

ภาคผนวก จ

เอกสารสอบเทียบเครื่องมือ

List of Instrument Certificates for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*
1	Incubator	FECAL COLIFORM BACTERIA	Memmert	IPP260 / V615.0187	National Food Institute, Ministry of Industry, Thailand	2502229-001-01	19/3/2025	18/3/2026
2	UV-VIS Spectrophotometer	PHOSPHATE PHOSPHORUS	Hitachi	U-2900 / 21E22-009	DQE Services Co.,Ltd.	SP25-001	3/1/2025	2/1/2026
3	Water Bath	FECAL COLIFORM BACTERIA	Memmert	WNE 14 / L416.0612	National Food Institute Ministry of Industry, Thailand	2501624-002-01	10/2/2025	9/2/2026

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

List of Instrument Certificates for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*
1	Cooled Incubator	TOTAL COLIFORM BACTERIA	Binder	KB400 / WTB20200000015535	National Food Institute, Ministry of Industry, Thailand	2502229-006-01	19/3/2025	18/3/2026
2	SCT Meter	CONDUCTIVITY (umhos/cm)	YSI Environmental	Pro 30 / 17A102921	Technology Promotion Association (Thailand-Japan)	24CH1158	18/9/2024	16/9/2025
			YSI Environmental	Pro 30 / 17A102921	Technology Promotion Association (Thailand-Japan)	25CH1064	10/9/2025	9/9/2026
3	UV-VIS Spectrophotometer	NITRATE NITROGEN	Hitachi	U-2900 / 21E22-009	DQE Services Co.,Ltd.	SP25-001	3/1/2025	2/1/2026
4	UV/VIS Spectrophotometer	AMMONIA-NITROGEN	Hitachi	U-5100 / 23A4-008	DQE Services Co.,Ltd.	SP25-024	17/6/2025	16/6/2026

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

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
Water								
1	pH Meter	pH	Horiba	LAQUA-PH210 HA0F0026	Technology Promotion Association (Thailand-Japan)	25CH22	9 Jan 25	8 Jan 26
2	DO Meter	DO	YSI	Pro 20i 23L100302	Technology Promotion Association (Thailand-Japan)	25TW56	21 Mar 25	20 Mar 26

Calibration Certificate

Certificate No.: 2501624-002-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakhonong, Bangkok 10260

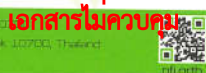
Page 1 of 3

Equipment: Water Bath
Manufacturer: MEMMERT
Model: WNE14
Serial No.: L416.0612
ID No.: UAE.MIC.003/2560
Order No.: 2501624
Operation No.: 2501624-002
Date of Receipt: 10 February 2025
Date of Calibration: 10 February 2025

Calibrated by Mr.Worapob Sooktong
Scientist
WB
Date of Issue: 19 February 2025
Approved by (Mr.Pheraphat Tuanjit) (for)
Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team

The uncertainties are for a confidence probability of approximately 95 %.
This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to 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



เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2501624-002-01
Equipment: Water Bath
Model: WNE14 Serial No.: L416.0612
Resolution: 0.1 °C ID No.: UAE.MIC.003/2560
Manufacturer: MEMMERT
Date of Calibration: 10 February 2025

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Calibration point: 44.5 °C
Calibration result:

Calibration Condition	Temperature (°C)	Relative Humidity (%)	Line Voltage (Volt)
Min	23.0	52	223.0
Max	25.0	65	225.0

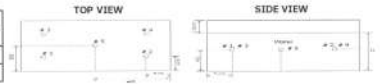


Table 1 : Reporting of Temperature

Calibration Point (°C)	Measured Temperature (°C) @ Sensor No. (Sensor No.5 is REF)					Uncertainty ± (°C)
	# 1	# 2	# 3	# 4	# 5	
44.5	44.45	44.52	44.47	44.48	44.45	0.20

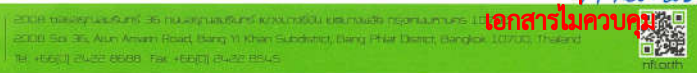
Table 2 : Reporting of Characterization Result

UUC* Setting (°C)	UUC* Reading (°C)			Stability ± (°C)	Uniformity (°C)	Overall Variation (°C)
	MIN	MAX	Average			
44.5	44.4	44.5	44.5	0.081	0.077	0.23

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

----- End -----

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



เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2501624-002-01
Equipment: Water Bath
Model: WNE14 Serial No.: L416.0612
Resolution: 0.1 °C ID No.: UAE.MIC.003/2560
Manufacturer: MEMMERT
Date of Calibration: 10 February 2025

Page 2 of 3

Location: 302 Microbiology Laboratory, UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Environment Condition: Ambient Temperature (24 ± 1) °C
Relative Humidity (59 ± 7) %
Line Voltage (224 ± 1) Volt

