


## ภาคผนวก ข

---

เอกสารสอบเทียบเครื่องมือที่ใช้ในการวิเคราะห์



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
53/4 PATTANAKARN ROAD SOI 18, SUANLUNG, SUANLUNG BANGKOK 10250  
TEL 02717-5002-29 FAX 0-2719-9484

Cert.No.: 23CH951  
Page.: 1 of 2

**Certificate of Calibration**

**Equipment :** pH Meter  
**Manufacturer :** Eutech  
**Model :** pH 700  
**Serial No. :** 2858459  
**ID No. :** LB-Eq-027  
**Condition As-Received:** Used Item  
**Received Date :** 04 August 2023  
**Calibration Date :** 07 August 2023  
**Reference :** 2308-0115WN-1  
**Submitted by :** Special Lab Envi And Consultant Co.Ltd  
47/91-93, 96 Moo 3 Tambon Tha-it, Pakkret  
Nonthaburi 11120

**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)

**Calibrated by :** Warakorn Lengagitrakul  
**Approved by :** *Saithip*  
( ) Saithip Meangmai  
( ) Warakorn Lengagitrakul  
( ) Porpan Paipim  
**Issue Date :** 16 August 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 & Equipment Calibration and Testing Services.

Cert. No.: 23CH951  
Page.: 2 of 2

**Condition of this calibration result**  
1. Reference Standard Instrument :  
Serial No. ID No. Cert. No.  
Instrument 54030049 130RC116 22E2769  
24 Aug 2023  
This certification is traceable to the International System of Unit maintained through:-  
- Technology Promotion Association (Thailand-Japan)

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 (±mV)	Coverage factor k
		mV	pH	mV	pH		
pH Meter S/N.: 2858459	pH 4.00	177.48	4.01	177.5	4.01	0.058	2.00
	pH 7.00	0.00	7.00	0.1	7.00	0.058	2.00
	pH 10.00	-177.48	10.01	-177.4	10.01	0.058	2.00

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


Unit Under Calibration	Standard Buffer Solution	Actual pH Reading (mV)		Uncertainty of pH measurement (±)	Coverage factor k
		Actual pH Reading (mV)	Actual mV Reading (mV)		
pH Electrode S/N.: 3101624	4.008	4.01	170.7	0.0085	2.05
	6.986	6.99	-2.0	0.011	2.00
	10.010	10.01	-178.2	0.0096	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 %.


*Saithip*  
a 1174396



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
5344 PATTANAKARN ROAD SOI 18, SUANLIANG, SUANLIANG BANGKOK 10250  
TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert. No.: 23LM132  
Page: 1 of 2




NIST-781-7817825  
CALIBRATION 0008

## Certificate of Calibration

Equipment :	pH Meter with Sensor	Received Order :	04 August 2023	Approved by :	Preecha Hahib
Manufacturer :	Eutech	Calibrated Date :	09 August 2023	<input type="checkbox"/> Ponthippa Tameyakul <input type="checkbox"/> Ponpan Palpim <input checked="" type="checkbox"/> Suwit Imjai	Approved Signatory 17 August 2023
Model :	pH 700	Ambient Temperature :	( 26 ± 10 ) °C		
Serial No. :	2858459	Relative Humidity :	( 50 ± 30 ) %		
ID No. :	LB-Eq-027	AC Line Voltage :	( 220 ± 22 ) V		
Submitted by :	Special Lab Envi And Consultant Co.,Ltd. 47/91-93 Moo 3 Tambon Tha-it, Pakkrret, Nonthaburi 11120	Location :	TPA On Site Calibration Laboratory		


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 : pH Meter with Sensor  
Condition As-Received : New Item  
Reference : 2308-015VN-2  
Procedure Used : Calibration were conducted using in-house calibration procedure CP-QT01 according to comparison with Industrial Platinum Resistance Thermometer ( IPT ) into Temperature Bath.  
The temperature scale used was based on ITS-90.

Cert. No.: 23LM132  
Page: 2 of 2



TPA

## Certificate of Calibration

Instrument :	Digital Thermometer	UUC* :	PH5TEMB01P	Coverage Factor	k
Serial No. :	2188080	Reading :	25.0	<input type="checkbox"/> Ponthippa Tameyakul <input type="checkbox"/> Ponpan Palpim <input checked="" type="checkbox"/> Suwit Imjai	Approved Signatory 17 August 2023
Traceable :	TPA	Error :	-0.002		
Due Date :	21 Oct 2023	Uncertainty :	( ± °C )		
Condition of this result of calibration					
1. Reference standard instrument:					
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 : Temperature measurement.					
This instrument was connected with temperature sensor, SIN.: PH5TEMB01P					

Calibration Point ( °C )	Immersion Depth ( mm )	Standard Temperature ( °C )	UUC* Reading ( °C )	Error ( °C )	Uncertainty ( ± °C )	Coverage Factor k
25.0	100	25.002	25.0	-0.002	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 %.

