermometer.  
- The Calibration is determined by comparing with a known temperature from a standard resistance thermometer.  
- The temperature scale in use at this laboratory is the International Temperature scale of 1990 (ITS-90 ).  
2. Reference Standard Instrument :

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
HANDHELD THERMOMETER	1521	A85997	TE 660039-01	10-Dec-23	NATIONAL FOOD INSTITUTE
Platinum Resistance Thermometer (PRT)	385	509201			

Support Equipment : - Low Temperature Bath (ISOCAL-6), Model: Europa-6 Plus Basic, S/N: 341592/2

- This certificate is traceable to International System of Units (SI Units).
- This certificate was certified only for the instrument we calibrated.
- This result of calibration was found accurate as shown on date and place of calibration only.
- Condition of Calibrated item : Good
- Result of Calibration : ☒ Without adjustment ☐ After adjustment

F-CS-012 Revision: 01 Date: 20-04-65

## Calibration Certificate

Certificate No.: 2301846-001-01  
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.  
Address: 3 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Prakhonong, Bangkok 10260

Equipment: pH Meter  
Manufacturer: Mettler Toledo  
Model: SevenEasy TM S20 pH  
Serial No.: 1231155210  
ID No.: UAE.WAT.010/2553  
Order No.: 2301846  
Operation No.: 2301846-001  
Date of Receipt: 17 February 2023  
Date of Calibration: 24 February 2023

Calibrated by [Signature] Approved by [Signature]  
Scientist Specialist, Division of Calibration Laboratory  
Date of Issue: 24 February 2023 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 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-009 Revision: 01 Date: 20-04-65

## Calibration Report

**Certificate No.:** 2301846-001-01  
**Equipment:** pH Meter  
**Resolution:** 0.01 pH ; 1 mV  
**Manufacturer:** Mettler Toledo  
**Model:** SevenEasy TM S20 pH  
**Serial No.:** 1231155210  
**Type:** Bench top  
**ID No.:** UAE.WAT.010/2553

**Date of Calibration:** 24 February 2023 **Page 2 of 5**

**Location:** Chemical Calibration Laboratory, National Food Institute  
**Environment Condition:** Ambient Temperature: ( 25.1 ± 1.5 ) °C Relative Humidity: ( 50 ± 5 ) %  
**Condition of Equipment:** Good Condition  
**Condition of this Results of Calibration**

1. Calibration Method In house method : W-CO-002 based on direct measurement by using standard voltage calibrator and certified reference material (CRM)  
2. Reference Standards / Certified Reference Material

Instruments	Serial / ID No.	Manufacturer	Certificate No.	Due Date
2.1 DC Voltage Calibrator	2709007	Fluke	2ZE1959	17 June 2023
2.2 Digital Thermometer	2709007	Fluke	CC 650577-01	30 October 2023
2.3 Thermo-Hygro Meter	NFI.BTH 007/18	PONPE 490	QR22-0888	26 April 2023
Certified Reference Material				
	Lot. No.	Manufacturer	Ref. N	Expire Date
2.4 pH buffer 4.008 (Primary pH buffer Solution)	832608	CPAchem	PH216.L5	8 August 2024
2.5 pH buffer 6.865 (Primary pH buffer Solution)	832607	CPAchem	PH217.L5	8 August 2024
2.6 pH buffer 10.01 (Primary pH buffer Solution)	832609	CPAchem	PH220.L5	8 August 2023
2.7 pH buffer 7.00 (Standard pH buffer Solution)	832610	CPAchem	PH107.L5	8 August 2023

3. This certification is traceable to The International System of Unit (SI Unit)  
3.1 Instruments No.2.1 through NSC-TISI-TIS 17025 Laboratory Accreditation of Calibration No.0008  
3.2 Instruments No.2.2 through NSC-TISI-TIS 17025 Laboratory Accreditation of Calibration No.0061  
3.3 Instruments No.2.3 through NSC-TISI-TIS 17025 Laboratory Accreditation of Calibration No.0292  
3.4 Certified Reference Material No. 2.4 to 2.6 traceable to Primary measurement method- Hamed cell using calibrated thermometer, barometer, and nanovoltmeter. The Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17034 and ISO/IEC 17025  
3.5 Certified Reference Material No.2.7 traceable to BIM ReN H-27 LoN 04.06.2021; BIM ReN H-28 LoN 28.05.2021; BIM ReN H-27 LoN 04.06.2021; BIM ReN H-28 LoN 28.05.2021, the Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17034 and ISO/IEC 17025  
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.

F-CS-012 Revision: 01 Date: 20-04-65

## Calibration Report

**Certificate No.:** 2301846-001-01  
**Equipment:** pH Meter  
**Resolution:** 0.01 pH ; 1 mV  
**Manufacturer:** Mettler Toledo  
**Model:** SevenEasy TM S20 pH  
**Serial No.:** 1231155210  
**Type:** Bench top  
**ID No.:** UAE.WAT.010/2553

**Date of Calibration:** 24 February 2023 **Page 3 of 5**

**Calibration Results:**

1. Calibration of pH Meter ( Manual Temperature Compensation at 25 °C )

Nominal pH	DC Voltage Standard (mV)	Average Indicator Reading		Uncertainty (±mV)	Coverage Factor (k)
		mV	pH		
9	414.120	414	0.00	0.58	2.00
2	295.814	296	2.00	0.58	2.00
4	177.464	178	4.00	0.58	2.00
6	59.160	59	6.00	0.58	2.00
7	0.000	0	7.00	0.58	2.00
8	-59.158	-59	8.00	0.58	2.00
10	-177.460	-177	10.00	0.58	2.00
12	-295.811	-296	12.00	0.58	2.00
14	-414.117	-414	14.00	0.58	2.00

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

**Equipment:** pH Electrode **Type:** Combined Electrode  
**Manufacturer:** Mettler Toledo **Model:** InLab Solids  
**Serial No.:** 9018311 **ID No.:** N/A

**Performance of Electrode system** (Three-Point Calibration at pH 4, pH 7 and pH 10)

Certified Value @25 °C (pH)	Average Indicator Reading		Relative Slope (%)	Uncertainty (± pH)	Coverage Factor (k)
	pH	mV			
4.008	4.01	186	-	0.0071	2.00
6.865	6.90	19	97.68	0.0075	2.00
10.008	10.01	-160	97.29	0.0095	2.00
6.985	6.99	15	-	0.0092	2.00

F-CS-012 Revision: 01 Date: 20-04-65

## Calibration Report

**Certificate No.:** 2301846-001-01  
**Equipment:** Digital Thermometer with RTD  
**Resolution:** 0.1 °C **Model:** SevenEasy TM S20 pH  
**Serial No.:** 1231155210 **ID No.:** UAE.WAT.010/2553  
**Manufacturer:** Mettler Toledo

**Date of Calibration:** 24 February 2023 **Page 4 of 5**

**Location:** Chemical Calibration Laboratory, National Food Institute  
**Environment Condition:** Ambient Temperature 25 °C ± 1 °C  
Relative Humidity 48 % ± 3 %

**Condition of this results of Calibration:**

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

2. Reference Standard Instrument :

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
HANDHELD THERMOMETER	1523	2118154	PSL-T 0673/65	07-Jun-23	TISTR
Platinum Resistance Thermometer (PRT)	5627A	877332			

Support Equipment : - Low Temperature Bath (Micro Bath), Model: 7103, S/N: A39538,AN65 A85181.

