

ภาคผนวกที่ 4

เอกสารสอบเทียบความถูกต้องของเครื่องมือตรวจวัดคุณภาพสิ่งแวดล้อม

ลำดับที่ 1	คุณภาพอากาศในบรรยากาศ
ลำดับที่ 2	คุณภาพอากาศในสถานประกอบการ
ลำดับที่ 3	ระดับเสียงในบรรยากาศโดยทั่วไป
ลำดับที่ 4	ระดับเสียงในสถานประกอบการ
ลำดับที่ 5	คุณภาพน้ำทิ้ง
ลำดับที่ 6	คุณภาพน้ำทะเลชายฝั่ง

**ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม**

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
1. คุณภาพอากาศในบรรยากาศ		
Total Hydrocarbons	-	THC Analyzer No. R02
Methane Hydrocarbons	-	THC Analyzer No. R02
Non-Methane Hydrocarbons	-	THC Analyzer No. R02
Benzene	Mass flow meter	GC/MS
1,3-Butadiene	Mass flow meter	GC/MS
Acrylonitrile	Mass flow meter	GC/MS
2. คุณภาพอากาศในสถานประกอบการ		
Total Hydrocarbons	-	THC Analyzer No. R02
Methane Hydrocarbons	-	THC Analyzer No. R02
Non-Methane Hydrocarbons	-	THC Analyzer No. R02
Benzene	Mass flow meter	GC/MS
1,3-Butadiene	Mass flow meter	GC/MS
Acrylonitrile	Mass flow meter	GC/MS
3. ระดับเสียงในบรรยากาศโดยทั่วไป Leq 24 hrs.	Acoustic Calibrator Sound Level Meter No. ACO-R11, R14, R15, R34	-
4. ระดับเสียงในสถานประกอบการ Leq 8 hrs., Leq 12 hrs.	Acoustic Calibrator Sound Level Meter No. ACO-R12, R13, R15, R17, R18, R19, R20, R21, R22, R23, R25, R28, R32, R33, R34, R35, R37, R42, R44, R46, R47, R48	-
5. คุณภาพน้ำทิ้ง		
pH	-	pH Meter
Total Suspended Solids	-	Digital Balance
Total Dissolved Solids	-	Digital Balance
BOD ₅	-	BOD Analyzer
COD	-	COD Reactor
Grease & Oil	-	Digital Balance
Nitrate	-	Spectrophotometer
Phosphate-Phosphorus	-	Spectrophotometer

ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม (ต่อ)

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
6. คุณภาพน้ำทะเลชายฝั่ง		
pH	-	pH Meter
Turbidity	-	Turbid Meter
Total Suspended Solids	-	Digital Balance
Total Dissolved Solids	-	Digital Balance
BOD ₅	-	BOD Analyzer
COD	-	COD Reactor
Grease & Oil	-	Digital Balance
Nitrate	-	Spectrophotometer
Phosphate-Phosphorus	-	Spectrophotometer

ลำดับที่ 1

คุณภาพอากาศในบรรยากาศ



Certificate of Calibration

Certificate Number : SPR23050422-1

Page : 1 of 3

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

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

Equipment Name : Mass Flow Meter

Manufacturer : Dwyer

Model : GMF-2101

Serial Number : N/A

ID. Number : MF01/51

Environmental Conditions

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

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

Location of Calibration : In-Lab

Calibration Procedure : SP-CPM-04-13

Received Date : 26 May 2023

Calibration Date : 29 May 2023

Recommend Due Date : 29 May 2024

Date of Issue : 30 May 2023

Method of Calibration

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

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

Calibrated by : Mr.Jirasak Pumbut

Calibration Officer

Approved by :





Calibration Report

Certificate Number : SPR23050422-1

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Mass Flow Calibrator	AFC-COMPLETE-10	12532	AD2207-177-0001	17 Jul 2023
Standard Flow Meter	520-H	200353	MW-0071-22	25 Aug 2023

Traceability

This certification is traceable to the International System of Unit maintained at :
MIT - Miracle International Technology Co.,Ltd.
MesaLabs - Mesa Laboratories, Inc.NVLEP Lab Code 200661-0 (ISO17025)

69/29 Moo 1 Klongsi Klonguang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 คู่มือการใช้งานเครื่องมือวัด.com



Result of Calibration

Certificate No. : SPR23050422-1

Page : 3 of 3

Function : Air Flow Measurement

Unit : mL/min

Calibration Point	UUC Reading	Standard Reading	UUC Error	K Factor Value	Uncertainty (±)
0.0	0.00	0.00	0.00	1.00000	0.12
3.3	3.42	3.59	-0.17	1.04971	0.26
7.3	7.52	7.78	-0.26	1.03457	0.26
13.5	13.83	14.34	-0.51	1.03688	0.26
17.0	17.12	17.65	-0.53	1.03096	0.26

Note:

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

Measurement Uncertainty

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

- End of Certificate -



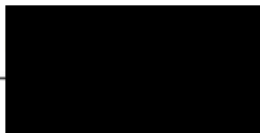
บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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

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

Calibration Report Total Hydrocarbon Analyzer			
Date :	05 July 2023	Brand :	HORIBA
No.	R02	Model :	APHA-370
		Serial No.	6F3AC3V4
Calibrator (Dilution System)			
Brand :	API	Model :	700
Last Cal. Date :	04 August 2022	Serial No. :	911
Reference Standard Gas			
Standard Gas :	Methane (CH ₄)	Cylinder No. :	D612165
Certified Date :	25 February 2023	Expired Date :	25 February 2031
		Cylinder Conc. :	453 ppm
Calibrating Condition			
Pressure	1011 mmbar	Temp.	24.6 °C
		% RH	49
		Start Time :	9:00 AM
Pre-Calibration Checks			
Change Particulate Filter	Yes	Station Temp :	25.0 °C
Leak Test	Yes		
Calibration Setting			
Span Set Point	Initial Reading (Before Adj)		Final Reading (After Adj)
	Expected Concentration (PPM)	Analyzer Response (PPM)	Analyzer Response (PPM)
Zero	0	0.10	0
Span	10	10.02	10
Calibration Setting (Final)			
Span Instrument Gain:	0.999	Finish Time:	10:00 AM
APHA-360 Total Hydrocarbon Analyzer			
Test Values	Observed Value	Units	Nominal Range
Signal (CH ₄)	912.4	mV	800-1,350
Signal (THC)	916.9	mV	800-1,350
Detector	78.0	kPa	((Pressure Air/1013)x100)-20 ± 4 kPa
Purifier	19.1	kPa	8 - 25
NMC	259.6	°C	260 ± 10
Bypass	0.9	L / min	0.9 ± 0.3
Over Flow	0.8	L / Min	0.8

Calibrated by :



Approved by :



Certificate of System Qualification

GC-OQ + GCMS-OQ

System ID: GC_MS_03_52_CN10925102
Organization Name: S.P.S Consulting service
Organization Location: 7 Sol Phaholyothin Road, Ladyao, Khet Jatujak, Bangkok 10900

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

System Inspection and Basic Safety and Operation

Name: 7890

Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressure Decay

Name: 7890

Front

SSL

Setpoint Status: Pass

Pressure: 25.0 psi

Pressure Change: -0.1 psi /5 minutes

Agilent Recommended: ≥ -2.0 and ≤ 0.5

Overall Inlet Pressure Decay Test Status

Pass

Inlet Pressure Accuracy

Name: 7890

Front

SSL

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

Setpoint Status:

Pass

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

Overall Inlet Pressure Accuracy Test Status

Pass

Inlet Pressure Accuracy

Name:

7890

Back

SSL

Setpoint Status:

Pass

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

Overall Inlet Pressure Accuracy Test Status

Pass

Detector Flow Accuracy

Name:

7890

Front

FID

Setpoint Status:

Pass

Flow Type:

Fuel

Setpoint:

30.0

mL/min

Measured Flow:

30.3

mL/min

Accuracy:

0.3

mL/min

Agilent Recommended:

<=

10.0

% setpoint

(

3.0

mL/min

)

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

Date:

March 31, 2023 1:21:52 PM

System ID:

GC_MS_03_52_CN10925102

Setpoint Status: Pass

Flow Type: Oxidizer

Setpoint: 400.0 mL/min **Measured Flow:** 396.2 mL/min

Accuracy: 3.8 mL/min

Agilent Recommended: <= 10.0 % setpoint (40.0 mL/min)

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

Setpoint Status: Pass

Flow Type: Makeup

Setpoint: 25.0 mL/min **Measured Flow:** 25.1 mL/min

Accuracy: 0.1 mL/min

Agilent Recommended: <= 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 StatusPass**GC Oven Temperature Accuracy**

Name: 7890

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual

Temperature: 230.0 230.6 °C

Accuracy: 0.6 °C

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

<= 1.0 % setpoint in K (5.0 °C)

Setpoint Status:

Pass

Zone:

Oven

Setpoint/Actual

Temperature:

100.0 100.4 °C

Accuracy:

0.4 °C

Agilent Recommended:

>= -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:

100.0 100.3833 °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

Manual Injection

Name:

Not applicable

Setpoint Status:

Completed

Injection Volume on Column:

1.0 µL

Overall Scouting Run Status

Completed

Noise and Drift

Tested Combination1

Front

SSL

/ Front

FID

Date:

March 31, 2023 1:21:52 PM

System ID:

GC_MS_03_52_CN10925102

Name: 7890

Setpoint Status: Pass

Base Signal: 89800 Ab

	ASTM Noise counts	Drift counts/Hr
Agilent Recommended:	285.31	96.04
Status:	\leq 768.00	\leq 19200.00
	Pass	Pass

Overall Noise and Drift Test Status

Pass

Signal to Noise

Tested Combination1 Front SSL / Front FID

Manual Injection

Name: 7890

Setpoint Status: Pass

Signal to Noise: 3814254

Agilent Recommended: \geq 300000

Overall Signal to Noise Test Status

Pass

Log Amp

Tested Combination2 Back SSL / External SQ

Name: 5975C

Setpoint Status: Pass

Overall Log Amp Test Status

Pass

RFPA

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

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

Overall RFP Test Status

Pass

Tune EI

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

Overall Tune EI Test Status

Pass

Signal to Noise EI

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

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

Source: El - Inert Filament: 2

Setpoint Status: Pass

Signal to Noise: 566

Agilent Recommended: >= 160

Overall Signal to Noise EI Test Status

Pass

Instrument Details

Purpose

This section describes the as found system configuration.

