

ภาคผนวก ง  
เอกสารสอบเทียบเครื่องมือ

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รายการเครื่องมือหลักประจำห้องปฏิบัติการวิเคราะห์ สำหรับตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
Laboratory Instrument/Equipments.(คุณภาพน้ำ)									
1	pH Meter	ความเป็นกรด-ด่าง (pH)	Hanna Instrument	HI2211 / 8165345	National Food Institute, Ministry of Industry, Thailand	2202097-001-01	16 Mar 22	15 Mar 23	-
2	pH Meter		Mettler-Toledo	Seven Easy S20 / 1231155210	National Food Institute, Ministry of Industry, Thailand	2201793-001-01	1 Mar 22	28 Feb 23	-
3	COD Reactor (Heating Block)	ซีโอดี (COD)	Hanna	HI839800-02 / 4500052101	Hanna Instruments (Thailand) Ltd.	HIT-2219-0480	9 May 22	8 May 23	-
4	COD Reactor (Heating Block)	ซีโอดี (COD)	Hanna	HI839800 / 1147807	Hanna Instruments (Thailand) Ltd.	HIT-2132-0756	2 Aug 21	1 Aug 22	-
5	Analytical Balance (Readability 0.01 mg)	ของแข็งแขวนลอย (SS) ของแข็งละลายน้ำทั้งหมด(TDS)	Mettler-Toledo	AX105DR / 1122100406	National Food Institute, Ministry of Industry, Thailand	2200708-001-01	24 Nov 21	23 Nov 22	-
6	Analytical Balance (Readability 0.01 mg)		Mettler-Toledo	XSR205DU / C009071872	Technology Promotion Association (Thailand-Japan)	22MM210	26 Apr 22	25 Apr 23	-
7	Analytical Balance (Readability 0.1 mg)	น้ำมันและไขมัน (Oil & Grease)	Mettler-Toledo	AB-204S/FACT / 1129361010	National Food Institute, Ministry of Industry, Thailand	2203120-001-01	1 Jun 22	31 May 23	-
8	Conductivity Meter	ความเค็ม (Salinity)	SI Analytics	Lab955 / 16300356	SPC Calibration Center Co.,Ltd.	C24220084	22 Mar 22	21 Mar 23	-
9	UV-VIS Spectrophotometer	ไนเตรต-ไนโตรเจน (NO <sub>3</sub> as N)	Agilent Technologies	Cary60 G6860A / MY15410009	DQE Services Co.,Ltd.	SP22-016	31 May 22	30 May 23	-
10	UV-VIS Spectrophotometer		Hitachi	U-1900 / 2021-064	DQE Services Co.,Ltd.	SP22-007	20 Jan 22	19 Jan 23	-

Due Date of Calibration\* : Schedule the program once a year at least once a year.

## Calibration Certificate

**Certificate No.:** 2202097-001-01  
**Client name:** UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.  
**Address:** 3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchack, Prakhong, Bangkok 10260

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**Equipment:** pH Meter  
**Manufacturer:** HANNA INSTRUMENTS  
**Model:** HI 2211  
**Serial No.:** 08165345  
**ID No.:** UAE.WAT.004/2556  
**Order No.:** 2202097  
**Operation No.:** 2202097-001  
**Date of Receipt:** 11 March 2022  
**Date of Calibration:** 16 March 2022

**Calibrated by** Mr.Manas Somsak  
Specialist

**Approved by**   
( Mr.Pheraphat Tuanjit )

Manager, Division of Calibration Laboratory

**Date of Issue:** 21 March 2022

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.

## Calibration Report

**Certificate No.:** 2202097-001-01

**Equipment:** pH Meter **Resolution:** 0.01 pH ; 0.1/1 mV  
**Manufacturer:** HANNA INSTRUMENTS **Model:** HI 2211  
**Serial No.:** 08165345 **Type:** Bench top  
**ID No.:** UAE.WAT.004/2556

**Date of Calibration:** 16 March 2022

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**Location:** Chemical Calibration Laboratory, National Food Institute.

**Environment Condition:** **Ambient Temperature:** ( 23.0 ± 1.5 ) °C **Relative Humidity:** ( 49.5 ± 5 ) %

**Condition of Equipment:** Good Condition

### Condition of this Results of Calibration

1. Calibration Method In house method : W-CC-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	SCL-21F-0687	24 June 2022
2.2 Digital Thermometer	2709007	Fluke	CC-640599-01	30 October 2022
2.3 Thermo-Hygro Meter	สทอ.พล.BTH 005/58	PONPE	QR21-2787	15 November 2022

Certified Reference Material	Lot. No.	Manufacturer	Ref N	Expire Date
2.4 pH buffer 4.008 (Primary pH buffer Solution)	780012	CPAchem	PH216.L5	21 November 2023
2.5 pH buffer 6.865 (Primary pH buffer Solution)	780013	CPAchem	PH217.L5	21 November 2023
2.6 pH buffer 10.01 (Primary pH buffer Solution)	780015	CPAchem	PH220.L5	21 November 2022
2.7 pH buffer 7.00 (Standard pH buffer Solution)	776840	CPAchem	PH107.L5	8 November 2022

### 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.0075
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- Harned 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 RefN HI-7 LotN 30.04.2020; BIM RefN HI-9 LotN 28.05.2020; BIM RefN HI-8 LotN 30.04.2020; BIM RefN HI-10 LotN 28.05.2020. 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.



## Calibration Report

Certificate No.: 2202097-001-01

Equipment: pH Meter Resolution: 0.01 pH ; 0.1/1 mV  
Manufacturer: HANNA INSTRUMENTS Model: HI 2211  
Serial No.: 08165345 Type: Bench top  
ID No.: UAE.WAT.004/2556

Date of Calibration: 16 March 2022

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### 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	414.117	414	0.00	0.58	2.00
2	295.811	295.7	2.00	0.063	2.00
4	177.462	177.4	4.00	0.063	2.00
6	59.159	59.2	6.00	0.063	2.00
7	-0.001	0.1	7.00	0.063	2.00
8	-59.159	-59.1	8.00	0.063	2.00
10	-177.463	-177.3	10.00	0.063	2.00
12	-295.812	-295.6	12.00	0.063	2.00
14	-414.119	-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: LE420  
Serial No.: 1142602 ID.No. N/A

#### Performance of Electrode system (Three-Point Calibration at pH4, pH7 and pH10)

Certified Value @25 °C (pH)	Average Indicator Reading		Relative Slope (%)	Uncertainty ( ± pH )	Coverage Factor ( k )
	pH	mV			
4.008	4.01	180.5	99.3	0.0071	2.00
6.866	6.87	12.5	-	0.0074	2.00
10.015	10.01	-171.5	99.1	0.0090	2.00
6.983	6.98	5.2	-	0.0092	2.00

## Calibration Report

**Certificate No.:** 2202097-001-01

**Equipment:** Digital Thermometer with RTD (pH Meter)

Resolution: 0.1 °C Model: HI 2211

Serial No.: 08165345 ID No.: UAE.WAT.004/2556

Manufacturer: HANNA INSTRUMENTS

**Date of Calibration:** 16 March 2022

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**Location:** Chemical Calibration Laboratory, National Food Institute.

**Environment Condition:** Ambient Temperature ( 23.0 ± 1.0 ) °C  
Relative Humidity ( 50 ± 4 ) %

### 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	1523	2118154	PSL-T 0851/64	24-Jun-22	TISTR
Platinum Resistance Thermometer (PRT)	5627A	877332			

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

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. Condition of Calibrated item : Good

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

## Calibration Report

**Certificate No.:** 2202097-001-01

**Equipment:** Digital Thermometer with RTD (pH Meter)

Resolution: 0.1 °C Model: HI 2211

Serial No.: 08165345 ID No.: UAE.WAT.004/2556

Manufacturer: HANNA INSTRUMENTS

**Date of Calibration:** 16 March 2022

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**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 100 mm.

