

## ภาคผนวกที่ 5

เอกสารสอบเทียบความถูกต้องของเครื่องมือ

ตารางสรุปรายการเอกสารการสอบเทียบเครื่องมือตรวจวิเคราะห์คุณภาพน้ำ

รายการตรวจวิเคราะห์	เครื่องมือตรวจวิเคราะห์
- Temperature	- Thermometer
- Turbidity	- Turbid Meter
- pH	- pH Meter
- Conductivity	- Conductivity Meter
- Dissolved Oxygen (DO)	- DO Meter
- BOD <sub>5</sub>	- DO Meter
- Total Suspended Solids (TSS)	- Electronic Balance
- Total Dissolved Solids (TDS)	- Electronic Balance
- Grease and Oil	- Electronic Balance
- Total Phosphorus	- Spectrophotometer
- Total Nitrogen	- Spectrophotometer
- Lead	- Spectrophotometer
- Mercury	- Spectrophotometer
- Cadmium	- Spectrophotometer



**QUALITY CALIBRATION CO.,LTD.**

235 Petchkasem 63/2 Road, Laksong, Bangkai, Bangkok 10160

Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

[www.qcalibration.com](http://www.qcalibration.com)CERTIFICATE No : 21T3943  
REFERENCE No : 60857-1

PAGE : 1 OF 2

**Certificate of Calibration**

**EQUIPMENT** : DIGITAL THERMOMETER WITH PROBE  
**MANUFACTURER** : HANNA  
**MODEL** : HI 3512  
**SERIAL No** : TH118035  
**ID No** : PH 04/56  
**PROBE TYPE** : THERMOCOUPLE  
**CONDITION AS RECEIVED** : USED ITEM  
**SUBMITTED BY** : S.P.S. CONSULTING SERVICE CO., LTD.  
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,  
JOMPOL, CHATUCHAK, BANGKOK 10900

**CALIBRATED BY** : CHARUKIT L.  
**CALIBRATION DATE** : 20-Apr-21  
**APPROVED BY** : [REDACTED]  
**ISSUED DATE** : 20-Apr-21  
**RECEIVED DATE** : 09-Apr-21

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

F-G010 REV 02

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CERTIFICATE No : 21T3943

PAGE : 2 OF 2

**Calibration Report**

**EQUIPMENT** : DIGITAL THERMOMETER WITH PROBE  
**MANUFACTURER** : HANNA  
**MODEL** : HI 3512  
**ID No** : PH 04/56  
**RECEIVED DATE** : 09-Apr-21  
**AMBIENT TEMPERATURE** : 23 °C ± 3 °C  
**SERIAL NUMBER** : TH118035  
**PROBE TYPE** : THERMOCOUPLE  
**CALIBRATION DATE** : 20-Apr-21  
**RELATIVE HUMIDITY** : 50 %RH ± 20 %RH

**CONDITION OF THIS RESULTS OF CALIBRATION**

- THIS INSTRUMENT WAS CALIBRATED BASED ON WI-TQ-017 BY COMPARISON WITH STANDARD PLATINUM RESISTANCE THERMOMETER (SPRT) INTO LIQUID BATH TEMPERATURE CONTROLLER. THE TEMPERATURE SCALE USED WAS BASED ON ITS-90.
- REFERENCE STANDARD INSTRUMENTS :-

<u>INSTRUMENT</u>	<u>MODEL</u>	<u>SERIAL No</u>	<u>CERTIFICATE No</u>	<u>DUE DATE</u>
1) STANDARD THERMOMETER	1529	A22167	20T12169	10-Dec-21
2) SPRT PROBE	5612	587312	20T12169	10-Dec-21
3) MICRO-BATH	7103	A14258	20T12167	08-Dec-21
- THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.
- THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
- THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-  
- NATIONAL INSTITUTE OF METROLOGY (THAILAND).

**RESULT OF CALIBRATION : WITHOUT ADJUSTMENT**

STANDARD READING (°C)	UUC* READING (°C)	IMMERSION DEPTH (mm)	CORRECTION (°C)	UNCERTAINTY OF MEASUREMENT (±°C)
25.0035	24.8	80	0.2035	0.21

USER SHOULD EVALUATE THE UUC ERROR IF IT IS USED OUTSIDE THE AMBIENT TEMPERATURE RANGE DURING CALIBRATION.

