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## เอกสารการสอบเทียบความถูกต้องของเครื่องมือ

**ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง  
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม**

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
<b>1. คุณภาพอากาศ</b>		
<u>คุณภาพอากาศในบรรยากาศ</u>		
- Total Suspended Particulate	- High Volume Air Sampler No. B08, B09, B20	- Digital Balance
- Nitrogen Dioxide	- NO <sub>x</sub> Analyzer No. B02, B05, B14	- NO <sub>x</sub> Analyzer No. B02, B05, B14
- o-Xylene	- Personal Pump SKC No. B04, B43, B47, B53, B55	- GC/FID
- Maleic Anhydride	- Rotameter No. L-B05 - Personal Pump SKC No. B02, B06, B07, B08, B09 - Rotameter No. L-B05	- HPLC Meter
<u>คุณภาพอากาศจากปล่อง</u>		
- Total Suspended Particulate	- Console No. B04 - Pitot Tube No. B04	- Digital Balance
- Oxide of Nitrogen	- Vacuum Gauge	- Spectrophotometer
- Carbon Monoxide	- Personal Pump SKC No. B16 - Rotameter No. H-B08	- CO Analyzer No. B01
- o-Xylene	- Personal Pump SKC No. B17 - Rotameter No. L-B08 - Pitot Tube No. B04	- GC/FID
- Maleic Anhydride	- Personal Pump SKC No. B16 - Rotameter No. H-B08 - Pitot Tube No. B04	- HPLC Meter
<u>คุณภาพอากาศในสถานประกอบการ</u>		
- Total Dust	- Personal Pump SKC No. B02, B70 - Rotameter No. H-B03, H-B09	- Digital Balance
- Octhanol	- Personal Pump SKC No. B53, B83 - Rotameter No. L-B03, L-B09	- GC/FID
- Dioctyl Phthalate	- Personal Pump SKC No. B04, B09, B21, B36, B54, B67 - Rotameter No. H-B03, H-B09	- GC/FID
- o-Xylene	- Personal Pump SKC No. B13, B53 - Rotameter No. L-B03, L-B09	- GC/FID

ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง  
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม (ต่อ)

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
<b>2. ระดับเสียง</b> <u>ระดับเสียงในบรรยากาศ</u> - Leq 24 hr  <u>ระดับเสียงในสถานประกอบการ</u> - Leq 8 hr และ L <sub>max</sub>  - Noise Dose	- Acoustic Calibrator - Sound Level Meter No. ACO-B33  - Acoustic Calibrator - Sound Level Meter No. ACO-B18, B29, B33, B36 - Acoustic Calibrator - Noise Dosimeter No. NMD-B06, B07, B09	-  -  -
<b>3. คุณภาพน้ำ</b> <u>คุณภาพน้ำทิ้ง</u> - pH - Total Suspended Solids - Total Dissolved Solid - COD - BOD <sub>5</sub> - Grease & Oil <u>คุณภาพน้ำใต้ดินจากบ่อสังเกตการณ์</u> - pH - o-Xylene - Phthalate esters - 2-Ethylhexanol - Total Petroleum Hydrocarbon	- - - - - - - - - -	- pH Meter - Digital Balance - Digital Balance - COD Reactor - DO Meter - Digital Balance  - pH Meter - GC/MS - GC/MS - GC/MS - GC/FID
<b>4. ระดับความร้อนในสถานประกอบการ</b> - WBGT	- Heat Stress WBGT Meter No. B22, B24	- Heat Stress WBGT Meter No. B22, B24
<b>5. ระดับความเข้มของแสงสว่างในสถานประกอบการ</b> - Light	- Lux Meter No. B09	-

คุณภาพอากาศ





บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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

## High Volume Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3611

### Calibration Data

High Volume Air Sampler Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft <sup>3</sup> /min)	R <sup>2</sup>
B01	B01	01/08/2023	y = 1.289x-5.689	0.999
B02	B02	02/08/2023	y = 1.106x+2.666	0.999
B03	B03	01/08/2023	y = 1.126x-0.852	0.997
B04	B04	01/08/2023	y = 1.294x-8.235	0.998
B05	B05	04/08/2023	y = 1.279x-7.416	0.996
B06	B06	01/08/2023	y = 1.280x-7.015	0.999
B07	B07	01/08/2023	y = 1.220x-6.249	0.998
B08	B08	01/08/2023	y = 1.268x-7.621	0.999
B09	B09	01/08/2023	y = 1.258x-5.982	1.000
B10	B10	04/08/2023	y = 1.142x+0.294	0.999
B11	B11	04/08/2023	y = 1.165x-3.050	0.998
B12	B12	04/08/2023	y = 1.227x-5.594	0.999
B13	B13	04/08/2023	y = 1.282x-7.522	0.998
B14	B14	04/08/2023	y = 1.298x-7.713	0.999
B15	B15	02/08/2023	y = 1.176x-3.322	0.997
B16	B16	02/08/2023	y = 1.316x-9.126	0.997
B17	B17	02/08/2023	y = 1.235x-5.694	1.000
B18	B18	02/08/2023	y = 1.323x-10.629	0.998
B19	B19	02/08/2023	y = 1.277x-8.109	0.997
B20	B20	02/08/2023	y = 1.297x-8.466	0.998
B21	B21	03/08/2023	y = 1.186x-3.582	1.000
B22	B22	03/08/2023	y = 1.274x-8.729	0.998
B23	B23	03/08/2023	y = 1.224x-5.880	0.995
B24	B24	03/08/2023	y = 1.185x-3.773	0.999
B25	B25	01/08/2023	y = 1.075x+1.295	0.998
B26	B26	01/08/2023	y = 1.282x-7.798	0.997
B27	B27	01/08/2023	y = 1.248x-7.408	0.997
B28	B28	01/08/2023	y = 1.279x-8.370	0.999
B29	B29	04/08/2023	y = 1.292x-7.541	0.999
B30	B30	04/08/2023	y = 1.270x-8.142	0.995
B31	B31	04/08/2023	y = 1.284x-8.212	0.999
B32	B32	04/08/2023	y = 1.294x-6.759	0.999
B33	B33	04/08/2023	y = 1.252x-5.024	0.999
B34	B34	04/08/2023	y = 1.262x-7.362	0.998

Calibrated by :



Approved by :





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## High Volume Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3611

### Calibration Data

High Volume Air Sampler Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft <sup>3</sup> /min)	R <sup>2</sup>
B35	B35	03/08/2023	y = 1.221x - 4.116	0.995
B36	B36	03/08/2023	y = 1.247x - 6.537	0.999
B37	B37	03/08/2023	y = 1.313x - 8.352	0.997
B38	B38	03/08/2023	y = 1.279x - 8.340	0.998
B39	B39	03/08/2023	y = 1.286x - 6.520	0.999
B40	B40	03/08/2023	y = 1.241x - 6.104	1.000
B41	B41	03/08/2023	y = 1.203x - 4.249	0.999
B42	B42	03/08/2023	y = 1.296x - 8.828	0.999
B43	B43	04/08/2023	y = 1.245x - 5.710	0.997
B44	B44	04/08/2023	y = 1.262x - 5.417	0.999
R01	R01	04/08/2023	y = 1.285x - 8.953	0.999
R02	R02	04/08/2023	y = 1.268x - 8.283	0.998
R03	R03	04/08/2023	y = 1.283x - 9.563	0.999
R04	R04	04/08/2023	y = 1.234x - 5.231	0.999
R05	R05	04/08/2023	y = 1.303x - 10.505	0.999
R06	R06	04/08/2023	y = 1.287x - 7.927	0.997
R07	R07	04/08/2023	y = 1.084x + 0.577	0.999
R08	R08	04/08/2023	y = 1.304x - 9.687	0.998
R09	R09	04/08/2023	y = 1.286x - 8.387	0.998
R10	R10	03/08/2023	y = 1.241x - 6.099	0.996
R11	R11	03/08/2023	y = 1.112x - 1.473	0.998
R12	R12	03/08/2023	y = 1.250x - 6.933	0.997
R13	R13	02/08/2023	y = 1.142x - 2.480	0.998
R14	R14	02/08/2023	y = 1.205x - 3.813	0.998
R15	R15	01/08/2023	y = 1.160x - 3.518	0.999
R16	R16	01/08/2023	y = 1.229x - 7.416	0.998
R17	R17	01/08/2023	y = 1.209x - 4.808	0.998
R18	R18	01/08/2023	y = 1.257x - 6.979	0.999
R19	R19	01/08/2023	y = 1.256x - 7.676	0.998
R20	R20	01/08/2023	y = 1.279x - 8.603	0.998

Calibrated by :



Approved by :







บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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## CALIBRATION REPORT

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

DATE : 16 November 2023

BRAND : API

MODEL : 200A

NO. NOX-B02

SERIAL NO. 2409

#### Calibrator (Dilution System)

Brand : Teledyne

Model : 700E

Last Cal. Date : 30 October 2023

Serial No. : 201-S

#### 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 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	0.11	-	0	-
NO Span	400	399.7	-0.075	400.0	1.005
NO <sub>x</sub> Span	400	400.1	0.025	400.0	1.009

#### API Model 200A 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	103.4	mV	-20 - 150
AZERO	94.2	mV	-20 - 150
HVPS	670	V	420 - 900 constant
RCELL TEMP	50.5	°C	50 ± 1
BOX TEMP	29.3	°C	8 - 48
PMT TEMP	7.4	°C	7 ± 2
MOLY TEMP	314.7	°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	1.009	-	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 :

Approved by :



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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO <sub>2</sub> / NO <sub>x</sub> ANALYZER					
DATE :	16 November 2023	BRAND :	API	MODEL :	200E
NO.	NOX-B05	SERIAL NO.	2284		
Calibrator (Dilution System)					
Brand	: Teledyne			Model	: 700E
Last Cal. Date	: 30 October 2023			Serial No.	: 201-S
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 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	-
NO Span	400	399.6	-0.100	400.0	1.004
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	509	cc/min	500 ± 50		
OZONE FLOW	79	cc/min	80 ± 15		
PMT	103.2	mV	-20 - 150		
AZERO	94.0	mV	-20 - 150		
HVPS	673	V	420 - 900 constant		
RCELL TEMP	50.2	°C	50 ± 1		
BOX TEMP	29.4	°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	28.6	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	1.004	-	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 :

(Mr.Adul Dangklom)

Approved by :

(Mr.Peera Detudom)





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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO <sub>2</sub> / NO <sub>x</sub> ANALYZER					
DATE :	16 November 2023	BRAND :	API	MODEL :	200A
NO.	NOX-B14	SERIAL NO.	212		
Calibrator (Dilution System)					
Brand	: Teledyne			Model	: 700E
Last Cal. Date	: 30 October 2023			Serial No.	: 201-S
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	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	-
NO Span	400	400.1	0.025	400.0	1.009
NO <sub>x</sub> Span	400	400.2	0.050	400.0	1.012
API Model 200A NO <sub>x</sub> Analyzer Check List					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	504	cc/min	500 ± 50		
OZONE FLOW	78	cc/min	80 ± 15		
PMT	102.9	mV	-20 - 150		
AZERO	93.7	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	7.0	°C	7 ± 2		
MOLY TEMP	315.3	°C	315 ± 5		
RCELL PRESS	8.2	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	1.009	-	1.0 ± 0.3		
NO <sub>x</sub> Slope	1.012	-	1.0 ± 0.3		
NO Offset	1.6	mV	-20 to +150		
NO <sub>x</sub> Offset	1.0	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by : \_\_\_\_\_

Approved by : \_\_\_\_\_





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### 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.)			y	R <sup>2</sup>
					1	2	3	1	2	3		
B41	SKC	224-PCXR4	612669	10/10/2023	1,000	1,500	2,000	999	1,491	1,993	0.994x + 2.802	1.000
B42	SKC	224-PCXR4	626041	10/10/2023	1,000	1,500	2,000	994	1,490	1,989	0.995x - 1.759	1.000
B43	SKC	224-PCXR4	034636	07/10/2023	1,000	1,500	2,000	995	1,488	1,989	0.991x + 2.866	1.000
B44	SKC	224-PCXR8	529341	07/10/2023	1,000	1,500	2,000	992	1,503	1,998	1.009x - 23.051	0.999
B45	SKC	224-PCXR8	529594	10/10/2023	1,000	1,500	2,000	1,000	1,495	1,989	0.989x + 10.094	1.000
B46	SKC	224-PCXR8	566743	02/10/2023	1,000	1,500	2,000	1,000	1,500	1,998	1.008x - 19.564	0.999
B47	SKC	224-PCXR8	566747	02/10/2023	1,000	1,500	2,000	994	1,502	1,996	1.011x - 27.787	0.999
B48	SKC	224-PCXR8	566753	03/10/2023	1,000	1,500	2,000	1,000	1,495	2,000	1.005x - 13.577	1.000
B49	SKC	224-PCXR8	566780	02/10/2023	1,000	1,500	2,000	998	1,498	2,000	1.010x - 21.853	0.999
B50	SKC	224-PCXR8	500400	07/10/2023	1,000	1,500	2,000	999	1,495	1,989	0.991x + 5.640	1.000
B51	SKC	224-PCXR8	500363	07/10/2023	1,000	1,500	2,000	993	1,501	1,996	1.009x - 24.941	0.999
B52	SKC	224-PCXR8	093186	07/10/2023	1,000	1,500	2,000	994	1,500	1,991	0.996x + 2.910	1.000
B53	SKC	224-PCXR8	707670	06/10/2023	1,000	1,500	2,000	990	1,498	1,996	1.014x - 33.838	0.999
B54	SKC	224-PCXR3	509821	05/10/2023	1,000	1,500	2,000	991	1,499	1,995	1.012x - 30.494	0.999
B55	SKC	224-PCXR3	510710	05/10/2023	1,000	1,500	2,000	996	1,493	1,996	0.999x - 2.301	1.000
B56	SKC	224-PCXR3	511450	05/10/2023	1,000	1,500	2,000	992	1,487	1,996	1.006x - 16.797	1.000
B57	SKC	224-PCXR3	510798	04/10/2023	1,000	1,500	2,000	989	1,493	1,994	1.001x - 9.175	1.000
B58	SKC	224-PCXR3	509852	04/10/2023	1,000	1,500	2,000	1,000	1,497	1,997	1.009x - 21.172	0.999
B59	SKC	224-PCXR3	509862	04/10/2023	1,000	1,500	2,000	995	1,495	1,988	0.993x + 2.723	1.000
B60	SKC	224-PCXR3	512655	07/10/2023	1,000	1,500	2,000	992	1,498	1,997	1.013x - 31.979	0.999
B61	SKC	224-PCXR3	503915	07/10/2023	1,000	1,500	2,000	1,000	1,502	1,997	1.007x - 20.065	0.999
B62	SKC	224-PCXR3	505975	07/10/2023	1,000	1,500	2,000	996	1,489	1,991	0.990x + 6.791	1.000
B63	SKC	224-PCXR3	511432	07/10/2023	1,000	1,500	2,000	993	1,500	1,995	1.003x - 8.208	1.000
B64	SKC	224-PCXR3	508302	05/10/2023	1,000	1,500	2,000	991	1,496	1,988	0.998x - 5.262	1.000
B65	SKC	224-PCXR3	508310	05/10/2023	1,000	1,500	2,000	993	1,492	1,991	0.999x - 4.884	1.000
B66	SKC	224-PCXR3	509861	06/10/2023	1,000	1,500	2,000	996	1,493	1,985	0.992x + 2.675	1.000
B67	SKC	224-PCXR3	506295	04/10/2023	1,000	1,500	2,000	1,000	1,498	1,998	1.009x - 21.534	0.999
B68	SKC	224-PCXR3	505872	04/10/2023	1,000	1,500	2,000	994	1,493	1,987	0.993x + 3.176	1.000
B69	SKC	224-PCXR3	508375	07/10/2023	1,000	1,500	2,000	999	1,495	1,996	1.005x - 19.592	0.999
B70	SKC	224-PCXR3	510623	04/10/2023	1,000	1,500	2,000	992	1,486	1,995	1.002x - 11.762	1.000
B71	SKC	224-PCXR3	508367	05/10/2023	1,000	1,500	2,000	999	1,497	1,996	1.008x - 21.646	0.999
B72	SKC	224-PCXR3	505977	03/10/2023	1,000	1,500	2,000	993	1,490	1,990	0.997x - 4.295	1.000
B73	SKC	224-PCXR3	512606	05/10/2023	1,000	1,500	2,000	995	1,495	1,989	0.994x + 1.210	1.000
B74	SKC	224-PCXR3	505993	05/10/2023	1,000	1,500	2,000	997	1,496	1,986	0.987x + 12.602	1.000
B75	SKC	224-PCXR3	509820	05/10/2023	1,000	1,500	2,000	994	1,490	1,991	0.998x - 5.143	1.000
B76	SKC	224-PCXR3	509811	06/10/2023	1,000	1,500	2,000	1,000	1,497	1,999	1.010x - 23.063	0.999
B77	SKC	224-PCXR3	508301	06/10/2023	1,000	1,500	2,000	992	1,501	1,998	1.013x - 32.023	0.999
B78	SKC	224-PCXR3	510677	05/10/2023	1,000	1,500	2,000	1,001	1,498	1,997	1.007x - 18.549	0.999
B79	SKC	224-PCXR3	510920	03/10/2023	1,000	1,500	2,000	999	1,509	1,997	0.996x + 4.999	1.000

Calibrated by :

Approved by :





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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.)			y	R <sup>2</sup>
					1	2	3	1	2	3		
B01	SKC	224-PCXR4	262101	02/10/2023	1,000	1,500	2,000	997	1,494	1,995	0.998x - 5.198	1.000
B02	SKC	224-PCXR4	626166	02/10/2023	1,000	1,500	2,000	995	1,491	1,987	0.995x - 0.239	1.000
B03	SKC	224-PCXR4	612968	02/10/2023	1,000	1,500	2,000	994	1,498	1,996	1.004x - 17.211	0.999
B04	SKC	224-PCXR4	602804	03/10/2023	1,000	1,500	2,000	1,001	1,502	1,997	0.999x - 3.961	1.000
B05	SKC	224-PCXR4	612693	03/10/2023	1,000	1,500	2,000	1,000	1,500	1,998	1.008x - 19.564	0.999
B06	SKC	224-PCXR4	262188	04/10/2023	1,000	1,500	2,000	999	1,497	1,998	1.005x - 13.275	1.000
B07	SKC	224-PCXR4	626262	04/10/2023	1,000	1,500	2,000	997	1,491	1,992	0.995x + 0.103	1.000
B08	SKC	224-PCXR4	626100	03/10/2023	1,000	1,500	2,000	995	1,490	1,994	0.999x - 3.162	1.000
B09	SKC	224-PCXR4	626479	04/10/2023	1,000	1,500	2,000	1,012	1,500	2,001	0.998x + 1.604	0.999
B10	SKC	224-PCXR4	091950	05/10/2023	1,000	1,500	2,000	992	1,486	1,994	1.002x - 11.842	1.000
B11	SKC	224-PCXR8	564315	05/10/2023	1,000	1,500	2,000	993	1,501	1,996	1.010x - 26.335	0.999
B12	SKC	224-PCXR4	034656	05/10/2023	1,000	1,500	2,000	1,000	1,496	1,998	1.007x - 17.721	0.999
B13	SKC	224-PCXR4	602073	04/10/2023	1,000	1,500	2,000	1,000	1,488	1,987	0.986x + 13.398	1.000
B14	SKC	224-PCXR4	626313	04/10/2023	1,000	1,500	2,000	996	1,493	1,996	0.999x - 2.380	1.000
B15	SKC	224-PCXR4	626474	06/10/2023	1,000	1,500	2,000	1,000	1,498	1,998	1.007x - 16.567	0.999
B16	SKC	224-PCXR4	626477	06/10/2023	1,000	1,500	2,000	1,001	1,498	1,999	1.010x - 21.673	0.999
B17	SKC	224-PCXR4	626860	06/10/2023	1,000	1,500	2,000	1,000	1,492	1,998	0.997x - 1.859	1.000
B18	SKC	224-PCXR4	691484	03/10/2023	1,000	1,500	2,000	995	1,494	1,992	1.000x - 5.493	1.000
B19	SKC	224-PCXR4	691599	02/10/2023	1,000	1,500	2,000	991	1,500	1,998	1.015x - 32.922	0.999
B20	SKC	224-PCXR4	691587	02/10/2023	1,000	1,500	2,000	1,001	1,496	1,999	1.010x - 23.222	0.999
B21	SKC	224-PCXR4	691531	03/10/2023	1,000	1,500	2,000	994	1,491	1,997	1.004x - 12.881	1.000
B22	SKC	224-PCXR4	691654	03/10/2023	1,000	1,500	2,000	991	1,492	1,994	1.002x - 9.860	1.000
B23	SKC	224-PCXR4	798393	02/10/2023	1,000	1,500	2,000	991	1,498	1,997	1.014x - 33.810	0.999
B24	SKC	224-PCXR4	626363	02/10/2023	1,000	1,500	2,000	1,001	1,499	2,001	1.011x - 23.676	0.999
B25	SKC	224-PCXR4	798489	04/10/2023	1,000	1,500	2,000	996	1,497	1,989	0.991x + 6.619	1.000
B26	SKC	224-PCXR4	798479	05/10/2023	1,000	1,500	2,000	996	1,492	1,990	0.996x - 1.146	1.000
B27	SKC	224-PCXR4	691673	09/10/2023	1,000	1,500	2,000	989	1,506	1,998	1.016x - 34.646	0.999
B28	SKC	224-PCXR4	691570	09/10/2023	1,000	1,500	2,000	992	1,487	1,996	1.006x - 16.996	1.000
B29	SKC	224-PCXR4	626472	09/10/2023	1,000	1,500	2,000	998	1,495	1,992	0.997x - 0.693	1.000
B30	SKC	224-PCXR4	691489	03/10/2023	1,000	1,500	2,000	993	1,490	1,990	0.999x - 7.320	1.000
B31	SKC	224-PCXR4	691509	03/10/2023	1,000	1,500	2,000	1,001	1,497	1,997	1.007x - 18.788	0.999
B32	SKC	224-PCXR4	091567	04/10/2023	1,000	1,500	2,000	998	1,499	1,996	1.009x - 22.780	0.999
B33	SKC	224-PCXR4	091756	05/10/2023	1,000	1,500	2,000	1,000	1,489	1,994	0.995x - 0.223	1.000
B34	SKC	224-PCXR4	612962	05/10/2023	1,000	1,500	2,000	992	1,501	1,997	1.013x - 31.362	0.999
B35	SKC	224-PCXR4	602682	03/10/2023	1,000	1,500	2,000	998	1,496	1,998	0.998x - 7.157	0.999
B36	SKC	224-PCXR4	626164	07/10/2023	1,000	1,500	2,000	995	1,487	1,990	0.991x + 3.901	1.000
B37	SKC	224-PCXR4	626256	02/10/2023	1,000	1,500	2,000	990	1,500	1,993	1.000x - 6.520	1.000
B38	SKC	224-PCXR4	626167	03/10/2023	1,000	1,500	2,000	989	1,498	1,995	1.015x - 35.470	0.999
B39	SKC	224-PCXR4	034637	09/10/2023	1,000	1,500	2,000	991	1,495	1,994	1.004x - 14.572	1.000
B40	SKC	224-PCXR4	798349	07/10/2023	1,000	1,500	2,000	999	1,497	1,996	1.008x - 21.526	0.999

Calibrated by :

Approved by :



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### Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

#### Environmental Conditions

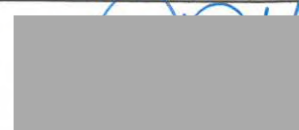
Temperature : 25  $\pm$  3  $^{\circ}$ C  
 Pressure : 1010  $\pm$  15 mmbar

