

ภาคผนวก จ
เอกสารสอบเทียบเครื่องมือที่ใช้ในการตรวจวิเคราะห์

List of Instruments Certification for Water Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Water									
1	pH Meter	pH	Ecosence	pH100A JC04742	Technology Promotion Association (Thailand-Japan)	24CH054	24 Apr 24	23 Apr 25	-



Certificate of Calibration

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

Equipment : pH Meter
Manufacturer : EcoSense
Model : pH100A
Serial No. : JC04742
ID No. : UAE-EFM.051/2586 (EFM.pH.04/68)
Condition As-Received: Used Item
Received Date : 22 April 2024
Calibration Date : 24 April 2024
Reference : 2404-0487WSC-3
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
3 Sol Udomsak 41, Sukhumvit Road, Bangkok,
Prakhanong, Bangkok 10280
Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (60 ± 15) %
Calibration Procedure : In-house method :
- CP-CH5 by direct measurement with DC voltage
standard and direct measurement with
certified reference material (CRM)
- CP-CH6 by comparison with temperature standard

Calibrated by : Waleek Sirikhan

Approved by :

Approved Signatory

() Urochaphol Hanachai
() Ponpan Palpin
(✓) Sakthip Meangmai

Issue Date : 25 April 2024

The Uncertainties are for a confidence probability of approximately 95%

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

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030048	130RC116	23E2802	27 Aug 2024
2) Ref. Standard Thermometer	4882054	110RCD44	23A908	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	970851	25 Apr 2026
pH 6.866	CPA chem	970852	25 Apr 2026
pH 9.997	CPA chem	970853	25 Apr 2026

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

Calibration Results

Function : mV Measurement

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

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor k
			mV	pH		
pH Meter B/N.: JC04742	4.00	177.48	177	4.01	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	10.00	-177.48	-177	10.01	0.58	2.00

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

Cert.No.: 24CH454
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Calibration Results

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (±)	Coverage factor k
pH Electrode S/N.: 230308SIA605377	4.008	4.01	154	0.0079	2.00
	6.866	7.00	-20	0.0069	2.00
	6.986	7.00	-20	0.0069	2.00
	9.997	10.00	-193	0.0085	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe:

- Model :
- Serial No. : 230308SIA605377
Dimension of probe
- Length : 110 mm.
- Diameter : 12 mm.
- Immersion Depth : 100 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
25.0	24.899	25.0	0.001	0.13	2.00
30.0	30.000	30.0	0.000	0.13	2.00
35.0	35.000	35.0	0.000	0.13	2.00

Remark : - UUC* = Unit Under Calibration

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

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เอกสารไม่ควบคุม

List of Instruments Certification for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
Equipment for Water Quality Analysis									
1	pH Meter	pH	Horiba	LAQUA-PH210 / HA1M0036	Technology Promotion Association (Thailand-Japan)	24CH240	20 Feb 24	20 Feb 25	-
2	pH Meter		Horiba	LAQUA-PH210 / HA9M0048	Technology Promotion Association (Thailand-Japan)	24CH723	19 Jun 24	17 Jun 25	-
3	pH Meter		EcoSense	pH100A / JC04744	Technology Promotion Association (Thailand-Japan)	24CH452	23 Apr 24	22 Apr 25	-
4	pH Meter		Horiba	LAQUA-PH210 / HAOC0025	Technology Promotion Association (Thailand-Japan)	24CH1319	14 Mar 24	13 Mar 25	-
5	BOD Meter	BOD	YSI	5100 / 11B 101863	Technology Promotion Association (Thailand-Japan)	24TW539	21 Feb 24	20 Feb 25	-
6	BOD Incubator		ARCO	UR-1320 / -	Technology Promotion Association (Thailand-Japan)	24TM588	1 Apr 24	31 Mar 25	-
7	BOD Incubator		ARCO	UC4-1320 / 13URC4S013201	Technology Promotion Association (Thailand-Japan)	24TM303	10 Jan 24	8 Feb 25	-
8	Analytical Balance	Total Suspended Solids	Mettler Toledo	XSR205DU / C009071872	National Food Institute, Ministry of Industry, Thailand	2402283-001-01	2 Apr 24	1 Apr 25	-
9	Hot Air Oven	Total Dissolved Solids	Mettmer	UF55 / B212.0411	Technology Promotion Association (Thailand-Japan)	24TM589	1 Apr 24	31 Mar 25	-
10	Analytical Balance	Total Dissolved Solids	Mettler Toledo	XSR205DU / C210685394	National Food Institute, Ministry of Industry, Thailand	2402283-002-01	2 Apr 24	1 Apr 25	-
11	Analytical Balance	Fat Oil and Grease	Mettler Toledo	A8204-S/FACT / 1129361010	Technology Promotion Association (Thailand-Japan)	24MM292	11 May 24	10 May 25	-