UUC\* : UNIT UNDER CALIBRATION

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 02





TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)

CALIBRATION AND TESTING EQUIPMENT SERVICES

534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250

TEL. 0-2717-3000-24 FAX. 0-2719-9484

Cert.No.: 21CH645

Page.: 1 of 2

## Certificate of Calibration

**Equipment :** Turbidity Meter  
**Manufacturer :** Eutech  
**Model :** CyberScan WL TB1000  
**Serial No. :** 201802206  
**ID. No. :** TB 03/61  
**Condition As-Received:** Used Item  
**Received Date :** 17 May 2021  
**Calibration Date :** 19 May 2021  
**Reference :** 2105-0511WN-1  
**Submitted by :** S.P.S. Consulting Service Co.,Ltd.  
7 Phaholyothin 24, Phaholyothin Road, Jompol,  
Chatuchak, Bangkok 10900  
**Ambient Temperature :** (25 ± 2.5) °C  
**Relative Humidity :** (50 ± 20) %  
**Calibration Procedure :** In - house method : CP-CH11  
based on direct measurement by  
using Formazin standard solution

**Calibrated by :**



**Approved by :**

Approved Signatory

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

**Issue Date :** 21 May 2021

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

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



Cert.No. : 21CH645

Page. : 2 of 2

### Condition of this calibration result

1. Reference Standard Instruments :

This certification is traceable to the International System of unit through the reference standards laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan).

Instruments	Serial No.	ID No.	Certificate No.	Due date
1) Thermo-Hygrograph	1103328	130EC010	20H1607	2 July 2021
2) Electronic Balance	1126143764	140RC004	20MM595	27 Sep 2021

2. Standard Material : The Formazin suspension has been prepared gravimetric from

Material	Manufacturer	Lot No.	Assay
1) Hexamethylenetetramine	HIMEDIA	0000343342	99.5%
2) Hydrazinium Sulfate	HIMEDIA	0000332928	99.2%

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

### Calibration result

Performing three - Formazin suspension standard curve by using 0,10,1000 NTU  
Turbidity Meter Serial Number : 201802206

Standard Formazine suspension ( NTU )	UUC* Reading ( NTU )	Uncertainty of Measurement ( ± NTU )	Coverage Factor k
20	19.3	0.38	2.00
40	39.8	0.40	2.00
100	98.0	0.71	2.00
400	387	1.5	2.13

### Remark

- UUC\* = Unit Under Calibration  
- NTU = Nephelometric Turbidity Units

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-

A 0006902

a 1055630



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CERTIFICATE No : 21E3943

REFERENCE No : 60857-1

PAGE : 1 OF 3

**Certificate of Calibration**

**EQUIPMENT** : pH METER

**MANUFACTURER** : HANNA

**MODEL** : HI 3512

**SERIAL No** : TH118035

**ID No** : PH 04/56

**CONDITION AS RECEIVED** : USED ITEM

**SUBMITTED BY** : S.P.S. CONSULTING SERVICE CO., LTD.  
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,  
JOMPOL, CHATUCHAK, BANGKOK 10900

**CALIBRATED BY** : ATSAWIN Y.

**CALIBRATION DATE** : 20-Apr-21

**APPROVED BY** : 

**ISSUED DATE** : 20-Apr-21

**RECEIVED DATE** : 09-Apr-21

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**QUALITY CALIBRATION CO.,LTD.**