- Description of probe, model : N/A S/N : N/A

Dimension of probe : Diameter 3.5 mm., Length 100 mm.,

Sheath material : Stainless Steel

UUC* Reading (°C)	Standard Temperature (°C)	Correction Value (°C)	Uncertainty ± (°C)
15.0	15.001	0.0	0.099
25.0	25.002	0.0	0.099
35.0	35.002	0.0	0.099

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 -----


## Calibration Certificate

**Certificate No.:** 2201793-001-01  
**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.:** 1231155210  
**ID No.:** UAE.WAT.010/2553  
**Order No.:** 2201793  
**Operation No.:** 2201793-001  
**Date of Receipt:** 21 February 2022  
**Date of Calibration:** 1 March 2022

**Calibrated by** Mr.Pheraphat Tuanjit  
Scientist

**Approved by**   
( M  
Specialist, Division of Calibration Laboratory  
Responsible for the Technical Management Team

**Date of Issue:** 1 March 2022

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.



## Calibration Report

**Certificate No.:** 2201793-001-01

**Equipment:** pH Meter **Resolution:** 0.01 pH ; 1 mV  
**Manufacturer:** METTLER TOLEDO **Model:** SevenEasy pH  
**Serial No.:** 1231155210 **Type:** Bench top  
**ID No.:** UAE.WAT.010/2553

**Date of Calibration:** 1 March 2022

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**Location:** Chemical Calibration Laboratory, NATIONAL FOOD INSTITUTE

**Environment Condition:** **Ambient Temperature:** ( 23.5 ± 1.5 ) °C **Relative Humidity:** ( 53 ± 5 ) %

**Condition of Equipment:** Good Condition

### Condition of this Results of Calibration

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

### 2. Reference Standards / Certified Reference Material

<u>Instruments</u>	<u>Serial / ID No.</u>	<u>Manufacturer</u>	<u>Certificate No.</u>	<u>Due Date</u>
2.1 DC Voltage Calibrator	2709007	Fluke	SCL-21F-0687	24 June 2022
2.2 Digital Thermometer	2709007	Fluke	CC-640599-01	30 October 2022
2.3 Thermo-Hygro Meter	NFI.BTH004/18	PONPE	QR22-0195	27 January 2023

<u>Certified Reference Material</u>	<u>Lot. No.</u>	<u>Manufacturer</u>	<u>Ref N</u>	<u>Expire Date</u>
2.4 pH buffer 4.008 (Primary pH buffer Solution)	741339	CPAchem	PH216.L5	19 April 2023
2.5 pH buffer 6.865 (Primary pH buffer Solution)	741340	CPAchem	PH217.L5	19 April 2023
2.6 pH buffer 10.01 (Primary pH buffer Solution)	741342	CPAchem	PH220.L5	19 April 2022
2.7 pH buffer 7.00 (Standard pH buffer Solution)	735836	CPAchem	PH107.L5	16 March 2022

### 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.0075
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- Harned 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 RefN HI-7 LotN 30.04.2020; BIM RefN HI-9 LotN 28.05.2020; BIM RefN HI-8 LotN 30.04.2020; BIM RefN HI-10 LotN 28.05.2020. 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.

## Calibration Report

Certificate No.: 2201793-001-01

Equipment:

pH Meter

Resolution: 0.01 pH ; 1 mV

Manufacturer: METTLER TOLEDO

Model: SevenEasy pH

Serial No.: 1231155210

Type: Bench top

ID No.: UAE.WAT.010/2553

Date of Calibration: 1 March 2022

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### 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		
0.00	414.117	414	0.00	0.58	2.00
2.00	295.811	296	2.00	0.58	2.00
4.00	177.462	178	4.00	0.58	2.00
6.00	59.159	59	6.00	0.58	2.00
7.00	-0.001	0	7.00	0.58	2.00
8.00	-59.159	-59	8.00	0.58	2.00
10.00	-177.463	-177	10.00	0.58	2.00
12.00	-295.812	-296	12.00	0.58	2.00
14.00	-414.119	-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: InLabSolids

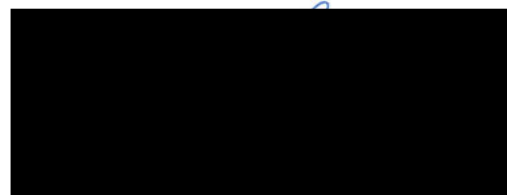
Serial No.: 1156882

ID.No. N/A

#### Performance of Electrode system

(Three-Point Calibration at pH4, pH7 and pH10)

Certified Value @25 °C (pH)	Average Indicator Reading		Relative Slope (%)	Uncertainty ( ± pH )	Coverage Factor ( k )
	pH	mV			
4.008	4.00	180	96.25	0.0076	2.00
6.866	6.88	16	-	0.0079	2.00
10.012	10.01	-162	96.13	0.0094	2.00
6.985	7.00	9	-	0.0097	2.00



เอกสารไม่ควบคุม

## Calibration Report

**Certificate No.:** 2201793-001-01

**Equipment:** Digital Thermometer with RTD (pH Meter)

Resolution: 0.1 °C Model: SevenEasy pH

Serial No.: 1231155210 ID No.: UAE.WAT.010/2553

Manufacturer: METTLER TOLEDO

**Date of Calibration:** 1 March 2022

Page 4 of 5

**Location:** Chemical Calibration Laboratory, NATIONAL FOOD INSTITUTE

**Environment Condition:**

Ambient Temperature 24 °C ± 1 °C

Relative Humidity 53 % ± 2 %

### 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	1523	2118154	PSL-T 0851/64	03-Jun-22	TISTR
Platinum Resistance Thermometer (PRT)	5627A	877332			

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

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. Condition of Calibrated item :

Good

7. Result of Calibration :

☒

Without adjustment

☐

After adjustment



## Calibration Report

**Certificate No.:** 2201793-001-01

**Equipment:** Digital Thermometer with RTD (pH Meter)

Resolution: 0.1 °C Model: SevenEasy pH

Serial No.: 1231155210 ID No.: UAE.WAT.010/2553

Manufacturer: METTLER TOLEDO

**Date of Calibration:** 1 March 2022

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 100 mm.
- Description of probe, model : N/A S/N : N/A
- Dimension of probe : Diameter 4 mm., Length 100 mm.,
- Sheath material : Stainless Steel

UUC* Reading (°C)	Standard Temperature (°C)	Correction Value (°C)	Uncertainty ± (°C)
15.1	15.006	-0.1	0.099
25.1	25.004	-0.1	0.099
35.1	35.003	-0.1	0.099

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 -----

Certificate No. : HIT-2219-0480

Page : 1 of 2

**CERTIFICATE OF CALIBRATION**

<b>Equipment :</b>	COD Test Tube Heater		
<b>Meter Model :</b>	HI839800-02	<b>Serial No. :</b>	04500052101
<b>Tube Heater :</b>	25 Vial Capacity	<b>Accuracy :</b>	$\pm 2^{\circ}\text{C}$
<b>Temperature Range :</b>	$-10^{\circ}\text{C}$ to $160^{\circ}\text{C}$	<b>Temperature of Reaction :</b>	$150^{\circ}\text{C}$
<b>Ambient Temperature :</b>	$(25 \pm 2)^{\circ}\text{C}$	<b>Relative Humidity :</b>	$(50 \pm 15)\% \text{ RH}$
<b>Manufacturer :</b>	Hanna Instruments	<b>Made in :</b>	Romania
<b>Condition As-Received :</b>	Used Product	<b>Reference :</b>	RE220588
<b>Customer name :</b>	United Analyst and Engineering Consultant Co., Ltd. 3 Soi Udomsuk 41, Sukhumvit Rd., Bangchak, Phrakhanong, Bangkok 10260		
<b>Received date :</b>	29 April 2022		
<b>Calibrate date :</b>	9 May 2022		
<b>Issue date :</b>	10 May 2022		
<b>Calibrated Location :</b>	Hanna Instruments (Thailand) Ltd.		
<b>Calibration Procedure :</b>	This calibrator was conducted by using in-house: calibration procedure CP-04 by using certified reference material		

Calibrated by :



Calibration Engineer

Approved by :



Authorized Signatory

 **HANNA**  
Instruments  
(Thailand) Limited

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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**Condition of this calibration result**
**Reference Standard Instruments:**

Instruments	Model	Serial No.	Certificate No.	Traceable
Data Acquisition Switch Unit	34970A	US37038858	WK2106-154-1	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	150.2	0.55	2	Pass

Figure: Shows the location of the temperature source.

