

# ภาคผนวกที่ 4

เอกสารสอบเทียบความถูกต้องของเครื่องมือ

ตรวจวัดคุณภาพสิ่งแวดล้อม

ภาคผนวกที่ 4-1	คุณภาพอากาศในบรรยากาศ
ภาคผนวกที่ 4-2	คุณภาพอากาศจากปล่องระบาย
ภาคผนวกที่ 4-3	คุณภาพอากาศในสถานประกอบการ
ภาคผนวกที่ 4-4	ระดับเสียงในบรรยากาศ
ภาคผนวกที่ 4-5	ระดับเสียงในสถานประกอบการ
ภาคผนวกที่ 4-6	คุณภาพน้ำทิ้ง
ภาคผนวกที่ 4-7	ระดับความร้อนในสถานประกอบการ

ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง  
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
<b>คุณภาพอากาศในบรรยากาศ</b> Total Suspended Particulate	High Volume Air Sampler No. R02, R08, R13	Digital Balance
Particulate Matter less than 10 microns	High Volume PM-10 Air Sampler No. R03, R12, R17	Digital Balance
Nitrogen Dioxide	NO <sub>2</sub> Analyzer No. R04, R09, R11	NO <sub>2</sub> Analyzer No. R04, R09, R11
<b>คุณภาพอากาศจากปล่องระบาย</b> Total Suspended Particulate	Console No. R04 Pitot Tube No. B40	Digital Balance
Oxides of Nitrogen	Vacuum Gauge	Spectrophotometer
Hydrogen Chloride	Personal Pump SKC No. B66 Rotameter No. H-R05	IC
Hydrogen Fluoride	Personal Pump SKC No. B66 Rotameter No. H-R05	IC
<b>คุณภาพอากาศในสถานประกอบการ</b> Total Dust	Personal Pump SKC No. B07, B09, B44, B47, B52, B55, B57, B69, B84 Rotameter No. H-R02	Digital Balance
Respirable Dust	Personal Pump SKC No. B12, B44, B45, B55, B57, B84, B86 Rotameter No. H-R02	Digital Balance
Aluminum Fume	Personal Pump SKC No. B45, B47, B55 Rotameter No. H-R02	ICP
Hydrogen Chloride	Personal Pump SKC No. B69 Rotameter No. L- R02	IC
Hydrogen Fluoride	Personal Pump SKC No. B86 Rotameter No. L- R02	IC
Ammonia	Personal Pump SKC No. B84 Rotameter No. L- R02	IC
<b>ระดับเสียงในบรรยากาศ</b> L <sub>eq</sub> 24 hr, L <sub>max</sub> , L <sub>90</sub> และเสียงรบกวน	Acoustic Calibrator Sound Level Meter : ACO-R19, R22, R25, R39 Sound Level Meter : CR-B10	-

ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง  
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม (ต่อ)

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
ระดับเสียงในสถานประกอบการ $L_{eq}$ 8 hr และ $L_{max}$	Acoustic Calibrator Sound Level Meter : ACO-B36, B41, B43, R50, R51, R52	-
TWA	Sound Level Meter : NMD-B01, B02, B03, B04, B05	
คุณภาพน้ำทิ้ง		
pH	-	pH Meter
Total Dissolved Solids	-	Digital Balance
Total Suspended Solids	-	Digital Balance
BOD <sub>5</sub>	-	BOD Analyzer
COD	-	COD Reactor
Grease & Oil	-	Digital Balance
Total Aluminum	-	ICP
ระดับความร้อนในสถานประกอบการ WBGT	Digital Thermometer Heat Meter No. R04, R06, R08	-

ภาคผนวกที่ 4-1

คุณภาพอากาศในบรรยากาศ





บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

S.P.S. CONSULTING SERVICE CO., LTD.

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

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

Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

## High Volume Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3611

### 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	04/11/2024	y = 1.159x-2.093	0.999
B36	B36	04/11/2024	y = 1.167x-3.333	0.996
B37	B37	06/11/2024	y = 1.152x-2.051	0.997
B38	B38	04/11/2024	y = 1.144x-4.581	0.998
B39	B39	05/11/2024	y = 1.160x-3.397	0.997
B40	B40	01/11/2024	y = 1.168x-3.661	0.996
B41	B41	04/11/2024	y = 1.150x-2.581	0.999
B42	B42	04/11/2024	y = 1.177x-4.883	0.997
B43	B43	01/11/2024	y = 1.165x-3.033	0.998
B44	B44	05/11/2024	y = 1.173x-1.743	0.999
R01	R01	04/11/2024	y = 1.134x-3.385	0.998
R02	R02	04/11/2024	y = 1.173x-4.742	0.998
R03	R03	04/11/2024	y = 1.166x-4.405	0.998
R04	R04	01/11/2024	y = 1.133x-2.807	0.998
R05	R05	01/11/2024	y = 1.148x-2.112	0.997
R06	R06	01/11/2024	y = 1.196x-4.533	0.998
R07	R07	01/11/2024	y = 1.082x+0.340	0.999
R08	R08	01/11/2024	y = 1.112x-1.862	0.997
R09	R09	04/11/2024	y = 1.166x-3.534	0.997
R10	R10	04/11/2024	y = 1.191x-4.707	0.998
R11	R11	05/11/2024	y = 1.170x-4.815	0.997
R12	R12	05/11/2024	y = 1.138x-3.913	0.998
R13	R13	05/11/2024	y = 1.105x-2.238	0.998
R14	R14	06/11/2024	y = 1.183x-3.021	0.999
R15	R15	06/11/2024	y = 1.190x-5.879	0.999
R16	R16	06/11/2024	y = 1.137x-3.608	0.999
R17	R17	01/11/2024	y = 1.140x-2.475	0.998
R18	R18	01/11/2024	y = 1.142x-2.703	0.998
R19	R19	01/11/2024	y = 1.134x-4.199	0.999
R20	R20	04/11/2024	y = 1.147x-3.807	0.998

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



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Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

## High Volume PM-10 Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3611

### 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	01/11/2024	y = 1.175x-5.215	0.998
R02	R02	01/11/2024	y = 1.157x-3.322	0.996
R03	R03	06/11/2024	y = 1.147x-4.899	0.998
R04	R04	06/11/2024	y = 1.158x-5.443	0.997
R05	R05	01/11/2024	y = 1.128x-3.926	0.997
R06	R06	01/11/2024	y = 1.135x-2.508	0.996
R07	R07	06/11/2024	y = 1.156x-2.437	0.996
R08	R08	06/11/2024	y = 1.163x-5.100	0.998
R09	R09	01/11/2024	y = 1.142x-4.291	0.996
R10	R10	01/11/2024	y = 1.184x-4.270	0.999
R11	R11	01/11/2024	y = 1.140x-1.292	0.997
R12	R12	01/11/2024	y = 1.182x-4.934	0.998
R13	R13	05/11/2024	y = 1.130x-1.455	0.997
R14	R14	04/11/2024	y = 1.177x-4.675	0.996
R15	R15	04/11/2024	y = 1.144x-4.059	0.998
R16	R16	01/11/2024	y = 1.163x-2.835	0.997
R17	R17	04/11/2024	y = 1.178x-3.580	0.996
R18	R18	04/11/2024	y = 1.136x-3.484	0.997
R19	R19	06/11/2024	y = 1.166x-4.037	0.996
R20	R20	06/11/2024	y = 1.152x-4.500	0.997

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)





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## CALIBRATION REPORT

### CHEMILUMINESCENT NO / NO<sub>2</sub> / NO<sub>x</sub> ANALYZER

DATE : 12 November 2024

BRAND : API

MODEL : 200E

NO. NOX-R04

SERIAL NO. 4411

#### Calibrator (Dilution System)

Brand : API

Model : 700

Last Cal. Date : 05 August 2024

Serial No. : 911

#### Reference Standard Gas

Standard Gas : Nitric Oxide (NO)

Cylinder No. : A00726SV

Certified Date : 05 January 2023

Expired Date : 05 January 2026

Cylinder Conc. : 48.8 ppm

#### CALIBRATING CONDITION

Pressure 1011 mmbar

Temp. 24.6 °C

% RH 48

#### CALIBRATION SETTING

Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
NO Span	400	399.7	-0.075	400.0	1.005
NO <sub>x</sub> Span	400	400.1	0.025	400.0	1.009

#### API Model 200E NO<sub>x</sub> Analyzer Check List

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	500 standard
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air
SAMPLE FLOW	510	cc/min	500 ± 50
OZONE FLOW	79	cc/min	80 ± 15
PMT	103.4	mV	-20 - 150
AZERO	94.1	mV	-20 - 150
HVPS	674	V	420 - 900 constant
RCELL TEMP	50.2	°C	50 ± 1
BOX TEMP	29.3	°C	8 - 48
PMT TEMP	7.1	°C	7 ± 2
MOLY TEMP	314.8	°C	315 ± 5
RCELL PRESS	8.3	IN-Hg-A	2 - 10 constant
SAMPLE PRESS	28.5	IN-Hg-A	25 - 30 constant
NO Span Conc	400	PPB	20 - 20,000
NO <sub>x</sub> Span Conc	400	PPB	20 - 20,000
NO Slope	1.005	-	1.0 ± 0.3
NO <sub>x</sub> Slope	1.009	-	1.0 ± 0.3
NO Offset	1.2	mV	-20 to +150
NO <sub>x</sub> Offset	0.8	mV	-20 to 150
Stability at Zero	0.1	PPB	< 0.2
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas

Calibrated by :

Adul Dangklom

(Mr.Adul Dangklom)

Approved by :

Peera Detudom

(Mr.Peera Detudom)



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Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO <sub>2</sub> / NO <sub>x</sub> ANALYZER					
DATE :	12 November 2024	BRAND :	API	MODEL :	200E
NO.	NOX-R09	SERIAL NO.	252		
Calibrator (Dilution System)					
Brand	: API			Model	: 700
Last Cal. Date	: 05 August 2024			Serial No.	: 911
Reference Standard Gas					
Standard Gas	: Nitric Oxide (NO)			Cylinder No.	: A00726SV
Certified Date	: 05 January 2023		Expired Date	: 05 January 2026	
				Cylinder Conc.	: 48.8 ppm
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.6	°C
			% RH	48	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.11	-	0	-
NO Span	400	400.1	0.025	400.0	1.008
NO <sub>x</sub> Span	400	400.3	0.075	400.0	1.012
API Model 200E NO <sub>x</sub> Analyzer Check List					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	506	cc/min	500 ± 50		
OZONE FLOW	78	cc/min	80 ± 15		
PMT	103.2	mV	-20 - 150		
AZERO	94.0	mV	-20 - 150		
HVPS	672	V	420 - 900 constant		
RCELL TEMP	50.0	°C	50 ± 1		
BOX TEMP	29.4	°C	8 - 48		
PMT TEMP	7.2	°C	7 ± 2		
MOLY TEMP	315.2	°C	315 ± 5		
RCELL PRESS	8.4	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.6	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO <sub>x</sub> Span Conc	400	PPB	20 - 20,000		
NO Slope	1.008	-	1.0 ± 0.3		
NO <sub>x</sub> Slope	1.012	-	1.0 ± 0.3		
NO Offset	1.6	mV	-20 to +150		
NO <sub>x</sub> Offset	1.0	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

Peer Detudom  
(Mr.Peera Detudom)





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## CALIBRATION REPORT

### CHEMILUMINESCENT NO / NO<sub>2</sub> / NO<sub>x</sub> ANALYZER

DATE : 12 November 2024

BRAND : API

MODEL : 200E

NO. NOX-R11

SERIAL NO. 2621

#### Calibrator (Dilution System)

Brand : API

Model : 700

Last Cal. Date : 05 August 2024

Serial No. : 911

#### Reference Standard Gas

Standard Gas : Nitric Oxide (NO)

Cylinder No. : A00726SV

Certified Date : 05 January 2023

Expired Date : 05 January 2026

Cylinder Conc. : 48.8 ppm

#### CALIBRATING CONDITION

Pressure 1011 mmbar

Temp. 24.6 °C

% RH 48

#### CALIBRATION SETTING

Span Set Point	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	399.6	-0.100	400.0	1.004
NO <sub>x</sub> Span	400	399.9	-0.025	400.0	1.008