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (ml/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R <sup>2</sup>
B80	SKC	224-PCXR3	504569	07/10/2023	1,000	1,500	2,000	1,001	1,497	2,000	1.007x - 19.202	0.999
B81	SKC	224-PCXR3	503480	07/10/2023	1,000	1,500	2,000	994	1,496	1,996	1.006x - 17.526	1.000
B82	SKC	224-PCXR3	505673	05/10/2023	1,000	1,500	2,000	992	1,495	1,992	1.002x - 11.742	1.000
B83	SKC	224-PCXR3	510785	05/10/2023	1,000	1,500	2,000	994	1,497	1,998	1.005x - 15.177	1.000
B84	SKC	224-PCXR3	508333	04/10/2023	1,000	1,500	2,000	1,000	1,498	1,999	1.003x - 16.041	0.999
B85	SKC	224-PCXR3	505757	04/10/2023	1,000	1,500	2,000	999	1,498	1,999	1.010x - 23.715	0.999
B86	SKC	224-PCXR3	512625	02/10/2023	1,000	1,500	2,000	1,000	1,493	1,989	0.994x + 1.568	1.000
B87	SKC	224-PCXR3	504324	09/10/2023	1,000	1,500	2,000	1,001	1,500	1,996	1.006x - 16.049	0.999
B88	SKC	224-PCXR3	508307	09/10/2023	1,000	1,500	2,000	1,000	1,496	1,990	0.990x + 9.617	1.000
B89	SKC	224-PCXR3	509860	05/10/2023	1,000	1,500	2,000	999	1,496	1,998	0.997x - 5.214	0.999
B90	SKC	224-PCXR3	508366	03/10/2023	1,000	1,500	2,000	992	1,495	1,992	0.999x - 5.095	1.000
B91	SKC	224-PCXR3	510919	10/10/2023	1,000	1,500	2,000	998	1,496	1,993	0.995x - 1.847	1.000
B92	SKC	224-PCXR3	510987	04/10/2023	1,000	1,500	2,000	1,001	1,496	1,997	1.009x - 22.028	0.999
B93	SKC	224-PCXR3	509845	04/10/2023	1,000	1,500	2,000	997	1,491	1,990	0.993x + 2.516	1.000
B94	SKC	224-PCXR8	A127871	04/10/2023	1,000	1,500	2,000	998	1,495	1,995	1.005x - 19.074	0.999
B95	SKC	224-PCXR8	A127921	09/10/2023	1,000	1,500	2,000	998	1,498	1,999	1.012x - 25.793	0.999
B96	SKC	224-PCXR8	A127942	09/10/2023	1,000	1,500	2,000	999	1,495	1,989	0.991x + 5.720	1.000
B97	SKC	224-PCXR8	A127955	09/10/2023	1,000	1,500	2,000	994	1,496	1,996	1.011x - 28.512	0.999
B98	SKC	224-PCXR8	A127956	10/10/2023	1,000	1,500	2,000	995	1,489	1,987	0.994x + 1.218	1.000

Calibrated by :



Approved by :







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### 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>
R01	SKC	224-PCXR4	602467	02/10/2023	1,000	1,500	2,000	1,001	1,499	1,999	1.010x – 22.581	0.999
R02	SKC	224-PCXR4	626450	06/10/2023	1,000	2,000	3,000	996	1,493	1,986	0.992x + 3.742	1.000
R03	SKC	224-PCXR4	691592	06/10/2023	1,000	1,500	2,000	989	1,495	1,994	0.999x – 6.866	1.000
R04	SKC	224-PCXR4	691672	06/10/2023	1,000	1,500	2,000	998	1,491	1,989	0.991x + 5.421	1.000
R05	SKC	224-PCXR4	798470	06/10/2023	1,000	1,500	2,000	999	1,495	1,995	1.005x – 18.995	0.999
R06	SKC	224-PCXR4	798456	02/10/2023	1,000	1,500	2,000	1,000	1,488	1,987	0.986x + 13.398	1.000
R07	SKC	224-PCXR4	798480	02/10/2023	1,000	1,500	2,000	1,000	1,497	1,998	1.009x – 21.689	0.999
R08	SKC	224-PCXR4	883215	05/10/2023	1,000	1,500	2,000	994	1,500	1,990	0.995x + 3.109	1.000
R09	SKC	224-PCXR4	034650	05/10/2023	1,000	1,500	2,000	999	1,497	1,996	1.008x – 21.526	0.999
R10	SKC	224-PCXR4	091765	05/10/2023	1,000	1,500	2,000	996	1,493	1,994	1.000x - 6.596	1.000
R11	SKC	224-PCXR4	091763	04/10/2023	1,000	1,500	2,000	998	1,496	1,983	0.998x – 9.346	0.999
R12	SKC	224-PCXR4	091568	04/10/2023	1,000	1,500	2,000	1,000	1,497	1,999	1.009x – 21.948	0.999
R13	SKC	224-PCXR4	091638	02/10/2023	1,000	1,500	2,000	994	1,495	1,986	0.993x + 2.981	1.000
R14	SKC	224-PCXR4	091764	06/10/2023	1,000	1,500	2,000	998	1,498	2,000	1.012x – 26.788	0.999
R15	SKC	224-PCXR8	529457	06/10/2023	1,000	1,500	2,000	995	1,492	1,987	0.994x + 1.457	1.000
R16	SKC	224-PCXR8	529643	04/10/2023	1,000	1,500	2,000	1,000	1,498	1,997	1.007x - 17.908	0.999
R17	SKC	224-PCXR8	529645	07/10/2023	1,000	1,500	2,000	998	1,496	1,998	1.011x – 25.546	0.999
R18	SKC	224-PCXR8	566756	03/10/2023	1,000	1,500	2,000	994	1,490	1,989	0.995x – 1.759	1.000
R19	SKC	224-PCXR8	566802	02/10/2023	1,000	1,500	2,000	1,000	1,496	1,999	1.010x – 22.864	0.999
R20	SKC	224-PCXR8	529089	06/10/2023	1,000	1,500	2,000	992	1,506	1,996	1.008x – 22.151	0.999
R21	SKC	224-PCXR8	665728	02/10/2023	1,000	1,500	2,000	992	1,486	1,994	1.002x – 11.842	1.000
R22	SKC	224-PCXR8	707444	03/10/2023	1,000	1,500	2,000	1,001	1,500	1,999	1.007x – 18.171	0.999
R23	SKC	224-PCXR8	761067	06/10/2023	1,000	1,500	2,000	1,000	1,488	1,993	0.992x + 5.744	1.000
R24	SKC	224-PCXR8	707893	05/10/2023	1,000	1,500	2,000	994	1,505	1,996	1.005x – 15.010	0.999
R25	SKC	224-PCXR8	761052	06/10/2023	1,000	1,500	2,000	999	1,495	1,989	0.991x + 5.640	1.000
R26	SKC	224-PCXR8	707956	07/10/2023	1,000	1,500	2,000	1,010	1,497	2,002	0.999x – 2.874	0.999
R27	SKC	224-PCXR8	707398	07/10/2023	1,000	1,500	2,000	1,001	1,496	1,997	1.008x – 20.237	0.999
R28	SKC	224-PCXR8	707481	07/10/2023	1,000	1,500	2,000	993	1,506	1,995	1.002x – 10.719	1.000
R29	SKC	224-PCXR8	707402	04/10/2023	1,000	1,500	2,000	995	1,495	1,989	0.995x + 1.091	1.000
R30	SKC	224-PCXR8	093811	04/10/2023	1,000	1,500	2,000	998	1,495	1,992	0.997x - 0.693	1.000
R31	SKC	224-PCXR8	093183	06/10/2023	1,000	1,500	2,000	999	1,502	1,997	0.988x + 9.127	0.999
R32	SKC	224-PCXR8	671950	07/10/2023	1,000	1,500	2,000	998	1,495	1,994	0.998x - 3.451	1.000
R33	SKC	224-PCXR4	626254	07/10/2023	1,000	1,500	2,000	992	1,503	1,995	1.011x – 30.016	0.999
R34	SKC	224-PCXR4	626131	03/10/2023	1,000	1,500	2,000	990	1,499	1,997	1.014x – 32.986	0.999
R35	SKC	224-PCXR8	707460	07/10/2023	1,000	1,500	2,000	990	1,501	1,997	1.005x - 15.898	1.000
R36	SKC	224-PCXR8	707446	05/10/2023	1,000	1,500	2,000	1,000	1,497	1,997	1.002x – 7.547	1.000
R37	SKC	224-PCXR8	707432	02/10/2023	1,000	1,500	2,000	995	1,498	1,995	0.999x - 4.856	1.000
R38	SKC	224-PCXR8	707349	02/10/2023	1,000	1,500	2,000	991	1,496	1,992	1.000x – 7.364	1.000
R39	SKC	224-PCXR8	761095	06/10/2023	1,000	1,500	2,000	995	1,489	1,985	0.990x + 6.253	1.000

Calibrated by :

Approved by :



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

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>
R40	SKC	224-PCXR4	612753	07/10/2023	1,000	1,500	2,000	999	1,496	1,996	1.008x – 21.287	0.999
R41	SKC	224-PCXR4	626140	03/10/2023	1,000	1,500	2,000	990	1,499	1,996	1.013x – 31.991	0.999
R42	SKC	224-PCXR4	626463	07/10/2023	1,000	1,500	2,000	998	1,493	1,994	0.998x – 4.088	1.000
R43	SKC	224-PCXR4	626129	07/10/2023	1,000	1,500	2,000	1,001	1,498	1,999	1.010x – 21.673	0.999
R44	SKC	224-PCXR4	602753	07/10/2023	1,000	1,500	2,000	994	1,492	1,990	0.997x - 4.275	1.000
R45	SKC	224-PCXR4	626137	06/10/2023	1,000	1,500	2,000	992	1,487	1,996	1.006x – 16.996	1.000

Calibrated by :

Approved by :





บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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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-B01	Dwyer	VFB-65	04/07/2023	500	1,000	2,000	503.2	990.1	1974.7	0.990x + 7.225	1.000
H-B02	Dwyer	VFB-65	07/07/2023	500	1,000	2,000	495.6	994.6	1994.1	0.995x + 2.972	1.000
H-B03	Dwyer	VFB-65	07/07/2023	500	1,000	2,000	497.1	989.8	2007.6	1.002x - 12.719	0.999
H-B04	Dwyer	VFB-65	06/07/2023	500	1,000	2,000	500.3	999.5	2004.4	0.996x - 0.709	1.000
H-B05	Dwyer	VFB-65	07/07/2023	500	1,000	2,000	499.3	990.7	1972.3	0.982x + 17.213	0.999
H-B06	Dwyer	VFB-65	06/07/2023	500	1,000	2,000	504.0	991.4	1982.0	0.988x + 8.755	1.000
H-B07	Dwyer	VFB-65	04/07/2023	500	1,000	2,000	501.3	989.4	2014.7	0.999x - 0.490	1.000
H-B08	Dwyer	VFB-65	05/07/2023	500	1,000	2,000	499.2	996.1	1977.8	0.993x + 2.247	0.999
H-B09	Dwyer	VFB-65	07/07/2023	500	1,000	2,000	504.0	1006.4	2008.7	0.991x + 16.313	1.000
H-B10	Dwyer	VFB-65	10/07/2023	500	1,000	2,000	495.7	993.0	2011.6	1.000x - 1.820	1.000

Calibrated by :

Approved by :



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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

Flow Rate 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-B01	Dwyer	VFA-21	04/07/2023	50	100	200	50.2	99.7	198.7	0.994x + 0.959	0.999
L-B02	Dwyer	VFA-21	07/07/2023	50	100	200	49.1	98.9	198.5	0.999x - 0.773	1.000
L-B03	Dwyer	VFA-21	07/07/2023	50	100	200	49.1	99.5	198.1	1.006x - 0.411	1.000
L-B04	Dwyer	VFA-21	06/07/2023	50	100	200	49.2	100.7	202.6	1.005x - 0.435	1.000
L-B05	Dwyer	VFA-21	07/07/2023	50	100	200	50.1	98.9	198.0	0.999x - 0.013	0.999
L-B06	Dwyer	VFA-21	06/07/2023	50	100	200	50.4	99.9	200.4	1.007x - 0.221	1.000
L-B07	Dwyer	VFA-21	04/07/2023	50	100	200	50.5	99.6	199.1	0.995x + 1.029	0.999
L-B08	Dwyer	VFA-21	05/07/2023	50	100	200	49.4	101.7	197.5	1.001x - 0.332	1.000
L-B09	Dwyer	VFA-21	07/07/2023	50	100	200	49.7	98.5	199.6	1.003x - 0.786	1.000
L-B10	Dwyer	VFA-21	10/07/2023	50	100	200	49.9	98.4	200.4	1.007x - 1.164	1.000

Calibrated by :

Approved by :



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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-B01	Dwyer	VFB-65	02/10/2023	500	1,000	2,000	500.1	992.7	1979.6	0.993x + 4.560	1.000
H-B02	Dwyer	VFB-65	03/10/2023	500	1,000	2,000	503.6	989.1	1983.1	0.991x + 6.131	1.000
H-B03	Dwyer	VFB-65	02/10/2023	500	1,000	2,000	498.7	991.6	2006.8	0.999x - 9.214	0.999
H-B04	Dwyer	VFB-65	04/10/2023	500	1,000	2,000	502.3	988.1	2003.7	1.000x - 2.013	1.000
H-B05	Dwyer	VFB-65	03/10/2023	500	1,000	2,000	497.8	989.1	1971.6	0.981x + 16.401	0.999
H-B06	Dwyer	VFB-65	05/10/2023	500	1,000	2,000	499.3	995.9	1979.0	0.988x + 11.304	1.000
H-B07	Dwyer	VFB-65	04/10/2023	500	1,000	2,000	495.1	995.8	1991.3	0.997x - 1.222	1.000
H-B08	Dwyer	VFB-65	05/10/2023	500	1,000	2,000	500.7	998.7	1975.8	0.990x + 5.555	0.999
H-B09	Dwyer	VFB-65	03/10/2023	500	1,000	2,000	496.9	998.5	1979.0	0.989x + 10.735	1.000
H-B10	Dwyer	VFB-65	07/10/2023	500	1,000	2,000	499.4	997.5	2004.6	0.998x - 1.062	1.000

Calibrated by :

Approved by :





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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

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-B01	Dwyer	VFA-21	02/10/2023	50	100	200	50.2	100.3	202.6	0.997x + 0.475	0.999
L-B02	Dwyer	VFA-21	03/10/2023	50	100	200	50.5	98.9	201.1	1.001x - 0.121	1.000
L-B03	Dwyer	VFA-21	02/10/2023	50	100	200	50.1	100.7	200.2	1.007x - 1.206	0.999
L-B04	Dwyer	VFA-21	04/10/2023	50	100	200	50.4	99.6	201.9	1.006x - 0.142	1.000
L-B05	Dwyer	VFA-21	03/10/2023	50	100	200	49.7	101.1	197.7	0.997x - 0.218	1.000
L-B06	Dwyer	VFA-21	05/10/2023	50	100	200	50.3	101.5	200.1	1.003x - 0.332	0.999
L-B07	Dwyer	VFA-21	04/10/2023	50	100	200	50.9	100.4	202.4	0.990x + 2.441	1.000
L-B08	Dwyer	VFA-21	05/10/2023	50	100	200	50.7	99.8	197.9	1.005x - 1.343	0.999
L-B09	Dwyer	VFA-21	03/10/2023	50	100	200	50.2	100.3	203.0	1.007x + 0.375	1.000
L-B10	Dwyer	VFA-21	07/10/2023	50	100	200	49.5	99.4	200.3	1.009x - 1.182	1.000

Calibrated by :

Approved by :



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## Console Calibration Report

Calibration Method

Critical Orifices

### Calibration Data

Console Data		Calibration Data		
No.	Serial No.	Date	y	DH <sub>g</sub> (mmH <sub>2</sub> O)
B01	1563	04/09/2023	0.997	50.11
B02	8002514	06/09/2023	1.002	49.25
B03	1503016	05/09/2023	0.998	50.44
B04	00006659	05/09/2023	1.004	49.37
B05	00007428	05/09/2023	0.996	49.77
R01	1561	06/09/2023	1.004	49.86
R02	8002513	08/09/2023	1.005	50.36
R03	1570	07/09/2023	0.997	49.55
R04	8002519	04/09/2023	1.004	49.69
R05	1503015	07/09/2023	0.999	50.08

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

Accept Value of DH<sub>g</sub> (test) is  $46.7 \pm 6.4$  (mmH<sub>2</sub>O)

Calibrated by :



Approved by :





บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด  
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## 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
B03	S	0.99	02/08/2023	0.84	0.84
B04	S	0.99	02/08/2023	0.85	0.84
B05	S	0.99	02/08/2023	0.84	0.83
B07	S	0.99	02/08/2023	0.84	0.84
B08	S	0.99	03/08/2023	0.84	0.85
B09	S	0.99	01/08/2023	0.85	0.84
B11	S	0.99	04/08/2023	0.84	0.85
B16	S	0.99	02/08/2023	0.84	0.85
B18	S	0.99	02/08/2023	0.83	0.84
B19	S	0.99	01/08/2023	0.84	0.84
B21	S	0.99	03/08/2023	0.84	0.85
B24	S	0.99	03/08/2023	0.84	0.84
B27	S	0.99	02/08/2023	0.84	0.84
B30	S	0.99	01/08/2023	0.85	0.84
B31	S	0.99	03/08/2023	0.83	0.84
B33	S	0.99	03/08/2023	0.84	0.84
B35	S	0.99	01/08/2023	0.84	0.85

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

Calibrated by :



Approved by :







บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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## 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	01/08/2023	0.85	0.84
B37	S	0.99	02/08/2023	0.84	0.84
B38	S	0.99	03/08/2023	0.84	0.83
B39	S	0.99	03/08/2023	0.84	0.84
B40	S	0.99	01/08/2023	0.85	0.84
B41	S	0.99	02/08/2023	0.84	0.85
B44	S	0.99	01/08/2023	0.84	0.84
B45	S	0.99	01/08/2023	0.85	0.84
B46	S	0.99	01/08/2023	0.84	0.85
B47	S	0.99	01/08/2023	0.84	0.84
B48	S	0.99	01/08/2023	0.84	0.85
B49	S	0.99	03/08/2023	0.85	0.84
B54	S	0.99	03/08/2023	0.83	0.84
B56	S	0.99	03/08/2023	0.84	0.85
B57	S	0.99	03/08/2023	0.84	0.83
B58	S	0.99	03/08/2023	0.85	0.84

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

Calibrated by :

Approved by :

## CERTIFICATE OF CALIBRATION FOR

NOMENCLATURE : VACUUM GAUGE  
MANUFACTURER : HI-LIGHT  
MODEL / TYPE : N/A  
SERIAL NO. : N/A[64-220066-3]  
CLID. NO. : 212201114  
JOB CONTROL NO. : 230725081569

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

DATE OF RECEIVED : 25 July 2023

DATE OF ISSUED : 31 July 2023

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

Calibrated By : Sittipong Pimdee  
Calibration Engineer



Approved By : Mongkol Yotsoontorn  
Authorized Signatory  
31 July 2023



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. Q23081569

F3-011-04/01-12

page 1 of 3



@clccalibration



## REPORT OF CALIBRATION

### FOR

NOMENCLATURE	:	VACUUM GAUGE
MANUFACTURER	:	HI-LIGHT
MODEL / TYPE	:	N/A
SERIAL NO.	:	N/A[64-220066-3]
DATE OF CALIBRATION	:	26 July 2023
DUE DATE OF CALIBRATION	:	26 July 2024

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#### 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-0035-23, Due Date 02 February 2024.

#### 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. Q23081569

F3-011-04/01-12

page 2 of 3



@clccalibration



**CLC**  
Accredited  
ISO/IEC 17025

# 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



## CONDITION OF CALIBRATION ITEM : GOOD

## 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	-16.66	-16.69	-4.9	-4.9	+0.1	+0.1
-10	-33.79	-33.79	-10.0	-10.0	0.0	0.0
-15	-50.76	-50.76	-15.0	-15.0	0.0	0.0
-20	-67.79	-67.82	-20.0	-20.0	0.0	0.0
-25	-84.68	-84.72	-25.0	-25.0	0.0	0.0
-30	-101.51	-101.51	-30.0	-30.0	0.0	0.0

Uncertainty of measurement  $\pm 0.2$  inHg

Transmitting fluid : Air.

Technical Note. Conversion factor 1 kPa ; 0.2953003 inHg

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 008 Page 36 of 54

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

### End of Certificate ###

Certificate No. Q23081569

F3-011-04/01-12

page 3 of 3



@clccalibration



**QUALITY CALIBRATION CO.,LTD.**

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

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

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

CERTIFICATE No : 23M2441

REFERENCE No : 68471-1

PAGE : 1 OF 2

**Certificate of Calibration**

**EQUIPMENT** : DIGITAL BALANCE

**MANUFACTURER** : METTLER TOLEDO

**MODEL** : XS105DU

**SERIAL No** : 1126422905

**ID No** : BA 05/50

**CONDITION AS RECEIVED** : USED ITEM

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

**CALIBRATED BY** : ATSAWIN Y.

**CALIBRATION DATE** : 10-Mar-23

**APPROVED BY** : 

**ISSUED DATE** : 16-Mar-23

**RECEIVED DATE** : 10-Mar-23

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





CERTIFICATE No : 23M2441

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : XS105DU  
MANUFACTURER : METTLER TOLEDO S/N : 1126422905  
ID No : BA 05/50 RECEIVED DATE : 10-Mar-23  
AIR PRESSURE : 1010mbar  $\pm$  1mbar CALIBRATION DATE : 10-Mar-23  
AMBIENT TEMPERATURE : 23°C  $\pm$  1°C RELATIVE HUMIDITY : 49 %RH  $\pm$  10 % RH

### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY ACCORDING TO UKAS LAB 14 EDITION 6:2019 BY USING KNOWN WEIGHT STANDARD WEIGHT. THE BALANCE WAS NOT ADJUSTED BEFORE CALIBRATION. THE BALANCE HAS NO ZERO TRACKING FUNCTION. REPEATABILITY WAS MEASURED BY USING 10 REPEATED MEASUREMENTS. LINEARITY WAS MEASURED COVERING 10 POINTS, EVENLY SPREAD OVER THE RANGE. THE INSTRUMENT WAS SET ZERO BEFORE PERFORMING THE LINEARITY TEST. OFF-CENTER LOADING WAS MEASURED BY USING STANDARD WEIGHTS PLACED ON THE PAN AND MOVED TO VARIOUS POSITIONS ON THE PAN.

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) STANDARD WEIGHT SET	E2	QK-I-151	M2302013S	02-Feb-25
2) STANDARD WEIGHT	E2	15843	M2302014S	02-Feb-25

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

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

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH CENTRAL BUREAU OF WEIGHTS&MEASURES

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

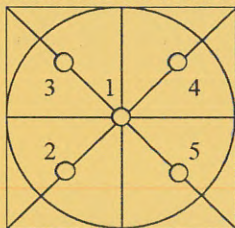
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY ( $\pm$ g)
0.00	0.00000	0.00000	0.000039
0.02	0.02000	0.00000	0.000039
0.10	0.10000	0.00000	0.000039
0.20	0.20001	-0.00001	0.000040
0.50	0.50001	-0.00001	0.000040
1.00	1.00000	0.00000	0.000041
2.00	2.00003	-0.00003	0.000042
5.00	5.00001	-0.00001	0.000046
10.00	10.00003	-0.00003	0.000053
20.00	20.00005	-0.00005	0.000067
50.00	50.00001	-0.00001	0.00011
100.00	100.00001	-0.00001	0.00019
200.00	200.00001	-0.00001	0.00032

5. OFF CENTER LOADING ERROR



POINT	READING (g)
1	50.0000
2	50.0001
3	50.0000
4	50.0000
5	49.9999
OFF-CENTER LOADING	0.0001

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



**GAS CHROMATOGRAPH TEST CERTIFICATION**

Certificate No. : SV0823/21044

Instrument Type : GC

Model : CP-3800

Serial Number : 00734

Organization : S.P.S. Consulting Service Co., Ltd.

