

## ภาคผนวกที่ 4

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เอกสารสอบเทียบความถูกต้องของเครื่องมือ

**ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง  
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม**

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
<b>1. คุณภาพอากาศในบรรยากาศ</b>		
Sulfur Dioxide	Serial No. 3490, TRS1064, CM06280010, 0620617611, CM09540005, TRS1068, 3431	Serial No. 3490, TRS1064, CM06280010, 0620617611, CM09540005, TRS1068, 3431
Nitrogen Dioxide	Serial No. 4412, 2285, 2621, 11070530044, 620617608, CM9540006, 2285, 243	Serial No. 4412, 2285, 2621, 11070530044, 620617608, CM9540006, 2285, 243
Total Hydrocarbon	Serial No. 510710, 505977, 508301, 200800005504, NM7K7YND, 2ERTBRJ	Serial No. 510710, 505977, 508301, 200800005504, NM7K7YND, 2ERTBRJ
<b>2. คุณภาพอากาศจากแหล่งกำเนิด</b>		
Total Suspended Particulate	Console No. B05 Pitot Tube No. B38	Digital Balance
Oxides of Nitrogen	Vacuum Gauge	Spectrophotometer
Sulfur Dioxide	Personal Pump SKC No. B77 Rotameter No. H-R02, R03	-
Carbon Monoxide	Personal Pump SKC No. B55 Rotameter No. H-R02, R03	CO Analyzer No. R01
Lead	Console No. R05 Pitot Tube No. B38	ICP
Mercury	Console No. R05 Pitot Tube No. B38	AAS
<b>3. คุณภาพน้ำ</b>		
pH	-	pH Meter
Temperature	-	Thermometer
BOD <sub>5</sub>	-	BOD Analyzer
Total Suspended Solids (TSS)	-	Digital Balance
Grease & Oil	-	Digital Balance
<b>4. ระดับเสียงทั่วไป</b>		
L <sub>eq</sub> 24 hr และ L <sub>max</sub>	Acoustic Calibrator Sound Level Meter No. CR-B01	-
<b>5. ระดับเสียงในสถานประกอบการ</b>		
L <sub>eq</sub> 8 hr, L <sub>max</sub> และ TWA	Acoustic Calibrator Sound Level Meter ACO No. R50	-
<b>6. ปริมาณเสียงสะสมแบบติดตัวบุคคล</b>		
Noise Dose	Acoustic Calibrator Sound Level Meter ACO No. B01, R41	-

คุณภาพอากาศในบรรยากาศ

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CALIBRATION REPORT						
SO <sub>2</sub> FLUORESCENT ANALYZER						
DATE :	12 August 2024	BRAND :	API	MODEL :	100E	
NO.	SO <sub>2</sub> -R05	SERIAL NO.	3490			
Calibrator (Dilution System)						
Brand : Teledyne			Model : 700			
Last Cal. Date : 30 October 2023			Serial No. : 421			
Reference Standard Gas						
Standard Gas : Sulphur Dioxide (SO <sub>2</sub> )			Cylinder No. : A00814SK			
Certified Date : 21 June 2021		Expired Date : 21 June 2029		Cylinder Conc. : 49.8 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	-	
SO <sub>2</sub> Span	400.0	400.3	0.075	400.0	1.014	
API Model 100E SO <sub>2</sub> Analyzer Check list						
Test Values	Observed Value	Units	Nominal Range			
RANGE	500	PPB	0-500			
SAMPLE PRESS	28.4	in-Hg	25-35			
SAMPLE FLOW	657	cc/min	650 ± 10%			
PMT	103.3	mV	-20-150 with Zero Air			
UV LAMP	3039.1	mV	1000-4900			
STR. LGT	61.5	PPB	<100			
DRK PMT	63.0	mV	-50 - 200			
DRK LMP	57.8	mV	-50 - 200			
HVPS	671	V	550-900 constant			
DCPS	2515	mV	2500 ± 200			
RCELL TEMP	50.4	°C	50 ± 1			
BOX TEMP	29.2	°C	5-40			
PMT TEMP	7.1	°C	7 ± 2.0			
SO <sub>2</sub> Span Conc	400	PPB	20-20,000			
SO <sub>2</sub> Slope	1.014	-	1.0 ± 0.3			
SO <sub>2</sub> Offset	22.0	mV	<250			
Stability at Zero	0.1	PPB	<0.2			
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)			

Calibrated by :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

Peera Detudorn  
(Mr.Peera Detudorn)





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## CALIBRATION REPORT

### SO<sub>2</sub> FLUORESCENT ANALYZER

DATE : 12 August 2024

BRAND : TELEDYNE

MODEL : TML-60

NO. SO<sub>2</sub>-R07

SERIAL NO. TR51068

#### Calibrator (Dilution System)

Brand : Teledyne

Model : 700

Last Cal. Date : 30 October 2023

Serial No. : 421

#### Reference Standard Gas

Standard Gas : Sulphur Dioxide (SO<sub>2</sub>)

Cylinder No. : A00814SK

Certified Date : 21 June 2021

Expired Date : 21 June 2029

Cylinder Conc. : 49.8 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	-
SO <sub>2</sub> Span	400.0	400.1	0.025	400.0	1.010

#### API Model TML-60 SO<sub>2</sub> Analyzer Check list

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	0-500
SAMPLE PRESS	28.7	in-Hg	25-35
SAMPLE FLOW	656	cc/min	650 ± 10%
PMT	103.1	mV	-20-150 with Zero Air
UV LAMP	3019.8	mV	1000-4900
STR. LGT	61.4	PPB	<100
DRK PMT	62.9	mV	-50 - 200
DRK LMP	57.6	mV	-50 - 200
HVPS	674	V	550-900 constant
DCPS	2519	mV	2500 ± 200
RCELL TEMP	50.4	°C	50 ± 1
BOX TEMP	29.1	°C	5-40
PMT TEMP	7.2	°C	7 ± 2.0
SO <sub>2</sub> Span Conc	400	PPB	20-20,000
SO <sub>2</sub> Slope	1.010	-	1.0 ± 0.3
SO <sub>2</sub> Offset	22.2	mV	<250
Stability at Zero	0.1	PPB	<0.2
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)

Calibrated by :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

Peera Detudorn  
(Mr.Peera Detudorn)



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CALIBRATION REPORT					
SO <sub>2</sub> FLUORESCENT ANALYZER					
DATE :	12 August 2024	BRAND :	TELEDYNE	MODEL :	TML-60
NO.	SO <sub>2</sub> -R08	SERIAL NO.	TRS1064		
Calibrator (Dilution System)					
Brand : Teledyne			Model : 700		
Last Cal. Date : 30 October 2023			Serial No. : 421		
Reference Standard Gas					
Standard Gas : Sulphur Dioxide (SO <sub>2</sub> )			Cylinder No. : A008145K		
Certified Date : 21 June 2021		Expired Date : 21 June 2029		Cylinder Conc. : 49.8 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	-0.10	-	0	-
SO <sub>2</sub> Span	400.0	399.7	-0.075	400.0	1.006
API Model TML-60 SO <sub>2</sub> Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.6	in-Hg	25-35		
SAMPLE FLOW	658	cc/min	650 ± 10%		
PMT	103.5	mV	-20-150 with Zero Air		
UV LAMP	3046.7	mV	1000-4900		
STR. LGT	61.8	PPB	<100		
DRK PMT	63.4	mV	-50 - 200		
DRK LMP	57.9	mV	-50 - 200		
HVPS	669	V	550-900 constant		
DCPS	2528	mV	2500 ± 200		
RCELL TEMP	50.0	°C	50 ± 1		
BOX TEMP	28.8	°C	5-40		
PMT TEMP	7.1	°C	7 ± 2.0		
SO <sub>2</sub> Span Conc	400	PPB	20-20,000		
SO <sub>2</sub> Slope	1.006	-	1.0 ± 0.3		
SO <sub>2</sub> Offset	21.8	mV	<250		
Stability at Zero	0.1	PPB	<0.2		
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)		

Calibrated by :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

Peera Detudorn  
(Mr.Peera Detudorn)



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# CALIBRATION REPORT

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

DATE : 12 August 2024

BRAND : API

MODEL : 200E

NO. NOX-B09

SERIAL NO. 4412

### Calibrator (Dilution System)

Brand : Teledyne

Model : 700

Last Cal. Date : 30 October 2023

Serial No. : 421

### 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	399.7	-0.075	400.0	1.003
NO <sub>x</sub> Span	400	399.9	-0.025	400.0	1.007

### 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	507	cc/min	500 ± 50
OZONE FLOW	78	cc/min	80 ± 15
PMT	102.9	mV	-20 - 150
AZERO	93.7	mV	-20 - 150
HVPS	675	V	420 - 900 constant
RCELL TEMP	50.2	°C	50 ± 1
BOX TEMP	29.5	°C	8 - 48
PMT TEMP	7.3	°C	7 ± 2
MOLY TEMP	314.7	°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	1.003	-	1.0 ± 0.3
NO <sub>x</sub> Slope	1.007	-	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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## CALIBRATION REPORT

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

DATE : 12 August 2024

BRAND : API

MODEL : 200E

NO. NOX-R02

SERIAL NO. 2285

#### Calibrator (Dilution System)

Brand : Teledyne

Model : 700

Last Cal. Date : 30 October 2023

Serial No. : 421

#### 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	399.9	-0.025	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	509	cc/min	500 ± 50
OZONE FLOW	78	cc/min	80 ± 15
PMT	103.1	mV	-20 - 150
AZERO	93.9	mV	-20 - 150
HVPS	669	V	420 - 900 constant
RCELL TEMP	50.0	°C	50 ± 1
BOX TEMP	28.8	°C	8 - 48
PMT TEMP	7.1	°C	7 ± 2
MOLY TEMP	314.9	°C	315 ± 5
RCELL PRESS	8.3	IN-Hg-A	2 - 10 constant
SAMPLE PRESS	28.4	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	1.4	mV	-20 to +150
NO <sub>x</sub> Offset	0.9	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 Dangklorn  
(Mr. Adul Dangklorn)

Approved by :

Peera Detudorn  
(Mr. Peera Detudorn)



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# CALIBRATION REPORT

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

DATE : 12 August 2024

BRAND : API

MODEL : 200E

NO. NOX-R11

SERIAL NO. 2621

### Calibrator (Dilution System)

Brand : Teledyne

Model : 700

Last Cal. Date : 30 October 2023

Serial No. : 421

### 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	399.7	-0.075	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	511	cc/min	500 ± 50
OZONE FLOW	79	cc/min	80 ± 15
PMT	103.2	mV	-20 - 150
AZERO	93.8	mV	-20 - 150
HVPS	671	V	420 - 900 constant
RCELL TEMP	50.2	°C	50 ± 1
BOX TEMP	29.1	°C	8 - 48
PMT TEMP	7.4	°C	7 ± 2
MOLY TEMP	315.4	°C	315 ± 5
RCELL PRESS	8.2	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	1.004	-	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 Dangklorn  
(Mr. Adul Dangklorn)