#### API Model 200E NO<sub>x</sub> Analyzer Check List

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	500 standard
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air
SAMPLE FLOW	504	cc/min	500 ± 50
OZONE FLOW	78	cc/min	80 ± 15
PMT	103.1	mV	-20 - 150
AZERO	93.8	mV	-20 - 150
HVPS	670	V	420 - 900 constant
RCELL TEMP	50.3	°C	50 ± 1
BOX TEMP	29.5	°C	8 - 48
PMT TEMP	7.4	°C	7 ± 2
MOLY TEMP	314.9	°C	315 ± 5
RCELL PRESS	8.5	IN-Hg-A	2 - 10 constant
SAMPLE PRESS	28.7	IN-Hg-A	25 - 30 constant
NO Span Conc	400	PPB	20 - 20,000
NO <sub>x</sub> Span Conc	400	PPB	20 - 20,000
NO Slope	1.004	-	1.0 ± 0.3
NO <sub>x</sub> Slope	1.008	-	1.0 ± 0.3
NO Offset	1.1	mV	-20 to +150
NO <sub>x</sub> Offset	0.7	mV	-20 to 150
Stability at Zero	0.1	PPB	< 0.2
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas

Calibrated by :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

Peera Detudom  
(Mr.Peera Detudom)



**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 : 24M2227

REFERENCE No : 72448-1

PAGE : 1 OF 2

**Certificate of Calibration**

**EQUIPMENT** : DIGITAL BALANCE

**MANUFACTURER** : METTLER TOLEDO

**MODEL** : XS105DU

**SERIAL No** : 1126422905

**ID No** : BA05/50

**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** : 08-Mar-24

**APPROVED BY** :   
PONGSAK J.

**ISSUED DATE** : 14-Mar-24

**RECEIVED DATE** : 08-Mar-24

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





CERTIFICATE No : 24M2227

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : XS105DU  
MANUFACTURER : METTLER TOLEDO S/N : 1126422905  
ID No : BA05/50 RECEIVED DATE : 08-Mar-24  
AIR PRESSURE : 1010mbar  $\pm$  1mbar CALIBRATION DATE : 08-Mar-24  
AMBIENT TEMPERATURE : 25°C  $\pm$  1°C RELATIVE HUMIDITY : 53 %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	M2302013S	02-Feb-25
2) STANDARD WEIGHT	E2	15843	M2302014S	02-Feb-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 CENTRAL BUREAU OF WEIGHTS&MEASURES

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

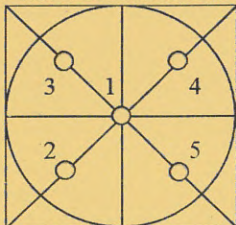
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0.000055 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY ( $\pm$ g)
0.00	0.00000	0.00000	0.000065
0.02	0.02001	-0.00001	0.000065
0.10	0.10002	-0.00002	0.000066
0.20	0.20001	-0.00001	0.000066
0.50	0.50001	-0.00001	0.000065
1.00	1.00003	-0.00003	0.000066
2.00	2.00001	-0.00001	0.000067
5.00	5.00001	-0.00001	0.000068
10.00	9.99994	0.00006	0.000070
20.00	20.00008	-0.00008	0.000078
50.00	50.0000	0.0000	0.00013
100.00	100.0001	-0.0001	0.00019
120.00	120.0001	-0.0001	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

ภาคผนวกที่ 4-2

คุณภาพอากาศจากปล่องระบาย





บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด  
S.P.S. CONSULTING SERVICE CO., LTD.  
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900  
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900  
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

## Console Calibration Report

Calibration Method

Critical Orifices

### Calibration Data

Console Data		Calibration Data		
No.	Serial No.	Date	y	$\Delta H_{\text{H}_2\text{O}}$ (mmH <sub>2</sub> O)
B01	1563	02/09/2024	0.998	50.16
B02	8002514	04/09/2024	1.002	50.08
B03	1503016	02/09/2024	1.005	50.02
B04	00006659	03/09/2024	0.997	49.84
B05	00007428	02/09/2024	1.003	49.95
R01	1561	03/09/2024	0.998	50.11
R02	8002513	04/09/2024	0.997	49.97
R03	1570	03/09/2024	1.004	49.82
R04	8002519	02/09/2024	0.996	49.74
R05	1503015	04/09/2024	0.999	49.88

Remark : Accept Value of y (test) is  $0.97 < y < 1.03$

Accept Value of  $\Delta H_{\text{H}_2\text{O}}$  (test) is  $46.7 \pm 6.4$  (mmH<sub>2</sub>O)

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

S.P.S. CONSULTING SERVICE CO., LTD.

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Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

## Pitot Tube Calibration Report

Calibration Method

Standard Pitot Tube

### Calibration Data

Pitot Tube Data			Calibration Data		
No.	Type of Pitot	Coefficient of Standard Pitot	Date	Avg. of Cp (test)	
				Side A	Side B
B36	S	0.99	04/11/2024	0.84	0.84
B37	S	0.99	04/11/2024	0.84	0.84
B38	S	0.99	04/11/2024	0.85	0.84
B39	S	0.99	05/11/2024	0.84	0.84
B40	S	0.99	05/11/2024	0.84	0.83
B41	S	0.99	01/11/2024	0.85	0.84
B44	S	0.99	01/11/2024	0.84	0.84
B45	S	0.99	04/11/2024	0.84	0.84
B46	S	0.99	05/11/2024	0.85	0.84
B47	S	0.99	05/11/2024	0.84	0.84
B48	S	0.99	05/11/2024	0.84	0.83
B49	S	0.99	05/11/2024	0.84	0.84
B54	S	0.99	05/11/2024	0.85	0.84
B56	S	0.99	05/11/2024	0.84	0.83
B57	S	0.99	01/11/2024	0.84	0.85
B58	S	0.99	01/11/2024	0.83	0.84

Remark : Accept value of Cp (test) is  $0.84 \pm 0.01$

Calibrated by

:

Adul Dangklom

(Mr. Adul Dangklom)

Approved by :

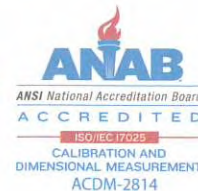
Peera Detudom

(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 : VACUUM GAUGE  
MANUFACTURER : HI-LIGHT  
MODEL / TYPE : N/A  
SERIAL NO. : N/A[64-220066-3]  
CLID. NO. : 212201114  
JOB CONTROL NO. : 240720076546  
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

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

DATE OF RECEIVED : 20 July 2024

DATE OF ISSUED : 23 July 2024

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Sittipong Pimdee  
Calibration Engineer

Approved By : Mongkol Yotsoontorn  
Authorized Signatory  
23 July 2024



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. Q24076546

F3-011-05/12-23

page 1 of 3



@clccalibration



## REPORT OF CALIBRATION

### FOR

NOMENCLATURE	:	VACUUM GAUGE
MANUFACTURER	:	HI-LIGHT
MODEL / TYPE	:	N/A
SERIAL NO.	:	N/A[64-220066-3]
DATE OF CALIBRATION	:	22 July 2024
DUE DATE OF CALIBRATION	:	22 July 2025

#### ENVIRONMENT CONDITIONS :

Temperature :  $(23 \pm 2) ^\circ\text{C}$

Relative Humidity :  $(55 \pm 10) \% \text{RH}$

#### PROCEDURE USED :

This instrument was calibrated under procedure No. **CLC-CPPP-05** according to **DKD-R 6-1** as calibration guidelines.

The calibration was performed by direct measurement with Document Process Calibrator and Pressure Module which maintained by the Calibration Laboratory Co., Ltd.

#### REFERENCE STANDARD USED :

Document Process Calibrator, Fluke Model 741B S/N. 8295020 with Pressure Module Model 700PD5 S/N. 89404505.

#### TRACEABILITY :

The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand).  
Certificate No. MP-0040-24, Due Date 08 February 2025.

#### UNCERTAINTY :

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor of  $k = 2$ . It has been evaluated according to the "Calibration of Pressure Gauges (DKD-R 6-1)" which provides a level of confidence approximately 95%.

Certificate No. Q24076546

F3-011-05/12-23

page 2 of 3



## CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

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

The DUC was exercised by applying a known pressure from its zero to full scale 1 times. Then 2 series of known gauge pressure were applied. The STD reading were recorded and the means value were reported in the table below.

### CALIBRATION DATA

#### CORRECTION OF PRESSURE

DUC Test point ( inHg )	STD Reading ( kPa )		Conversion to inHg		Correction ( inHg )	
	Up	Down	Up	Down	Up	Down
0	0.00	0.00	0.0	0.0	0.0	0.0
-5	-17.95	-17.95	-5.3	-5.3	-0.3	-0.3
-10	-34.88	-34.88	-10.3	-10.3	-0.3	-0.3
-15	-51.47	-51.81	-15.2	-15.3	-0.2	-0.3
-20	-68.06	-68.40	-20.1	-20.2	-0.1	-0.2
-25	-84.99	-84.99	-25.1	-25.1	-0.1	-0.1
-30	-101.58	-101.58	-30.0	-30.0	0.0	0.0

Uncertainty of measurement  $\pm 0.2$  inHg

Transmitting fluid : Air.

Technical Note. Conversion factor 1 kPa ; 0.2953003 inHg

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 43 of 67

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

### End of Certificate ###

Certificate No. Q24076546

F3-011-05/12-23

page 3 of 3







บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด  
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Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com., www.spscon.com