Address : 7 Phahonyothin Soi 24 Phahonyothin Rd. Ladyao Chatuchak Bangkok 10900

Date : 09/08/2023

**ELECTRONIC TEST**

CPU	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
LCD TEST	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
VENT TEST	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
KEY ECHO TEST	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
DESTRUCTION RAM TEST	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

**RUN CHROMATOGRAM TEST**

DETECTOR : Flame Ionization Detector ( FID Channel Front)

INJECTOR : Capillary Injector Model 1079

**GC CONDITION:**

Column	80 °C hold 1 min., rate 20 °C/min. to 200 °C hold 1min.
Injector	220 °C
Detector	300 °C
Column flow	5 mL/min
Makeup flow	25 mL/min
Air flow	300 mL/min
Hydrogen flow	30 mL/min

Column: Capillary Column CP sil 5 CB 0.25 ID x 15 M

Sample: 1 µL Injection FID Test Sample 0.218 g/L C14, C15, C16 in hexane

SENSITIVITY TEST: C15. ( Area count ) = 362,972 Counts.





## Detector Sensitivity ( FID )

Detector Response	Result	Specification
Baseline Noise ( $\mu$ V)	1.47	$\leq 50$
Baseline Drift (%)	0.09	$\leq 1$
Sensitivity ( S/N for C15)	19,600	$\geq 1,024$

## Temperature Specification

Temperature	Set	Result	Specification
Column Oven ( $^{\circ}$ C)	80	80	$\pm 5$
Injector ( $^{\circ}$ C)	220	220	$\pm 5$
Detector ( $^{\circ}$ C)	300	300	$\pm 5$
Incubator ( $^{\circ}$ C)	60	N/A	$\pm 5$

## Relative Standard Deviation % ( % RSD)

Checkout Procedure	Result	Specification
Area C15 ( %)	1.52	$\leq 5$
Retention Time C15( %)	0.01	$\leq 0.5$

APPROVAL :

Signature:

Engineer :

Date : 09/08/2023







บริษัท ไทยยูนิค จำกัด

THAI UNIQUE CO., LTD.

80-82 ถนนประชาธิปไตย แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200

80-82 Prachathipatai Rd., Bangkhunphrom, Pranakorn, Bangkok 10200

Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thawatt@thaiunique.com, Website : www.thaiunique.com

### Results Integrated System Testing

Checkout Procedure	FID
Detector Position	Front
Inlet Type	1079 Injector
C15 Area 1	357,863
C15 Area 2	357,824
C15 Area 3	367,724
C15 Area 4	361,724
C15 Area 5	369,724
C15 Area Average	362,972
* % RSD ( < 5 % )	1.52

\* The precision specification should be less than 2.0 % RSD \*\* ( Relative Standard Deviation ) for an Auto sampler injection and less than 5 % for Manual injections. To calculate the %RSD, select the C15 peak area for each of the five ( 5 ) samples.

\*\* (Relative Standard Deviation is determined by dividing the standard deviation by the average and multiplying by 100.)

$$\% \text{ RSD} = ( \text{std.dev} / \text{avg} ) * 100$$

Compliance	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail
Performance by		
Date	09/08/2023	



Comments				
Reviewed by			Date	09/08/2023



VARIAN



บริษัท ไทยยูนิค จำกัด

THAI UNIQUE CO., LTD.

80-82 ถนนประชาธิปไตย แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200

80-82 Prachathipatai Rd., Bangkhunphrom, Pranakorn, Bangkok 10200

Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thawatt@thaiunique.com, Website : www.thaiunique.com

### Results Integrated System Testing

Checkout Procedure	FID
Detector Position	Front
Inlet Type	1079 Injector
C15 RT 1	4.125
C15 RT 2	4.125
C15 RT 3	4.125
C15 RT 4	4.124
C15 RT 5	4.124
C15 RT Average	4.122
* % RSD ( < 0.5 % )	0.01

\* The precision specification should be less than 0.5 % RSD \*\* ( Relative Standard Deviation ) for an Auto sampler injection and less than 0.5 % for Manual injections. To calculate the %RSD, select the RT C15 peak for each of the five ( 5 ) samples.

\*\* (Relative Standard Deviation is determined by dividing the standard deviation by the average and multiplying by 100.)

$$\% \text{ RSD} = ( \text{std.dev} / \text{avg} ) * 100$$

Compliance	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail
Performance by	[Redacted]	
Date	09/08/2023	



Comments	[Redacted]		
Reviewed by	[Redacted]	Date	09/08/2023



VARIAN

Injection Date: 9/8/2566 13:13      Calculation Date: 9/8/2566 13:34

```

Detector Type: 3800 (10 Volts)
Bus Address   : 44
Sample Rate   : 10.00 Hz
Run Time      : 21.208 min

```

Chart Speed = 1.03 cm/min      Attenuation = 1      Zero Offset = 3%  
Start Time = 0.000 min      End Time = 21.208 min      Min / Tick = 1.00



Title :  
Run File : d:\c       gc\c      .N      \drive-d\2017\2023\08\blk2023.run  
Method File : C:\star\data\TU\cal2023\baseline FID.mth  
Sample ID : Blk2023

Injection Date: 9/8/2566 13:13      Calculation Date: 9/8/2566 13:34

Operator : watsamon      Detector Type: 3800 (10 Volts)  
Workstation: GC-LAB      Bus Address : 44  
Instrument :      Sample Rate : 10.00 Hz  
Channel : Front = FID      Run Time : 21.208 min

\*\* GC Workstation Version 6.41 \*\* 03334-6390-826-0764 \*\*

Run Mode : Blank Baseline  
Peak Measurement: Peak Area  
Calculation Type: External Standard

Peak No.	Peak Name	Result ( )	Ret. Time (min)	Time Offset (min)	Area (counts)	Sep. Code	Width 1/2 (sec)	Status Codes
-----	-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	=====	-----	=====	=====	-----	-----	-----
	Totals:	0.0000		0.000	0			

Total Unidentified Counts :      0 counts

Detected Peaks: 0      Rejected Peaks: 0      Identified Peaks: 0

Multiplier: 1      Divisor: 1      Unidentified Peak Factor: 0

Baseline Offset: -14 microVolts      LSB: 1 microVolts

Noise (used): 19 microVolts - monitored before this run

Manual injection

\*\*\*\*\*

Print Date: Wed Aug 09 11:38:05 2023

Title : c:\star\data\tu\cal2023\fid\calfid2023003.run  
Run File : d:\method-gc\star c\star\method\cp-wax\without glasswool\calfid2023003-front.mth  
Method File : Manual Sample  
Sample ID : Manual Sample

Injection Date: 9/8/2566 10:31 Calculation Date: 9/8/2566 10:40

Operator : watsamon  
Workstation: Local Disk  
Instrument : Front = FID  
Channel : Detector Type: 3800 (10 Volts)  
Bus Address : 44  
Sample Rate : 10.00 Hz  
Run Time : 7.993 min

\*\* GC Workstation Version 6.41 \*\* 03334-6390-826-0764 \*\*

Run Mode : Analysis  
Peak Measurement: Peak Area  
Calculation Type: External Standard

Peak No.	Peak Name	Result ( )	Ret. Time (min)	Time Offset (min)	Area (counts)	Sep. Code	Width 1/2 (sec)	Status Codes
1	C14	33.8385	3.520	-0.003	362495	BB	2.2	C
2	C15	33.4804	4.125	-0.006	357824	BB	2.3	C
3	C16	32.6143	4.699	-0.001	344951	BB	2.2	
Totals:					1065270			

Status Codes:

C - Out of calibration range

Total Unidentified Counts : 0 counts

Detected Peaks: 3 Rejected Peaks: 0 Identified Peaks: 3

Multiplier: 1 Divisor: 1 Unidentified Peak Factor: 0

Baseline Offset: 28 microVolts LSB: 1 microVolts

Noise (used): 26 microVolts - monitored before this run

Manual injection

Calib. out of range; No Recovery Action Specified

\*\*\*\*\*

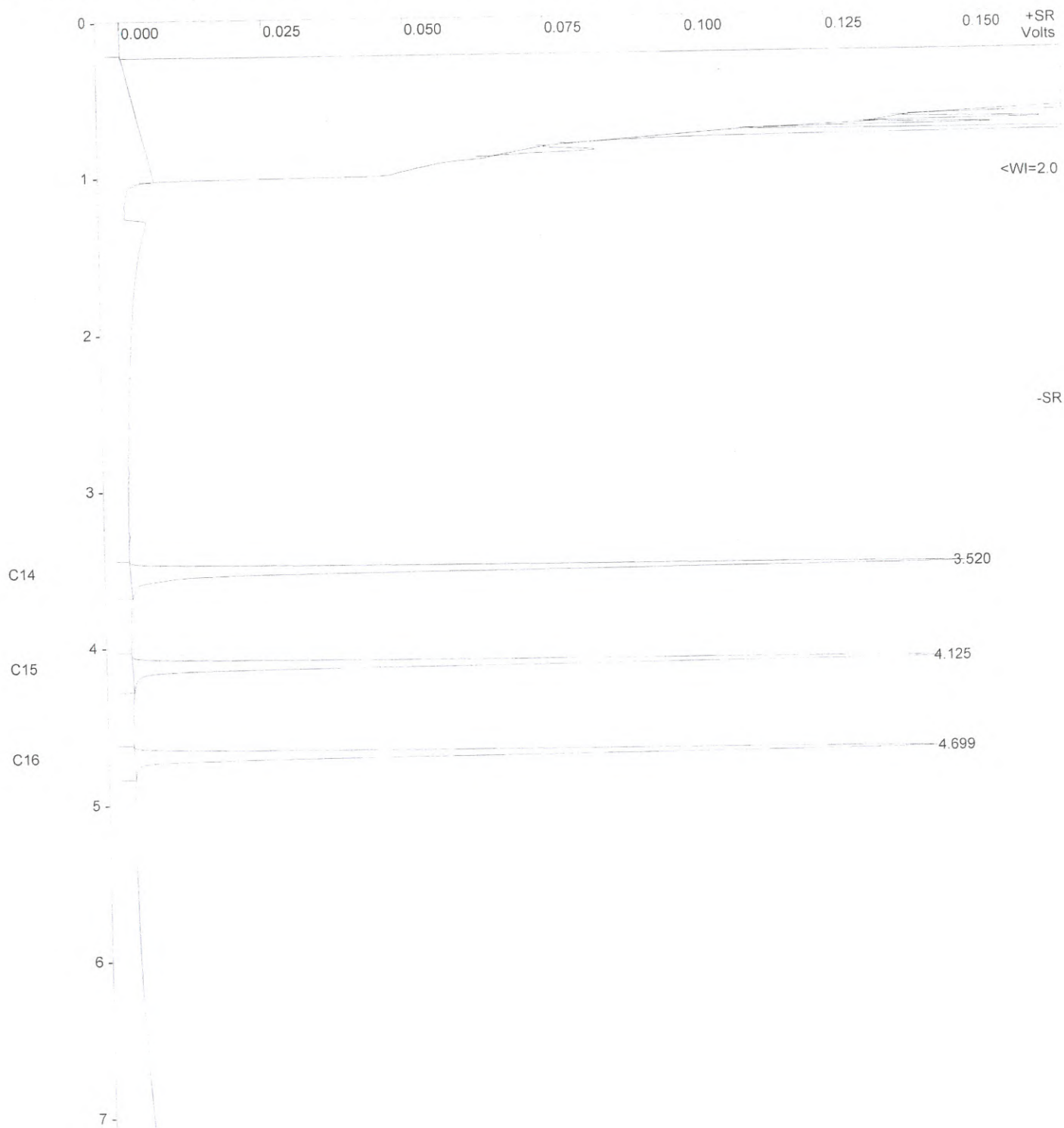
Title :  
Run File : c:\star\data\tu\cal2023\fid\calfid2023003.run  
Method File : d:\method-gc\star c\star\method\cp-wax\without glasswool\calfid2023003-front.mth  
Sample ID : Manual Sample

Injection Date: 9/8/2566 10:31      Calculation Date: 9/8/2566 10:40

Operator : watsamon      Detector Type: 3800 (10 Volts)  
Workstation: Local Disk      Bus Address : 44  
Instrument :      Sample Rate : 10.00 Hz  
Channel : Front = FID      Run Time : 7.993 min

\*\* GC Workstation Version 6.41 \*\* 03334-6390-826-0764 \*\*

Chart Speed = 2.73 cm/min      Attenuation = 70      Zero Offset = 2%  
Start Time = 0.000 min      End Time = 7.993 min      Min / Tick = 1.00



Sample ID: **fid std**

Operator (Inj): Suwarot

Injection Date: 09/08/2023

Calc Date: 09/08/2023

Run Time (min): 7.993

Workstation: Local Disk

Instrument (Inj):



**VARIAN**

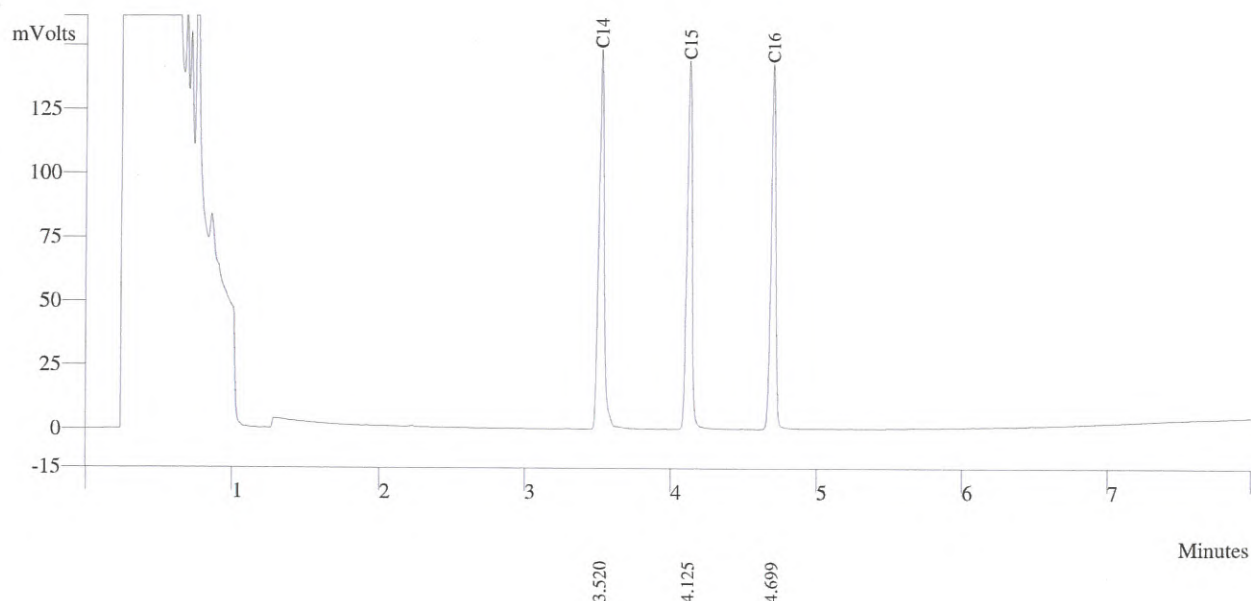
Run Mode: Analysis

Peak Measurement: Peak Area

Calculation Type: External Std.

c:\star\data\tu\cal2023\fid\calfid2023001.run

A = FID 10 V RESULTS



Peak No	Peak Name	Result ()	Ret Time (min)	Peak Area (counts)	Sep. Code	Width 1/2 (sec)
1	C14	33.8385	3.520	359491	BB	2.2
2	C15	33.4804	4.125	357863	BB	2.3
3	C16	32.6143	4.699	344951	BB	2.2
Totals		99.9312		1062305		





Sample ID: **fid std**

Operator (Inj): Suwarot

Injection Date: 09/08/2023

Calc Date: 09/08/2023

Run Time (min): 7.993

Workstation: Local Disk

Instrument (Inj):



**VARIAN**

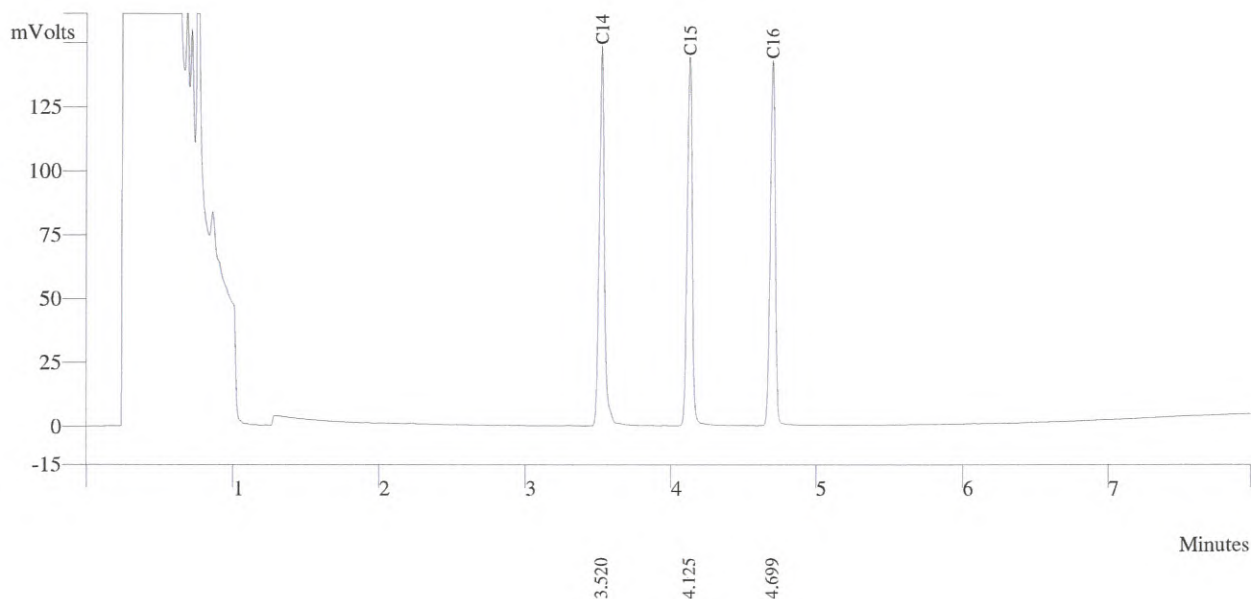
Run Mode: Analysis

Peak Measurement: Peak Area

Calculation Type: External Std.

c:\star\data\tu\cal2023\fid\calfid2023001.run

A = FID 10 V RESULTS



Peak No	Peak Name	Result ()	Ret Time (min)	Peak Area (counts)	Sep. Code	Width 1/2 (sec)
1	C14	33.8385	3.520	362495	BB	2.2
2	C15	33.4804	4.125	357824	BB	2.3
3	C16	32.6143	4.699	344951	BB	2.2
	Totals	99.9332		1065270		





Sample ID: **fid std**

Operator (Inj): Suwarot

Injection Date: 09/08/2023

Calc Date: 09/08/2023

Run Time (min): 7.993

Workstation: Local Disk

Instrument (Inj):



**VARIAN**

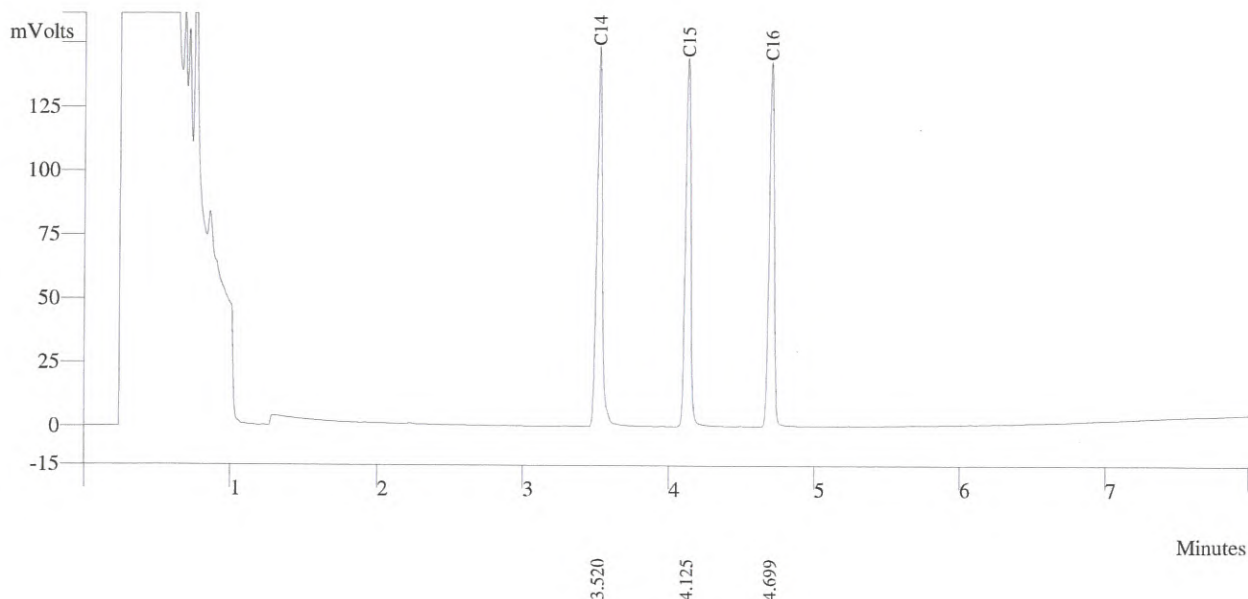
Run Mode: Analysis

Peak Measurement: Peak Area

Calculation Type: External Std.

c:\star\data\tu\cal2023\fid\calfid2023002.run

A = FID 10 V RESULTS



Peak No	Peak Name	Result ()	Ret Time (min)	Peak Area (counts)	Sep. Code	Width 1/2 (sec)
1	C14	33.8385	3.520	362495	BB	2.2
2	C15	33.4824	4.125	367724	BB	2.3
3	C16	32.6143	4.699	354951	BB	2.2
	Totals	99.9352		1085170		



Sample ID: **fid std**

Operator (Inj): Suwarot

Injection Date: 09/08/2023

Calc Date: 09/08/2023

Run Time (min): 7.993

Workstation: Local Disk

Instrument (Inj):



**VARIAN**

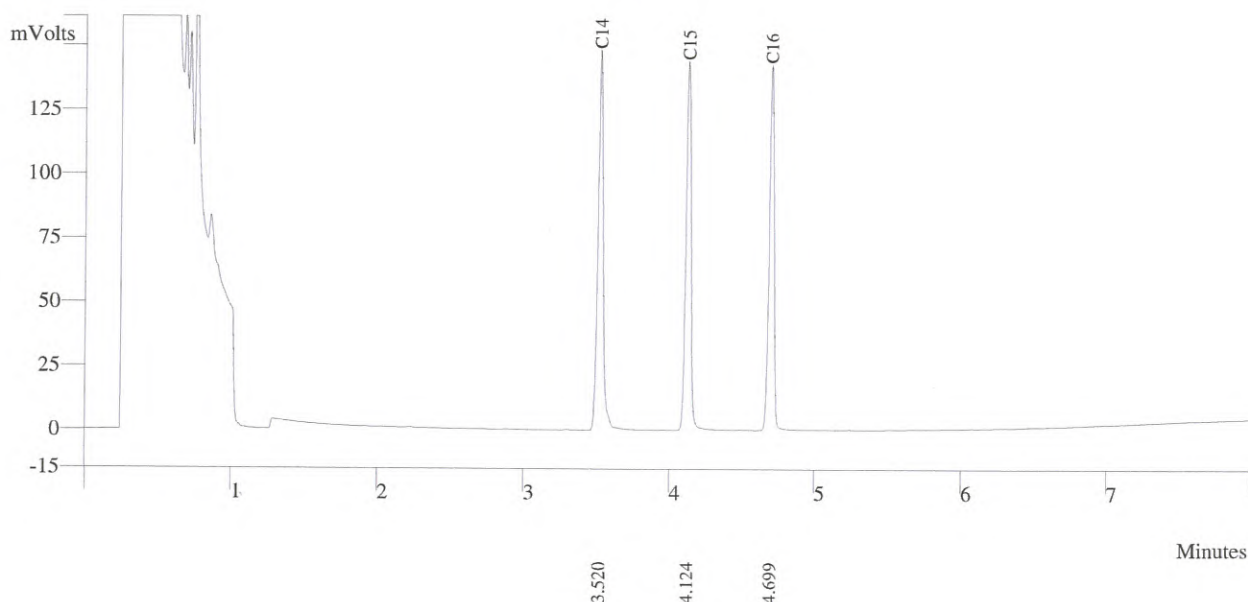
Run Mode: Analysis

Peak Measurement: Peak Area

Calculation Type: External Std.

