

ภาคผนวก จ

ใบรับรองการสอบเทียบเครื่องมือ



right solutions.
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	RYG_FS0657	1-Apr-24	1-Jul-24	3
Ambient	Formaldehyde	Field Rotameter	BKK_FS1006	2-Jul-24	2-Oct-24	3
Ambient	Formaldehyde	Field Rotameter	RYG_FS0199	2-Jul-24	2-Oct-24	3
Ambient	Formaldehyde	DRYCAL FLOWMETER	BKK_FS1346	29-Jan-24	28-Jan-25	12
Ambient	Formaldehyde	GC-FID	BKK_EN0126	21-Apr-23	21-Oct-24	18
Ambient	Formaldehyde	GC-FID	BKK_EN0126	22-Oct-24	22-Apr-26	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	BKK_FS0143	20-Aug-24	20-Feb-26	18
Noise	Leq 24 hrs	Sound Calibrator	RYG_FS0496	26-Jan-24	25-Jan-25	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0431	22-Feb-24	21-Feb-25	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0433	22-Feb-24	21-Feb-25	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0434	22-Feb-24	21-Feb-25	12
Noise	Leq 12 hrs	Sound Calibrator	RYG_FS0213	28-Feb-24	27-Feb-25	12
Noise	Leq 12 hrs	Sound Level Meter	RYG_FS0618	12-Jan-24	11-Jan-25	12
Noise	Leq 12 hrs	Sound Level Meter	RYG_FS0620	12-Jan-24	11-Jan-25	12
Noise	Noise Dose, TWA	Dose Badge Reader	RYG_FS0210	29-Jan-24	28-Jan-25	12
Workplace	Formaldehyde	Field Rotameter	RYG_FS0199	2-Jul-24	2-Oct-24	3
Workplace	Formaldehyde	DRYCAL FLOWMETER	BKK_FS1346	29-Jan-24	28-Jan-25	12
Workplace	Formaldehyde	GC-FID	BKK_EN0126	21-Apr-23	21-Oct-24	18
Workplace	Formaldehyde	GC-FID	BKK_EN0126	22-Oct-24	22-Apr-26	18
Workplace	Toluene	Field Rotameter	RYG_FS0199	2-Jul-24	2-Oct-24	3
Workplace	Toluene	DRYCAL FLOWMETER	BKK_FS1346	29-Jan-24	28-Jan-25	12
Workplace	Toluene	GC-MSD	BKK_EN0410	10-May-24	10-Nov-25	18
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-Jun-25	18
Rayong Lab	BOD	DO meter with Sensor	RYG_EN0032	24-Jul-23	24-Jan-25	18
Rayong Lab	BOD	Incubator	RYG_EN0154	1-Nov-24	1-May-26	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-Jun-25	18
Water Lab	Methanol	Gas Chromatography	BKK_EN0041	26-Jun-23	26-Dec-24	18
Water Lab	Toluene	Gas Chromatography (MSD)	BKK_EN0059	13-Dec-23	13-Jun-25	18
Soil	Methanol	Gas Chromatography	BKK_EN0041	26-Jun-23	26-Dec-24	18
Soil	Formaldehyde	Spectrophotometer	BKK_EN0356	9-Nov-23	9-Nov-24	12
Soil	Toluene	Gas Chromatography (MSD)	BKK_EN0059	13-Dec-23	13-Jun-25	18
Soil	Moisture	Electronic Top-Loading Balance	BKK_EN0003	2-Aug-24	2-Aug-25	12

Certificate of System Qualification

GC-OQ + GCMS-OQ

System ID:	RYG_EN0136
Organization Name:	ALS Laboratory Group (Thailand) Co.Ltd.
Organization Location:	516/10, Moo 5, Tambol Mae Nam Khu, Pluek Daeng, Rayong, 21140, Thailand
Date:	January 5, 2024 10:53:24 AM
EQP Name:	AgilentRecommended , AgilentRecommended
EQP Revision:	GC.02.54, GCMS.02.54
Overall Qualification Status:	Pass

REVIEW 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

Accuracy: 0.0 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: 230.0 229 °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

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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

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Tested Combination1 Front SSL / External SQ

Manual Injection

Name: Not applicable

Source: EI - Extractor

Setpoint Status: Completed

Injection Volume on Column: 1.0 µL

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.

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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 Combination 1

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

Mainframe 1

Manufacturer	Agilent Technologies
Name	7890
Model Number	G3442B
Serial Number	CN18463238
Firmware Revision	5.02.04.3
Component ID/Asset No.	061117000235
Oven Type	Standard

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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	US101M008
Firmware Revision	5977 6.00.34
High Vacuum System	Turbo Pump
Scouting Run Standard	CFM Std
Component ID/Asset No	DH1117000236

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_END138

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 Agent representative who has delivered this service understands the meaning and legal status of an electronic signature. As a trained official operator, the Agent 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 Puangsopa
Logged On User Name:	eaknarin_puangsope@ajphinf.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: RYO_EN0136

[illegible]

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

User Name: sakurita_junghepa
Report Generated by Hostname: ASRYGW0074
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 4, 2024 10:46:05 AM	Start	Execution	System Inspection and Basic Safety and Operation - 7890 - Qualitative Test - No samples associated	None
January 4, 2024 10:46:16 AM	End	Execution	System Inspection and Basic Safety and Operation - 7890 - Qualitative Test - No samples associated	Run Count: 1
January 4, 2024 10:48:22 AM	Start	Execution	Inlet Pressure Accuracy - Front SSI - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
January 4, 2024 10:49:52 AM	End	Execution	Inlet Pressure Accuracy - Front SSI - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count: 1
January 4, 2024 10:49:54 AM	Start	Execution	GC Oven Temperature Accuracy - 7890 - Temperature - Oven - S: 230.0°C - L: >= 1.0 AND <= 1.0 % repeat in K	None
January 4, 2024 10:51:09 AM	End	Execution	GC Oven Temperature Accuracy - 7890 - Temperature - Oven - S: 230.0°C - L: >= 1.0 AND <= 1.0 % repeat in K	Manual Data Entry
January 4, 2024 10:51:09 AM	End	Execution	GC Oven Temperature Accuracy - 7890 - 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 - 7890 - Temperature - Oven - S: 100.0°C - L: >= 1.0 AND <= 1.0 % repeat in K	None
January 4, 2024 10:58:43 AM	End	Execution	GC Oven Temperature Accuracy - 7890 - Temperature - Oven - S: 100.0°C - L: >= 1.0 AND <= 1.0 % repeat in K	Manual Data Entry

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System ID: RYG_EN0136

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User Name: sakurita_junghepa
Report Generated by Hostname: ASRYGW0074
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 4, 2024 10:52:46 AM	End	Execution	GC Oven Temperature Accuracy - 7890 - Temperature - Oven - S: 100.0°C - L: >= 1.0 AND <= 1.0 % repeat in K	Run Count: 1
January 4, 2024 10:55:09 AM	Start	Execution	GC Oven Temperature Stability - 7890 - Temperature - Oven - S: 100.0°C - L: <= 0.5°C	None
January 4, 2024 11:23:26 AM	End	Execution	GC Oven Temperature Stability - 7890 - Temperature - Oven - S: 100.0°C - L: <= 0.5°C	Manual Data Entry
January 4, 2024 11:23:26 AM	Start	Execution	GC Oven Temperature Stability - 7890 - Temperature - Oven - S: 100.0°C - L: <= 0.5°C	Run Count: 1
January 4, 2024 11:23:35 AM	Start	Execution	Lag Amp - 5977B SQ - Source: None	None
January 4, 2024 11:43:21 AM	End	Execution	Lag Amp - 5977B SQ - Source: None	Run Count: 1
January 4, 2024 11:43:21 AM	Start	Execution	ETPA - 5977B SQ - Source: None	None
January 4, 2024 11:53:21 AM	End	Execution	ETPA - 5977B SQ - Source: None	Run Count: 1
January 4, 2024 11:55:28 AM	Start	Execution	Tune EI - 5977B SQ - Source: None	None
January 4, 2024 1:27:26 PM	End	Execution	Tune EI - 5977B SQ - Source: None	Run Count: 1
January 4, 2024 1:37:29 PM	Start	Execution	Tune EI - 5977B SQ - Source: None	None

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User Name: sakurita_junghepa
Report Generated by Hostname: ASRYGW0074
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 4, 2024 1:48:59 PM	End	Execution	Tune EI - 5977B SQ - Source: None	Run Count: 1
January 4, 2024 1:49:02 PM	Start	Execution	Scouting Run - Manual Injection, Front SSI, SQ - Source: EI - Extraction Part of GCMS System Preparation	None
January 4, 2024 2:00:05 PM	End	Execution	Scouting Run - Manual Injection, Front SSI, SQ - Source: EI - Extraction Part of GCMS System Preparation	None
January 5, 2024 6:28:16 AM	End	Execution	Scouting Run - Manual Injection, Front SSI, SQ - Source: EI - Extraction Part of GCMS System Preparation	None
January 5, 2024 8:26:18 AM	End	Execution	Scouting Run - Manual Injection, Front SSI, SQ - Source: EI - Extraction Part of GCMS System Preparation	None
January 5, 2024 8:28:23 AM	Start	Execution	Scouting Run - Manual Injection, Front SSI, SQ - Source: EI - Extraction Part of GCMS System Preparation	None
January 5, 2024 8:28:23 AM	Start	Execution	Scouting Run - Manual Injection, Front SSI, SQ - Source: EI - Extraction Part of GCMS System Preparation	None
January 5, 2024 9:21:29 AM	End	Execution	Scouting Run - Manual Injection, Front SSI, SQ - Source: EI - Extraction Part of GCMS System Preparation	None
January 5, 2024 9:21:32 AM	End	Execution	Scouting Run - Manual Injection, Front SSI, SQ - Source: EI - Extraction Part of GCMS System Preparation	Run Count: 1
January 5, 2024 9:21:35 AM	Start	Execution	Signal to None EI - Liquid Injection, Front SSI, SQ - Source: EI - Extraction using Flammant 1 - L: <= 1200	None

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System ID: RYG_EN0136

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User Name: sakurita_junghepa
Report Generated by Hostname: ASRYGW0074
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 9:25:38 AM	End	Qualification	Session	DO
January 5, 2024 9:25:39 AM	Start	Reporting	Session	None
January 5, 2024 9:27:08 AM	End	Reporting	Session	None
January 5, 2024 9:27:49 AM	Start	Qualification	Session	DO
January 5, 2024 9:27:49 AM	Start	Execution	Signal to None EI - Liquid Injection, Front SSI, SQ - Source: EI - Extraction using Flammant 1 - L: <= 1200	None
January 5, 2024 9:33:18 AM	End	Execution	Signal to None EI - Liquid Injection, Front SSI, SQ - Source: EI - Extraction using Flammant 1 - L: <= 1200	Data File Path: D:\OQ2024\None_#1.J
January 5, 2024 9:45:22 AM	End	Execution	Signal to None EI - Liquid Injection, Front SSI, SQ - Source: EI - Extraction using Flammant 1 - L: <= 1200	Run Count: 1
January 5, 2024 9:49:32 AM	Start	Execution	Signal to None EI - Liquid Injection, Front SSI, SQ - Source: EI - Extraction using Flammant 1 - L: <= 1200	None
January 5, 2024 9:50:15 AM	End	Execution	Signal to None EI - Liquid Injection, Front SSI, SQ - Source: EI - Extraction using Flammant 1 - L: <= 1200	Data File Path: D:\OQ2024\None_#2.J
January 5, 2024 10:00:19 AM	End	Execution	Signal to None EI - Liquid Injection, Front SSI, SQ - Source: EI - Extraction using Flammant 1 - L: <= 1200	Run Count: 1

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System ID: RYG_EN0136

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Live Name: rotemid_rpmomple
Report Generated by Hostname: ASRY0W0074
System ID: RYG_EN0136
Print Date: January 5, 2024 10:53:23 AM

ALS_OG_RYG_EN0136 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
January 5, 2024 10:10:53 AM	Auto	Test/Blocked	Signal to Noise E1 - Liquid Injection, Front SSL, SQ - Source: E1 - Extractor using Filament 2 - L1 => 1200	Deviation Used for Run Count : 1
January 5, 2024 10:21:53 AM	Start	Execution	Signal to Noise E1 - Liquid Injection, Front SSL, 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 SSL, SQ - Source: E1 - Extractor using Filament 2 - L1 => 1200	Data File Path : D:\OG2014\HSH_F00.D
January 5, 2024 10:17:58 AM	End	Execution	Signal to Noise E1 - Liquid Injection, Front SSL, SQ - Source: E1 - Extractor using Filament 2 - L1 => 1200	Run Count : 2
January 5, 2024 10:22:04 AM	Auto	Test/Blocked	Signal to Noise E1 - Liquid Injection, Front SSL, SQ - Source: E1 - Extractor using Filament 2 - L1 => 1200	Deviation Used for Run Count : 2
January 5, 2024 10:22:06 AM	Start	Execution	Signal to Noise E1 - Liquid Injection, Front SSL, 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 SSL, SQ - Source: E1 - Extractor using Filament 2 - L1 => 1200	Data File Path : D:\OG2014\HSH_F00.D
January 5, 2024 10:25:55 AM	End	Execution	Signal to Noise E1 - Liquid Injection, Front SSL, SQ - Source: E1 - Extractor using Filament 2 - L1 => 1200	Run Count : 3

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Live Name: rotemid_rpmomple
Report Generated by Hostname: ASRY0W0074
System ID: RYG_EN0136
Print Date: January 5, 2024 10:53:23 AM

ALS_OG_RYG_EN0136 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
January 5, 2024 10:20:11 AM	Auto	Test/Blocked	Signal to Noise E1 - Liquid Injection, Front SSL, SQ - Source: E1 - Extractor using Filament 2 - L1 => 1200	Deviation Used for Run Count : 3
January 5, 2024 10:20:11 AM	Start	Execution	Signal to Noise E1 - Liquid Injection, Front SSL, 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 SSL, SQ - Source: E1 - Extractor using Filament 2 - L1 => 1200	Data File Path : D:\OG2014\HSH_F00.D
January 5, 2024 10:46:34 AM	End	Execution	Signal to Noise E1 - Liquid Injection, Front SSL, SQ - Source: E1 - Extractor using Filament 2 - L1 => 1200	Run Count : 4
January 5, 2024 10:46:41 AM	End	Qualification	Session	DQ
January 5, 2024 10:46:41 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 10:51:28 AM	Auto	Reporting	Session	Report Generated : Certificate
January 5, 2024 10:52:09 AM	Auto	Reporting	Session	Report Generated : Report

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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_FS1011	07 May 24	Y = 1.3995x - 7.1671	0.9994
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



ROTA METER CALIBRATION RESULT APRIL 2024

Rotameter ID.	Calibration Date	Regression Result	Coefficient (R ²)
SGK_FS0135	23 Apr 24	Y = 1.0117x + 4.8833	1.0000
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



ROTA METER CALIBRATION RESULT JULY 2024

Rotameter ID.	Calibration Date	Regression Result	Coefficient (R ²)
BKK_FS0577	01 Jul 24	Y = 1.0001x - 0.0433	1.0000
BKK_FS0584	01 Jul 24	Y = 1.0056x - 2.7974	1.0000
BKK_FS0585	02 Jul 24	Y = 1.0315x + 3.0033	0.9998
BKK_FS0587	02 Jul 24	Y = 1.0294x + 0.71	1.0000
BKK_FS0588	01 Jul 24	Y = 0.9751x + 9.8452	0.9999
BKK_FS0591	01 Jul 24	Y = 1.0035x - 8.2303	1.0000
BKK_FS0592	02 Jul 24	Y = 1.002x + 14.273	1.0000
BKK_FS0594	02 Jul 24	Y = 1.0003x + 7.0095	1.0000
BKK_FS0595	01 Jul 24	Y = 1.0871x - 114.97	0.9985
BKK_FS1004	02 Jul 24	Y = 0.9826x + 13.51	0.9999
BKK_FS1005	02 Jul 24	Y = 1.0217x - 0.5833	0.9997
BKK_FS1006	02 Jul 24	Y = 1.149x - 1.0422	0.9981
BKK_FS1007	02 Jul 24	Y = 1.1116x + 3.3558	0.9994
BKK_FS1008	02 Jul 24	Y = 1.1273x + 0.4837	0.9999
BKK_FS1009	01 Jul 24	Y = 1.1044x - 0.8245	1.0000
BKK_FS1017	02 Jul 24	Y = 1.0488x - 2.2027	0.9998
BKK_FS1018	02 Jul 24	Y = 1.0173x - 0.1967	0.9999
BKK_FS1019	02 Jul 24	Y = 1.0022x + 5.619	1.0000
BKK_FS1026	01 Jul 24	Y = 1.072x - 2.4954	1.0000
BKK_FS1027	01 Jul 24	Y = 1.0104x - 4.4788	0.9999
BKK_FS1028	01 Jul 24	Y = 1.0009x - 3.7755	1.0000
BKK_FS1029	01 Jul 24	Y = 1.1118x - 4.4431	0.9965
BKK_FS1030	01 Jul 24	Y = 1.0159x - 6.395	1.0000
BKK_FS1031	01 Jul 24	Y = 0.9973x - 5.3371	0.9999
BKK_FS1039	02 Jul 24	Y = 0.9992x + 9.6833	0.9992
BKK_FS1040	01 Jul 24	Y = 1.0034x - 2.5343	1.0000
BKK_FS1041	02 Jul 24	Y = 1.0511x + 1.1272	0.9996
BKK_FS1042	02 Jul 24	Y = 1.0016x + 10.387	0.9995
BKK_FS1043	01 Jul 24	Y = 0.9965x + 9.3743	1.0000
BKK_FS1044	02 Jul 24	Y = 1.1237x - 0.4231	0.9981
BKK_FS1200	01 Jul 24	Y = 1.0337x - 0.1016	0.9994
BKK_FS1201	01 Jul 24	Y = 0.9871x + 5.0931	0.9986
BKK_FS1202	01 Jul 24	Y = 0.7978x + 301.39	0.9334
PHK_FS0027	02 Jul 24	Y = 1.0722x + 3.4395	0.9988
PHK_FS0028	02 Jul 24	Y = 1.0254x + 1.04	1.0000
PHK_FS0029	02 Jul 24	Y = 0.999x + 12.73	1.0000
RYG_FS0197	01 Jul 24	Y = 1.0045x + 10.291	1.0000
RYG_FS0198	01 Jul 24	Y = 1.0056x + 1.8883	1.0000
RYG_FS0199	02 Jul 24	Y = 1.0029x + 3.2381	0.9990

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ALS Laboratory Group



ROTA METER CALIBRATION RESULT JULY 2024

Rotameter ID.	Calibration Date	Regression Result	Coefficient (R ²)
RYG_FS0654	02 Jul 24	Y = 1.0421x + 1.4935	1.0000
RYG_FS0655	02 Jul 24	Y = 0.975x + 15.2	0.9994
RYG_FS0656	01 Jul 24	Y = 1.0042x + 7.1067	0.9999
RYG_FS0657	02 Jul 24	Y = 1.0337x + 1.8918	0.9998
RYG_FS0658	02 Jul 24	Y = 0.9921x + 10.87	0.9996
RYG_FS0659	01 Jul 24	Y = 1.0022x + 8.4152	1.0000
SGK_FS0135	02 Jul 24	Y = 1.0193x + 3.6833	0.9999
SGK_FS0136	02 Jul 24	Y = 1.0217x + 1.63	1.0000
SGK_FS0138	02 Jul 24	Y = 1.055x + 4.5833	0.9999
SGK_FS0139	02 Jul 24	Y = 1.0154x + 3.74	0.9998
SGK_FS0140	02 Jul 24	Y = 1.0008x + 13.353	1.0000
SGK_FS0141	02 Jul 24	Y = 1.1185x + 1.4867	0.9998
SGK_FS0142	02 Jul 24	Y = 1.0211x + 1.39	1.0000
SGK_FS0143	02 Jul 24	Y = 1.0045x + 5.6981	1.0000

Review By :

(Mr. Wichan Choonharat)

Enviro Field Services Manager

Approved By :

(Mr. Sarayuth Jitranont)

Assistant General Manager

Page 2 of 2

ALS Laboratory Group

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
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TEL : 0600-2116-5500-1 FAX: 0600-2116-7140



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Certificate of Calibration

Certificate No : 24-AFM-018 Rev.1

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.

Request No : Req-2024-0043

Address : 104 Soi Phanthanaka 40, Phanthanaka Road, Suan Luang, Bangkok
10250

Unit Under Calibration Details

Measurement Item : Air Flow Meter

Manufacturer : Bios

Model : Defender 510-L

Sensor Model : -

Serial Number : 206895

Sensor Serial Number : -

ID : BKK_FS1346

Location of Calibration : LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature : 23 °C ± 3 °C

Humidity : 55 %RH ± 20 %RH

Barometric Pressure : 1013 hPa ± 10 hPa

Received Date : 3 January 2024

Calibration Date : 29 January 2024

Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	1850101006	Sensidyne	12 July 2024
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	12 July 2024
Temperature meter	GT 11	08090057	Qreborn	27 February 2024
Pressure meter	CPG2400	-41000KDU/651882	TPA	9 November 2024

Traceability :

This Certificate is traceable to SI Unit through Sensidyne AZLA Accreditation No. 3943.01

Note :

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.

This Certificate was issued to replace to Calibration Certificate No. 24-AFM-018

Calibration By :

Mr. Noppadol Luangart

Service Calibration Engineer

Approved By :

Mr. Pacit Mathavorn

Calibration Engineer Supervisor

Issue Date : 1 February 2024

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-AFM-01 Rev.01 Issue date 25/01/24

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
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Page 2/2

Certificate No : 24-AFM-018 Rev.1

Request No : Req-2024-0043

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (ml/min)	UUC (ml/min)	Error (ml/min)	Uncertainty (ml/min)
25.00	101.66	20	20.148	0.1	1.3
25.00	101.67	100	99.409	-0.6	2.8
24.90	101.63	199	197.46	-1.5	5.6
25.00	101.61	300	298.15	-1.8	8.4
24.90	101.60	399	400.13	1	11
24.90	101.59	480	478.02	-2.0	6.8

Note

STD : Standard UUC : Unit Under Calibration

- UUC Reference Condition : At atmospheric pressure and room temperature condition

- Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P_{meas}} \times \frac{T_{meas}}{T_{ref}}$$

where Q = Flow Rate P = Absolute Pressure T = Absolute Temperature

Meas = Measurement Condition ref = Standard Condition

* Indicates non accredited

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-AFM-01 Rev.01 Issue date 25/01/24



Calibration Certificate

Certificate No. 610563
Product 200-S10M Defender S10 Medium Flow
Serial No. 151114
Cal. Date 21-May-2024

Sold To:

All calibrations are performed in accordance with ISO 17025 at Mesa Laboratories, Inc., 12100 W. 6th Ave, Lakewood, CO 80228, an ISO 17025:2017 accredited laboratory through NVLAP. This report shall not be reproduced except in full without the written approval of the laboratory. Results only relate to the items calibrated. This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

As Received Calibration Data

Technician	Derek Dellape	Lab. Pressure Lab. Temperature	614.2 mmHg 24.3 °C	
Instrument Reading	Lab Standard Reading	Deviation	Allowable Deviation	As Received
0 ccm	4504.81 ccm	-100.0%	1.00%	Out of Tolerance
0 ccm	1000.98 ccm	-100.0%	1.00%	Out of Tolerance
0 ccm	249.55 ccm	-100.0%	1.00%	Out of Tolerance

Mesa Laboratories Standards Used

Description	Standard Serial Number	Calibration Date	Calibration Due Date
ML-800-24	117991	13-Nov-2023	13-Nov-2024



As Shipped Calibration Data

Certificate No	610563		Lab. Pressure	617 mmHg
Technician	Derek Dellape		Lab. Temperature	24.6 °C
Instrument Reading	Lab Standard Reading	Deviation	Allowable Deviation	As Shipped
4482.47 ccm	4493.49 ccm	-0.25%	1.00%	In Tolerance
997.25 ccm	996.83 ccm	0.04%	1.00%	In Tolerance
248.51 ccm	248.67 ccm	-0.06%	1.00%	In Tolerance

Mesa Laboratories Standards Used

Description	Standard Serial Number	Calibration Date	Calibration Due Date
ML-800-24	211063	04-Oct-2023	04-Oct-2024

Calibration Notes

The expanded uncertainty of flow has a coverage factor of $k = 2$ for a confidence interval of approximately 95%.
Flow testing is in accordance with our test number MP-00672 with an expanded uncertainty of 0.27% using high-purity nitrogen or filtered laboratory air.
Traceability to the International System of Units (SI) is verified by accreditation to ISO/IEC 17025 by NVLAP under NVLAP Code 200661-0.

