

ภาคผนวก จ

ใบรับรองการสอบเทียบเครื่องมือ



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right partner.

รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Ambient	Toluene	GC-MSD	RYG_EN0136	5-Jan-24	4-Jul-25	18
Ambient	Formaldehyde	Field Rotameter	BKK_FS1006	4-Jan-24	4-Apr-24	3
Ambient	Formaldehyde	Field Rotameter	RYG_FS0657	4-Jan-24	4-Apr-24	3
Ambient	Formaldehyde	Field Rotameter	RYG_FS0199	1-Apr-24	1-Jul-24	3
Ambient	Formaldehyde	Field Rotameter	RYG_FS0654	1-Apr-24	1-Jul-24	3
Ambient	Formaldehyde	GC-FID	BKK_EN0126	21-Apr-23	21-Oct-24	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	RYG_FS0328	18-Aug-23	18-Feb-25	18
Stack	Formaldehyde	Pitot Tube	BKK_FS0560	8-Jan-24	8-Jul-24	6
Stack	Formaldehyde	Flue gas Analyzer	RYG_FS0565	13-Nov-23	12-Nov-24	12
Stack	Formaldehyde	Field Rotameter	RYG_FS0198	1-Apr-24	1-Jul-24	3
Stack	Formaldehyde	Field Rotameter	RYG_FS0658	1-Apr-24	1-Jul-24	3
Stack	Formaldehyde	GC-FID	BKK_EN0126	21-Apr-23	21-Oct-24	18
Noise	Leq 24 hrs	Sound Calibrator	RYG_FS0496	26-Jan-24	25-Jan-25	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0030	25-Jan-24	24-Jan-25	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0031	10-Aug-23	10-Aug-24	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0301	12-Jan-24	11-Jan-25	12
Workplace	Formaldehyde	Field Rotameter	BKK_FS1006	4-Jan-24	4-Apr-24	3
Workplace	Formaldehyde	Field Rotameter	RYG_FS0654	1-Apr-24	1-Jul-24	3
Workplace	Formaldehyde	GC-FID	BKK_EN0126	21-Apr-23	21-Oct-24	18
Workplace	Toluene	Field Rotameter	BKK_FS1006	4-Jan-24	4-Apr-24	3
Workplace	Toluene	Field Rotameter	RYG_FS0654	1-Apr-24	1-Jul-24	3
Workplace	Toluene	GC-MSD	BKK_EN0119	18-Apr-23	18-Oct-24	18
Noise	Leq 12 hrs	Sound Calibrator	RYG_FS0215	20-Sep-23	20-Sep-24	12
Noise	Leq 12 hrs	Sound Level Meter	RYG_FS0026	25-Jan-24	24-Jan-25	12
Noise	Leq 12 hrs	Sound Level Meter	RYG_FS0027	22-Jan-24	21-Jan-25	12
Noise	Noise Dose, TWA	Dose Badge Reader	RYG_FS0440	29-Jan-24	28-Jan-25	12
Rayong Lab	Formaldehyde	SPECTROPHOTOMETER	RYG_EN0037	18-Sep-23	18-Mar-25	18
Rayong Lab	pH at 25 °C	pH Meter	RYG_EN0152	14-Dec-23	14-Dec-24	12
Rayong Lab	BOD	DO meter with Sensor	RYG_EN0032	24-Jul-23	24-Jan-25	18
Rayong Lab	BOD	Incubator	RYG_EN0154	29-May-23	29-Nov-24	18
Rayong Lab	COD	Spectrophotometer	RYG_EN0037	18-Sep-23	18-Mar-25	18
Rayong Lab	Total Suspended Solids	Electronic Balance	RYG_EN0002	22-Feb-24	22-Feb-25	12
Rayong Lab	Total Suspended Solids	Hot Air Oven	RYG_EN0010	21-Mar-24	21-Sep-25	18
Rayong Lab	Total Dissolved Solids 180°C	Electronic Balance	RYG_EN0002	22-Feb-24	22-Feb-25	12
Rayong Lab	Total Dissolved Solids 180°C	Hot Air Oven	RYG_EN0010	21-Mar-24	21-Sep-25	18
Rayong Lab	Oil & Grease	Electronic Balance	RYG_EN0002	22-Feb-24	22-Feb-25	12
Rayong Lab	Oil & Grease	Hot Air Oven	RYG_EN0213	21-Mar-24	21-Mar-25	12
Rayong Lab	Oil & Grease	Water Bath	RYG_EN0061	21-Mar-24	21-Sep-25	18
Rayong Lab	Total Kjeldahl Nitrogen	Block Digestion Unit	RYG_EN0188	15-Mar-23	11-Sep-25	15
Rayong Lab	Total Kjeldahl Nitrogen	pH Meter	RYG_EN0152	14-Dec-23	14-Dec-24	12

Certificate of System Qualification

GC-OQ + GCMS-OQ

System ID: RYG_EN0136
Organization Name: ALS Laboratory Group (Thailand) Co Ltd.
Organization Location: 618/10 Moo 5, Tambol Mae Nam Koo, A.Phuakdaeng, Rayong, 21140, Thailand
Date: July 7, 2022 11:27:53 AM
EQP Name: Agilent/Recommended, Agilent/Recommended
EQP Revision: GC.02.52, GCMS.02.52
Overall Qualification Status: Pass

REVIEW BY: *M. Bannix*
APPROVED BY: *D. [Signature]*
NEXT CAL. DATE: 09/01/24

CDS Logon Verification - GC

Logon: dej.changchon

Overall CDS Logon Verification - GC Test 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 Accuracy

Name: 7890

Front SSL

Setpoint Status: Pass

Setpoint Actual
Inlet Pressure: 25.0 psi 25.1 psi
Accuracy: 0.1 psi
Agilent Recommended: <= 1.2

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Overall Inlet Pressure 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 99.9 °C

Accuracy: -0.1 °C

Agilent Recommended: >= -1.0 % setpoint in K (-3.7 °C)
<= 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 99.91667 °C

Stability: 0.1 °C

Agilent Recommended: <= 0.5

Overall GC Oven Temperature Stability Test Status

Pass

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Log Amp

Tested Combination1 Front SSL / External SQ

Name: 5977B

Setpoint Status: Pass

Overall Log Amp Test Status

Pass

RFPA

Tested Combination1 Front SSL / External SQ

Name: 5977B

Setpoint Status: Pass

Amu: 1050 m/z

Drift After Five Minutes:

-1 mV

RFPA Voltage:

479 mV

Agilent Recommended: >= -100 and <= 100

<= 1100

Overall RFPA Test Status

Pass

Tune EI

Tested Combination1 Front SSL / External SQ

Name: 5977B

Setpoint Status: Pass

Filament: 1

Setpoint Status: Pass

Filament: 2

Overall Tune EI Test Status

Pass

Signal to Noise EI

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Tested Combination1 Front SSL / External SQ

Name: 5977B

Source: EI - Extractor Filament: 1

Setpoint Status: Pass

Signal to Noise: 7485

Agilent Recommended: >= 1200

Source: EI - Extractor Filament: 2

Setpoint Status: Pass

Signal to Noise: 2097

Agilent Recommended: >= 1200

This test's 2 comment(s) and 7 deviation(s) are available in the Attachments section.

Overall Signal to Noise EI Test Status

Pass

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Instrument Details

Purpose

This section describes the as found system configuration

Details

System

System ID	RYG_EN0126
Manufacturer	Agilent Technologies
Name	7890
Flow Data Input	Manual Data
Temperature Data Input	Manual Data or Other Data Logging

Tested Combination1

Injection Technique	Manual Injection
Inlet	Front
Detector	External
LTM Included?	No

Sampler 1

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

Membrane 1

Manufacturer	Agilent Technologies
Name	7890
Model Number	G3442B
Serial Number	CN16463238
Firmware Revision	B.02.04.3
Component ID/Asset No.	081117000238
Oven Type	Standard

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inlet 1

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

Detector 1

Manufacturer	Agilent Technologies
Name	Mass Spectrometer
Type	Mass Spectrometer
Location	External

Mass Spectrometer 1

Manufacturer	Agilent Technologies
Type	SQ
Name	5977B
Serial Number	US1701M068
Firmware Revision	5977 6.00.04
High Vacuum System	Turbo Pump
Scouting Run Standard	OFN Std
Component ID/Asset No.	0B1177000236

MS E| Source 1

Manufacturer	Agilent Technologies
Source Type	El - Extractor
Number of flammors	2

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Electronic Signature

Purpose

This signature page was created and published because the ACE sign-off action was executed, which is valid for the entire document, including attachments. The ACE sign-off is an electronic signature that requires two distinct identification components: unique username and personal password. The Agilent representative who has delivered this service understands the meaning and legal status of an electronic signature. As a trained official operator, the Agilent representative has a unique password and login to access ACE and electronically sign this document. (Other e-signatures can be applied to this document using a Document Content Management or other suitable method defined in your data access and control procedures.)

Details

Full Name of Signer:	Eaknarin Puangsoa
Logged On User Name:	eaknarin_puangsoa@agileint.com
Signature Creation Date:	July 7, 2022
Reason for Signature:	Executed protocol and published this original version of document

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Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
July 6, 2022 1:11:54 PM	Auth	Session Created	Session	None
July 6, 2022 1:11:54 PM	Start	Configuration	Session	None
July 6, 2022 1:11:54 PM	Auth	Enrollment	Libertek	User is Nonpaying and does not require an unlock code
July 6, 2022 1:17:19 PM	Auth	Exp/Loaded	Session	<p>EDP details for primary technique (Gd) -</p> <p>File path: [Protocol\Halo\Co\Conf\Gms\G2\S2\Gg\G2.S2.exp]</p> <p>EDP File Name: [Gc\G2.S2.exp], EDP Name: [AgentRecommendat]</p> <p>EDP details for hybridated technique (GCM) -</p> <p>File path: [Protocol\Halo\Gd\Co\Conf\Gms\G2\S2\Gg\G2.S2.exp], EDP File Name: [GCM\G2.S2.exp], EDP Name: [AgentRecommendat]</p>
July 6, 2022 1:17:23 PM	End	Configuration	Session	None
July 6, 2022 1:17:29 PM	Start	Qualification	Session	DD
July 6, 2022 1:17:30 PM	Start	Execution	CD3 Logon Verification - GC	None - Qualitative test
July 6, 2022 1:18:43 PM	End	Execution	CD3 Logon Verification - GC	Test Chart : 1 - Qualitative test
July 6, 2022 1:18:59 PM	Start	Execution	System Inspection and Basic Safety and Operation - PESD	None Qualitative Test - No subtests executed

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User Name: sakmarin_puangsept
 Username: ASRYGW7002
 System ID: RYG_EN0136
 Print Date: July 7, 2022 11:27:56 AM

ALS_RYG_EN0136 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
July 6, 2022 1:19:39 PM	End	Execution	System Inspection and Basic Safety and Qualities - T850 - Qualitative Test - No setpoints associated	Run Count: 1
July 6, 2022 1:20:15 PM	Start	Execution	Int Pressure Accuracy - Front, SBL - Pressure Controlled Inlet - S: 25.0 psi - L: ± 1.2 psi	None
July 6, 2022 1:21:43 PM	End	Execution	Int Pressure Accuracy - Front, SBL - Pressure Controlled Inlet - S: 25.0 psi - L: ± 1.2 psi	Run Count: 1
July 6, 2022 1:21:45 PM	Start	Execution	GC Oven Temperature Accuracy - T950 - Temperature : Oven - S: 230.0°C - L: ± 1.0 AND ± 1.0 % setpoint in K	None
July 6, 2022 1:23:12 PM	Auto	Data	GC Oven Temperature Accuracy - T950 - Temperature : Oven - S: 230.0°C - L: ± 1.0 AND ± 1.0 % setpoint in K	Manual Data Entry
July 6, 2022 1:25:15 PM	End	Execution	GC Oven Temperature Accuracy - T950 - Temperature : Oven - S: 230.0°C - L: ± 1.0 AND ± 1.0 % setpoint in K	Run Count: 1
July 6, 2022 1:29:17 PM	Start	Execution	GC Oven Temperature Accuracy - T950 - Temperature : Oven - S: 100.0°C - L: ± 1.0 AND ± 1.0 % setpoint in K	None
July 6, 2022 1:29:32 PM	Start	Execution	GC Oven Temperature Accuracy - T950 - Temperature : Oven - S: 100.0°C - L: ± 1.0 AND ± 1.0 % setpoint in K	None
July 6, 2022 1:33:42 PM	Auto	Data	GC Oven Temperature Accuracy - T950 - Temperature : Oven - S: 100.0°C - L: ± 1.0 AND ± 1.0 % setpoint in K	Manual Data Entry

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User Name: sakmarin_puangsept
 Username: ASRYGW7002
 System ID: RYG_EN0136
 Print Date: July 7, 2022 11:27:56 AM

ALS_RYG_EN0136 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
July 6, 2022 1:35:43 PM	End	Execution	GC Oven Temperature Accuracy - T950 - Temperature : Oven - S: 100.0°C - L: ± 1.0 AND ± 1.0 % setpoint in K	Run Count: 1
July 6, 2022 1:35:45 PM	Start	Execution	GC Oven Temperature Stability - T950 - Temperature : Oven - S: 100.0°C - L: ± 0.5 °C	None
July 6, 2022 1:53:05 PM	Auto	Data	GC Oven Temperature Stability - T950 - Temperature : Oven - S: 100.0°C - L: ± 0.5 °C	Manual Data Entry
July 6, 2022 1:53:07 PM	End	Execution	GC Oven Temperature Stability - T950 - Temperature : Oven - S: 100.0°C - L: ± 0.5 °C	Run Count: 1
July 6, 2022 1:53:11 PM	Start	Execution	Log Amp - 5977B SQ - Source: EI - Extractor	None
July 6, 2022 1:57:10 PM	End	Execution	Log Amp - 5977B SQ - Source: EI - Extractor	Run Count: 1
July 6, 2022 1:57:24 PM	Start	Execution	RPPA - 5977B SQ - Source: EI - Extractor	None
July 6, 2022 2:09:24 PM	End	Execution	RPPA - 5977B SQ - Source: EI - Extractor	Run Count: 1
July 6, 2022 2:09:28 PM	Start	Execution	Tune EI - 5977B SQ - Source: EI - Extractor Filament 1 (Qualitative - No setpoints associated)	None
July 6, 2022 2:24:45 PM	End	Qualification	Session	QC
July 6, 2022 2:24:45 PM	Start	Reporting	Session	None
July 6, 2022 2:41:09 PM	End	Reporting	Session	None
July 6, 2022 2:41:28 PM	Start	Configuration	Session	None
July 6, 2022 2:41:40 PM	End	Configuration	Session	None

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User Name: sakmarin_puangsept
 Username: ASRYGW7002
 System ID: RYG_EN0136
 Print Date: July 7, 2022 11:27:56 AM

ALS_RYG_EN0136 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
July 6, 2022 2:41:40 PM	Start	Qualification	Session	QC
July 6, 2022 2:41:40 PM	Start	Execution	Tune EI - 5977B SQ - Source: EI - Extractor Filament 1 (Qualitative - No setpoints associated)	None
July 6, 2022 2:41:58 PM	End	Execution	Tune EI - 5977B SQ - Source: EI - Extractor Filament 1 (Qualitative - No setpoints associated)	Run Count: 1
July 6, 2022 2:41:58 PM	Start	Execution	Tune EI - 5977B SQ - Source: EI - Extractor Filament 2 (Qualitative - No setpoints associated)	None
July 6, 2022 2:42:45 PM	End	Qualification	Session	QC
July 6, 2022 2:42:48 PM	Start	Reporting	Session	None
July 6, 2022 2:50:55 PM	End	Reporting	Session	None
July 6, 2022 2:50:52 PM	Start	Qualification	Session	QC
July 6, 2022 2:50:52 PM	Start	Execution	Tune EI - 5977B SQ - Source: EI - Extractor Filament 2 (Qualitative - No setpoints associated)	None
July 6, 2022 2:51:12 PM	End	Qualification	Session	QC
July 6, 2022 2:51:12 PM	Start	Reporting	Session	None
July 6, 2022 2:55:28 PM	End	Reporting	Session	None
July 6, 2022 2:55:28 PM	Start	Qualification	Session	QC
July 6, 2022 2:55:29 PM	Start	Execution	Tune EI - 5977B SQ - Source: EI - Extractor Filament 2 (Qualitative - No setpoints associated)	None

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User Name: sakmarin_puangsept
 Username: ASRYGW7002
 System ID: RYG_EN0136
 Print Date: July 7, 2022 11:27:56 AM

ALS_RYG_EN0136 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
July 6, 2022 2:55:40 PM	End	Execution	Tune EI - 5977B SQ - Source: EI - Extractor Filament 2 (Qualitative - No setpoints associated)	Run Count: 1
July 6, 2022 2:56:45 PM	Start	Execution	Signal to Noise EI - Liquid Injection, Front SBL, SQ - Source: EI - Extractor using Filament 1 - L: ± 1200	None
July 6, 2022 3:21:52 PM	End	Qualification	Session	QC
July 6, 2022 3:21:52 PM	Start	Reporting	Session	None
July 6, 2022 3:25:04 PM	End	Reporting	Session	None
July 6, 2022 3:25:04 PM	Start	Qualification	Session	QC
July 6, 2022 3:25:04 PM	Start	Execution	Signal to Noise EI - Liquid Injection, Front SBL, SQ - Source: EI - Extractor using Filament 1 - L: ± 1200	None
July 6, 2022 4:00:40 PM	Auto	Acquisition	Session	None
July 7, 2022 9:13:47 AM	Auto	Acquisition	Session	None
July 7, 2022 9:13:49 AM	Auto	Acquisition	Session	None
July 7, 2022 9:15:54 AM	Start	Qualification	Session	QC
July 7, 2022 9:15:54 AM	Start	Execution	Signal to Noise EI - Liquid Injection, Front SBL, SQ - Source: EI - Extractor using Filament 1 - L: ± 1200	None
July 7, 2022 9:55:06 AM	Auto	Data	Signal to Noise EI - Liquid Injection, Front SBL, SQ - Source: EI - Extractor using Filament 1 - L: ± 1200	Data file Path: D:\QC\2022\CHN_IN\F01.D

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User Name: eskmurin_puanggsapo
Hostname: ASRYGW7052
System ID: RYG_EN0136
Print Date: July 7, 2022 11:27:58 AM

ALS_RYG_EN0136 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
July 7, 2022 9:09:53 AM	End	Execution	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 1 - L = 1200	Run Count: 1
July 7, 2022 10:01:46 AM	Awake	TestUnlocked	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 1 - L = 1200	Deviation Used for Run Count: 1
July 7, 2022 10:01:45 AM	Start	Execution	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 1 - L = 1200	None
July 7, 2022 10:02:00 AM	Awake	Data	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 1 - L = 1200	Data File Path: D:\Q02022\OPEN_SH_F01.D
July 7, 2022 10:04:56 AM	End	Execution	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 1 - L = 1200	Run Count: 2
July 7, 2022 10:07:50 AM	Awake	TestUnlocked	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 1 - L = 1200	Deviation Used for Run Count: 3
July 7, 2022 10:07:50 AM	Start	Execution	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 1 - L = 1200	None
July 7, 2022 10:07:56 AM	Awake	Data	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 1 - L = 1200	Data File Path: D:\Q02022\OPEN_SH_F01.D

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System ID: RYG_EN0136

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User Name: eskmurin_puanggsapo
Hostname: ASRYGW7052
System ID: RYG_EN0136
Print Date: July 7, 2022 11:27:58 AM

ALS_RYG_EN0136 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
July 7, 2022 10:05:18 AM	End	Execution	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 1 - L = 1200	Run Count: 3
July 7, 2022 10:10:26 AM	Awake	TestUnlocked	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 1 - L = 1200	Deviation Used for Run Count: 3
July 7, 2022 10:10:28 AM	Start	Execution	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 1 - L = 1200	None
July 7, 2022 10:10:58 AM	Awake	Data	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 1 - L = 1200	Data File Path: D:\Q02022\OPEN_SH_F01.D
July 7, 2022 10:14:03 AM	End	Execution	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 1 - L = 1200	Run Count: 4
July 7, 2022 10:14:56 AM	Awake	TestUnlocked	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 1 - L = 1200	Deviation Used for Run Count: 4
July 7, 2022 10:14:54 AM	Start	Execution	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 1 - L = 1200	None
July 7, 2022 10:15:15 AM	Awake	Data	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 1 - L = 1200	Data File Path: D:\Q02022\OPEN_SH_F01.D

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Date: July 7, 2022 11:27:53 AM
System ID: RYG_EN0136

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User Name: eskmurin_puanggsapo
Hostname: ASRYGW7052
System ID: RYG_EN0136
Print Date: July 7, 2022 11:27:58 AM

ALS_RYG_EN0136 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
July 7, 2022 10:10:27 AM	End	Execution	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 1 - L = 1200	Run Count: 5
July 7, 2022 10:18:46 AM	Awake	TestUnlocked	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 1 - L = 1200	Deviation Used for Run Count: 5
July 7, 2022 10:18:48 AM	Start	Execution	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 1 - L = 1200	None
July 7, 2022 10:17:05 AM	Awake	Data	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 1 - L = 1200	Data File Path: D:\Q02022\OPEN_SH_F01.D
July 7, 2022 10:17:14 AM	Start	Execution	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 1 - L = 1200	Run Count: 6
July 7, 2022 10:18:49 AM	End	Qualification	Session	QC
July 7, 2022 10:18:46 AM	Start	Reporting	Session	None
July 7, 2022 10:21:10 AM	End	Reporting	Session	None
July 7, 2022 10:21:10 AM	Start	Qualification	Session	QC
July 7, 2022 10:21:17 AM	Start	Execution	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 2 - L = 1200	None
July 7, 2022 10:08:49 AM	End	Qualification	Session	QC
July 7, 2022 10:08:49 AM	Start	Reporting	Session	None
July 7, 2022 10:07:58 AM	End	Reporting	Session	None

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Date: July 7, 2022 11:27:53 AM
System ID: RYG_EN0136

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User Name: eskmurin_puanggsapo
Hostname: ASRYGW7052
System ID: RYG_EN0136
Print Date: July 7, 2022 11:27:58 AM

ALS_RYG_EN0136 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
July 7, 2022 10:57:38 AM	Start	Qualification	Session	QC
July 7, 2022 10:57:38 AM	Start	Execution	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 2 - L = 1200	None
July 7, 2022 11:09:50 AM	Awake	Data	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 2 - L = 1200	Data File Path: D:\Q02022\OPEN_SH_F01.D
July 7, 2022 11:13:47 AM	Start	Execution	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 2 - L = 1200	None
July 7, 2022 11:15:18 AM	End	Execution	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 2 - L = 1200	Run Count: 7
July 7, 2022 11:14:29 AM	Awake	TestUnlocked	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 2 - L = 1200	Deviation Used for Run Count: 1
July 7, 2022 11:14:29 AM	Start	Execution	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 2 - L = 1200	None
July 7, 2022 11:14:47 AM	Awake	Data	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 2 - L = 1200	Data File Path: D:\Q02022\OPEN_SH_F01.D
July 7, 2022 11:18:34 AM	End	Execution	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 2 - L = 1200	Run Count: 8

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Date: July 7, 2022 11:27:53 AM
System ID: RYG_EN0136

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User Name: notmale_pumpkapa
Hostname: ASRYGW7022System ID: RYG_EN0136
Print Date: July 7, 2022 11:27:58 AM

ALS_RYG_EN0136 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
July 7, 2022 11:19:58 AM	Auto	Test/Discover	Signal to Helix EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 2 - L=+ 1200	Deviation (Std for Run Check) -2
July 7, 2022 11:19:58 AM	Start	Execution	Signal to Helix EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 2 - L=+ 1200	None
July 7, 2022 11:20:13 AM	Auto	Data	Signal to Helix EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 2 - L=+ 1200	Data File Path: O:\Q3022\QFN_SH\J071.D
July 7, 2022 11:21:02 AM	SW	Discover	Signal to Helix EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 2 - L=+ 1200	Run Count: 3
July 7, 2022 11:22:48 AM	End	Qualification	Signal to Helix EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 2 - L=+ 1200	CQ
July 7, 2022 11:22:48 AM	Start	Reporting	Signal to Helix EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 2 - L=+ 1200	None
July 7, 2022 11:26:46 AM	Auto	Reporting	Signal to Helix EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 2 - L=+ 1200	Report Generated Certificate

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Date: July 7, 2022 11:27:58 AM
System ID: RYG_EN0136

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Certificate of System Qualification

GC-OQ + GCMS-OQ

System ID: RYG_EN0136
Organization Name: ALS Laboratory Group (Thailand) Co.Ltd.
Organization Location: 616/10, Moo 5, Tambol Mae Nam Khu, Phrak Daeng, Rayong, 21140, ThailandDate: January 5, 2024 10:53:24 AM
EQP Name: AgilentRecommended, AgilentRecommended
EQP Revision: GC.02.54, GCMS.02.54
Overall Qualification Status: PassREVIEW BY: Chonticha
APPROVED BY: [Signature]
NEXT CAL DATE: 11/07/2025

CDS Logon Verification - GC

Logon: chonticha.khunkaew

Overall CDS Logon Verification - GC Test 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 Accuracy

Name: 7890
Front: SSL

Setpoint Status: Pass

Setpoint: 25.0 psi Actual: 25 psi

Inlet Pressure: 25.0 psi Accuracy: 0.0 psi

Agilent Recommended: <= 1.2

Date: January 5, 2024 10:53:24 AM
System ID: RYG_EN0136

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Overall Inlet Pressure Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name: 7890
Setpoint Status: Pass
Zone: Oven
Setpoint/Actual
Temperature: 230.0 229 °C
Accuracy: -1.0 °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: 100.0 100.8 °C
Accuracy: 0.8 °C
Agilent Recommended: >= -1.0 % setpoint in K (-3.7 °C)
<= 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: 100.0 100.8167 °C
Stability: 0.1 °C
Agilent Recommended: <= 0.5

Overall GC Oven Temperature Stability Test Status

Pass

Date: January 5, 2024 10:53:24 AM
System ID: RYG_EN0136

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Log Amp

Tested Combination1 Front SSL / External SQ

Name: 5977B

Setpoint Status: Pass

Overall Log Amp Test Status

Pass

RFPA

Tested Combination1 Front SSL / External SQ

Name: 5977B

Setpoint Status: Pass

Amu: 1050 m/z Drift After Five Minutes: 8 mV RFPA Voltage: 509 mV
Agilent Recommended: >= -100 and <= 100 <= 1100

Overall RFPA Test Status

Pass

Tune EI

Tested Combination1 Front SSL / External SQ

Name: 5977B

Setpoint Status: Pass

Filament: 1

Setpoint Status: Pass

Filament: 2

Overall Tune EI Test Status

Pass

Scouting Run

Date: January 5, 2024 10:53:24 AM
System ID: RYG_EN0136

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Tested Combination1 Front SSL / External SQ
Name: Manual Injection
Source: EI - Extractor

Setpoint Status: Completed
Injection Volume on Column: 1.0 μ L

Overall Scouting Run Status
Completed

Signal to Noise EI

Tested Combination1 Front SSL / External SQ
Name: 5977B

Source: EI - Extractor Filament: 1

Setpoint Status: Pass

Signal to Noise: 5113
Agilent Recommended: $>=$ 1200

Source: EI - Extractor Filament: 2

Setpoint Status: Pass

Signal to Noise: 4456
Agilent Recommended: $>=$ 1200

Overall Signal to Noise EI Test Status

Pass

NOTE: This test's 2 comment(s) and 3 deviation(s) are available in the Attachments section.