Details

System

System ID	GC_MS_03_52_CN10925102
Manufacturer	Agilent Technologies
Name	7890

Tested Combination1

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

Tested Combination2

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

Sampler 1

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

Sampler 2

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

Mainframe 1

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

Inlet 1

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

Inlet 2

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

Detector 1

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

Detector 2

Manufacturer	Agilent Technologies
Name	Mass Spectrometer
Type	Mass Spectrometer
Location	External

Mass Spectrometer 1

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

MS EI Source 1

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

Electronic Signature

Purpose

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

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User Name: saenguthai.tarak
 Hostname: LAPTOP-CQ38KOMV

System Id: GC_MS_03_52_CN10925102
 Print Date: March 31, 2023 1:21:53 PM

GC_MS_03_52_CN10925102 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
March 31, 2023 9:12:26 AM Audit		SessionCreated	Session	None
March 31, 2023 9:12:28 AM Start		Configuration	Session	None
March 31, 2023 9:12:26 AM Audit		Entitlement	Licensing	User is Nonpaying and does not require an unlock code
March 31, 2023 9:20:14 AM Audit		EqpLoaded	Session	EQP details for primary technique [Gc] - File path: [ProtocolPacks/Gc/Configurations/02.50/Gc.02.50.eqp], EQP File Name: [Gc.02.50.eqp], EQP Name: [AgilentRecommended], Protocol Revision :[Gc.02.50] EQP details for hyphenated technique [GcMs] - File path: [ProtocolPacks/GcMs/Configurations/02.50/GcMs.02.50.eqp], EQP File Name: [GcMs.02.50.eqp], EQP Name: [AgilentRecommended]
March 31, 2023 9:20:17 AM End		Configuration	Session	None
March 31, 2023 9:20:27 AM Start		Qualification	Session	OQ
March 31, 2023 9:20:27 AM Start		Execution	System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated	None
March 31, 2023 9:21:33 AM End		Execution	System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated	Run Count : 1

User Name: saenguthai.tarak
 Hostname: LAPTOP-QQ3SKOMV

System Id: GC_MS_03_52_CN10925102
 Print Date: March 31, 2023 1:21:53 PM

GC_MS_03_52_CN10925102 Transaction log :

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

User Name: saenguthai, tarak
 Hostname: LAPTOP-GQ3SKOMV

System Id: GC_MS_03_52_CN10925102
 Print Date: March 31, 2023 1:21:53 PM

GC_MS_03_52_CN10925102 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
March 31, 2023 9:22:42 AM	Start	Execution	Detector Flow Accuracy - Front FID: - Type : Makeup - S: 26.0 mL/min - L: <= 10.0% setpoint	None
March 31, 2023 9:22:48 AM	End	Execution	Detector Flow Accuracy - Front FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
March 31, 2023 9:22:49 AM	Start	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
March 31, 2023 9:23:31 AM	Audit	Data	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
March 31, 2023 9:23:34 AM	End	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1
March 31, 2023 9:23:37 AM	Start	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
March 31, 2023 9:26:00 AM	Audit	Data	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
March 31, 2023 9:26:03 AM	End	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1
March 31, 2023 9:26:05 AM	Start	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	None

User Name: saenguthai.tarak
 Hostname: LAPTOP-CQ39KOMV

System Id: GC_MS_03_52_CN10925102
 Print Date: March 31, 2023 1:21:53 PM

GC_MS_03_52_CN10925102 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
March 31, 2023 9:28:42 AM	Start	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	None
March 31, 2023 9:27:39 AM	Audit	Data	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Manual Data Entry
March 31, 2023 9:27:46 AM	End	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Run Count : 1
March 31, 2023 9:27:51 AM	Start	Execution	GC Scouting Run - Manual Injection, Front SSL, Front FID: - Part of System Preparation - No limits associated	None
March 31, 2023 9:54:35 AM	Start	Execution	Log Amp - 5975C SQ: - Source: - EI - Inert	None
March 31, 2023 9:55:59 AM	Start	Execution	RFPA - 5975C SQ: - Source: EI - Inert	None
March 31, 2023 10:23:19 AM	Start	Execution	Signal to Noise EI - Liquid Injection, Back SSL, SQ: - Source: EI - Inert using Filament 1 - L: >= 160	None
March 31, 2023 10:37:53 AM	Start	Execution	Tune EI - 5975C SQ: - Source: - EI - Inert Filament 1 (Qualitative - No setpoints associated)	None
March 31, 2023 10:38:04 AM	Start	Execution	Tune EI - 5975C SQ: - Source: - EI - Inert Filament 2 (Qualitative - No setpoints associated)	None
March 31, 2023 10:38:11 AM	Start	Execution	Tune EI - 5975C SQ: - Source: - EI - Inert Filament 1 (Qualitative - No setpoints associated)	None

User Name: saenguthai.tarak
 Hostname: LAPTOP-CQ3SKOMV

System Id: GC_MS_03_52_CN10925102
 Print Date: March 31, 2023 1:21:53 PM

GC_MS_03_52_CN10925102 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
March 31, 2023 10:38:14 AM	Start	Execution	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	None
March 31, 2023 10:38:17 AM	Start	Execution	GC Scouting Run - Manual Injection, Front SSL, Front FID: - Part of System Preparation - No limits associated	None
March 31, 2023 10:46:28 AM	Audit	Data	GC Scouting Run - Manual Injection, Front SSL, Front FID: - Part of System Preparation - No limits associated	Data files Path : F:\Data\SC_FID,D\FID1A.ch
March 31, 2023 10:47:01 AM	End	Execution	GC Scouting Run - Manual Injection, Front SSL, Front FID: - Part of System Preparation - No limits associated	Run Count : 1
March 31, 2023 10:58:27 AM	Start	Execution	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	None
March 31, 2023 10:58:52 AM	Audit	Data	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Data files Path : F:\Data\ND_FID,D\FID1A.ch
March 31, 2023 11:00:53 AM	End	Execution	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Run Count : 1
March 31, 2023 11:02:02 AM	Start	Execution	Signal to Noise - Manual Injection, Front SSL, Front FID: - Detector FID - L: >= 300000	None
March 31, 2023 11:14:32 AM	Audit	AppClosed	Session	None

User Name: seenguthal.tarak
 Hostname: LAPTOP-CQ3SKOMV

System Id: GC_MS_03_52_CN10925102
 Print Date: March 31, 2023 1:21:53 PM

GC_MS_03_52_CN10925102 Transaction log :

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

User Name: saenguthai.tarak
 Hostname: LAPTOP-CQ3SKOMV

System Id: GC_MS_03_52_CN10925102
 Print Date: March 31, 2023 1:21:53 PM

GC_MS_03_52_CN10925102 Transaction log :

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

User Name: saenguthai.tanak
Hostname: LAPTOP-CQ3SKQMV

System Id: GC_MS_03_52_CN10925102
Print Date: March 31, 2023 1:21:53 PM

GC_MS_03_52_CN10925102 Transaction log :

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

ลำดับที่ 2

คุณภาพอากาศในสถานประกอบการ



Certificate of Calibration

Certificate Number : SPR23050422-1

Page : 1 of 3

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

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

Equipment Name : Mass Flow Meter

Manufacturer : Dwyer

Model : GMF-2101

Serial Number : N/A

ID. Number : MF01/51

Environmental Conditions

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

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

Location of Calibration : In-Lab

Calibration Procedure : SP-CPM-04-13

Received Date : 26 May 2023

Calibration Date : 29 May 2023

Recommend Due Date : 29 May 2024

Date of Issue : 30 May 2023

Method of Calibration

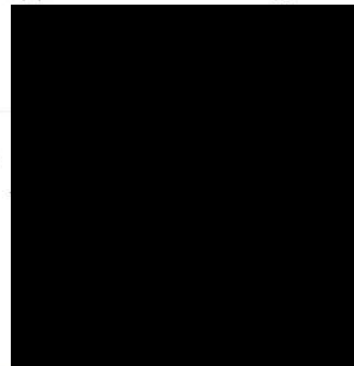
This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical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

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

Calibrated by : Mr.Jirasak Pumbut

Calibration Officer

Approved by :





Calibration Report

Certificate Number : SPR23050422-1

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Mass Flow Calibrator	AFC-COMPLETE-10	12532	AD2207-177-0001	17 Jul 2023
Standard Flow Meter	520-H	200353	MW-0071-22	25 Aug 2023

Traceability

This certification is traceable to the International System of Unit maintained at :
MIT - Miracle International Technology Co.,Ltd.
MesaLabs - Mesa Laboratories, Inc.NVLEP Lab Code 200661-0 (ISO17025)

69/29 Moo 1 Klongsi Klonguang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 คู่สาย www.spmetrology.com