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

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>
B41	SKC	224-PCXR4	612669	02/07/2024	1,000	1,500	2,000	1,009	1,502	2,005	1.006x - 11.146	0.999
B42	SKC	224-PCXR4	626041	02/07/2024	1,000	1,500	2,000	1,005	1,499	2,005	0.997x + 6.432	1.000
B43	SKC	224-PCXR4	034636	02/07/2024	1,000	1,500	2,000	1,004	1,505	2,013	1.010x - 15.091	0.999
B44	SKC	224-PCXR8	529341	02/07/2024	1,000	1,500	2,000	1,004	1,506	2,005	1.005x - 9.731	0.999
B45	SKC	224-PCXR8	529594	03/07/2024	1,000	1,500	2,000	996	1,491	2,002	1.009x - 16.399	1.000
B46	SKC	224-PCXR8	566743	03/07/2024	1,000	1,500	2,000	996	1,495	2,001	1.001x - 5.621	1.000
B47	SKC	224-PCXR8	566747	03/07/2024	1,000	1,500	2,000	1,003	1,496	1,996	0.995x + 7.632	1.000
B48	SKC	224-PCXR8	566753	03/07/2024	1,000	1,500	2,000	1,007	1,503	2,005	1.007x - 9.047	0.999
B49	SKC	224-PCXR8	566780	05/07/2024	1,000	1,500	2,000	1,005	1,492	2,001	0.998x + 2.047	1.000
B50	SKC	224-PCXR8	500400	05/07/2024	1,000	1,500	2,000	997	1,513	2,006	1.008x - 10.870	1.000
B51	SKC	224-PCXR8	500363	05/07/2024	1,000	1,500	2,000	1,007	1,496	2,010	1.003x - 3.758	1.000
B52	SKC	224-PCXR8	093186	05/07/2024	1,000	1,500	2,000	1,003	1,496	2,002	0.999x + 1.439	1.000
B53	SKC	224-PCXR8	707670	05/07/2024	1,000	1,500	2,000	999	1,501	1,998	1.002x - 4.254	0.999
B54	SKC	224-PCXR3	509821	05/07/2024	1,000	1,500	2,000	1,000	1,503	1,998	1.003x - 5.249	1.000
B55	SKC	224-PCXR3	510710	03/07/2024	1,000	1,500	2,000	998	1,519	2,003	1.006x - 5.785	0.999
B56	SKC	224-PCXR3	511450	03/07/2024	1,000	1,500	2,000	1,003	1,506	2,001	1.004x - 7.748	1.000
B57	SKC	224-PCXR3	510798	01/07/2024	1,000	1,500	2,000	1,008	1,505	2,008	1.010x - 16.191	0.999
B58	SKC	224-PCXR3	509852	01/07/2024	1,000	1,500	2,000	1,002	1,505	2,007	1.012x - 20.201	0.999
B59	SKC	224-PCXR3	509862	01/07/2024	1,000	1,500	2,000	997	1,501	1,999	1.000x + 0.760	1.000
B60	SKC	224-PCXR3	512655	05/07/2024	1,000	1,500	2,000	1,014	1,507	2,003	1.002x - 1.563	0.999
B61	SKC	224-PCXR3	503915	05/07/2024	1,000	1,500	2,000	999	1,517	2,000	0.998x + 5.213	0.999
B62	SKC	224-PCXR3	505975	05/07/2024	1,000	1,500	2,000	1,000	1,501	2,010	1.008x - 7.876	1.000
B63	SKC	224-PCXR3	511432	05/07/2024	1,000	1,500	2,000	1,005	1,506	2,009	1.010x - 11.514	1.000
B64	SKC	224-PCXR3	508302	05/07/2024	1,000	1,500	2,000	999	1,512	2,009	1.009x - 11.825	1.000
B65	SKC	224-PCXR3	508310	05/07/2024	1,000	1,500	2,000	998	1,499	2,004	1.008x - 11.573	1.000
B66	SKC	224-PCXR3	509861	05/07/2024	1,000	1,500	2,000	999	1,517	2,000	0.999x + 4.094	0.999
B67	SKC	224-PCXR3	506295	03/07/2024	1,000	1,500	2,000	997	1,505	2,006	1.011x - 17.514	1.000
B68	SKC	224-PCXR3	505872	01/07/2024	1,000	1,500	2,000	999	1,517	1,999	0.999x + 3.174	0.999
B69	SKC	224-PCXR3	508375	01/07/2024	1,000	1,500	2,000	1,008	1,505	2,009	1.013x - 17.610	0.999
B70	SKC	224-PCXR3	510623	01/07/2024	1,000	1,500	2,000	996	1,504	2,002	1.006x - 9.583	1.000
B71	SKC	224-PCXR3	508367	01/07/2024	1,000	1,500	2,000	997	1,499	1,996	1.001x - 8.495	1.000
B72	SKC	224-PCXR3	505977	01/07/2024	1,000	1,500	2,000	997	1,496	1,999	1.005x - 12.009	1.000
B73	SKC	224-PCXR3	512606	03/07/2024	1,000	1,500	2,000	1,007	1,504	2,007	1.006x - 15.183	0.999
B74	SKC	224-PCXR3	505993	03/07/2024	1,000	1,500	2,000	1,004	1,504	2,002	1.007x - 14.720	0.999
B75	SKC	224-PCXR3	509820	03/07/2024	1,000	1,500	2,000	1,005	1,493	2,002	1.000x - 3.606	1.000
B76	SKC	224-PCXR3	509811	03/07/2024	1,000	1,500	2,000	1,000	1,495	2,002	0.999x - 0.580	1.000
B77	SKC	224-PCXR3	508301	04/07/2024	1,000	1,500	2,000	1,005	1,505	2,010	1.008 - 12.453	0.999
B78	SKC	224-PCXR3	510677	04/07/2024	1,000	1,500	2,000	998	1,503	2,005	1.009x - 17.250	1.000
B79	SKC	224-PCXR3	510920	04/07/2024	1,000	1,500	2,000	998	1,509	1,996	1.002x - 3.822	1.000

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด  
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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	03/07/2024	50	100	200	50.7	101.9	201.5	1.004x + 0.202	0.999
L-R02	Dwyer	VFA-21	03/07/2024	50	100	200	50.1	100.8	201.6	1.001x + 0.433	1.000
L-R03	Dwyer	VFA-21	02/07/2024	50	100	200	50.2	101.2	201.3	1.005x - 0.046	1.000
L-R04	Dwyer	VFA-21	02/07/2024	50	100	200	50.3	100.3	201.4	1.002x + 0.230	1.000
L-R05	Dwyer	VFA-21	02/07/2024	50	100	200	50.4	101.9	200.3	1.003x - 0.041	0.999
L-R06	Dwyer	VFA-21	01/07/2024	50	100	200	50.8	100.5	200.7	1.006x + 0.021	1.000

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



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Tel : (662) 939-1370-72 Fax : (662) 513-4221 E-mail : sale@spscon.com, www.spscon.com

CALIBRATION REPORT			
Total Hydrocarbon Analyzer			
DATE :	12 August 2024	BRAND :	HORIBA
MODEL :	APHA-370	NO.	THC-R02
SERIAL NO.	6F3AC3V4		
Calibrator (Dilution System)			
Brand :	Teledyne	Model :	700
Last Cal. Date :	30 October 2023	Serial No.	421
Reference Standard Gas			
Standard Gas :	Methane (CH <sub>4</sub> )	Cylinder No.	D612165
Certified Date :	25 February 2023	Expired Date :	25 February 2031
Cylinder Conc.	453 ppm		
Calibrating Condition			
Pressure	1011 mmbar	Temp.	24.6 °C
% RH	48	Start Time :	2:00 PM
Pre-Calibration Checks			
Change Particulate Filter	YES	Station Temp :	25.0 °C
Leak Test	YES		
Calibration Setting			
Span Set Point	Initial Reading (Before Adj)		Final Reading (After Adj)
	Expected Concentration (PPM)	Analyzer Response (PPM)	Analyzer Response (PPM)
Zero	0	0.10	0
Span	10	10.04	10
Calibration Setting (Final)			
Span Instrument Gain:	0.997	Finish Time:	3:00 PM
APHA-370 Total Hydrocarbon Analyzer			
Test Values	Observed Value	Units	Nominal Range
SIGNAL (CH <sub>4</sub> )	911.5	mV	800-1,350
SIGNAL (THC)	917.1	mV	800-1,350
DETECTOR	78.0	kPa	((Pressure air/1013)x100)-20 ± 4 kPa
PURIFIER	19.2	kPa	8 - 25
NMC	258.5	°C	260 ± 10
BYPATH	0.9	L / min	0.9 ± 0.3
OVER FLOW	0.8	L / min	0.8

Calibrated by Adul Dangklom  
(Mr.Adul Dangklom)

Approved by Peera Detudom  
(Mr.Peera Detudom)





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# CALIBRATION REPORT

## SO<sub>2</sub> FLUORESCENT ANALYZER

DATE : 07 November 2024

BRAND : TELEDYNE

MODEL : TML-60

NO. SO<sub>2</sub>-R07

SERIAL NO. TRS1068

### Calibrator (Dilution System)

Brand : API

Model : 700

Last Cal. Date : 05 August 2024

Serial No. : 911

### Reference Standard Gas

Standard Gas : Sulphur Dioxide (SO<sub>2</sub>)

Cylinder No. : A00814SK

Certified Date : 21 June 2021

Expired Date : 21 June 2029

Cylinder Conc. : 49.8 ppm

### CALIBRATING CONDITION

Pressure 1011 mmbar

Temp. 24.5 °C

% RH 50

### 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	-
SO <sub>2</sub> Span	400.0	400.3	0.075	400.0	1.013

### API Model TML-60 SO<sub>2</sub> Analyzer Check list

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	0-500
SAMPLE PRESS	28.5	in-Hg	25-35
SAMPLE FLOW	656	cc/min	650 ± 10%
PMT	103.4	mV	-20-150 with Zero Air
UV LAMP	3037.7	mV	1000-4900
STR. LGT	61.9	PPB	<100
DRK PMT	63.3	mV	-50 - 200
DRK LMP	58.2	mV	-50 - 200
HVPS	670	V	550-900 constant
DCPS	2519	mV	2500 ± 200
RCELL TEMP	50.3	°C	50 ± 1
BOX TEMP	29.2	°C	5-40
PMT TEMP	7.5	°C	7 ± 2.0
SO <sub>2</sub> Span Conc	400	PPB	20-20,000
SO <sub>2</sub> Slope	1.013	-	1.0 ± 0.3
SO <sub>2</sub> Offset	21.6	mV	<250
Stability at Zero	0.1	PPB	<0.2
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)

Calibrated by :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

(Mr.Peera Detudom)



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CALIBRATION REPORT					
SO <sub>2</sub> FLUORESCENT ANALYZER					
DATE :	07 November 2024	BRAND :	API	MODEL :	100E
NO.	SO <sub>2</sub> -R02	SERIAL NO.	3431		
Calibrator (Dilution System)					
Brand	: API			Model	: 700
Last Cal. Date	: 05 August 2024			Serial No.	: 911
Reference Standard Gas					
Standard Gas	: Sulphur Dioxide (SO <sub>2</sub> )			Cylinder No.	: A00814SK
Certified Date	: 21 June 2021	Expired Date	: 21 June 2029	Cylinder Conc.	: 49.8 ppm
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.5	°C
% RH	50				
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	-0.10	-	0	-
SO <sub>2</sub> Span	400.0	399.9	-0.025	400.0	1.009
API Model 100E SO <sub>2</sub> Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.6	in-Hg	25-35		
SAMPLE FLOW	658	cc/min	650 ± 10%		
PMT	103.5	mV	-20-150 with Zero Air		
UV LAMP	3041.9	mV	1000-4900		
STR. LGT	61.8	PPB	<100		
DRK PMT	63.2	mV	-50 - 200		
DRK LMP	57.9	mV	-50 - 200		
HVPS	672	V	550-900 constant		
DCPS	2521	mV	2500 ± 200		
RCELL TEMP	50.0	°C	50 ± 1		
BOX TEMP	28.8	°C	5-40		
PMT TEMP	7.2	°C	7 ± 2.0		
SO <sub>2</sub> Span Conc	400	PPB	20-20,000		
SO <sub>2</sub> Slope	1.009	-	1.0 ± 0.3		
SO <sub>2</sub> Offset	22.2	mV	<250		
Stability at Zero	0.1	PPB	<0.2		
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)		