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CERTIFICATE No : 21E3943

PAGE : 2 OF 3

**Calibration Report**

**EQUIPMENT** : pH METER

**MANUFACTURER** : HANNA

**ID No** : PH 04/56

**RECEIVED DATE** : 09-Apr-21

**AMBIENT TEMPERATURE** : 20 ° C ± 1 ° C

**MODEL** : HI 3512

**SERIAL NUMBER** : TH118035

**CALIBRATION DATE** : 20-Apr-21

**RELATIVE HUMIDITY** : 50 % RH ± 10% RH

**CONDITION OF THIS RESULTS OF CALIBRATION**

- THIS INSTRUMENT WAS CALIBRATED BY DIRECT MEASUREMENT METHOD BASED ON WI-TQ-062 AND WI-TQ-063. THE DISPLAY UNIT WAS TESTED BY GENERATING STANDARD VOLTAGE TO THE UNIT AND READ THE VALUE COMPARED WITH CALCULATED VALUE. THE DISPLAY AND ELECTRODE WAS CALIBRATED BY USING STANDARD pH BUFFER
- REFERENCE STANDARD INSTRUMENTS :-

<u>INSTRUMENT</u>	<u>MODEL</u>	<u>SERIAL No</u>	<u>CERTIFICATE No</u> <u>/ LOT No</u>	<u>DUE DATE</u>
1) pH STANDARD SOLUTION	00651-36	CC639097	4956-10686748	05-Sep-21
2) pH STANDARD SOLUTION	00651-38	CC646738	4957-10828986	25-Oct-21
3) pH STANDARD SOLUTION	00651-40	CC635214	4958-10640234	13-Aug-21
4) PROCESS CALIBRATOR	744	7514008	20E1318	10-May-21
5) BATH	260014	1247 48074	20T9392	10-Sep-21
6) THERMOMETER WITH PROBE	421504	55000379	20T9616	10-Sep-21

- THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.
- THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
- THIS CERTIFICATE IS TRACEABLE TO SI UNIT MAINTAINED AT :-
  - NATIONAL INSTITUTE OF STANDARD AND TECHNOLOGY, USA.
  - NATIONAL INSTITUTE OF METROLOGY (THAILAND)

**RESULT OF CALIBRATION : ADJUSTMENT****1. DISPLAY UNIT ONLY**

SLOPE FACTOR k = 2.303 RT/F = 59 mV/pH

mV APPLIED	UUC READING (mV)	CORRECTION (mV)	UUC READING (pH)	UNCERTAINTY OF MEASUREMENT (± mV)	COVERAGE FACTOR k
414.11	414.8	-0.69	-0.43	0.14	2.0
354.95	355.6	-0.65	0.62	0.14	2.0
295.80	296.4	-0.60	1.68	0.14	2.0
236.64	237.2	-0.56	2.73	0.14	2.0
177.48	177.9	-0.42	3.79	0.14	2.0
118.32	118.8	-0.48	4.84	0.14	2.0
59.16	59.6	-0.44	5.89	0.14	2.0
0.00	0.4	-0.40	6.95	0.14	2.0
-59.16	-58.8	-0.36	7.99	0.14	2.0
-118.32	-117.9	-0.42	9.03	0.14	2.0
-177.48	-177.1	-0.38	10.07	0.14	2.0
-236.64	-236.3	-0.34	11.08	0.14	2.0
-295.80	-295.5	-0.30	12.09	0.14	2.0
-354.95	-354.7	-0.25	13.10	0.14	2.0
-414.11	-413.9	-0.21	14.11	0.14	2.0

END OF CALIBRATION REPORT PAGE 2 OF 3



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CERTIFICATE No : 21E3943

PAGE : 3 OF 3

**Calibration Report****RESULT OF CALIBRATION (CONTINUE) :****2. DISPLAY UNIT WITH pH ELECTRODE S/N: 061416CM**

STANDARD pH BUFFER SOLUTION (pH)	UUC READING (pH)	CORRECTION (pH)	VALUE BEFORE ADJUSTMENT	UNCERTAINTY OF MEASUREMENT (± pH)	COVERAGE FACTOR k
4.007	4.008	-0.001	4.018	0.012	2.0
6.992	7.001	-0.009	6.888	0.012	2.0
10.016	10.011	0.005	10.027	0.014	2.0