Condition of this results of Calibration:

- This instrument was calibrated by insert 5 standard thermometer into its liquid bath and calibration according to W-TE-011 based on ASTM E715-80 (2022): Standard Specification for Gravity-Convection and Forced-Circulation Water Baths.
- The temperature scale used is 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./ ID No.	Certificate No.	Due Date	Through
Digital Thermometer with sensor	34972A	MY59002902	TE 670478-01	4-May-25	NATIONAL FOOD INSTITUTE
	RTD	RTD306-310 / CH306-310			

- 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 1 Hour 9 Minute At 44.5 °C
7. Result of Calibration : ☒ Without adjustment
☐ After adjustment

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



เอกสารไม่ควบคุม

Calibration Certificate

Certificate No.: 2502229-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakhonong, Bangkok 10260

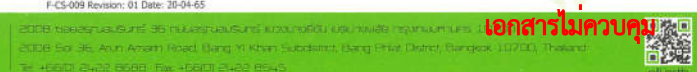
Page 1 of 3

Equipment: CHAMBER (Incubator)
Manufacturer: MEMMERT
Model: IPP 260
Serial No.: V615.0187
ID No.: UAE.MIC.003/2559
Order No.: 2502229
Operation No.: 2502229-001
Date of Receipt: 19 March 2025
Date of Calibration: 19 March 2025

Calibrated by Mr.Jerawut Prapawuttipong
Scientist
Date of Issue: 25 March 2025
Approved by (Mr.Pheraphat Tuanjit) (for)
Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team

The uncertainties are for a confidence probability of approximately 95 %.
This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to 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-012 Revision: 01 Date: 20-04-65



เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2502229-001-01
Equipment: CHAMBER (Incubator)
Model: IPP 260 **Serial No.:** V615.0187
Resolution: 0.1 °C **ID No.:** UAE.MIC.003/2559
Manufacturer: MEMMERT
Date of Calibration: 19 March 2025 Page 2 of 3

Location: LABORATORY, UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Environment Condition:
Ambient Temperature (16.2 ± 1) °C
Relative Humidity (32 ± 4) %
Line Voltage (223 ± 3) Volt

Condition of this results of Calibration:

- This instrument was calibrated by insert 9 standard thermometer into its chamber and calibration according to W-TE-014 Based on TLAS G-20-1/02-08 (E): Guidelines for Calibration and Checks of Temperature Controlled Enclosures.
- 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./ID No.	Certificate No.	Due Date	Through
Digital Thermometer with sensor	34972A	MY49016851	TE 670477-01	4 May 2025	NATIONAL FOOD INSTITUTE
RTD	CHP101-109/RTD#101-109				

- 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 1 Hour 9 Minute At 35.0 °C
Fresh air Damper
X Open Position -
X Close Fan -
- Not Available

- Result of Calibration : ☒ Without adjustment ☐ After adjustment

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

2008 บางเขน กรุงเทพฯ 2502229-001-01
2008 Soi 35, Anur Acharn Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel: +66(0) 2422 8588 Fax: +66(0) 2422 8545

เอกสารไม่ควบคุม



Calibration Report

Certificate No.: 2502229-001-01
Equipment: CHAMBER (Incubator)
Model: IPP 260 **Serial No.:** V615.0187
Resolution: 0.1 °C **ID No.:** UAE.MIC.003/2559
Manufacturer: MEMMERT
Date of Calibration: 19 March 2025 Page 3 of 3

Calibration point: 35.0 °C

Calibration result:

Calibration Condition	Temperature (°C)	Relative Humidity (%)	Line Voltage (Volt)
MIN	15.5	28	220.0
MAX	17.1	35	225.0

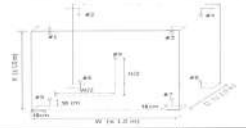


Table 1 : Reporting of Temperature

Calibration point (°C)	Measured Temperature (°C) @ Sensor No. (Sensor No.9 is REF)									Uncertainty ± (°C)
	# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9	
35.0	34.94	34.95	34.91	34.93	35.15	35.01	34.98	35.05	35.12	0.29

Table 2 : Reporting of Characterization Result

UUC* Setting (°C)	UUC* Reading (°C)			Stability ± (°C)	Uniformity (°C)	Overall Variation (°C)
	MIN	MAX	Average			
35.0	35.0	35.0	35.0	0.10	0.21	0.35

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

----- End -----

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

2008 บางเขน กรุงเทพฯ 2502229-001-01
2008 Soi 35, Anur Acharn Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel: +66(0) 2422 8588 Fax: +66(0) 2422 8545

เอกสารไม่ควบคุม



DQE Services Co.,Ltd.