List of Instruments Certification for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
12	Kjeltec Distillation Unit	Total Kjeldahl Nitrogen	FOSS	KT9 / 91905393	FOSS South East Asia	12875	5 Jul 24	4 Jul 25	-
13	Digestion Units		Foss Tecator	2520 Auto / 91794469	National Food Institute,Ministry of Industry,Thailand	2402957-001-02	23 May 24	22 May 25	-
14	Kjeltec System Distilling		Foss Tecator	KT200 / 91790524	FOSS South East Asia	9810	8 Feb 24	7 Feb 25	-
15	Kjeltec Distillation Unit		FOSS	Kjeltec 8100 / 91889052	FOSS South East Asia	9807	8 Feb 24	7 Feb 25	-
16	Incubator	Escherichia Coli Fecal Coliform Bacteria Total Coliform Bacteria	Blinder	KB400 / 202200000000391	Technology Promotion Association (Thailand-Japan)	24TM884	7 Jun 24	6 Jun 25	-
17	Incubator	Pseudomonas Aeruginosa	Mammert	IPP260 / V616.0066	Technology Promotion Association (Thailand-Japan)	24TM650	2 Apr 24	2 Apr 25	-
18	Incubator	Staphylococcus Aureus	Mammert	IPP260 / V615 0187	Technology Promotion Association (Thailand-Japan)	24TM648	1 Apr 24	31 Mar 25	-

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



Cert.No.: 24CH246
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Certificate of Calibration

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH210
Serial No. : HA1M0036
ID No. : UAE.EFM.012/2585(EFM.pH.02/85)
Condition As-Received: Used Item
Received Date : 19 February 2024
Calibration Date : 20 February 2024
Reference : 2402-0594WSC-4
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangkok,
Phrakhanong, Bangkok 10260
Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In-house method :
- CP-CH5 by direct measurement with
DC Voltage Standard and direct measurement
with certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Watsak Sirithan

Approved by : 
Approved Signatory

() Pornthips Taneyasul
() Unnophol Hanchai
(✓) Sathip Meangmai

Issue Date : 22 February 2024

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services & Equipment Calibration and Testing Services.

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a 1203290



Cert.No.: 24CH240
Page: 3 of 3

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4.7)(7.18)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (k)	Coverage factor k
pH Electrode S/N: Q92M0181	4.008	4.01	177.8	0.0071	2.00
	6.988	6.99	2.5	0.0089	2.00
	6.985	6.99	1.8	0.0089	2.00
	9.997	10.00	-169.2	0.0095	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : 9625-100
- Serial No. : Q92M0181

Dimension of probe

- Length : 107 mm.
- Diameter : 16 mm.
- Immersion Depth : 100 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
25.0	25.000	25.0	0.000	0.13	2.00
30.0	30.000	30.0	0.000	0.13	2.00
35.0	34.999	35.0	0.001	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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Sathip

a 1203289

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH210
Serial No. : HA6M0048
ID No. : UAE.EFM.003/2583(EFM.pH.03/83)
Condition As-Received: Used Item
Received Date : 18 June 2024
Calibration Date : 18 June 2024
Reference : 2406-0570WSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangkok, Phrakhanong, Bangkok 10260
Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In-house method :
- CP-CH5 by direct measurement with DC voltage
standard and direct measurement with
certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Watsak Lemgatrakul

Approved by : 
Approved Signatory

() Unnophol Hanchai
() Porpan Paipom
(✓) Sathip Meangmai

Issue Date : 20 June 2024

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services & Equipment Calibration and Testing Services.



Cert.No.: 24CH723
Page: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument

	Serial No.	ID No.	Cert. No.	Exp. Date
1) Document Process Calibrator	54030049	130RC116	23E2802	27 Aug 2024
2) Ref. Standard Thermometer	4982054	110RC044	23A908	26 July 2024

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

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	970851	25 Apr 2025
pH 6.985	CPA chem	970852	25 Apr 2025
pH 9.997	CPA chem	970853	25 Apr 2025

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

Calibration Results

Function : mV Measurement

Performing standard curve by Document Process Calibrator at pH (4.7)(7.10)

Unit Under Calibration	Nominal Value		Standard Voltage Input		Actual Reading		Uncertainty of Measurement (mV)	Coverage factor k
	pH	mV	mV	pH	mV	pH		
pH Meter S.N.: HAG10045	4.00	177.48	177.6	4.01	0.098	0.098	2.00	
	7.00	0.00	0.2	7.00	0.098	0.098	2.00	
	7.00	0.00	0.2	7.00	0.098	0.098	2.00	
	10.00	-177.48	-177.3	10.01	0.098	0.098	2.00	