**3. PERCENT SLOPE 90%**

UUC : UNIT UNDER CALIBRATION

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

END OF CALIBRATION REPORT

**QUALITY CALIBRATION CO.,LTD.**

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CERTIFICATE No : 21E3943

REFERENCE No : 60857-1

PAGE : 1 OF 2

**Certificate of Calibration**

**EQUIPMENT** : CONDUCTIVITY METER  
**MANUFACTURER** : HANNA  
**MODEL** : HI 3512  
**SERIAL No** : TH118035  
**ID No** : PH 04/56  
**CONDITION AS RECEIVED** : USED ITEM  
**SUBMITTED BY** : S.P.S. CONSULTING SERVICE CO., LTD.  
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,  
JOMPOL, CHATUCHAK, BANGKOK 10900

**CALIBRATED BY** : ATSAWIN Y.**CALIBRATION DATE** : 20-Apr-21**APPROVED BY** : **ISSUED DATE** : 20-Apr-21**RECEIVED DATE** : 09-Apr-21

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## QUALITY CALIBRATION CO.,LTD.

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CERTIFICATE No : 21E3943

PAGE : 2 OF 2

### Calibration Report

EQUIPMENT : CONDUCTIVITY METER  
MANUFACTURER : HANNA  
SERIAL NUMBER : TH118035  
RECEIVED DATE : 09-Apr-21  
AMBIENT TEMPERATURE : 20 °C ± 1 °C  
MODEL : HI 3512  
ID No : PH 04/56  
CALIBRATION DATE : 20-Apr-21  
RELATIVE HUMIDITY : 50 % RH ± 15% RH

#### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY DIRECT MEASUREMENT METHOD. THE DISPLAY AND ELECTRODE WAS CALIBRATED BY USING STANDARD CONDUCTIVITY BUFFER SOLUTION IN CONTROLLED TEMPERATURE BATH.

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	LOT No	CERTIFICATE No	DUE DATE
1) REFERENCE MATERIAL	00652-26	CC20562	4066-11793752	09-Dec-21
2) REFERENCE MATERIAL	00652-30	CC20458	4173-11692041	04-Nov-21
3) REFERENCE MATERIAL	00652-32	CC20466	4068-11695401	05-Nov-21
4) REFERENCE MATERIAL	00652-34	CC20523	4069-11762897	01-Dec-21
5) BATH	260014	1247 48074	20T9392	10-Sep-21
6) STANDARD THERMOMETER	421504	55000379	20T9616	10-Sep-21

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.

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

5. THIS CERTIFICATE IS TRACEABLE TO :-

- NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST), USA.

- NATIONAL INSTITUTE OF METROLOGY (THAILAND)

#### RESULT OF CALIBRATION : WITHOUT ADJUSTMENT

1. DISPLAY UNIT WITH ELECTRODE S/N 0649082M

CONDUCTIVITY BUFFER SOLUTION	UUC READING	CORRECTION	VALUE BEFORE ADJUSTMENT	UNIT	UNCERTAINTY OF MEASUREMENT (±)	COVERAGE FACTOR
99.0	98.30	0.70	N/A	µS/cm	3.0	2.0
1.413	1.413	0.00	N/A	mS/cm	0.03	2.0
9.992	8.921	1.07	N/A	mS/cm	0.21	2.0
99.915	89.01	10.91	N/A	mS/cm	2.1	2.0

UUC : UNIT UNDER CALIBRATION

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR SHOWN IN THE TABLE, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



## TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)

### CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES


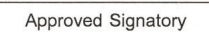
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TEL. 0-2717-3000 FAX. 0-2719-9484

Cert.No.: 21TW92

Page.: 1 of 2

### Certificate of Testing

Equipment : DO Meter  
Manufacturer : YSI  
Model : 5100  
Serial No. : 01H1079 AB  
ID No. : -  
Received Date : 19 April 2021  
Test Date : 21 April 2021  
Reference : 2104-0372WN-1  
Submitted by : S.P.S. Consulting Service Co.,Ltd.  
7 Soi Phaholyothin 24, Phaholyothin Rd.,  
Jompol, Chatuchak, Bangkok 10900  
Laboratory Condition : Temperature ( 25 ± 5 ) °C  
Humidity (50 ± 20) %  
Test Procedure : In - house method : CP-CH9  
by Comparison Technique with Azide Modification Method  
Tested by :   
Approved by :   
Approved Signatory  
( ) Malee Bulkruea  
( ) Saithip Meangmai  
(✓) Warakorn Lerngagtrakul

