

## ภาคผนวกที่ 5

เอกสารการสอบเทียบความถูกต้อง<sup>๑</sup>  
ของเครื่องมือ

**ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง  
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม**

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง		เครื่องมือตรวจวิเคราะห์	
	ชื่อเครื่องมือ	เลขหน้า	ชื่อเครื่องมือ	เลขหน้า
<b>1. คุณภาพอากาศในบรรยากาศ</b>				
- Total Suspended Particulates	- High Volume Air Sampler & Blower	ผ5	-	-
- PM-10	- High Volume PM-10 Air Sampler & Blower	ผ5	-	-
<b>2. ระดับเสียง</b>	- Sound Level Meter	ผ5	-	-
- Leq 24 hr		ผ5	-	-
<b>3. การตรวจวิเคราะห์คุณภาพน้ำ</b>				
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. Manganese	-	-	- Electronic Balance	ผ5
9. Arsenic	-	-	- Electronic Balance	ผ5



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7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900  
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscn.com, www.spscn.com

## High Volume Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3440

### Calibration Data

High Volume Air Sampler Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft <sup>3</sup> /min)	R <sup>2</sup>
B01	B01	01/02/2021	y = 1.233x-4.054	0.998
B02	B02	01/02/2021	y = 1.159x-3.009	0.997
B03	B03	01/02/2021	y = 1.243x-5.430	0.999
B04	B04	03/02/2021	y = 1.227x-4.684	1.000
B05	B05	01/02/2021	y = 1.142x-1.066	1.000
B06	B06	03/02/2021	y = 1.254x-6.175	0.998
B07	B07	01/02/2021	y = 1.205x-3.131	0.999
B08	B08	02/02/2021	y = 1.329x-8.622	0.997
B09	B09	02/02/2021	y = 1.225x-5.372	0.995
B10	B10	01/02/2021	y = 1.309x-7.675	0.998
B11	B11	02/02/2021	y = 1.272x-5.813	1.000
B12	B12	03/02/2021	y = 1.155x-1.611	0.999
B13	B13	01/02/2021	y = 1.248x-6.903	0.999
B14	B14	03/02/2021	y = 1.144x-1.611	0.998
B15	B15	02/02/2021	y = 1.208x-4.057	0.997
B16	B16	01/02/2021	y = 1.256x-5.635	1.000
B17	B17	01/02/2021	y = 1.266x-8.252	0.999
B18	B18	03/02/2021	y = 1.066x+1.784	0.998
B19	B19	01/02/2021	y = 1.162x-1.198	0.999
B20	B20	01/02/2021	y = 1.292x-6.825	0.997
B21	B21	03/02/2021	y = 1.171x-1.729	1.000
B22	B22	03/02/2021	y = 1.162x-3.080	0.998
B23	B23	02/02/2021	y = 1.242x-6.426	0.997
B24	B24	02/02/2021	y = 1.214x-4.562	1.000
B25	B25	01/02/2021	y = 1.317x-9.030	0.998
B26	B26	02/02/2021	y = 1.159x-4.121	0.999
B27	B27	01/02/2021	y = 1.112x-0.394	0.996
B28	B28	02/02/2021	y = 1.169x-3.815	0.996
B29	B29	02/02/2021	y = 1.097x+1.354	0.998
B30	B30	01/02/2021	y = 1.272x-7.537	0.998
B31	B31	02/02/2021	y = 1.308x-7.805	1.000
B32	B32	02/02/2021	y = 1.073x+2.738	0.996
B33	B33	03/02/2021	y = 1.221x-4.454	0.998
B34	B34	03/02/2021	y = 1.243x-4.471	0.999

Calibrated by :

Phakhinai Khongkonnard  
(Mr. Phakhinai Khongkonnard)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



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## High Volume Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3440