Technician Notes:
By:

Approved By:

Derek Dellape
Production Assembler II

Troy Thacker
Quality Engineer

Mesa Laboratories, Inc. certifies that the above instrument meets or exceeds published specifications, and that the calibration results in this certificate were obtained using equipment capable of producing results that are traceable through NIST to the International System of Units (SI). Calibration results are in compliance with ISO/IEC 17025:2017. Calibrations process has a Test Uncertainty Ratio (TUR) of 4:1 or greater. Any Pass/Fail determination is made without taking measurement uncertainty into account and is based on UUT performance against required tolerance only.

Mesa Laboratories Inc., 12100 W. 6th Ave, Lakewood, CO 80228 USA
(303) 987-8000 www.mesalabs.com Symbol "MLAB" on the NASDAQ

Mesa Laboratories Inc., 12100 W. 6th Ave, Lakewood, CO 80228 USA
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INNOVATIVE INSTRUMENT CALIBRATION LAB
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AMPHOE BANG PHU SAMUT PRAKAN PROVINCE 10540 THAILAND
TEL: 6609-2116-5560-1 FAX: 6609-2116-7140



Certificate of Calibration

Customer Name : ALS Laboratory Group Thailand Co., Ltd.
Address : 104 Soi Phatthamakan 40, Phatthamakan Road, Sun Luang, Bangkok 10250

Certificate No : 24-AFM-033
Request No : Req-2024-0241

Unit Under Calibration Details

Measurement Item : Primary Flow Calibrator
Manufacturer : Bios
Model : Defender S10-L
Serial Number : 130027
ID : RYG_FS0208
Sensor Model : -
Sensor Serial Number : -
Location of Calibration : LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 31 January 2024
Calibration Date : 13 February 2024
Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	12 July 2024
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	12 July 2024
Temperature meter	GT 11	08000057	Qreborn	27 February 2024
Pressure meter	CPG2400	41000KDU/651882	TPA	9 November 2024

Traceability :

This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No. 3943.01

Note :

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.

Calibration By : Mr. Noppadon Luangart
Service Calibration Engineer

Approved By : Mr. Pacit Mathavorn
Calibration Engineer Supervisor

Issue Date : 13 February 2024

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
7-139 MOO 13, SOI SUTINAKORN II TAMBON BANG KAE O,
AMPHOE BANG PHU SAMUT PRAKAN PROVINCE 10540 THAILAND
TEL: 6609-2116-5560-1 FAX: 6609-2116-7140



Certificate No : 24-AFM-033
Request No : Req-2024-0241

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)
24.50	101.26	20	19.965	0.0	1.3
24.20	101.25	101	100.50	-0.5	2.8
24.00	101.31	200	199.13	-0.9	5.6
23.90	101.42	301	303.56	2.6	8.4
24.10	101.41	401	404.57	4	11
24.10	101.49	480	483.81	3.8	7.0

Note

STD : Standard UUC : Unit Under Calibration
- UUC Reference Condition : At atmospheric pressure and room temperature condition
- Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{\text{meas}} = Q_{\text{ref}} \times \frac{P_{\text{ref}}}{P_{\text{meas}}} \times \frac{T_{\text{meas}}}{T_{\text{ref}}}$$

where Q = Flow Rate P = Absolute Pressure T = Absolute Temperature
Meas = Measurement Condition ref = Standard Condition

* Indicates non accredited

End of Certificate

Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.
Address : 104 Soi Phatthakan 40, Phatthakan Road, Suan Luang, Bangkok
10250

Certificate No : 24-AFM-032

Request No : Req-2024-0240

Unit Under Calibration Details

Measurement Item : Primary Flow Calibrator

Manufacturer : Bios

Model : Defender 510-M

Sensor Model : -

Serial Number : 129958

Sensor Serial Number : -

ID : RYG_F50209

Location of Calibration : LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature : 23 °C ± 3 °C

Humidity : 55 %RH ± 20 %RH

Barometric Pressure : 1013 hPa ± 10 hPa

Received Date : 31 January 2024

Calibration Date : 13 February 2024

Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator


Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	12 July 2024
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	12 July 2024
Temperature meter	GT 11	08000057	Qreborn	27 February 2024
Pressure meter	CPG2400	41000KDU/651882	TPA	9 November 2024


Traceability :

This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No. 3943.01

Note :

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.

Calibration By : 
Mr. Noppadol Luangart
Service Calibration Engineer

Approved By : 
Mr. Pacit Mathavorn
Calibration Engineer Supervisor
Issue Date : 13 February 2024

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-AFM-01 Rev.01 Issue date 25/01/24

Certificate No : 24-AFM-032

Request No : Req-2024-0240

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)
23.80	101.89	95	100.13	5.1	2.8
23.90	101.71	501	513.93	12.9	7.2
24.18	101.62	1006	1019.3	13	14
24.00	101.81	1997	2023.0	26	29
24.10	101.87	2999	3035.5	37	45
24.60	102.00	3944	3991.8	48	59
24.60	102.08	4739	4790.5	52	72

Note

STD : Standard UUC : Unit Under Calibration

- UUC Reference Condition : At atmospheric pressure and room temperature condition

- Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P_{meas}} \times \frac{T_{meas}}{T_{ref}}$$

where Q = Flow Rate P = Absolute Pressure T = Absolute Temperature

Meas = Measurement Condition ref = Standard Condition

* Indicates non accredited

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-AFM-01 Rev.01 Issue date 25/01/24

Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.
Address : 104 Soi Phatthakan 40, Phatthakan Road, Suan Luang,
Bangkok 10250

Certificate No : 24-AFM-174

Request No : Req-2024-1861

Unit Under Calibration Details

Measurement Item : Air Flow Meter

Manufacturer : MesaLabs

Model : 510-M

Accuracy : 1% of Reading

Serial Number : 208345

Sensor Model : -

ID : BKK_F51347

Sensor Serial Number : -

Location of Calibration : LAB 4 AIR VELOCITY METER

Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 3 °C

Humidity : 55 %RH ± 20 %RH

Barometric Pressure : 1013 hPa ± 10 hPa

Received Date : 22 August 2024

Calibration Date : 28 August 2024

Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator


Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	6 August 2025
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	2 August 2025
Temperature meter	GT 11	08000057	Qreborn	1 March 2025
Pressure meter	CPG2400	41000KDU/651882	TPA	9 November 2024


Traceability :

This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No. 3943.01

Note :

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.

Calibration By : 
Mr. Noppadol Luangart
Service Calibration Engineer

Approved By : 
Mr. Pacit Mathavorn
Calibration Engineer Supervisor
Issue Date : 28 August 2024

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-AFM-01 Rev.04 Issue date 17/6/24

Certificate No : 24-AFM-174

Request No : Req-2024-1861

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)	MPE (cc/min)	Result
22.30	100.57	100	99.526	-0.5	2.8	1	N/A
22.40	100.61	499	500.48	1.5	7.8	5	N/A
22.50	100.56	1004	1004.8	1	15	10	N/A
22.60	100.54	2008	2003.3	-5	29	20	N/A
22.80	100.62	3034	3032.1	-2	45	30	N/A
23.20	100.71	4032	4022.4	-10	60	40	N/A
23.40	100.73	5060	5056.4	-4	79	51	N/A

Note

STD : Standard UUC : Unit Under Calibration

- UUC Reference Condition : At atmospheric pressure and room temperature condition

- Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P_{meas}} \times \frac{T_{meas}}{T_{ref}}$$

where Q = Flow Rate P = Absolute Pressure T = Absolute Temperature

Meas = Measurement Condition ref = Standard Condition

* Indicates non accredited

MPE = Maximum Permissible Error (Specified in Manufacturer's Specifications)

N/A = Not Available. Customer does not require a statement of conformity.

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-AFM-01 Rev.04 Issue date 17/6/24

Certificate No : 24-AFM-174

Request No : Req-2024-1861

Decision Rule for Statements of Conformity

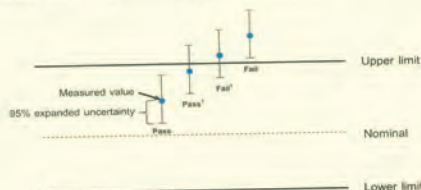
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09-2019: Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

Pass - The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass¹ - The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ - The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail - The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-AFM-01 Rev.04 Issue date 17/6/24

Certificate of Calibration

Certificate No : 24-AFM-177

Request No : Req-2024-1862

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.
Address : 104 Soi Phanthanakul 40, Phantnanakul Road, Suan Luang,
Bangkok 10250

Unit Under Calibration Details

Measurement Item : Air Flow Meter
Manufacturer : Bios
Model : Defender 510-L
Serial Number : 130026
ID : BKK_FS0619
Location of Calibration : LAB 4 AIR VELOCITY METER

Accuracy : 1% of Reading

Sensor Model : -

Sensor Serial Number : -

Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 22 August 2024
Calibration Date : 9 September 2024

Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	6 August 2025
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	2 August 2025
Temperature meter	GT 11	08000057	Qreborn	1 March 2025
Pressure meter	CPG2400	41000KDU/651882	TPA	9 November 2024

Traceability :

This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No. 3943.01

Note :

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.

Calibration By :

Mr. Noppadon Luangart
Service Calibration Engineer

Approved By :

Mr. Paitit Mahitayorn
Calibration Engineer Supervisor

Issue Date : 9 September 2024

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-AFM-01 Rev.04 Issue date 17/6/24

Certificate No : 24-AFM-177

Request No : Req-2024-1862

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (cc/min)	UUC ¹ (cc/min)	Error (cc/min)	Uncertainty (cc/min)	MPE (cc/min)	Result
24.70	100.92	20	20.192	0.2	1.3	0.2	N/A
24.70	100.90	100	99.923	-0.1	2.8	1.0	N/A
24.70	100.94	201	200.7	-0.3	5.6	2.0	N/A
24.70	100.97	298	300.1	2.1	8.4	3.0	N/A
24.70	100.99	403	399.1	-4	11	4.0	N/A
24.80	101.05	482	477.6	-4.4	6.9	4.8	N/A

Note

STD : Standard UUC¹ : Unit Under Calibration

- UUC Reference Condition : At atmospheric pressure and room temperature condition

- Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{\text{meas}} = Q_{\text{ref}} \times \frac{P_{\text{ref}}}{P_{\text{meas}}} \times \frac{T_{\text{meas}}}{T_{\text{ref}}}$$

where : Q = Flow Rate P = Absolute Pressure T = Absolute Temperature
Meas = Measurement Condition ref = Standard Condition

* Indicates non accredited

MPE = Maximum Permissible Error (Specified in Manufacturer's Specifications)

N/A = Not Available, Customer does not require a statement of conformity.

Certificate No : 24-AFM-177

Request No : Req-2024-1862

Decision Rule for Statements of Conformity

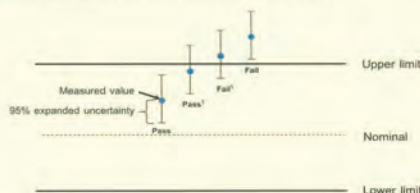
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09-2019: Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

Pass - The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass¹ - The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ - The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail - The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-AFM-01 Rev.04 Issue date 17/6/24

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-AFM-01 Rev.04 Issue date 17/6/24

Certificate of System Qualification

GC-OQ

System ID: CN11461066
Organization Name: ALS Laboratory Group (Thailand) Co., Ltd.
Organization Location: 104 Soi 40 Phatthanakan Rd, Khwang 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

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REVIEW BY *Jinda K.*
APPROVED BY *Tangtan M.*
NEXT CAL DATE *31 Oct 24*

Overall Inlet Pressure Decay Test Status

Pass

Inlet Pressure Accuracy

Name: 7890

Front SSL

Setpoint Status: Pass

Inlet Pressure: 25.0 psi

Actual 25.2 psi

Accuracy: 0.2 psi

Agilent Recommended: <= 1.2

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 SSL

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

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Setpoint Status: Pass

Inlet Pressure: 25.0 psi

Accuracy: 0.2 psi

Agilent Recommended: <= 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

Detector Flow Accuracy

Name: 7890

Front FID

Setpoint Status: Pass

Flow Type: Fuel

Setpoint: 30.0 mL/min Measured Flow: 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 Combination1 Front SSL / Front FID
Injection Tower
Name: 7893A

Date: April 21, 2023 3:26:38 PM
System ID: CN11461068

Setpoint Status: **Completed**
Injection Volume on Column: 1.0 µL
Overall Scouting Run Status
Completed

Noise and Drift

Tested Combination1 Front SSL / Front FID
Name: 7890
Setpoint Status: **Pass**
Base Signal: 22.7 pA
ASTM Noise
pA 0.06
Agilent Recommended: ≤ 0.10
Status: **Pass**
Drift
pA/hr 0.05
Agilent Recommended: ≤ 2.50
Status: **Pass**

Overall Noise and Drift Test Status

Pass

Injection Precision

Tested Combination1 Front SSL / Front FID
Name: 7893A
Setpoint Status: **Pass**
Injection Volume on Column: 1.0 µL
Area RSD: 0.32 %
Agilent Recommended: ≤ 3.00
Retention Time RSD: 0.87 %
Agilent Recommended: ≤ 1.00

Overall Injection Precision Test Status

Pass

Signal to Noise

Date: April 21, 2023 3:26:38 PM
System ID: CN11461068

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: 7893A

Setpoint Status: **Completed**
Injection Volume on Column: 1.0 µL

Overall Scouting Run Status

Completed

Noise and Drift

Tested Combination2 Back SSL / Back FID
Name: 7890
Setpoint Status: **Pass**
Base Signal: 22.6 pA
ASTM Noise
pA 0.07
Agilent Recommended: ≤ 0.10
Status: **Pass**
Drift
pA/hr 0.09
Agilent Recommended: ≤ 2.50
Status: **Pass**

Date: April 21, 2023 3:26:38 PM
System ID: CN11461068

Overall Noise and Drift Test Status

Pass

Injection Precision

Tested Combination2 Back SSL / Back FID
Name: 7893A
Setpoint Status: **Pass**
Injection Volume on Column: 1.0 µL
Area RSD: 1.28 %
Agilent Recommended: ≤ 3.00
Retention Time RSD: 0.83 %
Agilent Recommended: ≤ 1.00

Overall Injection Precision Test Status

Pass

Signal to Noise

Tested Combination2 Back SSL / Back FID
Injection Tower
Name: 7890
Setpoint Status: **Pass**
Signal to Noise: 2404398
Agilent Recommended: ≥ 300000

Overall Signal to Noise Test Status

Pass

Date: April 21, 2023 3:26:38 PM
System ID: CN11461068

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 Combination 1	
Injection Technique	Injection Tower
Sampler Identifier	Sampler 2
Inlet	Front
Detector	Front
LTM Included?	No

Tested Combination 2	
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	CN15386030
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

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System ID: CN11461066

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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
Adaptor	Capillary
Control Type	Electronic Pressure Control (EPC)
Location	Front
Makeup Gas	Nitrogen

Detector 2

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

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

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Electronic Signature

Purpose

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Details

Full Name of Signer:	Saenguthai Tarak
Logged On User Name:	saenguthai.tarak@non.agilent.com
Signature Creation Date:	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

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Hostname: LAPTOP-CQ8SK0MV

System id: CH11461060
Print Date: April 21, 2023 3:28:40 PM

GC-5_BKK_EN0127_ALS Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 21, 2023 11:21:05 AM	Auth	Session Created	Session	None
April 21, 2023 11:21:06 AM	Start	Configuration	Session	None
April 21, 2023 11:21:36 AM	Auth	Initiate	Logging	User is logging in and does not initiate an upload code
April 21, 2023 11:22:04 AM	Auth	Discovered	Session	EQP details for primary technique [34] - File path: [Profile]Perks/GoConfiguration/003 5010c 02 52.asp, EQP File Name: [00.02.52.Asp], EQP Name: [AgentRecommend_Protocol] of Respon (00.02.32)
April 21, 2023 11:22:05 AM	End	Configuration	Session	None
April 21, 2023 11:22:34 AM	Start	Initialization	Session	OK
April 21, 2023 11:22:44 AM	Start	Execution	CO2 Logon Verification - GC - Qualifier test	None
April 21, 2023 11:23:14 AM	End	Execution	CO2 Logon Verification - GC - Qualifier test	Run Count : 1
April 21, 2023 11:23:16 AM	Start	Execution	System Inspection and Basic Safety and Operation - 7890 - Qualifier Test - No exception associated	None
April 21, 2023 11:23:30 AM	End	Execution	System Inspection and Basic Safety and Operation - 7890 - Qualifier Test - No exception associated	Run Count : 1
April 21, 2023 11:23:37 AM	Start	Execution	High Pressure Decay - FmH (SCL - Pressure Controlled) and 5: 28.0 psi - L - m - 2.0 psi and <= 0.5 psi	None

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Date: April 21, 2023 3:25:38 PM
System ID: CN11461066

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User Name: 3607gtrval2@nec
Host: LAPTOP-CO3SKOMV

System Id: CN11481046
Print Date: April 21, 2023 3:26:10 PM

GC-6_BKK_BN0127_ALS Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 21, 2023 11:24:01 AM	Start	Execution	Inlet Pressure Decay - Front SSL - Pressure Controlled Inlet • S: 25.0 psi - L: ~+0.0 psi end → 0.3 psi	Rain Count: 1
April 21, 2023 11:24:04 AM	Start	Execution	Inlet Pressure Accuracy - Front SSL - Pressure Controlled Inlet • S: 25.0 psi - L: ~+1.2 psi	None
April 21, 2023 11:24:20 AM	End	Execution	Inlet Pressure Accuracy - Front SSL - Pressure Controlled Inlet • S: 25.0 psi - L: ~+1.2 psi	Rain Count: 1
April 21, 2023 11:24:41 AM	Start	Execution	Inlet Pressure Decay - Back SSL - Pressure Controlled Inlet • S: 25.0 psi - L: ~+0.0 psi end → 0.5 psi	None
April 21, 2023 11:24:43 AM	End	Execution	Inlet Pressure Decay - Back SSL - Pressure Controlled Inlet • S: 25.0 psi - L: ~+0.0 psi end → 0.3 psi	Rain Count: 1
April 21, 2023 11:24:48 AM	Start	Execution	Inlet Pressure Accuracy - Back SSL - Pressure Controlled Inlet • S: 25.0 psi - L: ~+1.2 psi	None
April 21, 2023 11:24:51 AM	End	Execution	Inlet Pressure Accuracy - Back SSL - Pressure Controlled Inlet • S: 25.0 psi - L: ~+1.2 psi	Rain Count: 1
April 21, 2023 11:24:53 AM	Start	Execution	Distalnet Flow Accuracy - Front FIQI - Type: Fuel - S: 30.0 mL/min - L: ~+ 10.0% average	None
April 21, 2023 11:25:00 AM	End	Data	Distalnet Flow Accuracy - Front FIQI - Type: Fuel - S: 30.0 mL/min - L: ~+ 10.0% average	Manual Check Entry
April 21, 2023 11:25:23 AM	End	Execution	Distalnet Flow Accuracy - Front FIQI - Type: Fuel - S: 30.0 mL/min - L: ~+ 10.0% average	Rain Count: 1

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

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User Name: kengulmba@msn.com

System ID: CN1548T000
Print Date: April 21, 2023 3:28:40 PM

DC-8 JKK EN0127 ALS Transaction log 1

Time	Transaction Status	Activity Performed	Type of Transaction	Optional Information
April 21, 2023 11:29:25 AM	Start	Execution	Detector Flow Accuracy - Fresh FID - Type: Oxidizer - S: 400.0 mL/min - L: <= 10.0% selected	None
April 21, 2023 11:30:40 AM	Awake	Data	Detector Flow Accuracy - Fresh FID - Type: Oxidizer - S: 400.0 mL/min - L: <= 10.0% selected	Manual Data Entry
April 21, 2023 11:35:42 AM	End	Execution	Detector Flow Accuracy - Fresh FID - Type: Oxidizer - S: 400.0 mL/min - L: <= 10.0% selected	Run Count: 1
April 21, 2023 11:39:44 AM	Start	Execution	Detector Flow Accuracy - Fresh FID - Type: Makeup - S: 25.0 mL/min - L: <= 10.0% selected	None
April 21, 2023 11:39:51 AM	Awake	Data	Detector Flow Accuracy - Fresh FID - Type: Makeup - S: 25.0 mL/min - L: <= 10.0% selected	Manual Data Entry
April 21, 2023 11:39:54 AM	End	Execution	Detector Flow Accuracy - Fresh FID - Type: Makeup - S: 25.0 mL/min - L: <= 10.0% selected	Run Count: 1
April 21, 2023 11:39:56 AM	Start	Execution	Detector Flow Accuracy - Fresh FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% selected	None
April 21, 2023 11:40:16 AM	Awake	Data	Detector Flow Accuracy - Fresh FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% selected	Manual Data Entry
April 21, 2023 11:50:22 AM	End	Execution	Detector Flow Accuracy - Fresh FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% selected	Run Count: 1
April 21, 2023 11:55:24 AM	Start	Execution	Detector Flow Accuracy - Back FID - Type: Catalyst - S: 400.0 mL/min - L: <= 10.0% selected	None
April 21, 2023 11:56:39 AM	Awake	Data	Detector Flow Accuracy - Back FID - Type: Catalyst - S: 400.0 mL/min - L: <= 10.0% selected	Manual Data Entry

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

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User Name: [aaeguthal@rak](#)
 Password: [LANTON-COINTEGR](#)

System id: C7419451046
 Host Name: April 21, 2021 3:26:40 PM

GC-8 BKK EN0123 ALS Transaction log.c

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 21, 2023 11:26:43 AM	End	Execution	Derivative Flow Accuracy - Back FID - Type: Outflow - \$ 460.0 relErr = L <= 10.0% support	Run Count : 1
April 21, 2023 11:28:45 AM	Start	Execution	Derivative Flow Accuracy - Back FID - Type: Makeup - \$ 25.0 relErr = L <= 10.0% support	None
April 21, 2023 11:27:03 AM	Abort	Data	Derivative Flow Accuracy - Back FID - Type: Makeup - \$ 25.0 relErr = L <= 10.0% support	Manual Data Entry
April 21, 2023 11:27:05 AM	End	Execution	Derivative Flow Accuracy - Back FID - Type: Makeup - \$ 25.0 relErr = L <= 10.0% support	Run Count : 1
April 21, 2023 11:27:07 AM	Start	Execution	GC Oven Temperature Accuracy : 7890 - Temperature 1 Over - \$ 230.0°C - L <= -1.0 AND <= 1.0 % support in R	None
April 21, 2023 11:27:33 AM	Abort	Data	GC Oven Temperature Accuracy : 7890 - Temperature 1 Over - \$ 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 Over - \$ 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 Over - \$ 100.0°C - L <= -1.0 AND <= 1.0 % support in R	None
April 21, 2023 11:37:54 AM	Abort	Data	GC Oven Temperature Accuracy : 7890 - Temperature 1 Over - \$ 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: CN11461065

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User Name: scmgp@hls-lab
Host Name: LAPTOP-GQ3BK09VSystem ID: CN11481066
Print Date: April 21, 2023 3:26:49 PM

GC-4_BKK_ENV127_ALS Transaction Log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 21, 2023 11:27:37 AM	End	Execution	GC Oven Temperature Accuracy - 7890 - Temperature Over - 5 100.0°C - L <= -1.0 ASD <= 1.0 % setpoint in K	Run Count : 1
April 21, 2023 11:27:50 AM	Start	Execution	GC Oven Temperature Stability - 7890 - Temperature Over - 5 100.0°C - L <= 0.5°C	None
April 21, 2023 11:28:07 AM	Auto	Data	GC Oven Temperature Stability - 7890 - Temperature Over - 5 100.0°C - L <= 0.5°C	Manual Data Entry
April 21, 2023 11:28:10 AM	End	Execution	GC Oven Temperature Stability - 7890 - Temperature Over - 5 100.0°C - L <= 0.5°C	Run Count : 1
April 21, 2023 11:29:12 AM	Start	Execution	GC Sampling Run - Injection Tower, Front SSI, Front FID - Part of System Preparation - No limits associated	None
April 21, 2023 11:30:27 AM	Auto	Data	GC Sampling Run - Injection Tower, Front SSI, Front FID - Part of System Preparation - No limits associated	Data File Path : C:\Users\Public\Documents\GC ItemStation\3\Data\GC-4_ALS_2023-04-20\GC-4_2023-2023-04-20-14-36-08\FID-01\FID1A.ch
April 21, 2023 11:31:04 AM	End	Execution	GC Sampling Run - Injection Tower, Front SSI, Front FID - Part of System Preparation - No limits associated	Run Count : 1
April 21, 2023 11:31:07 AM	Start	Execution	Injection Precision - Injection Tower, Front SSI, Front 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: CN11481066