Calibrated by :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

Peera Detudom  
(Mr.Peera Detudom)

Job Number :	J092400007	Customer Name :	IRPC
Equipment :	AQMs Station.	Contact Name :	KhunWirasakKhumsuk
Model :	AQMs Station.	Telephone Number :	081-803-0475
Serial Number :	Pluak Kate Station	E-mail address/Fax. :	<a href="mailto:wirasak.k@irpc.co.th">wirasak.k@irpc.co.th</a>
Working Date :	06 November 2024	Working Hour :	4 Hours

## Service Report

Working Scope:

Service Station

Physical Checking:

- ตรวจเช็ค Data logger พบว่าทำงานได้ปกติ
- ตรวจเช็ค Diagnostic of all analyzers อยู่ในเกณฑ์ปกติ
- ตรวจเช็ค Reading of all analyzers และ Met sensor พบว่าปกติ
- ตรวจเช็ค ผล Calibration พบว่าอยู่ในเกณฑ์ปกติ
- ตรวจเช็ค Dilutor และ Zero Air พบว่าทำงานได้ปกติ
- ตรวจเช็ค เครื่องวัดฝุ่น PM-10 พบว่าทำงานได้ปกติ
- ตรวจเช็ค เครื่อง THC analyzer พบว่าทำงานได้ปกติ
- ตรวจเช็ค การทำงานของระบบไฟฟ้า และ UPS พบว่าทำงานได้ปกติ
- ทำความสะอาดภายในสถานี และ บริเวณรอบสถานี

Correction working:

Calibrate single-point of all analyzers.	Drain water for pump of Zero Air.
Replace sample filter 47 mm.	

Part Replacements:

- Sample Filter 47 mm. 6 ea. (Part support by IRPC)

Addition Recommended:

- End -

Serviced by :	เอกราช สะสีแสง	Serviced Date	06 November 2024
Approved by:		Approved Date :	06 November 2024



บริษัท คิว-ชี โซลูชั่นส์ จำกัด

7/409 ซอยวิภาวดีรังสิต 36 ถนนวิภาวดีรังสิต แขวงจตุจักร เขตจตุจักร กรุงเทพฯ 10900

โทรศัพท์ : (662) 939-5711 (12 Lines) โทรสาร : (662) 939-4207-8

Website <http://www.qshe.co.th> E-mail-address: [info@qshe.co.th](mailto:info@qshe.co.th)

## General Checking

Equipment :	AQMs Pluak Kate	Model :	-
Serial Number :	Pluak Kate Station	Manufacturer :	-

Item	Description	Set-Point Value	Status & Value	Remark
	<u>On Mobile</u>			
1	Air conditioner operation	OK	OK	
2	Mobile temperature	25-27 °C	26°C	
3	Lighting system	OK	OK	
4	Lamp in sampling box	OK	OK	
5	Sampling probe	Clean	Clean	
6	Blower	OK	OK	
7	Drain liquid in tank	Drain	Drain	
8	Compressor tank set pressure	80 psi	80 psi	
9	Zero air compressor operation	OK	OK	
10	Silica gel for dry air of NO <sub>x</sub> analyzer	OK	OK	
11	UPS 3 KVA	OK	OK	
12	Data logger	OK	OK	
13	Ventilation fan	OK	OK	
14	Power cable	OK	OK	
15	Hydrogen Gas	-	1950/42 psi	
16	Standard gas#1 (NO,SO <sub>2</sub> ,HC,CO)	-	2000/32 psi	

Note :



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NO-NO<sub>2</sub>-NO<sub>x</sub> Analyzer

Equipment :	NO-NO <sub>2</sub> -NO <sub>x</sub> analyzer.	Model :	42i
Serial Number :	1170530044	Manufacturer :	Thermo Scientific

Diagnostic test value				
Parameter	Observed value		Unit	Nominal range
	Before	After		
Sample reading				
NO reading	1.8	13.3	ppb	
NO <sub>x</sub> reading	7.3	31.1	ppb	
Range	500	500	ppb	50 to 1000 ppb
Averaging Time	30	30	Sec	10 to 300 Sec
Calibration Factors				
NO BKG. ppb	12.9	12.9	ppb	0 to 60
NO <sub>x</sub> BKG. ppb	12.7	12.7	ppb	0 to 60
NO COEF.	0.967	0.963	-	1.0 ± 0.3
NO <sub>x</sub> COEF.	1.000	1.000	-	1.0 ± 0.3
NO <sub>2</sub> COEF.	1.000	1.000	-	1.0 ± 0.3
Instrument Controls				
Ozonator	On	On		On/Off
PMT Supply	On	On		On/Off
Auto/Manual Mode	NO/NO <sub>x</sub>	NO/NO <sub>x</sub>		NO/NO <sub>x</sub> , NO, NO <sub>x</sub>
Baud Rate	9600	9600	bps	1200 to 9600
Temp Compensation	On	On	-	On/Off
Pressure Compensation	On	On	-	On/Off
Screen Contrast	45	45	%	0 to 100
Service Mode	Off	Off	-	On/Off, Up to used
Diagnostics				
Voltages				
PMT Supply	-917.6	-917.6	Vdc	-400 to -1200 Vdc
5 Supply	4.9	4.9	Vdc	5.0 ± 1 Vdc
15 Supply	15.1	15.1	Vdc	15.0 ± 1 Vdc
-15 Supply	-14.8	-14.8	Vdc	-15.0 ± 1 Vdc
Temperatures				
Internal	32.9	34.9	°C	15 °C to 45 °C
Chamber	49.9	49.8	°C	50 °C ± 2 °C
Cooler	-3.0	-3.0	°C	(-)3 °C ± 2 °C
Converter	326.0	325.8	°C	325 °C ± 5 °C
Converter Set	325.0	325.0	°C	325 °C
Pressure	279.0	285.3	mmHg	250 ± 100 mmHg
Flow	0.633	0.671	L/min	0.5 to 1.00 L/min

Note :



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## SINGLE-POINT GAS CALIBRATION

All analyzer.

Equipment :	All analyzer.	Model :	42C, 43i , 48i, 49i
Serial Number :	0504710413,CM06280010, 1201351403,CM09040067	Manufacturer :	Thermo

Standard gas concentration			Dilutor detail	
Sulfur Dioxide (SO <sub>2</sub> )	44.7	ppm	Manufacturer :	Thermo
Nitric Oxide (NO)	45.0	ppm	Model :	146C
Methane (CH <sub>4</sub> )	498	ppm	Serial number :	0504710414
Carbon oxide (CO)	4550	ppm		
Cylinder NO. :	A00931SK			
Expiration Date :	8 Sep 2026			

## BEFORE CALIBRATION RESULT

PARAMETER	ZERO			SPAN			JUDGEMENT
	IDEAL	ACTUAL	ERROR	IDEAL	ACTUAL	%ERROR	
NO (ppb)	0.00	0.6	0.60	400	404.0	1.00	Valid
NO <sub>x</sub> (ppb)	0.00	1.2	1.20	400	408.0	2.00	Valid
SO <sub>2</sub> (ppb)	0.00	1.0	1.00	400	406.0	1.50	Valid
CO (ppm)	0.00	0.11	0.11	40.3	40.3	0.00	Valid
O <sub>3</sub> (ppb)	0.00	0.0	0.00	400	411.0	2.75	Valid
CH <sub>4</sub> (ppm)	0.00			5.00			
THC (ppm)	0.00			5.00			

## AFTER CALIBRATION RESULT

PARAMETER	ZERO			SPAN			JUDGEMENT
	IDEAL	ACTUAL	ERROR	IDEAL	ACTUAL	%ERROR	
NO (ppb)	0.00	0.5	0.50	400	399.0	-0.25	Valid
NO <sub>x</sub> (ppb)	0.00	1.4	1.40	400	402.0	0.50	Valid
SO <sub>2</sub> (ppb)	0.00	1.0	1.00	400	400.0	0.00	Valid
CO (ppm)	0.00	0.09	0.09	40.3	40.3	0.00	Valid
O <sub>3</sub> (ppb)	0.00	1.0	1.00	400	399.0	-0.25	Valid
CH <sub>4</sub> (ppm)	0.00			5.00			
THC (ppm)	0.00			5.00			

Remark :



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Website <http://www.qshe.co.th> E-mail-address: [info@qshe.co.th](mailto:info@qshe.co.th)

Job Number :	J092400007	Customer Name :	IRPC
Equipment :	AQMs Station.	Contact Name :	Khun Wirasak Khumsuk
Model :	AQMs Station.	Telephone Number :	081-803-0475
Serial Number :	Technology Station	E-mail address/Fax. :	<a href="mailto:wirasak.k@irpc.co.th">wirasak.k@irpc.co.th</a>
Working Date :	09 November 2024	Working Hour :	6 Hours

## Service Report

## Working Scope:

Service Station

## Physical Checking:

- ตรวจเช็ค Data logger พบว่าทำงานได้ปกติ
- ตรวจเช็ค Diagnostic of all analyzers อยู่ในเกณฑ์ปกติ
- ตรวจเช็ค Reading of all analyzers และ Met sensor พบว่าปกติ
- ตรวจเช็ค ผล Calibration พบว่าอยู่ในเกณฑ์ปกติ
- ตรวจเช็ค Dilutor และ Zero Air พบว่าทำงานได้ปกติ
- ตรวจเช็ค เครื่องวัดฝุ่น PM-10 & PM-2.5 พบว่าทำงานได้ปกติ
- ตรวจเช็ค เครื่อง THC analyzer พบว่าทำงานได้ปกติ
- ตรวจเช็ค การทำงานของระบบไฟฟ้า และ UPS พบว่าทำงานได้ปกติ
- ทำความสะอาดภายในสถานี และ บริเวณรอบสถานี

## Correction working:

Calibrate single-point of all analyzers.	Replace silica gel for dryer NO <sub>x</sub> Analyzer.
Replace sample filter 47 mm.	Drain water for pump of Zero Air.