### Calibration Data

High Volume Air Sampler Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft <sup>3</sup> /min)	R <sup>2</sup>
B35	B35	06/02/2021	y = 1.324x-5.897	0.998
B36	B36	06/02/2021	y = 1.206x-1.051	0.995
B37	B37	06/02/2021	y = 1.349x-9.106	0.998
B38	B38	06/02/2021	y = 1.258x-2.337	0.997
B39	B39	06/02/2021	y = 1.180x-2.835	0.999
B40	B40	06/02/2021	y = 1.277x-4.231	0.997
B41	B41	06/02/2021	y = 1.322x-6.433	0.998
B42	B42	02/02/2021	y = 1.127x-0.983	0.995
B43	B43	01/02/2021	y = 1.132x-0.815	1.000
B44	B44	01/02/2021	y = 1.220x-5.384	0.999
R01	R01	01/02/2021	y = 1.192x-3.072	0.999
R02	R02	01/02/2021	y = 1.182x-2.419	0.997
R03	R03	03/02/2021	y = 1.141x+0.215	1.000
R04	R04	02/02/2021	y = 1.180x-0.720	0.996
R05	R05	02/02/2021	y = 1.134x-1.312	0.996
R06	R06	02/02/2021	y = 1.084x+1.626	0.998
R07	R07	02/02/2021	y = 1.168x-1.244	1.000
R08	R08	03/02/2021	y = 1.220x-3.908	0.997
R09	R09	03/02/2021	y = 1.202x-4.369	0.998
R10	R10	03/02/2021	y = 1.211x-5.062	0.995
R11	R11	03/02/2021	y = 1.298x-7.436	0.996
R12	R12	03/02/2021	y = 1.195x-4.071	1.000
R13	R13	02/02/2021	y = 1.201x-4.888	0.997
R14	R14	02/02/2021	y = 1.268x-8.254	0.998
R15	R15	02/02/2021	y = 1.127x-0.466	0.999
R16	R16	02/02/2021	y = 1.296x-8.361	1.000
R17	R17	01/02/2021	y = 1.214x-3.117	0.997
R18	R18	01/02/2021	y = 1.227x-5.918	0.996
R19	R19	01/02/2021	y = 1.109x-0.584	0.995
R20	R20	01/02/2021	y = 1.215x-3.398	0.996

Calibrated by :

Phakhinei Khongkomnerd  
 (Mr. Phakhinei Khongkomnerd)

Approved by :

Peera Detudom  
 (Mr. Peera Detudom)



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## High Volume PM-10 Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3440

### Calibration Data

High Volume PM-10 Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft <sup>3</sup> /min)	R <sup>1</sup>
B01	B01	02/02/2021	y = 1.146x-2.826	0.998
B02	B02	01/02/2021	y = 1.167x-0.998	0.995
B03	B03	02/02/2021	y = 1.221x-6.189	1.000
B04	B04	01/02/2021	y = 1.161x-0.851	0.999
B05	B05	02/02/2021	y = 1.087x+1.143	0.996
B06	B06	02/02/2021	y = 1.267x-6.192	0.998
B07	B07	02/02/2021	y = 1.184x-2.593	1.000
B08	B08	01/02/2021	y = 1.178x-3.545	0.999
B09	B09	01/02/2021	y = 1.206x-5.267	0.997
B10	B10	02/02/2021	y = 1.248x-6.593	1.000
B11	B11	02/02/2021	y = 1.219x-4.855	0.998
B12	B12	02/02/2021	y = 1.248x-6.593	1.000
B13	B13	01/02/2021	y = 1.154x-1.333	0.997
B14	B14	01/02/2021	y = 1.100x+0.001	0.997
B15	B15	01/02/2021	y = 1.215x-6.558	1.000
B16	B16	02/02/2021	y = 1.208x-4.245	0.996
B17	B17	02/02/2021	y = 1.194x-3.823	0.995
B18	B18	02/02/2021	y = 1.195x-4.256	0.997
B19	B19	01/02/2021	y = 1.308x-8.408	1.000
B20	B20	01/02/2021	y = 1.102x+1.503	0.999
B21	B21	02/02/2021	y = 1.092x-0.380	0.996
B22	B22	02/02/2021	y = 1.190x-5.483	0.999
B23	B23	01/02/2021	y = 1.107x+0.797	0.998
B24	B24	01/02/2021	y = 1.191x-3.386	1.000
B25	B25	01/02/2021	y = 1.169x-2.739	0.998
B26	B26	02/02/2021	y = 1.140x-1.138	1.000
B27	B27	01/02/2021	y = 1.167x-2.259	0.999
B28	B28	02/02/2021	y = 1.249x-5.961	0.999
B29	B29	01/02/2021	y = 1.194x-4.841	0.998
B30	B30	01/02/2021	y = 1.279x-7.914	1.000
B31	B31	06/02/2021	y = 1.189x-2.806	0.996
B32	B32	06/02/2021	y = 1.265x-5.519	0.999
B33	B33	01/02/2021	y = 1.155x-1.141	0.995
B34	B34	01/02/2021	y = 1.280x-6.325	0.997