Cert.No.: 24CH723
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.: C9AD0211	4.008	4.01	176.1	0.0079	2.00
	6.985	7.00	0.7	0.0093	2.00
	6.985	7.01	0.7	0.0093	2.00
	9.997	10.01	-172.2	0.0092	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe:

- Model : 9852-100
- Serial No. : C9AD0211

Dimension of probe

- Length : 100 mm.
- Diameter : 16 mm.
- Immersion Depth : 80 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
25.0	25.002	25.0	-0.002	0.13	2.00
30.0	30.001	30.0	-0.001	0.13	2.00
35.0	35.004	35.0	-0.004	0.13	2.00

Remark : - UUC* = Unit Under Calibration

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
53/4 PATTANAKARN ROAD SOI 18, SUKHUMVIT, SUKHUMVIT BANGKOK 10250
TEL 0-2717-3000-29 FAX 0-2719-9484



Certificate of Calibration

Cert.No.: 24CH452
Page: 1 of 3

Equipment : pH Meter
Manufacturer : EcoSense
Model : pH100A
Serial No. : JC04744
ID No. : UAE.FRM.058/2586(EFM.pH.01/86)
Condition As-Received : Used item
Received Date : 22 April 2024
Calibration Date : 23 April 2024
Reference : 2404-0487WBC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
9 Soi Udomsak 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260
Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In-house method :
- CP-CHS by direct measurement with DC voltage standard and direct measurement with certified reference material (CRM)
- CP-CH0 by comparison with temperature standard

Calibrated by : Warakorn Lomgatrakul
Approved by : [Signature]
Approved Signatory

() Unnopphol Harechai
() Ponpan Paipim
(✓) Sathip Meangmai
Issue Date : 25 April 2024

The Uncertainty are for a confidence probability of approximately 95%

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Cert.No.: 24CH452
Page: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument

	Serial No.	ID No.	Cert. No.	Exp. Date
1) Document Process Calibrator	54030049	130RC116	23E2802	27 Aug 2024
2) Ref. Standard Thermometer	4982054	110RC044	23A908	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.,
ANGSIASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	970851	25 Apr 2025
pH 6.985	CPA chem	970852	25 Apr 2025
pH 9.997	CPA chem	970853	25 Apr 2025

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

Calibration Results

Function : mV Measurement

Performing standard curve by Document Process Calibrator at pH (4.7)(7.10)

Unit Under Calibration	Nominal Value		Standard Voltage Input		Actual Reading		Uncertainty of Measurement (mV)	Coverage factor k
	pH	mV	mV	pH	mV	pH		
pH Meter S.N.: JC04744	4.00	177.48	177	4.01	0.58	0.58	2.00	
	7.00	0.00	0	7.00	0.58	0.58	2.00	
	7.00	0.00	0	7.00	0.58	0.58	2.00	
	10.00	-177.48	-177	10.01	0.58	0.58	2.00	



Cert.No.: 24CH452
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: 230906SIA605377	4.008	4.01	174	0.0071	2.00
	6.986	7.00	0	0.0063	2.00
	6.988	6.96	0	0.0069	2.00
	9.997	10.05	-175	0.0085	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model :
- Serial No. : 230906SIA605377
Dimension of probe
- Length : 110 mm.
- Diameter : 12 mm.
- Immersion Depth : 100 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
25.0	25.002	25.1	0.098	0.13	2.00
30.0	30.002	30.1	0.098	0.13	2.00
35.0	35.003	35.1	0.097	0.13	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 %.

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
1344 PATTANAKARN ROAD SOI 18, SUKHUMVIT, SUKHUMVIT BANGKOK 10259
TEL: 0-2717 30429 FAX: 0-2719-9434



Cert.No.: 24CH319
Page: 1 of 3

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH210
Serial No. : HA0C0025
ID No. : UAE.EPM.117/2663(EFM.pH.0763)
Condition As-Received: Used Item
Received Date : 12 March 2024
Calibration Date : 14 March 2024
Reference : 2403-0386WSC-1
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
3 Sol Udomsuk 41, Sukhumvit Road,
Bangkok, Phrakhanong, Bangkok 10260

Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 16) %
Calibration Procedure :
- CP-CHS by direct measurement with DC voltage standard and direct measurement with certified reference material (CRM)
- CP-CHS by comparison with temperature standard

Calibrated by : Waratorn Lemgathakul

Approved by :
Approved Signatory

() Ponnipha Tanayakul
() Unnaphol Harachai
(x) Sakthip Meangmai

Issue Date : 15 March 2024

The Uncertainties are for a confidence probability of approximately 95%

This certificate only applies to the equipment specified above, except for the prior written approval of the head of Corporate Services & Equipment Calibration and Testing Services.