(1A)	(2A)	(3A)	(4A)	(5A)
149.82°C	149.36°C	149.92°C	149.43°C	149.83°C
(1B)	(2B)	(3B)	(4B)	(5B)
150.45°C	150.66°C	150.37°C	149.66°C	150.01°C
(1C)	(2C)	(3C)	(4C)	(5C)
150.78°C	151.30°C	151.33°C	149.57°C	150.52°C
(1D)	(2D)	(3D)	(4D)	(5D)
151.12°C	151.59°C	150.80°C	149.62°C	149.81°C
(1E)	(2E)	(3E)	(4E)	(5E)
150.69°C	149.58°C	149.60°C	149.24°C	149.93°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%.

\*\* End of certificate \*\*

**เอกสารไม่ควบคุม**

**CERTIFICATE OF CALIBRATION**

**Equipment :** COD Test Tube Heater  
**Meter Model :** HI839800-02 **Serial No. :** 1147807  
**Manufacturer :** Hanna Instruments  
**Made in :** Romania  
**Condition As-Received :** Used Product  
**Reference :** RE211097  
**Customer name :** United Analyst and Engineering Consultant Co., Ltd.  
3 Soi Udomsuk 41, Sukhumvit Rd., Bangchak,  
Phrakhanong, Bangkok 10260  
**Received date :** 29 July 2021  
**Calibrate date :** 2 August 2021  
**Issue date :** 5 August 2021  
**Ambient Temperature :** ( 25 ± 2 )°C  
**Relative Humidity :** ( 50 ± 15 )% RH  
**Calibrated Location :** Hanna Instruments (Thailand) Ltd.

**Calibrated by :**  
Mr. Athakom Sumphan  
Calibration Engineer**Approved by :**  
Mr. Anan Suwanchaisakul  
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.

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

approval of the head of Hanna Instrument (Thailand)

**เอกสารไม่ควบคุม**



**Condition of this result of calibration**
**Reference Standard Instruments :**

Instruments	Model	Serial No.	Certificate No.	Traceable
Thermometer With Sensor	HI935005	03250060101	21T167	Technology Promotion Association ( Thailand-Japan )

**Reference / Procedure :**

This equipment was calibration by comparison to the reference standard (Standard platinum resistance thermometer) whose accuracy is traceable to the national standard. The calibration was performed by generating the specified working point of temperature then recorded the temperature reading values against the reference standard according to Hanna Calibration Laboratory work Instruction No. 141.

This temperature scale used was based on ITS-90

All data shown below were as-received values without adjustment.

**SITE CALIBRATION**

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

**Result of Calibration :**

Calibration Point	Unit Under Calibration Setting	Unit Under Calibration Reading	Temperature Stability	Uncertainty of Measurement
150.0 (°C)	150.3 (°C)	150.0 (°C)	2.4 (°C)	± 0.59 (°C)

Calibration Point (°C)	Average Standard Reading (°C)				
	Position				
150.0	1	2	3	4	5
	148.9	149.5	150.1	150.4	149.7
	6	7	8	9	10
	149.9	151.1	151.5	150.5	150.3
	11	12	13	14	15
	149.4	149.6	150.4	150.3	150.2
	16	17	18	19	20
	149.5	149.9	150.4	150.1	150.3
	21	22	23	24	25
	149.1	149.1	149.6	149.8	150.1

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%

\*\* End of certificate \*\*

เอกสารไม่ควบคุม

## Calibration Certificate

**Certificate No.:** 2200708-001-01  
**Client name:** UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.  
**Address:** 3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchack, Prakhnong, Bangkok 10260

Page 1 of 4

**Equipment:** Electronic Balance  
**Manufacturer:** METTLER TOLEDO  
**Model:** AX 105 DR  
**Serial No.:** 1122100406  
**ID No.:** UAE.WAO.004/2546  
**Order No.:** 2200708  
**Operation No.:** 2200708-001  
**Date of Receipt:** 24 November 2021  
**Date of Calibration:** 24 November 2021

**Calibrated by** Mr.Worapob Sooktong  
Scientist

**Approved by**

( Mr. [Redacted] )

Manager, Division of Calibration Laboratory

**Date of Issue:** 30 November 2021

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.



## Calibration Report

**Certificate No.:** 2200708-001-01

**Equipment:**

Electronic Balance

**Manufacturer:** METTLER TOLEDO

**Model:** AX 105 DR

**Resolution:** 0.00001 g/ 0.0001 g

**Serial No.:** 1122100406

**ID No.:** UAE.WAO.004/2546

**Capacity:** 110 g

**Date of Calibration:** 24 November 2021

Page 2 of 4

**Environment Condition:** Ambient Temperature: 22.0 ± 0.5 °C Relative Humidity: 39 ± 1 %

**Place of Calibration:** 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	1-500mg	15880	TCS	M20111955	28 November 2021
Standard Weight Class E2	1-500g	15882	TCS	M20111965	28 November 2021

Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	11A1	สนท.ฟป. BTH 003/55	Quality Reborn	QR21-0297	15 February 2022

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:**

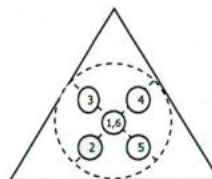
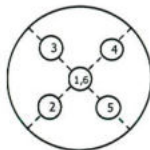
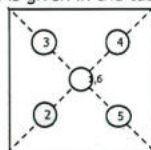
**1. Repeatability of Reading:**

Nominal Value ( g )	Standard Deviation of Reading ( g )
15	0.0000057
30	0.0000084
50	0.0000053
100	0.0000048

**2. Off-Center Error:**

A mass of 50 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 )
50.0000	50.0000	49.9999	50.0000	49.9999	49.9999	0.0001

เอกสารนี้เป็นเอกสารของบริษัท

## Calibration Report

**Certificate No.:** 2200708-001-01

**Equipment:** Electronic Balance

**Manufacturer:** METTLER TOLEDO

**Model:** AX 105 DR

**Resolution:** 0.00001 g/ 0.0001 g

**Serial No.:** 1122100406

**ID No.:** UAE.WAO.004/2546

**Capacity:** 110 g

**Date of Calibration:** 24 November 2021

Page 3 of 4

**Calibration Results:** (Continued)

**Calibration Range:** 0-100 g

**Calibration Adjustment:** Internal Calibration

**3. Departure from Nominal Value:** ( Range: 0 - 30 g ; Resolution: 0.00001 g )

Nominal Value ( g )	Standard Value ( g )	Average Reading ( g )	Correction ( g )	Uncertainty ( ± g )	Coverage Factor k
Unload	0.000000	0.00000	0.00000	0.0000089	2.00
0.01	0.009998	0.01000	0.00000	0.000011	2.00
0.02	0.019997	0.02000	0.00000	0.000012	2.00
0.05	0.050001	0.05000	0.00000	0.000011	2.00
0.1	0.100002	0.10000	0.00000	0.000012	2.00
0.2	0.200004	0.20000	0.00000	0.000013	2.00
0.5	0.499994	0.50000	-0.00001	0.000014	2.00
1	0.999986	1.00000	-0.00001	0.000026	2.00
2	1.999989	1.99998	0.00001	0.000019	2.00
5	4.999979	4.99998	0.00000	0.000022	2.00
10	10.000026	9.99994	0.00009	0.000074	2.00
20	20.000037	19.99991	0.00013	0.000099	2.00
30	30.000063	30.00000	0.00006	0.00013	2.00