Calibrated by :

Phakthai Khongkomnerd  
(Mr. Phakthai Khongkomnerd)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)





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## High Volume PM-10 Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3440

### Calibration Data

High Volume PM-10 Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft <sup>3</sup> /min)	R <sup>2</sup>
R01	R01	02/02/2021	$y = 1.265x - 4.693$	1.000
R02	R02	02/02/2021	$y = 1.222x - 4.177$	0.998
R03	R03	01/02/2021	$y = 1.193x - 4.299$	0.999
R04	R04	02/02/2021	$y = 1.123x - 0.345$	0.997
R05	R05	03/02/2021	$y = 1.176x - 1.931$	0.997
R06	R06	02/02/2021	$y = 1.137x - 0.095$	1.000
R07	R07	01/02/2021	$y = 1.241x - 5.849$	0.996
R08	R08	01/02/2021	$y = 1.188x - 4.483$	0.999
R09	R09	01/02/2021	$y = 1.076x + 1.816$	0.997
R10	R10	01/02/2021	$y = 1.238x - 6.794$	0.995
R11	R11	01/02/2021	$y = 1.184x - 4.348$	1.000
R12	R12	02/02/2021	$y = 1.203x - 4.827$	0.995
R13	R13	02/02/2021	$y = 1.109x + 0.105$	0.998
R14	R14	02/02/2021	$y = 1.097x + 1.923$	0.999
R15	R15	02/02/2021	$y = 1.139x - 2.845$	1.000
R16	R16	02/02/2021	$y = 1.142x - 1.748$	1.000
R17	R17	01/02/2021	$y = 1.264x - 7.761$	0.999
R18	R18	01/02/2021	$y = 1.210x - 4.220$	0.995
R19	R19	01/02/2021	$y = 1.074x + 1.836$	0.998
R20	R20	01/02/2021	$y = 1.240x - 4.996$	0.998

Calibrated by :

Phakhinai Khongkornnerd  
(Mr. Phakhinai Khongkornnerd)

Approved by :

Peern Detudom  
(Mr. Peern Detudom)



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-64/0528

MTC No. EEL. BP. 17/0564

## CALIBRATION CERTIFICATE

Submitted by : S.P.S. Consulting Services Service Co.,Ltd.  
Address : 7 Soi Phaholyothin 24, Phaholyothin Road, Jompol, Chatuchak, Bangkok 10900.  
Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.  
: Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

### Instrument Calibrated :

Description : Sound Calibrator  
Manufacturer : ACO  
Model : 2127  
Serial No. : 130006

### Ambient Environment

Temperature :  $(23 \pm 3) ^\circ\text{C}$   
Relative Humidity :  $(50 \pm 15) \%$   
Ambient Pressure :  $(101.325 \pm 1.500) \text{ kPa}$

Standards used : 1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.  
2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.  
3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.  
4. Digital Multimeter Agilent 34401A S/N MY44005560.  
5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.  
6. Audio Analyzer Keithley 2015-P S/N 4106495.  
7. Condenser Microphone Bruel&Kjaer 4180 S/N 2889871.