DQE Services

32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230
Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com



CERTIFICATE OF CALIBRATION

Certificate No.: SP25-001 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 213

Equipment: UV-Vis Spectrophotometer

Manufacturer: Hitachi

Model: U-2900

Serial No.: 21E22-009

ID No.: UAE.WAT.051/2564

Received Date: 3 January 2025

Calibration Date: 3 January 2025

Issue Date: 8 January 2025

Condition Instrument: Good

Calibrated by:

(Signature)
(Mr.Tanawat Rittidach)

Technical Manager

Approved by:

(Signature)
(Ms.Chonthicha Sangern)

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 permission of the laboratory.

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021

DQE Services Co.,Ltd.

DQE Services

32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230
Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com



REPORT OF CALIBRATION

Certificate No.: SP25-001 Page 2 of 5
Environment Condition: Ambient Temperature 25 ± 5 °C
Relative humidity 55 ± 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	115663	25 October 2025
Absorbance Standard set	25757	115638	25 October 2025
Wavelength Standard set	25806	115657	25 October 2025
Wavelength Standard set	25758	115665	25 October 2025

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: 200 nm/min

Scan Interval of UUC: 0.1 nm.


Resolution of UUC: Photometric 0.001 Abs.

Wavelength 0.1 nm.

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021

DQE Services Co.,Ltd.
32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230
Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com


ISO 17025:2017
CALIBRATION DATA

REPORT OF CALIBRATION

Certificate No. : SP25-001Page 3 of 5

Calibration Results : Without adjustment


Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
420	0.0000	0.000	0.0000	0.0028	2.00
	0.5780	0.578	0.0000	0.0031	2.00
	1.0484	1.045	0.0034	0.0029	2.00
	2.1876	2.192	-0.0044	0.0075	2.00
440	0.0000	0.000	0.0000	0.0028	2.00
	0.5595	0.560	-0.0005	0.0034	2.00
	1.0239	1.023	0.0009	0.0035	2.00
	2.1230	2.125	-0.0020	0.0079	2.00
465	0.0000	0.000	0.0000	0.0028	2.00
	0.5230	0.521	0.0020	0.0030	2.00
	0.9633	0.961	0.0023	0.0029	2.00
	1.9753	1.977	-0.0017	0.0070	2.00
546.1	0.0000	0.000	0.0000	0.0028	2.00
	0.5181	0.518	0.0001	0.0031	2.00
	1.0002	0.998	0.0022	0.0033	2.00
	1.9973	1.993	0.0043	0.0084	2.00
590	0.0000	0.000	0.0000	0.0028	2.00
	0.5517	0.552	-0.0003	0.0030	2.00
	1.0803	1.079	0.0013	0.0030	2.00
	2.0373	2.032	0.0053	0.0079	2.00
635	0.0000	0.000	0.0000	0.0028	2.00
	0.5591	0.559	0.0001	0.0031	2.00
	1.0518	1.050	0.0018	0.0030	2.00
	1.9274	1.923	0.0044	0.0079	2.00

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021

DQE Services Co.,Ltd.
32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230
Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com


ISO 17025:2017
CALIBRATION DATA

REPORT OF CALIBRATION

Certificate No. : SP25-001Page 4 of 5


Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
235	0.0000	0.000	0.0000	0.0050	2.00
	0.7469	0.744	0.0029	0.0057	2.00
257	0.0000	0.000	0.0000	0.0050	2.00
	0.8674	0.863	0.0044	0.0059	2.00
313	0.0000	0.000	0.0000	0.0050	2.00
	0.2919	0.290	0.0019	0.0051	2.00
350	0.0000	0.000	0.0000	0.0050	2.00
	0.6430	0.640	0.0030	0.0055	2.00

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FM-708-02 R01 1/11/2021

DQE Services Co.,Ltd.
32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230
Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com


ISO 17025:2017
CALIBRATION DATA

REPORT OF CALIBRATION

Certificate No. : SP25-001Page 5 of 5

Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor k
241.72	241.1	0.62	0.18	2.00
279.45	279.0	0.45	0.18	2.00
287.81	287.3	0.51	0.18	2.00
334.06	333.8	0.26	0.18	2.00
360.93	360.6	0.33	0.18	2.00
418.59	418.2	0.39	0.18	2.00
445.94	445.5	0.44	0.18	2.00
453.66	453.4	0.26	0.18	2.00
460.02	459.8	0.22	0.18	2.00
536.59	536.6	-0.01	0.18	2.00
637.98	637.7	0.28	0.18	2.00
431.38	431.1	0.28	0.18	2.00
472.50	472.3	0.20	0.18	2.00
513.47	513.4	0.07	0.18	2.00
528.88	528.9	-0.02	0.18	2.00
573.17	573.3	-0.13	0.18	2.00
585.35	585.1	0.25	0.20	2.00
684.40	684.5	-0.10	0.18	2.00
740.72	741.0	-0.28	0.20	2.00
748.55	748.8	-0.25	0.18	2.00
807.03	807.3	-0.27	0.18	2.00
879.28	879.6	-0.32	0.18	2.00