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 131614

Environmental Conditions

Temperature : 25 ± 3 °C  
Pressure : 1010 ± 15 mmbar

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (mL/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R <sup>2</sup>
B41	SKC	224-PCXR4	612669	02/10/2024	1,000	1,500	2,000	1,010	1,497	2,001	0.994x + 9.527	1.000
B42	SKC	224-PCXR4	626041	04/10/2024	1,000	1,500	2,000	998	1,507	2,005	1.009x - 14.416	0.999
B43	SKC	224-PCXR4	034636	03/10/2024	1,000	1,500	2,000	1,005	1,494	2,001	0.995x + 6.369	1.000
B44	SKC	224-PCXR8	529341	03/10/2024	1,000	1,500	2,000	1,010	1,494	2,000	0.990x + 14.704	1.000
B45	SKC	224-PCXR8	529594	02/10/2024	1,000	1,500	2,000	1,014	1,504	2,010	0.997x + 11.890	1.000
B46	SKC	224-PCXR8	566743	04/10/2024	1,000	1,500	2,000	1,006	1,514	2,009	1.002x - 1.391	0.999
B47	SKC	224-PCXR8	566747	02/10/2024	1,000	1,500	2,000	1,000	1,513	2,009	1.009x - 11.714	1.000
B48	SKC	224-PCXR8	566753	04/10/2024	1,000	1,500	2,000	1,020	1,513	2,012	0.995x + 15.140	0.999
B49	SKC	224-PCXR8	566780	04/10/2024	1,000	1,500	2,000	999	1,498	2,000	1.000x + 0.144	1.000
B50	SKC	224-PCXR8	500400	04/10/2024	1,000	1,500	2,000	1,000	1,508	2,006	1.004x - 5.541	1.000
B51	SKC	224-PCXR8	500363	04/10/2024	1,000	1,500	2,000	996	1,506	2,005	1.007x - 10.582	1.000
B52	SKC	224-PCXR8	093186	03/10/2024	1,000	1,500	2,000	998	1,509	2,003	1.006x - 10.386	1.000
B53	SKC	224-PCXR8	707670	03/10/2024	1,000	1,500	2,000	1,000	1,493	1,996	0.994x + 4.977	0.999
B54	SKC	224-PCXR3	509821	02/10/2024	1,000	1,500	2,000	1,001	1,493	2,008	1.006x - 9.295	1.000
B55	SKC	224-PCXR3	510710	04/10/2024	1,000	1,500	2,000	999	1,508	2,004	1.005x - 8.519	1.000
B56	SKC	224-PCXR3	511450	03/10/2024	1,000	1,500	2,000	1,003	1,502	2,012	1.008x - 10.418	1.000
B57	SKC	224-PCXR3	510798	02/10/2024	1,000	1,500	2,000	997	1,503	2,005	1.009x - 15.639	1.000
B58	SKC	224-PCXR3	509852	02/10/2024	1,000	1,500	2,000	1,016	1,517	2,008	0.994x + 13.453	0.999
B59	SKC	224-PCXR3	509862	04/10/2024	1,000	1,500	2,000	999	1,511	2,010	1.010x - 14.912	0.999
B60	SKC	224-PCXR3	512655	02/10/2024	1,000	1,500	2,000	1,009	1,514	1,996	0.992x + 12.737	0.999
B61	SKC	224-PCXR3	503915	04/10/2024	1,000	1,500	2,000	1,005	1,503	2,006	1.011x - 15.735	0.999
B62	SKC	224-PCXR3	505975	03/10/2024	1,000	1,500	2,000	1,006	1,513	2,008	1.002x - 0.788	0.999
B63	SKC	224-PCXR3	511432	02/10/2024	1,000	1,500	2,000	1,020	1,513	2,013	0.995x + 14.152	0.999
B64	SKC	224-PCXR3	508302	04/10/2024	1,000	1,500	2,000	1,000	1,508	2,007	1.004x - 5.189	1.000
B65	SKC	224-PCXR3	508310	02/10/2024	1,000	1,500	2,000	997	1,514	2,005	1.006x - 7.652	1.000
B66	SKC	224-PCXR3	509861	04/10/2024	1,000	1,500	2,000	996	1,499	2,003	1.009x - 13.421	1.000
B67	SKC	224-PCXR3	506295	03/10/2024	1,000	1,500	2,000	998	1,510	2,004	1.010x - 17.666	0.999
B68	SKC	224-PCXR3	505872	03/10/2024	1,000	1,500	2,000	998	1,494	1,997	0.996x + 2.043	1.000
B69	SKC	224-PCXR3	508375	04/10/2024	1,000	1,500	2,000	996	1,499	2,003	1.004x - 4.961	1.000
B70	SKC	224-PCXR3	510623	03/10/2024	1,000	1,500	2,000	1,002	1,504	2,000	1.002x - 1.959	1.000
B71	SKC	224-PCXR3	508367	03/10/2024	1,000	1,500	2,000	996	1,503	1,999	1.003x - 5.913	1.000
B72	SKC	224-PCXR3	505977	04/10/2024	1,000	1,500	2,000	997	1,499	1,996	0.998x - 0.140	1.000
B73	SKC	224-PCXR3	512606	02/10/2024	1,000	1,500	2,000	1,005	1,504	2,007	1.008x - 11.262	1.000
B74	SKC	224-PCXR3	505993	03/10/2024	1,000	1,500	2,000	998	1,504	2,002	1.005x - 10.110	1.000
B75	SKC	224-PCXR3	509820	02/10/2024	1,000	1,500	2,000	1,004	1,503	2,007	1.009x - 12.679	1.000
B76	SKC	224-PCXR3	509811	04/10/2024	1,000	1,500	2,000	1,005	1,493	2,003	0.997x + 5.309	1.000
B77	SKC	224-PCXR3	508301	02/10/2024	1,000	1,500	2,000	998	1,495	2,002	1.002x - 3.498	1.000
B78	SKC	224-PCXR3	510677	03/10/2024	1,000	1,500	2,000	1,015	1,505	2,010	1.003x - 0.420	0.999
B79	SKC	224-PCXR3	510920	04/10/2024	1,000	1,500	2,000	999	1,493	2,004	1.008x - 14.332	1.000

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

Rotameter Calibration Report (For Personal Pump High Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Calibration Data

Rotameter Data			Calibration Data								
No.	Brand	Model	Date	Flow Rate (mL/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R <sup>2</sup>
H-R01	Dwyer	VFB-65	03/10/2024	500	1,000	2,000	500.9	1000.8	1994.3	1.003x + 0.055	1.000
H-R02	Dwyer	VFB-65	01/10/2024	500	1,000	2,000	500.1	998.9	1992.4	1.002x - 3.472	0.999
H-R03	Dwyer	VFB-65	02/10/2024	500	1,000	2,000	501.6	999.3	2001.6	0.994x + 6.383	1.000
H-R04	Dwyer	VFB-65	03/10/2024	500	1,000	2,000	503.3	999.8	1993.2	1.001x - 1.914	0.999
H-R05	Dwyer	VFB-65	01/10/2024	500	1,000	2,000	500.2	1002.6	2000.4	1.002x - 0.160	1.000
H-R06	Dwyer	VFB-65	02/10/2024	500	1,000	2,000	503.1	1002.8	1999.6	0.999x + 5.589	1.000

Calibrated by :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



**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 : 24M2227

REFERENCE No : 72448-1

PAGE : 1 OF 2

**Certificate of Calibration**

**EQUIPMENT** : DIGITAL BALANCE

**MANUFACTURER** : METTLER TOLEDO

**MODEL** : XS105DU

**SERIAL No** : 1126422905

**ID No** : BA05/50

**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** : 08-Mar-24

**APPROVED BY** :   
PONGSAK J.

**ISSUED DATE** : 14-Mar-24

**RECEIVED DATE** : 08-Mar-24

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





CERTIFICATE No : 24M2227

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : XS105DU  
MANUFACTURER : METTLER TOLEDO S/N : 1126422905  
ID No : BA05/50 RECEIVED DATE : 08-Mar-24  
AIR PRESSURE : 1010mbar  $\pm$  1mbar CALIBRATION DATE : 08-Mar-24  
AMBIENT TEMPERATURE : 25°C  $\pm$  1°C RELATIVE HUMIDITY : 53 %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	M2302013S	02-Feb-25
2) STANDARD WEIGHT	E2	15843	M2302014S	02-Feb-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 CENTRAL BUREAU OF WEIGHTS&MEASURES

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

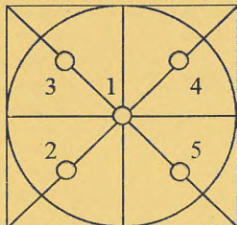
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0.000055 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY ( $\pm$ g)
0.00	0.00000	0.00000	0.000065
0.02	0.02001	-0.00001	0.000065
0.10	0.10002	-0.00002	0.000066
0.20	0.20001	-0.00001	0.000066
0.50	0.50001	-0.00001	0.000065
1.00	1.00003	-0.00003	0.000066
2.00	2.00001	-0.00001	0.000067
5.00	5.00001	-0.00001	0.000068
10.00	9.99994	0.00006	0.000070
20.00	20.00008	-0.00008	0.000078
50.00	50.0000	0.0000	0.00013
100.00	100.0001	-0.0001	0.00019
120.00	120.0001	-0.0001	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



**Cert. No. : SP24020**

**Pages 1 of 3**

## Calibration Certificate

**Equipment :** UV-VIS SPECTROPHOTOMETER

**Manufacturer :** PERKINELMER

**Model :** LAMBDA 25

**Serial No.:** 501S14123010

**ID No.:** SP03/58

**Calibration Mode :** WAVELENGTH ACCURACY  
PHOTOMETRIC ACCURACY

**Condition As Found :** GOOD

**Customer :** S.P.S. CONSULTING SERVICE CO., LTD.  
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN ROAD,  
CHOMPHON, CHATUCHAK,  
BANGKOK 10900, THAILAND.

**Location :** WET CHEMISTRY LABORATORY IV

**Ambient Temperature :** ( 28.1  $\pm$  5 ) °C

**Relative Humidity :** ( 47.2  $\pm$  25 ) %

**Received Date :** 27 AUGUST 2024

**Calibration Date :** 27 AUGUST 2024

**Date of Issue :** 27 AUGUST 2024

**Calibrated by :** Nathakorn Pisutpaisan

**Approved by :**

  
( Thanakul Petchurai )

# SITHIPORN ASSOCIATES CO., LTD.

## CALIBRATION LABORATORY

451-451/1 Sirinthorn Road, Bangbunru, Bangplud, Bangkok, 10700 Thailand  
Tel. +66 2433 8331 Email : calibration@sithiporn.com

SITHIPORN  
associates



Cert. No. : SP24020

Job No. : VC67SP0013

Pages : 2 of 3

### Calibration Method :

This instrument was calibrated by using on-site calibration procedure In-house method : CP-SP-01

The calibration procedure to direct measurement wavelength accuracy by using wavelength standard solution, Photometric accuracy by using absorbance standard filter and absorbance standard solution

The calibration procedure used was based on ASTM E275-01, ASTM E925-02

### Condition of this result of calibration :

#### 1. Certified reference materials

Material	Ref. type	Cell serial No.	Cert. No.	Due Date
Holmium liquid	RM-HL	29706	106864	01/11/2024
Didymium liquid	RM-DL	28912	106905	02/11/2024
Neutral density filter	RM-1N2N3N	13877	106918	03/11/2024
Potassium dichromate solutions	RM-0204060810	14204	106902	02/11/2024
Potassium Iodide solution	-	KI-0701-001	CI-0185-24	14/05/2026

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

3. This certificate is traceable to the international system of unit maintained at :

3.1 The UK National Physical Laboratory (NPL)

3.2 The National Institute of Standards and Technology, NIST.

### Result of calibration : Wavelength Accuracy

(Without adjustment)

Material	Certified Values of Reference Material (nm)	UUC* Reading (nm)	Error (nm)	Uncertainty ± (nm)	k Factor
RM-HL	278.13	278.3	0.17	0.16	2.00
	361.25	361.4	0.15	0.16	2.00
	467.82	467.7	-0.12	0.16	2.00
	536.56	536.5	-0.06	0.16	2.00
	640.50	640.4	-0.10	0.16	2.00
RM-DL	740.09	739.9	-0.19	0.16	2.00
	864.94	865.2	0.26	0.16	2.00

UUC\* = Unit Under Calibration

*G. Petch*

# SITHIPORN ASSOCIATES CO., LTD.

## CALIBRATION LABORATORY

451-451/1 Sirinthorn Road, Bangbunru, Bangplud, Bangkok, 10700 Thailand  
Tel. +66 2433 8331 Email : calibration@sithiporn.com

SITHIPORN  
associates



Cert. No. : SP24020

Job No. : VC67SP0013

Pages : 3 of 3

### Result of calibration : Photometric Accuracy

(Without adjustment)

Material	Wavelength (nm)	Filter S/N	Nominal Absorbance (A)	Certified Absorbance (A)	UUC* Reading Absorbance (A)	Error (A)	Uncertainty ± (A)	k Factor
Neutral Density glass filter	440.0	29360	1.0	1.0517	1.0550	0.0033	0.0029	2.00
		29914	0.7	0.7445	0.7460	0.0015	0.0029	2.00
		29381	0.5	0.5416	0.5431	0.0015	0.0030	2.00
	546.1	29360	1.0	0.9821	0.9820	-0.0001	0.0028	2.00
		29914	0.7	0.6961	0.6958	-0.0003	0.0028	2.00
		29381	0.5	0.5073	0.5080	0.0007	0.0029	2.00
	590.0	29360	1.0	1.0222	1.0210	-0.0012	0.0028	2.00
		29914	0.7	0.7237	0.7221	-0.0016	0.0029	2.00
		29381	0.5	0.5361	0.5361	0.0000	0.0031	2.00
	635.0	29360	1.0	0.9753	0.9745	-0.0008	0.0028	2.00
		29914	0.7	0.6910	0.6900	-0.0010	0.0029	2.00
		29381	0.5	0.5211	0.5210	-0.0001	0.0032	2.00
Material	Wavelength (nm)	Solution (mg/l)	Certified Absorbance (A)	UUC* Reading Absorbance (A)	Error (A)	Uncertainty ± (A)	k Factor	
RM-0204060810	235.0	20	0.2422	0.2418	-0.0004	0.0101	2.00	
		40	0.4866	0.4852	-0.0014	0.0115	2.00	
		60	0.7414	0.7389	-0.0025	0.0067	2.00	
		80	0.9858	0.9842	-0.0016	0.0093	2.00	
		100	1.2442	1.2414	-0.0028	0.0086	2.00	

UUC\* = Unit Under Calibration

### Condition of this result of calibration : Spectrophotometer PERKINELMER Model Lambda 25 S/N 501S14123010

Resolution of Wavelength Mode	0.1 nm
Resolution of Photometric Mode	0.0001 A
Parameter Setting	
Measurement Mode	Wavelength, Absorbance
Wavelength Scan	1100 nm-190 nm
Scanning Speed	7.5 nm/min
Data Pitch	0.1 nm
Band width(Wavelength)	1.0 nm
Band width(Vis)	1.0 nm
Band width(Uv)	1.0 nm

Stray Light** UUC* Reading at 220 nm	
Transmission T(%)	Absorbance(A)
0.0117	3.8659

\*\*Specific Acceptance :

Transmission  $\leq$  1.0 T(%), Absorbance  $\geq$  2.0 A

\*\*Stray light not TISI Accredited

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

End of Calibration Certificate

*T. Ketch*





## Certificate of Calibration

### Aquion: Anion (ID#894)

This certificate is to verify that instrument below are calibrated  
by Archemica Lab Co.,Ltd.

