

ภาคผนวก ฉ

สำเนาเอกสารรับรองเครื่องมือการตรวจวัด

Calibratech Co., Ltd.
7/1067 Moo 2, Sukhaphrasam 3 Rd., Banggood, Pakkred, Northaburi 11120
Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech.co@yahoo.com, calibratech.co@hotmail.com

Certificate of Calibration

Certificate No. : 68-300653-1 Page : 1 of 2

Submitted by : M Green Group Co.,Ltd.
188/46 Wisutesukrakon 25, Pracha-Uttd Rd., Thungkru, Bangkok 10140 Thailand

Equipment : Cylinder
Manufacturer : GLASSCO Class : A
Capacity : 100 ml Graduation : 1 ml
ID No. : CY100/01/24


Environment : Ambient Temperature : (20 ± 3) °C
Relative Humidity : (50 ± 10) %
Air Pressure : 1007.7 mbar.

Date of Received : 28 August 2025
Date of Calibration : 05 September 2025
Date of Issue : 05 September 2025
Calibrated by : Areerat Sombun

Calibration Method : In-house method CAL-M3001 based on ASTM E 542-22

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

Electronic Balance			
ID No.	Cert. No.	Due Date	Traceability
241002	68-2002598-1	02 Dec 2025	National Institute of Metrology (Thailand) (NIMT)

Approved by : 
(Wipa Tovadee)
Supervisor

The Uncertainties are for a confidence probability of approximately 95%
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Calibratech Co.,Ltd.
7/1067 Moo 2, Sukhaphrasam 3 Rd., Banggood, Pakkred, Northaburi 11120
Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech.co@yahoo.com, calibratech.co@hotmail.com

Certificate of Calibration

Certificate No. : 68-300653-1 Page : 2 of 2

Result of Calibration : This result of true Volume is referred to standard temperature at 20 °C
UUC Condition As-Received : Good

Nominal Volume (ml)	Measuring Volume (ml)
100	100.61

Uncertainty of measurement with in ± 0.063 ml
This result of calibration was found accurate as shown on date and place of calibration only.
This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k = 2.00 ,
providing a level of confidence of approximately 95%

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Certificate of Calibration

Certificate No. : 68-300653-2 **Page : 1 of 2**

Submitted by : M Green Group Co.,Ltd.
188/46 Wisatesuknakhon 25, Pracha-Uttd Rd., Thungkru, Bangkok 10140 Thailand

Equipment : Cylinder
Manufacturer : GLASSCO **Class** : A
Capacity : 250 ml **Graduation** : 2 ml
ID No. : CY250/01/19


Environment
Ambient Temperature : (20 ± 3) °C
Relative Humidity : (50 ± 10) %
Air Pressure : 1007.7 mbar.

Date of Received : 28 August 2025
Date of Calibration : 05 September 2025
Date of Issue : 05 September 2025
Calibrated by : Areerat Sornbun

Calibration Method : In-house method CAL-M3001 based on ASTM E 542-22

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

Electronic Balance
ID No. **Cert. No.** **Due Date** **Traceability**
241 002 68-200298-1 02 Dec 2025 National Institute of Metrology (Thailand) (NIMT)

Approved by : 
(Wipa Tovadee)
Supervisor

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Certificate of Calibration

Certificate No. : 68-300653-2 **Page : 2 of 2**

Result of Calibration : This result of true Volume is referred to standard temperature at 20 °C

UUC Condition As-Received : Good

Nominal Volume (ml)	Measuring Volume (ml)
250	251.21

Uncertainty of measurement with in ± 0.087 ml
This result of calibration was found accurate as shown on date and place of calibration only.
This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k = 2.00 , providing a level of confidence of approximately 95%

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Certificate of Calibration

Certificate No. : 68-300653-3 **Page : 1 of 2**

Submitted by : M Green Group Co.,Ltd.
188/46 Wisatsuknakhon 25, Pracha-Utd Rd., Thungkru, Bangkok 10140 Thailand

Equipment : Cylinder

Manufacturer : GLASSCO	Class : A
Capacity : 1000 ml	Graduation : 10 ml
ID No. : CY1000/01/24	

Environment	Ambient Temperature :	(20 ± 3)	°C
	Relative Humidity :	(50 ± 10)	%
	Air Pressure :	1007.7	mbar.

Date of Received : 28 August 2025

Date of Calibration : 05 September 2025

Date of Issue : 05 September 2025

Calibrated by : Areerat Sombun

Calibration Method : In-house method CAL-M3001 based on ASTM E 542-22

Reference Standard Instrument : This certification is traceable to the International System of Units
Electronic Balance

ID No.	Cert. No.	Due Date	Traceability
241002	68-200298-1	02 Dec 2025	National Institute of Metrology (Thailand) (NIMT)

Approved by : 
 (Wipa Tovadee)
 Supervisor

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Certificate of Calibration

Certificate No. : 68-300653-3 **Page : 2 of 2**

Result of Calibration : This result of true Volume is referred to standard temperature at 20 °C

UUC Condition As-Received : Good

Nominal Volume (ml)	Measuring Volume (ml)
1000	1002.97

Uncertainty of measurement with in ± 0.17 ml

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

This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k = 2.00 , providing a level of confidence of approximately 95%

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Certificate of Calibration

Certificate No. : 68-410130-1

Page : 1 of 2

Submitted by : M Green Group Co., Ltd.

188/46 Wisatsukrakon 25, Pracha-Utd Rd., Thungkru, Bangkok 10140 Thailand

Equipment : Digital Thermo-Hygrometer

Manufacturer : Digicon Model : TH-02A

Range Temperature : 0 °C to 50 °C Resolution : 0.1 °C

Range Humidity : 20 %R.H. to 99 %R.H. Resolution : 1 %R.H.

Serial No. : 1819A0771796 ID No. : N/A

Environment : Ambient Temperature : (23 ± 2) °C

Relative Humidity : (50 ± 15) %

Date of Received : 28 August 2025

Date of Calibration : 02 September to 04 September 2025

Date of Issue : 04 September 2025

Calibrated by : Chortip Samchusri

Calibration Method : This instrument was calibrated by In-house method comparison technique CAL-M4013 by compared with standard probe sensor humidity/temperature into humidity/temperature chamber.

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

Digital Indicator with Standard Probe Temp&Hum

ID No. Cert. No. Due Date Traceability

400034 & 400036 SG-H-00599/68 02 Jan 2026 Success Gateway Co., Ltd., Accredited by TISI Calibration No.0268

Approved by :

(Permpoon Chianpu)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 68-410130-1

Page : 2 of 2

UUC Condition As-Received : Good

Result of Calibration : Without Adjustment

Function : Temperature measurement

Reference Humidity @ 50 %R.H.

Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
19.97	19.7	0.3	0.46
24.97	24.7	0.3	0.46
29.99	29.6	0.4	0.46

Result of Calibration : Without Adjustment

Function : Humidity measurement

Reference Temperature @ 25 °C

Standard Humidity (%R.H.)	UUC Reading (%R.H.)	Correction (%R.H.)	Uncertainty (± %R.H.)
40.01	37	3	2.2
60.00	56	4	2.3

Remark

UUC : Unit Under Calibration

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

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

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Certificate of Calibration

Certificate No. : 68-200497-1

Page : 1 of 2

Submitted by :

M Green Group Co.,Ltd.

188/46 Wisutesuknakhon 25, Pracha-Utd Rd., Thungkru, Bangkok 10140 Thailand

Equipment :

Electronic Balance

Manufacturer : SHIMADZU

Model : AP225WD

Serial No. : D316300690

Capacity : 220 g Resolution : 0.00001g/102g, 0.0001g/220g

Environment :

On site calibration was carried out at the Laboratory, M Green Group Co.,Ltd.

Ambient Temperature : (24.0 to 24.2) °C

Relative Humidity : (53.8 to 62.6) %

Air Pressure : 1008.0 mbar

Date of Received :

28 August 2025

Date of Calibration :

28 August 2025

Date of Issue :

04 September 2025

Calibrated by :

Akaradith Thippichai

Calibration Method :

In-house method CAL-M2001 based on UKAS Publication ref : LAB 14

Edition 7 - November 2022

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

Standard Weights

ID No.

Cart.No.

Due Date

Traceability

E261-E2624

C02242009

07 Nov 2025

National Institute of Metrology (Thailand), (NIMT)

Approved by :

(Sajja Sangkhum

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 68-200497-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Departure of indication from nominal value

Nominal Value (g)	Correction (g)	Uncertainty ± (g)
0.001	0.00000	0.000016
0.01	0.00000	0.000016
0.1	0.00000	0.000018
1	0.00000	0.000027
10	0.00000	0.000053
20	-0.00002	0.000071
50	0.00004	0.00011
100	0.00009	0.00020
150	0.0001	0.00038
200	0.0000	0.00038

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

This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k = 2.20$, providing a level of confidence of approximately 95%

Eccentric error

Load test : 50 g



A

B

C

D

E

0.00000 0.00008 0.00009 -0.00001 0.00000 g

Repeatability

Load test : 200 g

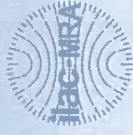
Sidev. : 0.000053 g

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S K SALES AND SERVICE CO.,LTD.
194/56, 194/57 Thokhom Rd. Samoe Dum,
Bang Khun Thien, Bangkok 10150
Tel : 02-417-2144 Fax : 02-417-2155



Certificate of Calibration

Reference No. : 3677/2512-088
Customer : M green Group Co.,Ltd.
: 188/46 Wisatesuknakhon 25, Pracha-Utd Rd.,
: Thungkru Bangkok 10140 Thailand
Equipment : Heating Block
Manufacturer : MIULAB
Model : DKT200-2
Serial No. : MU-EC7-91255
ID No. : -
Received Date : 15 December 2025
Calibrated Date : 19 December 2025
Issued Date : 22 December 2025

Environment	Start	Stop
Ambient Temperature (°C)	24.3	25.4
Relative Humidity (% RH)	62	63

Place Of Calibration : Temperature Calibration Room

Calibrated by : Mr. Thanapop Klaikaew

Calibration Method : SK-WI-017

Condition of this result of calibration

1. Reference standard instrument

Instrument : Data Acquisition with sensor
Serial No. : MY41085938
Certificate No. : L2511-0001
Due Date : 30 April 2026

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

3. This certificate can be traceable to International System of Unit :

- Through Temperature Laboratory, SK Sales and Service Co.,Ltd.

Approved by :

(Mr.Supachal Saksri)
Authorized Signatory



The reported uncertainty is based on a standard uncertainty multiplied by a converage factor k = 2, providing a level of confidence level of approximately 95 %

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Certificate No. : L2512-1005

Page 2 of 2

Result of Calibration
Range : 150 (°C)
Resolution : 0.1 (°C)

Channel	UUC Setting (°C)	UUC Reading (°C)	STD Reading (°C)	UUC Error (°C)	Measurement Uncertainty (± °C)
1	150	150.0	150.75	-0.75	0.10
2	150	150.0	150.75	-0.75	0.10
3	150	150.0	150.74	-0.74	0.10
4	150	150.0	150.75	-0.75	0.10
5	150	150.0	150.81	-0.81	0.10

STD= Standard

UUC= Unit Under Calibration

	1	2	3	4	5	6
A	1					2
B				5		
C						
D	3					4

** End of Calibration Report **

Certificate of Calibration

Certificate No. : 68-300660-1 Page : 1 of 2

Submitted by : M Green Group Co., Ltd.
188/46 Wisutesukhaknon 25, Pracha-Utd Rd., Thungkru, Bangkok 10140 ThailandEquipment : Inhoff Cone
Manufacturer : VITLAB
Capacity : 1000 ml Graduation : 50 ml
ID No. : CY1000/01/22Environment : Ambient Temperature : (20 ± 3) °C
Relative Humidity : (50 ± 10) %
Air Pressure : 1002.7 mbar.Date of Received : 28 August 2025
Date of Calibration : 01 September 2025
Date of Issue : 01 September 2025
Calibrated by : Areerat Sombun

Calibration Method : In-house method CAL-M3001 based on ASTM E 542-22

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

ID No.	Cert. No.	Due Date	Traceability
241002	68-200298-1	02 Dec 2025	National Institute of Metrology (Thailand) (NIMT)

Approved by :

(Wipa Tovadee)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 68-300660-1 Page : 2 of 2

Result of Calibration : This result of true Volume is referred to standard temperature at 20 °C

UUC Condition As-Received : Good

Nominal Volume (ml)	Measuring Volume (ml)
500	501.20
1000	1008.19

Uncertainty of measurement with in \pm 0.17 ml

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

This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k = 2.00$, providing a level of confidence of approximately 95%

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Certificate of Calibration

Certificate No. : 68-400473-3 Page : 1 of 2

Submitted by : M Green Group Co., Ltd.
188/46 Wisetukhachon 25, Pracha-Utd Rd., Thungkru Bangkok 10140 ThailandEquipment : Temperature controlled enclosure (Incubator)
Manufacturer : Biobase
Range : 0 °C to 65 °C
Model : Biochemistry Incubator
Resolution : 0.1 °C
Serial No. : KYP1502202003 ID No. : N/A

Environment : On site calibration was carried out at the Laboratory, M Green Group Co., Ltd.

Ambient Temperature : (27.0 to 28.0) °C
Relative Humidity : (40 to 50) %
Line Voltage : (226.0 to 230.0) V

Date of Received : 28 August 2025

Date of Calibration : 28 August 2025

Date of Issue : 30 August 2025

Calibrated by : Permpoon Chanpu

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

Reference Standard Instruments : This certification is traceable to the International System of Units
Standard Digital Thermometer with RTD ProbeID No. Cert. No. Due Date Traceability
400046 & 400047 68-400410-2 26 Jan 2026 National Institute of Metrology Thailand (NIMT)

Approved by :

(Permpoon Chanpu)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

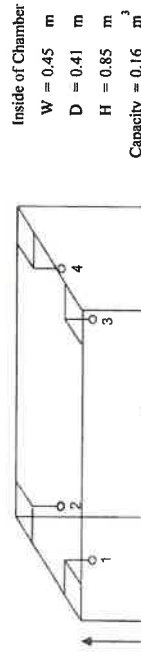
Certificate No. : 68-400473-3 Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

This instrument was setting air ventilation at position 0 (close)



Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Temperature (°C) @ Sensor No.									Uncertainty (± °C)
			1	2	3	4	5	6	7	8	9	
20.0	20.4	20.4	20.39	20.30	20.30	20.12	20.05	20.07	19.68	19.95	20.07	0.88
Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Uniformity (°C)									Overall Variation (°C)
20.0	20.4	20.4	0.86									1.46

Remark: The uncertainty is not combine uniformity of the air chamber

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

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

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Certificate of Calibration

Certificate No. : 68-400490-1

Submitted by : M Green Group Co., Ltd.
188/46 Wisetuknakhon 25, Pracha-Utd Rd., Thungkru, Bangkok 10140 Thailand

Equipment : Liquid in Glass Thermometer
Manufacturer : N/A
Range : 0 °C to 100 °C
Serial No. : N/A
ID No. : 94-49747
Model : N/A
Resolution : 1 °C
Immersion : Total


Environment :
Ambient Temperature : (23 ± 2) °C
Relative Humidity : (50 ± 15) %
Line Voltage : (220 ± 22) VAC

Date of Received : 28 August 2025
Date of Calibration : 30 August 2025
Date of Issue : 30 August 2025
Calibrated by : Chortip Samchusri

Calibration Method : This instrument was calibrated by In-house method comparison technique CAL-M4001 based on ASTM E77-07 by compared with PRT in the liquid bath at the constant controlled temperature.
The temperature scale used was based on ITS-90

Reference Standard Instruments :

ID No.	Cert. No.	Due Date	Traceability
400001	TT-0023-24	16 Feb 2026	National Institute of Metrology Thailand (NIMT)
ID No.	Cert. No.	Due Date	Traceability
400003	25E1656	22 May 2027	National Institute of Metrology Thailand (NIMT)
400004	25E1656	22 May 2027	National Institute of Metrology Thailand (NIMT)

Approved by : 
(Perrapon Chanpu)
Supervisor

Certificate of Calibration

Certificate No. : 68-400490-1

Result of Calibration : Without Adjustment
UUC Condition As-Received : Good

Function : Temperature measurement
Ice point check : UUC* reading 0 ° C Standard reading -0.0320 ° C

Standard Reading (° C)	UUC Reading (° C)	Correction (° C)	Uncertainty (± ° C)
39.8996	40	-0.1	0.31

Remark
UUC : Unit Under Calibration

This result of calibration was found accurate as shown on date and place of calibration only.
This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k = 2 ,
providing a level of confidence of approximately 95%

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Certificate of Calibration

Certificate No. : 68-420073-1

Page : 1 of 2

Submitted by : M Green Group Co., Ltd.

188/46 Wisatsuekhakhon 25, Pracha-Uttd Rd., Thungkru Bangkok 10140 Thailand

Equipment : pH Meter with electrode

pH meter

Manufacturer : Eutech Model : pH 700

Range : N/A pH Resolution : 0.01 pH

Serial No. : 2884323 ID No. : N/A

Electrode

Model : ECF7252101B Serial No. : 01X099320

Environment : On site calibration was carried out at the Laboratory, M Green Group Co., Ltd.