Issue Date : 26 April 2021

B 0259252





Cert.No.: 21TW92  
Page.: 2 of 2

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

Dissolved Oxygen Probe No.: 14J100195

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.00	7.99	0.0055

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a 1052037



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PAGE : 1 OF 2

## Certificate of Calibration

**EQUIPMENT** : DIGITAL BALANCE  
**MANUFACTURER** : SARTORIUS  
**MODEL** : BSA224S-CW  
**SERIAL No** : 36591842  
**ID No** : BA 08/61  
**CONDITION AS RECEIVED** : USED ITEM  
**SUBMITTED BY** : S.P.S. CONSULTING SERVICE CO., LTD.  
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,  
JOMPOL, CHATUCHAK, BANGKOK 10900

**CALIBRATED BY** : ATSAWIN Y.

**CALIBRATION DATE** : 19-Mar-21

**APPROVED BY** :

**ISSUED DATE** : 20-Mar-21

**RECEIVED DATE** : 19-Mar-21

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www.qcalibration.com

CERTIFICATE No : 21M3168

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : BSA224S-CW  
MANUFACTURER : SARTORIUS S/N : 36591842  
ID No : BA 08/61 RECEIVED DATE : 19-Mar-21  
AIR PRESSURE : 1009mbar  $\pm$  1mbar CALIBRATION DATE : 19-Mar-21  
AMBIENT TEMPERATURE : 24° C  $\pm$  1° C RELATIVE HUMIDITY : 52 %RH  $\pm$  10 % RH

### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY ACCORDING TO UKAS LAB 14 EDITION 6:2019 BY USING KNOWN WEIGHT STANDARD WEIGHT. THE BALANCE WAS ADJUSTED USING WEIGHT OF QUALITY CALIBRATION TO ADJUST. THE BALANCE HAS NO ZERO TRACKING FUNCTION. REPEATABILITY WAS MEASURED BY USING 10 REPEATED MEASUREMENTS. LINEARITY WAS MEASURED COVERING 10 POINTS, EVENLY SPREAD OVER THE RANGE. THE INSTRUMENT WAS SET ZERO BEFORE PERFORMING THE LINEARITY TEST. OFF-CENTER LOADING WAS MEASURED BY USING STANDARD WEIGHTS PLACED ON THE PAN AND MOVED TO VARIOUS POSITIONS ON THE PAN.

### 2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) STANDARD WEIGHT SET	E2	QK-I-151	C02210415	09-Feb-23
2) STANDARD WEIGHT	E2	15843	C02210419	10-Feb-23
3) STANDARD WEIGHT	E2	QK-I-349	M2103235S	26-Mar-23

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON 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 CENTRAL BUREAU OF WEIGHTS&MEASURES

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

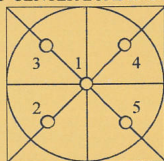
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0.000045 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY ( $\pm$ g)
0.0	0.0000	0.0000	0.000075
0.1	0.1000	0.0000	0.000075
0.2	0.2000	0.0000	0.000076
0.5	0.5000	0.0000	0.000076
1.0	1.0000	0.0000	0.000077
2.0	2.0000	0.0000	0.000077
5.0	5.0000	0.0000	0.000079
10.0	10.0000	0.0000	0.000082
20.0	20.0000	0.0000	0.000086
50.0	50.0000	0.0000	0.00013
100.0	100.0001	-0.0001	0.00019
200.0	200.0000	0.0000	0.00032

### 5. OFF CENTER LOADING ERROR



POINT	READING (g)
1	100.0000
2	100.0000
3	100.0000
4	100.0000
5	100.0000
OFF-CENTER LOADING	0.0000

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

END OF CALIBRATION REPORT



## Lambda UV Preventive Maintenance (PM)

Company Name:	S.P.S. CONSULTING SERVICE CO., LTD.		
Address:	7, Soi Phaholyothin24, Ladyao, Jatujak, Bangkok		
User Name:		WO Number:	WO-01550999
Telephone Number:		PM Number:	6 of 6 P
Customer Support Engineer:		Certificate Number:	UV2004-2022
Date PM Performed: (DD-MMM-YYYY)	25-Jan-2022	Next PM Due Date: (DD-MMM-YYYY)	25-Jul-2022