c:\star\data\tu\cal2023\fid\calfid2023002.run

A = FID 10 V RESULTS



Peak No	Peak Name	Result ()	Ret Time (min)	Peak Area (counts)	Sep. Code	Width 1/2 (sec)
1	C14	33.8385	3.520	362495	BB	2.2
2	C15	33.4824	4.124	361724	BB	2.3
3	C16	32.6143	4.699	354991	BB	2.2
	Totals	99.9352		1079210		



Sample ID: **fid std**

Operator (Inj): Suwarot

Injection Date: 09/08/2023

Calc Date: 09/08/2023

Run Time (min): 7.993

Workstation: Local Disk

Instrument (Inj):



**VARIAN**

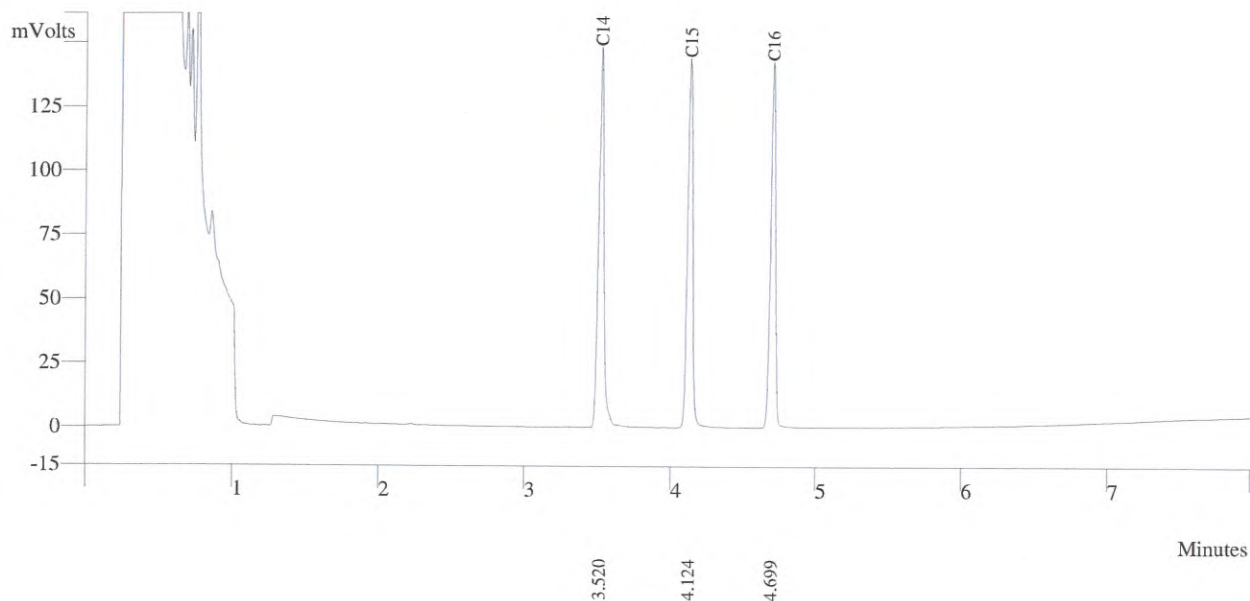
Run Mode: Analysis

Peak Measurement: Peak Area

Calculation Type: External Std.

c:\star\data\tu\cal2023\fid\calfid2023002.run

A = FID 10 V RESULTS



Peak No	Peak Name	Result ()	Ret Time (min)	Peak Area (counts)	Sep. Code	Width 1/2 (sec)
1	C14	33.8385	3.520	362495	BB	2.2
2	C15	33.4824	4.124	369724	BB	2.3
3	C16	32.6143	4.699	354591	BB	2.2
Totals		99.9552		1087210		





Agilent Technologies

## Certificate of Analysis

### FID-TCD Performance Evaluation Sample Kit

Agilent Part

Number: 5080-8842, 18710-60170

Sample Lot

Number: 0006637856

This analytical reference material was manufactured and verified in accordance with an ISO 9001 registered quality system, and the analyte concentrations were verified by an ISO 17025 accredited laboratory. The certified value for each analyte was determined gravimetrically.

#### Concentrations:

n-tetradecane	0.218 g/L ( $\pm 0.5\%$ )	0.033 w/w %
n-pentadecane	0.218 g/L ( $\pm 0.5\%$ )	0.033 w/w %
n-hexadecane	0.218 g/L ( $\pm 0.5\%$ )	0.033 w/w %

Solvent: hexane

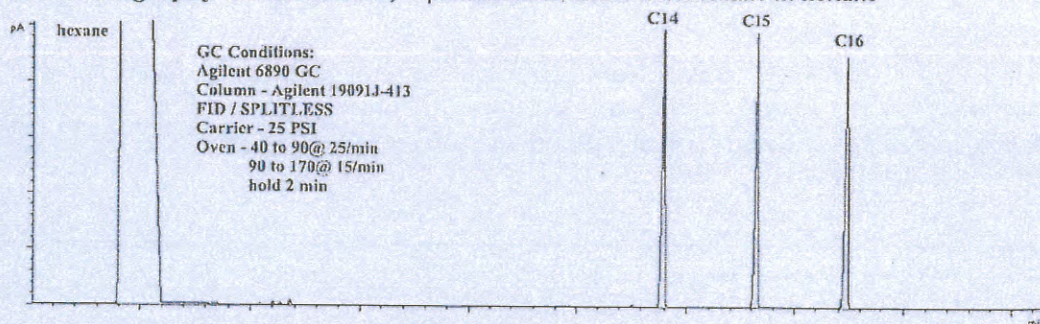
Calibrated Class A glassware and clean bottles were used in the manufacture of this standard. Balances used in the manufacture of this standard are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1 and ISO 9001.

#### Purities:

n-tetradecane	99.6%
n-pentadecane	99%
n-hexadecane	99%
hexane	99%

#### Typical Analytical Spectrum or Chromatography

GC Chromatography – n-tetradecane, n-pentadecane, and n-hexadecane in hexane



Date of release: 30 September 2021

Date of expiration: 31 October 2023

QMS Representative



# *Certificate*

It is hereby certified that

**Suwarot Trikainut**

Has successfully completed the Application Training for

**Basic Gas Chromatography and Sampler**

Training Contents were:

**Hardware Operation, Software Operation, Data analysis and**

**Troubleshooting : Model**

**CP-3800, 3900, 450-GC, 430-GC, 456-GC, 436-GC**

At Thai Unique Co., Ltd, Bangkok, Thailand

On 15<sup>th</sup> March, 2019

A rectangular area where the signature of the Service Manager has been redacted with a grey box. A blue ink mark is visible above the box.

Service Manager

## CERTIFICATE OF QUALIFICATION

Qualification Date : 22 June 2023

Next Due : 21 June 2024

<b>Certificate No.</b>	<b>QUAL2023-13</b>
<b>Customer Name</b>	S.P.S Consulting Service Co.,Ltd.
<b>Address</b>	7 Soi Phaholyothin 24, Phaholyothin Road, Ladyao, Jatujak, Bangkok, 10900
<b>Phone</b>	+66 (0) 2939 4370
<b>Fax</b>	-

### Instrument Identification

<b>Model</b>	<b>Serial No.</b>	<b>Manufacturer</b>
e2695	M13SM7942A	WATERS
Column Heater/Cooler	C14SMC892G	WATERS
2489 UV/Vis Detector	B1487E998A	WATERS

### Operational And Performance Qualification Test Completed

<input checked="" type="checkbox"/> 1. System Precision 250uL	<input checked="" type="checkbox"/> 6. Flow Rate Linearity Accuracy
<input checked="" type="checkbox"/> 2. Wavelength Accuracy	<input checked="" type="checkbox"/> 7. Compositional Precision
<input checked="" type="checkbox"/> 3. Detector Linearity Sensitivity	<input checked="" type="checkbox"/> 8. Noise and Drift
<input checked="" type="checkbox"/> 4. Injector Linearity Accuracy	<input checked="" type="checkbox"/> 9. Signal to Noise
<input checked="" type="checkbox"/> 5. Injector Carryover	<input checked="" type="checkbox"/> 10. Temperature Accuracy

Result Of Qualification: **Passes & Certifies For 1 Year**

Qualified By



Engineer Technical Services

Approved By



AGM, Technical Services

- The document is invalid if without authorize signatures and reference numbers.
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# SITHIPHORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY



451-451/1 Sirinthorn Rd.,Bangbumru, Bangplud Bangkok 10700 THAILAND.  
Tel.0-2435-8800 Fax.0-2433-1679 e-mail:cal-center@sithiphorn.com http://www.sithiphorn.com

NSC-TISI-TIS 17025  
CALIBRATION 0394

Cert. No. : SP23016

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 :** ORGANIC LABORATORY IV  
**Ambient Temperature :** ( 25.0 ± 5 ) °C  
**Relative Humidity :** ( 48.4 ± 25 ) %  
**Received Date :** 30 AUGUST 2023  
**Calibration Date :** 30 AUGUST 2023  
**Date of Issue :** 31 AUGUST 2023

**Calibrated by :**

Nathakorn Pisutpaisan

**Approved by :**

( [Redacted Signature] )

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.



## Continuation of Calibration Certificate

Cert. No. : SP23016

Job No. : VC66SP0014

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-0090-22	08/04/2024

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	361.3	0.05	0.16	2.00
	467.82	468.0	0.18	0.16	2.00
	536.56	536.6	0.04	0.16	2.00
	640.50	640.4	-0.10	0.16	2.00
RM-DL	740.09	740.0	-0.09	0.16	2.00
	864.94	865.0	0.06	0.16	2.00

UUC\* = Unit Under Calibration



Continuation of Calibration Certificate

Cert. No. : SP23016  
Job No. : VC66SP0014  
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	1.0564	0.0047	0.0031	2.00
		29914	0.7	0.7445	0.7460	0.0015	0.0032	2.00
		29381	0.5	0.5416	0.5429	0.0013	0.0032	2.00
	546.1	29360	1.0	0.9821	0.9849	0.0028	0.0030	2.00
		29914	0.7	0.6961	0.6961	0.0000	0.0030	2.00
		29381	0.5	0.5073	0.5073	0.0000	0.0030	2.00
	590.0	29360	1.0	1.0222	1.0244	0.0022	0.0030	2.00
		29914	0.7	0.7237	0.7234	-0.0003	0.0030	2.00
		29381	0.5	0.5361	0.5360	-0.0001	0.0031	2.00
	635.0	29360	1.0	0.9753	0.9775	0.0022	0.0030	2.00
		29914	0.7	0.6910	0.6910	0.0000	0.0030	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	0.2462	0.0040	0.0101	2.00	
		40	0.4866	0.4900	0.0034	0.0115	2.00	
		60	0.7414	0.7390	-0.0024	0.0068	2.00	
		80	0.9858	0.9871	0.0013	0.0093	2.00	
		100	1.2442	1.2480	0.0038	0.0087	2.00	

UUC\* = Unit Under Calibration

**Condition of this result of calibration : Spectrophotometer PERKINELMER Model Lambda 25 S/N 501S141230**

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	
Transimission T(%)	Absorbance(A)
0.0111	3.9564

\*\*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





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

Calibration Report					
Non-Dispersive Infrared CO Analyzer					
Date :	01 November 2023	Brand :	API	Model :	300E
No.	CO-B01			Serial No.	782
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 08 August 2023			Serial No. : 911		
Reference Standard Gas					
Standard Gas : Carbon Monoxide (CO)			Cylinder No. : D196045		
Certified Date : 16 April 2022		Expired Date : 15 April 2024		Cylinder Conc. : 4,570 ppm	
Calibrating Condition					
Pressure : 1011 mmbar		Temp. : 24.5 °C		% RH : 48	
Calibration Setting					
Span	Initial Reading (Before Adj.), PPM			Final Reading (After Adj.), PPM	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	
Zero	0	-0.10	-	0	
CO Span	40.00	39.95	-0.125	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	4015.8	mV	2500-4800 mV		
CO Reference	3947.3	mV	2500-4800 mV		
Measure/Reference Ratio	1.180	-	1.1-1.3 W/Zero Air		
Sample Pressure	28.7	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	68.4	°C	68 ± 2		
Box Temperature	30.9	°C	Ambient Temp + 7 ± 10		
Photo-Drive	3027.1	mV	250 mV to 4750 mV		
Slope	1.017	-	1.0 ± 0.3		
Offset	0.2	-	0 ± 0.3		

Calibrated by : \_\_\_\_\_

Approved by : \_\_\_\_\_

ระดับเสียง



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0413

MTC No. EEL. BP. 109/0366

## 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 :  $(23 \pm 3) ^\circ\text{C}$

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 : 27 Mar. 2023

Date of Calibration : 29 Mar. 2023

1 / 2

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

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0413

MTC No. EEL. BP. 109/0366

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

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

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

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	93.94	-0.06	$\pm 0.10$	$\pm 0.40$ dB

2. Frequency

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

3. Total distortion

Standard Microphone Type	Measured Total distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1.80	$\pm 0.50$	$\pm 3.0\%$

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

[Redacted Signature]

Approved by :

[Redacted Signature]

Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 29 Mar. 2023

Date of Issue : 30 Mar. 2023

Ref : 2011266032701228001

End of Certificate

2 / 2

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

Noise B\_438/23

## 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	29 March 2023
		Due Date	29 March 2024

### Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B18	ACO	6236	00172048	16 November 2023	94.0	94.0
ACO-B29	ACO	6236	00182011	16 November 2023	94.0	94.0
ACO-B33	ACO	6236	00182015	16 November 2023	93.9	94.0
ACO-B36	ACO	6236	00192027	16 November 2023	93.9	94.0
ACO-B41	ACO	6236	00192032	16 November 2023	94.0	94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.94 ± 0.10 dB	

Calibrated by :

Approved by :



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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

Noise B\_446/23

## 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	29 March 2023
		Due Date	29 March 2024

### Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B33	ACO	6236	00182015	16 November 2023	94.0	94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.94 ± 0.10 dB	

Calibrated by :



Approved by :





Request No. 21-66/0639

MTC No. EEL. BP. 40/0866

## 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 Bruel&Kjaer 4180 S/N 2633526.

**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 : 11 Aug. 2023

Date of Calibration : 22 Aug. 2023

1 / 2

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

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E-mail : sumalee@tistr.or.th

Request No. 21-66/0639

MTC No. EEL. BP. 40/0866

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	114.01	0.01	$\pm 0.10$	$\pm 0.75$ 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	0.19	$\pm 0.50$	$\pm 4.0\%$

**Note :** 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

.....  
( )

Approved by :

.....  


**Director**  
**TISTR**

**Electrical and Electronic Standards Laboratory**

**Industrial Metrology and Testing Service Centre**

**Date of Calibration** : 22 Aug. 2023

**Date of Issue** : 24 Aug. 2023

**Ref :** 2011266081103146003

End of Certificate

2 / 2

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

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**Head Office**

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Noise Dose B\_439/23

## Noise Dose Meter Calibration Report

### Acoustic Calibrator Data

Brand	SVANTEK	Number	SV 03/60
Model	SV34	Serial No.	83820
Calibration Range	114 dB, 1000 Hz	Last Calibration	22 August 2023
		Due Date	22 August 2024

### Calibration Data

#### Sound Level Meter Data

#### Calibration Data

SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
NMD-B06	SVANTEK	SV-104IS	80816	16 November 2023	114.0	114.0
NMD-B07	SVANTEK	SV-104IS	80817	16 November 2023	114.0	114.0
NMD-B09	SVANTEK	SV-104IS	80829	16 November 2023	114.0	114.0

Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)

114.01 ± 0.10 dB

Calibrated by :



Approved by :



คุณภาพน้ำ





# 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 : 23E8494  
REFERENCE No : 70413-1

PAGE : 1 OF 3

## Certificate of Calibration

EQUIPMENT : pH METER  
MANUFACTURER : HANNA  
MODEL : HI 3512  
SERIAL No : TH118035  
ID No : pH04/56  
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 : 06-Sep-23

APPROVED BY : 

ISSUED DATE : 06-Sep-23

RECEIVED DATE : 31-Aug-23

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





CERTIFICATE No : 23E8494

PAGE : 2 OF 3

## Calibration Report

EQUIPMENT : pH METER  
MANUFACTURER : HANNA  
ID No : pH04/56  
RECEIVED DATE : 31-Aug-23  
AMBIENT TEMPERATURE : 23 ° C ± 3 ° C

MODEL : HI 3512  
SERIAL NUMBER : TH118035  
CALIBRATION DATE : 06-Sep-23  
RELATIVE HUMIDITY : 50 % RH ± 10% RH

### CONDITION OF THIS RESULTS OF CALIBRATION

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

<u>INSTRUMENT</u>	<u>MODEL</u>	<u>SERIAL No/</u> <u>LOT No</u>	<u>CERTIFICATE No</u>	<u>DUE DATE</u>
1) pH STANDARD SOLUTION	00651-06	CC767907	4880-13836406	29-Dec-24
2) pH STANDARD SOLUTION	00651-08	CC765602	4881-13757019	18-Nov-24
3) pH STANDARD SOLUTION	00651-10	CC767180	4882-13813369	14-Dec-24
4) PROCESS CALIBRATOR	CA150	91S6079	23E1312	19-Apr-24
5) BATH	260014	1247 48074	22T9870	13-Sep-23
6) THERMOMETER WITH PROBE	421504	55000379	22T9904	13-Sep-23

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

### RESULT OF CALIBRATION : ADJUSTMENT

#### 1. DISPLAY UNIT ONLY

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

mV APPLIED	UUC READING (mV)	CORRECTION (mV)	UUC READING (pH)	UNCERTAINTY OF MEASUREMENT (± mV)	COVERAGE FACTOR k
414.11	414.6	-0.49	-0.290	0.15	2.00
354.95	355.4	-0.45	0.741	0.15	2.00
295.80	296.3	-0.50	1.773	0.15	2.00
236.64	237.1	-0.46	2.804	0.15	2.00
177.48	177.9	-0.42	3.835	0.15	2.00
118.32	118.7	-0.38	4.867	0.15	2.00
59.16	59.6	-0.44	5.898	0.15	2.00
0.00	0.4	-0.40	6.930	0.15	2.00
-59.16	-58.8	-0.36	7.961	0.15	2.00
-118.32	-117.9	-0.42	8.992	0.15	2.00
-177.48	-177.1	-0.38	10.024	0.15	2.00
-236.64	-236.3	-0.34	11.055	0.15	2.00
-295.80	-295.5	-0.30	12.087	0.15	2.00
-354.95	-354.6	-0.35	13.118	0.15	2.00
-414.11	-413.8	-0.31	14.149	0.15	2.00

END OF CALIBRATION REPORT PAGE 2 OF 3





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

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

CERTIFICATE No : 23E8494

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
4.006	4.006	0.000	4.015	0.012	2.00
7.000	7.000	0.000	6.914	0.012	2.00
10.008	10.010	-0.002	9.996	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
25.005	25.0	0.005	---	0.0085	2.00

#### 4. PERCENT SLOPE 100%

UUC : UNIT UNDER CALIBRATION

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

END OF CALIBRATION REPORT





CERTIFICATE No : 23M2442

REFERENCE No : 68471-2

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** : 10-Mar-23

**APPROVED BY** : [REDACTED]

**ISSUED DATE** : 16-Mar-23

**RECEIVED DATE** : 10-Mar-23





CERTIFICATE No : 23M2442

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT	:	DIGITAL BALANCE	MODEL	:	BSA224S-CW
MANUFACTURER	:	SARTORIUS	S/N	:	36591843
ID No	:	BA 09/61	RECEIVED DATE	:	10-Mar-23
AIR PRESSURE	:	1010mbar $\pm$ 1mbar	CALIBRATION DATE	:	10-Mar-23
AMBIENT TEMPERATURE	:	23° C $\pm$ 1° C	RELATIVE HUMIDITY	:	49 %RH $\pm$ 10 % RH

### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY ACCORDING TO UKAS LAB 14 EDITION 6:2019 BY USING KNOWN WEIGHT STANDARD WEIGHT. THE BALANCE WAS NOT ADJUSTED BEFORE CALIBRATION. THE BALANCE HAS NO ZERO TRACKING FUNCTION. REPEATABILITY WAS MEASURED BY USING 10 REPEATED MEASUREMENTS. LINEARITY WAS MEASURED COVERING 10 POINTS, EVENLY SPREAD OVER THE RANGE. THE INSTRUMENT WAS SET ZERO BEFORE PERFORMING THE LINEARITY TEST. OFF-CENTER LOADING WAS MEASURED BY USING STANDARD WEIGHTS PLACED ON THE PAN AND MOVED TO VARIOUS POSITIONS ON THE PAN.

### 2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) STANDARD WEIGHT SET	E2	QK-I-151	M2302013S	02-Feb-25
2) STANDARD WEIGHT	E2	15843	M2302014S	02-Feb-25

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

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

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH CENTRAL BUREAU OF WEIGHTS&MEASURES

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

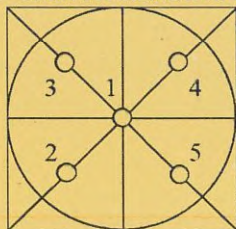
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY ( $\pm$ g)
0.0	0.0000	0.0000	0.000058
0.1	0.1000	0.0000	0.000059
0.2	0.2000	0.0000	0.000059
0.5	0.5000	0.0000	0.000060
1.0	1.0000	0.0000	0.000060
2.0	2.0000	0.0000	0.000061
5.0	5.0000	0.0000	0.000063
10.0	10.0000	0.0000	0.000067
20.0	20.0001	-0.0001	0.000073
50.0	50.0000	0.0000	0.00011
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	99.9999
3	99.9998
4	100.0001
5	100.0000
OFF-CENTER LOADING	0.0002

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





# QUALITY CALIBRATION CO.,LTD.

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

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

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

CERTIFICATE No : 22T10972

REFERENCE No : 66837-1

PAGE : 1 OF 3

## Certificate of Calibration

**EQUIPMENT** : COD REACTOR

**MANUFACTURER** : HACH

**MODEL** : DRB 200

**SERIAL No** : 15110C0497

**ID No** : DRB 04/59

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

**CALIBRATED BY** : CHAICHARN CH.

**CALIBRATION DATE** : 20-Dec-22

**APPROVED BY** : 

**ISSUED DATE** : 20-Dec-22

**RECEIVED DATE** : 20-Dec-22

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

F-G010 REV : 02





CERTIFICATE No : 22T10972

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : COD REACTOR  
MANUFACTURER : HACH  
ID NUMBER : DRB 04/59  
RECEIVED DATE : 20-Dec-22  
AMBIENT TEMPERATURE : 23° C ± 1° C

MODEL : DRB 200  
SERIAL NUMBER : 15110C0497  
CALIBRATION DATE : 20-Dec-22  
RELATIVE HUMIDITY : 52 %RH ± 10 % RH

### CONDITION OF THIS RESULTS OF CALIBRATION

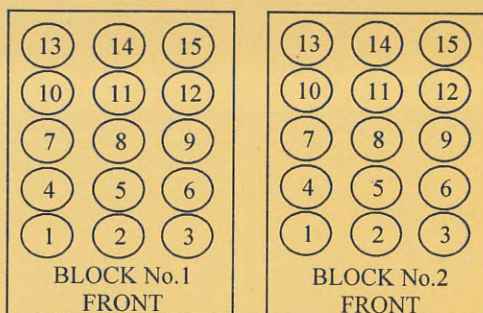
1. THIS INSTRUMENT WAS CALIBRATED BY DIRECT MEASUREMENT TEMPERATURE RECORDER WITH THERMOCOUPLE TYPE K UNDER NO LOAD CONDITION. THE THERMOCOUPLES WERE PLACED ON 15 POINTS AND LOCATED ONE THERMOCOUPLE IN EACH OF THE FOUR CORNERS OF THE REACTOR AND PLACED THE EIGHTH THERMOCOUPLE AT THE CENTER OF THE REACTOR.