## Calibration Report

**Certificate No.:** 2200708-001-01

**Equipment:** Electronic Balance

**Manufacturer:** METTLER TOLEDO

**Model:** AX 105 DR

**Resolution:** 0.00001 g/ 0.0001 g

**Serial No.:** 1122100406

**ID No.:** UAE.WAO.004/2546

**Capacity:** 110 g

**Date of Calibration:** 24 November 2021

Page 4 of 4

**Calibration Results:** (Continued)

**Calibration Range:** 0-100 g

**Calibration Adjustment:** Internal Calibration

**3. Departure from Nominal Value:** ( Range: 31 - 100 g ; Resolution: 0.0001 g )

Nominal Value ( g )	Standard Value ( g )	Average Reading ( g )	Correction ( g )	Uncertainty ( ± g )	Coverage Factor k
40	40.00000	39.9999	0.0001	0.00014	2.00
45	44.99998	44.9999	0.0001	0.00015	2.00
50	49.99999	49.9999	0.0001	0.00016	2.00
55	54.99997	54.9998	0.0002	0.00016	2.00
60	60.00002	59.9999	0.0001	0.00018	2.00
65	65.00000	64.9999	0.0001	0.00018	2.00
70	70.00003	69.9999	0.0001	0.00019	2.00
75	75.00001	74.9999	0.0001	0.00020	2.00
80	80.00005	79.9998	0.0003	0.00021	2.00
85	85.00003	84.9998	0.0002	0.00022	2.00
90	89.99999	89.9998	0.0002	0.00021	2.00
100	99.99997	99.9998	0.0002	0.00020	2.00

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

----- End -----





TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert.No.: 22MM210  
Page.: 1 of 3

## Certificate of Calibration

<b>Equipment :</b>	Electronic Balance
<b>Manufacturer :</b>	Mettler Toledo
<b>Model :</b>	XSR205
<b>Serial No. :</b>	C009071872
<b>ID No. :</b>	UAE.WAO.012/2563
<b>Submitted by :</b>	United Analyst and Engineering Consultant Co.,Ltd. 3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phakhanong, Bangkok 10260
<b>Location :</b>	Balance Room
<b>Received order :</b>	26 April 2022
<b>Calibration Date :</b>	26 April 2022
<b>Ambient Temperature :</b>	15 °C to 40 °C
<b>Relative Humidity :</b>	30 % to 90 %
<b>Calibrated by :</b>	Kunchit Promprat
<b>Approved by :</b>	<div style="text-align: center;">_____ App [Redacted Signature]</div> <div style="margin-top: 10px;"><input type="checkbox"/> Pornthippa Tameyakul <input checked="" type="checkbox"/> Malee Butkruea <input type="checkbox"/> Suwit Imjai</div>
<b>Issue Date :</b>	29 April 2022

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 : Electronic Balance  
Condition As-Received : Used Item  
Reference : 2204-0542OC-1

Cert.No.: 22MM210  
Page: 2 of 3

**Procedure used :-**

Calibration were conducted using in-house calibration procedure CP-OB01 according to direct measurement method against standard weight.

**Condition of this result of calibration**

**1. Reference standard instruments:-**

<u>Instruments</u>	<u>Model</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Test report No.</u>	<u>Due date</u>
1) Standard Weight Set (E2)	15884	-	70RC138	MM-0009-21	3 Feb 2023

2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This result of calibration was made on requested at the point specified by customer.
4. This certificate is not certified for any commercial transaction.
5. This certification is traceable to the International System of Unit.

**Result of calibration** ( ) Without Adjustment ( \* ) After Adjustment by Internal Calibration

<b>Range capacity :</b>	0 g to 81 g	<b>Resolution</b>	0.00001 g
	81 g to 220 g	<b>Resolution</b>	0.0001 g

**Before Adjustment :**

<u>Applied Weight</u>	<u>Balance Reading</u>	<u>Correction</u>	<u>Measurement Uncertainty</u>	<u>Coverage Factor</u>
( g )	( g )	( g )	( $\pm$ mg )	( k )
80	80.00004	-0.00004	0.15	2.00
200	199.9999	+0.0001	0.35	2.00

**After Adjustment :**

**1. Determination of the standard deviation of weighing machine** ( n = 10 )

<u>Applied Weight</u>	<u>Standard Deviation of Reading ( g )</u>
( g )	
80	0.000008
200	0.00005



Equipment : Electronic Balance  
Condition As-Received : Used Item  
Reference : 2204-0542OC-1

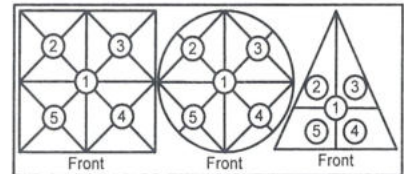
Cert.No.: 22MM210

Page: 3 of 3

### Result of calibration

#### 2. Effect of off center loading

A mass of 100 g was placed to various position on the pan.  
The weighing machine reading error obtained is given in the table



Maximum difference between  
off-center and central loading

Position 1 ( g )	Position 2 ( g )	Position 3 ( g )	Position 4 ( g )	Position 5 ( g )	( g )
-0.0002	-0.0001	0.0000	-0.0002	-0.0002	0.0002

#### 3. Departure from nominal value

Applied Weight ( g )	Balance Reading ( g )	Correction ( g )	Measurement Uncertainty ( ± mg )	Coverage Factor ( k )
Unload	0.00000	0.00000	0.016	2.13
0.05	0.05001	-0.00001	0.016	2.13
0.1	0.10001	-0.00001	0.017	2.11
1	1.00002	-0.00002	0.019	2.05
5	5.00003	-0.00003	0.026	2.00
20	20.00008	-0.00008	0.049	2.00
50	50.00010	-0.00010	0.080	2.00
80	80.00014	-0.00014	0.15	2.00
100	100.0001	-0.0001	0.21	2.00
150	150.0001	-0.0001	0.29	2.00
200	200.0001	-0.0001	0.35	2.00

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

-o0o-



## Calibration Certificate

**Certificate No.:** 2203120-001-01  
**Client name:** UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.  
**Address:** 3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchack, Prakanong, 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.:** 2203120  
**Operation No.:** 2203120-001  
**Date of Receipt:** 1 June 2022  
**Date of Calibration:** 1 June 2022

**Calibrated by** Mr.Taveesak Seilee  
Scientist

**Approved by**

( Mr.Pheraphat Tuanjit )

Manager, Division of Calibration Laboratory

**Date of Issue:** 7 June 2022

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.:** 2203120-001-01

**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:** 1 June 2022

Page 2 of 3

**Environment Condition:** Ambient Temperature: 19.9 ± 0.3 °C Relative Humidity: 45 ± 1.5 %

**Place of Calibration:** 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	1-500mg	B308068554	TCS	M2201020S	6 January 2023
Standard Weight Class E2	1-500g	B308068128	TCS	M2201021S	6 January 2023
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	PONPE 490	NFI.BTH 010/18	Quality Reborn	QR22-0350	18 February 2023