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User Name: scmgp@hls-lab
Host Name: LAPTOP-GQ3BK09VSystem ID: CN11481066
Print Date: April 21, 2023 3:26:46 PM

GC-4_BKK_ENV127_ALS Transaction Log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 21, 2023 11:31:43 AM	Auto	Data	Injection Precision - Injection Tower, Front SSI, Front FID - Detector FID - L (Noise) <= 0.10 pA - L (Drift) <= 2.50 pA/dec	Data File Path : C:\Users\Public\Documents\GC ItemStation\3\Data\GC-4_ALS_2023-04-20\GC-4_2023-2023-04-20-14-36-08\FID-01\FID1A.ch
April 21, 2023 11:32:00 AM	End	Execution	Injection Precision - Injection Tower, Front SSI, 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 SSI, Front FID - GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	None
April 21, 2023 11:32:23 AM	Start	Execution	Injection Precision - Injection Tower, Front SSI, Front FID - GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	None
April 21, 2023 11:33:25 AM	Auto	Data	Injection Precision - Injection Tower, Front SSI, Front FID - GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Data File Path : C:\Users\Public\Documents\GC ItemStation\3\Data\GC-4_ALS_2023-04-20\GC-4_2023-2023-04-20-14-36-08\FID-01\FID1A.ch
April 21, 2023 11:33:55 AM	Auto	Data	Injection Precision - Injection Tower, Front SSI, Front FID - GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Data File Path : C:\Users\Public\Documents\GC ItemStation\3\Data\GC-4_ALS_2023-04-20\GC-4_2023-2023-04-20-14-36-08\FID-01\FID1A.ch

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

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User Name: scmgp@hls-lab
Host Name: LAPTOP-GQ3BK09VSystem ID: CN11481066
Print Date: April 21, 2023 3:26:46 PM

GC-4_BKK_ENV127_ALS Transaction Log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 21, 2023 11:33:35 AM	Auto	Data	Injection Precision - Injection Tower, Front SSI, Front FID - GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Data File Path : C:\Users\Public\Documents\GC ItemStation\3\Data\GC-4_ALS_2023-04-20\GC-4_2023-2023-04-20-14-36-08\FID-01\FID1A.ch
April 21, 2023 11:33:55 AM	Auto	Data	Injection Precision - Injection Tower, Front SSI, Front FID - GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Data File Path : C:\Users\Public\Documents\GC ItemStation\3\Data\GC-4_ALS_2023-04-20\GC-4_2023-2023-04-20-14-36-08\FID-01\FID1A.ch
April 21, 2023 11:33:59 AM	Auto	Data	Injection Precision - Injection Tower, Front SSI, Front FID - GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Data File Path : C:\Users\Public\Documents\GC ItemStation\3\Data\GC-4_ALS_2023-04-20\GC-4_2023-2023-04-20-14-36-08\FID-01\FID1A.ch
April 21, 2023 11:33:59 AM	Auto	Data	Injection Precision - Injection Tower, Front SSI, Front FID - GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Data File Path : C:\Users\Public\Documents\GC ItemStation\3\Data\GC-4_ALS_2023-04-20\GC-4_2023-2023-04-20-14-36-08\FID-01\FID1A.ch
April 21, 2023 11:34:03 AM	End	Execution	Injection Precision - Injection Tower, Front SSI, Front FID - GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Run Count : 1
April 21, 2023 11:34:04 AM	Start	Execution	Signal to Noise - Injection Tower, Front SSI, Front FID - Detector FID - L <= 300000	None

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

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User Name: scmgp@hls-lab
Host Name: LAPTOP-GQ3BK09VSystem ID: CN11481066
Print Date: April 21, 2023 3:26:46 PM

GC-4_BKK_ENV127_ALS Transaction Log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 21, 2023 11:36:28 AM	Auto	Data	Signal to Noise - Injection Tower, Front SSI, Front FID - Detector FID - L <= 300000	Data File Path : C:\Users\Public\Documents\GC ItemStation\3\Data\GC-4_ALS_2023-04-20\GC-4_2023-2023-04-20-14-36-08\FID-01\FID1A.ch
April 21, 2023 11:36:49 AM	End	Execution	Signal to Noise - Injection Tower, Front SSI, Front FID - Detector FID - L <= 300000	Run Count : 1
April 21, 2023 11:36:49 AM	Start	Execution	GC Sampling Run - Injection Tower, Back SSI, Back FID - Part of System Preparation - No limits associated	None
April 21, 2023 11:36:58 AM	Auto	Data	GC Sampling Run - Injection Tower, Back SSI, Back FID - Part of System Preparation - No limits associated	Data File Path : C:\Users\Public\Documents\GC ItemStation\3\Data\GC-4_ALS_2023-04-20\GC-4_2023-2023-04-20-14-36-08\FID-01\FID1A.ch
April 21, 2023 11:37:30 AM	End	Execution	GC Sampling Run - Injection Tower, Back SSI, Back FID - Part of System Preparation - No limits associated	Run Count : 1
April 21, 2023 11:37:32 AM	Start	Execution	Signal to Noise - Injection Tower, Back SSI, 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: CN11481066

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User Name: saengulhai.jarak
Hardware: LAPTOP-Q239K09Y

System ID: CN11481066
Print Date: April 21, 2023 3:29:48 PM

GC-6_BKK_EN0127_ALS Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 21, 2023 11:38:06 AM	Auto	Data	Note and Det - Back PID - Detector FID - L (Noise) <= 0.10 pA - L (Det) <= 2.50 pA/Hz	Data File Path: C:\Users\Public\Documents\IC ItemStatus\GC6\GC-6_ALS_2023-04-20\GC-6_2023-04-20 14-35-09\GC-6-008.D\FID 28.ch
April 21, 2023 11:38:33 AM	End	Execution	Note and Det - Back PID - Detector FID - L (Noise) <= 0.10 pA - L (Det) <= 2.50 pA/Hz	Run Count: 1
April 21, 2023 11:38:32 AM	Start	Injection	Injection Precision - Injection Tower, Back SSL, Back PID - 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 PID - 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 PID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data File Path: C:\Users\Public\Documents\IC ItemStatus\GC6\GC-6_ALS_2023-04-20\GC-6_2023-04-20 10-37-32\Pre11-008.D\FID 28.ch
April 21, 2023 11:40:17 AM	Auto	Data	Injection Precision - Injection Tower, Back SSL, Back PID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data File Path: C:\Users\Public\Documents\IC ItemStatus\GC6\GC-6_ALS_2023-04-20\GC-6_2023-04-20 10-37-32\Pre11-008.D\FID 28.ch

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

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User Name: saengulhai.jarak
Hardware: LAPTOP-Q239K09Y

System ID: CN11481066
Print Date: April 21, 2023 3:29:48 PM

GC-6_BKK_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 PID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data File Path: C:\Users\Public\Documents\IC ItemStatus\GC6\GC-6_ALS_2023-04-20\GC-6_2023-04-20 10-37-32\Pre11-008.D\FID 28.ch
April 21, 2023 11:40:17 AM	Auto	Data	Injection Precision - Injection Tower, Back SSL, Back PID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data File Path: C:\Users\Public\Documents\IC ItemStatus\GC6\GC-6_ALS_2023-04-20\GC-6_2023-04-20 10-37-32\Pre11-008.D\FID 28.ch
April 21, 2023 11:40:21 AM	Auto	Data	Injection Precision - Injection Tower, Back SSL, Back PID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data File Path: C:\Users\Public\Documents\IC ItemStatus\GC6\GC-6_ALS_2023-04-20\GC-6_2023-04-20 10-37-32\Pre11-008.D\FID 28.ch
April 21, 2023 11:40:21 AM	Auto	Data	Injection Precision - Injection Tower, Back SSL, Back PID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data File Path: C:\Users\Public\Documents\IC ItemStatus\GC6\GC-6_ALS_2023-04-20\GC-6_2023-04-20 10-37-32\Pre11-008.D\FID 28.ch
April 21, 2023 11:41:23 AM	End	Execution	Injection Precision - Injection Tower, Back SSL, Back PID - 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 PID - Detector FID - L <= 500000	None

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

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User Name: saengulhai.jarak
Hardware: LAPTOP-Q239K09Y

System ID: CN11481066
Print Date: April 21, 2023 3:26:43 PM

GC-6_BKK_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 PID - Detector FID - L <= 500000	Data File Path: C:\Users\Public\Documents\IC ItemStatus\GC6\GC-6_ALS_2023-04-20\GC-6_2023-04-20 14-35-09\GC-6-008.D\FID 28
April 21, 2023 11:42:50 AM	End	Execution	Signal to Noise - Injection Tower, Back SSL, Back PID - Detector FID - L <= 500000	Run Count: 1
April 21, 2023 11:42:53 AM	End	Qualification	Session	OK
April 21, 2023 11:42:53 AM	Start	Reporting	Session	None
April 21, 2023 12:01:47 PM	Auto	Acquisition	Session	None
April 21, 2023 12:16:07 PM	Auto	Acquisition	Session	None
April 21, 2023 12:16:10 PM	Auto	Injection/Retention	Session	None
April 21, 2023 12:16:31 PM	Start	Qualification	Session	OK
April 21, 2023 12:05:08 PM	Auto	Acquisition	Session	None
April 21, 2023 12:21:09 PM	Auto	Injection/Retention	Session	None
April 21, 2023 12:21:09 PM	Start	Qualification	Session	OK
April 21, 2023 12:21:45 PM	Auto	Reporting	Session	Report Generated / Certificate

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

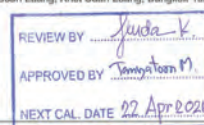
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Certificate of System Qualification

GC-00

System ID: GC-6_CN11481066
Organization Name: ALS Laboratory Group (Thailand) Co., Ltd.
Organization Location: 104 Soi 40 Phatthanakan Rd, Khwang Suan Luang, Khet Suan Luang, Bangkok 10250

Date: October 22, 2024 9:27:05 AM
EQP Name: Agilent Recommended
EQP Revision: GC.02.53
Overall Qualification Status: Pass



CDS Logon Verification - GC

Logon: Saengulhai Jarak

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: 0.0 psi / 5 minutes

Agilent Recommended: >= -2.0 and <= 0.5

Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11481066

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BKK_EN0126

Overall Inlet Pressure Decay Test Status

Pass

Inlet Pressure Accuracy

Name: 7890
Front SSL

Setpoint Status: Pass

Inlet Pressure: Setpoint 25.0 psi Actual 25.07 psi

Accuracy: 0.1 psi
Agilent Recommended: ≤ 1.2

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: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11481066

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Setpoint Status: Pass

Inlet Pressure: Setpoint 25.0 psi Actual 25.08 psi
Accuracy: 0.1 psi
Agilent Recommended: ≤ 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

Detector Flow Accuracy

Name: 7890
Front FID

Setpoint Status: Pass

Flow Type: Fuel
Setpoint: 30.0 mL/min Measured Flow: 28.6 mL/minAccuracy: 1.2 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: 392 mL/minAccuracy: 8.0 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: 25.4 mL/minAccuracy: 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.

Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11481066

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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: 30.8 mL/minAccuracy: 0.8 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: 393 mL/minAccuracy: 7.0 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: 25.2 mL/minAccuracy: 0.2 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: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11481066

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Setpoint Status: Pass

Zone: Oven

Setpoint/Actual
Temperature: 230.0 230.3 °C
Accuracy: 0.3 °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: 100.0 100.0 °C
Accuracy: 0.0 °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: 100.0 100.0167 °CStability: 0.1 °C
Agilent Recommended: ≤ 0.5

Overall GC Oven Temperature Stability Test Status

Pass

Scouting Run

Tested Combination1 Front SSL / Front FID

Injection Tower

Name: 7893A

Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11481066

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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: Pass

Base Signal: 14.05 pA

ASTM Noise		Drift	
pA		pA/Hr	
0.05		0.03	
≤ 0.10		≤ 2.50	
Agilent Recommended:		Status:	
Pass		Pass	

Overall Noise and Drift Test Status

Pass

Injection Precision

Tested Combination1 Front SSL / Front FID

Name: 7893A

Setpoint Status: Pass

Injection Volume on Column: 1.0 μ L

Area RSD:	0.30 %	Retention Time RSD:	0.63 %
Agilent Recommended:	≤ 3.00	≤ 1.00	

Overall Injection Precision Test Status

Pass

Signal to Noise

Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

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Tested Combination1 Front SSL / Front FID

Injection Tower

Name: 7890

Setpoint Status: Pass

Signal to Noise: 11078525

Agilent Recommended: ≥ 300000

Overall Signal to Noise Test Status

Pass

Scouting Run

Tested Combination2 Back SSL / Back FID

Injection Tower

Name: 7893A

Setpoint Status: Completed

Injection 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: Pass

Base Signal: 13.79 pA

ASTM Noise		Drift	
pA		pA/Hr	
0.05		0.01	
≤ 0.10		≤ 2.50	
Agilent Recommended:		Status:	
Pass		Pass	

Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

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Overall Noise and Drift Test Status

Pass

Injection Precision

Tested Combination2 Back SSL / Back FID

Name: 7893A

Setpoint Status: Pass

Injection Volume on Column: 1.0 μ L

Area RSD:	1.06 %	Retention Time RSD:	0.93 %
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: Pass

Signal to Noise: 1771221

Agilent Recommended: ≥ 300000

Overall Signal to Noise Test Status

Pass

Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

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Instrument Details

Purpose

This section describes the as found system configuration.

Details

System

System ID	GC-6_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 1
	Inlet	Front
	Detector	Front
	LTM Included?	No

Tested Combination2	Injection Technique	Injection Tower
	Sampler Identifier	Sampler 2
	Inlet	Back
	Detector	Back
	LTM Included?	No

Sampler 1	Manufacturer	Agilent Technologies
	Type	Injection Tower
	Name	7893A
	Model Number	G4513A
	Serial Number	CNCN10340103
	Firmware Revision	A.11.06
	Usage	Sample Injection
	Location	Front
	Syringe Volume (μ L)	10

Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

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Sampler 2	
Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7693A
Model Number	G4513A
Serial Number	CN16280128
Firmware Revision	A.11.06
Usage	Sample Injection
Location	Back
Syringe Volume (µL)	10
Sampler 3	
Manufacturer	Agilent Technologies
Type	Trip
Name	7693A
Model Number	G4514A
Serial Number	CN16380030
Firmware Revision	A.11.03
Vial Header	Not installed
Mainframe 1	
Manufacturer	Agilent Technologies
Name	7890
Model Number	G3440A
Serial Number	CN11461066
Firmware Revision	A.01.16
Oven Type	Standard

Date: October 22, 2024 9:27:05 AM
System ID: GC-6_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: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

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: Saenguthai Tarek
Logged On User Name: saenguthai.tarek@non.agilent.com
Signature Creation Date: October 22, 2024
Reason for Signature: Executed protocol and published this original version of document

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

User Name: saenguthai.tarek

Report Generated by Username: LAPTOP-GC25AD8EV

System ID: GC-6_CN11461066

Print Date: October 22, 2024 5:27:10 AM

GC-6_CN11461066_QC-WF Transaction Log ()

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2024 3:18:06 PM	Acq1	Session Created	Session	None
October 21, 2024 3:18:07 PM	Start	Configuration	Session	None
October 21, 2024 3:16:07 PM	Acq1	Environment	Loading	User is logging in and does not require an unlock code.
October 21, 2024 3:22:40 PM	Acq1	File Loaded	Session	EOP details for primary Nonunique (GC) File path: (Protocol/Release/Out/Default/unlock2.5340c-82.83.exe) EOP File Name: (GC-02.30.wsp) EOP Name: (Agilent Recommended) Press and Release (GC-02.30)
October 21, 2024 3:22:44 PM	End	Configuration	Session	None
October 21, 2024 3:22:47 PM	Start	Qualification	Session	QC
October 21, 2024 3:22:48 PM	Start	Execution	GC-6 Login Verification - GC-7890 - Qualitative Test	None
October 21, 2024 3:23:08 PM	End	Execution	GC-6 Login Verification - GC-7890 - Qualitative Test	Run Count: 1
October 21, 2024 3:23:40 PM	Start	Execution	System Inspection and Basic Safety and Operation - 7890 - Qualitative Test - No subpoints associated	None
October 21, 2024 3:23:56 PM	End	Execution	System Inspection and Basic Safety and Operation - 7890 - Qualitative Test - No subpoints associated	Run Count: 1

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

User Name: saangyul.kark
Report Generated by Hostname: LAPTOP-CQ25KDMV
System ID: GC-6_CN1461066
Print Date: October 22, 2024 9:27:05 AM

2024_ALS_GC-6_CN1461066_OQHW Transaction Log

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2024 3:24:51 PM	Start	Execution	Int Pressure Decay - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= -2.0 psi and <= 0.5 psi	None
October 21, 2024 3:25:06 PM	End	Execution	Int Pressure Decay - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= -2.0 psi and <= 0.5 psi	Run Count: 1
October 21, 2024 3:25:25 PM	Start	Execution	Int Pressure Accuracy - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
October 21, 2024 3:29:32 PM	End	Execution	Int Pressure Accuracy - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count: 1
October 21, 2024 3:29:50 PM	Start	Execution	Int Pressure Decay - Back SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= -2.0 psi and <= 0.5 psi	None
October 21, 2024 3:28:01 PM	End	Execution	Int Pressure Decay - Back SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= -2.0 psi and <= 0.5 psi	Run Count: 1
October 21, 2024 3:28:05 PM	Start	Execution	Int Pressure Accuracy - Back SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
October 21, 2024 3:28:16 PM	End	Execution	Int Pressure Accuracy - Back SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count: 1
October 21, 2024 3:28:12 PM	Start	Execution	Detector Flow Accuracy - Front FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% response	None

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN1461066

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User Name: saangyul.kark
Report Generated by Hostname: LAPTOP-CQ25KDMV
System ID: GC-6_CN1461066
Print Date: October 22, 2024 9:27:05 AM

2024_ALS_GC-6_CN1461066_OQHW Transaction Log

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2024 3:28:50 PM	Start	Data	Detector Flow Accuracy - Front FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% response	Manual Data Entry
October 21, 2024 3:28:53 PM	End	Execution	Detector Flow Accuracy - Front FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% response	Run Count: 1
October 21, 2024 3:28:54 PM	Start	Execution	Detector Flow Accuracy - Front FID - Type: Gasoline - S: 400.0 mL/min - L: <= 10.0% response	None
October 21, 2024 3:27:10 PM	Start	Data	Detector Flow Accuracy - Front FID - Type: Gasoline - S: 400.0 mL/min - L: <= 10.0% response	Manual Data Entry
October 21, 2024 3:27:13 PM	End	Execution	Detector Flow Accuracy - Front FID - Type: Gasoline - S: 400.0 mL/min - L: <= 10.0% response	Run Count: 1
October 21, 2024 3:28:11 PM	Start	Execution	Detector Flow Accuracy - Front FID - Type: Making - S: 20.0 mL/min - L: <= 10.0% response	None
October 21, 2024 3:28:27 PM	Start	Data	Detector Flow Accuracy - Front FID - Type: Making - S: 20.0 mL/min - L: <= 10.0% response	Manual Data Entry
October 21, 2024 3:29:29 PM	End	Execution	Detector Flow Accuracy - Front FID - Type: Making - S: 20.0 mL/min - L: <= 10.0% response	Run Count: 1
October 21, 2024 3:29:30 PM	Start	Execution	Detector Flow Accuracy - Back FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% response	None
October 21, 2024 3:29:47 PM	Start	Data	Detector Flow Accuracy - Back FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% response	Manual Data Entry
October 21, 2024 3:29:52 PM	End	Execution	Detector Flow Accuracy - Back FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% response	Run Count: 1

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN1461066

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User Name: saangyul.kark
Report Generated by Hostname: LAPTOP-CQ25KDMV
System ID: GC-6_CN1461066
Print Date: October 22, 2024 9:27:05 AM

2024_ALS_GC-6_CN1461066_OQHW Transaction Log

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2024 3:28:54 PM	Start	Execution	Detector Flow Accuracy - Back FID - Type: Gasoline - S: 400.0 mL/min - L: <= 10.0% response	None
October 21, 2024 3:30:07 PM	Start	Data	Detector Flow Accuracy - Back FID - Type: Gasoline - S: 400.0 mL/min - L: <= 10.0% response	Manual Data Entry
October 21, 2024 3:30:09 PM	End	Execution	Detector Flow Accuracy - Back FID - Type: Gasoline - S: 400.0 mL/min - L: <= 10.0% response	Run Count: 1
October 21, 2024 3:30:11 PM	Start	Execution	Detector Flow Accuracy - Back FID - Type: Making - S: 20.0 mL/min - L: <= 10.0% response	None
October 21, 2024 3:30:34 PM	Start	Data	Detector Flow Accuracy - Back FID - Type: Making - S: 20.0 mL/min - L: <= 10.0% response	Manual Data Entry
October 21, 2024 3:39:57 PM	End	Execution	Detector Flow Accuracy - Back FID - Type: Making - S: 20.0 mL/min - L: <= 10.0% response	Run Count: 1
October 21, 2024 3:30:38 PM	Start	Execution	GC Oven Temperature Accuracy - 780.0 - Temperature - Over - S: 230.0°C - L: <= -1.0 AND <= 1.0 % response in K	None
October 21, 2024 3:31:58 PM	Start	Data	GC Oven Temperature Accuracy - 780.0 - Temperature - Over - S: 230.0°C - L: <= -1.0 AND <= 1.0 % response in K	Manual Data Entry
October 21, 2024 3:31:57 PM	End	Execution	GC Oven Temperature Accuracy - 780.0 - Temperature - Over - S: 230.0°C - L: <= -1.0 AND <= 1.0 % response in K	Run Count: 1

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN1461066

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User Name: saangyul.kark
Report Generated by Hostname: LAPTOP-CQ25KDMV
System ID: GC-6_CN1461066
Print Date: October 22, 2024 9:27:05 AM

2024_ALS_GC-6_CN1461066_OQHW Transaction Log

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2024 3:31:58 PM	Start	Execution	GC Oven Temperature Accuracy - 780.0 - Temperature - Over - S: 100.0°C - L: <= -1.0 AND <= 1.0 % response in K	None
October 21, 2024 3:34:37 PM	Start	Data	GC Oven Temperature Accuracy - 780.0 - Temperature - Over - S: 100.0°C - L: <= -1.0 AND <= 1.0 % response in K	Manual Data Entry
October 21, 2024 3:34:39 PM	End	Execution	GC Oven Temperature Accuracy - 780.0 - Temperature - Over - S: 100.0°C - L: <= -1.0 AND <= 1.0 % response in K	Run Count: 1
October 21, 2024 3:34:42 PM	Start	Execution	GC Oven Temperature Stability - 780.0 - Temperature - Over - S: 100.0°C - L: <= 0.5%	None
October 21, 2024 3:39:05 PM	Start	Data	GC Oven Temperature Stability - 780.0 - Temperature - Over - S: 100.0°C - L: <= 0.5%	Manual Data Entry
October 21, 2024 3:39:07 PM	End	Execution	GC Oven Temperature Stability - 780.0 - Temperature - Over - S: 100.0°C - L: <= 0.5%	Run Count: 1
October 21, 2024 3:38:33 PM	Start	Execution	GC Solvent then Injection Tower, Front SSL, Front FID - Part of System Preparation - No further associated	None
October 21, 2024 3:40:12 PM	Start	AcqClosed	Sensor	None
October 22, 2024 6:55:47 AM	Start	AcqResumed	Sensor	None
October 22, 2024 6:55:50 AM	Start	SensorResumed	Sensor	None
October 22, 2024 6:56:02 AM	Start	Qualification	Sensor	CG