### 2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) DATA LOGGER WITH TC TYPE K	HYDRA 2635A	8009008	22T7511	10-Jul-23

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.  
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.  
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-  
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO.,LTD.

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



### TEMPERATURE MEASUREMENT ACCURACY TEST

Block No.	1	2
Controller temperature (°C)	145	145
Indicating Temperature	145	145
Measured Temperature (°C) at Spread Locations	1	149.8
	2	149.6
	3	149.7
	4	149.8
	5	149.9
	6	149.8
	7	149.8
	8	149.8
	9	149.9
	10	149.8
	11	149.9
	12	149.7
	13	149.9
	14	149.9
	15	149.7
Uncertainty of Measurement(± °C)	0.86	0.86

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

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

END OF CALIBRATION REPORT



CERT.No.: HS-U017D

Calibration Date : 3 Apr 23  
Submitted by : S.P.S CONSULTING SERVICE CO.,LTD  
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol,  
Chatuchak, Bangkok, Thailand 10900

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. E00522  
Barometric ref : S/N. E00522  
Water Temp ref : S/N. 11431  
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.



(Kittipong Maekwong)



(Natenapha Pisatkunchon)



# Certificate of System Qualification

GC-OQ + GCMS-OQ

System ID: GC\_MS\_03\_52\_CN10925102  
Organization Name: S.P.S Consulting service  
Organization Location: 7 Soi Phaholyothin Road, Ladyao, Khet Jatujak, Bangkok 10900

Date: March 31, 2023 1:21:52 PM  
EQP Name: AgilentRecommended , AgilentRecommended  
EQP Revision: GC.02.50, GCMS.02.50  
Overall Qualification Status: Pass

## System Inspection and Basic Safety and Operation

Name: 7890

Setpoint Status: Pass

## Overall System Inspection and Basic Safety and Operation Test Status

Pass

## Inlet Pressure Decay

Name: 7890

Front

SSL

Setpoint Status: Pass

Pressure: 25.0 psi

Pressure Change: -0.1 psi /5 minutes

Agilent Recommended:  $\geq -2.0$  and  $\leq 0.5$ 

## Overall Inlet Pressure Decay Test Status

Pass

## Inlet Pressure Accuracy

Name: 7890

Front

SSL

Date: March 31, 2023 1:21:52 PM  
System ID: GC\_MS\_03\_52\_CN10925102

## Setpoint Status:

Pass

	Setpoint		Actual	
Inlet Pressure:	25.0	psi	25.0	psi
Accuracy:			0.0	psi
Agilent Recommended:			<= 1.2	

## Overall Inlet Pressure Accuracy Test Status

Pass

## Inlet Pressure Accuracy

Name:

7890

Back

SSL

## Setpoint Status:

Pass

	Setpoint		Actual	
Inlet Pressure:	25.0	psi	25.2	psi
Accuracy:			0.2	psi
Agilent Recommended:			<= 1.2	

## Overall Inlet Pressure Accuracy Test Status

Pass

## Detector Flow Accuracy

Name:

7890

Front

FID

## Setpoint Status:

Pass

Flow Type:

Fuel

Setpoint:

30.0

mL/min

Measured Flow:

30.3

mL/min

Accuracy:

0.3

mL/min

Agilent Recommended:

&lt;=

10.0

% setpoint

(

3.0

mL/min

)

Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Date:

March 31, 2023 1:21:52 PM

System ID:

GC\_MS\_03\_52\_CN10925102



## Setpoint Status:

Pass

Flow Type:

Oxidizer

Setpoint:

400.0 mL/min

Measured Flow:

396.2 mL/min

Accuracy:

3.8 mL/min

Agilent Recommended:

&lt;= 10.0 % setpoint ( 40.0 ml/min )

Limit is percentage of setpoint or 0.5 ml/minute, whichever is largest.

## Setpoint Status:

Pass

Flow Type:

Makeup

Setpoint:

25.0 mL/min

Measured Flow:

25.1 mL/min

Accuracy:

0.1 mL/min

Agilent Recommended:

&lt;= 10.0 % setpoint ( 2.5 ml/min )

Limit is percentage of setpoint or 0.5 ml/minute, whichever is largest.

## Overall Detector Flow Accuracy Test Status

Pass

## GC Oven Temperature Accuracy

Name:

7890

Setpoint Status:

Pass

Zone:

Oven

Setpoint/Actual

Temperature:

230.0 230.6 °C

Accuracy:

0.6 °C

Agilent Recommended:

>= -1.0 % setpoint in K ( -5.0 °C )  
<= 1.0 % setpoint in K ( 5.0 °C )

## Setpoint Status:

Pass

Zone:

Oven

Setpoint/Actual

Temperature:

100.0 100.4 °C

Accuracy:

0.4 °C

Agilent Recommended:

&gt;= -1.0 % setpoint in K

( -3.7 °C )

&lt;= 1.0 % setpoint in K

( 3.7 °C )

## Overall GC Oven Temperature Accuracy Test Status

Pass

## GC Oven Temperature Stability

Name:

7890

Setpoint Status:

Pass

Setpoint/Average

Temperature:

100.0 100.3833 °C

Stability:

0.1 °C

Agilent Recommended:

&lt;= 0.5

## Overall GC Oven Temperature Stability Test Status

Pass

## Scouting Run

Tested Combination1

Front

SSL

/ Front

FID

Manual Injection

Name:

Not applicable

Setpoint Status:

Completed

Injection Volume on Column:

1.0 µL

## Overall Scouting Run Status

Completed

## Noise and Drift

Tested Combination1

Front

SSL

/ Front

FID

Date:

March 31, 2023 1:21:52 PM

System ID:

GC\_MS\_03\_52\_CN10925102



Name: 7890

Setpoint Status: Pass

Base Signal: 89800 Ab

ASTM Noise

counts

285.31

Drift

counts/Hr

96.04

Agilent Recommended:

&lt;= 768.00

&lt;= 19200.00

Status:

Pass

Pass

## Overall Noise and Drift Test Status

Pass

## Signal to Noise

Tested Combination1

Front

SSL

/ Front

FID

Manual Injection

Name: 7890

Setpoint Status: Pass

Signal to Noise: 3814254

Agilent Recommended: &gt;= 300000

## Overall Signal to Noise Test Status

Pass

## Log Amp

Tested Combination2

Back

SSL

/ External

SQ

Name: 5975C

Setpoint Status: Pass

## Overall Log Amp Test Status

Pass

## RFPA

Date: March 31, 2023 1:21:52 PM  
System ID: GC\_MS\_03\_52\_CN10925102

Tested Combination2	Back	SSL	/ External	SQ
Name:	5975C			
Setpoint Status:	Pass			
Amu:	1050	m/z	Drift After Five Minutes:	RFP Voltage:
			1 mV	479 mV
Agilent Recommended:	>= -100	and	<= 100	<= 1100

**Overall RFP Test Status**

Pass

**Tune EI**

Tested Combination2	Back	SSL	/ External	SQ
Name:	5975C			
Setpoint Status:	Pass			
Filament:	1			
Setpoint Status:	Pass			
Filament:	2			

**Overall Tune EI Test Status**

Pass

**Signal to Noise EI**

Tested Combination2	Back	SSL	/ External	SQ
Name:	5975C			
Source:	EI - Inert	Filament:	1	
Setpoint Status:	Pass			
Signal to Noise:	425			
Agilent Recommended:	>= 160			

Date: March 31, 2023 1:21:52 PM  
System ID: GC\_MS\_03\_52\_CN10925102



Source:

El - Inert

Filament:

2

Setpoint Status:

Pass

Signal to Noise:

566

Agilent Recommended:

$\geq$  160

Overall Signal to Noise EI Test Status

Pass

## Instrument Details

### Purpose

This section describes the as found system configuration.

### Details

#### System

System ID	GC_MS_03_52_CN10925102
Manufacturer	Agilent Technologies
Name	7890

#### Tested Combination1

Injection Technique	Manual Injection
Sampler Identifier	Sampler 1
Inlet	Front
Detector	Front
LTM Included?	No

#### Tested Combination2

Injection Technique	Manual Injection
Sampler Identifier	Sampler 2
Inlet	Back
Detector	External
LTM Included?	No

#### Sampler 1

Manufacturer	Agilent Technologies
Type	Manual Injection
Usage	Sample Injection
Syringe Volume (µL)	10

#### Sampler 2

Manufacturer	Agilent Technologies
Type	Manual Injection
Usage	Sample Injection
Syringe Volume (µL)	10



## Mainframe 1

Manufacturer	Agilent Technologies
Name	7890
Model Number	G3440A
Serial Number	CN10925120
Firmware Revision	A.01.10.3
Oven Type	Standard

## Inlet 1

Manufacturer	Agilent Technologies
Name	7890
Type	SSL
Location	Front
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes

## Inlet 2

Manufacturer	Agilent Technologies
Name	7890
Type	SSL
Location	Back
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes

## Detector 1

Manufacturer	Agilent Technologies
Name	7890
Type	FID
Adapter	Capillary
Control Type	Electronic Pressure Control (EPC)
Location	Front
Makeup Gas	Nitrogen

## Detector 2

Manufacturer	Agilent Technologies
Name	Mass Spectrometer
Type	Mass Spectrometer
Location	External

## Mass Spectrometer 1

Manufacturer	Agilent Technologies
Type	SQ
Name	5975C
Serial Number	US91732743
Firmware Revision	5975 5.02.07
High Vacuum System	Turbo Pump
Scouting Run Standard	OFN Std

## MS EI Source 1

Manufacturer	Agilent Technologies
Source Type	EI - Inert
Number of filaments	2



## Electronic Signature

### Purpose

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### Details

Full Name of Signer:	Saenguthai Tarak
Logged On User Name:	saenguthai.tarak@non.agilent.com
Signature Creation Date:	March 31, 2023
Reason for Signature:	Executed protocol and published this original version of document

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This document provides a protocol to verify and record instrument configuration and evidence of proper operation. It has been prepared from our interpretation of applicable regulations as well as industry best practices. The document is designed to provide an important component of a complete compliance package. Validation depends upon many factors and use of this protocol alone does not assure compliance. Agilent Technologies makes no promises or representations as to its sufficiency for any specific regulatory program.

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Date:	March 31, 2023 1:21:52 PM
System ID:	GC_MS_03_52_CN10925102

User Name: saenguthai.tarak  
 Hostname: LAPTOP-CQ39KOMV

System Id: GC\_MS\_03\_52\_CN10925102  
 Print Date: March 31, 2023 1:21:53 PM

## GC\_MS\_03\_52\_CN10925102 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
March 31, 2023 9:12:26 AM Audit		SessionCreated	Session	None
March 31, 2023 9:12:26 AM Start		Configuration	Session	None
March 31, 2023 9:12:26 AM Audit		Entitlement	Licensing	User is Nonpaying and does not require an unlock code
March 31, 2023 9:20:14 AM Audit		EqpLoaded	Session	EQP details for primary technique [Gc] - File path: [ProtocolPacks/Gc/Configurations/02.50/Gc.02.50.eqp], EQP File Name: [Gc.02.50.eqp], EQP Name: [AgilentRecommended], Protocol Revision :[Gc.02.50] EQP details for hyphenated technique [GcMs] - File path: [ProtocolPacks/GcMs/Configurations/02.50/GcMs.02.50.eqp], EQP File Name: [GcMs.02.50.eqp], EQP Name: [AgilentRecommended]
March 31, 2023 9:20:17 AM End		Configuration	Session	None
March 31, 2023 9:20:27 AM Start		Qualification	Session	OQ
March 31, 2023 9:20:27 AM Start		Execution	System Inspection and Basic Safety and Operation - 7890; - Qualitative Test - No setpoints associated	None
March 31, 2023 9:21:33 AM End		Execution	System Inspection and Basic Safety and Operation - 7890; - Qualitative Test - No setpoints associated	Run Count : 1



User Name: saenguthai.tarak  
 Hostname: LAPTOP-CQ3SKOMV

System Id: GC\_MS\_03\_52\_CN10925102  
 Print Date: March 31, 2023 1:21:53 PM

## GC\_MS\_03\_52\_CN10925102 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
March 31, 2023 9:21:35 AM	Start	Execution	Inlet Pressure Decay - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	None
March 31, 2023 9:21:51 AM	End	Execution	Inlet Pressure Decay - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	Run Count : 1
March 31, 2023 9:21:54 AM	Start	Execution	Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
March 31, 2023 9:21:59 AM	End	Execution	Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count : 1
March 31, 2023 9:22:02 AM	Start	Execution	Inlet Pressure Accuracy - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
March 31, 2023 9:22:07 AM	End	Execution	Inlet Pressure Accuracy - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count : 1
March 31, 2023 9:22:09 AM	Start	Execution	Detector Flow Accuracy - Front FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	None
March 31, 2023 9:22:29 AM	End	Execution	Detector Flow Accuracy - Front FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
March 31, 2023 9:22:30 AM	Start	Execution	Detector Flow Accuracy - Front FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	None
March 31, 2023 9:22:41 AM	End	Execution	Detector Flow Accuracy - Front FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Run Count : 1

User Name: saenguthai.tarak  
 Hostname: LAPTOP-CQ3SKOMV

System Id: GC\_MS\_03\_52\_CN10925102  
 Print Date: March 31, 2023 1:21:53 PM

## GC\_MS\_03\_52\_CN10925102 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
March 31, 2023 9:22:42 AM	Start	Execution	Detector Flow Accuracy - Front FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	None
March 31, 2023 9:22:48 AM	End	Execution	Detector Flow Accuracy - Front FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
March 31, 2023 9:22:49 AM	Start	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
March 31, 2023 9:23:31 AM	Audit	Data	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
March 31, 2023 9:23:34 AM	End	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1
March 31, 2023 9:23:37 AM	Start	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
March 31, 2023 9:26:00 AM	Audit	Data	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
March 31, 2023 9:26:03 AM	End	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1
March 31, 2023 9:26:05 AM	Start	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	None

User Name: saenguthai.tarak  
 Hostname: LAPTOP-CQ3SKQMV

System Id: GC\_MS\_03\_52\_CN10925102  
 Print Date: March 31, 2023 1:21:53 PM

## GC\_MS\_03\_52\_CN10925102 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
March 31, 2023 9:26:42 AM	Start	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	None
March 31, 2023 9:27:39 AM	Audit	Data	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Manual Data Entry
March 31, 2023 9:27:46 AM	End	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Run Count : 1
March 31, 2023 9:27:51 AM	Start	Execution	GC Scouting Run - Manual Injection, Front SSL, Front FID: - Part of System Preparation - No limits associated	None
March 31, 2023 9:54:35 AM	Start	Execution	Log Amp - 5975C SQ: - Source: EI EI - Inert	None
March 31, 2023 9:55:59 AM	Start	Execution	RFPA - 5975C SQ: - Source: EI - Inert	None
March 31, 2023 10:23:19 AM	Start	Execution	Signal to Noise EI - Liquid Injection, Back SSL, SQ: - Source: EI - Inert using Filament 1 - L: >= 160	None
March 31, 2023 10:37:53 AM	Start	Execution	Tune EI - 5975C SQ: - Source: - EI - Inert Filament 1 (Qualitative - No setpoints associated)	None
March 31, 2023 10:38:04 AM	Start	Execution	Tune EI - 5975C SQ: - Source: - EI - Inert Filament 2 (Qualitative - No setpoints associated)	None
March 31, 2023 10:38:11 AM	Start	Execution	Tune EI - 5975C SQ: - Source: - EI - Inert Filament 1 (Qualitative - No setpoints associated)	None



User Name: saenguthai.tarak  
 Hostname: LAPTOP-CQ3SKOMV

System Id: GC\_MS\_03\_52\_CN10925102  
 Print Date: March 31, 2023 1:21:53 PM

## GC\_MS\_03\_52\_CN10925102 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
March 31, 2023 10:38:14 AM	Start	Execution	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	None
March 31, 2023 10:38:17 AM	Start	Execution	GC Scouting Run - Manual Injection, Front SSL, Front FID: - Part of System Preparation - No limits associated	None
March 31, 2023 10:45:28 AM	Audit	Data	GC Scouting Run - Manual Injection, Front SSL, Front FID: - Part of System Preparation - No limits associated	Data files Path : F:\Data\SC_FID.D\FID1A.ch
March 31, 2023 10:47:01 AM	End	Execution	GC Scouting Run - Manual Injection, Front SSL, Front FID: - Part of System Preparation - No limits associated	Run Count : 1
March 31, 2023 10:58:27 AM	Start	Execution	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	None
March 31, 2023 10:58:52 AM	Audit	Data	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Data files Path : F:\Data\ND_FID.D\FID1A.ch
March 31, 2023 11:00:53 AM	End	Execution	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Run Count : 1
March 31, 2023 11:02:02 AM	Start	Execution	Signal to Noise - Manual Injection, Front SSL, Front FID: - Detector FID - L: >= 300000	None
March 31, 2023 11:14:32 AM	Audit	AccClosed	Session	None

User Name: saenguthai.tarak  
 Hostname: LAPTOP-CQ3SKOMV

System Id: GC\_MS\_03\_52\_CN10925102  
 Print Date: March 31, 2023 1:21:53 PM

## GC\_MS\_03\_52\_CN10925102 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
March 31, 2023 11:15:13 AM	Audit	AceRestarted	Session	None
March 31, 2023 11:15:14 AM	Audit	SessionReloaded	Session	None
March 31, 2023 11:15:19 AM	Start	Qualification	Session	OQ
March 31, 2023 11:15:19 AM	Start	Execution	Signal to Noise - Manual Injection, Front SSL, Front FID: - Detector FID - L: >= 300000	None
March 31, 2023 11:16:23 AM	Audit	AceClosed	Session	None
March 31, 2023 11:21:04 AM	Audit	AceRestarted	Session	None
March 31, 2023 11:21:04 AM	Audit	SessionReloaded	Session	None
March 31, 2023 11:21:09 AM	Start	Qualification	Session	OQ
March 31, 2023 11:21:09 AM	Start	Execution	Signal to Noise - Manual Injection, Front SSL, Front FID: - Detector FID - L: >= 300000	None
March 31, 2023 11:22:15 AM	Audit	Data	Signal to Noise - Manual Injection, Front SSL, Front FID: - Detector FID - L: >= 300000	Data files Path : F:\ASN_FID.D\FID1A.ch
March 31, 2023 11:24:02 AM	End	Execution	Signal to Noise - Manual Injection, Front SSL, Front FID: - Detector FID - L: >= 300000	Run Count : 1
March 31, 2023 11:24:17 AM	Start	Execution	Log Amp - 5975C SQ: - Source: EI - Inert	None
March 31, 2023 11:24:31 AM	End	Execution	Log Amp - 5975C SQ: - Source: EI - Inert	Run Count : 1

User Name: saenguthai.tarak  
 Hostname: LAPTOP-CQ3SKOMV

System Id: GC\_MS\_03\_52\_CN10925102  
 Print Date: March 31, 2023 1:21:53 PM

## GC\_MS\_03\_52\_CN10925102 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
March 31, 2023 11:24:33 AM	Start	Execution	RFPA - 5975C SQ: - Source: EI None - Inert	
March 31, 2023 11:27:22 AM	End	Execution	RFPA - 5975C SQ: - Source: EI Run Count : 1 - Inert	
March 31, 2023 11:27:25 AM	Start	Execution	Tune EI - 5975C SQ: - Source: - None EI - Inert Filament 1 (Qualitative - No setpoints associated)	
March 31, 2023 11:28:04 AM	End	Execution	Tune EI - 5975C SQ: - Source: - Run Count : 1 EI - Inert Filament 1 (Qualitative - No setpoints associated)	
March 31, 2023 11:28:06 AM	Start	Execution	Tune EI - 5975C SQ: - Source: - None EI - Inert Filament 2 (Qualitative - No setpoints associated)	
March 31, 2023 11:28:26 AM	End	Execution	Tune EI - 5975C SQ: - Source: - Run Count : 1 EI - Inert Filament 2 (Qualitative - No setpoints associated)	
March 31, 2023 11:28:28 AM	Start	Execution	Signal to Noise EI - Liquid Injection, Back SSL, SQ: - Source: EI - Inert using Filament 1 - L: >= 160	None
March 31, 2023 12:59:45 PM	Start	Execution	Signal to Noise EI - Liquid Injection, Back SSL, SQ: - Source: EI - Inert using Filament 1 - L: >= 160	None
March 31, 2023 1:00:09 PM	Audit	Data	Signal to Noise EI - Liquid Injection, Back SSL, SQ: - Source: EI - Inert using Filament 1 - L: >= 160	Data files Path : F:\SN_F1_01.D\DATASIM.MS
March 31, 2023 1:00:41 PM	End	Execution	Signal to Noise EI - Liquid Injection, Back SSL, SQ: - Source: EI - Inert using Filament 1 - L: >= 160	Run Count : 1



User Name: saenguthai.tarak  
Hostname: LAPTOP-CQ3SKOMV

System Id: GC\_MS\_03\_52\_CN10925102  
Print Date: March 31, 2023 1:21:53 PM

## GC\_MS\_03\_52\_CN10925120 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
March 31, 2023 1:00:43 PM	Start	Execution	Signal to Noise EI - Liquid Injection, Back SSL, SQ: - Source: EI - Inert using Filament 2 - L: >= 160	None
March 31, 2023 1:01:52 PM	Audit	Data	Signal to Noise EI - Liquid Injection, Back SSL, SQ: - Source: EI - Inert using Filament 2 - L: >= 160	Data files Path : F:\SN_F2_01.D\DATASIM.MS
March 31, 2023 1:02:09 PM	End	Execution	Signal to Noise EI - Liquid Injection, Back SSL, SQ: - Source: EI - Inert using Filament 2 - L: >= 160	Run Count : 1
March 31, 2023 1:02:13 PM	End	Qualification	Session	OQ
March 31, 2023 1:02:13 PM	Start	Reporting	Session	None
March 31, 2023 1:20:27 PM	Audit	Reporting	Session	Report Generated : Certificate



## GAS CHROMATOGRAPH TEST CERTIFICATION

Certificate No. : SV0823/21044

Instrument Type : GC

Model : CP-3800

Serial Number : 00734

Organization : S.P.S. Consulting Service Co., Ltd.

Address : 7 Phahonyothin Soi 24 Phahonyothin Rd. Ladyao Chatuchak Bangkok 10900

Date : 09/08/2023

### ELECTRONIC TEST

CPU	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
LCD TEST	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
VENT TEST	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
KEY ECHO TEST	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
DESTRUCTION RAM TEST	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

### RUN CHROMATOGRAM TEST

DETECTOR : Flame Ionization Detector ( FID Channel Front)

INJECTOR : Capillary Injector Model 1079

#### GC CONDITION:

Column	80 °C hold 1 min., rate 20 °C/min. to 200 °C hold 1min.
Injector	220 °C
Detector	300 °C
Column flow	5 mL/min
Makeup flow	25 mL/min
Air flow	300 mL/min
Hydrogen flow	30 mL/min

Column: Capillary Column CP sil 5 CB 0.25 ID x 15 M

Sample: 1 µL Injection FID Test Sample 0.218 g/L C14, C15, C16 in hexane

SENSITIVITY TEST: C15. ( Area count ) = 362,972 Counts.