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021

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%
- End of Certificate -


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


ilac-MRA


ISO 17025:2017
CALIBRATION DATA

Certificate of Calibration

Cert.No.: 24CH1158Page.: 1 of 3

Equipment : Conductivity Meter
Manufacturer : YSI
Model : Pro30
Serial No. : 17A102921
ID No. : UAE.EFM.123/2560(ENV.SCT.03/60)
Condition As-Received: Used Item
Received Date : 17 September 2024
Calibration Date : 18 September 2024
Reference : 2409-0635WSC-2
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-CH6 by direct measurement
with certified reference material (CRM)
- CP-CH8 by comparison with temperature standard
Calibrated by : Warakorn Lernagatrakul
Approved by : Approved Signatory
() Unnoppol Harachai
() Ponpan Paipim
(✓) Saitip Meangmai
Issue Date : 23 September 2024
The Uncertainties are for a confidence probability of approximately 95%
This certificate may not be reproduced other than in full, except with the prior written
Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.



Cert.No.: 24CH1158

Page.: 2 of 3

Condition of this result of calibration

1. Reference Standard Instrument :-

Instrument	Serial No.	ID No.	Certificate No.	Due date
1) Thermometer	9549224	130RC003	24I426	24 Apr 2025
2) Ref. Std. Thermometer	2188080	130RC044	231216	10 Oct 2024

- This Certification is traceable to SI Through Technology Promotion Association (Thailand - Japan)

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

Conductivity Solution	Manufacturer	Lot No.	Exp. date
1412.9 μ S/cm	CPA Chem	1005307	15 June 2025
12.880 mS/cm	CPA Chem	940112	02 Nov 2024

- Control Conductivity calibration solution temperature by Water bath (25 ± 0.1) °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 1412.9 μ S/cm

Conductivity Electrode Serial No.: 17A100315

Standard Conductivity Solution	Before Adjustment UUC* Reading	After Adjustment UUC* Reading	Uncertainty of Measurement (\pm)	Coverage factor k
1412.9 μ S/cm	1317 μ S/cm	1414 μ S/cm	9.2 μ S/cm	2.00
12.880 mS/cm	10.60 mS/cm	11.99 mS/cm	0.086 mS/cm	2.00

Remark : - UUC* = Unit Under Calibration



Cert.No.: 24CH1158

Page.: 3 of 3

Calibration Results**Function : Temperature Measurement**

This equipment was connected with Temperature Probe;

- Model :	PRO 30 COND-T
- Serial No. :	17A100315

Dimension of probe;

- Length :	95 mm
- Diameter :	2.5 mm
- Immersion Depth :	90 mm

Calibration Result : Without adjustment

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (\pm °C)	Coverage factor k
25.0	25.003	24.7	-0.303	0.13	2.00
30.0	30.002	29.7	-0.302	0.13	2.00
35.0	35.002	34.7	-0.302	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 %.

-o0o-



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**

Cert.No.: 25CH1064

Page.: 1 of 3

Equipment : Conductivity Meter
Manufacturer : YSI
Model : Pro30
Serial No. : 17A102921
ID No. : UAE.EFM.123/2560(ENV.SCT.03/60)
Condition As-Received: Used Item
Received Date : 09 September 2025
Calibration Date : 10 September 2025
Reference : 2509-0326WSC-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-CH6 by direct measurement
with certified reference material (CRM)
- CP-CH8 by comparison with temperature standard
Calibrated by : Watelak Sirithean
Approved by : Approved Signatory
() Chakrit Waewwanjua
() Ponpan Paipim
(✓) Saithip Meangmai
Issue Date : 12 September 2025

The Uncertainties are for a confidence probability of approximately 95%

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Cert.No.: 25CH1064

Page.: 2 of 3

Condition of this result of calibration

1. Reference Standard Instrument :-

Instrument	Serial No.	ID No.	Certificate No.	Due date
1) Thermometer	9549224	130RC003	25I440	16 Apr 2026
2) Ref. Std. Thermometer	4982054	110RC044	25I708	03 July 2026

- This measurement result is traceable to SI through Technology Promotion Association (Thailand - Japan)

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

Conductivity Solution	Manufacturer	Lot No.	Exp. date
1413.5 μ S/cm	CPA Chem	1135361	16 Aug 2026
12.881 mS/cm	CPA Chem	1081099	11 Mar 2026

- Control Conductivity calibration solution temperature by Water bath (25 ± 0.1) °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 1413.5 μ S/cm