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:**

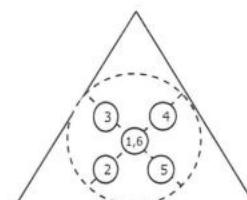
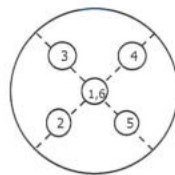
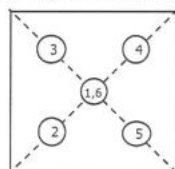
**1. Repeatability of Reading:**

Nominal Value ( g )	Standard Deviation of Reading ( g )
100	0.000048
200	0.000052

**2. Off-Center Error:**

A mass of 50 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 )
49.9999	49.9998	49.9998	49.9999	49.9998	49.9998	0.0001

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

เอกสารไม่ควบคุม

2008 ซอยอรุณอมรินทร์ 36 ถนนอรุณอมรินทร์ แขวงบางยี่ขัน เขตบางพลัด กรุงเทพมหานคร 10700

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



nfi.or.th

## Calibration Report

**Certificate No.:** 2203120-001-01

**Equipment:**

Electronic Balance

**Model:** AB204-S/FACT

**Serial No.:** 1129361010

**Capacity:** 220 g

**Manufacturer:** METTLER TOLEDO

**Resolution:** 0.0001 g

**ID No.:** UAE.WAS.002/2552

**Date of Calibration:** 1 June 2022

Page 3 of 3

**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 <i>k</i>
Unload	0.00000	0.0000	0.0000	0.000088	2.00
0.01	0.01000	0.0100	0.0000	0.000088	2.00
0.05	0.05000	0.0499	0.0001	0.000088	2.00
0.1	0.10000	0.1000	0.0000	0.000088	2.00
0.2	0.20000	0.2000	0.0000	0.000088	2.00
0.5	0.50000	0.5000	0.0000	0.000088	2.00
1	1.00000	0.9999	0.0001	0.000088	2.00
2	2.00000	1.9999	0.0001	0.000089	2.00
5	5.00000	5.0000	0.0000	0.000089	2.00
10	9.99998	9.9999	0.0001	0.000092	2.00
20	19.99999	19.9999	0.0001	0.000094	2.00
50	49.99990	49.9999	0.0000	0.00012	2.00
70	69.99989	69.9998	0.0001	0.00014	2.00
100	100.00001	99.9999	0.0001	0.00017	2.00
150	149.99991	149.9997	0.0002	0.00022	2.00
200	200.00007	199.9998	0.0003	0.00030	2.00

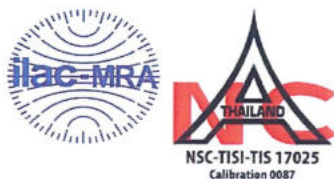
The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor *k*, providing a level of confidence of approximately 95 %.

----- End -----

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



เอกสารไม่ควบคุม



# Certificate of Calibration

<b>Equipment:</b>	CONDUCTIVITY METER	<b>Certificate No.:</b>	C24220084
<b>Model:</b>	Lab955	<b>Issued Date:</b>	22 March 2022
<b>Serial No. (or ID.):</b>	16300356	<b>Job No.:</b>	KSPR2203267
<b>Manufacturer:</b>	SI Analytics	<b>Page:</b>	1 of 2
<b>Electrode Serial No.</b>	16070067	<b>Model :</b>	LF413T
<b>Condition:</b>	In Condition	<b>Brand :</b>	SI Analytics

**Customer:** United Analyst and Engineering Consultant Company Limited  
3 Soi Udomsuk 41 Sukhumvit Road,  
Bangkok, Prakanong, Bangkok 10260 Thailand

**Environment Condition:**

Temperature	23	°C	±	2	°C
Humidity	50	%RH	±	15	%RH

**Calibration Place:** Environment Laboratory, SPC RT Co., Ltd.  
1194 Soi Wachirathamsathit 57, Sukhumvit 101/1 Rd.,  
Bangchak, Prakanong, Bangkok 10260 Thailand

**Calibration By:** Mr. Wasan Nuchnabee

**Calibration Date:** 22 March 2022

**The Method used:** In house method, SPCC-WI-49, base on ASTM D 1125-14 and D 5391-14

**Traceability:** This certificate is traceable to the SI Units maintained by CRM of NIST(SRM) through CPA chem Co., Ltd. (ISO/IEC 17034) Certificate No. 794135, 794136, 772624

(Mr. [Redacted] ee)

Person in charge

**SERT**  
บริษัท เอสพีซี อาร์ที จำกัด  
SPC RT Co., Ltd.

(Mr. [Redacted] Boonsophon)

Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).

These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of SPC RT Co., Ltd.



## Calibration Results:

### Before Adjustment

Standard Conductivity Solution	Unit Under Calibration Reading	Correction	Coverage Factor ( k )	Uncertainty ( ± )
25.000 $\mu\text{S/cm}$	25.9 $\mu\text{S/cm}$	-0.900 $\mu\text{S/cm}$	2.00	0.22 $\mu\text{S/cm}$
1413.0 $\mu\text{S/cm}$	1444 $\mu\text{S/cm}$	-31.0 $\mu\text{S/cm}$	2.00	8.9 $\mu\text{S/cm}$
111.3 $\text{mS/cm}$	107.9 $\text{mS/cm}$	3.40 $\text{mS/cm}$	2.00	0.66 $\text{mS/cm}$

### After Adjustment ; at 1413 $\mu\text{S/cm}$

Standard Conductivity Solution	Unit Under Calibration Reading	Correction	Coverage Factor ( k )	Uncertainty ( ± )
25.000 $\mu\text{S/cm}$	25.0 $\mu\text{S/cm}$	0.000 $\mu\text{S/cm}$	2.00	0.22 $\mu\text{S/cm}$
1413.0 $\mu\text{S/cm}$	1413 $\mu\text{S/cm}$	0.0 $\mu\text{S/cm}$	2.00	8.9 $\mu\text{S/cm}$
111.3 $\text{mS/cm}$	107.2 $\text{mS/cm}$	4.10 $\text{mS/cm}$	2.00	0.66 $\text{mS/cm}$

The End of Certificate

## ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: KSPR2203267

ชนิดเครื่องมือ: CONDUCTIVITY METER

รุ่น: Lab955

หมายเลขเครื่อง: 16300356

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
22 Mar 2022			22 Mar 2022		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความสมบูรณ์เครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด ( ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิทช์ ปิด – เปิด เครื่อง (On-Off Swicth)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
		Spectrophotometer			
<input type="checkbox"/>	<input type="checkbox"/>	6. แรงดันไฟฟ้า (Battery Backup) >= 2.5 VDC	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	7. ตัวหมุนเลือกความยาวคลื่น (Wavelength Control)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	9. แหล่งกำเนิดแสง (UV < 3,000 hour)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	10. แหล่งกำเนิดแสง (Visible < 5,000 hour)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	11. ช่องวัดหลายตัวอย่าง (Carousel Module)	<input type="checkbox"/>	<input type="checkbox"/>	
		pH Meter and Conductivity Meter			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. อิเล็กโทรด ( Electrode and Connection Cable )	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	13. ระดับสารละลายใน Electrode (Level KCl )	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	14. ฝาปิดกันปลาย Electrode (Dust Protection Hood)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	15. ขาจับอิเล็กโทรด (Stand)	<input type="checkbox"/>	<input type="checkbox"/>	
		Turbidimeter			
<input type="checkbox"/>	<input type="checkbox"/>	16. ค่าความขุ่นที่ต่ำสุด (No Sample)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	17. ระดับการส่องสว่างของแสง (>= 2.5 ไม่เกิน 3.0)	<input type="checkbox"/>	<input type="checkbox"/>	
		Automatic titrator			
<input type="checkbox"/>	<input type="checkbox"/>	18. สภาพ Piston Burettes	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	19. Function Rinsing and Dosing	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	20. ระบบท่อสายยางและอุปกรณ์ประกอบ	<input type="checkbox"/>	<input type="checkbox"/>	