Ambient Temperature : (24.0 to 25.0) °C

Relative Humidity : (40 to 45) %

Date of Received : 28 August 2025

Date of Calibration : 28 August 2025

Date of Issue : 30 August 2025

Calibrated by : Permpoon Champo

Calibration Method : In-house method CAL-M4201 direct measurement by using standard voltage calibrator and using certified reference material (CRM)

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

1. Multiproduct Calibrator

ID No.	Cert. No.	Due Date	Traceability
400005	SG-E-00231/68	20 Aug 2027	National Institute of Metrology Thailand (NIMT)

2. Standard Buffer Solution

pH	Cert. No.	Lot No.	Exp. Date	Traceability
4.007	61314276	1081108	28 Feb 2027	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
6.965	61318175	1081110	28 Feb 2026	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
10.010	61325043	1081109	28 Feb 2026	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025

Approved by :

(Permpoon Champo)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 68-420073-1

Page : 2 of 2

Result of Calibration :

UUC Condition As-Received : Good

Function : Electrical measurement

pH meter

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

Adjustment Curve at nominal pH	Applied Voltage (mV)	Nominal Value (pH)	UUC Reading		Correction (mV)	Uncertainty (± mV)
			(pH)	(mV)		
4, 7, 10	177.4800	4	4.00	177.4	0.1	0.12
	0.0000	7	7.00	0.0	0.0	0.086
	-177.4800	10	10.00	-177.5	0.0	0.12

Function : pH meter with electrode

Performing a three - buffer standard curve using buffer nominal pH (4,7,10)

Adjustment Curve at nominal pH	Standard Buffer (pH)	UUC Reading (pH)	Correction (pH)	Uncertainty (± pH)
4, 7, 10	4.007	4.01	0.00	0.0097
	6.965	7.00	-0.03	0.011
	10.010	10.01	0.00	0.014

Remark

UUC : Unit Under Calibration

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

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

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Certificate of Calibration

Certificate No. : 68-400473-2

Page : 1 of 2

Submitted by : M Green Group Co., Ltd.

188/46 Wisutesukhakhon 25, Pracha-Utd Rd., Thungkru Bangkok 10140 Thailand

Equipment : Temperature controlled enclosure (Refrigerator)

Manufacturer : Biobase

Model : BXC-V250M (II)

Range : N/A °C

Resolution : 0.1 °C

Serial No. : YC025025190108

ID No. : N/A

Environment : On site calibration was carried out at the Laboratory, M Green Group Co., Ltd.

Ambient Temperature : (28.3 to 29.2) °C

Relative Humidity : (42 to 48) %

Line Voltage : (226.0 to 230.0) V

Date of Received : 28 August 2025

Date of Calibration : 28 August 2025

Date of Issue : 30 August 2025

Calibrated by : Permpon Chanpu

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

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

Standard Digital Thermometer with RTD Probe

ID No. Cert. No. Due Date Traceability

400029 & 400048 68-400411-1

29 Jan 2026

National Institute of Metrology Thailand (NIMT)

Approved by :

(Permpon Chanpu)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 68-400473-2

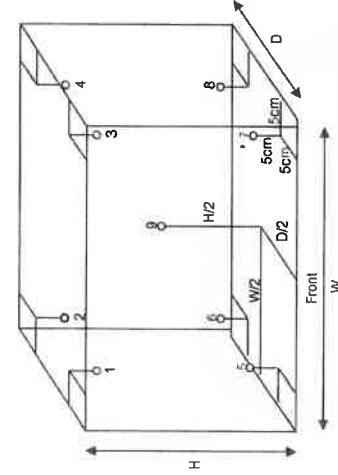
Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

This instrument was setting air ventilation at position 0 (close)



Inside of Chamber

W = 0.50 m

D = 0.40 m

H = 1.20 m

Capacity = 0.24 m³

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Temperature (°C) @ Sensor No.									Uncertainty (± °C)
			1	2	3	4	5	6	7	8	9	
4.0	2.0	3.7	5.28	5.39	6.74	5.85	7.00	6.56	6.08	6.02	5.36	0.52

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)
4.0	2.0	3.7	1.72	0.11	1.84

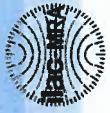
Remark The uncertainty is not combine uniformity of the air chamber

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

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

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Certificate of Calibration

Certificate No. : 68-400473-4

Page : 1 of 2

Submitted by :

M Green Group Co., Ltd.

188/46 Wisatsukhakdon 25, Pracha-Uttd Rd., Thungkru Bangkok 10140 Thailand

Equipment :

Water Bath

Manufacturer : Memmert

Model : WNB29

Range : N/A °C

Resolution : 0.1 °C

Serial No. : L619,0037

ID No. : N/A

Environment :

On site calibration was carried out at the Laboratory, M Green Group Co., Ltd.

Ambient Temperature : (27.0 to 28.0) °C

Relative Humidity : (40 to 50) %

Line Voltage : (226.0 to 230.0) V

Date of Received : 28 August 2025

Date of Calibration : 28 August 2025

Date of Issue : 30 August 2025

Calibrated by : Permpoon Chanpu

Calibration Method : This instrument was calibrated by In-house method CAL-M4006 based on ASTM E715-80

The temperature scale used was based on ITS-90

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

Standard Digital Thermometer with RTD probe

ID No. Cert. No. Due Date Traceability

400046 & 400024 68-400148-2 30 Sep 2025

National Institute of Metrology Thailand (NIMT)

Approved by :

(Permpoon Chanpu)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

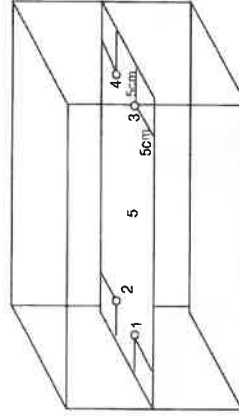
Certificate No. : 68-400473-4

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement



Front

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Temperature (°C) @ Sensor No.					Uncertainty (± °C)	Measured Uniformity (°C)	Measured Stability (°C)
			1	2	3	4	5			
85.0	85.0	85.0	84.86	85.03	84.47	84.77	84.92	0.22	0.54	0.07

Remark The uncertainty is not combine uniformity of the water bath

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

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

-o0o-





Certificate of Calibration

Certificate No. : 68-210356-1

Page : 1 of 2

Submitted by :

M Green Group Co., Ltd.

188/46 Wisatsuknakthon 25, Pracha-Utd Rd., Thungkru, Bangkok 10140 Thailand

Equipment :

Weight

Manufacturer : N/A

Material : Stainless Steel

Weight size : 1 g

ID No. : 63-210391-1

Assumed density of weight : 7950 kg / m³Assumed Air density : 1.2 kg / m³

Environment :

Ambient Temperature : (20 ± 2) °C

Relative Humidity : (50 ± 10) %

Air Pressure : 1006.7 mbar

Date of Received :

28 August 2025

Date of Calibration :

01 September 2025

Date of Issue :

01 September 2025

Calibrated by :

Wutichai Swatphong

Calibration Method : In-house method CAL-M2101 based on OIML R 111-1 : 2004(E)

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

Standard Weights

Cert.No.

Due Date

Traceability

National Institute of Metrology (Thailand), (NIMT)

MM-0044-25

11 Apr 2028

Approved by :

(Sajja Sangkhuan)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 68-210356-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

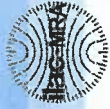
No.	Nominal Value	Idl.Mark	Conventional mass Value	Measuring Uncertainty
1	1 g	none	1 g -0.006 mg	± 0.023 mg

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

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

-oOo-





Certificate of Calibration

Certificate No. : 68-210356-2 Page : 1 of 2

Submitted by : M Green Group Co., Ltd.
188/46 Wisutesuknakhon 25, Pracha-Utd Rd., Thungkru, Bangkok 10140 ThailandEquipment : Weight
Manufacturer : N/A Material : Stainless Steel
Weight size : 100 gID No. : 63-210391-2
Assumed density of weight : 7950 kg / m³
Assumed Air density : 1.2 kg / m³Environment : Ambient Temperature : (20 ± 2) °C
Relative Humidity : (50 ± 10) %
Air Pressure : 1006.7 mbar

Date of Received : 28 August 2025

Date of Calibration : 01 September 2025

Date of Issue : 01 September 2025

Calibrated by : Wuttichai Swaphong

Calibration Method : In-house method CAL-M2101 based on OIML R 111-1 : 2004(E)

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

Standard Weights

ID No.	Cert.No.	Due Date	Traceability
E2413-E2425	MM-0044-25	11 Apr 2028	National Institute of Metrology (Thailand), (NIMT)

Approved by :
(Satja Sangkhruai)
Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 68-210356-2 Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

No.	Nominal Value	Id.Mark	Conventional mass Value	Measuring Uncertainty
1	100 g	none	100 g +0.03 mg	± 0.11 mg

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

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

-oOo-



Certificate of Calibration

Certificate No. : 68-210356-3
 Page : 1 of 2


Submitted by : M Green Group Co., Ltd.
 188/46 Wisatsukrakchon 25, Pracha-Utd Rd., Thungkru, Bangkok 10140 Thailand

Equipment : Weight
Manufacturer : N/A **Material :** Stainless Steel
Weight size : 200 g
ID No. : 63-210391-3
Assumed density of weight : 7950 kg / m³
Assumed Air density : 1.2 kg / m³
Environment : **Ambient Temperature :** (20 ± 2) °C
Relative Humidity : (50 ± 10) %
Air Pressure : 1006.7 mbar

Date of Received : 28 August 2025
Date of Calibration : 01 September 2025
Date of Issue : 01 September 2025
Calibrated by : Wuttichai Swatphong

Calibration Method : In-house method CAL-M2101 based on OIML R 111-1 : 2004(E)
Reference Standard Instruments : This certification is traceable to the International System of Units
Standard Weights

ID No.	Cart. No.	Due Date	Traceability
E2420	C02250960	06 Jun 2028	National Institute of Metrology (Thailand), (NIMT)

Approved by : 
 (Sajja Sangkham)
 Supervisor



Certificate of Calibration

Certificate No. : 68-210356-3
 Page : 2 of 2

Result of Callibration : Without Adjustment
UUC Condition As-Received : Good

No.	Nominal Value	Id.Mark	Conventional mass Value	Measuring Uncertainty
1	200 g	none	200 g -0.10 mg	± 0.17 mg

This result of calibration was found accurate as shown on date and place of calibration only.
 This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%

-o0o -







PinAAcle 900F Preventive Maintenance Report

Company Name: TEST TECH CO., LTD.
Instrument Location: 30,32 RAMA2 SOI 63, RAMA 2 RD.,
SAMMAEDAM, BANGKHUNTEN, BANGKOK 10150
Instrument Serial No.: PFBS21091601
Date: 18-Feb-2025

PinAAcle 900F Preventive Maintenance (PM)

Company Name:	TEST TECH CO., LTD.				
Address (Instrument Location):	30.32 RAMA2 SOI 63, RAMA 2 RD., BANGKHUNTEN, BANGKOK 10150				
Serial Number:	PFBS21091601	PM Number:	1 of 1		
Customer Name (if applicable):	Juraiat Jongprakobkit	Telephone Number:	087-5199005		
Customer Support Engineer Name:	Chainarong	Service Order Number:	WO-03179699		
Date PM Performed: (DD-MMM-YY)	18-Feb-2025	Next PM Due Date: (DD-MMM-YY)	18-Feb-2028		
Standard Labor Hours to Complete PM :			5 hours		

Part Number	Release	Publication Date
09370145 Rev.9	A	January 2018



Scope

The purpose of this PM is to ensure the continued functionality of the PinAAcle 900F by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer.

The customer should save their method before the PM begins.

General Instructions:

The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM.

Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files.

The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer.

Update the PM sticker and instrument logbook as required.

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Component List

Component / Specific Model	Serial #	Configuration Notes
FIAS 400	400521100101	Syngistix version 4.0

Parts Lists

Parts Included with the PM		
Part Number (if applicable)	Description	Quantity
B0501696	Fan Filters	2
N3160156	O-Ring Kits for Sampling Introduction (Stainless Steels Nebulizer)	N/A
N3160157	O-Ring Kits for Sampling Introduction (Plastic Nebulizer)	1
N9301714	Replacement Acetylene Filter Cartridge	1
TH001022	Replacement Air Filter Cartridge	2

Additional Reagents and Standards Required for PM				
Part Number (if applicable)	Description	Quality	Batch/Lot #	Expired Date (MM/YY)
N9300183	1000 mg/L Copper Standard	AR	27-39CUY1	APR-2025

Additional Reagents and Standards Required for PM (Customer Support Solution)				
Part Number (if applicable)	Description	Quantity	Batch/Lot #	Expiration Date (MM/YY)
N/A	D1 Water	250 mL	AR	AR
N/A	0.5% HNO ₃	250 mL	AR	AR

Additional Tools Required for PM				
Part Number (if applicable)	Description	Quantity	Serial #	
N1013000	0.2A Neutral density filter	1	MG0-685	
N1013002	1.0A Neutral density filter	1	MG2-680	
03030997	System 2 EDL Driver	1	839936	
N3050605	As System 2 EDL	1	06261	
N3050121	Cu Lumina HCL	1	101615-010080	
N3050109	Ba Lumina HCL	1	858AD8	
N3050139	K Lumina HCL	1	011604-41713	
N3050152	NI Lumina HCL	1	050914-010060	

Procedure Checklist

Use (✓) to check off those steps in the checklist that have been completed.

1. General:

- ☒ Review the instrument performance with the customer and document any recent problems.
- ☒ Inspect the customer log book and make any appropriate PM entries.
- ☒ Perform general inspection of system for cleanliness.

2. PC Instrument Software:

- ☒ Instrument Software user files/databases archived, packed, and/or deleted as needed.

3. Mechanical:

- ☒ Inspect and clean all fans and filters. Replace filters if necessary
- ☒ Inspect all gas lines for leaks and/or wear. Replace if needed.
- ☒ Clean exterior of the instrument.
- ☒ Inspect the burner head, burner chamber, and nebulizer. Clean if needed as stated in the Hardware Guide.
- ☒ Check burner head dimensions with the feeler gauge as stated in the Hardware Guide in the Maintenance chapter section on cleaning the burner head and checking sloth width. Replace if out of specification
- ☒ Check the condition of the end cap, burner head, and nebulizer O-rings. Replace if necessary.
- ☒ Check the drain system for signs of wear. Replace worn or damaged parts.
- ☒ Visually check for proper flame conditions when igniting the Air-C2H2 and N2O-C2H2 flames (if applicable).

4. Electrical:

- ☒ Inspect PC boards. Clean if necessary.
- ☒ Carefully check all internal and external cable connections.
- ☒ Check instrument firmware revisions upgrade to current levels (if necessary)
- ☒ Run Diagnostics Test within the Advanced function of the Spectrometer page. Check the results in the service log folder in the Spectrometer BIM Log Viewer.

5. Optics:

- ☒ Inspect and clean the sample compartment windows, if needed.
- ☒ Inspect optics. Clean or replace if necessary.

6. Gasses:

- ☒ Verify that the Gasses supplied to the instrument are within the pressure and purity specifications found in the PinAAcle 900F Series Pre-Installation Checklist SOB.
- ☒ Verify that the acetylene filter and air filter element is dry. Replace if necessary.

7. Flame Interlock Check:

Description: Check to ensure that all safety interlocks are closed.

Parameter	Specification	Test Results	Pass/Fail
Flame Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Drain Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Nebulizer Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
C ₂ H ₂ Pressure Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Air Pressure Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Burner Head Sensor	Choosing Nitrous Oxide as the oxidant should trigger an interlock shuts down	Active	Passed

8. After PM Performance tests:

8.1 Detector Linearity with Barium

Description: Ensures that the detector is linear in the Visible Range.

Parameter	Specification	Certificate Value at 553.6 nm (Abs.)	Test Results	Pass/Fail
1.0 A ND Filter	± 5% from Cert.	0.9684	0.9702	Passed
0.2 A ND Filter	± 5% from Cert.	0.1944	0.1927	Passed

8.2 Baseline Noise at 1.0 Absorbance with Barium

Description: Ensures that a high absorbance will not produce excessive noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0008	Passed

8.3 AA Baseline Noise with Copper

Description: Check baseline noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.001	0.0002	Passed

8.4 D₂ Background Compensation with Copper

Description: Verifies the instruments ability to compensate for Background absorption.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0075	Passed

8.5 AA-BG Baseline Noise with Copper

Description: Ensures that background correction does not produce excessive noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0002	Passed

8.6 AA-BG Baseline Noise with Arsenic

Description: Ensures that background correction does not produce excessive noise at a low wavelength.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0003	Passed

8.7 Flame Sensitivity

Description: Instrument Sensitivity checked against Copper standard.

Standard Copper Sensitivity	Specification	Results (Abs.)	Pass/Fail
5 mg/L Sensitivity SS Neb (if applicable)	> 0.250 Abs.	N/A	Not Applicable
2 mg/L Sensitivity HS Neb (if applicable)	> 0.250 Abs.	0.3463	Passed

10. Review:

- ☒ Review with the customer PM work performed.
- ☒ Review with the customer routine maintenance procedures.
- ☒ Discuss recommended customer supplied materials to have on hand.
- ☒ Attach PM sticker.