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN1461066

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User Name: sangeetha.laksh Report Generated by Hostname: LAPTOP-CQ35KDMV System ID: GC-6_CN1461066 Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN1461066_QCWH Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2024 8:36:02 AM	Start	Execution	QC Scouting Run - Injection Tower, Front SSL, Front PID - Part of System Preparation - No limits associated	None
October 22, 2024 8:56:46 AM	Auto	Data	QC Scouting Run - Injection Tower, Front SSL, Front PID - Data files Path: D:\Data\FromFront_SSL.D\FID1A.ch	Run Count: 1
October 22, 2024 8:57:20 AM	End	Execution	QC Scouting Run - Injection Tower, Front SSL, Front PID - Part of System Preparation - No limits associated	Run Count: 1
October 22, 2024 8:57:56 AM	Start	Execution	Noise and DR - Front PID - Detector FID - L (Noise) <= 0.10 pA - L (DR) <= 2.00 pA/Hz	None
October 22, 2024 8:58:03 AM	Auto	Data	Noise and DR - Front PID - Data files Path: D:\Data\FromFront_SSL.D\FID1A.ch	Run Count: 1
October 22, 2024 8:58:37 AM	End	Execution	Noise and DR - Front PID - Detector FID - L (Noise) <= 0.10 pA - L (DR) <= 2.00 pA/Hz	Run Count: 1
October 22, 2024 8:58:40 AM	Start	Execution	Injection Precision - Injection Tower, Front SSL, Front PID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	None
October 22, 2024 8:58:06 AM	Auto	Data	Injection Precision - Injection Tower, Front SSL, Front PID - Data files Path: D:\Data\FromFront_SSL.D\FID1A.ch	Run Count: 1

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN1461066

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User Name: sangeetha.laksh Report Generated by Hostname: LAPTOP-CQ35KDMV System ID: GC-6_CN1461066 Print Date: October 22, 2024 9:27:30 AM

2024_ALS_GC-6_CN1461066_QCWH Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2024 9:01:43 AM	Auto	Data	Injection Precision - Injection Tower, Front SSL, Front PID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data files Path: D:\Data\FromFront_SSL.D\FID1A.ch
October 22, 2024 9:01:43 AM	Auto	Data	Injection Precision - Injection Tower, Front SSL, Front PID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data files Path: D:\Data\FromFront_SSL.D\FID1A.ch
October 22, 2024 9:01:43 AM	Auto	Data	Injection Precision - Injection Tower, Front SSL, Front PID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data files Path: D:\Data\FromFront_SSL.D\FID1A.ch
October 22, 2024 9:01:43 AM	Auto	Data	Injection Precision - Injection Tower, Front SSL, Front PID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data files Path: D:\Data\FromFront_SSL.D\FID1A.ch
October 22, 2024 9:01:43 AM	Auto	Data	Injection Precision - Injection Tower, Front SSL, Front PID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data files Path: D:\Data\FromFront_SSL.D\FID1A.ch
October 22, 2024 9:02:11 AM	End	Execution	Injection Precision - Injection Tower, Front SSL, Front PID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Run Count: 1
October 22, 2024 9:02:16 AM	Start	Execution	Signal to Noise - Injection Tower, Front SSL, Front PID - Detector FID - L <= 30000	None
October 22, 2024 9:02:34 AM	Auto	Data	Signal to Noise - Injection Tower, Front SSL, Front PID - Detector FID - L <= 30000	Data files Path: D:\Data\FromFront_SSL.D\FID1A.ch

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN1461066

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User Name: sangeetha.laksh Report Generated by Hostname: LAPTOP-CQ35KDMV System ID: GC-6_CN1461066 Print Date: October 22, 2024 9:27:35 AM

2024_ALS_GC-6_CN1461066_QCWH Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2024 9:02:34 AM	End	Execution	Signal to Noise - Injection Tower, Front SSL, Front PID - Detector FID - L <= 30000	Run Count: 1
October 22, 2024 9:03:00 AM	Start	Execution	QC Scouting Run - Injection Tower, Back SSL, Back PID - Part of System Preparation - No limits associated	None
October 22, 2024 9:03:31 AM	Auto	Data	QC Scouting Run - Injection Tower, Back SSL, Back PID - Data files Path: D:\Data\BackBack_SSL.D\FID2B.ch	Run Count: 1
October 22, 2024 9:04:03 AM	End	Execution	QC Scouting Run - Injection Tower, Back SSL, Back PID - Part of System Preparation - No limits associated	Run Count: 1
October 22, 2024 9:04:05 AM	Start	Execution	Noise and DR - Back PID - Detector FID - L (Noise) <= 0.10 pA - L (DR) <= 2.00 pA/Hz	None
October 22, 2024 9:05:56 AM	Auto	Data	Noise and DR - Back PID - Data files Path: D:\Data\BackBack_SSL.D\FID2B.ch	Run Count: 1
October 22, 2024 9:06:13 AM	End	Execution	Noise and DR - Back PID - Detector FID - L (Noise) <= 0.10 pA - L (DR) <= 2.00 pA/Hz	Run Count: 1
October 22, 2024 9:09:28 AM	Start	Execution	Injection Precision - Injection Tower, Back SSL, Back PID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	None

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN1461066

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User Name: sangeetha.laksh Report Generated by Hostname: LAPTOP-CQ35KDMV System ID: GC-6_CN1461066 Print Date: October 22, 2024 9:27:35 AM

2024_ALS_GC-6_CN1461066_QCWH Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2024 9:10:44 AM	Auto	Data	Injection Precision - Injection Tower, Back SSL, Back PID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data files Path: D:\Data\BackBack_SSL.D\FID2B.ch
October 22, 2024 9:10:44 AM	Auto	Data	Injection Precision - Injection Tower, Back SSL, Back PID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data files Path: D:\Data\BackBack_SSL.D\FID2B.ch
October 22, 2024 9:10:44 AM	Auto	Data	Injection Precision - Injection Tower, Back SSL, Back PID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data files Path: D:\Data\BackBack_SSL.D\FID2B.ch
October 22, 2024 9:10:44 AM	Auto	Data	Injection Precision - Injection Tower, Back SSL, Back PID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data files Path: D:\Data\BackBack_SSL.D\FID2B.ch
October 22, 2024 9:10:44 AM	Auto	Data	Injection Precision - Injection Tower, Back SSL, Back PID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data files Path: D:\Data\BackBack_SSL.D\FID2B.ch
October 22, 2024 9:11:45 AM	Auto	Data	Signal to Noise - Injection Tower, Back SSL, Back PID - Detector FID - L <= 30000	Data files Path: D:\Data\BackBack_SSL.D\FID2B.ch

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN1461066

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User Name: sornwatt.tanai
Report Generated by Testuser: LAP10H-CQ35-KQWV
System ID: GC-6_CN11481066
Print Date: October 22, 2024 9:27:58 AM

2024_A18_GC-6_CN11481066_QQWV Transaction log 1

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2024 9:12:08 AM	End	Execution	Signal to Mass - Injection 1 Towel, Back ESR, Back FID - Detector FID - L-33 305005	Run Count: 1
October 22, 2024 9:12:15 AM	End	Qualification	Session	QC
October 22, 2024 9:12:15 AM	Start	Reporting	Session	None
October 22, 2024 9:24:05 AM	Auto	Reporting	Session	Report Generated: Certificate
October 22, 2024 9:25:58 AM	Auto	Reporting	Session	Print Generated: Report

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Date: October 22, 2024 9:27:58 AM
System ID: GC-6_CN11481066

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Certificate Number

CWS-030-67

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM

Cup anemometer

MANUFACTURER

Novamys

MODEL/TYPE

Sensor: WS-02F

SERIAL NUMBER

Data logger: WS-25DL

ID NUMBER

Sensor: WSD-A4562

CONDITION AS-RECEIVED

Data logger: A4562

CUSTOMER

BKK_F50143

RECEIVED DATE

Used item

MEASUREMENT DATE

ALS laboratory group (Thailand) Co., Ltd.

ISSUE DATE

104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang,
Khet Suan Luang, Bangkok 10250 Thailand.

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follows:

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 area¹300 cm²Wind direction frontal area²100 cm²Diameter of mounting pipe³

-

Blockage ratio of test object⁴

0.111 [-]

Preconditioning

24 hours at ambient conditions.

Measurement Condition

The average values during measurement are (24.2) °C, (41.9) %RH and (1007.5) hPa.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

Mr. Sorawit Thachad

Miss Jitraporn Lertsomphol

Remarks:

1. Nozzle cross-section area of the wind tunnel

2. Projected cross-section area of the tested object include mounting pipe

3. Diameter of mounting pipe

4. Ratio¹ to¹

Approved signature

Mr. Parinya Booncharoen
Calibration Department Manager

REVIEW BY

APPROVED BY

NEXT CAL DATE

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

Page 2 of 2 Pages

MEASUREMENT RESULTS¹

The Cup anemometer, Unit Under Calibration (UUC) was exercised at 10 m/s for 5 minutes prior to calibration being performed. The standard air velocity 0.5 m/s to 5 m/s was calculated by a standard air velocity transducer which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section and the standard air velocity 5 m/s to 30 m/s was calculated by a pitot tube with precision differential pressure meter which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section. UUC was mounted on a round vertical tube of the lower plate at center of test section. The calibration was carried out under both rising and falling air velocity in the range of 1 m/s to 16 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

V _{std} (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	V _{std} (m/s)	Error (m/s)	U (k=2) (m/s)
0.99	23.08	24.20	0.9	-0.1	0.31
2.043	24.42	24.20	1.8	-0.2	0.31
2.982	23.80	24.20	2.9	-0.1	0.31
4.108	23.82	24.20	3.8	-0.3	0.31
4.97	23.62	24.20	4.9	-0.1	0.31
5.95	23.34	24.20	6.0	0.0	0.31
7.01	23.46	24.20	7.0	0.0	0.31
7.96	23.80	24.20	8.0	0.0	0.31
8.98	23.90	24.20	9.1	0.3	0.31
9.96	23.74	24.20	10.1	0.1	0.31
10.94	24.00	24.20	11.1	0.2	0.31
12.01	23.82	24.20	12.2	0.2	0.31
12.92	24.00	24.20	13.3	0.2	0.31
14.06	23.86	24.20	14.2	0.2	0.31
15.00	24.00	24.20	15.2	0.2	0.31
15.93	23.96	24.20	16.2	0.2	0.31

Remark:

¹ Calibration results only cover for the tested circumstances and environmental condition during which calibration took place² Velocity of standard³ Velocity of Unit Under Calibration

PHOTO OF CALIBRATION SET-UP



Calibration set-up of the Cup anemometer calibration in the wind tunnel of Jiranatee Associates Co., Ltd. The Cup anemometer shown may differ from the calibrated one. Remark: The proportion of the set-up is not true to scale due to imaging geometry.



Certificate Number

CWD-030-67

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM

Wind Direction Sensor

MANUFACTURER

Novamys

MODEL/TYPE

Sensor: WS-02F

SERIAL NUMBER

Data logger: WS-25DL

ID NUMBER

Sensor: WSD-A4562

CONDITION AS-RECEIVED

Data logger: A4562

CUSTOMER

BKK_F50143

RECEIVED DATE

Used item

MEASUREMENT DATE

ALS laboratory group (Thailand) Co., Ltd.

ISSUE DATE

104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang,
Khet Suan Luang, Bangkok 10250 Thailand.

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follows:

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 area¹900 cm²Wind direction frontal area²129 cm²Diameter of mounting pipe³

-

Blockage ratio of test object⁴

0.143 [-]

Preconditioning

24 hours at ambient conditions.

Measurement Condition

The average values during measurement are (23.7) °C, (42.6) %RH and (1007.5) hPa.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

Mr. Sorawit Thachad

Miss Jitraporn Lertsomphol

Remarks:

1. Nozzle cross-section area of the wind tunnel

2. Projected cross-section area of the tested object include mounting pipe

3. Diameter of mounting pipe

4. Ratio¹ to¹

Approved signature

Mr. Parinya Booncharoen
Calibration Department Manager

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Certificate Number
CWD-030-67

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 ₁₀₀ Degree (°)	D ₁₀₀ Degree (°)	Error Degree (°)	U (k=2) Degree (°)
5.01	45.000	41	-4	0.80
	90.000	97	-3	0.80
	135.000	132	-3	0.80
	180.000	181	1	0.80
	225.000	229	4	0.80
	270.000	275	5	0.80
	315.000	320	5	0.80
	360.000	359	-1	0.80

Remarks:

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

End of Certificate of Calibration



SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

459-459/1 Sirinthorn Road, Bangbunmi, Bangkok, 10700 Thailand
Tel. +66 2433 8331 Email: calibration@sithiporn.com

SITHIPORN
ASSOCIATES



Cert. No. : ACC24008
Pages : 1 of 3

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 : *T. Petchurani*
(Thanakul Petchurani)

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.

SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

459-459/1 Sirinthorn Road, Bangbunmi, Bangkok, 10700 Thailand
Tel. +66 2433 8331 Email: calibration@sithiporn.com



Cert. No. : ACC24008
Job No. : VC67AC0058
Pages : 2 of 3

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).

SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

459-459/1 Sirinthorn Road, Bangbunmi, Bangkok, 10700 Thailand
Tel. +66 2433 8331 Email: calibration@sithiporn.com



Cert. No. : ACC24008
Job No. : VC67AC0058
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	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

T. Petchurani

T. Petchurani



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0232

MTC No. EEL. BP. 171/0167

CALIBRATION CERTIFICATE

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

Address : 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phattankan, Khet Suan Luang, Bangkok 10250.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., A-Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Sound Level Meter

Manufacturer : Rion

Model : NL-42

Serial No. : 00296518 (ID: RYG_FS0431)

Microphone : Type UC-52 No.66239

Preamplifier : Type NH-24 No.34375

Standards used :

1. Band Pass Filter Wavetek 752A S/N 90010494.
2. Condenser Microphone Brüel&Kjær 4180 S/N 2889871.
3. Decade Attenuator Ando AL-205 S/N 00464602.
4. Function/Arbitrary Waveform Generator Agilent 33220A S/N MY44042668.
5. Digital Function Synthesizer NF Electronic Instruments DF-193A S/N 122037.
6. Digital Multimeter Fluke 8520A S/N 4985007.
7. Pistonphone Rion NC-72 S/N 00402446.
8. Measuring Amplifier Brüel&Kjær 2636 S/N 1537484.

Date of Receipt : 24 Jan. 2024

Date of Calibration : 22-28 Feb. 2024

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Request No. 21-67/0232

MTC No. EEL. BP. 171/0167

9. Power Amplifier Brüel&Kjær 2706 S/N 1517650.

10. Speaker Tannoy Limited, Great Britain British Patent No. 215300.

11. Digital Multimeter Agilent 34401A S/N MY44005560.

12. Programmable Attenuator Tamagawa TPA-303A S/N 2212.

Calibration Procedure :

This instrument was calibrated by using calibration procedures no CP-102-02 and CP-102-03, which were based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2013). These calibration procedures were related to the electrical and acoustic signal tests. The electrical signal test was carried out with the direct measurement method. The acoustic signal test was performed in an anechoic room with the comparison measurement method.

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

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

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

Date of Calibration : 22-28 Feb. 2024

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Request No. 21-67/0232

MTC No. EEL. BP. 171/0167

1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)		Deviation value (dB)	Acceptance limit Class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	Before adjust	After adjust				
113.96	114.3	113.9	-0.1	1.0	0.30	N/A

Note: The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 125.1 dB.

2. Self-generated noise

2.1 Normal test

Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
20.2	0.10	N/A

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

Frequency Weighting	Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
A-Weight	14.4	0.10	N/A
C-Weight	19.9	0.10	N/A
Flat	25.3	0.10	N/A

Date of Calibration : 22-28 Feb. 2024

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Request No. 21-67/0232

MTC No. EEL. BP. 171/0167

3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response (dB)			Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight	Flat			
125	-0.1	0.2	0.1	1.5	0.45	0.6
1 000	0.0	0.0	0.0	1.0	0.45	0.6
8 000	-1.7	-1.7	-1.7	5.0	0.45	0.7

4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response (dB)			Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight	Flat			
63	-0.1	-0.1	-0.1	2.0	0.20	0.6
125	-0.1	0.0	0.0	1.5	0.20	0.6
250	-0.1	0.0	0.0	1.5	0.20	0.6
500	-0.1	0.0	0.0	1.5	0.20	0.6
1 000	0.0	0.0	0.0	1.0	0.20	0.6
2 000	-0.1	0.0	-0.1	2.0	0.20	0.6
4 000	-0.1	0.0	0.0	3.0	0.20	0.6
8 000	0.0	0.0	0.0	5.0	0.20	0.7

Date of Calibration : 22-28 Feb. 2024

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Request No. 21-67/0232

MTC No. EEL. BP. 171/0167

5. Long-term stability

Time	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Begin	94.0	0.0	0.3	0.10	0.1
End	94.0				

6. Frequency and time weightings at 1 kHz

6.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
A-weight	94.0	0.0	0.2	0.20	0.2
C-weight	94.0	0.0	0.2	0.20	0.2
Flat	94.1	0.1	0.2	0.20	0.2

6.2 Time weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Fast	94.0	0.0	0.1	0.20	0.2
Slow	94.0	0.0	0.1	0.20	0.2
Leq	94.0	0.0	0.1	0.20	0.2

Date of Calibration : 22-28 Feb. 2024

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Request No. 21-67/0232

MTC No. EEL. BP. 171/0167

7. Level linearity on the reference level range

Anticipated value (dB)	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
137	137.0	0.0	1.1	0.30	0.3
136	136.0	0.0	1.1	0.30	0.3
135	135.0	0.0	1.1	0.30	0.3
133	133.0	0.0	1.1	0.30	0.3
132	132.0	0.0	1.1	0.30	0.3
131	131.0	0.0	1.1	0.30	0.3
130	130.0	0.0	1.1	0.30	0.3
129	129.0	0.0	1.1	0.30	0.3
124	124.0	0.0	1.1	0.30	0.3
119	119.0	0.0	1.1	0.30	0.3
114	114.0	0.0	1.1	0.30	0.3
109	109.0	0.0	1.1	0.30	0.3
104	104.0	0.0	1.1	0.30	0.3
99	99.0	0.0	1.1	0.30	0.3
94	94.0	0.0	1.1	0.30	0.3
89	89.0	0.0	1.1	0.30	0.3
84	84.0	0.0	1.1	0.30	0.3
79	79.0	0.0	1.1	0.30	0.3
74	74.0	0.0	1.1	0.30	0.3
69	69.0	0.0	1.1	0.30	0.3
64	63.9	-0.1	1.1	0.30	0.3
59	59.0	0.0	1.1	0.30	0.3

Date of Calibration : 22-28 Feb. 2024

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Request No. 21-67/0232

MTC No. EEL. BP. 171/0167

7. Level linearity on the reference level range (cont.)

Anticipated value (dB)	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
54	53.9	-0.1	1.1	0.30	0.3
49	49.0	0.0	1.1	0.30	0.3
44	43.9	-0.1	1.1	0.30	0.3
39	39.0	0.0	1.1	0.30	0.3
34	33.9	-0.1	1.1	0.30	0.3
29	28.9	-0.1	1.1	0.30	0.3
28	27.9	-0.1	1.1	0.30	0.3
27	26.9	-0.1	1.1	0.30	0.3
26	25.9	-0.1	1.1	0.30	0.3
25	24.8	-0.2	1.1	0.30	0.3

8. Level linearity including the level range control

At reference sound level on the reference level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
30-130	94.0	94.0	0.0	1.1	0.30	0.3

Date of Calibration : 22-28 Feb. 2024

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8. Level linearity including the level range control

At reference level at 5 dB greater than the under-range on a level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
30-130	25	25.0	0.0	1.1	0.30	0.3

9. Tone burst response

Time Weighting	Toneburst Duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Fast	200	126.0	0.0	±1.0	0.20	0.3
	2	108.9	-0.1	+1.0; -2.5	0.20	0.3
	0.25	100.0	0.0	+1.5; -5.0	0.20	0.3
Slow	200	119.5	-0.1	±1.0	0.20	0.3
	2	100.0	0.0	+1.0; -5.0	0.20	0.3

Date of Calibration : 22-28 Feb. 2024

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10. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Complete cycle	125.4	125.5	0.1	3.0	0.20	0.35
Positive half cycle	124.4	124.1	-0.3	2.0	0.20	0.35
Negative half cycle	124.4	124.1	-0.3	2.0	0.20	0.35

11. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Positive one-half cycle	Negative one-half cycle				
135.4	135.4	0.0	1.5	0.55	0.25

12. High-level stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Begin	129.0	0.0	0.3	0.10	0.1
End	129.0				

Calibrated by:
(Mr. Pannasit Phasingari)Approved by:
(Mr. Pannasit Phasingari)Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Date of Calibration : 22-28 Feb. 2024

Date of Issue : 29 Feb. 2024

Ref: 2011267012400347001

End of Certificate

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- Power Amplifier Brüel&Kjær 2706 S/N 1517650.
- Speaker Tannoy Limited, Great Britain British Patent No. 215300.
- Digital Multimeter Agilent 34401A S/N MY44005560.
- Programmable Attenuator Tamagawa TPA-303A S/N 2212.

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

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Request No. 21-67/0232

MTC No. EEL. BP. 173/0167

CALIBRATION CERTIFICATE

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

Address : 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan, Khet Suan Luang, Bangkok 10250.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., A.Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Sound Level Meter

Manufacturer : Rion

Model : NL-42

Serial No. : 00296516 (ID: RYG_FS0433)

Microphone : Type UC-52 No.180412

Preamplifier : Type NH-24 No.88182

Ambient Environment

Temperature : (23 ± 3) °C

Relative Humidity : (50 ± 15) %

Ambient Pressure : (101.325 ± 1.5) kPa

Standards used :

- Band Pass Filter Wavetek 752A S/N 90010494.
- Condenser Microphone Brüel&Kjær 4180 S/N 2889871.
- Decade Attenuator Ando AL-205 S/N 00464602.
- Function/Arbitrary Waveform Generator Agilent 33220A S/N MY44042668.
- Digital Function Synthesizer NF Electronic Instruments DF-193A S/N 122037.
- Digital Multimeter Fluke 8520A S/N 4985007.
- Pistonphone Rion NC-72 S/N 00402446.
- Measuring Amplifier Brüel&Kjær 2636 S/N 1537484.

Date of Receipt : 24 Jan. 2024

Date of Calibration : 22-28 Feb. 2024

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FMBL.MTC.002 Rev.4



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0232

MTC No. EEL. BP. 173/0167

1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)		Deviation value (dB)	Acceptance limit Class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	Before adjust	After adjust				
113.96	114.1	113.9	-0.1	1.0	0.30	N/A

Note: The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 124.1 dB.