## Detector Sensitivity ( FID )

Detector Response	Result	Specification
Baseline Noise ( $\mu$ V)	1.47	$\leq 50$
Baseline Drift (%)	0.09	$\leq 1$
Sensitivity ( S/N for C15)	19,600	$\geq 1,024$

## Temperature Specification

Temperature	Set	Result	Specification
Column Oven ( $^{\circ}$ C)	80	80	$\pm 5$
Injector ( $^{\circ}$ C)	220	220	$\pm 5$
Detector ( $^{\circ}$ C)	300	300	$\pm 5$
Incubator ( $^{\circ}$ C)	60	N/A	$\pm 5$

## Relative Standard Deviation % ( % RSD)

Checkout Procedure	Result	Specification
Area C15 ( %)	1.52	$\leq 5$
Retention Time C15( %)	0.01	$\leq 0.5$

APPROVAL :

Signature: 

Engineer : Suwarot Trikainut

Date : 09/08/2023







บริษัท ไทยยูนิค จำกัด

THAI UNIQUE CO., LTD.

80-82 ถนนประชาธิปไตย แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200

80-82 Prachathipatai Rd., Bangkhunphrom, Pranakorn, Bangkok 10200

Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thawatt@thaiunique.com, Website : www.thaiunique.com

### Results Integrated System Testing

Checkout Procedure	FID
Detector Position	Front
Inlet Type	1079 Injector
C15 Area 1	357,863
C15 Area 2	357,824
C15 Area 3	367,724
C15 Area 4	361,724
C15 Area 5	369,724
C15 Area Average	362,972
* % RSD ( < 5 % )	1.52

\* The precision specification should be less than 2.0 % RSD \*\* ( Relative Standard Deviation ) for an Auto sampler injection and less than 5 % for Manual injections. To calculate the %RSD, select the C15 peak area for each of the five ( 5 ) samples.

\*\* (Relative Standard Deviation is determined by dividing the standard deviation by the average and multiplying by 100.)

$$\% \text{ RSD} = ( \text{std.dev} / \text{avg} ) * 100$$

Compliance	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail
Performance by		
Date	09/08/2023	



Comments			
Reviewed by		Date	09/08/2023



VARIAN



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80-82 Prachathipatai Rd., Bangkhunphrom, Pranakorn, Bangkok 10200

Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thawatt@thaiunique.com, Website : www.thaiunique.com

### Results Integrated System Testing

Checkout Procedure	FID
Detector Position	Front
Inlet Type	1079 Injector
C15 RT 1	4.125
C15 RT 2	4.125
C15 RT 3	4.125
C15 RT 4	4.124
C15 RT 5	4.124
C15 RT Average	4.122
* % RSD ( < 0.5 % )	0.01

\* The precision specification should be less than 0.5 % RSD \*\* ( Relative Standard Deviation ) for an Auto sampler injection and less than 0.5 % for Manual injections. To calculate the %RSD, select the RT C15 peak for each of the five ( 5 ) samples.

\*\* (Relative Standard Deviation is determined by dividing the standard deviation by the average and multiplying by 100.)

$$\% \text{ RSD} = ( \text{std.dev} / \text{avg} ) * 100$$

Compliance	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail
Performance by		
Date	09/08/2023	



Comments			
Reviewed by		Date	09/08/2023



VARIAN

Injection Date: 9/8/2566 13:13      Calculation Date: 9/8/2566 13:34

```
Detector Type: 3800 (10 Volts)
Bus Address   : 44
Sample Rate   : 10.00 Hz
Run Time      : 21.208 min
```

Chart Speed = 1.03 cm/min      Attenuation = 1      Zero Offset = 3%  
Start Time = 0.000 min      End Time = 21.208 min      Min / Tick = 1.00



Title :  
Run File : d:\c       gc\c      .N      \drive-d\2017\2023\08\blk2023.run  
Method File : C:\star\data\TU\cal2023\baseline FID.mth  
Sample ID : Blk2023

Injection Date: 9/8/2566 13:13      Calculation Date: 9/8/2566 13:34

Operator : watsamon      Detector Type: 3800 (10 Volts)  
Workstation: GC-LAB      Bus Address : 44  
Instrument :      Sample Rate : 10.00 Hz  
Channel : Front = FID      Run Time : 21.208 min

\*\* GC Workstation Version 6.41 \*\* 03334-6390-826-0764 \*\*

Run Mode : Blank Baseline  
Peak Measurement: Peak Area  
Calculation Type: External Standard

Peak No.	Peak Name	Result ( )	Ret. Time (min)	Time Offset (min)	Area (counts)	Sep. Code	Width 1/2 (sec)	Status Codes
-----	-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	=====	-----	=====	=====	-----	-----	-----
	Totals:	0.0000		0.000	0			

Total Unidentified Counts :      0 counts

Detected Peaks: 0      Rejected Peaks: 0      Identified Peaks: 0

Multiplier: 1      Divisor: 1      Unidentified Peak Factor: 0

Baseline Offset: -14 microVolts      LSB: 1 microVolts

Noise (used): 19 microVolts - monitored before this run

Manual injection

\*\*\*\*\*

Print Date: Wed Aug 09 11:38:05 2023

Title : c:\star\data\tu\cal2023\fid\calfid2023003.run  
Run File : d:\method-gc\star c\star\method\cp-wax\without glasswool\calfid2023003-front.mth  
Method File : Manual Sample  
Sample ID : Manual Sample

Injection Date: 9/8/2566 10:31 Calculation Date: 9/8/2566 10:40

Operator : watsamon  
Workstation: Local Disk  
Instrument : Front = FID  
Channel : Detector Type: 3800 (10 Volts)  
Bus Address : 44  
Sample Rate : 10.00 Hz  
Run Time : 7.993 min

\*\* GC Workstation Version 6.41 \*\* 03334-6390-826-0764 \*\*

Run Mode : Analysis  
Peak Measurement: Peak Area  
Calculation Type: External Standard

Peak No.	Peak Name	Result ( )	Ret. Time (min)	Time Offset (min)	Area (counts)	Sep. Code	Width 1/2 (sec)	Status Codes
1	C14	33.8385	3.520	-0.003	362495	BB	2.2	C
2	C15	33.4804	4.125	-0.006	357824	BB	2.3	C
3	C16	32.6143	4.699	-0.001	344951	BB	2.2	
Totals:					1065270			

Status Codes:

C - Out of calibration range

Total Unidentified Counts : 0 counts

Detected Peaks: 3 Rejected Peaks: 0 Identified Peaks: 3

Multiplier: 1 Divisor: 1 Unidentified Peak Factor: 0

Baseline Offset: 28 microVolts LSB: 1 microVolts

Noise (used): 26 microVolts - monitored before this run

Manual injection

Calib. out of range; No Recovery Action Specified

\*\*\*\*\*

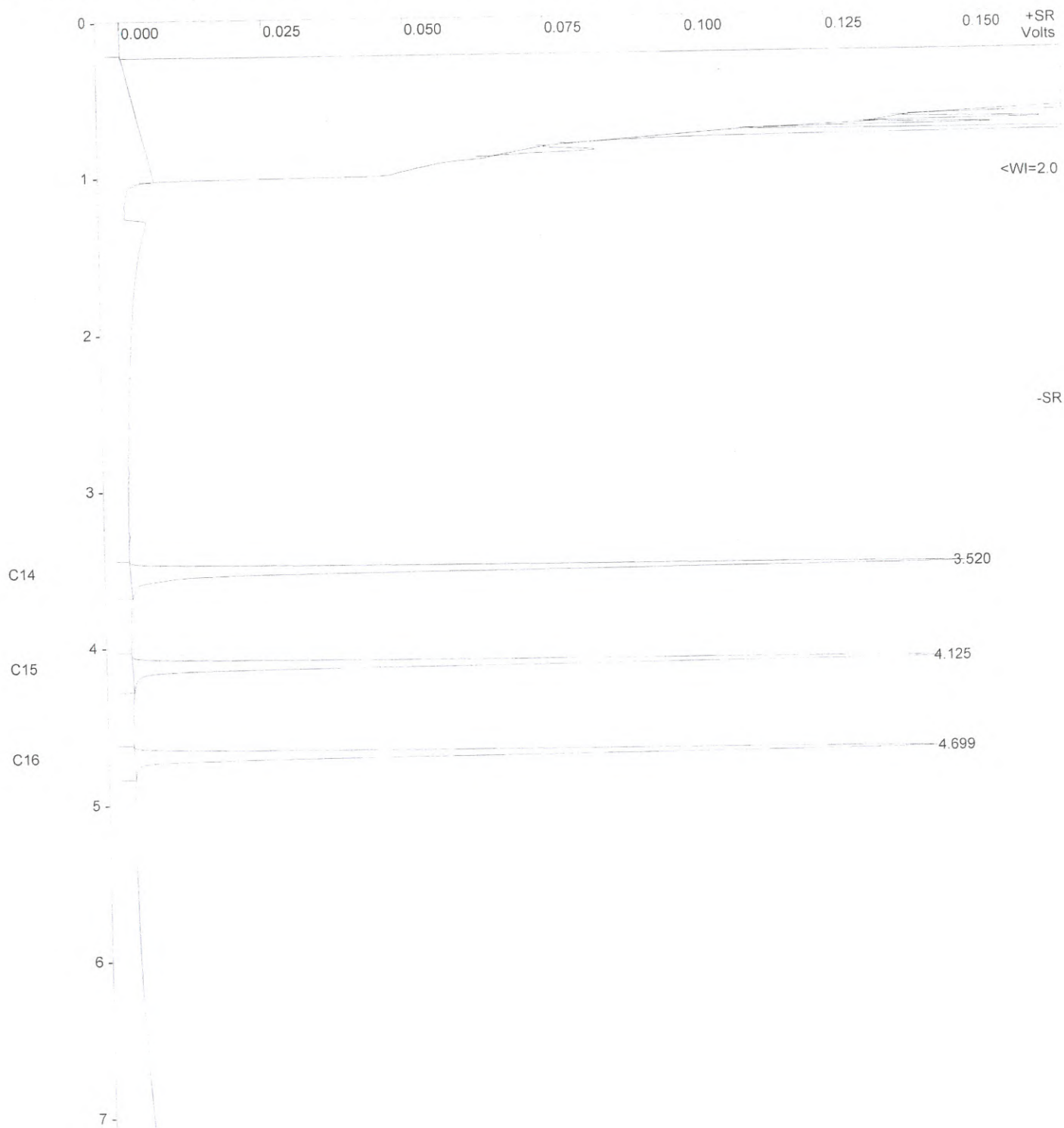
Title :  
Run File : c:\star\data\tu\cal2023\fid\calfid2023003.run  
Method File : d:\method-gc\star c\star\method\cp-wax\without glasswool\calfid2023003-front.mth  
Sample ID : Manual Sample

Injection Date: 9/8/2566 10:31      Calculation Date: 9/8/2566 10:40

Operator : watsamon      Detector Type: 3800 (10 Volts)  
Workstation: Local Disk      Bus Address : 44  
Instrument :      Sample Rate : 10.00 Hz  
Channel : Front = FID      Run Time : 7.993 min

\*\* GC Workstation Version 6.41 \*\* 03334-6390-826-0764 \*\*

Chart Speed = 2.73 cm/min      Attenuation = 70      Zero Offset = 2%  
Start Time = 0.000 min      End Time = 7.993 min      Min / Tick = 1.00





Sample ID: **fid std**

Operator (Inj): Suwarot

Injection Date: 09/08/2023

Calc Date: 09/08/2023

Run Time (min): 7.993

Workstation: Local Disk

Instrument (Inj):



**VARIAN**

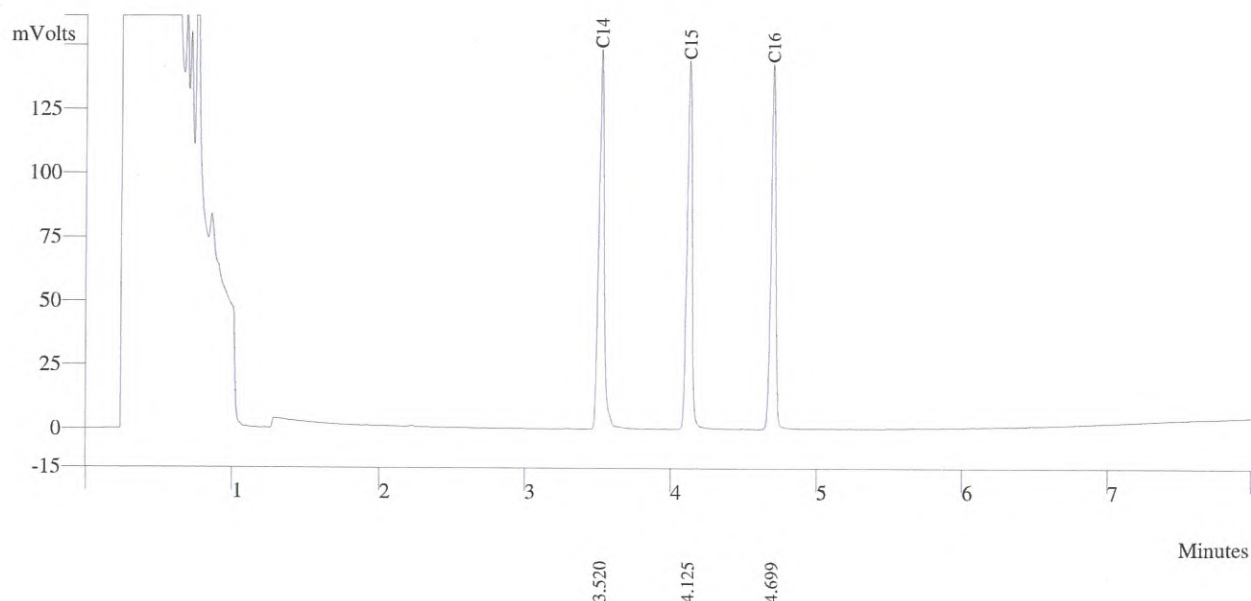
Run Mode: Analysis

Peak Measurement: Peak Area

Calculation Type: External Std.

c:\star\data\tu\cal2023\fid\calfid2023001.run

A = FID 10 V RESULTS



Peak No	Peak Name	Result ()	Ret Time (min)	Peak Area (counts)	Sep. Code	Width 1/2 (sec)
1	C14	33.8385	3.520	359491	BB	2.2
2	C15	33.4804	4.125	357863	BB	2.3
3	C16	32.6143	4.699	344951	BB	2.2
Totals		99.9312		1062305		



Sample ID: **fid std**

Operator (Inj): Suwarot

Injection Date: 09/08/2023

Calc Date: 09/08/2023

Run Time (min): 7.993

Workstation: Local Disk

Instrument (Inj):



**VARIAN**

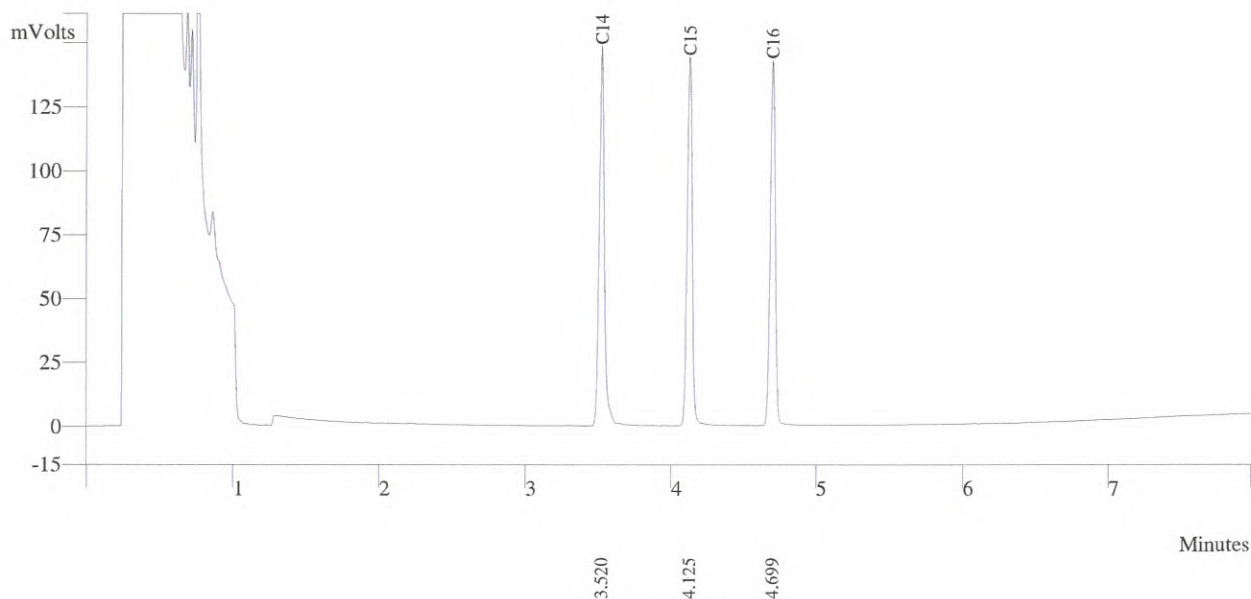
Run Mode: Analysis

Peak Measurement: Peak Area

Calculation Type: External Std.

c:\star\data\tu\cal2023\fid\calfid2023001.run

A = FID 10 V RESULTS



Peak No	Peak Name	Result ()	Ret Time (min)	Peak Area (counts)	Sep. Code	Width 1/2 (sec)
1	C14	33.8385	3.520	362495	BB	2.2
2	C15	33.4804	4.125	357824	BB	2.3
3	C16	32.6143	4.699	344951	BB	2.2
	Totals	99.9332		1065270		



Sample ID: **fid std**

Operator (Inj): Suwarot

Injection Date: 09/08/2023

Calc Date: 09/08/2023

Run Time (min): 7.993

Workstation: Local Disk

Instrument (Inj):



**VARIAN**

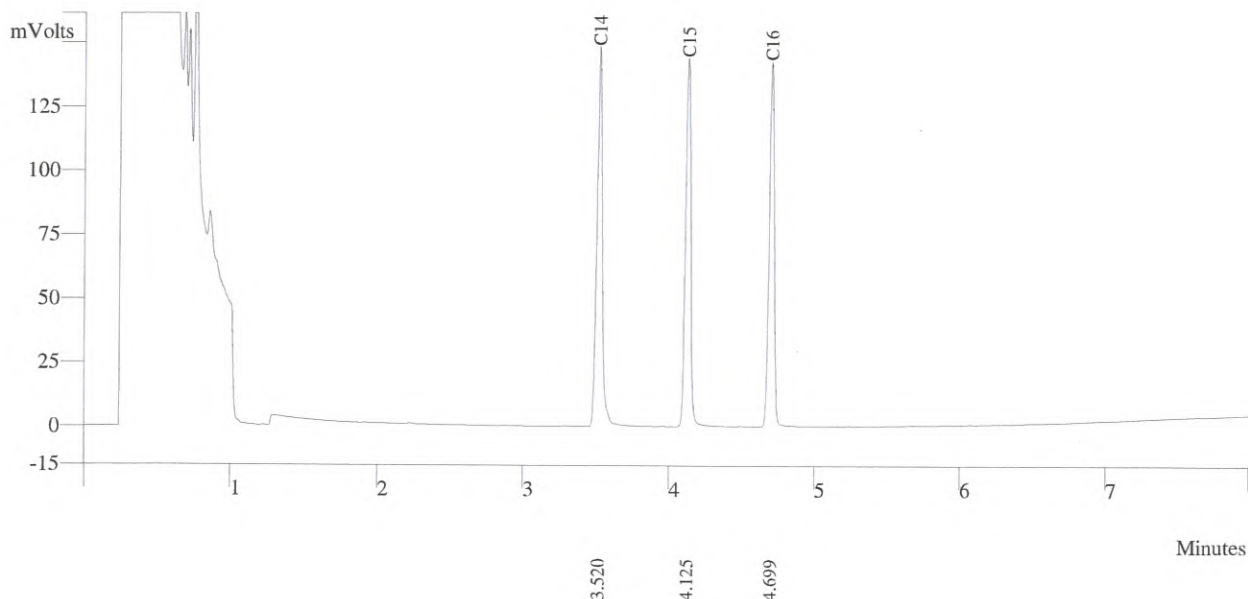
Run Mode: Analysis

Peak Measurement: Peak Area

Calculation Type: External Std.

c:\star\data\tu\cal2023\fid\calfid2023002.run

A = FID 10 V RESULTS



Peak No	Peak Name	Result ()	Ret Time (min)	Peak Area (counts)	Sep. Code	Width 1/2 (sec)
1	C14	33.8385	3.520	362495	BB	2.2
2	C15	33.4824	4.125	367724	BB	2.3
3	C16	32.6143	4.699	354951	BB	2.2
	Totals	99.9352		1085170		





Sample ID: **fid std**



**VARIAN**

Operator (Inj): Suwarot

Injection Date: 09/08/2023

Calc Date: 09/08/2023

Run Time (min): 7.993

Workstation: Local Disk

Instrument (Inj):

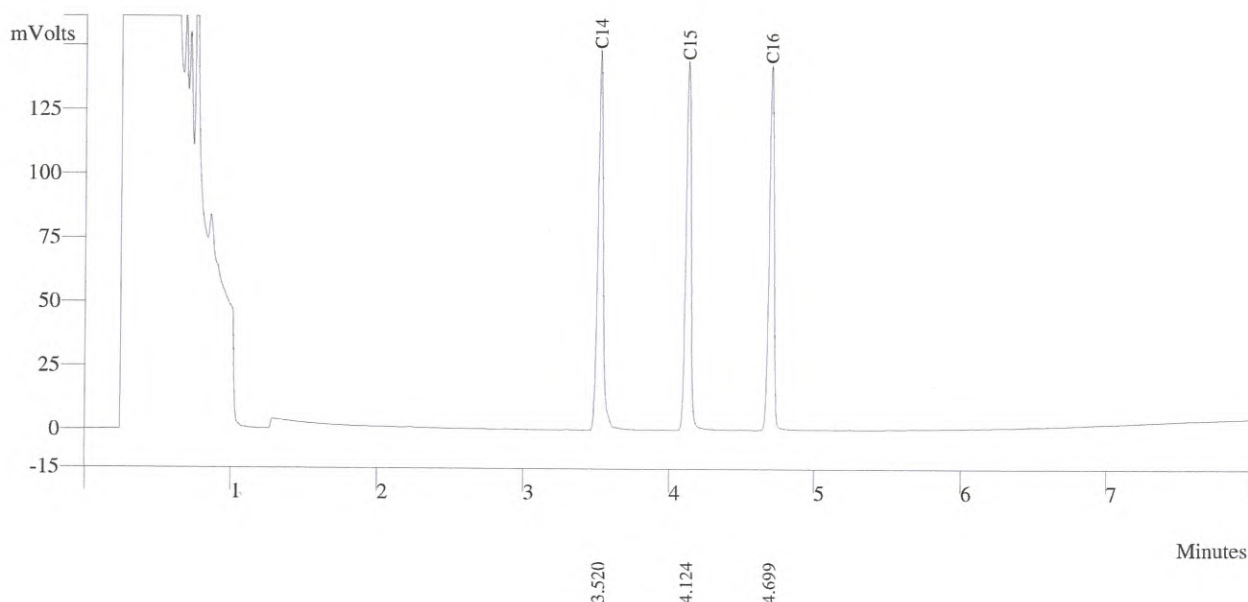
Run Mode: Analysis

Peak Measurement: Peak Area

Calculation Type: External Std.