A 0064529



Cert.No.: 24CH319
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	64030049	130RC116	23E2802	27 Aug 2024
2) Ref. Standard Thermometer	4892054	110RC044	23008	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., ANSL-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	940104	02 Nov 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 Document Process Calibrator at pH (4,7)(7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter S/N: HA0C0025	4.00	177.48	177.5	4.01	0.068	2.00
	7.00	0.00	0.0	7.02	0.068	2.00
	7.00	0.00	0.0	7.02	0.068	2.00
	10.00	-177.48	-177.5	10.01	0.069	2.00



Cert.No.: 24CH319
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	149.4	0.0091	2.07
	6.986	7.00	-25.1	0.0093	2.00
	6.988	7.02	-24.3	0.011	2.00
	9.997	10.01	-189.5	0.0095	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model :
- Serial No. :
Dimension of probe
- Length : 103 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 k
25.0	25.001	25.0	-0.001	0.13	2.00
30.0	30.001	30.0	-0.001	0.13	2.00
35.0	35.002	35.0	-0.002	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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Cert.No.: 24TW39
Page: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : YSI
Model : 5100
Serial No. : 11B 101863
ID No. : UAE.WAO.004/2654
Received Date : 20 February 2024
Test Date : 21 February 2024
Reference : 2402-0629DSC-1
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangkok,
Phraekhanong, Bangkok 10260
Laboratory Condition : Temperature : (25 ± 5) °C
Humidity : (50 ± 20) %
Test Procedure : In-house method : GP-C16
by Comparison Test using with Azide Modification Method
Tested by : Watalek Santhana
Approved by :
() Pornthapae Tanyasaka
() Unnophol Harachai
(x) Sathip Mesngma
Issue Date : 22 February 2024

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Cert.No.: 24TW38
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	-	1308U10	23CG1172	22 Mar 2025
2. Balance	14233621	110RC001	23MFM405	18 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.: 22B100125

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.20	8.19	0.0055

This report was drafted only for the instrument we tested it is allowable to use for study
tended 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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Cert. No.: 24TM588
Page : 1 of 3

Certificate of Calibration

Equipment : BOD Incubator
Manufacturer : ARCO
Model : UR-1320
Serial No. :
ID No. : UAE.WAO.0062553
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangkok, Phraekhanong,
Bangkok 10260
Location : Lab Floor 2
Received Order : 01 April 2024
Calibration Date : 01 April 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Kriade Meles
Approved by :
() Ponpan Pailin
(x) Suwit Injai
() Kunchit Promprut
Issue Date : 5 April 2024

The Uncertainties are for a confidence probability of approximately 95%

This certificate is only valid for the instrument and the conditions stated on the certificate.
Any use of the instrument for other purposes is the responsibility of the user.

เอกสารไม่ควบคุม

A 0065054



Equipment : BOD Incubator
Condition As-Received : Load Item
Reference : 2404-0004OC-2
Procedure Used :-

Cert. No.: 24TM588
Page : 2 of 3

Calibration were conducted using calibration procedure GP-OTG based on PLAS Q-20 according to direct measurement method with Data Acquisition which connected with Resistive Temperature Detector (RTD).
The temperature scale used was based on ITS-90

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY57013711	23LM115	TPA	11 Jul 2024

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

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

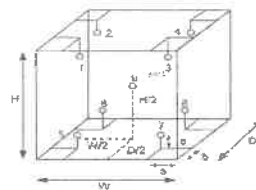
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration : () Without Adjustment

Function of UUC : Temperature Source

Fresh air setting : Not Available

Environment during calibration		
	Beginning	Finished
Temp. (°C)	26	27
REL-Humid. (%)	45	47
AC Supply (VOR)	220	221



Probe Installation Details :

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

Dimension of Chamber :

D =	0.62	m
W =	1.2	m
H =	1.2	m
Capacity =	0.89	m³

Position :	Ref. Std. ID No. :
1	22-18RTD-2/1
2	18RTD-2/2
3	18RTD-2/3
4	18RTD-2/4
5	18RTD-2/5
6	18RTD-2/6
7	18RTD-2/7
8	18RTD-2/8
9 (ref.)	18RTD-2/9

เอกสารไม่ควบคุม

A 1209741



Equipment : BOD Incubator
 Condition As-Received : Used Item
 Reference : 2404-0004OC-2
 Result of Calibration : (") Without Adjustment
 Function of UUC* : Temperature Source
 Fresh air setting : Not Available

Cert. No.: 24TM588
 Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
20.0	20.0	19.9	0.47	0.69	1.4	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
20.0	20.289	19.835	20.129	19.985	20.190	20.180	20.300	20.487	20.248	0.67