Result of Calibration

Certificate No. : SPR23050422-1

Page : 3 of 3

Function : Air Flow Measurement

Unit : mL/min

Calibration Point	UUC Reading	Standard Reading	UUC Error	K Factor Value	Uncertainty (±)
0.0	0.00	0.00	0.00	1.00000	0.12
3.3	3.42	3.59	-0.17	1.04971	0.26
7.3	7.52	7.78	-0.26	1.03457	0.26
13.5	13.83	14.34	-0.51	1.03688	0.26
17.0	17.12	17.65	-0.53	1.03096	0.26

Note:

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

Measurement Uncertainty

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

- End of Certificate -



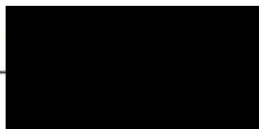
บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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

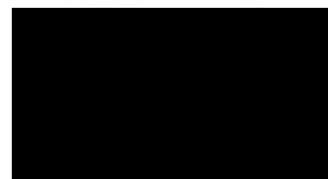
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจตุจักร เขตจตุจักร กรุงเทพฯ 10900
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

Calibration Report Total Hydrocarbon Analyzer			
Date :	05 July 2023	Brand :	HORIBA
		Model :	APHA-370
No.	R02	Serial No.	6F3AC3V4
Calibrator (Dilution System)			
Brand :	API	Model :	700
Last Cal. Date :	04 August 2022	Serial No. :	911
Reference Standard Gas			
Standard Gas :	Methane (CH ₄)	Cylinder No. :	D612165
Certified Date :	25 February 2023	Expired Date :	25 February 2031
		Cylinder Conc. :	453 ppm
Calibrating Condition			
Pressure	1011 mmbar	Temp.	24.6 °C
		% RH	49
		Start Time :	9:00 AM
Pre-Calibration Checks			
Change Particulate Filter	Yes	Station Temp :	25.0 °C
Leak Test	Yes		
Calibration Setting			
Span Set Point	Initial Reading (Before Adj)		Final Reading (After Adj)
	Expected Concentration (PPM)	Analyzer Response (PPM)	Analyzer Response (PPM)
Zero	0	0.10	0
Span	10	10.02	10
Calibration Setting (Final)			
Span Instrument Gain:	0.999	Finish Time:	10:00 AM
APHA-360 Total Hydrocarbon Analyzer			
Test Values	Observed Value	Units	Nominal Range
Signal (CH ₄)	912.4	mV	800-1,350
Signal (THC)	916.9	mV	800-1,350
Detector	78.0	kPa	((Pressure Air/1013)x100)-20 ± 4 kPa
Purifier	19.1	kPa	8 - 25
NMC	259.6	°C	260 ± 10
Bypass	0.9	L / min	0.9 ± 0.3
Over Flow	0.8	L / Min	0.8

Calibrated by :



Approved by :



Certificate of System Qualification

GC-OQ + GCMS-OQ

System ID: GC_MS_03_52_CN10925102
Organization Name: S.P.S Consulting service
Organization Location: 7 Sol Phaholyothin Road, Ladyao, Khet Jatujak, Bangkok 10900

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

System Inspection and Basic Safety and Operation

Name: 7890

Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressure Decay

Name: 7890

Front SSL

Setpoint Status: Pass

Pressure: 25.0 psi

Pressure Change: -0.1 psi /5 minutes

Agilent Recommended: ≥ -2.0 and ≤ 0.5

Overall Inlet Pressure Decay Test Status

Pass

Inlet Pressure Accuracy

Name: 7890

Front SSL

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

Setpoint Status:

Pass

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

Overall Inlet Pressure Accuracy Test Status

Pass

Inlet Pressure Accuracy

Name:

7890

Back

SSL

Setpoint Status:

Pass

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

Overall Inlet Pressure Accuracy Test Status

Pass

Detector Flow Accuracy

Name:

7890

Front

FID

Setpoint Status:

Pass

Flow Type:

Fuel

Setpoint:

30.0

mL/min

Measured Flow:

30.3

mL/min

Accuracy:

0.3

mL/min

Agilent Recommended:

<=

10.0

% setpoint

(

3.0

mL/min

)

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

Date:

March 31, 2023 1:21:52 PM

System ID:

GC_MS_03_52_CN10925102

Setpoint Status: Pass

Flow Type: Oxidizer

Setpoint: 400.0 mL/min **Measured Flow:** 396.2 mL/min

Accuracy: 3.8 mL/min

Agilent Recommended: ≤ 10.0 % setpoint (40.0 mL/min)

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

Setpoint Status: Pass

Flow Type: Makeup

Setpoint: 25.0 mL/min **Measured Flow:** 25.1 mL/min

Accuracy: 0.1 mL/min

Agilent Recommended: ≤ 10.0 % setpoint (2.5 mL/min)

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

Overall Detector Flow Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name: 7890

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual

Temperature: 230.0 230.6 °C

Accuracy: 0.6 °C

Agilent Recommended: ≥ -1.0 % setpoint in K (-5.0 °C)
≤ 1.0 % setpoint in K (5.0 °C)

Setpoint Status:

Pass

Zone:

Oven

Setpoint/Actual

Temperature:

100.0 100.4 °C

Accuracy:

0.4 °C

Agilent Recommended:

>= -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:

100.0 100.3833 °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

Manual Injection

Name:

Not applicable

Setpoint Status:

Completed

Injection Volume on Column:

1.0 µL

Overall Scouting Run Status

Completed

Noise and Drift

Tested Combination1

Front

SSL

/ Front

FID

Date:

March 31, 2023 1:21:52 PM

System ID:

GC_MS_03_52_CN10925102

Name: 7890

Setpoint Status: Pass

Base Signal: 89800 Ab

ASTM Noise

counts

285.31

Drift

counts/Hr

96.04

Agilent Recommended:

<= 768.00

<= 18200.00

Status: Pass Pass

Overall Noise and Drift Test Status

Pass

Signal to Noise

Tested Combination1 Front SSL / Front FID

Manual Injection

Name: 7890

Setpoint Status: Pass

Signal to Noise: 3814254

Agilent Recommended: >= 300000

Overall Signal to Noise Test Status

Pass

Log Amp

Tested Combination2 Back SSL / External SQ

Name: 5975C

Setpoint Status: Pass

Overall Log Amp Test Status

Pass

RFPA

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

Tested Combination2

Back

SSL

/ External

SQ

Name:

5975C

Setpoint Status:

Pass

Amu:

1050

m/z

Drift After Five Minutes:

1

mV

RFPA Voltage:

479

mV

Agilent Recommended:

>=

-100

and

<=

100

<=

1100

Overall RFPA Test Status

Pass

Tune EI

Tested Combination2

Back

SSL

/ External

SQ

Name:

5975C

Setpoint Status:

Pass

Filament:

1

Setpoint Status:

Pass

Filament:

2

Overall Tune EI Test Status

Pass

Signal to Noise EI

Tested Combination2

Back

SSL

/ External

SQ

Name:

5975C

Source:

EI - Inert

Filament:

1

Setpoint Status:

Pass

Signal to Noise:

425

Agilent Recommended:

>=

160

Date:

March 31, 2023 1:21:52 PM

System ID:

GC_MS_03_52_CN10925102

Source: El - Inert Filament: 2

Setpoint Status: Pass

Signal to Noise: 566

Agilent Recommended: >= 160

Overall Signal to Noise EI Test Status

Pass

Instrument Details

Purpose

This section describes the as found system configuration.

Details

System

System ID	GC_MS_03_52_CN10925102
Manufacturer	Agilent Technologies
Name	7890

Tested Combination1

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

Tested Combination2

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

Sampler 1

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

Sampler 2

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

Mainframe 1

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

Inlet 1

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

Inlet 2

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

Detector 1

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

Detector 2

Manufacturer	Agilent Technologies
Name	Mass Spectrometer
Type	Mass Spectrometer
Location	External

Mass Spectrometer 1

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

MS EI Source 1

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

Electronic Signature

Purpose

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

Regulatory Disclaimer

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User Name: saenguthai.tarak
 Hostname: LAPTOP-CQ38KOMV

System Id: GC_MS_03_52_CN10925102
 Print Date: March 31, 2023 1:21:53 PM

GC_MS_03_52_CN10925102 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
March 31, 2023 9:12:26 AM Audit		SessionCreated	Session	None
March 31, 2023 9:12:28 AM Start		Configuration	Session	None
March 31, 2023 9:12:26 AM Audit		Entitlement	Licensing	User is Nonpaying and does not require an unlock code
March 31, 2023 9:20:14 AM Audit		EqpLoaded	Session	EQP details for primary technique [Gc] - File path: [ProtocolPacks/Gc/Configurations/02.50/Gc.02.50.eqp], EQP File Name: [Gc.02.50.eqp], EQP Name: [AgilentRecommended], Protocol Revision :[Gc.02.50] EQP details for hyphenated technique [GcMs] - File path: [ProtocolPacks/GcMs/Configurations/02.50/GcMs.02.50.eqp], EQP File Name: [GcMs.02.50.eqp], EQP Name: [AgilentRecommended]
March 31, 2023 9:20:17 AM End		Configuration	Session	None
March 31, 2023 9:20:27 AM Start		Qualification	Session	OQ
March 31, 2023 9:20:27 AM Start		Execution	System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated	None
March 31, 2023 9:21:33 AM End		Execution	System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated	Run Count : 1

User Name: saenguthai.tarak
 Hostname: LAPTOP-QQ3SKOMV

System Id: GC_MS_03_52_CN10925102
 Print Date: March 31, 2023 1:21:53 PM

GC_MS_03_52_CN10925102 Transaction log :