Additional Comments

Additional Comments Regarding the PM	
PERFORMANCE TEST FOR FIAS	
1. Characteristics mass for Mercury. (500uL of 10ug/L Hg and 5 replicates)	306.4 pg/0.0044 A
Characteristics mass %RSD	1.02 %
2. Characteristics mass for Arsenic. (500uL of 10ug/L As and 5 replicates)	137.8 pg/0.0044 A
Characteristics mass %RSD	1.87 %
2. Characteristics mass for Selenium. (500uL of 10ug/L Se and 5 replicates)	78.4 pg/0.0044 A
Characteristics mass %RSD	0.46 %
Wavelength Accuracy Check	
As 193.700 nm +/- 0.3nm	193.700 nm
Cu 324.750 nm +/- 0.3nm	324.800 nm
Ba 553.550 nm +/- 0.3nm	553.650 nm
K 766.490 nm +/- 0.3nm	766.590 nm

Review

The preventive maintenance checks and if applicable performance tests for PinAAcle 900F have been completed.	
This PinAAcle 900F Passes <input checked="" type="checkbox"/> Fails <input type="checkbox"/> the preventive maintenance.	
Review of Preventive Maintenance:	
Authorized PerkinElmer Representative:	Date: 18-Feb-2025 (DD-MMM-YYYY) <i>Chen Zhang</i>
Authorized Customer Representative:	Date: 18-Feb-2025 (DD-MMM-YYYY) Jouirat



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL.0-2777-3000-29 FAX.0-2719-9484



Certificate of Calibration

Cert.No.: 25CG3566
Page.: 1 of 2

Equipment : Auto Burette

Capacity : 25 mL

Serial No. :

ID. No. : 6210BU25/01

Manufacturer :

Made In : EM Germany

Submitted by :

TEST TECH CO.,LTD. (Head Office)
30, 32 Rama II Soi 63, Rama II Rd.
Samaedam, Bangkhunthian, Bangkok 10150

Ambient Temperature :

Relative Humidity : (20 ± 2.5) °C

Barometric Pressure : (50 ± 10) %

Calibration Procedure : 756 mmHg

ASTM E 542 - 01

Calibrated by :

Sa-ngaeunkam Wongsa

Approved by :

Approved Signatory

(✓) Sriuda Khamtha

() Ponpan Palpm

() Chakrit Waewwarjua

Issue Date :

15 September 2025

The Uncertainties are for a confidence probability of approximately 95%

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Equipment : Auto Burette

Received Date : 11 September 2025

Condition As-Received : Used Item

Calibration Date : 15 September 2025

Reference : 2509-0413DN-1

Cert.No.: 25CG3566
Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :

Instruments	Model	Serial No.	ID. No.	Certificate No.	Traceability	Due date
1) Balance	XP205	B134206712	140RC007	25MM296	TPA	16 July 2026
2) Humidity/BaroTemp	MHB-382SD	AM.42259	140EC016	25H1616	TPA	14 Aug 2026
3) Digital Thermometer	HH376	230806555	140EC013	25H1740	TPA	17 Jan 2026

This measurement result is traceable to SI Unit

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

3. True value is converted to true volume at the standard temperature of 20 °C

Calibration result :

Nominal capacity (mL)	Reading (mL)	Std.dev	Uncertainty (± mL)	k Factor
5	5.0196	0.00120	0.0059	2.00
15	15.0159	0.00118	0.0065	2.00

Remark mL = cm³

Std.dev = Standard deviation

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-



CERTIFICATE No : 25T0975
REFERENCE No : 76012-7

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : AUTOCLAVE
MANUFACTURER : HIRAYAMA
MODEL : HVE-50
SERIAL No : 30612085166
No : EQL-155
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : TEST TECH CO., LTD.
30,32 RAMA II RD., SAMAEADAM,
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY : CHAICHARN CH.
CALIBRATION DATE : 04-Feb-25

APPROVED BY :
ISSUED DATE : 12-Feb-25
RECEIVED DATE : 04-Feb-25

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF
QUALITY CALIBRATION CO., LTD.



CERTIFICATE No : 25T0975

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : AUTOCLAVE
MANUFACTURER : HIRAYAMA
ID NUMBER : EQL-155
RECEIVED DATE : 04-Feb-25
AMBIENT TEMPERATURE : 29° C ± 1° C
MODEL : HVE-50
SERIAL NUMBER : 30612085166
CALIBRATION DATE : 04-Feb-25
RELATIVE HUMIDITY : 53 %RH ± 10 % RH

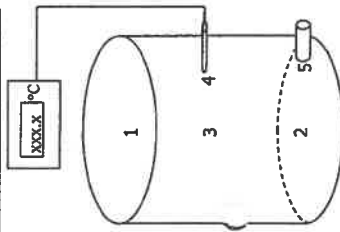
CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BASED ON BS 2646-1:2021 BY COMPARISON WITH CALIBRATED RTD DATA LOGGERS UNDER NO LOAD CONDITION. THE SENSORS WERE PLACED ON FIVE LOCATIONS AS SHOWN IN THE PICTURE. THE SENSOR ON LOCATION 1 AND 2 WERE PLACED IN THE UPPER HALF AND LOWER HALF OF CHAMBER FREE SPACE RESPECTIVELY. THE THIRD SENSOR WAS PLACED WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE INSTRUMENT CHAMBER. SENSOR NUMBER 4 WAS ATTACHED TO THE LOAD TEMPERATURE PROBE, IF FITTED, WITHIN 15 mm OF ITS TIP. SENSOR NUMBER 5 WAS PLACED IN THE CHAMBER DRAIN OR VENT WITHIN 100 mm OF ITS CONNECTION TO THE CHAMBER.

REFERENCE STANDARD INSTRUMENTS :

- INSTRUMENT MODEL SERIAL No CERTIFICATE No DUE DATE
- 1) DATA LOGGER VALPROBE S350S367,DV35,DN94 25T0777 24-Jan-26
 3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.
 4. THIS RESULT EXCLUDES LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
 5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO., LTD.

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



GENERAL INFORMATION

Overall Ambient Temperature around the Chamber variation : 1.2 °C
Autoclave Condition : Normal
Chamber Size (Diameter*H): 30 * 71 cm

CHAMBER PERFORMANCE

Controller Temperature (°C)	Average All Temperature Position (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)	Pressure (MPa)	Holding time (min)	Operating Cycle time (min)
115	115.71	0.10	0.20	0.20	0.090	15	60
121	121.65	0.10	0.20	0.20	0.125	15	60

FRONT

TEMPERATURE MEASUREMENT ACCURACY TEST (°C)

Calibration Point	Controller Temp.	Indicating Temp.	Measured Temperature (°C) at Spread Locations					Uncertainty (± °C)
			#1	#2	#3	#4	#5	
115	115	115	115.66	115.65	115.76	115.76	115.70	0.63
121	121	121	121.59	121.60	121.71	121.71	121.66	0.64

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT OF TEMPERATURE MEASUREMENT ACCURACY TEST EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER.

NOTE 2 : THE STABILITY TERM IN THE UNCERTAINTY BUDGET WAS REPLACED BY THE STANDARD REPEATABILITY.

NOTE 3 : LOCATION 3 WAS REFERENCE LOCATION.

NOTE 4 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

F-Q010 REV 1/3



CERTIFICATE No : 25T8232
REFERENCE No : 78147-2

PAGE : 1 OF 3

Certificate of Calibration

EQUIPMENT : BOD INCUBATOR
MANUFACTURER : N/A
MODEL : N/A
SERIAL No : N/A
ID No : EQL-166
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : TEST TECH CO., LTD.
30,32 RAMA II SOI 63, RAMA II RD., SAMAEDAM,
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY : CHAICHARN CH.
CALIBRATION DATE : 11-Aug-25

APPROVED BY :
ISSUED DATE : 14-Aug-25
RECEIVED DATE : 11-Aug-25

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF
QUALITY CALIBRATION CO., LTD.



F-G010 REV : 03



CERTIFICATE No : 25T8232

PAGE : 2 OF 3

Calibration Report

EQUIPMENT : BOD INCUBATOR
MANUFACTURER : N/A
ID NUMBER : EQL-166
RECEIVED DATE : 11-Aug-25
AMBIENT TEMPERATURE : 27°C ± 1°C
MODEL : N/A
SERIAL NUMBER : N/A
CALIBRATION DATE : 11-Aug-25
RELATIVE HUMIDITY : 45 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO TLAS G-20 BY COMPARISON WITH CALIBRATED THERMOCOUPLE TYPE K UNDER NO LOAD CONDITION. THE THERMOCOUPLES WERE PLACED ON 19 POINTS AND LOCATED AS THE PICTURE BELOW AND WAS AWAY FROM THE EACH WALL OF 5 cm TO 10 cm. AND PLACED THE TENTH THERMOCOUPLE WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE CHAMBER. THE UNIFORMITY WAS MEASURED BETWEEN REFERENCE PROBE AND OTHER PROBES AT THE SAME TIME.
2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT

1) DATA LOGGER WITH TC TYPE K HYDRA 2635A

MODEL

7286308

CERTIFICATE No

25T5347

DUE DATE

11-Jun-26

3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO., LTD.

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

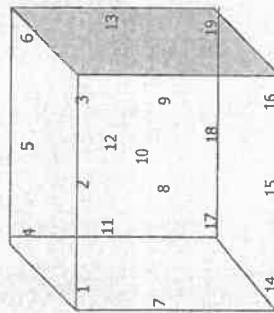
GENERAL INFORMATION

Overall Ambient Temperature around the Chamber (°C) variation : 0

Overall Line Voltage (V) variation : 2

Instrument Condition : Normal

Chamber Size (W*L*H): 190*70*174 cm



CHAMBER PERFORMANCE

Calibration Point (°C)	Average All Located (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
20.0	20.12	0.06	0.46	0.51

END OF CALIBRATION REPORT PAGE 2 OF 3

F-G010 REV : 03



Calibration Report

RESULT OF CALIBRATION (CONTINUE):-

TEMPERATURE MEASUREMENT ACCURACY TEST	
Controller temperature (°C) Indicating Temperature	20.0
1	20.0
2	20.30
3	20.29
4	20.25
5	20.38
6	20.22
7	20.23
8	20.12
9	20.06
10 Ref.	20.05
11	19.97
12	20.21
13	20.14
14	20.12
15	20.11
16	20.06
17	19.94
18	20.01
19	19.89
Uncertainty of Measurement (± °C)	0.40

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER.

NOTE 2 : LOCATION 10 WAS REFERENCE LOCATION.

NOTE 3 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR $k=2$, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



Certificate of Calibration

Equipment: SPECTROPHOTOMETER
Model: DR6000
Serial No. (or ID.): 1693421 (EQL-197)
Manufacturer: HACH
Condition: In Condition

Certificate No.: C06250150
Issued Date: 10 April 2025
Job No.: WO-00067645
Page: 1 of 3

Customer: TEST TECH CO., LTD.
30,32 Rama II Soi 63, Rama II Rd.,
Samaedam, Bangkhuntian Bangkok 10150 Thailand.

Environment Condition: Temperature 27.2 °C ± 0.5 °C
Humidity 50.1 %RH ± 0.3 %RH

Calibration Place: TEST TECH CO., LTD. (แผนกน้ำดี)
30,32 Rama II Soi 63, Rama II Rd.,
Samaedam, Bangkhuntian Bangkok 10150 Thailand

Calibration By: Mr. Piypat Saldoung

Calibration Date: 10 April 2025

The Method used: In house method, CAL-WI-24, base on ASTM E 275-08 and ASTM E 387-04

Traceability: This certificate is traceable to the CRM maintained by National Institute of Standards and Technology (NIST) through Starna Scientific Limited.

The standard for Wavelength Certificate No. 118106 and 118118
The standard for Photometric Certificate No. 118123 and 118113
The standard for Stray light Certificate No. 118110 and 118112
The standard for Spectral resolution Certificate No. 118104

(Mr. Piypat Saldoung)

Person in charge

(Miss Kaewkan Suradech)

Authorized signatory

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

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

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

DKSH Technology Limited

2533 Sukhumvit Road, Bangkok, 10260
Phone: +66 2638 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth - in Asia and Beyond.



Calibration Results:
Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of Std at 2 nm and UUC at 2 nm

Standard Wavelength	Unit Under Calibration	Correction	Uncertainty
418.61	418.6	0.01	0.13
536.66	536.8	-0.14	0.13
637.98	638.0	-0.02	0.13
748.48	748.9	-0.42	0.14
807.03	807.5	-0.47	0.13

Photometric Accuracy (Absorbance)			
Wavelength	Standard absorbance	Unit Under Calibration	Uncertainty
420 nm	0.0000	0.000	0.0045
	0.5772	0.577	0.0045
	0.7198	0.719	0.0045
440 nm	1.0394	1.037	0.0045
	0.0000	0.000	0.0045
	0.5608	0.560	0.0045
465 nm	0.7062	0.705	0.0045
	1.0189	1.017	0.0045
	0.0000	0.000	0.0045
546.1 nm	0.5214	0.521	0.0045
	0.6652	0.665	0.0045
	0.9577	0.956	0.0045
590 nm	0.0000	0.000	0.0045
	0.5530	0.552	0.0045
	0.7555	0.755	0.0045
635 nm	1.0761	1.074	0.0045
	0.0000	0.000	0.0045
	0.5604	0.559	0.0045
	0.7418	0.741	0.0045
	1.0467	1.045	0.0045



Calibration Results:
Without Adjustment

Photometric Accuracy (Absorbance)

Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
235 nm	0.0000	0.000	0.0000	0.0080
	0.7533	0.750	0.0033	0.0080
257 nm	0.0000	0.000	0.0000	0.0080
	0.8745	0.870	0.0045	0.0080
313 nm	0.0000	0.000	0.0000	0.0080
	0.2926	0.293	-0.0004	0.0080
350 nm	0.0000	0.000	0.0000	0.0080
	0.6486	0.644	0.0046	0.0080

Stray light *

Standard: cut-off	UUC: Wavelength (nm)	UUC: Transmission (%T)	Absorbance (A)
260.95 +/- 0.11 nm	261.0	1.2	1.921
392.04 +/- 0.11 nm	392.0	1.4	1.854

Spectral Resolution *

Nominal Concentration 0.02 % v/v	Peak	Trough	Ratio	SBW
Standard Wavelength (nm)	288.74	286.81	1.30	2.00
UUC: Wavelength (nm)	268.5	266.6		
Std Absorbance (A)	0.5137	0.3473		
UUC: Absorbance (A)	0.465	0.358		

* Calibration Marked " Not TISI Accredited " in this Certificate have been included for completeness.

The End of Certificate



CERTIFICATE No : 25T8755
REFERENCE No : 78325-6

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : HEATING BLOCK
MANUFACTURER : MULBERRY
MODEL : HB-44
SERIAL No : 1904009
ID No : EQL-207

CONDITION AS RECEIVED : USED ITEM

SUBMITTED BY : TEST TECH CO., LTD.
30,32 RAMA II SOI 63, RAMA II RD.,
SAMAEDAM, BANGKHUNTHIAN,
BANGKOK 10150

CALIBRATED BY : CHAICHARN CH.

CALIBRATION DATE : 26-Aug-25

APPROVED BY : PRASERT D.

ISSUED DATE : 28-Aug-25

RECEIVED DATE : 26-Aug-25



CERTIFICATE No : 25T8755

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : HEATING BLOCK
MANUFACTURER : MULBERRY
MODEL : HB-44
ID No : EQL-207
RECEIVED DATE : 26-Aug-25
AMBIENT TEMPERATURE : 25 °C ± 1 °C
S/N : 1904009
CALIBRATION DATE : 26-Aug-25
RELATIVE HUMIDITY : 53 %RH ± 10 %RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY DIRECT MEASUREMENT METHOD WITH CALIBRATED RTD PT-100. THE PROBE
WERE PLACED ON POINTS AND LOCATED AS THE PICTURE .
2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT : MODEL : SERIAL No : 7408027
1) DATA LOGGER WITH RTD : HYDRA 2635A
25T3344
18-Jun-26
3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO., LTD.

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

34	35	36	37	38	39	40	41	42	43	44
23	24	25	26	27	28	29	30	31	32	33
12	13	14	15	16	17	18	19	20	21	22
1	2	3	4	5	6	7	8	9	10	11

FRONT

HEATING BLOCK PERFORMANCE

Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
150.0	150.0	0.34	1.71	1.90

TEMPERATURE MEASUREMENT ACCURACY TEST

Measured Temperature (°C) at Spread Locations											Uncertainty (± °C)
1	2	3	4	5	6	7	8	9	10	11	
149.50	149.41	150.06	149.89	150.29	150.74	150.88	150.67	150.39	149.73	149.77	0.82
Measured Temperature (°C) at Spread Locations											Uncertainty (± °C)
12	13	14	15	16	Ref.17	18	19	20	21	22	
149.76	149.74	149.59	149.90	150.63	150.69	150.70	150.63	150.08	149.88	149.47	0.82
Measured Temperature (°C) at Spread Locations											Uncertainty (± °C)
23	24	25	26	27	28	29	30	31	32	33	
149.54	149.53	149.90	150.47	150.71	150.91	150.65	150.25	150.57	149.89	149.53	0.82
Measured Temperature (°C) at Spread Locations											Uncertainty (± °C)
34	35	36	37	38	39	40	41	42	43	44	
149.26	149.75	149.95	150.50	150.56	150.49	150.16	150.80	149.95	150.02	149.61	0.82

NOTE 1: LOCATION 17 WAS REFERENCE LOCATION.

NOTE 2: THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.
END OF CALIBRATION REPORT





CERTIFICATE No : 25T8754
REFERENCE No : 78325-5

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : HOT AIR OVEN
MANUFACTURER : MEMMERT
MODEL : UFE 500
SERIAL No : G512.2005
ID No : EQL-161
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : TEST TECH CO., LTD.
30,32 RAMA II SOI 63, RAMA II RD.,
SAMAEDAM, BANGKHUNTHIAN,
BANGKOK 10150
CALIBRATED BY : CHAICHARN CH.
CALIBRATION DATE : 26-Aug-25
APPROVED BY :
PRASERT D.
ISSUED DATE : 28-Aug-25
RECEIVED DATE : 26-Aug-25



THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF
QUALITY CALIBRATION CO., LTD.