Conductivity Electrode Serial No.: 17A100315

Standard Conductivity Solution	Before Adjustment UUC* Reading	After Adjustment UUC* Reading	Uncertainty of Measurement (\pm)	Coverage factor k
1413.5 μ S/cm	1466 μ S/cm	1414 μ S/cm	9.2 μ S/cm	2.00
12.881 mS/cm	12.81 mS/cm	12.44 mS/cm	0.086 mS/cm	2.00

Remark : - UUC* = Unit Under Calibration



Cert.No.: 25CH1064
Page.: 3 of 3

Calibration Results

Function : Temperature Measurement
(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : PRO 30 COND-T
- Serial No. : 17A100315

Dimension of probe;

- Length : 95 mm
- Diameter : 2.5 mm
- Immersion Depth : 90 mm

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (± °C)	Coverage factor k
15.0	14.998	14.7	-0.298	0.13	2.00
30.0	30.002	29.6	-0.402	0.13	2.00
45.0	45.002	44.6	-0.402	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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ศูนย์บริการร่วมปฏิบัติการอุตสาหกรรม
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Certificate

Certificate No.: 2502229-006-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road, Bangchack, Prakhonong, Bangkok 10260

Page 1 of 3

Equipment: CHAMBER (Incubator)

Manufacturer: BINDER

Model: KB 400

Serial No.: 20200000015535

ID No.: UAE.MIC.018/2564

Order No.: 2502229

Operation No.: 2502229-006

Date of Receipt: 19 March 2025

Date of Calibration: 19 March 2025

Calibrated by Mr.Jerawut Prapawuttipong Scientist
Approved by (Mr.Pheraphat Tuanjit) (fn)
Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team

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

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to 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

เอกสารไม่ควบคุม



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ศูนย์บริการร่วมปฏิบัติการอุตสาหกรรม
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Report

Certificate No.: 2502229-006-01
Equipment: CHAMBER (Incubator)
Model: KB 400 Serial No.: 20200000015535
Resolution: 0.1 °C ID No.: UAE.MIC.018/2564
Manufacturer: BINDER

Date of Calibration: 19 March 2025 Page 2 of 3

Location: LABORATORY, UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Environment Condition:
Ambient Temperature (18 ± 1) °C
Relative Humidity (50 ± 5) %
Line Voltage (223 ± 3) Volt

Condition of this results of Calibration:

- This instrument was calibrated by insert 13 standard thermometer into its chamber and calibration according to W-TE-014 Based on TLAS G-20-1/02-08 (E): Guidelines for Calibration and Checks of Temperature Controlled Enclosures.
- The temperature scale used was based on ITS - 90.
- All data show below were final values and the initial data may be obtained upon request.

2. Reference Standard Instrument :

Instrument	Model	Serial No./ID No.	Certificate No.	Due Date	Through
Digital Thermometer with sensor	34972A	MY49016851	TE 670477-01	4 May 2025	NATIONAL FOOD INSTITUTE
	RTD	CHP201-303 / RTD#201-303			

- 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.
- Date of Calibrated item : Good

UUC Description :

Time of Record 1 Hour 9 Minute At 35.0 °C
Fresh air Damper - Open Position -
X Close Fan -
Not Available

- Result of Calibration : X Without adjustment After adjustment

S. Jerngphatit
25 March 2025

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

เอกสารไม่ควบคุม



มูลนิธิพัฒนาอุตสาหกรรม
ศูนย์บริการร่วมปฏิบัติการอุตสาหกรรม
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Report

Certificate No.: 2502229-006-01
Equipment: CHAMBER (Incubator)
Model: KB 400 Serial No.: 20200000015535
Resolution: 0.1 °C ID No.: UAE.MIC.018/2564
Manufacturer: BINDER

Date of Calibration: 19 March 2025 Page 3 of 3

Calibration point: 35.0 °C

Calibration result:

Calibration Condition	Temperature (°C)	Relative Humidity (%)	Line Voltage (Volt)
MIN	17.1	45	220.0
MAX	18.1	55	225.0

Table 1 : Reporting of Temperature

Calibration point (°C)	Measured Temperature (°C) @ Sensor No. (Sensor No.13 is REF)													Uncertainty ± (°C)
	# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9	# 10	# 11	# 12	# 13	
35.0	34.98	35.17	34.99	34.92	35.18	35.01	35.00	35.13	35.00	34.96	35.02	35.17	35.04	0.27

Table 2 : Reporting of Characterization Result

UUC* Setting (°C)	UUC* Reading (°C)			Temperature Stability ± (°C)	Temperature Uniformity (°C)	Overall Variation (°C)
	MIN	MAX	Average			
35.0	35.0	35.0	35.0	0.029	0.15	0.30

Note: The quoted uncertainty include " Stability " and " Loading effect (20% of Temp Uniformity) "

UUC* = Unit Under Calibration

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

Uniformity = The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time.