ข้อแนะนำ : Electrode วัดอุณหภูมิได้  $24.9^{\circ}\text{C}$  โดย Control Waterbath ที่  $25.0 \pm 0.1^{\circ}\text{C}$

Mr. Wasan Nuchnabee

Service Engineer

## CERTIFICATE OF CALIBRATION

**Certificate No. :** SP22-016

Page 1 of 5

**Customer :** United Analyst and Engineering Consultant Co.,Ltd. (Head Office)

**Address :** 3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong,

Bangkok 10260

**Location of calibration :** Laboratory 315

**Equipment :** UV-Vis Spectrophotometer

**Manufacturer :** Agilent Technologies

**Model :** Cary 60

**Serial No. :** MY15410009

**ID No. :** N/A

**Received Date :** 23 May 2022

**Calibration Date :** 23 May 2022

**Issue Date :** 26 May 2022

**Condition Instrument :** Good

**Calibrated by :**

( Mr. Panawat Kintadaeh )

Technical Manager

**Approved by :**

( Ms. Chantana Wongkum )

Quality Manager

The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

The measurement capability of the laboratory and its traceability to recognized national standards and to the unit 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 DQE Services Co., Ltd.

**เอกสารไม่ควบคุม**



## REPORT OF CALIBRATION

**Certificate No. :** SP22-016

Page 2 of 5

**Environment Condition :** Ambient Temperature  $25 \pm 5$  °CRelative humidity  $55 \pm 20$  %RH**Calibration method :** In-house method CP-01 Based on ASTM E275-08**Certified Reference Materials :**

Material	Serial No.	Certificate No.	Due date
Absorbance Standard set	25760	95935	22 October 2023
Absorbance Standard set	25757	95929	22 October 2023
Wavelength Standard set	25806	95916	22 October 2023
Wavelength Standard set	25758	95915	22 October 2023

**Traceability :** This certification is traceable to the International System of Unit maintained at National -

Institute of Standards and Technology (NIST) through Starna Scientific Limited

**Spectral Band Width of UUC :** 1.5 nm.**Scan Speed of UUC :** 90 nm/min**Scan Interval of UUC :** 0.15 nm.**Resolution of UUC :** Photometric 0.0001 Abs.

Wavelength 0.1 nm.

**เอกสารไม่ควบคุม**



## REPORT OF CALIBRATION

Certificate No. : SP22-016

Page 3 of 5

Calibration Results : Without adjustment

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor <i>k</i>
420	0.0000	0.0000	0.0000	0.0028	2.00
	0.5787	0.5755	0.0032	0.0031	2.00
	1.0490	1.0436	0.0054	0.0029	2.00
	2.1900	2.1847	0.0053	0.0075	2.00
440	0.0000	0.0000	0.0000	0.0028	2.00
	0.5607	0.5588	0.0019	0.0034	2.00
	1.0247	1.0232	0.0015	0.0035	2.00
	2.1229	2.1211	0.0018	0.0082	2.00
465	0.0000	0.0000	0.0000	0.0028	2.00
	0.5236	0.5197	0.0039	0.0029	2.00
	0.9634	0.9625	0.0009	0.0028	2.00
	1.9763	1.9752	0.0011	0.0070	2.00
546.1	0.0000	-0.0001	0.0001	0.0028	2.00
	0.5191	0.5171	0.0020	0.0031	2.00
	1.0003	0.9984	0.0019	0.0033	2.00
	1.9987	1.9946	0.0041	0.0084	2.00
590	0.0000	0.0000	0.0000	0.0028	2.00
	0.5523	0.5509	0.0014	0.0030	2.00
	1.0809	1.0799	0.0010	0.0029	2.00
	2.0391	2.0329	0.0062	0.0080	2.00
635	0.0000	0.0000	0.0000	0.0028	2.00
	0.5601	0.5584	0.0017	0.0031	2.00
	1.0512	1.0498	0.0014	0.0029	2.00
	1.9294	1.9265	0.0029	0.0082	2.00

เอกสารไม่ควบคุม

## REPORT OF CALIBRATION

Certificate No. : SP22-016

Page 4 of 5

### Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor <i>k</i>
235	0.0000	0.0001	-0.0001	0.0050	2.00
	0.7478	0.7421	0.0057	0.0056	2.00
257	0.0000	0.0000	0.0000	0.0050	2.00
	0.8686	0.8619	0.0067	0.0059	2.00
313	0.0000	0.0000	0.0000	0.0050	2.00
	0.2912	0.2896	0.0016	0.0051	2.00
350	0.0000	0.0000	0.0000	0.0050	2.00
	0.6448	0.6403	0.0045	0.0055	2.00

**เอกสารไม่ควบคุม**

## REPORT OF CALIBRATION

Certificate No. : SP22-016

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### Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor <i>k</i>
241.72	242.0	-0.28	0.18	2.00
279.45	279.5	-0.05	0.18	2.00
287.81	287.5	0.31	0.18	2.00
334.06	333.5	0.56	0.18	2.00
360.93	360.5	0.43	0.18	2.00
418.59	418.0	0.59	0.18	2.00
445.94	445.4	0.54	0.18	2.00
453.66	453.2	0.46	0.18	2.00
460.02	459.7	0.32	0.18	2.00
536.59	536.2	0.39	0.18	2.00
637.98	638.3	-0.32	0.18	2.00
431.38	431.0	0.38	0.18	2.00
472.50	472.5	0.00	0.18	2.00
513.47	513.5	-0.03	0.18	2.00
528.88	528.5	0.38	0.18	2.00
573.17	573.0	0.17	0.18	2.00
585.35	585.0	0.35	0.20	2.00
684.40	684.7	-0.30	0.18	2.00
740.72	740.8	-0.08	0.20	2.00
748.55	748.5	0.05	0.18	2.00
807.03	807.3	-0.27	0.18	2.00
879.28	879.0	0.28	0.18	2.00

Remark : - UUC = Unit Under Calibration

- N/A = Not Available

- The result expanded uncertainty of measurement  $U$  is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k$ ,

which for a normal distribution corresponds to a coverage probability of approximately 95%

- \* Indicates non TISI accredited

- End of Certificate -

# เอกสารไม่ควบคุม

## CERTIFICATE OF CALIBRATION

**Certificate No. :** SP22-007

Page 1 of 5

**Customer :** United Analyst and Engineering Consultant Co.,Ltd. (Head Office)**Address :** 3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong,  
Bangkok 10260**Location of calibration :** Laboratory 315**Equipment :** UV-Vis Spectrophotometer**Manufacturer :** Hitachi**Model :** U-1900**Serial No. :** 2021-064**ID No. :** UAE.WAS.006/2552**Received Date :** 20 January 2022**Calibration Date :** 20 January 2022**Issue Date :** 24 January 2022**Condition Instrument :** Good**Calibrated by :**  
( Ms. (redacted) )

Technical Manager

**Approved by :**  
( Ms. (redacted) )

Quality Manager

The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

The measurement capability of the laboratory and its traceability to recognized national standards and to the unit 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 DQE Services Co., Ltd.



