

ภาคผนวกที่ 5

เอกสารการสอบเทียบความถูกต้อง^๗
ของเครื่องมือ

ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง		เครื่องมือตรวจวิเคราะห์	
	ชื่อเครื่องมือ	เลขหน้า	ชื่อเครื่องมือ	เลขหน้า
1. การตรวจวิเคราะห์คุณภาพน้ำ				
1. pH	-	-	- pH Meter	ผ5
2. Turbidity	-	-	- Turbidity Meter	ผ5
3. Total Suspended Solids	-	-	- Electronic Balance	ผ5
4. Total Dissolved Solids	-	-	- Electronic Balance	ผ5
5. Total Hardness	-	-	- Electronic Balance	ผ5
6. Sulfate	-	-	- Spectrophotometer	ผ5
7. Total Iron	-	-	- Inductively Coupled Plasma (ICP)	ผ5
8. Arsenic	-	-	- Electronic Balance	ผ5

CAL

Calibratech Co., Ltd.

7/106-7 Moo 2, Sukhaphichawan 1 Rd., Bangpoo, Pakkred, Nonthaburi 11120

Tel: (02) 964-6211 Fax: (02) 964-3155 e-mail: calibratech.cal@yahoo.com, calibratech.cal@hotmail.com



NSC-TIS-TIS17025
CALIBRATION 0010

Certificate of Calibration

Certificate No. : 63-420104-1

Page : 1 of 2

Submitted by : S.P.S Consulting Service Co., Ltd.

7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900

Equipment : pH Meter with electrode

pH meter

Manufacturer : WTW

Model : inoLab pH Level 1

Range : N/A pH

Resolution : 0.001 pH

Serial No. : 01510033

ID No. : PH03/45

Electrode

Model : Sen Tix 81

Serial No. : C200337086

Environment : Ambient Temperature : (25 ± 2) °C

Relative Humidity : (50 ± 15) %

Date of Received : 20 July 2020

Date of Calibration : 22 July 2020

Date of Issue : 22 July 2020

Calibrated by : Bunjerd Masri

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
440001	19E779	13 Feb 2021	National Institute of Metrology Thailand (NIMT)

2. Certified Reference Material (CRM)

pH	Cert. No.	Lot No.	Exp. Date	Traceability
4.003	TRM-S2003	280319	29 Jul 2020	National Institute of Metrology Thailand (NIMT)
7.025	TRM-S2005	280119	29 Jul 2020	National Institute of Metrology Thailand (NIMT)
10.008	TRM-S2007	080719	29 Jul 2020	National Institute of Metrology Thailand (NIMT)

Approved by : 
(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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1. 00011-03

CAL

Calibratech Co., Ltd.

7/106-7 Moo 2, Sukhapholatan 3 Rd., Bangpoo, Pakkred, Nonthaburi 11120

Tel. (02) 964-6211 Fax (02) 964-5155, e-mail : calibratech.cal@yahoo.com, calibratech.cal@hotmail.com

Certificate of Calibration

Certificate No. : 63-420104-1

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Result of Calibration :

UUC Condition As-Received : Good

Function : Electrical measurement
pH meter

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

Adjustment Curve at nominal pH	Applied Voltage (mV)	Nominal Value (pH)	UUC Reading		Correction (mV)	Uncertainty (± mV)
			(pH)	(mV)		
4, 7	177.4800	4	4.00	176.6	0.7	0.060
	0.0000	7	7.00	-0.3	0.5	0.058
7, 10	0.0000	7	7.00	-0.3	0.5	0.058
	-177.4800	10	10.00	-177.6	0.1	0.060

Function : pH meter with electrode

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

Adjustment Curve at nominal pH	Standard Buffer (pH)	UUC Reading (pH)	Correction (pH)	Uncertainty (± pH)
4, 7	4.003	4.007	-0.003	0.025
	7.025	7.016	0.009	0.024
7, 10	7.025	7.017	0.008	0.024
	10.008	10.010	-0.002	0.070

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%

- 003 -



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CALIBRATION AND TESTING EQUIPMENT SERVICES

53/4 PATTANAKARN ROAD SOI 13, SUANLUANG, SUANLUANG BANGKOK 10150

TEL. 0-2717-3000-2 FAX 0-2719 9434

Cert.No.: 20CH747

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 : 26 May 2020
Calibration Date : 27 May 2020
Reference : 2005-0839WN-1
Submitted by : S.P.S. Consulting Service Co.,Ltd.
7 Soi Phaholyothin 24, Phaholyothin Rd.,
Jompol, Chatuchak, Bangkok 10900
Ambient Temperature : $(25 \pm 2.5) ^\circ\text{C}$
Relative Humidity : $(50 \pm 20) \%$
Calibration Procedure : In-house method : CP-CH11
based on direct measurement by
using Formazin standard solution

Calibrated by : Walalak Sirithean

Approved by :

Malee

Approved Signatory

- () Pornthippa Tameyakul
(☒) Malee Butkruea
() Saithip Meangmai

Issue Date : 2 June 2020

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

A 0004697



Cert.No. : 20CH747

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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).