F-G010 REV : 03



CERTIFICATE No : 25T8754

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : HOT AIR OVEN
MANUFACTURER : MEMMERT
MODEL : UFE 500
ID No : EQL-161
RECEIVED DATE : 26-Aug-25
AMBIENT TEMPERATURE : 25 °C ± 1 °C
S/N : G512.2005
CALIBRATION DATE : 26-Aug-25
RELATIVE HUMIDITY : 53 %RH ± 10 %RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO TIAS G-20 BY COMPARISON WITH CALIBRATED RTD Pt100 UNDER NO LOAD CONDITION. THE TEMPERATURE PROBES WERE PLACED ON NINE POINTS AND LOCATED ONE THERMOMETER PROBE IN EACH OF THE EIGHT CORNERS OF THE CHAMBER AND WAS AWAY FROM THE EACH WALL OF 5 cm TO 10 cm. AND PLACED THE NINTH THERMOMETER PROBE WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE CHAMBER. THE UNIFORMITY WAS MEASURED BETWEEN REFERENCE PROBE AND OTHER PROBES AT THE SAME TIME.

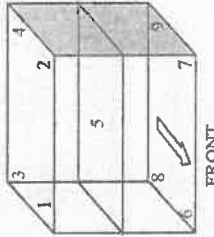
REFERENCE STANDARD INSTRUMENTS :-

- INSTRUMENT : DATA LOGGER WITH RTD
MODEL : HYDRA 2635A
SERIAL No : 6849323
CERTIFICATE No : 25T3342
DUE DATE : 18-Jun-26
3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO., LTD.

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

GENERAL INFORMATION

Overall Ambient Temperature around the Chamber (°C) variation : 1
Overall Line Voltage (V) variation : 3
Instrument Condition : Normal
Chamber Size (W*H*J): 56*40*48 cm



CHAMBER PERFORMANCE		Temperature Uniformity		Temperature Variation	
Calibration Point (°C)	Average All Position (°C)	Stability (±°C)	Temperature Uniformity (°C)	Temperature Variation (°C)	Overall Variation (°C)
104.0	104.11	0.10	0.88	0.97	

TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (± °C)
		#1	#2	#3	#4	Ref 5	#6	#7	#8	#9	
104.5	104.5	104.15	104.14	104.25	103.95	103.64	104.12	104.46	104.06	104.24	0.38

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER.

NOTE 2 : LOCATION 5 WAS REFERENCE LOCATION.

NOTE 3 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.
THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

F-G010 REV : 03



CERTIFICATE No : 25T0970
REFERENCE No : 76012-2

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : INCUBATOR
MANUFACTURER : MEMMERT
MODEL : IF 160
SERIAL No : D518.0082
ID No : EQL-205
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : TEST TECH CO., LTD.
30,32 RAMA II RD., SAMAEDAM,
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY : CHAICHARN CH.
CALIBRATION DATE : 04-Feb-25
APPROVED BY :
PONGSAK J.
ISSUED DATE : 12-Feb-25
RECEIVED DATE : 04-Feb-25



CERTIFICATE No : 25T0970

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : INCUBATOR
MANUFACTURER : MEMMERT
MODEL : IF 160
ID No : EQL-205
RECEIVED DATE : 04-Feb-25
AMBIENT TEMPERATURE : 25 °C ± 1 °C
S/N : D518.0082
CALIBRATION DATE : 04-Feb-25
RELATIVE HUMIDITY : 50 %RH ± 10 %RH

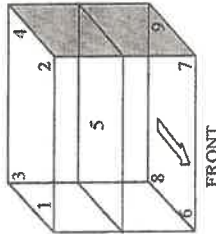
CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO TLAS G-20 BY COMPARISON WITH CALIBRATED RTD Pt100 UNDER NO LOAD CONDITION. THE TEMPERATURE PROBES WERE PLACED ON NINE POINTS AND LOCATED ONE THERMOMETER PROBE IN EACH OF THE EIGHT CORNERS OF THE CHAMBER AND WAS AWAY FROM THE EACH WALL OF 5 cm TO 10 cm. AND PLACED THE NINTH THERMOMETER PROBE WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE CHAMBER. THE UNIFORMITY WAS MEASURED BETWEEN REFERENCE PROBE AND OTHER PROBES AT THE SAME TIME.
2. REFERENCE STANDARD INSTRUMENTS :-
INSTRUMENT : MODEL : SERIAL No : CERTIFICATE No : DUE DATE
1) DATA LOGGER WITH RTD : HYDRA 2635A : 7301307 : 24T6467 : 26-Jun-25
3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO., LTD.

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

GENERAL INFORMATION

Overall Ambient Temperature around the Chamber (°C) variation : 2
Overall Line Voltage (V) variation : 11
Instrument Condition : Normal
Chamber Size (W*L*H): 56*40*72 cm



CHAMBER PERFORMANCE

Calibration Point (°C)	Controller Temperature (°C)	Average All Position (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
35.0	35.0	34.98	0.03	0.08	0.12
36.0	36.0	35.99	0.02	0.16	0.16
41.5	41.6	41.51	0.03	0.19	0.23

TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (± °C)
		#1	#2	#3	#4	Ref. 5	#6	#7	#8	#9	
35.0	35.0	34.96	35.01	34.94	35.00	35.01	34.99	34.98	34.97	35.01	0.25
36.0	36.0	35.98	36.03	35.95	36.01	36.04	36.01	35.91	35.99	36.04	0.25
41.6	41.6	41.49	41.53	41.43	41.52	41.59	41.53	41.42	41.53	41.58	0.36

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER.

NOTE 2 : LOCATION 5 WAS REFERENCE LOCATION.

NOTE 3 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k =2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.
END OF CALIBRATION REPORT

F-G010 REV : 03



บริษัท ซีจี ไซแอนติฟิค จำกัด
CG SCIENTIFIC CO., LTD.



บริษัท ซีจี ไซแอนติฟิค จำกัด
CG SCIENTIFIC CO., LTD.

การดูแลบำรุงรักษาเชิงป้องกัน

Preventive Maintenance

Customer Name : บริษัท เทสท์ เทค จำกัด
Product : Distillation Unit
Brand : GERHARDT
Model : Vapodest 30
Serial number : GER003718

- Part 1: สัญญาการให้บริการ (Service Contact)
Part 2: ข้อมูลพื้นฐานของเครื่องมือ (Details of Instrument)
Part 3: ตรวจสอบประสิทธิภาพเครื่อง
Part 4: รายละเอียดและรายงานผลการให้บริการ Preventive Maintenance
4.1 ขั้นตอนการบริการ
4.2 รายงานผลการให้บริการ
Part 5: ข้อมูลสนับสนุนด้านเทคนิค (General Technical Support)
5.1 Care and Maintenance
5.1.1 การบำรุงรักษาทั่วไป (Basic maintenance)
5.1.2 General error message





บริษัท ซีจี ไชออนติฟิค จำกัด
CG SCIENTIFIC CO., LTD.



บริษัท ซีจี ไชออนติฟิค จำกัด
CG SCIENTIFIC CO., LTD.

1. สัญญาการใช้บริการ (Service Contact)

หน่วยงานลูกค้า :	บริษัท เทสท์ เทคโนโลยี
ที่อยู่ :	30/32 ซอยพระรามที่ 2 ขยาย 63 แขวงสามเสนล่าง เขตบางเขน กรุงเทพมหานคร 10150
โทรศัพท์ :	
อีเมล :	
บุคคลติดต่อ :	คุณ กรรณภพ ขุนพิทักษ์
ชื่อ- นามสกุล :	
ตำแหน่ง :	
โทรศัพท์ :	02-893-4211-17
อีเมล :	lab_center@testtech.co.th

สัญญาการใช้บริการจำนวน 1 ครั้ง ต่อ ปี

ครั้งที่ 1 วันที่ : 19 มีนาคม 2568

ครั้งที่ 2 วันที่ :

ครั้งที่ 3 วันที่ :

2. ข้อมูลพื้นฐานของเครื่องมือ (Details of Instrument)

2.1 รายละเอียดเครื่องมือ (Instrument Description)

ประเภทเครื่องมือ :	Distillation Unit
ผลิตภัณฑ์ :	GERHARDT
รุ่น :	Vapodest 30
หมายเลขเครื่อง :	GER003718
หมายเลขครุภัณฑ์ :	EQL-062

2.2 ผู้ดำเนินการ

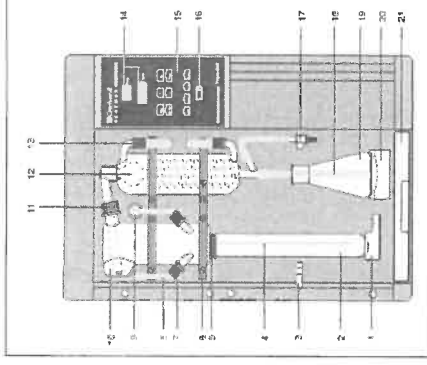
ดำเนินการทำ PM โดย

ชื่อ-นามสกุล :	คุณณฤทธิ์ เดชเนติวัฒน์
ตำแหน่ง :	วิศวกร
แผนก :	บริการหลังการขาย
ฝ่าย :	บริการหลังการขาย

Part 3: Operational Qualification (OQ)

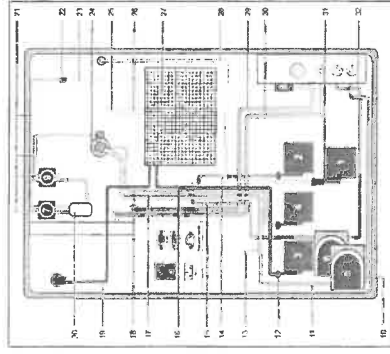
3.1 ตรวจสอบสภาพเครื่อง

FRONT



No	Description	PASS	FAIL	N/A
1.	Quick clamping device with wedge	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	Kjeldatherm digestion tube	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.	Holder for steam inlet tubing	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	PTFP-inlet tubing, steam	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.	Viton-cone	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.	Clamping for glassware	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.	Screw cap GL18 with silicone seal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8.	PTFP-inlet tubing, NaOH	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.	PP-Distributor with PP-threaded joint	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.	Distribution head, PP	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.	Screw cap GL32 with silicone seal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12.	Distillation condenser	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13.	Screw cap GL14 with plastic screw connection	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14.	Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.	Keyboard, chemical-resistant	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16.	Main switch, green	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17.	Ventilation valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18.	Distillate outlet tubing	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19.	Erlenmeyer flask	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20.	Platform	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21.	Drip tray	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

REAR



No	Description	PASS	FAIL	N/A
1.	Diaphragm pump NaOH	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	Diaphragm pump H ₂ SO ₄	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> *Vap40
3.	Diaphragm pump H ₂ O for steam generator	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> *Vap30, *
4.	Diaphragm pump H ₂ O for sample	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> *Vap30, *
5.	Peristaltic pump for suction sample	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> Option
6.	Peristaltic pump for suction receiver	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7.	Pinch-solenoid valve, steam	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8.	Magnetic valve with pressure control	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.	Pinch-solenoid valve, shut-off	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.	Verprene-tubing 4x8 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.	Verprene-tubing 4x8 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> *Vap30, *
12.	Non-return valve for diaphragm pumps	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13.	Tubing reduction PP 51x10x5 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> *Vap30, *
14.	Silicone tubing 4x7 mm.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> *Vap40
15.	Silicone tubing 4x7 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> Option
16.	Silicone-tubing 4x7 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17.	Verprene-tubing 8x12 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> *Vap30, *
18.	Verprene tubing 4x7 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> *Vap30, *
19.	Silicone tubing 4x7 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20.	Ventilation glass	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21.	Novoprene-tubing 4.8x8 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22.	Tubing reduction	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23.	Silicone tubing 6x10 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24.	PP-distributor with PP-thread	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25.	SKT-valve (built in with brass fitting)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26.	Silicone tubing 8x16x80 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27.	Steam generator	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28.	PTFE-inlet tubing NaOH	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29.	Silicone tubing 8x16 for cooling water inlet	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30.	Silicone tubing 8x16 for cooling water outlet	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31.	Viton-tubing 6x12*50 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32.	Silicone tubing 4x7 mm.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> Option

Part 4:

รายละเอียดการตรวจสอบ

4.1 ขั้นตอนการบริการ

ตารางสอบระบบไฟฟ้า (Electrical Test)

- ความต้านทานทางไฟฟ้าของเครื่องกับกราวด์
- กระแสไฟฟ้าที่ใช้

ตรวจสุขภาพเครื่อง (Optical Test)

- Main cable
- Electric wiring
- Pumps
- Distribution Head
- Condensor
- Steam generator
- Tubing
- Viton cone

ตรวจสอบ Function ทดทำงาน (The Function Test)	PASS	FAIL	Remark
- ตรวจสอบและปรับความดันของ Steam	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
- ตรวจสอบระดับน้ำใน Sample Tube	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
- ตรวจสอบสาร NaOH	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
- ตรวจสอบการดูดกลับ Sample Tube and Receiver	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

4.2 รายงานผลการให้บริการ

1. TECHNICAL DATA

- Main Supply 220 volt + 10% 50 Hz
Nominal current

1. TECHNICAL DATA		PASS	FAIL	Remark
Main Supply 220 volt + 10% 50 Hz		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Nominal current		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
1.1 COOLING WATER BATH				
		PASS	FAIL	Remark

1.1 COOLING WATER BATH

- Temperature 15-20 °C
Cooling Water Outlet
Control Temperature

1.1	COOLING WATER BATH	PASS	FAIL	Remark
	Temperature 15-20 °C	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	Cooling Water Outlet	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	Control Temperature	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

1.2 OPTICAL TEST VAP 30

- Screw cap GL14
Screw cap GL18
Screw cap GL32
Distillation Head
Condensor
Viton Cone
Ventilation Valve
Micro Switch Sample

1.2	OPTICAL TEST VAP	30	PASS	FAIL	Remark
	Screw cap GL14		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	Screw cap GL18		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	Screw cap GL32		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	Distillation Head		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	Condensor		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	Viton Cone		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	Ventilation Valve		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	Micro Switch Sample		<input checked="" type="checkbox"/>	<input type="checkbox"/>	

2. SYSTEM COOLING WATER INLET

- Cooling Water Inlet
Cooling Water Outlet
Flow control valve

2. SYSTEM COOLING WATER INLET	PASS	FAIL	Remark
Cooling Water Inlet	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Cooling Water Outlet	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Flow control valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	



3. SYSTEM CONTROL

	PASS	FAIL	Remark
Key Board	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Program D	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Adding H ₂ O	<input checked="" type="checkbox"/>	<input type="checkbox"/>	*Vap30-40
Adding NaOH	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Adding H ₃ BO ₃	<input type="checkbox"/>	<input type="checkbox"/>	*Vap40
Suction Sample	<input checked="" type="checkbox"/>	<input type="checkbox"/>	*Vap30-40

4. SYSTEM DISTILLATION

	PASS	FAIL	Remark
Boiler	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Level Sensor	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Neoprene-Tubing	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Solenoid Valve Shut-Off	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Solenoid Valve Steam	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Excess Pressure Detector	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Ventilation Valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Heater	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

5. PUMPS

	PASS	FAIL	Remark
Pump H ₂ O Steam	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
- Non-Return Valve			
Pump H ₂ O Sample	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
- Non-Return Valve			
Pump NaOH	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
- Non-Return Valve			
Pump H ₃ BO ₃	<input type="checkbox"/>	<input type="checkbox"/>	N/A
- Non-Return Valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Pump suction			

6. THE FOLLOWING PROGRAM RUN

	PASS	FAIL	Remark
Addition H ₂ O	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0-99 sec.
Addition NaOH	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0-99 sec.
Addition H ₃ BO ₃	<input type="checkbox"/>	<input type="checkbox"/>	0-99 sec.
Reaction Time	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0-99 min
Distillation Time	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0-99 min
Steam Capacity	<input checked="" type="checkbox"/>	<input type="checkbox"/>	30%-100%
Suction Time	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0-99 sec.
The Instrument is in perfect technical shape	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Remark:



4.2 Error Code

The micro-processor continually surveys all the functions of the distillation system. As soon as an error arises it is shown on the display and accompanied by an acoustic signal.

Error message	Measures
No tap water	Check cooling water inlet for blockages. Ensure the tap is turned on
No sample tube	Insert tube
Check chemicals	Check set of tanks
Low water Press Enter	Check the water inlet distilled H ₂ O
Filling Steam generator	This message disappears as soon as steam generator is filled

After the above mentioned errors are corrected, the following message is displayed.