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

User Name: saenguthai, tarak
 Hostname: LAPTOP-GQ3SKOMV

System Id: GC_MS_03_52_CN10925102
 Print Date: March 31, 2023 1:21:53 PM

GC_MS_03_52_CN10925102 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
March 31, 2023 9:22:42 AM	Start	Execution	Detector Flow Accuracy - Front FID: - Type : Makeup - S: 26.0 mL/min - L: <= 10.0% setpoint	None
March 31, 2023 9:22:48 AM	End	Execution	Detector Flow Accuracy - Front FID: - Type : Makeup - S: 26.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
March 31, 2023 9:22:49 AM	Start	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
March 31, 2023 9:23:31 AM	Audit	Data	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
March 31, 2023 9:23:34 AM	End	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1
March 31, 2023 9:23:37 AM	Start	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
March 31, 2023 9:26:00 AM	Audit	Data	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
March 31, 2023 9:26:03 AM	End	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1
March 31, 2023 9:26:05 AM	Start	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	None

User Name: saenguthai.tarak
 Hostname: LAPTOP-CQ39KOMV

System Id: GC_MS_03_52_CN10925102
 Print Date: March 31, 2023 1:21:53 PM

GC_MS_03_52_CN10925102 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
March 31, 2023 9:28:42 AM	Start	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	None
March 31, 2023 9:27:39 AM	Audit	Data	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Manual Data Entry
March 31, 2023 9:27:46 AM	End	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Run Count : 1
March 31, 2023 9:27:51 AM	Start	Execution	GC Scouting Run - Manual Injection, Front SSL, Front FID: - Part of System Preparation - No limits associated	None
March 31, 2023 9:54:35 AM	Start	Execution	Log Amp - 5975C SQ: - Source: EI - Inert	None
March 31, 2023 9:55:59 AM	Start	Execution	RFPA - 5975C SQ: - Source: EI - Inert	None
March 31, 2023 10:23:19 AM	Start	Execution	Signal to Noise EI - Liquid Injection, Back SSL, SQ: - Source: EI - Inert using Filament 1 - L: >= 160	None
March 31, 2023 10:37:53 AM	Start	Execution	Tune EI - 5975C SQ: - Source: - EI - Inert Filament 1 (Qualitative - No setpoints associated)	None
March 31, 2023 10:38:04 AM	Start	Execution	Tune EI - 5975C SQ: - Source: - EI - Inert Filament 2 (Qualitative - No setpoints associated)	None
March 31, 2023 10:38:11 AM	Start	Execution	Tune EI - 5975C SQ: - Source: - EI - Inert Filament 1 (Qualitative - No setpoints associated)	None

User Name: saenguthai.tarak
 Hostname: LAPTOP-CQ3SKOMV

System Id: GC_MS_03_52_CN10925102
 Print Date: March 31, 2023 1:21:53 PM

GC_MS_03_52_CN10925102 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
March 31, 2023 10:38:14 AM	Start	Execution	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	None
March 31, 2023 10:38:17 AM	Start	Execution	GC Scouting Run - Manual Injection, Front SSL, Front FID: - Part of System Preparation - No limits associated	None
March 31, 2023 10:46:28 AM	Audit	Data	GC Scouting Run - Manual Injection, Front SSL, Front FID: - Part of System Preparation - No limits associated	Data files Path : F:\Data\SC_FID,D\FID1A.ch
March 31, 2023 10:47:01 AM	End	Execution	GC Scouting Run - Manual Injection, Front SSL, Front FID: - Part of System Preparation - No limits associated	Run Count : 1
March 31, 2023 10:58:27 AM	Start	Execution	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	None
March 31, 2023 10:58:52 AM	Audit	Data	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Data files Path : F:\Data\ND_FID,D\FID1A.ch
March 31, 2023 11:00:53 AM	End	Execution	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Run Count : 1
March 31, 2023 11:02:02 AM	Start	Execution	Signal to Noise - Manual Injection, Front SSL, Front FID: - Detector FID - L: >= 300000	None
March 31, 2023 11:14:32 AM	Audit	AppClosed	Session	None

User Name: seenguthal.tarak
 Hostname: LAPTOP-CQ3SKOMV

System Id: GC_MS_03_52_CN10925102
 Print Date: March 31, 2023 1:21:53 PM

GC_MS_03_52_CN10925102 Transaction log :

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

User Name: saenguthai.tarak
 Hostname: LAPTOP-CQ3SKOMV

System Id: GC_MS_03_52_CN10925102
 Print Date: March 31, 2023 1:21:53 PM

GC_MS_03_52_CN10925102 Transaction log :

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

User Name: saenguthai.tanak
Hostname: LAPTOP-CQ3SKQMV

System Id: GC_MS_03_52_CN10925102
Print Date: March 31, 2023 1:21:53 PM

GC_MS_03_52_CN10925102 Transaction log :

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

ลำดับที่ 3

ระดับเสียงในบรรยากาศโดยทั่วไป

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0413

MTC No. EEL. BP. 109/0366

CALIBRATION CERTIFICATE

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

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

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
: Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : ACO

Model : 2127

Serial No. : 130006

Ambient Environment

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

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

Ambient Pressure : $(101.325 \pm 1.500) \text{ kPa}$

Standards used : 1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
4. Digital Multimeter Agilent 34401A S/N MY44005560.
5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
6. Audio Analyzer Keithley 2015-P S/N 4106495.
7. Condenser Microphone Bruel&Kjaer 4180 S/N 2889871.

Calibration Procedure: CP-102-04 based on IEC 60942-2003. The sound pressure level of instrument was measured by standard microphone using an insert voltage technique.

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

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

Date of Receipt : 27 Mar. 2023

Date of Calibration : 29 Mar. 2023

1 / 2

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

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BL.MTC.002 Rev.4

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Office/Laboratory
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Fax. (66) 0 2579 8592
E-mail : sumalee@tistr.or.th

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0413

MTC No. EEL. BP. 109/0366

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

Nominal Output of Unit Under Test = 94 dB re 20 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	93.94	-0.06	± 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	999.9	-0.1	± 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 not included.

Calibrated by :

.....
(Mr.Weerachai Deechaiyae)

Approved by :

.....

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 29 Mar. 2023

Date of Issue : 30 Mar. 2023

Ref : 2011266032701228001

End of Certificate

2 / 2

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

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FM.BL.MTC.002 Rev.4

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Fax. (66) 0 2323 9165
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Thailand
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
Fax. (66) 0 2579 8592
E-mail : sumalee@tistr.or.th



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

Noise R_347/23

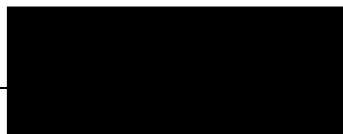
Sound Level Meter Calibration Report

Acoustic Calibrator Data						
Brand	ACO			Number	AC 03/56	
Model	2127			Serial No.	130006	
Calibration Range	94 dB, 1000 Hz			Last Calibration	29 March 2023	
				Due Date	29 March 2024	

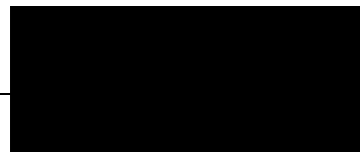
Calibration Data						
Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-R11	ACO	6236	00172038	04 July 2023	94.1	94.0
ACO-R14	ACO	6236	00172061	04 July 2023	94.1	94.0
ACO-R15	ACO	6236	00172062	04 July 2023	94.0	94.0
ACO-R34	ACO	6236	00192046	04 July 2023	94.0	94.0

Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)	93.94 ± 0.10 dB
--	-----------------

Calibrated by :



Approved by :



ลำดับที่ 4

ระดับเสียงในสถานประกอบการ

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0413

MTC No. EEL. BP. 109/0366

CALIBRATION CERTIFICATE

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

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

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
: Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : ACO

Model : 2127

Serial No. : 130006

Ambient Environment

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

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

Ambient Pressure : $(101.325 \pm 1.500) \text{ kPa}$

Standards used : 1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
4. Digital Multimeter Agilent 34401A S/N MY44005560.
5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
6. Audio Analyzer Keithley 2015-P S/N 4106495.
7. Condenser Microphone Bruel&Kjaer 4180 S/N 2889871.

Calibration Procedure: CP-102-04 based on IEC 60942-2003. The sound pressure level of instrument was measured by standard microphone using an insert voltage technique.

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

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

Date of Receipt : 27 Mar. 2023

Date of Calibration : 29 Mar. 2023

1 / 2

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FM.BL.MTC.002 Rev.4

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0413

MTC No. EEL. BP. 109/0366

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

Nominal Output of Unit Under Test = 94 dB re 20 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	93.94	-0.06	± 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	999.9	-0.1	± 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 not included.

Calibrated by :

.....
(Mr. Weerachai Deechaiyae)

Approved by :

.....

Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 29 Mar. 2023

Date of Issue : 30 Mar. 2023

Ref : 2011266032701228001

End of Certificate

2 / 2

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

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FM.BL.MTC.002 Rev.4

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Thailand

Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217

Fax. (66) 0 2579 8592

E-mail : sumalee@tistr.or.th



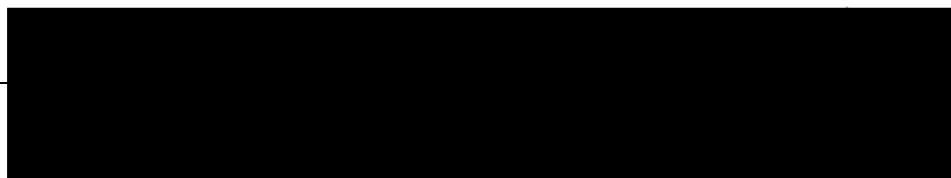
บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

Noise R_347/23

Sound Level Meter Calibration Report

Acoustic Calibrator Data						
Brand		ACO		Number		AC 03/56
Model		2127		Serial No.		130006
Calibration Range		94 dB, 1000 Hz		Last Calibration		29 March 2023
				Due Date		29 March 2024
Calibration Data						
Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-R12	ACO	6236	00172040	04 July 2023	94.0	94.0
ACO-R13	ACO	6236	00172041	04 July 2023	94.0	94.0
ACO-R18	ACO	6236	00172065	04 July 2023	94.0	94.0
ACO-R19	ACO	6236	00182001	04 July 2023	94.0	94.0
ACO-R20	ACO	6236	00182003	04 July 2023	94.1	94.0
ACO-R21	ACO	6236	00182004	04 July 2023	94.0	94.0
ACO-R25	ACO	6236	00192037	04 July 2023	94.0	94.0
ACO-R37	ACO	6236	00192049	04 July 2023	94.1	94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.94 ± 0.10 dB	

Calibrated by :





Noise R_520/23

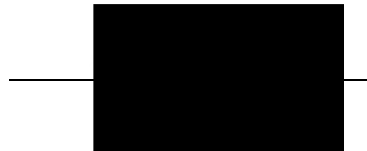
Sound Level Meter Calibration Report

Acoustic Calibrator Data						
Brand	ACO			Number	AC 03/56	
Model	2127			Serial No.	130006	
Calibration Range	94 dB, 1000 Hz			Last Calibration	29 March 2023	
				Due Date	29 March 2024	
Calibration Data						
Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-R15	ACO	6236	00172062	04 October 2023	94.0	94.0
ACO-R17	ACO	6236	00172064	04 October 2023	94.0	94.0
ACO-R19	ACO	6236	00182001	04 October 2023	94.0	94.0
ACO-R20	ACO	6236	00182003	04 October 2023	94.0	94.0
ACO-R21	ACO	6236	00182004	04 October 2023	94.0	94.0
ACO-R22	ACO	6236	00182010	04 October 2023	94.0	94.0
ACO-R23	ACO	6236	00192035	04 October 2023	94.0	94.0
ACO-R25	ACO	6236	00192037	04 October 2023	94.0	94.0
ACO-R28	ACO	6236	00192040	04 October 2023	94.0	94.0
ACO-R32	ACO	6236	00192044	04 October 2023	94.0	94.0
ACO-R33	ACO	6236	00192045	04 October 2023	94.0	94.0
ACO-R34	ACO	6236	00192046	04 October 2023	94.0	94.0
ACO-R35	ACO	6236	00192047	04 October 2023	94.0	94.0
ACO-R42	ACO	6236	00192054	04 October 2023	94.0	94.0
ACO-R44	ACO	6236	00192056	04 October 2023	94.0	94.0
ACO-R46	ACO	6236	00192058	04 October 2023	94.0	94.0
ACO-R47	ACO	6236	00192059	04 October 2023	94.0	94.0
ACO-R48	ACO	6236	00192060	04 October 2023	94.0	94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.94 ± 0.10 dB	

Calibrated by :



Approved by :



ลำดับที่ 5

คุณภาพน้ำทิ้ง



QUALITY CALIBRATION CO.,LTD.

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

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



CERTIFICATE No : 22E9693

REFERENCE No : 66476-1

PAGE : 1 OF 3

Certificate of Calibration

EQUIPMENT : pH METER

MANUFACTURER : HANNA

MODEL : HI 3512

SERIAL No : TH118035

ID No : pH 04/56

CONDITION AS RECEIVED : USED ITEM

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

CALIBRATED BY : 

CALIBRATION DATE : 15-Sep-22

APPROVED BY : 

ISSUED DATE : 15-Sep-22

RECEIVED DATE : 14-Sep-22

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



QUALITY CALIBRATION CO.,LTD.

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

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

CERTIFICATE No : 22E9693

PAGE : 2 OF 3

Calibration Report

EQUIPMENT : pH METER
MANUFACTURER : HANNA
ID No : pH 04/56
RECEIVED DATE : 14-Sep-22
AMBIENT TEMPERATURE : 20 °C ± 1 °C
MODEL : HI 3512
SERIAL NUMBER : TH118035
CALIBRATION DATE : 15-Sep-22
RELATIVE HUMIDITY : 50 % RH ± 10% RH

CONDITION OF THIS RESULTS OF CALIBRATION

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

<u>INSTRUMENT</u>	<u>MODEL</u>	<u>SERIAL No/</u> <u>LOT No</u>	<u>CERTIFICATE No</u>	<u>DUE DATE</u>
1) pH STANDARD SOLUTION	00651-06	CC719181	4880-12119147	05-Apr-23
2) pH STANDARD SOLUTION	00651-08	CC718727	4881-12110709	31-Mar-23
3) pH STANDARD SOLUTION	00651-10	CC717045	4882-12065386	17-Mar-23
4) PROCESS CALIBRATOR	CA150	91S6079	22E1145	31-Mar-23
5) BATH	260014	1247 48074	22T9870	13-Sep-23
6) THERMOMETER WITH PROBE	421504	55000379	22T9904	13-Sep-23

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

RESULT OF CALIBRATION : ADJUSTMENT

1. DISPLAY UNIT ONLY

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

mV APPLIED	UUC READING (mV)	CORRECTION (mV)	UUC READING (pH)	UNCERTAINTY OF MEASUREMENT (± mV)	COVERAGE FACTOR k
414.11	414.8	-0.69	-0.171	0.14	2.0
354.95	355.6	-0.65	0.860	0.14	2.0
295.80	296.4	-0.60	1.892	0.14	2.0
236.64	237.2	-0.56	2.922	0.14	2.0
177.48	178.0	-0.52	3.954	0.14	2.0
118.32	118.8	-0.48	4.985	0.14	2.0
59.16	59.7	-0.54	6.016	0.14	2.0
0.00	0.5	-0.50	7.049	0.14	2.0
-59.16	-58.8	-0.36	8.136	0.14	2.0
-118.32	-117.9	-0.42	9.223	0.14	2.0
-177.48	-177.1	-0.38	10.311	0.14	2.0
-236.64	-236.3	-0.34	11.399	0.14	2.0
-295.80	-295.5	-0.30	12.487	0.14	2.0
-354.95	-354.7	-0.25	13.575	0.14	2.0
-414.11	-413.9	-0.21	14.662	0.14	2.0

END OF CALIBRATION REPORT PAGE 2 OF 3

**QUALITY CALIBRATION CO.,LTD.**

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

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

CERTIFICATE No : 22E9693

PAGE : 3 OF 3

Calibration Report**RESULT OF CALIBRATION (CONTINUE) :****2. DISPLAY UNIT WITH pH ELECTRODE S/N: 09081C6M**

STANDARD pH BUFFER SOLUTION (pH)	UUC READING (pH)	CORRECTION (pH)	VALUE BEFORE ADJUSTMENT	UNCERTAINTY OF MEASUREMENT (± pH)	COVERAGE FACTOR k
4.007	4.007	0.000	3.996	0.012	2.0
7.004	7.006	-0.002	6.944	0.012	2.0
10.016	10.012	0.004	10.194	0.014	2.0

3. DISPLAY UNIT WITH TEMPERATURE

STANDARD READING (°C)	UUC READING (°C)	CORRECTION (°C)	VALUE BEFORE ADJUSTMENT	UNCERTAINTY OF MEASUREMENT (± °C)	COVERAGE FACTOR k
25.003	25.0	0.003	---	0.0085	2.0

4. PERCENT SLOPE 100%

UUC : UNIT UNDER CALIBRATION

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

END OF CALIBRATION REPORT



CERTIFICATE No : 23M2442

REFERENCE No : 68471-2

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE

MANUFACTURER : SARTORIUS

MODEL : BSA224S-CW

SERIAL No : 36591843

ID No : BA 09/61

CONDITION AS RECEIVED : USED ITEM

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

CALIBRATED BY : ATSAWIN Y.

CALIBRATION DATE : 10-Mar-23

APPROVED BY : 

ISSUED DATE : 16-Mar-23

RECEIVED DATE : 10-Mar-23



CERTIFICATE No : 23M2442

PAGE : 2 OF 2

Calibration Report

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

CONDITION OF THIS RESULTS OF CALIBRATION

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

2. REFERENCE STANDARD INSTRUMENTS :-

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

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

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

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

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

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

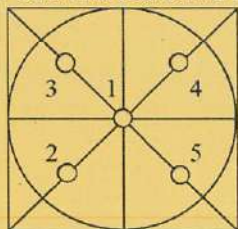
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (\pm g)
0.0	0.0000	0.0000	0.000058
0.1	0.1000	0.0000	0.000059
0.2	0.2000	0.0000	0.000059
0.5	0.5000	0.0000	0.000060
1.0	1.0000	0.0000	0.000060
2.0	2.0000	0.0000	0.000061
5.0	5.0000	0.0000	0.000063
10.0	10.0000	0.0000	0.000067
20.0	20.0001	-0.0001	0.000073
50.0	50.0000	0.0000	0.00011
100.0	100.0001	-0.0001	0.00019
200.0	200.0000	0.0000	0.00032

5. OFF CENTER LOADING ERROR



POINT	READING (g)
1	100.0000
2	99.9999
3	99.9998
4	100.0001
5	100.0000
OFF-CENTER LOADING	0.0002

NOTE: THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR $k=2$, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

CERT.No.: HS-U017D

Harikul Science Co.,Ltd.
 694 Soi Ratchadanivet 24, Pracharatbamphen,
 Samsaennok, Huaikhwang, Bangkok 10310
 Tel: 0-2274-2456 Fax: 0-2274-2443
 Email: info@harikul.com www.harikul.com
Certificate of Calibration

Calibration Date : 3 Apr 23
 Submitted by : S.P.S CONSULTING SERVICE CO.,LTD
 7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol,
 Chatuchak, Bangkok, Thailand 10900
 Avg Room Temp : 20 °C
 Avg Water Temp : 20 °C
 Air Pressure : 760.00 mmHg
 Salinity : 0 ppt

Model : YSI 5000
 S/N : 15B100751
 Probe : YSI 5010
 S/N : 22D100097
 ID NO. : -
 Air Temp ref : S/N. E00522
 Barometric ref : S/N. E00522
 Water Temp ref : S/N. 11431
 Technician : Kittipong M.