2. Self-generated noise

2.1 Normal test

Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
18.9	0.10	N/A

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

Frequency Weighting	Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
A-Weight	12.3	0.10	N/A
C-Weight	17.7	0.10	N/A
Flat	23.1	0.10	N/A

Date of Calibration : 22-28 Feb. 2024

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FMBL.MTC.002 Rev.4



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0232

MTC No. EEL. BP. 173/0167

3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response (dB)			Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight	Flat			
125	0.0	0.2	0.1	1.5	0.45	0.6
1 000	0.0	0.0	0.0	1.0	0.45	0.6
8 000	-0.3	-0.3	-0.3	5.0	0.45	0.7

4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response (dB)			Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight	Flat			
63	-0.1	0.0	0.0	2.0	0.20	0.6
125	-0.1	0.0	0.0	1.5	0.20	0.6
250	0.0	0.0	0.0	1.5	0.20	0.6
500	0.0	0.0	0.0	1.5	0.20	0.6
1 000	0.0	0.0	0.0	1.0	0.20	0.6
2 000	0.0	0.0	0.0	2.0	0.20	0.6
4 000	0.0	0.0	0.0	3.0	0.20	0.6
8 000	0.0	0.0	0.0	5.0	0.20	0.7

Date of Calibration : 22-28 Feb. 2024

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0232

MTC No. EEL. BP. 173/0167

5. Long-term stability

Time	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Begin	94.0	0.0	0.3	0.10	0.1
End	94.0				

6. Frequency and time weightings at 1 kHz

6.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
A-weight	94.0	0.0	0.2	0.20	0.2
C-weight	94.0	0.0	0.2	0.20	0.2
Flat	94.1	0.1	0.2	0.20	0.2

6.2 Time weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Fast	94.0	0.0	0.1	0.20	0.2
Slow	94.0	0.0	0.1	0.20	0.2
Leq	94.0	0.0	0.1	0.20	0.2

Date of Calibration : 22-28 Feb. 2024

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Request No. 21-67/0232

MTC No. EEL. BP. 173/0167

7. Level linearity on the reference level range

Anticipated value (dB)	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
137	137.1	0.1	1.1	0.30	0.3
136	136.1	0.1	1.1	0.30	0.3
135	135.1	0.1	1.1	0.30	0.3
133	133.1	0.1	1.1	0.30	0.3
132	132.1	0.1	1.1	0.30	0.3
131	131.0	0.0	1.1	0.30	0.3
130	130.0	0.0	1.1	0.30	0.3
129	129.0	0.0	1.1	0.30	0.3
124	124.0	0.0	1.1	0.30	0.3
119	119.0	0.0	1.1	0.30	0.3
114	114.0	0.0	1.1	0.30	0.3
109	109.0	0.0	1.1	0.30	0.3
104	104.0	0.0	1.1	0.30	0.3
99	99.0	0.0	1.1	0.30	0.3
94	94.0	0.0	1.1	0.30	0.3
89	89.0	0.0	1.1	0.30	0.3
84	84.1	0.1	1.1	0.30	0.3
79	79.0	0.0	1.1	0.30	0.3
74	74.0	0.0	1.1	0.30	0.3
69	69.0	0.0	1.1	0.30	0.3
64	64.0	0.0	1.1	0.30	0.3
59	59.0	0.0	1.1	0.30	0.3

Date of Calibration : 22-28 Feb. 2024

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Request No. 21-67/0232

MTC No. EEL. BP. 173/0167

7. Level linearity on the reference level range (cont.)

Anticipated value (dB)	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
54	54.0	0.0	1.1	0.30	0.3
49	48.9	-0.1	1.1	0.30	0.3
44	44.0	0.0	1.1	0.30	0.3
39	38.9	-0.1	1.1	0.30	0.3
34	33.9	-0.1	1.1	0.30	0.3
29	28.8	-0.2	1.1	0.30	0.3
28	27.8	-0.2	1.1	0.30	0.3
27	26.9	-0.1	1.1	0.30	0.3
26	25.9	-0.1	1.1	0.30	0.3
25	24.8	-0.2	1.1	0.30	0.3

8. Level linearity including the level range control

At reference sound level on the reference level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
30-130	94.0	94.0	0.0	1.1	0.30	0.3

Date of Calibration : 22-28 Feb. 2024

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Request No. 21-67/0232

MTC No. EEL. BP. 173/0167

8. Level linearity including the level range control

At reference level at 5 dB greater than the under-range on a level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
30-130	25	25.0	0.0	1.1	0.30	0.3

9. Tone burst response

Time Weighting	Toneburst Duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Fast	200	126.0	0.0	±1.0	0.20	0.3
	2	108.9	-0.1	+1.0; -2.5	0.20	0.3
	0.25	100.0	0.0	+1.5; -5.0	0.20	0.3
Slow	200	119.5	-0.1	±1.0	0.20	0.3
	2	100.0	0.0	+1.0; -5.0	0.20	0.3

Date of Calibration : 22-28 Feb. 2024

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Request No. 21-67/0232

MTC No. EEL. BP. 173/0167

10. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Complete cycle	125.4	125.5	0.1	3.0	0.20	0.35
Positive half cycle	124.4	124.1	-0.3	2.0	0.20	0.35
Negative half cycle	124.4	124.1	-0.3	2.0	0.20	0.35

11. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Positive one-half cycle	Negative one-half cycle				
135.4	135.4	0.0	1.5	0.55	0.25

12. High-level stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Begin	129.0	0.0	0.3	0.10	0.1
End	129.0				

Calibrated by :
(Mr. Pannasit Phasingsri)

Approved by :
(Mr. Prawate Klueppa)

Director
Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Date of Calibration : 22-28 Feb. 2024

Date of Issue : 29 Feb. 2024

Ref : 2011267012400347003

End of Certificate

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0232

MTC No. EEL. BP. 174/0167

CALIBRATION CERTIFICATE

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

Address : 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phattakan, Khet Suan Luang, Bangkok 10250.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., A.Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Sound Level Meter
Manufacturer : Rion
Model : NL-42
Serial No. : 00296517 (ID: RYG_FS0434)
Microphone : Type UC-52 No.135220
Preamplifier : Type NH-24 No.87527

Ambient Environment

Temperature : (23 ± 3) °C
Relative Humidity : (50 ± 15) %
Ambient Pressure : (101.325 ± 1.5) kPa

Standards used :

1. Band Pass Filter Wavetek 752A S/N 90010494.
2. Condenser Microphone Brüel&Kjær 4180 S/N 2889871.
3. Decade Attenuator Ando AL-205 S/N 00464602.
4. Function/Arbitrary Waveform Generator Agilent 33220A S/N MY44042668.
5. Digital Function Synthesizer NF Electronic Instruments DP-193A S/N 122037.
6. Digital Multimeter Fluke 8520A S/N 4985007.
7. Pistonphone Rion NC-72 S/N 00402446.
8. Measuring Amplifier Brüel&Kjær 2636 S/N 1537484.



Date of Receipt : 24 Jan. 2024

Date of Calibration : 22-28 Feb. 2024

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0232

MTC No. EEL. BP. 174/0167

9. Power Amplifier Brüel&Kjær 2706 S/N 1517650.

10. Speaker Tannoy Limited, Great Britain British Patent No. 215300.

11. Digital Multimeter Agilent 34401A S/N MY44005560.

12. Programmable Attenuator Tamagawa TPA-303A S/N 2212.

Calibration Procedure :

This instrument was calibrated by using calibration procedures no CP-102-02 and CP-102-03, which were based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2013). These calibration procedures were related to the electrical and acoustic signal tests. The electrical signal test was carried out with the direct measurement method. The acoustic signal test was performed in an anechoic room with the comparison measurement method.

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

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

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

Date of Calibration : 22-28 Feb. 2024

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0232

MTC No. EEL. BP. 174/0167

1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)		Deviation value (dB)	Acceptance limit Class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	Before adjust	After adjust				
113.96	114.3	113.9	-0.1	1.0	0.30	N/A

Note: The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 123.5 dB.

2. Self-generated noise

2.1 Normal test

Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
19.7	0.10	N/A

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

Frequency Weighting	Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
A-Weight	14.1	0.10	N/A
C-Weight	19.6	0.10	N/A
Flat	24.9	0.10	N/A

Date of Calibration : 22-28 Feb. 2024

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0232

MTC No. EEL. BP. 174/0167

3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response (dB)			Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight	Flat			
125	#DIV/0!	#DIV/0!	#DIV/0!	1.5	#DIV/0!	0.6
1 000	#DIV/0!	#DIV/0!	#DIV/0!	1.0	#DIV/0!	0.6
8 000	#DIV/0!	#DIV/0!	#DIV/0!	5.0	#DIV/0!	0.7

4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response (dB)			Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight	Flat			
63	-0.1	-0.1	-0.1	2.0	0.20	0.6
125	-0.1	0.0	0.0	1.5	0.20	0.6
250	-0.1	0.0	0.0	1.5	0.20	0.6
500	-0.1	0.0	0.0	1.5	0.20	0.6
1 000	0.0	0.0	0.0	1.0	0.20	0.6
2 000	0.0	0.0	-0.1	2.0	0.20	0.6
4 000	0.0	0.0	0.0	3.0	0.20	0.6
8 000	0.0	0.0	0.0	5.0	0.20	0.7

Date of Calibration : 22-28 Feb. 2024

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FIABL.MTC.002 Rev.4

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0232

MTC No. EEL. BP. 174/0167

5. Long-term stability

Time	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Begin	94.0	0.0	0.3	0.10	0.1
End	94.0				

6. Frequency and time weightings at 1 kHz

6.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
A-weight	94.0	0.0	0.2	0.20	0.2
C-weight	94.0	0.0	0.2	0.20	0.2
Flat	94.1	0.1	0.2	0.20	0.2

6.2 Time weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Fast	94.0	0.0	0.1	0.20	0.2
Slow	94.0	0.0	0.1	0.20	0.2
Leq	94.0	0.0	0.1	0.20	0.2

Date of Calibration : 22-28 Feb. 2024

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0232

MTC No. EEL. BP. 174/0167

7. Level linearity on the reference level range

Anticipated value (dB)	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
137	137.0	0.0	1.1	0.30	0.3
136	136.0	0.0	1.1	0.30	0.3
135	135.0	0.0	1.1	0.30	0.3
133	133.0	0.0	1.1	0.30	0.3
132	132.0	0.0	1.1	0.30	0.3
131	131.0	0.0	1.1	0.30	0.3
130	130.0	0.0	1.1	0.30	0.3
129	129.0	0.0	1.1	0.30	0.3
124	124.0	0.0	1.1	0.30	0.3
119	119.0	0.0	1.1	0.30	0.3
114	114.0	0.0	1.1	0.30	0.3
109	109.0	0.0	1.1	0.30	0.3
104	104.0	0.0	1.1	0.30	0.3
99	99.0	0.0	1.1	0.30	0.3
94	94.0	0.0	1.1	0.30	0.3
89	89.0	0.0	1.1	0.30	0.3
84	84.0	0.0	1.1	0.30	0.3
79	79.0	0.0	1.1	0.30	0.3
74	74.0	0.0	1.1	0.30	0.3
69	69.0	0.0	1.1	0.30	0.3
64	63.9	-0.1	1.1	0.30	0.3
59	59.0	0.0	1.1	0.30	0.3

Date of Calibration : 22-28 Feb. 2024

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0232

MTC No. EEL. BP. 174/0167

7. Level linearity on the reference level range (cont.)

Anticipated value (dB)	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
54	53.9	-0.1	1.1	0.30	0.3
49	49.0	0.0	1.1	0.30	0.3
44	44.0	0.0	1.1	0.30	0.3
39	38.9	-0.1	1.1	0.30	0.3
34	33.9	-0.1	1.1	0.30	0.3
29	29.0	0.0	1.1	0.30	0.3
28	27.9	-0.1	1.1	0.30	0.3
27	26.9	-0.1	1.1	0.30	0.3
26	25.9	-0.1	1.1	0.30	0.3
25	24.9	-0.1	1.1	0.30	0.3

8. Level linearity including the level range control

At reference sound level on the reference level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
30-130	94.0	94.0	0.0	1.1	0.30	0.3

Date of Calibration : 22-28 Feb. 2024

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0232

MTC No. EEL. BP. 174/0167

8. Level linearity including the level range control

At reference level at 5 dB greater than the under-range on a level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
30-130	25	25.0	0.0	1.1	0.30	0.3

9. Tone burst response

Time Weighting	Toneburst Duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Fast	200	126.0	0.0	±1.0	0.20	0.3
	2	108.9	-0.1	+1.0; -2.5	0.20	0.3
	0.25	100.0	0.0	+1.5; -5.0	0.20	0.3
Slow	200	119.5	-0.1	±1.0	0.20	0.3
	2	100.0	0.0	+1.0; -5.0	0.20	0.3

Date of Calibration : 22-28 Feb. 2024

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0232

MTC No. EEL. BP. 174/0167

10. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Complete cycle	125.4	125.5	0.1	3.0	0.20	0.35
Positive half cycle	124.4	124.1	-0.3	2.0	0.20	0.35
Negative half cycle	124.4	124.1	-0.3	2.0	0.20	0.35

11. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Positive one-half cycle	Negative one-half cycle				
135.4	135.4	0.0	1.5	0.55	0.25

12. High-level stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Begin	129.0	0.0	0.3	0.10	0.1
End	129.0				

Calibrated by :
(Mr. Pannasit Phasingri)

Approved by :
(Mr. Pravee Klaiyap)

Director
Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Date of Calibration : 22-28 Feb. 2024

Date of Issue : 29 Feb. 2024

Ref: 2011267012400347004

End of Certificate

9/9

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0292

MTC No. EEL. BP. 83/0267

CALIBRATION CERTIFICATE

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

Address : 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan, Khet Suan Luang, Bangkok, 10250.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : Rion

Model : NC-74

Serial No. : 34178121 (ID-RYG_FS0213)

Standards used : 1, Digital Function Synthesizer NF Electronic DF-193A S/N 122037.

2, Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.

3, Programmable Attenuator Tanigawa TPA-303A S/N OF 2214.

4, Digital Multimeter Agilent 34401A S/N MY44005560.

5, Pressure Transmitter Vaisala PTB202AD S/N T0650001.

6, Audio Analyzer Keithley 2015-P S/N4106495.

7, Condenser Microphone B&K 4180 S/N 2889871.

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

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

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

Date of Receipt : 19 Feb. 2024

Date of Calibration : 28 Feb. 2024

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FMBL-MTC.002 Rev.5

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0292 MTC No. EEL. BP. 83/0267

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

Nominal Output of Unit Under Test = 94 dB re 20 μ Pa at 1000 Hz

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

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	94.01	0.01	± 0.10	± 0.40 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1003.1	3.1	± 1.5	$\pm 1.0\%$

3. Total Distortion

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

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was included at level of 0.16 dB from manual.

Calibrated by :

(Mr. Weerachai Deechaiyao)

Approved by :

(Mr. Praveen Khuyapa)

Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 28 Feb. 2024

Date of Issue : 29 Feb. 2024

Ref : 2011267021900719001

End of Certificate

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Cert. No. : ACL24034
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42A / Microphone UC-52 / Preamplifier NH-24
Serial No. : 00623393 / 198640 / 26421
ID No. : RYG_FS0618

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 \pm 3) °C
Pressure : (101.3 \pm 3) kPa
Relative Humidity : (50.0 \pm 20) %

Received Date : 05 JANUARY 2024
Calibration Date : 12-15 JANUARY 2024
Date of Issue : 16 JANUARY 2024

Calibrated by : Nathakorn Pisutpaisan

Approved by : (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.

SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

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

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Cert. No. : ACL24034
Job No. : VC67AC0052
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-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).

SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

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Cert. No. : ACL24034
Job No. : VC67AC0052
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

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)
14.6

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

Frequency Weighting	Measured value (dB)
A - weight	10.8
C - weight	17.4
Flat	23.3

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	-0.3	-0.2	-0.2	±5.0

T. Petch

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	0.0	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	0.0	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	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	28.0	0.0	± 1.1
27.0	27.0	0.0	± 1.1
26.0	26.1	0.1	± 1.1
25.0	24.9	-0.1	± 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, 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
	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, Lepeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	135.5	-0.9	±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

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11. Overload indication

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

T. Petchur

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Cert. No. : ACL24036
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42A / Microphone UC-52 / Preamplifier NH-24
Serial No. : 00623395 / 198642 / 26423
ID No. : RYG_FS0620

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 : 05 JANUARY 2024
Calibration Date : 12-15 JANUARY 2024
Date of Issue : 16 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.

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Job No. : VC67AC0052
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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. Petchur

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Cert. No. : ACL24036
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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. Petchur

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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)
14.2

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

Frequency Weighting	Measured value (dB)
A - weight	9.9
C - weight	16.5
Flat	22.3

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	0.4	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	0.7	0.8	0.8	±5.0

T. Ratan

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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	0.0	±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	-0.1	±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	0.1	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. Ratan

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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	79.0	0.0	± 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	29.0	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	24.9	-0.1	± 1.1

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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
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	128.0	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	136.1	-0.3	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.1	0.1	±2.0
Positive half cycle	135.4	135.3	-0.1	±2.0
Negative half cycle	135.4	135.3	-0.1	±2.0

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11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89,7	89,7	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

Y. Petch...

CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc

DATE OF ISSUE 29 January 2024

CERTIFICATE NUMBER 207437

REVIEW BY *John P*

APPROVED BY *John P*

NEXT CAL DATE 26 / 1 / 25

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

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

doseBadge Reader : IEC 60942:2003

Instrument information

Manufacturer: Cirrus Research plc

Notes:

Model: RC110A

Serial number: 73729

Class: 2

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 evaluation 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:
207437

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Environmental conditions

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

Before Pressure: 101.44 kPa Temperature: 21.3 °C Humidity: 35.8 %
After Pressure: 101.44 kPa Temperature: 21.3 °C Humidity: 35.9 %

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	114.31	114.31	114.29	114.30	0.30	±0.75	0.11 dB
Distortion (%)	< 4.00	0.32	0.26	0.40	0.33	0.33	+4.00	0.13 %
Frequency (Hz)	1000.0	998.2	998.3	998.3	998.3	-1.7	±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	114.01	114.01	114.02	114.01	0.01	±0.75	0.11 dB
Distortion (%)	< 4.00	0.30	0.34	0.34	0.33	0.33	+4.00	0.13 %
Frequency (Hz)	1000.0	998.1	998.3	998.3	998.2	-1.6	±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

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Agilent CrossLab Compliance Services

Certificate of System Qualification

GC-OQ + GCMS-OQ

System ID: GM-12
Organization Name: ALS Laboratory Group (Thailand) Co Ltd
Organization Location: 104 Phattanasak 40 Phatthanakan Rd Bangkok 10250
Date: May 10, 2024 2:18:55 PM
EQP Name: AgilentRecommended , AgilentRecommended
EQP Revision: GC-02.53, GCMS-02.54
Overall Qualification Status: Pass

REVIEW BY *Suchada T*
APPROVED BY *Tomytom*
NEXT CAL DATE 10 Nov 25

CDS Logon Verification - GC

Logon: asbkk.env03

Overall CDS Logon Verification - GC Test Status

Pass

System Inspection and Basic Safety and Operation

Name: 8890
Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressure Accuracy

Name: 8890
Front SSL

Setpoint Status: Pass

Setpoint Actual
Inlet Pressure: 25.0 psi 25.0 psi

Accuracy: 0.0 psi
Agilent Recommended: <= 1.2

Date: May 10, 2024 2:18:55 PM
System ID: GM-12

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Overall Inlet Pressure Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name:	8890		
Setpoint Status:	Pass		
Zone:	Oven		
Setpoint/Actual			
Temperature:	230.0	229.1	°C
Accuracy:	-0.9		°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	101.1	°C
Accuracy:	1.1		°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:	8890		
Setpoint Status:	Pass		
Setpoint/Average			
Temperature:	100.0	100.9	°C
Stability:	0.0		°C
Agilent Recommended:	<= 0.5		

Overall GC Oven Temperature Stability Test Status

Pass

Date: May 10, 2024 2:18:55 PM
System ID: GM-12

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Log Amp

Tested Combination1	Front	SSL	/ External	SQ
Name:	5977C			
Setpoint Status:	Pass			

Overall Log Amp Test Status

Pass

RPPA

Tested Combination1	Front	SSL	/ External	SQ
Name:	5977C			
Setpoint Status:	Pass			
Amu:	1050	m/z	Drift After Five Minutes:	RPPA Voltage:
			4	482
			mV	mV
Agilent Recommended:	>= -100	and	<= 100	<= 1100

Overall RPPA Test Status

Pass

Tune EI

Tested Combination1	Front	SSL	/ External	SQ
Name:	5977C			
Setpoint Status:	Pass			
Filament:	1			
Setpoint Status:	Pass			
Filament:	2			

Overall Tune EI Test Status

Pass

Scouting Run

Date: May 10, 2024 2:18:55 PM
System ID: GM-12

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Tested Combination1	Front	SSL	/ External	SQ
Name:	Injection Tower			
Source:	7693A			
Setpoint Status:	Completed			
Injection Volume on Column:	1.0	µL		
Overall Scouting Run Status	Completed			

Instrument Detection Limit

Tested Combination1	Front	SSL	/ External	SQ	
Name:	Injection Tower				
Source:	7693A				
Setpoint Status:	Pass				
Injection Volume on Column:	1.0	µL			
Area					
Minimum RSD:	0.72	%	Retention Time	0.01	%
Agilent Recommended:	<= 5.00		<= 1.00		
Status:	Pass		Pass		
Instrument Detection Limit:	2.41164	fg			
Agilent Recommended:	<= 16.82500				
Status:	Pass				

Overall Instrument Detection Limit Test Status

Pass

Mass Ratio Precision

Date: May 10, 2024 2:18:55 PM
System ID: GM-12

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Tested Combination1	Front	SSL	/ External	SQ	
Name:	Injection Tower				
Source:	7693A				
Setpoint Status:	Pass				
Injection Volume on Column:	1.0	µL			
Area Mass 1					
Abundance's					
RSD:	0.71	%	Mass Ratio	0.19	%
Agilent Recommended:	<= 5.00		<= 5.00		
	Pass		Pass		

Overall Mass Ratio Precision Test Status

Pass

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System ID: GM-12

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Instrument Details

Purpose

This section describes the as found system configuration.

Details

System	
System ID	GM-12
Manufacturer	Agilent Technologies
Name	8890
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	CN23125102
Firmware Revision	A.11.07
Usage	Simple Injection
Location	Front
Syringe Volume (µL)	10

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Sampler 2	
Manufacturer	Agilent Technologies
Type	Tray
Name	7693A
Model Number	G4514A
Serial Number	CN23147D49
Firmware Revision	A.12.03
Val Heater	Not installed
Mainframe 1	
Manufacturer	Agilent Technologies
Name	8890
Model Number	G3540A
Serial Number	CN2303A031
Firmware Revision	2.8.1.6
Oven Type	Standard
Inlet 1	
Manufacturer	Agilent Technologies
Name	8890
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

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Mass Spectrometer 1	
Manufacturer	Agilent Technologies
Type	SG
Name	5977C
Model Number	G7077C
Serial Number	J52307MA25
Firmware Revision	B.00.36
High Vacuum System	Turbo Pump
Scouting Run Standard	CFW Std
MS EI Source 1	
Manufacturer	Agilent Technologies
Source Type	EI - Extractor
Number of filaments	2

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System ID: GM-12

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:	May 10, 2024
Reason for Signature:	Executed protocol and published this original version of document

Regulatory Disclaimer

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

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Date: May 10, 2024 2:18:55 PM
System ID: GM-12

User Name: supasak.kimwong@ham
Report Generated by Hostname: SCG1115H6C
System ID: GM-12
Print Date: May 10, 2024 2:18:57 PM

GM-12 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2024 2:25:19 PM	Auth	Session Created	Session	None
May 9, 2024 2:25:19 PM	Start	Configuration	Session	None
May 9, 2024 2:25:19 PM	Auth	EnkMonstr	Logging	User is Field Engineer and 3063 N/A require an initial test
May 9, 2024 2:31:20 PM	Auth	EmLearner	Session	EDP details for primary technique [OQ] - File path: (Protocol)Pecha/CocConfig/over02.53/GC.D2.33.ssp; EDP File Name: [GC.D2.33.ssp]; EOP Name: (Agilent)Recommendations/Protocol Review [GC.D2.33]; EDP available for systemised (ndotype) [S&M] - File path: (Protocol)Pecha/GCM/Cocfig/over02.54/GCM.D2.34.ssp; EDP File Name: [GCM.D2.34.ssp]; EOP Name: (Agilent)Recommendations
May 9, 2024 2:31:23 PM	End	Configuration	Session	None
May 9, 2024 2:31:27 PM	Start	Qualification	Session	OQ
May 9, 2024 2:31:27 PM	Start	Execution	COG Logon Verification - GC-MSD - Qualitative test	None
May 9, 2024 2:32:31 PM	End	Execution	COG Logon Verification - GC-MSD - Qualitative test	Run Count: 1
May 9, 2024 2:32:35 PM	Start	Execution	System Inspection and Basic Safety and Operation - MSD - Qualitative Test - No response associated	None

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User Name: supasak.kimwong@ham
Report Generated by Hostname: SCG1115H6C
System ID: GM-12
Print Date: May 10, 2024 2:18:57 PM

GM-12 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2024 2:32:44 PM	End	Execution	System Inspection and Basic Safety and Operation - MSD - Qualitative Test - No response associated	Run Count: 1
May 9, 2024 2:32:47 PM	Start	Execution	MSD Pressure Accuracy - Front SSU - Pressure Controlled inlet - S: 25.0 psi - L: <= 1.2 psi	None
May 9, 2024 2:32:54 PM	End	Execution	MSD Pressure Accuracy - Front SSU - Pressure Controlled inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count: 1
May 9, 2024 2:32:58 PM	Auth	AuthClosed	Session	None
May 9, 2024 2:33:43 PM	Auth	AuthRestarted	Session	None
May 9, 2024 2:33:44 PM	Auth	SessionReloading	Session	None
May 9, 2024 2:33:49 PM	Start	Qualification	Session	OQ
May 9, 2024 2:33:54 PM	Start	Execution	Injection Detection Limit - Injection Tower: Front SSU, SQ - Source: E1 - Extractor - RSD L (Area): <= 5.0% - RSD L (Peak Area): <= 5.0%	None
May 9, 2024 2:34:16 PM	Start	Execution	Mass Ratio Precision - Injection Tower: Front SSU, SQ - Source: E1 - Extractor - L (RSD): <= 5.0%	None
May 9, 2024 2:34:29 PM	Auth	AuthClosed	Session	None
May 10, 2024 10:19:03 AM	Auth	AuthRestarted	Session	None
May 10, 2024 10:19:05 AM	Auth	SessionReloading	Session	None
May 10, 2024 10:19:08 AM	Start	Qualification	Session	OQ
May 10, 2024 10:19:09 AM	Start	Execution	Mass Ratio Precision - Injection Tower: Front SSU, SQ - Source: E1 - Extractor - L (RSD): <= 5.0%	None