Overall Variation = The difference of the maximum and minimum measured temperatures throughout observation time.

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

----- End -----

S. Jerngphatit
25 March 2025


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

เอกสารไม่ควบคุม



DQEServices

DQE Services Co.,Ltd.
32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230
Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com


MTC-T80-1701
CALIBRATION MARK

CERTIFICATE OF CALIBRATION

Certificate No. : SP25-001Page 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 213

Equipment : UV-Vis Spectrophotometer

Manufacturer : Hitachi

Model : U-2900

Serial No. : 21E22-009

ID No. : UAE.WAT.051/2564

Received Date : 3 January 2025

Calibration Date : 3 January 2025

Issue Date : 8 January 2025

Condition Instrument : Good

Calibrated by : (Mr.Tanawat Rittidach)Approved by : (Ms.Chonthicha Sangnern)
Technical ManagerQuality 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 permission of DQE Services Co., Ltd.

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FM-708-02 R01 1/11/2021

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MTC-T80-1701
CALIBRATION MARK

REPORT OF CALIBRATION

Certificate No. : SP25-001Page 2 of 5

Environment Condition : Ambient Temperature 25 ± 5 °C
Relative humidity 55 ± 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	115663	25 October 2025
Absorbance Standard set	25757	115638	25 October 2025
Wavelength Standard set	25806	115657	25 October 2025
Wavelength Standard set	25758	115665	25 October 2025

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 : 200 nm/min

Scan Interval of UUC : 0.1 nm.


Resolution of UUC : Photometric 0.001 Abs.
Wavelength 0.1 nm.

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FM-708-02 R01 1/11/2021

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MTC-T80-1701
CALIBRATION MARK

REPORT OF CALIBRATION

Certificate No. : SP25-001Page 3 of 5

Calibration Results : Without adjustment

Photometric Accuracy :


Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
420	0.0000	0.000	0.0000	0.0028	2.00
	0.5780	0.578	0.0000	0.0031	2.00
	1.0484	1.045	0.0034	0.0029	2.00
	2.1876	2.192	-0.0044	0.0075	2.00
440	0.0000	0.000	0.0000	0.0028	2.00
	0.5595	0.560	-0.0005	0.0034	2.00
	1.0239	1.023	0.0009	0.0035	2.00
	2.1230	2.125	-0.0020	0.0079	2.00
465	0.0000	0.000	0.0000	0.0028	2.00
	0.5230	0.521	0.0020	0.0030	2.00
	0.9633	0.961	0.0023	0.0029	2.00
	1.9753	1.977	-0.0017	0.0070	2.00
546.1	0.0000	0.000	0.0000	0.0028	2.00
	0.5181	0.518	0.0001	0.0031	2.00
	1.0002	0.998	0.0022	0.0033	2.00
	1.9973	1.993	0.0043	0.0084	2.00
590	0.0000	0.000	0.0000	0.0028	2.00
	0.5517	0.552	-0.0003	0.0030	2.00
	1.0803	1.079	0.0013	0.0030	2.00
	2.0373	2.032	0.0053	0.0079	2.00
635	0.0000	0.000	0.0000	0.0028	2.00
	0.5591	0.559	0.0001	0.0031	2.00
	1.0518	1.050	0.0018	0.0030	2.00
	1.9274	1.923	0.0044	0.0079	2.00

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MTC-T80-1701
CALIBRATION MARK

REPORT OF CALIBRATION

Certificate No. : SP25-001Page 4 of 5



Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
235	0.0000	0.000	0.0000	0.0050	2.00
	0.7469	0.744	0.0029	0.0057	2.00
257	0.0000	0.000	0.0000	0.0050	2.00
	0.8674	0.863	0.0044	0.0059	2.00
313	0.0000	0.000	0.0000	0.0050	2.00
	0.2919	0.290	0.0019	0.0051	2.00
350	0.0000	0.000	0.0000	0.0050	2.00
	0.6430	0.640	0.0030	0.0055	2.00

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FM-708-02 R01 1/11/2021

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REPORT OF CALIBRATION

Certificate No. : SP25-001Page 5 of 5

Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor k
241.72	241.1	0.62	0.18	2.00
279.45	279.0	0.45	0.18	2.00
287.81	287.3	0.51	0.18	2.00
334.06	333.8	0.26	0.18	2.00
360.93	360.6	0.33	0.18	2.00
418.59	418.2	0.39	0.18	2.00
445.94	445.5	0.44	0.18	2.00
453.66	453.4	0.26	0.18	2.00
460.02	459.8	0.22	0.18	2.00
536.59	536.6	-0.01	0.18	2.00
637.98	637.7	0.28	0.18	2.00
431.38	431.1	0.28	0.18	2.00
472.50	472.3	0.20	0.18	2.00
513.47	513.4	0.07	0.18	2.00
528.88	528.9	-0.02	0.18	2.00
573.17	573.3	-0.13	0.18	2.00
585.35	585.1	0.25	0.20	2.00
684.40	684.5	-0.10	0.18	2.00
740.72	741.0	-0.28	0.20	2.00
748.55	748.8	-0.25	0.18	2.00
807.03	807.3	-0.27	0.18	2.00
879.28	879.6	-0.32	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%