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

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

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

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

UUC* : Unit Under Calibration

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

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

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กำหนดจุดห้ามใช้งาน

References Certificate Number. : 234TM588

Equipment : BOD Incubator

Model : UR-1320

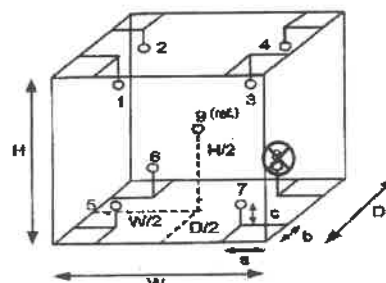
Serial No. : -

ID No. : UAE.WAO.006/2553

Manufacturer : ARCO

Calibration Point : 20.0 °C

Unit Under Calibration Setting : 20.0 °C



รูปภาพเครื่องมือ แสดงจุดที่ได้รับการสอบเทียบ และสัญลักษณ์ ⊗ แสดงจุดห้ามใช้งาน

กำหนดจุดห้ามใช้งานตำแหน่งที่.....8.....

เอกสารแนบ

ร. 1209740

หมายเลข เก็บใบแจ้ง.....

เอกสารแนบ Lab-BODYTEMPERATURE (1-2) 4.016-1/REV-SEP-2020 2553/1 กำหนดจุดห้ามใช้งาน

เอกสารแนบควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
 CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
 301 PATTANAKARN ROAD 25, BANGKOK 10110, THAILAND
 TEL : 02-272-0000-25 FAX : 02-272-0000-26



Cert. No.: 24TM303
 Page : 1 of 3

Certificate of Calibration

Equipment : BOD Incubator

Manufacturer : Arco

Model : UC4-1320

Serial No. : 18U9C45013201

ID No. : UAE.WAO.0152561

Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
 3 Soi Udomsak 41, Sukhumvit Road,
 Bangkok, Prachinong,
 Bangkok 10260

Location : Lab Floor 2

Received Order : 10 February 2024

Calibration Date : 10 February 2024

Ambient Temperature : (28 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Tawatchai Parra

Approved by :

Approved Signatory

() Pornthepa Tanayakul

() Unnophol Harachai

() Suwit Imjai

Issue Date : 19 February 2024

The Uncertainties are for a confidence probability of approximately 95 %

This is a copy of the original certificate. The original certificate is the only valid one.

Approved on behalf of Corporation : () Engineer Calibration : () Engineer



Equipment : BOD Incubator
 Condition As-Received : Used Item
 Reference : 2402-0234OC-1
 Result of Calibration : (") Without Adjustment
 Function of UUC* : Temperature Source
 Fresh air setting : Not Available

Cert. No.: 24TM303
 Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
20.0	20.1	19.9	0.37	0.72	1.4	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
20.0	19.873	19.803	20.322	19.960	19.615	19.595	19.612	19.558	19.645	0.58

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

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

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

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

UUC* : Unit Under Calibration

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

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

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—0000—

Calibration Certificate

Certificate No.: 2402283-002-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 301 UDOMSUK 41, SUKHUMVIT ROAD,
 Bangkok, Prakhong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR205DU

Serial No.: C210685394

ID No.: UAE.WAO.010/2565

Order No.: 2402283

Operation No.: 2402283-002

Date of Receipt: 2 April 2024

Date of Calibration: 2 April 2024

Calibrated by: Mr. Jarawut Praputthong
 Scientist

Approved by:

(Mr. Phasaphat Tansit)

Manager, Division of Calibration Laboratory

Date of Issue: 9 April 2024

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 Service, which expresses the technical capability of the laboratory and its proficiency in comparison with national standards and to the best of the laboratory's knowledge, the corresponding international laboratory. This certificate may not be reproduced or used in full without the prior written approval of the National Food Institute.

FCS-022 Revision: 01 Date: 20-04-65

2009 ถนนวิภาวดีรังสิต 35 หมู่ 10 แขวงจตุจักร เขตจตุจักร กรุงเทพมหานคร 10140
 2009 Soi 35, Anusorn Road, Bang 10 Khan, Suburban, Bang Phai District, Bangkok 10140, Thailand
 Tel: +662 2452 0000 Fax: +662 2452 0045



Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C210685394
Capacity: 210 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g / 0.001 g
ID No.: UAE.WAO.010/2565

Page 2 of 4

Date of Calibration: 2 April 2024

Environment Condition: Ambient Temperature: 24.5 ± 0.5 °C Relative Humidity: 47.3 ± 2.5 %

Place of Calibration: Laboratory (METTLER ANALYTICAL) AND REGULATING CONSTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Service: NFI Method 010-011 Thermal Analysis and XAS, Ltd. 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E1	100 g 7000	100500001	QC	2402283-01	8 April 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermal Analyzer	TA 100	101000001	Quality Control	2402283-01	9 February 2025

3. This calibration is intended to be used for:

4. This certificate was certified only for the laboratory's use.

5. This report of calibration was issued, accurate and valid as the date of issue of the report.

Calibration Results:

1. Repeatability of Reading:

Reading (g)	Standard Deviation of Reading (g)
40	0.00001
50	0.00001
100	0.00001
200	0.00001

2. Off-Center Error:

A certified 100 g mass was used with a certified 100 g mass.