Part Number	Release	Publication Date	
09370504	B	March 2013	

### Scope

The purpose of this PM is to ensure the continued functionality of the PerkinElmer Lambda UV/Vis Spectrophotometer 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 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 #	Software Version		Configuration Notes
Lambda 25	501S14123010	6.2.0.0741	STD	1.27
NA	NA	NA	NA	NA

### Parts Lists

Parts Included with the PM				
Part Number (if applicable)	Description	Quantity	Serial Number	Expiration Date (MM/YY)
B250 0099	Stray Light standard			
	NaI cell	1	1943	Jan-22
	NaNO2 cell	1	2963	
	KCl cell	1	31030	
	H2O	1	71497	
B050 7805	Secondary Standards for calibration of wavelength and photometric accuracy or use NBS/NIST 390 standards			
	Gray Glass G1	1	2926	Jan-22
	Gray Glass G2	1	3501	
	Gray Glass G3	1	2552	
	Holmium Glass	1	1085	

Additional Tools Required for PM					
Part Number (if applicable)	Description	Quantity	Serial #		Remark
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
Additional Reagents and Standards Required for PM					
Part Number (if applicable)	Description	Quantity	Batch/Lot #		Expiration Date (MM/YY)
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-



## 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. Optical checks:

- ☒ Lamp Alignment/Energy
- ☒ Sample Compartment Windows/Monochromator
- ☒ Mirror and Grating Alignment
- ☒ Cell Holder Alignment

### 3. Mechanical:

- ☒ Physical inspection – Please write any comments in the additional comments section.
- ☒ Grating Drive Mechanism.
- ☒ Lamp Change Mechanism.
- ☐ Slit Drive Manual Servo.

### 4. Test:

Refer to Appendix A for the specifications of the instrument being tested.

- ☒ D2 Wavelength accuracy

	Actual Value	Specification
Accuracy at 656.1 nm	656.16	± 0.1

- ☒ Holmium Oxide wavelength accuracy

Filter ID #		1085		
Test	Calibration Value	Actual Value	Deviation	Specification
279.3 nm	279.3	279.39	-0.09	± 0.5
360.8 nm	360.9	360.93	-0.03	± 0.5
459.9 nm	460.0	460.07	-0.07	± 0.5
536.4 nm	536.2	536.40	-0.20	± 0.5

- ☒ Scattered Light.

Test	Filter ID #	Result	Specification
NaI @ 220 nm	1943	0.0133	< 0.02 %T
NaNO <sub>2</sub> @ 340 nm	2963	-0.1296	< 0.02 %T
NaNO <sub>2</sub> @ 370 nm	2963	-0.0002	< 0.02 %T
KCl @ 200 nm	31030	2.4808	≥ 2 A

- ☒ Baseline Flatness.

Corrected Baseline	Specification
0.000163	± 0.001 A

- ☒ Noise Test @ 500 nm.

Actual Value	Specification
0.0000240	± 0.00008 A

☒ Photometric Accuracy.

Filter 1 ID #		2926		
Test	Calibrated Value	Actual Value	Deviation	Specification
440 nm	0.3483	0.3493	-0.0010	± 0.006 A
546 nm	0.3029	0.3046	-0.0017	± 0.006 A
635 nm	0.3200	0.3232	-0.0032	± 0.006 A
Filter 2 ID #		3501		
Test	Calibrated Value	Actual Value	Deviation	Specification
440 nm	1.001	1.0024	-0.0014	± 0.006 A
546 nm	0.9797	0.9813	-0.0016	± 0.006 A
635 nm	1.0285	1.0325	-0.0040	± 0.006 A
Filter 3 ID #		2552		
Test	Calibrated Value	Actual Value	Deviation	Specification
440 nm	0.489	0.4935	-0.0045	± 0.006 A
546 nm	0.4582	0.4595	-0.0013	± 0.006 A
635 nm	0.5046	0.5075	-0.0029	± 0.006 A