Date: January 5, 2024 10:53:24 AM
System ID: RYG_EN0136

Instrument Details

Purpose

This section describes the as found system configuration.

Details

System

System ID: RYG_EN0136
Manufacturer: Agilent Technologies
Name: 7890
Flow Data Input: Manual Data
Temperature Data Input: Manual Data or Other Data Logging

Tested Combination1

Injection Technique: Manual Injection
Inlet: Front
Detector: External
LTM Included?: No

Sampler 1

Manufacturer: Agilent Technologies
Type: Manual Injection
Usage: Sample Injection
Syringe Volume (μ L): 19

Mainframe 1

Manufacturer: Agilent Technologies
Name: 7890
Model Number: G3442B
Serial Number: CN16463238
Firmware Revision: B.02.04.3
Component ID/Asset No.: 061117000235
Oven Type: Standard

Date: January 5, 2024 10:53:24 AM
System ID: RYG_EN0136

Inlet 1

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

Detector 1

Manufacturer: Agilent Technologies
Name: Mass Spectrometer
Type: Mass Spectrometer
Location: External

Mass Spectrometer 1

Manufacturer: Agilent Technologies
Type: SQ
Name: 5977B
Model Number: G7077B
Serial Number: US1101M008
Firmware Revision: 5977 6.00.34
High Vacuum System: Turbo Pump
Scouting Run Standard: OFN Std
Component ID/Asset No.: 061117000236

MS EI Source 1

Manufacturer: Agilent Technologies
Source Type: EI - Extractor
Number of Filaments: 2

Date: January 5, 2024 10:53:24 AM
System ID: RYG_EN0136

Electronic Signature

Purpose

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Details

Full Name of Signer: Eakmarin Puangsopa
Logged On User Name: eakmarin_puangsope@agilent.com
Signature Creation Date: January 5, 2024
Reason for Signature: Executed protocol and published this original version of document

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Date: January 5, 2024 10:53:24 AM
System ID: RYG_EN0136

User Name: sakshini_jain@agilent.com
Report Generated by: sakshini_jain@agilent.com
System ID: RYO_EN0136
Print Date: January 5, 2024 10:53:24 AM

ALS_OQ_RYO_EN0136 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
January 4, 2024 10:37:51 AM	Start	Simplex/Control	Session	None
January 4, 2024 10:37:51 AM	Start	Configuration	Session	None
January 4, 2024 10:37:51 AM	Start	Endurance	Learning	User is Field Engineer and does not require an unlock code
January 4, 2024 10:39:29 AM	Start	Explosion	Session	SDP details for primary technique (GC) - File path: (P:\Process\Photo\GC\Config\Initial\SDP\GC_32_Maps) SDP File Name: (GC_32_54_Aggs) SDP Name: (AgilentRecommended) Physical Revision: (GC_02_34) SDP details for hypercooled technique (GCMS) - File path: (P:\Process\Photo\GCMS\Config\Initial\SDP\GCMS_62_54_Aggs) SDP File Name: (GCMS_62_54_Aggs) SDP Name: (AgilentRecommended)
January 4, 2024 10:39:40 AM	End	Configuration	Session	None
January 4, 2024 10:39:44 AM	Start	Qualification	Session	OG
January 4, 2024 10:39:44 AM	Start	Execution	GCs Logon Verification - GC - F800 - Qualitative test	None
January 4, 2024 10:40:00 AM	End	Execution	GCs Logon Verification - GC - F800 - Qualitative test	Run Count: 1

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Date: January 5, 2024 10:53:24 AM
System ID: RYO_EN0136

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User Name: sakshini_jain@agilent.com
Report Generated by: sakshini_jain@agilent.com
System ID: RYO_EN0136
Print Date: January 5, 2024 10:53:24 AM

ALS_OQ_RYO_EN0136 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
January 4, 2024 10:40:08 AM	Start	Execution	System Inspection and Basic Safety and Operation - F800 - Qualitative Test - No supports associated	None
January 4, 2024 10:41:16 AM	End	Execution	System Inspection and Basic Safety and Operation - F800 - Qualitative Test - No supports associated	Run Count: 1
January 4, 2024 10:48:22 AM	Start	Execution	Real Pressure Accuracy - Front SGL - Pressure Controlled Test - S: 25.0 psi - L: <= 1.2 psi	None
January 4, 2024 10:49:52 AM	End	Execution	Real Pressure Accuracy - Front SGL - Pressure Controlled Test - S: 25.0 psi - L: <= 1.2 psi	Run Count: 1
January 4, 2024 10:49:54 AM	Start	Execution	GC Oven Temperature - Accuracy - F800 - Temperature - Oven - S: 230.0°C - L: <= +1.0 AND <= 1.0 % repeat in K	None
January 4, 2024 10:51:09 AM	Start	Data	GC Oven Temperature - Accuracy - F800 - Temperature - Oven - S: 230.0°C - L: <= +1.0 AND <= 1.0 % repeat in K	Manual Data Entry
January 4, 2024 10:51:28 AM	End	Execution	GC Oven Temperature - Accuracy - F800 - Temperature - Oven - S: 230.0°C - L: <= +1.0 AND <= 1.0 % repeat in K	Run Count: 1
January 4, 2024 10:51:43 AM	Start	Execution	GC Oven Temperature - Accuracy - F800 - Temperature - Oven - S: 100.0°C - L: <= +1.0 AND <= 1.0 % repeat in K	None
January 4, 2024 10:58:45 AM	Start	Data	GC Oven Temperature - Accuracy - F800 - Temperature - Oven - S: 100.0°C - L: <= +1.0 AND <= 1.0 % repeat in K	Manual Data Entry

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Date: January 5, 2024 10:53:24 AM
System ID: RYO_EN0136

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User Name: sakshini_jain@agilent.com
Report Generated by: sakshini_jain@agilent.com
System ID: RYO_EN0136
Print Date: January 5, 2024 10:53:24 AM

ALS_OQ_RYO_EN0136 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
January 4, 2024 10:59:46 AM	End	Execution	GC Oven Temperature - Accuracy - F800 - Temperature - Oven - S: 100.0°C - L: <= +1.0 AND <= 1.0 % repeat in K	Run Count: 1
January 4, 2024 10:59:59 AM	Start	Execution	GC Oven Temperature Stability - F800 - Temperature - Oven - S: 100.0°C - L: <= 0.5°C	None
January 4, 2024 11:03:26 AM	Start	Data	GC Oven Temperature Stability - F800 - Temperature - Oven - S: 100.0°C - L: <= 0.5°C	Manual Data Entry
January 4, 2024 11:03:29 AM	End	Execution	GC Oven Temperature Stability - F800 - Temperature - Oven - S: 100.0°C - L: <= 0.5°C	Run Count: 1
January 4, 2024 11:23:35 AM	Start	Execution	Loop Amp - 5977B SQ - Source: None - E1 - Extractor	None
January 4, 2024 11:43:25 AM	End	Execution	Loop Amp - 5977B SQ - Source: None - E1 - Extractor	Run Count: 1
January 4, 2024 11:43:26 AM	Start	Execution	RPFA - 5977B SQ - Source: E1 - Extractor	None
January 5, 2024 11:51:21 AM	End	Execution	RPFA - 5977B SQ - Source: E1 - Extractor	Run Count: 1
January 4, 2024 11:53:26 AM	Start	Execution	Tune E1 - 5977B SQ - Source: None - E1 - Extractor Flamed 1 (Qualitative - No supports associated)	None
January 4, 2024 1:37:26 PM	End	Execution	Tune E1 - 5977B SQ - Source: None - E1 - Extractor Flamed 1 (Qualitative - No supports associated)	Run Count: 1
January 4, 2024 1:37:29 PM	Start	Execution	Tune E1 - 5977B SQ - Source: None - E1 - Extractor Flamed 2 (Qualitative - No supports associated)	None

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Date: January 5, 2024 10:53:24 AM
System ID: RYO_EN0136

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User Name: sakshini_jain@agilent.com
Report Generated by: sakshini_jain@agilent.com
System ID: RYO_EN0136
Print Date: January 5, 2024 10:53:24 AM

ALS_OQ_RYO_EN0136 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
January 4, 2024 1:48:59 PM	End	Execution	Tune E1 - 5977B SQ - Source: None - E1 - Extractor Flamed 2 (Qualitative - No supports associated)	Run Count: 1
January 4, 2024 1:49:02 PM	Start	Execution	Scouting Run - Manual Injection, Front SGL SQ - Source: E1 - Extractor Part of GCMS System Preparation	None
January 4, 2024 2:00:05 PM	Start	Acquisition	Session	None
January 5, 2024 6:28:16 AM	Start	Acquisition	Session	None
January 5, 2024 8:26:16 AM	Start	Acquisition	Session	None
January 5, 2024 8:28:23 AM	Start	Qualification	Session	OG
January 5, 2024 8:28:23 AM	Start	Execution	Scouting Run - Manual Injection, Front SGL SQ - Source: E1 - Extractor Part of GCMS System Preparation	None
January 5, 2024 9:21:29 AM	Start	Data	Scouting Run - Manual Injection, Front SGL SQ - Source: E1 - Extractor Part of GCMS System Preparation	Date file Path: D:\OQ2024\Manual\1.0
January 5, 2024 9:21:52 AM	End	Execution	Scouting Run - Manual Injection, Front SGL SQ - Source: E1 - Extractor Part of GCMS System Preparation	Run Count: 1
January 5, 2024 9:21:55 AM	Start	Execution	Signal to Noise E1 - Liquid Injection, Front SGL SQ - Source: E1 - Extractor using Flamed 1 - L: <= 1200	None

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Date: January 5, 2024 10:53:24 AM
System ID: RYO_EN0136

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User Name: admin@_psscagp
Report Generated by Hostname: ASRYGW074

System ID: RYG_EN0136
Print Date: January 5, 2024 10:53:25 AM

ALS_OQ_RYG_EN0136 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
January 5, 2024 9:25:36 AM	End	Qualification	Session	DQ
January 5, 2024 9:28:39 AM	Start	Reporting	Session	None
January 5, 2024 9:27:48 AM	End	Reporting	Session	None
January 5, 2024 9:27:46 AM	Start	Qualification	Session	DQ
January 5, 2024 9:27:46 AM	Start	Execution	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 2 - L1 => 1200	None
January 5, 2024 9:33:18 AM	Auto	Data	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 2 - L1 => 1200	Data File Path: D:\OQ2024\EN_F03.D
January 5, 2024 9:45:22 AM	End	Execution	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 2 - L1 => 1200	Run Count: 1
January 5, 2024 9:46:32 AM	Start	Execution	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 2 - L1 => 1200	None
January 5, 2024 9:50:18 AM	Auto	Data	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 2 - L1 => 1200	Data File Path: D:\OQ2024\EN_F03.D
January 5, 2024 10:00:19 AM	End	Execution	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 2 - L1 => 1200	Run Count: 1

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Date: January 5, 2024 10:53:24 AM
System ID: RYG_EN0136

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User Name: admin@_psscagp
Report Generated by Hostname: ASRYGW074

System ID: RYG_EN0136
Print Date: January 5, 2024 10:53:25 AM

ALS_OQ_RYG_EN0136 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
January 5, 2024 10:00:03 AM	Auto	Test/Unlocked	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 2 - L1 => 1200	Deviation Note for Run Count: 1
January 5, 2024 10:01:53 AM	Start	Execution	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 2 - L1 => 1200	None
January 5, 2024 10:13:48 AM	Auto	Data	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 2 - L1 => 1200	Data File Path: D:\OQ2024\EN_F03.D
January 5, 2024 10:17:58 AM	End	Execution	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 2 - L1 => 1200	Run Count: 2
January 5, 2024 10:22:04 AM	Auto	Test/Unlocked	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 2 - L1 => 1200	Deviation Note for Run Count: 2
January 5, 2024 10:22:06 AM	Start	Execution	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 2 - L1 => 1200	None
January 5, 2024 10:22:15 AM	Auto	Data	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 2 - L1 => 1200	Data File Path: D:\OQ2024\EN_F03.D
January 5, 2024 10:29:35 AM	End	Execution	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 2 - L1 => 1200	Run Count: 3

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Date: January 5, 2024 10:53:24 AM
System ID: RYG_EN0136

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User Name: admin@_psscagp
Report Generated by Hostname: ASRYGW074

System ID: RYG_EN0136
Print Date: January 5, 2024 10:53:25 AM

ALS_OQ_RYG_EN0136 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
January 5, 2024 10:29:11 AM	Auto	Test/Unlocked	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 2 - L1 => 1200	Deviation Note for Run Count: 3
January 5, 2024 10:29:11 AM	Start	Execution	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 2 - L1 => 1200	None
January 5, 2024 10:42:05 AM	Auto	Data	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 2 - L1 => 1200	Data File Path: D:\OQ2024\EN_F03.D
January 5, 2024 10:48:34 AM	End	Execution	Signal to Noise E1 - Liquid Injection, Front SSI, SQ - Source: E1 - Extractor using Filament 2 - L1 => 1200	Run Count: 4
January 5, 2024 10:48:41 AM	End	Qualification	Session	DQ
January 5, 2024 10:48:41 AM	Start	Reporting	Session	None
January 5, 2024 10:50:27 AM	Auto	Reporting	Session	Report Generated: Certificate
January 5, 2024 10:51:07 AM	Auto	Reporting	Session	Report Generated: Report
January 5, 2024 10:51:29 AM	Auto	Reporting	Session	Report Generated: Certificate
January 5, 2024 10:52:00 AM	Auto	Reporting	Session	Report Generated: Report

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Date: January 5, 2024 10:53:24 AM
System ID: RYG_EN0136

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ROTA METER CALIBRATION RESULT JANUARY 2024

Rotameter ID.	Calibration Date	Regression Result	Coefficient (R ²)
BKK_FS0585	10 Jan 24	Y = 1.0351x + 2.3733	0.9998
BKK_FS0587	10 Jan 24	Y = 1.0168x + 15.05	0.9997
BKK_FS0592	10 Jan 24	Y = 1.0013x + 12.556	1.0000
BKK_FS0594	10 Jan 24	Y = 1.0048x + 4.9762	1.0000
BKK_FS1004	04 Jan 24	Y = 0.9873x + 13.47	0.9993
BKK_FS1005	04 Jan 24	Y = 1.0187x + 1.25	0.9998
BKK_FS1006	04 Jan 24	Y = 1.1589x - 3.6605	0.9981
BKK_FS1007	10 Jan 24	Y = 1.1347x + 1.6007	0.9989
BKK_FS1008	10 Jan 24	Y = 1.127x + 4.3827	0.9996
BKK_FS1017	04 Jan 24	Y = 1.0632x - 0.0701	0.9998
BKK_FS1018	04 Jan 24	Y = 1.0115x + 1.2867	0.9996
BKK_FS1019	04 Jan 24	Y = 1.0019x + 8.4867	1.0000
BKK_FS1026	19 Jan 24	Y = 0.9618x + 1.9626	0.9999
BKK_FS1027	19 Jan 24	Y = 1.0065x - 4.3786	1.0000
BKK_FS1028	19 Jan 24	Y = 1.0184x - 37.308	0.9997
BKK_FS1029	19 Jan 24	Y = 0.9809x + 2.7925	0.9977
BKK_FS1030	19 Jan 24	Y = 0.996x - 1.3286	1.0000
BKK_FS1031	19 Jan 24	Y = 1.015x - 27.236	0.9997
BKK_FS1039	04 Jan 24	Y = 1.0047x + 8.0267	0.9997
BKK_FS1040	04 Jan 24	Y = 1.0059x + 3.6952	1.0000
BKK_FS1041	04 Jan 24	Y = 1.0677x - 0.0486	0.9995
BKK_FS1042	04 Jan 24	Y = 1.0021x + 11.273	0.9995
BKK_FS1043	04 Jan 24	Y = 1.0023x + 8.3905	1.0000
BKK_FS1044	04 Jan 24	Y = 1.0738x + 1.2527	0.9997
PHK_FS0027	10 Jan 24	Y = 1.1096x + 0.3565	1.0000
PHK_FS0028	10 Jan 24	Y = 1.034x - 2.52	1.0000
PHK_FS0029	10 Jan 24	Y = 1.0017x + 8.0124	1.0000
RYG_FS0197	04 Jan 24	Y = 1.0045x + 10.275	1.0000
RYG_FS0198	04 Jan 24	Y = 1.0024x + 10.1	1.0000
RYG_FS0199	04 Jan 24	Y = 1.0343x - 0.3854	0.9999
RYG_FS0654	04 Jan 24	Y = 1.0529x + 0.1565	0.9996
RYG_FS0655	04 Jan 24	Y = 0.992x + 8.9667	0.9992
RYG_FS0656	04 Jan 24	Y = 1.0068x - 2.8429	1.0000
RYG_FS0657	04 Jan 24	Y = 1.0472x + 1.9228	0.9999
RYG_FS0658	04 Jan 24	Y = 0.9675x + 20.263	0.9996
RYG_FS0659	04 Jan 24	Y = 1.0028x + 10.275	1.0000
SGK_FS0135	17 Jan 24	Y = 1.0145x + 2.8273	1.0000
SGK_FS0136	17 Jan 24	Y = 1.0113x + 1.75	0.9999
SGK_FS0138	04 Jan 24	Y = 1.0632x - 1.0034	0.9999



ROTA METER CALIBRATION RESULT JANUARY 2024

Rotameter ID.	Calibration Date	Regression Result	Coefficient (R ²)
SGK_FS0139	04 Jan 24	Y = 1.0047x + 1.8667	0.9999
SGK_FS0140	04 Jan 24	Y = 1.0001x + 14.149	1.0000
SGK_FS0141	04 Jan 24	Y = 1.111x - 1.1337	0.9994
SGK_FS0142	04 Jan 24	Y = 1.0179x + 0.3633	0.9999
SGK_FS0143	04 Jan 24	Y = 1.054x + 2.2352	1.0000

Review By :

(Mr. Wichan Choonharat)
Enviro Field Services Manager

Approved By :

(Mr.Sarayuth Jittrantont)
Assistant General Manager



ROTA METER CALIBRATION RESULT APRIL 2024

Rotameter ID.	Calibration Date	Regression Result	Coefficient (R ²)
BKK_FS0585	23 Apr 24	Y = 1.0322x + 2.25	0.9997
BKK_FS0587	23 Apr 24	Y = 1.0111x + 16.357	0.9994
BKK_FS0592	23 Apr 24	Y = 1.001x + 14.551	1.0000
BKK_FS0594	23 Apr 24	Y = 1.0048x + 4.9762	1.0000
BKK_FS1004	01 Apr 24	Y = 0.9826x + 12.32	0.9998
BKK_FS1005	01 Apr 24	Y = 1.0183x + 0.0633	0.9998
BKK_FS1006	01 Apr 24	Y = 1.1534x - 3.3241	0.9989
BKK_FS1007	23 Apr 24	Y = 1.1084x + 2.9017	0.9994
BKK_FS1008	06 May 24	Y = 1.1347x + 2.1915	0.9996
BKK_FS1012	07 May 24	Y = 1.0488x - 26.533	0.9998
BKK_FS1013	07 May 24	Y = 1.0255x - 57.741	1.0000
BKK_FS1017	04 Apr 24	Y = 1.0213x + 0.1156	1.0000
BKK_FS1018	04 Apr 24	Y = 1.0007x + 1.3933	0.9999
BKK_FS1019	04 Apr 24	Y = 1.0038x - 1.3381	1.0000
BKK_FS1020	04 Apr 24	Y = 1.003x + 5.7656	1.0000
BKK_FS1021	04 Apr 24	Y = 1.0096x - 25.605	0.9926
BKK_FS1022	04 Apr 24	Y = 1.0937x - 103.66	0.9980
BKK_FS1023	07 May 24	Y = 1.1613x - 2.675	1.0000
BKK_FS1024	07 May 24	Y = 1.0157x - 4.3362	1.0000
BKK_FS1025	07 May 24	Y = 1.0018x - 4.6236	0.9999
BKK_FS1039	01 Apr 24	Y = 0.9909x + 11.357	0.9991
BKK_FS1040	01 Apr 24	Y = 1.0121x - 19.203	0.9996
BKK_FS1041	01 Apr 24	Y = 1.0176x + 1.4813	0.9996
BKK_FS1042	01 Apr 24	Y = 0.9927x + 10.76	0.9995
BKK_FS1043	01 Apr 24	Y = 0.9965x + 13.696	1.0000
BKK_FS1044	01 Apr 24	Y = 1.1159x - 0.9354	0.9978
PHK_FS0027	06 May 24	Y = 1.1281x + 0.4949	0.9997
PHK_FS0028	06 May 24	Y = 1.0332x - 1.8233	0.9999
PHK_FS0029	06 May 24	Y = 1.001x + 10.848	1.0000
RYG_FS0197	01 Apr 24	Y = 1.0045x + 10.275	1.0000
RYG_FS0198	01 Apr 24	Y = 1.0061x + 0.715	0.9999
RYG_FS0199	01 Apr 24	Y = 0.976x + 3.1497	0.9998
RYG_FS0654	01 Apr 24	Y = 1.0354x + 0.3361	0.9998
RYG_FS0655	01 Apr 24	Y = 0.978x + 13.603	0.9991
RYG_FS0656	01 Apr 24	Y = 1.0035x + 6.879	0.9999
RYG_FS0657	01 Apr 24	Y = 1.0233x + 0.8908	0.9982
RYG_FS0658	01 Apr 24	Y = 0.9905x + 9.8867	0.9996
RYG_FS0659	01 Apr 24	Y = 0.9994x + 13.924	1.0000
SGK_FS0135	23 Apr 24	Y = 1.0117x + 4.8833	1.0000



ROTA METER CALIBRATION RESULT APRIL 2024

Rotameter ID.	Calibration Date	Regression Result	Coefficient (R ²)
SGK_FS0136	23 Apr 24	Y = 1.0134x + 3.6467	1.0000
SGK_FS0138	04 Apr 24	Y = 1.0449x - 0.3684	0.9988
SGK_FS0139	04 Apr 24	Y = 1.0086x + 3.1267	0.9988
SGK_FS0140	04 Apr 24	Y = 1.0029x + 7.5181	1.0000
SGK_FS0141	23 Apr 24	Y = 1.1129x - 0.0619	0.9997
SGK_FS0142	23 Apr 24	Y = 1.0136x + 2.4267	0.9999
SGK_FS0143	23 Apr 24	Y = 1.0036x + 8.3162	1.0000

Review By :

(Mr. Wichan Choonharat)
Enviro Field Services Manager

Approved By :

(Mr.Sarayuth Jittrantont)
Assistant General Manager

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Agilent CrossLab Compliance Services

Certificate of System Qualification
GC-QQ

System ID: CN11461066
Organization Name: ALS Laboratory Group (Thailand) Co., Ltd.
Organization Location: 104 Soi 40 Phatthanakan Rd, Kluang Suan Luang, Khet Suan Luang, Bangkok 10250

Date: April 21, 2023 3:26:38 PM
EQP Name: Agilent/Recommended.
EQP Revision: GC.02.52
Overall Qualification Status: Pass

CDS Logon Verification - GC

Logon: Saenguthai Tarak

Overall CDS Logon Verification - GC Test 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: >= -2.0 and <= 0.5