## Part Replacement:

- Sample filter 47 mm. 7 ea. (Part Support by IRPC)
- Silica gel. P/N: 6998 1/2 Bottle. (Part Support by IRPC)

## Addition Recommended:

- NO<sub>x</sub> analyzer เป็นเครื่องของ สถานีกันหนอง ยกมาติดตั้งชั่วคราว

-- End --

Serviced by :	เอกราช สะสีแสง	Serviced Date :	09 November 2024
Approved by:		Approved Date :	09 November 2024



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Website <http://www.qshe.co.th> E-mail-address: [info@qshe.co.th](mailto:info@qshe.co.th)

## General Checking

Equipment : AQMs Technology

Model : -

Serial Number : -

Manufacturer : -

Item	Description	Set-Point Value	Status & Value	Remark
	<u>On Mobile</u>			
1	Air conditioner operation	OK	OK	
2	Station temperature	25-27 °C	25-27 °C	
3	Lighting system	OK	OK	
4	Lamp in sampling box	OK	OK	
5	Sampling probe	Clean	Clean	
6	Blower	OK	OK	
7	Drain liquid in tank	Drain	Drain	
8	Compressor tank set pressure	80 psi	80 psi	
9	Zero air compressor operation	OK	OK	
10	Silica gel for dry air of NO <sub>x</sub> analyzer	OK	OK	
11	UPS 3 KVA	OK	OK	
12	Data logger	OK	OK	
13	Ventilation fan	OK	OK	
14	Power cable	OK	OK	
15	Hydrogen Gas	>500 psi	1900/28 psi	
16	Standard gas#1 (NO,SO <sub>2</sub> ,HC,CO)	-	2050/30 psi	

Note :



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NO-NO<sub>2</sub>-NO<sub>x</sub> Analyzer

Equipment :	NO-NO <sub>2</sub> -NO <sub>x</sub> analyzer.	Model :	42i
Serial Number :	0620617608	Manufacturer :	Thermo Scientific

Diagnostic test value				
Parameter	Observed value		Unit	Nominal range
	Before	After		
<b>Sample reading</b>				
NO reading	2.1	1.0	ppb	
NO <sub>x</sub> reading	15.4	5.6	ppb	
<b>Range</b>	500	500	ppb	50 to 1000 ppb
<b>Averaging Time</b>	30	30	Sec	10 to 300 Sec
<b>Calibration Factors</b>				
NO BKG. Ppb	37.0	37.4	ppb	0 to 60
NO <sub>x</sub> BKG. Ppb	36.8	37.3	ppb	0 to 60
NO COEF.	0.930	0.945	-	1.0 ± 0.3
NO <sub>x</sub> COEF.	1.000	1.000	-	1.0 ± 0.3
NO <sub>2</sub> COEF.	1.000	1.000	-	1.0 ± 0.3
<b>Instrument Controls</b>				
Ozonator	On	On		On/Off
PMT Supply	On	On		On/Off
Auto/Manual Mode	NO/NO <sub>x</sub>	NO/NO <sub>x</sub>		NO/NO <sub>x</sub> , NO, NO <sub>x</sub>
Baud Rate	9600	9600	bps	1200 to 9600
Temp Compensation	On	On	-	On/Off
Pressure Compensation	On	On	-	On/Off
Screen Contrast	40	40	%	0 to 100
Service Mode	Off	Off	-	On/Off, Up to used
<b>Diagnostics</b>				
<b>Voltages</b>				
<b>Motherboard voltages:</b>				
3.3 Supply	3.3	3.3	Vdc	3.3 ± 1 Vdc
5.0 Supply	5.0	5.0	Vdc	5.0 ± 1 Vdc
15.0 Supply	14.9	14.9	Vdc	15.0 ± 1 Vdc
24.0 Supply	23.7	23.7	Vdc	24.0 ± 1 Vdc
-3.3 Supply	-3.2	-3.2	Vdc	-3.3 ± 1 Vdc
<b>Interface board voltages:</b>				
PMT Supply	-1056.7	-1056.7	Vdc	-400 to -1200 Vdc
3.3 Supply	3.3	3.3	Vdc	3.3 ± 1 Vdc
5.0 Supply	4.9	4.9	Vdc	5.0 ± 1 Vdc
15.0 Supply	15.1	15.1	Vdc	15.0 ± 1 Vdc
P15.0 Supply	14.8	14.8	Vdc	15.0 ± 1 Vdc
24.0 Supply	23.4	23.4	Vdc	24.0 ± 1 Vdc
-15.0 Supply	-15.0	-15.0	Vdc	-15.0 ± 1 Vdc
<b>Temperatures</b>				
Internal	33.1	33.7	°C	15 °C to 45 °C
Chamber	49.7	50.1	°C	50°C ± 2 °C
Cooler	-2.8	-3.0	°C	(-)3 °C ± 2 °C
Converter	326.3	322.9	°C	325 °C ± 5 °C
Converter Set	325.0	325.0	°C	325 °C
<b>Pressure</b>	287.9	287.3	mmHg	250 ± 100 mmHg
<b>Flow</b>	0.693	0.702	L/min	0.5 to 1.00 L/min

**Note :** เป็นเครื่องของสถานีกันหนอง ยกมาใช้ชั่วคราว



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Website <http://www.qshe.co.th> E-mail-address: [info@qshe.co.th](mailto:info@qshe.co.th)

## SINGLE-POINT GAS CALIBRATION

All analyzer.

Equipment :	All analyzer.	Model :	42i, 43i , 48i , 49i , 410i, APHA-370
Serial Number :	—	Manufacturer :	Thermo, Horiba

Standard gas concentration			Dilutor detail	
Sulfur Dioxide (SO <sub>2</sub> )	44.8	ppm	Manufacturer :	Thermo
Nitric Oxide (NO)	45.3	ppm	Model :	146i
Methane (CH <sub>4</sub> )	495	ppm	Serial number :	0630318396
Carbon Monoxide (CO)	4540	ppm		
Cylinder NO. :	D636101			
Expiration Date :	8 Sep 2026			

## BEFORE CALIBRATION RESULT

PARAMETER	ZERO			SPAN			JUDGEMENT
	IDEAL	ACTUAL	ERROR	IDEAL	ACTUAL	%ERROR	
NO (ppb)	0.0	1.40	1.40	400.0	394.0	-1.50	Valid
NO <sub>x</sub> (ppb)	0.0	1.50	1.50	400.0	395.0	-1.25	Valid
SO <sub>2</sub> (ppb)	0.0	1.30	1.30	400.0	404.0	1.00	Valid
CO(ppm)	0.0	0.10	0.10	40.1	39.8	-0.75	Valid
O3(ppb)	0.0	1.50	1.50	400.0	398.0	-0.50	Valid
CH4(ppm)	0.0	0.01	0.01	4.50	4.50	0.00	Valid
THC(ppm)	0.0	0.01	0.01	4.50	4.50	0.00	Valid

## AFTER CALIBRATION RESULT

PARAMETER	ZERO			SPAN			JUDGEMENT
	IDEAL	ACTUAL	ERROR	IDEAL	ACTUAL	%ERROR	
NO (ppb)	0.0	0.80	0.80	400.0	399.0	-0.25	Valid
NO <sub>x</sub> (ppb)	0.0	1.40	1.40	400.0	401.0	0.25	Valid
SO <sub>2</sub> (ppb)	0.0	1.50	1.50	400.0	404.0	1.00	Valid
CO(ppm)	0.0	0.1	0.10	40.1	40.1	0.00	Valid
O3(ppb)	0.0	0.90	0.90	400.0	401.0	0.25	Valid
CH4(ppm)	0.0	0.01	0.01	4.50	4.50	0.00	Valid
THC(ppm)	0.0	0.01	0.01	4.50	4.50	0.00	Valid

Remark : NO<sub>x</sub> เป็นเครื่องของสถานี กั้นหนอง ยกมาใช้ชั่วคราว

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Website <http://www.qshe.co.th> E-mail-address: [info@qshe.co.th](mailto:info@qshe.co.th)

Job Number :	J092400007	Customer Name :	IRPC
Equipment :	AQMs Station.	Contact Name :	Khun Wirasak Khumsuk
Model :	AQMs Station.	Telephone Number :	081-803-0475
Serial Number :	Ban Lang Station	E-mail address/Fax. :	<a href="mailto:wirasak.k@irpc.co.th">wirasak.k@irpc.co.th</a>
	07 November 2024	Working Hour :	6 Hours

## Service Report

## Working Scope:

Service Station

## Physical Checking:

- ตรวจเช็ค Data logger พบว่าทำงานได้ปกติ
- ตรวจเช็ค Diagnostic of all analyzers อยู่ในเกณฑ์ปกติ
- ตรวจเช็ค Reading of all analyzers และ Met sensor พบว่าปกติ
- ตรวจเช็ค ผล Calibration พบว่าอยู่ในเกณฑ์ปกติ
- ตรวจเช็ค Dilutor และ Zero Air พบว่าทำงานได้ปกติ
- ตรวจเช็ค เครื่องวัดฝุ่น PM-10 พบว่าทำงานได้ปกติ
- ตรวจเช็ค เครื่อง THC analyzer พบว่าทำงานได้ปกติ
- ตรวจเช็ค การทำงานของระบบไฟฟ้า และ UPS พบว่าทำงานได้ปกติ
- ทำความสะอาดภายในสถานี และ บริเวณรอบสถานี

## Correction working:

Calibrate single-point of all analyzers.	Replace silica gel for dryer NO <sub>x</sub> Analyzer.
Replace sample filter 47 mm.	Drain water for pump of Zero Air.


## Part Replacement:

- Sample filter 47 mm. 5 ea. (Part Support by IRPC)
- Silica gel. P/N: 6998 1/2 Bottle. (Part Support by IRPC)

## Addition Recommended:

- Zero air นำมาจาก Micro#1 มาติดตั้งใช้งานชั่วคราว

-- End --

Serviced by :	เอกราช สะสีแสง	Serviced Date :	07 November 2024
Approved by:		Approved Date :	07 November 2024



บริษัท คิว-ชี โซลูชั่นส์ จำกัด

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Website <http://www.qshe.co.th> E-mail-address: [info@qshe.co.th](mailto:info@qshe.co.th)

## General Checking

Equipment : AQMs Ban Lang

Model : -

Serial Number : -

Manufacturer : -

Item	Description	Set-Point Value	Status & Value	Remark
	<u>On Mobile</u>			
1	Air conditioner operation	OK	OK	
2	Mobile temperature	25-27 °C	25-27 °C	
3	Lighting system	OK	OK	
4	Lamp in sampling box	OK	OK	
5	Sampling probe	Clean	Clean	
6	Blower	OK	OK	
7	Drain liquid in tank	Drain	Drain	
8	Compressor tank set pressure	80 psi	80 psi	
9	Zero air compressor operation	OK	OK	
10	Silica gel for dry air of NO <sub>x</sub> analyzer	OK	OK	
11	UPS 6 KVA	Bypass	Not use	
12	Data logger	OK	OK	
13	Ventilation fan	OK	OK	
14	Power cable	OK	OK	
15	Hydrogen Gas	>500 psi	1100/38 psi	
16	Standard gas#1 (NO,SO <sub>2</sub> ,HC,CO)	-	2050/18 psi	

Note :



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NO-NO<sub>2</sub>-NO<sub>x</sub> Analyzer

Equipment :	NO-NO <sub>2</sub> -NO <sub>x</sub> analyzer.	Model :	42i
Serial Number :	CM9540006	Manufacturer :	Thermo Scientific