#### 5. Accessory (where applicable):

- ☐ Integrating Sphere
- ☐ Reflecting Attachment
- ☐ Cell Changer
- ☐ Sipper
- ☐ Auto Sampler

#### 6. 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.
- ☒ Update Logbook.



## Additional Comments

Additional Comments Regarding the PM

## Review

<p><i>The preventive maintenance checks and if applicable performance tests for Lambda UV have been completed.</i></p> <p><b>This Lambda UV Passes</b> <input checked="" type="checkbox"/> <b>Fails</b> <input type="checkbox"/> <i>the preventive maintenance.</i></p>	
<p align="center"><b>Review of Preventive Maintenance:</b></p>	
<p>Authorized PerkinElmer Representative:</p> <p align="center">[Redacted Signature]</p>	<p>Date:</p> <p align="center">25-Jan-2022 (DD-MM-YYYY)</p>
<p>Authorized Customer Representative:</p> <p align="center">[Redacted Signature]</p>	<p>Date:</p> <p align="center">25-Jan-2022 (DD-MM-YYYY)</p>



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## CALIBRATION CERTIFICATE

Certificate No. : SS2110-013-0001

Date Issued : 04-Oct-21

**Customer & Calibrated Place** : S.P.S. CONSULTING SERVICE CO., LTD.  
7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak, Bangkok 10900

**Equipment** : Incubator

**Manufacturer** : Memmert

**Model** : U 15

**Serial No.** : 880 503

**ID No./Tag No.** : IN 03/36

**Date Received** : 01-Oct-21

**Date Calibrated** : 01-Oct-21

**Calibrated by** : [Redacted]

### Calibration Method or Calibration Procedure Used

Standard method : CP-05 TLAS G-20.

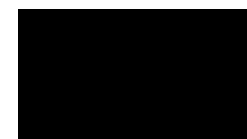
This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

### Result of Calibration

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

This certificate may not be reproduced other than in full except with the prior written approval of the Miracle International Technology Company Limited.

Approved by :



Certificate No. : SS2110-013-0001

Environment : Ambient Temperature : Start record 28.9 °C, Stop record 25.8 °C  
Relative Humidity : Start record 55.8 %RH, Stop record 55.5 %RH

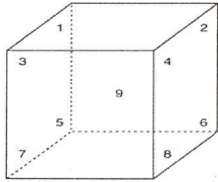
Calibration Temperature (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Stability <sup>1</sup> (°C)	Measured Uniformity <sup>2</sup> (°C)	Overall Variation <sup>3</sup> (°C)
37	37.0	37.0	0.02	0.20	0.27
44	44.0	44.0	0.03	0.11	0.20

Without adjustment

Calibration Temperature (°C)	STD No. 1 (°C)	STD No. 2 (°C)	STD No. 3 (°C)	STD No. 4 (°C)	STD No. 5 (°C)	STD No. 6 (°C)	STD No. 7 (°C)	STD No. 8 (°C)	STD No. 9 (°C)	Uncertainty <sup>4</sup> ±°C
37	37.12	37.03	36.99	37.12	37.23	36.99	37.14	37.13	37.18	0.18
44	44.21	44.11	44.07	44.20	44.21	44.08	44.24	44.23	44.17	0.18

Note : Probe No. 9 is Reference Probe

Setting Air Fresh No. 0



Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. AD2106-112-0001 for Data Acquisition STD-286 Module 1 Serial No. MY44023139, Due 13-Dec-21

Notes : 1. The temperature stability is the one-half of greatest maximum difference of measured temperatures at any one probe.

2. The temperature uniformity is the maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time.

3. Overall variation is the difference of maximum and minimum measured temperatures throughout observation time.

4. The uncertainty of measurement is included temperature stability.

5. The temperature uniformity, stability, overall variation and indicating temperature is applicable to all air or gas filled temperature controlled enclosures at atmospheric pressure.

End of Certificate