Date: April 21, 2023 3:26:38 PM
System ID: CN11461066

Overall Inlet Pressure Decay Test Status

Pass

Inlet Pressure Accuracy

Name: 7890
Front SSL

Setpoint Status:

Pass

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

Overall Inlet Pressure Accuracy Test Status

Pass

Inlet Pressure Decay

Name: 7890
Back SSL

Setpoint Status:

Pass

Pressure: 25.0 psi
Pressure Change: 0.0 psi /5 minutes
Agilent Recommended: >= -2.0 and <= 0.5

Overall Inlet Pressure Decay Test Status

Pass

Inlet Pressure Accuracy

Name: 7890
Back SSLDate: April 21, 2023 3:26:38 PM
System ID: CN11461066

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Setpoint Status:

Pass

Inlet Pressure: Setpoint 25.0 psi Actual 24.8 psi
Accuracy: 0.2 psi
Agilent Recommended: <= 1.2 psi

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: 28.9 mL/min
Accuracy: 1.1 mL/min
Agilent Recommended: <= 10.0 % setpoint (3.0 mL/min)
Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Setpoint Status:

Pass

Flow Type: Oxidizer
Setpoint: 400.0 mL/min Measured Flow: 400 mL/min
Accuracy: 0.0 mL/min
Agilent Recommended: <= 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: 24.9 mL/min
Accuracy: 0.1 mL/min
Agilent Recommended: <= 10.0 % setpoint (2.5 mL/min)
Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.Date: April 21, 2023 3:26:38 PM
System ID: CN11461066

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Overall Detector Flow Accuracy Test Status

Pass

Detector Flow Accuracy

Name: 7890
Back FID

Setpoint Status:

Pass

Flow Type: Fuel
Setpoint: 30.0 mL/min Measured Flow: 30.7 mL/min
Accuracy: 0.7 mL/min
Agilent Recommended: <= 10.0 % setpoint (3.0 mL/min)
Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Setpoint Status:

Pass

Flow Type: Oxidizer
Setpoint: 400.0 mL/min Measured Flow: 399 mL/min
Accuracy: 1.0 mL/min
Agilent Recommended: <= 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: 24.8 mL/min
Accuracy: 0.4 mL/min
Agilent Recommended: <= 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

Date: April 21, 2023 3:26:38 PM
System ID: CN11461066

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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: 100.0 100.9 °C
Accuracy: 0.9 °C
Agilent Recommended: >= -1.0 % setpoint in K (-3.7 °C)
<= 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: 100.0 100.8833 °C
Stability: 0.1 °C
Agilent Recommended: <= 0.5

Overall GC Oven Temperature Stability Test Status

Pass

Scouting Run

Tested Combination: Front SSL / Front FID
Injection Tower
Name: 7893ADate: April 21, 2023 3:26:38 PM
System ID: CN11461066

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Setpoint Status: **Completed**Injection Volume on Column: **1.0** μ L

Overall Scouting Run Status

Completed

Noise and Drift

Tested Combination1 Front SSL / Front FID

Name: **7890**

Setpoint Status:

PassBase Signal: **22.7** pA

ASTM Noise

pA

0.06**<=** **0.10**

Drift

pA/hr

0.05**<=** **2.50**

Agilent Recommended:

Status:

Pass**Pass**

Overall Noise and Drift Test Status

Pass

Injection Precision

Tested Combination1 Front SSL / Front FID

Name: **7693A**

Setpoint Status:

PassInjection Volume on Column: **1.0** μ LArea RSD: **0.32** %Retention Time RSD: **0.87** %

Agilent Recommended:

<= **3.00****<=** **1.00**

Overall Injection Precision Test Status

Pass

Signal to Noise

Date: April 21, 2023 3:26:38 PM
System ID: CN11461066

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Tested Combination1 Front SSL / Front FID

Injection Tower

Name: **7890**

Setpoint Status:

Pass

Signal to Noise:

721755

Agilent Recommended:

>= **300000**

Overall Signal to Noise Test Status

Pass

Scouting Run

Tested Combination2 Back SSL / Back FID

Injection Tower

Name: **7693A**

Setpoint Status:

CompletedInjection Volume on Column: **1.0** μ L

Overall Scouting Run Status

Completed

Noise and Drift

Tested Combination2 Back SSL / Back FID

Name: **7890**

Setpoint Status:

PassBase Signal: **22.6** pA

ASTM Noise

pA

0.07**<=** **0.10**

Agilent Recommended:

Status:

Pass**Pass**

Drift

pA/hr

0.09**<=** **2.50**Date: April 21, 2023 3:26:38 PM
System ID: CN11461066

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Overall Noise and Drift Test Status

Pass

Injection Precision

Tested Combination2 Back SSL / Back FID

Name: **7693A**

Setpoint Status:

PassInjection Volume on Column: **1.0** μ LArea RSD: **1.28** %Retention Time RSD: **0.83** %

Agilent Recommended:

<= **3.00****<=** **1.00**

Overall Injection Precision Test Status

Pass

Signal to Noise

Tested Combination2 Back SSL / Back FID

Injection Tower

Name: **7890**

Setpoint Status:

PassSignal to Noise: **2404398**

Agilent Recommended:

>= **300000**

Overall Signal to Noise Test Status

PassDate: April 21, 2023 3:26:38 PM
System ID: CN11461066

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Instrument Details

Purpose

This section describes the as found system configuration.

Details

System

System ID	CN11461066
Manufacturer	Agilent Technologies
Name	7890
Flow Data Input	Manual Data
Temperature Data Input	Manual Data or Other Data Logging

Tested Combination1

Injection Technique	Injection Tower
Sampler Identifier	Sampler 2
Inlet	Front
Detector	Front
LTM Included?	No

Tested Combination2

Injection Technique	Injection Tower
Sampler Identifier	Sampler 3
Inlet	Back
Detector	Back
LTM Included?	No

Sampler 1

Manufacturer	Agilent Technologies
Type	Tray
Name	7693A
Model Number	G4516A
Serial Number	CN15380030
Firmware Revision	A.11.01
Vial Heater	Not installed

Date: April 21, 2023 3:26:38 PM
System ID: CN11461066

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Sampler 2	
Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7693A
Model Number	G4513A
Serial Number	CN16280128
Firmware Revision	A.10.09
Usage	Sample Injection
Location	Front
Syringe Volume (µL)	10
Sampler 3	
Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7693A
Model Number	G4513A
Serial Number	CN10340103
Firmware Revision	A.10.09
Usage	Sample Injection
Location	Back
Syringe Volume (µL)	10
Mainframe 1	
Manufacturer	Agilent Technologies
Name	7890
Model Number	G3440A
Serial Number	CN11461066
Firmware Revision	Version 4.27
Oven Type	Standard

Date: April 21, 2023 3:26:38 PM
System ID: CN11461066

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	7890
Type	FID
Adapter	Capillary
Control Type	Electronic Pressure Control (EPC)
Location	Back
Makeup Gas	Nitrogen

Date: April 21, 2023 3:26:38 PM
System ID: CN11461066

Electronic Signature

Purpose

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Details

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Logged On User Name:	saenguthai.tarak@non.agilent.com
Signature Creation Date:	April 21, 2023
Reason for Signature:	Executed protocol and published this original version of document

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Date: April 21, 2023 3:26:38 PM
System ID: CN11461066

User Name: saenguthai.tarak
Full Name: LAPTOP-CQ385CMV
System ID: CN11461066
Print Date: April 21, 2023 3:26:40 PM

GC-5_BK06_EN0127_AL3 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 21, 2023 11:21:09 AM	Auth	Session Created	Session	None
April 21, 2023 11:21:09 AM	Start	Configuration	Session	None
April 21, 2023 11:21:09 AM	Auth	Endscreen	Logging	User is attempting to end session requires an unlock code
April 21, 2023 11:22:04 AM	Auth	Disconnected	Session	EOP details for primary technique [GC] - File path: [ProtocolPocData\Configurat ions\GC-5\GC-02-32.asp] EOP File Name: [GC-02-32-App].EOP Name: [AgilentCrossLabComplianceProt ocol Revision] [GC-02-32]
April 21, 2023 11:22:05 AM	End	Configuration	Session	None
April 21, 2023 11:22:14 AM	Start	Qualitative	Session	QQ
April 21, 2023 11:22:14 AM	Start	Execution	CDS Login Verification - GC - Qualitative test	None
April 21, 2023 11:22:14 AM	End	Execution	CDS Login Verification - GC - Qualitative test	Run Count : 1
April 21, 2023 11:22:16 AM	Start	Execution	System Inspection and Basic Safety and Operation - 7890 - Qualitative Test - No response associated	None
April 21, 2023 11:22:20 AM	End	Execution	System Inspection and Basic Safety and Operation - 7890 - Qualitative Test - No response associated	Run Count : 1
April 21, 2023 11:22:27 AM	Start	Execution	Inlet Pressure Decay - Front GC - Pressure Controlled Inlet -5.25.0 psi - L1 -> -2.0 psi and -< 0.5 psi	None

Date: April 21, 2023 3:26:38 PM
System ID: CN11461066

Issue Name: [Sahagunna Lake](#)
 Hosted on: [LAKTOB.COM](#)

System Id: CN11481066
Print Date: April 21, 2023 3:20:40 PM

GC-6 BKK EN0127 ALS Transaction log

Time	Transaction State	Activity Performance	Type of Transaction	Optional Information
April 21, 2023 11:24:01 AM	End	Execution	Intel Pressure Decay - Front SSL - Pressure Controlled Init - S: 25.0 psi - L: <= -2.0 psi and +> 0.3 psi	Run Count : 1
April 21, 2023 11:24:04 AM	Start	Execution	Intel Pressure Accuracy - Front SSL - Pressure Controlled Init + S: 25.0 psi - L: <= 1.2 psi	None
April 21, 2023 11:24:05 AM	End	Execution	Intel Pressure Accuracy - Front SSL - Pressure Controlled Init + S: 25.0 psi - L: <= 1.2 psi	Run Count : 1
April 21, 2023 11:24:11 AM	Start	Execution	Intel Pressure Decay - Back SSL - Pressure Controlled Init + S: 25.0 psi - L: <= -2.0 psi and +> 0.5 psi	None
April 21, 2023 11:24:45 AM	End	Execution	Intel Pressure Decay - Back SSL - Pressure Controlled Init - S: 25.0 psi - L: <= -2.0 psi and +> 0.3 psi	Run Count : 1
April 21, 2023 11:24:48 AM	Start	Execution	Intel Pressure Accuracy - Back SSL - Pressure Controlled Init + S: 25.0 psi - L: <= 1.2 psi	None
April 21, 2023 11:24:51 AM	End	Execution	Intel Pressure Accuracy - Back SSL - Pressure Controlled Init + S: 25.0 psi - L: <= 1.2 psi	Run Count : 1
April 21, 2023 11:24:53 AM	Start	Execution	Differential Flow Accuracy - Front FID - Type: Fuel - S: 30.0 mL/min - L: <= 30.0% setpoint	None
April 21, 2023 11:25:20 AM	Start	Data	Demand Flow Accuracy - Front FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
April 21, 2023 11:25:23 AM	End	Execution	Differential Flow Accuracy - Front FID - Type: Fuel - S: 30.0 mL/min - L: <= (0.0%) setpoint	Run Count : 1

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Date: April 21, 2023 3:26:38 PM
System ID: CN11481066

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User Name: kargu@math.fsu.edu

System ID: CH143108
Print Date: April 21, 2023 3:28:40 PM

DC-8 DKK EN9127 ALS Transaction log 1

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
Apr 21, 2023 11:20:26 AM	Start	Execution	Detector Flow Accuracy - Fuel FD - Type: Outlier - \$ 450.0 mL/min - L <= 10.0% suspect	None
Apr 21, 2023 11:20:40 AM	Auto	Data	Detector Flow Accuracy - Fuel FD - Type: Outlier - \$ 450.0 mL/min - L <= 10.0% suspect	Manual Data Entry
Apr 21, 2023 11:20:42 AM	End	Execution	Detector Flow Accuracy - Fuel FD - Type: Outlier - \$ 450.0 mL/min - L <= 10.0% suspect	Risk Count: 1
Apr 21, 2023 11:20:44 AM	Start	Execution	Detector Flow Accuracy - Fuel FD - Type: Mismatch - \$ 25.0 mL/min - L <= 10.0% suspect	None
Apr 21, 2023 11:20:51 AM	Auto	Data	Detector Flow Accuracy - Fuel FD - Type: Mismatch - \$ 25.0 mL/min - L <= 10.0% suspect	Manual Data Entry
Apr 21, 2023 11:20:54 AM	End	Execution	Detector Flow Accuracy - Fuel FD - Type: Mismatch - \$ 25.0 mL/min - L <= 10.0% suspect	Risk Count: 1
Apr 21, 2023 11:20:58 AM	Start	Execution	Detector Flow Accuracy - Gas FD - Type: Fuel - \$ 30.0 mL/min - L <= 10.0% suspect	None
Apr 21, 2023 11:20:59 AM	Auto	Data	Detector Flow Accuracy - Gas FD - Type: Fuel - \$ 30.0 mL/min - L <= 10.0% suspect	Manual Data Entry
Apr 21, 2023 11:20:22 AM	End	Execution	Detector Flow Accuracy - Gas FD - Type: Fuel - \$ 30.0 mL/min - L <= 10.0% suspect	Risk Count: 1
Apr 21, 2023 11:25:24 AM	Start	Execution	Detector Flow Accuracy - Gas FD - Type: Outlier - \$ 450.0 mL/min - L <= 10.0% suspect	None
Apr 21, 2023 11:26:39 AM	Auto	Data	Detector Flow Accuracy - Gas FD - Type: Outlier - \$ 450.0 mL/min - L <= 10.0% suspect	Manual Data Entry

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Date: April 21, 2023 3:26:38 PM
System ID: CN11461065