<u>Instruments</u>	<u>Model</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Certificate No.</u>	<u>Due date</u>
1) Thermo-Hygrograph	NSII-Q	1103328	130EC010	19H1780	9 July 2020
2) Electronic Balance	AE200S	N03679	140RC001	19MM505	3 Oct 2020

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

<u>Material</u>	<u>Manufacturer</u>	<u>Lot No.</u>	<u>Assay</u>
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	19.1	0.39	2.00
40	39.5	0.40	2.00
100	99.1	0.71	2.00
400	392	1.5	2.00

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 %.

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a 1001499



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



CERTIFICATE No. : 2(MJ)69
REFERENCE No. : 60627-5


PAGE 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : METTLER TOLEDO
MODEL : XS105DU
SERIAL No : 1126422905
ID No : BA 05/50
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 : 
PONGSAK J.

ISSUED DATE : 20-Mar-21

RECEIVED DATE : 19-Mar-21

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



QUALITY CALIBRATION CO., LTD.

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

Tel. (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4534

www.qcalibration.com

CERTIFICATE No. : 21M3169

PAGE : 2 OF 2

Calibration Report

EQUIPMENT	DIGITAL BALANCE	MODEL	XS103DU
MANUFACTURER	METTLER TOLEDO	S/N	1126422905
ID No	BA 05/40	RECEIVED DATE	19-Mar-21
AIR PRESSURE	1009 mbar = 1 mbar	CALIBRATION DATE	19-Mar-21
AMBIENT TEMPERATURE	24°C ± 1°C	RELATIVE HUMIDITY	52% RH ± 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-F151	C02210415	09-Feb-23
2) STANDARD WEIGHT	E2	15813	C02210419	10-Feb-23
3) STANDARD WEIGHT	E2	QK-T-349	N21032355	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

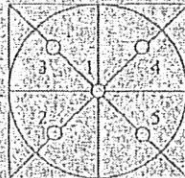
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH CENTRAL BUREAU OF WEIGHTS & MEASURES

RESULT OF CALIBRATION - WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL
2. TARE FUNCTION : NORMAL
3. REPEATABILITY OF READING AT 100 g WAS 0.000055 g
4. DEPARTURE FROM NOMINAL VALUE / LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (± g)
0.00	0.00000	0.00000	0.000066
0.02	0.01998	0.00002	0.000066
0.10	0.10001	-0.00001	0.000066
0.20	0.20001	-0.00001	0.000067
0.50	0.49996	0.00004	0.000065
1.00	0.99997	0.00003	0.000066
2.00	2.00000	0.00000	0.000067
5.00	5.00002	-0.00002	0.000068
10.00	10.00003	-0.00003	0.000070
20.00	20.00000	0.00000	0.000075
50.00	50.00000	0.00000	0.00013
100.00	100.00001	-0.00001	0.00019
120.00	120.00001	-0.00001	0.00022

5. OFF-CENTER LOADING ERROR



POINT	READING (g)
1	50.0000
2	50.0000
3	50.0000
4	50.0000
5	50.0000
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 MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



บริษัท แอนนาไลต์ดีเคิลแลบไซน์ จำกัด
Analytical Lab Science Co., Ltd.

บริษัท เอส.พี.เอส.คอนซัลติง เซอร์วิส จำกัด

7 ซอย พหลโยธิน 24 แขวงจอมพล

เขตจตุจักร จังหวัดกรุงเทพมหานคร 10900

Spectrophotometer Inspection Report												
Apparatus	:	Spectrofluorometer										
Model	:	JASCO FP-8200										
Serial No.	:	B001861448										
Check Date	:	October 08, 2020										
Standard Materials	:	DI Water, Air										
Items Test												
Wavelength Repeatability of Ex/Em Conclusion	:	<input checked="" type="checkbox"/> Passed	<input type="checkbox"/> Fail									
Wavelength Accuracy of Ex/Em Conclusion	:	<input checked="" type="checkbox"/> Passed	<input type="checkbox"/> Fail									
Resolution of Ex/Em Conclusion	:	<input checked="" type="checkbox"/> Passed	<input type="checkbox"/> Fail									
Sensitivity Conclusion	:	<input checked="" type="checkbox"/> Passed	<input type="checkbox"/> Fail									
Photometric Stability Conclusion	:	<input checked="" type="checkbox"/> Passed	<input type="checkbox"/> Fail									
<table border="1"><thead><tr><th>Rescription</th><th>Test By</th><th>Approve By</th></tr></thead><tbody><tr><td>Sign</td><td>Aplnat</td><td>Aplnat</td></tr><tr><td>Date</td><td>08/10/2020</td><td>08/10/2020</td></tr></tbody></table>				Rescription	Test By	Approve By	Sign	Aplnat	Aplnat	Date	08/10/2020	08/10/2020
Rescription	Test By	Approve By										
Sign	Aplnat	Aplnat										
Date	08/10/2020	08/10/2020										