- End of Certificate -

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021

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CERTIFICATE OF CALIBRATION

Certificate No. : SP25-024Page 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 : Instrument room (207)

Equipment : UV-Vis Spectrophotometer

Manufacturer : HITACHI

Model : U-5100

Serial No. : 23A4-008


ID No. : UAE.WAS.010/2567


Received Date : 17 June 2025

Calibration Date : 17 June 2025

Issue Date : 20 June 2025

Condition Instrument : Good

Calibrated by : 
(Mr.Tanawut Rittidach)

Approved by : 
(Ms.Chonticha Sangngern)

Technical Manager

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.

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FM-708-02 R01 1/11/2021

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Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com



REPORT OF CALIBRATION

Certificate No. : SP25-024Page 2 of 5

Environment Condition : Ambient Temperature 25 ± 5 °C

Relative humidity 55 ± 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	115663	25 October 2025
Absorbance Standard set	25757	115638	25 October 2025
Wavelength Standard set	25806	115657	25 October 2025
Wavelength Standard set	25758	115665	25 October 2025

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 : 5.0 nm.

Scan Speed of UUC : 40

Scan Interval of UUC : 0.1 nm.



Resolution of UUC : Photometric 0.001 Abs.

Wavelength 0.1 nm.

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021

DQE Services Co.,Ltd.
32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Ladprao, Bangkok 10230
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REPORT OF CALIBRATION

Certificate No. : SP25-024Page 3 of 5

Calibration Results : Without adjustment

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
420	0.0000	0.000	0.0000	0.0028	2.00
	0.5780	0.574	0.0040	0.0031	2.00
	1.0484	1.044	0.0044	0.0029	2.00
	2.1876	2.185	0.0026	0.0075	2.00
440	0.0000	0.000	0.0000	0.0028	2.00
	0.5595	0.558	0.0015	0.0035	2.00
	1.0239	1.021	0.0029	0.0035	2.00
	2.1230	2.122	0.0010	0.0079	2.00
465	0.0000	0.000	0.0000	0.0028	2.00
	0.5230	0.519	0.0040	0.0030	2.00
	0.9633	0.961	0.0023	0.0029	2.00
	1.9753	1.975	0.0003	0.0071	2.00
546.1	0.0000	0.000	0.0000	0.0028	2.00
	0.5181	0.515	0.0031	0.0031	2.00
	1.0002	0.996	0.0042	0.0033	2.00
	1.9973	1.994	0.0033	0.0084	2.00
590	0.0000	0.000	0.0000	0.0028	2.00
	0.5517	0.549	0.0027	0.0030	2.00
	1.0803	1.078	0.0023	0.0030	2.00
	2.0373	2.031	0.0063	0.0082	2.00
635	0.0000	0.000	0.0000	0.0028	2.00
	0.5591	0.557	0.0021	0.0031	2.00
	1.0518	1.049	0.0028	0.0030	2.00
	1.9274	1.924	0.0034	0.0081	2.00

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021

REPORT OF CALIBRATION

Certificate No. : SP25-024

Page 4 of 5

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
235	0.0000 0.7469	0.000 0.747	0.0000 -0.0001	0.0050 0.0057	2.00 2.00
257	0.0000 0.8674	0.000 0.864	0.0000 0.0034	0.0050 0.0059	2.00 2.00
313	0.0000 0.2919	0.000 0.293	0.0000 -0.0011	0.0050 0.0051	2.00 2.00
350	0.0000 0.6430	0.000 0.639	0.0000 0.0040	0.0050 0.0055	2.00 2.00

REPORT OF CALIBRATION

Certificate No. : SP25-024

Page 5 of 5

Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor k
241.00	240.4	0.60	0.18	2.00
279.30	278.8	0.50	0.18	2.00
288.90	288.3	0.60	0.18	2.00
334.50	333.9	0.60	0.18	2.00
361.40	360.8	0.60	0.18	2.00
418.40	417.9	0.50	0.18	2.00
447.20	446.6	0.60	0.18	2.00
459.30	459.1	0.20	0.18	2.00
537.00	536.4	0.60	0.18	2.00
638.00	637.5	0.50	0.18	2.00
441.29	440.7	0.59	0.18	2.00
479.88	479.4	0.48	0.18	2.00
513.75	513.3	0.45	0.18	2.00
528.59	528.2	0.39	0.18	2.00
575.10	574.5	0.60	0.18	2.00
585.56	585.4	0.16	0.20	2.00
684.70	684.1	0.60	0.18	2.00
740.51	740.2	0.31	0.20	2.00
747.61	747.0	0.61	0.18	2.00
807.04	806.4	0.64	0.18	2.00
879.68	879.1	0.58	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%