This balance reading was used to determine the off-center error.



1	2	3	4	5	6	(Maximum Difference)
100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000

FCS-022 Revision: 01 Date: 20-04-65

2009 ถนนวิภาวดีรังสิต 35 หมู่ 10 แขวงจตุจักร เขตจตุจักร กรุงเทพมหานคร 10140
 2009 Soi 35, Anusorn Road, Bang 10 Khan, Suburban, Bang Phai District, Bangkok 10140, Thailand
 Tel: +662 2452 0000 Fax: +662 2452 0045



Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C210685394
Capacity: 210 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g / 0.001 g
ID No.: UAE.WAO.010/2565

Date of Calibration: 2 April 2024

Calibration Results: (Continued)

Calibration Range: 0 - 210 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 210 g; Resolution: 0.0001 g)

Sample Value	Reference Value	Average Reading	Uncertainty	Departure	Coverage Factor
1	2	3	4	5	6
0.00	0.00000	0.00000	0.00000	0.00000	2.00
0.01	0.00001	0.00001	0.00001	0.00001	2.00
0.02	0.00002	0.00002	0.00002	0.00002	2.00
0.03	0.00003	0.00003	0.00003	0.00003	2.00
0.04	0.00004	0.00004	0.00004	0.00004	2.00
0.05	0.00005	0.00005	0.00005	0.00005	2.00
0.06	0.00006	0.00006	0.00006	0.00006	2.00
0.07	0.00007	0.00007	0.00007	0.00007	2.00
0.08	0.00008	0.00008	0.00008	0.00008	2.00
0.09	0.00009	0.00009	0.00009	0.00009	2.00
0.10	0.00010	0.00010	0.00010	0.00010	2.00
0.11	0.00011	0.00011	0.00011	0.00011	2.00
0.12	0.00012	0.00012	0.00012	0.00012	2.00
0.13	0.00013	0.00013	0.00013	0.00013	2.00
0.14	0.00014	0.00014	0.00014	0.00014	2.00
0.15	0.00015	0.00015	0.00015	0.00015	2.00
0.16	0.00016	0.00016	0.00016	0.00016	2.00
0.17	0.00017	0.00017	0.00017	0.00017	2.00
0.18	0.00018	0.00018	0.00018	0.00018	2.00
0.19	0.00019	0.00019	0.00019	0.00019	2.00
0.20	0.00020	0.00020	0.00020	0.00020	2.00
0.21	0.00021	0.00021	0.00021	0.00021	2.00
0.22	0.00022	0.00022	0.00022	0.00022	2.00
0.23	0.00023	0.00023	0.00023	0.00023	2.00
0.24	0.00024	0.00024	0.00024	0.00024	2.00
0.25	0.00025	0.00025	0.00025	0.00025	2.00
0.26	0.00026	0.00026	0.00026	0.00026	2.00
0.27	0.00027	0.00027	0.00027	0.00027	2.00
0.28	0.00028	0.00028	0.00028	0.00028	2.00
0.29	0.00029	0.00029	0.00029	0.00029	2.00
0.30	0.00030	0.00030	0.00030	0.00030	2.00
0.31	0.00031	0.00031	0.00031	0.00031	2.00
0.32	0.00032	0.00032	0.00032	0.00032	2.00
0.33	0.00033	0.00033	0.00033	0.00033	2.00
0.34	0.00034	0.00034	0.00034	0.00034	2.00
0.35	0.00035	0.00035	0.00035	0.00035	2.00
0.36	0.00036	0.00036	0.00036	0.00036	2.00
0.37	0.00037	0.00037	0.00037	0.00037	2.00
0.38	0.00038	0.00038	0.00038	0.00038	2.00
0.39	0.00039	0.00039	0.00039	0.00039	2.00
0.40	0.00040	0.00040	0.00040	0.00040	2.00
0.41	0.00041	0.00041	0.00041	0.00041	2.00
0.42	0.00042	0.00042	0.00042	0.00042	2.00
0.43	0.00043	0.00043	0.00043	0.00043	2.00
0.44	0.00044	0.00044	0.00044	0.00044	2.00
0.45	0.00045	0.00045	0.00045	0.00045	2.00
0.46	0.00046	0.00046	0.00046	0.00046	2.00
0.47	0.00047	0.00047	0.00047	0.00047	2.00
0.48	0.00048	0.00048	0.00048	0.00048	2.00
0.49	0.00049	0.00049	0.00049	0.00049	2.00
0.50	0.00050	0.00050	0.00050	0.00050	2.00
0.51	0.00051	0.00051	0.00051	0.00051	2.00
0.52	0.00052	0.00052	0.00052	0.00052	2.00
0.53	0.00053	0.00053	0.00053	0.00053	2.00
0.54	0.00054	0.00054	0.00054	0.00054	2.00
0.55	0.00055	0.00055	0.00055	0.00055	2.00
0.56	0.00056	0.00056	0.00056	0.00056	2.00
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0.59	0.00059	0.00059	0.00059	0.00059	2.00