c:\star\data\tu\cal2023\fid\calfid2023002.run

A = FID 10 V RESULTS



Peak No	Peak Name	Result ()	Ret Time (min)	Peak Area (counts)	Sep. Code	Width 1/2 (sec)
1	C14	33.8385	3.520	362495	BB	2.2
2	C15	33.4824	4.124	361724	BB	2.3
3	C16	32.6143	4.699	354991	BB	2.2
	Totals	99.9352		1079210		



Sample ID: **fid std**

Operator (Inj): Suwarot

Injection Date: 09/08/2023

Calc Date: 09/08/2023

Run Time (min): 7.993

Workstation: Local Disk

Instrument (Inj):



**VARIAN**

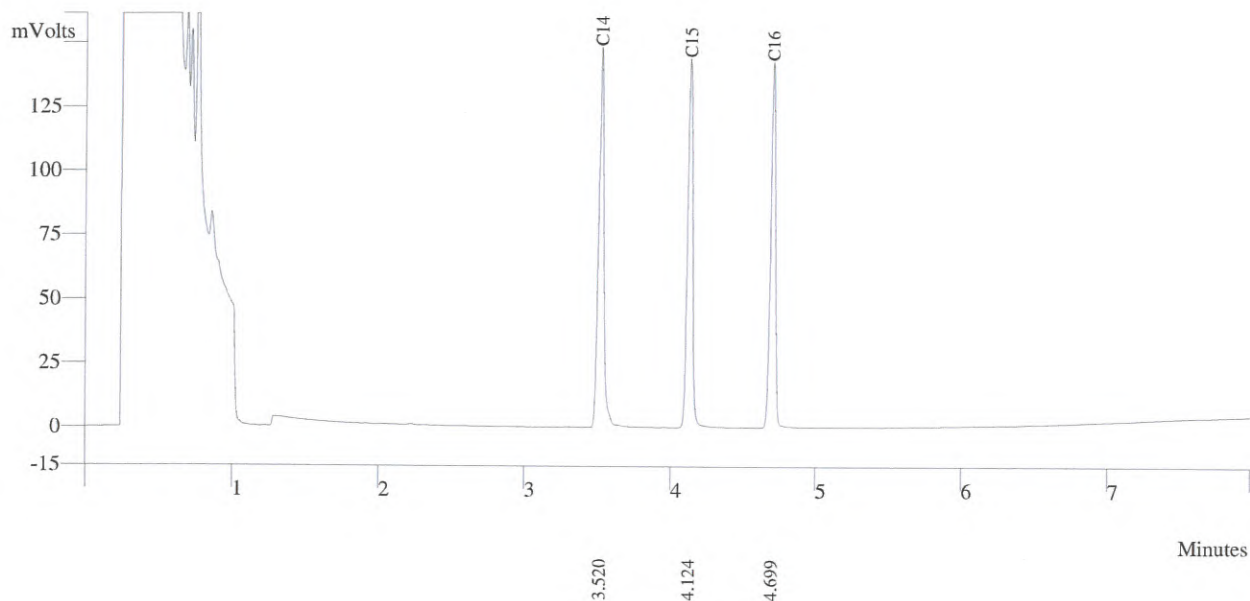
Run Mode: Analysis

Peak Measurement: Peak Area

Calculation Type: External Std.

c:\star\data\tu\cal2023\fid\calfid2023002.run

A = FID 10 V RESULTS



Peak No	Peak Name	Result ()	Ret Time (min)	Peak Area (counts)	Sep. Code	Width 1/2 (sec)
1	C14	33.8385	3.520	362495	BB	2.2
2	C15	33.4824	4.124	369724	BB	2.3
3	C16	32.6143	4.699	354591	BB	2.2
Totals		99.9552		1087210		







Agilent Technologies

## Certificate of Analysis

### FID-TCD Performance Evaluation Sample Kit

Agilent Part

Number: 5080-8842, 18710-60170

Sample Lot

Number: 0006637856

This analytical reference material was manufactured and verified in accordance with an ISO 9001 registered quality system, and the analyte concentrations were verified by an ISO 17025 accredited laboratory. The certified value for each analyte was determined gravimetrically.

#### Concentrations:

n-tetradecane	0.218 g/L ( $\pm 0.5\%$ )	0.033 w/w %
n-pentadecane	0.218 g/L ( $\pm 0.5\%$ )	0.033 w/w %
n-hexadecane	0.218 g/L ( $\pm 0.5\%$ )	0.033 w/w %

Solvent: hexane

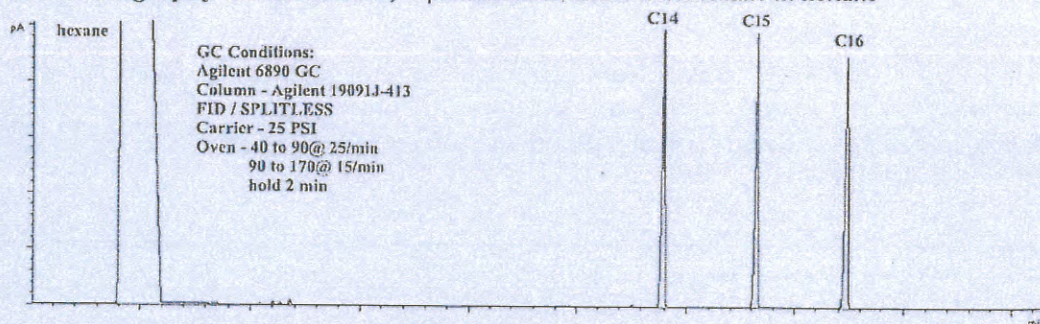
Calibrated Class A glassware and clean bottles were used in the manufacture of this standard. Balances used in the manufacture of this standard are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1 and ISO 9001.

#### Purities:

n-tetradecane	99.6%
n-pentadecane	99%
n-hexadecane	99%
hexane	99%

### Typical Analytical Spectrum or Chromatography

GC Chromatography – n-tetradecane, n-pentadecane, and n-hexadecane in hexane



Date of release: 30 September 2021

Date of expiration: 31 October 2023

QMS Representative



# *Certificate*

It is hereby certified that

**Suwarot Trikainut**

Has successfully completed the Application Training for

**Basic Gas Chromatography and Sampler**

Training Contents were:

**Hardware Operation, Software Operation, Data analysis and**

**Troubleshooting : Model**

**CP-3800, 3900, 450-GC, 430-GC, 456-GC, 436-GC**

At Thai Unique Co., Ltd, Bangkok, Thailand

On 15<sup>th</sup> March, 2019



Service Manager

ระดับความร้อน



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

Heat B064\_1/23

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No.	: B22	Verification Date	: 26 April 2023
Brand	: 3M	Ambient Temp.	: 24.5 °C
Model	: QUESTemp <sup>o</sup> 32	Barometric Pressure	: 1011 mmbar
Serial No.	: TPK040059	Relative Humidity	: 49 %
Verification Module (Electronic Sensor Check) :			
Verification Module No. : <u>21</u> WB = <u>12.5</u> °C , DB = <u>47.1</u> °C , G = <u>69.3</u> °C			
Result of Verification : Without Adjustment			
Wet Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
12.5	12.5	0.0	± 0.5
Dry Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
47.1	47.0	0.1	± 0.5
Globe Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
69.3	69.3	0.0	± 0.5
UUC* = UNIT UNDER CALIBRATION			

Verified by :



Approved by :







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

Heat B064\_2/23

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No.	: B24	Verification Date	: 26 April 2023
Brand	: 3M	Ambient Temp.	: 24.5 °C
Model	: QUESTemp <sup>o</sup> 32	Barometric Pressure	: 1011 mmbar
Serial No.	: TPH050002	Relative Humidity	: 49 %
Verification Module (Electronic Sensor Check) :			
Verification Module No. : 21 WB = 12.5 °C , DB = 47.1 °C , G = 69.3 °C			
Result of Verification : Without Adjustment			
Wet Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
12.5	12.6	-0.1	± 0.5
Dry Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
47.1	47.1	0.0	± 0.5
Globe Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
69.3	69.2	0.1	± 0.5
UUC* = UNIT UNDER CALIBRATION			

Verified by :



Approved by :





**CLC**  
Accredited  
ISO/IEC 17025

# 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



NSC-TISI-TIS 17025  
CALIBRATION 0059  
CLC

## CERTIFICATE OF CALIBRATION

### FOR

NOMENCLATURE : DIGITAL THERMOHYGRO METER  
(THERMAL ENVIRONMENT MONITOR)

MANUFACTURER : 3M

MODEL / TYPE : QUESTemp° 32

SERIAL NO. : TPK040059

CLID. NO. : 231802519

JOB CONTROL NO. : 221028109981

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

7 SOI PHAHOLYOTHIN 24 ROAD., JOMPOL,  
CHATUCHAK, BANGKOK 10900

DATE OF RECEIVED : 28 October 2022

DATE OF ISSUED : 31 October 2022

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

Calibrated By :

Oranut Kamchatphai

Calibration Engineer

Approved By :



Authorized Signatory

31 October 2022



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

Certificate No. Q22109981

F3-011-04/01-12

page 1 of 3



@clccalibration



## REPORT OF CALIBRATION

### FOR

**NOMENCLATURE** : **DIGITAL THERMOHYGRO METER**  
**(THERMAL ENVIRONMENT MONITOR)**

**MANUFACTURER** : **3M**

**MODEL / TYPE** : **QUESTemp° 32**

**SERIAL NO.** : **TPK040059**

**DATE OF CALIBRATION** : **29 October 2022**

---

#### 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. **WI-305-74**. The calibration was performed by using Chilled Mirror Hygrometer and Temperature & Humidity Chamber which maintained by the Calibration Laboratory Co., Ltd.

#### REFERENCE STANDARD USED :

Chilled Mirror Hygrometer, Edgetech Model Dew Master S/N. 44602.

Temperature & Humidity Chamber, PGC Model 9141-5116 S/N. 1304261.

#### TRACEABILITY :

The measurements are traceable to International System of Units (SI) , through Thunder Scientific Corporation.  
Certificate No. 19944, Due Date 26 January 2023.

#### UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k = 2,00$  which for a normal distribution corresponds to a coverage probability of approximately 95 %.  
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2021)"

**Certificate No. Q22109981**

**F3-011-04/01-12**

page 2 of 3







**CLC**  
Accredited  
ISO/IEC 17025

# 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



NSC-TISI-TIS 17025  
CALIBRATION 0059  
CLC

## CONDITION OF CALIBRATION ITEM : GOOD

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

The table in the following gives the calibration results and associated measurement uncertainties of the measuring digital thermohygro meter (thermal environment monitor).

### CALIBRATION DATA

#### 1. CORRECTION OF TEMPERATURE : WET

Test point ( ° C )	Actual Temperature ( ° C )	DUC Reading ( ° C )	Correction ( ° C )	Uncertainty ± ( ° C )
30.0	30.01	30.1	-0.09	0.40
35.0	35.00	35.1	-0.10	
40.0	40.01	39.9	+0.11	

#### 2. CORRECTION OF TEMPERATURE : DRY

Test point ( ° C )	Actual Temperature ( ° C )	DUC Reading ( ° C )	Correction ( ° C )	Uncertainty ± ( ° C )
30.0	30.01	30.1	-0.09	0.40
35.0	35.00	35.2	-0.20	
40.0	40.01	40.1	-0.09	

#### 3. CORRECTION OF TEMPERATURE : GLOBE BULB

Test point ( ° C )	Actual Temperature ( ° C )	DUC Reading ( ° C )	Correction ( ° C )	Uncertainty ± ( ° C )
30.0	30.01	30.1	-0.09	0.40
35.0	35.00	35.1	-0.10	
40.0	40.01	39.8	+0.21	

Note. The Scope of Accredited TISI Certificate No. 19C087/0655 Issue 1 Page 36 of 111

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

### End of Certificate ###

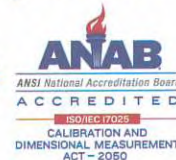
Certificate No. Q22109981

F3-011-04/01-12

page 3 of 3



@clccalibration



## Certificate of Calibration

Certificate Number : SPR23030505-3

Page : 1 of 3

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

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

Equipment Name : Area Heat Stress Monitor

Manufacturer : Quest Technologies

Model : QUESTemp 32

Serial Number : TPH050002

ID. Number : B24

### Environmental Conditions

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

Received Date : 30 Mar 2023

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

Calibration Date : 31 Mar 2023

Location of Calibration : In-Lab

Recommend Due Date : 31 Mar 2024

Calibration Procedure : SP-CPT-04-13

Date of Issue : 01 Apr 2023

### Method of Calibration

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

All calibrations are performed within manufacture's specifications. The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by : Mr. Sarawut Khitmai

Calibration Officer

Approved by :



Authorized Signatory





## Calibration Report

Certificate Number : SPR23030505-3

Page : 2 of 3

### Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Humidity Chamber	TH-80S	N/A	SPR23010480-5	22 Feb 2024
THERMO-HYGROMETER	5020A	A47046	QR23-0176	26 Jan 2024

### Traceability

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

SP Metrology - SP Metrology system (Thailand) Co.Ltd.

Quality Reborn Co., Ltd





## Result of Calibration

Certificate No. : SPR23030505-3

Page : 3 of 3

Temperature Accuracy in the Measurement. (WET)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty ( ± )
30.0	30.013	30.2	0.187	0.50
35.0	35.010	35.2	0.190	0.50
40.0	40.015	40.2	0.185	0.50

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty ( ± )
30.0	30.013	30.2	0.187	0.50
35.0	35.010	35.2	0.190	0.50
40.0	40.015	40.2	0.185	0.50

Temperature Accuracy in the Measurement. (GLOBE)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty ( ± )
30.0	30.013	30.3	0.287	0.50
35.0	35.010	35.3	0.290	0.50
40.0	40.015	40.3	0.285	0.50

### Note:

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

### Measurement Uncertainty

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

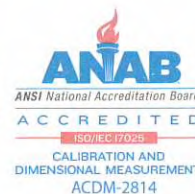
- End of Certificate -

ระดับความเข้มของแสงสว่าง



# 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 : LUX METER  
MANUFACTURER : EXTECH INSTRUMENTS  
MODEL / TYPE : 407026  
SERIAL NO. : A.052239/A.052239 [B09]  
CLID. NO. : 252201677  
JOB CONTROL NO. : 230725081567

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

DATE OF RECEIVED : 25 July 2023

DATE OF ISSUED : 31 July 2023

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

Calibrated By : Suwit Phuanbusabong  
Calibration Engineer

Approved By :

Authorized Signatory  
31 July 2023



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. Q23081567

F3-011-04/01-12

page 1 of 3



@clccalibration



## REPORT OF CALIBRATION

### FOR

NOMENCLATURE	:	LUX METER
MANUFACTURER	:	EXTECH INSTRUMENTS
MODEL / TYPE	:	407026
SERIAL NO.	:	A.052239/A.052239 [B09]
DATE OF CALIBRATION	:	26 July 2023
DUE DATE OF CALIBRATION	:	26 July 2024

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#### ENVIRONMENT CONDITIONS :

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

Relative Humidity :  $(55 \pm 15) \% \text{RH}$

#### PROCEDURE USED :

This instrument was calibrated under procedure No. **CLC-CPEE-18** by comparison with Photometer/Radiometer & Illuminance Sensor which maintained by the Calibration Laboratory Co., Ltd.

#### REFERENCE STANDARD USED :

Photometer/Radiometer & Illuminance Sensor, Bentham Model ORM400/DH400VL S/N. 27710,27585/3.

#### TRACEABILITY :

The measurements are traceable to International System of Units (SI) , through Optical Test and Calibration Ltd.  
Certificate No. 144408/ABU, Due Date 03 April 2024.

#### UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k = 2,00$  which for a normal distribution corresponds to a coverage probability of approximately 95 %.  
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q23081567

F3-011-04/01-12

page 2 of 3





**CLC**  
Accredited  
ISO/IEC 17025

# 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



**CONDITION OF CALIBRATION ITEM : GOOD**

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

## CALIBRATION DATA

### LUX METER

STD Applied ( lux )	DUC Reading ( lux )	Correction ( lux )	Uncertainty $\pm$ ( % of rdg. )
100	102	-2	2.6
200	202	-2	2.6
300	300	0	2.6
1000	991	+9	2.6
2000	1920	+80	2.6
3000	2910	+90	3.6

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 008 Page 46 of 54

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

**### End of Certificate ###**

Certificate No. Q23081567

F3-011-04/01-12

page 3 of 3



@clccalibration

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หนังสืออนุญาตขึ้นทะเบียนห้องปฏิบัติการ  
วิเคราะห์เอกชน



ที่ อก ๐๓๑๐(๑)/ ๑๔ ๓ ๒ ๑



กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท  
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๑๑ ตุลาคม ๒๕๖๖

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท เอส.พี.เอส. คอนสตรัคติ้ง เซอร์วิส จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน  
ลงวันที่ ๒๒ มิถุนายน ๒๕๖๖

- สิ่งที่ส่งมาด้วย ๑. รายชื่อผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๑ แผ่น  
๒. รายชื่อเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๒ แผ่น  
๓. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๔ แผ่น

ตามหนังสือที่อ้างถึง บริษัท เอส.พี.เอส. คอนสตรัคติ้ง เซอร์วิส จำกัด ห้องปฏิบัติการวิเคราะห์เอกชน  
เลขทะเบียน ว-๐๑๑ สถานที่ตั้งเลขที่ ๗ ซอยพหลโยธิน ๒๔ ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร  
กรุงเทพมหานคร ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท เอส.พี.เอส. คอนสตรัคติ้ง เซอร์วิส จำกัด ต่ออายุ  
หนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้

- ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๓๔ ราย ตามสิ่งที่ส่งมาด้วย ๑  
ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๔๗ ราย ตามสิ่งที่ส่งมาด้วย ๒  
ค. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย น้ำใต้ดิน อากาศเสีย สิ่งปฏิกูล  
หรือวัสดุที่ไม่ใช้แล้ว และดิน ตามสิ่งที่ส่งมาด้วย ๓

หนังสือฉบับนี้จะหมดอายุในวันที่ ๑๐ กรกฎาคม ๒๕๖๙ หากประสงค์จะต่ออายุหนังสือ  
รับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อกรมโรงงาน  
อุตสาหกรรมภายใน ๓๐ วัน ก่อนวันสิ้นอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ทั้งนี้  
สามารถยื่นคำขอผ่านระบบอิเล็กทรอนิกส์ได้ที่หน้าเว็บไซต์กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ



ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน  
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและเตือนภัยมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕

โทรสาร ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๙๙

ไปรษณีย์อิเล็กทรอนิกส์ saraban@diw.mail.go.th



“อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว”



เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

เลขทะเบียน ว-๐๑๑

ที่ อก ๐๓๑๐(๑)/ ๑๔ ๓ ๒ ๑

ลงวันที่ ๑๑ ตุลาคม ๒๕๖๖

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๓๔ ราย

๑)		ทะเบียนเลขที่	ว-๐๑๑-ค-๐๐๐๒
๒)		ทะเบียนเลขที่	ว-๐๑๑-ค-๐๐๐๓
๓)		ทะเบียนเลขที่	ว-๐๑๑-ค-๐๐๐๔
๔)		ทะเบียนเลขที่	ว-๐๑๑-ค-๐๐๐๕
๕)		ทะเบียนเลขที่	ว-๐๑๑-ค-๐๐๐๖
๖)		ทะเบียนเลขที่	ว-๐๑๑-ค-๐๐๐๘
๗)		ทะเบียนเลขที่	ว-๐๑๑-ค-๐๐๐๙
๘)		ทะเบียนเลขที่	ว-๐๑๑-ค-๐๐๑๐
๙)		ทะเบียนเลขที่	ว-๐๑๑-ค-๐๐๑๑
๑๐)		ทะเบียนเลขที่	ว-๐๑๑-ค-๐๐๑๒
๑๑)		ทะเบียนเลขที่	ว-๐๑๑-ค-๐๐๑๓
๑๒)		ทะเบียนเลขที่	ว-๐๑๑-ค-๐๐๑๔
๑๓)	นา	ทะเบียนเลขที่	ว-๐๑๑-ค-๐๐๑๕
๑๔)		ทะเบียนเลขที่	ว-๐๑๑-ค-๐๐๑๖
๑๕)		ทะเบียนเลขที่	ว-๐๑๑-ค-๐๐๑๗
๑๖)		ทะเบียนเลขที่	ว-๐๑๑-ค-๐๐๑๘
๑๗)		ทะเบียนเลขที่	ว-๐๑๑-ค-๐๐๑๙
๑๘)		ทะเบียนเลขที่	ว-๐๑๑-ค-๐๐๒๐
๑๙)		ทะเบียนเลขที่	ว-๐๑๑-ค-๐๐๒๑
๒๐)		ทะเบียนเลขที่	ว-๐๑๑-ค-๐๐๒๒
๒๑)		ทะเบียนเลขที่	ว-๐๑๑-ค-๐๐๒๓
๒๒)		ทะเบียนเลขที่	ว-๐๑๑-ค-๐๐๒๔
๒๓)		ทะเบียนเลขที่	ว-๐๑๑-ค-๐๐๒๕
๒๔)		ทะเบียนเลขที่	ว-๐๑๑-ค-๐๐๒๖
๒๕)		ทะเบียนเลขที่	ว-๐๑๑-ค-๐๐๒๗
๒๖)		ทะเบียนเลขที่	ว-๐๑๑-ค-๐๐๒๘
๒๗)		ทะเบียนเลขที่	ว-๐๑๑-ค-๐๐๒๙
๒๘)		ทะเบียนเลขที่	ว-๐๑๑-ค-๐๐๓๐
๒๙)		ทะเบียนเลขที่	ว-๐๑๑-ค-๐๐๓๑
๓๐)		ทะเบียนเลขที่	ว-๐๑๑-ค-๐๐๓๒
๓๑)		ทะเบียนเลขที่	ว-๐๑๑-ค-๐๐๓๓
๓๒)		ทะเบียนเลขที่	ว-๐๑๑-ค-๐๐๓๔
๓๓)		ทะเบียนเลขที่	ว-๐๑๑-ค-๐๐๓๕
๓๔)		ทะเบียนเลขที่	ว-๐๑๑-ค-๐๐๓๖

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

เลขทะเบียน ว-๐๑๑

ที่ อก ๐๓๑๐(๑)/ ๑๔ ๓ ๒ ๑

ลงวันที่ ๑๑ ตุลาคม ๒๕๖๖

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๔๗ ราย

๑) น	ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๐๑
๒) น	ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๐๕
๓) น	ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๐๘
๔) น	ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๐๙
๕) น	ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๑๐
๖) น	ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๑๑
๗) น	ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๑๒
๘) น	ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๑๓
๙) น	ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๑๔
๑๐) น	ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๑๕
๑๑) น	ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๑๖
๑๒) น	ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๑๗
๑๓) น	ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๑๘
๑๔) น	ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๑๙
๑๕) น	ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๒๐
๑๖) น	ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๒๑
๑๗) น	ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๒๒
๑๘) น	ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๒๓
๑๙) น	ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๒๔
๒๐) น	ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๒๕
๒๑) น	ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๒๖
๒๒) น	ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๒๗
๒๓) น	ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๒๘
๒๔) น	ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๒๙
๒๕) น	ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๓๐
๒๖) น	ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๓๑
๒๗) น	ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๓๒
๒๘) น	ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๓๓
๒๙) น	ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๓๔
๓๐) น	ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๓๕
๓๑) น	ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๓๖
๓๒) น	ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๓๗
๓๓) น	ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๓๘
๓๔) น	ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๓๙
๓๕) น	ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๔๐