Error message	Measures
Stop Prog.No. x Continue=Enter	Enter = continue of interrupted program Reset = Standby-mode

Other error messages

Error message	Measures
Wait for steam	Message disappears as soon as stand-by is reached
Add sol. > 1 min Continue=Enter	Check programming Enter=continue of interrupted program Reset=Standby-mode
Program undefined	Check programming
Excess steam pressure	Switch the system off and call service
Sensor error	Switch the system off and call service



Certificate of Calibration

Equipment: TURBIDIMETER
Model: TL2300
Serial No. (or ID.): 2024080C0139 (EQL-282)
Manufacturer: HACH
Condition: New
Certificate No.: C08240209
Issued Date: 23 December 2024
Job No.: WO-00053212
Page: 1 of 2
Customer: TEST TECH CO., LTD.
30, 32 Rama II Soi 63, Rama II Rd., Samaedam,
Bangkhunthian, Bangkok 10150, Thailand

Environment Condition: Temperature 23 °C ± 2 °C
Humidity 50 %RH ± 15 %RH

Calibration Place: Environment Laboratory, DKSH Technology Limited.
2533 Sukhumvit Road, Bangkok,
Phrakhanong, Bangkok 10260 Thailand

Calibration By: Mr. Pongpisut Suebchantha
Calibration Date: 26 November 2024
The Method used: In house method, CAL-VI-23, base on Hach Manufacturer Method 8195
Traceability: This certificate is traceable to Primary standard Fromazin and StablCal accepted by United States Environmental Protection Agency (EPA) through Hach Company
Certificate No. A3304 , A3312 , A3305 , A3304 , A3305


(Mr. Pongpisut Suebchantha)
Person in charge

(Miss Kaewkan Suradech)
Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

บริษัท ดีเคเอสเอช (ประเทศไทย) จำกัด
DKSH Technology Limited
2533 สุขุมวิท ถนน แขวง:คลองเตย กรุงเทพมหานคร 10260
2533 Sukhumvit Road, Bangkok Phrakhanong, Bangkok 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth - In Asia and Beyond.

CAL-FM-C08-08: 20 Jul 2022



Certificate No.: C08240209 Page 2 of 2

Calibration Results:

Without Adjustment

Std Turbidity (NTU)	UUC Reading	Correction	Deviation	Uncertainty
0.040	0.059	-0.019	0.0000	0.070
20.40	20.4	0.00	0.04	1.0
205.0	205	0.0	0.0	10
1026.0	1026	0.0	0.4	50
4114.0	4114	0.0	0.8	200

The End of Certificate

บริษัท ดีเคเอสเอช (ประเทศไทย) จำกัด
DKSH Technology Limited
2533 สุขุมวิท ถนน แขวง:คลองเตย กรุงเทพมหานคร 10260
2533 Sukhumvit Road, Bangkok Phrakhanong, Bangkok 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth - In Asia and Beyond.

CAL-FM-C08-08: 20 Jul 2022



CERTIFICATE No : 25T6062
REFERENCE No : 77516-2

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : WATER BATH
MANUFACTURER : MEMMERT
MODEL : WPE 45
SERIAL No : L711.0024
ID No : EQL-147
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : TEST TECH CO., LTD.
30,32 RAMA II SOI 63, RAMA II RD., SAMAEDAM,
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY : ATSAWIN Y.
CALIBRATION DATE : 23-Jun-25

APPROVED BY : PONGSAK J.
ISSUED DATE : 24-Jun-25
RECEIVED DATE : 23-Jun-25



THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF
QUALITY CALIBRATION CO., LTD.

F-G010 REV : 03



CERTIFICATE No : 25T6062

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : WATER BATH
MANUFACTURER : MEMMERT
ID NUMBER : EQL-147
RECEIVED DATE : 23-Jun-25
AMBIENT TEMPERATURE : 27 °C ± 1 °C
MODEL : WPE 45
SERIAL NUMBER : L711.0024
CALIBRATION DATE : 23-Jun-25
RELATIVE HUMIDITY : 51 %RH ± 10 % RH

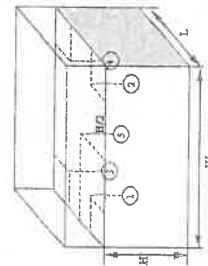
CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO ASTM E715-80 (REAPPROVED 2001) BY COMPARISON WITH CALIBRATED RTD. THE PROBES WERE PLACED ON FIVE POINTS AND LOCATED ONE PROBE IN EACH OF THE FOUR CORNERS OF THE BATH AND PLACED THE FIFTH RTD WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE WATER VOLUME (REFERENCE LOCATION) UNDER NO LOAD CONDITION.
2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT

1) DATA LOGGER WITH RTD
2) CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.
3. THIS RESULT EXCLUDES LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
4. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO., LTD.

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



PROBE INSTALLATION
POSITION IN THE BATH

GENERAL INFORMATION

Overall Variation of Ambient Temperature around the Bath (°C) : 1.1
Overall Variation of Line Voltage (V) : 4
Instrument Condition : Normal
Bath Inner Size (W*L*H) : 59*35*22 cm

BATH PERFORMANCE

Calibration Point (°C)	Average All Position (°C)	Temperature Stability (± °C)	Radius Uniformity (°C)	Axial Uniformity (°C)	Overall Variation
41.5	41.50	0.05	0.04	0.07	0.12
44.5	44.48	0.03	0.04	0.10	0.08

TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations					Uncertainty (± °C)
		#1	#2	#3	#4	Ref. 5	
41.5	41.5	41.51	41.47	41.52	41.48	41.50	0.14
44.5	44.5	44.48	44.46	44.50	44.47	44.49	0.14

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE BATH.

NOTE 2 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

F-G010 REV : 03



SCIMET Co., Ltd.
1194 Soi Wachirathamsothit 57, Bangkok,
Phraekhanong, Bangkok 10260 Thailand
Email: scimet2022@gmail.com, Tel: 02 460 9239
https://www.scimet.co.th



Certificate No. C06240053

Calibration Certificate

Equipment: TURBIDIMETER
Model: 2100N
Serial No.(or ID): 970400003415 (EQL-024)
Manufacturer: HACH
Condition: In Condition
Job No.: KSM72402432
Received Date: 12 September 2024
Issued Date: 12 September 2024
Page: 1 of 2

Customer
TEST TECH CO., LTD.
30,32 Rama II Soi 63, Rama II Rd., Samaedam, Bangkokunten Bangkok 10150 Thailand

Calibration Place
TEST TECH CO., LTD.(503 แขวงตลาดใหม่)
30,32 Rama II Soi 63, Rama II Rd., Samaedam, Bangkokunten Bangkok 10150 Thailand

Calibration Date
12 September 2024

Environment Condition
Temperature: 24.4 °C ± 0.2 °C
Humidity: 58.4 %RH ± 1.1 %RH

The Method used
In-house method, W106, based on Hach Manufacturer Method 8195
Traceability
This certificate is traceable to Primary standard Fromazin and StablCal accepted by United States Environmental Protection Agency (EPA) through Hach Company Certificate No. A3304, A3312, A3305, A3304, A3305



(Mr. Durrong Boonsopon)
Person in charge

(Mr. Thelemgkeat Pongngam)
Authorized signatory

Calibration Results:

Std Turbidity (NTU)	UUC Reading	Correction	Deviation	Uncertainty
0.040	0.121	-0.081	0.002	0.070
20.40	20.0	0.40	0.0	1.0
205.0	198	7.0	0.3	10
1026.0	995	31.0	0.0	50
4114.0	4017	97.0	5.0	200

Std Turbidity (NTU)	UUC Reading	Correction	Deviation	Uncertainty
0.040	0.122	-0.082	0.003	0.070
20.40	20.5	-0.10	0.0	1.0
205.0	205	0.0	0.3	10
1026.0	1027	-1.0	0.3	50
4114.0	4113	1.0	1.1	200

The End of Certificate



ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: KSMT2402432

รุ่น: 2100N

ชนิดเครื่องมือ: TURBIDIMETER

หมายเลขเครื่อง: 970400003415

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
12 Sep 2024			12 Sep 2024		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความสมบูรณ์เครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายในนอกเครื่อง)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิตช์ ปิด - เปิด เครื่อง (On-Off Switch)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. ค่าความทึบที่ต่ำสุด (No Sample)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0.078 NTU
<input type="checkbox"/>	<input type="checkbox"/>	7. ระดับการส่องสว่างของแสง (≥ 2.5 ไม่นเกิน 3.0)	<input type="checkbox"/>	<input type="checkbox"/>	-

เห็นด้วยและแนบ:

Mr. Dumrong Boonsopon
Service Engineer

บริษัท ชัยนิคม จำกัด (SCIMET CO., LTD.)
1194 Soi Wachirathamsatit 57, Bangkok, Phrakhanong, Bangkok 10260 Thailand
Email: scime2022@gmail.com, Tel: 02 460 9239

F108-01: 08 MAR 2023



Certificate of Calibration

Equipment: TURBIDIMETER
Model: TL2300
Serial No. (or ID.): 2024080C0139 (EQL-282)
Manufacturer: HACH
Condition: New
Certificate No.: C08240209
Issued Date: 23 December 2024
Job No.: WO-00053212
Page: 1 of 2

Customer: TEST TECH CO., LTD.
30, 32 Rama II Sol 63, Rama II Rd., Samaedam,
Bangkhunthian, Bangkok 10150, Thailand

Environment Condition: Temperature 23 °C \pm 2 °C
Humidity 50 %RH \pm 15 %RH

Calibration Place: Environment Laboratory, DKSH Technology Limited.
2533 Sukhumvit Road, Bangchak,
Phrakhanong, Bangkok 10260 Thailand

Calibration By: Mr. Pongpisut Suebchantha
Calibration Date: 26 November 2024
The Method used: In house method, CAL-VI-23, base on Hach Manufacturer Method 8195
Traceability: This certificate is traceable to Primary standard Fromazin and StabCal accepted by
United States Environmental Protection Agency (EPA) through Hach Company
Certificate No. A3304 , A3312 , A3305 , A3304 , A3305

(Mr. Pongpisut Suebchantha)

Person in charge

(Miss Kaewkan Suradech)
Authorized signatory

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

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

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

DKSH Technology Limited
2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
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Delivering Growth - In Asia and Beyond.

CAL-FIM-C08-08: 20 Jul 2022



Certificate No.: C08240209

Page 2 of 2

Calibration Results:

Without Adjustment

Std Turbidity (NTU)	UUC Reading	Correction	Deviation	Uncertainty
0.040	0.059	-0.019	0.0000	0.070
20.40	20.4	0.00	0.04	1.0
205.0	205	0.0	0.0	10
1026.0	1026	0.0	0.4	50
4114.0	4114	0.0	0.8	200

The End of Certificate

บริษัท ดีเคเอส อีซี จำกัด
2533 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260
Phone: +66 2269 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand
Delivering Growth - In Asia and Beyond.

CAL-FIM-C08-08: 20 Jul 2022



ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: WO-00053212

หมายเลขเครื่อง: 2024080C0139

รุ่น: TL2300

ชนิดเครื่องมือ: TURBIDIMETER

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
✓	□	General	✓	□	
✓	□	1. ความสมบูรณ์เครื่อง	✓	□	
✓	□	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	✓	□	
✓	□	3. สวิตช์ ปิด - เปิด เครื่อง (On-Off Switch)	✓	□	
✓	□	4. ปุ่มกด (Keypad)	✓	□	
✓	□	5. หน้าจอ (Display, Screen Contrast)	✓	□	
□	□	Spectrophotometer	□	□	
□	□	6. แรงดันไฟฟ้า (Battery Backup) ≥ 2.5 VDC	□	□	
□	□	7. ตัวหมุนเลือกความยาวคลื่น (Wavelength Control)	□	□	
□	□	8. ความยาวคลื่น (Wavelength Check)	□	□	
□	□	9. แหล่งกำเนิดแสง (UV $< 3,000$ hour)	□	□	
□	□	10. แหล่งกำเนิดแสง (Visible $< 5,000$ hour)	□	□	
□	□	11. ช่องวัดหลายตัวอย่าง (Carousel Module)	□	□	
□	□	pH Meter and Conductivity Meter	□	□	
□	□	12. อิเล็กโทรด (Electrode and Connection Cable)	□	□	
□	□	13. ระดับสารละลายใน Electrode (Level KCl)	□	□	
□	□	14. ฝาปิดกันปลาน Electrode (Dust Protection Hood)	□	□	
□	□	15. ขาจับอิเล็กโทรด (Stand)	□	□	
□	□	Turbidimeter	□	□	
✓	□	16. ค่าความขุ่นที่ต่ำสุด (No Sample)	✓	□	0.012 NTU
□	□	17. ระดับการส่องสว่างของแสง (≥ 2.5 ไม่นเกิน 3.0)	□	□	
□	□	Automatic titrator	□	□	
□	□	18. สภาพ Piston Burettes	□	□	
□	□	19. Function Rinsing and Dosing	□	□	
□	□	20. ระบบท่อสายยางและอุปกรณ์ประกอบ	□	□	

เห็นเดิม/ข้อแนะนำ :

Mr. Pongpisut Suebchantha
Service Engineer

บริษัท ดีเคเอส อีซี จำกัด
2533 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260
Phone: +66 2269 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand
Delivering Growth - In Asia and Beyond.

CAL-FIM-R31-03: 20 Jul 2022



CERTIFICATE No : 25T6064
REFERENCE No : 77516.4

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : INCUBATOR
MANUFACTURER : MEMMERT
MODEL : INB400
SERIAL No : E405.0946
ID No : EQL-087
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : TEST TECH CO., LTD.
30,32 RAMA II SOI 63, RAMA II RD., SAMAEADAM,
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY : ATSAWIN Y.
CALIBRATION DATE : 23-Jun-25

APPROVED BY : 
PONGSAK J.
ISSUED DATE : 24-Jun-25
RECEIVED DATE : 23-Jun-25

๗10

ใบรับรองการสอบเทียบ “ตู้บ่มเชื้อ”
(Calibration Certificate of Incubator)





QUALITY CALIBRATION CO., LTD.
235 Petcharasen 63/2 Road, Laksong, Bangkok 10160
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584



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www.qcalibration.com



CERTIFICATE No : 25T6064

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : INCUBATOR
MANUFACTURER : MEMMERT
MODEL : INB400
ID No : EOL-087
RECEIVED DATE : 23-Jun-25
AMBIENT TEMPERATURE : 26 °C ± 1 °C
SN : E405.0946
CALIBRATION DATE : 23-Jun-25
RELATIVE HUMIDITY : 46 %RH ± 10 %RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO TLA5 G-20 BY COMPARISON WITH CALIBRATED RTD PH100 UNDER NO LOAD CONDITION. THE TEMPERATURE PROBES WERE PLACED ON NINE POINTS AND LOCATED ONE THERMOMETER PROBE IN EACH OF THE EIGHT CORNERS OF THE CHAMBER AND WAS AWAY FROM THE EACH WALL OF 5 cm TO 10 cm. AND PLACED THE NINTH THERMOMETER PROBE WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE CHAMBER. THE UNIFORMITY WAS MEASURED BETWEEN REFERENCE PROBE AND OTHER PROBES AT THE SAME TIME.

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT MODEL SERIAL No CERTIFICATE No DUE DATE
1) DATA LOGGER WITH RTD HYDRA 2635A 6635300 2476468 26-Jun-25
3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

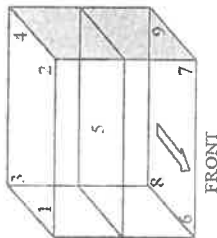
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO., LTD.

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

GENERAL INFORMATION

Overall Ambient Temperature around the Chamber (°C) variation : 1
Overall Line Voltage (V) variation : 6
Instrument Condition : Normal
Chamber Size (W*L*H): 40*33*40 cm



CHAMBER PERFORMANCE

Calibration Point (°C)	Average All Position (°C)	Indicating Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
44.0	44.10	43.5	0.04	0.57	0.62
58.0	57.83	57.0	0.07	0.75	0.78

TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (± °C)
		#1	#2	#3	#4	Ref. 5	#6	#7	#8	#9	
43.5	43.5	43.94	44.08	43.84	43.77	44.34	44.29	44.31	44.04	44.30	0.36
57.0	57.0	57.65	57.75	57.52	57.51	58.22	57.98	58.16	57.59	58.14	0.36

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER.

NOTE 2 : LOCATION 5 WAS REFERENCE LOCATION.

NOTE 3 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k =2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF QUALITY CALIBRATION CO., LTD.

F-G010 REV : 03

PAGE : 1 OF 2

Certificate of Calibration

CERTIFICATE No : 25T0971
REFERENCE No : 76012-3

EQUIPMENT : INCUBATOR
MANUFACTURER : MEMMERT
MODEL : IF 110
SERIAL No : D415.0802
ID No : EQL-190
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : TEST TECH CO.,LTD.
30,32 RAMA II RD., SAMAEDAM,
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY : CHAICHARN CH.
CALIBRATION DATE : 04-Feb-25

APPROVED BY :
PONGSAK J.
ISSUED DATE : 12-Feb-25
RECEIVED DATE : 04-Feb-25



QUALITY CALIBRATION CO., LTD.
235 Petchkasem 63/2 Road, Lakson, Bangkok 10160
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584



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CERTIFICATE No : 25T0971

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : INCUBATOR
MANUFACTURER : MEMMERT
MODEL : IF 110
ID No : EQL-190
RECEIVED DATE : 04-Feb-25
AMBIENT TEMPERATURE : 25 °C ± 1 °C
S/N : D415.0802
CALIBRATION DATE : 04-Feb-25
RELATIVE HUMIDITY : 50 %RH ± 10 %RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO TILAS G-20 BY COMPARISON WITH CALIBRATED RTD PH100 UNDER NO LOAD CONDITION. THE TEMPERATURE PROBES WERE PLACED ON NINE POINTS AND LOCATED ONE THERMOMETER PROBE IN EACH OF THE EIGHT CORNERS OF THE CHAMBER AND WAS AWAY FROM THE EACH WALL OF 5 cm TO 10 cm. AND PLACED THE NINTH THERMOMETER PROBE WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE CHAMBER. THE UNIFORMITY WAS MEASURED BETWEEN REFERENCE PROBE AND OTHER PROBES AT THE SAME TIME.