- This certificate is traceable to International System of Units (SI Units).
- This certificate was certified only for the instrument we calibrated.
- This result of calibration was found accurate as shown on date and place of calibration only.
- Condition of Calibrated item : Good
- Result of Calibration : ☒ Without adjustment ☐ After adjustment

F-CS-012 Revision: 01 Date: 20-04-65

## Calibration Report

**Certificate No.:** 2301846-001-01  
**Equipment:** Digital Thermometer with RTD  
**Resolution:** 0.1 °C **Model:** SevenEasy TM S20 pH  
**Serial No.:** 1231155210 **ID No.:** UAE.WAT.010/2553  
**Manufacturer:** Mettler Toledo

**Date of Calibration:** 24 February 2023 **Page 5 of 5**

**Calibration point:** 15.0, 25.0 and 35.0 °C

**Calibration result:**

- The probe was immersed in liquid bath or dry bath to a minimum depth of 120 mm.
- Description of probe, model : - S/N : -  
Dimension of probe : Diameter 9 mm., Length 120 mm.,  
Sheath material : Stainless Steel

UUC* Reading (°C)	Standard Temperature (°C)	Correction Value (°C)	Uncertainty ± (°C)
15.1	15.015	- 0.1	0.11
25.0	25.014	0.0	0.11
35.1	35.016	- 0.1	0.11

**Note**

- UUC\* : Unit Under Calibration


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

----- End -----

F-CS-012 Revision: 01 Date: 20-04-65







**Equipment :** BOD Incubator

**Condition As-Received :** Used Item

**Reference :** 2307-0615OC-1

**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	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

**Fresh air setting :** Not Available

**Cert. No.:** 23TM1176

**Page :** 2 of 3

**Probe Installation Details :**

a = 10 cm

b = 10 cm

c = 10 cm

**Dimension of Chamber :**

D = 0.53 m

W = 1.2 m

H = 1.2 m

Capacity = 0.76 m<sup>3</sup>

**Environment during calibration**

	Beginning	Finished
Temp. ( °C )	27	28
REL.Humid. ( % )	65	67
AC Supply ( Volt )	222	223

**Position :**

1 19RTD-2/1

2 19RTD-2/2

3 19RTD-2/3

4 19RTD-2/4

5 19RTD-2/5

6 19RTD-2/6

7 19RTD-2/7

8 19RTD-2/8

9 (ref.) 19RTD-2/9

**Ref. Std. ID No.:**

1 19RTD-2/1

2 19RTD-2/2

3 19RTD-2/3

4 19RTD-2/4

5 19RTD-2/5


6 19RTD-2/6

7 19RTD-2/7

8 19RTD-2/8

9 (ref.) 19RTD-2/9

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**Equipment :** BOD Incubator

**Condition As-Received :** Used Item

**Reference :** 2307-0615OC-1

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

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

**Fresh air setting :** Not Available

**Cert. No.:** 23TM1176

**Page :** 3 of 3

**Calibration Point ( °C )**

20.0

**UUC\* Setting ( °C )**

20.0

**UUC\* Reading ( °C )**

19.7

**Temperature stability ( ± °C )**

0.48

**Temperature uniformity ( °C )**

0.55

**Overall Variation ( °C )**

1.2

**Coverage Factor k**

2

**Calibration Point ( °C )**

20.0

**Measured Temperature ( °C )**

Position	1	2	3	4	5	6	7	8	9 (ref.)
20.048	20.200	20.072	19.768	19.985	20.074	19.861	19.827	19.977	0.74

**Uncertainty ( ± °C )**

0.74

**Average\* :** The average of 30 values in each position.

**Temperature stability :** One-half of the greatest maximum difference of measured temperature at any one sensor.

**Temperature uniformity :** The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location, which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.


**Overall Variation :** The Difference of the maximum and minimum measured temperatures throughout observation.

**UUC\* :** Unit Under Calibration

**Note :** The reported uncertainty of measurement was included stability and excluded uniformity .


The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor *k*, providing a level of confidence of approximately 95 %.

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**Hanna Instruments (Thailand) Ltd.**

410/67-68 Soi Ratchadapisek 24, Ratchadapisek Rd., Samsen-nok, Huaykwang, Bangkok 10310 Tel: 0-2541-4199 Fax: 0-2541-4198



**Certificate No. :** HIT-2312-0342

**Page :** 1 of 2

**CERTIFICATE OF CALIBRATION**

**Equipment :** COD Test Tube Heater

**Meter Model :** HI839800-02

**Tube Heater :** 25 Vial Capacity

**Temperature Range :** -10 °C to 160 °C

**Ambient Temperature :** (25 ± 2) °C

**Manufacturer :** Hanna Instruments

**Condition As-Received :** Used Product

**Customer name :** United Analyst and Engineering Consultant Co., Ltd.

**Serial No. :** H018500I

**Accuracy :** ± 2 °C

**Temperature of Reaction :** 150 °C

**Relative Humidity :** ( 50 ± 15 ) % RH

**Made in :** Romania

**Reference :** RE230392

3 Soi Udomsuk 41, Sukhumvit Rd., Bangchak, Phrakhanong, Bangkok 10260

**Received date :** 8 March 2023

**Calibrate date :** 10 March 2023

**Issue date :** 20 March 2023


**Calibrated Location :** Hanna Instruments (Thailand) Ltd.

**Calibration Procedure :** This calibrator was conducted by using in-house: calibration procedure CP-04 by using certified reference material.


**Calibrated by :** ☒ Mr. Pichit Petthong

☐ Mr. Jakkapob Pentisan

☐ Mr. Channarong Soinak

**Approved by :** 

Authorized Signatory




This certificate was certified only for the instrument we calibrated.

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

**\*\* This certificate may not be reproduced other than in full, except with the prior written \*\***

approval of the head of Hanna Instrument (Thailand).

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**Certificate No. :** HIT-2312-0342

**Page :** 2 of 2

**Condition of this calibration result**

**Reference Standard Instruments:**

Instruments	Model	Serial No.	Certificate No.	Traceable
Data Acquisition Switch Unit	34970A	MY44065265	WK2207-065-1	WK Electric Co., Ltd.

**Calibration Result:**

**Measurement Temperature Source Accuracy for COD Reactor**

Capacity (Vial)	Nominal Value (°C)	Average Value (°C)	± Uncertainty (°C)	± Tolerance of UUC (°C)	Acceptance Criteria
25 Vial	150.0	150.3	0.59	2	Pass

**Figure: Shows the location of the temperature source.**

(1A)	(2A)	(3A)	(4A)	(5A)
149.78 °C	150.31 °C	150.63 °C	149.93 °C	150.31 °C
(1B)	(2B)	(3B)	(4B)	(5B)
150.35 °C	150.18 °C	149.93 °C	150.18 °C	150.21 °C
(1C)	(2C)	(3C)	(4C)	(5C)
150.24 °C	151.10 °C	150.80 °C	150.36 °C	150.86 °C
(1D)	(2D)	(3D)	(4D)	(5D)
150.16 °C	149.77 °C	150.22 °C	150.67 °C	150.43 °C
(1E)	(2E)	(3E)	(4E)	(5E)
149.94 °C	150.44 °C	150.06 °C	150.63 °C	149.29 °C

**Remark:** The Acceptance criteria is the error value plus or minus the Measurement Uncertainty, and then Not More than the Tolerance value of UUC, therefore concluded that pass.

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

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Calibration Certificate

Certificate No.: 2303074-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road, Bangchack, Prakhnong, Bangkok 10260

Page 1 of 3

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: AB204-S/FACT

Serial No.: 1129361010

ID No.: UAE.WAS.002/2552

Order No.: 2303074

Operation No.: 2303074-001

Date of Receipt: 26 May 2023

Date of Calibration: 26 May 2023

Calibrated by: [Signature] Approved by: [Signature]
Scientist Vice President, Department of Laboratory Services
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...