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```
User Name: user@ultra.safel
Host name: LAPTOP-CQ1SKOMV
```

System id: CNA1461066
View Date: April 21, 2023 3:26:40 PM

GC-8 B10K EN0123 ALS Transaction log.c

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 21, 2023 11:26:43 AM	End	Execution	Direction Flow Accuracy - Back FID - Type: Oxidize - S: 40.0 relHum - L <= 10.0% support	Run Count : 1
April 21, 2023 11:28:45 AM	Start	Execution	Direction Flow Accuracy - Back FID - Type: Makeup - S: 25.0 relHum - L <= 10.0% support	None
April 21, 2023 11:27:01 AM	Start	Data	Direction Flow Accuracy - Back FID - Type: Makeup - S: 25.0 relHum - L <= 10.0% support	Manual Data Entry
April 21, 2023 11:27:05 AM	End	Execution	Direction Flow Accuracy - Back FID - Type: Makeup - S: 25.0 relHum - L <= 10.0% support	Run Count : 1
April 21, 2023 11:27:37 AM	Start	Execution	GC Oven Temperature Accuracy : 7890 - Temperature 1 Oven : S: 230.0°C - L <= -1.0 AND <= 1.0 % support in R	None
April 21, 2023 11:27:33 AM	April	Data	GC Oven Temperature Accuracy : 7890 - Temperature 1 Oven : S: 230.0°C - L <= -1.0 AND <= 1.0 % support in R	Manual Data Entry
April 21, 2023 11:27:35 AM	End	Execution	GC Oven Temperature Accuracy : 7890 - Temperature 1 Oven : S: 230.0°C - L <= -1.0 AND <= 1.0 % support in R	Run Count : 1
April 21, 2023 11:27:37 AM	Start	Execution	GC Oven Temperature Accuracy : 7890 - Temperature 1 Oven : S: 100.0°C - L <= -1.0 AND <= 1.0 % support in R	None
April 21, 2023 11:27:54 AM	Start	Data	GC Oven Temperature Accuracy : 7890 - Temperature 1 Oven : S: 100.0°C - L <= -1.0 AND <= 1.0 % support in R	Manual Data Entry

Figure 2.94

Date: April 21, 2023 3:28:38 PM
System ID: CH11461066

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User Name: xiangyu.han@tsinghua.edu.cn

System #: CH16401086
Print Date: April 26, 2023 2:36:40 PM

GC-6 BKK EN0127 ALS Transaction log

Time	Transaction Status	Activity Performed	Type of Transaction	Optional Information
April 21, 2023 11:27:37 AM	End	Execution	GC Oven Temperature Accuracy - 7800 - Temperature Oven - S: 105.0°C, L: >= -1.0 XSD <= 1.0 S selected to N	Run Count : 1
April 21, 2023 11:27:50 AM	Start	Execution	GC Oven Temperature Stability - 7800 - Temperature - Oven: S: 100.0°C, L: <= 0.3°C	None
April 21, 2023 11:28:07 AM	Acqfil	Data	GC Oven Temperature Stability - 7800 - Temperature - Oven: S: 100.0°C, L: <= 0.3°C	Manual Data Entry
April 21, 2023 11:28:10 AM	End	Execution	GC Oven Temperature Stability - 7800 - Temperature - Oven: S: 100.0°C, L: <= 0.3°C	Run Count : 1
April 21, 2023 11:29:12 AM	Start	Execution	GC Sampling Valve - Injection Towee, Front SSL, Front FID - Part of System Preparation - No inlets associated	None
April 21, 2023 11:30:27 AM	Acqfil	Data	GC Sampling Valve - Injection Towee, Front SSL, Front FID - Part of System Preparation - No inlets associated	Gate Site Path : C:\Users\Public\Documents\h ms\Station\DMADQ_60_A pril_2023\64-2010Q_60_A pril_2023\64-2010Q_60_A pril_2023\64-2010Q_60_A pril_2023\64-2010Q_60_A
April 21, 2023 11:31:04 AM	End	Execution	GC Sampling Valve - Injection Towee, Front SSL, Front FID - Part of System Preparation - No inlets associated	Run Count : 1
April 21, 2023 11:31:07 AM	Start	Execution	Innocuous Drift - Front FID - Innocuous FID - L: 1.0000000 S: 0.0000000, L: 0.0000000 XSD: 0.0000000	None

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Date: April 21, 2023 3:26:38 PM
System ID: CN11481066

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User Name: samguthal@ark
Host Name: LAPTOP-GQ3XKQMFSystem ID: CH11481066
Print Date: April 21, 2023 3:29:46 PM

GC-4_BKK_ENH127_ALS Transaction Log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 21, 2023 11:31:43 AM	Auto	Data	Noise and Drift - Front FID - Detector FID - L (Noise) <= 0.10 pA - L (Drift) <= 2.50 pA/dec	Data File Path: C:\Users\Public\Documents\GC ItemStation\3Data\GC-4_ALS_2023-04-20\GC-4_2023-04-20 14-35-08\FID-L-015F.D\FID 1A.ch
April 21, 2023 11:32:00 AM	End	Execution	Noise and Drift - Front FID - Detector FID - L (Noise) <= 0.10 pA - L (Drift) <= 2.50 pA/dec	Run Count: 1
April 21, 2023 11:32:03 AM	Start	Execution	Injection Precision - Injection Tower, Front SSL, Front FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	None
April 21, 2023 11:32:23 AM	Start	Execution	Injection Precision - Injection Tower, Front SSL, Front FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	None
April 21, 2023 11:33:25 AM	Auto	Data	Injection Precision - Injection Tower, Front SSL, Front FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data File Path: C:\Users\Public\Documents\GC ItemStation\3Data\GC-4_ALS_2023-04-20\GC-4_2023-04-20 14-36-08\FID-L-015F.D\FID 1A.ch
April 21, 2023 11:33:55 AM	Auto	Data	Injection Precision - Injection Tower, Front SSL, Front FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data File Path: C:\Users\Public\Documents\GC ItemStation\3Data\GC-4_ALS_2023-04-20\GC-4_2023-04-20 14-36-08\FID-L-015F.D\FID 1A.ch

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Date: April 21, 2023 3:26:35 PM
System ID: CH11481066

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User Name: samguthal@ark
Host Name: LAPTOP-GQ3XKQMFSystem ID: CH11481066
Print Date: April 21, 2023 3:29:46 PM

GC-4_BKK_ENH127_ALS Transaction Log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 21, 2023 11:33:55 AM	Auto	Data	Injection Precision - Injection Tower, Front SSL, Front FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data File Path: C:\Users\Public\Documents\GC ItemStation\3Data\GC-4_ALS_2023-04-20\GC-4_2023-04-20 14-36-08\FID-L-015F.D\FID 1A.ch
April 21, 2023 11:33:58 AM	Auto	Data	Injection Precision - Injection Tower, Front SSL, Front FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data File Path: C:\Users\Public\Documents\GC ItemStation\3Data\GC-4_ALS_2023-04-20\GC-4_2023-04-20 14-36-08\FID-L-015F.D\FID 1A.ch
April 21, 2023 11:33:59 AM	Auto	Data	Injection Precision - Injection Tower, Front SSL, Front FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data File Path: C:\Users\Public\Documents\GC ItemStation\3Data\GC-4_ALS_2023-04-20\GC-4_2023-04-20 14-36-08\FID-L-015F.D\FID 1A.ch
April 21, 2023 11:33:59 AM	Auto	Data	Injection Precision - Injection Tower, Front SSL, Front FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data File Path: C:\Users\Public\Documents\GC ItemStation\3Data\GC-4_ALS_2023-04-20\GC-4_2023-04-20 14-36-08\FID-L-015F.D\FID 1A.ch
April 21, 2023 11:34:00 AM	End	Execution	Injection Precision - Injection Tower, Front SSL, Front FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Run Count: 1
April 21, 2023 11:34:04 AM	Start	Execution	Signal to Noise - Injection Tower, Front SSL, Front FID - Detector FID - L <= 2000%	None

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Date: April 21, 2023 3:26:38 PM
System ID: CH11481066

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User Name: samguthal@ark
Host Name: LAPTOP-GQ3XKQMFSystem ID: CH11481066
Print Date: April 21, 2023 3:29:46 PM

GC-4_BKK_ENH127_ALS Transaction Log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 21, 2023 11:35:28 AM	Auto	Data	Signal to Noise - Injection Tower, Front SSL, Front FID - Detector FID - L <= 2000%	Data File Path: C:\Users\Public\Documents\GC ItemStation\3Data\GC-4_ALS_2023-04-20\GC-4_2023-04-20 14-36-08\FID-L-015F.D\FID 1A.ch
April 21, 2023 11:36:00 AM	End	Execution	Signal to Noise - Injection Tower, Front SSL, Front FID - Detector FID - L <= 2000%	Run Count: 1
April 21, 2023 11:36:03 AM	Start	Execution	GC Spooling Run - Injection Tower, Back SSL, Back FID - Part of System Preparation - No limits associated	None
April 21, 2023 11:36:08 AM	Auto	Data	GC Spooling Run - Injection Tower, Back SSL, Back FID - Part of System Preparation - No limits associated	Data File Path: C:\Users\Public\Documents\GC ItemStation\3Data\GC-4_ALS_2023-04-20\GC-4_2023-04-20 14-36-08\FID-L-015F.D\FID 1A.ch
April 21, 2023 11:37:30 AM	End	Execution	GC Spooling Run - Injection Tower, Back SSL, Back FID - Part of System Preparation - No limits associated	Run Count: 1
April 21, 2023 11:37:32 AM	Start	Execution	Noise and Drift - Back FID - Detector FID - L (Noise) <= 0.10 pA - L (Drift) <= 2.50 pA/dec	None

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Date: April 21, 2023 3:26:38 PM
System ID: CH11481066

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User Name: samguthal@ark
Host Name: LAPTOP-GQ3XKQMFSystem ID: CH11481066
Print Date: April 21, 2023 3:29:46 PM

GC-4_BKK_ENH127_ALS Transaction Log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 21, 2023 11:38:09 AM	Auto	Data	Noise and Drift - Back FID - Detector FID - L (Noise) <= 0.10 pA - L (Drift) <= 2.50 pA/dec	Data File Path: C:\Users\Public\Documents\GC ItemStation\3Data\GC-4_ALS_2023-04-20\GC-4_2023-04-20 14-36-08\FID-L-015F.D\FID 2B.ch
April 21, 2023 11:38:23 AM	End	Execution	Noise and Drift - Back FID - Detector FID - L (Noise) <= 0.10 pA - L (Drift) <= 2.50 pA/dec	Run Count: 1
April 21, 2023 11:38:32 AM	Start	Execution	Injection Precision - Injection Tower, Back SSL, Back FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	None
April 21, 2023 11:38:51 AM	Start	Execution	Injection Precision - Injection Tower, Back SSL, Back FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	None
April 21, 2023 11:40:17 AM	Auto	Data	Injection Precision - Injection Tower, Back SSL, Back FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data File Path: C:\Users\Public\Documents\GC ItemStation\3Data\GC-4_ALS_2023-04-20\GC-4_2023-04-20 14-37-32\FID-L-015F.D\FID 2B.ch
April 21, 2023 11:42:17 AM	Auto	Data	Injection Precision - Injection Tower, Back SSL, Back FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data File Path: C:\Users\Public\Documents\GC ItemStation\3Data\GC-4_ALS_2023-04-20\GC-4_2023-04-20 14-37-32\FID-L-015F.D\FID 2B.ch

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Date: April 21, 2023 3:26:38 PM
System ID: CH11481066

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User Name: saengchai.lamk
Host Name: LAPTOP-CQ358DVF
System ID: CN11481888
Print Date: April 21, 2023 3:20:38 PM

QC-6_RKX_EN0127_ALS Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 21, 2023 11:40:17 AM	Auto	Data	Injection Precision - Injection Tower, Back SSL, Back FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data File Path: C:\Users\Public\Documents\GC\RawData\InjectionPrecision\GC-6_RKX_2023-04-20\GC-6_RKX_2023-04-21_10-37-02\FID11-0018.D\FID11-0018.D\FID11-0018.D\FID11-0018.D\FID11-0018.D\FID11-0018.D\FID11-0018.D\FID11-0018.D\FID11-0018.D\FID11-0018.D
April 21, 2023 11:40:17 AM	Auto	Data	Injection Precision - Injection Tower, Back SSL, Back FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data File Path: C:\Users\Public\Documents\GC\RawData\InjectionPrecision\GC-6_RKX_2023-04-20\GC-6_RKX_2023-04-21_10-37-02\FID11-0018.D\FID11-0018.D\FID11-0018.D\FID11-0018.D\FID11-0018.D\FID11-0018.D\FID11-0018.D\FID11-0018.D\FID11-0018.D\FID11-0018.D
April 21, 2023 11:40:21 AM	Auto	Data	Injection Precision - Injection Tower, Back SSL, Back FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data File Path: C:\Users\Public\Documents\GC\RawData\InjectionPrecision\GC-6_RKX_2023-04-20\GC-6_RKX_2023-04-21_10-37-02\FID11-0018.D\FID11-0018.D\FID11-0018.D\FID11-0018.D\FID11-0018.D\FID11-0018.D\FID11-0018.D\FID11-0018.D\FID11-0018.D\FID11-0018.D
April 21, 2023 11:40:21 AM	Auto	Data	Injection Precision - Injection Tower, Back SSL, Back FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data File Path: C:\Users\Public\Documents\GC\RawData\InjectionPrecision\GC-6_RKX_2023-04-20\GC-6_RKX_2023-04-21_10-37-02\FID11-0018.D\FID11-0018.D\FID11-0018.D\FID11-0018.D\FID11-0018.D\FID11-0018.D\FID11-0018.D\FID11-0018.D\FID11-0018.D\FID11-0018.D
April 21, 2023 11:41:23 AM	End	Execution	Injection Precision - Injection Tower, Back SSL, Back FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Run Count: 1
April 21, 2023 11:41:33 AM	Start	Execution	Signal to Noise - Injection Tower, Back SSL, Back FID - Detector FID - L <= 300000	None

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Date: April 21, 2023 3:20:38 PM
System ID: CN11481888

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User Name: saengchai.lamk
Host Name: LAPTOP-CQ358DVF
System ID: CN11481888
Print Date: April 21, 2023 3:20:38 PM

QC-6_RKX_EN0127_ALS Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 21, 2023 11:42:22 AM	Auto	Data	Signal to Noise - Injection Tower, Back SSL, Back FID - Detector FID - L <= 300000	Data File Path: C:\Users\Public\Documents\GC\RawData\SignalToNoise\GC-6_RKX_2023-04-20\GC-6_RKX_2023-04-21_10-38-09\FID11-0018.D\FID11-0018.D\FID11-0018.D\FID11-0018.D\FID11-0018.D\FID11-0018.D\FID11-0018.D\FID11-0018.D\FID11-0018.D\FID11-0018.D
April 21, 2023 11:42:22 AM	End	Execution	Signal to Noise - Injection Tower, Back SSL, Back FID - Detector FID - L <= 300000	Run Count: 1
April 21, 2023 11:42:53 AM	End	Qualification	Sealant	DQ
April 21, 2023 11:42:53 AM	Start	Reporting	Sealant	None
April 21, 2023 12:01:47 PM	Auto	Acquisition	Sealant	None
April 21, 2023 2:16:07 PM	Auto	Acquisition	Sealant	None
April 21, 2023 2:16:10 PM	Auto	Injection/Sealant	Sealant	None
April 21, 2023 2:16:31 PM	Start	Qualification	Sealant	DQ
April 21, 2023 2:20:08 PM	Auto	Acquisition	Sealant	None
April 21, 2023 2:21:00 PM	Auto	Sealant/Injection	Sealant	None
April 21, 2023 2:21:07 PM	Start	Qualification	Sealant	DQ
April 21, 2023 2:25:45 PM	Auto	Reporting	Sealant	Report Generated: Certificate

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Date: April 21, 2023 3:20:38 PM
System ID: CN11481888

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J NAC
JIRANATEE ASSOCIATES CO., LTD.
Institute Associates Co., Ltd.
63/74-15, 63/75-36
Petchkasem 7, 7/1, Rd. Watthana, Bangkok.
Bangkok 10000 (Thailand)
Tel: +66(0)83812
Mobile: +66(0)8399453
E-mail: jna-calibration@jiranatee.com
Web site: www.jiranatee.com

Accredited calibration laboratory
ISO/IEC 17025:2017
MSC 170-175 17025
CALIBRATION 0367

Air speed measurement laboratory
Calibration services department

REVIEW BY: *Parinya P.*
APPROVED BY: *[Signature]*
NEXT CAL DATE: 18/2/26

Certificate Number

CWS-004-66

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM
MANUFACTURER
MODEL/TYPE

: Cup anemometer
: Nowlyne
: Sensor: WS-02F
: Data logger: 200-WS-25LB

SERIAL NUMBER

: Sensor: WSD-A5191
: Data logger: AS191

ID NUMBER

: RYD_F50328

CONDITION AS-RECEIVED

CUSTOMER

: Used item
: ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang,
Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE

: 11 Aug 2023

MEASUREMENT DATE

: 18 Aug 2023

ISSUE DATE

: 23 Aug 2023

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature: 23.0 ± 3.0 °C
Relative Humidity: 55.0 ± 15.0 %RH
Atmospheric Pressure: 1010 ± 10 hPa

PLACE OF CALIBRATION

: Effel-type wind tunnel of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITIONS

: Wind tunnel cross-section area¹ 900 cm²
Win direction frontal area² 100 cm²
Diameter of mounting pipe³ mm
Blockage ratio of test object⁴ 0.113 [-]

Preconditioning

: 24 hours at ambient conditions.

Measurement Condition

: The average values during measurement are (24.3) °C, (44.3) %RH and (1005.44) hPa.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:
[X] Mr. Sorawit Thachalad
[X] Miss Jittrajorn Lertsomphol



Approved signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

Remarks:
¹ build on projection area of the wind tunnel
² projected cross-section area of the tested object include mounting pipe
³ diameter of mounting pipe
⁴ Ratio "to"

THIS CERTIFICATE OF CALIBRATION MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY

J NAC
JIRANATEE ASSOCIATES CO., LTD.
Institute Associates Co., Ltd.
63/74-15, 63/75-36
Petchkasem 7, 7/1, Rd. Watthana, Bangkok.
Bangkok 10000 (Thailand)
Tel: +66(0)83812
Mobile: +66(0)8399453
E-mail: jna-calibration@jiranatee.com
Web site: www.jiranatee.com

Accredited calibration laboratory
ISO/IEC 17025:2017
MSC 170-175 17025
CALIBRATION 0367

Air speed measurement laboratory
Calibration services department

Certificate Number

CWD-004-66

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM
MANUFACTURER
MODEL/TYPE

: Wind Direction Sensor
: Nowlyne
: Sensor: WS-02F
: Data logger: 200-WS-25LB

SERIAL NUMBER

: Sensor: WSD-A5191
: Data logger: AS191

ID NUMBER

: RYD_F50328

CONDITION AS-RECEIVED

CUSTOMER

: Used item
: ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang,
Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE

: 11 Aug 2023

MEASUREMENT DATE

: 18 Aug 2023

ISSUE DATE

: 21 Aug 2023

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature: 23.0 ± 3.0 °C
Relative Humidity: 55.0 ± 15.0 %RH
Atmospheric Pressure: 1010 ± 10 hPa

PLACE OF CALIBRATION

: Effel-type wind tunnel of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITION

: Wind tunnel cross-section area¹ 900 cm²
Win direction frontal area² 129 cm²
Diameter of mounting pipe³ mm
Blockage ratio of test object⁴ 0.143 [-]

Preconditioning

: 24 hours at ambient conditions.

Measurement Condition

: The average values during measurement are (23.9) °C, (41.2) %RH and (1009.3) hPa.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:
[X] Mr. Sorawit Thachalad
[X] Miss Jittrajorn Lertsomphol



Approved signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

Remarks:
¹ build on projection area of the wind tunnel
² projected cross-section area of the tested object include mounting pipe
³ diameter of mounting pipe
⁴ Ratio "to"

THIS CERTIFICATE OF CALIBRATION MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY

Certificate Number
CWD-004-66

Page 2 of 2 Pages

MEASUREMENT RESULTS¹

The wind direction sensor was calibrated against standard rotary encoder by comparison method. During calibration, the measurement was carried out at 45° intervals in clockwise and counterclockwise directions after offset adjustment has been made. The flow speed of wind tunnel (usually 5 m/s) is kept constant while the sensor is rotated around its vertical axis. The results of calibration and associated measurement uncertainties are reported in the table below.

Air speed m/s	D ⁺ _{std} Degree (°)	D ⁻ _{std} Degree (°)	Error Degree (°)	U (k=2) Degree (°)
45.000	42	42	-3	1.0
90.000	87	87	-3	1.0
135.000	133	133	-2	1.0
180.000	182	182	2	1.0
225.000	229	229	4	1.0
270.000	275	275	5	1.0
315.000	320	320	5	1.0
360.000	359	359	-1	1.0

Remark:

¹ Calibration results only count for the tested circumstances and environmental conditions during which calibration took place

² Direction of standard

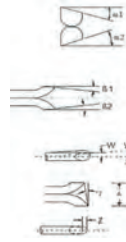
³ Direction of Unit Under Calibration



Type S Pitot Tube Calibration

Date Calibration 8-Jan-24
Pitot ID BKK_FS0560
Pitot SN -

Due Date 8-Jul-24
Inclinometer ID BKK_FS1131
Vernier ID RYG_FS0539



Parameter	Value	Allowable Range	Check
α1	0.6	-10° < α1 < +10°	OK
α2	1.4	-10° < α2 < +10°	OK
β1	-2.3	-5° < β1 < +5°	OK
β2	-0.5	-5° < β2 < +5°	OK
γ	-1.1	-	-
θ	1.3	-	-
Z = A tan γ	-0.017	Z ≤ 0.125"	OK
W = A tan θ	0.020	W ≤ 0.031"	OK
Dt	0.311	0.188" to 0.375"	OK
A/2Dt	1.415	1.05 ≤ PA/Dt ≤ 1.5	OK
A	0.88	2.1Dt ≤ A ≤ 3Dt	OK

Certify that pitot tube/probe meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a pitot tube certification fact of 0.84. See 40 CFR Pt. 60, App. A, EPA Method 2.

Calibrated by: Saksit Phaisanphut
(Mr. Saksit Phaisanphut)
RYG Field Services Scientist (4)

Approved by: Nattapol Jengwareewong
(Mr. Nattapol Jengwareewong+)
RYG Field Services Specialist (1)

FORM NO.: F 06-124 REVISION NO.: 0 ISSUE DATE: 25/12/23



Calibration Certificate



Certificate No: G 660705
Date of issue : 14-Nov-23

Instrument description : Blue Gas Analyzer
Instrument model : Testo 340
Control unit serial no. : -
Instrument serial no. : 63119028
ID no. or control no. : RYG_FS0565
Manufacturer : Testo SE & Co. KGaA
Probe description : -
Probe model : -
Probe serial no. : -
Customer name : ALS LABORATORY GROUP (THAILAND) CO.,LTD.
Customer address : 104 Phatthanakan 40, Phatthanakan Road, Khwaeng Phatthanakan, Khet Suan Luang, Bangkok, 10250 Thailand
Total pages of certificate : 3 Pages
Receiving no. : L-233748
Receiving date : 08-Nov-23
Parameter of calibration : Gas Calibration (Oxygen 2.498, 10.04, 21.02 %vol, Carbon Monoxide 80.14, 302, 1003 ppm, Nitric Oxide 30.01, 151.5, 322.5 ppm, Sulphur Dioxide 50.36, 100.8, 600.8 ppm)

Condition of UUC : Used
Ambient condition : All of the Measurement were carried out the stabilized laboratory
Temperature : 23 ± 5 °C
Humidity : 55 ± 15 %RH

Calibration place : 17/121 Soi Ngamwongwan 47 Yae 48, Toongsongkhong, Laksa, Bangkok 10210

Calibration procedure no. : This instrument was calibrated by comparison with Standard gas mixture according to calibration Work Instruction no. WI-CL-28-C

The calibration certificate expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%. This certificate is applied only to item under test Environmental condition.

This Calibration Certificate may not be reproduced other than in full except with the permission of the issuing laboratory. Calibration certificates without signature and seal not valid and The results relate only to the items tested/calibrated.

This calibration certificate documents are traceability to national standards, which realize measurement according to the International System of Units (SI).

Date of calibration : 13-Nov-23

Kwanchoi K.
Mr. Kwanchoi Khamsoung
Calibration Technician

Wongluck Wongsattae
Mrs. Wongluck Wongsattae
Technical Manager



Calibration Certificate



Certificate No.: G 660705

Standard References (Table 1)

Standard	Certificate No.	Vendor	Due date
Oxygen (O2) 2.498 % Vol	4219/21	Linde	30-Sep-25
Oxygen (O2) 10.04 % Vol	CG-0153-21	Nirx	18-Nov-26
Oxygen (O2) 21.02 % Vol	CG-0041-22	Nirx	10-Feb-27
Carbon monoxide (CO) 80.14 ppm	CG-0040-22	Nirx	14-Feb-27
Carbon monoxide (CO) 302 ppm	1913/23	Linde	16-Jun-25
Carbon monoxide (CO) 1003 ppm	2584/23	Linde	10-Sep-25
Nitric Oxide (NO) 30.01 ppm	CG-0014-23	Nirx	19-Feb-25
Nitric Oxide (NO) 151.5 ppm	0161/23	Linde	22-Jan-25
Nitric Oxide (NO) 322.5 ppm	1974/23	Linde	17-Jul-25
Sulphur Dioxide (SO2) 50.36 ppm	2004/23	Linde	17-Jul-25
Sulphur Dioxide (SO2) 100.8 ppm	3507/22	Linde	09-Nov-24
Sulphur Dioxide (SO2) 600.8 ppm	2003/23	Linde	17-Jul-25

Measured room conditions

Temperature : 22.4 °C Humidity : 67.8 %RH Pressure : 1010.2 mbar

Calibration conditions

Gas Temperature : 23 °C Flow rate : 600 ml/min Gas pressure : 1017.2 mbar

Calibration Results (Before adjustment) (Table 2)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (s)
O2 (%Vol)	2.498	2.44	-0.058	0.15
O2 (%Vol)	10.04	9.96	-0.08	0.20
O2 (%Vol)	21.02	21.13	0.11	0.30
CO (ppm)	80.14	86	5.86	3.0
CO (ppm)	302	318	16	6.0
CO (ppm)	1003	1049	46	12
NO (ppm)	30.01	27	-3.01	8.0
NO (ppm)	151.5	148	-3.5	8.0
NO (ppm)	322.5	309	-13.5	12
SO2 (ppm)	50.36	52	1.64	6.0
SO2 (ppm)	100.8	103	2.2	6.0
SO2 (ppm)	600.8	604	3.2	13

Calibration Results (After adjustment) (Table 3)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
O ₂ (%Vol)	2.498	2.44	-0.058	0.15
O ₂ (%Vol)	10.04	9.96	-0.08	0.20
O ₂ (%Vol)	21.02	21.13	0.11	0.30
CO (ppm)	80.14	81	0.86	2.0
CO (ppm)	302	302	0	6.0
CO (ppm)	1003	1001	-2	12
NO (ppm)	30.01	32	1.99	8.0
NO (ppm)	151.5	153	1.5	8.0
NO (ppm)	322.5	319	-3.5	12
SO ₂ (ppm)	50.36	52	1.64	6.0
SO ₂ (ppm)	100.8	103	2.2	6.0
SO ₂ (ppm)	600.8	604	3.2	13

Remark : 1 cmol/mol = 1 %Vol, 1 μmol/mol = 1 ppm.

End of Report

Calibration Certificate

Equipment : SOUND CALIBRATOR
Manufacturer : RION
Model : NC-75
Serial No.: 35002736
ID No.: RYG_FS0496

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 19 JANUARY 2024
Calibration Date : 26 JANUARY 2024
Date of Issue : 29 JANUARY 2024

Calibrated by : Nathakorn Pisutpaisan

Approved by :
(Thanakul Petchurui)

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.

Calibration Procedure : CP-AC-03

Calibration Method :

This equipment was calibrated by follow on IEC-60942-2003 Standard.

The sound pressure level, frequency and total distortion of the sound calibrator was measured using the reference microphone.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL_BP 30/0266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL_BP 30/0267	13-FEB-24
Digital Multimeter	33461A	MY60024273	EEL_BP 31/0266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAJ	34560495	AA-3002-23	14-FEB-24
Audio Analyzer	AVR-3360A	V744B6069	EF-0012-23	10-FEB-24

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

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

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

Result of calibration :

1. Sound pressure level

Specified sound pressure level (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Acceptance limit (dB)
94	93.98	-0.02	0.14	0.40

2. Frequency

Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Acceptance limit (%)
1000	1000.0	0.0	0.1	1.0

3. Total distortion

Measured value (%)	Uncertainty (%)	Acceptance limit (%)
0.83	0.10	3.0

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

Cert. No. : ACL24093
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 00734225 / 145272 / 34370
ID No.: RYG_FS0030

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location : -
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 19 JANUARY 2024
Calibration Date : 25-26 JANUARY 2024
Date of Issue : 29 JANUARY 2024

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchur
(Thanakul Petchurai)

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.

Cert. No. : ACL24093
Job No. : VC67AC0058
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference
Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EELBP 30/0266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EELBP 29/0266	13-FEB-24
Digital Multimeter	34461A	MY60024273	EELBP 31/0266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAJ	34560495	AA-3002-23	14-FEB-24

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

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

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

Cert. No. : ACL24093
Job No. : VC67AC0058
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
8000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.6
For > 4 kHz to 10 kHz	0.3	0.7
For > 10 kHz to 20 kHz	-	1.0
5. Frequency and time weightings at 1 kHz	0.2	0.2
6. Long - term stability	0.1	0.1
7. Level linearity on the reference level range	0.2	0.3
8. Level linearity including the level range control	0.2	0.3
9. Tone burst response	0.2	0.3
10. Peak C sound level	0.2	0.35
11. Overload indication	0.2	0.25
12. High level stability	0.1	0.1

Cert. No. : ACL24093
Job No. : VC67AC0058
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.98)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
21.4

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Measured value (dB)
A - weight	11.6
C - weight	17.9
Flat	23.6

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.3	0.3	0.3	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-1.1	-0.9	-0.9	±5.0

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	0.0	0.0	±2.0
125	0.0	0.1	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.2
C - weight	94.0	94.0	0.0	± 0.2
Flat	94.0	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	± 0.1
Slow	94.0	94.0	0.0	± 0.1
Leq	94.0	94.0	0.0	± 0.1

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.3

T. Petch

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	53.9	-0.1	± 1.1
49.0	49.0	0.0	± 1.1
44.0	43.9	-0.1	± 1.1
39.0	38.9	-0.1	± 1.1
34.0	33.9	-0.1	± 1.1
30.0	29.9	-0.1	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.0	0.0	± 1.1
26.0	26.0	0.0	± 1.1
25.0	25.0	0.0	± 1.1

T. Petch

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, T _b (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	136.2	-0.2	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

T. Petch

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.6	89.8	0.2	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$