AQUION S/N : 190840059

AS-DV S/N : 190915235

for

**S.P.S. Consulting Service Co., Ltd.**



บริษัท อาร์เคมีกา แล็บ จำกัด  
ARCHEMICA LAB CO.,LTD.

Operator Signature: \_\_\_\_\_

Date: June 24, 2024

(Mr. Ponwut Kornthongnimit)

Test Engineer

ภาคผนวกที่ 4-3

คุณภาพอากาศในสถานประกอบการ



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด  
S.P.S. CONSULTING SERVICE CO., LTD.  
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900  
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900  
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Environmental Conditions

Temperature : 25  $\pm$  3  $^{\circ}$ C  
Pressure : 1010  $\pm$  15 mmbar

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (mL/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R <sup>2</sup>
B01	SKC	224-PCXR4	262101	03/10/2024	1,000	1,500	2,000	1,006	1,505	2,012	1.013x - 17.267	0.999
B02	SKC	224-PCXR4	626166	03/10/2024	1,000	1,500	2,000	998	1,500	1,995	1.000x - 2.067	1.000
B03	SKC	224-PCXR4	612968	02/10/2024	1,000	1,500	2,000	1,005	1,494	2,006	0.998x + 4.721	0.999
B04	SKC	224-PCXR4	602804	03/10/2024	1,000	1,500	2,000	996	1,511	2,007	1.012x - 19.485	0.999
B05	SKC	224-PCXR4	612693	02/10/2024	1,000	1,500	2,000	1,005	1,504	2,008	1.004x - 4.306	1.000
B06	SKC	224-PCXR4	262188	02/10/2024	1,000	1,500	2,000	1,013	1,505	2,008	0.996x + 6.748	0.999
B07	SKC	224-PCXR4	626262	02/10/2024	1,000	1,500	2,000	1,005	1,506	2,010	1.011x - 12.753	1.000
B08	SKC	224-PCXR4	626100	03/10/2024	1,000	1,500	2,000	1,000	1,498	1,993	0.995x + 5.105	1.000
B09	SKC	224-PCXR4	626479	02/10/2024	1,000	1,500	2,000	1,005	1,494	2,002	0.996x + 5.969	1.000
B10	SKC	224-PCXR4	091950	02/10/2024	1,000	1,500	2,000	1,004	1,504	2,008	1.011x - 15.436	1.000
B11	SKC	224-PCXR8	564315	03/10/2024	1,000	1,500	2,000	1,010	1,497	2,001	0.993x + 10.007	1.000
B12	SKC	224-PCXR4	034656	04/10/2024	1,000	1,500	2,000	998	1,507	2,005	1.013x - 22.552	0.999
B13	SKC	224-PCXR4	602073	03/10/2024	1,000	1,500	2,000	1,001	1,494	2,000	0.998x + 1.307	1.000
B14	SKC	224-PCXR4	626313	03/10/2024	1,000	1,500	2,000	1,014	1,504	2,013	0.999x + 8.699	1.000
B15	SKC	224-PCXR4	626474	03/10/2024	1,000	1,500	2,000	1,006	1,513	2,008	1.002x - 0.788	0.999
B16	SKC	224-PCXR4	626477	03/10/2024	1,000	1,500	2,000	1,001	1,514	2,009	1.009x - 11.678	1.000
B17	SKC	224-PCXR4	626860	02/10/2024	1,000	1,500	2,000	1,018	1,513	2,013	0.997x + 11.094	0.999
B18	SKC	224-PCXR4	691484	02/10/2024	1,000	1,500	2,000	999	1,498	1,999	1.000x + 0.668	1.000
B19	SKC	224-PCXR4	691599	03/10/2024	1,000	1,500	2,000	1,000	1,508	2,007	1.004x - 5.189	1.000
B20	SKC	224-PCXR4	691587	03/10/2024	1,000	1,500	2,000	997	1,514	2,005	1.010x - 12.129	1.000
B21	SKC	224-PCXR4	691531	04/10/2024	1,000	1,500	2,000	996	1,499	2,000	1.001x - 1.875	1.000
B22	SKC	224-PCXR4	691654	03/10/2024	1,000	1,500	2,000	999	1,508	2,006	1.008x - 13.641	1.000
B23	SKC	224-PCXR4	798393	03/10/2024	1,000	1,500	2,000	1,001	1,494	1,995	0.996x + 3.954	1.000
B24	SKC	224-PCXR4	626363	02/10/2024	1,000	1,500	2,000	999	1,492	2,003	1.001x - 3.994	1.000
B25	SKC	224-PCXR4	798489	03/10/2024	1,000	1,500	2,000	1,001	1,501	1,995	0.993x + 10.846	1.000
B26	SKC	224-PCXR4	798479	03/10/2024	1,000	1,500	2,000	996	1,507	2,004	1.007x - 13.888	1.000
B27	SKC	224-PCXR4	691673	03/10/2024	1,000	1,500	2,000	1,006	1,505	2,009	1.010x - 14.064	0.999
B28	SKC	224-PCXR4	691570	03/10/2024	1,000	1,500	2,000	996	1,510	2,008	1.012x - 19.941	0.999
B29	SKC	224-PCXR4	626472	03/10/2024	1,000	1,500	2,000	1,005	1,502	2,005	1.006x - 9.763	1.000
B30	SKC	224-PCXR4	691489	03/10/2024	1,000	1,500	2,000	1,004	1,501	2,008	1.009x - 13.737	1.000
B31	SKC	224-PCXR4	691509	03/10/2024	1,000	1,500	2,000	1,012	1,497	1,997	0.990x + 14.932	1.000
B32	SKC	224-PCXR4	091567	03/10/2024	1,000	1,500	2,000	1,010	1,510	2,008	1.003x - 3.978	0.999
B33	SKC	224-PCXR4	091756	02/10/2024	1,000	1,500	2,000	998	1,512	2,005	1.007x - 10.478	1.000
B34	SKC	224-PCXR4	612962	02/10/2024	1,000	1,500	2,000	999	1,504	2,000	1.001x - 0.963	1.000
B35	SKC	224-PCXR4	602682	02/10/2024	1,000	1,500	2,000	1,004	1,498	2,002	0.996x + 5.501	1.000
B36	SKC	224-PCXR4	626164	02/10/2024	1,000	1,500	2,000	1,008	1,507	2,004	1.000x + 2.331	1.000
B37	SKC	224-PCXR4	626256	04/10/2024	1,000	1,500	2,000	1,008	1,505	2,008	1.002x - 2.423	1.000
B38	SKC	224-PCXR4	626167	04/10/2024	1,000	1,500	2,000	997	1,499	1,998	1.001x - 2.994	1.000
B39	SKC	224-PCXR4	034637	04/10/2024	1,000	1,500	2,000	998	1,504	1,999	1.004x - 8.599	1.000
B40	SKC	224-PCXR4	798349	04/10/2024	1,000	1,500	2,000	1,001	1,500	1,994	0.999x - 2.619	1.000

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)





บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด  
S.P.S. CONSULTING SERVICE CO., LTD.  
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900  
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Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com., www.spscon.com

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 131614

Environmental Conditions

Temperature : 25  $\pm$  3  $^{\circ}$ C  
Pressure : 1010  $\pm$  15 mmbar

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (mL/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R <sup>2</sup>
B41	SKC	224-PCXR4	612669	02/10/2024	1,000	1,500	2,000	1,010	1,497	2,001	0.994x + 9.527	1.000
B42	SKC	224-PCXR4	626041	04/10/2024	1,000	1,500	2,000	998	1,507	2,005	1.009x - 14.416	0.999
B43	SKC	224-PCXR4	034636	03/10/2024	1,000	1,500	2,000	1,005	1,494	2,001	0.995x + 6.369	1.000
B44	SKC	224-PCXR8	529341	03/10/2024	1,000	1,500	2,000	1,010	1,494	2,000	0.990x + 14.704	1.000
B45	SKC	224-PCXR8	529594	02/10/2024	1,000	1,500	2,000	1,014	1,504	2,010	0.997x + 11.890	1.000
B46	SKC	224-PCXR8	566743	04/10/2024	1,000	1,500	2,000	1,006	1,514	2,009	1.002x - 1.391	0.999
B47	SKC	224-PCXR8	566747	02/10/2024	1,000	1,500	2,000	1,000	1,513	2,009	1.009x - 11.714	1.000
B48	SKC	224-PCXR8	566753	04/10/2024	1,000	1,500	2,000	1,020	1,513	2,012	0.995x + 15.140	0.999
B49	SKC	224-PCXR8	566780	04/10/2024	1,000	1,500	2,000	999	1,498	2,000	1.000x + 0.144	1.000
B50	SKC	224-PCXR8	500400	04/10/2024	1,000	1,500	2,000	1,000	1,508	2,006	1.004x - 5.541	1.000
B51	SKC	224-PCXR8	500363	04/10/2024	1,000	1,500	2,000	996	1,506	2,005	1.007x - 10.582	1.000
B52	SKC	224-PCXR8	093186	03/10/2024	1,000	1,500	2,000	998	1,509	2,003	1.006x - 10.386	1.000
B53	SKC	224-PCXR8	707670	03/10/2024	1,000	1,500	2,000	1,000	1,493	1,996	0.994x + 4.977	0.999
B54	SKC	224-PCXR3	509821	02/10/2024	1,000	1,500	2,000	1,001	1,493	2,008	1.006x - 9.295	1.000
B55	SKC	224-PCXR3	510710	04/10/2024	1,000	1,500	2,000	999	1,508	2,004	1.005x - 8.519	1.000
B56	SKC	224-PCXR3	511450	03/10/2024	1,000	1,500	2,000	1,003	1,502	2,012	1.008x - 10.418	1.000
B57	SKC	224-PCXR3	510798	02/10/2024	1,000	1,500	2,000	997	1,503	2,005	1.009x - 15.639	1.000
B58	SKC	224-PCXR3	509852	02/10/2024	1,000	1,500	2,000	1,016	1,517	2,008	0.994x + 13.453	0.999
B59	SKC	224-PCXR3	509862	04/10/2024	1,000	1,500	2,000	999	1,511	2,010	1.010x - 14.912	0.999
B60	SKC	224-PCXR3	512655	02/10/2024	1,000	1,500	2,000	1,009	1,514	1,996	0.992x + 12.737	0.999
B61	SKC	224-PCXR3	503915	04/10/2024	1,000	1,500	2,000	1,005	1,503	2,006	1.011x - 15.735	0.999
B62	SKC	224-PCXR3	505975	03/10/2024	1,000	1,500	2,000	1,006	1,513	2,008	1.002x - 0.788	0.999
B63	SKC	224-PCXR3	511432	02/10/2024	1,000	1,500	2,000	1,020	1,513	2,013	0.995x + 14.152	0.999
B64	SKC	224-PCXR3	508302	04/10/2024	1,000	1,500	2,000	1,000	1,508	2,007	1.004x - 5.189	1.000
B65	SKC	224-PCXR3	508310	02/10/2024	1,000	1,500	2,000	997	1,514	2,005	1.006x - 7.652	1.000
B66	SKC	224-PCXR3	509861	04/10/2024	1,000	1,500	2,000	996	1,499	2,003	1.009x - 13.421	1.000
B67	SKC	224-PCXR3	506295	03/10/2024	1,000	1,500	2,000	998	1,510	2,004	1.010x - 17.666	0.999
B68	SKC	224-PCXR3	505872	03/10/2024	1,000	1,500	2,000	998	1,494	1,997	0.996x + 2.043	1.000
B69	SKC	224-PCXR3	508375	04/10/2024	1,000	1,500	2,000	996	1,499	2,003	1.004x - 4.961	1.000
B70	SKC	224-PCXR3	510623	03/10/2024	1,000	1,500	2,000	1,002	1,504	2,000	1.002x - 1.959	1.000
B71	SKC	224-PCXR3	508367	03/10/2024	1,000	1,500	2,000	996	1,503	1,999	1.003x - 5.913	1.000
B72	SKC	224-PCXR3	505977	04/10/2024	1,000	1,500	2,000	997	1,499	1,996	0.998x - 0.140	1.000
B73	SKC	224-PCXR3	512606	02/10/2024	1,000	1,500	2,000	1,005	1,504	2,007	1.008x - 11.262	1.000
B74	SKC	224-PCXR3	505993	03/10/2024	1,000	1,500	2,000	998	1,504	2,002	1.005x - 10.110	1.000
B75	SKC	224-PCXR3	509820	02/10/2024	1,000	1,500	2,000	1,004	1,503	2,007	1.009x - 12.679	1.000
B76	SKC	224-PCXR3	509811	04/10/2024	1,000	1,500	2,000	1,005	1,493	2,003	0.997x + 5.309	1.000
B77	SKC	224-PCXR3	508301	02/10/2024	1,000	1,500	2,000	998	1,495	2,002	1.002x - 3.498	1.000
B78	SKC	224-PCXR3	510677	03/10/2024	1,000	1,500	2,000	1,015	1,505	2,010	1.003x - 0.420	0.999
B79	SKC	224-PCXR3	510920	04/10/2024	1,000	1,500	2,000	999	1,493	2,004	1.008x - 14.332	1.000