Calibration Report

Certificate No.: 2303074-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: AB204-S/FACT
Resolution: 0.0001 g
Serial No.: 1129361010
ID No.: UAE.WAS.002/2552
Capacity: 220 g

Page 2 of 3

Date of Calibration: 26 May 2023
Environment Condition: Ambient Temperature: 23.7 ± 0.1 °C Relative Humidity: 61 ± 2.2 %
Place of Calibration: Room 108 Balance Room, UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Condition of Equipment: Good Condition
Condition of This Results of Calibration:
1. Calibration Method: NFI Method W-MA-001 In-House Method based on UKAS Lab 14 : 2019
2. Reference Standards:
Reference Standard Model Serial No. Calibrated By Certificate No. Due Date
Standard Weight Class E2 1mg to 200g 850556752 TCS M23040535 8 April 2024
Instrument Model Serial No. Calibrated By Certificate No. Due Date
Thermo-Hygro Meter 608-H1 NFI.BTH 018/23 Quality Reborn QR23-0491 21 February 2024

Calibration Results:

1. Repeatability of Reading:

Table with 2 columns: Nominal Value (g), Standard Deviation of Reading (g). Rows for 100g and 200g.

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan. The balance reading obtained is given in the table.

Table showing off-center error readings at different positions (1-6) and maximum difference.

F-CS-012 Revision: 01 Date: 20-04-65

Calibration Report

Certificate No.: 2303074-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: AB204-S/FACT
Resolution: 0.0001 g
Serial No.: 1129361010
ID No.: UAE.WAS.002/2552
Capacity: 220 g

Date of Calibration: 26 May 2023 Page 3 of 3

Calibration Results: (Continued)
Calibration Range: 0-200 g
Calibration Adjustment: Internal Calibration
3. Departure from Nominal Value:

Table with 6 columns: Nominal Value (g), Standard Value (g), Average Reading (g), Correction (g), Uncertainty (g), Coverage Factor k. Rows for various weights from 0.01g to 200g.

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor of approximately 95 %.

----- End -----

F-CS-012 Revision: 01 Date: 20-04-65

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
Certificate of Calibration
Equipment: Hot Air Oven
Manufacturer: Memmert
Model: UF 55
Serial No.: B212.0411
ID No.: UAE.WAO.005/2556
Submitted by: United Analyst and Engineering Consultant Co.,Ltd.
Location: Lab Floor 2
Received Order: 11 April 2023
Calibration Date: 11 - 12 April 2023
Ambient Temperature: (26 ± 10) °C
Relative Humidity: (50 ± 30) %
Calibrated by: [Signature]
Approved by: [Signature]
Issue Date: 24 April 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.



Equipment : Hot Air Oven

Condition As-Received : Used Item

Reference : 2304-0156OC-1

Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector ( RTD ) and Thermocouple Type T.

The temperature scale used was based on ITS-90.

**Condition of this result of calibration**

1. Reference standard instrument:-

**Instrument**      **Model**      **Serial No.**      **Cert. No.**      **Due Date**

1 ) Data Acquisition      34972A      MY59003411      22LM165      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.

**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. ( % )	45	44
AC Supply ( Volt )	221	220

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

Position :	( 120 to 180 ) °C	( 104 ) °C
1	18-20TC-01	20RTD-2/1
2	18-20TC-02	20RTD-2/2
3	18-20TC-03	20RTD-2/3
4	18-20TC-04	20RTD-2/4
5	18-20TC-05	20RTD-2/5
6	18-20TC-06	20RTD-2/6
7	18-20TC-07	20RTD-2/7
8	18-20TC-08	20RTD-2/8
9 (ref.)	18-20TC-09	20RTD-2/9

**Probe Installation Details :**      **Dimension of Chamber :**

a = 5.0 cm      D = 0.50 m

b = 5.0 cm      W = 0.80 m

c = 5.0 cm      H = 0.75 m

Capacity = 0.30 m<sup>3</sup>

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a 1158261

Equipment : Hot Air Oven

Condition As-Received : Used Item

Reference : 2304-0156OC-1

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source

Fresh air setting : Close

Calibration Point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Temperature stability ( ± °C )	Temperature uniformity ( °C )	Overall Variation ( °C )	Coverage Factor k
104.0	104.0	104.0	0.054	0.59	0.95	2
120.0	120.0	120.0	0.12	0.89	1.5	2
180.0	180.0	180.0	0.12	1.5	2.5	2

Calibration Point ( °C )	Measured Temperature ( °C )									Uncertainty ( ± °C )
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
104.0	104.512	104.016	104.542	104.407	103.704	103.729	104.167	104.158	104.001	0.42
120.0	120.317	119.768	120.524	120.232	119.363	119.209	119.888	119.797	119.735	1.1
180.0	180.878	179.819	181.357	180.871	179.303	179.139	180.230	180.055	179.960	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 %.

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a 1158260

Calibration Certificate ID  
TH3067-038-092023-ACC-TH

Mettler-Toledo (Thailand) Ltd.  
846/4 - 846/5 Lasalle Rd., Bangna Tai Sub-District  
Bangna District, Bangkok 10260  
+662 723 0382  
MT-TH.ServiceSupport@mt.com

METTLER TOLEDO



## Accuracy Calibration Certificate

### Customer

Company: United Analyst and Engineering Consultant Co., Ltd.  
Address: 3 Soi Udom Suk 41, Sukhumvit Rd., Bang Chak  
City: Phra Khanong      Contact: Suwit Chotnok  
Zip / Postal: 10260  
State / Province: Bangkok  
Order Number:

### Weighing Device

Manufacturer: Mettler Toledo      Instrument Type: Weighing Instrument  
Model: XPE205      Asset Number: UAE.CAL.004/2561  
Serial No.: B748058497      Terminal Model: PEAT  
Building: N/A      Terminal Serial No.: B748058497  
Floor: 4      Terminal Asset No.: N/A  
Room: Calibration Laboratory

Range	Max. Capacity	Readability (d)
1	220 g	0.00001 g

### Procedure

Calibration Guideline: EURAMET cg-18 v. 4.0 (11/2015)  
METTLER TOLEDO Work Instruction: CPW002/20  
This calibration certificate contains measurements for As Found and As Left calibrations.  
The sensitivity/span of the weighing instrument was adjusted before As Found and As Left calibrations 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: 21.9 °C    End: 21.6 °C	Start: 41.1 %    End: 45.7 %
As Left	Start: 21.6 °C    End: 21.3 °C	Start: 45.3 %    End: 43.8 %

As Found Calibration Date: 20-Sep-2023      Calibrator:

As Left Calibration Date: 20-Sep-2023

Issue Date: 20-Sep-2023      Approved Signatory:

Technical Manager / Head of Calibration Center

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Calibration Certificate ID  
TH3067-038-092023-ACC-TH

METTLER TOLEDO Service

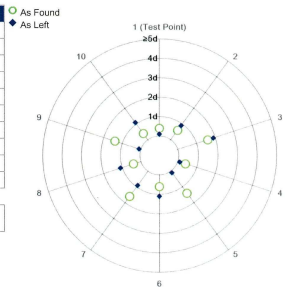
## Measurement Results

### Repeatability

Test Load: 100 g

	As Found	As Left
1	99.99992 g	100.00005 g
2	99.99991 g	100.00004 g
3	99.99990 g	100.00003 g
4	99.99992 g	100.00005 g
5	99.99993 g	100.00005 g
6	99.99991 g	100.00006 g
7	99.99990 g	100.00004 g
8	99.99992 g	100.00006 g
9	99.99993 g	100.00005 g
10	99.99992 g	100.00006 g

Standard Deviation	0.000011 g	0.000010 g
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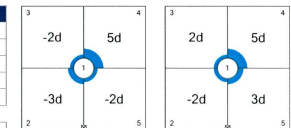
The "d" in the graph represents the readability of the range/interval in which the test was performed.  
The results of this graph are based upon the absolute values of the differences from the mean value.