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT MODEL SERIAL No CERTIFICATE No DUE DATE
1) DATA LOGGER WITH RTD HYDRA 2635A 7408027 24T6469 26-Jun-25
3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

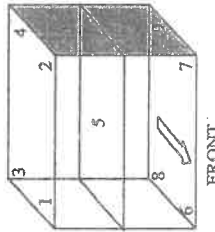
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO., LTD.

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

GENERAL INFORMATION

Overall Ambient Temperature around the Chamber (°C) variation : 4
Overall Line Voltage (V) variation : 15
Instrument Condition : Normal
Chamber Size (W*H*L) : 56*40*48 cm



CHAMBER PERFORMANCE

Calibration Point (°C)	Controller Temperature (°C)	Average All Position (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
37.0	37.0	36.90	0.09	0.19	0.31
44.0	44.0	44.10	0.07	0.24	0.34

TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (± °C)
	#1	#2	#3	#4	Ref. 5	#6	#7	#8	#9	
37.0	37.00	36.91	36.87	36.88	36.94	36.89	36.88	36.85	36.88	0.25
44.0	44.0	44.22	44.09	44.05	44.06	44.18	44.10	44.02	44.05	0.36

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER.

NOTE 2 : LOCATION 5 WAS REFERENCE LOCATION.

NOTE 3 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.
END OF CALIBRATION REPORT



F-G010 REV : 03

CERTIFICATE No : 25T0970
REFERENCE No : 76012-2

Certificate of Calibration

EQUIPMENT : INCUBATOR
MANUFACTURER : MEMMERT
MODEL : IF 160
SERIAL No : D518.0082
ID No : EQL-205
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : TEST TECH CO.,LTD.
30,32 RAMA II RD., SAMAEADAM,
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY : CHAICHARN CH.
CALIBRATION DATE : 04-Feb-25

APPROVED BY :
ISSUED DATE : 12-Feb-25
RECEIVED DATE : 04-Feb-25

PONGSAK J.

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF
QUALITY CALIBRATION CO., LTD.



F-G010 REV : 03



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www.qcalibration.com



CERTIFICATE No : 25T0970

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : INCUBATOR
MANUFACTURER : MEMMERT
MODEL : IF 160
ID No : EQL-205
RECEIVED DATE : 04-Feb-25
AMBIENT TEMPERATURE : 25 °C ± 1 °C
SN : D518.0082
CALIBRATION DATE : 04-Feb-25
RELATIVE HUMIDITY : 50 %RH ± 10 %RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO TLA5 G-20 BY COMPARISON WITH CALIBRATED RTD P100 UNDER NO LOAD CONDITION. THE TEMPERATURE PROBES WERE PLACED ON NINE POINTS AND LOCATED ONE THERMOMETER PROBE IN EACH OF THE EIGHT CORNERS OF THE CHAMBER AND WAS AWAY FROM THE EACH WALL OF 5 cm TO 10 cm. AND PLACED THE NINTH THERMOMETER PROBE WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE CHAMBER. THE UNIFORMITY WAS MEASURED BETWEEN REFERENCE PROBE AND OTHER PROBES AT THE SAME TIME.

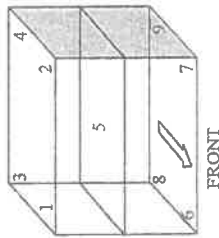
2. REFERENCE STANDARD INSTRUMENTS :-

- 1) DATA LOGGER WITH RTD
INSTRUMENT : MODEL : SERIAL No : CERTIFICATE No : DUE DATE
HYDRA 2635A 7301307 24T6467 26-Jun-25
3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO., LTD.

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

GENERAL INFORMATION

Overall Ambient Temperature around the Chamber (°C) variation : 2
Overall Line Voltage (V) variation : 11
Instrument Condition : Normal
Chamber Size (W*L*H): 56*40*72 cm



CHAMBER PERFORMANCE

Calibration Point	Controller Temperature (°C)	Average All Position (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
35.0	35.0	34.98	0.03	0.08	0.12
36.0	36.0	35.99	0.02	0.16	0.16
41.5	41.6	41.51	0.03	0.19	0.23

TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (± °C)
	#1	#2	#3	#4	#5	#6	#7	#8	#9	
35.0	35.0	34.96	35.01	34.94	35.00	35.01	34.99	34.97	35.01	0.25
36.0	36.0	35.98	36.03	35.95	36.01	36.04	36.01	35.91	35.99	0.25
41.6	41.6	41.49	41.53	41.43	41.52	41.59	41.53	41.42	41.53	0.36

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER.

NOTE 2 : LOCATION 5 WAS REFERENCE LOCATION.

NOTE 3 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.
END OF CALIBRATION REPORT



F-G010 REV : 03

CERTIFICATE No : 25T0972

REFERENCE No : 76012-4

Certificate of Calibration

EQUIPMENT : INCUBATOR
MANUFACTURER : MEMMERT
MODEL : IF 160
SERIAL No : D518.0240
ID No : EQL-218
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : TEST TECH CO.,LTD.
30,32 RAMA II RD., SAMAEDAM,
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY : CHAICHARN CH.
CALIBRATION DATE : 04-Feb-25

APPROVED BY :  PONGSAK J.
ISSUED DATE : 12-Feb-25
RECEIVED DATE : 04-Feb-25

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF
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F-G010 REV : 03



CERTIFICATE No : 25T0972

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : INCUBATOR
MANUFACTURER : MEMMERT
MODEL : IF 160
ID No : EQL-218
RECEIVED DATE : 04-Feb-25
AMBIENT TEMPERATURE : 25 °C ± 1 °C

S/N : D518-0240
CALIBRATION DATE : 04-Feb-25
RELATIVE HUMIDITY : 50 %RH ± 10 %RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO TIAS G-20 BY COMPARISON WITH CALIBRATED RTD P100 UNDER NO LOAD CONDITION. THE TEMPERATURE PROBES WERE PLACED ON NINE POINTS AND LOCATED ONE THERMOMETER PROBE IN EACH OF THE EIGHT CORNERS OF THE CHAMBER AND WAS AWAY FROM THE EACH WALL OF 5 cm TO 10 cm. AND PLACED THE NINTH THERMOMETER PROBE WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE CHAMBER. THE UNIFORMITY WAS MEASURED BETWEEN REFERENCE PROBE AND OTHER PROBES AT THE SAME TIME.

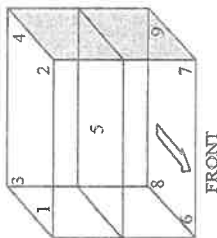
2. REFERENCE STANDARD INSTRUMENTS :-

- INSTRUMENT MODEL SERIAL No CERTIFICATE No DUE DATE
1) DATA LOGGER WITH RTD HYDRA 2635A 7408027 24T6469 26-Jun-25
3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO., LTD.

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

GENERAL INFORMATION

Overall Ambient Temperature around the Chamber (°C) variation : 4	
Overall Line Voltage (V) variation : 13	
Instrument Condition : Normal	
Chamber Size (W*L*H) : 56*40*72 cm	



CHAMBER PERFORMANCE

Calibration Point	Controller Temperature (°C)	Average All Position (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
35.0	35.0	34.99	0.02	0.10	0.20
36.0	36.0	35.98	0.02	0.11	0.19

TEMPERATURE MEASUREMENT ACCURACY TEST

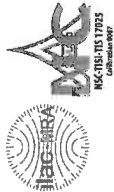
Controller Temp (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (± °C)
	#1	#2	#3	#4	Ref 5	#6	#7	#8	#9	
35.0	34.97	34.95	34.93	34.92	34.99	35.07	35.04	35.05	35.03	0.25
36.0	35.96	35.94	35.93	35.91	35.96	36.06	36.03	36.04	36.01	0.25

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER.

NOTE 2 : LOCATION 5 WAS REFERENCE LOCATION.

NOTE 3 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k = 2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.
END OF CALIBRATION REPORT



Certificate of Calibration

Equipment: Incubator Certificate No.: C31250176
Model: IF160 Issued Date: 28 January 2025
Serial No.(or ID): D519.0140 (EQL-231) Job No.: WO-00059088
Manufacturer: Memmert Page: 1 of 5
Condition: In Condition Ventilation Valve: Closed
Shelves(pc.): 2

Customer: TEST TECH CO., LTD.

30,32 Rama II Soi 63, Rama II Rd.,
Samaedam, Bangkokthian Bangkok 10150 Thailand.

Environment Condition: Temperature: 22 °C ± 0.5 °C
Humidity: 53 %RH ± 4.8 %RH
Voltage: 228 VAC ± 2.3 VAC

Calibration Place: TEST TECH CO., LTD. (Incubation room 408)

30,32 Rama II Soi 63, Rama II Rd.,
Samaedam, Bangkokthian Bangkok 10150 Thailand.

Calibration By: Mr. Atachai Ngamchanat

Calibration Date: 28 January 2025

The Method used: In house method, CAL-WI-16, base on TLAS-G20

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited.
Certificate No. C10250001

(Mr. Atachai Ngamchanat)

Person in charge

(Mr. Chaiwat Srisanguan)

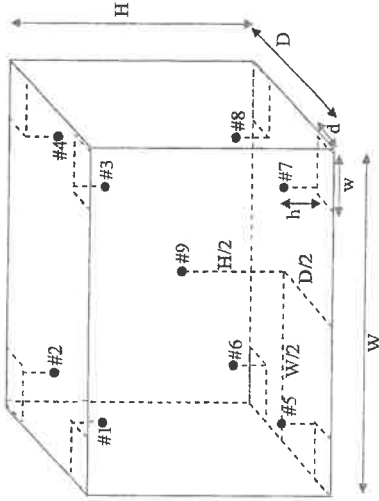
Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to International or national standard or other recognized national standard laboratories.
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

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Delivering Growth - In Asia and Beyond.





Standard Installation Locations

Volume (Calibration Zone)= 43 (Liters)

Inside chamber:

Standard Locations (#1, #2, #3, #4): W = 56 (cm) D = 40 (cm) H = 72 (cm)

Standard Locations (#5, #6, #7, #8): w = 10 (cm) d = 5 (cm) h = 20 (cm)

Standard Locations (#9): Geometric center of the chamber

Position of Std	#1	#2	#3	#4	#5	#6	#7	#8	#9
Channel of Logger	301	302	303	304	305	306	307	308	309

Definitions

Indicating Temperature: The average reading of indicating device which forms the integral part of the enclosure.

Measured Temperature: The average reading of standards at any positions or location.

Measured Uniformity: The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference probe is preferably located in the geometric center of the chamber.

Measured Stability: The one-half of greatest maximum difference of measured temperatures at any one probe.

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

Without adjustment (Cont.)

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 37.0 °C

Locations	Measured Temperature (°C)	Correction of UUC (°C)	Uncertainty (± °C)
#1	37.07	0.07	0.23
#2	36.99	-0.01	0.23
#3	37.07	0.07	0.23
#4	37.04	0.04	0.23
#5	36.97	-0.03	0.23
#6	36.85	-0.15	0.23
#7	37.06	0.06	0.23
#8	37.03	0.03	0.23
#9	37.04	0.04	0.23

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
37.0	37.0	37.0	37.07	36.99	37.07	37.04	36.97	36.85	37.06	37.03	37.04	0.23

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
37.0	0.19	0.01	0.24

Note: * Maximum uncertainty of the each position



Certificate No.: C31250176 Page: 5 of 5

Without adjustment (Cont.)

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 41.5 °C

Locations	Measured Temperature (°C)	Correction of UUC (°C)	Uncertainty (± °C)
#1	41.58	0.08	0.23
#2	41.50	0.00	0.23
#3	41.59	0.09	0.23
#4	41.58	0.08	0.23
#5	41.49	-0.01	0.23
#6	41.35	-0.15	0.23
#7	41.54	0.04	0.23
#8	41.54	0.04	0.23
#9	41.54	0.04	0.23

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
41.5	41.5	41.5	41.58	41.50	41.59	41.58	41.49	41.35	41.54	41.54	41.54	0.23

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
41.5	0.20	0.02	0.28

Note: * Maximum uncertainty of the each position

The End of Certificate

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ใบรับรองการทวนสอบ “เครื่อง Atomic Absorption Spectrophotometer”
(Calibration Certificate of Atomic Absorption Spectrophotometer)



บริษัท ไทยยูนิค จำกัด THAI UNIQUE CO., LTD.

80-82 ถนนประชาทิพย์ แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200
80-82 Prachathipatani Rd., Bangkokkhunprom, Pranakorn, Bangkok 10200
Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thawati@thaiunique.com, Website : www.thaiunique.com

ATOMIC ABSORPTION SPECTROMETER TEST CERTIFICATE

Certificate No : SV2410/2223
Instrument Type : Atomic Absorption Spectrophotometers
Model : AA240FS
Serial Number : EL08043418
Organization : Test Tech Co., Ltd.
Address : 3032 Soi 63 Rama II Rd. Sarnaeadam Bangkokkhun, Bangkok. 10150
Date : 17 Oct 2024

Hollow cathode lamps used

Element	Lamp number	Comments
Arsenic	56-101003-00	
Copper	56-101014-00	
Potassium	56-101042-00	
Iron	56-101027-00	
Manganese	56-101337-00	

Test description	Specification	Result	Comments
Light throughput (%Gain) or (EHT)			
Cu at 324.8 nm	≤ 64 % or 380 V	32 %	Pass
As at 193.7 nm	≤ 80 % or 540 V	54 %	Pass
K at 766.5 nm*	≤ 84 % or 540 V	64 %	Pass
Fe at 248.3 nm	≤ 80 % or 540 V	63 %	Pass
Mn at 279.5 nm	≤ 64 % or 380 V	53 %	Pass
Photometric noise Cu BGC off			
STDV @ 0 Abs	≤ 0.0005	0.0001	Pass



บริษัท ไทยยูนิค จำกัด THAI UNIQUE CO., LTD.

80-82 ถนนประชาทิพย์ แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200
80-82 Prachathipatani Rd., Bangkokkhunprom, Pranakorn, Bangkok 10200
Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thawati@thaiunique.com, Website : www.thaiunique.com

Wavelength accuracy

Cu at 324.8 nm	323.0 nm – 326.0 nm	324.7 nm	Pass
As 193.7 nm	192.0 nm – 195.0 nm	193.7 nm	Pass
K at 766.5 nm*	765.0 nm – 768.0 nm	766.4 nm	Pass
Fe at 248.3 nm	246.8 nm - 249.8 nm	248.2 nm	Pass
Mn at 279.5 nm	278.0 nm - 281.0 nm	279.5 nm	Pass

High solids nebulizer setting**

Uptake rate	7.2 – 10.6 ml / min	7.8 ml/min	Pass
Max Abs	≥ 0.75 Abs	0.79 Abs	Pass
Precision(%RSD)	≤ 0.5 %	0.4 %	Pass

Zeeman Background Correction Accuracy (%)*

BCA @ Au 242.8 nm	< 3.7 %	***	***
-------------------	---------	-----	-----

Zeeman Magnetic Sensitivity Ratio (%)***

MSR @ Cu 324.7 nm	> 70 %	***	***
-------------------	--------	-----	-----

Characteristic mass and sensitivity ****

Sensitivity	≥ 0.21 Abs	****	****
Precision (%RSD)	≤ 4.0 %	****	****

* for Wideband PMT (Wavelength 190nm – 900nm)

** for Flame system

*** for Zeeman system

**** for Graphite furnace system



CALIBRATED BY :

Signature : 
Engineer : Suriya Nacharoen

Date : 17 / Oct / 2024

APPROVED BY :

Signature : 
Service Manager : Suchai Sangnukiatchai

Date : 17 / Oct / 2024



PinAAcle 900F Preventive Maintenance Report

Company Name: TEST TECH CO., LTD.
Instrument Location: 30,32 RAMA2 SOI 63, RAMA 2 RD.,
SAMMAEDAM, BANGKHUNTEN, BANGKOK 10150
Instrument Serial No.: PFBS21091601
Date: 18-Feb-2025

PinAAcle 900F Preventive Maintenance (PM)

Company Name:	TEST TECH CO., LTD.			
Address (Instrument Location):	30,32 RAMA2 SOI 63, RAMA 2 RD., BANGKHUNTEN, BANGKOK 10150			
Serial Number:	PFBS21091601	PM Number:	1 of 1	
Customer Name (if applicable):	Juralrat Jongprakobkit	Telephone Number:	087-5199005	
Customer Support	Chaiharong	Service Order Number:	WO-03179699	
Engineer Name:		Next PM Due Date:	18-Feb-2026	
Date PM Performed: (DD-MMM-YYY)	18-Feb-2025	(DD-MMM-YYY)		
Standard Labor Hours to Complete PM :			5 hours	

Part Number	Release	Publication Date
09370145 Rev.9	A	January 2018



Scope

The purpose of this PM is to ensure the continued functionality of the PinAAcle 900F by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer.

The customer should save their method before the PM begins.

General Instructions:

The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM.

Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files.

The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer.

Update the PM sticker and instrument logbook as required.