-000-





**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

**Certificate of Testing**

**Equipment :** DO Meter  
**Manufacturer :** Hanna  
**Model :** HI98193  
**Serial No. :** 03030056991  
**ID No. :** LB-Eq-014  
**Received Date :** 16 February 2023  
**Test Date :** 17 February 2023  
**Reference :** 2302-0616WN-1  
**Submitted by :** Special Lab Envi And Consultant Co.,Ltd  
47/91 Moo 3 Thambon Tha-it,  
Pakket, Nonthaburi 11120

**Laboratory Condition :**  
Temperature ( 25 ± 5 ) °C  
Humidity ( 50 ± 20 ) %  
**Test Procedure :** In - house method : CP-CH9  
by Comparison Technique with Azide Modification Method

**Tested by :** Walalak Sirthean


**Approved by :**   
Approved Signatory

( / ) Malee Bulkruea  
( ) Sathip Meangmai  
( ) Warakorn Lemgagrakul

**Issue Date :** 20 February 2023

Cert.No.: 23TW41  
Page.: 1 of 2

B 0307483



**Cert.No.: 23TW41**  
**Page.: 2 of 2**

**Condition of this result of calibration**

1. Reference Standard Instruments :  
This certification is traceable to the International System of Unit through the reference standards laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan).

Instruments	Serial No.	ID No.	Certificate No.	Due Date
1) Burette	130BU10	21CG1389	21CG1389	25 Mar 2023
2) Balance	1126143764	14ORC004	22MM50	20 Sep 2023

2. Standard Material :-

Material	Manufacturer	Lot.No.	Assay
Sodium Thiosulfate pentahydrate	Merck	AM1763316	100.2%

**Result :** Dissolved Oxygen Meter Adjustment With Air 100 %  
Dissolved Oxygen Probe No.: KC1N20CDJ

Titration Method (Azide Modification Method)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.12	8.13	0.0045

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

-000-

Cert.No.: 23TW41  
Page.: 2 of 2


a 1148751

<b>SLECCO</b>	บริษัท สเปซเทค เอเชีย จำกัด	หน้าที่: 1/1
	แผนกบริหารงานตรวจสอบคุณภาพของ Block Digestion	วันที่ส่งกลับใช้: 01/04/2563

1. Block Digestion  
ผู้ถือ: ... Serial No.: ... รหัสเครื่อง: ...  
วันที่ตรวจสอบ: ... ความชื้นสัมพัทธ์: ...  
2. Digital Thermometer with TC Probe  
ผู้ถือ: ... Serial No.: ... รหัสเครื่อง: ...  
ความละเอียด: ... °C วันที่สอบเทียบ: ...  
3. ผลการตรวจสอบ (จำนวน) ... N ... ความชื้นสัมพัทธ์: ... %

ว/ด/ป	Position No.	Set point (°C)	อุณหภูมิ อ่านได้จาก เครื่อง (°C)	อุณหภูมิที่อ่านได้โดยวิธีไมโคร (°C)		Error	ผลการทวน สอบ	
				ครั้งที่ 1 (A)	ครั้งที่ 2 (B)		ค่า	ไม่ผ่าน
3/1/23	1	250	252	252.4	252.1	+2.2	±5	ผ่าน
	2			250.3	250.6	+0.4	±5	ผ่าน
	3			251.4	250.1	+0.1	±5	ผ่าน
	4			251.7	251.2	+1.4	±5	ผ่าน
	5			250.4	250.7	+0.7	±5	ผ่าน
	6			252.3	252.0	+2.2	±5	ผ่าน
	7			250.1	250.6	+0.4	±5	ผ่าน
	8			251.1	251.3	+1.2	±5	ผ่าน
	9			251.3	250.9	+1.1	±5	ผ่าน
	10			250.9	251.1	+1.0	±5	ผ่าน
	11			250.4	250.7	+0.6	±5	ผ่าน
	12			250.9	250.1	0.0	±5	ผ่าน
	13			250.9	250.1	0.0	±5	ผ่าน
	14			250.1	250.4	+0.2	±5	ผ่าน
	15			252.7	252.0	+2.1	±5	ผ่าน
	16			251.3	251.7	+1.5	±5	ผ่าน
	17			250.7	250.6	+0.7	±5	ผ่าน
	18			250.8	250.9	+0.9	±5	ผ่าน
	19			250.9	250.3	+0.6	±5	ผ่าน
	20			250.1	250.3	+0.2	±5	ผ่าน

FM-LB-85:Rev0



**Calibratech Co., Ltd.**  
7/106-7 Moo 2, Sukhaphum 3 Rd., Banggood, Pakkret, Nonthaburi 11120  
Tel: (02) 964-6211 Fax: (02) 964-3155, e-mail: calibratech.cal@yahoo.com, calibratech.cal@hotmail.com