### Eccentricity

Test Load: 100 g

Position	As Found	As Left
1	99.99992 g	100.00010 g
2	99.99989 g	100.00008 g
3	99.99990 g	100.00012 g
4	99.99997 g	100.00015 g
5	99.99990 g	100.00013 g

Maximum Deviation	0.00005 g	0.00005 g
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The "d" in the graph represents the readability of the range/interval in which the test was performed.

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Error of Indication

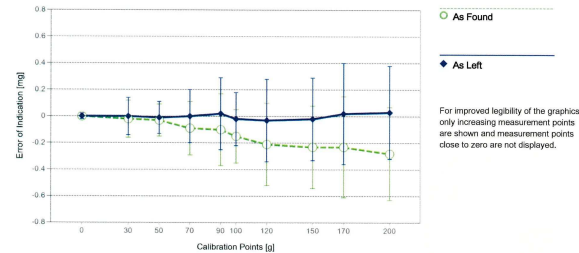
As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.00000 g	0.00000 g	0.00000 g	0.022 mg	2
2	9.99999 g	9.99998 g	-0.00001 g	0.063 mg	2
3	30.00001 g	29.99999 g	-0.00002 g	0.14 mg	2
4 *	50.00001 g	49.99998 g	-0.00003 g	0.12 mg	2
5 *	70.00003 g	69.99994 g	-0.00009 g	0.20 mg	2
6	90.00005 g	89.99995 g	-0.00010 g	0.27 mg	2
7 *	100.00007 g	99.99992 g	-0.00015 g	0.20 mg	2
8 *	120.00008 g	119.99987 g	-0.00021 g	0.31 mg	2
9 *	150.00008 g	149.99985 g	-0.00023 g	0.31 mg	2
10	170.00009 g	169.99986 g	-0.00023 g	0.38 mg	2
11	199.99998 g	199.99970 g	-0.00028 g	0.35 mg	2

As Left

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.00000 g	0.00000 g	0.00000 g	0.021 mg	2
2	9.99999 g	9.99998 g	-0.00001 g	0.062 mg	2
3	30.00001 g	30.00001 g	0.00000 g	0.14 mg	2
4 *	50.00001 g	50.00000 g	-0.00001 g	0.12 mg	2
5 *	70.00003 g	70.00003 g	0.00000 g	0.20 mg	2
6	90.00005 g	90.00007 g	0.00002 g	0.27 mg	2
7 *	100.00007 g	100.00005 g	-0.00002 g	0.20 mg	2
8 *	120.00008 g	120.00005 g	-0.00003 g	0.31 mg	2
9 *	150.00008 g	150.00006 g	-0.00002 g	0.31 mg	2
10	170.00009 g	170.00011 g	0.00002 g	0.38 mg	2
11	199.99998 g	200.00001 g	0.00003 g	0.35 mg	2

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



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

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

เอกสารไม่ควบคุม

The results of this calibration certificate relate only to the calibrated item.

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.: WS52 Date of Issue: 22-Nov-2022  
Certificate Number: 182272 Calibration Due Date: 21-May-2024

Thermo Hygrometer

Equipment No.: IN193 Date of Issue: 19-May-2023  
Certificate Number: SG-H-00418/66 Calibration Due Date: 18-May-2024

Remarks

FACT adjustment functionality activated  
Value of the built-in weight adjusted  
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.

เอกสารไม่ควบคุม

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

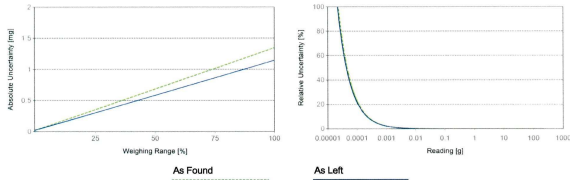
Linearization of Uncertainty Equation

Range			As Found	As Left
	d	Max		
1	0.00001 g	220 g	$U_1 = 0.023 \text{ mg} + 0.00602 \text{ mg/g} \cdot R$	$U_1 = 0.021 \text{ mg} + 0.00511 \text{ mg/g} \cdot R$

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	
0.00220 g	0.023 mg	1.0%	0.021 mg	0.96%
0.02200 g	0.023 mg	0.11%	0.021 mg	0.096%
0.22000 g	0.024 mg	0.011%	0.022 mg	0.010%
2.20000 g	0.036 mg	0.0016%	0.032 mg	0.0015%
220.00000 g	1.3 mg	0.00061%	1.1 mg	0.00052%



เอกสารไม่ควบคุม

# GWP® Certificate



As Found



The weighing device meets the given process requirements.

As Left



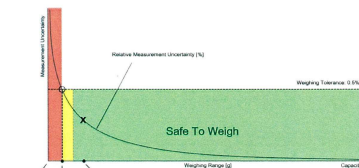
The weighing device meets the given process requirements.

Tests Performed: ☒ As Found ☒ As Left

## Process Requirements

Weighing Tolerance: 0.5% | Smallest Net Weight: 10.00000 g | Safety Factor: 2

### Safe Weighing Range



While the values in this graph reflect the actual calibration results, the measurement uncertainty curves are simply a visual representation. This graph reflects As Left testing, unless only As Found was performed.

เอกสารไม่ควบคุม



## Minimum Weight

### As Found Minimum Weight Table

Minimum weights for different weighing tolerances and safety factors					
Tolerance	Safety Factor				
	1	2	3	5	10
0.1%	0.023137 g	0.046556 g	0.070262 g	0.118558 g	0.244714 g
0.2%	0.011534 g	0.023137 g	0.034811 g	0.058373 g	0.118558 g
0.5%	0.004605 g	0.009221 g	0.013849 g	0.023137 g	0.046556 g
1%	0.002301 g	0.004605 g	0.006912 g	0.011534 g	0.023137 g
2%	0.001150 g	0.002301 g	0.003453 g	0.005756 g	0.011534 g
5%	0.000460 g	0.000920 g	0.001380 g	0.002301 g	0.004605 g

✓ Pass: The determined minimum weight meets the requirement for the smallest net weight.

### As Left Minimum Weight Table

Minimum weights for different weighing tolerances and safety factors					
Tolerance	Safety Factor				
	1	2	3	5	10
0.1%	0.021610 g	0.043443 g	0.065502 g	0.110314 g	0.226566 g
0.2%	0.010777 g	0.021610 g	0.032496 g	0.054444 g	0.110314 g
0.5%	0.004304 g	0.008617 g	0.012939 g	0.021610 g	0.043443 g
1%	0.002151 g	0.004304 g	0.006460 g	0.010777 g	0.021610 g
2%	0.001075 g	0.002151 g	0.003227 g	0.005382 g	0.010777 g
5%	0.000430 g	0.000860 g	0.001290 g	0.002151 g	0.004304 g

✓ Pass: The determined minimum weight meets the requirement for the smallest net weight.

At these net minimum weight values, the measurement uncertainty of the weighing device is equal to or less than 1/1 (no safety factor), 1/2, 1/3, 1/5, or 1/10 of the required tolerance. The values are calculated with k = 2 and based on the linear formula of the measurement uncertainty of the weighing device in use.