or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

T. Petch

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 00734218 / 146937 / 34368
ID No.: RYG_FS0031

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location : -
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 13 JULY 2023
Calibration Date : 10 AUGUST 2023
Date of Issue : 11 AUGUST 2023

REVIEW BY: *Nathakorn P.*
APPROVED BY: *T. Petchur*
NEXT CAL. DATE: 10/8/24

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchur
(Thanakul Petchur)

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.

QF-TS12-04-04-020664

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL_BP 30/0266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL_BP 29/0266	13-FEB-24
Digital Multimeter	34461A	MY60024273	EEL_BP 31/0266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAI	34560495	AA-3002-23	14-FEB-24

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

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

- 3.1 National Institute of Metrology (Thailand).
- 3.2 Thailand Institute of Scientific and Technological Research (TISTR).

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long - term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

Note : Pass/Fail evaluation for each parameter,
will be considered together from the acceptance limit and the Maximum-permitted uncertainty of measurement.

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.98)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
23.3

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Measured value (dB)
A - weight	14.8
C - weight	19.7
Flat	25.7

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.7	0.8	0.8	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	0.2	0.3	0.3	± 5.0

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL23249
Job No. : VC66AC0085
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	-0.1	-0.1	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.2
C - weight	94.0	94.0	0.0	± 0.2
Flat	94.0	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	± 0.1
Slow	94.0	94.0	0.0	± 0.1
Leq	94.0	94.0	0.0	± 0.1

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.3

QF-TS12-04-04-020664

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23249
Job No. : VC66AC0085
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	53.9	-0.1	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	38.9	-0.1	± 1.1
34.0	34.0	0.0	± 1.1
30.0	29.9	-0.1	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.0	0.0	± 1.1
26.0	26.0	0.0	± 1.1
25.0	25.0	0.0	± 1.1

QF-TS12-04-04-020664

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23249
Job No. : VC66AC0085
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.1	0.1	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	135.3	-1.1	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

QF-TS12-04-04-020664

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23249
Job No. : VC66AC0085
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.6	89.5	-0.1	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$
or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

QF-TS12-04-04-020664

T. Petch

Cert. No. : ACL24027
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No. : 00472126 / 158778 / 88180
ID No. : RYG_FS0301

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location : -
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 19 DECEMBER 2023
Calibration Date : 12 JANUARY 2024
Date of Issue : 16 JANUARY 2024

Calibrated by : Nathakorn Pisutpaisan

Approved by : *T. Petchurui*
(Thanakul Petchurui)

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.

Cert. No. : ACL24027
Job No. : VC67AC0044
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference
Standard Instruments.
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL-BP 30/0266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL-BP 29/0266	13-FEB-24
Digital Multimeter	34461A	MY60024273	EEL-BP 31/0266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAI	34560495	AA-3002-23	14-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.
3. This certificate is traceable to the international system of unit maintained at :

- 3.1 National Institute of Metrology (Thailand),
3.2 Thailand Institute of Scientific and Technological Research (TISTR).

Cert. No. : ACL24027
Job No. : VC67AC0044
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
8000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.6
For >4 kHz to 10 kHz	0.3	0.7
For > 10 kHz to 20 kHz	-	1.0
5. Frequency and time weightings at 1 kHz	0.2	0.2
6. Long - term stability	0.1	0.1
7. Level linearity on the reference level range	0.2	0.3
8. Level linearity including the level range control	0.2	0.3
9. Tone burst response	0.2	0.3
10. Peak C sound level	0.2	0.35
11. Overload indication	0.2	0.25
12. High level stability	0.1	0.1

Cert. No. : ACL24027
Job No. : VC67AC0044
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.98)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
18.8

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Measured value (dB)
A - weight	12.0
C - weight	18.4
Flat	24.2

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.7	0.8	0.9	± 1.5
1000	-0.2	-0.2	-0.2	± 1.0
8000	-2.5	-2.5	-2.5	±5.0

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	0.0	-0.1	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.2
C - weight	94.0	94.0	0.0	± 0.2
Flat	94.0	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	± 0.1
Slow	94.0	94.0	0.0	± 0.1
Leq	94.0	94.0	0.0	± 0.1

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.3

g. Ratan

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.1	0.1	± 1.1
84.0	84.1	0.1	± 1.1
79.0	79.1	0.1	± 1.1
74.0	74.1	0.1	± 1.1
69.0	69.1	0.1	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.1	0.1	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.1	0.1	± 1.1
28.0	28.1	0.1	± 1.1
27.0	27.1	0.1	± 1.1
26.0	26.1	0.1	± 1.1
25.0	25.1	0.1	± 1.1

g. Ratan

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	135.3	-1.1	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

g. Ratan

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.7	89.6	-0.1	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$
or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

g. Ratan

Certificate of System Qualification

GC-OQ + GCMS-OQ

System ID: GM-2
Organization Name: ALS Laboratory Group (Thailand) Co., Ltd.
Organization Location: 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250
Date: April 18, 2023 3:15:25 PM
EQP Name: AgilentRecommended, AgilentRecommended
EQP Revision: GC.02.51, GCMS.02.51
Overall Qualification Status: Pass

REVIEW BY Suchada T.
APPROVED BY Thanyaporn P.
NEXT CAL. DATE 18 Oct 24

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 Accuracy

Name: 7890

Front MMI

Setpoint Status: Pass

Setpoint: 25.0 psi Actual: 25.0 psi

Accuracy: 0.0 psi

Agilent Recommended: <= 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name: 7890

Date: April 18, 2023 3:15:25 PM
System ID: GM-2

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Setpoint Status: Pass

Zone: Oven

Setpoint/Actual: 230.0 230.1 °C

Temperature: 230.0 230.1 °C

Accuracy: 0.1 °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: 100.0 100.4 °C

Temperature: 100.0 100.4 °C

Accuracy: 0.4 °C

Agilent Recommended: >= -1.0 % setpoint in K (-3.7 °C)

<= 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: 100.0 100.4 °C

Temperature: 100.0 100.4 °C

Stability: 0.0 °C

Agilent Recommended: <= 0.5

Overall GC Oven Temperature Stability Test Status

Pass

Log Amp

Tested Combination1: Front MMI / External SQ

Name: 5975C Inert XL with TAD

Setpoint Status: Pass

Date: April 18, 2023 3:15:25 PM
System ID: GM-2

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Overall Log Amp Test Status

Pass

RFPA

Tested Combination1: Front MMI / External SQ

Name: 5975C Inert XL with TAD

Setpoint Status: Pass

Amu: 1050 m/z Drift After Five Minutes: 4 mV RFPA Voltage: 441 mV

Agilent Recommended: >= -100 and <= 100 <= 1100

Overall RFPA Test Status

Pass

Tune EI

Tested Combination1: Front MMI / External SQ

Name: 5975C Inert XL with TAD

Setpoint Status: Pass

Filament: 1

Setpoint Status: Pass

Filament: 2

Overall Tune EI Test Status

Pass

Scouting Run

Tested Combination1: Front MMI / External SQ

Injection Tower

Name: 7693A

Source: EI - Inert

Setpoint Status: Pass

Injection Volume on Column: 1.0 µL

Area RSD: 1.66 % Retention Time RSD: 0.04 %

Agilent Recommended: <= 5.00 <= 1.00

Overall Injection Precision Test Status

Pass

Date: April 18, 2023 3:15:25 PM
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Setpoint Status: Completed

Injection Volume on Column: 1.0 µL

Overall Scouting Run Status

Completed

Signal to Noise EI

Tested Combination1: Front MMI / External SQ

Name: 5975C Inert XL with TAD

Source: EI - Inert Filament: 1

Setpoint Status: Pass

Signal to Noise: 456

Agilent Recommended: >= 320

Source: EI - Inert Filament: 2

Setpoint Status: Pass

Signal to Noise: 2034

Agilent Recommended: >= 320

Overall Signal to Noise EI Test Status

Pass

Injection Precision

Tested Combination1: Front MMI / External SQ

Name: 7693A

Source: EI - Inert

Setpoint Status: Pass

Injection Volume on Column: 1.0 µL

Area RSD: 1.66 % Retention Time RSD: 0.04 %

Agilent Recommended: <= 5.00 <= 1.00

Overall Injection Precision Test Status

Pass

Date: April 18, 2023 3:15:25 PM
System ID: GM-2

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Mass Ratio Precision

Tested Combination1

Front MMI / External SQ

Name:

Injection Tower

Source:

7693A

Setpoint Status:

EI - Inert

Injection Volume on Column:

1.0

µL

RSD:

Area Mass 1

Abundance's

1.66

%

Agilent Recommended:

<=

5.00

Pass

Mass Ratio

0.39

%

<=

5.00

Pass

Overall Mass Ratio Precision Test Status

Pass

Date: April 18, 2023 3:15:25 PM
System ID: GM-2

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Instrument Details

Purpose

This section describes the as found system configuration.

Details

System

System ID: GM-2
Manufacturer: Agilent Technologies
Name: 7690
Flow Data Input: Manual Data
Temperature Data Input: Manual Data or Other Data Logging

Tested Combination1

Injection Technique: Injection Tower

Inlet: Front

Detector: External

LTM Included?: No

Sampler 1

Manufacturer: Agilent Technologies
Type: Injection Tower
Name: 7693A
Model Number: G4513A
Serial Number: CN10120122
Firmware Revision: A.10.08
Usage: Sample Injection
Location: Front
Syringe Volume (µL): 10

Date: April 18, 2023 3:15:25 PM
System ID: GM-2

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Sampler 2

Manufacturer: Agilent Technologies
Type: Tray
Name: 7693A
Model Number: G4514A
Serial Number: CN10060099
Firmware Revision: A.10.16
Vial Heater: Not installed

Mainframe 1

Manufacturer: Agilent Technologies
Name: 7890
Model Number: G3440A
Serial Number: CN10141049
Firmware Revision: A.01.16
Oven Type: Standard

Inlet 1

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

Detector 1

Manufacturer: Agilent Technologies
Name: Mass Spectrometer
Type: Mass Spectrometer
Location: External

Date: April 18, 2023 3:15:25 PM
System ID: GM-2

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Mass Spectrometer 1

Manufacturer: Agilent Technologies
Type: SQ
Name: 5975C Inlet XL with TAD
Serial Number: US10153217
Firmware Revision: 5.02.12
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

Date: April 18, 2023 3:15:25 PM
System ID: GM-2

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Electronic Signature

Purpose

This signature page was created and published because the ACE sign-off action was executed, which is valid for the entire document, including attachments. The ACE sign-off is an electronic signature that requires two distinct identification components: unique username and personal password. The Agilent representative who has delivered this service understands the meaning and legal status of an electronic signature. As a trained official operator, the Agilent representative has a unique password and login to access ACE and electronically sign this document. (Other e-signatures can be applied to this document using a Document Content Management or other suitable method defined in your data access and control procedures.)

Details

Full Name of Signer: Supasak Nimsongtham
Logged On User Name: supasak.nimsongtham@agilent.com
Signature Creation Date: April 18, 2023
Reason for Signature: Executed protocol and published this original version of document

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Date: April 18, 2023 3:15:25 PM
System ID: GM-2

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User Name: supasak.nimsongtham
Host Name: SC0115HRC

System ID: GM-2
Print Date: April 18, 2023 3:15:38 PM

ALS GM2 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 18, 2023 2:14:23 PM	Auto	Baseline/Control	Session	None
April 18, 2023 2:14:23 PM	Start	Configuration	Session	None
April 18, 2023 2:14:23 PM	Auto	Enrichment	Licensing	User is First Engineer and does not require an unlock code
April 18, 2023 2:15:04 PM	Auto	Engaged	Session	EQP details for primary technique [Dc] - File path: [ProtocolFolder\GM2\Config\inst02.31Gn.02.51.asp], EQP File Name: [GC-02.51.asp], EQP Name: [Agilent/Recommended/Photo Revision (GC-02.51) EQP details for hyphenated technique [DcM] - File path: [ProtocolFolder\GM2\Config\inst02.31Gn.02.51.asp], EQP File Name: [GC-02.51.asp], EQP Name: [Agilent/Recommended]
April 18, 2023 2:15:07 PM	End	Configuration	Session	None
April 18, 2023 2:15:11 PM	Start	Configuration	Session	OQ
April 18, 2023 2:15:11 PM	Start	Execution	System Inspection and Basic Safety and Operation - 7890 - Qualitative Test - No warnings associated	None
April 18, 2023 2:17:27 PM	End	Execution	System Inspection and Basic Safety and Operation - 7890 - Qualitative Test - No warnings associated	Run Count: 1

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Date: April 18, 2023 3:15:25 PM
System ID: GM-2

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User Name: supasak.nimsongtham
Host Name: SC0115HRC

System ID: GM-2
Print Date: April 18, 2023 3:18:36 PM

ALS GM2 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 18, 2023 2:17:28 PM	Start	Execution	Initial Pressure Accuracy - Front - MFC - Pressure Controlled Test - S: 25.0 psi - L: +/- 0.2 psi	None
April 18, 2023 2:17:33 PM	End	Execution	Initial Pressure Accuracy - Front - MFC - Pressure Controlled Test - S: 25.0 psi - L: +/- 0.2 psi	Run Count: 1
April 18, 2023 2:17:38 PM	Start	Execution	GC Oven Temperature Accuracy - 7890 - Temperature : Oven - S: 230.0°C - L: +/- 1.0 AND +/- 1.0 % setpoint in K	None
April 18, 2023 2:18:01 PM	Auto	Data	GC Oven Temperature Accuracy - 7890 - Temperature : Oven - S: 230.0°C - L: +/- 1.0 AND +/- 1.0 % setpoint in K	Manual Data Entry
April 18, 2023 2:18:01 PM	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
April 18, 2023 2:18:03 PM	Start	Execution	GC Oven Temperature Accuracy - 7890 - Temperature : Oven - S: 230.0°C - L: +/- 1.0 AND +/- 1.0 % setpoint in K	None
April 18, 2023 2:18:30 PM	Auto	Data	GC Oven Temperature Accuracy - 7890 - Temperature : Oven - S: 230.0°C - L: +/- 1.0 AND +/- 1.0 % setpoint in K	Manual Data Entry
April 18, 2023 2:18:32 PM	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
April 18, 2023 2:18:44 PM	Start	Execution	GC Oven Temperature Stability - 7890 - Temperature : Oven - S: 230.0°C - L: +/- 0.5°C	None

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Date: April 18, 2023 3:15:25 PM
System ID: GM-2

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User Name: supasak.nimsongtham
Host Name: SC0115HRC

System ID: GM-2
Print Date: April 18, 2023 3:15:38 PM

ALS GM2 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 18, 2023 2:18:31 PM	Auto	Data	GC Oven Temperature Stability - 7890 - Temperature : Oven - S: 230.0°C - L: +/- 0.5°C	Manual Data Entry
April 18, 2023 2:18:33 PM	End	Execution	GC Oven Temperature Stability - 7890 - Temperature : Oven - S: 230.0°C - L: +/- 0.5°C	Run Count: 1
April 18, 2023 2:18:38 PM	Start	Execution	Log Amp - 5975C Inlet XL with TAD SQ - Source: EI - Inlet	None
April 18, 2023 2:18:46 PM	End	Execution	Log Amp - 5975C Inlet XL with TAD SQ - Source: EI - Inlet	Run Count: 1
April 18, 2023 2:19:48 PM	Start	Execution	RIPA - 5975C Inlet XL with TAD SQ - Source: EI - Inlet	None
April 18, 2023 2:22:58 PM	End	Execution	RIPA - 5975C Inlet XL with TAD SQ - Source: EI - Inlet	Run Count: 1
April 18, 2023 2:32:57 PM	Start	Execution	Time EI - 5975C Inlet XL with TAD SQ - Source: EI - Inlet	None
April 18, 2023 2:34:59 PM	End	Execution	Time EI - 5975C Inlet XL with TAD SQ - Source: EI - Inlet	Run Count: 1
April 18, 2023 2:34:57 PM	Start	Execution	Time EI - 5975C Inlet XL with TAD SQ - Source: EI - Inlet	None
April 18, 2023 2:34:59 PM	End	Execution	Time EI - 5975C Inlet XL with TAD SQ - Source: EI - Inlet	Run Count: 1

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Date: April 18, 2023 3:15:25 PM
System ID: GM-2

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User Name: srgopal.krishnamoorthy
Hostname: SC011586C
System ID: GM-2
Print Date: April 16, 2023 3:15:25 PM

ALS GM1 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 16, 2023 2:54:23 PM	Start	Execution	Scheduling Run - Injection Tower, Front MM, SQ - Source - EI - Inlet-Port of GCMS System Preparation	None
April 16, 2023 2:54:56 PM	Auto	Data	Scheduling Run - Injection Tower, Front MM, SQ - Source - EI - Inlet-Port of GCMS System Preparation	Data File Path: E:\GM-2\002023\PMRPUP_MRP001.D\DATA.MS
April 16, 2023 2:59:12 PM	End	Execution	Scheduling Run - Injection Tower, Front MM, SQ - Source - EI - Inlet-Port of GCMS System Preparation	Run Count: 1
April 16, 2023 2:59:13 PM	End	Execution	Signal to Noise EI - Injection Tower, Front MM, SQ - Source - EI - Inlet using Filament 1 - L >= 320	None
April 16, 2023 2:59:29 PM	Auto	Data	Signal to Noise EI - Injection Tower, Front MM, SQ - Source - EI - Inlet using Filament 1 - L >= 320	Data File Path: E:\GM-2\002023\PMRPUP_MRP001.D\DATA.MS
April 16, 2023 2:59:45 PM	End	Execution	Signal to Noise EI - Injection Tower, Front MM, SQ - Source - EI - Inlet using Filament 1 - L >= 320	Run Count: 1
April 16, 2023 2:59:47 PM	Start	Execution	Signal to Noise EI - Injection Tower, Front MM, SQ - Source - EI - Inlet using Filament 2 - L >= 320	None
April 16, 2023 2:59:52 PM	Start	Execution	Injection Precision - Injection Tower, Front MM, SQ - Source - EI - Inlet L (Area) <= 5.00% - L (Ret. Time) <= 1.00%	None

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Date: April 16, 2023 3:15:25 PM
System ID: GM-2

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User Name: srgopal.krishnamoorthy
Hostname: SC011586C
System ID: GM-2
Print Date: April 16, 2023 3:15:30 PM

ALS GM2 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 16, 2023 2:59:29 PM	Auto	Data	Injection Precision - Injection Tower, Front MM, SQ - Source - EI - Inlet L (Area) <= 5.00% - L (Ret. Time) <= 1.00%	Data File Path: E:\GM-2\002023\PMRPUP_MRP002.D\DATA.MS
April 16, 2023 2:59:30 PM	Auto	Data	Injection Precision - Injection Tower, Front MM, SQ - Source - EI - Inlet L (Area) <= 5.00% - L (Ret. Time) <= 1.00%	Data File Path: E:\GM-2\002023\PMRPUP_MRP003.D\DATA.MS
April 16, 2023 2:59:30 PM	Auto	Data	Injection Precision - Injection Tower, Front MM, SQ - Source - EI - Inlet L (Area) <= 5.00% - L (Ret. Time) <= 1.00%	Data File Path: E:\GM-2\002023\PMRPUP_MRP004.D\DATA.MS
April 16, 2023 2:59:30 PM	Auto	Data	Injection Precision - Injection Tower, Front MM, SQ - Source - EI - Inlet L (Area) <= 5.00% - L (Ret. Time) <= 1.00%	Data File Path: E:\GM-2\002023\PMRPUP_MRP005.D\DATA.MS
April 16, 2023 2:59:30 PM	Auto	Data	Injection Precision - Injection Tower, Front MM, SQ - Source - EI - Inlet L (Area) <= 5.00% - L (Ret. Time) <= 1.00%	Data File Path: E:\GM-2\002023\PMRPUP_MRP006.D\DATA.MS
April 16, 2023 2:59:31 PM	Auto	Data	Injection Precision - Injection Tower, Front MM, SQ - Source - EI - Inlet L (Area) <= 5.00% - L (Ret. Time) <= 1.00%	Data File Path: E:\GM-2\002023\PMRPUP_MRP007.D\DATA.MS
April 16, 2023 2:59:45 PM	End	Execution	Injection Precision - Injection Tower, Front MM, SQ - Source - EI - Inlet L (Area) <= 5.00% - L (Ret. Time) <= 1.00%	Run Count: 1
April 16, 2023 2:59:48 PM	Start	Execution	Mass Ratio Precision - Injection Tower, Front MM, SQ - Source - EI - Inlet - L (Ratio) <= 5.00%	None

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Date: April 16, 2023 3:15:25 PM
System ID: GM-2

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User Name: srgopal.krishnamoorthy
Hostname: SC011586C
System ID: GM-2
Print Date: April 16, 2023 3:15:38 PM

ALS GM2 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 16, 2023 2:57:34 PM	Auto	Data	Mass Ratio Precision - Injection Tower, Front MM, SQ - Source - EI - Inlet - L (Ratio) <= 5.00%	Data File Path: E:\GM-2\002023\PMRPUP_MRP002.D\DATA.MS
April 16, 2023 2:57:38 PM	Auto	Data	Mass Ratio Precision - Injection Tower, Front MM, SQ - Source - EI - Inlet - L (Ratio) <= 5.00%	Data File Path: E:\GM-2\002023\PMRPUP_MRP003.D\DATA.MS
April 16, 2023 2:57:51 PM	Auto	Data	Mass Ratio Precision - Injection Tower, Front MM, SQ - Source - EI - Inlet - L (Ratio) <= 5.00%	Data File Path: E:\GM-2\002023\PMRPUP_MRP004.D\DATA.MS
April 16, 2023 2:57:54 PM	Auto	Data	Mass Ratio Precision - Injection Tower, Front MM, SQ - Source - EI - Inlet - L (Ratio) <= 5.00%	Data File Path: E:\GM-2\002023\PMRPUP_MRP005.D\DATA.MS
April 16, 2023 2:57:59 PM	Auto	Data	Mass Ratio Precision - Injection Tower, Front MM, SQ - Source - EI - Inlet - L (Ratio) <= 5.00%	Data File Path: E:\GM-2\002023\PMRPUP_MRP006.D\DATA.MS
April 16, 2023 2:57:59 PM	Auto	Data	Mass Ratio Precision - Injection Tower, Front MM, SQ - Source - EI - Inlet - L (Ratio) <= 5.00%	Data File Path: E:\GM-2\002023\PMRPUP_MRP007.D\DATA.MS
April 16, 2023 2:57:57 PM	End	Execution	Signal to Noise EI - Injection Tower, Front MM, SQ - Source - EI - Inlet using Filament 2 - L >= 320	Run Count: 1
April 16, 2023 2:57:53 PM	Start	Execution	Signal to Noise EI - Injection Tower, Front MM, SQ - Source - EI - Inlet using Filament 2 - L >= 320	None

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Date: April 16, 2023 3:15:25 PM
System ID: GM-2

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User Name: srgopal.krishnamoorthy
Hostname: SC011586C
System ID: GM-2
Print Date: April 16, 2023 3:15:38 PM

ALS GM2 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 16, 2023 2:56:38 PM	Start	Execution	Signal to Noise EI - Injection Tower, Front MM, SQ - Source - EI - Inlet using Filament 2 - L >= 320	None
April 16, 2023 2:57:00 PM	Auto	Data	DetManager	DetManager was in a data verification state but the user chose to start over
April 16, 2023 2:57:16 PM	Auto	Data	Signal to Noise EI - Injection Tower, Front MM, SQ - Source - EI - Inlet using Filament 2 - L >= 320	Data File Path: E:\GM-2\002023\PMRPUP_MRP001.D\DATA.MS
April 16, 2023 2:57:58 PM	Start	Execution	Signal to Noise EI - Injection Tower, Front MM, SQ - Source - EI - Inlet using Filament 2 - L >= 320	None
April 16, 2023 2:58:05 PM	End	Execution	Signal to Noise EI - Injection Tower, Front MM, SQ - Source - EI - Inlet using Filament 2 - L >= 320	Run Count: 1
April 16, 2023 3:01:14 PM	End	Qualification	Session	OG
April 16, 2023 3:01:14 PM	Start	Reporting	Session	None
April 16, 2023 3:14:47 PM	Auto	Reporting	Session	Report Generated: Certificate

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Date: April 16, 2023 3:15:25 PM
System ID: GM-2

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SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

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



Cert. No. : ACC23029
Pages : 1 of 3

Calibration Certificate

Equipment : SOUND CALIBRATOR
Manufacturer : RION
Model : NC-74
Serial No. : 34178123
ID No. : RYG_FS0215

REVIEW BY: *Nathakorn P.*
APPROVED BY: *Thanakul P.*
NEXT CAL. DATE: 20/9/24

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 07 SEPTEMBER 2023
Calibration Date : 20 SEPTEMBER 2023
Date of Issue : 20 SEPTEMBER 2023

Calibrated by : Nathakorn Pisutpaisan

Approved by :

Thanakul P.
(Thanakul Petchurai)

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QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACC23029
Job No. : VC66AC0100
Pages : 2 of 3

Calibration Procedure : CP-AC-03

Calibration Method :

This equipment was calibrated by based on IEC-60942-2003 Standard.

The sound pressure level, frequency and total distortion of the sound calibrator was measured using the reference microphone.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL_BP 30/0266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL_BP 30/0267	13-FEB-24
Digital Multimeter	33461A	MY60024273	EEL_BP 31/0266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAI	34560495	AA-3002-23	14-FEB-24
Audio Analyzer	AVR-3360A	V744B6069	EF-0012-23	10-FEB-24

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

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

- 3.1 National Institute of Metrology (Thailand).
- 3.2 Thailand Institute of Scientific and Technological Research (TISTR).

QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACC23029
Job No. : VC66AC0100
Pages : 3 of 3

Result of calibration :

1. Sound pressure level

Specified sound pressure level (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Acceptance limit (dB)
94	94.1	0.10	0.14	0.40

2. Frequency

Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Acceptance limit (%)
1000	1001.5	0.1	0.1	1.0

3. Total distortion

Measured value (%)	Uncertainty (%)	Acceptance limit (%)
1.70	0.10	3.0

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

451-451/1 Sirinthorn Road, Bangbunru, Bangkok, 10700 Thailand
Tel. 166 2433 8831 Email : calibration@sithiporn.com

SITHIPORN ASSOCIATES



Cert. No. : ACL24092
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No. : 00734220 / 145286 / 34371
ID No. : RYG_FS0026

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 19 JANUARY 2024
Calibration Date : 25-26 JANUARY 2024
Date of Issue : 29 JANUARY 2024

Calibrated by : Nathakorn Pisutpaisan

Approved by :

Thanakul P.
(Thanakul Petchurai)

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SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY

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Tel. +66 2433 8331 Email: calibration@sithiporn.com



Cert. No. : ACL24092
Job No. : VC67AC0058
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).

The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL-BP 30/0266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL-BP 29/0266	13-FEB-24
Digital Multimeter	34461A	MY60024273	EEL-BP 31/0266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAI	34560495	AA-3002-23	14-FEB-24

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

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

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

T. Petch

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY

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



Cert. No. : ACL24092
Job No. : VC67AC0058
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
8000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.6
For > 4 kHz to 10 kHz	0.3	0.7
For > 10 kHz to 20 kHz	-	1.0
5. Frequency and time weightings at 1 kHz	0.2	0.2
6. Long - term stability	0.1	0.1
7. Level linearity on the reference level range	0.2	0.3
8. Level linearity including the level range control	0.2	0.3
9. Tone burst response	0.2	0.3
10. Peak C sound level	0.2	0.35
11. Overload indication	0.2	0.25
12. High level stability	0.1	0.1

T. Petch

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CALIBRATION LABORATORY

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Tel. +66 2433 8331 Email: calibration@sithiporn.com



Cert. No. : ACL24092
Job No. : VC67AC0058
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.98)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
16.3