Calibration Procedure: CP-102-04 based on IEC 60942-2003; The sound pressure level generated by sound calibrator under test shall be measured by standard microphone using an insert voltage technique.

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

Date of Receipt : 6 May 2021

Date of Calibration : 15 May 2021

1/2/

The results relate only to the items tested/calibrated or value assigned.  
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-64/0528

MTC No. EEL. BP. 17/0564

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level of confidence of approximately 95%.

Nominal Output of Unit Under Test = 94 dB re 20 $\mu$ Pa at 1000 Hz

Acoustic Output in dB re 20 $\mu$ Pa, Corrected to Reference Conditions: 101.325 kPa, 23.0 °C and 50 %RH.

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	93.96	-0.04	$\pm 0.10$	$\pm 0.40$ dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	999.9	-0.1	$\pm 1.5$	$\pm 1.0\%$

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1.26	$\pm 0.50$	$\pm 3.0\%$

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

(Mr. Weerachai Deechaiyae)

Approved by :

(Mr. Prawate Khuaypa)  
Acting Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 15 May 2021

Date of Issue : 18 May 2021

Ref : 2011264050601894002

End of Certificate

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The results relate only to the items tested/calibrated or value assigned.

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Noise B\_023/22

## Sound Level Meter Calibration Report

### Acoustic Calibrator Data

Brand	ACO	Number	AC 03/56
Model	2127	Serial No.	130006
Calibration Range	94 dB, 1000 Hz	Last Calibration	15 พฤษภาคม 2021
		Due Date	15 พฤษภาคม 2022

### Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B02	ACO	6236	00090370	September 16, 2022	94.0	94.0
ACO-B13	ACO	6236	00152084	September 16, 2022	94.1	94.0
ACO-B27	ACO	6236	00182008	September 16, 2022	94.0	94.0
ACO-B31	ACO	6236	00182013	September 16, 2022	94.0	94.0
Acoustic Certified Value : Thailand Institute Of Scientific And Technological Research (TISTR)					94.06 ± 0.15 dB	

Calibrated by :

Phakhinai Khongkomnerd  
(Mr. Phakhinai Khongkomnerd)

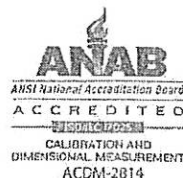
Approved by :

Peera Detudom  
(Mr. Peera Detudom)



# CALIBRATION LABORATORY CO., LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230  
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



## CERTIFICATE OF CALIBRATION FOR

NOMENCLATURE : pH METER  
MANUFACTURER : ECOSENSE/YSI  
MODEL / TYPE : PH100A  
SERIAL NO. : JC03148/YSI60537718A[PH 05/61]  
CLID. NO. : 272101139  
JOB CONTROL NO. : 220419039554

CUSTOMER : S.P.S. CONSULTING SERVICE CO., LTD.  
7 SOI PHAHOLYOTHIN 24 ROAD, JOMPOL,  
CHATUCHAK, BANGKOK 10900

DATE OF RECEIVED : 19 April 2022

DATE OF ISSUED : 23 April 2022

Report of calibration screening must not be taken in part. Except complete. Without the approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Sukgasem Seehanart  
Pimsiri Hemtanon  
Calibration Engineer

Approved By : Mongkol Yotsoontorn  
Authorized Signatory  
23 April 2022



This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q22039554

F3-011-04/01-12

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@clccalibration



CLC  
Accredited  
ISO/IEC 17025

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## REPORT OF CALIBRATION FOR

NOMENCLATURE : pH METER  
MANUFACTURER : ECOSENSE/YSI  
MODEL / TYPE : PH100A  
SERIAL NO. : JC03148/YSI60537718A[PH 05/61]  
DATE OF CALIBRATION : 20 April 2022

### ENVIRONMENT CONDITIONS :

Temperature :  $(25 \pm 2.5) ^\circ\text{C}$

Relative Humidity :  $(50 \pm 15) \% \text{ RH}$

### PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPCH-01, CLC-CPTH-04. The calibration was performed by direct measurement with Certified Reference Material (CRM) and comparison with Calibration Bath, Precision Thermometer and IPRT which maintained by the Calibration Laboratory Co., Ltd.