Diagnostic test value				
Parameter	Observed value		Unit	Nominal range
	Before	After		
Sample reading				
NO reading	1.7	1.0	ppb	
NO <sub>x</sub> reading	3.9	2.3	ppb	
Range	500	500	ppb	50 to 1000 ppb
Averaging Time	60	60	Sec	10 to 300 Sec
Calibration Factors				
NO BKG. ppb	36.4	39.9	ppb	0 to 60
NO <sub>x</sub> BKG. ppb	35.5	39.2	ppb	0 to 60
NO COEF.	1.263	1.215	-	1.0 ± 0.3
NO <sub>x</sub> COEF.	0.987	0.996	-	1.0 ± 0.3
NO <sub>2</sub> COEF.	1.000	1.000	-	1.0 ± 0.3
Instrument Controls				
Ozonator	On	On		On/Off
PMT Supply	On	On		On/Off
Auto/Manual Mode	NO/NO <sub>x</sub>	NO/NO <sub>x</sub>		NO/NO <sub>x</sub> , NO, NO <sub>x</sub>
Baud Rate	9600	9600	bps	1200 to 9600
Temp Compensation	On	On	-	On/Off
Pressure Compensation	On	On	-	On/Off
Screen Contrast	45	45	%	0 to 100
Service Mode	Off	Off	-	On/Off, Up to used
Diagnostics				
Voltages				
Motherboard voltages:				
3.3 Supply	3.3	3.3	Vdc	3.3 ± 1 Vdc
5.0 Supply	5.0	5.0	Vdc	5.0 ± 1 Vdc
15.0 Supply	15.3	15.3	Vdc	15.0 ± 1 Vdc
24.0 Supply	23.9	23.9	Vdc	24.0 ± 1 Vdc
-3.3 Supply	-3.2	-3.2	Vdc	-3.3 ± 1 Vdc
Interface board voltages:				
PMT Supply	-1055.6	-1055.6	Vdc	-400 to -1200 Vdc
3.3 Supply	3.3	3.3	Vdc	3.3 ± 1 Vdc
5.0 Supply	5.0	5.0	Vdc	5.0 ± 1 Vdc
15.0 Supply	15.0	15.0	Vdc	15.0 ± 1 Vdc
P15.0 Supply	15.1	15.1	Vdc	15.0 ± 1 Vdc
24.0 Supply	23.9	23.9	Vdc	24.0 ± 1 Vdc
-15.0 Supply	-15.0	-15.0	Vdc	-15.0 ± 1 Vdc
Temperatures				
Internal	39.4	38.4	°C	15 °C to 45 °C
Chamber	43.9	45.5	°C	50°C ± 2 °C
Cooler	-2.9	-2.9	°C	(-)3 °C ± 2 °C
Converter	327.1	322.4	°C	325 °C ± 5 °C
Converter Set	325.0	325.0	°C	325 °C
Pressure	294.9	276.7	mmHg	250 ± 100 mmHg
Flow	0.554	0.591	L/min	0.5 to 1.00 L/min

Note :



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## SINGLE-POINT GAS CALIBRATION

All analyzer.

Equipment :	All analyzer.	Model :	42i, 43i, 49i, 48i, APHA-370
Serial Number :	--	Manufacturer :	Thermo, Horiba

Standard gas concentration			Dilutor detail	
Sulfur Dioxide (SO <sub>2</sub> )	44.7	ppm	Manufacturer :	Thermo
Nitric Oxide (NO)	43.7	ppm	Model :	146i
Methane (CH <sub>4</sub> )	499	ppm	Serial number :	CM09350122
Carbon Monoxide (CO)	4560	ppm		
Cylinder NO. :	D519488			
Expiration Date :	8 Sep 2026			

## BEFORE CALIBRATION RESULT

PARAMETER	ZERO			SPAN			JUDGEMENT
	IDEAL	ACTUAL	ERROR	IDEAL	ACTUAL	%ERROR	
NO (ppb)	0.0	2.0	2.0	400	389	-2.8	valid
NO <sub>x</sub> (ppb)	0.0	2.0	2.0	400	391	-2.3	valid
SO <sub>2</sub> (ppb)	0.0	1.2	1.2	403	388	-3.7	valid
CO (ppm)	0.0	0.1	0.1	40.1	40.0	-0.2	valid
O <sub>3</sub> (ppb)	0.0	1.0	1.0	400	403	0.8	valid
CH <sub>4</sub> (ppm)	0.0			4.00			
THC (ppm)	0.0			4.00			

## AFTER CALIBRATION RESULT

PARAMETER	ZERO			SPAN			JUDGEMENT
	IDEAL	ACTUAL	ERROR	IDEAL	ACTUAL	%ERROR	
NO (ppb)	0.0	2.0	2.0	400	401	0.3	valid
NO <sub>x</sub> (ppb)	0.0	2.0	2.0	400	402	0.5	valid
SO <sub>2</sub> (ppb)	0.0	0.8	0.8	403	403	0.0	valid
CO (ppm)	0.0	0.1	0.1	40.1	40.0	-0.2	valid
O <sub>3</sub> (ppb)	0.0	1.0	1.0	400	400	0.0	valid
CH <sub>4</sub> (ppm)	0.0	0.01	0.010	4.00	4.00	0.0	valid
THC (ppm)	0.0	0.01	0.010	4.00	4.00	0.0	valid

Remark : Percent Error per point must be less than  $\pm 5\%$ 

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7/409 ซอยวิภาวดีรังสิต 36 ถนนวิภาวดีรังสิต แขวงจตุจักร เขตจตุจักร กรุงเทพฯ 10900

โทรศัพท์ : (662) 939-5711 (12 Lines) โทรสาร : (662) 939-4207-8

Website <http://www.qshe.co.th> E-mail-address: [info@qshe.co.th](mailto:info@qshe.co.th)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด  
S.P.S. CONSULTING SERVICE CO., LTD.  
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจตุจักร เขตจตุจักร กรุงเทพฯ 10900  
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompoi, Chatuchak, Bangkok 10900  
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 :	07 November 2024	BRAND :	API	MODEL :	200E
NO.	NOX-R02	SERIAL NO.	2285		
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.	24.5	°C
			% RH	50	
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	-0.10	-	0	-
NO Span	400	399.6	-0.100	400.0	1.005
NO <sub>x</sub> Span	400	399.8	-0.050	400.0	1.007
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	505	cc/min	500 ± 50		
OZONE FLOW	78	cc/min	80 ± 15		
PMT	103.4	mV	-20 - 150		
AZERO	94.2	mV	-20 - 150		
HVPS	672	V	420 - 900 constant		
RCELL TEMP	50.3	°C	50 ± 1		
BOX TEMP	29.2	°C	8 - 48		
PMT TEMP	7.0	°C	7 ± 2		
MOLY TEMP	315.3	°C	315 ± 5		
RCELL PRESS	8.4	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	1.005	-	1.0 ± 0.3		
NO <sub>x</sub> Slope	1.007	-	1.0 ± 0.3		
NO Offset	1.0	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)



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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 :	07 November 2024	BRAND :	API	MODEL :	200E
NO.	NOX-R08	SERIAL NO.	243		
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.	24.5	°C
			% RH	50	
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	-0.10	-	0	-
NO Span	400	399.8	-0.050	400.0	1.006
NO <sub>x</sub> Span	400	400.2	0.050	400.0	1.010
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	503	cc/min	500 ± 50		
OZONE FLOW	78	cc/min	80 ± 15		
PMT	103.1	mV	-20 - 150		
AZERO	93.8	mV	-20 - 150		
HVPS	669	V	420 - 900 constant		
RCELL TEMP	50.4	°C	50 ± 1		
BOX TEMP	29.1	°C	8 - 48		
PMT TEMP	7.4	°C	7 ± 2		
MOLY TEMP	315.4	°C	315 ± 5		
RCELL PRESS	8.3	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.4	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	1.006	-	1.0 ± 0.3		
NO <sub>x</sub> Slope	1.010	-	1.0 ± 0.3		
NO Offset	1.3	mV	-20 to +150		
NO <sub>x</sub> Offset	0.9	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 Dangklorn)

Approved by :

Peera Detudom  
(Mr.Peera Detudom)



Job Number :	J092400007	Customer Name :	IRPC
Equipment :	AQMs Station.	Contact Name :	KhunWirasakKhumsuk
Model :	AQMs Station.	Telephone Number :	081-803-0475
Serial Number :	Pluak Kate Station	E-mail address/Fax. :	<a href="mailto:wirasak.k@irpc.co.th">wirasak.k@irpc.co.th</a>
Working Date :	06 November 2024	Working Hour :	4 Hours

## Service Report

Working Scope:

Service Station

Physical Checking:

- ตรวจเช็ค Data logger พบว่าทำงานได้ปกติ
- ตรวจเช็ค Diagnostic of all analyzers อยู่ในเกณฑ์ปกติ
- ตรวจเช็ค Reading of all analyzers และ Met sensor พบว่าปกติ
- ตรวจเช็ค ผล Calibration พบว่าอยู่ในเกณฑ์ปกติ
- ตรวจเช็ค Dilutor และ Zero Air พบว่าทำงานได้ปกติ
- ตรวจเช็ค เครื่องวัดฝุ่น PM-10 พบว่าทำงานได้ปกติ
- ตรวจเช็ค เครื่อง THC analyzer พบว่าทำงานได้ปกติ
- ตรวจเช็ค การทำงานของระบบไฟฟ้า และ UPS พบว่าทำงานได้ปกติ
- ทำความสะอาดภายในสถานี และ บริเวณรอบสถานี

Correction working:

Calibrate single-point of all analyzers.	Drain water for pump of Zero Air.
Replace sample filter 47 mm.	

Part Replacements:

- Sample Filter 47 mm. 6 ea. (Part support by IRPC)

Addition Recommended:

- End -

Serviced by :	เอกราช สะสีแสง	Serviced Date	06 November 2024
Approved by:		Approved Date :	06 November 2024



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Website <http://www.qshe.co.th> E-mail-address: [info@qshe.co.th](mailto:info@qshe.co.th)

## General Checking

Equipment :	AQMs Pluak Kate	Model :	-
Serial Number :	Pluak Kate Station	Manufacturer :	-

Item	Description	Set-Point Value	Status & Value	Remark
	<u>On Mobile</u>			
1	Air conditioner operation	OK	OK	
2	Mobile temperature	25-27 °C	26°C	
3	Lighting system	OK	OK	
4	Lamp in sampling box	OK	OK	
5	Sampling probe	Clean	Clean	
6	Blower	OK	OK	
7	Drain liquid in tank	Drain	Drain	
8	Compressor tank set pressure	80 psi	80 psi	
9	Zero air compressor operation	OK	OK	
10	Silica gel for dry air of NO <sub>x</sub> analyzer	OK	OK	
11	UPS 3 KVA	OK	OK	
12	Data logger	OK	OK	
13	Ventilation fan	OK	OK	
14	Power cable	OK	OK	
15	Hydrogen Gas	-	1950/42 psi	
16	Standard gas#1 (NO,SO <sub>2</sub> ,HC,CO)	-	2000/32 psi	

Note :



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Website <http://www.qshe.co.th> E-mail-address: [info@qshe.co.th](mailto:info@qshe.co.th)

## THC Analyzer

Equipment :	Total hydrocarbon analyzer.	Model :	APHA-370
Serial Number :	200800005504	Manufacturer :	Horiba

Diagnostic test value				
Parameter	Observed value		Unit	Nominal range
	Before	After		
<b>Data logger reading</b>				
CH4 reading			ppm	0-25 ppm
NMHC reading			ppm	0-25 ppm
THC reading			ppm	0-25 ppm
<b>Analyzer reading</b>				
CH4 reading			ppm	0-25 ppm
NMHC reading			ppm	0-25 ppm
THC reading			ppm	0-25 ppm
<b>Calibration Factors</b>				
<b>CH4</b>				
Zero calibration coefficient			-	-3500 to 3500
Span calibration coefficient			-	0.50000 to 2.00000
<b>THC</b>				
Zero calibration coefficient			-	-3500 to 3500
Span calibration coefficient			-	0.50000 to 2.00000
<b>Analog Input</b>				
Detector temp			°C	Ambient Temp +(5 – 15 °C)
Detector pressure			kPa	80 kPa± 4 kPa
Ambient			kPa	Current Atmospheric pressure
Purifier temp			°C	390-430 °C
Purifier pressure			kPa	8 kPa -25 kPa
NMC cutter temp			°C	230-260 °C
DC.24V			V.	24V ± 0.5V
DC.5V			V.	5V ± 0.5V

## Note :

THC ยกกลับไปช่องทางที่ บริษัท PICO



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Website <http://www.qshe.co.th> E-mail-address: [info@qshe.co.th](mailto:info@qshe.co.th)

## SINGLE-POINT GAS CALIBRATION

All analyzer.