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Measured value (dB)
A - weight	13.4
C - weight	19.5
Flat	25.4

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.3	0.3	0.3	±1.5
1000	0.1	0.1	0.1	±1.0
8000	2.3	2.3	2.3	±5.0

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Cert. No. : ACL24092
Job No. : VC67AC0058
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±2.0
125	0.0	0.1	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.2
C - weight	94.0	94.0	0.0	± 0.2
Flat	94.0	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	± 0.1
Slow	94.0	94.0	0.0	± 0.1
Leq	94.0	94.0	0.0	± 0.1

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.3

T. Petch

Cert. No. : ACL24092
Job No. : VC67AC0058
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
30.0	29.9	-0.1	±1.1
29.0	29.0	0.0	±1.1
28.0	28.0	0.0	±1.1
27.0	27.1	0.1	±1.1
26.0	26.1	0.1	±1.1
25.0	25.1	0.1	±1.1

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Cert. No. : ACL24092
Job No. : VC67AC0058
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.1	0.1	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	135.6	-0.8	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

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Cert. No. : ACL24092
Job No. : VC67AC0058
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.6	89.7	0.1	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

T. Petchur

Cert. No. : ACL24076
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No. : 00734221 / 157777 / 22653
ID No. : RYG_FS0027

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location : -
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 11 JANUARY 2024
Calibration Date : 22-24 JANUARY 2024
Date of Issue : 24 JANUARY 2024

Calibrated by : Nathakorn Pisutpaisan

Approved by : T. Petchur
(Thanakul Petchurai)

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CALIBRATION LABORATORY

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Cert. No. : ACL24076
Job No. : VC67AC0054
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL_BP 30/0266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL_BP 29/0266	13-FEB-24
Digital Multimeter	34461A	MY60024273	EEL_BP 31/0266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KA1	34560495	AA-3002-23	14-FEB-24

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

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

- 3.1 National Institute of Metrology (Thailand).
- 3.2 Thailand Institute of Scientific and Technological Research (TISTR).

T. Petch

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Cert. No. : ACL24076
Job No. : VC67AC0054
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
8000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.6
For > 4 kHz to 10 kHz	0.3	0.7
For > 10 kHz to 20 kHz	-	1.0
5. Frequency and time weightings at 1 kHz	0.2	0.2
6. Long - term stability	0.1	0.1
7. Level linearity on the reference level range	0.2	0.3
8. Level linearity including the level range control	0.2	0.3
9. Tone burst response	0.2	0.3
10. Peak C sound level	0.2	0.35
11. Overload indication	0.2	0.25
12. High level stability	0.1	0.1

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Cert. No. : ACL24076
Job No. : VC67AC0054
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.98)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.4

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Measured value (dB)
A - weight	12.6
C - weight	18.9
Flat	24.7

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.3	0.3	0.3	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-0.5	-0.4	-0.4	± 5.0

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Job No. : VC67AC0054
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	-0.1	-0.1	±2.0
125	-0.1	0.0	-0.1	±1.5
250	-0.1	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.0	0.0	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.2
C - weight	94.0	94.0	0.0	± 0.2
Flat	94.0	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	± 0.1
Slow	94.0	94.0	0.0	± 0.1
Leq	94.0	94.0	0.0	± 0.1

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.3

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Cert. No. : ACL24076
Job No. : VC67AC0054
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.1	0.1	±1.1
136.0	136.1	0.1	±1.1
135.0	135.1	0.1	±1.1
134.0	134.1	0.1	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.1	0.1	±1.1
124.0	124.0	0.0	±1.1
119.0	119.1	0.1	±1.1
114.0	114.1	0.1	±1.1
109.0	109.0	0.0	±1.1
104.0	104.1	0.1	±1.1
99.0	99.1	0.1	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
30.0	29.9	-0.1	±1.1
29.0	28.9	-0.1	±1.1
28.0	27.9	-0.1	±1.1
27.0	26.9	-0.1	±1.1
26.0	25.9	-0.1	±1.1
25.0	24.9	-0.1	±1.1

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Cert. No. : ACL24076
Job No. : VC67AC0054
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	116.9	-0.1	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.8	-0.2	1.5 ; -5.0
	2	8	108.0	107.9	-0.1	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lcpeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	136.0	-0.4	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

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Job No. : VC67AC0054
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11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.6	89.6	0.0	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

T. Petch

CERTIFICATE OF CALIBRATION

ISSUED BY **Cirrus Research plc**
DATE OF ISSUE **29 January 2024** CERTIFICATE NUMBER **207436**

Cirrus Research plc
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

REVIEWED BY *Markom P*
APPROVED BY *[Signature]*
NEXT CAL DATE *28/1/25*

Page 1 of 2
Approved signatory
N. Smith
Electronically signed:
[Signature]

doseBadge Reader : IEC 60942:2003

Instrument information

Manufacturer: **Cirrus Research plc**
Model: **RC-110A**
Serial number: **89107**
Class: **2**

Notes:

Test summary

Date of calibration: **29 January 2024**

The doseBadge reader detailed above has been calibrated to the published data as described in the operating manual and in the half-inch configuration. The procedures and techniques used are as described in IEC60942_2003 Annex B – Periodic Tests and three determinations of the sound pressure level, frequency and total distortion were made.

The sound pressure level was measured using a WS2F condenser microphone type MK-224 manufactured by Cirrus Research plc.

The results have been corrected to the reference pressure of 101.33 kPa using the manufacturer's data.

The doseBadge Reader has been shown to conform to the Class 2 requirements for periodic testing, described in Annex B of IEC 60942:2003 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed.

However, as public evidence was not available, from a testing organisation responsible for pattern approval, to demonstrate that the model of doseBadge Reader conformed to the requirements for pattern approval described in Annex A of IEC 60942:2003, no general statement or conclusion can be made about conformance of the doseBadge Reader to the requirements of IEC 60942:2003.

Notes:

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%.

CERTIFICATE OF CALIBRATION

Certificate Number:
207436
Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test:

Before Pressure: 101.41 kPa Temperature: 21.2 °C Humidity: 37.1 %
After Pressure: 101.41 kPa Temperature: 21.2 °C Humidity: 37.4 %

Test equipment

Equipment	Manufacturer	Model	Serial number
Distortion Meter	Keithley	2015	0994818
Acoustic Calibrator	Bruel and Kjaer	4231	2610257
Environmental Monitor	Comet	T7510	21962628

Initial Acoustic Results

	Expected	Sample 1	Sample 2	Sample 3	Average	Deviation	Tolerance	Uncertainty
Level (dB)	114.00	113.55	113.54	113.54	113.54	-0.46	±0.75	0.11 dB
Distortion (%)	< 4.00	0.43	0.45	0.42	0.44	0.44	+4.00	0.13 %
Frequency (Hz)	1000.0	1002.3	1002.3	1002.3	1002.3	2.3	±20.0	0.1 Hz

The measured quantities or deviations (as applicable), extended by the expanded combined uncertainty of measurement, must not exceed the corresponding tolerance.

Adjusted Acoustic Results

	Expected	Sample 1	Sample 2	Sample 3	Average	Deviation	Tolerance	Uncertainty
Level (dB)	114.00	113.98	114.01	114.01	114.00	0.00	±0.75	0.11 dB
Distortion (%)	< 4.00	0.33	0.34	0.33	0.33	0.33	+4.00	0.13 %
Frequency (Hz)	1000.0	1002.3	1002.3	1002.3	1002.3	2.3	±20.0	0.1 Hz

Functionality Results

Function	Result
Keypad	Pass
Battery Power	Pass
Display	Pass
Communication	Pass
2 way IR link	Pass
Clock	Pass

End of results



Certificate of Calibration

Equipment: SPECTROPHOTOMETER
Model: DR6000
Serial No. (or ID.): 1627845 (RYG_EN0037)
Manufacturer: HACH
Condition: In Condition

Certificate No.: C06230441
Issued Date: 19 September 2023
Job No.: WO-00005382
Page: 1 of 3

Customer: ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)
618/10 Moo 5 T.Maenam Khu,
A.Pluakdaeng, Rayong 21140, Thailand.

Environment Condition: Temperature 23.9 °C ± 0.2
Humidity 65.3 %RH ± 1.4

Calibration Place: ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch) (Wet Chemistry)
618/10 Moo 5 T.Maenam Khu,
A.Pluakdaeng, Rayong 21140, Thailand.

Calibration By: Mr.Nattapat Rungueang
Calibration Date: 18 September 2023
The Method used: In house method, CAL-WI-24, base on ASTM E 275-08 and ASTM E 387-04
Traceability: This certificate is traceable to the CRM maintained by National Institute of Standards and Technology (NIST) through Stama Scientific Limited.

The standard for Wavelength Certificate No. 111583 and 111584
The standard for Photometric Certificate No. 9114984 and 111588
The standard for Stray light Certificate No. 111586 and 111585
The standard for Spectral resolution Certificate No. 111587

(Mr. Nattapat Rungueang)
Person in charge

(Mr. Nitinun Srihawan)
Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.
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Phone: +66 2636 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

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CAL-FM-C06-15: 12 Sep 2022



Certificate No.: C06230441 Page 2 of 3

Calibration Results: Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of Std at 2 nm and UUC at 2 nm				
Standard Wavelength	Unit Under Calibration	Correction	Uncertainty	
418.61	418.3	0.31	0.13	
536.66	536.6	0.06	0.13	
637.98	638.3	-0.32	0.13	
748.48	748.7	-0.22	0.13	
807.03	807.4	-0.37	0.13	
Photometric Accuracy (Absorbance)				
Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
420 nm	0.0000	0.000	0.0000	0.0045
	0.2930	0.289	0.0040	0.0045
	0.5168	0.519	-0.0022	0.0045
	1.0298	1.029	0.0008	0.0045
440 nm	0.0000	0.000	0.0000	0.0045
	0.2867	0.283	0.0037	0.0045
	0.5073	0.509	-0.0017	0.0045
	1.0083	1.007	0.0013	0.0045
465 nm	0.0000	0.000	0.0000	0.0045
	0.2516	0.250	0.0016	0.0045
	0.4595	0.462	-0.0025	0.0045
	0.9334	0.933	0.0004	0.0045
546.1 nm	0.0000	0.000	0.0000	0.0045
	0.2461	0.245	0.0011	0.0045
	0.4652	0.466	-0.0008	0.0045
	0.9468	0.946	0.0008	0.0045
590 nm	0.0000	0.000	0.0000	0.0045
	0.2594	0.259	0.0004	0.0045
	0.5040	0.505	-0.0010	0.0045
	1.0032	1.002	0.0012	0.0045
635 nm	0.0000	0.000	0.0000	0.0045
	0.2579	0.257	0.0009	0.0045
	0.4971	0.497	0.0001	0.0045
	0.9720	0.971	0.0010	0.0045

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CAL-FM-C06-15: 12 Sep 2022



Certificate No.: C06230441 Page 3 of 3

Calibration Results: Without Adjustment

Photometric Accuracy (Absorbance)				
Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
235 nm	0.0000	0.000	0.0000	0.0080
	0.7355	0.737	-0.0015	0.0080
257 nm	0.0000	0.000	0.0000	0.0080
	0.8574	0.857	0.0004	0.0080
313 nm	0.0000	0.000	0.0000	0.0080
	0.2864	0.290	-0.0036	0.0080
350 nm	0.0000	0.000	0.0000	0.0080
	0.6374	0.637	0.0004	0.0080
Stray light *				
Standard: cut-off	UUC: Wavelength (nm)	UUC: Transmission (%T)	Absorbance (A)	
260.62 +/- 0.11 nm	260.6	1.3	1.886	
391.44 +/- 0.11 nm	391.4	1.3	1.886	
Spectral Resolution *				
Nominal Concentration 0.02 % w/v	Peak	Trough	Ratio	SBW
Standard Wavelength (nm)	268.66	266.89	1.38	2.00
UUC: Wavelength (nm)	268.2	266.1		
Std Absorbance (A)	0.4566	0.2780		
Absorbance (A)	0.413	0.300		

* Calibration Marked "Not TISI Accredited" in this Certificate have been included for completeness.

The End of Certificate

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CAL-FM-C06-15: 12 Sep 2022

ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: WO-00005382

ชนิดเครื่องมือ: SPECTROPHOTOMETER รุ่น: DR6000

หมายเลขเครื่อง: 1627845

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
18 Sep 2023			18 Sep 2023		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
General					
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1. ความสมบูรณ์เครื่อง	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	3. สวิตช์ ปิด - เปิด เครื่อง (On-Off Switch)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Spectrophotometer					
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	6. แรงดันไฟฟ้า (Battery Backup) ≥ 2.5 VDC	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	7. ควบคุมเลือกความยาวคลื่น (Wavelength Control)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	9. แหล่งกำเนิดแสง (UV < 3,000 hour)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	9.2 Hours
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	10. แหล่งกำเนิดแสง (Visible < 5,000 hour)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	741.5 Hours
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	11. ช่องวัดหลายตัวอย่าง (Carousel Module)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
pH Meter and Conductivity Meter					
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	12. อิเล็กโทรด (Electrode and Connection Cable)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	13. ระดับสารละลายใน Electrode (Level KCl)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	14. ฝาปิดกันปลาย Electrode (Dust Protection Hood)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	15. ขาตั้งอิเล็กโทรด (Stand)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Turbidimeter					
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	16. ค่าความขุ่นที่ต่ำสุด (No Sample)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	17. ระดับการส่องสว่างของแสง (≥ 2.5 ไมล์กัน 3.0)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Automatic titrator					
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	18. สภาวะ Piston Burettes	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	19. Function Rinsing and Dosing	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	20. ระบบท่อสายยางและอุปกรณ์ประกอบ	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

เงื่อนไขข้อแนะนำ: *656.1nm=656.1nm

*486.0nm=485.5nm

Mr.Nattapat Rungueang
Service Engineer

บริษัท ดีเคเอส อีเซีย จำกัด
DKSH Technology Limited
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CAL-FM-R31-03: 20 Jul 2022



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL: 0-2717-3000-24 FAX: 0-2719-9484



Certificate of Calibration

Certificate No.: 23E3924
Page: 1 of 2

Equipment: pH Meter
Manufacturer: Mettler Toledo
Model: SevenExcellence
Serial No.: B834291445
ID No.: RYG_EN0152
Condition As-Received: Used Item
Received Date: 08 December 2023
Calibration Date: 14 December 2023

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Reference: 2312-0151DSC
Ambient Temperature: (23 \pm 2) °C
Relative Humidity: (50 \pm 10) %

Submitted by: ALS Laboratory Group (Thailand) Co.,Ltd. Rayong Branch

616/10 Moo 5, T.Maenam Khu, A.Plusdaeng,
Rayong 21140, Thailand

Procedure used: Calibration were conducted using calibration procedure No. CP-E17 according to EURAMET cg-15.

Condition of this result of calibration

1.Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Multi-Product Calibrator	5502A	2435802	EE-0041-23	26 Apr 2024

2.This result of calibration was made on requested at the point specified by customer.
3.The certificate is valid only to the item calibrated on date and place of calibration.
4.This Certification is traceable to the International System of Unit maintained through:-
-National Institute of Metrology Thailand (NIMT)

REVIEW BY *N.Bongkit*
APPROVED BY *D.Boon*
NEXT CAL. DATE 14/12/24

Calibrated by: Napachanok Prasomsocsi
Issue Date: 15 December 2023

Approved Signatory:
() Phalinee Pratsapaipal
(x) Nuntawat Khamchai
() Pongsagorn Boonyaporn

B 0331106



Cert. No.: 23E3924
Page: 2 of 2

Result of calibration:- (*) Without adjustment () After adjustment

Function: DC voltage measurement	Range:	2000	mV
Standard Value	UUC* Reading	Error	Uncertainty
(mV)	(mV)	(mV)	(\pm μ V)
-200.0000	-199.9	0.1	68
-150.0000	-150.0	0.0	65
-100.0000	-100.0	0.0	63
-50.0000	-50.0	0.0	61
0.0000	0.0	0.0	58
50.0000	50.0	0.0	61
100.0000	100.0	0.0	63
150.0000	150.0	0.0	65
200.0000	199.9	-0.1	68

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

UUC*= Unit Under Calibration.

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Certificate of Calibration

Cert.No.: 23CH1574
Page: 1 of 3

Equipment: pH Meter
Manufacturer: Mettler Toledo
Model: SevenExcellence
Serial No.: B834291445
ID No.: RYG_EN0152
Condition As-Received: Used Item
Received Date: 08 December 2023
Calibration Date: 15 December 2023
Reference: 2312-0151DSC-3
Submitted by: ALS Laboratory Group (Thailand) Co.,Ltd. Rayong Branch

616/10 Moo 5, T.Maenam Khu, A.Plusdaeng,
Rayong 21140, Thailand

Ambient Temperature: (25 \pm 2.5) °C
Relative Humidity: (50 \pm 15) %
Calibration Procedure:
- CP-CH5 by direct measurement with standard voltage calibrator and direct measurement with certified reference material (CRM)
- CP-CH8 by comparison with standard thermometer

Calibrated by: Warakorn Lemgatrakul

Approved by: *PE*
Approved Signatory

() Saithip Meangmai
() Warakorn Lemgatrakul
(x) Ponpan Paipim

Issue Date: 19 December 2023

The Uncertainties are for a confidence probability of approximately 95%

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Cert.No.: 23CH1574
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument :-

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	23E2802	27 Aug 2024
2) Ref. Standard Thermometer	4982054	110RC044	23I908	26 July 2024

This certification is traceable to the International System of Unit maintained through:-
- Technology Promotion Association (Thailand-Japan)

2. Certified Reference Materials :- The measurement results are traceable to SI through CPA chem Ltd., ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	913598	14 July 2025
pH 6.986	CPA chem	931959	01 Oct 2024
pH 9.997	CPA chem	940106	02 Nov 2024

3. This certificate is valid only to the item calibrated on date and place of calibration.

Calibration Results

Function : mV Measurement

Performing standard curve by Fluke at pH (4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input		Actual Reading		Uncertainty of Measurement (\pm mV)	Coverage factor k
	pH	mV	mV	pH	pH		
pH Meter S/N.: B834291445	4.000	177.48	177.3	4.000	0.058	2.00	2.00
	7.000	0.00	-0.1	7.000	0.058	2.00	2.00
	10.000	-177.48	-177.5	10.000	0.058	2.00	2.00

RL

a 1193852



Cert.No.: 23CH1574
Page.: 3 of 3

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (\pm)	Coverage factor k
pH Electrode S/N.: 3225368	4.008	4.013	184.1	0.0045	2.00
	6.986	6.998	8.7	0.0084	2.00
	9.997	10.002	-164.7	0.0088	2.11

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe:

- Model : InLab®Expert Pro-ISM

- Serial No. : 3225368

Dimension of probe:

- Length : 120 mm

- Diameter : 12 mm

- Immersion Depth : 100 mm

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (\pm °C)	Coverage factor k
25.0	25.003	24.3	-0.703	0.13	2.00

Remark : - 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 of approximately 95 %.

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RL

a 1193851



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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Cert.No.: 23TW168
Page.: 1 of 2

Certificate of Testing

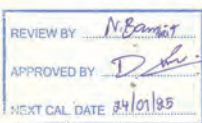
Equipment : DO Meter
Manufacturer : YSI
Model : 5000-115V
Serial No. : 15E102796
ID No. : RYG_EN0032
Received Date : 21 July 2023
Test Date : 24 July 2023
Reference : 2307-0713DSC-1
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
Rayong Branch
616/10 Moo 5, T.Maenam Khu, A.Pluakdaeng,
Rayong 21140, Thailand
Laboratory Condition : Temperature (25 \pm 5) °C
Humidity (50 \pm 20) %
Test Procedure : In - house method : CP-CH9
by Comparison Technique with Azide Modification Method

Tested by : Walalak Sirithean

Approved by :
Approved Signatory

() Malee Butkruea
(x) Saithip Meangmai
() Warakorn Lernagatrakul

Issue Date : 26 July 2023



Cert.No.: 23TW168
Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :-

This certification is traceable to the International System of Unit through the reference standards laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan).

Instruments	Serial No.	ID No.	Certificate No.	Due Date
1) Burette	-	130BU10	23CG1172	22 Mar 2025
2) Balance	1126143764	140RC004	22MM50	20 Sep 2023

2. Standard Material :-

Material	Manufacturer	Lot No.	Assay
Sodium Thiosulfate pentahydrate	Merck	AM1763316	100.2%

Result : Dissolved Oxygen Meter Adjustment With Air 100 %

Dissolved Oxygen Probe No.: 15E100464

Titration Method (Azide Modification Method)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.18	8.17	0.0055

This report was certified only for the instrument we tested. It is allowable to use for study the system efficiency. The environmental impact control and present to organization it may concerned intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full, without written approval of the laboratory

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Saithip

a 1172155

B 0320211



Cert. No.: 23LM125
Page.: 1 of 2

Certificate of Calibration

Equipment : DO Meter with Sensor
Manufacturer : YSI
Model : 5000-115V
Serial No. : 15E102796
ID No. : RYG_EN0032
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
Rayong Branch
616/10 Moo 5 T. Maenam Khu, A. Pluakdaeng,
Rayong 21140 Thailand
Location : TPA On Site Calibration Laboratory
Received Order : 25 July 2023
Calibrated Date : 27 July 2023
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V
Calibrated by : Preecha Hiahb
Approved by :
() Pornthippa Tameyakul
() Malee Butkruea
(✓) Suwit Imjai
Issue Date : 31 July 2023

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

A 0053616



Equipment : DO Meter with Sensor
Condition As-Received : Used Item
Reference : 2307-0713DSC-2
Procedure Used :-

Cert. No.: 23LM125
Page.: 2 of 2

Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with Industrial Platinum Resistance Thermometer (IPRT) into Temperature Bath.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Digital Thermometer	2188080	2211285	TPA	21 Oct 2023

2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certification is traceable to the International System of Unit.

Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function : Temperature measurement.

This instrument was connected with temperature sensor, S/N.: 1228475367

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty (± °C)	Coverage Factor k
20.00	100	20.011	19.91	-0.101	0.15	2.00

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 of approximately 95 %.

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a 1159515



Cert. No.: 23TM962
Page : 1 of 3

Certificate of Calibration

Equipment : Low Temp. Incubator
Manufacturer : Memmert
Model : IPP750
Serial No. : V818.0084
ID No. : RYG_EN0154
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
(Rayong Branch)
616/10 Moo 5 T. Maenam Khu,
A. Pluakdaeng, Rayong 21140 Thailand
Location : BOD Room
Received Order : 29 May 2023
Calibration Date : 29 May 2023
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Man Pattanapongpaiboon
Approved by :
() Pornthippa Tameyakul
() Malee Butkruea
(✓) Suwit Imjai
Issue Date : 7 June 2023

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written
Approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

A 0054967



Equipment : Low Temp. Incubator
Condition As-Received : Used Item
Reference : 2305-0898OC-2
Procedure Used :-

Cert. No.: 23TM962
Page : 2 of 3

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34972A	MY57013711	22LM83	02 Jul 2023

2. This certificate is valid only to the item calibrated on date and place of calibration.

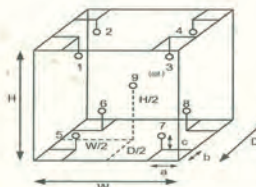
3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. (°C)	23	23
REL.Humid. (%)	54	56
AC Supply (Volt)	223	222



Probe installation Details :

a = 10 cm
b = 10 cm
c = 10 cm

Dimension of Chamber :

D = 0.60 m
W = 1.0 m
H = 1.2 m
Capacity = 0.75 m³

Position :	Ref. Std. ID No.:
1	18-18RTD-01
2	18-18RTD-02
3	18-18RTD-03
4	18-18RTD-04
5	18-18RTD-05
6	18-18RTD-10
7	18-18RTD-07
8	22-18RTD-08
9 (ref.)	18-18RTD-09

a 1165130



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2403-0563OC-1
Procedure Used :-

Cert. No.: 24TM632
Page : 2 of 3

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD) and Thermocouple Type T.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY57013711	23LM115	TPA	11 Jul 2024

2. This certificate is valid only to the item calibrated on date and place of calibration.

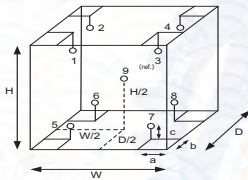
3. This certification is traceable to the International System of Unit.

Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Probe Installation Details : Dimension of Chamber :
a = 5.0 cm D = 0.40 m
b = 5.0 cm W = 0.56 m
c = 5.0 cm H = 0.48 m
Capacity = 0.11 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	27	27
REL.Humid. (%)	57	59
AC Supply (Volt)	222	224

Ref. Std. ID No. : @ Calibration Point		
Position :	(180) °C	(104) °C
1	18-18TC-01	18-18RTD-01
2	18-18TC-02	18-18RTD-02
3	18-18TC-03	18-18RTD-03
4	18-18TC-04	18-18RTD-04
5	18-18TC-05	18-18RTD-05
6	18-18TC-06	23-18RTD-06
7	18-18TC-07	18-18RTD-07
8	18-18TC-08	22-18RTD-08
9 (ref.)	18-18TC-09	18-18RTD-09



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2403-0563OC-1
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM632
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
104.0	104.0	104.0	0.051	0.59	0.62	2
180.0	180.0	180.0	0.15	1.3	1.7	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
104.0	103.921	103.786	103.757	103.759	103.950	103.817	104.213	103.672	103.673	0.42
180.0	179.614	179.270	179.145	179.599	180.001	180.423	180.293	180.629	179.429	1.1

Average* : The average of 30 values in each position.

Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.

Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.

UUC* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity .

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

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TEL.0-2717-3000-29 FAX.0-2719-9484



Certificate of Calibration

Cert. No.: 24TM634
Page : 1 of 3

Equipment : Hot Air Oven

Manufacturer : Memmert

Model : UF 110

Serial No. : B423.0853

ID No. : RYG_EN0213

Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)
616/10 Moo 5 T. Maenam Khu,
A. Pluakdaeng,
Rayong 21140 Thailand

Location : Oven Room

Received Order : 21 March 2024
Calibration Date : 21 - 22 March 2024

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Man Pattanapongpaiboon

Approved by :
Approved Signatory

() Pornthippa Tameyakul
() Unnopphol Harachai
(✓) Suwit Imjai

Issue Date : 23 March 2024

The Uncertainties are for a confidence probability of approximately 95%

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Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2403-0563OC-3
Procedure Used :-

Cert. No.: 24TM634
Page : 2 of 3

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD) and Thermocouple Type T.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY57013711	23LM115	TPA	11 Jul 2024

2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certification is traceable to the International System of Unit.

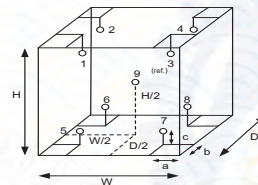
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. (°C)	27	27
REL.Humid. (%)	59	59
AC Supply (Volt)	224	223



Probe Installation Details : Dimension of Chamber :
a = 5.0 cm D = 0.40 m
b = 5.0 cm W = 0.56 m
c = 5.0 cm H = 0.48 m