### REFERENCE STANDARD USED :

1. pH Standard Solution, TRM CODE TRM-S-2003, TRM CODE TRM-S-2007.
2. pH Standard Solution, Catalog Number 06-664-260,11754256, Lot Number CC728484.
3. Calibration Bath, Kambic Model OB-22/2 ULT S/N. 17115653.
4. Precision Thermometer, ASL Model F200 S/N. 014433/03.
5. IPRT, ASL Model T100-250-1D S/N. L0193A-1-1.

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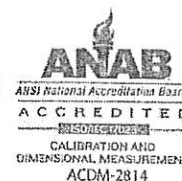


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## TRACEABILITY :

1. The measurements are traceable to International System of Units (SI) , through National Institute of Metrology (Thailand).  
Lot Number. 160221 , 180121. Due Date 14 June 2022.
2. The measurements are traceable to International System of Units (SI) , through Control Company.  
Certificate No. 4281-12405788 , Due Date 30 June 2023.
3. The measurements are traceable to International System of Units (SI) , through Calibration Laboratory Co., Ltd.  
Certificate No. Q22007520, Due Date 22 January 2023.
4. The measurements are traceable to International System of Units (SI) , through Thailand Institute of Scientific and Technological Research (TISTR). Certificate No. PSL-T 0717/64, Due Date 14 June 2022.
5. The measurements are traceable to International System of Units (SI) , through National Institute of Metrology (Thailand).  
Certificate No. TT-0121-21, Due Date 24 November 2022.

## UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor complies with the table which for a normal distribution corresponds to a coverage probability of approximately 95 %.

It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2021)"

Certificate No. Q22039554

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Accredited  
ISO/IEC 17025

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**CONDITION OF CALIBRATION ITEM : GOOD**

**MEASUREMENT RESULTS : ( X ) without adjustment ( ) adjustment**

The table in the following gives the calibration results and associated measurement uncertainties of pH meter.

## CALIBRATION DATA

### 1. pH METER RESULT @ 25 °C

Standard pH Buffer Solution (pH)	pH Meter Reading (pH)	pH Meter Reading (mV)	Correction (pH)	Uncertainty of pH Measurement ( $\pm$ pH)	k Factor
4.000	3.98	133	+0.020	0.012	2,20
6.996	7.02	-38	-0.024	0.015	2,06
10.007	10.02	-206	-0.013	0.013	2,00

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 008 Page 2,3 of 54

### 2. TEMPERATURE RESULT [ PROBE pH ]

Immersion depth (mm)	Actual Temperature ( °C )	DUC Reading ( °C )	Correction ( °C )	Uncertainty $\pm$ ( °C )
100	25.02	25.0	+0.02	0.07

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 008 Page 47 of 54

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor of  $k = 2,00$ .

**This report is valid for the above stated instrument/s only.**

### End of Certificate ###

Certificate No. Q22039554

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@clccalibration





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 :  $(25 \pm 2.5) ^\circ\text{C}$   
Relative Humidity :  $(50 \pm 20) \%$   
Calibration Procedure : In - house method : CP-CH11  
based on direct measurement by  
using Formazin standard solution  
Calibrated by : Saithip Meangmai  
Approved by : Malee  
Approved Signatory  
(☒) Malee Butkruea  
(☐) Saithip Meangmai  
(☐) Warakorn Lernagatrakul  
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.

A 0006902



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).