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Component List

Component / Specific Model	Serial #	Configuration Notes
FIAS 400	400521100101	Syngistix version 4.0

Parts Lists

Parts Included with the PM		
Part Number (if applicable)	Description	Quantity
B0501696	Fan Filters	2
N3160156	O-Ring Kits for Sampling Introduction (Stainless Steels Nebulizer)	N/A
N3160157	O-Ring Kits for Sampling Introduction (Plastic Nebulizer)	1
N9301714	Replacement Acetylene Filter Cartridge	1
TH001022	Replacement Air Filter Cartridge	2

Additional Reagents and Standards Required for PM				
Part Number (if applicable)	Description	Quality	Batch/Lot #	Expired Date (MM/YY)
N9300183	1000 mg/L Copper Standard	AR	27-39CUY1	APR-2025

Additional Reagents and Standards Required for PM (Customer Support Solution)				
Part Number (if applicable)	Description	Quantity	Batch/Lot #	Expiration Date (MM/YY)
N/A	DI Water	250 mL	AR	AR
N/A	0.5% HNO ₃	250 mL	AR	AR

Additional Tools Required for PM				
Part Number (if applicable)	Description	Quantity	Serial #	
N1013000	0.2A Neutral density filter	1	MG0-685	
N1013002	1.0A Neutral density filter	1	MG2-680	
O3030997	System 2 EDL Driver	1	839936	
N3050605	AS System 2 EDL	1	06261	
N3050121	Cu Lumina HCL	1	101615-010080	
N3050109	Ba Lumina HCL	1	858ADB	
N3050139	K Lumina HCL	1	011604-41713	
N3050152	Ni Lumina HCL	1	050914-010060	

Procedure Checklist

Use (✓) to check off those steps in the checklist that have been completed.

1. General:

- ☒ Review the instrument performance with the customer and document any recent problems.
- ☒ Inspect the customer log book and make any appropriate PM entries.
- ☒ Perform general inspection of system for cleanliness.

2. PC Instrument Software:

- ☒ Instrument Software user files/databases archived, packed, and/or deleted as needed.

3. Mechanical:

- ☒ Inspect and clean all fans and filters. Replace filters if necessary
- ☒ Inspect all gas lines for leaks and/or wear. Replace if needed.
- ☒ Clean exterior of the instrument.
- ☒ Inspect the burner head, burner chamber, and nebulizer. Clean if needed as stated in the Hardware Guide.
- ☒ Check burner head dimensions with the feeler gauge as stated in the Hardware Guide in the Maintenance chapter section on cleaning the burner head and checking sloth width. Replace if out of specification
- ☒ Check the condition of the end cap, burner head, and nebulizer O-rings. Replace if necessary.
- ☒ Check the drain system for signs of wear. Replace worn or damaged parts.
- ☒ Visually check for proper flame conditions when igniting the Air-C2H2 and N2O-C2H2 flames (if applicable).

4. Electrical:

- ☒ Inspect PC boards. Clean if necessary.
- ☒ Carefully check all internal and external cable connections.
- ☒ Check instrument firmware revisions upgrade to current levels (if necessary)
- ☒ Run Diagnostics Test within the Advanced function of the Spectrometer page. Check the results in the service log folder in the Spectrometer BM Log Viewer.

5. Optics:

- ☒ Inspect and clean the sample compartment windows, if needed.
- ☒ Inspect optics. Clean or replace if necessary,

6. Gasses:

- ☒ Verify that the Gasses supplied to the instrument are within the pressure and purity specifications found in the PinAAcle 900 Series Pre-Installation Checklist SDB.
- ☒ Verify that the acetylene filter and air filter element is dry. Replace if necessary.

7. Flame Interlock Check:

Description: Check to ensure that all safety interlocks are closed.

Parameter	Specification	Test Results	Pass/Fail
Flame Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Drain Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Nebulizer Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
C ₂ H ₂ Pressure Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Air Pressure Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Burner Head Sensor	Choosing Nitrous Oxide as the oxidant should trigger an interlock shuts down	Active	Passed

8. After PM Performance tests:

8.1 Detector Linearity with Barium

Description: Ensures that the detector is linear in the Visible Range.

Parameter	Specification	Certificate Value at 553.6 nm (Abs.)	Test Results	Pass/Fail
1.0 A ND Filter	± 5% from Cert.	0.9684	0.9702	Passed
0.2 A ND Filter	± 5% from Cert.	0.1944	0.1927	Passed

8.2 Baseline Noise at 1.0 Absorbance with Barium

Description: Ensures that a high absorbance will not produce excessive noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0008	Passed

8.3 AA Baseline Noise with Copper

Description: Check baseline noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.001	0.0002	Passed

8.4 D₂ Background Compensation with Copper

Description: Verifies the instruments ability to compensate for Background absorption.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0075	Passed

8.5 AA-BG Baseline Noise with Copper

Description: Ensures that background correction does not produce excessive noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0002	Passed

8.6 AA-BG Baseline Noise with Arsenic

Description: Ensures that background correction does not produce excessive noise at a low wavelength.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0003	Passed

8.7 Flame Sensitivity

Description: Instrument Sensitivity checked against Copper standard.

Standard Copper Sensitivity	Specification	Results (Abs.)	Pass/Fail
5 mg/L Sensitivity SS Neb (if applicable)	> 0.250 Abs.	N/A	Not Applicable
2 mg/L Sensitivity HS Neb (if applicable)	> 0.250 Abs.	0.3463	Passed

10. Review:

- ☒ Review with the customer PM work performed.
- ☒ Review with the customer routine maintenance procedures.
- ☒ Discuss recommended customer supplied materials to have on hand.
- ☒ Attach PM sticker.

Additional Comments

Additional Comments Regarding the PM

PERFORMANCE TEST FOR FIAS

1. Characteristics mass for Mercury.
(500uL of 10ug/L Hg and 5 replicates)
Characteristics mass
%RSD 306.4 pg/0.0044 A
1.02 %

2. Characteristics mass for Arsenic.
(500uL of 10ug/L As and 5 replicates)
Characteristics mass
%RSD 137.8 pg/0.0044 A
1.87 %

2. Characteristics mass for Selenium.
(500uL of 10ug/L Se and 5 replicates)
Characteristics mass
%RSD 78.4 pg/0.0044 A
0.46 %

Wavelength Accuracy Check

As 193.700 nm
Cu 324.750 nm +/- 0.3nm
Ba 553.550 nm +/- 0.3nm
K 766.490 nm +/- 0.3nm

Review

The preventive maintenance checks and if applicable performance tests for PinAAcle 900F have been completed.

This PinAAcle 900F: Passes ☒ Fails ☐ the preventive maintenance.

Review of Preventive Maintenance:

Authorized PerkinElmer Representative:	<i>Chinawong</i>	Date: 18-Feb-2025 (DD-MMM-YYYY)
Authorized Customer Representative:	Jurairat	Date: 18-Feb-2025 (DD-MMM-YYYY)

MAINTENANCE AND IPV TEST CERTIFICATE MODEL
OPTIMA 8000

MAINTENANCE AND IPV TEST CERTIFICATE MODEL
OPTIMA 8000

Customer :	บริษัท เทสท์ เทคโนโลยี	Date Tested:	13-May-2025
Address :	30, 32 ซอยพระรามที่ 2 ซอย 63 ถนนพระรามที่ 2 แขวงสามยุค เขตบางขุนเทียน กรุงเทพมหานคร 10150	Recommendation Recertification	
User Name:	คุณสุวิรัตน์ จงประยอยกิจ	Period	12 Months
Phone:	02-893-4211-17	Recertification Due:	13-May-2026
Fax/ Email:	02-893-4211-22 23	Date Last Certified:	14-May-2024
		Visit Number:	1 of 1
		PerkinElmer Phone:	02-719-6420 ext 3
		PerkinElmer Fax:	02-318-5597

CONFIGURATION TESTED		
MODEL	SERIAL NUMBER	SOFTWARE
OPTIMA 8000 (EQL-180)	078S1411171C	ICP WinLab32 version 5.5
TESTED EQUIPMENT IPV Methods	CALIBRATION NUMBER	EXPIRATION
TEST STANDARD USED Multielement Standard Instrument Cal. STD4	PART NUMBER	EXPIRATION DATE
	N069-1579	DEC 30 2025
	N930-0221	AUG 30 2025
CUSTOMER SUPPLIED 2 % HNO3 10 % HNO3	COMMENTS	CUSTOMER INITIALS

SERIAL NUMBER:	078S1411171C	DATE TESTED:	13-May-2025
1. MECHANICAL CHECKS			
A. Inspect and clean all fans and filters. <input type="checkbox"/> OK			
B. Inspect and replace as necessary, all torch components including the RF coil. <input type="checkbox"/> OK			
C. Inspect all tubing for sign of clacking or leaking. <input type="checkbox"/> OK			
D. Adjust water and gas pressure regulator settings. <input type="checkbox"/> OK			
E. Inspect and leak check pneumatics drawers. <input type="checkbox"/> OK			
F. Clean the exterior of the instrument. <input type="checkbox"/> OK			
2. OPTICAL CHECKS			
A. Inspect and clean all optical components. <input type="checkbox"/> OK			
B. As required, check and replace all purgebifilters. <input type="checkbox"/> OK			
C. Recheck optical alignment. <input type="checkbox"/> OK			
3. COOLING SYSTEM CHECKS			
A. Perform preventive maintenance on chiller. <input type="checkbox"/> OK			
B. Flush out the chiller every six months. <input type="checkbox"/> OK			
4. PERFORMANCE CHECKS			
A. Torch View Alignment <input type="checkbox"/> OK			
B. Wavelength Calibration. <input type="checkbox"/> OK			

MAINTENANCE AND IPV TEST CERTIFICATE MODEL

OPTIMA 8000

SERIAL NUMBER:	078S1411171C	DATE TESTED:	13-May-2025
PARAMETER	SPECIFICATION	FINAL VALUE	
Spectral Resolution : UV			
As 193.696 nm	≤ 0.009	0.00710 nm	
Ni 231.604 nm	≤ 0.011	0.00876 nm	
Ni 341.476 nm	≤ 0.015	0.01336 nm	
Spectral Resolution : VIS			
Ba 455.403 nm	≤ 0.020	0.01689 nm	
Precision			
Zn 206.200 nm	% RSD ≤ 1.0	0.38 %	
Mg 280.271 nm	% RSD ≤ 1.0	0.46 %	
Mg 285.213 nm	% RSD ≤ 1.0	0.78 %	
Ba 455.403 nm	% RSD ≤ 1.0	0.44 %	
Detection Limits : Axial			
Tl 190.801 nm	3(sd) ≤ 10.0 ppb	2.73 ppb	
As 193.696 nm	3(sd) ≤ 10.0 ppb	4.76 ppb	
Se 196.026 nm	3(sd) ≤ 5.0 ppb	4.37 ppb	
Pb 220.353 nm	3(sd) ≤ 3.0 ppb	1.77 ppb	
Detection Limits : Radial			
As 193.696 nm	3(sd) ≤ 60.0 ppb	7.02 ppb	
Zn 213.857 nm	3(sd) ≤ 2.0 ppb	0.28 ppb	
Mn 257.610 nm	3(sd) ≤ 1.0 ppb	0.06 ppb	
La 379.478 nm	3(sd) ≤ 3.0 ppb	0.55 ppb	
Ba 455.403 nm	3(sd) ≤ 0.3 ppb	0.09 ppb	
Ba 483.408 nm	3(sd) ≤ 0.6 ppb	0.07 ppb	
BEC : Axial (IB X 1000)/(S-IB)			
Mn 257.610 nm	≤ 30 ppb	6.48 ppb	
BEC : Radial (IB X 1000)/(S-IB)			
Mn 257.610 nm	≤ 30 ppb	8.14 ppb	

MAINTENANCE AND IPV TEST CERTIFICATE MODEL

OPTIMA 8000

SERIAL NUMBER:	078S1411171C	DATE TESTED:	13-May-2025
Remarks :	Commissioning follow as commissioning performance sheets.		
This is to certify that the above tests have been performed and the configuration tested			
<input checked="" type="checkbox"/> meets			
<input type="checkbox"/> does not meet			
the PerkinElmer Specifications listed on this certificate.			
This certificate does not modify PerkinElmer's standard terms and condition of sale, including warranty terms.			
Service Department PerkinElmer Ltd.			
Customer Service Engineer:	Chainarong Thanin	Service Engineer	



QUALITY CALIBRATION CO., LTD.
235 Petchkasem 63/2 Road, Laksong, Bangkok 10160
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584
www.qcalibration.com



NSC-TSI-TS11003
CALIBRATION 0049

CERTIFICATE No : 24T8052
REFERENCE No : 74209-1


PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT	:	WATER BATH
MANUFACTURER	:	MEMMERT
MODEL	:	WNE 45
SERIAL No	:	L720.0266
ID No	:	EQL-241
CONDITION AS RECEIVED	:	USED ITEM
SUBMITTED BY	:	TEST TECH CO., LTD. 30,32 RAMA II SOI 63, RAMA II RD., SAMAEDAM, BANGKHUNTHIAN, BANGKOK 10150

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ใบรับรองการทดสอบ "เครื่องอ่างน้ำ"
(Calibration Certificate of Water bath)

CALIBRATED BY	:	CHAICHARN CH.
CALIBRATION DATE	:	13-Aug-24
APPROVED BY	:	 PONGSAK J.
ISSUED DATE	:	19-Aug-24
RECEIVED DATE	:	13-Aug-24

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF
QUALITY CALIBRATION CO., LTD.



CERTIFICATE No : 25T6062
REFERENCE No : 77516-2

Certificate of Calibration

EQUIPMENT : WATER BATH
MANUFACTURER : MEMMERT
MODEL : WPE 45
SERIAL No : L711.0024
ID No : EQL-147
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : TEST TECH CO., LTD.
30.32 RAMA II SOI 63, RAMA II RD., SAMAEDAM,
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY : ATSAWIN Y.
CALIBRATION DATE : 23-Jun-25
APPROVED BY :
PONGSAK J.
ISSUED DATE : 24-Jun-25
RECEIVED DATE : 23-Jun-25



CERTIFICATE No : 25T6062

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : WATER BATH
MANUFACTURER : MEMMERT
ID NUMBER : EQL-147
RECEIVED DATE : 23-Jun-25
AMBIENT TEMPERATURE : 27 °C ± 1 °C
MODEL : WPE 45
SERIAL NUMBER : L711.0024
CALIBRATION DATE : 23-Jun-25
RELATIVE HUMIDITY : 51 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

- THIS INSTRUMENT WAS CALIBRATED ACCORDING TO ASTM E715-80 (REAPPROVED 2001) BY COMPARISON WITH CALIBRATED RTD. THE PROBES WERE PLACED ON FIVE POINTS AND LOCATED ONE PROBE IN EACH OF THE FOUR CORNERS OF THE BATH AND PLACED THE FIFTH RTD WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE WATER VOLUME (REFERENCE LOCATION) UNDER NO LOAD CONDITION.
- REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT

1) DATA LOGGER WITH RTD

MODEL : 2625A

SERIAL No : 6603614

CERTIFICATE No : 25T5341

DUE DATE : 04-Jun-26

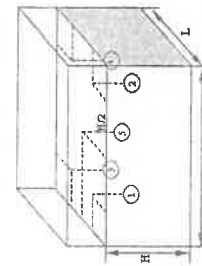
3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.

4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO., LTD.

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



PROBE INSTALLATION
POSITION IN THE BATH

GENERAL INFORMATION

Overall Variation of Ambient Temperature around the Bath (°C) : 1.1

Overall Variation of Line Voltage (V) : 4

Instrument Condition : Normal

Bath Inner Size (W*L*H) : 59*35*22 cm

BATH PERFORMANCE

Calibration Point (°C)	Average All Position (°C)	Temperature Stability (±°C)	Radius Uniformity (°C)	Axial Uniformity (°C)	Overall Variation (°C)
41.5	41.50	0.05	0.04	0.07	0.12
44.5	44.48	0.03	0.04	0.10	0.08

TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Measured Temperature (°C) at Spread Locations					Uncertainty (± °C)
	#1	#2	#3	#4	Ref. 5	
41.5	41.51	41.47	41.52	41.48	41.50	0.14
44.5	44.48	44.46	44.50	44.47	44.49	0.14

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE BATH.

NOTE 2 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

F-G010 REV : 03



CERTIFICATE No : 25T0969
REFERENCE No : 76012-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : WATER BATH
MANUFACTURER : MEMMERT
MODEL : WNE 22
SERIAL No : L516.1016
ID No : EQL-198
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : TEST TECH CO., LTD.
30,32 RAMA II RD., SAMAEADAM,
BANGKHUNTHAN, BANGKOK 10150

CALIBRATED BY : CHAICHARN CH.
CALIBRATION DATE : 04-Feb-25

APPROVED BY :
PONGSAK J.
ISSUED DATE : 12-Feb-25
RECEIVED DATE : 04-Feb-25



THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF
QUALITY CALIBRATION CO., LTD.

F-G010 REV : 03



CERTIFICATE No : 25T0969

PAGE : 2 OF 2

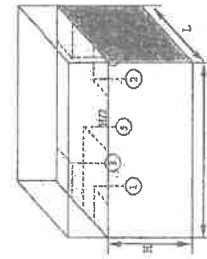
Calibration Report

EQUIPMENT : WATER BATH
MANUFACTURER : MEMMERT
MODEL : WNE 22
ID NUMBER : EQL-198
RECEIVED DATE : 04-Feb-25
SERIAL NUMBER : L516.1016
CALIBRATION DATE : 04-Feb-25
AMBIENT TEMPERATURE : 24 °C ± 1 °C
RELATIVE HUMIDITY : 50 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO ASTM E715-80 (REAPPROVED 2001) BY COMPARISON WITH CALIBRATED RTD. THE PROBES WERE PLACED ON FIVE POINTS AND LOCATED ONE PROBE IN EACH OF THE FOUR CORNERS OF THE BATH AND PLACED THE FIFTH RTD WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE WATER VOLUME (REFERENCE LOCATION) UNDER NO LOAD CONDITION.
2. REFERENCE STANDARD INSTRUMENTS :-
 - 1) DATA LOGGER WITH RTD 2625A
 - 2) REFERENCE TEMPERATURE POINTS
3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO., LTD.