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Date: May 10, 2024 2:18:55 PM
System ID: GM-12

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User Name: supasak.kimwong@ham
Report Generated by Hostname: SCG1115H6C
System ID: GM-12
Print Date: May 10, 2024 2:18:57 PM

GM-12 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 10, 2024 10:20:08 AM	Start	Execution	GC Oven Temperature Accuracy - 8900 - Temperature : Oven - S: 230.0°C - L: <= -1.0 AND <= 1.0 % response in K	None
May 10, 2024 10:24:46 AM	Auth	Data	GC Oven Temperature Accuracy - 8900 - Temperature : Oven - S: 230.0°C - L: <= -1.0 AND <= 1.0 % response in K	Manual Data Entry
May 10, 2024 10:24:49 AM	End	Execution	GC Oven Temperature Accuracy - 8900 - Temperature : Oven - S: 230.0°C - L: <= -1.0 AND <= 1.0 % response in K	Run Count: 1
May 10, 2024 10:24:50 AM	Start	Execution	GC Oven Temperature Accuracy - 8900 - Temperature : Oven - S: 100.0°C - L: <= -1.0 AND <= 1.0 % response in K	None
May 10, 2024 10:25:33 AM	Auth	AuthClosed	Session	None
May 10, 2024 10:27:35 AM	Auth	AuthRestarted	Session	None
May 10, 2024 10:27:38 AM	Auth	SessionReloading	Session	None
May 10, 2024 10:27:38 AM	Start	Qualification	Session	OQ
May 10, 2024 10:27:38 AM	Start	Execution	GC Oven Temperature Accuracy - 8900 - Temperature : Oven - S: 100.0°C - L: <= -1.0 AND <= 1.0 % response in K	None
May 10, 2024 10:28:03 AM	Auth	Data	GC Oven Temperature Accuracy - 8900 - Temperature : Oven - S: 100.0°C - L: <= -1.0 AND <= 1.0 % response in K	Manual Data Entry
May 10, 2024 10:28:05 AM	End	Execution	GC Oven Temperature Accuracy - 8900 - Temperature : Oven - S: 100.0°C - L: <= -1.0 AND <= 1.0 % response in K	Run Count: 1

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User Name: supasak.kimwong@ham
Report Generated by Hostname: SCG1115H6C
System ID: GM-12
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GM-12 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 10, 2024 10:28:06 AM	Start	Execution	GC Oven Temperature Stability - 8900 - Temperature : Oven - S: 100.0°C - L: <= 0.5%	None
May 10, 2024 10:31:26 AM	Auth	Data	GC Oven Temperature Stability - 8900 - Temperature : Oven - S: 100.0°C - L: <= 0.5%	Manual Data Entry
May 10, 2024 10:31:28 AM	Start	Execution	GC Oven Temperature Stability - 8900 - Temperature : Oven - S: 100.0°C - L: <= 0.5%	Run Count: 1
May 10, 2024 10:31:30 AM	End	Execution	Log Amp - 5977C SQ - Source: E1 - Extractor	None
May 10, 2024 10:35:40 AM	Auth	AuthClosed	Session	None
May 10, 2024 10:37:32 AM	Auth	AuthRestarted	Session	None
May 10, 2024 10:37:33 AM	Auth	SessionReloading	Session	None
May 10, 2024 10:37:38 AM	Start	Qualification	Session	OQ
May 10, 2024 10:37:52 AM	Start	Execution	Log Amp - 5977C SQ - Source: E1 - Extractor	None
May 10, 2024 11:00:05 AM	End	Execution	Log Amp - 5977C SQ - Source: E1 - Extractor	Run Count: 1
May 10, 2024 11:00:07 AM	Start	Execution	WFOA - 5977C SQ - Source: E1 - Extractor	None
May 10, 2024 11:01:19 AM	End	Execution	WFOA - 5977C SQ - Source: E1 - Extractor	Run Count: 1
May 10, 2024 11:01:25 AM	Start	Execution	Time E1 - 5977C SQ - Source: E1 - Extractor	None
May 10, 2024 11:01:50 AM	End	Execution	Time E1 - 5977C SQ - Source: E1 - Extractor	Run Count: 1

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User Name: lupasakul@msn.com Report Generated by Hostname: SCG11586C			System ID: GM-12 Print Date: May 10, 2024 2:18:57 PM	
GM-12 Transaction Log:				
Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 10, 2024 11:01:52 AM	Start	Execution	Tune E - 5977C SQ - Source - None E - Extractor Filament 2 (Qualitative - No stoichiometric stoichiometry)	
May 10, 2024 11:02:40 AM	End	Execution	Tune E - 5977C SQ - Source - None E - Extractor Filament 2 (Qualitative - No stoichiometric stoichiometry)	
May 10, 2024 11:03:42 AM	Start	Execution	Spooling Run - Injection Tower, None Front SSL SQ - Source - E1 - Extraction Part of GCMS System Preparation	
May 10, 2024 11:09:10 AM	Start	Execution	Instrument Detection Limit - Injection Tower, Front SSSL SQ - Source - E1 - Extractor - RSD L (Area) <= 5.00% - RSD L (Ret. Time) <= 1.00%	None
May 10, 2024 11:17:54 AM	Start	Execution	Spooling Run - Injection Tower, None Front SSSL SQ - Source - E1 Extraction Part of GCMS System Preparation	
May 10, 2024 11:17:55 AM	Start	Execution	Instrument Detection Limit - Injection Tower, Front SSSL SQ - Source - E1 - Extractor - RSD L (Area) <= 5.00% - RSD L (Ret. Time) <= 1.00%	None
May 10, 2024 11:18:02 AM	Start	Execution	Mass Ratio Precision - Injection Tower, Front SSSL SQ - Source: E1 - Extractor - L (RSD) <= 5.00%	None
May 10, 2024 11:33:09 AM	Abort	AcqClosed	Session	None
May 10, 2024 11:40:09 PM	Abort	AcqRejected	Session	None
May 10, 2024 11:40:09 PM	Abort	SessionRejected	Session	None

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User Name: lupasakul@msn.com Report Generated by Hostname: SCG11586C			System ID: GM-12 Print Date: May 10, 2024 2:18:57 PM	
GM-12 Transaction Log:				
Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 10, 2024 1:14:12 PM	Start	Qualification	Session	DQ
May 10, 2024 1:14:12 PM	Start	Execution	Mass Ratio Precision - Injection Tower, Front SSSL SQ - Source: E1 - Extractor - L (RSD): <= 5.00%	None
May 10, 2024 1:15:11 PM	Start	Execution	Spooling Run - Injection Tower, Front SSSL SQ - Source: E1 - Extractor: Part of GCMS System Preparation	None
May 10, 2024 1:15:45 PM	Abort	Data	Spooling Run - Injection Tower, Front SSSL SQ - Source: E1 - Extractor: Part of GCMS System Preparation	Data File Path: D:\GM-12 Front SSSL SQ - Source: E1 - Extractor\GCMS\Run001.D
May 10, 2024 1:18:09 PM	Abort	Reporting	Reintegration	Reintegration Count: 1 - [Integration Type: Injection; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaOffset: 0; InitialHeightOffset: 200; Integration: On at 0; Integration: On at 4;]
May 10, 2024 1:18:57 PM	Abort	Reporting	Reintegration	Reintegration Count: 3 - [Integration Type: Injection; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaOffset: 0; InitialHeightOffset: 200; Integration: Off at 0; Integration: On at 4;]

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User Name: lupasakul@msn.com Report Generated by Hostname: SCG11586C			System ID: GM-12 Print Date: May 10, 2024 2:18:57 PM	
GM-12 Transaction Log:				
Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 10, 2024 1:18:42 PM	Abort	Reporting	Reintegration	Reintegration Count: 1 - [Integration Type: Injection; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaOffset: 0; InitialHeightOffset: 200; Integration: Off at 0; Integration: On at 4;]
May 10, 2024 1:19:55 PM	Abort	Reporting	Reintegration	Reintegration Count: 3 - [Integration Type: Injection; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaOffset: 0; InitialHeightOffset: 200; Integration: Off at 0; Integration: On at 4;]
May 10, 2024 1:17:02 PM	End	Execution	Instrument Detection Limit - Injection Tower, Front SSSL SQ - Source: E1 - Extractor - RSD L (Area) <= 5.00% - RSD L (Ret. Time) <= 1.00%	Run Count: 1
May 10, 2024 1:17:06 PM	Start	Execution	Mass Ratio Precision - Injection Tower, Front SSSL SQ - Source: E1 - Extractor - L (RSD) <= 5.00%	
May 10, 2024 1:21:05 PM	Start	Execution	Mass Ratio Precision - Injection Tower, Front SSSL SQ - Source: E1 - Extractor - L (RSD) <= 5.00%	

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System ID: GM-12

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User Name: lupasakul@msn.com Report Generated by Hostname: SCG11586C			System ID: GM-12 Print Date: May 10, 2024 2:18:57 PM	
GM-12 Transaction Log				
Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 10, 2024 1:21:55 PM	Start	Execution	Mass Ratio Precision - Injection Tower, Front SSSL SQ - Source: E1 - Extractor - L (RSD) =< 5.00%	None
May 10, 2024 2:02:49 PM	Abort	Data	Mass Ratio Precision - Injection Tower, Front SSSL SQ - Source: E1 - Extractor - L (RSD) =< 5.00%	Data File Path: D:\GM-12 Front SSSL SQ - Source: E1 - Extractor - L (RSD) =< 5.00%
May 10, 2024 2:02:49 PM	Abort	Data	Mass Ratio Precision - Injection Tower, Front SSSL SQ - Source: E1 - Extractor - L (RSD) =< 5.00%	Data File Path: D:\GM-12 Front SSSL SQ - Source: E1 - Extractor - L (RSD) =< 5.00%
May 10, 2024 2:02:45 PM	Abort	Data	Mass Ratio Precision - Injection Tower, Front SSSL SQ - Source: E1 - Extractor - L (RSD) =< 5.00%	Data File Path: D:\GM-12 Front SSSL SQ - Source: E1 - Extractor - L (RSD) =< 5.00%
May 10, 2024 2:02:45 PM	Abort	Data	Mass Ratio Precision - Injection Tower, Front SSSL SQ - Source: E1 - Extractor - L (RSD) =< 5.00%	Data File Path: D:\GM-12 Front SSSL SQ - Source: E1 - Extractor - L (RSD) =< 5.00%
May 10, 2024 2:02:45 PM	Abort	Data	Mass Ratio Precision - Injection Tower, Front SSSL SQ - Source: E1 - Extractor - L (RSD) =< 5.00%	Data File Path: D:\GM-12 Front SSSL SQ - Source: E1 - Extractor - L (RSD) =< 5.00%
May 10, 2024 2:02:45 PM	Abort	Data	Mass Ratio Precision - Injection Tower, Front SSSL SQ - Source: E1 - Extractor - L (RSD) =< 5.00%	Data File Path: D:\GM-12 Front SSSL SQ - Source: E1 - Extractor - L (RSD) =< 5.00%

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System ID: GM-12

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User Name: supasak.silapachai@dksh.com
Report Generated by: supasak.silapachai@dksh.com
System ID: QM-12
Print Date: May 10, 2024 2:14:17 PM

QM-12 Transaction Log

Date	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 10, 2024 2:03:15 PM	Auto	Reporting	Integration	Reintegration Count: 1-1 Integration Type: Photometric BaselineCorrectionMethod: Advanced WavelengthAccuracy: 1.0 nm WavelengthOffset: 0.0 nm WavelengthOffset: 0.0 nm WavelengthOffset: 0.0 nm Integration: Off Integration: On
May 10, 2024 2:03:21 PM	End	Integration	Mass Ratio Precision - Injection	Run Count: 1
May 10, 2024 2:03:49 PM	End	Qualification	Sensor	OG
May 10, 2024 2:03:49 PM	Start	Reporting	Sensor	None
May 10, 2024 2:18:42 PM	Auto	Reporting	Sensor	Report Generated: Report
May 10, 2024 2:17:29 PM	Auto	Reporting	Sensor	Report Generated: Report

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System ID: QM-12

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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 Rungreueang
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 Rungreueang)
Person in charge

(Mr. Nitinun Srihawan)
Authorized signatory

This certificate is issued in 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 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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CAL-FM-C06-15: 12 Sep 2022

Certificate No.: C06230441

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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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Phone: +66 2696 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

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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
	0.2664	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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Delivering Growth - in Asia and Beyond.

CAL-FM-C06-15: 12 Sep 2022



ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: WO-0005382

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

เงื่อนไขข้อแนะนำ: *656.1nm=656.1nm

*486.0nm=485.5nm

Mr.Nattapat Rungueang
Service Engineer

บริษัท ดีเอส เทคโนโลยี จำกัด
2531 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110
2533 Subhassan Road, Bangkok, Phrasang, Bangkok 10100
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CAL-FM-R31-03: 20 Jul 2022



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
634/4 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
Reference: 2312-0151DSC
Ambient Temperature: $(25 \pm 2) ^\circ\text{C}$
Relative Humidity: $(50 \pm 10) \%$

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

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

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

Condition of this result of calibration

1. Reference standards (Instruments):

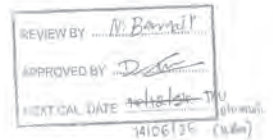
Instrument	Model	Serial No.	Certificate No.	Due Date
1) Multi-Product Calibrator	5502A	2435602	EE-0041-23	26 Apr 2024

2. This result of calibration was made on request 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)



Calibrated by: Napatcharak Prasomkorn
Issue Date: 15 December 2023

Approved Signatory:

| Pichaiwan Prasomkorn
| Nuntawat Khanchai
| Pongnagorn Boonyaporn

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)	(μV)
-200.0000	-199.9	0.1	66
-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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TEL: 0-2717-3000-24 FAX: 0-2719-9484



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.Maeniam Khu, A.Piungkdaeng,
Rayong 21140, Thailand
Ambient Temperature: $(25 \pm 2.5) ^\circ\text{C}$
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

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

Calibrated by: Warakorn Lemgatrakul

Approved by:
Approved Signatory

() Saithip Meangmal
() Warakorn Lemgatrakul
() Ponpan Palpin

Issue Date: 19 December 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 & Equipment Calibration and Testing Services.

1193422

1061696



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-1635

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 Meter S/N : B834291445	4.000	177.48	177.3	4.000	0.058	2.00
	7.000	0.00	-0.1	7.000	0.058	2.00
	10.000	-177.48	-177.5	10.000	0.058	2.00

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	0.0094	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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a 1193851



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

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 Lemgagrakul

Issue Date : 26 July 2023

B 0320211



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.

-000-

a 1172155



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%

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 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%

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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.

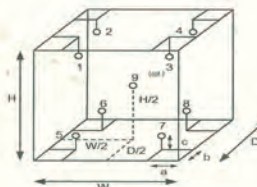
3. This certification is traceable to the International System of Unit.

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	m ³

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 : Low Temp. Incubator
Condition As-Received : Used Item
Reference : 2305-0896OC-2
Result of Calibration : (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 23TM962
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
20.0	20.0	20.0	0.019	0.72	1.0	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
20.0	19.547	19.780	19.487	19.529	19.408	20.139	20.112	20.406	20.116	0.30

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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a 1165129



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



Certificate of Calibration

Cert. No.: 24TM1663
Page : 1 of 3

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 : 01 November 2024

Calibration Date : 01 November 2024

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

AC Line Voltage : (220 ± 22) V

Calibrated by : Krisda Malee

Approved by : 
Approved Signatory

() Ponpan Paipim

() Suwit Imjai

(✓) Kunchit Promprat

Issue Date : 07 November 2024

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.



Equipment : Low Temp. Incubator
Condition As-Received : Used Item
Reference : 2411-0002OC-1
Procedure Used :-

Cert. No.: 24TM1663
Page : 2 of 3

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 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	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY44073381	24LM73	TPA	18 May 2025

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)

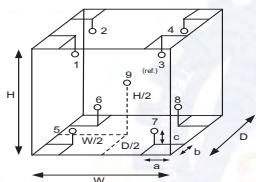
Result of Calibration : (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. (°C)	24	25
REL.Humid. (%)	55	53
AC Supply (Volt)	220	221

Position :	Ref. Std. ID No.:
1	1RTD-2/1
2	1RTD-2/2
3	22-01RTD-03
4	1RTD-2/4
5	1RTD-2/5
6	1RTD-2/6
7	23-01RTD-07
8	1RTD-2/8
9 (ref.)	23-01RTD-09



Probe Installation Details :

Dimension of Chamber :

a = 10 cm	D = 0.60 m
b = 10 cm	W = 1.0 m
c = 10 cm	H = 1.2 m
	Capacity = 0.72 m ³



Equipment : Low Temp. Incubator
Condition As-Received : Used Item
Reference : 2411-0002OC-1
Result of Calibration : (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM1663
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
20.0	20.0	20.0	0.026	0.26	0.53	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
20.0	20.071	19.915	20.273	20.179	19.977	19.782	20.056	20.026	20.033	0.30

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 %.

-o0o-



SARTORIUS

Certificate of Calibration

REVIEW BY *Tharitak*
APPROVED BY *D. J.*
NEXT CAL DATE 02/02/2025

Model Number : MSE224S-100-DU
Description : Analytical Balance
Serial Number : 0026207038
ID No. : RYG_EN0002
Manufacturer : Sartorius
Certificate No. : 24BC10069
Issued Date : Friday, February 23, 2024
Reference No. : 229196
Page No. : 1 of 2

Customer Name : ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)
816/10 Moo 5 T. Maenam Khu, A. Pluakdaeng, Rayong 21140, Thailand.

Calibrated Place : ALS Laboratory Group (Thailand) Co., Ltd. (Balance Room)
816/10 Moo 5 T. Maenam Khu, A. Pluakdaeng, Rayong 21140, Thailand.

Calibrated By : Mr. Chonchai Inthana
Calibration Date : Thursday, February 22, 2024
Calibration Procedure No. : This calibration was conducted by Using in-house calibration procedure number (WI-003) Based on UKAS LAB 14 : 2019

Metrological data :
Capacity : 220 g Readability : 0.0001 g
Ambient Conditions :
Temperature : 24.2 °C ± 5.0 °C
Humidity : 57.0 % RH ± 10.0 % RH
Pressure : ±

Reasons for calibration
☐ New Installation ☐ Service / Repair ☒ Re-calibration / Maintenance
Equipment Condition : ☒ Good Operate ☐ Fail

Measurement Method UKAS Publication Ref : Lab 14
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). The calibration certificate documents the traceability to National Standards, which realise the unit of measurement according to the International Standard System of Units (SI). Report of Tolerance came from list of Sartorius Metrological Specifications.

Traceability:

Model Number	Description	Traceability	Certificate No.	Due Date
YCS011-522-00	Sartorius weight set 1mg - 5000g E2 YCS011-522-00	TCS	M2308197S	23-Aug-2025
MHB-382SD	Humidity/Balometer/Temp. Lubron MHB-382SD	DKSH	C1923184S	23-Aug-2024

This certificate relate and apply this equipment only.
This certificate may not be reproduced other than in full except with the prior written approval of the Calibration Operation Division
Sartorius (Thailand) Co., Ltd.

Mr. Chonchai Inthana (Technical Manager)
STAMP
SARTORIUS
NSC-TIS-171025
CALIBRATION 0426

SOP FM 33 03 February 2022

SARTORIUS

Certificate of Calibration

Model Number : MSE224S-100-DU
Description : Analytical Balance
Serial Number : 0026207038
ID No. : RYG_EN0002
Manufacturer : Sartorius
Certificate No. : 24BC10069
Issued Date : Friday, February 23, 2024
Reference No. : 229196
Page No. : 2 of 2

Calibration Results : Without Adjustment

Repeatability		Eccentricity (Off-center loading error)	
The repeatability is the ability of a weighing instrument to display nearly identical readouts under identical test conditions when the same load within a measurement range is placed repeatedly on the weighing pan in the same manner. The standard deviation is used to express reproducibility quantitatively.		The off-center loading error is yielded by the difference between the readout of the load, i.e. 1/3 or 1/4 of maximum capacity, placed in the middle of the weighing pan and between each of four additional measurement points (positions defined according to OIML R78).	
Nominal Value : (Low Load)	20.0000 199.9999	Nominal value :	100 g
20 g	20.0000 200.0000	Tolerance	0.0004 g
Tolerance	0.0001 g	Difference	
Nominal Value : (High Load)	19.9999 200.0000	1 -	
200 g	20.0000 200.0000	2 -0.0001	
Tolerance	0.0001 g	3 -0.0001	
Standard Deviation	0.00007 0.00005	4 0.0000	
		5 -0.0001	
		6 -	

Linearity

The linearity, also called linearity error, describes the deviation of the characteristic curve of a weighing instrument from the linear slope.

Tolerance		0.0002 g		
Nominal Value	Conventional Mass Value	Displayed Value	Deviation	Uncertainty
(g)	(g)	(g)	(g)	(g)
0.01	0.0100	0.0100	0.0000	0.00018
0.05	0.0500	0.0500	0.0000	0.00018
0.1	0.1000	0.1000	0.0000	0.00018
0.5	0.5000	0.5000	0.0000	0.00018
1	1.0000	1.0000	0.0000	0.00018
5	5.0000	5.0000	0.0000	0.00018
10	10.0000	10.0000	0.0000	0.00018
20	20.0000	20.0000	0.0000	0.00024
50	50.0000	49.9999	-0.0001	0.00019
100	100.0000	100.0000	0.0000	0.00023
200	200.0000	199.9999	-0.0001	0.00032

End of Report.

SOP FM 33 03 February 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.0-2717-3000-29 FAX.0-2719-9484



Certificate of Calibration

Cert. No.: 24TM632
Page : 1 of 3

Equipment : Hot Air Oven
Manufacturer : Memmert
Model : UFE 500
Serial No. : G511.1572
ID No. : RYG_EN0010
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 March 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Man Pattanapongpaiboon
Approved by : *Man Pattanapongpaiboon*
() Pornthippa Tameyakul
() Unnophol Harachai
(✓) Suwit Imjai

REVIEW BY *Tharitak*
APPROVED BY *D. J.*
NEXT CAL DATE 21/09/25

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 March 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %

Calibrated by : Man Pattanapongpaiboon

Approved by : *Man Pattanapongpaiboon*
Approved Signatory

Issue Date : 22 March 2024

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.



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.

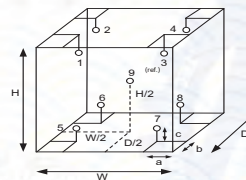
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC : Temperature Source

Fresh air setting : Close

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



Probe Installation Details :
a = 5.0 cm
b = 5.0 cm
c = 5.0 cm
Dimension of Chamber :
D = 0.40 m
W = 0.56 m
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-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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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL.0-2717-3000-29 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

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

Procedure Used :-

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)

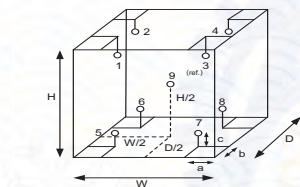
Result of Calibration :- (*) Without Adjustment

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

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



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



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 k
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 :

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



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.

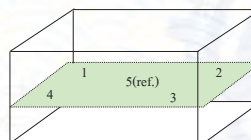
Remark : TPA : Technology Promotion Association (Thailand - Japan)

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)
			Position					
			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 k
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 %.

-00-



Certificate of Calibration

Represent to Certificate of Calibration No. C29240007

Equipment: Block Digestion Unit
Model: KT-20s
Serial No. (or ID.): 5720210008/5770200073
Manufacturer: Gerhardt
Condition: In Condition

Certificate No.: C29240011
Issued Date: 22 March 2024
Job No: WCO-00020429
Page: 1 of 4
Digestion Block: 20 holes.

Customer: ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)
616/10 Moo 5 T.Maenam Khu, A.Plukdaeng, 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.Plukdaeng, 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 in full compliance with the requirements of the International System of Units (SI), a global standard of measurement traceability and accuracy, as required by the International System of Units (SI).

The measurement uncertainty stated in this certificate is based on the expanded uncertainty (k=2) as required by the International System of Units (SI). It provides a level of confidence of approximately 95%.

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.