## REPORT OF CALIBRATION

**Certificate No. :** SP22-007

Page 2 of 5

**Environment Condition :** Ambient Temperature  $25 \pm 5$  °CRelative humidity  $55 \pm 20$  %RH**Calibration method :** In-house method CP-01 Based on ASTM E275-08**Certified Reference Materials :**

Material	Serial No.	Certificate No.	Due date
Absorbance Standard set	25760	95935	22 October 2023
Absorbance Standard set	25757	95929	22 October 2023
Wavelength Standard set	25806	95916	22 October 2023
Wavelength Standard set	25758	95915	22 October 2023

**Traceability** This certification is traceable to the International System of Unit maintained at National -

Institute of Standards and Technology (NIST) through Starna Scientific Limited

**Spectral Band Width of UUC :** 4.0 nm.**Scan Speed of UUC :** 200 nm/min**Scan Interval of UUC :** 0.1 nm.**Resolution of UUC:** Photometric 0.001 Abs.

Wavelength 0.1 nm.

**REPORT OF CALIBRATION**

Certificate No. : SP22-007

Page 3 of 5

Calibration Results : Without adjustment

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor <i>k</i>
420	0.0000	0.000	0.0000	0.0028	2.00
	0.5787	0.577	0.0017	0.0031	2.00
	1.0490	1.050	-0.0010	0.0029	2.00
	2.1900	2.183	0.0070	0.0080	2.00
440	0.0000	0.000	0.0000	0.0028	2.00
	0.5607	0.560	0.0007	0.0034	2.00
	1.0247	1.023	0.0017	0.0035	2.00
	2.1229	2.118	0.0049	0.0079	2.00
465	0.0000	0.000	0.0000	0.0028	2.00
	0.5236	0.521	0.0026	0.0030	2.00
	0.9634	0.963	0.0004	0.0029	2.00
	1.9763	1.974	0.0023	0.0070	2.00
546.1	0.0000	0.000	0.0000	0.0028	2.00
	0.5191	0.518	0.0011	0.0031	2.00
	1.0003	1.000	0.0003	0.0033	2.00
	1.9987	1.996	0.0027	0.0084	2.00
590	0.0000	0.000	0.0000	0.0028	2.00
	0.5523	0.552	0.0003	0.0030	2.00
	1.0809	1.082	-0.0011	0.0030	2.00
	2.0391	2.033	0.0061	0.0079	2.00
635	0.0000	0.000	0.0000	0.0028	2.00
	0.5601	0.562	-0.0019	0.0031	2.00
	1.0512	1.052	-0.0008	0.0030	2.00
	1.9294	1.925	0.0044	0.0079	2.00

**REPORT OF CALIBRATION**

Certificate No. : SP22-007

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**Photometric Accuracy :**

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor <i>k</i>
235	0.0000	0.000	0.0000	0.0050	2.00
	0.7478	0.746	0.0018	0.0057	2.00
257	0.0000	0.000	0.0000	0.0050	2.00
	0.8686	0.861	0.0076	0.0059	2.00
313	0.0000	0.000	0.0000	0.0050	2.00
	0.2912	0.291	0.0002	0.0051	2.00
350	0.0000	0.000	0.0000	0.0050	2.00
	0.6448	0.638	0.0068	0.0055	2.00

## REPORT OF CALIBRATION

Certificate No. : SP22-007

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### Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor <i>k</i>
241.54	240.8	0.74	0.18	2.00
279.40	278.5	0.90	0.18	2.00
288.70	288.0	0.70	0.18	2.00
334.22	333.5	0.72	0.18	2.00
361.26	360.5	0.76	0.18	2.00
418.48	418.0	0.48	0.18	2.00
446.70	446.0	0.70	0.18	2.00
453.20	453.0	0.20	0.18	2.00
460.06	459.5	0.56	0.18	2.00
536.90	536.0	0.90	0.18	2.00
637.94	637.2	0.74	0.18	2.00
440.74	440.0	0.74	0.18	2.00
472.22	471.6	0.62	0.18	2.00
513.70	513.0	0.70	0.18	2.00
528.72	528.0	0.72	0.18	2.00
574.60	573.8	0.80	0.18	2.00
585.48	584.6	0.88	0.20	2.00
684.63	684.0	0.63	0.18	2.00
740.27	739.8	0.47	0.20	2.00
748.28	747.8	0.48	0.18	2.00
807.16	806.4	0.76	0.18	2.00
879.70	878.8	0.90	0.18	2.00

Remark : - UUC = Unit Under Calibration

- N/A = Not Available

- The result expanded uncertainty of measurement  $U$  is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k$ ,

which for a normal distribution corresponds to a coverage probability of approximately 95%

- \* Indicates non TISI accredited

- End of Certificate -



## 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	Horiba	LAQUA-PH210 HA1F0002	Technology Promotion Association (Thailand-Japan)	21CH1607	19 Nov 21	18 Nov 22	-
2	DO Meter	DO	Horiba	LAQUA-DO210 HE1D0010	Technology Promotion Association (Thailand-Japan)	21TW250	19 Nov 21	18 Nov 22	-
3	Conductivity Meter	Conductivity	Horiba	LAQUA-EC210 HC0J0014	Technology Promotion Association (Thailand-Japan)	21CH1621	23 Nov 21	22 Nov 22	-



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert.No.: 21CH1607

Page.: 1 of 3

## Certificate of Calibration

**Equipment :** pH Meter  
**Manufacturer :** Horiba  
**Model :** LAQUA-PH210  
**Serial No. :** HA1F0002  
**ID No. :** UAE.EFM.200/2564(EFM.pH.08/64)  
**Condition As-Received:** Used Item  
**Received Date :** 18 November 2021  
**Calibration Date :** 19 November 2021  
**Reference :** 2111-0736WSC-1  
**Submitted by :** United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udomsuk 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 :** Warakorn Lernagtrakul

**Approved by :**

Ap [Redacted Signature]

- (✓) Malee Butkruea  
( ) Saithip Meangmai  
( ) Warakorn Lernagtrakul

**Issue Date :** 25 November 2021

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.: 21CH1607

Page.: 2 of 3

**Condition of this calibration result**

1. Reference Standard Instrument : -

<u>Instrument</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Document Process Calibrator	54030049	130RC116	21E2682	25 Aug 2022
2) Ref. Standard Thermometer	4982054	110RC044	21I1201	26 Oct 2022

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

<u>Buffer Solution</u>	<u>Manufacturer</u>	<u>Lot No.</u>	<u>Exp. date</u>
pH 4.008	CPA chem	761016	02 Aug 2023
pH 6.982	CPA chem	761017	02 Aug 2022
pH 10.015	CPA chem	761018	02 Aug 2022

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)**

<u>Unit Under Calibration</u>	<u>Nominal Value</u>	<u>Standard Voltage Input</u>	<u>Actual Reading</u>		<u>Uncertainty of Measurement</u> ( ±mV )	<u>Coverage factor</u> <i>k</i>
	<u>pH</u>	<u>mV</u>	<u>mV</u>	<u>pH</u>		
pH Meter S/N.: HA1F0002	4.00	177.48	177.4	4.01	0.058	2.00
	7.00	0.00	-0.2	7.02	0.058	2.00
	7.00	0.00	-0.2	7.02	0.058	2.00
	10.00	-177.48	-177.6	10.01	0.058	2.00

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Cert.No.: 21CH1607

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 ( $\pm$ )	Coverage factor $k$
pH Electrode S/N.: 991E0471	4.008	4.01	172	0.0071	2.00
	6.982	6.98	-4	0.011	2.00
	6.982	6.98	-4	0.011	2.00
	10.015	10.01	-181	0.011	2.05

**Function : Temperature Measurement****( \* ) Without adjustment**

This equipment was connected with Temperature Probe;

- Model : 9652  
- Serial No. : 991E0471

Dimension of probe;

- Length : 103 mm.  
- Diameter : 16 mm.  
- Immersion Depth : 90 mm.