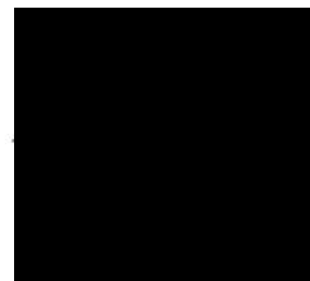
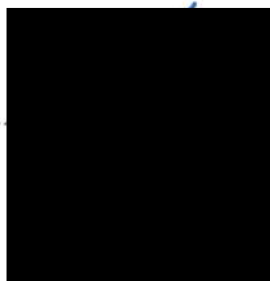
Calibration Details

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

Manufacturer Specification

Accuracy = +/- 0.02 mg/l

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





QUALITY CALIBRATION CO.,LTD.

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

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

www.qcalibration.com

CERTIFICATE No : 22T10972

REFERENCE No : 66837-1

PAGE : 1 OF 3

Certificate of Calibration

EQUIPMENT : COD REACTOR

MANUFACTURER : HACH

MODEL : DRB 200


SERIAL No : 15110C0497

ID No : DRB 04/59

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

CALIBRATED BY : 

CALIBRATION DATE : 20-Dec-22

APPROVED BY : 

ISSUED DATE : 20-Dec-22

RECEIVED DATE : 20-Dec-22



CERTIFICATE No : 22T10972

PAGE : 2 OF 2

Calibration Report

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

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

CONDITION OF THIS RESULTS OF CALIBRATION

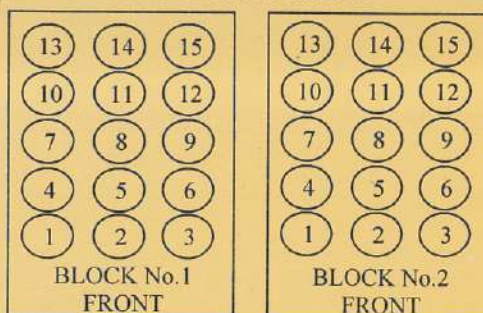
1. THIS INSTRUMENT WAS CALIBRATED BY DIRECT MEASUREMENT TEMPERATURE RECORDER WITH THERMOCOUPLE TYPE K UNDER NO LOAD CONDITION. THE THERMOCOUPLES WERE PLACED ON 15 POINTS AND LOCATED ONE THERMOCOUPLE IN EACH OF THE FOUR CORNERS OF THE REACTOR AND PLACED THE EIGHTH THERMOCOUPLE AT THE CENTER OF THE REACTOR.

2. REFERENCE STANDARD INSTRUMENTS :-

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

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

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



TEMPERATURE MEASUREMENT ACCURACY TEST

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

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

NOTE 2 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY M
COVERAGE FACTOR k =2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



CERTIFICATE No : 23M2442

REFERENCE No : 68471-2

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE

MANUFACTURER : SARTORIUS

MODEL : BSA224S-CW

SERIAL No : 36591843

ID No : BA 09/61

CONDITION AS RECEIVED : USED ITEM

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

CALIBRATED BY : ATSAWIN Y.

CALIBRATION DATE : 10-Mar-23

APPROVED BY : 

ISSUED DATE : 16-Mar-23

RECEIVED DATE : 10-Mar-23



CERTIFICATE No : 23M2442

PAGE : 2 OF 2

Calibration Report

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

CONDITION OF THIS RESULTS OF CALIBRATION

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

2. REFERENCE STANDARD INSTRUMENTS :-

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

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

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

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

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

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

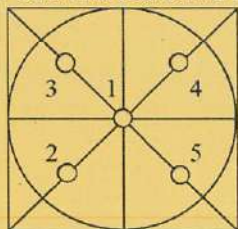
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (\pm g)
0.0	0.0000	0.0000	0.000058
0.1	0.1000	0.0000	0.000059
0.2	0.2000	0.0000	0.000059
0.5	0.5000	0.0000	0.000060
1.0	1.0000	0.0000	0.000060
2.0	2.0000	0.0000	0.000061
5.0	5.0000	0.0000	0.000063
10.0	10.0000	0.0000	0.000067
20.0	20.0001	-0.0001	0.000073
50.0	50.0000	0.0000	0.00011
100.0	100.0001	-0.0001	0.00019
200.0	200.0000	0.0000	0.00032

5. OFF CENTER LOADING ERROR



POINT	READING (g)
1	100.0000
2	99.9999
3	99.9998
4	100.0001
5	100.0000
OFF-CENTER LOADING	0.0002

NOTE: THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR $k=2$, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

SITHIPHORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY



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

NSC-TISI-TIS 17025
CALIBRATION 0394

Cert. No. : SP22018

Pages 1 of 3

Calibration Certificate

Equipment : UV-VIS SPECTROPHOTOMETER
Manufacturer : PERKINELMER
Model : LAMBDA 25
Serial No.: 501S14123010
ID No.: SP03/58
Calibration Mode : WAVELENGTH ACCURACY
PHOTOMETRIC ACCURACY

Condition As Found : GOOD

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

Location : ORGANIC LABORATORY IV

Ambient Temperature : (24.4 ± 5) °C
Relative Humidity : (60.1 ± 25) %

Received Date : 30 AUGUST 2022
Calibration Date : 30 AUGUST 2022
Date of Issue : 31 AUGUST 2022

Calibrated by :

Nathakorn Pisutpaisan

Approved by :



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

Continuation of Calibration Certificate

Cert. No. : SP22018

Job No. : VC65SP0008

Pages : 2 of 3

Calibration Method :

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

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

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

Condition of this result of calibration :

1. Certified reference materials

<u>Material</u>	<u>Ref. type</u>	<u>Cell serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
Holmium liquid	RM-HL	29706	87569	13/10/2022
Didymium liquid	RM-DL	28912	87588	15/10/2022
Neutral density filter	RM-1N2N3N	13877	87600	15/10/2022
Potassium dichromate solutions	RM-0204060810	14204	87614	16/10/2022
Potassium Iodide solution	-	KI-0701-001	CI-0090-22	08/04/2024

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

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

3.1 The UK National Physical Laboratory (NPL)

3.2 The National Institute of Standards and Technology,NIST.

Result of calibration : Wavelength Accuracy

(Without adjustment)

Material	Certified Values of Reference Material (nm)	UUC* Reading (nm)	Error (nm)	Uncertainty ± (nm)	k Factor
RM-HL	278.13	278.3	0.17	0.16	2.00
	361.25	361.4	0.15	0.16	2.00
	467.82	467.8	-0.02	0.16	2.00
	536.56	536.5	-0.06	0.16	2.00
	640.50	640.5	0.00	0.16	2.00
RM-DL	740.09	740.0	-0.09	0.16	2.00
	864.94	865.2	0.26	0.16	2.00

UUC* = Unit Under Calibration

Continuation of Calibration Certificate

Cert. No. : SP22018

Job No. : VC65SP0008

Pages : 3 of 3

Result of calibration : Photometric Accuracy

(Without adjustment)

Material	Wavelength (nm)	Filter: S/N	Nominal Absorbance (A)	Certified Absorbance (A)	UUC* Reading Absorbance (A)	Error (A)	Uncertainty ± (A)	k Factor
Neutral Density glass filter	440.0	29360	1.0	1.0524	1.0539	0.0015	0.0028	2.00
		29914	0.7	0.7454	0.7459	0.0005	0.0029	2.00
		29381	0.5	0.5426	0.5426	0.0000	0.0028	2.00
	546.1	29360	1.0	0.9822	0.9810	-0.0012	0.0028	2.00
		29914	0.7	0.6962	0.6960	-0.0002	0.0028	2.00
		29381	0.5	0.5076	0.5070	-0.0006	0.0029	2.00
	590.0	29360	1.0	1.0221	1.0202	-0.0019	0.0028	2.00
		29914	0.7	0.7238	0.7230	-0.0008	0.0029	2.00
		29381	0.5	0.5364	0.5360	-0.0004	0.0031	2.00
	635.0	29360	1.0	0.9751	0.9732	-0.0019	0.0028	2.00
		29914	0.7	0.6912	0.6902	-0.0010	0.0029	2.00
		29381	0.5	0.5214	0.5210	-0.0004	0.0032	2.00
Material	Wavelength (nm)	Solution (mg/l)	Certified Absorbance (A)	UUC* Reading Absorbance (A)	Error (A)	Uncertainty ± (A)	k Factor	
RM-0204060810	235.0	20	0.2436	0.2419	-0.0017	0.0101	2.00	
		40	0.4905	0.4855	-0.0050	0.0115	2.00	
		60	0.7453	0.7388	-0.0065	0.0067	2.00	
		80	0.9920	0.9839	-0.0081	0.0071	2.00	
		100	1.2487	1.2414	-0.0073	0.0073	2.00	

UUC* = Unit Under Calibration

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

Resolution of Wavelength Mode 0.1 nm

Resolution of Photometric Mode 0.0001 A

Parameter Setting

Measurement Mode Wavelength, Absorbance

Wavelength Scan 1100 nm-190 nm

Scanning Speed 7.5 nm/min

Data Pitch 0.1 nm

Band width(Wavelength) 1.0 nm

Band width(Vis) 1.0 nm

Band width(Uv) 1.0 nm

Stray Light UUC* Reading at 220 nm**

Transmission T(%)	Absorbance(A)
0.0107	3.9886

**Specific Acceptance :

Transmission ≤ 1.0 T(%), Absorbance ≥ 2.0 A

**Stray light not TISI Accredited

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

End of Calibration Certificate

ลำดับที่ 6

คุณภาพน้ำทะเลชายฝั่ง

**QUALITY CALIBRATION CO.,LTD.**

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

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



CERTIFICATE No : 22E9693

REFERENCE No : 66476-1

PAGE : 1 OF 3

Certificate of Calibration

EQUIPMENT : pH METER

MANUFACTURER : HANNA

MODEL : HI 3512

SERIAL No : TH118035

ID No : pH 04/56

CONDITION AS RECEIVED : USED ITEM

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

CALIBRATED BY : 

CALIBRATION DATE : 15-Sep-22

APPROVED BY : 

ISSUED DATE : 15-Sep-22

RECEIVED DATE : 14-Sep-22

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



QUALITY CALIBRATION CO.,LTD.