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



PROBE INSTALLATION
POSITION IN THE BATH

GENERAL INFORMATION

Overall Variation of Ambient Temperature around the Bath (°C) : 2.2
Overall Variation of Line Voltage (V) : 9
Instrument Condition : Normal
Bath Inner Size (W*L*H) : 35*29*22 cm

BATH PERFORMANCE

Calibration Point (°C)	Average All Position (°C)	Temperature Stability (±°C)	Radius Uniformity (°C)	Axial Uniformity (°C)	Overall Variation (°C)
41.5	41.58	0.02	0.02	0.00	0.05
45.0	45.04	0.02	0.01	0.02	0.04
50.0	50.08	0.03	0.01	0.00	0.07

TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations					Uncertainty (± °C)
		#1	#2	#3	#4	Ref. 5	
41.5	41.5	41.59	41.57	41.59	41.59	41.57	0.14
45.0	45.0	45.04	45.04	45.04	45.05	45.04	0.14
50.0	50.0	50.07	50.08	50.08	50.08	50.07	0.14

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE BATH.

NOTE 2 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

F-G010 REV : 03



Bara Scientific Co., Ltd.
988 U Chu Liang Building Floor 7 Rama4 Road
Silom Bangkok Bangkok Thailand 10500
Tel : 02-6324300 Fax : 02-6375495-7
www.barascientific.com



Certificate of Calibration

Number of Page(s) 1 of 3

Certificate No.	BSCC-UV-156/25
Equipment	UV/Vis Spectrophotometer
Model	UV-1900i
Manufacturer	Shimadzu
Serial No.	A12535780311 ML
ID No.	EQL-233
Date of receipt	22 April 2025
Date of calibration	22 April 2025
Date of issue	25 April 2025
Customer name	Test Tech Co., Ltd.
Address	30/32 Rama II Soi 63, Rama II Road, Samae Dam, Bang Khun Thian, Bangkok 10150.
Temperature	(25.5 - 26.6) °C (On site)
Humidity	(43.3 - 49.7) %RH (On site)
Equipment condition	Good Operation
Calibration Location	Water Room
Calibration Procedure	In-house method WI-UV-702-01 based on ASTM E275-01
Traceability	Wavelength Accuracy is traceable to certificate No. 126732 and 126733 Photometric Accuracy is traceable to certificate No. 126735 and 111398 Stray Light is traceable to certificate No. 126749 The above certificate are traceable to SI unit through Stama Scientific Ltd. (UKAS accredited calibration laboratory NO. 0659)
Calibrated by	Mr. Wanchana Janboey

Approved by

Mr. Pannaphong Phannmekakul
Technical Manager

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.
Advertising the report / Certificate and publicity of the results are prohibited and also shall not be reproduced
except in full, without written approval of the Bara Scientific Co., Ltd.

ใบรับรองการทวนสอบ “เครื่อง Spectrophotometer”
(Calibration Certificate of Spectrophotometer)

๗14



Bara Scientific Co., Ltd.
988 U Chu Liang Building Floor7 Rama4 Road
Siam Bangkok Bangkok Thailand 10500
Tel : 02-6324300 Fax : 02-6375496-7
www.barascientific.com



Certificate of Calibration

Certificate No.

BSCC-UV-156125

Number of Page(s)

2 of 3

Calibration Results:

1.Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty (nm)
279.44	279.20	-0.24	0.18
418.53	418.51	-0.02	0.18
536.52	536.54	0.02	0.18
684.50	684.64	0.14	0.18
879.41	879.45	0.04	0.18

2.Photometric Accuracy (UV)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
235	CNR	CNR	CNR	CNR
257	0.0000	0.0000	0.0000	0.0075
313	0.8540	0.8505	-0.0035	0.0075
350	0.0000	-0.0001	-0.0001	0.0075
	0.6332	0.6320	-0.0012	0.0075

*CNR = Customer not request

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.
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FM-UV-708-02 Rev.01 (23/01/63)



Bara Scientific Co., Ltd.
988 U Chu Liang Building Floor7 Rama4 Road
Siam Bangkok Bangkok Thailand 10500
Tel : 02-6324300 Fax : 02-6375496-7
www.barascientific.com



Certificate of Calibration

Certificate No.

BSCC-UV-156125

Number of Page(s)

3 of 3

Calibration Results:

3.Photometric Accuracy (Visible)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
420.0	0.0000	0.0000	0.0000	0.0042
	0.5761	0.5788	0.0027	0.0042
	0.7119	0.7131	0.0012	0.0042
	1.0189	1.0207	0.0018	0.0042
440.0	0.0000	0.0000	0.0000	0.0042
	0.5610	0.5634	0.0024	0.0042
	0.7001	0.7010	0.0009	0.0042
	1.0026	1.0039	0.0013	0.0042
465.0	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
546.1	0.0000	0.0000	0.0000	0.0042
	0.5249	0.5258	0.0009	0.0042
	0.6975	0.6968	-0.0007	0.0042
	1.0009	1.0002	-0.0007	0.0042
590.0	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
635.0	0.0000	0.0000	0.0000	0.0042
	0.5666	0.5670	0.0004	0.0042
	0.7620	0.7609	-0.0011	0.0042
	1.0992	1.0966	-0.0016	0.0042

*CNR = Customer not request

4.Stray Light*

Standard cut-off wavelength (nm)	Wavelength (nm)	Unit Under Calibration(UUC) Transmission (%T)	Absorbance (A)
201.13±0.11nm	200.85	0.9706	2.0130

The Stray light transmission reference is less than 1.0%T and Stray light absorbance reference is greater than 2.00A
*Stray Light not NSC-ONSC Accredited.

The measurement uncertainty is base on a standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%.

End of Certificate

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.
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FM-UV-708-02 Rev.01 (23/01/63)



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Certificate of Calibration

Certificate No. BSCC-UV-166/24

Number of Page(s) 1 of 3

Calibration Results:

1. Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty (±nm)
279.44	279.18	-0.26	0.18
418.53	418.46	-0.07	0.18
536.52	536.54	0.02	0.18
684.50	684.63	0.13	0.18
879.41	879.43	0.02	0.18

Temperature Humidity

(24.9 - 25.4) °C (On site)
(49.4 - 51.1) %RH (On site)

Equipment condition

Good Operation

Calibration Location

Water Room

Calibration Procedure

In-house method WI-UV-702-01 based on ASTM E275-01

Traceability

Wavelength Accuracy is traceable to certificate No. 106372 and 106371
Photometric Accuracy is traceable to certificate No. 106364 and 111398
Stray Light is traceable to certificate No. 106377
The above certificate are traceable to SI unit through Siama Scientific Ltd.
(UKAS accredited calibration laboratory NO. 0659)

Calibrated by

Mr. Wanchana Janloey

Approved by

Mr. Sonthi Temboonsakdi

Service Manager

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.
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Certificate of Calibration

Certificate No. BSCC-UV-166/24

Number of Page(s) 2 of 3

Calibration Results:

2. Photometric Accuracy (UV)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
235	CNR	CNR	CNR	CNR
257	0.0000	0.0000	0.0000	0.0075
313	0.8354	0.8333	-0.0021	0.0075
350	CNR	CNR	CNR	CNR
	0.0000	-0.0001	-0.0001	0.0075
	0.6199	0.6190	-0.0009	0.0075

*CNR = Customer not request

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Certificate of Calibration

Certificate No. BSCC-UV-166/24
Calibration Results:
3. Photometric Accuracy (Visible)
Number of Page(s) 3 of 3

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
420.0	0.0000	0.0000	0.0000	0.0042
	0.5761	0.5781	0.0030	0.0042
	0.7119	0.7132	0.0013	0.0042
	1.0189	1.0221	0.0032	0.0042
440.0	0.0000	0.0000	0.0000	0.0042
	0.5610	0.5636	0.0026	0.0042
	0.7001	0.7012	0.0011	0.0042
	1.0026	1.0052	0.0026	0.0042
465.0	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
546.1	0.0000	0.0000	0.0000	0.0042
	0.5249	0.5260	0.0011	0.0042
	0.6975	0.6971	-0.0004	0.0042
	1.0009	1.0012	0.0003	0.0042
590.0	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
635.0	0.0000	0.0000	0.0000	0.0042
	0.5666	0.5673	0.0007	0.0042
	0.7620	0.7611	-0.0009	0.0042
	1.0982	1.0976	-0.0006	0.0042

*CNR = Customer not request

4. Stray Light*

Standard cut-off wavelength (nm)	Unit Under Calibration(UUC)	
	Wavelength (nm)	Absorbance (A)
200.85±0.11nm	200.76	2.0091

The Stray light transmission reference is less than 1.0%T and Stray light absorbance reference is greater than 2.00A
*Stray Light not NSC-ONSC Accredited.

The measurement uncertainty is base on a standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%.
End of Certificate

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.
Advertising the report / Certificate and publicity of the results are prohibited and also shall not be reproduced except in full, without written approval of the Bara Scientific Co., Ltd.



Certificate of Calibration

Equipment: SPECTROPHOTOMETER
Model: DR6000
Serial No. (or ID.): 1693421 (EQL-197)
Manufacturer: HACH
Condition: In Condition

Certificate No.: C06240153
Issued Date: 18 April 2024
Job No.: WO-00024683
Page: 1 of 3

Customer: TEST TECH CO., LTD.
30,32 Rama II Soi 63, Rama II Rd.,
Samaedam, Bangkokthien Bangkok 10150 Thailand

Environment Condition: Temperature 29.8 °C ± 0.1 °C
Humidity 45.7 %RH ± 6.9 %RH

Calibration Place: TEST TECH CO., LTD. (แผนกวัด)
30,32 Rama II Soi 63, Rama II Rd.,
Samaedam, Bangkokthien Bangkok 10150 Thailand

Calibration By: Miss.Kaewkan Suradech
Calibration Date: 18 April 2024
The Method used: In house method, CAL-WI-24, base on ASTM E 275-08 and ASTM E 387-04
Traceability: This certificate is traceable to the CRM maintained by National Institute of Standards and Technology (NIST) through Siama Scientific Limited.

The standard for Wavelength Certificate No. 118106 and 118118
The standard for Photometric Certificate No. 118123 and 118113
The standard for Stray light Certificate No. 118110 and 118112
The standard for Spectral resolution Certificate No. 118104

(Miss Kaewkan Suradech)
Person in charge

(Mr. Nitinun Sihawan)
Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

บริษัท ดีเคเอส อีซี จำกัด
2533 สุขุมวิท 70 ถนนสุขุมวิท กรุงเทพมหานคร 10260
Phone : +66 2639 7000 Email : info.calibration@dksh.com Website: www.dksh.com/certificate-thailand

Delivering Growth - in Asia and Beyond.



Certificate No.: C08240153

Page 2 of 3

Calibration Results:
Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of Std at 2 nm and UUC at 2 nm

Standard Wavelength	Unit Under Calibration	Correction	Uncertainty
418.61	418.5	0.11	0.13
536.66	536.7	-0.04	0.13
637.98	637.9	0.08	0.13
748.48	748.6	-0.12	0.13
807.03	807.4	-0.37	0.13

Photometric Accuracy (Absorbance)			
Wavelength	Standard absorbance	Unit Under Calibration	Uncertainty
420 nm	0.0000	0.000	0.0045
	0.5772	0.576	0.0045
	0.7198	0.719	0.0045
	1.0394	1.039	0.0045
440 nm	0.0000	0.000	0.0045
	0.5608	0.560	0.0045
	0.7062	0.705	0.0045
	1.0189	1.018	0.0045
465 nm	0.0000	0.000	0.0045
	0.5214	0.521	0.0045
	0.8652	0.864	0.0045
	0.9577	0.957	0.0045
546.1 nm	0.0000	0.000	0.0045
	0.5192	0.518	0.0045
	0.6907	0.689	0.0045
	0.9949	0.993	0.0045
590 nm	0.0000	0.000	0.0045
	0.5530	0.551	0.0045
	0.7555	0.753	0.0045
	1.0761	1.073	0.0045
635 nm	0.0000	0.000	0.0045
	0.5604	0.559	0.0045
	0.7418	0.739	0.0045
	1.0467	1.044	0.0045

บริษัท ดีเคเอส อีซี จำกัด
DKSH Technology Limited
2533 หมู่ที่ 9 ตำบลบางนา, เขตบางนา กรุงเทพมหานคร 10260
Phone: +66 2357 7100 Email: info.asia@dksh.com Website: www.dksh.com/india-thailand

Delivering Growth - In Asia and Beyond.

CAL-FM-C06-16; 11 Mar 2024



BECTHAI BANGKOK EQUIPMENT & CHEMICAL CO., LTD.
CALIBRATION LABORATORY
99/9 Moo 2, Mueang Sawai, Phra Pradaeng District, Nakhon Pathom 73170, Thailand. Tel: +66 3424 5399 Fax: +66 3424 5350
E-mail: bdd@becthai.com Website: www.becthai.com

Certificate No.: CAL-24-196

Page: 1 of 3

CERTIFICATE OF CALIBRATION

Equipment	: Spectrophotometer
Manufacturer	: Thermo Scientific
Model	: Genesys 30
Serial No.	: 9A1Z099145
ID No.	: EQL-251
Customer	: TEST TECH CO., LTD.
	: 30,32 Rama II Soi 63, Rama II Rd.,
	: Samaedam, Bangkokhuthian,
	: Bangkok 10150
Location	: Wastewater Room 3
Date of Receipt	: 10 June 2024
Date of Calibration	: 10 June 2024
Date of Issue	: 13 June 2024
Ambient Temperature	: (25±10) °C
Relative Humidity	: (60±20) %
Condition As-Received	: Used Item

Calibrated by
Mr. Palawat Luchak

Calibration Engineer

Approved by

(Ms. Jintana Sangthajareonlap)
Calibration Manager

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

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

Indicated values are valid for the state of the Spectrophotometer at the time of calibration only.

ISSUE: 6 REV:5

FM-CAL-33/2

20/02/24

Certificate No. : CAL-24-196

Page : 2 of 3

CALIBRATION REPORT

Conditions of this result of calibration

1. Reference Standard Material :

Material	Model	Serial No.	Cert.No.	Due date
Holmium Glass Filter	RM-HG	12705	117342	13 December 2025
Dysmium Glass Filter	RM-DG	13498	117323	13 December 2025
Neutral Density Filter	RM-1N2NSN	8323	117341	13 December 2025

2. Traceability : This certification is traceable to the International System of Unit maintained at;

The Sigma Scientific Ltd. Accredited Calibration Laboratory No. 0659.

3. Method of calibration :

The calibration procedure was carried out according to ASTM E275-08 (2022) and ASTM E825-09 (2014).

4. Result of calibration :

(✓) without adjustment () after adjustment

5. Equipment Specifications:

Spectral Bandwidth :	5	nm
Data Interval :	1	nm
Scan Speed :	1200	nm/min

ISSUE: 6 REV/5

FM-CAL-33/2

20/02/24

Certificate No. : CAL-24-196

Page : 3 of 3

CALIBRATION REPORT

Wavelength Calibration

Certified Values of Reference Material	Nominal Value (nm)	UUC*Reading (nm)	Error (nm)	Uncertainty of Measurement (\pm nm)	k Factor
361.40	361.40	361	-0.40	0.59	2.00
537.00	537.00	537	0.00	0.59	2.00
879.68	879.68	879	-0.68	0.59	2.00

Spectrometric Calibration for Visible

Wavelength (nm)	Certified Values of Reference Material (A)	UUC* Reading (A)	Error (A)	Uncertainty of Measurement (\pm A)	k Factor
420.0	Zero	0.000	0.0000	0.0028	2.00
	0.5703	0.569	-0.0013	0.0045	2.00
	0.7336	0.733	-0.0006	0.0045	2.00
	1.0709	1.070	-0.0009	0.0045	2.00
440.0	Zero	0.000	0.0000	0.0028	2.00
	0.5592	0.559	-0.0002	0.0045	2.00
	0.716	0.718	0.0020	0.0045	2.00
	1.0454	1.045	-0.0004	0.0045	2.00
465.0	Zero	0.000	0.0000	0.0028	2.00
	0.5094	0.511	0.0016	0.0045	2.00
	0.6601	0.663	0.0029	0.0045	2.00
	0.963	0.966	0.0030	0.0045	2.00
546.1 (546.0)	Zero	0.000	0.0000	0.0028	2.00
	0.5206	0.522	0.0014	0.0045	2.00
	0.6677	0.670	0.0023	0.0045	2.00
	0.9763	0.977	0.0007	0.0045	2.00
590.0	Zero	0.000	0.0000	0.0028	2.00
	0.5522	0.553	0.0008	0.0045	2.00
	0.6966	0.698	0.0014	0.0045	2.00
	1.0201	1.021	0.0009	0.0045	2.00
635.0	Zero	0.000	0.0000	0.0028	2.00
	0.5377	0.540	0.0023	0.0045	2.00
	0.6649	0.667	0.0021	0.0045	2.00
	0.9736	0.974	0.0004	0.0045	2.00

Remark : Each individual filter is measured against the empty filter holder (blank) used to zero the Spectrophotometer.

note:

UC* : Unit Under Calibration

- End of Report -
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