DKSH Technology Limited

2533 Sukhumvit Road, Bangkok, Thailand 10110

Phone: +66 2261 1000 Email: info@dksh.com

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CAL-FM-029-01-23-01-2022

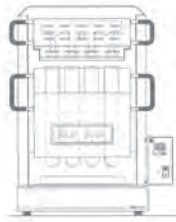
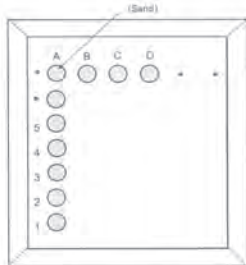


Fig. 1: Front view



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.

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				386.3	15.3	1.5
C2				386.6	15.6	1.5
C3				382.8	12.8	1.5
C4				381.7	11.7	1.5
C5				380.3	10.3	1.5
D1				397.6	17.6	1.5
D2				386.6	16.6	1.5
D3				395.0	15.0	1.5
D4				384.2	14.2	1.5
D5				383.6	13.6	1.5

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

ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: WO-00020429

ชนิดเครื่อง: Block Digestion Unit รุ่น: KT-20s

หมายเลขเครื่อง: 5720210009/5770200073

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

ข้อเสนอแนะ

Mr. Trianathorn Phonook
Service Engineer

Certificate of System Qualification

GC-OQ + GCMS-OQ

System ID: GM-6
Organization Name: ALS Laboratory Group (Thailand) Co., Ltd.
Organization Location: 104 Phatthanakan Rd., Suan Luang, Bangkok 10250

Date: June 26, 2023 5:00:36 PM
EQP Name: Agilent Recommended, Agilent Recommended
EQP Revision: GC.02.53, GCMS.02.54
Overall Qualification Status: Pass

REVIEW BY: *Nat Sont*
APPROVED BY: *AL AL*
NEXT CAL. DATE: *26/12/24*

CDS Logon Verification - GC

Logon: Nanthawadee.Somboon

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

Headspace Leak

Name: 7697A with Tray
Sampler 1

Setpoint Status: Pass

Overall Headspace Leak Test Status

Pass

Headspace Heated Zones Temperature Accuracy

Name: 7697A with Tray
Sampler 1

Setpoint Status: Pass
Zone: Transferline

Temperature:
Setpoint: 115.0 °C
Actual: 115.5

Accuracy: 0.5 °C
Agilent Recommended: >= -1.5 % setpoint (-2.1 °C)
<= 5.2 % setpoint (6.0 °C)

Setpoint Status: Pass
Zone: Sample Loop

Temperature:
Setpoint: 110.0 °C
Actual: 110.4

Accuracy: 0.4 °C
Agilent Recommended: >= -4.0
<= 4.0

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Setpoint Status: Pass

Zone: Oven

Temperature:
Setpoint: 100.0 °C
Actual: 100.8

Accuracy: 0.8 °C
Agilent Recommended: >= -4.0
<= 4.0

Overall Headspace Heated Zones Temperature Accuracy Test

Pass

GC Oven Temperature Accuracy

Name: 7890

Setpoint Status: Pass

Zone: Oven

Temperature:
Setpoint/Actual
230.0 231.1 °C

Accuracy: 1.1 °C
Agilent Recommended: >= -1.0 % setpoint in K (-5.0 °C)
<= 1.0 % setpoint in K (5.0 °C)

Setpoint Status: Pass

Zone: Oven

Temperature:
Setpoint/Actual
100.0 100.2 °C

Accuracy: 0.2 °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

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System ID: GM-6

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Setpoint Status: Pass

Setpoint/Average
Temperature: 100.0 100.1667 °C

Stability: 0.1 °C
Agilent Recommended: <= 0.5

Overall GC Oven Temperature Stability Test Status

Pass

Log Amp

Tested Combination1 Front SSL / External SQ

Name: 5975C Inert XL with TAD

Setpoint Status: Pass

Overall Log Amp Test Status

Pass

RFPA

Tested Combination1 Front SSL / External SQ

Name: 5975C Inert XL with TAD

Setpoint Status: Pass

Amu: 1050 m/z Drift After Five Minutes: RFPA Voltage: 542 mV

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

Overall RFPA Test Status

Pass

Tune EI

Tested Combination1 Front SSL / External SQ

Name: 5975C Inert XL with TAD

Setpoint Status: Pass

Filament: 1

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Setpoint Status: Pass

Filament: 2

Overall Tune EI Test Status

Pass

Scouting Run

Tested Combination1 Front SSL / External SQ

Name: Headspace

Source: 7697A with Tray

Source: EI - Inert

Setpoint Status: Completed

Injection Volume on Column: 1000 µL

Overall Scouting Run Status

Completed

Injection Precision

Tested Combination1 Front SSL / External SQ

Name: 7697A with Tray

Source: EI - Inert

Setpoint Status: Pass

Injection Volume on Column: 1000 µL

Area RSD: 1.27 %

Agilent Recommended: <= 5.00 %

Retention Time RSD: 0.00 %

Agilent Recommended: <= 1.00 %

Overall Injection Precision Test Status

Pass

Mass Ratio Precision

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System ID: GM-6

Tested Combination1 Front SSL / External SQ

Name: Headspace

Source: 7697A with Tray

Source: EI - Inert

Setpoint Status: Pass

Injection Volume on Column: 1000 µL

Area Mass 1 Abundance's Mass Ratio

RSD: 1.27 %

Agilent Recommended: <= 5.00 %

Agilent Recommended: <= 5.00 %

Agilent Recommended: <= 5.00 %

Overall Mass Ratio Precision Test Status

Pass

Injection Carry Over

Tested Combination1 Front SSL / External SQ

Name: 7697A with Tray

Source: EI - Inert

Setpoint Status: Pass

Injection Volume on Column: 1000 µL

Area Carry Over: 0.00 %

Agilent Recommended: <= 1.00 %

Overall Injection Carry Over Test Status

Pass

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System ID: GM-6

Instrument Details

Purpose

This section describes the as found system configuration.

Details

System

System ID: GM-6
Manufacturer: Agilent Technologies
Name: 7690
Flow Data Input: Manual Data
Temperature Data Input: Manual Data or Other Data Logging

Tested Combination1

Injection Technique: Headspace
Inlet: Front
Detector: External
LTM installed?: No

Sampler 1

Manufacturer: Agilent Technologies
Type: Headspace
Name: 7697A with Tray
Model Number: G4557A
Serial Number: CN13020009
Firmware Revision: A.01.05.1
Sampling System: Loop Fill
Location: Front
Injection Volume (µL): 1000
Headspace to GC Connection: EPC HeadspaceDate: June 26, 2023 5:00:36 PM
System ID: GM-6

Mainframe 1

Manufacturer: Agilent Technologies
Name: 7890
Model Number: G3440A
Serial Number: CN12511188
Firmware Revision: A.01.14
Oven Type: Standard

Inlet 1

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

Detector 1

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

Mass Spectrometer 1

Manufacturer: Agilent Technologies
Type: SQ
Name: 5975C Inert XL with TAD
Model Number: G3172A
Serial Number: US13023A30
Firmware Revision: 5.02.09
High Vacuum System: Turbo Pump
Scouting Run Standard: MRP StdDate: June 26, 2023 5:00:36 PM
System ID: GM-6

MS EI Source: ?

Manufacturer

Source Type

Number of filaments

Agilent Technologies

El A. Elvart

3

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:	Sukhfil Mama
Logged On User Name:	sukhfil.mama@agilent.com
Signature Creation Date:	June 26, 2023
Reason for Signature:	Executed protocol and pub

Regulatory Disclaimer

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Upload Name: sals2015.namap
Host Name: ASHGW7004

System ID: DM-6
Print Date: June 26, 2023 5:00:17 PM

6408258739_ALE_OQ_QM6 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
June 25, 2023 9:12:08 AM	Auth	Session Created	Session	None
June 26, 2023 9:42:05 AM	Start	Configuration	Session	
June 26, 2023 9:42:05 AM	Auth	Enrollment	Logging	User is Field Engineer and does not require an onlook code
June 26, 2023 9:18:38 AM	Auth	Signal Detected	Session	EOP details for primary technique [OQ] - File path: [Protocol/Packs/OQ/Configuration/5356c-02.03.xml], EOP File Name: [OQ-02.03.xml], EOP Name: [AgentRecommended] Protocol Revision [02-02.03] EOP details for hybridized technique [3cM4] - File path: [Protocol/Packs/GlobalConfiguration/03_04/0404-02.04.01.xml], EOP File Name: [3cM4-02.04.xml], EOP Name: [AgentRecommended]
June 26, 2023 9:36:13 AM	End	Configuration	Session	None
June 26, 2023 9:36:21 AM	Start	Configuration	Session	OQ
June 26, 2023 9:36:21 AM	Start	Execution	CDL Logon Verification - OC-7850 - Qualitative test	None
June 26, 2023 9:41:56 AM	End	Evaluation	CDL Logon Verification - OC-7850 - Qualitative test	Full Count: 1
June 26, 2023 9:41:57 AM	NAH	End/loop	System Inspection and Basic Safety and Qualification -7850 - Qualitative Test - No reports associated	None

User Name: a198104and
Hostname: A5H9W7054

System ID: GM-0
Print Date: June 26, 2023 5:00:17 PM

6068238759_ALS_OQ_OMB Transaction log :

Type	Transaction Date	Activity Performed	Type of Transaction	Optional Information
June 26, 2023 9:42:21 AM	End	Execution	System Inspection and Basic Safety and Operation - 709C- Qualitative Test - No setpoints associated	Run Count: 1
June 26, 2023 9:42:24 AM	Start	Execution	Hot Pressure Accuracy - Front 25L - Pressure Controlled test - 8: 25.0 psi - L: <= 1.2 psi	None
June 26, 2023 9:53:27 AM	End	Execution	Hot Pressure Accuracy - Front 25L - Pressure Controlled test - 8: 25.0 psi - L: <= 1.2 psi	Run Count: 1
June 26, 2023 9:53:37 AM	Start	Execution	Headspace Leak - 7097A with Tray (Sampler 1) - Qualitative Test - No setpoints associated	None
June 26, 2023 9:53:45 AM	End	Execution	Headspace Leak - 7097A with Tray (Sampler 1) - Qualitative Test - No setpoints associated	Run Count: 1
June 26, 2023 10:18:52 AM	Start	Execution	Headspace Heated Zones Temperature Accuracy - 7097A with Tray (Sampler 1) - Zone 1 Transmitter - 8: 115.0°C - L: >= -1.8% setpoint and <= 5.2% setpoint	None
June 26, 2023 10:20:42 AM	Awail	Done	Headspace Heated Zones Temperature Accuracy - 7097A with Tray (Sampler 1) - Zone 1 Transmitter - 8: 115.0°C - L: >= -1.8% setpoint and <= 5.2% setpoint	Manual Data Entry
June 26, 2023 10:20:41 AM	End	Execution	Headspace Heated Zones Temperature Accuracy - 7097A with Tray (Sampler 1) - Zone 1 Transmitter - 8: 115.0°C - L: >= -1.8% setpoint and <= 5.2% setpoint	Run Count: 1

User Name: kulkarni.jyoti
Hostname: A5BKA97504System ID: GM-6
Print Date: June 26, 2023 5:00:37 PM

606258789_ALS_OQ_GMS Transaction Log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
June 26, 2023 10:20:48 AM	Start	Execution	Headspace Heated Zones Temperature Accuracy - 7897A with Tray (Sampler 1) - Zone: Sample Loop - S: 110.0°C - L: -4.0°C and -4.0°C	None
June 26, 2023 10:25:37 AM	Auto	Data	Headspace Heated Zones Temperature Accuracy - 7897A with Tray (Sampler 1) - Zone: Sample Loop - S: 110.0°C - L: -4.0°C and -4.0°C	Manual Data Entry
June 26, 2023 10:30:38 AM	End	Execution	Headspace Heated Zones Temperature Accuracy - 7897A with Tray (Sampler 1) - Zone: Sample Loop - S: 110.0°C - L: -4.0°C and -4.0°C	Run Count: 1
June 26, 2023 10:38:41 AM	Start	Execution	Headspace Heated Zones Temperature Accuracy - 7897A with Tray (Sampler 1) - Zone: Oven - S: 100.0°C - L: -4.0°C and -4.0°C	None
June 26, 2023 10:52:53 AM	Auto	Data	Headspace Heated Zones Temperature Accuracy - 7897A with Tray (Sampler 1) - Zone: Oven - S: 100.0°C - L: -4.0°C and -4.0°C	Manual Data Entry
June 26, 2023 10:52:58 AM	End	Execution	Headspace Heated Zones Temperature Accuracy - 7897A with Tray (Sampler 1) - Zone: Oven - S: 100.0°C - L: -4.0°C and -4.0°C	Run Count: 1
June 26, 2023 10:52:58 AM	Start	Execution	GC Oven Temperature Accuracy - 7890 - Temperature: Oven - S: 230.0°C - L: -1.0 AND -1.0 % setpoint in K	None

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User Name: kulkarni.jyoti
Hostname: A5BKA97504System ID: GM-6
Print Date: June 26, 2023 5:00:37 PM

606258789_ALS_OQ_GMS Transaction Log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
June 26, 2023 10:37:21 AM	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
June 26, 2023 10:37:27 AM	End	Execution	GC Oven Temperature Accuracy - 7890 - Temperature: Oven - S: 230.0°C - L: -1.0 AND -1.0 % setpoint in K	Run Count: 1
June 26, 2023 10:37:29 AM	Start	Execution	GC Oven Temperature Accuracy - 7890 - Temperature: Oven - S: 100.0°C - L: -1.0 AND -1.0 % setpoint in K	None
June 26, 2023 10:42:29 AM	Auto	Data	GC Oven Temperature Accuracy - 7890 - Temperature: Oven - S: 100.0°C - L: -1.0 AND -1.0 % setpoint in K	Manual Data Entry
June 26, 2023 10:42:31 AM	End	Execution	GC Oven Temperature Accuracy - 7890 - Temperature: Oven - S: 100.0°C - L: -1.0 AND -1.0 % setpoint in K	Run Count: 1
June 26, 2023 10:42:32 AM	Start	Execution	GC Oven Temperature Stability - 7890 - Temperature: Oven - S: 100.0°C - L: -1.0 AND -1.0 % setpoint in K	None
June 26, 2023 10:44:35 AM	Start	Execution	Scouting Run - 7897A with Tray Headspace, Front SSL, SQ - Source - EI - Inert-Part of GCMS System Preparation	None
June 26, 2023 10:50:53 AM	Start	Execution	GC Oven Temperature Stability - 7890 - Temperature: Oven - S: 100.0°C - L: -1.0 AND -1.0 % setpoint in K	None
June 26, 2023 11:18:38 AM	Auto	Data	GC Oven Temperature Stability - 7890 - Temperature: Oven - S: 100.0°C - L: -1.0 AND -1.0 % setpoint in K	Manual Data Entry

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System ID: GM-6

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User Name: kulkarni.jyoti
Hostname: A5BKA97504System ID: GM-6
Print Date: June 26, 2023 5:00:37 PM

606258789_ALS_OQ_GMS Transaction Log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
June 26, 2023 11:18:42 AM	End	Execution	GC Oven Temperature Stability - 7890 - Temperature: Oven - S: 100.0°C - L: -1.0 AND -1.0 % setpoint in K	Run Count: 1
June 26, 2023 11:18:49 AM	Start	Execution	Scouting Run - 7897A with Tray Headspace, Front SSL, SQ - Source - EI - Inert-Part of GCMS System Preparation	None
June 26, 2023 11:21:51 AM	Start	Execution	Injection Precision - 7897A with Tray Headspace, Front SSL, SQ - Source - EI - Inert-Part of GCMS System Preparation	None
June 26, 2023 11:25:11 AM	Auto	Execution	Scouting Run - 7897A with Tray Headspace, Front SSL, SQ - Source - EI - Inert-Part of GCMS System Preparation	None
June 26, 2023 12:33:12 PM	Start	Execution	Mass Ratio Precision - 7897A with Tray Headspace, Front SSL, SQ - Source - EI - Inert-Part of GCMS System Preparation	None
June 26, 2023 12:54:09 PM	Start	Execution	Scouting Run - 7897A with Tray Headspace, Front SSL, SQ - Source - EI - Inert-Part of GCMS System Preparation	None
June 26, 2023 12:54:53 PM	Start	Execution	Injection Precision - 7897A with Tray Headspace, Front SSL, SQ - Source - EI - Inert-Part of GCMS System Preparation	None
June 26, 2023 12:55:07 PM	Start	Execution	Mass Ratio Precision - 7897A with Tray Headspace, Front SSL, SQ - Source - EI - Inert-Part of GCMS System Preparation	None

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System ID: GM-6

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User Name: kulkarni.jyoti
Hostname: A5BKA97504System ID: GM-6
Print Date: June 26, 2023 5:00:37 PM

606258789_ALS_OQ_GMS Transaction Log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
June 26, 2023 12:58:19 PM	Start	Execution	Injection Precision - 7897A with Tray Headspace, Front SSL, SQ - Source - EI - Inert-Part of GCMS System Preparation	None
June 26, 2023 1:00:18 PM	Start	Execution	Log Amp - 5975C Inert XL with TAD SQ - Source - EI - Inert	None
June 26, 2023 1:17:31 PM	End	Execution	Log Amp - 5975C Inert XL with TAD SQ - Source - EI - Inert	Run Count: 1
June 26, 2023 1:17:35 PM	Start	Execution	RPFA - 5975C Inert XL with TAD SQ - Source - EI - Inert	None
June 26, 2023 1:38:18 PM	End	Execution	RPFA - 5975C Inert XL with TAD SQ - Source - EI - Inert	Run Count: 1
June 26, 2023 1:38:52 PM	Start	Execution	Turns EI - 5975C Inert XL with TAD SQ - Source - EI - Inert	None
June 26, 2023 1:42:01 PM	End	Execution	Turns EI - 5975C Inert XL with TAD SQ - Source - EI - Inert	Run Count: 1
June 26, 2023 1:42:04 PM	Start	Execution	Turns EI - 5975C Inert XL with TAD SQ - Source - EI - Inert	None
June 26, 2023 1:48:45 PM	End	Execution	Turns EI - 5975C Inert XL with TAD SQ - Source - EI - Inert	Run Count: 1
June 26, 2023 1:48:47 PM	Start	Execution	Scouting Run - 7897A with Tray Headspace, Front SSL, SQ - Source - EI - Inert-Part of GCMS System Preparation	None

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Date: June 26, 2023 5:00:36 PM
System ID: GM-6

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User Name: sals@lmsms
Host Name: ABBKXW7004System ID: GM-6
Print Date: June 26, 2023 5:02:37 PM

606238789_ALS_OG_GMS Transaction Log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
June 26, 2023 3:01:34 PM	Start	Execution	Injection Precision - 7897A with Tray Headspace, Front SBL, SQ - Source: EI - Inert-L (Area) <= 5.00% - L (Ret. Time) <= 1.00%	None
June 26, 2023 4:20:32 PM	Start	Execution	Scouting Run - 7897A with Tray Headspace, Front SBL, SQ - Source: EI - Inert-Part of GCMS System Preparation	None
June 26, 2023 4:32:43 PM	Start	Execution	Scouting Run - 7897A with Tray Headspace, Front SBL, SQ - Source: EI - Inert-Part of GCMS System Preparation	None
June 26, 2023 4:33:04 PM	Avail	Data	Scouting Run - 7897A with Tray Headspace, Front SBL, SQ - Source: EI - Inert-Part of GCMS System Preparation	Data File Path: D:\GC2023\HSP03.D\DATA-MS
June 26, 2023 4:35:02 PM	End	Execution	Scouting Run - 7897A with Tray Headspace, Front SBL, SQ - Source: EI - Inert-Part of GCMS System Preparation	Run Count: 1
June 26, 2023 4:35:05 PM	Start	Execution	Injection Precision - 7897A with Tray Headspace, Front SBL, SQ - Source: EI - Inert-L (Area) <= 5.00% - L (Ret. Time) <= 1.00%	None
June 26, 2023 4:39:30 PM	Avail	Data	Injection Precision - 7897A with Tray Headspace, Front SBL, SQ - Source: EI - Inert-L (Area) <= 5.00% - L (Ret. Time) <= 1.00%	Data File Path: D:\GC2023\HSP03.D\DATA-MS

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Date: June 26, 2023 5:00:36 PM
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User Name: sals@lmsms
Host Name: ABBKXW7004System ID: GM-6
Print Date: June 26, 2023 5:00:37 PM

606238789_ALS_OG_GMS Transaction Log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
June 26, 2023 4:35:32 PM	Avail	Data	Injection Precision - 7897A with Tray Headspace, Front SBL, SQ - Source: EI - Inert-L (Area) <= 5.00% - L (Ret. Time) <= 1.00%	Data File Path: D:\GC2023\HSP03.D\DATA-MS
June 26, 2023 4:36:32 PM	Avail	Data	Injection Precision - 7897A with Tray Headspace, Front SBL, SQ - Source: EI - Inert-L (Area) <= 5.00% - L (Ret. Time) <= 1.00%	Data File Path: D:\GC2023\HSP04.D\DATA-MS
June 26, 2023 4:36:33 PM	Avail	Data	Injection Precision - 7897A with Tray Headspace, Front SBL, SQ - Source: EI - Inert-L (Area) <= 5.00% - L (Ret. Time) <= 1.00%	Data File Path: D:\GC2023\HSP05.D\DATA-MS
June 26, 2023 4:38:33 PM	Avail	Data	Injection Precision - 7897A with Tray Headspace, Front SBL, SQ - Source: EI - Inert-L (Area) <= 5.00% - L (Ret. Time) <= 1.00%	Data File Path: D:\GC2023\HSP06.D\DATA-MS
June 26, 2023 4:39:33 PM	Avail	Data	Injection Precision - 7897A with Tray Headspace, Front SBL, SQ - Source: EI - Inert-L (Area) <= 5.00% - L (Ret. Time) <= 1.00%	Data File Path: D:\GC2023\HSP07.D\DATA-MS
June 26, 2023 4:39:35 PM	End	Execution	Injection Precision - 7897A with Tray Headspace, Front SBL, SQ - Source: EI - Inert-L (Area) <= 5.00% - L (Ret. Time) <= 1.00%	Run Count: 1
June 26, 2023 4:39:04 PM	Start	Execution	Mass Ratio Precision - 7897A with Tray Headspace, Front SBL, SQ - Source: EI - Inert-L (RSD) <= 5.00%	None

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System ID: GM-6

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User Name: sals@lmsms
Host Name: ABBKXW7004System ID: GM-6
Print Date: June 26, 2023 5:00:37 PM

606238789_ALS_OG_GMS Transaction Log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
June 26, 2023 4:36:03 PM	Avail	Data	Mass Ratio Precision - 7897A with Tray Headspace, Front SBL, SQ - Source: EI - Inert-L (RSD) <= 5.00%	Data File Path: D:\GC2023\HSP02.D\DATA-MS
June 26, 2023 4:36:31 PM	Avail	Data	Mass Ratio Precision - 7897A with Tray Headspace, Front SBL, SQ - Source: EI - Inert-L (RSD) <= 5.00%	Data File Path: D:\GC2023\HSP03.D\DATA-MS
June 26, 2023 4:36:31 PM	Avail	Data	Mass Ratio Precision - 7897A with Tray Headspace, Front SBL, SQ - Source: EI - Inert-L (RSD) <= 5.00%	Data File Path: D:\GC2023\HSP04.D\DATA-MS
June 26, 2023 4:36:31 PM	Avail	Data	Mass Ratio Precision - 7897A with Tray Headspace, Front SBL, SQ - Source: EI - Inert-L (RSD) <= 5.00%	Data File Path: D:\GC2023\HSP05.D\DATA-MS
June 26, 2023 4:36:33 PM	Avail	Data	Mass Ratio Precision - 7897A with Tray Headspace, Front SBL, SQ - Source: EI - Inert-L (RSD) <= 5.00%	Data File Path: D:\GC2023\HSP06.D\DATA-MS
June 26, 2023 4:36:33 PM	Avail	Data	Mass Ratio Precision - 7897A with Tray Headspace, Front SBL, SQ - Source: EI - Inert-L (RSD) <= 5.00%	Data File Path: D:\GC2023\HSP07.D\DATA-MS
June 26, 2023 4:37:36 PM	End	Execution	Mass Ratio Precision - 7897A with Tray Headspace, Front SBL, SQ - Source: EI - Inert-L (RSD) <= 5.00%	Run Count: 1
June 26, 2023 4:37:38 PM	Start	Execution	Injection Carry Over - 7897A with Tray Headspace, Front SBL, SQ - Headspace Sample - EI - Inert - L <= 1.00%	None

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Date: June 26, 2023 5:00:36 PM
System ID: GM-6

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User Name: sals@lmsms
Host Name: ABBKXW7004System ID: GM-6
Print Date: June 26, 2023 5:00:37 PM

606238789_ALS_OG_GMS Transaction Log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
June 26, 2023 4:37:03 PM	Avail	Data	Injection Carry Over - 7897A with Tray Headspace, Front SBL, SQ - Headspace Sample - EI - Inert - L <= 1.00%	Data File Path: D:\GC2023\HSP07.D\DATA-MS
June 26, 2023 4:37:53 PM	Avail	Data	Injection Carry Over - 7897A with Tray Headspace, Front SBL, SQ - Headspace Sample - EI - Inert - L <= 1.00%	Data File Path: D:\GC2023\HSP08.D\DATA-MS
June 26, 2023 4:39:51 PM	End	Execution	Injection Carry Over - 7897A with Tray Headspace, Front SBL, SQ - Headspace Sample - EI - Inert - L <= 1.00%	Run Count: 1
June 26, 2023 4:38:58 PM	End	Qualification	System	EQ
June 26, 2023 4:38:58 PM	Start	Reporting	Sealed	None
June 26, 2023 4:38:30 PM	Avail	Reporting	Revised	Report Generated: Certificate

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Date: June 26, 2023 5:00:36 PM
System ID: GM-6

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Certificate of System Qualification

GC-OQ + GCMS-OQ

System ID: GM-7
Organization Name: ALS Laboratory Group (Thailand) Co., Ltd.
Organization Location: 104 Patthanakarn 40, Patthanakarn Rd., Khwang Suan Luang, Khet Suan Luang, Bangkok.