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

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

CERTIFICATE No : 22E9693

PAGE : 2 OF 3

Calibration Report

EQUIPMENT : pH METER
MANUFACTURER : HANNA
ID No : pH 04/56
RECEIVED DATE : 14-Sep-22
AMBIENT TEMPERATURE : 20 °C ± 1 °C
MODEL : HI 3512
SERIAL NUMBER : TH118035
CALIBRATION DATE : 15-Sep-22
RELATIVE HUMIDITY : 50 % RH ± 10% RH

CONDITION OF THIS RESULTS OF CALIBRATION

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

<u>INSTRUMENT</u>	<u>MODEL</u>	<u>SERIAL No/</u> <u>LOT No</u>	<u>CERTIFICATE No</u>	<u>DUE DATE</u>
1) pH STANDARD SOLUTION	00651-06	CC719181	4880-12119147	05-Apr-23
2) pH STANDARD SOLUTION	00651-08	CC718727	4881-12110709	31-Mar-23
3) pH STANDARD SOLUTION	00651-10	CC717045	4882-12065386	17-Mar-23
4) PROCESS CALIBRATOR	CA150	91S6079	22E1145	31-Mar-23
5) BATH	260014	1247 48074	22T9870	13-Sep-23
6) THERMOMETER WITH PROBE	421504	55000379	22T9904	13-Sep-23

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

RESULT OF CALIBRATION : ADJUSTMENT

1. DISPLAY UNIT ONLY

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

mV APPLIED	UUC READING (mV)	CORRECTION (mV)	UUC READING (pH)	UNCERTAINTY OF MEASUREMENT (± mV)	COVERAGE FACTOR k
414.11	414.8	-0.69	-0.171	0.14	2.0
354.95	355.6	-0.65	0.860	0.14	2.0
295.80	296.4	-0.60	1.892	0.14	2.0
236.64	237.2	-0.56	2.922	0.14	2.0
177.48	178.0	-0.52	3.954	0.14	2.0
118.32	118.8	-0.48	4.985	0.14	2.0
59.16	59.7	-0.54	6.016	0.14	2.0
0.00	0.5	-0.50	7.049	0.14	2.0
-59.16	-58.8	-0.36	8.136	0.14	2.0
-118.32	-117.9	-0.42	9.223	0.14	2.0
-177.48	-177.1	-0.38	10.311	0.14	2.0
-236.64	-236.3	-0.34	11.399	0.14	2.0
-295.80	-295.5	-0.30	12.487	0.14	2.0
-354.95	-354.7	-0.25	13.575	0.14	2.0
-414.11	-413.9	-0.21	14.662	0.14	2.0

END OF CALIBRATION REPORT PAGE 2 OF 3

**QUALITY CALIBRATION CO.,LTD.**

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

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

CERTIFICATE No : 22E9693

PAGE : 3 OF 3

Calibration Report**RESULT OF CALIBRATION (CONTINUE) :****2. DISPLAY UNIT WITH pH ELECTRODE S/N: 09081C6M**

STANDARD pH BUFFER SOLUTION (pH)	UUC READING (pH)	CORRECTION (pH)	VALUE BEFORE ADJUSTMENT	UNCERTAINTY OF MEASUREMENT (\pm pH)	COVERAGE FACTOR k
4.007	4.007	0.000	3.996	0.012	2.0
7.004	7.006	-0.002	6.944	0.012	2.0
10.016	10.012	0.004	10.194	0.014	2.0

3. DISPLAY UNIT WITH TEMPERATURE

STANDARD READING ($^{\circ}$ C)	UUC READING ($^{\circ}$ C)	CORRECTION ($^{\circ}$ C)	VALUE BEFORE ADJUSTMENT	UNCERTAINTY OF MEASUREMENT (\pm $^{\circ}$ C)	COVERAGE FACTOR k
25.003	25.0	0.003	---	0.0085	2.0

4. PERCENT SLOPE 100%

UUC : UNIT UNDER CALIBRATION

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

END OF CALIBRATION REPORT



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

Cert.No.: 23CH432

Page.: 1 of 2

Certificate of Calibration

Equipment : Turbidity Meter
Manufacturer : Eutech
Model : Cyberscan WL TB1000
Serial No. : 201802206
ID. No. : TB 03/61
Condition As-Received: Used Item
Received Date : 29 March 2023
Calibration Date : 30 March 2023
Reference : 2303-1034WN-1
Submitted by : S.P.S. Consulting Service Co.,Ltd.
7 Phaholyothin 24, Phaholyothin Road.,
Jompol, Chatuchak, Bangkok 10900
Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 20) %
Calibration Procedure : In - house method : CP-CH11
based on direct measurement by
using Formazin standard solution

Calibrated by : Walalak Sirithean

Approved by :

(/) Malee Butkruea
() Saithip Meangmai
() Warakorn Lerngagtrakul

Issue Date : 31 March 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 Calibration and Testing Equipment Services.

A 0010867



Cert.No. : 23CH432

Page. : 2 of 2

Condition of this calibration result

1. Reference Standard Instruments :

This certification is traceable to the International System of unit (SI unit) through Technology Promotion Association (Thailand-Japan).

<u>Instruments</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Certificate No.</u>	<u>Due date</u>
1) Thermo-Hygrograph	1103328	130EC010	22H1313	12 June 2023
2) Electronic Balance	N03679	140RC001	22MM49	20 Sep 2023

2. Standard Material : The Formazin suspension has been prepared gravimetric from

<u>Material</u>	<u>Manufacturer</u>	<u>Lot No.</u>	<u>Assay</u>
1) Hexamethylenetetramine	HIMEDIA	0000493947	99.65%
2) Hydrazinium Sulfate	HIMEDIA	0000522014	99.40%

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

Calibration result

Performing three - Formazin suspension standard curve by using 0,10,1000 NTU
Turbidity Meter Serial Number : 201802206

Standard Formazine suspension (NTU)	UUC* Reading (NTU)	Uncertainty of Measurement (\pm NTU)	Coverage Factor <i>k</i>
20	19.3	0.38	2.00
40	39.0	0.40	2.00
100	99.2	0.70	2.00
400	391	1.5	2.00

Remark

- UUC* = Unit Under Calibration
- NTU = Nephelometric Turbidity Units

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

-o0o-



CERTIFICATE No : 23M2442

REFERENCE No : 68471-2

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE

MANUFACTURER : SARTORIUS

MODEL : BSA224S-CW

SERIAL No : 36591843

ID No : BA 09/61

CONDITION AS RECEIVED : USED ITEM

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

CALIBRATED BY : 

CALIBRATION DATE : 10-Mar-23

APPROVED BY : 

ISSUED DATE : 16-Mar-23

RECEIVED DATE : 10-Mar-23



CERTIFICATE No : 23M2442

PAGE : 2 OF 2

Calibration Report

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

CONDITION OF THIS RESULTS OF CALIBRATION

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

2. REFERENCE STANDARD INSTRUMENTS :-

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

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

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

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

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

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

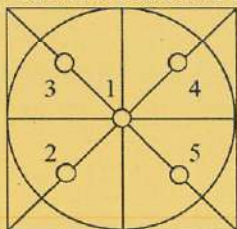
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (\pm g)
0.0	0.0000	0.0000	0.000058
0.1	0.1000	0.0000	0.000059
0.2	0.2000	0.0000	0.000059
0.5	0.5000	0.0000	0.000060
1.0	1.0000	0.0000	0.000060
2.0	2.0000	0.0000	0.000061
5.0	5.0000	0.0000	0.000063
10.0	10.0000	0.0000	0.000067
20.0	20.0001	-0.0001	0.000073
50.0	50.0000	0.0000	0.00011
100.0	100.0001	-0.0001	0.00019
200.0	200.0000	0.0000	0.00032

5. OFF CENTER LOADING ERROR



POINT	READING (g)
1	100.0000
2	99.9999
3	99.9998
4	100.0001
5	100.0000
OFF-CENTER LOADING	0.0002

NOTE: THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR $k=2$, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

CERT.No.: HS-U017D

Harikul Science Co.,Ltd.
 694 Soi Ratchadanivet 24, Pracharatbamphen,
 Samsaennok, Huaikhwang, Bangkok 10310
 Tel: 0-2274-2456 Fax: 0-2274-2443
 Email: info@harikul.com www.harikul.com
Certificate of Calibration

Calibration Date : 3 Apr 23
 Submitted by : S.P.S CONSULTING SERVICE CO.,LTD
 7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol,
 Chatuchak, Bangkok, Thailand 10900
 Avg Room Temp : 20 °C
 Avg Water Temp : 20 °C
 Air Pressure : 760.00 mmHg
 Salinity : 0 ppt

Model : YSI 5000
 S/N : 15B100751
 Probe : YSI 5010
 S/N : 22D100097
 ID NO. : -
 Air Temp ref : S/N. E00522
 Barometric ref : S/N. E00522
 Water Temp ref : S/N. 11431
 Technician : Kittipong M.