MAINTENANCE REPORT

OPTIMA 5300DV

Customer : S.P.S. CONSULTING SERVICE CO., LTD. Address : 7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak, Bangkok 10900 User Name: Phenpha Viphasathawat Phone: 0-2939-4370-72 Fax: 0-2513-4221	Date Tested: January 18, 2021 Recommendation Recertification Period 6 Months Recertification Due: July 18, 2021 Date Last Certified: July 21, 2020 Visit Number: 2 of 2 PerkinElmer Phone: 02-719-6420 ext 206 PerkinElmer Fax: 02-318-5597
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CONFIGURATION TESTED		ACCESSORIES/COMPONENT NOT INCLUDED
MODEL OPTIMA 5300DV	SERIAL NUMBER 077C7042401	
TESTED EQUIPMENT IPV Methods	CALIBRATION NUMBER	EXPIRATION
TEST STANDARD USED Multielement Standard Wavacal Solution VIS Wavacal solution Instrument Cal. STD4	PART NUMBER N069-1579 N058-2152 N930-2946 N930-0221	EXPIRATION DATE February 28, 2022 January 30, 2022 December 30, 2021 June 30, 2021
CUSTOMER SUPPLIED 2 % HNO3 10 % HNO3	COMMENTS	CUSTOMER INITIALS



MAINTENANCE REPORT

OPTIMA 5300DV

SERIAL NUMBER 077C7042401DATE TESTED January 18, 2021**1. MECHANICAL CHECKS**

- A. Inspect and clean all fans and filters.
- B. Inspect and replace as necessary, all torch components including the RF coil.
- C. Inspect all tubing for sign of clacking or leaking.
- D. Adjust water and gas pressure regulator settings.
- E. Inspect and leak check pneumatics drawers.
- F. Clean the exterior of the instrument.

☐ OK☐ OK☐ OK☐ OK☐ OK☐ OK**2. OPTICAL CHECKS**

- A. Inspect and clean all optical components.
- B. As required, check and replace all purge filters.
- C. Recheck optical alignment.

☐ OK☐ OK☐ OK**3. COOLING SYSTEM CHECKS**

- A. Perform preventive maintenance on chiller.
- B. Flush out the chiller every six months.

☐ OK☐ OK**4. PERFORMANCE CHECKS**

- A. Torch View Alignment.
- B. Wavelength Calibration.

☐ OK☐ OK



MAINTENANCE REPORT

OPTIMA 5300DV

SERIAL NUMBER : 077C7042401			DATE TESTED : January 18, 2021	
PARAMETER	SPECIFICATION		FINAL VALUE	
Spectral Resolution : UV	As 193.696 nm	≤ 0.007	0.00592	
	Ni 231.604 nm	≤ 0.008	0.00771	
	Ni 341.476 nm	≤ 0.012	0.00792	
Spectral Resolution : VIS	La 403.672 nm	≤ 0.020	0.01605	
	Ba 455.403 nm	≤ 0.025	0.02172	
Precision	As 193.656 nm	% RSD < 1.0	0.55 %	
	Zn 213.856 nm	% RSD < 1.0	0.53 %	
	Mn 257.610 nm	% RSD < 1.0	0.46 %	
	La 379.478 nm	% RSD < 1.0	0.36 %	
	Ba 455.403 nm	% RSD < 1.0	0.6 %	
	Ba 493.408 nm	% RSD < 1.0	0.74 %	
Detection Limits : Axial	Tl 190.800 nm	3(sd)	1.92	ppb
	As 193.696 nm	3(sd)	3.64	ppb
	Pb 220.353 nm	3(sd)	1.20	ppb
Detection Limits : Radial	As 193.696 nm	3(sd)	34.30	ppb
	Zn 213.856 nm	3(sd)	1.66	ppb
	Mn 257.610 nm	3(sd)	1.87	ppb
	La 379.478 nm	3(sd)	0.82	ppb
	Ba 455.403 nm	3(sd)	0.14	ppb
	Ba 493.408 nm	3(sd)	0.15	ppb
BEC : Axial (18 X 5000)/(1S-1B)	Cd 228.502 nm	≤ 150 ppb	28.94	ppb
BEC : Radial (18 X 1000)/(1S-1B)	Mn 257.610 nm	≤ 45 ppb	27.84	ppb



WO-01061838

MAINTENANCE REPORT

OPTIMA 5300DV

SERIAL NUMBER 077C7042401DATE TESTED January 18, 2021

Remarks :

Commissioning follow as commissioning performance sheets.

This is to certify that the above tests have been performed and the configuration tested



meets



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.

Authorized Representative: *Narong*

(Mr. Narong Watanakit)

Service Engineer

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