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0.61	0.00061	0.00061	0.00061	0.00061	2.00
0.62	0.00062	0.00062	0.00062	0.00062	2.00
0.63	0.00063	0.00063	0.00063	0.00063	2.00
0.64	0.00064	0.00064	0.00064	0.00064	2.00
0.65	0.00065	0.00065	0.00065	0.00065	2.00
0.66	0.00066	0.00066	0.00066	0.00066	2.00
0.67	0.00067	0.00067	0.00067	0.00067	2.00
0.68	0.00068	0.00068	0.00068	0.00068	2.00
0.69	0.00069	0.00069	0.00069	0.00069	2.00
0.70	0.00070	0.00070	0.00070	0.00070	2.00
0.71	0.00071	0.00071	0.00071	0.00071	2.00
0.72	0.00072	0.00072	0.00072	0.00072	2.00
0.73	0.00073	0.00073	0.00073	0.00073	2.00
0.74	0.00074	0.00074	0.00074	0.00074	2.00
0.75	0.00075	0.00075	0.00075	0.00075	2.00
0.76	0.00076	0.00076	0.00076	0.00076	2.00
0.77	0.00077	0.00077	0.00077	0.00077	2.00
0.78	0.00078	0.00078	0.00078	0.00078	2.00
0.79	0.00079	0.00079	0.00079	0.00079	2.00
0.80	0.00080	0.00080	0.00080	0.00080	2.00
0.81	0.00081	0.00081	0.00081	0.00081	2.00
0.82	0.00082	0.00082	0.00082	0.00082	2.00
0.83	0.00083	0.00083	0.00083	0.00083	2.00
0.84	0.00084	0.00084	0.00084	0.00084	2.00
0.85	0.00085	0.00085	0.00085	0.00085	2.00
0.86	0.00086	0.00086	0.00086	0.00086	2.00
0.87	0.00087	0.00087	0.00087	0.00087	2.00
0.88	0.00088	0.00088	0.00088	0.00088	2.00
0.89	0.00089	0.00089	0.00089	0.00089	2.00
0.90	0.00090	0.00090	0.00090	0.00090	2.00
0.91	0.00091	0.00091	0.00091	0.00091	2.00
0.92	0.00092	0.00092	0.00092	0.00092	2.00
0.93	0.00093	0.00093	0.00093	0.00093	2.00
0.94	0.00094	0.00094	0.00094	0.00094	2.00
0.95	0.00095	0.00095	0.00095	0.00095	2.00
0.96	0.00096	0.00096	0.00096	0.00096	2.00
0.97	0.00097	0.00097	0.00097	0.00097	2.00
0.98	0.00098	0.00098	0.00098	0.00098	2.00
0.99	0.00099	0.00099	0.00099	0.00099	2.00
1.00	0.00100	0.00100	0.00100	0.00100	2.00
1.01	0.00101	0.00101	0.00101	0.00101	2.00
1.02	0.00102	0.00102	0.00102	0.00102	2.00
1.03	0.00103	0.00103	0.00103	0.00103	2.00
1.04	0.00104	0.00104	0.00104	0.00104	2.00
1.05	0.00105	0.00105	0.00105	0.00105	2.00
1.06	0.00106	0.00106	0.00106	0.00106	2.00
1.07	0.00107	0.00107	0.00107	0.00107	2.00
1.08	0.00108	0.00108	0.00108	0.00108	2.00
1.09	0.00109	0.00109	0.00109	0.00109	2.00



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2408-01900C-2
Result of Calibration : () Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM884
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor K
35.0	35.0	35.0	0.028	0.28	0.53	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	Position									
35.0	1	2	3	4	5	6	7	8	9 (ref.)	
	35.317	35.184	35.142	35.064	35.068	35.063	34.894	34.826	35.056	0.30

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

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

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

UUC* : Unit Under Calibration

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

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

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กำหนดจุดห้ามใช้งาน

References Certificate Number. : 24TM884

Equipment : Incubator

Model : KB 400

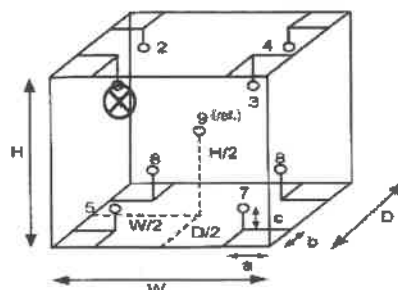
Serial No. : 20220000000391

ID No. : UAE.MIC.029/2565

Manufacturer : Binder

Calibration Point : 35.0 °C

Unit Under Calibration Setting : 35.0 °C



รูปภาพเครื่องมือ แสดงจุดที่ได้รับการสอบเทียบ และสัญลักษณ์ ⊗ แสดงจุดห้ามใช้งาน

กำหนดจุดห้ามใช้งานตำแหน่งที่.....1.....