- End of Certificate -

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021



Cert.No.: 24CH38
Page.: 1 of 3

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH210
Serial No. : HA0F0026
ID No. : UAE.EFM.068/2564(EFM.pH.01/64)
Condition As-Received: Used Item
Received Date : 09 January 2024
Calibration Date : 11 January 2024
Reference : 2401-0219WSC-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 Lernagatrakul

Approved by :
(✓) Saithip Meangmai
() Warakorn Lernagatrakul
() Ponpan Paipim

Issue Date : 15 January 2024

The Uncertainties are for a confidence probability of approximately 95%

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A 0062454



Cert.No.: 24CH38
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 | 23E2802 | 27 Aug 2024 |
| 2) Ref. Standard Thermometer | 4982054 | 110RC044 | 23I908 | 26 July 2024 |
- This certification is traceable to the International System of Unit maintained through:-
- Technology Promotion Association (Thailand-Japan)

2. Certified Reference Materials : The 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	940102	27 Nov 2025
pH 6.986	CPA chem	931959	01 Oct 2024
pH 9.997	CPA chem	940106	02 Nov 2024

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
			mV	pH		
pH Meter S/N.: HA0F0026	pH	mV	mV	pH		
	4.00	177.48	177.6	4.01	0.058	2.00
	7.00	0.00	0.2	7.00	0.058	2.00
	7.00	0.00	0.2	7.00	0.058	2.00
	10.00	-177.48	-177.2	10.01	0.058	2.00

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a 1197729



Cert.No.: 24CH38
Page.: 3 of 3

Calibration Results

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (±)	Coverage factor k
pH Electrode S/N.: -	4.008	4.01	171.6	0.0079	2.00
	6.986	7.01	-2.4	0.0093	2.00
	6.986	7.01	-2.2	0.0093	2.00
	9.997	10.00	-176.2	0.0095	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : -
- Serial No. : -

Dimension of probe;

- Length : 104 mm
- Diameter : 16 mm
- Immersion Depth : 90 mm

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
25.0	25.001	25.0	-0.001	0.13	2.00
30.0	30.003	30.0	-0.003	0.13	2.00
35.0	35.003	34.9	-0.103	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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a 1197728



Cert.No.: 24TW73
Page.: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : YSI
Model : Pro 20i
Serial No. : 23L100302
ID No. : UAE.EFM.001/2567 (EFM.DO.01/67)
Received Date : 01 April 2024
Test Date : 02 April 2024
Reference : 2404-0035WSC-3
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak,
Phrakhanong, Bangkok 10260
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 Sirithean
Approved by :
() Unnopphol Harachai
() Ponpan Paipim
(✓) Saithip Meangmai

Issue Date : 6 April 2024

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B 0338791



Cert.No.: 24TW73
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	130BU10	23CG1172	22 Mar 2025
2. Balance	14233821	110RC001	23MM405	16 July 2024

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.: 23K100659

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.22	8.22	0.0045

This report was certified only for the instrument we tested. It is allowable to use for study 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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A 1209896



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.: 24LM64
Page.: 1 of 2

Certificate of Calibration

Equipment : DO Meter with Sensor
Manufacturer : YSI
Model : Pro 20i
Serial No. : 23L100302
ID No. : UAE.EFM.001/2567 (EFM.DO.01/67)
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Location : TPA On Site Calibration Laboratory
Received Order : 01 April 2024
Calibrated Date : 03 April 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V
Calibrated by : Warakorn Lemgagrakul
Approved by :
(✓) Ponpan Paipim
() Suwit Imjai
() Kunchit Promprat
Issue Date : 7 April 2024

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 0065096



Equipment : DO Meter with Sensor
Condition As-Received : Used Item
Reference : 2404-0035WSC-4

Cert. No.: 24LM64
Page.: 2 of 2

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:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Digital Thermometer	A52847	2311222	TPA	10 Oct 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 : Temperature measurement.

This instrument was connected with temperature sensor, S/N.: 23K100659

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty (± °C)	Coverage Factor k
25.0	80	25.003	25.0	-0.003	0.16	2.00
30.0	80	30.003	30.0	-0.003	0.16	2.00
35.0	80	35.002	35.0	-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 %.

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A 1209896