Equipment :	All analyzer.	Model :	42C, 43i , 48i, 49i
Serial Number :	0504710413,CM06280010, 1201351403,CM09040067	Manufacturer :	Thermo

Standard gas concentration			Dilutor detail	
Sulfur Dioxide (SO <sub>2</sub> )	44.7	ppm	Manufacturer :	Thermo
Nitric Oxide (NO)	45.0	ppm	Model :	146C
Methane (CH <sub>4</sub> )	498	ppm	Serial number :	0504710414
Carbon oxide (CO)	4550	ppm		
Cylinder NO. :	A00931SK			
Expiration Date :	8 Sep 2026			

## BEFORE CALIBRATION RESULT

PARAMETER	ZERO			SPAN			JUDGEMENT
	IDEAL	ACTUAL	ERROR	IDEAL	ACTUAL	%ERROR	
NO (ppb)	0.00	0.6	0.60	400	404.0	1.00	Valid
NO <sub>x</sub> (ppb)	0.00	1.2	1.20	400	408.0	2.00	Valid
SO <sub>2</sub> (ppb)	0.00	1.0	1.00	400	406.0	1.50	Valid
CO (ppm)	0.00	0.11	0.11	40.3	40.3	0.00	Valid
O <sub>3</sub> (ppb)	0.00	0.0	0.00	400	411.0	2.75	Valid
CH <sub>4</sub> (ppm)	0.00			5.00			
THC (ppm)	0.00			5.00			

## AFTER CALIBRATION RESULT

PARAMETER	ZERO			SPAN			JUDGEMENT
	IDEAL	ACTUAL	ERROR	IDEAL	ACTUAL	%ERROR	
NO (ppb)	0.00	0.5	0.50	400	399.0	-0.25	Valid
NO <sub>x</sub> (ppb)	0.00	1.4	1.40	400	402.0	0.50	Valid
SO <sub>2</sub> (ppb)	0.00	1.0	1.00	400	400.0	0.00	Valid
CO (ppm)	0.00	0.09	0.09	40.3	40.3	0.00	Valid
O <sub>3</sub> (ppb)	0.00	1.0	1.00	400	399.0	-0.25	Valid
CH <sub>4</sub> (ppm)	0.00			5.00			
THC (ppm)	0.00			5.00			

Remark :



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Website <http://www.qshe.co.th> E-mail-address: [info@qshe.co.th](mailto:info@qshe.co.th)



Job Number :	J092400007	Customer Name :	IRPC
Equipment :	AQMs Station.	Contact Name :	Khun Wirasak Khumsuk
Model :	AQMs Station.	Telephone Number :	081-803-0475
Serial Number :	Technology Station	E-mail address/Fax. :	<a href="mailto:wirasak.k@irpc.co.th">wirasak.k@irpc.co.th</a>
Working Date :	09 November 2024	Working Hour :	6 Hours

## Service Report

## Working Scope:

Service Station

## Physical Checking:

- ตรวจเช็ค Data logger พบว่าทำงานได้ปกติ
- ตรวจเช็ค Diagnostic of all analyzers อยู่ในเกณฑ์ปกติ
- ตรวจเช็ค Reading of all analyzers และ Met sensor พบว่าปกติ
- ตรวจเช็ค ผล Calibration พบว่าอยู่ในเกณฑ์ปกติ
- ตรวจเช็ค Dilutor และ Zero Air พบว่าทำงานได้ปกติ
- ตรวจเช็ค เครื่องวัดฝุ่น PM-10 & PM-2.5 พบว่าทำงานได้ปกติ
- ตรวจเช็ค เครื่อง THC analyzer พบว่าทำงานได้ปกติ
- ตรวจเช็ค การทำงานของระบบไฟฟ้า และ UPS พบว่าทำงานได้ปกติ
- ทำความสะอาดภายในสถานี และ บริเวณรอบสถานี

## Correction working:

Calibrate single-point of all analyzers.	Replace silica gel for dryer NO <sub>x</sub> Analyzer.
Replace sample filter 47 mm.	Drain water for pump of Zero Air.

## Part Replacement:

- Sample filter 47 mm. 7 ea. (Part Support by IRPC)
- Silica gel. P/N: 6998 1/2 Bottle. (Part Support by IRPC)

## Addition Recommended:

- NO<sub>x</sub> analyzer เป็นเครื่องของ สถานีกันหนอง ยกมาติดตั้งชั่วคราว

-- End --

Serviced by :	เอกราช สะสีแสง	Serviced Date :	09 November 2024
Approved by:		Approved Date :	09 November 2024



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Website <http://www.qshe.co.th> E-mail-address: [info@qshe.co.th](mailto:info@qshe.co.th)

## General Checking

Equipment : AQMs Technology

Model : -

Serial Number : -

Manufacturer : -

Item	Description	Set-Point Value	Status & Value	Remark
	<u>On Mobile</u>			
1	Air conditioner operation	OK	OK	
2	Station temperature	25-27 °C	25-27 °C	
3	Lighting system	OK	OK	
4	Lamp in sampling box	OK	OK	
5	Sampling probe	Clean	Clean	
6	Blower	OK	OK	
7	Drain liquid in tank	Drain	Drain	
8	Compressor tank set pressure	80 psi	80 psi	
9	Zero air compressor operation	OK	OK	
10	Silica gel for dry air of NO <sub>x</sub> analyzer	OK	OK	
11	UPS 3 KVA	OK	OK	
12	Data logger	OK	OK	
13	Ventilation fan	OK	OK	
14	Power cable	OK	OK	
15	Hydrogen Gas	>500 psi	1900/28 psi	
16	Standard gas#1 (NO,SO <sub>2</sub> ,HC,CO)	-	2050/30 psi	

Note :



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Website <http://www.qshe.co.th> E-mail-address: [info@qshe.co.th](mailto:info@qshe.co.th)

## THC Analyzer

Equipment :	Total hydrocarbon analyzer.	Model :	APHA-370
Serial Number :	NM7K7YND	Manufacturer :	Horiba

Diagnostic test value				
Parameter	Observed value		Unit	Nominal range
	Before	After		
Data logger reading				
CH4 reading	1.686	1.705	ppm	0-25 ppm
NMHC reading	0.528	0.527	ppm	0-25 ppm
THC reading	2.214	2.232	ppm	0-25 ppm
Analyzer reading				
CH4 reading	1.686	1.705	ppm	0-25 ppm
NMHC reading	0.528	0.527	ppm	0-25 ppm
THC reading	2.214	2.232	ppm	0-25 ppm
Calibration Factors				
CH4				
Zero calibration coefficient	-200	-200	-	-3500 to 3500
Span calibration coefficient	0.9478	0.9478	-	0.50000 to 2.00000
THC				
Zero calibration coefficient	200	200	-	-3500 to 3500
Span calibration coefficient	1.0097	1.0097	-	0.50000 to 2.00000
Analog Input				
Detector temp	41.1	41.9	°C	Ambient Temp +(5 – 15 °C)
Detector pressure	73.3	73.3	kPa	80 kPa ± 4 kPa
Ambient	100.5	100.5	kPa	Current Atmospheric pressure
Purifier temp	415.7	415.7	°C	390-430 °C
Purifier pressure	10.1	10.1	kPa	8 kPa -25 kPa
NMC cutter temp	230.2	230.0	°C	230-260 °C
DC.24V	24.0	24.0	V.	24V ± 0.5 V
DC.5V	4.9	4.9	V.	5V ± 0.5 V

Note :



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## SINGLE-POINT GAS CALIBRATION

All analyzer.

Equipment :	All analyzer.	Model :	42i, 43i , 48i , 49i , 410i, APHA-370
Serial Number :	—	Manufacturer :	Thermo, Horiba

Standard gas concentration			Dilutor detail	
Sulfur Dioxide (SO <sub>2</sub> )	44.8	ppm	Manufacturer :	Thermo
Nitric Oxide (NO)	45.3	ppm	Model :	146i
Methane (CH <sub>4</sub> )	495	ppm	Serial number :	0630318396
Carbon Monoxide (CO)	4540	ppm		
Cylinder NO. :	D636101			
Expiration Date :	8 Sep 2026			

## BEFORE CALIBRATION RESULT

PARAMETER	ZERO			SPAN			JUDGEMENT
	IDEAL	ACTUAL	ERROR	IDEAL	ACTUAL	%ERROR	
NO (ppb)	0.0	1.40	1.40	400.0	394.0	-1.50	Valid
NO <sub>x</sub> (ppb)	0.0	1.50	1.50	400.0	395.0	-1.25	Valid
SO <sub>2</sub> (ppb)	0.0	1.30	1.30	400.0	404.0	1.00	Valid
CO(ppm)	0.0	0.10	0.10	40.1	39.8	-0.75	Valid
O3(ppb)	0.0	1.50	1.50	400.0	398.0	-0.50	Valid
CH4(ppm)	0.0	0.01	0.01	4.50	4.50	0.00	Valid
THC(ppm)	0.0	0.01	0.01	4.50	4.50	0.00	Valid

## AFTER CALIBRATION RESULT

PARAMETER	ZERO			SPAN			JUDGEMENT
	IDEAL	ACTUAL	ERROR	IDEAL	ACTUAL	%ERROR	
NO (ppb)	0.0	0.80	0.80	400.0	399.0	-0.25	Valid
NO <sub>x</sub> (ppb)	0.0	1.40	1.40	400.0	401.0	0.25	Valid
SO <sub>2</sub> (ppb)	0.0	1.50	1.50	400.0	404.0	1.00	Valid
CO(ppm)	0.0	0.1	0.10	40.1	40.1	0.00	Valid
O3(ppb)	0.0	0.90	0.90	400.0	401.0	0.25	Valid
CH4(ppm)	0.0	0.01	0.01	4.50	4.50	0.00	Valid
THC(ppm)	0.0	0.01	0.01	4.50	4.50	0.00	Valid

Remark : NO<sub>x</sub> เป็นเครื่องของสถานี กั้นหนอง ยกมาใช้ชั่วคราว

บริษัท คิว-ซี โซลูชั่นส์ จำกัด

7/409 ซอยวิภาวดีรังสิต 36 ถนนวิภาวดีรังสิต แขวงจตุจักร เขตจตุจักร กรุงเทพฯ 10900

โทรศัพท์ : (662) 939-5711 (12 Lines) โทรสาร : (662) 939-4207-8

Website <http://www.qshe.co.th> E-mail-address: [info@qshe.co.th](mailto:info@qshe.co.th)



Job Number :	J092400007	Customer Name :	IRPC
Equipment :	AQMs Station.	Contact Name :	Khun Wirasak Khumsuk
Model :	AQMs Station.	Telephone Number :	081-803-0475
Serial Number :	Ban Lang Station	E-mail address/Fax. :	<a href="mailto:wirasak.k@irpc.co.th">wirasak.k@irpc.co.th</a>
	07 November 2024	Working Hour :	6 Hours

## Service Report

## Working Scope:

Service Station

## Physical Checking:

- ตรวจเช็ค Data logger พบว่าทำงานได้ปกติ
- ตรวจเช็ค Diagnostic of all analyzers อยู่ในเกณฑ์ปกติ
- ตรวจเช็ค Reading of all analyzers และ Met sensor พบว่าปกติ
- ตรวจเช็ค ผล Calibration พบว่าอยู่ในเกณฑ์ปกติ
- ตรวจเช็ค Dilutor และ Zero Air พบว่าทำงานได้ปกติ
- ตรวจเช็ค เครื่องวัดฝุ่น PM-10 พบว่าทำงานได้ปกติ
- ตรวจเช็ค เครื่อง THC analyzer พบว่าทำงานได้ปกติ
- ตรวจเช็ค การทำงานของระบบไฟฟ้า และ UPS พบว่าทำงานได้ปกติ
- ทำความสะอาดภายในสถานี และ บริเวณรอบสถานี

## Correction working:

Calibrate single-point of all analyzers.	Replace silica gel for dryer NO <sub>x</sub> Analyzer.
Replace sample filter 47 mm.	Drain water for pump of Zero Air.