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)





บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด  
S.P.S. CONSULTING SERVICE CO., LTD.  
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900  
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900  
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Environmental Conditions

Temperature : 25  $\pm$  3  $^{\circ}$ C  
Pressure : 1010  $\pm$  15 mmbar

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (mL/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R <sup>2</sup>
B80	SKC	224-PCXR3	504569	03/10/2024	1,000	1,500	2,000	998	1,507	2,003	1.007x - 12.517	1.000
B81	SKC	224-PCXR3	503480	03/10/2024	1,000	1,500	2,000	997	1,496	1,997	1.001x - 3.994	1.000
B82	SKC	224-PCXR3	505673	03/10/2024	1,000	1,500	2,000	1,005	1,503	2,006	1.001x - 1.851	0.999
B83	SKC	224-PCXR3	510785	02/10/2024	1,000	1,500	2,000	1,001	1,505	2,000	0.999x + 0.108	1.000
B84	SKC	224-PCXR3	508333	02/10/2024	1,000	1,500	2,000	1,003	1,504	1,999	1.001x - 1.315	1.000
B85	SKC	224-PCXR3	505757	02/10/2024	1,000	1,500	2,000	1,003	1,506	2,001	1.003x - 1.855	1.000
B86	SKC	224-PCXR3	512625	04/10/2024	1,000	1,500	2,000	1,000	1,501	1,998	1.000x - 1.111	1.000
B87	SKC	224-PCXR3	504324	04/10/2024	1,000	1,500	2,000	999	1,509	2,007	1.009x - 15.683	0.999
B88	SKC	224-PCXR3	508307	04/10/2024	1,000	1,500	2,000	999	1,500	1,996	0.996x + 4.825	1.000
B89	SKC	224-PCXR3	509860	04/10/2024	1,000	1,500	2,000	1,002	1,503	2,006	1.008x - 10.170	1.000
B90	SKC	224-PCXR3	508366	02/10/2024	1,000	1,500	2,000	999	1,506	2,003	1.000x - 0.612	1.000
B91	SKC	224-PCXR3	510919	02/10/2024	1,000	1,500	2,000	1,011	1,504	2,001	0.991x + 17.894	1.000
B92	SKC	224-PCXR3	510987	03/10/2024	1,000	1,500	2,000	1,004	1,505	2,008	1.008x - 10.210	1.000
B93	SKC	224-PCXR3	509845	03/10/2024	1,000	1,500	2,000	1,005	1,505	2,005	1.005x - 5.793	1.000
B94	SKC	224-PCXR8	A127871	03/10/2024	1,000	1,500	2,000	1,003	1,503	2,001	1.003x - 3.458	1.000
B95	SKC	224-PCXR8	A127921	01/10/2024	1,000	1,500	2,000	998	1,506	2,006	1.008x - 11.706	1.000
B96	SKC	224-PCXR8	A127942	01/10/2024	1,000	1,500	2,000	1,003	1,502	2,000	0.999x + 2.679	1.000
B97	SKC	224-PCXR8	A127955	01/10/2024	1,000	1,500	2,000	1,004	1,505	2,008	1.010x - 12.557	1.000
B98	SKC	224-PCXR8	A127956	01/10/2024	1,000	1,500	2,000	998	1,497	2,001	1.004x - 8.311	1.000

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

S.P.S. CONSULTING SERVICE CO., LTD.

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

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

Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

Rotameter Calibration Report (For Personal Pump High Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Calibration Data

Rotameter Data			Calibration Data								
No.	Brand	Model	Date	Flow Rate (mL/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R <sup>2</sup>
H-R01	Dwyer	VFB-65	03/10/2024	500	1,000	2,000	500.9	1000.8	1994.3	1.003x + 0.055	1.000
H-R02	Dwyer	VFB-65	01/10/2024	500	1,000	2,000	500.1	998.9	1992.4	1.002x - 3.472	0.999
H-R03	Dwyer	VFB-65	02/10/2024	500	1,000	2,000	501.6	999.3	2001.6	0.994x + 6.383	1.000
H-R04	Dwyer	VFB-65	03/10/2024	500	1,000	2,000	503.3	999.8	1993.2	1.001x - 1.914	0.999
H-R05	Dwyer	VFB-65	01/10/2024	500	1,000	2,000	500.2	1002.6	2000.4	1.002x - 0.160	1.000
H-R06	Dwyer	VFB-65	02/10/2024	500	1,000	2,000	503.1	1002.8	1999.6	0.999x + 5.589	1.000

Calibrated by :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

S.P.S. CONSULTING SERVICE CO., LTD.

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

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

Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com., www.spscon.com

Rotameter Calibration Report (For Personal Pump Low Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Calibration Data

Rotameter Data			Calibration Data								
No.	Brand	Model	Date	Flow Rate (ml/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R <sup>2</sup>
L-R01	Dwyer	VFA-21	03/10/2024	50	100	200	50.3	101.1	201.1	1.006x - 0.517	0.999
L-R02	Dwyer	VFA-21	01/10/2024	50	100	200	50.5	100.1	200.8	1.002x + 0.130	1.000
L-R03	Dwyer	VFA-21	02/10/2024	50	100	200	49.8	100.7	200.9	1.004x - 0.236	1.000
L-R04	Dwyer	VFA-21	03/10/2024	50	100	200	49.9	99.9	201.0	1.005x - 0.411	1.000
L-R05	Dwyer	VFA-21	01/10/2024	50	100	200	50.7	101.1	201.2	1.005x - 0.153	0.999
L-R06	Dwyer	VFA-21	02/10/2024	50	100	200	50.4	99.7	201.1	1.001x + 0.149	1.000

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudorn  
(Mr. Peera Detudorn)



**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 : 24M2227

REFERENCE No : 72448-1

PAGE : 1 OF 2

**Certificate of Calibration**

**EQUIPMENT** : DIGITAL BALANCE

**MANUFACTURER** : METTLER TOLEDO

**MODEL** : XS105DU

**SERIAL No** : 1126422905

**ID No** : BA05/50

**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** : 08-Mar-24

**APPROVED BY** :   
PONGSAK J.

**ISSUED DATE** : 14-Mar-24

**RECEIVED DATE** : 08-Mar-24

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





CERTIFICATE No : 24M2227

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : XS105DU  
MANUFACTURER : METTLER TOLEDO S/N : 1126422905  
ID No : BA05/50 RECEIVED DATE : 08-Mar-24  
AIR PRESSURE : 1010mbar  $\pm$  1mbar CALIBRATION DATE : 08-Mar-24  
AMBIENT TEMPERATURE : 25°C  $\pm$  1°C RELATIVE HUMIDITY : 53 %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	M2302013S	02-Feb-25
2) STANDARD WEIGHT	E2	15843	M2302014S	02-Feb-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 CENTRAL BUREAU OF WEIGHTS&MEASURES

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

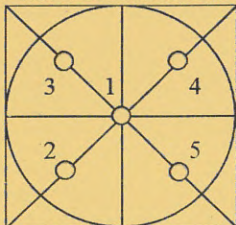
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0.000055 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY ( $\pm$ g)
0.00	0.00000	0.00000	0.000065
0.02	0.02001	-0.00001	0.000065
0.10	0.10002	-0.00002	0.000066
0.20	0.20001	-0.00001	0.000066
0.50	0.50001	-0.00001	0.000065
1.00	1.00003	-0.00003	0.000066
2.00	2.00001	-0.00001	0.000067
5.00	5.00001	-0.00001	0.000068
10.00	9.99994	0.00006	0.000070
20.00	20.00008	-0.00008	0.000078
50.00	50.0000	0.0000	0.00013
100.00	100.0001	-0.0001	0.00019
120.00	120.0001	-0.0001	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





## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

<b>Customer :</b> <u>S.P.S.Consulting Service Co.,Ltd</u>	<b>Date Tested:</b> <u>July 4, 2024</u>	
	<b>Recommendation Recertification</b>	
<b>Address :</b> <u>7 Soi Phaholyothin 24</u>	<b>Period</b> <u>6</u> <b>Months</b>	
<u>Paholyothin Road</u>	<b>Recertification Due:</b> <u>January 4, 2025</u>	
<u>Jompol Chatuchak, Bangkok 1090</u>	<b>Date Last Certified:</b> <u>January 4, 2024</u>	
<b>User Name:</b> <u>K.Phenpha Vipasthawatt</u>	<b>Visit Number:</b> <u>1 of 2</u>	
<b>Phone:</b> <u>083-9269252</u>	<b>PerkinElmer Phone:</b> <u>02-719-6420 ext 206</u>	
<b>Fax:</b> <u>02-513-4221</u>	<b>PerkinElmer Fax:</b> <u>02-318-5597</u>	

CONFIGURATION TESTED		ACCESSORIES/COMPONENT NOT INCLUDED
<b>MODEL</b>	<b>SERIAL NUMBER</b>	
<u>OPTIMA 5300DV</u>	<u>077C7042401</u>	
<b>TESTED EQUIPMENT</b>	<b>CALIBRATION NUMBER</b>	<b>EXPIRATION</b>
<u>IPV Methods</u>		
<b>TEST STANDARD USED</b>	<b>PART NUMBER</b>	<b>EXPIRATION DATE</b>
<u>Multielement Standard</u>	<u>N069-1579</u>	<u>December 30, 2024</u>
<u>Wavecal Solution</u>	<u>N058-2152</u>	<u>September 30, 2024</u>
<u>VIS Wavecal solution</u>	<u>N930-2946</u>	<u>January 30, 2025</u>
<u>Instrument Cal. STD4</u>	<u>N930-0221</u>	<u>November 30, 2024</u>
<b>CUSTOMER SUPPLIED</b>	<b>COMMENTS</b>	<b>CUSTOMER INITIALS</b>
<u>2 % HNO3</u>		
<u>10 % HNO3</u>		



## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

**SERIAL NUMBER** 077C7042401**DATE TESTED** July 4, 2024**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 :** July 4, 2024