The safety factor for As Found is always 1. This implies no safety factor. As Found testing looks at the behavior of the instrument from the past until test occurred. For the past, it is necessary to know that the tolerance was met, but not the safety factor. The safety factor is a proactive measure to apply for future measurements.

#### Notes on minimum weight values in above table:

- If "N/A" is shown above, no appropriate value could be calculated.
- METTLER TOLEDO is not responsible for the definition of the process requirements.

## Measurement Results

### Results Summary

	Repeatability	Eccentricity	Error of Indication
As Found	✓	✓	✓
As Left	✓	✓	✓

✓ = Passed  
✗ = Failed  
⚠ = Safety Factor not met

### Repeatability

Test Load: 100 g

		As Found		As Left	
Tolerance	Control Limit	Std. Deviation	Result	Std. Deviation	Result
0.1%	0.005000 g	0.000011 g	✓	0.000010 g	✓
0.2%	0.010000 g		✓		✓
0.5%	0.025000 g		✓		✓
1%	0.050000 g		✓		✓
2%	0.100000 g		✓		✓
5%	0.250000 g		✓		✓

The weighing tolerance is met if the standard deviation is less than or equal to the corresponding control limit.

### Eccentricity

Test Load: 100 g

		As Found		As Left	
Tolerance	Control Limit	Deviation	Result	Deviation	Result
0.1%	0.05000 g	0.00005 g	✓	0.00005 g	✓
0.2%	0.10000 g		✓		✓
0.5%	0.25000 g		✓		✓
1%	0.50000 g		✓		✓
2%	1.00000 g		✓		✓
5%	2.50000 g		✓		✓

The weighing tolerance is met if the deviation is less than or equal to the corresponding control limit.

### Error of Indication

#### As Found

		Control limits for various weighing tolerances					
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%
0.00000 g	0.00000 g	N/A	N/A	N/A	N/A	N/A	N/A
30.00001 g	-0.00002 g	0.01500 g	0.03000 g	0.07500 g	0.15000 g	0.30000 g	0.75000 g
50.00001 g	-0.00003 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	0.50000 g	1.25000 g
70.00003 g	-0.00009 g	0.03500 g	0.07000 g	0.17500 g	0.35000 g	0.70000 g	1.75000 g
90.00005 g	-0.00010 g	0.04500 g	0.09000 g	0.22500 g	0.45000 g	0.90000 g	2.25000 g
100.00007 g	-0.00015 g	0.05000 g	0.10000 g	0.25000 g	0.50000 g	1.00000 g	2.50000 g
120.00008 g	-0.00021 g	0.06000 g	0.12000 g	0.30000 g	0.60000 g	1.20000 g	3.00000 g
150.00008 g	-0.00023 g	0.07500 g	0.15000 g	0.37500 g	0.75000 g	1.50000 g	3.75000 g
170.00009 g	-0.00023 g	0.08500 g	0.17000 g	0.42500 g	0.85000 g	1.70000 g	4.25000 g
199.99998 g	-0.00028 g	0.10000 g	0.20000 g	0.50000 g	1.00000 g	2.00000 g	5.00000 g
Result		✓	✓	✓	✓	✓	✓

#### As Left

		Control limits for various weighing tolerances					
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%
0.00000 g	0.00000 g	N/A	N/A	N/A	N/A	N/A	N/A
30.00001 g	0.00000 g	0.01500 g	0.03000 g	0.07500 g	0.15000 g	0.30000 g	0.75000 g
50.00001 g	-0.00001 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	0.50000 g	1.25000 g
70.00003 g	0.00000 g	0.03500 g	0.07000 g	0.17500 g	0.35000 g	0.70000 g	1.75000 g
90.00005 g	0.00002 g	0.04500 g	0.09000 g	0.22500 g	0.45000 g	0.90000 g	2.25000 g
100.00007 g	-0.00002 g	0.05000 g	0.10000 g	0.25000 g	0.50000 g	1.00000 g	2.50000 g
120.00008 g	-0.00003 g	0.06000 g	0.12000 g	0.30000 g	0.60000 g	1.20000 g	3.00000 g
150.00008 g	-0.00002 g	0.07500 g	0.15000 g	0.37500 g	0.75000 g	1.50000 g	3.75000 g
170.00009 g	0.00002 g	0.08500 g	0.17000 g	0.42500 g	0.85000 g	1.70000 g	4.25000 g
199.99998 g	0.00003 g	0.10000 g	0.20000 g	0.50000 g	1.00000 g	2.00000 g	5.00000 g
Result		✓	✓	✓	✓	✓	✓

The weighing tolerance is met if the error (of indication) for each test point is less than or equal to the corresponding control limit for that particular weighing tolerance. Results at or close to the zero point cannot be assessed.

## Preventive Maintenance Report

Mettler-Toledo (Thailand) Ltd.  
846/4 - 846/5 Lasalle Rd., Bangna Tai Sub-District  
Bangna District, Bangkok 10260  
+66 2733 0382  
MT-TH.Servicesupport@mt.com

Document Number: TH3067-038-092023-PM

## Preventive Maintenance Report for Analytical/Micro/Ultra Micro Balances

### Customer

Company: United Analyst and Engineering Consultant Co., Ltd.  
Address: 3 Soi Udom Suk 41, Sukhumvit Rd., Bang Chak  
City: Phra Khanong State / Province: Bangkok  
Zip/Postal: 10260 Contact: Suwit Chotnok

### Weighing Instrument

Manufacturer: Mettler Toledo  
Model: XPE205 Location: Calibration Laboratory  
Serial No. 8748058497 Asset No: UAE.CAL.004/2561

### Summary

Task	Completed		
	Yes	No	N/A
Balance cleaned	☑	☐	☐
Device inspection performed	☑	☐	☐
Battery check performed	☑	☐	☐
Function tests performed	☑	☐	☐
All necessary labels attached	☑	☐	☐
Documents hand over to customer	☑	☐	☐
Eccentricity performed	☑	☐	☐
Repeatability performed	☑	☐	☐

### Corrective Actions

performed N/A

### Spare Parts

used N/A

### Comments

N/A

### Performed by

Name: Nithit Jongkrod Date: 20-09-23 Signature: [Signature]

Customer: Suwit Chotnok Date: Signature: [Signature]

Document Number: TH3067-038-092023-PM

## Cleaning

Task	Completed		
	Yes	No	N/A
Clean draft shield windows, incl. inner draft shield (if applicable)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Clean door, inner draft shield, guides and rails	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Remove weighing pan and clean and polish	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Clean or replace in-use cover	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Clean terminal and display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Clean housing	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Inspection

Test	Acceptance Criteria	Result		
		Pass	No	N/A
Check housing	No for cracks or loose screws	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check display	No cracks and transparent glass	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check draft shield (if existing)	No cracks or broken glass & firm fit	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check draft shield doors	Smooth movement and proper closing	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check weighing pan	Correct fit, proper position and not touching anywhere	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check leveling	Leveling bubble is centered and feet are not loose	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check protective cover	Is transparent and has correct fit	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check AC power adapter	Adapter is the original one and insulations are intact	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check connectors and data cables	Insulations are intact	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check for correct fit and connection	Mounting is correct and no damages on accessory is visible	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Function Test

Test	Acceptance Criteria	Result		
		Pass	No	N/A
Perform startup of balance	Balance starts up and displays correct menu, status light and a stable zero	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Perform touch screen test	All Keys correspond accordingly	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Perform display test	All display segments and pixels are active	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Test draft shield motor movement	Draft shield are moving smoothly and close without gap	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Perform internal adjustment	All display segments and pixels are active	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Perform sensitivity test	Sensitivity is within Tolerance	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Perform peripheral connectivity and function test	Peripheral gets and receive data and function is according intended use	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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REV 0, F/Version 1.21 01 Mar 2023