<u>Instruments</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Certificate No.</u>	<u>Due date</u>
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**

<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 ( $\pm$ NTU )	Coverage Factor <i>k</i>
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-

Mali

a 1055630

**QUALITY CALIBRATION CO.,LTD.**

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

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

[www.qcalibration.com](http://www.qcalibration.com)

CERTIFICATE No : 22M2567

REFERENCE No : 64386-1

PAGE : 1 OF 2

**Certificate of Calibration**

**EQUIPMENT** : DIGITAL BALANCE

**MANUFACTURER** : METTLER TOLEDO

**MODEL** : XS 105DU

**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** : TETNITHI W.

**CALIBRATION DATE** : 11-Mar-22

**APPROVED BY** :   
PONGSAK J.

**ISSUED DATE** : 17-Mar-22

**RECEIVED DATE** : 11-Mar-22

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 Petchkasem 63/2 Road, Laksong, Bangkac, Bangkok 10160

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

www.qcalibration.com

CERTIFICATE No : 22M2567

PAGE : 2 OF 2

### Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : XS 105DU  
MANUFACTURER : METTLER TOLEDO S/N : 1126422905  
ID No : BA 05/50 RECEIVED DATE : 11-Mar-22  
AIR PRESSURE : 1008mbar  $\pm$  1mbar CALIBRATION DATE : 11-Mar-22  
AMBIENT TEMPERATURE : 22°C  $\pm$  1°C RELATIVE HUMIDITY : 49 %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 NOT ADJUSTED BEFORE CALIBRATION. 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

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

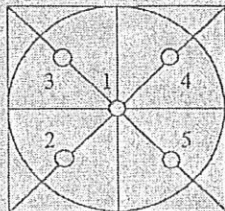
3. REPEATABILITY OF READING AT 20 g WAS 0.000004 g

4. REPEATABILITY OF READING AT 100 g WAS 0.000048 g

5. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY ( $\pm$ g)
0.00	0.00000	0.00000	0.000058
0.02	0.01999	0.00001	0.000058
0.10	0.09999	0.00001	0.000059
0.20	0.19999	0.00001	0.000059
0.50	0.50001	-0.00001	0.000058
1.00	1.00001	-0.00001	0.000059
2.00	2.00000	0.00000	0.000059
5.00	5.00001	-0.00001	0.000061
10.00	10.00005	-0.00005	0.000063
20.00	20.00006	-0.00006	0.000069
50.00	50.00000	0.00000	0.00011
100.00	100.00001	-0.00001	0.00019
120.00	120.0001	-0.0001	0.00022

#### 6. OFF CENTER LOADING ERROR



POINT	READING (g)	
1	10.00001	50.0000
2	10.00002	50.0000
3	10.00001	50.0000
4	10.00001	50.0000
5	10.00002	50.0001
OFF-CENTER LOADING	0.00001	0.0001

NOTE: THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT PRODUCTION 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



WO-01513756/2022

## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

<b>Customer :</b> S.P.S.Consulting Service Co.,Ltd	<b>Date Tested:</b> January 12, 2022
	Recommendation Recertification
<b>Address :</b> 7 Soi Phaholyothin 24	<b>Period</b> 6 Months
Paholyothin Road	<b>Recertification Due:</b> July 12, 2022
Jompol Chatuchak, Bangkok 1090	<b>Date Last Certified:</b> July 14, 2021
<b>User Name:</b> K.Phenpha Vipphastawat	<b>Visit Number:</b> 2 of 2
<b>Phone:</b> 083-9269252	<b>PerkinElmer Phone:</b> 02-719-6420 ext 206
<b>Fax:</b> 02-513-4221	<b>PerkinElmer Fax:</b> 02-318-5597