Calibration Point ( $^{\circ}\text{C}$ )	Standard Temperature ( $^{\circ}\text{C}$ )	UUC* Reading ( $^{\circ}\text{C}$ )	Error ( $^{\circ}\text{C}$ )	Uncertainty of measurement ( $\pm$ $^{\circ}\text{C}$ )	Coverage factor $k$
25.0	25.002	25.0	-0.002	0.13	2.00
30.0	30.004	30.0	-0.004	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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เอกสารไม่ค





**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 FAX. 0-2719-9484

**Cert.No.:** 21TW250

**Page.:** 1 of 2

## **Certificate of Testing**

**Equipment :** DO Meter  
**Manufacturer :** Horiba  
**Model :** LAQUA-DO210  
**Serial No. :** HE1D0010  
**ID No. :** UAE.EFM.208/2564(EFM.DO.10/64)  
**Received Date :** 18 November 2021  
**Test Date :** 19 November 2021  
**Reference :** 2111-0736WSC-11  
**Submitted by :** United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak,  
Phrakhanong, Bangkok 10260  
**Laboratory Condition :** Temperature (  $25 \pm 5$  ) °C  
Humidity (  $50 \pm 20$  ) %  
**Test Procedure :** In - house method : CP-CH9  
by Comparison Technique with Azide Modification Method  
**Tested by :** Walalak Sirithean  
**Approved by :**   
Approved Signatory  
☒ Malee Butkruea  
☐ Saithip Meangmai  
☐ Warakorn Lerngagtrakul  
**Issue Date :** 25 November 2021

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Cert.No.: 21TW250

Page.: 2 of 2

**Result :** Dissolved Oxygen Meter Adjustment With Air 100 %

Dissolved Oxygen Probe No.: 9K1B0023

<b>Titration Method (Azide Modification Method) (mg/L)</b>	<b>DO Meter Reading (mg/L)</b>	<b>Standard Deviation  (mg/L)</b>
8.16	8.15	0.0055

This report was certified only for the instrument we tested. It is allowable to use for study the system efficiency, The environmental impact control and present to organization it may concerned. Intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full, without written approval of the laboratory

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เอกสารไม่ [redacted]



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
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TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 21LM21

Page.: 1 of 2

## Certificate of Calibration

**Equipment :** DO Meter with Sensor

**Manufacturer :** Horiba

**Model :** LAQUA-DO210

**Serial No. :** HE1D0010

**ID No. :** UAE.EFM.208/2564(EFM.DO.10/64)

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

**Location :** TPA On Site Calibration Laboratory

**Received Order :** 18 November 2021

**Calibrated Date :** 26 November 2021

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

**Relative Humidity :** ( 50 ± 30 ) %

**AC Line Voltage :** ( 220 ± 22 ) V

**Calibrated by :** Malee Butkruea

**Approved by :**

Approved Signatory

( ) Pornthippa Tameyakul

(✓) Suwit Imjai

**Issue Date :** 2 December 2021

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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**Equipment :** DO Meter with Sensor

**Cert. No.:** 21LM21

**Condition As-Received :** Used Item

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**Reference :** 2111-0736WSC-12

**Procedure Used :-**

Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with Industrial Platinum Resistance Thermometer ( IPRT ) into Temperature Bath.

The temperature scale used was based on ITS-90.

**Condition of this result of calibration**

1. Reference standard instrument:-

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Digital Thermometer	1523	2188080	2111273	22 Nov 2022

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 :** Temperature measurement.

This instrument was connected with temperature sensor, S/N.: 9K1B0023

<u>Calibration Point</u> ( °C )	<u>Immersion Depth</u> ( mm )	<u>Standard Temperature</u> ( °C )	<u>UUC* Reading</u> ( °C )	<u>Error</u> ( °C )	<u>Uncertainty</u> ( ± °C )	<u>Coverage Factor</u> <i>k</i>
25.0	60	25.006	25.1	0.094	0.16	2.00
30.0	60	29.996	30.0	0.004	0.16	2.00
35.0	60	35.007	35.1	0.093	0.16	2.00

**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. 0-2717-3000-27 FAX. 0-2719-9484



Cert.No.: 21CH1621

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## Certificate of Calibration

<b>Equipment :</b>	Conductivity Meter
<b>Manufacturer :</b>	Horiba
<b>Model :</b>	LAQUA-EC210
<b>Serial No. :</b>	HC0J0014
<b>ID No. :</b>	UAE.EFM.205/2564(EFM.SCT.10/64)
<b>Condition As-Received:</b>	Used Item
<b>Received Date :</b>	18 November 2021
<b>Calibration Date :</b>	23 November 2021
<b>Reference :</b>	2111-0736WSC-6
<b>Submitted by :</b>	United Analyst and Engineering Consultant Co.,Ltd. 3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
<b>Ambient Temperature :</b>	(25 ± 2.5) °C
<b>Relative Humidity :</b>	(50 ± 15) %
<b>Calibration Procedure:</b>	In -house method : - CP-CH6 by direct measurement with certified reference material (CRM) - CP-CH8 by comparison with standard thermometer
<b>Calibrated by :</b>	Walalak Sirithean 
<b>Approved by :</b>	 Approved Signatory
<input checked="" type="checkbox"/> Malee Butkruea <input type="checkbox"/> Saithip Meangmai <input type="checkbox"/> Warakorn Lerngagtrakul	
<b>Issue Date :</b>	25 November 2021

The Uncertainties are for a confidence probability of approximately 95%

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Cert.No.: 21CH1621

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**Condition of this result of calibration**

**1. Reference Standard Instrument :-**

<u>Instrument</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Certificate No.</u>	<u>Due date</u>
1) Thermometer	9549224	130RC003	211451	15 Apr 2022
2) Ref. Std. Thermometer	4982054	110RC044	2111201	26 Oct 2022

This certification is traceable to the International System of Unit maintained at:-

- Traceable to National Institute of Metrology (Thailand), NIMT

**2. Certified Reference Materials :-**

- Conductivity calibration solution, CPA chem Ltd., The measurement results are traceable to SI through CPA chem Ltd., ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

<u>Conductivity Solution</u>	<u>Manufacturer</u>	<u>Lot No.</u>	<u>Exp. date</u>
1413.0 $\mu\text{S/cm}$	CPA Chem	761021	02 Aug 2022
12.8806 mS/cm	CPA Chem	754037	28 June 2022

- Control Conductivity calibration solution temperature by Water bath ( $25 \pm 0.1$ )  $^{\circ}\text{C}$

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

**Calibration results**

**Function : Conductivity Measurement**

**(\*) After Adjustment at 1413.0  $\mu\text{S/cm}$**

**Conductivity Electrode Serial No.: 9B0H0061**

Standard Conductivity Solution	Before Adjustment UUC* Reading	After Adjustment UUC* Reading	Uncertainty of Measurement ( $\pm$ )	Coverage factor k
1413.0 $\mu\text{S/cm}$	1312 $\mu\text{S/cm}$	1412 $\mu\text{S/cm}$	9.2 $\mu\text{S/cm}$	2.00
12.8806 mS/cm	11.67 mS/cm	12.79 mS/cm	0.086 mS/cm	2.00

**Remark - UUC\* = Unit Under Calibration**

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Cert.No.: 21CH1621

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### Calibration Results

#### Function : Temperature Measurement

#### ( \* ) Without adjustment

This equipment was connected with Temperature Probe;

- Model : 9383
- Serial No. 9B0H0061

Dimension of probe;

- Length : 113 mm.
- Diameter : 10 mm.
- Immersion Depth : 90 mm.

Calibration Point ( °C )	Standard Temperature ( °C )	UUC* Reading ( °C )	Error ( °C )	Uncertainty of Measurement ( ± °C )	Coverage factor <i>k</i>
25.0	24.999	24.9	-0.099	0.13	2.00
30.0	29.999	29.9	-0.099	0.13	2.00
35.0	34.998	34.9	-0.098	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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