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Document Not Controlled

## Verification Certificate

**Certificate No.:** 2302413-001-01  
**Client name:** UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.  
**Address:** 3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchack, Prakhonong, Bangkok 10260

Page 1 of 4

**Equipment:** HEATING BLOCK DIGESTION**Manufacturer:** FOSS**Model:** 2520**Serial No.:** 91794469**ID No.:** UAE.WAS.011/2560**Order No.:** 2302413**Operation No.:** 2302413-001**Date of Receipt:** 28 March 2023**Date of Calibration:** 30-31 March 2023**Calibrated by**   
Specialist**Approved by**   
Manager, Division of Calibration Laboratory  
Responsible for the Technical Management Team**Date of Issue:** 10 April 2023**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-009 Revision: 01 Date: 20-04-65

2008 36, Anurad Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand  
Tel: +66(0) 2422 8688 Fax: +66(0) 2422 8545



## Verification Report

**Certificate No.:** 2302413-001-01  
**Equipment:** HEATING BLOCK DIGESTION  
Model: 2520 Serial No.: 91794469  
Resolution: 1 °C ID No.: UAE.WAS.011/2560  
Manufacturer: FOSS  
**Date of Calibration:** 30-31 March 2023

Page 2 of 4

**Location:** Laboratory Room, NATIONAL FOOD INSTITUTE  
**Environment Condition:** Ambient Temperature ( 25 ± 3 ) °C  
Relative Humidity ( 55 ± 15 ) %  
Line Voltage ( 220 ± 10 ) Volt

## Condition of this results of Calibration:

- This instrument was calibrated by insert standard thermocouples type R into its heating block digestion and compared to temperature obtained from reference standards thermometer at calibrated point.
  - 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.
- Reference Standard Instrument :

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
Digital Thermometer with Thermocouple	34970A	MY44045576 / MY41194493	TC22/0044	5-May-2023	N.M. Technical Center Laboratory
	Type R	TC#101-103 / CH#101-103			

- This certificate is traceable to international system of units (SI Units).
- This certificate was certified only for the instrument we calibrated.
- This result of calibration was found accurate as shown on date and place of calibration only.
- Condition of Calibrated item : Good

UUC\* Description  
Time of Record - Hour 30 Minute At 380 °C

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

F-CS-009 Revision: 01 Date: 20-04-65

## Verification Report

**Certificate No.:** 2302413-001-01  
**Equipment:** HEATING BLOCK DIGESTION  
Model: 2520 Serial No.: 91794469  
Resolution: 1 °C ID No.: UAE.WAS.011/2560  
Manufacturer: FOSS  
**Date of Calibration:** 30-31 March 2023

Page 3 of 4

Reporting of Temperature					
Block No.	UUC* Setting (°C)	UUC* Reading (°C)	Stability (±°C)	Standard Thermometer (°C)	Uncertainty (±°C)
1	380	380	0.96	377.74	2.1
2	380	380	0.40	377.28	2.1
3	380	380	1.18	377.82	2.1
4	380	380	0.44	377.19	1.6
5	380	380	0.11	377.30	1.6
6	380	380	0.14	377.90	1.6
7	380	380	1.17	373.85	2.1
8	380	380	0.33	376.96	2.1
9	380	380	0.14	374.18	2.1
10	380	380	0.96	378.56	2.0
11	380	380	1.04	378.34	2.0
12	380	380	0.35	378.06	2.0
13	380	380	0.48	377.05	1.6
14	380	380	0.38	379.19	1.6
15	380	380	0.50	377.48	1.6
16	380	380	0.48	378.33	1.7
17	380	380	0.71	377.60	1.7
18	380	380	0.35	376.77	1.7
19	380	380	0.84	377.06	1.8
20	380	380	0.41	378.58	1.8

## Note:

- UUC\* = Unit Under Calibration
- Immersion depth of standard thermometer in tube level high of sand is equal heater plate of UUC.
- Stability = One-half of the greatest maximum difference of measured temperatures at one sensors, for at least half an hour after reaching steady state.

F-CS-009 Revision: 01 Date: 20-04-65

2008 36, Anurad Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand  
Tel: +66(0) 2422 8688 Fax: +66(0) 2422 8545

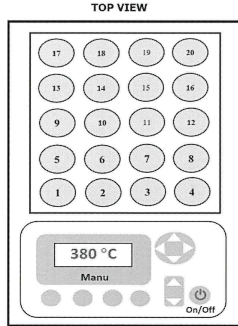




## Verification Report

**Certificate No.:** 2302413-001-01  
**Equipment:** HEATING BLOCK DIGESTION  
Model: 2520 Serial No.: 91794469  
Resolution: 1 °C ID No.: UAE.WAS.011/2560  
Manufacturer: FOSS  
**Date of Calibration:** 30-31 March 2023 Page 4 of 4  
**Calibration point:** 380 °C  
**Calibration result:** Continued

Figure 1. Location of Reference Standard and Block Diagram of Digestion Unit



Sensor Installation Location

**Note:**

- UUC\* = Unit Under Calibration
- Immersion depth of standard thermometer in tube level high of sand is equal heater plate of UUC.
- Stability = One-half of the greatest maximum difference of measured temperatures at one sensors, for at least half an hour after reaching steady state.

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

FCS-009 Revision: 01 Date: 20-04-65

## FOSS

### Customer Service Report

FOSS South East Asia  
3388 Sirinrat Building, 25th - 26th Floor, Unit No. 3388/90,  
Rama IV Road, Klongtoey, Bangkok, Thailand 10110

**Report No:** 7824

**Date:** 17/01/2023  
**Customer:** UAE  
**Instrument:** KT200

**Address:** Udomsuk, Bangkok

**Serial:** 91790524

Hours	Travel To Customer	Labour	Travel From Customer
Start	08:30	10:00	
Finish	10:00	15:00	3hr

Application	Special	Standard
Normal	Courtesy Visit	Installation
Distributor	PMA Onboarding	Quote
Internal	Warranty	Repair
Digital Service	Sales Support	Remote
		Other

PQ/Quote Number:	if applicable
PMA Type	Contract No.
Foss available	if applicable

Details of Work / Test	Condition / Status
- Function Test duration PM	OK
- ทดสอบอุณหภูมิในถัง ทดสอบเครื่อง Steam Generator	OK
- ทดสอบถัง Splash head → Splash head ควบคุม	OK
- ปล่อยน้ำ PM. kit KT200	OK
- ปล่อยน้ำ Alkali 30 ml → 29 ml ~ 30 ml	OK
- Function Test	OK
- Blank 0.100 Recovery = 99.8 %	OK
Instrument Ready for Use	OK Not OK (If not OK - Comment)

Part No.	Batch	Description	Qty
10009	18.01.201	Foss PM. kit KT200	1

I confirm this report is accurate and complete	
Signed FOSS	Signed Customer
Name	Name

Would you be willing to participate in a brief survey in order to tell us how we performed? Email

ถัง Splash head ควบคุม มีค่าการกระจาย 114.7175 ถึง 130.4125 ml/100 ml  
เติมน้ำกลั่น 25 ml และ เติมน้ำ Acetic หรือ Citric  
ทำซ้ำ 5-10 ครั้ง และทำซ้ำกลั่นน้ำเปล่า 100-125 ml 5 ครั้ง

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม



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.:** 23TM378  
**Page:** 1 of 3

## Certificate of Calibration

**Equipment:** Incubator  
**Manufacturer:** Memmert  
**Model:** IPP 260  
**Serial No.:** V615.0187  
**ID No.:** UAE.MIC.003/2559  
**Submitted by:** United Analyst and Engineering Consultant Co., Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong,  
Bangkok 10260  
**Location:** Microbiology Laboratory  
**Received Order:** 11 April 2023  
**Calibration Date:** 12 April 2023  
**Ambient Temperature:** (26 ± 10) °C  
**Relative Humidity:** (50 ± 30) %  
**Calibrated by:** [Signature]  
**Approved by:** [Signature]  
( ) Ponthippa Tameyakul  
( ) Malee Butkruea  
( ) Suwit Imjai  
**Issue Date:** 24 April 2023

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม



**Equipment:** Incubator  
**Condition As-Received:** Used Item  
**Reference:** 2304-01550C-1

**Cert. No.:** 23TM378  
**Page:** 2 of 3

### Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).  
The temperature scale used was based on ITS-90.

### Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34972A	MY49001451	23LM27	25 Feb 2024

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

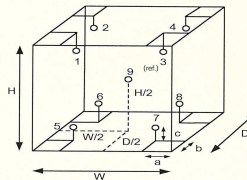
3. This certification is traceable to the International System of Unit.

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

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

**Fresh air setting:** Not Available

Environment during calibration		
	Beginning	Finished
Temp. (°C)	25	26
REL.Humid. (%)	57	61
AC Supply ( Volt )	220	220



### Probe Installation Details :

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

### Dimension of Chamber :

D = 0.50 m  
W = 0.64 m  
H = 0.80 m  
Capacity = 0.26 m³

Position :	Ref. Std. ID No.:
1	19RTD-2/1
2	19RTD-2/2
3	19RTD-2/3
4	19RTD-2/4
5	19RTD-2/5
6	19RTD-2/6
7	19RTD-2/7
8	19RTD-2/8
9 (ref.)	19RTD-2/9

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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.: 23TM193  
Page : 1 of 3

## Certificate of Calibration

**Equipment :** Water Bath  
**Manufacturer :** Memmert  
**Model :** WNE 14  
**Serial No. :** L416.0606  
**ID No. :** UAE.MIC.002/2560  
**Submitted by :** United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong,  
Bangkok 10260  
**Location :** Microbiology Laboratory  
**Received Order :** 15 February 2023  
**Calibration Date :** 15 February 2023  
**Ambient Temperature :** ( 26 ± 10 ) °C  
**Relative Humidity :** ( 50 ± 30 ) %  
**Calibrated by :**   
**Approved by :**   
( ) Pornthippa Tameyakul  
( ✓ ) Malee Butkruea  
**Issue Date :** 24 February 2023

The Uncertainties are for a confidence probability of approximately 95%

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**Equipment :** Water Bath  
**Condition As-Received :** Used Item  
**Reference :** 2302-0295OC-2

Cert. No.: 23TM193  
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:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1 ) Data Acquisition	34972A	MY59003411	22LM165	26 Nov 2023

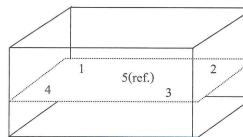
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

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

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

	Environmental		AC Voltage Supply
	( °C )	( %R.H. )	( Volt )
Beginning of Calibration	22	65	231
Finished of Calibration	23	61	231



Front

Position :	Ref. Std. ID No.:
1	4804539-001
2	4804539-002
3	4804539-003
4	4804539-004
5(ref.)	4804539-005

เอกสารไม่ควบคุม



**Equipment :** Water Bath  
**Condition As-Received :** Used Item  
**Reference :** 2302-0295OC-2  
**Result of Calibration :-** ( \* ) Without Adjustment  
**Function of UUC\* :** Temperature Source

Cert. No.: 23TM193  
Page : 3 of 3

Calibration point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Average* Standard Reading ( °C )				
			Position				
			1	2	3	4	5 (ref.)
44.5	44.5	44.5	44.453	44.437	44.428	44.477	44.459

Calibration point ( °C )	Uniformity ( °C )	Stability ( ± °C )	Uncertainty ( ± °C )	Coverage Factor k
44.5	0.079	0.038	0.15	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 %.

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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.: 23TM194  
Page : 1 of 3

## Certificate of Calibration

**Equipment :** Water Bath  
**Manufacturer :** Memmert  
**Model :** WNE 14  
**Serial No. :** L416.0612  
**ID No. :** UAE.MIC.003/2560  
**Submitted by :** United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong,  
Bangkok 10260  
**Location :** Microbiology Laboratory  
**Received Order :** 15 February 2023  
**Calibration Date :** 15 February 2023  
**Ambient Temperature :** ( 26 ± 10 ) °C  
**Relative Humidity :** ( 50 ± 30 ) %  
**Calibrated by :**   
**Approved by :**   
( ) Pornthippa Tameyakul  
( ✓ ) Malee Butkruea  
**Issue Date :** 24 February 2023

The Uncertainties are for a confidence probability of approximately 95%

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Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2302-0295OC-3  
Procedure Used :-  
Cert. No.: 23TM194  
Page : 2 of 3

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:-

Instrument Model Serial No. Cert. No. Due Date  
1) Data Acquisition 34972A MY59003411 22LM165 26 Nov 2023

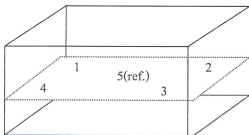
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source

	Environmental		AC Voltage Supply
	( °C )	( %R.H. )	
Beginning of Calibration	22	65	231
Finished of Calibration	22	63	230



Front

Position :	Ref. Std. ID No.:
1	4804539-001
2	4804539-002
3	4804539-003
4	4804539-004
5(ref.)	4804539-005

เอกสารไม่คว



Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2302-0295OC-3  
Result of Calibration :- ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source  
Cert. No.: 23TM194  
Page : 3 of 3

Calibration point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Average* Standard Reading ( °C )				
			Position				
			1	2	3	4	5 (ref.)
44.5	44.5	44.6	44.520	44.509	44.498	44.552	44.530

Calibration point ( °C )	Uniformity ( °C )	Stability ( ± °C )	Uncertainty ( ± °C )	Coverage Factor k
44.5	0.077	0.037	0.15	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.

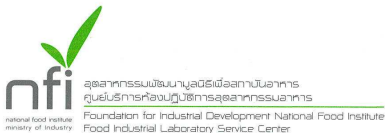
UUC\* : Unit Under Calibration

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 %.

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เอกสารไม่คว



## Calibration Certificate

Certificate No.: 2302827-001-01  
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.  
Address: 3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance  
Manufacturer: METTLER TOLEDO  
Model: XSR204  
Serial No.: C117635043  
ID No.: UAE.WAS.012/2564  
Order No.: 2302827  
Operation No.: 2302827-001  
Date of Receipt: 10 May 2023  
Date of Calibration: 10 May 2023

Calibrated by [Signature]  
Approved by [Signature]  
Manager, Laboratory  
Responsible for the Technical Management Team  
Date of Issue: 18 May 2023

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.

FCS-009 Revision: 01 Date: 20-04-65



## Calibration Report

Certificate No.: 2302827-001-01  
Equipment: Electronic Balance  
Model: XSR204  
Serial No.: C117635043  
Capacity: 220 g  
Manufacturer: METTLER TOLEDO  
Resolution: 0.0001 g  
ID No.: UAE.WAS.012/2564

Page 2 of 4

Date of Calibration: 10 May 2023  
Environment Condition: Ambient Temperature 21.4 ± 0.2 °C Relative Humidity: 43.4 ± 0.9 %

Place of Calibration: Balance room (Water Analysis Unit), UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment Good Condition

#### Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001 In-House Method based on UKAS Lab 14 : 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	8505567572	TCS	M23040535	8 April 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H1	NFLBTH 016/23	Quality Reborn	QR23-0489	21 February 2024

3. This certification is traceable to SI UNIT

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.