**Certificate of Calibration**

**Certificate No. :** 66-400192-1

**Submitted by :** Special Lab Envi and Consultant Co., Ltd.  
47/91 Moo 3, Tambol Tha-it, Pakkret, Nonthaburi 11120

**Equipment :** Digital Thermometer with Thermocouple probe Type K  
Temperature Indicator

**Environment :** Manufacturer : Thermo Scientific  
Range : -250 °C to 1372 °C  
Resolution : 0.1 °C  
Serial No. : 4008958  
Ambient Temperature : (23 ± 2) °C  
Relative Humidity : (50 ± 15) %  
Line Voltage : (220 ± 22) VAC

**Date of Received :** 06 April 2023  
**Date of Calibration :** 08 April to 10 April 2023  
**Date of Issue :** 10 April 2023  
**Calibrated by :** Chorip Samchusri

**Calibration Method :** This instrument was calibrated by In-house method comparison technique 'CAL-M4003 by compared with PRT in the liquid bath at the constant controlled temperature.  
The temperature scale used was based on ITS-90


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

1. Platinum Resistance Thermometer (PRT)

ID No.	Cert. No.	Due Date	Traceability
400001	TT-0016-22	07 Feb 2024	National Institute of Metrology Thailand (NIMT)
400016	TT-0059-21	02 Jun 2023	National Institute of Metrology Thailand (NIMT)

2. Standard Digital Thermometer

ID No.	Cert. No.	Due Date	Traceability
400003	21E1850	14 Jun 2023	National Institute of Metrology Thailand (NIMT)
400004	21E1850	14 Jun 2023	National Institute of Metrology Thailand (NIMT)

Approved by :   
( Bunjerd Masri )  
Supervisor

Page : 1 of 2

The Uncertainties are for a confidence probability of approximately 95%  
This certificate may not be reproduced other than in full except with the prior written approval of the Calibratech Co., Ltd.  
CAL-F0031-03



**CAL**  
Calibratech Co., Ltd.  
7/1067 Moo 2, Sukprachasarn 3 Rd., Banggood, Pakred, Nonthaburi 11120  
Tel: (02) 964-6211 Fax: (02) 964-5155, e-mail: calibratech.cal@yahoo.com, calibratech.cal@hotmail.com

Page : 2 of 2

**Certificate of Calibration**

**Certificate No. :** 66-400192-1

**Result of Calibration :** Without Adjustment

**UUC Condition As-Received :** Good

**Function :** Temperature measurement with Thermocouple probe Type K

**Model :** Type K      **Sheath Material :** Teflon

**Diameter :** 2 mm.      **Length :** 1500 mm.

**Serial No. :** N/A      **ID No. :** SL-39

Immersion Depth (mm.)	Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (±°C)
130	3.00336	3.5	-0.5	0.18
130	20.0024	20.4	-0.4	0.18
130	104.0011	104.3	-0.3	0.45
130	150.0027	150.2	-0.2	0.58
130	180.0040	180.0	0.0	0.65

**Model :** AD-1218-230      **Sheath Material :** Stainless

**Diameter :** 3.5 mm.      **Length :** 230 mm.

**Serial No. :** N/A      **ID No. :** SL-40

Immersion Depth (mm.)	Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (±°C)
124	379.9914	379.3	0.7	1.5
124	400.0011	399.2	0.8	1.6

**Remark**

UUC : Unit Under Calibration

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

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

- olo -

CAL-F0031-03

**Thermology Co., Ltd.**  
96/177-96/178 Moo 6, T. La-harn, A. Bangbuahtong, Nonthaburi 11110  
Tel : 0 2191 6479 Fax : 0 2191 6480 website : www.thermology.co

**CALIBRATION CERTIFICATE**

**Date of Issue** Jun 23, 2023

**Site Calibration**

**Customer** SPECIAL LAB ENVI AND CONSULTANT CO., LTD.  
47/91 Moo 3 Tha-It, Pak Kret, Nonthaburi, 11120.

**Place of Calibration** 1350, 1352 Suthisarnwinitchai Rd, Dindaeng, Bangkok 10400. (Calibration Room)

**Description** Oven

**Model** UF-30

**Serial No.** B123.0544

**ID No.**

**Date of Receipt** Jun 20, 2023

**Date of Calibration** Jun 20, 2023

**Environment**

**Temperature** (Min) 23.1 °C (Max) 25.3 °C

**Relative Humidity** (Min) 46.3 %RH (Max) 78.9 %RH

**Cert No.** 23/2342

**Order No.** 23060302

**Calibration Method**

WI-17 : The reference thermometer was placed into the chamber and measurement was performed based on AS-2853. The temperature scale in use at this laboratory is the International Temperature Scale of 1990.

**Standard**

1) Data Acquisition with Sensor Model 34972A S/N. MY49007789, Certificate No. QR23-0024, Calibrated by Quality Reborn Co., Ltd., ONAC Calibration No. 0292, Due Date Jan 10, 2024.

This certificate is traceable to SI unit.

Page 1 of 4

This certificate is issued in accordance with the conditions of Thermology Laboratory. The traceability to recognised national standard and the unit of measurement realised at corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of laboratory.