เอกสารไม่ควบคุม

หมายเหตุ เก็บเป็นแฟ้ม.....

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
63/4 PATTANAKARN ROAD SOI 18, SUKHUMVIT, SUKHUMVIT BANGKOK 10250
TEL 0-2717-3000-25 FAX 0-2719-9484



Certificate of Calibration

Cert. No.: 24TM850
Page : 1 of 3

Equipment : Incubator
Manufacturer : Memmert
Model : IPP 280
Serial No. : V618 0068
ID No. : UAE.MIC.032/2559
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsak 41, Sukhumvit Road,
Bangchak, Phraechanong,
Bangkok 10280
Location : Microbiology Laboratory (302)
Received Order : 01 April 2024
Calibration Date : 02 - 03 April 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Man Pattanasongpatiboon
Approved by :
() Ponpan Palpin
(✓) Suwit Jirajit
() Kunchit Promprai
Issue Date : 7 April 2024

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

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

เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2404-00090C-2
Procedure Used :

Cert. No.: 24TM850
Page : 2 of 3

Calibration were conducted using calibration procedure CP-CT32 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument.

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY48023832	23Jul122	TPA	28 Jul 2024

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

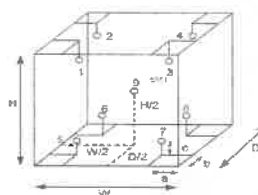
3. This certification is traceable to the International System of Unit.

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

Result of Calibration : () Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Probe Installation Details :

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

Dimension of Chamber :

D = 0.60 m
W = 0.54 m
H = 0.85 m
Capacity = 0.28 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	25	25
REL Humid (%)	57	54
AC Supply (Volt)	221	222

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

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

Cert. No.: 24TM660
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
25.0	25.0	25.0	0.053	0.78	1.3	2
36.0	36.0	36.0	0.14	0.57	0.93	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
25.0	25.586	25.310	25.439	25.412	24.347	24.332	24.313	24.414	24.875	0.30
36.0	35.843	35.985	35.616	35.701	36.239	36.260	36.343	36.357	36.082	0.31

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

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

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

UUC* : Unit Under Calibration

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

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTHAKARN ROAD SOI 16, SUKHUMVIT, SUKHUMVIT BANGKOK 10650
TEL 0-2717-8909-29 FAX 0-2718-9484



Certificate of Calibration

Cert. No.: 24TM648
Page : 1 of 3

Equipment : Incubator
Manufacturer : Memmert
Model : PP 260
Serial No. : V615.0187
ID No. : UAE.MJC.003/2559
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Sol Udomsuk 41, Sukhumvit Road,
Bangchak, Phraekhanong,
Bangkok 10260
Location : Microbiology Laboratory
Received Order : 01 April 2024
Calibration Date : 01 April 2024
Ambient Temperature : (28 ± 10) °C
Relative Humidity : (50 ± 30) %

Calibrated by : Man Pattanapongpisit

Approved by :

() Ponpan Palpin
(✓) Suwit Imjai
() Kunchit Promprei

Issue Date : 7 April 2024

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

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

Approved Signature

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Equipment : Incubator
Condition As-Received : Used Item
Reference : 2404-0003OC-1
Procedure Used :-

Cert. No.: 24TM648
Page : 2 of 3

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY46023932	23LM122	TPA	26 Jul 2024

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

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

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

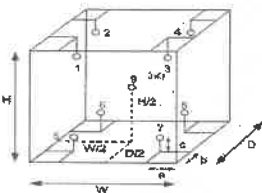
Result of Calibration :- (") Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. (°C)	24	24
REL.Humid. (%)	54	57
AC Supply (Volt)	221	223

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



Probe Installation Details :

Dimension of Chamber :
a = 5.0 cm
b = 5.0 cm
c = 6.0 cm
D = 0.50 m
W = 0.64 m
H = 0.80 m
Capacity = 0.26 m³



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2404-0003OC-1
Result of Calibration :- (") Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM643
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
36.0	33.0	35.0	0.028	0.13	0.24	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
25.0	34.908	35.004	34.989	35.089	35.089	35.095	34.921	34.930	35.002	0.30

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

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

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

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

UUC* : Unit Under Calibration

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

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

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