Date: December 13, 2023 3:32:46 PM
EQP Name: AgilentRecommended, AgilentRecommended
EQP Revision: GC.02.50, GCMS.02.50
Overall Qualification Status: Pass

System Inspection and Basic Safety and Operation

Name: 7890
Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status
Pass

Inlet Pressure Accuracy

Name: 7890
Front SSL
Setpoint Status: Pass
Setpoint Actual
Inlet Pressure: 25.0 psi 25.0 psi
Accuracy: 0.0 psi
Agilent Recommended: <= 1.2

Overall Inlet Pressure Accuracy Test Status
Pass

GC Oven Temperature Accuracy

Name: 7890

Date: December 13, 2023 3:32:46 PM
System ID: GM-7

Setpoint Status: Pass
Zone: Oven
Setpoint/Actual
Temperature: 230.0 232.3 °C
Accuracy: 2.3 °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: 100.0 100.7 °C
Accuracy: 0.7 °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: 100.0 100.4 °C
Stability: 0.0 °C
Agilent Recommended: <= 0.5

Overall GC Oven Temperature Stability Test Status
Pass

Log Amp

Tested Combination1 Front SSL / External SQ
Name: 5977A
Setpoint Status: Pass

Date: December 13, 2023 3:32:46 PM
System ID: GM-7

Overall Log Amp Test Status

Pass

RFPA

Tested Combination1 Front SSL / External SQ
Name: 5977A
Setpoint Status: Pass
Amu: 105Q m/z Drift After Five Minutes: RFPA Voltage:
2 mV 504 mV
Agilent Recommended: >= -100 and <= 100 <= 1100

Overall RFPA Test Status
Pass

Tune EI

Tested Combination1 Front SSL / External SQ
Name: 5977A
Setpoint Status: Pass
Filament: 1
Setpoint Status: Pass
Filament: 2

Overall Tune EI Test Status
Pass

Signal to Noise EI

Tested Combination1 Front SSL / External SQ
Name: 5977A

Date: December 13, 2023 3:32:46 PM
System ID: GM-7

Source: EI - Extractor Filament: 1
Setpoint Status: Pass
Signal to Noise: 11318
Agilent Recommended: >= 1200
Source: EI - Extractor Filament: 2
Setpoint Status: Pass
Signal to Noise: 16588
Agilent Recommended: >= 1200

Overall Signal to Noise EI Test Status
Pass

NOTE: This test's 0 comment(s) and 6 deviation(s) are available in the Attachments section.

Date: December 13, 2023 3:32:46 PM
System ID: GM-7

Instrument Details

Purpose

This section describes the as found system configuration.

Details

System

System ID	GM-7
Manufacturer	Agilent Technologies
Name	7890

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

Mainframe 1

Manufacturer	Agilent Technologies
Name	7890
Model Number	G3442B
Serial Number	CN14133181
Firmware Revision	B.02.03
Oven Type	Standard

Date: December 13, 2023 3:32:46 PM
System ID: GM-7

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	SiQ
Name	5977A
Serial Number	US1415M209
Firmware Revision	5977.6.00.21
High Vacuum System	Turbo Pump
Scouting Run Standard	QFN Std

MS EI Source 1

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

Date: December 13, 2023 3:32:46 PM
System ID: GM-7

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:	Supasek Nimsongtham
Logged On User Name:	supasak.nimsongtham@agilent.com
Signature Creation Date:	December 13, 2023
Reason for Signature:	Executed protocol and published this original version of document

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Date: December 13, 2023 3:32:46 PM
System ID: GM-7

User Name: supasak.nimsongtham

Report Generated by Hostname: ASB0KXW492

System ID: GM-7

Print Date: December 13, 2023 3:32:47 PM

GM-7-2023 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
December 13, 2023 10:22:24 AM	Audit	SessionCreated	Session	None
December 13, 2023 10:22:24 AM	Start	Configuration	Session	None
December 13, 2023 10:22:24 AM	Audit	Entitlement	Locking	User is FieldEngineer and does not require an unlock code
December 13, 2023 10:23:53 AM	Audit	ExpLoaded	Session	EQP details for primary technique [GC] - File path: [ProtocolPacks\Go\Configure\02.50\Go-02.50.aeq], EQP File Name: [Go-02.50.aeq], EQP Name: [AgilentRecommended\ProtocolRevision-[Go-02.50]] EQP details for hyphenated technique [GoMs] - File path: [ProtocolPacks\GoMs\Configure\02.50\GoMs-02.50.aeq], EQP File Name: [GoMs-02.50.aeq], EQP Name: [AgilentRecommended]
December 13, 2023 10:23:56 AM	End	Configuration	Session	None
December 13, 2023 10:23:59 AM	Start	Qualification	Session	OQ
December 13, 2023 10:23:59 AM	Start	Execution	System Inspection and Basic Safety and Operations - 7890 - Qualitative Test - No septum associated	None

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Date: December 13, 2023 3:32:46 PM
System ID: GM-7

User Name: supasak.nimsongtham

Report Generated by Hostname: ASBKKW0492

System Id: GM-7

Print Date: December 13, 2023 3:32:47 PM

GM-7-2023 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
December 13, 2023 10:24:10 AM	End	Execution	System Inspection and Basic Safety and Operation - 7890 - Qualitative Test - No setpoints associated	Run Count : 1
December 13, 2023 10:24:11 AM	Start	Execution	Intel Pressure Accuracy - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
December 13, 2023 10:24:15 AM	End	Execution	Intel Pressure Accuracy - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count : 1
December 13, 2023 10:24:17 AM	Start	Execution	GC Oven Temperature Accuracy - 7890 - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
December 13, 2023 10:32:09 AM	Audit	Data	GC Oven Temperature Accuracy - 7890 - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
December 13, 2023 10:32:11 AM	End	Execution	GC Oven Temperature Accuracy - 7890 - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1
December 13, 2023 10:32:12 AM	Start	Execution	GC Oven Temperature Accuracy - 7890 - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
December 13, 2023 10:34:58 AM	Audit	Data	GC Oven Temperature Accuracy - 7890 - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
December 13, 2023 10:34:59 AM	End	Execution	GC Oven Temperature Accuracy - 7890 - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1

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Date: December 13, 2023 3:32:46 PM
System ID: GM-7

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User Name: supasak.nimsongtham

Report Generated by Hostname: ASBKKW0492

System Id: GM-7

Print Date: December 13, 2023 3:32:47 PM

GM-7-2023 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
December 13, 2023 10:35:00 AM	Start	Execution	GC Oven Temperature Stability - 7890 - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	None
December 13, 2023 10:35:27 AM	Start	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 1 - L: >= 1200	None
December 13, 2023 10:35:39 AM	Start	Execution	GC Oven Temperature Stability - 7890 - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	None
December 13, 2023 10:55:10 AM	Audit	Data	GC Oven Temperature Stability - 7890 - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Manual Data Entry
December 13, 2023 10:55:12 AM	End	Execution	GC Oven Temperature Stability - 7890 - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Run Count : 1
December 13, 2023 10:55:13 AM	Start	Execution	Log Amp - 5977A SQ - Source: None EI - Extractor	None
December 13, 2023 10:56:42 AM	End	Execution	Log Amp - 5977A SQ - Source: None EI - Extractor	Run Count : 1
December 13, 2023 10:56:43 AM	Start	Execution	RPPA - 5977A SQ - Source: EI - Extractor	None
December 13, 2023 11:04:44 AM	End	Execution	RPPA - 5977A SQ - Source: EI - Extractor	Run Count : 1
December 13, 2023 11:04:45 AM	Start	Execution	Tune EI - 5977A SQ - Source: None EI - Extractor Filament 1 (Qualitative - No setpoints associated)	None
December 13, 2023 11:32:36 AM	End	Execution	Tune EI - 5977A SQ - Source: None EI - Extractor Filament 1 (Qualitative - No setpoints associated)	Run Count : 1

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Date: December 13, 2023 3:32:46 PM
System ID: GM-7

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User Name: supasak.nimsongtham

Report Generated by Hostname: ASBKKW0492

System Id: GM-7

Print Date: December 13, 2023 3:32:47 PM

GM-7-2023 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
December 13, 2023 11:32:38 AM	Start	Execution	Tune EI - 5977A SQ - Source: None EI - Extractor Filament 2 (Qualitative - No setpoints associated)	None
December 13, 2023 11:33:06 AM	Start	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 1 - L: >= 1200	None
December 13, 2023 11:49:58 AM	Start	Execution	Tune EI - 5977A SQ - Source: None EI - Extractor Filament 2 (Qualitative - No setpoints associated)	None
December 13, 2023 11:49:42 AM	End	Execution	Tune EI - 5977A SQ - Source: None EI - Extractor Filament 2 (Qualitative - No setpoints associated)	Run Count : 1
December 13, 2023 11:49:43 AM	Start	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 1 - L: >= 1200	None
December 13, 2023 11:49:49 AM	Audit	AcqClosed	Session	None
December 13, 2023 12:30:39 PM	Audit	AcqRestarted	Session	None
December 13, 2023 12:30:40 PM	Audit	SessionRelatched	Session	None
December 13, 2023 12:36:42 PM	Start	Qualification	Session	OQ
December 13, 2023 12:36:42 PM	Start	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 1 - L: >= 1200	None

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Date: December 13, 2023 3:32:46 PM
System ID: GM-7

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User Name: supasak.nimsongtham

Report Generated by Hostname: ASBKKW0492

System Id: GM-7

Print Date: December 13, 2023 3:32:47 PM

GM-7-2023 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
December 13, 2023 12:37:33 PM	Audit	Data	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 1 - L: >= 1200	Data File Path : D:\MassHunter\GCMS\1\data IQ02023ISN_F1.D
December 13, 2023 12:38:16 PM	End	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 1 - L: >= 1200	Run Count : 1
December 13, 2023 12:39:51 PM	Audit	TestUnlocked	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 1 - L: >= 1200	Deviation Start for Run Count : 1
December 13, 2023 12:39:51 PM	Start	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 1 - L: >= 1200	None
December 13, 2023 12:40:19 PM	Audit	Data	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 1 - L: >= 1200	Data File Path : D:\MassHunter\GCMS\1\data IQ02023ISN_F1.D
December 13, 2023 12:42:00 PM	End	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 1 - L: >= 1200	Run Count : 2
December 13, 2023 12:42:05 PM	Start	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 2 - L: >= 1200	None
December 13, 2023 12:42:47 PM	Audit	Data	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 2 - L: >= 1200	Data File Path : D:\MassHunter\GCMS\1\data IQ02023ISN_F2.D

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Date: December 13, 2023 3:32:46 PM
System ID: GM-7

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User Name: supasak.nimsongtham
Report Generated by Hostname: ASBKKW492
System ID: GM-7
Print Date: December 13, 2023 3:32:47 PM

GM-7-2023 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
December 13, 2023 12:43:54 PM	End	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 2 - L >= 1200	Run Count : 1
December 13, 2023 1:54:41 PM	Audit	TestUnlocked	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 1 - L >= 1200	Deviation Bed for Run Count : 2
December 13, 2023 1:54:41 PM	Start	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 1 - L >= 1200	None
December 13, 2023 1:54:50 PM	Audit	Data	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 1 - L >= 1200	Data files Path : D:\MassHunter\GCMS1\data\VOQ2023\SN_F1.D
December 13, 2023 1:55:22 PM	End	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 1 - L >= 1200	Run Count : 3
December 13, 2023 1:55:50 PM	Audit	TestUnlocked	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 1 - L >= 1200	Deviation Bed for Run Count : 3
December 13, 2023 1:56:50 PM	Start	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 1 - L >= 1200	None
December 13, 2023 2:14:32 PM	Audit	Data	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 1 - L >= 1200	Data files Path : D:\MassHunter\GCMS1\data\VOQ2023\SN_F1.D

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Date: December 13, 2023 3:32:46 PM
System ID: GM-7

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User Name: supasak.nimsongtham
Report Generated by Hostname: ASBKKW492
System ID: GM-7
Print Date: December 13, 2023 3:32:47 PM

GM-7-2023 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
December 13, 2023 2:15:03 PM	End	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 1 - L >= 1200	Run Count : 4
December 13, 2023 2:25:07 PM	Audit	TestUnlocked	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 2 - L >= 1200	Deviation Bed for Run Count : 1
December 13, 2023 2:25:07 PM	Start	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 2 - L >= 1200	None
December 13, 2023 2:25:20 PM	Audit	Data	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 2 - L >= 1200	Data files Path : D:\MassHunter\GCMS1\data\VOQ2023\SN_F2.D
December 13, 2023 2:25:41 PM	End	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 2 - L >= 1200	Run Count : 2
December 13, 2023 2:26:51 PM	Audit	TestUnlocked	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 2 - L >= 1200	Deviation Bed for Run Count : 2
December 13, 2023 2:26:51 PM	Start	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 2 - L >= 1200	None
December 13, 2023 2:27:01 PM	Audit	Data	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 2 - L >= 1200	Data files Path : D:\MassHunter\GCMS1\data\VOQ2023\SN_F2.D

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Date: December 13, 2023 3:32:46 PM
System ID: GM-7

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User Name: supasak.nimsongtham
Report Generated by Hostname: ASBKKW492
System ID: GM-7
Print Date: December 13, 2023 3:32:47 PM

GM-7-2023 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
December 13, 2023 2:27:42 PM	End	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 2 - L >= 1200	Run Count : 3
December 13, 2023 2:29:14 PM	Audit	TestUnlocked	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 2 - L >= 1200	Deviation Bed for Run Count : 3
December 13, 2023 2:29:14 PM	Start	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 2 - L >= 1200	None
December 13, 2023 2:34:02 PM	Start	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 2 - L >= 1200	None
December 13, 2023 2:41:28 PM	Start	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 2 - L >= 1200	None
December 13, 2023 2:42:42 PM	Audit	Data	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 2 - L >= 1200	Data files Path : D:\MassHunter\GCMS1\data\VOQ2023\SN_F2_001.D
December 13, 2023 2:44:32 PM	End	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 2 - L >= 1200	Run Count : 4
December 13, 2023 2:44:56 PM	End	Qualification	Session	DQ
December 13, 2023 2:44:56 PM	Start	Reporting	Session	None

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Date: December 13, 2023 3:32:46 PM
System ID: GM-7

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User Name: supasak.nimsongtham
Report Generated by Hostname: ASBKKW492
System ID: GM-7
Print Date: December 13, 2023 3:32:47 PM

GM-7-2023 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
December 13, 2023 3:01:22 PM	Audit	AcqClosed	Session	None
December 13, 2023 3:29:10 PM	Audit	AcqRestarted	Session	None
December 13, 2023 3:29:10 PM	Audit	SessionReattached	Session	None
December 13, 2023 3:29:13 PM	Start	Qualification	Session	DQ
December 13, 2023 3:31:33 PM	Audit	Reporting	Session	Report Generated : Certificate
December 13, 2023 3:32:15 PM	Audit	Reporting	Session	Report Generated : Report

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Date: December 13, 2023 3:32:46 PM
System ID: GM-7

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL: 0-2711-3000-29 FAX: 0-2716-9488



Cert.No.: 23CHO662
Page: 1 of 3

Certificate of Calibration

Equipment : Spectrophotometer

Manufacturer : HACH

Model : DR3900

Serial No. : 2021559

ID No. : BKK_EN0358

Condition As-Received: Used Item

Received Date : 09 November 2023

Calibration Date : 09 November 2023

Reference : 2311-00540G-1

Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand

Calibration Place : Wet Chemistry Lab 2

Ambient Temperature : (22.7 ~ 22.5) °C (On-Site)

Relative Humidity : (63.7 ~ 62.6) % (On-Site)

Calibration Procedure : In-house method :
CP-0CH4 based on ASTM E 275-01

Calibrated by : Kunchit Promprat

Approved by :

(✓) Sathip Meangmai
() Warakorn Lomgagrakul
() Ponpan Paipim

Issue Date : 15 November 2023

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced in whole or in part, except with prior written
approval of the head of Corporate Services 1 : Equipment Calibration and Testing Services

A 0060698



Cert. No. : 23CHO662

Page : 2 of 3

Condition of calibration result

1. Reference Standard Material :

Material	Serial No.	Certificate No.	Due date
1. Absorbance Standard set	8331	105939	28 Sep 2024
2. Wavelength Standard set	36730	98330	19 Jan 2024
3. Wavelength Standard set	36730	98331	19 Jan 2024

2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certificate is traceable to the International System of Unit maintained through :
- Starna Scientific Ltd.

4. Spectral Bandwidth : 5 nm
Scan Speed : - nm/min

Calibration Results : without adjustment

Wavelength Accuracy

Certified Values of Reference Material (nm)	UUC Reading (nm)	Uncertainty of Measurement (± nm)	Coverage Factor k
418.40	418	0.59	2.00
479.88	480	0.59	2.00
513.75	513	0.59	2.00
537.00	536	0.59	2.00
638.00	638	0.59	2.00
747.61	748	0.59	2.00
807.04	807	0.59	2.00

Sathip

a 1189959



Cert. No. : 23CHO662

Page : 3 of 3

Calibration Results : without adjustment

Photometric Accuracy

Wavelength (nm)	Certified Values of Reference Material (Abs)	UUC Reading (Abs)	Uncertainty of Measurement (± Abs)	Coverage Factor k
420.0	Zero 0.5712 0.7510 1.0893	0.000 0.572 0.752 1.090	0.0028 0.0031 0.0031 0.0033	2.00 2.00 2.00 2.00
440.0	Zero 0.5607 0.7336 1.0636	0.000 0.561 0.733 1.063	0.0028 0.0030 0.0030 0.0030	2.00 2.00 2.00 2.00
485.0	Zero 0.5111 0.6768 0.9802	0.000 0.514 0.679 0.984	0.0028 0.0029 0.0029 0.0029	2.00 2.00 2.00 2.00
546.1	Zero 0.5224 0.8856 0.9937	0.000 0.524 0.886 0.995	0.0028 0.0028 0.0029 0.0028	2.00 2.00 2.00 2.00
590.0	Zero 0.5542 0.7155 1.0366	0.000 0.554 0.714 1.035	0.0028 0.0028 0.0029 0.0028	2.00 2.00 2.00 2.00
635.0	Zero 0.5397 0.6832 0.9886	0.000 0.539 0.682 0.988	0.0028 0.0029 0.0028 0.0028	2.00 2.00 2.00 2.00

Remark

- Each individual filter is measured against the empty filter holder (blank) used to zero the spectrophotometer

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-

Sathip

a 1189958

Sartorius (Thailand) Co., Ltd.
329 Rama 9 Road, Huaykwang, Huaykwang, Bangkok 10320
Tel : +66 2643 8811-6, e-mail : service.thailand@sartorius.com



SARTORIUS

Certificate of Calibration

Model Number : MSE224S-100-DU
Description : Analytical Balance
Serial Number : 0077405555
ID No. : BKK_EN0003
Manufacturer : Sartorius
Certificate No. : 24BC0270
Issued Date : Monday, August 05, 2024
Reference No. : 240942
Page No. : 1 of 2

Customer Name : ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250

Calibrated Place : Lab Room

Calibrated By : Mr. Chuchit Inthra

Calibration Date : Friday, August 02, 2024

Calibration Procedure No. : This calibration was conducted by
Using in-house calibration procedure number (WI-003)
Based on UKAS LAB 14 : 2019

Metrological data :

Capacity : 220 g Repeatability : 0.0001 g
Temperature : 23.0 °C ± 0.0 °C
Humidity : 55.0 % RH ± 10.0 % RH
Pressure : ±

Reasons for calibration

☐ New installation ☒ Service / Repair ☒ Recalibration / Maintenance

Equipment Condition : ☒ Good Operation ☐ Fail

Measurement Method UKAS Publication Ref : Lab 14

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). The calibration certificate documents the traceability to National Standards, which realise the unit of measurement according to the International Standard System of Units (SI). Report of Tolerance came from list of Sartorius Metrological Specifications.

Traceability:

Model Number	Description	Traceability	Certificate No.	Due Date
YC5011-522-00	Sartorius weight set 100g - 8000g 12/YS011-522-00	YES	M23081975	23-Aug-2026
Testo 174 H	Thermo-Hygrometer, Testo 174H	ENTECH	11/T 661303/H081140	12-Nov-2024

This certificate entitles and apply this equipment only.

This certificate may not be reproduced other than in full except with the
prior written approval of the Verification Operation Division Sartorius
(Thailand) Co., Ltd.

Signature
Mr. Chuchit Inthra (Technical Manager)



SOP FM 33 (3) February 2022

Certificate

of Calibration

Model Number : MSE224S-100-DU
Description : Analytical Balance
Serial Number : 0027405555
ID No. : BKK_EN0003
Manufacturer : Sartorius

Certificate No. : 248C10270
Issued Date : Monday, August 05, 2024
Reference No. : 240942
Page No. : 2 of 2

Calibration Results : Without Adjustment

Repeatability

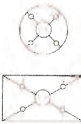
The reproducibility is the ability of a weighing instrument to display nearly identical results under constant test conditions when the same load within a measurement series is placed repeatedly on the weighing pan in the same manner. The standard deviation is used to express reproducibility.

Nominal Value : (Low Load)	20.0000	200.0000
20 g	20.0000	199.9999
Tolerance	20.0001	200.0000
0.0001 g	20.0000	200.0000
	20.0000	200.0000
	20.0000	200.0000
	20.0000	200.0000
Nominal Value : (High Load)	200.0000	200.0000
200 g	200.0001	200.0001
Tolerance	200.0000	200.0000
0.0001 g	200.0000	199.9999
	200.0000	200.0000
Standard Deviation	0.00004	0.00006

Eccentricity (Off-center loading error)

The off-center loading error is yielded by the difference between the readout of the load, i.e. 1/3 or 1/4 of maximum capacity, placed in the middle of the weighing pan and between each of four additional measurement points (positions defined according to OIML R110).

Nominal value : 100 g
Tolerance 0.0004 g



Difference	
1	-
2	0.0000
3	0.0000
4	0.0000
5	0.0001
6	-

Linearity

The linearity, also called linearity error. Describes the deviation of the characteristic curve of a weighing instrument from the linear slope.

Tolerance 0.0002 g

Nominal Value (g)	Conventional Mass Value (g)	Displayed Value (g)	Deviation (g)	Uncertainty (g)
0.01	0.0100	0.0100	0.0000	0.00015
0.1	0.1000	0.1000	0.0000	0.00015
1	1.0000	1.0000	0.0000	0.00015
2	2.0000	2.0000	0.0000	0.00015
5	5.0000	5.0000	0.0000	0.00015
10	10.0000	10.0000	0.0000	0.00015
20	20.0000	20.0000	0.0000	0.00015
50	50.0000	50.0001	0.0001	0.00016
100	100.0000	100.0001	0.0001	0.00019
200	200.0000	200.0000	0.0000	0.00029

End of Report.