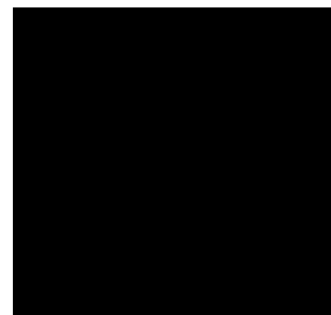
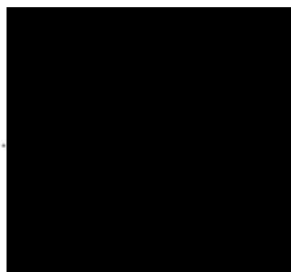
Calibration Details

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

Manufacturer Specification

Accuracy = +/- 0.02 mg/l

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





QUALITY CALIBRATION CO.,LTD.

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

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

www.qcalibration.com

CERTIFICATE No : 22T10972

REFERENCE No : 66837-1

PAGE : 1 OF 3

Certificate of Calibration

EQUIPMENT : COD REACTOR

MANUFACTURER : HACH

MODEL : DRB 200


SERIAL No : 15110C0497

ID No : DRB 04/59

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

CALIBRATED BY : 

CALIBRATION DATE : 20-Dec-22

APPROVED BY : 

ISSUED DATE : 20-Dec-22

RECEIVED DATE : 20-Dec-22



CERTIFICATE No : 22T10972

PAGE : 2 OF 2

Calibration Report

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

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

CONDITION OF THIS RESULTS OF CALIBRATION

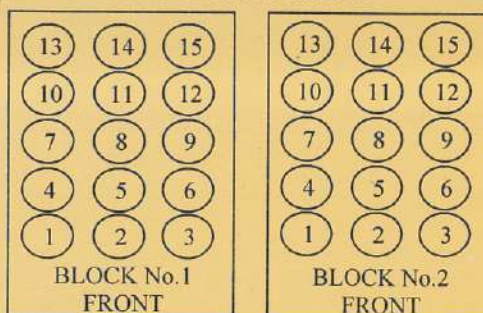
1. THIS INSTRUMENT WAS CALIBRATED BY DIRECT MEASUREMENT TEMPERATURE RECORDER WITH THERMOCOUPLE TYPE K UNDER NO LOAD CONDITION. THE THERMOCOUPLES WERE PLACED ON 15 POINTS AND LOCATED ONE THERMOCOUPLE IN EACH OF THE FOUR CORNERS OF THE REACTOR AND PLACED THE EIGHTH THERMOCOUPLE AT THE CENTER OF THE REACTOR.

2. REFERENCE STANDARD INSTRUMENTS :-

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

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

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



TEMPERATURE MEASUREMENT ACCURACY TEST

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

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

NOTE 2 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY IN
COVERAGE FACTOR k =2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



CERTIFICATE No : 23M2442

REFERENCE No : 68471-2

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE

MANUFACTURER : SARTORIUS

MODEL : BSA224S-CW

SERIAL No : 36591843

ID No : BA 09/61

CONDITION AS RECEIVED : USED ITEM

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

CALIBRATED BY : 

CALIBRATION DATE : 10-Mar-23

APPROVED BY : 

ISSUED DATE : 16-Mar-23

RECEIVED DATE : 10-Mar-23



CERTIFICATE No : 23M2442

PAGE : 2 OF 2

Calibration Report

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

CONDITION OF THIS RESULTS OF CALIBRATION

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

2. REFERENCE STANDARD INSTRUMENTS :-

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

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

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

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

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

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

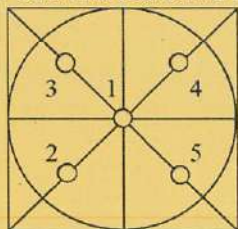
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (\pm g)
0.0	0.0000	0.0000	0.000058
0.1	0.1000	0.0000	0.000059
0.2	0.2000	0.0000	0.000059
0.5	0.5000	0.0000	0.000060
1.0	1.0000	0.0000	0.000060
2.0	2.0000	0.0000	0.000061
5.0	5.0000	0.0000	0.000063
10.0	10.0000	0.0000	0.000067
20.0	20.0001	-0.0001	0.000073
50.0	50.0000	0.0000	0.00011
100.0	100.0001	-0.0001	0.00019
200.0	200.0000	0.0000	0.00032

5. OFF CENTER LOADING ERROR



POINT	READING (g)
1	100.0000
2	99.9999
3	99.9998
4	100.0001
5	100.0000
OFF-CENTER LOADING	0.0002

NOTE: THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR $k=2$, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

SITHIPHORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY



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

NSC-TISI-TIS 17025
CALIBRATION 0394

Cert. No. : SP22018

Pages 1 of 3

Calibration Certificate

Equipment : UV-VIS SPECTROPHOTOMETER
Manufacturer : PERKINELMER
Model : LAMBDA 25
Serial No.: 501S14123010
ID No.: SP03/58
Calibration Mode : WAVELENGTH ACCURACY
PHOTOMETRIC ACCURACY

Condition As Found : GOOD

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

Location : ORGANIC LABORATORY IV

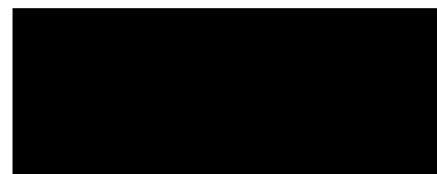
Ambient Temperature : (24.4 ± 5) °C
Relative Humidity : (60.1 ± 25) %

Received Date : 30 AUGUST 2022
Calibration Date : 30 AUGUST 2022
Date of Issue : 31 AUGUST 2022

Calibrated by :

Nathakorn Pisutpaisan

Approved by :



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

Continuation of Calibration Certificate

Cert. No. : SP22018

Job No. : VC65SP0008

Pages : 2 of 3

Calibration Method :

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

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

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

Condition of this result of calibration :

1. Certified reference materials

<u>Material</u>	<u>Ref. type</u>	<u>Cell serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
Holmium liquid	RM-HL	29706	87569	13/10/2022
Didymium liquid	RM-DL	28912	87588	15/10/2022
Neutral density filter	RM-1N2N3N	13877	87600	15/10/2022
Potassium dichromate solutions	RM-0204060810	14204	87614	16/10/2022
Potassium Iodide solution	-	KI-0701-001	CI-0090-22	08/04/2024

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

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

3.1 The UK National Physical Laboratory (NPL)

3.2 The National Institute of Standards and Technology,NIST.

Result of calibration : Wavelength Accuracy

(Without adjustment)

<u>Material</u>	<u>Certified Values of Reference Material (nm)</u>	<u>UUC* Reading (nm)</u>	<u>Error (nm)</u>	<u>Uncertainty ± (nm)</u>	<u>k Factor</u>
RM-HL	278.13	278.3	0.17	0.16	2.00
	361.25	361.4	0.15	0.16	2.00
	467.82	467.8	-0.02	0.16	2.00
	536.56	536.5	-0.06	0.16	2.00
	640.50	640.5	0.00	0.16	2.00
RM-DL	740.09	740.0	-0.09	0.16	2.00
	864.94	865.2	0.26	0.16	2.00

UUC* = Unit Under Calibration

Continuation of Calibration Certificate

Cert. No. : SP22018
Job No. : VC65SP0008
Pages : 3 of 3

Result of calibration : Photometric Accuracy

(Without adjustment)

Material	Wavelength (nm)	Filter: S/N	Nominal Absorbance (A)	Certified Absorbance (A)	UUC* Reading Absorbance (A)	Error (A)	Uncertainty ± (A)	k Factor
Neutral Density glass filter	440.0	29360	1.0	1.0524	1.0539	0.0015	0.0028	2.00
		29914	0.7	0.7454	0.7459	0.0005	0.0029	2.00
		29381	0.5	0.5426	0.5426	0.0000	0.0028	2.00
	546.1	29360	1.0	0.9822	0.9810	-0.0012	0.0028	2.00
		29914	0.7	0.6962	0.6960	-0.0002	0.0028	2.00
		29381	0.5	0.5076	0.5070	-0.0006	0.0029	2.00
	590.0	29360	1.0	1.0221	1.0202	-0.0019	0.0028	2.00
		29914	0.7	0.7238	0.7230	-0.0008	0.0029	2.00
		29381	0.5	0.5364	0.5360	-0.0004	0.0031	2.00
	635.0	29360	1.0	0.9751	0.9732	-0.0019	0.0028	2.00
		29914	0.7	0.6912	0.6902	-0.0010	0.0029	2.00
		29381	0.5	0.5214	0.5210	-0.0004	0.0032	2.00
Material	Wavelength (nm)	Solution (mg/l)	Certified Absorbance (A)	UUC* Reading Absorbance (A)	Error (A)	Uncertainty ± (A)	k Factor	
RM-0204060810	235.0	20	0.2436	0.2419	-0.0017	0.0101	2.00	
		40	0.4905	0.4855	-0.0050	0.0115	2.00	
		60	0.7453	0.7388	-0.0065	0.0067	2.00	
		80	0.9920	0.9839	-0.0081	0.0071	2.00	
		100	1.2487	1.2414	-0.0073	0.0073	2.00	

UUC* = Unit Under Calibration

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

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

Stray Light** UUC* Reading at 220 nm	
Transmission T(%)	Absorbance(A)
0.0107	3.9886

**Specific Acceptance :

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

**Stray light not TISI Accredited

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

End of Calibration Certificate