๓๖)		ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๔๑
๓๗)		ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๔๒
๓๘)		ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๔๓
๓๙)		ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๔๔
๔๐)		ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๔๕
๔๑)		ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๔๖
๔๒)		ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๔๗
๔๓)		ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๔๘
๔๔)		ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๔๙
๔๕)		ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๕๐
๔๖)		ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๕๑
๔๗)		ทะเบียนเลขที่ ว-๐๑๑-จ-๐๐๕๒



เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

เลขทะเบียน ว-๐๑๑

ที่ อก ๐๓๑๐(๑)/ ๑๔ ๓ ๒ ๑

ลงวันที่ ๑๑ ตุลาคม ๒๕๖๖

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๗๙ รายการ  
น้ำเสีย จำนวน 62 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aldicarb	High-Performance Liquid Chromatographic Method <sup>[4]</sup>
2	Aldicarb Sulfone	High-Performance Liquid Chromatographic Method <sup>[4]</sup>
3	Aldicarb Sulfoxide	High-Performance Liquid Chromatographic Method <sup>[4]</sup>
4	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
5	Arsenic	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>[4]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>
6	Barium	Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>
7	$\alpha$ -BHC	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
8	$\beta$ -BHC	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
9	$\delta$ -BHC	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
10	$\gamma$ -BHC	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
11	Biochemical Oxygen Demand	1) 5-Day BOD Test, Azide Modification Method <sup>[4]</sup> 2) 5-Day BOD Test, Membrane Electrode Method <sup>[4]</sup>
12	Cadmium	1) Digestion, Direct Air-Acetylene Flame Method <sup>[4]</sup> 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method <sup>[4]</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
13	Carbaryl	High-Performance Liquid Chromatographic Method <sup>[4]</sup>
14	Carbofuran	High-Performance Liquid Chromatographic Method <sup>[4]</sup>
15	Chemical Oxygen Demand	1) Open Reflux, Titrimetric method <sup>[4]</sup> 2) Closed Reflux, Colorimetric method <sup>[4]</sup> 3) Closed Reflux, Titrimetric Method <sup>[4]</sup>
16	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
17	Chromium	1) Digestion, Direct Air-Acetylene Flame Method <sup>[4]</sup> 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method <sup>[4]</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>
18	Color	ADMI Weighted-Ordinate Spectrophotometric Method <sup>[4]</sup>
19	Copper	1) Digestion, Direct Air-Acetylene Flame Method <sup>[4]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>
20	Cyanide	Distillation, Colorimetric method <sup>[4]</sup>
21	4,4'-DDD	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
22	4,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
23	4,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
24	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
25	Endosulfan I	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
26	Endosulfan II	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
27	Endosulfan Sulfate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
28	Endrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
29	Endrin aldehyde	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
30	Formaldehyde	Distillation, Colorimetric Method <sup>[3]</sup>
31	Free Chlorine	1) Iodometric Method <sup>[4]</sup> 2) DPD Colorimetric Method <sup>[4]</sup>
32	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
33	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
34	Hexavalent Chromium	Colorimetric Method <sup>[4]</sup>
35	3-Hydroxycarbofuran	High-Performance Liquid Chromatographic Method <sup>[4]</sup>
36	Lead	1) Digestion, Direct Air-Acetylene Flame Method <sup>[4]</sup> 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method <sup>[4]</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>
37	Malathion	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
38	Manganese	1) Digestion, Direct Air-Acetylene Flame Method <sup>[4]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>
39	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>[4]</sup>

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
40	Methiocarb	High-Performance Liquid Chromatographic Method <sup>[4]</sup>
41	Methomyl	High-Performance Liquid Chromatographic Method <sup>[4]</sup>
42	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[4]</sup>
43	Methyl parathion	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[4]</sup>
44	1-Naphthol	High-Performance Liquid Chromatographic Method <sup>[4]</sup>
45	Nickel	1) Digestion, Direct Air-Acetylene Flame Method <sup>[4]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>
46	Oil & Grease	1) Liquid-Liquid, Partition-Gravimetric Method <sup>[4]</sup> 2) Soxhlet Extraction Method <sup>[4]</sup>
47	Oxamyl	High-Performance Liquid Chromatographic Method <sup>[4]</sup>
48	pH	Electrometric Method <sup>[4]</sup>
49	Phenols	1) Distillation, Chloroform Extraction Method <sup>[4]</sup> 2) Distillation, Direct Photometric Method <sup>[4]</sup>
50	Propoxur	High-Performance Liquid Chromatographic Method <sup>[4]</sup>
51	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>[4]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>
52	Settleable Solids	Settleable Solids Method <sup>[4]</sup>
53	Sulfide	1) Iodometric method <sup>[4]</sup> 2) Methylene blue method <sup>[4]</sup>
54	Temperature	Laboratory and Field Methods <sup>[4]</sup>
55	Total Dissolved Solids	Dried at 180 °C <sup>[4]</sup>

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
56	Total Kjeldahl Nitrogen	Macro-Kjeldahl Method <sup>[4]</sup>
57	Total Phosphorous	Digestion, Colorimetric Method <sup>[4]</sup>
58	Total Suspended Solids	Dried at 103-105 °C <sup>[4]</sup>
59	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
60	Trivalent Chromium	Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation <sup>[4]</sup>
61	Turbidity	Nephelometric Method <sup>[4]</sup>
62	Zinc	1) Digestion, Direct Air-Acetylene Flame Method <sup>[4]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>

น้ำใต้ดิน จำนวน 126 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
2	Acetone	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
3	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
4	Anthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
5	Antimony	Digestion, Inductively Coupled Plasma Spectrometric Method <sup>[4]</sup>
6	Arsenic	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>[4]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>
7	Atrazine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
8	Barium	Digestion, Inductively Coupled Plasma Spectrometric Method <sup>[4]</sup>
9	Benz(a)anthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
10	Benzene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
11	Benzo(b)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
12	Benzo(k)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
13	Benzoic acid	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
14	Benzo(a)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
15	Benzo(g,h,i)perylene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
16	Beryllium	Digestion, Inductively Coupled Plasma Spectrometric Method <sup>[4]</sup>
17	Bis(2-chloroethyl)ether	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
18	Bis(2-ethylhexyl)phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
19	Bromodichloromethane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
20	Bromoform	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
21	Butanol	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
22	Butyl benzyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
23	Cadmium	Digestion, Inductively Coupled Plasma Spectrometric Method <sup>[4]</sup>

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
24	Carbazole	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
25	Carbon disulfide	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
26	Carbon tetrachloride	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
27	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
28	p-Chloroaniline	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
29	Chlorobenzene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
30	Chlorodibromomethane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
31	Chloroform	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
32	2-Chlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
33	Chromium	1) Digestion, Direct Air-Acetylene Flame Method <sup>[4]</sup> 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method <sup>[4]</sup> 3) Digestion, Inductively Coupled Plasma Spectrometric Method <sup>[4]</sup>
34	Chromium (III)	Digestion, Inductively Coupled Plasma Spectrometric Method; Colorimetric Method; Calculation <sup>[4]</sup>
35	Chromium (VI)	Colorimetric Method <sup>[4]</sup>
36	Chrysene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
37	Cyanide	Distillation, Colorimetric Method <sup>[4]</sup>

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
38	2,4-D	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>
39	DDD	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
40	DDE	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
41	DDT	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
42	Dibenz(a,h)anthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
43	Di-n-butyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
44	1,2-Dichlorobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
45	1,3-Dichlorobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
46	1,4-Dichlorobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
47	3,3'-Dichlorobenzidine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
48	1,1-Dichloroethane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
49	1,2-Dichloroethane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
50	1,1-Dichloroethylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
51	cis-1,2-Dichloroethylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
52	trans-1,2-Dichloroethylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
53	2,4-Dichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
54	1,2-Dichloropropane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
55	1,3-Dichloropropane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
56	1,3-Dichloropropene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
57	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
58	Diethyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
59	2,4-Dimethylphenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
60	2,4-Dinitrophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
61	2,4-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
62	2,6-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
63	Di-n-Octyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
64	Endosulfan	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
65	Endrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
66	Ethylbenzene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
67	Fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
68	Fluorene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
69	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
70	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
71	Hexachlorobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
72	Hexachloro-1,3-butadiene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
73	n-Hexane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
74	$\alpha$ -HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
75	$\beta$ -HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
76	$\gamma$ -HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
77	Hexachlorocyclopentadiene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
78	Hexachloroethane	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
79	Indeno(1,2,3-cd)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
80	Isophorone	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
81	Lead	1) Digestion, Direct Air-Acetylene Flame Method <sup>[4]</sup> 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method <sup>[4]</sup> 3) Digestion, Inductively Coupled Plasma Spectrometric Method <sup>[4]</sup>
82	Manganese	1) Digestion, Direct Air-Acetylene Flame Method <sup>[4]</sup> 2) Digestion, Inductively Coupled Plasma Spectrometric Method <sup>[4]</sup>

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
83	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>[4]</sup>
84	Methanol	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
85	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
86	Methyl bromide	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
87	Methylene chloride	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
88	2-Methylphenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
89	2-Methylnaphthalene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
90	Methyl tert-butyl ether	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
91	Naphthalene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
92	Nickel	1) Digestion, Direct Air-Acetylene Flame Method <sup>[4]</sup> 2) Digestion, Inductively Coupled Plasma Spectrometric Method <sup>[4]</sup>
93	Nitrobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
94	N-Nitrosodiphenylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
95	N-Nitrosodi-n-propylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
96	Polychlorinated Biphenyls - PCB-1016 - PCB-1221 - PCB-1232	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
	- PCB-1242 - PCB-1248 - PCB-1254 - PCB-1260	
97	Pentachlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
98	pH	Electrometric method <sup>[4]</sup>
99	Phenanthrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
100	Phenol	1) Distillation, Chloroform Extraction Method <sup>[4]</sup> 2) Distillation, Direct Photometric Method <sup>[4]</sup>
101	Pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
102	Selenium	Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>[4]</sup>
103	Silver	Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>
104	Styrene	Purge and Trap Gas Chromatographic/ Mass spectrometric Method <sup>[4]</sup>
105	1,1,2,2-Tetrachloroethane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
106	Tetrachloroethylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
107	Toluene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
108	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
109	TPH (C <sub>5</sub> -C <sub>8</sub> )	Purge and Trap, Gas Chromatographic Method <sup>[13,22]</sup>
110	TPH (C <sub>&gt;8</sub> -C <sub>16</sub> )	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[9,22]</sup>
111	TPH (C <sub>&gt;16</sub> -C <sub>35</sub> )	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[9,22]</sup>

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
112	1,2,4-Trichlorobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
113	1,1,1-Trichloroethane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
114	1,1,2-Trichloroethane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
115	Trichloroethylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
116	2,4,5-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
117	2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
118	1,3,5-Trimethylbenzene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
119	Vanadium	Digestion, Inductively Coupled Plasma Spectrometric Method <sup>[4]</sup>
120	Vinyl acetate	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
121	Vinyl chloride	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
122	m-Xylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
123	o-Xylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
124	p-Xylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
125	Xylene (Total)	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
126	Zinc	1) Digestion, Direct Air-Acetylene Flame Method <sup>[4]</sup> 2) Digestion, Inductively Coupled Plasma Spectrometric Method <sup>[4]</sup>

อากาศเสีย (ปล่อยระบาย) จำนวน 28 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Antimony	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method <sup>[5]</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup>
2	Arsenic	1) Isokinetic Sampling, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>[5]</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup>
3	Beryllium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup>
4	Cadmium	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method <sup>[5]</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup>
5	Carbon Monoxide	Instrumental Analyzer Method <sup>[5]</sup>
6	Chlorine	1) Absorption Sampling, Ion Chromatographic Method <sup>[5]</sup> 2) Isokinetic Sampling, Ion Chromatographic Method <sup>[5]</sup>
7	Chromium	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method <sup>[5]</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup>
8	Cobalt	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method <sup>[5]</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup>
9	Copper	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method <sup>[5]</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup>



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
10	Cresol	Adsorption Sampling, Gas Chromatographic Method <sup>[5]</sup>
11	Dioxins/Furans	Isokinetic Sampling <sup>[5]</sup>
12	Hydrogen Chloride	1) Absorption Sampling, Ion Chromatographic Method <sup>[5]</sup> 2) Isokinetic Sampling, Ion Chromatographic Method <sup>[5]</sup>
13	Hydrogen Fluoride	1) Absorption Sampling, Ion Chromatographic Method <sup>[5]</sup> 2) Isokinetic Sampling, Ion Chromatographic Method <sup>[5]</sup>
14	Hydrogen Sulfide	Absorption Sampling, Iodometric Method <sup>[5]</sup>
15	Lead	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method <sup>[5]</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup>
16	Manganese	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method <sup>[5]</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup>
17	Mercury	Isokinetic Sampling, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>[5]</sup>
18	Nickel	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method <sup>[5]</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup>
19	Opacity	Ringelmann's Method <sup>[2]</sup>
20	Oxides of Nitrogen	1) Absorption Sampling, Phenoldisulfonic acid Method <sup>[5]</sup> 2) Instrumental Analyzer Method <sup>[5]</sup>
21	Selenium	Isokinetic Sampling, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>[5]</sup>

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
22	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method <sup>[5]</sup> 2) Isokinetic Sampling, Barium-Thorin Titrimetric Method <sup>[5]</sup> 3) Instrumental Analyzer Method <sup>[5]</sup>
23	Sulfuric acid	Isokinetic Sampling, Barium-Thorin Titrimetric Method <sup>[5]</sup>
24	Tellurium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup>
25	Tin	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup>
26	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method <sup>[5]</sup>
27	Vanadium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup>
28	Xylene	1) Adsorption Sampling, Gas Chromatographic Method <sup>[5]</sup> 2) Adsorption Sampling, Gas Chromatographic/Mass Spectrometric Method <sup>[5]</sup>

สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน 38 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acrylonitrile	1) Waste Extraction, Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[1,13,27]</sup> 2) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
2	Aldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[1,9,23]</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>[10,23]</sup>

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
3	Antimony	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method <sup>[1,6,16]</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[1,6,15]</sup> 3) Digestion, Flame Atomic Absorption Spectrometric Method <sup>[7,16]</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup>
4	Arsenic	1) Waste Extraction, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>[1,6,17]</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[1,6,15]</sup> 3) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>[7,17]</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup>
5	Barium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[1,6,15]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup>
6	Beryllium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[1,6,15]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup>
7	Cadmium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method <sup>[1,6,16]</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[1,6,15]</sup> 3) Digestion, Flame Atomic Absorption Spectrometric Method <sup>[7,16]</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup>



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
8	Chlordane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[1,9,28]</sup> 2) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[10,28]</sup>
9	Chromium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method <sup>[1,6,16]</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[1,6,15]</sup> 3) Digestion, Flame Atomic Absorption Spectrometric Method <sup>[7,16]</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup>
10	Chromium (VI)	1) Waste Extraction, Colorimetric Method <sup>[1,18]</sup> 2) Alkaline Digestion, Colorimetric Method <sup>[8,18]</sup>
11	Cobalt	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method <sup>[1,6,16]</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[1,6,15]</sup> 3) Digestion, Flame Atomic Absorption Spectrometric Method <sup>[7,16]</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup>
12	Copper	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method <sup>[1,6,16]</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[1,6,15]</sup> 3) Digestion, Flame Atomic Absorption Spectrometric Method <sup>[7,16]</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup>

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
13	2,4-D	1) Waste Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[1,26]</sup> 2) Ultrasonic Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[26]</sup>
14	DDD	1) Waste Extraction, Separatory Funnel Liquid- Liquid Extraction, Gas Chromatographic Method <sup>[1,9,23]</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>[10,23]</sup>
15	DDE	1) Waste Extraction, Separatory Funnel Liquid- Liquid Extraction, Gas Chromatographic Method <sup>[1,9,23]</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>[10,23]</sup>
16	DDT	1) Waste Extraction, Separatory Funnel Liquid- Liquid Extraction, Gas Chromatographic Method <sup>[1,9,23]</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>[10,23]</sup>
17	Dieldrin	1) Waste Extraction, Separatory Funnel Liquid- Liquid Extraction, Gas Chromatographic Method <sup>[1,9,23]</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>[10,23]</sup>
18	Endrin	1) Waste Extraction, Separatory Funnel Liquid- Liquid Extraction, Gas Chromatographic Method <sup>[1,9,23]</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>[10,23]</sup>
19	Heptachlor	1) Waste Extraction, Separatory Funnel Liquid- Liquid Extraction, Gas Chromatographic Method <sup>[1,9,23]</sup>

2) Soxhlet Extraction...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
20	Kepone	2) Soxhlet Extraction, Gas Chromatographic Method <sup>[10,23]</sup> 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[1,9,28]</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[11,28]</sup>
21	Lead	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method <sup>[1,6,16]</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[1,6,15]</sup> 3) Digestion, Flame Atomic Absorption Spectrometric Method <sup>[7,16]</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup>
22	Lindane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[1,9,28]</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
23	Mercury	1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>[1,19]</sup> 2) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>[20]</sup>
24	Methoxychlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[1,9,23]</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>[10,23]</sup>
25	Mirex	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[1,9,28]</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>[10,23]</sup>



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
26	Molybdenum	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method <sup>[1,6,16]</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[1,6,15]</sup> 3) Digestion, Flame Atomic Absorption Spectrometric Method <sup>[7,16]</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup>
27	Nickel	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method <sup>[1,6,16]</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[1,6,15]</sup> 3) Digestion, Flame Atomic Absorption Spectrometric Method <sup>[7,16]</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup>
28	Polychlorinated Biphenyls - Aroclor 1016 - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[1,9,28]</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
29	Pentachlorophenol	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[1,9,28]</sup> 2) Soxhlet Extration, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
30	pH	Electrometric Method <sup>[32,33]</sup>

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
31	Selenium	1) Waste Extraction, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>[1,6,21]</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[1,6,15]</sup> 3) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>[7,21]</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup>
32	Silver	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method <sup>[1,6,16]</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[1,6,15]</sup> 3) Digestion, Flame Atomic Absorption Spectrometric Method <sup>[7,16]</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup>
33	Silvex	1) Waste Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[1,26]</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[26]</sup>
34	Thallium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[1,6,15]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup>
35	Toxaphene	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[1,9,28]</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
36	Trichloroethylene	1) Waste Extraction, Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[1,13,27]</sup> 2) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
37	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[1,6,15]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup>
38	Zinc	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method <sup>[1,6,16]</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[1,6,15]</sup> 3) Digestion, Flame Atomic Absorption Spectrometric Method <sup>[7,16]</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup>

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ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
2	Acetone	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
3	Aldrin	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
4	Anthracene	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
5	Antimony	1) Digestion, Flame Atomic Absorption Spectrometric Method <sup>[7,16]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup>



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
6	Arsenic	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>[7,17]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup>
7	Atrazine	Soxhlet Extraction, Gas Chromatographic Method <sup>[10,25]</sup>
8	Barium	Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup>
9	Benz(a)anthracene	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
10	Benzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
11	Benzo(b)fluoranthene	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
12	Benzo(k)fluoranthene	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
13	Benzoic acid	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
14	Benzo(a)pyrene	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
15	Benzo(g,h,i)perylene	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
16	Beryllium	Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup>
17	Bis(2-chloroethyl)ether	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
18	Bis(2-ethylhexyl)phthalate	Soxhlet Extraction, Gas Chromatographic Method <sup>[10,24]</sup>
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
20	Bromoform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
21	Butanol	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
22	Butyl benzyl phthalate	Soxhlet Extraction, Gas Chromatographic Method <sup>[10,24]</sup>
23	Cadmium	1) Digestion, Flame Atomic Absorption Spectrometric Method <sup>[7,16]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup>
24	Carbazole	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
25	Carbon disulfide	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
27	Chlordane	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
28	p-Chloroaniline	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
29	Chlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
30	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
31	Chloroform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
32	2-Chlorophenol	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
33	Chromium	1) Digestion, Flame Atomic Absorption Spectrometric Method <sup>[7,16]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup>
34	Chromium (III)	Digestion, Inductively Coupled Plasma Method; Alkaline Digestion Colorimetric Method; Calculation <sup>[7,8,15,18]</sup>

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
35	Chromium (VI)	Alkaline Digestion, Colorimetric Method <sup>[8,18]</sup>
36	Chrysene	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
37	Cyanide	Extraction, Distillation, Colorimetric Method <sup>[29,30,31]</sup>
38	2,4-D	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[26]</sup>
39	DDD	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
40	DDE	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
41	DDT	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
42	Dibenz(a,h)anthracene	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
43	Di-n-butyl phthalate	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
44	1,2-Dichlorobenzene	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
45	1,3-Dichlorobenzene	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
46	1,4-Dichlorobenzene	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
47	3,3'-Dichlorobenzidine	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
48	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
49	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
50	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
52	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
53	2,4-Dichlorophenol	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
54	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
56	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
57	Dieldrin	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
58	Diethyl phthalate	Soxhlet Extraction, Gas Chromatographic Method <sup>[10,24]</sup>
59	2,4-Dimethylphenol	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
60	2,4-Dinitrophenol	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
61	2,4-Dinitrotoluene	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
62	2,6-Dinitrotoluene	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
63	Di-n-Octyl phthalate	Soxhlet Extraction, Gas Chromatographic Method <sup>[10,24]</sup>
64	Endosulfan	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
65	Endrin	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
66	Ethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
67	Fluoranthene	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
68	Fluorene	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
69	Heptachlor	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
70	Heptachlor epoxide	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
71	Hexachlorobenzene	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
72	Hexachloro-1,3-butadiene	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
73	n-Hexane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
74	$\alpha$ -HCH	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
75	$\beta$ -HCH	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
76	$\gamma$ -HCH	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
77	Hexachlorocyclopentadiene	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
78	Hexachloroethane	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
79	Indeno(1,2,3-cd)pyrene	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
80	Isophorone	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
81	Lead	1) Digestion, Flame Atomic Absorption Spectrometric Method <sup>[7,16]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup>

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
82	Manganese	1) Digestion, Flame Atomic Absorption Spectrometric Method <sup>[7,16]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup>
83	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>[20]</sup>
84	Methanol	Equilibrium Headspace, Gas chromatographic Method <sup>[12,22]</sup>
85	Methoxychlor	Soxhlet Extraction, Gas Chromatographic Method <sup>[10,23]</sup>
86	Methyl bromide	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
87	Methylene chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
88	2-Methylphenol	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
89	2-Methylnaphthalene	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
90	Methyl tert-butyl ether	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
91	Naphthalene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
92	Nickel	1) Digestion, Flame Atomic Absorption Spectrometric Method <sup>[7,16]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup>
93	Nitrobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
94	N-Nitrosodiphenylamine	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
95	N-Nitrosodi-n-propylamine	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
96	Polychlorinated Biphenyls - Aroclor 1016 - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
97	Pentachlorophenol	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
98	Phenanthrene	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
99	Phenol	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
100	Pyrene	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
101	Selenium	Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>[7,21]</sup>
102	Silver	Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup>
103	Styrene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
104	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
105	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
106	Toluene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
107	Toxaphene	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
108	TPH (C <sub>5</sub> -C <sub>8</sub> )	Purge and Trap, Gas Chromatographic Method <sup>[14,22]</sup>

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
109	TPH (C <sub>8</sub> -C <sub>16</sub> )	Soxhlet Extraction, Gas Chromatographic Method <sup>[10,22]</sup>
110	TPH (C <sub>16</sub> -C <sub>35</sub> )	Soxhlet Extraction, Gas Chromatographic Method <sup>[10,22]</sup>
111	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
112	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
113	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
114	Trichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
115	2,4,5-Trichlorophenol	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
116	2,4,6-Trichlorophenol	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[10,28]</sup>
117	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
118	Vanadium	Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup>
119	Vinyl acetate	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
120	Vinyl chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
121	m-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
122	o-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
123	p-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>
124	Xylene (Total)	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[14,27]</sup>



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
125	Zinc	1) Digestion, Flame Atomic Absorption Spectrometric Method <sup>[7,16]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup>

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