## Part Replacement:

- Sample filter 47 mm. 5 ea. (Part Support by IRPC)
- Silica gel. P/N: 6998 1/2 Bottle. (Part Support by IRPC)

## Addition Recommended:

- Zero air นำมาจาก Micro#1 มาติดตั้งใช้งานชั่วคราว

-- End --

Serviced by :	เอกราช สะสีแสง	Serviced Date :	07 November 2024
Approved by:		Approved Date :	07 November 2024



บริษัท คิว-ชี โซลูชั่นส์ จำกัด

7/409 ซอยวิภาวดีรังสิต 36 ถนนวิภาวดีรังสิต แขวงจตุจักร เขตจตุจักร กรุงเทพฯ 10900

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Website <http://www.qshe.co.th> E-mail-address: [info@qshe.co.th](mailto:info@qshe.co.th)

## General Checking

Equipment : AQMs Ban Lang

Model : -

Serial Number : -

Manufacturer : -

Item	Description	Set-Point Value	Status & Value	Remark
	<u>On Mobile</u>			
1	Air conditioner operation	OK	OK	
2	Mobile temperature	25-27 °C	25-27 °C	
3	Lighting system	OK	OK	
4	Lamp in sampling box	OK	OK	
5	Sampling probe	Clean	Clean	
6	Blower	OK	OK	
7	Drain liquid in tank	Drain	Drain	
8	Compressor tank set pressure	80 psi	80 psi	
9	Zero air compressor operation	OK	OK	
10	Silica gel for dry air of NO <sub>x</sub> analyzer	OK	OK	
11	UPS 6 KVA	Bypass	Not use	
12	Data logger	OK	OK	
13	Ventilation fan	OK	OK	
14	Power cable	OK	OK	
15	Hydrogen Gas	>500 psi	1100/38 psi	
16	Standard gas#1 (NO,SO <sub>2</sub> ,HC,CO)	-	2050/18 psi	

Note :



บริษัท คิว-ชี โซลูชั่นส์ จำกัด

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## THC Analyzer

Equipment :	Total hydrocarbon analyzer.	Model :	APHA-370
Serial Number :	2ERTBRJ	Manufacturer :	Horiba

Diagnostic test value				
Parameter	Observed value		Unit	Nominal range
	Before	After		
<b>Data logger reading</b>				
CH4 reading	2.177	2.178	ppm	0-25 ppm
NMHC reading	0.025	0.032	ppm	0-25 ppm
THC reading	2.202	2.210	ppm	0-25 ppm
<b>Analyzer reading</b>				
CH4 reading	2.177	2.178	ppm	0-25 ppm
NMHC reading	0.025	0.032	ppm	0-25 ppm
THC reading	2.202	2.210	ppm	0-25 ppm
<b>Calibration Factors</b>				
<b>CH4</b>				
Zero calibration coefficient	13	13	-	-3500 to 3500
Span calibration coefficient	1.0000	1.0000	-	0.50000 to 2.00000
<b>THC</b>				
Zero calibration coefficient	37	37	-	-3500 to 3500
Span calibration coefficient	1.0000	1.0000	-	0.50000 to 2.00000
<b>Analog Input</b>				
Detector temp	37.8	37.3	°C	Ambient Temp +(5 – 15 °C)
Detector pressure	79.8	79.8	kPa	80 kPa ± 4 kPa
Ambient	99.2	99.2	kPa	Current Atmospheric pressure
Purifier temp	415.0	414.9	°C	390-430 °C
Purifier pressure	10.3	10.1	kPa	8 kPa -25 kPa
NMC cutter temp	241.8	242.5	°C	230-260 °C
DC.24V	23.9	23.9	V.	24V ± 0.5 V
DC.5V	5.0	5.0	V.	5V ± 0.5 V

Note :



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## SINGLE-POINT GAS CALIBRATION

All analyzer.

Equipment :	All analyzer.	Model :	42i, 43i, 49i, 48i, APHA-370
Serial Number :	--	Manufacturer :	Thermo, Horiba

Standard gas concentration			Dilutor detail	
Sulfur Dioxide (SO <sub>2</sub> )	44.7	ppm	Manufacturer :	Thermo
Nitric Oxide (NO)	43.7	ppm	Model :	146i
Methane (CH <sub>4</sub> )	499	ppm	Serial number :	CM09350122
Carbon Monoxide (CO)	4560	ppm		
Cylinder NO. :	D519488			
Expiration Date :	8 Sep 2026			

## BEFORE CALIBRATION RESULT

PARAMETER	ZERO			SPAN			JUDGEMENT
	IDEAL	ACTUAL	ERROR	IDEAL	ACTUAL	%ERROR	
NO (ppb)	0.0	2.0	2.0	400	389	-2.8	valid
NO <sub>x</sub> (ppb)	0.0	2.0	2.0	400	391	-2.3	valid
SO <sub>2</sub> (ppb)	0.0	1.2	1.2	403	388	-3.7	valid
CO (ppm)	0.0	0.1	0.1	40.1	40.0	-0.2	valid
O <sub>3</sub> (ppb)	0.0	1.0	1.0	400	403	0.8	valid
CH <sub>4</sub> (ppm)	0.0			4.00			
THC (ppm)	0.0			4.00			

## AFTER CALIBRATION RESULT

PARAMETER	ZERO			SPAN			JUDGEMENT
	IDEAL	ACTUAL	ERROR	IDEAL	ACTUAL	%ERROR	
NO (ppb)	0.0	2.0	2.0	400	401	0.3	valid
NO <sub>x</sub> (ppb)	0.0	2.0	2.0	400	402	0.5	valid
SO <sub>2</sub> (ppb)	0.0	0.8	0.8	403	403	0.0	valid
CO (ppm)	0.0	0.1	0.1	40.1	40.0	-0.2	valid
O <sub>3</sub> (ppb)	0.0	1.0	1.0	400	400	0.0	valid
CH <sub>4</sub> (ppm)	0.0	0.01	0.010	4.00	4.00	0.0	valid
THC (ppm)	0.0	0.01	0.010	4.00	4.00	0.0	valid

Remark : Percent Error per point must be less than  $\pm 5\%$ 

บริษัท คิว-ชี โซลูชั่นส์ จำกัด

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คุณภาพอากาศจากแหล่งกำเนิด

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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	$\Delta H_{\oplus}$ (mmH <sub>2</sub> O)
B01	1563	02/09/2024	0.993	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  $\Delta H_{\oplus}$  (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.

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

## 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 :  (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[64-220088-1]  
CLID. NO. : 212301419  
JOB CONTROL NO. : 240720076545  
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. Q24076545

F3-011-05/12-23

page 1 of 3



@clccalibration





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## REPORT OF CALIBRATION

### FOR

NOMENCLATURE	:	VACUUM GAUGE
MANUFACTURER	:	HI-LIGHT
MODEL / TYPE	:	N/A
SERIAL NO.	:	N/A[64-220088-1]
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. Q24076545

F3-011-05/12-23

page 2 of 3



@clccalibration

## 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	-15.58	-15.58	-4.6	-4.6	+0.4	+0.4
-10	-32.51	-32.84	-9.6	-9.7	+0.4	+0.3
-15	-49.44	-49.77	-14.6	-14.7	+0.4	+0.3
-20	-66.70	-66.70	-19.7	-19.7	+0.3	+0.3
-25	-83.63	-83.97	-24.7	-24.8	+0.3	+0.2
-30	-100.90	-100.90	-29.8	-29.8	+0.2	+0.2

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. Q24076545

F3-011-05/12-23

page 3 of 3



@dcalibration



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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

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

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 Dangkhom  
(Mr. Adul Dangkhom)

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)





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





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

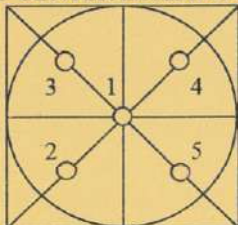
2. TARE FUNCTION : NORMAL

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*



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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, Chulachak, Bangkok 10900  
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

Calibration Report					
Non-Dispersive Infrared CO Analyzer					
Date :	02 October 2024	Brand :	API	Model :	300E
No.	CO-801			Serial No.	782
Calibrator (Dilution System)					
Brand : Teledyne			Model : 700		
Last Cal. Date : 30 October 2023			Serial No. : 421		
Reference Standard Gas					
Standard Gas : Carbon Monoxide (CO)			Cylinder No. : D711839		
Certified Date : 14 March 2024		Expired Date : 14 March 2032		Cylinder Conc. : 4,580 ppm	
Calibrating Condition					
Pressure : 1011 mmbar		Temp. : 24.6 °C		% RH : 49	
Calibration Setting					
Span Set Point	Initial Reading (Before Adj.), PPM			Final Reading (After Adj.), PPM	
	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	
Zero	0	-0.10	-	0	
CO Span	40.00	40.04	0.100	40.00	
API Model 300E CO Analyzer Check List					
Parameter	Observed Value	Units	Nominal Range		
Range	50	PPM	0-1000 ppm		
Stability	0.10	PPM	< 1 ppm With Zero Air		
CO Measure	4015.1	mV	2500-4800 mV		
CO Reference	3947.8	mV	2500-4800 mV		
Measure/Reference Ratio	1.180	-	1.1-1.3 W/Zero Air		
Sample Pressure	28.6	In-Hg-A	~2" < Ambient Absolute Pressure		
Sample Flow	811	CC/Min	800 ± 10%		
Sample Temperature	48.2	°C	48 ± 4		
Bench Temperature	48.0	°C	48 ± 2		
Wheel Temperature	68.3	°C	68 ± 2		
Box Temperature	30.8	°C	Ambient Temp + 7 ± 10		
Photo-Drive	3033.4	mV	250 mV to 4750 mV		
Slope	1.017	-	1.0 ± 0.3		
Offset	0.2	-	0 ± 0.3		

Calibrated by : Adul Dangklom  
(Mr. Adul Dangklom)

Approved by : Peera Detudom  
(Mr. Peera Detudom)



## 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 077C7042401DATE 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 : 077C7042401DATE TESTED : July 4, 2024

PARAMETER	SPECIFICATION			FINAL VALUE	
Spectral Resolution : UV	As	193.696 nm	≤ 0.007	0.00550	
	Ni	231.604 nm	≤ 0.008	0.00714	
	Ni	341.476 nm	≤ 0.012	0.00790	
Spectral Resolution : VIS	La	408.672 nm	≤ 0.020	0.01655	
	Ba	455.403 nm	≤ 0.025	0.02391	
Precision					
	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	%
Detection Limits : Axial	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
Detection Limits : Radial	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
BEC : Axial (IB X 500)/(IS-IB)	Cd	226.502 nm	≤ 150 ppb	64.72	
BEC : Radial (IB X 1000)/(IS-IB)	Mn	257.610 nm	≤ 45 ppb	15.04	