Capacity = 0.11 m³

Ref. Std. ID No. : @ Calibration Point		
Position :	(180) °C	(104) °C
1	18-18TC-01	18-18RTD-01
2	18-18TC-02	18-18RTD-02
3	18-18TC-03	18-18RTD-03
4	18-18TC-04	18-18RTD-04
5	18-18TC-05	18-18RTD-05
6	18-18TC-06	23-18RTD-06
7	18-18TC-07	18-18RTD-07
8	18-18TC-08	22-18RTD-08
9 (ref.)	18-18TC-09	18-18RTD-09



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2403-0563OC-3
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM634
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor <i>k</i>
104.0	104.0	104.0	0.065	0.52	0.90	2
180.0	180.0	180.0	0.20	1.2	2.0	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
104.0	104.169	103.506	103.898	103.712	103.772	103.730	104.289	103.805	103.798	0.42
180.0	180.701	179.239	179.935	179.999	180.127	180.138	180.895	179.313	180.211	1.1

Average* : The average of 30 values in each position.

Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.

Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.

UUC* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity .

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor *k*, providing a level of confidence of approximately 95 %.

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Certificate of Calibration

Cert. No.: 24TM635
Page : 1 of 3

Equipment : Water Bath
Manufacturer : Memmert
Model : WNB22
Serial No. : L513.0648
ID No. : RYG_EN0081

Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)
616/10 Moo 5, T. Maenam Khu,
A. Pluakdaeng,
Rayong 21140, Thailand
Location : Wet Chemistry Lab

Received Order : 21 March 2024
Calibration Date : 21 March 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %

Calibrated by : Man Pattanapongpaiboon

Approved by :
Approved Signatory

() Pornthippa Tameyakul
() Unnoppol Harachai
(✓) Suwit Imjai

Issue Date : 23 March 2024

The Uncertainties are for a confidence probability of approximately 95%

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Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2403-0563OC-4
Procedure Used :-

Cert. No.: 24TM635
Page : 2 of 3

Calibration were conducted using in-house calibration procedure CP-OT04 Based on ASTM E715 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer (IPRT).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY57013711	23LM115	TPA	11 Jul 2024

2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certification is traceable to the International System of Unit.

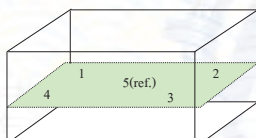
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Heat transfer medium used : Water

	Environmental		AC Voltage Supply
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	25	55	222
Finished of Calibration	25	57	223



Front

Position :	Ref. Std. ID No.:
1	4803988-001
2	4803988-002
3	4803988-003
4	4803988-004
5 (ref.)	4803988-005



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2403-0563OC-4
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 24TM635
Page : 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)					Uncertainty (± °C)
			1	2	3	4	5 (ref.)	
85.0	85.0	85.0	84.428	84.424	84.489	84.507	84.477	0.18

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Coverage Factor <i>k</i>
85.0	0.19	0.11	2

Average* : The average of 30 values in each position.

Uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

Stability : One-half of the greatest maximum difference of measured temperature at any one probe.

UUC* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity.

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor *k*, providing a level of confidence of approximately 95 %.

-o0o-

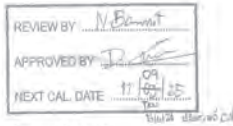
Certificate of Calibration

Represent to Certificate of Calibration No. C29240007

Equipment: Block Digestion Unit Certificate No.: C29240011
 Model: KT-20s Issued Date: 22 March 2024
 Serial No. (or ID.): 5720210009/5770200073 Job No: WO-00020429
 Manufacturer: Gerhardt Page: 1 of 4
 Condition: In Condition Digestion Block: 20 holes.

Customer: ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)
 616/10 Moo 5 T.Maenam Khu, A.Pluakdaeng, Rayong 21140, Thailand.

Environment Condition: Temperature: 25 °C ± 0.7 °C
 Humidity: 54 %RH ± 4.1 %RH
 Voltage: 225 VAC ± 1.7 VAC



Calibration Place: ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)
 (Wet Chemistry Lab)
 616/10 Moo 5 T.Maenam Khu, A.Pluakdaeng, Rayong 21140, Thailand.

Calibration By: Mr. Thanathorn Phunook

Calibration Date: 11 March 2024

The Method used: In house method, base on by comparison with standard

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through N.M. Technical Center Laboratory (NTL) Certificate No.: TC22/0080

(Mr. Thanathorn Phunook)

Person in charge

(Mr. Udon Srichana)

Authorized signatory

This certificate is issued the acts of measurement according to the International System of Units (SI), it provides traceability of measurement to international standards and is based on the expanded uncertainty which is derived from the laboratory measurement by the coverage factor (k=2) which provides a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).

These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

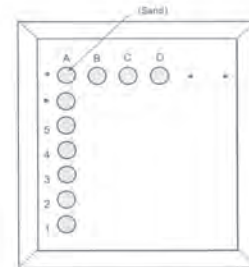
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 2533 Sukhumvit Road, Bangkok, Thailand 10260
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Fig. 1: Front view



Location of standard

Fig. 2: Digestion block

Definitions

Indicating Temperature: The average reading of indicating device which forms the integral part of the Digestion block.

Measured Temperature: The average reading of working standard at any position or location.

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Calibration Results:

Pre Calibration

Locations	Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature (°C)	Correction of UUC (°C)	Uncertainty (± °C)
A1	380	380	380	401.5	21.5	1.5
A2				401.2	21.2	1.5
A3				399.1	19.1	1.5
A4				397.8	17.8	1.5
A5				395.1	15.1	1.5
B1				396.6	16.6	1.5
B2				396.1	16.1	1.5
B3				392.9	12.9	1.5
B4				391.6	11.6	1.5
B5				390.7	10.7	1.5
C1				395.3	15.3	1.5
C2				395.6	15.6	1.5
C3				392.8	12.8	1.5
C4				391.7	11.7	1.5
C5				390.3	10.3	1.5
D1				397.6	17.6	1.5
D2				396.6	16.6	1.5
D3				395.0	15.0	1.5
D4				394.2	14.2	1.5
D5				393.6	13.6	1.5

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Calibration Results:

Without adjustment

Locations	Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature (°C)	Correction of UUC (°C)	Uncertainty (± °C)
A1	380	380	380	382.5	17.5	1.5
A2				382.4	17.4	1.5
A3				382.1	17.1	1.5
A4				379.7	14.7	1.5
A5				378.3	13.3	1.5
B1				380.1	15.1	1.5
B2				380.1	15.1	1.5
B3				378.5	13.5	1.5
B4				378.3	13.3	1.5
B5				379.1	14.1	1.5
C1				380.1	15.1	1.5
C2				380.1	15.1	1.5
C3				378.9	13.9	1.5
C4				378.2	13.2	1.5
C5				377.3	12.3	1.5
D1				380.5	15.5	1.5
D2				380.6	15.6	1.5
D3				378.1	13.1	1.5
D4				378.7	13.7	1.5
D5				377.7	12.7	1.5

The End of Certificate

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ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: WO-00020429

ชนิดเครื่องมือ: Block Digestion Unit

รุ่น: KT-20s

หมายเลขเครื่อง: 5720210009/5770200073

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
11 Mar 2024			11 Mar 2024		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	5. สภาพ Hole	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	6. สภาพฝาปิด	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input type="checkbox"/>	<input type="checkbox"/>	7. สภาพลิ้นเครื่อง	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	8. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง	<input type="checkbox"/>	<input type="checkbox"/>	

ชื่อคนกรอ

Mr. Trianathorn Phumook
Service Engineer

ภาคผนวก ฉ

สำเนาหนังสือใบอนุญาตขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

๗๕) นายประเสริฐ สุระชัย
๗๖) นายบุญล จันทะนิยม
๗๗) นายพิรพงษ์ ทองอุบลปริดา
๗๘) นายณัฐพล หอง
๗๙) นายอัครวัฒน์ ม่วงเพชร
๘๐) นายเจตศรัทธา พิพัฒน์
๘๑) นายภูษิต สหายธรรม
๘๒) นายพิชัย บุญยงค์
๘๓) นายภาณุพงศ์ โสมวงศ์
๘๔) นายสมานารถ คูณลี
๘๕) นายสิริชัย โกศลวิกรม
๘๖) นายณัฐวุฒิ ศรีประเสริฐ
๘๗) นายชวติชัย นาคพรม
๘๘) นายพชรชัย ชัยทรัพย์
๘๙) นายสิทธิโชค ทาสีลา
๙๐) นายณัฏฐา อินสุตา
๙๑) นางสาววรรณิษา ขวดีวันชัย
๙๒) นางสาวพิมพ์ขวัญ มีมากุล
๙๓) นางสาวเพ็ญรัตน์ สิงห์สมบุญ
๙๔) นางสาวชญาพร นพรมจันทร์
๙๕) นายกรรติ ทวีราช
๙๖) นายจักริน วัฒนวิศา
๙๗) นายฉัตรชัย สุขเปือย
๙๘) นายณฐกร สันทน
๙๙) นายทศพรชัย อุดมศรี
๑๐๐) นายณัฐพร นามะคุณนา
๑๐๑) นายณัฐพงศ์ ปิ่นแก้ว
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๑๐๓) นายณัฐวัฒน์ สาริน
๑๐๔) นายณัฐพล พลชนะศรี
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๑๑๕) นายณัฐพงศ์...

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๑๓๖) นายณัฐพงศ์ ณม

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๑๑๕) นางสาวอุบล...

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๑๕๒) นางสาวณัฐพร ทองสุ
๑๕๓) นายภาณุพงศ์ ปิ่นแก้ว
๑๕๔) นางสาวภาณุพงศ์ ปิ่นแก้ว
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๑๕๖) นายณัฐวัฒน์ สาริน
๑๕๗) นายณัฐพล พลชนะศรี
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๑๗๕) นายณัฐพงศ์ ณม

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สิ่งที่ส่งมาด้วย ๓

เอกสารแนบท้ายหนังสือรับข้อหาขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกสาร
บริษัท เอแอลเอส แล็บเทค จำกัด (ประเทศไทย) จำกัด เลขทะเบียน ๖-๒๐๔
ที่ อก ๐๓๑๐(๑)/ ๑๖ ๑๖ ๘ ลงวันที่ ๒๐ พฤศจิกายน ๒๕๖๖

๓. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๑๙๔ รายการ
น้ำเสีย จำนวน 60 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aldicarb	High-Performance Liquid Chromatographic Method ⁽¹⁾
2	Aldicarb Sulfone	High-Performance Liquid Chromatographic Method ⁽¹⁾
3	Aldicarb Sulfoxide	High-Performance Liquid Chromatographic Method ⁽¹⁾
4	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
5	Arsenic	1) Digestion, Inductively Coupled Plasma Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽¹⁾
6	Barium	1) Digestion, Inductively Coupled Plasma Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽¹⁾
7	α-BHC	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
8	β-BHC	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
9	δ-BHC	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
10	γ-BHC	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
11	Biochemical Oxygen Demand	1) 5-Day BOD Test, Azide Modification Method ⁽¹⁾ 2) 5-Day BOD Test, Membrane Electrode Method ⁽¹⁾
12	Carbaryl	High-Performance Liquid Chromatographic Method ⁽¹⁾
13	Carbofuran	High-Performance Liquid Chromatographic Method ⁽¹⁾
14	Cadmium	1) Digestion, Inductively Coupled Plasma Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽¹⁾
15	Chemical Oxygen Demand	1) Closed Reflux, Colorimetric Method ⁽¹⁾ 2) Closed Reflux, Titrimetric Method ⁽¹⁾
16	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
17	Chromium	1) Digestion, Inductively Coupled Plasma Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽¹⁾
18	Color	ADMI Weighted-Ordinate Spectrophotometric Method ⁽¹⁾

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
19	Copper	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
20	Cyanide	Distillation, Colorimetric Method ⁽⁴⁾
21	2,4'-DDD	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
22	4,4'-DDD	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
23	2,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
24	4,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
25	2,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
26	4,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
27	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
28	Endosulfan Sulfate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
29	Endosulfan I	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
30	Endosulfan II	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
31	Endrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
32	Endrin Aldehyde	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
33	Formaldehyde	Distillation, Colorimetric Method ⁽³⁾
34	Free Chlorine	1) DPD Ferrous Titrimetric Method ⁽³⁾ 2) DPD Colorimetric Method ⁽⁴⁾
35	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
36	Heptachlor Epoxide	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
37	Hexavalent Chromium	Colorimetric Method ⁽⁴⁾
38	3-Hydroxycarbofuran	High-Performance Liquid Chromatographic Method ⁽⁴⁾
39	Lead	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾

40 Manganese...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
40	Manganese	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
41	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
42	Methiocarb	High-Performance Liquid Chromatographic Method ⁽⁴⁾
43	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
44	Methomyl	High-Performance Liquid Chromatographic Method ⁽⁴⁾
45	Nickel	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
46	Oil & Grease	1) Liquid-Liquid, Partition-Gravimetric Method ⁽⁴⁾ 2) Soxhlet Extraction Method ⁽⁴⁾
47	Oxamyl	High-Performance Liquid Chromatographic Method ⁽⁴⁾
48	Propoxur	High-Performance Liquid Chromatographic Method ⁽⁴⁾
49	pH	Electrometric Method ⁽³⁾
50	Phenols	1) Distillation, Chloroform Extraction Method ⁽⁴⁾ 2) Distillation, Direct Photometric Method ⁽⁴⁾
51	Selenium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
52	Sulfide	Iodometric Method ⁽⁴⁾
53	Temperature	Laboratory and Field Methods ⁽⁴⁾
54	Total Dissolved Solids	Dried at 180 °C ⁽⁴⁾
55	Total Kjeldahl Nitrogen	Semi-Micro Kjeldahl Method ⁽⁴⁾
56	Total Phosphorous	Digestion, Colorimetric Method ⁽⁴⁾
57	Total Suspended Solids	Dried from 103-105 °C ⁽⁴⁾
58	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
59	Trivalent Chromium	1) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Colorimetric Method; Calculation ⁽⁴⁾
60	Zinc	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾

น้ำใต้ดิน...

น้ำใต้ดิน จำนวน 126 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
2	Acetone	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
3	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
4	Anthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
5	Antimony	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
6	Arsenic	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
7	Atrazine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
8	Barium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
9	Benz(a)anthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
10	Benzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
11	Benzo(b)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
12	Benzo(k)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
13	Benzoic Acid	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
14	Benzo(a)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
15	Benzo(g,h,i)perylene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
16	Beryllium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
17	Bis(2-chloroethyl)ether	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾

18 Bis(2-ethylhexyl)phthalate...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
18	Bis(2-ethylhexyl)phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
20	Bromoform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
21	Butanol	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
22	Butyl benzyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
23	Cadmium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
24	Carbazole	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
25	Carbon disulfide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
27	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
28	p-Chloroaniline	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
29	Chlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
30	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
31	Chloroform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
32	2-Chlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
33	Chromium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
34	Chromium (III)	1) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Colorimetric Method; Calculation ⁽⁴⁾
35	Chromium (VI)	Colorimetric Method ⁽⁴⁾

36 Chrysene...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
36	Chrysene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
37	Cyanide	Distillation, Colorimetric Method ⁽⁴⁾
38	2,4-D	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
39	DDD	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
40	DDE	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
41	DDT	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
42	Dibenz(a,h)anthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
43	Di-n-Butyl Phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
44	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
45	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
46	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
47	3,3-Dichlorobenzidine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
48	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
49	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
50	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
51	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
52	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
53	2,4-Dichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
54	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾

56 1,3-Dichloropropene...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
56	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
57	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
58	Diethyl Phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
59	2,4-Dimethylphenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
60	2,4-Dinitrophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
61	2,4-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
62	2,6-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
63	Di-n-octyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
64	Endosulfan	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
65	Endrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
66	Ethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
67	Fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
68	Fluorene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
69	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
70	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
71	Hexachlorobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
72	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
73	n-Hexane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
74	α-HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
75	β-HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾

76 γ-HCH...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
76	γ-HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
77	Hexachlorocyclopentadiene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
78	Hexachloroethane	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
79	Indeno(1,2,3-cd)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
80	Isophorone	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
81	Lead	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
82	Manganese	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
83	Mercury	1) Digestion, Cold Vapor Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
84	Methanol	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
85	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
86	Methyl bromide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
87	Methylene chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
88	2-Methylphenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
89	2-Methylnaphthalene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
90	Methyl tert-butyl Ether	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
91	Naphthalene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
92	Nickel	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
93	Nitrobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾

94 N-Nitrosodiphenylamine...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
94	N-Nitrosodiphenylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
95	N-Nitrosodi-n-Propylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
96	Polychlorinated Biphenyls - PCB 1016 - PCB 1221 - PCB 1232 - PCB 1242 - PCB 1248 - PCB 1254 - PCB 1260	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
97	Pentachlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
98	pH	Electrometric Method ⁽⁴⁾
99	Phenanthrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
100	Phenol	1) Distillation, Chloroform Extraction Method ⁽⁴⁾ 2) Distillation, Direct Photometric Method ⁽⁴⁾ 3) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
101	Pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
102	Selenium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
103	Silver	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
104	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
105	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
106	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
107	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
108	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
109	TPH (C ₉ -C ₁₄)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(4,25)

110 TPH (C₁₀-C₁₅)...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
110	TPH (C ₁₀ -C ₁₆)	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(9,22)
111	TPH (C ₁₁ -C ₁₅)	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(9,22)
112	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
113	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
114	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
115	Trichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
116	2,4,5-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
117	2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
118	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
119	Vanadium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁴⁾
120	Vinyl acetate	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
121	Vinyl chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
122	m-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
123	o-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
124	p-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
125	Xylene (Total)	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
126	Zinc	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁴⁾

จากผลเสีย

จากผลเสีย (ปล่อยรวม) จำนวน 28 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Antimony	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁵⁾
2	Arsenic	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁵⁾
3	Beryllium	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁵⁾
4	Cadmium	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁵⁾
5	Carbon Monoxide	1) Instrumental Analyzer Method ⁽⁵⁾ 2) Sampling Bag Non-Dispersive Infrared Method ⁽⁵⁾
6	Chlorine	1) Adsorption Sampling, Ion Chromatographic Method ⁽⁵⁾ 2) Isokinetic Sampling, Ion Chromatographic Method ⁽⁵⁾
7	Chromium	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁵⁾
8	Cobalt	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁵⁾
9	Copper	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁵⁾
10	Cresol	Adsorption Sampling, Gas Chromatographic Method ⁽⁵⁾
11	Dioxins	Isokinetic Sampling ⁽⁵⁾
12	Hydrogen Chloride	1) Adsorption Sampling, Ion Chromatographic Method ⁽⁵⁾ 2) Isokinetic Sampling, Ion Chromatographic Method ⁽⁵⁾
13	Hydrogen Fluoride	1) Adsorption Sampling, Ion Chromatographic Method ⁽⁵⁾ 2) Isokinetic Sampling, Ion Chromatographic Method ⁽⁵⁾
14	Hydrogen Sulfide	Absorption Sampling, Iodometric Method ⁽⁵⁾

15 Lead...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
15	Lead	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁵⁾
16	Manganese	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁵⁾
17	Mercury	1) Isokinetic Sampling, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ⁽⁵⁾
18	Nickel	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁵⁾
19	Opacity	Ringelmann's Method ⁽⁵⁾
20	Oxides of Nitrogen	1) Absorption Sampling, Phenoldisulfonic Acid Method ⁽⁵⁾ 2) Absorption Sampling, Alkaline Permanganate/Colorimetric Method ⁽⁵⁾ 3) Instrumental Analyzer Method ⁽⁵⁾
21	Selenium	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁵⁾
22	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method ⁽⁵⁾ 2) Instrumental Analyzer Method ⁽⁵⁾
23	Sulfuric Acid	Isokinetic Sampling, Barium-Thorin Titrimetric Method ⁽⁵⁾
24	Tellurium	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁵⁾
25	Tin	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁵⁾
26	Total Suspended Particulate	1) Isokinetic Sampling, Gravimetric Method ⁽⁵⁾ 2) Paired Train, Isokinetic Sampling, Gravimetric Method ⁽⁵⁾

27 Vanadium...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
27	Vanadium	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁵⁾
28	Xylene	Adsorption Sampling, Gas Chromatographic Method ⁽⁵⁾

สิ่งปลูกสร้างหรือวัตถุที่ไม่ใช่พื้นผิว จำนวน 35 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,26) 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(9,26) 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,26)
2	Antimony	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,16) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
3	Arsenic	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,16) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
4	Barium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,16) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)

5 Beryllium...

ลำดับที่	สารพิษ	วิธีการหา
5	Beryllium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,4,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,18) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
6	Cadmium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,4,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,16) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
7	Chlordane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,28) 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(9,28) 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,26)
8	Chromium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,4,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,16) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
9	Chromium (III)	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method; Waste Extraction, Colorimetric Method; Calculation Method ^(1,6,16,17) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation Method ^(1,4,17,19) 3) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(7,16,19) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method, Calculation Method ^(7,8,17,19)

10 Chromium (VI)...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
10	Chromium (VI)	1) Waste Extraction, Colorimetric Method ^(1,6,19) 2) Alkaline Digestion, Colorimetric Method ^(8,40)
11	Cobalt	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,11) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,17)
12	Copper	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,18) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,14) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
13	2,4-D	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,26) 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28) 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,29)
14	DDD	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,26) 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28) 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,29)
15	DDE	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,26) 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28) 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,29)
16	DDT	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,26)

2) Soxhlet...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
17	Dieldrin	2) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 3) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26) 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,26) 2) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 3) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