CONFIGURATION TESTED		ACCESSORIES/COMPONENT NOT INCLUDED
<b>MODEL</b>	<b>SERIAL NUMBER</b>	
OPTIMA 5300DV	077C7042401	
<b>TESTED EQUIPMENT</b>	<b>CALIBRATION NUMBER</b>	<b>EXPIRATION</b>
IPV Methods		
<b>TEST STANDARD USED</b>	<b>PART NUMBER</b>	<b>EXPIRATION DATE</b>
Multielement Standard	N069-1579	August 30, 2022
Wavecal Solution	N058-2152	January 30, 2022
VIS Wavecal solution	N930-2946	June 30, 2022
Instrument Cal. STD4	N930-0221	August 30, 2022
<b>CUSTOMER SUPPLIED</b>	<b>COMMENTS</b>	<b>CUSTOMER INITIALS</b>
2 % HNO3		
10 % HNO3		





**MAINTENANCE AND TEST CERTIFICATE MODEL**  
**OPTIMA 5300DV**

SERIAL NUMBER 077C7042401DATE TESTED January 12, 2022**1. MECHANICAL CHECKS**

A. Inspect and clean all fans and filters.

☐ OK

B. Inspect and replace as necessary, all torch components including the RF coil.

☐ OK

C. Inspect all tubing for sign of clacking or leaking.

☐ OK

D. Adjust water and gas pressure regulator settings.

☐ OK

E. Inspect and leak check pneumatics drawers.

☐ OK

F. Clean the exterior of the instrument.

☐ OK**2. OPTICAL CHECKS**

A. Inspect and clean all optical components.

☐ OK

B. As required, check and replace all purgefilters.

☐ OK

C. Recheck optical alignment.

☐ OK**3. COOLING SYSTEM CHECKS**

A. Perform preventive maintenance on chiller.

☐ OK

B. Flush out the chiller every year.

☐ N/A**4. PERFORMANCE CHECKS**

A. Torch View Alignment.

☐ OK

B. Wavelength Calibration.

☐ OK



## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

SERIAL NUMBER : 077C7042401			DATE TESTED : January 12, 2022		
PARAMETER	SPECIFICATION			FINAL VALUE	
Spectral Resolution : UV	As 193.696 nm	≤ 0.007		0.00554	
	Ni 231.604 nm	≤ 0.008		0.00725	
	Ni 341.476 nm	≤ 0.012		0.00752	
Spectral Resolution : VIS	La 408.672 nm	≤ 0.020		0.01616	
	Ba 455.403 nm	≤ 0.025		0.02416	
Precision					
	As 193.656 nm	% RSD < 1.0		0.34	%
	Zn 213.856 nm	% RSD < 1.0		0.27	%
	Mn 257.610 nm	% RSD < 1.0		0.41	%
	La 379.478 nm	% RSD < 1.0		0.57	%
	Ba 455.403 nm	% RSD < 1.0		0.33	%
	Ba 493.408 nm	% RSD < 1.0		0.26	%
Detection Limits : Axial	Tl 190.080 nm	3(sd)		5.51	ppb
	As 193.696 nm	3(sd)		8.59	ppb
	Pb 220.353 nm	3(sd)		0.50	ppb
Detection Limits : Radial	As 193.696 nm	3(sd)		21.00	ppb
	Zn 213.856 nm	3(sd)		0.32	ppb
	Mn 257.610 nm	3(sd)		0.18	ppb
	La 379.478 nm	3(sd)		0.44	ppb
	Ba 455.403 nm	3(sd)		0.17	ppb
	Ba 493.408 nm	3(sd)		0.12	ppb
BEC : Axial (IB X 500)/(IS-IB)	Cd 226.502 nm	≤ 150 ppb		12.46	
BEC : Radial (IB X 1000)/(IS-IB)	Mn 257.610 nm	≤ 45 ppb		30.82	



**MAINTENANCE AND TEST CERTIFICATE MODEL**  
**OPTIMA 5300DV**

SERIAL NUMBER 077C7042401DATE TESTED January 12, 2022

## Remarks :

Commissioning follow as commissioning performance sheets.

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\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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: \_\_\_\_\_

(

Mr. Wiphan Promlumda

)

Service Engineer