PARAMETER		SPECIFICATION		FINAL VALUE	
<b>Spectral Resolution : UV</b>	<b>As</b>	<b>193.696 nm</b>	$\leq 0.007$	<u>0.00550</u>	
	<b>Ni</b>	<b>231.604 nm</b>	$\leq 0.008$	<u>0.00714</u>	
	<b>Ni</b>	<b>341.476 nm</b>	$\leq 0.012$	<u>0.00790</u>	
<b>Spectral Resolution : VIS</b>	<b>La</b>	<b>408.672 nm</b>	$\leq 0.020$	<u>0.01655</u>	
	<b>Ba</b>	<b>455.403 nm</b>	$\leq 0.025$	<u>0.02391</u>	
<b>Precision</b>					
	<b>As</b>	<b>193.656 nm</b>	% RSD < 1.0	<u>0.72</u>	%
	<b>Zn</b>	<b>213.856 nm</b>	% RSD < 1.0	<u>0.66</u>	%
	<b>Mn</b>	<b>257.610 nm</b>	% RSD < 1.0	<u>0.30</u>	%
	<b>La</b>	<b>379.478 nm</b>	% RSD < 1.0	<u>0.98</u>	%
	<b>Ba</b>	<b>455.403 nm</b>	% RSD < 1.0	<u>0.95</u>	%
	<b>Ba</b>	<b>493.408 nm</b>	% RSD < 1.0	<u>0.78</u>	%
<b>Detection Limits : Axial</b>	<b>Tl</b>	<b>190.080 nm</b>	3(sd)	<u>6.22</u>	ppb
	<b>As</b>	<b>193.696 nm</b>	3(sd)	<u>6.44</u>	ppb
	<b>Pb</b>	<b>220.353 nm</b>	3(sd)	<u>2.06</u>	ppb
<b>Detection Limits : Radial</b>	<b>As</b>	<b>193.696 nm</b>	3(sd)	<u>78.26</u>	ppb
	<b>Zn</b>	<b>213.856 nm</b>	3(sd)	<u>2.07</u>	ppb
	<b>Mn</b>	<b>257.610 nm</b>	3(sd)	<u>0.52</u>	ppb
	<b>La</b>	<b>379.478 nm</b>	3(sd)	<u>2.63</u>	ppb
	<b>Ba</b>	<b>455.403 nm</b>	3(sd)	<u>0.08</u>	ppb
	<b>Ba</b>	<b>493.408 nm</b>	3(sd)	<u>0.75</u>	ppb
<b>BEC : Axial (IB X 500)/(IS-IB)</b>	<b>Cd</b>	<b>226.502 nm</b>	$\leq 150$ ppb	<u>64.72</u>	
<b>BEC : Radial (IB X 1000)/(IS-IB)</b>	<b>Mn</b>	<b>257.610 nm</b>	$\leq 45$ ppb	<u>15.04</u>	





## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

SERIAL NUMBER 077C7042401DATE TESTED July 4, 2024**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:**

( Wiphan Promlumda )

Service Engineer



## Certificate of Calibration

### Aquion: Anion (ID#894)

This certificate is to verify that instrument below are calibrated  
by Archemica Lab Co.,Ltd.

AQUION S/N : 190840059

AS-DV S/N : 190915235

for

**S.P.S. Consulting Service Co., Ltd.**



บริษัท อาร์เคมีกา แล็บ จำกัด  
ARCHEMICA LAB CO.,LTD.

Operator Signature: \_\_\_\_\_

Date: June 24, 2024

(Mr. Ponwut Kornthongnimit)

Test Engineer

ภาคผนวกที่ 4-4  
ระดับเสียงในบรรยากาศ





THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0304

MTC No. EEL. BP. 109/0267

## CALIBRATION CERTIFICATE

Submitted by : S.P.S.Consulting 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 :  $(23 + 3) ^\circ\text{C}$

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/N4106495.  
7. Condenser Microphone B&K 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 : 22 Feb. 2024

Date of Calibration : 4 Mar. 2024

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.

FM.BL.MTC.002 Rev.4

#### Head Office

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Request No. 21-67/0304

MTC No. EEL. BP. 109/0267

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 2
1/2 inch Bruel&Kjaer 4180	93.85	-0.15	$\pm 0.10$	$\pm 0.75$ dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	999.9	-0.1	$\pm 1.5$	$\pm 2.0\%$

3. Total Distortion

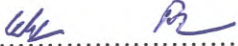
Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	1.65	$\pm 0.50$	$\pm 4.0\%$

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 Kluaypa)  
Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 4 Mar. 2024

Date of Issue : 5 Mar. 2024

Ref : 2011267022200795001

End of Certificate

2 / 2

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E-mail : sumalee@tistr.or.th





บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด  
S.P.S. CONSULTING SERVICE CO., LTD.  
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900  
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900  
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com., www.spscon.com

Noise R\_678/24

## 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	04 March 2024
		Due Date	04 March 2025

### Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-R19	ACO	6236	00182001	12 November 2024	93.9	93.9
ACO-R22	ACO	6236	00182010	12 November 2024	93.9	93.9
ACO-R25	ACO	6236	00192037	12 November 2024	94.0	93.9
ACO-R39	ACO	6236	00192051	12 November 2024	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.85 ± 0.10 dB	

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)

Request No. 21-67/0304

MTC No. EEL. BP. 110/0267

## CALIBRATION CERTIFICATE

Submitted by : S.P.S.Consulting 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 : Acoustic Calibrator

Manufacturer : Cirrus

Model : CR:515

Serial No. : 92002

### 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 of instrument was 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 : 22 Feb. 2024

Date of Calibration : 5 Mar. 2024

1 / 2

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FM.BL.MTC.002 Rev.4

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0304

MTC No. EEL. BP. 110/0267

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	94.04	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	1000.3	0.3	$\pm 1.5$	$\pm 1.0\%$

3. Total distortion

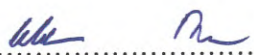
Standard Microphone Type	Measured Total distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1.70	$\pm 0.50$	$\pm 3.0\%$

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 Kluaypa)  
Director

Date of Calibration : 5 Mar. 2024

Date of Issue : 6 Mar. 2024

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Ref : 2011267022200795002

End of Certificate

2 / 2

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FM.BL.MTC.002 Rev.4

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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@spscon.com., www.spscon.com

Noise R\_678-1/24

## Sound Level Meter Calibration Report

### Acoustic Calibrator Data

Brand	CIRRUS	Number	AC-CR01/63
Model	CR515	Serial No.	92002
Calibration Range	94 dB, 1000 Hz	Last Calibration	05 March 2024
		Due Date	05 March 2025

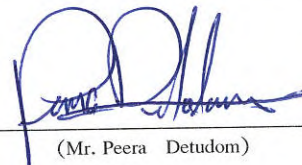
### Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
CR-B10	Cirrus	CR161B	G301407	12 November 2024	94.0	94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					94.04 ± 0.10 dB	

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

  
(Mr. Peera Detudom)

ภาคผนวกที่ 4-5  
ระดับเสียงในสถานประกอบการ



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0304

MTC No. EEL. BP. 109/0267

## CALIBRATION CERTIFICATE

Submitted by : S.P.S.Consulting 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 :  $(23 + 3) ^\circ\text{C}$

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/N4106495.  
7. Condenser Microphone B&K 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 : 22 Feb. 2024

Date of Calibration : 4 Mar. 2024

1 / 2 ✓

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

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FM.BL.MTC.002 Rev.4

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E-mail : sumalee@tistr.or.th



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0304

MTC No. EEL. BP. 109/0267

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 2
1/2 inch Bruel&Kjaer 4180	93.85	-0.15	$\pm 0.10$	$\pm 0.75$ dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	999.9	-0.1	$\pm 1.5$	$\pm 2.0\%$

3. Total Distortion

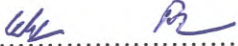
Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	1.65	$\pm 0.50$	$\pm 4.0\%$

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 Kluaypa)  
Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 4 Mar. 2024

Date of Issue : 5 Mar. 2024

Ref : 2011267022200795001

End of Certificate

2 / 2

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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@spscon.com., www.spscon.com

Noise R\_679/24

## 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	04 March 2024
		Due Date	04 March 2025

### Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B36	ACO	6236	00192027	13 November 2024	93.9	93.9
ACO-B41	ACO	6236	00192032	13 November 2024	93.9	93.9
ACO-B43	ACO	6236	00192034	13 November 2024	94.0	93.9
ACO-R50	ACO	6236	00192062	13 November 2024	93.9	93.9
ACO-R51	ACO	6236	00192063	13 November 2024	93.9	93.9
ACO-R52	ACO	6236	00192064	13 November 2024	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.85 ± 0.10 dB	

Calibrated by :

Abdul Dangklom  
(Mr. Abdul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)





THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0562

MTC No. EEL. BP. 71/0767

## CALIBRATION CERTIFICATE

Submitted by : S.P.S Consulting Services 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 : SVANTEK

Model : SV34

Serial No. : 33137

### 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 Panasonic VP-7722A S/N 041477D122.
7. Condenser Microphone Bruel&Kjaer 4180 S/N 2633526.

**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 : 31 Jul. 2024

Date of Calibration : 6 Aug. 2024

1 / 2

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FM.BL.MTC.002 Rev.5

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(66) 08 3219 9440  
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(66) 08 1889 6827



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

**Request No.** 21-67/0562

**MTC No.** EEL. BP. 71/0767

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 = 114 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 2
1/2 inch Bruel&Kjaer 4180	113.50	-0.50	$\pm 0.10$	$\pm 0.75$ dB

**2. Frequency**

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	1000.0	0.0	$\pm 1.5$	$\pm 2.0\%$

**3. Total Distortion**


Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	0.48	$\pm 0.50$	$\pm 4.0\%$

**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 Kluaypa)

**Director**

**Electrical and Electronic Standards Laboratory**

**Industrial Metrology and Testing Service Centre**

**Date of Calibration** : 6 Aug. 2024

**Date of Issue** : 7 Aug. 2024

**Ref :** 2011267073102836002

End of Certificate

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FM.BL.MTC.002 Rev.5

**Head Office**

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Tel. (66) 0 2577 9036  
Fax. (66) 0 2577 9009

**Office/Laboratory**

668 Mu 2 Tambon Bangpoomai, Amphoe Muang Samutprakan,  
Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
(66) 08 3219 9440  
E-mail : mtc@tistr.or.th Website : www.tistr.or.th

**Office**

196 Phahonyothin Road, Ladyao, Chatuchak,  
Bangkok 10900, Thailand  
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217  
(66) 08 1889 6827



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด  
S.P.S. CONSULTING SERVICE CO., LTD.  
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900  
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900  
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

Noise Dose R\_680/24

## Noise Dose Meter Calibration Report

### Acoustic Calibrator Data

Brand	SVANTEK	Number	SV 01/60
Model	SV34	Serial No.	33137
Calibration Range	114 dB, 1000 Hz	Last Calibration	06 August 2024
		Due Date	06 August 2025

### Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
NMD-B01	SVANTEK	SV-104IS	80840	13 November 2024	113.5	113.5
NMD-B02	SVANTEK	SV-104IS	80842	13 November 2024	113.5	113.5
NMD-B03	SVANTEK	SV-104IS	80852	13 November 2024	113.6	113.5
NMD-B04	SVANTEK	SV-104IS	80854	13 November 2024	113.5	113.5
NMD-B05	SVANTEK	SV-104IS	80856	13 November 2024	113.5	113.5
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					113.50± 0.10 dB	

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



ภาคผนวกที่ 4-6  
คุณภาพน้ำทิ้ง




CERTIFICATE No : 24E6416  
REFERENCE No : 73694-1

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** : 27-Jun-24

**APPROVED BY** :   
PONGSAK J.

**ISSUED DATE** : 27-Jun-24

**RECEIVED DATE** : 24-Jun-24





# 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

CERTIFICATE No : 24E6416

PAGE : 2 OF 3

## Calibration Report

EQUIPMENT : pH METER  
MANUFACTURER : HANNA  
ID No : pH 04/56  
RECEIVED DATE : 24-Jun-24  
AMBIENT TEMPERATURE : 23 ° C ± 3 ° C  
MODEL : HI 3512  
SERIAL NUMBER : TH118035  
CALIBRATION DATE : 27-Jun-24  
RELATIVE HUMIDITY : 50 % RH ± 10% RH

### CONDITION OF THIS RESULTS OF CALIBRATION

1. 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 READING THE VALUE COMPARED WITH THE CALCULATED VALUE. THE DISPLAY AND ELECTROD WAS CALIBRATED BY USING STANDARD pH BUFFER
2. REFERENCE STANDARD INSTRUMENTS :-