#### Calibration Results:

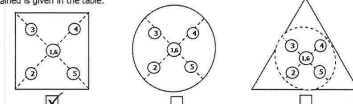
1. Repeatability of Reading:

Nominal Value ( g )	Standard Deviation of Reading ( g )
100	0.000032
200	0.000032

2. Off-Center Error:

A mass of 100 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	(Maximum Difference)
( g )	( g )	( g )	( g )	( g )	( g )	( g )
100.0002	100.0002	100.0002	100.0002	100.0003	100.0002	0.0001

FCS-012 Revision: 01 Date: 20-04-65

## Calibration Report

Certificate No.: 2302827-001-01

Equipment: Electronic Balance

Model: XSR204

Serial No.: C117635043

Capacity: 220 g

Manufacturer: METTLER TOLEDO

Resolution: 0.0001 g

ID No.: UAE.WAS.012/2564

Date of Calibration: 10 May 2023

Page 3 of 4

Calibration Results: (Continued)

Calibration Range: 0 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value:

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (±g)	Coverage Factor k
Unload	0.00000	0.0000	0.0000	0.000085	2.00
0.01	0.01000	0.0100	0.0000	0.000085	2.00
0.02	0.02001	0.0200	0.0000	0.000085	2.00
0.05	0.05000	0.0500	0.0000	0.000085	2.00
0.1	0.10001	0.1000	0.0000	0.000085	2.00
0.2	0.20001	0.2000	0.0000	0.000085	2.00
0.5	0.50002	0.5000	0.0000	0.000085	2.00
1	1.00000	1.0000	0.0000	0.000086	2.00
2	2.00002	2.0000	0.0000	0.000086	2.00
3	3.00003	3.0000	0.0000	0.000087	2.00
5	5.00002	5.0000	0.0000	0.000087	2.00
10	10.00001	10.0000	0.0000	0.000088	2.00
20	20.00003	20.0000	0.0000	0.000092	2.00
30	30.00004	30.0000	0.0000	0.000098	2.00
40	40.00007	40.0000	0.0000	0.00011	2.00
45	45.00009	45.0001	0.0000	0.00013	2.00

F-CS-012 Revision: 01 Date: 20-04-65

## Calibration Report

Certificate No.: 2302827-001-01

Equipment: Electronic Balance

Model: XSR204

Serial No.: C117635043

Capacity: 220 g

Manufacturer: METTLER TOLEDO

Resolution: 0.0001 g

ID No.: UAE.WAS.012/2564

Date of Calibration: 10 May 2023

Page 4 of 4

Calibration Results: (Continued)

Calibration Range: 0 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value:

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (±g)	Coverage Factor k
50	50.00003	50.0000	0.0000	0.00011	2.00
55	55.00005	55.0000	0.0000	0.00012	2.00
60	60.00004	60.0000	0.0000	0.00012	2.00
65	65.00005	65.0000	0.0000	0.00013	2.00
70	70.00006	70.0001	-0.0001	0.00013	2.00
75	75.00008	75.0002	-0.0001	0.00013	2.00
80	80.00007	80.0002	-0.0001	0.00014	2.00
85	85.00009	85.0002	-0.0001	0.00014	2.00
90	90.00010	90.0002	-0.0001	0.00015	2.00
100	100.00006	100.0002	-0.0001	0.00016	2.00
120	120.00009	120.0002	-0.0001	0.00018	2.00
150	150.00009	150.0002	-0.0001	0.00021	2.00
200	200.00016	200.0003	-0.0001	0.00028	2.00

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor of approximately 95 %.

----- End -----

F-CS-012 Revision: 01 Date: 20-04-65

2008 ๒๕๔๙ ถนนสุขุมวิท 36 แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10710 เอกสารไม่ควบคุม  
2008 Soi 36, Arun Amarin Road, Bang Yi Khan Subdistrict, Bang Phlat District, Bangkok 10700, Thailand  
Tel: +66(0) 2422 8688 Fax: +66(0) 2422 8545



2008 ๒๕๔๙ ถนนสุขุมวิท 36 แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10710 เอกสารไม่ควบคุม  
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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.: 23TM763  
Page : 1 of 3

## Certificate of Calibration

Equipment : Autoclave

Manufacturer : ALP

Model : CL-40L

Serial No. : 808763

ID No. : UAE.MIC.026/2563

Submitted by : United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong,  
Bangkok 10260

Location : Microbiology Laboratory (301)

Received Order : 27 April 2023

Calibration Date : 27 April 2023

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by :

Approved by :

( ) Pornthippa Tameyakul

( ) Malee Butkruea

( ) Suwit Imjai

Issue Date : 11 May 2023

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

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A 0053944



Equipment : Autoclave  
Condition As-Received : Used Item  
Reference : 2304-04610C-2

Cert. No.: 23TM763  
Page : 2 of 3

Procedure Used :-

Calibration was conducted using in-house calibration procedure CP-OT03 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	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34972A	MY59003411	22LM165	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.

4. This result of calibration covers laboratory autoclaves for the sterilization of goods and material which

could be infected with organisms categorized as Hazard Group 1, 2 and 3\*\*

(\*\* = Categorization of pathogens according to hazard and categories of containment, second edition, 1990)

It does not cover autoclaves for use with material infect with organisms in Hazard Group 4, for which

complete containment and sterilization of infected condensate is considered to be essential.

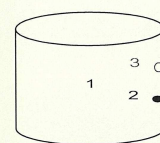
This result of calibration does not apply to sterilizers or disinfectors used for medical, dental, pharmaceutical

or veterinary purposes which are directly concerned with patient care, or those used for fabrics subjected to

sterilization which are required to be dry at the end of cycle.

Result of Calibration :- ( ) Without Adjustment

Function of UUC : Temperature Source



	Environmental		
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	27	60	220
Finished of Calibration	27	58	220

Position	Description	Ref. Std. ID No.:
1 =	Center of chamber	18-20TC-04
2 =	Temperature sensor	18-20TC-05
3 =	Exhaust port	18-20TC-06

เอกสารไม่ควบคุม

a 1159968





Equipment : Autoclave  
Condition As-Received : Used Item  
Reference : 2304-04610C-2  
Result of Calibration :- ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source

Cert. No.: 23TM763  
Page : 3 of 3

Operating parameter Set : Temperature = 115.0 °C  
Sterilization period = 15 minute

UUC* Setting ( °C )	UUC* Reading ( °C )	Position	Average* Standard Reading ( °C )	Stability ( ± °C )	Pressure Reading ( MPa )	Uncertainty ( ± °C )	Coverage Factor <i>k</i>
115.0	115.0	1	115.213	0.22	0.08	0.75	2
		2	115.166				
		3	115.260				

Operating parameter Set : Temperature = 121.0 °C  
Sterilization period = 30 minute

UUC* Setting ( °C )	UUC* Reading ( °C )	Position	Average* Standard Reading ( °C )	Stability ( ± °C )	Pressure Reading ( MPa )	Uncertainty ( ± °C )	Coverage Factor <i>k</i>
121.0	121.0	1	121.260	0.29	1.1	0.75	2
		2	121.224				
		3	121.284				

Average\* : The average of 30 values in each position.  
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 %.

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a 1159967