## 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

## MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

### ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

PinAAcle 900T

<b>Customer :</b>	<u>S.P.S.Consulting Service Co.,Ltd</u>	<b>Date Tested:</b>	<u>July 4, 2024</u>
		<b>Recommendation</b>	<u>Recertification</u>
<b>Address :</b>	<u>7 Soi Phaholyothin 24</u>	<b>Period</b>	<u>6</u> Months
	<u>Paholyothin Road</u>	<b>Recertification Due:</b>	<u>January 4, 2025</u>
	<u>Jompol Chatuchak, Bangkok 10900</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>2 OF 2</u>
<b>Phone:</b>	<u>083-9269252</u>	<b>PerkinElmer Phone:</b>	<u>02-719-6420 ext 204</u>
<b>Email:</b>	<u></u>	<b>PerkinElmer Fax:</b>	<u>02-318-5597</u>

### CONFIGURATION TESTED

MODEL	SERIAL NUMBER	SOFTWARE
<u>PinAAcle 900T</u>	<u>PTCS14111103</u>	<u>Wiblab V5.1</u>
<u>AS 900</u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>

TEST STANDARD USED	PART NUMBER	EXPIRATION DATE
<u>Copper</u>	<u>N9300183</u>	<u>APR 30 2025</u>
<u>GFAAS Mixed standard</u>	<u>N9300244</u>	<u>FEB 28 2025</u>
<u>MG0-042</u>	<u>N101-3000</u>	<u></u>
<u>MG2-045</u>	<u>N101-3002</u>	<u></u>

# MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

## ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

PinAAcle 900T

**SERIAL NUMBER** PTCS14111103

**DATE TESTED** July 4, 2024

### 1. INSTRUMENT CHECKS

A. The Mirror and Lenses Condition	<input type="text" value="OK"/>
B. Grating Condition	<input type="text" value="OK"/>
C. Replace or Clean Dust Filter	<input type="text" value="OK"/>
D. Cleaning the Contact Cylinders	<input type="text" value="OK"/>
E. Cleaning the Furnace Windows	<input type="text" value="OK"/>
F. Cleaning the Burner Head	<input type="text" value="OK"/>
G. Cleaning the Nebulizer	<input type="text" value="OK"/>
H. Cleaning the Drain System	<input type="text" value="OK"/>

### 2. AUTOSAMPLE CHECK

A. Sampling and Arm	<input type="text" value="OK"/>
B. Sampling & Rinse Pump	<input type="text" value="OK"/>
C. Sample Position & Clean	<input type="text" value="OK"/>

### 3. COOLING SYSTEM CHECKS

A. Clean and Change Distill water	<input type="text" value="OK"/>
B. Thermosensor	<input type="text" value="OK"/>

### 4. FIAS CHECKS

A. Pump and 5 Port Valve	<input type="text" value="N/A"/>
B. Chemifold and Tubing	<input type="text" value="N/A"/>
C. Power Supply	<input type="text" value="N/A"/>
D. Flow meter and Gas system	<input type="text" value="N/A"/>

# MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

## ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

PinAAcle 900T

SERIAL NUMBER	PTCS14111103	DATE TESTED	July 4, 2024
PARAMETER	SPECIFICATION	ACTUAL VAULE	
<b>A. Flame Mode Tests</b>			
1. Detector-Linearity with Barium (553.55 nm)			
Neutral Density Filter 0.2 :	0.2042    Abs. + 5%	0.1815	Abs.
Neutral Density Filter 1.0 :	0.9798    Abs. + 5%	1.0220	Abs.
2. Baseline Noise at 1 Abs with Barium (553.55 nm)			
(at an integration time of 0.5 seconds and 99 replicates)			
	SD ≤ 0.010 Abs.	0.0016	Abs.
3. AA Baseline with Copper (Cu 324.75 nm)			
(at an integration time of 0.5 seconds and 99 replicates)			
	SD ≤ 0.001 Abs.	0.0001	Abs.
4. D <sub>2</sub> Background Compensation (Copper 324.75 nm)			
with Neutral Density Filter 1.0	Absorbance ≤ 0.010 Abs	0.0079	Abs.
5. AA-BG Baseline Noise with Copper (324.75 nm)			
(at an integration time of 2.0 seconds and 99 replicates)			
	SD ≤ 0.005 Abs.	0.0007	Abs.
6. AA-BG Baseline Noise with Arsenic (193.70 nm)			
(at an integration time of 2.0 seconds and 99 replicates)			
	SD ≤ 0.005 Abs.	0.0024	Abs.

## MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

### ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

PinAAcle 900T

<b>SERIAL NUMBER</b>	<u>PTCS14111103</u>	<b>DATE TESTED</b>	<u>July 4, 2024</u>
<b>PARAMETER</b>	<b>SPECIFICATION</b>	<b>ACTUAL VAULE</b>	
7. Flame Interlock Shutdown	Shutdown correct?	<input type="checkbox"/> OK	
8. Flame Sensitivity with Copper (324.75 nm)			
(5 mg/L Cu Standard a read time of 10 seconds			
10 replicates, standard burner and Stainless stell nebulizer)			
	Sensitivity $\geq 0.250$ Abs.	<u>0.3118</u>	Abs.
(2 mg/L Cu Standard a read time of 10 seconds			
10 replicates, standard burner and High sensitivity nebulizer)			
	Sensitivity $\geq 0.250$ Abs.	<u>N/A</u>	Abs.



## MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

### ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

PinAAcle 900T

SERIAL NUMBER	PTCS14111103	DATE TESTED	July 4, 2024
PARAMETER	SPECIFICATION	ACTUAL VAULE	
B. THGA Tests			
1. Furnace Gas Flows			
Internal Flow	250 ± 25 mL/min	250	mL/min
External Flow	100 ± 10 mL/min	100	mL/min
2. Chromium Baseline Noise (357.87 nm)			
(mesure 5 furnace dry firings without any sample)			
	Baseline ≤ 0.005 Int.Abs	0.0021	
	SD ≤ 0.005 Int.Abs	0.0004	Int.Abs.
3. Chromium Characteristic Mass(m <sub>0</sub> ) and Precition (357.87 nm)			
(measure 5 furnace firing using 20 ul			
sample injections of 10 ug/L Cr standard)			
	m0 Results ≤ 7.0 pg/0.0044A-s	7	pg/0.0044A-s
	Precision ≤ 2.0%	1.32	%
4. Copper Characteristic Mass(m <sub>0</sub> ) and Zeeman Ratio (324.75 nm)			
(measure 5 furnace firing using 20 ul			
sample injections of 25 ug/L Cu standard)			
	m0 Results ≤ 16.5 pg/0.0044A-s	14.4	pg/0.0044A-s
	Zeeman Ratio 0.52 + 0.04	0.559	

## MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

### ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

PinAAcle 900T

SERIAL NUMBER PTCS14111103 DATE TESTED July 4, 2024

Remarks :

- Neutral Density Filter refer to data sheet

- Zeeman Ratio =  $\frac{\text{Atomic Signal(peak area)}}{\text{Atomic Signal(peak area)+Background Signal(peak area)}}$   
 $= 0.1491/0.1491+0.1176$   
0.559

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



meets



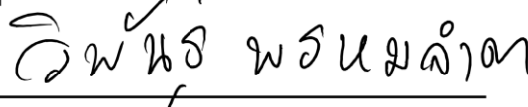
does not meet

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.**

Customer Service Engineer:

  
( Wiphan Promlumda )  
Service Engineer





# 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

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

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





# QUALITY CALIBRATION CO., LTD.

235 Petchkasem 63/2 Road, Laksong, 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, Bangkac, 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 of Calibration

**Certificate No. :** 67-400037-2

**Page :** 1 of 2

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

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

**Equipment :** Liquid in Glass Thermometer

Manufacturer : SK

Model : N/A

Range : 0 °C to 100 °C

Resolution : 1 °C

Serial No. : N/A

Immersion : Total

ID No. : TM21/59

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

Relative Humidity : (50 ± 15) %

Line Voltage : (220 ± 22) VAC

**Date of Received :** 23 January 2024

**Date of Calibration :** 03 February 2024

**Date of Issue :** 03 February 2024

**Calibrated by :** Chortip Samchusri

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

The temperature scale used was based on ITS-90

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

1. Platinum Resistance Thermometer (PRT)

ID No.	Cert. No.	Due Date	Traceability
400001	TT-0016-22	07 Feb 2024	National Institute of Metrology Thailand (NIMT)

2. Standard Digital Thermometer

ID No.	Cert. No.	Due Date	Traceability
400003	23E1866	01 Jun 2025	National Institute of Metrology Thailand (NIMT)
400004	23E1866	01 Jun 2025	National Institute of Metrology Thailand (NIMT)

Approved by :

( Surachai Promthong )

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full except with the prior written approval of the Calibratech Co.,Ltd.





## Certificate of Calibration

**Certificate No. :** 67-400037-2

**Page :** 2 of 2

**Result of Calibration :** Without Adjustment

**UUC Condition As-Received :** Good

**Function :** Temperature measurement

Ice point check : UUC\* reading 0 °C Standard reading 0.4336 °C

Standard Reading ( °C )	UUC Reading ( °C )	Correction ( °C )	Uncertainty ( ± °C )
20.5609	20	0.6	0.31

### Remark

UUC : Unit Under Calibration

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

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

- o()o -





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)



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

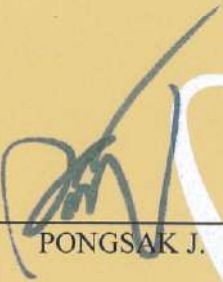
**ID No** : BA 09/61

**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 :-

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

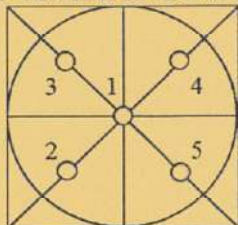
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0 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

ระดับเสียงทั่วไป

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

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

#### Head Office

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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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7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900  
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Noise R\_726/24

## 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-B01	Cirrus	CR161B	G301393	21 November 2024	94.0	94.0
CR-B02	Cirrus	CR161B	G301157	21 November 2024	94.1	94.0
CR-B05	Cirrus	CR161B	G301134	21 November 2024	94.0	94.0
CR-B06	Cirrus	CR161B	G301151	21 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 :

Peera Detudom

(Mr. Peera Detudom)

ระดับเสียงในสถานประกอบการ

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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

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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. 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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Noise R\_468/24

## 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-R41	ACO	6236	00192053	17 July 2024	93.9	93.9
ACO-R50	ACO	6236	00192062	17 July 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)

ปริมาณเสียงสะสม

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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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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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Noise R\_468/24

## 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-R41	ACO	6236	00192053	17 July 2024	93.9	93.9
ACO-R50	ACO	6236	00192062	17 July 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)



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0562

MTC No. EEL. BP. 72/0767

## 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. : 83820

### 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 B&K 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

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. 21-67/0562

MTC No. EEL. BP. 72/0767

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	114.03	0.03	$\pm 0.10$	$\pm 0.75$ 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	0.27	$\pm 0.50$	$\pm 4.0\%$

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 Kluyapa)

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 : 2011267073102836003

End of Certificate

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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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Noise Dose R\_722-1/24

## 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	20 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)