<u>INSTRUMENT</u>	<u>MODEL</u>	<u>SERIAL No/</u> <u>LOT No</u>	<u>CERTIFICATE No</u>	<u>DUE DATE</u>
1) pH STANDARD SOLUTION	00651-06	CC784945	4880-14413915	24-Aug-25
2) pH STANDARD SOLUTION	00651-08	CC785578	4881-14430633	31-Aug-25
3) pH STANDARD SOLUTION	00651-10	CC787086	4882-14483317	21-Sep-25
4) PROCESS CALIBRATOR	CA150	91S6079	24E1251	09-Apr-25
5) BATH	260014	1247 48074	23T9014	13-Sep-24
6) THERMOMETER WITH PROBE	421504	55000379	23T9623	13-Sep-24

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 SI UNIT MAINTAINED AT :-
  - NATIONAL INSTITUTE OF STANDARD AND TECHNOLOGY, USA.
  - NATIONAL INSTUTITE OF METROLOGY (THAILAND)

### RESULT OF CALIBRATION : ADJUSTMENT

#### 1. DISPLAY UNIT ONLY

SLOPE FACTOR  $k = 2.303 RT/F = 59 \text{ mV/pH}$

mV APPLIED	UUC READING (mV)	CORRECTION (mV)	UUC READING (pH)	UNCERTAINTY OF MEASUREMENT (± mV)	COVERAGE FACTOR k
414.11	414.8	-0.69	-0.115	0.15	2.00
354.95	355.5	-0.55	0.884	0.15	2.00
295.80	296.4	-0.60	1.885	0.15	2.00
236.64	237.1	-0.46	2.886	0.15	2.00
177.48	178.0	-0.52	3.887	0.15	2.00
118.32	118.8	-0.48	4.887	0.15	2.00
59.16	59.6	-0.44	5.887	0.15	2.00
0.00	0.4	-0.40	6.888	0.15	2.00
-59.16	-58.7	-0.46	8.101	0.15	2.00
-118.32	-117.9	-0.42	9.345	0.15	2.00
-177.48	-177.4	-0.08	10.589	0.15	2.00
-236.64	-236.4	-0.24	11.834	0.15	2.00
-295.80	-294.5	-1.30	13.077	0.15	2.00
-354.95	-354.7	-0.25	14.322	0.15	2.00
-414.11	-413.9	-0.21	15.565	0.15	2.00

END OF CALIBRATION REPORT PAGE 2 OF 3





# 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

CERTIFICATE No : 24E6416

PAGE : 3 OF 3

## Calibration Report

### RESULT OF CALIBRATION (CONTINUE):

#### 2. DISPLAY UNIT WITH pH ELECTRODE S/N: 09081C6M

STANDARD pH BUFFER SOLUTION (pH)	UUC READING (pH)	CORRECTION (pH)	VALUE BEFORE ADJUSTMENT	UNCERTAINTY OF MEASUREMENT ( $\pm$ pH)	COVERAGE FACTOR k
4.015	4.011	0.004	3.905	0.012	2.00
7.003	7.003	0.000	6.972	0.012	2.00
10.009	10.014	-0.005	9.570	0.014	2.00

#### 3. DISPLAY UNIT WITH TEMPERATURE

STANDARD READING ( $^{\circ}$ C)	UUC READING ( $^{\circ}$ C)	CORRECTION ( $^{\circ}$ C)	VALUE BEFORE ADJUSTMENT	UNCERTAINTY OF MEASUREMENT ( $\pm$ $^{\circ}$ C)	COVERAGE FACTOR k
25.004	25.0	0.004	---	0.0085	2.00

#### 4. PERCENT SLOPE 100%

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





CERTIFICATE No : 24M2229  
REFERENCE No : 72448-3

PAGE : 1 OF 2

## Certificate of Calibration

**EQUIPMENT** : DIGITAL BALANCE

**MANUFACTURER** : SARTORIUS

**MODEL** : BSA224S-CW

**SERIAL No** : 36591843

**ID No** : BA 09/61

**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** : 08-Mar-24

**APPROVED BY** :  PONGSAK J.

**ISSUED DATE** : 14-Mar-24

**RECEIVED DATE** : 08-Mar-24





CERTIFICATE No : 24M2229

PAGE : 2 OF 2

## Calibration Report

**EQUIPMENT** : DIGITAL BALANCE **MODEL** : BSA224S-CW  
**MANUFACTURER** : SARTORIUS **S/N** : 36591843  
**ID No** : BA 09/61 **RECEIVED DATE** : 08-Mar-24  
**AIR PRESSURE** : 1010mbar  $\pm$  1mbar **CALIBRATION DATE** : 08-Mar-24  
**AMBIENT TEMPERATURE** : 25° C  $\pm$  1° C **RELATIVE HUMIDITY** : 55 %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 :-

<u>INSTRUMENT</u>	<u>MODEL</u>	<u>SERIAL No</u>	<u>CERTIFICATE No</u>	<u>DUE DATE</u>
1) STANDARD WEIGHT SET	E2	QK-I-151	M2302013S	02-Feb-25
2) STANDARD WEIGHT	E2	15843	M2302014S	02-Feb-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 CENTRAL BUREAU OF WEIGHTS&MEASURES

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

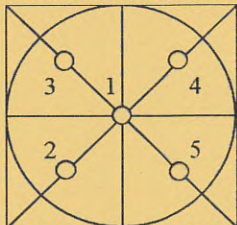
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY ( $\pm$ g)
0.0	0.0000	0.0000	0.000082
0.1	0.1000	0.0000	0.000083
0.2	0.2000	0.0000	0.000083
0.5	0.5000	0.0000	0.000083
1.0	1.0000	0.0000	0.000084
2.0	2.0000	0.0000	0.000084
5.0	5.0000	0.0000	0.000086
10.0	10.0000	0.0000	0.000089
20.0	20.0001	-0.0001	0.000094
50.0	50.0000	0.0000	0.00012
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 MULTIPLIED BY A COVERAGE FACTOR  $k=2$ , PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



CERT.No.: HS-V015C

Calibration Date : 20 Mar 24  
 Submitted by : ASIA LAB @ CONSULTANT CO.,LTD  
 184 Soi Phutthamonthon Sai 2 Soi 12,  
 Bangphai, Bangkae, Bangkok 10160

Avg Room Temp : 20 °C  
 Avg Water Temp : 20 °C  
 Air Pressure : 760.00 mmHg  
 Salinity : 0 ppt

Model : YSI 5000  
 S/N : 15B100751  
 Probe : YSI 5010  
 S/N : 22D100097  
 ID NO. : -  
 Air Temp ref : S/N. F8065C26  
 Barometric ref : S/N. F8065C26  
 Water Temp ref : S/N. 11430  
 Technician : Kittipong M.

#### Calibration Details

Calibration Point	100% air sat. (@20 °C, DO = 9.09 mg/l)	(status)	(status)
Measurement 1 (mg/l)	9.08	(PASS)	-
Measurement 2 (mg/l)	9.08	(PASS)	-
Measurement 3 (mg/l)	9.08	(PASS)	-
Measurement 4 (mg/l)	9.08	(PASS)	-
Measurement 5 (mg/l)	9.08	(PASS)	-
Measurement 6 (mg/l)	9.08	(PASS)	-
Measurement 7 (mg/l)	9.08	(PASS)	-
Measurement 8 (mg/l)	9.08	(PASS)	-
Measurement 9 (mg/l)	9.08	(PASS)	-
Measurement 10 (mg/l)	9.08	(PASS)	-
Mean Measurement	9.08	mg/l	-
Inaccuracy	0.01	mg/l	-

Overall Status (PASS)

#### Manufacturer Specification

Accuracy = +/- 0.02 mg/l

- 1) This certificate is issued based on the result that are found as shown on date and place of test only.
- 2) The calibration procedure followed in accordance with Harikul Science Co., Ltd.
- 3) This result shall not be used for advertising purpose.



Technician Signature  
 (Kittipong Maekwong)



Laboratory Manager  
 (Supreecha Sumaritam)



# 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 : 24T0774

REFERENCE No : 71986-2

PAGE : 1 OF 2

## Certificate of Calibration

**EQUIPMENT** : COD REACTOR

**MANUFACTURER** : HACH

**MODEL** : DRB 200


**SERIAL No** : 15110C0235

**ID No** : CRB 05/59

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

**CALIBRATED BY** : CHAICHARN CH.

**CALIBRATION DATE** : 5-Feb-24

**APPROVED BY** :   
PONGSAK J.

**ISSUED DATE** : 5-Feb-24

**RECEIVED DATE** : 5-Feb-24

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





CERTIFICATE No : 24T0774

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : COD REACTOR  
MANUFACTURER : HACH  
ID NUMBER : CRB 05/59  
RECEIVED DATE : 5-Feb-24  
AMBIENT TEMPERATURE : 23° C ± 1° C

MODEL : DRB 200  
SERIAL NUMBER : 15110C0235  
CALIBRATION DATE : 5-Feb-24  
RELATIVE HUMIDITY : 52 %RH ± 10 % RH

### CONDITION OF THIS RESULTS OF CALIBRATION

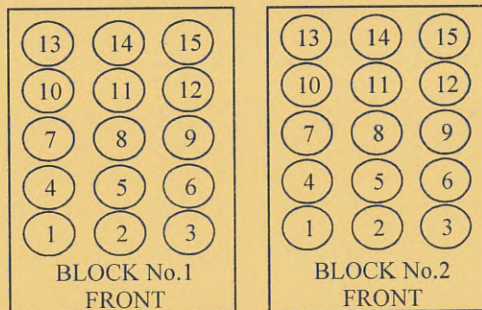
1. THIS INSTRUMENT WAS CALIBRATED BY DIRECT MEASUREMENT TEMPERATURE RECORDER WITH THERMOCOUPLE TYPE K UNDER NO LOAD CONDITION. THE THERMOCOUPLES WERE PLACED ON 15 POINTS AND LOCATED ONE THERMOCOUPLE IN EACH OF THE FOUR CORNERS OF THE REACTOR AND PLACED THE EIGHTH THERMOCOUPLE AT THE CENTER OF THE REACTOR.

### 2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) DATA LOGGER WITH TC TYPE K	HYDRA 2635A	8009008	23T6640	14-Jul-24

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 QUALITY CALIBRATION CO.,LTD.

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



### TEMPERATURE MEASUREMENT ACCURACY TEST

Block No.	1	2
Controller temperature (°C)	145	145
Indicating Temperature	145	145
Measured Temperature (°C) at Spread Locations	1	150.2
	2	150.2
	3	150.2
	4	149.9
	5	149.9
	6	150.1
	7	150.7
	8	149.9
	9	149.9
	10	150.8
	11	150.4
	12	149.5
	13	150.1
	14	150.6
	15	150.1
Uncertainty of Measurement(± °C)	0.86	0.86

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

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





## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

<b>Customer :</b> <u>S.P.S.Consulting Service Co.,Ltd</u>	<b>Date Tested:</b> <u>July 4, 2024</u>	
	<b>Recommendation Recertification</b>	
<b>Address :</b> <u>7 Soi Phaholyothin 24</u>	<b>Period</b> <u>6</u> <b>Months</b>	
<u>Paholyothin Road</u>	<b>Recertification Due:</b> <u>January 4, 2025</u>	
<u>Jompol Chatuchak, Bangkok 1090</u>	<b>Date Last Certified:</b> <u>January 4, 2024</u>	
<b>User Name:</b> <u>K.Phenpha Viphasthawat</u>	<b>Visit Number:</b> <u>1 of 2</u>	
<b>Phone:</b> <u>083-9269252</u>	<b>PerkinElmer Phone:</b> <u>02-719-6420 ext 206</u>	
<b>Fax:</b> <u>02-513-4221</u>	<b>PerkinElmer Fax:</b> <u>02-318-5597</u>	