18	Endrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,26) 2) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 3) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
19	Heptachlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,26) 2) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 3) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
20	Lead	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,16) 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
21	Lindane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,26) 2) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 3) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)

22 Mercury..

ลำดับที่	สารมลพิษ	วิธีการตรวจ
22	Mercury	1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^(1,6,20) 2) Waste Extraction, Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ^(1,6,20) 3) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽²⁰⁾ 4) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ⁽²⁰⁾ 5) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ⁽²¹⁾
23	Methoxychlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction Gas Chromatographic/Mass Spectrometric Method ^(1,9,28) 2) Soxhlet Extraction, Gas Chromatographic / Mass Spectrometric Method ^(10,28) 3) Automated Soxhlet Extraction, Gas Chromatographic / Mass Spectrometric Method ^(1,126)
24	Mirex	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction Gas Chromatographic/Mass Spectrometric Method ^(1,9,29) 2) Soxhlet Extraction, Gas Chromatographic / Mass Spectrometric Method ^(9,28) 3) Automated Soxhlet Extraction, Gas Chromatographic / Mass Spectrometric Method ^(1,126)
25	Molybdenum	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,14) 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
26	Nickel	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,14) 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
27	Polychlorinated biphenyls (PCBs) - 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 ^(1,9,24) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10,29) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(1,126)

- 2-ChlorobiphenylL...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
28	- 2-Chlorobiphenyl - 2,3-Dichlorobiphenyl - 2,2',5'-Trichlorobiphenyl - 2,4',5'-Trichlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',5,5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'-Pentachlorobiphenyl - 2,2',4,5,5'-Pentachlorobiphenyl - 2,3,3',4',6-Pentachlorobiphenyl - 2,2',3,4,4',5'-Hexachlorobiphenyl - 2,2',3,4,5,5'-Hexachlorobiphenyl - 2,2',3,5,5',6'-Hexachlorobiphenyl - 2,2',4,4',5,5'-Hexachlorobiphenyl - 2,2',3,3',4,4',5'-Heptachlorobiphenyl - 2,2',3,4,4',5,5'-Heptachlorobiphenyl - 2,2',3,4,4',5',6'-Heptachlorobiphenyl - 2,2',3,4',5,5',6'-Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6'-Nonachlorobiphenyl Pentachlorophenol	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,24) 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26) Electrometric Method ^(25,26) 4) Digestion, Inductively Coupled Plasma Method ^(1,6,16) 5) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,17) 6) Digestion, Inductively Coupled Plasma Method ^(7,16) 7) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
29	pH	
30	Selenium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,16) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)

31 Silver...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
31	Silver	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,16) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
32	Thallium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,16) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
33	Toxaphene	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,24) 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
34	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,16) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
35	Zinc	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,16) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)

31...

สืบ จำนวน 125 รายการ

ลำดับที่	สารเคมี	วิธีวิเคราะห์
1	Acenaphthene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
2	Acetone	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(15,25) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(13,25)
3	Aldrin	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
4	Anthracene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
5	Antimony	1) Digestion, Inductively Coupled Plasma Method ^(7,16) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
6	Arsenic	1) Digestion, Inductively Coupled Plasma Method ^(7,16) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
7	Atrazine	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
8	Barium	1) Digestion, Inductively Coupled Plasma Method ^(7,16) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
9	Benz(a)anthracene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
10	Benzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(15,25)

11 Benzol(b)fluoranthene

ลำดับที่	สารเคมี	วิธีวิเคราะห์
11	Benzol(b)fluoranthene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
12	Benzol(k)fluoranthene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
13	Benzoic acid	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
14	Benzol(a)pyrene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
15	Benzol(g,h)perylene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
16	Beryllium	1) Digestion, Inductively Coupled Plasma Method ^(7,16) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
17	Bis(2-chloroethyl)ether	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
18	Bis(2-ethylhexyl)phthalate	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(15,25)
20	Bromoform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(15,25)
21	Butanol	Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(13,25)
22	Butyl Benzyl Phthalate	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)

23 Cadmium...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
23	Cadmium	1) Digestion, Inductively Coupled Plasma Method ^(7,14) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
24	Carbazole	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
25	Carbon Disulfide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
27	Chlordane	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
28	p-Chloroaniline	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
29	Chlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
30	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
31	Chloroform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
32	2-Chlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
33	Chromium	1) Digestion, Inductively Coupled Plasma Method ^(7,14) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
34	Chromium (III)	1) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(7,8,16,19) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(7,8,17,19)
35	Chromium (VI)	Alkaline Digestion, Colorimetric Method ^(8,19)

36 Chrysene...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
36	Chrysene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
37	Cyanide	Extraction, Distillation, Colorimetric Method ^(27,28,29)
38	2,4-D	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
39	DDD	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
40	DDE	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
41	DDT	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
42	Dibenz(a,h)anthracene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
43	Di-n-Butyl Phthalate	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
44	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
45	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
46	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
47	3,3-Dichlorobenzidine	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
48	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)

49 1,2-Dichloroethane...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
49	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
50	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
51	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
52	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
53	2,4-Dichlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
54	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
56	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
57	Dieldrin	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
58	Diethyl Phthalate	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
59	2,4-Dimethylphenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
60	2,4-Dinitrophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
61	2,4-Dinitrotoluene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
62	2,6-Dinitrotoluene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)

63 Di-n-Octyl Phthalate...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
63	Di-n-Octyl Phthalate	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
64	Endosulfan	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
65	Endrin	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
66	Ethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
67	Fluoranthene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
68	Fluorene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
69	Heptachlor	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
70	Heptachlor epoxide	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
71	Hexachlorobenzene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
72	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
73	n-Hexane	1) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23) 2) Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ⁽¹³⁾

73 n-Hexane...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
74	α -HCH	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
75	β -HCH	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
76	γ -HCH	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
77	Hexachlorocyclopentadiene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
78	Hexachloroethane	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
79	Indeno(1,2,3-cd)pyrene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
80	Isophorone	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
81	Lead	1) Digestion, Inductively Coupled Plasma Method ^(7,16) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
82	Manganese	1) Digestion, Inductively Coupled Plasma Method ^(7,16) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
83	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽²⁰⁾ 2) Thermal Decomposition, Amalgamation, and Atomic Absorption Spectrophotometry ⁽²¹⁾ 3) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ⁽²⁰⁾

85 Methanol...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
84	Methanol	1) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23) 2) Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)
85	Methoxychlor	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
86	Methyl Bromide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)
87	Methylene Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)
88	2-methylphenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
89	2-Methylnaphthalene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
90	Methyl tert-Butyl Ether	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)
91	Naphthalene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
92	Nickel	1) Digestion, Inductively Coupled Plasma Method ^(7,16) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
93	Nitrobenzene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
94	N-Nitrosodiphenylamine	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
95	N-Nitrosodi-n-propylamine	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)

96 Polychlorinated biphenyls (PCBs)

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
96	Polychlorinated biphenyls (PCBs) - Aroclor 1016 - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260 - 2-Chlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',5,5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'-Pentachlorobiphenyl - 2,2',4,5,5'-Pentachlorobiphenyl - 2,3,3',4,6-Pentachlorobiphenyl - 2,2',3,4,4',5'-Hexachlorobiphenyl - 2,2',3,4,5,5'-Hexachlorobiphenyl - 2,2',3,5,5',6'-Hexachlorobiphenyl - 2,2',4,4',5,5'-Hexachlorobiphenyl - 2,2',3,3',4,4',5'-Heptachlorobiphenyl - 2,2',3,4,4',5,5'-Heptachlorobiphenyl - 2,2',3,4',5,5',6'-Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6'-Nonachlorobiphenyl	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
97	Pentachlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
98	Phenanthrene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)

99 Phenol...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
99	Phenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
100	Pyrene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
101	Selenium	1) Digestion, Inductively Coupled Plasma Method ^(7,16) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
102	Silver	1) Digestion, Inductively Coupled Plasma Method ^(7,16) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
103	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)
104	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)
105	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)
106	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)
107	Toxaphene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
108	TPH (C ₅ -C ₈)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)
109	TPH (C ₈ -C ₁₅)	1) Automate Extraction, Gas Chromatographic Method ^(11,22) 2) Solvent Extraction, Gas Chromatographic Method ^(12,22) 3) Ultrasonic Extraction, Gas Chromatographic Method ^(22,31)
110	TPH (C ₁₅ -C ₃₅)	1) Automate Extraction, Gas Chromatographic Method ^(11,22) 2) Solvent Extraction, Gas Chromatographic Method ^(12,22) 3) Ultrasonic Extraction, Gas Chromatographic Method ^(22,31)
111	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)
112	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)
113	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)
114	Trichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)

115 2,4,5-Trichlorophenol...

อนึ่ง หนังสือฉบับนี้จะหมดอายุพร้อมหนังสือต่ออายุไว้บนทะเบียนของปฏิบัติการวิเคราะหฺนอกขน
ในวันที่ ๒ กันยายน ๒๕๖๔

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ


(นายพรศ กษฺณกรอง)
รองอธิบดี ปฏิบัติราชการแทน
อธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและเเคือนกยมลพิษโรงงาน

กลุ่มภาคฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนของปฏิบัติการ

โทร. ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕

โทรสาร ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๐๔

ไปรษณีย์อิเล็กทรอนิกส์ saraban@dew.mail.go.th

ที่ อ.ก ๐๔๑๐(๓)/ ๖๔๗๐



กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๒๔ มิถุนายน ๒๕๖๔

เรื่อง ขึ้นทะเบียนของปฏิบัติการวิเคราะหฺนอกขน

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และขณิควมสทขของหองปฏิบัติการวิเคราะหฺนอกขน
ลงวันที่ ๒๔ เมษายน ๒๕๖๔

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือรับขึ้นทะเบียนของปฏิบัติการวิเคราะหฺนอกขน

บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด จำนวน ๒ แผ่น

ตามหนังสือที่ย่างถึง บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ขอขึ้นทะเบียน
หองปฏิบัติการวิเคราะหฺนอกขน พร้อมรายชื่อผู้ควบคุมดูแลหองปฏิบัติการวิเคราะหฺนอกขน เจ้าหน้าที่ประจำ
หองปฏิบัติการวิเคราะหฺนอกขน และรายการสารมลพิษที่จะทำการวิเคราะห์ หองกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป
(ประเทศไทย) จำกัด ขึ้นทะเบียนหองปฏิบัติการวิเคราะหฺนอกขน มีเลขทะเบียน ๖-๒๒๒ สถานที่ตั้งเลขที่
๖๒๖/๑๐ หมู่ที่ ๕ ตำบลแม่ไม้ อำเภอลำปาง จังหวัดลำปาง โดยมีองค์ประกอบดังนี้

ก. ผู้ควบคุมดูแลหองปฏิบัติการวิเคราะหฺนอกขน

๑) นายเดช ช้างชน	ทะเบียนเลขที่	๖-๒๒๒-๖-๑๙๙๖๐
๒) นางวิลาวัลย์ บริรักษ์	ทะเบียนเลขที่	๖-๒๒๒-๖-๑๙๙๖๑
๓) นายสุพจน์ สลนเต๊ะ	ทะเบียนเลขที่	๖-๒๒๒-๖-๑๙๙๖๔

ข. เจ้าหน้าที่ประจำหองปฏิบัติการวิเคราะหฺนอกขน

๑) นางสาวณัฐพร บรรจงกิจ	ทะเบียนเลขที่	๖-๒๒๒-๖-๑๙๙๖๕
๒) นางพจนา สีดา	ทะเบียนเลขที่	๖-๒๒๒-๖-๑๙๙๖๖
๓) นางสาวนิตา กุลสุริวงศ์	ทะเบียนเลขที่	๖-๒๒๒-๖-๑๙๙๖๗
๔) นายพิทยา ทองแดง	ทะเบียนเลขที่	๖-๒๒๒-๖-๑๙๙๖๘
๕) นางชลธิชา สูงเกษ	ทะเบียนเลขที่	๖-๒๒๒-๖-๑๙๙๖๙
๖) ว่าที่ ร.ต.รณชัย ม่วนมา	ทะเบียนเลขที่	๖-๒๒๒-๖-๑๙๙๗๐
๗) นายวรวิทย์ ทับทา	ทะเบียนเลขที่	๖-๒๒๒-๖-๑๙๙๗๑
๘) นายศักดิ์กรีนพร จรัสกาย	ทะเบียนเลขที่	๖-๒๒๒-๖-๑๙๙๗๒
๙) นายสุรศักดิ์ สาชิน	ทะเบียนเลขที่	๖-๒๒๒-๖-๑๙๙๗๓
๑๐) นางสาวพรพรรณ ภาณุตานนท์	ทะเบียนเลขที่	๖-๒๒๒-๖-๑๙๙๗๔
๑๑) นายสถาพร งามแก้ว	ทะเบียนเลขที่	๖-๒๒๒-๖-๑๙๙๗๕
๑๒) นายสุทธิดำรง โชคิณินันท์	ทะเบียนเลขที่	๖-๒๒๒-๖-๑๙๙๗๖

(๓๓) นายวัลลภ...



"อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว"



๓๓) นายวัลลภ หันไชยเนาว์
๓๔) นางสาวนาถิ เกรียงอุระกุล
๓๕) นางสาวนิตา ผดุงจิตต์
๓๖) นายธนะสิทธิ์ วงศ์ไชย
๓๗) นายชัยสุนทร เลิศนันท์กุลชัย
๓๘) นายสังจา เพ็ชรแสง
๓๙) นายกันตภณ มณีสันพันธ์
๔๐) นางสาวจันทิพย์ โกเมนชนะ
๔๑) นายอริวินทร์ อธิจินดา
๔๒) นายคุณวุฒิ พิสัยพันธ์
๔๓) นายศุภชัย วงศ์สุริยธาย
๔๔) นายปฐมพงศ์ กรสวัช
๔๕) นายโสว ตันโพธิ์
๔๖) นางสาวกิตติยา สันญายาธิยานนท์
๔๗) นางสาวเจษฎาพร ศรีบุญเรือง
๔๘) นางสาวสุวิมลพร สิงห์เจ้า
๔๙) นางสาวอริศวรรณ์ ศรีมงคลโร
๕๐) นายพิพัฒน์ นิภัทร์เศรษฐี
๕๑) นายศิริวิทย์ เรืองสม
๕๒) นายปารเมศ สัตยาคุณ
๕๓) นายณัฐพร ธรรมสระโร
๕๔) นางสาวศุภรัตน์ ไสจันทร
๕๕) นายพรกร อินทรเสนา
๕๖) นายพิวกร เชื้อมาก
๕๗) นายอนุวัชร ทองขจรศักดิ์
๕๘) นายอติชาติ วิลาศ
๕๙) นายจักรวรรดิ ศรีวิภา
๕๐) นายประสาธมิตร เชื้อนเพชร
๕๑) นายภาณุวัฒน์ วงษ์
๕๒) นายสันติ ชัยชนะ
๕๓) นายสิทธิชัย แก้วมาก
๕๔) นายทินกร กุลชาติ

ทะเบียนเลขที่ ๖-๒๒๒-๖-๑๙๙๗๗
ทะเบียนเลขที่ ๖-๒๒๒-๖-๑๙๙๗๘
ทะเบียนเลขที่ ๖-๒๒๒-๖-๑๙๙๗๙
ทะเบียนเลขที่ ๖-๒๒๒-๖-๑๙๙๘๐
ทะเบียนเลขที่ ๖-๒๒๒-๖-๑๙๙๘๑
ทะเบียนเลขที่ ๖-๒๒๒-๖-๑๙๙๘๒
ทะเบียนเลขที่ ๖-๒๒๒-๖-๑๙๙๘๓
ทะเบียนเลขที่ ๖-๒๒๒-๖-๑๙๙๘๔
ทะเบียนเลขที่ ๖-๒๒๒-๖-๑๙๙๘๕
ทะเบียนเลขที่ ๖-๒๒๒-๖-๑๙๙๘๖
ทะเบียนเลขที่ ๖-๒๒๒-๖-๑๙๙๘๗
ทะเบียนเลขที่ ๖-๒๒๒-๖-๑๙๙๘๘
ทะเบียนเลขที่ ๖-๒๒๒-๖-๑๙๙๘๙
ทะเบียนเลขที่ ๖-๒๒๒-๖-๑๙๙๙๐
ทะเบียนเลขที่ ๖-๒๒๒-๖-๑๙๙๙๑
ทะเบียนเลขที่ ๖-๒๒๒-๖-๑๙๙๙๒
ทะเบียนเลขที่ ๖-๒๒๒-๖-๑๙๙๙๓
ทะเบียนเลขที่ ๖-๒๒๒-๖-๑๙๙๙๔
ทะเบียนเลขที่ ๖-๒๒๒-๖-๑๙๙๙๕
ทะเบียนเลขที่ ๖-๒๒๒-๖-๑๙๙๙๖
ทะเบียนเลขที่ ๖-๒๒๒-๖-๑๙๙๙๗
ทะเบียนเลขที่ ๖-๒๒๒-๖-๑๙๙๙๘
ทะเบียนเลขที่ ๖-๒๒๒-๖-๑๙๙๙๙

ค. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย จำนวน ๑๕ รายการ
อากาศเสีย (ปล่องระบาย) จำนวน ๗ รายการ และน้ำใต้ดิน จำนวน ๓ รายการ รวมทั้งสิ้นจำนวน ๒๕ รายการ
ตามสิ่งที่ส่งมาด้วย

หนังสือฉบับนี้มีอายุ ๓ ปี นับจากวันที่กรมโรงงานอุตสาหกรรมออกหนังสือ หากประสงค์
จะต่ออายุหนังสือรับขึ้นทะเบียนของปฏิบัติการวิเคราะหฺนอกขน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบ
คำขอต่อกรมโรงงานอุตสาหกรรมภายใน ๓๐ วัน ก่อนวันสิ้นอายุของหนังสือรับขึ้นทะเบียนของปฏิบัติการ
วิเคราะหฺนอกขน ซึ่งคำขอต่ออายุดังกล่าวขอรับได้ที่กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ


(นางจินดา เสงศรีวินทร์)
ผู้อำนวยการกองวิจัยและเเคือนกยมลพิษโรงงาน
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

๒๔ มิ.ย. ๒๕๖๔

กองวิจัยและเเคือนกยมลพิษโรงงาน

ศูนย์วิจัยและเเคือนกยมลพิษโรงงานภาคตะวันออก

โทร. ๐ ๓๘๐๕ ๗๒๖๑-๓

ไปรษณีย์อิเล็กทรอนิกส์ eww@dew.mail.go.th

เอกสารแนบท้ายหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอลเอส แลบริทอรี กรุ๊ป (ประเทศไทย) จำกัด เลขทะเบียน ๖-๒๒๓

ที่ อก ๐๓๑๐(๓)/ ๖๔๗๐ ลงวันที่ ๒๔ มิถุนายน ๒๕๖๔

ขอข้ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๒๔ รายการ
น้ำเสีย จำนวน 14 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Biochemical Oxygen Demand	1) 5-Day BOD Test, Membrane Electrode Method ^[2] 2) 5-Day BOD Test, Azide Modification Method ^[2]
2	Chemical Oxygen Demand	1) Open Reflux, Titrimetric Method ^[2] 2) Closed Reflux, Colorimetric Method ^[2] 3) Closed Reflux, Titrimetric Method ^[2]
3	Color	ADMI Weighted - Ordinate Spectrophotometric Method ^[2]
4	Cyanide	Distillation, Colorimetric Method ^[2]
5	Formaldehyde	Distillation, Colorimetric Method ^[1]
6	Free Chlorine	DPD-Ferrous Titrimetric Method ^[2]
7	Oil and Grease	Liquid-Liquid Partition-Gravimetric Method ^[2]
8	pH	Electrometric Method ^[2]
9	Phenols	1) Distillation, Chloroform Extraction Method ^[2] 2) Distillation, Direct Photometric Method ^[2]
10	Sulfide	ZnS Precipitation, Iodometric Method ^[2]
11	Temperature	Laboratory and Field Method ^[2]
12	Total Dissolved Solids	Dried at 180 °C ^[2]
13	Total Kjeldahl Nitrogen	Semi-Micro Kjeldahl Method ^[2]
14	Total Suspended Solids	Dried at 103-105 °C ^[2]

อากาศเสีย (ปล่อยระบาย) จำนวน 7 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Carbon Monoxide	1) Sampling Bag, Non-Dispersive Infrared Method ^[5] 2) Instrumental Analyzer Method ^[6]
2	Hydrogen Sulfide	Absorption Sampling, Iodometric Method ^[5]
3	Opacity	Ringelmann's Method ^[3,4]
4	Oxide of Nitrogen	1) Absorption Sampling, Phenoldisulfonic Acid Method ^[6] 2) Instrumental Analyzer Method ^[6]
5	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method ^[5] 2) Instrumental Analyzer Method ^[10]

วิภา สิมะกุล
(นางสาววิภาดา สิมะกุล)

ผู้อำนวยการ

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

Sulfuric Acid...

-2-

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
6	Sulfuric Acid	Isokinetic Sampling, Barium - Thorin Titrimetric Method ^[6]
7	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method ^[7]

น้ำใต้ดิน จำนวน 3 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Cyanide	Distillation, Colorimetric Method ^[2]
2	pH	Electrometric Method ^[2]
3	Phenols	Distillation, Direct Photometric Method ^[2]

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วิภา สิมะกุล

(นางสาววิภาดา สิมะกุล)

ผู้อำนวยการ

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก กองวิจัยและเตือนภัยมลพิษโรงงาน กรมโรงงานอุตสาหกรรม โทร ๐ ๒๑๐๕ ๙๕๖๓-๔

สำเนา

ที่ อก.๐๓๑๐/ ๖๐๕๓

กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๒๒ มิ.ย. ๒๕๖๔

เรื่อง เปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เอลเอส แลบริทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอเปลี่ยนแปลงบุคลากร ของห้องปฏิบัติการวิเคราะห์เอกชน ลงวันที่ ๑๔ มีนาคม ๒๕๖๒

ตามที่หนังสือที่อ้างถึง บริษัท เอลเอส แลบริทอรี กรุ๊ป (ประเทศไทย) จำกัด ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๒๒๓ สถานที่ตั้งเลขที่ ๖๑๖/๑๐ หมู่ที่ ๕ ตำบลแม่ไม้ อำเภอลวกแดง จังหวัดระยอง ขอเปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์ ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

ก. ให้อยกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๕ ราย

๑) นางสาวเจษฎาพร ศรีบุญเรือง ทะเบียนเลขที่ ๖-๒๒๓-๖-๑๔๗๓

๒) นางสาวอรุณพร สิงห์ใจ ทะเบียนเลขที่ ๖-๒๒๓-๖-๑๔๗๒

๓) นางสาววันิดา ผดุงจิตต์ ทะเบียนเลขที่ ๖-๒๒๓-๖-๑๔๕๔

๔) นายคุณวุฒิ พิสัยพันธ์ ทะเบียนเลขที่ ๖-๒๒๓-๖-๑๔๖๖

๕) นายสิทธิชัย แก้วเกตุ ทะเบียนเลขที่ ๖-๒๒๓-๖-๑๔๘๗

ข. ให้เพิ่มเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๒ ราย

๑) นายณัฐพงษ์ เพ็ชรขาวมา ทะเบียนเลขที่ ๖-๒๒๓-๖-๐๐๐๑

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๔) นางสาวจิตติภา ประเทืองสุข ทะเบียนเลขที่ ๖-๒๒๓-๖-๐๐๐๔

๕) นายสมศรีชัย คุ้มบุญสุข ทะเบียนเลขที่ ๖-๒๒๓-๖-๐๐๐๕

๖) นายณัฐวุฒิ ออมพรพรราช ทะเบียนเลขที่ ๖-๒๒๓-๖-๐๐๐๖

๗) นายจิตรกร สีวะสา ทะเบียนเลขที่ ๖-๒๒๓-๖-๐๐๐๗

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๑๑) นายสุวิทย์ นราพงษ์ ทะเบียนเลขที่ ๖-๒๒๓-๖-๐๐๑๑

๑๒) นายอดิศักดิ์ ตะริสุนย์ ทะเบียนเลขที่ ๖-๒๒๓-๖-๐๐๑๒

อนึ่ง...

-๒-

อนึ่ง หนังสือฉบับนี้จะหมดอายุพร้อมหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
ที่ อก ๐๓๑๐(๓)/๖๐๕๓ ลงวันที่ ๒๔ มิถุนายน ๒๕๖๔ คือในวันที่ ๒๔ มิถุนายน ๒๕๖๔ ทั้งนี้ สามารถยื่นคำขอผ่าน
ระบบอิเล็กทรอนิกส์ได้ที่หน้าเว็บไซต์กรมโรงงานอุตสาหกรรมตาม QR Code ที่แนบมานี้

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายทรี อำพันพันธ์)

ผู้อำนวยการศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

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“อุตสาหกรรมก้าวหน้า ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว”



ที่ อก ๐๓๒๐/๒๕๖๓



กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๑๐ พ.ย. ๒๕๖๓

เรื่อง เปลี่ยนแปลงสารมลพิษของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอเปลี่ยนแปลงสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน ลงวันที่ ๒๕ ตุลาคม ๒๕๖๒

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือเปลี่ยนแปลงสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำนวน ๓ แผ่น

ตามหนังสือที่อ้างถึง บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๓๒๓ สถานที่ตั้งเลขที่ ๖๑๖/๑๐ หมู่ที่ ๕ ตำบลแม่ไม้คู อำเภอบลุกและจังหวัดระยอง ขอเปลี่ยนแปลงสารมลพิษของห้องปฏิบัติการวิเคราะห์ ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้ความเห็นชอบแก่บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด เพิ่มข้อบ่งชี้สารมลพิษที่วิเคราะห์ในน้ำเสีย จำนวน ๑๓ รายการ และไม่ได้คืน ๓ รายการ ตามสิ่งที่ส่งมาด้วย

อนึ่ง หนังสือฉบับนี้จะส่งมอบพร้อมหนังสือต่ออายุรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชนที่ อก ๐๓๒๐(๓)/๒๕๖๓ ลงวันที่ ๒๘ มิถุนายน ๒๕๖๔ คือในวันที่ ๒๘ มิถุนายน ๒๕๖๔ ทั้งนี้ สามารถยื่นคำขอผ่านระบบอิเล็กทรอนิกส์ได้ที่หน้าเว็บไซต์กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายทวี อำพันรัตน์)

ผู้อำนวยการศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

โทร. ๐ ๓๓๑๓ ๖๐๕๕ ต่อ ๕๐๐๑-๒

ไปรษณีย์อิเล็กทรอนิกส์ einw@dw.mail.go.th



"อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว"



เอกสารแนบท้ายหนังสือเปลี่ยนแปลงสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด เลขทะเบียน ๖-๓๒๓
ที่ อก ๐๓๒๐/๒๕๖๓ ลงวันที่ ๑๐ พ.ย. ๒๕๖๓

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๑๖ รายการ

น้ำเสีย จำนวน 13 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Biochemical Oxygen Demand	1) 5-Day BOD Test, Membrane Electrode Method 2) 5-Day BOD Test, Azide Modification Method
2	Chemical Oxygen Demand	1) Open Reflux, Titrimetric Method 2) Closed Reflux, Colorimetric Method 3) Closed Reflux, Titrimetric Method
3	Color	ADMI Weighted-Ordinate Spectrophotometric Method
4	Cyanide	Distillation, Colorimetric Method
5	Free Chlorine	DPD Ferrous Titrimetric Method
6	Oil and Grease	Liquid-Liquid, Partition-Gravimetric Method
7	pH	Electrometric Method
8	Phenols	1) Distillation, Chloroform Extraction Method 2) Distillation, Direct Photometric Method
9	Sulfide	ZnS Precipitation, Iodometric Method
10	Temperature	Field Method
11	Total Dissolved Solids	Dried at 180 °C
12	Total Kjeldahl Nitrogen	Semi-Macro Kjeldahl Method
13	Total Suspended Solids	Dried at 103-105 °C

น้ำใต้ดิน จำนวน 3 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Cyanide	Distillation, Colorimetric Method
2	pH	Electrometric Method
3	Phenols	Distillation, Direct Photometric Method

เอกสารอ้างอิง

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ที่ อก ๐๓๒๐/ ๔๖๐๐ 1



กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๑๔ พฤษภาคม ๒๕๖๓

เรื่อง เปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และขอคืนสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน

ลงวันที่ ๒๐ มีนาคม ๒๕๖๓

ตามคำขอ ที่อ้างถึง บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๓๒๓ สถานที่ตั้งเลขที่ ๖๑๖/๑๐ หมู่ที่ ๕ ตำบลแม่ไม้คู อำเภอบลุกและจังหวัดระยอง ขอเปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์ ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

๑. โยกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑ ราย

นางสาวพรศุมน ภวภูตานนท์ ทะเบียนเลขที่ ๖-๓๒๓-๖-๔๕๕๔

๒. ให้เพิ่มเจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน จำนวน ๑๕ ราย

๑) นายณัฐพล เจียรวิรัตน์ ทะเบียนเลขที่ ๖-๓๒๓-๖-๐๐๑๓

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๗) นายสันต์ ศิรินันท์ ทะเบียนเลขที่ ๖-๓๒๓-๖-๐๐๑๙

๘) นายวิญญู อิมพาสี ทะเบียนเลขที่ ๖-๓๒๓-๖-๐๐๒๐

๙) นายศุภณัฐ สุกกิตติมงคล ทะเบียนเลขที่ ๖-๓๒๓-๖-๐๐๒๑

๑๐) นายเอกชัย ถิ่นทอง ทะเบียนเลขที่ ๖-๓๒๓-๖-๐๐๒๒

๑๑) นายพงษ์เทพ สิทธิธาดา ทะเบียนเลขที่ ๖-๓๒๓-๖-๐๐๒๓

๑๒) นายพินกร กุมภะ ทะเบียนเลขที่ ๖-๓๒๓-๖-๐๐๒๔

๑๓) นางสาวนันทิยา เบญจรัตน์ ทะเบียนเลขที่ ๖-๓๒๓-๖-๐๐๒๕

๑๔) นายสิทธิชัย ยันพิมาย ทะเบียนเลขที่ ๖-๓๒๓-๖-๐๐๒๖

๑๕) นางสาวภาณิน หลอดทอง ทะเบียนเลขที่ ๖-๓๒๓-๖-๐๐๒๗

อนึ่ง หนังสือฉบับนี้จะส่งมอบพร้อมหนังสือต่ออายุรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
ในวันที่ ๒๗ มิถุนายน ๒๕๖๓

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายพรศุมน ภวภูตานนท์)
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อธิบดีกรมโรงงานอุตสาหกรรม

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

โทร. ๐ ๓๓๑๓ ๖๐๕๕ ต่อ ๕๐๐๑-๒

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