CONFIGURATION TESTED		ACCESSORIES/COMPONENT NOT INCLUDED
<b>MODEL</b>	<b>SERIAL NUMBER</b>	
<u>OPTIMA 5300DV</u>	<u>077C7042401</u>	
<b>TESTED EQUIPMENT</b>	<b>CALIBRATION NUMBER</b>	<b>EXPIRATION</b>
<u>IPV Methods</u>		
<b>TEST STANDARD USED</b>	<b>PART NUMBER</b>	<b>EXPIRATION DATE</b>
<u>Multielement Standard</u>	<u>N069-1579</u>	<u>December 30, 2024</u>
<u>Wavecal Solution</u>	<u>N058-2152</u>	<u>September 30, 2024</u>
<u>VIS Wavecal solution</u>	<u>N930-2946</u>	<u>January 30, 2025</u>
<u>Instrument Cal. STD4</u>	<u>N930-0221</u>	<u>November 30, 2024</u>
<b>CUSTOMER SUPPLIED</b>	<b>COMMENTS</b>	<b>CUSTOMER INITIALS</b>
<u>2 % HNO3</u>		
<u>10 % HNO3</u>		





## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

**SERIAL NUMBER** 077C7042401**DATE TESTED** July 4, 2024**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 :** July 4, 2024

PARAMETER		SPECIFICATION		FINAL VALUE	
<b>Spectral Resolution : UV</b>	As 193.696 nm	≤ 0.007		0.00550	
	Ni 231.604 nm	≤ 0.008		0.00714	
	Ni 341.476 nm	≤ 0.012		0.00790	
<b>Spectral Resolution : VIS</b>	La 408.672 nm	≤ 0.020		0.01655	
	Ba 455.403 nm	≤ 0.025		0.02391	
<b>Precision</b>					
	As 193.656 nm	% RSD	< 1.0	0.72	%
	Zn 213.856 nm	% RSD	< 1.0	0.66	%
	Mn 257.610 nm	% RSD	< 1.0	0.30	%
	La 379.478 nm	% RSD	< 1.0	0.98	%
	Ba 455.403 nm	% RSD	< 1.0	0.95	%
	Ba 493.408 nm	% RSD	< 1.0	0.78	%
<b>Detection Limits : Axial</b>	Tl 190.080 nm	3(sd)		6.22	ppb
	As 193.696 nm	3(sd)		6.44	ppb
	Pb 220.353 nm	3(sd)		2.06	ppb
<b>Detection Limits : Radial</b>	As 193.696 nm	3(sd)		78.26	ppb
	Zn 213.856 nm	3(sd)		2.07	ppb
	Mn 257.610 nm	3(sd)		0.52	ppb
	La 379.478 nm	3(sd)		2.63	ppb
	Ba 455.403 nm	3(sd)		0.08	ppb
	Ba 493.408 nm	3(sd)		0.75	ppb
<b>BEC : Axial (IB X 500)/(IS-IB)</b>	Cd 226.502 nm	≤ 150 ppb		64.72	
<b>BEC : Radial (IB X 1000)/(IS-IB)</b>	Mn 257.610 nm	≤ 45 ppb		15.04	





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

**SERIAL NUMBER** 077C7042401

**DATE TESTED** July 4, 2024

**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:**



( Wiphan Promlumda )

Service Engineer

ภาคผนวกที่ 4-7  
ระดับความร้อนในสถานประกอบการ





ID LINE : IEC17025



## Certificate of Calibration

Certificate Number : SPR24080586-1

Page : 1 of 3

Customer : S.P.S. CONSULTING SERVICE CO., LTD.

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

Equipment Name : Area Heat Stress Monitor

Manufacturer : Quest Technologies

Model : QUESTemp 34

Serial Number : TEN040005

ID. Number : R04

### Environmental Conditions

Ambient Temperature :  $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$

Received Date : 30 Aug 2024

Relative Humidity :  $50\% \pm 15\%$

Calibration Date : 30 Aug 2024

Location of Calibration : In-Lab

Recommend Due Date : 30 Aug 2025

Calibration Procedure : SP-CPT-04-13

Date of Issue : 31 Aug 2024

### Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by : Ms. Apinya Pinyo

Calibration Officer

Approved by :

( Mr. Prayoon Topart )

Authorized Signatory



ID LINE : IEC17025



## Calibration Report

Certificate Number : SPR24080586-1

Page : 2 of 3

### Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Humidity Chamber	TH-80S	N/A	SPR24020149-7	23 Feb 2025
THERMO-HYGROMETER	5020A	A47046	QR24-0167	26 Jan 2025

### Traceability

This certification is traceable to the International System of Unit maintained at :

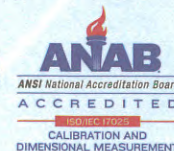
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Quality Reborn Co., Ltd





ID LINE : IEC17025



## Result of Calibration

Certificate No. : SPR24080586-1

Page : 3 of 3

Temperature Accuracy in the Measurement. (WET)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty ( ± )
30.0	30.025	30.1	0.075	0.20
35.0	35.020	35.1	0.080	0.20
40.0	40.018	40.1	0.082	0.20

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty ( ± )
30.0	30.025	30.0	-0.025	0.20
35.0	35.020	35.0	-0.020	0.20
40.0	40.018	40.0	-0.018	0.20

Temperature Accuracy in the Measurement. (GLOBE)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty ( ± )
30.0	30.025	30.2	0.175	0.20
35.0	35.020	35.2	0.180	0.20
40.0	40.018	40.2	0.182	0.20

### Note:

The result of calibration was found accurate as show on date and place of calibration only.  
This Certificate is not certified for any commercial transaction.

### Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor  $k = 2$ , providing a level of confidence approximately 95%.

- End of Certificate -



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S.P.S. CONSULTING SERVICE CO., LTD.  
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900  
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900  
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com., www.spscon.com

Heat R155

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No.	: R04	Verification Date	: 13 November 2024
Brand	: Quest Technologies	Ambient Temp.	: 24.5 °C
Model	: QUESTemp 34	Barometric Pressure	: 1011 mmbar
Serial No.	: TEN040005	Relative Humidity	: 49 %
Verification Module (Electronic Sensor Check) :			
Verification Module No. : 21 WB = 12.5 °C, DB = 47.1 °C, G = 69.3 °C			
Result of Verification : Without Adjustment			
Wet Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
12.5	12.7	-0.2	± 0.5
Dry Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
47.1	47.0	0.1	± 0.5
Globe Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
69.3	69.3	0.0	± 0.5
UUC* = UNIT UNDER CALIBRATION			

Verified by :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)





ID LINE : IEC17025



## Certificate of Calibration

Certificate Number : SPR24080586-2

Page : 1 of 3

Customer : S.P.S. CONSULTING SERVICE CO., LTD.

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

Equipment Name : Area Heat Stress Monitor

Manufacturer : Metrosonics

Model : hs-32

Serial Number : MCD070028

ID. Number : R06

### Environmental Conditions

Ambient Temperature : 23 °C  $\pm$  2 °C

Received Date : 30 Aug 2024

Relative Humidity : 50 %  $\pm$  15 %

Calibration Date : 30 Aug 2024

Location of Calibration : In-Lab

Recommend Due Date : 30 Aug 2025

Calibration Procedure : SP-CPT-04-13

Date of Issue : 31 Aug 2024

### Method of Calibration

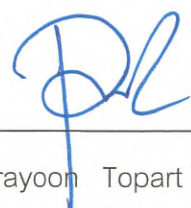
This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by : Ms. Apinya Pinyo

Calibration Officer

Approved by :

  
( Mr. Prayoon Topart )

Authorized Signatory



ID LINE : IEC17025



## Calibration Report

Certificate Number : SPR24080586-2

Page : 2 of 3

### Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Humidity Chamber	TH-80S	N/A	SPR24020149-7	23 Feb 2025
THERMO-HYGROMETER	5020A	A47046	QR24-0167	26 Jan 2025

### Traceability

This certification is traceable to the International System of Unit maintained at :

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## Result of Calibration

Certificate No. : SPR24080586-2

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Temperature Accuracy in the Measurement. (WET)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty ( ± )
30.0	30.018	30.0	-0.018	0.20
35.0	35.012	35.0	-0.012	0.20
40.0	40.022	40.0	-0.022	0.20

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty ( ± )
30.0	30.018	30.0	-0.018	0.20
35.0	35.012	35.0	-0.012	0.20
40.0	40.022	40.0	-0.022	0.20

Temperature Accuracy in the Measurement. (GLOBE)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty ( ± )
30.0	30.018	30.1	0.082	0.20
35.0	35.012	35.1	0.088	0.20
40.0	40.022	40.1	0.078	0.20

### Note:

The result of calibration was found accurate as show on date and place of calibration only.  
This Certificate is not certified for any commercial transaction.

### Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor  $k = 2$ , providing a level of confidence approximately 95%.

- End of Certificate -



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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@spscon.com., www.spscon.com

Heat R155

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No.	: R06	Verification Date	: 13 November 2024
Brand	: METROSONICS	Ambient Temp.	: 24.5 °C
Model	: hs-32	Barometric Pressure	: 1011 mmbar
Serial No.	: MCD070028	Relative Humidity	: 49 %
Verification Module (Electronic Sensor Check) :			
Verification Module No. : 21 WB = 12.5 °C, DB = 47.1 °C, G = 69.3 °C			
Result of Verification : Without Adjustment			
Wet Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
12.5	12.5	0.0	± 0.5
Dry Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
47.1	47.2	-0.1	± 0.5
Globe Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
69.3	69.2	0.1	± 0.5
UUC* = UNIT UNDER CALIBRATION			

Verified by :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)





ID LINE : IEC17025



## Certificate of Calibration

Certificate Number : SPR24030285-1

Page : 1 of 3

Customer : S.P.S. CONSULTING SERVICE CO., LTD.

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

Equipment Name : Area Heat Stress Monitor

Manufacturer : Quest Technologies

Model : QUESTemp 34

Serial Number : TEH090208

ID. Number : R08

### Environmental Conditions

Ambient Temperature :  $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$

Received Date : 19 Mar 2024

Relative Humidity :  $50\% \pm 15\%$

Calibration Date : 20 Mar 2024

Location of Calibration : In-Lab

Recommend Due Date : 20 Mar 2025

Calibration Procedure : SP-CPT-04-13

Date of Issue : 21 Mar 2024

### Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by : Mr. Navaporn Uengseng

Calibration Officer

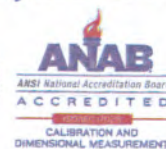
Approved by :

( Ms. Bussakorn Chaikaew )

Authorized Signatory



ID LINE : IEC17025



## Calibration Report

Certificate Number : SPR24030285-1

Page : 2 of 3

### Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Humidity Chamber	TH-80S	N/A	SPR24020149-7	23 Feb 2025
THERMO-HYGROMETER	5020A	A47046	QR24-0167	26 Jan 2025

### Traceability

This certification is traceable to the International System of Unit maintained at :  
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## Result of Calibration

Certificate No. : SPR24030285-1

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Temperature Accuracy in the Measurement. (WET)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty ( ± )
30.0	30.014	30.2	0.186	0.20
35.0	35.012	35.2	0.188	0.20
40.0	40.017	40.2	0.183	0.20

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty ( ± )
30.0	30.014	30.0	-0.014	0.20
35.0	35.012	35.0	-0.012	0.20
40.0	40.017	40.0	-0.017	0.20

Temperature Accuracy in the Measurement. (GLOBE)

Unit : °C

Humidity Setting	Standard Reading	UUC Reading	Error	Uncertainty ( ± )
30.0	30.014	30.1	0.086	0.20
35.0	35.012	35.1	0.088	0.20
40.0	40.017	40.1	0.083	0.20

### Note :

The result of calibration was found accurate as show on date and place of calibration only.  
This Certificate is not certified for any commercial transaction.

### Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor  $k = 2$ , providing a level of confidence approximately 95%.

- End of Certificate -



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S.P.S. CONSULTING SERVICE CO., LTD.

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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@spscon.com., www.spscon.com

Heat R155

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No.	: R08	Verification Date	: 13 November 2024
Brand	: Quest Technologies	Ambient Temp.	: 24.5 °C
Model	: QUESTemp 34	Barometric Pressure	: 1011 mmbar
Serial No.	: TEH090208	Relative Humidity	: 49 %
Verification Module (Electronic Sensor Check) :			
Verification Module No. : 21 WB = 12.5 °C, DB = 47.1 °C, G = 69.3 °C			
Result of Verification : Without Adjustment			
Wet Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
12.5	12.4	0.1	± 0.5
Dry Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
47.1	47.3	-0.2	± 0.5
Globe Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
69.3	69.5	-0.2	± 0.5
UUC* = UNIT UNDER CALIBRATION			

Verified by :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)